Pulse Shape Discrimination in the LUX Dark Matter Experiment[1] DEV ASHISH KHAITAN, University of Rochester, LUX COLLAB-ORATION — The Large Underground Xenon (LUX) experiment is a dual-phase xenon time projection chamber (TPC), with an active mass of approx. 250 kg, located in the Sanford Underground Research Facility in Lead, South Dakota, USA. The experiment searches for Weakly Interacting Massive Particles (WIMPs), a leading candidate for the dark matter content of the universe. It is expected that their interaction will be nuclear recoils (NR) and must be distinguished from background due to gamma rays and beta decays which will create electron recoil (ER) interactions. Typically, this is accomplished using the ratio of collected ionization charge to scintillation light. We present a new analysis of LUX calibration data that studies the time structure of liquid xenon scintillation in an attempt to improve ER/NR discrimination using Pulse Shape Discrimination (PSD). Using an advanced photon counting and timing algorithm, we reconstruct the detection time of photons and optimize a prompt fraction discriminator to distinguish between ER and NR interactions. We quantify how this discriminator performs and demonstrate how it can be used, in conjunction with the charge-to-light ratio, to improve the overall discrimination in LUX.

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