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Gravitational wave imprints of the doublet left-right symmetric model

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We study 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), and the resulting stochastic gravitational wave (GW) background. For different values of the symmetry-breaking scale $v_R = 20, 30, \text{ and } 50 \text{ TeV}$, we construct the one-loop finite temperature effective potential to explore the parameter space for SFOPT. We identify the region where the associated GW signature is detectable at planned GW observatories. A strong GW background 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 *vevs*: κ_1, κ_2 , and v_L . We 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 future colliders.

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Designation

Student

Institution

Indian Institute of Technology Indore

Primary author: Mr RINGE, Dhruv (Indian Institute of Technology Indore)

Co-author: KARMAKAR, Siddhartha (Indian Institute of Technology Mumbai)

Presenter: Mr RINGE, Dhruv (Indian Institute of Technology Indore)

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