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Pre-supernova Axion-like Particles and Their Detectability

Tuesday, 28 September 2021 14:15 (15 minutes)

Ultralight axion-like particles (ALPs) are a candidate of dark matter particles. We calculate the production of ALPs in a nearby supernova progenitor. Once produced, ALPs escape from the star and a part of them is converted into photons during propagation in the Galactic magnetic field. We report that the MeV photon flux that reaches Earth may be detectable by gamma-ray telescopes for ALPs lighter than ~ 1 neV when Betelgeuse undergoes oxygen and silicon burning. (Non-)detection of gamma-rays from a supernova progenitor with next-generation gamma-ray telescopes just after pre-supernova neutrino alerts would lead to an independent constraint on ALP parameters as stringent as an SN 1987A limit.

Presenter: MORI, Kanji

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