

# A CP-violating Two-Higgs-Doublet Model and the Proton Radius Problem

We consider the impact of a CP-violating Two-Higgs-Doublet Model Type-II on the proton radius puzzle and the anomalous magnetic moment of the muon. We show that a light scalar with a certain amount of CP-violation produces an energy shift that alleviates the observed  $7 - \sigma$  discrepancy in the muonic Lamb Shift  $\Delta E_{(2S-2P)}$ . Moreover, such a scalar contributes to the anomalous magnetic moment of the muon. We show that in a remarkable region of the parameter space the presence of the aforementioned scalar alleviates both discrepancies down to  $1 - \sigma$ . Thereafter, we discuss constraints on the parameter space coming from high and low energy particle physics experiments, i.e. precision tests at LEP,  $B$ -physics, Electric Dipole Moment of the electron. Finally, we discuss the limits of our approach in the context of atomic physics.

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