Study of the astrophysical reactions with photon beams and Warsaw active-target TPC

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Crucial interests in nuclear astrophysics are (p,γ) and (α,γ) reactions. In particular, those that regulate the ratio of C and O and those that burn ^{18}O and, therefore, regulate the ratio between ^{16}O and ^{18}O in the Universe. Such reactions in the stars happen at energies well below the Coulomb barrier and the respective cross-sections are incredibly small, often below the experimental reach. Therefore, the available experimental results on cross-sections for low energies are very sparse, and theoretical extrapolations are burdened with large uncertainties. An opportunity to elude a part of the experimental limitations is to study the time-reversal reaction, i.e. photo-disintegration. For this purpose, an active-target Time Projection Chamber (TPC) optimized for experiments with high-intensity γ-ray beams was developed and built at the Faculty of Physics, University of Warsaw. Preliminary results of the first measurements performed with Warsaw Active-target TPC will be presented and an outlook on future experiments will be given.