PXD Geometry Measurements

Commissioning @ KEK

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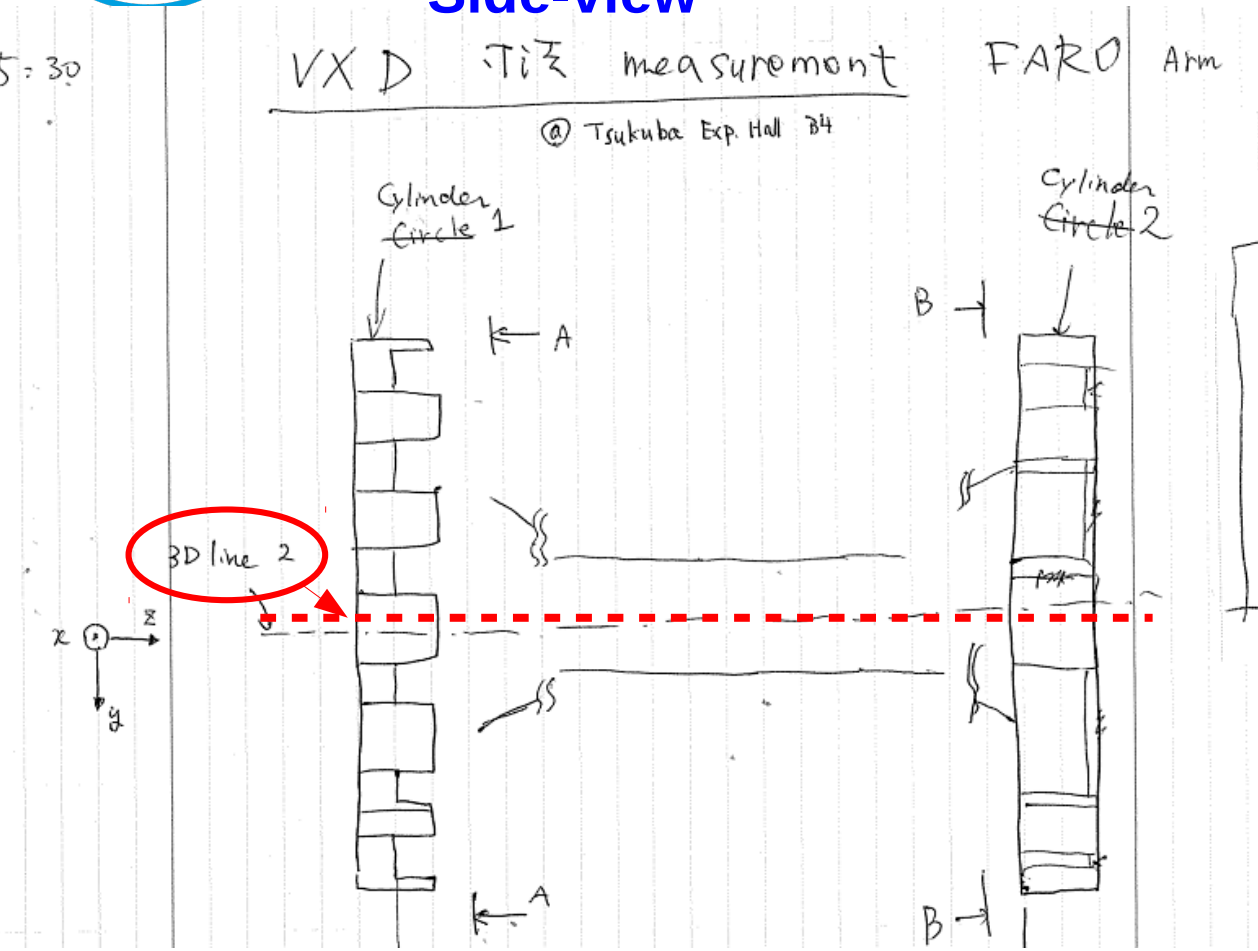
Varghese Babu
DESY, Hamburg

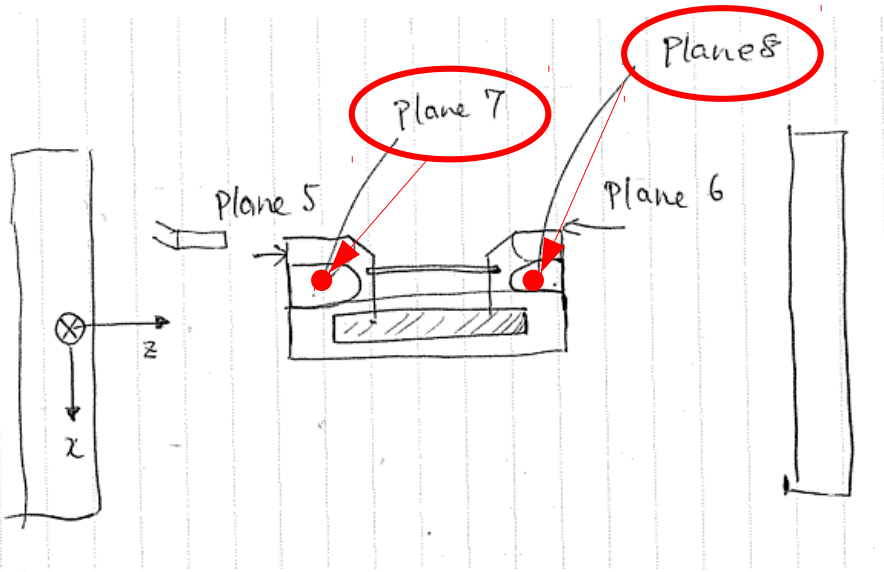
The FaroArm measuring device. The company claims a measurement uncertainty of 20 µm, but we consider a more conservative 50 µm.

Phase-2 PXD

Side-view



Top-view

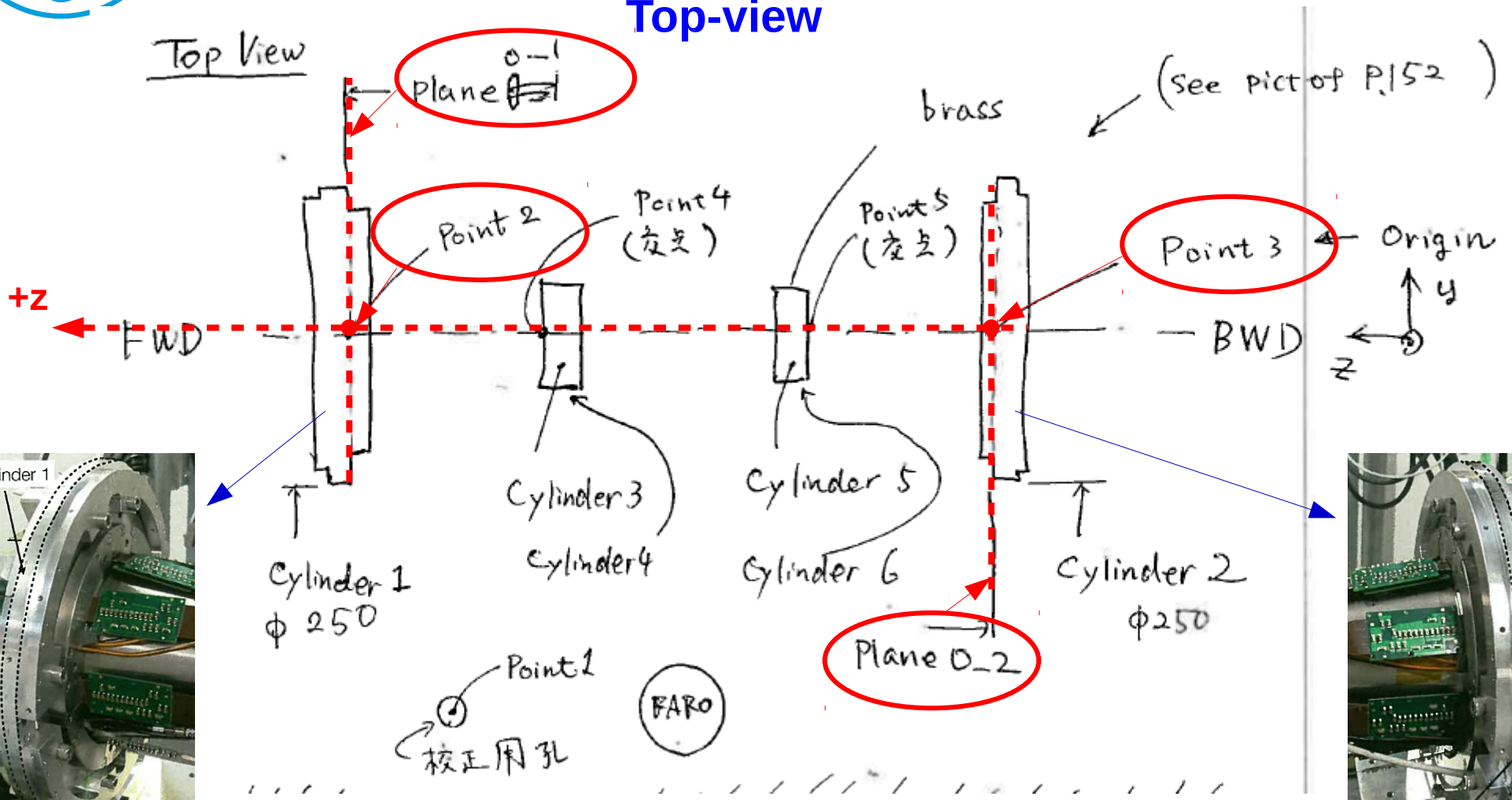


- **Data provided by Arimoto-san.**

- **3-D Angle between plane 7 and plane 8 = 0.0051 rad (0.29 deg)**
- **2-D Angle between plane 7 and plane 8 = 0.0018 rad (0.10 deg) (twist along length)**

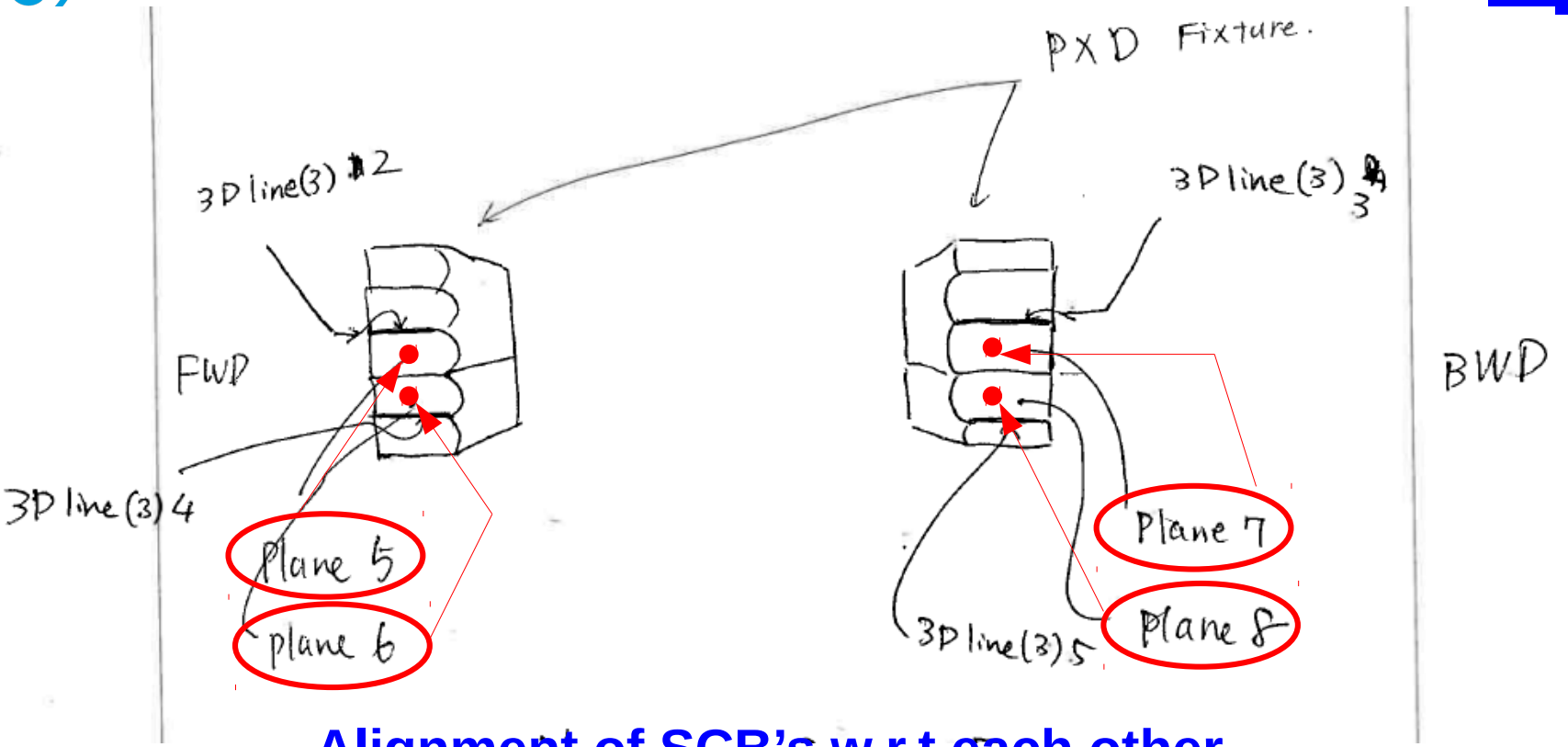
Phase-3 PXD

Top-view



Fixing the origin and z-axis.

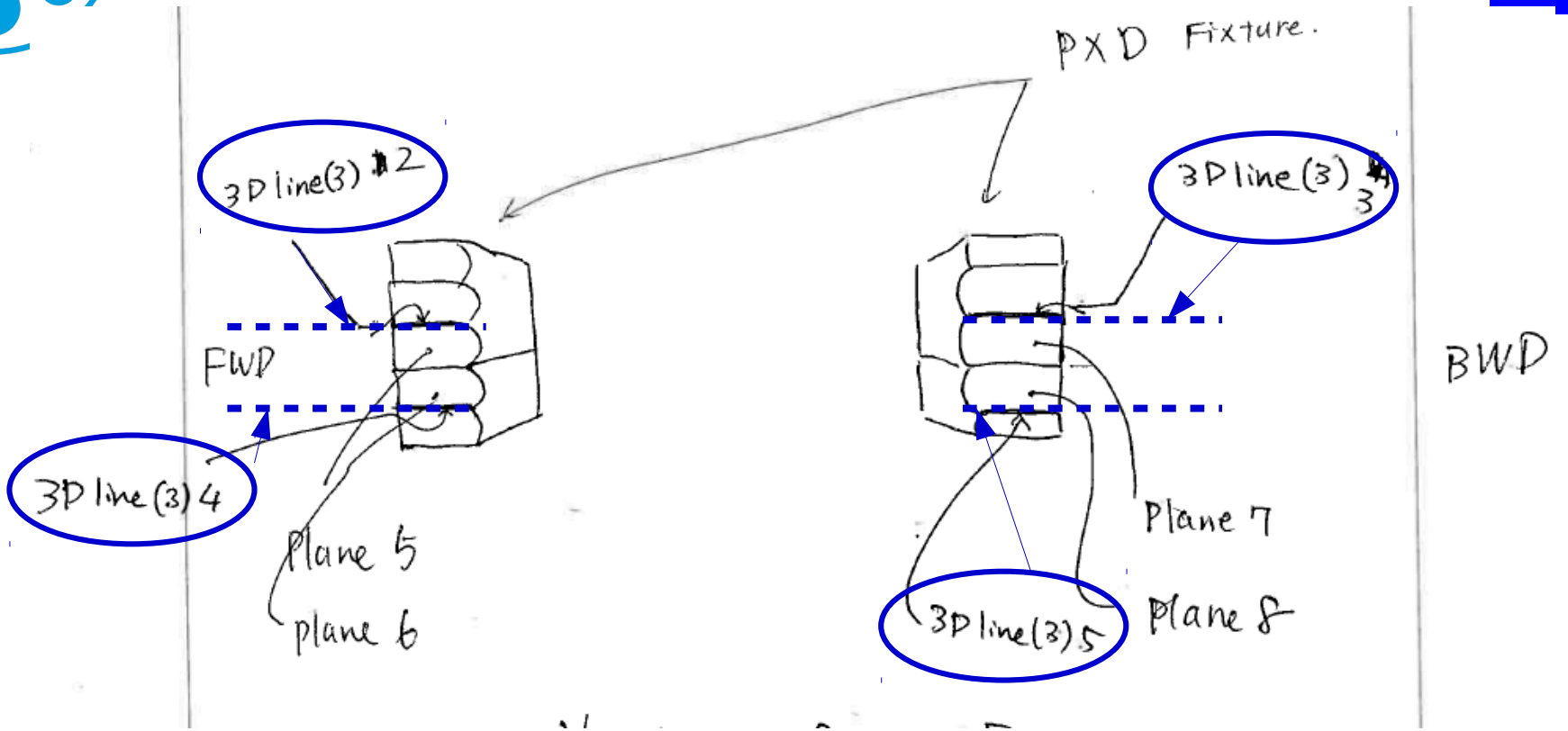
Phase-3 PXD



Alignment of SCB's w.r.t each other

Between planes	2-D Angle	3-D Angle (twist along z-axis)
5 & 7	0.0035 rad (0.20 deg)	0.0067 rad (0.38 deg)
6 & 8	0.0032 rad (0.18 deg)	0.0048 rad (0.27 deg)

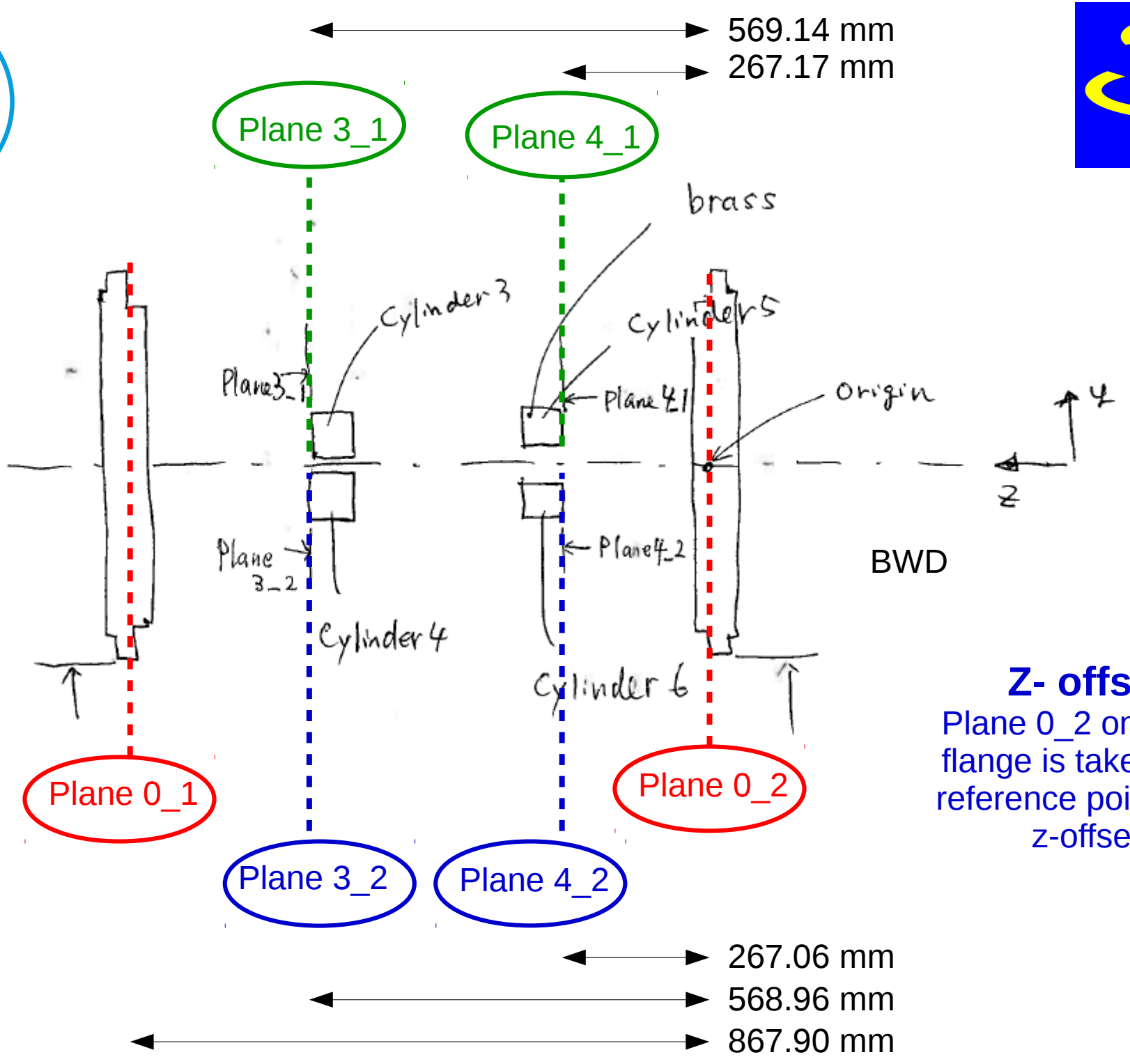
Phase-3 PXD



Gaps between top and bottom brass half-rings.

Between 3-D lines	Perpendicular distance (mm)
2 & 4 (FWD)	23.90
3 & 5 (BWD)	23.78

Difference of ~120 µm between FWD and BWD

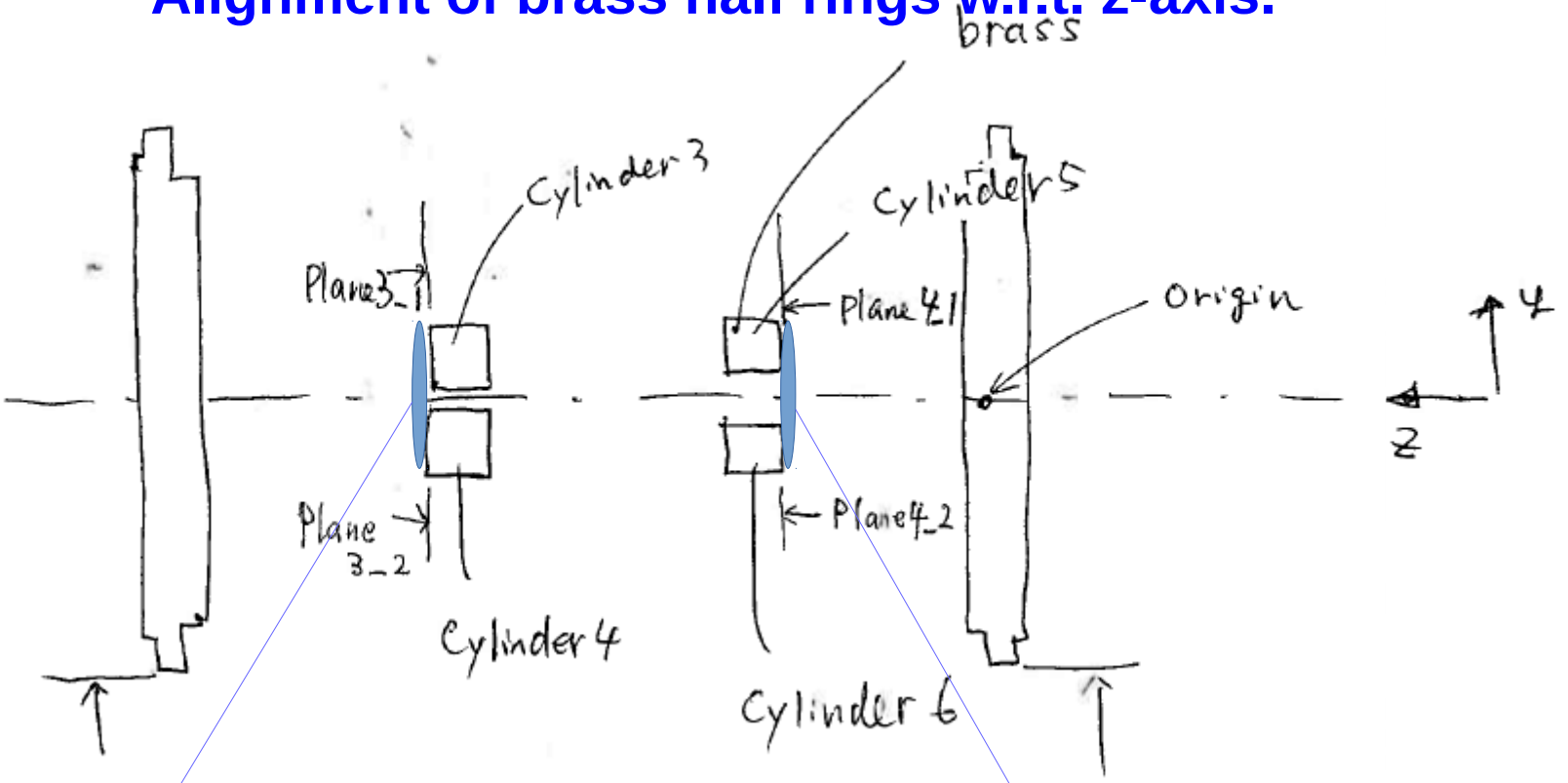


Z- offsets

Plane 0_2 on the BW flange is taken as the reference point for the z-offsets.

Phase-3 PXD

Alignment of brass half rings w.r.t. z-axis.



Plane	Angle w.r.t z-axis
3_1	0.0027 rad (0.16 deg)
3_2	0.0088 rad (0.50 deg)
4_1	0.0044 rad (0.25 deg)
4_2	0.0075 rad (0.43 deg)

Phase-3 PXD

Alignment of brass half rings with SCB's.

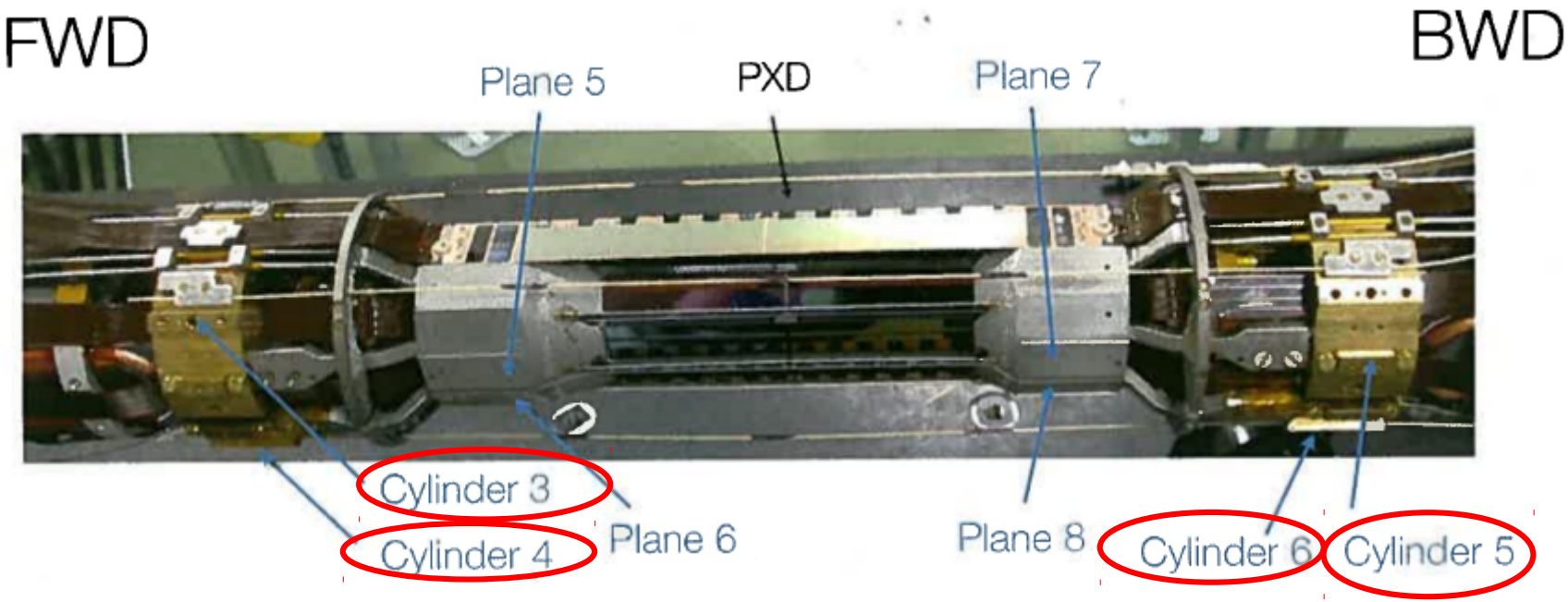
The angles are between the brass ring normals defined in the previous slide and the 3-D lines defined along the SCB in slide- 6.

Caveat: The 3-D lines are taken along the edges between flat surfaces on the SCB, and the tip of the FaroArm is ~3mm, so the direction vector may be subject to higher uncertainties.

Angle between SCB and brass half rings on	3-D Angle
FWD - top	0.0103 rad (0.58 deg)
FWD - bottom	0.0139 rad (0.79 deg)
BWD - top	0.0113 rad (0.64 deg)
BWD - bottom	0.0110 rad (0.63 deg)

Phase-3 PXD

Fitting Brass cylinders to get the maximum diameter



Perhaps the most important measurement as it tells us how close to SVD layer-3 we are.

Brass half ring	Diameter (mm)	Offset of fitted cylinder center from the z-axis in the x-y plane (mm)
FWD-top (cy-3)	65.93	(x,y) = (0.15, 0.04)
FWD-bottom (cy-4)	65.82	(x,y) = (0.16, -0.12)
BWD-top (cy-5)	65.77	(x,y) = (-0.12, 0.16)
BWD-bottom (cy-6)	65.81	(x,y) = (-0.11, -0.15)

Thank you!

Phase-3 PXD

Sanity check-1

Sanity check for the brass half-rings

Angle between the cylinder axes obtained by fitting the back plane vs that of the cylinder-fit. Ideally both normals should be parallel and hence the angle should be 0.

Angle for cylinder-3 = 0.0018 rad (0.10 deg)
Angle for cylinder-4 = 0.0007 rad (0.04 deg)
Angle for cylinder-5 = 0.0003 rad (0.02 deg)
Angle for cylinder-6 = 0.0007 rad (0.04 deg)
