The new Fast Interaction Trigger for the ALICE upgrade

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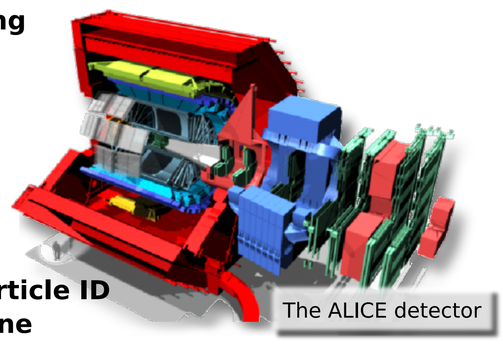
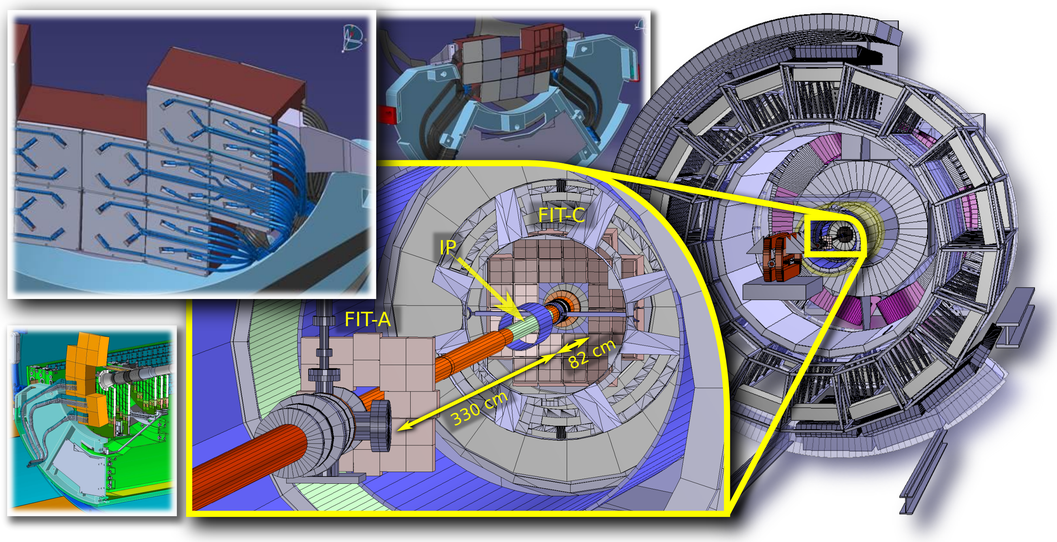
Why ALICE needs FIT

- **Luminosity monitoring & beam tuning**
- **Fast Interaction Trigger**
  - Online vertex determination
  - Minimum Bias trigger
  - Centrality selection
  - Rejection of beam/gas events
  - Veto for Ultra Peripheral Collisions without forward particles
- **Collision time → Time-Of-Flight → Particle ID**
- **Multiplicity → Centrality & Event Plane**



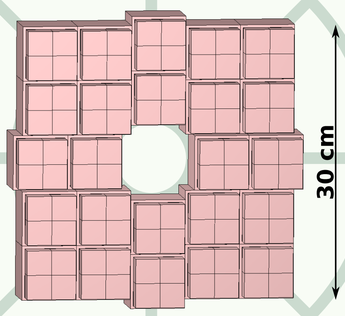
The ALICE detector

Location of FIT arrays within ALICE



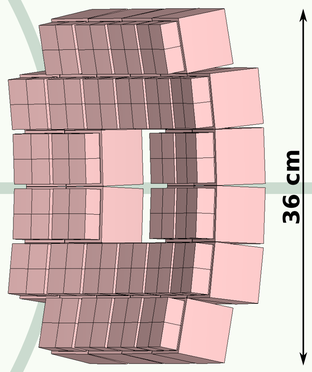
Geometry of FIT arrays

FIT A-side



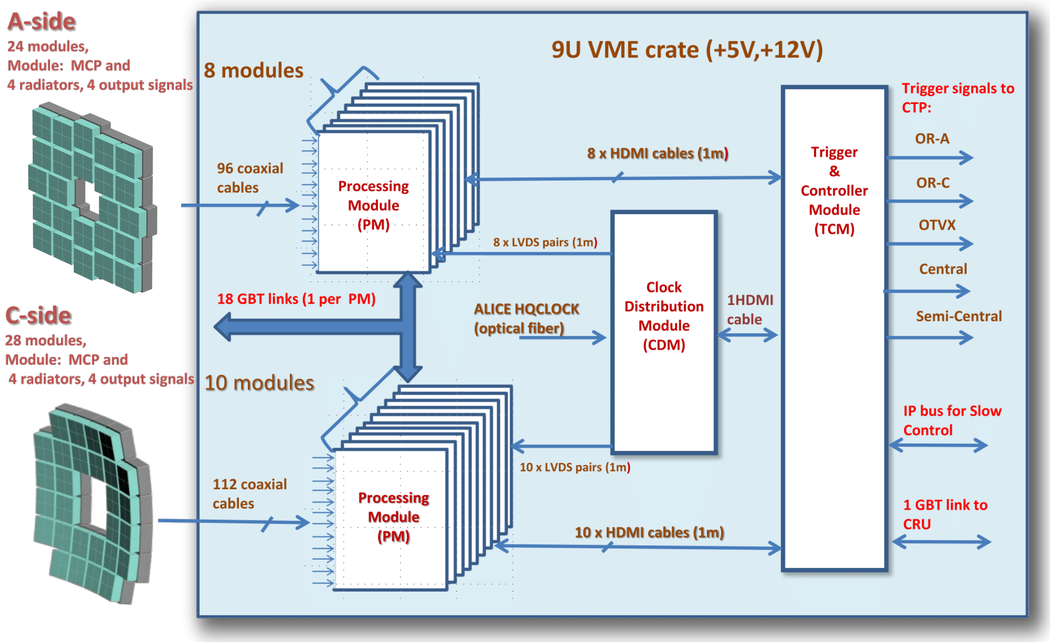
T0A+: 3.8 ≲ η ≲ 5.4
V0+: 2.2 < η < 5.1
V0+ diameter: 148 cm

FIT C-side



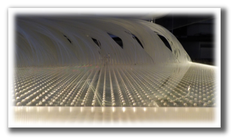
T0C+: -3.3 ≲ η ≲ -2.2

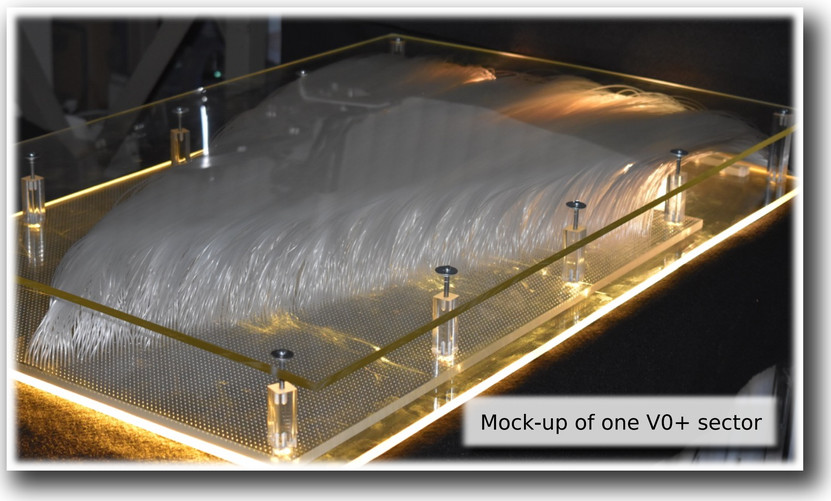
Electronics of T0+



FIT = T0+ and V0+

T0+ module



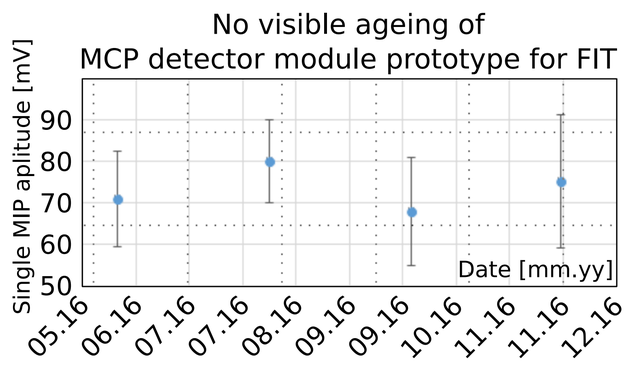


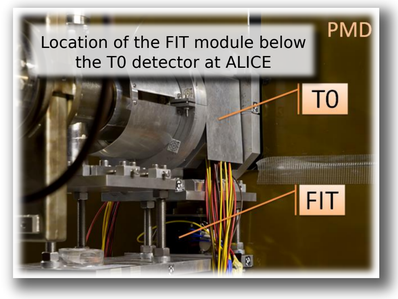
Mock-up of one V0+ sector

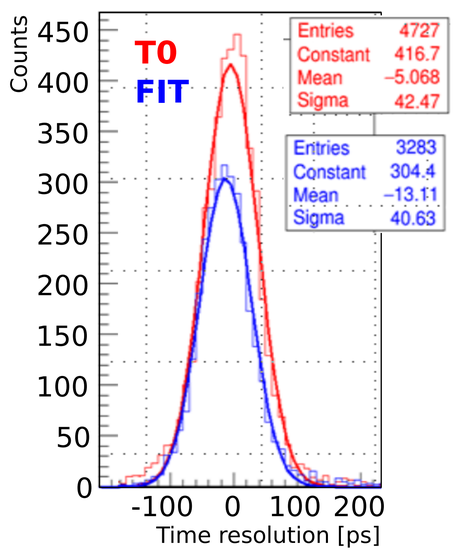
T0+ → modular detector:
- Improved T0
- Rectangular quartz radiators
- New sensors MCP-PMT
- Larger acceptance
- More channels
- Upgraded electronics and readout

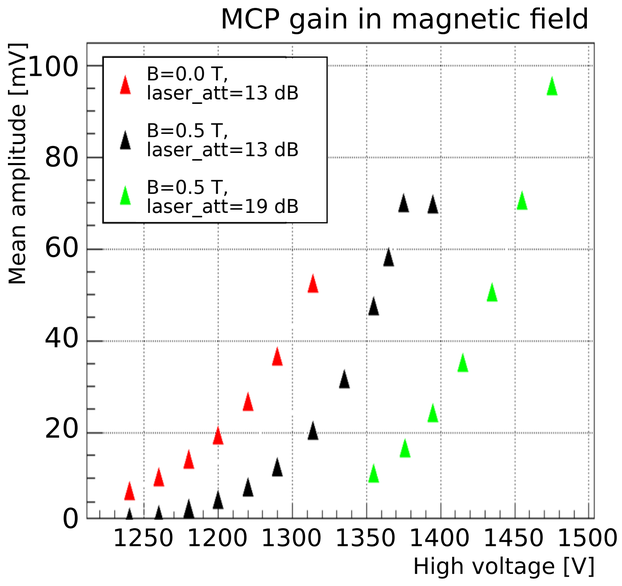
V0+ → sectored detector:
- Improved V0
- Faster plastic scintillator
- Monolithic structure
- Reduced fiber length
- New sensor (SiPM or MCP-PMT)
- New electronics and readout

FIT module test with LHC beams









Conclusions

- During the upcoming Long Shutdown 2 (2019-2020) ALICE is going to upgrade several of the key detectors including the Fast Interaction Trigger (FIT).
- FIT will replace currently used T0 and V0 detectors
- FIT will consist of two arrays of T0+ modules (quartz Cherenkov radiators coupled to MCP-PMTs) and one V0+ (segmented scintillator ring).
- T0+ prototype with a modified PLANACON XP85012 sensor routinely achieves ΔT~40 ps during the tests at ALICE in 2016
- The R&D is currently focused in defining plans for detector integration into ALICE, multichannel readout electronics prototyping and detector module testing performed with the real-life conditions at ALICE.