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The Fast Interaction Trigger Upgrade for ALICE

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In preparation for LHC Run 3 ALICE will upgrade its subsystems to cope with the increased interaction rate of 50 kHz in Pb-Pb and up to 1 MHz in other collision systems, resulting in the data throughput from the detector up to 3 TB/s. Storing and analyzing such amount of data is a significant challenge and therefore, the online event selection will be required.

The Fast Interaction Trigger (FIT) will generate minimum-bias and multiplicity triggers with maximum latency of 400 ns. It will measure the time of collision with resolution better than 40 ps. Moreover, FIT will serve as the main ALICE luminometer, providing direct, real-time feedback to the LHC for beam tuning. It will be also used to reconstruct vertex position, forward particle multiplicity, centrality and event plane, as well as study diffractive physics at forward rapidity.

FIT consists of three detector subsystems: the FT0, a fast Cherenkov detector array, using MCP-PMTs as photosensors; the FV0, a large scintillator ring with unique light collection system developed to avoid using wavelength shifters; the FDD, Forward Diffractive Detector using scintillator with state-of-art fast wavelength-shifting fibers. Since the overall latency of the FIT outputs is constrained by about 400 ns the online event selection is performed with FPGA integrated circuits including high speed serial interfaces.

We will present the FIT components and results of tests of fully-assembled FIT detectors. Moreover, the results of trigger simulations will be discussed.

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