Quark Matter 2019, Wuhan, China, 4-9 November, 2019

Muon Forward Tracker: adding vertexing capability to the ALICE MUON Spectrometer

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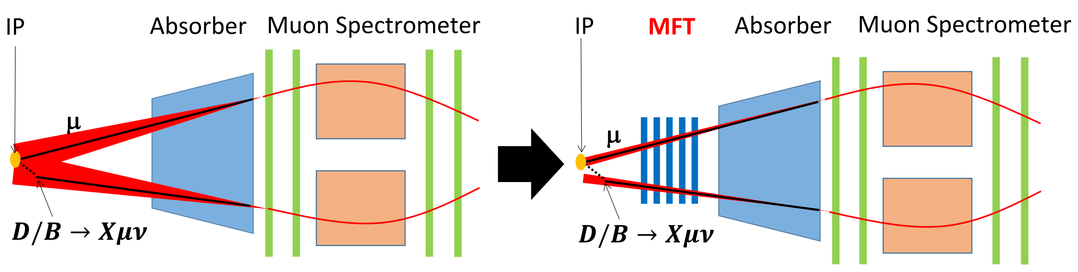
Installation of MFT

Before MFT installation (∽RUN2) / After MFT installation (RUN3∽)



Issue with muon measurements in the forward region (∽RUN2)

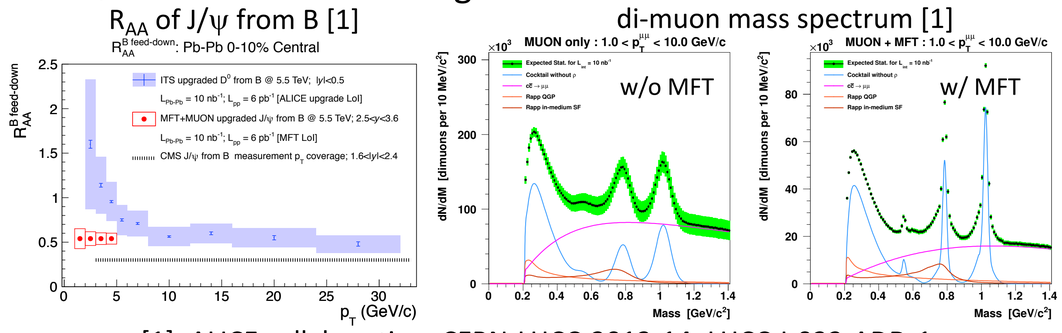
- Blurred vision of the muon vertex due to absence of track info in front of the Absorber

→ Solution: Installation of MFT for RUN3

Achievable measurements with MFT

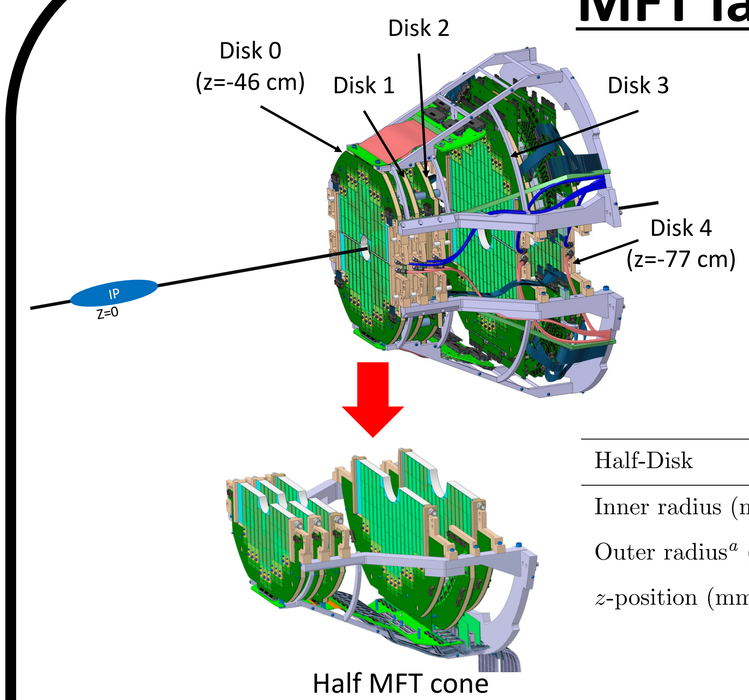
- Better rejection power of muons from π/K decays
- Separation of secondary vertex from IP
  → Measurements of open heavy flavors & J/ψ from B
- Better di-muon mass resolution
  → Measurements of Light Vector Mesons & di-muon continuum

R_{AA} of J/ψ from B [1] / di-muon mass spectrum [1]



[1]: ALICE collaboration, CERN-LHCC-2013-14; LHCC-I-022-ADD-1

MFT layout

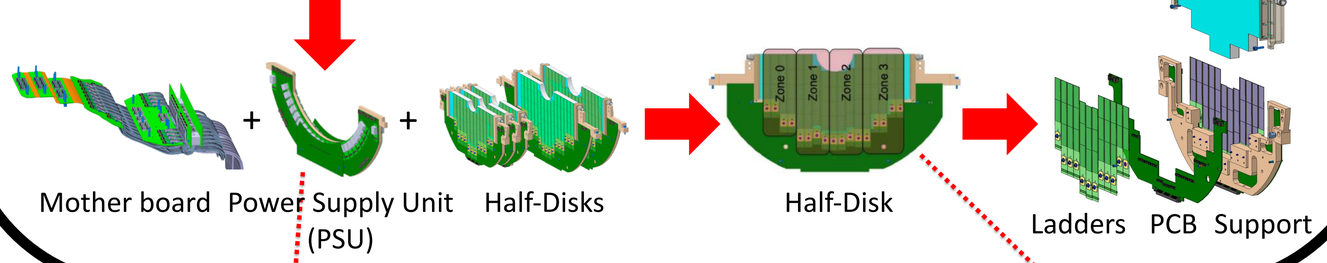


MFT parameters

Acceptance	-3.60 < η < -2.45
X/X_0 per disk	0.7%
# of Disks	5
# of Ladders	280
# of ALPIDE chips	936

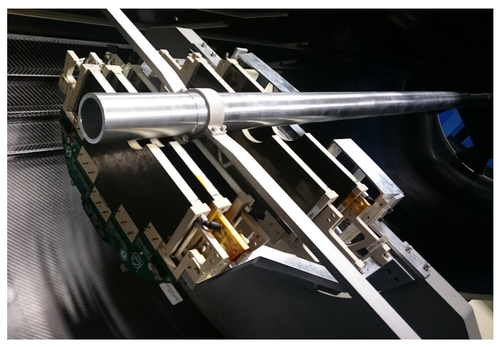
MFT disk geometries

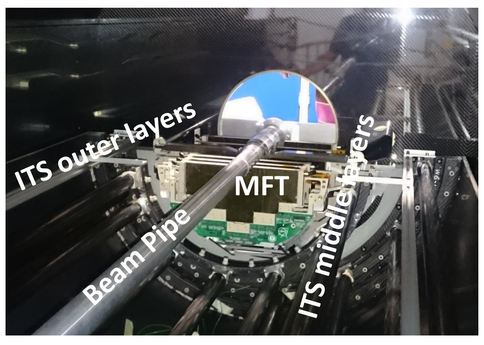
Half-Disk	0	1	2	3	4
Inner radius (mm)	25.0	25.0	25.0	38.2	39.2
Outer radius[a] (mm)	92.6	98.0	104.3	130.1	143.5
z-position (mm)	−460	−493	−531	−687	−768

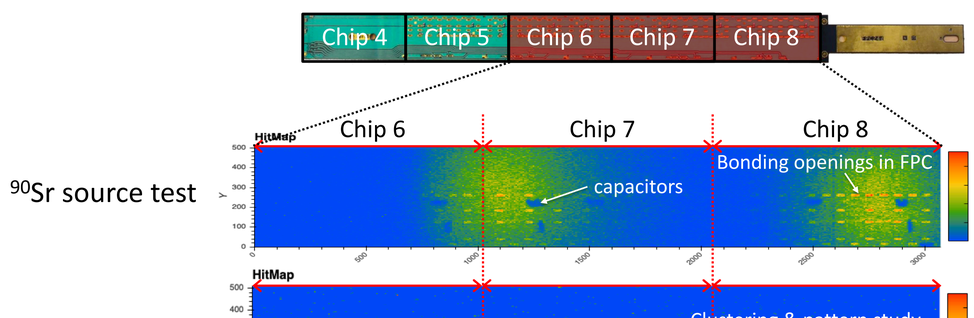


Commissioning at CERN

- MFT commissioning has started since this summer.
  - ✓ 1st Half-MFT assembly with full SC & Readout chain
  - ✓ Continue until May 2020, then installation in ALICE cavern



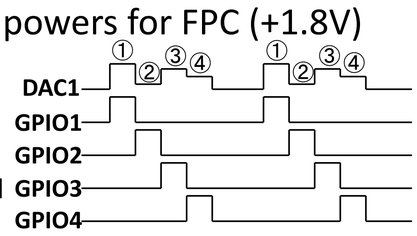




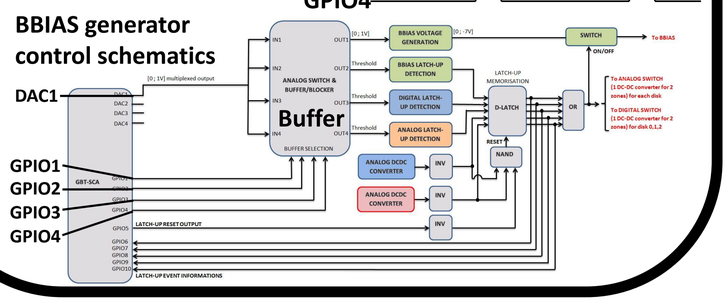
Power Supply Unit

- Connected with CAEN LV modules
- Power supply to separate 4 zones of each Half-Disk
  - ✓ Back Bias (BBIAS) for sensors (0;-3V)
  - ✓ Digital/Analog powers for FPC (+1.8V)

① BBIAS voltage setting
② BBIAS latch-up threshold
③ Digital latch-up threshold
④ Analog latch-up threshold



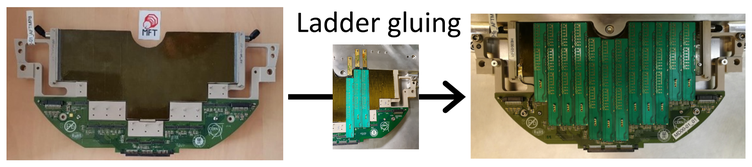
BBIAS generator control schematics



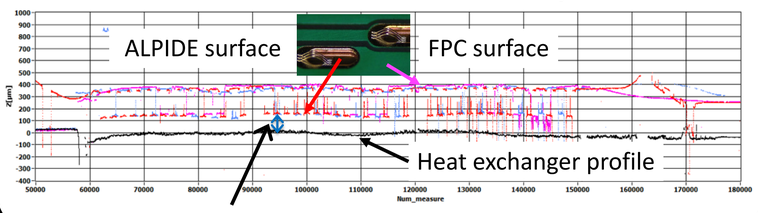
Half-Disk

Half-disk production

1. Assembly of PCB + Mechanical support + Heat exchanger
2. Ladder gluing on both disk surfaces



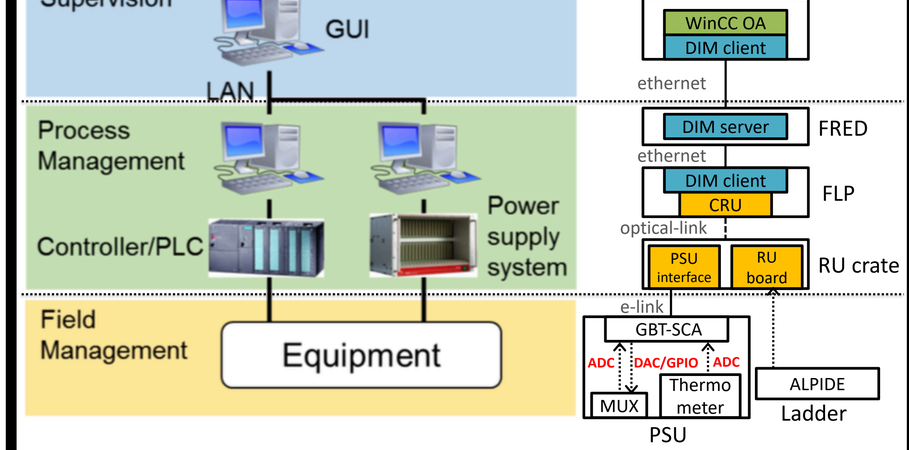
Glue thickness uniformity



ALPIDE + Glue thickness = 50 + 100μm

Detector Control System

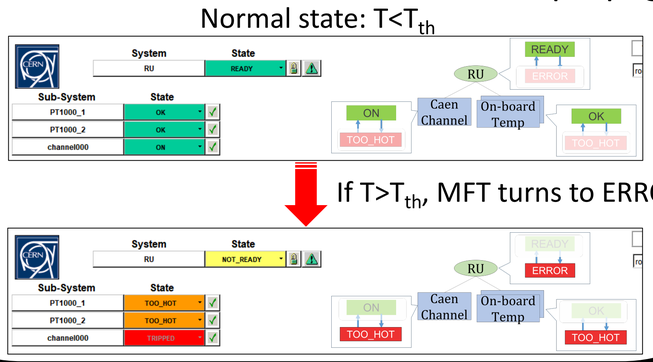
- Has to be updated for operation with the new ALICE computing system (O^2)
- CERN-developed JCOP framework with WinCC Open Architecture as SCADA



DCS test with Finite State Machine (FSM)

- FSM: Hierarchical control for independent hardware systems (Detector, Power Supply, Cooling plant)
- Successful demonstration of FSM state propagation

Normal state: T<T_{th}



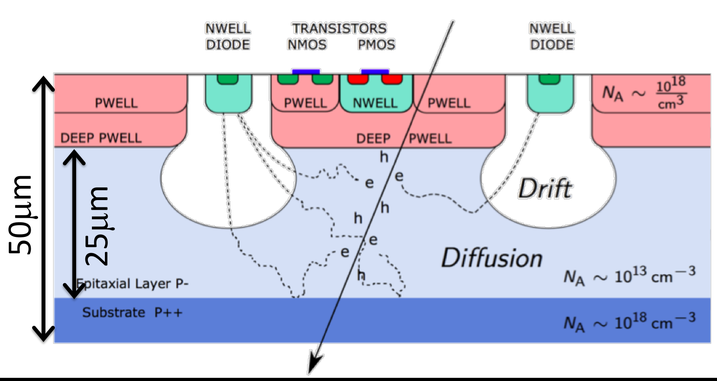
If T>T_{th}, MFT turns to ERROR state

ALPIDE and MFT Ladder

ALPIDE (ALICE Pixel Detector)

- Monolithic Active Pixel Sensors

Pixel size	27 x 29μm^2
Sensor size	15 x 30mm^2
Spatial resolution	~5μm
Integration time	4μs
Power consumption	40mW/cm^2



MFT Ladders

2-5 ALPIDE chips per ladder