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Performance of the CMS High Level Trigger

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The CMS experiment has been designed with a 2-level trigger system: the Level 1 Trigger, implemented using FPGA and custom ASIC technology, and the High Level Trigger (HLT), implemented running a streamlined version of the CMS offline reconstruction software on a cluster of commercial rack-mounted computers, comprising thousands of CPUs.

The design of a software trigger system requires a tradeoff between the complexity of the algorithms running online, the output rate, and the selection efficiency. The complexity is limited by the available computing power, while the rate is constrained by the offline storage and processing capabilities. The main challenge faced during 2011 was the fine-tuning and optimisation of the algorithms, in order to cope with the increasing LHC luminosity without impacting the physics performance.

Here we will present a review of the performance of the main triggers used during the 2011 data taking, ranging from simpler single-object selections to more complex algorithms combining different objects, and applying analysis-level reconstruction and selection.

We will discuss how the increasing LHC luminosity and pile-up have affected their performance, and how these effects have been mitigated.

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