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Perturbative EFT expansions for cosmological phase transitions

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Gravitational waves (GW) from cosmological phase transitions bear huge discovery potential and can be probed by planned future space-based experiments. Complementary to current and future collider experiments, such GW signatures can offer a powerful probe for beyond the Standard Model physics. Predictions for stochastic GW spectrum of a cosmological origin are often plagued by large theoretical uncertaintities related to poor understanding of phase transition thermodynamics. In this talk, I present novel reformulation to the perturbative analysis of equilibrium thermodynamics for generic cosmological phase transitions in terms of effective field theory (EFT) expansions. These EFT expansions resolve all theoretical inconsistencies that have plagued previous studies (spurious infrared divergences, imaginary parts, gauge dependence and renormalisation scale dependence). Moreover, EFT expansions provide a numerically inexpensive method to determine thermodynamics, and significantly improve agreement with the non-perturbative lattice simulations.

Primary author: Dr TENKANEN, Tuomas (Nordita, Tsung-Dao Lee Institute, Helsinki Institute of Physics)

Presenter: Dr TENKANEN, Tuomas (Nordita, Tsung-Dao Lee Institute, Helsinki Institute of Physics)

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