

CDEX collaboration published world leading results in light WIMPs direct detection

With the support by the National Natural Science Foundation of China and the National Key Research and Development Program of China, the CDEX collaboration led by Yue Qian (岳骞) from Tsinghua University reported the most stringent limits on spin-independent WIMP-nucleon cross sections for a WIMP mass of 4–5 GeV/c² with the lowest exclusion of 8×10^{-42} cm² using Point Contact Germanium detectors directly immersed into liquid nitrogen (LN₂). The results were published in *Physical Review Letters* (2018, 120: 241301).

The first results of a light weakly interacting massive particles (WIMPs) search were from the CDEX-10 experiment with a 10 kg germanium detector array immersed in LN₂ at the China Jinping Underground Laboratory (CJPL) based on a physics data set of 102.8 kg day. At an analysis threshold of 160 eV_{ee}, the lowest threshold and background among the various CDEX data set to date were achieved, which extended the reach of WIMP mass lower to 2 GeV/c². Simultaneously, this brought forth almost an order of magnitude improvement over their previous exclusion bounds, and the most stringent limits were given with the same detection technology. Especially for spin-independent cross sections, new regions for WIMP mass of 4–5 GeV/c² were probed and excluded.

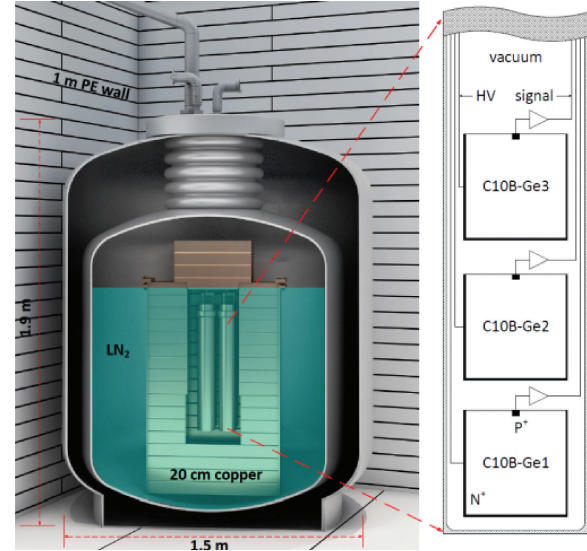


Figure 1 Configuration of CDEX-10 experimental setup and C10B detector layout inside the string.

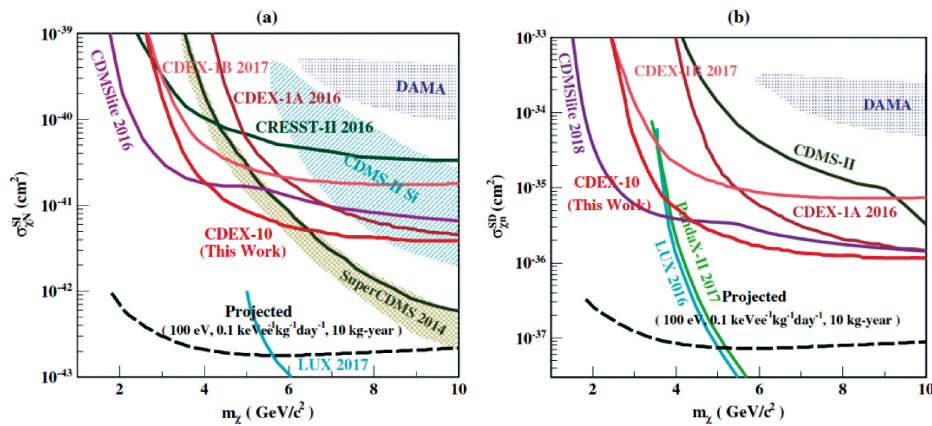


Figure 2 Exclusion plots of (a) SI χ -N coupling and (b) SD χ -neutron coupling at 90% C. L.

The CDEX-10 detector array will be moved to and installed in a new large LN₂ tank with a volume of about 1700 m³ at Hall-C of CJPL-II by the end of 2018, where shielding from ambient radioactivity is provided by the 6 m-thick LN₂. By then, the CDEX-10 experiment and future upgraded phases of CDEX experiment will run in this cryo-tank toward a ton-scale experiment (CDEX-1T) searching for dark matter and neutrino-less double beta decay.