



SEMINAIRE

(de 13 h à 14 h, Salle Belledonne, IMEP, MINATEC,
ouvert aux chercheurs des autres laboratoires)

Jeudi 10 avril 2008

“The OSQAR Experiments at CERN for Low Energy Laser-based
Particle Physics”

par Pierre PUGNAT

Abstract: Since its prediction in 1936 by Euler, Heisenberg and Weisskopf in the earlier development of the Quantum Electrodynamics (QED), the measurement of the Vacuum Magnetic Birefringence (VMB) is still a challenge for optical metrology. According to QED, the vacuum permeated by a transverse magnetic field is an active medium able to change the polarisation of light from linear to elliptical. Contributions to the VMB could also arise from new light scalar/pseudo-scalar particles like axions that couple to photons and this would manifest itself as a sizeable deviation from the pure QED prediction. On one side the interest in axion, providing the answer to the so-called strong-CP problem, lies beyond Particle Physics and overlaps with Cosmology since such particle is considered as a serious dark matter candidate. On the other side, the domain of Physics that will be investigated is guaranteed by the QED, which aimed to be tested down to an unprecedented level for a scientific theory, *i.e.* at the level of 10^{-22} that corresponds to the relative difference of the vacuum refractive indices in a 9.5 T field. By re-using major achievements of the Large Hadron Collider (LHC) now close to completion at CERN, like superconducting dipoles and test infrastructure, the unique opportunity to launch an innovative research programme in the emerging field of laser-based Particle Physics has been proposed and receives strong support from the CERN-SPSC scientific committee. Collaboration between seven European Institutes and CERN, including a team from IMEP-LAHC, is now working on a new “2-in-1”, laser-based Particle Physics experiments for *Optical Search of QED vacuum magnetic birefringence, Axions and photon Regeneration* (OSQAR). The preliminary phase of OSQAR is dedicated to a photon regeneration experiment that aims to confirm or invalidate the interpretation of the recent PVLAS result regarding the discovery of a new light scalar/pseudo-scalar particle. The status of this phase will be reported together with first results as well as the short and long term perspectives of the overall OSQAR project.

Pierre Pugnât received “Le Magistère de Physique” from the University Joseph Fourier (UJF Grenoble-1) in 1990 before preparing at the Louis Néel Laboratory of CNRS-Grenoble his Ph-D in Physics, which he obtained in 1995. After 2 years as Assistant Professor at the University of Savoie, he joined CERN to work on the LHC project for 10 years. He is now affiliated Physicist at CERN and Spokesperson of the OSQAR collaboration.

*Institut de Microélectronique, Electromagnétisme et Photonique
MINATEC, INPG, 3 Parvis Louis Néel, BP 257, 38016 GRENOBLE CEDEX 1, France
Tél. +33 (0) 456.529.503 - Fax. +33 (0) 456.529.501
UMR 5130 CNRS INPG UJF
Institut National Polytechnique de GRENOBLE*