



Contribution ID: 244

Type: Oral Presentation

DM Radio: A Quantum-Limited Axion Search

Thursday, 25 July 2019 16:00 (15 minutes)

The direct detection of WIMP dark matter has so far eluded detection efforts. Like WIMPs, the QCD axion is a natural dark-matter candidate, but large parts of its parameter space, including some of the most well-motivated models, remain unexplored. We describe the Dark Matter Radio (DM Radio), a low-temperature search for axions and hidden-photons over the $\text{peV} - \mu\text{eV}$ mass range. Axion and hidden-photon dark matter has wavelike properties and behaves as a coherent field. DM Radio uses a tunable, high-Q lumped-element resonator within a superconducting shield. Like an AM radio searching for a station at an unknown frequency, DM radio is tuned to search for signals created when axions or hidden photons are converted into photons at frequency $f = mc^2/h$, where m is the rest mass of dark matter. By using lumped-element components, it can search an extremely broad range of frequencies (from ~ 300 Hz to 300 MHz). DM Radio is designed to be a quantum limited search for dark matter, using both dc SQUIDs and other quantum sensors to read out the state of the resonator. We describe the ongoing development of the DM Radio 50 L experiment, and plans for DM Radio Cubic Meter, which will be sensitive to the QCD axion over two orders of magnitude in mass, from ~ 10 neV to $1 \mu\text{eV}$.

Less than 5 years of experience since completion of Ph.D

N

Student (Ph.D., M.Sc. or B.Sc.)

N

Primary authors: Dr LI, Dale (SLAC National Accelerator Laboratory); Mr CARMAN, Samuel (Stanford University); Mr CHAUDHURI, Saptarshi (Stanford University); Dr CHO, Hsiao-Mei (SLAC National Accelerator Laboratory); Mr DAWSON, Carl (Stanford University); Mr DROSTER, Alex (UC Berkeley); Mr FROLAND, Henry (Stanford University); Prof. GRAHAM, Peter (Stanford University); Prof. IRWIN, Kent (Stanford University); Mr KUENSTNER, Stephen (Stanford University); Dr LEDER, Alexander (UC Berkeley); Dr PHIPPS, Arran (Stanford University); Prof. RAJENDRAN, Surjeet (UC Berkeley); Mr WELLS, Kevin (Stanford University); Prof. YOUNG, Betty (Santa Clara University)

Presenter: Dr LI, Dale (SLAC National Accelerator Laboratory)

Session Classification: Orals LM 005

Track Classification: Low Temperature Detector for quantum technologies and other frontiers