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(G*) POS-J84 – The effect of single Coulomb scattering on Cherenkov emission

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Cherenkov radiation plays a crucial role in particle physics experiments.
This is of particular importance in water-filled neutrino detectors, where electron neutrinos are observed through the Cherenkov radiation of ultra-relativistic secondary particles created in the detector's volume. Modern simulation methods of the process that describe Cherenkov emission assume coherence of the radiation throughout the particle's path without accounting for the impact of scattering of the electrons in matter. Here we consider a more physically accurate calculation of Cherenkov radiation as a phenomenon of wave interference. We then apply this calculation to a simulation that accounts for single Coulomb scattering of the electron with the material.
The obtained angular distributions of the photons as they would be observed in a detector are compared to the ones predicted by standard simulation tools.

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