



CRAB Cavities Specification Drawings & Metrology

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CRAB Cavities

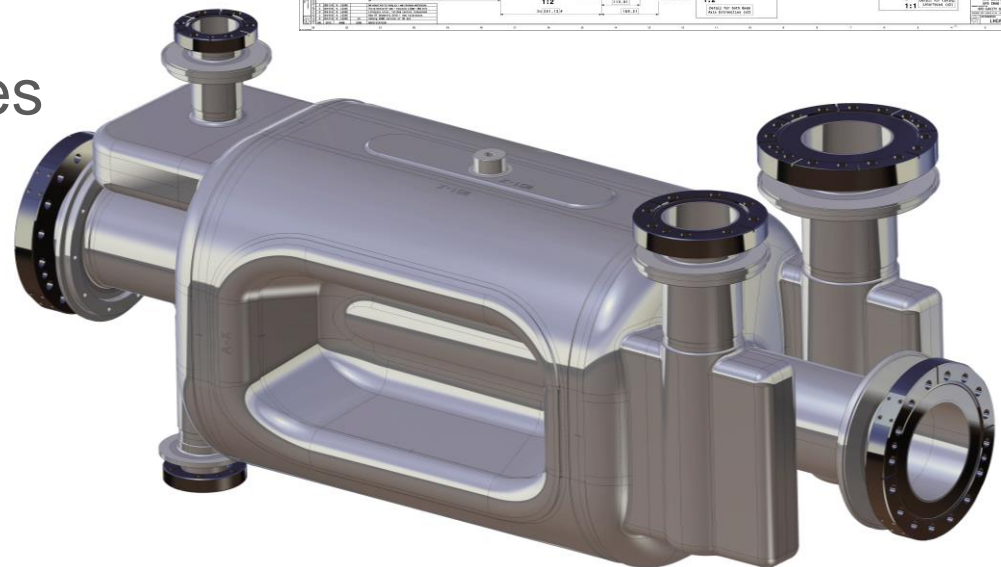
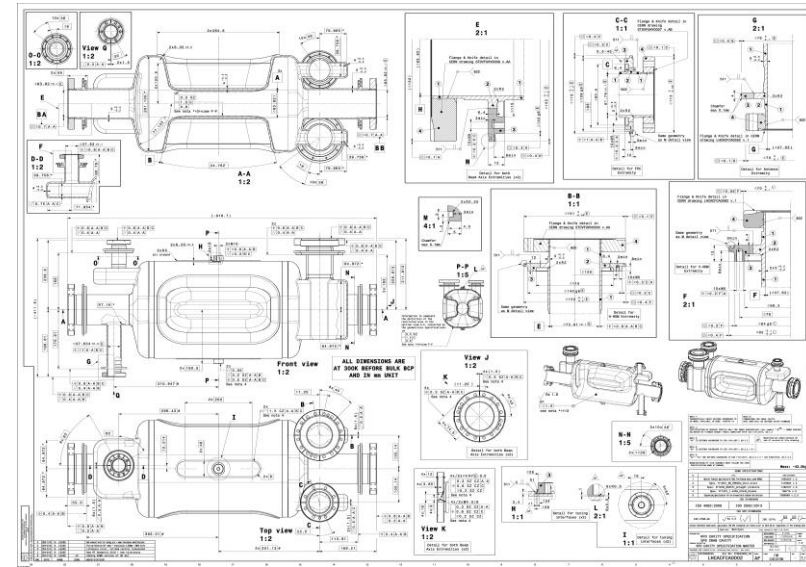
Specification Drawings & Metrology

1. Targets of Specification Drawings
2. Specification Drawing of DQW vs RFD
3. Metrology of Bare Cavities
4. One important final need: position with real beam
5. Metrology of Jacketed Cavities (He Tank)
6. Feedbacks from first cavities

1. Targets of Specification Drawings

Dimensions and Tolerances to ensure:

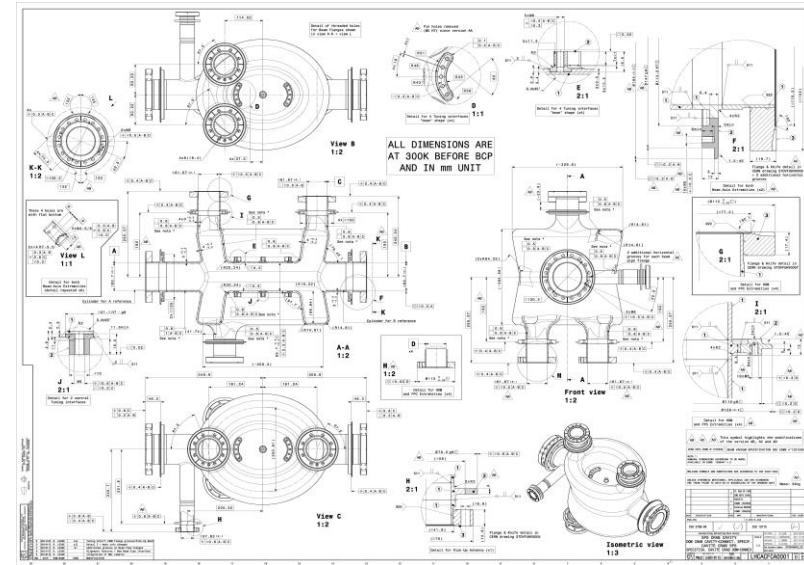
1. RF Shape
2. Tuning interfaces
3. He Tank interfaces
4. Wave Guides Shape
5. HOM & FPC interfaces
6. Beam interfaces
7. Pick-Up interfaces
8. Minimum thickness
9. Mechanical strength



1. Targets of Specification Drawings

These targets have some limits:

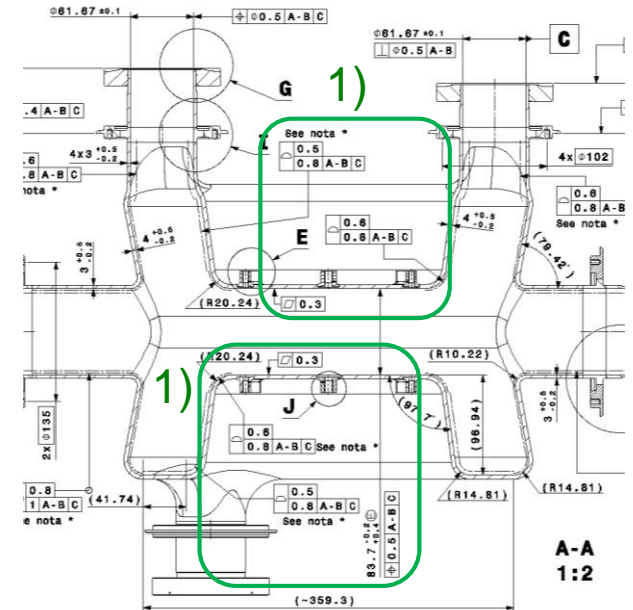
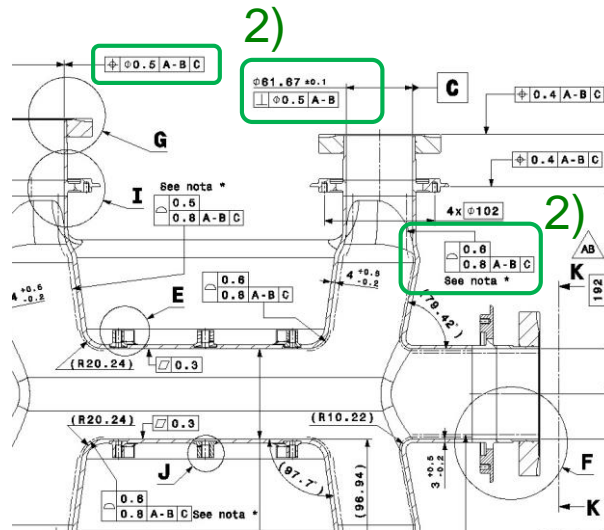
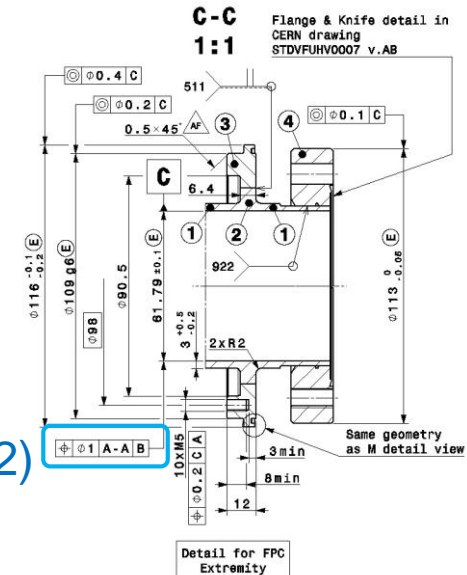
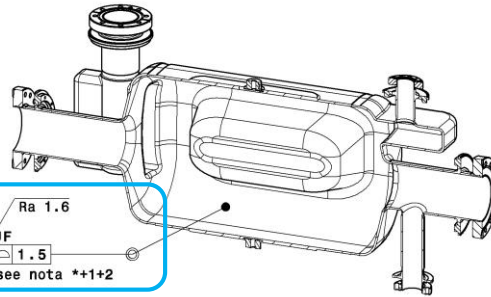
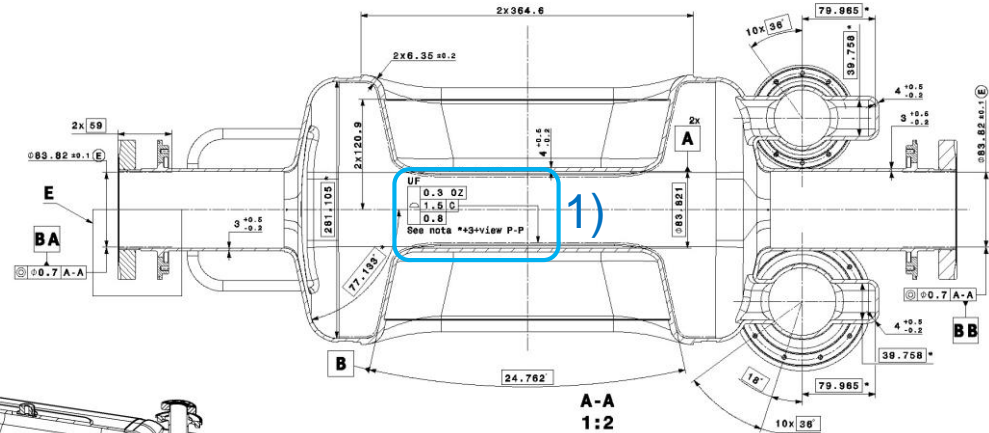
1. Some are hard to achieve.
2. Previous steps in manufacturing process can't ensure the target. Adjustments are necessary.
3. Some tolerances are not tight enough according to the real need.



2. Specification Drawing of DQW vs RFD

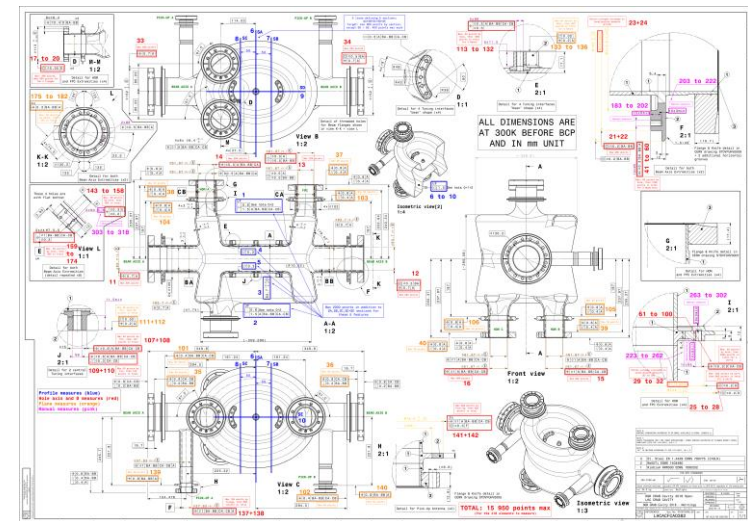
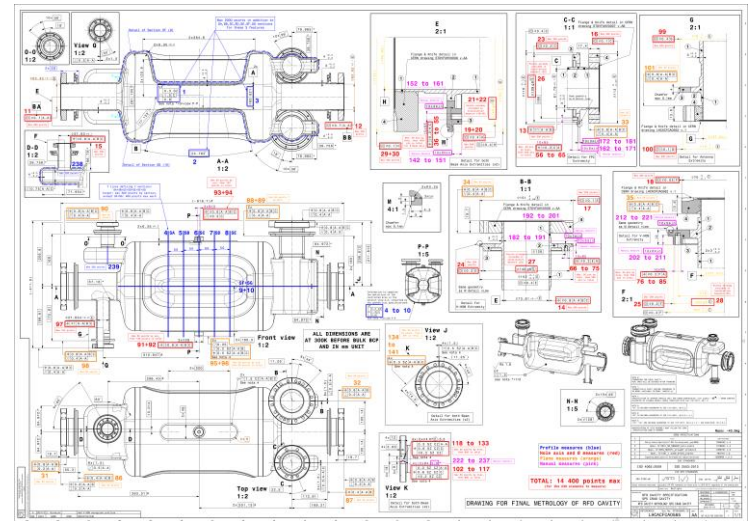
The drawings have differences

1. Heart of cavity
2. FPC/HOM/Pick-Up positions



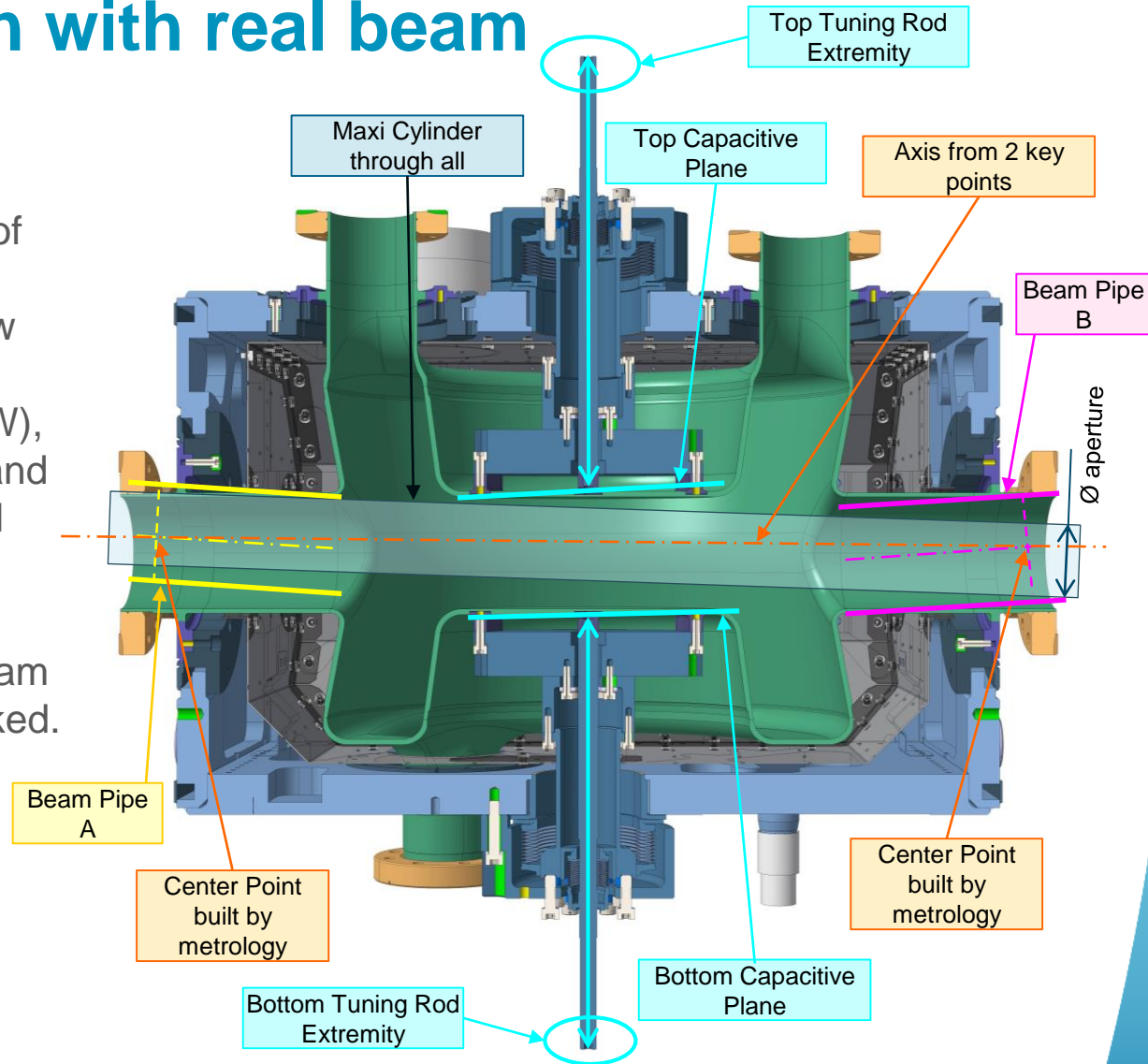
3. Metrology of Bare Cavities

- The Bare Cavity is a complex part
- First metrologies done on SPS prototypes helped a lot to define a metrology strategy
- Many elements to check
- Several ones can't be directly measured
- There's a need to measure in the same way in each collaboration metrology
- Special drawings have been created: LHCACFCA0382 (DQW) / LHCACFCA0565 (RFD)
- Some elements are measured in a way to be compatible and comparable with the last step: Jacketed Cavity (ex: St. Steel Flanges Planes)



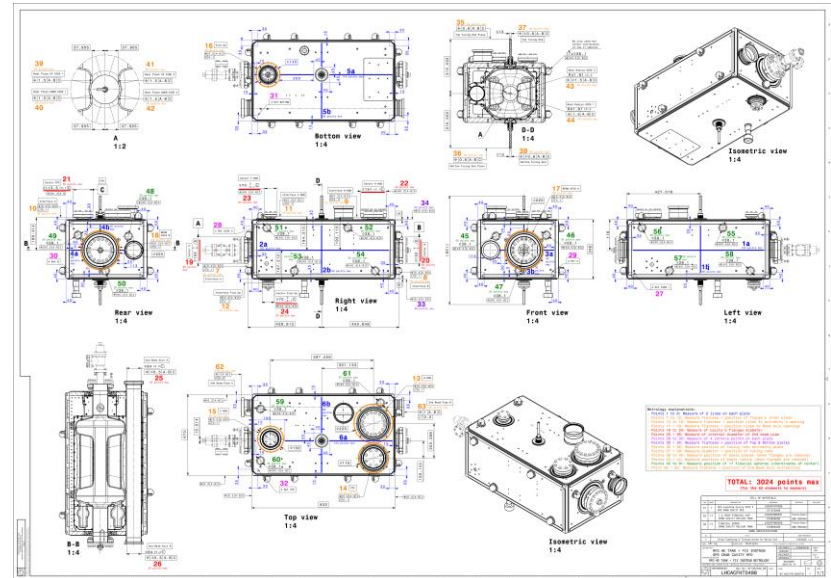
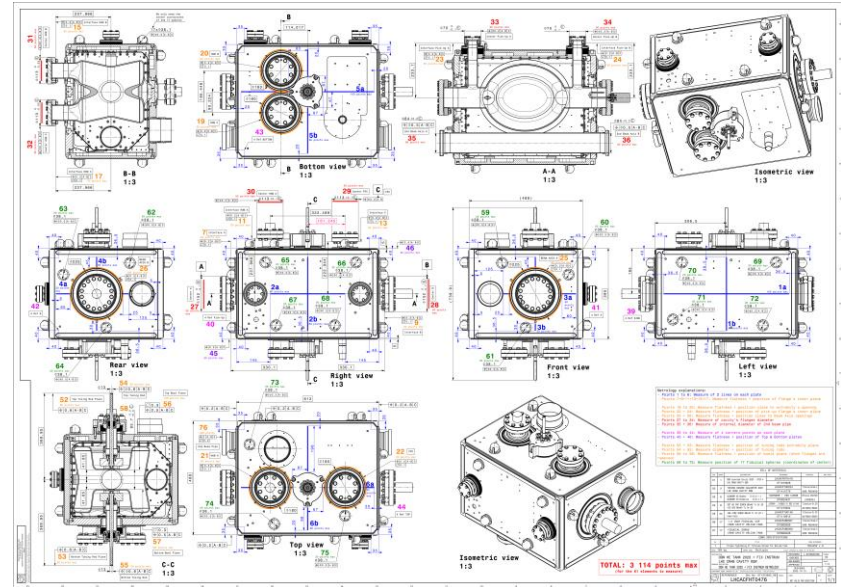
4. One important final need: position with real beam

- To ensure a correct position of the cavity according to the Beam, it is necessary to know where is the cavity center, horizontal middle plane (DQW), vertical middle plane (RFD) and RF axis according to external references.
- This requirement is also providing the value of the Beam aperture that has to be checked.
- Tuning Rods are crucial for DQW



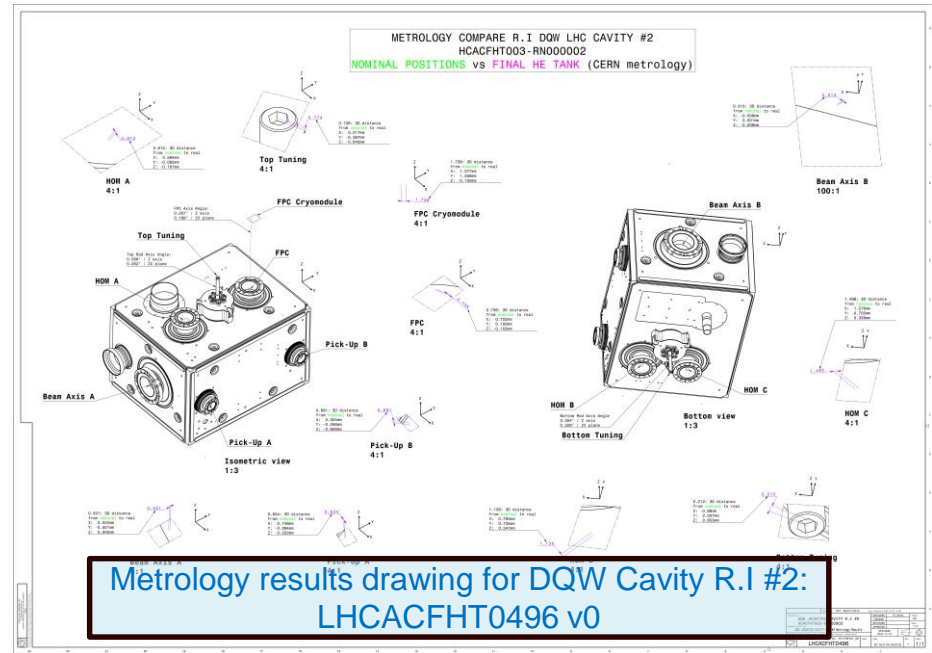
5. Metrology of Jacketed Cavities (He Tank)

- A final metrology is necessary after the final welding and the pressure test.
- It is also mandatory for fiducialisation of the cavity position according to the beam axis.
- Measuring all the positions of extremities (FPC, HOMs, Beam Axis, Pick-Ups) ensures to define the position of the cavity's center.
- Tuning Rods measurements are necessary.
- Intermediate metrologies are important, especially in case of non-conformity.
- This metrology is also important to check next assembly steps, especially in cryomodule.



6. Feedbacks from first cavities

- A direct measurement of capacitive plates helps a lot for the final check.
- Tuning Rods individual measurement is necessary.
- Tuning Rods identification is necessary.
- NCR must be analysed to check next assembly steps.
- Metrology drawings helps to follow and retrieve information several months/years after the metrology report.
- Surprises are better welcomed with a complete metrology... Some NCR were analysed thanks to unused metrology results until the NCR...



MÉTROLOGIE EN-MME-MM RAPPORT DE CONTRÔLE			
EDMS	2884712	Date de la mesure	19/05/2022 14:35
Jeu	2000199	N° de plan	LHCACFHT0496
Client	LEONE Raphael	Désignation	CAVITE DOW 2011 + 40mm
Contrôleur	BURKOWSKI Maciej	Fournisseur	
Machine	ZISS Primes Ultra 12.24.10	N° de pièce	HCACFCA06-CR000001 v2
Précision des mesures	1,2 µm + 1,000mm	Valeurs rouges	108
Température	20°C ± 1°C		
Commentaires:			
Nom du programme: LHCACFCA06 SCREWS VERSION cavity_CRS1			
<p>Coordinate System:</p> <ul style="list-style-type: none"> - Primary Orientation: Beam Axis BA-BB - Secondary Orientation: Symmetry Plane A - Origin: X - Plane REF A Y - Medium Point between Flanges CA and CB Z - Beam Axis BA-BB 			
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MÉTROLOGIE EN-MME-MM RAPPORT DE CONTRÔLE			
EDMS	2721810	Date de la mesure	07/02/2023 10:49
Jeu	2000199	N° de plan	LHCACFHT0496
Client	LEONE Raphael	Désignation	DQW Jawsed Cavity 2020
Contrôleur	BURKOWSKI Maciej	Fournisseur	CERN
Machine	ZISS Primes Ultra 12.24.10	N° de pièce	HCACFHT06-CR000001
Précision des mesures	1,2 µm + 1,000mm	Valeurs rouges	07
Température	20°C ± 1°C		
Commentaires:			
Nom du programme: LHCACFHT06 cav 01			
<p>Coordinate System:</p> <ul style="list-style-type: none"> - Primary Orientation: Beam Axis A-B - Secondary Orientation: Symmetry Plane - Origin: X - Medium Point between Flanges NOM A and FFC Y - Beam Axis BA-BB Z - Beam Axis BA-BB 			
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