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**Resolving the Proton Radius Puzzle Using QED-NRQED Effective Field Theory** STEVEN DYE, MATTHEW GONDERINGER, GIL PAZ, Wayne State University — The proton radius puzzle challenges our understanding of the structure of the proton. It can 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, 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. 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. We present some elements of this effective field theory, and compare them previously known results.

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