Charge to the Trigger Tracking Integration Subgroup

Co-chairs: Emmanuelle Perez and Anders Ryd

The Trigger Tracking Integration Subgroup is charged to provide options for use of tracking trigger primitives in the level-1 trigger post-LS3 and evaluate their potential performance given the specifications and resolution of the tracking trigger primitives from the Tracking Project.

The subgroup is expected to provide its conclusions as input to the Technical Proposal on the Phase-2 upgrade due by the end of 2014.

The subgroup is first charged to determine the requirements on the L1 tracking trigger, including the p_T resolution, need for isolation, and z-location resolution. These requirements should be delivered by mid-2013.

In addition, the subgroup is also charged to provide an initial assessment of studies and plans for carrying on its studies as input to the interim report of the Trigger Performance and Strategy Working Group at the end of this year.

The subgroup is charged to characterize the improved performance on the individual trigger objects used in benchmark channels that is expected from tracking information used to augment the calorimeter, muon, and jet triggers, e.g.:

- Providing more precise p_T measurement for Muons.
- Matching electrons to tracker hits to rejects photons and π^0's.
- Using tracker for lepton isolation, including cleaning for tau identification.
- Using vertex determination and possibly PF to improve jets.

These studies should compare the reduced rate and improved efficiency for CMS benchmarks over the Phase 1 CMS trigger system without a tracking trigger at the HL-LHC design luminosity of 5E34 with 25 ns bunch spacing. The subgroup should assume that when used, the resolution of the L1-Trigger Calorimeter and Muon objects expected in the Phase-1 upgrade are as specified in the documentation being prepared for the Level-1 Trigger TDR. Part of these results should be determined with realistic MC samples. The subgroup should take responsibility for planning the generation of these samples.

These studies should not be focused on (or limited to) a specific tracker geometry but should use the two current design versions as starting points.

The subgroup should evaluate the performance of the individual trigger objects in the combinations expected in the global trigger.

The subgroup should also evaluate the improvement in the CMS HLT through use of the data from the output of the L1 Tracking Trigger at the beginning of HLT processing.

The performance should be compared with the performance of tracking in the CMS HLT and also with the CMS trigger phase 1 Level-1 trigger without a tracking trigger.

On a longer term, the subgroup should evaluate the feasibility and usefulness of options available for a stand-alone L1 tracking trigger and possibilities for a pixel trigger, e.g.:

- Invariant mass of two body decays, e.g. D, B, Z decays?
- Separated vertex triggers

The subgroup should evaluate the improvement in hadronic triggers for these options.

The subgroup is also charged to coordinate the development of tools that use the Tracking Trigger primitives developed by the Tracking Project.

The subgroup should work with and coordinate closely with the Track Trigger Primitive program in the Tracker Project, the Muon and Calorimeter projects and the relevant POGs/PAGs and report at the meetings of the Trigger Performance and Strategy Working Group and at upgrade plenary sessions during CMS weeks.