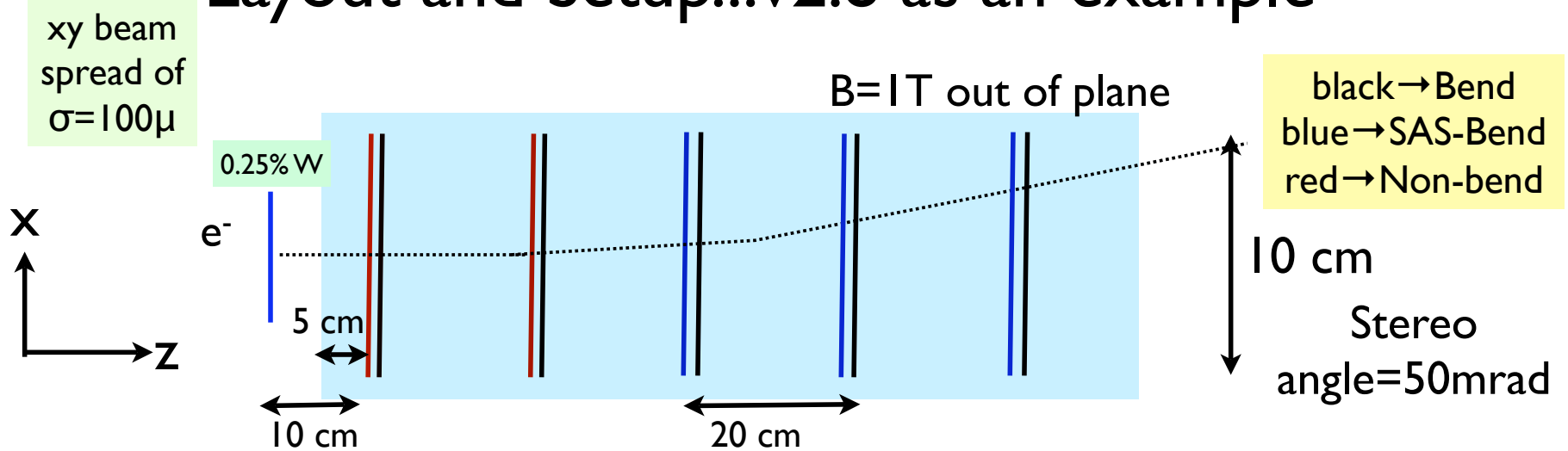


New Developments...

- 5-plane layout implemented
- TimN pointed out that making support/services for single or triple layer planes adds to the work and the total amount of material...
 - the triple layer seems to help quite a bit since it gives one very good space point measurement
 - can we come up with a layout with all double layers that does as well (see next few slides for some comparisons)
- Added ~realistic material amount (if not composition) for services and support
 - as per Tim's suggestion...0.2%/layer for double layers (0.4% total); 0.6% for single layers; 1% for triple layers
 - composition is just carbon for now...we can put something more realistic later, but I doubt it's too important
- looked at a number of different layouts
 - y =measures non-bend plane; x =bend plane; s =SAS-bend; s' =SAS-nonbend
 - v2.5: $yx - yx - x - szy - x$ (SAS=17 mrad)
 - v2.6: $yx - yx - yx - sx - s'y$ (SAS=17 mrad)
 - v2.7: $yx - yx - yx - sx - sx$ (SAS= \pm 17 mrad)
 - v2.8: $yx - yx - sx - sx - sx$ (SAS= \pm 50 mrad)
 - v2.9: $yx - yx - sx - s'y - sx$ (SAS= \pm 50 mrad)

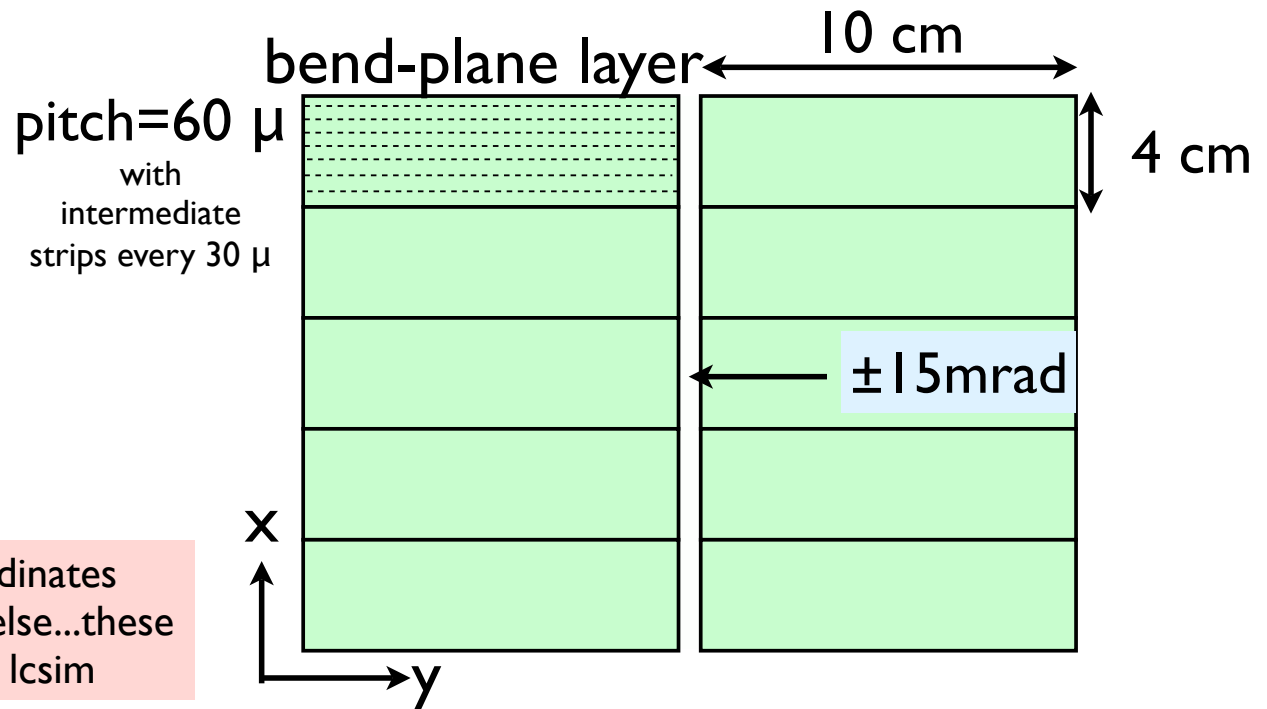
Layout and Setup...v2.8 as an example



Silicon is 300μ thick,
“services”=0.2%/layer;
detector is in
vacuum

readout chip=APV25
 \rightarrow 7.5 ns integration

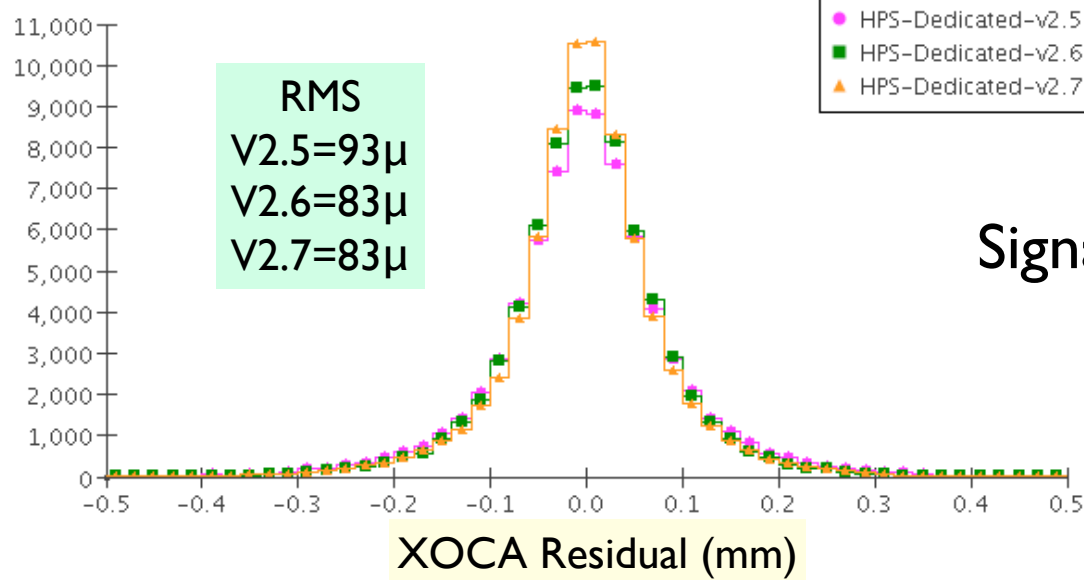
I am trying to use coordinates
consistent with everyone else...these
are not what's used in lcsim



Tracking/vertexing requirements

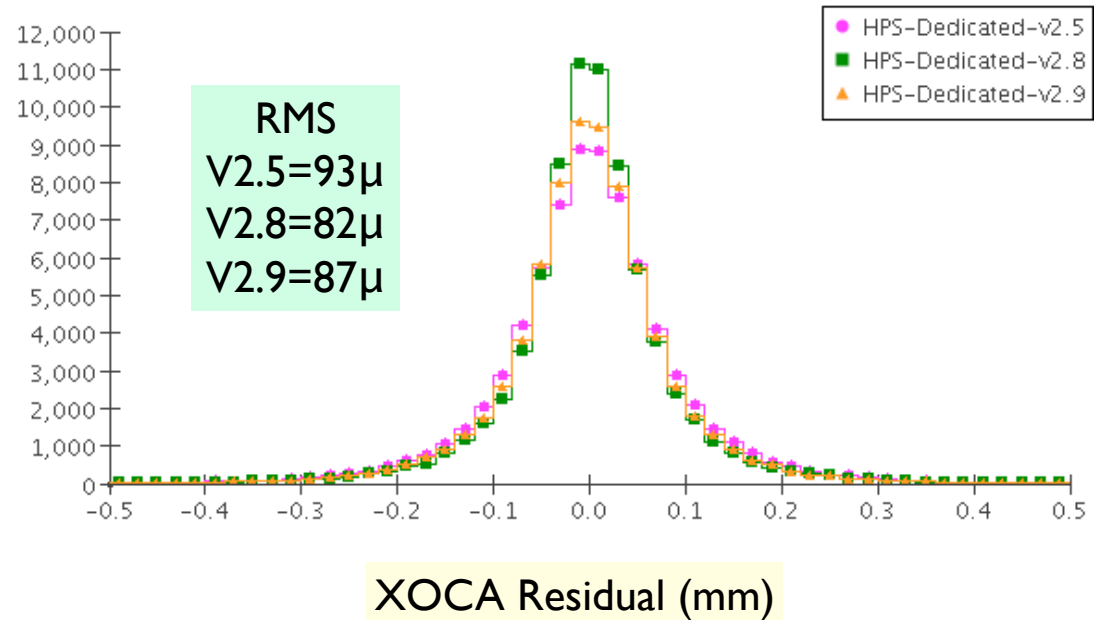
- In order for a track to be reconstructed
 - must have hits in first 4 planes...add 5th if possible
 - very loose cuts on χ^2 (both total and per-hit);
 - $|X|$ and $|Y|$ values of POCA to the beam axis must be less than 500μ
 - checked on displaced signal events and this is still very efficient
 - efficiency for tracks in acceptance $\sim 95\%$
- combine all e^+e^- pairs using vertex fitter based on SQUAW algorithm (see Rich's talk last week)
 - based on widths of X and Y distributions, can select "good" vertices with $|X_v| < 400\mu$ and $|Y_v| < 400\mu$
- The variations between detector layouts are small...use these definitions for all of them

Track comparison: XOCA

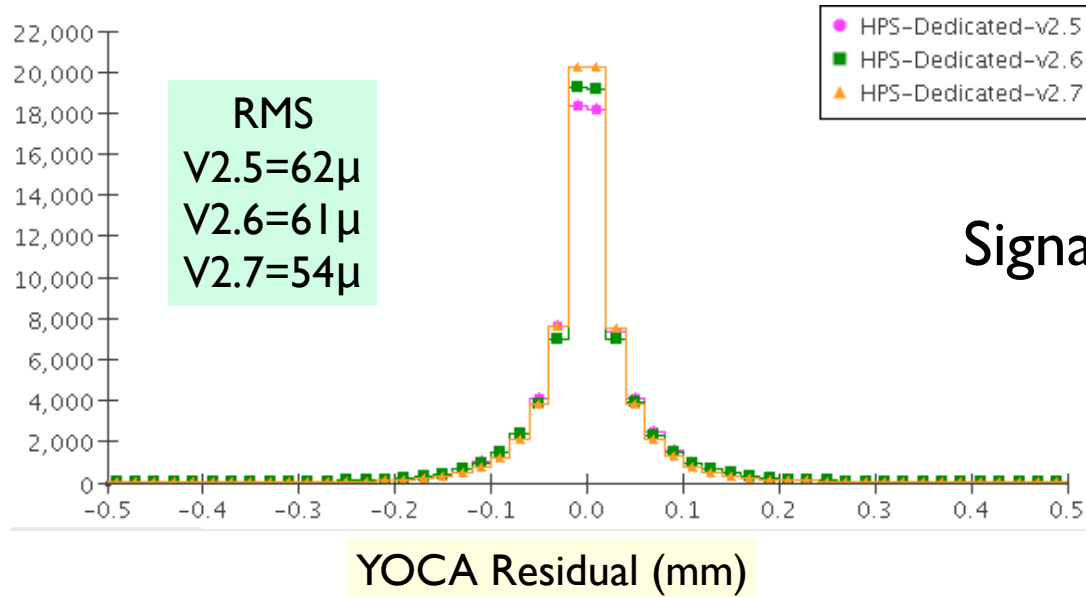


Signal-only events (200MeV)
require 0 bad hits

v2.6,7,8 look best

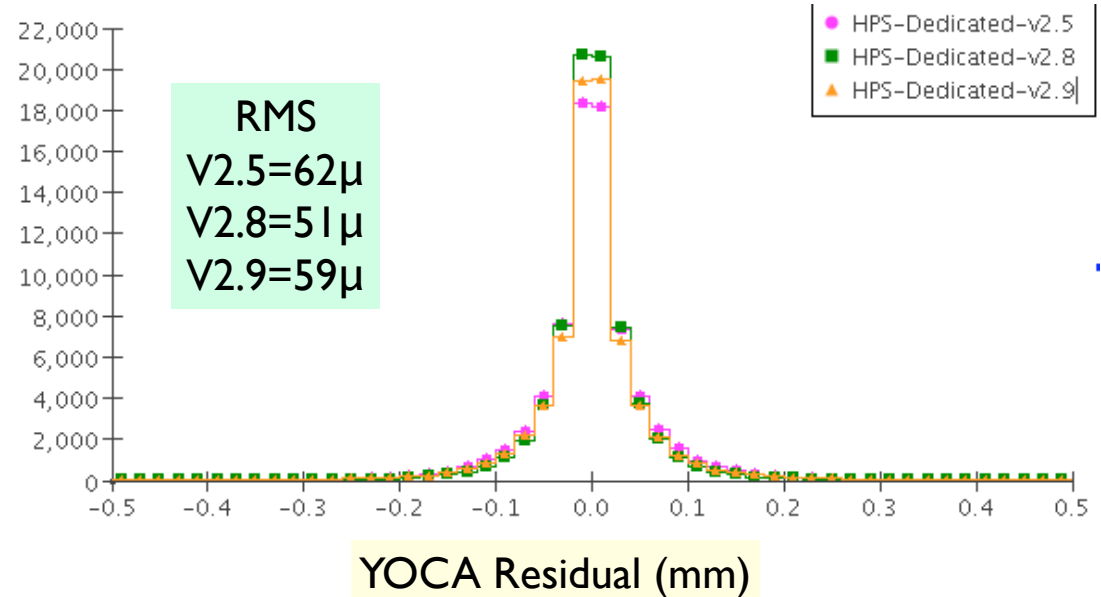


Track comparison: YOCA



Signal-only events (200MeV)
require 0 bad hits

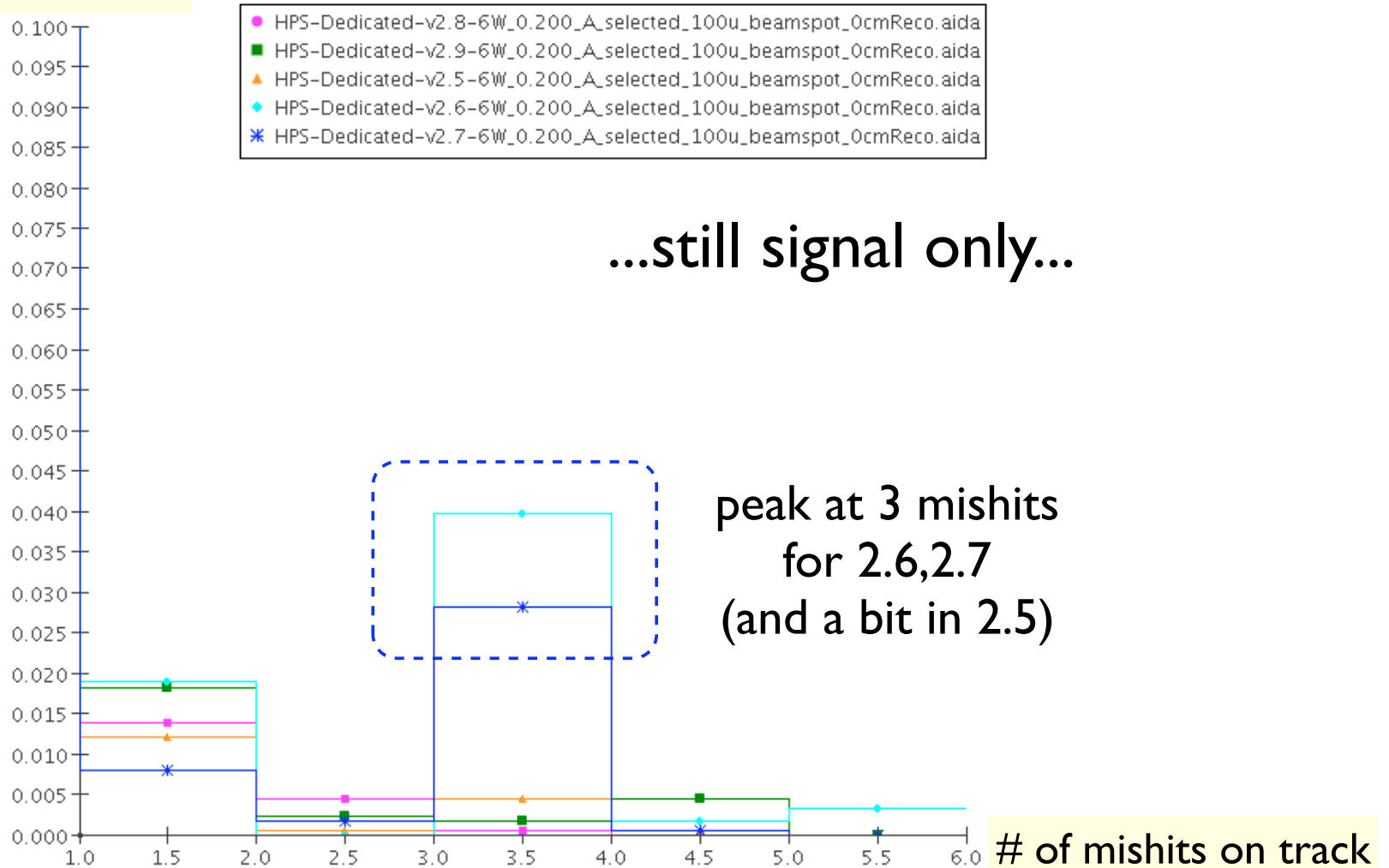
v2.7,8 look best
(strange since 2.6,9 have extra Y hits ...
still a mystery)



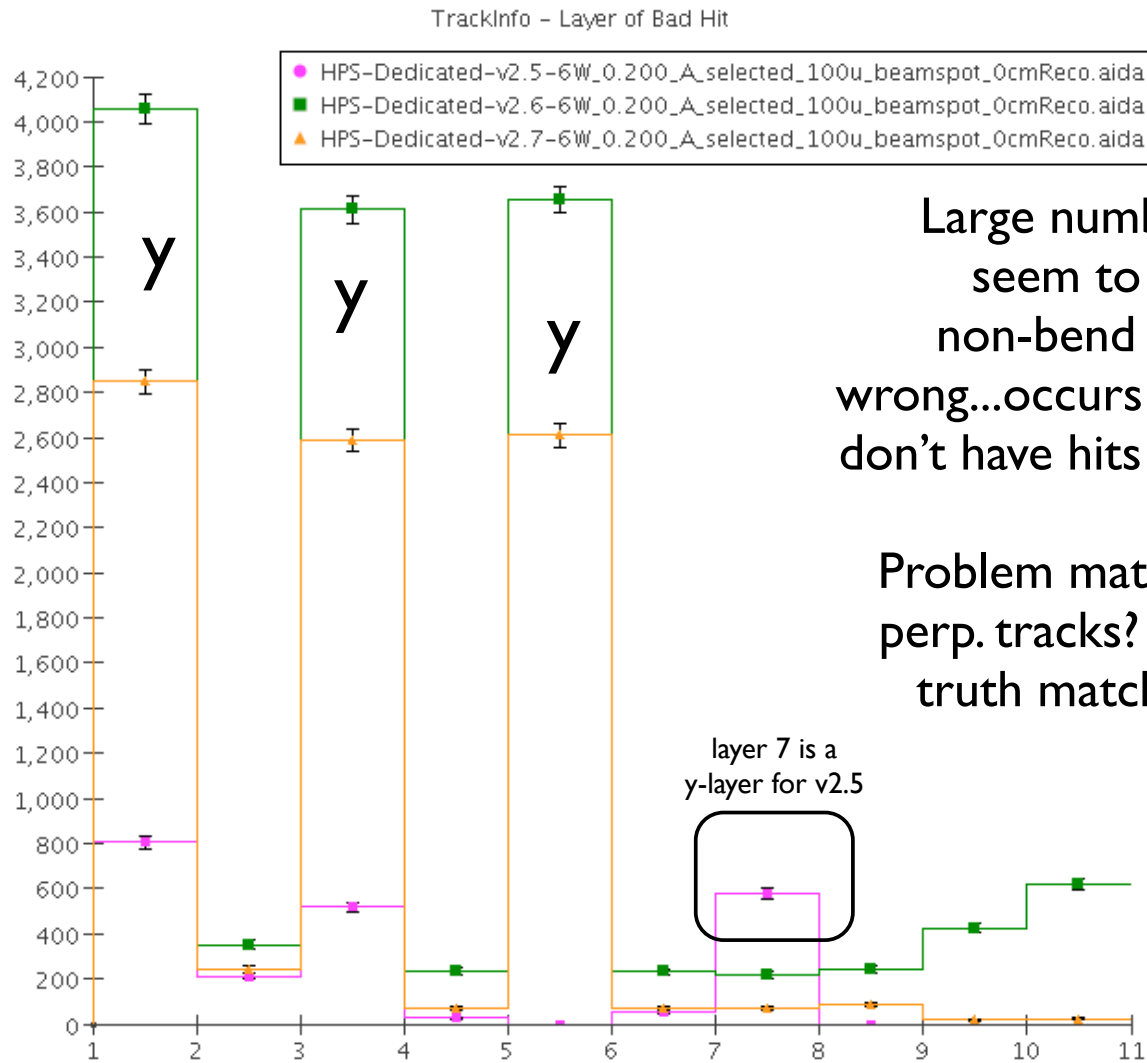
Track comparison: mishits

Fraction of tracks
with X mishits

Number of mis-matched hits (normalized)



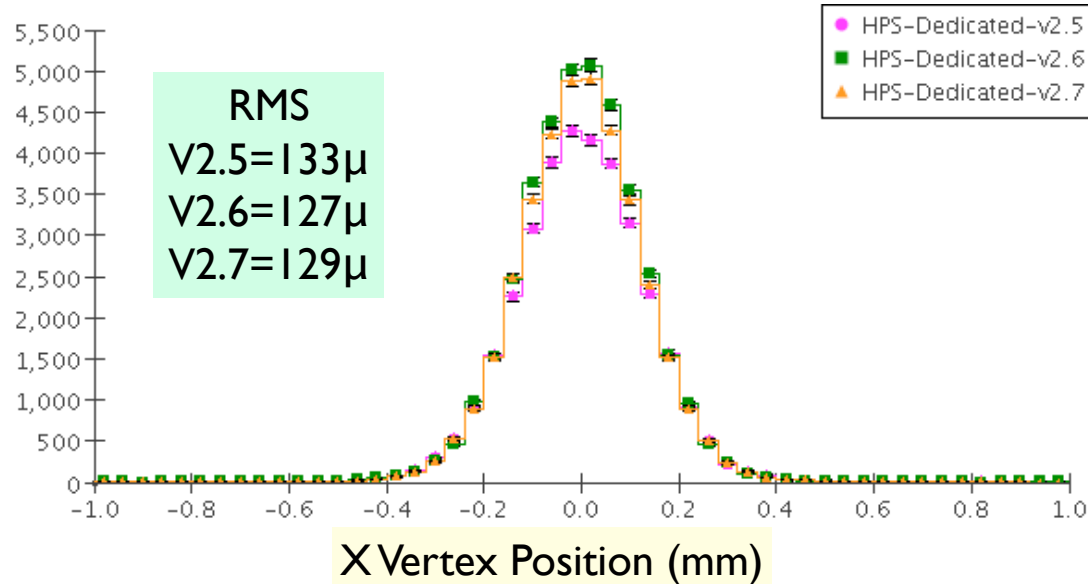
Track comparison: mishits



Large number of tracks seem to get first 3 non-bend plane layers wrong...occurs mainly when we don't have hits in the 5th plane.

Problem matching axial and perp. tracks? Problem with truth matching the hits?

e^+e^- Vertex: X_v

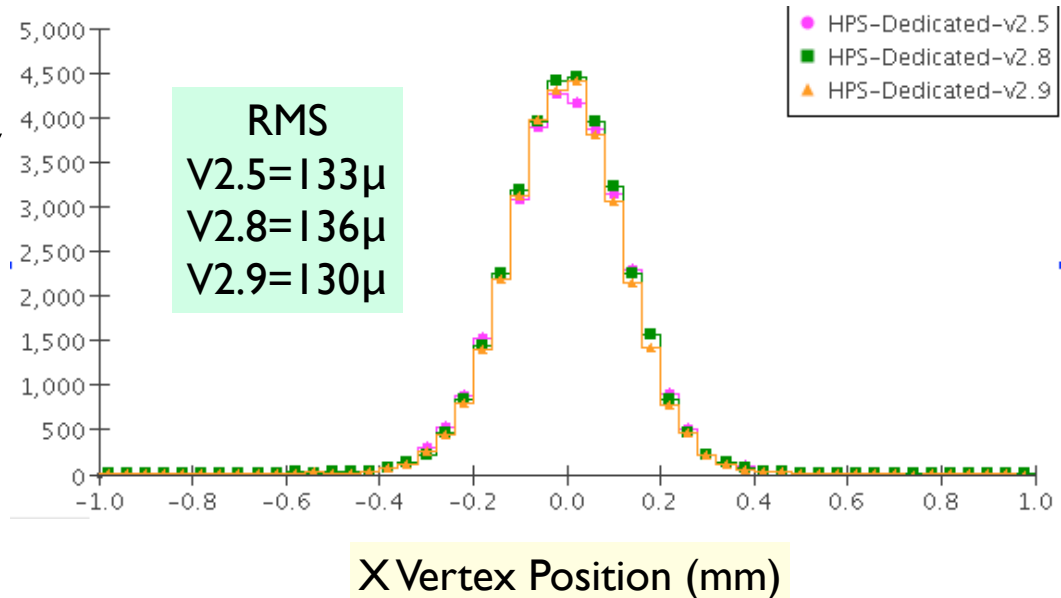


Signal only...
decaying at $Z=0$ cm

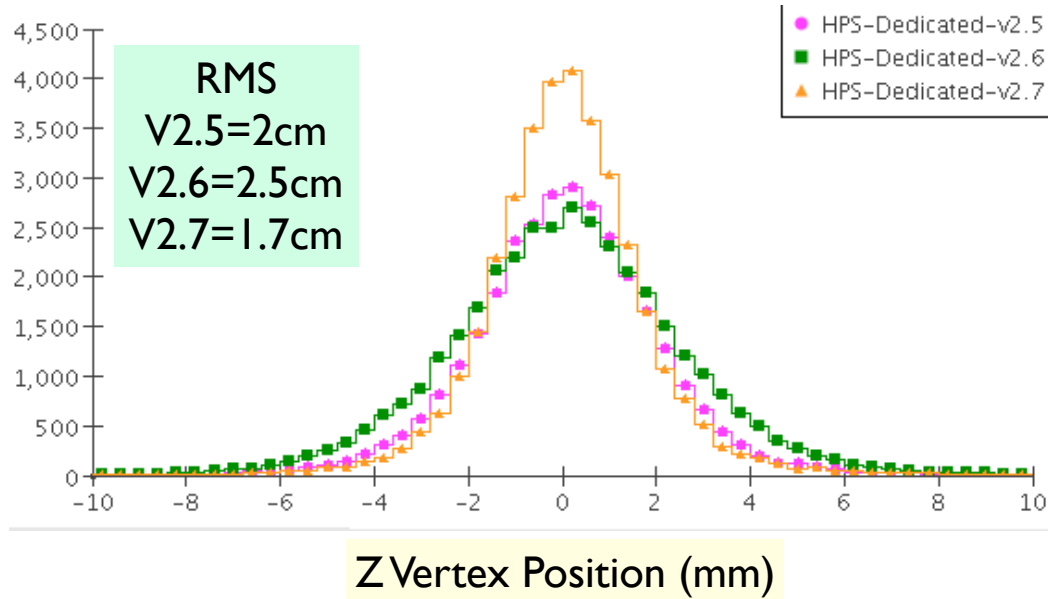
No selection
has been put on
the vertex (yet)

...these are all pretty
much the same.

Similarly with Y_v



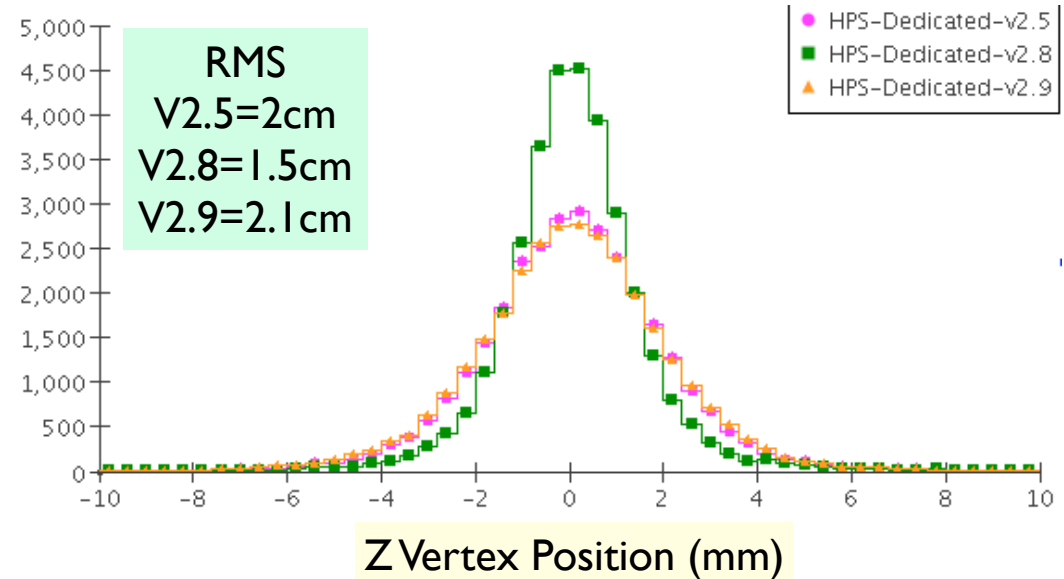
e^+e^- Vertex: Z_v



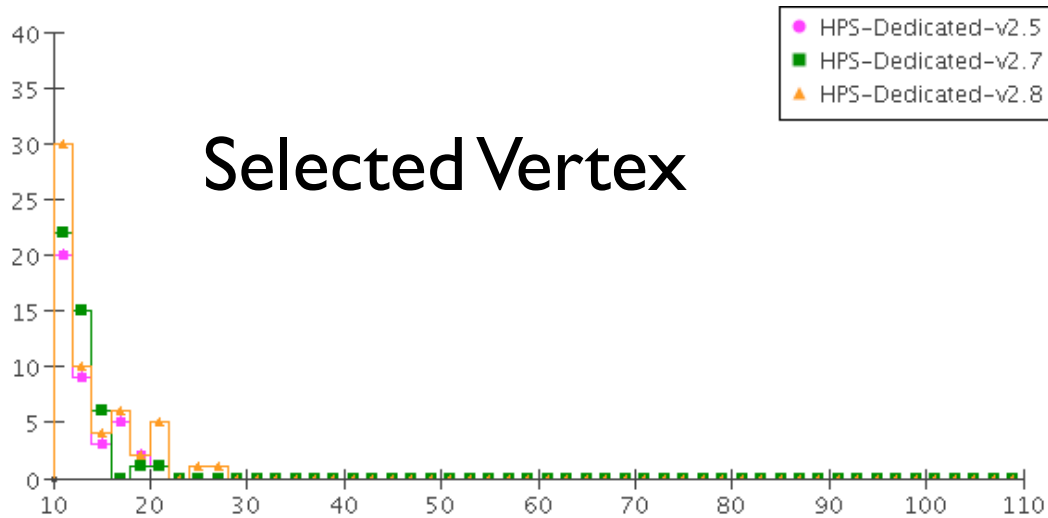
Signal only...
decaying at $Z=0$ cm

Require $|X_v| < 400\mu$
and $|Y_v| < 400\mu$

Looks like v2.8
is best here...



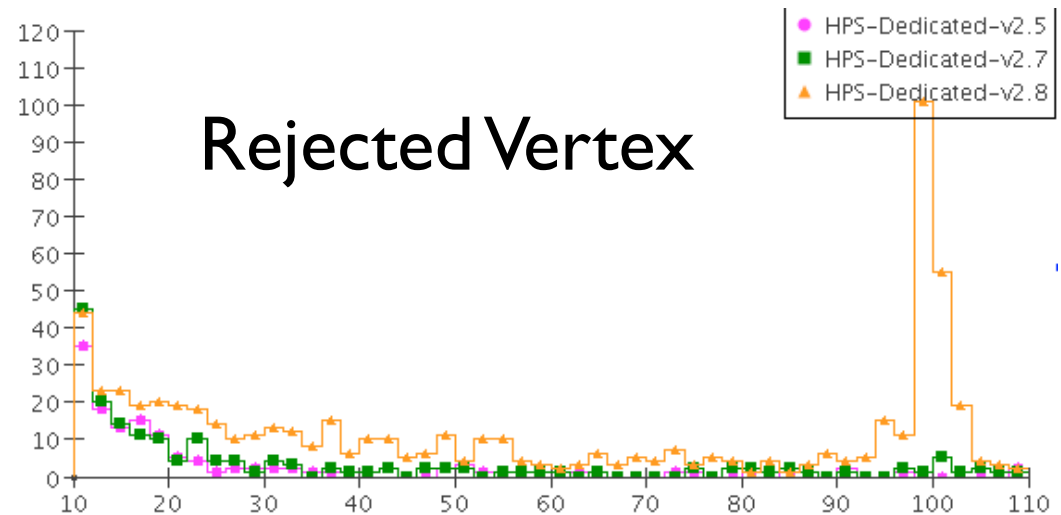
e^+e^- Vertex: Z_ν Tails



Selected Vertex

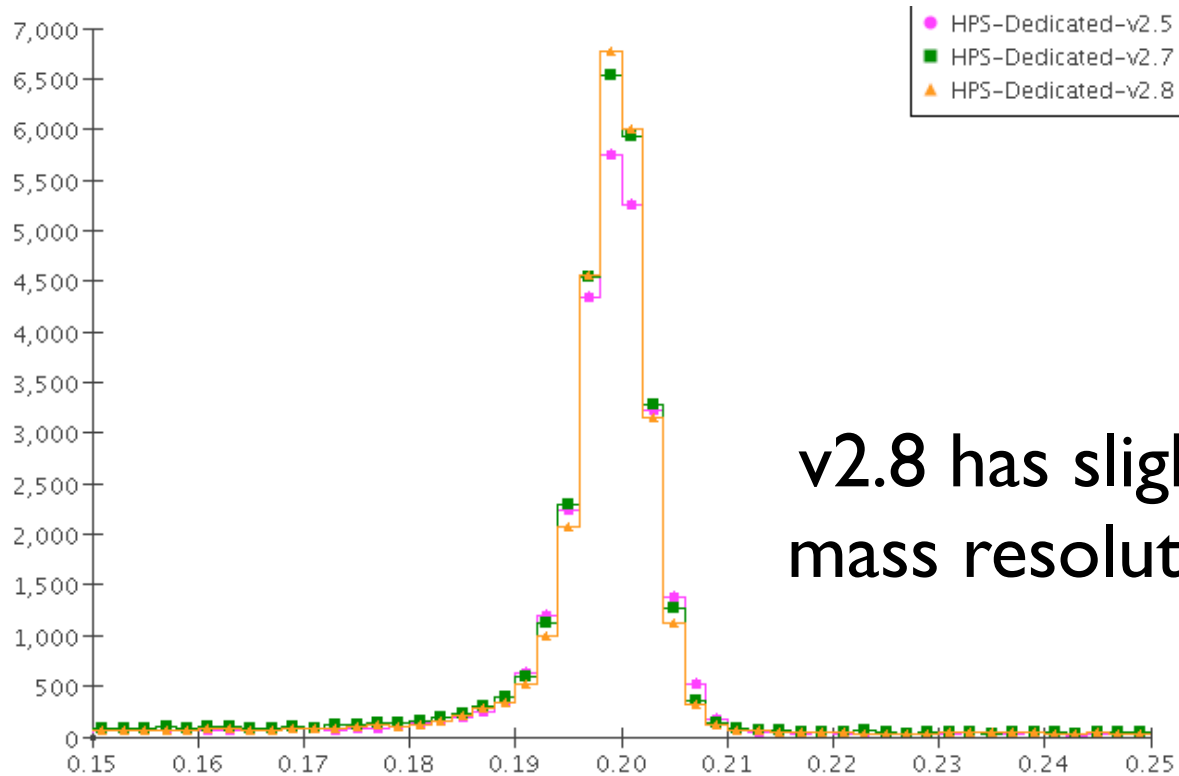
The tails of the Z_ν after selection are \sim same ... about 50 candidates > 1 cm out of 40k generated events. Nothing > 3 cm.

The rejected vertices show some interesting behavior...



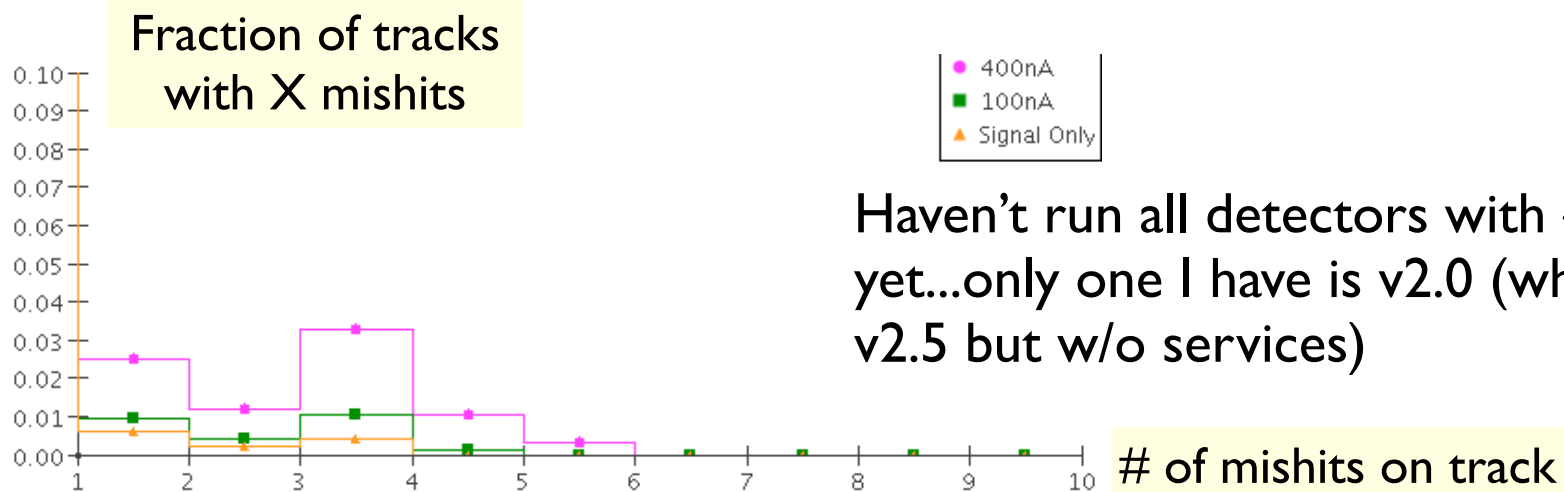
Rejected Vertex

e^+e^- Vertex: Invariant Mass



v2.8 has slightly better mass resolution as well

What about with beam on?



What we see:

- track and A' efficiency unaffected
- # of mishits grows; but even at 400nA >90% of all tracks have 0 bad hits
- Z_v resolution grows $\sim 10\%$ (tracks with mishits have worse resolution)
- Invariant mass resolution is basically the same

Need to check with a more realistic detector, but looks good so far!

Conclusions

- From the simulations, it looks like this 5 layer setup is going to work pretty well
- I think we are starting to converge on a layout...already we are just sharpening the edges.
- I'd say v2.8 looks like the best layout so far...I think I'll start using this as the "base layout" for more in depth studies unless there are objections.

Fit of Z_v for v2.8 (100nA, selected)

