Task 9.5: Improvement of mechanical and superconducting properties of RF resonator by laser radiation.

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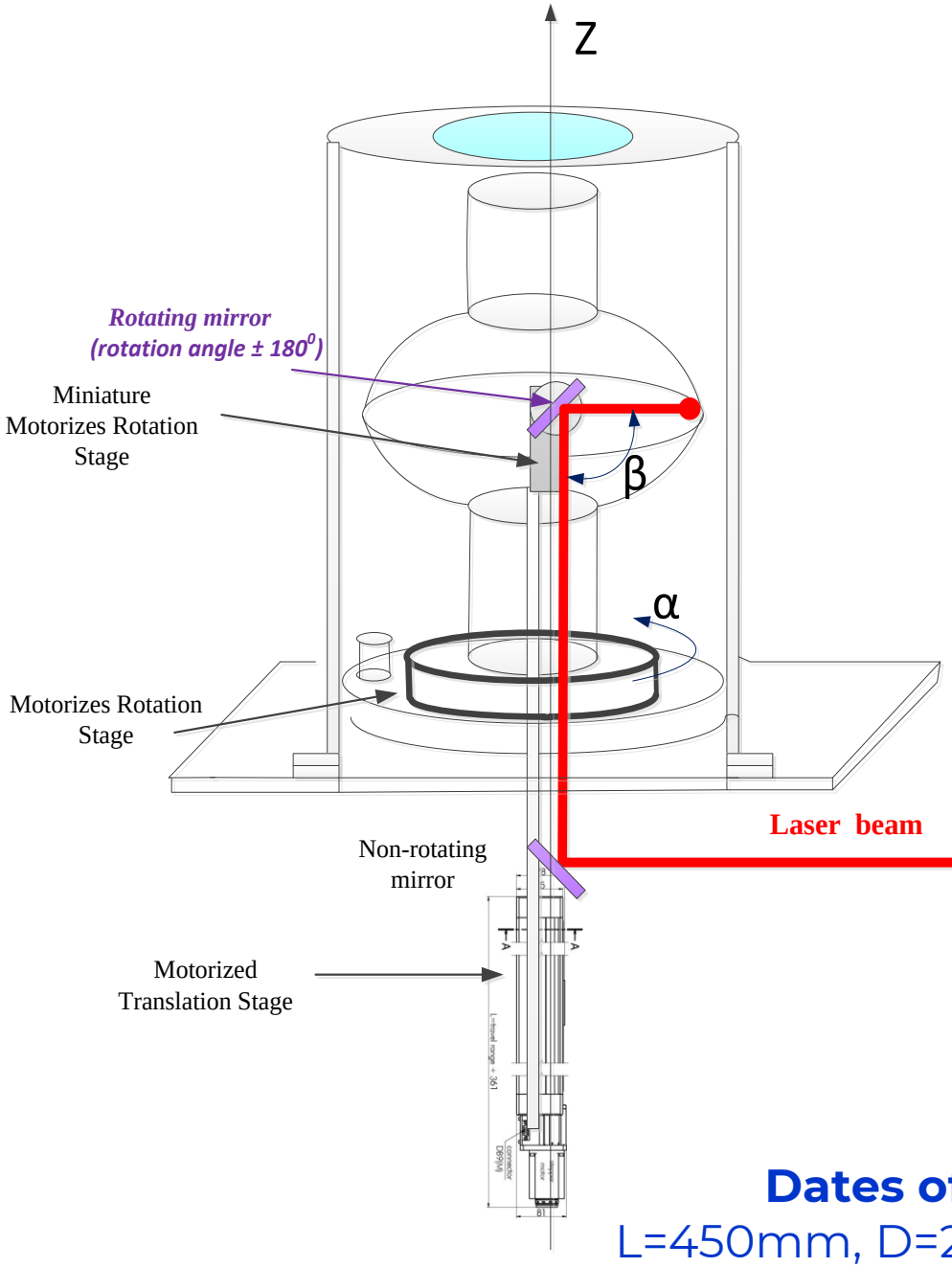
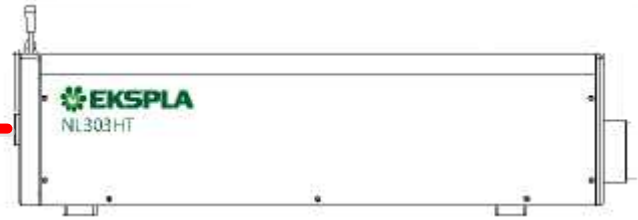


In an Ar gas chamber with an optical window, where a linear stepper motor (Z. coordinate) and a motorized rotating platform (α. coordinate) were installed.

A miniature rotation stage for mirror rotation (β. coordinate) is installed.

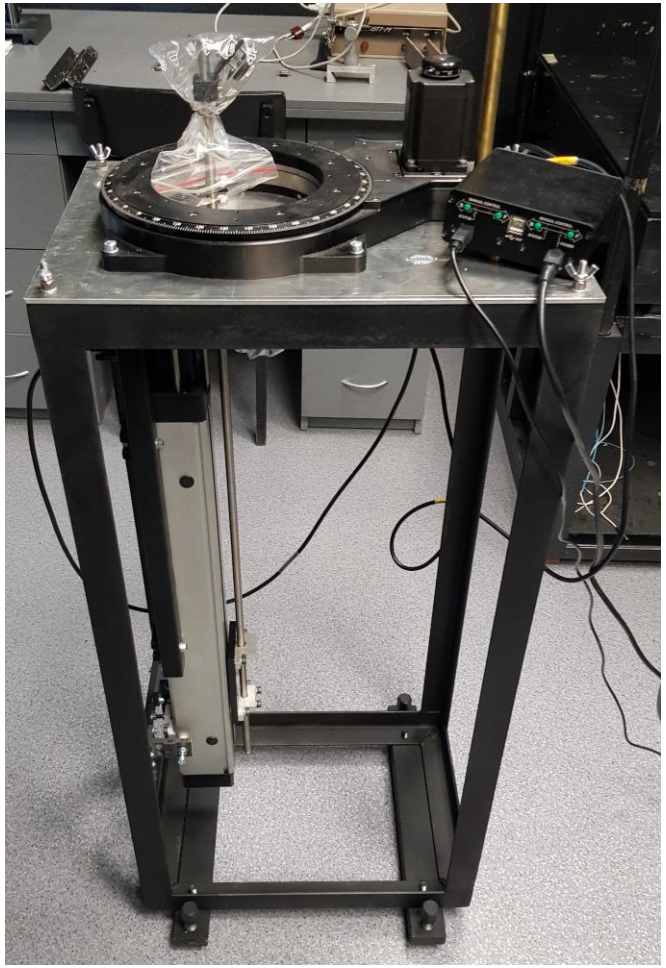


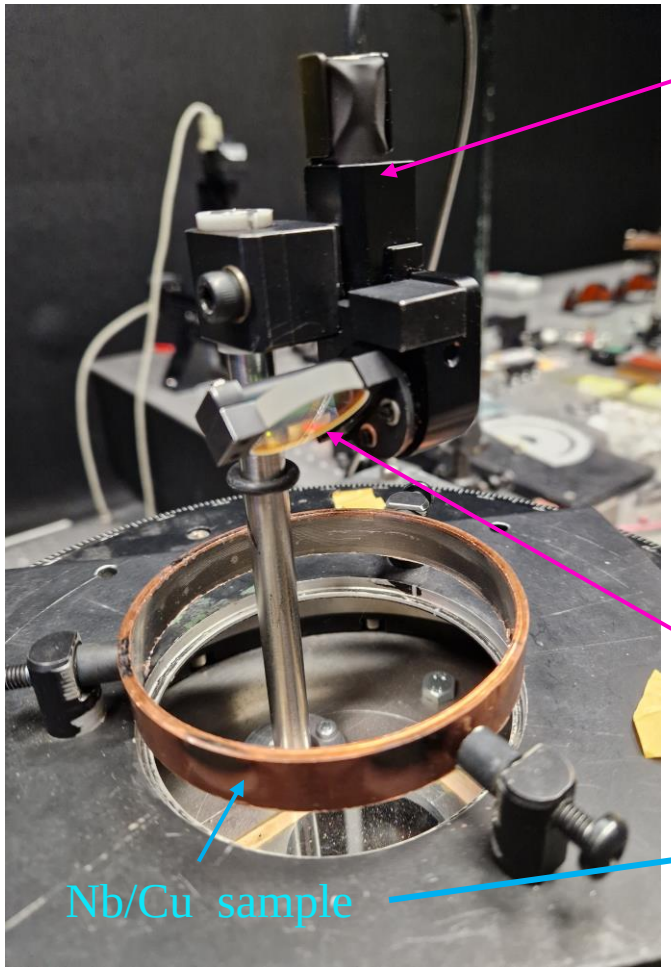
Dates of the RF cavity in gas chamber:
L=450mm, D=250mm, the Ar gas atmosphere 1.5 atm pressure.

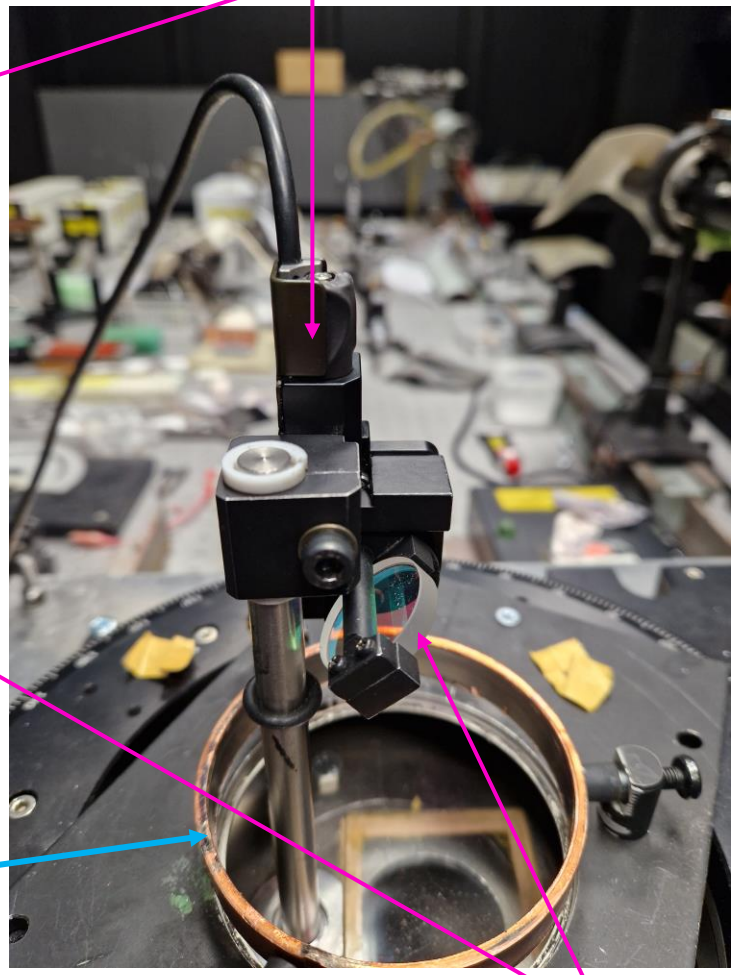
8MR20-F10 - Miniature Motorized Rotation Stage

360° continuous rotation
14 deg/sec max. rotation speed
8.375 arcsec (0.0023°) achievable resolution
0.5 kg max. load capacity
Ø23 mm rotating platform
Ultra-compact and lightweight

A miniature rotation stage is assembled with a mirror for laser irradiation of the spherical surface of the RF cavity. The software for the control of β coordinates is developing. It will be coordinated with the previous software for α and Z coordinates.







A miniature rotation stage for mirror rotation
(β coordinate) is installed.

Optical microscope image of sample 2.0

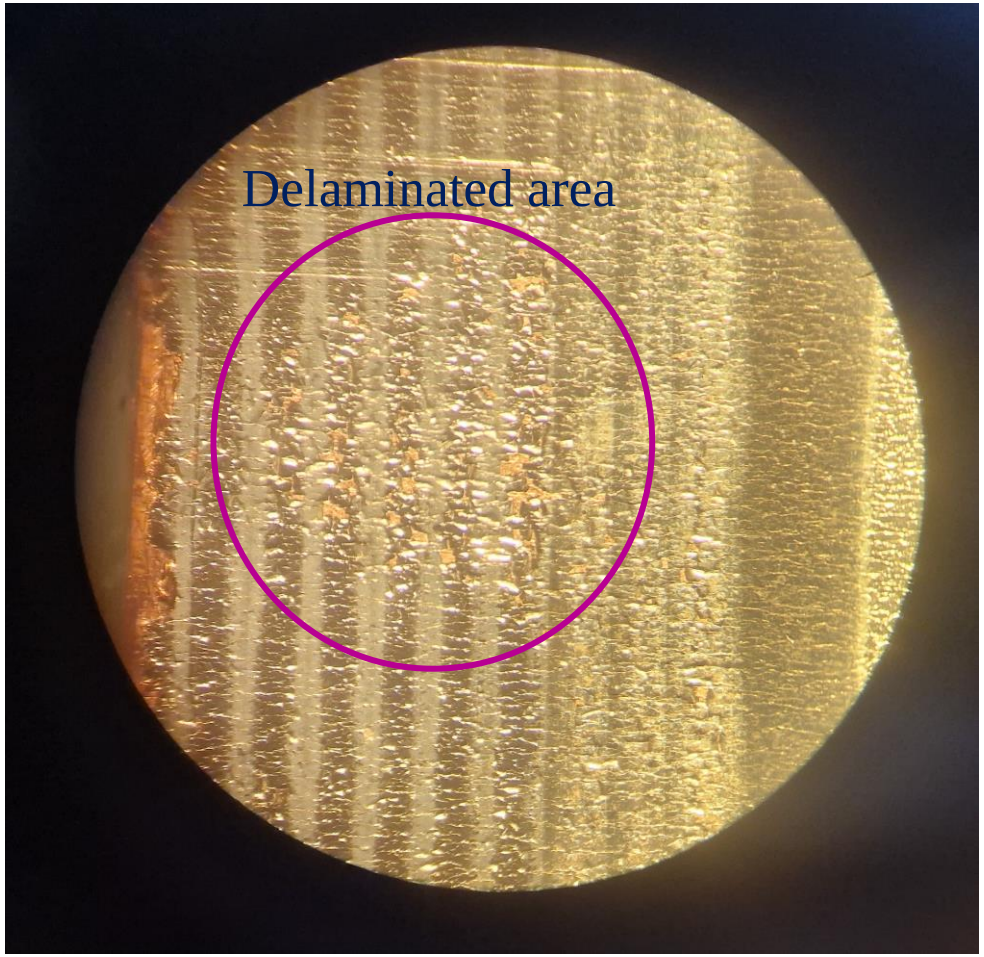


Fig.1 Irradiated surface part of the Nb/Cu cylinder sample 2.0 with delamination spots (5x magnification).

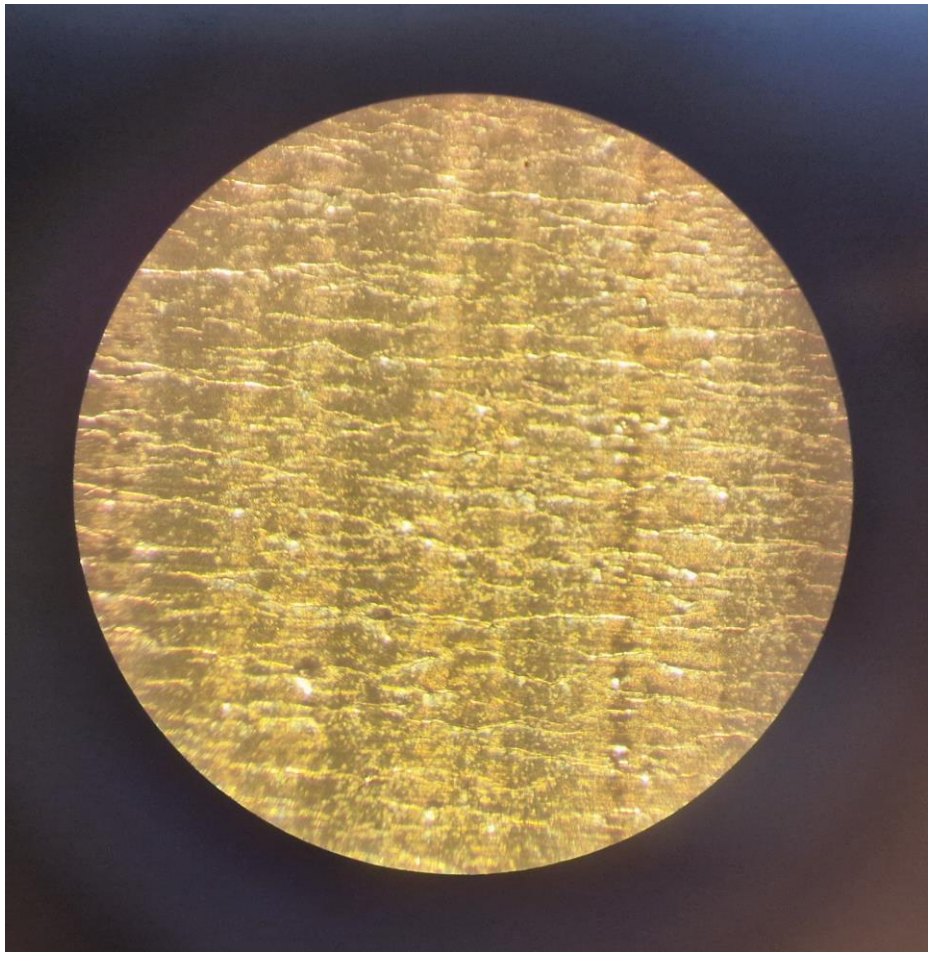


Fig.2 Irradiated surface part of the Nb/Cu cylinder sample 2.0 without delamination (7x magnification).

Optical microscope image

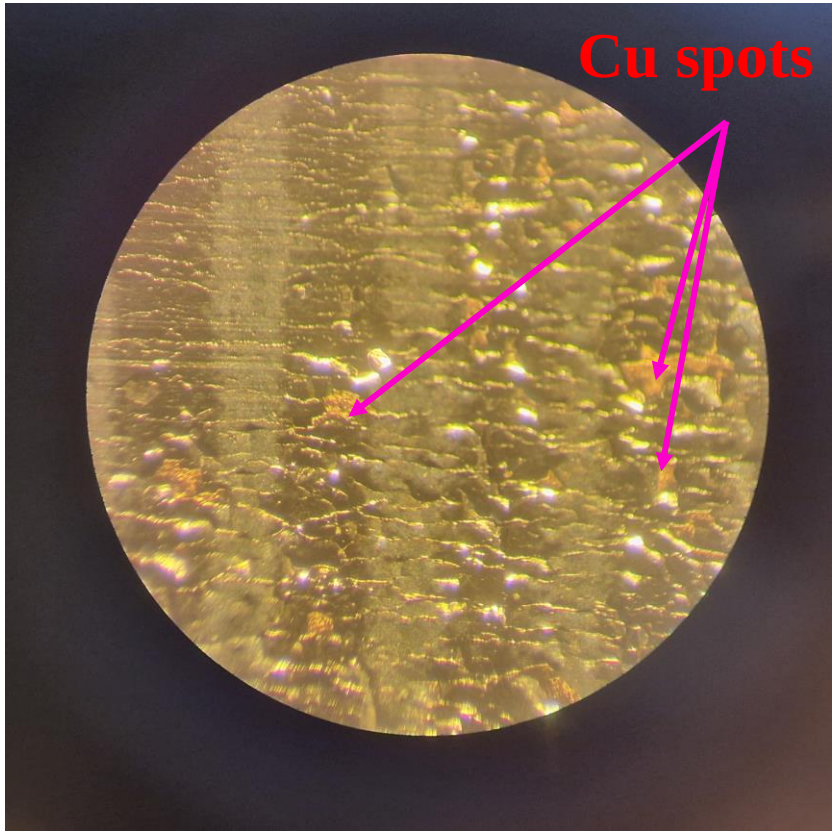


Fig.3 Irradiated surface part of a cylinder with delamination spots (10x magnification).

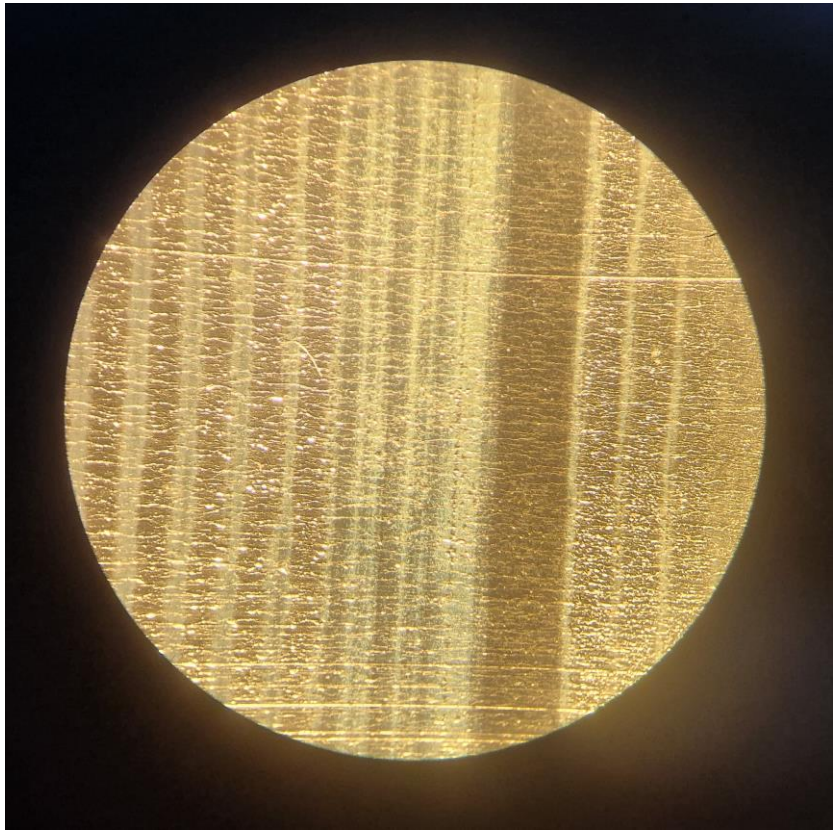


Fig.4. Irradiated surface part of cylinder without delamination (5x magnification).

Improvement of Mechanical Properties of Nb thin film on Cu Structure for RF Cavity by Laser Radiation: Formation of Soft Cu Buffer Layer

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- **Conclusion**
- Irradiation of the Nb on Cu structure by nanosecond laser radiation leads to a 2 μm soft Cu layer formation between Nb and Cu, like a buffer layer. With a longer pulse duration of up to 1 ms or longer or annealing in a furnace at a temperature of 400 °C for 1 h, the Cu substrate becomes soft, and the Nb/Cu structure can become mechanically unstable.

iFAST

Thank you very much for your attention!

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