

Metrology Reports DQW

R.I Cavity #1 + #2

Results according to CERN metrologies

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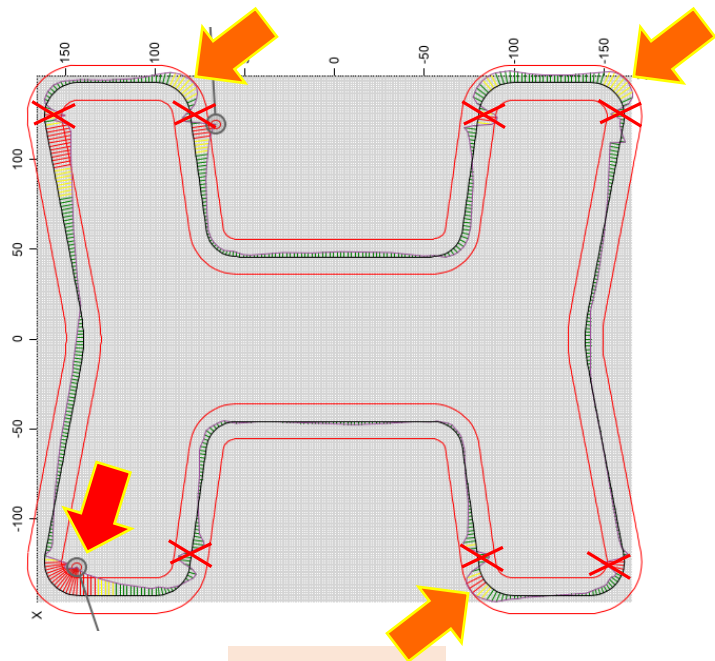
- Metrology done at CERN
- Cavity R.I #1 (HCACFCA001-RN000001):
EDMS 2583860 (<https://edms.cern.ch/document/2583860/1>)
SmarTeam: ST1502523_03
- Cavity R.I #2 (HCACFCA001-RN000002):
EDMS 2647462 (<https://edms.cern.ch/document/2647462/1>)
SmarTeam: ST1504886_03

RF shapes deviations

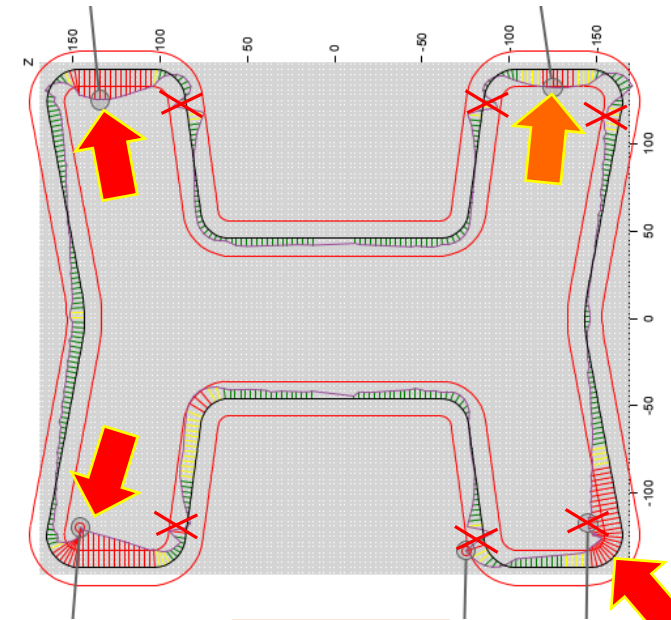
Both cavities are out of tolerances with important offset:

Cavity #1: offset 1.2mm, so 2.4mm tolerance instead of 1.5mm required

Cavity #2: offset 1.75mm, so 3.5mm tolerance instead of 1.5mm required



Cavity #1



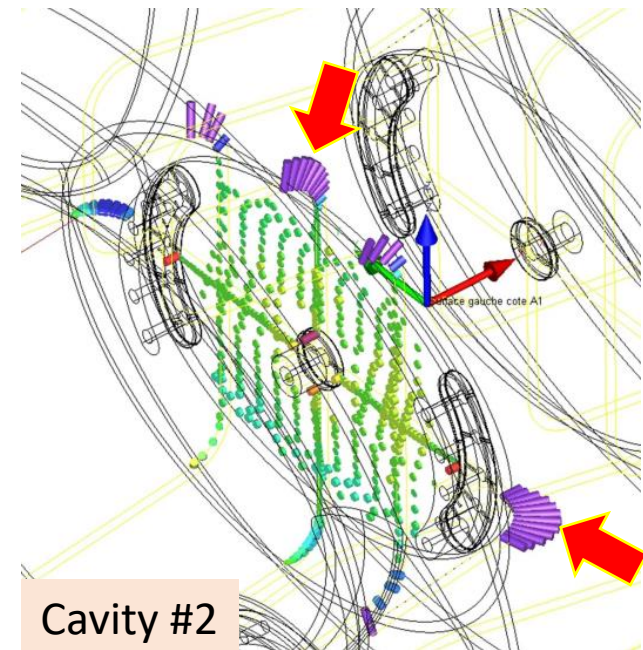
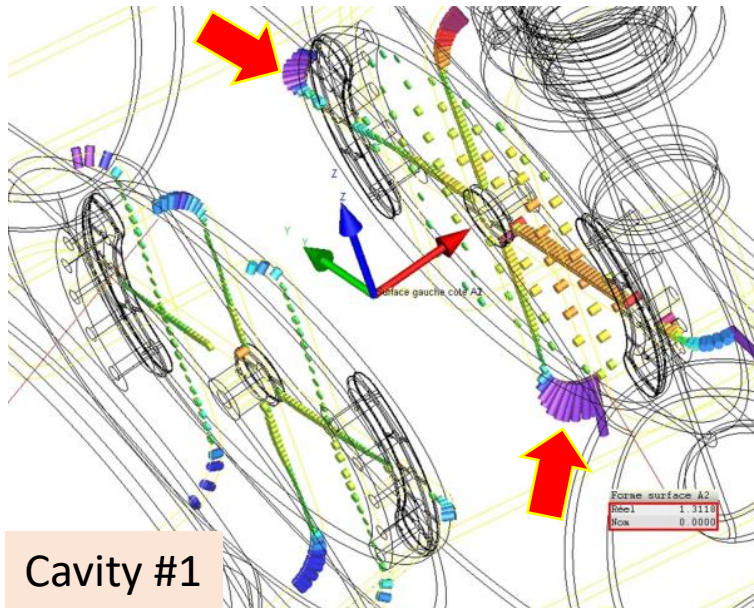
Cavity #2

RF shapes deviations

Both cavities are out of tolerances in the pole area:

Cavity #1: 1.31mm instead of 0.6mm required

Cavity #2: 1.55mm instead of 0.6mm required

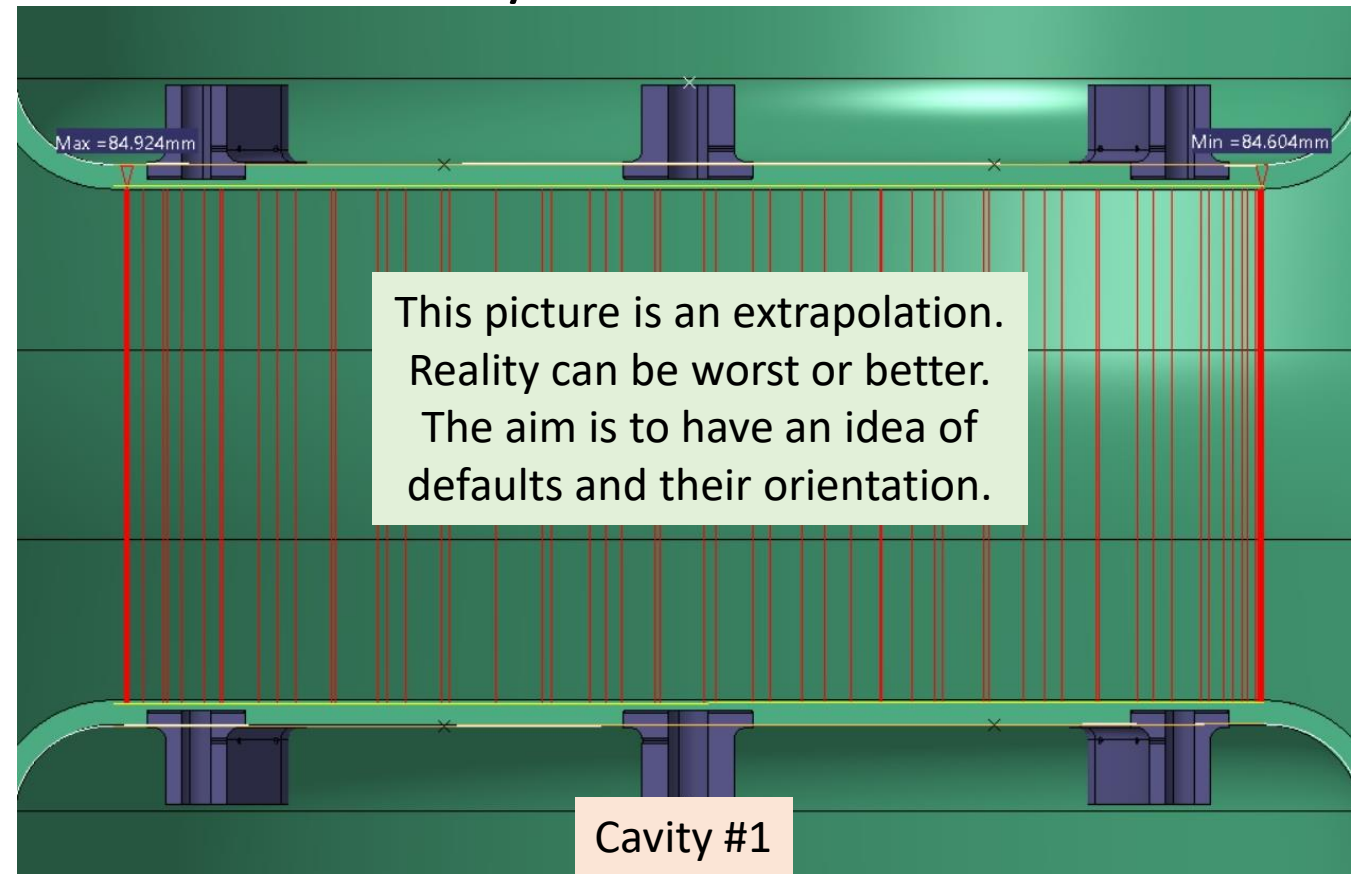
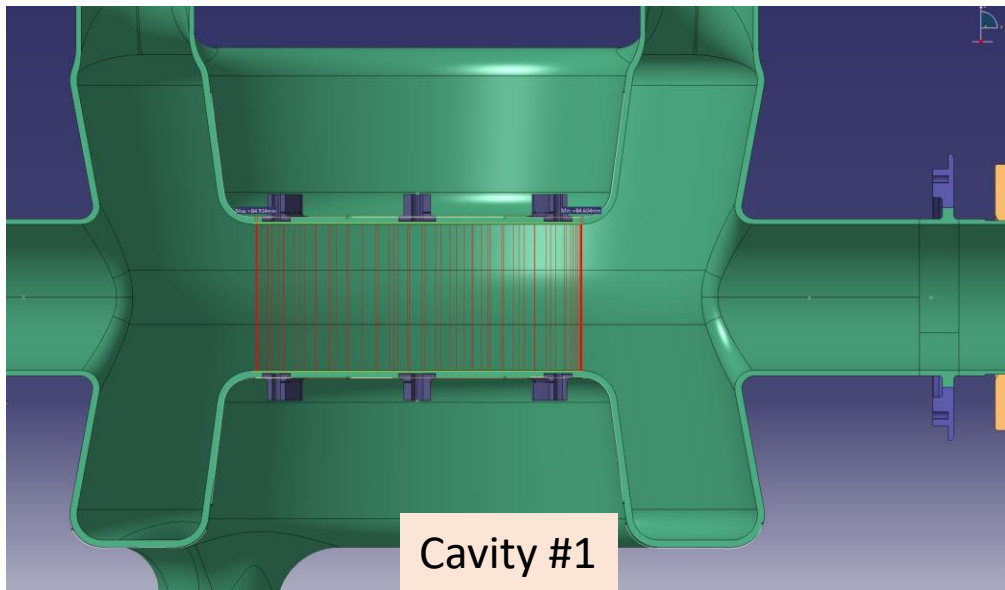


RF shapes deviations

Distance between poles:

Cavity #1: 84.8 mm instead of 83.7mm nominal/84.2mm max

Cavity #2 OK (~83.8mm)



RF shapes deviations

Despite the RF shape out of tolerance, RF function is OK for fundamental mode.

Errors seem mostly local. Could be identified and corrected at the subcomponent's stage by metrology and calibrations.

It has to be avoided for series production.

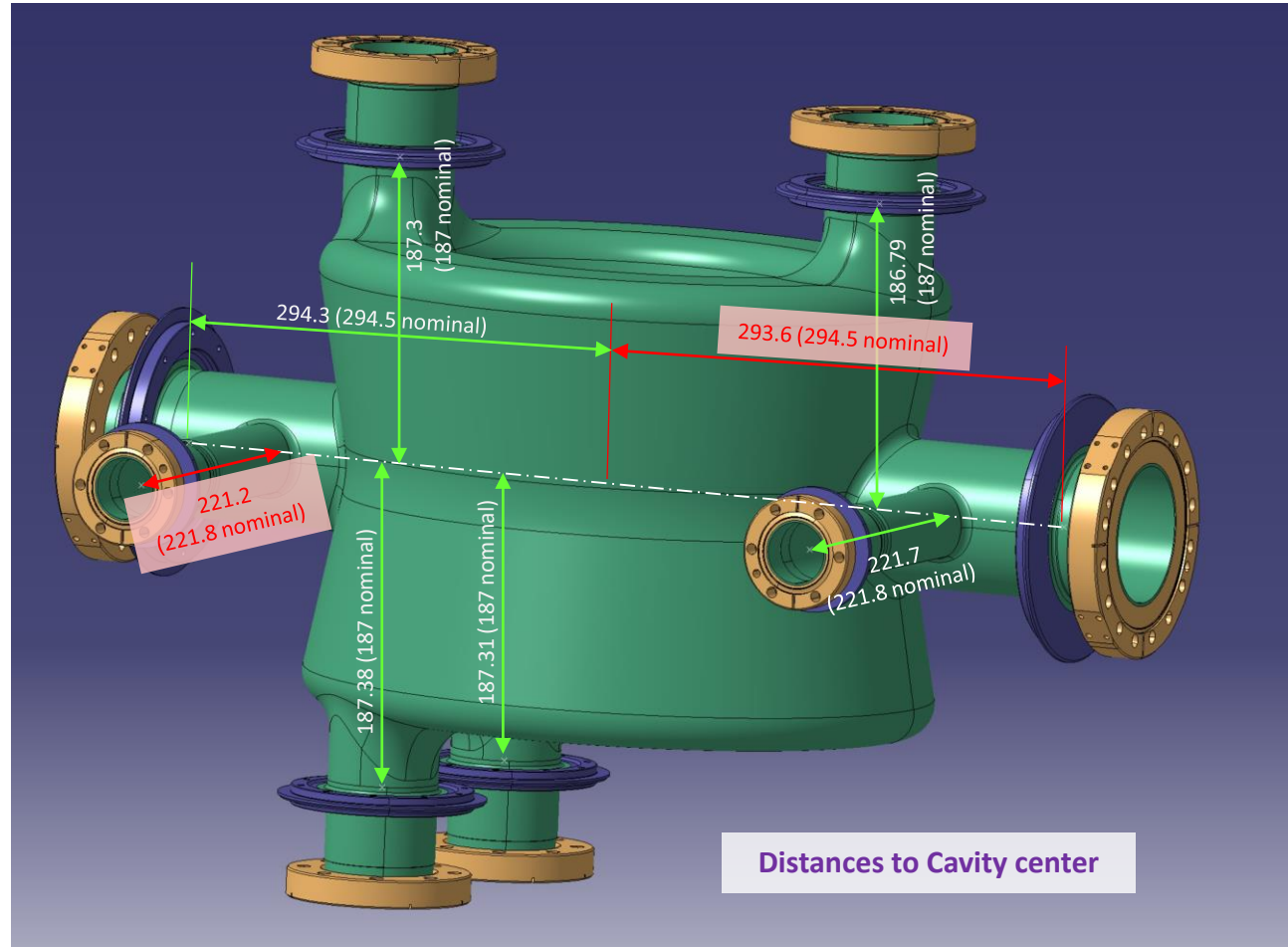
He-Tank interfaces checks

Cavity #1:

- 1) Trouble for Beam Axis B longitudinal position: 0.92mm offset (shorter). Adaptive rings original design for 0.6mm max. 0.92mm would be feasible but with special care.
- 2) Coaxiality trouble Pick-Up B: 1.3mm offset.
- 3) Coaxiality troubles for FPC and HOMs: 3 out of tolerance. Offset up to 0.8mm.
- 4) Doubts on M5 depth. To be checked and re-thread (spec: 8 min)

He-Tank interfaces checks

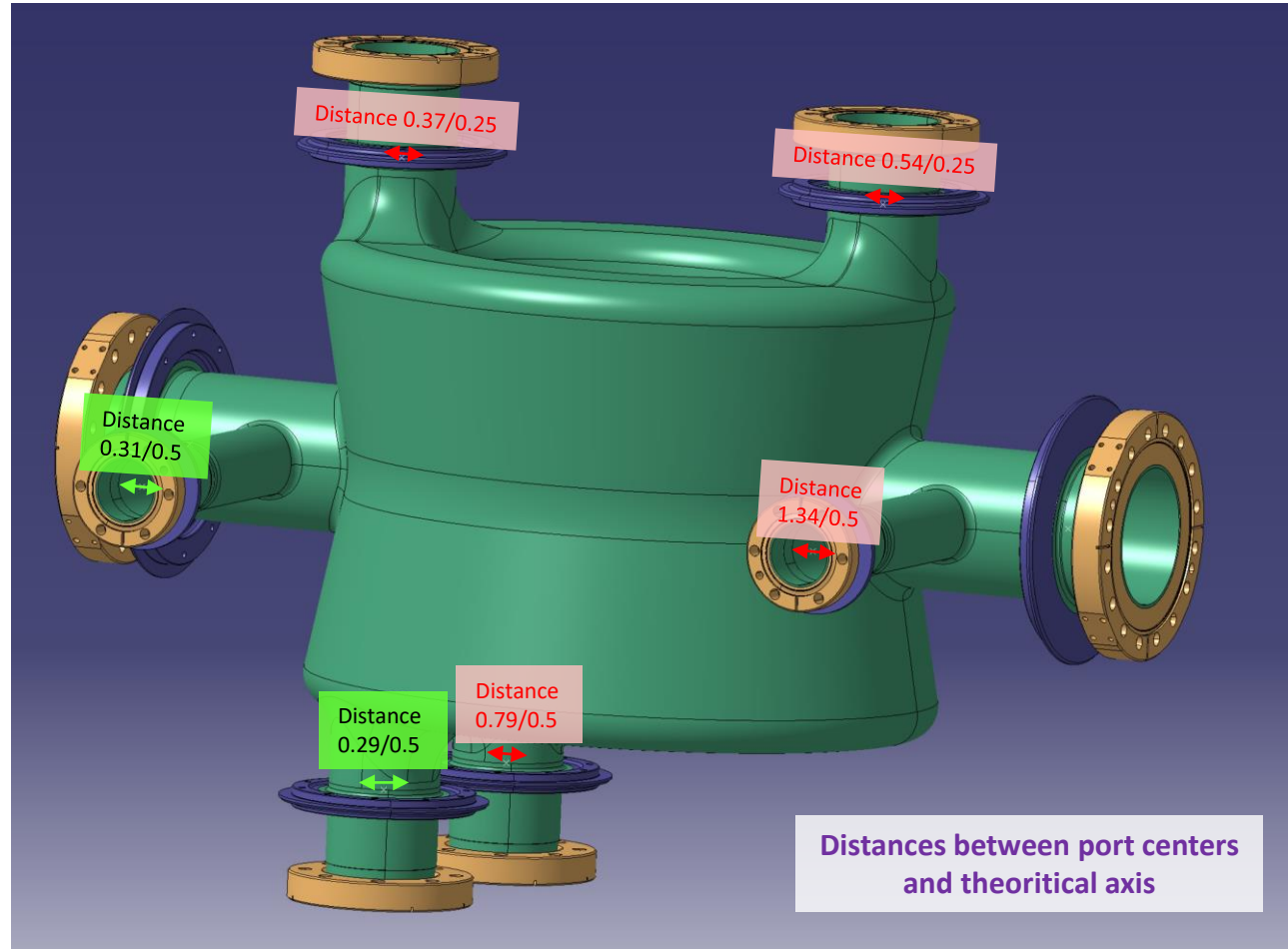
Cavity #1:



CERN: 0.45 max

He-Tank interfaces checks

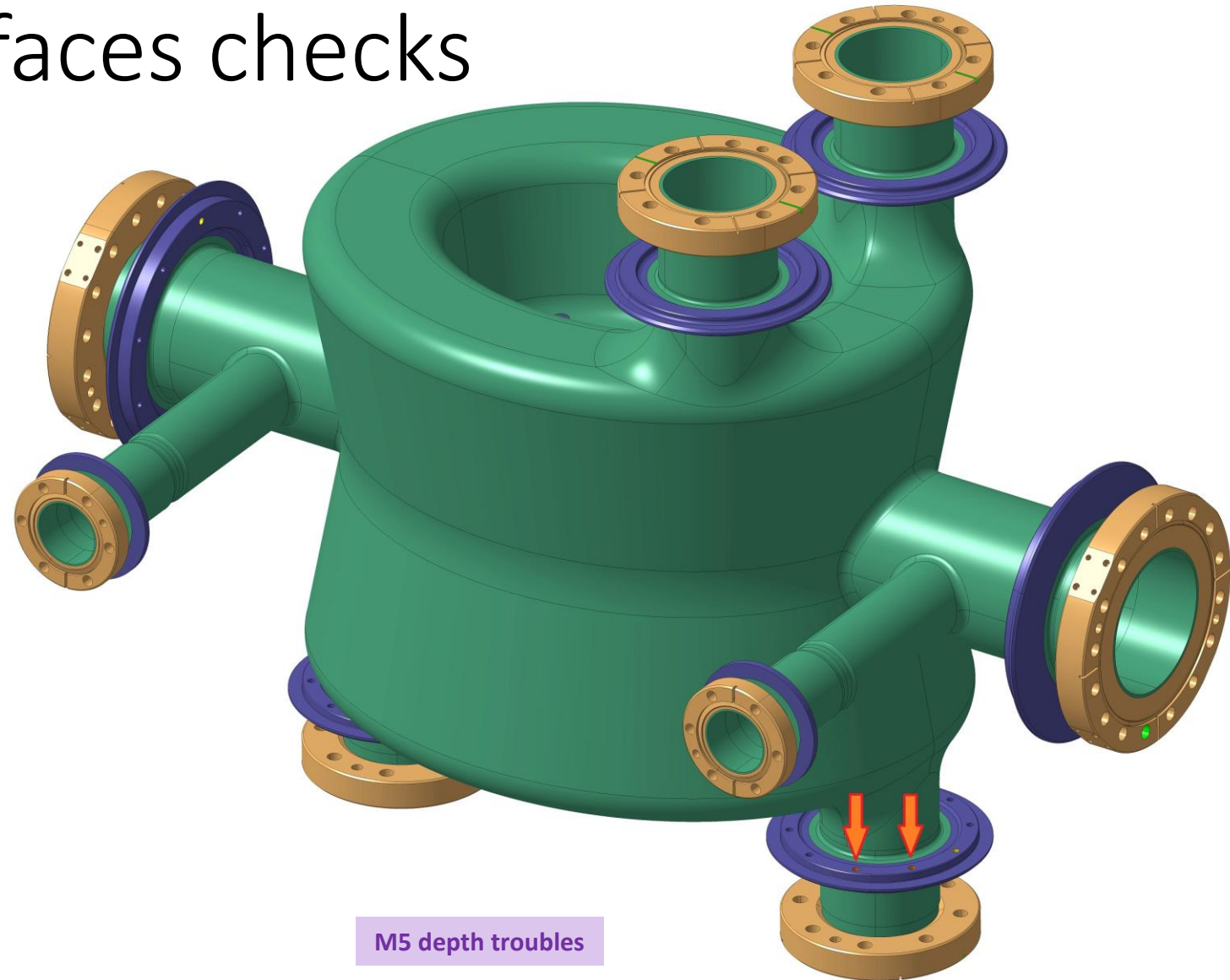
Cavity #1:



CERN: 0.35 max

He-Tank interfaces checks

Cavity #1:



He-Tank interfaces checks

Need to recalibrate to be able to mount on He Tank. This will significantly decrease forces and deformations on extremities.

It is necessary also to keep RF properties before/after jacketing.

Need to do again metrology once calibrations will have been done.

Process to define adaptive rings geometry will be available in EDMS.

Errors seem mostly local. Could be identified and corrected at the subcomponent's stage by metrology and calibrations.

M5 depth to be analysed.

It has to be avoided for series production.

Tuning interfaces checks

Cavity #1:

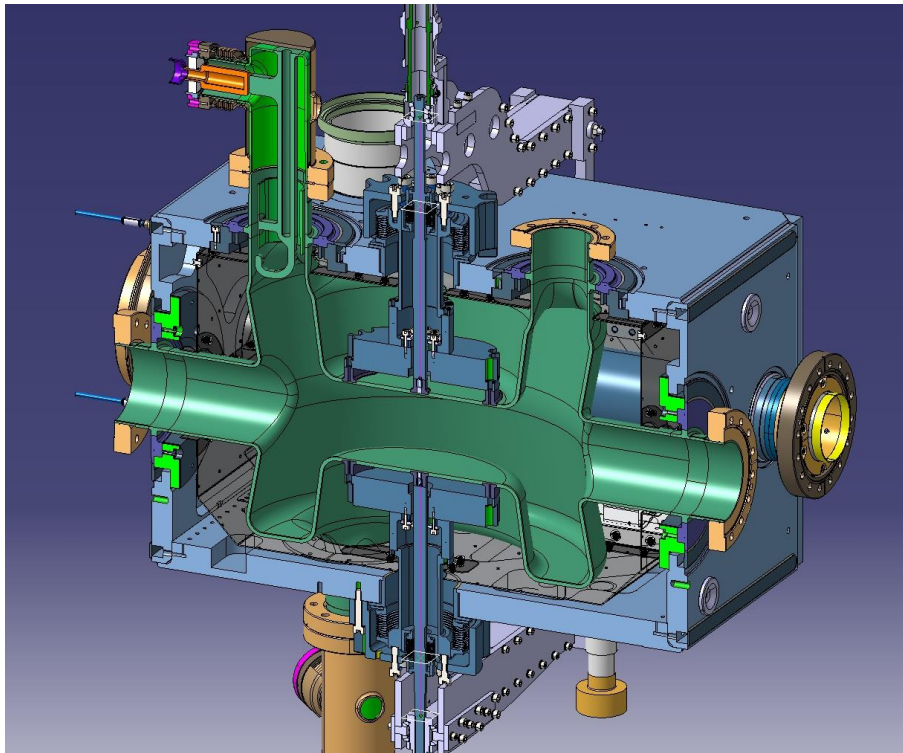
Top Tuning out of tolerance. The errors mix leads to 1.76mm expected radial offset errors for the frame connection, and 1.21mm radial offset for the tuning bellow.

Bottom Tuning out of tolerance. The errors mix leads to 0.69mm expected offset errors for the frame connection, and 0.54mm radial offset for the tuning bellow.

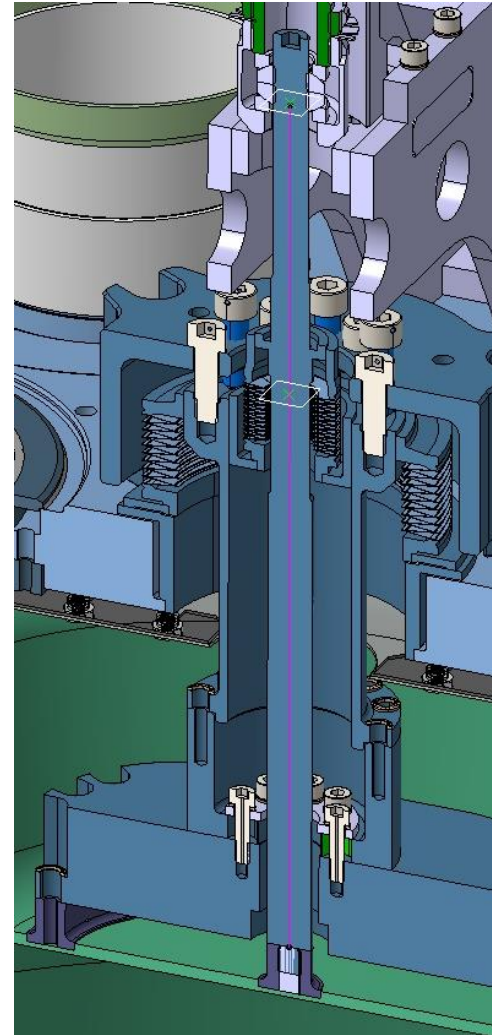
CERN: Top max 1.21mm / Bottom max 0.53

Tuning interfaces checks

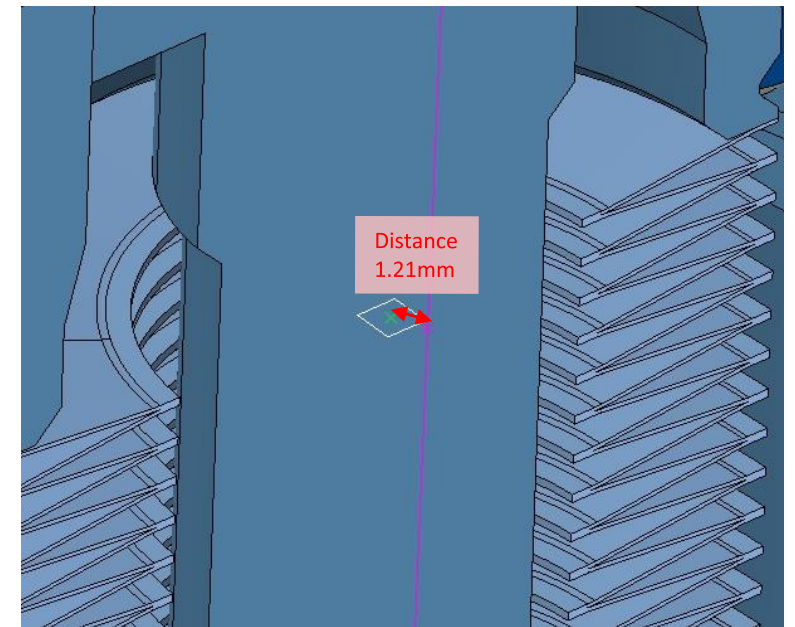
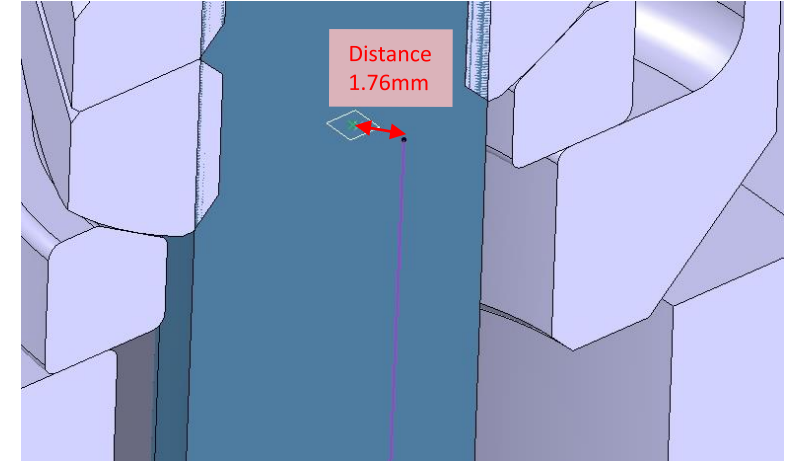
Cavity #1:



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Tuning interfaces checks

Today, we can't know if the tuning pin's deviations are acceptable or not. We are analysing the feasibility of mounting the tuner.

We are also waiting for metrology results of Cavity #2.

For cavity #1: Offset and parallelism are not the same between top and bottom. Tuning has to be symmetrical to work properly.

Errors measured are up to x3 specification.

Such deviation is not acceptable for series.

Thickness measurements

This a structural information and has safety impacts.

It is also critical to be able to retrieve the real RF surface.

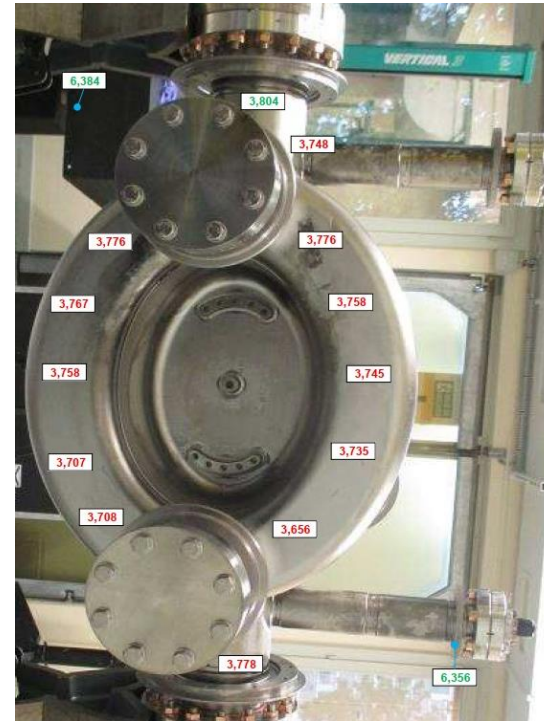
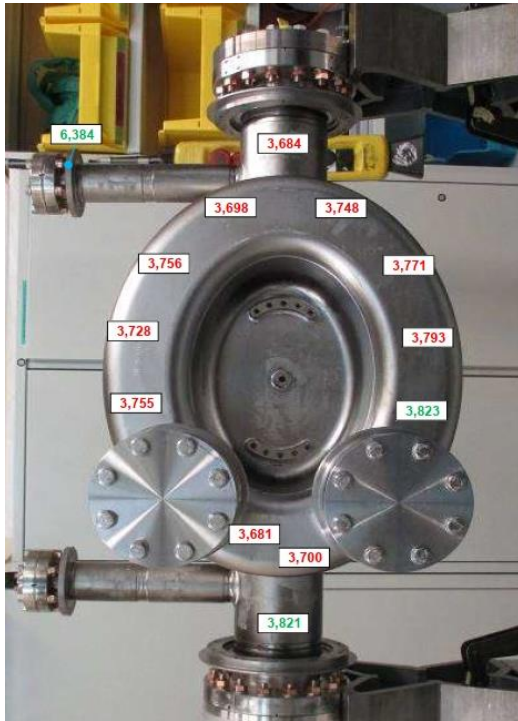
Thickness measurements at the subcomponent level is necessary to garanty the final RF surface's positions. This has to be achieved by external and internal profiles by metrology.

We were not able to find them in your metrology reports.

Our U.T. measurements from the external surfaces give only punctual thicknesses.

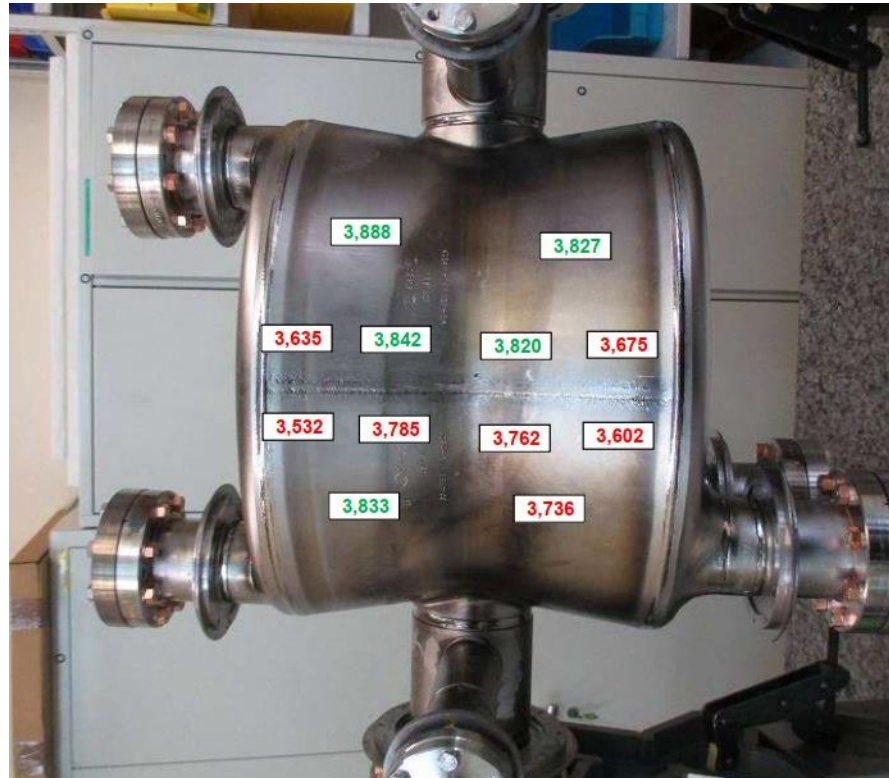
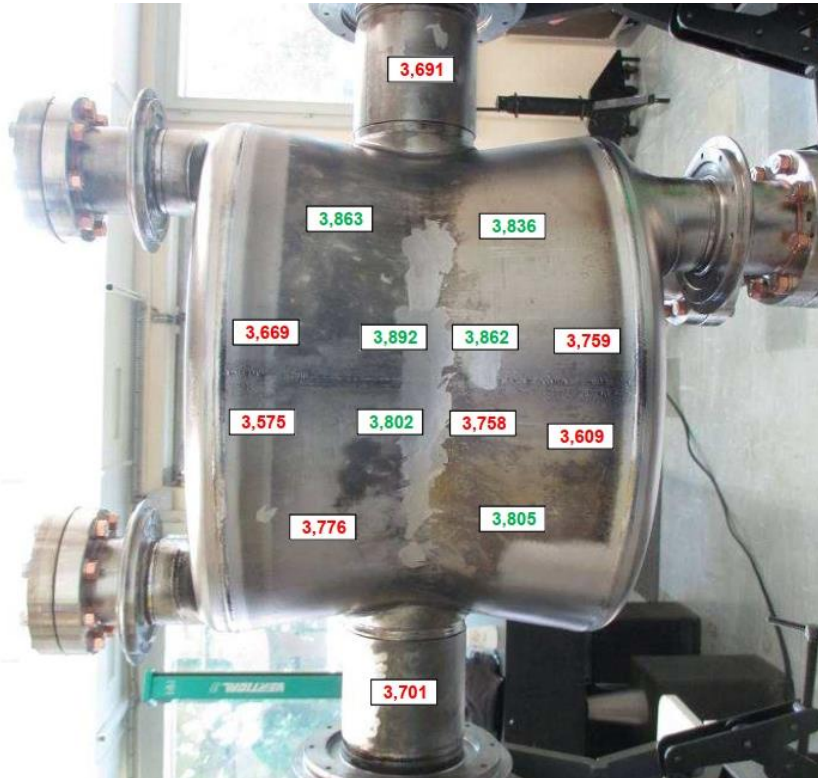
Thickness measurements

Cavity #1: thinner than required. Capacitive plates: 0.5/0.6mm less.
Inductive rings: 0.25mm less.



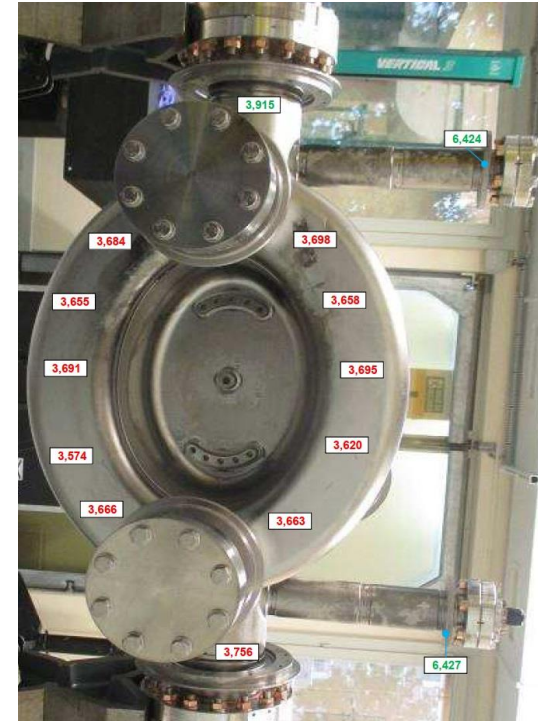
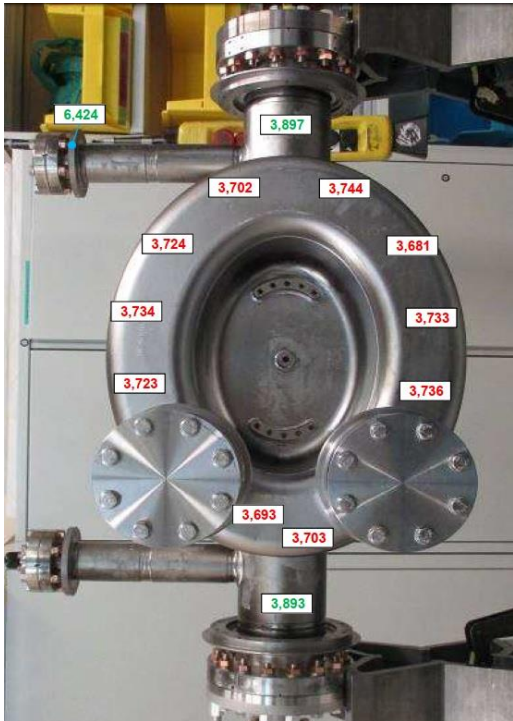
Thickness measurements

Cavity #1: thinner than required. Main body: ~0.25mm less



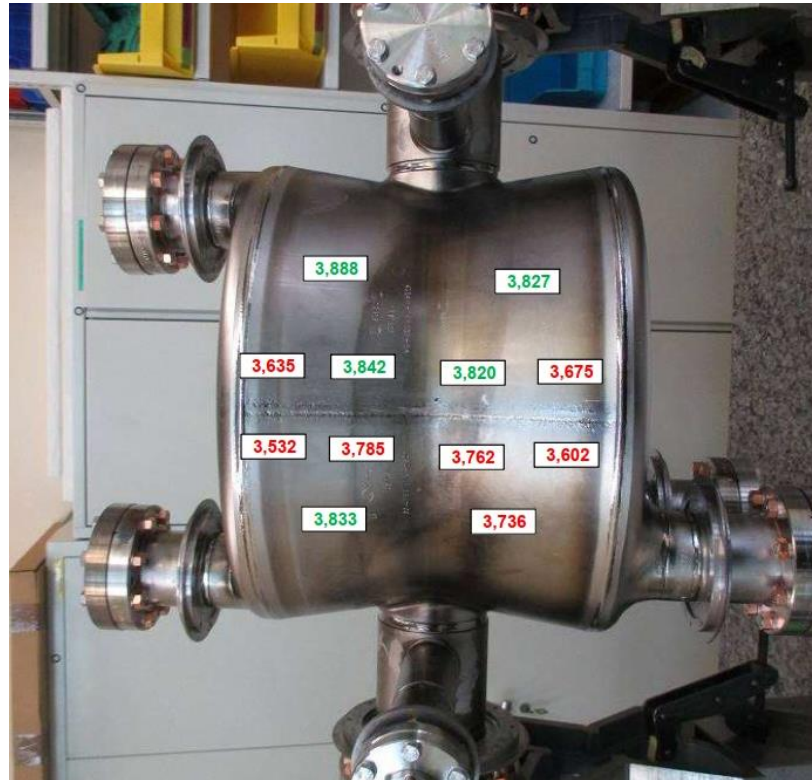
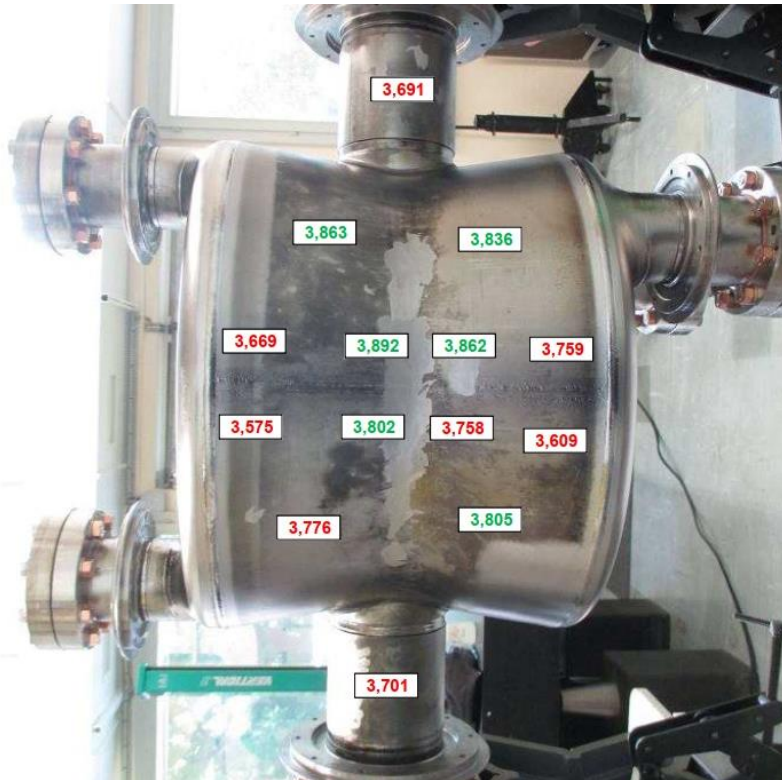
Thickness measurements

Cavity #2: thinner than required. Capacitive plates: 0.25/0.45mm less.
Inductive rings : 0.3mm less.



Thickness measurements

Cavity #2: thinner than required. Main body: ~0.25mm less



Thickness measurements

Cavities are thinner than required. CERN had to do additional calculations for this non conformity and appear OK but at the limit.

Mitigations should be put in place to stay within thickness tolerances for the series.

This also leads to misinterpretation on RF shapes from metrology.

Such deviation is not acceptable for series.

CERN: 3.95/4.02mm before BCP

Conclusion

Corrective actions are mandatory for next steps (He Tank)
For Tuning connections, analysis in progress.

More details will be given with cavity #2 metrology results.

Corrective actions are mandatory for series production