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Nucleon Structure: A Theoretical Overview

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This talk gives an overview of recent progress in nucleon structure studies with electromagnetic probes. Recent experimental data in elastic electron-nucleon scattering both at low and large momentum transfers will be discussed. The challenges which these precision measurements present for our theoretical understanding of nucleon structure will be outlined, and the role of two-photon exchange corrections in the extraction of elastic nucleon form factors will be highlighted. The current empirical information on the nucleon electromagnetic form factors will be used to map out the transverse charge densities in proton and neutron. Subsequently, a comprehensive framework for describing the quark and gluon structure of the nucleon, based on the concept of Generalized Parton Distributions (GPDs), will be reviewed. It will be discussed how the GPDs describe correlations between the momentum and spatial distributions of quarks, which are revealed in exclusive processes at large momentum transfers, such as the deeply virtual Compton scattering process on the nucleon. The first dedicated experiments in the field of hard exclusive processes, performed over the past few years, will be reviewed as well as the theoretical progress and perspectives.