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Particle discrimination in PIXeY, a prototype two-phase xenon detector for use in dark matter searches[1] N. LARSEN, E. BERNARD, S. CAHN, A. CURIONI, A. LYASHENKO, J. NIKKEL, Y. SHIN, A. YOUNG, D. MCKINSEY, Yale Univ., N. DESTEFANO, W. ZIMMERMAN, M. GAI, UConn — In the past few years xenon has risen as a forerunner as a medium for dark matter detection. PIXeY (Particle Identification in Xenon at Yale) is a small-scale two-phase xenon-based detector. Its primary use is that of an R&D detector for development of technologies to be used in direct dark matter detectors, as well in neutrinoless double-beta decay searches and gamma ray imaging. A major advantage of two-phase detectors is the ability to precisely measure the charge-to-light ratio of interactions within the detector. This provides an accurate method for discriminating between electron recoils (gamma rays) and nuclear recoils (neutrons, WIMPS) within the detector. Unlike similar detectors, PIXeY can operate at a very wide range of drift field strengths, up to 8kV/cm. One of PIXeY's main goals is to determine the effects of field strength on the charge-to-light ratio in order to determine the optimal field strength for discriminating between electron and nuclear interactions. In this presentation, I will discuss the physics of particle discrimination in PIXeY and in similar Xe-based detectors. In addition, I will report on the PIXeY cryogenics and purification system which maintain the stable environment and large charge yield essential for particle identification and discrimination.

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