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Multi-peaked Gravitational footprints of neutrino mass and lepton symmetry violation

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Content :

We investigate the production of primordial Gravitation Waves (GWs) arising from First Order Phase Transitions (FOPT) associated to neutrino mass generation in the context of type-I seesaw models. We examine both high scale and low scale variants, with either explicit or spontaneously broken lepton number symmetry. In the latter case, a pseudo-Goldstone boson, dubbed Majoron, may provide a candidate for warm or cold cosmological dark matter. We have found that schemes without Majoron lead to either no FOPT or to very weak FOPT, precluding the detectability of GWs in present or near future experiments. However, in the presence of Majorons, one can have strong FOPT and non-trivial GW spectra which can fall well within the frequency and amplitude sensitivity range of upcoming experiments. Furthermore, we show that in certain cases, the resulting GW spectra entail as characteristic features double or multiple peaks at the reach of future experiments. Our analysis shows that GWs can provide a new and complementary portal to test the neutrino mass sector.

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