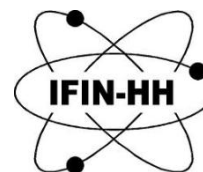




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# STT News & Activities

Peter Wintz (FZJ) for the STT group

**XLIX. PANDA Meeting, TRK session, June-10th, 2014**

# STT News & Activities

- STT wiki
- PANDA scrutiny process
- STT construction status
- Beam tests 2014

# STT Wiki

- Foswiki page: <https://panda-wiki.gsi.de/STT>
  - login with your PANDA foswiki account
- Common basis for news, information, material collection (pptx) ..

STT Editieren Anhang

Sie sind hier: Foswiki > STT Web > WebHome (26 May 2014, PeterWintz)

**PANDA Straw Tube Tracker (STT)**

Welcome to the home of Foswiki:STT. This is a web-based collaboration area for the PANDA Straw Tube Tracker group.

For further informations please contact [Peter Wintz](#).

→ [PeterWintz](#).

**Public information**

[General description](#) of the central PANDA Straw Tube Tracker (STT). The [Technical Design Report](#) of the STT has been approved (Jan 2013) after an evaluation by the [Expert Committee Experiments at FAIR](#) and is published. A recent [summary talk](#) about the PANDA Straw Tube Tracker was given at the LEAP 2013 conference. More talks and publications can be found in the [Publication list](#).

**STT group (Germany-Italy-Poland-Romania-U.S.A.)**

IFIN-HH Bukarest-Magurele, AGH Cracow, Jagiell. Univ. of Cracow, IFJ PAN Cracow, GSI Darmstadt, Northwestern Univ. Evanston, INFN and Univ. of Ferrara, INFN Frascati, INFN and Univ. of Pavia, and FZ Juelich.

**Internal information**

**News**

- July-21, 2014: First beam test week in 2014.
- Jan - to date, 2014: Ongoing preparations of straws and readout systems with cosmic test measurements.
- Dec-18, 2013: Setup of straw test system with ASIC+TRBv3 DAQ at COSY (Cracow/Juelich).
- Oct/Nov, 2013: Tests for analog amplifier + cabling design for FADC readout ongoing.
- Oct/Nov, 2013: Precise measurement of straw mechanics (pressurized length, diameter) ongoing.
- Sep 2013: First straw productions with (final) mylar tubes started. Leakage tests successful.

**Beam tests**

Beam times allocated for STT tests in 2014 (at COSY, Juelich):

- 1 week, starting July-21 (cw 30), protons at 3.0, 0.8, 0.6 GeV/c
- 1 week, starting Oct-20 (cw 43), deuterons at 2.0, 1.3, 1.0 GeV/c
- 1 week, starting Dec-1 (cw 49), protons at 2.0, 1.3, 1.0 GeV/c

Beam weeks are from monday-monday. The COSY beam time schedule can be found here: [COSYSchedule2014.pdf](#)

[STT workshops & meetings](#)

## Publication List

List of selected recent talks and publications:

### Technical Design Report:

- PANDA Collaboration, "Technical design report for the PANDA ([AntiProton](#) Annihilations at Darmstadt) Straw Tube Tracker", Eur.Phys.J. A49 (2013) 25, <http://dx.doi.org/10.1140/epja/i2013-13025-8>.

### General STT topics:

- P. Wintz for the PANDA Tracking Group, "The central straw tube tracker in the PANDA experiment", LEAP 2013 - 11th International Conference on Low Energy Antiproton Physics, Hyperfine Interaction, [http://dx.doi.org/10.1142/9789814](#)
- K. Pysz et al., "Tracking with Straw Tubes in the PANDA Experiment", INPC 2013 – International Nuclear Physics Conference, EPJ Web of Conferences 66, 11007 (2014), <http://dx.doi.org/10.1051/epjconf/201466>
- P. Gianotti et al., "The Straw Tube Trackers of the PANDA Experiment", IEEE Xplore publication (2013), <http://arxiv/1307.4537>.
- P. Wintz et al., "The Tracking system in the PANDA Apparatus", 13th ICATPP Conference on Astroparticle, Particle, Space Physics and Detectors for Physics Applications (2011), <http://dx.doi.org/10.1142/9789814>
- P. Gianotti et al., "Tracking with Straw Tubes in the PANDA experiment", 13th ICATPP Conference on Astroparticle, Particle, Space Physics and Detectors for Physics Applications (2011), <http://dx.doi.org/10.1142/9789814>
- S. Costanza et al., "A straw tube detector for the PANDA experiment", 23rd Conference on High Energy Physics (IFAE 2011), Nuovo Cim. [C03AN06](#) (2011) 94-96, <http://dx.doi.org/10.1393/nccl/2011-11017-6>.
- S. Costanza et al., "The straw tube tracker of the PANDA experiment", 11th Pisa Meeting on Advanced Detectors, Nucl Instrum Meth: A617 (2010) 148-150, <http://dx.doi.org/10.1016/j.nima.2009.06.105>.

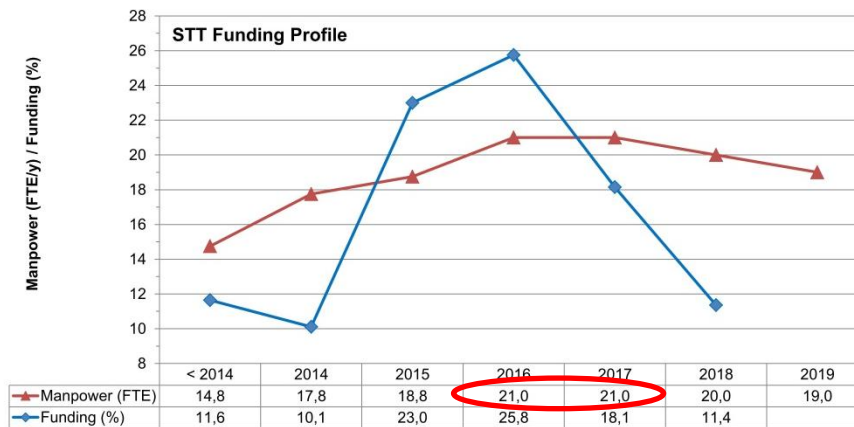
### Specific STT topics:

- L. Jokhovets et al., "Investigation of an ADC Based Signal Processing and Design of an ATCA Data Acquisition System Unit for the Straw Tube Tracker at PANDA", IEEE Nuclear Science Symposium and Medical Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors workshop, Seoul, South Korea, 10/27/2013 - 11/02/2013, ([http://user-6-juelich.de/record/150725](#)).
- M.C. Mertens for the PANDA collaboration, "Triplet based online track finding in the PANDA-STT", J.Phys.Conf.Ser. 503 (2014) 012036, <http://dx.doi.org/10.1088/1742-6596/503/1/012036>.
- M.C. Mertens et al., "Triplet based online track finding in the PANDA-STT", LEAP 2013 - 11th International Conference on Low Energy Antiproton Physics, Hyperfine Interaction, <http://dx.doi.org/10.1007/9789814>
- S. Jowzaee et al., "Particle identification using the time-over-threshold measurements in straw tube detectors", Nucl. Instrum. Meth. A718 (2013), 573-574, <http://dx.doi.org/10.1016/j.nima.2012.11.119>.
- P. Wustner et al., "Sophisticated online analysis in ADC boards", Real Time Conference (RT), 2012 18th IEEE-NPSS, DOI <http://dx.doi.org/10.1109/RTC.2012.6418220>.
- P. Kulesza et al., "A sampling ADC as a universal tool for data processing and trigger application", 50th International Winter Meeting on Nuclear Physics, [PoS Bormio2012](#) (2012).
- P. Kulesza et al., "Application of straw detector for particle identification: Feasibility studies with PANDA STT prototype", 49th International Winter Meeting on Nuclear Physics, [PoS Bormio2011](#) (2011) 010.
- K. Pysz et al., "Experimental results of the dE/dx resolution measurement in PANDA-type Straw Tube Tracker", 49th International Winter Meeting on Nuclear Physics, [PoS Bormio2011](#) (2011) 011.

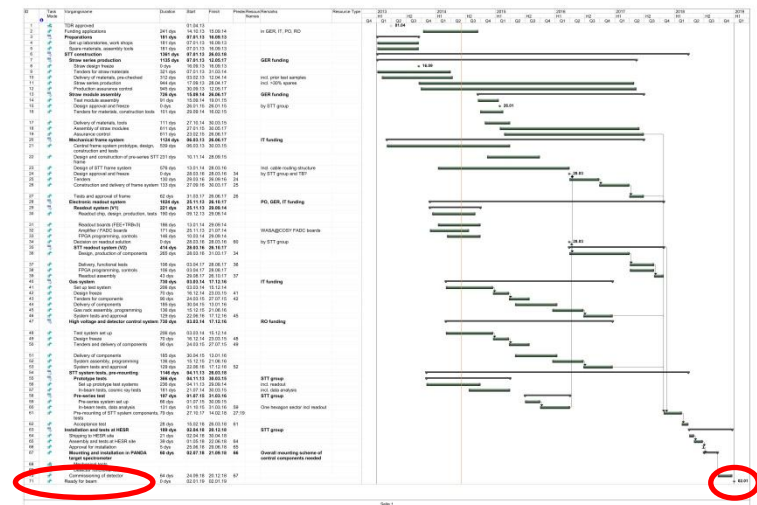
.. still in progress ..

# STT Scrutiny Process

- PANDA scrutiny process still ongoing
  - Questionnaire for each system: STT report with 100× Q&A
  - Issues: technical, software, project plan, financing ..
- STT funding profile and project plan (2013-2018)



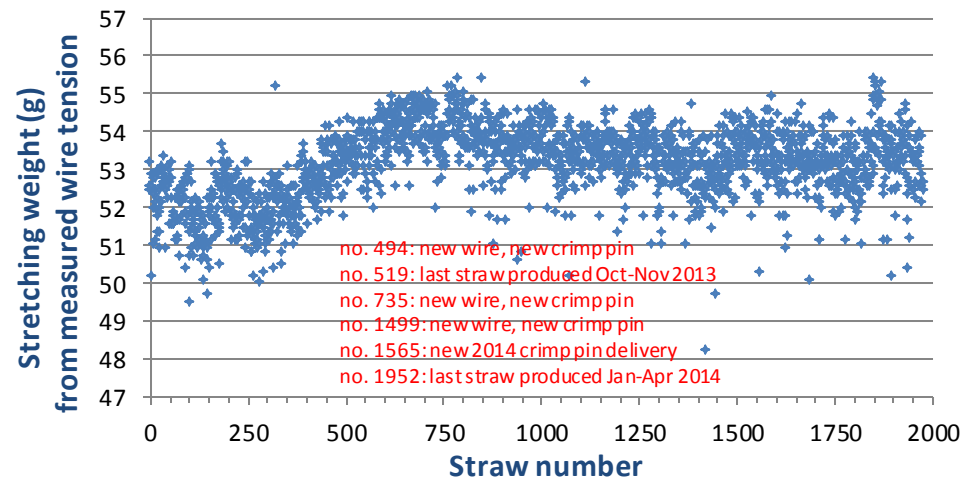
WPs: straw series production, assemblies & tests, technical system design, readout design, chip design, FPGA programming, test systems and measurements, software, data-analysis, ..



**STT in PANDA commissioned and ready for beam: 2. Jan. 2019**

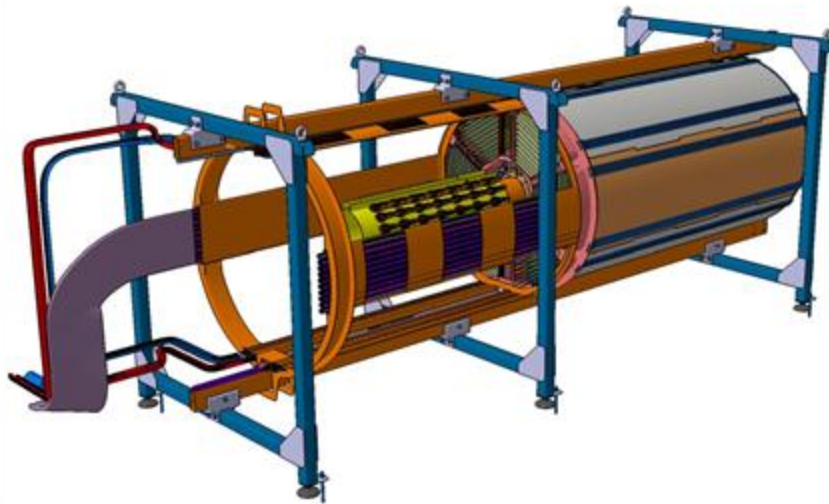
# STT Construction: Straws

- Straw series production & assurance tests: ~ 1950 straws to date
  - Leakage: ok for specific straw winding type (no strip self-overlap, wall  $d=27\mu\text{m}$ )
  - Wire tension: measured  $\langle m \rangle = 53.1\text{g} \pm 1.0\text{g}$  ( $\sigma$ ), nominal:  $m=50\text{g}$  (stretch weight)
    - Indicates smaller wire diam.  $\varnothing=19.4\mu\text{m}$  (nominal  $20\mu\text{m} \pm 4\%$  weight)
    - Safe below elastic wire limit ( $m=70\text{g}$ )
- Long-term test: 200 straws @ 2bar for 6 months, repeat tension meas.mnt
- Low production loss on 1% level
- Next steps: straw module gluing
- Straw pitch 10.14mm, final check
- Then: define all straw positions

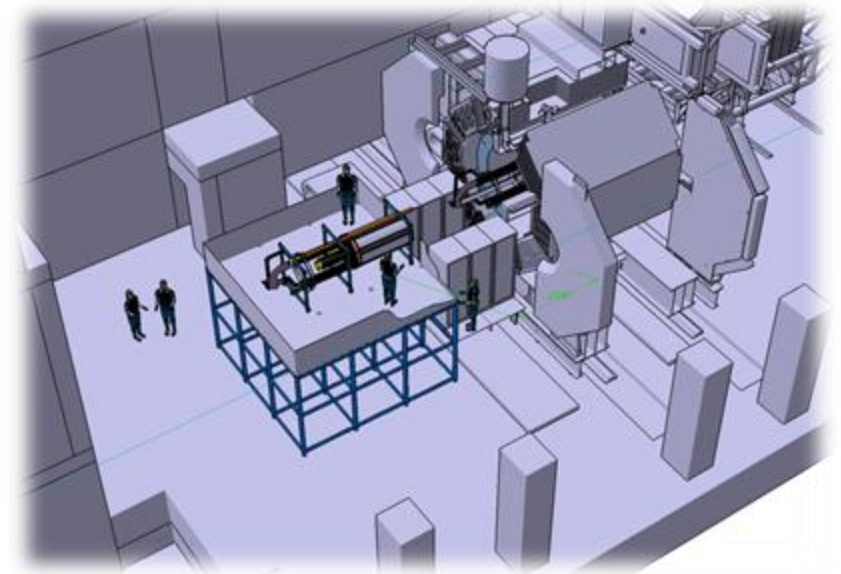


# STT Construction: System Layout

- Overall system layout
  - STT mech. frame structure: straw modules, services, cable routing ..
  - Central frame structure: beam pipe + MVD + STT
- Installation procedures, list of all assembly steps



***Drawings from Dario's talk  
in tomorrow's TB***



# STT Construction: Electronic Readout

- ToT-ASIC/TRB readout
  - PASTTREC chip, CMOS 0.35 $\mu$ m, 8 ch per chip
  - Aim for next chip production run in July
  - Front-end readout boards in preparation
  - TRBv3 boards ordered, FPGA programming
  - Reminder: 96-ch prototype system running since Dec-2013, cosmic-tests
  
- FADC based readout:
  - Modified setup (128-ch) for beam test, cosmic tests ongoing
  - Direct cabling to straws by thin coax ( $\varnothing=0.5$ mm), all electronics back-end
  - Analog amplifiers produced
  - Test 240/120 MHz sampling options for pulse shape
  - FPGA programming ongoing (pulse shape, baseline determ., ..)

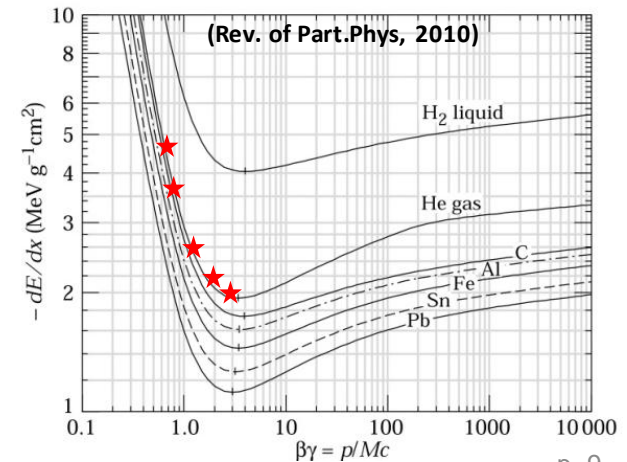
# STT Construction: Supply Systems

- Adding supply and control systems to STT test systems
- Leave straw systems in Juelich in steady operation (cosmic tests)
  - 192 straws, optional: more straws
- Option: STT semi-barrel (prototype), equipped with all gas manifolds
- “Strawnet“ with remote access set up ([ikpstraw01.ikp.kfa-juelich.de](http://ikpstraw01.ikp.kfa-juelich.de))
  - Router PC + DAQ-PC ([ikpstraw02](http://ikpstraw02))
  - ASIC+TRB readout control
  - Ethernet-controlled power lines (switch off lines from remote)
  - Start/stop data-taking, ASIC settings, .. (remotely controlled by Krakov)
- Option to add more control PCs (gas, DCS, ..)



# Beam Tests 2014

- Schedule: **3x1 week** allocated for STT tests
  - 1 week starting **July-21 (cw 30)**, protons, 3x diff. momenta
  - 1 week starting Oct-20 (cw 43), deuterons, 3x diff. momenta
  - 1 week starting Dec-1 (cw 49), protons, 3x diff. momenta
  - momentum range: 0.6 – 3.2 GeV/c (p/d), **dE/dx range: ~ 5× mips**
- Goals
  - readout with **high particle rates (~ 1MHz/straw)**
  - cover **full dynamical signal range**
  - dE/dx reconstruction (non-linear fit)
  - **pid: proton / deuteron separation**
  - comparable to proton / kaon separation at PANDA with  $p < 0.8 \text{ GeV}/c$



# Beam Test Preparations

- **Two straw setups & readouts** (amplitude/time)
  - **Ar/CO<sub>2</sub> (10%), 2 bar** pressure (absolute)
  - HV-range: 1700-1900V
  - **Default HV=1800V (5x10<sup>4</sup> gas gain)**
  - Low thresholds
- **Cosmic-ray tests ongoing** (+ pulser, <sup>55</sup>Fe)
  - Tune settings, threshold optimisations..
  - Develop analysis software & methods
  - Calibrations: isochrone - drift time, dE/dx
  - Tracking (hit filtering, re-fits), resolution
- **Important:** same **pre-defined settings** (straw-HV / electronic params.) to check coverage of signal dynamical range (dE/dx ~ 5× mips)



*2 straw setups, beam coming from the back*