

Electronics response to high rates at PANDA straws

Susanna Costanza (*INFN Pavia*)

Andreas Erven (*Forschungszentrum Jülich, ZEL*)

Wilhelm Erven (*Forschungszentrum Jülich, ZEL*)

Paweł Kulesa (*IFJ PAN Kraków / Forschungszentrum Jülich, IKP*)

Emeline Lesmanne (*Forschungszentrum Jülich, IKP*)

Marius Mertens (*Forschungszentrum Jülich, IKP*)

Robert Nellen (*Forschungszentrum Jülich, IKP*)

Henner Ohm (*Forschungszentrum Jülich, IKP*)

Krzysztof Pysz (*IFJ PAN Kraków / Forschungszentrum Jülich, IKP*)

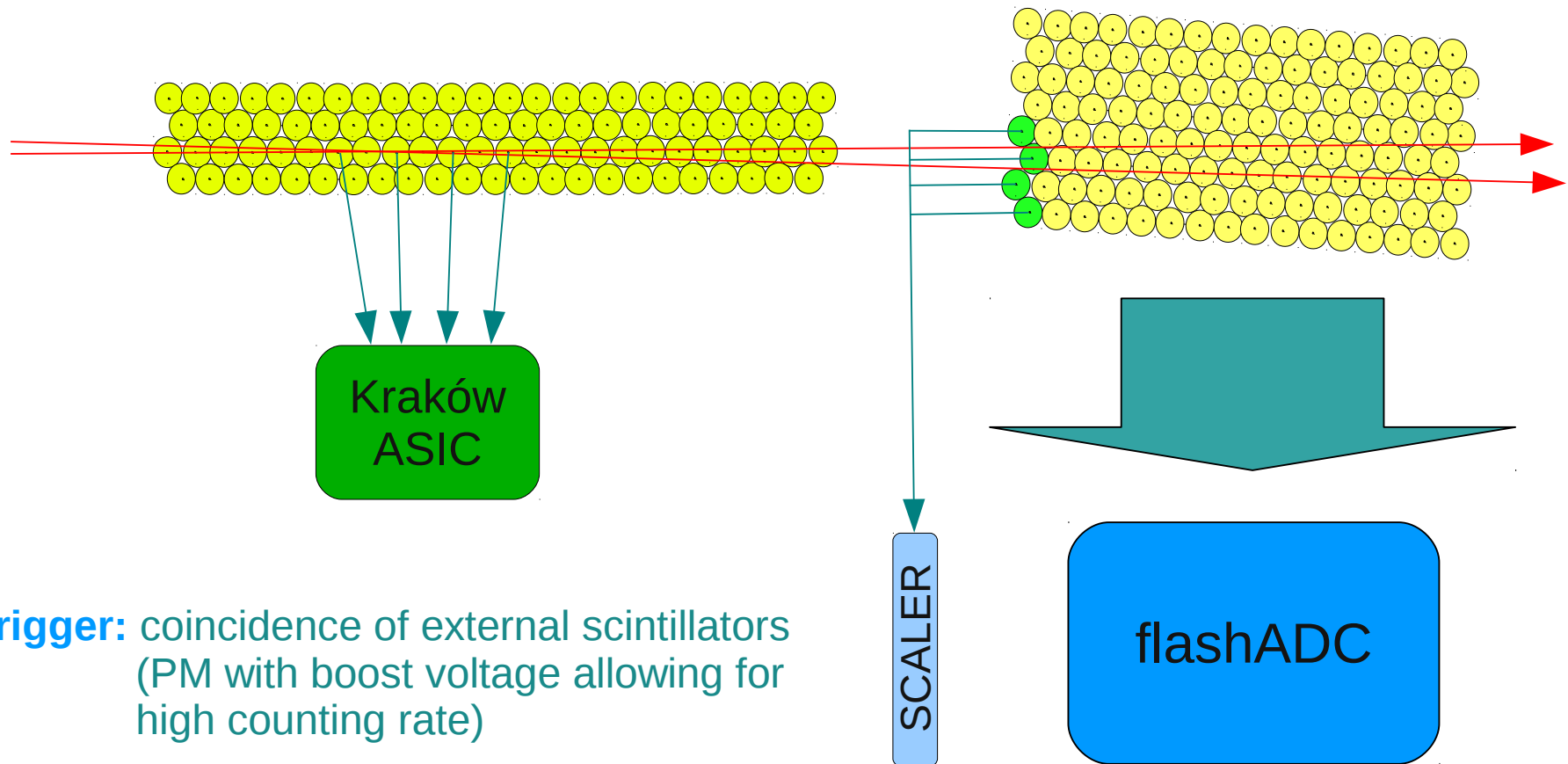
James Ritman (*Forschungszentrum Jülich, IKP*)

Valery Serdyuk (*Forschungszentrum Jülich / JINR Dubna*)

Peter Wintz (*Forschungszentrum Jülich, IKP*)

Peter Wuestner (*Forschungszentrum Jülich, ZEL*)

Setup for high rate test at COSY, December '11



Trigger: coincidence of external scintillators
(PM with boost voltage allowing for high counting rate)

Detector HV: 1800 V – 1900 V
(normal operational HV = 1850 V)

Front End Electronics

Front-end: current amplifier

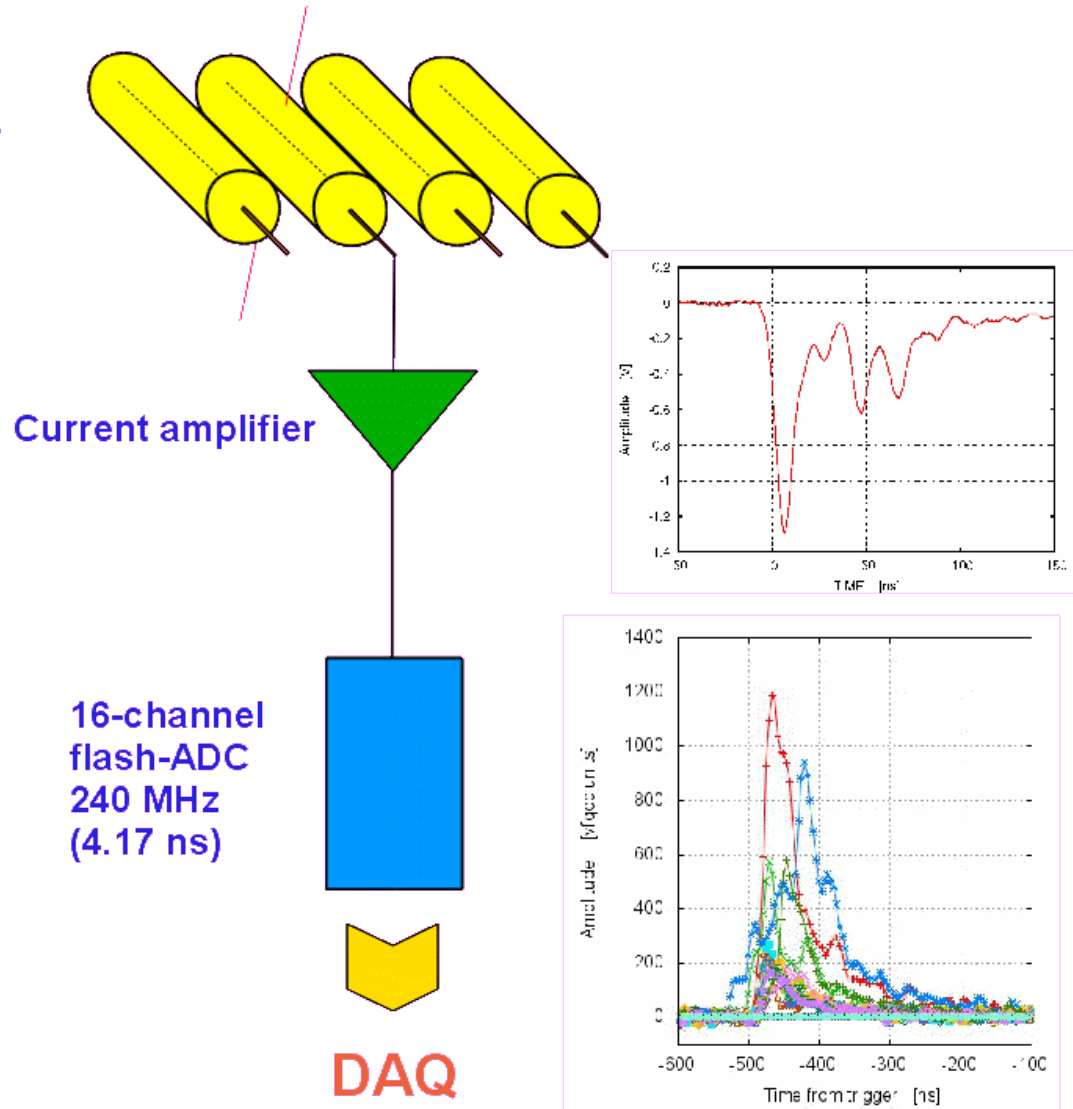
transresistance amplifier

- 8 ns rise-time,
- gain factor 360,
- single-ended output

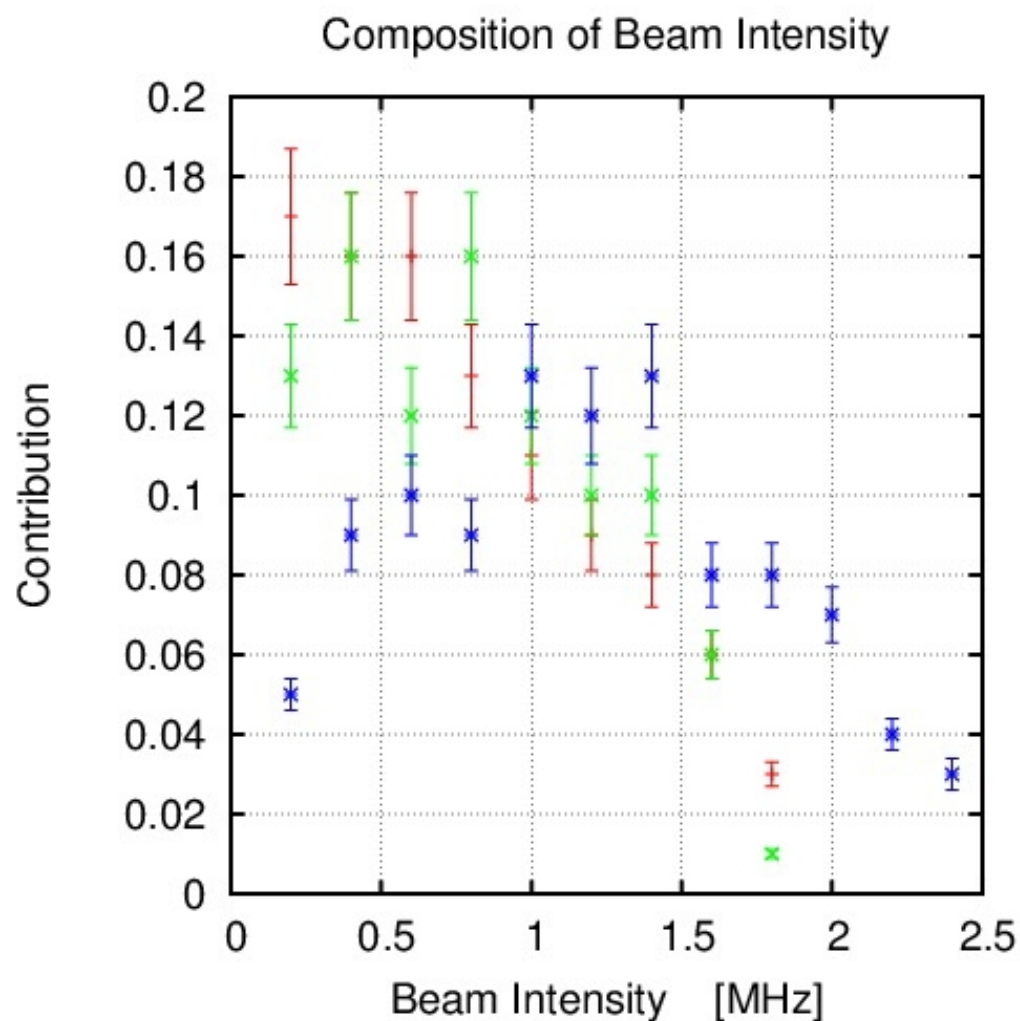
Total integration time ~ 7 ns

- no tail cancellation,
- no baseline correction

Almost undistorted probe
of straw's anode current



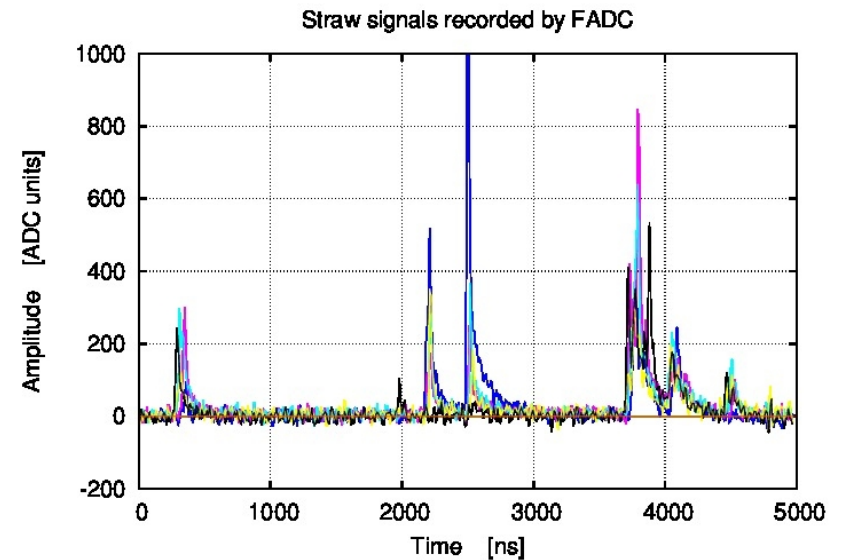
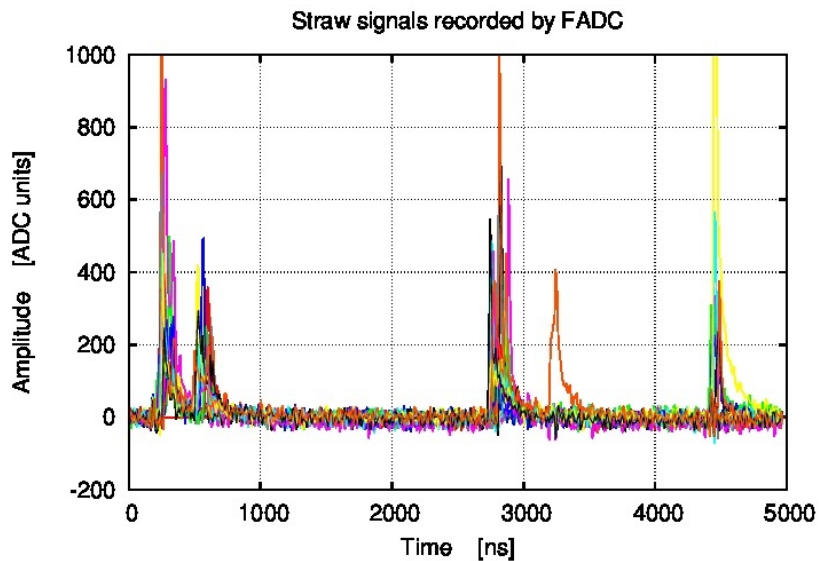
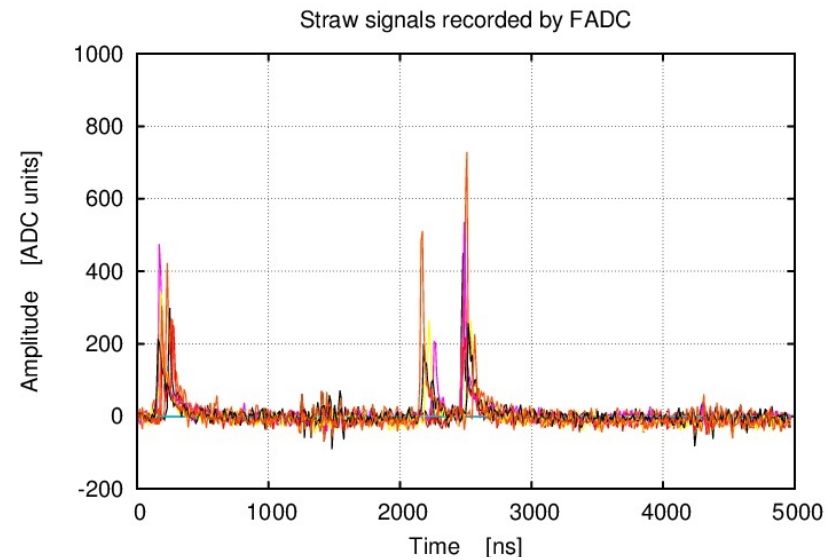
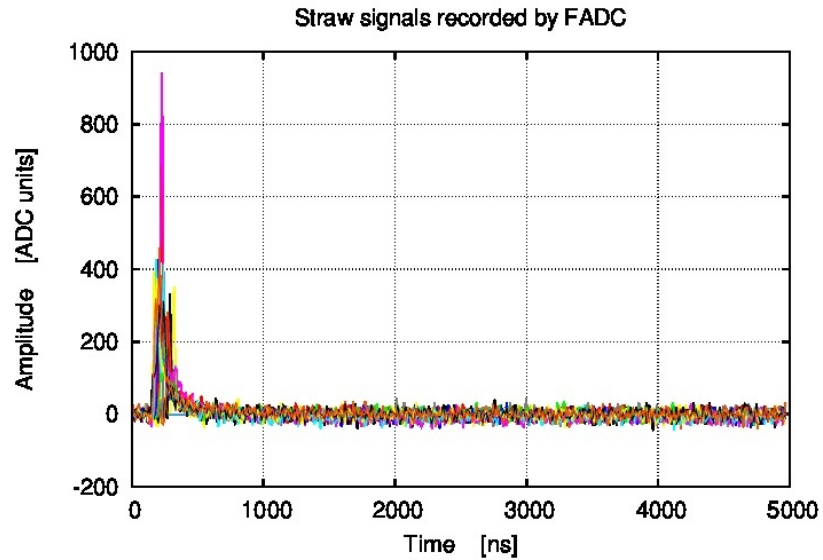
Beam



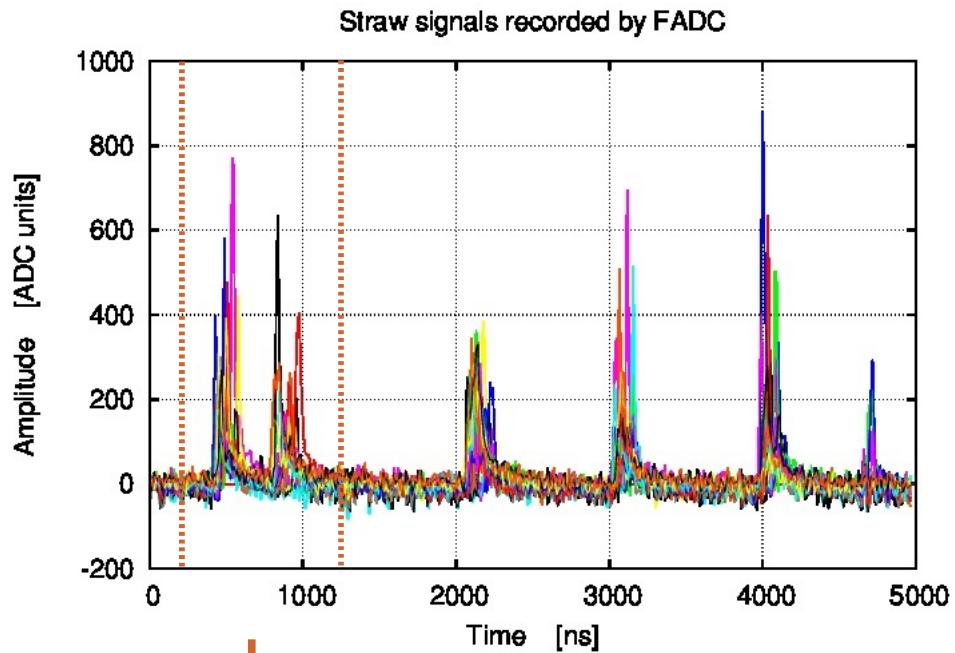
COSY Beam: 2.7 GeV/c

**Significant contribution
of beam intensities
greater than 1 MHz/straw**

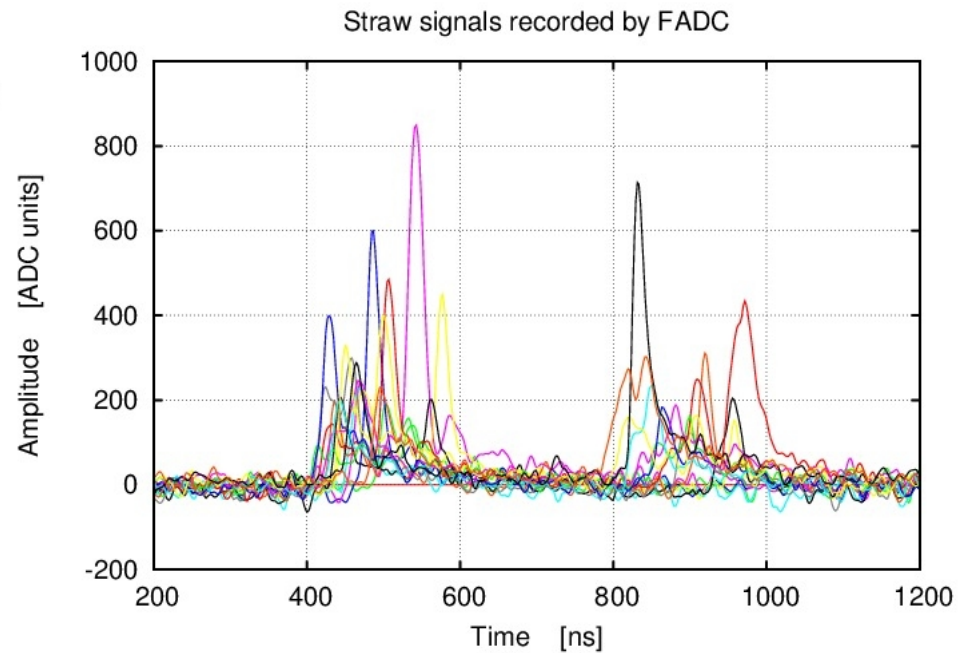
Output Signals



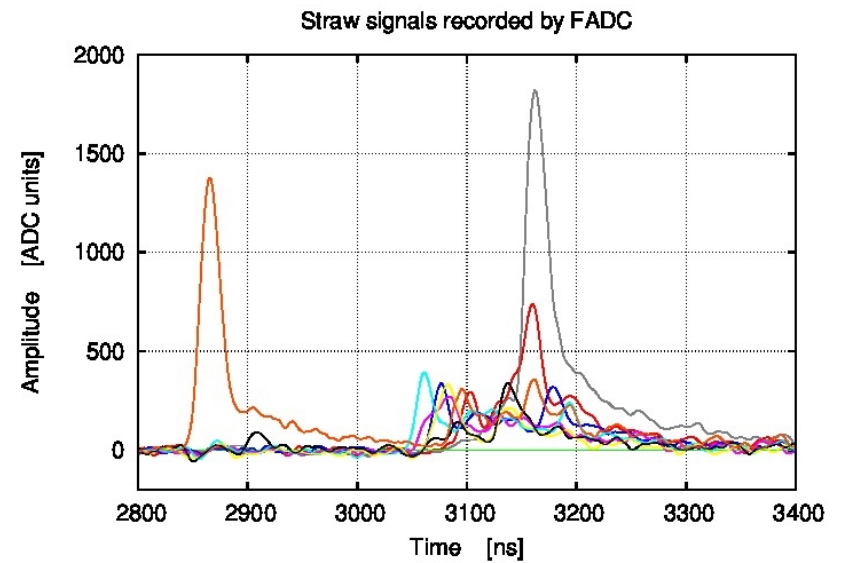
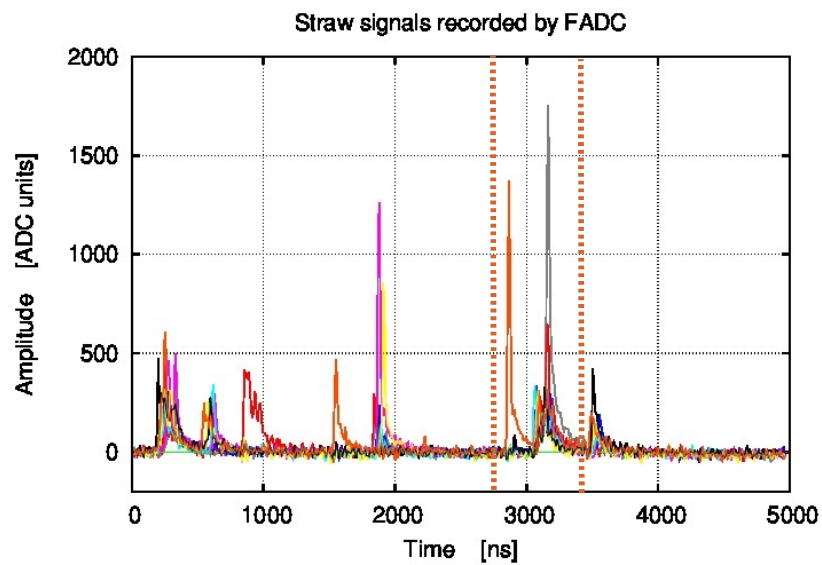
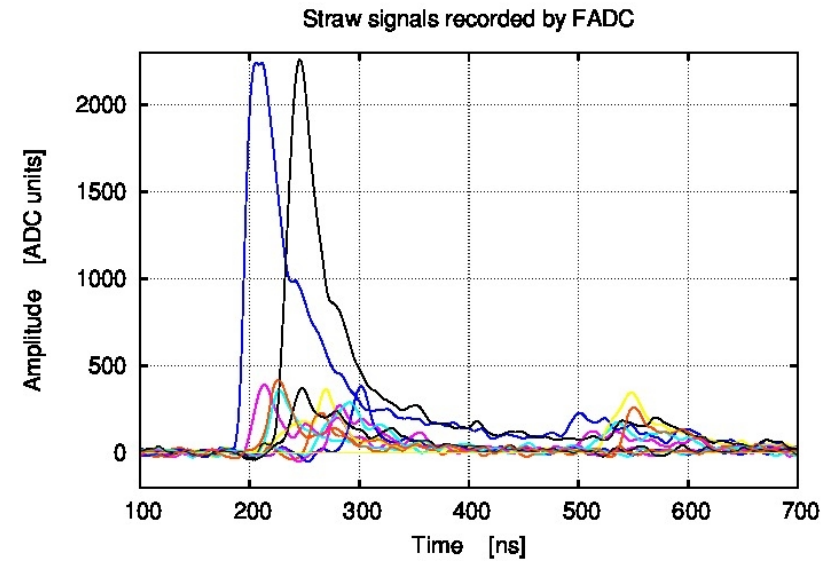
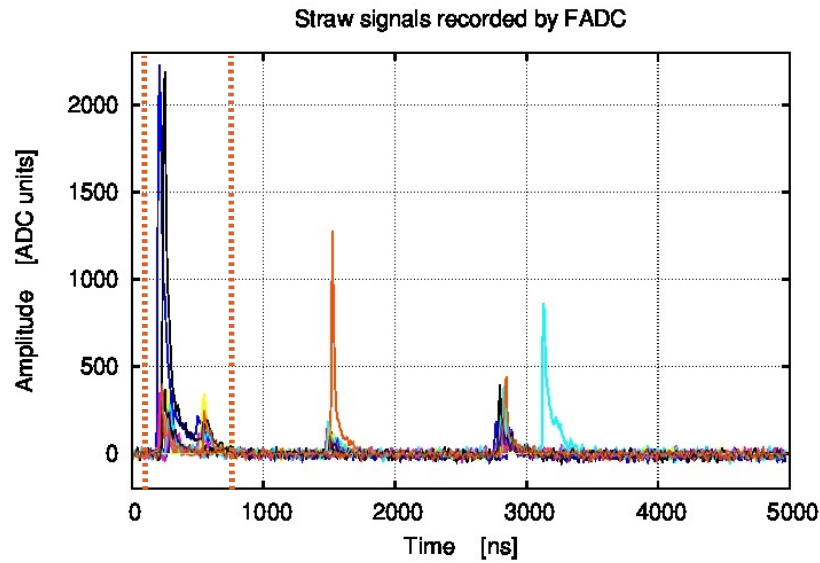
Output Signals



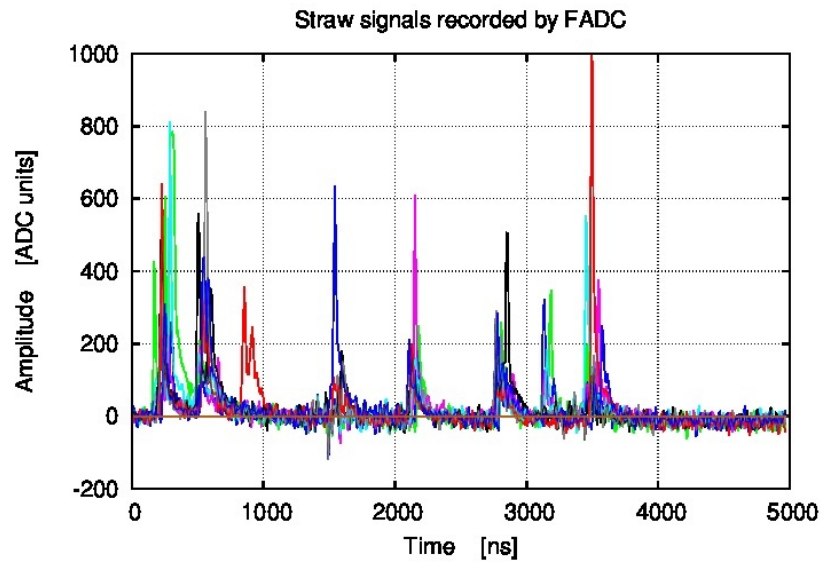
6 groups of signals in 5 μ s
→ 1.2 MHz rate



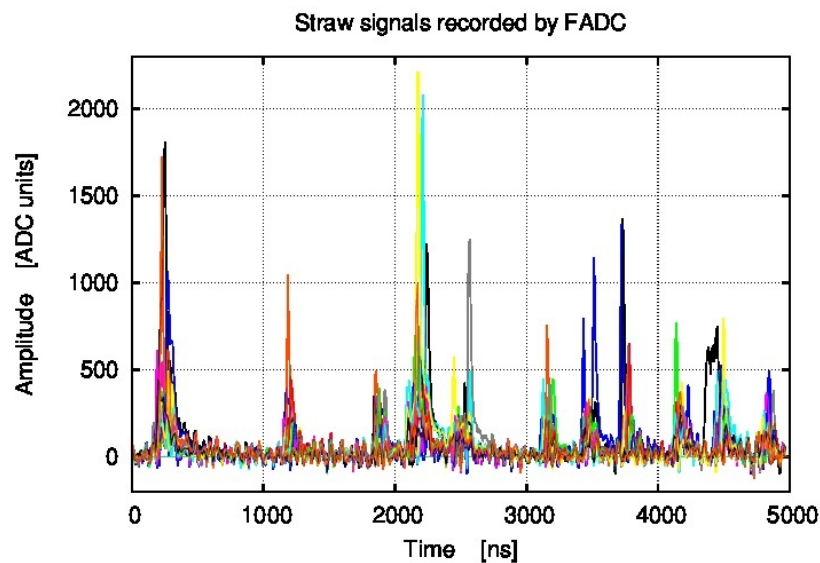
Signal Pileup



Very High Intensities



2 MHz



2.2 MHz

Conclusions

Minimum ionizing proton beam of the intensity between 0.1 – 2.2 MHz/straw was traversing the PANDA straws working at normal experimental conditions.

The output signal of straws was monitored by means of current transresistance amplifiers of short integration constant. Signals were recorded by means of fast sampling ADC in long window of 5 μ s.

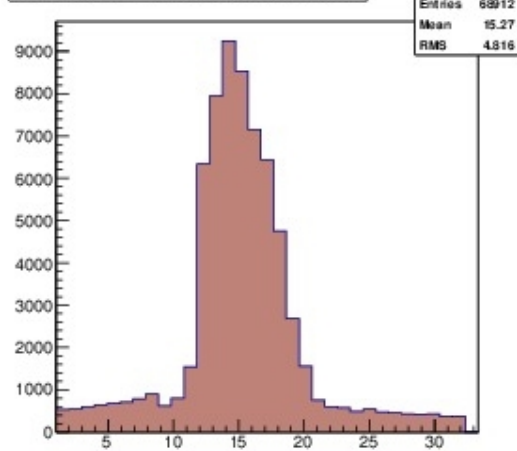
Irrespectively of the current beam intensity no any unfavorable phenomenons in the straws have been observed.
Baseline keeps always stable.

Both space- as well as energy resolution of the PANDA straws should not be affected by high counting rates expected during operation of PANDA experiment.

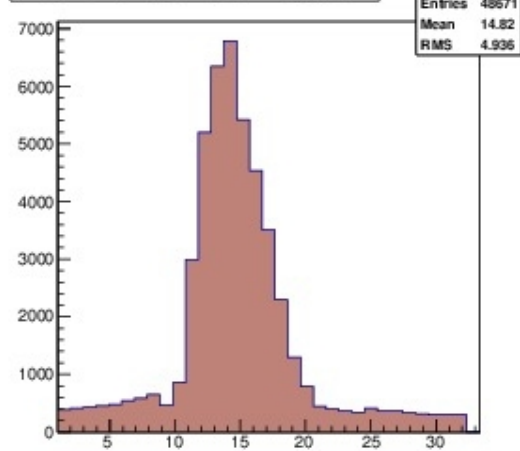
Backup Slides

Beam Profile

Wires in DC, horizontal, plane 1

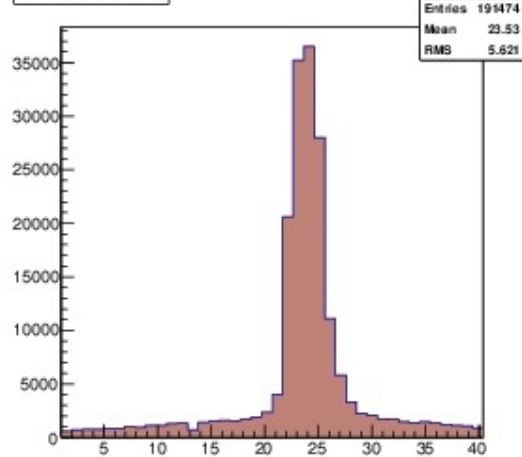


Wires in DC horizontal shifted 5mm TOP, plane 2

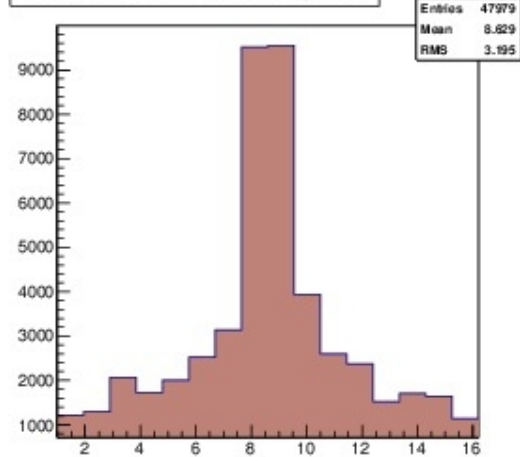


Vertical

Wires in STR



Wires in DC in GEMDC, vertical, plane 7



Horizontal