**ABSTRACT AND MOTIVATION**

$\text{Nb}_3\text{Sn}$ is one of the most promising alternative materials to niobium for applications in SRF cavities. With its high critical temperature of about 18.5 K and superheating critical field $B_{sh} \approx 400 \text{ mT}$, $\text{Nb}_3\text{Sn}$ provides potential major improvements for both applications currently being investigated in the SRF community, high gradient accelerators as well as high-$Q$ cavities with significantly reduced operating costs. Recent results with cavities have demonstrated $R_s$ values of about 27 nΩ at 4.2 K far beyond the fundamental limit of niobium [1].

The RF properties of a sample prepared by Cornell University were characterized using the HZB Quadrupole Resonator. In this contribution we present surface resistance and RF critical field measurements.

**THE SAMPLE**

QPR sample before coating:
- Pure Nb sample allows high $T$ treatments ($\text{Nb}_3\text{Sn}$ coating, N doping/infusion, …)
- UHV compatible at RT and in LHe
- Opportunity for additional temperature sensors
- Exchangeability between QPRs at CERN and HZB

QPR sample after coating with $\text{Nb}_3\text{Sn}$
- Residual resistance 4 nΩ
- RF critical field 220 mT

New sample holder design
- Connection with titanium screws and indium wire gasket
- Pure Nb sample allows high $T$ treatments ($\text{Nb}_3\text{Sn}$ coating, N doping/infusion, …)
- UHV compatible at RT and in LHe
- Opportunity for additional temperature sensors
- Exchangeability between QPRs at CERN and HZB

**SURFACE RESISTANCE**

- Calorimetric measurement of RF surface resistance
- Extended parameter space (frequency, temperature and RF field)

**RF CRITICAL FIELD**

Single pulse measurement, quench field from peak $P_{\text{quench}}$

$B_{\text{sh}} = 190 \text{ mT}$

At $T < 15 \text{ K}$ deviation from linear fit due to RF heating

Literature:
- $B_{\text{sh}} = 400 \text{ mT}$
- $B_{c1} = 25 \text{ mT}$

$\Rightarrow$ Critical field far above $B_{c1}$

**NEW SAMPLE HOLDER**

Up to now
- Niobium sample brazed into stainless steel flange

$\Rightarrow$ No heat treatments of sample assembly possible (few hundred °C max.)

Workaround: Electron-beam weld on niobium part after treatment

$\Rightarrow$ Possible impact on relevant material properties of the sample

**REFERENCES**