

# MUSE The MUon Scattering Experiment

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for the MUSE Collaboration

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September 23, 2022



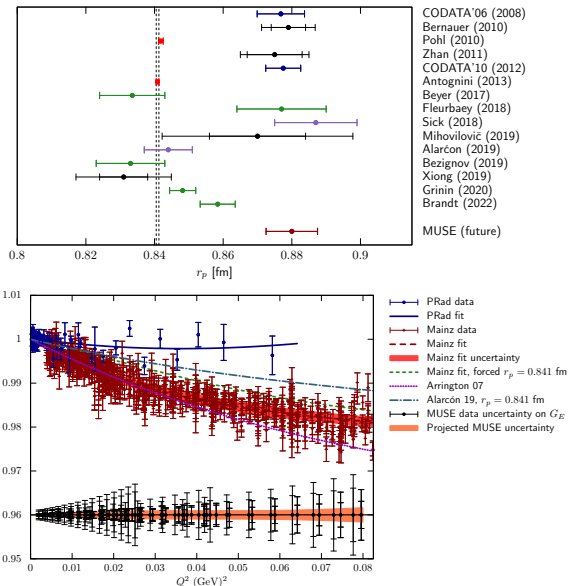
Stony Brook University



Ethan Cline is supported by NSF Grant Number: PHY-2012114

# Electromagnetic / Hadronic Physics Issues in Proton Radius Measurements

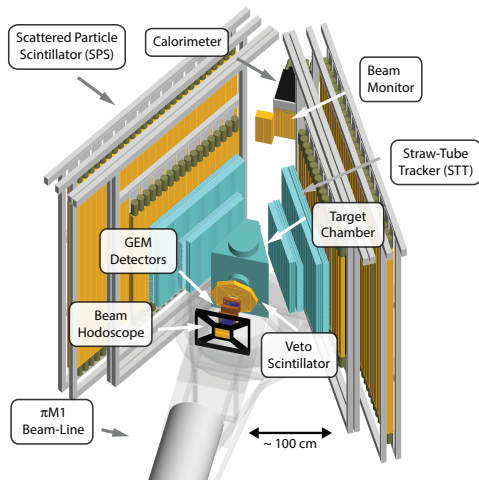
- Inconsistency between/within form factor and spectroscopy data
- Radiative corrections/Two-photon exchange
- All current measurements with negative polarity leptons



Precise measurement of cross sections and first high precision measurement of  $\mu p$  scattering for  $Q^2$  relevant to resolve puzzles

$e^\pm, \mu^\pm, \pi^\pm$ ;  $P_{\text{beam}}$ : 115, 161, 210 MeV;  $\theta$ : 20-100°;  $Q^2$ : 0.0016-0.08 GeV<sup>2</sup>

- Simultaneous elastic  $ep$  and  $\mu p$  scattering → test lepton universality
- Both lepton charge polarities → direct test, cancellation of two photon exchange
- Low energy  $\pi p$  scattering important for  $\chi PT$ , search for  $\sigma(\pi^+ p)/\sigma(\pi^- p)$  resonances
- PSI only facility world-wide suitable for these measurements
- Substantial progress, multi-year effort remaining



# The MUSE Collaboration

**Approximately 70 Collaborators, past and present, from four countries, supported by countless PSI staff!**

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