Experiments with Array for Nuclear Astrophysics and Structure with Exotic Nuclei (ANASEN)

Evgeniy Koshchiy

Cyclotron Institute, Texas A&M University

Abstract

The Array for Nuclear Astrophysics Structure with Exotic Nuclei (ANASEN) is a new active target detector array designed for direct and indirect measurement of the astrophysically important reaction cross-sections (such as (α,p) reactions), proton and alpha elastic and inelastic scattering and (d,p) reactions to study structure of exotic nuclei using rare isotope beams in inverse kinematics. ANASEN has cylindrically symmetric geometry and consists of an array of position sensitive silicon detectors backed by CsI(Tl) scintillators and an array of proportional counters surrounding the beam axis that add tracking capability and enables an active-target mode. The array covers almost 3π steradian solid angle providing high efficiency for experiments with low intense radioactive beams. Recently the ANASEN detector has been commissioned and utilized for experiments with rare isotope beams at the RESOLUT in-flight radioactive beam facility at the Florida State University and at the new ReA3 reaccelerated radioactive ion beam facility at the NSCL.

In this talk I am going to report in details of ANASEN features and to present some experimental results acquired with this setup at both facilities. The first result is related to study of clustering phenomena in ^{10}Be. Resonances with ^{6}He+α configuration were searched in excitation function for elastic scattering of ^{6}He on ^{4}He. The ^{6}He beam was produced at J.Fox Superconducting Linear Accelerator Laboratory at FSU.

Resonances in ^{38}Ca relevant for the ^{37}K(p,γ) reaction important for the X-ray burst were studied in the second project. The beam of ^{37}K was produced by the new ReA3 reaccelerated radioactive ion beam facility at the National Superconducting Cyclotron Laboratory. This experiment was the first commissioning run with rare isotope beam produced by ReA3. The excitation function for ^{37}K+p elastic scattering was measured using coincidence between protons in the silicon array of ANASEN and ^{37}K recoil identified in the ionization chamber downstream of the beam axis. No active target mode have been employed in this run. Some preliminary results of this first test run will be discussed.

Support for the construction of ANASEN was provided by the U.S. National Science Foundation's Major Research Instrumentation Program by awards PHY-0821308 and PHY-0820941.