

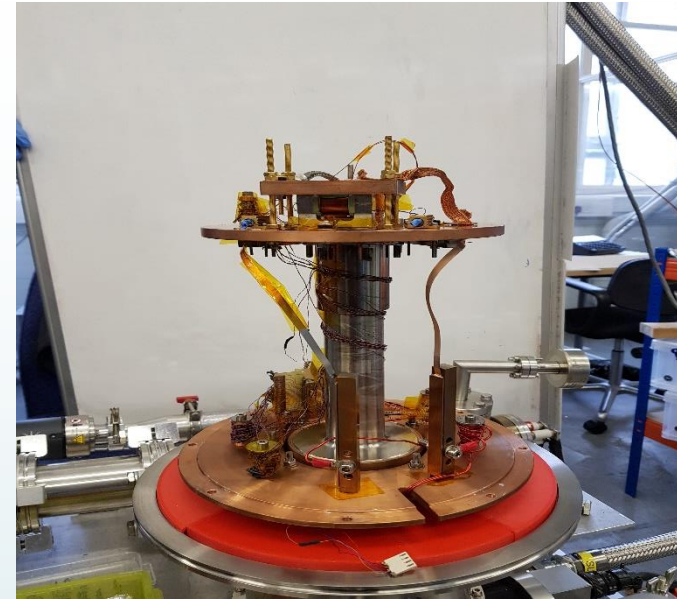
IFAST 1st Annual Meeting, 03/05/2022

Analysis of Nb and Pb foils.

Liam Smith, Daresbury Laboratory.

Penetration Facility, Method and Function.

- The penetration facility, determines the critical field (H_{fp}) of superconducting materials.
- The facility can reach cryogenic temperature of 2.6 K and applies a maximum magnetic field of 600mT.
- A magnetic field is applied parallel to the sample surface and is applied from one side of the sample to the other.
- There are two Hall probe detectors located each side of the sample (H_{p1} & H_{p2}) that determine the field of full flux penetration (B_{fp}).



Background of the study

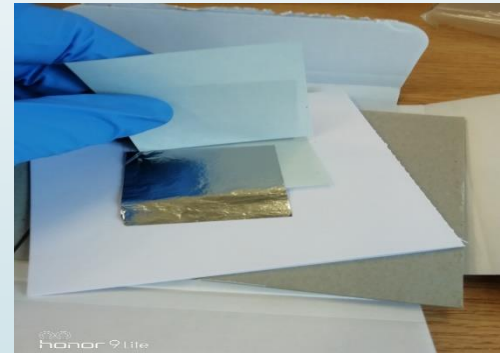
A paper by Dan Turner is being published after conducting an experiment to investigate how the size of a sample effects results due to leakage. In the study, a sample was reduced in size from 50x50 mm to 10x10 mm and the results were analysed.

Following on from that study, I have began to carry out the same investigation using Nb foil for comparison.

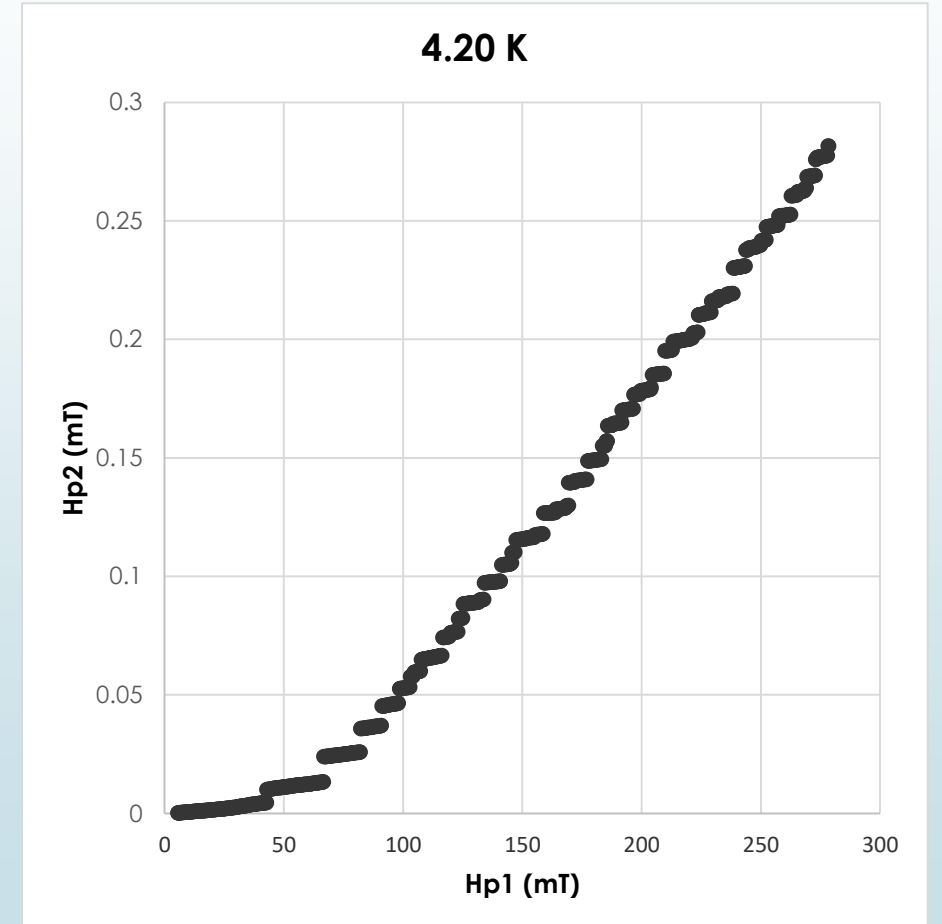
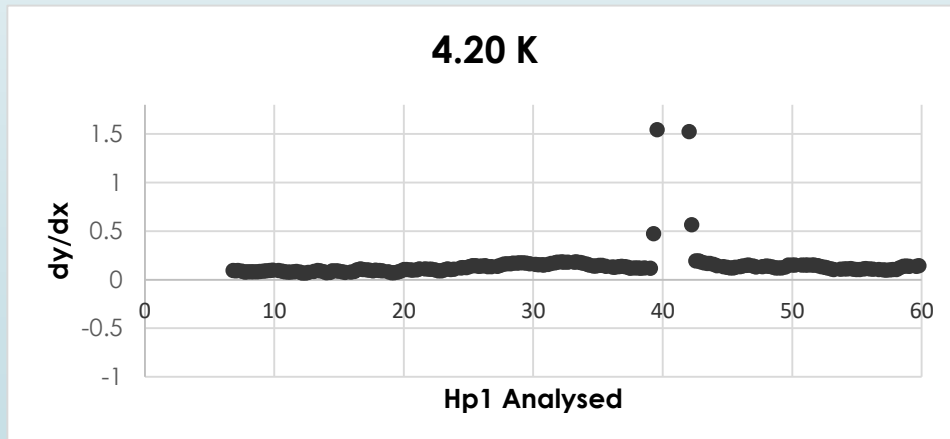
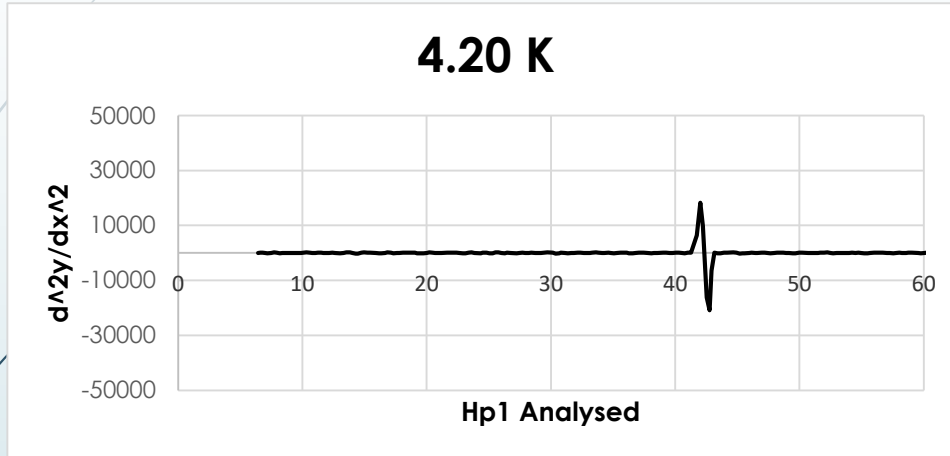
I have two samples that can also be cut down, starting from 50x50 mm. Sample thickness is 10 μm and 1 μm .

Early results have been demonstrated in this presentation.

Samples sourced from Goodfellow Ltd
99.99% purity

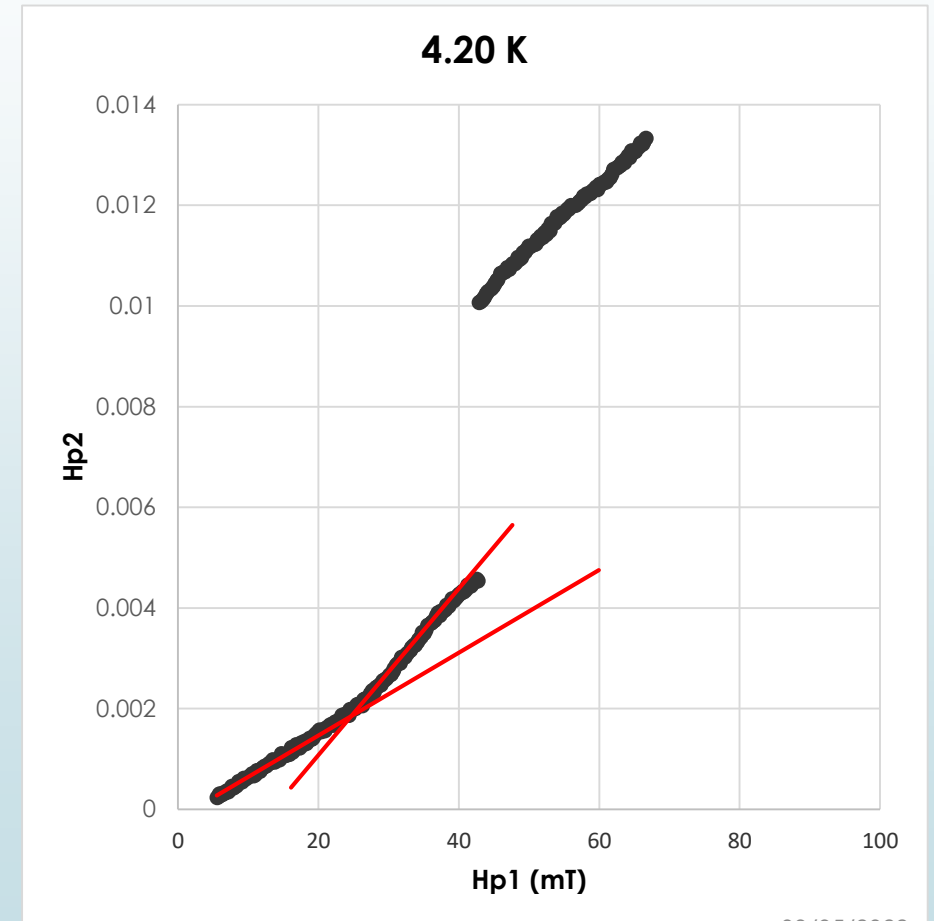
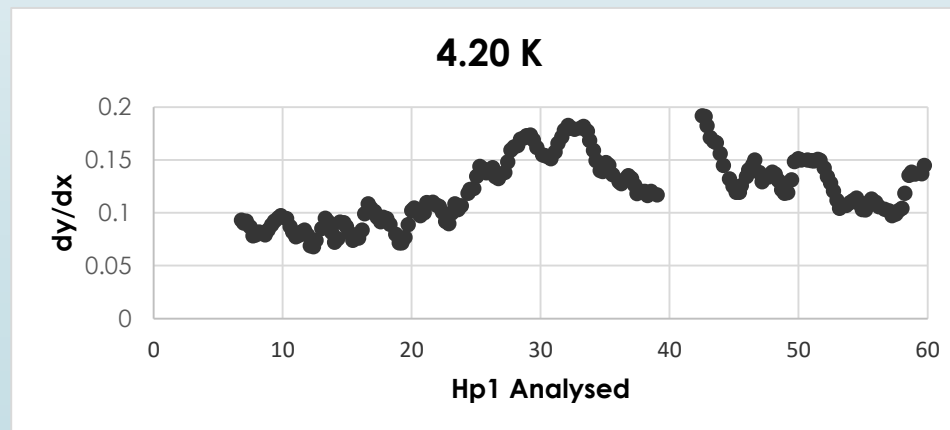
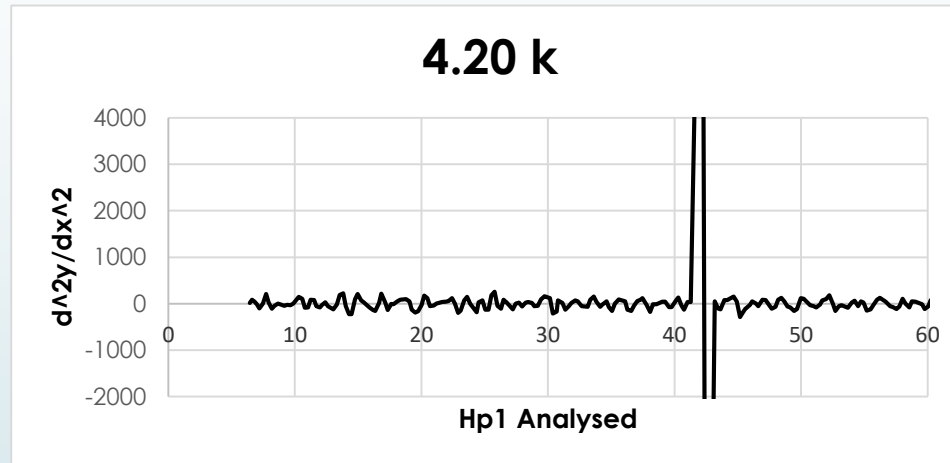


Nb Foil Samples, 50x50. 4.20 K ($1\mu m$)



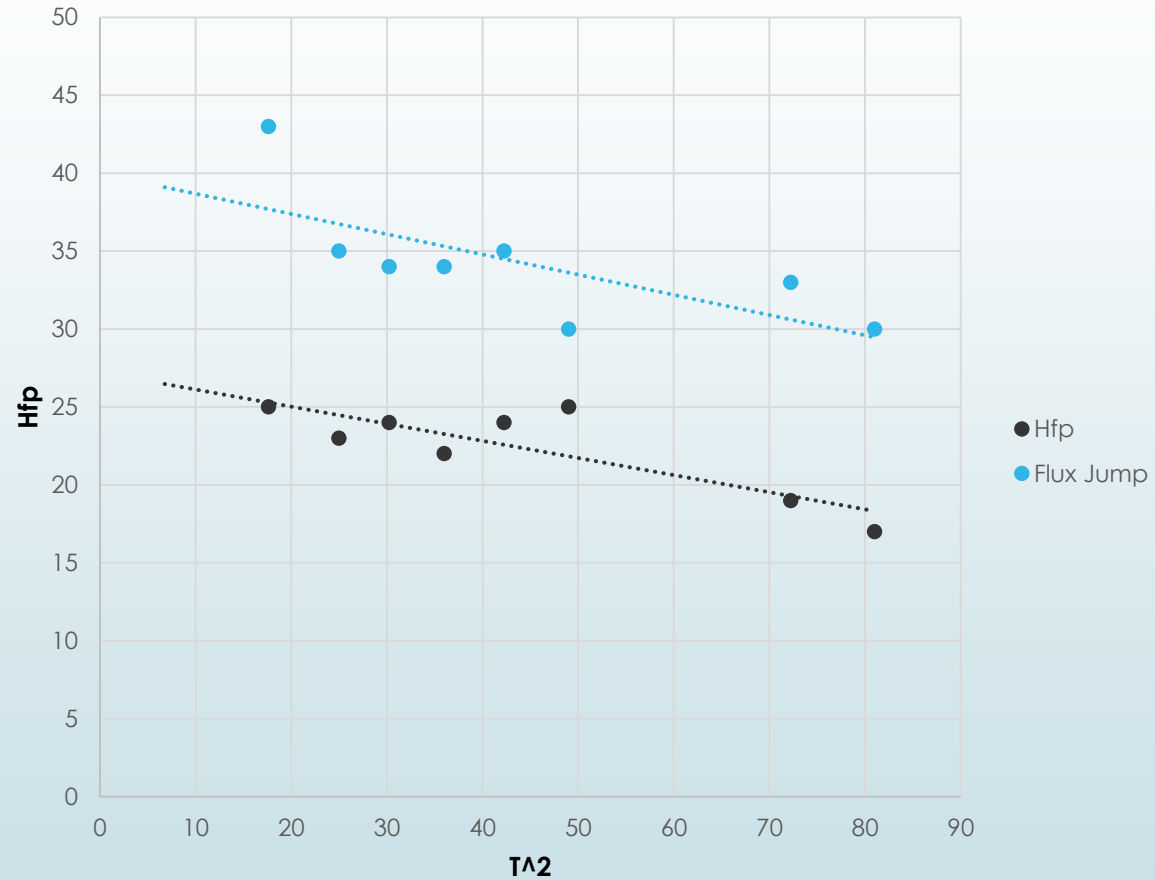
Further Analysis, Nb.

Type two Superconductor.

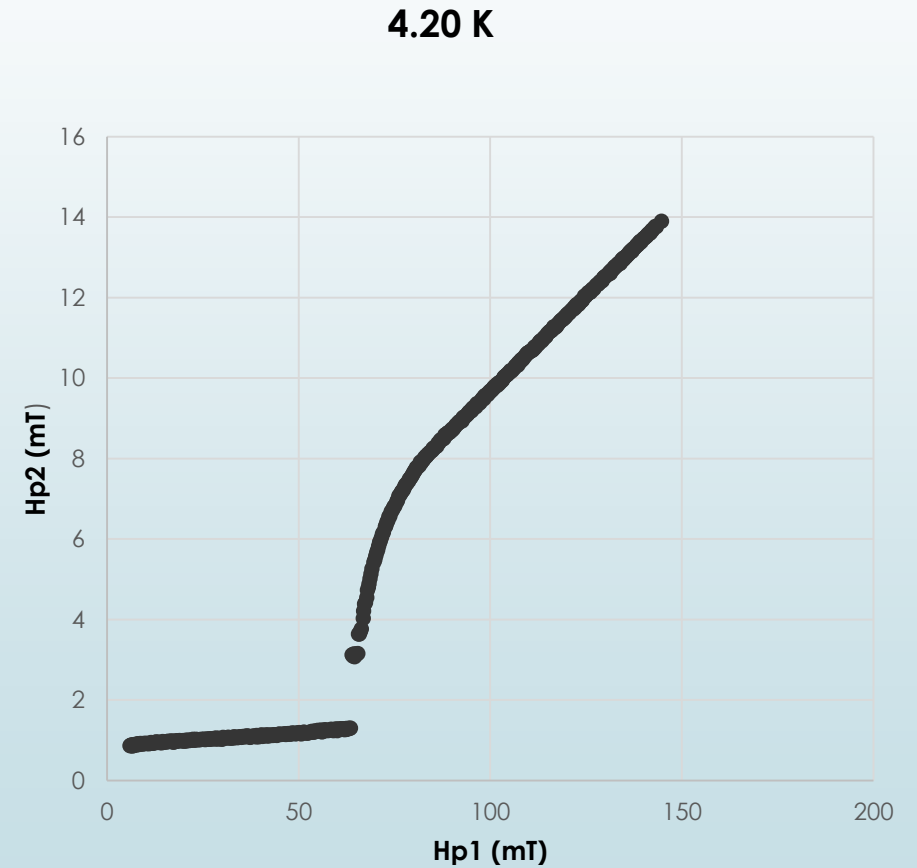
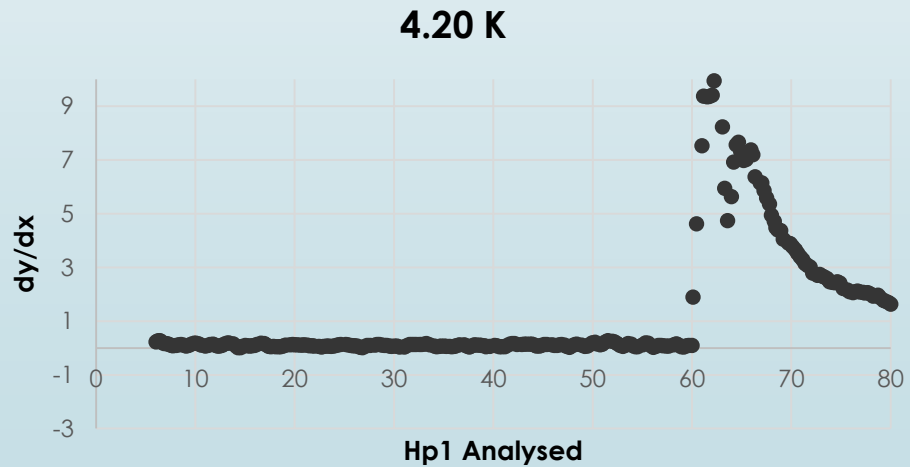
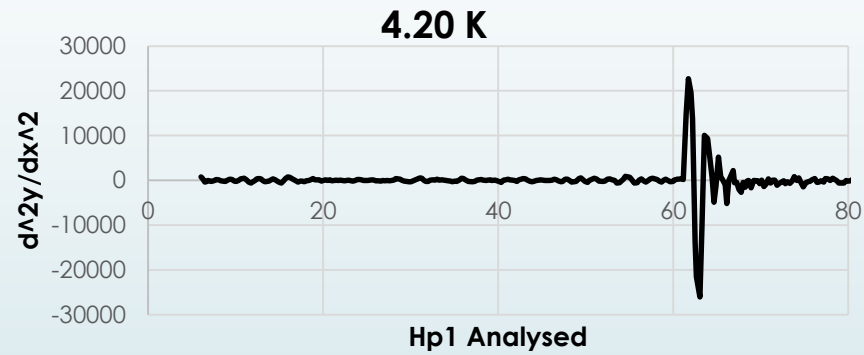


Points taken from the Critical field compared to points taken from possible Flux jump.

Hfp as a function of Time. Nb, 50x50.

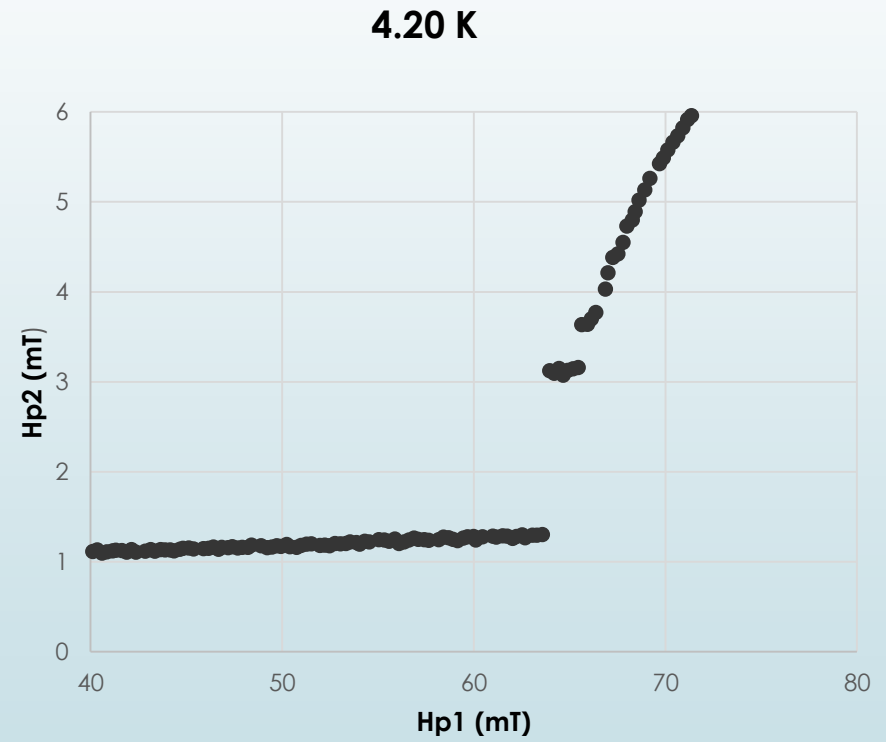
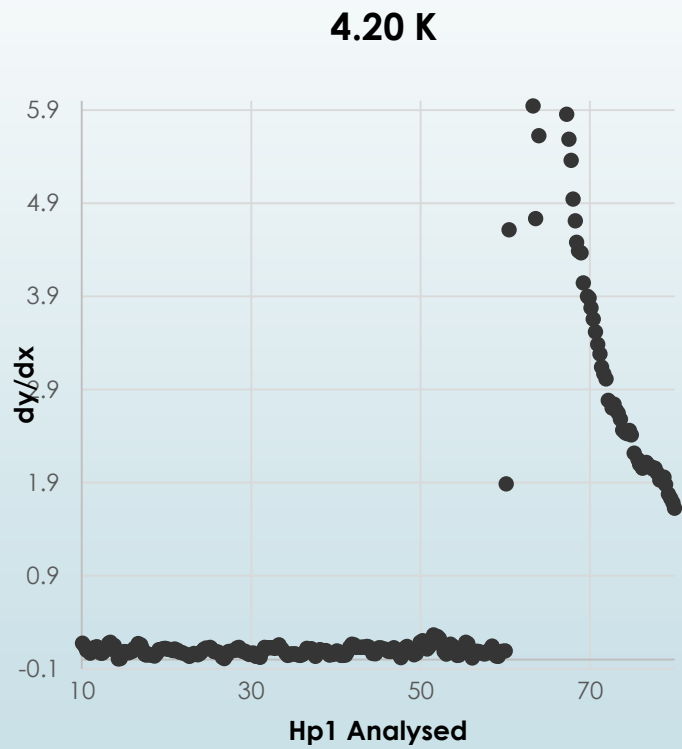


Pb Foil Samples, 50x50. 4.20 K, ($1\mu m$).

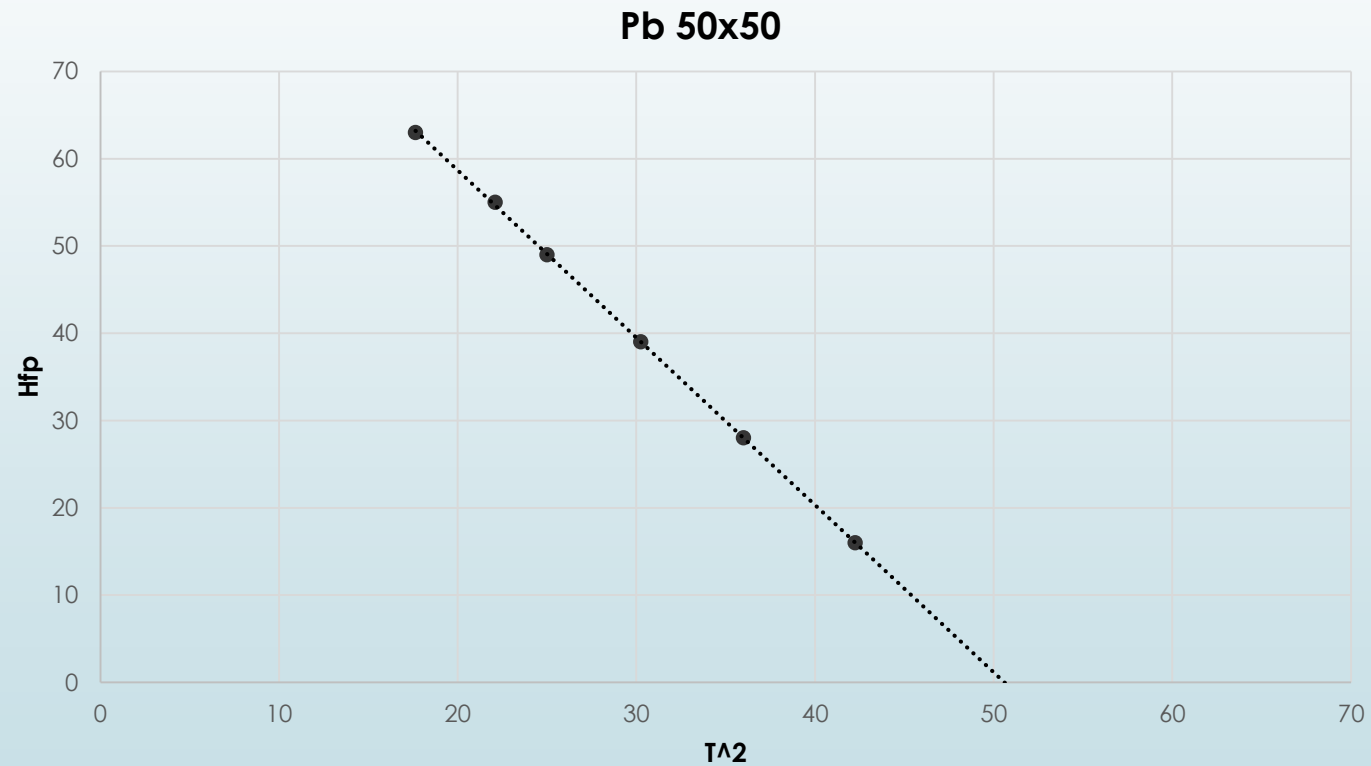


Further Analysis, Pb.

Type one Superconductor.



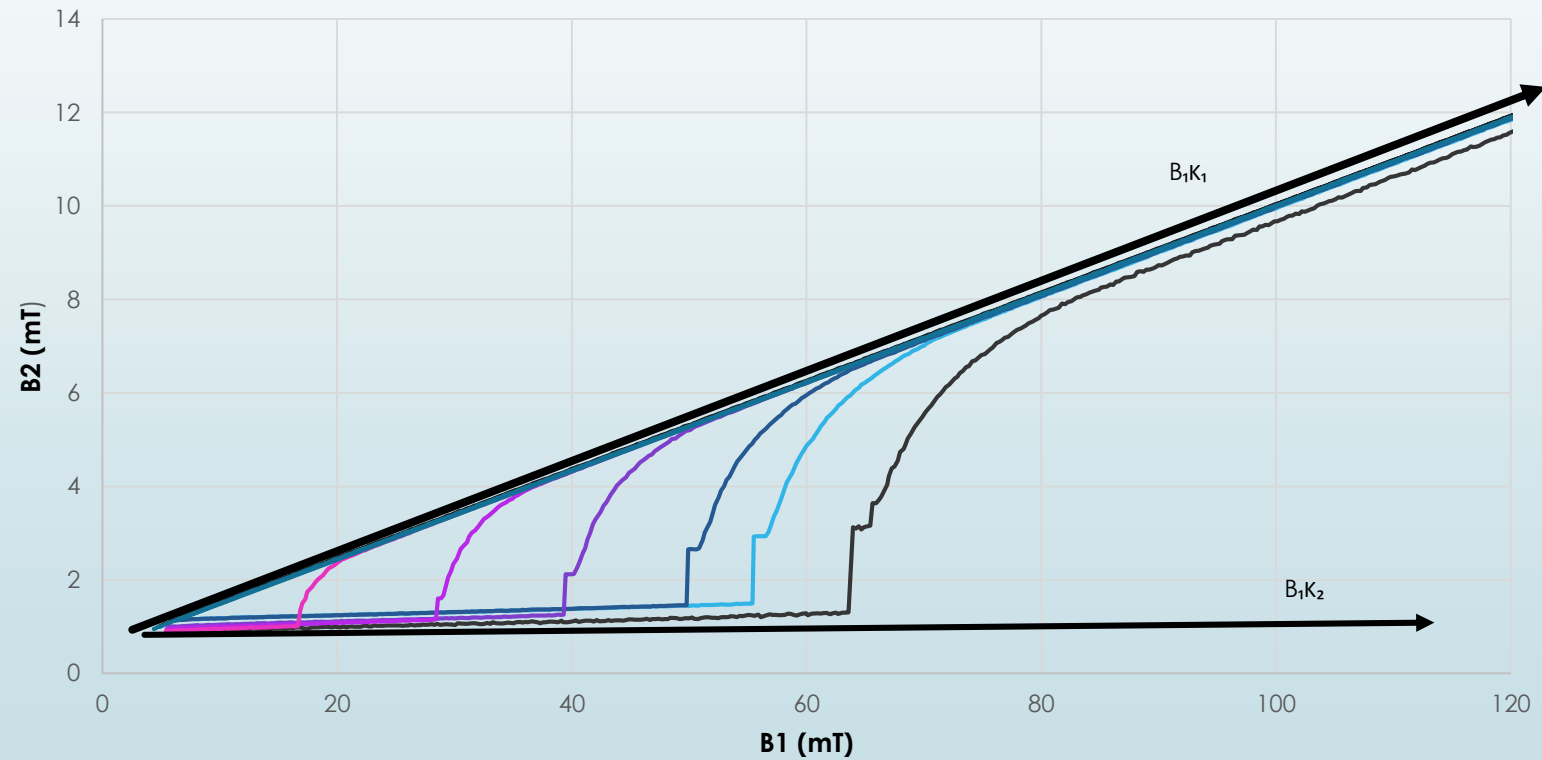
Hfp as a function of Time. Pb, 50x50.



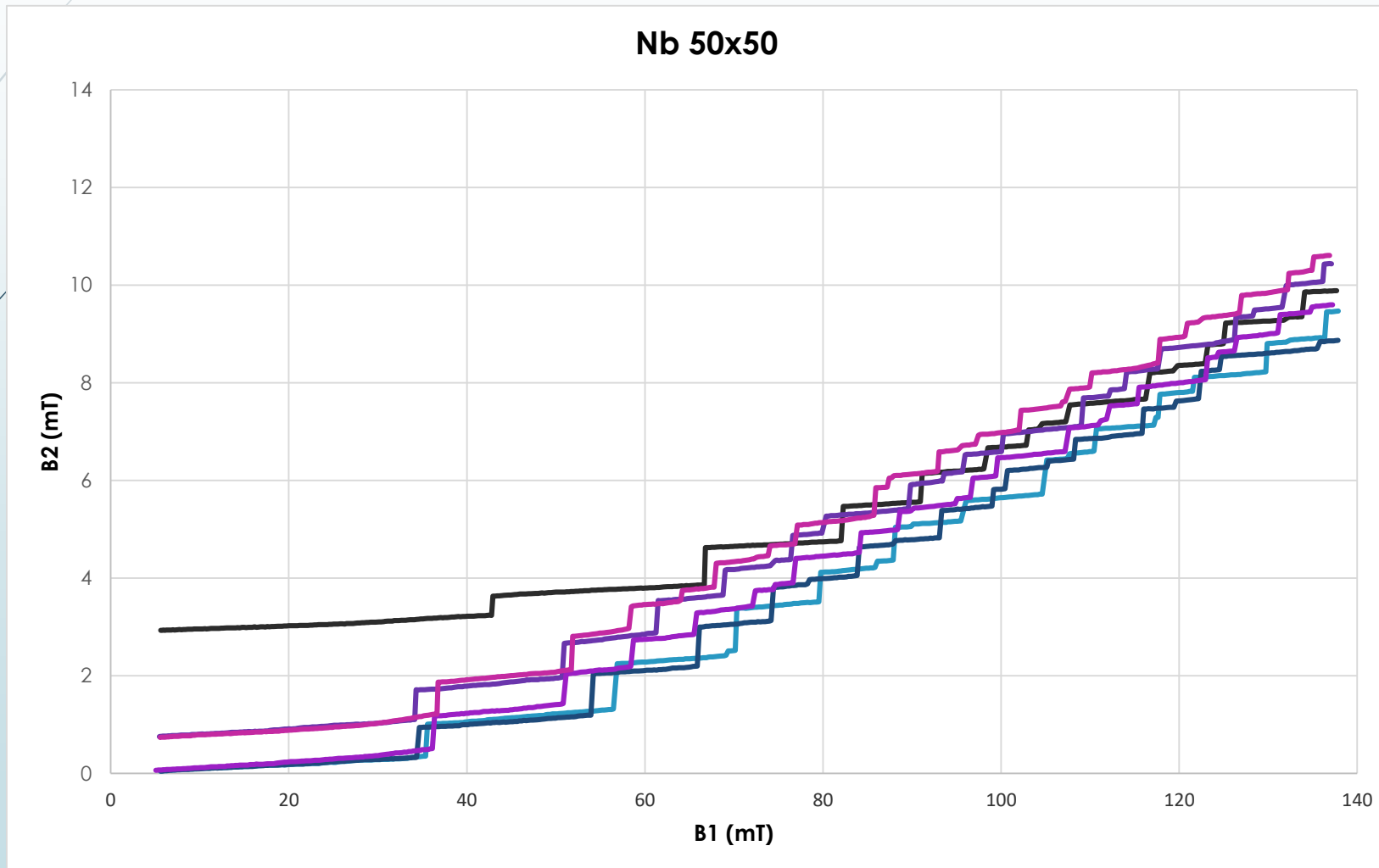
Bfp for all temperature points of Pb ($10 \mu m$)

- 4.20 K
- 4.70 K
- 5 K
- 5.50 K
- 6 K
- 6.50 K
- 7 K
- 8 K

Pb 50x50



Bfp for all temperature points of Nb foil (1 μm).



Conclusion

- Sample size is an issue.
- Add a further plate to the top of the sample.
- Should have better results at the next meeting from the 10 μm sample.

Thank you for your attention