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DAMIC Experiment

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Dark matter (DM) in the **sub-GeV mass** range is a theoretically motivated but largely unexplored paradigm, complementing the high mass search. Such light masses are out of reach for conventional nuclear recoil direct detection experiments, but may be detected through the small ionisation signals caused by dark matter-electron scattering. Investigating **Light DM** is an important and natural direction to pursue in the DM search effort.

DAMIC experiment at SNOLAB employs fully-depleted **charge-coupled devices *(CCD)**. Using the bulk silicon which composes the detector as target is expected to observe coherent WIMP-nucleus elastic scattering. Due to its low electronic readout noise allows an unprecedentedly low energy threshold that make it possible to detect silicon recoils resulting from interactions of low mass WIMPs. In addition the CCD's excellent energy and spatial resolutions, the DAMIC CCDs are well-suited to identify and suppress radioactive backgrounds, having an unrivalled sensitivity to WIMPs with masses < 6 GeV/c2 [1]. Early results motivated the construction of a 100 g detector, DAMIC100, recently installed and currently taking data, it is expected to provide results for the winter conferences. It will perform precise measurements of backgrounds (32 Si and tritium) and place dark matter limits with O(10 kg day) exposure. DAMIC had shown sensitivity to **other DM candidates** and had presented the most stringent direct detection constraints on **hidden photon**[2].

DAMIC collaboration is planning an **upgrade** increasing its **mass to 1kg**, that will be developed in the next three years **DAMIC-1K[3]** will search for low-mass DM in a broad range from 1 eV –few GeV with unprecedented sensitivity to DM-electron scattering and hidden-photon DM by improving by orders of magnitude the sensitivity to the ionisation signals from the scattering of dark matter particles with valence electrons. The technology to fabricate DAMIC-1K CCDs is already proven, with modest increase in area and thickness of the DAMIC detectors. Skipper design —developed, tested, and implemented by the SENSEI collaboration —will be used to reach sub-electron noise, combined with digital filtering for fast readout. DAMIC-1K will demonstrate the rejection of cosmogenic 32Si —the dominant background for SuperCDMS Si-HV —through spatial correlation of candidate events with the decay of the 32P daughter, providing a path to the exploration of low-mass DM interactions down to the Neutrino Floor.

The following plots show the DAMIC constraints and DAMIC-1K projections for the DM-electron scattering cross section σe for WIMPS and hidden photons respectively.

Authors: VILAR CORTABITARTE, Rocio (Instituto de Física de Cantabria (Universidad de Cantabria -CSIC)); LOPEZ VIRTO, Maria Amparo (Instituto de Física de Cantabria (Universidad de Cantabria -CSIC)); RODRIGO, Teresa (Instituto de Física de Cantabria (Universidad de Cantabria - CSIC))

Presenter: VILAR CORTABITARTE, Rocio (Instituto de Física de Cantabria (Universidad de Cantabria -CSIC))

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