Title: Collaborative Research: Equipment for and Running of the PSI MUSE Experiment

Institution: Rutgers University New Brunswick

NSF Program: Hadrons and Light Nuclei

Principal Investigator: Gilman, Ronald

Rating: Good

Review:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

The intellectual merit is strong. The proton radius problem is arguably the most pressing problem in hadronic physics today.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

Understanding this puzzle is important in understanding the structure of one of the principle building blocks of the visible matter in the universe. Several of the groups have a good record in bringing a diverse range of students into their projects.

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if applicable

The technical feasibility is difficult to judge on the basis of this proposal, or on what I could easily find on the web.

Summary Statement

This proposal requests significant funding for a muon-proton scattering experiment that could shed light on the proton radius puzzle. The scientific motivation is well founded; the proton radius puzzle is one of the most important problems in hadronic physics. Since this puzzle presented itself, no convincing explanation has come forward to explain it. The proponents propose to used a mixed beam at PSI to measure cross sections for e-p and mu-p elastic scattering. While I have been asked to comment on the scientific, and technical merit of this proposal, it is extremely difficult to comment on the latter based on this proposal. Unfortunately there is no reference to documents that might provide detailed information on the experiment. Based on this proposal, I am unable to judge the technical feasibility, and the TDR that I located on the web, did not help. My impression is that this TDR is more like the CDR required for CD1 in DOE projects, and needs significant work to rise to the level of a TDR. Both the proposal and the TDR should be more succinctly worded, with a few summary tables that convey the key information to the reader concerning: the necessary precision to be interesting; what is needed to reach that precision; and how the experiment will be designed to meet those requirements. My

conclusion is that the goal of this experiment is important, and the results will be very interesting if the projected sensitivity can be reached experimentally.