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Radiative corrections to inverse beta decay at low energies

We compute electromagnetic radiative corrections in the inverse beta decay, $\bar{\nu}_e + p \to e^+ + n$, at reactor antineutrino energies within the heavy baryon chiral perturbation theory, provide the most accurate cross-section predictions for this process, and present a complete error budget. For the first time, we consistently include quantum electrodynamics, chromodynamics, and electroweak contributions and present the positron energy spectrum accounting for radiative corrections. Our calculation also improves on previous evaluations by incorporating permille-level contributions. The results can be readily applied to normalize the reactor antineutrino flux, make precise measurements of neutrino oscillation parameters at JUNO, and search for new physics at nuclear power plants.

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