



This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under GA No 101004730.

# Task 9.3 Progress @ INFN

Liquid Tin Diffusion system progress

3<sup>rd</sup> iFAST annual meeting – Paris, 16 April 2024

Giovanni Marconato – INFN Legnaro National Laboratories

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# Nb<sub>3</sub>Sn Cylindrical target production by liquid tin diffusion (dipping)

**Problem:** Nb chamber oxidation with resistive heating in air

**Solution:** New custom vacuum chamber system that contains the Nb chamber and new inductive heating system

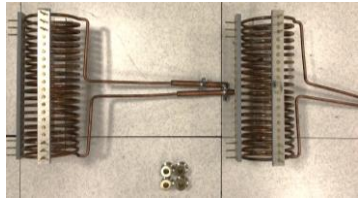
## New features:

- Integral chamber cooling;
- 2 viewports for monitoring;
- Isolated vacuum systems (external chamber + internal Nb chamber) for better control
- 3 kW total power
- Process entirely automated and remotely controlled
- More reliable system and more accurate temperature control



# CUSTOM INDUCTORS TESTED

Previous meeting:



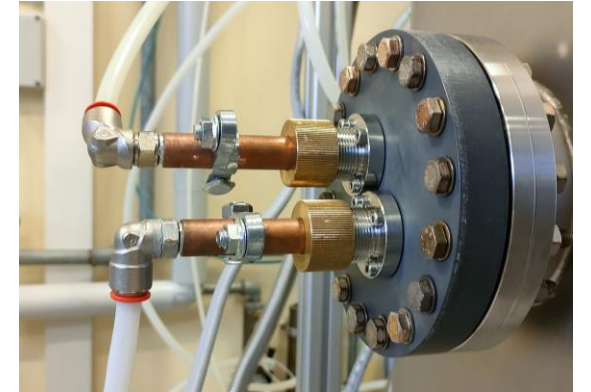
All instruments arrived at LNL



New developments:



System completed



Custom insulating flanges already tested ✓

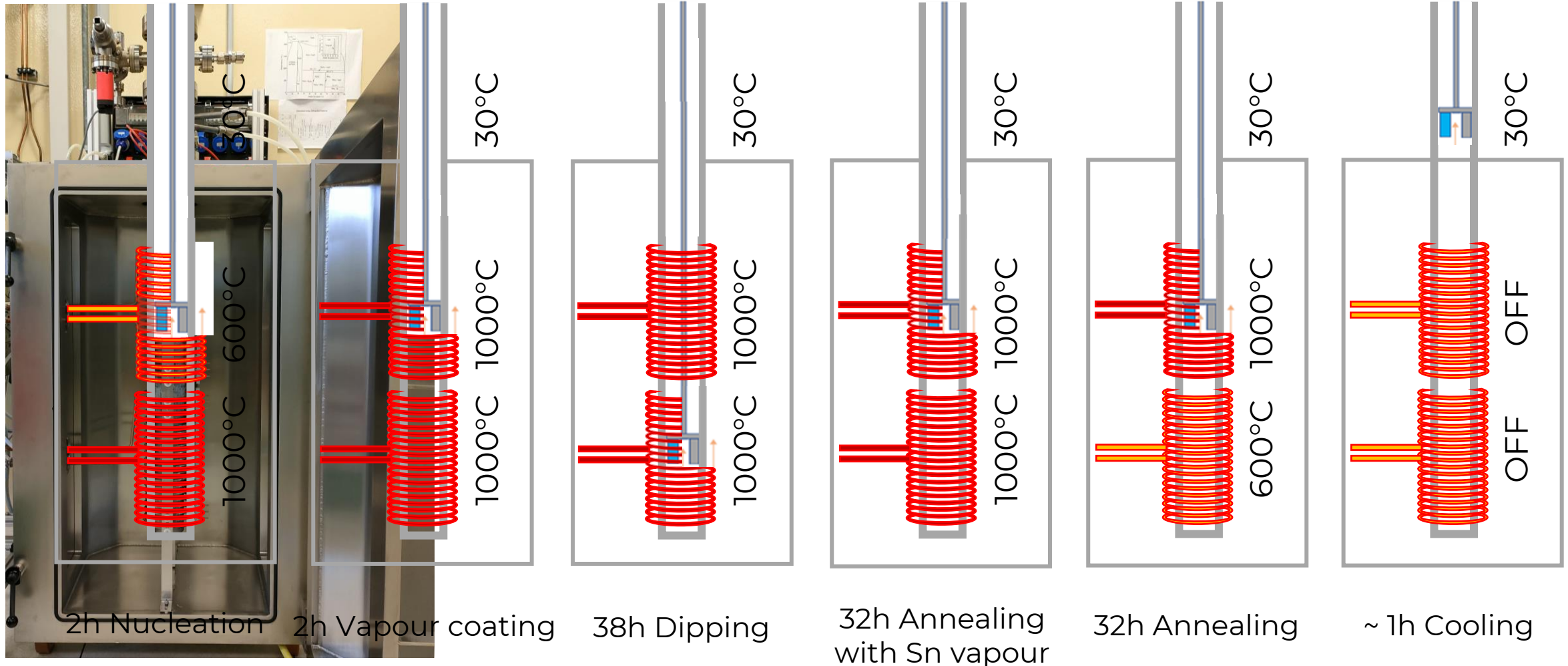
# NEW SYSTEM ASSEMBLED

(External vessel and control part assembled, missing the Nb chamber)

- ✓ System assembled and leak checked
- ✓ Inductors manufactured and tested
- ✓ Custom control system
- ✓ Custom vacuum feedthrough for inductors
- ✓ Custom insulating flanges for inductors manufactured
- ✓ Inductors final testing
- ❑ Inductors refinement
- ❑ First process within next month
- ❑ New master student currently training and will begin working on this project shortly
- ❑ In June we reasonably expect the production of the first targets for 6GHz cavity



# DIPPING PROCESS PREVIEW





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NbTiN/Cu 6GHz cavity RF test

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# 6 GHz RF tests

- 2 cavity from STFC to measure

- ✓ Nb on Cu

- **NbTiN on Cu (sputtered on top of a previous coating)**



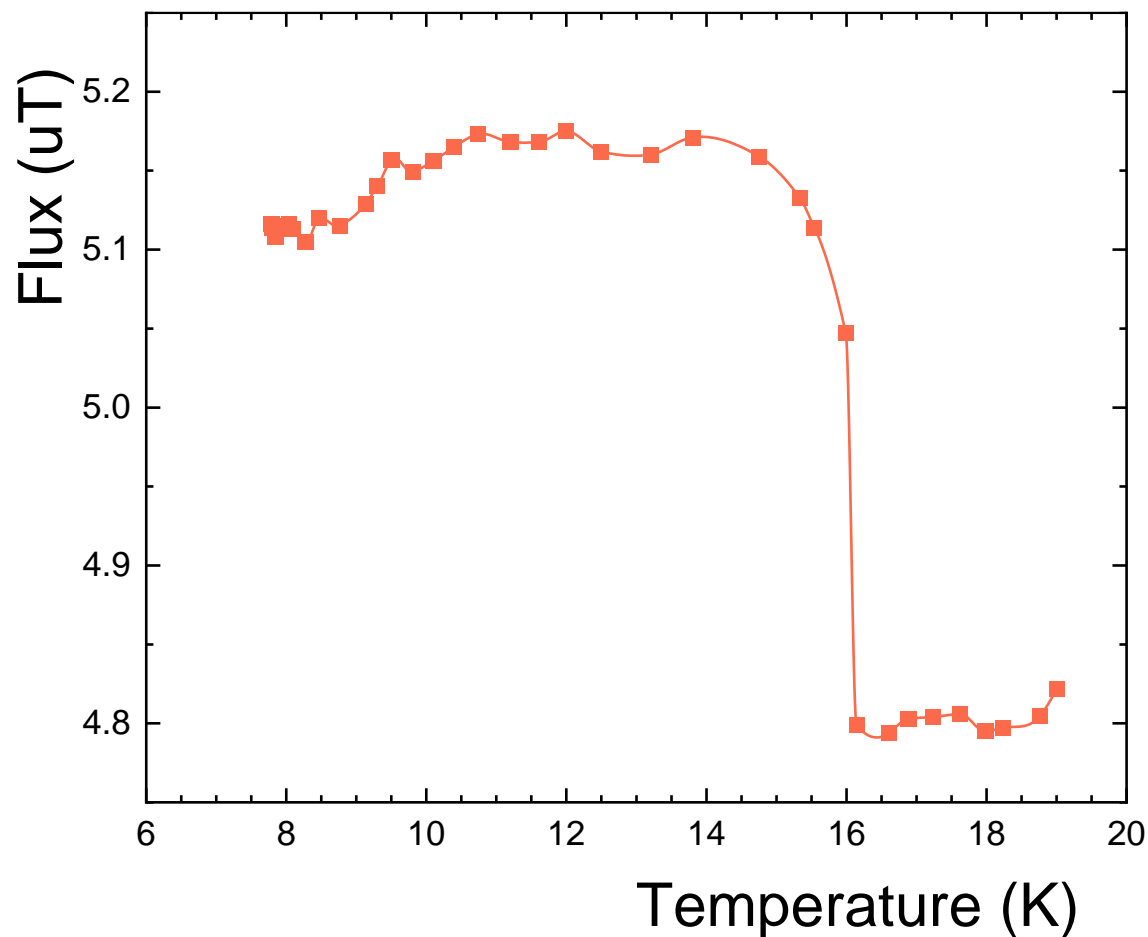
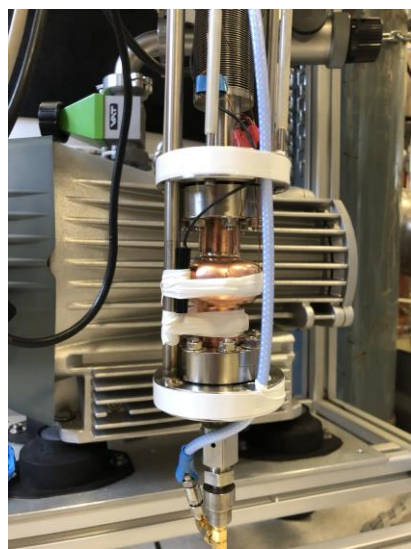
- HPR passed successfully
  - Leak on a flange → Flange machining necessary
  - RF test done @4.2 K, planned @1.8 K within a few weeks

# 6 GHz RF tests



Leak probably due to scratches on the flange surface.

Critical temperature measured through magnetic flux expulsion

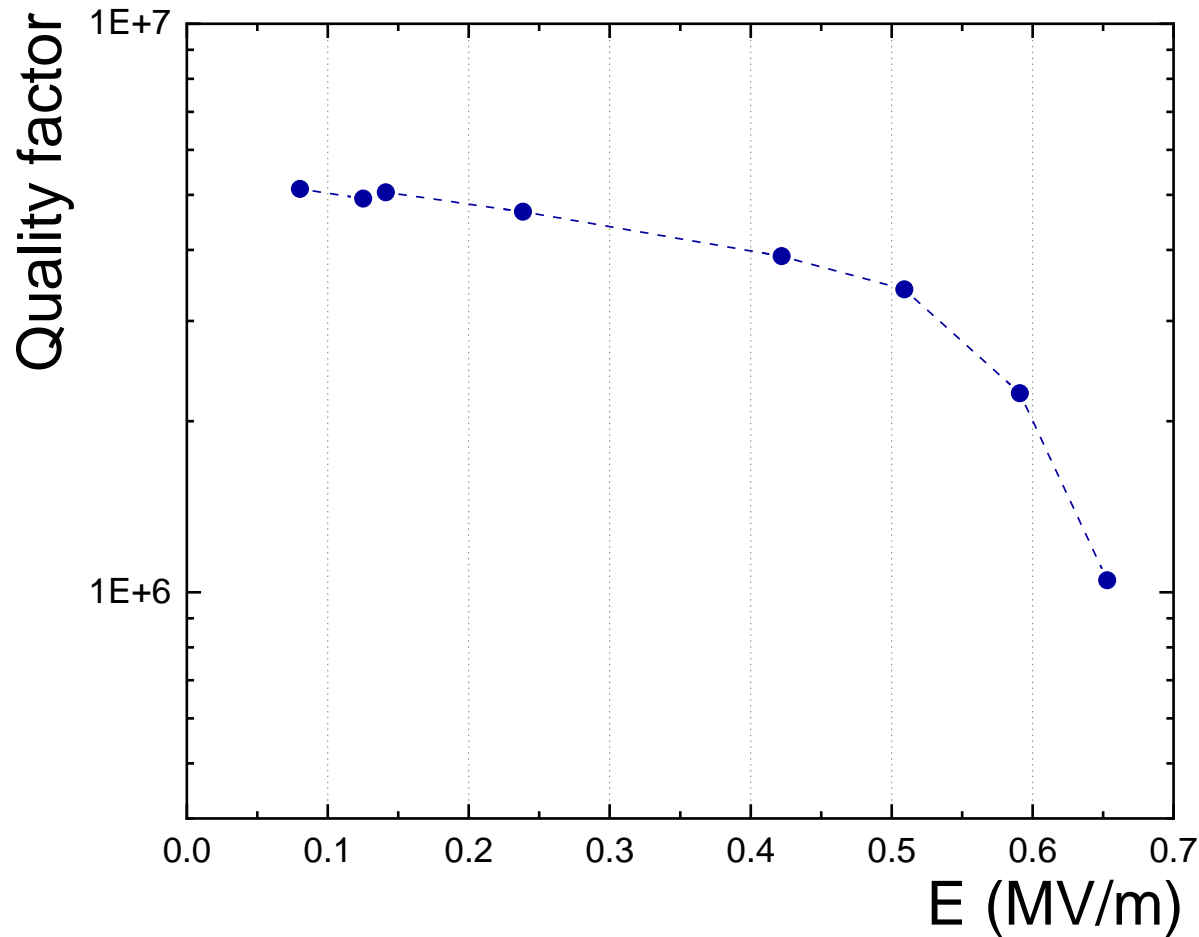


**Critical temperature**

**~16 K**

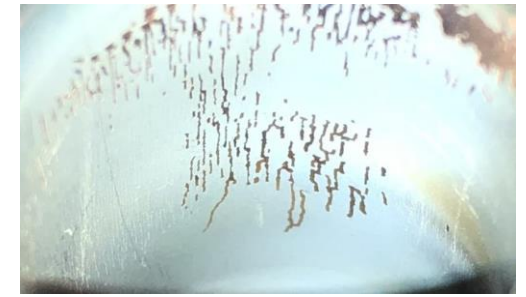


# 6 GHz RF tests



**Quality factor vs.  $E_{acc}$  (4.2 K)  $5 \cdot 10^6$**

Delamination of the film on the cutoff observed



Problems during 1,8 K cooldown due to pumping and thermometers failure

- Cavity still mounted to avoid contamination
- Measure rescheduled within the end of April
- Internal inspection after measure

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**Thanks for your attention**



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