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Semi-Analytical Approach to the Gravitational Wave Signal From the Electroweak Phase Transition in General Standard Model-like Effective Potentials JOHN KEHAYIAS, STEFANO PROFUMO, UC Santa Cruz — Upcoming gravitational wave (GW) detectors might detect a stochastic background of GWs possibly arising from bubble collisions and turbulence from a strongly first-order electroweak phase transition (EWPT). We investigate whether it is possible to connect, via a semi-analytical approximation to the tunneling rate of scalar fields with quartic potentials, the GW signal with the parameters entering the potential that drives the EWPT. We consider a finite temperature effective potential similar to the Higgs potential in the Standard Model (SM). In the context of a semi-analytic approximation to the three dimensional Euclidean action, we derive a general approximate form for the tunneling temperature and the relevant GW parameters. We explore the GW signal across the parameter space of the potential. We comment on the potential detectability of a GW signal with future experiments, and physical relevance of the associated potential parameters from extensions to the SM. In particular we consider singlet, triplet, higher dimensional operators, and top-flavor extensions to the Higgs sector of the SM. We find that the addition of a temperature independent cubic term in the potential, arising from a gauge singlet for instance, can greatly enhance the GW power. The other parameters have milder, but potentially noticeable, effects.

John Kehayias
UC Santa Cruz

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