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Posterior Shrinkage by Intelligent Design: An Application to Proton Compton Scattering[1] HARALD W. GRIESSHAMMER, George Washington Univ, BUQEYE COLLABORATION COLLABORATION[2] — Interpreting measurements requires a theory. Its accuracy varies with energy. To optimize experimental design, and so to ensure that the substantial resources of modern experiments acquire the most valuable data, both the theory uncertainty and the expected experimental errors must be considered. We apply a Bayesian approach to proton Compton scattering. Chiral Effective Field Theory (χEFT) is used to infer the electromagnetic polarizabilities of the nucleon from data. With increasing photon energy, both experimental rates and sensitivities to polarizabilities ncrease, but the accuracy of χEFT decreases. Our physics-based model of truncation errors is combined with present knowledge of the polarizabilities and assumptions about experimental capabilities at HIγS and MAMI. We assess the information gain from specific observables at specific kinematics: by how much are new data apt to shrink uncertainties? The strongest gains are in two spin observables at $\omega \simeq 140$ to 200 MeV, and tightly constrain $\gamma_{E1E1} - \gamma_{E1M2}$. New cross sections between 100 and 200 MeV will substantially improve $\alpha_{E1} - \beta_{M1}$, γ_π and $\gamma_{M1M1} - \gamma_{M1E2}$. Such data is pivotal to pin down the scalar and spin polarizabilities.

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