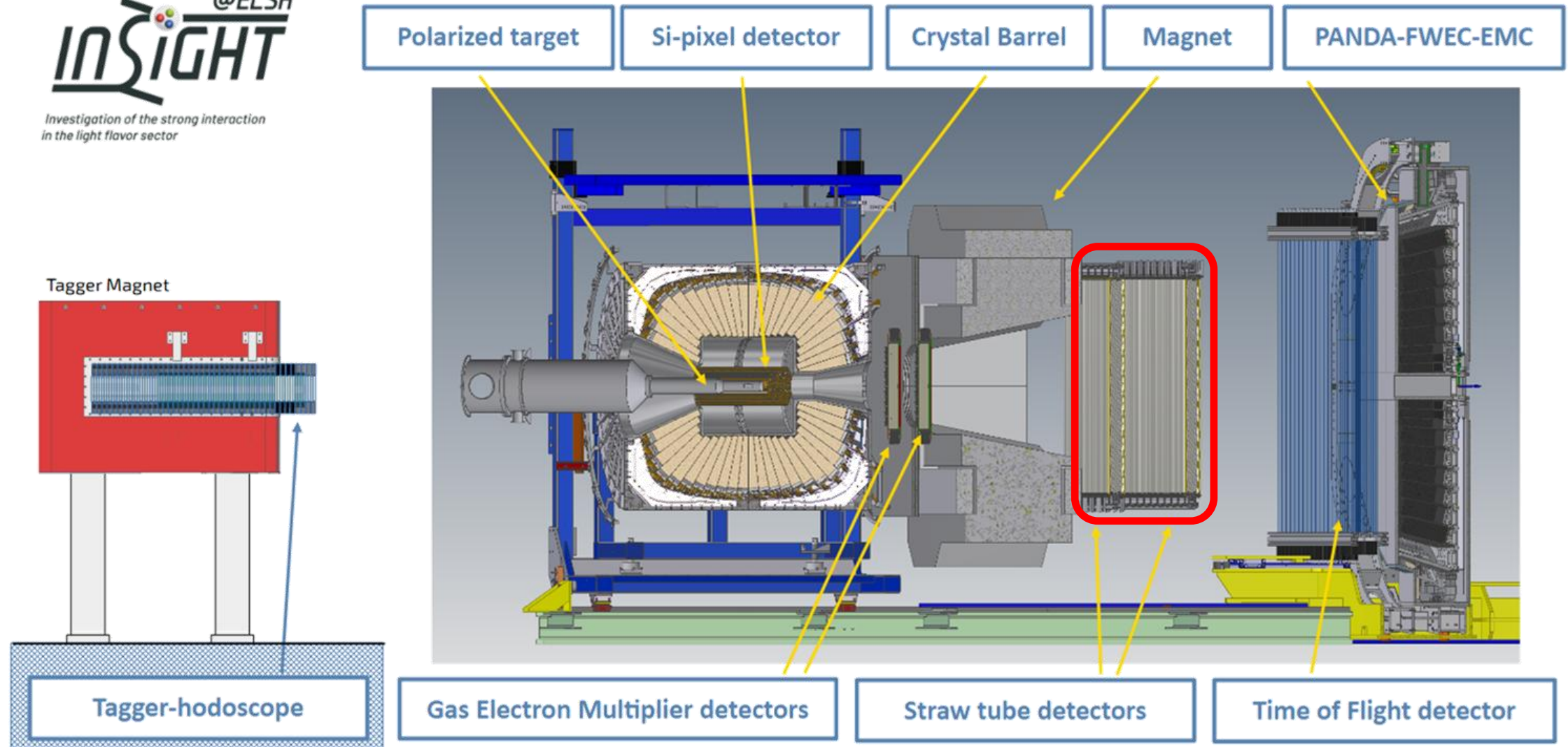


INSIGHT: straw tube detector - status and plans

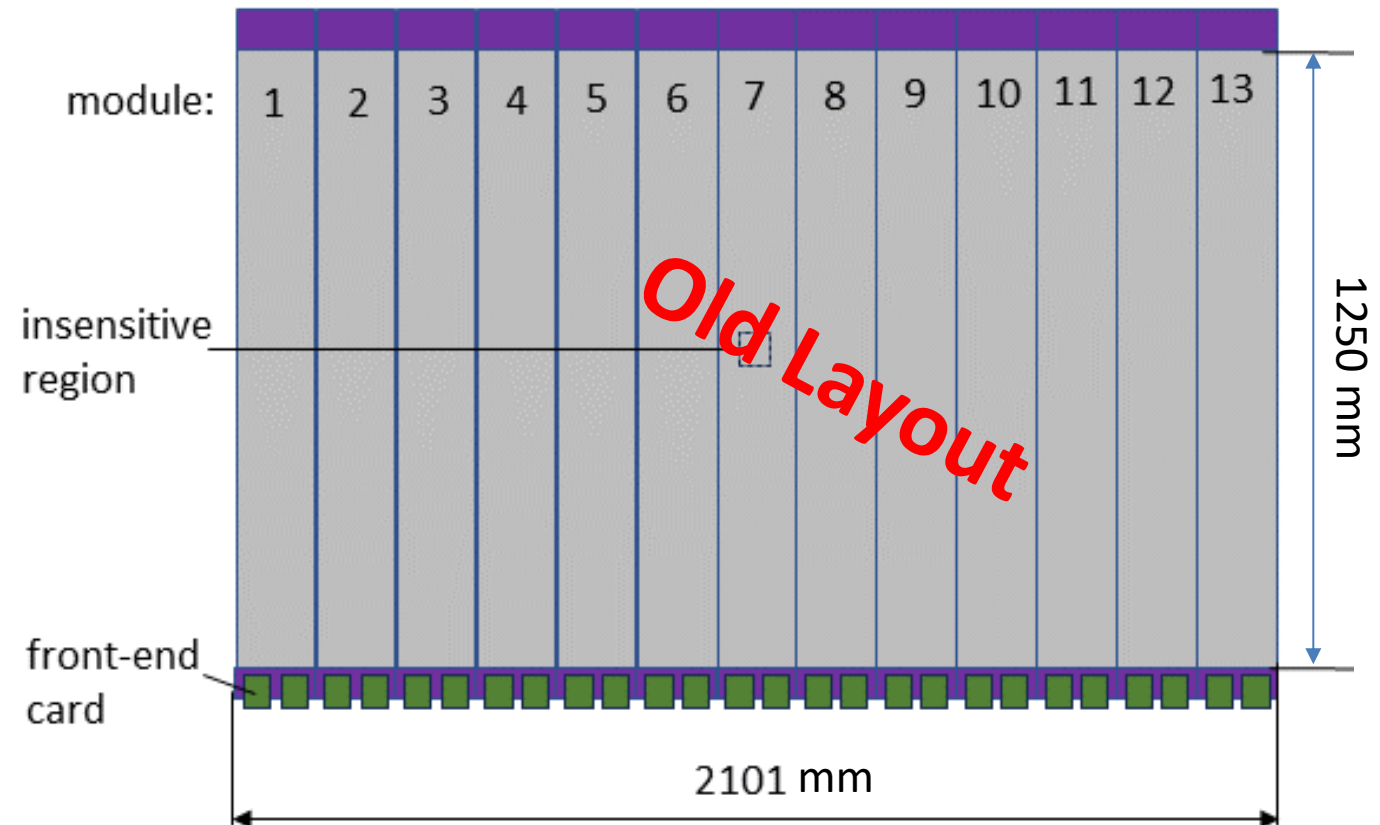
**Jagiellonian University Krakow, TU Dortmund,
Dirk Wiedner
on behalf of the INSIGHT SST group**



Straw Tube Tracker (STT)

- Behind dipole magnet
- **Four double layer planes**
 - **15, 17, 19 modules of**
 - 32 straws each
- Design based on PANDA Forward Tracker (prototype)
 - 10 mm diameter tubes
 - Aluminized Mylar foil
 - 27 μm thickness
 - 20 μm tungsten-rhenium wire anode
 - Ar-CO₂ (90:10) at 2 bar

2 or 3 stations: **15, 17, 17** modules



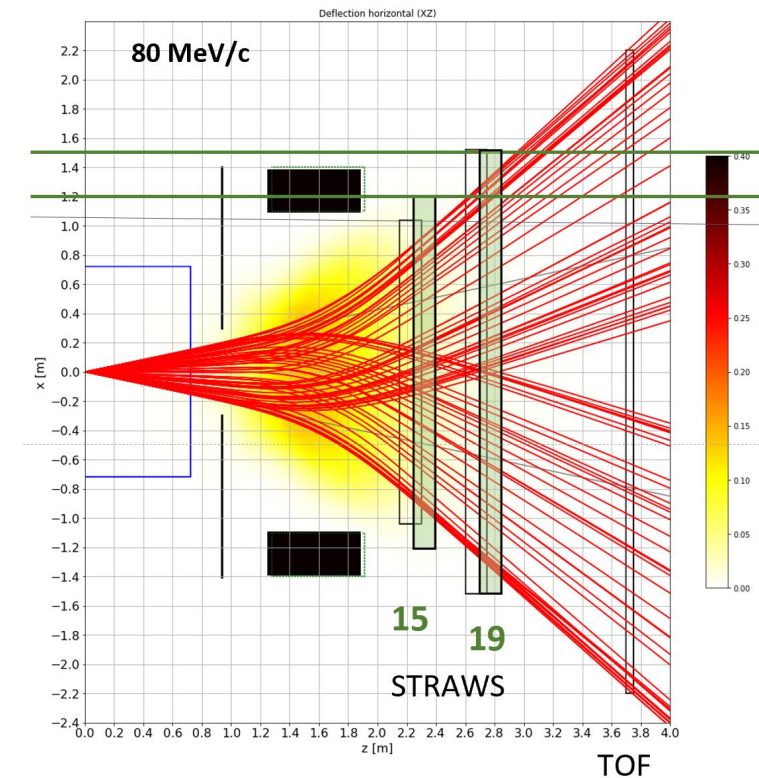
Arrangement of straw tube modules in double layer with vertical straws.

Straw Tube Tracker (STT)

- Behind dipole magnet
- **Four double layer planes**
 - **15, 17, 19 modules of**
 - 32 straws each
- Design based on PANDA Forward Tracker (prototype)
 - 10 mm diameter tubes
 - Aluminized Mylar foil
 - 27 μm thickness
 - 20 μm tungsten-rhenium wire anode
 - Ar-CO₂ (90:10) at 2 bar

Simulation studies ongoing

3 stations: 15, 17, 17 modules

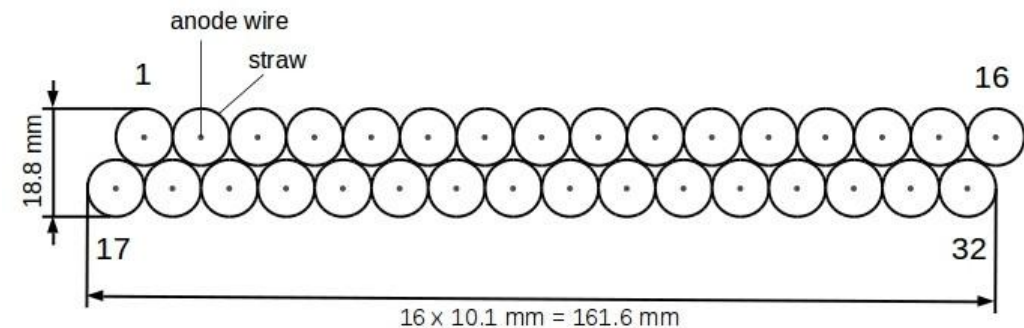


Preliminary magnetic field configuration

=> horizontal width of detector

Straw Tube Tracker (STT)

- Behind dipole magnet
- Four double layer planes
 - 13 modules of
 - **32 straws each**
- Design based on PANDA Forward Tracker
 - 10 mm diameter tubes
 - Aluminized Mylar foil
 - 27 μm thickness
 - 20 μm tungsten-rhenium wire anode
 - Ar-CO₂ (90:10) at 2 bar



Arrangement of straw tube detectors in one module.

Straw Tube Tracker (STT)

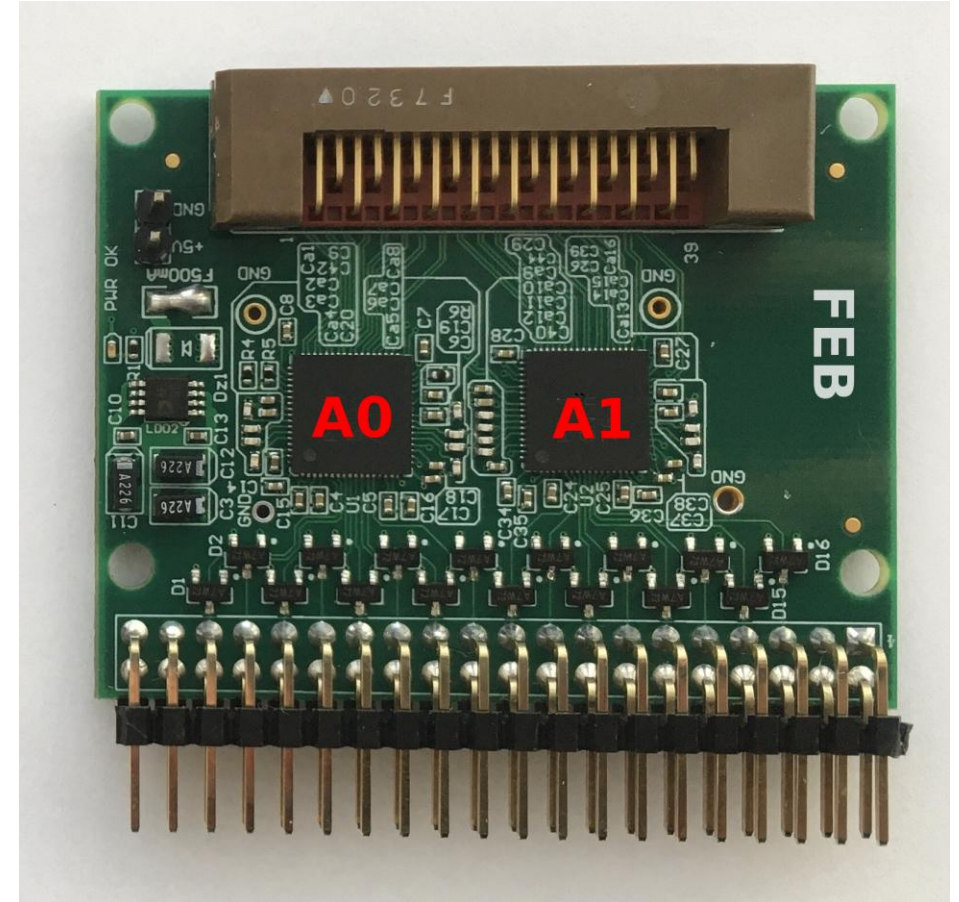
- Behind dipole magnet
- Four double layer planes
 - 13 modules of
 - 32 straws each
- **Design based on PANDA Forward Tracker**
 - 10 mm diameter tubes
 - Aluminized Mylar foil
 - 27 μm thickness
 - 20 μm tungsten-rhenium wire anode
 - Ar-CO₂ (90:10) at 2 bar



Double layer of straw tube detectors mounted on a half-frame for the PANDA Forward Tracker. The double layer contains 11 modules with 125 cm long straws and two short modules with 62 cm straws (on the left) used to create an opening for the beam pipe. Ref. (3)

Readout technology

- TDC system developed at GSI
 - NEW: **DiRICH5d2_DEP**
 - Or PASTTREC chip front end (8-ch)
- Front-end cards: 2x PASTTREC or equivalent
- TRB5 readout boards
- DOGMA system



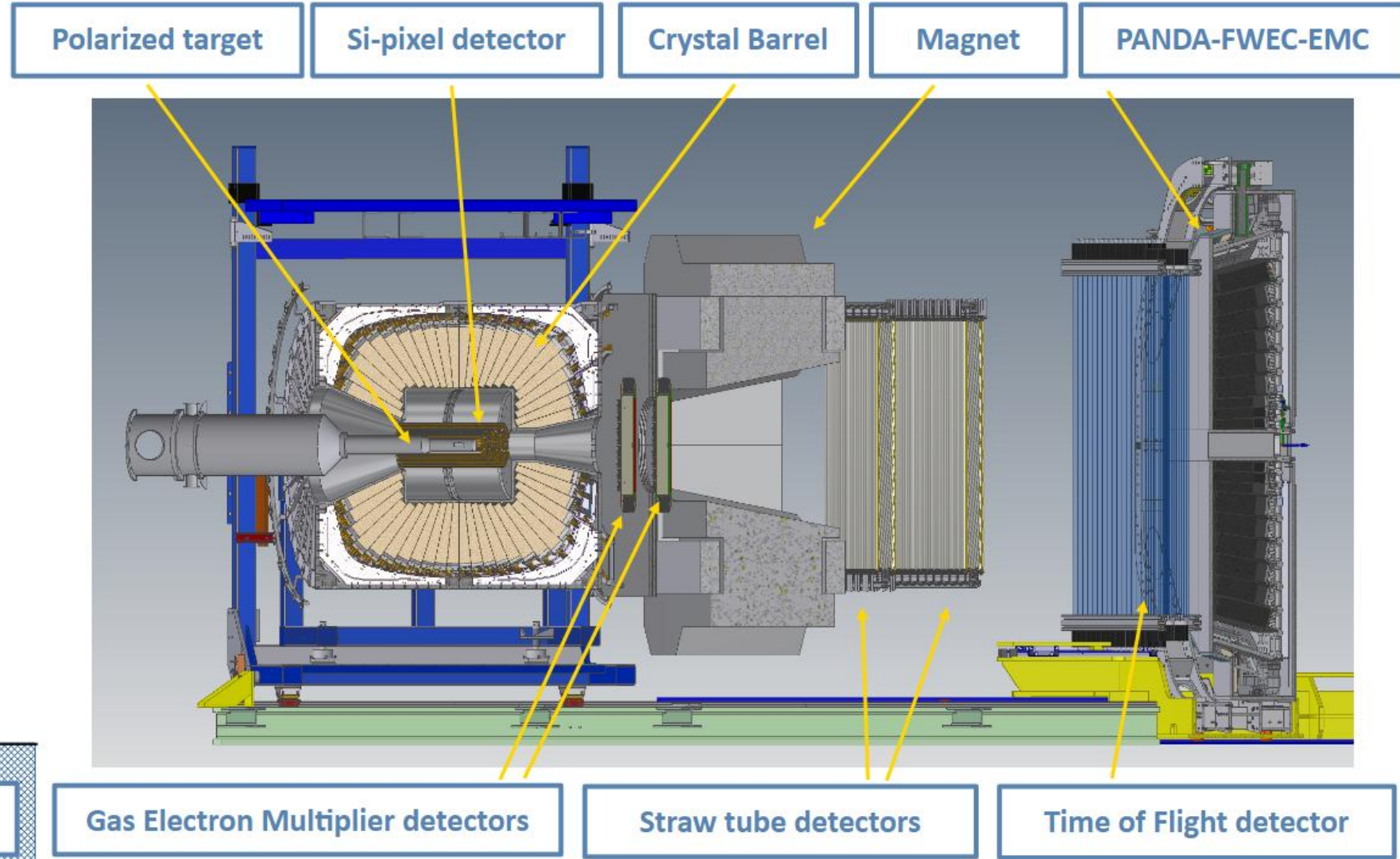
PASTTREC PCB Ref. (4):
Qualification tests of the PASTTREC
readout ASIC for straw tube detectors

Plans

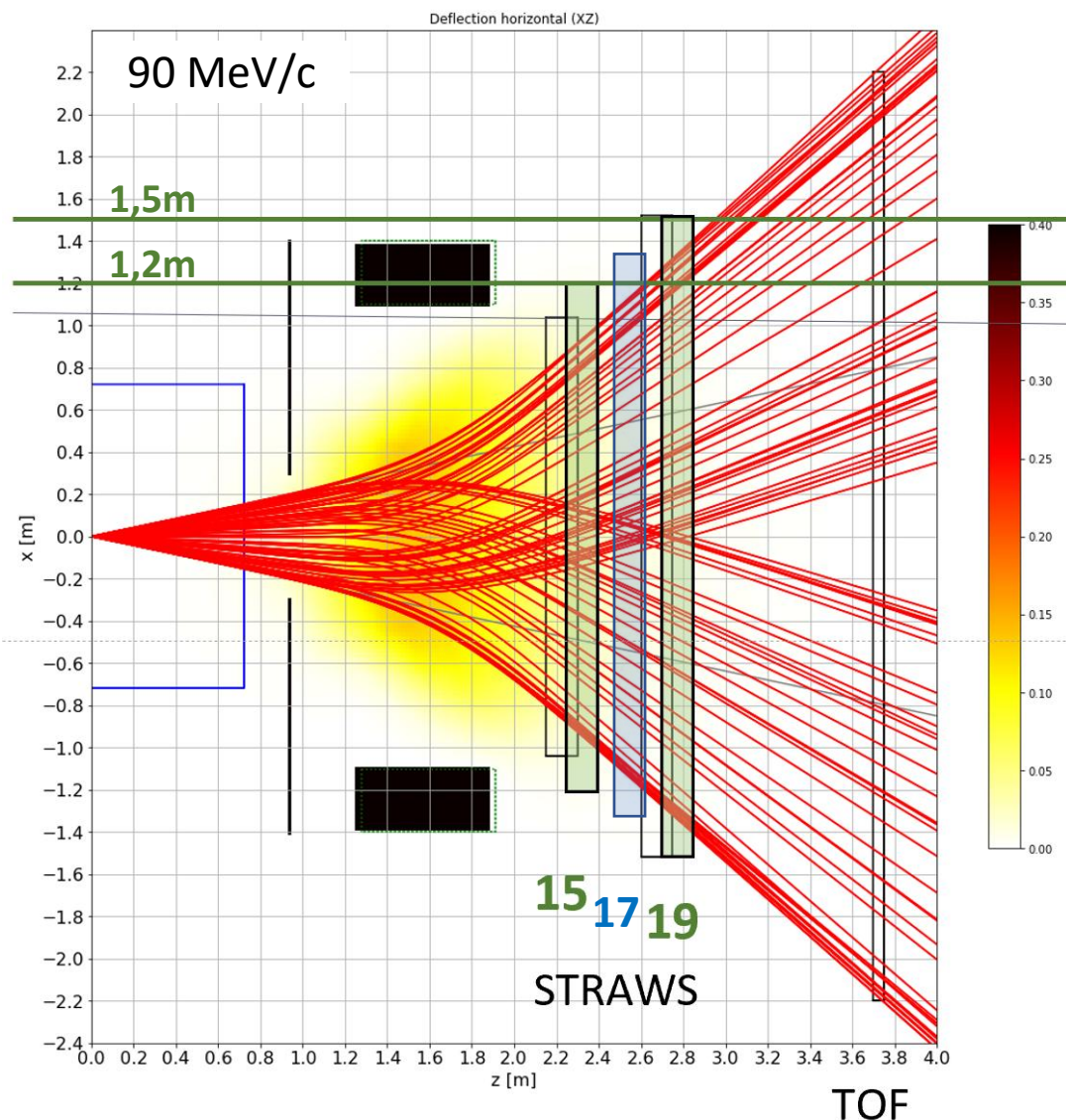
- Acquisition of materials ongoing
 - LAMINA can still produce the exact straw tubes
 - Iterate the readout scheme
 - Consolidate STT group
 - Start module production in 2026
- References:
 1. J. Smyrski et al., JINST 12 (2017) C06032.
 2. J. Smyrski et al., JINST 13 (2018) P06009.
 3. D. Przyborowski et al., JINST 11 (2016) P08009.
 4. Mirosław Firlej et al., JINST 18 (2023) 05, P05008
 5. DOGMA readout:
<https://dogma.gsi.de/>



*Investigation of the strong interaction
in the light flavor sector*



Preliminary magnetic field configuration => horizontal width of detector



width of one module with 32 straws: 161.6 mm

- **STATION 1** -- 15 MODULES WIDE
 - ⇔ 15 x 32 Straws (vertical layer 1)
 - ⇔ 15 x 32 Straws (+5° layer 2)
 - ⇔ 15x2x32 = **960**
 - **STATION 2** -- 17 MODULES WIDE
 - ⇔ 17 x 32 Straws (simulations for determination of best orientation)
 - ⇔ 17 x 32 Straws (simulations for determination of best orientation)
 - ⇔ 17x2x32 = **1088**
 - **STATION 3** -- 19 MODULES WIDE
 - ⇔ 19 x 32 Straws (vertical layer 6)
 - ⇔ 19 x 32 Straws (-5° layer 5)
 - ⇔ 19x2x32 = **1216**
- Sum= 102 modules

Sum = 3264 Straws + Replacements (4x6=24 mod., inner part)
 + Spares + Production losses (24%)
 ≈ **5000 Straws**

Open Question:

- Handling of the area where the photon beam passes

INSIGHT overview

- CB-ELSA major upgrade
- Subdetectors
 - EM calorimeter
 - Pixel
 - GEM Tracker
 - Straw Tracker
 - Time of Flight Wall
 - Forward EM calorimeter

