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Towards a Level-1 tracking trigger for the ATLAS experiment

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Plans for a physics-driven upgrade of the LHC foresee staged increases of the accelerator's average instantaneous luminosity, of up to a factor of five compared to the original design.

In order to cope with the sustained luminosity increase, and the resulting higher detector occupancy and particle interaction rates, the ATLAS experiment is planning phased upgrades of the trigger system and of the DAQ infrastructure. In the new conditions, maintaining an adequate signal acceptance for electro-weak processes will pose unprecedented challenges, as the default solution to cope with the higher rates would be to increase thresholds on the transverse momenta of physics objects (leptons, jets, etc). Therefore the possibility to apply fast processing at the first trigger level in order to use tracking information as early as possible in the trigger selection represents a most appealing opportunity, which can preserve the ATLAS trigger's selectivity without reducing its flexibility.

Studies to explore the feasibility of the new trigger component are ongoing and are developing in two directions: the definition of a fast readout for high-granularity silicon detectors, and the development of fast pattern-recognition algorithms to be applied immediately after the front-end readout of relevant sub-detectors. The status of ongoing tests and preliminary results for the system under development are discussed.

Summary

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