Contribution ID: **1088** Type: **Talk**

The ATLAS Run-2 Trigger Menu for higher luminosities: Design, Performance and Operational Aspects

Wednesday 23 August 2017 17:30 (30 minutes)

The ATLAS experiment aims at recording about 1 kHz of physics collisions, starting with an LHC design bunch crossing rate of 40 MHz. To reduce the massive background rate while maintaining a high selection efficiency for rare physics events (such as beyond the Standard Model physics), a two-level trigger system is used. Events are selected based on physics signatures such as presence of energetic leptons, photons, jets or large missing energy. The trigger system exploits topological information, as well as multi-variate methods to carry out the necessary physics filtering. In total, the ATLAS online selection consists of thousands of different individual triggers.

A trigger menu is a compilation of these triggers which specifies the physics algorithms to be used during data taking and the bandwidth a given trigger is allocated. Trigger menus reflect not only the physics goals of the collaboration for a given run, but also take into consideration the instantaneous luminosity of the LHC and limitations from the ATLAS detector readout and offline processing farm. For the 2017 run, the ATLAS trigger has been enhanced to be able to handle higher instantaneous luminosities (up to 2.0x10^{34}cm^{-2}s^{-1}) and to ensure the selection robustness against higher average multiple interactions per bunch crossing.

In this presentation, we describe the design criteria for the trigger menus used for Run 2 at the LHC. We discuss several aspects of the process, from the validation of the algorithms, the fine-tuning of the prescales, and the monitoring tools that ensure the smooth operation of the trigger during data-taking. We also report on the physics performance of a few trigger algorithms.

Topic:

Topic: High Energy Particle Physics

Summary

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Session Classification: Parallel session

Track Classification: A High Energy Particle Physics: