

Physics and Astrophysics Special Seminar

Thursday, March 11, 2021

1:00 p.m.

A Pathfinder Experiment to Detect Light Bosonic Dark Matter

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I will propose an experiment that can directly detect or place strong limits on dark photon dark matter in the lab at UCLA. In this experiment, dark photons of our galactic halo (should they exist...) which happen to pass through a dielectric stack convert into real photons that are detected with a cryogenic single photon detector array. The dielectric thicknesses and indices in the stack determine the dark photon energy interval over which the conversion is allowed (0.25 eV — 2.5 eV initially, using multiple stacks to cover the band). These physical characteristics also relate the detected photon power to the dark photon-real photon mixing. Sensitivity to axion dark matter can be achieved by passing a magnetic field through the stack. Background rejection and directional sensitivity can be enhanced by implementing fine scale position resolution on the photon detector array.

The talk will cover my previous research experiences as they underpin the proposed experiment. I will also talk about outreach, diversity and inclusion activities that interest me as a potential UCLA faculty member.

Born and raised in Maryland, Dr. Miguel Daal attended public K-12, then attended Brown university as an undergraduate, UC Berkeley as a graduate student, and works as a post doctoral researcher at UC Santa Barbara. Miguel was inspired to major in physics at Brown by his astronomy and cosmology courses and worked on a weak lensing survey, indirect dark matter detection, for his thesis. At Berkeley, he worked on a dark matter direct detection experiment, which required him to develop a strong skill set in low temperature and microwave-frequency detectors. At UCSB Miguel expanded his skill set involving the same detector technology but applied to detection and imaging of astrophysical X-rays. Miguel's central research interest is the detection of cosmic dark matter, and he applies state-of-the-art cryogenic detectors to search for it.