

L1 DQM and certification tools

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Purpose of the L1T DQM



- Provide **online/offline monitoring** of the Level 1 trigger:
 - Spot possible problems.
 - Help diagnose reasons for them.
 - Ensure quality of the L1T operation.
- **Data certification:**
 - Use L1T DQM information to assess quality of data.
 - Ultimate goal: provide a *global flag* reflecting the data quality LS-by-LS for the L1T.

Structure

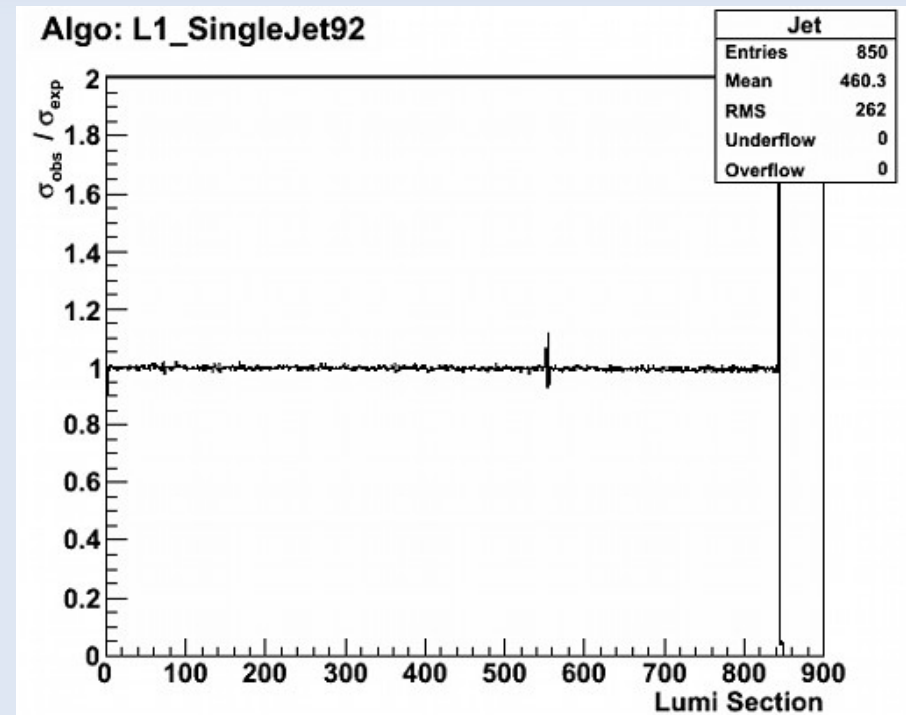
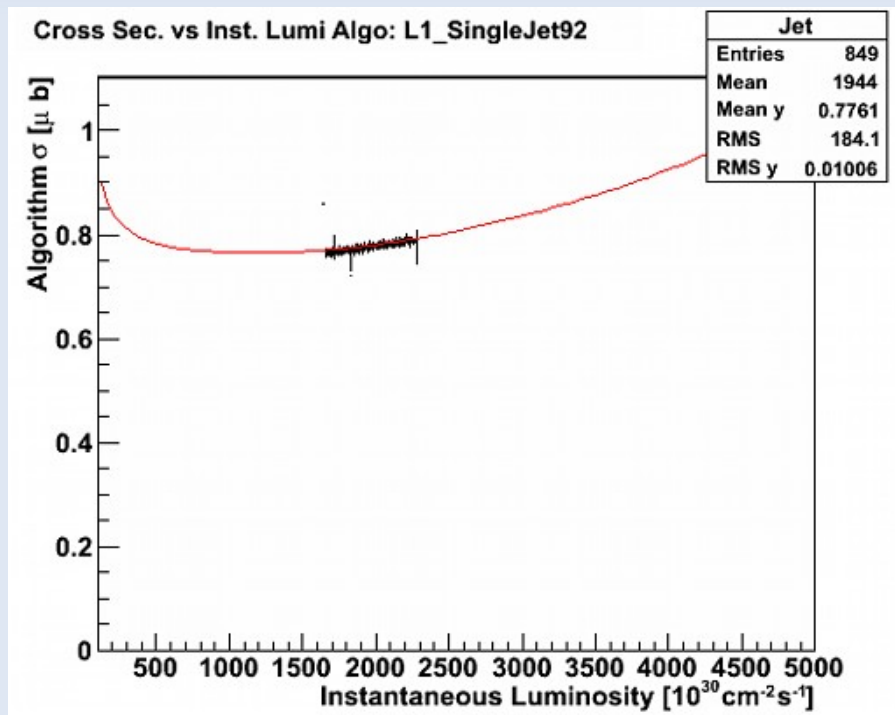


- **Online L1T DQM:**
 - Online tests using the *DQM Stream*.
 - Monitor trigger rates, synchronization and occupancy.
- **Offline L1T DQM:**
 - Online tests and additional object efficiency test.
 - Both data and MC validation.
 - Runs at every RECO of data/MC.
- This presentation focuses on the tools to be used for *automatic certification*.
 - Most of the tools have been developed in 2011.

Rate Monitoring



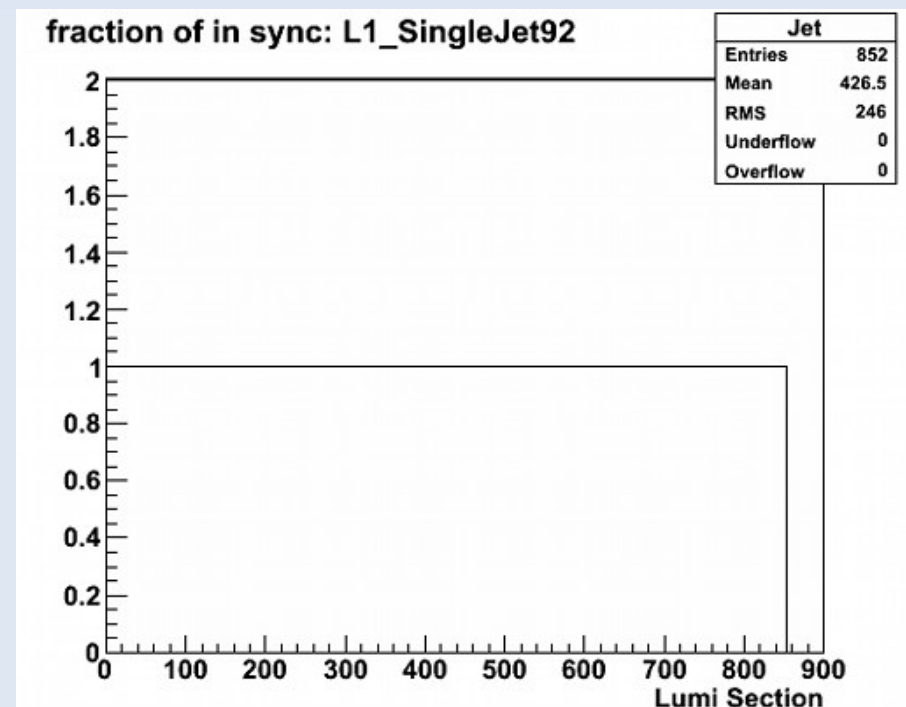
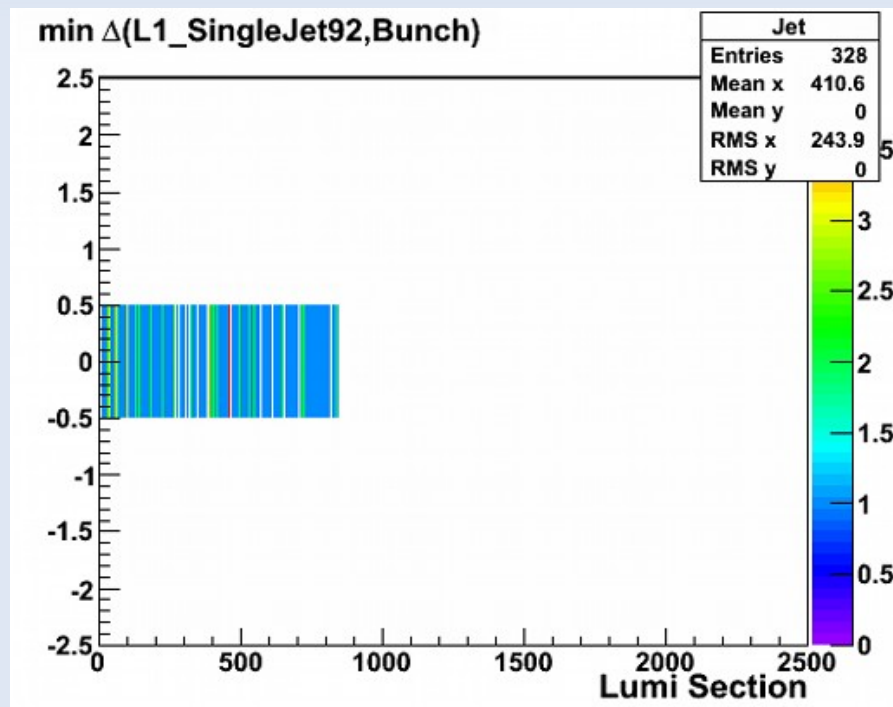
- Comparison between observed and expected rates.
 - Expected rates from WBM fits of trigger cross sections in previous runs:
 - **Online:** Retrieve from parametrization stored in OMDS
 - **Offline:** Needs O2O of information. To be done.
- Test all *L1 Single Object Lowest Prescale Triggers*.



Synchronization Monitoring



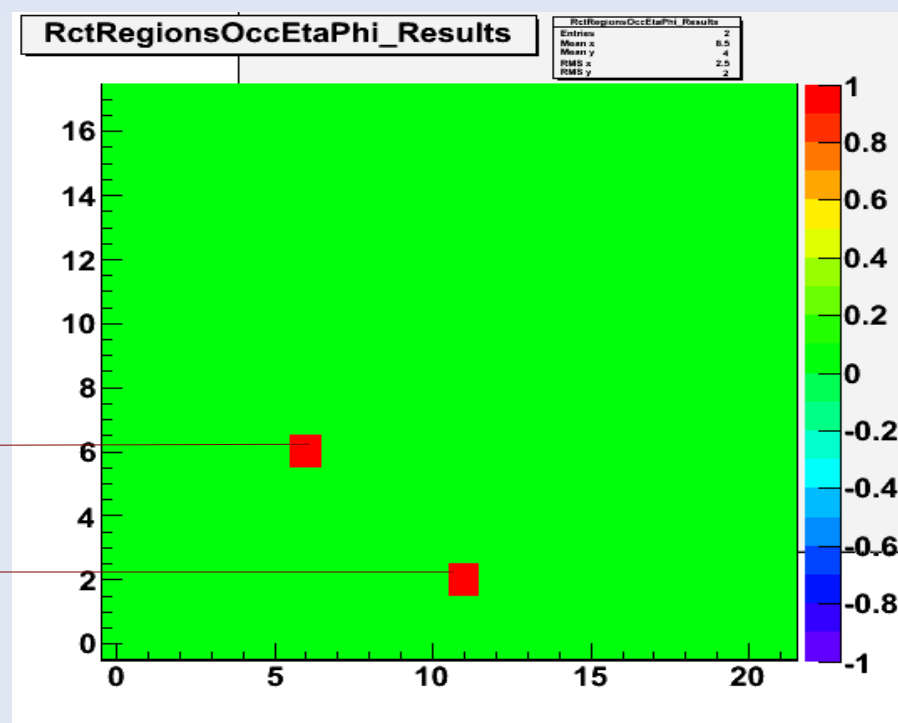
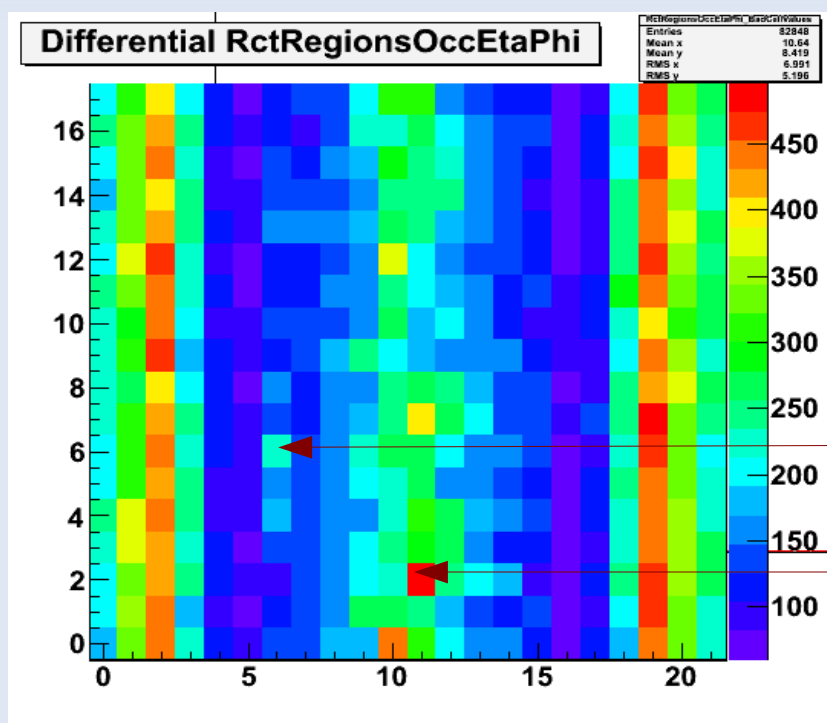
- Comparison between bx where triggers fired and *LHC Bunch Structure*.
- Test all *L1 Single Object Lowest Prescale Triggers*.
- “*LS Block certification*”
 - Test for a single LS is statistically limited
 - To reduce fluctuation we need to integrate (in some triggers) several LS



Occupancy Monitoring



- Exploits Eta-Phi symmetry to find *problematic spots*
 - Based on statistical test assuming Poisson Statistics. Therefore need absolute counts per bin.
- Differential analysis LS-by-LS of a given plot.
 - Plots should not be reset during the run.
- Block Certification (like defined for L1TSync)
- NOTE:** Currently only Calorimeter based histograms fulfill the described requirements.



L1T DQM Offline



- **L1ExtraDQM (L1Extra monitor)**
 - It is currently running (Vasile); several tools to be reused
- **L1ExtraRecoDQM (L1 vs Reco)**
 - Run on prompt reco, re-reco, data RelVals
 - DQMOffline/L1Trigger
- **L1ExtraGenDQM (L1 vs MC generated)**
 - Run on RelVals and MC production
 - Validation/L1Trigger
- **L1RecoGenDQM (Reco vs Gen)**
 - To check Reco with L1 choices of collections and binning
- The complete set useful to:
 - Online monitoring of trigger objects
 - Efficiencies with Express and PromptReco DQM
 - Release Validation

Status



- Both Rate and Synchronization Monitor are online since several months.
 - Monitored online and used for certification.
- New tag deployed recently (Oct 4)
 - Error monitoring.
 - **Rate Monitoring:** bug fixes and updated.
 - **Synchronization Monitoring:**
Now fully functional (LS Block Certification).
- **Occupancy Monitoring**
 - Currently in final testing phase.

Plans



- **Online**

- Provide a single data quality flag per L1 object.
 - Summarize all tests for each LS.

- **Offline DQM**

- Develop O2O of necessary data from DB to event.
- Adapt online code for the offline workflow:
 - Multiple jobs, merging, flag assignment.
- Efficiency Monitoring using L1TExtra
(first version to be ready by the end of the year).

Data Certification



- Monitoring tools currently used by humans (shifters/experts) doing data certification.
 - Gained operational experience.
 - Debugged data certification inputs.
- We would like to have automatic certification where possible.
 - Time-scale: 2012.
- Few developments are still needed.
 - Support for block certification in DQM framework.
 - Existing tools should be adapted to offline DQM.

Summary



- L1T DQM provides tools to monitor the performance of L1 Trigger.
- In the Online DQM, a set of tools aimed at data certification was developed in 2011.
 - Part of them are being routinely used since long time online (Rate/Synchronization).
 - Few more are currently being developed (Occupancy).
- The development of new tools in Offline DQM is starting.
- Final goal is to automatize the data certification procedure.
 - Good operational experience gained already.
 - Some more work is needed to make the automation technically possible.