

SES19-2019-000112

Abstract for an Invited Paper
for the SES19 Meeting of
the American Physical Society

Elastic and Inelastic Compton Scattering From ^{12}C at HIGS¹

DANULA GODAGAMA, Univ of Kentucky

A program of Compton scattering experiments is underway at HIGS with the goal of determining the nucleon polarizabilities. As part of that work, the HINDA detector array has been supplemented with a pair of very large NaI detectors, BUNI and DIANA, from Boston University and the University of Kentucky, respectively. Both have large acceptance and high resolution for gamma-ray energies above 50 MeV, where the sensitivity of Compton experiments to nucleon polarizabilities is largest. Two approved experiments aim to study the neutron electric and magnetic polarizability through measurements of elastic Compton scattering on targets of deuterium and ^3He at energies from 60 to 120 MeV. In both cases, inelastic processes must be resolved in the measured scattering spectra, and this requires not only the detectors but also the HIGS beam to operate in high resolution mode. As part of the development towards that goal, we have measured Compton scattering spectra from a carbon target with both BUNI and DIANA at 62 MeV. Both detectors exhibit clearly resolved elastic peaks, allowing for cross section measurements at both 115 and 150 degrees, which can be compared with previous results. In addition, due both to the suppression of atomic backgrounds at 150 degrees, as well as the exceptional stability of the HIGS beam, the back-angle spectrum collected with DIANA exhibits resolved transitions not only to the first, but also possibly to the second excited state of ^{12}C . This improved ability to quantify inelastic contributions contrasts with previous Compton measurements, which used a tagged bremsstrahlung beam. We will discuss the motivation and the methods used to collect these new data, and offer a preview of the neutron polarizability experiments expected to run soon at HIGS.

¹This work was supported by the Department of Energy's Office of Science through grant number DE-SC0016656.