



Superconducting Properties Evaluation At Daresbury Lab

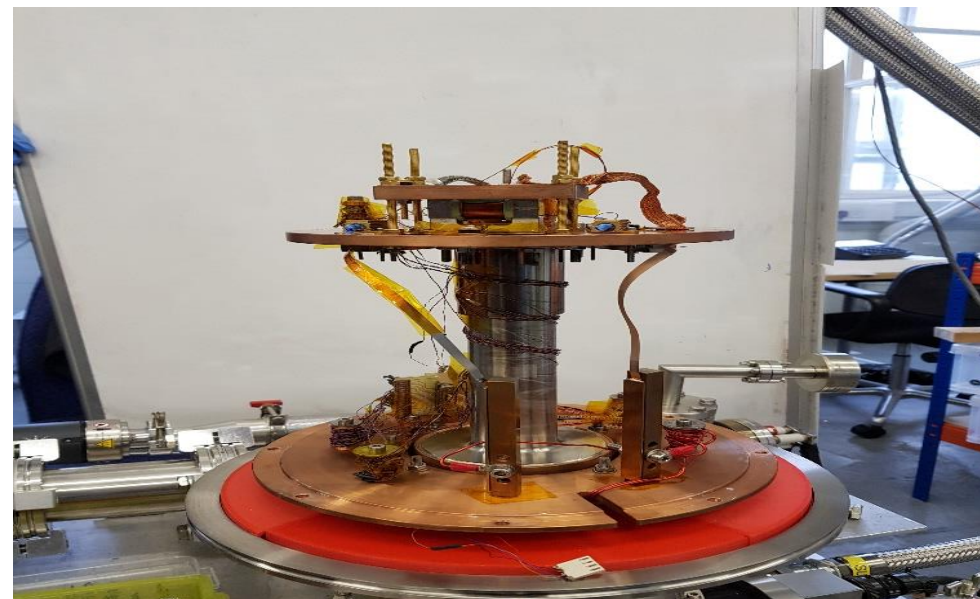
Liam Smith, Daresbury Lab, ASTeC, VSG.

On Behalf of the Team

Magnetic Field Penetration Facility

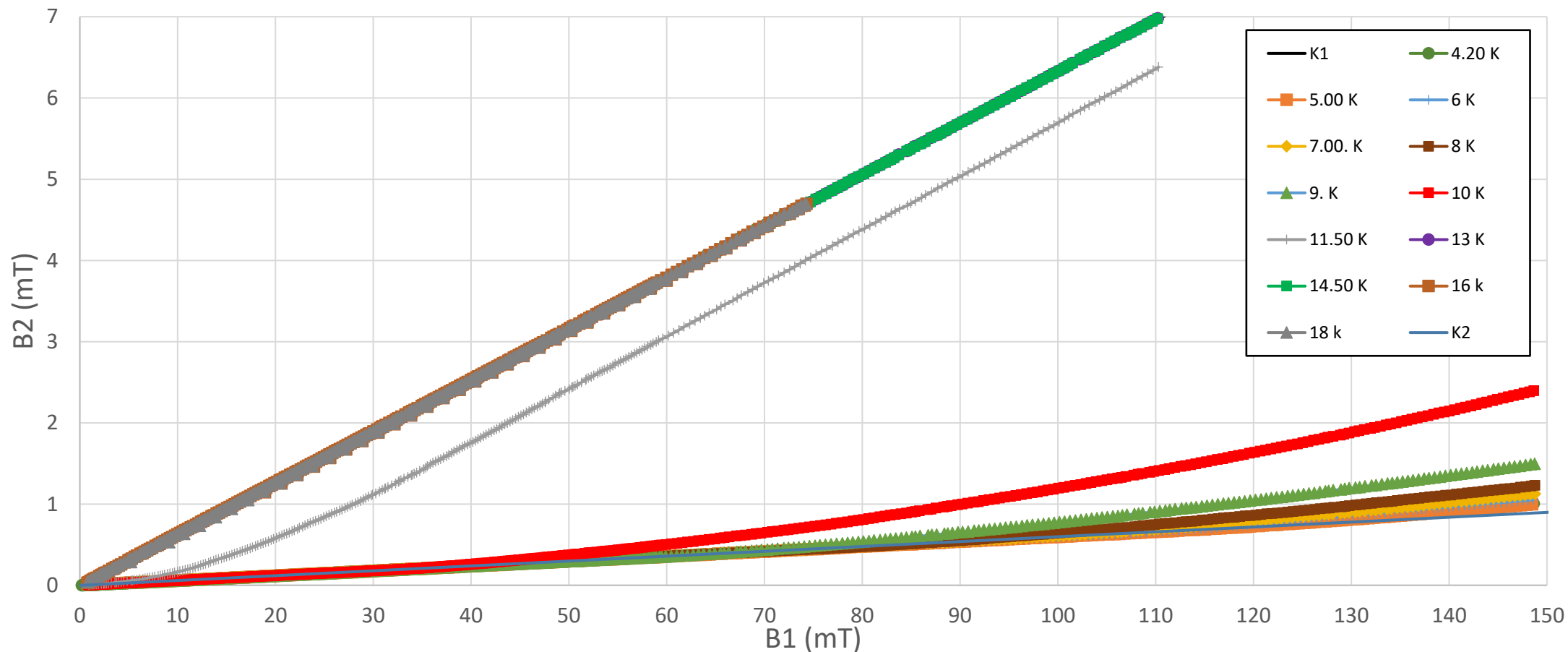
The MFPF measures samples using a DC localised field, applied parallel to a sample surface to replicate the conditions within the cavity walls.

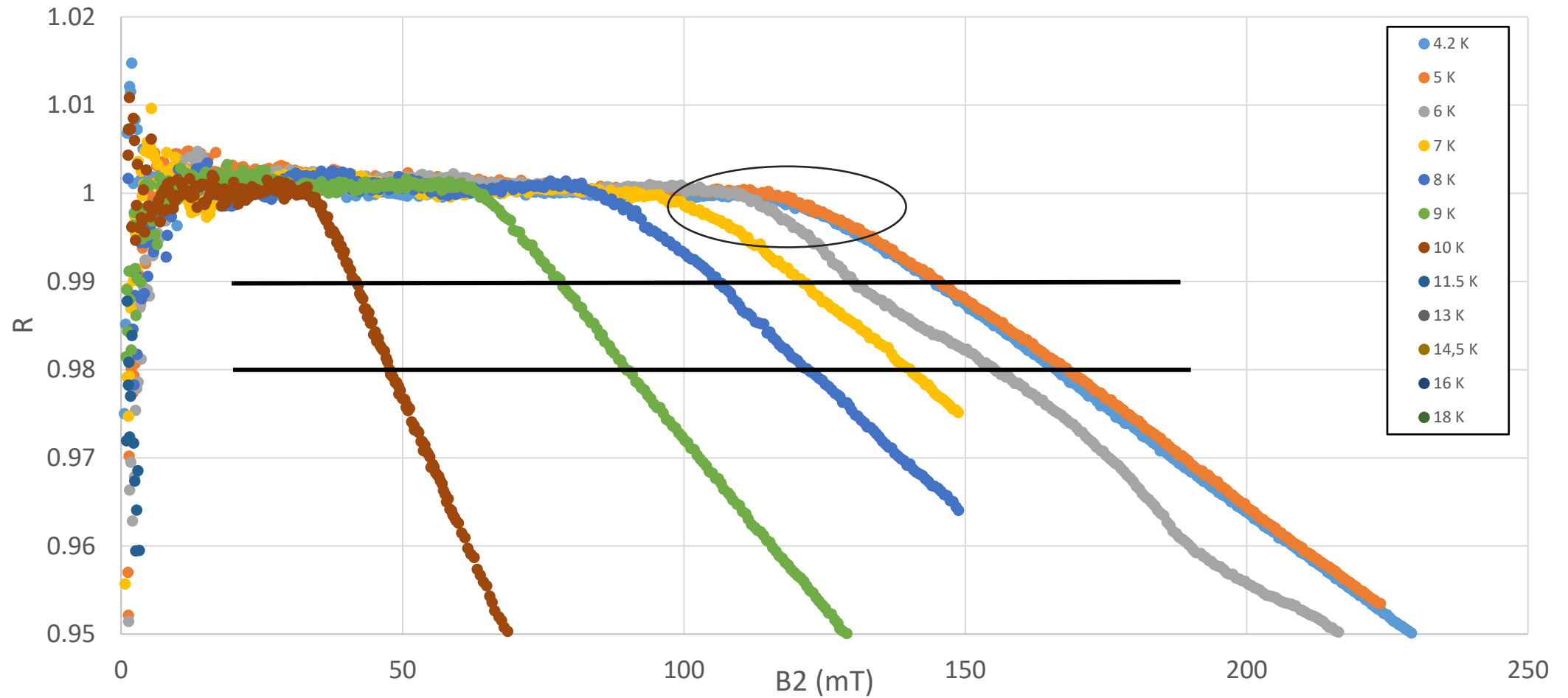
- The system has a superconducting coil made of NbTi with C-shaped yoke that applies a field of up to 600 mT parallel to a sample, through a 2 mm gap.
- There are two Hall probes located each side of the sample (Hp1 & Hp2) that determine B_{fp}.
- The system can efficiently test sample sizes from 75 x 45 – 40 x 40 mm². It is possible to test samples of a smaller geometry, however, field leakage around the sample becomes an issue at these dimensions.
- The system can reach temperatures as low as 2.6 K and up to 30 K.



Raw Data, B2(B1).

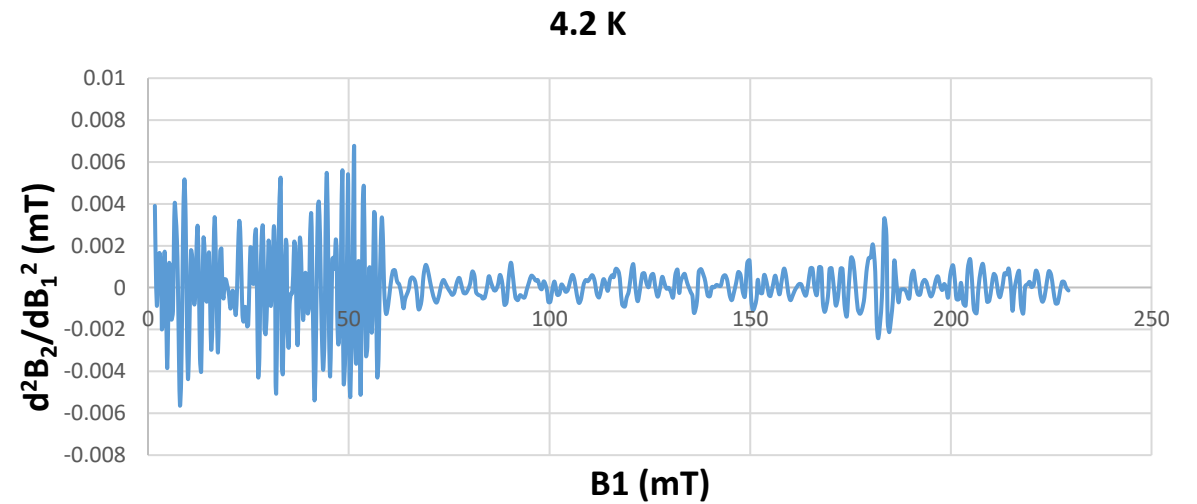
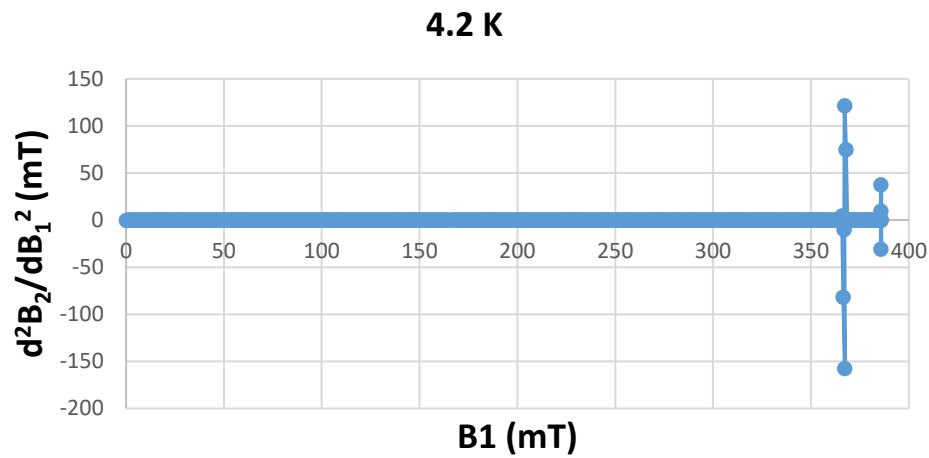
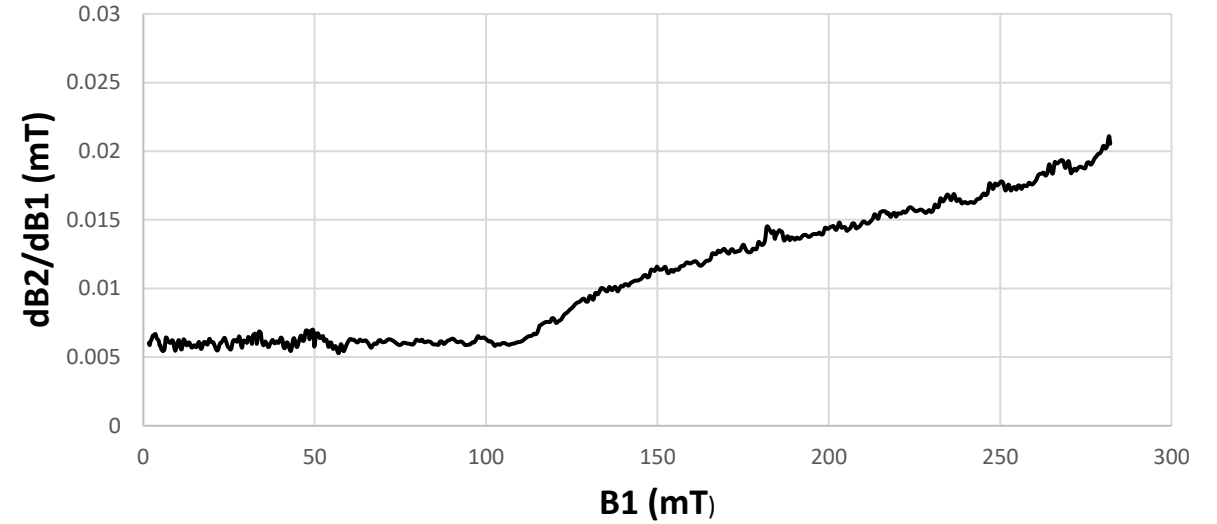
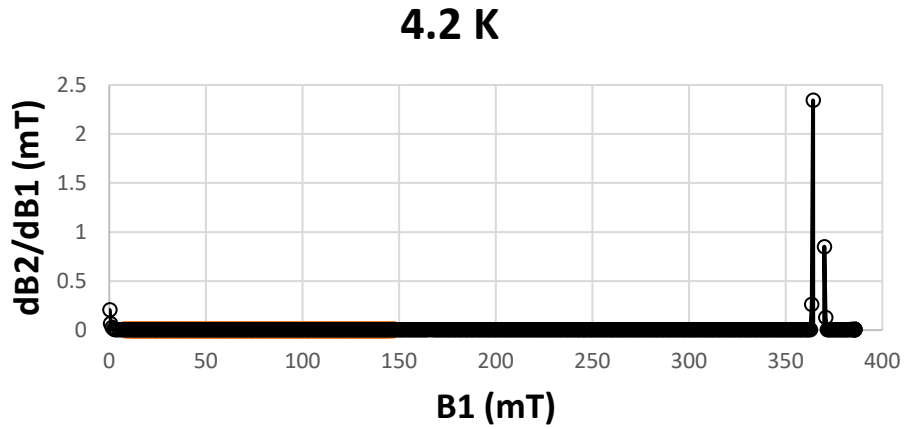
V3Si/Nb/Cu





Nb Foil 50 Micron.

4.2 K

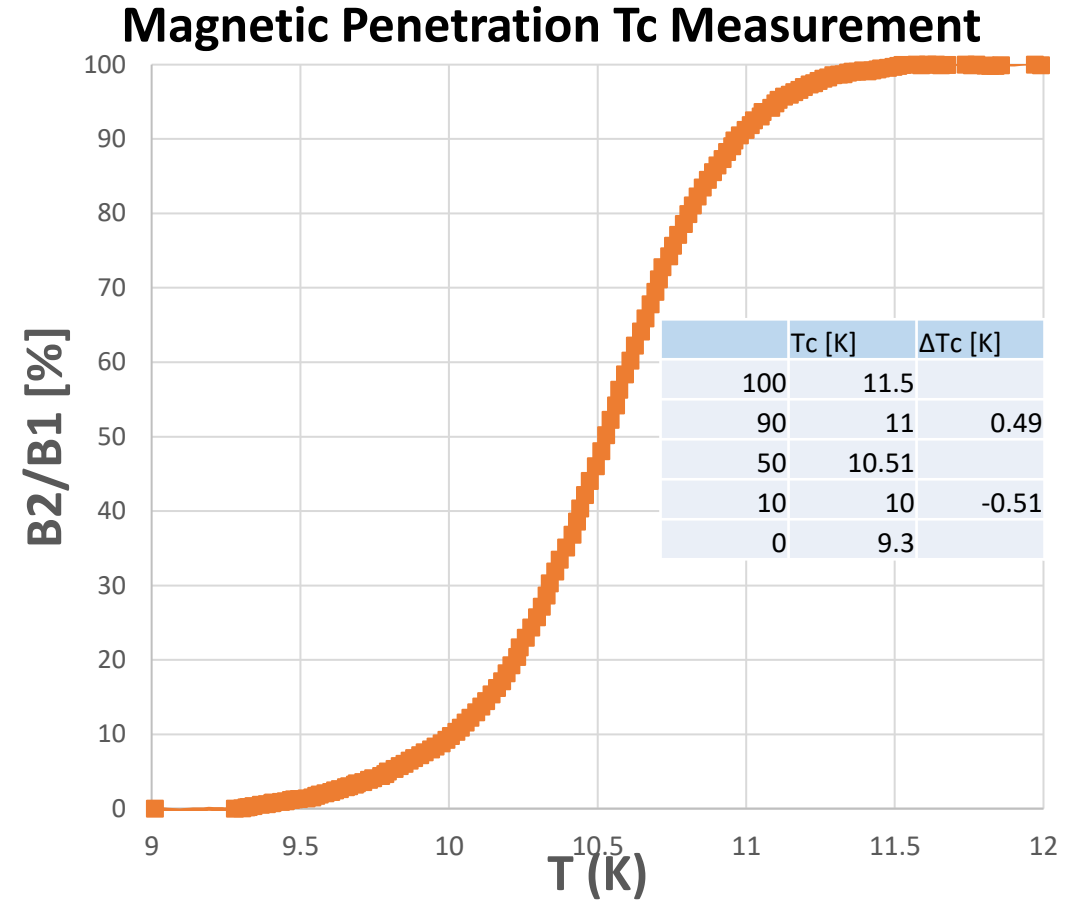
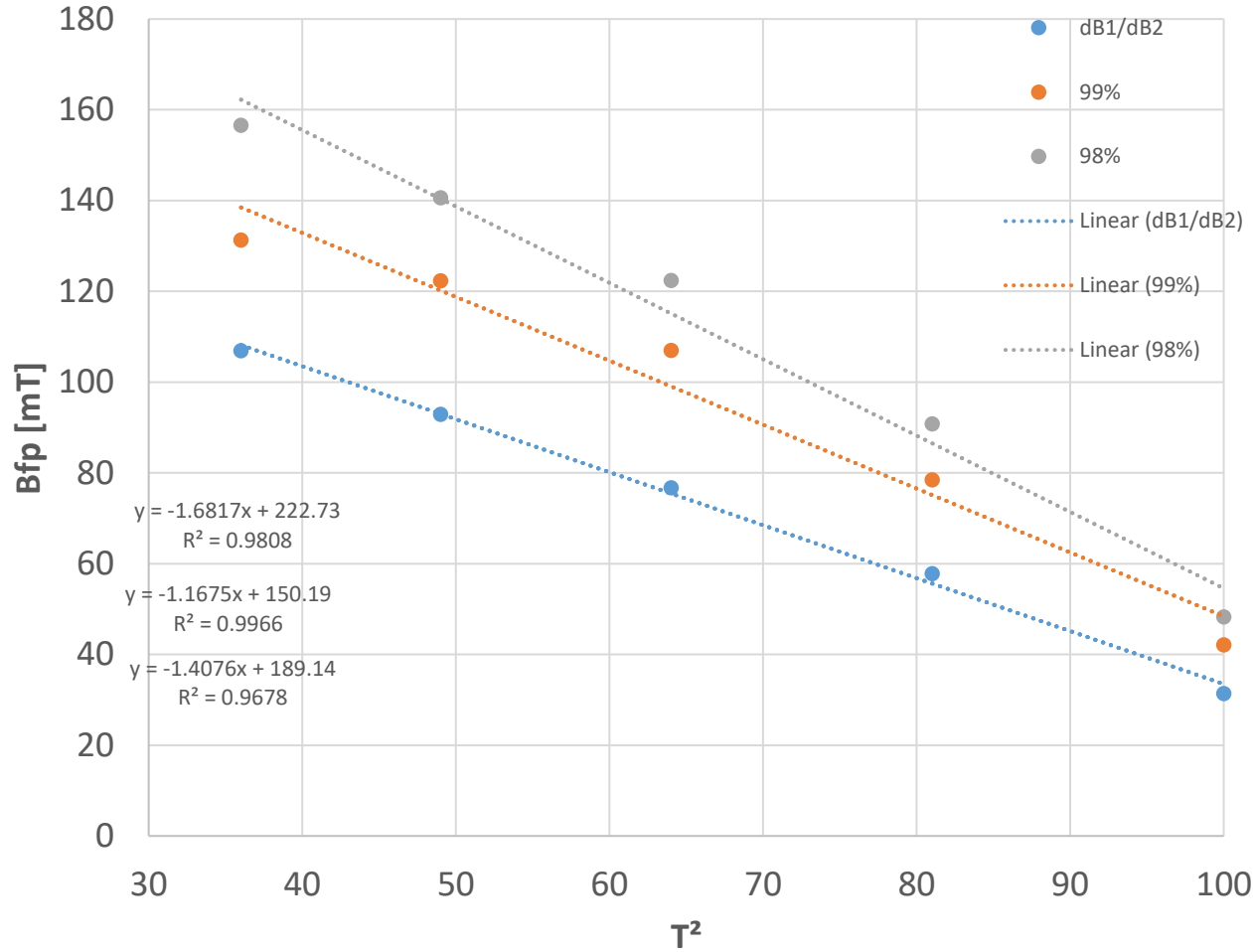


Results for V3Si/Nb/Cu.

V3Si-Nb-Cu

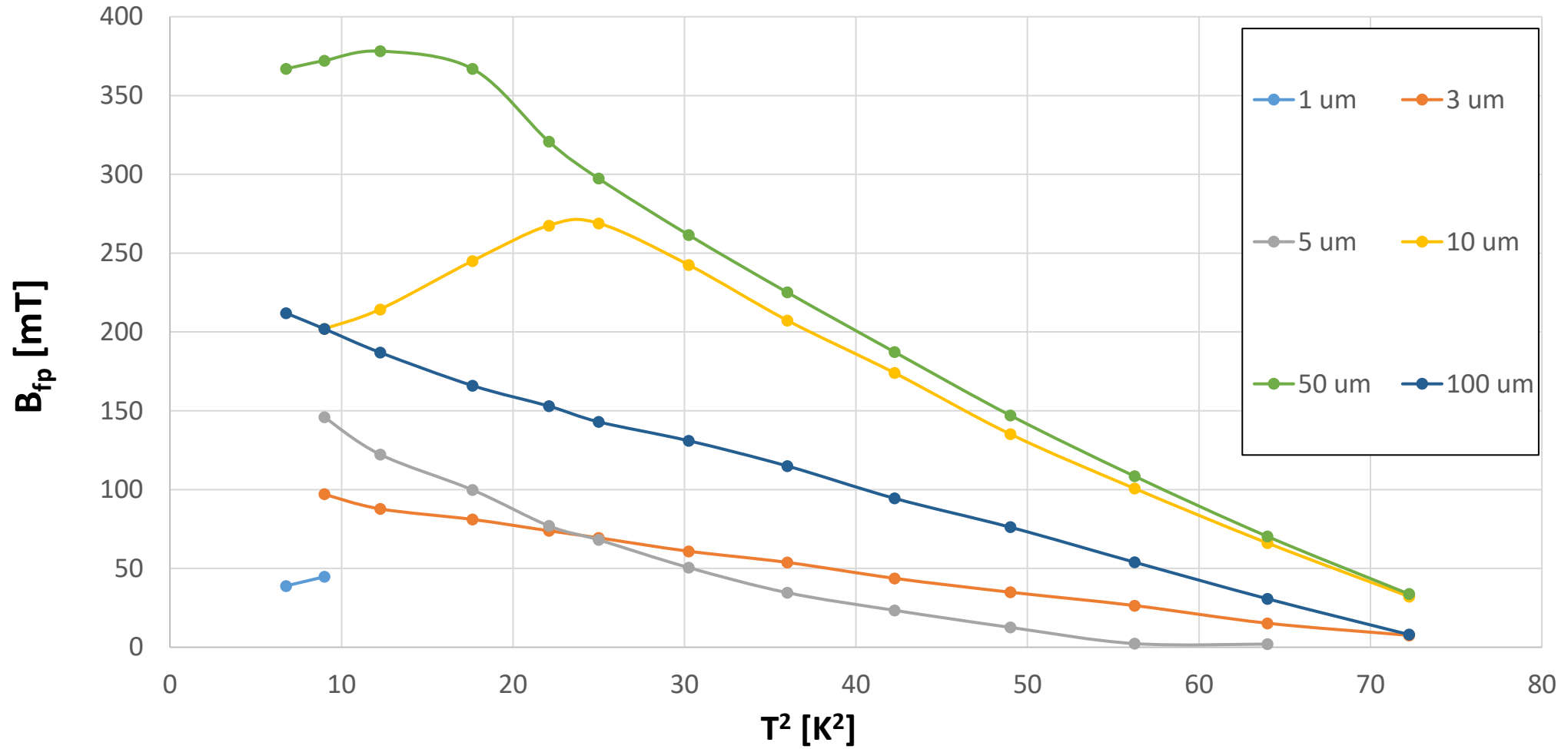
	98%	99%	dB2/dB1
	1.6817	1.4076	1.1675
Bfp(0K)=	222.73	189.14	150.19
Tc(0mT) =	11.5	11.5	11.3

		4.2 K
	Bfp =	146.8 mT
Mag	Tc =	10.3



Results for Nb foils

Nb Foil Thickness Comparison

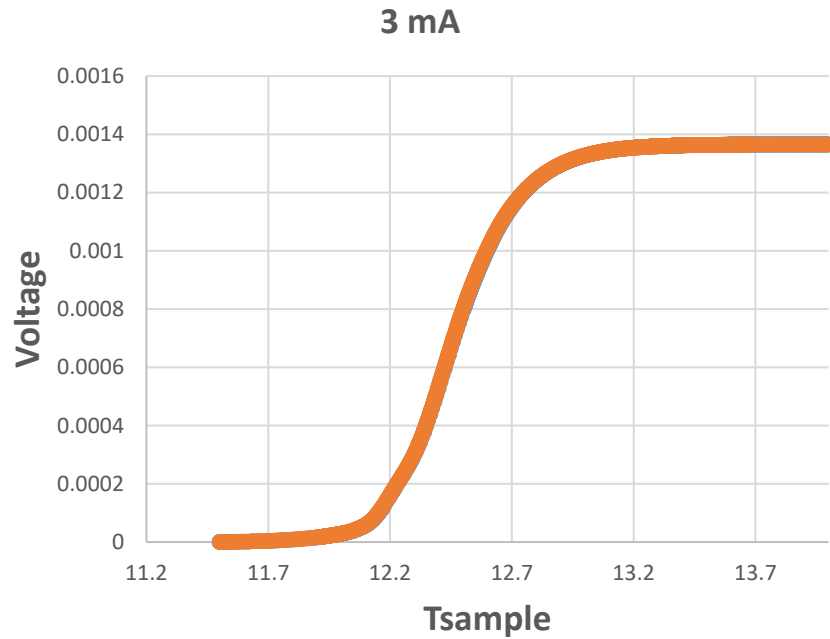




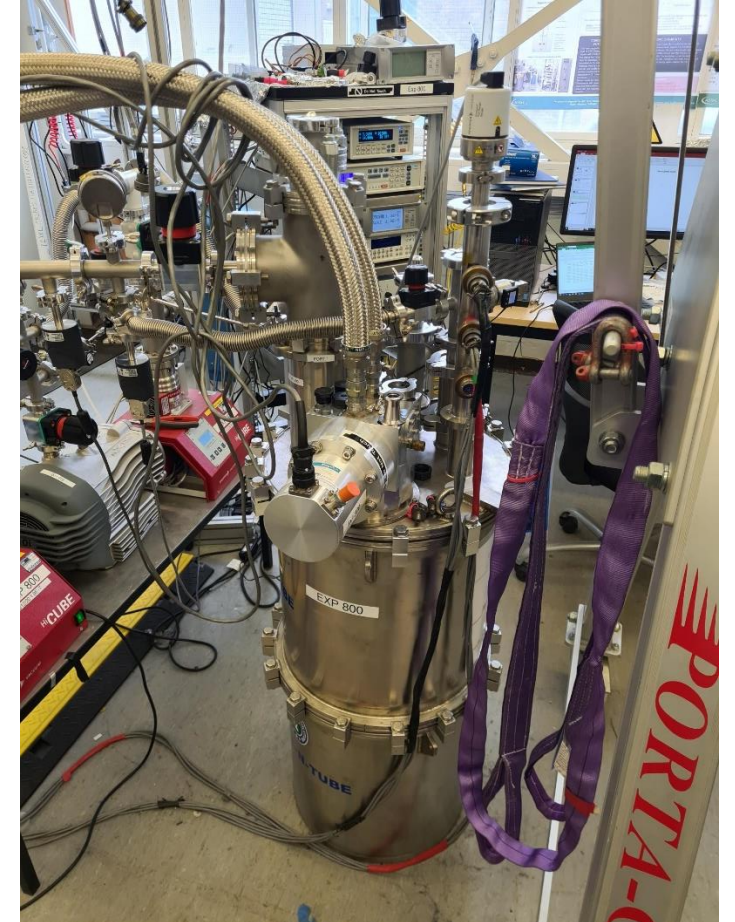
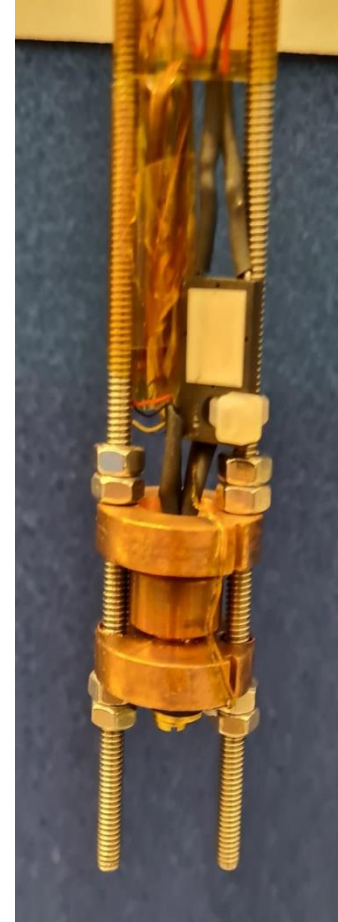
Samples Tested at MFPF over last 4 months

Sample	Deposition Date	Deposition Method/Rig	Deposition Temp °	Polished	Comments	Date of Measurement	Tc K Pen	Tc Mag	Tc Resistance RRR	Scientist	Bfp Mt 99% 4.2 k	98% 4. 2 k	dH2/dH1	d ² H2/dH1 ² 4.2 k
Nb3Sn	28/11/2022	Octopus				13/12/2022	13.7			Liam Smith	50.84	54.85	44.44	
V3Si x1	09/01/2023	Alfie				31/01/2023	9.2			Liam Smith	106	124	77	
V3Si (22)					Poor SC. R > 0!	24/02/2023				Liam Smith				
Nb Sapphire						09/03/2023	8.06			Liam Smith	43.9	48.6	38.4	
V3Si-Nb-Cu (27)						14/03/2023	11.5	10.37		Liam Smith	146.8	168.5	110	
V3Si Run2	16/01/2023	Alfie			Poor SC. R > 0!	25/03/2023				Liam Smith				
NbTiN	03/04/2023	Darcy			Poor SC. R > 0!	04/04/2023				Liam Smith				
V3Si 26	02/03/2023	Alfie			Not SC	21/03/2023				Liam Smith				
Nb Foil (Micron)														
1						25/01/2023				Liam Smith				
1 BS						23/01/2023				Liam Smith				
3						27/12/2022	9.19			Liam Smith			76.4	77.4
5						09/01/2023				Liam Smith	99.8	121	155.4	157.1
5 BS						05/01/2023				Liam Smith				
10						16/01/2023				Liam Smith	244.4	244.4	244	243
10 BS						12/01/2023				Liam Smith				
50						20/01/2023				Liam Smith	366.9	366.9	381.5	381.5
100						27/01/2023	8.6			Liam Smith	151	151	183	183

Multi-probe Insert for RRR measurements



	Cool			Warm			
	100	4.51E-03		100	4.51E-03		
	90	4.06E-03	12.643	90	4.06E-03	12.656	
	50	2.28E-03	12.284	50	2.28E-03	12.292	
	10	4.89E-04	12.042	10	4.89E-04	12.047	
	0	4.27E-05		0	4.27E-05		
Av			12.323			12.33167	
Tc			12.2			12.2	
Delta			0.359	0.242		0.364	0.245





Samples Tested at RRR facility over last 4 months

Sample+A1:I20	Deposition Date	Deposition Method and Rig	Deposition Temp °	Polished	Comments	Date of Tc measurement	Tc (K)	T90%-Tc [K]	T10% - Tc [K]	R(300K) [Ohm]	R(T100%) [Ohm]	T100% [K]	RRR	Scientist	Current (mA)	Pressure (mbar)
Nb3Al	22/03/2008	Divers Rig	400		N/A	02/03/2022	10.3							Liam Smith		
Nb3Al	21/04/2022		650		N/A	04/05/2022	14.5							Liam Smith		
NbTiN	09/03/2022				N/A	12/04/2022	14.8							Liam Smith		
Nb		Sharon				13/12/2022	9.16							Liam Smith	10	1.00E+00
Nb Foil 3 Micron		Goodfellows					8.9 (30mA), 8.9 (3mA))							Liam Smith		
Nb3Sn						12/12/2022	16.5							Liam Smith	10	8
NbSn						25/01/2023	16.2							Liam Smith		
V3Si x 1	09/01/2023	Alfie/ Pulsed DC magnetron	650		N/A	10/01/2023	14.2	0.01	0.001		1.84E-04	14.9		Liam Smith		6.00E-01
V3Si x 2		Alfie/ Pulsed DC magnetron	750		N/A	25/01/2023	14.8							Liam Smith		6.00E-01
V3Si x 3		Alfie/ Pulsed DC magnetron	880			02/02/2023	12.6	0.1	-0.07		2.94E-04	13.2		Liam Smith		6.00E-01
V3Si x 4		Alfie/ Pulsed DC magnetron	567			30/02/2023	14.3	0.15	-0.09		3.22E-04	14.5		Liam Smith		6.00E-01
V3Si x 5		Alfie/ Pulsed DC magnetron	660				11.3	0.06	-0.4		1.97E-05	11.5		Liam Smith		6.00E-01
V3SI X6		Alfie				24/02/2023	13.3	0.348	-0.3		5.90E-04	13.5		Liam Smith		6.00E-01
V3SI X7		Alfie					12.5	0.27	-0.3		4.50E-04	14		Liam Smith		6.00E-01
V3SI X8					Not SC									#DIV/0!		

Acknowledgments

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- Dan Turner
- Nathan Leicester



**Thank You For Listening.
Any Questions?**