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Approximate approaches for nuclear weak interaction rates for astrophysics B.M. ANDERSON, G.W. HITT, Department of Physics Engineering Science, Coastal Carolina University, P.O. Box 261954 Conway, SC 29528, USA, S.S. GUPTA, Indian Institute of Technology Ropar, Nangal Road, Rupnagar (Ropar), Punjab 140 001, India — Nuclear weak interactions, like beta decay and electron capture, are important inputs for modeling explosive astrophysical events. In the allowed approximation, nuclear weak interactions proceed as either Fermi or Gamow Teller (GT) processes where the spins of the electron and neutrino are either anti-parallel or parallel, respectively. In the GT case, transition probability is spread over many final states in the daughter nucleus, with each probability determination requiring numerical integration of the available phase space. Developing a fast and accurate method for calculating each contribution to the total decay rate would provide reliable weak rate libraries for astrophysical modelers. The integrand for the phase space includes the classical statistical factor, a coulomb correction, and the Fermi Dirac distribution of continuum electrons in the stellar material. In this talk, we specifically examine the phase space integration and discuss various approximations to the Coulomb correction, comparing computational speed and numerical accuracy.

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