High Level Trigger Selection in the CMS experiment

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Physics Selection at LHC

Level-I Trigger:
Hardwired processors
Output: 50 kHz
Latency: 3 msec

High Level Trigger:
Farm of commercial processors
Output: 150 Hz (suitable for storage)

Challenging task: Trigger Rejection 4 \times 10^5
Bunch crossing rate 40 MHz →
permanent storage rate 150 Hz

Conclusions and References

Triggering on low cross-section physics in the high-rate environment of the LHC is a challenging task. The CMS experiment has developed a two-stage trigger system. The Level-1 trigger based on custom hardware reduces the LHC bunch-crossing rate of 40 MHz to a maximum event rate of 50 Hz. The High-Level Trigger based on a farm of commercial processors performs further event rate reduction to the order of 150 Hz suitable for permanent storage.

Detailed studies of the trigger performance for a medium luminosity of 2 × 10^33 cm^-2 s^-1 have been performed. High efficiencies for most physics reactions can be obtained with a selection that remains inclusive and avoids detailed topological requirements on the event.