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Triggering in the ATLAS Experiment

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The ATLAS experiment at the LHC can record about 1 kHz of physics collisions, out of an LHC design bunch crossing rate of 40 MHz. To achieve a high selection efficiency for rare physics events (such as beyond the Standard Model physics) while reducing the significant background rate, a two-level trigger system is used. The event selection is based on physics signatures, such as the presence of energetic leptons, photons, jets or missing energy. In addition, the trigger system exploits algorithms using topological information and multivariate methods to carry out the filtering for the many physics analyses pursued by the ATLAS collaboration. In Run 2, around 1500 individual selections, the trigger chains, are comprised in the trigger menu specifying the selection algorithms to be used for data taking, their rate and the bandwidth. Trigger menus must reflect the physics goals for a given data-taking period, taking the instantaneous luminosity of the LHC and limitations from the ATLAS detector readout and offline processing farm into account. We will give an overview of the 2015-2018 trigger menu and its performance, allowing the audience to get a taste of the broad physics program that the trigger is supporting. We present the tools that allow us to predict and optimize the trigger rates and CPU consumption for the anticipated LHC luminosities and outline the system to monitor deviations from the individual trigger target rates, and to quickly react to the changing LHC conditions and data taking scenarios. As an outlook to the upcoming ATLAS data-taking period during Run 3 (2021 onwards), we present the design principles and currently ongoing implementation of the new trigger software within the multi-threaded framework AthenaMT.

I read the instructions

Secondary track (number)

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