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Introduction

The "Channeling" (International Conference on Charged and Neutral Particles Channeling Phenomena) series are the conferences devoted to new developments in the field of coherent and incoherent scattering of hadrons and leptons (protons, ions, electrons, muons and related antiparticles) in matter of various periodicity structures from the viewpoint of fundamental studies as well as applications. The organization of these conferences based on the traditions of the related successful meetings in Europe, America and Asia (including URSS and former URSS states' conferences) started more than 30 years ago.

The first meeting of the new series, the "Channeling 2004" workshop (Frascati, November 2–6, 2004), was organized by the National Laboratories of Frascati (INFN LNF). A special proceedings volume of SPIE (Proc. of SPIE, Vol. 5974, 2005) devoted to the "Channeling 2004" has been issued. By the subjects discussed and by the number of participants and contributions, the workshop and subsequent activity have shown growing interest to collaboration within the international and INFN projects. That is why in July 2006, the "Channeling 2006", the second international conference of these series, was again held in Frascati bringing together world-renowned scientific groups in channeling research.

Electromagnetic radiation by relativistic electrons and positrons traversing periodic fields, such as coherent bremsstrahlung, channeling radiation, transition radiation, parametric X-radiation, etc., representing a variety of processes of classical/quantum electrodynamics and atomic physics, attracts the attention of researchers from many laboratories throughout the world specializing in accelerator physics, radiation physics, nuclear physics, materials science, biology and medicine. New radiation sources of that origin, being complementary to conventional sources based on synchrotron radiation, undulator radiation, free electron lasers, and Thomson scattering sources, can deliver powerful photon beams of coherent radiation reshaping the landscape of radiation science and its applications.

Channeling of charged particles in periodic crystals (monocrystals, complex crystals, nanostructures, etc.) has the potential to handle the beams: bent crystal channeling may result in beam steering at accelerators providing in such a way the opportunity for beam extraction or collimation; by periodical variation in the continuous potential of a crystallographic plane, crystal can act as a rather effective compact undulator; channeling becomes a very promising instrument for cooling and accelerating muons, for production of positron, etc.

Channeling also works as a useful method to control X-ray and γ radiations for efficient beams deflection over the large angles at very short distances allowing in such a way the radiation intensity of existing sources to be increased in orders of the value (capillary/polycapillary optics, X-ray waveguides). Propagation of

charged particles in crystals and propagation of photons/neutrons in capillary systems, even if strongly different by nature, have much in common, as both can be described within the frame of channeling theory.

This volume, which includes the reports within five main sessions of the conference, is a collection of recent results on charged and neutral particles, coherent phenomena of propagation in structures of various sizes, and periodicities obtained by the leading researches at different world centers together with historical reviews by pioneers of crystal channeling collimation, coherent bremsstrahlung, and channeling radiation. The volume represents a unique opportunity for the wide interdisciplinary community to gain information about current and future research in the field of coherent/incoherent scattering of radiations in strong fields (crystals, undulators, nanoporous materials, capillaries, etc.), and, in particular, for young scientists who have interest in undertaking new investigations following the foreseen development of the next generation photon sources, as well as an important opportunity to learn new international initiatives in the physics of radiation interaction in matter and related studies.

I would like to thank the participants for their effective work during the conference sessions as well as for their important contributions to this volume. On behalf of the Organizing Committee, I am particularly grateful to our main sponsors: HADRON PHYSICS I3-EU Project (coordinator Prof. Carlo Guaraldo), CARE HHH-CERN (Switzerland), P.N. Lebedev Physical Institute RAS (Russia), Unisantis S.A. (Switzerland) and Institute of Nanostructured Materials (Italy), for the fruitful cooperation and support in organizing the "Channeling 2006". Special acknowledgments are to the administration of INFN LNF (Prof. Sergio Bertolucci and Prof. Mario Calvetti) and Comune di Frascati (Dr. Francesco Paolo Posa and Dr. Amedeo Frascatani) contributed to the success of the meeting by the continuous support of our initiatives. I sincerely appreciated the effective collaboration by Prof. Luigi Palumbo and Dr. Giorgio Cappuccio, co-chairs of the "Channeling 2006", Mrs. Donatella Pierluigi, secretary of the conference, and the SPIE Russia Chapter.

Sultan B. Dabagov

In memory of

Jens Lindhard

for his significant contribution to physics of charged particles channeling in crystals.

International Conference on Charged and Neutral Particles Channeling Phenomena II
"Channeling 2006" Attendees