Virtual Compton Scattering : First Results from JLab

R. Van de Vyver
on behalf of the JLab - Hall A Collaboration

Dept. Subatomic & Radiation Physics, Gent University
Proeftuinstraat 86, B-9000 Gent, Belgium
e-mail:robert@inwfsun1.rug.ac.be

Abstract

Virtual Compton Scattering (VCS) as a probe for the study of the internal structure of the nucleon became only recently useful, i.e. since the advent of high-intensity c.w. electron accelerators, equipped with high-resolution magnetic spectrometers such as MAMI in Mainz (Germany) and the 4 GeV facility at JLab (Newport News, USA). The VCS process off the proton below the pion production threshold allows the determination of (combinations of) the 6 so-called generalized polarizabilities (GPs). The reaction itself is accessible via photon electroproduction which is the coherent sum of two processes : the Bethe-Heitler (BH) contribution (a real photon is emitted by the incoming or outgoing electron) and the VCS process itself; in the latter the photon is either emitted by the nucleon acting as a point-like particle (Born term - B) or by the excited nucleon (Non-Born term, NB). This NB-amplitude contains the new physics and can be parametrized in terms of these 6 GPs. These are related to the 'ease' with which the nucleon adapts its internal structure to an external quasi-static e.m. field.

A first successful VCS experiment on the proton has been concluded at MAMI/Mainz at $Q^2 = 0.33$ (GeV)^2. Similar measurements have been performed at JLab/USA using the facilities available in Hall A. Data were taken below and above the pion production threshold as well as in the resonance region (search for missing resonances), at $Q^2 = 1.0$ and 1.9 (GeV)^2. Although the analysis is still far from being finished, preliminary results will be shown for all studied regions. They will indicate the trend of the behaviour of these GPs as a function of Q^2. Moreover, a comparison with the predictions from the recently developed "dispersion relation formalism" (B. Pasquini et al.) will allow a further in-depth interpretation of the available results, especially for what concerns the generalized polarizabilities.