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Pre-supernova neutrino monitor at KamLAND

Friday, 14 June 2019 18:00 (3 hours)

In the late stages of nuclear burning for massive stars, the pair production of neutrinos from positron-electron annihilation becomes a significant source of neutrino flux and therefore cooling. As the star evolves, the energy of these neutrinos increases and in the days preceding the supernova a significant fraction exceed the threshold for inverse beta decay. This is the golden channel for liquid scintillator detectors and Gd-doped water Cherenkov detectors because the coincidence signal allows for significant reductions in backgrounds. We find that KamLAND can detect these pre-supernova neutrinos from a star with a mass of 25 M_sun at < 660 pc with 3σ significance in the 48 hours before the supernova. This limit is dependent on the neutrino mass hierarchy and background levels. KamLAND takes data constantly and will provide a semi-realtime significance as a supernova alarm to the community.

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