



STT Status

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June-12th, 2023 | PANDA Collaboration Meeting

Outline

- Workpackage Status
- Resources
- Implications new PANDA-Setup
 - STT Layout
 - SIS Beams

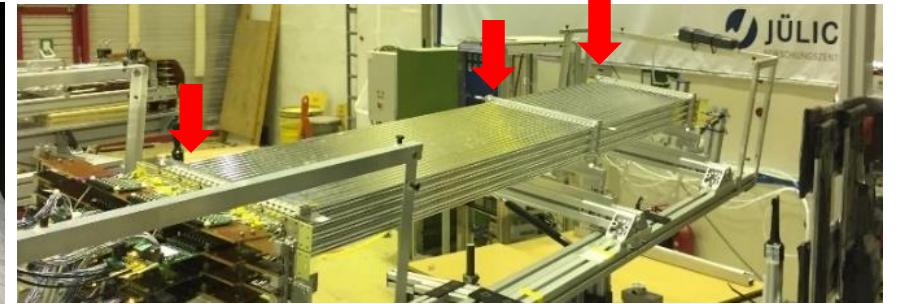
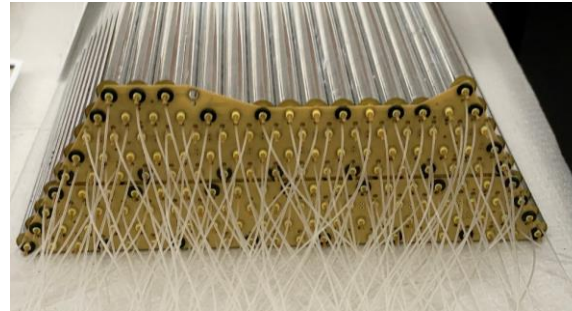
Workpackage List and Status

1. Straw series production (done, QA to be repeated)
2. Straw modules all components (new order for spring contacts, gas manifolds by FZJ)
3. **Straw modules design and assembly**, axial & stereo (**new personnel & training time needed**)
4. HV coupling boards, design and module adaption (open)
5. FE layout and mechanical system, **FEE-EMI** (**Pre-series setup needed**)
6. **Straw module in frame assembly** and alignment (Pre-series setup needed)
7. Cooling system concept: FEE + straw volume (**PANDA-TS layout needed**)
8. **Mechanical frame concept** and cable routing system (PANDA-TS layout needed)
9. ASIC & TRB3/5 Electronic readout (ASICs exist, FEB & TRB5sc ordered for tests, final order after)
10. High-Voltage System (Components identified, components partly existing)
11. **Gas system** (no personnel for system setup, DCS by IFIN-HH)
12. Detector Control System (IFIN-HH)
13. DAQ system set-up and operation
14. SW developments: FPGA processing, ..

Workpackage: Straw Modules

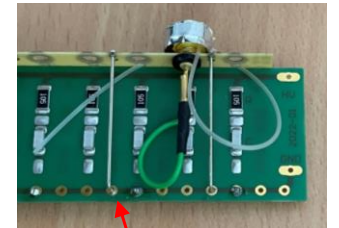
(Straw Module & HV Coupling)

1. Straw module design
2. Straw module assembly, techniques
3. Set up one STT sector, axial & stereo layers
4. Straw module alignment technique



5. HV coupling boards

- HV decoupling boards mounted to straw module
 - Crimp pin contact (Amplimite, 18 AWG)
 - Signal cables (16x flexTWP) to ASIC boards
- via 2-pin row connector to ASIC
- Tasks:
 - more dense layout 2x8 ch (d-sided, ~ 6cm width)
 - mechanical & electronic connection to ground belt



Grounding and mech. fixing

Cable, 2x8ch flexible twisted pair



Workpackage: Readout System

(Update by M. Idzik, AGH; TRB5s by JU)

Readout Status

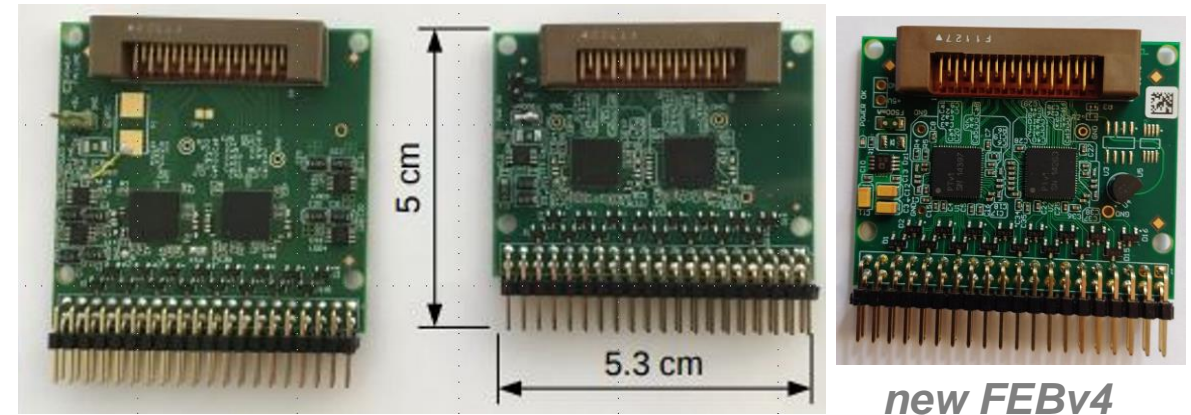
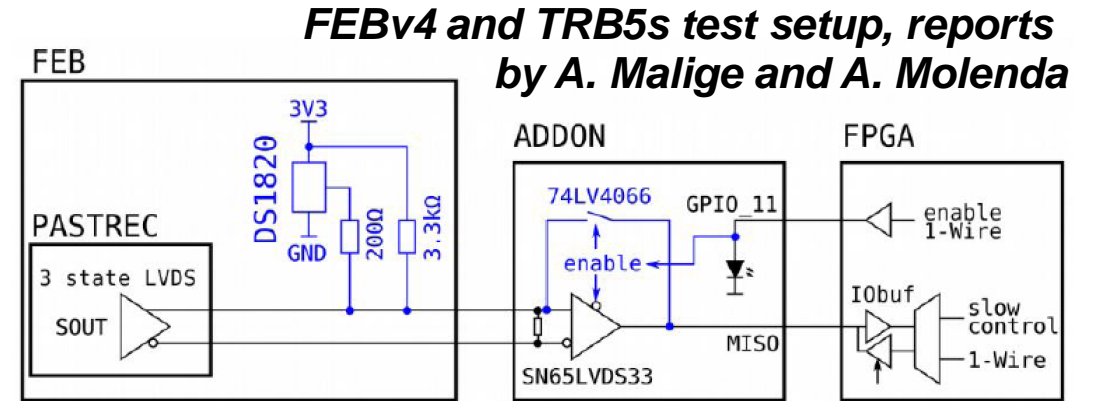
- TRB3 readout system installed for STS1 at HADES
- Readout system to be set-up in IKP

Readout components in production

- all PASTTREC ASICs required produced and available
- new FEBv4 version (T & chip ID) pre-production done
- QA of new FEBv4 with good results (56 tested)
- assembly of 5-10 new addon for FEBv4 in progress
- TRB5s, 5 boards for STT ordered
- 1x TRB5s crate ordered

Total number of channels planned

- 320 ch (5 boards x 64 ch) (TRB5s)
- FEBv3 and TRB3 system in addition



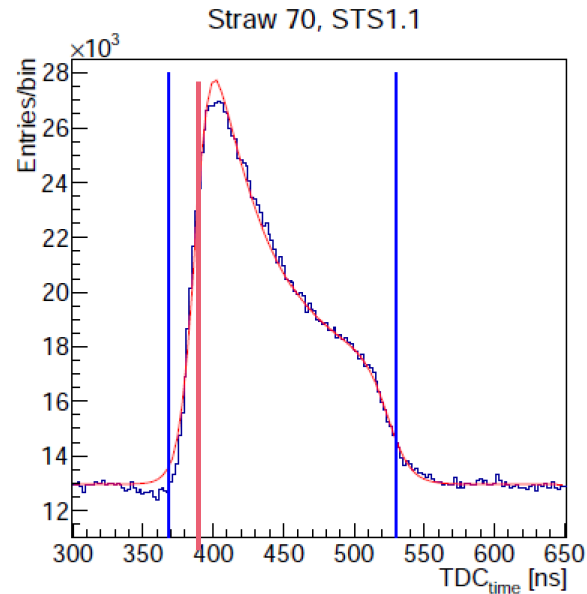
AddOn card with 1-wire switch

PASTTREC Results Phase 0

STS1/2 at HADES (Data Analysis by G. Perez-Andrade)

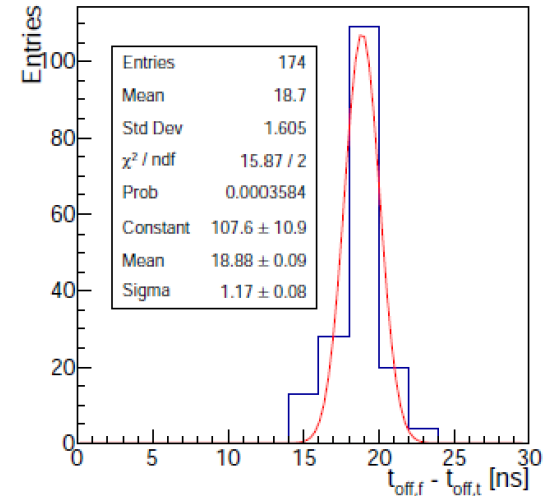
- STS1 settings
- Ar/CO2 (10%), 2 bar
- HV = 1700 V, gas gain 2×10^4
- ASIC settings:
 - 3.75 mV/fC
 - 20ns peaking time
 - threshold: 20 mV
 - sensitivity: 1.7 drift e-

$$n(t) = P_1 + P_2 \frac{[1 + P_3 e^{((P_3 - t)/P_4)}]}{[1 + e^{((P_3 - t)/P_7)}][1 + e^{((t + P_6)/P_8)}]}$$

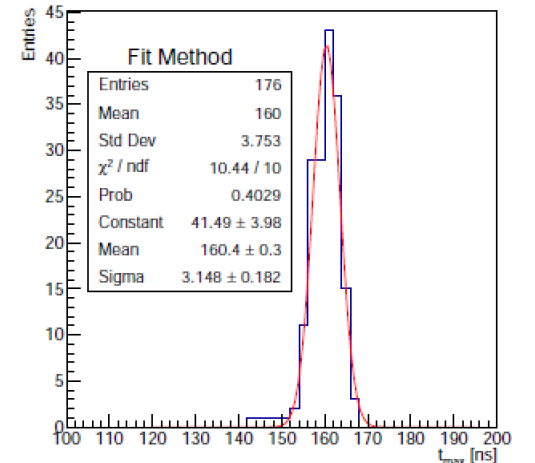


TDC spectrum, time offset and tmax determination

tmax, $\sigma = 3.2$ ns
TE-time, $\sigma \sim 2.9$ ns



time offsets, fit and threshold method, difference with $\sigma < 1.2$ ns



Status Resources

(To Date)

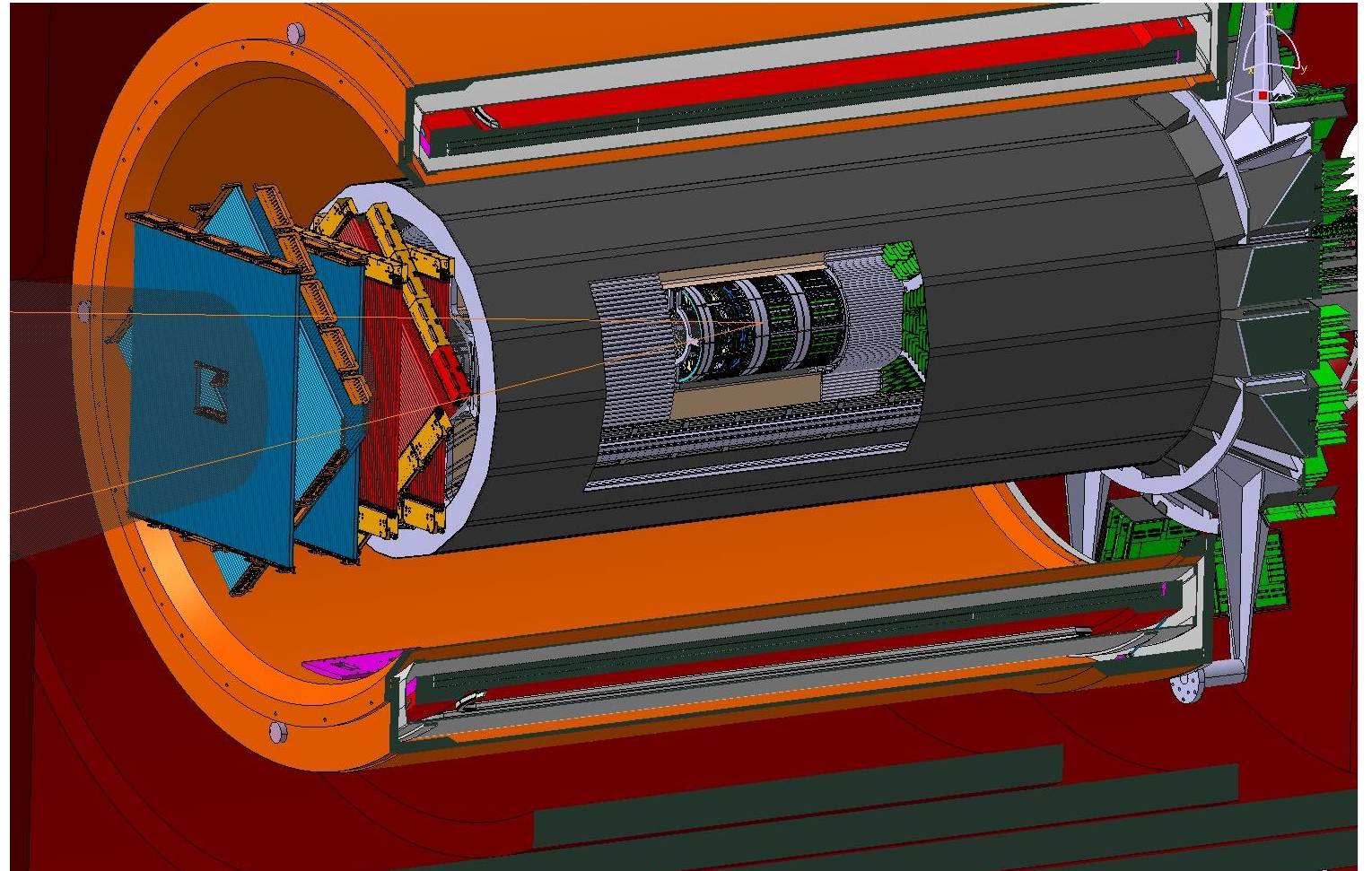
- In-kind AGH contract: STT&FT electronic readout
- In-kind FZJ: frozen
- IFIN-HH Bucharest
- Open workpackage, no funding
 - Gas system
 - Frame structure, cooling system
- Loss of workshops and personnel in FZJ
- New personnel for assembly in FZJ needed, discussions ongoing, additional training time needed
- Main next step: STT module assembly
- STT complete sector set-up and data-taking (cosmics, ^{90}Sr , ..)
- Resources for next 3-5 years must be allocated

New PANDA – TS

(New Layout and Dimensions (?))

- Magnet and field strength
 - DIRC layout, target geometry
- STT-backward region open or closed
- STT dimensions (outer radius)
- Tracking volume and resolution

- SIS 18/100: beam rates
- Interaction rates
- Particle rates, magnet field strength
- Maximum rates innermost straw layers
 - < 1 MHz/straw
 - < 20 kHz/cm ($\theta \sim 90^\circ$)



PANDA – STT Implications

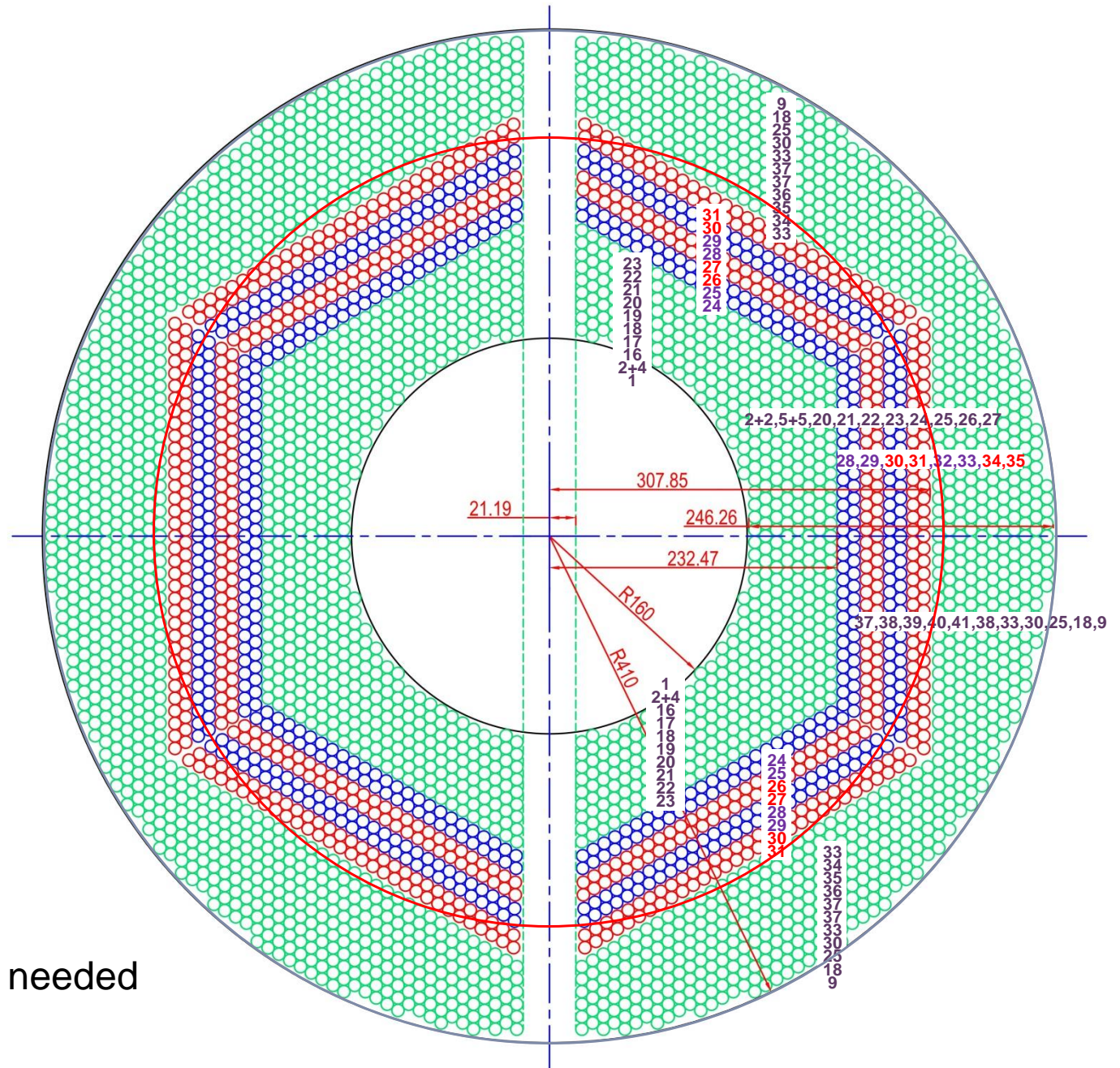
(Dimensions and Layout)

- PANDA org: $R_{\text{outer}} = 44.8 \text{ cm}$
- PANDA new (?): $R_{\text{outer}} = 33.6 \text{ cm}$
- RED ring: 32 cm : $L' \sim 0.75 \times L$
- But axial/stereo layout to be modified (?)
- Radial filling: ~ 8 axial + 8 stereo-layers

$$\left(\frac{\sigma_{p_{tr}}}{p_{tr}}\right) = \sqrt{k_1(\sigma_r, N) \times \left(\frac{p_{tr}}{BL^2}\right)^2 + k_2 \times \left(\frac{1}{B\sqrt{LX_0}}\right)^2}$$

$$\left(\frac{\sigma_{p_{tr}}}{p_{tr}}\right) = \sqrt{k_1(\sigma_r, N) \times \mathbf{1.8^2} \times \left(\frac{p_{tr}}{BL^2}\right)^2 + k_2 \times \left(\frac{1}{B\sqrt{LX_0}}\right)^2}$$

Simulation: expected particle rates in STT volume needed



**Thank you
for
your attention**

