



Contribution ID: 24

Type: not specified

## Higgs Alignment and Novel CP-Violating Observables in 2HDM

We propose novel CP-violating observables in complex two-Higgs-doublet models and undertake a systematic study of the interplay between Higgs alignment and CP-violation, which enables us to distinguish two separate sources of CP-violation in the scalar sector: in the mixing and in the decay, and identify a scenario where departures from Higgs alignment could be present independently of CP-violation. After including constraints from the electric dipole moment and measurements at the Large Hadron Collider, we suggest a smoking-gun signal of CP-violation, without recourse to the typically required angular correlations, in the Higgs-to-Higgs decay, ( $h_3 \rightarrow h_2 h_1$ ), where  $h_3$ ,  $h_2$ , and  $h_1$  are the heaviest, second heaviest and the SM-like neutral Higgs bosons, respectively. The mere presence of this decay channel, which is non-zero only away from the alignment limit, is sufficient to establish CP-violation in a complex two-Higgs-doublet model. A distinct discovery channel lies in final states with three 125 GeV Higgs bosons, which has yet to be searched for, and could be detected at the high-luminosity LHC.

### Scheduling Preferences

**Authors:** Prof. WANG, Xiaoping (Beihang University); Prof. SHAH, Nausheen (Wayne State University); LOW, Ian (Argonne National Lab/Northwestern Univ)

**Presenter:** Prof. WANG, Xiaoping (Beihang University)