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Long-term multi-messenger signal simulation of a supernova

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Supernovae are very promising multi-messenger astronomical targets. They emit electron-magnetic waves, neutrinos, gravitatinal waves and maybe beyond-standard model particles like axions.
Neutrinos are deeply involved in the mechanism of supernova explosions, which have been investigated along with the development of neutrino radiation transport. Gravitational waves are emitted from drasticaly moving matter. For further clarification, it is essential to observe neutrinos and gravitational waves directly exiting the high-density core. The extreme environment of the core may produce axions. Most recent simulations of supernova neutrinos have been of the order of 1 second due to their high computational cost. However, from the only observed case of supernova neutrinos, SN 1987A, it is predicted that if a supernova explosion occurs in the Galaxy, the neutrino detector, Super-Kamiokande, will observe more than several thousand neutrinos for more than 10 seconds. For this reason, we have performed long time calculations using neutrino radiation transport calculations with and without axions. Moreover I estimated long-term gravitational waves with the asteroseismology. In this talk, I will present the results of neutrino, gravitational waves and axions up to 20 seconds. I will also give a discussion on posibility for axion to be detected from galactic supernovae.

Collaboration you are representing

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