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Constraining Phase Transitions in Grand Unified Theories with Gravitational Waves

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The era of gravitational wave (GW) astronomy offers a new avenue to explore the early universe and with it an energy scale that may never be accessible to terrestrial colliders. This provides a fresh new way to investigate the phenomenology of grand unified theories (GUT). We construct an $SO(10)$ inspired Pati-Salam model encompassing an intermediate minimal left-right symmetric model. We calculate the stochastic GW background associated with the $SU(4)$ symmetry breaking phase transition and find that, in general, the spectrum peaks well above the sensitivity windows of any current or proposed GW detector. However, for some regions of the parameter space, the signal peaks close to LIGO and VIRGO's most sensitive region. We assess to what extent the LIGO-VIRGO network can already be used as a way to constrain GUT models and to what extent future observatories such as the Einstein Telescope could improve on this.

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