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Cosmic Archaeology with Gravitational Waves from Cosmic Strings

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Cosmic strings are generic cosmological predictions of many extensions of the Standard Model of particle physics, such as a $U(1)'$ symmetry breaking phase transition in the early universe. Unlike other topological defects, cosmic strings can reach a scaling regime that maintains a small fixed fraction of the total energy density of the universe from a very early epoch until today. If present, they will oscillate and generate gravitational waves with a frequency spectrum that imprints the dominant sources of total cosmic energy density throughout the history of the universe. We demonstrate that current and future gravitational wave detectors, such as LIGO and LISA, could be capable of measuring the frequency spectrum of gravitational waves from cosmic strings and discerning the energy composition of the universe at times well before primordial nucleosynthesis and the cosmic microwave background where standard cosmology has yet to be tested.

Parallel Session

Cosmology and Gravitational Waves

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Session Classification: Cosmology and Gravitational Waves