

# Collected datasets

BNL long strips	Notes
1 cm x 500 um, 300 um gaps, W1	
1 cm x 500 um, 200 um gaps, W2	From Wei Li. Died after ~ 1hr in beam
1 cm x 500 um, 400 um gaps, W2	Backup copy— first one not biasable
2.5 cm x 500 um, 300 um gaps, W1	From UCSC
2.5 cm x 500 um, 300 um gaps, W2	
0.5 cm x 500 um, 300 um gaps, W1	
0.5 cm x 500 um, 300 um gaps, W1	
1 cm multipitch (100, 200, 300 um), 50% gap, W1	

# Collected datasets

Other sensors	Notes
HPK 1 cm strips, 80 $\mu\text{m}$ pitch, Eb type 30 and 45 $\mu\text{m}$ gaps	
BNL 500 $\mu\text{m}$ pads, 4x4, squares 250 $\mu\text{m}$ metal	
BNL 500 $\mu\text{m}$ pads, 4x4, circles 150 $\mu\text{m}$ diameter metal	
BNL 2021 strips, 150 $\mu\text{m}$ pitch	repeat of 2021 measurement to study setup improvements

• What are main goals for paper and for collaboration?

## Analysis priorities

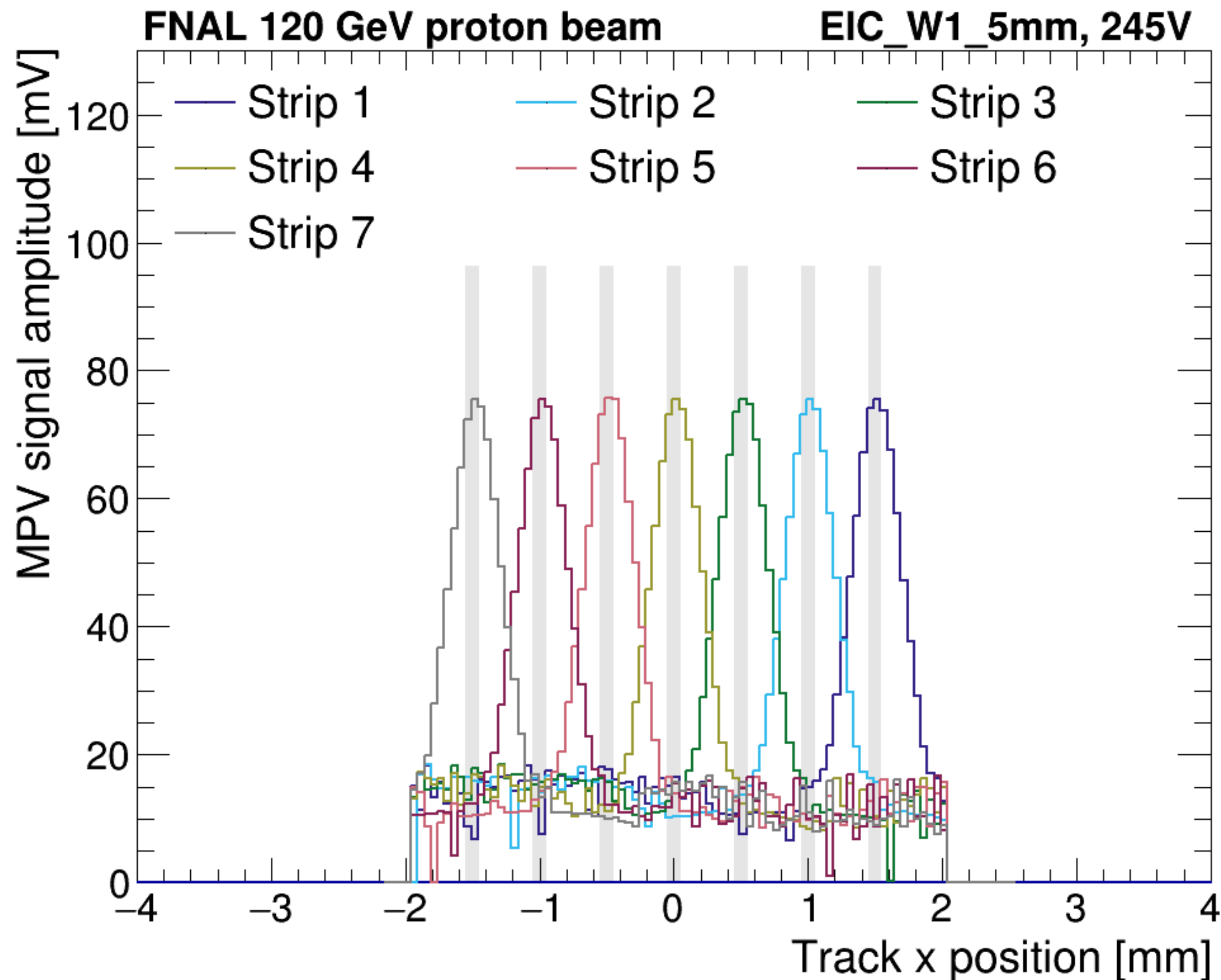
- Full resolution analysis for select set of sensors
  - Most promising from 0.5 cm, 1 cm, 2.5 cm?
  - BNL pads
  - HPK strips
  - BNL 2021 strips
- Extract lessons for sensor design
  - Pulse shape studies: signal size, geometry, travel distance, etc (Rene)
  - Impact of strip length
    - Slower risetime is established. Is it intrinsic or fixable with electronics?
    - Does longer strip affect AC coupling capacitance? (Not sure if this is answerable)
  - Impact of metal width
    - Signal sharing distance
    - Coupling capacitance—can we separate from gain non-uniformity?
  - Total capacitance vs individual dimensions: what matters?
  - Impact of pitch (capacitance, charge sharing, and delays)

# Analysis priorities

- Currently, resolution analysis has too many human-tuned parameters. Too time-intensive and leads to discrepancies in final results:
  - Sensor boundaries, strip centers, delay corrections, amplitude corrections, thresholds
  - Signal sharing polynomials (order and parameters)
  - Sensor orientation: alpha, beta, gamma, Z (Claudio automating)
- Need to automate to ensure some uniformity for comparisons and to easily reprocess/make changes.
  - 2021 AC-LGAD paper: summary table likely shows difference in analysis quality/effort, not sensor quality

# Parameter automizing

- Low hanging fruit: automate finding strip centers & time offsets/delays

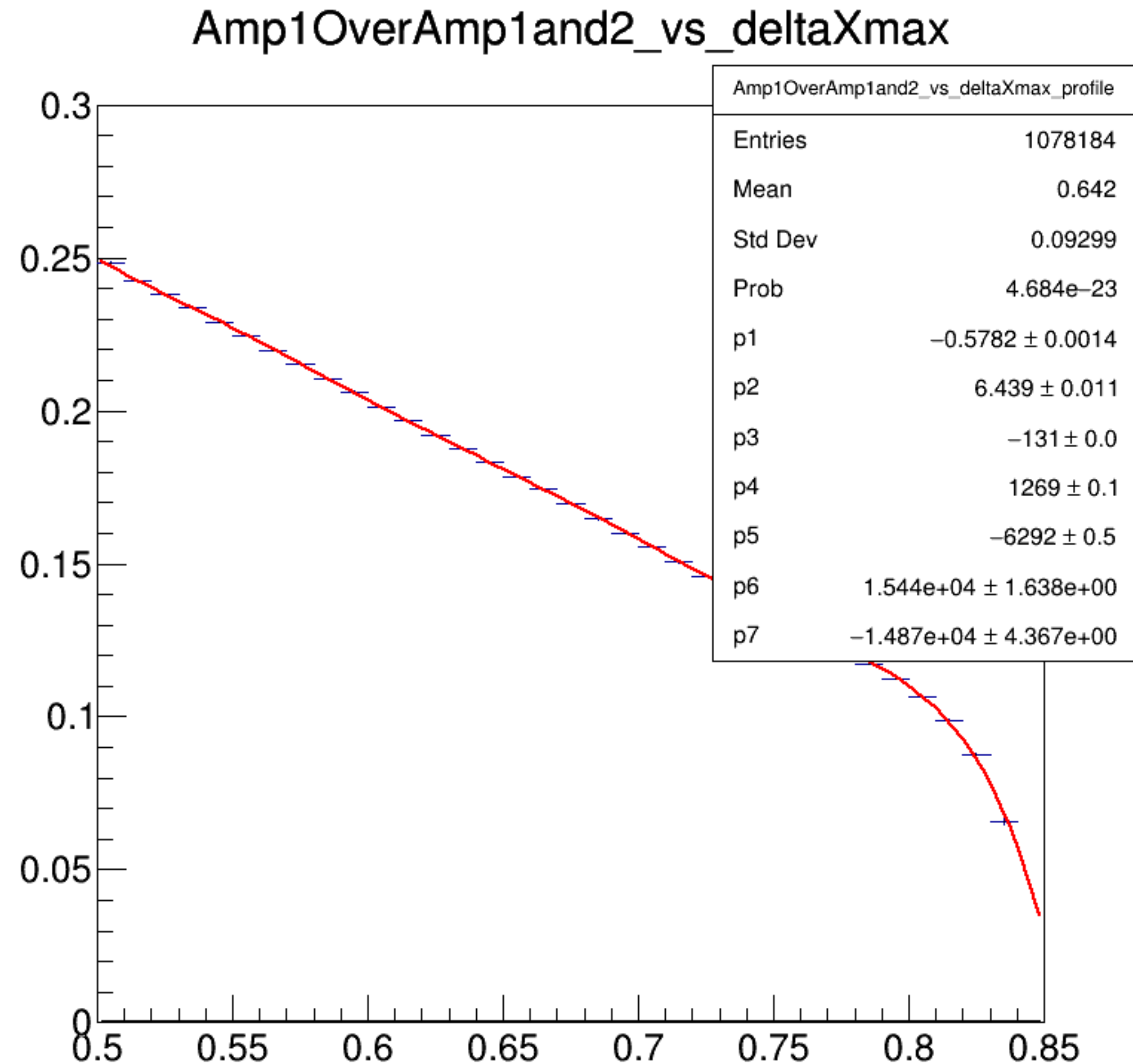


Strips centers are off-center— should be done with  $<10$   $\mu\text{m}$  precision. Bin and human estimates are rounded to 50  $\mu\text{m}$

Easy to fit with gaussians to extract centers (and verify pitch assumption)

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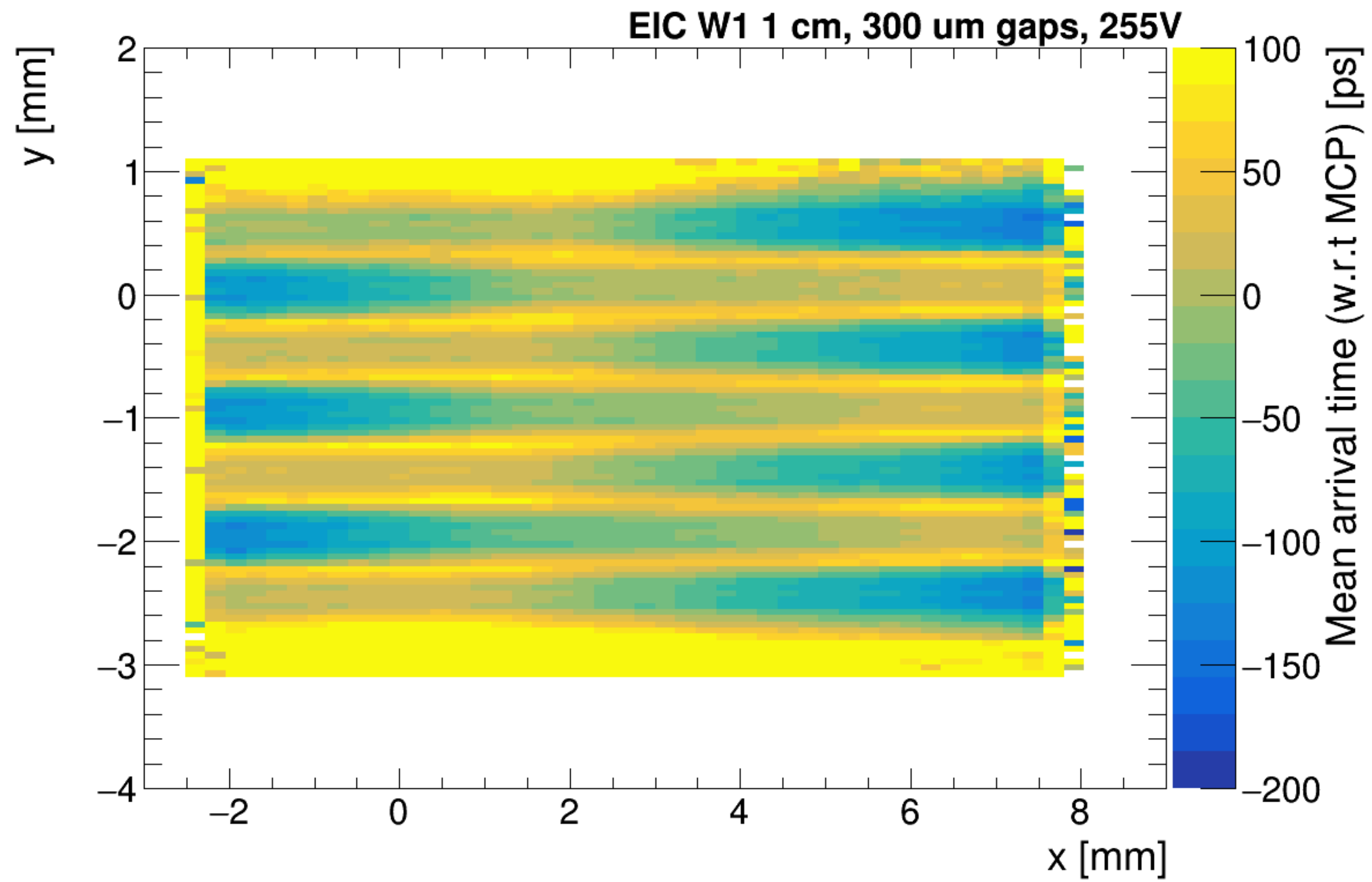
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Easy to fit with gaussians to extract centers (and verify pitch assumption)

Verify symmetry is good and strips are compatible before making folded plots

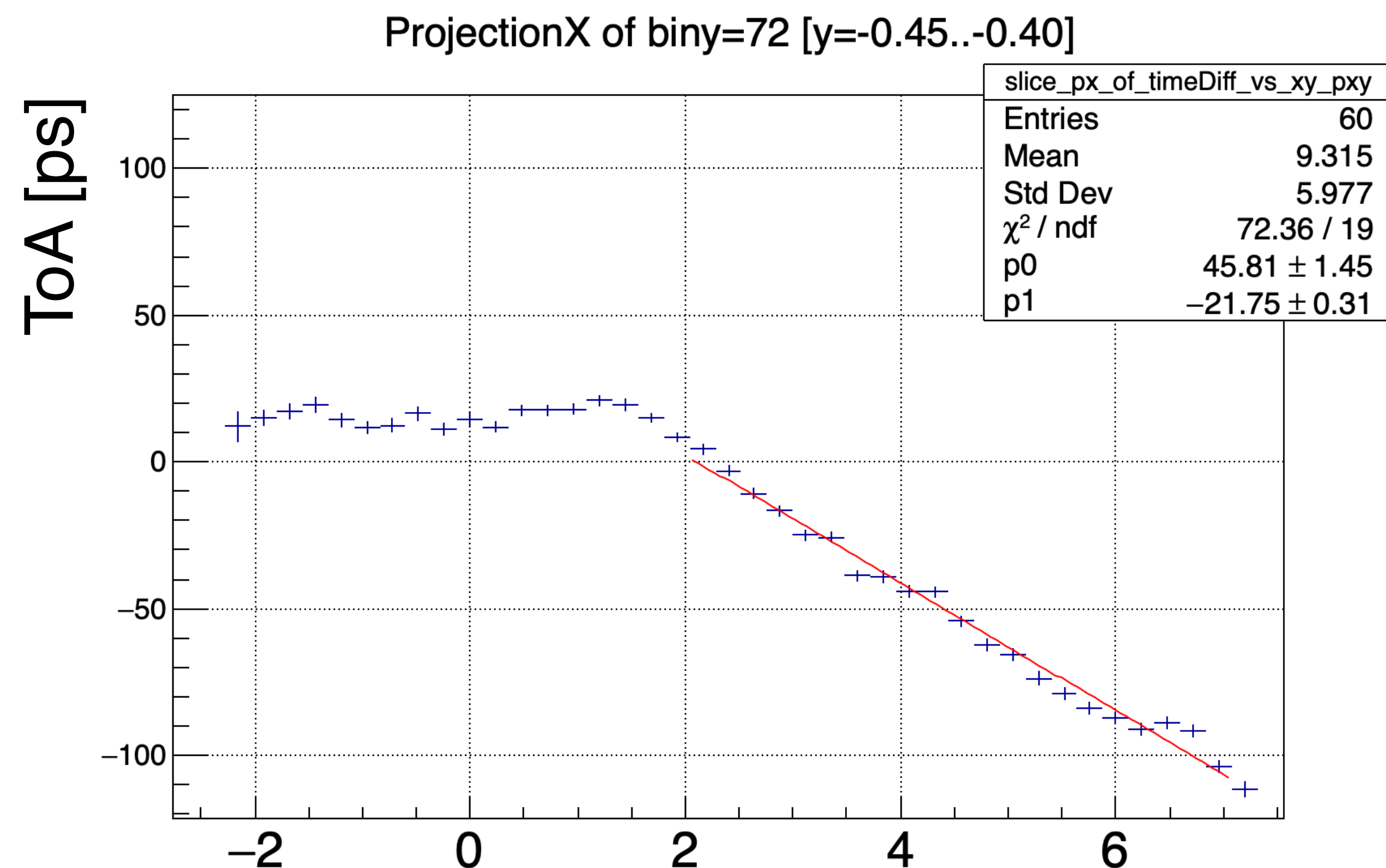


# Delay corrections



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- Could use set of TH2Ds as delay correction look-up table..
- Otherwise, need similar procedure as signal sharing fit:
  - Fold and collapse to 1D X and Y distributions (hopefully is the same for all strips)
  - Fit delay vs X and vs Y
  - Likely sensitive to selection, nonuniformities....
  - Does not need to be very accurate due to 30 ps floor.