CALOL2 DQM - Diagnosing system performance with online DQM

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Outline

Overview

1. Introduction to DQM
2. Overview of available functionality
3. Online DQM
4. Emulator DQM
5. Customisation
6. Conclusion

Online DQM

1. `https://cmsweb.cern.ch/dqm/online/` (requires grid certificate)
2. Receives a subset (≈ 1 %) of data-stream that comes out of DAQ
3. Intended for real-time diagnostics and quality monitoring of detector sub-systems
4. Comprised of CMSSW modules that process data each lumi-section (23 sec) as data becomes available
5. Generates a set of histograms which are processed by DQM GUI (data is accumulated)
6. DQM GUI offers limited interactive functionality for styling, documentation and automation of plots

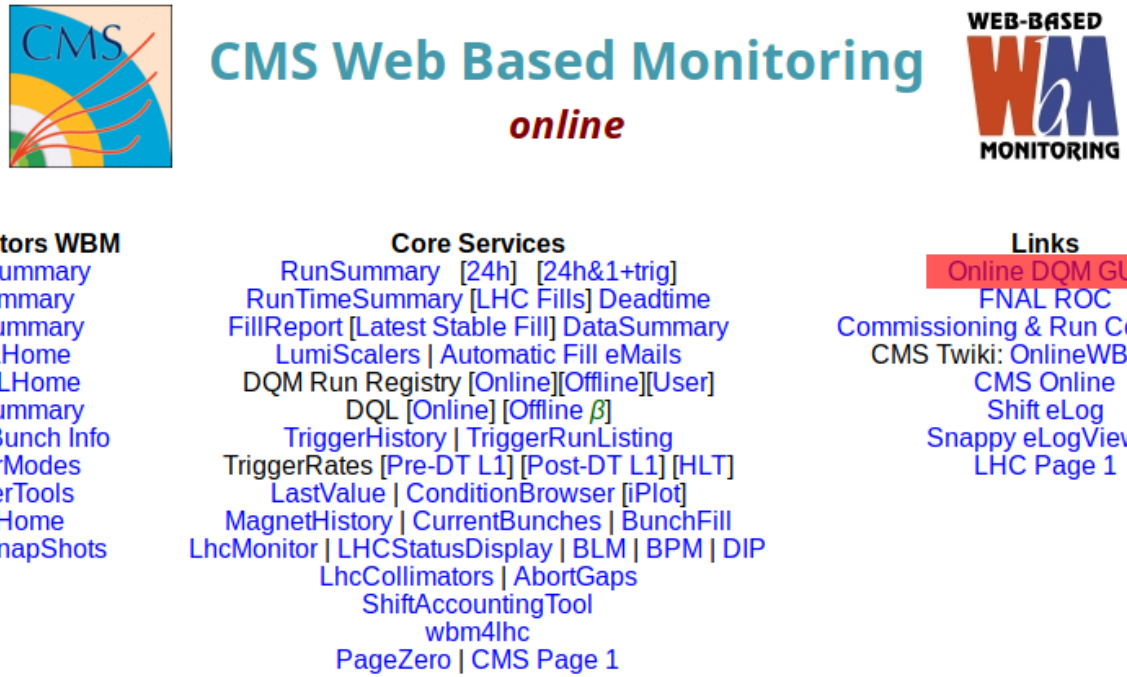
Offline DQM

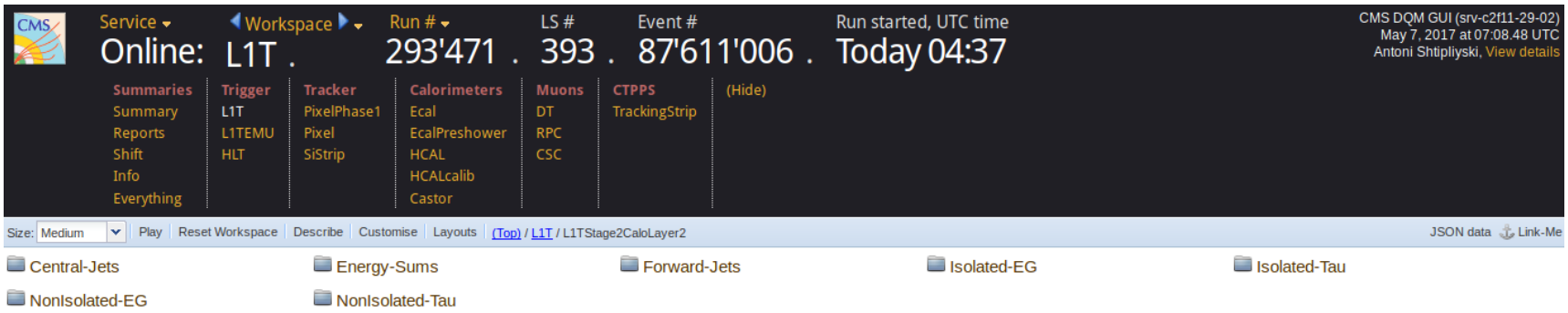
1. Runs on full dataset after completion
2. Useful for performance studies (i.e. turn-ons, efficiencies)

CALOL2 Specific DQM functionality

1. Distributions of object properties from data / emulator (jet position, energy, etc)
   - jets (central and forward): E_T (rank), position (η, ϕ)
   - e/γ (iso and non-iso): E_T (rank), position (η, ϕ)
   - τ (iso and non-iso): E_T (rank), position (η, ϕ)
   - sums: scalar sums (ETT, HTT), vector sums (MET/MHT E_T, ϕ)
2. Diagnostic plots, i.e. timing and isolation
   - 2D occupancy
   - Bx occupancy (check of timing)
   - Quality bits
   - Isolation (for e/γ, τ)
3. Data-emulator comparisons (ratio plots useful for debugging firmware issues)
   - ratio is taken of object distributions
   - deviations suggest issues with either algorithm firmware/emulator
   - useful as a sanity check after a firmware upgrade

- WBM available at `https://cmswbm.cern.ch/`





- Workspace → L1T → (Top) → L1TStage2CaloLayer2

Online DQM - Example

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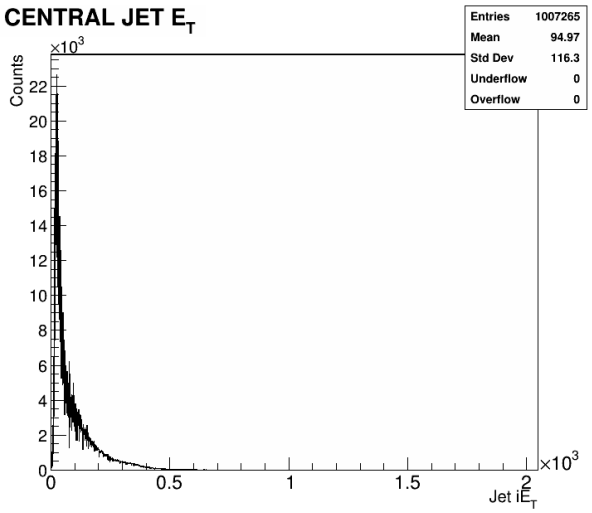
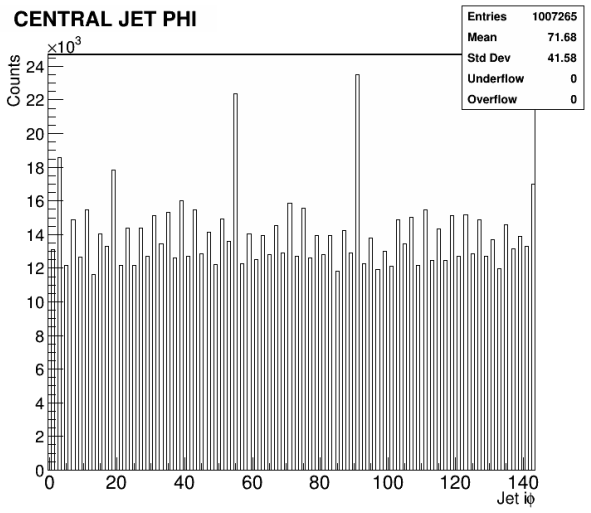
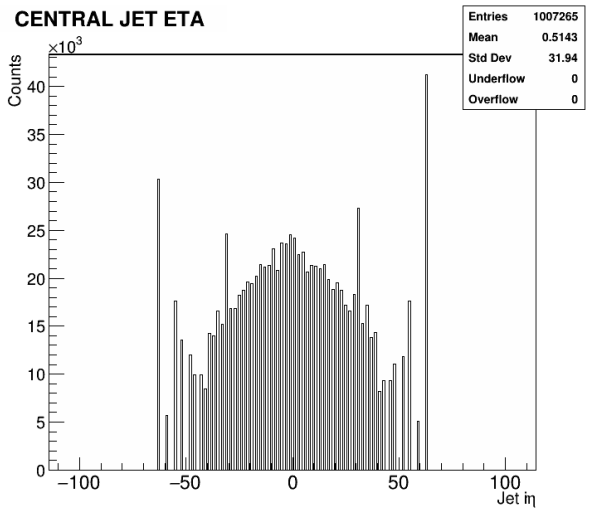
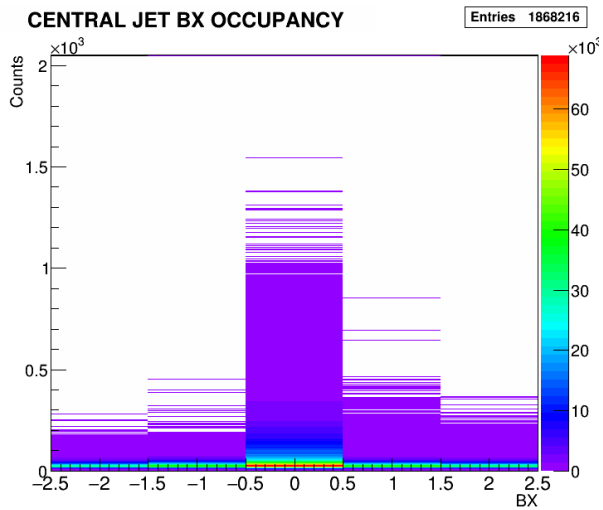
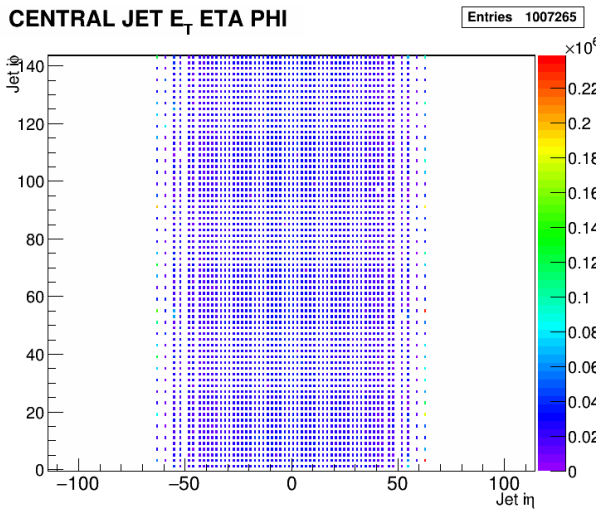
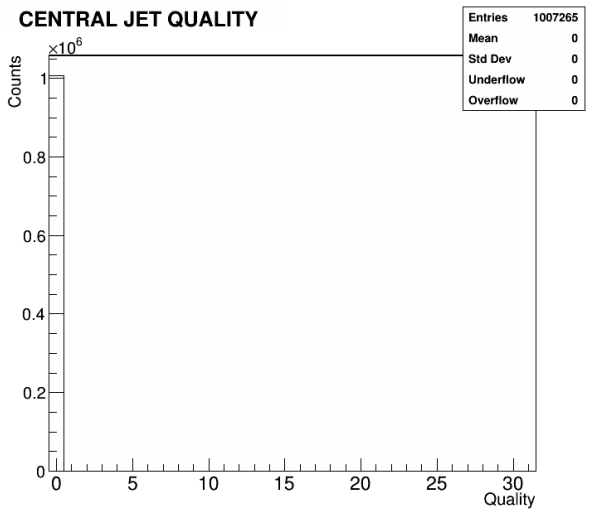




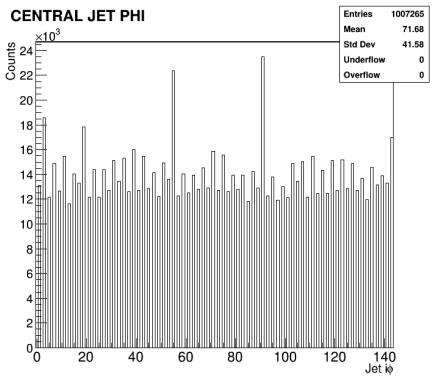


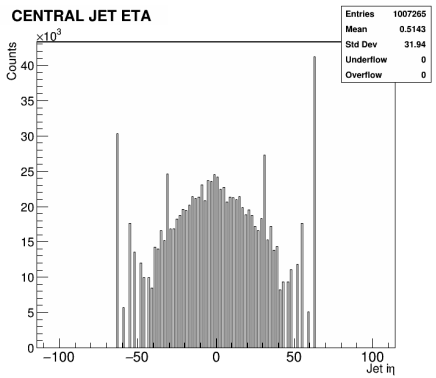


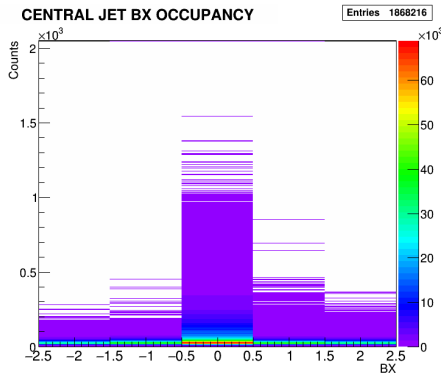




Online DQM - Expectations







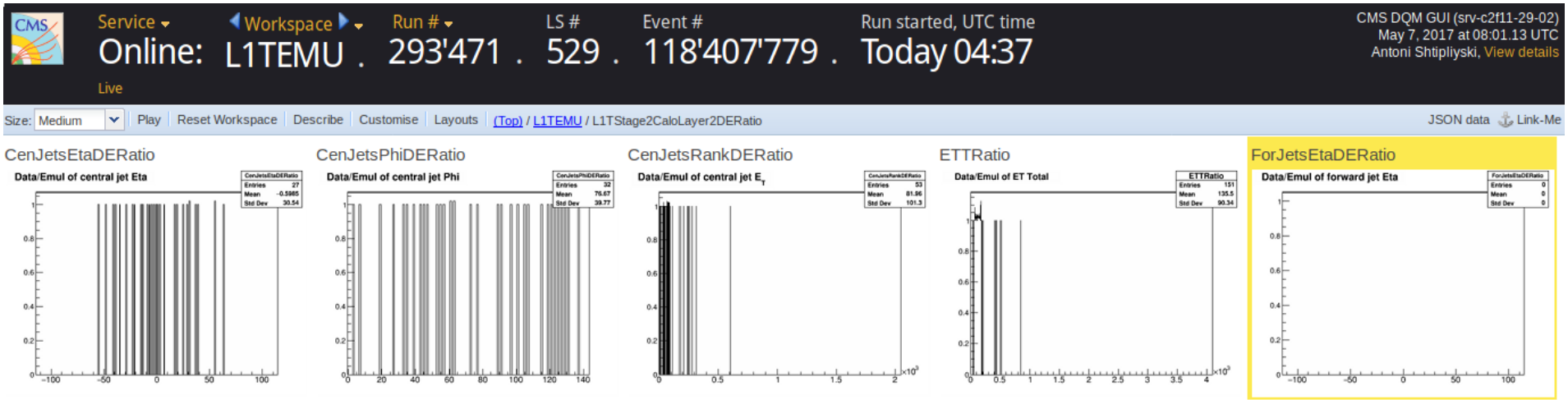
Position

- Distribution should not be necessarily flat but should see symmetry in ϕ and mirror symmetry in η.
- Spikes are often an indication of a hot tower

Timing

- During collisions we expect to see a peak at Bx 0
- For cosmics, distribution may vary

Online DQM - Data-Emulator Comparisons



- Ratios for each object property (jets, e/γ, τ, sums)
- Useful for a check after the deployment of new firmware
- Currently waiting for a PR for automatic configuration of the emulator (expected in the next couple of weeks)

Online DQM - Data-Emulator Agreement Summaries

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- Data-emulator agreement now summarised in a set of high-level plots
- Comparisons performed on event-by-event basis and more accurate than ratio plots
- Plots are organised in progressively greater detail to allow finding source of problems quickly

Online DQM - Data-Emulator Comparisons

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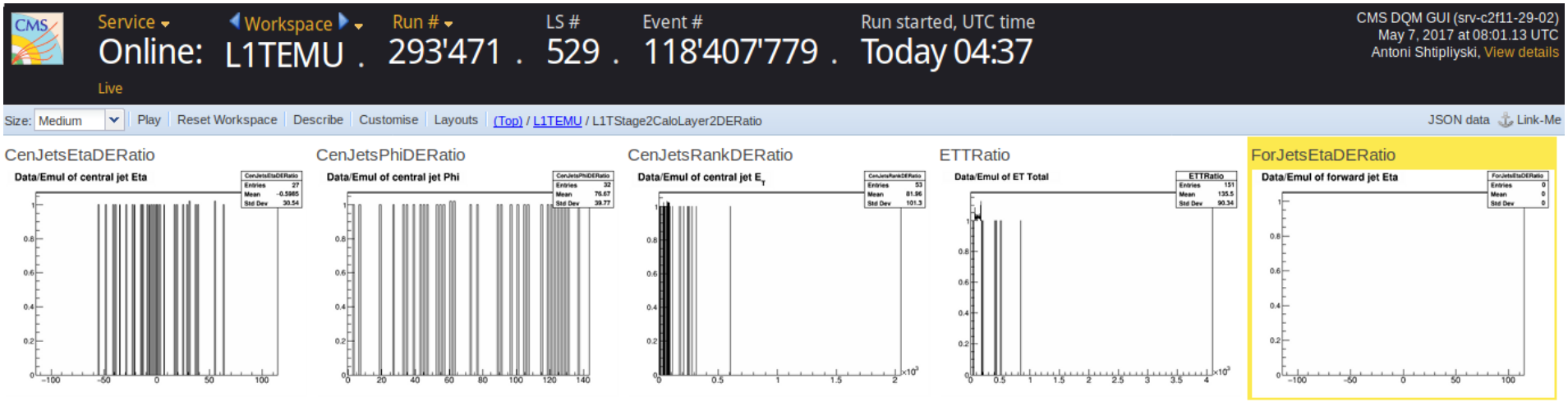

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Plot customisation

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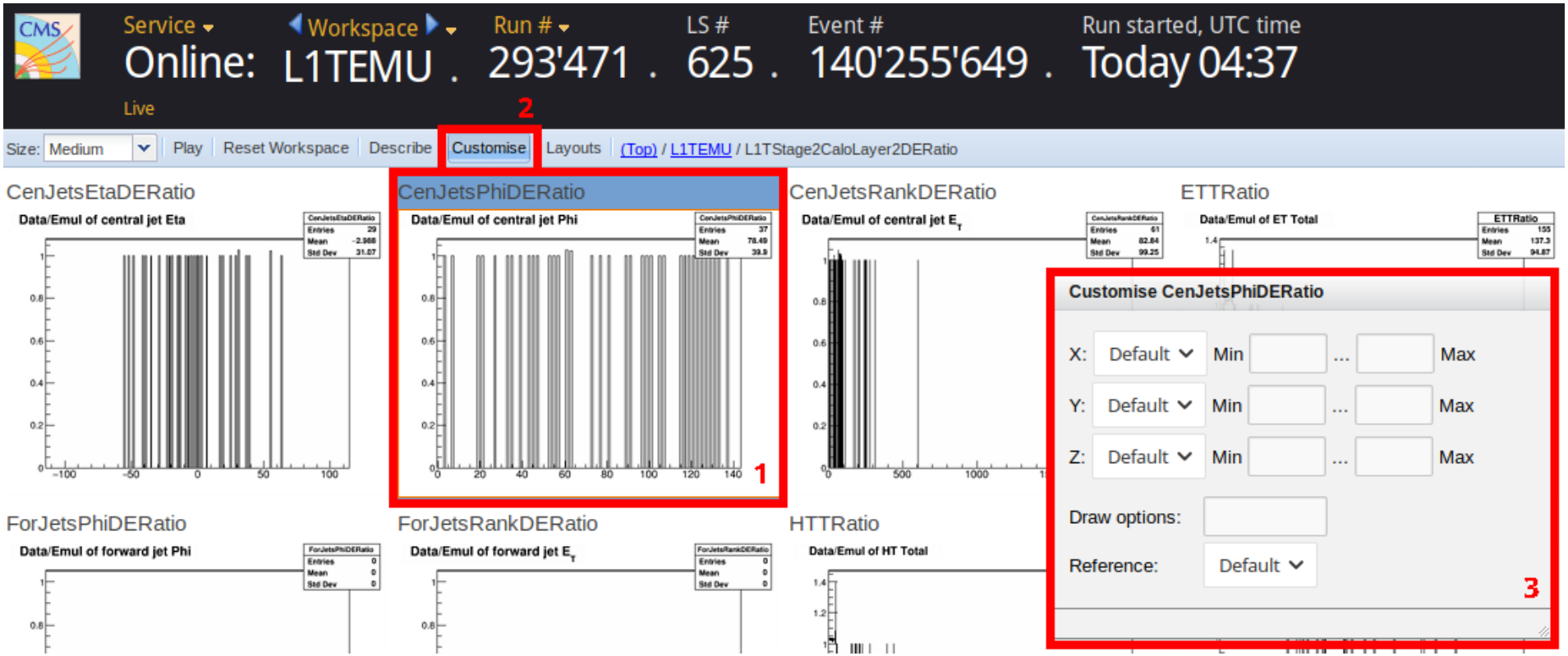

In any given view one can "customise" the plots seen:

1. Identify plot that you want to customise and click on it. Once selected you will see blue border.
2. Click "Customise" button from top menu.
3. Use the Customise panel to change the axes ranges, scale (log/linear) or change the Draw options (a la ROOT)