

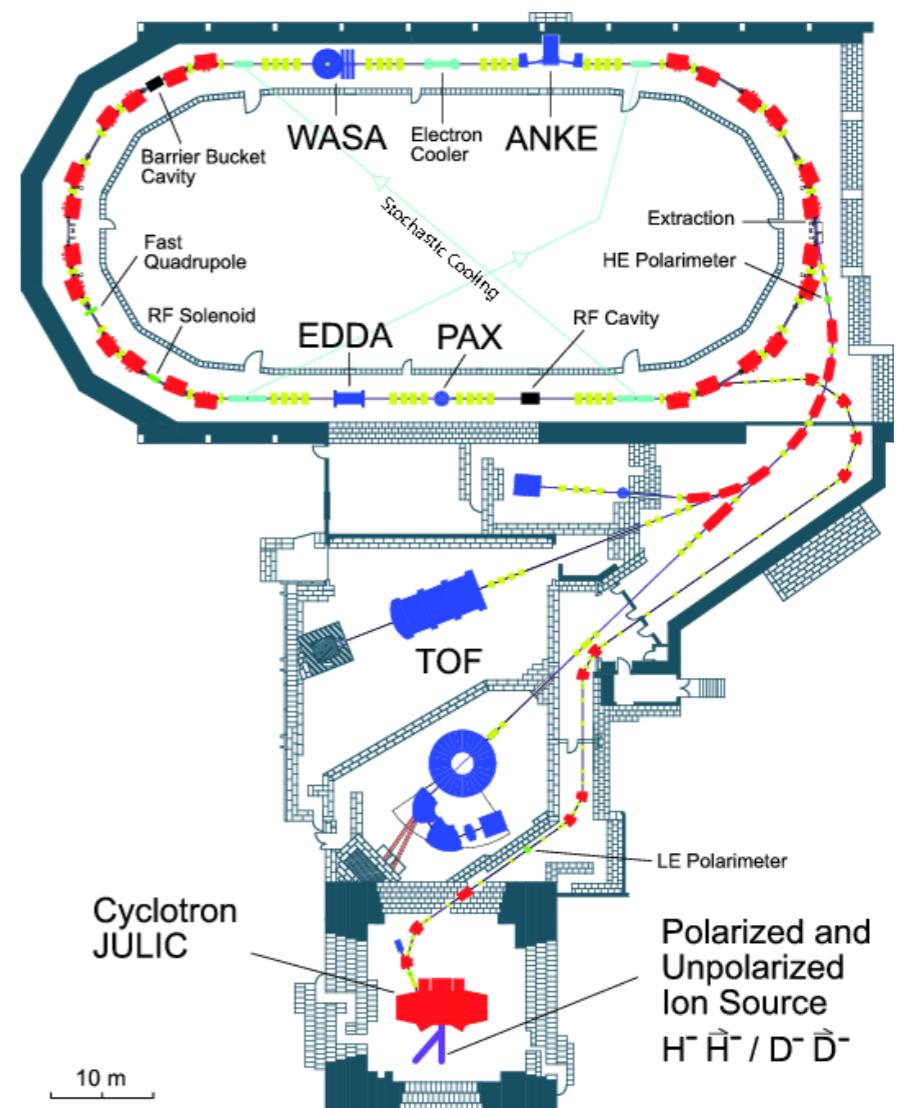


Multipurpose silicon detector for (polarized) internal target experiments at the COSY Storage Ring in Jülich.

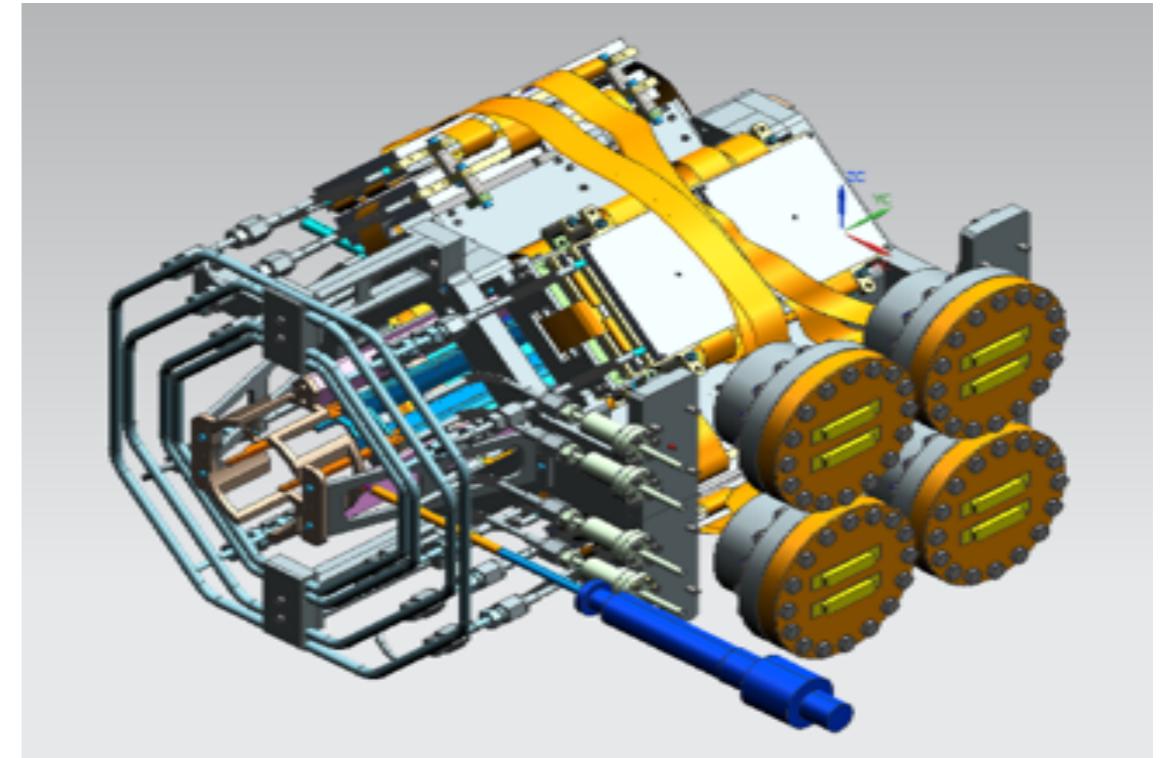
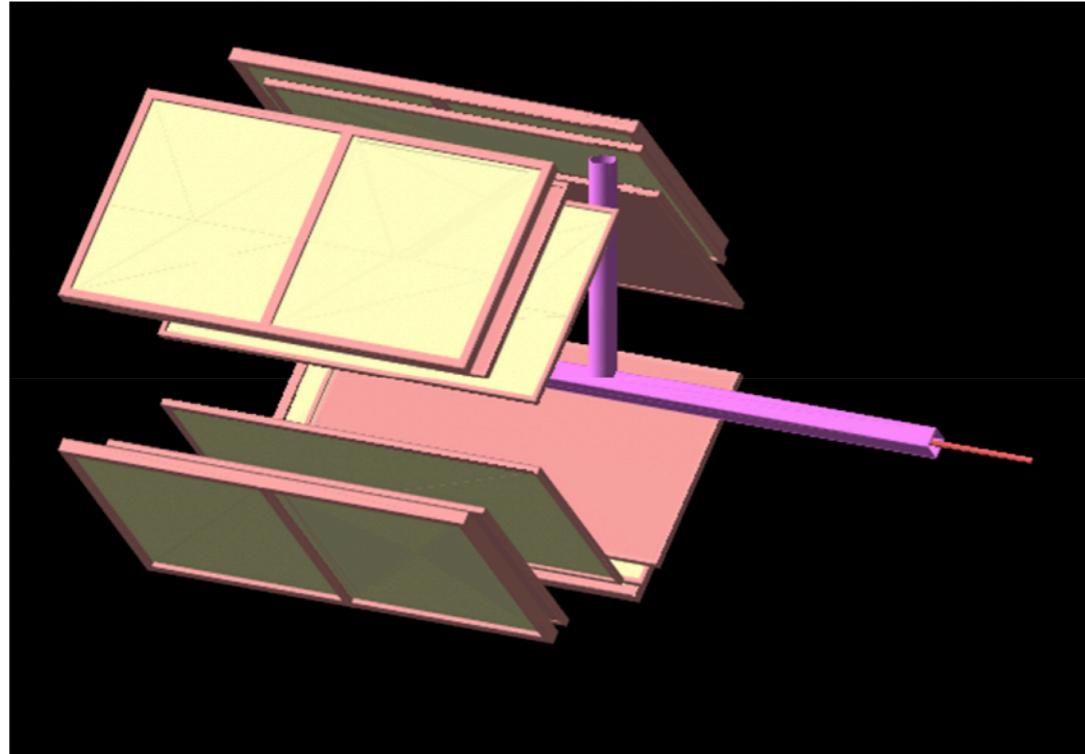
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University of Ferrara
11.09.2018

Aim of the detector

- Exploration of techniques for producing polarized beam and internal target
- Null test of T reversal invariance by investigating the T-violating null observable $A_{y,xz}$

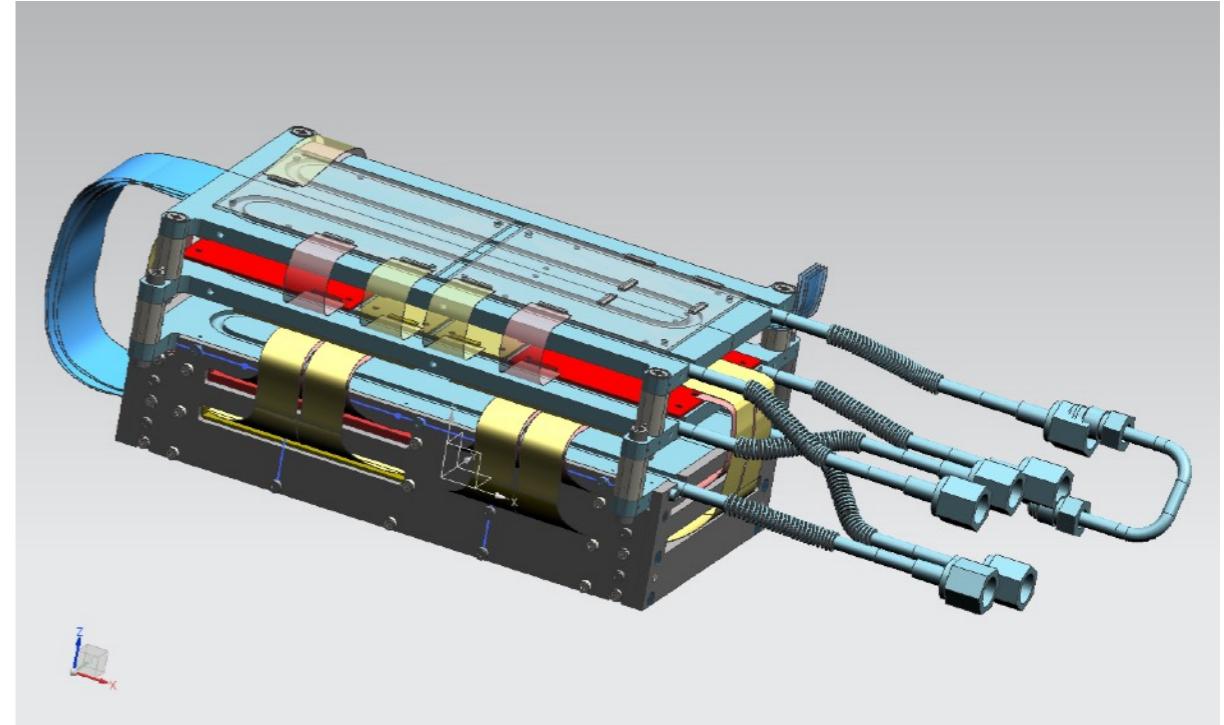
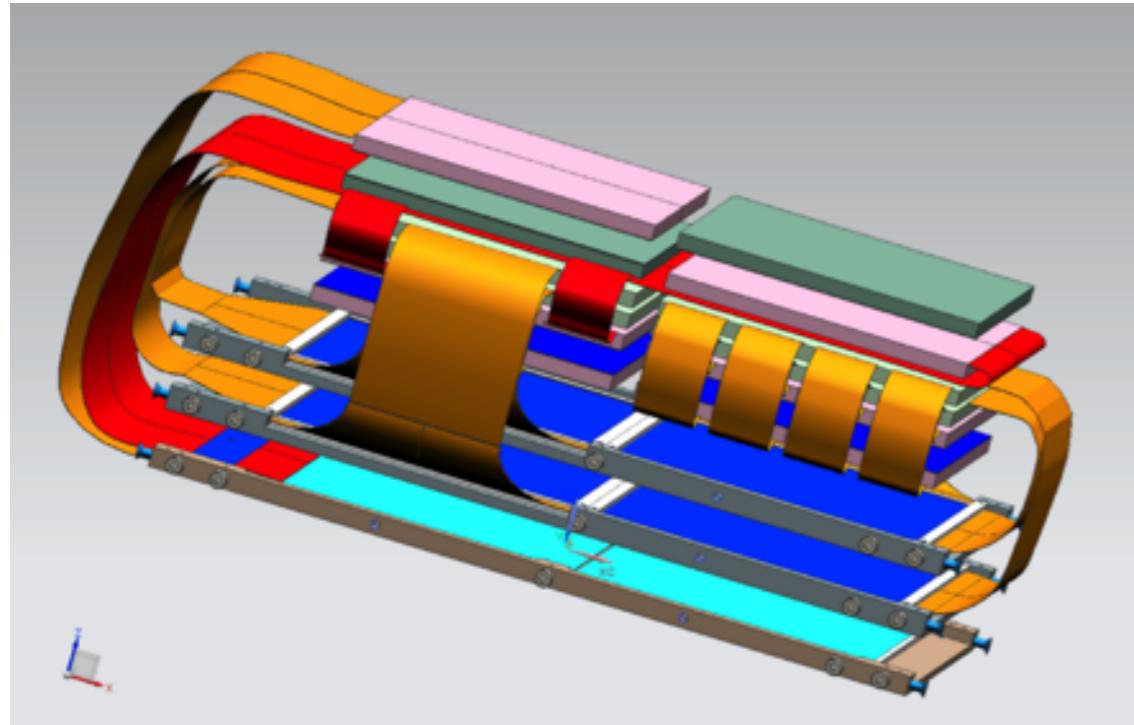


Overview



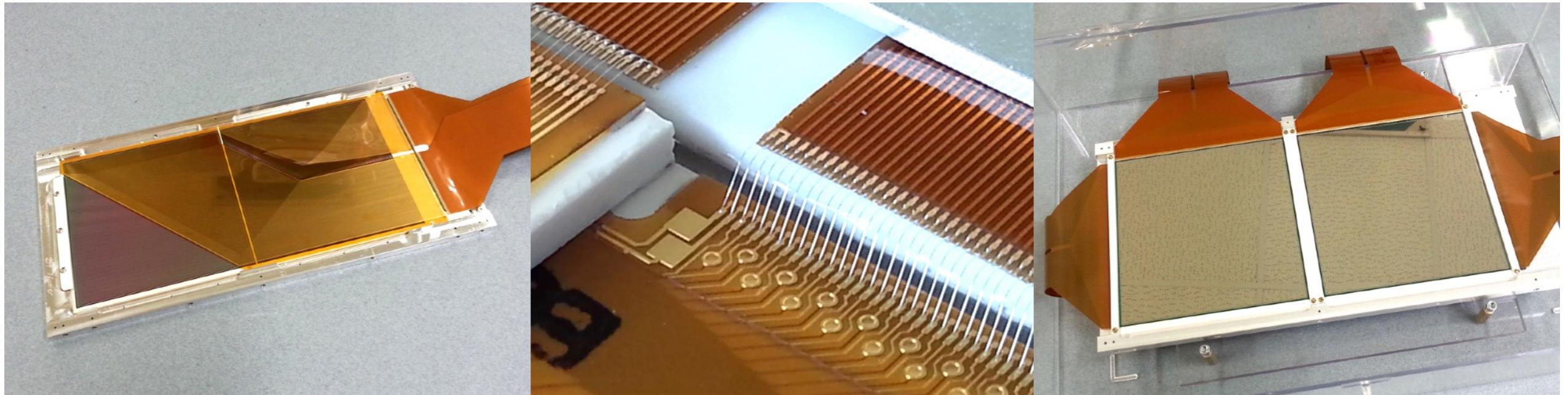
- Multipurpose detector installed around the storage cell for:
 - $p-p$ (and $\bar{p} - p$) elastic
 - $p-d$ elastic
- In the range 30-200 MeV beam energy
- Polarimeter
- Diamond-shape configuration

Detector concept



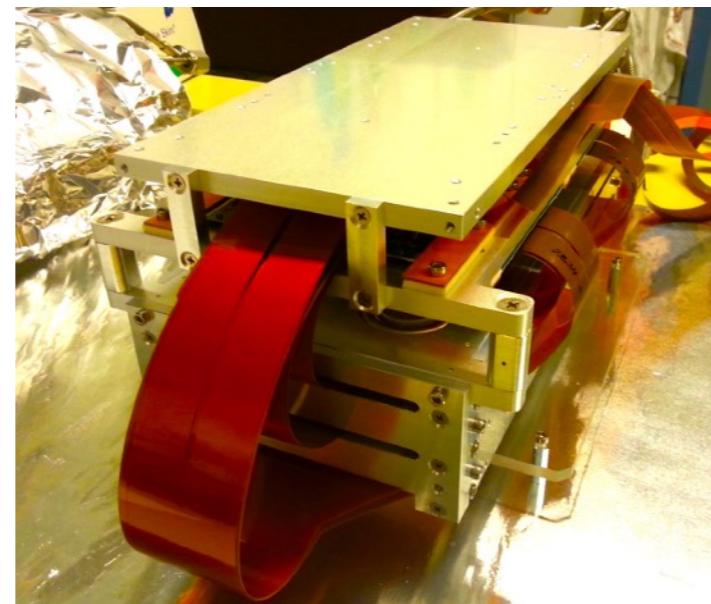
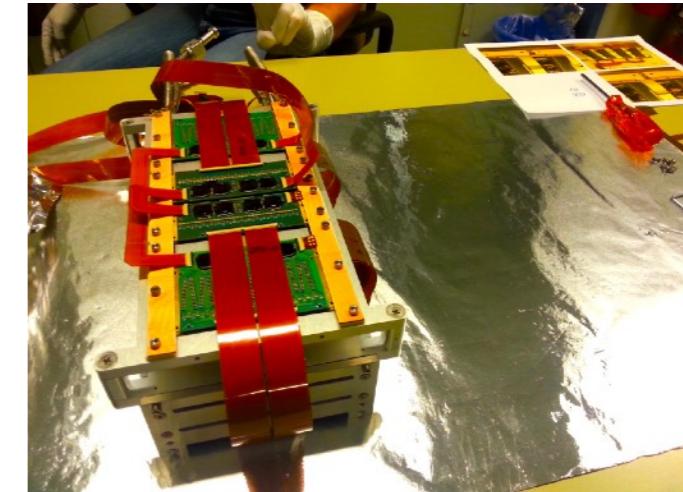
- **4 identical quadrants in diamond configuration**
- **3 layers of double-sided silicon strip sensors per quadrant**
 - I layer: 2xHERMES sensors
 - II layer: 2xPAX sensor
 - III layer: 1xPAX sensor

Sensors



- **$4 \times 300 \mu\text{m}$ from the HERMES experiment (Micron)**
- **$8 \times 300 \mu\text{m}$ PAX type sensors from Micron (UK)**
- **$4 \times 1000 \mu\text{m}$ PAX type sensors from Micron (UK)**
 - Active area $97 \text{ mm} \times 97 \text{ mm}$
 - 128 strips

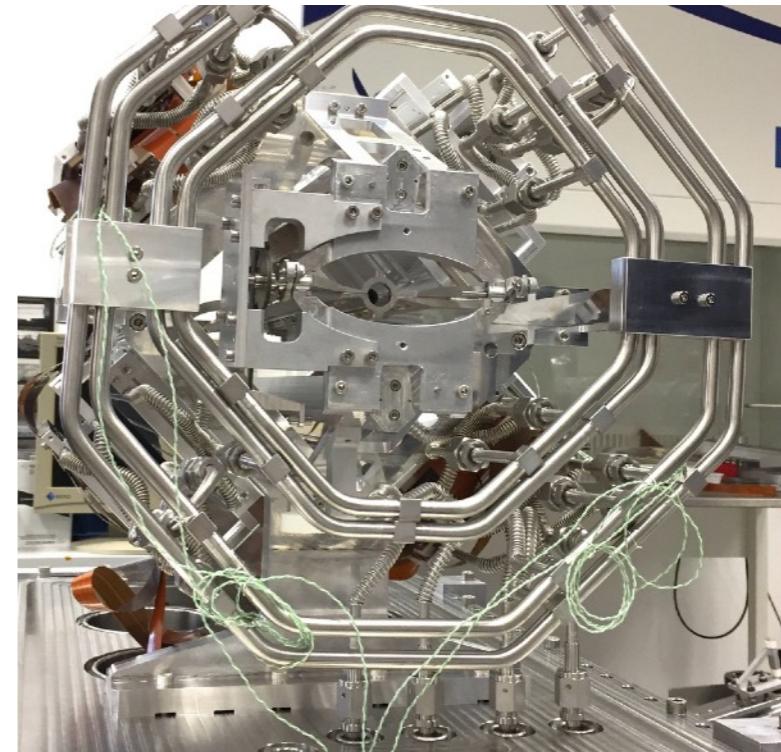
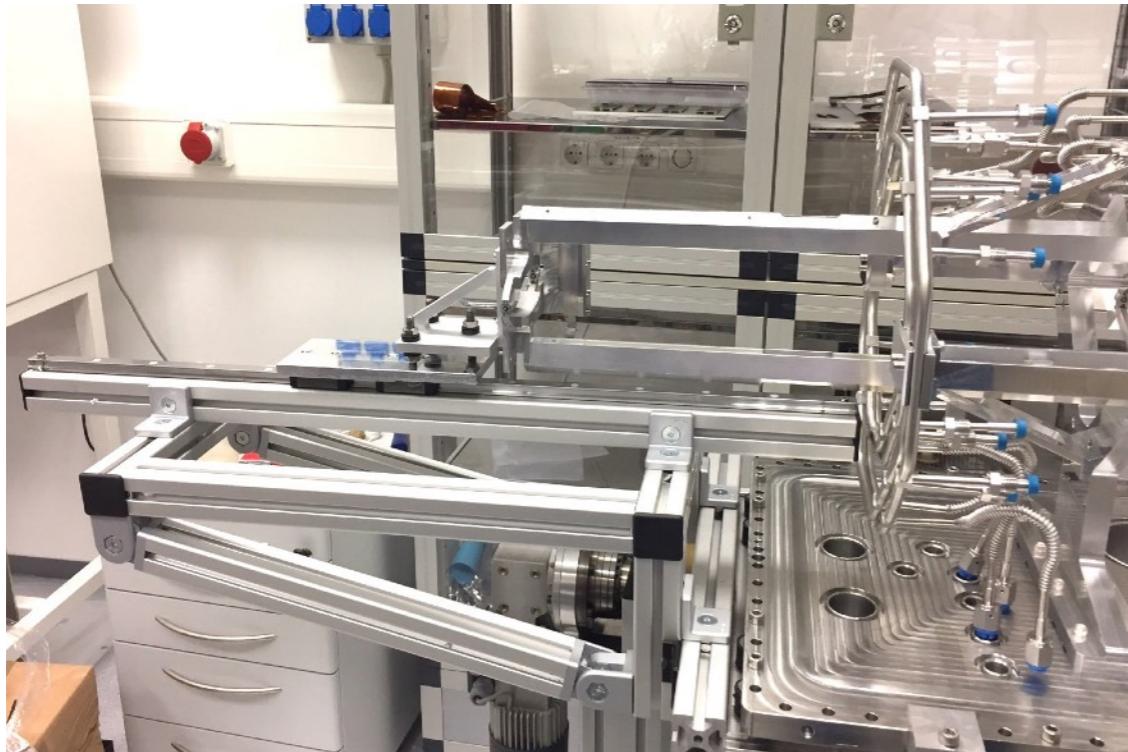
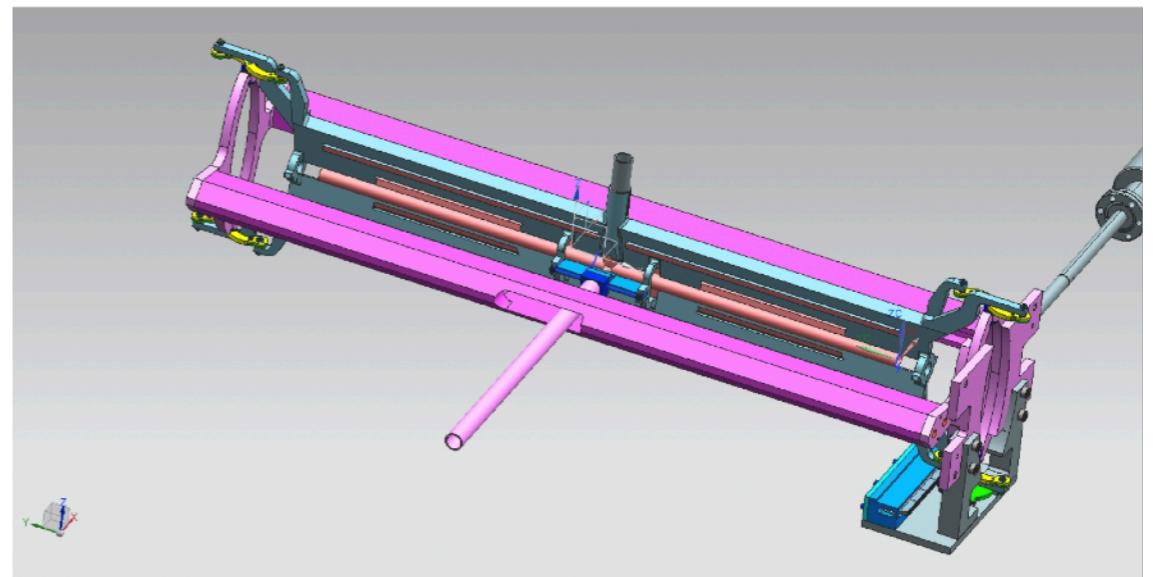
Quadrants



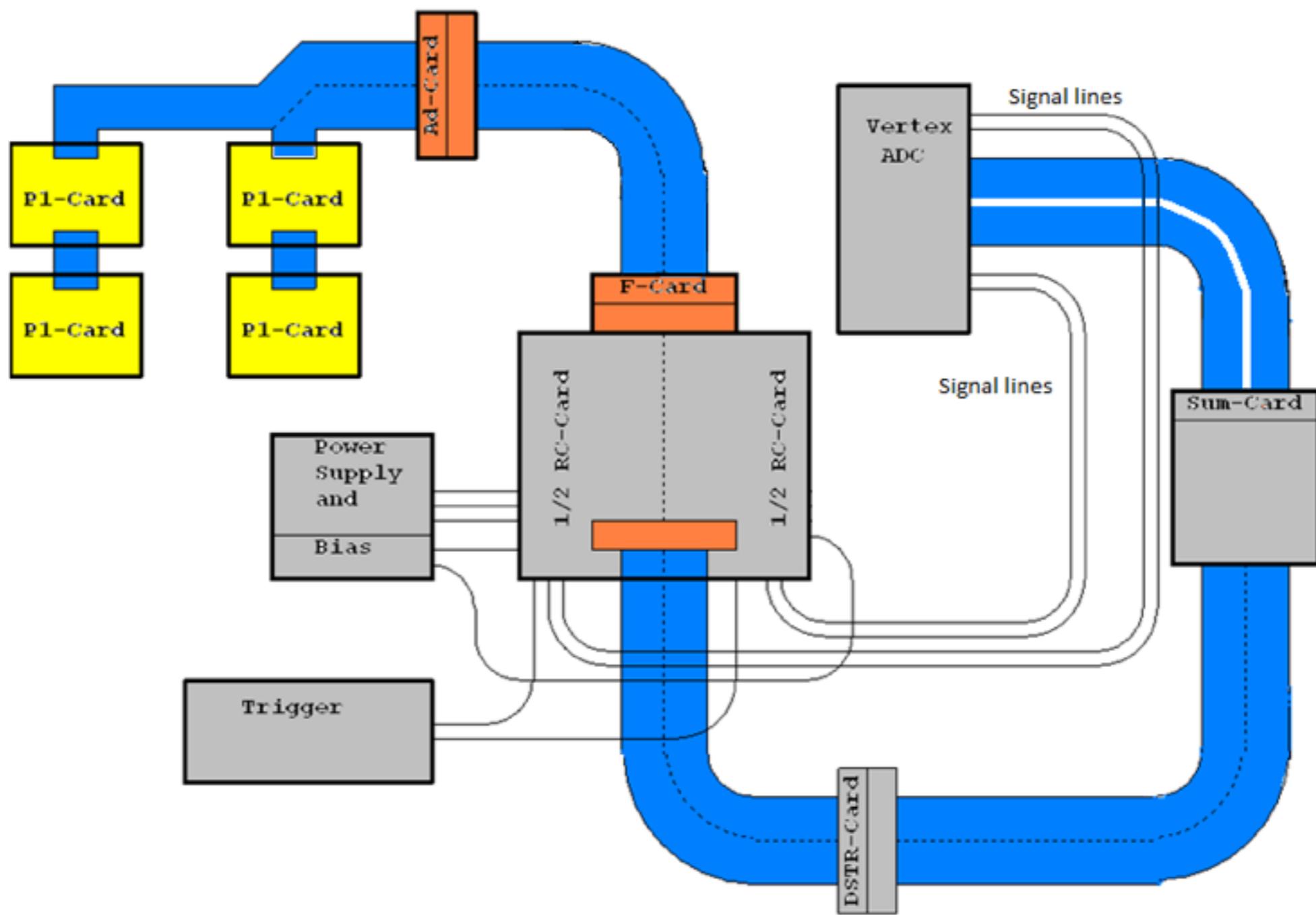
- All of 4 quadrants completed in November 2017
 - Individually tested with alfa and gamma sources
- Vacuum part of detector is assembled in December 2017

Openable storage cell

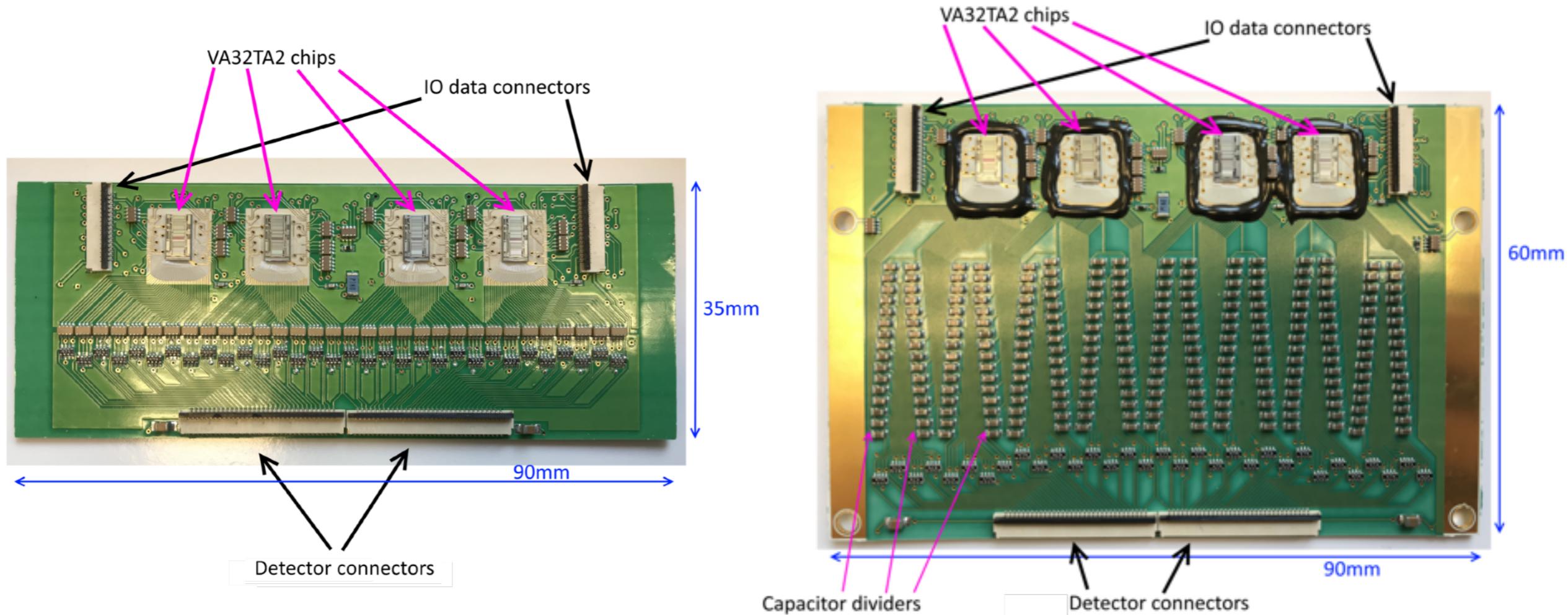
- 40 cm long and 10 mm diameter when closed
- Aluminum foil 50 μm thick
- Increasing of target density



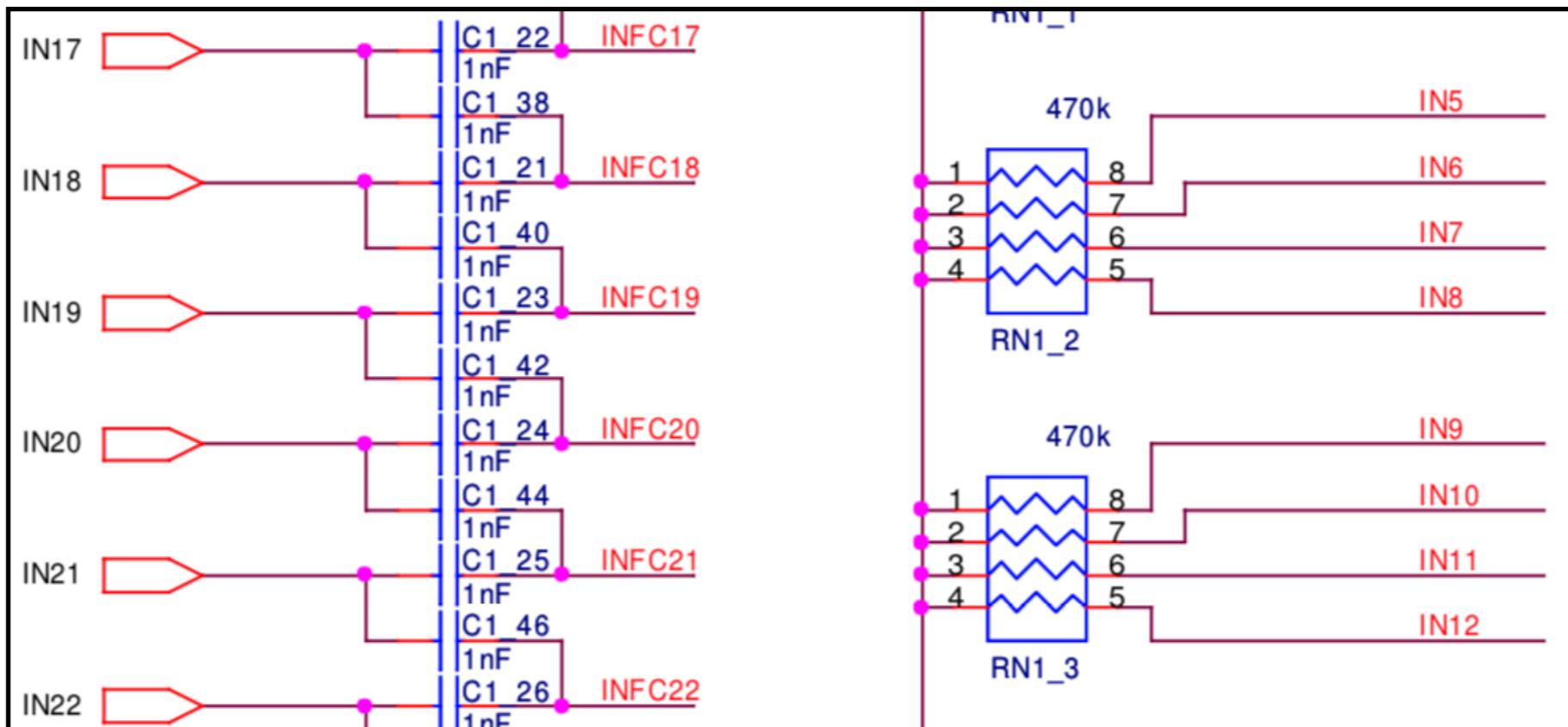
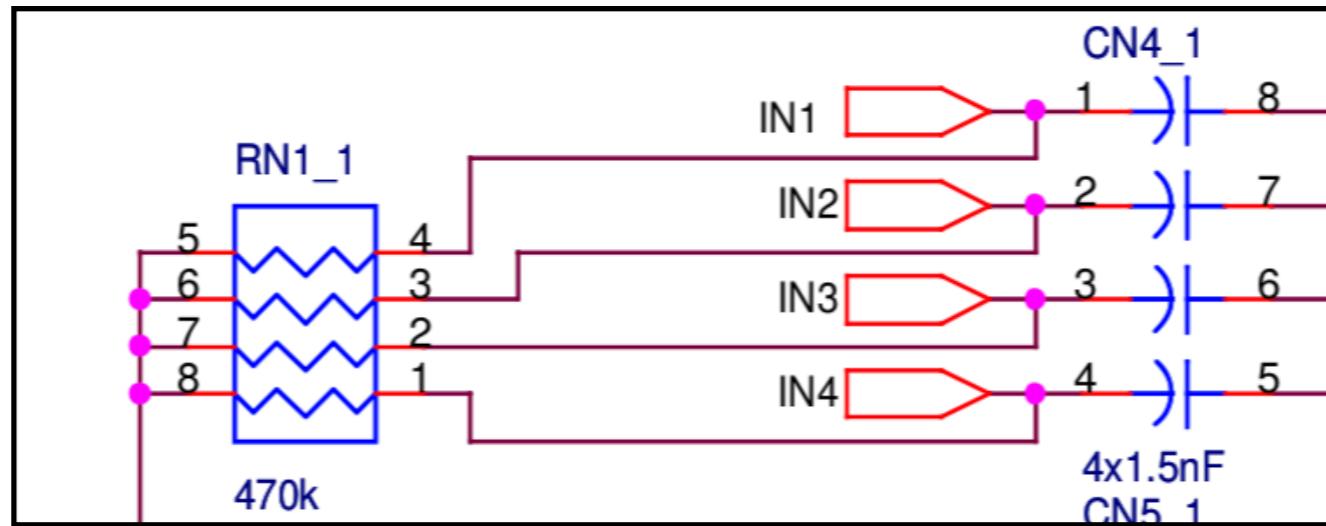
Scheme for 2 layers



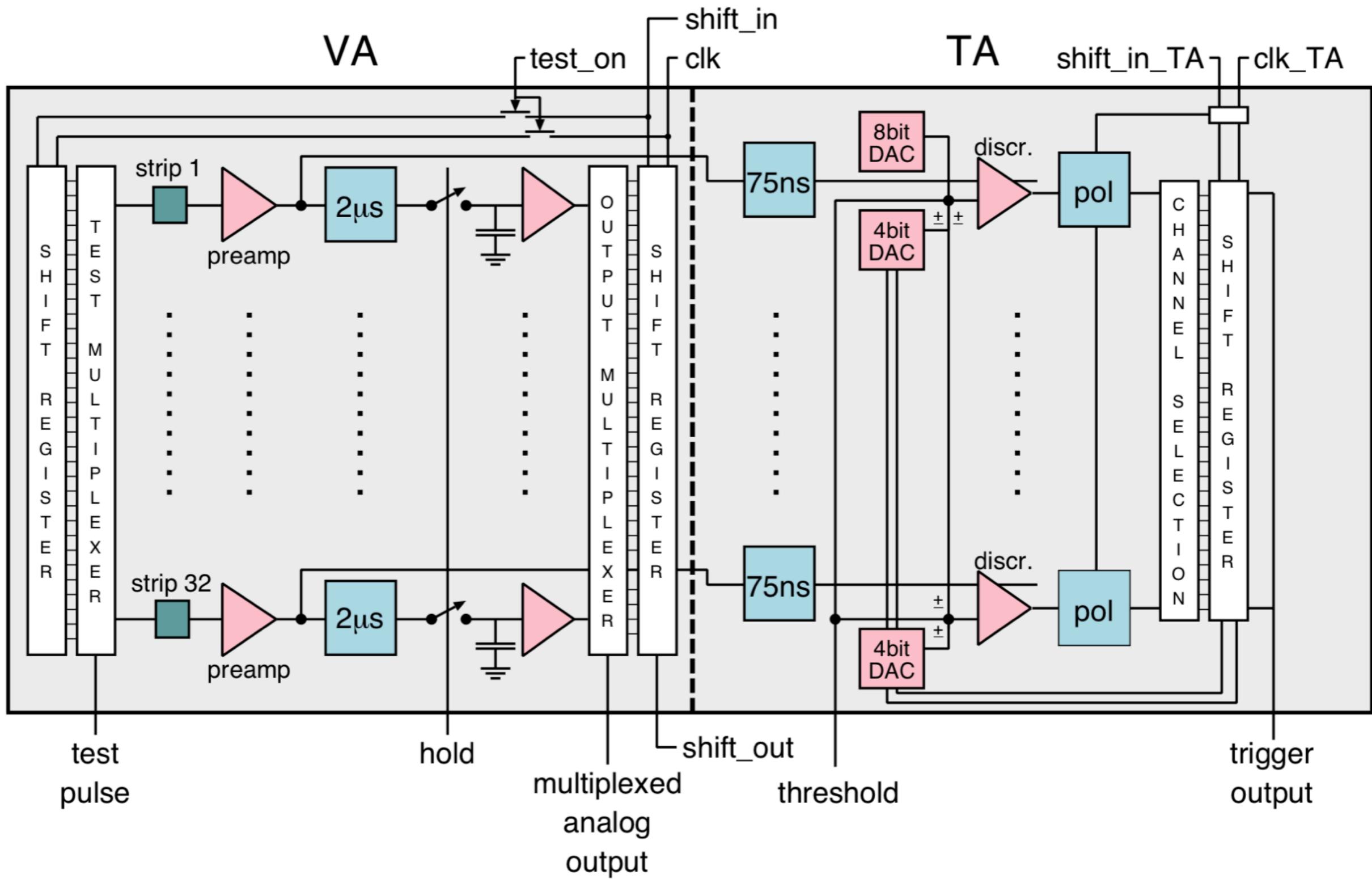
Preamplifier boards



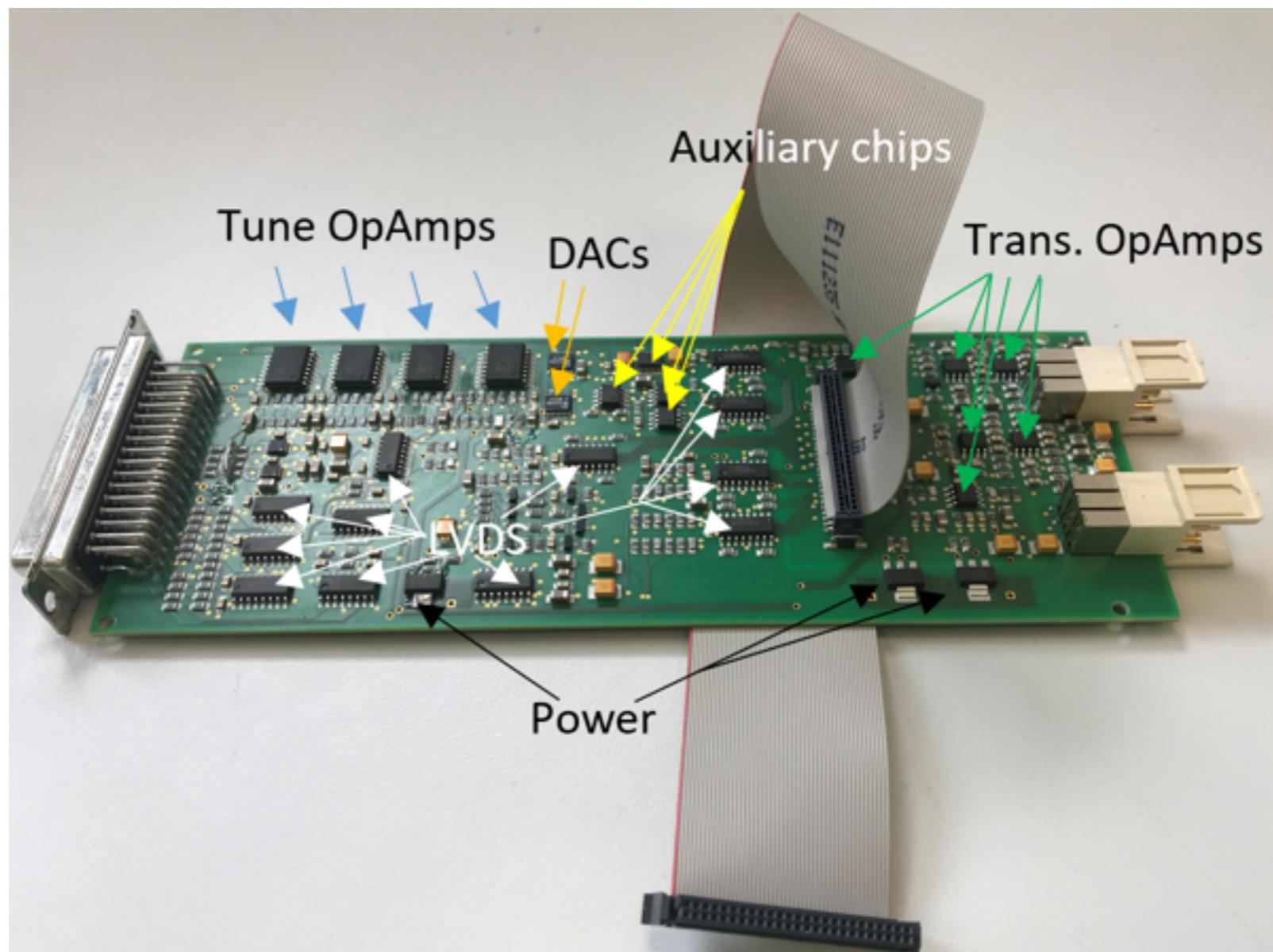
Preamplifier boards



Preamplifiers: Va32Ta2.2



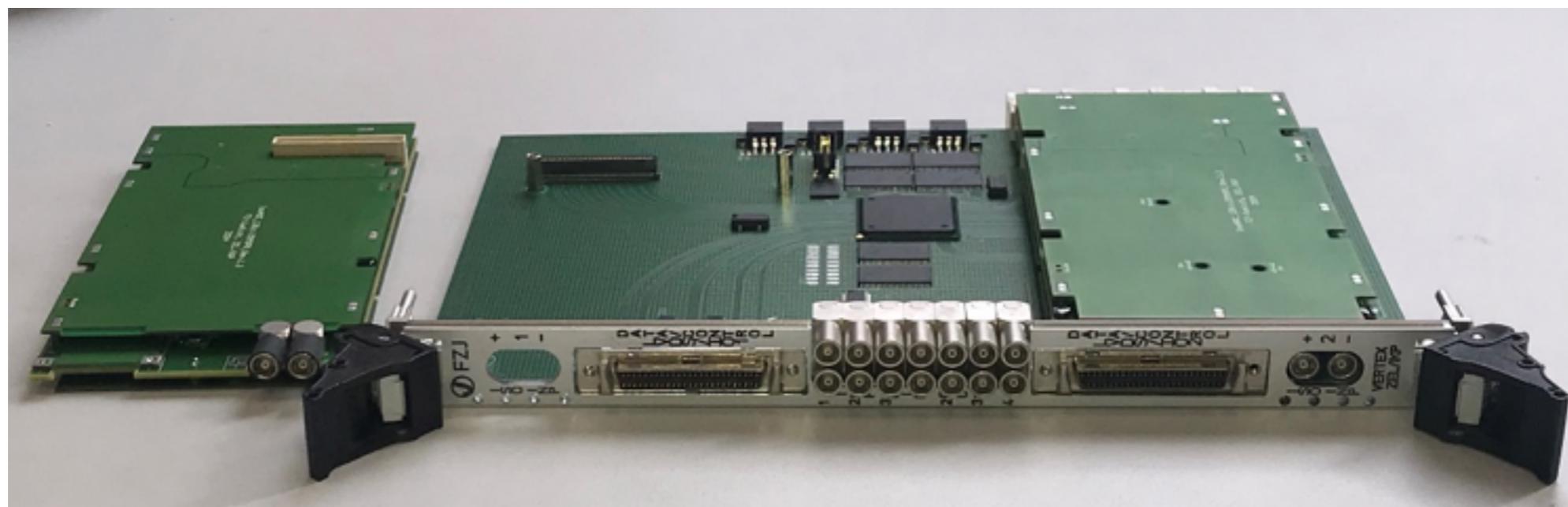
Repeater card



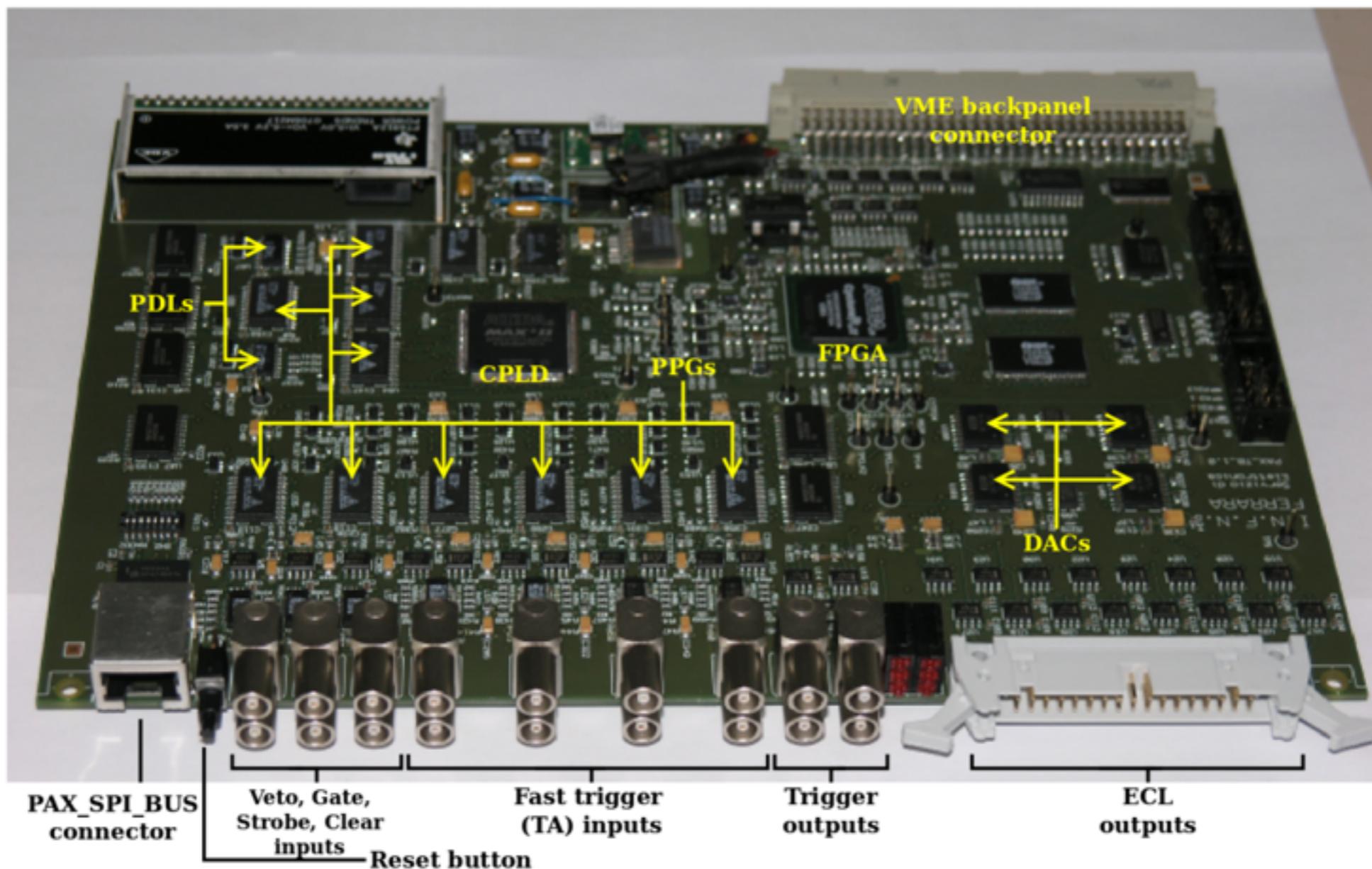
ADC + Sequencer

- **12 Bit ADCs, up to 10MHz sampling**
- **One sequencer per detector side**
- **Hardware common-mode correction**
- **Hardware zero suppression**

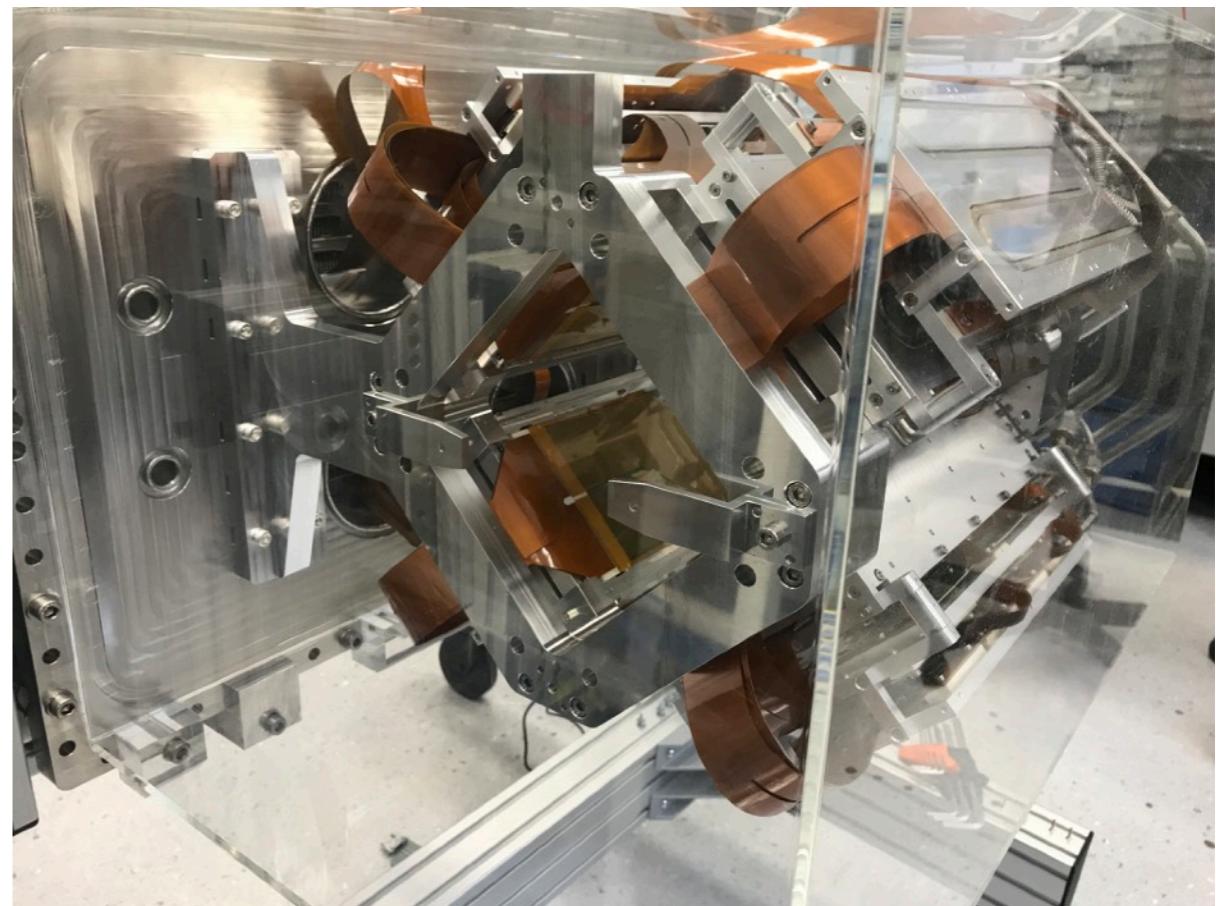
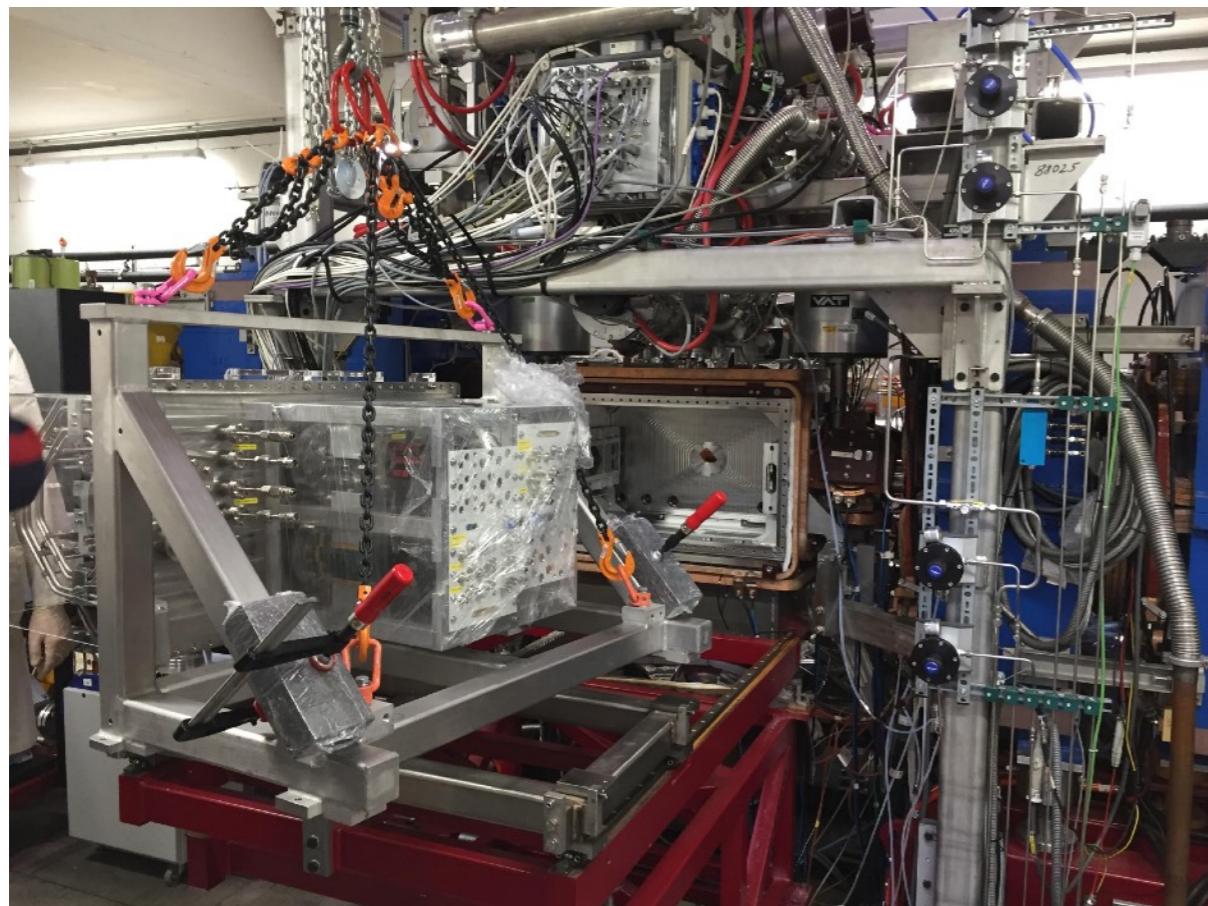
Data flow for 2 STTs: event rate ~ 1000 /s
 $< 50 \mu\text{s}$ dead-time



Trigger module



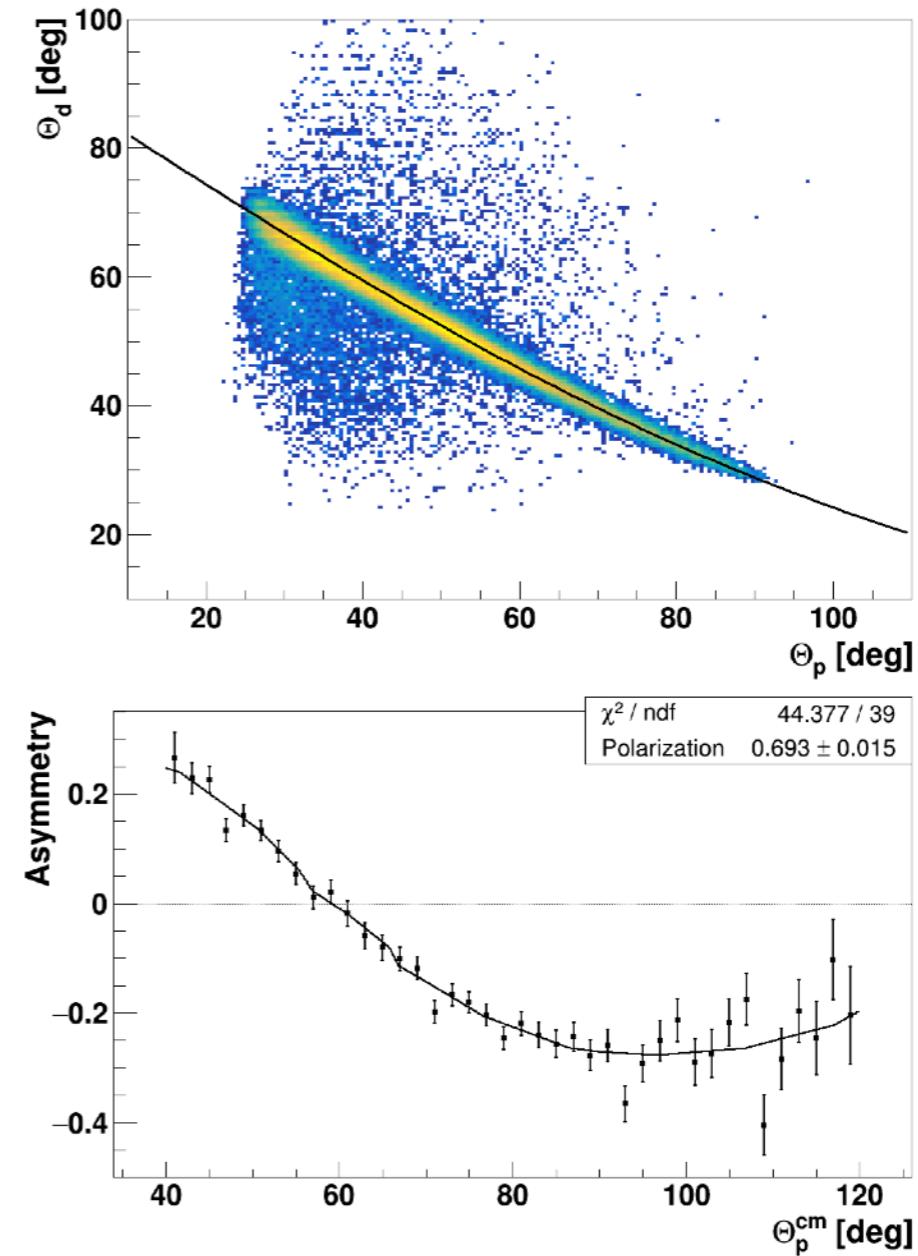
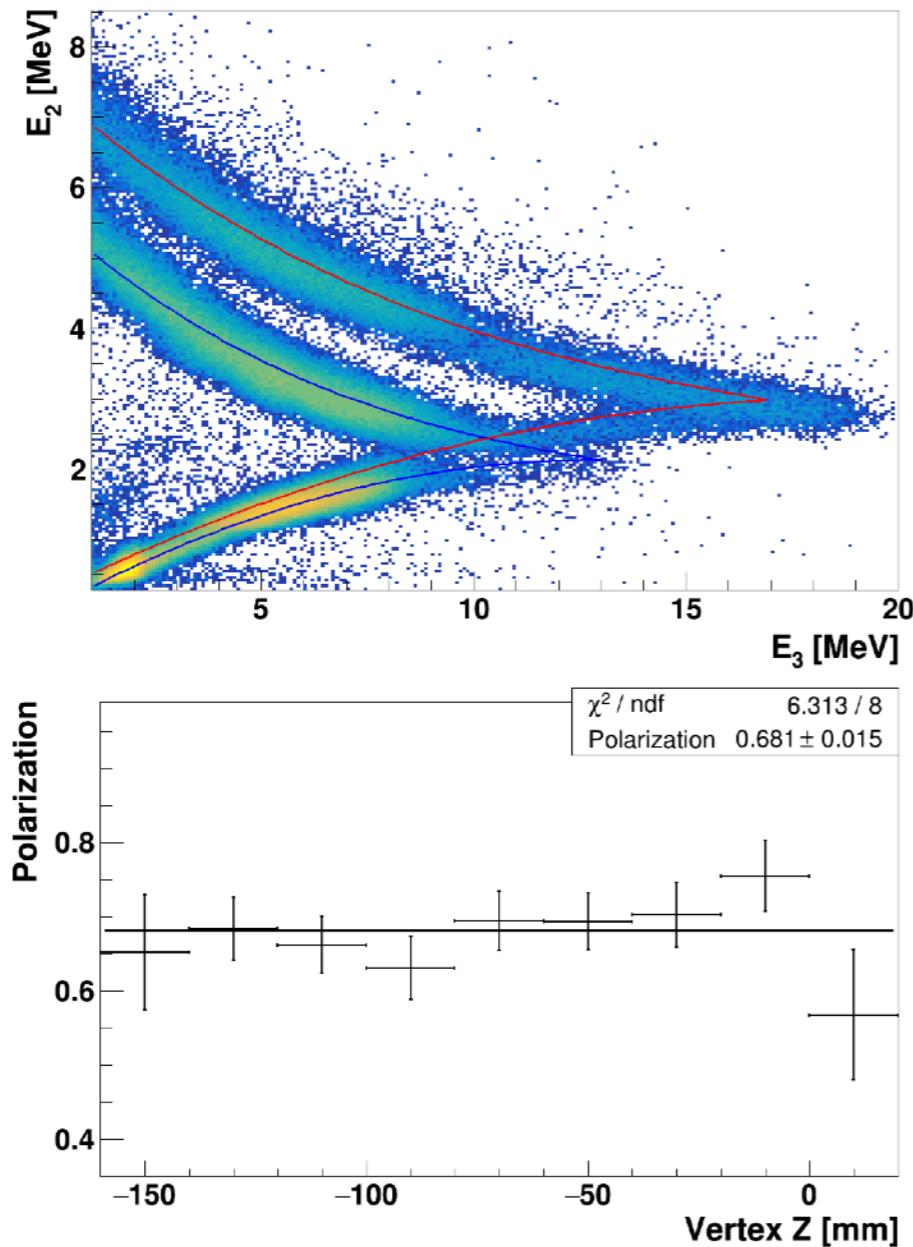
Detector commissioning



- April 2017 - Successful beam-time with two quadrants
- Polarized Deuteron target
- Unpolarized proton beam: 135 MeV

Results

- Identification of p-d elastic events

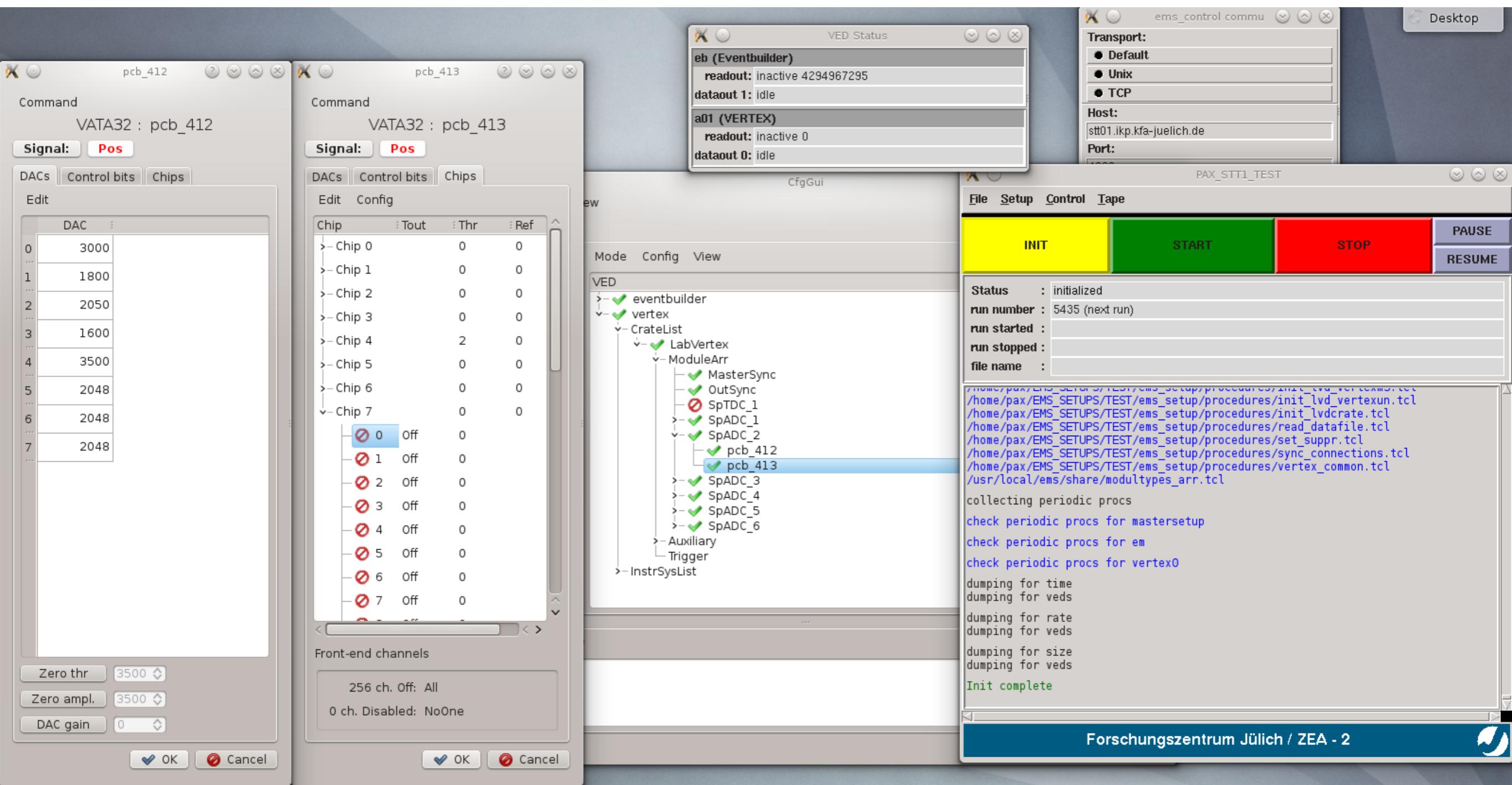


PAX/TRIC detector group

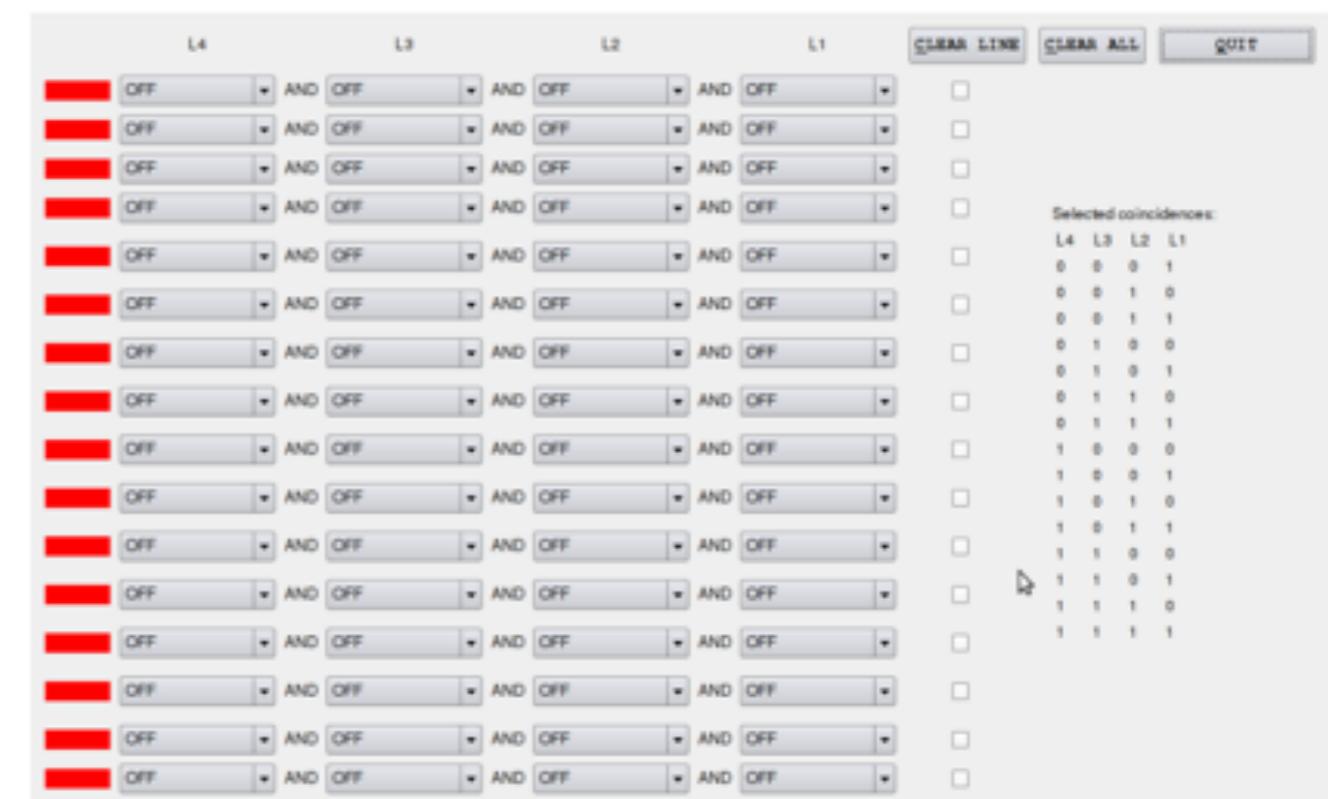
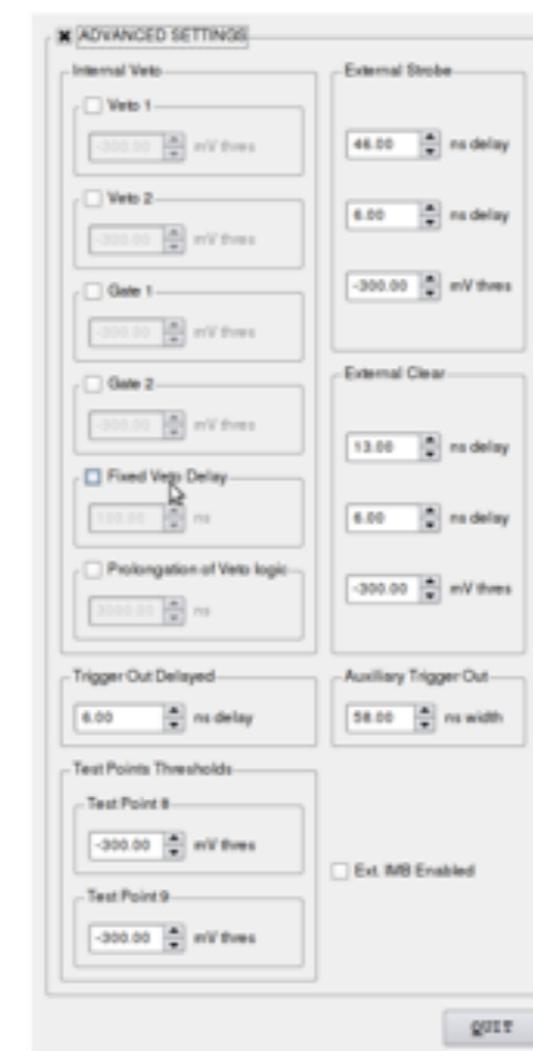
- P. Lenisa
- P. Benati
- V. Carassiti
- L. Cibinetto
- G. Ciullo
- G. Guidoboni
- H. Jagdfeld
- T. Krings
- S. Merzliakov
- S. Michiritychians
- A. Pesce
- L. Semke
- M. Statera
- S. Squerzanti
- G. Tagliente
- S. Trusov
- C. Weidemann

Thank you for your attention!

Additional slides



Additional slides



(a) Main window.

(b) Advanced settings window.

(c) LUTs window.

Additional slides

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