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TPEX@DESY - Measuring Two-Photon Exchange at the DESY Test Beam Facility

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The striking discrepancy in the proton form factor ratio, $\mu_p G_E^p/G_M^p$, measured using unpolarized and polarized techniques is still not resolved. The leading explanation is hard two-photon exchange (TPE). Hard TPE is difficult to calculate without significant model dependence, and has generally not been included in radiative corrections. Three recent experiments found only a small contribution but were limited to relatively low Q^2 where the discrepancy is not clear. A new proposal, TPEX@DESY, would use an extracted beam at the DESY test beam facility together with a liquid hydrogen target and high precision lead tungstate calorimeters to measure hard TPE at higher beam energies. This would permit measurements in a Q^2 regime where the discrepancy in the proton form factor ratio is significant and where the expected hard TPE contribution is predicted to be large. The motivation and overview of the proposed measurements will be presented.

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