Contribution ID: **58** Type: **not specified**

Gravitational Waves from compressional and vortical modes in strong first order phase transitions

Monday 14 April 2025 10:15 (15 minutes)

Multiple extensions of the Standard Model of particle physics predict the existence of first order phase transitions occurring in the early Universe, leading to an imprint in the stochastic background of gravitational waves. When the transition occurs at the electroweak scale, this imprint will be in the expected range of LISA. In this talk we explore the gravitational wave production of strong first order phase transitions, seeking to understand the role of fluid non-linearities and their impact on the expected signal. To do so, we employ large scale simulations of two transitions: one preceded by a detonation, another by a deflagration. We then study the evolution of vortical and compressional modes, how they are intrinsically related and what their respective impacts are on the expected gravitational wave background signal. We also demonstrate saturation of the gravitational wave power spectra due to non-linear decay of flow.

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Session Classification: Session 1 - Phase Transitions & Topological Defects

Track Classification: Talk