Gravitational waves from supercooled phase transitions in conformal neutrino mass models

António de Aguiar e Pestana de Morais
Universidade de Aveiro, Portugal

We study supercooled first-order phase transitions above the QCD scale in a wide class of conformal U(1) neutrino mass models that explain the totality of oscillation data and produce a detectable stochastic gravitational wave background (SGWB) at LIGO, LISA and ET. We place constraints
on the U(1) breaking scale and gauge coupling using current LIGO-Virgo-Kagra data. We find that strong supercooling can be ruled out in large regions of parameter space if a SGWB is not detected by these experiments. A null signal at LIGO and ET will disfavor a type-I seesaw scale above $10^{14}~\mathrm{GeV}$, while a positive signal is a signature of heavy right-handed neutrinos.
On the other hand, LISA will be sensitive to seesaw scales as low as a TeV, and could detect a SGWB even if the right-handed neutrinos are decoupled.
Under certain circumstances, strongly supercooling can also lead to the formation of primordial black holes that act as dark matter candidates.