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A multidisciplinary endeavor in experimentation in DAMIC

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Experimental efforts of the last decades have been unsuccessful in detecting WIMPs (Weakly Interacting Massive Particles) in the 10-to-104 GeV/⊠2 range, thus motivating the search for lighter Dark Matter (DM). DAMIC (DArk Matter in CCDs) experiment aims for direct detection of light DM particles (⊠⊠<10 GeV/⊠2) by means of Charge-Coupled Devices (CCDs). Scientific fully-depleted CCDs consisting of high resistivity silicon (~10 kΩ·cm) and about ten times more massive than conventional ones are used to such end. The low electronic readout noise (~2 eV) and operation at cryogenic temperatures allow for detection thresholds of few eV. Focusing on nuclear recoil and electronic scattering as potential detection processes, DAMIC has so far set competitive constraints on the detection of low mass WIMPs (1 to 10 GeV/⊠2), hidden-sector particles (1 to 102 MeV/⊠2) and eV-scale hidden photons.

As a doctoral researcher, being part of the DAMIC collaboration means witnessing and taking part in all phases of experimentation. CCDs deployment out of their long-established scientific field, i.e., astronomical imaging, is a challenging, yet rewarding endeavor. The involvement of traditionally separate subjects such as background physics and cosmology adds complexity, yet brings richness to the task. The usage of analysis tools of proven effectiveness in quantitative science – from Monte Carlo methods to Bayesian inference – requires careful intellectual engagement. These are among the reasons why I get inspired daily in DAMIC.

This work presents an overview of the DAMIC experiment, describing its key aspects. The scientific results of the collaboration are also subject of discussion.

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