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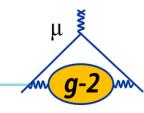
Field DAQ Status

Matthias Smith Fermilab Computing Readiness Review November 8th 2016

Outline of Talk

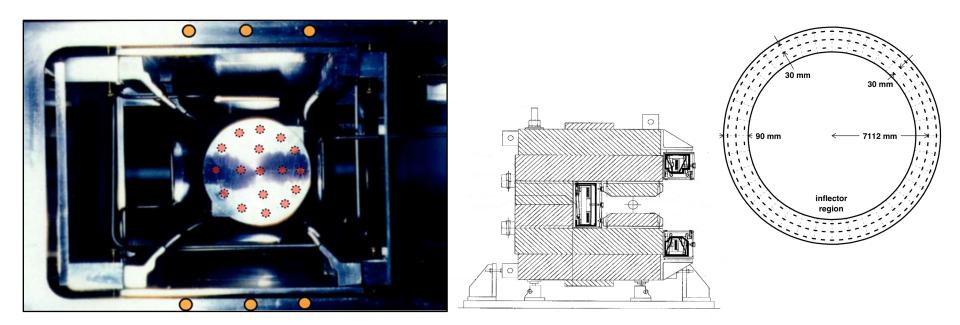
- Overview of System
- Per subsystem
 - Details
 - Current status
 - Remaining action items
- Milestones/Scheduling
- Summary





Field DAQ: Primary Measurements

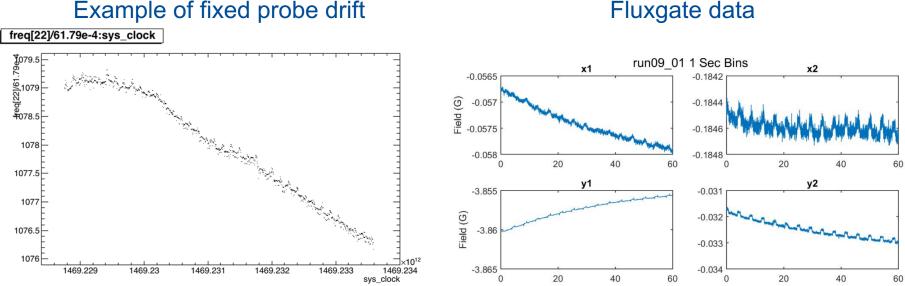
- Map the magnetic field in the muon storage region
 - Trolley with array of 17 NMR probes
 - Connect trolley runs with 378 fixed probes
 - Transfer absolute calibration to the trolley using plunging probe



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Field DAQ: Supplementary Measurements

- Feedback to the power supply to stabilize the field
- Correct azimuthal field deviations with surface coils
- Monitor transient fields with fluxgates



Fluxgate data

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Field DAQ Component Design

- MIDAS framework
- Each subsystem
 - Front-end to retrieve data events
 - Simulation front-end for development
 - Online sifting of events with data quality monitor (DQM)
 - Unpackers + gm2midastoart turn MIDAS file into art file
- Run art analyzers run on raw data
- Online displays and diagnostics
 - Alarm system from MIDAS
 - DQM (js + html + art)



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Field DAQ Subsystems

- General tasks (affecting multiple subsystems)
- Fixed probes (~ 1s)
- Trolley system (~ few days)
- Plunging probe (~ few months)
- Absolute calibration (as necessary, ~months)
- Supplementary: fluxgates (~ 2kHz), surface coils (~ 1s)

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General Field DAQ Work

- μ š **g-2**
- Establish standards, frameworks, and guides for team
- Task list 21% completed
- Estimated 75 work days remaining
- Team
 - *Matthias Smith
 - *Ran Hong
 - Rachel Osofsky



Subsystem: Fixed NMR Probes Details

- Procedure
 - Sequence 378 NMR probes
 - Record waveforms
 - Extract frequency from signal
 - Feedback to magnet power supply
- Data rates:
 - 4 MB per event
 - At ~1 Hz
- Estimated storage 250 TB (assuming 2 years of running)

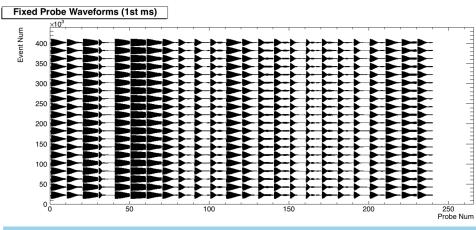


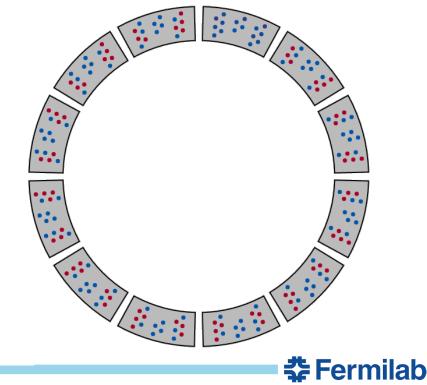
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Subsystem: Fixed Probe Status

- Prototype MIDAS front-end implemented
 - Successful readout of 1/12 of probe suite
- Prototype for online display
- Overall progress 25% (including analysis work)

Figure (right): showing all probes and health by color Figure (below): subset of fixed probe signals





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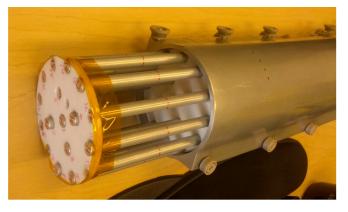
Subsystem: Fixed Probes Remaining Action Items

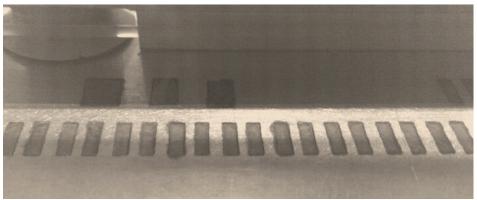
- Install all fixed probes (delays tests)
- Implement analysis on GPU to improve speed
- Test with full suite of probes
- Implement data unpacker
- Further work on displays and diagnostics
- Estimated 28 work days remaining
- Team
 - *Matthias Smith
 - Erik Swanson



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- Procedure
 - Motor system moves trolley around ring measuring 2D slices
 - Measure field with array of 17 NMR probes
 - Measure position by digitizing printed barcode
- Data rates
 - 4GB per run
 - Measure every few days
- Estimated storage 2 TB



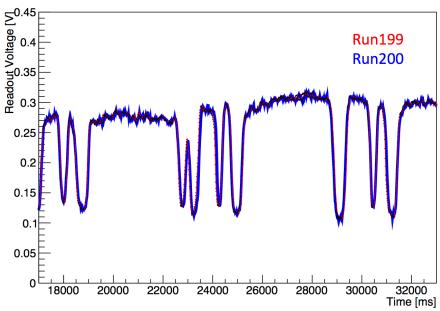




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Subsystem: Trolley Status

- MIDAS front-ends implemented
 - NMR trolley
 - Barcode reader
- Overall progress 68%



Barcode Readout



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Subsystem: Trolley Remaining Action Items

- Implement art data unpacker
- Implement online displays
- Implement diagnostic displays
- Estimated 37 work days remaining
- Team
 - *Ran Hong
 - Peter Winter



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Subsystem: Supplementary Devices Details

- Surface coils
 - Set of tunable current sheets
 - Monitor system
- Fluxgates
 - Mobile detectors to monitor field transients
- Estimated data stored 60 TB

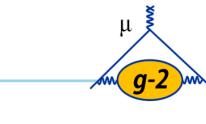
4 fluxgates + readout boards



Surface coils

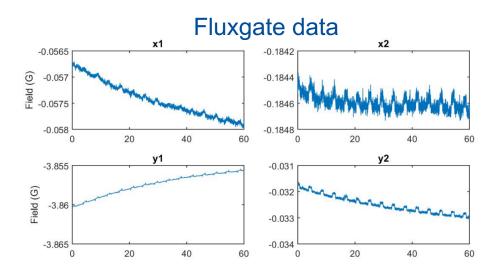






Subsystem: Supplementary Devices Status

- Surface coils
 - Hardware installation done
 - Calibration tests beginning
- Fluxgates
 - Prototype readout functional
- Progress 34%





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Subsystem: Supplementary Devices Remaining Action Items

- Surface coils
 - Complete software chain
- Fluxgates
 - Port to MIDAS framework
 - Finish out the software chain
- Estimated 27 work days remaining
- Team
 - *Alec Tewsley-Booth (fluxgates)
 - *Brendan Kiburg (surface coils)



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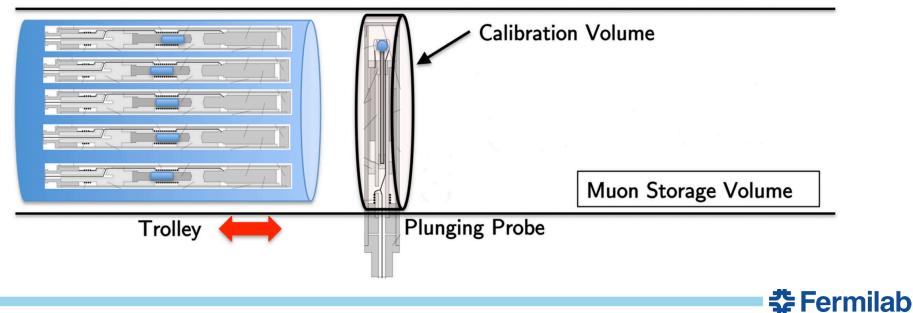
Subsystem: Absolute/Plunging Probes Details

- Procedure
 - Record waveforms from absolute calibration NMR probe

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- Extract frequency
- Operate alignment motor (only plunging probe)
- Different experiment space than other subsystems
- Data requirements small compared to other subsystems



Subsystem: Absolute/Plunging Probes Status

- Working solution exists (non MIDAS) for data taking
- Will be ported to MIDAS framework
- Overall progress 66%

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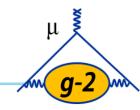
Subsystem: Absolute/Plunging Probes Remaining Action Items

- Migrate to MIDAS framework
- MIDAS-to-art unpacker
- Online displays
- Diagnostic displays
- Estimated 120 work days remaining
- Team
 - *David Flay
 - David Kawall



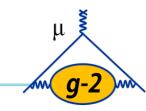
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- Milestones
 - First full data chain (fixed probes or trolley)
 - Exercise data taking machinery for all subsystems
 - Implement full chain with all subsystems (up to raw data art file)
- Schedule Goals
 - First full chain finished by Dec. 1st Collaboration meeting
 - All subsystems will be taking data by end of year





Subsystem	Progress	Remaining	Notes
General Tasks	21%	75	High priority
Fixed Probes	25%	28	
Trolley System	68%	37	
Supplementary	34%	27	
Absolute/Plunging	66%	120	Lower priority

