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Large-acceptance scintillator ring of the Fast Interaction Trigger for the ALICE Experiment.

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During the upcoming Long Shutdown 2 the accelerator complex at CERN will implement significant improvements to the performance of the collider including the increase of the luminosity such that it is expected a sustain interaction rates up to 1MHz for p-p collisions and 50 kHz for Pb-Pb collisions. In order to remain operational during the Run 3 and Run 4 ALICE has to upgrade many of its subsystems or replace these with new detector solutions [1] including the new Fast Interaction Trigger (FIT) [2,3]. The main online functionalities of FIT will be luminosity monitoring with a direct link to the LHC and generation of a fast trigger signal for ALICE subsystems. This trigger must be generated with the latency of less than 425 ns, of which 222 ns is the delay along the connecting cables. The trigger generated by FIT will allow for online vertex determination, minimum bias and centrality-based event selection, suppression of beam-gas events, and for a veto of ultra-peripheral collisions. FIT is a hybrid detector composed of two Cherenkov detector arrays (T0+) and a large, sectored scintillator ring (V0+). Due to the limited space, unlike with the T0+ arrays, the V0+ scintillator disk can be located only on one side of the interaction point.

The V0+ is a 148 cm diameter plastic scintillator disc divided into 40 optically-separated modules, forming eight 45 degrees wedges subdivided into 5 radial segments. The size of the radial segments was chosen to cover equal pseudo-rapidity chunks. The scintillator will be viewed by clear optical fibers coupled perpendicularly to its surface. At the other end the fibers will be gathered into bundles and read out by fine-mesh PMT sensors. V0+ will be characterized by high efficiency, single Minimum Ionizing Particle (MIP) time resolution of around 250 ps, and the ability to cope with a high dynamic range (1-600 MIP). The presentation will focus on the design of the V0+ and the test results obtained with the latest prototype representing a 45 degrees section of the actual detector. These test measurements were carried out using beams from the CERN-PS accelerator.

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[3] M. Slupecki, ALICE forward rapidity upgrades, PoS (EPS-HEP2017) 519

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