

Probing fundamental laws of physics from Multi-Messenger astronomy

New high energy astro-particle physics experiments will provide a new whole avenue towards innovative explorations of new physics beyond the Standard Model and Quantum Gravity. In this talk, we will discuss several exotic phenomena which can be probed from next generation of experiments such as LHAASO and JUNO and further other cosmic rays facilities, in a multi-messenger strategy. The most exciting and unexpected frontier is on searching any footprints of Exotic Compact Objects, hunting for Gravastars, Wormholes, Fuzzballs and Boson Stars, beyond standard General Relativity Black Holes.

Cross-comparisons among high energy nuclei, gamma rays, neutrinos and gravitational waves signals can highly improve our understanding of the Black Hole event horizon, possible suggesting a way-out from Firewall and Hawking paradoxes.

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