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THE HENRYK NIEWODNICZAŃSKI INSTITUTE OF NUCLEAR PHYSICS POLISH ACADEMY OF SCIENCES

The Fast Interaction Trigger Upgrade for ALICE

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FIT is new **forward** detector of ALICE consisting of 3 modules built to make the most of the **Run3+**. It will be used for **triggering**, **beam monitoring** and determination of **centrality** and **event plane**.

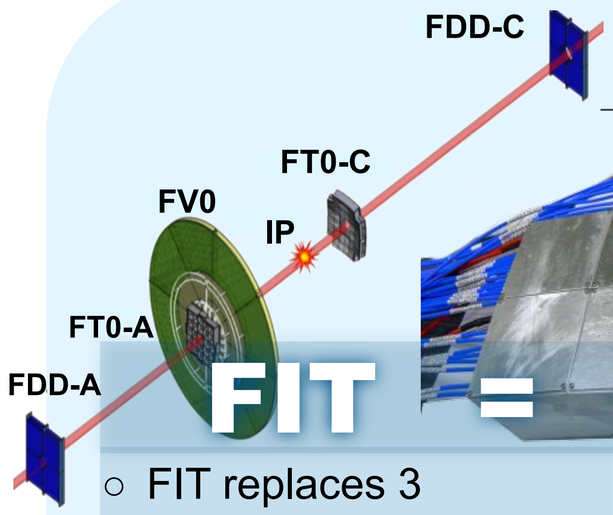
Motivation

ALICE detector is undergoing a major upgrade during the second long shutdown (LS2) of the LHC. It is being prepared to collect PbPb data with increased interaction rate of 50 kHz. To make it possible, most detectors within ALICE will operate in continuous read-out mode, which require online event selection with fast and efficient forward detectors.

Tasks

- luminosity and beam monitoring, feedback to LHC
- triggering:
  - Minimum Bias trigger
  - centrality/multiplicity selection
  - online vertex determination
  - beam-gas events rejection
  - veto for ultraperipherial collisions without activity in forward direction
- centrality & event plane determination
- PID via providing time0 for TOF detector

What is FIT?



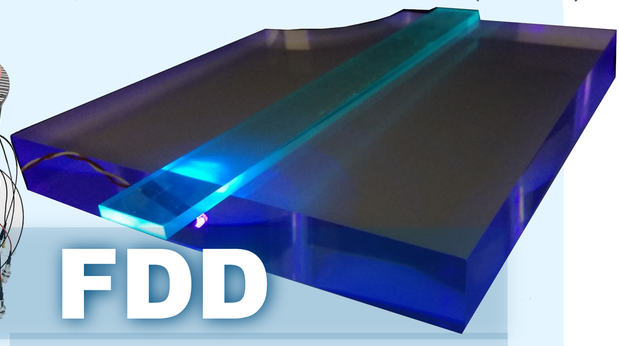
$3.8 \leq \eta \leq 5$, 3.5m from IP (A side)
$-3.4 \leq \eta \leq -2.3$, -0.8m from IP (C side)

FIT = **FT0** +

$2.2 \leq \eta \leq 5.1$, 3 m from IP (A side only)

FV0 +

$4.7 \leq \eta \leq 6.3$, 17 m from IP (A side)
$-6.9 \leq \eta \leq -4.9$, 19.5 m from IP (C side)



FDD

- FIT replaces 3 detectors from Run2 setup: T0, V0, AD
- benefits from usage of the same readout electronics and better integration of subdetectors

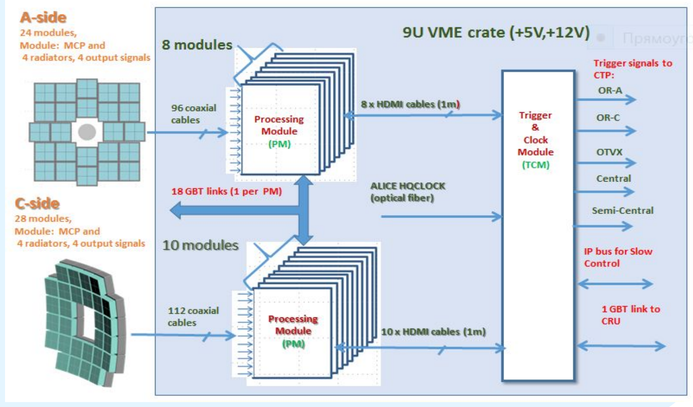
- two arrays of 28/24 Cherenkov modules
- module = 2cm-thick quartz radiator optically coupled to MCP-PMT (customized Planacon XP85012)
- each module split into 4 independent channels

- due to limited space, located only on one side
- large area (∅=148cm)
- plastic scintillator connected with clear fibers to 48 Hammamatsu PMTs
- split into 5 rings with equal η coverage

- 4 sectors on each side
- plastic scintillator
  - → wavelength shifters
  - → clear fibers
  - → PMT

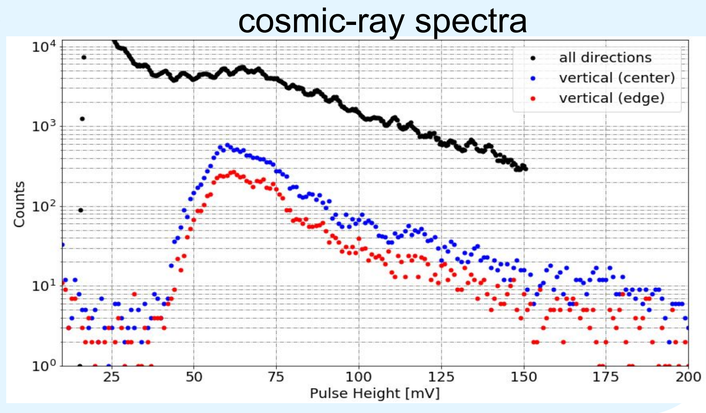
FIT electronics

all FIT detectors share common custom-made electronics boards: PM & TCM (Processing Module & Trigger and Clock Module)
but each needs custom FPGA firmware

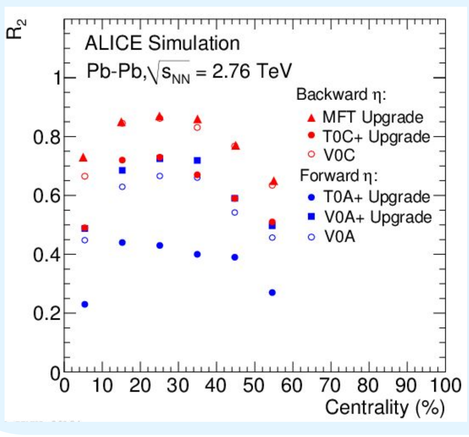


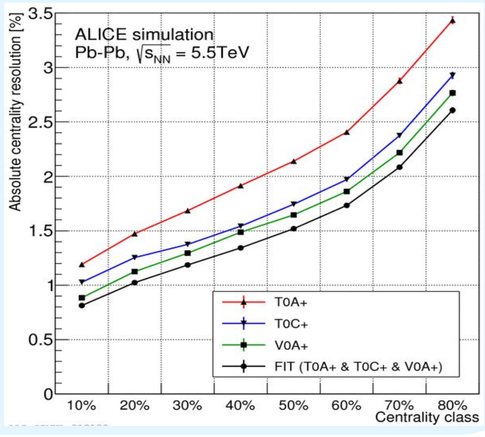
FV0 comissioning

- detector is fully assembled
- measurements with cosmic-rays and laser were performed with actual front-end electronics



Simulation performance





Trigger?