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Impact of the Active-Sterile MSW Resonance on Fast Flavor Conversions in Supernovae

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Sterile neutrinos, hypothetical singlet fermions, interact with ordinary matter only through mixing with active neutrinos. In core-collapse supernovae, their production via Mikheyev-Smirnov-Wolfenstein (MSW) resonances of electron neutrinos and antineutrinos can influence explosion dynamics and nucleosynthesis. We probe the effect of these kinds of MSW conversions on the fast flavor conversions (FFC's) of neutrinos occurring deep inside the SN core. Using a 2+1 framework with two active and one sterile species, we analyze how electron neutrino depletion from MSW conversions modifies electron lepton number (ELN) crossings, a crucial factor for FFCs. We show that MSW resonance (outer resonance) can potentially modify the ELN crossings and thus affect the occurrence of FFC's significantly. Further, we carry out a qualitative analysis considering the scenario of inner resonance with varying conversion probabilities.

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