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Direct Detection: The Search for Dark Matter Particles with LUX and LZ

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Of the four fundamental interactions, only gravity has hinted at the existence of dark matter. Yet the astrophysical evidence gleaned from this interaction is now overwhelming, and its implications striking: dark matter constitutes nearly 6/7 of the universe's matter composition, a ratio that holds true in our own Milky Way. The evidence further indicates that this mysterious substance participates in neither the strong nor electromagnetic interactions, its indifference to the latter having inspired its "dark"moniker. The experimental particle physicist's only hope, then, is in the weak force. Miraculously, calculations of thermal equilibrium in the early universe strongly validate such faith in the weak interaction. Here on Earth, devices using liquid xenon as a target have proven to be an invaluable tool in the search for these weak interactions with dark matter particles. Liquid xenon detectors are expandable, straightforward to calibrate, and have extensively studied discriminating power between expected dark matter and background signals. The LUX and LZ programs represent the realization of all these attributes, and are the focus of my presentation.

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