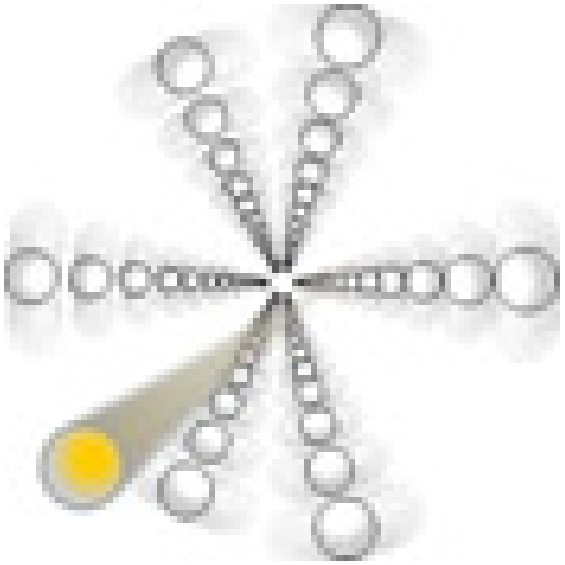
Channeling 2012



Report of Contributions

https://agenda.infn.it/e/4688

Contribution ID: **3** Type: **not specified**

Spectral Method in the Axial Channeling Theory

Monday, 24 September 2012 19:20 (1 minute)

The results of computation of transverse energy levels for the electrons moving in the system of parallel atomic strings in the axial channeling regime are presented.

Primary author: Prof. SYSHCHENKO, Vladislav (Belgorod State University)

Co-authors: Prof. SHUL'GA, Nikolai (A.I. Akhiezer Institute for Theoretical Physics, NSC "KIPT"); Ms NERYABOVA, Violetta (Belgorod State University)

Presenter: Prof. SYSHCHENKO, Vladislav (Belgorod State University)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **4** Type: **not specified**

Transmission Axial and Planar Channeling of Protons from Ultra Thin(55nm) Si.

Tuesday, 25 September 2012 11:10 (25 minutes)

The report contained information about my project includes the fabrication of thin silicon [001] membranes (55nm) and the experimental observation of Rainbow Channeling fine angular distributions through these membranes using a nuclear microprobe facility. The observation of these fine angular structures in the channeling patterns will be the first experimental proof of the simulations done by various groups in the past 25 years. This is possible because of the reduced multiple scattering in the thinner silicon crystals.

Simulations predicted the existence of a super focusing effect of ion beam by each unit cell of a thin crystal membrane. The predicted super focused spot size is about ~20 pm and can be used as a Sub atomic- Nuclear Microscope. However, this was never experimentally proven as thin enough crystals were not available.

These experimental results confirm the many Rainbow Channeling simulations previously done and provide further evidences to the existence of the Super focusing effect.

Primary author: Mr MOTAPOTHULA, MALLIKARJUNA RAO (GRADUATE STUDENT)

Co-authors: Prof. MARK, Breese (PROFESSOR); Dr MUKHTAR, Rana (Principal Scientist); Prof. TIRUMALAI, Venkatesan (PROFESSOR); Ms DANG, Zhiya (GRADUATE STUDENT)

Presenter: Mr MOTAPOTHULA, MALLIKARJUNA RAO (GRADUATE STUDENT)

Session Classification: S3.2 Channeling & Crystal Collimation

Track Classification: Channeling & Crystal Collimation

Contribution ID: **5** Type: **not specified**

Dynamic theory of coherent X-radiation of relativistic electron within a periodic layered medium in Bragg scattering geometry

Wednesday, 26 September 2012 11:40 (15 minutes)

In the present work the dynamic theory of the relativistic electron radiation in periodic layered structure is built in Bragg scattering geometry. The expression for spectral - angular distribution of the radiation is derived and the possibilities of the manifestation of dynamic diffraction effects in the radiation are shown for this scattering geometry.

Primary author: Prof. BLAZHEVICH, Sergey (Belgorod State University)

Co-author: Dr NOSKOV, Anton (Belgorod University of Cooperation, Economics and Low, Belgorod, Russia)

Presenter: Prof. BLAZHEVICH, Sergey (Belgorod State University)

Session Classification: S2-S5 Nouvel Sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **6** Type: **not specified**

Coherent X-radiation Generated in Periodic Layered Medium along the Relativistic Electron Velocity

Monday, 24 September 2012 19:21 (1 minute)

A dynamic theory of coherent radiation generated along the velocity of the relativistic electron crossing a layered periodic medium in Bragg geometry is constructed for general case of asymmetric reflection. The group velocities of the X-ray waves relating to different branches of dispersion equation solution are investigated and it is shown that the contributions of these waves in the total radiation depend on reflection asymmetry.

Primary author: Prof. BLAZHEVICH, Sergey (Belgorod State University)

Co-authors: Dr NOSKOV, Anton (Belgorod University of Cooperation, Economics and Low, Belgorod, Russia); GLADKIH, Yuliya (Belgorod State University)

Presenter: Prof. BLAZHEVICH, Sergey (Belgorod State University)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **7** Type: **not specified**

Dynamic Interaction of Neutral Atoms with Crystal Surface at Grazing Incidence

Thursday, 27 September 2012 19:20 (1 minute)

Dynamic effects that have been recently discovered in the rainbow scattering of neutral atoms from crystal surfaces at grazing incidence are interpreted. It is shown that these features can be explained by the electron drag of scattered atomic particles near the crystal surface.

Primary author: Mr MALYSHEVSKY, Vyacheslav (Southern Federal University, 344090, Rostov-on--Don, Russia)

Presenter: Mr MALYSHEVSKY, Vyacheslav (Southern Federal University, 344090, Rostov-on-Don, Russia)

Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **8** Type: **not specified**

Diagnostics of Compressed Atoms Encapsulated in Fullerenes

Fullerenes with atomic and molecular compounds inside have been of great interest recently due to their application e.g. in drug delivery systems. However it should be noted that atoms encapsulated in fullerenes undergo the impact of fullerenes'electron shells, which causes deformation of atoms, i.e. contraction or expansion. In such cases relative deformations may vary from portions to tens of percents. It is shown that one can estimate the deformation value by analyzing spectra of polarization bremsstrahlung (PB). The estimations for an endohedral nano-compound P@C60 are given as example.

Primary author: Mr GRISHIN, Vladislav (D.V. Scobeltsyn Institute of Nuclear Physics of MSU, 119992 Moscow, Russia)

Co-author: Mr NIKITIN, Denis (Lomonosov Moscow State University, Faculty of Physics, Russia, 119991, Moscow, GSP-1, 1-2 Leninskiye Gory)

Presenter: Mr NIKITIN, Denis (Lomonosov Moscow State University, Faculty of Physics, Russia, 119991, Moscow, GSP-1, 1-2 Leninskiye Gory)

Track Classification: Poster Session

Contribution ID: **11** Type: **not specified**

Peculiarities in the behavior of impurity atoms in the conducting crystals

The experiment on registration of low-energy electrons which occur after the fusion reaction of two deuterons in the palladium crystal at very low excitation energies was modeled using Monte Carlo simulations.

Primary author: Dr TSYGANOV, Edward (UTSWMC)

Co-authors: BAVIZHEV, Mukhamed (NCSTU); LOBASTOV, Sergei (JINR); Dr GOLOVATYUK, Vjacheslav (JINR)

Presenter: Dr TSYGANOV, Edward (UTSWMC)

Contribution ID: **12** Type: **not specified**

A Search for nEDM and New Constraints on Short-range ”Pseudo-magnetic” Interaction Using Neutron Optics of Noncentrosymmetric Crystals

Monday, 24 September 2012 18:20 (15 minutes)

Here we discuss new effects resulting from the recently predicted and discovered strong electric fields (up to 109 V/cm), which affect the neutrons moving through noncentrosymmetric crystals. That opens, for example, a new way for searching the electric dipole moment of a neutron (nEDM) with the sensitivity comparable or exceeding that for the most sensitive now magnetic resonance method.
A series of experiments on neutron diffraction and optics was carried out in Gatchina at the PNPI reactor WWR-M to study the polarization phenomena in the noncentrosymmetric quartz crystals, as well as the test experiment at ILL reactor confirmed this conclusion.
Also the direct constraint on the parameters of short range pseudomagnetic interaction of free neutron with matter is obtained from that test experiment.

Primary author: Prof. FEDOROV, Valery (Petersburg Nuclear Physics Institute, Gatchina, Russia)

Co-authors: Dr KUZNETSOV, Igor (Petersburg Nuclear Physics Institute, Gatchina, Russia); Dr VORONIN, Vladimir (Petersburg Nuclear Physics Institute, Gatchina, Russia)

Presenter: Prof. FEDOROV, Valery (Petersburg Nuclear Physics Institute, Gatchina, Russia)

Session Classification: S2.2 Channeling Radiation & Related Phenomena

Track Classification: Channeling Radiation & Related Phenomena

Contribution ID: **13** Type: **not specified**

Twenty five years of bent crystal channeling applications for beam splitting, extraction and collimation in the U-70 accelerator of IHEP.

Thursday, 27 September 2012 11:10 (25 minutes)

The report presents an overview the results of IHEP activity in the field of study and using bent crystals to steer high-energy particle beams obtained during 1987-2012. The hardware installed to study crystal beam splitting, collimation and extraction is described. It has been shown that the crystal deflectors developed are capable of sustaining long-term operation to deliver high-energy extracted beams for fixed-target physics. First results on the extraction 24.1 GeV/nucleon carbon ions are also presented.

Primary author: Prof. CHESNOKOV, Yury (IHEP)

Co-authors: Dr AFONIN, Alexander (IHEP); BRITVICH, Gennadiy (IHEP); YAZYNIN, Igor (IHEP); CHIRKOV, Petr (IHEP); TEREKHOV, Viktor (IHEP); BARANOV, Vladimir (IHEP); MAISHEEV, Vladimir (IHEP)

Presenter: Prof. CHESNOKOV, Yury (IHEP)

Session Classification: S3.3 Channeling & Crystal Collimation

Track Classification: Channeling & Crystal Collimation

Contribution ID: **14** Type: **not specified**

How to Measure the LPM Effect in Low Z Medium?

Monday, 24 September 2012 19:22 (1 minute)

This is a pilot study to investigate whether it is possible to observe the aforementioned problems of LPM theory in low-Z mediums at an available accelerator environment (i.e. CERN-SPS beams). For this purpose, under the guidance of previous experiments [2, 3] we performed several GEANT4 simulations with realistic setups.

Primary authors: Dr DIZDAR, Alper (Istanbul University); Mr BIROL, Savaş (Istanbul University)

Presenter: Mr BIROL, Savaş (Istanbul University)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **15** Type: **not specified**

Undulator radiation inside a dielctric waveguide

Wednesday, 26 September 2012 12:00 (15 minutes)

We investigate the radiation from a charge moving along a helix around a dielectric cylinder immersed in a homogeneous medium. We are mainly concerned with the radiation propagating inside the cylinder. The radiation intensity for the modes propagating inside the cylinder is evaluated by using the work done by the radiation field on the charge and by evaluating the energy flux through the cross-section of the cylinder.

Primary author: Mrs KOTANJYAN, Anna (Yerevan State University)

Co-author: Prof. SAHARIAN, Aram (Yerevan State University)

Presenter: Mrs KOTANJYAN, Anna (Yerevan State University)

Session Classification: S2-S5 Nouvel Sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **16** Type: **not specified**

Time Oscillations of the Intensity of Parametric and Diffracted Channeling X-Ray Radiation

Monday, 24 September 2012 16:00 (25 minutes)

The time evolution of parametric X-Ray radiation (PXR) and Diffracted Channeling X-Ray Radiation (DCR) produced by a relativistic charged particle passing through a crystal is studied. Formulas describing this processes are derived.
It is shown that the conditions can be realized under which parametric X-ray radiation and DCR lasts much longer than the particle flight time through the crystal. The PXR radiation pulse emitted at large angles with respect to particle velocity consists of two strong oscillating diffraction peaks. Such pulse form differs noticeably from that calculated using the kinematic approximation. Total duration of the X-ray pulse can reach tens of picoseconds. Thus, a crystal is a high-quality resonator.
Modern X-ray detectors providing picosecond and femtosecond time resolution allow a detailed experimental investigation of a complicated time structure of parametric and DCR pulses generated by electron bunches available with modern acceleration facilities.

Primary author: Prof. BARYSHEVSKY, Vladimir (Research Institute for Nuclear Problems)

Co-authors: Mrs GURINOVICH, Alexandra (Research Institute for Nuclear Problems); Mr ANISHCHENKO, Sergei (Research Institute for Nuclear Problems)

Presenter: Prof. BARYSHEVSKY, Vladimir (Research Institute for Nuclear Problems)

Session Classification: S2.1 Channeling Radiation & Related Fenomena

Track Classification: Channeling Radiation & Related Phenomena

Contribution ID: **17** Type: **not specified**

Measurement of the Dechanneling Length for High-Energy Negative Pions

Monday, 24 September 2012 19:23 (1 minute)

Charged particles impinging on a crystal can be captured into channeling regime provided that their trajectories are aligned with crystalline planes or axes within the critical angle for channeling [1]. Experimental knowledge about channeling of negative particles is less studied due to experimental difficulties arising from peculiarities of particle motion in the crystal. However, recent experiments demonstrated the possibility to steer negatively charged particle beams through bent crystals at the full bending angle [2-4].
Due to incoherent interaction with the crystal atoms, negative channelled particles suffer a strongest dechanneling with respect to the positive counterpart. A physical quantity that quantifies the rate of incoherent interactions is the dechanneling length. This parameters for negative particles lacks of investigation because of the experimental difficulties encountered in studying channeling of negative particles. Negative hadrons represent a useful opportunity to measure the dechanneling length because for such heavier particles the radiation is negligible.
The dechanneling length of 150 GeV π- interacting with a short bent crystal has been measured. Comparison between experiment and simulation show that dechanneling mainly occurs as a result of incoherent interaction with the nuclei.

Primary author: Mr BAGLI, Enrico (FE)

Presenter: Mr BAGLI, Enrico (FE)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **18** Type: **not specified**

SPARC Beamline Optimization for Channeling Experiments

Monday, 24 September 2012 19:24 (1 minute)

The SPARC facility at LNF delivers 150MeV electron beam with high quality. In this work the "dogleg"area of the SPARC facility is evaluated for a planned channeling experiment which is a pilot investigation for future positron source experiments. The beam optics simulations for the dogleg section is done up to a crystal and the beam characteristics and the beam spot on the crystal is simulated with G4beamline simulation package which mainly extends GEANT4 toolkit [2]. Further a preliminary optimization study for a near future setup for the detection system and shielding requirements for the background sources have been done with the same simulation package.

Primary authors: Dr DIZDAR, Alper (Istanbul University); Mr KOLCU, Onur Buğra (Istanbul University)

Presenter: Mr KOLCU, Onur Buğra (Istanbul University)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **19** Type: **not specified**

Coherent X-Ray Radiation Produced by Microbunched Beams in Amorphous and Crystalline Radiators

Monday, 24 September 2012 11:10 (25 minutes)

A review on the coherent X-ray bremsstrahlung (CXBR), X-ray transition (CXTR), resonance transition (CXRTR), diffraction (CXDR), channeling (CXCHR), parametric (CXPXR) and crystalline undulator (CXCUR) radiation produced by microbunched beams passing through crystalline radiators without the accompanying SASE beams of X-ray FELs is given. Formulas for the spectral and angular distributions as well as the total number of photons of these radiations are derived and numerically studied. It is discussed the possibility of observing of these types of radiation and their application for the study of the parameters of the electron beam microbunching which is important for the effectiveness of XFELs and for production of additional beams of intense monochromatic X-ray beams.

Primary author: Prof. ISPIRIAN, Karo (A.I. Alikhanian National Laboratory (Yerevan Physics Institute))

Presenter: Prof. ISPIRIAN, Karo (A.I. Alikhanian National Laboratory (Yerevan Physics Institute))

Session Classification: S1.2 Coherent Bremsstrahlung

Track Classification: Coherent Bremsstrahlung

Contribution ID: **21** Type: **not specified**

Theoretical and experimental study of beam focusing with the help of bent single crystals.

Tuesday, 25 September 2012 12:20 (15 minutes)

The mathematical description of beam focusing with the help of bent single crystals is proposed. The description allows us to calculate the parameters of beam focusing at the arbitrary shape of cut of crystal edge and for crystals with the variable curvature.
The results of recent (April, 2012) experiment on the external proton beam line of IHEP accelerator are presented.

Primary author: Dr MAISHEEV, Vladimir (IHEP, Protvino, Russia)

Co-authors: Mr AFONIN, Alexander (IHEP); Dr YANOVICH, Andrey (IHEP); Dr DURUM, Arthur (IHEP); Dr BRITVICH, Gennady (IHEP); Dr YAZYNIN, Igor (IHEP); Dr CHIRKOV, Petr (IHEP); Prof. CHESNOKOV, Yury (IHEP)

Presenter: Dr MAISHEEV, Vladimir (IHEP, Protvino, Russia)

Session Classification: S3.2 Channeling & Crystal Collimation

Track Classification: Channeling & Crystal Collimation

Contribution ID: **22** Type: **not specified**

Influence of Slowing Down in the Radiator on the Cherenkov Radiation Angular Distributions from Relativistic Heavy Ions at FAIR, SPS and LHC Energies

Friday, 28 September 2012 10:30 (15 minutes)

The calculations of Cherenkov radiation (ChR) angular distributions from relativistic heavy ions (RHI) with very high energies (from 30 GeV/u up to 3000 GeV/u) taking into account their stopping in a radiator are performed for the first time. The results of this work may be used in developing of new experimental proposals on studies of the ChR angular distributions from RHI beams at modern (SPS CERN, LHC) and future (FAIR Darmstadt) accelerators. Moreover, the theoretically predicted new peculiarities of the Cherenkov radiation could reveal new ways of relativistic particles charge and energy identification.

Primary author: Ms FIKS, Elena (National Research Tomsk Polytechnic University)

Co-authors: Dr SCHEIDENBERGER, C. (GSI Darmstadt, Germany); Dr GEISSEL, H. (GSI Darmstadt, Germany); Dr BOGDANOV, Oleg (National Research Tomsk Polytechnic University & laboratori Nazionali di Frascati); Prof. PIVOVAROV, Yury (National Research Tomsk Polytechnic University)

Presenter: Ms FIKS, Elena (National Research Tomsk Polytechnic University)

Session Classification: S5.3 Novel sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **23** Type: **not specified**

UV and X-Ray Diffraction and Transition Radiation from Charged Particles Bunches

Monday, 24 September 2012 19:25 (1 minute)

UV and X-ray polarization radiation of the bunch of charged particles, both diffraction radiation and transition radiation, is investigated theoretically in case when the bunch flies near the edge screen. The form factor is obtained in the most general form, both for longitudinal and transverse distributions particles over the bunch. The form factor is proved to depend on dielectrical properties of the target in general case. Also, it is shown that the incoherent part of the form factor exists.

Primary author: SERGEEVA, Darya (National Research Nuclear University ”MEPhI”)

Co-authors: TISHCHENKO, Alexey (National Research Nuclear University ”MEPhI”); STRIKHANOV, Mikhail (National Research Nuclear University ”MEPhI”)

Presenter: SERGEEVA, Darya (National Research Nuclear University ”MEPhI”)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **24** Type: **not specified**

Twisted electron in a strong laser wave

Wednesday, 26 September 2012 12:40 (15 minutes)

It has recently been discovered theoretically [1] and proved experimentally [2] that free electrons can carry orbital angular momentum being as large as $m \sim 100\hbar$ [3]. These \textit{twisted electrons} can be considered as massive analogs of the well-known \textit{twisted photons} whose Pointing vector rotates about the direction of their propagation. We consider such an electron with orbital angular momentum and spin (and, consequently, spin-orbital connection) moving in external field of a plane electromagnetic wave. It is studied how the orbital angular momentum modifies motion of the electron and the simplest radiation processes like Compton effect. In particular, motion of a twisted electron in the circularly polarized wave reveals twofold quiver character: the wave-packet center moves along the classical helical trajectory accompanied with the pure quantum vibrations around it due to the orbital angular momentum. We present the exact solution of the Dirac equation, which describes a "non-Volkov" state with orbital angular momentum and, consequently, generalize the free-electron Bessel state. Using these twisted states, we calculate the total angular momentum of the electron in the laser wave and predict its shift in a classically strong-field regime ($-e^2\bar{A}^2/m^2$
$gtrsim1$) that is analogous to the well-known shift of the electron's momentum and mass (and to a less known shift of its spin) in the strong laser fields. Since the effective total angular momentum of the electron is preserved in the azimythally symmetric fields, we discuss some possibilities for accelerating the non-relativistic twisted electrons.

Primary author: Dr KARLOVETS, Dmitry (Tomsk polytechnic university)

Presenter: Dr KARLOVETS, Dmitry (Tomsk polytechnic university)

Session Classification: S2-S5 Nouvel Sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **25** Type: **not specified**

Stark Effect for He-like Ions Planar Channeled in a Crystal

Monday, 24 September 2012 19:26 (1 minute)

The channeled ion interacts with the continuous planar electric field. This electric field not only defines the trajectory of the ion but also acts on the electrons of ion. Hence, electronic energy levels are shifted and are split due to Stark effect. The influence of Stark effect depends on the position of ion in the planar channel.

In this work the influence of trajectory-dependent Stark effect on electronic energy levels is analyzed for relativistic He-like Fe ions. The calculations for the inhomogeneous electric field of crystallographic planes are carried out in the first and second orders of the perturbation theory. The first order is defined by the gradient of strength of electric field and it is proportional to relativistic factor. The main contribution to the second order comes mainly from the second degree of strength and this order is proportional to the second degree of relativistic factor.

Hence, the second order for relativistic channeled ion having several electrons can play the significant role in the electronic states forming. This situation differs from the case of hydrogen-like ions, where electronic states is defined by the first order. This fact influences on both the excitation of channeled ion and radiation from the excited ion.

Primary author: Dr BABAEV, Anton (Tomsk Polytechnic University)

Co-author: Prof. PIVOVAROV, Yury (Tomsk Polytechnic University)

Presenter: Dr BABAEV, Anton (Tomsk Polytechnic University)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **26** Type: **not specified**

Resonant Coherent Excitation of Relativistic Highly Charged Ions at Planar Channelling in Si-Crystal

Monday, 24 September 2012 18:40 (15 minutes)

In the present contribution we report on the first measurement of Resonant Coherent Excitation of Li-like uranium ions. A cooled, well collimated beam of U89+ at 192 MeV/u delivered by the Experimental Storage Ring (ESR) at GSI, Darmstadt (Germany), was sent through a 10 μm effective thickness Si-crystal mounted on a high precision, 5-axis goniometer under the (220) planar orientation. The resonant ion excitation was identified by measuring the yield of the x-rays emitted during the de-excitation process of the channelled ions as a function of the crystal orientation. Using the absolute beam velocity measured at the electron cooler in the ESR, the transition energy was determined from the resonance curve with a precision of 10-4.

Primary author: Ms ANANYEVA, Alena (Goethe-Universität, 60325 Frankfurt am Main, Germany)

Co-authors: Dr BRAEUNING-DEMIAN, Angela (b GSI Helmholtzzentrum, 64291 Darmstadt, Germany); Dr DAUVERGNE, Denis (IPNL - Institut de Physique Nucléaire de Lyon, 69100 Lyon, France); Dr BRÄUNING, Harald (GSI Helmholtzzentrum, 64291 Darmstadt, Germany); Mr SUDA, Shintaro (Tokyo Metropolitan University, Hachioji, 192-0397 Tokyo, Japan); Mr SHINDO, Taiki (Tokyo Metropolitan University, Hachioji, 192-0397 Tokyo, Japan); Prof. AZUMA, Toshiyuki (Tokyo Metropolitan University, Hachioji, 192-0397 Tokyo, Japan); Prof. YAMAZAKI, Yasunori (RIKEN Advanced Science Institute, Wako, 351-0198 Saitama, Japan); Dr KANAI, Yasuyuki (RIKEN Advanced Science Institute, Wako, 351-0198 Saitama, Japan); Dr NAKANO, Yuji (Tokyo Metropolitan University, Hachioji, 192-0397 Tokyo, Japan); Prof. PIVOVAROV, Yuri (National Research Tomsk Polytechnic University, 634050 Tomsk, Russia)

Presenter: Ms ANANYEVA, Alena (Goethe-Universität, 60325 Frankfurt am Main, Germany)

Session Classification: S2.2 Channeling Radiation & Related Phenomena

Track Classification: Channeling Radiation & Related Phenomena

Contribution ID: **27** Type: **not specified**

On the Influence of a Particle's Field Evolution on its Ionization Energy Losses in Thin Layers of Substance

Monday, 24 September 2012 09:50 (15 minutes)

The process of evolution of electromagnetic field around a particle during its entry to a dielectric medium is considered. The influence on this field of the processes of its dispersion as of an electromagnetic wave packet as well as of its absorption in the substance is considered. The special attention is drawn to the analysis of evolution of Fourier-components of the field around the particle which frequencies are close to the own frequencies of the substance. It is shown that in solids absorption of these Fourier-components occurs on distances from the interface which are much less than the characteristic distances within which the transformation of these components to diverging waves of transition radiation takes place. In gases, however, there is a region of energies of the incident particle within which the change of these components can be defined, primarily, by their dispersion. On the basis of the study of particle's field evolution the question about its energy losses in the boundary layer of substance is considered. Also the regeneration of the field around a particle after its exit from medium is investigated on the basis of the study of the particle energy losses in thin plates situated on different distances from the point of exit along the particle trajectory.

Primary author: Mr TROFYMENKO, Sergii (Akhiezer Institute for Theoretical Physics of NSC KIPT)

Co-author: Prof. SHUL'GA, Nikolai (Akhiezer Institute for Theoretical Physics of NSC KIPT)

Presenter: Mr TROFYMENKO, Sergii (Akhiezer Institute for Theoretical Physics of NSC KIPT)

Session Classification: S1.1 Coherent Bremsstrahlung

Contribution ID: **28** Type: **not specified**

Laser Induced Light Ion Acceleration at INFN National Laboratories in Frascati.

Thursday, 27 September 2012 19:21 (1 minute)

LILIA is an experiment of light ions acceleration trough laser interaction with thin metal targets to be done at the SPARC-LAB facility under operation in Frascati. The main goal is to obtain a beam suitable for injection in other accelerating structure. The laser beam and focusing optics parameters available for the first phase of experiments are: beam diameter ≈120mm, ~flat top, M2≈1.5 ; waist (I/e2)≈ 10μ ; contrast ≈10-10; Raileigh length ≈ 260μ; pulse duration 25-35 fs; Max Energy on target 4J; with long focal length parabola Max Intensity I≈5·1019W/cm2 (35 fs) or 1020 (25fs).
As for now we are limited to 5x1019 W/cm2, we can foresee a maximum proton energy of ≈10MeV and the activity will concern a parametric study of the correlation of the maximum TNSA accelerated proton energy, with respect to the laser pulse intensity (1018 < I < 1020 W/cm2), pulse energy (0.1-4 J), pulse length (25 fs-1ps), metallic target thickness (1-10 microns). In such a frame we would like to deeply investigate the experimental scale rules within the possibilities offered by the FLAME facility. Moreover, this will provide the opportunity to get experience in the development of diagnostic techniques and in target optimization. In this configuration we expect a beam of N<1012 protons with Emax≈10MeV. Such energy is below the present state of art, however the scientific relevance is due to the fact we will obtain a real laser driven source, with a proton beam that will be focused and transported on significant distances (50-75 cm) away from the interaction point.
In a second phase, when FLAME performances will be optimized due to the introduction of Adaptive Optics and the use of a short focal length OA parabola will allow to obtain a waist ≈2.5μ and an intensity on target of I≈1021W/cm2, we will be able to accelerate protons at an energy in excess of 60MeV and to select a bunch at E = 30 MeV with a narrow spread ΔE and still have a reasonable number of protons (107 - 108). This opens a very interesting perspective for applications such as hadrontherapy in connection with a post-acceleration stage in order to reach energies up and beyond 100 MeV. Indeed if a sufficient current intensity can be reached at 30 MeV with a narrow spread ΔE/E≈1% and a good beam quality after transport, energy selection and collimation, the protons bunch might be post-accelerated after injection in a high field linac, as the one developed for the INFN ACLIP project, suitable for medical applications. 3D "start to end"simulations for the 30MeV beam post accelerated up to 60 MeV by means of 6 ACLIP modules has been performed.

Primary author: Prof. GIULIETTI, Danilo (PI)

Presenter: Prof. GIULIETTI, Danilo (PI)

Session Classification: PS2 Poster Sesion

Track Classification: Channeling Primer

Contribution ID: **29** Type: **not specified**

Radiation and Particle Secondary Sources based on electron Laser Plasma Acceleration

Thursday, 27 September 2012 18:20 (15 minutes)

Ultra-short Ti:Sa laser pulses at relativistic intensities, propagating in plasmas at densities of the order of 1018-19 el/cm3, can induce accelerating electric fields up to 104 times the maximum fields available in the conventional accelerators. The consequent drastic reduction of the dimensions and costs of the apparatus, open to several applications. In fact, once energetic electron bunches at rep rate of a few Hz are produced, X-ɣ radiation and particle secondary sources can be carried out. Beside their compactness these sources are easily synchronized with other laser systems, fulfilling the best conditions for femtosecond time resolved pump and probe experiments. The talk will concern the experimental chances the 250TW Ti:Sa laser, operating in the INFN Frascati National Laboratories, offers in this very active research field.

Primary author: Prof. GIULIETTI, Danilo (PI)

Presenter: Prof. GIULIETTI, Danilo (PI)

Session Classification: S5.2 Novel sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **30** Type: **not specified**

High-Energy Wave Packets in Processes of Bremsstrahlung, Transition and Coherent Radiation

Monday, 24 September 2012 09:00 (25 minutes)

The evolution in space and time of localized high-energy wave packets which take place in processes of transition radiation and bremsstrahlung by ultra relativistic electrons is considered. It is shown that high energies make stabilizing influence upon the motion of such packets and that the lengths within which their dispersion and reconstruction into the packets of diverging waves occurs can be macroscopic. In this case the problem of measurement of radiation characteristics in the pre-wave zone arises which consists in dependence of the results of measurements on the detector's size and its position relative to the region of packet formation. It is shown that the structures of electromagnetic wave packets which arise at the instantaneous scattering of a fast electron to a large angle and after its traverse of thin metallic plate are analogous. In both cases, in particular, the ultra relativistic electron can be in 'half-bare' state with considerably suppressed low frequency Fourier-components of the field around it during long period of time. Some manifestations of such state of electron in processes of bremsstrahlung, transition and coherent radiation by ultra relativistic electrons are discussed.

Primary author: Prof. SHUL'GA, Nikolai (Akhiezer Institute for Theoretical Physics of NSC KIPT)

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Session Classification: S1.1 Coherent Bremsstrahlung

Track Classification: Coherent Bremsstrahlung

Contribution ID: **31** Type: **not specified**

Far- and near-field approximation for diffraction radiation

Thursday, 27 September 2012 19:22 (1 minute)

New research in acceleration physics leads to growing up the brilliance of charged particles bunches. Existed methods based on interaction of detection devices with bunches do not satisfy our need, because of the fact that new high intensity bunches could damage this devices. Moreover, these methods do not allow analyzing the bunches in real time. Recently new technique based on ODRI (optical diffraction radiation interference) by a bunch at its propagation through the slit was proposed.

Primary author: Mr SHPAKOV, Vladimir (RAS P.N.Lebedev Physical Institute)

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Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **32** Type: **not specified**

Method of Induced Currents and its Applications to the Different Problems of Polarization Radiation

Monday, 24 September 2012 10:10 (15 minutes)

When moving in a substance or nearby some optical inhomogeneity, a charged particle produces the so-called polarization (or induced) currents, which can be considered as a source for different types of polarization radiation: Cherenkov radiation (ChR), transition radiation (TR), diffraction radiation (DR), Smith-Purcell radiation (SPR), etc. We apply the method of induced currents [1] for a wide class of problems by studying the radiation generated by a particle moving nearby the targets of the complicated shapes and arbitrary permittivity $\varepsilon(\omega) = \varepsilon' + i\varepsilon''$. In particular, we present solutions for the following problems: DR from a thin rectangular screen, SPR from a thin grating of rectangular strips separated with vacuum gaps, DR from a round hole in a screen, as well as from a rectangular slit in a screen. In all these cases, the solutions obtained have no limitations on the value of the target's permittivity (that means the ChR is automatically included in these solutions) and the particle's energy. In the special cases of ChR in a boundless medium and TR from a slab, our results completely coincide with those by Tamm and Frank, Ginzburg and Frank, Pafomov, Garibyan, et al. We study in detail some interesting examples like SPR from a grating of a finite permittivity and compare the result with the available solutions obtained for the ideally-conducting gratings. The discussion is given on how the method of induced currents is changed when the targets are well-conducting and the skin-effect occurs. We show that the surface current density induced by external field on an ideally-conducting screen must have all three components including the one perpendicular to the screen. This normal component of the surface current is neglected in the existing models for DR or SPR (see review in [2]). However, we demonstrate that it vanishes for ultrarelativistic particles that allows one to indicate the region of applicability for the models with only two tangential components of the surface current. On the other hand, we discuss how one can simplify calculations for the targets of the complicated shapes. It turns out that even for the transparent media all the calculations can be significantly simplified if one neglects from the very beginning the secondary re-reflections of the waves of polarization radiation inside the target. Finally, we show that in the corresponding limiting cases our results coincide with those obtained with the use of some approximate methods applicable when $|\varepsilon(\omega) - 1| \ll 1$ (for example, the eikonal method [3]).

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Session Classification: S1.1 Coherent Bremsstrahlung

Track Classification: Coherent Bremsstrahlung

Contribution ID: **34** Type: **not specified**

Line Spectra of Electromagnetic Radiation from Relativistic Nuclei Passing through Matter

Monday, 24 September 2012 10:30 (15 minutes)

When the relativistic nucleus penetrates through a matter, besides nuclear reactions the relativistic Coulomb excitation of projectile nucleus occurs. The de-excitation results in emission of electromagnetic radiation, characterized by continuous spectrum with broad maximum in the case of Coulomb excitation to giant dipole resonance (A.Sorensen, Channeling-2010). If the separate nuclear levels of relativistic projectile nucleus are excited, one may expect not continuous but line spectra of electromagnetic radiation from these nuclei. Here, we report on the first calculations of emission line spectra from light and heavy relativistic nuclei at FAIR, SPS and LHC energies, based on the theory of relativistic Coulomb excitation in collisions of relativistic bare nuclei with target atoms. The experimental schemes to observe the emission line spectra from relativistic nuclei penetrating through solid targets are discussed, as well as their relevance to be the new tool for nuclear spectroscopy, especially for exotic short-lived isotopes.

Primary author: Prof. PIVOVAROV, Yury (National Research Tomsk Polytechnic University)

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Session Classification: S1.1 Coherent Bremsstrahlung

Track Classification: Coherent Bremsstrahlung

Contribution ID: **35** Type: **not specified**

On the Radiation Accompanying Volume Reflection

Tuesday, 25 September 2012 10:30 (20 minutes)

In last years, the effects of volume reflection (VR) and multiple volume reflection in one crystal (MVROC) were observed and widely studied mainly in connection with the problem of particle beam steering. Moreover, in the case of ultrarelativistic electron/positron beams, both effects are also interesting from the point of view of radiation emission.
The electromagnetic radiation emitted by 120 GeV/c electrons and positrons in bent silicon crystals have been investigated at CERN SPS-H4 beamline. Silicon crystals in the shape of strips, suited for studies of coherent interactions between crystals and charged particle beams, have been fabricated through silicon anisotropic etching technique. The trajectories of e± crossing a silicon strip crystal have been reconstructed by high precision silicon microstrip detectors. A spectrometer and an electromagnetic calorimeter have been used to measure the energy loss spectra both in VR and in MVROC conditions. The experimental measurements are in agreement with theoretical predictions and have shown that VR and MVROC radiations weakly depend on the particle incidence direction and have a large angular acceptance.

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Session Classification: S3.1 Channeling & Crystal Collimation

Track Classification: Channeling & Crystal Collimation

Contribution ID: **36** Type: **not specified**

Development of a Beam Profile Monitor Using Parametric X-ray Radiation

Thursday, 27 September 2012 19:23 (1 minute)

We propose two new methods (local and remote methods) of measuring electron beam profiles using parametric X-ray radiation (PXR). For the local method, we have demonstrated a proof-of-principle experiment, in good agreement with the results obtained with an ordinary method using a fluorescent screen. For the remote method, we have proposed to use Fresnel zone plates (FZPs) as X-ray lenses. As a first step, the experiments on PXR focusing using a single FZP are in progress at the SAGA Light Source. The proposed methods may be useful for recent advanced accelerators where the bunch length of the electron beam is too short or the beam size is too small.

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Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **37** Type: **not specified**

Computed Tomography for Light Materials Using Monochromatic X-ray Beam Produced by Parametric X-ray Radiation

Wednesday, 26 September 2012 09:30 (15 minutes)

Computed tomography (CT) for light materials such as bio-sample
were carried out using parametric -X-ray radiation (PXR) and a
flat panel detector (FPD).
Tomography images were actually reconstructed from the projection images
which obtained for the measurement time of 5 min to 1 hour.

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Session Classification: S4.3 X-ray Channeling & X-ray Optics

Track Classification: X-ray Channeling & X-ray Optics

Contribution ID: **38** Type: **not specified**

Doughnut Scattering of 255 MeV Electrons at <100> Axial Channeling in Thin Si Crystal

Monday, 24 September 2012 19:27 (1 minute)

The properties of both angular and spatial distribution of 255 MeV electrons at <100> axial channeling in thin silicon crystal has been investigated experimentally at the linac injector of SAGA light source and by computer simulations using a computer code "Basic Channeling with Mathematica©"BCM–1.0 developed by the authors. Comparison of the experimental and theoretical results shows a good agreement. Both experimental data and simulations show the brilliant effect of so-called "doughnut scattering"that can be used for the diagnostics of the incident beam angular divergence.
The spatial distributions of electrons penetrating through the thin Si crystal at (220) alignment are also studied. The results are compared with DS at <100> axial channeling
Further perspectives of experimental studies of electrons scattering in crystal at SAGA LS are discussed.

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Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **39** Type: **not specified**

Monte Carlo Modelling of High-Energy Channeling Studies

Monday, 24 September 2012 19:28 (1 minute)

Channeling in bent crystals is becoming a reliable and efficient technique for collimating beams. At CERN, the installation of crystals in the LHC is under scrutiny by the UA9 collaboration with the goal of investigating if they are a viable option for the collimation system upgrade. This paper describes a new model of channeling in bent crystals which has been developed from scratch in order to be implemented in the FLUKA Monte Carlo code simulating particle transport and interactions. It enables energy deposition calculations in crystals as well as the tracking of secondary particles downstream. Experimental data from the experiment performed by the UA9 collaboration on the H8 beamline (CERN North Area, [3]) has been analyzed and the comparison with the results of simulations is presented.

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Presenter: Mr SCHOOFS, Philippe (CERN - EPFL)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **40** Type: **not specified**

DYNECHARM++: a Software to Simulate the Motion of Charged Particles in Complex Atomic Structures

Monday, 24 September 2012 19:29 (1 minute)

Charged particle impinging onto a crystal with small angle with respect to an atomic plane or axis can undergo planar or axial channeling regime with high probability. Trajectory of a ultra-relativistic particle under channeling regime can be studied through the usage of continuous potential approximation [1] and approximation of relativistic equations of motion [2]. Averaged electric field experienced by particles in their motion can be calculated through classical physical equations and the expansion of periodic functions as a Fourier series [3].
Based the on these calculation methods we have developed the PATAC code, which allows to integrate the particle equations of motion under channeling regime inside a complex atomic structures. The code has been written in C++ programming language to simplify the integration within other software. Comparison between simulations and experimental results have been carried out.

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Co-author: Prof. GUIDI, Vincenzo (FE)

Presenter: Mr BAGLI, Enrico (FE)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **41** Type: **not specified**

Experimental and Theoretical Study of PXRC (Parametric X-Radiation at Channeling) from 255 MeV Electrons in Si

Thursday, 27 September 2012 19:24 (1 minute)

The X-radiation from relativistic channelled electrons at the Bragg angles –Parametric X-Radiation at Channeling (PXRC) –is studied both experimentally and theoretically.
The experiment was carried out using a 255 MeV electron beam from a linac at newly constructed beam line for the study of interactions between a relativistic electron beam and crystals at the SAGA Light Source. The observed asymmetry of PXRC angular distribution at (220) planar channelling in a 20 μm Si is explained taking account of two quantum effects: initial population and transverse form-factor of quantum states of planar channelled electrons. Further perspectives for PXRC studies at SAGA-LS are analyzed.

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Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **42** Type: **not specified**

Elemental Analysis Using Parametric X-ray Generated at LEBRA, Nihon University

Thursday, 27 September 2012 19:25 (1 minute)

Using the energy-valuable monochromatic X-ray beam sourced by Parametric X-ray radiation at the Laboratory for Electron Beam Research and Application (LEBRA) of Nihon University, distribution map of Sr in the fossil dinosaur eggshell could be revealed by tracing the X-ray absorption edge. The more advanced and smart element detecting system was built at LEBRA. The new system enabled to detect the interested element by taking an image of the higher and the lower side of the X-ray energy for the elemental aborption edge similtaneously.

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Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **43** Type: **not specified**

Smith-Purcell radiation from a one-dimensional photonic wire

Thursday, 27 September 2012 19:26 (1 minute)

We present a theory of diffraction radiation based on the Smith - Purcell mechanism of the radiation generation from a circularly symmetric photonic wire with one - dimensional periodic dielectric function.

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Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **44** Type: **not specified**

X-ray microflurescence analysis of Augustan coins

Tuesday, 25 September 2012 19:00 (15 minutes)

Augustus has been the first Roman Emperor (27 B.C. - A.D. 14). He introduced a radical reform (23 B.C.) of the Roman monetization. Gold and silver coins were struck under his direct control, while the copper-based money (aes) were under the control of the Senatus.
X-ray microfluorescence analysis has been applied to 477 Augustan coins coming from the National Archaeologic Museum of Florence, an important collection owned in origin by the powerful Medicean family. This study has included several alloys used in that period's coinage: gold , silver, copper-based. The spectrometer equipped with policapillary optics, focuses the X-ray beam down to 50 μ, a unique feature of this device is the possibility of focusing on the small patina free areas already present on the coin surface, with no need for further cleaning. The chemical elements investigated are Ti, Fe, Ni, Cu, Zn, As, Br, Ag, Au, Pb, Sn, Sb, Hg, depending on the coin type examined. Interesting trends are found between the composition and the different issues/year struck. In particular, few coins outlined suspect by numismatic properties have been confirmed to be possible fakes.

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Session Classification: S4.2 X-ray Channeling & X-ray Optics

Track Classification: X-ray Channeling & X-ray Optics

Contribution ID: **45** Type: **not specified**

One way to Lorentz's Transformations

The derivation of Lorentz Transformations (LT) based on the Principle of Relativity and dependence of the rate of clocks tick (time dilation) on their velocity is presented. The analysis of different ways of the LT derivation allows to look at LT and their consequences from different standpoints, to make them more accessible to a wide circle of readers interested in the relativistic physics [1].

References

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Primary author: Dr BESSONOV, Evgeny (Lebedev Physical Institute RAS)

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Contribution ID: **46** Type: **not specified**

Transition Radiation From a Monoenergetic Electron Bunch on the Acoustic Superlattice

Thursday, 27 September 2012 19:27 (1 minute)

We consider the forward transition radiation generated by a monoenergetic electron bunch in a dielectric plate in presence of ultrasonic waves. The expression for the spectral-angular distribution of the radiation intensity is given for the general case of electrons distribution in the bunch. Various special cases are discussed and the coherence effects are investigated. Conditions are specified under which the coherent radiation exceeds the incoherent part. The numerical examples are given for a plate of fused quartz.

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Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **47** Type: **not specified**

Investigation of Coherent Bremsstrahlung A-type and B-type at Electron Energy 200 MeV

Monday, 24 September 2012 12:40 (15 minutes)

Coherent bremsstrahlung (CB) linearly polarized photon beam has been produced at the MAX-lab facility at interaction of electron beam with energy E0=192.7 MeV with diamond crystals 0.1 mm [1].
Since then the CB characteristics of the A-type were studied for diamond crystal 0.1 mm and more thin crystal 0.5 mm thick, as well, for orientations when main contribution to the CB cross section gave both one and many points of the reciprocal lattice of the crystal and various photon beam collimation was applied. A beam polarization ~25% was obtained at the CB peak energy ~50 MeV without any beam collimation. The polarization was increased up to ~45-50% when strong beam collimation (⊠c~0.5⊠⊠) was applied. (⊠⊠=mc2/E0, m is the electron mass, E0 is the electron energy). The spectra of the CB of B-type were also measured for axial orientation of the diamond crystal when the electrons move near the crystal axes. An enhancement was observed nearby the end of the photon spectrum. The results obtained are compared with theoretical calculation based on semi-classical model developed by the Kharkov's group [2].

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2. N.F. Shul'ga, V.I. Truten', A.A. Greenenko, Nual.Instr.Meth. B145 (1988)

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Session Classification: S1.2 Coherent Bremsstrahlung

Track Classification: Coherent Bremsstrahlung

Contribution ID: **48** Type: **not specified**

Radiation Spectra of Electrons with Energy Two Hundred MeV Moving in Diamond and Silicon Crystals near their Axis and Planes

Monday, 24 September 2012 19:30 (1 minute)

In this report it is presented results of data processing and analysis on studying radiation spectra of electrons with energy ~200 MeV in a diamond and silicon crystals at orientations when the electrons move near the crystal axes and planes. Preliminary results were presented in [1].
At energies of some hundred MeV the coherent effects in radiation resulted from an electron dynamic in the crystal were not practically investigated until now. At these energies the electrons motion in the crystal can be both regular, when axial and planar channeling is possible, and chaotic, when the coherent electron interaction with single strings reveals itself. The experimental results demonstrate strong increasing of the radiation intensity in energy region less 20 MeV. The maximal enhancement at axial orientation for diamond crystal 0.1 mm thick reaches at photon energy ~2-3 MeV about ten times more than the electron radiation in the amorphous matter of the same thickness.
At increasing the angle between crystal axis and electron beam the intensity at the low energy maximum decrease and peaks from coherent bremsstrachlung are appeared.
The experimental spectra are compared with theoretical calculation based on semi-classical model developed by the Kharkov's group [2]. The experimental data show that the coherent electron interaction with single crystal strings gives the main contribution to the electron radiation.

References

1. K. Fissum, J. Brudvik, D. Burdeinyi, V. Ganenko, K. Hansen, L. Isaksson, K. Livingston, M. Lundin, V. Morokhovskyi, B. Nilsson, B. Schröder, G. Vashchenko, Radiation Spectra of Two Hundred MeV Electrons in Diamond and Silicon Crystals at Axial and Planar Orientations. "Charged and Neutral Particles Channeling Phenomena - Channeling 2008", Proceedings of the 51st Workshop of the INFN Eloisatron Project, S.B. Dabagov and L. Palumbo, Eds., World Scientific, 2010 (The Science and Culture series - Physics, Series Ed. A. Zichichi), p. 331.
2. N.F. Shul'ga, V.I. Truten', A.A. Greenenko, Nual.Instr.Meth. B145 (1988)

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Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **49** Type: **not specified**

3D Simulation for PolyCO X Imaging of Fuel Sprays

Thursday, 27 September 2012 19:28 (1 minute)

In this work the results of numerical computation applied to X-ray absorption by fuel sprays are reported. A radiation source of Cu K X-ray tube in combination with a polycapillary halflens has been simulated with the emerging radiation impacted on a CCD detector. A 3D software reproduces both parallel and low divergent X-ray beams irradiating the samples of various shapes and different transmitting media. To evaluate X-ray propagation in fuel sprays, which are practically transparent at X-ray frequencies, we have simulated the fuel sprays with the additive of Cerium at different concentrations that allows the X-ray absorption to be enhanced. The density of a spray has been simulated by having varied both number and shape of the droplets over the X-ray optical path.
Rotating irradiated sample around the radiation propagation axis has been simulated for a tomography reconstruction with successful resulting images.

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Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **50** Type: **not specified**

Laboratory PolyCO Based X-ray Imaging of High-Pressure Fuel Sprays

Tuesday, 25 September 2012 18:40 (15 minutes)

Table-top experiment using a microfocus X-ray source for radiography and tomography has been used for investigating the structure of a gasoline pulsed spray flowing from a GDI injector for automotive applications. A Cu Kα X-ray source at 8.048 keV in combination with a polycapillary halflens has been used to focus the radiation on the spray while a CCD detector collected the resulting signal. The fuelling apparatus feeds an injector inserted in a high-pressure rotating device actuated with angular steps Delta(Teta)= 1°. The acquisition has been carried out on 180° angular trip at the injection pressure of 8.0 MPa. The image processing has permitted sinogram reconstructions of the jets by slices allowing a 360° spray access to the spatial and temporal distribution of the fuel downstream the nozzle tip.

Primary author: Dr ALLOCCA, Luigi (Istituto Motori - C.N.R.)

Co-authors: Dr HAMPAI, Dariush (LNF - INFN); Dr MARCHITTO, Luca (Istituto Motori - CNR); Prof. DABAGOV, Sultan (INFN Laboratori Nazionali di Frascati)

Presenter: Dr ALLOCCA, Luigi (Istituto Motori - C.N.R.)

Session Classification: S4.2 X-ray Channeling & X-ray Optics

Track Classification: X-ray Channeling & X-ray Optics

Contribution ID: **51** Type: **not specified**

X-Ray Spectroscopy of Fluorescence Radiation Channeling in μ-Capillary Holed Glass Plates

Wednesday, 26 September 2012 09:50 (15 minutes)

In this work soft X-ray synchrotron radiation transmitted through microchannel plates was investigated. Primary monochromatic beam penetrates into microchannels of a hexagonally regular polycapillary structure ~ 0.4 mm thick, with channels of 10 μm hole diameter and 12 μm pitch. Fine structure of reflection and XANES spectra at the Si L-edge at the exit of SiO2 MCP has been analysed. The characterization of the X-ray fluorescence exiting by micro-channels and the transmission by hollow silicon-glass microcapillary structures is the objective of this research. The anomalous dispersion region (Si L-edge) channeling of X-rays in MCPs as well as the interaction of standing waves in a media with unoccupied electronic states has been studied.

Primary author: Dr MAZURITSKIY, Mikhail (Southern Federal University)

Co-authors: Dr MARCELLI, Augusto (INFN Laboratori Nazionali di Frascati, Frascati, Italy); Prof. DABAGOV, Sultan (INFN Laboratori Nazionali di Frascati)

Presenter: Dr MAZURITSKIY, Mikhail (Southern Federal University)

Session Classification: S4.3 X-ray Channeling & X-ray Optics

Track Classification: X-ray Channeling & X-ray Optics

Contribution ID: **52** Type: **not specified**

Generation of Plasmon and Electron Exitations by Quantum Channeled Particle in Crystal

Monday, 24 September 2012 19:31 (1 minute)

A theory of the energy losses for the quantum channeled particle is developed. The probability of generating plasmons in the case of "channel-plasmon"resonance is calculated. The possibility of appearance of the peaks in the curve of the energy loss on the particle energy fixing the distance between the transverse levels of the cross-motion is evaluated. The transition probabilities of the crystal electron subsystem excitation with the change of the quantum levels of the transverse motion are investigated.

Primary author: Dr MAZUR, Evgeny (NATIONAL RESEARCH NUCLEAR UNIVERSITY MEPHI)

Presenter: Dr MAZUR, Evgeny (NATIONAL RESEARCH NUCLEAR UNIVERSITY MEPHI)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **53** Type: **not specified**

High-Order Diffraction Reflection and DCR

Monday, 24 September 2012 17:10 (15 minutes)

The goal of our repot is compare the results obtained by exact formula of DCR angular distribution and ones in dipole approximation.

Primary author: Dr KOROTCHENKO, Konstantin (National Research Tomsk Polytechnic University)

Co-author: Prof. KUNASHENKO, Yury (National Research Tomsk Polytechnic University)

Presenter: Dr KOROTCHENKO, Konstantin (National Research Tomsk Polytechnic University)

Session Classification: S2.1 Channeling Radiation & Related Fenomena

Track Classification: Channeling Radiation & Related Phenomena

Contribution ID: **54** Type: **not specified**

Orientation Dependence of Energy Loss of Relativistic Electrons and Positrons by Channeling Radiation in Thin Si Crystal

Monday, 24 September 2012 19:32 (1 minute)

Here, we carry out computer simulation of radiation energy loss of the 255MeV electrons and positrons at <100> axial and (100) planar channeling in 20 μm silicon crystal taking into account the angular divergence of the initial electron beam, using computer code BCM-1. The possibility to align thin crystals using the orientation dependence of channeling radiation energy loss is discussed.

Primary authors: Dr BOGDANOV, Oleg (LNF&TPU); Mr ABDRASHITOV, Sergey (National Research Tomsk State University, National Research Tomsk Polytechnic University); Dr TUKHFATULLIN, Timur (National Research Tomsk Polytechnic University); Prof. PIVOVAROV, Yury (National Research Tomsk Polytechnic University)

Presenter: Mr ABDRASHITOV, Sergey (National Research Tomsk State University, National Research Tomsk Polytechnic University)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **55** Type: **not specified**

Observation of Undulator Radiation at Channeling of Electrons in Strained Layer Si-Ge Crystals at MAMI

Thursday, 27 September 2012 09:00 (25 minutes)

Experiments have been performed at the Mainz Microtron MAMI to explore the radiation emission from a 4-period epitaxially grown strained layer Si-Ge undulator with a period length of 9.9 μm. Electron energies between 190 and 855 MeV have been chosen. In comparison with a flat silicon reference crystal, a broad excess yield around the theoretically expected photon energies between 0.036 and 0.637 MeV, respectively, has been observed for channeling at the undulating (110) planes.

Primary author: Prof. BACKE, Hartmut (Institute for Nuclear Physics)

Co-authors: Dr KRAMBRICH, Dirk (Institute for Nuclear Physics, University of Mainz, Germany); Dr LUNDSGAARD HANSEN, J. (Department of Physics and Astronomy, University of Aarhus, Denmark); Dr ANDERSEN, K. K. (Department of Physics and Astronomy, University of Aarhus, Denmark); Prof. UGGERHØJ, Ulrik I. (Department of Physics and Astronomy, University of Aarhus, Denmark); Dr LAUTH, Werner (Institute for Nuclear Physics, University of Mainz, Germany)

Presenter: Prof. BACKE, Hartmut (Institute for Nuclear Physics)

Session Classification: S2.3 Channeling Radiation & Related Phenomena

Track Classification: Channeling Radiation & Related Phenomena

Contribution ID: **56** Type: **not specified**

Simulation of Crystal Assisted Collimation of the SPS Beam

Model for simulation of the crystal assisted collimation of the SPS beam halo and simulation results are presented. The impact parameters and angles of halo particles in the first hits with the crystal primary collimator are considered taking into account the measured oscillation amplitude growth. The model of the crystal with a miscut angle was developed. It was shown that the miscut angle of the available crystal produces an increase by more than two times of the beam halo losses in the crystal for its perfect alignment. The loss reduction obtained by simulation for the crystal with a miscut is closer to the measured value. Taking into consideration the interaction of halo particles with the secondary collimator-absorber allows formulating a criterion for selection of optimal crystal parameters and gap value between the crystal and absorber.

Primary author: Dr TARATIN, Alexander (Joint Institute for Nuclear Research)

Co-author: Dr SCANDALE, Walter (CERN, European Organization for Nuclear Research, CH-1211 Geneva 23, Switzerland)

Presenter: Dr TARATIN, Alexander (Joint Institute for Nuclear Research)

Contribution ID: **57** Type: **not specified**

Strong Reduction of the Off-momentum Halo in Crystal Assisted Collimation of the SPS Beam

Thursday, 27 September 2012 11:40 (15 minutes)

Study of crystal assisted collimation has been continued at the CERN SPS for different energies of stored beams using 120 GeV/c and 270 GeV/c protons and Pb ions with 270 GeV/c per charge. A bent silicon crystal used as a primary collimator deflected halo particles in channeling regime directing them into the tungsten absorber. A strong correlation of the beam losses in the crystal and off-momentum halo intensity measured in the first high dispersion area downstream was observed. The loss reduction in the crystal was maximal, larger 20, for 270 GeV/c protons. A maximal reduction of the off-momentum halo intensity in the HD area was above 7 and it was observed with Pb ions. A strong loss reduction was also detected in regions of the SPS ring far from the collimation area.

Primary author: Dr SCANDALE, Walter (CERN, European Organization for Nuclear Research, CH-1211 Geneva 23, Switzerland)

Co-author: Dr TARATIN, Alexander (Joint Institute for Nuclear Research, Dubna, Russia)

Presenter: Dr SCANDALE, Walter (CERN, European Organization for Nuclear Research, CH-1211 Geneva 23, Switzerland)

Session Classification: S3.3 Channeling & Crystal Collimation

Track Classification: Channeling & Crystal Collimation

Contribution ID: **58** Type: **not specified**

Experiments with Bent Crystals for High Energy Ion Beams

Tuesday, 25 September 2012 09:30 (15 minutes)

Short review of the experiments on the deflection and extraction (collimation) of high energy ion beams with bent crystals performed in the accelerator centers is presented. The channeling parameters depend on the ratio of particle momentum to its charge pz therefore the efficiency of the crystal deflector is the same for protons and ions with equal pz. The difference appears mainly in multi-turn process of the beam halo collimation because of much larger cross section for nuclear interactions and ionization losses of heavy ions in a crystal. Besides, a probability of electromagnetic dissociation for Pb ions of the LHC energies becomes visible even for well channeled particles.

Primary author: Dr TARATIN, Alexander (Joint Institute for Nuclear Research, Dubna, Russia)

Co-authors: Dr KOVALENKO, Alexander (Joint Institute for Nuclear Research, Dubna, Russia); Dr SCANDALE, Walter (CERN, European Organization for Nuclear Research, CH-1211 Geneva 23, Switzerland)

Presenter: Prof. KOVALENKO, Alexander (Joint Institute for Nuclear Research)

Session Classification: S3.1 Channeling & Crystal Collimation

Track Classification: Channeling & Crystal Collimation

Contribution ID: **59** Type: **not specified**

Original aspects of Heavy-ion interactions in crystals at non relativisic energy

Monday, 24 September 2012 19:00 (15 minutes)

Primary author: Dr DAUVERGNE, Denis (Institut de Physique Nucléaire de Lyon)

Presenter: Dr DAUVERGNE, Denis (Institut de Physique Nucléaire de Lyon)

Session Classification: S2.2 Channeling Radiation & Related Phenomena

Track Classification: Channeling Radiation & Related Phenomena

Contribution ID: **60** Type: **not specified**

Coherent Bremsstrahlung from Channeled Positron

Monday, 24 September 2012 19:33 (1 minute)

In the present report we calculate the cross –section of radiation from axially channeled polarized electron.

Primary author: Prof. KUNASHENKO, Yuri (National Research Tomsk Polytechnic University; Tomsk State Pedagogical University)

Co-author: Dr KOROTCHENKO, Konstantin (National Research Tomsk Polytechnic University)

Presenter: Prof. KUNASHENKO, Yuri (National Research Tomsk Polytechnic University; Tomsk State Pedagogical University)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **61** Type: **not specified**

Parametric gamma-radiation: parametric x-rays from relativistic electrons passing through a Mossbauer crystal

Wednesday, 26 September 2012 12:20 (15 minutes)

The possibility to apply PXR radiation mechanism to generate resonant gamma-rays for the Mossbauer experiments –parametric gamma-radiation (PGR) –was suggested quite ago, but experimental conditions for its observation were not discussed before. Besides, the interference conditioned by the electron and nuclear contributions to PGR was not taken into account in the previous consideration. As a result, no any experiment with Mossbauer crystal target was performed. In the current contribution we analyze PGR mechanism in more detail.

Primary author: Prof. LOBKO, Alexander (Institute for Nuclear Problems, Belarus State University)

Co-authors: Mr AHMADI, Abbas (Belarusian State University, Minsk, Belarus); Prof. FERANCHUK, Iliya (Belarusian State University, Minsk, Belarus)

Presenter: Prof. LOBKO, Alexander (Institute for Nuclear Problems, Belarus State University)

Session Classification: S2-S5 Nouvel Sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **62** Type: **not specified**

Radiation from a Particle in Flight through a Plate, the Parameters of Which Vary According to an Arbitrary Periodical Law

Monday, 24 September 2012 19:34 (1 minute)

The radiation from a particle in flight through a plate, the parameters of which along the direction of motion change according to an arbitrary periodical law, has been investigated. The expressions for determination of spectral-angular distribution of radiation energy in vacuum (at large distances from the plate) are derived. The results of corresponding numerical calculations are given.

Primary authors: Prof. MKRTCHYAN, Alpik (Institute of Applied Problems in Physics); Prof. GRIGORYAN, Levon (Institute of Applied Problems in Physics)

Co-authors: Mr ASLANYAN, Ashot (Institute of Applied Problems in Physics); Dr KHACHATRYAN, Hrant (Institute of Applied Problems in Physics)

Presenter: Prof. GRIGORYAN, Levon (Institute of Applied Problems in Physics)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **63** Type: **not specified**

Intense Cherenkov Radiation from a Particle Rotating About a Dielectric Ball Along a Non-equatorial Orbit

Thursday, 27 September 2012 16:50 (15 minutes)

The radiation from a relativistic charged particle uniformly revolving along a non-equatorial orbit about a dielectric ball has been investigated. The results of numerical calculations testify that (a) for definite «resonant» values of the particle revolution frequency, and (b) in case of large values of the permittivity of ball material (strontium titanite) an intensive Cherenkov radiation is generated by the revolving electron with energy in excess of 20 KeV.

Primary authors: Dr MKRTCHYAN, Artak (Institute of Applied Problems in Physics); Prof. GRIGORYAN, Levon (Institute of Applied Problems in Physics)

Co-authors: Mr MKRTCHYAN, Edgar (Institute of Applied Problems in Physics); Dr KHACHATRYAN, Hrant (Institute of Applied Problems in Physics); Dr GRIGORYAN, Mher (Institute of Applied Problems in Physics)

Presenter: Prof. GRIGORYAN, Levon (Institute of Applied Problems in Physics)

Session Classification: S5.1 Nouvel sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **64** Type: **not specified**

Radiation from Channeling Electrons, Stimulated by Laser Beam

Monday, 24 September 2012 19:35 (1 minute)

Ultra relativistic electrons, moving in a channel along electron plane, may occupy only certain discrete energy quantum levels. Transition between levels is accompanied with emitting electromagnetic radiation. Due to high energy of electrons and due to Lorenz effect, energy of this radiated emission can be very high
This radiation can be additionally stimulated by certain interference with an electromagnetic wave, having the same frequency as the electron, moving in a channel in its own accompanying system.
Accurate calculations show, that due to Lorenz effect optical frequency range stimulating radiation can provoke intensive gamma-ray radiation from channeling electrons.
It means: we may convert the energy of the accelerated electron beam into the energy of emitted gamma-quants with much higher energies.
The effect can be realized on the electron beams with energies of several GeV or more and high intensity optical lasers, sending their beams nearly opposite the electron beam.

Primary authors: Dr OLCHAK, Andrey (MEPhI, Russia); Prof. KALASHNIKOV, Nikolai (MEPhI, Russia)

Co-author: Dr KHANGULIAN, E.V. (MEPhI, Russia)

Presenter: Dr OLCHAK, Andrey (MEPhI, Russia)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **65** Type: **not specified**

The effect of electron beam reflection in axial channeling Mode

Tuesday, 25 September 2012 12:40 (15 minutes)

Primary author: POLIMATIDI, Ilya (Lomonosov Moscow State University)

Presenter: POLIMATIDI, Ilya (Lomonosov Moscow State University)

Session Classification: S3.2 Channeling & Crystal Collimation

Track Classification: Channeling & Crystal Collimation

Contribution ID: **66** Type: **not specified**

Polarization Radiation Generated by a Charged Particle on a Rectangular Screen of Finite Permittivityy

Monday, 24 September 2012 19:36 (1 minute)

When a charged particle moves in a medium (or close to it), different types of
polarization radiation can arise: Cherenkov, transition, diffraction radiation, etc.
Because the particle's radiation losses are small compared to its total energy, polarization radiation can be used for non-intercepting beam diagnostic in modern accelerators [1]. Therefore, it is of great interest to investigate the characteristics of polarization radiation generated under the conditions close to experimental ones. In particular, it is of primary concern to consider diffraction radiation arising when a charged particle moves obliquely near a target with the finite sizes and permittivity.
To calculate radiation characteristics we use the method developed in the paper [2]; the method essence is that the polarization current induced in the target by the field of the charge moving rectilinearly and uniformly is considered as a radiation source. By means of the method, the characteristics of polarization radiation generated when relativistic charged particle with arbitrary energy moves obliquely near a rectangular screen and through a slit in the screen with the finite size and permittivity are obtained. Diffraction radiation characteristics
from the rectangular screen in the high-frequency approximation, i.e. at the frequencies much greater than the plasma frequency, are also investigated. The obtained results in the limiting cases (ideal conductivity, normal incidence, zero slit width) coincide with the known ones. The influence of multiple reflections in the target as well as the influence of imaginary part of permittivity on radiation characteristics is studied. The dependence of spectral and angular density of diffraction radiation on geometric sizes of the target is analyzed.

Primary author: Mr KRUCHININ, Konstantin (Tomsk Polytechnic University)

Co-authors: Dr KARLOVETS, Dmitry (Tomsk Polytechnic University); TALAEVA, Julia (Tomsk Polytechnic University)

Presenter: Mr KRUCHININ, Konstantin (Tomsk Polytechnic University)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **67** Type: **not specified**

BTF: status and evolution of the DAFNE beam test facility

Friday, 28 September 2012 12:00 (15 minutes)

The DAFNE beam test facility (BTF) has been operating successfully for ten years. The electron(positron) 50-750(550) MeV beams can also produce a tagged photon (Bremsstrahlung) beam and a neutron photo-production source (n@BTF) is under characterization. In addition to detector and beam diagnostics tests, the positron beam (down to 2 mrad divergence, 2 mm transverse rms size) has been also used for channeling experiments. We will presents the facility, as well as preliminary results and future development plans.

Primary author: VALENTE, Paolo (ROMA1)

Co-authors: Dr BUONOMO, Bruno (INFN LNF); Dr MAZZITELLI, Giovanni (INFN LNF); Dr QUINTIERI, Lina (INFN LNF); Dr FOGGETTA, Luca (INFN LNF); Dr FRASCIELLO, Oscar (INFN LNF)

Presenter: VALENTE, Paolo (ROMA1)

Session Classification: S5.4 Novel sorces: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **68** Type: **not specified**

Is it Possible to Produse Circularly Polarized γ-beam via Coherent Bremsstrahlung Process?

Monday, 24 September 2012 12:20 (15 minutes)

Beams of polarized electrons and positrons play an important role in experiments for discovering physics beyond the standard model [1]. Circularly polarized γ-beams are used for longitudinally-polarized positrons producing. Nowadays, there are experimentally improved methods for generation circularly polarized γ-beams based on electron radiation in the helical undulators [2] and Compton backscattering process where circularly polarized laser photons are scattered on electron beam [3].

In such a case, it seems very important to analyze new possibilities for circularly polarized photon beams generation.

We investigate the method for obtaining the circularly polarized photon beam based on the fact that superposition of two linearly-polarized beams can give a circularly polarized beam as a result. As a source of linearly-polarized photons we propose to use two crystals oriented in such a way that coherent bremsstrahlung (CBS) beams, which planes of polarization are rotated by 90 degrees, are generated in these crystals. In the first approximation, the CBS process of electrons passing through a set of crystalline chains can be described by the formulas for undulator radiation [4]. In this approximation, we investigate the dependence of circular polarization degree on
emitted photons energy and the distance between crystals. We have shown that with beam energy of 10 GeV and for emitted photon energy 50 MeV it is possible to achieve a circular polarization of the beam above 50 percent at the distance between crystals comparable with the formation length.

Primary author: Mr KRUCHININ, Konstantin (Tomsk Polytechnic University)

Co-author: Prof. POTYLITSYN, Alexander (Tomsk Polytechnic University)

Presenter: Mr KRUCHININ, Konstantin (Tomsk Polytechnic University)

Session Classification: S1.2 Coherent Bremsstrahlung

Track Classification: Coherent Bremsstrahlung

Contribution ID: **69** Type: **not specified**

Multiple Volume Reflection as an Origin of Significant Scattering Intensity and Radiation Power Increase

Tuesday, 25 September 2012 09:00 (25 minutes)

The effect of Multiple Volume Reflection from bent planes of one crystal combines the advantages of the space order of the planar and the strength of the axial fields. The experiments confirme that this effect gives rise to a five-time increase of one-plane Volume Reflection effect and manifests itself in much wider angular region than axial channeling. The advantages of the Multiple Volume Reflection applications for both the LHC beam collimation and gamma-radiation production are discussed.

Primary author: Prof. TIKHOMIROV, Victor (Research Institute for Nuclear Problems)

Co-author: Mr SYTOV, Alexei (Belarus State University)

Presenter: Prof. TIKHOMIROV, Victor (Research Institute for Nuclear Problems)

Session Classification: S3.1 Channeling & Crystal Collimation

Track Classification: Channeling & Crystal Collimation

Contribution ID: **70** Type: **not specified**

Experimental Demonstration of Unexpected Behavior of Angular Cherenkov Radiation Distribution

Thursday, 27 September 2012 17:10 (15 minutes)

The report is devoted to the discussion of the nature of Vavilov-Cherenkov effect. This radiation in transparent medium becomes observable under the condition when the phase velocity of its propagating turns out to be less than the velocity of the initial charged particle. The geometry of Vavilov-Cherenkov radiation driven by an electron bunch traveling obliquely in a vicinity of a prismatic dielectric target is very interesting from the pseudo-photon point of view. Unexpected experimental results show that Vavilov-Cherenkov criterion is the special case, which corresponds to the parallel passing of electron beam near the dielectric target. The experimental observation of Vavilov-Cherenkov radiation was performed in the millimeter wavelength range using extracted bunched 6,1 MeV electron beam of the microtron at Tomsk Polytechnic University. The obtained results may be useful for research and developed of new compact radiation source in a sub-mm and THz region.

The work is supported by the joint Russian-Chinese grant NSFC No 110210935011 and RFBR No 11-02-91177-GFEN_a.

Primary author: Mr SHEVELEV, Mikhail (Tomsk Polytechnic University)

Co-authors: Prof. POTYLITSYN, Alexander (Tomsk Polytechnic University); Mr KONKOV, Anatoly (Tomsk Polytechnic University); Dr NAUMENKO, Gennady (Tomsk Polytechnic University); Mrs SOBOLEVA, Veronika (Tomsk Polytechnic University); Mr BLEKO, Vitold (Tomsk Polytechnic University)

Presenter: Mr SHEVELEV, Mikhail (Tomsk Polytechnic University)

Session Classification: S5.1 Nouvel sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **71** Type: **not specified**

Plasmon "Wings"in the Photon Emission Spectra of the Quantum Channeled Particle

Monday, 24 September 2012 16:50 (15 minutes)

The photon emission of a quantum channeled particle, accompanied by a plasmon excitation in a crystal target is considered. It is taken into account that the plasmon energy in the crystal is of the same order with the depth of the potential well in which the channeled particle moves . A weak dispersion of the plasmons in the crystal is taken into account, which leads to the selection of the fixed plasmon energy. It is shown that fast charged particle in the rest frame emits photons with an energy equal to the energy difference between two quantized levels of transverse motion with the deduction of the net plasmon energy. The characteristics of photon-plasmon radiation are investigated.

Primary author: Prof. KALASHNIKOV, Nikolay (NATIONAL RESEARCH NUCLEAR UNIVERSITY MEPHI)

Co-author: Dr MAZUR, Evgeny (NATIONAL RESEARCH NUCLEAR UNIVERSITY)

Presenter: Prof. KALASHNIKOV, Nikolay (NATIONAL RESEARCH NUCLEAR UNIVERSITY MEPHI)

Session Classification: S2.1 Channeling Radiation & Related Fenomena

Track Classification: Channeling Radiation & Related Phenomena

Contribution ID: **72** Type: **not specified**

Coherent Bremsstrahlung from Neutrons

Monday, 24 September 2012 12:00 (15 minutes)

In a present report we develop theory and study coherent bremsstrahlung emitted from neutrons passing through crystal with small angle with respect to crystal axis. We calculate the dependence of the neutron bremsstrahlung cross-section on the neutron energies, and emitted photon energies.

Primary author: Prof. KUNASHENKO, Yuri (National Research Tomsk Polytechnic University; Tomsk State Pedagogical University)

Presenter: Prof. KUNASHENKO, Yuri (National Research Tomsk Polytechnic University; Tomsk State Pedagogical University)

Session Classification: S1.2 Coherent Bremsstrahlung

Contribution ID: **73** Type: **not specified**

Characteristics of final particles in multiple Compton backscattering process

Thursday, 27 September 2012 16:00 (25 minutes)

An electron passing through a counter propagated laser flash can interact with a few laser photons with emission a hard photon in each collision event. In contrast with the well-know nonlinear Compton backscattering (CBS) process where an initial electron "absorbs"a few laser photons and emits one hard photon the above mentioned process may be named as multiple CBS process. Physics of such a process is similar to electron radiation in a long undulator for ultrarelativistic case.
The report represents the results of Monte Carlo simulation of the multiple CBS process. The statistics of emitted hard photons number coincides with Poisson distribution in the case when the energy of initial photon approaches zero, i.e. for the undulator radiation process, that agrees with the result, obtained by Robb G.R.M. and Bonifacio R. [1]. However, rigorous quantum treatment of the process gives continuous energy distribution of final electrons in contrast to a discrete one, obtained in the cited work. The comparison of results obtained by Monte-Carlo simulations with analytical ones based on solution of kinetic equations [2] showed a good agreement between them for the case when an energy of initial photons is much less than electron rest mass. A taking into account of the multiple photon emission by each electron affects a resulting photon spectral distribution significantly.

1. Robb G.R.M. and Bonifacio R., Europhys. Lett. 94 (2011) 34002.
2. A.Kolchuzhkin, A. Potylitsyn, S. Strokov et al., Nucl. Instr. and Meth. B 201 (2003) 307.

Primary author: Prof. POTYLITSYN, Alexander (Tomsk Polytechnic University)

Co-author: Prof. KOL'CHUZHKIN, A. (Moscow Sate Technological University)

Presenter: Prof. POTYLITSYN, Alexander (Tomsk Polytechnic University)

Session Classification: S5.1 Nouvel sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **74** Type: **not specified**

Coherent Bremsstrahlung from Planar Channeled Positron

Monday, 24 September 2012 19:37 (1 minute)

In a present report we develop theory and study coherent bremsstrahlung emitted from planar channeled positrons passing through crystal with small angle with respect to crystal axis

Primary author: Prof. KUNASHENKO, Yuri (National Research Tomsk Polytechnic University; Tomsk State Pedagogical University)

Presenter: Prof. KUNASHENKO, Yuri (National Research Tomsk Polytechnic University; Tomsk State Pedagogical University)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **75** Type: **not specified**

Channeling of a Free Electron in a Field of Crossed Laser Beams

Monday, 24 September 2012 19:38 (1 minute)

The results of estimation and modeling of nonrelativistic electrons' dynamics in standing electromagnetic wave field, formed by crossed laser beams and accelerating electrostatic field, are shown here. Special interest was paid to defining the conditions of charged particles' bound state occurrence in such fields: a part of the electron beam might be trapped, that could be described as channeling in the field formed by a standing laser electromagnetic wave. A numerical model was created for describing and visualizing of the phenomenon in case of non-interacting electrons.

Primary authors: Mr DIK, Alexey (PN Lebedev Phys Institute, Moscow); Mr FROLOV, Evgenii (National Research Tomsk Polytechnic University); Prof. DABAGOV, Sultan (INFN LNF)

Presenter: Mr FROLOV, Evgenii (National Research Tomsk Polytechnic University)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **76** Type: **not specified**

Diffraction of Neutrons on the Acoustic Superlattice

Wednesday, 26 September 2012 10:30 (15 minutes)

In this work the effect of thermal neutrons focusing in a quartz single crystal under the influence of acoustic fields in Laue diffraction geometry has been theoretically discussed. It is shown, that by the variation of operating parameters of spatial acoustic fields induced in a quartz single crystal, it is possible to monochromatize the neutron beam, tenfold increase its intensity, focus and control the focusing location in space.

Primary authors: Dr MKRTCHYAN, Artak (Institute of Applied Problems of Physics NAS RA,); Dr KOCHARYAN, Vahan (Institute of Applied Problems of Physics NAS RA,)

Presenter: Dr KOCHARYAN, Vahan (Institute of Applied Problems of Physics NAS RA,)

Session Classification: S4.3 X-ray Channeling & X-ray Optics

Track Classification: X-ray Channeling & X-ray Optics

Contribution ID: **77** Type: **not specified**

Dechanneling Studies for Moderate Energy Electrons in Si Crystals

Monday, 24 September 2012 19:39 (1 minute)

In this report we have presented the results of our study on the problem of dechanneling for the SPARC electron beam energies. Dechanneling processes for electrons in (111), (110), (100) Si crystals based on the solution of Fokker-Planck equation have been studied. The influence of beam redistribution due to the processes of electron both dechanneling and rechanneling on spectral intensity of channeling radiation for electrons in a crystal is investigated.

Primary author: Dr BOGDANOV, Oleg (LNF&TPU)

Co-author: Prof. DABAGOV, Sultan (INFN Laboratori Nazionali di Frascati)

Presenter: Dr BOGDANOV, Oleg (LNF&TPU)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **78** Type: **not specified**

Light Sources Based on Relativistic Ion Beams

Monday, 24 September 2012 19:40 (1 minute)

Possible parameters of Light Sources based on Backward Rayleigh scattering of laser photons on relativistic ion beams in storage rings are discussed. Both electronic and nuclear ion transitions can be used. Different schemes of ion beam cooling are discussed to decrease the emittance of ion beams and such a way to increase the brilliance of the Light Sources.

Primary author: Dr BESSONOV, Evgeny (Lebedev Physical Institute RAS)

Presenter: Dr BESSONOV, Evgeny (Lebedev Physical Institute RAS)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **79** Type: **not specified**

Comparison of the SLAC Experimental Data on the Radiation of Planarly Channeled Positrons with Theory Taking into Account the Medium Polarization

Monday, 24 September 2012 16:30 (15 minutes)

The experimental results on radiation of (4-16) GeV positrons channeled between the diamond crystallographic planes have been compared with theories without taking into account the medium polarization in many works. Recently it has been developed the corresponding theory taking into account the density effect, and it has been carried out comparison with the experimental data only at 4 GeV and zero entrance angle. In this work using the theory it is presented the results of more complete comparison for various positron energies and entrance angles obtaining better agreement as in the region of relatively low energy photons as well as in the region of high energy photons.

Primary authors: Dr GEVORGIAN, Lekdar (Alikhanian National Science Laboratory, Yerevan Physics Institute); Prof. AVAGYAN, Robert (Alikhanian National Science Laboratory, Yerevan Physics Institute)

Presenter: Prof. AVAGYAN, Robert (Alikhanian National Science Laboratory, Yerevan Physics Institute)

Session Classification: S2.1 Channeling Radiation & Related Fenomena

Track Classification: Channeling Radiation & Related Phenomena

Contribution ID: **80** Type: **not specified**

Recent Progress in the Theory of the Crystalline Undulator

Thursday, 27 September 2012 09:50 (15 minutes)

The present state-of-the-art synchrotron radiation sources are capable for emitting electromagnetic radiation in a wide frequency range up to soft X rays. Moving further, i.e. into hard X ray and gamma-ray band, requires new technologies. One of the most promising ideas is using the phenomenon of charged particle channeling in single crystals.

A single crystal with periodically bent crystallographic planes can be used to force channeling particles to move along nearly sinusoidal trajectories and radiate in hard X ray and gamma ray frequency range. Such a device is known as {\it crystalline undulator}. Its advantage is due to the extremely strong electrostatic fields inside a crystal which are able to steer the particles much more effectively than even the most advanced superconductive magnets.

Initially, it was thought that a positron beam was needed to make the crystalline undulator feasible. Later, it was demonstrated that an electron based crystalline undulator was also possible, but it required an electron
beam with the energy in the range of several tens of GeV.

Due to the recent development of a new Monte Carlo code, a detailed simulation of particle channeling and radiation emission in a periodically bent crystal could be performed.

According to the newest the findings, the energy of electron beam below 1 GeV may be sufficient for the study of the undulator effect in periodically bent crystals and for obtaining very important and interesting results in the field.

Primary author: Dr KOSTYUK, Andriy (FIAS & ITP. Frankfurt University, Germany)

Presenter: Dr KOSTYUK, Andriy (FIAS & ITP. Frankfurt University, Germany)

Session Classification: S2.3 Channeling Radiation & Related Phenomena

Track Classification: Channeling Radiation & Related Phenomena

Contribution ID: **81** Type: **not specified**

Potential thermal and radiation damage to crystals in the LHC beams

Thursday, 27 September 2012 12:20 (15 minutes)

Limitations on application of silicon crystals for collimation of the LHC beams due to crystal damage are considered in the framework of FLUKA Monte Carlo tool.

Primary author: Prof. SMIRNOV, George (CERN)

Co-authors: Dr LECHNER, Anton (CERN); Dr PERILLO MARCONE, Antonio (CERN); Mr SCHOOFS, Philippe (CERN and EPFL)

Presenter: Prof. SMIRNOV, George (CERN)

Session Classification: S3.3 Channeling & Crystal Collimation

Track Classification: Channeling & Crystal Collimation

Contribution ID: **82** Type: **not specified**

On the phase contrast imaging by parametric x-rays

Tuesday, 25 September 2012 17:10 (15 minutes)

In the current contribution we analyze PXR-based phase contrast imaging in detail. It is shown that a PXR source can provide necessary spatial resolution, penetrating power, and sensitivity to soft tissue that is required to visualize biological and medical specimens on a scale from millimeters to microns. It should be also mentioned that because higher quality images require greater x-ray fluxes, there exists an inherent balance between image quality and bio-tissue damage.

Primary author: Prof. LOBKO, Alexander (Institute for Nuclear Problems, Belarus State University)

Presenter: Prof. LOBKO, Alexander (Institute for Nuclear Problems, Belarus State University)

Session Classification: S4.1 X-ray Channeling & X-ray Optics

Track Classification: X-ray Channeling & X-ray Optics

Contribution ID: **83** Type: **not specified**

High-Energy Charged Particle Deflection by a Bent Crystal in TeV energy Region

Tuesday, 25 September 2012 09:50 (15 minutes)

In this report the results of comparative analysis of the efficiencіy of charged particle deflection by a bent crystal using different deflection mechanisms in the TeV energy region are presented.

Primary author: Mr KYRYLLIN, Igor (Akhiezer Institute for Theoretical Physics of National Science Center Kharkov Institute of Physics and Technology)

Co-authors: Prof. SHUL'GA, Nikolai (Akhiezer Institute for Theoretical Physics of National Science Center Kharkov Institute of Physics and Technology); Dr TRUTEN', Valentyn (Akhiezer Institute for Theoretical Physics of National Science Center Kharkov Institute of Physics and Technology)

Presenter: Mr KYRYLLIN, Igor (Akhiezer Institute for Theoretical Physics of National Science Center Kharkov Institute of Physics and Technology)

Session Classification: S3.1 Channeling & Crystal Collimation

Track Classification: Channeling & Crystal Collimation

Contribution ID: **84** Type: **not specified**

Left handled materials in millimeter wavelength region

Friday, 28 September 2012 10:10 (15 minutes)

We demonstrate a type of composite meta-materials, which is constructed by combining thin copper wires and split ring resonators on the same board. Using the analysis of the phase delay of one-dimensional structures of meta-material, we reached the optimal structure parameters. Using the optimized target parameters we had investigated the orientation-angular dependence of radiation refraction in meta-material target. The measurements were performed in free space as well, as the spectral characteristics of refracted radiation in comparison with the initial spectra. The measured dependences show the formal correspondence of the radiation characteristics to the negative refraction index of the meta-material structures. This correspondence is only formal one, which follows from the Sinellius law, because really the permittivity and the permeability should be considered as macroscopic tensor characteristics of meta-material targets. But such viewpoint is usually applicable.

Primary author: Dr NAUMENKO, Gennady (Tomsk Polytechnic University)

Co-authors: Dr POTYLITSYN, Alexander (Tomsk Polytechnic University); Dr SHEVELEV, Mikhail (Tomsk Polytechnic University); Ms SOBOLEVA, Veronika (Tomsk Polytechnic University); Mr BLEKO, Vitold (Tomsk Polytechnic University)

Presenter: Dr NAUMENKO, Gennady (Tomsk Polytechnic University)

Session Classification: S5.3 Novel sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **85** Type: **not specified**

Observation and Comparative Analysis of Proton Beam Extraction/Collimation by Different Planar Channels of a Bent Crystal

Monday, 24 September 2012 19:41 (1 minute)

The results of recent IHEP (Protvino, Russia) experiment on 50 GeV proton beam extraction from the accelerator by means of a bent crystal are discussed.

Primary author: Mr KYRYLLIN, Igor (Akhiezer Institute for Theoretical Physics of National Science Center Kharkov Institute of Physics and Technology)

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Presenter: Mr KYRYLLIN, Igor (Akhiezer Institute for Theoretical Physics of National Science Center Kharkov Institute of Physics and Technology)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **86** Type: **not specified**

X-ray Generation from Tribocharging and Feasibility of Application for X-ray Fluorescence Analysis

Thursday, 27 September 2012 19:29 (1 minute)

X-ray generation by tribocharging is currently an attractive issue. C.G.Camara et al showed that x-rays can be generated by only peeling adhesive tape in vacuum without external electrical high-voltage power supply and demonstrated radiography of human fingers using this unique x-ray source. The X-ray emission, in this scheme, is interpreted as Bremsstrahlung radiation from electrons which are accelerated by the high electric fields that form as a result of charge separation at the dielectric surfaces of the peeling tape. X-ray generation by tribocharging has an advantage of flexibility for device design because of its simple structure and, making use of its flexibility, the x-ray generator is expected to be, not only compact, but also easily customized according to the sample shape.
Here, we proposed and made a prototype of looped-tape style, which consisted of two reels connected with a plastic looped-tape in a vacuum chamber and a shaft of one of the reels was covered with a double-side adhesive tape. In this scheme, x-ray emissions from same point and same angle, while in the original type of one-way wind up style, the emission point and angle are not fixed, but changed according to the remainder of the tape. We investigated its characteristics of the emission such as energy spectra and dependence on vacuum degrees.When the vacuum degrees was varied from 6.0×10-4 to 4.9×10-2 Torr, x-rays with energies over of 10 keV were observed in a vacuum less than 3.1×10-2 Torr, and the photon number was maximized around 3×10-3 Torr, which is similar to the results of E. Constable et al's group. Furthermore, we also showed the feasibility of its application for x-ray fluorescence analysis (XRF). By irradiating the tribocharging x-rays on a stainless-steel plate, the corresponding XRF peaks such as k-α lines of Cr, Fe, Ni were observed.

Primary author: Dr OISHI, Yuji (INFN(PI), CRIEPI)

Co-author: Dr NAYUKI, Takuya (CRIEPI)

Presenter: Dr OISHI, Yuji (INFN(PI), CRIEPI)

Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **87** Type: **not specified**

Modulation of FEL electron beam in the field of external laser radiation

Thursday, 27 September 2012 19:30 (1 minute)

This report describes research work on studying and testing the enhanced harmonic generation at FEL machines by external amplified signal of high harmonics generated in a gas to be applied to the SPARC accelerated electron beam. The aim is to investigate how the presence of the reinforcing laser radiation affects the motion of electrons and its characteristics. The task of this work is to optimize the external laser beam characteristics with regard to the characteristics of accelerated electron beam for generating the resulted radiation in X-ray range of the spectrum.

Primary author: Mr LIGIDOV, Azamat (National Research Nuclear University "MEPHI")

Co-authors: Dr MASSIMO, Ferrario (INFN Laboratori Nazionali di Frascati); Dr GIANNESSI, Luca (ENEA C.R. Frascati)

Presenter: Mr LIGIDOV, Azamat (National Research Nuclear University "MEPHI")

Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **89** Type: **not specified**

Excitation of evanescent wave by parametric X-ray radiation

Tuesday, 25 September 2012 16:50 (15 minutes)

Before, the evanescent X-ray wave was observed with use of characteristic X-rays as a source of radiation. Recently, V.P. Petukhov proposed the excitation of the evanescent wave by the Okorokov radiation of relativistic ions moving in a crystal [1]. In present paper we discuss possibilities for experimental observation of the evanescent wave excited by parametric X-ray radiation (PXR). The evanescent wave can be excited at the surface of the crystal in which the PXR is generated by relativistic charged particles. The reflection of the PXR should be emitted along the crystal surface. Conditions for excitation of the evanescent wave by the PXR reflection in Bragg and Laue cases with arbitrary direction of linear polarization are considered. Possibilities for experimental observation of the evanescent wave excited by the PXR in the both cases with use of the imaging plate [2] are discussed.

References

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2. Y. Takabayashi, A.V. Shchagin, Nucl. Instum. and Meth. B 278 (2012) 78-81.

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Presenter: Dr SHCHAGIN, Alexander (Kharkov Institute of Physics and Tecknology)

Session Classification: S4.1 X-ray Channeling & X-ray Optics

Track Classification: X-ray Channeling & X-ray Optics

Contribution ID: **90** Type: **not specified**

On Creation and Control of Dielectric Constant Superlattice in Spin-Glass Medium

Thursday, 27 September 2012 19:31 (1 minute)

The formation and governing of periodically modulated refractive index in medium is a most important problem of solid state physics and material science. First of all it is related to the possibility of developing compact UV or X-ray Free-Electron Lasers (FEL) based on emission of transition radiation (TR).
Currently the following two problems are discussed intensely:
a. A gas-plasma medium with periodically varied ionization density,
b. A special periodical solid-state superlattice-like (SSL) structures composed of layers with different refraction indexes.

Primary authors: Prof. MKRTCHYAN, Alpik (Institute of Applied Problems of Physics NAS RA); Dr GEVORKYAN, Ashot (Institute of Informatics and Automation Problems, NAS RA)

Presenter: Dr GEVORKYAN, Ashot (Institute of Informatics and Automation Problems, NAS RA)

Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **91** Type: **Oral**

Experimental and Theoretical Study of PXRC (Parametric X-Radiation at Channeling) from 255 MeV Elcetrons in Si

Monday, 24 September 2012 17:50 (25 minutes)

Primary author: KOROTCHENKO, K.B. (Tomsk Polytechnic University,Tomsk, Russia)

Co-author: Prof. PIVOVAROV, Yu. L. (Tomsk Polytechnic University,Tomsk, Russia)

Presenter: Prof. PIVOVAROV, Yu. L. (Tomsk Polytechnic University,Tomsk, Russia)

Session Classification: S2.2 Channeling Radiation & Related Phenomena

Track Classification: Channeling Radiation & Related Phenomena

Contribution ID: **92** Type: **not specified**

Radiation Energy Loss of Relativistic Electrons at Axial and Planar Channeling in Tungsten Crystal

Thursday, 27 September 2012 10:30 (15 minutes)

The results of computer simulation of electrons axial and planar channeling in thin tungsten crystal are presented. We calculated trajectories of relativistic electrons, spatial distributions and energy loss due to channeling radiation in the framework of classical electrodynamics using the computer code, developed by authors. Calculations are performed in connection with the experimental program for future positron source experiments on SPARC facility at LNF.

Primary author: Dr BOGDANOV, Oleg (National Research Tomsk Polytechnic University & Laboratori Nazionali di Frascati)

Co-authors: Prof. DABAGOV, Sultan (INFN Laboratori Nazionali di Frascati); Dr TUKHFATULLIN, Timur (National Research Tomsk Polytechnic University)

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Session Classification: S2.3 Channeling Radiation & Related Phenomena

Track Classification: Channeling Radiation & Related Phenomena

Contribution ID: **93** Type: **not specified**

Noncorrect Inverse Problems in N2 and CO2:N2:He Acoustoplasma

Thursday, 27 September 2012 19:32 (1 minute)

By the method of solving the noncorrect inverse problem is explored the influence of controlling parameters on the formation of acoustoplasma emission radiation lines and is determined the operating parameters of acoustic vibrations. With the help of experimental measurements of current and voltage values the parameters of acoustoplasma in a discharge tube are determined.

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Presenter: Prof. MKRTCHYAN, Alpik (Institute of Applied Problems of Physics NAS RA)

Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **94** Type: **not specified**

X-Ray Acoustic Diffractometer

Thursday, 27 September 2012 19:33 (1 minute)

The aim of this work is to show the advantages of monochromatic X-ray beam obtained by the acoustic monochromator (AM) with respect to X-ray beam obtained by the Bragg monochromator. On the basis of the AM, X-ray detector and a goniometer with two heads, developed at the Institute of IAPP NAS RA, and using only usual (old) diffractometers X-ray tube, an automated diffractometer for structural studies at high speed and high accuracy is designed.

Primary authors: Prof. MKRTCHYAN, Alpik (Institute of Applied Problems of Physics NAS RA, Yerevan, Armenia); Mr MOVSISYAN, Artur (Institute of Applied Problems of Physics NAS RA, Yerevan, Armenia)

Co-authors: Prof. POTYLITSYN, Alexander (Tomsk Polytechnic University, Russia, Tomsk); Dr MKRTCHYAN, Artak (Institute of Applied Problems of Physics NAS RA, Yerevan, Armenia); Prof. DABAGOV, Sultan (INFN Laboratori Nazionali di Frascati); Dr KOCHARYAN, Vahan (Institute of Applied Problems of Physics NAS RA, Yerevan, Armenia)

Presenter: Mr MOVSISYAN, Artur (Institute of Applied Problems of Physics NAS RA, Yerevan, Armenia)

Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **96** Type: **not specified**

Monochromatization of Diffracted Neutrons by the Acoustic Superlattice

In the work [1], for the first time the phenomena of transition of thermal neutrons from transmission to the reflection direction has been experimental obtained. The phenomena investigated for the neutrons diffracted on atomic planes of quartz single crystal under the influence of temperature gradient.
In this work the results of investigations of thermal neutrons scattering on quartz single crystal in Laue geometry under the influence of temperature gradient or acoustic waves created superlattice are represented.
As a source of neutrons the plutonium-239-berillium tablets are used with a paraffin moderator in form of 10 mm diameter discs
Experiments carried out for thermal neutrons without external influences point out that the diffracted neutrons energy distribution has an asymmetric form and becomes symmetric at the presence of external influences, i.e. the monocromatization effect observed.
Meantime, experiments pointed out, that for increasing temperature gradient or amplitude of acoustic vibrations the intensity of diffracted neutrons bunch increases up to maximal value, and after that decreases with increasing of governing parameters of external influences.
Experimental and theoretical results are in agreement.

References

1. A.R. Mkrtchyan, L.A. Kocharyan, M.A. Navasardyan at all. Journal of Contemporary Physics Arm SSR, vol..21, iss. 5, (1986) 287-289, (in russian).

Primary authors: Prof. MKRTCHYAN, Alpik (Institute of Applied Problems of Physics NAS RA); Dr MKRTCHYAN, Artak (Institute of Applied Problems of Physics NAS RA)

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Presenter: Dr MKRTCHYAN, Artak (Institute of Applied Problems of Physics NAS RA)

Contribution ID: **97** Type: **not specified**

Terahertz Radiation from Electrons Moving through a Waveguide with Variable Radius, Based on Smith-Purcell and Cherenkov Mechanisms

Thursday, 27 September 2012 19:35 (1 minute)

Cherenkov radiation arising when electrons pass through the hole (channel) in a target is known to be a very good source of THz radiation. In this work we explore theoretically the situation when internal radius of the channel is periodically changed. In this case Smith-Purcell radiation is added to the Cherenkov one. The expressions obtained coincide with the known ones in case of usual Cherenkov radiation, including the so called Tamm problem in it, and give the correct Smith-Purcell relation. We present the analytical and numerical analysis from point of view of enhancing the resulting radiation in THz range.

Primary author: Mr PONOMARENKO, Alexsandr (National Research Nuclear University «MEPHI»)

Co-author: Mr TISHCHENKO, Aleksey (National Research Nuclear University «MEPHI»)

Presenter: Mr PONOMARENKO, Alexsandr (National Research Nuclear University «MEPHI»)

Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **98** Type: **not specified**

Deflection of MeV Protons by an Unbent Half-Wavelength Silicon Crystal

Tuesday, 25 September 2012 11:40 (15 minutes)

Channeling effect in bent crystals is used as a power tool for beam steering. Motion of a channeled particle is characterized by oscillations between neighbor bent atomic planes. We studied the interaction between a 2 MeV proton beam and an unbent crystal as thin as 92 nm, i.e. half of the oscillation wavelength, demonstrating that also an unbent crystal can be used to steer charged particle beams. As the nominal beam direction is inclined by less than the critical angle for planar channeling with respect to the crystal planes, under-barrier particles undergo half an oscillation and exit the crystal with the reversal of the transverse momenta; i.e., the protons are "mirrored" by the crystal planes. Over-barrier particles suffer deflection, too, to a direction opposite that of mirroring. On the strength of such coherent interactions, charged particle beams can be efficiently steered through an ultrathin unbent crystal by the same physical processes as for thicker bent crystals.

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Presenter: Dr MAZZOLARI, Andrea (Ferrara)

Session Classification: S3.2 Channeling & Crystal Collimation

Track Classification: Channeling & Crystal Collimation

Contribution ID: **99** Type: **not specified**

Coherent X-ray Cherenkov and Transition Radiation at Bunch Oblique Incidence on a Target as X-ray Source

Thursday, 27 September 2012 19:36 (1 minute)

Polarization radiation from a relativistic charged particles bunch is considered at its oblique incidence onto amorphous target. The spectral-angular characteristics of both Cherenkov and transition radiation are explored at the X-ray frequencies. It is shown that for forward radiation the peaks both transition and Cherenkov (near the absorption lines) exist, whereas for backward direction there are only transition radiation peaks. The coherence effects and their dependence on the form of bunch, energy of the charged particles, the radiation wavelength are discussed. The analysis is made mainly for so called "water window"frequencies domain (energy of the radiation quanta are 284 –543 eV, the wavelength 4.47 –2.36 nm) that is of the most interest in the soft X-rays for practical applications in physics, biology and medicine. However, the results obtained are correct for much more wide frequencies range. It was demonstrated that coherence effects are very sensitive to the effects of radiation refraction on the target surface, and, consequently, to the surface shape.

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Presenter: Dr TISHCHENKO, Alexey (National Research Nuclear University "MEPhI")

Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **100** Type: **not specified**

About the Acoustoplasma State at Low Pressure

Thursday, 27 September 2012 19:37 (1 minute)

Changing of the emission spectrum of the first positive system of nitrogen is obtained in nitric low-pressure acoustoplasma (<1 torr) at a discharge current modulation. The intensity of all lines of the first positive system of nitrogen decreases, while the intensity of the line of doubly ionized nitrogen atom N II at 0,6482 micron is increasing significantly. Because the ionization potential of the N II ion is equal to 29,6 eV, for multiplying intensity of shining of this line energy of the electrons must be of the same order. The decreasing of the line intensities of the first positive system of nitrogen suggests that the average energy of electrons is much greater than the ionization potential of N I = 14,5 eV. The form of the spectrum suggests that the step ionization is not happened, but only single. Consequently, character of spectrum of nitric low- pressure acoustoplasma allows to talk that the middle electron energy increases from ~ 1 eV (for the usual plasma without acoustic disturbance) to 30 eV, and more (for acoustoplasma). I.e. practically takes place not step and single ionization. Also is observed the possibility of acceleration of positively charged particles in a magnetized low-pressure acoustoplasma in a magnetron diode.

Primary author: Prof. MKRTCHYAN, Alpik (Institute of Applied Problems of Physics NAS RA)

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Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **101** Type: **not specified**

Diffraction radiation from periodical structures as a source of X-rays

Friday, 28 September 2012 09:50 (15 minutes)

A theoretical analysis of the X-ray radiation emitted at the interaction of an ultra-relativistic particle with periodical structures is given. Two types of periodical target are considered: a thin crystalline plate and a diffraction grating consisting of strips. For the first case the analogous of parametric X-ray radiation in the geometry of diffraction radiation is explored. For the diffraction grating consisting of separate strips the Smith-Purcell radiation is investigated, including the coherence effects in the bunch radiation.

Primary author: Dr TISHCHENKO, Alexey (National Research Nuclear University "MEPhI")

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Presenter: Dr TISHCHENKO, Alexey (National Research Nuclear University "MEPhI")

Session Classification: S5.3 Novel sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **102** Type: **not specified**

Desktop X-ray Tomography of Low Contrast Samples

Tuesday, 25 September 2012 18:20 (15 minutes)

X Lab Frascati has one of the main activity dedicated to Imaging and tomography reconstruction, improving a new imaging technique on the base of polycapillary optics in order to study low contrast, even in combination with fast developing processes.
In this talk we are going to present our first results on micro-Tomography as possible future development of experimental layout characterized by polycapillary devices in the fields of biomedical imaging diagnostics, material science, environmental science, diagnostic for hi-tech, etc.

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Presenter: Dr HAMPAI, Dariush (LNF)

Session Classification: S4.2 X-ray Channeling & X-ray Optics

Track Classification: X-ray Channeling & X-ray Optics

Contribution ID: **103** Type: **not specified**

X-Ray Free-Electron Laser Based on Irregular Microundulator

The radiation characteristics of the electron bunch spontaneous radiation are obtained in irregular microundulator, where the radiation line width is conditioned by the irregularity. In the hard frequency region the spectrum is drastically changed due to the irregularity. In this case the linear gain of the stimulated radiation is conditioned by the distribution of the field sources and is dozens of times higher than that in case of the regular undulator. It was shown that using TTF FEL's 233 MeV energy electron bunch instead of SLAC's 13.6 GeV energy bunch it is possible to generate 8.3 KeV energy photon beam from the 10cm length of the interaction path.

Primary authors: Dr GEVORGIAN, Lekdar (ANL (Yerevan Physics Institute) Foundation); VARDANYAN, Valeri (ANL (Yerevan Physics Institute) Foundation)

Presenter: VARDANYAN, Valeri (ANL (Yerevan Physics Institute) Foundation)

Contribution ID: **104** Type: **not specified**

Symmetry Properties in Angular Distribution of Radiation in Thin Crystals

Monday, 24 September 2012 09:30 (15 minutes)

Radiation from an electron passing through a sufficiently thin oriented crystal is of dipole type, and so its spectral-angular distribution must be isomorphic for all species of crystals, depending only on the direction and anisotropy of the electron deflection in the crystal. The dipole radiation angular distribution, even at photon energies commensurable with the electron energy, possesses a high degree of symmetry elucidated by the notion of stereographic projection [1]. In particular, it proves that radiation polarization in the plane of small radiation angles at absolutely anisotropic scattering is distributed along a family of circles intersecting in two knots. One of those circles, with the opening radius exactly $\theta = 1/\gamma$, has the centre at zero angle, thus being invariant under rotations relative to the beam axis. That observation may be used to explain the fact that at this emission angle the radiation polarization is always 100\%, irrespective of the scattering anisotropy degree. When the photon to electron energy ratio becomes sizeable, the radiation becomes more isotropic. The notion of stereographic projection proves valid for non-dipole radiation as well, provided the electron deflection anisotropy degree is close to unity, as realized in undulators. Possibilities of experimental verification of the polarized dipole radiation symmetry properties are discussed, for various types of crystals capable of providing a high anisotropy degree of electron scattering.

References

[1] M.V. Bondarenco, Phys. Rev. A 82 (2010) 042723.

Primary author: Dr BONDARENCO, Micola (Kharkov Institute of Physics and Technology)

Presenter: Dr BONDARENCO, Micola (Kharkov Institute of Physics and Technology)

Session Classification: S1.1 Coherent Bremsstrahlung

Contribution ID: **105** Type: **not specified**

Multiple Scattering and Volume Capture of Charged Particles in Bent Crystals

Tuesday, 25 September 2012 12:00 (15 minutes)

Recent results [1] on incoherent multiple scattering for charged particles passing through bent crystals in planar orientation are surveyed. Regions in the crystal bending radius vs. particle energy (R, E) plane are determined, where:

i- the number of bent atomic planes crossed by the particle within the intrinsic volume reflection region of extent $\sim R\theta_c$ is greater than 1;
ii- the influence of thermal spread $u(T)$ of atomic nuclei in the crystallographic planes on the interplanar potential is negligible;
iii- multiple scattering angles acquired in the intrinsic volume reflection region are small compared to the Lindhard's critical angle θ_c;
iv- the volume capture probability is small.

Intersection of those regions gives optimal conditions for beam steering by volume reflection.

The estimates for volume capture indicate that it must occur predominantly as a result of scattering in the bent plane closest to the radial reflection point. Thereat, the volume capture probability obeys the scaling law [1]

\[
P_{\text{capt}}\propto \frac{R}{u^{1/2}(T)E^{3/2}}.
\]

References
[1] M.V. Bondarenco, Phys. Rev. ST-AB 15 (2012) 032802.

Primary author: Dr BONDARENCO, Micola (Kharkov Institute of Physics and Technology)

Presenter: Dr BONDARENCO, Micola (Kharkov Institute of Physics and Technology)

Session Classification: S3.2 Channeling & Crystal Collimation

Track Classification: Channeling & Crystal Collimation

Contribution ID: **106** Type: **not specified**

SuperB: a New Frascati Collider Facility

Sunday, 23 September 2012 16:15 (30 minutes)

An overview of the SuperB, high luminosity B-Factory project in Italy, will be presented. The main design features to reach the very high luminosity requested and a status of progress in the design will be given. The option of using the injector linac for accelerating a ultra low emittance beam for a SASE FEL facility will be also presented.

Primary author: GUIDUCCI, Susanna (LNF)

Presenter: GUIDUCCI, Susanna (LNF)

Session Classification: CHANNELING PRIMER

Contribution ID: **107** Type: **not specified**

Picosecond narrow bandwidth X-ray pulses from a Laser-Thomson-Backscattering source

Thursday, 27 September 2012 16:30 (15 minutes)

Intense ultra-short hard X-ray pulses can serve as a novel tool for structural analysis of complex systems with unprecedented temporal and spatial resolution. With the simultaneous availability of a high power short-pulse laser system it provides unique opportunities for a number of subsequent research steps at the forefront of relativistic light-matter interactions. At HZDR we demonstrated the generation of such a light source (PHOENIX) by colliding picosecond electron bunches from the ELBE linear accelerator with counter-propagating femtosecond laser pulses from the 150 TW Draco Ti:Sapphire laser system. The generated narrowband X-rays are highly collimated and can be reliably adjusted from 5.5 to 23.5 keV by tuning the electron energy (24 MeV to 30 MeV) and the laser intensity. Ensuring the spatial-temporal overlap at the interaction point and suppressing the Bremsstrahlung background we have achieved a signal to noise ratio of greater than 300. Together with the use of an X-ray camera to record the spectrum (resolution of 250 eV FWHM) we were able to resolve the angular-energy correlation and to study the influence of the beam emittance on the observed bandwidth. Besides the use of the thermionic gun we also collided electron bunches generated from an SRF photo-injector. Here we detected a few orders of magnitude higher Bremsstrahlung background from the machine dark current. By carefully subtracting the background we extracted the X-ray spectrum whose peak overlaps with the one from the thermionic as expected for the same electron energy.

Primary author: Mr JOCHMANN, Axel (Helmholtz-Zentrum Dresden-Rossendorf)

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

Session Classification: S5.1 Nouvel sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **108** Type: **Invited talk**

Electron and X-ray Beam with Laser-plasma accelerators

Sunday, 23 September 2012 16:45 (30 minutes)

The giant longitudinal electric fields produced in laser plasmas can be used to generate, in a compact and reproducible way, energetic electron beams with tuneable parameters. In those laser plasma accelerators, different injection schemes have been demonstrated such as the forced laser wake field [1], the bubble/blow out regime [2], or the colliding laser pulses [3] that offers the possibility to control the electron beam parameters. These electron beams with peak current of a few kA [4] are of interest for a very broad range of applications in medical, biological, chemistry or material science domains [5]. They are also of major interest for the production of very bright X/gamma ray beams [6]. I report here on the evolution of laser plasma accelerators developed at LOA and on very recent achievements we performed on the applications side.

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Primary author: Prof. MALKA, Victor (LOA)

Presenter: Prof. MALKA, Victor (LOA)

Session Classification: CHANNELING PRIMER

Track Classification: Channeling Primer

Contribution ID: **109** Type: **not specified**

Experimental Setup on 5.7 MeV Microtron for Investigation of Vacuum Ultraviolet and Ultrasoft X-Ray Radiations Generated in Multilayered Mirror

Thursday, 27 September 2012 19:38 (1 minute)

Experimental setup on the base of 5.7 MeV microtron for investigation of the radiation in the ultrasoft X-ray and vacuum ultraviolet region generated at incidence of relativistic electrons on the surface of a multilayer X-ray mirror is described. The results of the first test experiments carried out for observing the contribution of parametric radiation in generated X-rays are also presented.

Primary author: Dr UGLOV, Sergey (Tomsk Polytechnic University)

Co-authors: Dr KAPLIN, Valery (Tomsk Polytechnic University); Dr ZABAEV, Victor (Tomsk Polytechnic University)

Presenter: Dr UGLOV, Sergey (Tomsk Polytechnic University)

Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **110** Type: **not specified**

Energy Dependence of Angular Patterns of X-rays Generated by 20-35 MeV Rechanneling Electrons in Ultrathick Si Crystals

Thursday, 27 September 2012 19:39 (1 minute)

In this work the energy dependences of the spots and bands in angular patterns of X-rays generated by 20-35 MeV rechanneling electrons in a 2 mm thick Si crystal are presented. It is shown that such a complicated "background"additional to ordinary bremsstrahlung must be taken into account at studying of X-ray generation in periodic structures created on crystalline substrates because in the some cases the X-rays from rechanneling electrons might be so intensive that could mask the effects defined by the periodic structures.

Primary author: Dr KAPLIN, Valery (Tomsk Polytechnic University)

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Presenter: Dr UGLOV, Sergey (Tomsk Polytechnic University)

Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **111** Type: **Oral**

Opening of Channeling Primer

Flash trace over previous Channeling Editions

Contribution ID: **112** Type: **not specified**

First Measurement of Sub-picosecond Electron Bunch Length with Coherent Diffraction Radiation Interferometry

Thursday, 27 September 2012 19:40 (1 minute)

The interference pattern obtained by two diffraction radiation (DR) beams from two shifted targets may be used to determine the length of ultra-short electron bunches.Recently there was established the flexible coherent diffraction radiation interferometry scheme at the SINAP accelerator facility. Here we report the results of the first measurement of the electron bunch length down to sub-picosecond using such a technique.
The main parameters of fs linac were followings: beam energy −21 MeV, macropulse repetition rate −6.25 Hz, micropulse repetition frequency −2856.2 MHz. This accelerator provides electron bunch length of 0.3 −3 ps and normalized emittance ~10π mm×mrad.
The DR target was consisted of two plates (with sizes 46×20 mm2) made from 2 μm aluminum foil covered on 0.3 mm polyamide film. Both plates fixed on the holder with a possibility to move one plate relative other one along the beam direction with a step 16 μm. During such a movement we measured coherent DR intensity for each position (interferogram). We used a pyroelectric detector (the aperture diameter 5 mm, the sensitivity range 0.01 −3 mm).
From the measured interferogram the rms bunch length was found to be about 660 femtosecond, which confirms the ability of the proposed technique for non-invasive bunch length measurements in the sub-picosecond range.

Primary authors: Mr SHKITOV, Dmitry (Tomsk Polytechnic University); Mr ZHANG, Jianbing (Shanghai Institute of Applied Physics)

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Presenter: Prof. POTYLITSYN, Aleksandr (Tomsk Polytechnic University)

Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **113** Type: **Oral**

Opening of Channeling Primer

Flash trace over previous Channeling editions

Primary author: Prof. DABAGOV, Sultan

Presenter: Prof. DABAGOV, Sultan

Track Classification: Channeling Primer

Contribution ID: **114** Type: **not specified**

Inelastic Nuclear Interactions at Crystal Collimation of Proton Beams

Monday, 24 September 2012 19:42 (1 minute)

This work is devoted to the aspect of crystal collimation concerning the interactions between projectiles of a collimated beam and nuclei of a bent crystal used as a collimator (inelastic nuclear interactions, INI). Namely, here we continue to analyze
the dependence of INI intensity on crystal orientation. Additionally to that analysis here we consider the non-saturated regime of beam passage and include miscut-related effects.

Primary author: Dr BABAEV, Anton (Tomsk Polytechnic University)

Co-author: Prof. DABAGOV, Sultan (INFN Laboratori Nazionali di Frascati)

Presenter: Dr BABAEV, Anton (Tomsk Polytechnic University)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **115** Type: **not specified**

Simulations of Crystal Collimation in View of SPS/CERN Beam Optics

Monday, 24 September 2012 19:43 (1 minute)

In this work we present the computer code to simulate the influence of crystal collimator on the particle orbits in the storage ring. The code is adopted to be used together with ICOSIM \& ICOSIM++ codes. ICOSIM \& ICOSIM++ allow observing the
particle trajectory through the sequential magnetic collimators of different types. Our program uses the input data in ICOSIM format, simulates the passage of a particle through the crystal collimator and presents the output data in the known format. Hence, the program gives the possibility to place the crystal collimator into a set of magnetic collimators.

Primary author: Dr BABAEV, Anton (Tomsk Polytechnic University)

Co-authors: Mr CLIVAZ, Joel (CERN, European Organization for Nuclear Research); Prof. DABAGOV, Sultan (INFN Laboratori Nazionali di Frascati)

Presenter: Dr BABAEV, Anton (Tomsk Polytechnic University)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **116** Type: **not specified**

Radiation induced by charged particles in optical fibers

Wednesday, 26 September 2012 11:10 (25 minutes)

The field of a charged particle passing trough or near an optical fiber induces a transient polarization of the fiber atoms. This polarization turns into radiation, part of which is channelled by the fiber. We call it particle-induced guided light (PIGL). PIGL can also be generated by a particle passing trough or near a metallic object stuck to the fiber. This occurs via surface plasmons.

Two types of PIGL are considered, depending on whether translation invariance along the fiber axis is broken or not. Type-I occurs on a uniform part of the fiber. Type-II occurs at a fiber cut, at indentations or through metallic objects. Type-II, but not type-I, may receive background from real photons accompanying the beam.

Properties of type-I PIGL in a single-mode fiber are reviewed: intensity, spectrum, linear and circular polarizations in function of the particle velocity, impact parameter and incidence angle. Rough estimations of the Type-II PIGL intensity are given for a fiber cut or a metallic ball. Interference between regularly spaced balls leads to a guided Smith-Purcell radiation.

Application of PIGL to beam diagnostic is discussed.

Primary author: Mr ARTRU, Xavier (Université de Lyon, CNRS/IN2P3, IPNL)

Co-author: RAY, Cédric (Université de Lyon, CNRS/IN2P3, IPNL)

Presenter: Mr ARTRU, Xavier (Université de Lyon, CNRS/IN2P3, IPNL)

Session Classification: S2-S5 Nouvel Sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **117** Type: **not specified**

Plasma-based waveguides for acceleration of electrons: Experiment and theory

Thursday, 27 September 2012 19:41 (1 minute)

An experimental set-up has been developed at University of Pecs to generate plasma based waveguides for acceleration of electrons by the Hungarian Extreme Laser Infrastructure (ELI). The present study is focused on the theoretical analysis and experimental adjustment of the most critical parameters of the hydrogen-plasma generator that uses the so-called C-C excitation scheme for creation of a z-pinch with the waveguide-like gradient refraction index.

Primary author: Prof. KUKHLEVSKY, Sergei (University of Pecs)

Presenter: Prof. KUKHLEVSKY, Sergei (University of Pecs)

Session Classification: PS2 Poster Sesion

Track Classification: Channeling Primer

Contribution ID: **118** Type: **not specified**

ABOVE-BARRIER REFLECTION AND DEGENERATE STATES OF ENERGY BAND SPECTRUM IN PLANAR CHANNELING OF ELECTRONS AND POSITRONS

Thursday, 27 September 2012 12:40 (15 minutes)

ABSTRACT

The motion of a charged particle in a one-dimensional periodic potential of the Krönig-Penney type is considered. The energy band structure, Bloch wave functions in coordinate and momentum representation are investigated in detail. Two sharply distinguished groups of states, i.e. below-barrier and above-barrier, are extracted and the role of both of them in the channeling of positively and negatively charged particles is explained. It is shown that only using a dispersion equation form one is able to obtain information on the symmetry properties of the Bloch wave functions at the edges of energy bands. An estimate of the corresponding regions of the edge coherence in the Brillouin zone is given. In the above-barrier case a nontrivial effect is found of parity interchange violation of the Bloch wave functions at the edges of energy bands, connected with the nullification of the reflection coefficient either from the single barrier or well. An oscillatory behaviour of both allowed and forbidden band widths is revealed. The analytical results for different values of the parameters are illustrated by computer calculations.
The behaviour of Bloch wave reflection coefficients from potential barriers and wells for the nearest above-barrier energy band as a function of quasi-momentum in the Brillouin zone is investigated for different energies of channeled electrons and positrons. The variation of above-barrier reflection coefficients for the whole energy spectrum at transition from one energy band to another for each fixed energy value of incident particles is also studied.

Primary author: Dr BABAKHANYAN, Erine (National Research Laboratory after A.I. Alikhanian (Yerevan Physics Institute), Armenia)

Presenter: Dr BABAKHANYAN, Erine (National Research Laboratory after A.I. Alikhanian (Yerevan Physics Institute), Armenia)

Session Classification: S3.3 Channeling & Crystal Collimation

Track Classification: Channeling Radiation & Related Phenomena

Contribution ID: **119** Type: **not specified**

X-ray elemental imaging with scanning and projection modes in the laboratory

Tuesday, 25 September 2012 17:50 (25 minutes)

A nondestructive elemental imaging is important for environmental, forensic, and material sciences. In this seminar, a few approaches for x-ray elemental imaging in the laboratory at OCU will be introduced.
1) Scanning type micro-XRF method including confocal 3D-XRF
A confocal micro XRF instrument was developed using two polycapillary focusing lenses in the laboratory. This instrument showed a spatial (depth) resolution of 14 micro-meters for Au Lb. Several applications of confocal micro-XRF to forensic samples, industrial samples, and painting samples, will be shown.
2) Projection type XRF imaging (WD-XRF imaging)
The drawback of the confocal micro-XRF will be a long acquisition time. Thus, a projection type XRF imaging has been studied. In my laboratory, we have studied the combination of WD-XRF, straight polycapillary optics, and x-ray CCD camera. The preliminary elemental images will be shown.

Primary author: Prof. TSUJI, Kouichi (Osaka City University)

Co-authors: Mr NAKAZAWA, Takashi (Osaka City University); Mr OHMORI, Takashi (Osaka City University)

Presenter: Prof. TSUJI, Kouichi (Osaka City University)

Session Classification: S4.2 X-ray Channeling & X-ray Optics

Track Classification: X-ray Channeling & X-ray Optics

Contribution ID: **120** Type: **not specified**

Crystal Undulators: from the Prediction to the Mature Simulations

Thursday, 27 September 2012 09:30 (15 minutes)

The history of crystal undulator prediction is reminded, the method of simulation of the radiation from crystal undulators, based on both the realistic particle trajectory simulation and direct consistent integration of the general radiation formula, is outlined and a performance of possible crystal undulator constructions is simulated.

Primary author: Prof. TIKHOMIROV, Victor (Research Institute for Nuclear Problems)

Co-author: Prof. BARYSHEVSKY, Vladimir (Research Institute for Nuclear Problems)

Presenter: Prof. TIKHOMIROV, Victor (Research Institute for Nuclear Problems)

Session Classification: S2.3 Channeling Radiation & Related Phenomena

Track Classification: Channeling Radiation & Related Phenomena

Contribution ID: **121** Type: **not specified**

Features of Non-Dipole Radiation by Relativistic Electron in Thin Crystal

Monday, 24 September 2012 11:40 (15 minutes)

The multiple scattering of ultrarelativistic electron on atoms of matter conduces to violation of the dipole regime of radiation process. It occurs when the mean-square angle of electron scattering within the coherence length of radiation θms exceeds the characteristic angle of radiation of relativistic particle θ ~ 1/γ, where γ is the electron Lorenz-factor. One of the well-known examples of the non-dipole regime is the Landau-Pomeranchuk-Migdal effect of suppression of radiation in amorphous medium [1]. Another manifestation of the non-dipole regime of radiation is the effect of radiation suppression in a thin layer of matter, which was predicted and theoretically studied in [2, 3] and recently discovered experimentally in SLAC E-146 [4] and CERN NA63 [5]. Now this effect is called as the Ternovskii-Shul'ga-Fomin effect (TSF effect) [5]. One of the most unusual features of radiation process in a thin target at the TSF effect conditions is the logarithmic dependence of radiation yield in the soft part of the spectral density from the target thickness [3, 5, 6].

In crystals, the condition of non-dipole regime of radiation, namely θms > 1/γ, can be fulfilled at less thickness than in amorphous target due to the coherent electron scattering on atomic rows, known as the "doughnut scattering"effect (see, e.g. [7]). In a thin crystal, when the coherence length of radiation process is bigger than the crystal thickness, there are some interesting features of angular distributions and polarisation characteristics of radiation at the non-dipole regime [6, 8], which may be used for polarized gamma-quanta beam production.

We present here a brief review of theoretical and experimental studies of the features of the non-dipole regime of radiation in amorphous and crystalline targets and our propositions for a new experimental investigation in this field, especially concerning the angular distributions and polarisation characteristics of the non-dipole radiation in a thin crystal.

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Presenter: Dr FOMIN, Sergii (National Science Center "Kharkov Institute of Physics and Technology")

Session Classification: S1.2 Coherent Bremsstrahlung

Track Classification: Coherent Bremsstrahlung

Contribution ID: **122** Type: **not specified**

Parametric X-rays as conversion of virtual to real quanta

Thursday, 27 September 2012 19:42 (1 minute)

Emission of parametric X-ray radiation by relativistic charged particle is considered as a result of conversion of virtual quanta accompanying the relativistic charged particle moving in a crystal to real ones. A simple expression for conversion coefficient is obtained. Conditions when the coefficient value can exceed the unity are found.

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Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **123** Type: **not specified**

Phenomenon of Neutron-Fission Wave in Multiplicative Medium

A great interest for the future power engineering presents the development of new concepts of nuclear fission reactors with the so-called intrinsic safety, in which the development of uncontrolled chain nuclear reaction is impossible due to the physical principles of their operation. One of such concepts, proposed by Lev Feoktistov in 1988, is based on the phenomenon of self-sustained neutron-fission wave in a multiplicative medium [1]. The critical state in such a reactor is kept automatically without external control due to the negative reactivity feedback inherent in this non-linear regime of the neutron-fission wave propagation. Several research groups study this phenomenon using different approaches and different names for it: deflagration wave [2], CANDLE [3], nuclear burning wave (NBW) [4] etc. Lately, the most frequently used name is the "Traveling Wave Reactor"due to the TerraPower and Bill Gates activity [5].

We present here the results of our investigation of the neutron-fission wave phenomenon, which was carried out on the basis of numerical solution of non-stationary nonlinear diffusion equation for neutron transport in a multiplicative medium together with a set of the burn-up equations for fuel components and the equations of nuclear kinetics for precursor nuclei of delayed neutrons. A notable stability of the NBW regime relative to disturbances of the neutron flux in the system has been shown. This stability is conditioned by the above-mentioned negative reactivity feedback which is inherent in this regime .

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Presenter: Dr FOMIN, Sergii (National Science Center "Kharkov Institute of Physics and Technology")

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **124** Type: **not specified**

Scattering of Relativistic Particles in Bent Crystal with Variable Curvature

Tuesday, 25 September 2012 10:10 (15 minutes)

The scattering of relativistic particles in a bent crystal potential with a
variable curvature is considered using QM curvilinear squared Dirac equation and its classical relativistic spinless analogue with account of a dissipation.
The equations are solved numerically and the result demonstrates
several distinct features:
• The reflection of positive and negative particles when.
• The refraction of positive and negative particles, even
in the case of zero friction.
• The negative singularities (spiral scattering).
• The total number of refracted particles has a maximum near a critical
curvature. For high curvature, the number of refracted and reflected particles
becomes equal.
• For thin crystal, there is ”the effect of empty core”: positive particles
are refracted, negative particles are deflected.
• The phenomenon of spiral scattering and refraction is a primary coherent
effect and exists in the absence of dissipation.

Primary author: Dr KOVALEV, Gennady (UofM)

Presenter: Dr KOVALEV, Gennady (UofM)

Session Classification: S3.1 Channeling & Crystal Collimation

Track Classification: Channeling & Crystal Collimation

Contribution ID: **125** Type: **not specified**

High Energy Channeling History

Sunday, 23 September 2012 15:15 (30 minutes)

This short primer will cover the developments of GeV and TeV-scale channeling over more than four decades and also look to the future. Early studies at CERN and Fermilab confirmed that GeV scale channeling continued the behavior seen in the MeV regime. While working on the first channeling experiment at Fermilab, Tsyganov suggested using bent crystals. This enormously amplified the possibilities for channeling at high energy. Tsyganov and others subsequently demonstrated bent crystal channeling at Dubna. Experiments at Serpukhov, CERN, and Fermilab applied these new techniques to beam manipulation, collimation, and extraction. Overlooked in the initial wave of developments was a significant idea due to Taratin and Vorobiev for volume reflection. Clever arrangements of multiple crystal arrays such as those developed by Guidi have overcome the limitations of small deflection angles for volume reflection. Short crystal bending schemes have also broadened channeling possibilities. For the future, sophisticated approaches to crystal alignment are raising the hopes for axial bending. There are topics still to be covered in the detail they may merit. Muon channeling with the opportunity to study negative particles deserves more attention. Almost at the same time Tsyganov suggested bent crystal channeling, he also proposed using channeling for cooling beams. These and other possibilities for the future will be reviewed.

Primary author: Dr CARRIGAN, Dick (Fermilab)

Presenters: Dr CARRIGAN, Dick (Fermilab); Dr TSYGANOV, Edward (UTSWMC)

Session Classification: CHANNELING PRIMER

Contribution ID: **126** Type: **not specified**

Simulation of Positron Beam Generated by Photons from Channeled Relativistic Electrons on Different Crystallographic Planes and axes of Si, C, Ge and W Crystals with Geant4 and Mcnpx Monte-Carlo Codes

Monday, 24 September 2012 19:44 (1 minute)

A non conventional positron source using the intense γ radiation from different planes and axes of Si, C, Ge and W crystals which materialize into e+e- pairs in a tungsten amorphous converter is described. In this work we have calculated channeling radiation spectra from different planes and axes of Si, C, Ge and W crystals. The dependence of radiation on the incident angle of electrons are also investigated. The channeling radiation are then impinging on an amorphous tungsten target producing positrons by e+e− pair creation. The simulations are made with our developed Mathematica code which calculates the electron trajectories and the photon energy distribution for the crystal and Geant4 or Mcnpx for the amorphous target.

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Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **127** Type: **not specified**

Simulation of planar channeling radiation spectra of relativistic electrons and positrons in single crystals base on Mathematica

Thursday, 27 September 2012 10:10 (15 minutes)

We present new Mathematica codes for simulation of planar channeling radiation spectra of relativistic electrons (positrons) channeled along major crystallographic planes of a diamond-structure single crystal. The programs are based on the quantum and classical theory of channeling radiation which have been successfully applied to study planar channeling.

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Session Classification: S2.3 Channeling Radiation & Related Phenomena

Track Classification: Channeling Radiation & Related Phenomena

Contribution ID: **128** Type: **not specified**

Spectral and Angular Distributions of Emission from Relativistic Channeled Electrons in a Diamond Crystal in Vicinity of the Cherenkov Angle

Monday, 24 September 2012 19:45 (1 minute)

Here, we investigate in detail the influence of channelling in an optically transparent crystal on Cherenkov radiation from relativistic electrons. The obvious break of the Tamm-Frank condition for appearance of the Cherenkov radiation (rectilinear motion with a constant velocity, greater than the phase velocity of light in a crystal) is due to periodic or quasi-periodic motion under channelling or quasi- channelling. In connection with this, one may expect: a) broadening of the Cherenkov cone, connected with periodic deviation of the channelled electron velocity vector from the average one; b) peculiarities of spectral-angular distribution at the fixed emission angle in vicinity of the Cherenkov cone. In addition, at planar channelling one may expect the break of the axial symmetry of angular distribution of Cherenkov radiation and even appearance of new features of linear polarization. The predicted effects strongly depend on electron beam energy. The connections with normal and anomalous Doppler effect are discussed.
The results of this work will be used in developing of new experimental proposal on studies of the ChR angular distributions from moderate energy electron beams, e.g. at SAGA-LS.

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Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **129** Type: **not specified**

Spheroidal Coordinates and Diffraction of Waves by Prolate Spheroid and Polyhedrons

Thursday, 27 September 2012 19:43 (1 minute)

The total cross section for the wave scattering by prolate spheroid is compared with the traditional approach of solving the similar problem of scattering by atomic chain.
We show that a set of piecewise continuous spheroidal coordinates and corresponding spheroidal functions can be a powerful tool for wide class of scatterers, in particular: cylinders with polygon profiles and 3D polyhedrons. These geometrical scatterers play an important role in physical theory of diffraction (PTD, Ufimtsev), geometrical theory of diffraction (GTD, Keller) and scattering the De Broglie waves and have many applications in microwave and radar technologies.

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Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **130** Type: **Oral**

Effects of picosecond terawatt UV laser beam filamentation and a repetitive pulse train on creation of prolonged plasma channels in atmospheric air

Thursday, 27 September 2012 19:00 (20 minutes)

The multiple filamentation over very long propagation distances ~ 100 m was measured for peak pulse power exceeding the critical value for λ=248-nm radiation (~108 W) in 2000 times. An all-reflection mirror focusing scheme with a small numerical aperture of about 3 10-4 was designed. The intensity distribution was recorded by using glass plate fluorescence under UV irradiation with imaging at the time-gated CCD. It was found that the filamentation of high-power UV laser beam is quite different of longer wavelengths.

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Presenter: Dr ZVORYKIN, Vladimir (PN Lebedev Phys Institute)

Session Classification: S5.2 Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **131** Type: **not specified**

Parametric X-Ray Radiation Produced by Microbunched Beams

Thursday, 27 September 2012 19:44 (1 minute)

Analytical and numerical results on the coherent parametric X-ray radiation (CXPXR) produced by microbunched beams passing through the crystalline planes of single crystals under certain conditions are obtained. Despite the expectations the preliminary results for ultrarelativistic particles obtained in first approximation under certain assumptions show that the intensity of CXPXR is lower that of coherent x-ray transition radiation (CXTR) of microbunched electron beams because in contrast to XTR, RTR and other types of radiation the spectral distribution of PXR of single particles is very narrow. There is a hope that more accurate calculations of CXPXR taking accurately into account the angular and spectral distributions will give higher intensity of CXPXR.

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Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **132** Type: **not specified**

Channeling Radiation of Microbunched Beams

Monday, 24 September 2012 19:46 (1 minute)

Theoretical and numerical results on the spectral and angular distributions as well as on total number of the radiated photons of the coherent X-ray channeling radiation (CXChR) produced by microbunched beams channeled in single crystals are obtained. The results show that for certain conditions CXChR has spectral and angular distributions much narrower than the channeling radiation of single relativistic particles, while its narrow angular distribution has a maximum at angles much less than the channeling radiation for single particles. Due to the stimulated nature the intensity of CXChR is proportional to the square of the number of the channeled electrons and of the beam modulation. Possible applications of CXChR are discussed.

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Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **133** Type: **not specified**

Focusing Systems for X-ray Micro Beam: an Overview

Sunday, 23 September 2012 17:15 (30 minutes)

This work reviews the most used optical systems for X-ray microprobes and summarizes the experiences in research with synchrotron radiation as well as with X-ray tube generators.
The need for smaller beam spot sizes for various applications and the unique properties of X-rays have induced a remarkable and fast development in X-ray optical systems. These systems are divided into four main categories: diffractive, reflective, refractive and absorbing. Examples of the first three will be covered in this work, highlighting the properties that allow having spot sizes down to sub-micrometer regime.
However, the extraordinary capabilities of such systems are always relative. Therefore, an overview of the techniques that use such optical systems will be given, emphasizing their applicability on several case studies.

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Session Classification: CHANNELING PRIMER

Contribution ID: **134** Type: **not specified**

Optimization of Heating Problems using Granular Positron Converters

Friday, 28 September 2012 09:30 (15 minutes)

At GeV incident electron energies on axially oriented crystals, channeling radiation is providing a powerful source of photons ; these photons generate a large number of e+e- pairs in a converter. The hybrid positron source associating a crystal-radiator and an amorphous converter, with a bending magnet in between, looks interesting for the deposited energy and its density in the amorphous converter; such concept has been adopted for the CLIC baseline positron source. Using a granular converter made of small spheres, improve the heat dissipation and allow us to consider such solution for very intense beams. The main characteristics of a hybrid positron source using a granular converter are described; they concern the photons as well as the positrons. Precisions on the deposited energy and is density in the target, are given. Methods of cooling are also reported. Solutions compatible with ILC conditions and requirements are presented.

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Session Classification: S5.3 Novel sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **135** Type: **not specified**

Crystalline Undulator Radiation of Microbunched Beams Taking into Account the Medium Polarization

Monday, 24 September 2012 19:47 (1 minute)

Analytical and numerical results are obtained on the angular and spectral distributions as well as on the total number of the photons of the coherent X-ray crystalline undulator radiation (CXCUR) produced by microbunched beams passing through a crystalline undulators (CU). The results show that one can use CXCUR for studying the microbunching process in XFELs and for production of additional monochromatic intense beams

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Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **136** Type: **not specified**

High-reflectivity Laue lens made by curved crystals for high-resolution focusing of x and gamma rays

Tuesday, 25 September 2012 16:30 (15 minutes)

At Sensor and Semiconductor Laboratory (Ferrara, Italy) we have undertaken a research and development plan to implement Si and Ge grooved CDP crystals onto the lens through several methods. An intriguing effect of anisotropy in crystal deformation is exploited to combine the high reflectivity of the CDP with the capability of focusing the radiation onto a very small focal spot. Quasi-mosaicity is used to fabricate self-standing curved crystals with two curvatures of different crystalline planes. Since the size of the focal spot of the photons diffracted by a crystal can be controlled by the quasi-mosaic (QM) curvature, QM crystals allow focusing with very high resolution, the signal-to-noise ratio being about an order of magnitude larger than that for mosaic crystals. On the other hand, a stacking of equally curved crystal plates, aligned with each other with high accuracy is also proposed as an optical element for x- and gamma-ray focusing. In a Laue lens scheme, the stack should be positioned with the diffracting planes parallel to the major surface of the crystalline plate and perpendicular to the lens surface. Photons enter the stack nearly parallel to the diffracting planes, suffer diffraction and undergo focusing onto the detector. A stacking of grooved Si crystals has been characterized at ILL (Grenoble, France) and has proven to yield a well-defined focal spot under x-ray diffraction, highlighting sufficiently good alignment of the CDP in the stack. In this way the stack behaves as it were a single crystal from the point of view of diffraction by CDP. This technology opens up a viable way to build up optical components for x- or ɣ-ray diffraction without any size constraint, which may be useful in Laue lens application, where weight constraint is mandatory.

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Session Classification: S4.1 X-ray Channeling & X-ray Optics

Track Classification: X-ray Channeling & X-ray Optics

Contribution ID: **137** Type: **not specified**

Brief history of CLIC and other brilliant positron sources

Friday, 28 September 2012 09:00 (25 minutes)

The CLIC (Compact Linear Collider), as future linear collider, requires intense positron source. For the baseline configuration, it assumes unpolarized beams. A conventional scheme, with a single tungsten target as source of e-e+ pairs, has been studied several years ago. But, in order to reduce the beam energy deposition on the e+ target converter, a double-target system has been studied and proposed as baseline for CLIC. With this "hybrid targets", the positron production scheme is based on channeling process. A 5 GeV electron beam impinges on a thin crystal tungsten target aligned along its <111> axis, enhancing the photon production with channeling radiation. The large number of photons is sent to a thick amorphous tungsten target, generating large number of e-e+ pairs, while the charged particles are bent away, reducing the deposited energy and the PEDD (Peak Energy Deposition Density). The targets parameters are optimized for the positron production. Polarized positron beams, is an option for CLIC, which needs much further R&D and will be simply mentioned. Some other brilliant positron sources (ILC, LHeC, SuperB,⋯) will also be briefly reviewed.

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Session Classification: S5.3 Novel sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **138** Type: **not specified**

Advances in Laser Fusion Energy

Thursday, 27 September 2012 18:40 (15 minutes)

The long running quest for demonstrating ignition and gain in Inertial Confinement Fusion [1] has come to crucial point, where the proof of principle of this approach to fusion energy is within the reach of the scientific community. We present the status of this field of research, both at the international [2] and european level [3], focussing on the experimental activities, on the guiding models, and on the diagnostic tools that are routinely used or currently developed. The path ahead is also indicated, highlighting some of the key points in the design of a fusion reactor. The recent results obtained by our group concerning target design for shock ignition [4] and optimization of irradiation schemes [5] are illustrated.

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[4] S. Atzeni, A. Schiavi and A. Marocchino, Plasma Physics and Controlled Fusion 53 (2011) 35010
[5] A. Schiavi, S. Atzeni and A. Marocchino, Europhysics Letters 94 (2011) 35002

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Session Classification: S5.2 Novel sources: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **139** Type: **not specified**

Gamma-ray Optics for High-Energy Astrophysics

Tuesday, 25 September 2012 16:00 (25 minutes)

Gamma-ray astronomy presents an extraordinary scientific potential for the study of the most powerful sources and the most violent events in the Universe. Those extreme conditions occur generally at the endpoints of stellar lives, when the comparatively calm thermal evolution gives way to more violent non-thermal processes.
Present telescopes in nuclear astrophysics make use of inelastic interaction processes based on geometrical optics or quantum optics, i.e. shadowcasting in modulating aperture systems, and particle tracking detectors respectively. After reviewing the above instrument concepts, we focus on recent developments in crystal diffraction optics. For the first time in gamma-ray astronomy, this type of optics permits to concentrate photons from a large collector onto a small detector, dramatically improving the sensitivity of next generation space telescopes.

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Session Classification: S4.1 X-ray Channeling & X-ray Optics

Track Classification: X-ray Channeling & X-ray Optics

Contribution ID: **140** Type: **not specified**

UV/X-ray Diffraction Radiation for Non-intercepting Micron-scale Beam Size Measurement

Thursday, 27 September 2012 19:45 (1 minute)

Diffraction radiation (DR) is produced when a relativistic charged particle moves in the vicinity of a medium. The electric field of the charged particle polarizes the target atoms which then oscillate, emitting radiation with a very broad spectrum. The spatial-spectral properties of DR are sensitive to a range of electron beam parameters. Furthermore, the energy loss due to DR is so small that the electron beam parameters are unchanged. Therefore DR can be used to develop non-invasive diagnostic tools. The aim of this project is to measure the transverse (vertical) beam size using incoherent DR. To achieve the micron-scale resolution required by CLIC, DR in UV and X-ray spectral-range must be investigated. During the next few years, experimental validation of such a scheme will be conducted on the CesrTA at Cornell University, USA. Here we present the current status of the experiment preparation.

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Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **141** Type: **not specified**

Gamma Resist Experiment at SPARC_LAB

Friday, 28 September 2012 12:20 (15 minutes)

Gamma Resist (γ-Resist) is the name of a new proposed experiment to be hosted at INFN laboratories in Frascati. The purpose of the experiment is to set up an all optical γ-ray source driven by Thomson/Compton scattering between laser plasma generated electrons and a counterpropagating laser pulse. The 250 TW FLAME laser will be used to drive the whole process. Compactness, tunability and photon flux make this source of γ-rays is interesting for a range of applications, possibly including nuclear resonance fluorescence (NRF), compact cold positron source, provided electron bunch parameters and interaction configuration are optimized. Moreover, the proposed experiments at FLAME could help developing detection capabilities and solving technical issues related to the identification of physical processes like radiation friction which, according to recent models, are expected to affect the properties of the γ-rays emitted at the extreme intensities foreseen in future bigger scale facilities.

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Session Classification: S5.4 Novel sorces: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **142** Type: **not specified**

Nuclear Synthesis On Ordered Crystal Target With Participation Of Monochromatic Beams Of Light Or Middle Isotopes

Thursday, 27 September 2012 19:46 (1 minute)

In ordered crystal lattice very strong influence of crystal axes and planes electrical field on motion and interaction of fast charged particles with crystal atoms and nuclei exists. In works [1,2] it was shown that in monocrystal targets like possibility of fusion process with the participation of both target nuclei (e.g.) and beam of fast nuclei (e.g.), directed at Lindhard angle, increases by 10-100 times relative to the possibility of alternative process of deceleration on atomic electrons. Such changes are based on the usage of specific channeling physics regime of motion - "overbarrier motion". At such regime the processes of spatial redistribution and dechanneling of accelerated ions take place. In the report the methods of optimization and practical realization of such nuclear fusion are discussed in details.

The additional method of radical optimization of fusion processes with the participation of monochromatic beams of middle mass isotopes is proposed. It is well known that the presence of the Coulomb barrier is the main obstacle to performing nuclear reactions of synthesis with low energy of interacting nuclei. In order to make such reaction possible, it is necessary to place interacting particles in the same spot simultaneously (within the range of atomic force action). In this case, the cross section of nuclear reaction depends on the energy of reciprocal movement of nuclei and matches the "internal atomic cross section". The features of optimized nuclear fusion model, with the use of accelerated average-mass ions beams and condensed-surface targets, based on resonant tunneling effect were considered. Optimization process based on the using of conditions for the interaction of nuclear beam and target, for which "internal cross-section"of fusion exceeds the cross-section of crystal low-level cell, and resonant tunneling effect provides the full transparency of reaction barrier. The use of particle beams with optimal energy and small (but real) energy distribution, which correspond to total transparency "window"of reaction barrier, as it was shown, leads to the possibility of positive nuclear fusion energy release on one atomic monolayer [3]! Such effect can be regarded as nuclear super absorption of accelerated beam. The possibility of nuclear reactions and at such motion regime with positive energy release was examined.

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Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **143** Type: **not specified**

Ion-Channeled Electron Radiation

Thursday, 27 September 2012 19:47 (1 minute)

Researches of the last years showed that interaction of intense ultrashort laser impulses with plasma can be a source of compact bunches of electrons as well as of powerful high- energy electromagnetic radiation. Due to the high gradient of the field of a laser, impulse electrons can be accelerated till the speeds close to the light velocity. Plasma waves being formed behind a laser impulse degenerate in a cavity, free of plasma electrons and capable to trap the electrons accelerated by a laser impulse. It should be underlined that this cavity moves with a speed of the laser impulse, forming in this way a continuous potential to bound the electrons under successful acceleration. In other words the cavity becomes an infinite ion-channel for an electron.
In this work we have studied the electron motion in continuous ion-channel and the processes of electromagnetic radiation by ion-channeled electron. Both classical and quantum cases in approach of a scalar electron are considered.

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Session Classification: PS2 Poster Sesion

Track Classification: Poster Session

Contribution ID: **144** Type: **not specified**

Generation and Application of Channeling X-Rays using a Novel Low-Emittance Electron Beam: Plans and Status

Wednesday, 26 September 2012 09:00 (25 minutes)

We have plans to use very low-emittance electron beams to generate channeling x-rays capable of being used for phase-contrast imaging and electron diffraction imaging. We have developed field-emission cathodes made of small needles of diamond with end radii of 10 nm. We have measured emission of 10 μA per tip at modest accelerating fields, and we have fabricated them as single emitters and as arrays. We have run simulations that indicate that the very low emittance can be preserved through an RF gun and accelerator and focused to a 40 nm spot on the crystal target, yielding very high x-ray spectral brilliance. We are planning channeling experiments with these novel cathodes on two accelerators at Fermilab: the High-Brightness Electron Source Laboratory photoinjector and later on the Advanced Superconducting Test Accelerator.

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Session Classification: S4.3 X-ray Channeling & X-ray Optics

Track Classification: X-ray Channeling & X-ray Optics

Contribution ID: **145** Type: **not specified**

Acceleration with self-injection and all-optical radiation sources at LNF

Friday, 28 September 2012 11:10 (25 minutes)

Laser-plasma acceleration of electrons is currently being explored worldwide as a possible future alternative to conventional accelerators.
In the mean time, existing approaches for accelerating electrons at relativistic energies using compact schemes and relatively high power lasers are being considered for a range of studies aiming at fundamental and applied research.
Among these, the possibility of exploring fundamental open issues of electrodynamics, including radiation reaction effects on accelerated electrons, can be combined with the opportunity of generating bright γ-ray radiation via Thomson and inverse Compton scattering in an all-optical configuration.
A programme has been established at LNF within the Sparclab infrastructure which is dedicated to the exploration of these issues , starting from the generation of a reliable source of relativistic electrons using laser-plasma acceleration with self-injection in gases and aiming at the establishment of a unique experimental configuration in which interaction of laser-accelerated electrons with intense laser pulses occurs at the highest possible electromagnetic field intensities to explore inverse Compton and to demonstrate the use of scattered γ-rays for applications to material sciences and astrophysics. An overview of the underlying physics and a description of the current state of the programme will be given in the presentation.

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a on behalf of the SL-SITE and SL-G-RESIST collaboration
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Session Classification: S5.4 Novel sorces: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **146** Type: **not specified**

SPARC_LAB

Friday, 28 September 2012 11:40 (15 minutes)

A new facility named SPARC_LAB (Sources for Plasma Accelerators and Radiation Compton with Lasers and Beams) has been recently launched at the INFN National Labs in Frascati, merging the potentialities of the old projects SPARC and PLASMONX. The test facility is now completed, hosting a 150 MeV high brightness electron beam injector which feeds a 12 meters long undulator. Observation of FEL radiation in the SASE, Seeded and HHG modes has been recently performed from 500 nm down to 40 nm wevelength. A second beam line has been also installed and is now hosting a narrow band THz radiation source. In parallel to that, INFN decided to host a 300 TW laser that will be linked to the linac and devoted to explore laser-matter interaction, in particular with regard to laser-plasma acceleration of electrons (and protons) in the self injection and external injection modes, (the PLASMONX experiments). The facility will be also used for particle driven plasma acceleration experiments (the COMB experiment). A Thomson scattering experiment coupling the electron bunch to the high-power laser to generate coherent monochromatic X-ray radiation is also in the commissioning phase.

- on behalf of SPARC_LAB collaboration

Primary author: Dr FERRARIO, Massimo (INFN LNF)

Presenter: Dr FERRARIO, Massimo (INFN LNF)

Session Classification: S5.4 Novel sorces: PXR&TR&FEL&Plasma

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **147** Type: **not specified**

Registration

Sunday, 23 September 2012 13:00 (1 hour)

Session Classification: CHANNELING PRIMER

Contribution ID: **148** Type: **not specified**

Opening

Sunday, 23 September 2012 14:00 (15 minutes)

Presenter: DABAGOV, Sultan (LNF)

Session Classification: CHANNELING PRIMER

Contribution ID: **149** Type: **not specified**

Greetings from Comune di Alghero

Sunday, 23 September 2012 14:15 (30 minutes)

Presenter: LUBRANO, S.

Session Classification: CHANNELING PRIMER

Contribution ID: **150** Type: **not specified**

LNF: New trends of Frascati

Sunday, 23 September 2012 14:45 (30 minutes)

Presenter: DOSSELLI, Umberto (PD)

Session Classification: CHANNELING PRIMER

Contribution ID: **151** Type: **not specified**

LHC: Status & Future

Sunday, 23 September 2012 15:45 (30 minutes)

Presenter: BERTOLUCCI, Sergio (LNF)

Session Classification: CHANNELING PRIMER

Contribution ID: **152** Type: **not specified**

Quantum FEL

Presenter: BONIFACIO, Rodolfo

Contribution ID: **153** Type: **not specified**

Quantum FEL

Sunday, 23 September 2012 17:45 (30 minutes)

Presenter: BONIFACIO, Rodolfo

Session Classification: CHANNELING PRIMER

Contribution ID: **154** Type: **not specified**

On the influence of a particle's field evolution on its ionization energy losses in thin layers of substance

Presenter: Mr TROFYMENKO, Sergii (Akhiezer Institute for Theoretical Physics of NSC KIPT)

Track Classification: Coherent Bremsstrahlung

Contribution ID: **155** Type: **Invited talk**

Current and future ion acceleration mechanisms employing ultraintense lasers

Thursday, 27 September 2012 17:50 (25 minutes)

Over the last 10 years the acceleration of ions with high-power lasers has been extensively investigated by many groups worldwide. The main acceleration mechanisms studied in experiments are via electrostatic sheaths set-up at the surface of laser-irradiated foils by relativistic electrons. Beams produced via this mechanism have very different properties from conventional accelerator beams. Some of these unique characteristics (very low emittance, picosecond emission time, ultralarge current) have already been exploited in a number of innovative applications.

Other properties, less desirable for some applications, are the broad spectrum (cutting off in the 70-100 MeV range) and the beam divergence, and various techniques are being developed with the aim of controlling/optimizing these parameters.

Different mechanisms currently emerging are based on the enormous radiation pressure carried by intense laser pulses, and promise natively narrow band spectra at GeV energies/nucleon with the next generation of high power lasers.

This talk will briefly review the current status and the prospects for near term progress of laser-driven ion acceleration through these mechanisms, with particular reference to recent experimental activities on UK high-power laser facilities.

Presenter: Prof. BORGHESI, Marco (Queen's University Belfast)

Session Classification: S5.2 Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **156** Type: **Poster**

The Effect of Electron Beam Reflection in Axial Channeling Mode

Monday, 24 September 2012 19:48 (1 minute)

The subject of this work is description and investigation of some of the recently demonstrated phenomena in the thin crystal channeling related to charged particle refraction effects via computer simulations based on methods developed in [1,2].
In the proposed model charged particle beam evolution is simulated using the trajectory- based approach. The latter can be viewed as the Monte-Carlo method applied to the kinetic energy equation for distribution in the 2D phase space of particle's position and velocity in the plane transversal to the crystallographic axis. Each trajectory is evaluated as a solution of the corresponding stochastic differential equation. The coherent scattering of particle by crystal atomic chain is taken into account as an interaction with averaged (along crystallographic axis) potential. Contribution of incoherent scattering to atoms thermal vibrations is introduced into the model via diffusion coefficient.
Computer simulation involving the 500'000 trajectories for each initial parameter set revealed the following picture. For the beams falling at small angles (10-50% of the Lindhard critical angle) the angular distributions of the reflected beams have strong preferable direction for small crystal thickness l ~ c/(2ω0), where c –light velocity, ω0 –frequency of electron oscilation in the transversal potential well.
Simulations with the proposed model show specific structure of angular beam distribution's evolution in thin crystals in axial channeling mode. The proposed model can be used for reliable beam control (focusing, splitting).

References

[1] A.V. Lukshin, A.K. Maslov, I.V. Polimatidi, S.N. Smirnov. Stochastic model of ultrarelativistic electrons passage through a thick monocrystals. Matem. Mod, 2000, 9:12, 25-44 (in Russian)
[2] A.K. Maslov, I.V. Polimatidi Modeling of axial channeling of ultra-relativistic charged particles in a bent single crystal. Computational Mathematics and Mathematical Physics, 2002, 42:12, 1780–1791

Primary author: Dr POLIMATIDI, Ilya (M.V. Lomonosov Moscow State University)

Co-author: Prof. SMIRNOV, Sergey (National University Higher School of Economics)

Presenter: Dr POLIMATIDI, Ilya (M.V. Lomonosov Moscow State University)

Session Classification: PS1 Poster Session

Track Classification: Poster Session

Contribution ID: **157** Type: **not specified**

Wave undulators and Free Electron Lasers

The working conditions of Free Electron Lasers operating in the SASE regime with wave undulators are examined.
General scaling criteria for a succesful operation are discussed. The analysis include the laser and electron beam characteristics.
The model we develop is essentially analytical, the relevant conclusions are corroborated with an appropriate numerical simulations.

Primary author: Dr DATTOLI, Giuseppe (ENEA Frascati)

Track Classification: Novel sources: PXR&TR&FEL&Plasma

Contribution ID: **158** Type: **not specified**

Meghri 2013

Friday, 28 September 2012 13:20 (1 minute)

Session Classification: Closing

Contribution ID: **159** Type: **not specified**

RREPS 2013

Friday, 28 September 2012 13:21 (1 minute)

Session Classification: Closing

Contribution ID: **160** Type: **not specified**

Simulation of the SPS beam collimation

Thursday, 27 September 2012 12:05 (10 minutes)

Presenter: TARANTIN, A.

Session Classification: S3.3 Channeling & Crystal Collimation

Contribution ID: **161** Type: **not specified**

Wave Undulators and Sase Fel Devices

Friday, 28 September 2012 12:35 (20 minutes)

Presenter: DATTOLI, G.

Session Classification: S5.4 Novel sorces: PXR&TR&FEL&Plasma

Contribution ID: **162** Type: **not specified**

Institute of Applied Problems of Physics NAS RA, Yerevan, Armenia

Friday, 28 September 2012 12:55 (20 minutes)

Presenter: ARTAK HENRIK, Mkrtchyan (Institute of Applied Problems of Physics NAS RA)

Session Classification: S5.4 Novel sorces: PXR&TR&FEL&Plasma