

Electroweak Baryogenesis Sketch: Present & Future & Future Colliders

Jing Shu*

Center for Future High Energy Physics, Institute of High Energy Physics, Chinese Academy of Sciences,
Beijing, China

*jshu@itp.ac.cn

In this talk, I will first give a heuristic argument that the baryon asymmetry and elementary particle masses are generated simultaneously during the electroweak phase transition in the context of electroweak baryogenesis (EWBG), which is the root of intrinsic connection between EWBG & Higgs physics. For the strongly 1st order EW phase transition, I will use a super master formula to demonstrate that either it requires new particles strongly coupled to the Higgs or tune the Higgs potential to be shallow. For the former case, if the new particle is colored or electric charged, is already strongly constrained by the current LHC data or will be probed soon. Otherwise, it requires future precision on EW & Higgs observables at the CEPC/FCC-ee/ILC or direct searches at the SPPC/FCC-hh if the new particle is a singlet without a vev. For the latter case, which always involves Higgs-singlet mixing, though difficult to prove to be the 1st order EWPT as sufficient condition, can show some specific particle spectra pattern and get tested at the LHC. The CP violation, on the other hand, requires an imaginary part of the amplitude in the Higgs production and decay, therefore can affect both the Higgs global fits (total amplitude) and direct Higgs CP violation searches (phases). The low energy electric dipole moment (EDM) constrain on Higgs CP violation is also discussed. The current interplay between LHC Higgs CP physics and EDM experiments, together with the future collider Higgs CP measurements and projected future EDM experiments is mentioned at the end of the talk.