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Application of Gas Electron Multipliers (GEM) in a Dual-Phase XenonIonization Detector ROMAN GOMEZ, UWE OBERLACK, Rice University, XENON DARK MATTER SEARCH COLLABORATION[1] — We present progress on the operation of GEMs in a high-purity, dual-phase liquid/gas Xenon detector for possible application in Dark Matter search, such as with the XENON time projection chamber (TPC). The TPC will ultimately detect both ionization charge and UV scintillation light from interactions of gamma-rays or WIMPs with the dense liquid. Our current test chamber deals with ionization only. A GEM is a thin, densely perforated polymer foil with copper coating on both sides. Application of voltage between the metal films leads to high electric fields inside the small holes, in which drifting electrons are multiplied. GEMs have been successfully employed in various applications, where large internal charge gain is required. For the situation of a cryogenic (165 K) xenon detector, several issues need to be addressed to exploit the power of GEMs: Proper stretching of the foil under thermal cycling, impact on xenon purity, where electronegative impurities need to be kept below the ppb level, and the achievable charge gain under conditions near the xenon triple point and with a large drift field of several kV/cm. We report on the status of these studies.

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Uwe Oberlack
Rice University

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