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CP-violation of charged Higgs in 3HDM CP asymmetries of $\overline{B} \to X_s/X_d\gamma$ in models with three Higgs doublets and the constraints from the electric dipole moments(EDMs)

This talk contains two research papers, arXiv: 2009.05779 [hep-ph] and 2012.08846 [hep-ph]. We investigated the general two Z_2 symmetry three-Higgs-doublet model (3HDM) with two experiement constraints, $\overline{B} \to X_s\gamma$ and electric dipole moment (EDM) when CP-violation appear in charged Higgs sector.

Direct CP asymmetries ($cal A_{CP}$) in the inclusive decays of $\overline{B} \to X_s\gamma$ and $\overline{B} \to X_{s+d}\gamma$ of the order of 1% will be probed at the BELLE II experiment. In this work, three such asymmetries are studied in the context of a 3HDM, and it is shown that all three $cal A_{CP}$ can be as large as the current experimental limits. Of particular interest is $cal A_{CP}$ for $\overline{B} \to X_{s+d}\gamma$, which is predicted to be effectively zero in the Standard Model (SM). A measurement of 2.5% or more for this observable with the full BELLE II data would give 5σ evidence for physics beyond the SM. We display parameter space in the 3HDM for which such a clear signal is possible. Furthemore, We demonstrate a new type of cancellation of contributions to the electron and neutron EDMs that occurs in 3HDM. The cancellation becomes exact when the two physical charged Higgs bosons in the model are degenerate in mass.

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