T 131: Searches V

Time: Thursday 17:30–18:45

Location: HSZ/0403

T 131.1 Thu 17:30 HSZ/0403

Gamma-gamma collider with Energy < 12 GeV based on European XFEL — •Marten Berger — Universität Hamburg

The possibility of a Gamma-gamma collider extension to the Beam dump 17.5 GeV European XFEL has been discussed. This collider would be without competition in the region $5-12$ GeV. In this range $b\bar{b}$ resonances, tetraquarks as well as mesonic molecules can be observed. Apart from these there are also BSM and dark matter processes that can be observed. In this talk we want to focus on possible BSM and dark matter observations with dark photon and ALPs.

T 131.2 Thu 17:45 HSZ/0403

SUPAX - A Superconducting Axion Search Experiment — •Tim Schneemann, Kristof Schmieden, and Matthias Schott — Johannes Gutenberg-Universität, Mainz

Supax is one of the first RF cavity based experiments in Germany to search for axions. Axions are hypothetical particles that could solve the well known strong CP problem in the standard model of particle physics. Furthermore axions could explain the dark matter content of the universe. Axions are expected to convert to photons in the presence of a strong magnetic field, where the photon frequency depends on the axions mass. For wavelengths in the microwave regime resonators are typically used to enhance the axion signal. We propose to use a superconducting radio frequency cavity with high quality factor. A Copper RF cavity has already been successfully tested probing for Dark Photons in the absence of a magnetic field whilst tune-able and superconducting RF cavities are currently being developed. With this innovative approach and by using an existing 14T magnet at the Institute of Physics at the Johannes Gutenberg University in Mainz, the largely unexplored mass region between 20 μeV to 50 μeV could be tested.

In this talk I will cover the experimental setup, data acquisition, analysis and current results of the experiment as well as future ideas of the experiment beside the search for axions.

T 131.3 Thu 18:00 HSZ/0403

BabyIAXO: prospects and status of a new generation axion helioscope — •Daniel Heuchel[1] and the IAXO-Collaboration[2] — [1]Deutsches Elektronen-Synchrotron (DESY) — [2]https://iaxo.desy.de

In order to search for solar axions and axion-like particles (ALPs) with unprecedented sensitivities, the International Axion Observatory (IAXO) aims to convert those particles via the interaction with virtual photons into X-rays in a strong magnet pointing towards the sun followed by high-precision focusing and ultra-low background and high-efficiency X-ray detectors.

The intermediate experimental stage, BabyIAXO, proposed to be sited at DESY Hamburg, will not only serve as a prototype-stage for all IAXO subsystems, but it will be a fully fledged helioscope with potential for discovery. Along with a 10 m long and about 2 T strong superconducting magnet hosting two 70 cm diameter bores, optics and detector systems very similar to the ones foreseen for IAXO will complete the two detection lines. Based on this setup, BabyIAXO will be able probe axion-photon couplings down to $1.5{\times}10^{-11}$ GeV^{-1} for axion masses of up to 0.25 eV.

In this contribution, the general prospects of BabyIAXO, the current status of the different BabyIAXO subsystems including the different X-ray detector technologies and the ongoing background simulation campaigns are presented and discussed.

T 131.4 Thu 18:15 HSZ/0403

Results from First Simulation Studies for a Dark Photon Search Experiment at the ELSA Electron Accelerator — Philip Bechtle, Klaus Desch, Oliver Freyermuth, Matthias Hamer, •Jan-Eric Heinrichs, and Martin Schürmann — Rheinische Friedrich-Wilhelms-Universität Bonn

The true nature of Dark Matter (DM) has long been of interest for scientists worldwide. Previous searches have so far been unsuccessful in finding proposed DM particles. A promising and not well explored family of DM models contains dark matter particles and a portal to the SM with masses below ≈ 1 GeV. Mainly two approaches are investigated by the community, namely beam dump and fixed targets experiments.

Lohengrin is a proposed experiment to search for a dark sector that couples to the SM through a dark photon at the ELSA accelerator in Bonn. In this presentation, the underlying theory and the proposed experiment strategy will be explained. The challenges for the proposed experiment are presented, as well as first steps towards the reconstruction of high level physics objects using a Geant 4 simulation.

T 131.5 Thu 18:30 HSZ/0403

QCD Generative Model Without Machine Learning — •Samuel Bein — Universität Hamburg, Hamburg, Germany

The Rebalance and Smear technique for the modeling of QCD backgrounds to searches for dark matter at the LHC is presented as a publicly available toolkit. Bayesian inference is carried out on real data events to estimate a latent space of the true jet energy values within each event. The latent space is sampled multiple times per event according to a known PDF of the detector response to the jet energy, and the resulting collection represents a high-statistics proxy for the true QCD background. This method, previously carried out at CMS and ATLAS for background estimation, can be further employed in the training of multivariate classifiers to optimally extend the sensitivity of searches to BSM scenarios with compressed mass spectra. An example future search probing pure Higgsino dark matter in gluino and squark simplified models, is a suitable application of this method in Run 3.