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The ATLAS Trigger in Run-2 - Design, Menu and Performance

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The ATLAS trigger has been used very successfully for online event selection during the first part of the second LHC run (Run-2) in 2015/16 at a centre-of-mass energy of 13 TeV. The trigger system is composed of a hardware Level-1 trigger and a software-based high-level trigger. 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. Taken together constitute the trigger menu, which reflects the physics goals of the collaboration while taking into account available data taking resources.

The trigger selection capabilities of ATLAS during Run-2 have been significantly improved compared to Run-1, in order to cope with the higher event rates and number of interactions per bunch crossing (pileup) which are the result of the almost doubling of the center-of-mass collision energy and the increase in the instantaneous luminosity of the LHC. At Level-1 the undertaken improvements resulted in more pileup-robust selection efficiencies and event rates and in a reduction of fake candidate particles, including the novel use of topological information. The re-design of the high-level trigger allows deployment of more sophisticated reconstruction techniques online, resulting in trigger selection performance nearly matching that of offline reconstruction.

This presentation gives a comprehensive review the ATLAS trigger system and menu in Run 2, covering validation and operational aspects, trigger bandwidth constraints, and the latest performance evaluations. Using a few examples the presentation shows the impressive improvements that were made in preparation for the expected highest ever luminosities and pileup in the 2017/18 LHC run.

Experimental Collaboration

ATLAS

Primary author: VAZQUEZ SCHROEDER, Tamara (McGill University (CA))**Presenter:** VAZQUEZ SCHROEDER, Tamara (McGill University (CA))**Session Classification:** Detectors and data handling**Track Classification:** Detector R&D and Data Handling