CBM silicon planes for forward tracking

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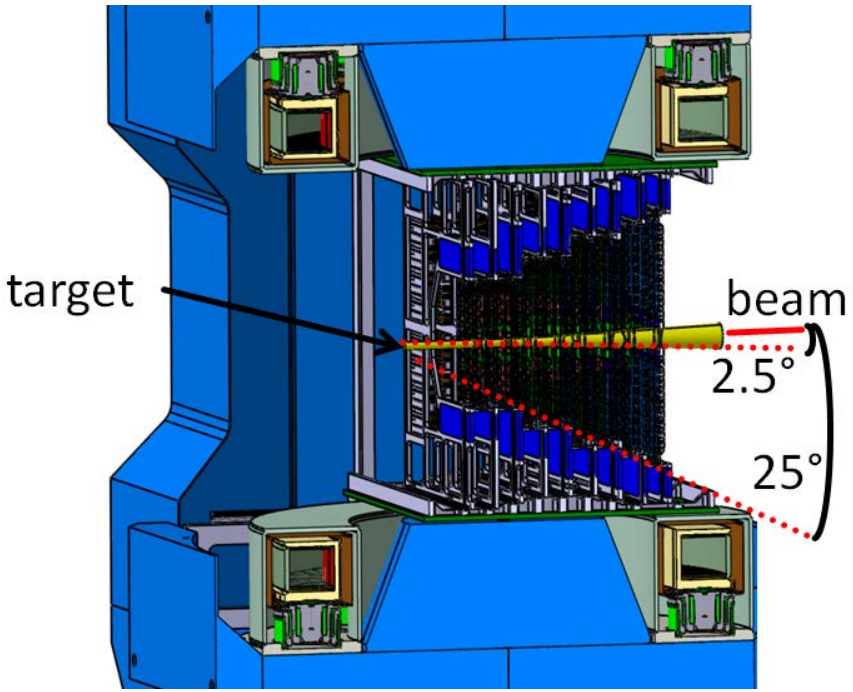
CBM Silicon Tracking System

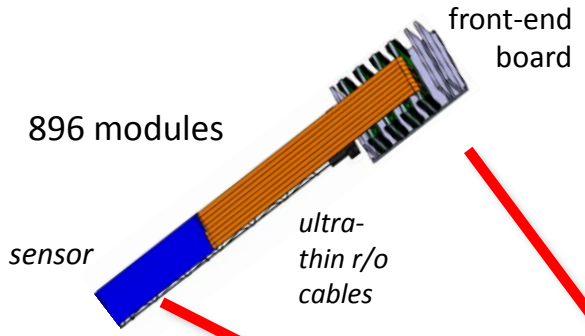


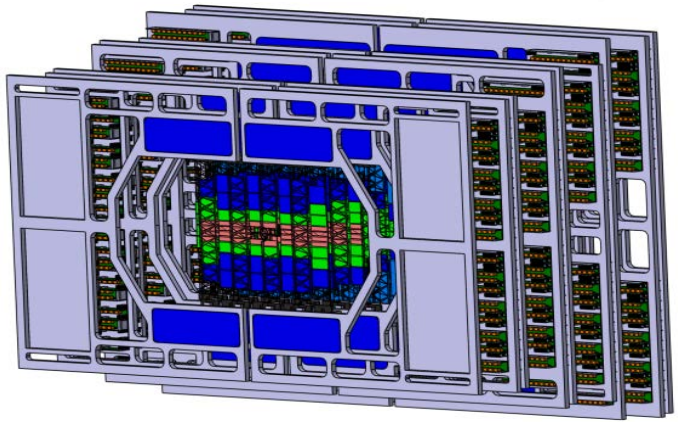
longitudinal cut – Silicon Tracking System in Dipole Magnet

- pile-up free track point determination in high-rate collision environment: $10^5 - 10^7$/s (A+A), up to 10^9/s (p+A)
- physics aperture : $2.5° \leq \Theta \leq 25°$, $0.3\ \text{m} \leq z \leq 1.0\ \text{m}$
- 8 tracking stations
- double-sided silicon microstrip sensors
- hit spatial resolution ≈ 25 µm
- self-triggering front-end electronics
- time-stamp resolution ≈ 5 ns
- material : ≈ 0.3 % – 1% X_0 per station
- momentum resolution: $\Delta p/p \approx 1.8\%$ (p > 1 GeV/c, 1 Tm field)

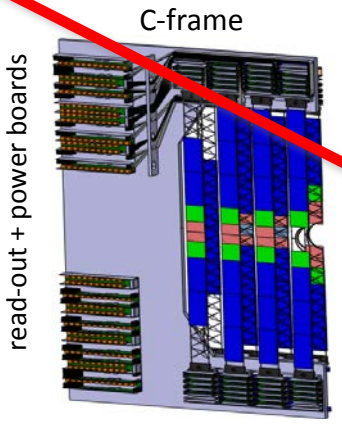
CBM Silicon Tracking System

- 8 stations, volume 2 m^3, area 4 m^2
- 896 detector modules in various lengths
  - 896 double-sided microstrip sensors
  - ~ 1.8 million read-out channels
  - ~ 16 000 r/o STS-XYTER ASICs
  - ~ 16 000 ultra-thin r/o cables (5÷50 cm long)
- 106 detector ladders with 8-10 modules
- power dissipation: ~40 kW (CO_2 cooling)
- thermal enclosure: sensors at T = -5° C

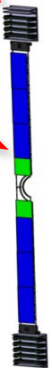




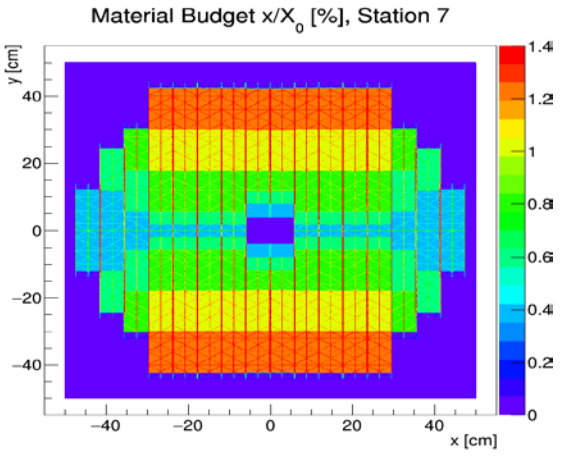
8 tracking stations



18 mechanical half-units

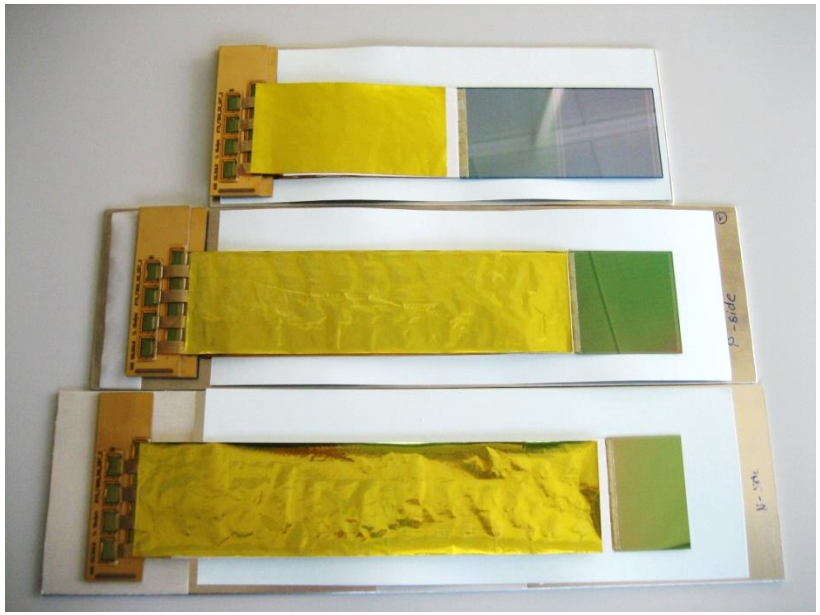


106 ladders

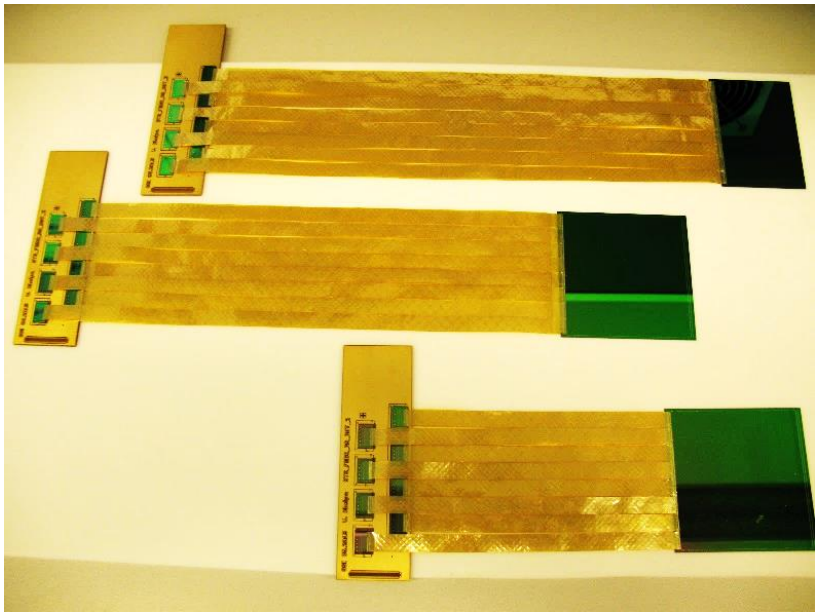


Modules

GSI



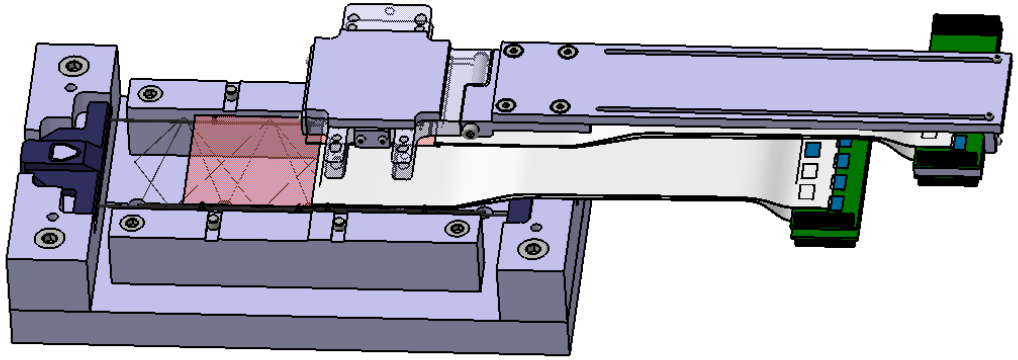
JINR



dummy modules from assembly procedure set-up

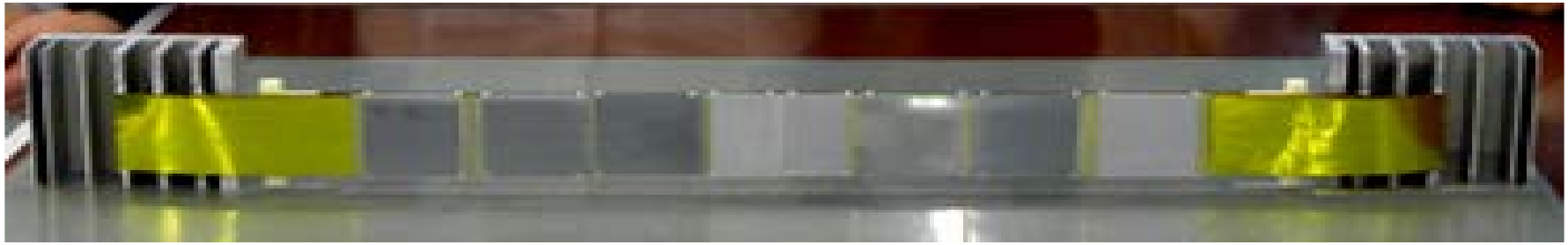
Ladders

pre-series carbon-fiber ladders (GSI)



tool to place modules onto carbon fiber ladders (GSI)

mock-up ladder, JINR-LTU



Summary

- CBM-STS stations are probably suited to the tracking task in Forward STAR
  - Rates, spatial resolution OK. Aperture similar/the same? ASIC? CERN GBT chip set?
- CBM-STS project plan:
  - production readiness of its components: 2017 – 2018
  - series production of components: 2018 – 2020
  - system assembly and commissioning in lab until: 12/2021
- current status:
  - preparing for production readiness:
    sensors, ASIC, FEB, r/o cables, module + ladder assembly, system integration
  - sensors: final prototypes
  - front-end electronics: first prototypes in hand
  - dummy modules and ladders assembled
  - preparation of assembly sites and teams (GSI, KIT, JINR)
- FAIR-0:
  - STS plans to add CBM-STS-like tracking stations to the BM@N experiment at JINR, 2018 - 2021; Additional stations to those in CBM. MoU signed in 2016 (GSI, Tübingen, JINR).
- CBM-STS project has no valences to build further STS modules/ladders/stations, not to mention their integration into a further experiment.
  STAR could probably copy (features of) CBM-STS. Cooperation with CBM welcome.
  First discussions: participation in work packages (e.g. micro-cables), reviews.
  Technology transfer.