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Direct Search for Dark Matter with Two-phase Xenon Detectors: Current Status of LUX and Plans for LZ

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The search for dark matter reaches back generations and remains one of the most compelling endeavors in the hunt for physics beyond the Standard Model. Experiments attempting to directly detect weakly interacting massive particle (WIMP) dark matter have made remarkable progress in increasing their sensitivity to the elastic scattering of WIMPs on nuclei. The Large Underground Xenon (LUX) experiment is a 370-kg, two-phase, xenon time projection chamber currently running at the Sanford Underground Research Facility (SURF), 4850 feet below Lead, SD. LUX recently completed its first science run (in the fall of 2013) and was sensitive to spin independent WIMP scattering at cross sections below $1e-45$ square centimeters for WIMP masses of approximately 20 to 80 GeV. Preparations for the final science run of LUX are currently underway, with final results expected in 2015. Successful operation of the LUX detector is also an important milestone in the use of technologies (such as water shielding and thermosyphon cryogenics) proposed for even larger detectors. We will present results from and current status of the LUX experiment, as well as plans for a follow-on, multi-ton-scale xenon experiment at SURF.

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