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Gravitational Wave Emissions From Magnetized Core-Collapse Supernova Simulations

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Detection of gravitational wave emissions from a nearby core-collapse supernova explosion would mark the next milestone in gravitational wave astrophysics and multi-messenger astronomy, although the nature of the supernova explosion engine remains elusive. One possible engine is through the magneto-rotational mechanism, which may power extreme phenomena such as hypernovae and long gamma-ray bursts, and produce unique gravitational wave signatures. In this talk, I will present our recent multi-dimensional magnetized core-collapse supernova simulations with self-consistent neutrino transport. We find that the simulation outcomes fall into four categories: bipolar jets, monopolar jets, neutron-driven winds, and failed supernovae, depending on the initial magnetic field strength and rotational speed. Each category exhibits a unique gravitational signature.

Primary author: PAN, Kuo-Chuan (National Tsing Hua University, Taiwan)

Presenter: PAN, Kuo-Chuan (National Tsing Hua University, Taiwan)

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