

Deciphering the CP nature of the 95 GeV Higgs boson

Wednesday, September 24, 2025 2:30 PM (15 minutes)

The excesses observed by CMS in the $\tau\tau$ and $\gamma\gamma$ channels around 95 GeV, together with the $b\bar{b}$ excess reported by the LEP collaboration in the same mass region, have sparked significant interest in the possibility of new physics beyond the Standard Model (BSM). Several BSM frameworks featuring a non-standard Higgs-like state lighter than 125-GeV have been proposed to explain the anomalies observed around 95-GeV. Notable among them are the two Higgs doublet model (2HDM) with specific Yukawa textures, as well as minimal extensions of the 2HDM. As all these frameworks include in their particle spectra a CP-even and a CP-odd scalar, or as well as possible mixtures thereof, determining the CP nature of the 95-GeV Higgs state becomes crucial.

In this talk, I will address the problem of determining the CP nature of the 95-GeV resonance within a simplified model. Where the additional scalar state of mass 95 GeV has Yukawa couplings, scaled by the SM Yukawa coupling, and the interaction Lagrangian is constructed to include both scalar and pseudoscalar components, which can be tuned to a particular CP state through an appropriate mixing angle. Assuming that the 95-GeV anomalies persist in the high-luminosity phase of the LHC, I will demonstrate that the $\tau\tau$ decay mode of the 95-GeV Higgs-like state can serve as a unique probe of its CP nature, distinguishing whether it is a CP-even, CP-odd, or a CP-mixed state.

Primary author: SANYAL, Prasenjit (CQUeST, Sogang University)

Presenter: SANYAL, Prasenjit (CQUeST, Sogang University)

Session Classification: Parallel 1

Track Classification: Parallel