Signals from fluorescent materials on the surface of silicon micro-strip sensors

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Setup

- utilise a 15 keV X-ray beam focused to 5\(\mu\)m diameter
- beam edge on sensor
- scan in a 25\(\mu\)m \(\times\) 200\(\mu\)m grid
- 51\% absorption of X-rays per 300\(\mu\)m of silicon
- \(\sim\) 100\(\mu\)m high blob of glue on sensor
  - this glue is known to fluoresce under UV light
- sensor is connected to an Alibava readout system \cite{Marco-Hernandez2009}
- charge deposit was counted as hit if it is above 2.6 times the noise

Sensor

- 320\(\mu\)m thick silicon, n\textsuperscript{+}-in-p doped
- 103 channels with 75.5\(\mu\)m strip pitch
- diced to 10000 \(\times\) 8580\(\mu\)m\textsuperscript{2}
- only 400\(\mu\)m dead material between edge and first strip
- bias voltage 150 V
  - 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\(\mu\)m stepping
- edge of sensor shows \(\sim\) 250\(\mu\)m sensitive depth from top surface
- after 1.2 mm 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\(\mu\)m steps parallel to the surface of the sensor
- first plot shows beam hitting the tilted sensor but not the glue directly
- factor 100 lower detection efficiency with given thresholds

References


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