

CNS Active Target for Missing Mass Spectroscopy with Intense Beam

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A gaseous active target based on GEM-TPC, named CAT, is being developed for the forward angle measurement of deuteron or alpha induced reactions in inverse kinematics aiming at studying the Equation of State of nuclear matter and the electron capture rate at the prior to supernova explosion [1]. The gaseous active targets like CAT enable us to perform traditional reactions with light ions in inverse kinematics, such as deuteron or alpha inelastic scattering (d,d'), (a,a'), charge exchange reaction (d,2p), and transfer reactions, especially with exotic beam. To perform missing mass spectroscopy in inverse kinematics, one needs to measure the momentum vector of very low energy recoiled particle. The CAT is operated with 0.4-atm deuterium gas and the low energy threshold for detection is about 0.5 MeV. Recently, the amplification part is modified to perform high luminosity measurement with 10^6 -Hz beam.

The property of GEM in deuterium gas was studied[2] and recently 10^4 gain was achieved with three GEMs. The track of recoiled particle is deduced using charge division method with triangular shape readout pads. The measured position resolution was 300 μm . The pilot experiments with ^{14}O and 10^6 -Hz ^{132}Xe beam were performed at HIMAC with high intensity beam. The recoiled deuteron was successfully measured. In this talk, the results of pilot experiments and farther development for intense beam injection will be reported and the other choices of the target will be also discussed.

[1] S. Ota et al., CNS Annual Report 2012 (2014) 49

[2] C.S. Lee et al., JINST9 (2014) C05014