

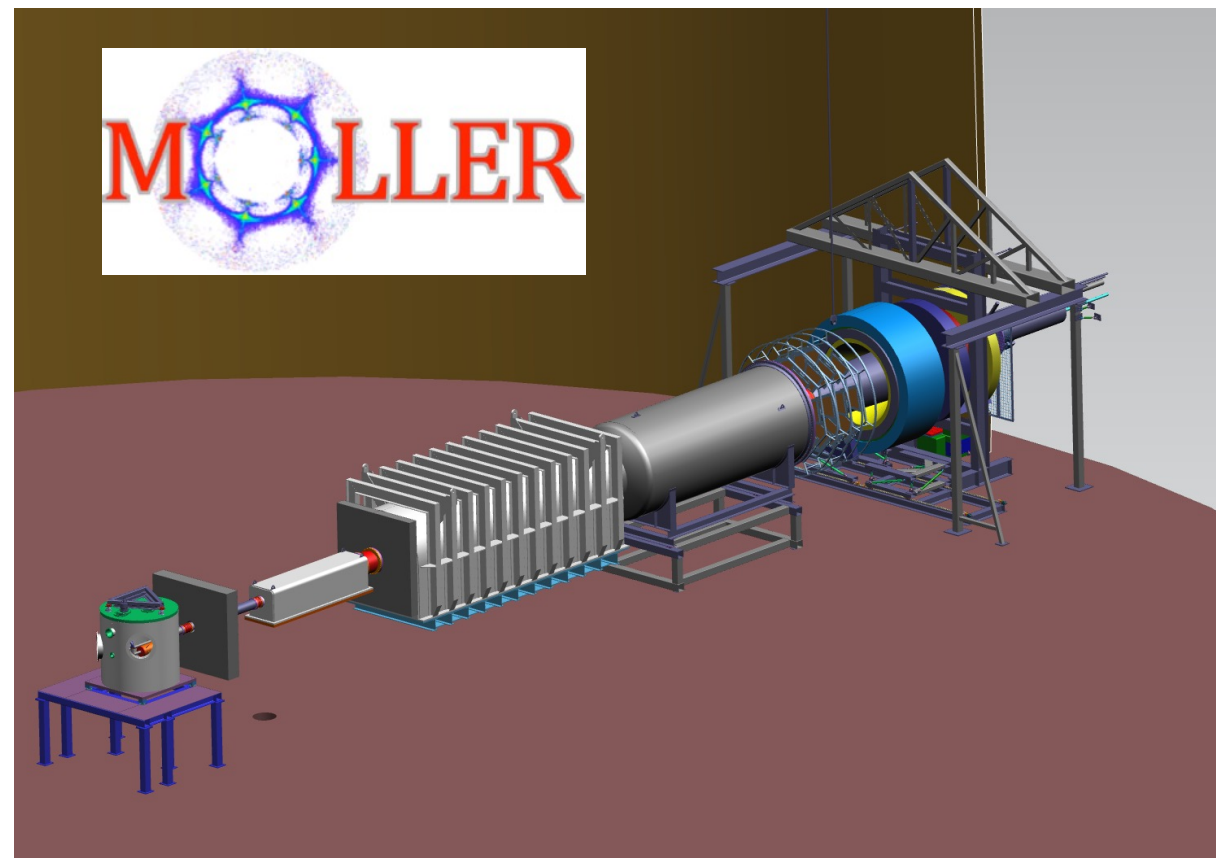
MOLLER-NSF Midscale Project Update

MOLLER Collaboration Meeting

June 2021

Mark Pitt
Virginia Tech

Jefferson Lab



MOLLER-NSF in the Overall MOLLER Experiment

MOLLER-NSF “Apparatus for Normalization and Systematic Control of the MOLLER Experiment”

Distinct roles for funding agencies supporting the experiment:

- **DOE MIE:** Prepare quantum state to be measured: scattered Møller electrons – beam-related issues, construction of target, spectrometer, required hall infrastructure
- **CFI (Canada Foundation for Innovation)/RM (Research Manitoba):** Measure raw asymmetry and achieve the needed statistical error – construction of main thin quartz integrating detector and integrating electronics chain
- **NSF Physics Division Midscale:** Make measurements needed to provide the [Normalization and Systematic Control](#) to achieve the systematic error goals – construction of the tracking system, background detectors, main detector mechanics, auxiliary asymmetry detectors, and certain aspects of beam monitoring and polarimetry

MOLLER-NSF Team

Subsystem	Institution	Major Team Member
Science contact - MIE portion	University of Manitoba	Juliette Mammei
Science contact - NSERC/CFI portion	University of Manitoba	Michael Gericke
Science contact - Jefferson Lab/DOE	Jefferson Lab	Robert Michaels
Shower-max detector	Idaho State Univesity	Dustin McNulty
Pion detector	William & Mary	David Armstrong
Tracking system: GEM Detectors	University of Virginia	Nilanga Liyanage Kondo Gnanvo
Tracking system: Trigger Scintillators	Louisiana Tech	Rakitha Beminiwattha
Tracking system: Electronics	William & Mary	David Armstrong
Tracking system: Rotation system and support	William & Mary Muskingum University	David Armstrong Chandika Annasiwatta
Scanner	Virginia Tech	Mark Pitt
Integrating detector mounting/support	University of Massachusetts Amherst Syracuse University	Krishna Kumar Paul Souder
Scattered beam monitors	Virginia Tech	Mark Pitt
Data acquisition and monitoring system	Ohio University	Paul King
Polarized beam: Pockels cell and polarimetry detector	University of Virginia	Kent Paschke

- 9 collaborating universities
- Three “science contacts” (unfunded senior personnel) to Jefferson Lab and the other potentially funded pieces

Recent MOLLER-NSF Midscale Administrative Events

- **March 2021:** Funding received from NSF; start of 4 year \$5.7M project; March 2021 – March 2025
- **April 2021:**
 - Started monthly updates to DOE ONP in their monthly call with MOLLER; NSF program managers join this monthly meeting
 - NSF (and CFI) scope formally removed from DOE MIE project
- **June 2021:** Project tracking: first monthly report to NSF following their template

Subsystems (L2 or L3 WBS)	Budgeted Cost	Cumulative Actual cost	Work % complete
Project total	\$5,706,183	\$82,228	1.02

Spending will pick up with summer labor added and some GEM prototype and DAQ test stand procurements expected soon.

Technical Progress Highlights

- **WBS 2.04.02: Main Detector Mechanics/Supports:** Work in progress with UMass/Syracuse and Bartoszek Engineering for main detector external support structure made of 3 sections and concept to load individual submodules and associated shielding with a robot arm.
- **WBS 2.04.03: Shower-max detector:** ISU: quartz and long pass filter irradiation studies ongoing at Idaho Accelerator Center; working on load and deformation analysis of the shower-max chassis assuming a simple 1/28 type assembly
- **WBS 2.04.04 Scanners and WBS 2.07.06 Scattered Beam Monitors:** VT: graduate student starting work on simulations needed before finalizing design; postdoc Devi Adhikari will join in August
- **WBS 2.05.01 GEM Detectors and WBS 2.05.05 Møller Polarimeter GEM detectors:** UVa: completed the CAD design for the prototype GEMS; initiated the process for preliminary design review; new cleanroom being assembled at UVa
- **WBS 2.05.02 Pion Detectors and Tracking Electronics:** W&M: Simulations underway to adjust design to minimize Møller background; updated quotations for x10 amps and NIM bins (tracking electronics) obtained
- **WBS 2.05.02 Tracking system: Trigger scintillator:** LaTech: implementing scintillator setup in CAD; simulation ongoing to check scintillator acceptance with most recent Moller and ep envelopes
- **WBS 2.05.03 Ferris Wheel:** Muskingum: 3D model of ferris wheel, support, and GEM sliding mechanism underway
- **WBS 2.07.02/.03/.04: Data acquisition, trigger, online computing:** Ohio U.: successful PDR (60% design) in March 2021; acquiring the test stand crates and electronics needed to validate the DAQ and trigger design.