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Core-collapse simulation of SN 1987A binary progenitor and its multimessenger signals

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We perform a three-dimensional self-consistent core-collapse supernova simulation using a binary evolution progenitor model of SN 1987A by Urushibara et al. (2018). This progenitor model is based on a slow-merger of 14 and 9 solar-mass stars and it satisfies most of the observational constraints such as red-to-blue evolution, lifetime, total mass and position in the Hertzsprung-Russell diagram at collapse, and chemical anomalies. We find that this progenitor model successfully present explosion and leave a 1.53 solar-mass neutron star with a kick velocity of 70 km/s and a spin period of 0.1 s. Assuming a detector sensitivity of Kamiokande-II and the distance to the supernova of 51 kpc, we obtain 16 neutrino detection events in one second. Some characteristic modes in its gravitational wave signal will also be discussed in our presentation.

Reference to paper (DOI or arXiv)

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