

Compton scattering at MAX-lab

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The emphasis of the Compton scattering programme at MAX-lab is presently on significantly improving the world data-set on elastic Compton scattering on deuterium in order to obtain the neutron polarizabilities and provide a test of modern calculations. A precise data set is required in order to enable a meaningful comparison with calculations and the aim is to obtain a large number of data points with less than 5% uncertainties in the energy range ~ 60 – 110 MeV and angular range 45° – 150° .

The experiment is performed at the MAX-lab tagged photon facility. The facility is based on a ~ 200 MeV linac followed by a pulse stretcher ring. The extracted electron beam ($\sim 50\%$ duty factor) is used to generate a bremsstrahlung beam and photons are tagged by a choice of two tagging spectrometers, optimized for different energy regions. The tagged photon range may presently be chosen between 15 MeV and 185 MeV. The energy resolution is typically ~ 0.5 MeV and the tagged intensity is $\sim 10^6$ MeV $^{-1}$ s $^{-1}$. The available energy is expected to increase somewhat in the near future.

Three of the largest NaI detectors worldwide, namely BUNI (Boston), CATS (Mainz) and DIANA (Kentucky), are employed by the experiment. The three detectors share a similar design although exact dimensions vary somewhat. CATS, as an example, consists of a segmented NaI cylinder, 48.3 cm in diameter and 63.5 cm long. The NaI is surrounded by thick plastic scintillators identifying cosmic radiation events and finally shielded by a thick layer of lead. The three detectors show a very good energy resolution. The obtained missing-energy resolution ranges around 2% at 100 MeV, fully sufficient for separating elastic scattering on the deuteron from break-up events.

The data analysis is presently in progress and results are not yet final, however, preliminary results are encouraging. In addition, commissioning runs on carbon have been performed, comparing well to previous measurements on the same reaction.

The Compton scattering programme at MAX-lab will be presented and some preliminary results shown.