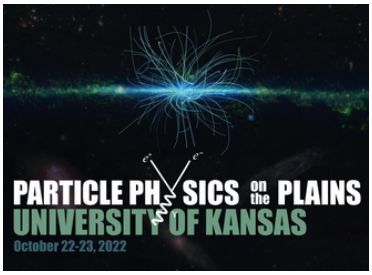

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First Order Electroweak Phase Transitions in the Standard Model with a Singlet Extension

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A common assumption about the early universe is that it underwent an electroweak phase transition (EWPT). Though the standard model (SM) is able to restore the electroweak symmetry through a smooth cross over PT, we require a strongly first-order PT to ensure electroweak baryogenesis, requiring us to look at new physics beyond the SM. The simplest case to extend the SM is to add a real singlet field, which allows for a first-order EWPTs (FOEPT) to occur.

Starting with the most general higgs+singlet Lagrangian, we fixed four of its coupling constants as functions of the three quartics, the singlet and higg's mass and vacuum expectation value, whose range of values had more experimental motivation than the former. We scanned over these five free parameters, requiring each point to be a FOEPT and the singlet mass to be between zero and twice the Higgs mass. The resulting parameter space was studied for light and intermediate singlet masses less than half the higgs mass and masses above this, respectively. In each region we explored the main modes of production, looking for complimentary modes in the parameter space to aid in di-Higgs precision measurements.

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