Construction of rebondable module and first measurements with RD50 micron sensors and 3D-stc sensors

10th RD 50 Workshop

4.-6. June 2007

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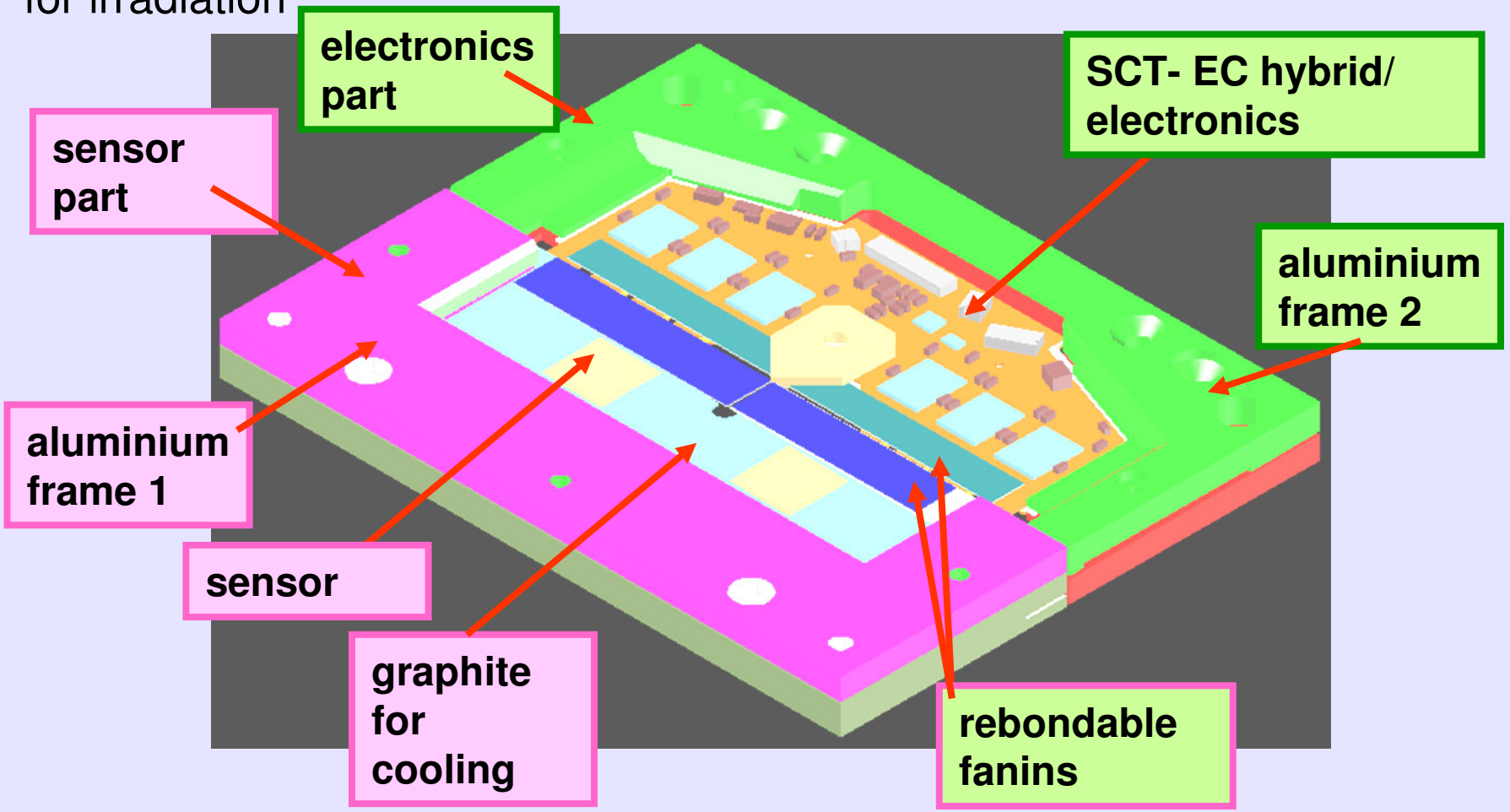
Outline

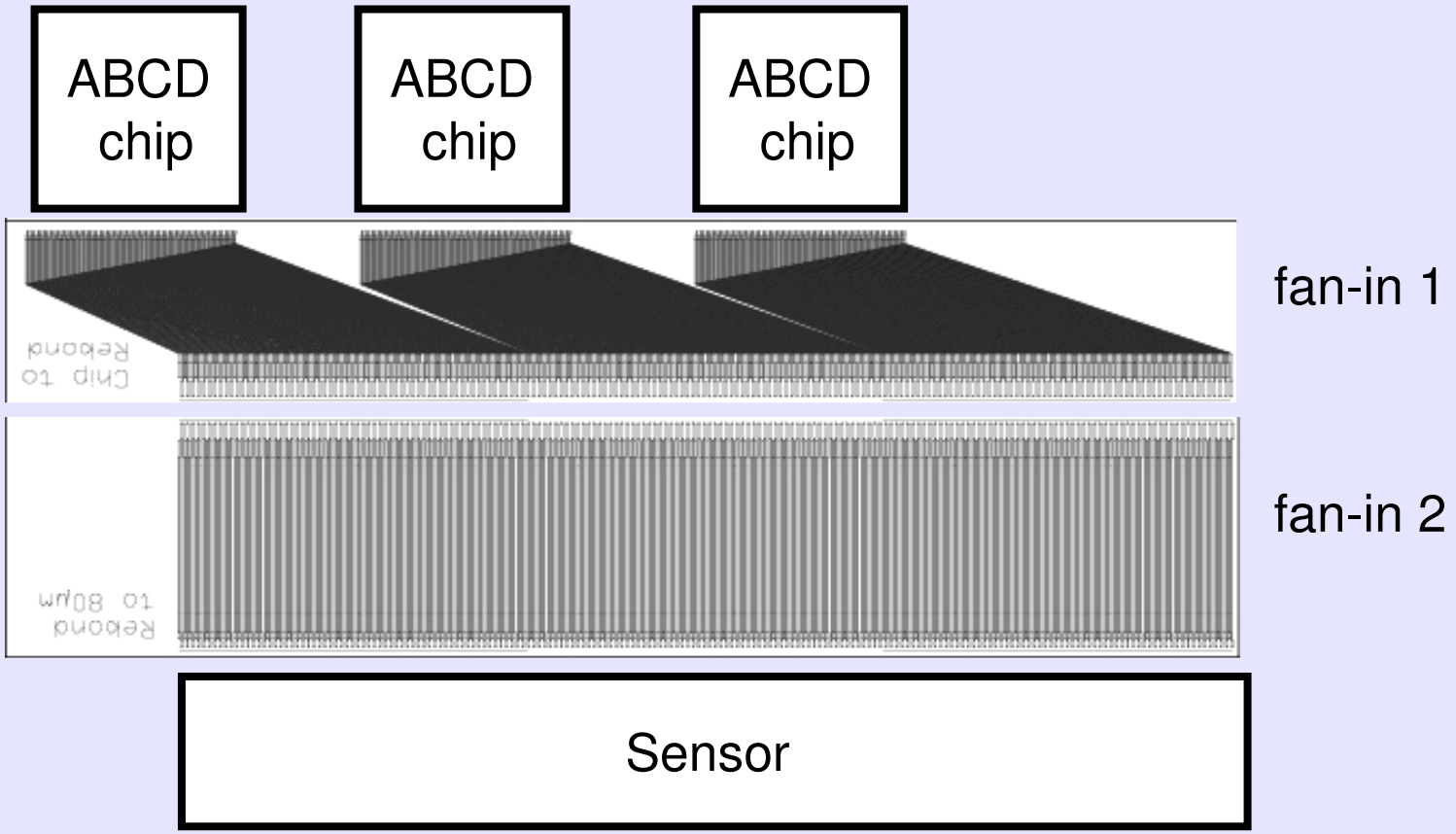
- Assembly of rebondable prototype module
- CV and IV measurements of long 3D-stc sensors
- CV and IV measurements of Micron p-type sensors
- Measurements of a small 3D-stc sensor with ^{90}Sr-source
- Outlook

Assembly of rebondable prototype module

• rebondable module to separate front-end electronics and sensor part for irradiation

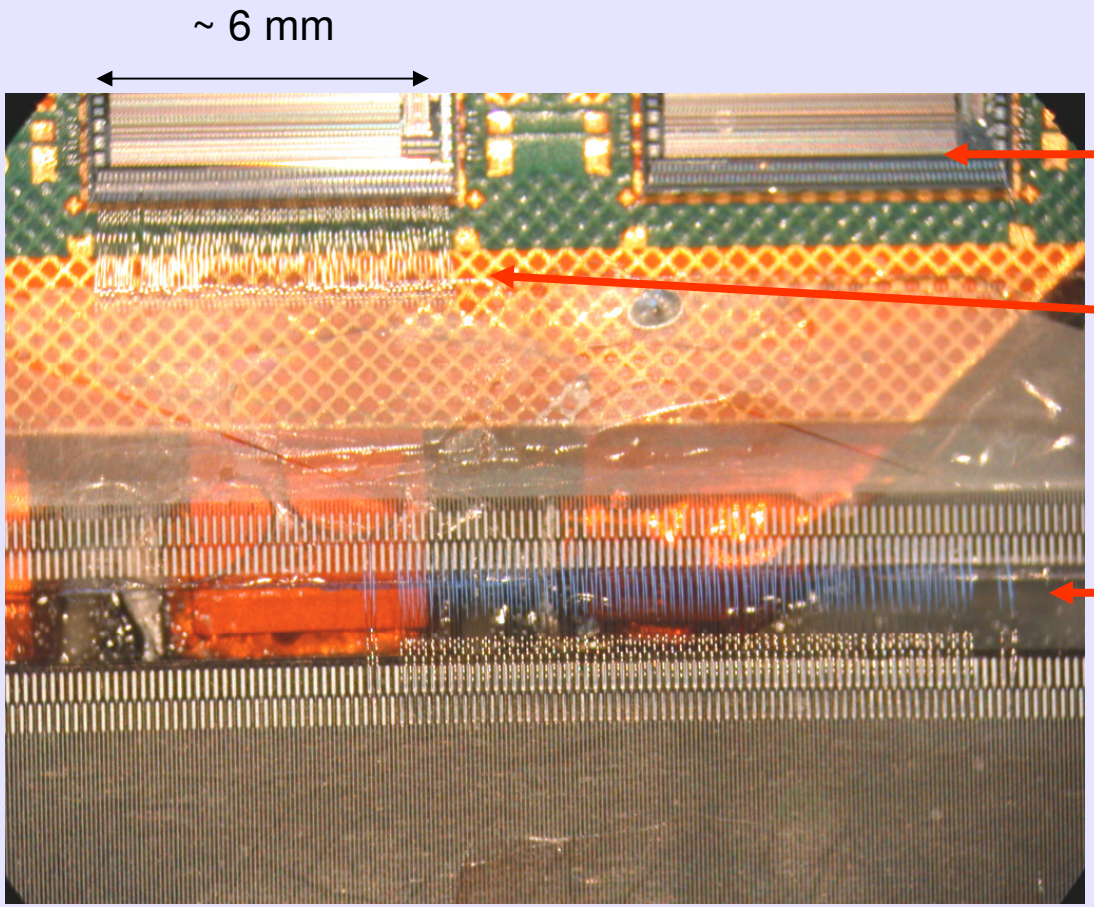


Rebondable fan-ins



- Shape determined by layout of ATLAS SCT- EC hybrid

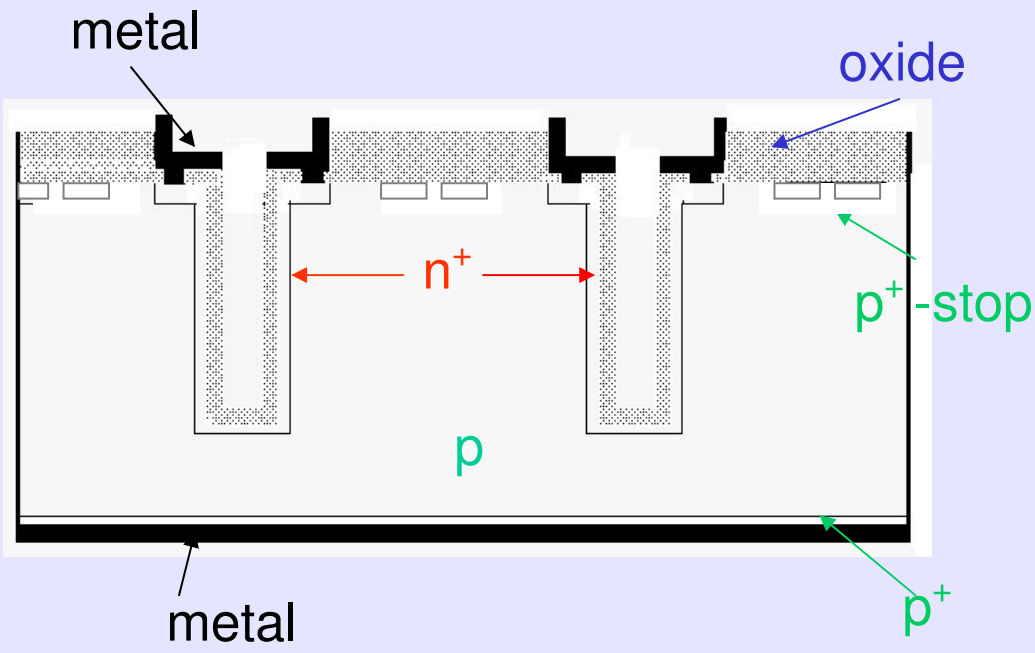
Assembly of rebondable module



- Next steps: connect to new sensors and measurements with laser and beta souce setup

Long 3d-stc sensors

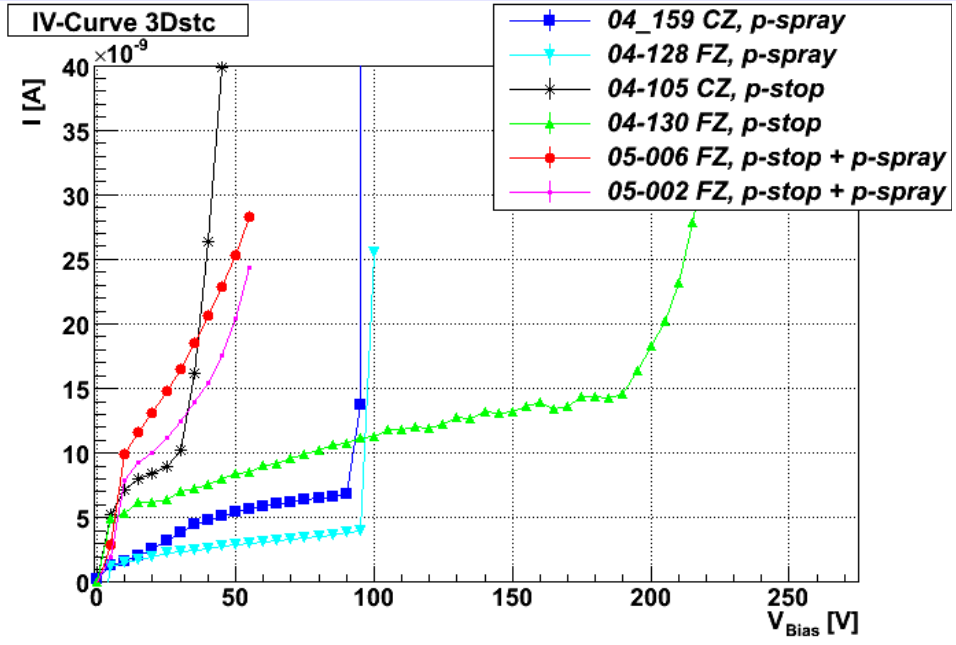
- 3D-stc n^+-in-p microstrip devices from FBK-irst, Trento

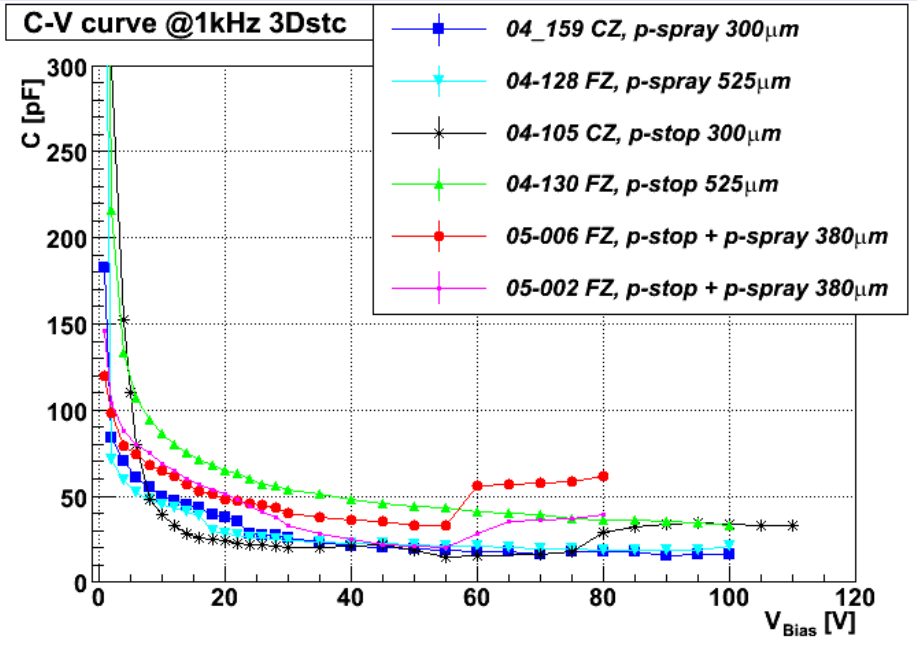


[C. Piemonte et al., NIM A 541 (2005) 441-448]

- sensor size: 10 mm x 21 mm
- 64 strips with each 230 columns, 1 strip ≈ 18 mm
- thickness: 300 µm, 380 µm or 525 µm
- strip pitch: 80 µm
- FZ and MCZ sensors with different p-stop and p-spray structures

IV and CV measurements

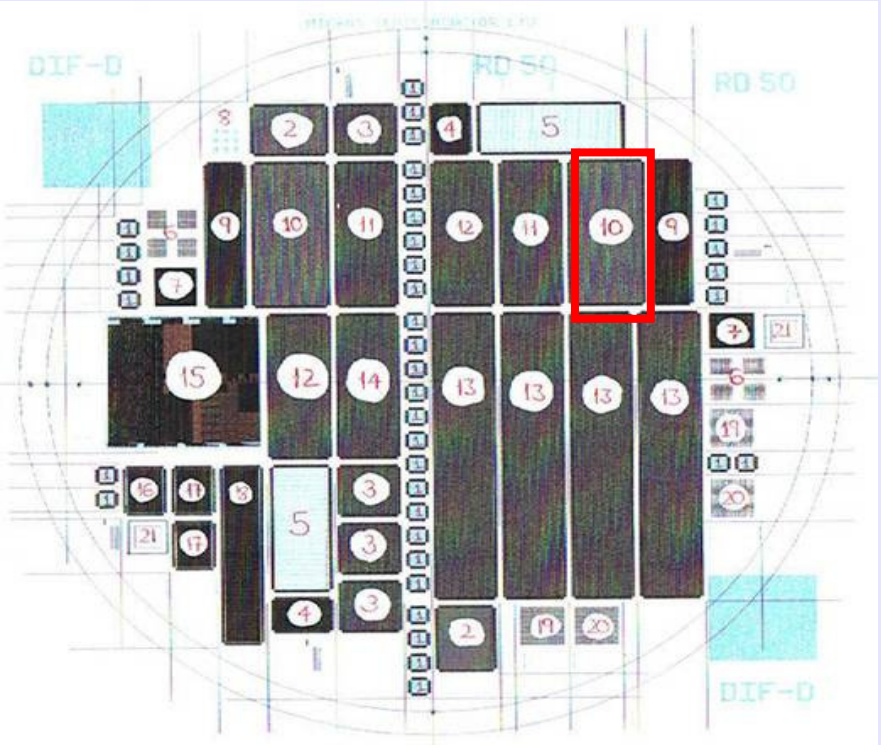


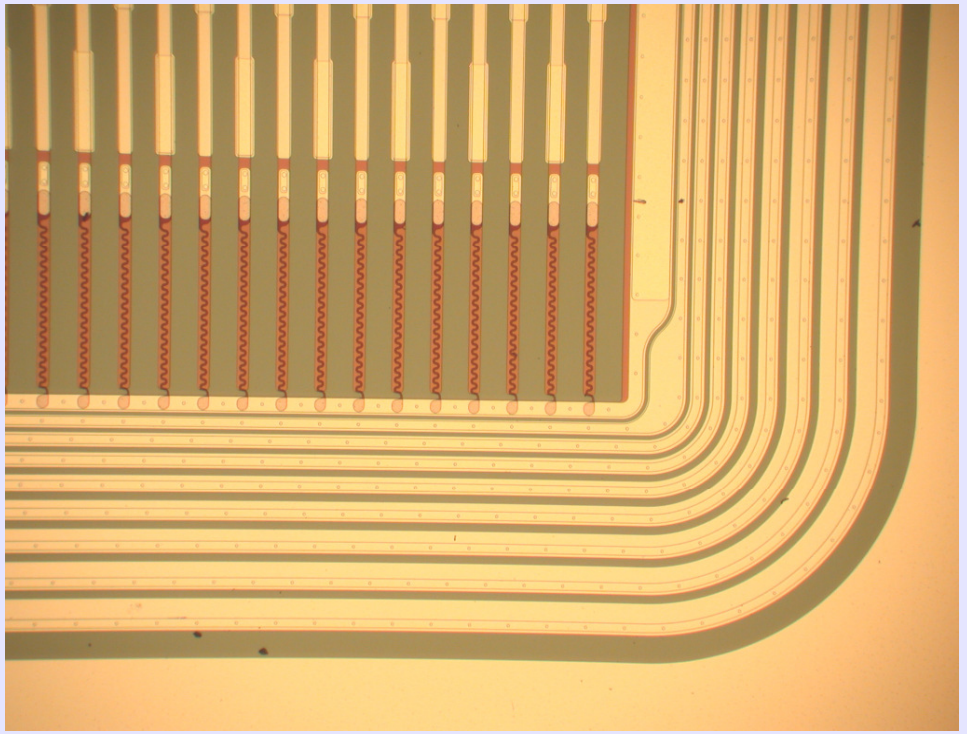


- few IV-curves show breakthrough at $V_{Bias} > 40$ V,
- lateral depletion at 5 V expected

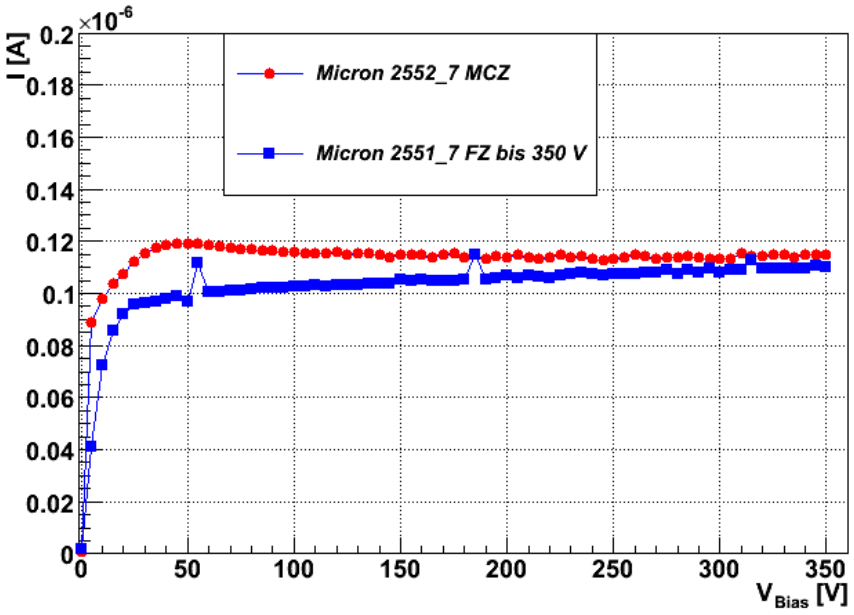
RD 50 Micron p-type sensors

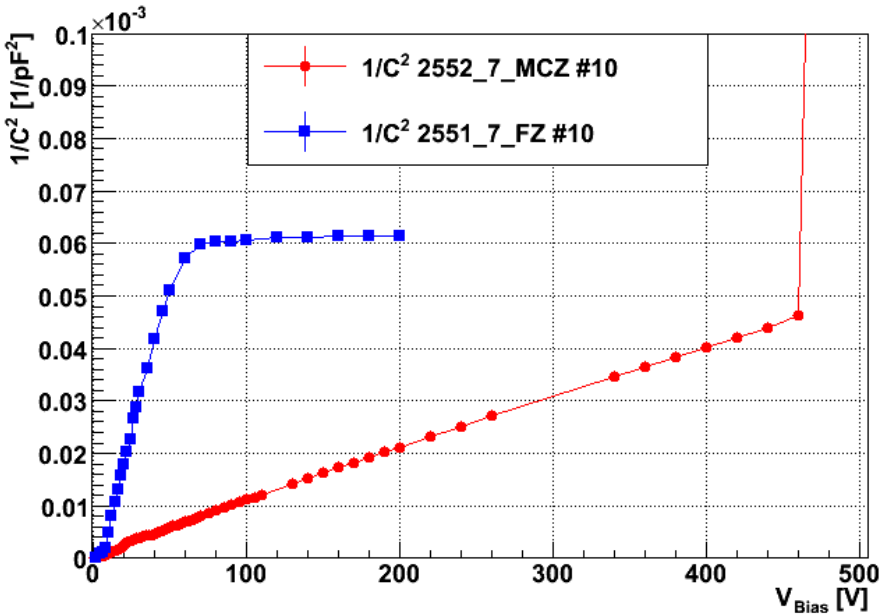
- MCZ and FZ p-type sensors
  # 10 from RD 50 Wafer
- pitch: 100 µm
- sensor size: 15 mm x 32 mm
- thickness: 300 µm





IV and CV measurements Micron





- IV-curves saturate at V_{Bias} ~ 50 V
- I_{leak} < 0.12 µA

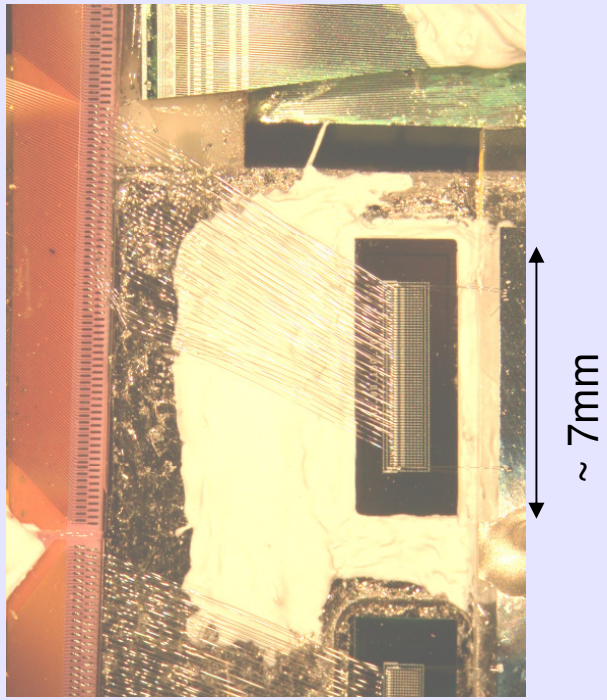
→ good sensors

- full depletion of FZ-sensor at V_{Bias} ~ 50 V
- MCZ-sensor can‘t be depleted

Beta source measurements of module with small 3D-stc sensor

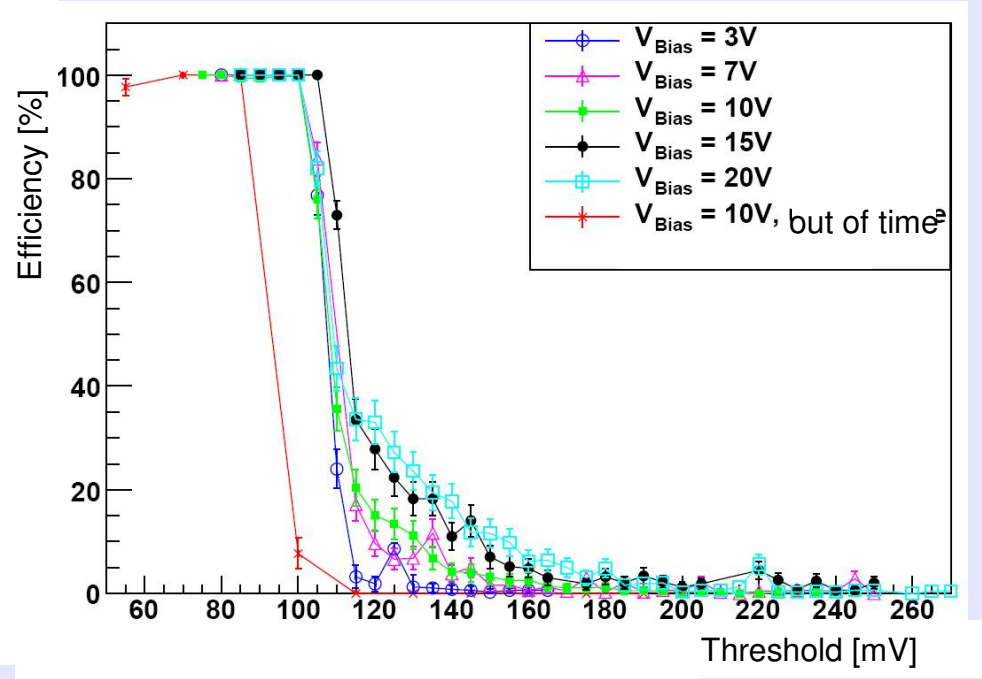
- 3D-stc sensor FZ n^+-in-p (AC_80_100_10)
- sensor size: 2.4 mm x 7 mm
- 64 strips with 10 columns each, p-stop around each strip
- thickness 500 µm
- strip pitch: 80 µm

Thanks to FBK-irst for the sensors



- Module tested with ATLAS SCT hybrid and electronics (binary readout only)
- Beta source setup has a spatial width/opening window of ~ 4mm
  → aluminium cover with smaller window set in front of the sensor

Efficiency of 3Dstc-modul



- no usual S-curves but efficiency raises at higher bias voltages
- reason: very small sensor, geometry?

→ signal visible above noise

Further measurements of this module with laser setup in Simon‘s talk (Wednesday)

Summary and Outlook

- rebondable module assembled
- IV and CV curves look promising for coming measurements
- first beta source measurements with LHC-speed electronics of 3D-stc sensor
- p-type readout is working, but no usual S-curves for small 3D-stc sensors

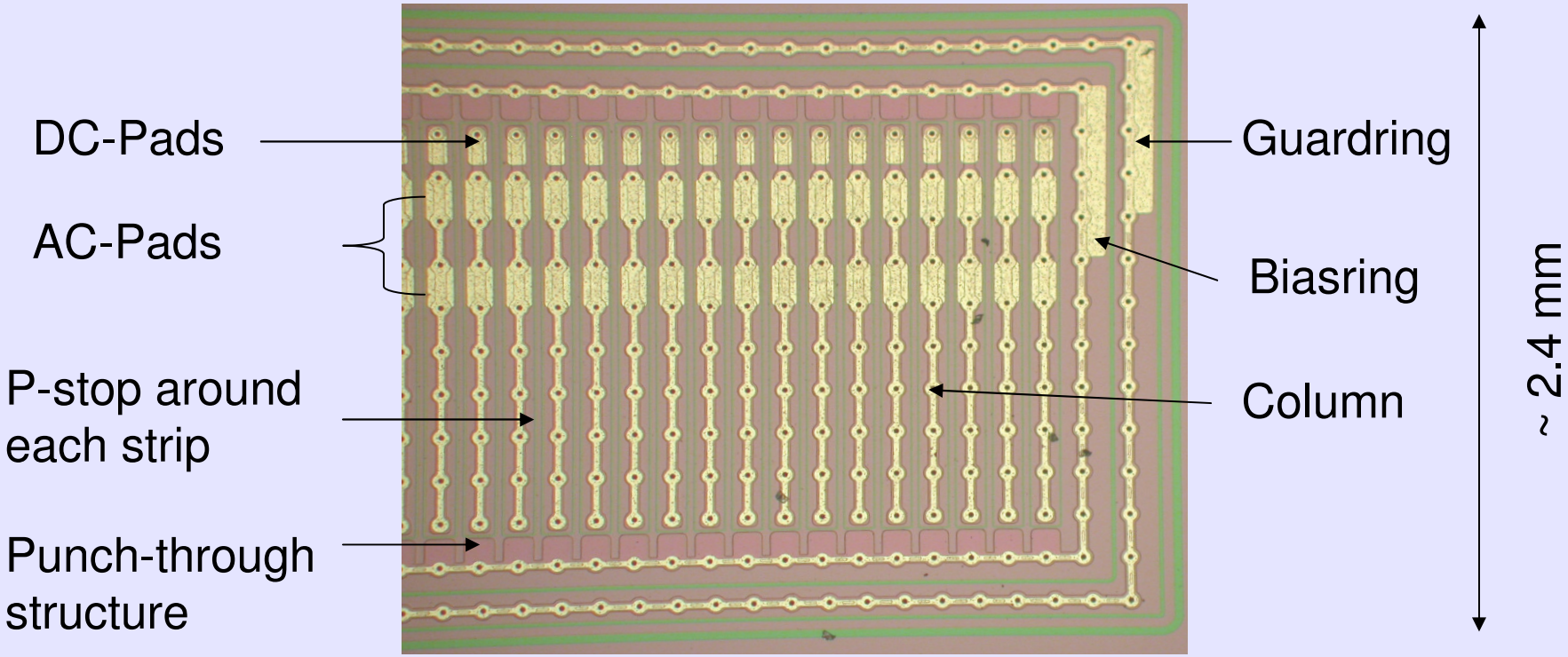
To do:

- measure and build further modules
- irradiate sensors

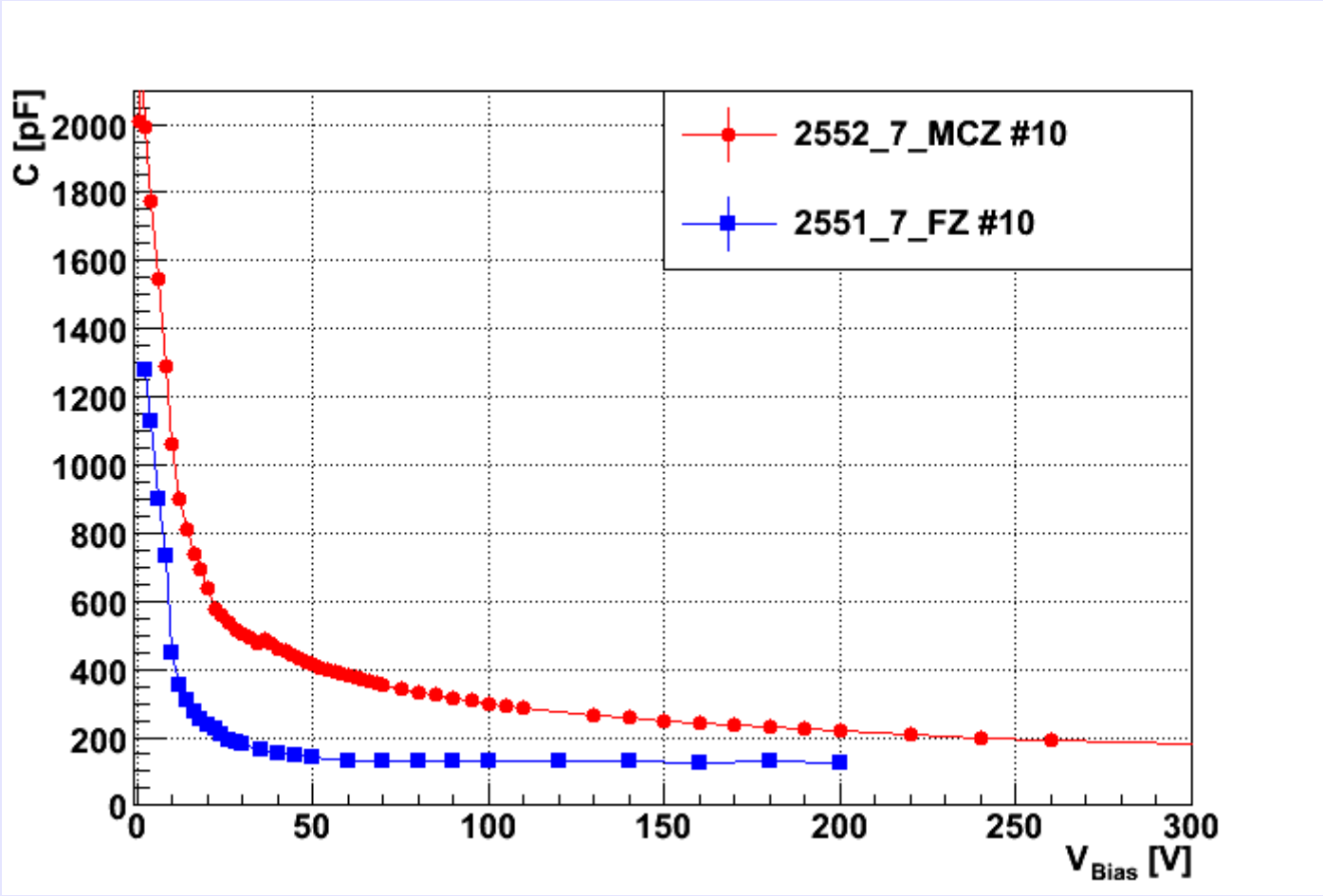
Thanks to colleagues for sensors

3d-stc sensor: AC_80_100_10

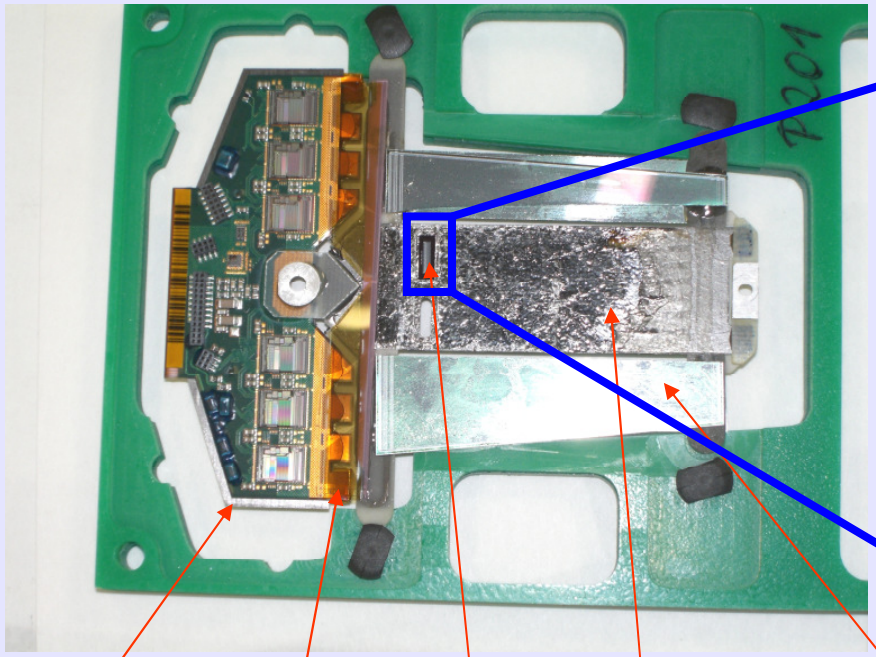
- AC coupling, punch-through structure
- strip pitch: 80 µm, interstrip pitch: 100 µm, hole diameter 10 µm
- common p-stop for each strip

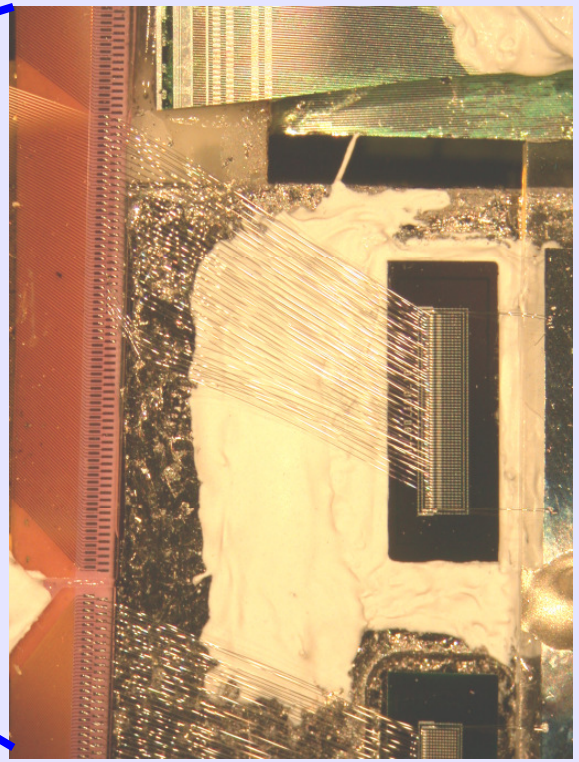


IV and CV measurements Micron



Das 3Dstc-Modul





2,4 cm

SCT hybrid

Fan-in

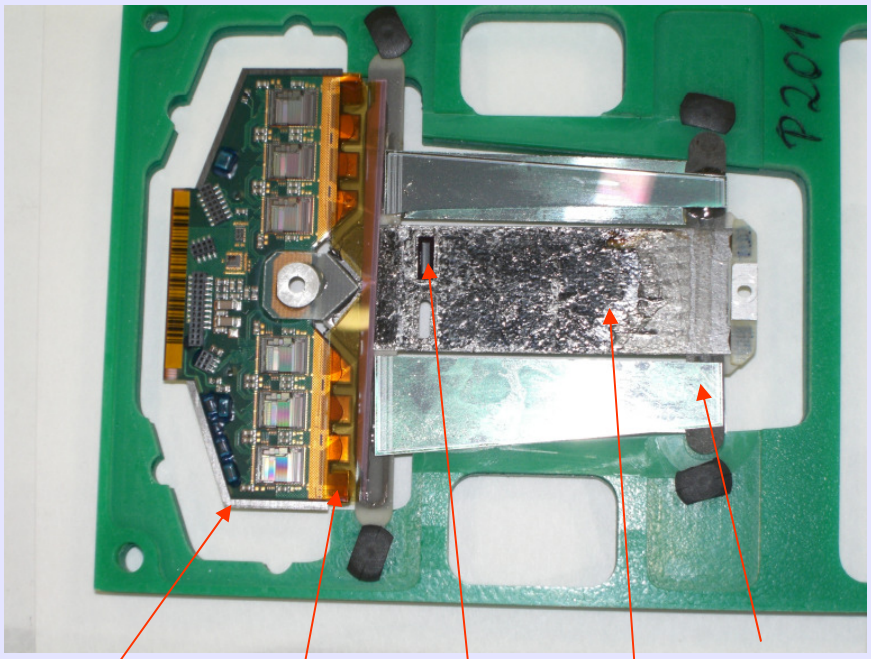
3D-Sensor

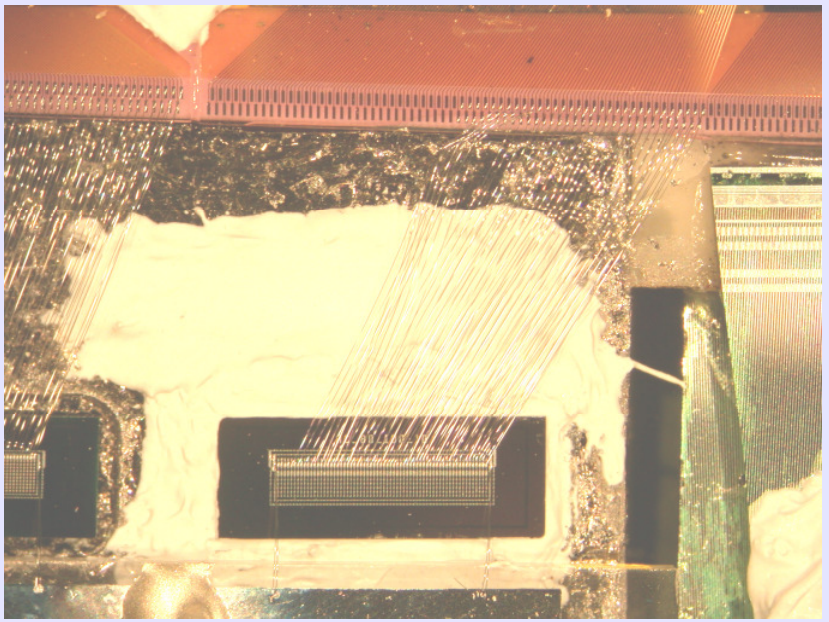
TPG zum Kühlen

Si zur Stabilisierung

Beta source measurements of module with small 3D-stc sensor

- 3D-stc sensor AC_80_100_10





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