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Probing leptogenesis with scalar induced gravitational waves

We demonstrate in this work that scalar-induced gravitational waves (SIGWs) can serve as a natural and powerful probe of thermal leptogenesis occurring at extremely high scales-beyond the reach of conventional particle physics experiments. As a proof of concept, we present a simple leptogenesis model in which an early matter-dominated phase, tracking the leptogenesis scale, is responsible for the production of GWs sourced by the early structure (halos of the scalar field giving mass to the right-handed neutrinos seeding leptogenesis) formation taking place before the Big Bang Nucleosynthesis (BBN). Leveraging recent N-body and lattice simulation results for GW computations in the nonlinear regime, we show that it is possible to establish a direct link between the frequency and the amplitude of these SIGWs and the thermal leptogenesis scale.

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