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# WP 9.3 progress at INFN-LNL on $\text{Nb}_3\text{Sn}$ films R&D via DCMS

I.FAST 13<sup>th</sup> WP9 meeting

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# Outline

- Status of DCMS for Nb<sub>3</sub>Sn thin films R&D
- Status of new 1.3 GHz sputtering system
- Status of samples exchange
- AoB and conclusion

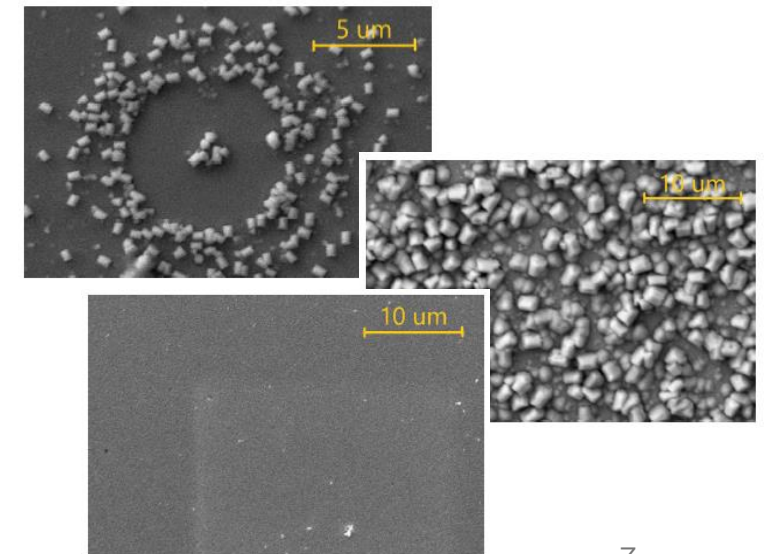
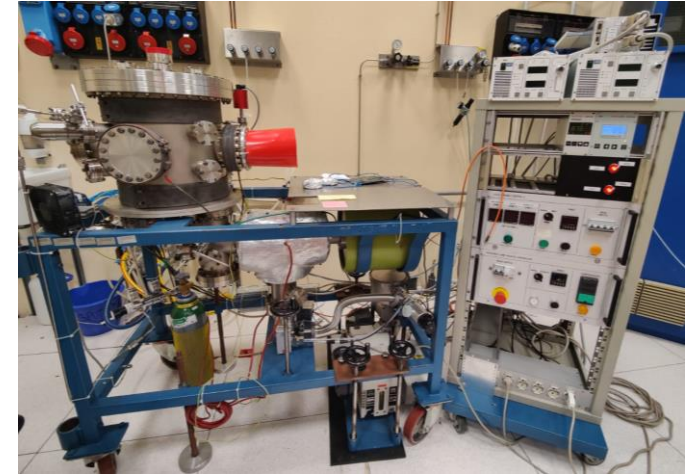
# Status of DCMS for Nb<sub>3</sub>Sn thin films R&D

## Depositions with 4" sputtering system:

- R&D on small samples for recipe optimization coming to an end
- now focus is on QPR and samples for investigation of additional properties

## New 2" sputtering system

- operation validated and recipe developed for 4" system demonstrated/reproduced:  $T_c = 17.5$  K on Al<sub>2</sub>O<sub>3</sub> substrate
- **next steps:**
- reproduce recipe on NbBL/Cu substrates
- nucleation of Sn-rich islands nucleation



# Status of new 1.3 GHz system

## Objective:

- «Hybrid» coating system for 1.3 GHz cavities
  - **Rectangular fixed magnetron & rotating cavity**
  - Post magnetron configuration with Nb<sub>3</sub>Sn cylindrical target produced via dipping

## Rectangular magnetron:

- parts delivery expected for **February 2025**
- Nb<sub>3</sub>Sn target (300 mm length by design) purchased (2x config.):

Length: 100 mm (3x)

**1** Width: 40 mm

Thickness: 3 mm, 5 mm

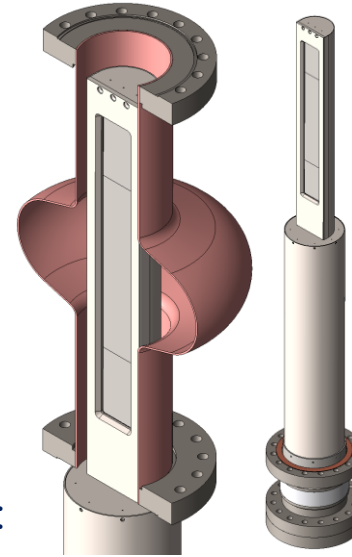
Length: 170 mm (1x) + 65 mm (2x)

**2** Width: 40 mm

Thickness: 3 mm, 5 mm

## Cavity flanges:

- CF style with cavity «lip»
- Base CF100 is double-sided
- did not pass leak test: new design in progress



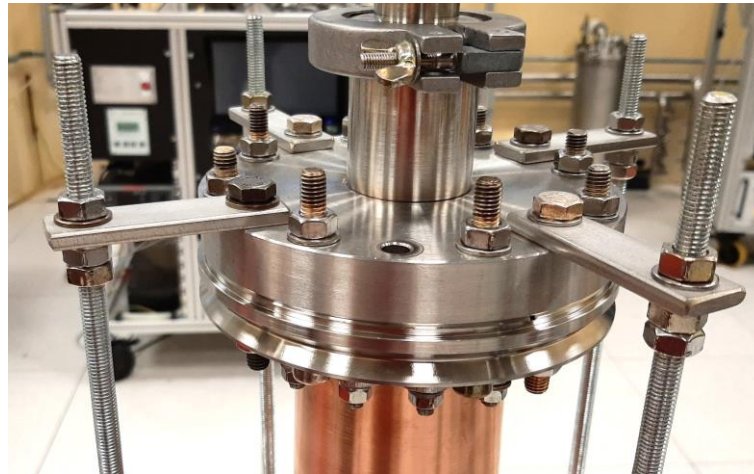
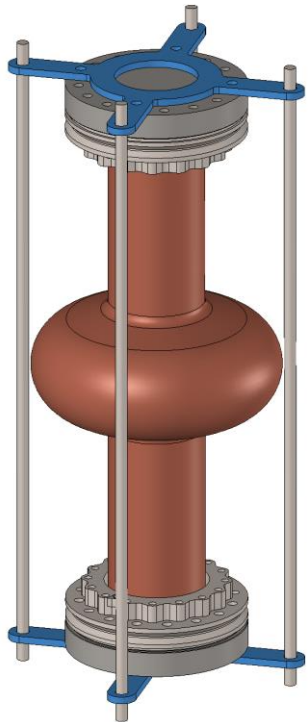
# Cavity Support Structure

After heat treatment (4 h @ 600 °C): **cavity collapsed**



New support:

- 4 stainless steel bars (M8) tested successfully, with ongoing design improvements



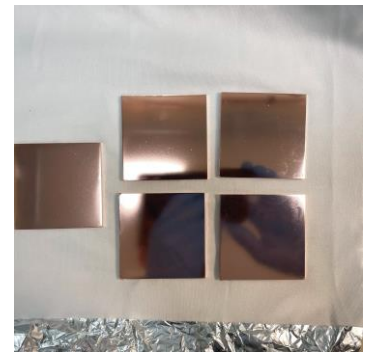
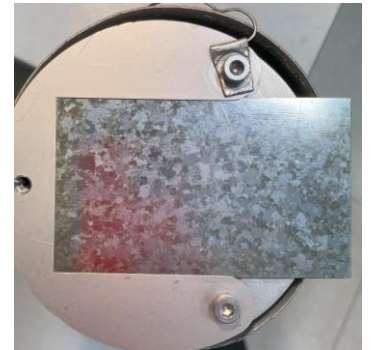
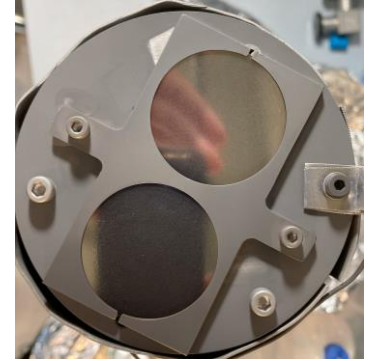
# Travelling samples

## Shipped:

- **DESY** (thermal conductivity measurement)  
2x disks Nb<sub>3</sub>Sn/NbBL-30/Cu  
2x disks Nb<sub>3</sub>Sn/Cu
- **HZB** (thermoelectric current measurement)  
1x slab Nb<sub>3</sub>Sn/NbBL-30/Cu  
1x slab Nb<sub>3</sub>Sn/Cu
- **HZDR** (FLA flash lamp annealing treatment):  
5x polished (SUBU) Cu substrates  
4x small samples Nb<sub>3</sub>Sn/NbBL/Cu (500 – 550 °C, NbBL-9/-30)

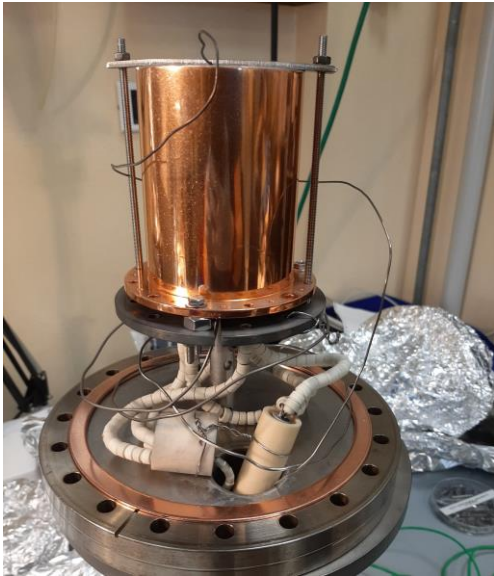
## In preparation:

- **CEA**: Nb<sub>3</sub>Sn/NbBL/Cu, Nb<sub>3</sub>Sn/bulk Nb (SC gap measurement)
- **HZDR**: 1x Nb coated 6 GHz copper cavity (FLA flash lamp annealing treatment)
- **HZB**: next slide



# QPR

- coated with NbBL-30, delaminated (issues with temperature during deposition)
- Nb coating stripped
- tested again for temperature gradient
- residual upper part removed mechanically (~ 100  $\mu\text{m}$ )
- to be polished (PEP) and coated (Nb<sub>3</sub>Sn/NbBL) soon



# Outlook

- **2x Nb<sub>3</sub>Sn sputtering systems** for small samples (4", 2") with 2" intended to test pulsed MS too
- **1.3 GHz sputtering system**: magnetron parts delivery by Feb2025, target purchased, cavity flanges to be improved, support needed for heat treatments...
- lively **collaborations** ongoing 😊