

## **Combined Pre-supernova Alert System with KamLAND and Super-Kamiokande**

As a pre-supernova star approaches the end of its life, neutrinos are emitted copiously with mounting energies. Although these neutrinos have a smaller luminosity compared to supernova neutrinos, they are potentially detectable by large-scale terrestrial detectors. In consideration of these neutrinos being a signal of the impending supernova, KamLAND and Super-Kamiokande have established pre-supernova alert systems in 2015 and 2021, respectively. Recently, through a joint study, Super-Kamiokande and KamLAND have developed a combined pre-supernova alert system, extending the warning time and coverage. The expected warning time and coverage for various of pre-supernova neutrino models are estimated. We present in detail the combined pre-supernova alert system, as well as the improvement on the sensitivities to pre-supernova neutrinos.

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