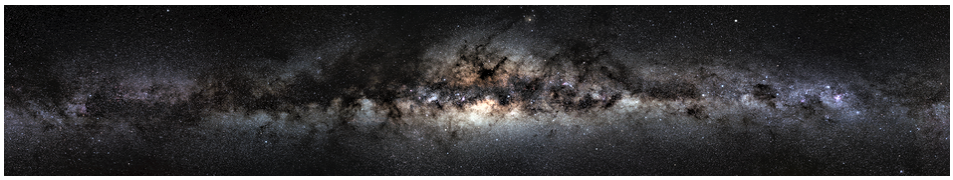

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Mergers as a Probe of Particle Dark Matter

Tuesday, 7 December 2021 12:50 (18 minutes)

Unusual masses of black holes being discovered by gravitational wave experiments pose fundamental questions about their origin. More interestingly, black holes with masses smaller than the Chandrasekhar limit (~ 1.4 solar mass) are essentially impossible to produce through any standard stellar evolution. Primordial black holes, with fine-tuned parameters, and with no compelling formation mechanisms, are the most discussed explanation of these objects. In this talk, I will discuss a simple production channel of these low mass black holes – particle dark matter with no antiparticle counterpart, owing to their interaction with stellar nuclei, can catastrophically accumulate inside compact stars, and eventually transmute them to sub-Chandrasekhar mass black holes, ordinarily forbidden by the Chandrasekhar limit. I will point out several avenues to test the origin of these low mass black holes, concentrating on the cosmic evolution of the binary merger rates. I will demonstrate how measurement of these merger rates, especially at higher redshifts, by the imminent gravitational wave detectors can conclusively determine the origin of these low mass black holes, and therefore, can test the particle dark matter hypothesis.

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