Contribution ID: **7** Type: **not specified**

# Effects of RPA correlations on charged-current neutrino opacities in supernova neutrino-sphere

*Tuesday, 16 July 2019 17:50 (20 minutes)*

The study of neutrino interaction processes with core-collapse supernova matter is crucial to our understanding of the explosion mechanism. The charged-current processes $\nu_e + n \to p + e^-$ and $\bar{\nu}_e + p \to n + e^+$ are mainly responsible for heating behind the stalled shock front and thus for reviving the explosion. Neutrino transport to the shock region is sensitive to the physics of hot and dense nuclear matter, which is a complex problem due to the strong correlations induced by nuclear forces.

We have analyzed the combined effect of mean-field potentials and RPA correlations on the $\nu_e$ and $\bar{\nu}_e$ opacity in the neutrino-sphere. The RPA response function for the hot and dense nuclear matter is computed by a self-consistent approach based on the solution of the Bethe-Solpiter equation with the Skyrme forces. Using different Skyrme parametrizations, we have shown that the joint effect of mean-field potentials and RPA correlations makes the neutrino-sphere more opaque (transparent) for (anti) neutrino radiation as compared to the noninteracting Fermi gas model.

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**Session Classification:** Modern problems in nuclear and elementary particle physics