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Flavour dependence and Coulomb corrections for charged current neutrino-nucleus scattering

QED effects are controllable and calculable corrections that must be understood for percent-level neutrino cross section inputs. Of particular importance are “enhanced” corrections stemming from either large-logs or coherent effects. Of particular importance are corrections that depend on lepton mass, or the sign of the charged lepton that is produced. In the former case, the mass dependence inherited from the charged lepton results in a neutrino-flavour dependent correction, while in the latter case it introduces an additional discrepancy between neutrino and antineutrino cross sections.

In this talk I will discuss recent progress towards a rigorous treatment of Coulomb corrections that stem from the coherent exchange of soft-photons between the outgoing lepton and the final nuclear state (of charge Z). I will outline the construction of an effective field theory that is appropriate for high-energy lepton kinematics and that can capture all-order behaviour in Z\alpha via high energy expansion. A power-counting scheme for the computation of distorted-wave matrix elements in the high energy limit will be presented, which allows for an analytic description of Coulomb corrections. Useful phenomenological examples will be highlighted.

Working group

WG2

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