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Dark Matter in CCDs at Modane (DAMIC-M): a silicon detector apparatus searching for low-energy physics processes

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Dark Matter In CCDs (DAMIC) is a silicon detector apparatus used primarily for searching for low-mass dark matter using the silicon bulk of Charge-Coupled Devices (CCDs) as targets. The silicon target within each CCD is $675\ \mu\text{m}$ thick and its top surface is divided into over 16 million $15\ \mu\text{m} \times 15\ \mu\text{m}$ pixels. The DAMIC collaboration has installed and operated seven of these CCDs at SNOLAB, achieving a pixel readout noise of $1.6\ e$ and a leakage current as low as $2E-22\text{A}/\text{cm}^2$. The low instrumental noise of the devices allowed DAMIC at SNOLAB to perform highly sensitive searches for the scattering and absorption of light dark matter particles. A new DAMIC apparatus will be installed at Laboratoire Souterrain de Modane in a few years. The DAMIC at Modane (DAMIC-M) collaboration will be using an improved version of CCDs designed by Lawrence Berkeley National Laboratory with skipper amplifiers that use non-destructive readout with multiple-sampling, enabling the CCDs to achieve a readout noise of $0.068\ e$. The low readout noise, in conjunction with low leakage current of these skipper CCDs, will allow DAMIC-M to observe physics processes with collision energies less than $10\ \text{eV}$. The DAMIC-M experiment will consist of an array of 50 large-area skipper CCDs with more than 36 million pixels in each CCD. The following talk will introduce the DAMIC apparatus at SNOLAB and its results as well as the capabilities and the status of the new DAMIC-M experiment.

Primary author: LEE, Steven Juhyung (University of Zurich (CH))

Presenter: LEE, Steven Juhyung (University of Zurich (CH))

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