

PDVD geometry check

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PDVD; wire geometry check

Xin's observation

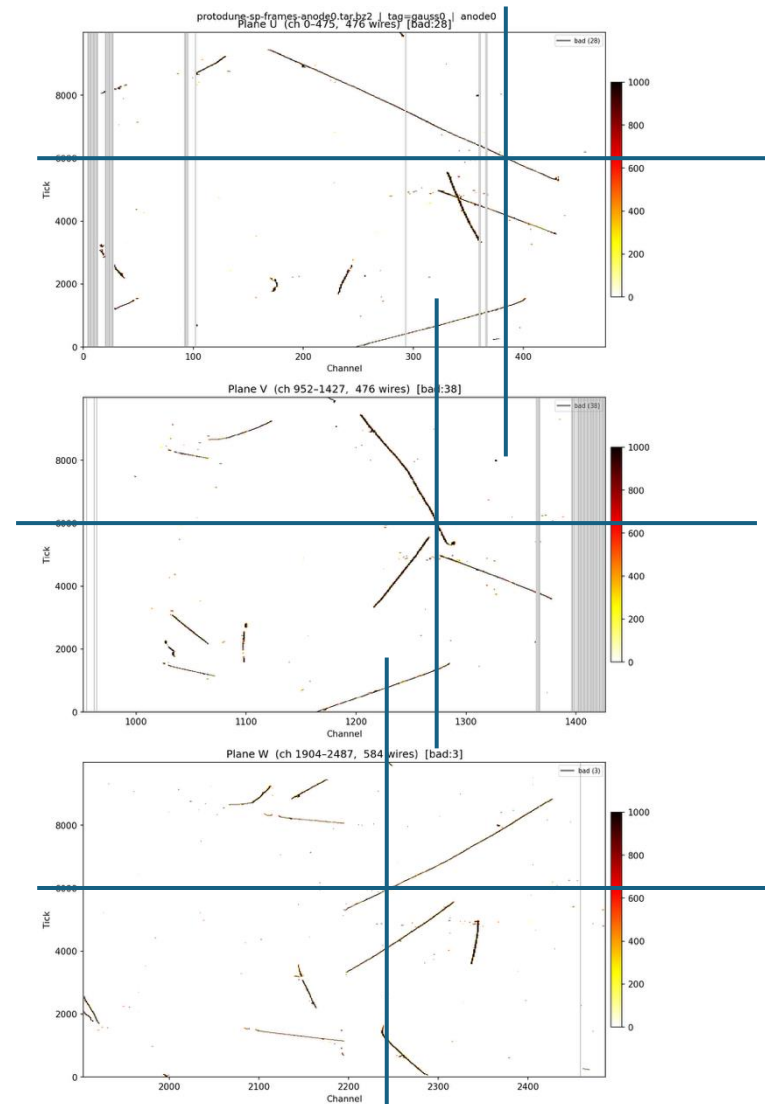
- The U/V wires should be shifted along the **z** direction:
 - **Anodes 0, 2, 5, 7:** ($z - 9.8$) mm
 - **Anodes 1, 3, 4, 6:** ($z + 13.2$) mm

Calibration using data

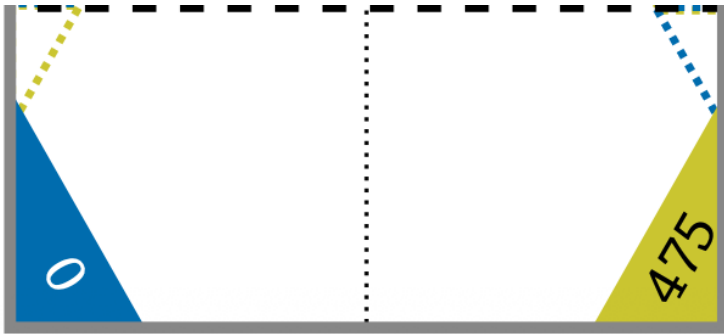
- Select the same time region across all three wire planes.
- Determine the **y-z** positions of the fired wires.
- The three fired wires are expected to intersect at the same point.

Cross-check

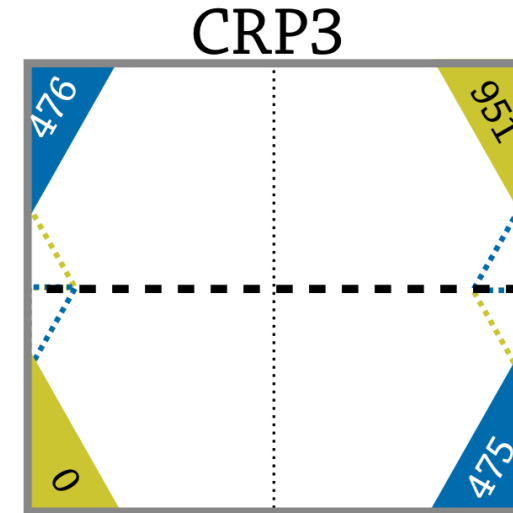
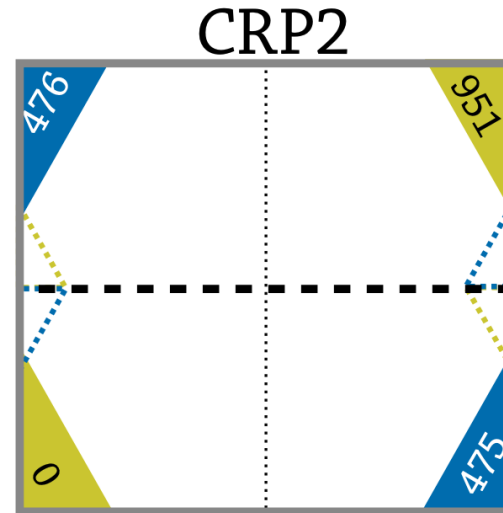
- I verified this by selecting one reference point in each anode.



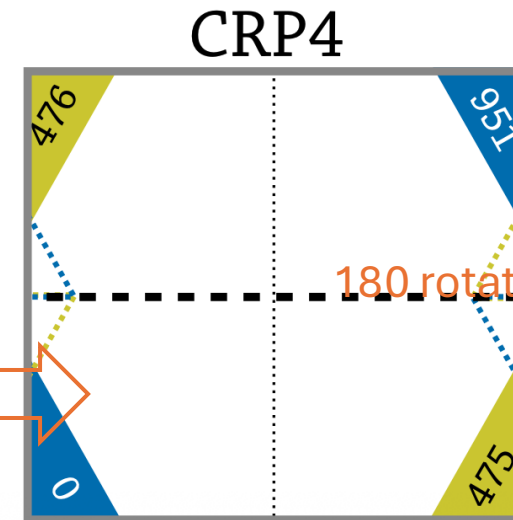
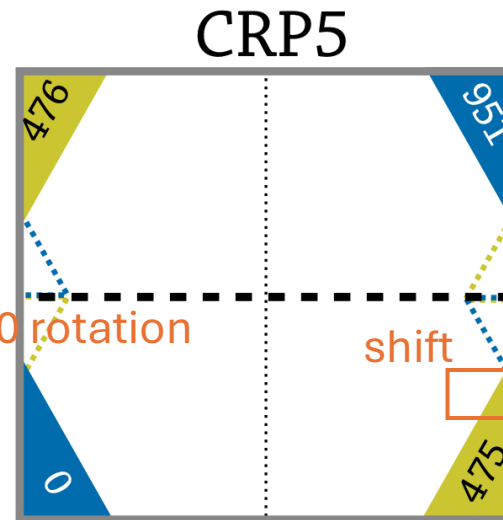
PDVD geometry formation



- The **A CRU U wires** are used as the reference geometry.
- The remaining anodes are derived by rotation, translation, and mirroring.
- Therefore, an incorrect base wire offset propagates to all anodes, creating the observed pattern in which some anodes are shifted upward and others downward.



View 0
View 1
View 2



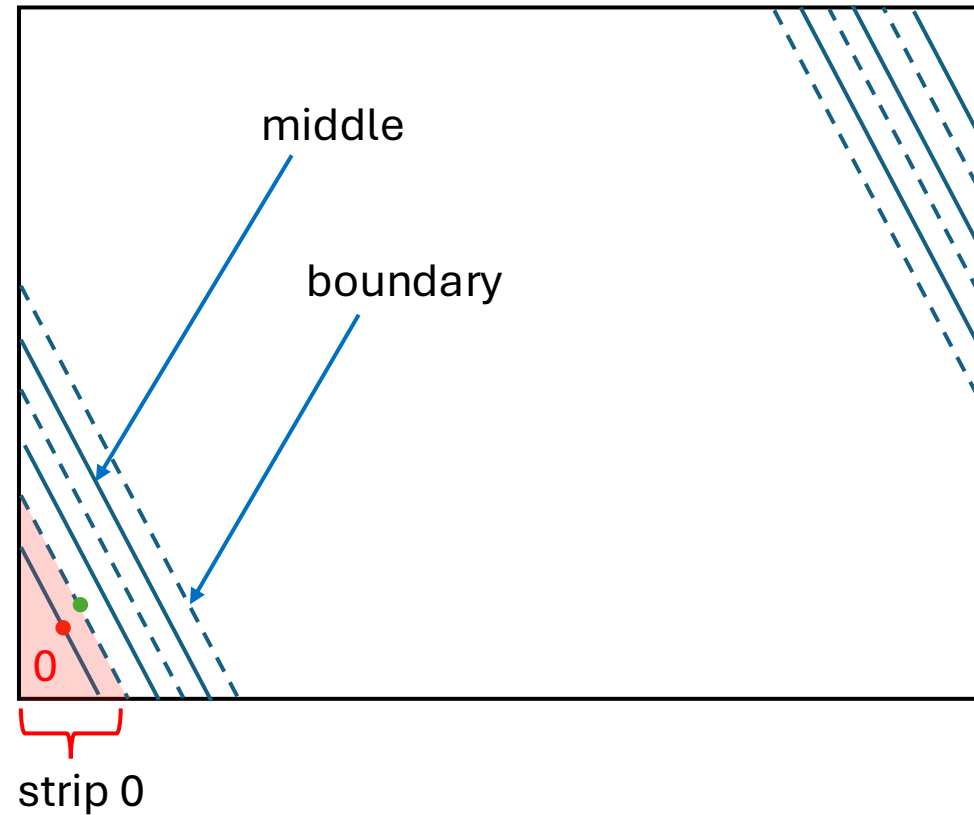
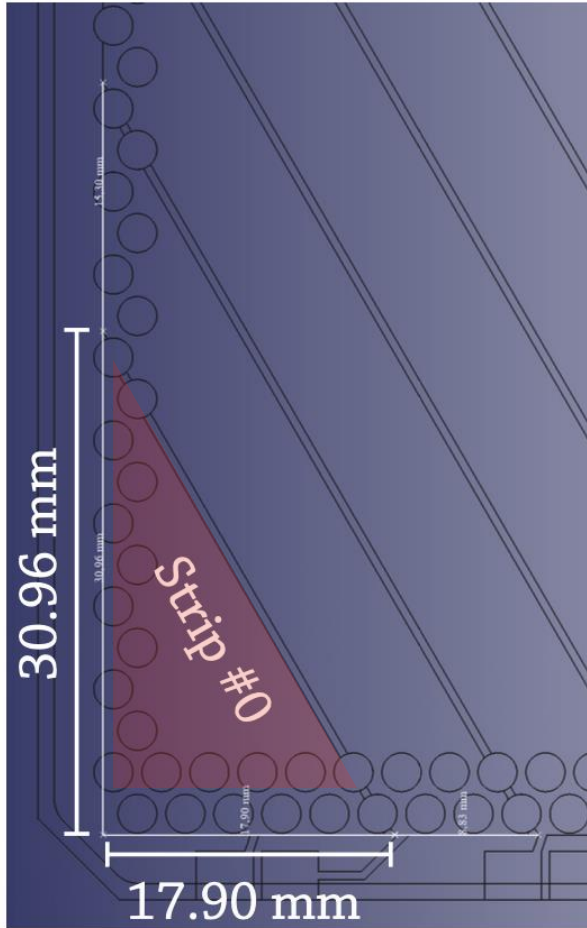
180 rotation

shift

180 rotation

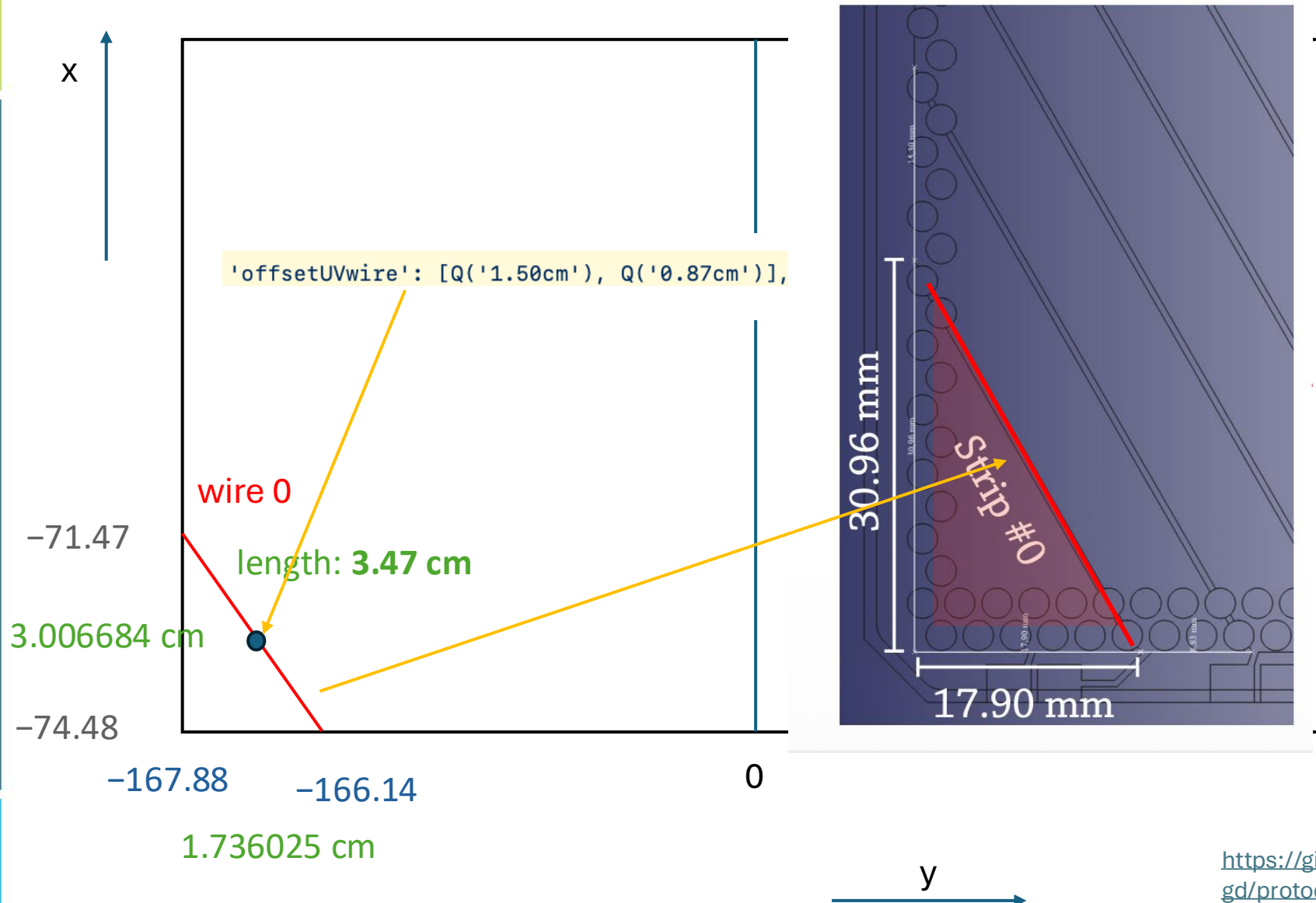


PDVD induction view offset



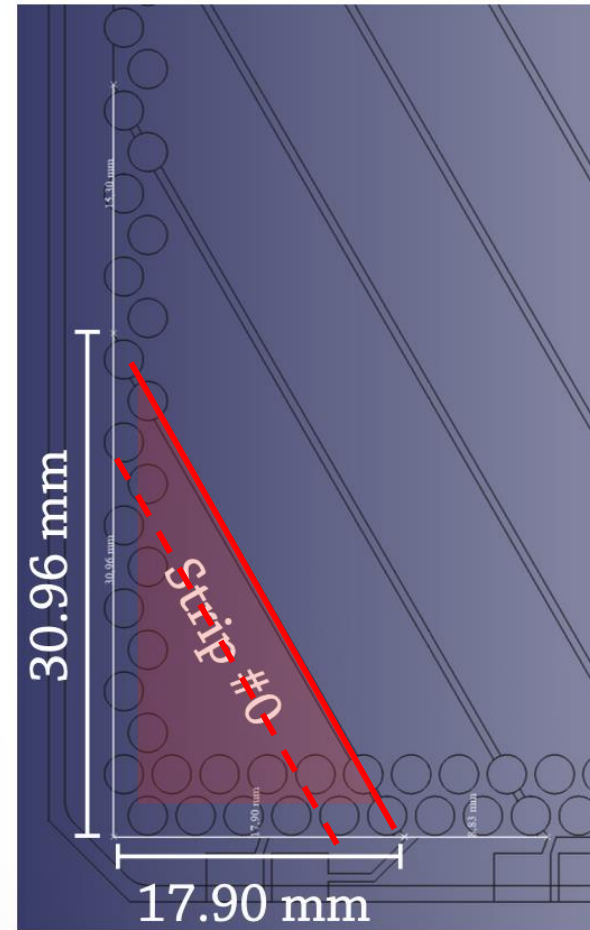
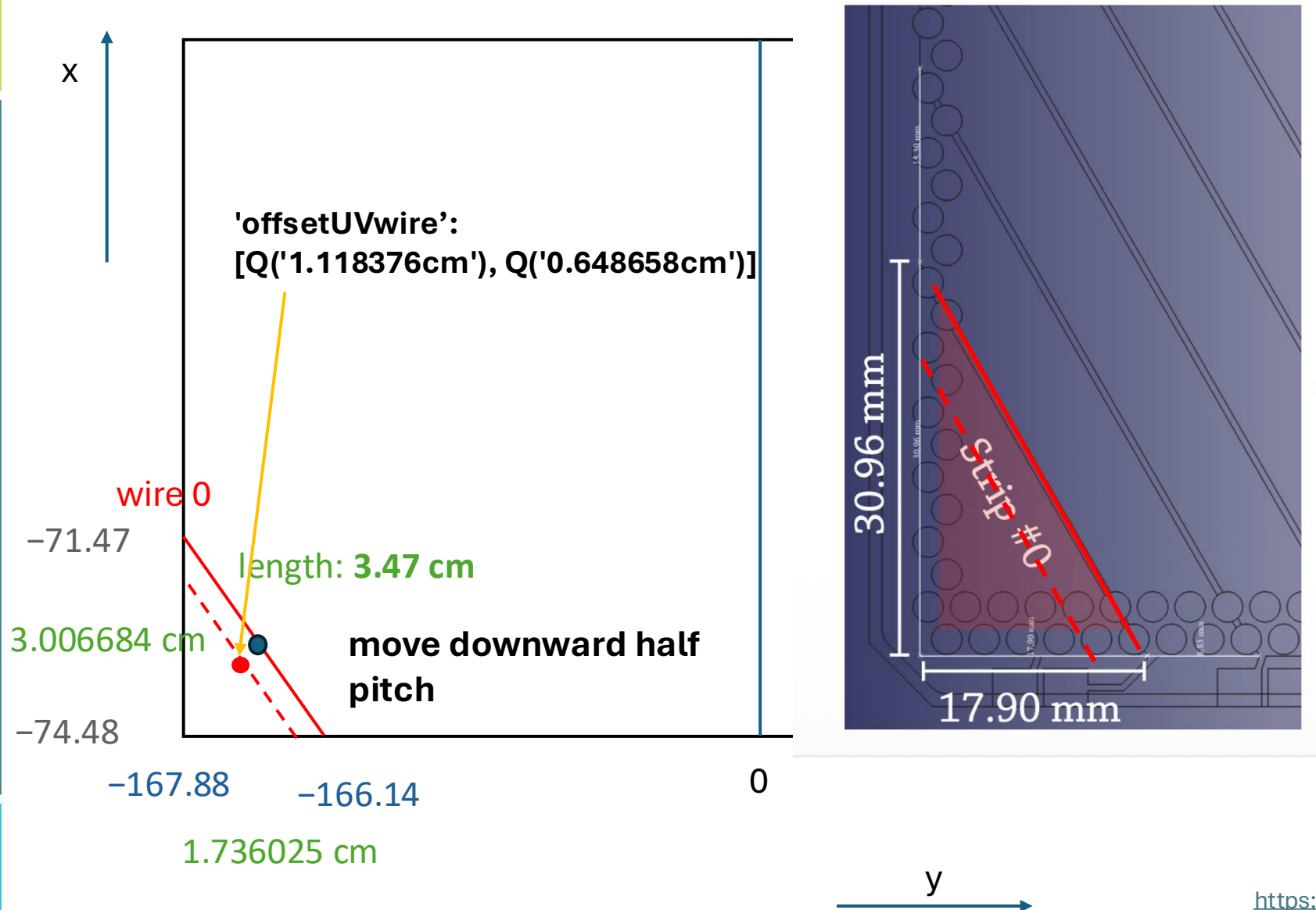
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Extracted coordinate from base CRU in geometry



- In the current official geometry, **Wire 0 is defined at the strip edge.**
- All wire positions are then defined relative to this edge.
- In Wire-Cell, **Wire 0 should be located at the strip center.**
- This initial misalignment is propagated through the rotation and mirroring operations, affecting all derived anodes.

Updated offset:

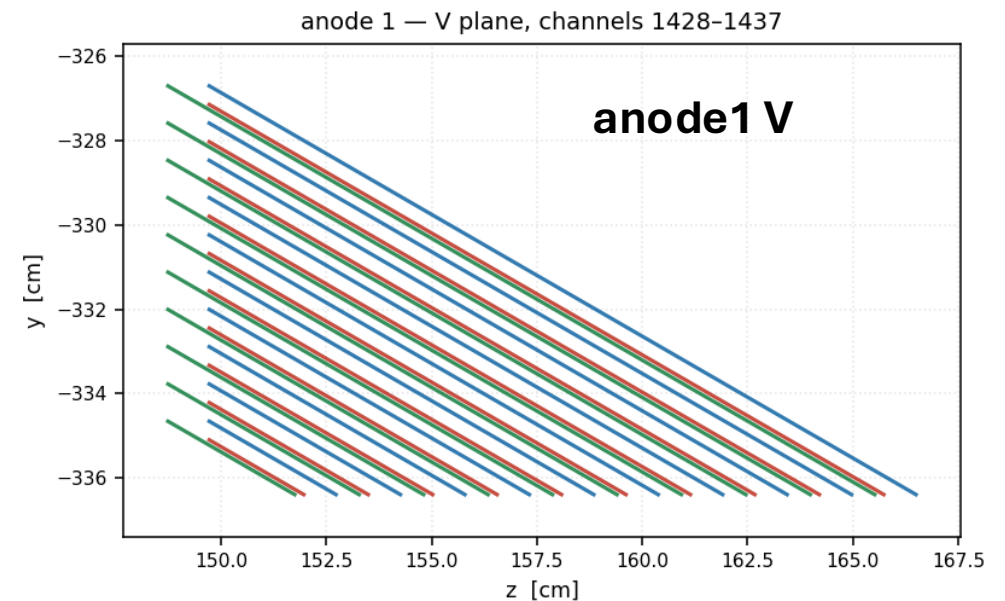
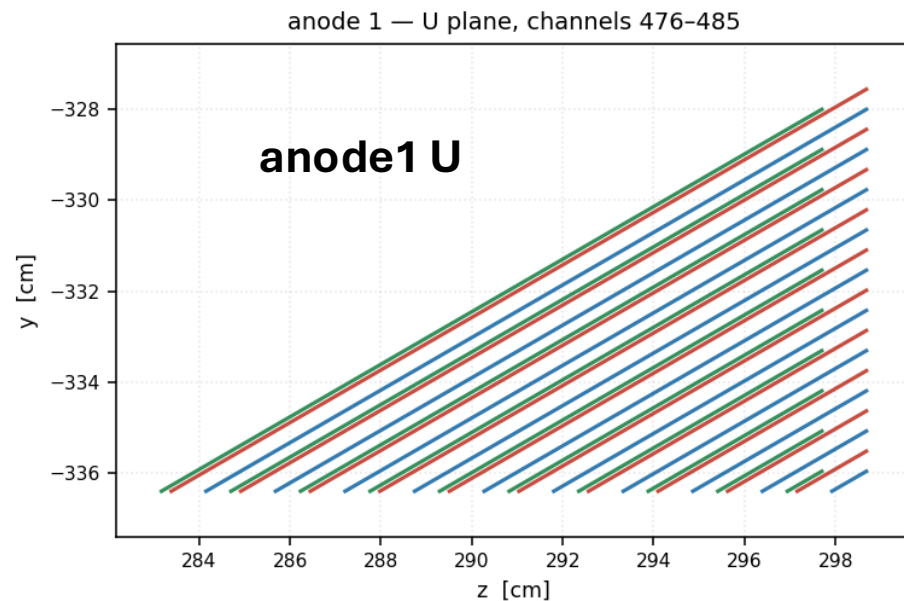
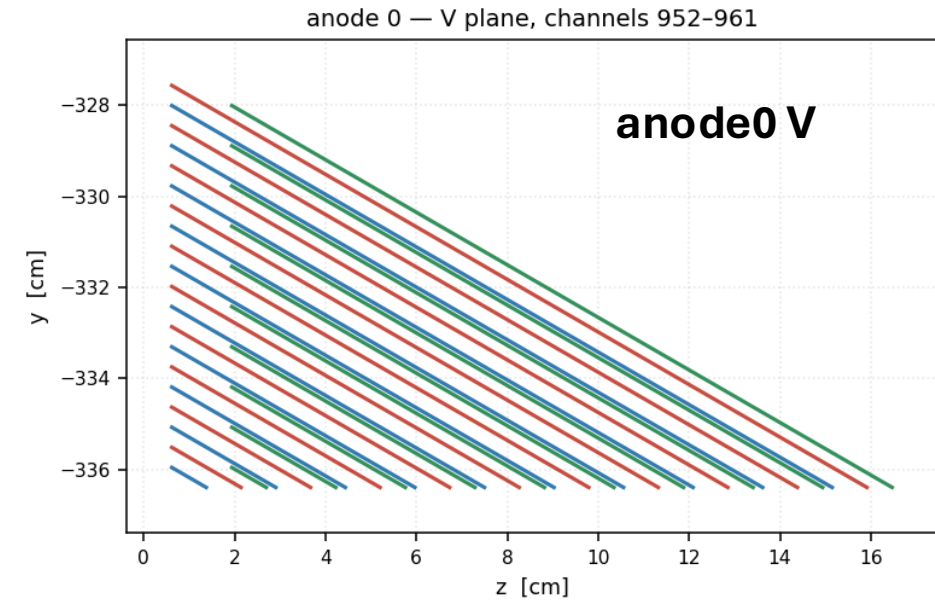
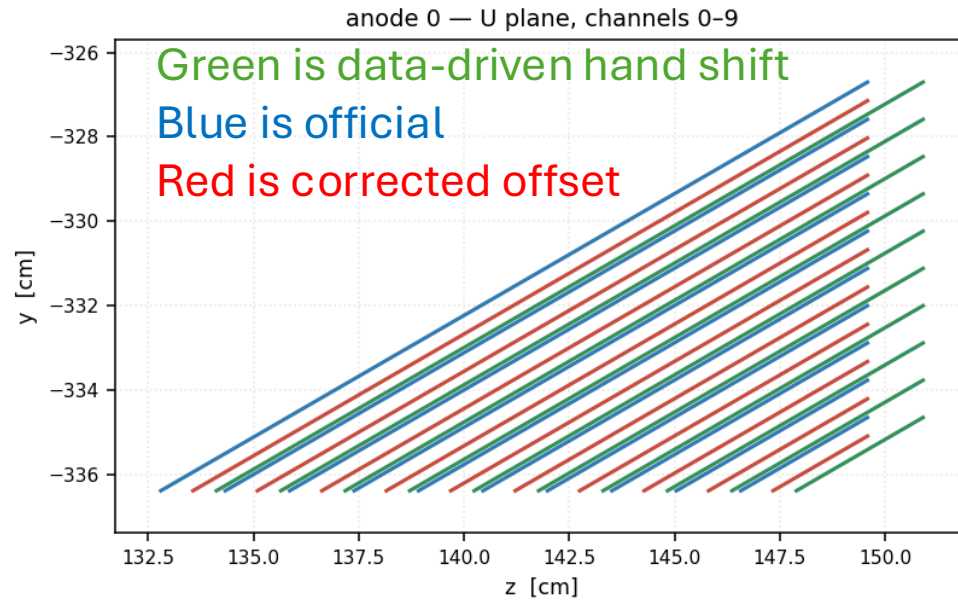


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shift visualize:

ProtoDUNE-VD — first 10 U and V wires per anode, yz projection (page 1/2: anodes 0-3)

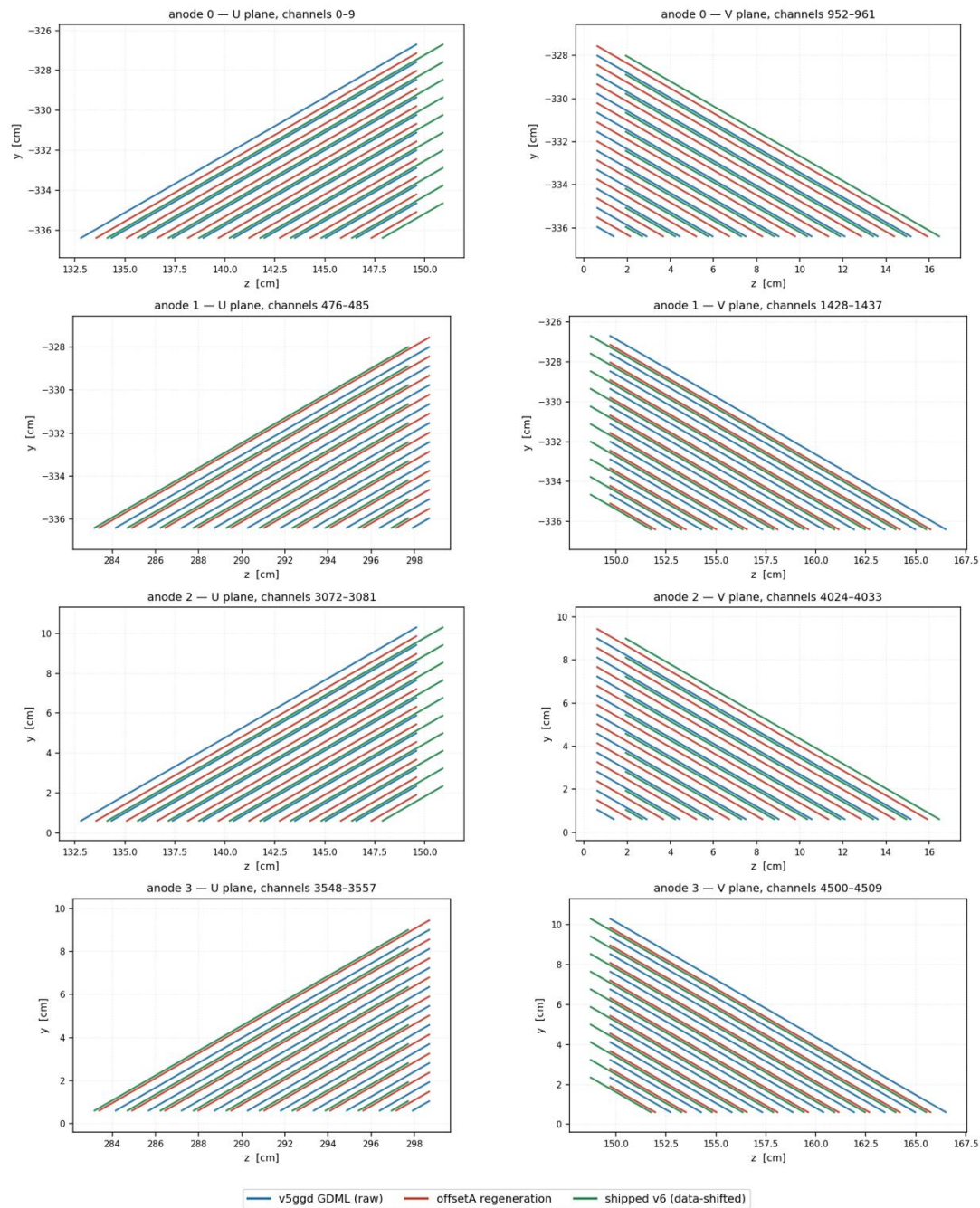
anode0 U



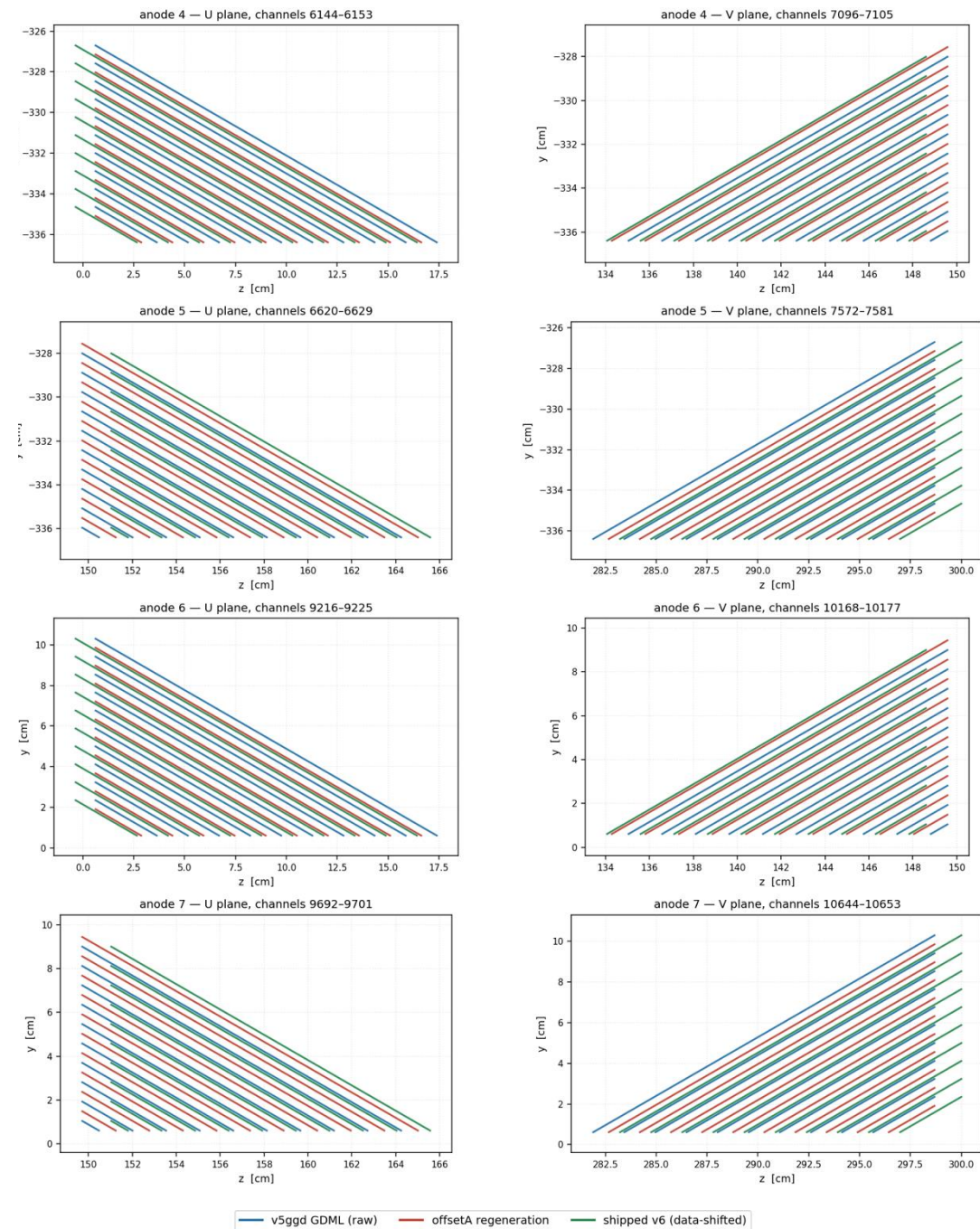
red lines become more closer to the green lines

overall shift visualize:

ProtoDUNE-VD — first 10 U and V wires per anode, yz projection (page 1/2: anodes 0-3)



ProtoDUNE-VD — first 10 U and V wires per anode, yz projection (page 2/2: anodes 4-7)



current official gdml

CRP5

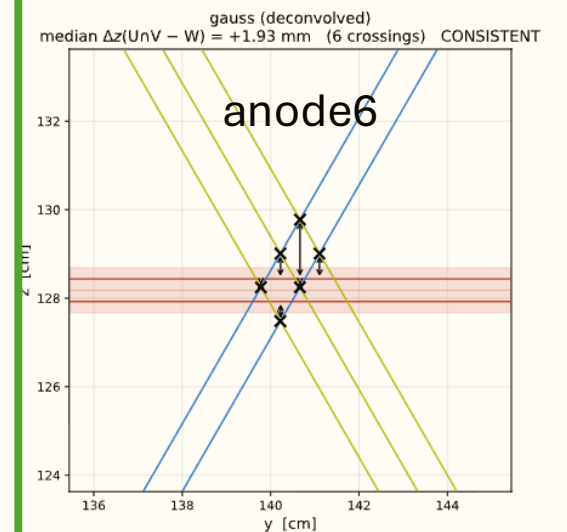
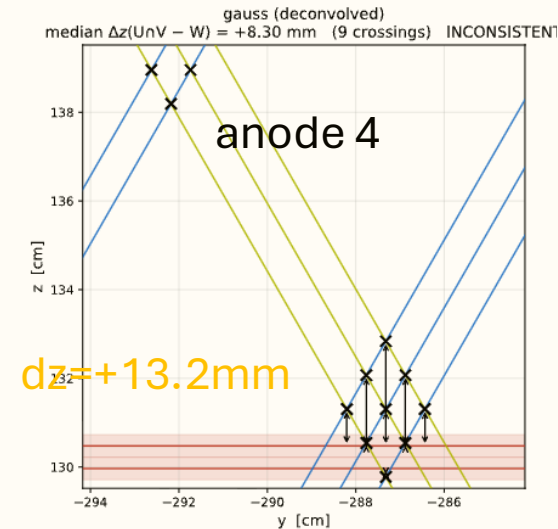
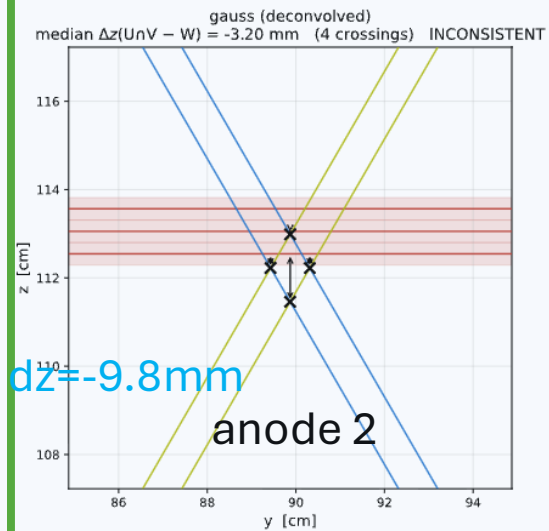
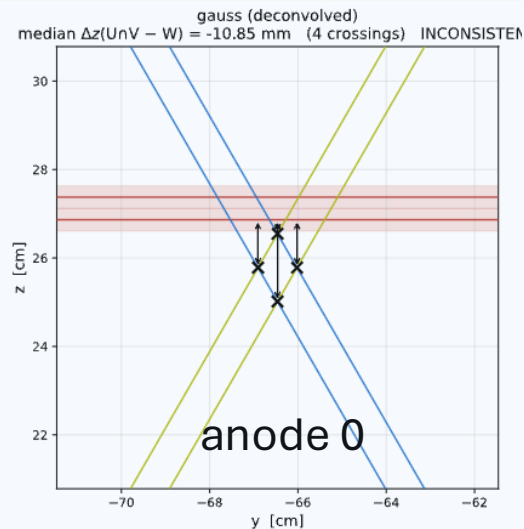
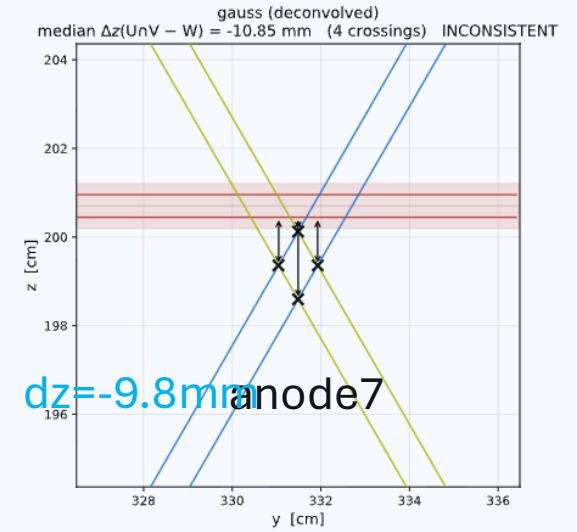
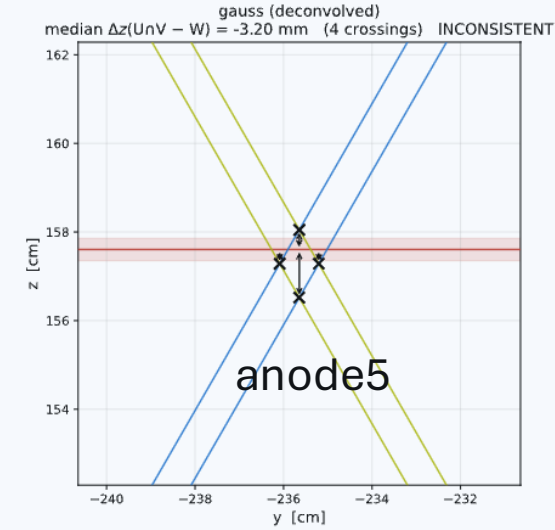
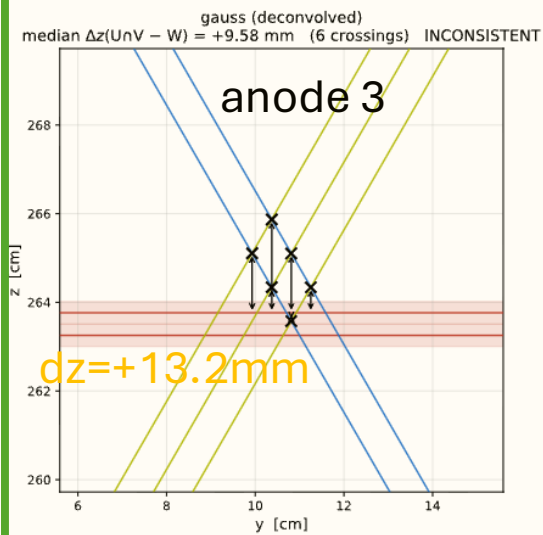
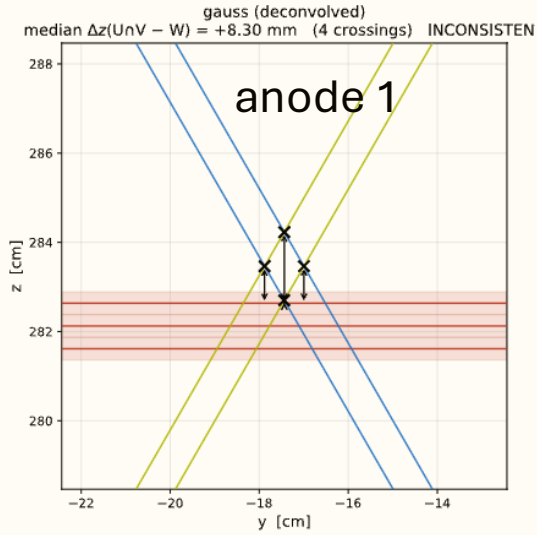
bottom

CRP4

CRP2

top

CRP3



After correct offset; based on CAD file

bottom

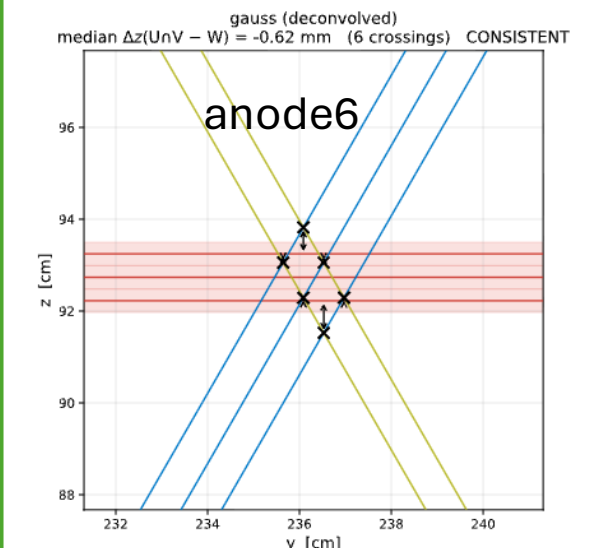
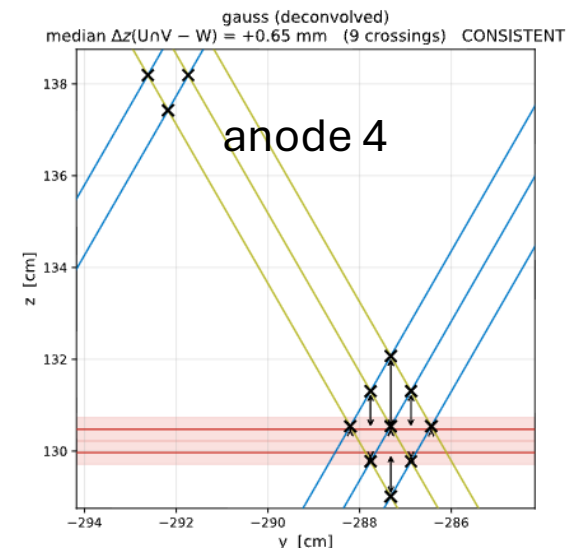
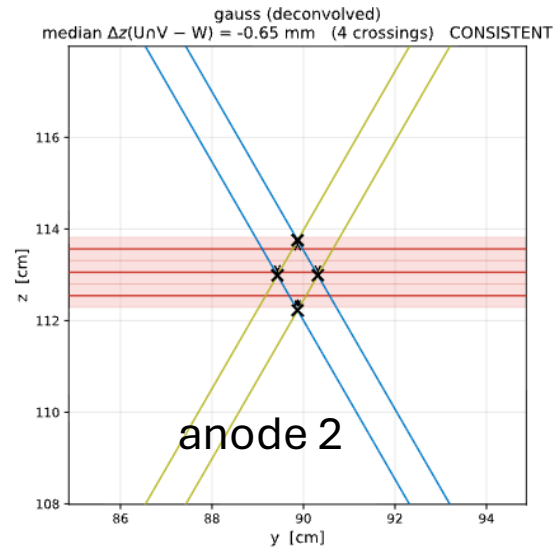
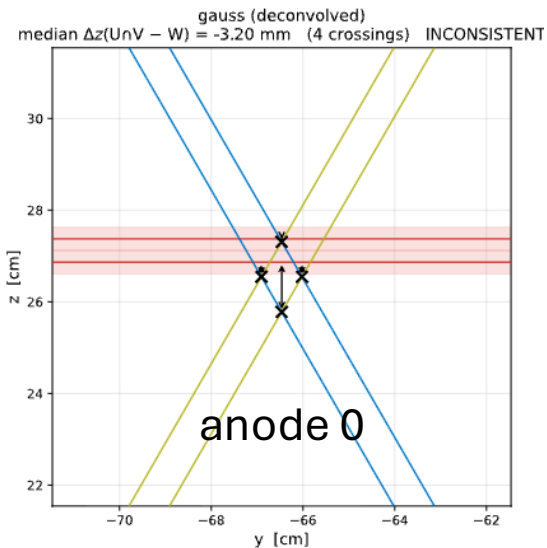
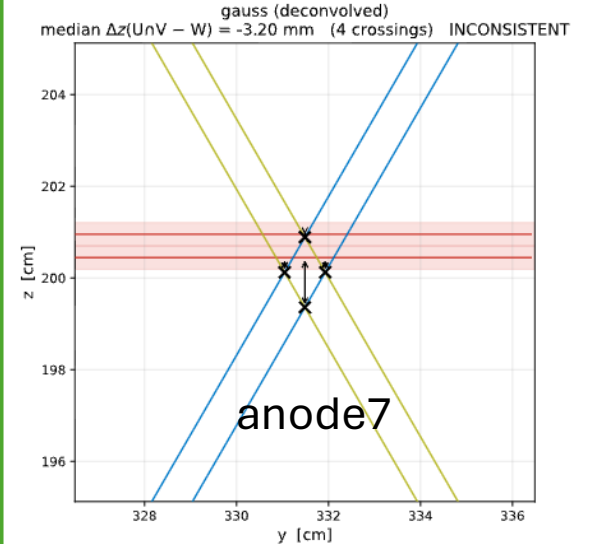
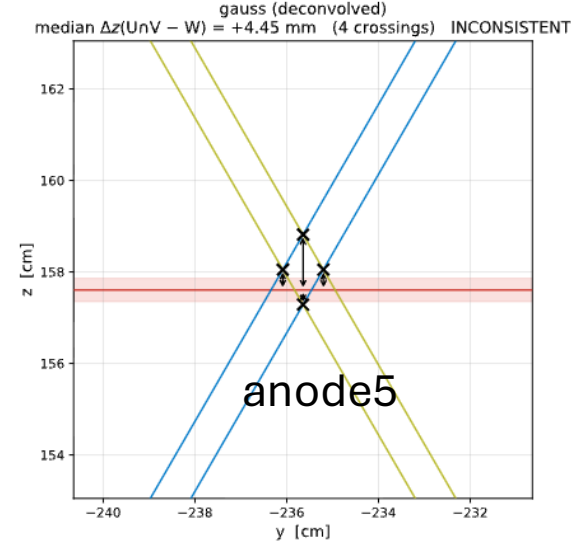
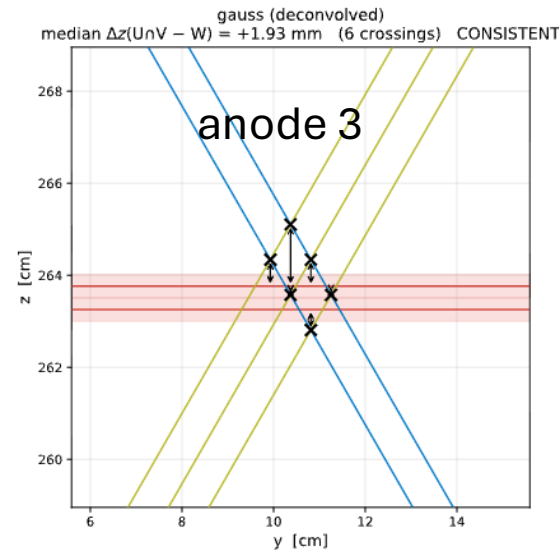
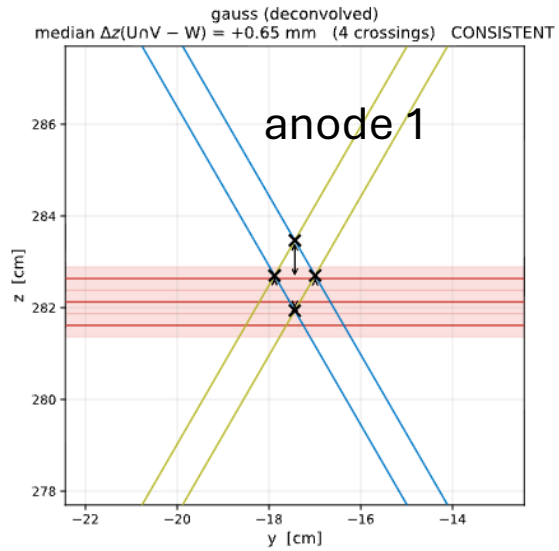
top

CRP5

CRP4

CRP2

CRP3



data-driven, wirecell-v6

bottom

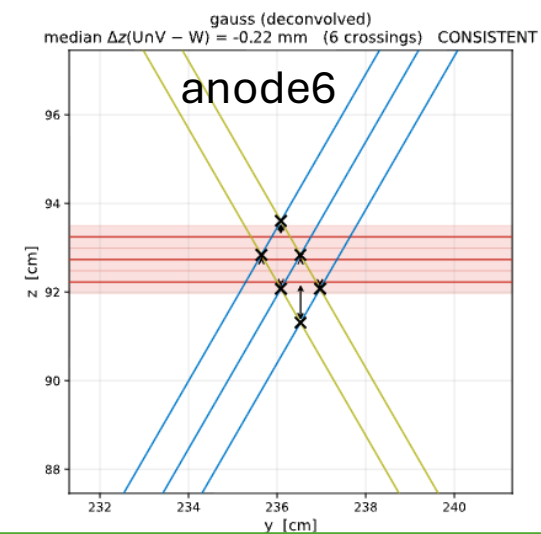
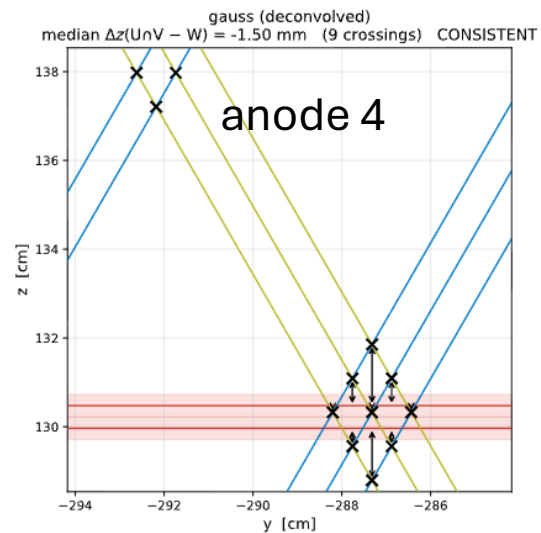
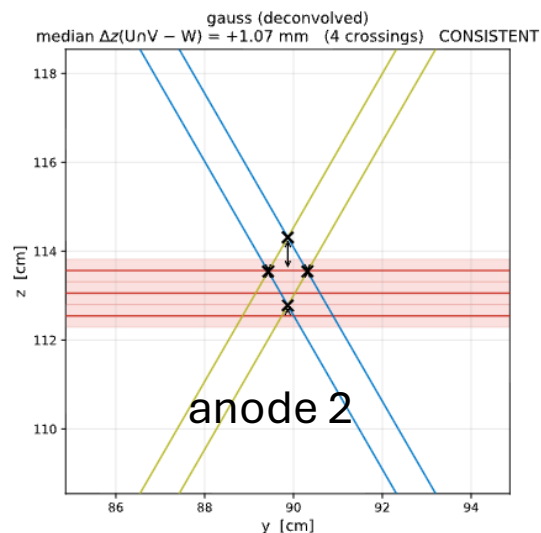
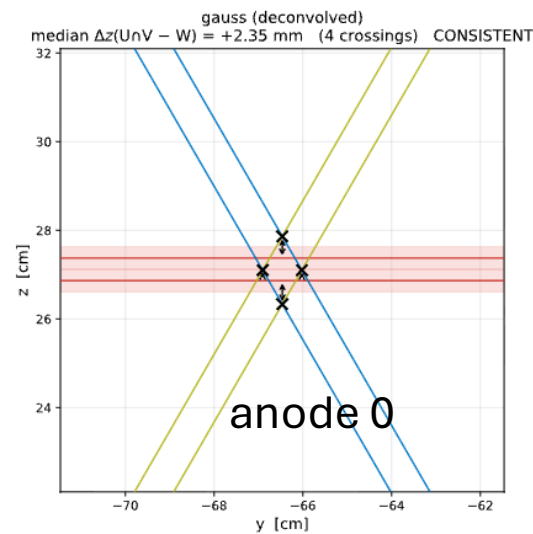
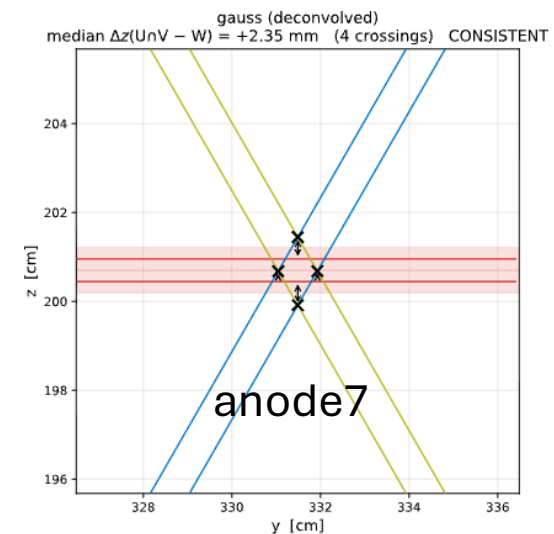
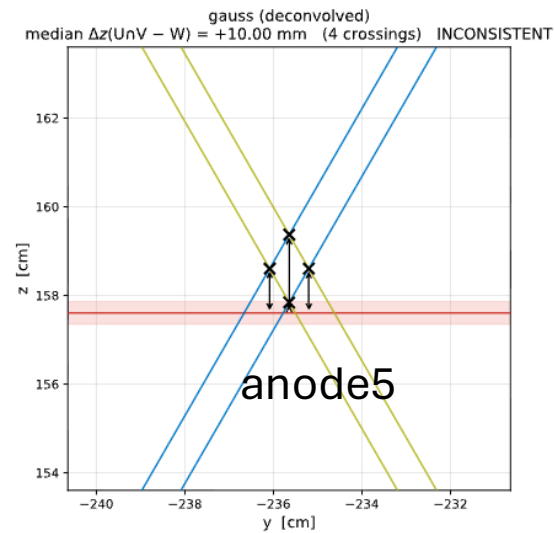
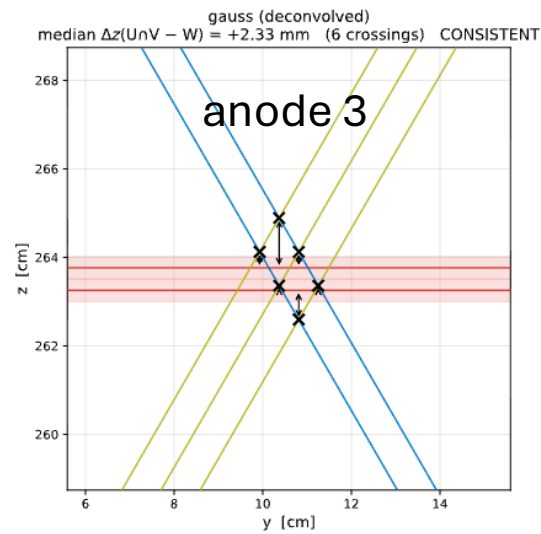
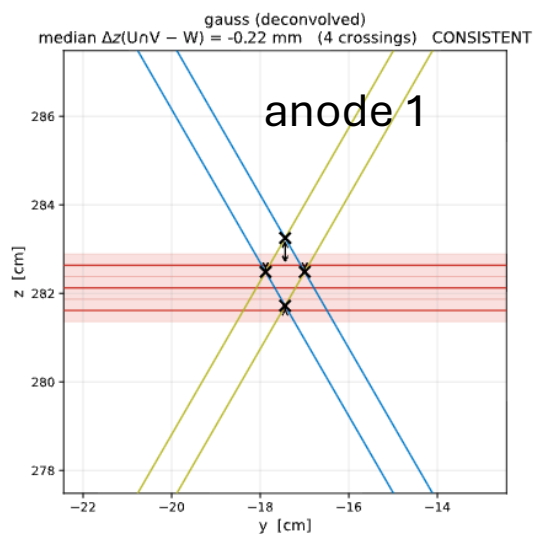
top

CRP5

CRP4

CRP2

CRP3



Data calibration geometry

- W (collection) plane is correct as built: wire 0 sits at 0.5 pitch from the plane edge
- Calibrate the **induction** planes against W, using one clean track per anode
- Observable: $\Delta Z_W = z(\text{UnV crossing}) - z(\text{W wire})$, per drift tick

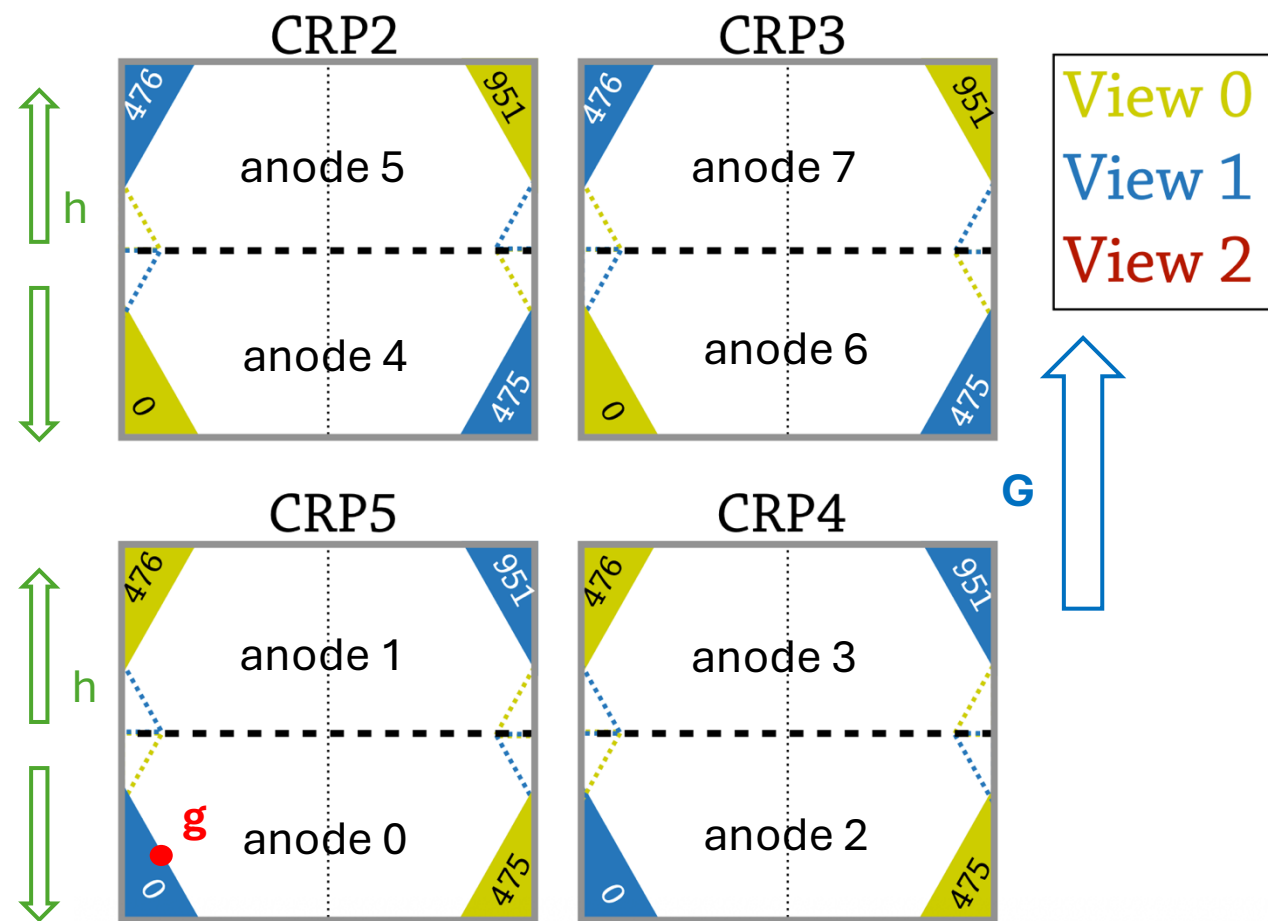
- 3 fit parameters (induction planes only; W held fixed)
- Induction wire 0 offset:
 - Anodes 0, 2, 5, 7 shift **+g** vs 1, 3, 4, 6 shift **-g**
- global shift in z axis:
 - all anodes shift in distance **G**
- parity symmetric shift in z axis:
 - Anode 0,2,4,6 shift **+h** vs 1,3,5,7 shift **-h**

final fit result:

g = -10.603 mm

h = -2.189 mm

G = +0.260 mm

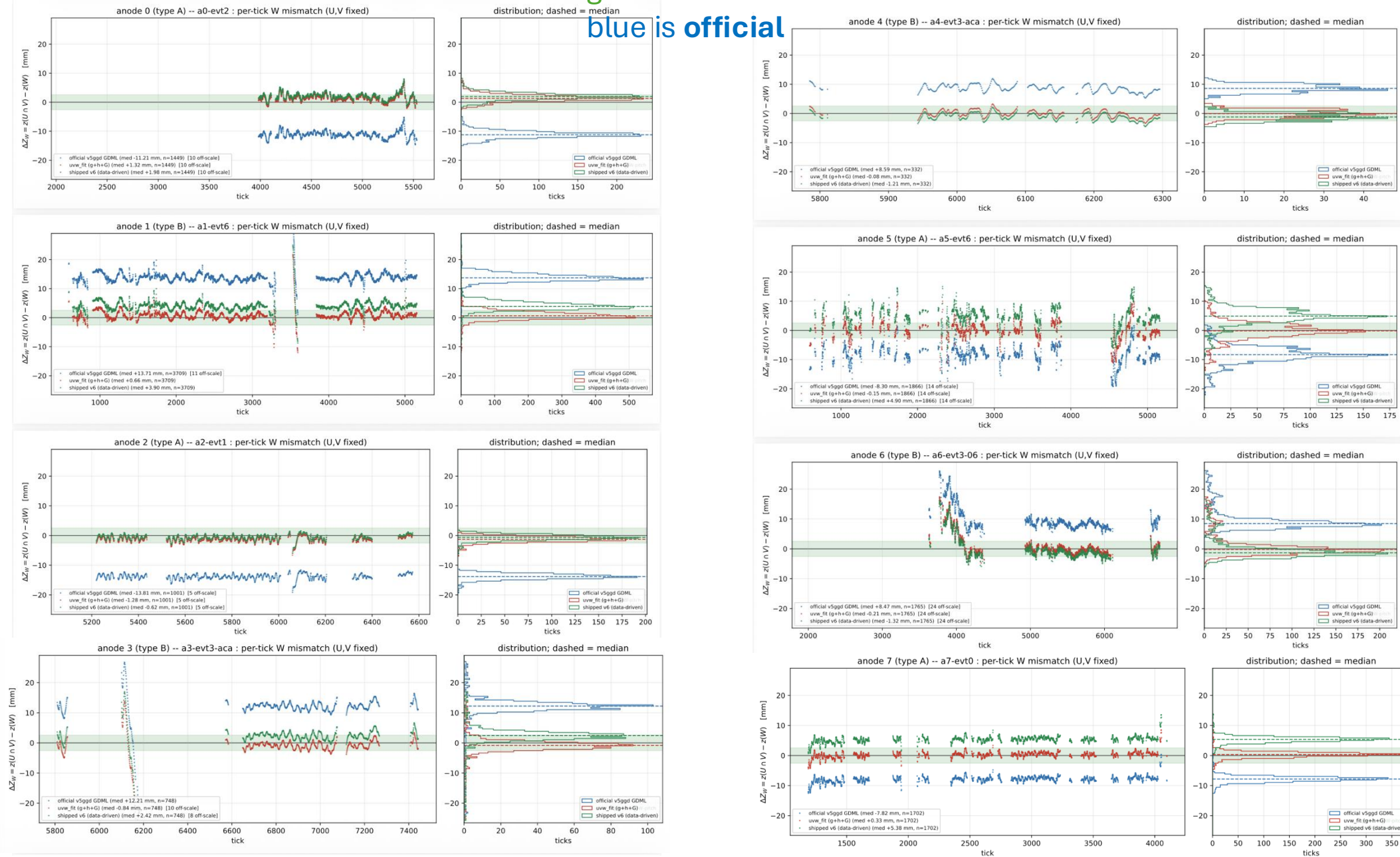


Fit result compare:

red line is fitting result this time;

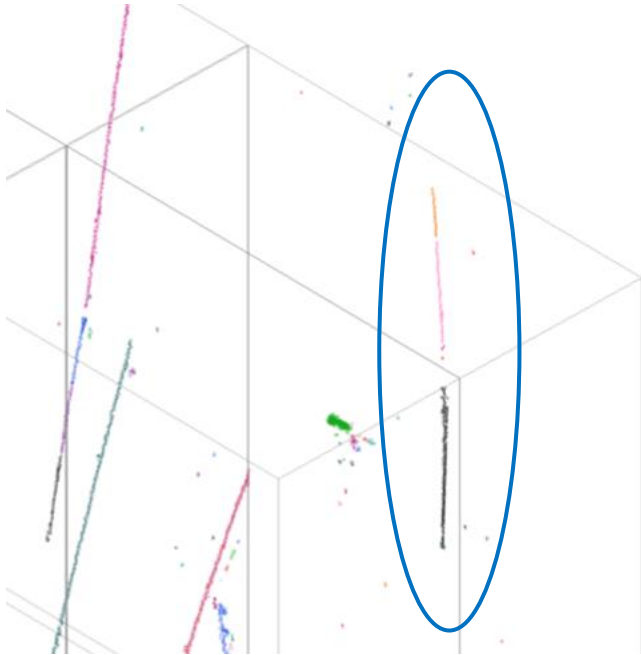
green is data-driven wire-v6

blue is official

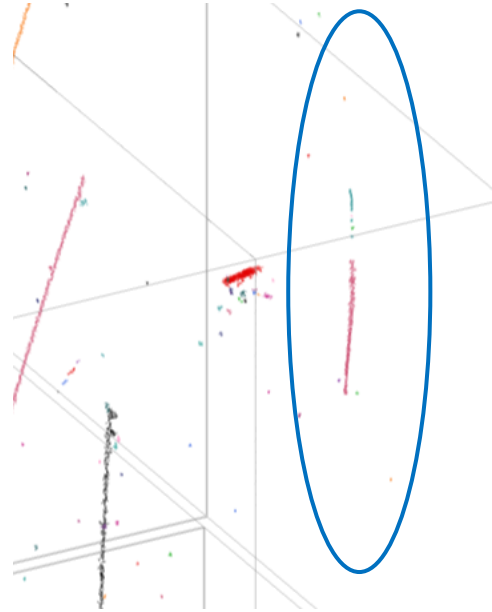


Imaging in new geometry

bestfit geometry this time:



wire-v6 geometry



<https://www.phy.bnl.gov/twister/bee/set/15b26fd3-2fec-434b-9100-12a605563b28/event/0/>

<https://www.phy.bnl.gov/twister/bee/set/e9dba0b2-2ada-41e5-8071-6064d5ce2b27/event/0/>

backup:

