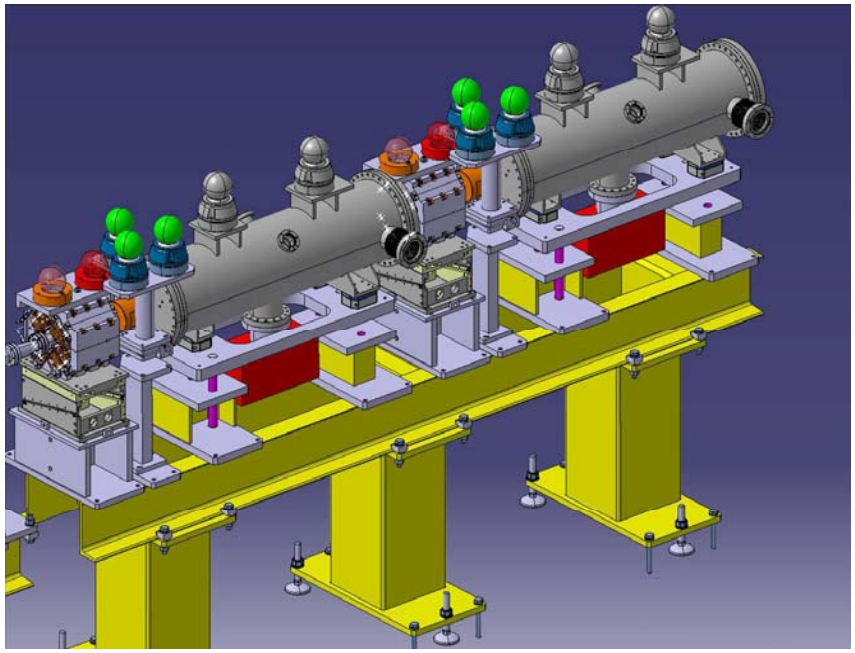
Progress on TBL PETS prototype and movers



Courtesy N. Chritin, CERN

MINISTERIO DE EDUCACIÓN Y CIENCIA

Ciemat
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas

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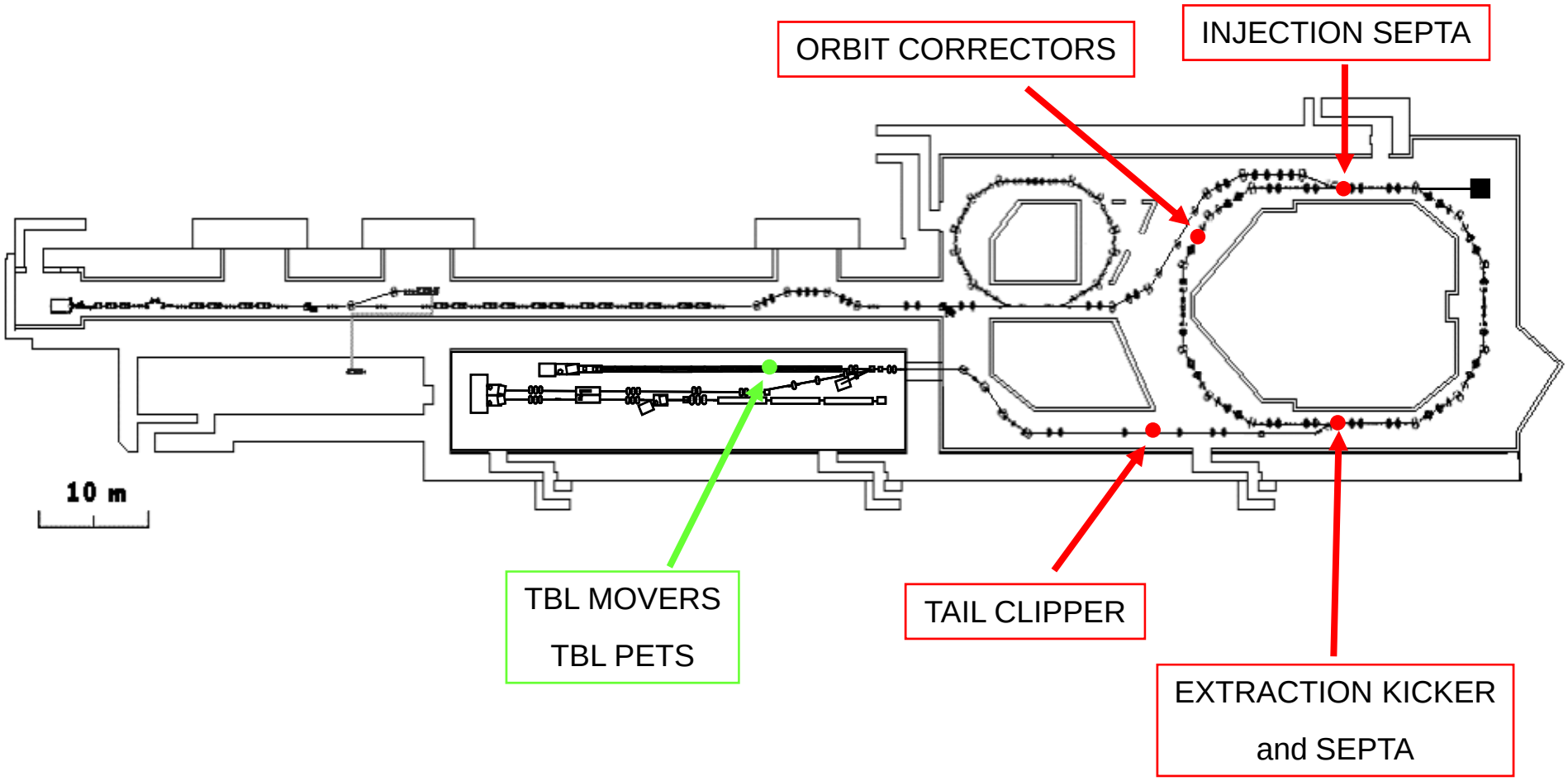
N. Chritin, S. Doebert, I. Syratchev, CERN

CERN, 28/01/2009

CIEMAT contribution to CTF3



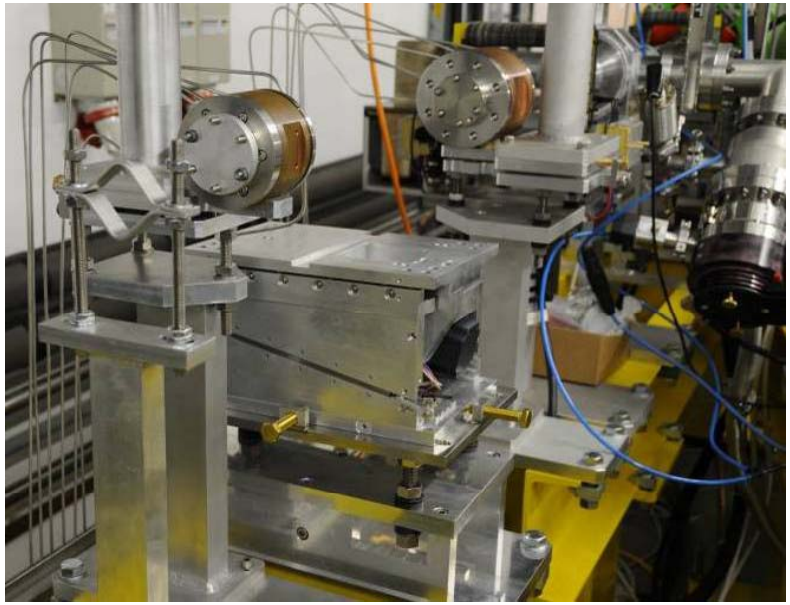
Outline

- ✓ TBL Movers prototype and series
- ✓ TBL PETS prototype
- ✓ Near future plans

TBL movers prototypes

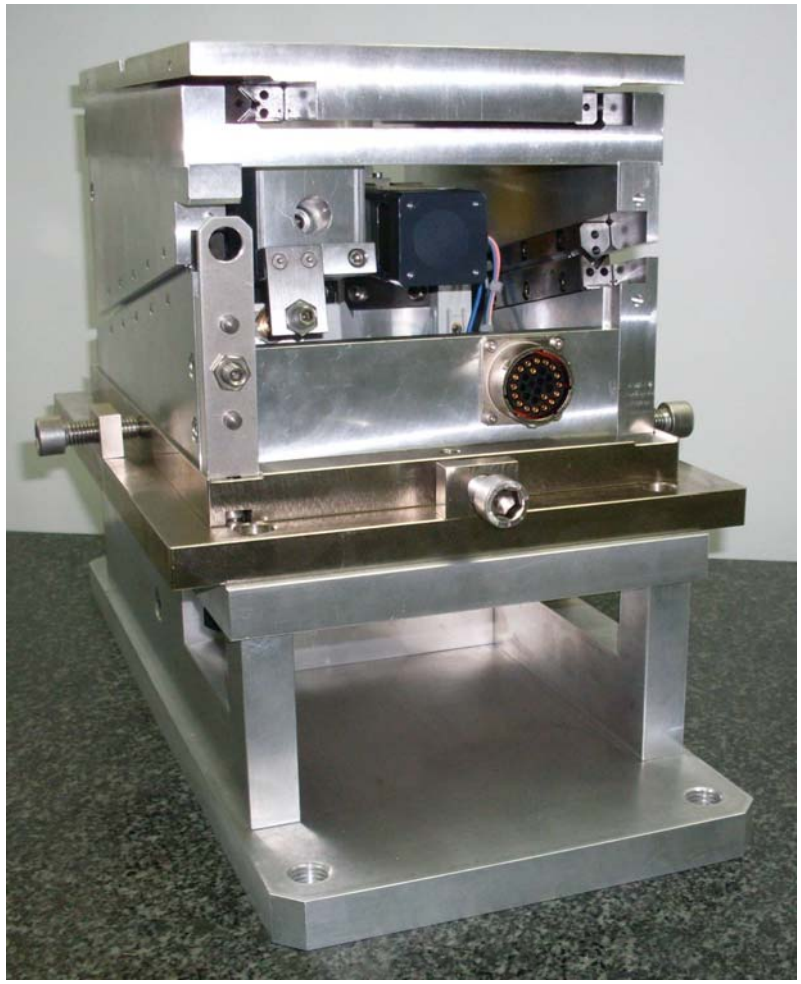
Length	<200	mm
Stroke	+/- 4	mm
Position resolution	1	micron
Position reproducibility	+/- 5	micron
Movement speed	>0.5	mm/s
Distance from driver to motor	up to 50	m
Mass to move	~50	kg
Number of units	16	

- The first prototype was successfully developed in 2007.
- Two additional units have been fabricated in 2008 to qualify two firms more for the series production.



TBL movers series production

- Minor design modifications for series production:
  - More reliable switches
  - CERN-type connector
- The order has been placed to Index (Spanish company).
- Series supports will be delivered in week 8 to allow the complete TBL beam pipe installation.
- Movers will be finished next July.



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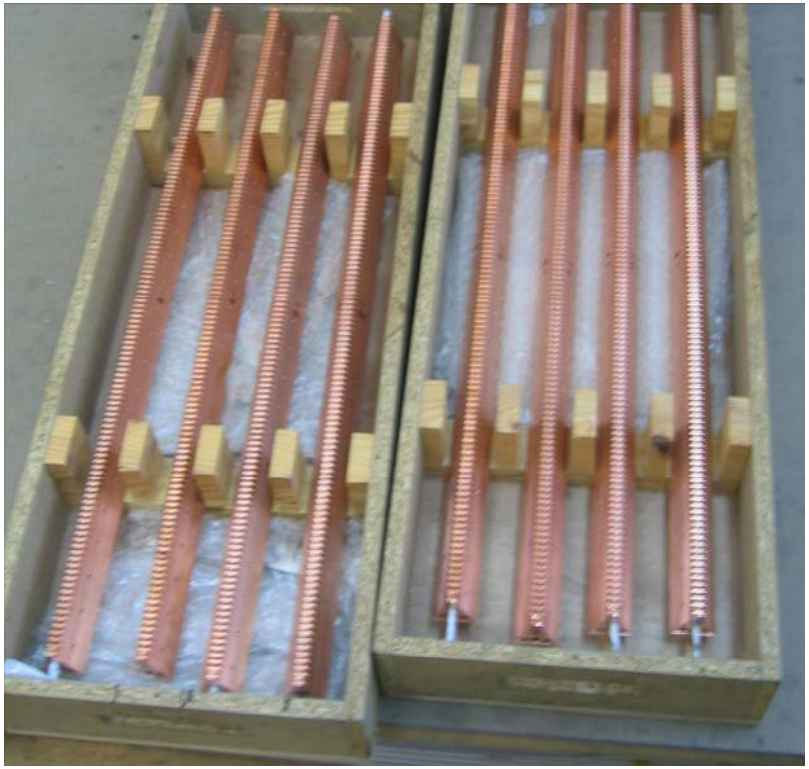
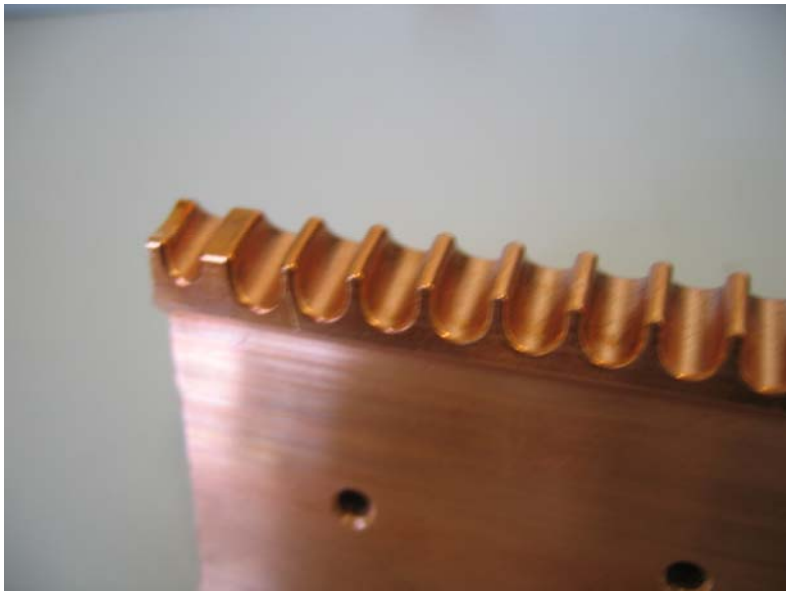
OFE copper rods fabrication

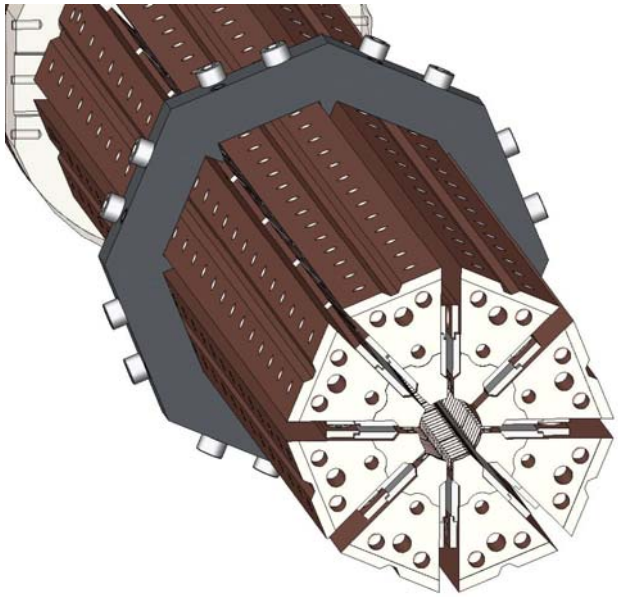
- Eight OFE copper rods have been fabricated at Utillajes Huerta (Spain).
- The temperature control in the company was not good enough, and production was stopped in summertime.
- Problems with internal stress release to achieve the requested tolerances (+/- 20 microns).





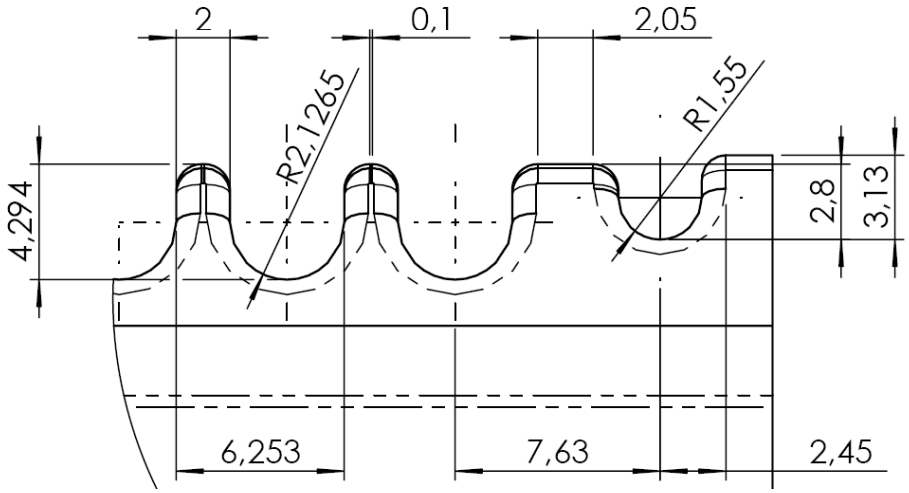
Copper rods dimension control (I)

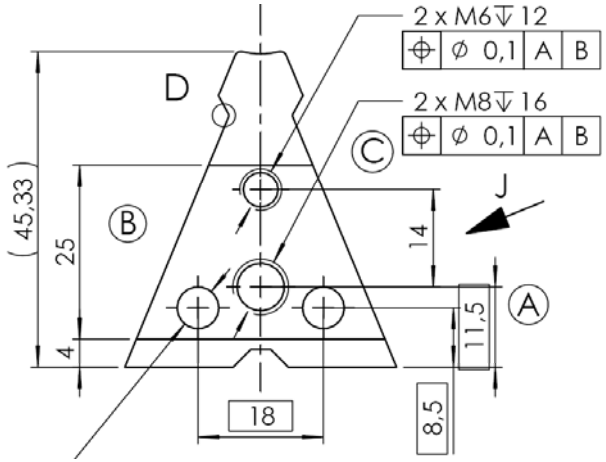
- We have used a fully automatic 3-D measurement machine, to enhance measuring reproducibility:
  - Some uncertainty when the sensor ball touches a curved surface with a small curvature radius if the approach is not perpendicular.
  - Direct comparison of the 3-D model with the machined piece.
- There is a sag up to 0.2 mm in the central part of 4 rods if they lay free:
  - We expect to compensate it with the intermediate support ring and the proper assembly of the rods.
  - Machining after second heat treatment was only 0.5 mm deep, but we got such deformation.
  - We preferred not to change the procedure once series production was started.



Copper rods dimension control (II)

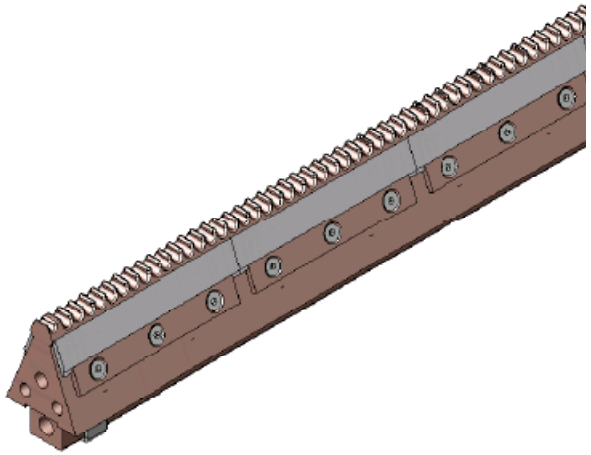
- The teeth position is within tolerances. Some measurements are out of tolerances by 20-40 micron, due to the central sag or random errors, but do not imply a wrong shape.
- The side faces (where the RF absorbers should be placed) are between 0.1 and 0.2 mm bigger, due to the wrong nominal dimension of the tool and its fast erosion. This part is not very sensitive, and we decided not to machine it again.

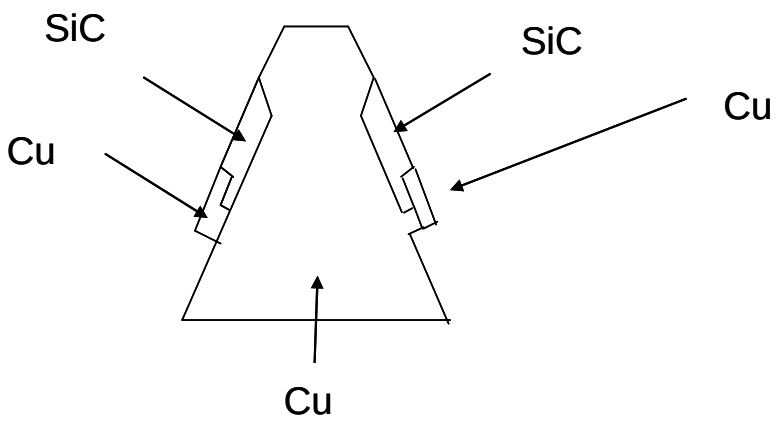




RF absorbers

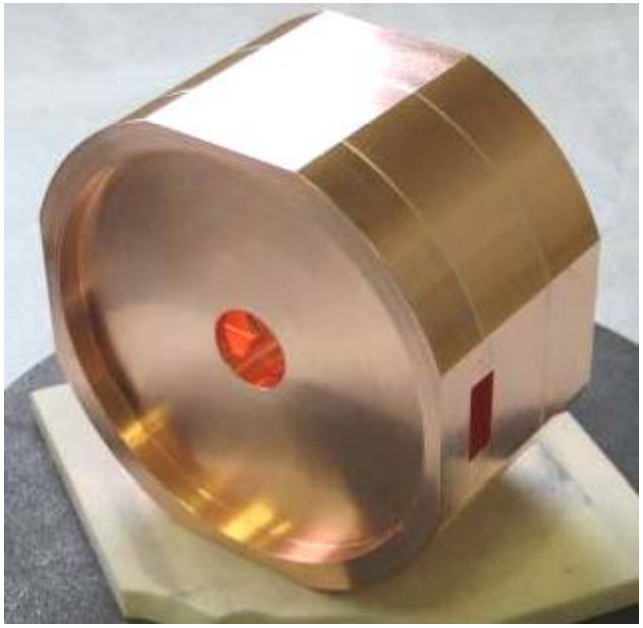
- RF absorbers are necessary to damp HOM.
- Up to now, all the materials tested have not fulfilled the required properties (tan δ ~ 0.3, ε ~ 30).
- Aluminium nitride samples from Ceradyne did not performed as reported in the catalogue. Their electrical conductivity was very high.
- We are willing to continue our contribution to this task.





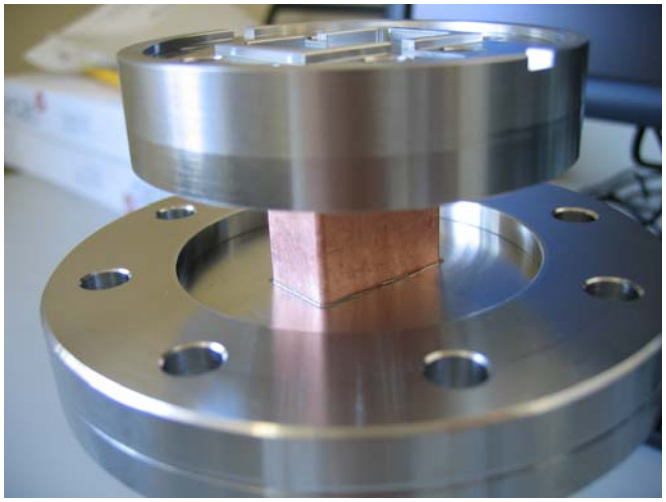
Power extractor

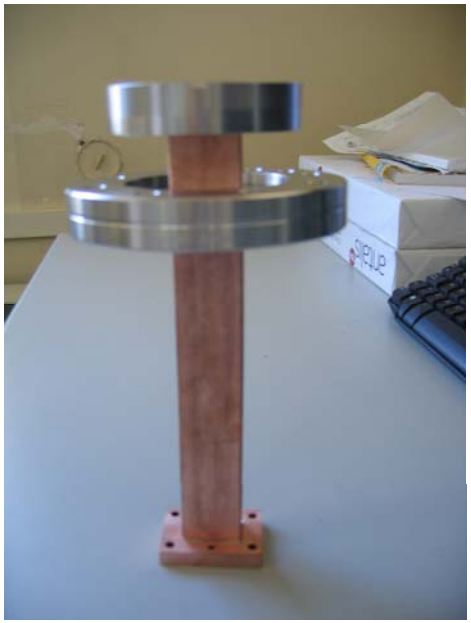
- A lot of problems for the brazing of the extractor at AIMEN (Spain): the alloy poured out and spoiled RF surfaces.
- Successful brazing at CERN (S. Mathot). We are analyzing the reasons: possible lack of flatness of the contact surfaces.
- Next step is to machine the holes for the screws and pins to hold the copper rods.
- Opposite part already finished, ready for ultrasonic bath cleaning.



Waveguides

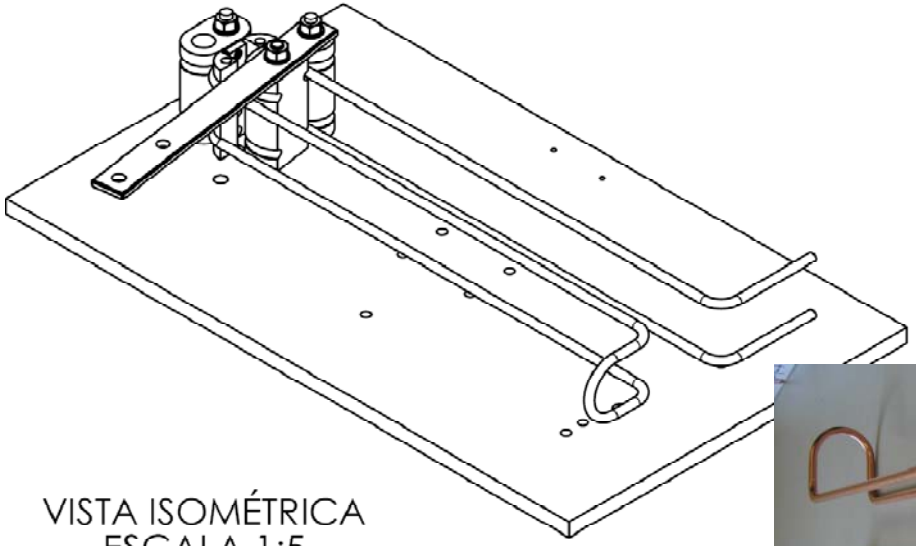
- AIMEN decides to use nickel-gold alloy for brazing.
- Some concerns at CERN, but it is used at SLAC.
- It allows for another brazing cycle if any leak is detected.
- The first waveguide has been bent during shipping.
- It is not the bottle neck because it is the last step of the assembly.





Cooling system

- Two custom connectors with Helicoflex gaskets are brazed.
- Special tooling is necessary for proper pipe bending.
- Dummy pipe successful. Four pipes sent for brazing.



VISTA ISOMÉTRICA
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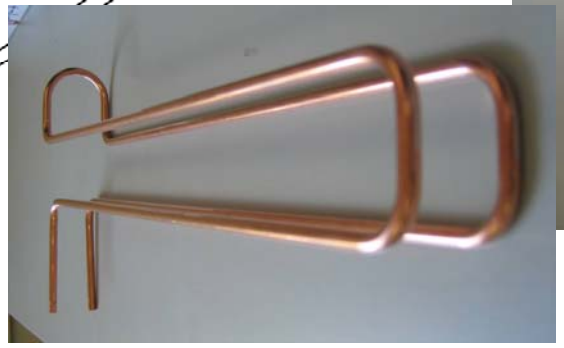
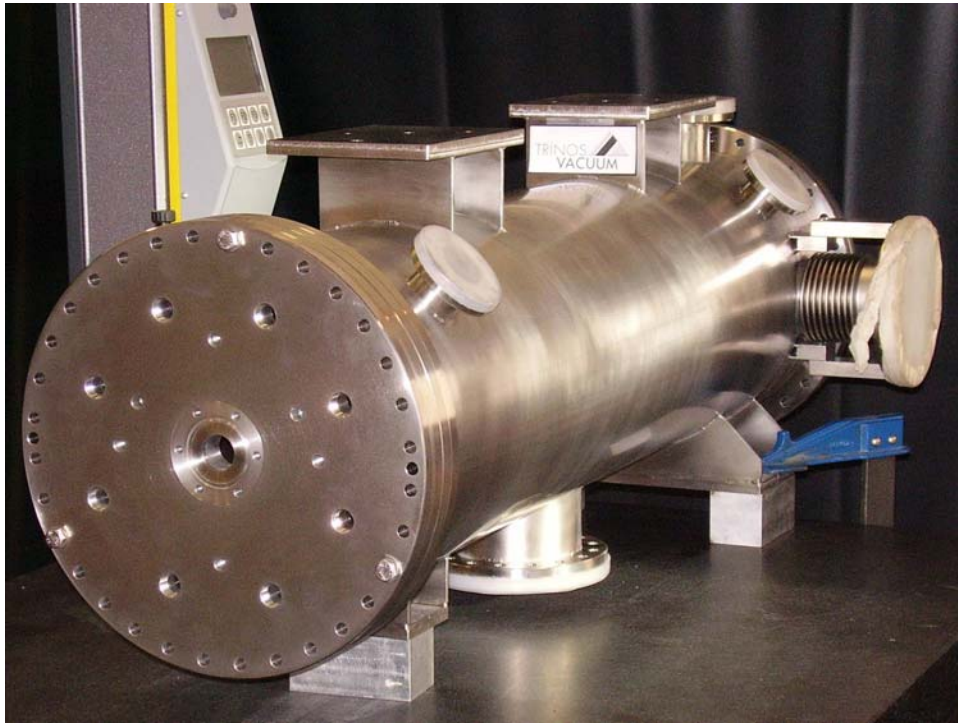


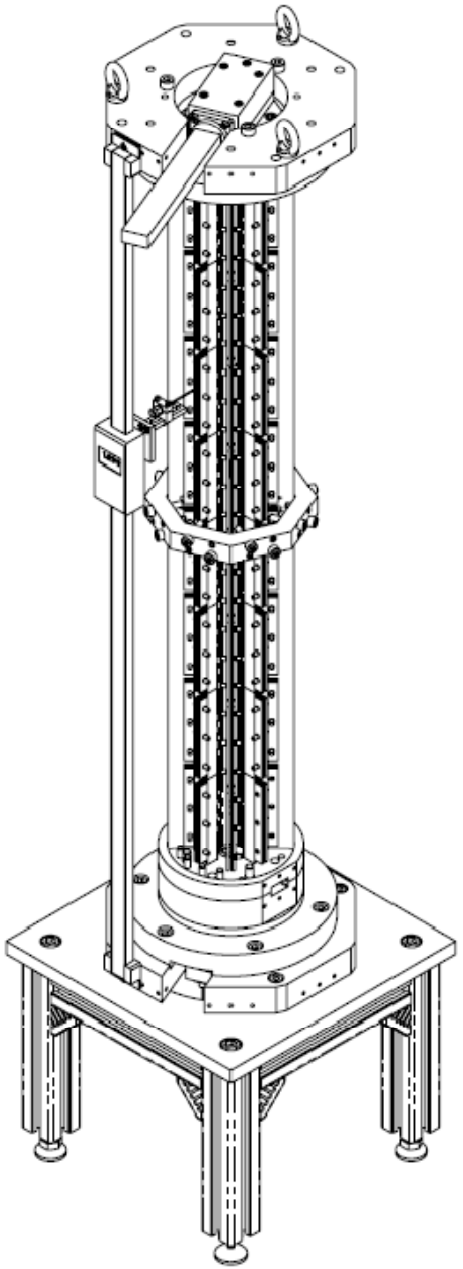
Vacuum tank

- Finished except leak test.
- Final length below 1 m: 986 mm
- 316LN flanges
- Ports for pumping and instrumentation (temperature sensors).
- Fiducials and main supports according to CTF3 standards.
- As the inner parts are referenced to the endplates by pins, their position is directly transferred to the outer side, and available for alignment.
- Auxiliary plates to avoid below compression during pumping and for RF waveguides support.



Assembly

- Vertical assembly of the copper rods on top of the power extractor, with the central ring.
- RF measurements with the antenna.
- The assembly is lifted, and the tank endplate positioned below the copper parts, referenced by two 8 mm pins.
- Cooling circuit and temperature sensors clamping.
- Tank wall is placed.
- Waveguides assembly.
- Last endplate to close the tank, also with pins for reference.
- Leak test.



Near future schedule

- Mover series is ongoing with a qualified company.
- PETS copper rods assembly for low power RF measurements.
- PETS tank assembly.
- Meeting to organize further work on RF absorbers.
- Meeting to plan the fabrication and funding (shared with CERN and other partners) of the next seven PETS, in principle with the same design than the prototype.