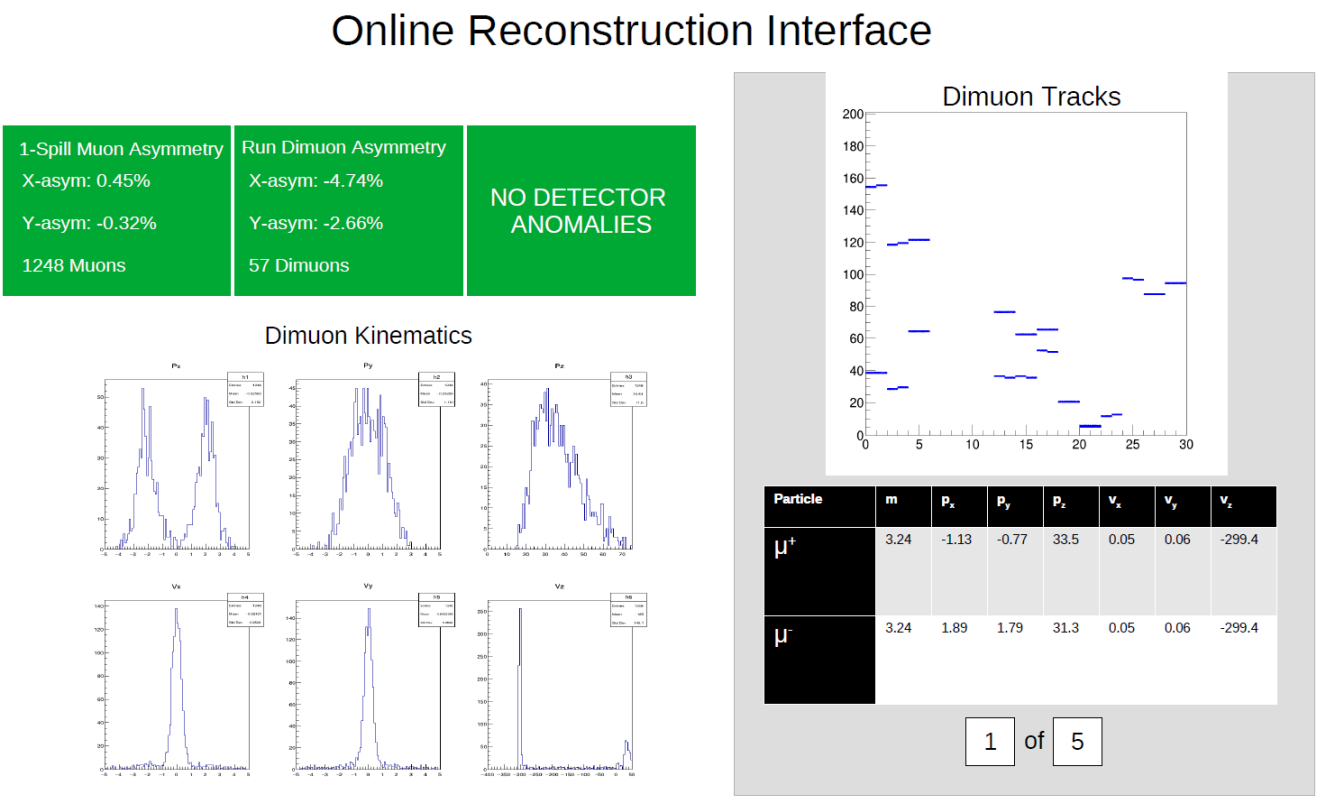
Online Monitoring GUI



Plot hit matrix with recent Dimuon tracks in a human-readable format.

Kinematic data for dimuons from the last spill.

Use recent reconstructed single-muons and dimuons to display asymmetry in the last spill and the run, respectively.

Display the number of single-muon events in the last spill and dimuon events in the run.

Display distribution of kinematics and vertex information for reconstructed tracks.

Add high-voltage slow controls information as a function of occupancy and efficiency/ alarm when out of expected range.

In addition, we could have pattern indicators that help to identify the health of the various DC plans. This can be done by training on patterns that are understood to be indicative of certain problems from certain chambers as a function of voltage.

A left right asymmetry over the last 10 spills can be plotted and correlated to the rates in the scalars.

Plots of the number of muons accumulating along the z-axis can be produce in real time for each spill.

Plots for the scintillation hodoscope and Prop tubes can also be made for similar hit matrix types.

These hit matrices can but put together to make a full even display. This should have a few separate plots:

one showing the event display (full hit matrix) for any most recent dimuon from that spill, one that shows

a list (over 45 seconds) of several single muon tracks, and one that subtracts the golden run info from several single muon tracks to help determine if there are any issues arising.

There should be some information about the quality of fits of vertex and momentum and perhaps a indication of the differences between there various tracking parts of the different methods (tracking finding, fitting, 3-mom).

The display should indicate how many DY and J/Psi there are in each spill.

The display might also indicate how many DY and J/Psi came for the dump.

Monitoring Features:

Information Needed Fast (per spill)

Basic Monitoring
- Number of triggers (FPGA), road set monitor, (sig/back), lineshape
- DAQ + DAQ error rates (at TDC, ROC, TS, etc.)
- Occupancy per spill (set of histos: DC, SH, FH, PT), TDC-time distros, in-time peak monitoring
- Comparison of real trigger bits and emulated trigger bits
- TDC-time distribution: particularly of hodoscopes, where the in-time peak shifted several times during E906 due to hardware failure
- Beam intensity: veto percentage, triggered-RF intensity
- Monitoring scalars
- Active/inactive paddles and detector issues

Higher Level Monitoring (with slow control integration)
- TDC time difference between H2XT and H4XB vs flight distance
- Hit pattern overlap from DC, SHodo and FHodo
- Hodo rates vs High Voltage
- PMT rates vs High Voltage
- Tempurature in analysis magnet and polarity vs hit patterns for +/- muons
- Hit pattern in detectors in comparison to golden hits
- Gas flow pressure with rates

Beam-target interaction (info from scalars and cherenkov)
- Rates in scalers
- Changes in structure of the beam
- Timing and distribution in space

Reconstructed Information (Px, Py, Pz, Vx, Vy, Vz)
- J/psi mass (mean and width)
- Kinematics of Dimuons (q_T, x_b, X_F, phi)
- Kinematics of single tracks (differential charge)
- Degree of L/R asymmetry, U/D asymmetry from all incoming events
- Monitoring of non-target interactions: ladder
- Counting the number of J/psi and DY per spill
- Lineshape monitoring
- Target fully intact

Higher Level Analysis
- Real-time L/R asymmetry from J/psi (spill and accumulated statistics)
- Asymmetry as a function of kinematics
- Pattern recognition of all detector systems per spill with correlations for timing and element ID
- Deviations from golden run based on trained data
- Partial track or track quality for k-tracker
- Level of background from Qtracking
- Rates just from target from Qtracking
- Quality factors based on slow control information and high level analysis
- Full N-dimension correlations in real-time
- Monitor of real-time dilution factor of x_b

Calibration
- Initial Insert Analysis: level of target rotation, pitch, and alignment with calibrating slug
- Pencil target beam position analysis

Part of Shift Monitoring scheme and Displays

Display from histograms and high-level analysis from above and;

Monitoring Features:
  o Ability to choose trigger or trigger mask (set of triggers) for each monitoring plot
  o Ability to overlay any histogram with a reference histogram from a file
  o Track quality, such as N of associated chamber hits and chi2/NDF

High level monitored plots:
  o Dimuon mass (dimuon triggers)
  o Dimuon mass (special low mass trigger to include full J/psi line shape)
  o Angular asymmetry for J/psi region
  o Reconstructed vertex position (x,y,z, 3 plots)

Reliable Event display with the following default views:
  o X-Z plane (plan view of experiment, not a point viewer perspective)
  o Y-Z plane (elevation view of experiment, not a point viewer perspective)
  o U-Z plane (not a point viewer perspective)
  o V-Z plane (not a point viewer perspective)
  o Display should also include Beam Cherenkov information available from the event
  o Integrated scalar with slow controls information