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Upgrade of ALICE forward detectors

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In 2019-2020 the upgrade of CERN LHC will increase the luminosity and the collision rate beyond the design parameters of several of the key ALICE detectors [1]. To benefit from the improved performance of the LHC, ALICE will install two new forward detectors: the Fast Interaction Trigger (FIT) [2][3] and the Muon Forward Tracker (MFT) [4]. A further upgrade opportunity might arise during the shutdown between Run 3 and Run 4 when the Forward Calorimeter (FoCal) may be added to the ALICE setup.

The presentation will contain a short description of the new forward detectors. The required functionality and the main physics goals will be given together with the main highlights concerning the design and performance of the detector prototypes.

The main focus will be on FIT. It will replace existing trigger and multiplicity detectors: T0, V0 and FMD. FIT will consist of two Cherenkov detector arrays and a large sectored scintillator ring on opposite sides of the interaction point (IP). FIT will be capable of operating at the sustained Pb-Pb interaction rate of 50 kHz in a continuous readout mode. It will provide the collision time with resolution better than 40 ps and trigger with maximum latency of 400 ns. Several online triggering modes will be available, including multiplicity (centrality) trigger and vertex position trigger. FIT will be able to reconstruct the collision centrality and reaction plane with resolution similar to that of the present ALICE apparatus, while the trigger efficiency for pp collisions will be improved.

The main role of MFT is to add secondary vertex reconstruction capabilities for muon tracks at forward rapidity and to supplement the acceptance of the already operating Muon Spectrometer. The MFT will consist of a stack of 5 disks mounted in front of the hadron absorber shielding the Muon Spectrometer from the IP. The active part is made of custom-designed Monolithic Active Pixel Sensors (MAPS). Most prominent properties of MFT include radiation hardness, low material budget, high granularity of pixels and readout speed.

A SiW electromagnetic calorimeter, FoCal, is considered as a possible upgrade to the ALICE detector. It should be characterized by a very high granularity allowing for γ/π_0 discrimination, especially for very high momenta. The main candidates to instrument the sensitive area are CMOS pixel sensors.

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