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Phase Transition Gravitational Waves as a Unique Discriminant for Warm Inflation

We investigate the properties of gravitational waves generated by heating-induced phase transitions in warm inflation. In this scenario, the heating phase of inflation followed by subsequent cosmological cooling can trigger two associated first-order phase transitions and generate characteristic gravitational waves. The correlated gravitational wave spectral features—amplitude, peak frequencies, and oscillatory behavior—originate from a unified model governing both phase transitions. These signatures allow discrimination between warm and cold inflation models, and give constraint on the key parameters including the dissipative coupling strength and the inflationary energy scale, collectively illuminating early-Universe dissipative dynamics. Future gravitational wave observatories such as BBO, Ultimate-DECIGO, μAres, resonant cavities, and Pulsar Timing Array experiments, will play a important role in testing these theoretical
predictions.

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