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QED nuclear medium effects in neutrino-nucleus and electron-nucleus scattering

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Effective field theories of QCD, such as soft collinear effective theory with Glauber gluons, have led to important advances in understanding of many-body nuclear effects. We provide first applications to QED processes. We study the exchange of photons between charged particles and the nuclear medium for (anti)neutrino-, electron-, and muon-induced reactions inside a large nucleus. We provide analytical expressions for the distortion of (anti)neutrino-nucleus and charged lepton-nucleus cross sections and estimate the QED-medium effects on the example of elastic lepton-nucleon reactions in kinematics of modern and future experiments. We find new permille-level effects, which were never accounted for in either (anti)neutrino-nucleus or electron-nucleus scattering.

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