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## Extracting neutron polarizabilities from Compton scattering on quasi-free neutron in gamma d->gamma n p

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Compton scattering processes are ideal to study electric and magnetic dipole polarizability coefficients of nucleons [1]. These fundamental quantities parametrize the response to a monochromatic photon probe. In this work, the inelastic channel  $\gamma d \rightarrow \gamma n p$  is treated in  $\chi$ EFT, with a focus on the NQFP - neutron quasi-free peak - kinematic region. In this region, the momentum of the outgoing proton is small enough that it is considered to remain at rest. This provides access to the Compton scattering process  $\gamma n \rightarrow \gamma n$  from which the neutron scalar polarizabilities  $\alpha$  and  $\beta$  are extracted. Using  $\chi$ EFT, differential cross-sections,  $d^3\sigma/dE_{\gamma}d\Omega_{\gamma}d\Omega_n$ , in the photon energy range of 200-400 MeV are computed. The biggest contribution comes from the impulse approximation, with small corrections stemming from final state interaction, meson exchange currents and rescattering. A new extraction of neutron polarizabilities from a two-parameter fit to the Kossert et al. [2] data taken at MAMI in 2002 is presented. Previously, the experiment was designed and the data analysed based on a theoretical model [3] that computed the NQFP differential cross-sections. The re-analysis of this data in a consistent, model independent framework -  $\chi$ EFT - provides reliable extraction of polarizabilities with controlled uncertainties.

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### References

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