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First-order phase transitions from a broken horizontal SU(2) gauge symmetry

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Under certain conditions, a first-order phase transition during early-universe symmetry breaking can generate observable signals in the stochastic gravitational-wave (GW) background. Since the Standard Model (SM) predicts a cross-over phase transition, detectable signals are expected to arise from beyond the SM frameworks, traditionally testable only at colliders. Motivated by this complementarity between collider experiments and GW observatories, we consider the breaking of a new non-abelian SU(2) gauge symmetry corresponding to a horizontal flavour gauge group embedded in the SM flavour structure. For such a model, the new gauge symmetry is broken far above the electroweak scale and constraints are dominated by "flavour-transfer"operators rather than flavour-changing currents. We calculate the finite-temperature corrections to the effective potential and determine the critical temperature for the phase transition. We compare two of the thermal resummation techniques favoured in the literature and examine the parameters for which the phase transition is strongly first-order.

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