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Dark matter program of the CDEX collaboration at China Jinping Underground Laboratory

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The CDEX program pursues the direct detection of light dark matter candidates with an array of germanium detectors since 2009 at the deepest operating underground site located in Sichuan, China. Searches of modulation effect of light WIMPs[1], WIMPs-nucleus interaction via Migdal effect[2], dark photon model[3], solar axions and axion-like particles[4] as well as the effective-Field-theory-involved interactions[5] have been recently carried out based on the CDEX-1 and CDEX-10 experiments. An upgraded dark matter experiment of the CDEX-50dm is proposed and on-going together with the R&D programs on the key low radioactivity technologies including electroformed copper at the underground site, fabrication and the extra-low-background front-ends of the various germanium detector types, operations of a germanium detector with its bare crystal immersed in liquid nitrogen, possible hybrid Anti-Compton detectors of the mixed PEN and liquid/solid argon as well as radon mitigation of a 1725 meter cube liquid nitrogen tank. Results and the prospects of the CDEX dark matter program will be described and discussed.

1. L. T. Yang et al.,(CDEX Collaboration) “Light WIMPs Search by Annual Modulation Analysis with a Point-Contact Germanium Detector at the China Jinping Underground Laboratory”, Phys. Rev. Lett. 123, 221301 (2019)
2. Z. Z. Liu(CDEX Collaboration) “Constraints on spin-independent nucleus scattering with sub-GeV WIMP dark matter from the CDEX-1B Experiment at CJPL”, Phys. Rev. Lett. 123 161301 (2019)
3. Z. She(CDEX Collaboration) “Direct Detection Constraints on Dark Photons with CDEX-10 Experiment at the China Jinping Underground Laboratory” Phys. Rev. Lett. 124, 111301 (2020)
4. Y. Wang(CDEX Collaboration) “Improved limits on solar axions and bosonic dark matter from the CDEX-1B experiment using profile likelihood ratio method” Phys. Rev. D 101, 052003 (2020)
5. Y. Wang (CDEX Collaboration), “First experimental constraints on WIMP couplings in the effective field theory framework from CDEX” Sci. China-Phys. Mech. Astron. 64, 281011 (2021)

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