

Electroweak Baryogenesis and Higgs Signatures

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We explore the connection between the strength of the electroweak phase transition and the properties of the Higgs boson. Our interest is in regions of parameter space that can realize electroweak baryogenesis. We do so in a simplified framework in which a single Higgs field couples to new scalar fields charged under $SU(3)_c$ by way of the Higgs portal. Such new scalars can make the electroweak phase transition more strongly first-order, while contributing to the effective Higgs boson couplings to gluons and photons through loop effects. For Higgs boson masses in the range $115 \text{ GeV} < m_h < 130 \text{ GeV}$, whenever the phase transition becomes strong enough for successful electroweak baryogenesis, we find that Higgs boson properties are modified by an amount observable by the LHC. We also discuss the baryogenesis window of the minimal supersymmetric standard model (MSSM), which appears to be under tension. Furthermore, we argue that the discovery of a Higgs boson with standard model-like couplings to gluons and photons will rule out electroweak baryogenesis in the MSSM.

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