

Gravitational wave imprints of the doublet left-right symmetric model

We study the stochastic gravitational wave (GW) background resulting from the strong first-order phase transition (SFOPT) associated with $SU(2)_R \times U(1)_{B-L}$ -breaking in the doublet left-right symmetric model (DLRSM). For different values of the symmetry-breaking scale $v_R = 20, 30, \text{ and } 50$ TeV, we construct the one-loop finite temperature effective potential to explore the parameter space for regions showing SFOPT. We identify the region where the associated GW background is strong enough to be detected at planned GW observatories. A strong GW signature favors a relatively light CP-even neutral scalar H_3 , arising from the $SU(2)_R$ doublet. The $SU(2)_L$ subgroup of DLRSM is broken by three $\{v\}$ vevs: κ_1, κ_2 , and v_L . We also observe a preference for $\mathcal{O}(1)$ values of the ratio $w = v_L/\kappa_1$, but no clear preference for the ratio $r = \kappa_2/\kappa_1$. A large number of points with strong GW signal can be ruled out from precise measurement of the trilinear Higgs coupling and searches for H_3 at the future colliders.

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