

Title: Polarization measurements and their perspectives: PVLAS Phase II

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Abstract

The polarization of light plays an important role in many phenomena where photons interact with matter and other electromagnetic fields. Photon-photon scattering and real, or virtual, production of ALPs and MCPs from a two-photon effective vertex are interesting examples of such interactions. We present the proposal for a “PVLAS-Phase II” experiment, with the main physics goal to achieve the first direct observation of non-linear effects predicted by QED and the measurement of the photon-photon scattering cross section at low energies (1-2 eV). Physical processes such as ALP and MCP production in magnetic field could also be accessible if a sensitive enough operation is reached. The short term experimental strategy is to compactify as much as possible the dimensions of the apparatus in order to bring the known noise sources under control. We will also discuss longer term developments, namely the use of higher energy photon sources, such as FEL’s, for ellipsometric measurements on QED effects and on sub-eV particle production. Here one hopes to take advantage of the high flux and of the higher photon energy to quickly achieve shot noise limited operation. On the other hand, measuring with a sufficient precision the polarization of photons in the energy range beyond the visible realm presents a stimulating technical challenge to be met with a dedicated research effort.