Miami Physics Conference 2023

Date: Dec 13-19, 2023

Location: LagoMar Resort

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Using Early Universe Gravitational Waves to Test Theories of Dark Matter, Baryogenesis, and Seesaw Models

Abstract

Three of the most puzzling problems in particle physics are: What is dark matter? What is the origin of the matter-antimatter asymmetry of the Universe? What is the mechanism behind neutrino masses? I will discuss how gravitational wave experiments help us probe theories providing answers to the above questions. As a particular realization, I will concentrate on a class of models with gauged baryon and lepton number symmetries. A primordial stochastic gravitational wave background is generated in such theories through first order phase transitions, cosmic strings, and domain walls. The expected spectrum lies within the reach of upcoming gravitational wave detectors, such as LISA, DECIGO, Big Bang Observer, Cosmic Explorer and Einstein Telescope.