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Background Discrimination Capability of a Dual Phase Xenon Detector for the XENON Dark Matter Experiment KAIXUAN NI, Columbia University, XENON COLLABORATION — The XENON experiment aims at searching for dark matter WIMPs via their elastic scattering off Xe nuclei. The detector is a dual phase (liquid/gas) xenon time projection chamber, which allows event-by-event discrimination through the different ratio of ionization (charge) and scintillation (light) signals produced in liquid xenon by nuclear recoils (WIMPs and neutrons) and by electron recoils (electrons and gammas). In the dual phase detector, the ionization signal is detected via proportional scintillation light produced by accelerated electrons extracted from the liquid to the gas. I will demonstrate the performance of event type discrimination of a dual phase xenon prototype with seven photomultiplier-tubes (PMTs) for detecting direct scintillation (S1) and proportional scintillation (S2) signals simultaneously. The values of S2/S1 were measured for electron (Co-57) and alpha (Po-210) recoils, with a difference about a factor of 30. A preliminary result of S2/S1 from nuclear recoils (Am-Be) will also be presented. Based on the distribution of S2 signals over the seven PMTs, an algorithm was developed to reconstruct the event positions, which shows promising capability to further reject background events from the detector surface. The background discrimination capability of a larger scale (10 kg) detector (XENON10) will be shown from detailed Monte Carlo simulations.

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