Upgraded muon trigger in CMS

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on behalf of the CMS collaboration

A new muon trigger for CMS

For the run2 of LHC the luminosity increases so much
that it is not possible to keep the muon pT threshold at the L1
An upgrade of the L1 muon boards will
* improve the pT assignment algorithm
* reduce the L1 rate due low pT muons promoted as high p_T muons
* reduce the pt threshold for a given signal efficiency
* reduce the L1 rate keeping the signal efficiency high

Description
* The new boards are using microTCA standard, optical links, a Virtex7 FPGA with a large (30bits) memory
* A new design will combine information from different detectors earlier in the L1 decision chain
* Algorithms will run a Boosted Decision Tree with a regression analysis directly in the FPGA for a better pT assignment
* A tail clipping, a technique that uses a feedback algorithm that will send the output of the FPGA back into it in case of large deviation from expectation will also reduce the rate keeping the efficiency high

First sectors already installed and under testing at the cavern using comics.

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✦ Barrel, Overlap, Endcap will be the regions where each track finder will create trigger primitives from, before sending them to the Global Muon Trigger where they will combined, their overlap removed, and sorter by quality and momentum.

✦ Tail clipping and the use of a much larger memory to load LUT improve the current system rate by a factor 3 at 20GeV and reduces the ratify 2 order of magnitude in the barrel and 3 order of magnitude in the endcap

✦ The global muon trigger will accept and combine a much larger number of trigger primitives from the different track finders. It will also receive input from the calorimeter so that isolation information can also be used in the L1 trigger logic which will reduce the rate especially for high PU