Physics > Instrumentation and Detectors

Axion Search with Q & A Experiment

Hsien-Hao Mei, Wei-Tou Ni, Sheng-Jui Chen, Sheau-shi Pan (Q & A Collaboration)

(Submitted on 25 Jan 2010 (v1), last revised 31 Jan 2010 (this version, v2))

Dark matter is a focused issue in galactic evolution and cosmology. Axion is a viable particle candidate for dark matter. Its interaction with photon is an effective way to detect it, e.g., pseudoscalar-photon interaction will generate vacuum dichroism in a magnetic field. Motivated to measure the QED vacuum birefringence and to detect pseudoscalar-photon interaction, we started to build up the Q & A experiment (QED [Quantum Electrodynamics] and Axion experiment) in 1994. In this talk, we first give a brief historical account of planet hunting and dark matter evidence. We then review our 3.5 m Fabry-Perot interferometer together with our results of measuring vacuum dichroism and gaseous Cotton-Mouton effects. Our first results give (-0.2 $\pm$ 2.8) $\times$ 10^{-13} rad/pass, at 2.3 T with 18,700 passes through a 0.6 m long magnet, for vacuum dichroism measurement. We are upgrading our interferometer to 7 m arm-length with a new 1.8 m 2.3 T permanent magnet capable of rotation up to 13 cycles per second. We aim at 10 nrad/Hz$^{1/2}$ optical sensitivity with 532 nm cavity finesse around 100,000. When achieved, vacuum dichroism would be measured to 8.6 $\times$ 10^{-17} rad/pass in about 50 days, and QED birefringence would be measured to 28 %.

Comments:	10 pages, 3 tables and 3 figures, presented in the International Workshop on Dark Matter, Dark Energy and Matter-Antimatter Asymmetry (Hsinchu, Taiwan, Nov. 20-21 2009); submitted to Modern Physics Letters. Rev. 2 is replaced for other collaborations' status/new-result corrections in Table 2, and 2 ref.s are added
Subjects:	**Instrumentation and Detectors (physics.ins-det)**; Cosmology and Extragalactic Astrophysics (astro-ph.CO); High Energy Physics - Experiment (hep-ex)
Cite as:	**arXiv:1001.4325v2 [physics.ins-det]**

Submission history

From: Hsien-Hao Mei [view email]
[v1] Mon, 25 Jan 2010 06:30:58 GMT (407kb)
[v2] Sun, 31 Jan 2010 09:31:40 GMT (407kb)

Which authors of this paper are endorsers?