

**Dark Interactions:  
Perspectives from Theory and  
Experiment**

**Report of Contributions**

Contribution ID: 0

Type: **not specified**

## **Theoretical Motivation for New Weakly Coupled States (includes axions, sub-MeV dark photons, ALPs, etc.)**

*Wednesday, 11 June 2014 09:00 (35 minutes)*

**Presenter:** WEINER, Neal (NYU)

**Session Classification:** Theoretical Motivation

Contribution ID: 1

Type: **not specified**

# Theory and Phenomenology of Dark Vector Bosons

*Wednesday, 11 June 2014 09:40 (35 minutes)*

New physics can be light relative to the electroweak scale provided it couples very weakly to the Standard Model. An attractive and well-motivated example of this is a new dark vector boson. In this talk I will cover the theory of dark vectors with an emphasis on kinetic mixing with the photon and mass mixing with the Z boson. I will also touch briefly on the experimental implications of various dark vector models.

**Presenter:** MORRISSEY, David (TRIUMF)

**Session Classification:** Theoretical Motivation

Contribution ID: 2

Type: **not specified**

## Discussion

*Wednesday, 11 June 2014 10:20 (10 minutes)*

**Session Classification:** Theoretical Motivation

Contribution ID: 3

Type: **not specified**

## Dark Light

*Wednesday, 11 June 2014 11:00 (15 minutes)*

The DarkLight experiment aims to search for a dark photon in the low mass region 10-100 MeV/c<sup>2</sup>. By using the Jefferson Lab FEL's high-intensity 100 MeV, 1 MW electron beam incident on a gaseous hydrogen target, the process  $ep \rightarrow ep, e^+e^-$  will be studied. To search for a dark photon, full track reconstruction of the four-particle final state will be performed in order to observe a resonance on the  $e^+e^-$  invariant mass spectrum. The design of a detector suited to this task and the status of its development will be presented.

**Presenter:** EPSTEIN, Charles (MIT)

**Session Classification:** Low-energy Direct Searches for Dark Photons

Contribution ID: 4

Type: **not specified**

## APEX - The APrime EXperiment at Jefferson Lab

*Wednesday, 11 June 2014 11:20 (15 minutes)*

APEX is a fixed target experiment in Experimental Hall A at Thomas Jefferson National Accelerator Facility (JLab) in Virginia, USA, that is designed to search for a new gauge boson ( $A'$ ) with sub-GeV mass and coupling to ordinary matter of  $g'/e \sim (1 - 10^{-4})$ . Electrons impinge upon a fixed target of high-Z material to produce an  $A'$  via a process analogous to photon bremsstrahlung. The  $A'$  then decays to an  $e+e^-$  pair that is detected by the JLab Hall A High Resolution Spectrometers. A test run was held in July of 2010, covering an  $A'$  mass range from 175 to 250 MeV and couplings  $g'/e > 10^{-3}$ . A full run is approved, with coverage projections of  $m_{A'} \sim 65$  to 525 MeV and  $g'/e > 2.3 \times 10^{-4}$ . The JLab accelerator facility is currently being upgraded to deliver 12 GeV beam. While the Hall A schedule has not yet been finalized, APEX will be ready to run soon after the completion of the upgrade and beam commissioning. I will present the results of the test run and report on the preparations for the full run.

**Presenter:** BEACHAM, James (New York University)

**Session Classification:** Low-energy Direct Searches for Dark Photons

Contribution ID: 5

Type: **not specified**

## HPS – The Heavy Photon Search Experiment at JLab

*Wednesday, 11 June 2014 11:40 (15 minutes)*

HPS is a new experiment at Jefferson Laboratory designed to look for hidden sector photons in the mass range 20 - 1000 MeV with couplings  $a'/a$  in the range  $10^{-5}$  to  $10^{-10}$ . Presently under construction, HPS will be installed this fall in Hall B at JLab, commission thereafter, and take data in 2015. Heavy photons are identified as invariant mass bumps and as separated decay vertices. The apparatus is a compact forward spectrometer, using silicon microstrip detectors inside a dipole analyzing magnet for momentum measurement and vertexing, and a highly segmented PbWO<sub>4</sub> crystal calorimeter for fast triggering and electron ID. Fast triggering and 40 Mz readout electronics perfectly exploit CEBAF's 100% duty cycle to deliver the high luminosities needed to probe small couplings. This talk will review the experimental challenges before HPS, solutions adopted in our design, status of the project, and our plans and prospects for widening the search for heavy photons to whole new regions of parameter space.

**Presenter:** JAROS, John A (SLAC National Accelerator Laboratory)

**Session Classification:** Low-energy Direct Searches for Dark Photons

Contribution ID: 6

Type: **not specified**

## Mainz MAMI

*Wednesday, 11 June 2014 12:00 (15 minutes)*

The A1 collaboration at the Mainz Microtron has concluded a pilot study in 2011 and data taking periods in 2012/2013 to search for a dark photon. The focus of the experiment was on the mass range between 50-200 MeV where dark matter provides a possible explanation for the discrepancy in the anomalous magnetic moment of the muon ( $g-2$ ). The analysis is finished and the final exclusion limits will be presented. The Mainz search for a dark photon will continue as a part of the new MESA (Mainz Energy-recovering Superconducting Accelerator) project. In this talk, the present status of the detector and target design will be shown.

**Presenter:** DISTLER, Michael (University Mainz, Germany)

**Session Classification:** Low-energy Direct Searches for Dark Photons



Contribution ID: 7

Type: **not specified**

## Discussion

*Wednesday, 11 June 2014 12:20 (10 minutes)*

**Session Classification:** Low-energy Direct Searches for Dark Photons

Contribution ID: 8

Type: **not specified**

## **Theory motivation for sub-GeV DM + searches at proton beam dumps**

*Wednesday, 11 June 2014 14:00 (25 minutes)*

**Presenter:** BATELL, Brian (University of Chicago)

**Session Classification:** Light (sub-GeV) Dark Matter

Contribution ID: 9

Type: **not specified**

## Electron Beam Dump Experiments

*Wednesday, 11 June 2014 14:30 (20 minutes)*

**Presenter:** SCHUSTER, Philip (Perimeter Institute)

**Session Classification:** Light (sub-GeV) Dark Matter

Contribution ID: **10**

Type: **not specified**

## **Direct Detection Prospects**

*Wednesday, 11 June 2014 14:55 (20 minutes)*

**Presenter:** MARDON, Jeremy (Stanford)

**Session Classification:** Light (sub-GeV) Dark Matter

Contribution ID: **11**

Type: **not specified**

## **Discussion**

*Wednesday, 11 June 2014 15:20 (10 minutes)*

**Session Classification:** Light (sub-GeV) Dark Matter

Contribution ID: 12

Type: **not specified**

## Search for Dark Photons and Higgs at BaBar

*Wednesday, 11 June 2014 16:00 (15 minutes)*

Extensions to the Standard Model allow for new particles, including low-mass Higgs bosons and dark photons, that may bridge the Standard Model to the Dark Sector. We present recent results of searches for such particles in electron-positron annihilation with the BaBar Detector at the SLAC National Accelerator Laboratory. We also report briefly on a measurement of antideuteron production at BaBar, and comment on its significance for dark matter searches.

**Presenter:** Prof. BROWN, David (University of Louisville)

**Session Classification:** Dark Bosons at  $e^+e^-$  Colliders, Meson Decays, and Parity Violation

Contribution ID: 13

Type: **not specified**

## Belle/Belle II

*Wednesday, 11 June 2014 16:20 (15 minutes)*

We will present a new Belle (preliminary) limit in the search for a dark photon,  $A$ , and a dark Higgs,  $h'$ , with  $A$  and  $h'$  prompt,  $m_{h'} > 2m_A$ ,  $100 \text{ MeV} < m_A < 3.5 \text{ GeV}$  and  $200 \text{ MeV} < m_{h'} < 10.5 \text{ GeV}$ . We will also discuss possible future contributions of Belle II to dark sector particle searches.

**Presenter:** JAEGLE, Igal (University of Hawaii at Manoa)

**Session Classification:** Dark Bosons at  $e^+e^-$  Colliders, Meson Decays, and Parity Violation

Contribution ID: 14

Type: **not specified**

## Meson-Decay Experiments

*Wednesday, 11 June 2014 16:40 (15 minutes)*

The dark photon couples to Standard Model particles via kinetic mixing, so it may be produced in SM processes and decay to SM particles. Experiments that are designed for precise measurements of meson decay and detection of rare meson decay have high-resolution detectors and large data samples, making them well suited to search for dark photons. I will describe limits on dark photons from pion, kaon, and phi decay at SINDRUM, WASA-at-COSY, KLOE, NA48/2, NA62, and E787/949. I will also describe limits from electron-positron annihilation in KLOE.

**Presenter:** WORCESTER, Elizabeth (BNL)

**Session Classification:** Dark Bosons at  $e^+e^-$  Colliders, Meson Decays, and Parity Violation



Contribution ID: 15

Type: **not specified**

## PHENIX Searches for Low Mass Dark Photons

*Wednesday, 11 June 2014 17:00 (15 minutes)*

Several theoretical models introduce an additional U(1) gauge boson, a “dark photon” which mixes with ordinary QED photons with very small mixing strength. The dark photon is considered as one of the strongest candidates to describe some astrophysical anomalies as well as the  $3\sigma$  deviation of the experimental muon  $g-2$  value from the Standard Model calculation. The dark photon as the cause for the muon  $g-2$  anomaly gets more important because of recent SUSY search result at the LHC. Recently the PHENIX experiment at RHIC searched for the dark photon in  $\pi^0$  and  $\eta$  Dalitz decays. With both a very good mass resolution of the PHENIX detector and a high statistics sample of pure  $e^+e^-$  pairs from Dalitz decays, we obtain the world’s best upper limits on the dark photon mixing parameter space for  $m_U$  between 30 and 90 MeV/c<sup>2</sup>. In this talk, the latest PHENIX result will be shown.

**Presenter:** YAMAGUCHI, Yorito (University of Tokyo)

**Session Classification:** Dark Bosons at  $e^+e^-$  Colliders, Meson Decays, and Parity Violation

Contribution ID: 16

Type: **not specified**

## Muon $g-2$ and dark parity violation

*Wednesday, 11 June 2014 17:20 (15 minutes)*

**Presenter:** Dr LEE, Hye-Sung (College of William and Mary / Jefferson Lab)

**Session Classification:** Dark Bosons at  $e^+e^-$  Colliders, Meson Decays, and Parity Violation

Contribution ID: 17

Type: **not specified**

## Exotic Higgs Decays (theory, various models)

*Thursday, 12 June 2014 09:00 (20 minutes)*

Exotic Higgs decays may be our main window to new physics. They are common and often well-motivated in various new physics scenarios, partly due to the small natural width of the Higgs. Some exotic decay modes are cascades resulting in high multiplicity of the final state, and are therefore potentially spectacular. Still, they could easily be missed, partly due to triggering thresholds. This strongly suggests new dedicated experimental searches to be performed. I will review the motivation and show current and prospective estimated reach at LHC for a few exotic decay modes.

**Presenter:** SURUJON, Ze'ev (Stony Brook University)

**Session Classification:** Higgs Window into Dark Sectors

Contribution ID: **18**Type: **not specified**

## Higgs decays to exotic particles at CMS

*Thursday, 12 June 2014 09:30 (20 minutes)*

The results of searches for invisible decays of the Higgs boson in the vector boson fusion and associated ZH production modes, where Z decays to a pair of charged leptons or a  $b\bar{b}$  quark pair, are presented. Searches performed using data collected in proton-proton collisions at center-of-mass energies of 7 TeV and 8 TeV by the CMS experiment at the LHC. With no excess of the observed data over the expected Standard Model backgrounds, limits on the production cross section times invisible branching fraction, as a function of the Higgs boson mass, are set. Assuming the Standard Model Higgs boson cross sections, the limit on the invisible branching fraction of the Higgs boson is set and interpreted in terms of Higgs-portal model of dark matter. In addition, a search for non-SM Higgs boson decays to a pair of new light bosons, each of which subsequently decays into a collimated pair of muons, is presented. The search is performed using data collected by the CMS experiment in proton-proton collisions at center-of-mass energies of 8 TeV. Results are interpreted in a model independent fashion applicable to a broad class of models predicting the same signature as well as in the context of the SUSY with hidden dark sector.

**Presenter:** TATARINOV, Aysen (Texas A&M University)

**Session Classification:** Higgs Window into Dark Sectors

Contribution ID: 19

Type: **not specified**

## Higgs decays to exotic particles at ATLAS

*Thursday, 12 June 2014 09:55 (20 minutes)*

The discovery of a Higgs-like particle in ATLAS and CMS at the Large Hadron Collider opened a rich and interesting range of opportunities for discovery of exotic decays, i.e. decays that involve new light states beyond the SM. A large class of simplified and complete models gives rise to peculiar patterns of exotic decays of the Higgs boson, patterns that the ATLAS experiment is exploring with several dedicated analysis. The status of such searches in the data collected during the Run 1 of LHC, at center of mass energies of 7 and 8 TeV, will be reviewed, together with the perspectives for the new run at higher energy that will start in 2015. Particular emphasis will be given to the most recent results involving the direct search for invisible Higgs decays, and the indirect constraints on new phenomena obtained from coupling measurements of the Higgs boson, and the interpretation of these constraints in the context of the Higgs portal model to Dark Matter. Results of the searches performed in ATLAS for decays of the Higgs boson in exotic particles like lepton jets in Hidden Valley models, and multi-Higgs boson cascade predicted by many models beyond the SM will be also illustrated.

**Presenter:** GIAGU, Stefano (Sapienza University of Rome)

**Session Classification:** Higgs Window into Dark Sectors

Contribution ID: 20

Type: **not specified**

## Charged Higgs probes of dark bosons

*Thursday, 12 June 2014 10:20 (15 minutes)*

We suggest top quark decays as a venue to search for light dark force carriers. The top quark is the heaviest particle in the standard model whose decays are relatively poorly measured, allowing sufficient room for exotic decay modes from new physics. A very light (GeV scale) dark gauge boson ( $Z'$ ) is a recently highlighted hypothetical particle that can address some astrophysical anomalies as well as the 3.6 sigma deviation in the muon  $g-2$  measurement. We present and study a possible scenario that top quark decays as  $t \rightarrow b W + Z'$ 's. This is the same as the dominant top quark decay ( $t \rightarrow b W$ ) accompanied by one or multiple dark force carriers. The  $Z'$  can be easily boosted, and it can decay into highly collimated leptons (lepton-jet) with large branching ratio. We discuss the implications for the Large Hadron Collider experiments including the analysis based on the lepton-jets.

**Presenter:** KONG, Kyoungchul (University of Kansas)

**Session Classification:** Higgs Window into Dark Sectors

Contribution ID: 21

Type: **not specified**

## Dark Matter searches at ATLAS

*Thursday, 12 June 2014 11:10 (15 minutes)*

Numerous independent astrophysical experiments have observed and measured the influence of the phenomenon named Dark Matter, but its nature is still unknown. If the assumption that Dark Matter is a particle which has a weak coupling to the Standard Model is valid, then collider searches have the ability to search for the production of this new Weakly Interacting Massive Particle (WIMP). Any Dark Matter particles produced in collisions would escape the detector without being observed. Signatures which include an initial-state radiated particle balancing a large amount of Missing Transverse Momentum, known as mono-X topologies, provide a generic means of conducting Dark Matter searches. ATLAS has conducted several mono-X searches, including recoiling jets, photons, W/Z bosons which decay hadronically, and Z bosons which decay leptonically. Searches were carried out with centre of mass energies of both 7 and 8 TeV, and with up to 20/fb of data. No evidence for physics beyond the Standard Model is observed, and thus limits are placed on both Effective Field Theory models and Simplified Models of Dark Matter. These constraints are converted into bounds on WIMP-nucleon cross sections and WIMP annihilation cross-sections.

**Presenter:** SCHRAMM, Steven (University of Toronto)

**Session Classification:** LHC Probes of Dark Sectors I

Contribution ID: 22

Type: **not specified**

## **Dark Matter Searches at CMS**

*Thursday, 12 June 2014 11:30 (15 minutes)*

**Presenter:** DAMGOV, Jordan (Texas Tech University)

**Session Classification:** LHC Probes of Dark Sectors I



Contribution ID: 23

Type: **not specified**

## Searches for Hidden Valleys at ATLAS

*Thursday, 12 June 2014 11:50 (15 minutes)*

Hidden Valley models contain a hidden sector that communicates with the Standard Model via a scalar. The hidden sector phenomenology is unconstrained. It can be as complex or simple as desired, and prompt or long lived. In this case we explore the ATLAS program to search for long lived versions of the Hidden Valley model. The benchmark model is fairly simple, produces two hidden valley pions that decay somewhere in the detector. Many theories may generate these signatures. ATLAS has three custom triggers designed to capture these events, which are described, as well as an analysis designed to look for the very long decay length items. Sensitivity after the upgrade will also be addressed.

**Presenter:** WATTS, Gordon (University of Washington)

**Session Classification:** LHC Probes of Dark Sectors I

Contribution ID: 24

Type: **not specified**

## Searches for Hidden Valleys at CMS

*Thursday, 12 June 2014 12:10 (15 minutes)*

**Presenter:** CHOU, John Paul (Rutgers University)

**Session Classification:** LHC Probes of Dark Sectors I

Contribution ID: 25

Type: **not specified**

## **SUSY Dark Matter searches at CMS**

*Thursday, 12 June 2014 14:00 (15 minutes)*

In this talk I will discuss Implications of CMS Run 1 SUSY searches for the SUSY neutralino as a WIMP Dark Matter candidate

**Presenter:** RATNIKOV, Fedor (Inst. für Exp. Kernphysik)

**Session Classification:** LHC Probes of Dark Sectors II

Contribution ID: 26

Type: **not specified**

## SUSY Dark Matter searches at ATLAS

*Thursday, 12 June 2014 14:20 (15 minutes)*

Supersymmetry provides an excellent dark matter candidate. SUSY searches at ATLAS are sensitive to an extensive range of scenarios with either a neutralino or a gravitino as the lightest supersymmetric particle. In this talk I will present the latest results from analyses carried out using the Run 1 dataset collected by ATLAS at the LHC at 8 TeV center of mass energy.

**Presenter:** PEREZ CODINA, Estel (TRIUMF)

**Session Classification:** LHC Probes of Dark Sectors II

Contribution ID: 27

Type: **not specified**

## Search for exotic particles at LHCb

*Thursday, 12 June 2014 14:40 (15 minutes)*

LHCb, located on the LHC, is a fully instrumented forward detector with flexible triggers, low pileup, and excellent secondary vertex resolution which make it an ideal experiment to search for unique exotic signals. A review of current LHCb exotic particle searches is given. Searches for the anomalous decays of B-mesons and tau-leptons are presented, as well as direct searches through central exclusive production, di-tau production,  $b\bar{b}$  asymmetry, and displaced secondary vertices.

**Presenter:** ILTEN, James Philip (Massachusetts Institute of Technology)

**Session Classification:** LHC Probes of Dark Sectors II

Contribution ID: 28

Type: **not specified**

## Dark Photon Searches at ALICE

*Thursday, 12 June 2014 15:00 (15 minutes)*

ALICE is one of the largest experiments at the Large Hadron Collider at CERN and is designed to study the physics of strongly interacting matter at extreme high temperature and energy densities created in high-energy heavy ion collisions. ALICE has a good potential to search for a dark photon signal in  $\pi^0$  and  $\eta$  Dalitz decays, thanks to the excellent resolution of the tracking system and the high statistics of di-electrons pairs from Dalitz decays. The upgrade of the major ALICE detectors is foreseen to take place during the 2018 Long Shutdown (LS2). In this way, the experiment will fully exploit the high-luminosity Pb-Pb collisions provided by the LHC, recording events at a 50kHz rate. These conditions will significantly increase the dark photon search capabilities of ALICE. In this presentation, the current status of dark photon searches in the Run1 data sample will be shown and the expected constraints for the dark photon mixing parameter in the Run-2 and Run-3 conditions will be discussed.

**Presenter:** GUNJI, Taku (Center for Nuclear Study, the University of Tokyo)

**Session Classification:** LHC Probes of Dark Sectors II

Contribution ID: 29

Type: **not specified**

## Discussion

*Thursday, 12 June 2014 15:20 (10 minutes)*

**Session Classification:** LHC Probes of Dark Sectors II

Contribution ID: **30**

Type: **not specified**

## **Dark Matter Direct Detections**

*Thursday, 12 June 2014 16:00 (25 minutes)*

**Presenter:** ZUREK, Kathryn (University of Michigan)

**Session Classification:** Dark Matter and Dark Interactions



Contribution ID: 31

Type: **not specified**

## Dark matter annihilations in the Galactic Center

*Thursday, 12 June 2014 16:30 (25 minutes)*

Past studies have identified a spatially extended excess of  $\sim 1\text{-}3$  GeV gamma rays from the region surrounding the Galactic Center, consistent with the emission expected from annihilating dark matter. Recent improvements in the analysis techniques have found this excess to be robust and highly statistically significant, with a spectrum, angular distribution, and overall normalization that is in good agreement with that predicted by simple annihilating dark matter models. For example, the signal is very well fit by a 31-40 GeV dark matter particle annihilating to b quarks with an annihilation cross section of  $\sigma v = (1.7\text{-}2.3) \times 10^{-26} \text{ cm}^3/\text{s}$ . Furthermore, the angular distribution of the excess is approximately spherically symmetric and centered around the dynamical center of the Milky Way (within  $\sim 0.05$  degrees of Sgr A\*), showing no sign of elongation along or perpendicular to the Galactic Plane. The signal is observed to extend to at least 10 degrees from the Galactic Center, disfavoring the possibility that this emission originates from millisecond pulsars.

**Presenter:** HOOPER, Dan (Fermilab)

**Session Classification:** Dark Matter and Dark Interactions

Contribution ID: 32

Type: **not specified**

## CMB Constraints on Dark Matter Annihilation

*Thursday, 12 June 2014 17:00 (15 minutes)*

The Cosmic Microwave Background (CMB) is a remarkably powerful and clean probe of dark matter annihilation. I will review the constraints from existing CMB and low-redshift data, and discuss future prospects from current and upcoming CMB experiments such as Planck and Advanced ACTpol. Many simple models designed to explain various indirect detection anomalies can be decisively tested with the CMB in the next few years.

**Presenter:** SEHGAL, Neelima (Stony Brook University)

**Session Classification:** Dark Matter and Dark Interactions

Contribution ID: 33

Type: **not specified**

## Discussion

*Thursday, 12 June 2014 17:20 (10 minutes)*

**Session Classification:** Dark Matter and Dark Interactions

Contribution ID: 34

Type: **not specified**

## Black hole portal into hidden valleys

*Friday, 13 June 2014 09:00 (25 minutes)*

I will discuss electromagnetic signals of black hole superradiance in the presence of an axion coupled to a hidden QCD-like sector.

**Presenter:** DUBOVSKY, Sergei (New York University)

**Session Classification:** Axions and Axion-like particles

Contribution ID: 35

Type: **not specified**

## Cosmic Axion Spin Precession Experiment (CASPER)

*Friday, 13 June 2014 09:55 (20 minutes)*

We propose an experiment to search for QCD axion and axion-like-particle (ALP) dark matter. Nuclei that are interacting with the background axion dark matter acquire time-varying CP-odd nuclear moments such as an electric dipole moment. In analogy with nuclear magnetic resonance, these moments cause precession of nuclear spins in a material sample in the presence of a background electric field. This precession can be detected through high-precision magnetometry. With current techniques, this experiment has sensitivity to axion masses  $m_a \lesssim 10^{(-9)}$  eV, corresponding to theoretically well-motivated axion decay constants  $f_a \gtrsim 10^{16}$  GeV. With improved magnetometry, this experiment could ultimately cover the entire range of masses  $m_a \lesssim 10^{(-6)}$  eV, just beyond the region accessible to current axion searches.

**Presenter:** RAJENDRAN, Surjeet (Stanford)

**Session Classification:** Axions and Axion-like particles

Contribution ID: 36

Type: **not specified**

## ADMX

*Friday, 13 June 2014 09:30 (20 minutes)*

The axion is a well-motivated cold dark matter candidate first postulated to explain the absence of CP violation in strong interactions. Dark matter axions may be detected via their resonant conversion into photons in a high-Q microwave cavity permeated by a strong magnetic field. The Axion Dark Matter eXperiment (ADMX) has used this technique to exclude axion models in the few  $\mu\text{eV}$  mass range. Much of axion dark matter parameter space has until recently been beyond the reach of experiment, but advances in amplifier technology have enabled quantum-limited axion detection around  $20 \mu\text{eV}$  (5 GHz); ADMX-HF (high-frequency), currently under construction at Yale University, will have sufficient sensitivity to probe this region of parameter space. This talk will cover the principles of the microwave cavity axion search and the status of current experiments, with a focus on ADMX-HF. I will also discuss R&D efforts by the ADMX-HF collaboration aimed at extending the microwave cavity technique to weaker couplings and higher frequencies.

**Presenter:** BRUBAKER, Benjamin (Yale University)

**Session Classification:** Axions and Axion-like particles

Contribution ID: 37

Type: **not specified**

## Discussion

*Friday, 13 June 2014 10:20 (10 minutes)*

**Session Classification:** Axions and Axion-like particles

Contribution ID: 38

Type: **not specified**

## Neutrinos and hidden physics (sterile neutrinos)

*Friday, 13 June 2014 11:00 (25 minutes)*

The existence of sterile neutrinos has been presented as an explanation for many anomalous results in experimental astro-particle physics. This talk will discuss existing experimental indications for eV-scale sterile neutrinos, while surveying future prospects for resolving these hints at accelerator, reactor, and radioactive source neutrino experiments.

**Presenter:** LITTLEJOHN, Bryce (University Of Cincinnati)

**Session Classification:** Cosmology and astrophysics



Contribution ID: 39

Type: **not specified**

## **Cosmology probes of dark sectors**

*Friday, 13 June 2014 11:30 (25 minutes)*

**Presenter:** SMITH, Kendrik (Perimeter Institute)

**Session Classification:** Cosmology and astrophysics

Contribution ID: 40

Type: **not specified**

## Concluding remarks and outlook

*Friday, 13 June 2014 12:00 (25 minutes)*

**Presenter:** POSPELOV, Maxim (University of Victoria)

**Session Classification:** Cosmology and astrophysics

Contribution ID: 41

Type: **not specified**

## Workshop Group Photo

*Wednesday, 11 June 2014 12:30 (10 minutes)*