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R&D for the EXO-GAS experiment to search for neutrinoless double beta decay

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The EXO collaboration is searching for neutrinoless double beta decay using 80% of isotopically enriched xenon (136Xe) to probe its Majorana nature and measure its mass. A 100 kg liquid xenon detector is currently running at WIPP. EXO is also conducting R&D on a high pressure xenon gas detector using natural xenon in the pressure range of 1 to 10 atm. This technique may offer superior energy resolution than a liquid xenon detector and facilitate track reconstruction. To enhance energy resolution, the high pressure xenon detector will use electroluminescence light. Detection of primary scintillation light in the detector will provide reconstruction of the absolute position of the charge along the drift coordinate (T0) for totally contained events. Achieving good energy resolution requires low concentration of electronegative impurities in the medium and, therefore, needs to exploit robust and reliable purification techniques. Another opportunity offered by the gaseous detector may be to detect Ba++. Ba++ ions could be transported by high electric fields in the gas to a nozzle, extracted them into a very low pressure region and detected in order to separate signal events from radioactive background. The status of the EXO-GAS experiment, its detector design, construction, Ba++ ions identification, gas handling system, purification, and gas analysis purity system will be presented.

Primary author: PUSHKIN, Kirill (Department of Physics and Astronomy, University of Alabama)

Presenter: PUSHKIN, Kirill (Department of Physics and Astronomy, University of Alabama)

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