The 38th International Symposium on Lattice Field Theory

LATTICE 21

JULY 26-30 2021, ZOOM/GATHER@MIT

Contribution ID: **443** Type: **Oral presentation**

Lattice QCD calculation of the subtraction function

Wednesday, 28 July 2021 22:30 (15 minutes)

The nucleon forward Compton amplitude describes the process of a virtual photon scattering on a nucleon. It is an important object which encodes insights into hadronic structure. The real part of this amplitude contains a component that is unconstrained by a dispersive representation in terms of inelastic scattering data. This component, commonly referred to as the 'subtraction function', contributes significantly to the determination of key physical quantities such as the electromagnetic portion of the proton-neutron mass difference and hence constraining this function has gained renewed interest. Using lattice QCD, the second order Feynman-Hellmann theorem can be utilised to calculate the nucleon forward Compton amplitude. By judiciously choosing the photon and nucleon momenta and direction of the electromagnetic current, the subtraction function $S_1(Q^2)$ can be calculated at fixed photon virtuality, Q^2. The subtraction function is calculated for a range of photon momenta up to high $Q^2 \approx 11$ GeV^2, using different discretisations of the electromagnetic current. The results indicate an asymptotic behaviour that differs from that anticipated from the operator product expansion. A comparison of results between differing quark masses and lattice volumes and spacings is made to determine whether the behaviour survives the physical limit.

Primary author: SANKEY, Eddie (University of Adelaide)

Co-authors: YOUNG, Ross (University of Adelaide); ZANOTTI, James (University of Adelaide); CAN, Kadir Utku (RIKEN); HANNAFORD GUNN, Alec (The University of Adelaide)

Presenter: SANKEY, Eddie (University of Adelaide)

Session Classification: Hadron Structure

Track Classification: Hadron Structure