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SRF 19 DRESDEN

Effects of Static Magnetic Fields on a Low-frequency TEM Class Superconducting Cavity

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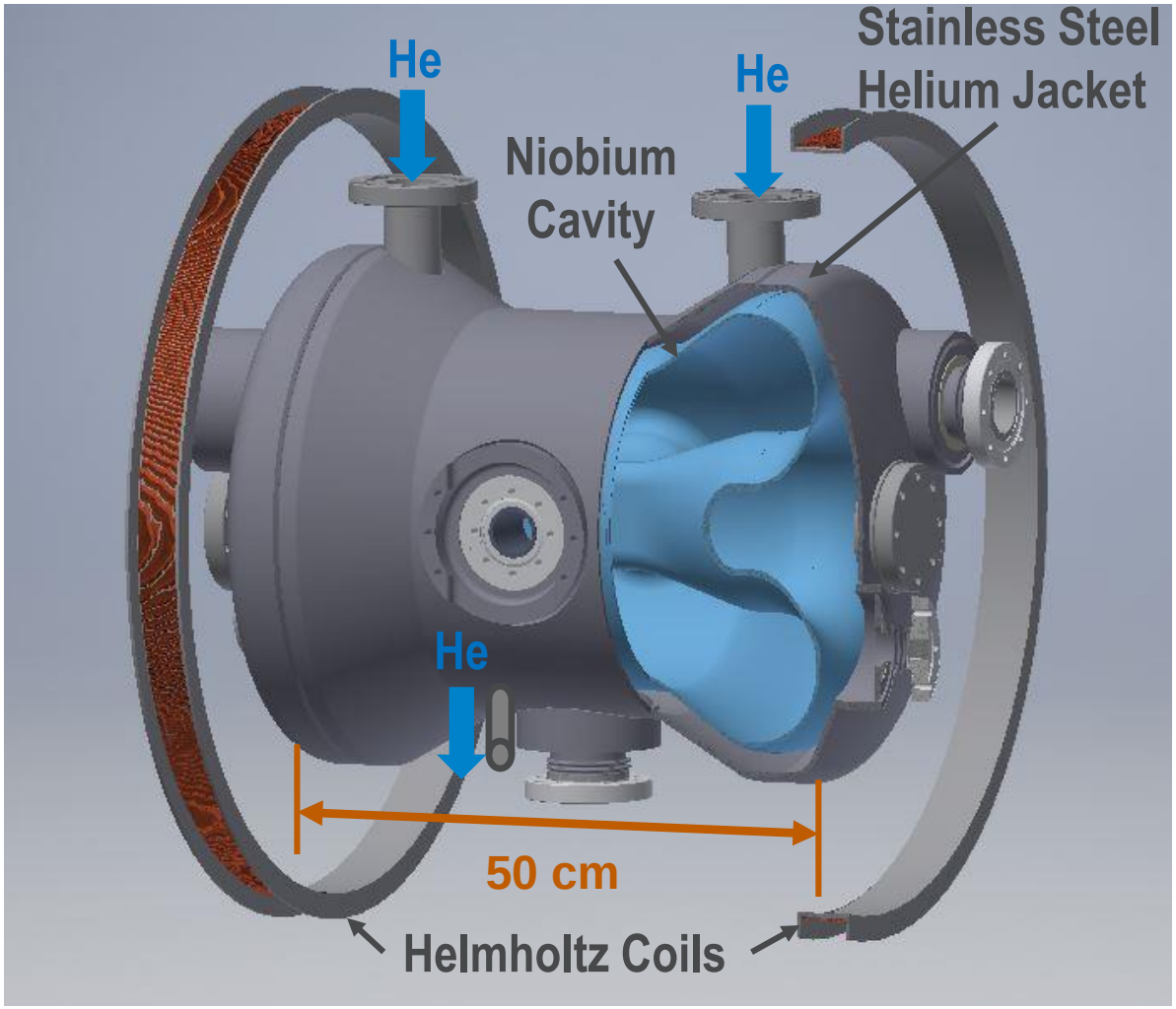
HWR Niobium Cavity and Experimental Setup

Frequency (MHz)	337
Effective Length* (m)	0.26
$\beta = v/c$	0.29
E_{pk}/E_{acc}	4.5
B_{pk}/E_{acc} (mT/(MV/m))	9.6
$G = R_sQ$ (Ω)	97
R_{sh}/Q (W)	194

Nb: Fine grain; RRR=280

1. Buffered Chemical Polishing
2. Bulk Electropolishing
3. H_2 Degassing (625C for 10 hrs)
4. Light Electropolishing
5. High Pressure Rinsing



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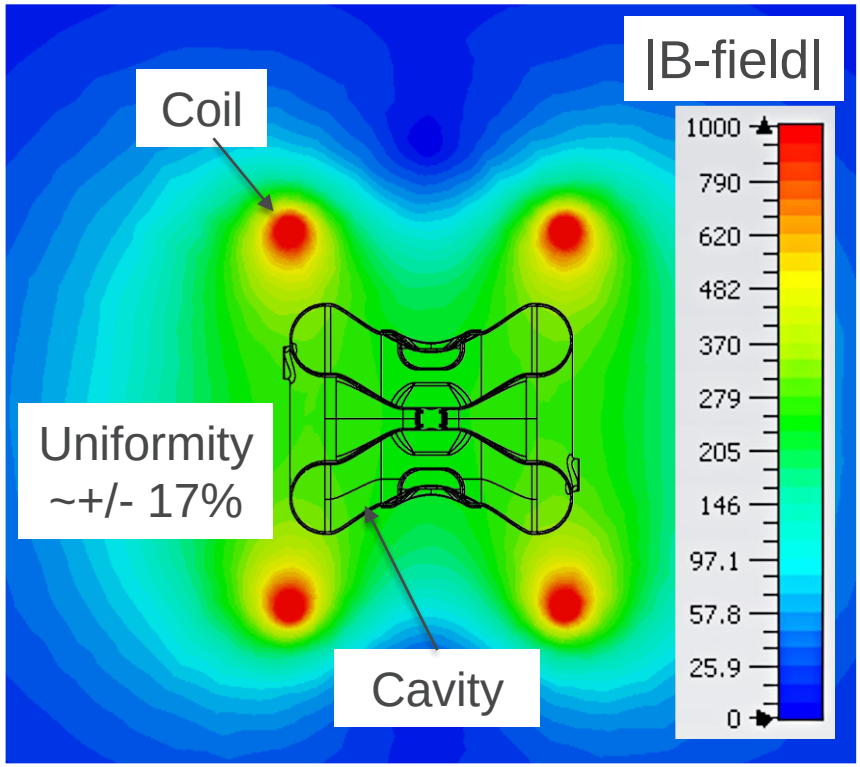
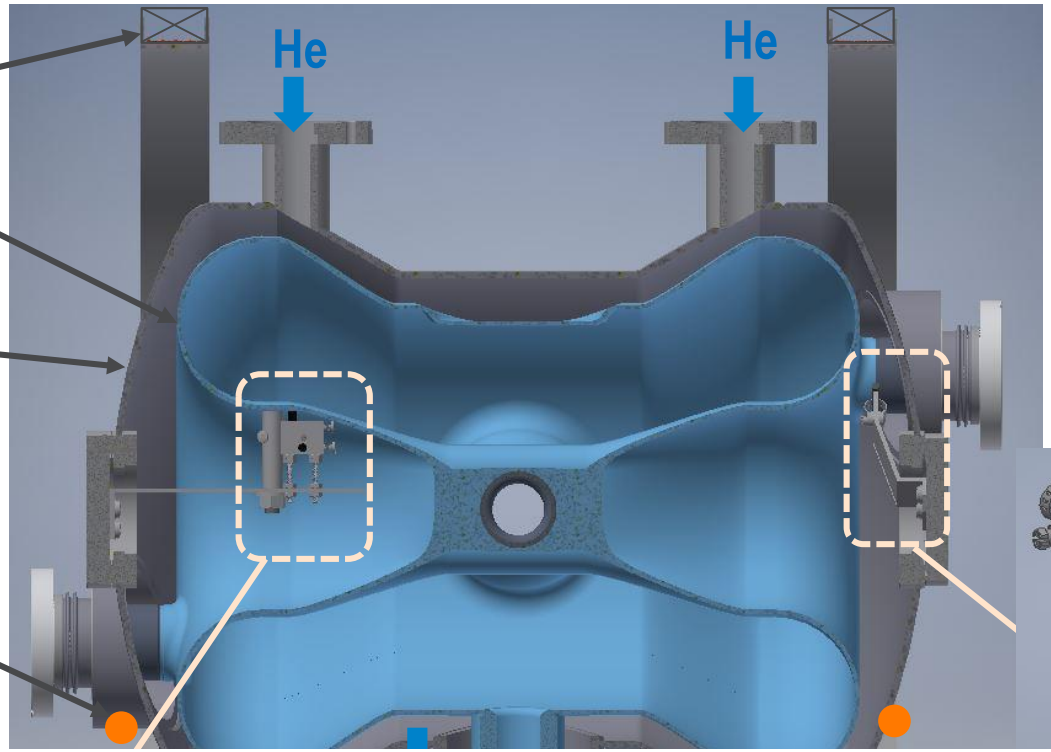
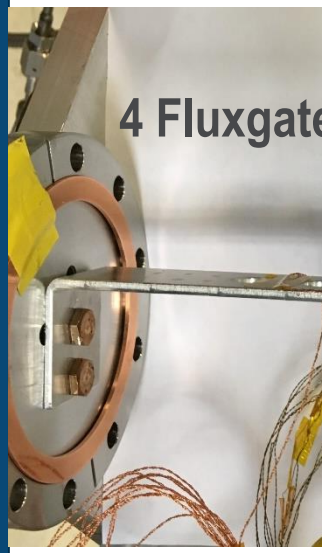
* Effective Length = βλ

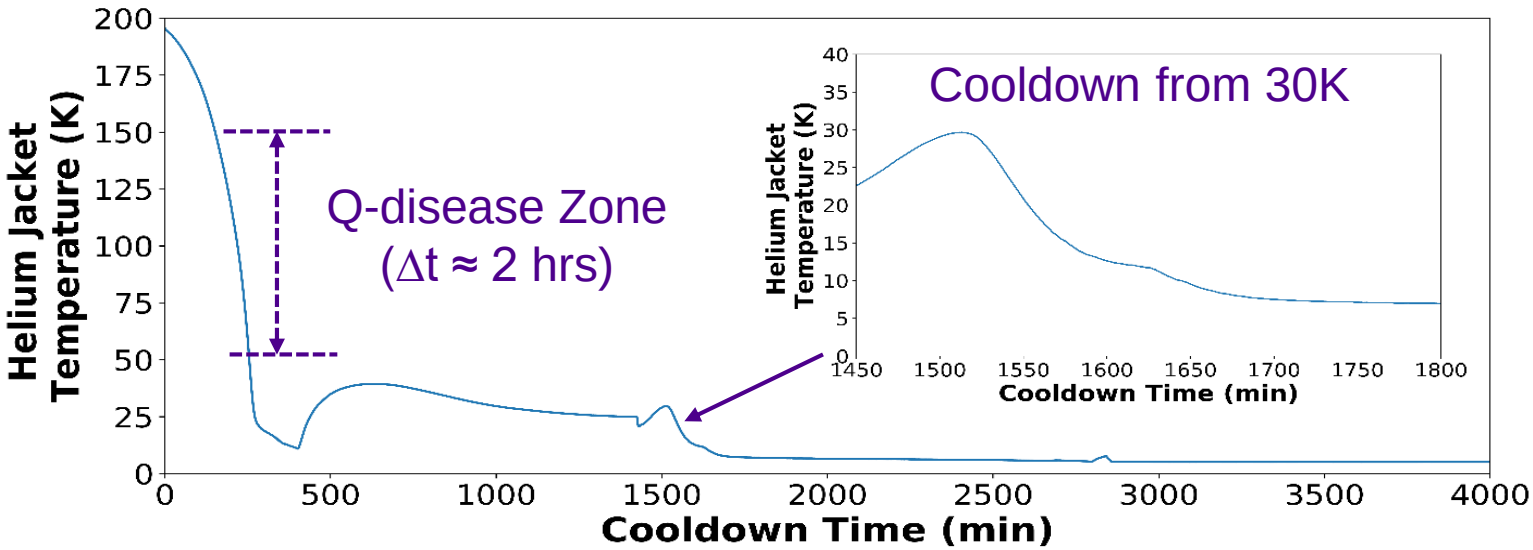
HWR Niobium Cavity and Experimental Setup



Experimental Setup

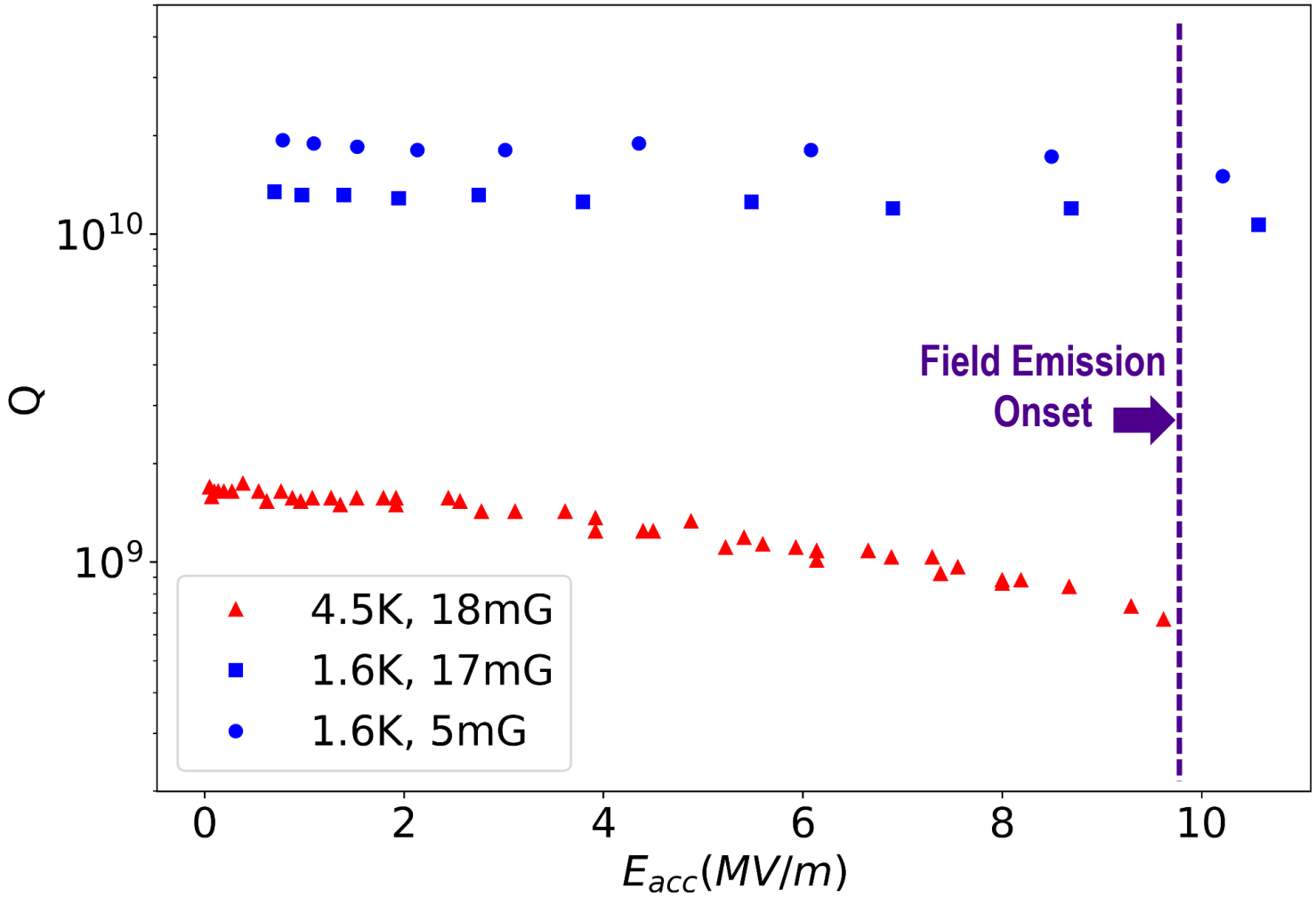




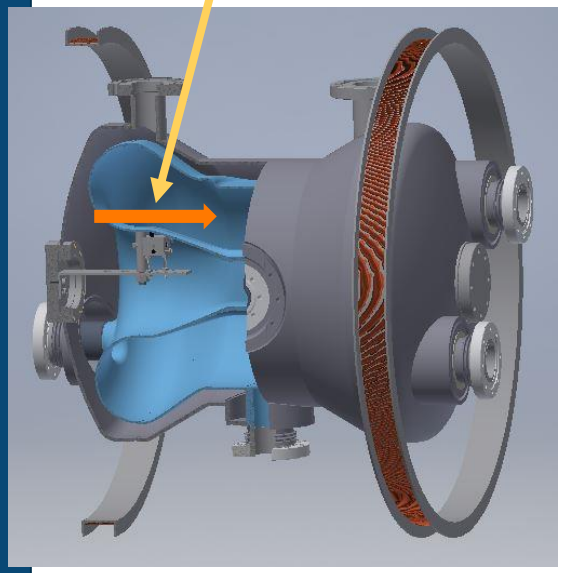


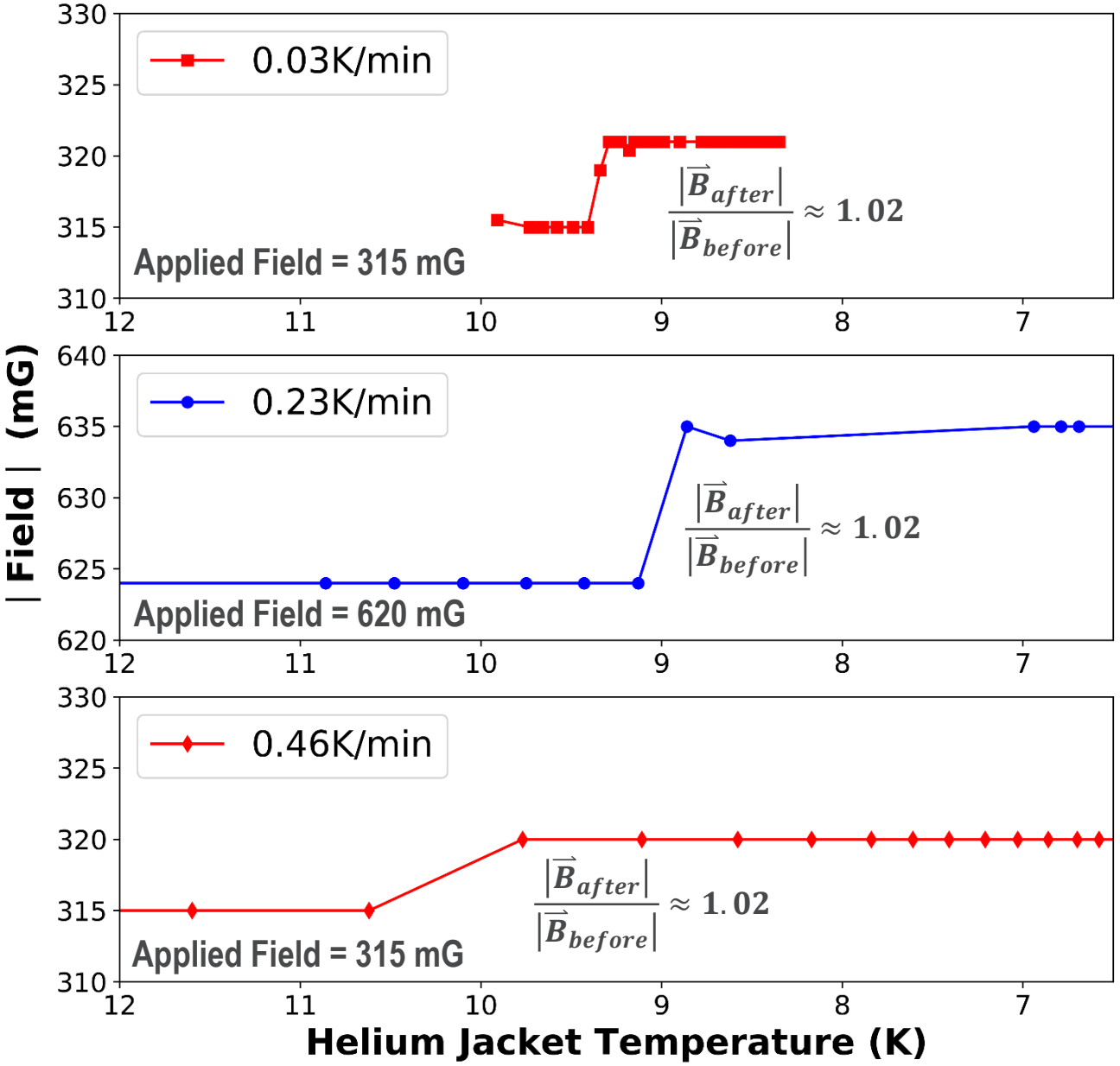
Q Curves

- Initial ambient magnetic field inside the test cryostat with magnetic shield: 18 ± 1 mG
- Improved ambient magnetic field with active cancellation: 5 ± 1mG



Flux Change Cooling Through Tc





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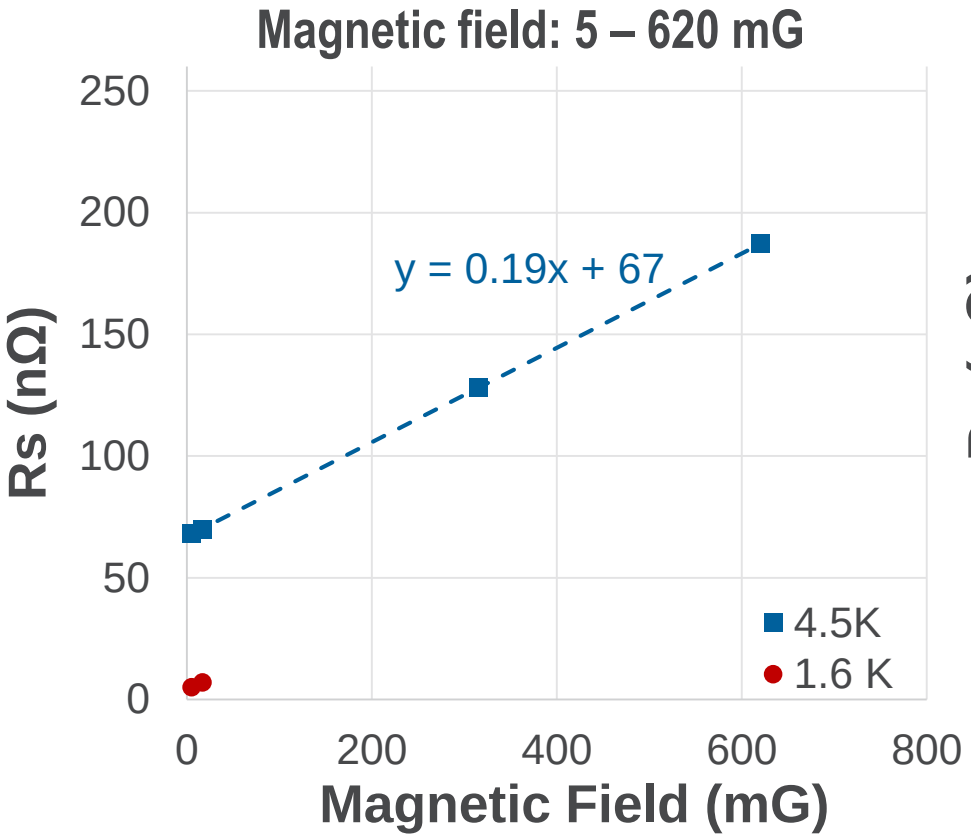
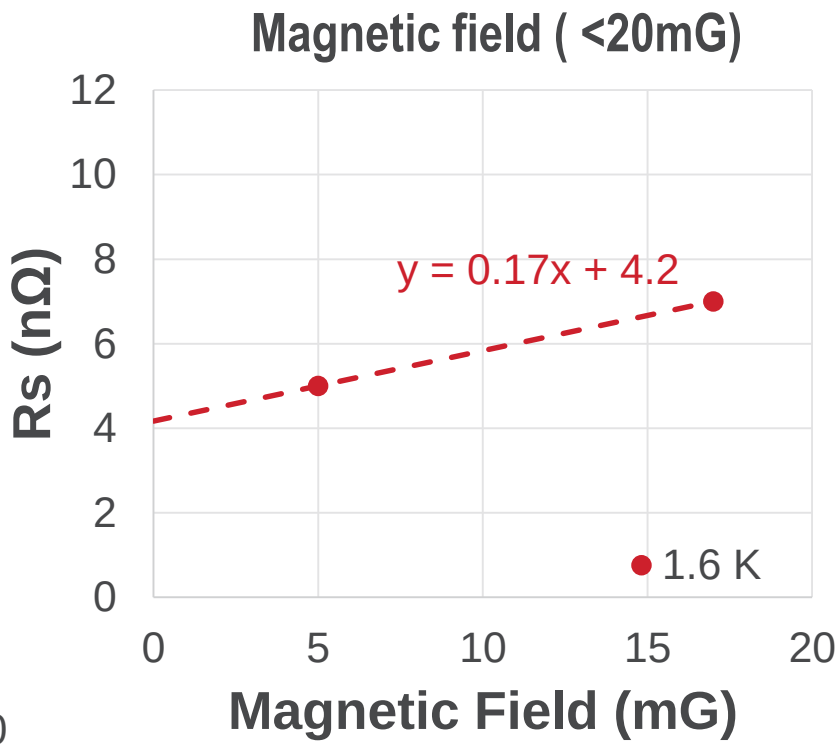
Surface Resistance





$$R_s \equiv \frac{G}{Q(E_{acc} \approx 1MV/m)}$$

$$R_{s,T} = R_{BCS,T} + R_{mag} + R_{res}$$

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Summary

- We see very little Meissner effect: flux trapping in our TEM cavity differs from some TM and TEM cavities
- The magnetic field dependence of the surface resistance is 0.17-0.19 nΩ/mG at both 1.6 K and 4.5 K.
- We see no thermocurrent (<5 mG induced field) in our SS-Nb cavity. We plan to measure this at a higher resolution.
- At our best achieved 5mG level, trapped flux may not be a dominant factor affecting the performance (Q) of our HWR cavity.