



Manufacturing and experimental activities

DIV-IDTT.T.01-T002

F. Giorgetti

Contributors: G. De Sano, P. Lorusso, A. Mancini, L. Verdini, E. Cacciotti, A. Satriano and S. Roccella

WPDIV-IDTT Midterm Monitoring Meeting for AWP 2023 – July 17-19, 2023 -Frascati

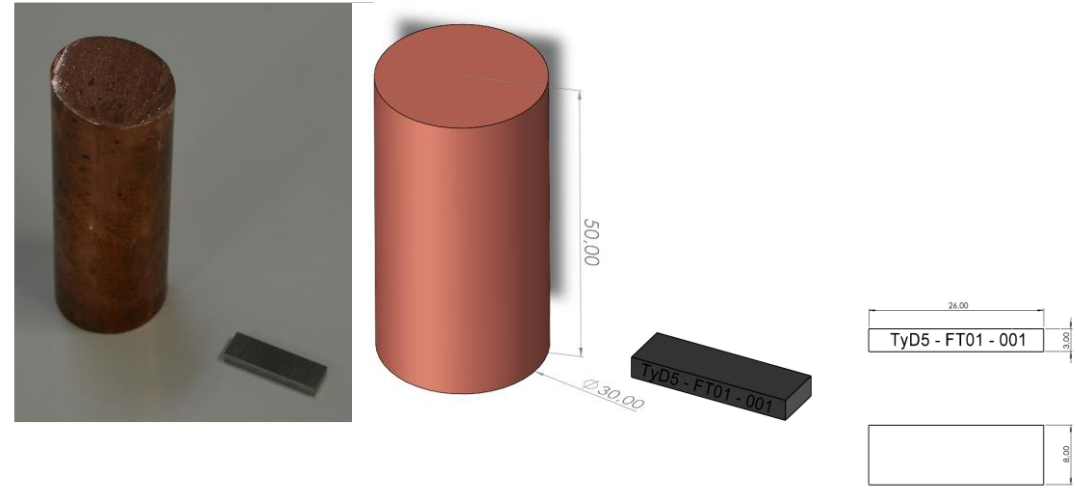
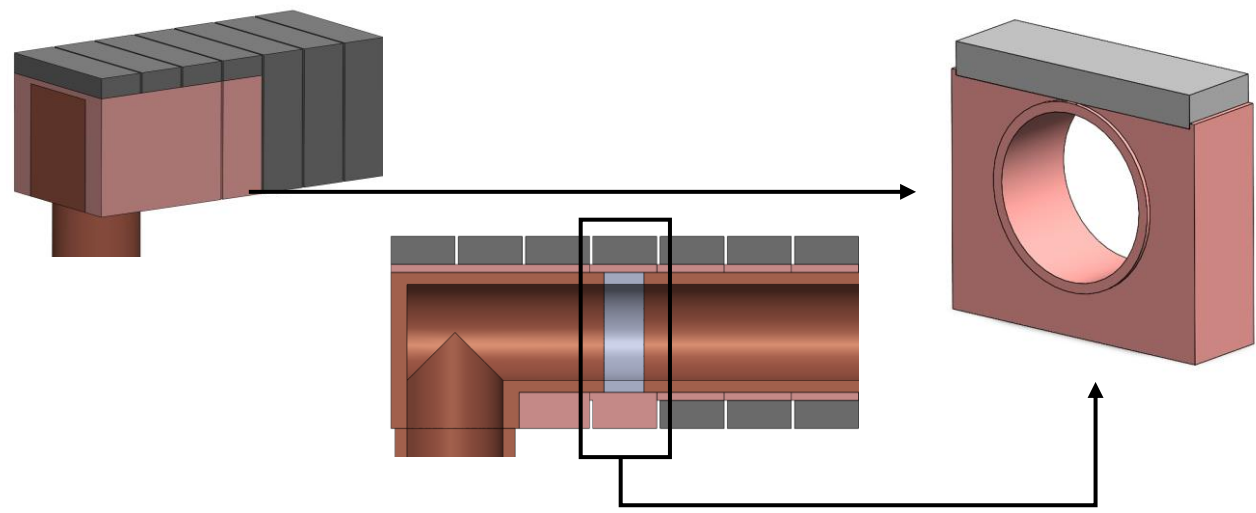
Activity progress:

- 1. Flat-tile dome extremity manufacturing**
- 2. DIV-IDTT.T.01-T002-D005: Design of the ovens for plasma facing units (PFU) prototypes**

Flat-tile dome extremity manufacturing

Manufacturing progress: Cu/W joining through casting

Cu CuCrZr W Inconel



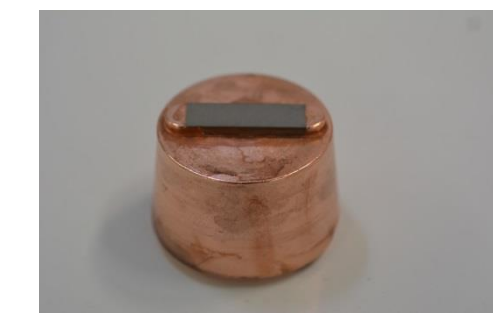
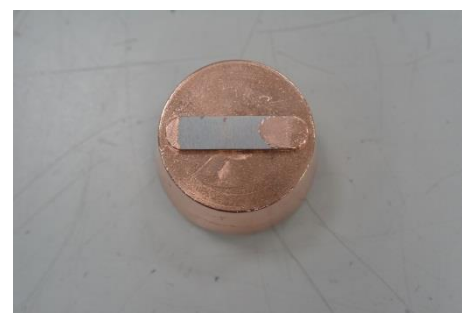
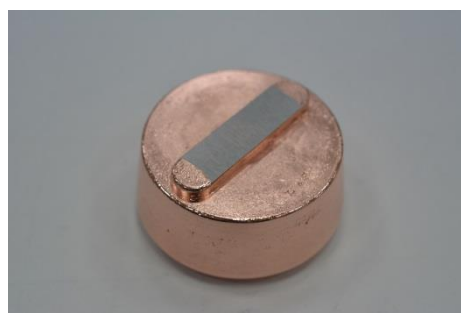
FT01-001

FT01-002

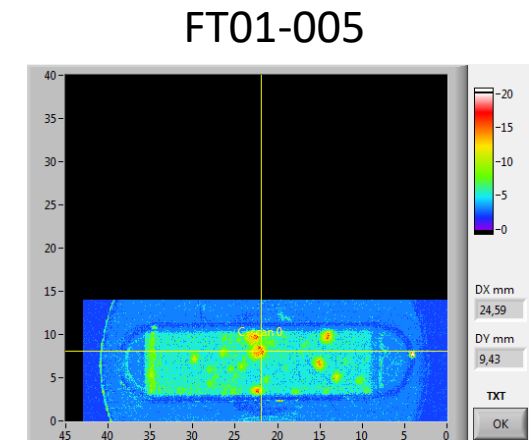
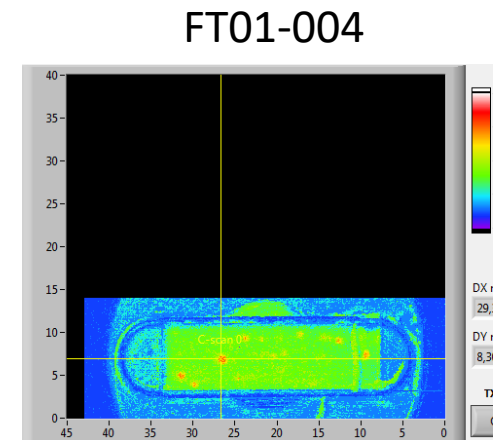
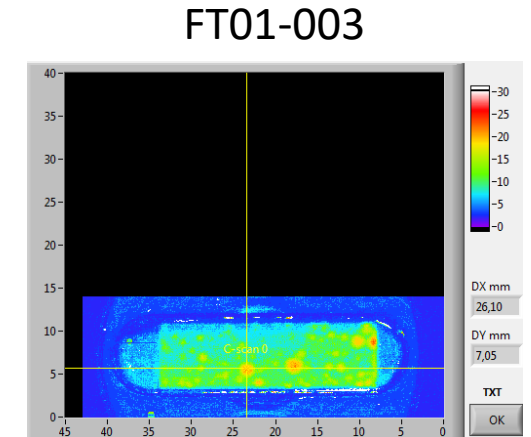
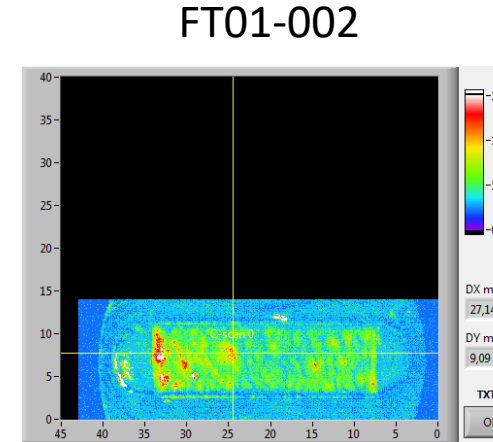
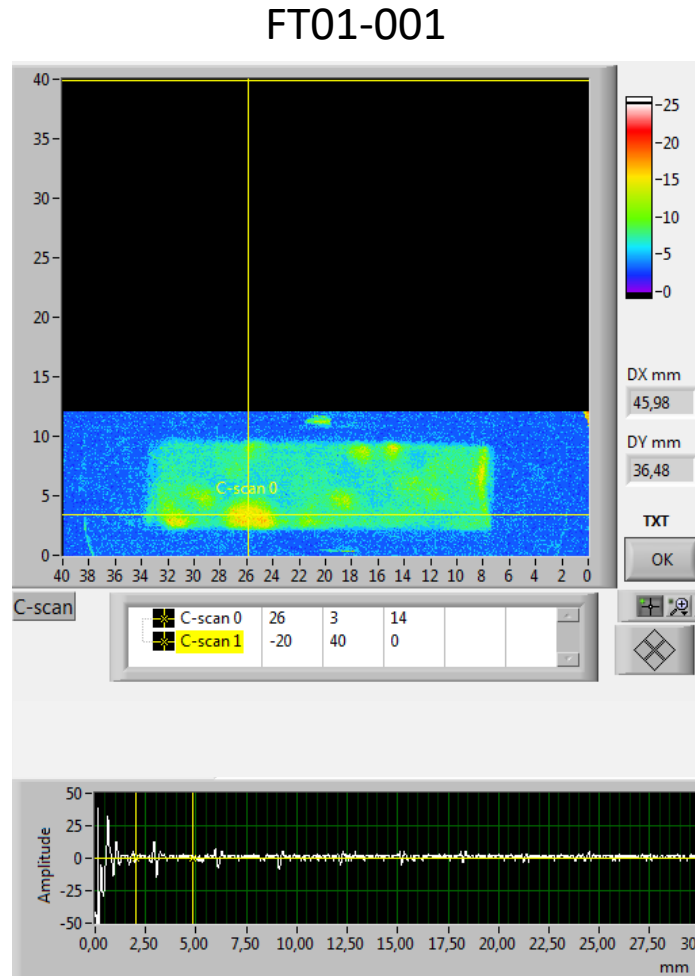
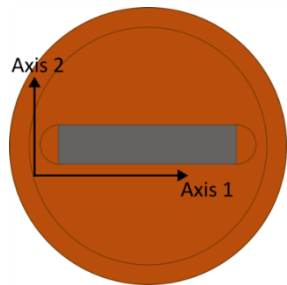
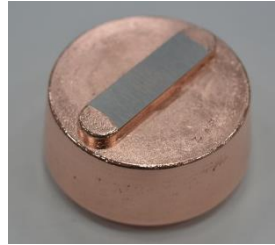
FT01-003

FT01-004

FT01-005



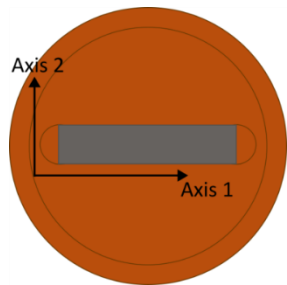
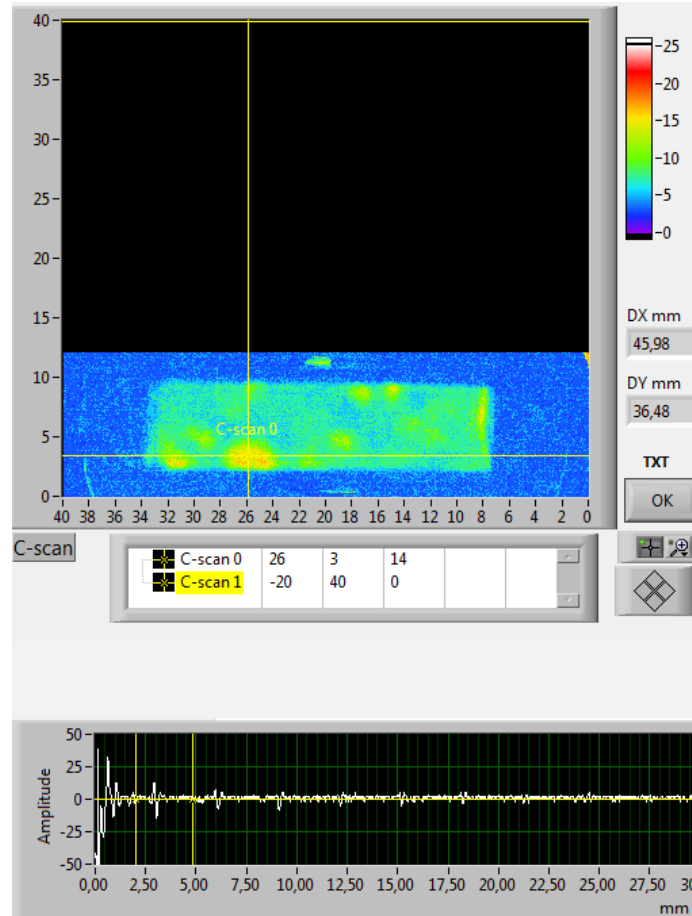
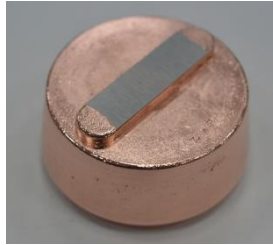
Manufacturing progress: UT results after Cu casting



C-scan W/Cu interface:
large bubbles detected

Manufacturing progress: UT results after Cu casting

FT01-001

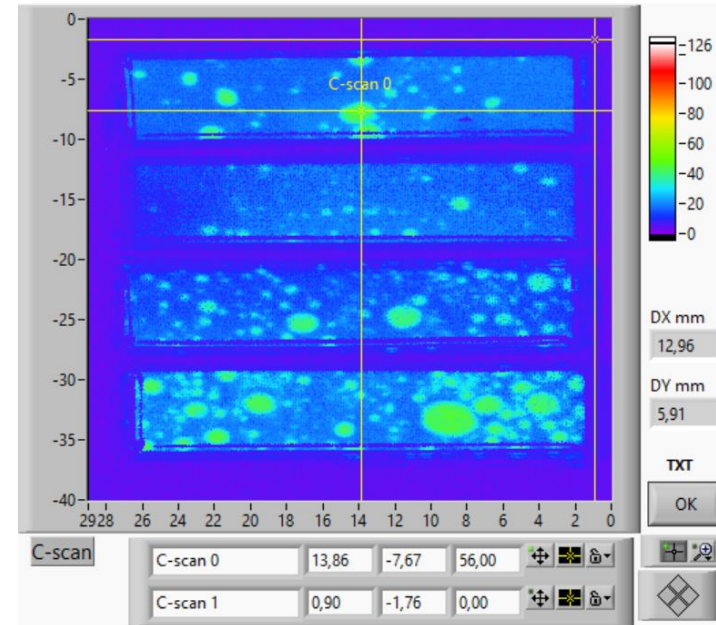
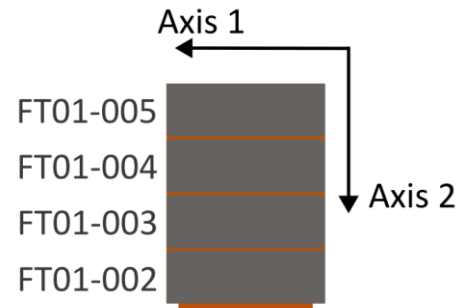


C-scan W/Cu interface:
large bubbles detected

- The results at the junction are still unsatisfactory.
- Casting process parameters and equipment are under optimization.
- Samples FT01-002, 003, 004 and 005 will still be used for a first HRP test.
- In parallel, casting activities will continue to improve the quality of the joint.
- Brazing of W- FTs on Cu block will be also investigated.

Manufacturing progress: UT results after block-shaped machining

UT examination from the W side



C-scan W/Cu interface

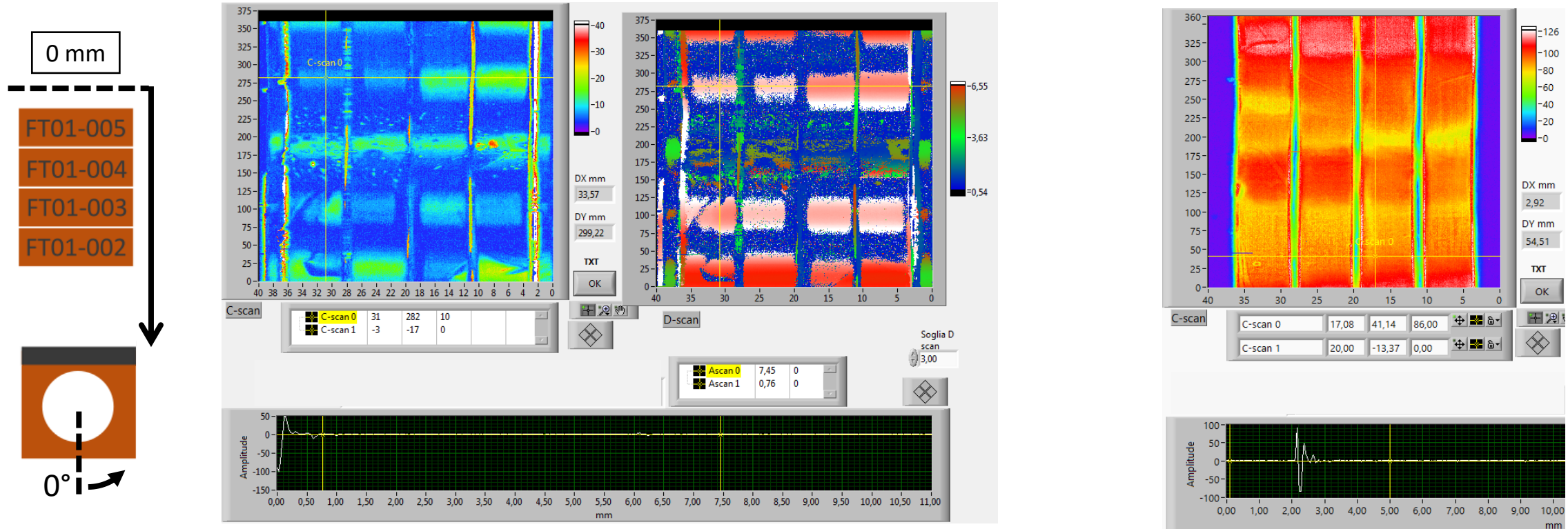
- Large bubbles detected.
- The best casting result confirmed for FT01-004.
- No new detachment due to block-shaped machining.



Flat-tile dome extremity manufacturing

Manufacturing progress: UT results after block-shaped machining

UT examination from the inside the Cu block hole



C-scan (left) and D-scan (Right) inside the Cu blocks:

No defects inside the Cu casting

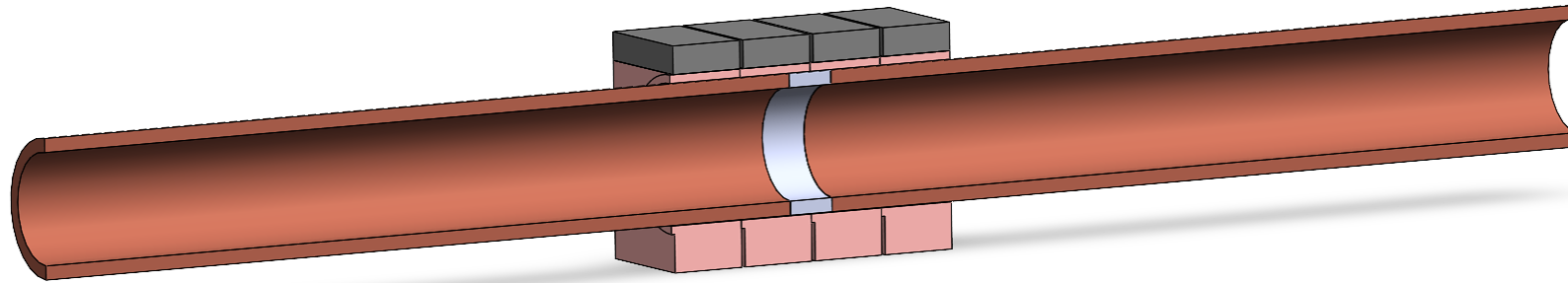
Back wall echoes clearly visible from the lateral and bottom sides

Bubbles at the interface Cu/W disturb the echo visibility from the HHF side

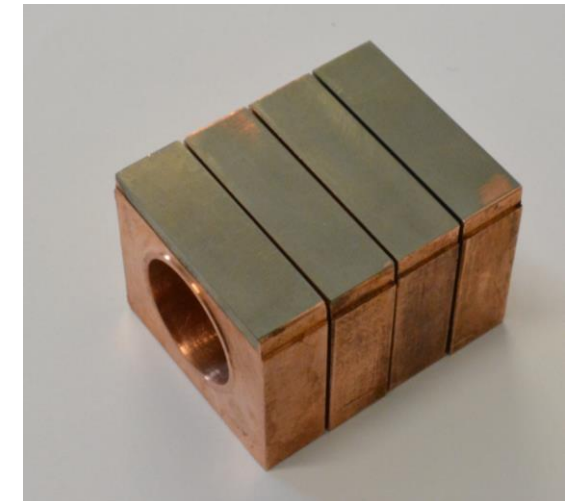
C-scan Cu internal hole surface:

No remarkable defects -> good surface machining

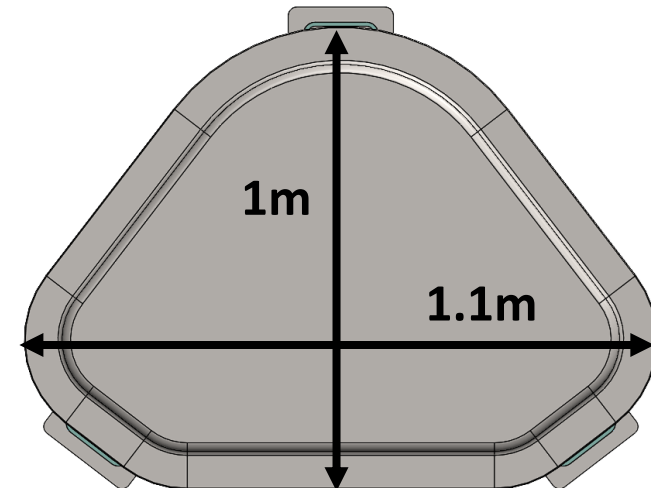
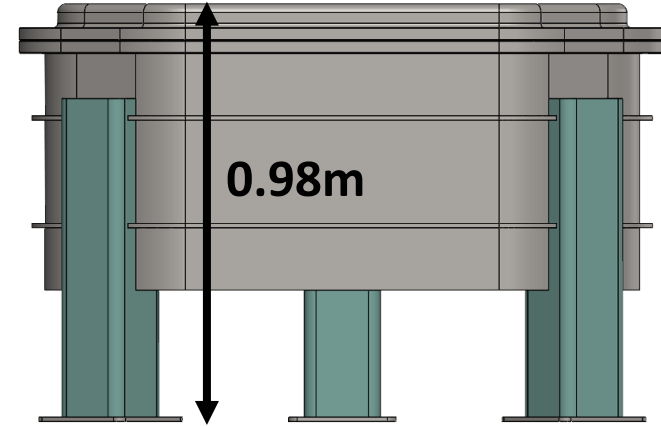
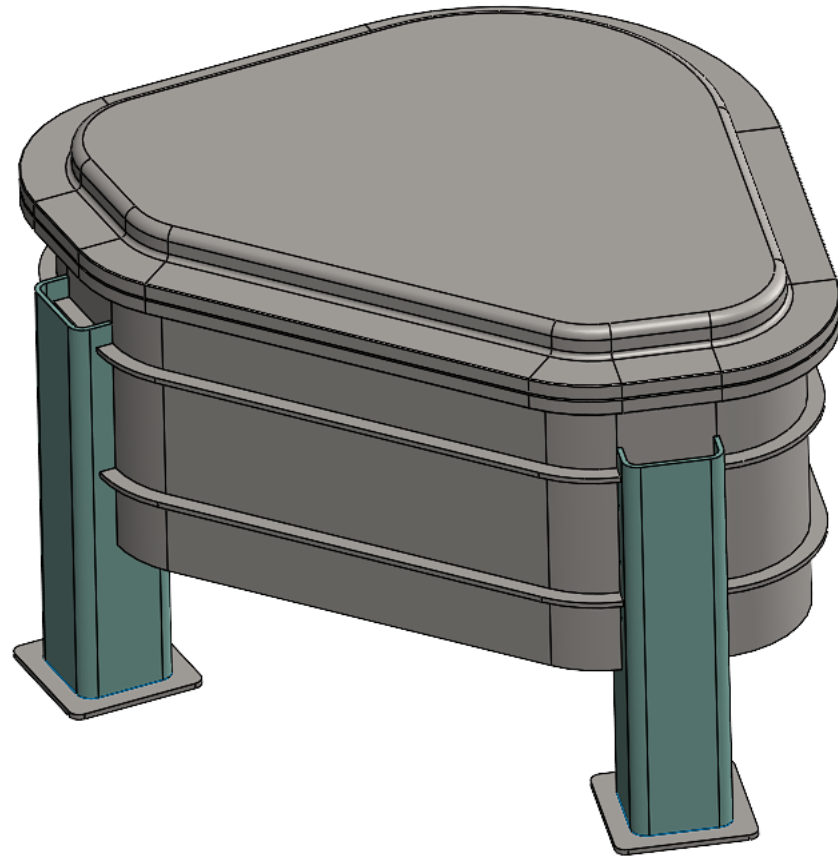
Manufacturing progress: HRP with Cu/W flat tile blocks



- Despite the presence of bubble at W/Cu interface an HRP testing will be performed with the monoblocks FT01-002, FT01-003, FT01-004 and FT01-005
- HRP process is planned between 24th and 28th July

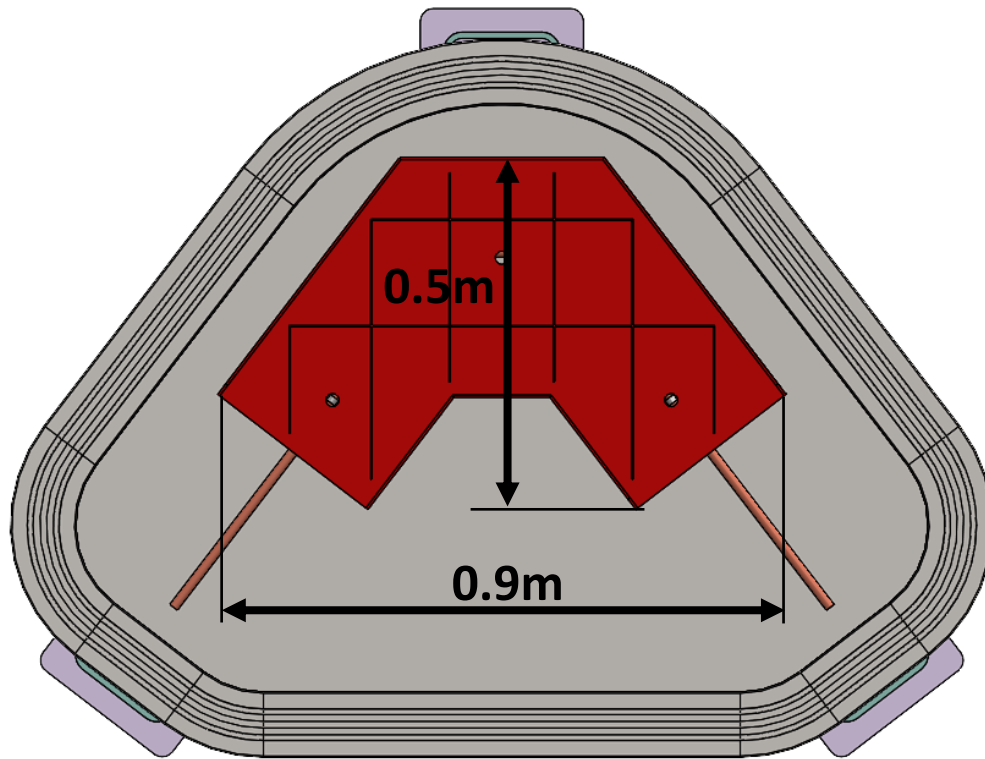


Design progress: vacuum chamber (cold chamber)

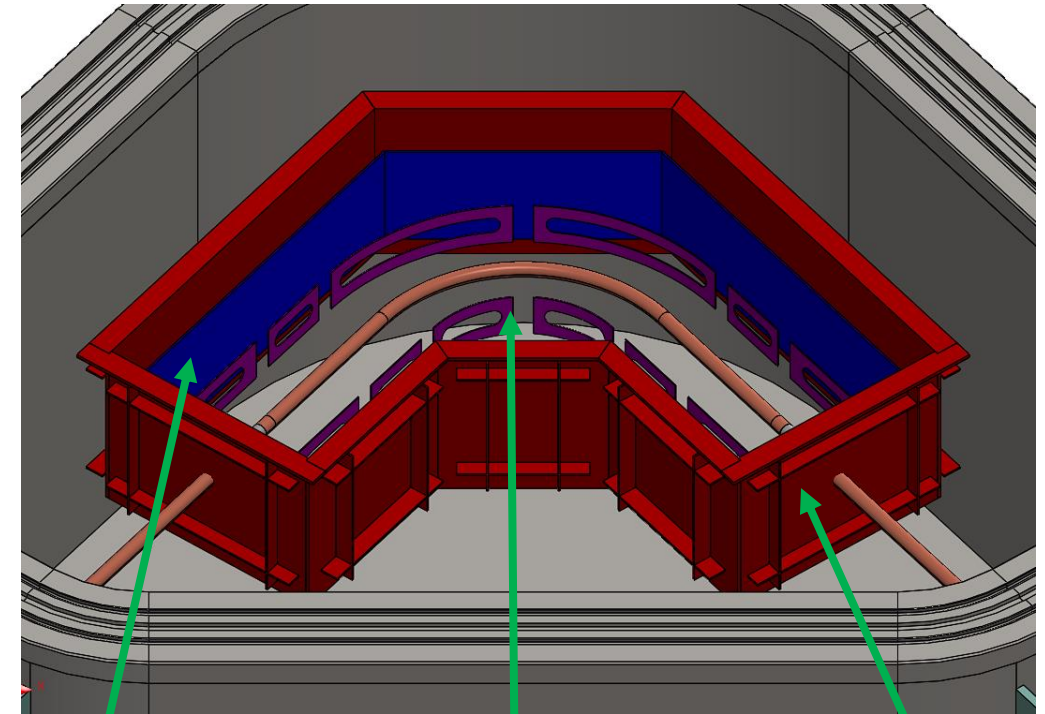


- Actively cooled vessel with internal volume of 0.5m^3

Design progress: hot chamber, thermal shield and heating



- The definition of the hot chamber shape is needed for the design of the heating system (e.g., heating elements, required heating power) and of the thermal shield.



Thermal shield

Heating elements

Hot chamber

Procurement progress

- The definition of the cold chamber (internal volume of 0.5m³) allowed to select the proper pumping system. The procurement is already ongoing.
- The procurement of the components for the pressurization system as well as the control systems (e.g., thermocouples) has been already launched.
- The control software will be the same already developed and used to produce the ITER IVT.



Dual-stage, high-performance rotary vane pump with a pumping speed up to 70 m³/h



powerful turbopump with a pumping speed of up to 790 l/s



Thank you for your attention!

F. Giorgetti

Contributors: G. De Sano, P. Lorusso, A. Mancini, L. Verdini, E. Cacciotti, A. Satriano and S. Roccella

WPDIV-IDTT Midterm Monitoring Meeting for AWP 2023 – July 17-19, 2023 -Frascati



Italian National Agency for New Technologies,
Energy and Sustainable Economic Development



This work has been carried out within the framework of the EUROfusion Consortium and has received funding from the Euratom research and training programme 2014-2018 and 2019-2020 under grant agreement No 633053. The views and opinions expressed herein do not necessarily reflect those of the European Commission.