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Type Ia Supernovae Induced by Primordial Black Holes from Dark First-Order Phase Transition

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We applied a novel scenario to impose constraints on the relic abundance $f_{\rm PBH}$ of primordial black holes (PBHs) in the mass range $10^{-14} \leq M_{\rm PBH}/M_{\odot} \leq 10^{-11}$ which cannot be probed by microlensing or evaporation methods: When a PBH with the aforementioned mass transits through a white dwarf (WD) made up of carbon and oxygen, Bondi-Hoyle-Lyttleton (BHL) accretion in a reactive medium creates a shock wave, which generates direct detonation ignition in the WD core and then leads to Type Ia supernovae (SNe Ia) whose event rate is to be compared with the observational data. PBHs in the constrained region can be produced by a cosmological first-order phase transition (FOPT) in the dark sector which associates with $\mathcal{O}(\mathrm{MeV})$ energy scale and thus gives rise to complementary signals of stochastic gravitational waves (GWs) from 10^{-6} Hz to 10^{-5} Hz peak frequency which can be probed by future μAres GW interferometer.

Primary authors: CHEN, Pin-Jung; Prof. TSENG, Po-Yen

Presenter: CHEN, Pin-Jung

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