Contribution ID: **24** Type: **Poster**

Ultrahigh-energy neutrino-nucleon deep-inelastic scattering and the Froissart bound violation

Tuesday, 27 June 2023 16:45 (15 minutes)

A simple formula for the total cross section \sigma_{\nu N} of neutral- and charged-current deep-inelastic scattering of ultrahigh-energy neutrinos on isoscalar nuclear targets is presented. The cross section \sigma_{\nu N} is proportional to the structure function F_2^{\nu N}(M^2_V/s,m_V^2) (M_V is the intermediate-boson mass and s is the square of the center-of-mass energy) with an additional coefficient, which depends on the asymptotic low-x behavior of F_2: it contains an additional \ln s term if F_2 scales with a power of \ln(1/x). Hence, an asymptotic low-x behavior F_2 \sim \ln^2(1/x), which is frequently assumed in the literature, already leads to a violation of the Froissart bound on \sigma_{\nu N}.

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Session Classification: Poster Session

Track Classification: Cosmic rays of very high energies (> 1 PeV)