Progress with RF Characterisation facility at STFC Daresbury

5th IFAST WP9 Meeting
3rd May 2022

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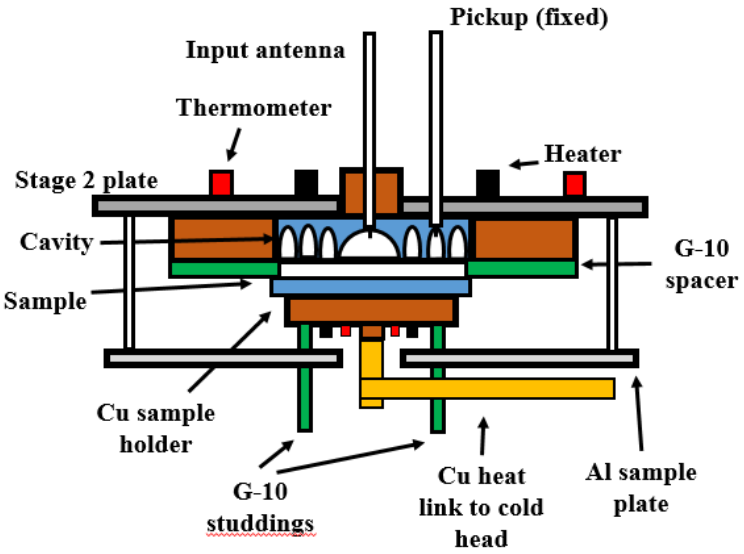
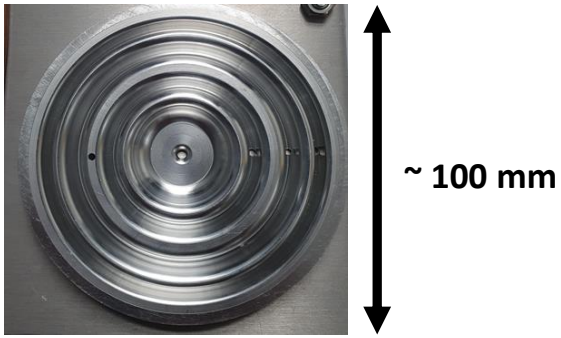
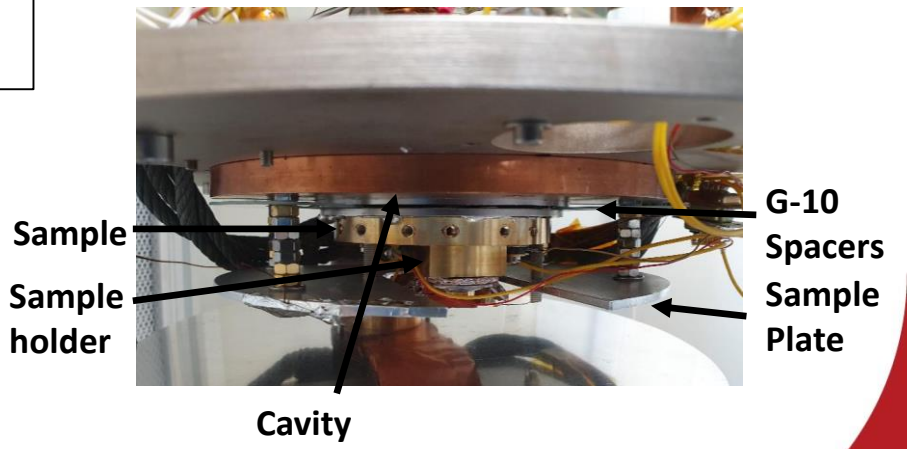
Facility

- Measurements of R_S with RF-DC compensation using Nb choke cavity (3 choke or 2 choke)
- Aim to test planar samples **90 - 110 mm** diameter with **2 to 3 day turnaround** between tests
- So far allows Rs measurements of
  - **f_0 = 7.8 GHz**
  - **T_S = 4 to 10 K**
  - **RF Power up to 1 W**
  - **$B_{s,pk} \leq 0.8$ mT**



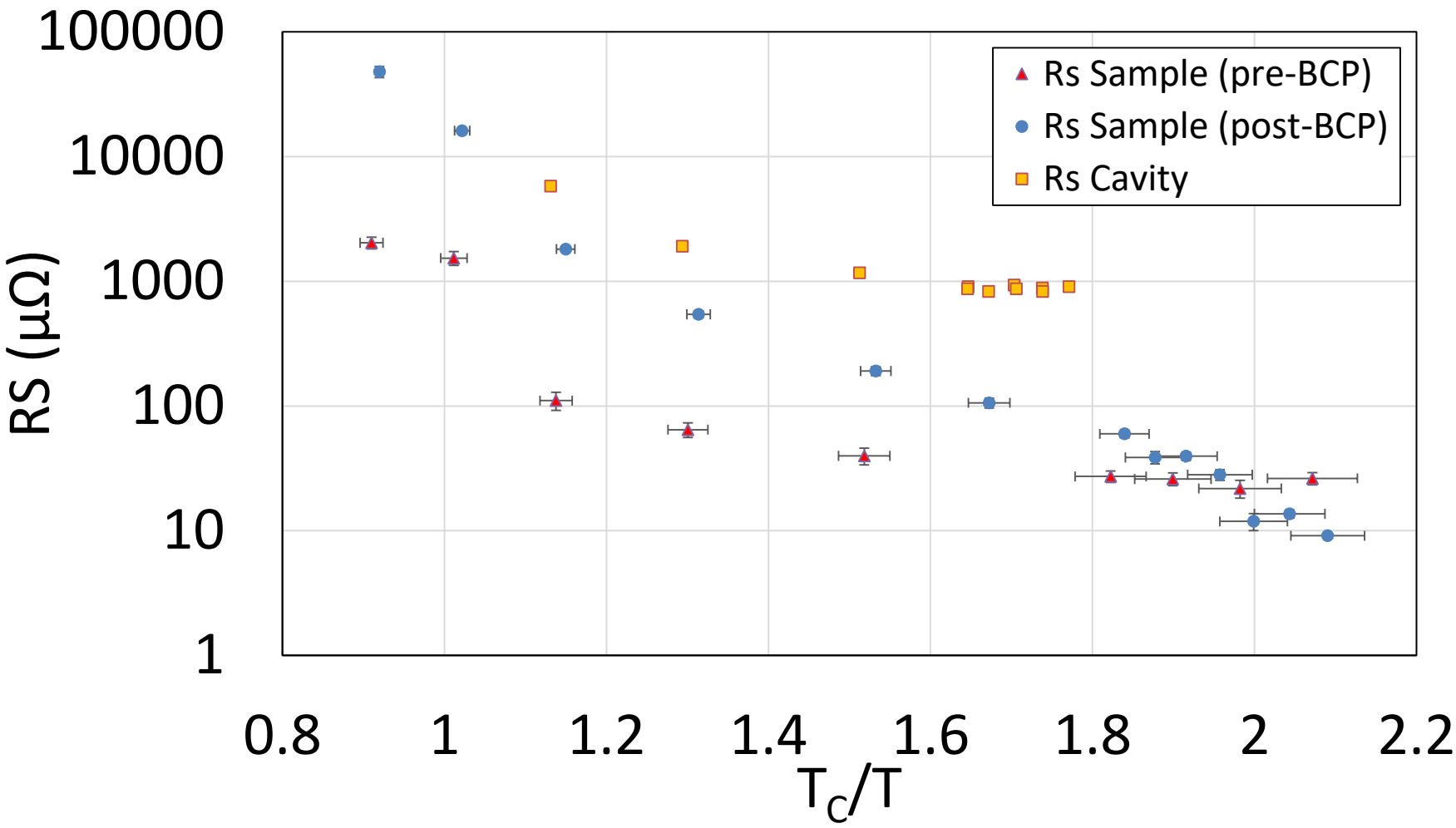




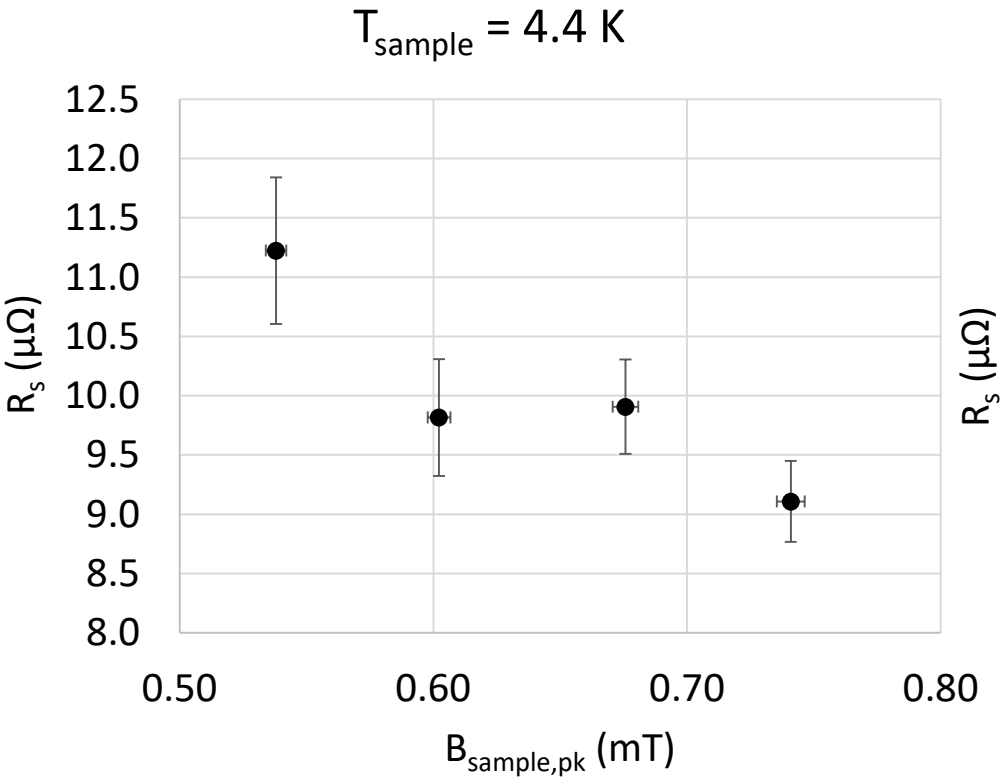
Current Status

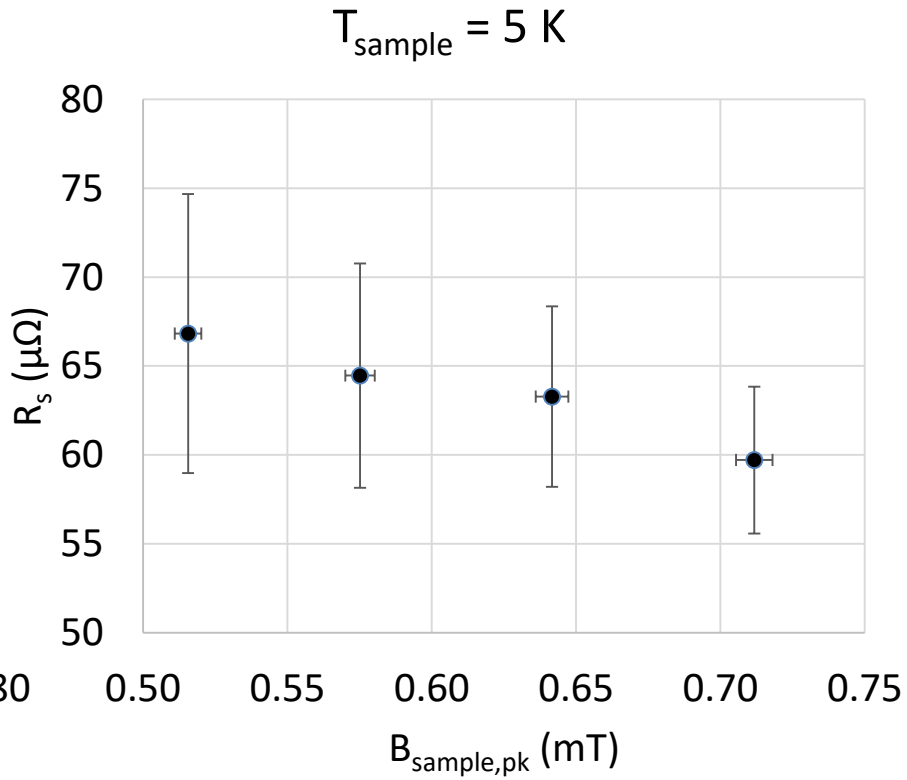
- Facility now utilises a pickup coupler allowing for direct measurements of stored energy and transmitted power – with clean S_{21} signal
- Been testing bulk Nb sample using 3 choke bulk Nb cavity – both treated by BCP at INFN
- Bulk Nb sample has been metallographically polished at IJCLab
- A phase-locked loop control system has now been developed to mitigate the effects of microphonics – still requires testing

Bulk Nb post BCP



T = 5.2 K, Q_{system} (meas) = 5.4 x 10^5, Q_{system} (exp) ~ 6 x 10^6


T_{sample} = 4.4 K
12.5
12.0
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
R_s (μΩ)
0.50
0.60
0.70
0.80
$B_{sample,pk}$ (mT)


T_{sample} = 5 K
80
75
70
65
60
55
50
R_s (μΩ)
0.50
0.55
0.60
0.65
0.70
0.75
$B_{sample,pk}$ (mT)

Future Plans

- Finish measuring bulk Nb samples:
  - Diagnose issues with cavity R_S and Q factors
  - Re-test post-BCP bulk Nb
  - Test metallographically polished bulk Nb
- Start thin film testing programme of 2 samples per week
  - Sample discs 90-110 mm diameter
  - With PLL, will be able to make measurements at up to 10 mT (currently only reaching maximum of 0.7 mT)
  - Moving facility to bunker will allow for higher fields

Thank you for listening

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