2nd European Advanced Accelerator Concepts Workshop

Abstracts book

Table of contents

Abstract ID : 1

Future Applications of the Dielectric Wakefield Accelerators in the SINBAD Project at DESY

Content :

Short, high-brightness relativistic electron bunches can drive ultra-high wakefields in the dielectric wakefield accelerators (DWFAs). Such effect can be used to generate high power THz coherent Cherenkov radiation, accelerate trailing particles in a witness bunch with gradient two orders of magnitude larger than that in the conventional RF linear accelerators, and produce energy modulation or reduce the correlated energy spread within the driving bunch itself, etc. The paper will study potential applications of the DWFAs in the SINBAD facility at DESY. The simulations show that the 100 MeV ultra-short bunches from the SINBAD injector ARES can excite accelerating wakefield with peak amplitudes of a few GV/m at frequencies higher than 10 THz in proper DWFA structures. In addition, we also present that the DWFA structure can serve as a de-chirper to reduce the correlated energy spread of the bunches accelerated by the laser plasma wakefield accelerator where the 100 MeV ARES ultra-short bunches are injected externally.

Primary authors : Dr. NIE, Yuancun (DESY)

Co-authors :

Presenter : Dr. NIE, Yuancun (DESY)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : poster

Submitted by : Dr. NIE, Yuancun

Submitted on Tuesday 17 March 2015

Last modified on : Tuesday 17 March 2015

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Status : SUBMITTED

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Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

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Date :

Comments : ""

Abstract ID : 2

BESTIA - the next-generation ultra-fast CO2 laser for advanced accelerator research

Content :

Strong-field research will benefit from ultrafast(3-10 cycles), relativistically intense (a0>>1), long wavelength (>>1um) lasers. The enhanced plasma response mainly manifested through a quadratic wavelength scaling of the ponderomotive energy and the critical density is deemed especially favorable for advanced laser plasma accelerators.
A next-generation mid-IR laser project is under construction at the BNL ATF as a part of the user facility upgrade. We discuss our innovative approach to this new 100-TW, 100-fs,9÷10um CO_2 laser BESTIA (Brookhaven Experimental Supra-Terawatt Infrared at ATF). Progress made recently, including chirped pulse amplification, already led to increase in the laser power delivered to ATF users' experiments.
BESTIA will enable new regimes in the acceleration of ions and electrons. In tenuous plasmas, it will be capable to generate plasma "bubbles" thousand times bigger in volume compared to those produced with near-IR solid state lasers of equivalent power. This wavelength scaling will facilitate the study of external seeding and staging of Laser Wake Field Accelerators.
Another example is the shock-wave ion acceleration from over-critical gas jets. At its full power, BESTIA should produce quasi-monoenergetic beams of protons at 200 MeV energy.

Primary authors : Dr. POGORELSKY, Igor (BNL)

Co-authors : Dr. POLYANSKIY, Mikhail (bnl) ; Prof. BEN-ZVI, Ilan (BNL) ; Mr. BABZIEN, Marcus (BNL) ; Mr. SKARITKA, John (BNL)

Presenter : Dr. POGORELSKY, Igor (BNL)

Track classification : WG7 - Laser technology for advanced accelerators

Contribution type : talk

Submitted by : Dr. POGORELSKY, Igor

Submitted on Wednesday 18 March 2015

Last modified on : Wednesday 27 May 2015

Comments :

Although, the talk's best subject fit is WG7 it is also not to be missed by WG1 and WG2 audience. Therefore, the best envisioned fit is a plenary session (sorry for self-inviting).
Other possibility for a broader exposure I am aiming for is a poster in addition to the WG7 contributed talk.
I am open to the committee's judgment about the best format, and will submit a second abstract for a poster if suggested.
IP

Status : SUBMITTED

Track judgments :

Track : WG7 - Laser technology for advanced accelerators

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 3

Phase space moment equation model of highly relativisitic electron beams in plasma wakefield accelerators

Content :

This talk outlines a new theoretical procedure for modelling the transverse dynamics of relativistic electron beams injected into plasma-based accelerators operated in the blow-out regime. Quantities of physical interest, such as the emittance,are furnished directly from solution of phase space moment equations formed from the relativistic Vlasov equation. The moment equations are closed by an Ansatz, and then solved analytically for a prescribed wakefield. The accuracy of the analytic result is established by benchmarking against a both a semi-analytic numerical procedure and a PIC simulation.

Primary authors : Prof. ROBSON, Robert (Griffith University, Australia)

Co-authors : Dr. MEHRLING, Timon (DESY) ; Dr. OSTERHOFF, Jens (DESY)

Presenter : Prof. ROBSON, Robert (Griffith University, Australia)

Track classification : WG6 - Theory and simulations

Contribution type : talk

Submitted by : Prof. ROBSON, Robert

Submitted on Monday 23 March 2015

Last modified on : Friday 22 May 2015

Comments :

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Track judgments :

Track : WG6 - Theory and simulations

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 4

Optimization of single bunch driven plasma wakefield acceleration in quasi-nonlinear regime

Content :

We report our studies on the single bunch driven plasma wakefield acceleration (PWFA) in quasi-nonlinear regime (QNL). For the QNL, a weak blowout can be obtained by using a relatively low-charge driving bunch with a density larger than that of the background plasma. In this case, the bubble formation leads to ultra-high accelerating wakefield and a transformer ratio exceeding the linear limit of 2, while the low total driving charge preserves certain linear behaviors of the excited wakefield. It was demonstrated that a cigar bunch shape was suitable for producing the so called QNL-PWFA regime. The case studies showed how one could optimize the plasma density for given driving bunch parameters and how to improve the bunch shape in order to make the useful accelerating wakefield and the transformer ratio as large as possible, under the guidance of the conventional linear theory. A useful accelerating field gradient of 3.7 GV/m and a transformer ratio of 2.3 were obtained via the interaction of a 100 μm, 250 pC relativistic electron bunch with the underdense ambient plasma.

Primary authors : Dr. NIE, Yuancun (DESY)

Co-authors :

Presenter : Dr. NIE, Yuancun (DESY)

Track classification : WG1 - Electron beams from plasmas

Contribution type : poster

Submitted by : Dr. NIE, Yuancun

Submitted on Monday 23 March 2015

Last modified on : Monday 23 March 2015

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

Judged by :

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Comments : ""

Abstract ID : 5

Advanced diagnostics for Laser Plasma Acceleration experiments.

Content :

Several radiation-based diagnostics for Laser Plasma Acceleration are presently studied in laboratories around the world. Of these the most interesting seem to be the Betatron Radiation, Thomson Scattering and Radiation Transition. In the presentation will highlight the potential of these techniques together with their limits and feasibility. In particular the Betatron Radiation as tool to diagnose the acceleration length, transverse bunch size and electron energy will be taken into account. The effects of the electron acceleration, energy spread, initial space-momentum configuration on the Betatron Radiation spectra, together with the elliptical shape of the accelerating structure and the possible interaction of the electrons with the laser field will be considered. A compact analytic method for first-order fast calculations of the Betatron Radiation spectral and spatial distribution will also be provided and discussed.

Primary authors : Dr. CURCIO, Alessandro (LNF)

Co-authors : Prof. GIULIETTI, Danilo (Dipartimento di Fisica dell'Università e INFN di Pisa)

Presenter : Dr. CURCIO, Alessandro (LNF)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures ; WG5 - High-gradient plasma structures/Advanced beam diagnostics ; WG6 - Theory and simulations

Contribution type : talk

Submitted by : CURCIO, Alessandro

Submitted on Wednesday 01 April 2015

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Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
Judged by :
Date :
Comments : ""

Track : WG6 - Theory and simulations

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 6

Energetic Particles from Laser Produced Plasmas and Applications

Content :

Since the beginning of the high power pulsed laser era, the energy of particles, emerging from plasmas generated in laser matter-interaction, was found sensibly higher than that expected on the basis of the plasma estimated temperature.The evolution in the laser pulse amplification techniques and the progressive shortening of the pulse duration was accompanied by a corresponding increase in power. This led to the production of particles of increasingly greater energy as new acceleration mechanisms could be reached. The characteristics of these sources of energetic particles strongly depend on the laser-pulse and target parameters, opening to different applications, from advanced acceleration technique to medicine, from new X-ray sources to the inertial confinement fusion.

Primary authors : Prof. GIULIETTI, Danilo (PI)

Co-authors : Dr. BONASERA, Aldo (LNS-INFN) ; Dr. CIPRIANI, Mattia (ENEA) ; Dr. CONSOLI, Fabrizio (ENEA) ; Dr. CURCIO, Alessandro (LNF) ; Dr. DE ANGELIS, Riccardo (ENEA) ; Dr. DELLE SIDE, Domenico (Salento University) ; Prof. NASSISI, Vincenzo (Salento University) ; Prof. TORRISI, Lorenzo (Messina University)

Presenter : Prof. GIULIETTI, Danilo (PI)

Track classification : WG1 - Electron beams from plasmas ; WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : GIULIETTI, Danilo

Submitted on Thursday 02 April 2015

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Track judgments :

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Judged by :
Date :
Comments : ""

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 7

Thermionic Electron Beam Guns for Accelerators

Content :

Thermionic Electron Beam (TEB) is main part of all types of linear accelerators in the field of Experimental High Energy Physics. In present work, we discussed applications of the electron beam with special reference to e-beam generation at high energy linear accelerators.

Primary authors : Dr. FARIDI, M. Ayub (Centre for High Energy Physics, University of the Punjab Lahore Pakistan)

Co-authors : Dr. IQBAL, Munawar (Centre for High Energy Physics, university of the Punjab Lahore Pakistan)

Presenter : Dr. FARIDI, M. Ayub (Centre for High Energy Physics, University of the Punjab Lahore Pakistan) ; Dr. IQBAL, Mur

Track classification : WG6 - Theory and simulations

Contribution type : talk

Submitted by : Dr. FARIDI, M. Ayub

Submitted on Wednesday 08 April 2015

Last modified on : Wednesday 08 April 2015

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Track judgments :

Track : WG6 - Theory and simulations

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 8

A New Scheme for High-Intensity Laser-Driven Electron Acceleration in a Plasma

Content :

We propose a new approach to high-intensity relativistic laser-driven electron acceleration in a plasma. Here, we demonstrate that a plasma wave generated by a stimulated forward-scattering of an incident laser pulse can be in the longest acceleration phase with injected relativistic beam electrons. This is why the plasma wave has the maximum amplification coefficient which is determined by the acceleration time and the breakdown (overturn) electric field in which the acceleration of the injected beam electrons occurs. We must note that for the longest acceleration phase the relativity of the injected beam electrons plays a crucial role in our scheme. We estimate qualitatively the acceleration parameters of relativistic electrons in the field of a plasma wave generated at the stimulated forward-scattering of a high-intensity laser pulse in a plasma.

Primary authors : Dr. SADYKOVA, Saltanat (Juelich Research Centre)

Co-authors : Prof. RUKHADZE, Anri (Prokhorov General Physics Institute) ; Prof. SAMKHARADZE, T (Moscow State University for Instrument Engineering and Computer Sceinces)

Presenter : Dr. SADYKOVA, Saltanat (Juelich Research Centre)

Track classification : WG6 - Theory and simulations

Contribution type : poster

Submitted by : Dr. SADYKOVA, Saltanat

Submitted on Wednesday 15 April 2015

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Track judgments :

Track : WG6 - Theory and simulations

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Comments : ""

Abstract ID : 9

Low energy gamma-gamma collider for QED measurements

Content :

Advanced Compton back-scattering sources under development for nuclear physics and photonics are enabling a new generation of gamma ray beams of high brilliance, which in turns allow now to conceive a low energy collider of photon beams in the 0.5-3 MeV center of mass energy range, with luminosity in the 10^25-10^26 s^-1cm^-2 range, just enough to generate a few events per day of elastic photon-photon scattering and a few tens of events per second of Breit-Wheeler (pair production in vacuum, i.e matter creation from light). None f these fundamental and long time predicted QED processes have been experimentally observed so far. An overview of other technologies possibly usable for these investigations will be discussed, based on high intensity lasers or high power bremsstrahlung sources or FEL's, and the uniqueness of Compton back-scattered based gamma-gamma collider in attaining the requested luminosity will be shown.

Primary authors : SERAFINI, Luca (MI)

Co-authors :

Presenter : SERAFINI, Luca (MI)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : SERAFINI, Luca

Submitted on Friday 24 April 2015

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Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 10

Synchronization of ebeam and laser beam in 'Trojan horse' plasma wakefield experiment

Content :

We observed Electro_Optic Sampling(EOS) signals on ZnTe and GaP with different thicknesses. The critical step for "Trojan horse" plasma wakefield acceleration experiment (E210) in FACET is to synchronize electron beam and laser beam at hundreds of femtosecond level to guarantee laser is injected into plasma bubble generated by driver bunch. EOS is a reliable technique to synchronize beams and has been applied in THz experiment for years. In our experiment, we are able to estimate ebeam bunch length from EOS signal width and compare result with TCAV measurement. Also, we explored the effect of TCAV and phase ramp on timing.

Primary authors : Mr. XI, Yunfeng (UCLA)

Co-authors : Dr. DENG, Aihua (UCLA) ; Mr. KARGER, Oliver (University of Hamburg, Institute for Experimental Physics) ; Dr. LITOS, Michael (SLAC) ; Dr. MANAHAN, Grace (University of Strathclyde) ; KNETSCH, Alexander (DESY)

Presenter : Mr. XI, Yunfeng (UCLA)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Mr. XI, Yunfeng

Submitted on Monday 04 May 2015

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Track judgments :

Track : WG1 - Electron beams from plasmas

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Date :

Comments : ""

Abstract ID : 11

Beam manipulation with Velocity Bunching for PWFA applications

Content :

SPARC-LAB is exploring the PWFA scheme by using multi-bunch electron
beam as driver to excite resonantly the plasma in a capillary discharge.
Velocity bunching is used to generate the train of short (<100fs) bunches
with the temporal spacing required to achieve the proper accelerating field and to accelerate the trailing witness bunch with low energy spread. Comparison between simulation and experimental results will be presented and future plan will be outlined

Primary authors : POMPILI, Riccardo (LNF)

Co-authors : ANANIA, Maria Pia (LNF) ; BELLAVEGLIA, Marco (LNF) ; CHIADRONI, Enrica (LNF) ; CIANCHI, Alessandro (ROMA2) ; FERRARIO, Massimo (LNF) ; VILLA, Fabio (LNF) ; SHPAKOV, Vladimir (LNF) ; VACCAREZZA, Cristina (LNF) ; ROMEO, Stefano (LNF)

Presenter : POMPILI, Riccardo (LNF)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : invited talk

Submitted by : POMPILI, Riccardo

Submitted on Monday 04 May 2015

Last modified on : Thursday 28 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :

Judged by :

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Comments : ""

Abstract ID : 12

X-band accelerator structures: on going R at the LNF-INFN

Content :

In the framework of a large collaboration among SLAC (USA), KEK (Japan) and INFN-LNF, our laboratories have been involved in the design, manufacture and test of short high power standing wave (SW) sections operating at 11.424 GHz. Because electroforming is a very attractive technique to manufacture compact structures avoiding the soft brazing while maintaining mechanical properties and high vacuum requirements, recently an electroformed SW structure has been realized. We report here the characterization of a hard high gradient RF accelerating structure at 11.424 GHz fabricated using the electroforming technique. Low-level RF measurements and high power RF tests carried out at the SLAC National Accelerator Laboratory are presented and discussed. In addition, based on the electroforming process we present also a possible layout where a water cooling of the irises has been considered for the first time.
Among other R activities, characterization and tests of molybdenum coatings are in progress.

Primary authors : Dr. SPATARO, Bruno (INFN - LNF)

Co-authors :

Presenter : Dr. SPATARO, Bruno (INFN - LNF)

Track classification :

Contribution type : talk

Submitted by : SPATARO, Bruno

Submitted on Wednesday 06 May 2015

Last modified on : Wednesday 06 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 13

An influence of plasma on the wakefield amplitude excited in a dielectric structure by bunch train

Content :

An influence of plasma on wakefield amplitude excited in dielectric structure by a sequence of relativistic electron bunches is investigated. The considered structure is a dielectric waveguide of a cylindrical configuration with the axial drift channel filled with plasma. Dependences of amplitude of longitudinal electric field on plasma density for three cases are obtained: a) parameters of dielectric structure and bunch train are fixed; b) inner or c) external radius of a dielectric tube is changed according to the change of plasma frequency. For the cases b) and c) the bunch repetition frequency is tuned to the plasma frequency and frequency of the first radial mode of a dielectric wave. It is shown that in the case of fine tuning of frequencies of eigen waves to the bunch repetition frequency due to the change of external radius of structure the interval of plasma densities where amplitude of excited wakefield is significantly higher, than in a vacuum structure, can be enlarged in comparison with two other analyzed cases.

Primary authors : Dr. SOTNIKOV, Gennadiy (NSC Kharkov Institute of Physics and Technology)

Co-authors : Mr. KNIAZIEV, Roman (V. N. Karazin Kharkiv National University) ; Prof. ONISHCHENKO, Ivan (NSC Kharkov Institute of Physics and Technology)

Presenter : Dr. SOTNIKOV, Gennadiy (NSC Kharkov Institute of Physics and Technology)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : talk

Submitted by : Dr. SOTNIKOV, Gennadiy

Submitted on Friday 08 May 2015

Last modified on : Monday 11 May 2015

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Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :
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Date :
Comments : ""

Abstract ID : 14

hybrid-code and PIC-code simulations for PWFA at SPARC_LAB

Content :

We present a possible working point for the Sparc_Lab LNF facility that preserve bunch quality: witness is positioned and shaped so to preserve, over the entire acceleration length, both emittance and energy spread. This configuration is characterised by a 200pC driver and a 20pC follower witness. The one driver plus one witness is extended to a COMB (train of bunches) configuration: 3 drivers plus a witness. Bunch characteristics are taken from recent Sparc_Lab experimental results.

To obtain the effective working point we used, and we currently use, a combination of two codes: Architect, an hybrid fast-running code, and ALaDyn a full PIC-code. Both tools are necessary to fully understand the underlying physics and to quickly asses feasible working points.

Architect is an hybrid code: bunches are treated kinetically while the background plasma is model as a cold fluid. The following approach allow to greatly reduce run time, a few hours, without loss of generality. We wish to point out that Architect is designed not to give qualitative solutions; Architect well predicts solutions up to the weakly-non-linear regimes, well reproducing the bubble-wake profile.

Primary authors : MAROCCHINO, Alberto (ROMA1) ; Mr. MASSIMO, Francesco (Department SBAI, Sapienza Università di Roma)

Co-authors : ROSSI, Andrea Renato (MI) ; CHIADRONI, Enrica (LNF) ; MOSTACCI, Andrea (ROMA1) ; PALUMBO, Luigi (ROMA1) ; FERRARIO, Massimo (LNF)

Presenter : MAROCCHINO, Alberto (ROMA1)

Track classification : WG6 - Theory and simulations

Contribution type : talk

Submitted by : MAROCCHINO, Alberto

Submitted on Tuesday 12 May 2015

Last modified on : Tuesday 12 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 15

Application of a PWFA to a X-ray FEL

Content :

Linac based X-ray FELs impact many fields of science. Some experiments require larger photon flux and shorter wavelength. Increasing the beam energy increases the pulse energy and decreases the radiation wavelength.

We explore with numerical simulations the possibility of using a plasma wakefield accelerator scheme to increase the beam energy without significantly increasing the accelerator length.

As an example we consider parameters of the Swiss FEL beam.

For the witness bunch, we assume the parameters envisaged for normal operation at 5.8 GeV. We determine the plasma and drive bunch parameters to double the witness bunch energy in a meter-scale distance. In order to preserve the witness bunch emittance, the PWFA has to operate in the non-linear regime. Loading of the plasma wake is necessary to keep the final energy spread at an acceptable level.

We study two options for the incoming witness bunch energy. In the first option the bunch enters the plasma with the full linac energy (5.8 GeV). In the second one, it has the energy reached after the accelerator second bunch compressor (2.1 GeV).
Numerical simulations are preformed in 2D cylindrical symmetry with the code OSIRIS. Initial results will be presented.

Primary authors : Ms. ISRAELI, Yasmine (Max Planck Institute for Physics)

Co-authors : Prof. MUGGLI, Patric (Max-Planck-Institut für Physik) ; Prof. SILVA, L. (IST) ; Dr. VIEIRA, Jorge (Instituto Superior Tecnico) ; Dr. PEDROZZI, M. (PSI) ; Dr. REICHE, S. (PSI)

Presenter : Ms. ISRAELI, Yasmine (Max Planck Institute for Physics)

Track classification : WG1 - Electron beams from plasmas ; WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : poster

Submitted by : Ms. ISRAELI, Yasmine

Submitted on Wednesday 13 May 2015

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Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 16

Betatron radiation based diagnostics for plasma wakefeld accelerated electron beams at the SPARC_LAB test facility

Content :

Beam diagnostics, both longitudinal and transverse, represents a crucial point for Plasma WakeField Acceleration (PWFA) with external injection. Matching conditions for the beam before the injection into the plasma and the preservation of beam quality at the plasma exit, both require precise beam size measurements. Betatron radiation emitted by the beam during acceleration in the plasma represents a valid tool for transverse beam size measurement, being also non-intercepting. In this work we report on the technical solutions chosen at SPARC LAB for such diagnostics tool, along with expected parameters of betatron radiation.

Primary authors : SHPAKOV, Vladimir (LNF)

Co-authors : CHIADRONI, Enrica (LNF) ; CIANCHI, Alessandro (ROMA2) ; CURCIO, Alessandro (LNF) ; DABAGOV, Sultan (LNF) ; FERRARIO, Massimo (LNF) ; Dr. PAROLI, Bruno (Dipartimento di Fisica, Università degli Studi di Milano) ; POMPILI, Riccardo (LNF) ; ROSSI, Andrea Renato (MI)

Presenter : SHPAKOV, Vladimir (LNF)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : talk

Submitted by : SHPAKOV, Vladimir

Submitted on Saturday 16 May 2015

Last modified on : Saturday 23 May 2015

Comments :

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Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
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Date :
Comments : ""

Abstract ID : 17

Laser Ion Acceleration at ELI-ALPS

Content :

Laser acceleration of ions from both solid and gaseous target attracts a great attention because of its potential medical applications including the hadron therapy. The recent development of ELI facility which will host the laser system capable of generating ultra-short pulses in the multiterawatt or even petawatt power range at high repetition rate, which is crucial for the investigation of new regimes of laser-matter interactions, especially laser proton acceleration. The most stable and well understood mechanism is the TNSA (Target Normal Sheath Acceleration), which usually requires long pulse duration in order to reach high cut-off energy. Since at ELI-ALPS the short pulses are in the center of interest, we have to consider different mechanisms, where the RPDA (Radiation Pressure Dominant Acceleration) is the driving process. The schemes of interest are the collision-less Shock Wave Acceleration and Magnetic Vortex Ion Acceleration, which is more efficient in near-critical density plasma.

Primary authors : Dr. SHARMA, Ashutosh (ELI-ALPS, Szeged, Hungary)

Co-authors :

Presenter : Dr. SHARMA, Ashutosh (ELI-ALPS, Szeged, Hungary)

Track classification : WG6 - Theory and simulations

Contribution type : poster

Submitted by : Dr. SHARMA, Ashutosh

Submitted on Monday 18 May 2015

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Comments :

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Track : WG6 - Theory and simulations

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Comments : ""

Abstract ID : 18

Attosecond electron sheets and attosecond light pulses from relativistic laser wakefields

Content :

We present a new regime of laser wakefield acceleration from which dense (overcritical density) attosecond (nanometers thick corresponding to attosecond duration) electron sheets (few microns in width determined by the laser focal spot) can be obtained and accelerated. The essential new features are a driving spot greater than the plasma wave length and an upramp-to-plateau density transition that enable disklike density wake wave crests to be trapped as a whole in a very short timescale. We show remarkable radiative properties of the accelerating sheets, including giant half-cycle attosecond pulses from a coherent synchrotronlike radiation and attosecond kilo-electronvolt x-rays via coherent Thomson backscattering. Scalings of these radiations with the laser-plasma parameters will be discussed, indicating attosecond light sources at unprecedented peak powers with the state-of-the-art high-power lasers available now or in the near future. These studies shall enable new opportunities for wakefield acceleration and attosecond applications, and provide vital guide for near-term experiments.

Primary authors : Dr. LI, Fei-yu (SUPA, Department of Physics, University of Strathclyde, Glasgow G4 0NG, United Kingdom) ; Prof. SHENG, Zheng-ming (SUPA, Department of Physics, University of Strathclyde, Glasgow G4 0NG, United Kingdom) ; Prof. CHEN, Min (Key Laboratory for Laser Plasmas (Ministry of Education), Department of Physics and Astronomy, Shanghai Jiao Tong University, Shanghai 200240, China)

Co-authors : Prof. MEYER-TER-VEHN, Juergen (Max-Planck-Institut fuer Quantenoptik, D-85748 Garching, Germany) ; Prof. MORI, Warren (University of California, Los Angeles, California 90095-1547, USA)

Presenter : Dr. LI, Fei-yu (SUPA, Department of Physics, University of Strathclyde, Glasgow G4 0NG, United Kingdom)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Dr. LI, Fei-yu

Submitted on Monday 18 May 2015

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Comments :

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
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Date :

Comments : ""

Abstract ID : 19

Experimental studies for rubidium-plasma generation by femtosecond laser pulses

Content :

The key element in the Proton-Driven-Plasma-Wake-Field-Accelerator (PWFA) experiments is the generation of highly uniform plasma from Rubidium vapor. In the Wigner Research Center of the Hungarian Academy of Sciences we developed an experimental facility which is capable to create an extended - a 25 cm long rubidium plasma via laser interaction. Some properties of the laser plasma can be examined via absorption and spectroscopic measurements from the sides at different temperatures. This study presents the recent results.

Primary authors : Mr. VARGA-UMBRICH, Károly (Wigner Research Center of the Hungarian Academy of Sciences) ; Dr. BARNA, Imre Ferenc (Wigner Research Center of the Hungarian Academy of Sciences)

Co-authors : Prof. BAKOS, József (Wigner Research Center of the Hungarian Academy of Sciences) ; Dr. DJOTYAN, Gagik (Research Center of the Hungarian Academy of Sciences) ; Dr. KEDVES, Miklós Ákos (Research Center of the Hungarian Academy of Sciences) ; Mr. POCSAI, Mihály (Research Center of the Hungarian Academy of Sciences) ; Dr. RÁCZ, Péter (Research Center of the Hungarian Academy of Sciences) ; Dr. RÁCZKEVI, Béla (Research Center of the Hungarian Academy of Sciences) ; Dr. SÖRLEI, Zsuzsa (Research Center of the Hungarian Academy of Sciences) ; Dr. SZIGETI, János (Research Center of the Hungarian Academy of Sciences) ; Dr. IGNÁCZ, Péter (Research Center of the Hungarian Academy of Sciences) ; Mr. BOLLA, Róbert (Research Center of the Hungarian Academy of Sciences) ; Dr. CZITROVSZKY, Aladár (Wigner Research Center of the Hungarian Acaddemy of Sciences) ; Mr. MÁRTON, István (Wigner Research of the Hungarian Academy of Sciences)

Presenter : Dr. BARNA, Imre Ferenc (Wigner Research Center of the Hungarian Academy of Sciences)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics ; WG7 - Laser technology for advanced accelerators

Contribution type : poster

Submitted by : Dr. BARNA, Dr Barna Imre Ferenc

Submitted on Monday 18 May 2015

Last modified on : Monday 18 May 2015

Comments :

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Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :

Judged by :
Date :
Comments : ""

Track : WG7 - Laser technology for advanced accelerators

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 20

Electron Acceleration by a Bichromatic Chirped Laser Pulse in Underdense Plasmas

Content :

An effective theory of laser−plasma based particle acceleration is presented. Here we treated the plasma as a continuous medium with an
index of refraction n_m in which a single electron propagates. We studied the properties of the electron motion due to the Lorentz force and the relativistic equations of motion were numerically solved and analysed. We compared our results to PIC simulations and experimental data. The bichormatic contribution gives an approximate ten percent enhancement in the final electron energy.

Primary authors : Mr. POCSAI, András (Wigner Research Center of the Hungarian Academy of Sciences)

Co-authors : Dr. BARNA, Dr Barna Imre Ferenc (Wigner Research Center of the Hungarian Academy of Sciences) ; Prof. VARRÓ, Sándor (Wigner Research of the Hungarian Academy of Sciences)

Presenter : Dr. BARNA, Dr Barna Imre Ferenc (Wigner Research Center of the Hungarian Academy of Sciences)

Track classification : WG6 - Theory and simulations

Contribution type : poster

Submitted by : Dr. BARNA, Dr Barna Imre Ferenc

Submitted on Monday 18 May 2015

Last modified on : Monday 18 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 21

Beam loading and betatron radiation from a bubble in a deep plasma channel

Content :

We develop an analytical model for beam loading in a bubble generated by a short laser pulse or a relativistic electron bunch in radially inhomogeneous plasma. The influence of a flat-top accelerated electron bunch on the bubble shape is described. The conversion efficiency from the fields of the bubble to the electrons is calculated and the optimal values of bunch charge and its position relative to the bubble that result in the efficiency of nearly 100% are derived. The bunch profile needed to produce a homogeneous accelerating field is also calculated. Betatron radiation from a bubble in a deep plasma channel is studied. The radiation spectrum is calculated. Our results are applied to deep plasma channels with various radial density profiles, namely a profile with the power-law dependence on the radial coordinate and a step-like profile for a hollow channel. We also discuss different approximations for the general theory of nonlinear wakefields in a radially inhomogeneous plasma and their applicability conditions. The model predictions are verified by 3D PIC simulations.

Primary authors : GOLOVANOV, Anton (Lobachevsky State University of Nizhni Novgorod; Institute of Applied Physics RAS)

Co-authors : Dr. KOSTYUKOV, Igor (Institute of Applied Physics RAS) ; Prof. PUKHOV, Alexander (Institut für Theoretische Physik I, University of Düsseldorf; Lobachevsky State University of Nizhni Novgorod) ; Dr. THOMAS, Johannes (Institut für Theoretische Physik I, University of Düsseldorf)

Presenter : GOLOVANOV, Anton (Lobachevsky State University of Nizhni Novgorod; Institute of Applied Physics RAS)

Track classification : WG6 - Theory and simulations

Contribution type : talk

Submitted by : GOLOVANOV, Anton

Submitted on Tuesday 19 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 22

Overview on advanced diagnostics for High Brightness Beams

Content :

Advanced diagnostics are essential tools in the development of plasma-based accelerators. The accurate measurement of the quality of beams at the exit of the plasma channel is crucial and will help also to optimize the parameters of the plasma accelerator. 6D electron beam diagnostics will be reviewed with emphasis on emittance measurement, which is particularly complex due to large energy spread and strong focusing of the emerging beams.

Primary authors : CIANCHI, Alessandro (ROMA2)

Co-authors : FERRARIO, Massimo (LNF) ; POMPILI, Riccardo (LNF) ; CHIADRONI, Enrica (LNF) ; ANANIA, Maria Pia (LNF) ; BISESTO, Fabrizio Giuseppe (LNF) ; CASTELLANO, Michele (LNF) ; SHPAKOV, Vladimir (LNF) ; VACCAREZZA, Cristina (LNF) ; VILLA, Fabio (LNF)

Presenter : CIANCHI, Alessandro (ROMA2)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : invited talk

Submitted by : CIANCHI, Alessandro

Submitted on Tuesday 19 May 2015

Last modified on : Tuesday 19 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 23

Ion acceleration by intense, few-cycle laser pulses with nanodroplets

Content :

The energy distribution of electron and ion beams emerging from the interaction of a few-cycle Gaussian laser pulse with spherical nanoclusters is investigated by means of 2D PIC simulations with the code EPOCH. It is found that the direct conversion of laser energy into dense attosecond electron nanobunches (Di Lucchio & Gibbon, PRSTAB 18, 02/2015) results in rapid charge separation and early onset of Coulomb-explosion-dominated ion dynamics. The ion core of the cluster starts to expand soon after the laser has crossed the droplet, the fastest ions attaining tens of MeV at relativistic intensities. After comparisons of the ion spectra created by two-cycle with those produced by more standard 16-cycle laser pulses, we find that the two-cycle pulse initially leads to a stronger scaling of the ion energies with laser intensity (~I^{2/3}), saturating at the pure Coulomb explosion limit when the electrons are completely stripped from the cluster (Di Lucchio et al., Phys. Plasmas, 2015, in press). The current investigation should serve as a guide for contemporary experiments using state-of-the-art few-cycle ultraintense lasers and electrically isolated nanoclusters of solid density.

Primary authors : Dr. DI LUCCHIO, Laura (Forschungszentrum Juelich)

Co-authors : Prof. ANDREEV, Alexander (MBI) ; Prof. GIBBON, Paul (FZJ)

Presenter : Dr. DI LUCCHIO, Laura (Forschungszentrum Juelich)

Track classification : WG2 - Ion beams from plasmas

Contribution type : talk

Submitted by : Dr. DI LUCCHIO, Laura

Submitted on Tuesday 19 May 2015

Last modified on : Tuesday 19 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG2 - Ion beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 24

Betatron radiation from a self-modulated laser-wakefield accelerator

Content :

To diagnose transient and extreme states of matter, the development of fast (sub-ps) x-ray probes with energies larger than 50 keV is essential for high energy density science experiments.
We will present results from a recent experiment performed using the Titan laser (150 J, 1 ps) at LLNL, showing evidence of Betatron x-rays in the self-modulated regime of laser wakefield acceleration (SMLWF).
When a 0.5-1 ps laser pulse with an intensity approaching 1020 W/cm2 is focused on a gas target (density 1019 cm-3), electrons are accelerated via the SMLWF regime and the direct laser acceleration (DLA) regime. In SMLWF acceleration, electrons are accelerated by the plasma wave created in the wake of the light pulse, whereas in DLA, electrons are accelerated from the interaction of the laser field with the focusing force of the plasma channel. It is the first observation of Betatron radiation in the SMLWF regime, for a0 ~ 1-3. This was enabled by the addition of a long focal length optics, favorable for guiding laser pulses in gases. We will show a detailed Betatron source characterization, electron spectra above 200 MeV and forward laser spectra indicating self modulation.

Primary authors : Dr. ALBERT, Felicie (Lawrence Livermore National Laboratory)

Co-authors : Dr. POLLOCK, Bradley (LLNL) ; Dr. GOYON, Clement (LLNL) ; Ms. SHAW, Jessica (UCLA) ; Dr. LEMOS, Nuno (UCLA) ; Dr. SCHUMAKER, Will (SLAC) ; Mr. MARSH, Ken (UCLA) ; Dr. CLAYTON, Chris (UCLA) ; Dr. FIUZA, Federico (SLAC) ; Dr. GLENZER, Siegfried (SLAC) ; Prof. JOSHI, Chandrashekhar (UCLA)

Presenter : Dr. ALBERT, Felicie (Lawrence Livermore National Laboratory)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Dr. ALBERT, Felicie

Submitted on Thursday 21 May 2015

Last modified on : Thursday 21 May 2015

Comments :

This talk overlaps both WG1 and WG4 themes.

Status : SUBMITTED

Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 25

WAKEFIELD PLASMA LENS, PROVIDING HOMOGENEOUS AND IDENTICAL FOCUSING OF TRAIN OF SHORT RELATIVISTIC ELECTRON BUNCHES

Content :

Focusing of relativistic electron bunches by wakefield, excited in the plasma, is important and interesting. The focusing of bunches by wakefield, excited in plasma by resonant train of relativistic electron bunches is inhomogeneous. Mechanism of focusing in the plasma, in which all bunches of train are focused identically and uniformly, is proposed and investigated by numerical simulation in. This plasma wake lens for short relativistic electron bunches is studied in this paper analytically and by numerical simulation by code lcode. Unbounded nonmagnetized homogeneous plasma is considered. The rectangular in longitudinal direction bunches (i.e. the bunch current is const along bunch axis) are considered in the fixed their current approximation. We consider a homogeneous focusing of train of short bunches. We show that all bunches of train are focused identically and uniformly.

Primary authors : Mrs. LEVCHUK, Iryna (National Science Center Kharkov Institute of Physics and Technology)

Co-authors : Prof. MASLOV, Vasyl (National Science Center Kharkov Institute of Physics and Technology) ; Prof. ONISHCHENKO, Ivan (National Science Center Kharkov Institute of Physics and Technology)

Presenter : Mrs. LEVCHUK, Iryna (National Science Center Kharkov Institute of Physics and Technology)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control ; WG6 - Theory and simulations

Contribution type : poster

Submitted by : Ms. LEVCHUK, Iryna

Submitted on Thursday 21 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :

Comments : ""

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 26

A Laser-Wakefield-Accelerator-Driven Transverse-Gradient Undulator Radiation Source at the JETI Laser in Jena

Content :

An experimental setup for generating undulator radiation at a Laser-Wakefield-Accelerator (LWFA) driven by the JETI laser system in Jena employing a superconducting transverse gradient undulator (TGU) is under development in a collaboration between the KIT and the Friedrich-Schiller-University Jena. The long-term aim of this setup is to explore the potential of the involved concepts of eventually realising laboratory-scale UV or even X-ray free electron lasers (FELs). This long-term goal presents a number of technological as well as general beam and accelerator physics challenges. The generation of spontaneous undulator radiation of good spectral quality at a LWFA, which is the purpose of this setup, would be a major milestone on the way to LWFA-driven FELs.

Recently, the major components of this setup, in particular the
superconducting TGU and a dispersive beam transport system from the LWFA to the TGU have been realized and successfully tested, and experiments investigating --- as a first step --- a linear beam optics for capturing, transporting, spectrally dispersing and focusing the LWFA beam have been conducted. In this contribution we present the current status of these developments.

Primary authors : Dr. BERNHARD, Axel (Karlsruhe Institute of Technology (KIT))

Co-authors : Mrs. AFONSO RODRIGUEZ, Veronica (Karlsruhe Institute of Technology (KIT)) ; Mr. WERNER, Walter (Karlsruhe Institute of Technology (KIT)) ; Mrs. WIDMANN, Christina (Karlsruhe Institute of Technology (KIT)) ; Prof. MUELLER, Anke-susanne (Karlsruhe Institute of Technology (KIT)) ; Prof. WEBER, Marc (Karlsruhe Institute of Technology (KIT)) ; Mr. KUSCHEL, Stephan (Helmholtz Institute Jena) ; SÄVERT, Alexander (Institute for Optics and Quantumelectronics, FSU Jena) ; Mr. SCHWAB, Matthew (Friedrich-Schiller University Jena) ; Prof. KALUZA, Malte (University of Jena, Helmholtz-Institute Jena)

Presenter : Dr. BERNHARD, Axel (Karlsruhe Institute of Technology (KIT))

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Dr. BERNHARD, Axel

Submitted on Friday 22 May 2015

Last modified on : Friday 22 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 27

Electron acceleration behind self-modulating proton beam in plasma with a density gradient

Content :

Presently available high-energy proton beams in circular accelerators carry enough momentum to accelerate high-intensity electron and positron beams to the TeV energy scale over several hundred meters of plasma with a density of ~1e15 1/cm^3. However the plasma wavelength at this density is 100-1000 times shorter than the typical longitudinal size of the high-energy proton beam. Therefore the self-modulation instability (SMI) of a long (~10 cm) proton beam in plasma should be used in order to create the train of micro-bunches which would then drive the plasma wake resonantly. Changing the plasma density profile offers a simple way to control the development of SMI and the acceleration of particles during this process. We present the simulations of the possible use of plasma density gradient as a way to control the injection and acceleration of electron beam during the development of the SMI of 400 GeV proton beam in 10 m long plasma. This work is done in the context of the AWAKE project -- the proof of principle experiment on proton driven plasma wakefield acceleration at CERN.

Primary authors : PETRENKO, Alexey (CERN, Budker INP)

Co-authors :

Presenter : PETRENKO, Alexey (CERN, Budker INP)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : PETRENKO, Alexey

Submitted on Friday 22 May 2015

Last modified on : Friday 22 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 28

High transformer ratio of multi-channel dielectric wakefield structures and real-time diagnostic for charging and damage of dielectrics

Content :

Dielectric wake field (DWA) accelerator concepts are receiving attention of late, on account of their promising performance, mechanical simplicity, and anticipated low cost. Interest in DWA physics directed toward an advanced high-gradient accelerator has been enhanced by a finding that some dielectrics can withstand very high fields (> 1 GV/m) for the short times during the passage of charged bunches along dielectric-lined channels. In a two-channel structure, a drive bunch train propagates in a first channel, and in the second adjacent channel where a high gradient wakefield develops, a witness bunch is accelerated. Compared with single-channel DWA's, a two-beam accelerator delivers higher transformer ratios, and thereby reduces the number of drive beam sections needed to achieve a given final test beam energy. An overview of multi-channel DWA structures will be given, with an emphasis on two-channel structures, presenting their advantages and drawbacks, and potential impact on the field. Studies that were aimed to study charging rate and charge distribution in a thin walled dielectric wakefield accelerator from a passing charge bunch and the physics of conductivity and discharge phenomena in dielectric materials useful for such accelerator applications will also be briefly presented.

Primary authors : Dr. SHCHELKUNOV, Sergey (Omega-P Inc)

Co-authors : Dr. SOTNIKOV, Gennadiy (NSC Kharkov Institute of Physics and Technology) ; Prof. MARSHALL, Thomas C. (Omega-P, Inc) ; Prof. HIRSHFIELD, Jay L. (Omega-P, Inc and Yale University)

Presenter : Dr. SHCHELKUNOV, Sergey (Omega-P Inc)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : invited talk

Submitted by : Dr. SHCHELKUNOV, Sergey

Submitted on Friday 22 May 2015

Last modified on : Friday 22 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :
Judged by :
Date :

Comments : ""

Abstract ID : 29

Real-time diagnostic for charging and damage of dielectrics

Content :

The research will be presented that was aimed to address issues of analysis and mitigation of high repetition rate effects in Dielectric Wakefield Accelerators, and more specifically, to study charging rate and charge distribution in a thin walled dielectric wakefield accelerator from a passing charge bunch and the physics of conductivity and discharge phenomena in dielectric. The issue is the role played by the beam halo and intense wakefields in charging of the dielectric, possibly leading to undesired deflection of charge bunches and degradation of the dielectric material. During initial stage of development, microwave apparatus was built and signal processing was developed for observing time-dependent charging of dielectric surfaces and/or plasmas located on or near the inner surface of a thin-wall hollow dielectric tube. Three frequencies were employed to improve the data handling rate and the signal-to-noise. The test and performance results for a plasma test case will be presented; the performance of the test unit showed capability to detect small changes ~ 0.1% of a dielectric constant, which would correspond to the scraping-off of only 0.3 nC to the walls of the dielectric liner inside the cavity from the passing charge bunch.

Primary authors : Dr. SHCHELKUNOV, Sergey (Omega-P Inc)

Co-authors : Prof. MARSHALL, Thomas C. (Omega-P, Inc) ; Prof. HIRSHFIELD, Jay L. (Omega-P, Inc and Yale University)

Presenter : Dr. SHCHELKUNOV, Sergey (Omega-P Inc)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : talk

Submitted by : Dr. SHCHELKUNOV, Sergey

Submitted on Friday 22 May 2015

Last modified on : Friday 22 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 30

High Efficiency and High-Gradient Acceleration of Electrons and Positrons in a Plasma Wakefield Accelerator

Content :

Recent progress on high-gradient and high-efficiency electron and positron acceleration in a plasma wakefield accelerator at the FACET facility will be described. In the case of electrons, a high current drive bunch is used to produce an extremely nonlinear, high gradient wake in a meter-scale plasma. An appropriately placed trailing bunch containing a significant charge loads the wake and flattens the accelerating field. The particles in the trailing bunch gain energy nearly at the same rate thus maintaining the narrow energy spread of the bunch. The beam loading leads to a high energy extraction efficiency.
For high efficiency, high gradient acceleration of positrons, we use a single, compressed positron bunch. The plasma electrons are now pulled inwards and cross the bunch axis even before the peak current of the bunch is reached. While most of the electrons overshoot the axis and form a bubble-like sheath, some of the plasma electrons are confined near the bunch axis by the back of the positron bunch. This alters (loads) the longitudinal wakefield such that the accelerating field is flattened and a significant fraction of the positrons gain energy at a near constant rate forming a spectrally narrow bunch.

Primary authors : Prof. JOSHI, Chandrashekhar (UCLA)

Co-authors : E200 COLLABORATION AT FACET, SLAC, E200 (SLAC-UCLA)

Presenter : Prof. JOSHI, Chandrashekhar (UCLA)

Track classification : WG1 - Electron beams from plasmas

Contribution type : invited talk

Submitted by : Prof. JOSHI, Chandrashekhar

Submitted on Saturday 23 May 2015

Last modified on : Saturday 23 May 2015

Comments :

This talk will present the latest data from the flagship advanced PWFA experiment at the FACET facility. It will be of interest to the entire conference audience given the topic of the conference. It is more appropriate as a plenary talk than as an invited talk belonging to a particular group (just a suggestion).

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 31

Self modulated dynamics of a relativistic charged particle beam in plasma wake field excitation

Content :

The self modulated dynamics of a relativistic charged particle beam is described within the theory of plasma wake field excitation, where the plasma is assumed to be magnetized, warm and collisional. A novel generalized Poisson-like equation for the wake potential is derived and coupled with the collisional Vlasov equation for the beam dynamics. The virial description and the stability analysis are then provided.

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Presenter : Mrs. AKHTER, Tahmina (Dipartimento di Fisica, Università di Napoli Federico II, Napoli, Italy and INFN Sezione di

Track classification : WG6 - Theory and simulations

Contribution type : talk

Submitted by : AKHTER, Tahmina

Submitted on Saturday 23 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 32

Ion accelerations via the interaction of intense lase pulses with cluster targets

Content :

In order to understand the synergetic interplay between the Coulomb explosion of clusters and the background gas dynamics, an energy spectrum of carbon/oxygen ions from the CO_2 clusters and that of protons from the background hydrogen gas are measured separately at 1×10^19 W/cm^2 with a careful analysis of etch pit structures on CR-39. The maximum energies of carbon/oxygen ions and protons are determined as 1.1 MeV/u and 1.6 MeV, respectively. The structure of electric field and dynamics of contact surface due to the interaction between cluster and background gas are analyzed with help from 2D-PIC simulations. The phenomenon is suggested to have a similarity to a structure formation process in Supernova remnants.
Moreover, we present a development of submicron-size hydrogen cluster targets using a cryogenic conical nozzle and their characterization with the Mie scattering method. Above 10^22 W/cm^2, achievable soon with the coming PW laser facilities, the anisotropic Coulomb explosion of submicron-size hydrogen clusters could produce directional proton beams with energies of several tens of MeV, quite advantageous to the future applications, since they are inherently impurity-free, high rep.rate, and robust.

Primary authors : Dr. FUKUDA, Yuji (Japan Atomic Energy Agency)

Co-authors : Dr. KANASAKI, Masato (Japan Atomic Energy Agency) ; Dr. JINNO, Satoshi (The University of Tokyo) ; Dr. SAKAKI, Hironao (Japan Atomic Energy Agency) ; Dr. NISHIUCHI, Mamiko (Japan Atomic energy Agency) ; Dr. PIROZHKOV, Alexander (Japan Atomic Energy Institute) ; Dr. KIRIYAMA, Hiromitsu (Japan Atomic Energy Agency) ; Dr. KANDO, Masaki (Japan Atomic Energy Agency) ; Dr. KONDO, Kiminori (Japan Atomic Energy Agency) ; Dr. PIKUZ, Tatiana (Osaka University) ; Prof. FAENOV, Anatoly (Osaka University) ; Prof. YAMAUCHI, Tomoya (Kobe University) ; Prof. ODA, Keiji (Kobe University) ; Mrs. SCULLION, Clare (Queen's University Belfast) ; Mr. SMYTH, Ashley (Queen’s University Belfast) ; Mr. ALONSO, Aaron (Queen’s University Belfast) ; Dr. DORIA, Domenico (Queen's University of Belfast) ; Prof. BORGHESI, Marco (Queen's University Belfast) ; Mr. MATSUI, Ryutaro (Kyoto University) ; Prof. KISHIMOTO, Yasuaki (Kyoto University)

Presenter : Dr. FUKUDA, Yuji (Japan Atomic Energy Agency)

Track classification : WG2 - Ion beams from plasmas

Contribution type : talk

Submitted by : Dr. FUKUDA, Yuji

Submitted on Saturday 23 May 2015

Last modified on : Thursday 28 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG2 - Ion beams from plasmas

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 33

WAKEFIELD PLASMA LENS, PROVIDING HOMOGENEOUS AND IDENTICAL FOCUSING OF TRAIN OF SHORT RELATIVISTIC ELECTRON BUNCHES

Content :

Focusing of relativistic electron bunches by wakefield, excited in the plasma, is important and interesting. The focusing of bunches by wakefield, excited in plasma by resonant train of relativistic electron bunches is inhomogeneous. Mechanism of focusing in the plasma, in which all bunches of train are focused identically and uniformly, is proposed and investigated by numerical simulation in. This plasma wake lens for short relativistic electron bunches is studied in this paper analytically and by numerical simulation by code lcode. Unbounded nonmagnetized homogeneous plasma is considered. The rectangular in longitudinal direction bunches (i.e. the bunch current is const along bunch axis) are considered in the fixed their current approximation. We consider a homogeneous focusing of train of short bunches. We show that all bunches of train are focused identically and uniformly.

Primary authors : Mrs. LEVCHUK, Iryna (NSC Kharkov Institute of Physics & Technology, 61108 Kharkov, Ukraine)

Co-authors : Prof. MASLOV, Vasyl (NSC Kharkov Institute of Physics & Technology, 61108 Kharkov, Ukraine) ; Prof. ONISHCHENKO, Ivan (NSC Kharkov Institute of Physics & Technology, 61108 Kharkov, Ukraine)

Presenter : Mrs. LEVCHUK, Iryna (NSC Kharkov Institute of Physics & Technology, 61108 Kharkov, Ukraine)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control ; WG6 - Theory and simulations

Contribution type : poster

Submitted by : Ms. LEVCHUK, Iryna

Submitted on Monday 25 May 2015

Last modified on : Monday 25 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :

Judged by :

Date :

Comments : ""

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 34

Piecewise-homogeneous model for electron side injection into linear plasma waves

Content :

An analytical-piecewise homogeneous model for side injection of an external electron beam into linear plasma waves is developed. The dynamics of transverse betatron oscillation of the electrons are studied. Based on the characteristics of the transversal motion the longitudinal motion of the electrons is described. The results of the analytical model are verified by numerical simulations in the scope of the piecewise-homogeneous model. The results predicted by this model are also compared to the results given by a more realistic inhomogeneous model. Comparison of the results to the 3D PIC simulations is discussed.

Primary authors : GOLOVANOV, Anton (Lobachevsky State University of Nizhni Novgorod; Institute of Applied Physics RAS)

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Presenter : GOLOVANOV, Anton (Lobachevsky State University of Nizhni Novgorod; Institute of Applied Physics RAS)

Track classification : WG6 - Theory and simulations

Contribution type : poster

Submitted by : GOLOVANOV, Anton

Submitted on Monday 25 May 2015

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Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 35

EMMITANCE’s INFLUENCE ON TRANSVERSE DYNAMICS OF ACCELERATED BUNCHES IN THE PLASMA-DIELECTRIC WAKEFIELD ACCELERATOR.

Content :

An important issue in the study of transverse dynamics of charged particles bunches is determining the minimum transverse dimensions of the bunch. In the paper[1] was examined acceleration scheme in which to focusing the accelerated bunch transit channel in the dielectric structure was filled plasma. It has been shown that there is a location of bunches, which can achieve simultaneous radial and longitudinal acceleration of the accelerated focusing bunch wake fields, which were initiated by driver bunch.
In this paper we analyze the transverse dynamics of the charged particle bunches in the plasma-dielectric wakefield accelerator with the initial emmitanse bunch.
For the study used a plasma-dielectric structure with the following parameters: quartz tube □d=3.7 with an outer radius b=0.511cm and the inner radius a=0.4cm. Parameters of bunches was selected to appropriate accelerator Argonne laboratory. Plasma density used in calculations np=7.455*10^11cm^-3. In that way,nb/np=1/3.
Obtained results allowed to find the limits of the initial EMMITANCE bunch of charged particles, in which the dynamics of the accelerated bunches remains stable.
[1]R.R.Kniaziev,etc.NuclearInstrumentsandMethodsinPhysicsResearchSectionA. 2014,V.740,pp.124-129.

Primary authors : Mr. KNIAZIEV, Roman (V. N. Karazin Kharkiv National University)

Co-authors : Dr. SOTNIKOV, Gennadiy (NSC Kharkov Institute of Physics and Technology)

Presenter : Mr. KNIAZIEV, Roman (V. N. Karazin Kharkiv National University)

Track classification : WG1 - Electron beams from plasmas ; WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures ; WG6 - Theory and simulations

Contribution type : poster

Submitted by : Mr. KNIAZIEV, Roman

Submitted on Monday 25 May 2015

Last modified on : Monday 25 May 2015

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Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

Judged by :
Date :
Comments : ""

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :
Judged by :
Date :
Comments : ""

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 36

Laser-plasma acceleration: A close view on self-injection mechanisms

Content :

In the original paper, Tajima and Dawson (1979), suggest to use a wakefield generated by an intense laser pulse to accelerate relativistic electron. In the Laser Wakefield Accelerators (LWFA), the high longitudinal electric field supported by plasma waves accelerates trapped (self-injected) electrons to velocities close to wave phase velocity. With respect to the standard RF-linacs, the accelerating distances is 1000 times shorter.
A critical aspect of LWFA is the self-injection mechanism which can influence the shot-to-shot stability. We will report on a recent experimental study on self-injection aimed at the optimization of a LWFA used for radiobiology and secondary sources.We will also compare the experimental results at ILIL laboratory with a PIC simulation code; the Jasmine code.

Primary authors : PALLA, Daniele (PI)

Co-authors : GIZZI, Leonida Antonio (PI) ; Dr. LABATE, Luca (Istituto Nazionale di Ottica - Consiglio Nazionale delle Ricerche) ; Mr. ROSSI, Francesco (INFN Bologna) ; LONDRILLO, Pasquale (BO) ; FERRARA, Paolo (INO CNR (Pisa)) ; FULGENTINI, Lorenzo (INO CNR (Pisa)) ; KOESTER, Petra (INO CNR (Pisa)) ; BAFFIGI, Federica (INo CNR (Pisa))

Presenter : PALLA, Daniele (PI)

Track classification : WG6 - Theory and simulations

Contribution type : either

Submitted by : PALLA, Daniele

Submitted on Monday 25 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 37

Architect: a 2D hybrid kinetic-fluid code for Plasma Wake Field Acceleration

Content :

Plasma Wakefield Acceleration (PWFA) needs efficient simulation tools to assess possible scenarios of experimental interest. While fluid models provide quick tools to understand the basic mechanisms, kinetic methods as the Particle in Cell (PIC)provide the most general and widely used self consistent tools to study the interaction between the injected beam and the plasma. Nonetheless, fully kinetic codes require time-consuming simulations. The need for fast running simulation tools to perform online analysis of PWFA experiments leads to studies on the validity of reduced models.
To address these necessities, a 2D hybrid fluid-kinetic code for PWFA is presented: Architect. The beam particles are treated in a kinetic PIC-like mode, while the plasma wake is treated as a fluid. The reduced number of particles involved in the hybrid model significantly reduces the number of operations required in a simulation with respect of full PIC codes with the same number of dimensions.
The accuracy and validity of the hybrid scheme is assessed against 3D full PIC code ALaDyn simulations, the drastic run time reduction will be highlighted.

Primary authors : Mr. MASSIMO, Francesco (ROMA1) ; MAROCCHINO, Alberto (ROMA1)

Co-authors : CHIADRONI, Enrica (LNF) ; FERRARIO, Massimo (LNF) ; MOSTACCI, Andrea (ROMA1) ; PALUMBO, Luigi (ROMA1) ; ROSSI, Andrea Renato (MI)

Presenter : Mr. MASSIMO, Francesco (ROMA1)

Track classification : WG6 - Theory and simulations

Contribution type : either

Submitted by : MASSIMO, Francesco

Submitted on Monday 25 May 2015

Last modified on : Monday 25 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 38

The Accelerator Test Facility and its Accelerator Stewardship Role*

Content :

The Brookhaven Lab's Accelerator Test Facility (ATF) was recently named a DOE Office of Science User Facility. This new designation of the ATF coincides with major facility upgrades and expansions to accommodate the growing demand of users from industry and academia. This designation recognizes the ATF's past performance, current excellence, and future importance to the Office of Science and our international community of scientific users from industry, academia, and other major laboratories.
The ATF is now funded by the Accelerator Stewardship sub-program at the US DOE High-Energy Physics program, and is the flagship facility of this program.
The ATF has been serving users for about a quarter of a century; in particular it has been a unique site for advanced accelerator concepts R and diverse R on subjects like Free-Electron Lasers, beam instrumentation, laser and beam driven plasma acceleration and much more.
The ATF is undergoing major upgrades to accommodate more users and a greater
range of experiments. These upgrades, dubbed ATF-II, include relocating to a larger building, constructing additional experimental beam lines, and radically increasing the energy and versatility of the ATF laser and electron beams.

Primary authors : Prof. BEN-ZVI, Ilan (Brookhaven National Laboratory)

Co-authors :

Presenter : Prof. BEN-ZVI, Ilan (Brookhaven National Laboratory)

Track classification :

Contribution type : talk

Submitted by : Prof. BEN-ZVI, Ilan

Submitted on Monday 25 May 2015

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Comments :

*) Work supported by Brookhaven Science Associates, LLC, under contract No. DE-AC02-98CH10886 with the US DOE.

Status : SUBMITTED

Track judgments :

Abstract ID : 39

Indirect Proton Beam Self-Modulation Instability Measurements

Content :

AWAKE, the Advanced Proton-Driven Plasma Wakefield Acceleration Experiment, is a proof-of-principle R experiment at CERN using a 400GeV proton beam from the CERN SPS (sigmaz=12mm) which will be sent into a 10m long plasma section with a nominal density of ~7e14 1/cm^3 (plasma wavelength lambda=1mm).
A proton beam with a length much longer than the plasma wavelength experiences a self-modulation instability (SMI) when going through a plasma cell and consequently produces a train of micro-bunches. These micro bunched protons drive the plasma wake resonantly with strong longitudinal and transverse electric fields, which are then used for electron beam acceleration.
In the AWAKE experiment the defocusing of the proton beam at an angle of around 1mrad is a clear indication of this fully developed SMI. Therefore the observations of the proton beam defocusing will be used in the AWAKE experiment as an indirect measurement of the SMI. By using 2imaging screens at a distance of ~8m it is possible to measure both the beam size and its angular divergence.
The layout of the measurement setup and the design of the detectors is shown, the simulations of the expected signals are presented.

Primary authors : Mrs. TURNER, Marlene (CERN/TU Graz)

Co-authors : PETRENKO, Alexey (CERN, Budker INP) ; Dr. GSCHWENDTNER, Edda (CERN) ; Prof. VINCKE, Helmut (CERN) ; Mr. BISKUP, Bartolomej (CERN) ; Dr. MAZZONI, Stefano (CERN)

Presenter : Mrs. TURNER, Marlene (CERN/TU Graz)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics ; WG6 - Theory and simulations

Contribution type : --not specified--

Submitted by : Mrs. TURNER, Marlene

Submitted on Tuesday 26 May 2015

Last modified on : Tuesday 26 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
Judged by :
Date :
Comments : ""

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 40

Modeling of two-electron temperature plasma expansion into vacuum

Content :

A theoretical model is developed to describe self-similar plasma expansion into vacuum with two electron temperature distribution function. The cold electrons are modeled with a Maxwellian distribution while the hot ones are supposed to be nonthermal obeying a kappa distribution function. It is shown that ion density and velocity profiles depend only on cold electrons in early stage of expansion whereas ion acceleration is strongly enhanced with the proportion of kappa distributed electrons at the ion front. It is also found that when the kappa index is decreasing, the critical value of temperature ratio Teh/Tec, limiting the application of quasi-neutrality, becomes larger than the value obtained in the two electron Maxwellian Bezzerides model [1].

[1]: B. Bezzerides, D. W. Forslund, and E. L. Lindman, Phys. Fluids 21, 2179 (1978)

Primary authors : Mr. BARA, Djemai (CDTA)

Co-authors : Dr. BENNACEUR-DOUMAZ, Djamila (CDTA)

Presenter : Mr. BARA, Djemai (CDTA)

Track classification : WG6 - Theory and simulations

Contribution type : poster

Submitted by : Mr. BARA, Djemai

Submitted on Tuesday 26 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 41

Opto-acoustic measurements of the plasma density within a gas-filled capillary plasma source

Content :

Plasma density represents a very important parameter for both laser wakefield acceleration and plasma wakefield acceleration, which use a gas-filled capillary plasma source. Several techniques can be used to measure the plasma density within a capillary discharge, which are mainly based on optical diagnostic methods, as an example the well-known spectroscopic method using the Stark broadening effect. In this work, we want to introduce a preliminary study about an alternative way to detect the plasma density, based on the shock waves produced by gas discharge in a capillary plasma source. Firstly, the measurements of the acoustic spectral content relative to the laser-induced plasmas by a solid target allowed us to understand the main properties of the acoustic waves produced during this kind of plasma generation; afterwards, we have extended such acoustic technique to the capillary plasma source in order to calibrate it by comparison with the stark broadening method.

Primary authors : Dr. BIAGIONI, Angelo (LNF)

Co-authors : Dr. ANANIA, Maria Pia (LNF) ; Dr. BELLAVEGLIA, Marco (LNF) ; Dr. CHIADRONI, Enrica (LNF) ; Dr. CIANCHI, Alessandro (ROMA2) ; Dr. DI GIOVENALE, Domenico (LNF) ; Dr. DI PIRRO, Giampiero (LNF) ; Dr. FERRARIO, Massimo (LNF) ; Dr. FILIPPI, Francesco (ROMA1) ; Dr. MOSTACCI, Andrea (ROMA1) ; Dr. POMPILI, Riccardo (LNF) ; Dr. SHPAKOV, Vladimir (LNF) ; Dr. VACCAREZZA, Cristina (LNF) ; Dr. VILLA, Fabio (LNF) ; Prof. ZIGLER, Arie (LNF)

Presenter : Dr. BIAGIONI, Angelo (LNF)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : either

Submitted by : BIAGIONI, Angelo

Submitted on Tuesday 26 May 2015

Last modified on : Tuesday 26 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 42

Investigations of the concept of a multibunch dielectric wakefield accelerator

Content :

Theoretical and experimental investigations of the physical principles of multibunch dielectric wakefield accelerator creation that is based on wakefield excitation in the dielectric structure by a sequence of relativistic electron bunches are presented. The purpose of the concept was to enhance wakefield intensity due to multibunch coherent excitation, multimode summation of transversal modes, and wakefields accumulation in a resonator. The sequence of bunches can be divided into exciting and accelerated parts in any proportion by means of its displacing into decelerating/accelerating phases of wakefield at the proper detuning of bunch repetition frequency relative to the frequency of the excited wakefield principle mode. A periodic sequence of 6000 electron bunches, each of energy 4.5MeV, charge 0.16nC, duration 60psec, diameter 1.0cm, and angular spread 0.05 mrad was produced by a linear resonant accelerator. Bunch repetition frequency 2805 MHz can be varied within 2MHz by means of changing master oscillator frequency. The sequence of bunches was injected into copper waveguide/resonator of cylindrical or rectangular cross-section partially filled with dielectric. Also the change of the permittivity and loss tangent of dielectrics under the influence of 100 MeV electron beam radiation exposure was studied.

Primary authors : Prof. ONISHCHENKO, Ivan (NSC KIPT)

Co-authors :

Presenter : Prof. ONISHCHENKO, Ivan (NSC KIPT)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : invited talk

Submitted by : Prof. ONISHCHENKO, Ivan

Submitted on Tuesday 26 May 2015

Last modified on : Tuesday 26 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 43

Beam-driven plasma acceleration of electrons and positrons at FACET

Content :

Beam-driven plasma accelerators, with their high electric fields and energy efficiencies, are being considered as a mean to make future electron-positron colliders more compact and affordable. The field of beam-driven plasma acceleration has recently seen a rapid experimental progress, in particular with the last few years of running of the FACET facility at SLAC.

I will present some of the key results recently obtained at FACET. First, the acceleration of a distinct trailing bunch of electrons, at high fields and with high energy efficiency, was demonstrated. We have also shown that a short electron bunch is capable of generating very high fields in a beam-ionized high-ionization-potential gas, leading to energy gains of nearly 30 GeV in a ~25 cm acceleration distance. The problematic of the acceleration of the electron antimatter counterpart, the positron, was studied. A new regime where energy is efficiently transferred from the front to the rear within a single positron bunch was discovered. The self-loading of the wake leads to the formation of a narrow energy spread bunch of positrons. Finally, experimental results on hollow plasma channels, which are also considered for positron acceleration, will be presented.

Primary authors : Prof. CORDE, Sébastien (Ecole Polytechnique)

Co-authors : Dr. ADLI, Erik (University of Oslo, Norway) ; Mr. ALLEN, James (SLAC National Accelerator Laboratory) ; Dr. AN, Weiming (UCLA) ; Dr. CLARKE, Christine (SLAC National Accelerator Laboratory) ; Dr. CLAYTON, Chris (UCLA) ; Dr. DELAHAYE, Jean-pierre (SLAC National Accelerator Laboratory) ; Mr. FREDERICO, Joel (SLAC National Accelerator Laboratory) ; Mr. GESSNER, Spencer (SLAC National Accelerator Laboratory) ; Dr. GREEN, Selina (SLAC National Accelerator Laboratory) ; HOGAN, Mark (SLAC National Accelerator Laboratory) ; Prof. JOSHI, Chandrashekhar (UCLA) ; Mr. LINDSTROM, Carl (University of Oslo) ; Dr. LITOS, Michael (SLAC National Accelerator Laboratory) ; Prof. LU, Wei (Tsinghua University) ; Dr. MARSH, Ken (UCLA) ; Prof. MORI, Warren (UCLA) ; Prof. MUGGLI, Patric (Max-Planck-Institut für Physik) ; Dr. O'SHEA, Brendan (SLAC National Accelerator Laboratory) ; Mr. VAFAEI-NAJAFABADI, Navid (UCLA) ; Dr. WALZ, Dieter (SLAC National Accelerator Laboratory) ; Dr. YAKIMENKO, Vitaly (SLAC National Accelerator Laboratory)

Presenter : Prof. CORDE, Sébastien (Ecole Polytechnique)

Track classification : WG1 - Electron beams from plasmas

Contribution type : invited talk

Submitted by : Prof. CORDE, Sébastien

Submitted on Tuesday 26 May 2015

Last modified on : Tuesday 26 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 44

Plasma Wakefield Acceleration at VELA/CLARA Facility

Content :

An ultra short, relativistic electron beam with beam energy of 5-250 MeV will be employed to study the key issues in the plasma wakefield acceleration (PWFA) at VELA/CLARA facility at Daresbury laboratory. In this talk, detailed research program on PWFA, e.g. high amplitude wakefield excitation, two-bunch acceleration for VELA/CLARA beam energy doubling, high transformer ratio, long bunch self-modulation and the related beam instabilities will be presented. A 10-20 cm capillary discharge plasma waveguide development will also be discussed.

Primary authors : Dr. METE, Oznur (University of Manchester) ; Mr. HANAHOE, Kieran (University of Manchester) ; Mr. PACEY, Thomas (University of Manchester and the Cockcroft Institute) ; Ms. LI, Yangmei (University of Manchester and the Cockcroft Institute) ; Dr. XIA, Guoxing (Cockcroft Institute and the University of Manchester)

Co-authors : Prof. WELSCH, Carsten (University of Liverpool) ; Mr. WEI, Yelong (University of Liverpool and the Cockcroft Institute)

Presenter : Mr. HANAHOE, Kieran (University of Manchester) ; Dr. XIA, Guoxing (Cockcroft Institute and the University of Ma

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Dr. XIA, Guoxing

Submitted on Tuesday 26 May 2015

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Comments :

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Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 45

Streak camera diagnostics for a self-modulated proton bunch

Content :

The AWAKE experiment relies on the self-modulation instability of a long (ns) proton bunch in a plasma. The self-modulation of the bunch is responsible for resonantly driving the plasma wakefields. The proton bunch develops a density sub-structure with a scale on the order of the plasma wavelength (~1.2 mm) and thus scales with the square root of the plasma density. To detect this sub-structure one needs a diagnostic capable of detecting ~4-5ps periodic density modulation. Optical transition radiation (OTR) provides a prompt light source to diagnose the sub-structure of the bunch with a time resolved measurement using a streak camera.
The diagnostic consists of an OTR screen from which the incoherent light is coupled to a streak camera. The ability of the streak camera to detect the ps modulation of the light signal was tested using beating laser beams. Test results and plans to apply the diagnostic to the AWAKE experiment will be presented.

Primary authors : Mr. RIEGER, Karl (Max Planck Institute for Physics Munich)

Co-authors : Dr. REIMANN, Olaf (Max Planck Institut für Physik) ; Prof. MUGGLI, Patric (Max-Planck-Institut für Physik)

Presenter : Mr. RIEGER, Karl (Max Planck Institute for Physics Munich)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : poster

Submitted by : Mr. RIEGER, Karl

Submitted on Tuesday 26 May 2015

Last modified on : Tuesday 26 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 46

The electron accelerator for the AWAKE experiment at CERN

Content :

The AWAKE collaboration prepares a proton driven plasma wake field acceleration experiment using the SPS beam at CERN. A long proton bunch extracted from the SPS interacts with a high power laser and a 10 m long rubidium vapour plasma cell to create strong wake fields allowing sustained electron acceleration. The electron bunch to probe these wake fields get produced by a 20 MeV electron accelerator. The electron accelerator consists of an rfgun and a short booster structure. This electron source should provide beams with intensities between 0.1 to 1 nC, bunch length's between 0.3 and 3 ps and an emittance of the order of 2 mm mrad. The wide range of parameters should cope with the uncertainties and future prospects of the planned experiments. The layout of the electron accelerator and beam dynamics simulations are presented.

Primary authors : Dr. DOEBERT, Steffen (CERN)

Co-authors : Dr. PEPITONE, Kevin (CERN)

Presenter : Dr. DOEBERT, Steffen (CERN) ; Dr. PEPITONE, Kevin (CERN)

Track classification : WG1 - Electron beams from plasmas

Contribution type : either

Submitted by : Dr. DOEBERT, Steffen

Submitted on Tuesday 26 May 2015

Last modified on : Tuesday 26 May 2015

Comments :

Either Kevin or myself can be the presenter. We are ready to give a short talk in the WG or present a poster

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 47

Temporal and spectral characterization of the ultra-short high power laser pulses.

Content :

One of the most promising techniques about characterization of the ultra-short high power laser pulses is GRENOUILLE, that simplifies the set up compared to other popular full intensity-phase measurement technique. This new technique has many advantages: it is considerably more sensitive, extremely simple to set up and align. It provides us a trace that yields the full pulse intensity and phase, a spectrogram, that involves temporal and frequency resolution simultaneously. We present the development of the analysis software for data acquired by a GRENOUILLE. The software has been tested on experimental images acquired in the Front-End at low-power and in the Target Area Petawatt (full power) at the Vulcan Facility (RAL). This innovative diagnostic will be fruitfully employed on the FLAME laser at LNF-INFN.

Primary authors : Mr. GALLETTI, Mario (Università di Pisa)

Co-authors : Dr. GALIMBERTI, Marco (Science and Technology Facilities Council) ; GIULIETTI, Danilo (PI)

Presenter : Mr. GALLETTI, Mario (Università di Pisa) ; Dr. GALIMBERTI, Marco (Science and Technology Facilities Council)

Track classification : WG7 - Laser technology for advanced accelerators

Contribution type : talk

Submitted by : Mr. GALLETTI, Mario

Submitted on Tuesday 26 May 2015

Last modified on : Tuesday 26 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG7 - Laser technology for advanced accelerators

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 48

Interferometric stabilisation of pulse train generation and high repetition rate, high energy fibre laser development

Content :

We review recent experimental work carried out at Oxford University on laser technology for conventional and plasma wakefield accelerators. We demonstrate using a low power, inexpensive continuous wave laser to stabilise a double unbalanced Michelson interferometer. When a pulsed laser is injected into the interferometers a train of up to 4 pulses with freely controlled variable spacing and intensity produced, stabilised to less than one-twentieth of a wavelength. This technique can be transferred to higher power lasers to produce controlled pulse trains for multiple-pulse laser wakefield acceleration (MP-LWFA). We also report on progress towards high repetition rate (6.5MHz) fibre lasers for accelerator applications such as laserwire or driving photocathodes, including compression of high energy pulses in burst mode operation to near transform limited duration with excellent spatial mode quality and efficiency.

Primary authors : Dr. CORNER, Laura (JAI, Oxford University) ; Mr. SHALLOO, Rob (JAI, Oxford University) ; Mr. TUDOR, Peter (JAI, Oxford University)

Co-authors :

Presenter : Dr. CORNER, Laura (JAI, Oxford University)

Track classification : WG7 - Laser technology for advanced accelerators

Contribution type : talk

Submitted by : Dr. CORNER, Laura

Submitted on Tuesday 26 May 2015

Last modified on : Thursday 28 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG7 - Laser technology for advanced accelerators

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 49

Science and the art of inventiveness

Content :

A talk of a general interest about connecting science with the industrial art of inventiveness. The industrial methodology of inventiveness is rarely heard of in scientific world, but is used widely in the industrial world. Mixing science with industrial methodology give a new powerful eye-opening method that can stimulate inventiveness in science.

Primary authors : Prof. SERYI, Andrei (John Adams Institute for Accelerator Science)

Co-authors :

Presenter : Prof. SERYI, Andrei (John Adams Institute for Accelerator Science)

Track classification :

Contribution type : invited talk

Submitted by : Prof. SERYI, Andrei

Submitted on Tuesday 26 May 2015

Last modified on : Tuesday 26 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 50

UH-FLUX project

Content :

Research plans toward UH-FLUX (Ultra High - Flux) project -- compact Compton X-ray source based on SC coupled dual cavity linac with energy recovery.

Primary authors : Prof. SERYI, Andrei (John Adams Institute for Accelerator Science)

Co-authors :

Presenter : Prof. SERYI, Andrei (John Adams Institute for Accelerator Science)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Prof. SERYI, Andrei

Submitted on Tuesday 26 May 2015

Last modified on : Tuesday 26 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 51

DESIGN AND TEST OF DAMPED/HIGH GRADIENT/HIGH REPETITION RATE C-BAND ACCELERATING STRUCTURES FOR THE ELI-NP LINAC

Content :

The linac energy booster of the European ELI-NP proposal foresees the use of 12, 1.8 m long, travelling wave C-Band structures, with a field phase advance per cell of 2pi/3 and a repetition rate of 100 Hz. Because of the multi-bunch operation, the structures have been designed with a very effective dipole HOM damping system to avoid beam break-up (BBU). They are quasi-constant gradient structures operating at 33 MV/m average accelerating gradient with symmetric input couplers. An optimization of the electromagnetic and mechanical design has been done to simplify the fabrication and to reduce their cost. The first full scale structure has been fabricated, tuned and tested at high power. In the presentation I will illustrate the main design criteria and all the experimental results with particular attention to the high power RF test that demonstrated the feasibility of the high gradient/high repetition rate operation.

Primary authors : ALESINI, David (LNF)

Co-authors : FICCADENTI, Luca (INFN) ; Mr. PIERSANTI, Luca (La Sapienza) ; PALUMBO, Luigi (ROMA1) ; CARDELLI, Fabio (ROMA1) ; LOLLO, Valerio (LNF) ; PETTINACCI, Valerio (ROMA1) ; PELLEGRINO, Luigi (LNF) ; MOSTACCI, Andrea (ROMA1) ; GALLO, Alessandro (LNF) ; MIGLIORATI, Mauro (ROMA1) ; SERAFINI, Luca (MI) ; BINI, Simone (LNF) ; FRASCIELLO, Oscar (LNF)

Presenter : ALESINI, David (LNF)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : talk

Submitted by : ALESINI, David

Submitted on Tuesday 26 May 2015

Last modified on : Tuesday 26 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :

Judged by :

Date :
Comments : ""

Abstract ID : 52

A New Technology for High Gradient Radiofrequency Photogun

Content :

High gradient RF photoguns have been a key development to enable several applications of high quality electron beams. They allow the generation of beams with very high peak current and low transverse emittance, satisfying the tight demands for FELs, ERLs, Compton/Thomson Sources and high-energy linear colliders. In the present paper we present the design of a new RF photogun recently developed for the SPARC photoinjector at LNF and for the ELI-NP photoinjector. This design implements several new features from the electromagnetic point of view and, more important, a novel technology for its realization that does not involve any brazing process. This strongly reduces the cost, the realization time and the risk of failure. Details on the electromagnetic design and low power RF measurements are presented. Results of the high power test performed in two different facilities are also presented.

Primary authors : ALESINI, David (LNF)

Co-authors : FICCADENTI, Luca (INFN) ; FERRARIO, Massimo (LNF) ; CARDELLI, Fabio (ROMA1) ; Mr. PIERSANTI, Luca (La Sapienza) ; Prof. MUSUMECI, Pietro (UCLA) ; PETTINACCI, Valerio (ROMA1) ; PELLEGRINO, Luigi (LNF) ; LOLLO, Valerio (LNF) ; BATTISTI, Antonio (LNF) ; PALUMBO, Luigi (ROMA1)

Presenter : ALESINI, David (LNF)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : talk

Submitted by : ALESINI, David

Submitted on Tuesday 26 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 53

A high-density plasma source for AWAKE

Content :

A prototype high density helicon discharge is under development, which aims to demonstrate its feasibility as a plasma cell for advanced accelerator schemes as AWAKE. The discharge mechanisms relies on the non-resonant absorption of low-frequency plasma waves (with a frequency typically on the order of 10MHz), which are excited by antennas outside the vacuum chamber. The external wave excitation scheme allows for a distributed plasma generation without any obstacles within the beam path and thus, makes the plasma cell scalable to almost arbitrary lengths. In this paper results from the PROMETHEUS-A experiment are presented. The cell consists of a 1m long, 5cm diameter quarz vacuum tube embedded into a set of 4 water-cooled magnetic field coils, generating a homogenous magnetic field B<130mT. Helicon waves are excited by 4 individual helical antennas wrapped around the tube, which are energeized with a total peak rf power of 40kW at an rf frequency of 13.56 MHz. Unparalleled peak plasma densities compatible with AWAKE's nominal plasma density are achieved.

Primary authors : Dr. GRULKE, Olaf (MPI for Plasma Physics)

Co-authors : Dr. BUTTENSCHOEN, Birger (MPI for Plasma Physics)

Presenter : Dr. GRULKE, Olaf (MPI for Plasma Physics)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : either

Submitted by : Dr. GRULKE, Olaf

Submitted on Tuesday 26 May 2015

Last modified on : Tuesday 26 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 54

Stark broadening measurements of Hydrogen lines for electron density measurements in SPARC_LAB plasma-based acceleration experiments.

Content :

The high accelerating gradient of the plasma-based techniques is one of the most attractive property of this new generation of particle accelerators. The quality and the energy gain of the accelerated beam depend on the electron density of the plasma and its variation. Therefore in order to control the
efficiency of the acceleration and the quality of the accelerated beam the knowledge of the plasma electron density is mandatory. Both particle-driven and laser-driven Plasma Wakefield Acceleration experiments are foreseen at SPARC_LAB with the aim to demonstrate the stable and repeatable acceleration of high brightness beams externally-injected inside a plasma. The Stark broadening of the Hydrogen spectral lines is a promising candidate to characterize plasma density for these experiments. The implementation of this diagnostic for plasma-based experiments at SPARC_LAB will be presented.

Primary authors : FILIPPI, Francesco (ROMA1)

Co-authors : ANANIA, Maria Pia (LNF) ; BELLAVEGLIA, Marco (LNF) ; BIAGIONI, Angelo (LNF) ; CHIADRONI, Enrica (LNF) ; CIANCHI, Alessandro (ROMA2) ; DI GIOVENALE, Domenico (LNF) ; DI PIRRO, Giampiero (LNF) ; FERRARIO, Massimo (LNF) ; MOSTACCI, Andrea (ROMA1) ; PALUMBO, Luigi (ROMA1) ; POMPILI, Riccardo (LNF) ; SHPAKOV, Vladimir (LNF) ; VACCAREZZA, Cristina (LNF) ; VILLA, Fabio (LNF) ; ZIGLER, Arie (L)

Presenter : FILIPPI, Francesco (ROMA1)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : either

Submitted by : FILIPPI, Francesco

Submitted on Tuesday 26 May 2015

Last modified on : Thursday 28 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
Judged by :
Date :

Comments : ""

Abstract ID : 55

High transformer ratio in dielectric wakefield structures using longitudinal bunch shaping with a emittance exchange beam line.

Content :

Two figures of merit of the collinear wakefield accelerator are the longitudinal electric field, Ez, and the transformer ratio, R, and both depend on the longitudinal bunch distribution. Precise control over the longitudinal distribution allows for optimization of the collinear wakefield accelerator for the application under consideration. A new program is under development at Argonne National Laboratory (ANL) to use an emittance exchange beamline to produce longitudinally shaped electron bunches in order to realize high transformer ratios. We present the status of the bunch shaping experiments as well as future plans for realizing high transformation ratios.

Primary authors : Mr. POWER, John (Argonne National Laboratory)

Co-authors :

Presenter : Mr. POWER, John (Argonne National Laboratory)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : invited talk

Submitted by : POWER, John

Submitted on Tuesday 26 May 2015

Last modified on : Tuesday 26 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 56

The concept of coupling impedance in the plasma wake field excitation as a new tool for describing the self-consistent interaction between the driving beam with the surrounding plasma

Content :

R. Fedele1,2, T. Akhter1,2, S. De Nicola3,2, M. Migliorati1,2, A. Marocchino4,5, F. Massimo,4,5, L. Palumbo4,5

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Within the framework of the Vlasov-Maxwell system of equations, we describe the self-consistent interaction of a relativistic charged-particle beam with the surroundings while propagating through a plasma-based acceleration device. This is done in terms of the concept of coupling impedance (both longitudinal and transverse) in full analogy with the conventional accelerators. It is shown that also here the coupling impedance is a very useful tool for the Nyquist-type stability analysis. Examples of specific physical situations are finally illustrated.

Primary authors : Prof. FEDELE, Renato (NA)

Co-authors :

Presenter : Prof. FEDELE, Renato (NA)

Track classification : WG6 - Theory and simulations

Contribution type : talk

Submitted by : Prof. FEDELE, Renato

Submitted on Wednesday 27 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 57

Using ionization injection to get high quality electron beam in laser wakefield acceleration

Content :

Ionization injection can be used to get high quality electron beam in laser wakefield acceleration. To get low energy spread, two injection schemes are proposed here. By use of certain initially unmatched laser pulses, the electron injection can be constrained to the very front region of the mixed gas target, typically in a length of a few hundreds micro meters, and energy spread is largely reduced. By using this method, electron beam with FWHM energy spread less than 5% and peak energy around 500MeV is demonstrated by PIC simulations. In a second scheme, we suggest to use two-color beat wave to control the injection length. A beat wave is generated and the highest electric field due to the overlapping of the two peaks of the two laser waves can ionize the internal electrons and trigger the ionization injection. Due to the phase velocity difference of the two color pulses, the ionization distance is very limited which then lowers the injection length. By multi dimensional PIC simulations, we demonstrate electron beam with ultralow energy spread less than 1% percent and central energy of 400MeV can be obtained by using \omega and 3\omega laser pulses in a gas.

Primary authors : Dr. CHEN, Min (Shanghai Jiao Tong University)

Co-authors : Mr. ZENG, Ming (Shanghai Jiao Tong University) ; Prof. SHENG, Zheng-ming (Shanghai Jiao Tong University) ; Mrs. YU, Lule (Shanghai Jiao Tong University) ; Prof. HIDDING, Bernhard (Uni Gamburg/DESY & UCLA) ; Prof. ZHANG, Jie (Shanghai Jiao Tong University) ; Prof. JAROSZYNSKI, D.a. (University of Strathclyde) ; Prof. MORI, W.b. (University of California, Los Angeles)

Presenter : Dr. CHEN, Min (Shanghai Jiao Tong University)

Track classification : WG1 - Electron beams from plasmas

Contribution type : invited talk

Submitted by : Dr. CHEN, Min

Submitted on Wednesday 27 May 2015

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Comments :

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 58

Laser Wakefield Acceleration with Multi-Color Pulse Stacks: Designer Electron Beams for Advanced Radiation Sources

Content :

Photon engineering [S. Kalmykov et al., New J. Phys. 14, 033025 (2012)] offers new avenues to coherently control electron beam phase space on a femtosecond time scale. It enables generation of high-quality beams at a kHz-scale repetition rate. Reducing the peak pulse power (and thus the average laser power) is the key to effectively exercise such control.

A stepwise negative chirp, synthesized by incoherently stacking collinear sub-Joule pulses from conventional CPA, affords a micron-scale bandwidth. It is sufficient to prevent rapid compression of the pulse into an optical shock, while delaying electron dephasing. This extends electron energy far beyond the limits suggested by accepted scalings (beyond 1 GeV in a 3 mm plasma), without compromising beam quality [S. Kalmykov et al., Phys. Plasmas 22, 056701 (2015) - Invited Paper at 56th Annual Meeting of the APS Division of Plasma Physics]. In addition, acceleration with a stacked pulse in a channel favorably modifies electron beam on a femtosecond time scale, controllably producing synchronized sequences of 100 kA-scale, quasi-monoenergetic bunches. These comb-like, designer GeV electron beams are ideal drivers of polychromatic, tunable inverse Compton gamma-ray sources [S. Kalmykov et al., AIP Proc. (2015), to appear].

Primary authors : Dr. KALMYKOV, Serge (University of Nebraska - Lincoln)

Co-authors : Dr. DAVOINE, Xavier (CEA DAM DIF) ; Dr. LEHE, Remi (Lawrence Berkeley National Laboratory) ; Dr. LIFSCHITZ, Agustin (LOA, ENSTA-CNRS-Ecole Polytechnique) ; Dr. GHEBREGZIABHER, Isaac (Penn State) ; Prof. SHADWICK, Bradley (University of Nebraska - Lincoln)

Presenter : Dr. KALMYKOV, Serge (University of Nebraska - Lincoln)

Track classification : WG1 - Electron beams from plasmas ; WG6 - Theory and simulations

Contribution type : invited talk

Submitted by : Dr. KALMYKOV, Serguei

Submitted on Wednesday 27 May 2015

Last modified on : Wednesday 27 May 2015

Comments :

If downgraded from invited, please make it an oral presentation in either WG1 or WG6.

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

Judged by :

Date :
Comments : ""

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 59

LCODE: quasistatic code for computationally heavy problems of plasma wakefield acceleration

Content :

LCODE is a freely-distributed code for simulating plasma wakefield acceleration, notable for its numerical stability, performance optimizations and bundling an extensive set of in-built diagnostics.
Using the quasistatic approximation it calculates the plasma response and the particle beam evolution in either axisymmetric or plain 2D geometry. The beam is modelled with fully relativistic macro-particles in a simulation window copropagating with the light velocity. The plasma can be modelled by either kinetic or fluid model. Substepping is used to selectively decrease the simulation steps, increasing the accuracy when it is required. These and various other techniques are used to obtain exceptional numerical stability and precision while simultaneously being light on resources, enabling LCODE to simulate the evolution of long particle beams over long propagation distances.
A recent upgrade allowed LCODE to perform the calculations in parallel. A pipeline of several LCODE instances communicating via MPI (Message Passing Interface) is capable of executing multiple time steps of the simulation in a single pass. This approach can be used to speedup the calculations by hundreds of times.
Upgrades for a laser beam driver and fully 3D simulations are in progress.

Primary authors : SOSEDKIN, Alexander (Novosibirsk State University)

Co-authors :

Presenter : SOSEDKIN, Alexander (Novosibirsk State University)

Track classification : WG6 - Theory and simulations

Contribution type : poster

Submitted by : SOSEDKIN, Alexander

Submitted on Wednesday 27 May 2015

Last modified on : Wednesday 27 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 60

Injection of electrons into the wakefield over a smooth plasma density entrance

Content :

This work is related to the AWAKE project at CERN. It is a plasma wakefield acceleration experiment designed to test the possibility of transferring energy from the 400 GeV proton beam to electrons through a plasma. In the experiment, the vacuum beam line and the plasma cell have different gas pressures, which results in a plasma density transition region between them. Electron trapping is well understood for the case of a sharp increase in the plasma density. However, the previously found optimal parameters cannot be used in the case of a smooth increase of the plasma density because of defocusing of the electrons in the transition region.

This effect is associated with the slowly changing component of wakefield potential. Injected electrons are not trapped by the plasma-frequency component of the wakefield, as this component averages out because of quick change of the local plasma frequency. The proton beam current interacts with the plasma in such a way that the electrons are defocused. Nevertheless, the injection is possible if the electrons stay outside the plasma until the end of the transition region. Numerical simulations with LCODE prove this idea.

Primary authors : Mr. TUEV, Petr (Novosibirsk State University)

Co-authors :

Presenter : Mr. TUEV, Petr (Novosibirsk State University)

Track classification : WG6 - Theory and simulations

Contribution type : poster

Submitted by : Mr. TUEV, Petr

Submitted on Wednesday 27 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 61

Optimized matching strategy for laser driven plasma boosters

Content :

Plasma accelerated beams possess peculiar properties that make them quite different from beams accelerated by conventional means. Rather large energy spreads and divergences (with relativistic transverse momenta) are among such properties. In order to be fruitfully produced and employed, for example for driving cutting edge electromagnetic radiation sources, a careful manipulation is needed, especially when a beam produced by conventional technology is boosted by plasma. An issue of paramount importance is attaining a reasonable matching when a beam enters a stage of plasma acceleration and, on the other hand, a strategy for reducing their high divergence at plasma exit is needed. Both operations should allow to preserve beam properties, such as brightness.
In this work we investigate a matching procedure by numerical simulations and optimize the parameters for the planned External Injection experiment at the SPARC_LAB facility.

Primary authors : ROSSI, Andrea Renato (MI)

Co-authors : ANANIA, Maria Pia (LNF) ; BACCI, Alberto Luigi (MI) ; BELLAVEGLIA, Marco (LNF) ; BISESTO, Fabrizio Giuseppe (LNF) ; CHIADRONI, Enrica (LNF) ; CIANCHI, Alessandro (ROMA2) ; CURCIO, Alessandro (LNF) ; DI GIOVENALE, Domenico (LNF) ; DI PIRRO, Giampiero (LNF) ; FERRARIO, Massimo (LNF) ; GALLO, Alessandro (LNF) ; MAROCCHINO, Alberto (ROMA1) ; MASSIMO, Francesco (ROMA1) ; MOSTACCI, Andrea (ROMA1) ; PETRARCA, Massimo (ROMA1) ; POMPILI, Riccardo (LNF) ; SERAFINI, Luca (MI) ; VACCAREZZA, Cristina (LNF)

Presenter : ROSSI, Andrea Renato (MI)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : ROSSI, Andrea Renato

Submitted on Wednesday 27 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 62

Generation of the collimated quasi-monochromatic beams of accelerated electrons in the interaction of an intense femtosecond laser pulse with an inhomogeneous plasma

Content :

The formation of quasi monoenergetic beams of accelerated electrons by focusing femtosecond laser radiation with an intensity of 2×1017 W/cm2 onto an edge of aluminium foil has been experimentally demonstrated. The maximum of electrons energy distributions lied in the range from 0.2 to 0.8 MeV with an energy spread less than 20 %. The acceleration mechanism related to the generation of a plasma wave as a result of self-modulation instability of the laser pulse in the dense plasma formed by the prepulse of the laser system (arriving 10 ns before the main pulse) is considered. PIC simulations of the laser-plasma interaction showed that effective excitation of a plasma wave as well as trapping and acceleration of an electron beam with an energy about 1 MeV may occur in the presence of sharp gradients in plasma density and in the temporal shape of the pulse.

Primary authors : Dr. STEPANOV, Andrey (Insitute of Applied Physics)

Co-authors :

Presenter : Dr. STEPANOV, Andrey (Insitute of Applied Physics)

Track classification : WG1 - Electron beams from plasmas

Contribution type : invited talk

Submitted by : Dr. STEPANOV, Andrey

Submitted on Wednesday 27 May 2015

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Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 63

Beam Loading in a Plasma Wakefield Accelerator at Daresbury Laboratory

Content :

Theory and particle-in-cell simulation results for beam loading using at the proposed Plasma Accelerator Research Station (PARS) at Daresbury Laboratory are presented. Results show an acceleration gradient of approximately 2 GV/m is possible, and the variation of the final energy spread and emittance of the witness beam with different beam and plasma parameters is investigated.

Primary authors : Mr. HANAHOE, Kieran (University of Manchester)

Co-authors : Dr. XIA, Guoxing (Cockcroft Institute and the University of Manchester) ; Dr. METE, Oznur (University of Manchester) ; Dr. SMITH, Jonathan (Tech-X UK Ltd) ; Dr. ANGAL-KALININ, Deepa (ASTeC) ; Dr. JONES, James (ASTeC)

Presenter : Mr. HANAHOE, Kieran (University of Manchester)

Track classification : WG6 - Theory and simulations

Contribution type : poster

Submitted by : Mr. HANAHOE, Kieran

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Track judgments :

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 64

Generation of Pulse Trains Suitable for Multi-Pulse Laser Wakefield Acceleration

Content :

In multi-pulse laser wakefield acceleration a plasma wave is driven by a train of laser pulses separated by the plasma period. This allows laser-driven plasma accelerators to be driven by emerging technologies, such as fibre and thin-disk lasers, which can generate low-energy pulses at kilohertz repetition rates with high efficiency.

As a first test of this concept we plan to convert single pulses from a Ti:sapphire laser into a train of ultrafast laser pulses, and use these to drive a plasma wakefield. This can be achieved by chirping the laser pulse and passing it through a multi-order waveplate (MWP) and a linear polarizer. This combination acts as a spectral filter for wavelengths for which the retardance of the MWP is an odd integer times pi. Varying the thickness of the MWP and the magnitude of chirp allows control over the number and spacing of the pulses.

We present simulations for parameters corresponding to the Astra laser system at Rutherford Laboratory. These show generation of trains of up to 47 pulses with pulse separation of 100-150fs. 2D EPOCH simulations of the wakefield driven by these trains predict accelerating gradients in excess of 11GV/m.

Primary authors : Mr. SHALLOO, Robert (JAI, University of Oxford) ; Dr. CORNER, Laura (JAI, University of Oxford) ; Mr. ARRAN, Christopher (JAI, University of Oxford) ; Mr. COWLEY, James (University of Oxford) ; Mr. CHEUNG, Gavin (University of Oxford) ; Mr. THORNTON, Christopher (JAI, University of Oxford) ; Prof. WALCZAK, Roman (JAI, University of Oxford) ; Prof. HOOKER, Simon (University of Oxford)

Co-authors :

Presenter : Mr. SHALLOO, Robert (JAI, University of Oxford)

Track classification : WG6 - Theory and simulations

Contribution type : poster

Submitted by : Mr. SHALLOO, Robert

Submitted on Wednesday 27 May 2015

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Track judgments :

Track : WG6 - Theory and simulations

Judgment :

Judged by :

Date :
Comments : ""

Abstract ID : 65

VELA/CLARA at Daresbury Laboratory as a test-bed for advanced accelerator concepts

Content :

VELA (Versatile Electron Linear Accelerator) is a new small scale facility at Daresbury Laboratory, UK. It is based on RF photoelectron gun and currently delivers high quality short electron bunches with the beam energy of ~5MeV. The facility has two dedicated experimental areas. One of them is specifically designed to accommodate various experimental arrangements including studies and testing of advanced accelerator concepts. This area is further enhanced by the availability of high power TW femtosecond laser. In the near future, the VELA capability will be further enhanced after commissioning of the CLARA (Compact Linear Accelerator for Research and Applications) front end in the first half of 2016. This will enable VELA to generate sub-ps electron bunches with up to 250pC, ~50MeV beam energy and a rep-rate of 10Hz (with further upgrade to 400Hz). This presentation gives and overview of the facility, summarises experimental data and computer simulations and discusses its usage for advanced accelerator concepts studies.

Primary authors : Dr. SAVELIEV, Yuri (STFC, Daresbury Lab., ASTeC)

Co-authors :

Presenter : Dr. SAVELIEV, Yuri (STFC, Daresbury Lab., ASTeC)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures ; WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Dr. SAVELIEV, Yuri

Submitted on Wednesday 27 May 2015

Last modified on : Wednesday 27 May 2015

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Status : SUBMITTED

Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :
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Date :
Comments : ""

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :

Date :
Comments : ""

Abstract ID : 66

Production of quasi-ellipsoidal photo cathode laser pulses for next generation high brightness photo injectors.

Content :

The use of high brightness electron beams in Free Electron Laser (FEL) applications is of increasing importance. One of the most promising methods to generate such beams is the shaping of the photo cathode laser pulses. It was already demonstrated that temporal and transverse flat-top laser pulses can produce very low emittance beams. Theoretical considerations supported by simulations suggest that further improvements can be achieved using quasi-ellipsoidal laser pulses, namely a reduction in transverse projected emittance at 1 nC bunch charge by 30%.
In a collaboration between DESY, the Institute of Applied Physics (IAP) in Nizhny Novgorod and the Joint Institute of Nuclear Research (JINR) in Dubna such a laser system capable of producing trains of micropulses, where each micropulse has a quasi-ellipsoidal pulse shape, has been developed. The prototype of the system was recently installed at the Photo Injector Test facility at DESY in Zeuthen (PITZ) and is now in the commissioning phase.
In this contribution comparison of beam dynamics simulations for different laser beam shapes, the overall setup, as well as first experimental results of the new laser system will be presented.

Primary authors : Dr. RUBLACK, Tino (DESY)

Co-authors : Mr. GOOD, James (DESY) ; KHOJOYAN, Martin (SOLEIL synchrotron) ; Dr. KRASILNIKOV, Mikhail (DESY) ; Dr. STEPHAN, Frank (DESY, Zeuthen site) ; Dr. ANDRIANOV, Alexey (Institute of Applied Physics RAS) ; Mrs. GACHEVA, Ekaterina (Institute of Applied Physics RAS) ; Dr. MIRONOV, Sergey (Institute of Applied Physics RAS) ; Dr. POTEOMKIN, Anatoly (Institute of Applied Physics RAS) ; Mr. ZELENOGORSKII, Viktor (Institute of Applied Physics RAS) ; Prof. KHAZANOV, Efim (Institute of Applied Physics RAS) ; Dr. HARTL, Ingmar (DESY) ; Dr. SCHREIBER, Siegfried (DESY) ; Prof. SYRESIN, Evgeny (Joint Institute for Nuclear Research)

Presenter : Dr. RUBLACK, Tino (DESY)

Track classification : WG7 - Laser technology for advanced accelerators

Contribution type : poster

Submitted by : Dr. RUBLACK, Tino

Submitted on Wednesday 27 May 2015

Last modified on : Saturday 30 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG7 - Laser technology for advanced accelerators

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 67

Beam dynamics in resonant plasma wakefield acceleration @SPARC_LAB

Content :

The purpose of this contribute is the study of the matching conditions of the electron beams inside plasma in the context of the 3 bunch comb scheme experiment in preparation @SPARC_LAB.
We begin by discussing the motivations that led to the choice of the quasi non-linear plasma regime for this experiment.
The study will be carried out through the analysis of some simulations performed with Architect a code developed specifically for comb studies.
An analysis will be performed about the influence of the drivers transverse spot size and length on the shape of the bubble in order to make the fields as stable as possible. In this regard the optimal injection distances and the possibility of a charge ramp will be investigated as well.
A similiar analysis will be performed for the witness spot size in order to prevent oscillations that could lead to emittance growth. The other features of the witness, longitudinal length, injection distance and beam loading, will be studied in order to prevent energy spread growth.
All the parameters used in this study were taken from experiments and simulations performed within SPARC_LAB facility.

Primary authors : ROMEO, Stefano (LNF)

Co-authors : CHIADRONI, Enrica (LNF) ; CROIA, Michele (LNF) ; FERRARIO, Massimo (LNF) ; MAROCCHINO, Alberto (ROMA1) ; MASSIMO, Francesco (ROMA1) ; POMPILI, Riccardo (LNF) ; VACCAREZZA, Cristina (LNF)

Presenter : ROMEO, Stefano (LNF)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : ROMEO, Stefano

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 68

The Extreme Light Infrastructure (ELI) - from distributed implementation to unified operation

Content :

The Extreme Light Infrastructure ELI (www.eli-laser.eu) will be the world's first international user facility for laser-based research and applications. In 2015, while nearing completion of its construction, ELI was selected as one of the "ESFRI Landmarks" for its role as reference project of scientific excellence and of competitiveness of the European Research Area.
ELI is dedicated to fundamental research in the light-matter interaction field in the laser intensity regime up to 1023W/cm2, and beyond. ELI's laser technologies are mainly based on chirped pulse amplification of femtosecond optical pulses in broadband solid-state laser materials and/or nonlinear crystals. Single-beam laser peak-power will exceed 10PW (1016Watt). Diode pumping will allow for up to 10Hz operation at the multi-Petawatt level.
ELI is presently being built as a distributed research facility in the Czech Republic, Hungary and Romania, and user operation is scheduled to begin in 2018, very likely as an European Research Infrastructure Consortium (ELI-ERIC).
The talk will briefly discuss some of the novel research opportunities at ELI, from photonuclear science to tracking ultrafast electro-nuclear wave packets in atoms and molecules or applications of secondary radiation and particle beams.

Primary authors : Dr. MIRON, Catalin (Extreme Light Infrastructure - Delivery Consortium (ELI-DC AISBL))

Co-authors :

Presenter : Dr. MIRON, Catalin (Extreme Light Infrastructure - Delivery Consortium (ELI-DC AISBL))

Track classification : WG7 - Laser technology for advanced accelerators

Contribution type : invited talk

Submitted by : Dr. MIRON, Catalin

Submitted on Wednesday 27 May 2015

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Comments :

Abstract submitted following email invitation by Ralph Assmann/Massimo Ferrario (email exchange March 18, 2015).

Status : SUBMITTED

Track judgments :

Track : WG7 - Laser technology for advanced accelerators

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 69

Ion Acceleration from ultra thin foils on the Astra GEMINI facility

Content :

Laser driven ion acceleration is an area receiving increasing interest in fundamental research due to the continuous progression in high power laser technology and to its possible applications, including proton radiography, production of warm dense matter, fast ignition of fusion targets, biomedical applications and nuclear and particle physics.

Two experiments were carried out on the Astra GEMINI laser system at Rutherford Appleton Laboratory, STFC, United Kingdom. The ion beams were generated by focusing a single beam of Astra GEMINI with an f/2 parabola onto ultra-thin carbon and plastic targets (thicknesses ranging from 2.5nm to 100nm). A quarter waveplate controlled the polarisation of the laser pulse. Thomson parabola (TP) spectrometers, radiochromic film (RCF) stacks and CR-39 stacks were used to gather information on the quantity, type, energy and distribution of ions produced. The effect of laser light polarisation on the acceleration of ions from ultrathin foils was investigated to determine the optimum configuration for acceleration processes.

The highest energies for both carbon ions and protons (~30MeV) were obtained for 10nm targets and circularly polarised light. The beam profiles obtained show significant differences between circular and linear polarisation. These features are supported by particle-in-cell (PIC) simulations.

Primary authors : Ms. SCULLION, Clare (Queen's University Belfast)

Co-authors : Dr. DORIA, Domenico (Queens University of Belfast) ; Ms. HANTON, Fiona (Queen's University Belfast) ; Ms. GWYNNE, Deborah (Queen's University Belfast) ; Dr. ROMAGNANI, Lorenzo (Laboratoire LULI) ; Mr. NAUGHTON, Kealan (Queen's University Belfast) ; Dr. GRAY, Ross (University of Strathclyde) ; Mr. PADDA, Hersimerjit (University of Strathclyde) ; Dr. SGATTONI, Andrea (University of Pisa) ; Dr. MACCHI, Andrea (CNR/INFM/polyLAB, Pisa, Italy) ; Dr. KAR, Satyabrata (Queen's University Belfast) ; Dr. AHMED, Hamad (Queen's University Belfast) ; Dr. DANIEL, Jung (Queen's University Belfast) ; Dr. SYMES, Daniel (Rutherford Appleton Laboratory) ; Dr. SCOTT, Graeme (Rutherford Appleton Laboratory) ; Mr. HICKS, George (Imperial College London) ; Mr. ETTLINGER, Oliver (Imperial College London) ; Mr. PODER, Kristjan (Imperial College London) ; Prof. MCKENNA, Paul (University of Strathclyde) ; Prof. NEELY, David (STFC) ; Prof. NAJMUDIN, Zulfikar (Imperial College London) ; Prof. ZEPF, Matthew (Queen's University Belfast) ; Prof. BORGHESI, Marco (Queen's University Belfast)

Presenter : Ms. SCULLION, Clare (Queen's University Belfast)

Track classification : WG2 - Ion beams from plasmas

Contribution type : talk

Submitted by : Ms. SCULLION, Clare

Submitted on Wednesday 27 May 2015

Last modified on : Wednesday 27 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG2 - Ion beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 70

Laser-driven electron beams and their applications

Content :

We present the activities in laser-wakefield acceleration at Garching. Stable electron beams have been characterized and used to drive a a variety of all-optical x-ray sources. The betatron-xrays have been demonstrated to be suitable for taking high-resolution phase-contrast tomograms of biological samples, while scattering a counter-propagating laser pulse off the electron beam yields a quasi-monochromatic, tunable Thomson source. Its spectral characterization directly reveals characteristics of the nonlinear scattering regime for the first time.
Finally, we will present the latest plans and results from the updated ATLAS laser at the newly created LEX laboratory in Garching.

Primary authors : Prof. KARSCH, Stefan (LMU Munich)

Co-authors : Mr. KHRENNIKOV, Konstantin (LMU/MPQ) ; Mr. WENZ, Johannes (LMU/MPQ) ; Mr. HEIGOLDT, Matthias (LMU/MPQ) ; Mr. GILLJOHANN, Max (LMU) ; Mrs. SCHINDLER, Sabine (LMU) ; Mr. DING, Hao (LMU) ; Ms. POPP, Antonia (Max-Planck-Institute for Quantum Optics) ; Dr. VEISZ, Laszlo (Max-Planck-Institut fuer Quantenoptik) ; Dr. BUCK, Alexander (MPQ) ; Mrs. SCHLEEDE, Sabine (TUM) ; Prof. PFEIFFER, Franz (TUM) ; Mr. CHOU, Shao-wei (MPQ) ; Prof. HOOKER, Simon (University of Oxford)

Presenter : Prof. KARSCH, Stefan (LMU Munich)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Prof. KARSCH, Stefan

Submitted on Wednesday 27 May 2015

Last modified on : Wednesday 27 May 2015

Comments :

I would prefer a talk scheduled after tuesday, since I have an urgent private matter planned on tuesday. This talk is intended as an overview of Garching activities on LWFA, with separate specialized talks and poster presentations by the respective students.

Status : SUBMITTED

Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 71

Controlled, High-repetition rate Plasma Accelerators

Content :

We will describe work towards developing a new architecture for plasma accelerators able to generate GeV-scale electron beams at kilohertz repetition rates. Our approach is based on multi-pulse laser wakefield acceleration (MP-LWFA) in which a plasma wakefield is excited by a train of low-energy laser pulses; this approach opens wakefield acceleration to rapidly evolving laser technologies, such as fibre and thin-disk lasers, which are able to deliver ultrafast multi-mJ pulses at kHz repetition rates with high wall-plug efficiency.

Generating high-quality electron bunches with high reliability and low shot-to-shot jitter requires control over electron injection. For the case of MP-LWFAs this requires the development of new methods since the wakefield will be quasi-linear regime, and hence existing techniques developed for nonlinear wakes will not be directly applicable.

We will describe progress in understanding processes which might limit the operation of MP-LWFAs, such as non-uniformities in the plasma or pulse train and the effects of ion motion and laser hosing. Possible methods for controlling injection in MP-LWFAs will be discussed.

Primary authors : Prof. HOOKER, Simon (University of Oxford)

Co-authors : Mr. ARRAN, Christopher (University of Oxford) ; Dr. CORNER, Laura (JAI, Oxford University) ; Mr. CHEUNG, Gavin (University of Oxford) ; Mr. COWLEY, James (University of Oxford) ; Mr. SHALLOO, Robert (JAI, University of Oxford) ; Mr. THORNTON, Christopher (JAI) ; Prof. WALCZAK, Roman (University of Oxford)

Presenter : Prof. HOOKER, Simon (University of Oxford)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Prof. HOOKER, Simon

Submitted on Wednesday 27 May 2015

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Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 72

SMILEI, an open source PIC code with focus on load balancing issues

Content :

SMILEI stands for Simulating Matter Irradiated by Light at Extreme Intensities. It is a new open source Particle In Cell (PIC) code, developed jointly by physicists and HPC experts in order to make sure that it performs well on the newest supercomputers architectures. State of the art algorithms are implemented and innovative ones are developed.

Recent simulation campaigns of laser wakefield electron acceleration, showed that, performance-wise, the most urgent concern is to find a way to face the strong load imbalance that arises on very large full 3D simulations. The hybrid MPI-openMP typical implementation performs quite well on systems with a couple hundreds of cores. But the accessible number of openMP threads is limited and, as the number of MPI processes increases, this relatively small number of threads is not able to balance the load anymore. Imbalance issues come back, wasting our precious computation time again. Hence the need for an efficient dynamic load balancing algorithm.

The algorithm we present is based on the division of each MPI domain into many smaller, so called, patches. These patches are used as sorting structures and can be exchanged between MPI processes in order to balance the computational load.

Primary authors : Dr. BECK, Arnaud (LLR - Ecole Polytechnique - CNRS/IN2P3)

Co-authors : Mr. DEROUILLAT, Julien (Maison de la Simulation - CEA) ; Dr. GRECH, Mickael (LULI - Ecole Polytechnique - CNRS)

Presenter : Dr. BECK, Arnaud (LLR - Ecole Polytechnique - CNRS/IN2P3)

Track classification : WG6 - Theory and simulations

Contribution type : talk

Submitted by : Dr. BECK, Arnaud

Submitted on Thursday 28 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 73

Self-modulation of long particle beams in plasma wakefield accelerators

Content :

The self-modulation instability (SMI) is the key effect that makes possible the usage of presently available high-energy proton beams as drivers for plasma wakefield acceleration. The seeded SMI first transforms the long beam into a bunch train and then partly destroys these bunches. Both effects occur because of particle defocusing by the plasma wakefield. Development of the instability is always accompanied with a flow of beam particles through potential wells of the plasma wave.

The character of beam evolution changes favorably by a small increase of the plasma density at the linear stage of SMI growth. The optimum magnitude of the increase is such that to make the beam one wavelength longer if measured in local plasma wavelengths. As a result, well separated bunches are formed, and these bunches quickly come to equilibrium with the wave and excite the strong wakefield over a long propagation distance.

The final stage of beam evolution in both the uniform and increasing density plasmas strongly depends on the initial beam emittance. The established wakefield amplitude drops down approximately linearly with the emittance growth.

Primary authors : Prof. LOTOV, Konstantin (Novosibirsk State University)

Co-authors :

Presenter : Prof. LOTOV, Konstantin (Novosibirsk State University)

Track classification : WG6 - Theory and simulations

Contribution type : talk

Submitted by : Prof. LOTOV, Konstantin

Submitted on Thursday 28 May 2015

Last modified on : Thursday 28 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 74

The AWAKE Facility at CERN

Content :

The Advanced Proton Driven Plasma Wakefield Acceleration Experiment (AWAKE) aims at studying plasma wakefield generation and electron acceleration driven by proton bunches. It is a proof-of-principle R experiment at CERN and the world's first proton driven plasma wakefield acceleration experiment. The AWAKE experiment will be installed in the former CNGS facility and uses the 400 GeV proton beam bunches from the SPS. The first experiments will focus on the self-modulation instability of the long (rms ~12cm) proton bunch in the plasma. These experiments are planned for the end of 2016. Later, in 2017/2018, low energy (~15 MeV) electrons will be externally injected to sample the wakefields and be accelerated beyond 1GeV.
The main goals of the experiment will be summarized; an overview of the beam lines and the experimental area will be given; the status and planning of the facility will be shown.

Primary authors : Dr. GSCHWENDTNER, Edda (CERN)

Co-authors :

Presenter : Dr. GSCHWENDTNER, Edda (CERN)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Dr. GSCHWENDTNER, Edda

Submitted on Thursday 28 May 2015

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Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 75

Laser Wakefield Acceleration of positrons in the blowout regime

Content :

Exotic lasers are beams with orbital angular momentum and are described by higher order Laguerre Gaussian modes. These lasers have been leading to transformative scientific advance in applications ranging from ultrafast communications and super-resolution microscopy to quantum computing and astrophysics. This talk addresses how lasers with orbital angular momentum could be used to tackle important questions in plasma-based acceleration. Using three-dimensional particle-in-cell simulations in Osiris and theory we show that exotic laser beams with orbital angular momentum can drive doughnut shaped plasma wakes in strongly non-linear regimes. We show that these wakefields can self-trap and accelerate ring electron bunches to high energies. These shaped electron bunches perform betatron oscillations around the doughnut bubble centroid, which can influence x-ray betatron radiation emission. These results then suggest novel pathways to tailor the transverse profile of relativistic beams produced in plasma accelerators. Unlike the spherical blowout regime, doughnut shaped wakefields can also be used to accelerate positrons to high energies. We then provide a solution to a key challenge in plasma-based accelerators critical for future plasma based linear colliders. We will describe how these lasers could be produced in the laboratory.

Primary authors : Dr. VIEIRA, Jorge (Instituto Superior Tecnico)

Co-authors :

Presenter : Dr. VIEIRA, Jorge (Instituto Superior Tecnico)

Track classification : WG1 - Electron beams from plasmas ; WG6 - Theory and simulations

Contribution type : invited talk

Submitted by : Dr. VIEIRA, Jorge

Submitted on Thursday 28 May 2015

Last modified on : Thursday 28 May 2015

Comments :

I could not add most of my collaborators as co-authors and so I decided not to include any. However, if possible, I would then like to add the following list of authors to this abstract:

J. Vieira1, E.P. Alves1, R. Trines2, R.A. Fonseca1, R. Bingham2, P. Norreys2, J. T. Mendonça1, L.O. Silva1
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2 Rutherford Appleton Laboratory, United Kingdom

Thank you very much!

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
Judged by :
Date :
Comments : ""

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 76

Design and Characterization of Permanent Magnetic Solenoids for REGAE

Content :

REGAE is a small electron linear accelerator at DESY. In order to inject short and low charged electron bunches in to laser-driven plasma wakefield permanent magnetic solenoids for the final focus down to 10^-6 m were designed, assembled and field measurements were done.
Due to a shortage of space close to the operation area an in-vacuum solution has been chosen. Furthermore a two-ring design made of wedges has been preferred in terms of beam dynamic issues. To keep the field quality of a piecewise built magnet still high a sorting algorithm for the wedge arrangement has been developed and used for the construction of the magnets. The magnetic field of these solenoids has been measured with high precision and has been compared to the simulated magnetic field.

Primary authors : Mr. HACHMANN, Max (DESY)

Co-authors : Dr. FLOETTMANN, Klaus (DESY) ; Mr. MAYET, Frank (DESY) ; Mr. GEHRKE, Tim (DKFZ)

Presenter : Mr. HACHMANN, Max (DESY)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : either

Submitted by : Mr. HACHMANN, Max

Submitted on Thursday 28 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 77

A diagnostic to measure rubidium vapor density during the AWAKE experiment at CERN

Content :

For the AWAKE experiment, one needs an online and automatic rubidium (Rb) vapor density measurement device. Due to the laser tunnel-ionization of the Rb vapor, the plasma density is equal to the vapor density, which is measured instead. The diagnostic consists of a Mach-Zehnder interferometer built of single mode fibers and a fiber spectrograph. We use the hook method adapted from oblique to vertical fringes. Without vapor, the spectrum is sinusoidal. Anomalous dispersion due to the Rb transition line at 780.2412 nm (5^2S1/2 to 5^2P3/2) causes a change in the spectrum periodicity in the vicinity of the transition wavelength. The oscillation period becomes smaller the closer to the transition line and also the higher the density. The Rb vapor density is obtained by fitting these curves with the formula described in the literature. The Rb vapor density will be measured at both ends of the plasma source in order to measure and control the linear density gradient along the plasma source that will be used to optimize the accelerated electron bunch parameters.

Primary authors : Mr. BATSCH, Fabian (Max-Planck-Institute for Physics)

Co-authors : Dr. OEZ, Erdem (Max-Planck-Institute for Physics) ; Dr. MOODY, Joshua (Max Planck Institute for Physics) ; Prof. MUGGLI, Patric (Max-Planck-Institut für Physik)

Presenter : Mr. BATSCH, Fabian (Max-Planck-Institute for Physics)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : poster

Submitted by : Mr. BATSCH, Fabian

Submitted on Thursday 28 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 78

Ion acceleration from laser driven collisionless shockwaves in optically shaped gas targets

Content :

We report on recent experiments using the high power CO_2 laser (λ ~ 10 μm , a_0 ~ 1) at the Accelerator Test Facility, Brookhaven National Laboratory to generate ~MeV protons and helium ions, which are accelerated by collisionless shockwave acceleration in overcritical gas targets. We have developed new techniques of shaping gas jet targets with optically induced hydrodynamic shocks, allowing us to tailor density profiles to optimise ion generation. Sufficiently steep gradients resulted in quasi-monoenergetic proton beams with a single laser pulse, in contrast to previous work relying on pulse trains. The laser plasma interaction also generates energetic electrons, which propagate into the target with beam to background ratio up to ~0.1. We have observed transverse filamentation in this region, which is reproduced by PIC modelling. These simulations also elucidate the key role of the laser-generated electrons in heating the plasma to create the conditions required for collisionless shockwave formation and subsequent ion generation.

Primary authors : Dr. DOVER, Nicholas (Imperial College London)

Co-authors : Dr. TRESCA, Olivier (Brookhaven National Laboratory) ; Dr. COOK, Nathan (Stony Brook University) ; Dr. KINGHAM, Robert (Imperial College London) ; Dr. MAHARJAN, Chakra (Stony Brook University) ; Dr. POLYANSKIY, Mikhail (Brookhaven National Laboratory) ; Dr. SHKOLNIKOV, Peter (Stony Brook University) ; Dr. POGORELSKY, Igor (Brookhaven National Laboratory) ; Prof. NAJMUDIN, Zulfikar (Imperial College London)

Presenter : Dr. DOVER, Nicholas (Imperial College London)

Track classification : WG2 - Ion beams from plasmas

Contribution type : talk

Submitted by : Dr. DOVER, Nicholas

Submitted on Thursday 28 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG2 - Ion beams from plasmas

Judgment :
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Date :
Comments : ""

Abstract ID : 79

Advanced Bunching Scheme at REGAE

Content :

The field of laser wakefield acceleration offers very high accelerating gradients. To combine the university research on this topic with the expertise of a large and well-established accelerator facility, the LAOLA Collaboration was formed between DESY and the University of Hamburg. One of the campaigns pursued within this framework is the external injection of an electron bunch from a conventional gun into a laser-driven plasma wakefield, which is a promising path towards increased control over the injected electron phase space.
The Relativistic Electron Gun for Atomic Exploration (REGAE), a small accelerator located at DESY, is an interesting candidate for such an external injection experiment due to the short bunches on the order of 10 fs, required for the primary design goal of the machine: Time-resolved electron diffraction.
In this case the particles are compressed using the ballistic bunching method. The shortness of the bunching is limited by non-linearities in the longitudinal phase space. We present a method that allows for a correction of these non-linearities, enabling even shorter bunches.

Primary authors : Mr. ZEITLER, Benno (Center for Free-Electron Laser Science & Department of Physics, University of Hamburg)

Co-authors : Dr. FLOETTMANN, Klaus (DESY) ; Prof. GRUENER, Florian (Center for Free-Electron Laser Science & Department of Physics, University of Hamburg)

Presenter : Mr. ZEITLER, Benno (Center for Free-Electron Laser Science & Department of Physics, University of Hamburg

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Mr. ZEITLER, Benno

Submitted on Thursday 28 May 2015

Last modified on : Thursday 28 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 80

Transverse emittance measurement at REGAE

Content :

The linear accelerator REGAE at DESY produces short and low charged electron bunches, on the one hand to resolve the excitation transitions of atoms temporally by pump probe electron diffraction experiments and on the other hand to investigate principal mechanisms of laser plasma acceleration. For both cases a high quality electron beam is required which can be identified with a small beam emittance. A standard magnet scan is used for the emittance measurement which is in case of a low charged bunch most sensitive to the beam size determination (2nd central moment). Therefore the diagnostic and a routine to calculate proper central moments will be introduced and discussed.

Primary authors : Mr. HACHMANN, Max (DESY)

Co-authors : Dr. FLOETTMANN, Klaus (DESY)

Presenter : Mr. HACHMANN, Max (DESY)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : either

Submitted by : Mr. HACHMANN, Max

Submitted on Thursday 28 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 81

All-optical free electron lasers -- realizable with Traveling-wave Thomson scattering

Content :

Optical free-electron lasers (OFEL) based on the Traveling-wave Thomson scattering (TWTS) geometry are realizable using existing petawatt class laser systems and electron beams from either conventional or Laser-wakefield accelerators. Such OFELs operate in the EUV to x-ray range, while at the same time remaining compact.

Such TWTS OFELs optimally exploit the high spectral photon density in high-power laser pulses by spatially stretching the laser pulse and overlapping it with the electrons in a side scattering setup. The introduction of a laser pulse-front tilt provides for interaction lengths appropriate for FEL operation, so that beam electrons witness an undulator field of near-constant strength and wavelength over hundreds to thousands of undulator periods, thus giving enough time for self-amplified spontaneous emission (SASE) to seed the FEL instability and the realization of large laser gains.

Based on results from our analytical 1.5D-theory and numerical investigations, we discuss scaling laws and show using example scenarios that TWTS OFELs can be realized with existing RF sources such as ELBE at HZDR as well as LWFA electrons. We detail the necessary equipment for a TWTS OFEL experiment and discuss how current experimental limitations affect the design.

Primary authors : Dr. DEBUS, Alexander (Helmholtz-Zentrum Dresden-Rossendorf) ; Mr. STEINIGER, Klaus (Helmholtz-Zentrum Dresden-Rossendorf)

Co-authors : Dr. BUSSMANN, Michael (Forschungszentrum Dresden-Rossendorf e.V.) ; Dr. IRMAN, Arie (Helmholtz Zentrum Dresden Rossendorf) ; Dr. JOCHMANN, Axel (Helmholtz-Zentrum Dresden-Rossendorf) ; Mr. PAUSCH, Richard (Helmholtz-Zentrum Dresden - Rossendorf) ; Dr. ROESER, Fabian (Helmholtz-Zentrum Dresden-Rossendorf) ; Prof. SCHRAMM, Ulrich (Helmholtz-Zentrum Dresden-Rossendorf) ; Prof. SAUERBREY, Roland (Helmholtz-Zentrum Dresden-Rossendorf)

Presenter : Dr. DEBUS, Alexander (Helmholtz-Zentrum Dresden-Rossendorf)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Dr. DEBUS, Alexander

Submitted on Thursday 28 May 2015

Last modified on : Thursday 28 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 82

Longitudinal phase space diagnostic for ultrashort bunches

Content :

Ultrashort electron bunches of few femtoseconds length are highly desirable for a large number of applications such as ultrafast electron diffraction, free-electron lasers or for external injection into plasma wakefields. As the plasma wavelength determines the length scale in plasma accelerators, also the bunches produced by this technique intrinsically are very short.
A precise knowledge of the longitudinal phase space is crucial in order to optimize the acceleration process and bunch compression. However, measuring the longitudinal phase space becomes increasingly challenging for shorter bunches.
We will present a new method to diagnose ultrashort bunches and explore its limitations in terms of resolution in time and energy spread.

Primary authors : DORNMAIR, Irene (University of Hamburg)

Co-authors : Dr. FLOETTMANN, Klaus (DESY) ; Dr. SCHROEDER, Carl (Lawrence Berkeley National Laboratory) ; MARCHETTI, Barbara (DESY) ; Dr. ASSMANN, Ralph (DESY) ; MAIER, Andreas (CFEL/UHH)

Presenter : DORNMAIR, Irene (University of Hamburg)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : talk

Submitted by : DORNMAIR, Irene

Submitted on Thursday 28 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 83

Broadband transition radiation measurements for the temporal diagnosis of ultra-short plasma-accelerated electron bunches

Content :

We report on the development of a broadband transition radiation (TR) diagnostic for use during plasma wakefield experiments at FLASHForward. Here, 1~GeV, 50~fs electron bunches will drive a plasma wakefield accelerator, generating ultra-short ($\sim~$fs) `witness' electron bunches with energies $\leq~5$~GeV.

TR is generated whenever a charged particle travels between materials with different dielectric constants. Broadband spectral measurements of coherent TR can be used to obtain information about the longitudinal charge distribution. DESY has developed several broadband spectrometers, for this purpose, with spectral sensitivity in the range 0.7-150~THz.

Stable generation of electron bunches from plasma wakefield acceleration is an area of research. Therefore, for accurate diagnosis of bunch parameters, not only should the spectral range be sufficiently broad to support phase retrieval and the upper frequency limit be sufficiently high to resolve the femtosecond bunch durations expected, but the diagnostic should be able to perform single shot measurements.

We present the proposed setup to combine these novel broadband spectrometers and extend the high-frequency limit, to form a single shot diagnostic covering the range 0.7-1000~THz. We consider both the general technical challenges and specific issues affecting plasma wakefield accelerators.

Primary authors : Dr. PALMER, Charlotte (DESY)

Co-authors : Mr. BORNHOLDT, Michael (DESY) ; Dr. SCHMIDT, Bernhard (DESY) ; Mr. WUNDERLICH, Steffen (DESY) ; Ms. SEIDLITZ, Silvia (DESY) ; Dr. STREETER, Matthew (DESY) ; Dr. OSTERHOFF, Jens (Deutsches Elektronen-Synchrotron DESY)

Presenter : Dr. PALMER, Charlotte (DESY)

Track classification : WG1 - Electron beams from plasmas ; WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : talk

Submitted by : Dr. PALMER, Charlotte

Submitted on Thursday 28 May 2015

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
Judged by :
Date :
Comments : ""

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 84

Continuous-Flow Plasma Target for LWFA: Concept Towards High Repetition Rates

Content :

Stable and high-repetition operation of a plasma-target for Laser Wakefield Acceleration is a key element for reliable, accessible and reproducible experiments. Many LWFA experiments rely on targets, which operate with short bursts of gas in order to reduce gas load within the system to a minimum. However, even in burst mode it requires considerable time to reduce the pressure to a level low enough for the next laser-shot, which is one of the most limiting constraints in electron repetition rate. In contrast to pulsed operation, this talk will show a concept to be implemented at the LUX-Beamline, operated by University of Hamburg and DESY, that allows for continuous flow operation of a capillary-type target. This enables the highest electron repetition rates, only limited by the repetition rate of the driver laser. Additionally, we expect continuous gas flow operation to reduce possible error sources from pressure fluctuations inside the target as well as timing jitter issues between laser pulse and gas pulse, stemming from non-reproducible gas valve dynamics. Our concept features a differential pumping setup, specially designed for laser applications, and allows for direct online pressure measurement inside the target, which yields absolutely calibrated values.

Primary authors : Mr. DELBOS, Niels (University of Hamburg / Center for Free Electron Laser Science)

Co-authors : Mr. KOCON, Dariusz (University of Hamburg, ELI) ; Mr. MESSNER, Philipp (University of Hamburg / Center for Free Electron Laser Science) ; Mr. WERLE, Christian (University of Hamburg) ; MAIER, Andreas (CFEL/UHH)

Presenter : Mr. DELBOS, Niels (University of Hamburg / Center for Free Electron Laser Science)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Mr. DELBOS, Niels

Submitted on Thursday 28 May 2015

Last modified on : Friday 29 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 85

Interstage optics design for a plasma wakefield linear collider

Content :

Plasma wakefield acceleration offers acceleration gradients of several GeV/m as well as high power efficiency, ideal for a next-generation linear collider. The beam optics requirements between each plasma stage include injection and extraction of drive beams, controlling and matching the main beam beta functions to the plasma, cancelling dispersion as well as constraining bunch lengthening and chromaticity. To maintain a high effective acceleration gradient, this must be accomplished in the shortest distance possible. We present scaling laws for a working design, including a discussion of novel methods to address chromaticity correction.

Primary authors : Dr. ADLI, Erik (University of Oslo, Norway) ; Mr. LINDSTRØM, Carl Andreas (University of Oslo)

Co-authors :

Presenter : Mr. LINDSTRØM, Carl Andreas (University of Oslo)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Mr. LINDSTRØM, Carl Andreas

Submitted on Thursday 28 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 86

Potential clinical impact of laser-accelerated ion beams in cancer therapy

Content :

Plasma-accelerated ion beams have lately advanced from mere proofs-of-principle experiments to what can now be called a maturing phase of new technologies: with higher intensity lasers, new target materials and particle injection schemes becoming available. We present some unique advantages of these beams in hadron cancer therapy:

These beams could be delivered at short pulses, with very high fluence, short inter-particle distance which then creates quite dense ionization track signatures (spurs, blobs, etc.) in target tumors. Hence at the micro-level, their RBEs could be much higher than those of standard ion sources from synchro-/cyclotrons.

Highly peaked "quasi-monoenergetic " beams could be achieved, making it ideal for fast energy switching in pencil beam scanning as a treatment delivery.

Well-collimated beams would be ideal for proximal normal tissue-sparing as in mini-beam grid scheme where entering beams get evenly split but become interlaced (due to multiple coulomb scattering) as they penetrate the tumor target volume, thus delivering full dose to the target volume but sparing the intervening normal tissues.

Lastly, looking into the future they provide compact, eventually more cost-effective clinical treatment machines that could deliver protons and other heavier ion species.

Primary authors : Prof. OBCEMEA, Ceferino (Memorial Sloan Kettering Cancer Center)

Co-authors :

Presenter : Prof. OBCEMEA, Ceferino (Memorial Sloan Kettering Cancer Center)

Track classification : WG2 - Ion beams from plasmas ; WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : OBCEMEA, Ceferino

Submitted on Thursday 28 May 2015

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Track judgments :

Track : WG2 - Ion beams from plasmas

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Date :
Comments : ""

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 87

Status of the proton and electron transfer lines for the AWAKE experiment at CERN

Content :

The AWAKE project at CERN is planned to study proton driven plasma wakefield acceleration of an externally injected electron beam. The CNGS extraction line will be modified to provide the plasma cell with a proton beam from the CERN SPS. A new transfer line was designed to transport the electrons from an RF gun to the cell. The commissioning of the proton line will take place in 2016 for the first phase of the experiment, which is focused on the study of the self-modulation of the proton bunch in the plasma. A co-propagating laser beam will be used to seed and control this process. The electron line will be added for the second phase of AWAKE in 2017, when the wakefield will be probed with an electron beam. The challenge for these transfer lines lies in the parallel operation of the proton, electron and laser beam. These beams, with different characteristics, need to be synchronised and aligned to optimize the injection conditions. This task requires great flexibilities in the transfer line optics, as well as special designs for the beam instrumentation and the electron line magnets. The status of theses design will be presented in this paper.

Primary authors : Dr. SCHMIDT, Janet (CERN)

Co-authors : BAUCHE, Jeremie (CERN) ; BISKUP, Bartolomej (CERN) ; Dr. BRACCO, Chiara (CERN) ; Dr. DOEBERT, Steffen (CERN) ; GODDARD, Brennan (CERN) ; Dr. GSCHWENDTNER, Edda (CERN) ; JENSEN, Lars (CERN) ; JONES, Rhodri (CERN) ; MAZZONI, Stefano (CERN) ; MEDDAHI, Malika (CERN) ; PETRENKO, Alexey (CERN, Budker INP) ; VELOTTI, Francesco (CERN) ; VOROZHTSOV, Alexey (CERN) ; Prof. MUGGLI, Patric (Max-Planck-Institut für Physik) ; Mr. DORDA, Ulrich (DESY) ; MERMINGA, Lia (TRIUMF) ; VERZILOV, Victor (TRIUMF)

Presenter : Dr. SCHMIDT, Janet (CERN)

Track classification : WG1 - Electron beams from plasmas

Contribution type : poster

Submitted by : Dr. SCHMIDT, Janet

Submitted on Thursday 28 May 2015

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
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Date :
Comments : ""

Abstract ID : 88

Effect of the laser wavefront in a high repetition rate laser-plasma accelerator

Content :

Recently, several groups have been developing laser-plasma accelerators operating at high repetition rate, using kHz lasers with energies < 10 mJ [1, 2]. Such developments are particularly important for applications as the high repetition rate improves the beam stability and permits data accumulation [3].
We performed an experiment of electrons acceleration by tightly focusing kHz, few-mJ laser pulses into an underdense plasma. This high intensity laser-plasma interaction led to stable electron beams with strikingly complex transverse distributions even for good quality laser focal spots. The laser wavefront at focus was measured experimentally and we performed for the first time PIC simulations including experimentally retrieved wavefronts.
Analysis of the experimental data, along with results of PIC simulations demonstrates the effect of the distorsions of the laser wavefront on the acceleration of electrons [2]: the laser pulse drives an inhomogenous transverse wakefield whose focusing/defocusing properties affect the electron distribution. These findings explain the experimental results and suggest the possibility of controlling the electron spatial distribution by tailoring the laser wavefront.

[1] Z. He et al, NJP 15 (2013) 053016
[2] B. Beaurepaire et al, arXiv:1501.05797
[3] Z. He et al, APL 102, 064104 (2013)

Primary authors : Mr. BEAUREPAIRE, Benoit (Laboratoire d'Optique Appliquée (LOA))

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Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Mr. BEAUREPAIRE, Benoit

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Track judgments :

Track : WG1 - Electron beams from plasmas

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Abstract ID : 89

High gradient IFEL acceleration and deceleration in strongly tapered undulators.

Content :

Efficient coupling of relativistic electron beams with high power radiation in magnetic undulators lies at the heart of advanced accelerator and light source research and development. Recent inverse free electron laser experiments using strongly tapered undulators have demonstrated high-gradient (>100 MV/m) and high energy gain (> 50 MeV) acceleration of externally injected electrons, producing beams of high-quality (< 2 % energy spread and < 3 mm-mrad emittance). Using the tapering optimization principles developed for IFEL accelerators and taking into account the evolution of the radiation field along the interaction, it is possible to design strong tapering undulators where a large fraction of energy (> 50 %) may be transferred between the electrons and laser, enabling compact, high-current GeV accelerators and light-sources of unprecedented average and peak powers.

Primary authors : Prof. MUSUMECI, Pietro (UCLA)

Co-authors :

Presenter : Prof. MUSUMECI, Pietro (UCLA)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : talk

Submitted by : Prof. MUSUMECI, Pietro

Submitted on Thursday 28 May 2015

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Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :

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Date :

Comments : ""

Abstract ID : 90

Electron rephasing in a laser-plasma accelerator

Content :

Energy gain in laser wakefield accelerators is generally limited by dephasing between highly relativistic electrons and the driving laser pulse. But as the relative phase depends on both the driver and the cavity length, the effects of dephasing can be mitigated with appropriate tailoring of the plasma density along propagation. The ideal case would provide constant phase adaption, but such a target is difficult to design.
Here we present a simplified approach, which uses a sharp upward plasma density transition, generated by introducing a knife edge into the gas jet. Depending on the position of the shock, we observe that this onetime boost can augment the cutoff energy of electrons by almost 50 percent.

Primary authors : Mr. DÖPP, Andreas (Laboratoire d'Optique Appliquée / Centro de Láseres Pulsados)

Co-authors : Mr. GUILLAUME, Emillien (LOA) ; Dr. THAURY, Cédric (LOA) ; Dr. TA PHUOC, Kim (LOA) ; Dr. LIFSCHITZ, Agustin (LOA) ; Dr. GODDET, Jean-phillipe (LOA) ; Dr. TAFZI, Amar (LOA) ; Dr. CHOU, Shao-wei (MPQ) ; Dr. VEISZ, Laszlo (Max-Planck-Institut fuer Quantenoptik) ; Prof. MALKA, Victor (LOA)

Presenter : Mr. DÖPP, Andreas (Laboratoire d'Optique Appliquée / Centro de Láseres Pulsados)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Mr. DÖPP, Andreas

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
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Date :
Comments : ""

Abstract ID : 91

Laser-ionized plasma source for plasma wakefield accelerators

Content :

In 2016, AWAKE will be the first experiment to use a high energy, 400 GeV, CERN proton bunch to drive a plasma wakefield. AWAKE requires a unique plasma source. It is a 10 meter long, 2 mm diameter, laser-ionized Rb plasma with a density range of 10^14 to 10^15 cm^-3 . Plasma density variations as small as 0.2 % can have a detrimental effect on the acceleration of the injected electron bunch since the large (GeV/m) wakefield is driven by self-modulation-instability formed micro-bunches. This strict requirement on the density uniformity is satisfied by a laser ionized Rb vapor. The 10 m long 4 cm diameter vapor is heated uniformly by an oil heat exchanger and is dynamically confined in by continuous flow of Rb provided by precisely controlled Rb reservoirs located at both ends. The vapor and plasma density along the source are controlled by adjusting the reservoirs temperature, allowing for generation of positive or negative density gradients. Here we present the details of the plasma source along with the initial experimental and analytical studies on the laser ionization.

Primary authors : Dr. OZ, Erdem (Max Planck for Physics)

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Presenter : Dr. OZ, Erdem (Max Planck for Physics)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : talk

Submitted by : Dr. OZ, Erdem

Submitted on Thursday 28 May 2015

Last modified on : Thursday 28 May 2015

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Status : SUBMITTED

Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
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Date :
Comments : ""

Abstract ID : 92

6D phase space electron beam analysis and machine sensitivity studies for ELI-NP GBS

Content :

The ELI-NP Gamma Beam Source is now under construction in Magurele - Bucharest (RO). Here an advanced source of gamma photons with unprecedented specifications of brilliance (>10^21), monochromaticity (0.3%) and energy tunability (0.2–20.0 MeV) is being built, based on Inverse Compton Scattering in the head-on configuration between an electron beam of maximum energy 740 MeV and a high quality high power psec laser beam. These requirements make the ELI-NP GBS an advanced and challenging gamma ray source. The electron beam dynamics analysis and control regarding the machine sensitivity to the possible jitters and misalignments are presented. The effects on the beam quality are illustrated providing the basis for the alignment procedure and jitters tolerances.

Primary authors : Ms. GIRIBONO, Anna (ROMA1)

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Presenter : Ms. GIRIBONO, Anna (ROMA1)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : poster

Submitted by : GIRIBONO, Anna

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Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
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Date :
Comments : ""

Abstract ID : 93

6D phase space electron beam analysis and machine sensitivity studies for ELI-NP GBS

Content :

The ELI-NP Gamma Beam Source is now under construction in Magurele - Bucharest (RO). Here an advanced source of gamma photons with unprecedented specifications of brilliance (>10^21), monochromaticity (0.3%) and energy tunability (0.2–20.0 MeV) is being built, based on Inverse Compton Scattering in the head-on configuration between an electron beam of maximum energy 740 MeV and a high quality high power psec laser beam. These requirements make the ELI-NP GBS an advanced and challenging gamma ray source. The electron beam dynamics analysis and control regarding the machine sensitivity to the possible jitters and misalignments are presented. The effects on the beam quality are illustrated providing the basis for the alignment procedure and jitters tolerances.

Primary authors : Ms. GIRIBONO, Anna (ROMA1)

Co-authors : BACCI, Alberto Luigi (MI) ; CURATOLO, Camilla (MI) ; DREBOT, Illya (MI) ; PALUMBO, Luigi (ROMA1) ; PETRILLO, Vittoria (MI) ; ROSSI, Andrea Renato (MI) ; SERAFINI, Luca (MI) ; VACCAREZZA, Cristina (LNF) ; VANNOZZI, Alessandro (ROMA1) ; VARIOLA, Alessandro (LNF)

Presenter : Ms. GIRIBONO, Anna (ROMA1)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : poster

Submitted by : GIRIBONO, Anna

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Judgment :
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Date :
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Abstract ID : 94

Generation of 600 MeV carbon ions with composite ultrathin targets

Content :

Here we report recent experimental results on ion acceleration with high-contrast femtosecond Petawatt laser and novel composite targets. Linearly-polarized, 30-fs, 9.2 J, high-contrast laser pulses were focused onto double-layer targets composed of nanofoams and nanofoils. It was found that ion energy strongly depends on the thickness of nanofoam layer. At optical thickness, 58 MeV protons and 600 MeV carbon ions were generated, which is 1.7 and 3.5 times of that from single-layer nanofoil targets correspondingly.

Primary authors : Dr. MA, Wenjun (Faculty of Physics, Ludwig-Maximilians University (LMU))

Co-authors : Dr. KIM, I Jong (APRI, GIST, Gwangju, Korea) ; Dr. LIN, Chen (Beijing University) ; Prof. YAN, Xueqing (Beijing University) ; Prof. NAM, Chang Hee (GIST, Korea) ; Prof. SCHREIBER, Joerg (LMU & MPQ) ; Prof. ZEPF, Matt (QUB & Jena) ; Dr. CHOI, Il Woo (GIST, Korea) ; Dr. WANG, Hongyong (Jena Helmholtz Institute) ; Dr. BIN, Jianhui (LMU)

Presenter : Dr. MA, Wenjun (Faculty of Physics, Ludwig-Maximilians University (LMU))

Track classification : WG2 - Ion beams from plasmas

Contribution type : talk

Submitted by : Dr. MA, Wenjun

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Track : WG2 - Ion beams from plasmas

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Abstract ID : 95

Progress of self-modulation experiments with electron and positron beams in plasma wakefield experiments at FACET

Content :

The E209 experiment at FACET studies the physics of the self-modulation instability in long electron and positron beams in dense plasmas. We report on initial results from experiments in Lithium, Argon and Hydrogen plasmas. We highlight the various experimental challenges, and steps taken to overcome them.

Primary authors : Dr. ADLI, Erik (University of Oslo)

Co-authors : Dr. MUGGLI, Patric (MPP Munchen) ; Dr. VIEIRA, Jorge (Instituto Superior Tecnico) ; Mrs. AMORIM, Ligia Diana (IST Portugal) ; Dr. LITOS, Michael D. (SLAC) ; HOGAN, Mark (SLAC National Accelerator Laboratory) ; Dr. YAKIMENKO, Vitaly (SLAC) ; Mr. LINDSTROM, Carl A. (University of Oslo) ; Mrs. OLSEN, Veronica K. B. (University of Oslo)

Presenter : Dr. ADLI, Erik (University of Oslo)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : poster

Submitted by : Dr. ADLI, Erik

Submitted on Friday 29 May 2015

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Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
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Date :
Comments : ""

Abstract ID : 96

Laser-driven ion acceleration using truly mass-limited targets

Content :

Results on experiments on laser driven ion acceleration will be presented, which have been carried out at the IOQ in Jena, either with the 40-TW Ti:Sapphire system JETI or with the fully diode pumped, 100-TW POLARIS system. First, experiments on truly mass-limited targets will be presented, which have used water droplets of few-μm diameter showing a clear modulation of the protons' energy spectrum. Furthermore, experimental results on the first application of mass-limited, cryogenically cooled, solid-hydrogen targets will be presented, which show for the first time a significant enhancement of conversion efficiency and the clear formation of non-thermal features in the spectrum, which can be explained by means of 2D PIC simulations. Finally, experimental results using nm-thin foils and frequency doubled, ultra-high contrast pulses from POLARIS will be presented. Here, clear signatures of acceleration both by the radiation pressure (RPA) and via target normal sheath acceleration TNSA can be distinguished in the protons' beam profile and spectrum. Details of the physics underlying the interaction process will be discussed using numerical simulations and an outlook for the future program on ion acceleration in Jena will be given.

Primary authors : Prof. KALUZA, Malte (University of Jena, Helmholtz-Institute Jena)

Co-authors :

Presenter : Prof. KALUZA, Malte (University of Jena, Helmholtz-Institute Jena)

Track classification : WG2 - Ion beams from plasmas

Contribution type : invited talk

Submitted by : Prof. KALUZA, Malte

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Track judgments :

Track : WG2 - Ion beams from plasmas

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Date :

Comments : ""

Abstract ID : 97

First steps towards independent 2-stage laser plasma accelerator

Content :

Laser-plasma acceleration has demonstrated its huge potential for the generation of relativistic electron bunches. Considering the limitations of single stage acceleration as well as the emergence of PW lasers all over the world, multi-stage accelerator schemes have been proposed to scale the electron energy up to the 10's GeV level and even more. In the context of the French CILEX project, one of the pillar of the electron acceleration program planned with APOLLON 10 PW laser is the demonstration of a laser plasma accelerator based on 2 independent stages. Future experiments are designed by a collaboration of several group from the Plateau de Saclay. As a first step to test the feasability, a laser plasma electron source, and a dedicated magnetic line to transport and focus the electron bunches, were designed, build and set-up at the UHI100 facility of CEA-Saclay. Preliminary experimental results using the 100TW, 25fs UHI100 laser beam will be presented.

Primary authors : Dr. DOBOSZ DUFRÉNOY, Sandrine (CEA-Saclay)

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Presenter : Dr. DOBOSZ DUFRÉNOY, Sandrine (CEA-Saclay)

Track classification :

Contribution type : poster

Submitted by : Dr. DOBOSZ DUFRÉNOY, Sandrine

Submitted on Friday 29 May 2015

Last modified on : Friday 29 May 2015

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Status : SUBMITTED

Track judgments :

Abstract ID : 98

Laser-capillary interaction for the EXIN project

Content :

The EXIN project is under development within the SPARC_LAB facility of the National Laboratory of Frascati (LNF-INFN).
This project aims to accelerate preexisting electron bunches with high brightness exploiting the wakefield plasma acceleration technique while preserving the initial quality. The electron bunches are generated by the SPARC photo injector with an energy of about 80MeV, a normalized emittance of ~1 mm-mrad, a charge Q~10-20 pC and a repetition rate 1-10 Hz.
The wakefield is excited inside a capillary by high intensity laser pulses produced by the FLAME 200TW laser interacting with a gas/plasma.
Nowadays, the plasma wakefield acceleration is worldwide studied thanks to the high accelerating gradient that can be reached. At LNF we are focusing on the possibility of obtaining high quality accelerated bunches exploiting these high gradient.
The chosen acceleration regime is the "quasi non linear" with normalized laser intensity a0~1.3 and a plasma density corresponding to a wavelength λplasma~100μm. These values determine the range of the laser and capillary parameters to be employed.
We discus the choice of the experimental parameters and we present the laser-capillary matching condition and the interaction point layout.

Primary authors : Mr. BISESTO, Fabrizio (INFN-LNF)

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Track classification : WG7 - Laser technology for advanced accelerators

Contribution type : poster

Submitted by : BISESTO, Fabrizio Giuseppe

Submitted on Friday 29 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG7 - Laser technology for advanced accelerators

Judgment :

Judged by :
Date :
Comments : ""

Abstract ID : 99

Matching beams into plasma-based accelerators

Content :

The conservation of the quality of beams externally injected into - or extracted from - a plasma accelerator stage is very challenging, mainly due to the huge focusing forces inside the plasma. In particular, a proper matching of the beam is mandatory to prevent irreversible emittance spoiling. We will summarize the underlying beam dynamics and discuss practical methods envisaged to fight against any detrimental dilution.

Primary authors : MAIER, Andreas (CFEL/UHH)

Co-authors : DORNMAIR, Irene (University of Hamburg) ; Dr. FLOETTMANN, Klaus (DESY) ; Dr. MEHRLING, Timon (DESY)

Presenter : MAIER, Andreas (CFEL/UHH)

Track classification : WG1 - Electron beams from plasmas

Contribution type : invited talk

Submitted by : MAIER, Andreas

Submitted on Friday 29 May 2015

Last modified on : Friday 29 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 100

MULTI-BEAM LINEAR ACCELERATOR EVT

Content :

A novel multi-beam linear accelerator EVT (Electron Voltage Transformer) concerns to a class of two–beam accelerators. It comprises a common electron gun generating drive beam-lets and an accelerated beam. All beams are modulated in RF modulators and pass in accelerating structure, where interaction of beams occurs in uncoupled with each other and inductive tuned cavities. A phasing of beams is solved by choice correspond distances between centers of gaps of the adjacent cavities. The result of numerical simulation and the specification of the accelerator EVT operating in S-band, having 60 kV voltage of the gun and generating 1.1 MV accelerated beam is submitted. The high efficiency (67%) shown in numerical simulations and high design average power are suitable for use of the accelerator EVT in industrial applications.

Primary authors : Dr. TERYAEV, Vladimir E. (Omega-P, Inc., New Haven, CT 06510, USA)

Co-authors : Dr. KAZAKOV, Sergey Yu. (Fermilab, Batavia, IL 60510, USA) ; Prof. HIRSHFIELD, Jay L. (Yale University, New Haven, CT 06511, USA)

Presenter : Dr. TERYAEV, Vladimir E. (Omega-P, Inc., New Haven, CT 06510, USA) ; Prof. HIRSHFIELD, Jay L. (Yale Unive

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures ; WG6 - Theory and simulations

Contribution type : poster

Submitted by : Dr. TERYAEV, Vladimir

Submitted on Friday 29 May 2015

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Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :
Judged by :
Date :
Comments : ""

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 101

First plasma acceleration experiments at PITZ

Content :

One key aspect of the plasma acceleration experiment which is prepared by the AWAKE collaboration at CERN is the self-modulation of a long (compared to the plasma wavelength) particle beam in a plasma. To study this effect in detail an experiment was conceptualized at the Photo-Injector Test Facility at DESY, Zeuthen site (PITZ) to inject a 6 mm long electron beam into a lithium plasma with a density of 10E15 cm-3.
In this contribution we report about first experiments with the plasma cell which was inserted into the PITZ beam line. The cell is prepared with lithium and argon buffer gas, then heated up to 700C to achieve a lithium atmosphere with the necessary density. The lithium is ionized with an ArF laser (193 nm wavelength) via sideports, creating a plasma channel with a length of 10 cm. The 22 MeV electron beam available at PITZ is focused tightly into the plasma, then guided from there to the diagnostics elements. The reaction of the electron beam in the plasma is recorded and is compared to the case when the oven heating and ionization laser is switched off.

Primary authors : Dr. GROSS, Matthias (DESY)

Co-authors : Dr. BRINKMANN, Reinhard (DESY) ; Prof. GRÜNER, Florian (University of Hamburg) ; Mr. KOSS, Gerald (DESY) ; Dr. KRASILNIKOV, Mikhail (DESY) ; Mr. LISHILIN, Osip (DESY) ; Mr. PATHAK, Gaurav (University of Hamburg) ; Dr. RICHTER, Dieter (HZB) ; Dr. SCHROEDER, Carl (Lawrence Berkeley National Laboratory) ; Mr. SCHÜTZE, Rico (DESY) ; Dr. STEPHAN, Frank (DESY, Zeuthen site)

Presenter : Dr. GROSS, Matthias (DESY)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Dr. GROSS, Matthias

Submitted on Friday 29 May 2015

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Comments :

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
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Date :
Comments : ""

Abstract ID : 102

Semianalytical fluid study of the propagation of an ultrastrong femtosecond laser pulse in a plasma with ultrarelativistic electron jitter

Content :

The interaction of a multi-petawatt, pancake-shaped laser pulse with an unmagnetized plasma is studied analytically and numerically in the blowout regime of fully relativistic electron jitter velocities and in the context of the laser wakefield acceleration scheme. A set of novel nonlinear equations is derived using a three-timescale description, with an intermediate timescale associated with the nonlinear phase of the electromagnetic wave and with the spatial bending of its wave front. The new nonlinear terms in the wave equation, introduced by the nonlinear phase, describe a smooth transition to a nondispersive electromagnetic wave at very large intensities, and the simultaneous saturation of the previously known nonlocal cubic nonlinearity. The temporal evolution of the laser pulse is studied by the numerical solution of the model equations in a two-dimensional geometry, with the spot diameter below 100 microns. The most stable initial pulse length is found to be somewhat larger than 1 micron, but a rapid stretching of the laser pulse in the direction of propagation to around 10 microns ensued, due to the nonlocality of the plasma response, followed by the bending of the laser wave front.

Primary authors : Dr. JOVANOVIC, Dusan (Institute of Physics, University of Belgrade)

Co-authors : Prof. FEDELE, Renato (NA) ; Dr. DE NICOLA, Sergio (SPIN-CNR, Complesso Universitario di M.S. Angelo, Napoli, Italy) ; Prof. BELIC, Milivoj (Texas A University at Qatar, P.O. Box 23874, Doha, Qatar)

Presenter : Prof. FEDELE, Renato (NA)

Track classification : WG6 - Theory and simulations

Contribution type : poster

Submitted by : Dr. JOVANOVIC, Dusan

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Track : WG6 - Theory and simulations

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Abstract ID : 103

Propagation of high-intensity femtosecond laser pulses through ablating metal waveguides

Content :

Recent experiments at the Institute of Laser Physics SB RAS are reported. In the experiments, high-intensity, high-contrast (<1e-8), 50 fs laser pulses propagate through 20-mm-long, about 0.05-mm-wide copper waveguides of the triangular cross-section. The triangular shape is chosen for its manufacturability. The transmission through waveguides is 70% for input intensities up to 1e17 W/cm2. The copper reflectivity in vacuum, helium, and air is measured in the intensity range of 1e10-1e17 W/cm2. No reflectivity decrease in vacuum and helium is observed, which leads to the conclusion that copper waveguides can efficiently guide laser pulses of intensities up to 1e19 W/cm2 on the waveguide axis (that corresponds to 1e17 W/cm2 on the walls). The transmission efficiency linearly decreases with the number of transmitted pulses because of plug formation inside the waveguide. The waveguide lifetime decreases exponentially with the energy of the laser pulse. In general, experimental results show that there are no stoppers found on the path to guiding higher intensity pulses by plasma-walled metal waveguides for the laser wakefield acceleration.

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Presenter : Prof. LOTOV, Konstantin (Novosibirsk State University)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : talk

Submitted by : Prof. LOTOV, Konstantin

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Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :

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Date :

Comments : ""

Abstract ID : 104

Electron-Beam Manipulation Techniques in the SINBAD Linac for External Injection in PWFA

Content :

The SINBAD facility (Short and INnovative Bunches and Accelerators at Desy) is foreseen to host various experiments in the field of production of ultra-short electron bunches and novel high gradient acceleration techniques.
Besides studying novel acceleration techniques aiming to produce high brightness short electron bunches, the ARD group at DESY is working on the design of a conventional RF accelerator that will allow the production of low charge (0.5pC - few pC) ultra-short electron bunches (having FWHM length<1fs – few fs). The setup will allow the direct experimental comparison of the performance achievable by using different compression techniques (velocity bunching, magnetic compression, hybrid compression scheme). At a later stage ARES will be used to inject such electron bunches into a laser driven Plasma Wake-field Accelerator, which imposes strong requirements on parameters such as the arrival time jitter and the pointing stability of the beam.
In this paper we review the compression techniques feasible at SINBAD and we underline the differences in terms of peak current, beam quality and arrival time stability.

Primary authors : MARCHETTI, Barbara (DESY)

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Presenter : MARCHETTI, Barbara (DESY)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : either

Submitted by : MARCHETTI, Barbara

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Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

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Comments : ""

Abstract ID : 105

Study and design of the acceleration of electrons by Laser Wakefield Acceleration (LWFA) in the CILEX project using WARP

Content :

The Particle-in-cell (PIC) Framework WARP was recently adapted to describe Laser Wakefield Acceleration. It is also well adapted to the modeling of the CILEX project, in which experiments on electron acceleration by multi-stages LWFA using multi-PW APOLLON are in preparation. The strength of this code lies in its ability to treat the whole aspect of a multi-stage accelerator, beginning from the injection of the electron beam in a plasma wakefield, its transport through the electromagnetic focusing devices and finally its acceleration in the plasma accelerator stages.
We have recently improved the physical model of our simulations, we take into account a mixture of gases in modeling the injector because the injection induced by ionization of high Z atoms allows a much better control in the injection process; we use the cylindrical azimuthal Fourier decomposition for plasma-based acceleration. This provides a quasi-3D description of the laser-plasma interaction in underdense plasmas with computational load similar to 2D calculations.
We will present at the conference our latest results on the optimization of a 50 MeV quasi-monoenergetic electron beam injected via ionization of high Z atoms. These results will be compared to the experimental ones.

Primary authors : Mr. LEE, Patrick (LPGP)

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Track classification : WG6 - Theory and simulations

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Abstract ID : 106

SINBAD - The accelerator R facility under construction at DESY

Content :

The SINBAD facility (Short INnovative Bunches and Accelerators at DESY) is a long-term dedicated accelerator research and development facility currently under construction at DESY. It will be located in the premises of the old DORIS accelerator complex and host multiple independent experiments cost-effectively accessing the same central infrastructure like a central high power laser. With the removal of the old DORIS accelerator being finished, the refurbishment of the technical infrastructure is currently starting up.

The presently ongoing conversion of the area into the SINBAD facility and the currently foreseen layout is described. The first experiment will use a compact S-band linac for the production of ultra-short bunches at hundred MeV. Once established, one of the main usages will be to externally inject electrons into a laser-driven plasma wakefield accelerator to boost the energy to GeV-level while maintaining a usable beam quality, ultimately aiming to drive a FEL. The second experiment already under planning is the setup of an attosecond radiation source with advanced technology. Further usage of the available space and infrastructure is revised and national and international collaborations are being established.

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Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : either

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Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

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Judged by :
Date :
Comments : ""

Abstract ID : 107

Status of the preparations for a plasma wakefield acceleration experiment at PITZ

Content :

A proof-of-concept experiment for the AWAKE experiment is in preparation at the Photo-Injector Test Facility at DESY, Zeuthen site (PITZ). The goal of the experiment is to observe and measure the energy and density self-modulation of a long electron beam passing through a laser generated lithium plasma.
A new type of plasma cell was manufactured to fulfill feasible constraints of the experiment at PITZ. The plasma cell is a lithium heat pipe oven with inert gas buffers at all input/output ports. Key aspects of the construction are an ArF laser coupled through side ports for the plasma generation, as well as electron windows which separate the plasma from the vacuum beamline. Although side ports design is more complicated than coaxial laser coupling, it also has an advantage: a shadow mask can be used to control the plasma channel parameters, including its length. The electron windows have to be thin enough to minimize electron scattering, but have to be thick enough to maintain low buffer gas diffusion out of the plasma cell. Other aspects of the preparations are the generation of homogenous lithium vapor inside the cell and adjustments to the beamline to accommodate the experiment.

Primary authors : Mr. LISHILIN, Osip (DESY)

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Presenter : Mr. LISHILIN, Osip (DESY)

Track classification : WG1 - Electron beams from plasmas

Contribution type : poster

Submitted by : Mr. LISHILIN, Osip

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Track judgments :

Track : WG1 - Electron beams from plasmas

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Date :
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Abstract ID : 108

Simulation of Errors in Multi-Pulse Laser Wakefield Acceleration

Content :

Laser wakefield acceleration (LWFA) has achieved many notable successes in recent years. However, the lasers used today have low wall-plug efficiency and pulse repetition rates typically limited to a few pulses per second. With these limitations LWFA would not meet the requirements of many applications such as next generation light sources with high average brightness and short pulses. In multi-pulse laser wakefield acceleration (MP-LWFA) the plasma wakefield is instead driven by a train of low-energy laser pulses separated by the plasma period. This opens plasma accelerators to laser technologies, such as fibre and thin-disk lasers, which cannot provide high pulse energies, but can produce low-energy pulses at kHz repetition rates with high efficiency.

For this approach the response of the plasma to a train of laser pulses must be well understood. We present the results of a study of the effects of errors in the pulse train and/or plasma density, including tuning errors and random fluctuations around the ideal pulse spacing. An analytic theory is found to be in good agreement with simulations using the Particle In Cell code EPOCH.

Primary authors : Mr. ARRAN, Christopher (University of Oxford)

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Presenter : Mr. ARRAN, Christopher (University of Oxford)

Track classification : WG6 - Theory and simulations

Contribution type : --not specified--

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Track : WG6 - Theory and simulations

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Date :
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Abstract ID : 109

Effect of transverse non-uniformity of the plasma density on wakefield evolution

Content :

Evolution of the plasma wakefield in transversely non-uniform plasmas is numerically studied in terms of energy fluxes in the co-moving frame. For stationary transverse inhomogeneities, two effects are observed. First, the wave energy is always pushed out of the vicinity of local density extrema. In both V-shaped density channels and ⊠-shaped density crests the behavior of energy fluxes is similar to that in the case of a smooth Gaussian density distribution. Second, longitudinal plasma oscillations quickly transform to transverse ones, which fade away promptly. An oblique density crest co-propagating with the wave driver can sweep out the wave completely and clean the plasma for the next driver. There is also a configuration in which the longitudinal wakefield component increases due to the ion motion. This corresponds to self-modulating long beams like that of the AWAKE experiment at CERN.

Primary authors : Mr. MINAKOV, Vladimir (Novosibirsk State University)

Co-authors :

Presenter : Mr. MINAKOV, Vladimir (Novosibirsk State University)

Track classification : WG6 - Theory and simulations

Contribution type : poster

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Judgment :
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Date :
Comments : ""

Abstract ID : 110

Laser-Driven Proton Acceleration at POLARIS with SHG and nm thin Foils

Content :

To investigate laser-driven ion acceleration in the regime of Light-Sail Radiation Pressure Acceleration it is essential to use foils of few nm thickness. Therefore an extremely high temporal intensity contrast is required to avoid destruction of the target by the prepulse. An ion acceleration experiment was performed at the fully diode pumped laser system POLARIS at the Helmholtz-Institute Jena. POLARIS has been developed and improved within the last two decades and was commissioned for experiments in 2012. It has a very high temporal intensity contrast by using an XPW stage in a double CPA setup. However, to use few nm thin diamond-like-carbon or plastic foils a further enhancement of the contrast was necessary. A KDP crystal has been used to generate the second harmonic of the laser at 515 nm wavelength which significantly enhances the ns- and ps-contrast by several orders of magnitude. These pulses were focused on targets with thicknesses in the range between 5 nm and 800 nm. The results showing the influence of different laser polarizations on the maximum proton energies as well as the investigation of the proton beam profile will be presented.

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Track classification : WG2 - Ion beams from plasmas

Contribution type : poster

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Track : WG2 - Ion beams from plasmas

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Date :

Comments : ""

Abstract ID : 111

GENERATION AND MATCHING SUB-FS ELECTRON BUNCH FOR LASER-DRIVEN PLASMA ACCELERATION AT SINBAD

Content :

Electron bunches with sub-fs duration are required in order to achieve high quality beams by laser-driven plasma acceleration with external injection. SINBAD (Short Innovative Bunches and Accelerators at DESY) is a proposed dedicated accelerator research and development facility at DESY. One of the baseline experiments at SINBAD is ARES (Accelerator Research Experiment at SINBAD), which will provide ultra-short electron bunches of over 100 MeV. We present simulation studies of a few pC, sub-fs bunch generation at ARES with a magnetic bunch compressor by using two different codes (IMPACT-T and CSRTrack). Since the sub-fs will elongate quickly after compression, matching the ultra-short bunch into the plasma cell in a short distance is also vital important. Preliminary design of the matching beamline and beam dynamic simulation are also presented in this paper.

Primary authors : Mr. ZHU, Jun (MPY, DESY)

Co-authors : MARCHETTI, Barbara (DESY) ; Dr. ASSMANN, Ralph (DESY) ; Mr. DORDA, Ulrich (DESY)

Presenter : Mr. ZHU, Jun (MPY, DESY)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : poster

Submitted by : Mr. ZHU, Jun

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Date :

Comments : ""

Abstract ID : 112

Generation of attosecond electron bunches in a laser-plasma accelerator

Content :

The generation of ultrashort accelerated electron bunches is essential for the production of radiation pulses in the attosecond regime with most current techniques, such as Thomson scattering and free-electron lasers.
Using particle-in-cell simulations and analytical models, the suitability for the experimental realization of a novel scheme producing attosecond duration electron bunches from laser-wakefield acceleration in plasma with self-injection in a plasma upramp profile has been investigated. This setup provides control over the point of wave breaking via the plasma density gradient and hence enables a sharp, quasi-1D injection process at the end of the plasma ramp, limiting the accelerated electrons to an extremely compressed bunch.
It is predicted previously that this requires laser power above a few hundred terawatts typically. Here we show that the scheme can be extended with reduced driving laser powers down to tens of terawatts, generating accelerated electron pulses of around 150 attoseconds length and with picocoulombs charge. With the electron properties dependent on, among others, the laser strength, the ramp length and the background plasma density, simple scalings are presented to optimise the output pulse through these initial laser and plasma characteristics.

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Track classification : WG1 - Electron beams from plasmas

Contribution type : poster

Submitted by : Ms. WEIKUM, Maria Katharina

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Track : WG1 - Electron beams from plasmas

Judgment :

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Date :

Comments : ""

Abstract ID : 113

Electron beam final focus system for Thomson scattering

Content :

The design of an electron beam Final Focus System (FFS) and first experimental results aiming for high-flux laser-Thomson backscattering X-ray sources at ELBE are presented. A telescope system consisting of four permanent magnet based quadrupoles was found to have significantly less chromatic aberrations than e.g. a quadrupole triplet. Consequently, smaller focal spot sizes can be achieved, increasing the yield of X-rays from the interaction with the laser. We characterize the electron beam (divergence, spot size, bunch charge, energy and energy spread) at the interaction point and study the influence on the Thomson backscattering process.
We also present the design and test results of the permanent magnet quadrupoles. Adjustable shunts allow for correction of the field strength and compensation of deviations in the permanent magnet material.

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Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : poster

Submitted by : Mr. KRÄMER, Jakob

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Abstract ID : 114

Broadband (UV - mid-IR) spectrometer for single-shot femtosecond electron bunch measurement

Content :

Laser-wakefield accelerators (LWFA) feature electron bunch durations ranging from several fs to tens of fs. Precise knowledge of the longitudinal profile of such fS electron bunches is essential for the design of future table-top Xray sources and remains a big challenge due to the resolution limit of existing diagnostic techniques.
Measurement of broadband coherent and incoherent transition radiation produced when LWFA electron bunches pass a metal foil is a promising way to analyze longitudinal characteristics of these bunches.
Because of the limited reproducibility due to the nonlinear nature of the electron source this characterization requires single-shot capability.
Our spectrometer combines the TR spectrum in UV/VIS (200-1000nm), NIR (0.9-1.7μm) and mid-IR (1.6-12μm). A high spectral sensitivity, dynamic bandwidth and spectral resolution are realized by three optimized dispersion and detection systems to a single-shot spectrometer.
A complete calibration of the spectrometer has been done with regard to wavelengths, relative spectral sensitivities and absolute photometric sensitivity, also taking into account for the light polarization.
Our spectrometer is able to characterize electron bunches with charges as low as 1 pC and resolve time-scales from 0.7 to 40 fs.

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Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : talk

Submitted by : Mr. ZARINI, Omid

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Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :

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Date :
Comments : ""

Abstract ID : 115

Investigation of electron beam dynamics from the Betatron radiation pattern of laser-wakefield accelerators

Content :

Betatron radiation emitted by accelerated electrons in laser-wakefield accelerators can be used as a diagnostic tool to investigate electron dynamics during the acceleration process. Utilizing a 2D X-ray imaging spectroscopy technique we analyse the spectral dependence of the emitted Betatron pattern which basically represents certain electron beam parameters inside the plasma cavity. We also compare to the case when electrons are intentionally injected off-axis by introducing a pulse front tilt on the driver laser beam. The experiments are carried out with the Draco Ti:Sapphire laser sytem at HZDR.

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Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Mr. KOEHLER, Alexander

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Abstract ID : 116

Picosecond metrology of laser driven ion bursts

Content :

Over the last decade research into laser driven ion acceleration has led to the development of a new generation of ultra-compact accelerators. While this high flux source has been exploited for applications [1], the direct observation of ultrafast processes initiated by laser-driven ion bunches has yet to be realised. Here we report on the absolute metrology of proton bursts as short as 3.5 ± 0.7 ps from laser solid target interactions for this purpose. Our methodology relies on observing prompt ionisation dynamics [2] in high purity SiO_2 irradiated by protons which permits single-shot temporal characterisation of the proton pulse. This new class of ultrafast detector (< 0.5 ps) takes advantage of the high degree of synchronicity between the ion source and optical probe laser pulses. We demonstrate how this metrology can allow near jitter-free tracking of ultrafast ion induced dynamics/radiolysis in condensed matter using optical probing and, in the future, laser-driven ultraviolet/X-ray sources [3].

[1] Macchi, A., et al. Rev. Mod. Phys., 85, 751 (2013)
[2] Audebert, P., et al., Phys. Rev. Lett., 73, 1990–1993 (1994)
[3] Dromey, B. et al. Nature Physics, 8, 804 (2012)

Primary authors : Dr. DROMEY, Brendan (Queens University Belfast)

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Track classification : WG2 - Ion beams from plasmas

Contribution type : talk

Submitted by : Dr. DROMEY, Brendan

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Track : WG2 - Ion beams from plasmas

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Abstract ID : 117

Linear and nonlinear Thomson scattering from the PHOENIX x-ray source

Content :

Development of advanced x-ray sources based on the laser-Thomson scattering mechanism is becoming important pushed by a strong demand for ultrashort hard x-ray pulses. These can serve as a tool for structural analysis of complex systems with unprecedented temporal and spatial resolution. We explored the spectral shape and bandwidth of the x-ray beam as a result from the interaction of electron and laser beam. The intensity dependence of the backscattered photon spectrum is investigated and compared to full-physics 3D ab-initio simulations. The realization of a non-linear Thomson scattering source qualifies as an initial step towards strong field physics research.

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Presenter : Mr. JOCHMANN, Axel (Helmholtz-Zentrum Dresden-Rossendorf)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control ; WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : talk

Submitted by : Mr. JOCHMANN, Axel

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Date :

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Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :

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Comments : ""

Abstract ID : 118

Wakefield-Induced Ionization Injection and Self-Similar Staging in Beam-driven Plasma Wakes.

Content :

We propose a simple strategy for controlled ionization-induced trapping of electrons in beam-driven plasma accelerators (PWFA) [1]. The presented method exploits the electric wakefields to ionize electrons from a dopant gas and to capture them into a well-defined volume of the accelerating and focusing wake phase, leading to the formation of high-quality witness bunches. This injection principle is explained by example of three-dimensional particle-in-cell simulations using the code OSIRIS. The produced bunches feature multi-kA peak currents, ~1 μm transverse normalized emittances, uncorrelated energy spreads of <1% on a GeV-energy scale, and femtosecond bunch lengths. The hereby generated witness bunches fulfill all the requirements to drive the same injection principle in a largely increased plasma density. This brings up a new concept of staging that has the potential of producing electron beams with unprecedented energy and quality in PWFA.

References
[1] A. Martinez de la Ossa et al., Phys. Rev. Lett. 111, 245003 (2013).

Primary authors : Dr. MARTINEZ DE LA OSSA, Alberto (DESY)

Co-authors : Dr. OSTERHOFF, Jens (Deutsches Elektronen-Synchrotron DESY) ; Dr. SCHAPER, Lucas (University Hamburg / DESY) ; Dr. MEHRLING, Timon (DESY) ; Dr. STREETER, Matthew (DESY)

Presenter : Dr. MARTINEZ DE LA OSSA, Alberto (DESY)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Dr. MARTINEZ DE LA OSSA, Alberto

Submitted on Friday 29 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
Judged by :
Date :
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Abstract ID : 119

FLASH Pulse Stacker for FLASHForward double electron bunch generation upgrade and initial compression studies.

Content :

A core study at the Plasma Wakefield Accelerator (PWFA) FLASHForward is the acceleration of an externally injected witness electron bunch in the wake generated by a driver electron bunch. To perform these external injection experiments the drive and witness electron bunches require a separation of the order of 100 microns. To generate the electron bunches a pulse stacker has been constructed and recently upgraded in the FLASH injector laser hutch. The pulse stacker uses the combination of a 1/2 wave plate, beam splitters and a delay stage to delay part of the injector laser pulse. The temporally separated pulses are used with the FLASH electron gun to generate two electron bunches which can be accelerated in the same FLASH RF bucket. In this contribution the tests of the upgraded pulse stacker and the initial double electron bunch compression studies will be presented.

Primary authors : Dr. DALE, John (DESY)

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Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

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Date :

Comments : ""

Abstract ID : 120

The CTF3 facility: a unique place for testing future accelerators concepts.

Content :

Since 2008, the Compact Linear Collider (CLIC) project is running a test facility called CTF3 where the two-beam acceleration principle has been successfully validated. This facility is composed of a Drive Beam Linac of 3.5 Amps, a delay loop and a combiner ring where the electron bunches are interleaved by a factor 8 up to 28 Amps and an experimental room (CLEX) where the beam energy is converted in RF power at 12 GHz. Inside the CLEX a second accelerator produces a probe beam used for testing the performances of the high gradient accelerating structures powered by the Drive beam generated RF.
Many experiments have been conducted in the CTF3 facility, including accelerating gradient of 100 MV/m, breakdown analysis, beam characteristics after acceleration and test of several innovative beam diagnostics.
After 2016 and the end of the CTF3 program, there are plans to continue using the facility, with possible enhancement works, to test advanced accelerator concepts like beam-driven plasma accelerators.

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Co-authors : Dr. CORSINI, Roberto (CERN) ; GAMBA, Davide (CERN; John Adams Institute (JAI)) ; Mr. TECKER, Frank (CERN) ; Dr. DOEBERT, Steffen (CERN)

Presenter : Mr. FARABOLINI, Wilfrid (CEA/IRFU and CERN) ; GAMBA, Davide (CERN; John Adams Institute (JAI))

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures ; WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : poster

Submitted by : Mr. FARABOLINI, Wilfrid

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Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

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Judged by :
Date :
Comments : ""

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :

Comments : ""

Abstract ID : 121

Laser pulse propagation in a meter scale Rb vapor plasma

Content :

AWAKE is a proof-of-principle proton-driven plasma wakefield electron acceleration experiment at CERN. The purpose of the experiment is to demonstrate the acceleration of electrons from MeV to GeV scale within a 10 meter plasma with an electron density of 1014-1015 cm-3. An ultrashort terawatt laser pulse ionizes rubidium vapor, creating plasma and seeding the self-modulation instability with a sharp moving ionization front. To mitigate the effects of laser density ramps at the entrance and exit of the plasma, limiting apertures have been proposed. The beam diffracts after passing through the entrance aperture. Also, along propagation of the laser pulse in plasma, dispersion, kerr-induced self-focusing and filamentation may occur. These effects potentially lead to a decrease in laser pulse intensity below the rubidium ionization threshold, thereby limiting the radial and longitudinal extent of the plasma. We present results of numerical studies aimed at finding laser beam parameter suitable to obtain a uniform, 10m-long, at least 1mm in radius plasma.

Primary authors : Mrs. JOULAEI, Atefeh (Max-Planck Institute for Physics)

Co-authors : Dr. MOODY, Joshua (Max Planck Institute for Physics) ; Mr. BATSCH, Fabian (Max Planck Institute for Physics) ; Dr. EOZ, Erdem (Max Planck Institute for Physics) ; Dr. MUGGLI, Patric (Max Planck Institute for Physics) ; Prof. KASPARIAN, Jérôme (University of Geneva) ; Mr. BERTI, Nicolas (University of Geneva) ; Prof. MIRZANEJAD, Saeed (University of Mazandaran)

Presenter : Mrs. JOULAEI, Atefeh (Max-Planck Institute for Physics)

Track classification : WG1 - Electron beams from plasmas

Contribution type : poster

Submitted by : Mrs. JOULAEI, Atefeh

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 122

Transofrming the CNGS installatino into AWAKE: Status and challenges.

Content :

The Advanced Proton Driven Plasma Wakefield Acceleration Experiment (AWAKE) is a proof-of-principle R experiment at CERN, installed in the former CNGS facility. It is the world's first proton driven plasma wakefield acceleration experiment, using a high-energy proton bunch to drive a plasma wakefield for electron beam acceleration. Modifying the CNGS underground high radiation area for AWAKE beam, expected at the end of 2016 (protons) and 2017 (electrons), requires challenging modifications in a complex intervention area. Dismantling of activated elements, separation of the highest activated areas and installation of shielding were followed by underground civil engineering works to create new tunnels and cores for AWAKE electron and laser beams. AWAKE services and infrastructure must be integrated within the existing radiation facility and at the same time be designed and installed to keep the radiation dose to personnel as low as possible. This poster shows the main challenges encountered in matters of integration, safety and coordination. It gives an overview of the dismantling and installation works completed, on-going and planned to ensure the timely start of a safe and technically reliable AWAKE facility.

Primary authors : PARDONS, Ans (CERN)

Co-authors :

Presenter : PARDONS, Ans (CERN)

Track classification :

Contribution type : poster

Submitted by : PARDONS, Ans

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Last modified on : Friday 29 May 2015

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Track judgments :

Abstract ID : 123

Generation of Quasi-Monoenergetic Electron Pulses at POLARIS

Content :

We present experimental results on laser-driven electron acceleration achieved with the POLARIS laser in Jena (Germany) delivering pulses of 2.4 J in 160-170 fs. Here, we observed the generation of quasi-monoenergetic electron pulses by self-modulated laser wakefield acceleration in a gas cell. We found a clear correlation between the accelerating length and the peak electron energies. Through a parabolic fit of the accelerating length vs. the peak electron energy the accelerating E-field, injection position and dephasing legth could be estimated. Furthermore, the aceleration process could be devided into three steps. First, the laser intensity increases most likely in the region of out-streaming gas in front of the gas cell. When the laser intensity is sufficiently high wavebreaking occurs. Afterwards, the electron energy grows with the acceleration length in the linearly decreasing E-field amplitude. Once the electron pulse approaches the decelerating electric field ($E > 0$) of the plasma wave, the electron energy reaches its maximum achievable value.

Primary authors : Ms. REUTER, Maria (Helmholtz Institut Jena)

Co-authors :

Presenter : Ms. REUTER, Maria (Helmholtz Institut Jena)

Track classification : WG1 - Electron beams from plasmas

Contribution type : poster

Submitted by : Ms. REUTER, Maria

Submitted on Friday 29 May 2015

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Track : WG1 - Electron beams from plasmas

Judgment :

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Date :

Comments : ""

Abstract ID : 124

The dynamics of metal surfaces under high fields

Content :

The CLIC study has successfully developed X-band accelerating structure prototypes that reliably operate at an accelerating gradient above 100 MV/m. An important contribution to the development has been a study of the dynamics of metal surfaces under high electromagnetic fields. This multidisciplinary study has resulted in a number of important insights into the fundamental limitations of gradient in metal structures. The program and selected results are reviewed.

Primary authors : WUENSCH, Walter (CERN)

Co-authors :

Presenter : WUENSCH, Walter (CERN)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : either

Submitted by : WUENSCH, Walter

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Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :

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Date :

Comments : ""

Abstract ID : 125

Controlled injection of electrons in a laser wakefield accelerator

Content :

To improve the stability and reproducibility of laser wakefield accelerators and to allow for future applications, controlling the injection of electrons, both in terms of position of injection and amount of injected charge, is of great importance.

We will present results from our recent experiment on controlled injection, using the scheme of colliding pulses, performed using the Lund multi-terawatt laser. Each laser pulse is split into two parts, close to the interaction point. The main pulse, containing approximately 500 mJ of energy, is focused on a 2 mm diameter gas jet to drive a nonlinear plasma wave below threshold for self-injection. The second pulse, containing approximately 40 mJ of energy, is focused to collide with the main pulse in the gas jet with a collision angle of 150 degrees.

Beams of accelerated electrons with low energy spread are produced using this set-up. Furthermore, the amount of accelerated charge is controlled by rotating the plane of polarization of the second pulse.

The experiment is a part of our studies on different schemes for controlled injection and the findings from this experiment will be compared to the schemes of ionization-induced injection and density down-ramp injection.

Primary authors : Mr. HANSSON, Martin (Lund University)

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Presenter : Mr. HANSSON, Martin (Lund University)

Track classification : WG1 - Electron beams from plasmas ; WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : talk

Submitted by : Mr. HANSSON, Martin

Submitted on Friday 29 May 2015

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Track judgments :

Track : WG1 - Electron beams from plasmas

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Date :
Comments : ""

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
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Date :
Comments : ""

Abstract ID : 126

RF power distribution System and experimental characterization of RF Gun and C-band accelerating structures for the ELI-NP Linac

Content :

ELI-NP is a gamma-source based on electron-photon Compton back-scattering under construction in Romania by the European consortium Eurogammas. The collision of a train of 32 electron bunches accelerated up to ≈750 MeV by a linac with an intense 1000 nm laser pulse recirculated 32 times through the IP at a repetition rate of 100 Hz produces photons with tunable energy. The electron linac energy booster is based on two SLAC-type S-band (f=2856MHz) and twelve C-band (f=5712MHz) Travelling Wave(TW) accelerating structures. Because of the multi-bunch operation, the cells of all the C-band TW structures are equipped with high-order modes dampers to avoid beam break-up transverse instability. The high power RF for the RF Gun and for the S-band and C-band accelerating structures will be provided respectively by two Toshiba E37314 and ten Toshiba E37212 klystrons both driven by ScandiNova solid state modulators. A complete description of the RF power distribution system of the ELI-NP Linac will be reported. Moreover, results of the conditioning and tuning of the first C-band accelerating structure will be presented, together with Bead-drop measurements of the RF Gun.

Primary authors : CARDELLI, Fabio (ROMA1)

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Presenter : CARDELLI, Fabio (ROMA1)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : poster

Submitted by : CARDELLI, Fabio

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Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 127

Proton acceleration by interaction of high intensity laser with microstructured snow targets

Content :

Traditional approach to laser based acceleration of protons relies on target normal sheath acceleration (TNSA) or radiation pressure acceleration (RPA) schemes. However, achieving the 150MeV proton energy levels applicable for cancer treatment requires multi-PW laser systems. We have demonstrated possibility to obtain 25MeV proton bunches accelerated by the interaction of a 5TW ultra short laser pulse with a microstructured snow target. This significantly increased proton energy is the result of localized enhancement of the laser field intensity near the microstructured tip which in turn amplify the charge separation in the plasma, leading to improved acceleration of the protons for the same laser power. Our microstructured snow scheme also relaxes the requirements of high contrast ratio of the laser system. I will present our results related to the target structure, influence of prepulse on the target structure and density gradients. The 2D PIC simulations conducted by us provide a significant understanding of the approach.

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Presenter : Prof. ZIGLER, Arie (Hebrew University)

Track classification : WG2 - Ion beams from plasmas

Contribution type : talk

Submitted by : ZIGLER, Arie

Submitted on Friday 29 May 2015

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Track : WG2 - Ion beams from plasmas

Judgment :

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Date :

Comments : ""

Abstract ID : 128

Laser-plasma interaction at near-critical densities

Content :

During the interaction between an intense laser pulse and a plasma medium, energetic particles such as, electrons, protons and ions can be accelerated through various acceleration mechanisms. For electron densities close to critical density (ne ~= nc), laser-plasma interaction is under explored. Here, it is expected that the laser energy absorbed by the plasma is enhanced due to resonance conditions. Simulations show that this density region can be used for efficient electron and ion acceleration, contrast improvement and pulse shortening.

In order to shed more light into this interaction region, an experiment has been carried out at JETI40, IOQ Jena, where Argon gas jet is used to produce near-critical plasma. The interaction region has been imaged using a 2omega probe beam at 90deg to the propagation direction. As the focused laser pulse propagates towards the high density regions of the gas jet, Raman side scattering has been observed to occur preferentially in the upper part of the interaction region. The corresponding plasma densities are measured using interferometry. As the plasma density increases, Raman side scattering vanishes and laser pulse collapse occurs at the near-critical region followed by lamentation.

Primary authors : Mr. ARUNACHALAM, Ajay Kawshik (University of Jena)

Co-authors : Mr. SCHWAB, Matthew (Friedrich-Schiller-University Jena) ; Prof. KALUZA, Malte (University of Jena, Helmholtz-Institute Jena)

Presenter : Mr. ARUNACHALAM, Ajay Kawshik (University of Jena)

Track classification : WG1 - Electron beams from plasmas ; WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : poster

Submitted by : Mr. ARUNACHALAM, Ajay Kawshik

Submitted on Friday 29 May 2015

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Comments :

Looking forward to the Conference.

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Track : WG1 - Electron beams from plasmas

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Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :

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Date :
Comments : ""

Abstract ID : 129

Progress of the characterization of the components of the COXINEL transfer line towards the undulator

Content :

W. Yang, F. Briquez, T. El Ajjouri, F. Marteau, M. Valléau, M. Labat, A. Loulergue, M. E. Couprie

COXINEL (COherent X-ray source INferred from Electron accelerated by Laser) aims at demonstrating Free Electron Laser (FEL) amplification with a laser Wakefield Accelerator, thanks to a specifically designed transfer line to manipulate the electron beam properties. The line will start with strong permanent quadrupoles with variable gradient, followed by a chicane formed by four dipoles to reduce the slice energy spread, and a second set of quadrupoles for proper focusing in the undulator, with diagnostics distributed all along. Magnetic measurements required for the simulation of the beam dynamics will be reported. And the preparation of the diagnostics, including the electron beam profile monitors relying on a five lenses telescope with two available magnifications will be presented.

Primary authors : Mr. YANG, Wei (Synchrotron SOLEIL)

Co-authors :

Presenter : Mr. YANG, Wei (Synchrotron SOLEIL)

Track classification : WG7 - Laser technology for advanced accelerators

Contribution type : poster

Submitted by : Mr. YANG, Wei

Submitted on Friday 29 May 2015

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Track : WG7 - Laser technology for advanced accelerators

Judgment :
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Date :
Comments : ""

Abstract ID : 130

Laser Focusing and Electron Spectrometer Design of the LUX Beamline

Content :

Within the LAOLA collaboration the University of Hamburg and DESY work closely together to combine university research in the field of plasma-based acceleration with the expertise of a large and well-established accelerator facility. In this poster we will present the design and development of two elements of the future LUX beamline, a dedicated beamline for generation of laser-plasma-driven undulator radiation within the LAOLA framework. The laser focusing system allows for positioning of the focusing mirror in 5 degrees of freedom in order to align the laser beam driver onto the acceleration target. A 4D-beam diagnostic ensures that the laser positioning and angle is kept at its design values, a key requirement for both a high driver focus quality and a semi-automated day-to-day operation. The electron spectrometer, based on a C-shaped permanent dipole magnet, is specifically designed to offer a very large dynamic range (50 to 1200 MeV). This caters nicely to both the experimental nature of the beams in this research field and the high scalability of the LUX beamline. Both designs are developed with the accelerator technology standards in mind.

Primary authors : Mr. WERLE, Christian Markus (University of Hamburg / Center for Free Electron Laser Science)

Co-authors : Mr. KOCON, Dariusz (University of Hamburg / Center for Free Electron Laser Science / ELI Beamlines) ; Mr. RODRÍGUEZ GARCÍA, Enrique (ELI Beamlines) ; Mr. ASTÚA, Carlos-josé (ELI Beamlines) ; Mr. DELBOS, Niels (University of Hamburg / Center for Free Electron Laser Science) ; Dr. WALKER, Paul Andreas (UHH/CFEL) ; MAIER, Andreas (CFEL/UHH)

Presenter : Mr. WERLE, Christian Markus (University of Hamburg / Center for Free Electron Laser Science)

Track classification : WG1 - Electron beams from plasmas

Contribution type : poster

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Track : WG1 - Electron beams from plasmas

Judgment :

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Date :

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Abstract ID : 131

LUX laser beamline for LWFA

Content :

Within the LAOLA collaboration the university of Hamburg and DESY work closely together within the field of Laser Wakefield Acceleration. We report on a new laser beamline which will feed two laser plasma target areas, LUX and REGAE. The physics explored at LUX include 5 Hz, continuous gas flow operation, adiabatic matching, a pump probe set-up, and undulatory radiation. Because LUX is connected to REGAE, which uses a conventional electron gun and explores LWFA via external injection, the LUX part of the beamline is situated within a particle-free vacuum system. We outline the technical challenges and their solutions the first high power laser beamline within the accelerator UHV environment posed.
The in-house design of the 7 inch diameter low-vibration mirror mounts and the design process of their vacuum chambers are discussed alongside vibration studies, vacuum force analysis, and material selections. The laser diagnostics - far field and near field cameras behind every mirror chamber and the post target diagnostics - are also discussed.

Primary authors : Dr. WALKER, Paul Andreas (UHH/CFEL)

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Presenter : Dr. WALKER, Paul Andreas (UHH/CFEL)

Track classification : WG1 - Electron beams from plasmas ; WG7 - Laser technology for advanced accelerators

Contribution type : talk

Submitted by : Dr. WALKER, Paul Andreas

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Track : WG7 - Laser technology for advanced accelerators

Judgment :

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Date :
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Abstract ID : 132

Energetic ion beams from relativistically transparent ultra-thin foils

Content :

In high intensity laser solid interactions, it has been supposed that going to ultra thin foils will allow access to novel regimes of acceleration such as radiation pressure, hole boring and relativistic transparency. We present data from an experiment on the Vulcan Petawatt laser at the Central Laser Facility, UK. We irradiated ultra-thin CH foils with a 220J, 1ps laser pulse focussed to a 9.5μm spot at 0° incidence to accelerate ions of >50MeV.

The use of ultra thin foils necessitates the use of a high contrast laser pulse. The improved OPCPA front end of Vulcan PetaWatt produced a contrast ratio at 1ns before the pulse of 10-10, allowing us to obtain energetic protons from CH foils down to 25nm thickness, without the use of a plasma mirror. A study of optimum target thickness was carried out and a thickness of 250nm was found to give the highest energy proton beams.

During relativistic transparency the bulk electron population is heated to super-ponderomotive energies, resulting in strong longitudinal accelerating fields. These findings are supported by an analytical model and 2D particle-in-cell simulations.

Primary authors : Mr. HICKS, George (Imperial College London)

Co-authors : Dr. DOVER, Nicholas (Imperial College London) ; Dr. STREETER, Matthew (DESY) ; Dr. NAKAMURA, Hirotaka (Osaka University) ; Dr. AHMED, Hamad (Queen's University Belfast) ; Prof. BORGHESI, Marco (Queen's University Belfast) ; Mr. FERNANDEZ-TOBIAS, Javier (STFC Rutherford Appleton Laboratory) ; Mr. HEATHCOTE, Robert (STFC Rutherford Appleton Laboratory) ; Dr. KAR, Satyabrata (Queen's University Belfast) ; Mr. KREUZER, Christian (Ludwig-Maximilians-Universitat Munchen) ; Dr. MACLELLAN, David (University of Strathclyde) ; Dr. MCKENNA, Paul (University of Strathclyde) ; Mr. MUSGRAVE, Ian (STFC Rutherford Appleton Laboratory) ; Prof. NEELY, David (STFC) ; Dr. NOTLEY, Margaret (STFC Rutherford Appleton Laboratory) ; Mr. SHAIHK, Waseem (STFC Rutherford Appleton Laboratory) ; Prof. SCHREIBER, Joerg (Ludwig-Maximilians-Universitat Munchen) ; Prof. NAJMUDIN, Zulfikar (Imperial College London)

Presenter : Mr. HICKS, George (Imperial College London)

Track classification : WG2 - Ion beams from plasmas

Contribution type : talk

Submitted by : Mr. HICKS, George

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Track judgments :

Track : WG2 - Ion beams from plasmas

Judgment :

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Date :

Comments : ""

Abstract ID : 133

Experimental considerations on emittance growth in the Drive Beam recombination at CTF3.

Content :

One of the main objective of the CLIC Test Facility (CTF3) at CERN is to demonstrate the two-beam acceleration scheme of CLIC.
A key point to ensure stable power production is to obtain a stable and loss-less Drive Beam recombination without spoiling the initial beam quality.
The projected emittance of the recombined beam is a clear measurement of the quality of the full process: orbit and dispersion mismatch of the single sub-sections result in a projected emittance growth that makes difficult to transport the beam afterwards.
Another source of emittance growth has been identified in the strong isochronous optics, together with the high energy spread of the beam.
A collection of measurement and feedback tools have been implemented and tested to mitigate orbit and dispersion mismatches.
The latest results on emittance growth due to the chromatic aberrations and non-linear dispersion will also be presented.

Primary authors : GAMBA, Davide (CERN; John Adams Institute (JAI))

Co-authors :

Presenter : GAMBA, Davide (CERN; John Adams Institute (JAI))

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : poster

Submitted by : GAMBA, Davide

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Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :

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Date :

Comments : ""

Abstract ID : 134

Control systems and operation of a 200 TW laser system for laser-plasma acceleration

Content :

Within the LAOLA Collaboration, the University of Hamburg and DESY work closely together to combine university research in the field of laser-plasma acceleration with the expertise of a large and well-established accelerator facility. We present in this talk a summary of hardware, software, and operation based changes to the 200 TW ANGUS laser system to increase ease of operation and stability. After a brief introduction of the laser, we concentrate on the components that rely heavily on the DESY in-house control system architecture and software, and show recent statistics for both laser operation and long-term stability. These improvements to the laser system will greatly help the operation of LUX and REGAE, the two dedicated experiments in Hamburg which study laser-plasma acceleration.

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Co-authors : LEROUX, Vincent (Center for Free-Electron Laser Science & Department of Physics, Hamburg University) ; TROSIEN, Dominik (Center for Free-Electron Laser Science & Department of Physics, Hamburg University) ; SCHNEPP, Matthias (University of Hamburg) ; MAIER, Andreas (CFEL/UHH)

Presenter : JOLLY, Spencer (Center for Free-Electron Laser Science & Department of Physics, Hamburg University)

Track classification : WG7 - Laser technology for advanced accelerators

Contribution type : talk

Submitted by : JOLLY, Spencer

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Track judgments :

Track : WG7 - Laser technology for advanced accelerators

Judgment :
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Date :
Comments : ""

Abstract ID : 135

Transport and control of LWFA electron beam towards the FEL amplification at COXINEL

Content :

COXINEL [1] is a project within the frame of ERC advanced grand at synchrotron SOLEIL in collaboration with the Laboratory of Optical Applications (LOA) in France. It aims at demonstrating Free Electron Laser (FEL) amplification using Laser Wakefield Acceleration (LWFA) towards more compact FEL facility. The transport and the control of the electron bunches created by the LFWA is a challenging task due to the strong initial beam divergence and the large energy spread. A specific beam manipulation scheme was recently proposed for the COXINEL setup, which takes benefit from the intrinsically large chromatic emittance of such beams [2]. This submission summarizes the benchmarking of two different tracking codes (including nonlinear dynamics and collective effects) for the COXINEL setup: one which was developed at the synchrotron SOLEIL and ASTRA [3]. A detailed description of the beam transport and the obtained results will be presented and discussed.

[1] M.E. Couprie et al., Proc. of IPAC 2014, THPRO003, Dresden, Germany.
[2] A. Loulergue et al., New J. Phys. (2015), 023028.
[3] K. Floettmann, ASTRA, http://www.desy.de/~mpyflo.

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Presenter : Dr. KHOJOYAN, Martin (Synchrotron SOLEIL)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : either

Submitted by : KHOJOYAN, Martin

Submitted on Friday 29 May 2015

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Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :

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Date :
Comments : ""

Abstract ID : 136

First Measurements of Low Breakdown Rate in a Beam-Loaded High-Gradient Accelerating Structure

Content :

The Compact Linear Collider (CLIC) is a study for a future room-temperature electron-positron collider with a maximum centre-of-mass energy of 3 TeV. To efficiently achieve such high energy the project relies on a novel two-beam acceleration concept and on high-gradient accelerating structures working at 100 MV/m. In order to meet the luminosity requirements the break-down rate in these high-field structures has to be kept below 10 per billion. Such gradients and break-down rates have been demonstrated by high-power RF testing of several 12 GHz structure prototypes. However, the presence of high beam-loading modifies the field distribution in the structure, such that a higher input power is needed in order to achieve the desired accelerating gradient with respect to the unloaded case. The impact on the break-down rate, of general interest for the high-gradient community, was never measured before. In this contribution we present the successful commissioning and operation of the first experiment quantifying this effect and we discuss the first measurements.

Primary authors : Dr. NAVARRO QUIRANTE, Jose Luis (CERN)

Co-authors : GAMBA, Davide (CERN; John Adams Institute (JAI))

Presenter : Dr. NAVARRO QUIRANTE, Jose Luis (CERN)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures ; WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Dr. NAVARRO QUIRANTE, Jose Luis

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Comments :

Others co-authors will be added.

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Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

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Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
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Date :
Comments : ""

Abstract ID : 137

Ionization induced compression of a tightly focused laser beam

Content :

The generation of electron sources in the MeV range and few fs durations requires the development of sub 10fs high power laser pulses [1]. However, standard Ti :sapphire lasers cannot provide pulses of duration below 20fs. In order to decrease the duration of these pulses, several schemes have been proposed, most of them based either on gas ionization in a fiber, or on compression in nonlinear plasma waves. More recently, a new self-compression method based on ionization by a tightly focused beam in a gas jet has been proposed and observed [2]. In this scheme, the pulse is blueshifted by the rapid ionization of the gas, and the ionization gradient leads to temporal compression of the pulse. We have studied under which conditions this method is suitable for generating compressed laser pulses. In particular, we characterized the influence of the gas jet on the spectral broadening, temporal compression and spatial homogeneity. We found that the generated beam properties depend strongly on the gas jet parameters, and that at best, spatially homogeneous compression down to 12fs can be produced from a 25 fs pulse.

[1] B. Beaurepaire etal, NJP, 023023 (2014)
[2] Z.-H He etal, PRL 113, 26904 (2014)

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Presenter : Dr. GUENOT, Diego (Laboratoire d'Optique Applique)

Track classification : WG7 - Laser technology for advanced accelerators

Contribution type : either

Submitted by : Dr. GUENOT, Diego

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Track judgments :

Track : WG7 - Laser technology for advanced accelerators

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 138

Collective Effects in the Phase-Space Manipulation of a Low Energy Electron Beam

Content :

Phase-space manipulation of electron beam generated from a photo-injector has been experimentally demonstrated in the past several years at beam energy above 10 MeV. In this paper, we study the multi-stage phase space manipulation of a lower energy beam,such as the beam extracted from a high-brightness photo-cathode RF gun. The numerical simulations of collective effects including space charge, coherent synchrontron radiation are presented.

Primary authors : Dr. SUN, Yine (Argonne National Lab.)

Co-authors : Dr. ZHOLENTS, Alexander (Argonne National Laboratory)

Presenter : Dr. SUN, Yine (Argonne National Lab.)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : poster

Submitted by : Dr. SUN, Yine

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Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :

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Date :

Comments : ""

Abstract ID : 139

A “slingshot” laser-driven acceleration mechanism of plasma electrons

Content :

We have recently proposed [1-2] a new laser-driven acceleration mechanism based on the violent impact of an ultra-short and ultra-intense laser pulse against the electrons belonging to a superficial thin layer of a low-density plasma (or gas, provided the pulse is sufficiently intense to locally cause its complete ionization). The interplay among the strong ponderomotive effect, the excited restoring electric field (originated by charge separation) and the finite size of the laser spot causes the expulsion of electrons from the plasma surface with high energy in the direction opposite to that of the pulse propagation (“slingshot effect”). We now reduce [4] the relevant equations to two first order ODE (or a collection of) and thus give a reliable quantitative description of the effect for a broad range of intensities and initial densities, both smooth and step-shaped. Its experimental verification seems to be feasible and, if confirmed, would provide a new laser-driven acceleration mechanism for electrons.
[1] G. Fiore, R. Fedele, U. De Angelis, Phys. Plasmas 21 (2014), 113105.
[2] G. Fiore, J. Phys. A47 (2014), 225501; Acta Appl. Math. 132 (2014), 261-271.
[4] G. Fiore, S. De Nicola, in preparation.

Primary authors : FIORE, Gaetano (NA)

Co-authors : Prof. FEDELE, Renato (NA) ; Dr. DE NICOLA, Sergio (Spin-CNR, Napoli) ; GIZZI, Leonida Antonio (PI)

Presenter : FIORE, Gaetano (NA)

Track classification : WG1 - Electron beams from plasmas ; WG6 - Theory and simulations

Contribution type : talk

Submitted by : FIORE, Gaetano

Submitted on Friday 29 May 2015

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
Judged by :
Date :
Comments : ""

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :

Comments : ""

Abstract ID : 140

Measurement of 300MV/m Accelerating Gradients in a Dielectric Wakefield Accelerator

Content :

The future of electron driven light sources and colliders alike is quickly approaching a financial barrier that is only overcome by international collaborations. Size reduction of experimental systems, along with attendant reduction in cost, is one of many possible steps necessary to reaching TeV scale linear colliders and allowing for the spread of short-pulse x-ray light sources, such as free-electron lasers (FEL). To that end we present new experimental results that measure accelerating gradients using a witness electron bunch in excess of 300 MV/m in a Dielectric Wakefield Accelerator (DWA). The fields were measured in an annular quartz dielectric structure of 10 cm length driven by a 1.6 nC electron bunch of 55 um r.m.s. length and witnessed by an 880 pC electron bunch of 30 um r.m.s. length. The nominal energy of the two bunches was 20.35 GeV before interaction in the structure. This work, performed at the FACET facility at SLAC National Accelerator Laboratory, shall be presented in the context of preceding work that demonstrated that fields in excess of 1 GV/m are attainable in DWA systems as well as plans for future work.

Primary authors : Dr. O'SHEA, Brendan (SLAC National Accelerator Laboratory)

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Presenter : Dr. O'SHEA, Brendan (SLAC National Accelerator Laboratory)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : either

Submitted by : Dr. O'SHEA, Brendan

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Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

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Date :
Comments : ""

Abstract ID : 141

Transverse emittance of electron beams generated by ionization injection in laser-plasma accelerators

Content :

Ionization injection has become a commonly used technique to trap electrons in plasma wakefields. Ionization injection, where electrons are ionized by an intense laser in the plasma wakefield, reduces the wakefield amplitude required for trapping. The lower trapping threshold allows operation at lower plasma densities, enabling higher beam energy gains. However, ionization injection can also result in poor quality of the trapped electron bunch, compared to self-injection. We examine the transverse emittance of beams generated by laser ionization injection. Methods to improve the beam quality will be discussed. The transverse beam quality may be greatly improved by using two lasers with different wavelengths. This two-color ionization injection technique can generate beams with transverse emittance on the order of tens of nm.

Primary authors : Dr. SCHROEDER, Carl (Lawrence Berkeley National Laboratory)

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Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Dr. SCHROEDER, Carl

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Track : WG1 - Electron beams from plasmas

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Abstract ID : 142

Laser pulse shaping for high gradient accelerators

Content :

In many high gradient accelerator schemes, i.e. with plasma or dielectric wakefield induced by particles, many electron pulses are required to drive the acceleration of one of them. Those electron bunches, that generally should have very short duration and low emittance, can be generated in photoinjectors driven by a train of laser pulses coming inside the same RF bucket. We present the system used to shape and characterize the laser pulses used in multibunch operations at Sprac_lab. Our system give us control over the main parameter useful to produce up to five high brightness bunches with tailored intensity and time distribution. We use crosscorrelation with the fundamental of our laser system to have a characterization of the photocathode UV laser train with high resolution over a large time window.

Primary authors : VILLA, Fabio (LNF)

Co-authors : ANANIA, Maria Pia (LNF) ; BISESTO, Fabrizio Giuseppe (LNF) ; CHIADRONI, Enrica (LNF) ; CIANCHI, Alessandro (ROMA2) ; CURCIO, Alessandro (LNF) ; DI GIOVENALE, Domenico (LNF) ; DI PIRRO, Giampiero (LNF) ; FERRARIO, Massimo (LNF) ; GATTI, Giancarlo (LNF) ; PETRARCA, Massimo (ROMA1) ; Dr. PETRALIA, Alberto (ENEA Frascati) ; POMPILI, Riccardo (LNF)

Presenter : VILLA, Fabio (LNF)

Track classification : WG1 - Electron beams from plasmas ; WG7 - Laser technology for advanced accelerators

Contribution type : either

Submitted by : VILLA, Fabio

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Judgment :
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Date :
Comments : ""

Track : WG7 - Laser technology for advanced accelerators

Judgment :
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Date :

Comments : ""

Abstract ID : 143

Transverse effects in plasma wakefield experiments at FACET

Content :

We report on various transverse effects studied experimentally at plasma wakefield experiments at FACET, including betatron motion in a plasma channel, hosing and ion motion. Preliminary results from the FACET 2015 run are included, comparing transverse effects in Hydrogen and Argon plasmas.

Primary authors : Dr. ADLI, Erik (University of Oslo, Norway)

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Presenter : Dr. ADLI, Erik (University of Oslo, Norway)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Dr. ADLI, Erik

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Track : WG1 - Electron beams from plasmas

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Date :

Comments : ""

Abstract ID : 144

Mono-Energetic Ions emission by nanosecond laser solid target irradiation

Content :

An experimental campaign aiming to investigate the acceleration mechanisms through Laser-matter interaction in nanosecond domain has been carried out at the LENS (Laser Energy for Nuclear Science) laboratory of INFN-LNS, Catania. Different techniques permit to monitor the plasma and to determine its reproducibility. Different targets of pure Al are placed in a vacuum chamber an innovative diagnostic systems, like Thomson Parabola (TP) spectrometer has been used. Targets were then irradiated by Nd:YAG 2J, 6 ns infrared laser (L=1064 nm) at different pumping energies. Advanced diagnostics tools were used for characterizing the plasma plume and ion production: two IC (ion collectors) for time-of-flight measurements, an X-ray sensitive CCD camera for X-ray imaging and X-ray flux measurements and an ICCD-camera for time resolved optical imaging.

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Track classification : WG2 - Ion beams from plasmas

Contribution type : poster

Submitted by : MUOIO, Annamaria

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Track : WG2 - Ion beams from plasmas

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Judged by :

Date :

Comments : ""

Abstract ID : 145

High-Gradient Normal-Conducting Radio-Frequency Photoinjector System for the STAR Project

Content :

Radiabeam Technologies presents the development of a high gradient normal conducting radio frequency (NCRF) 1.6 cell photoinjector system for the STAR project (Southern european Thomson source for Applied Research), in progress at the University of Calabria (Italy). The RF Gun is designed to operate with a peak accelerating electric field of 120MV/m and up to a repetition rate of 100Hz. The input RF power is fed through a single waveguide and a dummy waveguide is used to avoid field dipole components. The design includes enhanced cell-to-cell coupling to produce a 15 MHz mode separation, fat-lipped symmetric coupling slots and racetrack geometry for the coupler cell to minimize field quadrupole components. The photoinjector system also includes the emittance-compensation solenoid. Full overview of the project to date is discussed along with basic design, engineering, manufacturing, brazing and final tuning.

Primary authors : Dr. FAILLACE, Luigi (RadiaBeam Technologies)

Co-authors :

Presenter : Dr. FAILLACE, Luigi (RadiaBeam Technologies)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures ; WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Dr. FAILLACE, Luigi

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Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
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Date :

Comments : ""

Abstract ID : 146

Experimental Results of Carbon-Nanotube Cathodes inside Radio-Frequency Environment

Content :

Carbon Nano Tubes (CNT's) as field-emitters have been investigated for more than two decades and can produce relatively low emittance electron beams for a given cathode size. Unlike thermionic cathodes, CNT cathodes are able to produce electrons at room temperature and relatively low electric field (a few MV/m). In collaboration with FermiLab, we have recently tested CNT cathodes both with DC and RF fields. We observed a beam current close to 1A with a ~1cm2 CNT cathode inside an L-band RF gun. Steady operation was obtained up to 650 mA and the measured current vs. surface field plot showed perfect agreement with the Fowler-Nordheim distribution.

Primary authors : Dr. FAILLACE, Luigi (RadiaBeam Technologies)

Co-authors :

Presenter : Dr. FAILLACE, Luigi (RadiaBeam Technologies)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures ; WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

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Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

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Date :
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Abstract ID : 147

A collinear wakefield accelerator for a high repetition rate multi beamline soft x-ray free-electron laser facility

Content :

A concept is presented for a multi beamline soft x-ray FEL facility where several free-electron laser (FEL) undulator lines are driven by equal number of high repetition rate single-stage collinear wakefield accelerators (CWA). Various means to mitigate the adverse collective effects are considered and a practical design of the CWA, embedded into a quadrupole wiggler to control a beam breakup instability, and extending over 30 meters is presented. It is shown that the maximum achievable strength of the quadrupole gradient defines a threshold charge in the drive beam and a maximum attainable acceleration gradient for the witness beam. It is also pointed out that the distance between the drive and witness bunches varies along the accelerator with a measurable impact on the energy gain of the witness bunch and its energy spread. Means to mitigate these effects are also considered. Obtaining the witness bunch with a minimum energy spread is discussed. Finally, results are presented for the expected FEL performance using an appropriately tapered undulator.

Primary authors : Dr. ZHOLENTS, Alexander (Argonne National Laboratory)

Co-authors :

Presenter : Dr. ZHOLENTS, Alexander (Argonne National Laboratory)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : either

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Date :
Comments : ""

Abstract ID : 148

Numerical investigation on the formation and stability of a hollow electron beam in the presence of a plasma wake field driven by an ultra-short electron bunch

Content :

A numerical investigation on the spatiotemporal evolution of an electron beam, externally injected in a plasma in the presence of a plasma wake field is carried out. The latter is driven by an ultra-short relativistic axially-symmetric femtosecond electron bunch. We first derive a novel Poisson-like equation for the wake potential where the driving term is the ultra-short bunch density, taking suitably into account the interplay between the sharpness and high energy of the bunch. Then, we show that a channel is formed longitudinally, through the externally injected beam while experiencing the effects of both the beam-plasma self-interaction and the bunch-driven PWF, within the context of thermal wave model. The formation of the channel seems to be a final stage of the 3D evolution of the beam. This involves the appearance of small filaments and bubbles around the longitudinal axis. The bubbles coalesce forming a relatively stable axially-symmetric hollow beam structure.

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Track classification : WG1 - Electron beams from plasmas ; WG6 - Theory and simulations

Contribution type : talk

Submitted by : TANJIA, Fatema

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Track : WG6 - Theory and simulations

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Comments : ""

Abstract ID : 149

High-performance modeling of plasma-based acceleration using the full PIC method

Content :

Numerical simulations have been critical in the recent rapid developments of plasma-based acceleration concepts. Among the various available numerical techniques, the Particle-In-Cell (PIC) approach is the method of choice for self-consistent simulations from first principles. We report on several recent advances in PIC related algorithms that are of interest for application to plasma-based accelerators, including: (a) detailed analysis of the numerical Cherenkov instability and remediation for the modeling in laboratory and Lorentz boosted frames [1], (b) analytic pseudo-spectral electromagnetic solvers in Cartesian and cylindrical (with azimuthal modes decomposition) geometries [2,3], (c) arbitrary-order finite-difference and generalized pseudo-spectral Maxwell solvers [4], (d) novel analysis of Maxwell's solvers' stencil variation and truncation, in application to domain decomposition strategies and implementation of Perfectly Matched Layers in high-order and pseudo-spectral solvers [5,6].

[1]B. B. Godfrey, J.-L. Vay, J.Comput.Phys. 267 (2014)
[2]J.-L. Vay, I. Haber, B. B. Godfrey, J.Comput.Phys. 243 (2013)
[3]R. Lehe et al. (in preparation)
[4]J.-L. Vay et al. (in preparation)
[5]P. Lee, J.-L. Vay, Comp.Phys.Comm. 94 (2015)
[6]H. Vincenti et al. (in preparation)

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Presenter : VAY, Jean-luc (Berkeley Lab)

Track classification : WG6 - Theory and simulations

Contribution type : talk

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Track : WG6 - Theory and simulations

Judgment :

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Date :
Comments : ""

Abstract ID : 150

Recent Experiments at the Argonne Wakefield Accelerator Facility (AWA)

Content :

The Argonne Wakefield Accelerator Facility develops technology for future HEP accelerators. Its main focus is on the use of electron beam driven wakefield acceleration using RF structures. A high intensity electron linac is used to drive wakefields, and a second electron linac provides electron bunches to be accelerated by these wakefields. Recent two-beam-acceleration (TBA) experiments have demonstrated accelerating gradients higher than 50 MV/m, while preserving the beam quality of the accelerated bunches. Further experiments aim at surpassing 100 MV/m gradients and achieving net energy gains of more than 100 MeV. Demonstration of successive acceleration using two TBA stages will follow shortly.
Work supported by the U.S. Department of Energy under contract No. DE-AC02-06CH11357.

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Presenter : CONDE, Manoel (Argonne National Laboratory)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : talk

Submitted by : Dr. CONDE, Manoel

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Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :
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Abstract ID : 151

The evolution of the laser pulse in the quasistatic model of Plasma Wakefield Accelerator

Content :

Performance of a newly developed quasistatic model of a laser pulse is studied. The code solves the envelope equation for the vector-potential with the five-point Thomas algorithm. The finite-difference scheme has the second order by the transverse coordinate, the third order by the longitudinal coordinate, and the first order by the time step. The stability region of the scheme is studied experimentally; operational points of the algorithm are found.
The numerical solution precisely agrees with the available analytics. The calculated group velocity of the pulse is correct for different laser wavelengths. Tests with parabolic plasma density profiles correspond to the «channel-guided regime»; the calculated matched radius of the Gaussian pulse and the period of spot size oscillations agree with theoretical predictions.

Primary authors : Mr. SPITSYN, Roman (Novosibirsk State University)

Co-authors :

Presenter : Mr. SPITSYN, Roman (Novosibirsk State University)

Track classification : WG6 - Theory and simulations

Contribution type : poster

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The SPARC_Lab Thomson Source

Content :

The SPARC_LAB Thomson source is a compact X-rays source based on the Thomson backscattering process presently under its second phase of commissioning at LNF. The electron beam energy ranges between 30-150 MeV, the electrons collide head-on with the Ti:Sapphire FLAME laser pulse wich energy ranges between 1 and 2.5 J with pulse lengths n the 0.1-10 psec range, this provides a Xrays yield energy tunability in the range of 20-500 keV, with the further capability to generate strongly non-linear phenomena and to drive diffusion processes due to multiple and plural scattering effects. The experimental results on the obtained X-ray radiation and its characterization are presented.

Primary authors : VACCAREZZA, Cristina (LNF)

Co-authors :

Presenter : VACCAREZZA, Cristina (LNF)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : VACCAREZZA, Cristina

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Date :

Comments : ""

Abstract ID : 153

Development of short period High field cryogenic undulator at SOLEIL

Content :

Short period high field undulators are required for compact Free Electron Lasers. Permanent magnet based hybrid undulators, well understood from a technological point of view, are still very competing when temperature is decreased, enabling both the coercivity and the remanence to be enhanced. At SOLEIL, the used PrFeB magnets enable to avoid the spin transition reorientation phenomenon occurring with NdFeB magnets enabling to cool down directly at 77 K. A 2 m long cryogenic undulator of period 18 mm was first built in house, with a specific Hall probe bench directly installed in the final vacuum chamber. This first cryogenic undulator is in operation on the storage ring since three years. A second U18 cryo-ready undulator using a slightly different magnet grade with a higher coercivity and modules with magnets surrounded by two half poles for easier swapping is under construction. A third 3 m long cryo-ready undulator U15 with a period of 15 mm is under development. It will be first used for the LUNEX5 FEL project (COXINEL demonstration of FEL amplification with a laser wakefield acceleration).

Primary authors : Dr. COUPRIE, Marie-emmanuelle (Synchrotron SOLEIL)

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Presenter : Dr. COUPRIE, Marie-emmanuelle (Synchrotron SOLEIL)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : --not specified--

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Date :

Comments : ""

Abstract ID : 154

Characterisation of Bright X-ray Beams by Powder Diffraction

Content :

It is well known that plasma accelerators can generate bright, energetic X-ray beams via transverse betatron oscillations of the accelerating electron bunch. Many of the applications of betatron radiation require the radiation to be well characterised, but this is difficult owing to large shot-to-shot fluctuations. It is therefore desirable to develop single-shot, non-invasive methods for characterizing broad-band X-ray beams.

We present such a method based on energy-resolved diffraction from a thin powdered target. We show, via numerical simulations, that the spectrum and divergence of the radiation can be retrieved from a single shot without apriori assumptions of the form of the spectrum. Since the diffracted X-rays are detected off-axis, the undiffracted portion of the beam can be used in applications. Simulations show that existing betatron sources have sufficient photons to be accurately characterised by this method.

Primary authors : Mr. CHEUNG, Gavin (University of Oxford) ; Prof. HOOKER, Simon (University of Oxford)

Co-authors :

Presenter : Mr. CHEUNG, Gavin (University of Oxford)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics ; WG6 - Theory and simulations

Contribution type : talk

Submitted by : Mr. CHEUNG, Gavin

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Date :
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Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :

Comments : ""

Abstract ID : 155

High-repetition-rate laser-proton acceleration employing a cryogenic Hydrogen jet as a target

Content :

Applications of laser-accelerated protons demand a stable, high-energy and high-repetition rate particle source. We present the results of our experimental campaign in cooperation with the HED group at SLAC, performed at the 10 Hz Ti:Sa laser Draco of Helmholtz-Zentrum Dresden-Rossendorf (HZDR), employing a cryogenic Hydrogen jet as a renewable target. Draco delivers pulses of 30 fs and 5 J at 800 nm, focussed to a 3 μm spot by a F/2.5 off-axis parabolic mirror. The cylindrical jet has a diameter of 2 μm or 5 μm and a nominal electron density of 30 times the critical density. Preliminary results show a mono-species proton acceleration in a solid angle of at least +/-45° with respect to the incoming laser beam and proton energies exceeding 10 MeV. Radiochromic film stacks in forward direction show signatures of two acceleration mechanisms, one being the conventional TNSA and a second one leading to filament-like structures, possibly stemming from an instability within the plasma. Among other results, an on-shot monitoring of the stability of the jet by means of a temporally synchronized probe beam will be shown in the presentation.

Primary authors : Mrs. OBST, Lieselotte (Helmholtz-Zentrum Dresden-Rossendorf)

Co-authors : Dr. GÖDE, Sebastian (SLAC National Accelerator Laboratory) ; Dr. GAUTHIER, Maxence (SLAC National Accelerator Laboratory) ; MACDONALD, Michael (SLAC National Accelerator Laboratory) ; Dr. RÖDEL, Christian (SLAC National Accelerator Laboratory) ; Dr. GLENZER, Siegfried (SLAC National Accelerator Laboratory) ; Dr. ZEIL, Karl (Helmholtz-Zentrum Dresden-Rossendorf) ; METZKES, Josefine (Helmholtz-Zentrum Dresden-Rossendorf) ; Dr. SCHUMAKER, William (SLAC National Accelerator Laboratory) ; Dr. SCHLENVOIGT, Hans-peter (Helmholtz-Zentrum Dresden-Rossendorf) ; SOMMER, Philipp (Helmholtz-Zentrum Dresden-Rossendorf) ; REHWALD, Martin (Helmholtz-Zentrum Dresden-Rossendorf) ; BRACK, Florian-emanuel (Helmholtz-Zentrum Dresden-Rossendorf) ; Prof. SCHRAMM, Ulrich (Helmholtz-Zentrum Dresden-Rossendorf)

Presenter : Mrs. OBST, Lieselotte (Helmholtz-Zentrum Dresden-Rossendorf)

Track classification : WG2 - Ion beams from plasmas

Contribution type : talk

Submitted by : Mrs. OBST, Lieselotte

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Track : WG2 - Ion beams from plasmas

Judgment :

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Abstract ID : 156

Controlled Plasma Generation for Beam Driven Plasma Wakefield Accelerators

Content :

Plasma-based accelerators offer the chance of dramatically shrinking the size and cost of future particle accelerators and free-electron lasers. In the FLASHForward project a high-power laser creates a plasma inside which an electron bunch from the FLASH linac drives large amplitude wakefields. Disentangling the processes of ionisation and excitation of wakefields enables improved control over the radial and longitudinal plasma density profile and hence the structure of the wakefields. The disentanglement facilitates the preservation of beam quality during the acceleration. Simulations have shown that using hollow-core plasma channels allow for control of the beam transport and acceleration separately by decoupling transverse and longitudinal fields. To model the plasma density distribution across the target we compute over-barrier, strong-field ionisation rates for a measured laser-intensity. We benchmark the calculated ionisation and dissociation behaviour against measurements using plasma interferometry. These studies provide for an optimisation of the focusing geometry and laser-power-profile to obtain specific plasma profiles. Moreover, comprehension of the underlying processes of laser induced plasma generation allows a better estimation of additional plasma properties. As a proof of concept we create plasma channels with tailored shapes and lengths of approximately 25 centimeters experimentally.

Primary authors : Ms. TAUSCHER, Gabriele (DESY)

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Presenter : Ms. TAUSCHER, Gabriele (DESY)

Track classification : WG1 - Electron beams from plasmas ; WG6 - Theory and simulations

Contribution type : poster

Submitted by : Ms. TAUSCHER, Gabriele

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Date :
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Track : WG6 - Theory and simulations

Judgment :
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Date :
Comments : ""

Abstract ID : 157

Development of desktop Dielectric Ion Accelerator for radiobiological experiment

Content :

Desktop size Dielectric Ion Accelerator (DIA) is being developed at The University of Tokyo and KEK in Japan. X-ray, proton beam, and carbon beam have been widely used in radiation therapy for cancer treatment in order to study the factors that decide the radiation therapy sensitivity. It is important to analyze the cellular response to these radiations. However, the biological irradiation studies for the heavy particle radiotherapy can be carried out in limited facilities. For that reason, we focused on developing a compact accelerator for the spread of the radiation therapy. Therefore we plan to develop a 500[keV]-1[MeV] acceleration system only several dozen centimeters in length which dedicated to the cell irradiation. This DIA consists of stacked Blumlein circuits which made from Si wafer with microstrip line. Blumlein circuit switched by photoconductive switch can be a multistage structure and can generate intense electric field in the interior of the acceleration tube. Current status of our research is that we are examining material property of the device composed of an integrated combination of Blumlein circuit with microstrip line, the photoconductive switch and the acceleration tube. At the meeting we report on this progress.

Primary authors : Mr. SHINOMIYA, Kenichi (The University of Tokyo)

Co-authors : Prof. UESAKA, Mitsuru (The University of Tokyo) ; Mr. JINNO, Satoshi (The University of Tokyo) ; Mr. KOYAMA, Kazuyoshi (KEK) ; Mr. NATSUI, Takuya (KEK) ; Mr. YOSHIDA, Mitsuhiro (KEK)

Presenter : Mr. SHINOMIYA, Kenichi (The University of Tokyo)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : poster

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Date :

Comments : ""

Abstract ID : 158

Rep-rated operation of laser-plasma accelerator for dosimetry and gamma-ray generation.

Content :

We present recent results concerning repetitive operation of a laser-driven electron beam-line in the self-injection regime to deliver a stable, high charge electron bunch in the 20 MeV energy range. We describe the main properties of the acceleration regime and we show recent experimental results concerning the dosimetry carried out for radiobiology tests of direct electron beam irradiation and the generation of gamma-rays for calibration of detectors and imaging applications.

Primary authors : GIZZI, Leonida Antonio (PI)

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Presenter : GIZZI, Leonida Antonio (PI)

Track classification : WG1 - Electron beams from plasmas ; WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : poster

Submitted by : GIZZI, Leonida Antonio

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Date :

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Abstract ID : 159

LIGHT ION ACCELERATION: BULK VS. SURFACE ACCELERATION AND ROLE OF TARGET THICKNESS AND RESISTIVITY

Content :

Laser driven light-ion acceleration is being investigated for the optimization of ion cut-off energy and ion current using the ILIL laser at an intensity of 2E19 W/cm2. Here we focus our attention to the identification of the role of surface and target thickness and resistivity in the fast electron transport and in the acceleration process. We will show experimental results which clearly show a limited, but non negligible role of bulk ions in the acceleration process. We will also show that cold target resistivity has a non-detectable effect on the final acceleration process.

Primary authors : Dr. GIZZI, Leonida Antonio (ILIL, INO-CNR, Pisa, Italy and INFN, Pisa, Italy)

Co-authors : ALTANA, Carmen (LNS) ; Dr. BRANDI, Fernando (ILIL, INO-CNRm Pisa, Italy and IIT, genova, Italy) ; Dr. BUSSOLINO, Giancarlo (ILIL, INO-CNR, Pisa, Italy) ; Dr. CRISTOFORETTI, Gabriele (ILIL, INO-CNR, Pisa, Italy) ; FAZZI, Alberto (M) ; Dr. FERRARA, Paolo (ILIL, INO-CNR, Pisa, Italy) ; Dr. FULGENTINI, Lorenzo (ILIL, INO-CNR, Pisa, Italy) ; GIOVE, Dario Augusto (MI) ; Dr. KOESTER, Petra (ILIL, INO-CNR, Pisa, Italy) ; Dr. LABATE, Luca (ILIL, INO-CNR, Pisa, Italy and INFN, Pisa, Italy) ; LANZALONE, Gaetano (LNS) ; LONDRILLO, Pasquale (BO) ; MUOIO, Annamaria (LNS) ; PALLA, Daniele (ILIL, INO-CNR, Pisa, Italy and INFN, Pisa Italy) ; SINIGARDI, Stefano (BO) ; TUDISCO, Salvatore (LNS) ; TURCHETTI, Giorgio (BO)

Presenter : Dr. GIZZI, Leonida Antonio (ILIL, INO-CNR, Pisa, Italy and INFN, Pisa, Italy)

Track classification : WG2 - Ion beams from plasmas

Contribution type : poster

Submitted by : GIZZI, Leonida Antonio

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Abstract ID : 160

Electron acceleration in deep plasma channels in the Bubble regime

Content :

We study hollow plasma channels with smooth boundaries for laser-driven electron acceleration in the bubble regime. Contrary to the uniform plasma case, the laser forms no optical shock and no etching at the front. This increases the effective bubble phase velocity and energy gain. The longitudinal field has a plateau that allows for mono-energetic acceleration. We observe as low as 1e−3 r.m.s. relative witness beam energy uncertainty in each cross-section and 0.3% total energy spread. By varying plasma density profile inside a deep channel, the bubble fields can be adjusted to balance the laser depletion and dephasing lengths. Bubble scaling laws for the deep channel are
derived. Ultra-short pancake-like laser pulses lead to the highest energies of accelerated electrons per Joule of laser pulse energy. Simulations for the future APOLLON laser parameters suggest that electron energies as high as 24 GeV might be achievable.

Primary authors : Prof. PUKHOV, Alexander (uni duesseldorf)

Co-authors : Mr. THOMAS, Johannes (Uni Duesseldorf) ; Mr. JANSEN, Oliver (Uni Duesseldorf) ; Dr. KOSTYUKOV, Igor (IAP RAS)

Presenter : Prof. PUKHOV, Alexander (uni duesseldorf)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : invited talk

Submitted by : Prof. PUKHOV, Alexander

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Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 161

Hosing in Multi-Pulse Laser Wakefield Accelerators

Content :

It has now been shown experimentally that electrons can be accelerated to 4-GeV energies in a plasma wakefield driven by a single high-intensity laser pulse. However, such laser systems have limited repetition rates and low wall-plug efficiency. An alternative method is to resonantly excite plasma oscillations using a train of laser pulses of lower intensity spaced by the plasma period to drive multi-pulse laser wakefield accelerators (MP-LWFAs). Fibre and thin-disc laser technologies offer the possibility to drive MP-LWFAs efficiently and at high repetition rate (tens of kHz), opening a new domain for applications including compact X-ray sources with high mean brightness.
We will describe our study of one potential issue for MP-LWFAs: laser pulse hosing. This can arise when the centroid of a laser pulse is displaced from the axis of the wake or pulse guiding structure, due to transverse refractive index gradients. We use three-dimensional (axial symmetry), weakly relativistic fluid simulations and particle-in-cell simulations to study the effect of random and systematic pulse misalignment. We show that hosing can be stabilized by adjusting the laser pulse separation and/or by channelling the laser pulses in a waveguide.

Primary authors : Prof. WALCZAK, Roman (University of Oxford) ; Prof. HOOKER, Simon (University of Oxford) ; Dr. MANGLES, Stuart (Imperial College)

Co-authors :

Presenter : Prof. WALCZAK, Roman (University of Oxford)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Prof. WALCZAK, Roman

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Track : WG1 - Electron beams from plasmas

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Abstract ID : 162

Plasma torch electron bunch generation in plasma wakefield accelerators

Content :

We present a novel and very robust scheme for optical triggered electron bunch generation in plasma wakefield accelerators. In this technique a quasi-stationary plasma column is ignited prior the arrival of the plasma wave by a transversally propagating, focused laser pulse. This localized plasma torch is easy tunable by shifting the laser focal position and spot size and causes a strong distortion of the plasma blowout during passage of the electron driver bunch, leading to collective alteration of plasma electron trajectories and to controlled injection. The proposed method is more flexible and faster when compared to hydrodynamically controlled gas density transition methods and it fits experimentalist's needs as it is straight forward to implement and easy to align. Hereby it is also suited for probing a wakefield and timing purposes.

Primary authors : Mr. WITTIG, Georg (Universität Hamburg, CFEL)

Co-authors : Mr. KNETSCH, Alexander (University of Hamburg) ; Mr. KARGER, Oliver (Uni Hamburg) ; Prof. HIDDING, Bernhard (Uni Hamburg) ; MANAHAN, Grace (University of Strathclyde)

Presenter : Mr. WITTIG, Georg (Universität Hamburg, CFEL)

Track classification : WG1 - Electron beams from plasmas ; WG6 - Theory and simulations

Contribution type : either

Submitted by : Mr. WITTIG, Georg

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Track : WG6 - Theory and simulations

Judgment :

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Date :
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Abstract ID : 163

Exploring the capabilities of the Trojan Horse method to drive soft and hard X-ray FEL's

Content :

The underdense photocathode technique "Trojan Horse" is used to create extreme electron witness bunches utilized in free electron lasing process to produce brilliant few nm to Å level wavelengths. We present results of coupled PIC and FEL code simulations and discuss the capabilities and limits of the Trojan Horse method to create suitable FEL driver bunches as well as the optimal undulator conditions for them to generate high gain X-ray radiation.

Primary authors : Mr. WITTIG, Georg (Universität Hamburg, CFEL)

Co-authors : Mr. KNETSCH, Alexander (University of Hamburg) ; KARGER, Oliver (Uni Hamburg) ; Prof. HIDDING, Bernhard (Uni Hamburg) ; MANAHAN, Grace (University of Strathclyde)

Presenter : Mr. WITTIG, Georg (Universität Hamburg, CFEL)

Track classification : WG1 - Electron beams from plasmas ; WG6 - Theory and simulations

Contribution type : either

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Track : WG6 - Theory and simulations

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Abstract ID : 164

Plasma Density Measurement Using Interferometry.

Content :

Gas-filled capillary discharge waveguides have been used very successfully to extend the length over which acceleration can be maintained in a laser-plasma accelerator, leading to the first generation of 1 GeV beams and, recently, the production of 4 GeV electrons.

We present new transverse interferometric measurements of the plasma channel formed in a gas-filled capillary waveguide driven by two discharge circuits: (i) a conventional thyratron-based circuit; and (ii) a compact Marx bank. These both show the production of a long-lived guiding channels, but the Marx bank driver produces a channel which evolves more slowly.

We also present the first measurements of plasma channels produced in this device with a helium gas fill, which is much more convenient experimentally. The plasma channels formed are found to have similar parameters to those produced with hydrogen.

Primary authors : Mr. THORNTON, Christopher (University of Oxford)

Co-authors : Prof. HOOKER, Simon (University of Oxford) ; Dr. DYSON, Anthony (University of Oxford)

Presenter : Mr. THORNTON, Christopher (University of Oxford)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : poster

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Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
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Date :
Comments : ""

Abstract ID : 165

Influence of realistic plasma density profile on ionization-induced electron injection driven by laser wakefield

Content :

Several important issues have to be addressed to optimize a laser plasma accelerator (LPA) for specific applications. In particular, for high energy physics, a multi-staged scheme consisting of one injector and several LPA stages connected by transmission lines appears most promising.
In the frame of the CILEX project, multi-stage experiments are planned with the multi-PW facility APOLLON. On-going studies are related to the development of the plasma target and characterization of the electron bunch produced by ionization-induced injection. A gas cell with variable length was designed and built by the LPGP and LIDyL groups.
Using this cell, the laser-plasma acceleration of a relativistic electron beam was investigated during an experimental campaign at the Lund Laser Centre in Sweden. A wide range of parameters have been explored, such as the pressure and composition of the gas, the cell length and its position relatively to the focal plane. We will focus on the role of the density profile and the relative focal plane position by comparison of the experimental data with theoretical ones obtained with 2D PIC numerical simulations using the WARP code.

Primary authors : Mr. AUDET, Thomas (Laboratoire de physique des Gazs e des Plasmas, CNRS UMR - Université Paris Sud)

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Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : talk

Submitted by : Mr. AUDET, Thomas

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Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

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Date :
Comments : ""

Abstract ID : 166

Towards Underdense Photocathode Plasma Wakefield Acceleration at FACET

Content :

A comprehensively synchronized beam-laser-plasma photocathode setup has been developed at FACET within the E210 program. Spatial and temporal alignment allow to carry through proof-of-concept experiments, aiming at demonstrating the feasibility of underdense photocathode "Trojan Horse" plasma wakefield acceleration. Multiple laser pulses are synchronized with the 20 GeV electron driver beam based on two electro optical sampling diagnostics, and are independently tunable to accomodate maximum flexibility. Important milestones made towards first realization of the scheme are presented. The scheme promises a route towards production of electron bunches with unprecedented electron bunch brightness, exceeding those of existing facilities by orders of magnitude.

Primary authors : Mr. KNETSCH, Alexander (University of Hamburg)

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Presenter : Mr. KNETSCH, Alexander (University of Hamburg)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Mr. KNETSCH, Alexander

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

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Abstract ID : 167

A compact, low cost Marx bank for driving capillary discharge plasmas

Content :

We describe a Compact Marx Bank (CMB) that provides 20 kV, 500A pulses of around 100 ns duration. This is used to drive a gas-filled capillary discharge plasma of density 1018 cm⊠3. This plasma cools at the capillary walls and so forms a positive GRIN waveguide that can guide intense laser pulses over lengths of up to 30 mm. The CMB is triggered with a high speed solid state switch with less than 5 ns voltage jitter. The small size of the CMB (20 cm 25 cm 5 cm) means that it can be placed in the vacuum target chamber, right next to the capillary, avoiding the need to impedance match as there is negligible cable transit time.

Since the electrical energy required per discharge is < 1 J and the shot rate is presently < 1 Hz, it can be powered by a small lead acid battery and floated relative to laboratory earth. The CMB is readily scalable and pulses > 50 kV have been demonstrated for use with longer capillaries. Its small size means that many CMB units can be placed next to each other inside the target chamber to create long waveguides, or for staging plasma accelerators.

Primary authors : Dr. DYSON, Anthony (Oxford University)

Co-authors : Mr. THORNTON, Christopher (JAI) ; Prof. HOOKER, Simon (University of Oxford)

Presenter : Dr. DYSON, Anthony (Oxford University)

Track classification : WG1 - Electron beams from plasmas

Contribution type : poster

Submitted by : Dr. DYSON, Anthony

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Abstract ID : 168

Testing advanced coming techniques

Content :

An Coherent-electron Cooling (CeC) based on the FEL and micro-bunching instability had been proposed few years ago. Being a very flexible version of stochastic cooling, the CeC approach promises significant increase in the bandwidth and, therefore, significant shortening of cooling time in high-energy hadron colliders.In principle, it also can be considered as a possible final-stage cooling technique for muon colliders. In this paper we present our plans of simulating and testing the key aspects of this proposed techniques using the coherent-electron-cooling proof-of-principle experiment at BNL.

Primary authors : Prof. LITVINENKO, Vladimir (Stony Brook University)

Co-authors : Dr. GANG, Wang (Brookhaven National Laboratory) ; Dr. PINAYEV, Igor (Brookhaven National Laboratory) ; Dr. RATNER, Daniel (SLAC)

Presenter : Prof. LITVINENKO, Vladimir (Stony Brook University)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Prof. LITVINENKO, Vladimir

Submitted on Saturday 30 May 2015

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Judged by :
Date :
Comments : ""

Abstract ID : 169

Project towards CO2-laser-driven wake-field accelerator with external injection

Content :

The project will explore a large (e.g. psec or 0.5 mm) length of "bubble" in CO2-laser driven plasma wake-field accelerator. Injecting of an external high quality electron bunch with duration ~ 10 fsec synchronized with the "bubble" would allow us to accelerate high quality electron beams with energy stability and spread reaching towards 1E-4. We rely on CO2-laser power upgrades that are in progress at BNL. We present our considerations for visible diagnostics, plasma source with ramp-up and ramp-down density profiles and the electron bunch compressor to 10 fsec with emittance preservation.
This project is supported by DoE HEP office grant #215125.

Primary authors : Prof. LITVINENKO, Vladimir (Stony Brook University)

Co-authors : Prof. JOSHI, Chandrashekhar (UCLA) ; Prof. MORI, Warren (UCLA) ; Prof. DOWNER, Michael (UT Austin) ; Dr. ZGADZAJ, Rafal (UT Austin) ; Dr. POGORELSKY, Igor (BNL) ; Dr. HAO, Yue (BNL) ; Dr. YICHAO, Jing (BNL)

Presenter : Prof. LITVINENKO, Vladimir (Stony Brook University)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

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Track : WG1 - Electron beams from plasmas

Judgment :

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Date :

Comments : ""

Abstract ID : 170

High Frequency Single Mode Traveling Wave Structure for Particle Acceleration

Content :

The new high frequency traveling wave structure with single TM01 slow mode is studied. The structure is composed of a metallic tube with an internally coated low conductive thin layer. It is shown that the impedance of the internally coated metallic tube (ICMT) has a narrow-band single resonance at a high frequency. The resonant frequency corresponds to synchronous TM01 mode excited by the relativistic charge. The dispersion properties of the fundamental and high order modes of ICMT structure are analyzed. Proof-of-principle experimental setup at AREAL facility is given. The potential of the new structure for the particle acceleration and generation of monochromatic radiation in THz region are discussed.

Primary authors : Prof. TSAKANOV, Vasili (CANDLE Synchrotron Research Institute) ; Dr. IVANYAN, Michael (CANDLE Synchrotron Research Institute) ; Dr. TSAKANIAN, Andranik (TU Darmstadt/CANDLE Synchrotron Research Institute) ; Dr. GRIGORYAN, Bagrat (CANDLE Synchrotron Research Institute)

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Presenter : Prof. TSAKANOV, Vasili (CANDLE Synchrotron Research Institute)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : poster

Submitted by : Prof. TSAKANOV, Vasili

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Comments : ""

Abstract ID : 171

Density downramp injection of plasma electrons into a laser-driven wakefield using a gas target of variable length

Content :

Plasma wakefields can support very high field gradients (~ 100 GV/m) which makes particle acceleration to ultra-relativistic energies possible within a few millimeters. Precise control over the electron bunch phasespace during the process of injection into the accelerating wakefield is needed for the production of high-quality electron beams. Shaping of the longitudinal plasma-density profile, e.g. through the use of downramps, has been proposed as a possible controlled injection mechanism [1,2, e.g.].
In this report the study of density down-ramp injection into a plasma wakefield using gas target of variable length is presented.
Suitable target density profiles, with a short down ramp length, preceded by a high-density peak are of crucial importance. The target is a gas cell with variable length of peak and plateau regions and was operated with a helium.
The goals and first preliminary results of the experiment are presented, including hydrodynamic simulations of the tailored target, performed using OpenFOAM.
[1] S. Bulanov et al., Phys. Rev. E 58, R5257 (1998)
[2] H. Suk et al., Phys. Rev. Lett. 86, 1011–1014 (2001)

Primary authors : KONONENKO, Olena (Deutsches-Elektronen-Synchrotron (DESY))

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Track classification : WG1 - Electron beams from plasmas

Contribution type : either

Submitted by : KONONENKO, Olena

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 172

AREAL Test Facility for Advanced Accelerator and Radiation Sources Concepts

Content :

Advanced Research Electron Accelerator Laboratory (AREAL) is a 20 MeV electron linear accelerator with laser driven RF gun being constructed in the CANDLE institute. Along with applications in life and material sciences, it aims to serve as a test facility for experimental study in the fields of novel accelerator technology and radiation sources. The construction of the 5 MeV RF photogun section of the facility is completed, which provides up to 300 pC bunch charge with variable electron bunch length from 0.4 to 8 psec. The review of the facility performance and main parameters is given. The experimental program on advanced accelerator concepts and new radiation sources is discussed.

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Presenter : Prof. TSAKANOV, Vasili (CANDLE Synchrotron Research Institute)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : talk

Submitted by : Prof. TSAKANOV, Vasili

Submitted on Saturday 30 May 2015

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Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 173

Optimization of a magnetic energy selector for laser-driven proton beams and application for the domain of Cultural Heritage

Content :

Laser-driven proton acceleration represents an important field of interest for nowadays research. Laser accelerated protons feature interesting characteristics such as beam current, beam charge and bunch duration, that make them potentially a complementary solution to conventional sources and enable several novel applications. Nevertheless, their intrinsic broadband energy spectrum precludes many applications that require more monochromatic proton beams.
We report on the design study of a flexible, versatile device for the energy selection of laser-driven proton beams, based on permanent magnets. We concentrate on the energy range from 2 to 50 MeV, i.e the typical energies that can be obtained routinely for ion acceleration using a commercial 250 TW-power laser system.
We determine the key technical features of the energy-selector that define the energy selection process in terms of energy bandwidth and transmission efficiency, indicating the best working point based on requirements and technical constraints.
As an example of potential applications, we show that laser generated proton beams with a low energy spread can be used in the domain of Cultural Heritage: tailoring the proton beam with an energy selector allows performing an improved material analysis compared to what is currently used in conventional diagnostic techniques.

Primary authors : SCISCIO', Massimiliano (ROMA1)

Co-authors : MIGLIORATI, Mauro (ROMA1) ; Dr. BARBERIO, Marianna (DiBEST - Università della Calabria) ; Ms. VELTRI, Simona (DiBEST - Univeristà della Calabria) ; PALUMBO, Luigi (ROMA1) ; ANTICI, Patrizio (LNF)

Presenter : SCISCIO', Massimiliano (ROMA1)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : SCISCIO', Massimiliano

Submitted on Saturday 30 May 2015

Last modified on : Saturday 30 May 2015

Comments :

If the judging committee should consider the topic as not appropriated for a talk or if a talk should not be possible due to organizing reasons, a poster presentation would be thankfully accepted.

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Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
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Date :
Comments : ""

Abstract ID : 174

Optimization study of a transport line for electron beams generated by laser-plasma interaction

Content :

Many facilities worldwide are currently studying electron beams generated by laser-plasma interaction and looking in its usability for developing laser-driven electron beamlines. Many efforts are focused on the plasma source, the capture and transport of the laser-generated particles in order to obtain electron beams with characteristics comparable to those obtained in traditional accelerator facilities based on RF technology. Laser-plasma sources have a strong advantage in terms of size and cost of the global accelerating infrastructure, compared to conventional accelerators. Although the laser-driven electron acceleration has been extensively studied since a decade, many improvements are still necessary since the laser-accelerated beams are not sufficiently controllable to make them suitable as a replacement for conventional accelerators.
We report on the optimization study for capturing and transporting laser-accelerated electrons using conventional beam transport elements. We focus on laser-generated electrons as obtained on commercially available multi-hundred TW systems, but also on electrons as estimated to be obtained on future planned facilities, e.g. on ELI. We analyze different configurations and different beam energies, and indentify the main problems that arise when trying to control laser-plasma electron beams with conventional magnetic elements.

Primary authors : SCISCIO', Massimiliano (ROMA1) ; LANCIA, Livia (Dept. SBAI, Sapienza, Universityof Rome) ; MIGLIORATI, Mauro (ROMA1)

Co-authors : Dr. PAPAPHILIPPOU, Yannis (CERN) ; ANTICI, Patrizio (LNF) ; MOSTACCI, Andrea (ROMA1) ; PALUMBO, Luigi (ROMA1)

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Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : SCISCIO', Massimiliano

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Judgment :

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Date :

Comments : ""

Abstract ID : 175

Laser-driven protons for nanomaterial production

Content :

The enhancement and control of growing techniques for nanomaterials, in particular nanocrystals, is one of the current key challenges in nanoscience and nanotechnology. The possibility to obtain routinely nanocrystals with controlled shape, dimensions and crystallinity is a challenge that many research groups are pursuing and strategically important for manifold applications.
The irradiation of a bulk target by high energetic laser-generated protons can generate the temperature and pressure conditions required to grow crystalline structure. The short bunch duration of the exhibiting proton beam limits the nucleation time to the range of ps-ns ensuring the stop of nucleation at crystallinity phase without aggregation of amorphous structures.
We will show how laser-generated protons can be used to grow and obtain nanostructured surfaces where the constituent nanomaterials are nanocrystals with well defined shape, dimensions and crystallinity. We control the nanocrystals properties tuning the laser-accelerated proton beam characteristics (energy, pulse duration and fluence), i.e. working on the source and the geometry in the irradiation process.

Primary authors : ANTICI, Patrizio (LNF)

Co-authors : SCISCIO', Massimiliano (ROMA1) ; Dr. BARBERIO, Marianna (INFN-CS) ; Dr. CHEN, Sophia (CNRS/LULI) ; Mr. GANDOLF, Thomas (LULI) ; XU, Fang (CS) ; Mrs. VELTRI, Simona (INRS) ; Mrs. MORABITO, Antonia (INFN / ELI-ALPS) ; Mr. TOBIAS, Javier (INFN / ELI-ALPS)

Presenter : ANTICI, Patrizio (LNF)

Track classification : WG2 - Ion beams from plasmas ; WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : ANTICI, Patrizio

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Date :
Comments : ""

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 176

Dielectric wakefield accelerator experiments in modal confinement and pulse shaping

Content :

Significant experimental milestones in beam-driven wakefield acceleration in dielectric structures have been demonstrated in recent years. Such experimental work is necessary to ascertain the viability of such schemes as next generation accelerators. Some outstanding issues that require further investigation include control of resonant mode confinement and enhanced energy efficiency. In this paper, we will describe experimental efforts that took place at the Brookhaven National Laboratory Accelerator Test Facility. The first measurement successfully demonstrates resonant excitation of specific terahertz frequency modes in a dielectric structure using Bragg-reflective boundaries. The second measurement focusses on phase space manipulations to enhance transformer ratios using shaped beam profiles from a dielectric structure and compact magnetic chicane.

Primary authors : Dr. ANDONIAN, Gerard (UCLA)

Co-authors :

Presenter : Dr. ANDONIAN, Gerard (UCLA)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : --not specified--

Submitted by : Dr. ANDONIAN, Gerard

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Status : SUBMITTED

Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 177

Experimental Characterization of Rubidium Vapor Photoionization in a Meter-Scale Rubidium plasma source

Content :

AWAKE is a proof-of-principle proton driven plasma wakefield electron acceleration experiment that requires a 10 meter long plasma source with a density of 1014-1015 cm-3. To create this plasma, an ultrafast terawatt laser pulse ionizes rubidium vapor at the required density. Although the ionization process can be described as a form of tunnel ionization, the Keldysh parameter is on the order of unity, causing some commonly applied approximations to break down. By selecting a laser with the D1 and D2 transition lines within its bandwidth the effects of anomalous dispersion in the vapor will broaden the pulse significantly from its transform limited with on a centimeter scale. By propagating the laser pulse over meter scales the resulting laser pulse length will be significantly broadened unless ionization occurs over the entire vapor column. The laser's pulse length can act as an ionization diagnostic. We describe the results of experimental characterization of the photoionization process through a meter long heat pipe oven using a 100 fs FWHM laser pulse and compare them to numerical results of standard ionization models.

Primary authors : Dr. MOODY, Joshua (Max Planck Institute for Physics)

Co-authors : Mrs. JOULAEI, Atefeh (Max-planck institute) ; Dr. OZ, Erdem (Max Planck for Physics) ; Mr. BATSCH, Fabian (Max-Planck-Institute for Physics) ; Prof. MUGGLI, Patric (Max-Planck-Institut für Physik)

Presenter : Dr. MOODY, Joshua (Max Planck Institute for Physics)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics ; WG7 - Laser technology for advanced accelerators

Contribution type : talk

Submitted by : Dr. MOODY, Joshua

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Date :
Comments : ""

Track : WG7 - Laser technology for advanced accelerators

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 178

AREAL Low Energy Electron Beam Application in Life and Materials Sciences

Content :

AREAL laser driven RF gun provides the 2-5 MeV energy ultrashort electron pulses for experimental study in life and materials sciences. We report the first experimental results of the AREAL electron beam application in the study of molecular-genetic effects of ultrafast radiation, electro-physical properties of silicon and silicon-dielectric structures, characteristics of ferroelectric nanofilms and the single crystals for scintillators.

Primary authors : Prof. TSAKANOV, Vasili (CANDLE Synchrotron Research Institute) ; Dr. GRIGORYAN, Bagrat (CANDLE Synchrotron Research Institute) ; Prof. HAROUTIUNIAN, Samvel (Yerevan State University) ; Prof. AROUTIOUNIAN, Rouben (Yerevan State University) ; Prof. YERITSYAN, Grant (Yerevan Physics Institute) ; Dr. MARTIROSYAN, Norair (Yerevan Engineering Univeristy) ; Prof. DALYAN, Eva (Yerevan State University)

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Presenter : Prof. TSAKANOV, Vasili (CANDLE Synchrotron Research Institute)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : poster

Submitted by : Prof. TSAKANOV, Vasili

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Date :

Comments : ""

Abstract ID : 179

Capturing an RF Photo-Electron Bunch in a Laser Plasma Wakefield

Content :

RF photoguns are an appealing source for injecting electrons into a plasma wake because they can produce extremely high brightness beams. In order to capture a large percentage of the beam, we find that it is necessary to pre-bunch the beam close to the plasma frequency. We determine the plasma parameters necessary to capture and accelerate electrons from a table-top sized RF beamline such as that at UCLA's PEGASUS facility. Bunch dynamics are confirmed by particle tracking.

Primary authors : CESAR, David (UCLA-PBPL)

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Presenter : CESAR, David (UCLA-PBPL)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : poster

Submitted by : CESAR, David

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Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
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Comments : ""

Abstract ID : 180

Downramp-assisted underdense photocathode electron bunch generation in plasma wakefield accelerators

Content :

The underdense photocathode "Trojan Horse" plasma wakefield acceleration is a promising technique for the generation of high-brightness and low-emittance witness bunches.
It is shown that requirements on the driver electron beam can be substantially
decreased by performing the witness beam generation on a soft density downramp, which facilitates trapping.
As a consequence the underdense photocathode technique is applicable by a larger
number of accelerator facilities and dark current is eff ectively suppressed.

Primary authors : Mr. KNETSCH, Alexander (University of Hamburg)

Co-authors : Mr. KARGER, Oliver (University of Hamburg, Institute for Experimental Physics) ; Mr. WITTIG, Georg (Universität Hamburg, CFEL) ; Mr. XI, Yunfeng (UCLA) ; Mr. GROTH, Henning (University of Hamburg) ; Dr. DENG, Aihua (UCLA) ; Prof. ROSENZWEIG, James (UCLA) ; DAVID L., Bruhwiler (RadiaSoft LLC) ; Dr. SMITH, Jonathan (Tech-X UK Ltd) ; Prof. JAROSZYNSKI, D. A. (SUPA, Department of Physics, University of Strathclyde) ; Prof. SHENG, Zheng-ming (SUPA, Department of Physics, University of Strathclyde) ; Dr. MANAHAN, Grace Gloria (SUPA, Department of Physics, University of Strathclyde) ; Dr. XIA, Guoxing (Cockcroft Institute and the University of Manchester) ; Dr. JAMISON, Steven (STFC Daresbury Laboratory) ; Prof. HIDDING, Bernhard (University of Hamburg DESY , University of Strathclyde & UCLA)

Presenter : Mr. KNETSCH, Alexander (University of Hamburg)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Mr. KNETSCH, Alexander

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
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Date :

Comments : ""

Abstract ID : 181

Ion acceleration driven by high intensity, multiple beams at Arcturus Laser System

Content :

Here, we report novel experimental results on topic ion acceleration in ultra-high intensity regime using multiple beams. The experiments have been performed at Arcturus laser facility (Heinrich Heine University, Düsseldorf) using both arms of ultra-short 200TW beams and a 10 TW probe pulse. The main interaction beams (energy up to 6J and pulse duration 30 fs) were focused at intensities >1020 W/cm2 and spatially overlapped onto thin Ti foil. The system allows relative temporal delay between pulses and independently control pulse contrast by means of the separate plasma-mirror setups. The ion beams accelerated on the target rear side were monitored by two Thomson spectrometers (0° and 10°). Depending on the relative delay between the beams, different interaction regimes can be accessed and recognized in the enhancement of the ion energy and/or modulation of the energy spectrum. For example, at the relative temporal delay of 250 ps, the proton energy was enhanced up to 50%. Furthermore, enhancement of heavy ion (e.g. C+4) energies and increase in flux near the cut-off energies were also observed at different delays. The dynamic of the expanding plasma was monitored by high resolution spectral interferometry and reflectometry.

Primary authors : Dr. CERCHEZ, Mirela (Institute for Laser and Plasma Physics, Heinrich Heine University Düsseldorf, Germany)

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Track classification : WG2 - Ion beams from plasmas

Contribution type : talk

Submitted by : Dr. CERCHEZ, Mirela

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Track judgments :

Track : WG2 - Ion beams from plasmas

Judgment :

Judged by :
Date :
Comments : ""

Abstract ID : 182

Brilliance increase of Thomson scattered x-rays by modulating the undulator laser pulse

Content :

At the ATLAS facility electron beams with energy of more than 100 MeV can be generated by laser wakefield acceleration (LWFA). These beams can be used to produce highly brilliant and extremely short x-ray pulses by Thomson scattering of the counter propagating laser pulse, but previous experiments produced an insufficient number of photons for applications.

Mathematically can be shown that, with appropriate stretching and chirping of the undulator laser pulse and a corresponding adaption of the laser parameter to the varying wavelength, a reduction of the bandwidth as well as an increase of the peak intensity, hence an improvement of the brilliance can be achieved.

The scheduled experiments will be performed with higher laser energy, are based on the results of these calculations and should further enhance the brilliance of the generated x-ray beams.
In comparison to other groups (e.g. Debus et al. 2010, Ghebregziabher et at. 2013) in our case there is not only an enlargement of the interaction region or a reduction of the bandwidth but both of it.

I would like to present the simulation results of the improvement of Thomson scattered x-rays produced by LWFA electrons.

Primary authors : SCHINDLER, Sabine (LMU München)

Co-authors :

Presenter : SCHINDLER, Sabine (LMU München)

Track classification : WG1 - Electron beams from plasmas ; WG6 - Theory and simulations

Contribution type : poster

Submitted by : SCHINDLER, Sabine

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Track judgments :

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Track : WG6 - Theory and simulations

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 183

Emission of Strong Terahertz pulses from Laser Wakefields in weakly coupled Plasma

Content :

Now a days Terahertz frequency domain of electromagnetic spectrum has been a very important and integrated part of technology based on their application as a potential field of research due to its viability. Terahertz radiation is nonionizing electro-magnetic radiation with submilimeter wavelength, which can be used non-invasively to several applications. here in the present paper we study the effect of magnetic field, laser pulse paramenters, plasma density and different profiling of laser pulses on the mechanism of terahertz generation from laser plasma interaction. Terahertz fields are computed after evaluation of the components of wakefield those are generated due to propagation of highly intense pulse in a uniform density magnetoactive plasma. The effect of different profile of lasers on the magnitude of wakefield are investigated and further theoretical description is presented for emission of terahertz pulses. It is also observed that there is no wakefield produced in the direction of the external magnetic field whereas components of wakefield are observed in the direction parallel and perpendicular to the axis of propagation of laser perpendicular to the direction of magnetic field.this transverse component of wakefield is responsible for causing emission of strong terahertz pulses.

Primary authors : Ms. SINGH, Divya (university of delhi)

Co-authors : Prof. MALIK, Hitendra Kumar (indian institute of technology, delhi)

Presenter : Ms. SINGH, Divya (university of delhi)

Track classification : WG6 - Theory and simulations

Contribution type : either

Submitted by : Ms. SINGH, Divya

Submitted on Sunday 31 May 2015

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Track judgments :

Track : WG6 - Theory and simulations

Judgment :

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Date :

Comments : ""

Abstract ID : 184

Experiments to observe multi-pulse laser wakefield acceleration

Content :

In multiple-pulse laser wakefield acceleration (MP-LWFA), a train of laser pulses spaced by the plasma period is used to drive a plasma wave, rather than the single pulse used in most experiments. Driving wakefields with a train of low-energy pulses has several advantages: laser-driven plasma accelerators can exploit new laser technologies which cannot deliver high-energy pulses, but which can provide ultrafast, few-mJ pulses at kHz repetition rates with high wall-plug efficiency; in principle the properties of each pulse in the train can be tuned to optimize the wake amplitude; the reduced peak intensity of each pulse could allow the use of smaller optical components; and the architecture naturally lends itself to recovery of energy left in the wakefield by a second pulse train separated from the first by an odd number of half plasma periods.

We report progress on the first experiments to observe MP-LWFA, using the Astra laser at the Rutherford Appleton Laboratory. The experiments employ frequency-domain holography to measure the wake amplitude as a function of the properties of the pulse train and target plasma, enabling studies of the effects of detuning from resonance and of ion motion.

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Presenter : Mr. COWLEY, James (University of Oxford)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Mr. JAMES, Cowley

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Track judgments :

Track : WG1 - Electron beams from plasmas

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Date :

Comments : ""

Abstract ID : 185

The ELIMED transport and dosimetry beamline for laser-driven ion beams

Content :

Nowadays the innovative particle acceleration technique based on laser-target interaction, represents a promising alternative to the conventional one. Nevertheless the peculiarities of the laser-accelerated ion beams, as the broad energy and angular distribution and the low reproducibility make necessary the development of dedicated non-conventional transport devices in order to obtain suitable beams for multidisciplinary applications, such as the hadrontherapy. At this aim, a contract has been signed between the INFN-LNS and Eli-Beamlines and provides the realization of a whole beamline, named ELIMED, completely
dedicated to the transport, the diagnostic and the dosimetry of laser driven ion beams.
The transport devices will be composed of a set of permanent quadrupoles, located few
cm downstream the target, and able to collect, focus and pre-select in energy laser driven
beams up to 60 MeV/u , and an energy selector system made of conventional resistive
magnets. Anyway the in-air section consists of an ionization chamber, of a SEM detector and of an innovative Faraday Cup, accurately designed to optimize the dose measurement of high-pulsed ion beams. The detailed description of the whole ELIMED beamline, which will be installed in Prague within the 2017, will be reported.

Primary authors : MILLUZZO, Giuliana Giuseppina (LNS)

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Presenter : MILLUZZO, Giuliana Giuseppina (LNS)

Track classification : WG2 - Ion beams from plasmas

Contribution type : poster

Submitted by : MILLUZZO, Giuliana Giuseppina

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Track : WG2 - Ion beams from plasmas

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Abstract ID : 186

Ion acceleration using fully isolated targets

Content :

We present experiments with fully isolated, levitating targets irradiated by PW class laser pulses. For the first time, our novel setup allows exploitation of the well defined target mass spanning 6 orders of magnitude, in particular for the optimisation of laser driven ion sources.

Primary authors : Mr. OSTERMAYR, Tobias (LMU München and MPI-Q)

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Presenter : Mr. OSTERMAYR, Tobias (LMU München and MPI-Q)

Track classification : WG2 - Ion beams from plasmas

Contribution type : talk

Submitted by : Mr. OSTERMAYR, Tobias

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Abstract ID : 187

From Fiber Laser Electron Photoinjector/linac forward Dielectric Laser Accelerator

Content :

The Er fiber laser oscillator and Ti:Sa amplifier for the laser photocathode S-band RF injector/linac has been operating for ultrafast radiation chemistry. Since the quantum efficiency of the photocathodes from Cu (10-5) to Na2KSb (10-2) remarkably is improved, one multipath amplifier is not needed. Therefore, we can put the whole laser near by the injector so that the position stability of the laser spot is much improved. Sub-picosecond electron single bunch and femtosecond laser are synchronized with picosecond time resolution. Recently, we start developing an on-chip dielectric electron accelerator (DLA) for radiation biology, semiconductor technology, etc. Yr fiber laser of 1.03 ⊠m wavelength, 291 THz, 5 ps and 50 ⊠J are also under development. Not only its nano-m beam size but also attosecond ultrashort pulse is the innovative aspect of DLA. We are numerically designing and manufacturing a SiO2 accelerating structure. Energy gain confirmation experiment is planned soon. We are designing to realize hundreds nm beam size, 30 attosecond, 100 fC microbunchs for 5 ps macrobunch at 50 kHz. We are seeking and developing a nano-m and attosecond on-chip accelerator system.

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Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : talk

Submitted by : Prof. UESAKA, Mitsuru

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Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :

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Date :

Comments : ""

Abstract ID : 188

Cooling of relativistic electron beams in intense laser pulses

Content :

The next few years will see next-generation high-power laser facilities (such as the Extreme Light Infrastructure) become operational, for which it is important to understand how interaction with intense laser pulses affects the bulk properties of a relativistic electron beam. As we move to higher laser intensities, we expect both radiation reaction and quantum effects to play a significant role in the beam dynamics.

At the upcoming field strengths, quantum effects can no longer be neglected and it is expected that the resulting reduction in relative energy spread (beam cooling) at the expense of mean beam energy predicted by classical theories of radiation reaction will not be observed. Unlike classical predictions, the final properties of a particle beam colliding with a high-intensity laser predicted by semi-classical and quantum theories of radiation reaction are highly sensitive to the distribution of energy in the laser pulse. This offers potential opportunities to modify or control final beam properties. In addition, longitudinal and transverse contributions to cooling are no longer equal [1].

[1] S. R. Yoffe, Y. Kravets, A. Noble, D. A. Jaroszynski, New J. Phys. 17: (2015) <10.1088/1367-2630/17/5/053025>

Primary authors : Dr. YOFFE, Samuel (University of Strathclyde)

Co-authors : Dr. NOBLE, Adam (University of Strathclyde) ; Prof. JAROSZYNSKI, Dino (University of Strathclyde)

Presenter : Dr. YOFFE, Samuel (University of Strathclyde)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control ; WG6 - Theory and simulations

Contribution type : talk

Submitted by : Dr. YOFFE, Samuel

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Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

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Date :
Comments : ""

Track : WG6 - Theory and simulations

Judgment :

Judged by :
Date :
Comments : ""

Abstract ID : 189

Mobile X-band Electron Linac X-ray/neutron Source

Content :

We have developed portable X-band (9.3GHz) 3.95 MeV linac X-ray source for on-site inspection of social infrastructure such as bridge. We have already started on-site X-ray inspection of bridge. It can generate 100 mA, 0.4 kW, 2 mGy/s@1 m. X-ray transmitted image of 400 mm thick iron-reinforced concrete can be obtained by 1 s using the flat-panel X-ray camera. By partial angle CT and tomosynthesis, even iron-wires of 7 mm diameter can be reconstructed with 1 mm spatial resolution. Moreover, we are designing 3.95 MeV electron linac neutron source using a Be target. Neutron flux is expected to be more than 1011 n/s. By comparing neutron images with X-ray images we try to estimate the depth of corroded layer of iron rod/wire to evaluate structural degradation. This neutron source can be also used for precise nuclear data of nuclear materials like U, Pu, Am,Cm, etc. Upgraded nuclear data are expected to be used for melt fuel debris analysis in Fukushima and the design of ADS (Accelerator Driven System). Optimization of the whole system is under way.

Primary authors : Prof. UESAKA, Mitsuru (University of Tokyo, Nuclear Professional School)

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Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Prof. UESAKA, Mitsuru

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Abstract ID : 190

Proton energy enhancement by controlled preplasma formation

Content :

The continuous development of laser systems, now easily reaching the petawatt level, is posing an interesting challenge related to understanding the effect of the prepulse. This effect is important even when using lower power systems, if the main pulse intensity on target is enough to work in Target Normal Sheath Acceleration conditions. Every time we irradiate with such a laser system a solid target, a preplasma made by the prepulse is created. This poses a serious challenge to understand its effects, due to its importance even in high-contrast experimental conditions. Several phenomena can lead both to an enhancement of the quality of the beam or to a severe decrease. Depending on the prepulse duration, intensity and temporal shape we can have many different target configurations when the main pulse arrives on it. In this work, we will investigate those conditions through a multi parametric 2D particle-in-cell scan. From the results of this systematic numerical study, we will discuss the optimal working conditions also in view of the attempt to model the experimental results for a particular case which is related to the ILIL/INO Laser system installed in Pisa.

Primary authors : SINIGARDI, Stefano (BO)

Co-authors : TURCHETTI, Giorgio (BO) ; LONDRILLO, Pasquale (BO) ; GIZZI, Leonida Antonio (PI) ; Dr. LABATE, Luca (Istituto Nazionale di Ottica - Consiglio Nazionale delle Ricerche) ; Dr. CRISTOFORETTI, Gabriele (CNR)

Presenter : SINIGARDI, Stefano (BO)

Track classification : WG2 - Ion beams from plasmas ; WG6 - Theory and simulations

Contribution type : talk

Submitted by : SINIGARDI, Stefano

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Track judgments :

Track : WG2 - Ion beams from plasmas

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Date :
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Track : WG6 - Theory and simulations

Judgment :
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Date :

Comments : ""

Abstract ID : 191

FLASHForward - Future-Oriented Wakefield-Accelerator Research and Development at FLASH

Content :

FLASHForward is a beam-driven plasma wakefield acceleration facility, currently under construction at DESY (Hamburg, Germany), aiming at the stable generation of electron beams of several GeV with small energy spread and emittance.
High-quality 1 GeV-class electron beams from the free-electron laser FLASH will act as the wake driver.
The setup will allow studies on external injection as well as on various internal injection techniques, such as density-downramp or ionisation injection.
With a triangular-shaped drive beam electron energies of up to 5 GeV can be anticipated.
Particle-In-Cell simulations are used to assess the feasibility of each technique and to predict properties of the accelerated electron bunches.

In this contribution the physics case and the current status of FLASHForward will be reviewed.
Concepts of the main components - the extraction beamline from the FLASH linac, the target area, the plasma cell and the post-plasma beam transport and diagnostics - will be described.

Primary authors : Dr. LIBOV, Vladyslav (DESY)

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Presenter : Dr. LIBOV, Vladyslav (DESY)

Track classification : WG1 - Electron beams from plasmas ; WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Dr. LIBOV, Vladyslav

Submitted on Sunday 31 May 2015

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Comments :

The Principal Investigator for this work is Dr. Jens Osterhoff (DESY)

Status : SUBMITTED

Track judgments :

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Date :
Comments : ""

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 192

Improving the Reproducibility of LWFA Experiments with Particle-In-Cell Simulations

Content :

We present studies on improving the quantitative reproducibility of laser-wakefield acceleration experiments conducted at LMU with particle-in-cell simulations. The evolution of a simulation is sensitive to numerical instabilities or artifacts and the correct description of the laser pulse and the plasma, whereas usually their profiles are oversimplified to basic analytic functions. We study the influence and scaling of simulations to numerical artifacts which mainly heat the plasma particles or cause incorrect dispersion and result in increased trapping of particles in the wakefield. These effects scale with different kinds of resolution parameters and the type of solver. Furthermore, we study the scaling with basic plasma and laser parameters such as the pulse energy and plasma density, and the influence of using experimentally measured laser and plasma profiles. This is an ongoing study, and we expect to be able to present the final results at the workshop.

Primary authors : Mr. GILLJOHANN, Max (LMU Munich)

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Presenter : Mr. GILLJOHANN, Max (LMU Munich)

Track classification : WG1 - Electron beams from plasmas ; WG6 - Theory and simulations

Contribution type : poster

Submitted by : Mr. GILLJOHANN, Max

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Track : WG6 - Theory and simulations

Judgment :
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Date :

Comments : ""

Abstract ID : 193

Tunable All-Optical Quasimonochromatic Thomson X-Ray Source in the Nonlinear Regime

Content :

We present an all-laser-driven, energy-tunable, and quasimonochromatic x-ray source based on Thomson scattering from laser-wakefield-accelerated electrons. One part of the 40TW laser beam was used to drive a few-fs bunch of quasimonoenergetic electrons, produced using the shock-front injection scheme, while the remainder was backscattered off the bunch at a weakly relativistic intensity(a0=0.9). When the electron energy was tuned from 17–50 MeV, narrow x-ray spectra peaking at 5–42 keV were recorded with high resolution. These measurements reveal nonlinear features including spectral red-shift and onset of higher harmonics, which we present along with the corresponding calculations. We show large statistics demonstrating the stability and practicality of this source concept as well as suitability of the shock-front injection for the collision experiments. Finally we discuss the further prospects of this technology and the application-oriented future developments.

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Presenter : Mr. KHRENNIKOV, Konstantin (Ludwig-Maximilians-University Munich (LMU), Max-Planck-Institute for Quantum

Track classification : WG1 - Electron beams from plasmas ; WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Mr. KHRENNIKOV, Konstantin

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

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Date :
Comments : ""

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 194

Multistage laser wakefield acceleration driven by two laser pulses with different focal lengths

Content :

We are developing high-quality electron source (stable, ultrashort, high charge and narrow energy spread) based on multistage LWFA towards practical applications such as ultrafast electron imaging and x-ray free electron laser. The multistage technique using two laser pulses with different focal lengths enables flexible energy control of the electron beam. In this technique, firstly, tightly focused laser pulse produces injector beam via wavebreaking process of the plasma wave. Then the injector beam injects into the linear wakefield excited by the long focused laser pulse. The energy of the injector beam can be modified in the linear wakefield. The electron beam with narrow energy spread can be obtained by phase rotation and/or the high-energy electron beam can be obtained by further acceleration in the linear wakefield. The energy can be controlled by changing the timing between two laser pulses. We have performed the experiment of the two-pulse-driven multistage LWFA and succeeded to generate quasi-monoenergetic electron beams having the energies from a few MeV to hundreds MeV.

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Presenter : Dr. NAKANII, Nobuhiko (Osaka University)

Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Dr. NAKANII, Nobuhiko

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Comments :

I'm a member of Prof. Hosokai's group at Osaka University. Prof. Hosokai will give a talk as invited speaker. I would like to talk about the detail of our staging LWFA study which he can not cover in his invited talk.

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
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Date :
Comments : ""

Abstract ID : 195

Bunch Profile Reconstruction and Evolution of Laser-Wakefield accelerated Electron Bunches by Single-Shot Measurement of Coherent Transition Radiation

Content :

A unique property of laser-wakefield accelerated electron bunches is their ultra-short duration, resulting in peak currents in the kA range, which may benefit future applications such as laboratory scale X-ray sources or ultrafast time resolved measurements. We present single-shot, high-resolution measurements of the longitudinal bunch profile based on detection of coherent transition radiation in a broad spectral range. To avoid the necessity for assumption about the bunch shape as well as the spectral shape in unmeasured regions, we have developed an iterative algorithm capable of reconstructing the longitudinal bunch profile. Our method is sensitive to complex features, such as multi-bunch structures. A gas-target of variable length is used to assess the evolution of the bunch profile during the acceleration process. Our results suggest that after laser energy depletion, a mode transition from a laser-driven wakefield to a particle-driven wakefield occurs, associated with the injection of a secondary bunch. The resulting double bunch structure could be exploited for driver-witness type experiments, i.e. allowing a non dephasing-limited acceleration of the secondary bunch in a plasma-afterburner stage.

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Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : Mr. HEIGOLDT, Matthias

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Track : WG1 - Electron beams from plasmas

Judgment :

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Date :

Comments : ""

Abstract ID : 196

Quantitative X-Ray Phase-Contrast Microtomography from a Compact Laser Driven Betatron Source

Content :

With excellent resolving power and tissue contrast, X-ray phase-contrast imaging holds great promise but the source requirements have limited its use. Here we present the first quantitative phase-contrast micro-tomogram of a biological specimen produced by a laser driven Betatron source.
The fundamental mechanism behind the so called betatron radiation is the wiggling of the electrons in the radial fields of the plasma wake during the acceleration process. The um source size enables its use for producing high resolution phase contrast images by the free space propagation technique. These images combined with computed tomography technique are able to provide detailed information about the specimen.
Along with the tomogram we present a comprehensive characterization of the electron acceleration process, which defines the Betatron source. For this purpose we have indirectly measured and analyzed the main X-ray properties, like source size and photon spectrum.
We address the optimization of the source for phase-contrast imaging and the essential steps necessary for a quantitative reconstruction. Also a successful crosscheck of the retrieved electron densities against the values measured with an electron microscope confirming the accuracy of the source characterization and the validity of our approach will be presented.

Primary authors : Mr. WENZ, Johannes (Ludwig-Maximilians-Universität München)

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Presenter : Mr. WENZ, Johannes (Ludwig-Maximilians-Universität München)

Track classification : WG1 - Electron beams from plasmas ; WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : Mr. WENZ, Johannes

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
Judged by :
Date :
Comments : ""

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 197

Few-cycle Optical Probing of Laser Wakefield Acceleration Experiments

Content :

Several applications of a few-cycle optical probe-pulse (fc-probe) in Laser Wakefield Acceleration (LWFA) experiments on the JETI 40 TW laser system in Jena, Germany will be described. This research is motivated by the need for diagnostics of the plasma wakefield with micron-scale spatial and femtosecond-scale temporal resolution to gain a deeper understanding into the physics underlying the injection and acceleration processes as well as the need to benchmark numerical simulations which have so far been the only source for such detailed information.

Several experimental setups using the fc-probe pulses were implemented in the last two experimental campaigns in 2014 and 2015 allowing for various measurements to be performed. Electron plasma density distributions were measured interferometrically using a Mach-Zehnder type interferometer, and an achromatic quadri-wave lateral shearing interferometer. Shadowgraphic imaging techniques were used to investigate the evolution of the wakefield in self-injection and ionization-injection regimes, asymmetries in the wakefield due to laser asymmetries (i.e. asymmetric focal spot and pulse front tilt), birefringence of the plasma’s refractive index due to strong magnetic fields, and the feasibility of recording the temporal evolution of the wakefield in a single pump-probe interaction.

Primary authors : Mr. SCHWAB, Matthew (Friedrich-Schiller-University Jena)

Co-authors : SÄVERT, Alexander (Institute for Optics and Quantumelectronics, FSU Jena) ; Dr. EVANGELOS, Siminos (Max-Planck-Institut für Physik komplexer Systeme) ; Mr. KUSCHEL, Stephan (Helmholtz Institute Jena) ; Mr. HOLLATZ, Dominik (Institut für Optik und Quantum Elektronik) ; Mr. HEINEMANN, Thomas (Institute for Experimental Physics, University of Hamburg) ; Mr. CORVAN, Darragh (Queens University Belfast) ; Mr. DING, Hao (Ludwig-Maximilians-Universität München) ; Mr. GILJOHANN, Max (Ludwig-Maximilians-Universität München) ; Mr. SEIDEL, Andreas (Helmholtz Institute Jena) ; Mr. BLINNE, Alexander (Theoretisch-Physikalisches Institute Jena) ; Mr. ESCHEN, Wilhelm (Institute für Optik und Quantumelektronik Jena) ; Prof. ZEPF, Matt (Helmholtz Institute Jena) ; Prof. KALUZA, Malte (University of Jena, Helmholtz-Institute Jena)

Presenter : Mr. SCHWAB, Matthew (Friedrich-Schiller-University Jena)

Track classification : WG1 - Electron beams from plasmas

Contribution type : poster

Submitted by : Mr. SCHWAB, Matthew

Submitted on Sunday 31 May 2015

Last modified on : Sunday 31 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :

Judged by :
Date :
Comments : ""

Abstract ID : 198

Coherent transition radiation in a microwave millimeter band from AWAKE modulated proton bunch

Content :

AWAKE project at CERN is an international collaboration of many institutes worldwide and it aims to accelerate electrons in a plasma wake excited by SPS proton bunch. The length of the proton bunch is much longer then plasma wavelength 1-3 mm for the considered plasma concentration (1-10)e14 cm-3, and various numerical simulations showed that charge density within a bunch tends to be radially (not longitudinally, no micro-bunches in a common sense) modulated with a plasma wavelength at the output of a 10 meter long plasma.

The experimental observation and quantitative analysis of a proton bunch radial density modulation would be an experimental proof of the efficient plasma wake excitation. Besides incoherent optical methods mainly based on streak camera measurements, the coherent transition radiation (CTR) detection technique in millimeter microwave range gives an access to a time-dependent information of the modulation vs. time.

The aim of this work is to calculate the yield of CTR for the real AWAKE experimental conditions. Calculations based on different approaches (simple Frank-Tamm formula, exact vector diffraction theory) are compared, far / near CTR field distribution as well as a finite target screen size are considered.

Primary authors : Dr. MARTYANOV, Mikhail (Max Planck Institut fur Physik, Munich)

Co-authors : Prof. MUGGLI, Patric (Max-Planck-Institut für Physik)

Presenter : Dr. MARTYANOV, Mikhail (Max Planck Institut fur Physik, Munich)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : --not specified--

Submitted by : Dr. MARTYANOV, Mikhail

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Status : SUBMITTED

Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 199

Influence of medium length in self-guided laser wakefield accelerators

Content :

Laser wakefield accelerators appear promising as compact sources of highly relativistic electrons and ultrashort pulses of X-rays. However, improving the control of the electron- and X-ray beam parameters is crucially important in order to enable laser wakefield accelerators to be efficiently used in applications. We report on our recent experiments of laser wakefield acceleration and X-ray generation inside a variable length gas cell. The motivation is to generate electron beams with a well defined electron kinetic energy and with low shot-to-shot fluctuations in charge, divergence and pointing. The experiments are performed using the Ti:Sapphire-based multi-terawatt laser at the Lund Laser Centre. Electrons are trapped in the accelerating phase of the plasma wave by self-injection and ionization-induced injection. Stable electron- and X-ray beams are generated both when the cell is filled with pure hydrogen and with an addition of 1% nitrogen. The evolution of the electron- and X-ray energy spectra is studied as a function of acceleration distance by varying the length of the gas cell. The experimental findings are qualitatively reproduced in particle-in-cell simulations.

Primary authors : Dr. LUNDH, Olle (Lund University)

Co-authors : Mr. HANSSON, Martin (Lund University) ; Ms. GALLARDO GONZALEZ, Isabel (Lund University) ; Dr. AURAND, Bastian (Lund University) ; Mr. EKERFELT, Henrik (Lund University) ; Dr. PERSSON, Anders (Lund University) ; Prof. WAHLSTRÖM, Claes-göran (Lund University) ; Dr. DAVOINE, Xavier (CEA DAM DIF) ; Mrs. DOBOSZ DUFRENOY, Sandrine (CEA Saclay) ; Mr. AUDET, Thomas (Université Paris-Sud XI) ; Mr. DESFORGES, Frédéric Guillaume (Université Paris-Sud XI) ; Dr. CROS, Brigitte (Université Paris-Sud XI)

Presenter : Dr. LUNDH, Olle (Lund University)

Track classification : WG1 - Electron beams from plasmas ; WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control ; WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : talk

Submitted by : Dr. LUNDH, Olle

Submitted on Sunday 31 May 2015

Last modified on : Sunday 31 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
Judged by :
Date :
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Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 200

Inverse Compton Scattering as a diagnostic of electron beams

Content :

The interaction of an intense laser pulse with a relativistic electron beam results in a burst of highly energetic photons, via the Inverse Compton Scattering (ICS) process. For a GeV electron beam, photons are generated with energies in excess of 10 MeV, far exceeding the energies possible from magnetic undulators. Characterizing such a photon source presents a real challenge for diagnostic development, but also is of great interest to several potential applications typically serviced by bremsstrahlung sources or electron-positron annihilation. Here, we report on the development of an ICS diagnostic, planned for use with the FLASHForward electron driven plasma wakefield acceleration experiment at DESY. The primary goal of this diagnostic is to reveal properties of the driver and witness beams from the plasma experiments that are otherwise not possible to measure. We will report on the simulated source properties and diagnostic performance, as well as preparatory work with a 25 TW laser wakefield accelerator.

Primary authors : Dr. STREETER, Matthew (DESY)

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Presenter : Dr. STREETER, Matthew (DESY)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : talk

Submitted by : Dr. STREETER, Matthew

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 201

Investigation of ion acceleration mechanism through laser-matter interaction in femtosecond domain

Content :

An experimental campaign aiming to investigate the ion acceleration mechanism trough laser-matter interaction in femtosecond domain has been carried out at the ILIL facility with a laser intensity of 2E19 W/cm2.
A combination of detectors were used to measure the proprieties of accelerated light ions, including a Thomson Parabola (TP), CR-39 detectors and Radiochromic films (RCF) to identify different ion species and measure cut-off energy.
We will present the main experimental data and will discuss the correlation between TP, CR-39 and data which give us confidence in measuring cut-off energy and estimate the total number of ions obtained shot-by shot.

Primary authors : Dr. ALTANA, Carmen (INFN-LNS, Univ. di Catania - Dip. di Fisica e Astronomia) ; Dr. LANZALONE, Gaetano (INFN-LNS, Univ. Kore di Enna)

Co-authors : Dr. MUOIO, Annamaria (INFN-LNS, Univ. di Messina-Dip. di Fisica e Sc. della Terra) ; Dr. TUDISCO, Salvatore (INFN-LNS) ; Dr. CIRRONE, G.a.pablo (INFN-LNS) ; Dr. SCHILLACI, Francesco (INFN-LNS) ; Dr. BRANDI, Fernando (ILIL-INO-CNR, IIT Genova) ; Dr. CRISTOFORETTI, Gabriele (ILIL-INO-CNR) ; Dr. FERRARA, Paolo (ILIL-INO-CNR) ; Dr. FULGENTINI, Lorenzo (ILIL-INO-CNR) ; Dr. KOESTER, Petra (ILI-INO-CNR) ; Dr. LABATE, Luca (ILIL-INO-CNR, INFN Pisa) ; Dr. PALLA, Daniele (ILI-INO-CNR, INFN Pisa, Dip. Fisica di Pisa) ; Dr. GIZZI, Leonida A. (ILIL-INO-CNR, INFN Pisa)

Presenter : Dr. ALTANA, Carmen (INFN-LNS, Univ. di Catania - Dip. di Fisica e Astronomia)

Track classification : WG2 - Ion beams from plasmas

Contribution type : either

Submitted by : ALTANA, Carmen

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Last modified on : Sunday 31 May 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG2 - Ion beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 202

Overview of the control and performance monitoring system of the 200TW ANGUS laser system

Content :

Within the LAOLA Collaboration, the University of Hamburg and DESY work closely together to combine university research in the field of laser-plasma acceleration with the expertise of a large and well-established accelerator facility. We present in this poster a summary of hardware and software based changes to the 200 TW ANGUS laser system to increase ease of operation and stability. We will give an overview of the architecture of the recently accomplished laser monitoring system that relies heavily on DESY in-house control system infrastructure. All important laser performance parameters will be measured, displayed and logged into a central archive by this system.

Primary authors : Mr. SCHNEPP, Matthias (Center for Free-Electron Laser Science & Department of Physics, Hamburg University)

Co-authors : JOLLY, Spencer (Center for Free-Electron Laser Science & Department of Physics, Hamburg University, Hamburg, Germany) ; Mr. LEROUX, Vincent (Center for Free-Electron Laser Science & Department of Physics, Hamburg University)) ; Mr. TROSIEN, Dominik Claus (Center for Free-Electron Laser Science & Department of Physics, Hamburg University) ; MAIER, Andreas (Center for Free-Electron Laser Science & Department of Physics, Hamburg University)

Presenter : Mr. SCHNEPP, Matthias (Center for Free-Electron Laser Science & Department of Physics, Hamburg University

Track classification : WG7 - Laser technology for advanced accelerators

Contribution type : poster

Submitted by : Mr. SCHNEPP, Matthias

Submitted on Sunday 31 May 2015

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Comments :

Status : SUBMITTED

Track judgments :

Track : WG7 - Laser technology for advanced accelerators

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 203

Wakefield electron acceleration in guiding structures under real 3-D nonsymmetrical conditions

Content :

The nonlinear structures of wakefields exited by the laser and ion bunch drivers are analyzed. The effect of noncollinear electron bunch injection into the wakefields is examined and conditions for an effective trapping of electrons are found.
The effect of non-symmetric focusing of the laser radiation into a capillary waveguide and plasma channel on the structure of wakefields and on the effectiveness of the electron bunch acceleration is studied. The restrictions on the maximum adoptable asymmetry for an effective acceleration of electron bunches are found and discussed for different phases and energies of the electron bunch injection depending on the asymmetry of radial laser intensity distributions and displacements of the laser focusing point relatively waveguide axis. Obtained results are in agreement with previous studies [1 - 3].
The work is supported by the RSCF grant No 14-50-00124.
References
[1] M. Veysman, N.E. Andreev, G. Maynard, B. Cros, Physical Review E 86 (2012) 066411.
[2] N.E. Andreev, V.E. Baranov, B. Cros, G. Maynard, P. Mora, M.E. Veysman, Journal of Plasma Physics 79 (2013) 143.
[3] N.E. Andreev, S.V. Kuznetsov, M.E. Veysman, Nuclear Instruments and Methods in Physics Research A 740 (2014) 273.

Primary authors : Prof. ANDREEV, Nikolay (Joint Institute for High Temperatures of RAS)

Co-authors : Mr. BARANOV, Victor (JIHT of RAS) ; Mr. KOSHELEV, Anton (JIHT of RAS) ; Dr. VEYSMAN, Mikhail (JIHT of RAS) ; Dr. CROS, Brigitte (LPGP-CNRS-UP11)

Presenter : Prof. ANDREEV, Nikolay (Joint Institute for High Temperatures of RAS)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : talk

Submitted by : Prof. ANDREEV, Nikolay

Submitted on Sunday 31 May 2015

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Comments :

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Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :

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Date :

Comments : ""

Abstract ID : 204

Plasma production for electron acceleration by resonant plasma wave.

Content :

Plasma wakefield acceleration is the most promising acceleration technique known nowadays, able to provide very high accelerating fields (10−100 GVm−1), enabling acceleration of electrons to GeV energy in few centimetres. However, the quality of the electron bunches accelerated with this technique is still not comparable with that of conventional accelerators; Radiofrequency-based accelerators, in fact, are limited in accelerating field (10 − 100 MVm−1) requiring therefore kilometric distances to reach the GeV energies, but can provide very bright electron bunches. To combine high brightness electron bunches from conventional accelerators and high accelerating fields reachable with plasmas could be a good compromise allowing to further accelerate high brightness electron bunches coming from LINAC while preserving electron beam quality. Following the idea of plasma wave resonant excitation driven by a train of short bunches, we have started to study the requirements in terms of plasma for SPARC_LAB. In particular here we focus on hydrogen plasma discharge, both from a theoretical and an experimental point of view.

Primary authors : ANANIA, Maria Pia (LNF)

Co-authors : FILIPPI, Francesco (ROMA1) ; BIAGIONI, Angelo (LNF) ; FERRARIO, Massimo (LNF) ; CIANCHI, Alessandro (ROMA2) ; CHIADRONI, Enrica (LNF) ; DI GIOVENALE, Domenico (LNF) ; ZIGLER, Arie (LNF)

Presenter : ANANIA, Maria Pia (LNF)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control ; WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : either

Submitted by : ANANIA, Maria Pia

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Judgment :
Judged by :
Date :
Comments : ""

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
Judged by :

Date :
Comments : ""

Abstract ID : 205

Spectroscopic determination of electron density and species distribution

Content :

For particle acceleration in plasmas one of the key issues for stable and reproducible beams is control over and knowledge of the background plasma parameters. Sophisticated electron injection and laser beam transport mechanisms require not only specific plasma parameters but also e.g. a longitudinal and transverse density profile. In addition the species distribution and ionisation- and dissociation-dynamics can have significant impact on the generated beams. Currently established methods, like interferometry or gas density diagnostics using scattering processes, only allow for analysis of gas targets operated at densities well above 10^17 cm-3 and can only dress the electron density distribution.
Plasma spectroscopy allows to decode with nanosecond temporal resolution the before mentioned plasma properties which are embedded in the radiation emerging the plasma. Exemplarily spatially and temporally resolved electron density profile inside a capillary discharge waveguide are presented. Results show that the technique can easily resolve electron densities in the low 10^17 cm-3 regime and will, even with the current setup, allow to resolve densities in the 10^16 cm-3 regime and possibly lower, which are important e.g. for upcoming experiments at PW class lasers systems.

Primary authors : Dr. SCHAPER, Lucas (University Hamburg / DESY)

Co-authors : Mr. GOLDBERG, Lars (DESY) ; Mr. KLEINWAECHTER, Tobias (DESY) ; Mr. SCHWINKENDORF, Jan-patrick (Deutsches Elektronen-Synchrotron) ; Dr. OSTERHOFF, Jens (Deutsches Elektronen-Synchrotron DESY)

Presenter : Dr. SCHAPER, Lucas (University Hamburg / DESY)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : talk

Submitted by : Dr. SCHAPER, Lucas

Submitted on Sunday 31 May 2015

Last modified on : Sunday 31 May 2015

Comments :

If there is a WG with a section on target diagnostics / plasma targets please feel free to adjust the WG for this presentation accordingly.

Status : SUBMITTED

Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 206

Numerical investigation of suprathermal electrons generation from under-critical density targets under the action of petawatt-class laser pulses

Content :

The generation of suprathermal electrons from foam targets under the action of laser pulses is numerically studied in the work. This investigation is important for creation and optimization of laser driven sources of particles and radiation for diagnostics of matter states with high energy density. In performed 3D PIC simulations with the code VLPL, the foam is treated as plasma with near critical density. The laser pulse has parameters of the PHELIX laser with wavelength of 1 μm, duration of 400 fs and intensity of 4•1019 W/cm2. Possible mechanisms of electron acceleration relevant to this laser-plasma interaction conditions such as betatron resonance or stochastic heating in combined plasma and laser fields are considered by analyzing sample particles trajectories, high-frequency and quasistatic fields distributions. In simulations the length of plasma layer in the range of 100-400 μm and the plasma density in the near-critical range are varied to obtain the highest electron beam charge and the lowest divergence. It is shown that the obtained number of electrons with energy of 10 MeV can exceed at least 100 times the number of ponderomotively heated electrons for 10% absorption coefficient of laser radiation with the same parameters.

Primary authors : Mr. PUGACHEV, Leonid (Joint Institute for High Temperatures RAS)

Co-authors : Prof. ANDREEV, Nikolay (Joint Institute for High Temperatures of RAS) ; Dr. LEVASHOV, Pavel (Joint Institute for High Temperatures RAS)

Presenter : Mr. PUGACHEV, Leonid (Joint Institute for High Temperatures RAS)

Track classification : WG1 - Electron beams from plasmas

Contribution type : poster

Submitted by : Mr. PUGACHEV, Leonid

Submitted on Sunday 31 May 2015

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Comments :

I would like to apply for support.

Status : SUBMITTED

Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
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Date :
Comments : ""

Abstract ID : 207

Electron spin precession in the laser wakefield acceleration

Content :

The acceleration of highly polarized electron beams are widely used in state-of-the-art high-energy physics experiments. In this work, the dynamics of the electron spin precession in the process of laser wakefield electron acceleration in plasma channel is considered. The spin precession of an electron is described by the Thomas-Bargman-Michel-Telegdi equations taking into account the self-consistent nonlinear dynamics of the laser pulse propagation and wakefield generation. Modeling was carried out for different initial energies and injection phase of an electron depending on its transverse momentum. Based on the obtained data optimal parameters of injection were found to preserve the
initial polarization of an electron when it is accelerated in the laser wakefields. With these parameters, the evolution of the polarization of the electron bunch was investigated including the impact of beam emittance on its depolarization.

Primary authors : Mrs. PUGACHEVA, Daria (JIHT RAS)

Co-authors : Prof. ANDREEV, Nikolay (Joint Institute for High Temperatures of RAS) ; Dr. CROS, Brigitte (LPGP-CNRS-UP11)

Presenter : Mrs. PUGACHEVA, Daria (JIHT RAS)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : poster

Submitted by : Mrs. PUGACHEVA, Daria

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Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

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Comments : ""

Abstract ID : 208

A novel ultra-high gradient travelling wave ion accelerator driven by intense lasers

Content :

The key to the growing interest in laser based ion accelerators lies in their cost effectiveness and compactness, which,coupled to ongoing technological developments, makes the prospects for all-optical accelerators very promising and appealing. Among various shortcomings to overcome, the challenge is to produce a high energy pencil beam of narrow band spectrum.

High power lasers are capable of generating kiloampere current pulses with unprecedented short duration. The large electric field from such localised charge pulses can be harnessed in a travelling wave particle accelerator arrangement. By directing the ultra-short charge pulse along a helical path surrounding a laser-accelerated ion beams, one can achieve simultaneous beam shaping and re-acceleration of a selected portion of the beam by the components of the associated electric field within the helix. Here we show the core concept of the novel scheme in a proof-of-principle experiment using a200TW university scale laser, achieving almost 100% reduction of beam divergence in a narrow energy bandwidth and post-acceleration of ~10^8 protons by ~5MeV over less than a cm of propagation−i.e. an accelerating gradient ~0.5GeV/m which is already beyond what can be sustained by conventional accelerator technologies.

Primary authors : Dr. KAR, Satyabrata (Queen's University Belfast)

Co-authors :

Presenter : Dr. KAR, Satyabrata (Queen's University Belfast)

Track classification : WG2 - Ion beams from plasmas

Contribution type : talk

Submitted by : Dr. KAR, Satyabrata

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Track judgments :

Track : WG2 - Ion beams from plasmas

Judgment :

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Date :

Comments : ""

Abstract ID : 209

From FACET to FACET-II: Accelerator R Facilities for SLAC's Future

Content :

FACET operates as a National User Facility delivering unique beams to a diverse community of users. The evolution of FACET into the FACET-II test facility is is proposed to provide the DOE with a unique capability to develop advanced acceleration and coherent radiation techniques with electron and positron beams. Based on efficient use of existing linac infrastructure, the facility will provide well-characterized 10 GeV beams of unmatched brightness to support development of accelerator techniques that will become the basis of future high energy physics colliders and photon science light sources. The science case for FACET-II has three primary elements: (1) high gradient acceleration techniques that will reduce the cost of both a future high-energy collider and linac-based light sources, (2) high brightness beam techniques that improve the generation, preservation, and application of such beams, and (3) wide-ranging experiments to develop and apply novel radiation techniques (spanning terahertz to gamma-rays) that can be generated by FACET's high brightness beams. This presentation will review our ideas for the facility and the user proposed scientific case.

Primary authors : HOGAN, Mark (SLAC National Accelerator Laboratory)

Co-authors :

Presenter :

Track classification : WG1 - Electron beams from plasmas

Contribution type : poster

Submitted by : LILLI, Lucia

Submitted on Tuesday 02 June 2015

Last modified on : Wednesday 03 June 2015

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Track judgments :

Track : WG1 - Electron beams from plasmas

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 210

Advanced Acceleration and THz Generation by Dielectric Based Structures: ANL/AWA/Euclid Techlabs Collaboration Activities

Content :

Relativistic, high intensity and small emittance electron bunches are the basis of linear collider and FEL projects. Using Cherenkov radiation generated by a high current bunch passing a dielectric wake-field accelerator may provide a significant cost saving and reduction of the linear collider or FEL facility size. Femto-pico-second electron bunches are used for high power THz generation for particle acceleration and other applications. With this talk, we present our recent developments on (1) a linear collider concept based on a short rf pulse, high gradient dielectric two beam acceleration scheme to avoid the breakdown regime and achieve higher gradient; dielectric materials are likely to withstand higher electric fields than metals; we use structures that can accelerate electrons and also positrons; our schemes allow for staging. (2) We also consider a concept for a multi-beamline FEL driven by high repetition rate dielectric based wakefield accelerators. (3) Additional our interest focused on wakefields generated by using dielectric based structures and introducing an energy modulation that allows THz radiation in the range 0.5 - 1 THz as well a passive energy chirp correction.

Primary authors : Dr. KANAREYKIN, Alexei (Euclid Techlabs LLC/ANL)

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Presenter : Dr. KANAREYKIN, Alexei (Euclid Techlabs LLC/ANL)

Track classification : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Contribution type : talk

Submitted by : LILLI, Lucia

Submitted on Wednesday 03 June 2015

Last modified on : Thursday 04 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG3 - Electron beams from electromagnetic structures, including dielectric and laser-driven structures

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 211

Recent studies of Smith-Purcel radiation as longitudinal bunch profile monitor

Content :

We report on the recent studies of Smith-Purcell radiation aimed at developing a longitudinal bunch profile monitor. In particular we report on first measurements of the polarization and azimuthal distribution of the radiation. We also report on studies done in the linac of synchrotron SOLEIL to measure the distribution of Smith-Purcell radiation. Using these results we update our plan to build a single shot Smith-Purcell radiation monitor.

Primary authors : Mr. DELERUE, Nicolas (LAL, CNRS and Université Paris-Sud 11)

Co-authors :

Presenter : Mr. DELERUE, Nicolas (LAL, CNRS and Université Paris-Sud 11)

Track classification : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Contribution type : poster

Submitted by : LILLI, Lucia

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Comments :

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Track judgments :

Track : WG5 - High-gradient plasma structures/Advanced beam diagnostics

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 212

Electrons Injection, Boost and Collimation in Laser Plasma Accelerators

Content :

The density profile is a key parameter to optimize the properties of electron beams in laser-plasma accelerators [1,2]. Here we present three different experiments illustrating the use of density tailoring for injecting, increasing the energy or focusing relativistic electron beams. We show that shocks allow to confine injection and hence to reduce significantly the beam energy spread, compared to pure ionization injection, and with a different setup, shock fronts has been used to rephase the electron beam and to increase the electron energy by almost 50%. Finally, we present the principle of the laser-plasma lens [3] and show that this device can be used to reduce the electron beam divergence by a factor of almost 3 [4].

[1] A. Buck et al., Phys. Rev. Lett. 110, 185006 (2013).
[2] P. Sprangle et al., Phys. Rev. E 63, 056405 (2001).
[3] R. Lehe et al., Phys. Rev. Spec. Top. Acc. Beams 17, 121301 (2014)
[4] C. Thaury et al., Nature Comm. 6, 6860 (2015)

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Track classification : WG1 - Electron beams from plasmas

Contribution type : talk

Submitted by : LILLI, Lucia

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Track : WG1 - Electron beams from plasmas

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Abstract ID : 213

Quantum dynamics of relativistic charged particles interacting with a laser-induced plasmon wave

Content :

We analyse the new exact solutions [1-3] of the relativistic wave equations of a charged particle propagating in a plasmon wave of arbitrary high amplitude. The nonlinearities associated to these solutions depend on a new intensity parameter, which is the work done by the laser field along the plasmon wavelength divided by the laser photon energy. These solutions describe a high-contrast periodic longitudinal density structure on the plasma length scale (a sort of 'quantum-bubble'), whose existence relies on the discrete absorption of momentum quanta along the wave's transverse electric field. We show that for vanishing plasma density, certain 'coherent superpositions' of our solutions reproduce the Volkov states [4], which, by now, have been the only closed form exact solutions in a plane wave in vacuum. This is relevant for solving the boundary-value problem at the plasma-vacuum interface.

[1] Varró S, Las. Phys. Lett. 10 (2013) 095301. [2] Varró S, ibid. 11 (2014) 016001.
[3] Varró S, Nucl. Instr. Meth. Phys. Res. A 740 (2014) 280-283.
[4] Volkov D M, Zeitschrift für Physik 94 (1935) 250-260.

Primary authors : Prof. VARRO, Sandor (Wigner Research Centre for Physics, Budapest, Hungary)

Co-authors :

Presenter : Prof. VARRO, Sandor (Wigner Research Centre for Physics, Budapest, Hungary)

Track classification : WG6 - Theory and simulations

Contribution type : talk

Submitted by : LILLI, Lucia

Submitted on Thursday 04 June 2015

Last modified on : Thursday 04 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 214

Bulk ion Acceleration in the Light-Sail regime, studied by ion and neutron spectroscopy

Content :

The rapid progress in laser technologies has led to an increasing interest in ion acceleration due to the reduced costs and compactness in comparison with conventional accelerators. Among other mechanisms, Radiation Pressure Acceleration, particularly LightSail regime, has drawn significant attention due to its ion energy and efficiency scaling. RPA relies on the target remaining reflective for the pulse duration for the exchange of momentum to happen, whereas ultrathin targets are prone to premature transparency for several reasons. We report on the extension of the LS regime to ultrathin, lowdensity targets by using multilayer targets, preventing relativistic transparency. Significantly narrow_band spectral features at high deuteron energies (central energy ~15MeV) were produced by lowering the target thickness to hundreds of nm, in agreement with LS mechanism. Where further reduction in thickness led to a significant spectral broadening of those peaks, using a thin layer of highZ material enabled reasserting the bunched acceleration of bulk ions. Such acceleration was not only studied using traditional Thompson parabola spectrometers, but also characterized using neutron spectroscopy. Since neutrons' flux, angular distribution and spectrum solely depend on the parent ion_beam characteristics, neutron spectroscopy feedbacks information extremely difficult otherwise to measure.

Primary authors : Mr. ALEJO, Aaron (Queen's University of Belfast)

Co-authors :

Presenter : Mr. ALEJO, Aaron (Queen's University of Belfast)

Track classification : WG2 - Ion beams from plasmas

Contribution type : talk

Submitted by : LILLI, Lucia

Submitted on Thursday 04 June 2015

Last modified on : Thursday 04 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG2 - Ion beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 215

Formation of sub-femtosecond microstructures via transverse-to-longitudinal phase space exchange

Content :

The formation of short microstructure on the current density of an electron bunch can have application to coherent light sources and advanced acceleration techniques. In this contribution we compare different design of longitudinal-to-transverse phase space exchanger [P. Piot, et al., PRSTAB 14, 022801 (2011)] combined with structure cathodes to produce current modulation at the sub fs regime [W. S> Graves et al., PRL 108, 263904 (2012)]. We discuss possible
applications and the limitations of the technique to inverse Compton scattering source, free-electron laser and advanced acceleration techniques.

Primary authors : PHILIPPE, Piot (northern Illinois University & Fermilab)

Co-authors :

Presenter : PHILIPPE, Piot (northern Illinois University & Fermilab)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : either

Submitted by : LILLI, Lucia

Submitted on Thursday 04 June 2015

Last modified on : Thursday 04 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :
Judged by :
Date :
Comments : ""

Abstract ID : 216

Tailored electron bunches from a superconducting linac for beam-driven-acceleration methods with enhanced transformer ratios

Content :

In this contribution we describe a possible layout of a superconducting linac that could provide shaped high-charge (up 5 nC) electron "drive" bunches to excite wakefield in a dielectric or plasma wakefield accelerator. The work capitalize on a new class of smooth shape recently proposed [F. Lemery and P. Piot, ArXiV arXiv:1505.06218 (2015)]. Start-to-end simulations and performances ofthe proposed accelerator are presented. The improvement in transformer ratios supported by the produced current profiles is also discussed along with possible applications to, e.g., compact multi-user free-electron laser [A. Zholents, et al., Proc. FEL14, 993 (2014)].

Primary authors : PHILIPPE, Piot (northern Illinois University & Fermilab)

Co-authors :

Presenter : PHILIPPE, Piot (northern Illinois University & Fermilab)

Track classification : WG2 - Ion beams from plasmas

Contribution type : either

Submitted by : LILLI, Lucia

Submitted on Thursday 04 June 2015

Last modified on : Thursday 04 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG2 - Ion beams from plasmas

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 217

The Dynamics of the Electron Bunches Accelarated by the Wakefield Bubbles Excited by the Laser Pulse

Content :

We present the results of fully relativistic electromagnetic PIC simulation, which was performed by a modified version of the UMKA2D3V-code. The laser pulse at a wavelength λ = 0.8 μm enters the computation region which is filled with uniform plasma from the left boundary and is incident normally on the plasma. The plasma density n0 = 1.8·1019 cm-3. The longitudinal and transverse dimensions of the laser pulse are selected to be shorter than the plasma wavelength. Full length at half maximum of the laser pulse is 2λ and full width at half maximum is 8λ. The laser pulse intensity I = 5.3·1019 W/cm2. The main aim of this work is the research of the electron bunches dynamics accelerated by wakefield bubbles excited by laser pulse in blowout regime. It has been shown that with time the Laser Plasma Wakefield Acceleration (LPWA) Scheme changes into combined LPWA Scheme and Beam Plasma Wakefield Acceleration Scheme. It leads to additional acceleration of 3rd self-consistently formed short electron bunch by combination of laser pulse, 1st and 2nd self-consistently formed short electron bunches. 2nd electron bunch after deceleration is self-cleaned due to defocusing by radial fields of bubble.

Primary authors : Ms. SVYSTUN, Olena (National Science Center Kharkov Institute of Physics and Technology)

Co-authors :

Presenter : Ms. SVYSTUN, Olena (National Science Center Kharkov Institute of Physics and Technology)

Track classification :

Contribution type : either

Submitted by : LILLI, Lucia

Submitted on Thursday 04 June 2015

Last modified on : Tuesday 09 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 218

Numerical investigation of the lepton self-modulation plasma wakefield acceleration for the E-209 experiment at SLAC-FACET

Content :

Plasma-based wakefield accelerators are promising configurations for future generation linear colliders. The E-209 experiment [1], currently running at SLAC-FACET was proposed to investigate key-physics of the self-modulated [2] plasma wakefield accelerator using uncompressed lepton bunches. Recent E-209 results show evidence of the self-modulation instability using several diagnostics including: coherent transition radiation (CTR), optical transition radiation and particles energy spectrum measurements. Here we present numerical simulations, performed with the fully-relativistic PIC code OSIRIS [3], using parameters that closely follow the experimental bunch and plasma ones. Numerical results indicate that the self-modulation can be detected by CTR diagnostics. In addition, simulations show the presence of a defocused electron/positron bunch halo as seen with the OTR diagnostics. Simulations suggest that the use of bunches with shorter rise times could enhance experimental self-modulation measurements [4].

[1] J.Vieira, et al., Phys .Plasmas 19, 063105 (2012)
[2] N.Kumar, et al., Phys.Rev.Lett.104, 255003 (2010)
[3] R. A. Fonseca, et al., Lect. Notes Comput. Sci. 2331, 342 (2002)
[4] J. Vieira, et al., Plasma Phys. Control Fusion 56, 084014 (2014)

Primary authors : Ms. AMORIM, Ligia Diana (GoLP/Instituto de Plasmas e Fusão Nuclear, Instituto Superior Técnico, Universidade de Lisboa)

Co-authors :

Presenter : Ms. AMORIM, Ligia Diana (GoLP/Instituto de Plasmas e Fusão Nuclear, Instituto Superior Técnico, Universidade de

Track classification : WG6 - Theory and simulations

Contribution type : poster

Submitted by : FERRAZZA, Maria Rita

Submitted on Tuesday 09 June 2015

Last modified on : Tuesday 09 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG6 - Theory and simulations

Judgment :
Judged by :
Date :

Comments : ""

Abstract ID : 219

Prospects for Advanced Accelerator R in the US: Perspectives on the HEPAP Accelerator R Sub-panel Report

Content :

An accelerator R sub-panel of the US High Energy Physics Advisory Panel (HEPAP) was set up to examine the research portfolio of the current HEP accelerator R program, and to identify the most promising research areas to support the advancement of particle physics in synergy with the P5 roadmap for discovery in the field. This presentation will describe the major findings and recommendations issued in the sub-panel report, with emphasis on new accelerator concepts, and will highlight the prospects for advanced accelerator R in the US.

Primary authors : Prof. ROSENZWEIG, James (UCLA)

Co-authors :

Presenter : Prof. ROSENZWEIG, James (UCLA)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Tuesday 09 June 2015

Last modified on : Tuesday 09 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 220

Overview of Advanced Accelerator Development in Asia

Content :

Recently in all major regions of Asia there is great interest growing in advanced accelerator technologies. An overview of the latest development from accelerator advanced concepts to recent demonstrations will be given. In particular, programs on plasma based acceleration which are conducted in several laboratories in Asia and their recent results will be reported.

Primary authors : Prof. LU, Wei (Tsinghua University of Beijing, China)

Co-authors :

Presenter : Prof. LU, Wei (Tsinghua University of Beijing, China)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Tuesday 09 June 2015

Last modified on : Tuesday 09 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 221

BELLA: multi-GeV electron beam generation and outlook

Content :

Multi-GeV electron beam has been produced from a capillary discharge waveguide structure powered by the BELLA laser at LBNL. Comparison between simulation and experiment will be detailed and future prospects in plasma acceleration using petawatt class lasers will be given.

Primary authors : Dr. LEEMANS, Wim (Lawrence Berkeley National Laboratory)

Co-authors :

Presenter :

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Tuesday 09 June 2015

Last modified on : Tuesday 09 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 222

High Efficiency and High-Gradient Acceleration of Electrons and Positrons in a Plasma Wakefield Accelerator

Content :

Recent progress on electron and positron acceleration in a plasma wakefield accelerator at the FACET facility at SLAC National Accelerator Laboratory will be described [1,2]. In the case of electrons, a high current drive bunch is used to produce an extremely nonlinear, high gradient wake in a meter-scale plasma. An appropriately placed trailing bunch containing a significant charge loads the wake and flattens the accelerating field. As a result the particles in the trailing bunch gain energy nearly at the same rate thus maintaining the narrow energy spread of the bunch. The beam loading implies that the energy extraction efficiency from the wake to the accelerating bunch can be tens of percent. For high efficiency, high gradient acceleration of positrons, we use a single, compressed positron bunch. The plasma electrons are now pulled inwards and cross the bunch axis even before the peak current of the bunch is reached. ......

Primary authors : Prof. JOSHI, Chandrashekhar (UCLA)

Co-authors :

Presenter : Prof. JOSHI, Chandrashekhar (UCLA)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Tuesday 09 June 2015

Last modified on : Tuesday 09 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 223

THz-based acceleration

Content :

The presentation will review the R effort on high gradient metallic RF structures. The most recent experimental results, as well as the state-of-the-art theoretical models which describe the mechanisms that limit the gradient, will be detailed. Materials, manufacturing, surface preparation techniques and rf processing methods to improve the RF performance will be discussed.

Primary authors : KAERTNER, Franz (DESY)

Co-authors :

Presenter : KAERTNER, Franz (DESY)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Tuesday 09 June 2015

Last modified on : Tuesday 09 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 224

From conventional to advanced concepts for Linear Colliders

Content :

Advanced accelerator concepts could potentially make a linear collider more compact and hence cheaper than a conventional one. In particular, laser or beam driven plasma acceleration are of interest. The presentation will discuss the parameter choices for conventional multi-TeV linear colliders and the physics and technology driving these choices. It will highlight the implications for the design of a plasma acceleration-based linear collider and raise issues that need to be addressed to arrive at a viable design.

Primary authors : SCHULTE, Daniel (CERN)

Co-authors :

Presenter : SCHULTE, Daniel (CERN)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Tuesday 09 June 2015

Last modified on : Tuesday 09 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 225

PIC modelling of laser-solid interactions: from ion acceleration to high field plasmonics

Content :

The study of the interaction of high power laser pulses with over-dense plasmas (obtained from the ionisation of solid targets) is of great interest to develop techniques for the acceleration of ions or electrons. Besides the use of flat foils, structured target (e.g. nano-structured surfaces, multilayer targets) are now considered for experiments as a mean to obtain more efficient coupling of the laser light with the plasma. The role of the numerical simulations, typically Particle In Cell simulations, is essential to model the effects of such configurations or to study the rise of instabilities in extreme conditions. Thin solid foils (1mm) covered with a nano-structured carbon foams having a mean density of few mg/cm3 have been used as target in experiment of laser-driven ion acceleration. The modelling of this regime was performed with PIC simulation where the plasma was initialised as an open structure of dense clusters distributed with a Diffusion Limited Aggregation (DLA) algorithm. These simulations allowed to catch some essential features of the laser-foam interaction such as the weak role played by the light polarisation, not found for a uniform low density plasma. ....

Primary authors : SGATTONI, Andrea (CNR Pisa)

Co-authors :

Presenter :

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Tuesday 09 June 2015

Last modified on : Tuesday 09 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 226

Dielectric laser acceleration: results and perspective

Content :

Dielectric laser accelerators are potential candidates to succeed conventional RF accelerators because they can support high accelerating field and use commercial lasers as a power source. The recent results achieved in proof-of-concept experiments will be detailed. The next steps envisaged to demonstrate the viability of dielectric laser acceleration for various applications will be outlined.

Primary authors : ENGLAND, Joel (SLAC)

Co-authors :

Presenter : ENGLAND, Joel (SLAC)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Tuesday 09 June 2015

Last modified on : Tuesday 09 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 227

High gradient, X-band and above, metallic RF structures

Content :

The presentation will review the R effort on high gradient metallic RF structures. The most recent experimental results, as well as the state-of-the-art theoretical models which describe the mechanisms that limit the gradient, will be detailed. Materials, manufacturing, surface preparation techniques and rf processing methods to improve the RF performance will be discussed.

Primary authors : DOLGASHEV, Valery (SLAC National Accelerator Laboratory)

Co-authors :

Presenter :

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Wednesday 10 June 2015

Last modified on : Wednesday 10 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 228

Prospects for proton-driven plasma acceleration

Content :

Proton beam is the most promising driver of wakefields to accelerate electrons to very high energy in a single plasma cell. After a brief review of the the physical principles, the (AWAKE) experiment at CERN will be described and its current status will be presented. Further considerations for a future proton-driven plasma wakefield accelerator will be discussed.

Primary authors : CALDWELL, Allen (Max-Planck-Institute for Physics)

Co-authors :

Presenter :

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Wednesday 10 June 2015

Last modified on : Wednesday 10 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 229

Ion acceleration from ultra thin foils

Content :

Significant progress in understanding the dynamics of ultrathin foils during the process of ion acceleration has been achieved over the past few years.The acceleration process. Experiments and related numerical modelling to understand and optimise the acceleration mechanism under different radiation pressure regimes will be reviewed.

Primary authors : Dr. MCKENNA, Paul (University of Strathclyde)

Co-authors :

Presenter : Dr. MCKENNA, Paul (University of Strathclyde)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Wednesday 10 June 2015

Last modified on : Wednesday 10 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 230

Laser interaction with nearly -overdense gas targets for ion acceleration

Content :

Operation at near critical plasma density can provide efficient ion acceleration with narrow energy spread. The presentation will describe the mechanisms involved in this acceleration process and review the experiments operating so far in this regime. Perspective of near-critical regime will be also given.

Primary authors : Dr. FLACCO, Alessandro (LOA/ENSTA)

Co-authors :

Presenter : Dr. FLACCO, Alessandro (LOA/ENSTA)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Wednesday 10 June 2015

Last modified on : Wednesday 10 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 231

LWFA electron beam manipulation for FEL amplification

Content :

The large energy spread and divergence of the electron beam produced currently in laser-driven wakefield accelerators could dramatically reduce the gain amplification expected in LWFA-based free electron lasers . Single beam decompression stage or transverse gradient undulator have been proposed to cope with the large energy spread. Another method based on a further beam manipulation has been proposed to recover high FEL peak power despite the large initial energy spread and divergence of the electron beam . Results of particle tracking and FEL process simulation will be also presented.

Primary authors : Dr. LOULERGUE, Alexandre (Synchrotron SOLEIL)

Co-authors :

Presenter : Dr. LOULERGUE, Alexandre (Synchrotron SOLEIL)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Wednesday 10 June 2015

Last modified on : Wednesday 10 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 232

Staging acceleration to improve an energy spread in laser wakefield acceleration

Content :

Laser acceleration of electrons is now considered to be promising for a compact, high-quality, high-energy accelerator scheme. Indeed, there are a lot of publications showing high reproducibility, small emittance (<1 mm mrad), shot pulse duration (~ fs), high energy (> 1GeV). Thus the capability to use such beams for a source of compact X-ray free-electron laser. In order to use laser electron accelerators for XFEL drivers, an energy spread of the electron beam is crucial. We are now designing the system composed of an injector, a phase rotator, and a booster. Our goal beam parameters are an energy of >1 GeV, a pulse duration of < 10fs, an energy spread of <1%, and an emittance of <1 mm mrad. A whole project system is also discussed including a laser system and an compact undulator system.

Primary authors : Dr. KANDO, Masaki (Japan Atomic Energy Agency)

Co-authors :

Presenter :

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Wednesday 10 June 2015

Last modified on : Wednesday 10 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 233

Review on Betatron/Compton sources

Content :

Compact and femtosecond X-ray source is one of the most exciting prospects for laser wakefield accelerator. The presentation will review betatron radiation and Compton scattering LWFA-based sources with a description of the experimental conditions.The results achieved so far in terms of photon flux and spectrum will be reviewed and prospects of betatron and Compton X-ray sources will be given.

Primary authors : Dr. TA PHUOC, Kim (LOA)

Co-authors :

Presenter :

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Wednesday 10 June 2015

Last modified on : Wednesday 10 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 234

Ultra-high brilliance g-ray beams generation

Content :

g-ray beam of ultrahigh peak brilliance has been produced from nonlinear relativistic Thomson scattering.The experimental setup will be described and the measurement of the g-ray spectrum will be reported. Prospects and future application for such g-ray sources will be discussed.

Primary authors : SARRI, Gianluca (Queen's University Belfast)

Co-authors :

Presenter : SARRI, Gianluca (Queen's University Belfast)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Wednesday 10 June 2015

Last modified on : Wednesday 10 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 235

State-of-the-art high power and rep' rate laser

Content :

Next generation of laser-driven wakefield accelerators require extreme performance in critical laser parameters (energy, repetition rate, efficiency, contrast, stabilities) while keeping high reliability and availability levels. The presentation will review the state-of-the-art laser in terms of high peak power and average power. The expected and realistic parameters achievable in the near future, as well as the trend in the technology choice will be discussed.

Primary authors : DRUON, Frederic (Laboratoire Charles Fabry, Institut d'Optique)

Co-authors :

Presenter : DRUON, Frederic (Laboratoire Charles Fabry, Institut d'Optique)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Wednesday 10 June 2015

Last modified on : Wednesday 10 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 236

Experimental program with the multi-PW laser of the Apollon facility in the CILEX centre

Content :

Apollon is a high-intensity laser facility delivering multi-PW pulses on target at one shot per minute. Under construction, the facility includes four laser beams and two experimental areas. It is designed to study physics such as laser-plasma electron or ion acceleration, X-ray and gamma-ray sources and applications and high-fields physics. The short-term experiments in both electron and ion production dedicated areas will be described and long-term perspectives will be outlined.

Primary authors : AMIRANOFF, Francois (Ecole Polytechnique)

Co-authors :

Presenter : AMIRANOFF, Francois (Ecole Polytechnique)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Wednesday 10 June 2015

Last modified on : Wednesday 10 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 237

Staging laser wakefield acceleration research at Osaka university; Towards practical accelerators

Content :

Laser-based wakefield accelerators have tremendous potential in basic science, photon science, medical and industrial applications. However challenging issues, as beam quality and stability, must be solved before such compact accelerators become mature user facilities. In Osaka University, the efforts are now focused on the design and construction of a usable laser-driven plasma accelerator. The studies, as well as the status of the accelerator will be presented.

Primary authors : Prof. HOSOKAI, Tomonao (OSAKA University)

Co-authors :

Presenter : Prof. HOSOKAI, Tomonao (OSAKA University)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Wednesday 10 June 2015

Last modified on : Wednesday 10 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 238

Impact of emittance and energy spread on the transverse coherence and pointing stability of FEL output

Content :

Following the analysis of the transverse coherence of FLASH output radiation, which suffers from the mode competition in the FEL process, it is concluded that a reduction of the transverse beam dimension and/or an increase of the beam energy spread would be helpful in mode separation or suppression. This analysis will be extended to the LWFA-based FEL driven by a high energy spread beam. The resulting transverse coherence and pointing stability, at the expense of a smaller saturation power, will be discussed.

Primary authors : Dr. DEBUS, Alexander (Helmholtz-Zentrum Dresden-Rossendorf)

Co-authors :

Presenter :

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Wednesday 10 June 2015

Last modified on : Wednesday 10 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 239

Transport solutions for laser driven ion beams

Content :

The extreme and peculiar features of laser accelerated ion beams, (like the wide energy and angular distribution and the instability), make them actually not directly suitable for multidisciplinary applications. In this contest the ELIMED (ELI-beamlines MEDical and multidisciplinary applications), will be designed and realized by INFN-LNS and then installed in Prague within the 2017, in order to achieve stable laser-driven output beams for multidisciplinary applications. The beamline transport section will be composed of five permanent quadrupoles and an energy selector. The quadrupoles, located just few centimeters downstream the target, will be able to collect the particles with an energy from 3 MeV/u to 60 MeV/u, reduce the angular divergence of the beam and inject the particles in the energy selection system. The design is based on a standard trapezoidal Hallbach array allowing a more versatile focusing and an high transmission efficiency. ....

Primary authors : CIRRONE, Paolo (LNS - INFN)

Co-authors :

Presenter : CIRRONE, Paolo (LNS - INFN)

Track classification : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Contribution type : talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Wednesday 10 June 2015

Last modified on : Wednesday 10 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Track : WG4 - Application of compact and high-gradient accelerators/Advanced beam manipulation and control

Judgment :

Judged by :

Date :

Comments : ""

Abstract ID : 240

Recent advances in plasma accelerator modelling and theory

Content :

Tremendous efforts have been made over the last few years to lay the foundation for theoritical modeling and to develop advanced simulation tools in plasma based accelerators. The massively parallel particle-in-cell simulations include sophisticated tehniques as numerical noise reduction, Lorentz boosted frame, digital filtering, implementation of GPU architectures, etc. These advanced simulation techniques allowed accurate prediction of the mechanisms involved in the process of plasma-based electron or ion acceleration and are used to model experiments, to test new ideas and to optimise parameters in current or planned experiments.

Primary authors : SILVA, Luis (Instituto Superior Tecnico)

Co-authors :

Presenter : SILVA, Luis (Instituto Superior Tecnico)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Thursday 11 June 2015

Last modified on : Thursday 11 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 241

Optical probing of a laser-driven electron accelerator

Content :

Probe-beam system is a powerful diagnostics tool providing detailed information about the evolution of the laser-plasma interaction. After the description of such probe-beam setup, the presentation will show recent results of several optical probing campaigns on laser-driven electron acceleration.

Primary authors : SÄVERT, Alexander (Institute for Optics and Quantumelectronics, FSU Jena)

Co-authors :

Presenter : SÄVERT, Alexander (Institute for Optics and Quantumelectronics, FSU Jena)

Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Thursday 11 June 2015

Last modified on : Thursday 11 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 242

Controlling ion acceleration and RPA with carbon nanofoam targets

Content :

Carbon Naotube Foam (CNF) allows the controlled formation of near critical density plasmas over tightly defined spatial intervals and steep gradients. These unique characteristics make
it a powerful new tool for the control of laser plasma interactions. When a laser propagates through CNF, the laser pulse front is steepened substantially and even lasers with high numerical aperture undergo rapid self focusing on micron scale distances. The results is an ultrasteep risetime pulse with substantially enhanced intensity. In particular the combination of CNF with a solid density target is shown to lead to enhanced ion acceleration, with particular improvement on the heavy ion species.
Similarly, CNF are excellent for controlling the group velocity mismatch between laser and accelerated ion bunch. For the correct intensity, very strong shaping and enhanced energy gain is predicted, lowering the threshold for the transition to Radiation Pressure dominant acceleration substantially. Experimental and theoretical results are presented.

Primary authors : ZEPF, Matt (Helmholtz Institut Jena and Queen's University Belfast)

Co-authors :

Presenter : ZEPF, Matt (Helmholtz Institut Jena and Queen's University Belfast)

Track classification :

Contribution type : talk

Submitted by : FERRAZZA, Maria Rita

Submitted on Thursday 11 June 2015

Last modified on : Thursday 11 June 2015

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 243

Using ionization injection to get high quality electron beam in laser wakefield acceleration

Content :

Ionization injection can be used to get high quality electron beam in laser wakefield acceleration. To get low energy spread, two injection schemes are proposed here. By use of certain initially unmatched laser pulses, the electron injection can be constrained to the very front region of the mixed gas target, typically in a length of a few hundreds micro meters determined by laser-driven bubble deformation, and energy spread is largely reduced [1]. By using this method, electron beam with FWHM energy spread less than 5% and peak energy around 500MeV is demonstrated by multi-dimensional particle in cell (PIC) simulations We will show some recent experimental demonstration of this scheme at Laboratory for Laser Plasmas at Shanghai Jiao Tong University. In a second scheme, we suggest to use two color beat wave to control the injection length [2]. When two laser pulses with fundamental frequency and high harmonics co-propagate with each other, a beat wave is generated and the highest electric field due to the overlapping of the two peaks of the two laser waves can ionize the internal electrons and trigger the ionization injection. ....

Primary authors : Dr. CHEN, Min (Shanghai Jiao Tong University)

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Track classification :

Contribution type : invited talk

Submitted by : FERRAZZA, Maria Rita

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Comments :

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Track judgments :

Abstract ID : 244

Prospects for advanced combined laser and beam driven plasma accelerators

Content :

The highest quality electron bunches can be produced by combining the advantages of beam-driven and laser-driven wakefield accelerators. Such compact hybrid plasma accelerators promise electron beams of unprecedented quality and are natural candidates for future light sources. The development of such hybrid plasma acceleration schemes and planned experiments will be presented and their potential as future plasma-based accelerators will be discussed.

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LIGHT project: a bridge lab for ion acceleration

Content :

The LIGHT project aims to accelerate ion beams with laser pulse focused on a solid target and to inject them into conventional focusing and accelerating structures.The presentation will describe the overall experiment and the current status of the project at GSI.

Primary authors : BAGNOUD, Vincent (GSI)

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