

Testbeam analysis with Corryvreckan

Overview

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Crosstalk

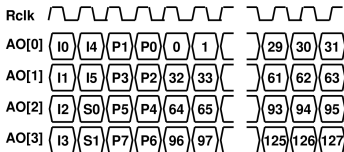
- Tried to contact people with ALiBaVa expertise about Crosstalk
- Contacted ALiBaVa systems people/Carlos Lacasta → Know problem exists, but no idea how to correct for it
- Contacted Ricardo Marco Hernández → Also no idea how to correct for it, suggested Crosstalk stems from Beetle Chip, maybe pitch adapter

⇒ Need to implement correction ourselves

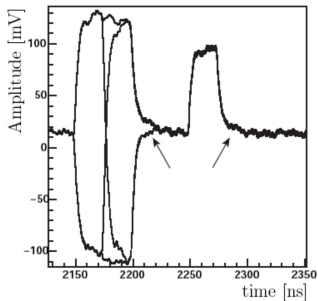
Crosstalk

So far Crosstalk seems to be comprised of two different effects:

- Header Crosstalk
- Internal Crosstalk



The Beetle Reference Manual, p.16



Tests on the VeLo analogue transmission line with the TELL1 prototype RB3, L. Locatelli et al.

Crosstalk

How to correct for it

For header crosstalk:

- Decode header (wrote E-Mail to ALiBaVa systems for that)
- Calculate influence of header bits on channels (e.g. assume linear effect)
- Determine correction factors

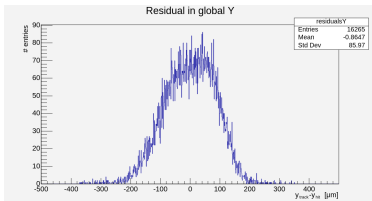
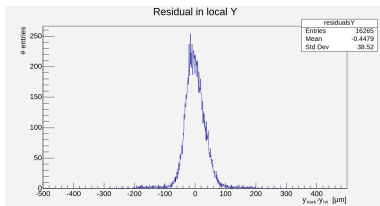
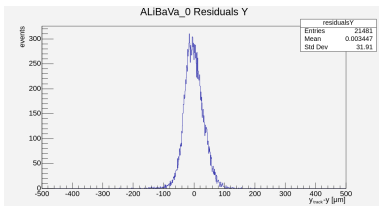
For internal crosstalk:

- Determine impulse response by either:
 - Built-in calibration pulse and pulse only one channel
 - Reconstructed tracks that pass close to strip center (no charge sharing)
- Use impulse response to calculate FIR coefficients
- Apply FIR (finite impulse response filter) to data

DUT Alignment

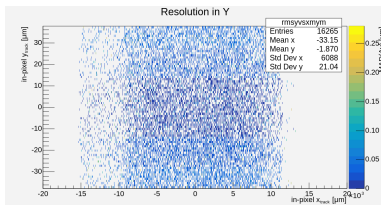
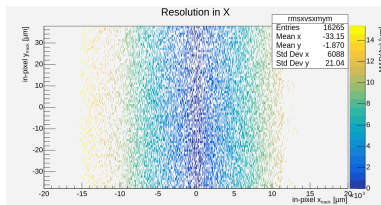
- DUTAlignment generally working but still some problems:
- Alignment with all DoF not working \Rightarrow Alternating between position and orientation alignment
- Position alignment in x,y and orientation alignment around z axis stable
- Orientation alignment around x-axis unstable (varying between roughly $\pm 0.7^\circ$)
- Orientation alignment around y-axis unstable (sometimes close to $\pm 0^\circ$, sometimes flipping to very large angles)
- Instability of orientation alignment around y-axis fixed by only aligning two angles at the same time
- No solution yet for instability of orientation alignment around x-axis (maybe reduce length of strip in geometry to width of ALPIDE sensor)

DUT Alignment and Analysis



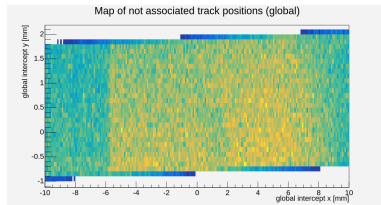
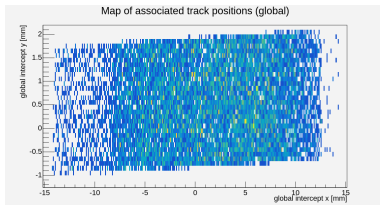
- Y distribution of alignment and local y distribution of analysis very similar
- Global y distribution wider and asymmetrical \Rightarrow Y-axis of global and local coordinate system not parallel

DUT Analysis



- Both x and y resolution are symmetrical
- For x the MAD increases when going further away from the zero point (most probably due to telescope/beam effects)
- For y the MAD increases slightly when going further away from the zero point (would not make a definite statement yet)
- Resolution in y around 21 μm , slightly better than expected binary resolution (21.8 μm) \Rightarrow Due to most events being single strip, with a few two/three strip events

DUT Analysis



- Association of tracks nearly over entire area of ALPIDE sensor
- Fewer tracks overall visible on left side (this feature was already visible in the hitmaps of the telescope planes)
- Clearly visible that DUT and telescope are rotated against one another (big steps visible just artifacts of binning)

Outlook

To Do:

- Stabilize orientation alignment
- Determine optimal seed/neighbour cuts
- Set up jobsub system to automate analysis

Additional point: Tried to use AnalysisTelescope module, but it needs MC data to determine telescope resolution at the DUT position \Rightarrow Should the effort be invested in a simulation of the Telescope (e.g. with Allpix²)? (Especially when considering further testbeam campaigns)