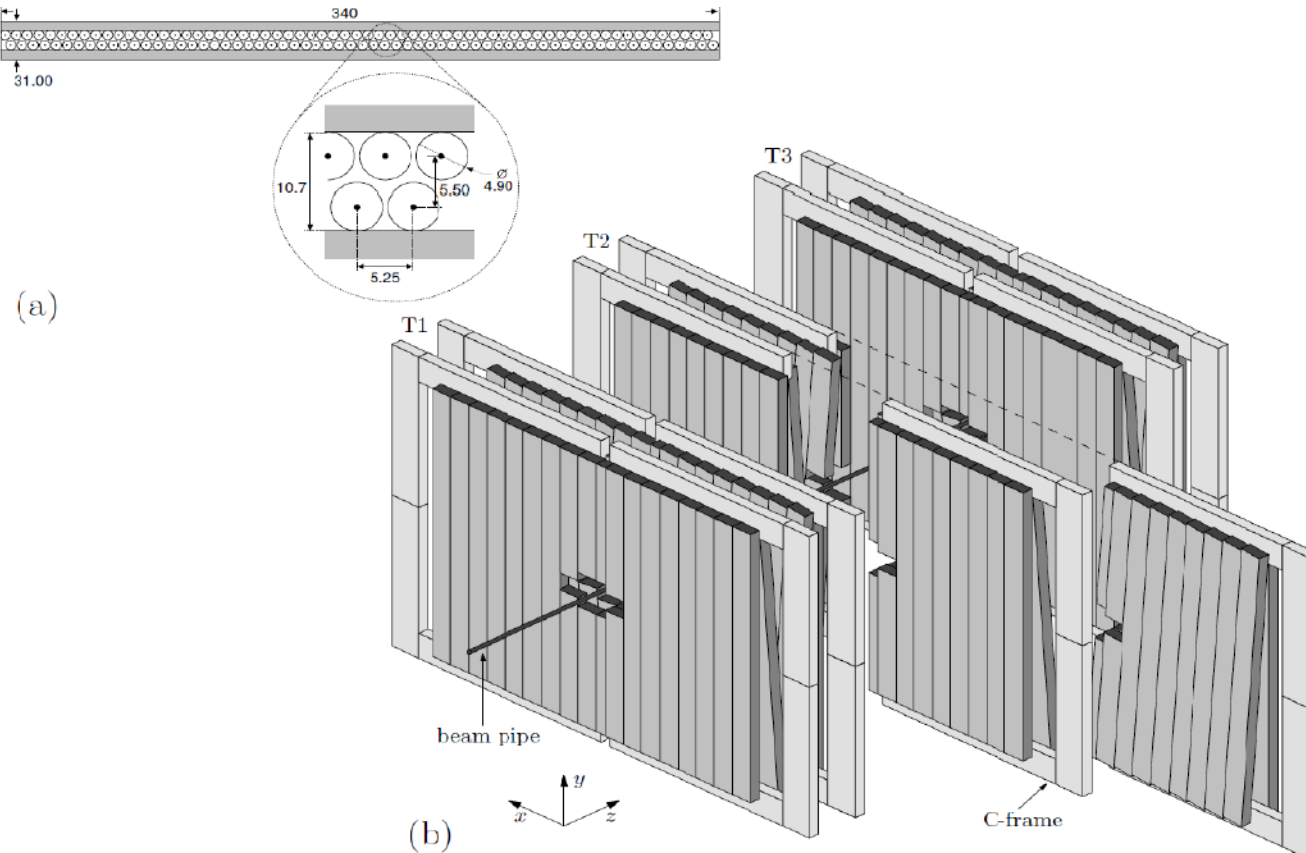


Overview – LHCb OT at GSI

Task Force OT CBM PANDA (Mtg. 2)

A. Belias (GSI)

LHCb Outer Tracker Straws - Overview



LHCb Outer Tracker straw tube brief specs

Tube elements

- Diameter_(i), length: 4.9mm, 2.4m
- Anode wire: 25 μ m at 1550 V
- Gas: Ar/CO₂/O₂ (70/28.5/1.5)
- Two staggered layers of mostly 64 tubes (few have 32 tubes)

Module

- Enclosure (5m length) with straw tubes in upper and lower parts
- Two staggered layers of 64(32) tubes in each part
- Single sided and independent readout of each part
- Module type S; can be separated into U and L parts
- Module type F; cannot be separated (staggered in y)

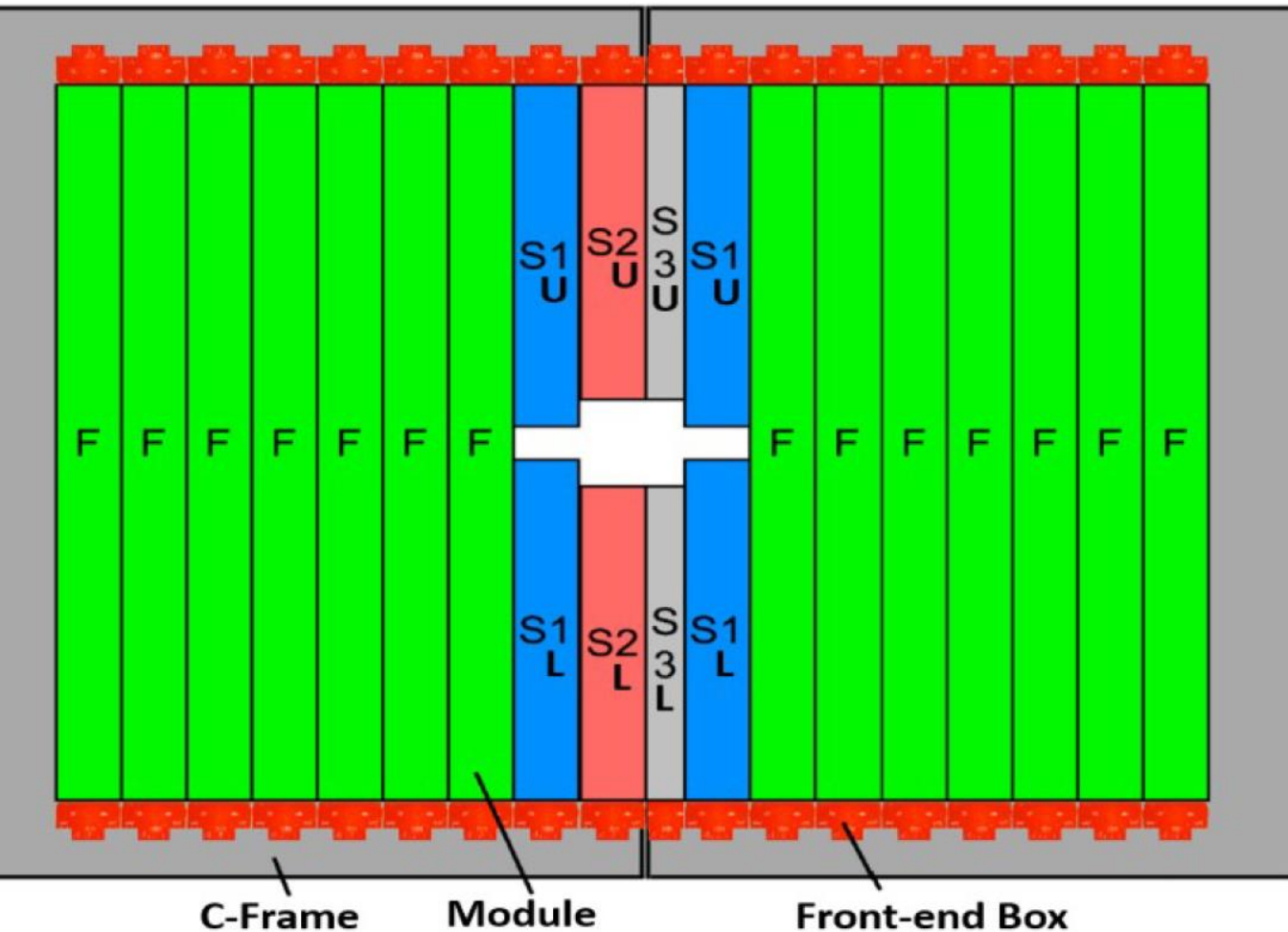
Whole Detector

- 53,760 straw tubes in 216 modules with 432 FEE
- Module F: 168, Module S: 48 (96 U or L parts)
- C-Frame: Mechanics and operations support 2x9 modules
- Area coverage: (5 x 6)m² x 12 planes

Performance at LHCb (Run1&2)

- $\epsilon \sim 98\%$, $\sigma \sim 170 \mu\text{m}$
- $\delta p/p \sim 0.4\%$ (2-100 GeV tracks)

LHCb Outer Tracker Straws - Overview



12/9/2024

OT in LHCb

A.Belias (GSI)

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PANDA receives the whole LHCb Outer Tracker - straw tube detector



LHCb/CERN donated the formidable Outer Tracker straw tube detector to PANDA at GSI/FAIR.



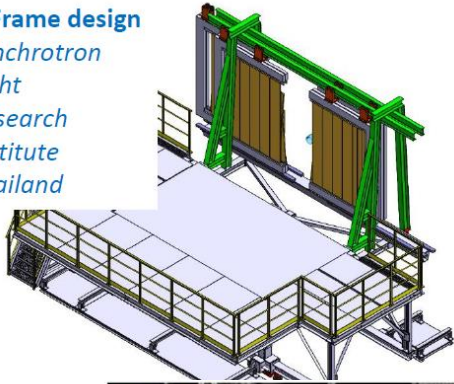
Whole OT in transport frame, 7x5.5x3.5 m³, 24t, arrival at GSI, Aug. 25, 2023. (Photo courtesy: GSI)

A. Belias (GSI),
Niels Tuning (LHCb), Tassos, Uli Uwer (LHCb), Lars, Klaus

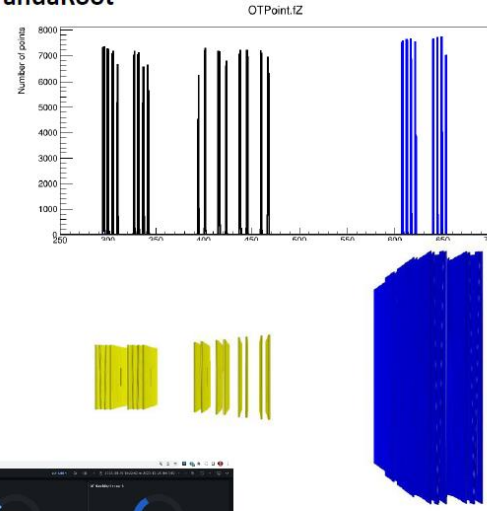
25 Aug. 2023

OT Projects

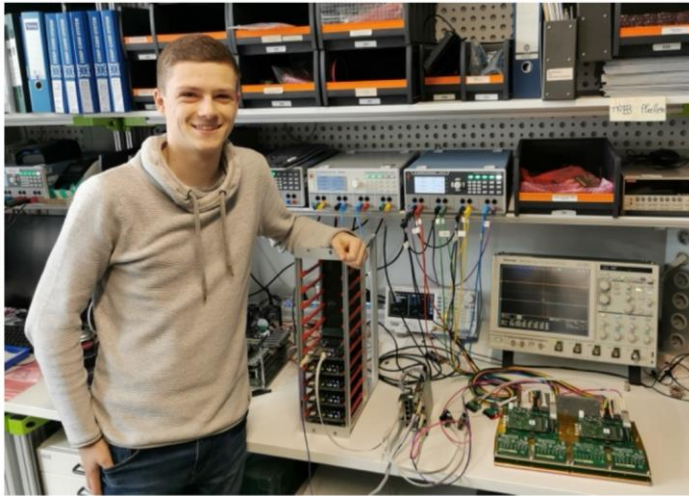
C-Frame design
Synchrotron
Light
Research
Institute
Thailand



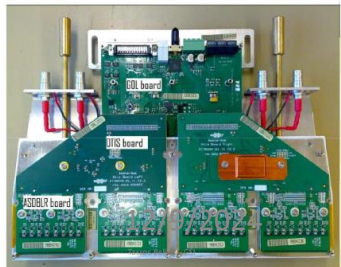
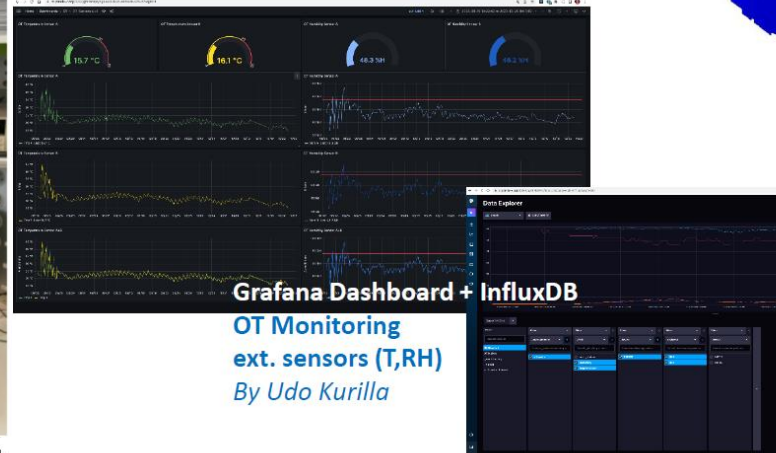
Simulations of alternative straw tube tracker in PandaRoot



Interface board
designed for
DiRICH/TRB DAQ
with OT ASICs
(ASDBLR)



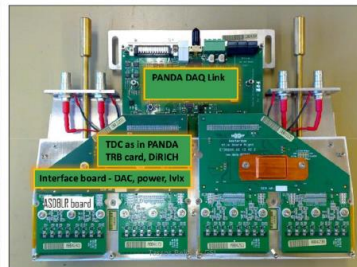
Werkstudent:
Luca Schramm
im EEL/GSI



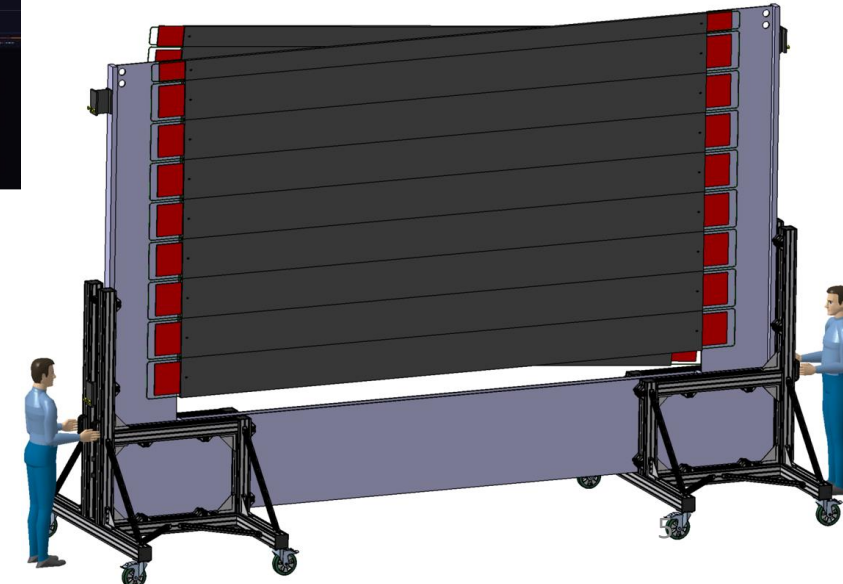
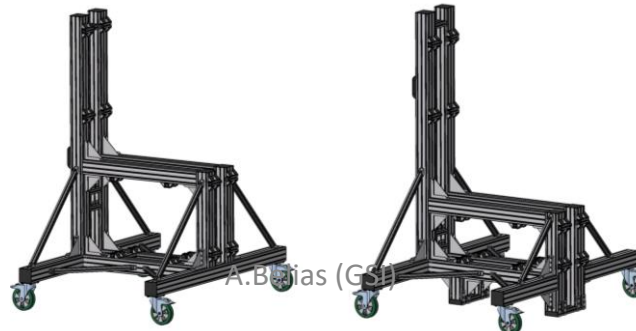
1 optical link,
1.28 Gbit/s

4 OTIS TDC chips,
32 ch/chip

16 ASDBLR chips,
8 ch/chip
(2 chips/board)
Input: 128 channel



Extraction of C-Frames

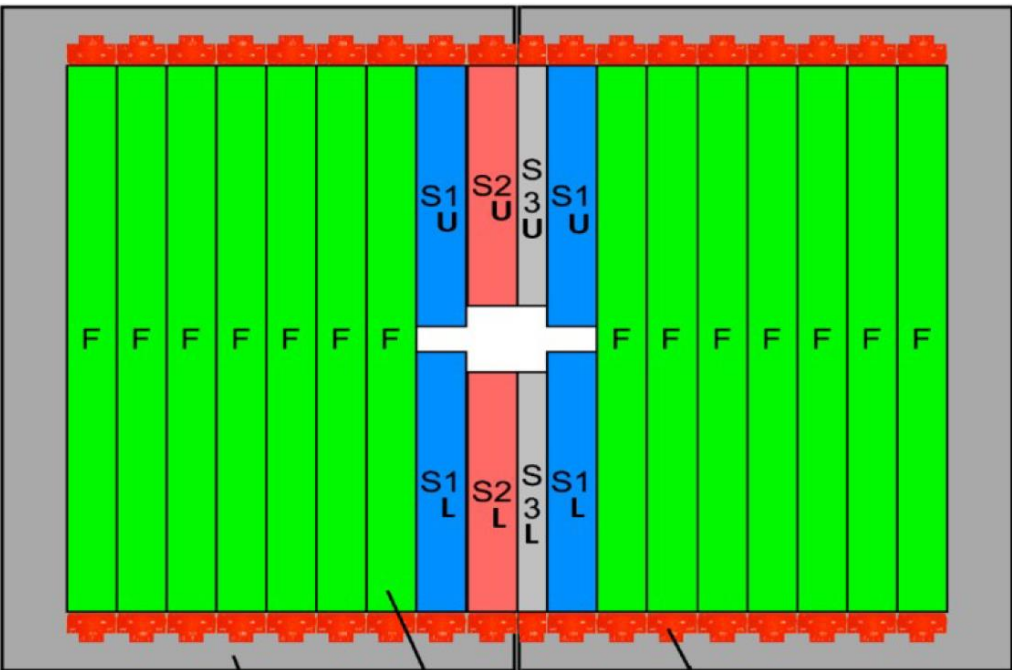


A. Bojars (GSI)

LHCb Outer Tracker Straws – Use case I

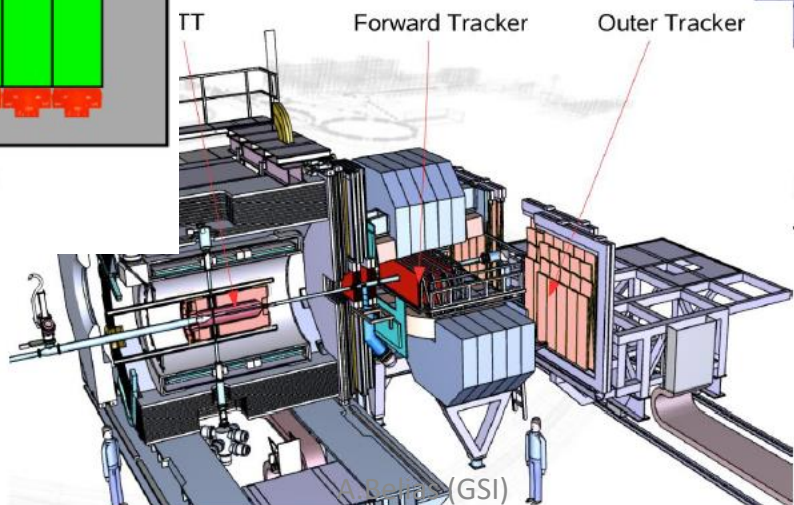
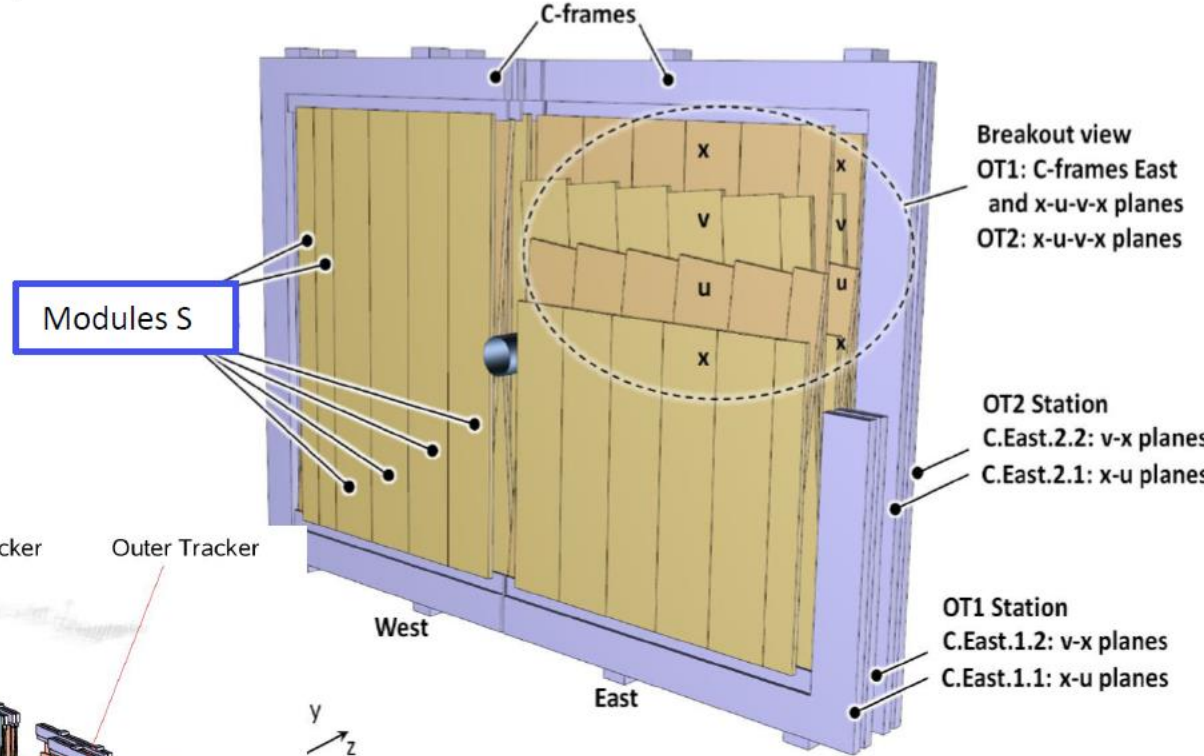
Forward tracking planes in PANDA

LHCb: Modules S separable in “U” and “L” parts



OT in LHCb

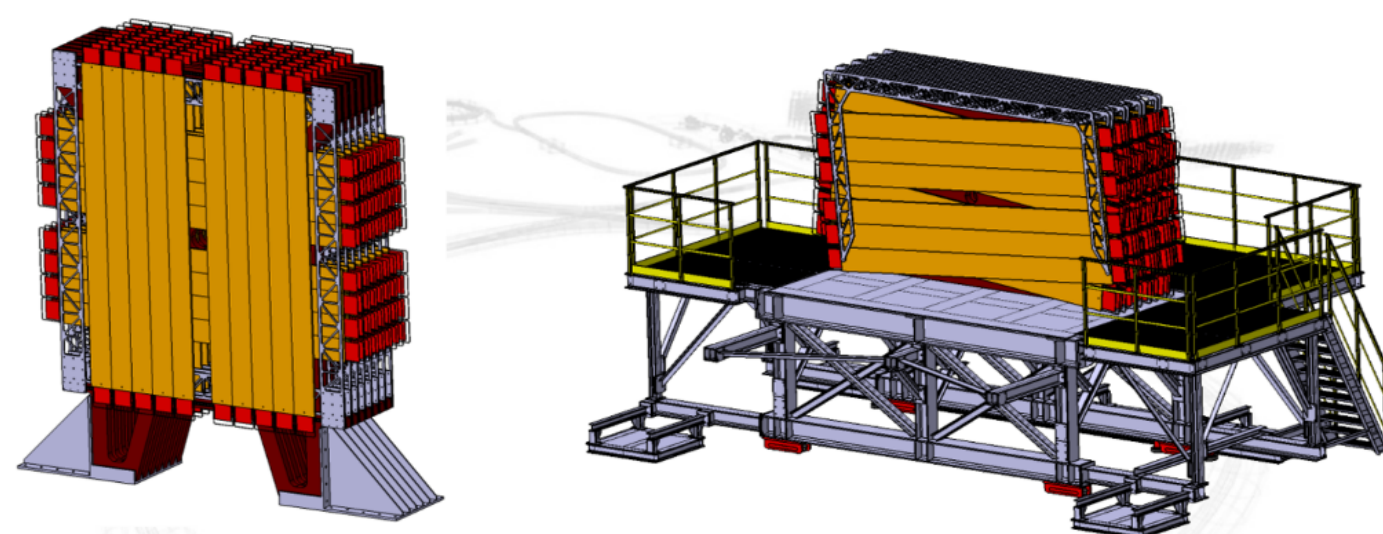
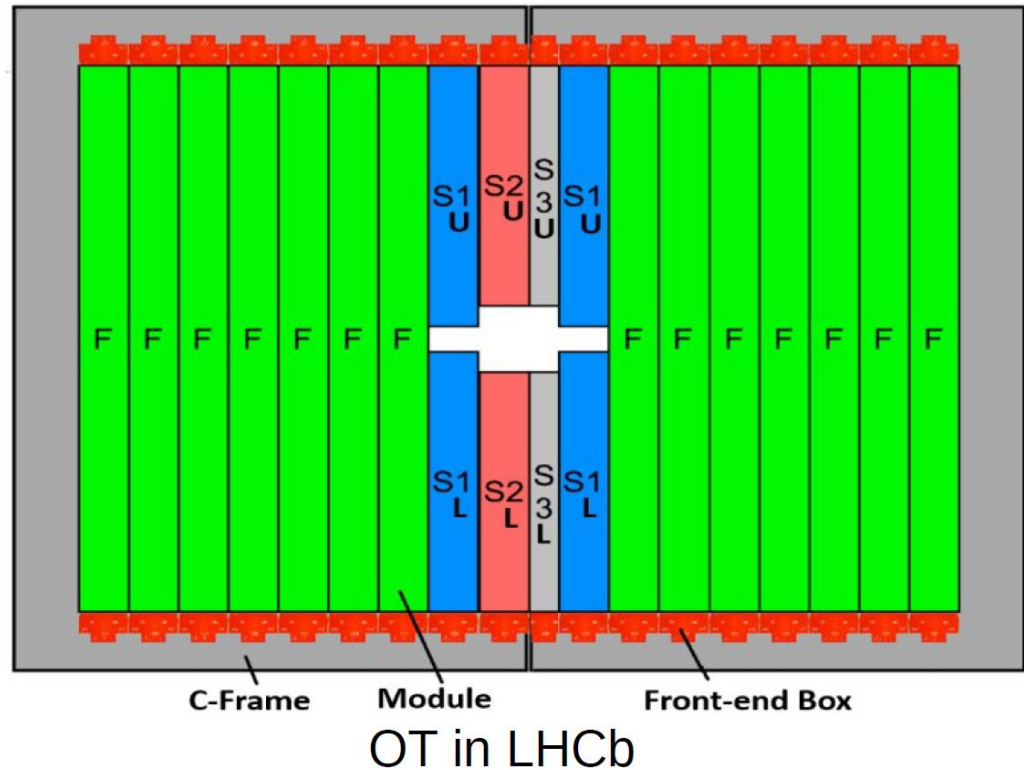
PANDA: Split & pair “U” and “L” parts of S Modules



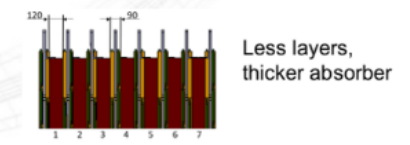
LHCb Outer Tracker Straws – Use case II Forward Muon Range System in PANDA

LHCb: Modules F cannot be separated (*)

PANDA: F Modules interspersed with absorber material

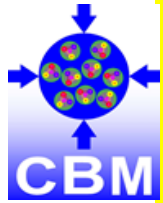


- LHCb Outer Tracker long modules for PANDA Muon Range System,
- Option 1 (right): $+5^\circ$ angle, same size as original FRS
- Option 2 (left): 90° angle, fixed absorber planes



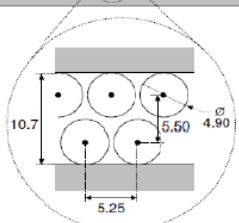
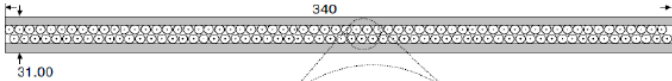
(*) Monolayers in modules F are offset along their length.

LHCb Outer Tracker Straws – New use case Muon tracking detector in CBM → MuST

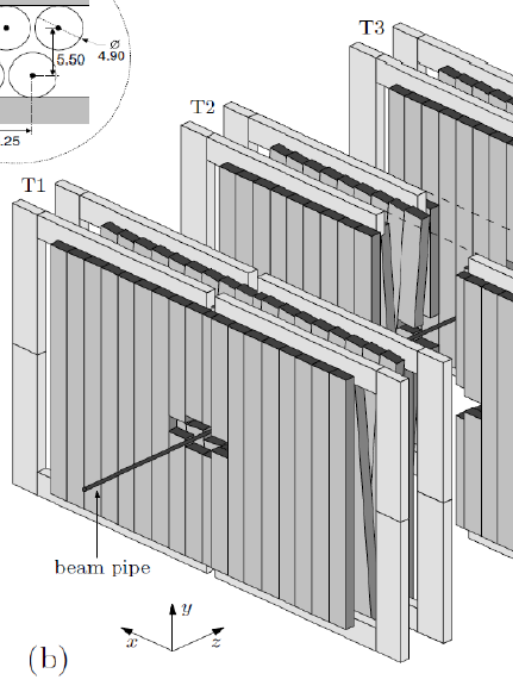


Task Force of CBM and PANDA colleagues in cooperation:

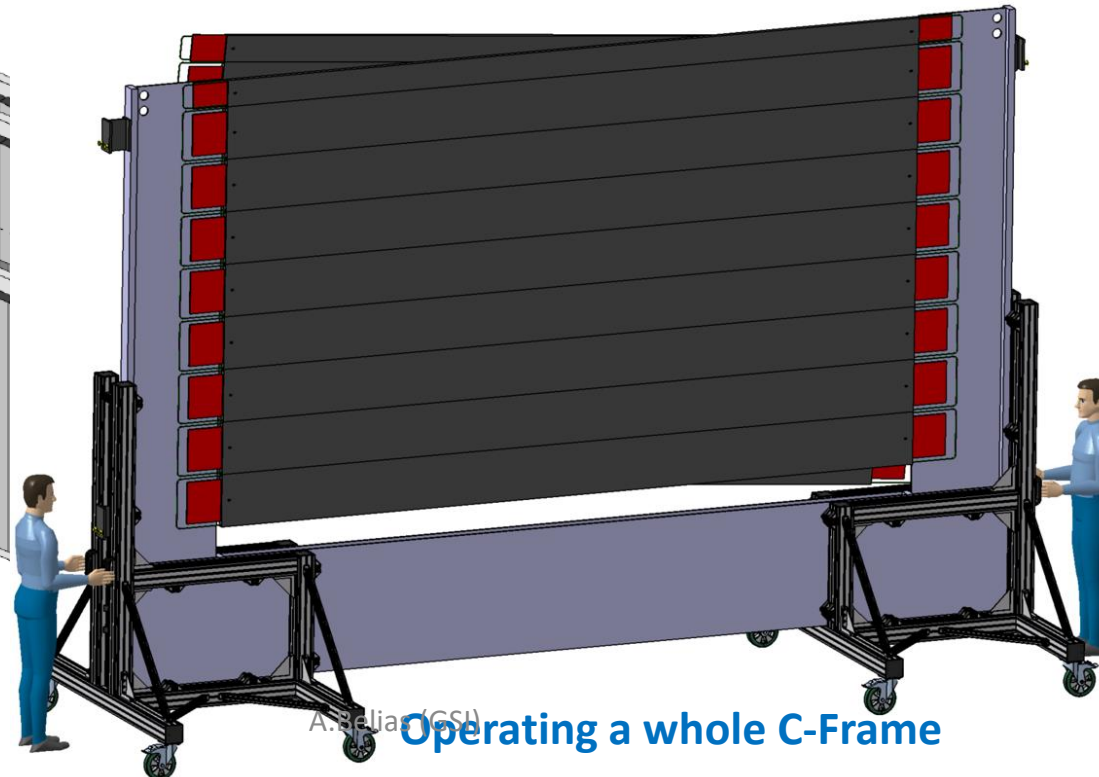
- to investigate the possibilities of using the LHCb OT in CBM
- to validate the detector performance in p-p and Au-Au collisions through simulations
- to estimate effects on the detector for further future re-use



(a)

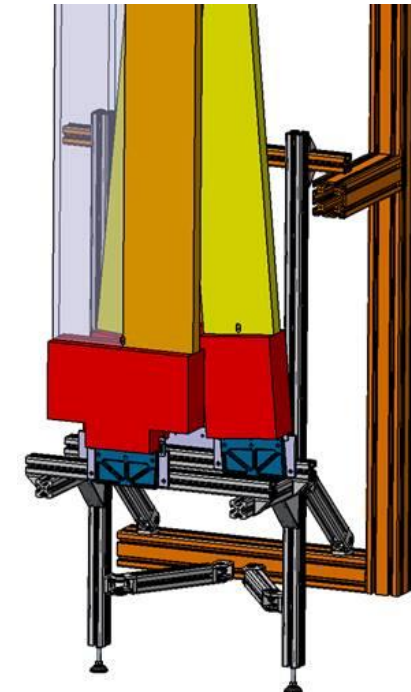


(b)



A. Belian (GSU)

Operating a whole C-Frame



OT-Tests in mCBM
beam time (Feb. `25)