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Nuclear Astrophysics With an Optical Readout TPC (O-TPC) at the HIγS Facility *

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An Optical Readout TPC (O-TPC) [1] has been used over the last four years for studies in Nuclear Astrophysics (and Nuclear Structure) with gamma-beams extracted from the HIγS facility at TUNL, Duke University [2]. The O-TPC operates with the gas mixture of CO2(80%) + N2(20%) at 100 torr [1], as well as with N2O(80%) + N2(20%) gas. Both carbon and oxygen contained in the CO2 gas were used as active targets. The O-TPC is intended primarily for measuring the photo-dissociation of 16O in the 16O(γ,α) reaction which is the time reverse of the 12C(α,γ) reaction, an essential ingredient of stellar evolution. The 12C(γ,3α) reaction was also used to study the structure of 12C [3]. We are in the process of installing an isotopically enriched gas handling system with gas recycling that will be used for example with the 13CO2 gas in order to remove the background from the 12C(γ,3α) reaction. The new isotopically enriched gas system, the optical readout with a fast CCD camera and the first significant result on the 16O(γ,α) reaction measured with N2O gas will be discussed.

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