Measurements of $^7\text{Li} + d \rightarrow n + \alpha + \alpha$ and $^7\text{Be} + d \rightarrow p + \alpha + \alpha$ nuclear reactions and their implication in the Standard Big Bang Nucleosynthesis (SBBN)\(^1\) NABIN RIJAL, I. WIEDENHOVER, L.T. BABY, J. BELARGE, S. KUVIN, Florida State University, J.C. BLACKMON, K.T. MACON, M. MATOS, Louisiana State University, E. KOSCHIY, G. ROGACHEV, Cyclotron Laboratory, Texas A&M University — Current models of SBBN predict 3-4 times more $^7\text{Li}$ than observed. The nuclear reaction $^7\text{Be} + d \rightarrow p + \alpha + \alpha$ at energies relevant to SBBN, could destroy a fraction of mass-7 nuclei. We investigate the $^7\text{Be} + d$ reaction at SBBN energies using a radioactive $^7\text{Be}$ beam and deuterium gas target inside ANASEN (Array for Nuclear Astrophysics Studies with Exotic Nuclei). ANASEN is an active target detector system which tracks the charged particles using a position sensitive proportional counter and 24-SX3 and 4-QQQ position sensitive Silicon detectors, all backed up by CsI detectors. The experiment measures a continuous excitation function by slowing down the beam in the target gas down to zero energy. Our set-up provides a high detection efficiency for all relevant reaction channels. We also performed an experiment for the mirror nuclear reaction $^7\text{Li} + d \rightarrow n + \alpha + \alpha$ with ANASEN in solid target mode using $\text{CD}_2$ target and a neutron detectors wall. The results of the experiment along with details of ANASEN and plans for the $^7\text{Be} + d$ experiment using ANASEN in gas target mode will be presented.

\(^1\)This work is supported in part by the NSF, grant no. PHY-0821308 and PHY-1401574.

Nabin Rijal
Florida State Univ

Date submitted: 23 Jun 2015