WP6
Activities of Karlsruhe IT

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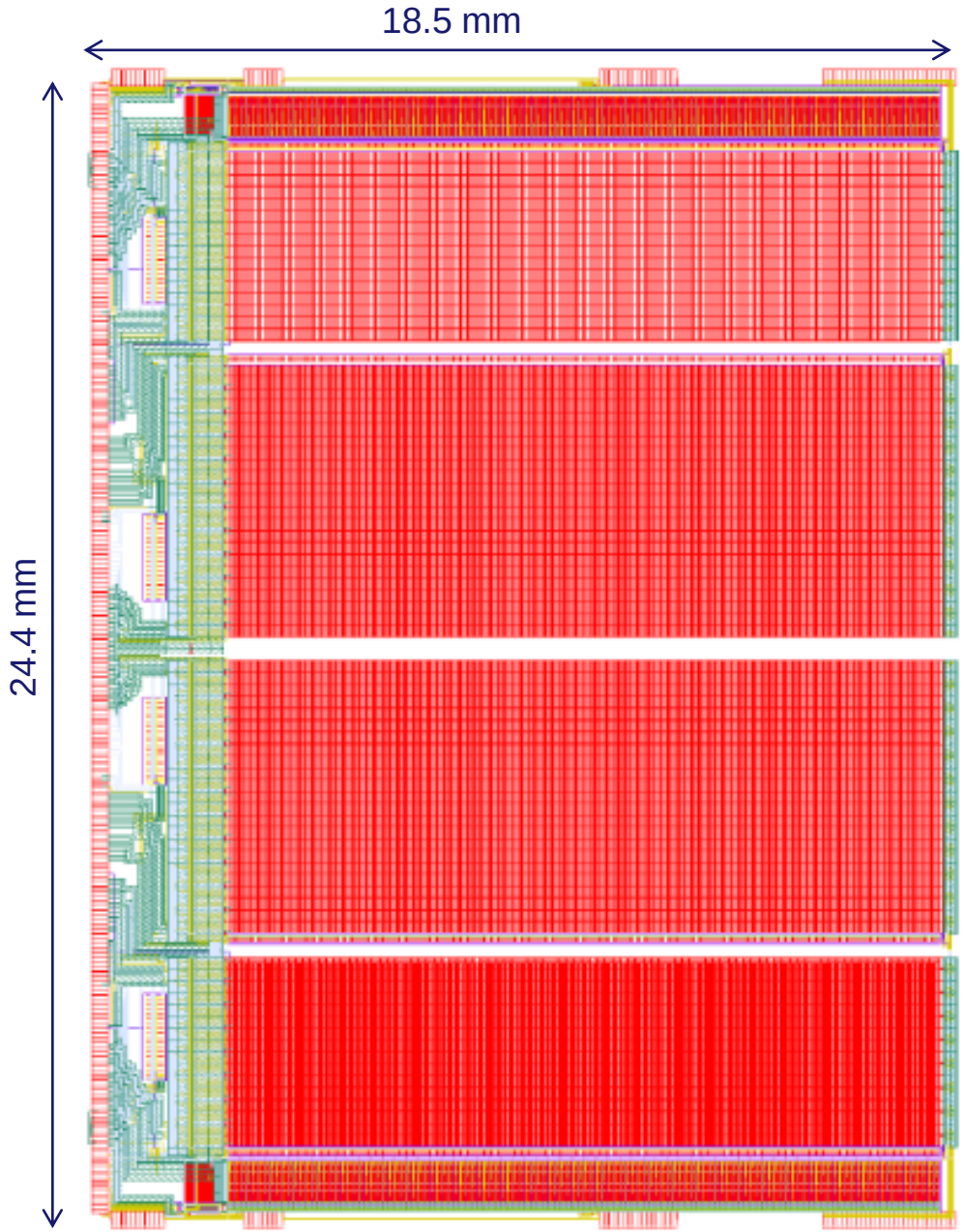
Task 3: Reticle size sensor in AMS H35 - H35DEMO

- Layout of the sensor
- Producer AMS – technology H35 350nm
- Pixel size is 250 µm x 50 µm.
- The sensors have been produced on p-type substrates with four different substrate resistivities: 20, 80 (50-100), 200 (200-400) and 1000 (600-2000) Ωcm
- Sensor type HVCMOS (see later)
- Sensor contains four matrices
- The first two pixel matrices contain 300 x 23 analog pixels each, that can be chip filpped to FEI4 and signals readout by bumps or capacitive coupling
- Third matrix: 16 x 300 digital pixels - pixel electronics with comparator. Standalone (monolithic) readout possible
- Third matrix: 16 x 300 digital pixels - pixel electronics with comparator. Standalone (monolithic) readout possible
- Fourth matrix: 16 x 300 analog pixels with standalone readout

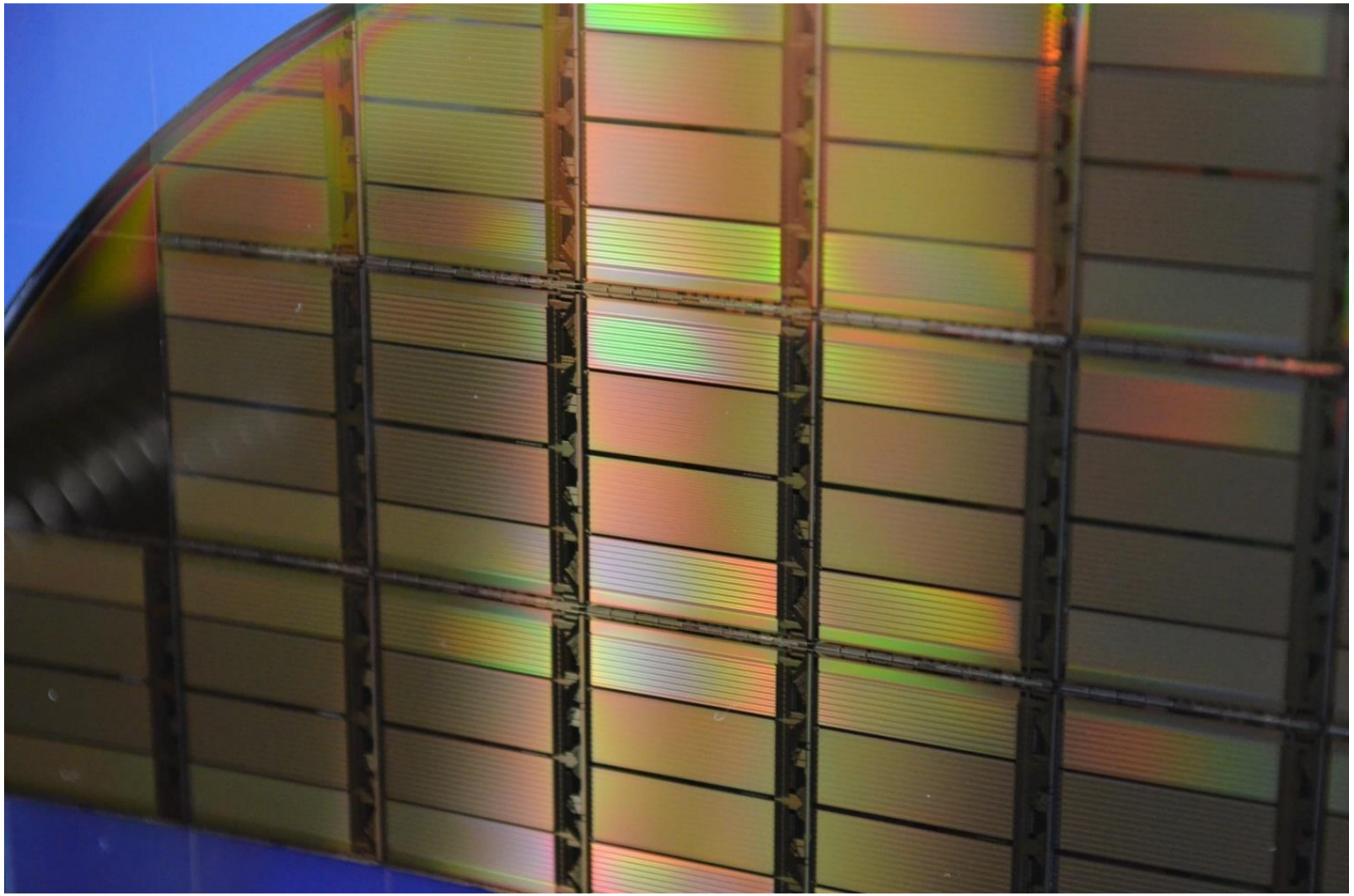


Task 3: Reticle size sensor in AMS H35

- Several test structures implemented
- Structures for measurements of sensor capacitance
- Diodes for laser measurements
- Diodes with fast on-chip amplifier
- H35DEMO detector can be used to test the quality of capacitive coupling.
- It is possible to apply an externally generated test pulse to every bump bond pad.
- Coupling capacitance can be determined
- Capacitive coupling between large area chips can be tested

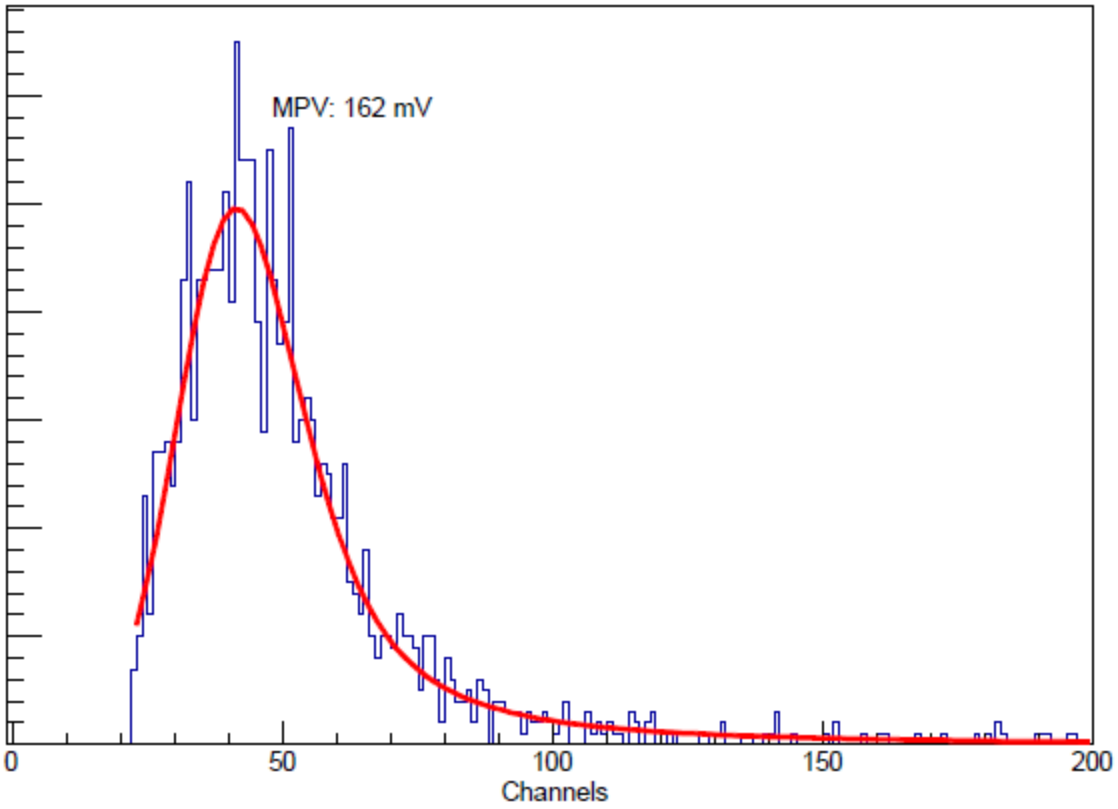
Task 3: Reticle size sensor in AMS H35

- Photograph of diced wafer



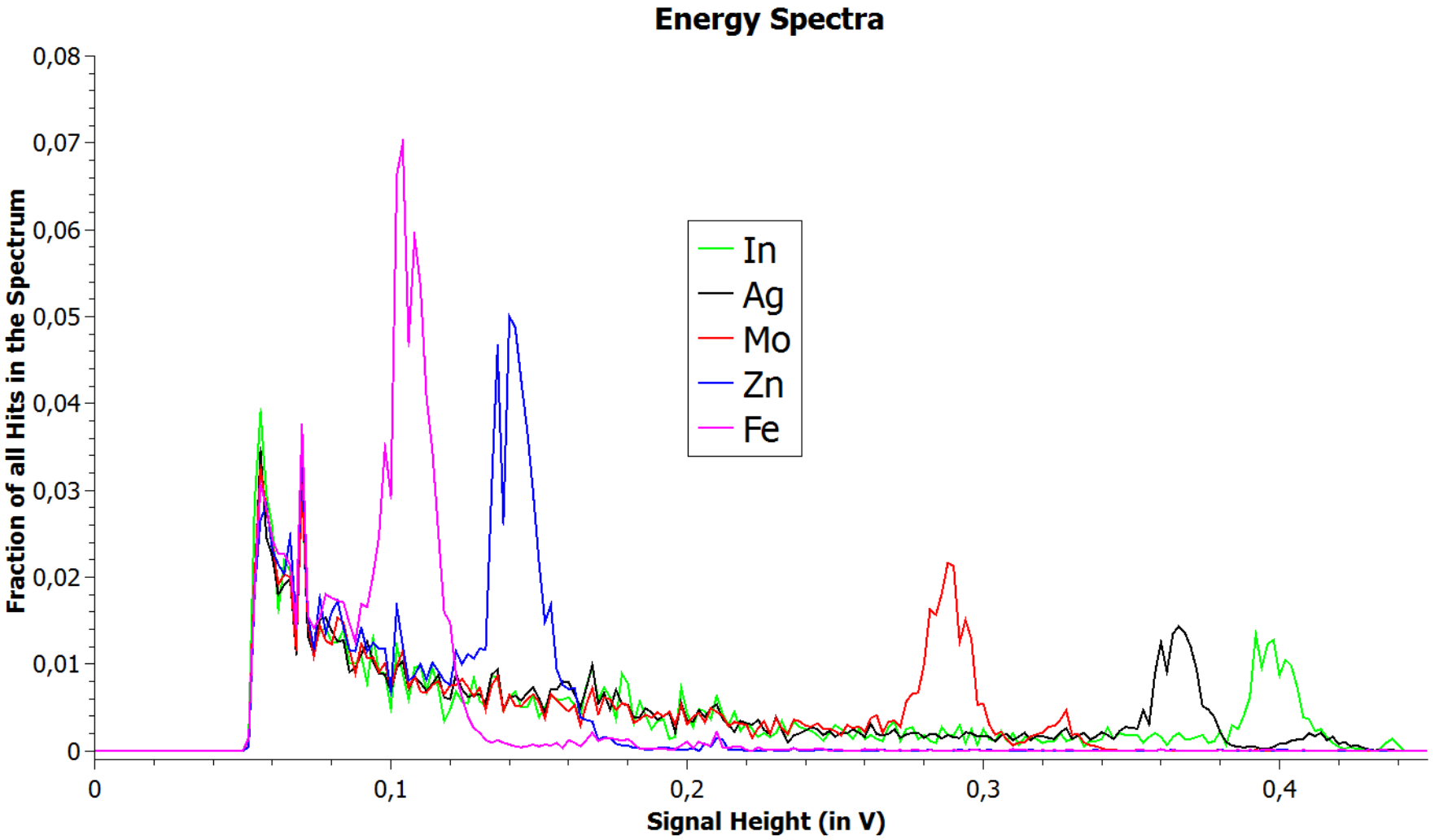
Task 3: Reticle size sensor in AMS H35

- Chip on high resistivity substrate 80 Ωcm
- Sr90 spectrum, HV bias ~ 100V (possible up to 160V)
- Signal: 3700e – about 2x more than in the case of standard substrate



Task 3: Reticle size sensor in AMS H35

- Spectra of different elements (targets irradiated with x-ray tube)



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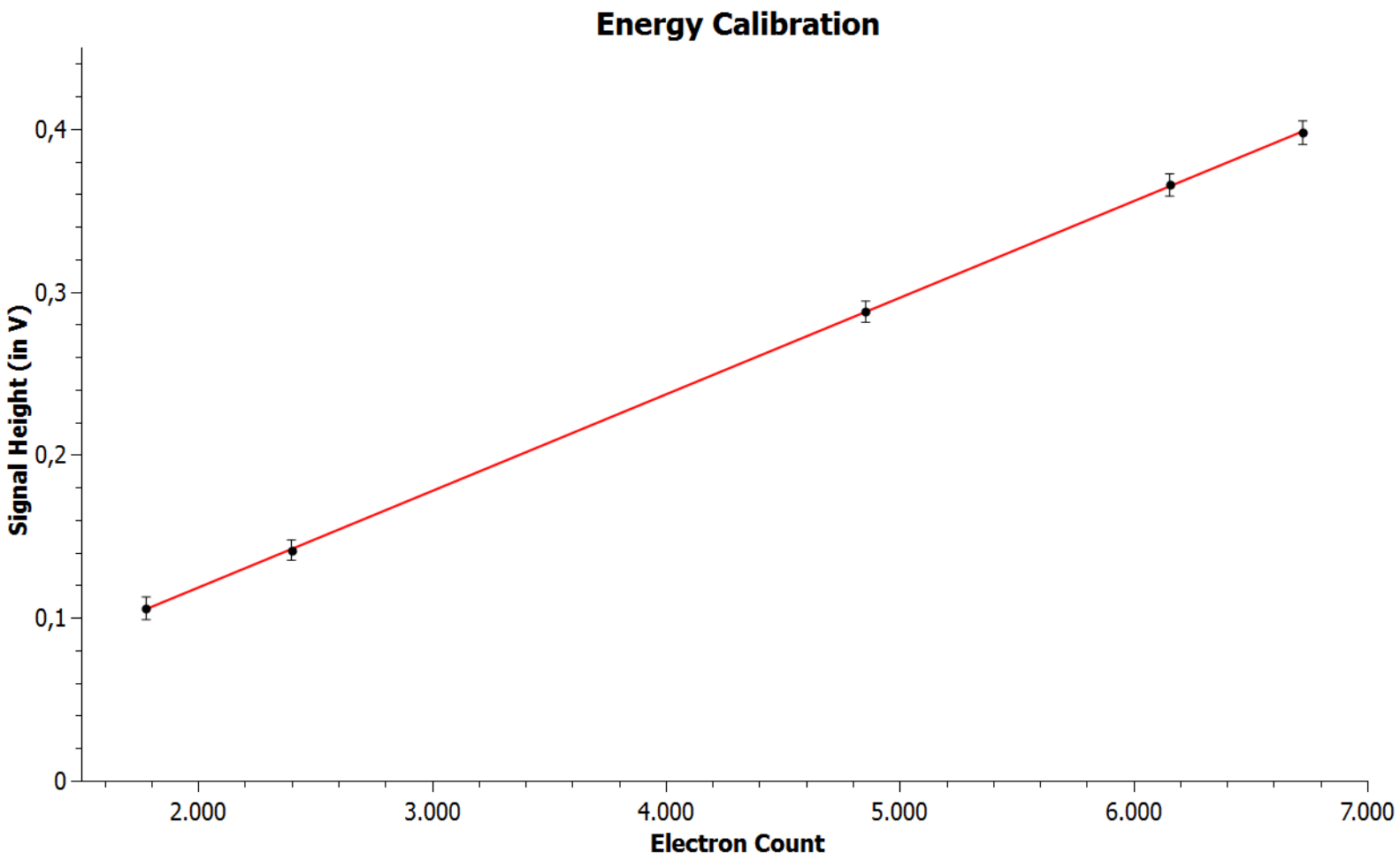
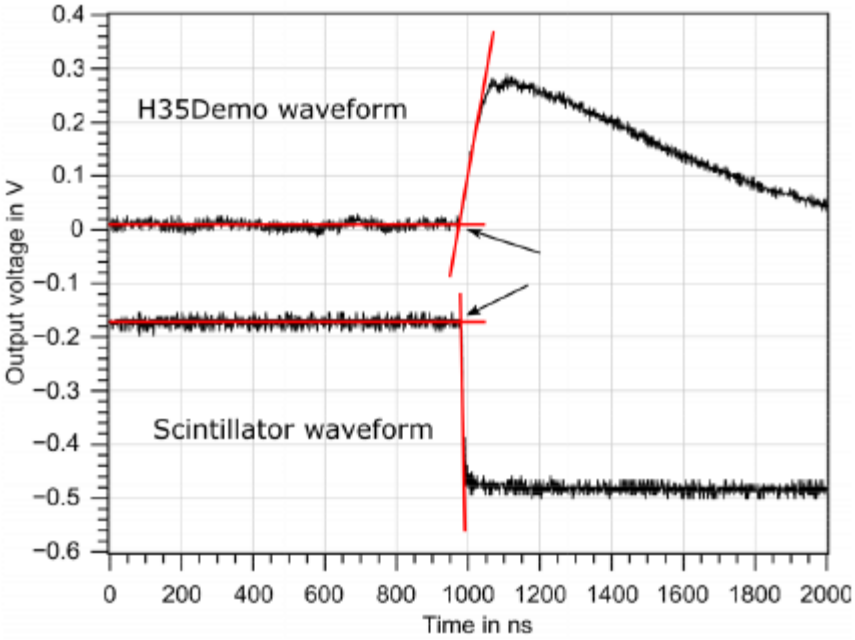
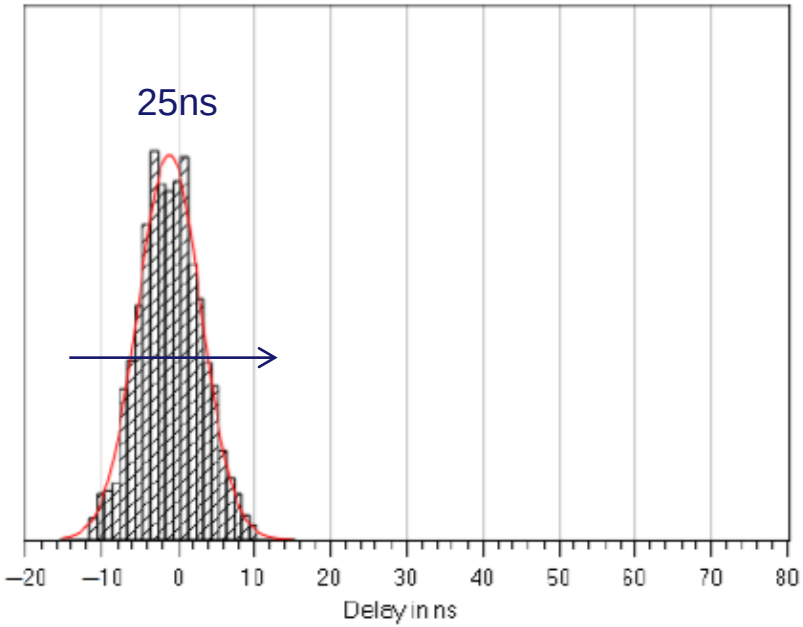
- Energy calibration



Task 3: Reticle size sensor in AMS H35

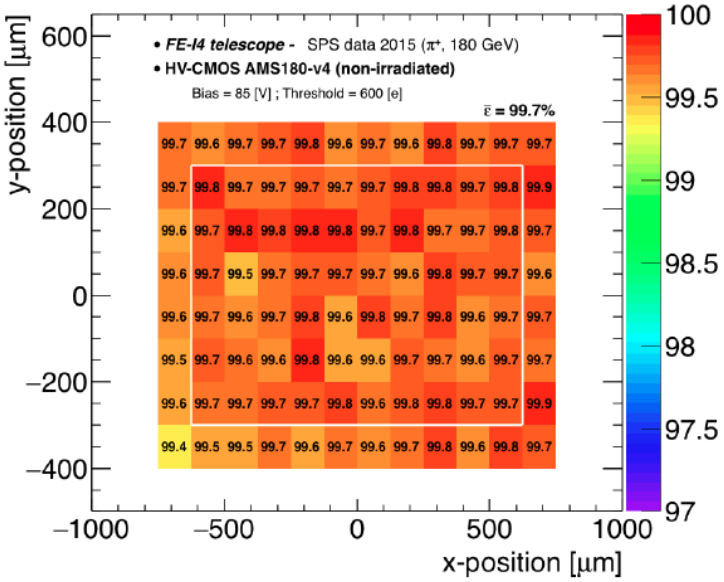
- Time resolution
- Fit of waveform

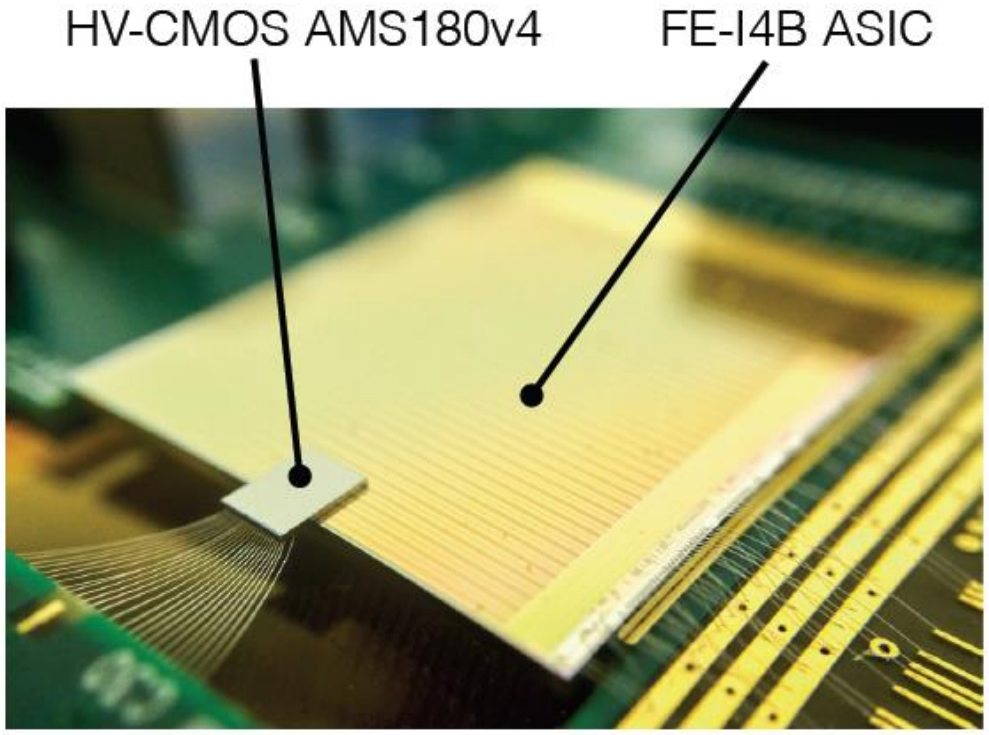




Task 4: Hybridization

- Small capacitive coupled pixel detectors
- CCPD for ATLAS

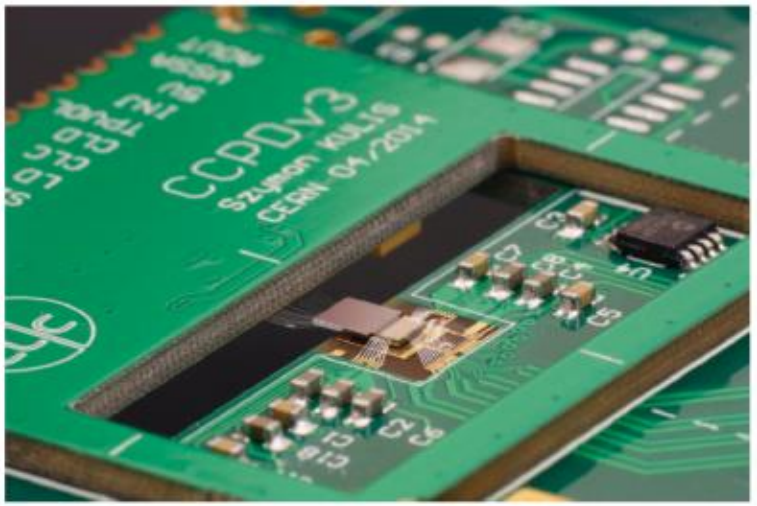




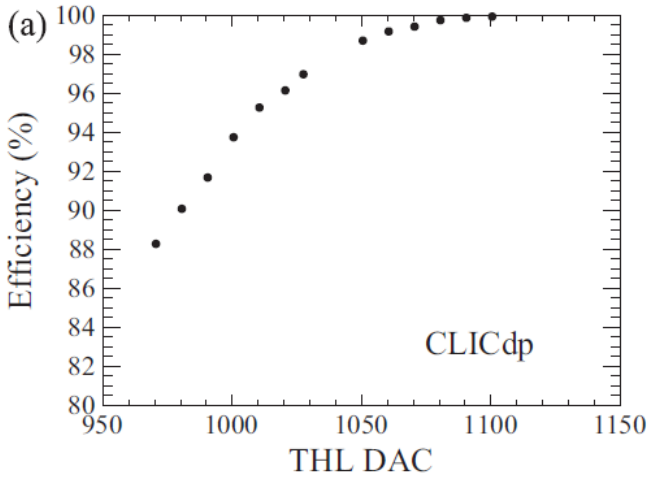
HVCMOS sensor glued onto FEI4

Task 4: Hybridization

- Small capacitive coupled pixel detectors
- CCPD for CLIC



CLICPIX glued onto the HVCMOS sensor



Single hit efficiency for single-stage amplification pixels versus threshold at 60V

Summary

- Large scale (2cm x 2cm) HVCMOS sensors in AMS 350nm technology produced and tested
- The sensor is implemented of 4 different substrate materials, it contains various tests structures and can be attached (capacitively or with bumps) and readout by FEI4. Monolithic readout is also possible. The sensor can be used for development of interconnection technology. Test beams and irradiations are planned
- HVCMOS CCPD Sensor with small pixels (25um x 25um) C3PD produced within CLIC project – it can be used for interconnect technology studies. Similar sensor is being designed in LFoundry
- Capacitive coupling works well on small CCPD chips – investigation of the interconnect technology of large chips ongoing
- Several samples H35CCPD and FEI4 are available