

Abstract Submitted  
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**Two-photon exchange corrections in elastic lepton-proton scattering** OLEKSANDR TOMALAK, MARC VANDERHAEGHEN, JGU Mainz — In recent years, two experimental approaches, with and without polarized protons, gave strikingly different results for the ratio of the electric to magnetic proton form factors. Even more recently, a mysterious discrepancy (“the proton radius puzzle”) has been observed in the extraction of the proton charge radius from the muonic hydrogen versus regular hydrogen and electron-proton scattering. Two-photon exchange (TPE) contributions are the largest source of the hadronic uncertainty in these experiments. To determine TPE corrections to the S level in muonic hydrogen, the forward virtual Compton scattering is calculated within dispersion relation (DR) formalism. Comparing a box graph model with the DRs at fixed low momentum transfer, we develop and test the subtracted DR formalism for TPE in electron-proton scattering. Its relative effect on the cross section is in the 1 – 2 % range. We include the inelastic states both in the approximation of the *near-forward* unpolarized virtual Compton scattering as well as using the empirical information on the  $\pi N$  states contribution. We compare the resulting TPE with MAMI, VEPP-3 and CLAS data, and make predictions for the OLYMPUS and the forthcoming MUSE experiments.

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