
Contribution ID: **128** Type: **not specified**

# Towards a First-Principles Light-Front Hamiltonian Framework for the Nucleon

Basis light-front quantization (BLFQ) is a fully relativistic, nonperturbative approach that employs a light-front quantized Hamiltonian with Quantum Chromodynamics (QCD) inputs, aiming for first-principles calculations. For QCD applications in limited Fock space of the nucleon, we incorporate effective confinement into the Hamiltonian, achieving results consistent with global fits and experimental data on various nucleon properties. Recent advancements include extending Fock spaces to five- and six-particle sectors, such as five-quark, three-quark-two gluon, and three-quark-three-gluon configurations, as well as replacing the effective confining potential with relevant QCD interactions. BLFQ generated light-front wavefunctions enable the calculation of observables like quark and gluon parton distribution functions (PDFs) at low scales, with QCD evolution facilitating comparisons with experimental data. Additionally, we explore generalized parton distribution functions (GPDs), transverse momentum-dependent distributions (TMDs), and the spin decomposition of the nucleon. Prospects for further developments are also highlighted.

**Author:** MONDAL, Chandan

**Presenter:** MONDAL, Chandan

**Session Classification:** WG1: Structure Functions and Parton Densities

**Track Classification:** Structure Functions and Parton Densities