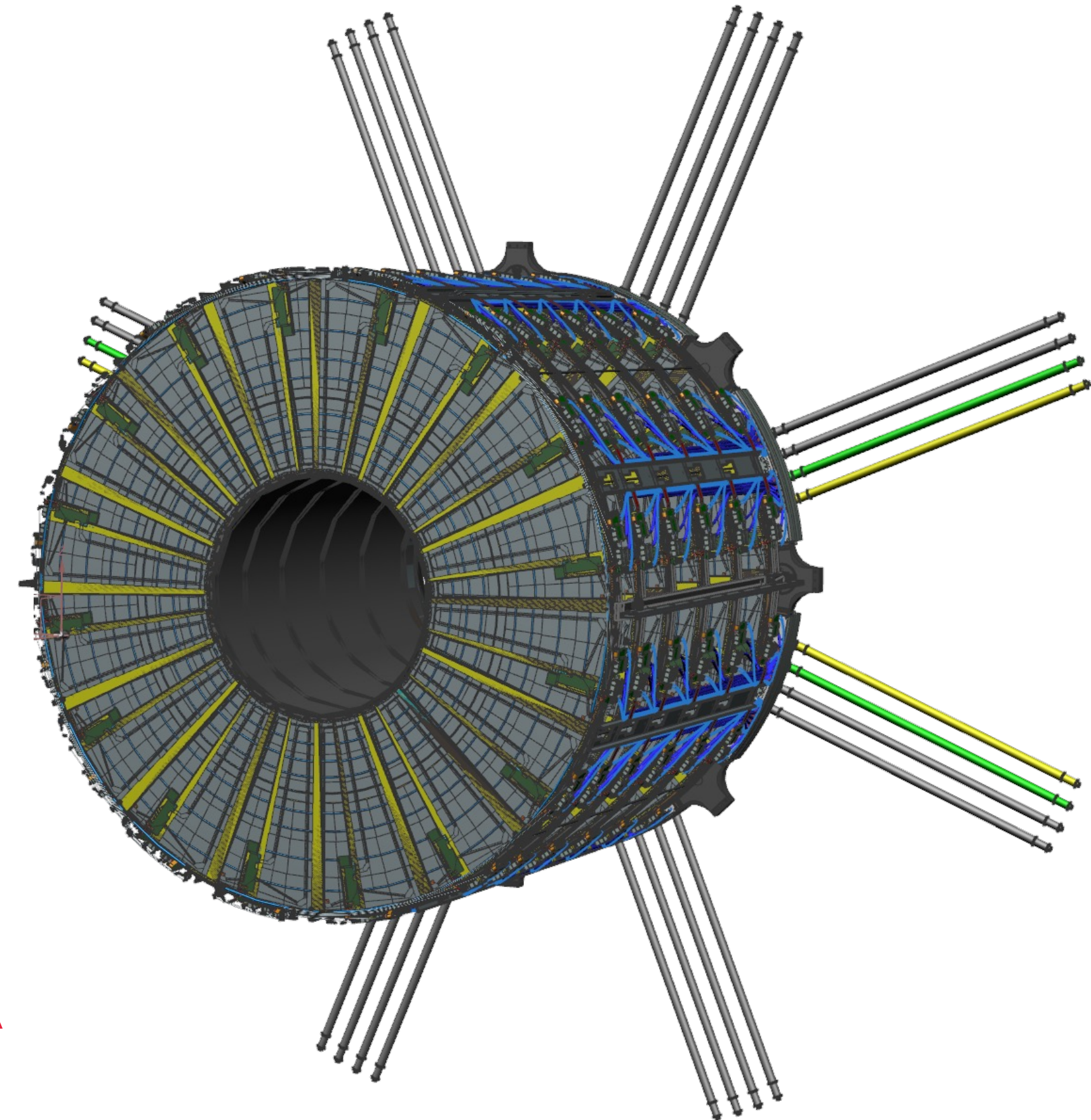




MEASUREMENTS

MAPPING WHEELS

HEIGHT A-SIDE. End-cap A



Andrea García Alonso

ITK-EC mechanics/integration engineers phone meeting

11<sup>th</sup> January 2023

# SETUP: Petal with dial gauge

**Motivation:** Clash petal and EC structure. On the petal, there's an RF DC-DC box that wasn't considered before. For the lower petals, it must fit without touching the wheel rim (it's not clear how much distance is needed to avoid contact and coupling).

Total clearance is 600  $\mu\text{m}$  (space between wheel rim and petal).

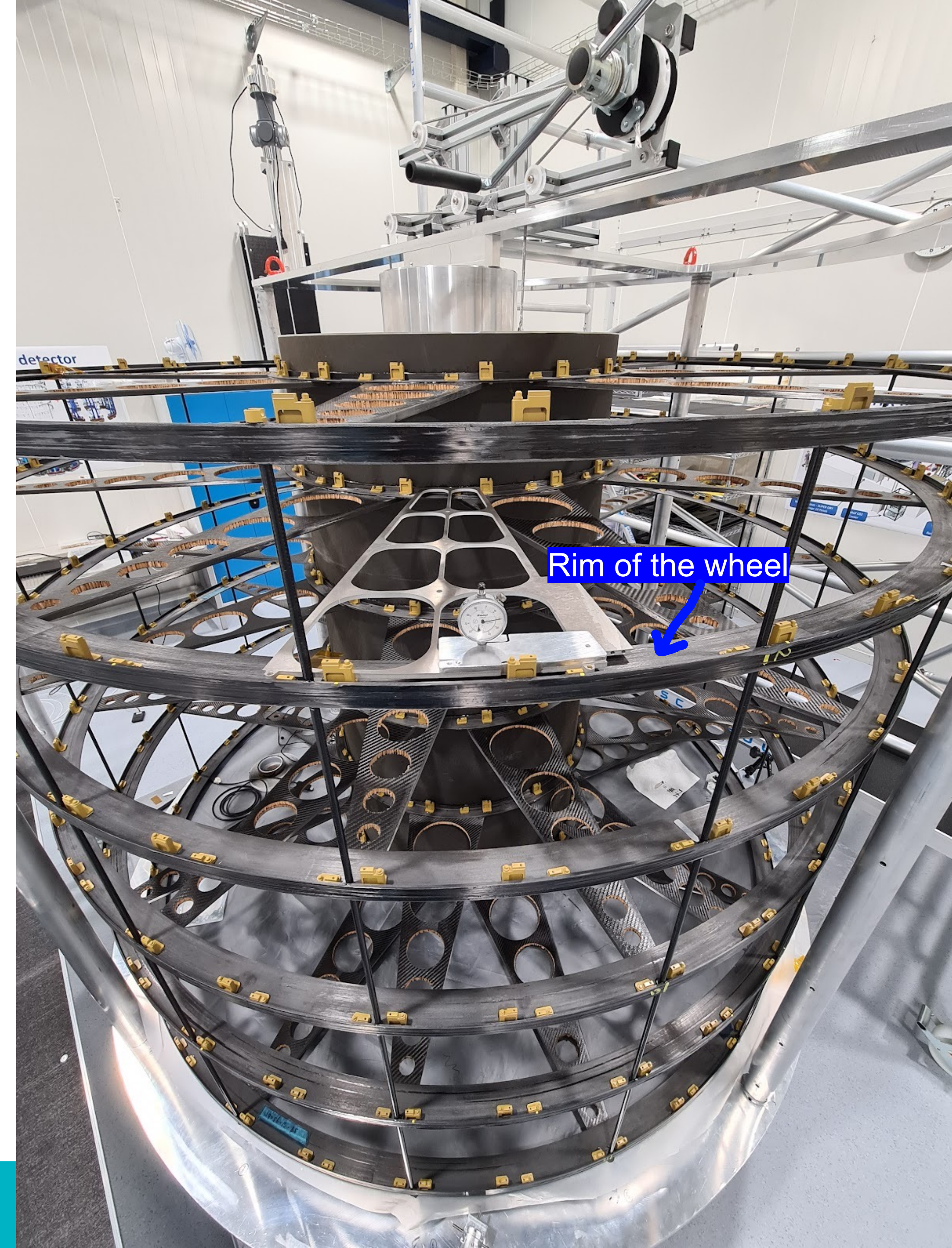
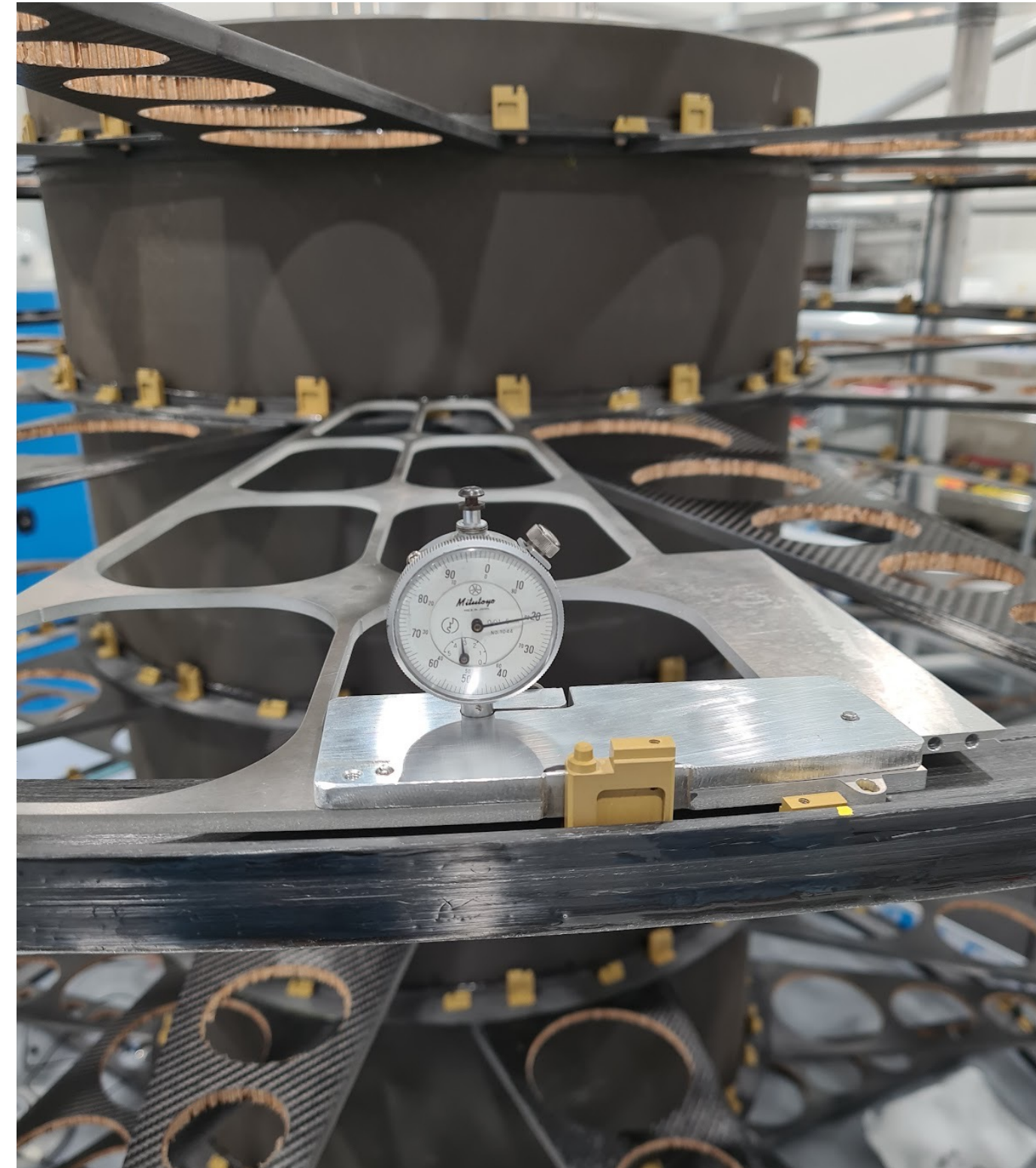
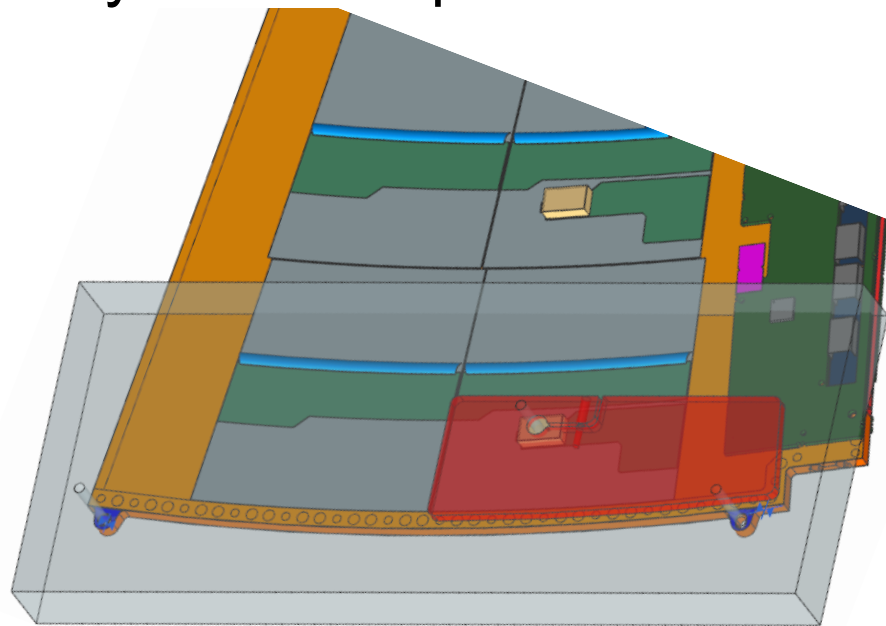
**Measurement:** Lowest wheel (#5) was measured first and continued upwards. Test petal was placed on low locking points and the gauge needle was touching the wheel rim.

**Nominal value:** 3.00 mm (this is the reference (0.0) with respect to the 7 mm high low locking point)

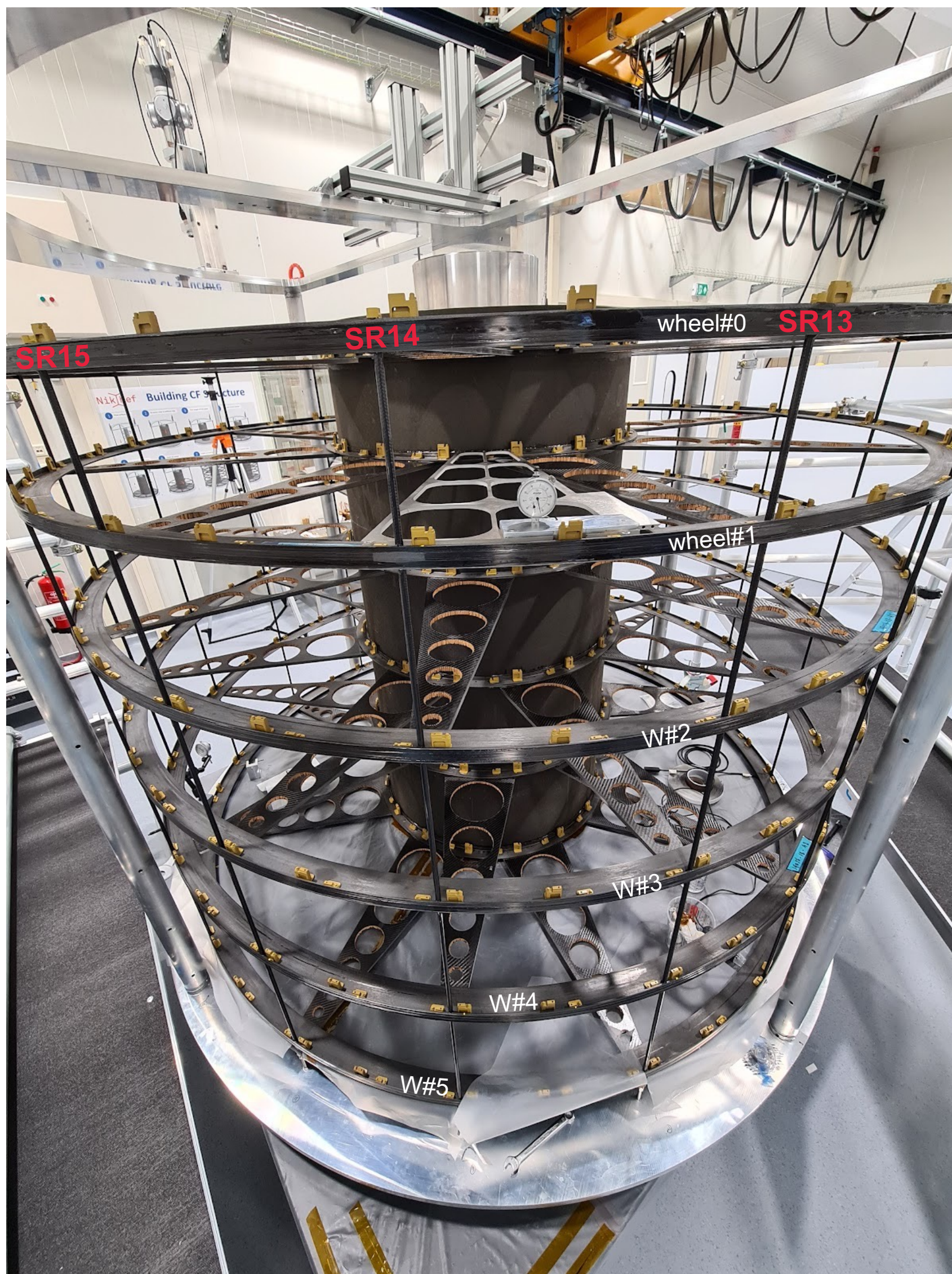
A lower value means: wheel rim and petal are more separated than expected (good).

A higher value means: there is less space between them (less space to fit electronics).

**Petal for this test:** old petal that was used for the pipe bending frame. Added a plate with the gauge. The position for the height test is determined by the latest petal model.

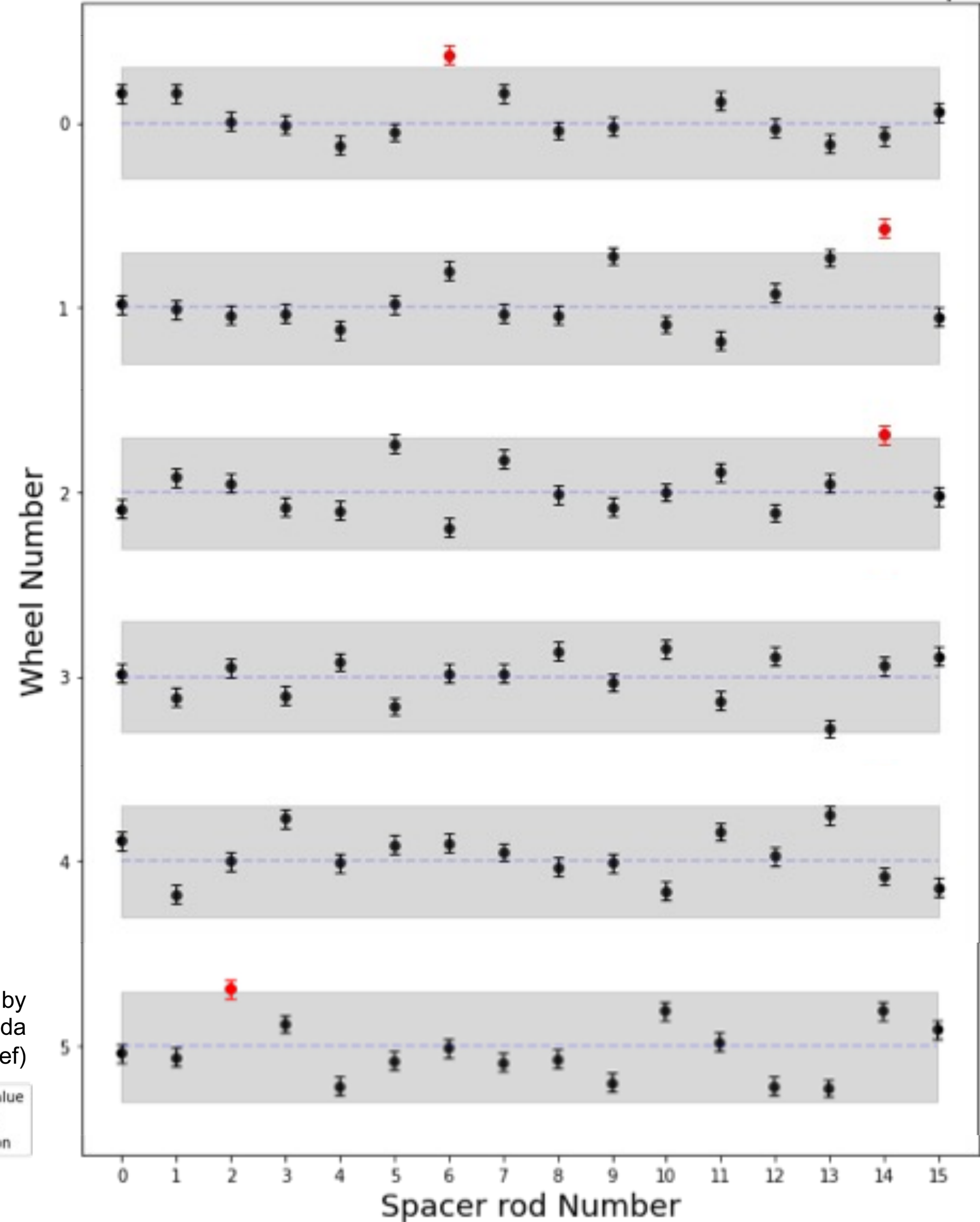


# MEASUREMENTS: Clearance between the wheel rim and the lower petal



Nominal value on the gauge: 3.00 mm

Measurement of distance between wheels and lower petal



Plot by Pranati Kharbanda (Nikhef)

- 3 mm nominal value
- Measured points
- ±0.3mm deviation

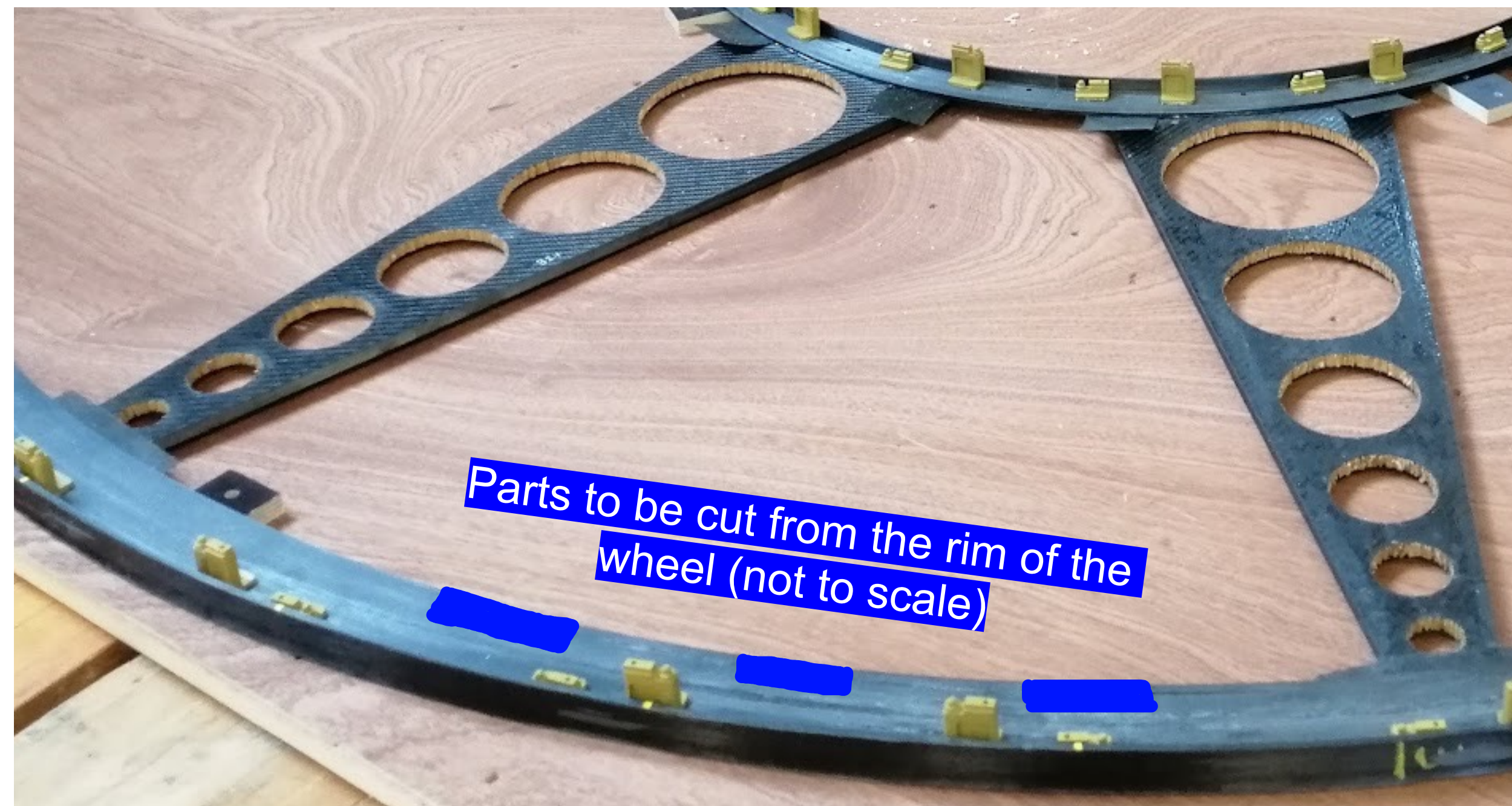
# CONCLUSION

We measured a 600  $\mu\text{m}$  clearance with a deviation of  $\pm 300 \mu\text{m}$  on average, with some points reaching 400  $\mu\text{m}$ .

This means that the RF DC-DC box doesn't fit.

Since the board design is not going to be modified, the wheel rims need to be cut to make space.

It's not clear how much extra space is needed to also avoid electrical coupling, so the easiest solution would be to shield this RF DC-DC box, by adding an isolation layer around it. In that case, the quantity that needs to be cut from the wheel rims is just the one that fits the box with the isolation layer.



# BACKUP

## WHEEL BY WHEEL DATA

# WHEEL#5

Wu0 connects D0P02-D0P17

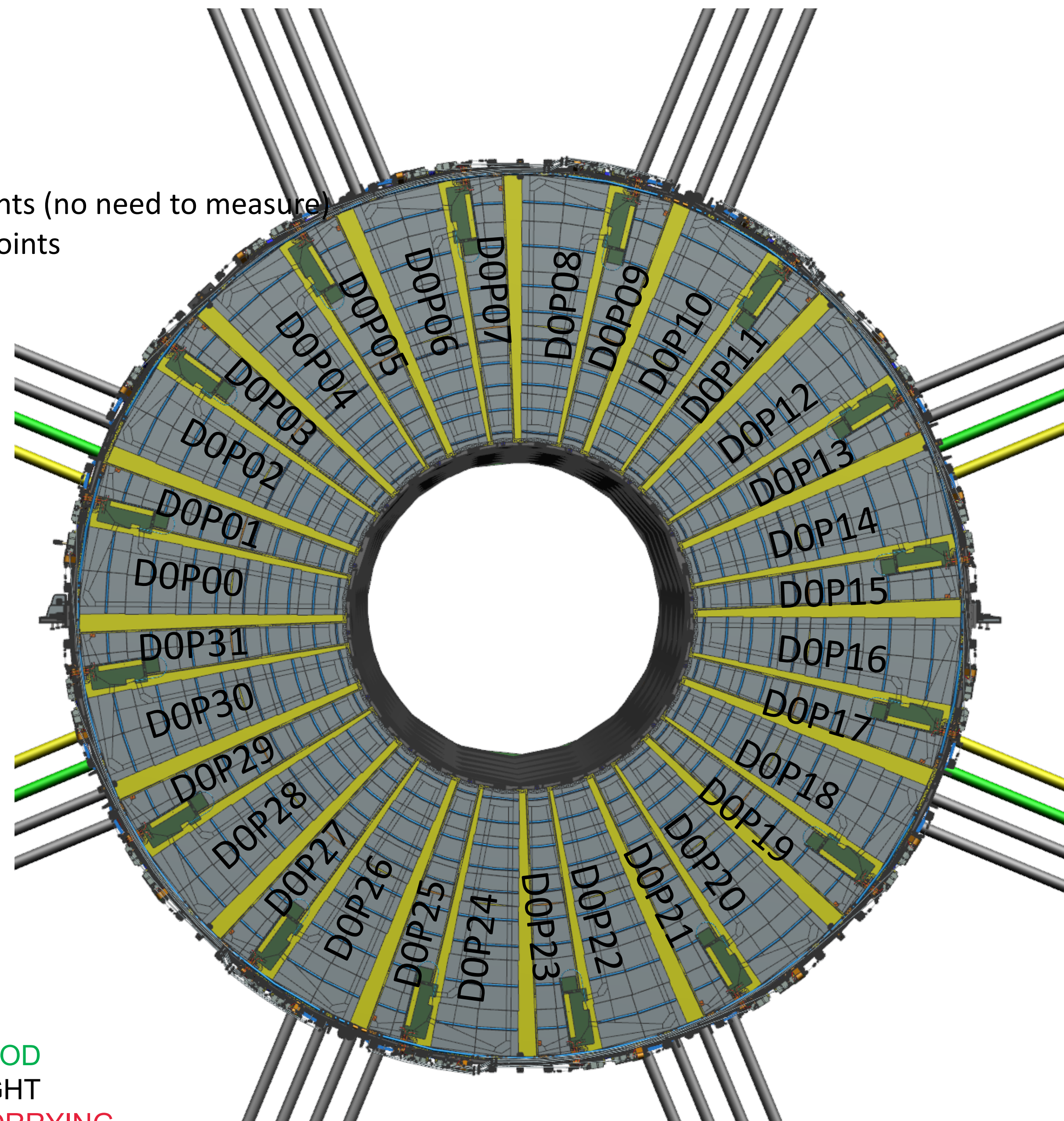
Wd0 connects D0P18-D0P01

Petals with even numbers: on high lockingpoints (no need to measure)

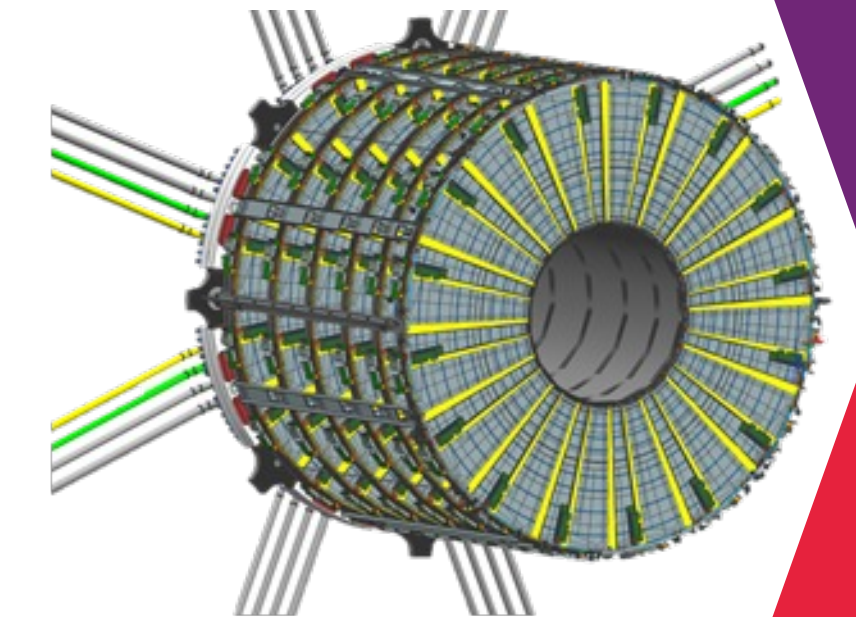
Petals with uneven numbers: on low lockingpoints

Touching spacer rod	Readout / mm
1	2.94
2	3.31
3	3.12
4	2.78
5	2.92
6	2.99
7	2.91
8	2.93
9	2.80
10	3.19
11	3.02
12	2.78
13	2.77
14	3.19
15	3.09
0	2.96

COLORS:  
 < 3.10      GOOD  
 3.10 - 3.15      TIGHT  
 3.15 - 3.20      WORRYING  
 > 3.20      BAD...



Cooling tube mapping in strip Ecs A-Side



Seen from the IP

# WHEEL#4

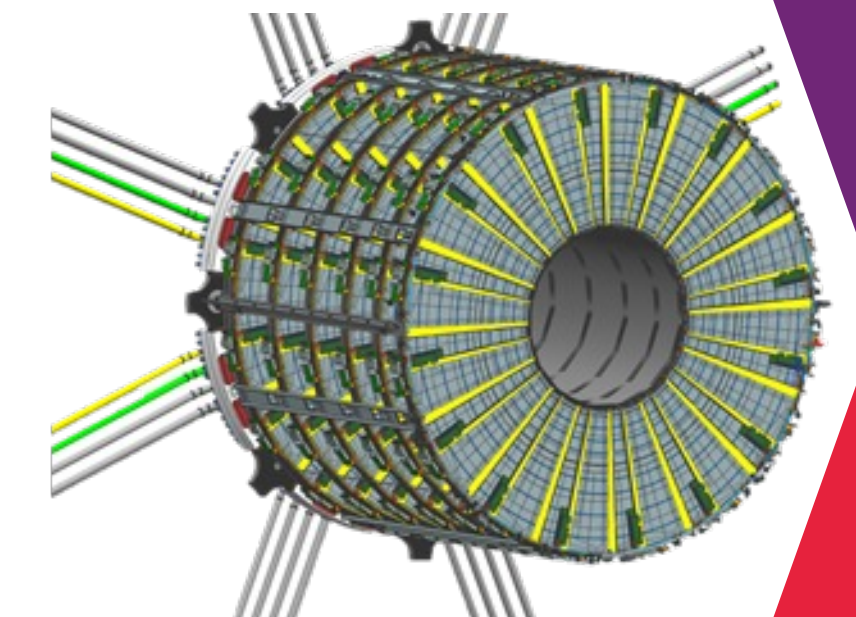
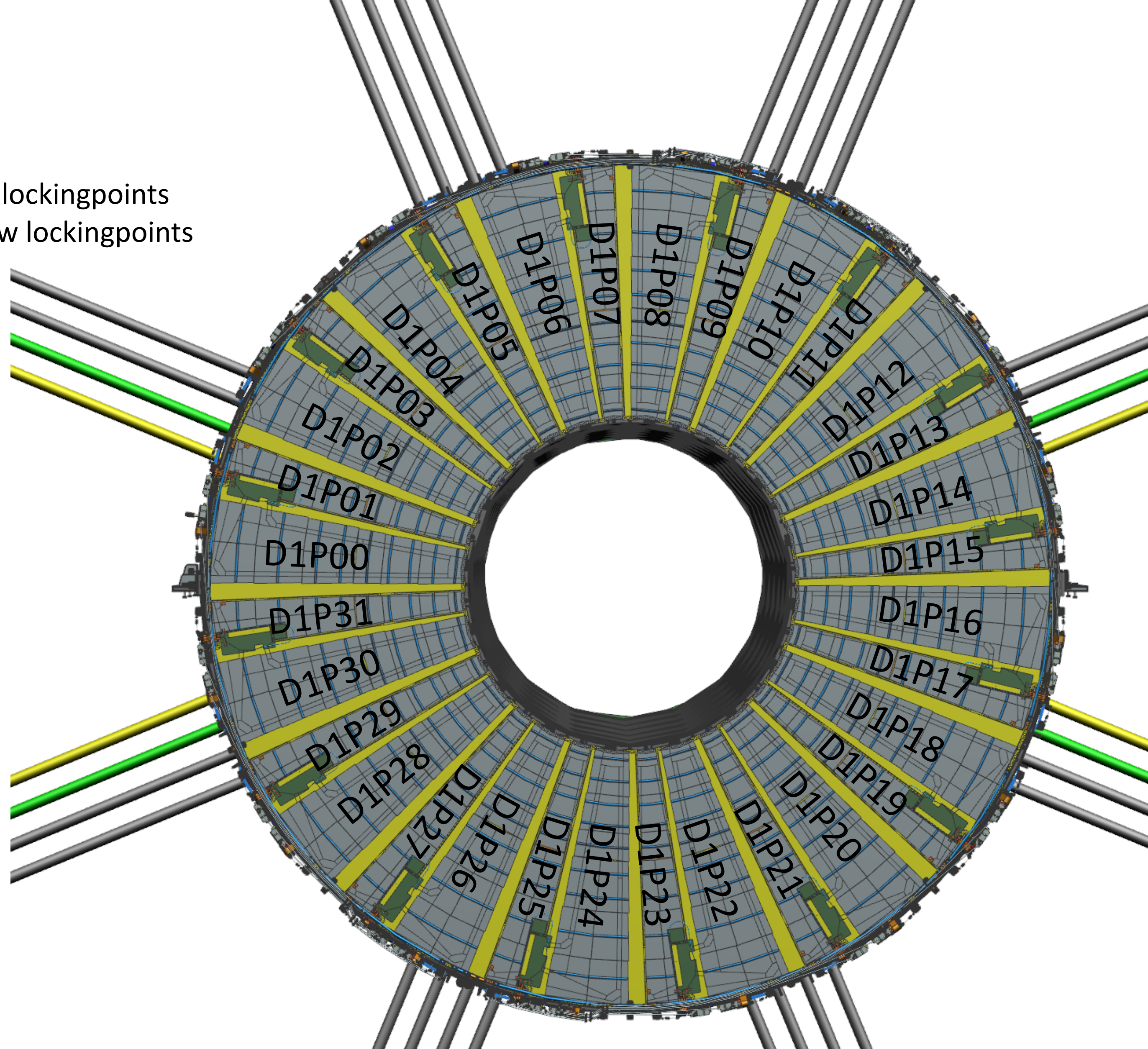
Wu1 connects D1P30-D1P13

Wd1 connects D1P14-D1P29

Petals with even numbers: on high lockingpoints

Petals with uneven numbers: on low lockingpoints

Touching spacer rod	Readout / mm
1	2.82
2	3.00
3	<b>3.23</b>
4	2.99
5	3.09
6	3.10
7	3.05
8	2.97
9	2.99
10	2.84
11	3.16
12	3.03
13	<b>3.25</b>
14	2.92
15	2.86
0	3.11



Seen from the IP

Cooling tube mapping in strip Ecs **A-Side**

# WHEEL#3

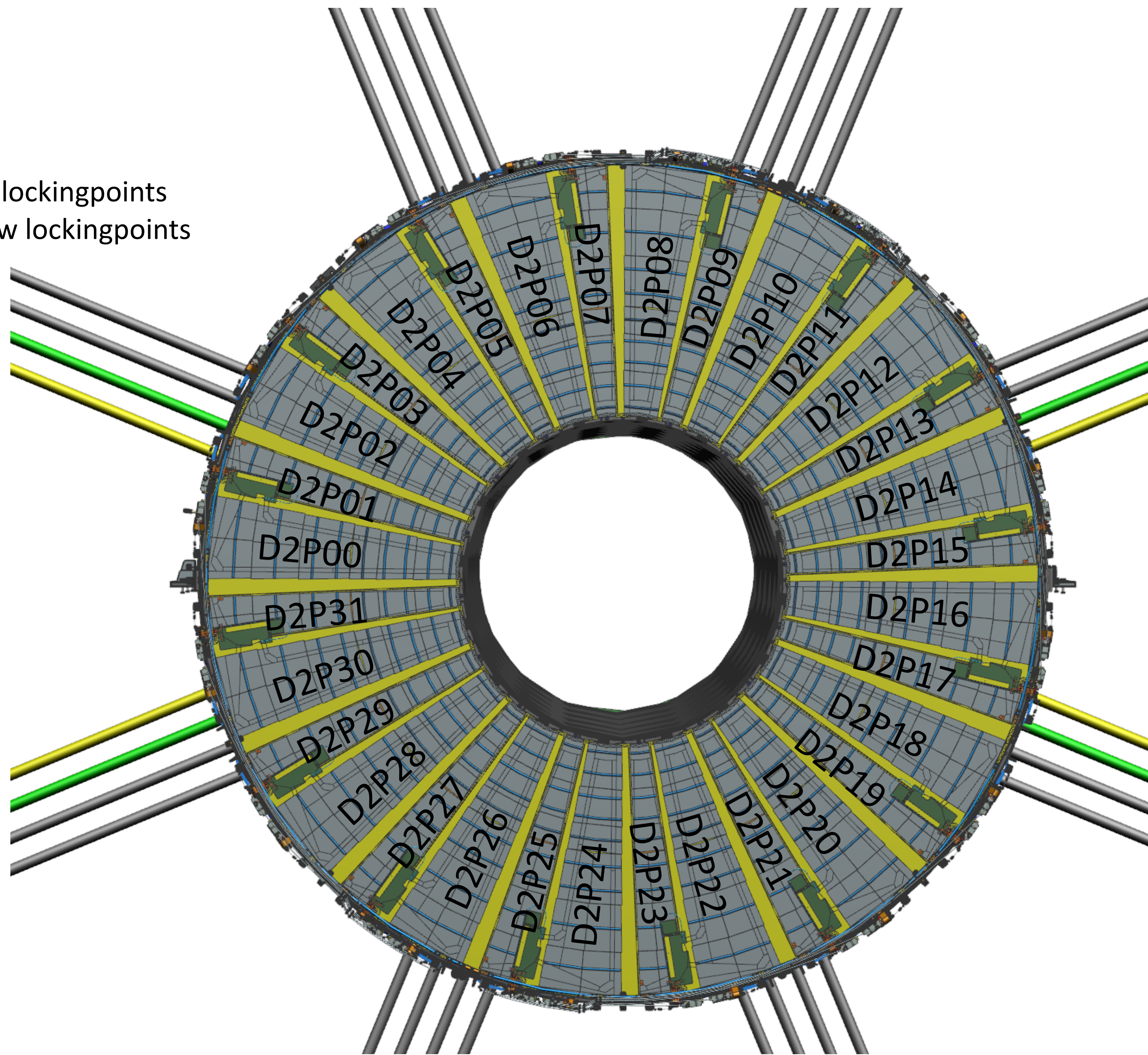
Wu2 connects D2P26-D2P09

Wd2 connects D2P10-D2P25

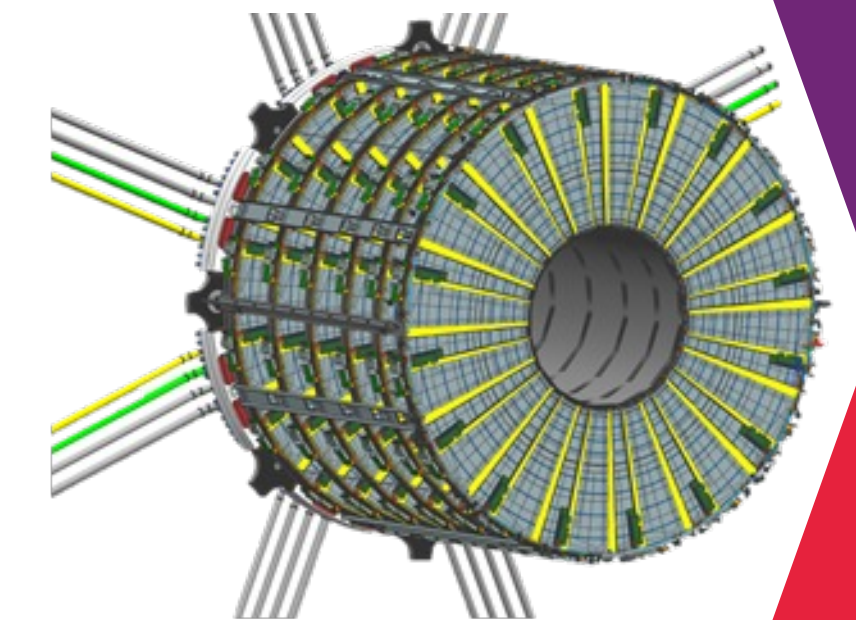
Petals with even numbers: on high lockingpoints

Petals with uneven numbers: on low lockingpoints

Touching spacer rod	Readout / mm
1	2.89
2	3.05
3	2.90
4	3.08
5	2.84
6	3.02
7	3.02
8	3.14
9	2.97
10	3.15
11	2.87
12	3.11
13	2.72
14	3.06
15	3.11
0	3.02



Cooling tube mapping in strip Ecs **A-Side**



Seen from the IP



# WHEEL#2

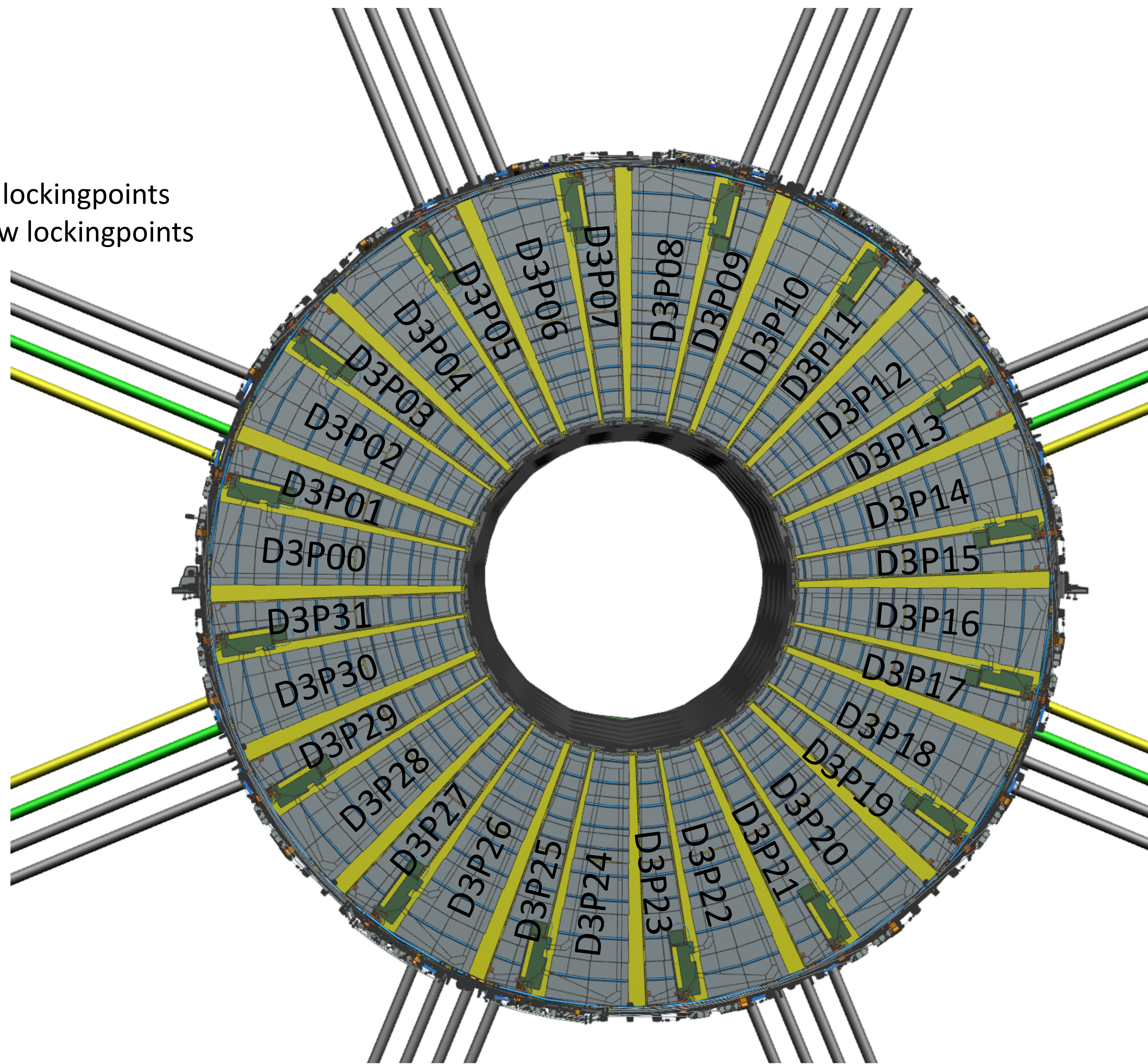
Wu3 connects D3P22-D3P05

Wd3 connects D3P06-D3P21

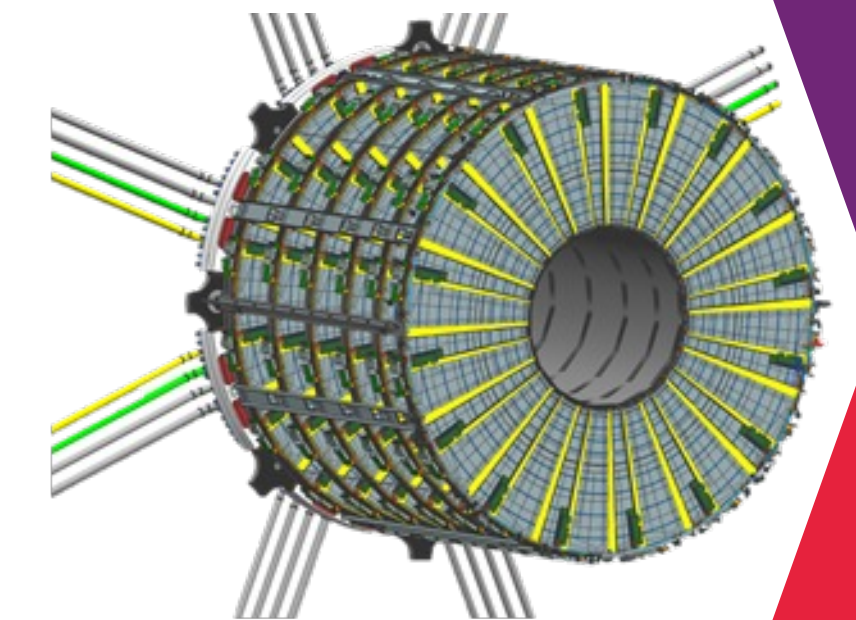
Petals with even numbers: on high lockingpoints

Petals with uneven numbers: on low lockingpoints

Touching spacer rod	Readout / mm
1	3.08
2	3.05
3	2.92
4	2.90
5	<b>3.26</b>
6	2.81
7	<b>3.18</b>
8	2.99
9	2.92
10	3.00
11	3.11
12	2.89
13	3.05
14	<b>3.31</b>
15	2.98
0	2.91



Cooling tube mapping in strip Ecs **A-Side**



Seen from the IP

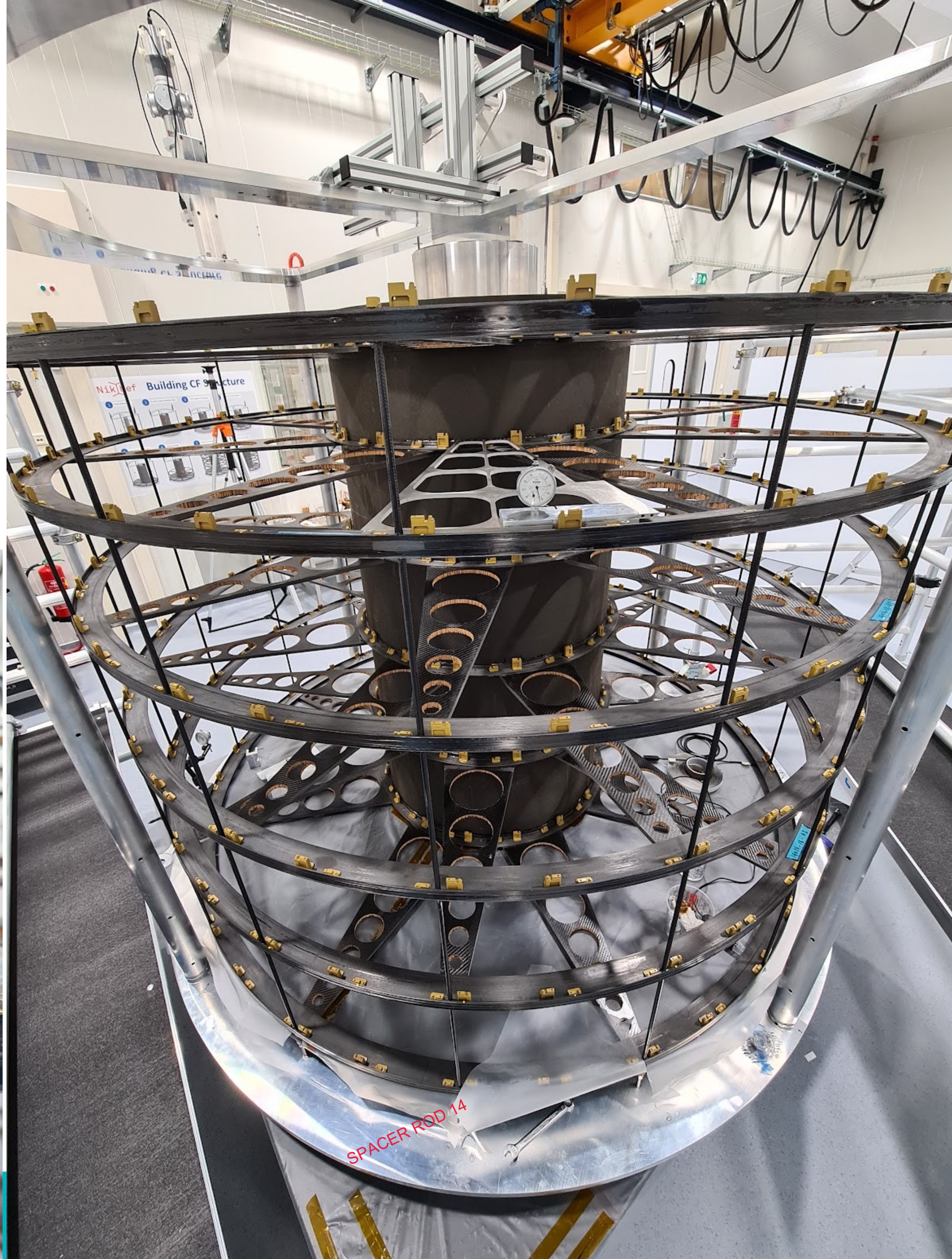
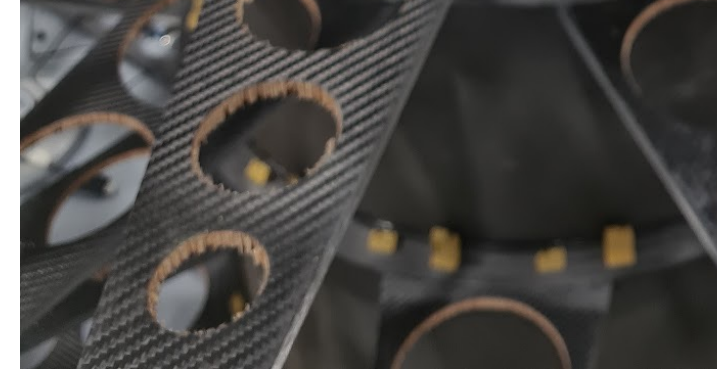
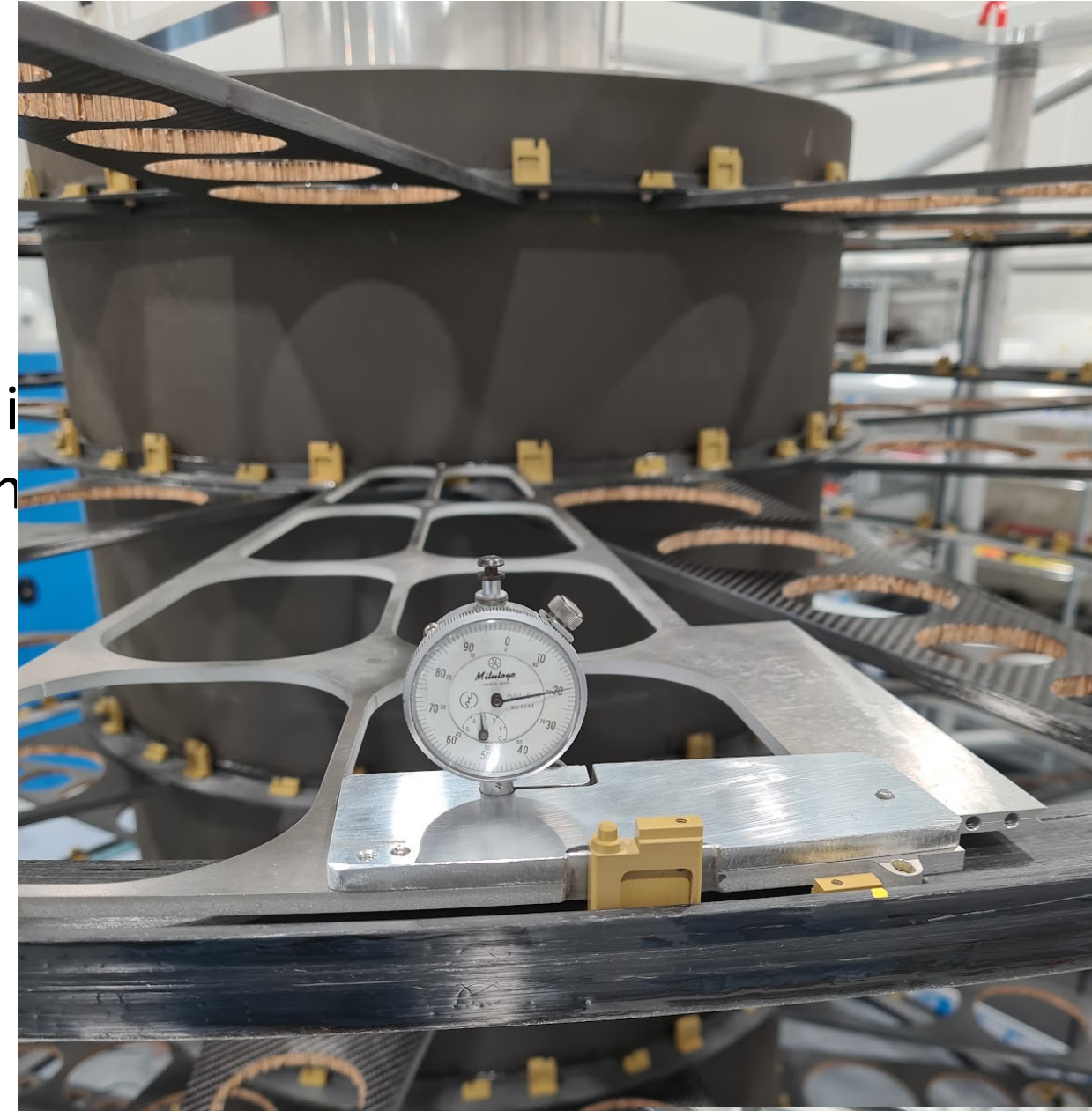
# WHEEL#1

Wu4 connects D4P02-D4P17

Wd4 connects D4P18-D4P01

Petals with even numbers: on hi

Petals with uneven numbers: on



Touching spacer rod	Readout / mm
1	2.99
2	2.96
3	2.97
4	2.88
5	3.02
6	3.20
7	2.97
8	2.96
9	3.28
10	2.91
11	2.82
12	3.08
13	3.27
14	3.43
15	2.95
0	3.02

# WHEEL#0

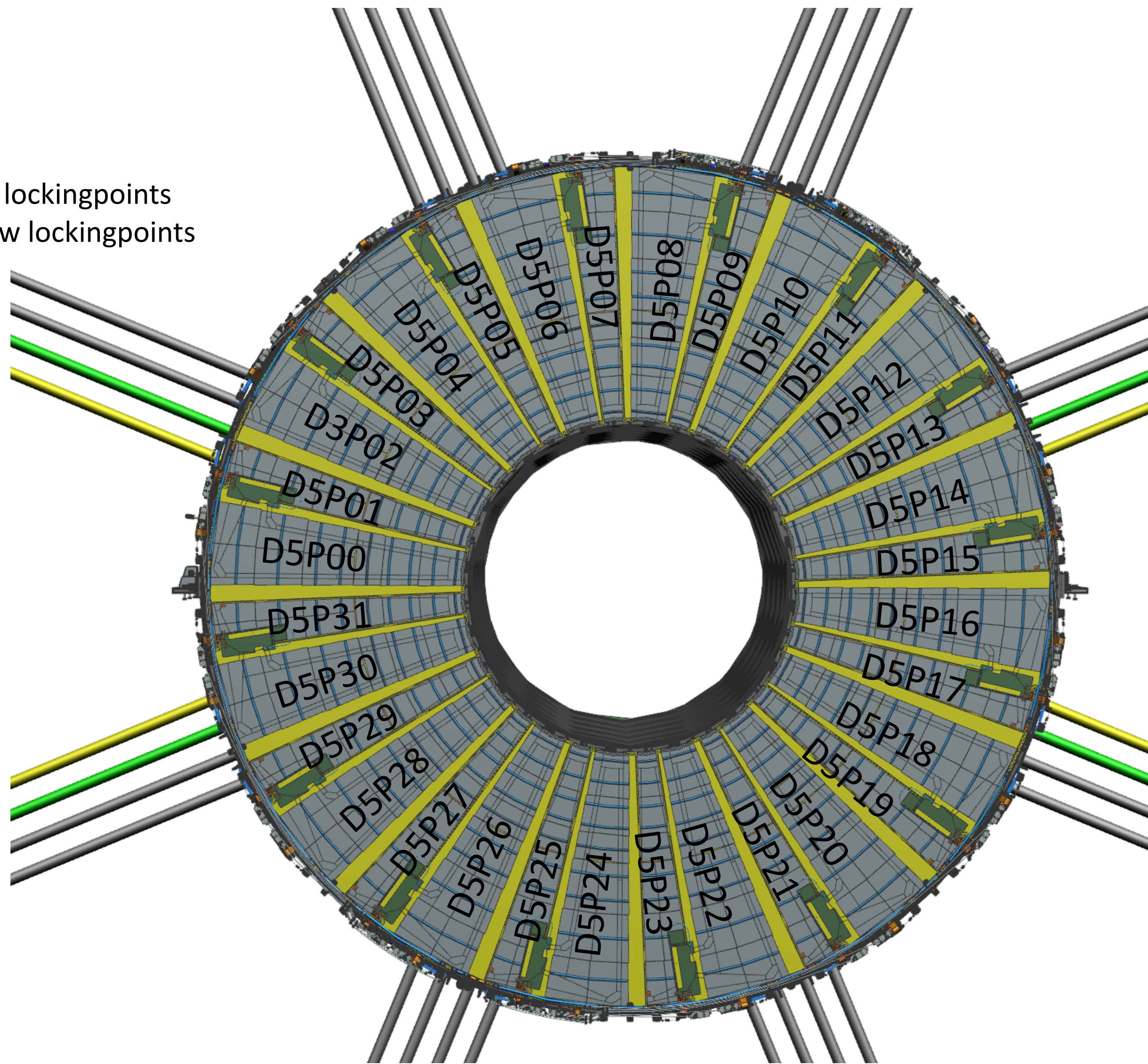
Wu5 connects D5P30-D5P13

Wd5 connects D5P14-D5P29

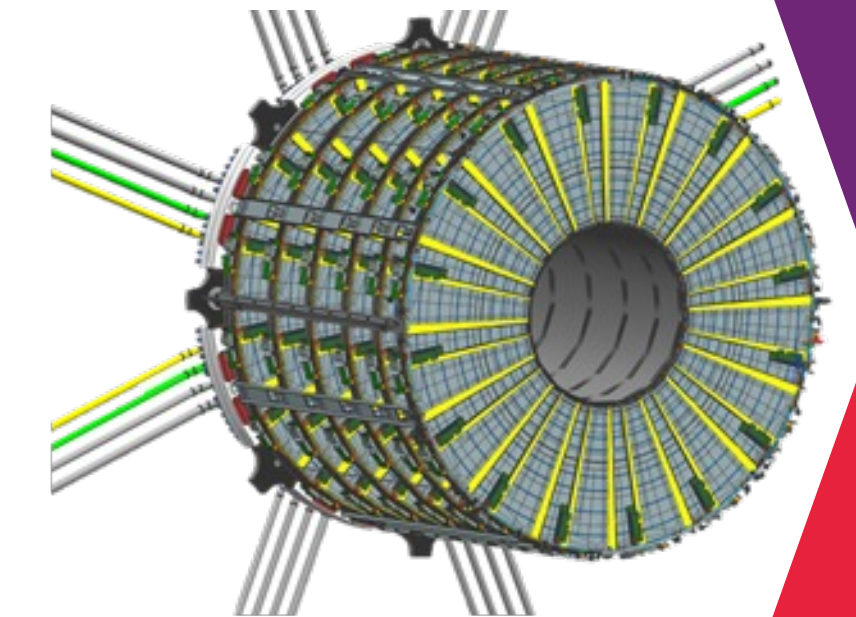
Petals with even numbers: on high lockingpoints

Petals with uneven numbers: on low lockingpoints

Touching spacer rod	Readout / mm
1	3.16
2	3.01
3	2.99
4	2.88
5	2.95
6	3.37
7	3.16
8	2.96
9	2.98
10	-- tape on SR
11	3.12
12	2.97
13	2.89
14	2.93
15	3.06
0	3.16



Cooling tube mapping in strip Ecs **A-Side**



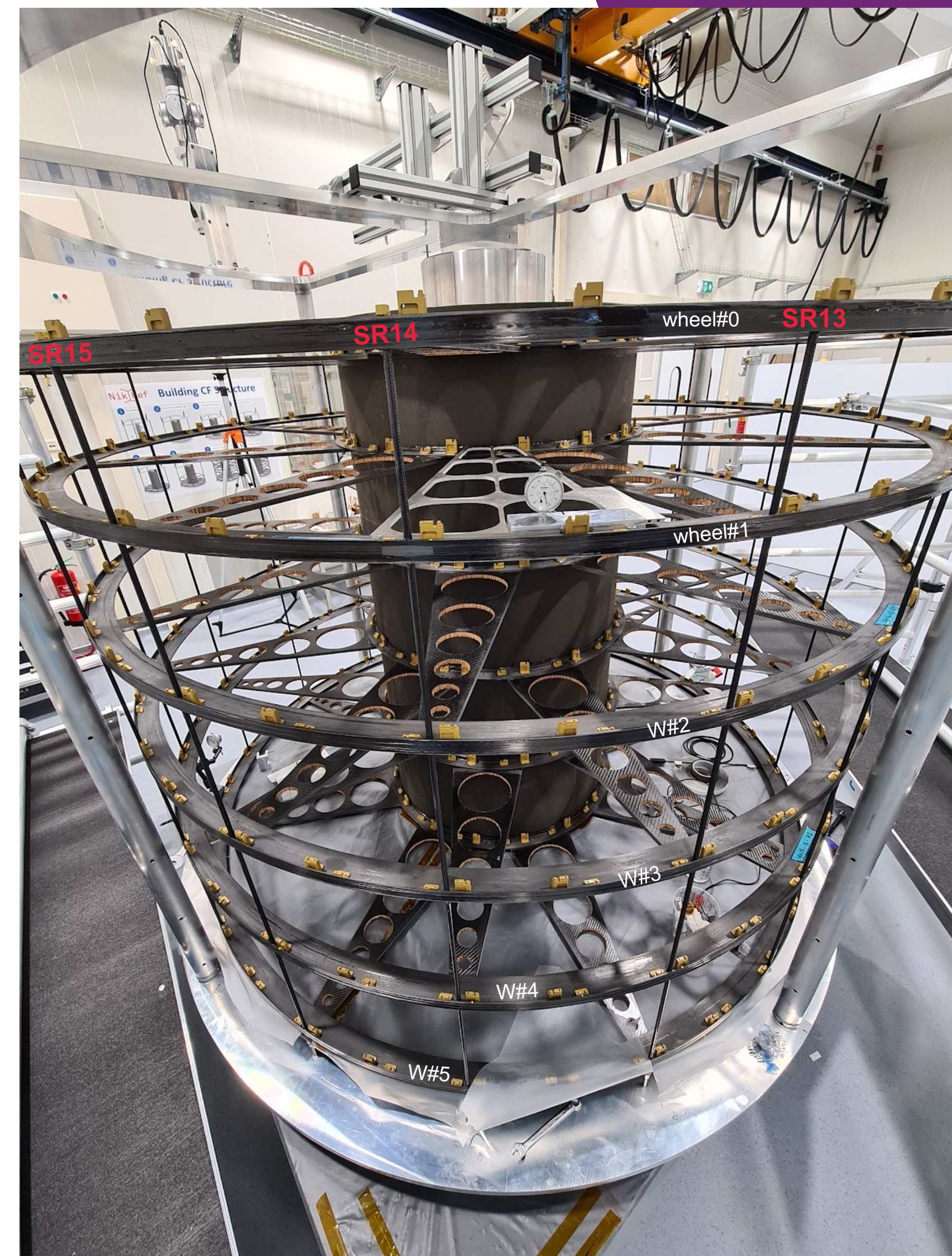
Seen from the IP

# MEASUREMENTS

Clearance between the rim of the wheel and the lower petal  
Nominal value on the gauge: **3.00 mm**



Touching spacer rod	Readout wheel #5 /mm	Readout wheel #4 /mm	Readout wheel #3 /mm	Readout wheel #2 /mm	Readout wheel #1 /mm	Readout wheel #0 /mm
1	2.94	2.82	2.89	3.08	2.99	3.16
2	3.31	3.00	3.05	3.05	2.96	3.01
3	3.12	3.23	2.90	2.92	2.97	2.99
4	2.78	2.99	3.08	2.90	2.88	2.88
5	2.92	3.09	2.84	3.26	3.02	2.95
6	2.99	3.10	3.02	2.81	3.20	3.37
7	2.91	3.05	3.02	3.18	2.97	3.16
8	2.93	2.97	3.14	2.99	2.96	2.96
9	2.80	2.99	2.97	2.92	3.28	2.98
10	3.19	2.84	3.15	3.00	2.91	- tape on SR
11	3.02	3.16	2.87	3.11	2.82	3.12
12	2.78	3.03	3.11	2.89	3.08	2.97
13	2.77	3.25	2.72	3.05	3.27	2.89
14	3.19	2.92	3.06	3.31	3.43	2.93
15	3.09	2.86	3.11	2.98	2.95	3.06
0	2.96	3.11	3.02	2.91	3.02	3.16

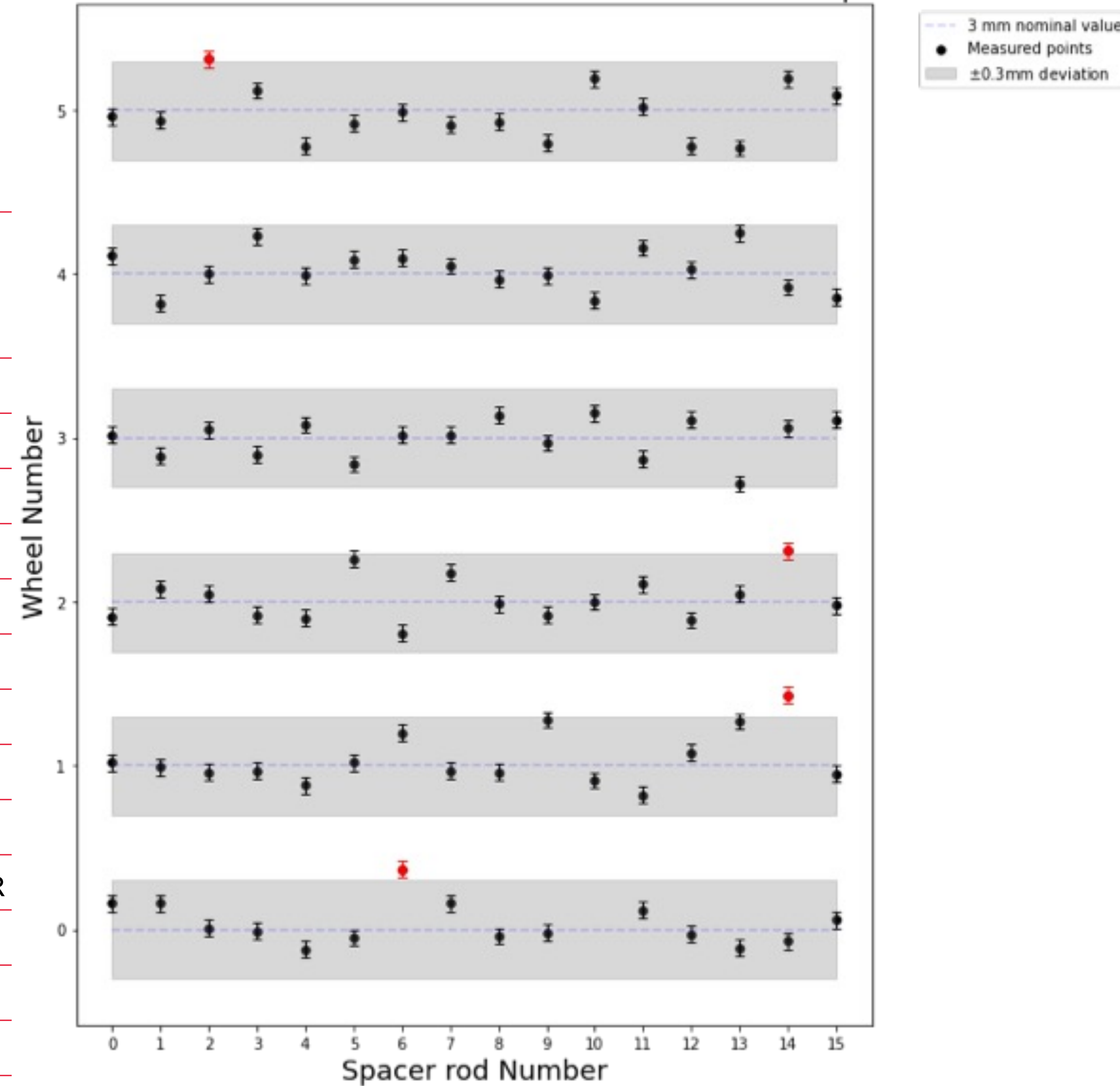


# MEASUREMENTS

Clearance between the rim of the wheel and the lower petal  
Nominal value on the gauge: **3.00 mm**



Measurement of distance between wheels and lower petal



Original plot by Pranati Kharbanda (Nikhef).  
The one shown previously in this slides is the same one, but I modified the wheels order to show them like in the end-cap

Touching spacer rod	Readout wheel #5 /mm	Readout wheel #4 /mm	Readout wheel #3 /mm	Readout wheel #2 /mm	Readout wheel #1 /mm	Readout wheel #0 /mm
1	2.94	2.82	2.89	3.08	2.99	3.16
2	3.31	3.00	3.05	3.05	2.96	3.01
3	3.12	3.23	2.90	2.92	2.97	2.99
4	2.78	2.99	3.08	2.90	2.88	2.88
5	2.92	3.09	2.84	3.26	3.02	2.95
6	2.99	3.10	3.02	2.81	3.20	3.37
7	2.91	3.05	3.02	3.18	2.97	3.16
8	2.93	2.97	3.14	2.99	2.96	2.96
9	2.80	2.99	2.97	2.92	3.28	2.98
10	3.19	2.84	3.15	3.00	2.91	- tape on SR
11	3.02	3.16	2.87	3.11	2.82	3.12
12	2.78	3.03	3.11	2.89	3.08	2.97
13	2.77	3.25	2.72	3.05	3.27	2.89
14	3.19	2.92	3.06	3.31	3.43	2.93
15	3.09	2.86	3.11	2.98	2.95	3.06
0	2.96	3.11	3.02	2.91	3.02	3.16