

Online Monitoring and Analysis for Muon Tomography Readout System

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Outline

- Motivation
- Muon Tomography Station
- Online Monitoring GUI
- Explanation of Individual Plots
- Future Plans

Motivation

- Perform all monitoring and analysis in real time
- Cut analysis time in half
- Integrate all previous work on MTS software
- Standardize the DAQ system and make it easily accessible

Muon Tomography Station



Scalable Readout System (SRS)



AMORE: Publisher and Subscribers

- AMORE agent as an FSM with a single publisher and many subscribers
- Each agent has its own table in MySQL database to store published data
- Subscriber retrieves data by subscribing to the agent
- Allows for dual processing
- Secure monitoring



Online Visualization Shell

	Amore Visualization Main Window
Amore Agents Objects Help	
Amore	AmoreCanvas 📓
🗋 🖾 😹 🕹	
Draw option (selected pad) : default 💌	
Filter agents :	
Event Display Poca	
Auto Layout Shifter objects only	
Hide idle agents	
Macros	
agents	
	Description
	No object in the selected pad.
	Please click on a pad where an object is displayed.

Raw Data



Pedestals



Pedestals: Intuitive Explanation

• Mean noise level in each channel during pedestal run is subtracted from event data



A sample event on one detector in the X and Y strips following pedestal subtraction

Charge Clusters



Charge Clusters: Intuitive Explanation



Individual Strips



Track Reconstruction with Multiple Clusters

2d Charge and Position Maps



Challenges

Speed up event processing: Taking data at 30 Hz; Processing data at 10-15 Hz on 4 core processor with 10 GB RAM

- Software solutions
 - Code optimization
- Hardware solutions
 - Perform analysis on cluster
 - Parallel processing with GPUs

What's Next: Add Functionality for . . .



Event Display

• Analysis Plots



Conclusions

- Successfully implemented a customized GUI that makes the performance of the readout system easily accessible in real time
- Revived and integrated past work into our display
- Converted data analysis to online platform that is significantly faster and better suited for real-life applications