Preliminary results of the December beamtime for FEE-free readout

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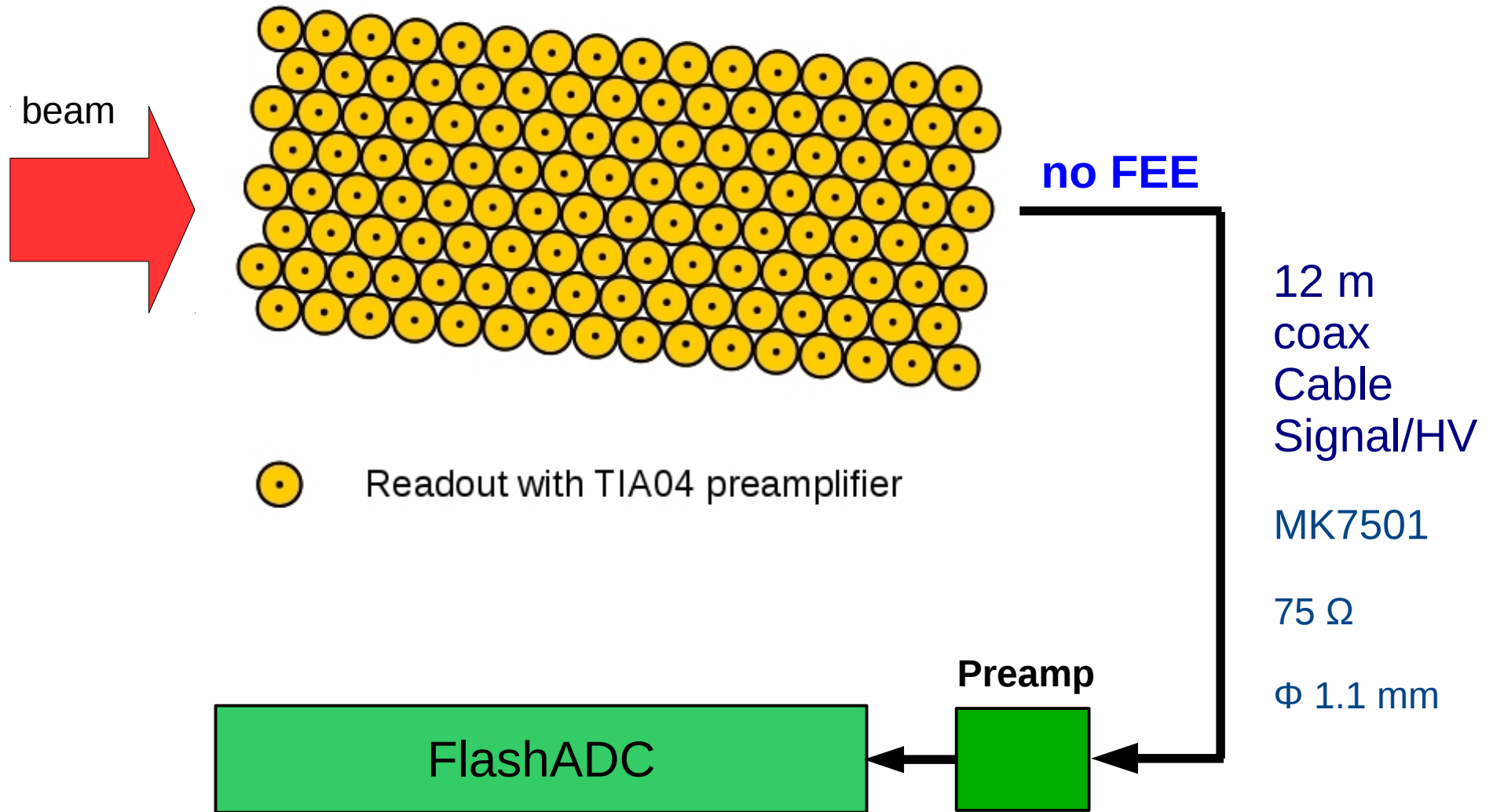**Henner Ohm** *(Forschungszentrum Jülich, IKP)*
Krzysztof Pysz *(IFJ PAN Kraków / Forschungszentrum Jülich, IKP)*
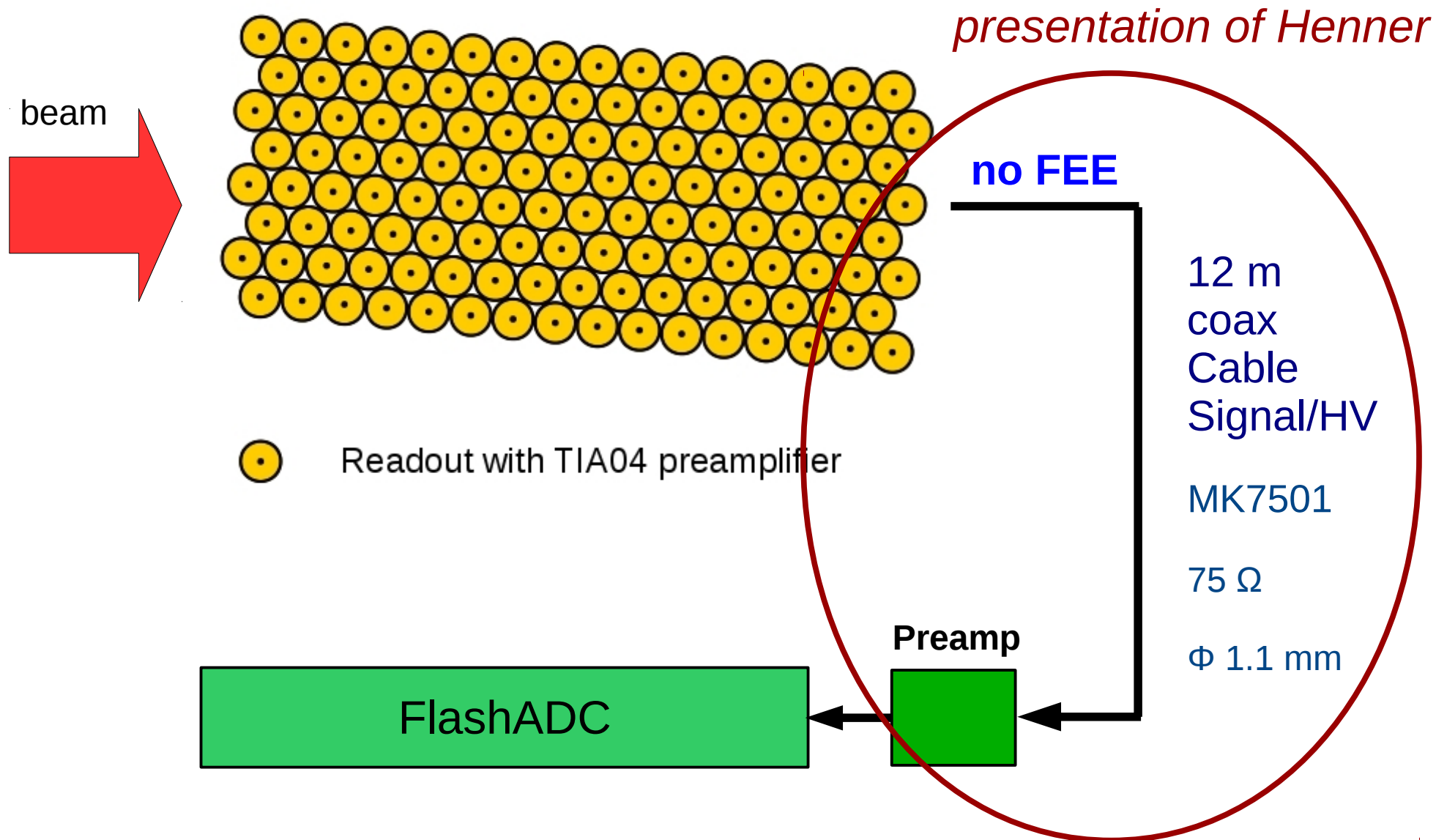**James Ritman** *(Forschungszentrum Jülich, IKP)*
Valery Serdyuk *(Forschungszentrum Jülich, IKP)*
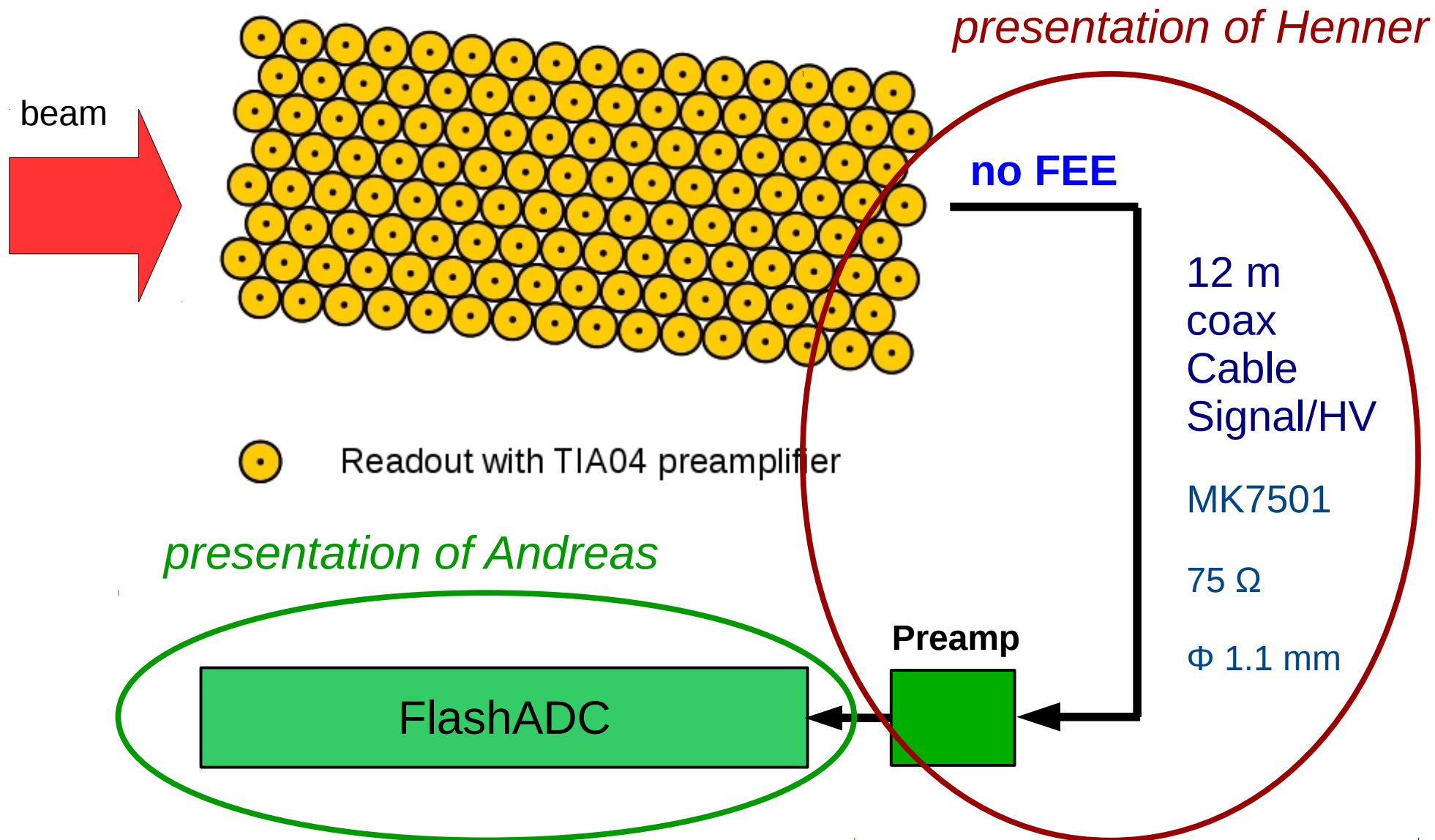**Peter Wintz** *(Forschungszentrum Jülich, IKP)*

December beamtime

beam

no FEE

Readout with TIA04 preamplifier

12 m
coax
Cable
Signal/HV

MK7501

75 Ω

Φ 1.1 mm

Preamp

FlashADC

December beamtime

presentation of Henner

beam

no FEE

12 m coax Cable Signal/HV

MK7501

75 Ω

Φ 1.1 mm

⊙ Readout with TIA04 preamplifier

Preamp

FlashADC

December beamtime

beam

presentation of Henner

no FEE

12 m coax Cable Signal/HV

MK7501

75 Ω

Φ 1.1 mm

Readout with TIA04 preamplifier
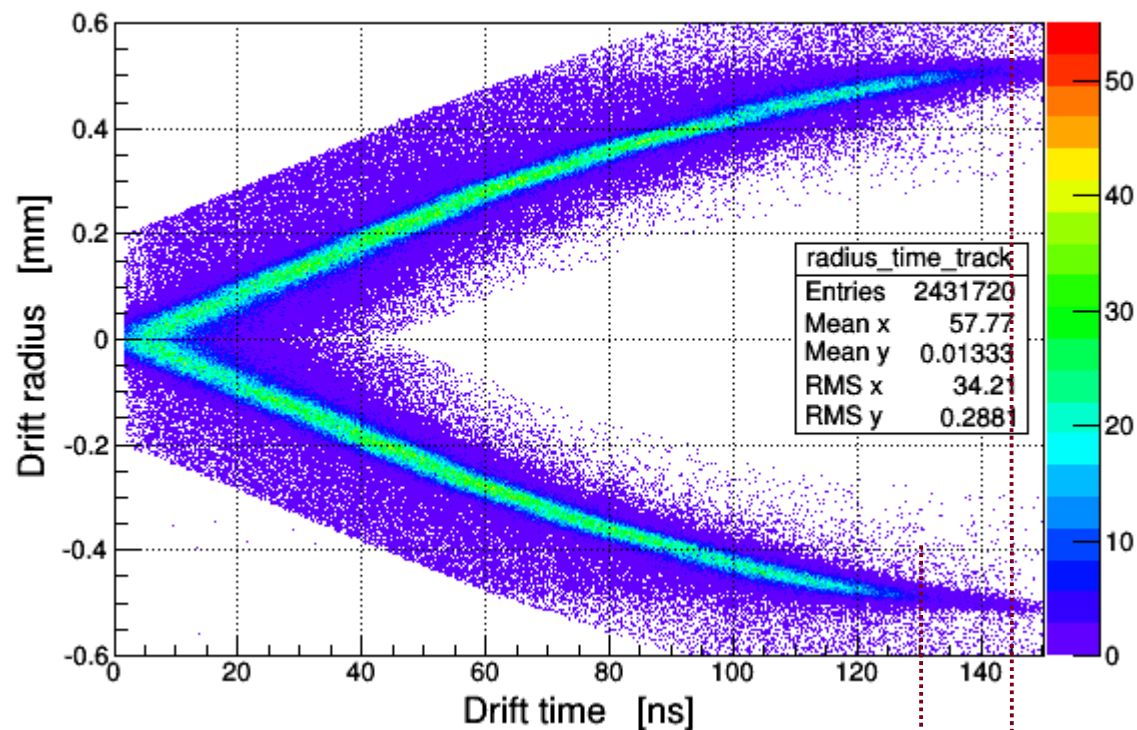
presentation of Andreas

FlashADC

Preamp

Improvement of STT1 geometry

Small deformation of STT1 prototype due to fixation of the straw ends identified and corrected.
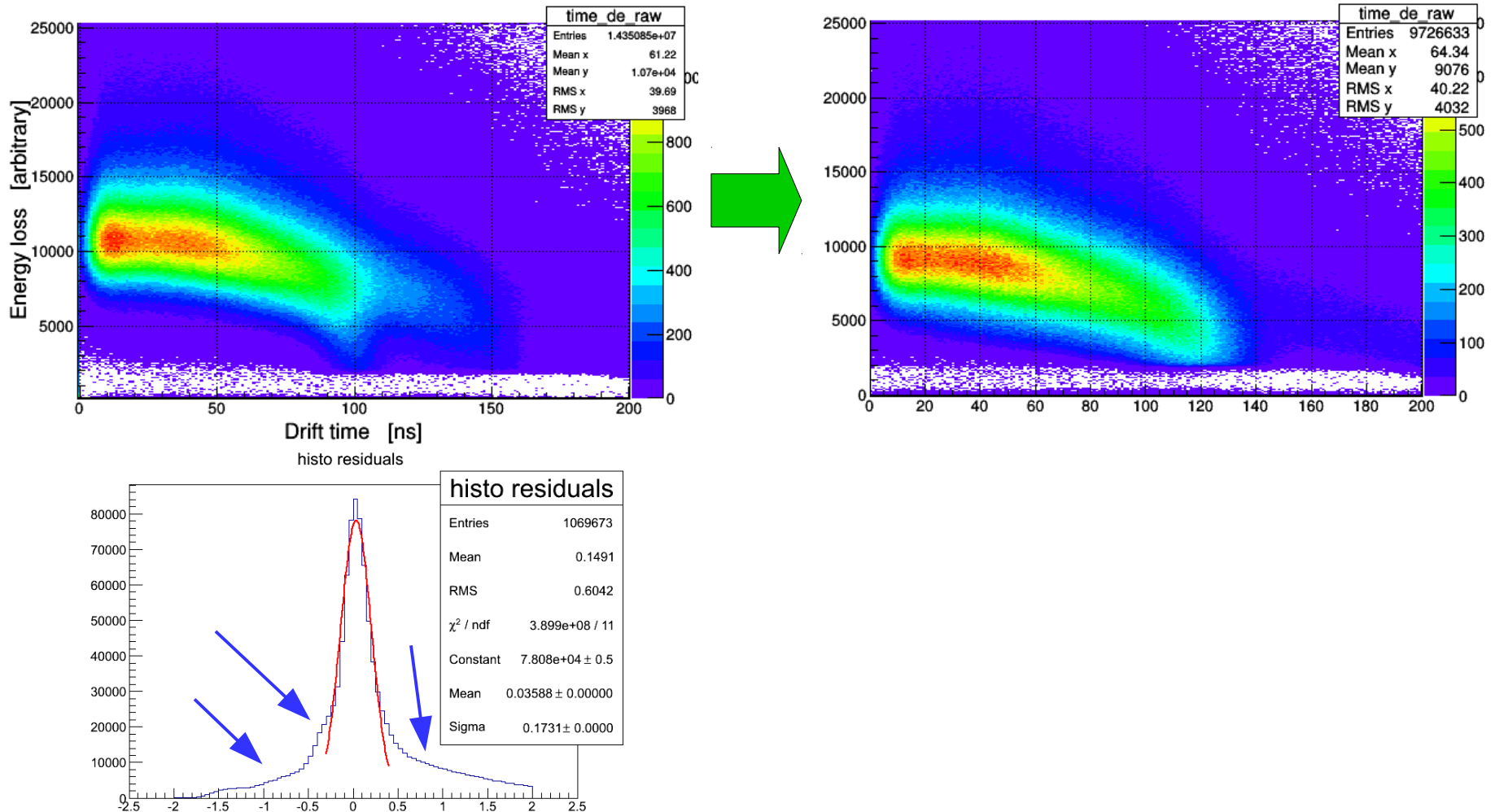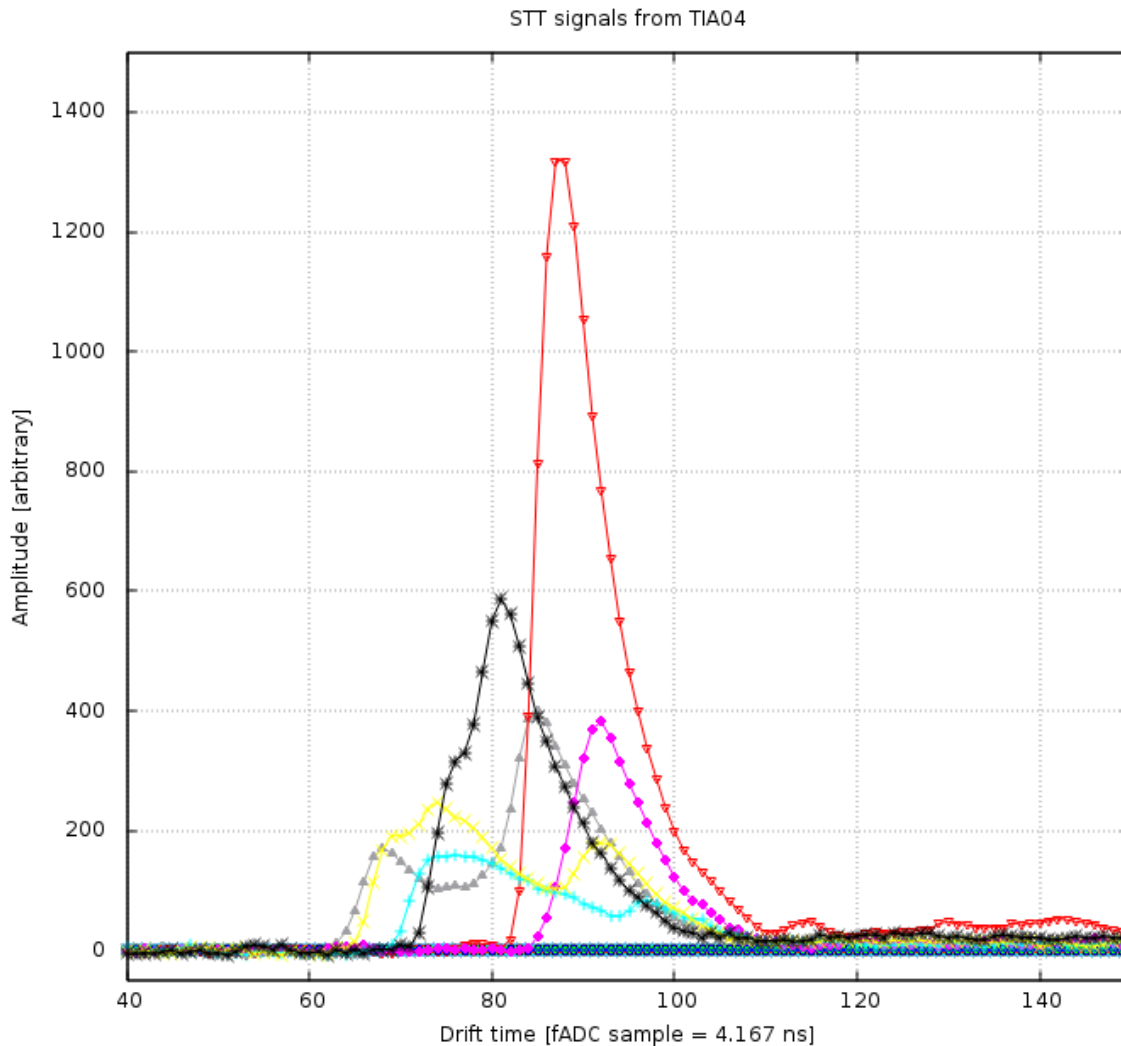
Current geometry of STT1

Still tiny displacement of the wires down resulting in the difference in up/down drift times ranges of ~ 15 ns
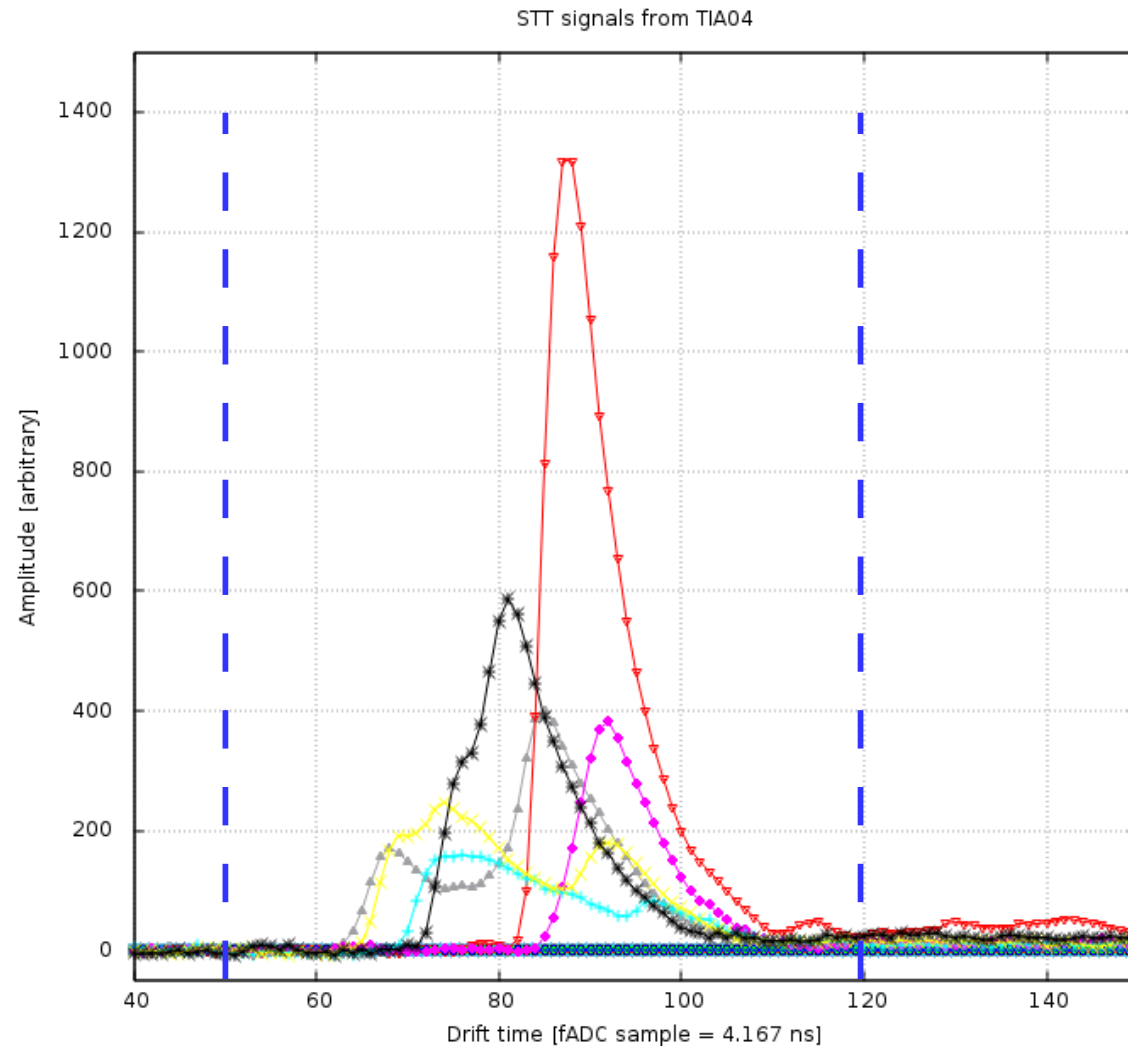
→ needs to be further investigated

~ 15 ns

Signals

- very low noise level (< 3 mV),

- rising edge with low curvature,

- 5 - 7 samples before maximum,

- trailing edge tail
  (due to a chain of capacitors
  in the current coupling
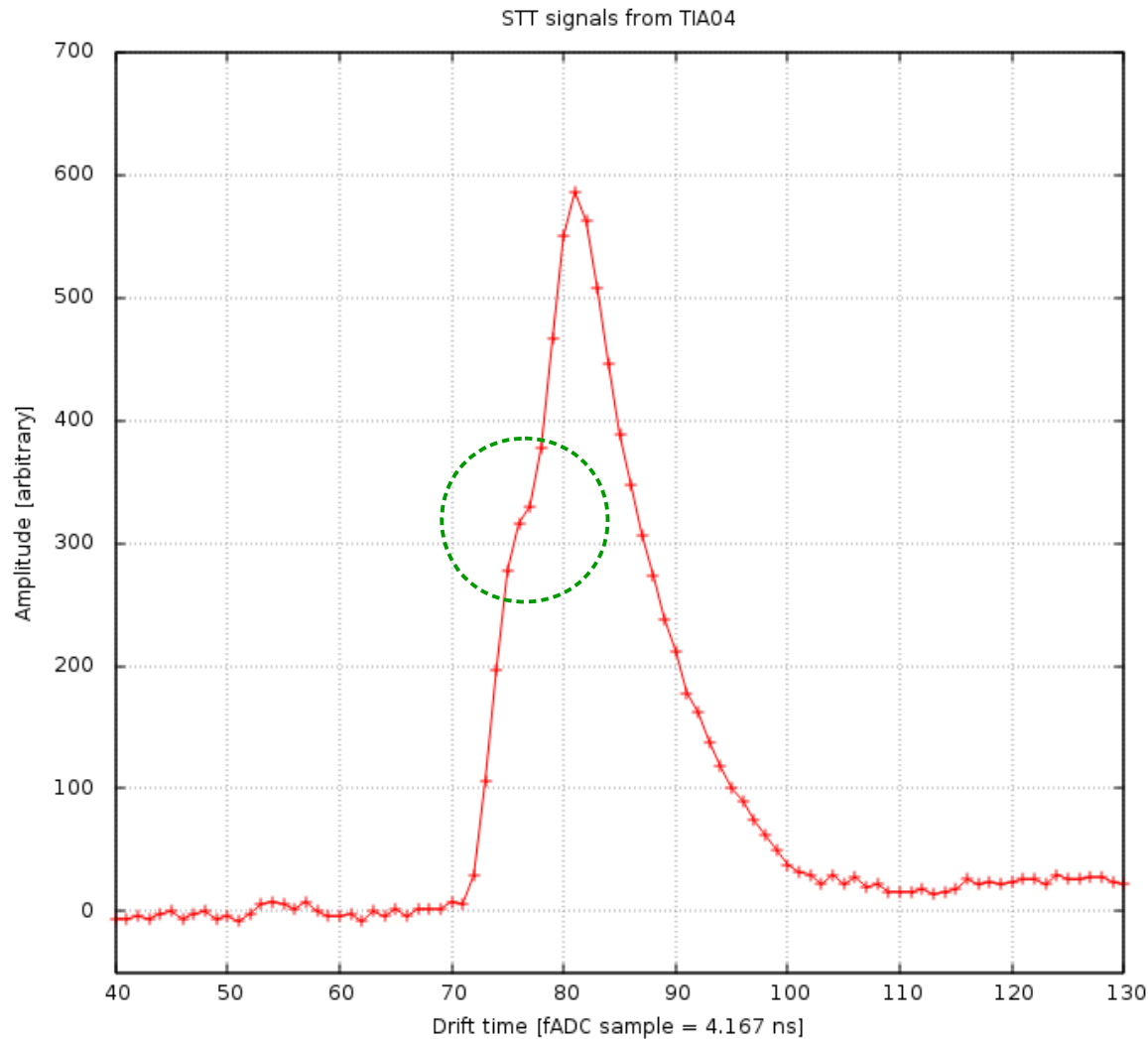 to fashADC - will be avoided
  in target system).

Energy loss estimation
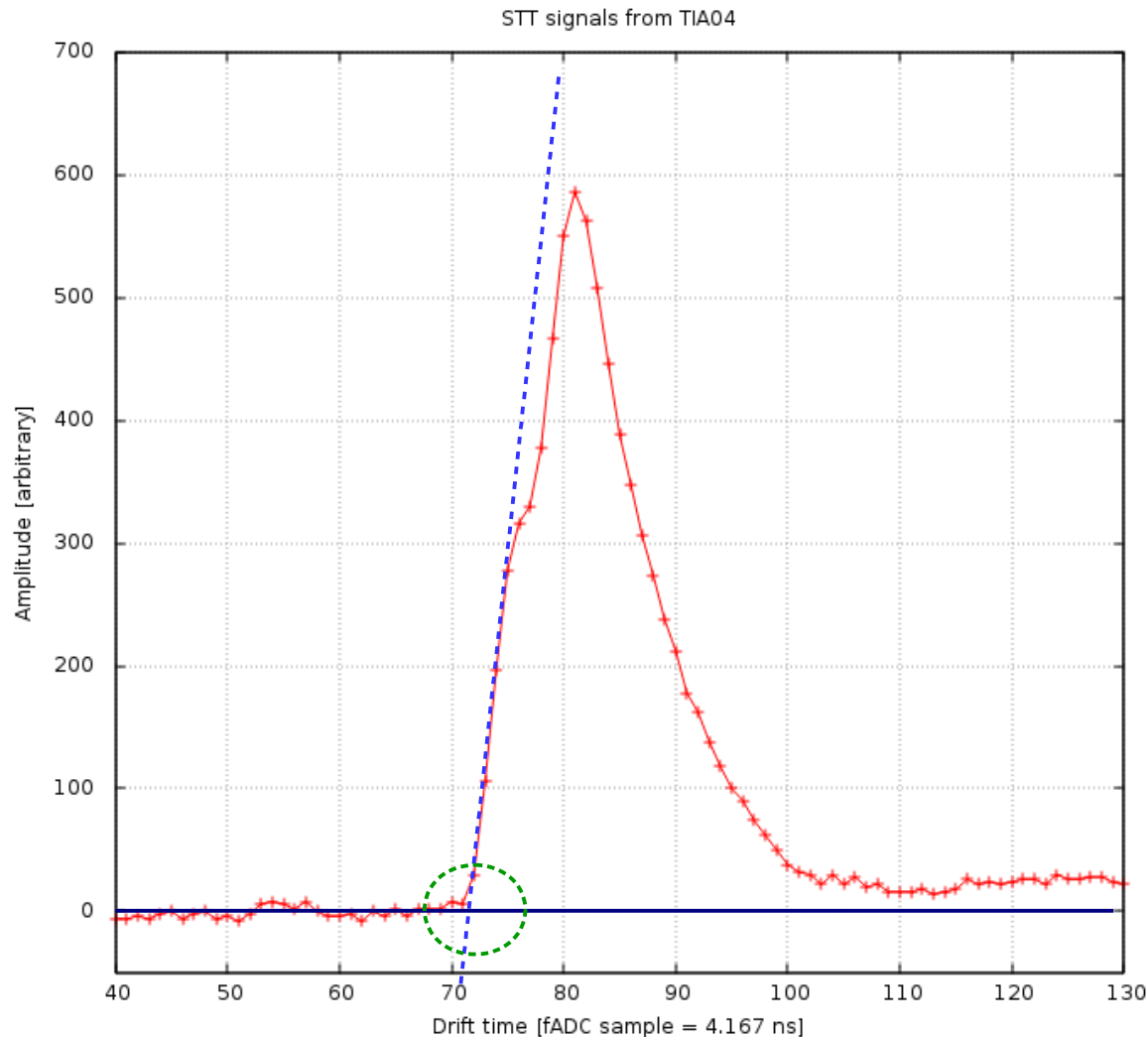

Preliminary analysis:

- **integration** between sample **50** and sample **120**
  $\rightarrow$ **dE**

- **normalization to path length**

- **truncation mean**

Time estimation – Zero Crossing Time

STT signals from TIA04

On the leading edge
derivative checked until
it starts to decrease

Time estimation – Zero Crossing Time
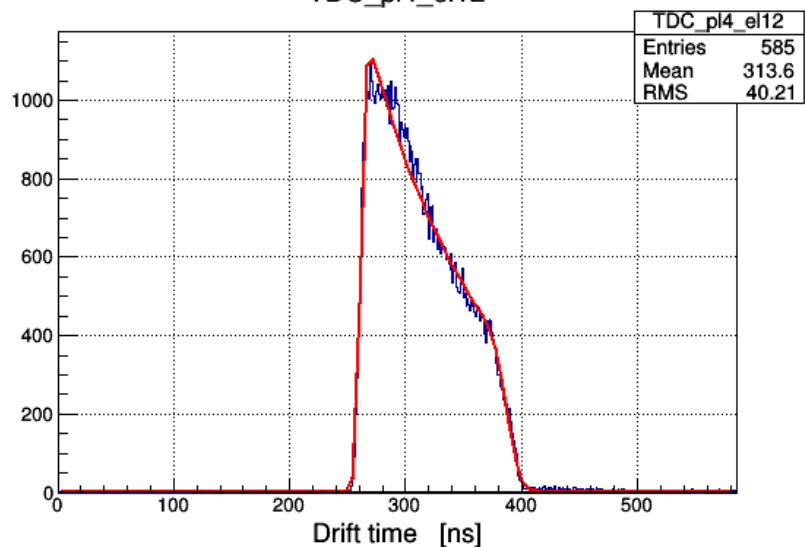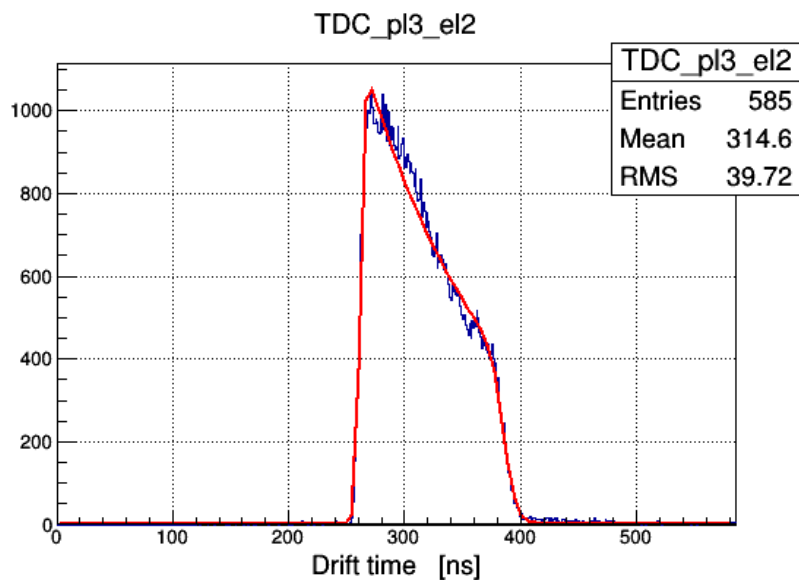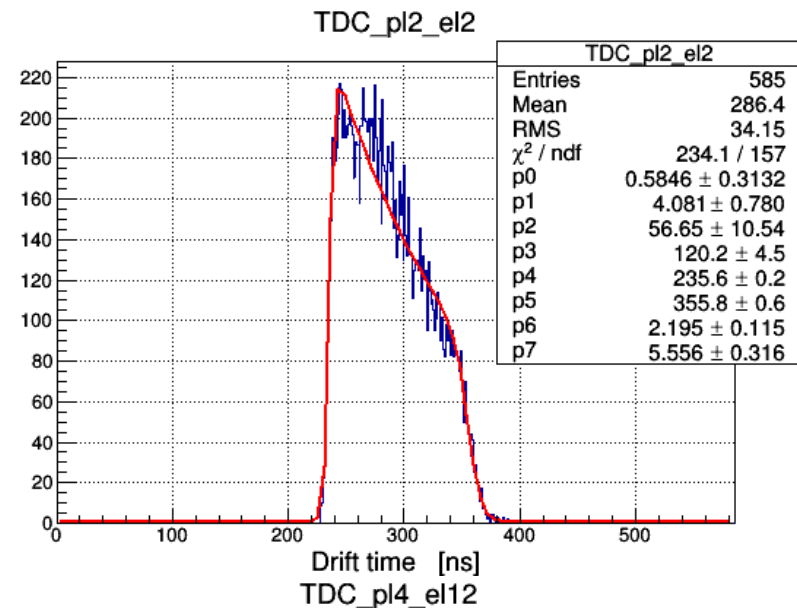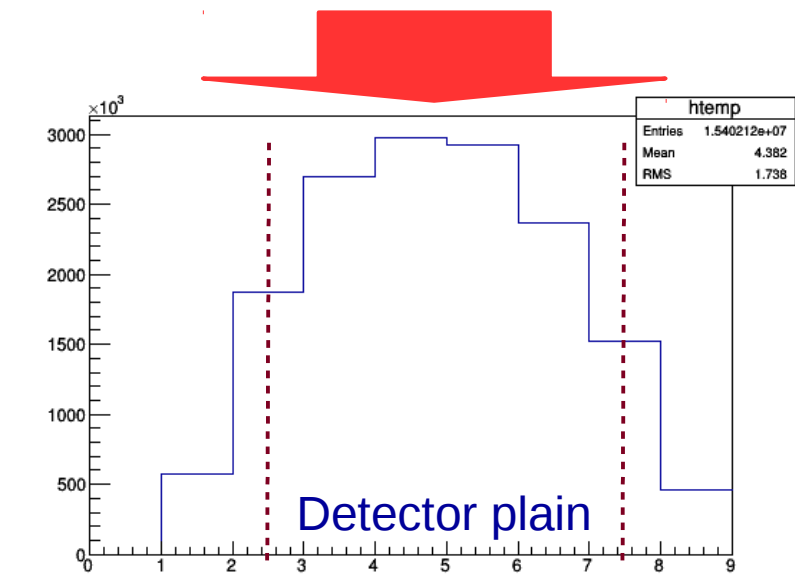

STT signals from TIA04

On the leading edge derivative checked until it starts to decrease

then

at the highest steepness of leading edge straight line fit
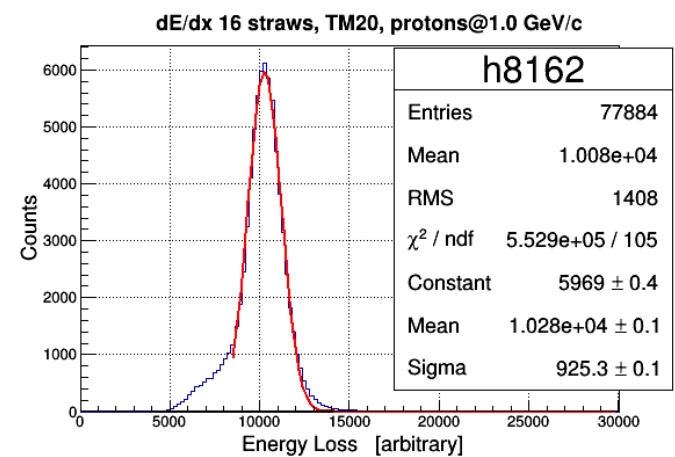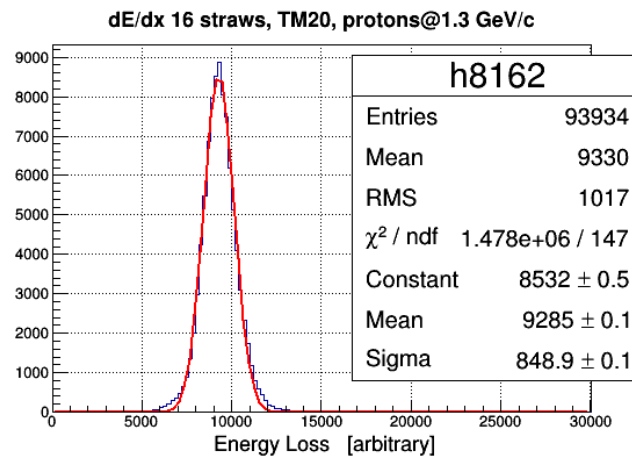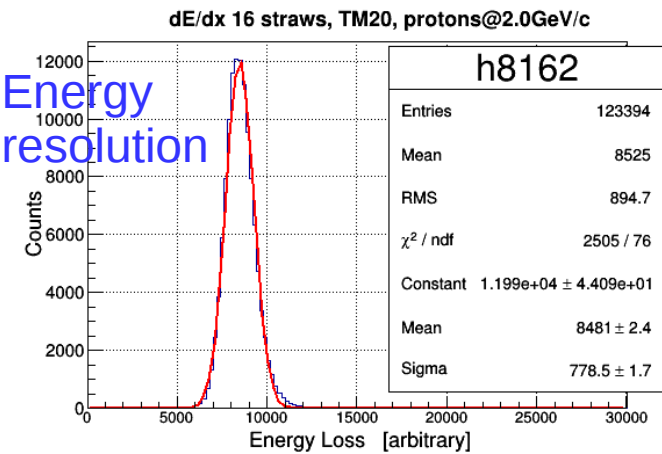
→ **Zero Crossing Time**

Drift time spectra

K. Pysz
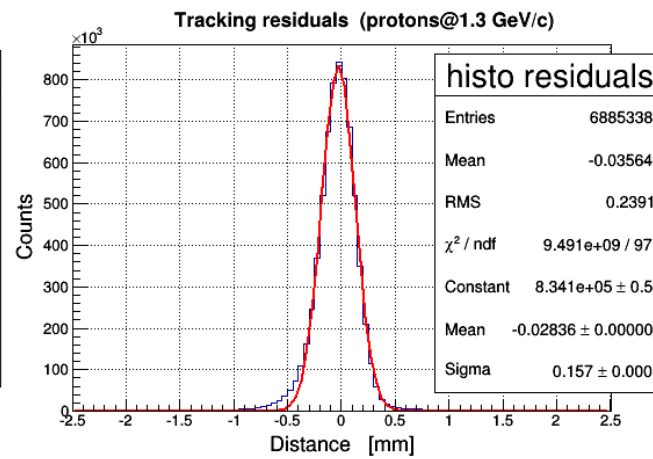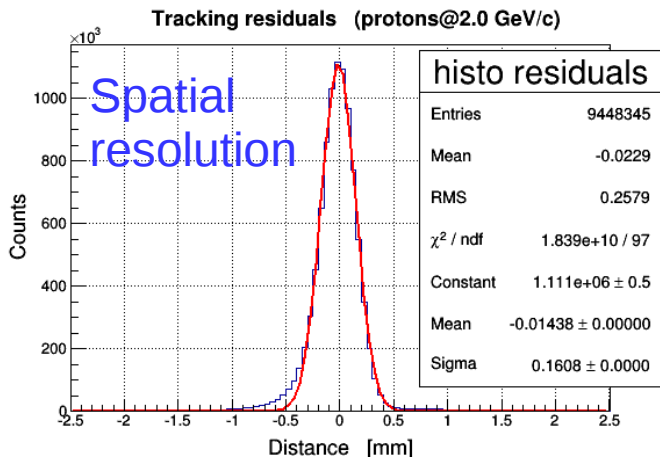
Preliminary results

2.0 GeV/c

1.3 GeV/c

1.0 GeV/c
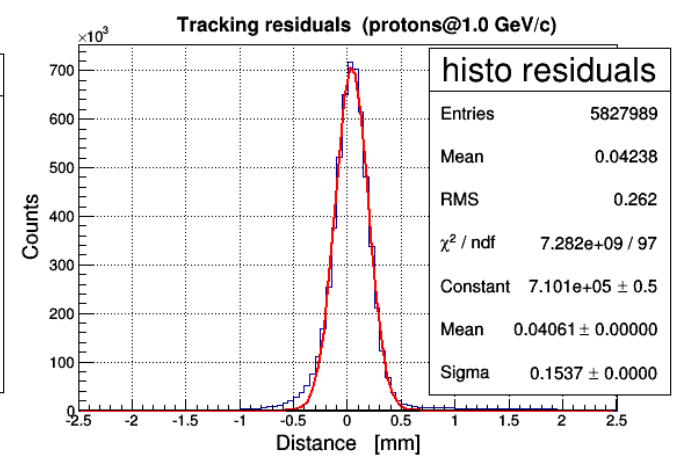
Preliminary results

	Spatial resolution [μm] uncertainty: ~ 10	Energy resolution [%] uncertainty: ~ 1.0
2.0 GeV/c	160	9.2
1.3 GeV/c	157	9.1
1.0 GeV/c	154	9.0
Cosmics	154	

Energy resolution for
16 hit tracks.

Beam data collected
with the beam intensities
of up to 300 kHz
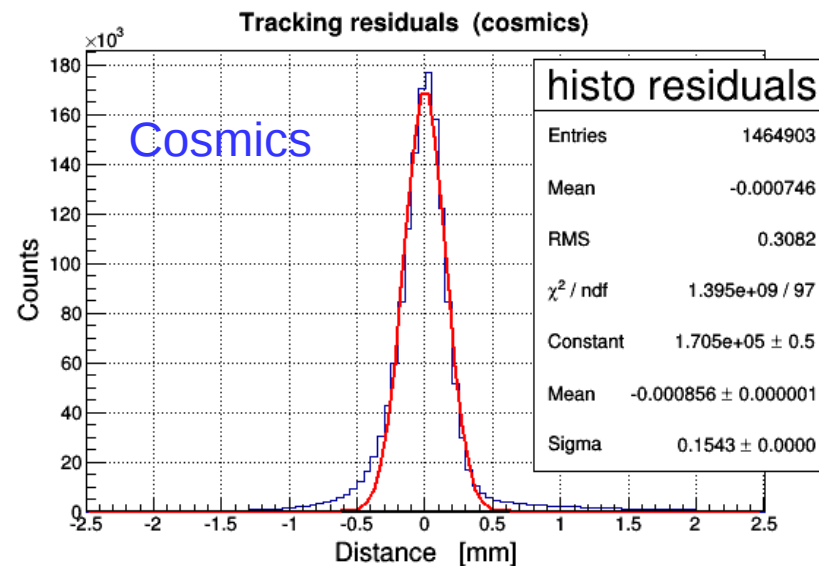
Summary

- 128 channels of STT1 prototype (8 layers 16 channels each) was equipped with 12 meter long signals/HV cables. Cables was fed into TIA04 transimpedance analog amplifier. Signals were digitized with the use of 240 MHz flashADC.

- Mechanical imperfections of STT1 detector has been corrected.

- Data for various proton beam momenta were collected and preliminary analyzed.

- Proper dependence of the drift time on the drift radius is obtained. Drift time spectra are sharp and tail-free.

- Zero crossing method to get the times and charge integration together with truncation mean method to get the energy loss were applied.

- Obtained tracking residuals as well as the dE/dx distributions have correct Gaussian shapes.

- Obtained spatial resolution of about 160 μm and energy resolution of about 9 % are very close to the demanded values.

- Feasibility of the FFE-free readout of PANDA STT based on TIA04 amplifier and 12 m long signal transmission cable is confirmed.

Outlook

- The design idea and operation parameters of the analog part of FFE-free readout are fixed. No further progress in this domain is expected.

- The further efforts will be concentrated on the digital part of the readout chain.

- Various aspect of new flashADC system needs to be work out. It concerns:

  - system architecture,
  - interconnection to analog and processing (FPGA) part of the system,
  - HV decoupling,
  - development and implementation of signal processing procedures,
  - ......

- The test of prototype of a new digital system with (initially) several channels of fADC together with the analog part should start soon.

- Implementation of new system into DAQ before the next year beam tests is demanded.

Thank you !