Neutrino Rates in Color Flavor Locked Quark Matter

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We study weak interaction rates involving Goldstone bosons in Color Flavor Locked (CFL) quark matter. Neutrino mean free path and the rate of energy loss due to neutrino emission in a thermal plasma of CFL pions and kaons is calculated. We find that in addition to neutrino scattering off thermal mesons, novel Cherenkov like processes wherein mesons are either emitted or absorbed contribute to the neutrino opacity. Lack of Lorentz invariance in the medium and loss of rotational invariance for processes involving mesons moving relative to the medium allow for novel processes such as $\pi^0 \to \nu\bar{\nu}$ and $e^-\pi^+ \to \nu_e$. We explore and comment on various astrophysical implications of our finding.

References

[1] S. Reddy, M. Sadzikowski and M. Tachibana, arXiv:*nucl-th/0203011*.