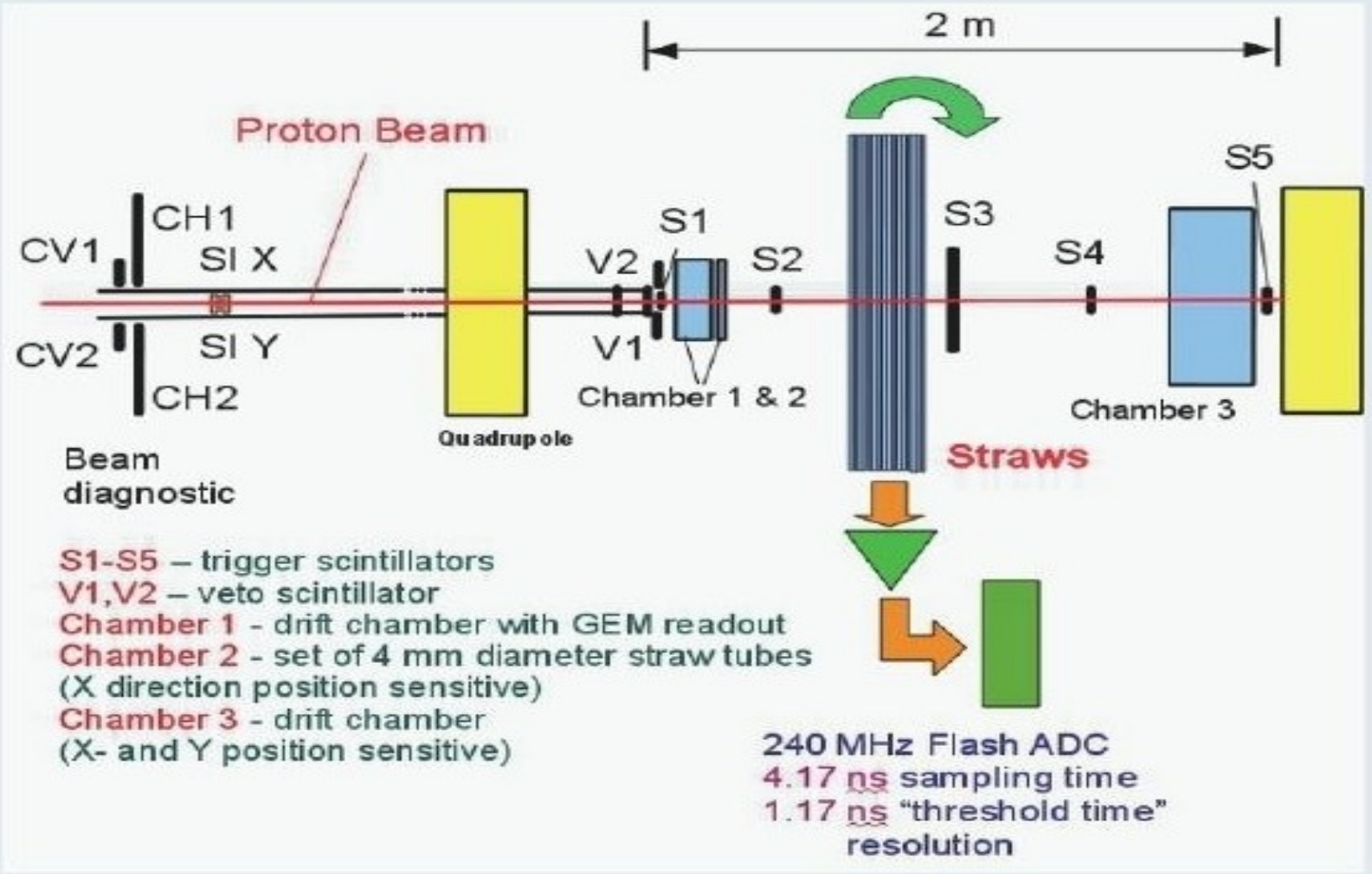
Upgrades of the STT beam tests at COSY.

Valery Serdyuk, FZJ Julich

Beam time for STT at COSY– 3 weeks in 2014

- 3 beam times are planned in 2014 for STT prototypes tests at COSY Big Karl beam setup
- cw 30, July 21 , protons 3.0, 0.8, 0.6 GeV/c
- cw 43, Oct 20 , deuterons 2.0, 1.3, 1.0 GeV/c
- cw 49, Dec 1 , protons 2.0, 1.3, 1.0 GeV/c

Preparation for the July 2014 beam time with different types of electronics.
Refurbishing of the chamber mechanical support → improve precision of detectors relative positions, measurements, alignment. Addition of a new DC package.
Improvement of the on-line monitoring – optimizations of beam shapes and controlling on-line raw data histograms:
beam profiles (beam divergence), bunch time structure, drift time spectra, multiplicities
for FQDC readout in addition – charge, amplitude spectra, baseline stability



Proton Beam:

Momentum: 2.85 GeV/c

Intensity: 1 - 6 x 10^3

Dimension: 1 cm (X), 4 cm (Y)

Detector Parameters:

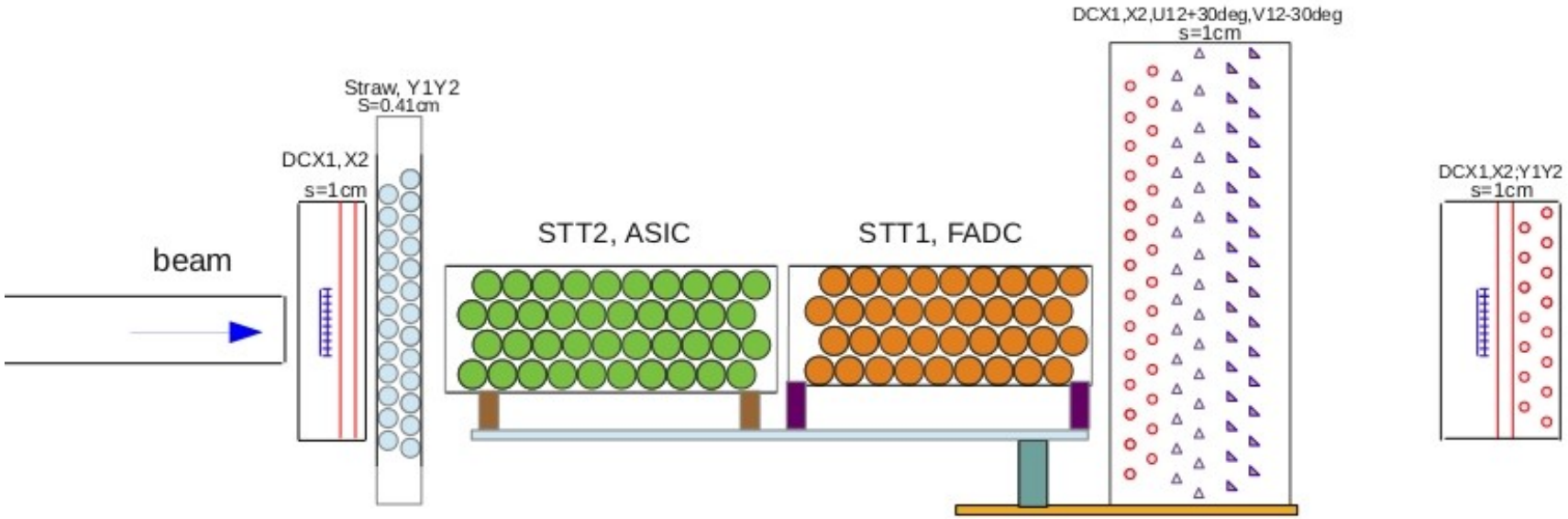
Gas: Argon + CO2 (9/1)

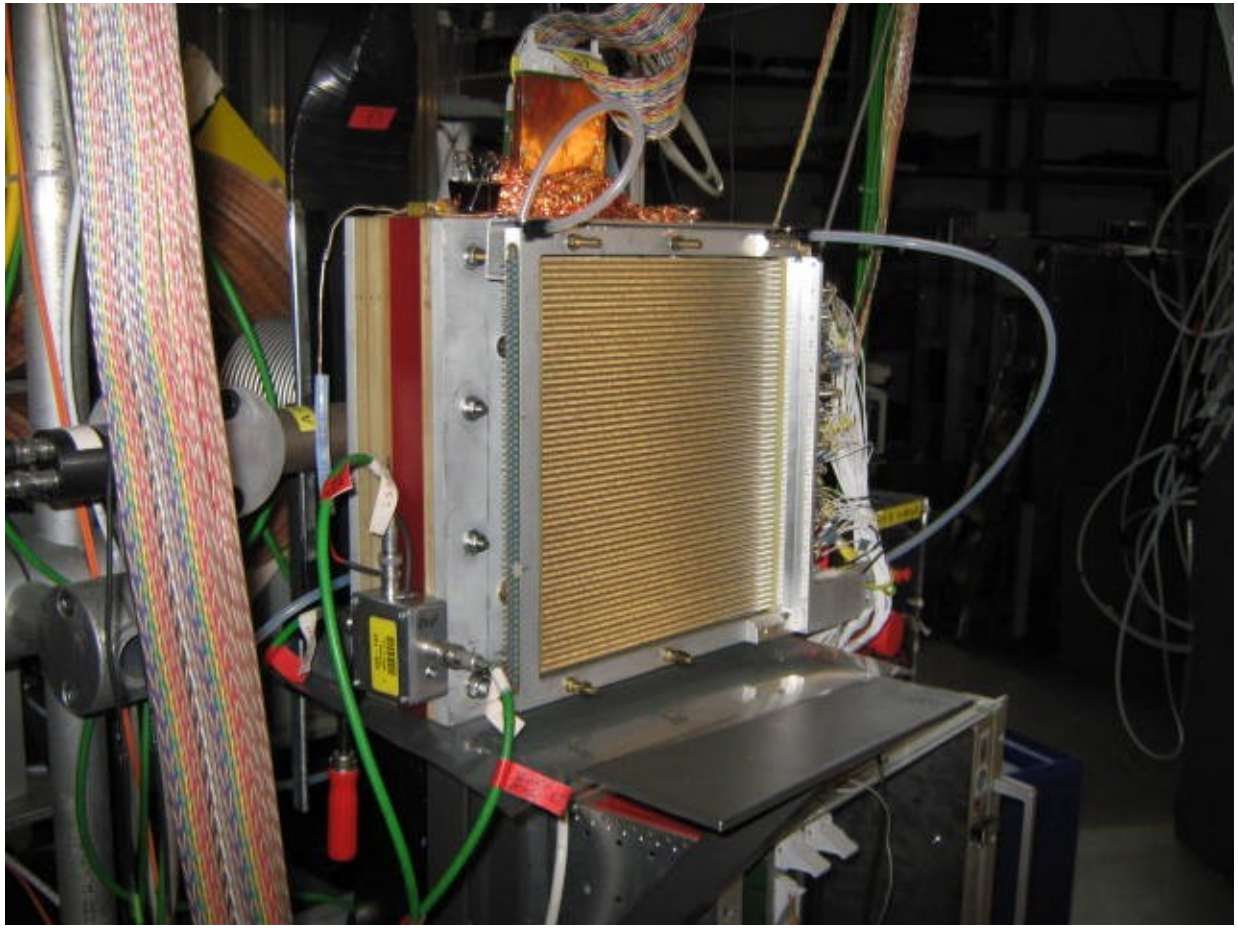
Pressure: 1 bar overpressure

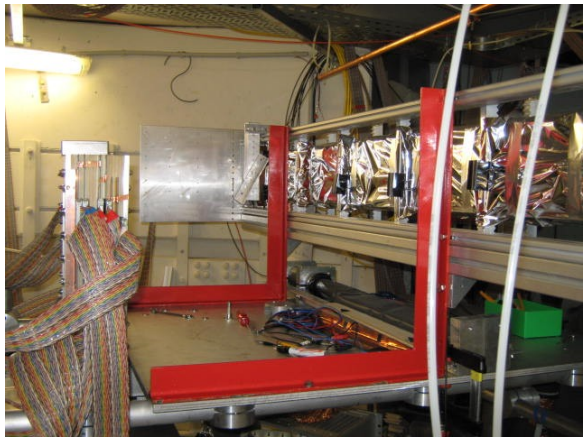
HV: 1800 - 1850 V

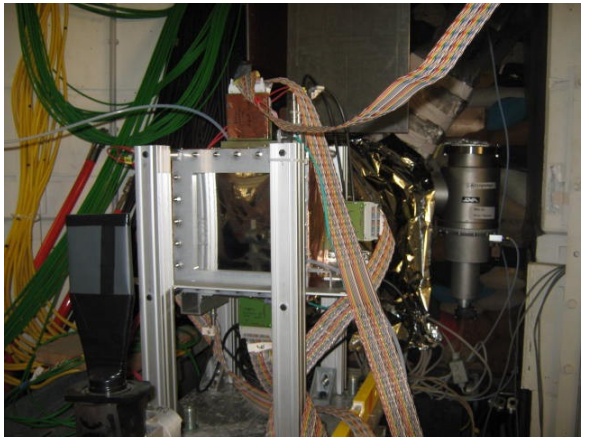
- 1st package – 2 drift chamber planes, 1 cm pitch, 2X- horizontal coordinate, 2 layers of 4 mm mylar straw tube, pitch 4.125 mm, 2Y- vertical coordinate.
- 2nd package – 6 drift chamber planes, 1 cm pitch, 2Y- vertical coordinate,

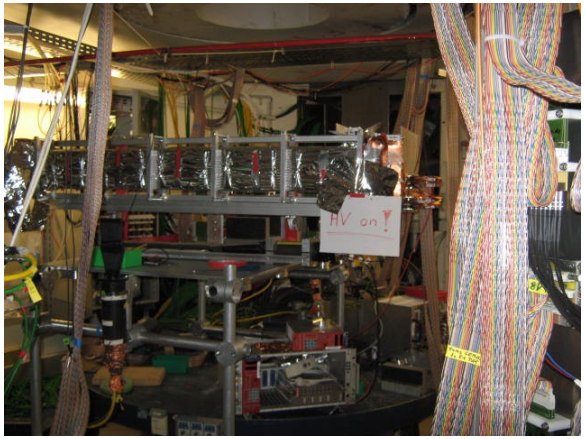
  2U-30deg, 2V+30deg inclined planes.
- 3rd package – 4 drift chamber planes, 1 cm pitch, 2X, 2Y.

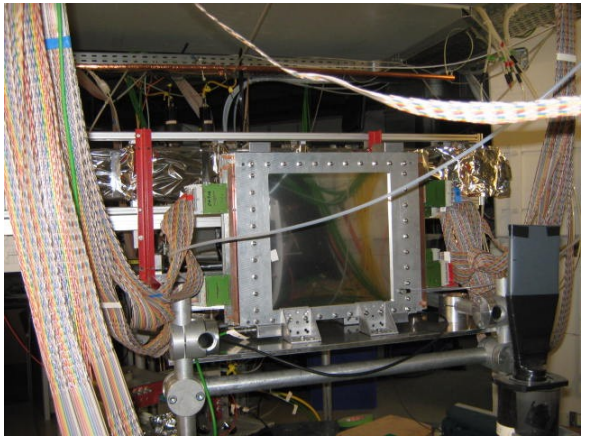

DCX1,X2,U12+30deg,V12-30deg
s=1cm
Straw, Y1Y2
S=0.41cm
DCX1, X2
s=1cm
beam
STT2, ASIC
STT1, FADC
DCX1,X2;Y1Y2
s=1cm







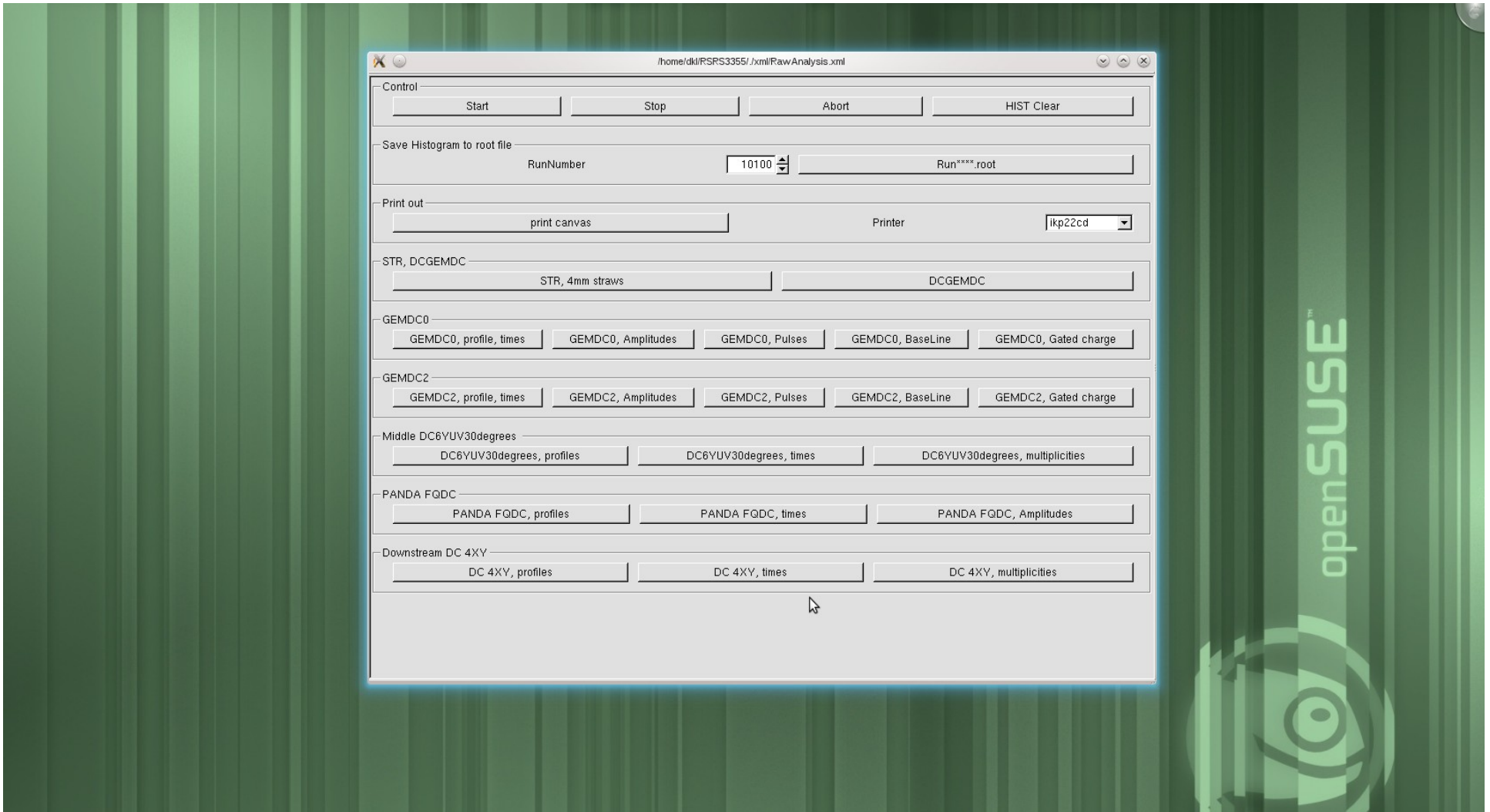

HV on



On-line monitoring in WASA ROOT sorter software

- drift chambers read out with CMP16 discriminators and F1 TDC, synchronously in one crate with FQDC modules (FPGA algorithms)
- improvement of the on-line monitoring – optimization beam shapes and control during the experiment raw data histograms
- beam profiles (beam divergence), bunch time structure, drift time spectra, multiplicities
- for FQDC readout in addition – the FPGA amplitude and charge spectra, baseline stability
- in principal – with 3 stations possible external tracking to use for off-line analysis and calibration

Graphical interface for the on-line monitoring



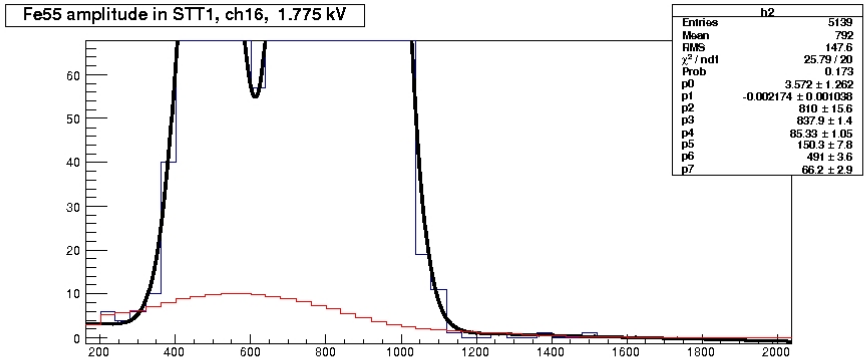
STT energy calibration with a 10 cm long Fe55 5.9 keV gamma source.

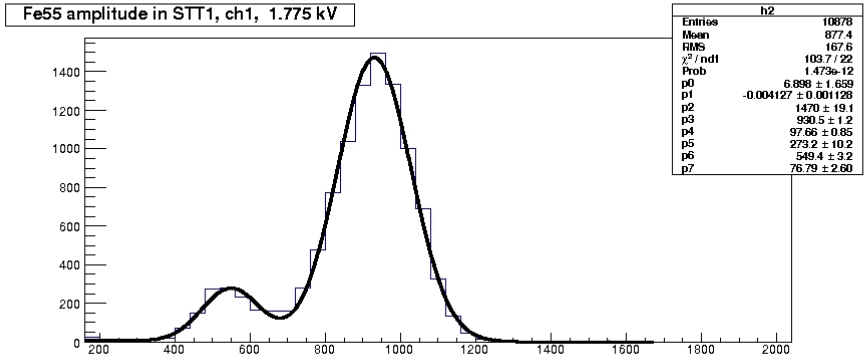
-From cluster data files -> ROOT file with Trees

-Production of files with histograms of pulse height distributions for each straw from ROOT files

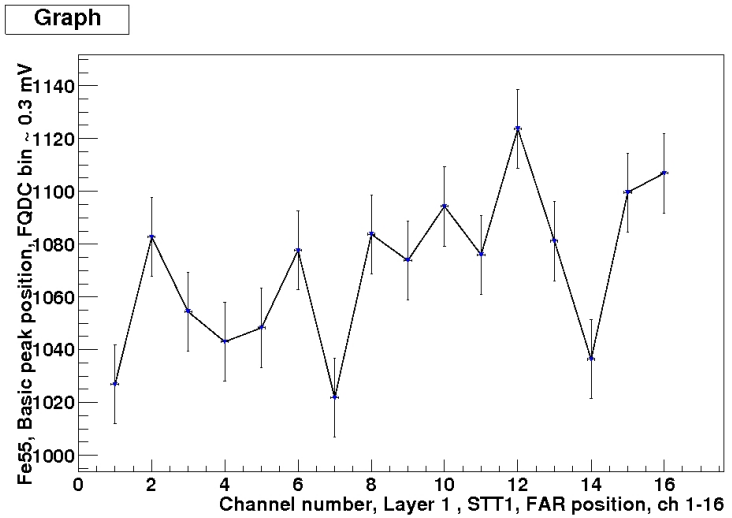
- Finding and fitting the peak is done by Tspectrum algorithm from ROOT.

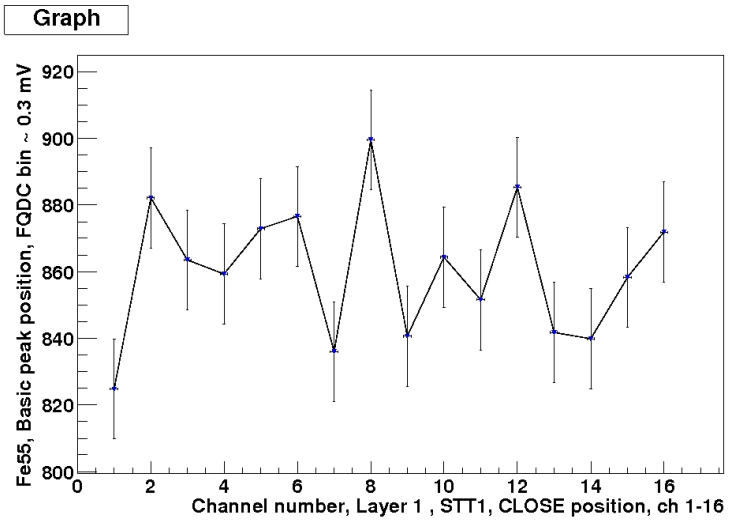
It finds the position of maximums in amplitude spectra and fit it with a double Gaussian distribution (basic absorption peak and Argon escape peak) and a linear background. The background is subtracted from the distribution and the fit parameter corresponding to the basic maximum is taken as energy calibration constant for a given straw. The vectors of calibration constant can be used in real data.

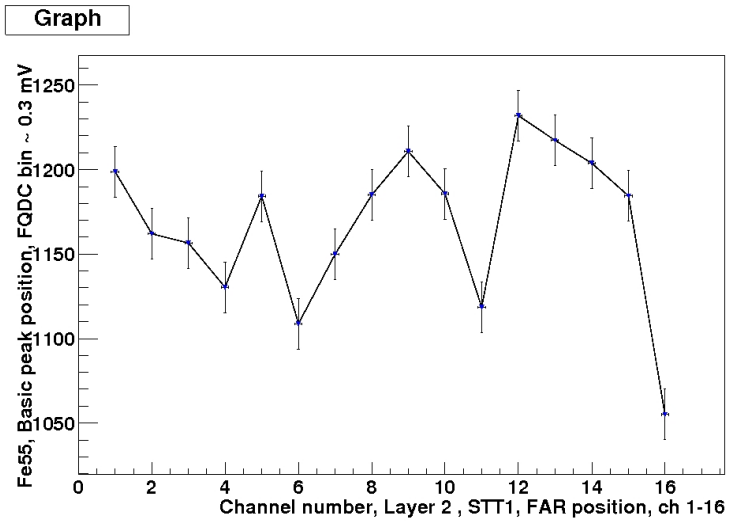

Fe55 amplitude in STT1, ch16, 1.775 kV
h2
Entries 5139
Mean 792
RMS 147.6
χ²/ndf 25.79 / 20
Prob 0.173
p0 3.572 ± 1.262
p1 -0.002174 ± 0.001038
p2 810 ± 15.6
p3 837.9 ± 1.4
p4 85.33 ± 1.05
p5 150.3 ± 7.8
p6 491 ± 3.6
p7 66.2 ± 2.9
0 10 20 30 40 50 60
200 400 600 800 1000 1200 1400 1600 1800 2000

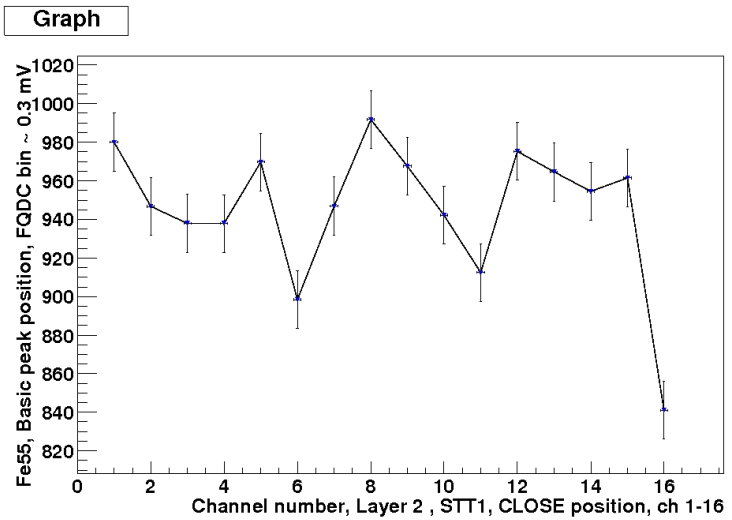

Fe55 amplitude in STT1, ch1, 1.775 kV
h2
Entries 10878
Mean 877.4
RMS 167.6
χ²/ndf 103.7 / 22
Prob 1.473e-12
p0 6.898 ± 1.659
p1 -0.004127 ± 0.001128
p2 1470 ± 19.1
p3 930.5 ± 1.2
p4 97.66 ± 0.85
p5 273.2 ± 10.2
p6 549.4 ± 3.2
p7 76.79 ± 2.60
0 200 400 600 800 1000 1200 1400
200 400 600 800 1000 1200 1400 1600 1800 2000

Calibration with Fe55, Layer 1, 2; FAR and CLOSE positions







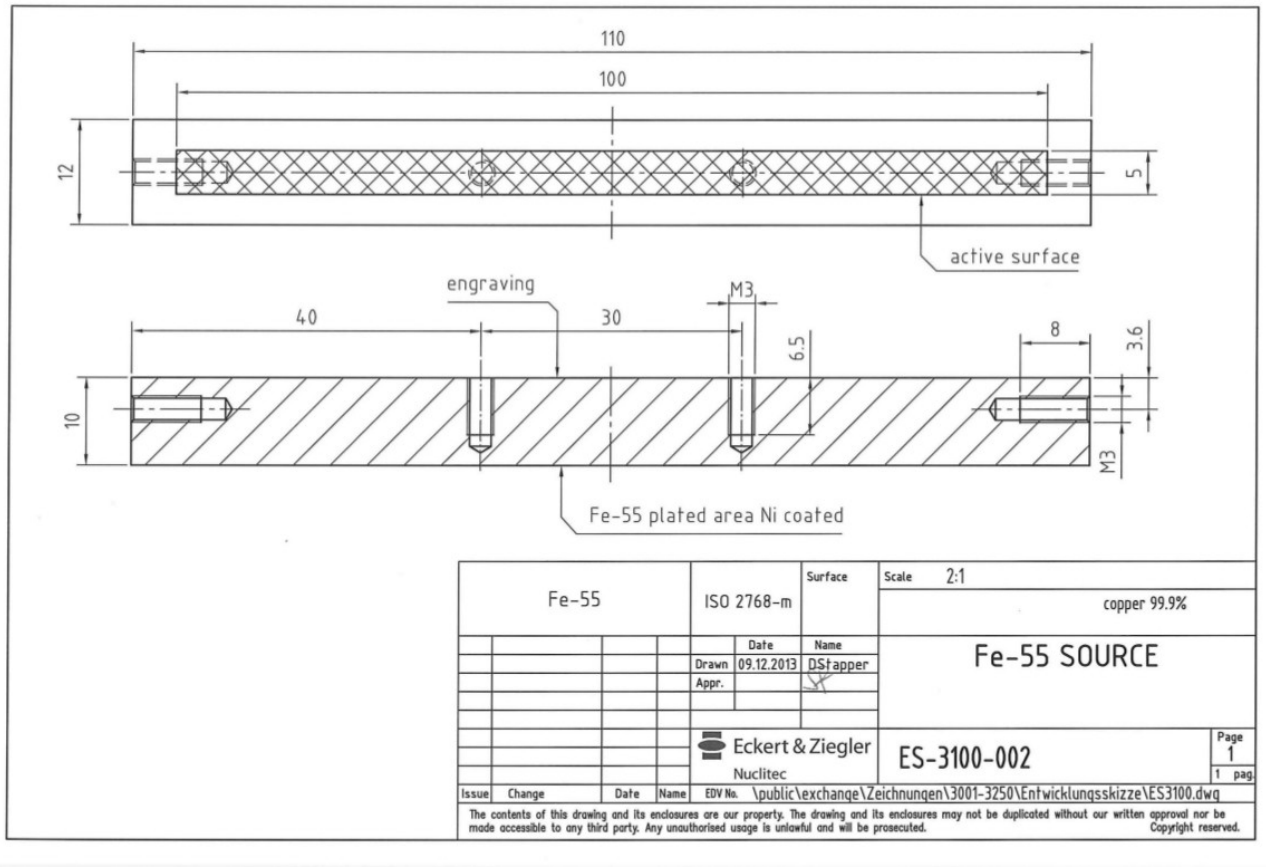


Summary

- Upgrade of the STT test setup at COSY. New mechanical support. Rearrangement of chamber positions. A 3rd package of drift chambers.
- New preamplifiers with time shapings and cables for the new generation FADC ready for beam tests in July.
- On-line monitor based on WASA ROOT Sorter framework developed for beam monitoring and data control .
- Energy calibration procedure with a long Fe55 gamma source checked and algorithm elaborate.

In progress

Mechanical tools for detector position measurements and alignment in preparation. Planned to be ready before the next beam time


110
100
12
5
active surface
engraving
M3
40
30
6.5
8
3.6
10
M3
Fe-55 plated area Ni coated
Fe-55
ISO 2768-m
Surface
Scale 2:1
copper 99.9%
Date
Name
Drawn 09.12.2013 DStapper
Appr.
Fe-55 SOURCE
Eckert & Ziegler
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Upgrade of the PANDA STT detector setup at COSY external beam line.
STT energy calibration procedure with a new Fe55 source.

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