HAW05-2005-000507

Abstract for an Invited Paper
for the HAW05 Meeting of
the American Physical Society

Compton Scattering from Nucleons and Nuclei

ALAN NATHAN, University of Illinois

This talk will introduce the minisymposium by presenting an overview of the physics issues that are addressed by Compton scattering from nucleons/nuclei. At low energies, the scattering determines the generalized polarizabilities, which characterize the response of the system to slowly-varying external electric and magnetic fields. These quantities provide stringent tests of models of nucleon or nuclear structure, such as chiral perturbation theory, lattice QCD, and the effective nucleon-nucleon interaction. The simplest of these are the dipole electric and magnetic polarizabilities, which are well measured for the proton and less well measured for the neutron. With polarized beams and targets, one can measure the spin polarizabilities. With incident virtual photons, one can probe the spatial distribution of charges and currents contributing to the polarizabilities, allowing a separation of short-range (e.g., quark core) from long-range (e.g., pion cloud) contributions. For high energies and momentum transfers, the scattering is sensitive to the spatial distribution of the scattering centers. For nuclei, the photon scatters from nucleons, so that the scattering is sensitive to polarizabilities of bound nucleons as well as exchanged meson. For nucleons, the photon scatters from quarks, giving rise to new form factors that are derived from the same generalized parton distributions as the electron scattering form factors. The present status of these issues will be discussed in light of recent and planned experiments.