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First results from the LUX Dark Matter Experiment

The discovery of the nature of the dark matter is presently one of the greatest challenges in fundamental physics. One favored class of dark matter candidates, the Weakly Interacting Massive Particles (WIMPs), are expected to interact with ordinary matter. LUX is one of the experiments that aim to detect nuclear recoils of energies of several keV resulting from the interaction of galactic WIMPs at a rate of less than 1 event/kg/year. For that, it employs a double-phase (liquid/gas) time projection chamber with 370 kg of mass, operating in the Davis Cavern of the Sanford Underground Laboratory, South Dakota USA. In this seminar we will present the results from the first WIMP search run of LUX. From a total exposure of 85 live-days, we found no evidence of signal above expected background, constraining scalar WIMP-nucleon interactions above 7.6×10^{-46} cm^2 at 33 GeV/c^2 WIMP mass (90% C.L.) - three times more sensitive than any competing experiment. The improvement in the sensitivity is more significant at low energies and seriously challenges the interpretation of hints of signal detected in other experiments as arising from low-mass WIMPs. This improvement in the current limits was achieved due the large mass of the detector and the high efficiency of detection of scintillation photons, the latter enabling to decrease the energy threshold for nuclear recoils to 3 keV. LUX is preparing a new dark-matter search run that will last around one year and will improve significantly the current limits. We are also planning a multi-tonne successor to LUX: the LZ experiment. This instrument will have sensitivity ideally matched to explore the bulk of the remaining theoretically favored electroweak phase space for galactic Dark Matter discovery.

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