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Cosmogenic Production Rates in Germanium with CDMSlite Run 2 (G)*

Monday 11 June 2018 17:30 (15 minutes)

The Super Cryogenic Dark Matter Search (SuperCDMS) uses cryogenic semiconductor detectors to search for Weakly Interacting Massive Particles (WIMPs), a well-motivated class of candidate particles for the dark matter that constitutes 27% of the energy density of the universe. The CDMS Low Ionization Threshold Experiment (CDMSlite) probes the low mass WIMP region (<10 GeV/c²) by applying a high voltage (HV) across the SuperCDMS detectors, utilizing the Neganov-Trofimov-Luke effect to amplify small energy deposits. While this results in a very low energy threshold (<60 eV has been achieved), it is no longer possible to discriminate the electron recoil background from a potential nuclear recoil WIMP signal. In the SuperCDMS Soudan experiment (completed in 2015), two germanium detectors were operated in the CDMSlite mode.

In the next phase of SuperCDMS at SNOLAB, half of the detectors will be operated in HV mode. The limiting background is expected to result from cosmogenic activation of the detector material itself; ³H dominates in germanium (and is also significant in silicon). However, with a wide spread in the results of theoretical calculations and only one experimental data point with large uncertainty, the cosmogenic production rate of ³H in germanium is not well known. Using data from the second run of CDMSlite at Soudan and the location history of the detector, cosmogenic production rates are extracted for ³H and several other cosmogenically produced isotopes.

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