

β -Source Setup for the charge collection efficiency measurements of radiation damaged sensors

14 November 2012

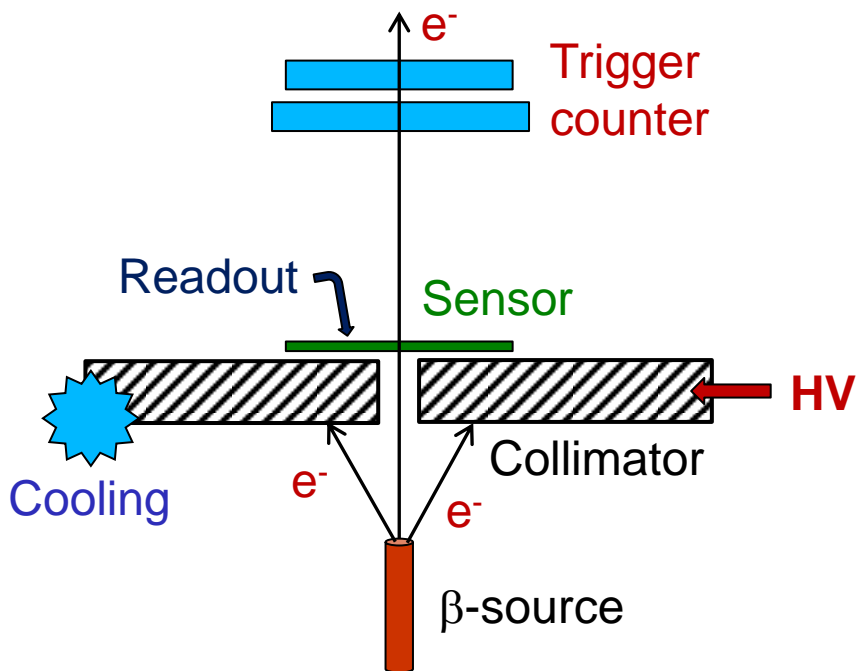
FCAL Collaboration Meeting

Sergej Schuwalow

Universität Hamburg/ DESY Zeuthen

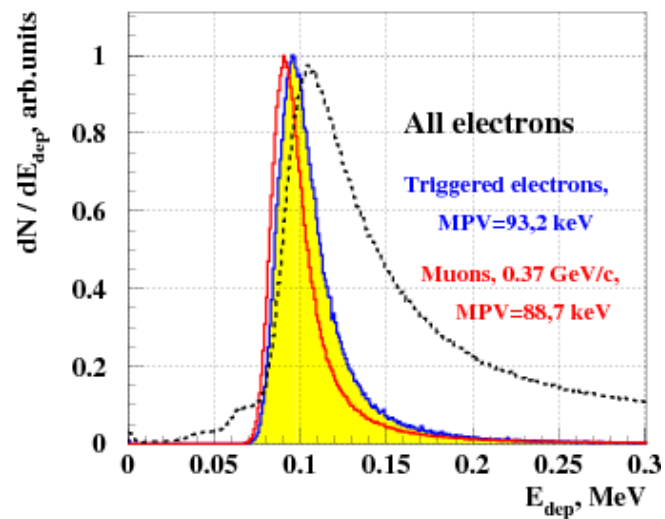
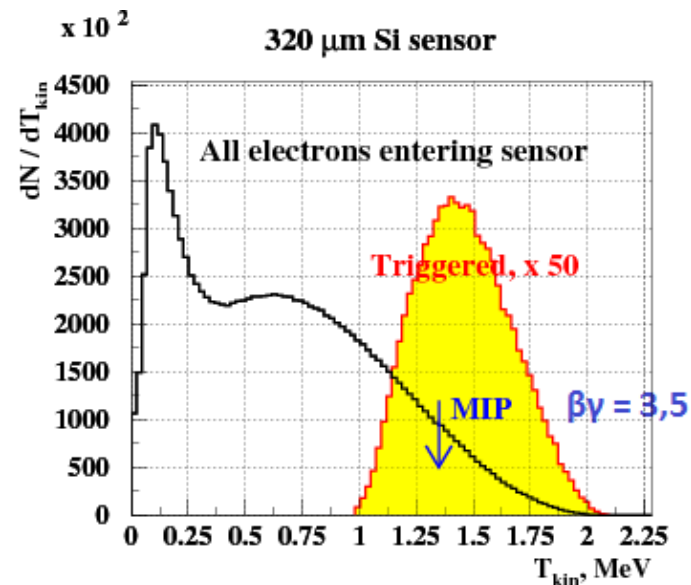
New setup has to have the following abilities:

- Measuring of very low signals (highly radiation damaged sensors, study of charge collection at low electric field, study of sensors with small CCE).
 - Low noise, good shielding, reliable trigger system
 - Separate measurements of signal and pedestal, perfect beam collimation
 - Study of charge collection in the wide range of sensor temperatures
 - temperature control
 - good thermal contact between the sensor and thermal sink
 - Ability to acquire signals of different polarity (polarization studies, testing of semiconductor structures)
 - specially designed readout electronics
 - No need of sensor bonding (sensors production tests)
- ➡ “probe station like” design, cold chuck + test needle contact



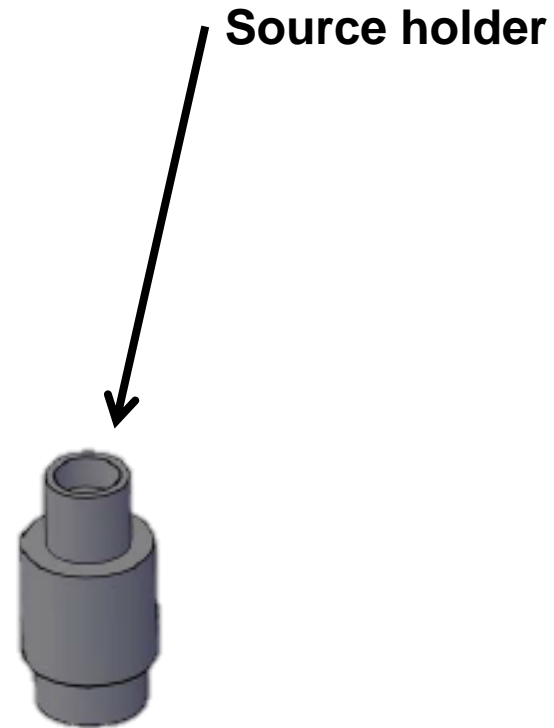
Trigger:

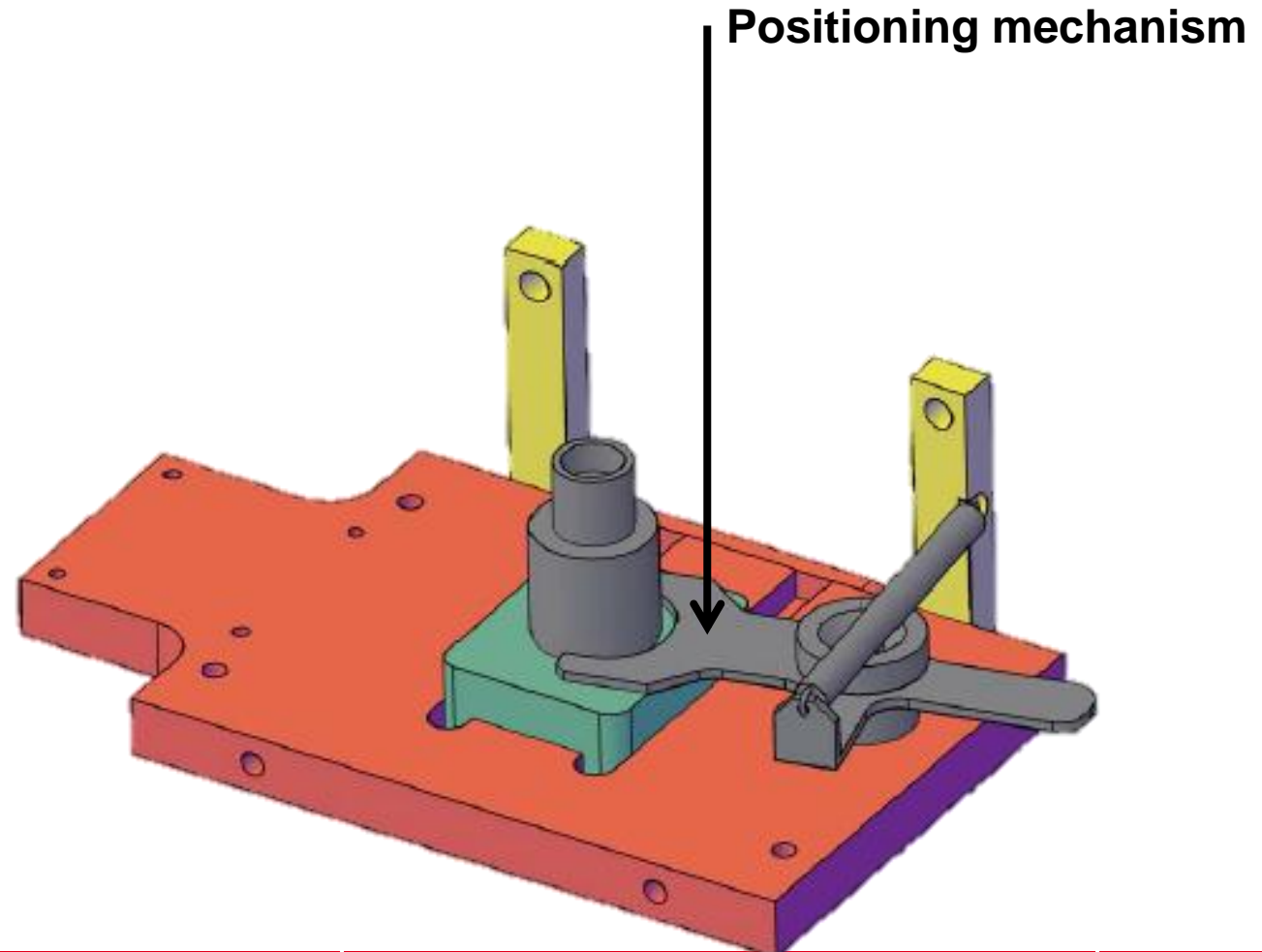
- Gate for signal digitization
- MIP selection

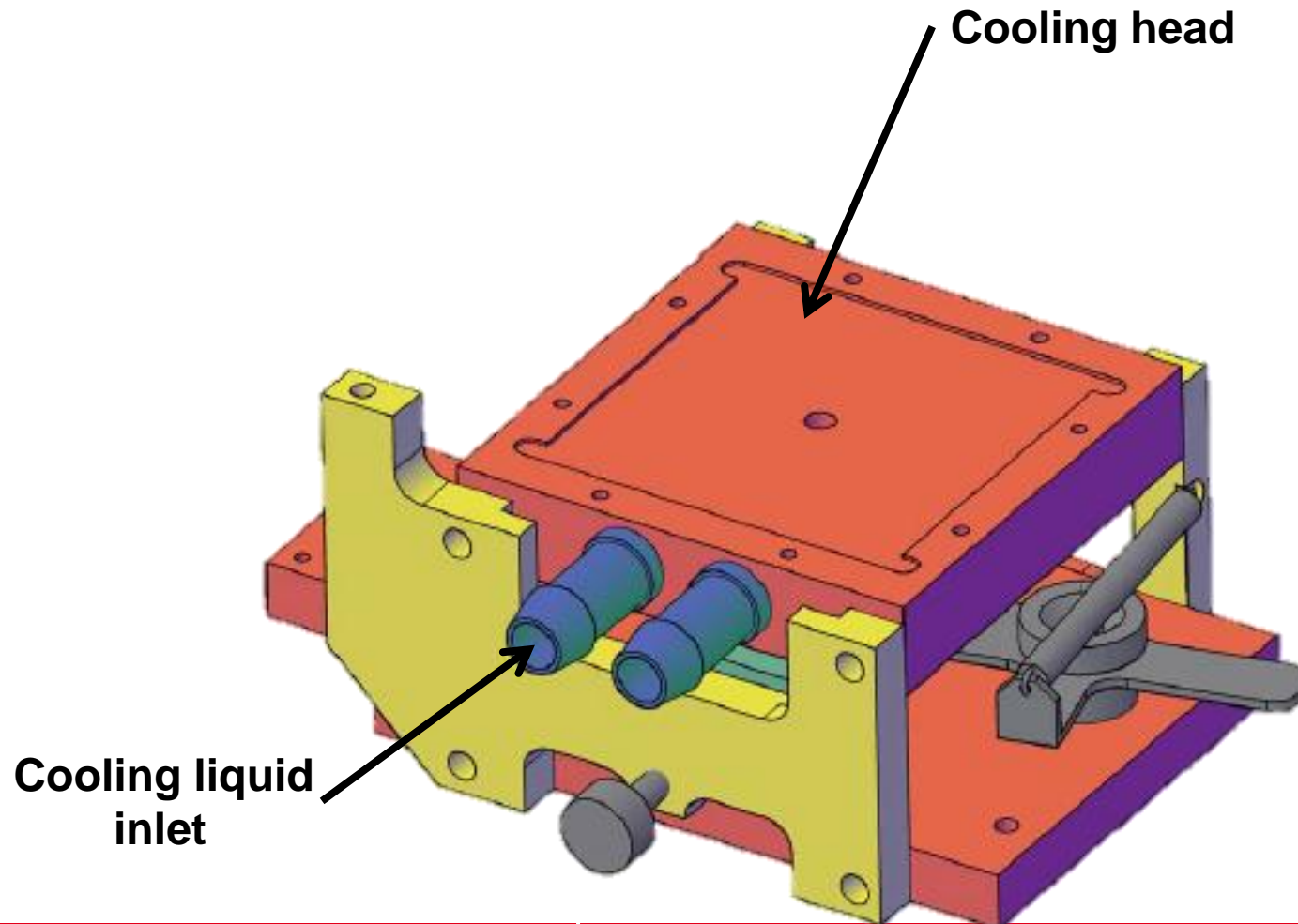


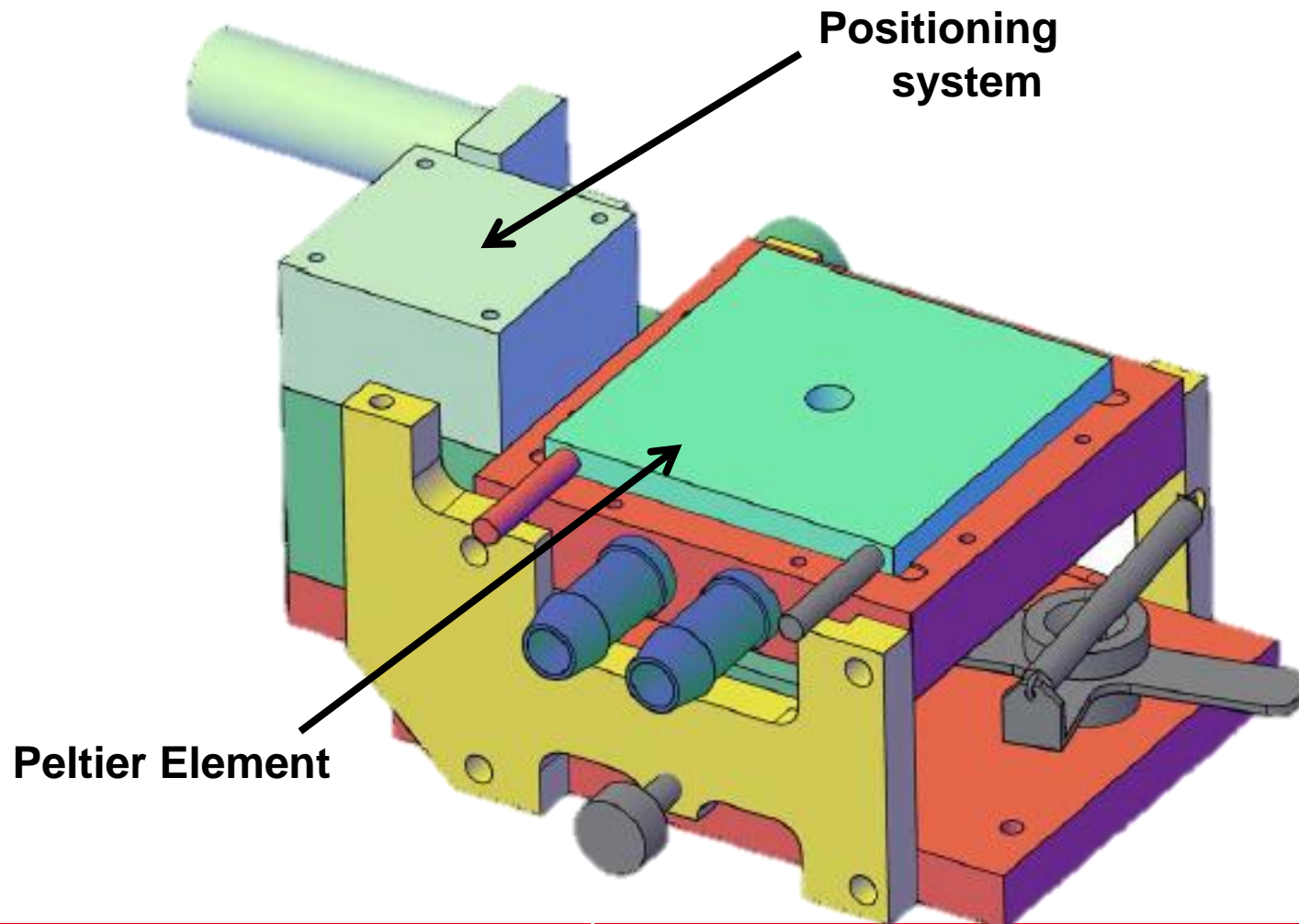
β -Source
 ^{90}Sr 37 MBq

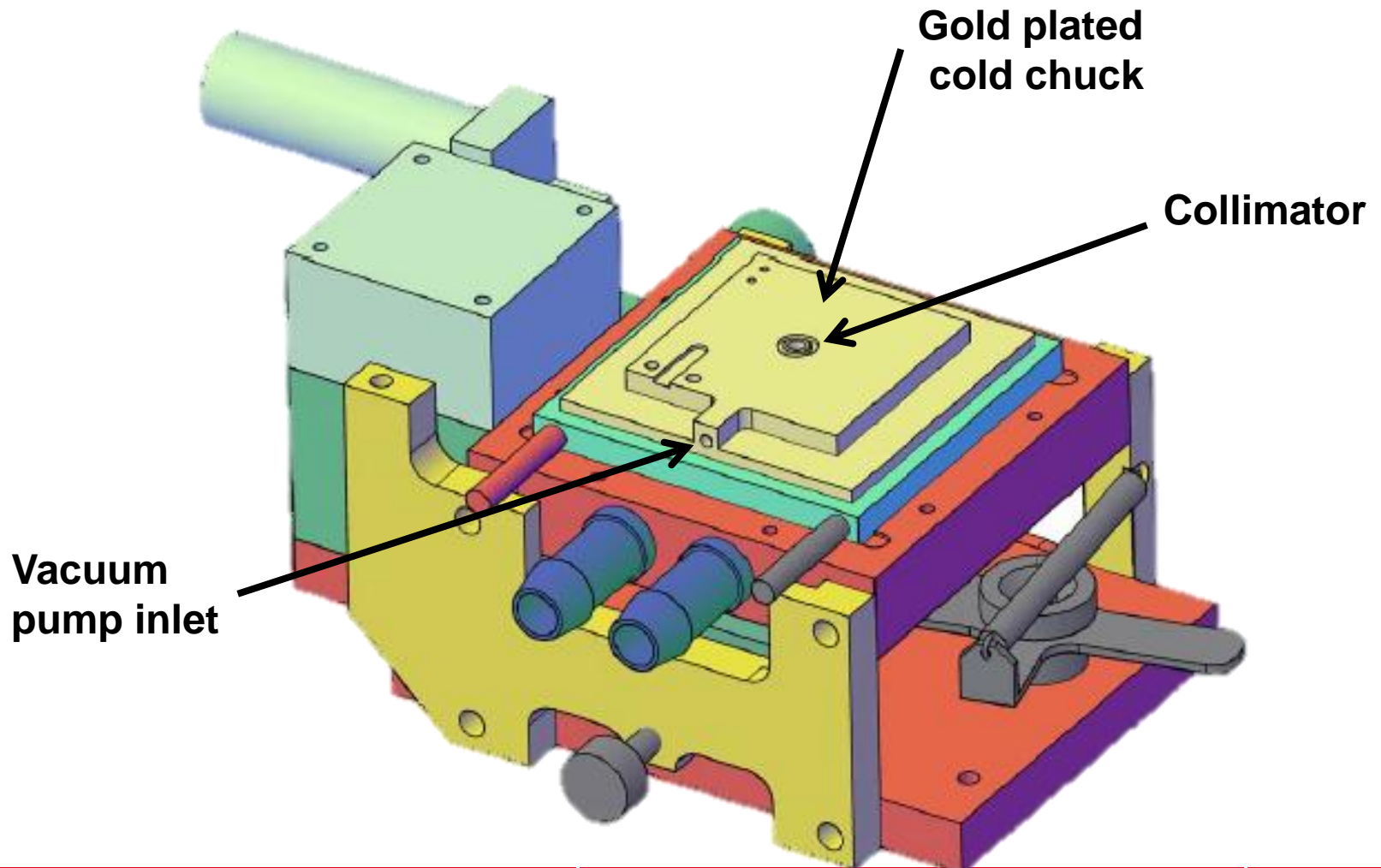


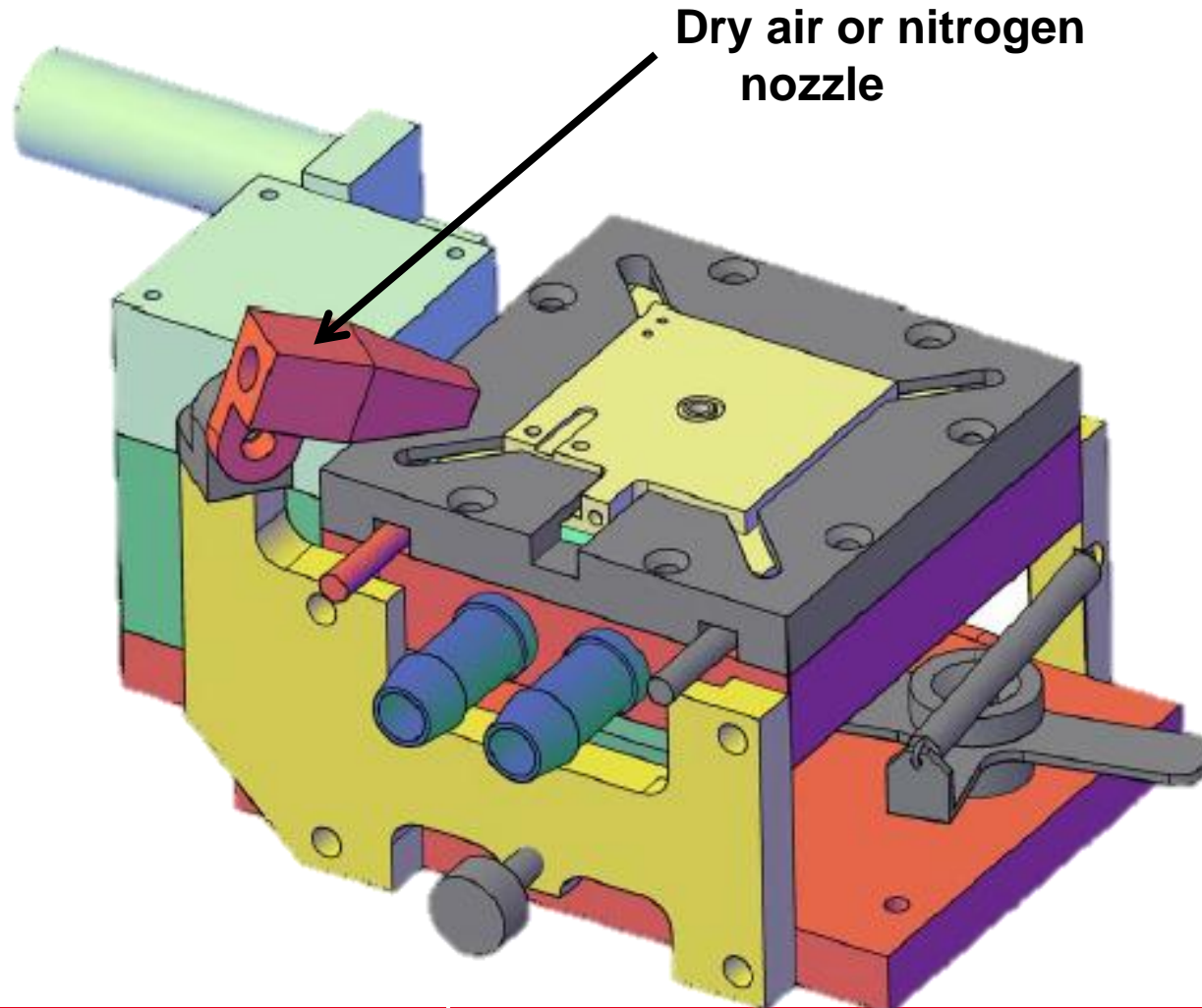


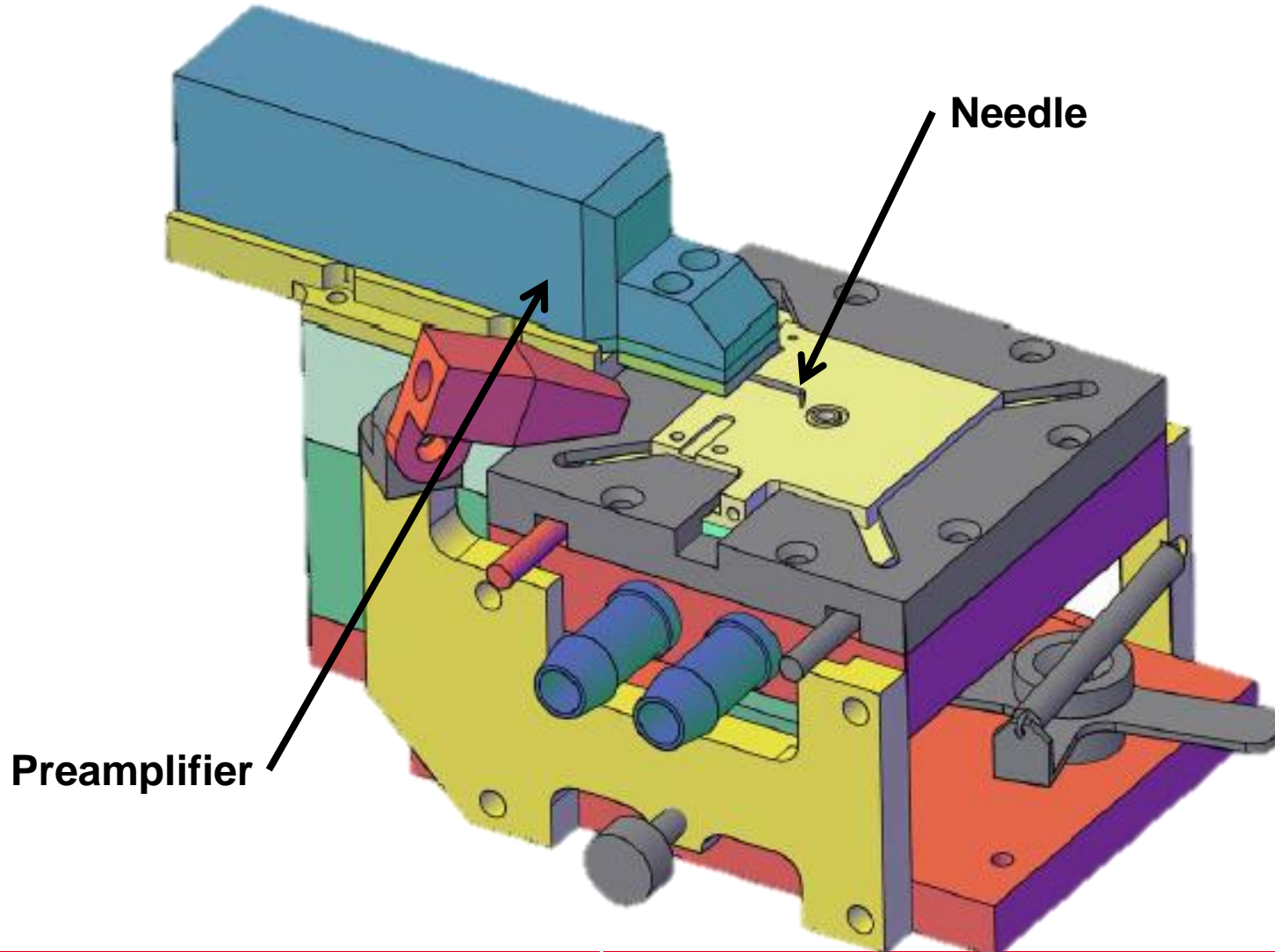


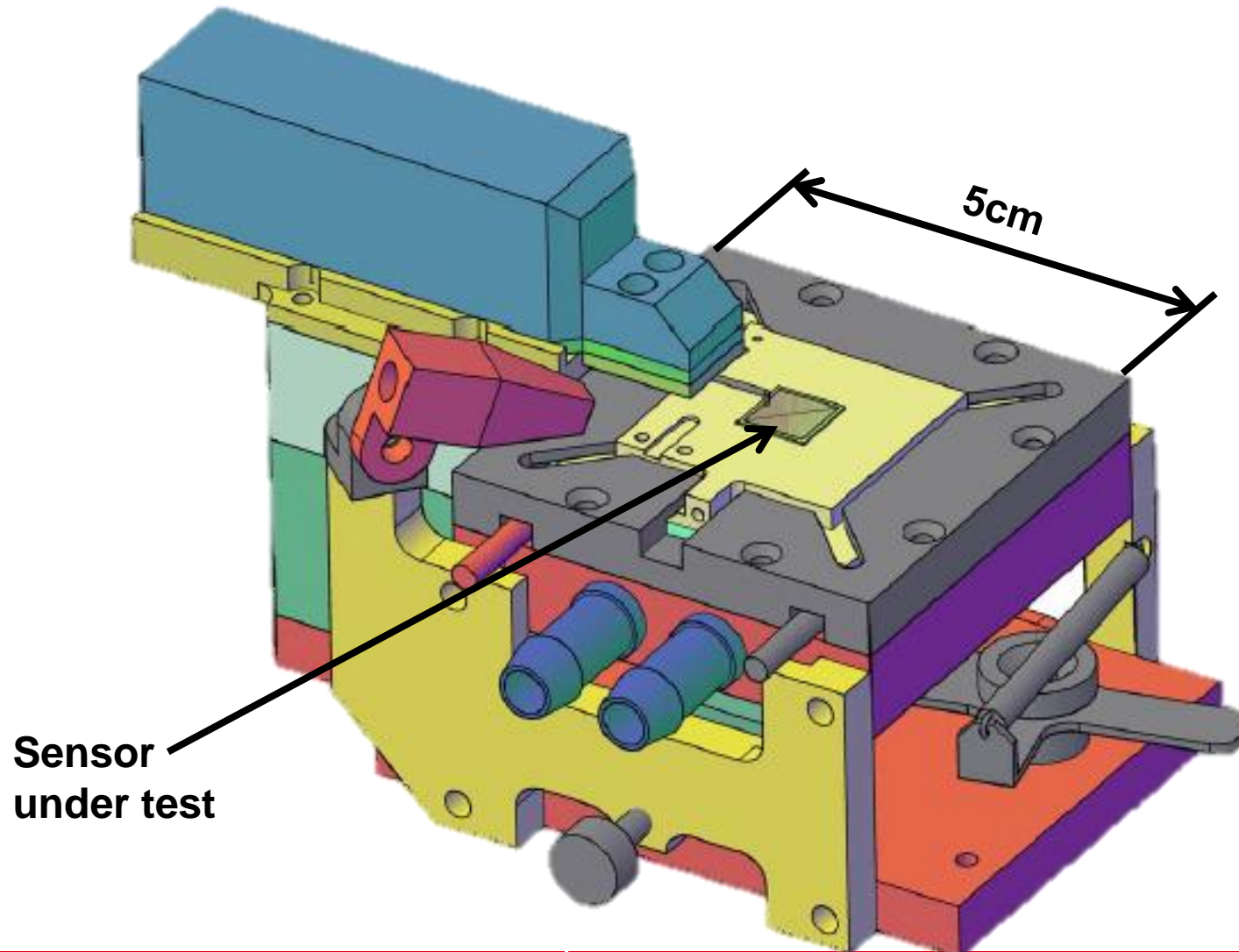




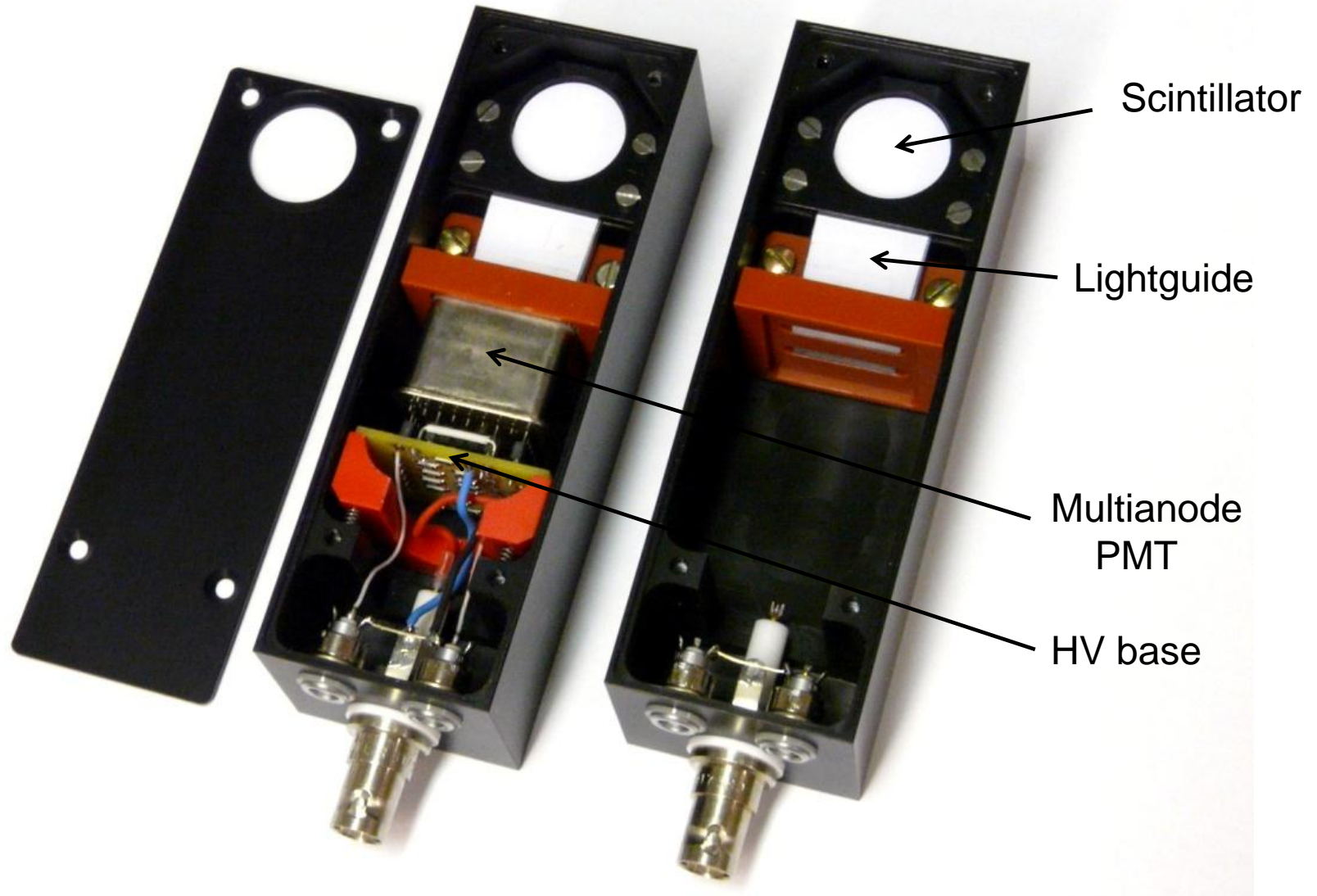




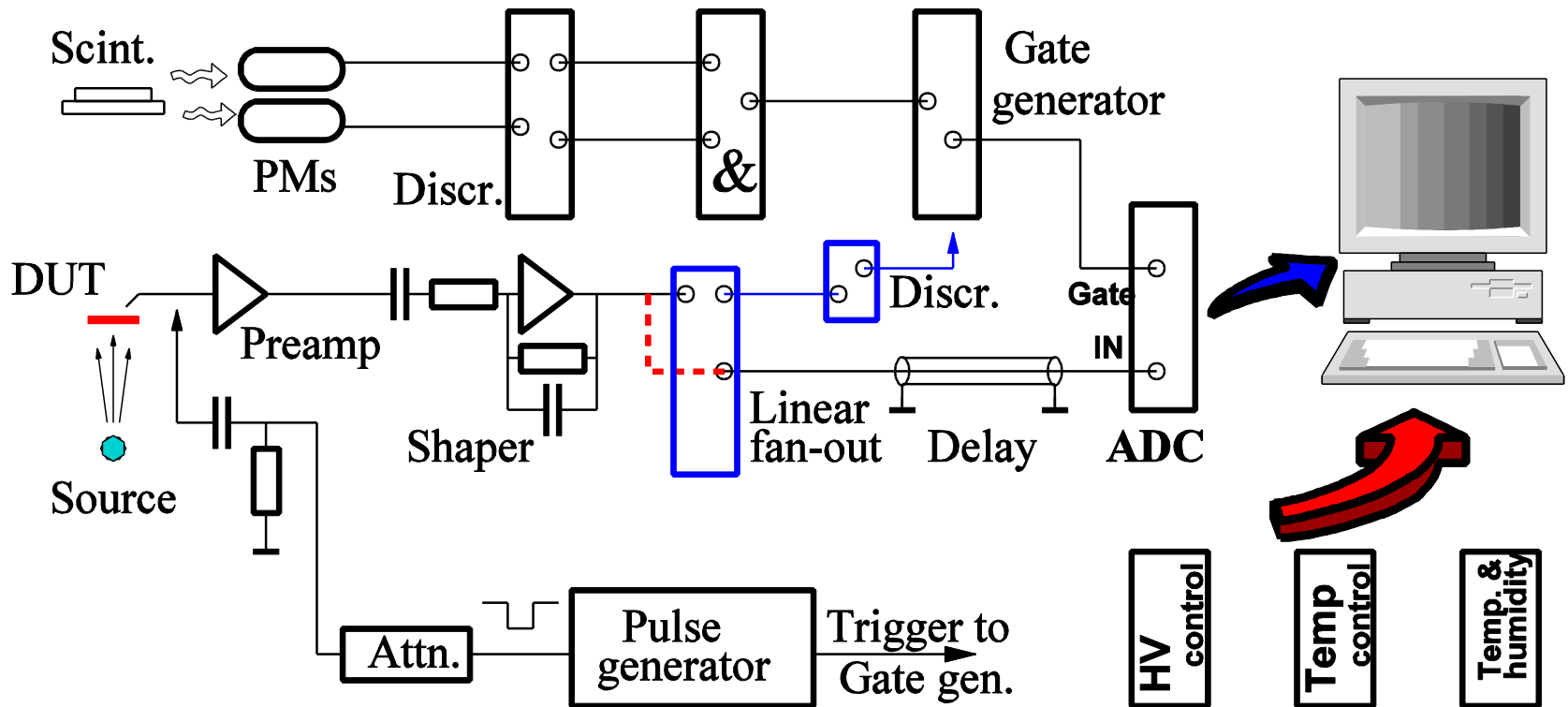




Trigger counter

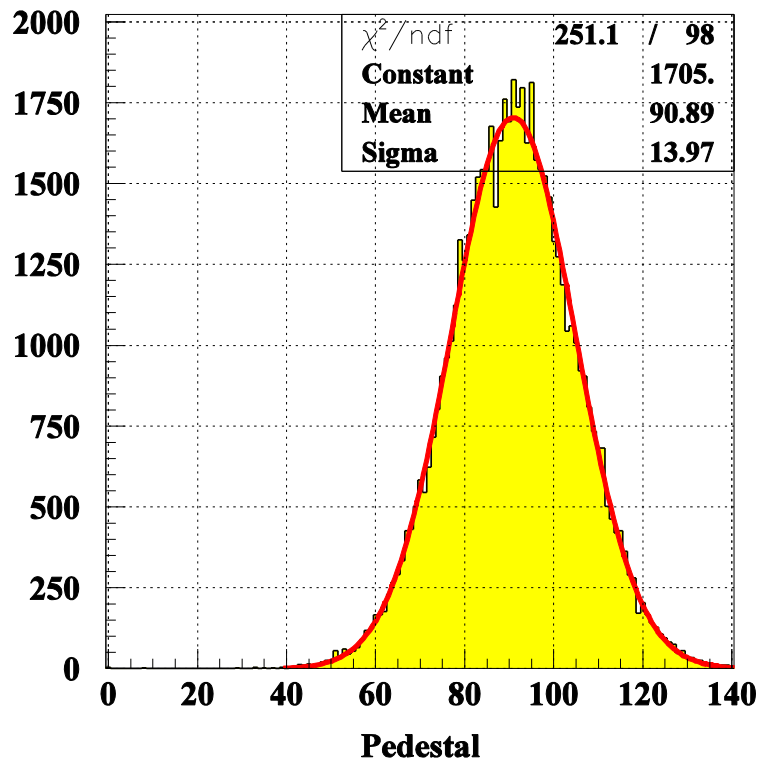


Trigger and Readout



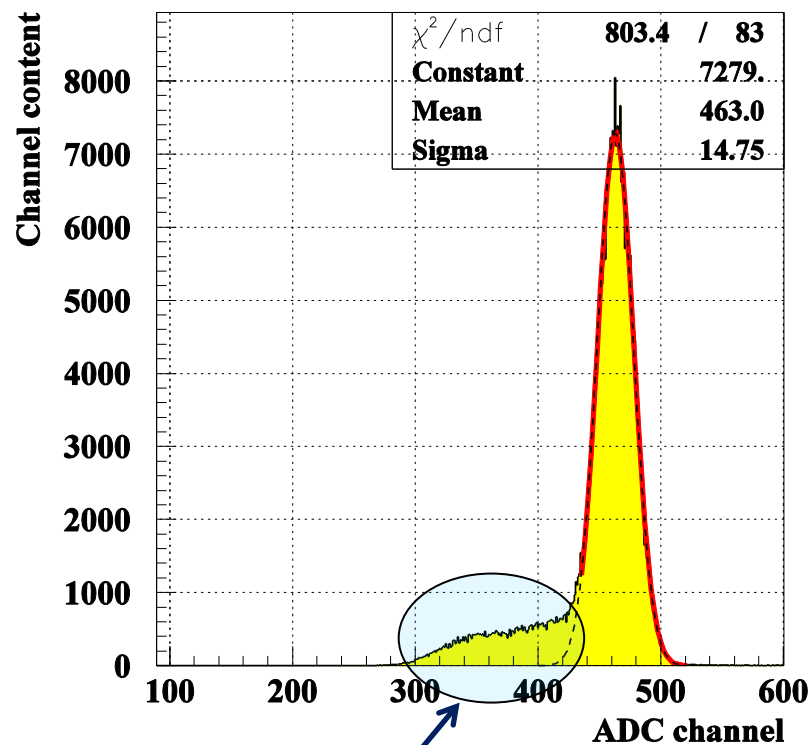
- First version of the setup had been built for Si sensors studies
- Some results: see next slides
- DESY-Zeuthen version:
 - improved shielding
 - usage of DC-coupled ADC (CAEN v965)
instead of AC-coupled (CAEN v265)
 - safe temperature control
 - new fast shaper?

Calibration with ^{241}Am source



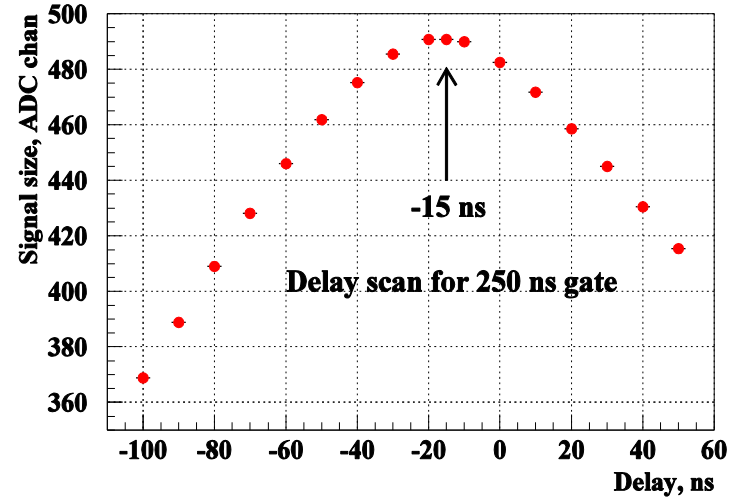
Noise ~ 600 e

Calibration with ^{241}Am source

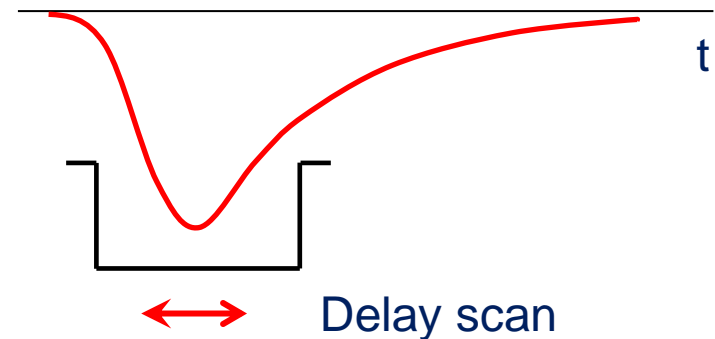


Compton scattering

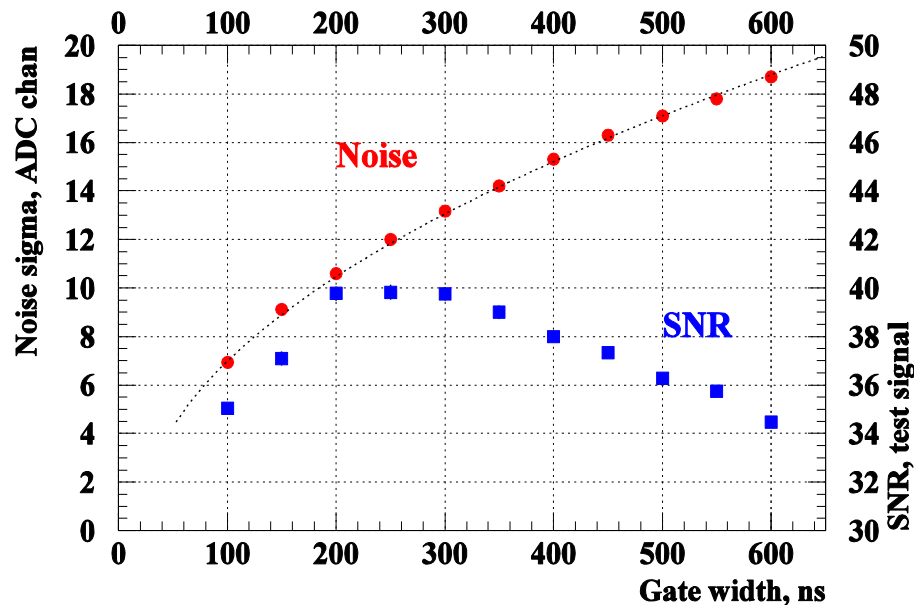
Noninverting channel 13.04.2012



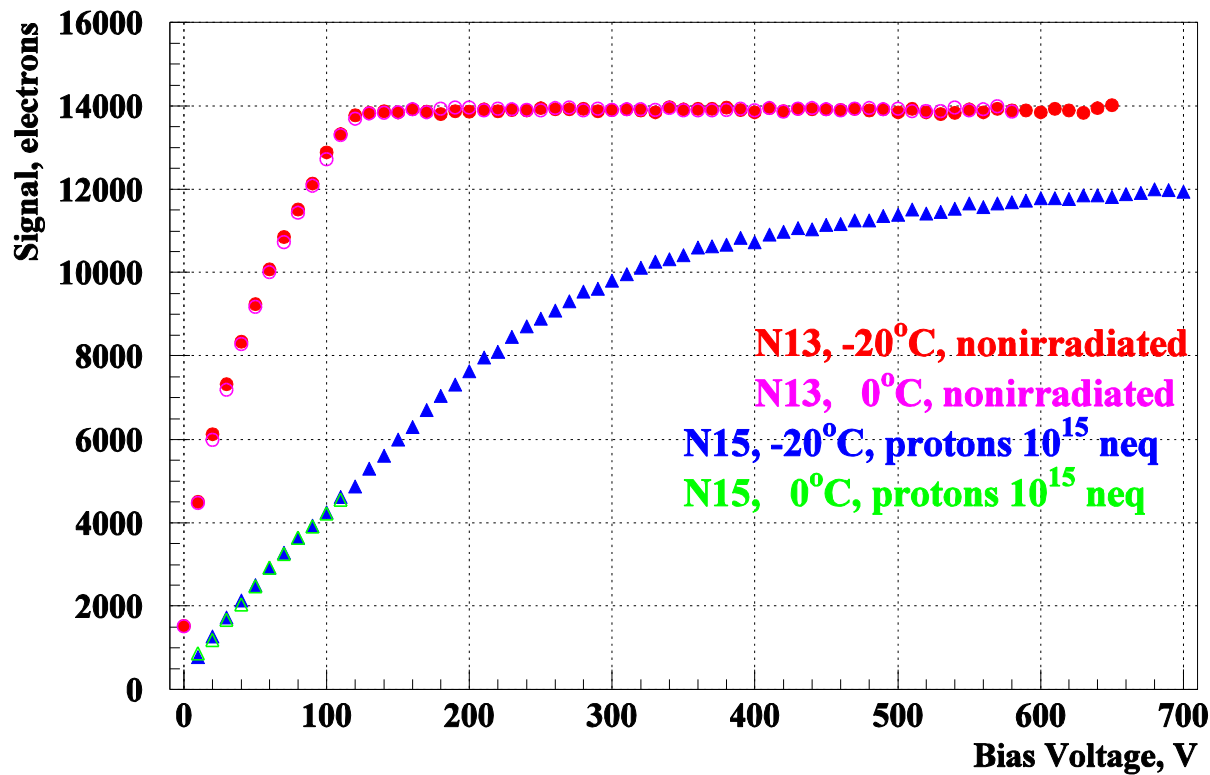
- Use test pulse ~20000 e
- For each gate width perform delay scan to define max response



Noninverting channel 12.04.2012



MCZ200N 05 DiodeS (Beta setup)



- New ^{90}Sr -setup optimized for small signal measurements had been designed and produced (Uni-Hamburg for Si sensors, DESY-Zeuthen optimized for diamond, GaAs and sapphire sensors)
- First results available from Uni-Hamburg setup
- DESY-Zeuthen setup construction is finished, first tests started (Oliver)
- Looking forward to see results

Next steps:

- Readout adjustment (baseline, SNR optimization)
- Calibration
- Measurements at room temperature
- Chiller and Peltier element connection, temperature control

Thank you