

1st Joint ILIAS-CAST-CERN Axion Training

Report of Contributions

Contribution ID: 1

Type: **not specified**

Introduction

Wednesday 30 November 2005 09:00 (10 minutes)

Author: KONSTANTIN ZIOUTAS (University of Patras)

Presenter: KONSTANTIN ZIOUTAS (University of Patras)

Session Classification: Lectures I

Contribution ID: 2

Type: **not specified**

The Strong CP Problem and Axions

Wednesday 30 November 2005 09:10 (1h 30m)

<h4>Outline of the lecture:</h4>

In this lecture I will explain the origin of the Strong CP Problem, which is connected to the non-trivial structure of the vacuum state of the Standard Model. The most natural solution to this problem involves introducing an additional global chiral $U(1)$ symmetry in the theory. Because this symmetry is both spontaneously broken and anomalous, this solution necessitates the presence of a very light, very weakly coupled boson, known as the axion.

Physical properties of axions, including their mixing with pions and etas and their coupling to two-photons are described. Using these results, it is possible to rule out weak-scale axions. However, invisible axions models are still viable. Some of the properties of these latter models will be also discussed.

Author: ROBERTO PECCEI (University of California)

Presenter: ROBERTO PECCEI (University of California)

Session Classification: Lectures I

Contribution ID: 3

Type: **not specified**

Axion Searches, Old and New

Wednesday 30 November 2005 11:10 (1h 30m)

<h4>Outline of the lecture:</h4>

Constraints from laboratory searches and astrophysics, axion cosmology, the cavity detector of dark matter axions, solar axion searches, laser experiments, a telescope search, macroscopic forces mediated by axions.

Author: PIERRE SIKIVIE (Institute for Advanced Study and University of Florida)

Presenter: PIERRE SIKIVIE (Institute for Advanced Study and University of Florida)

Session Classification: Lectures I

Contribution ID: 4

Type: **not specified**

Detecting Solar Axions Using Earth's Magnetic Field

Wednesday 30 November 2005 17:00 (25 minutes)

Author: HOOMAN DAVOUDIASL (University of Wisconsin)

Presenter: HOOMAN DAVOUDIASL (University of Wisconsin)

Session Classification: Presentations II

Contribution ID: 5

Type: **not specified**

PVLAS-Recent Results

Wednesday 30 November 2005 17:50 (30 minutes)

Author: GIOVANNI CANTATORE (Universita di Trieste - I.N.F.N.)

Presenter: GIOVANNI CANTATORE (Universita di Trieste - I.N.F.N.)

Session Classification: Presentations II

Contribution ID: 6

Type: **not specified**

Round Table Discussion

Wednesday 30 November 2005 18:20 (30 minutes)

Author: ALL

Presenter: ALL

Session Classification: Presentations II

Contribution ID: 7

Type: **not specified**

Photon-Axion Conversion as a Mechanism for Supernova Dimming: Limits from CMB Spectral Distortion

Wednesday 30 November 2005 16:35 (25 minutes)

Author: ALESSANDRO MIRIZZI (University of Bari)

Presenter: ALESSANDRO MIRIZZI (University of Bari)

Session Classification: Presentations II

Contribution ID: 8

Type: **not specified**

Search for KK axions with a low pressure gas TPC

Wednesday 30 November 2005 17:25 (25 minutes)

Author: NEIL SPOONER (University of Sheffield)

Presenter: NEIL SPOONER (University of Sheffield)

Session Classification: Presentations II

Contribution ID: 9

Type: **not specified**

Large Extra Dimensions and CAST

Wednesday 30 November 2005 15:10 (30 minutes)

Author: BILJANA LAKIC (Rudjer Boskovic Institute)

Presenter: BILJANA LAKIC (Rudjer Boskovic Institute)

Session Classification: Presentations I

Contribution ID: **10**

Type: **not specified**

The BMV Project : Axions Search with a Pulsed Magnet

Wednesday 30 November 2005 14:45 (25 minutes)

Author: REMY BATTESTI (Universite Paul Sabatier)

Presenter: REMY BATTESTI (Universite Paul Sabatier)

Session Classification: Presentations I

Contribution ID: **11**

Type: **not specified**

Astrophysical Signatures for Axion(-like) Particles

Wednesday 30 November 2005 15:40 (30 minutes)

Author: KONSTANTIN ZIOUTAS (University of Patras)

Presenter: KONSTANTIN ZIOUTAS (University of Patras)

Session Classification: Presentations I

Contribution ID: **12**

Type: **not specified**

Coherence

Wednesday 30 November 2005 14:00 (20 minutes)

Author: YANNIS SEMERTZIDIS (Brookhaven National Laboratory)

Presenter: YANNIS SEMERTZIDIS (Brookhaven National Laboratory)

Session Classification: Presentations I

Contribution ID: **13**

Type: **not specified**

Introduction to X-ray Optics

Wednesday 30 November 2005 14:20 (25 minutes)

Author: PETER FRIEDRICH (Max-Planck Institut fuer extraterrestrische Physik)

Presenter: PETER FRIEDRICH (Max-Planck Institut fuer extraterrestrische Physik)

Session Classification: Presentations I

Contribution ID: 14

Type: **not specified**

Round Table Discussion

Thursday 1 December 2005 15:45 (1 hour)

Author: ALL

Presenter: ALL

Session Classification: Workshop on Future Axion Searches

Contribution ID: 15

Type: **not specified**

Search for (solar) Axions in the Visible

Thursday 1 December 2005 14:30 (25 minutes)

Author: KONSTANTIN ZIOUTAS (University of Patras)

Presenter: KONSTANTIN ZIOUTAS (University of Patras)

Session Classification: Workshop on Future Axion Searches

Contribution ID: **16**

Type: **not specified**

Introduction

Thursday 1 December 2005 14:00 (5 minutes)

Author: KONSTANTIN ZIOUTAS (University of Patras)

Presenter: KONSTANTIN ZIOUTAS (University of Patras)

Session Classification: Workshop on Future Axion Searches

Contribution ID: 17

Type: **not specified**

Towards a Large-Scale Axion Laser Experiment

Thursday 1 December 2005 14:55 (25 minutes)

Author: ANDREAS RINGWALD (DESY)

Presenter: ANDREAS RINGWALD (DESY)

Session Classification: Workshop on Future Axion Searches

Contribution ID: **18**

Type: **not specified**

Laboratory Experiments for Axion Search Using Decommissioned LHC Superconducting Dipoles

Thursday 1 December 2005 14:05 (25 minutes)

Author: PIERRE PUGNAT (CERN)

Presenter: PIERRE PUGNAT (CERN)

Session Classification: Workshop on Future Axion Searches

Contribution ID: **19**

Type: **not specified**

Some Remarks About Light Pseudoscalar Particles

Thursday 1 December 2005 15:20 (25 minutes)

Author: RAUL RABADAN (Institute for Advanced Study, Princeton)

Presenter: RAUL RABADAN (Institute for Advanced Study, Princeton)

Session Classification: Workshop on Future Axion Searches

Contribution ID: 20

Type: **not specified**

Electric and Magnetic Dipole Moments

Thursday 1 December 2005 11:00 (1h 30m)

Outline of the lecture:

The stringent limit on the electric dipole moment of the neutron forced the issue on the strong CP-problem. The most elegant solution of which is the axion field proposed by Peccei and Quinn. The current limit on the QCD parameter θ coming from the limit on the neutron EDM is of order 10^{-10} . I am going to describe the present status on the neutron EDM searches and further prospects on getting down to θ_{qcd} sensitivity of 10^{-13} with the new deuteron EDM in storage rings proposal. For completeness the current status and prospects of the muon $g-2$ experiment will also be given.

Author: YANNIS SEMERTZIDIS (Brookhaven National Laboratory)

Presenter: YANNIS SEMERTZIDIS (Brookhaven National Laboratory)

Session Classification: Lectures II

Contribution ID: 21

Type: **not specified**

Axions and Astrophysics

Thursday 1 December 2005 09:00 (1h 30m)

<h4>Outline of the lecture:</h4>

Axion emission from stars, astrophysical limits on axion parameters: from globular clusters, SN 1987A, ...

Axions as hot dark matter, limits from cosmological structure formation.

Author: GEORG RAFFELT (Max-Planck Institut fuer Physik)

Presenter: GEORG RAFFELT (Max-Planck Institut fuer Physik)

Session Classification: Lectures II

Contribution ID: 22

Type: **not specified**

Cavity Microwave Searches for Cosmological Axions

Friday 2 December 2005 09:00 (1h 30m)

<h4>Outline of the lecture:</h4>

The lecture will cover the searches for dark matter axions based on the microwave cavity experiment of Sikivie. The topics will begin with a brief overview of halo dark matter, and the axion as a candidate. The principle of resonant conversion of axions in an external magnetic field will be described, and practical considerations in optimizing the experiment as a signal-to-noise problem. A major focus of the lecture will be the two complementary strategies for ultra-low noise detection of the microwave photons - the “photon-as-wave” approach (i.e. conventional heterojunction amplifiers and soon quantum-limited SQUID devices), and “photon-as-particle” (i.e. Rydberg-atom single-quantum detection). Experimental results will be presented; these experiments have already reached well into the range of sensitivity to exclude plausible axion models, for limited ranges of mass. The lecture will conclude with a discussion of future plans and challenges for the microwave cavity experiment.

Author: KARL VAN BIBBER (LLNL)**Presenter:** KARL VAN BIBBER (LLNL)**Session Classification:** Lectures III

Contribution ID: 23

Type: **not specified**

Axions and Their Relatives

Friday 2 December 2005 11:00 (1h 30m)

<h4>Outline of the lecture:</h4>

A summary of the status of axions and axion-like particles will be given. Special attention is devoted to the recent results of the PVLAS collaboration, which are in conflict with CAST data and with astrophysical constraints. Solutions to this puzzle and the implications for new physics are discussed. The subject of axion-like particles as dark matter will be included in the lecture. Finally some new results on new forces mediated by light scalars are debated.

Author: EDUARD MASSO (University of Barcelona)

Presenter: EDUARD MASSO (University of Barcelona)

Session Classification: Lectures III

Contribution ID: 24

Type: **not specified**

Summary and Closing Remarks

Friday 2 December 2005 12:30 (15 minutes)

Author: KONSTANTIN ZIOUTAS (University of Patras)

Presenter: KONSTANTIN ZIOUTAS (University of Patras)

Session Classification: Lectures III