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Suppression of Anomalous Events Using PMT Pattern Information in XENON100 Data YUAN MEI, Rice University, XENON100 COLLABORATION — Background discrimination in the XENON100 Dark Matter experiment relies on the identification of events with a single interaction in a selected fiducial volume. The yield difference in primary scintillation light (S1) and ionization charge (S2) distinguishes nuclear recoils from interactions with electrons. Anomalous events with apparent single S1 and single S2, but which are truly multiple scatter events, constitute a substantial fraction of background in the Dark Matter region of interest. Such events have additional scattering sites, yielding S1 PMT patterns different from those of true single scatters. We have developed a method to discriminate against these anomalous events, using the Log Likelihood Ratio of measured PMT patterns over expected single scatter patterns obtained from calibration data. Since the method directly compares the information from background data with calibration data, it is robust against systematic uncertainties in, e.g., PMT quantum efficiencies, position reconstruction, or light collection efficiency.

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