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Low-threshold WIMP search at SuperCDMS

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Gravitational effects observed at different astronomical scales indicate that ~85% of the matter content of the Universe consist of dark matter (DM) whose particle nature remains unknown. Hints from direct and indirect measurements, together with some theoretical scenarios, motivate the interest in low-mass ($< 30 \text{ GeV}/c^2$) weakly-interacting massive particles (WIMPs) as DM candidates.

The Super Cryogenic Dark Matter Search (SuperCDMS) experiment has been operating 15 germanium detectors at the Soudan Underground Laboratory in Minnesota (USA) since March 2012 with improved background rejection capabilities with respect to CDMS II. A low-threshold analysis of the SuperCDMS data has been performed using events from the seven detectors with the lowest trigger thresholds, allowing to explore WIMP masses below $30 \text{ GeV}/c^2$. This is the first analysis using the full background rejection capabilities of SuperCDMS. In particular both ionization and phonon signals are used for defining a fiducial volume excluding events near any of the surfaces of the detectors. In addition, the background discrimination includes multivariate techniques optimized for several WIMP masses. The results are competitive with other low-threshold WIMP searches, and probe new parameter space for WIMP-nucleon scattering for WIMP masses between 4 and $6 \text{ GeV}/c^2$.

Summary

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