# CHARGED CURRENT INTERACTIONS OF $\nu_\mu$ NEUTRINOS IN SUPERNOVA

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We calculate opacities and production rates for charged current interaction reactions for muon neutrinos and muons in core collapse supernovae. We find that these reactions contribute significantly to the opacity of muon neutrinos at densities of $10^{13}$ g/cm$^3$ and higher. Consequently the neutrinosphere position becomes different for $\nu_\mu$ and $\nu_\mu$, probably resulting in spectral differences between $\nu_\mu$, $\nu_\mu$ and $\nu_\tau$, $\nu_\tau$. For the above densities, we find that the rate of muon production is faster than the dynamical evolution timescale. Muons will reach equilibrium abundances in the supernova core allready before bounce. The change in composition due to equilibration of muons is investigated in a post-processing way. It leads to a temporary net antineutrino abundance in the core, possibly affecting the deleptonization of the proto neutron star and resulting in a net muon flavour abundance in the stellar core. We therefore recommend implementation of these reactions in future simulations. Andreas Lohs is a member of H-QM Helmholtz graduate school and supported by GSI and HIC for FAIR. This work is partly supported by Deutsche Forschungsgemeinschaft through contract SFB 634.