The Fermilab Test Beam Facility Data Acquisition System using *otsdaq*

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Description of the Facility

The Fermilab Test Beam Facility is a high-energy test beam used for precision tests of high-energy physics (HEP) detectors. Users include large HEP experiments such as CMS and NOvA, as well as smaller research groups testing novel detector technologies. The beam is variable in energy and intensity, and a target can be inserted into the beam to convert the protons to other particle types for the users.

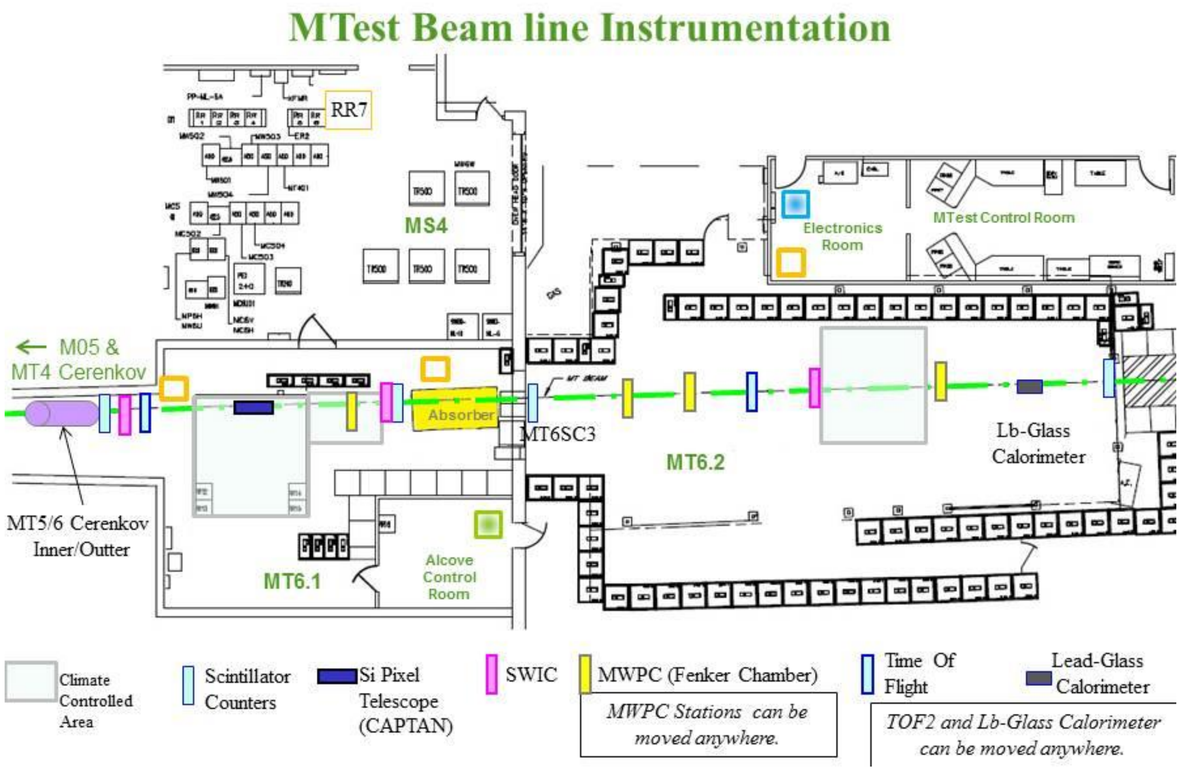

Figure 1 – Schematic bird's-eye view
Showing detector's places on the floor
With control rooms for monitoring
What they're all here for

DAQ Design

The facility has several detectors along its beamline, which are used for energy measurement and beam positioning. A strip telescope gives micron-level position resolution in the first enclosure, while wire chambers give millimeter precision along the entire beamline. Before the Facility DAQ project, each detector had a separate read-out, making integrated studies difficult.

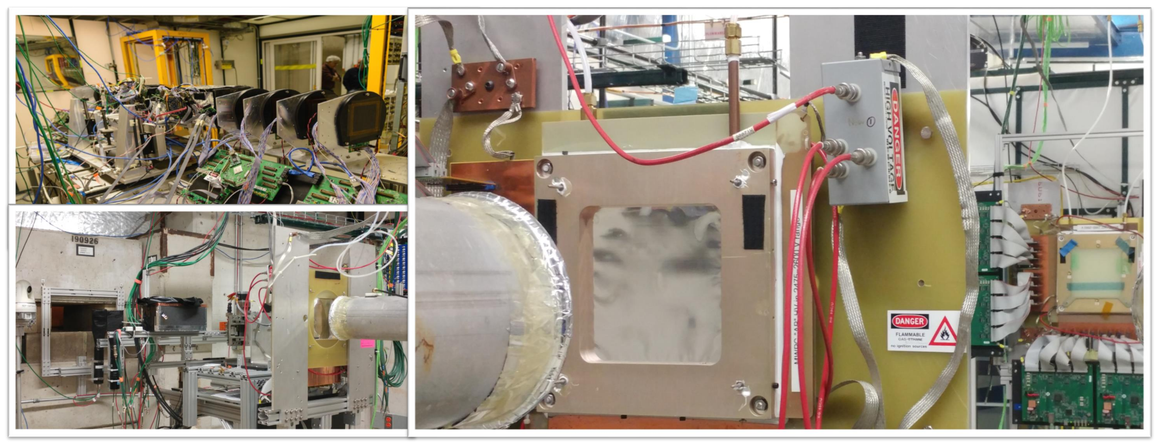

Figure 2 – A beam of protons or mesons galore
Striking through the experiment hall
Quantified by the detectors sitting,
Patiently recording the particle's fall

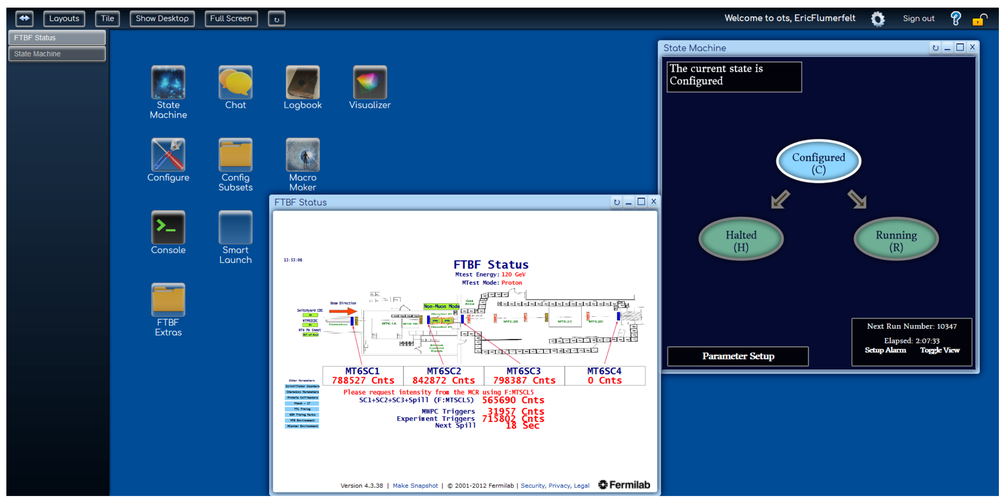

Figure 3 – A Run Control foundation
Seen through a web-based station
Buttons for states
A Chat with the mates
And live tree-based Configuration

The *otsdaq* product was implemented as a DAQ solution for the facility, initially reading out the telescope and the wire chambers. In addition to providing data to experiments' DAQs, the DAQ facility reads out all detectors on a spill-by-spill basis.

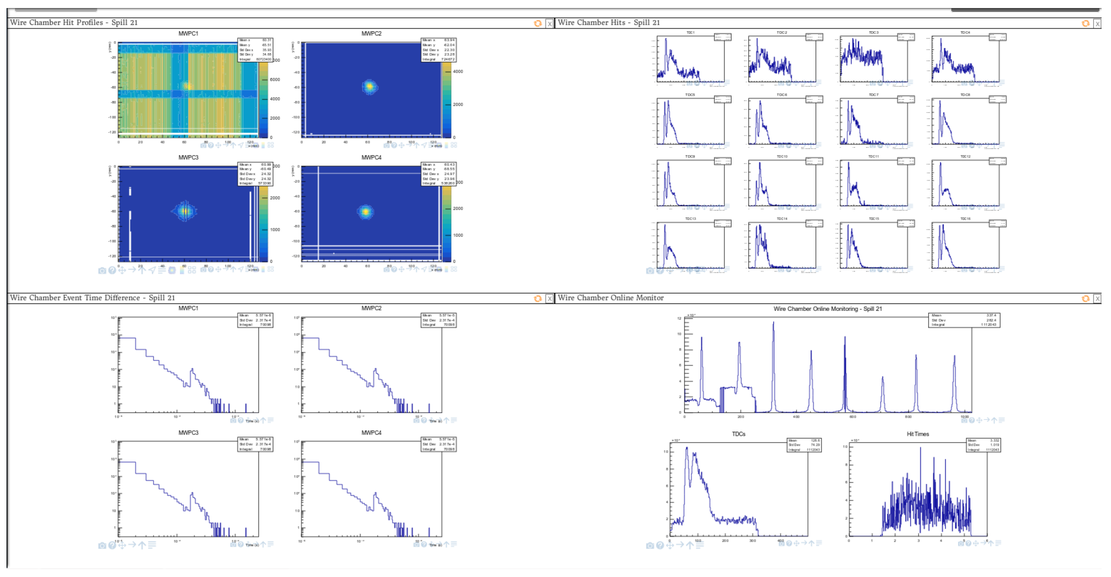

Figure 4 - Online Monitor
Plotting all the useful data
Updating itself

DAQ Operations

The Facility DAQ has been running regularly, and additional facility detectors are still being integrated into the system. Online Monitor modules for the integrated system are under development, which will allow for an Event Display capable of particle track reconstruction through all of the facility's detectors.

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