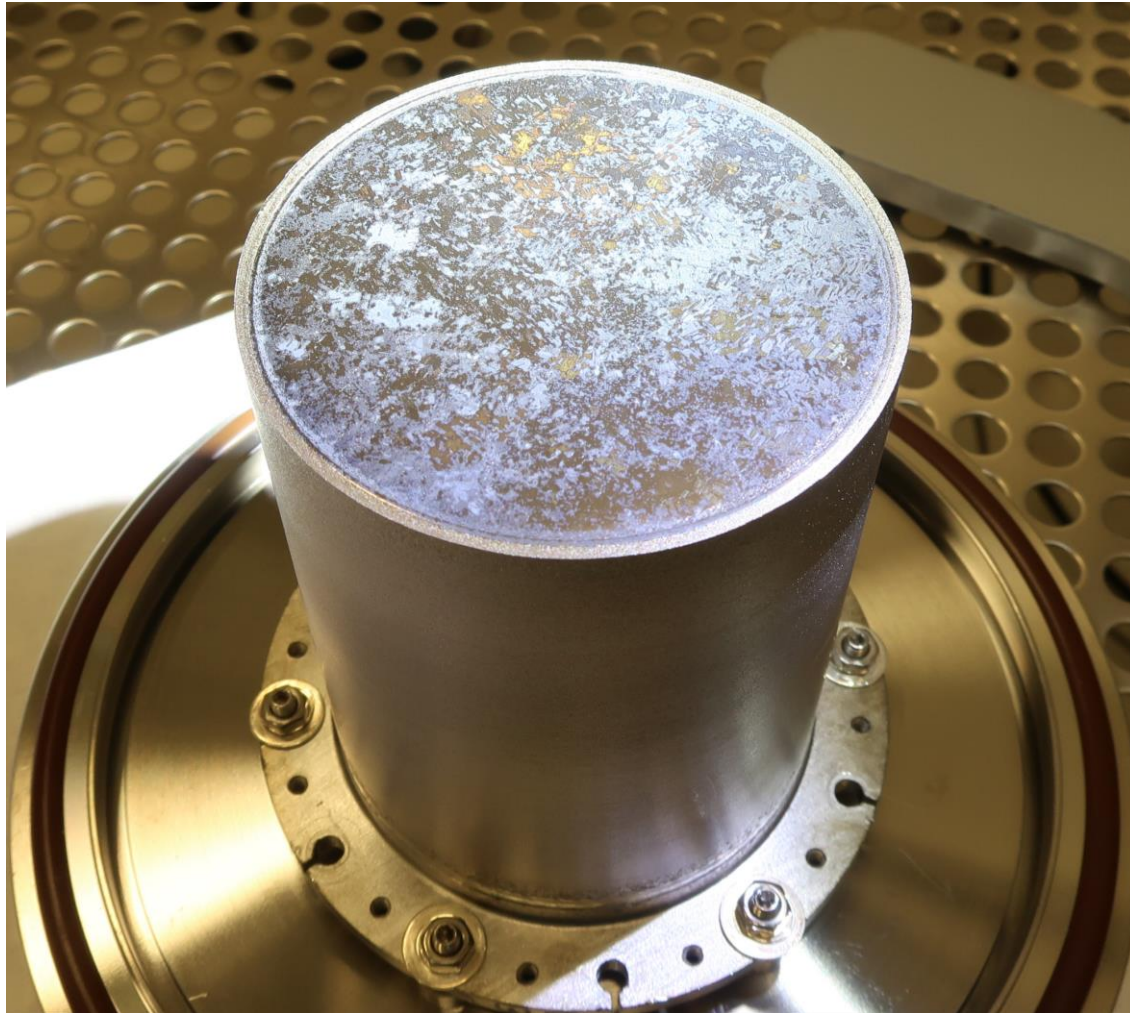




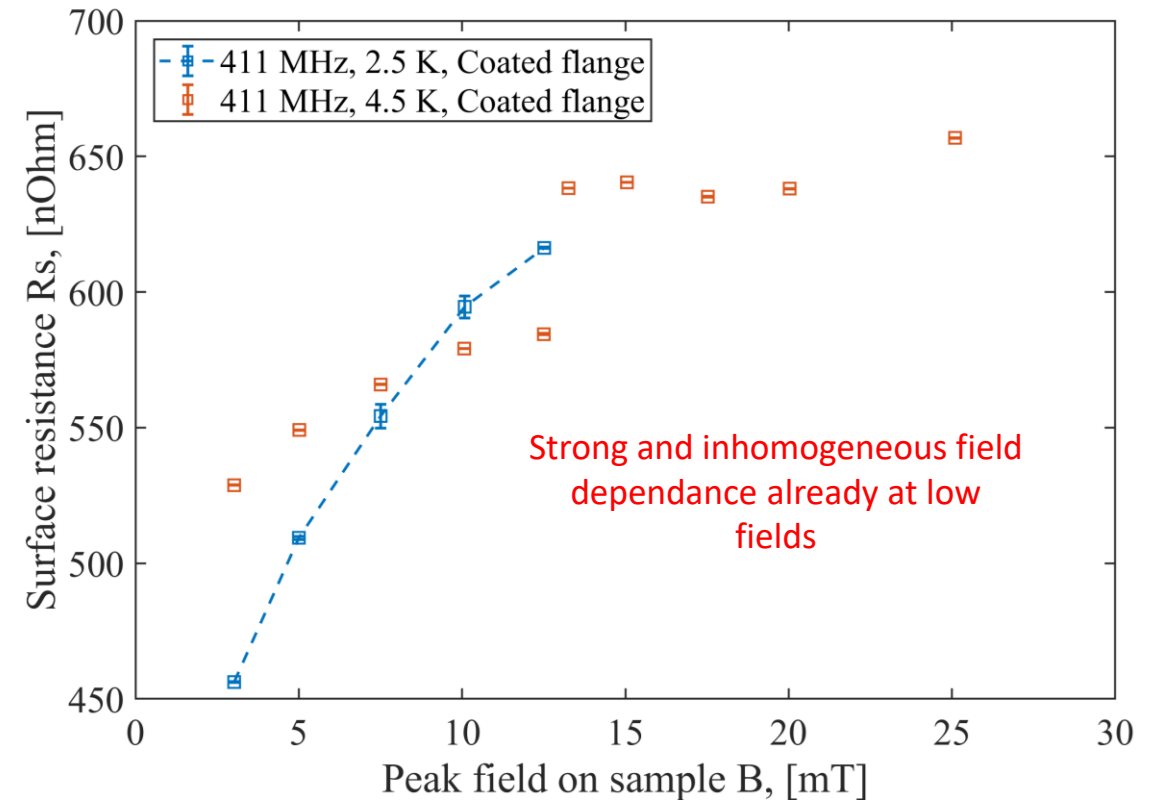
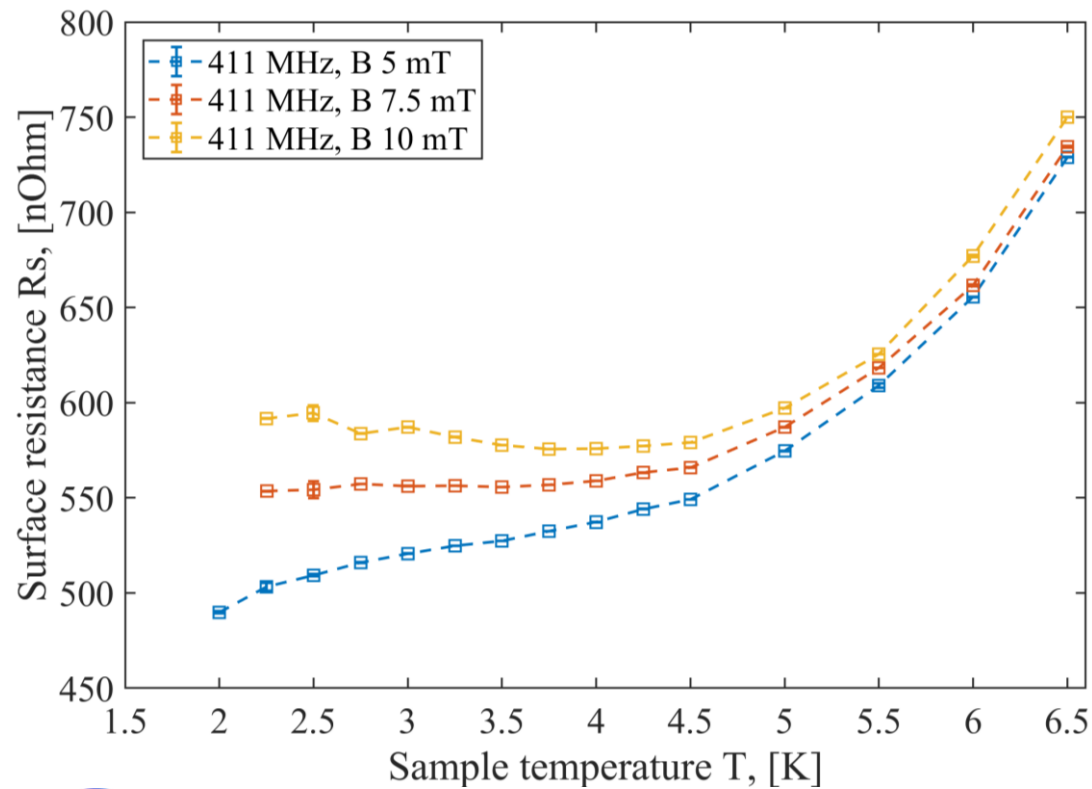
3rd IFAST WP9 meeting

D. Tikhonov

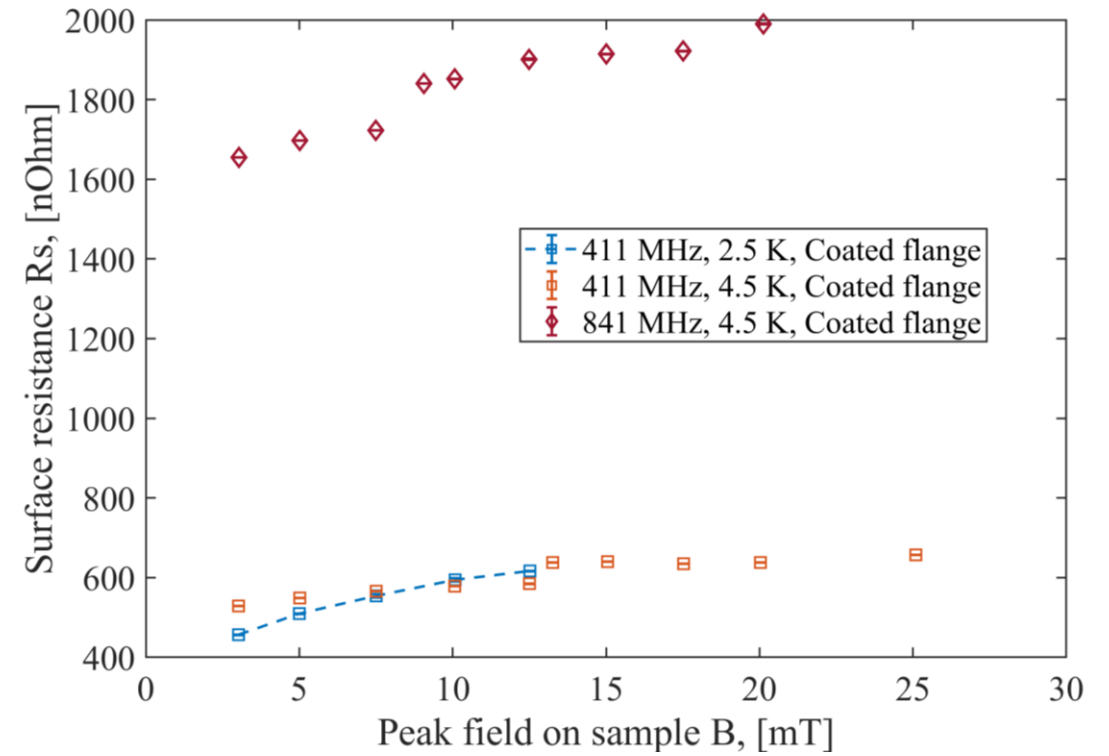
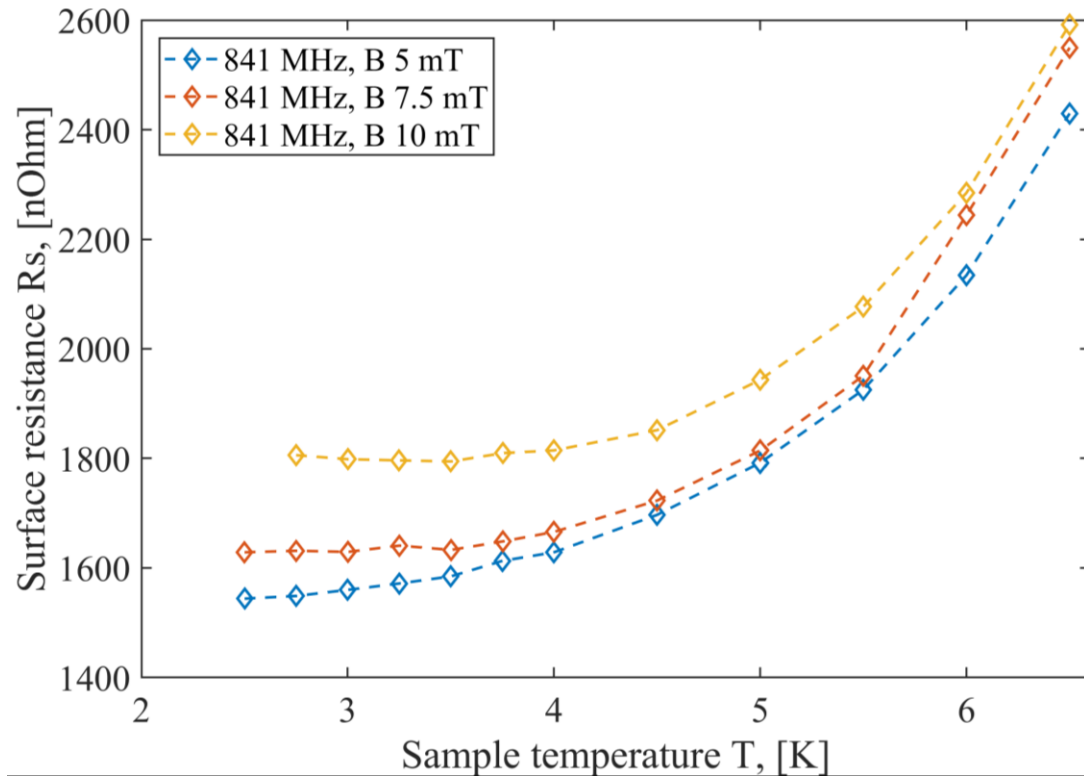


Measurements at 410 MHz already shows poor performance of the film with **Superconducting coated flange**

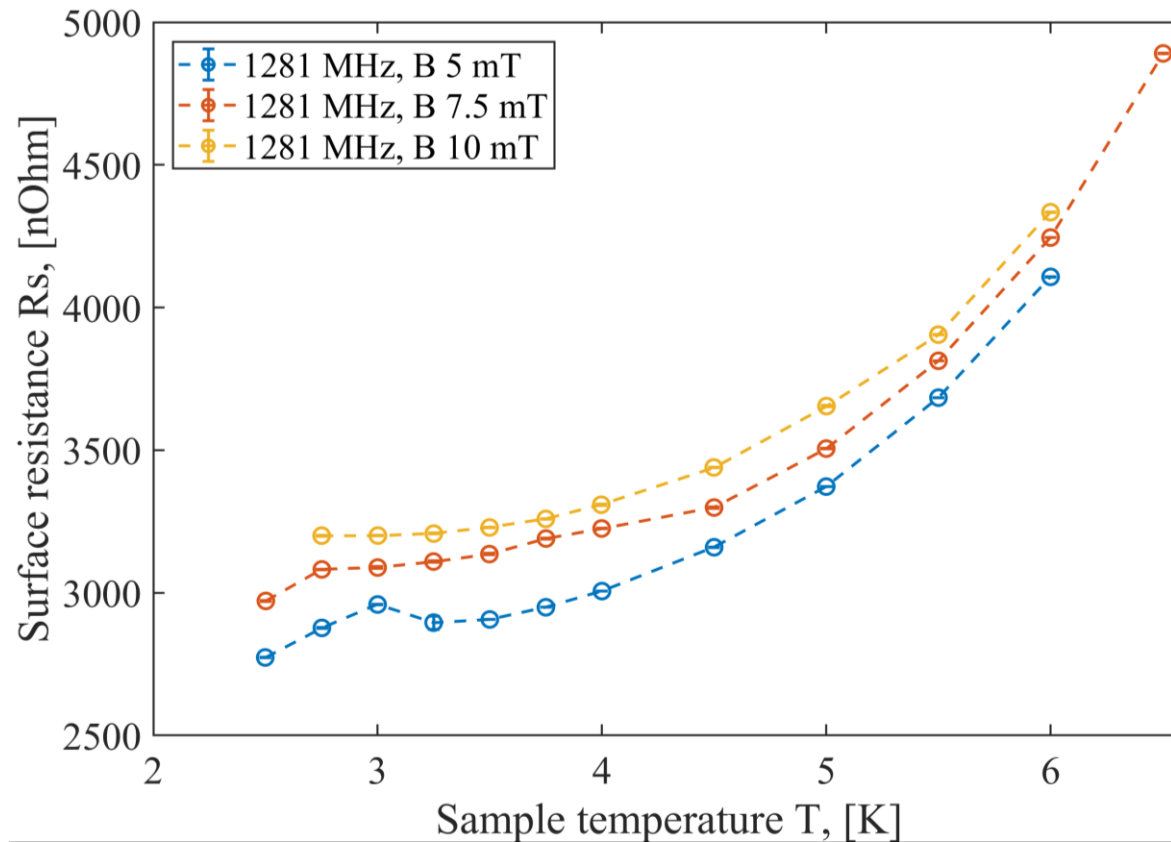
The maximum field achieved is a limitation from heating due to high R_s



Measurements at 840 MHz also shows High Res



Data for 1280 MHz

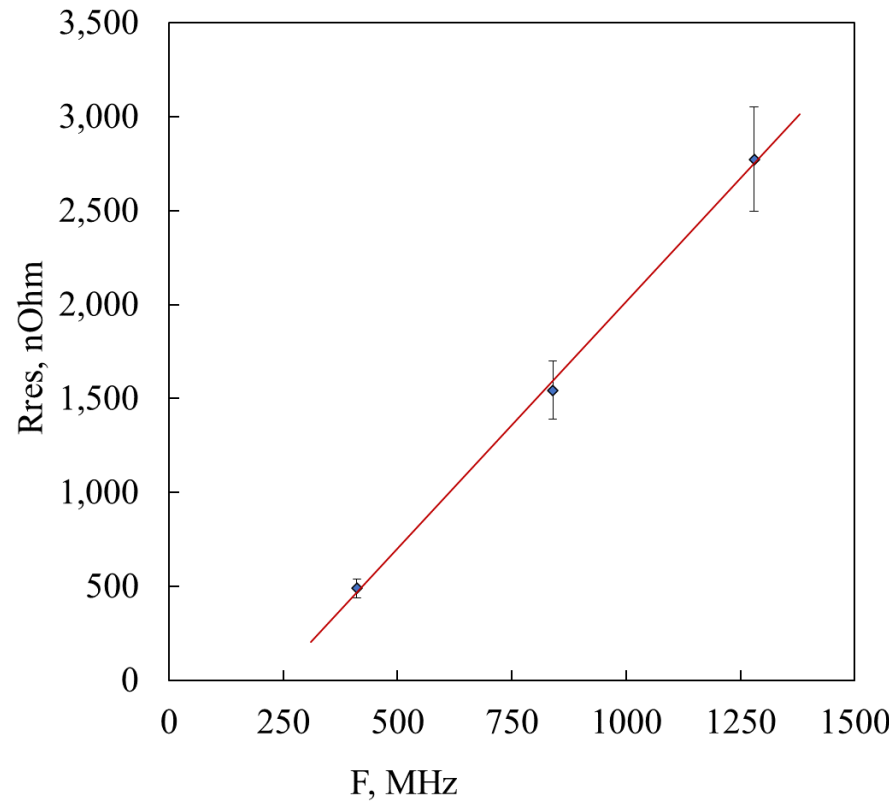


Values are very approximate due to poor film quality and large field dependence

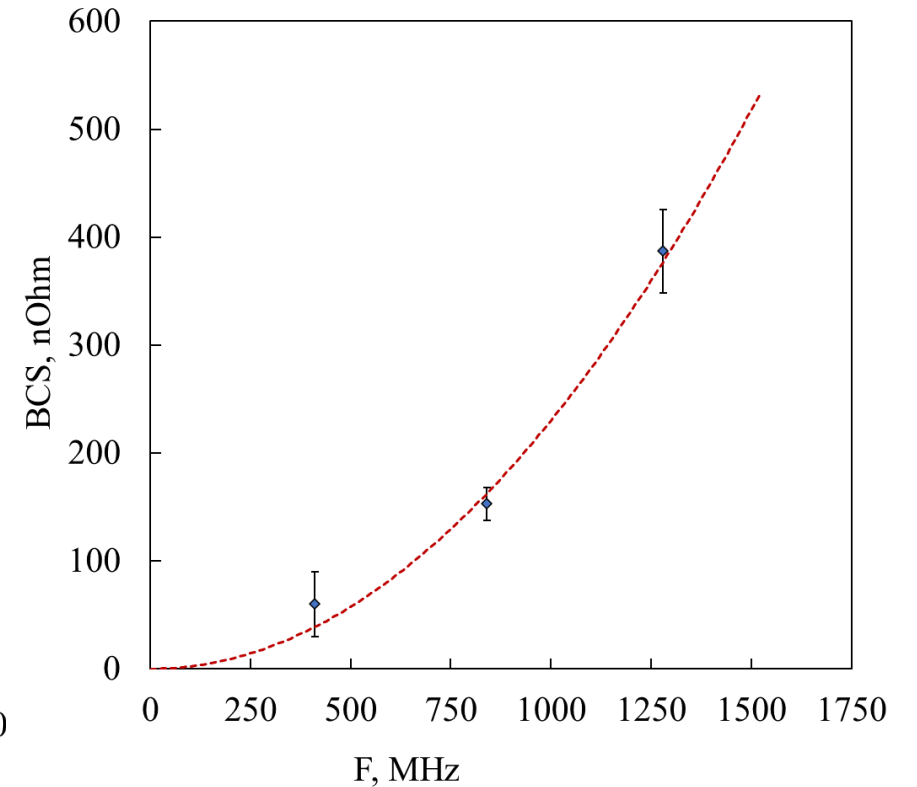
Despite of poor performance the BCS scaling with frequency is approximately follows quadratic trend

Residual resistance is linear with the frequency

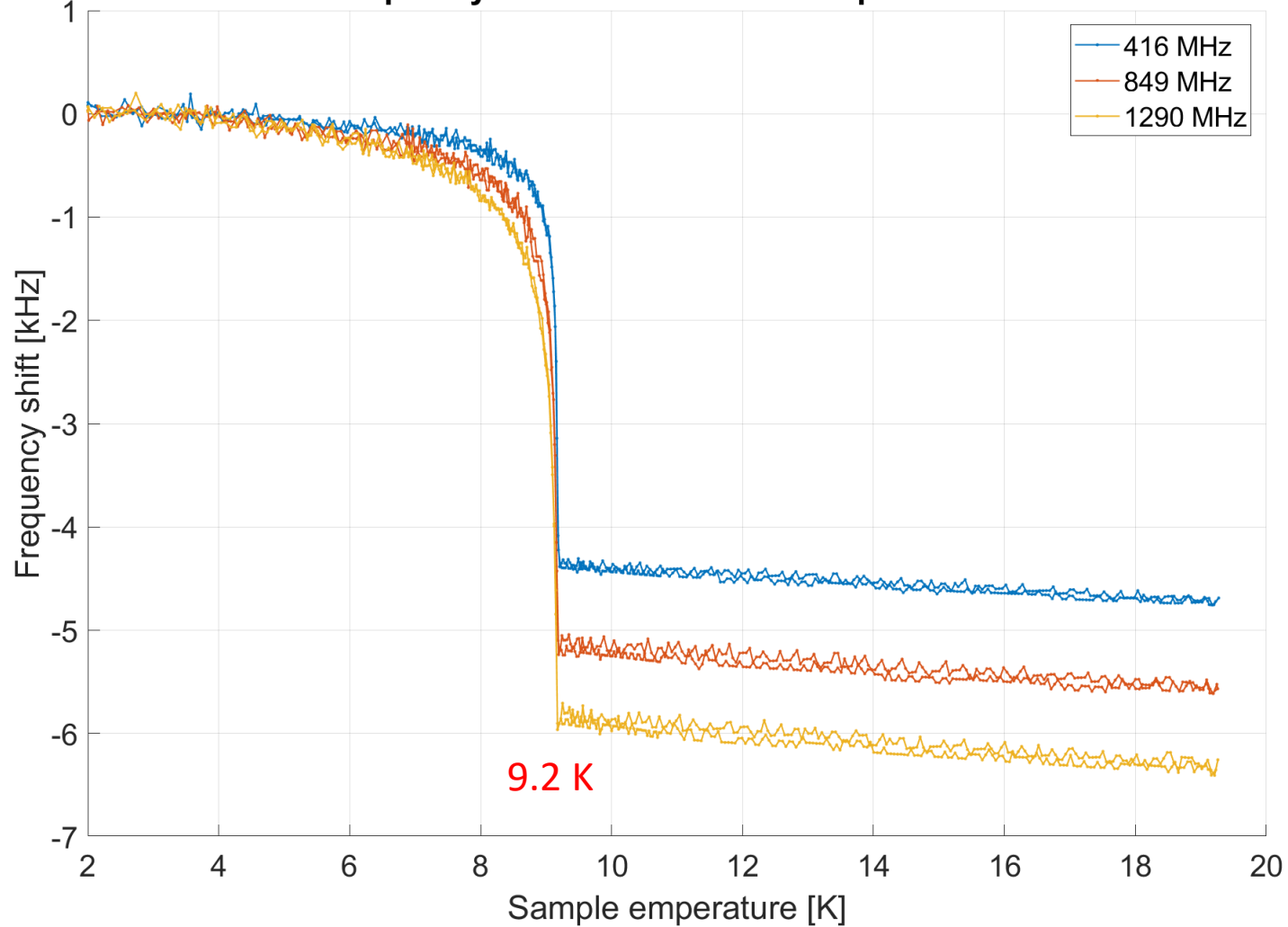
Residual R vs Frequency



BCS R vs Frequency

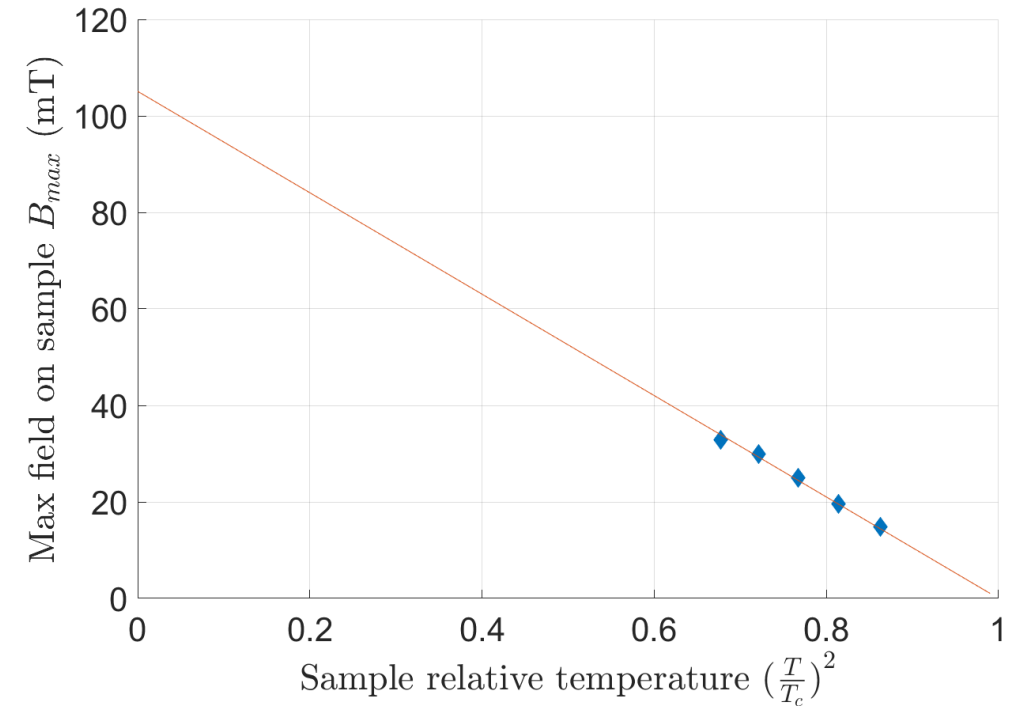
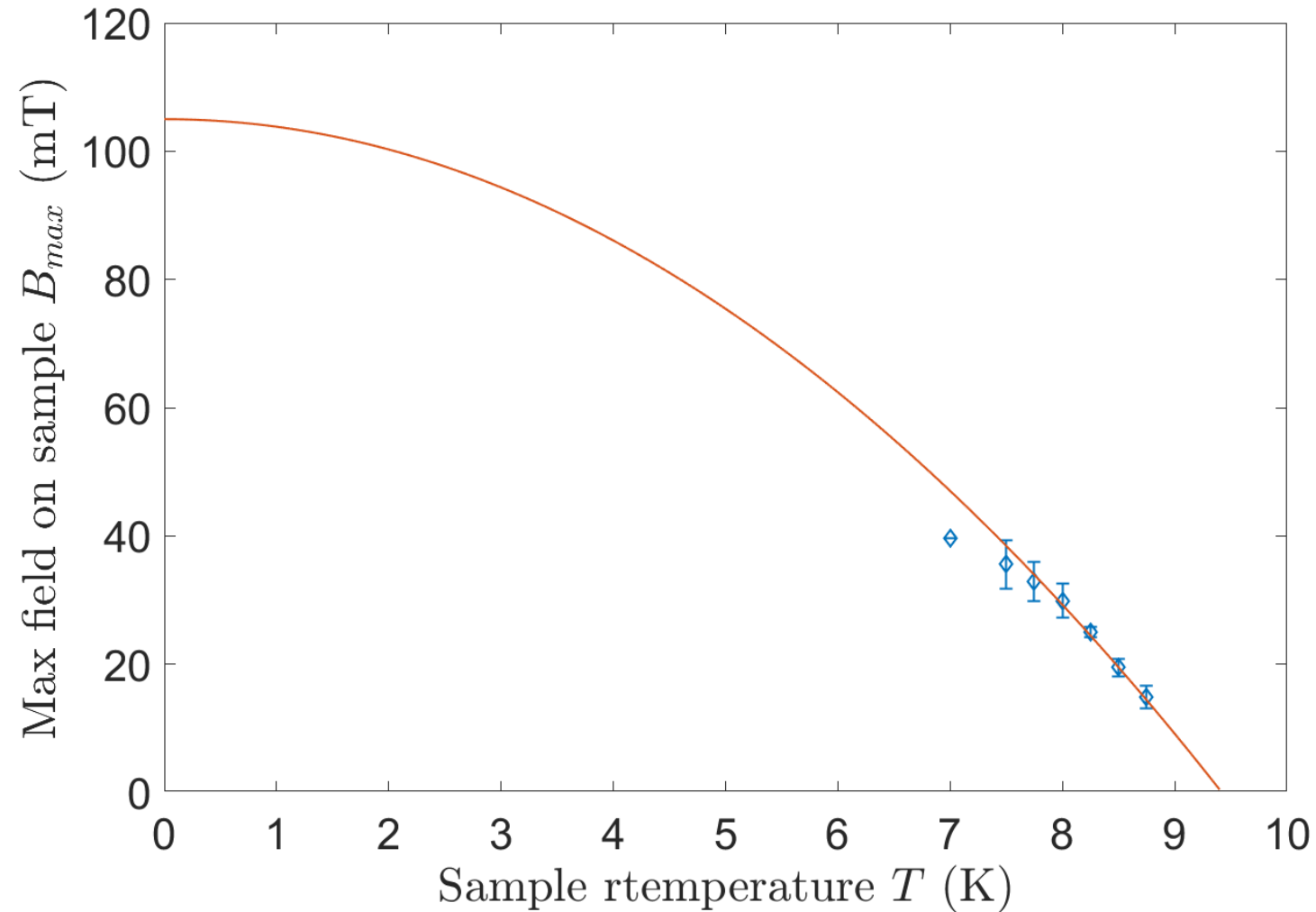


Measured resonance frequency shift as a function temperature for the thin film sample



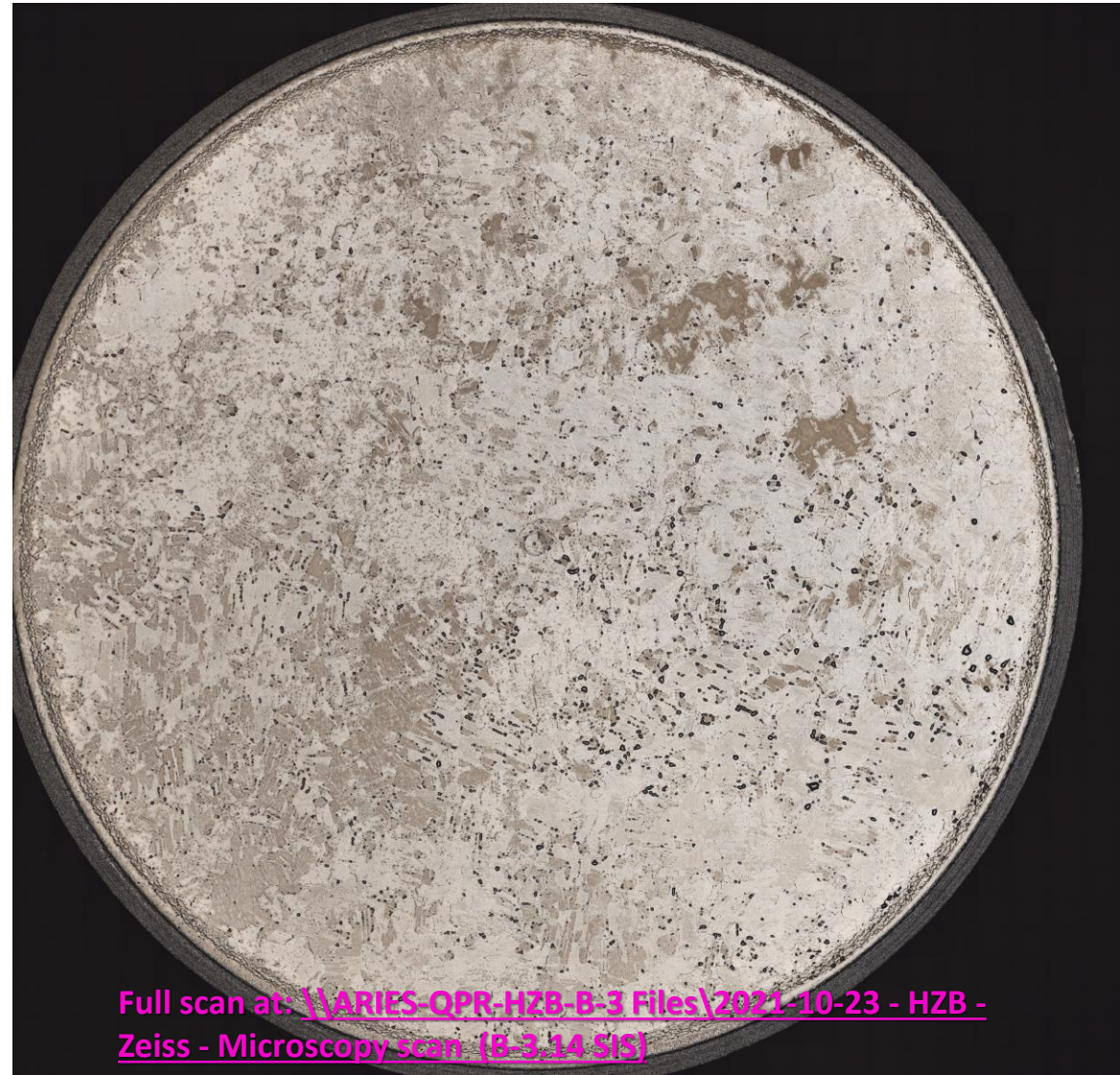
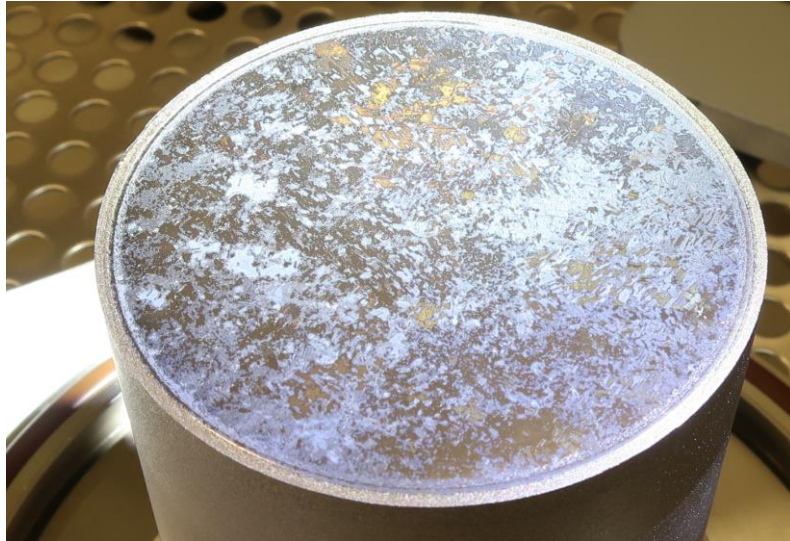
Wide frequency shift did not show any indication of NbN T_c (at least before further evaluation)

The Nb T_c from the shift gives value: 9.2 K



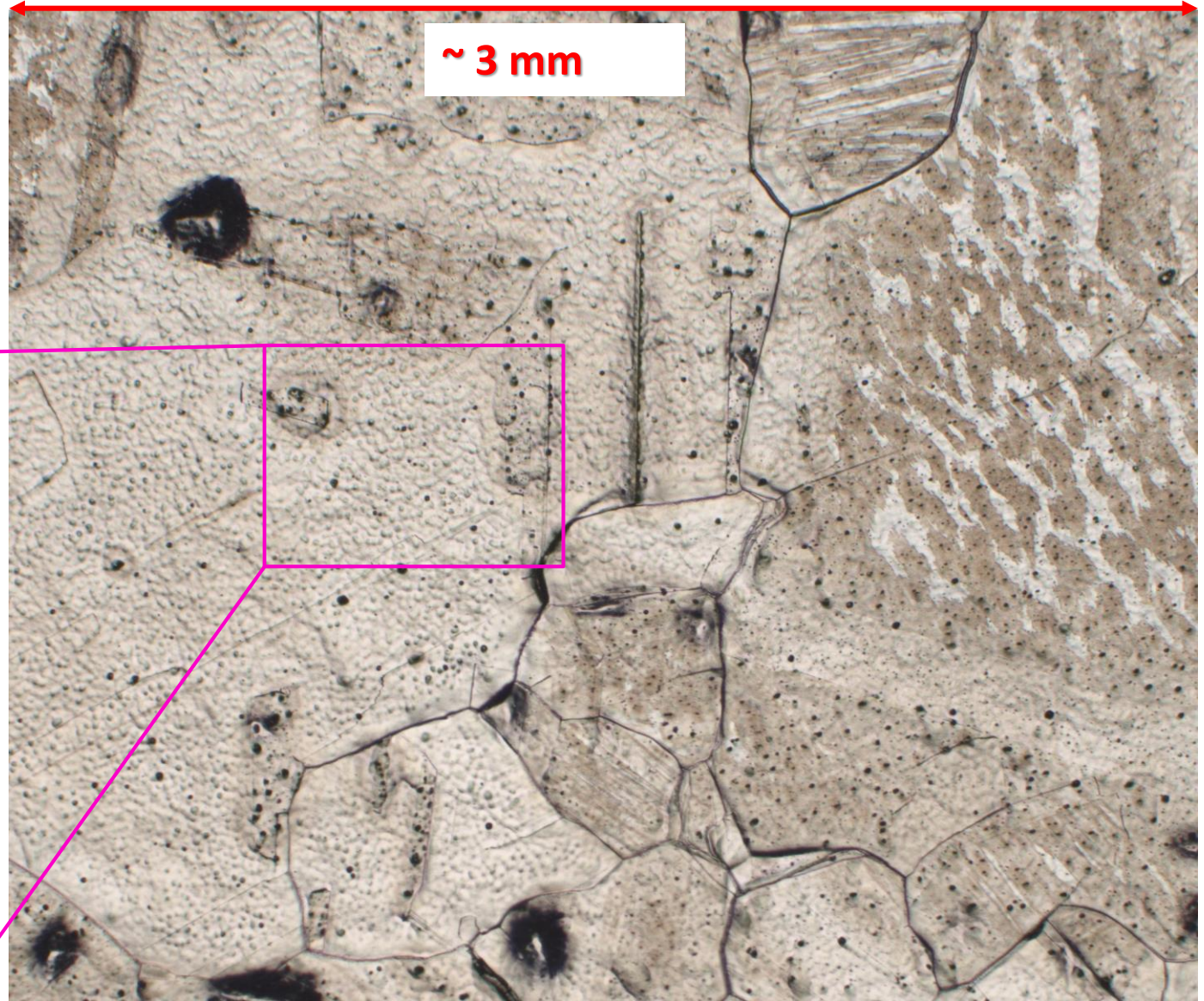
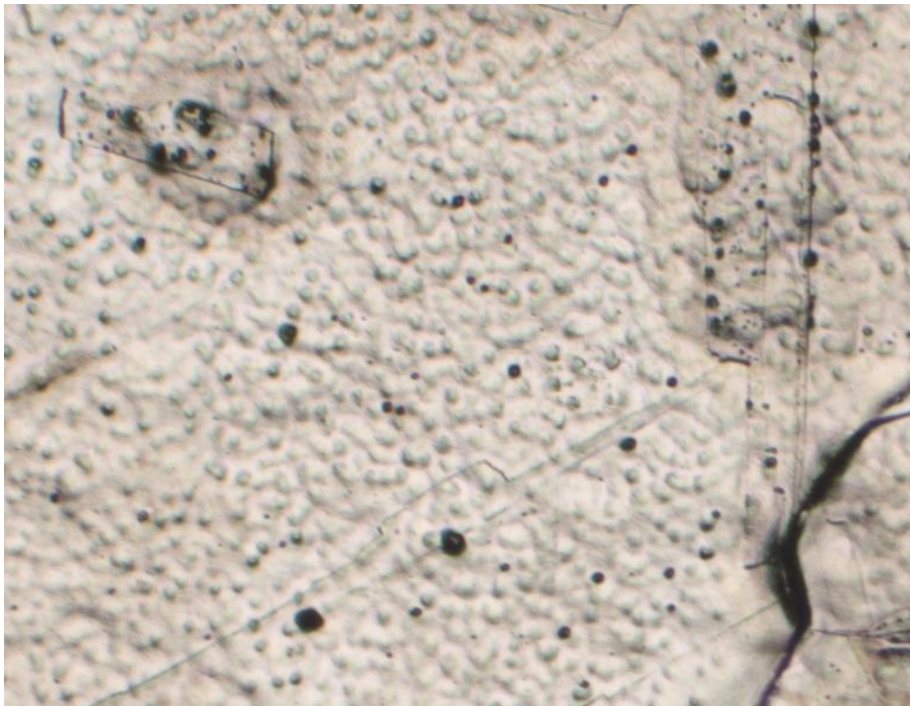
B quench as a function of T shows B₀ around 105 mT, however not clear if the quench comes from NbN layer or Nb

T_c used here was 9.4 K

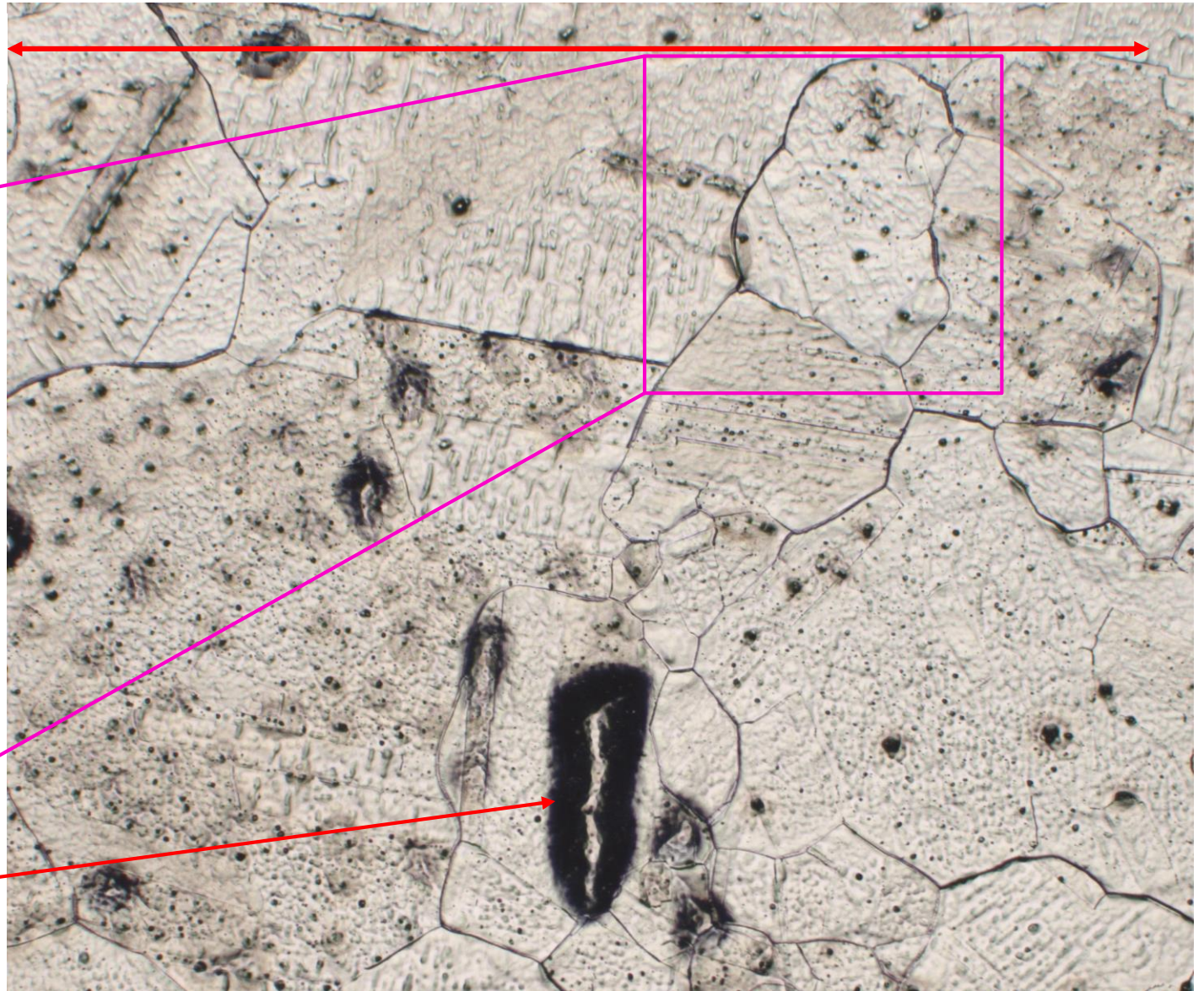
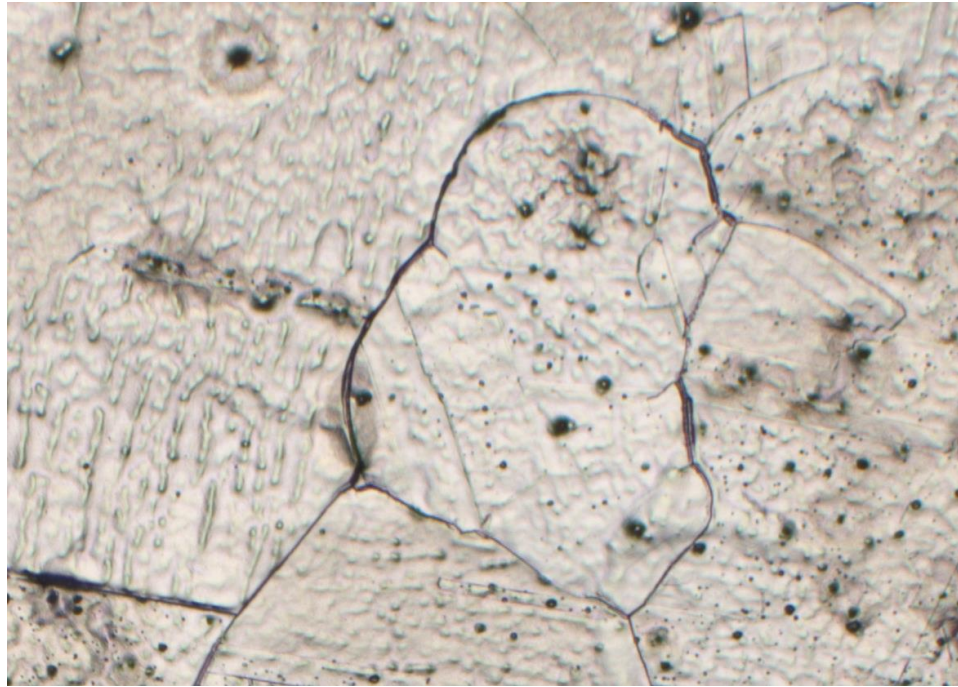


Full scan at: [\\ARIES-QPR-HZB-B-3 Files\2021-10-23 - HZB - Zeiss - Microscopy scan \(8-3.14.5IS\)](#)

Small pitting

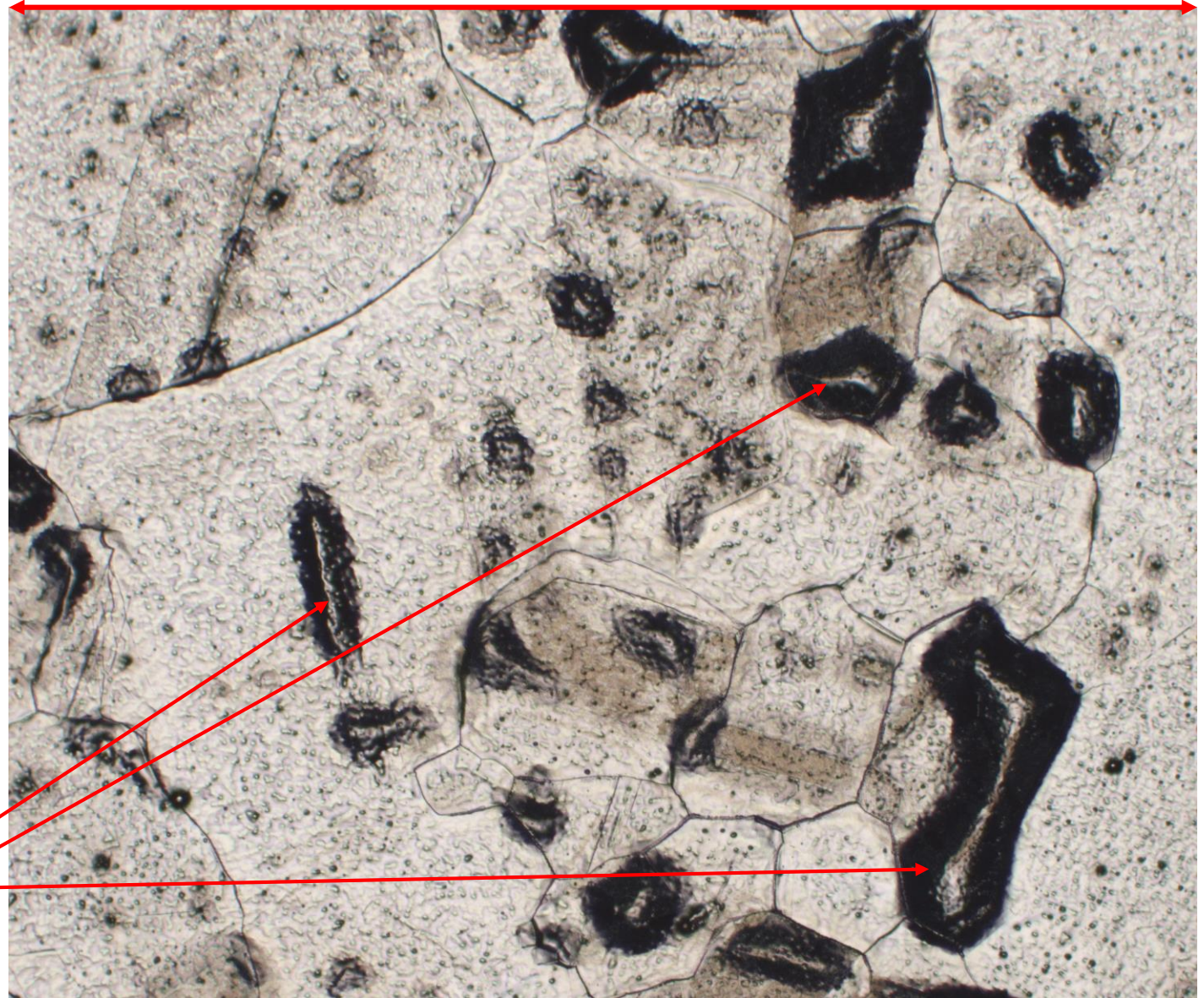


~ 3 mm



HILLS

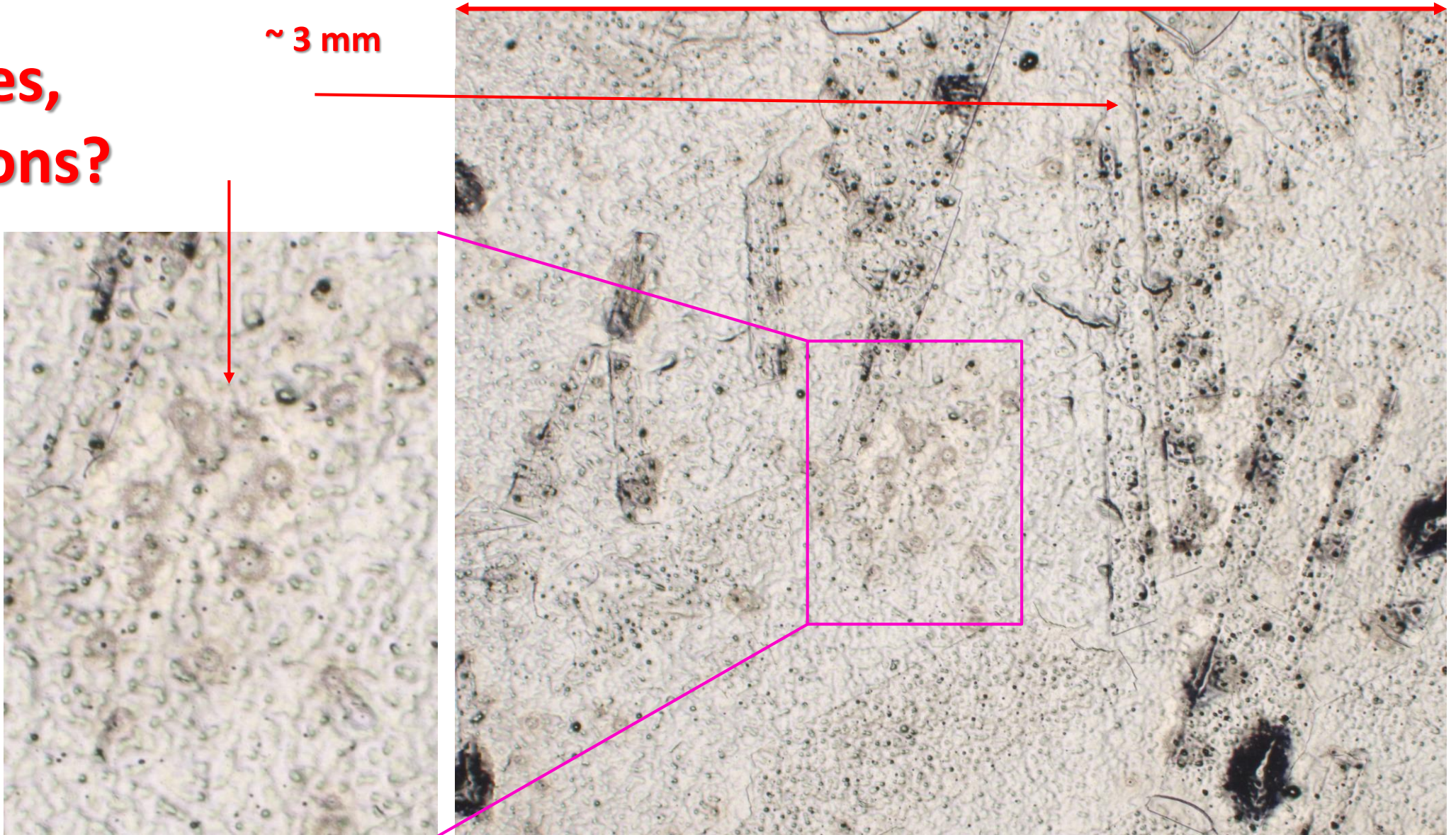
~ 3 mm



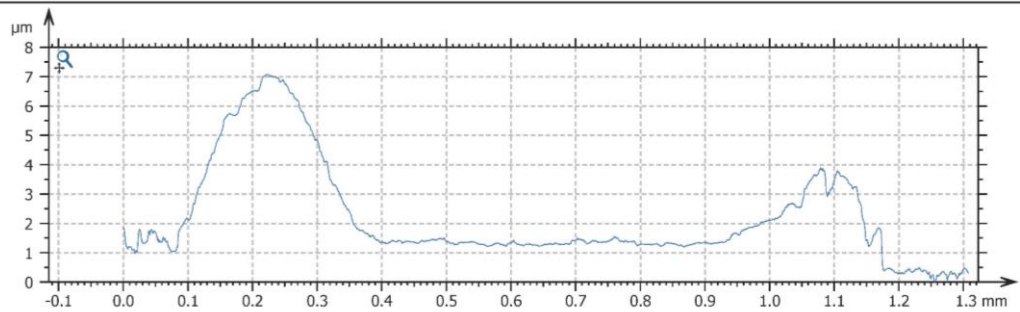
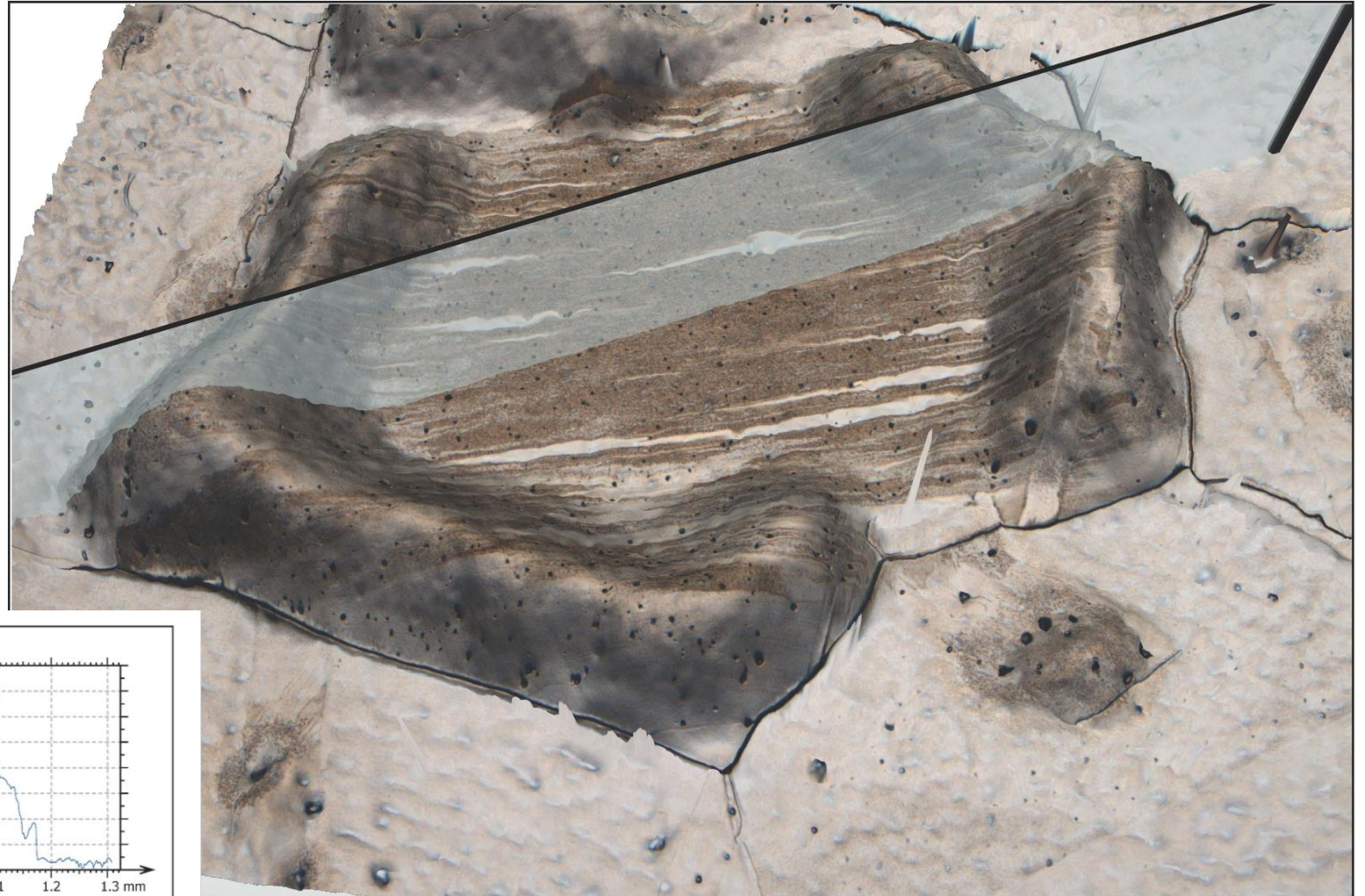
HILLS

**Stretches,
explosions?**

~ 3 mm



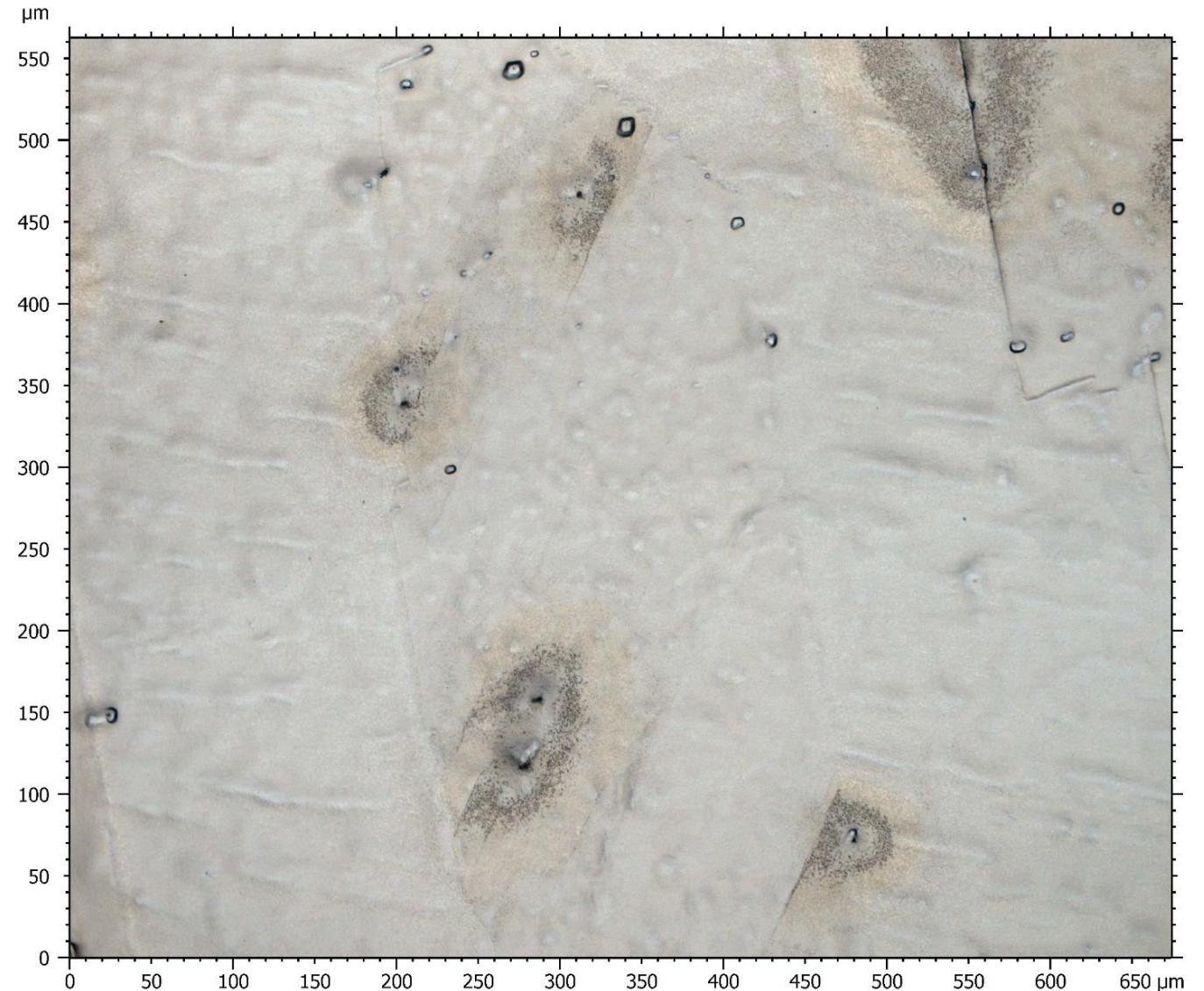
- 6 mkm hills with observable pitting on them



Parameters	Value	Unit
Length	1.307	mm

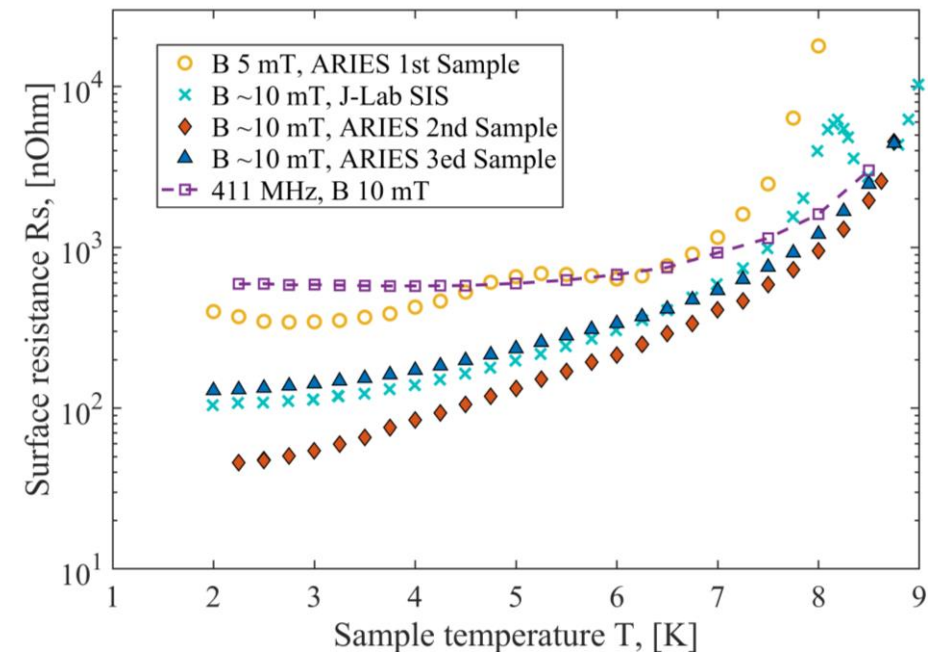
Conclusions:




- Film is very defective (in future we should consider if to test films with so many visible defects)
- Hills could be delaminated film or anomalous film growth or defects on copper due to **high heating**.
- Film performance is quite poor
- We should use HIPIMS method rather than DC MS



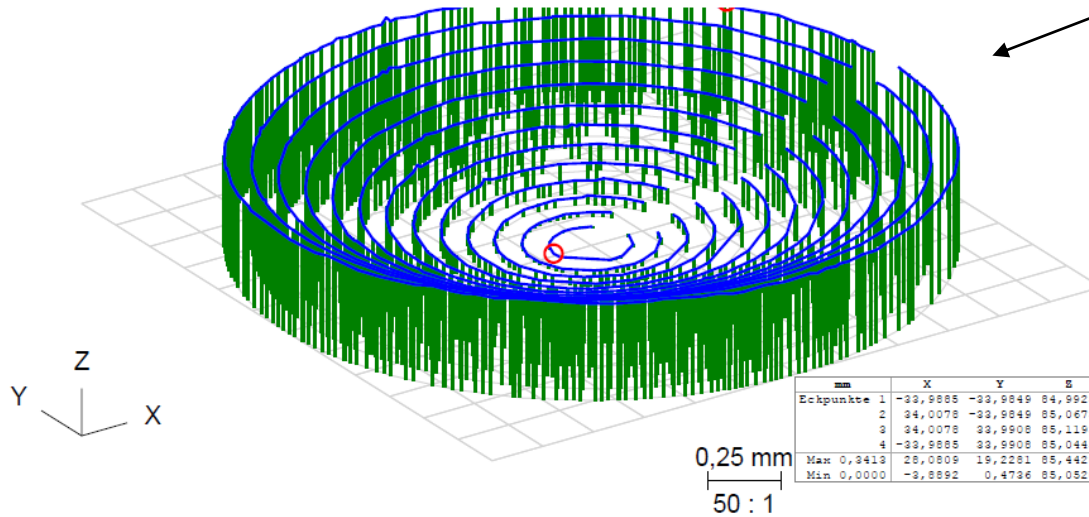
NN	SIS films tested	Structure	Base test?	Method	FACILITY	
1	J-Lab SIS	NbTiN – AlN – Nb(bulk)	75 nm – 15 nm – bulk Nb	Yes		J-Lab
2	ARIES 1st SIS	NbN – AlN – Nb(film)/Cu	197 nm – 35 nm – 3 μm Nb	Yes	DC MS	SIEGEN
3	ARIES 2nd SIS	NbN – AlN – Nb(film)/Cu	180 nm – 8 nm – 4 μm Nb	No	HiPIMS	SIEGEN
4	ARIES 3ed SIS	NbN – AlN – Nb(film)/Cu	180 nm – 24 nm – 4 μm Nb	No	HiPIMS	SIEGEN
5	ARIES 4th SIS STFC	NbN – AlN – Nb(film)/Cu	180 nm – 1/2 nm – 4 μm Nb	No	DC MS	STFC
6	Opt. 5th SIS	NbN – AlN – Nb(film)/Cu	180 nm – 35 nm – 3 μm Nb	No	HiPIMS	SIEGEN
7	planned Saclay SIS	??? – AlN – Nb (bulk)	?? nm – ?? nm – bulk Nb	Yes	???	Saclay

Two the worst samples were coated with DC MS. Although its not clear if poor the performance was result of the method itself, it was shown that HIPIMS films have better structure



Name	Messwert	Nennmaß	+Tol	-Tol	Abweichung +/-
 Ebenheit1	0,341	0,000	0,000	0,000	0,341   0,341

Punkte 2093
 Filtertyp Kein Filter
 Lc
 W/U
 Vmess[mm/sec] 15,00
 Tasterradius 1,501
 Berechnungsmethode Minimum-Element



Sample top surface profile is bended with the center point ~ - 0.3..0.4 mm

Possible reasons of deformation:

1. Turning
2. Heating to high temperature

iFAST

Thank you!



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