PHENIX Beam Angle Scan

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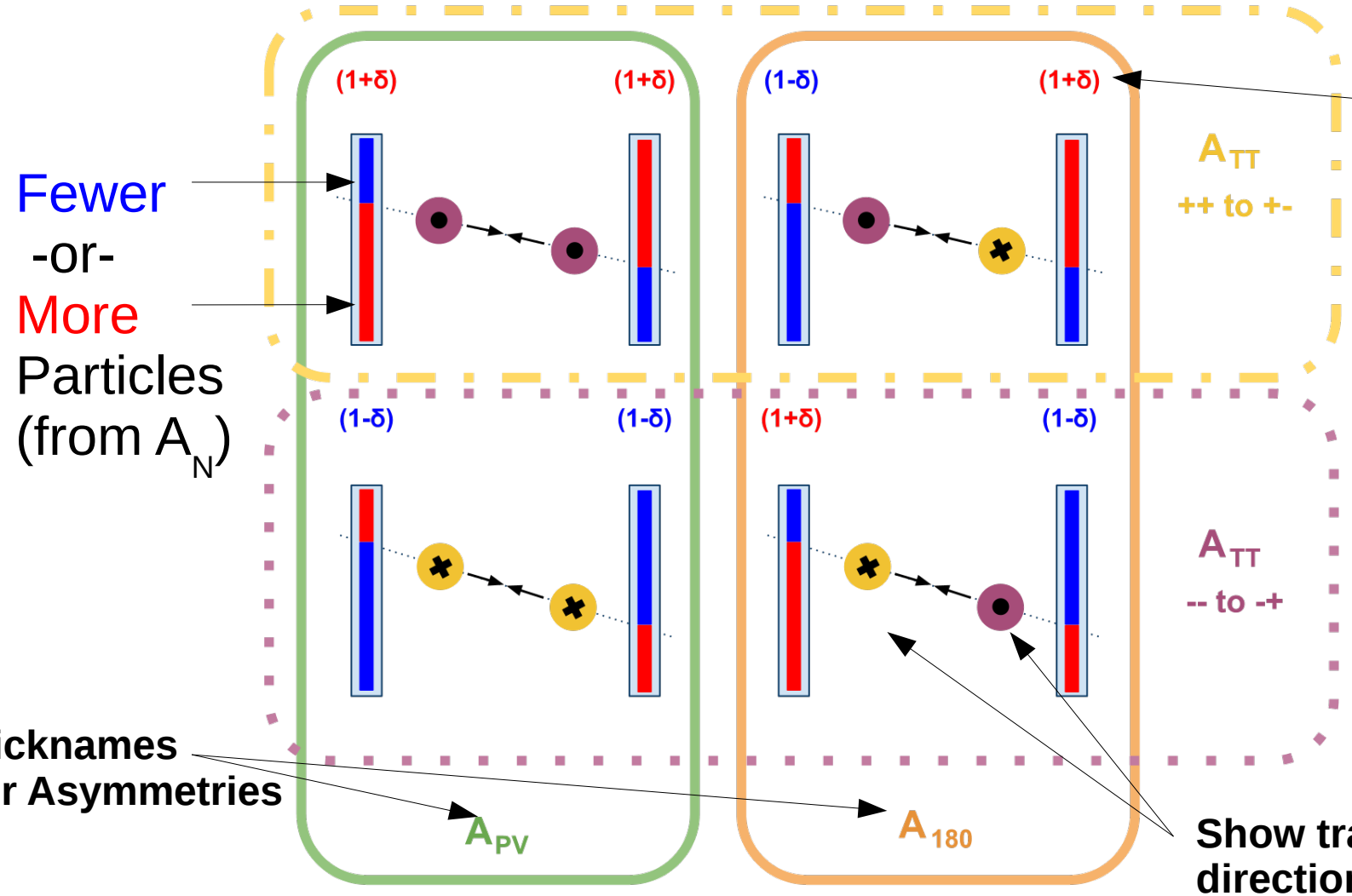
RSC meeting
Friday, March 9

Review of Model



Fewer
-or-
More
Particles
(from A_N)

Acceptance modification factor

Nicknames for Asymmetries

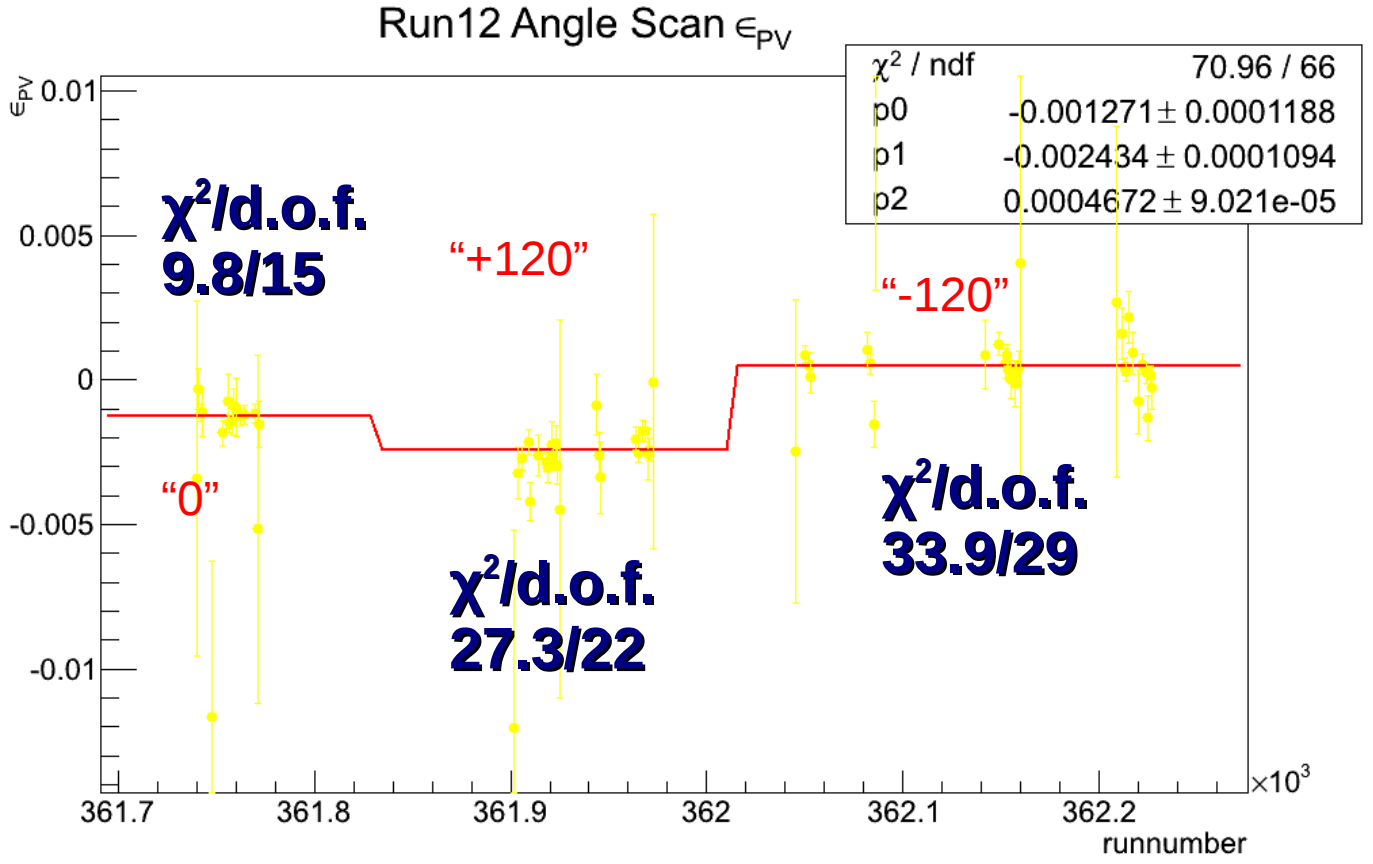
Show transverse pol. direction

Run12 Beam Angle Scan

- Using angles reported by Angelika for this quick analysis
  - More on BPMs toward the end of this talk
- PHENIX angle scanned @
  - “default” (with attempt to make beams collinear),
  - “default+120 μrad”,
  - “default-120 μrad”

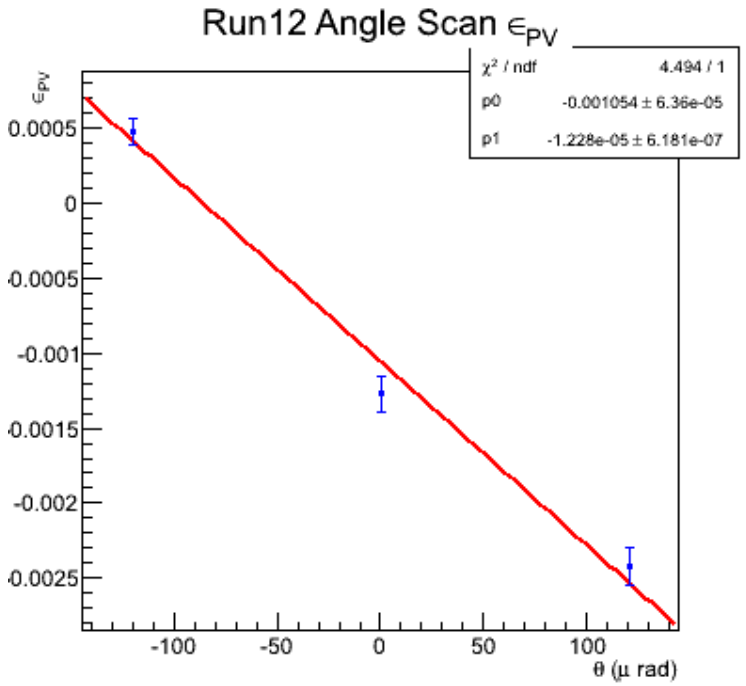
Results So Far from Run12 Angle Scan

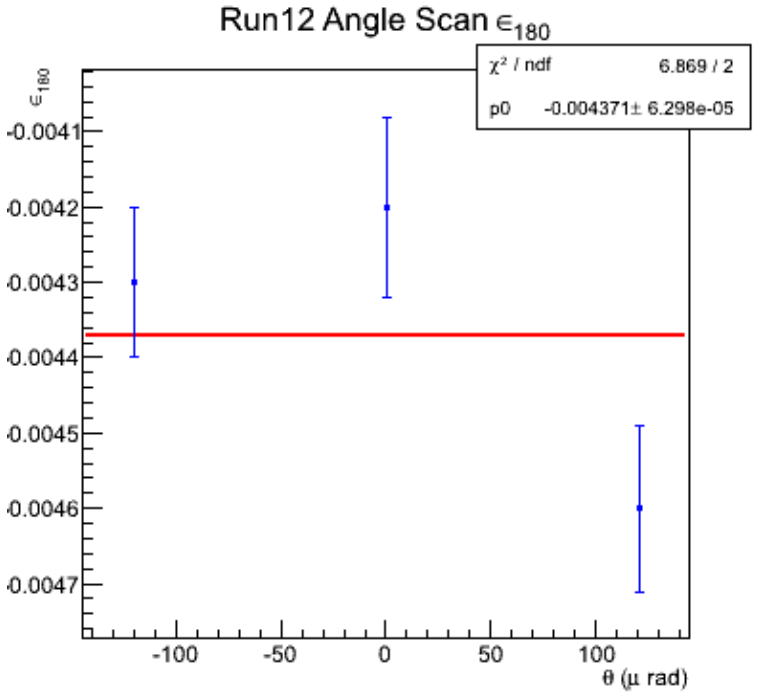
- Shown vs. runnumber, different pol0 fits for different “angles”: “default”, “default+120 μrad”, “default-120 μrad”



ε_{PV} was expected to scale most strongly with beam angles

Data Points Plotted vs. Angle





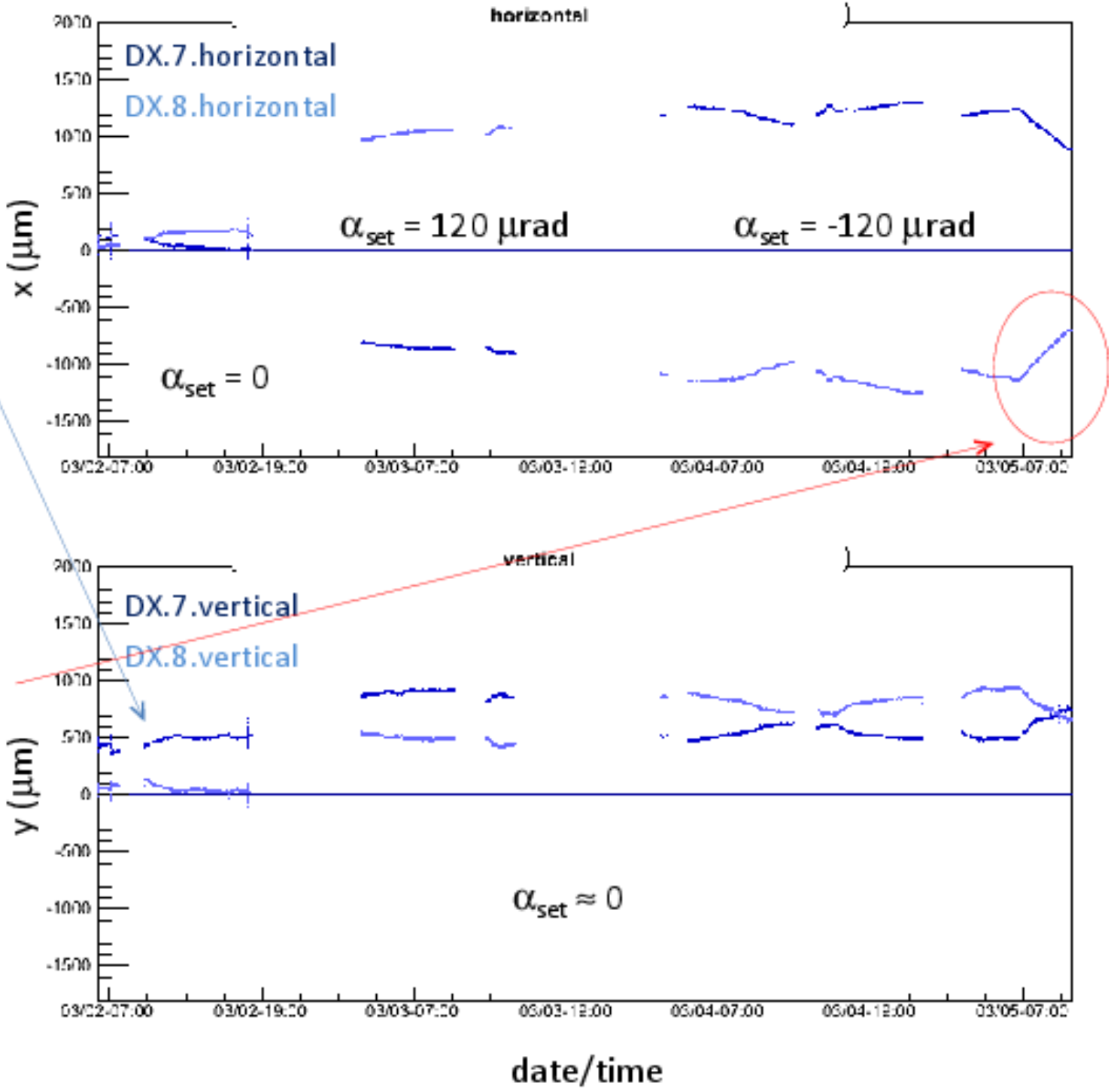
Model predicted ε_{PV} changes with angle, ε_{180} should not

BPM Data

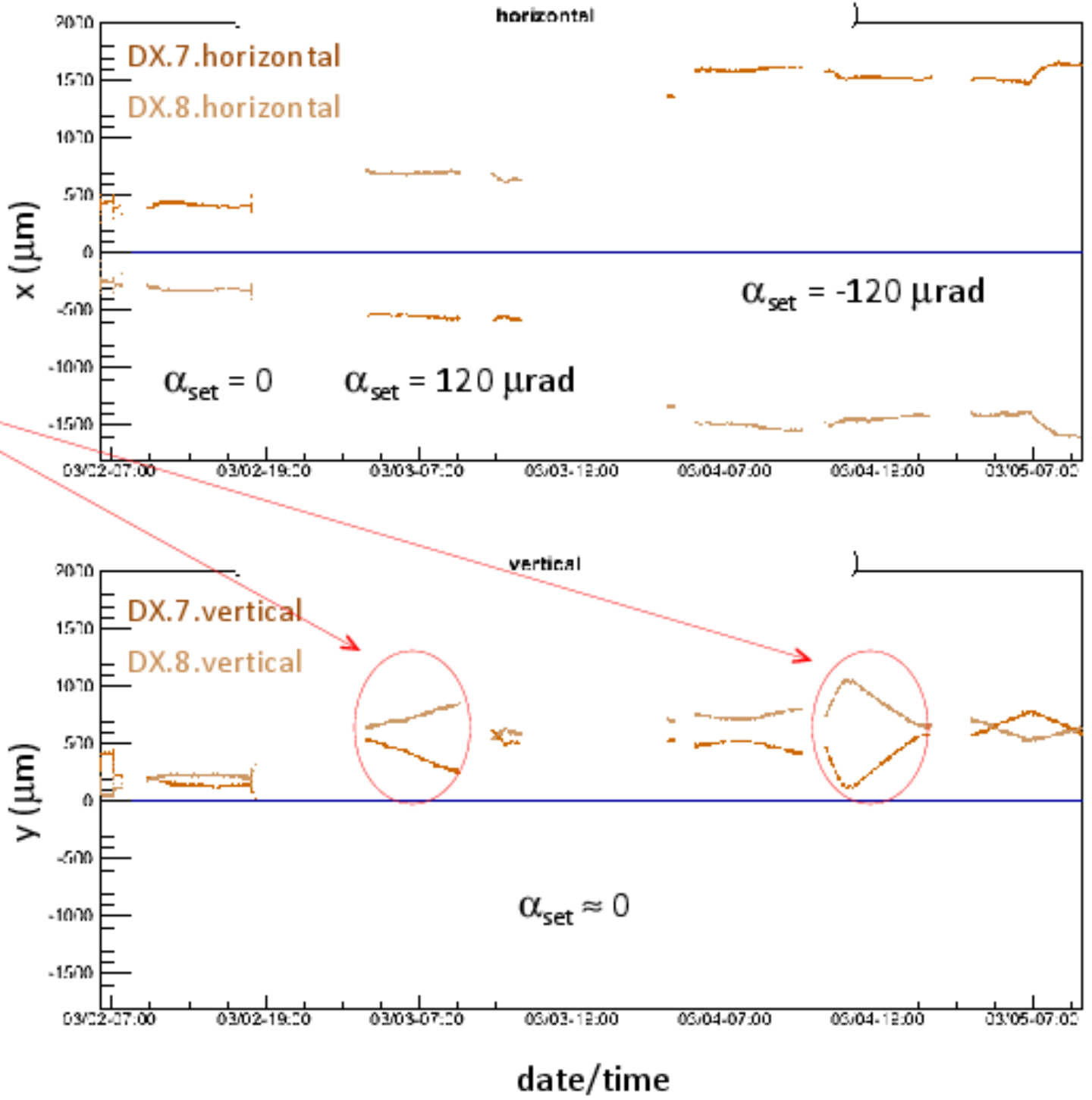
- From Oleg, thanks Oleg!
- He says that, if the BPMs are accurate,
  - “...We can conclude that the angles are indeed set at values of 120 um or maybe a little higher.”
- But there are some drifts we will have to include in systematic uncertainties

We usually use the BPMs for relative changes on the order of a few minutes.
The absolute offset is not relevant.
There is a slow drift in the beams during the fills.
If the offset changes on the same time scale, we can't calculate the angles accurately.
There is a significant drift in the second half of the last fill.

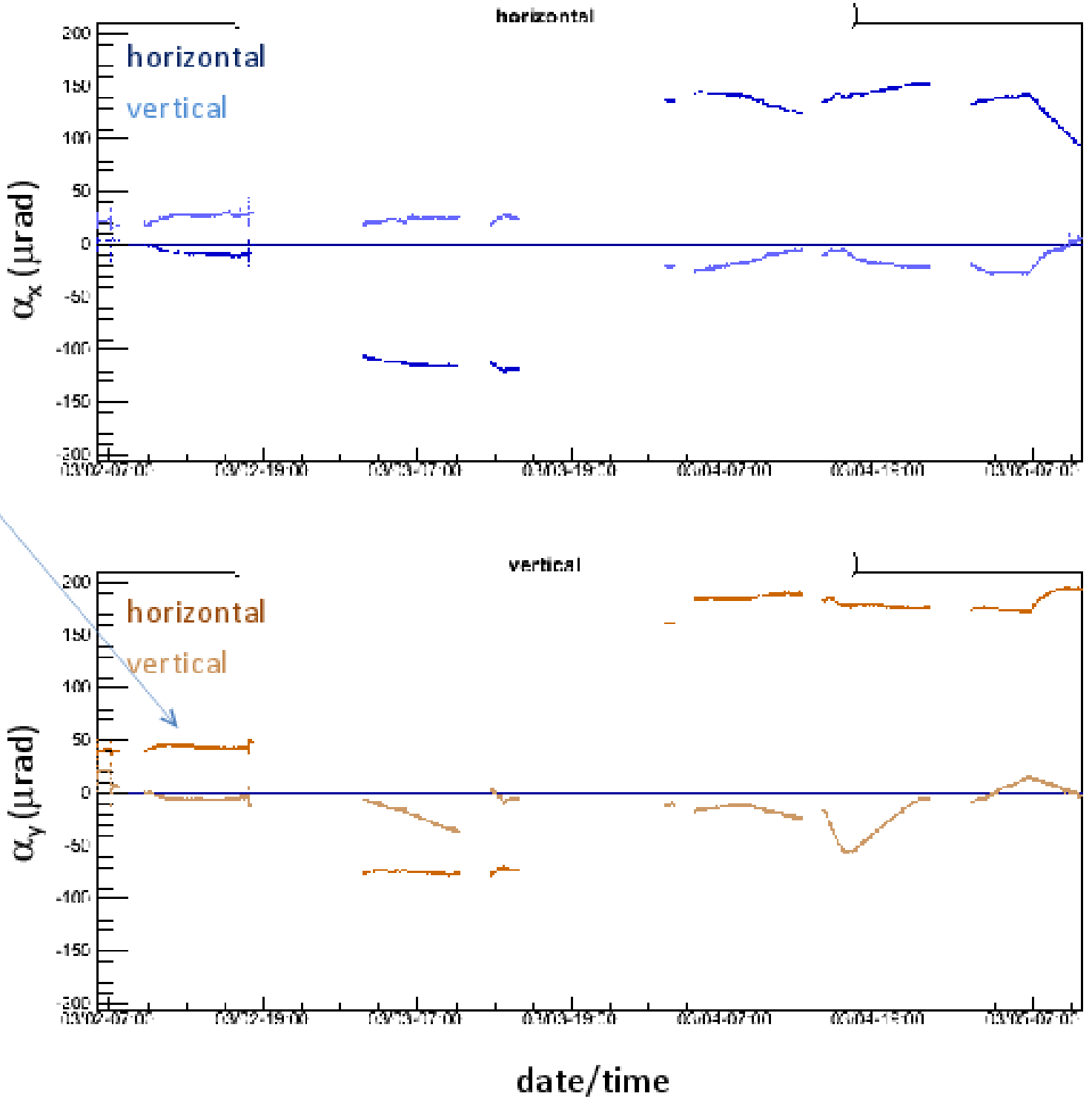
We use the difference between DX in sectors 7 and 8.
$2*L_{DX}$=16.65 m



Same for yellow beam.
There are weird drifts in the vertical direction during some of the fills.



With the BPMs we see angles of about >100 µrad in the blue beam.
Yellow looks different – we have to include the offset here though (shifting the horizontal angles by ≈ -40 µrad
The drift in the last fill (blue) affects the angles, same for the vertical drift in yellow.



Abrupt end to talk (a.k.a. Conclusion)

- Thank you to everyone for their support in this study!
- We clearly see an effect, as expected with our model
- We need to corroborate the angles as measured by the BPMs with additional measurements
  - VTX

Review of Model Predictions

- **Assuming equal transverse polarizations in two beams**

Situation	A_{PV}	A_{180}	A_{TT}(++ to +-)	A_{TT}(-- to -+)
collinear angles	+2Pδ	0	+Pδ	-Pδ
Offset/Boost	0	-2Pϵ	+Pϵ	-Pϵ
Offset + Angle	+2Pδ	-2Pϵ	+P(δ+ϵ)	-P(δ+ϵ)

Equal and opposite
should cancel if have lumi balance