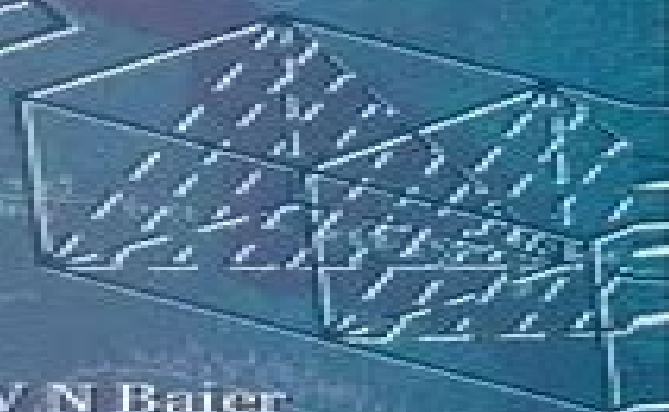


Electromagnetic Processes at High Energies in Oriented Single Crystals



V N Baier

V M Katkov

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Electromagnetic Processes At High Energies In Oriented Single Crystals

Mikhail Korzhik, Alexander Gektin



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Electromagnetic Processes At High Energies In Oriented Single Crystals Vladimir N Baier, Valery M Katkov, Vladimir M Strakhovenko, 1998-06-06 The book is devoted to processes at the interaction of high energy charged particles and photons with crystals Among them are the creation of electron positron pair by photon in crystalline field the radiation of particles in this field and connected with these effects the new type of electromagnetic showers in crystals the channeling of fast particles in crystal and channeling radiation At high energies the processes of quantum electrodynamics QED in intense external fields play an important role in crystals The first third of the book contains a new formulation of QED in external fields which is valid for any external field including an essentially nonuniform one and has vast applications

Electromagnetic Processes at High Energies in Oriented Single Crystals Vladimir Nikolaevich Baier, V. M. Katkov, Vladimir Moiseevich Strakhovenko, 1998 The book is devoted to processes at the interaction of high energy charged particles and photons with crystals Among them are the creation of electron positron pair by photon in crystalline field the radiation of particles in this field and connected with these effects the new type of electromagnetic showers in crystals the channeling of fast particles in crystal and channeling radiation At high energies the processes of quantum electrodynamics QED in intense external fields play an important role in crystals The first third of the book contains a new formulation of QED in external fields which is valid for any external field including an essentially nonuniform one and has vast applications

Charged and Neutral Particles Channeling Phenomena Sultan B. Dabagov, 2010 The book Channeling 2008 Charged and Neutral Particles Channeling Phenomena is formed by the same title conference contributions This volume includes papers by leading researchers from different world centers Their recent results on the coherent phenomena of charged and neutral particles propagating through the structures of various sizes and periodicities are included here along with historical reviews by pioneers of coherent Bremsstrahlung and channeling radiation as well as crystal channeling collimation

Electromagnetic Radiation of Electrons in Periodic Structures Alexander Potylitsyn, 2011-05-04 Periodic magnetic structures undulators are widely used in accelerators to generate monochromatic undulator radiation UR in the range from far infrared to the hard X ray region Another periodic crystalline structure is used to produce quasimonochromatic polarized photon beams via the coherent bremsstrahlung mechanism CBS Due to such characteristics as monochromaticity polarization and adjustability these types of radiation is of large interest for applied and basic research of accelerator emitted radiation The book provides a detailed overview of the fundamental principles behind electromagnetic radiation emitted from accelerated charged particles e g UR CBS radiation of fast electrons in Laser flash fields as well as a unified description of relatively new radiation mechanisms which attracted great interest in recent years This are the so called polarization radiation excited by the Coulomb field of incident particles in periodic structures parametric X rays resonant transition radiation and the Smith Purcell effect Characteristics of such radiation sources and perspectives of their usage are discussed

The recent experimental results as well as their interpretation are presented

Engineering of Scintillation Materials and Radiation Technologies Mikhail Korzhik, Alexander Gektin, 2017-11-21 This volume provides a broad overview of the latest achievements in scintillator development from theory to applications and aiming for a deeper understanding of fundamental processes as well as the discovery and availability of components for the production of new generations of scintillation materials It includes papers on the microtheory of scintillation and the initial phase of luminescence development applications of the various materials and development and characterization of ionizing radiation detection equipment The book also touches upon the increased demand for cryogenic scintillators the renaissance of garnet materials for scintillator applications nano structuring in scintillator development development and applications for security and exploration of hydrocarbons and ecological monitoring

Advanced Radiation Sources and Applications Helmut Wiedemann, 2006-01-14 A NATO Advanced Research Workshop on Advanced Radiation Sources and Applications was held from August 29 to September 2 2004 Hosted by the Yerevan Physics Institute Yerevan Armenia 30 invited researchers from former Soviet Union and NATO countries gathered at Nor Hamberd Yerevan on the slopes of Mount Aragats to discuss recent theoretical as well as experimental developments on means of producing photons from mostly low energy electrons This meeting became possible through the generous funding provided by the NATO Science Committee and the programme director Dr Fausto Pedrazzini in the NATO Scientific and Environmental Affairs Division The workshop rectors were Robert Avakian Yerevan Physics Institute Armenia and Helmut Wiedemann Stanford USA Robert Avakian provided staff logistics and frastructure from the Yerevan Physics institute to assure a smooth execution of the workshop Special thanks goes to Mrs Ivetta Keropyan for administrative and logistics support to foreign visitors The workshop was held at the institute's resort in Nor Hamberd on the slopes of Mount Aragats not far from the Yerevan cosmic ray station The isolation and peaceful setting of the resort provided the background for a fruitful week of presentations and discussions Following our invitations 38 researchers in this field came to the workshop from Armenia Belarus Romania Russia Ukraine Denmark France Germany and the USA Commuting from Yerevan local scientists joined the daily presentations Over a five day period 40 presentations were given

Parametric X-Ray Radiation in Crystals Vladimir G. Baryshevsky, Ilya D. Feranchuk, Alexander P. Ulyanenko, 2005-12-20 This systematic and comprehensive monograph is devoted to parametric X ray radiation PXR This radiation is generated by the motion of electrons inside a crystal whereby the emitted photons are diffracted by the crystal and the radiation intensity critically depends on the parameters of the crystal structure Nowadays PXR is the subject of numerous theoretical and experimental studies throughout the world The first part of the book is a theoretical treatment of PXR which includes a new approach to describe the radiation process in crystals The second part is a survey of PXR experimental results and the possible applications of PXR as a tool for crystal structure analysis and a source of tunable X ray radiation

Exciting Interdisciplinary Physics Walter Greiner, 2014-07-08 Nuclear physics is an exciting broadly faceted

field It spans a wide range of topics reaching from nuclear structure physics to high energy physics astrophysics and medical physics heavy ion tumor therapy New developments are presented in this volume and the status of research is reviewed A major focus is put on nuclear structure physics dealing with superheavy elements and with various forms of exotic nuclei strange nuclei very neutron rich nuclei nuclei of antimatter Also quantum electrodynamics of strong fields is addressed which is linked to the occurrence of giant nuclear systems in e g U U collisions At high energies nuclear physics joins with elementary particle physics Various chapters address the theory of elementary matter at high densities and temperature in particular the quark gluon plasma which is predicted by quantum chromodynamics QCD to occur in high energy heavy ion collisions In the field of nuclear astrophysics the properties of neutron stars and quark stars are discussed A topic which transcends nuclear physics is discussed in two chapters The proposed pseudo complex extension of Einstein s General Relativity leads to the prediction that there are no black holes and that big bang cosmology has to be revised Finally the interdisciplinary nature of this volume is further accentuated by chapters on protein folding and on magnetoreception in birds and many other animals

Quantum Aspects of Beam Physics Pisin Chen,Kevin Reil,2004 This was the third in the QABP workshop series Pref **Quantum Radiation in Ultra-Intense Laser Pulses** K. Felix Mackenroth,2014-06-11

Scientific advances and several technical breakthroughs have led to a remarkable increase in available laser intensities over the past decades In available ultra intense laser fields photon fluxes may become so high that free charge carriers interact coherently with several of the field s photons In this thesis such nonlinear interactions are investigated for the prime example of radiation emission by electrons scattered from intense laser pulses of arbitrary temporal structure To this end nonlinear quantum field theory is employed taking the interaction with the laser into account exactly After an in depth introduction to classical particle dynamics as well as quantum field theory in nonlinearly intense laser fields the emission of one and two photons is explicitly analyzed The results are then translated to viable technical applications such as a scheme for the determination of the carrier envelope phase of ultra intense laser pulses and a proposal for detecting the strongly suppressed two photon signal

Beam Acceleration In Crystals And Nanostructures - Proceedings Of The Workshop Swapan Chattopadhyay, Gerard Mourou, Vladimir D Shiltsev, Toshiki Tajima,2020-02-18 Recent advancements in generation of intense X ray laser ultrashort pulses open opportunities for particle acceleration in solid state plasmas Wakefield acceleration in crystals or carbon nanotubes shows promise of unmatched ultra high accelerating gradients and possibility to shape the future of high energy physics colliders This book summarizes the discussions of the Workshop on Beam Acceleration in Crystals and Nanostructures Fermilab June 24 25 2019 presents next steps in theory and modeling and outlines major physics and technology challenges toward proof of principle demonstration experiments Beam Acceleration In Crystals And Nanostructures - Proceedings Of The Workshop Gerard Mourou,2020 Recent advancements in generation of intense X ray laser ultrashort pulses open opportunities for particle acceleration in solid state plasmas Wakefield acceleration in

crystals or carbon nanotubes shows promise of unmatched ultra high accelerating gradients and possibility to shape the future of high energy physics colliders This book summarizes the discussions of the Workshop on Beam Acceleration in Crystals and Nanostructures Fermilab June 24 25 2019 presents next steps in theory and modeling and outlines major physics and technology challenges toward proof of principle demonstration experiments Publisher's website *Proceedings of the Fifty-first Workshop of the INFN Eloisatron Project* INFN ELOISATRON Project. Workshop, Sultan B. Dabagov, Istituto nazionale di fisica nucleare, 2010 The book Channeling 2008 Charged and Neutral Particles Channeling Phenomena is formed by the same title conference contributions This volume includes papers by leading researchers from different world centers Their recent results on the coherent phenomena of charged and neutral particles propagating through the structures of various sizes and periodicities are included here along with historical reviews by pioneers of coherent bremsstrahlung and channeling radiation as well as crystal channeling collimation 18th Advanced ICFA Beam Dynamics Workshop on Quantum Aspects of Beam Physics Pisin Chen, 2002 Of working group C Introduction and summary of working group C part I J S T Ng Contributed papers Is there emitted radiation in the Unruh effect B L Hu and A Raval Fermilab A0 channeling program R A Carrigan Jr and others Integral characteristics of bremsstrahlung and pair photoproduction in a medium V N Baier and V M Katkov The Coulomb corrections to e^+e^- pair production in ultrarelativistic heavy ion collisions R N Lee Spin depolarization due to beam-beam interaction in linear colliders K A Thompson Gravitational bremsstrahlung and scalar stars S Capozziello G Lambiase and D F Torres D Quantum methodologies in beam physics Plenary papers Supersymmetry and beam dynamics J D Bjorken and P Chen Landau damping in nonlinear Schrödinger equations R Fedele and others Summary of working group D Quantum methodology in beam physics A Dragt and M Pusterla Contributed papers Controlled stochastic collective dynamics of particle beams in the stability regime C Petroni and others Quantum mechanical formalism of particle beam optics S A Khan Localized coherent structures and patterns formation in collective models of beam motion A Fedorova and M Zeitlin Quasiclassical calculations for Wigner functions via multiresolution A Fedorova and M Zeitlin Single particle quantum dynamics in a magnetic lattice M Venturini and R D Ruth Quantum like approach to beam dynamics application to the LHC and HIDIF projects M Pusterla Quantum mechanics of Dirac particle beam optics single particle theory R Jaganathan Quantum models in beam physics and signal analysis M Manko Radiative corrections in symmetrized classical electrodynamics J R Van Meter and others Beyond Unruh effect nonequilibrium quantum dynamics of moving charges B L Hu and P R Johnson Channeling and Radiation in Periodically Bent Crystals Andrey V. Korol, Andrey V. Solov'yov, Walter Greiner, 2014-05-13 The development of coherent radiation sources for sub-angstrom wavelengths in the hard X-ray and gamma-ray range is a challenging goal of modern physics The availability of such sources will have many applications in basic science technology and medicine and in particular they may have a revolutionary impact on nuclear and solid state physics as well as on the life sciences The present state of the art lasers are capable of emitting electromagnetic

radiation from the infrared to the ultraviolet while free electron lasers X FELs are now entering the soft X ray region Moving further i e into the hard X and or gamma ray band however is not possible without new approaches and technologies In this book we introduce and discuss one such novel approach the radiation formed in a Crystalline Undulator whereby electromagnetic radiation is generated by a bunch of ultra relativistic particles channeling through a periodically bent crystalline structure Under certain conditions such a device can emit intensive spontaneous monochromatic radiation and even reach the coherence of laser light sources Readers will be presented with the underlying fundamental physics and be familiarized with the theoretical experimental and technological advances made during the last one and a half decades in exploring the various features of investigations into crystalline undulators This research draws upon knowledge from many research fields such as materials science beam physics the physics of radiation solid state physics and acoustics to name but a few Accordingly much care has been taken by the authors to make the book as self contained as possible in this respect so as to also provide a useful introduction to this emerging field to a broad readership of researchers and scientist with various backgrounds This new edition has been revised and extended to take recent developments in the field into account

Novel Lights Sources Beyond Free Electron Lasers Andrei Korol, Andrey V. Solov'yov, 2022-06-09 This book discusses possibilities and perspectives for designing and practical realization of novel intensive gamma ray crystal based light sources that can be constructed through exposure of oriented crystals linear bent and periodically bent to beams of ultrarelativistic positrons and electrons The book shows case studies like the tunable light sources based on periodically bent crystals that can be designed with the state of the art beam facilities A special focus is given to the analysis of generation of the gamma rays because the current technologies based on particle motion in the magnetic field become inefficient or incapable to achieve the desired gamma rays intensities It is demonstrated that the intensity of radiation from crystal based light sources can be made comparable to or even higher than what is achievable in conventional synchrotrons and undulators operating although in the much lower photon energy range By exploring the coherence effects the intensity can be boosted by orders of magnitude The practical realization of such novel light sources will lead to the significant technological breakthroughs and societal impacts similar to those created earlier by the developments of lasers synchrotrons and X rays free electron lasers Readers learn about the underlying fundamental physics and familiarize with the theoretical experimental and technological advances made during last two decades in exploring various features of investigations into crystal based light sources This research draws upon knowledge from many research fields such as material science beam physics physics of radiation solid state physics and acoustics to name but a few The authors provide a useful introduction in this emerging field to a broad readership of researchers and scientists with various backgrounds and accordingly make the book as self contained as possible

Soviet Physics, JETP. ,1992 Classical and Quantum Description of Plasma and Radiation in Strong Fields Fabien Niel, 2021-05-06 This thesis presents several important aspects of the plasma dynamics in extremely high intensity

electromagnetic fields when quantum electrodynamics effects have to be taken into account This work is of utmost importance for the forthcoming generation of multipetawatt laser facilities where this physics will be tested The first part consists of an introduction that extends from classical and quantum electrodynamics in strong fields to the kinetic description of plasmas in the interaction with such fields This can be considered as an advanced tutorial which would be extremely useful to researchers and students new to the field The second part describes original contributions on the analysis of the signatures of classical and quantum radiation reaction on the distribution function of the charged particles and of the photon spectrum and leads to significant advances on this topic These results are then extended to the analysis of the so called QED cascades which are of central importance for a better understanding of some astrophysical phenomena and basic physics problems Finally the book discusses future directions for the high intensity laser plasma interaction community The results presented in this thesis are expected to become more and more relevant as the new multipetawatt facilities become operative

Frontiers Of Physics 1998, Proceedings Of The Intl Mtg D A Bradley, S P Chia, 2000-11-24 Contents Progress of RFQ and Superconducting Accelerators in China C E Chen et al QCD Phase Transition in the Laboratory and in the Early Universe B Sinha Frontiers in Ultrafast Laser Science W Sibbett Asymmetries of Sea Quark Distributions in Baryons M Alberg et al A Variational Approach to Many Particle Systems C K Kim et al Synchrotron Radiation Activities at KEK M Kihara Results of the UNU ICTP PFF Network S Lee New Generation Positron Atom Scattering Theories K Ratnavelu Superconducting Pairing of Quarks in QCD N V Hieu L T Tuong Photon Gated Persistent Spectral Hole Burning Y X Nie L Z Zhao Wind Driven Circulation of the South China Sea A Camerlengo Effect of Soil Type on Environmental Terrestrial Gamma Radiation Dose in Johor State Malaysia A T Ramli et al Research in Optical Fibres Devices at Telekom Malaysia Photonics Laboratory H B Ahmad et al Simplifying Complexity W A T Wan Abdullah Gravitational Wave Detection in the Laboratory Y T Chen et al and other papers Readership Theoretical physicists

I. Ya Pomeranchuk And Physics At The Turn Of The Century, Proceedings Of The International Conference Alexander Berkov, Nikolay B Narozhny, Lev Borisovich Okun, 2004-02-09 This conference was dedicated to the memory of the great scientist and teacher I Ya Pomeranchuk on the occasion of his 90th birthday It was multidisciplinary and covered those fields of physics where Pomeranchuk made outstanding contributions including high energy physics quantum field theory theory of liquid helium condensed matter physics physics of electromagnetic processes in matter and astrophysics Most of the plenary talks and reports were given by Pomeranchuk s former students and coworkers The proceedings volume provides an excellent review of some important areas of modern physics and reflects the Pomeranchuk school s contributions to modern physics It is useful for graduate students lecturers and researchers in high energy physics quantum field theory and condensed matter physics The proceedings have been selected for coverage in Index to Scientific Technical Proceedings ISTEP ISI Proceedings Index to Scientific Technical Proceedings ISTEP CDROM version ISI Proceedings

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