Commissioning of the UHH Quadrupole Resonator at DESY

Marc Wenskat – on behalf of our SRF R&D Team

HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

Bundesministerium für Bildung und Forschung

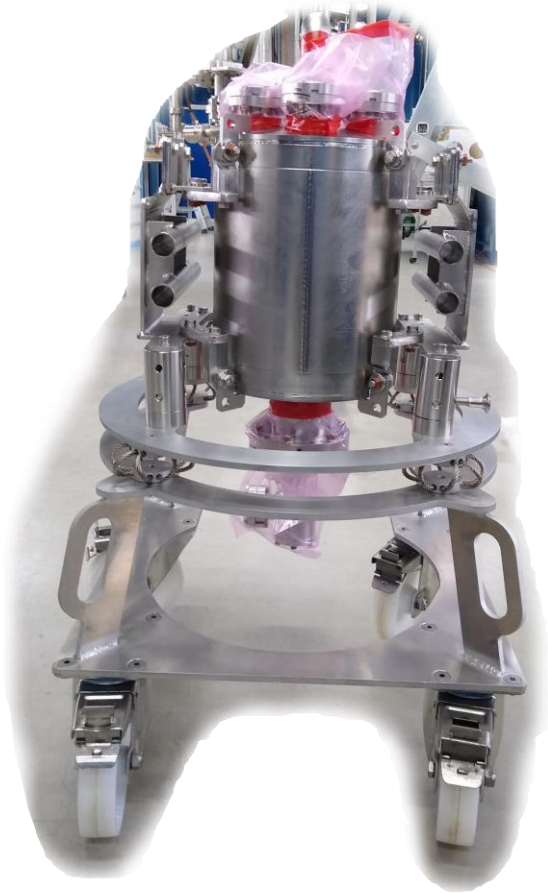
Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

DESY.

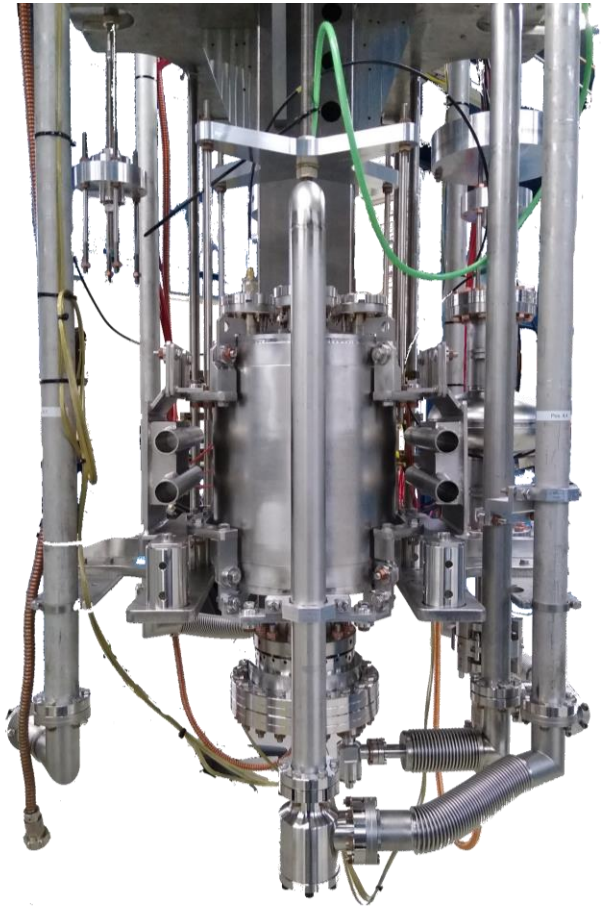
QPR successfully fabricated at Zanon R.&I. SRL

Commissioning at DESY ongoing – so far successfull

Cutoff tube, vessel, rods, and pole shoe before welding.



QPR is moved around with the trolley.



QPR is installed in insert.

QPR successfully fabricated at Zanon R.&I. SRL

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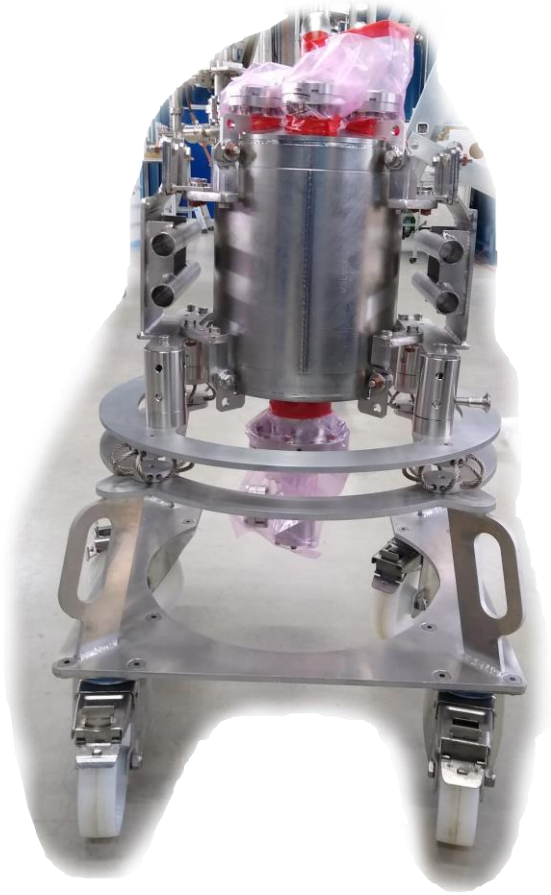
After fabrication, the QPR underwent a standard chemical treatment for SRF cavities.

Cutoff tube, vessel, rods, and pole shoe before welding.



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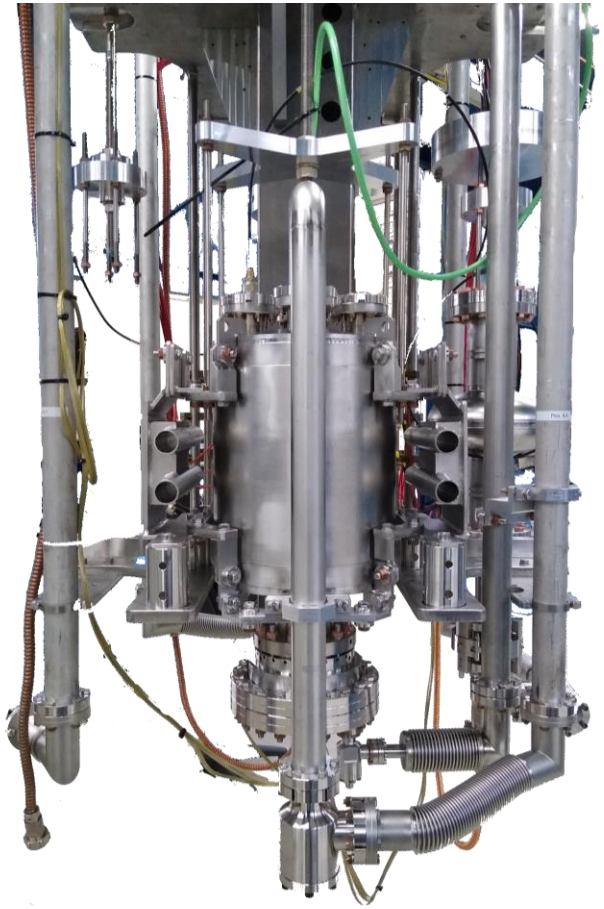
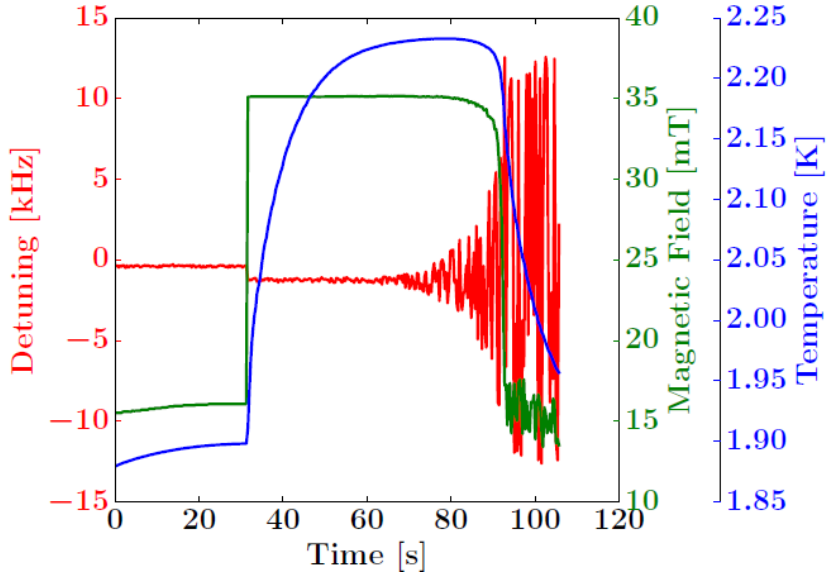


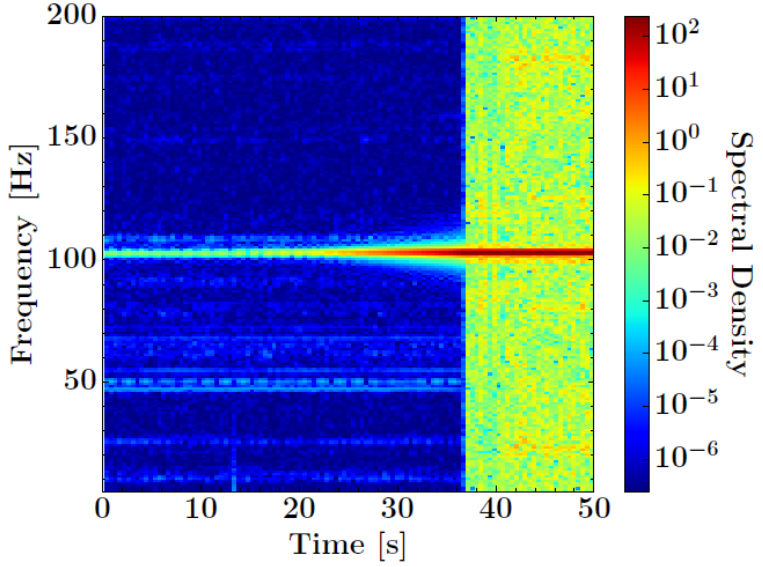
QPR is installed in insert.

Design optimization: stiffening of the rods

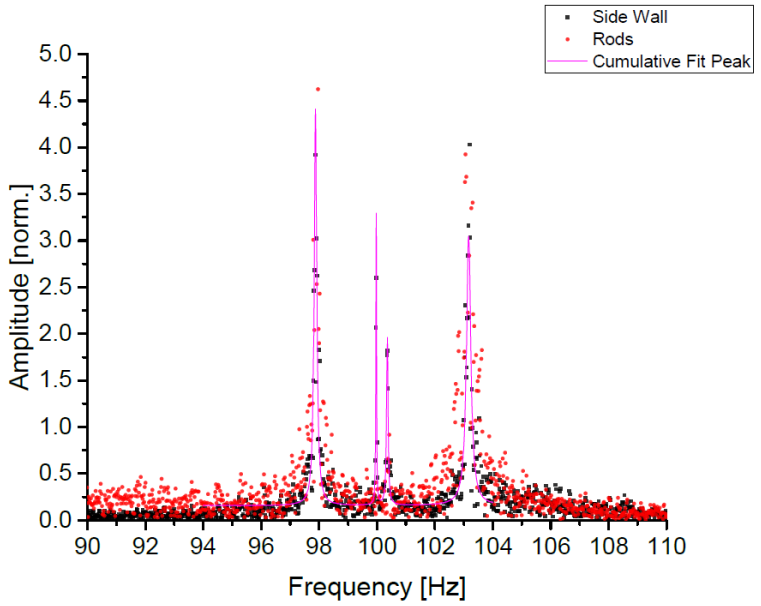
HZB QPR:



Observed detuning leads to PLL losing it's lock on the resonance peak.



Spectrogram of RF signal shows a 100 Hz contribution.



The rods have a 100 Hz mechanical mode.

⇒ Pulsed operation must avoid this mode

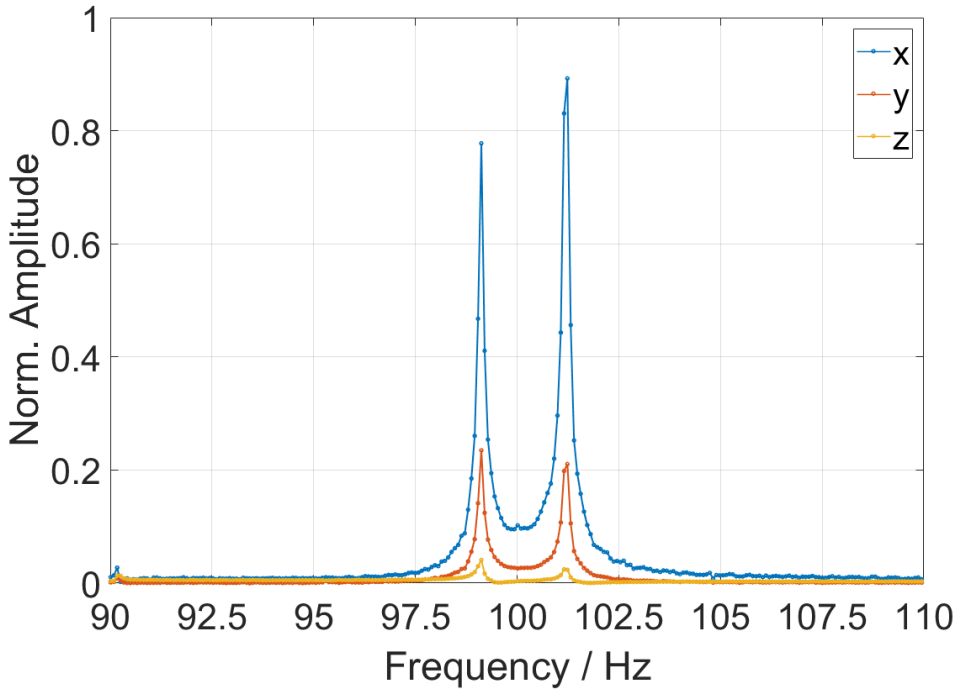
R. Kleindienst, Ph.D. Thesis, Universität Siegen, Siegen, Germany, 2017.

Design optimization: stiffening of the rods

UHH QPR:

Metal bars welded to the rods to enhance their rigidity.

Sensors on top in x-,y- & z-direction.

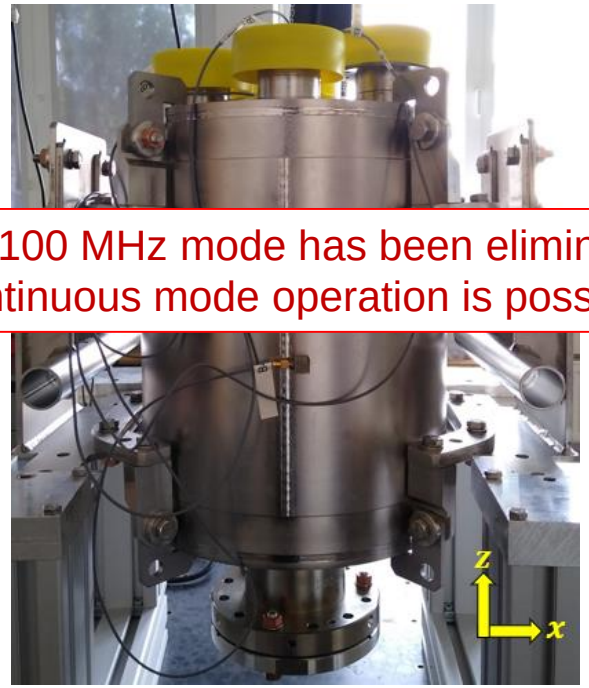


Mechanical spectrum of the rods.

Design optimization: stiffening of the rods

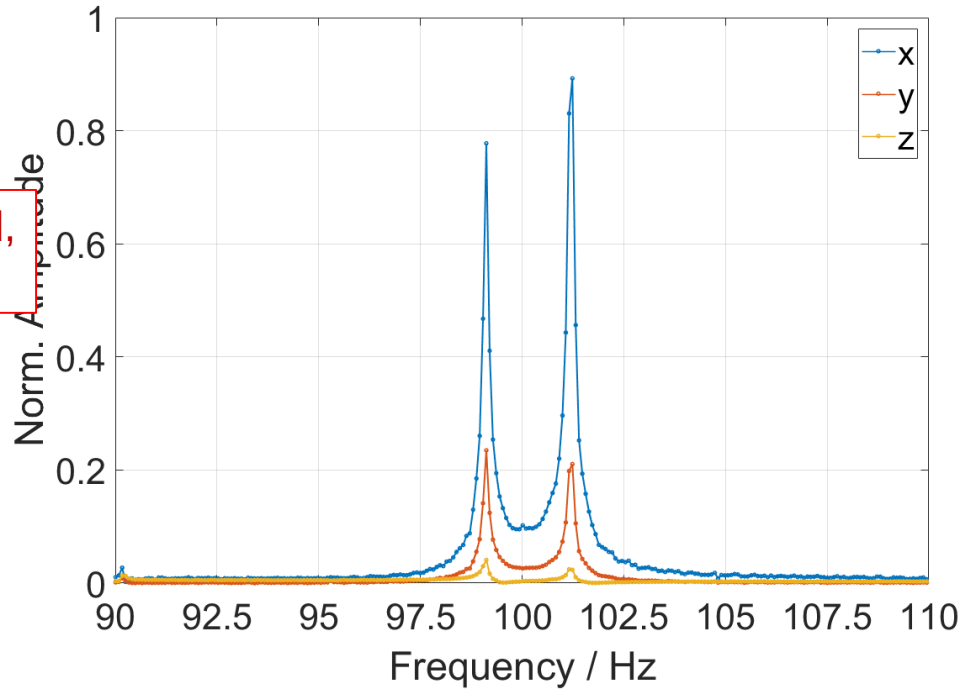
UHH QPR:

Metal bars welded to the rods to enhance their rigidity.



As 100 MHz mode has been eliminated, continuous mode operation is possible!

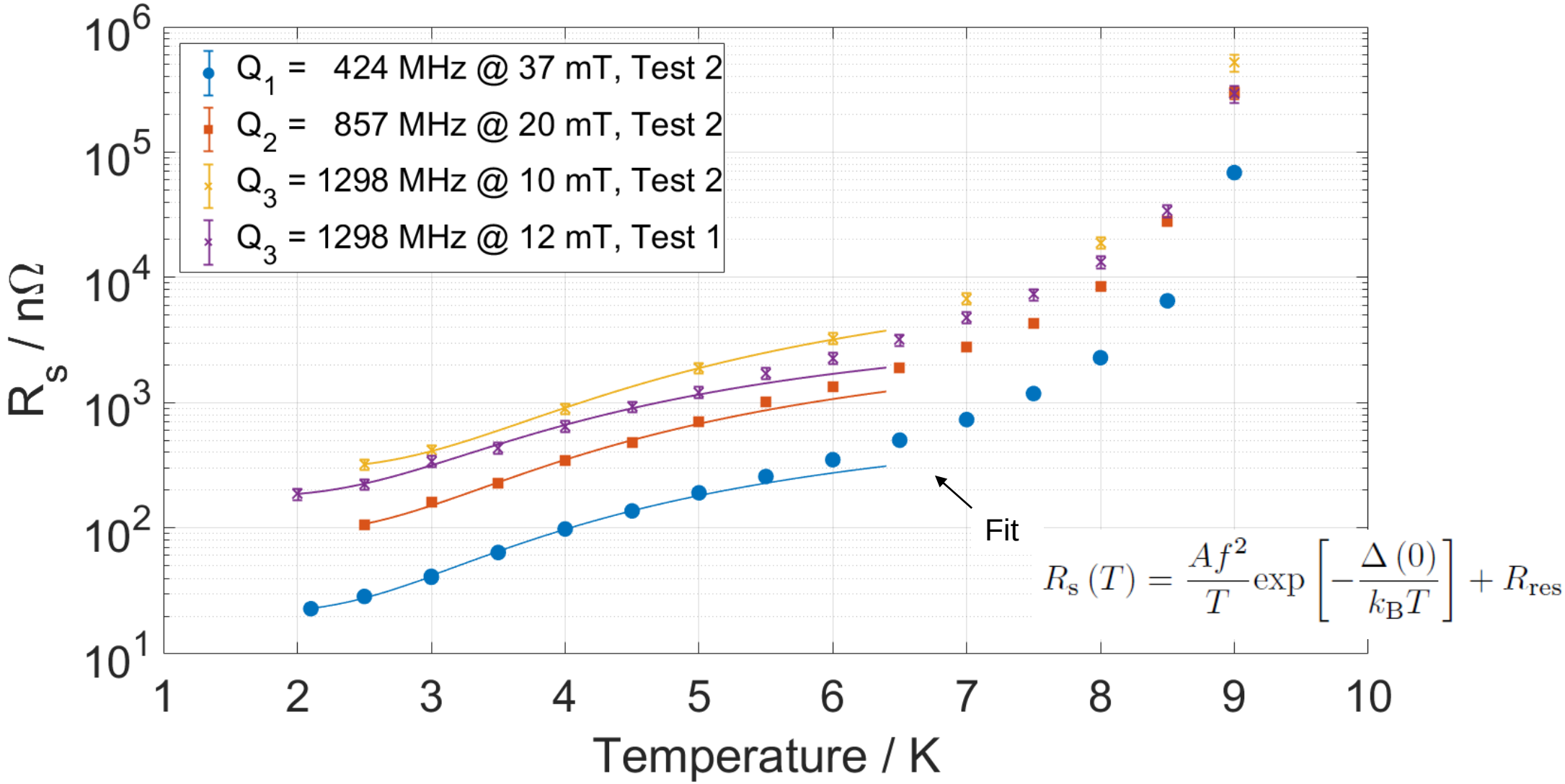
Sensors on top in x-,y- & z-direction.



Mechanical spectrum of the rods.

R_s of the sample measured for all quadrupole modes

Fixed B_{peak} field



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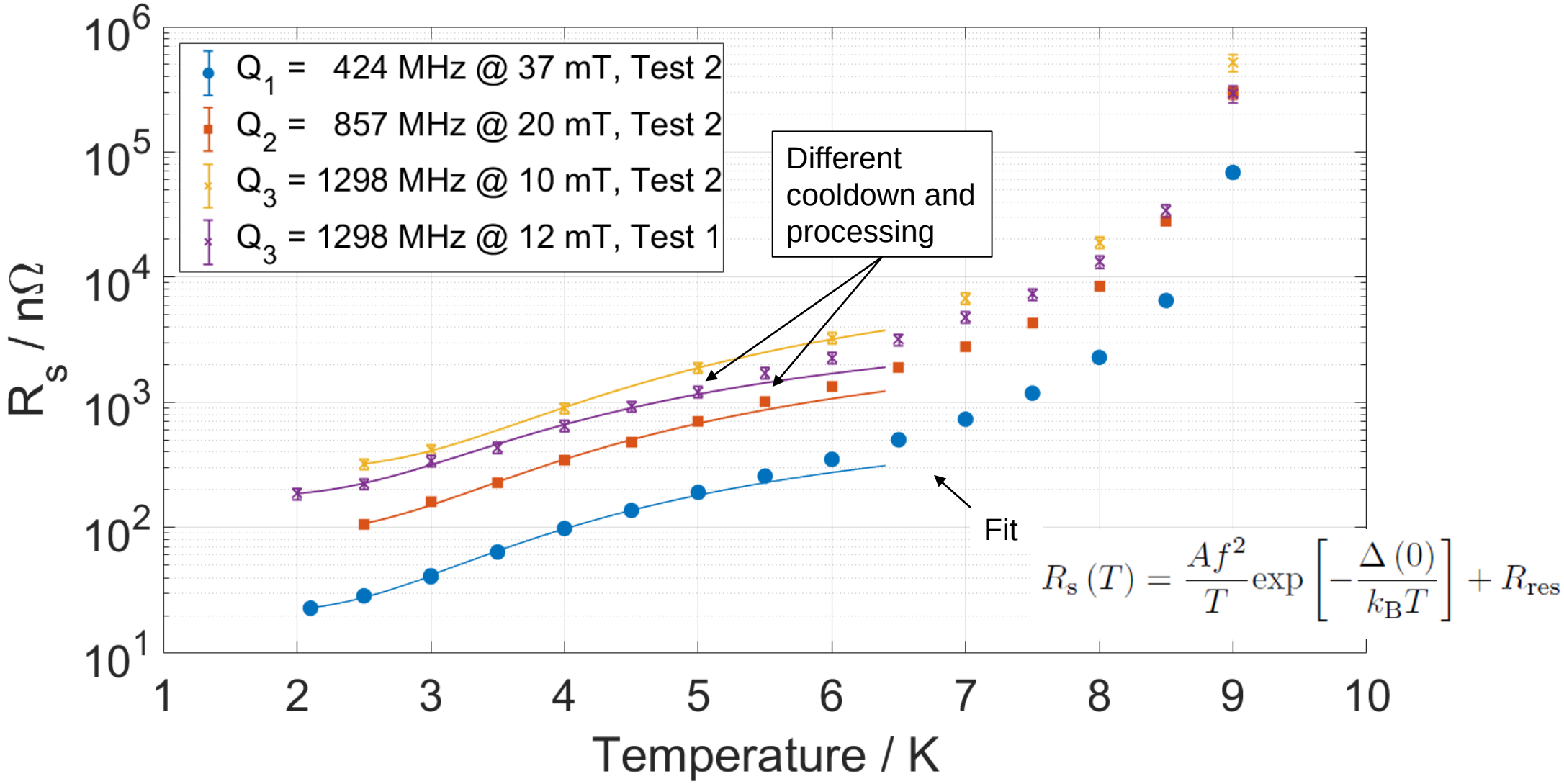
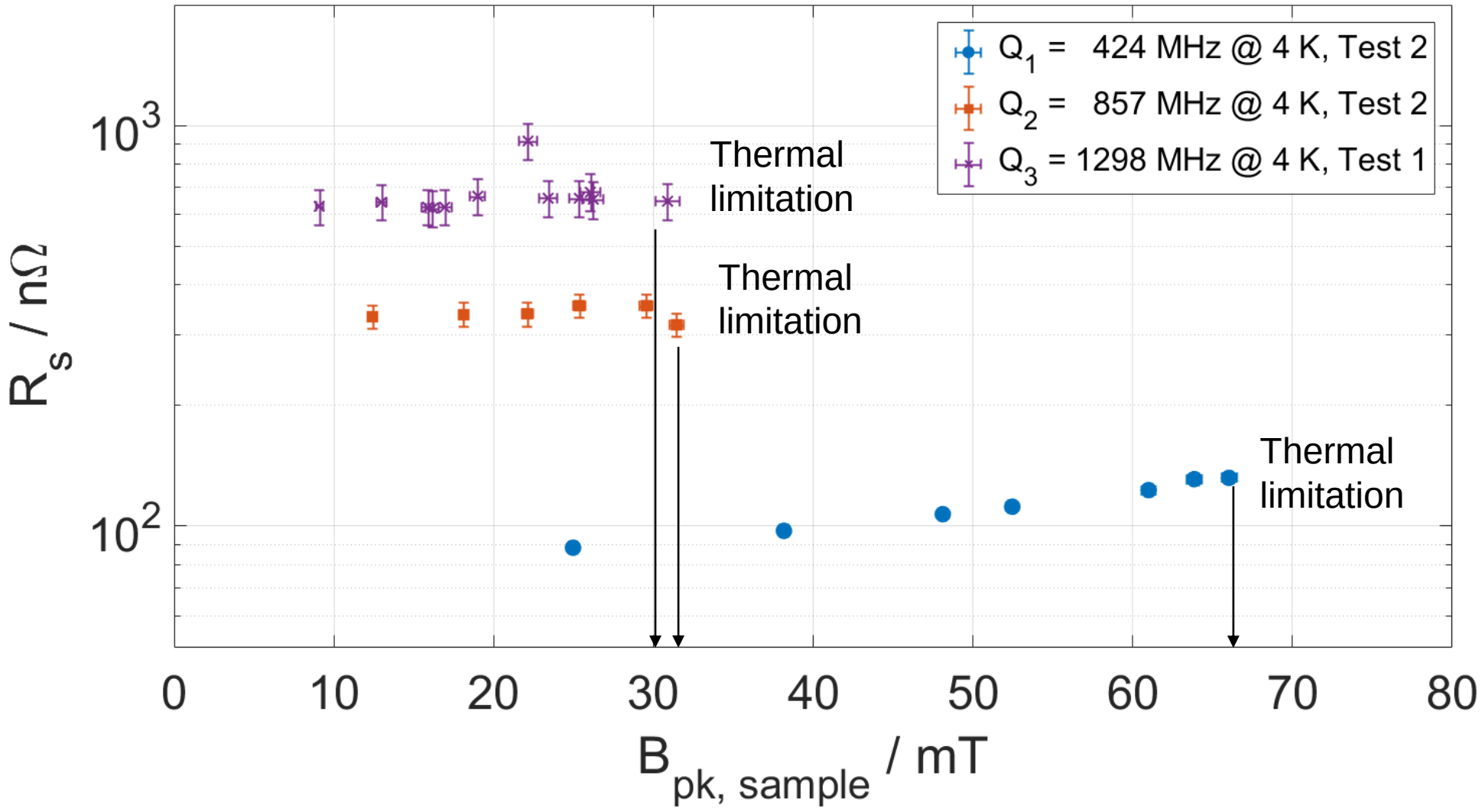


R_s of the sample measured for all quadrupole modes

Fixed temperature of T_1=4 K



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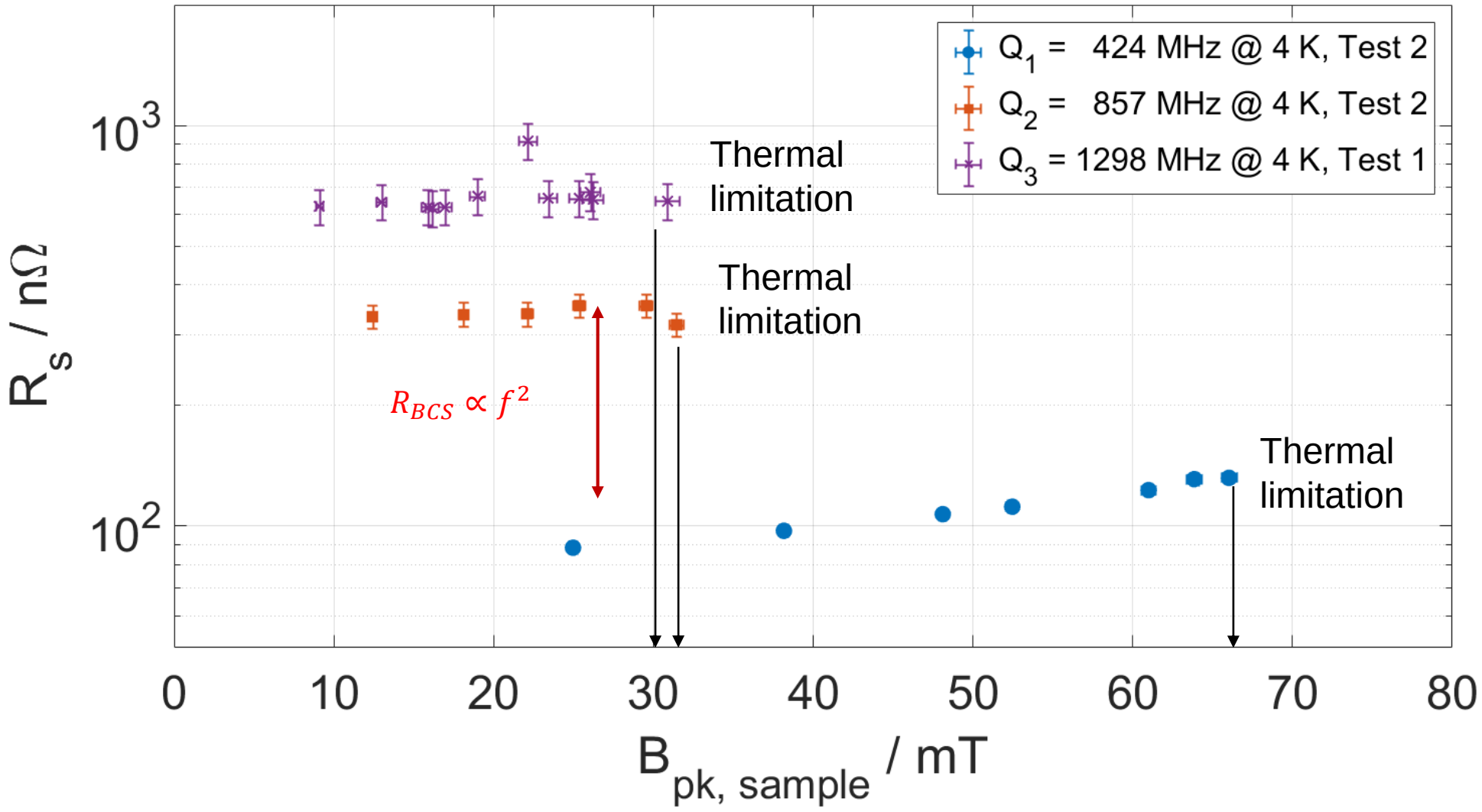
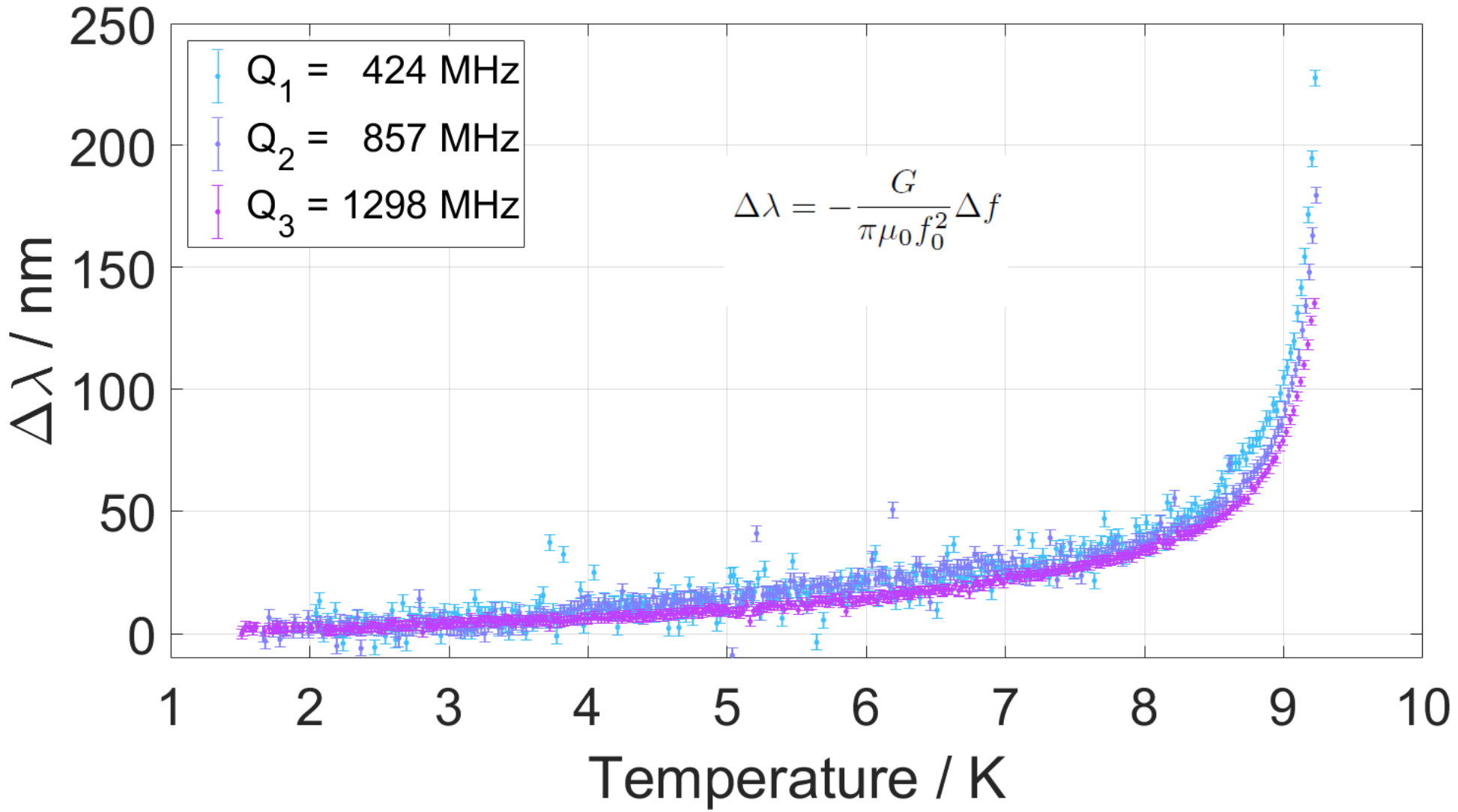


The London penetration depth for each quadrupole mode

Results from frequency measurements



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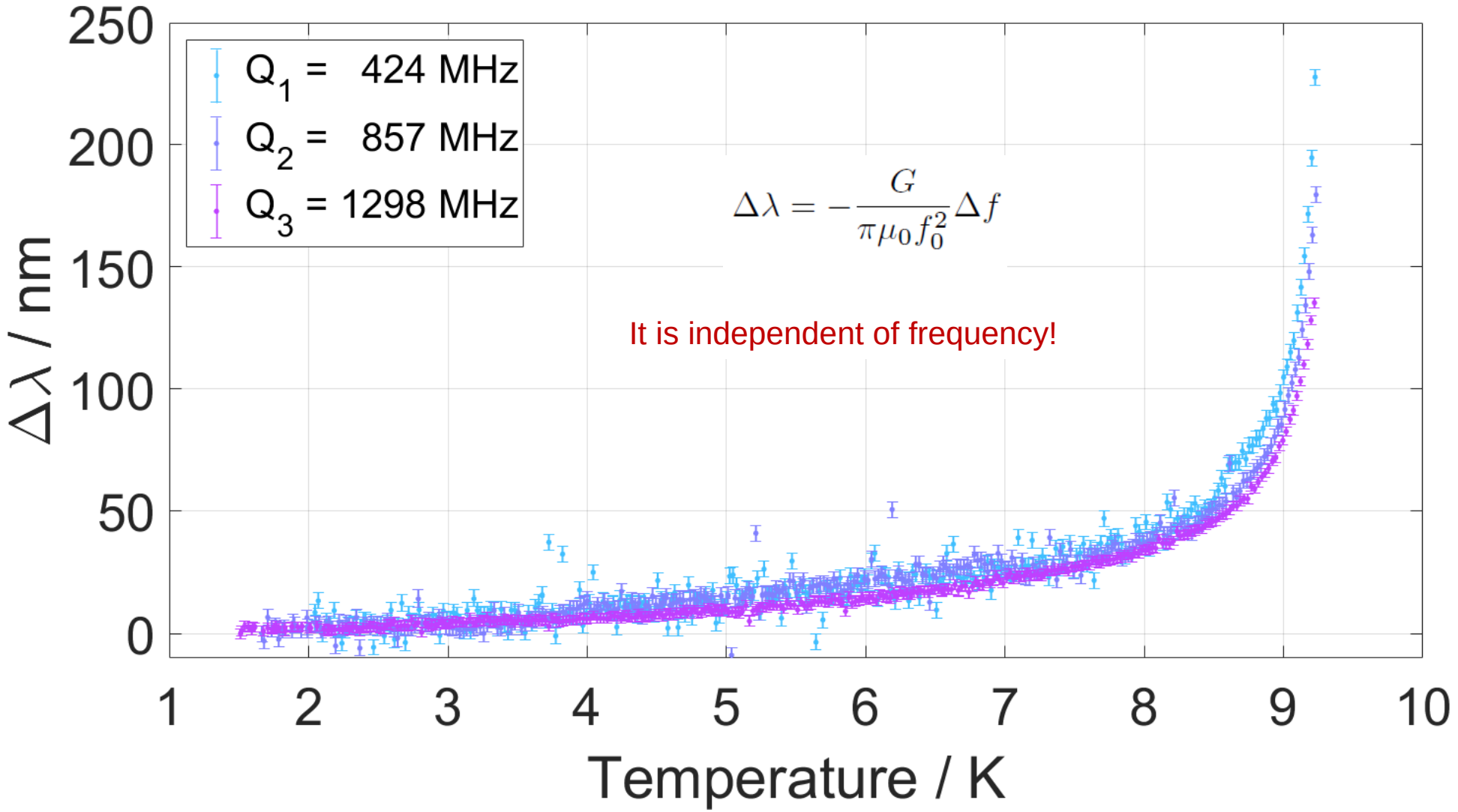

Summary

- **Another QPR (UHH QPR) available, designed at UHH and DESY**
  - Based on the successful system at HZB
  - Improved rods- and sample flange designs led to simplified operation

- **Fabricated at Zanon R. & I. SRL, commissioning on going → It is alive!**
  - First cooldowns successful
  - Commissioning goes faster than expected
  - Need for a new PhD student to continue work

- **HZB Nb sample investigated at all QPR modes → results are as expected for sample with Q-disease**
  - $R_s \propto f^2$
  - $\Delta\lambda$ independent of mode