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## Addressing the Proton Radius Puzzle Using QED-NRQED Effective Field Theory

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The proton radius puzzle, i.e. the large discrepancy in the extraction of the proton charge radius between regular and muonic hydrogen, challenges our understanding of the structure of the proton. It can also be an indication of a new force that couples to muons, but not to electrons. An effective field theory analysis using Non Relativistic Quantum Electrodynamics (NRQED) indicates that the muonic hydrogen result can be interpreted as a large, compared to some model estimates, muon-proton spin-independent contact interaction. The muonic hydrogen result can be tested by a muon-proton scattering experiment, MUSE, that is planned at the Paul Scherrer Institute in Switzerland. The typical momenta of the muons in this experiment are of the order of the muon mass. In this energy regime the muons are relativistic but the protons are still non-relativistic. The interaction between the muons and protons can be described by a hybrid QED-NRQED effective field theory.

**Primary author:** Mr DYE, Steven (Wayne State University)

**Co-authors:** Prof. PAZ, Gil (Wayne State University); Dr GONDERINGER, Matthew (Wayne State University)

**Presenter:** Mr DYE, Steven (Wayne State University)

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