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# Probing neutrino-antineutrino interactions from light gauge boson production in proto-neutron stars

*Tuesday, September 12, 2023 4:30 PM (15 minutes)*

In this talk, I will analyse the effect on the supernova neutrino flux duration of the resonant production of low-mass vector mediators from neutrino-antineutrino coalescence in the core of proto-neutron stars. First, I will argue that, in the regime where neutrino-antineutrino interactions via the new vector mediator dominate over the Standard Model neutrino-nucleon scattering, a redistribution of the neutrino energies might take place, making low-energy neutrinos more trapped. Since this only affects 10% of the neutrino population, it cannot be observed in the SN 1987A data, but it could be analysed with future supernova detection data. I will then focus on small gauge couplings, where the decay length of the new gauge boson is larger than the neutrino-nucleon mean free path, but still smaller than the size of proto-neutron star. I will show for the first time that, in this regime, the resonant production of a long-lived vector mediator and its subsequent decay into neutrinos can significantly reduce the duration of the neutrino burst. By using this argument, we rule out new areas of the parameter space of the well-motivated U(1)Lμ-Lτ model. In particular, we extend cooling bounds to higher couplings, probing values of the coupling to 6x10-8.

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