

Minutes of the “1st Axion Strategy Meeting: Brainstorming and discussion on future axion searches”

Organized by the CAST collaboration; Held at CERN on 27 January 2009

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Agenda:

After introductory remarks by Igor Irastorza (chairperson of meeting) and Konstantin Zioutas (chairperson of CAST), the following presentations were given. The presentation materials are available at this web site:

<http://indico.cern.ch/conferenceDisplay.py?confId=54150>

- **“Introductory Remarks”**
 - Konstantin Zioutas
- **“Astrophysical motivations for axion-like particles”**
 - Sergey Troitsky
- **“Solar X-ray searches for axions”**
 - Hugh Hudson
- **“On search for eV hidden photons from the Sun”**
 - Sergei Gninenko
- **“A map of the low energy frontier: WISP opportunities beyond QCD axions”**
 - Javier Redondo
- **“Evading the CAST bound with chameleons”**
 - Phillipe Brax
- **“New prospects for CAST from the new Microbulk performance”**
 - Thomas Papaevangelou
- **“ALP detection via resonant regeneration at CAST”**
 - Giovanni Cantatore
- **“Cavity enhanced ALP-photon reconversion in the visible”**
 - Giovanni Cantatore

Additionally, Emmanuel TSESMELIS from the CERN Director’s General office presented the increase importance of non-accelerator-based science for the new CERN administration. The first workshop on this topic, with an emphasis on ideas beyond the LHC, will be held at CERN 11–13 May 2009. A forum on particle astrophysics will be organized by CERN in the near future. The dates have not yet been determined.

Discussion, general comments

After all the formal presentations, there was a lively discussion about specific science topics and general strategy. It was not possible to capture all of the threads. Instead, we capture some of the key comments.

- Igor I. argues for a cohesive front on theoretical work that would motivate any future experiments
- Space missions are driven by astrophysical and cosmological observational needs; any space instrument suitable for axions would likely have a different primary purpose, with the axion observations likely ancillary to the main objective,
- Konstantin Z. states that he feels purely laboratory-based experiments (e.g., shining light through walls) would also be supported, since their results (on the coupling constant) are independent on astrophysical modeling. Thus, they are certainly complimentary to searches with solar axion detectors of all kind, including space-based or laboratory-solar experiment (i.e., axion helioscopes).
- The axion “band” is motivated by strong CP; if searches also consider axion-like particles (ALPs), then entire parameter space of coupling vs mass opens up
- Some purely vacuum effects, like Birefringence, can occur even if no axions exist
- For space applications, it is important to look for “piggy-back” opportunities, either as a small, separate instrument or using an existing instrument to search for axions

- Hugh Hudson requests permission to invoke this workshop to argue for additional observing time from **Hinode** (a Japanese solar telescope) for more axion observations
- It would be very useful to perform a census of existing magnets and magnet facilities to scope potential laboratory missions; as part of this exercise, it would also be useful to estimate the cost for building magnets tailored for axion or ALP searches

Discussion, specific recommendations

At the end of the discussion, it was agreed that there should be separated sub-committees devoted to pursuing ideas for specific types of experiments. The sub-committees and topic leaders are as follows:

1. spaced-based missions; **co-leaders:** Markus Kuster & Mike Pivovarov
2. "pure" laboratory experiments; **leader:** Giovanni Cantatore
3. experiments that utilize the existing CAST apparatus and leverage existing teaming arrangements; **leader:** Thomas Papaevangelou

The purpose of each sub-committee is to hold teleconferences with other colleagues interested in each topic and to write a white-paper that would outline specific topics. These white-papers can then be used to socialize the ideas with potential funding agencies. The sub-committees must (1) remember that experiments can take up to 5 years to begin, (2) an excellent goal is to have a mature idea (e.g., budgets, scope, potential collaboration institutions) within 12-18 months and (3) clarify the political and financial situations in the home countries and institutes.