



SIGNALS FROM FLUORESCENT MATERIALS

ON THE SURFACE OF SILICON MICRO-STRIP SENSORS

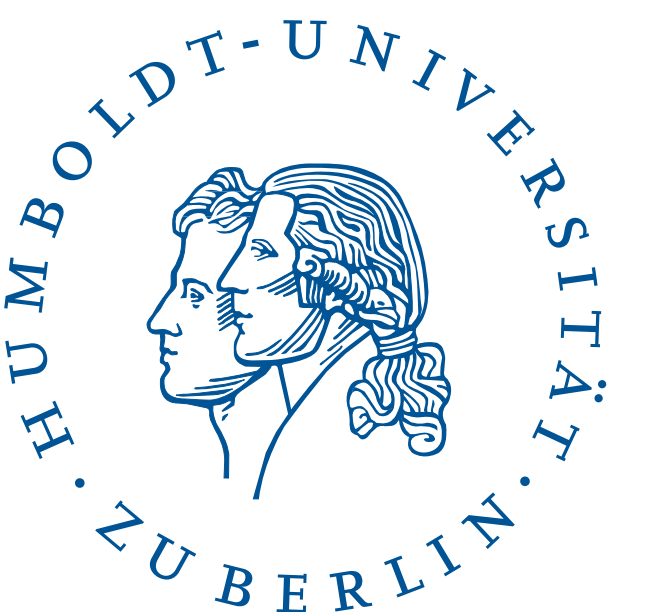
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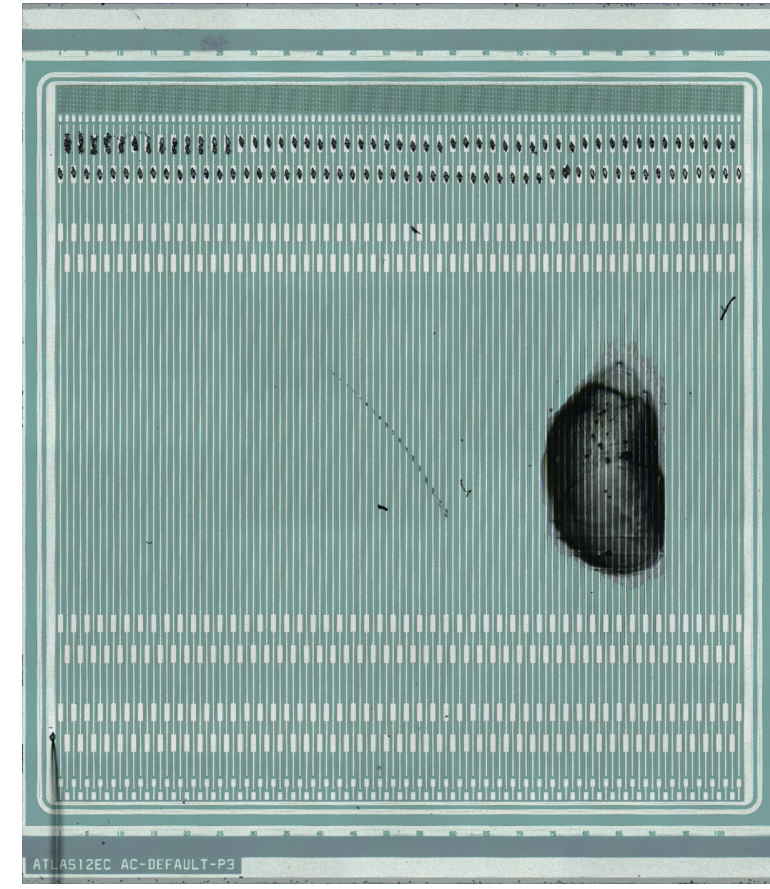
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Setup

- utilise a 15 keV X-ray beam focussed to 5 μ m diameter
- beam edge on sensor
- scan in a 25 μ m \times 200 μ m grid
- 51% absorption of X-rays per 300 μ m of silicon
- \sim 100 μ m high blob of glue on sensor
 - this glue is known to fluoresce under UV light
- sensor is connected to a Alibava readout system [1]
- charge deposit was counted as hit if it is above 2.6 times the noise

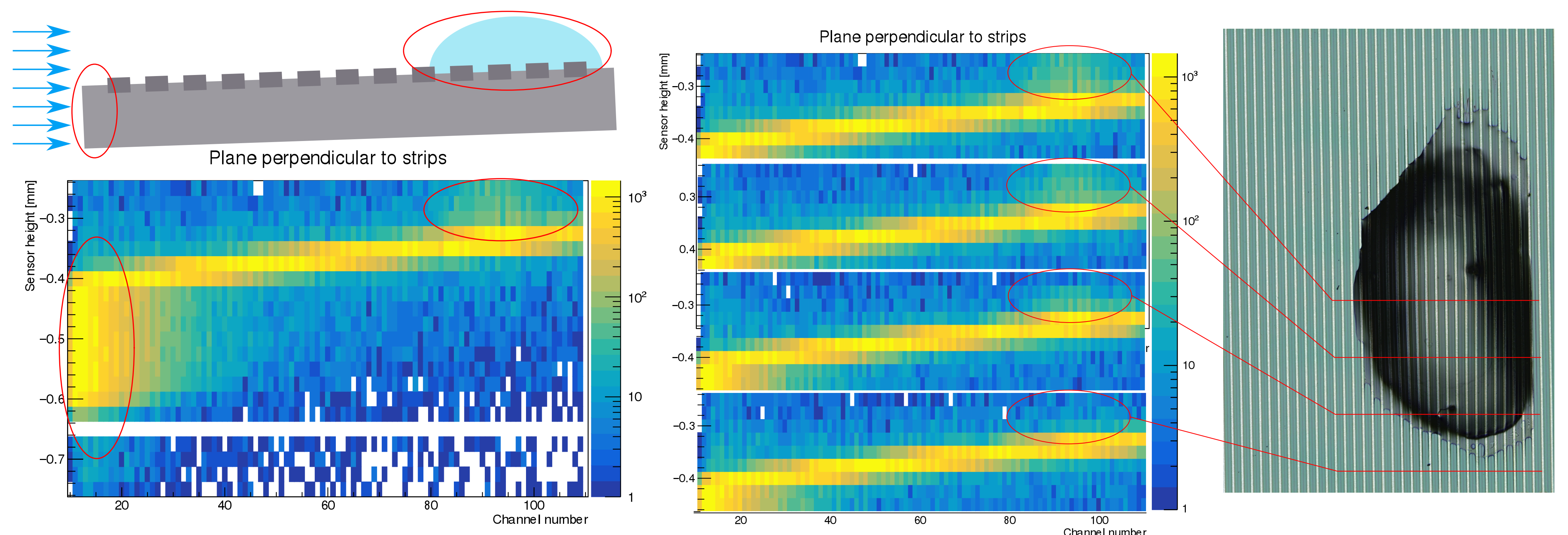


Sensor

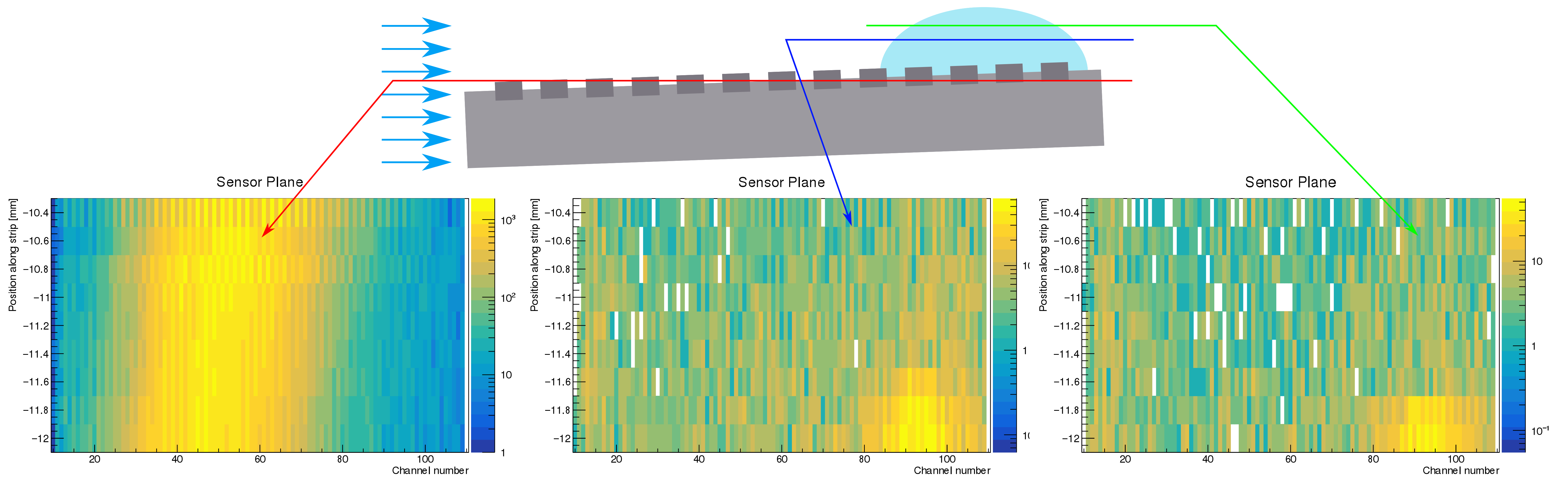
- 320 μ m thick silicon, n^+ -in- p doped
- 103 channels with 75.5 μ m strip pitch
- diced to 10000 \times 8580 μ m²
- only 400 μ m dead material between edge and first strip
- bias voltage 150V
 - due to the very slim dicing higher bias was not possible
- tilted \sim 0.5 $^\circ$ relative to beam

Sensor cross section

- four scan lines with 25 μ m stepping
- edge of sensor shows \sim 250 μ m sensitive depth from top surface
- after 1.2mm hit rate decreased by factor 10
- \sim 0.5 $^\circ$ tilt creates hits in four positions on top of sensor
- when beam hits glue, sensor detects some hits even though beam is above sensor
- the length of wirebonds for neighbouring strips is slightly different
 - this results in different noise and thus different signal cuts



Signal into sensor top surface



- three scan lines in 200 μ m steps parallel to the surface of the sensor
- first plot shows beam hitting the tilted sensor but not the glue directly

- other two plots show cases where beam only hits glue and not the sensor
- factor 100 lower detection efficiency with given thresholds

References

[1] R. Marco-Hernandez, "A portable readout system for microstrip silicon sensors (alibava)," *IEEE Transactions on Nuclear Science*, vol. 56, pp. 1642–1649, June 2009.

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