



Institute of Electrical Engineering SAS

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SC characterization at IEE Bratislava

IEE OVERVIEW

Sample Batches since the last meeting (3.Dec.20):

prepared at Siegen Uni:

- HiPIMS Nb films on Cu – 6.10.2020 series (*finalised*)
- HiPIMS NbN; SIS; on Cu – 3.11.2020 series
1.12.2020 series *in progress...*
all SIS's = NbN/AlN/Nb measured, incl. AC susc. for Tc's
- HiPIMS SIS on Cu – 15.1.2021 series *not prepared yet...*

prepared at STFC:

- V₃Si, HiPIMS Nb, NbTiN, var. substrates (Cu,Sapp,Ta, vitr.C) – 18.9.2020 series
not measured yet...

COVID-19 related restrictions at IEE – SEVERE

Lockdown since 1.Jan.2021 (until 31.3. I expect)

Article on Laser treated Nb samples (*R. Ries*)

Changes (1/2 of samples removed), re-submitted to Supercond. Sci. Technol. (16.2.)

Table-summary

sample: Ben [Oe] Tc [K]
perp. Parallel VSM

HiPIMS NbN (on Cu)	1284	80	14.6
	1285	130	16.5
	1287	275	15.5
	1288	250	15.5
	1291	80	10
	1295	90	~ 13
	1296	280	14.6
	1325	140	14.6
Uni Siegen	1327	220	13.5
6.10.2020 series	1341	250	12.3
Stewart Leith	1359	-	-
	1377	140	14
	1379	70	8.8
	1381	130	16
	1404	100	12.8
	1441	300	14
	1445	110	9.5
	1448	160	11.5
	1455	160	15.5
HiPIMS Nb	NbTiN_19_02_20_Cu		
NbTiN	NbTiN_19_02_20_VG		
V3Si	NbTiN_19_02_20_Ta		
	Nb_14_07_20_Cu		
Substrates:	Nb_14_07_20_Ta		
Cu	Nb_16_07_20_Cu		
Sapphire	Nb_16_07_20_Ta		
Tantal	Nb_22_07_20_Cu		
VG - Vitreous graphite	Nb_22_07_20_Ta		
	V3Si_24_07_20_Cu		
	V3Si_24_07_20_Ta		
STFC Daresbury	V3Si_28_07_20_Cu		
18.9.2020 series	V3Si_28_07_20_VG		
Reza Valizadeh	V3Si_28_07_20_Ta		
	Nb_31_07_20_Cu		
	Nb_31_07_20_Sapp		
	Nb_31_07_20_Ta		
	Nb_01_08_20_Cu		
	Nb_01_08_20_Sapp		

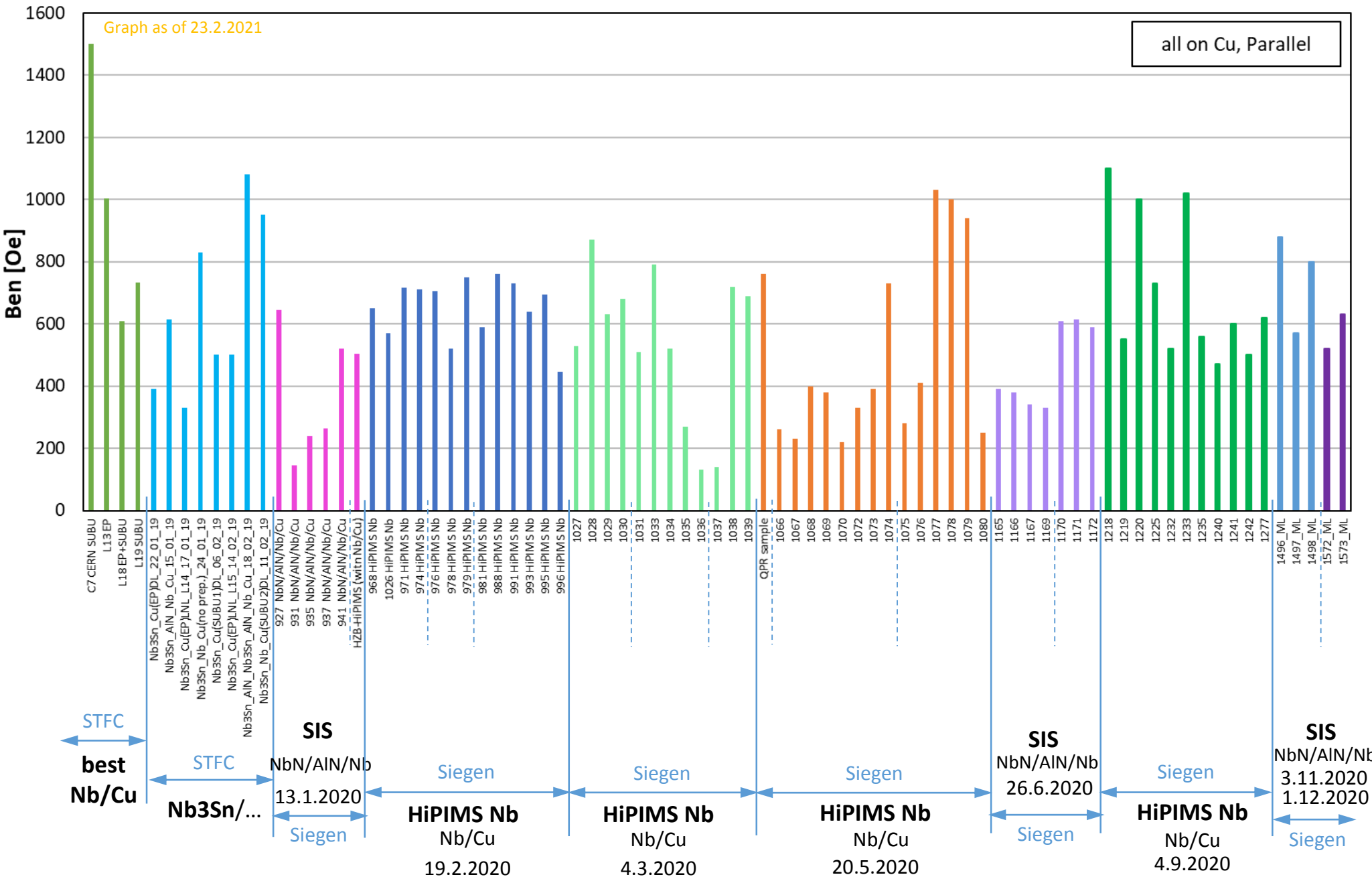
sample: Ben [Oe] Tc [K]
perp. Parallel VSM

STFC Daresbury	V3Si_28_07_20_Cu		
18.9.2020 series	V3Si_28_07_20_VG		
Reza Valizadeh	V3Si_28_07_20_Ta		
	Nb_31_07_20_Cu		
	Nb_31_07_20_Sapp		
	Nb_31_07_20_Ta		
	Nb_01_08_20_Cu		
	Nb_01_08_20_Sapp		
	Nb_01_08_20_Ta		
	Nb_06_08_20_Cu		
	Nb_06_08_20_Sapp		
	Nb_06_08_20_Ta		
HiPIMS NbN	1467	110	11
HiPIMS ML: Nb/NbN	1468	200	11.5
Substrate:	1472	200	11.5
Cu	1475	210	11.5
	1477	100	11
Uni Siegen	1496_ML	880	9.3
3.11.2020 series	1497_ML	570	9.3
Stewart Leith	1498_ML	800	9.3
HiPIMS NbN	1550	~ 70	8.9
HiPIMS ML: Nb/NbN	1551	140	15.6
Substrate:	1552		
Cu	1553		
	1554		
Uni Siegen	1555		
1.12.2020 series	1556		
Stewart Leith	1570		
	1572_ML	520	9.4
	1573_ML	630	9.4
HiPIMS Nb/AlN/NbN	1594		
NbN	1595		
	1596		
Substrate:	1597		
Cu	1598		
Uni Siegen	1599		
15.1.2021 series	1600		
Stewart Leith	1375		

Selected films on Cu substrates:

Graph as of 23.2.2021

all on Cu, Parallel



STFC
best Nb/Cu

STFC
Nb3Sn/...

SIS
NbN/AlN/Nb

Siegen
HiPIMS Nb
Nb/Cu
19.2.2020

Siegen
HiPIMS Nb
Nb/Cu
4.3.2020

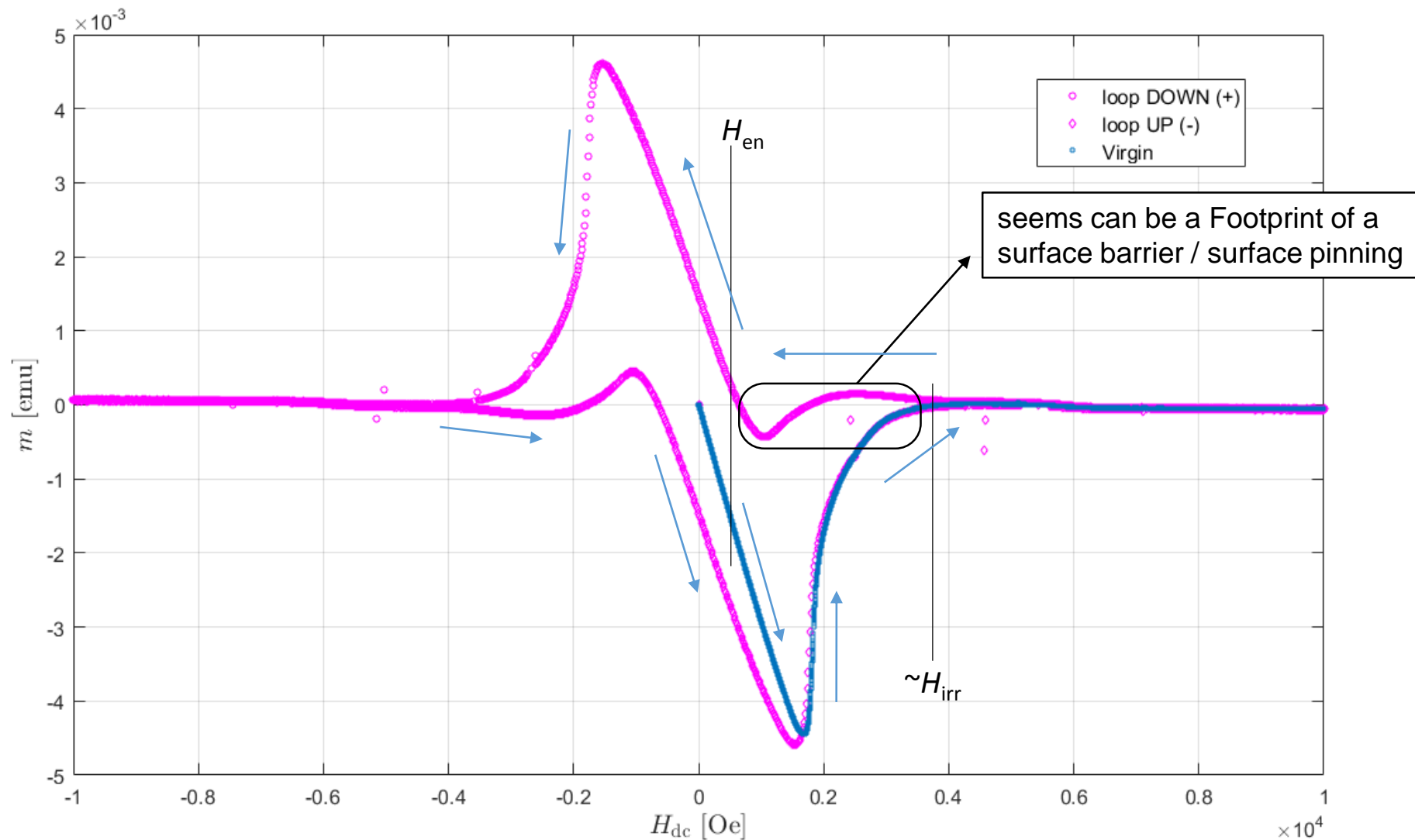
Siegen
HiPIMS Nb
Nb/Cu
20.5.2020

SIS
NbN/AlN/Nb
26.6.2020
Siegen

Siegen
HiPIMS Nb
Nb/Cu
4.9.2020

SIS
NbN/AlN/Nb
3.11.2020
1.12.2020
Siegen

Shape of magnetization loop

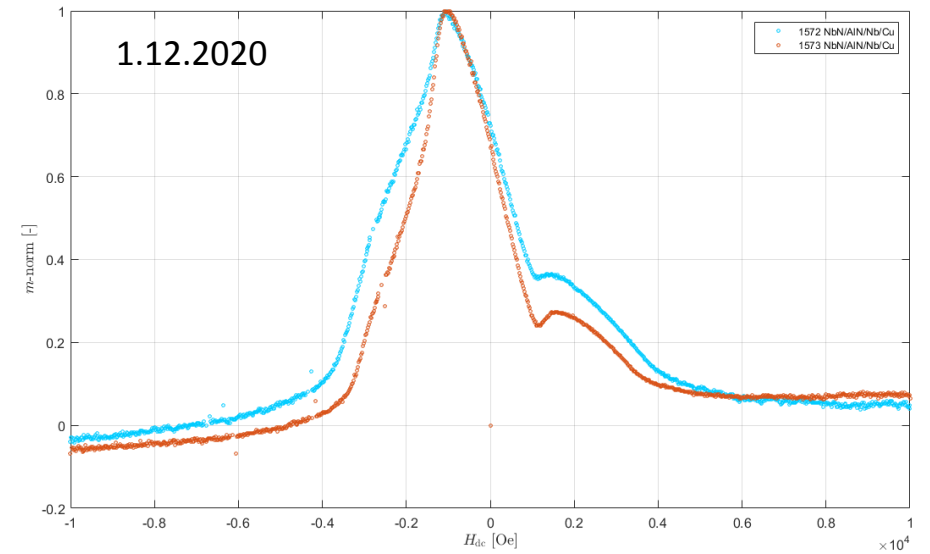
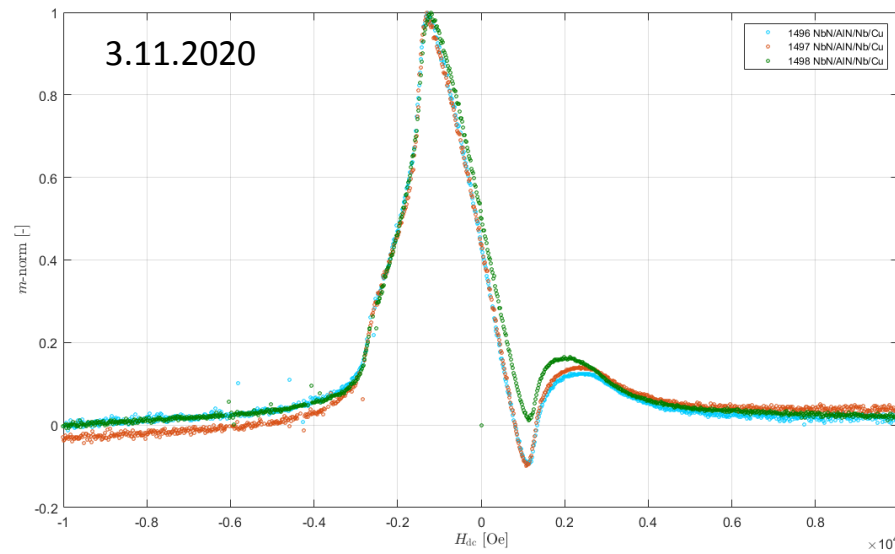
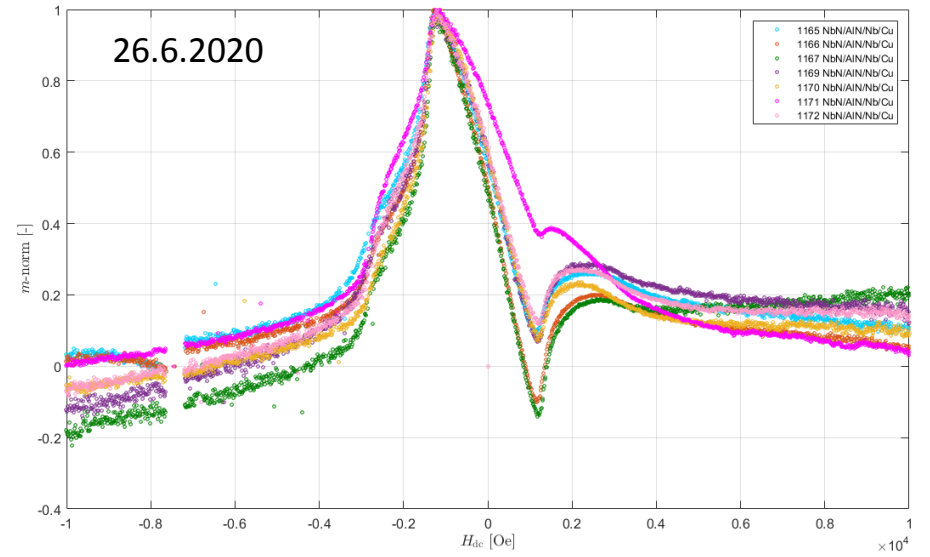
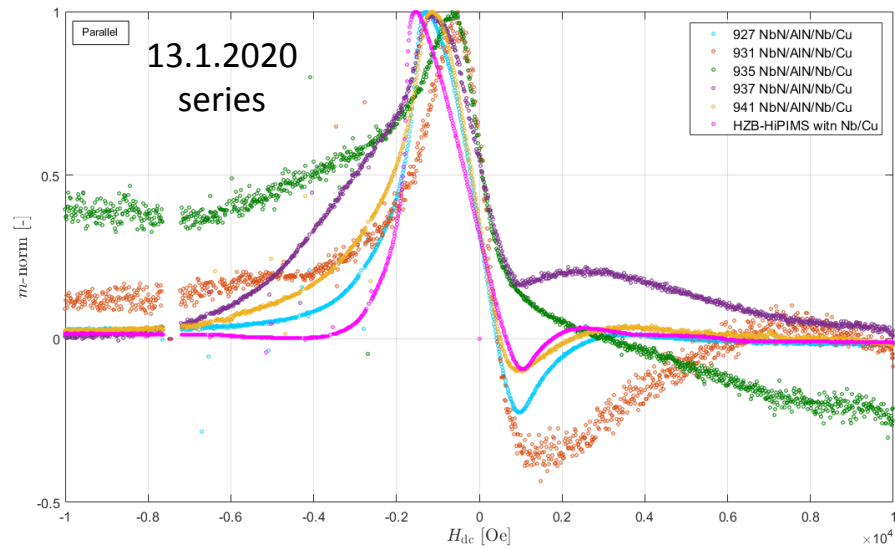


see e.g.: S B Roy et al, Supercond. Sci. Technol. 21 (2008) 065002

E H Brandt, Physica C 332 (2000) 99–107

A S Dhavale et al, Supercond. Sci. Technol. 25 (2012) 065014

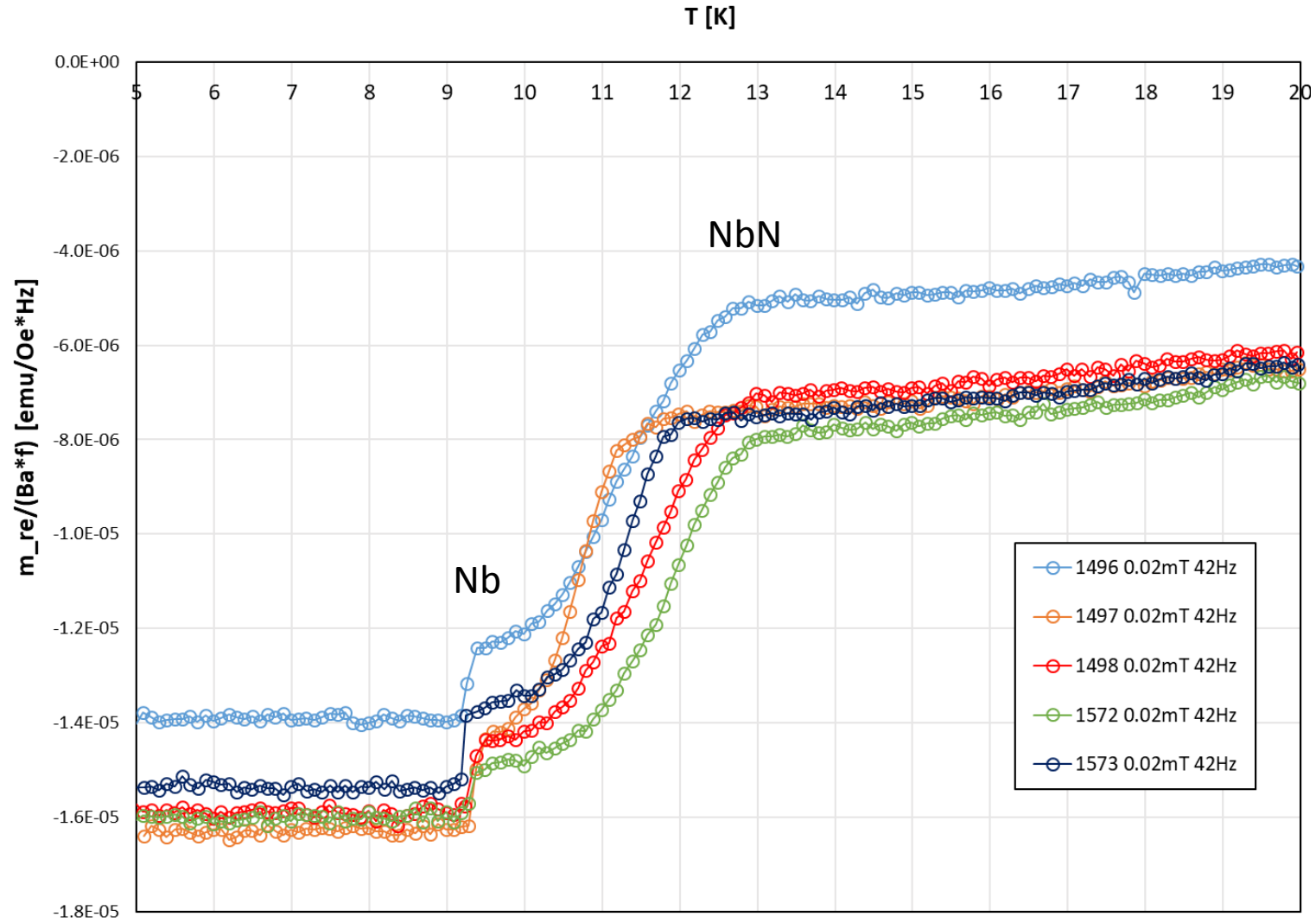
SIS NbN/AlN/Nb/Cu of Siegen Uni



T-dependence of AC susceptibility

SIS NbN/AlN/Nb/Cu of Siegen Uni

3.11.2020, 1.12.2020 series



FURTHER

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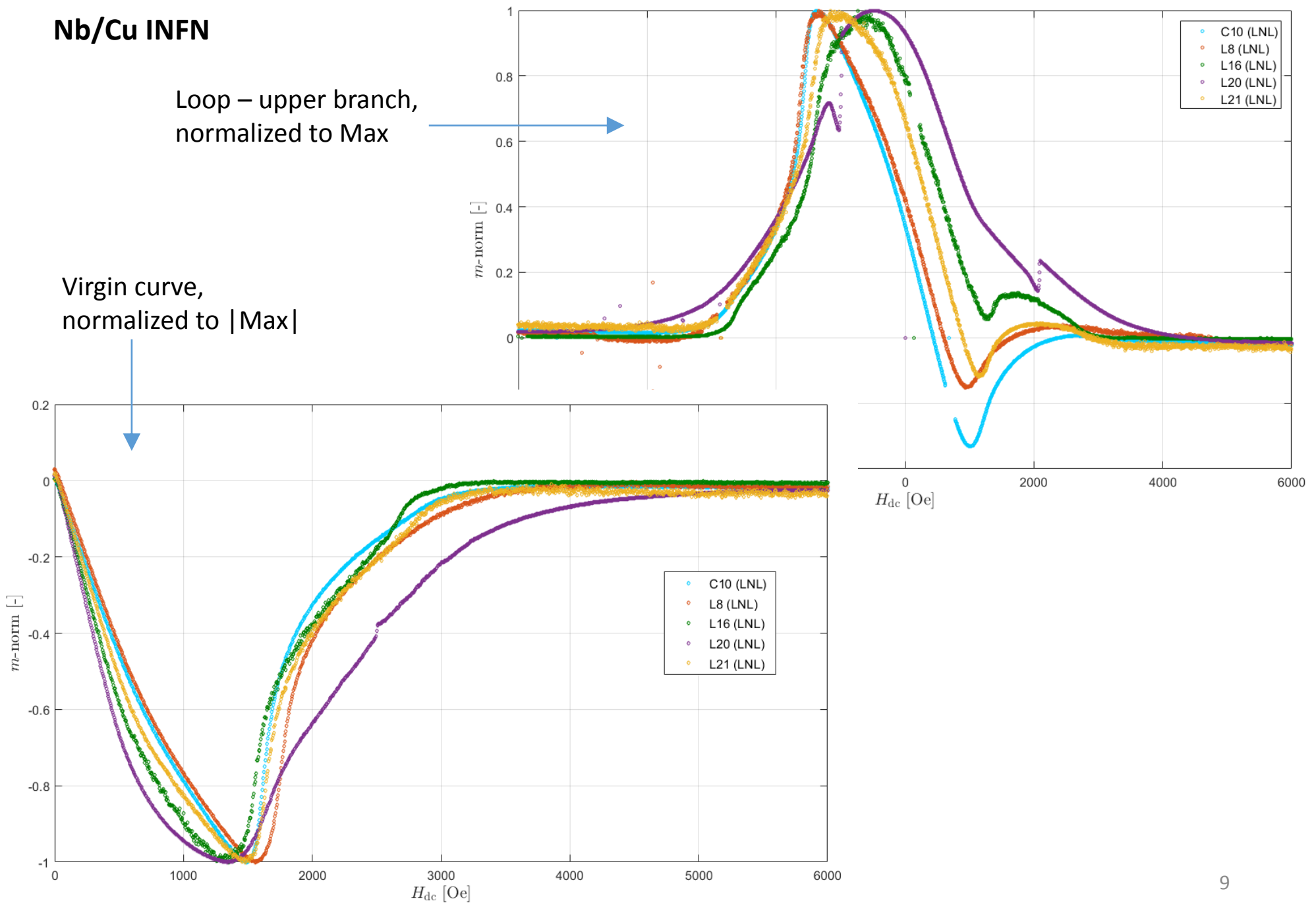
Comparisons of mag. loops

All series on Cu substrates

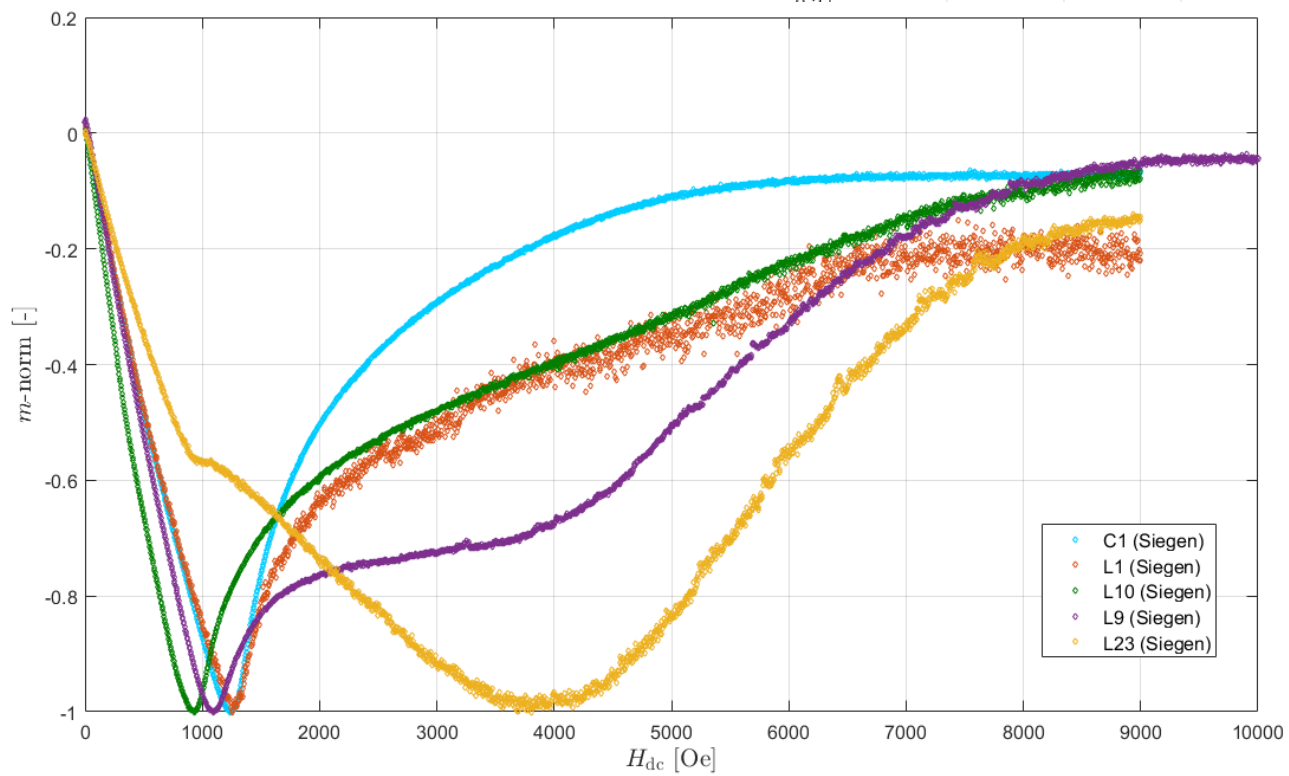
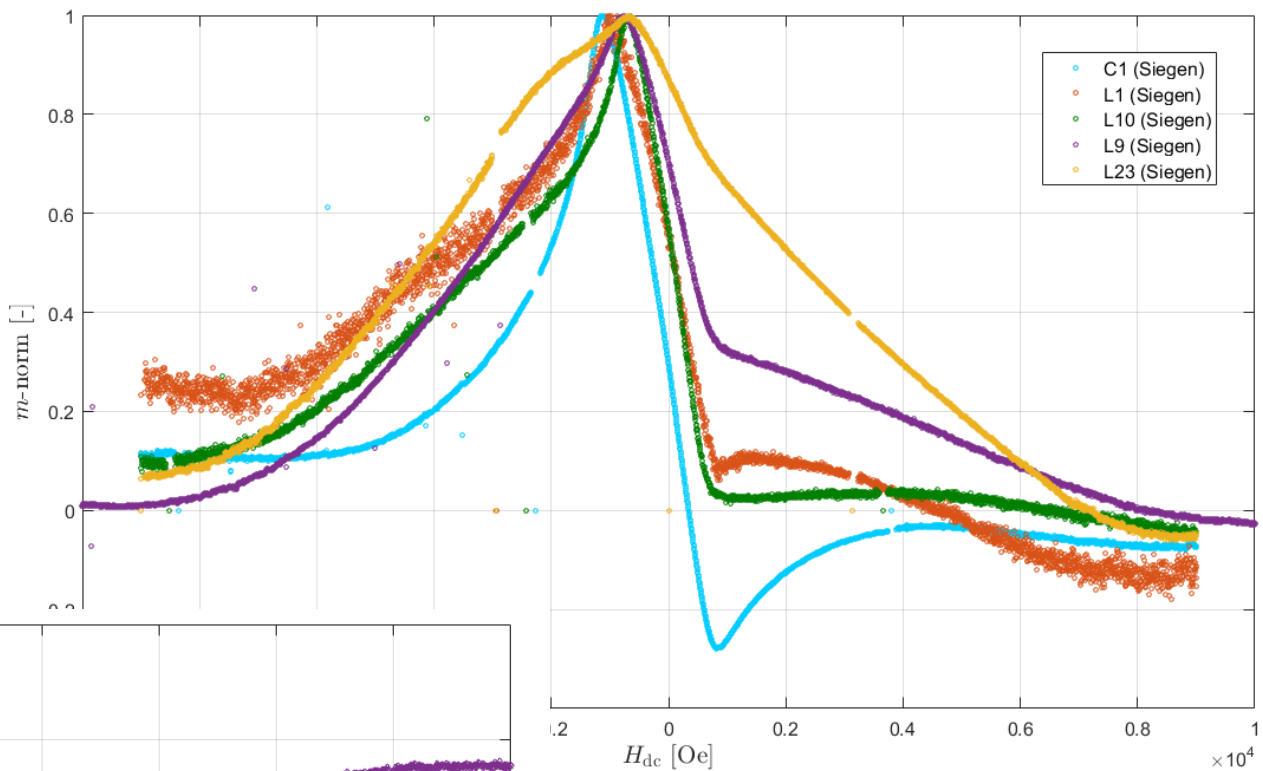
Nb/Cu INFN

Loop – upper branch,
normalized to Max

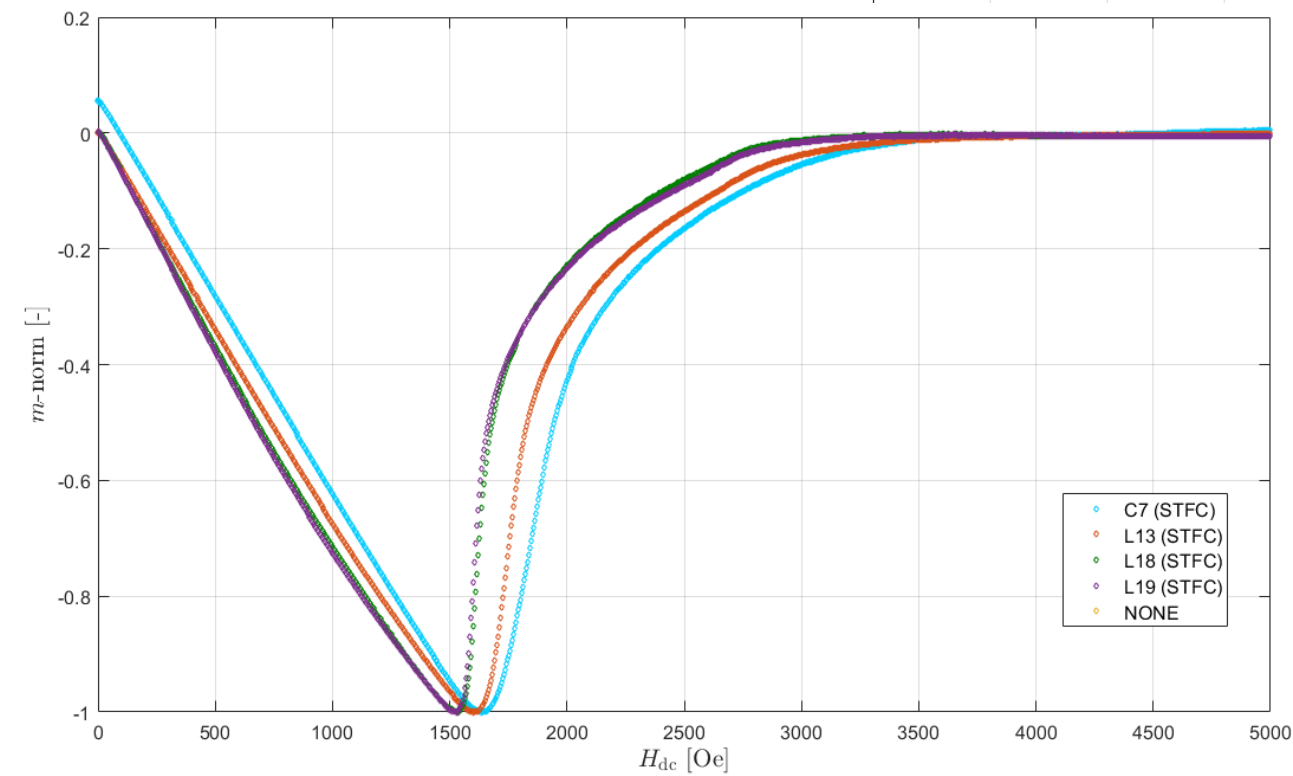
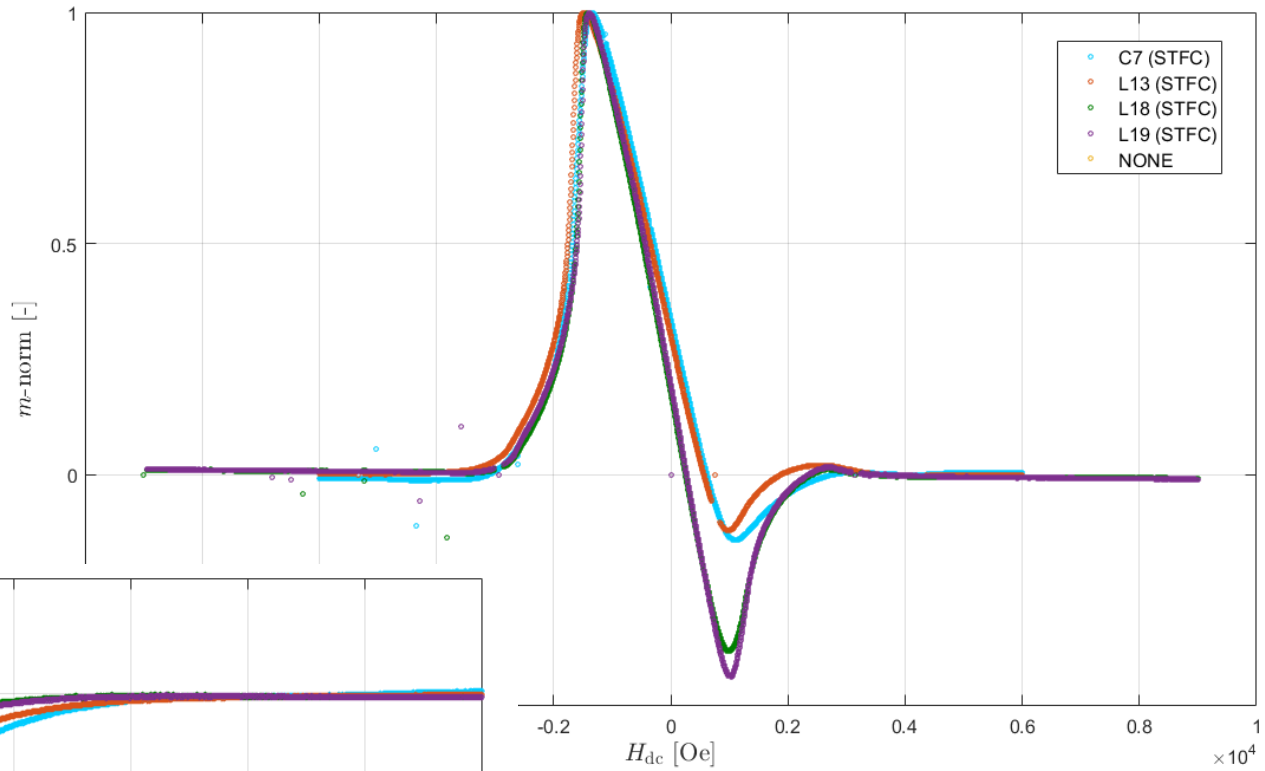
Virgin curve,
normalized to |Max|



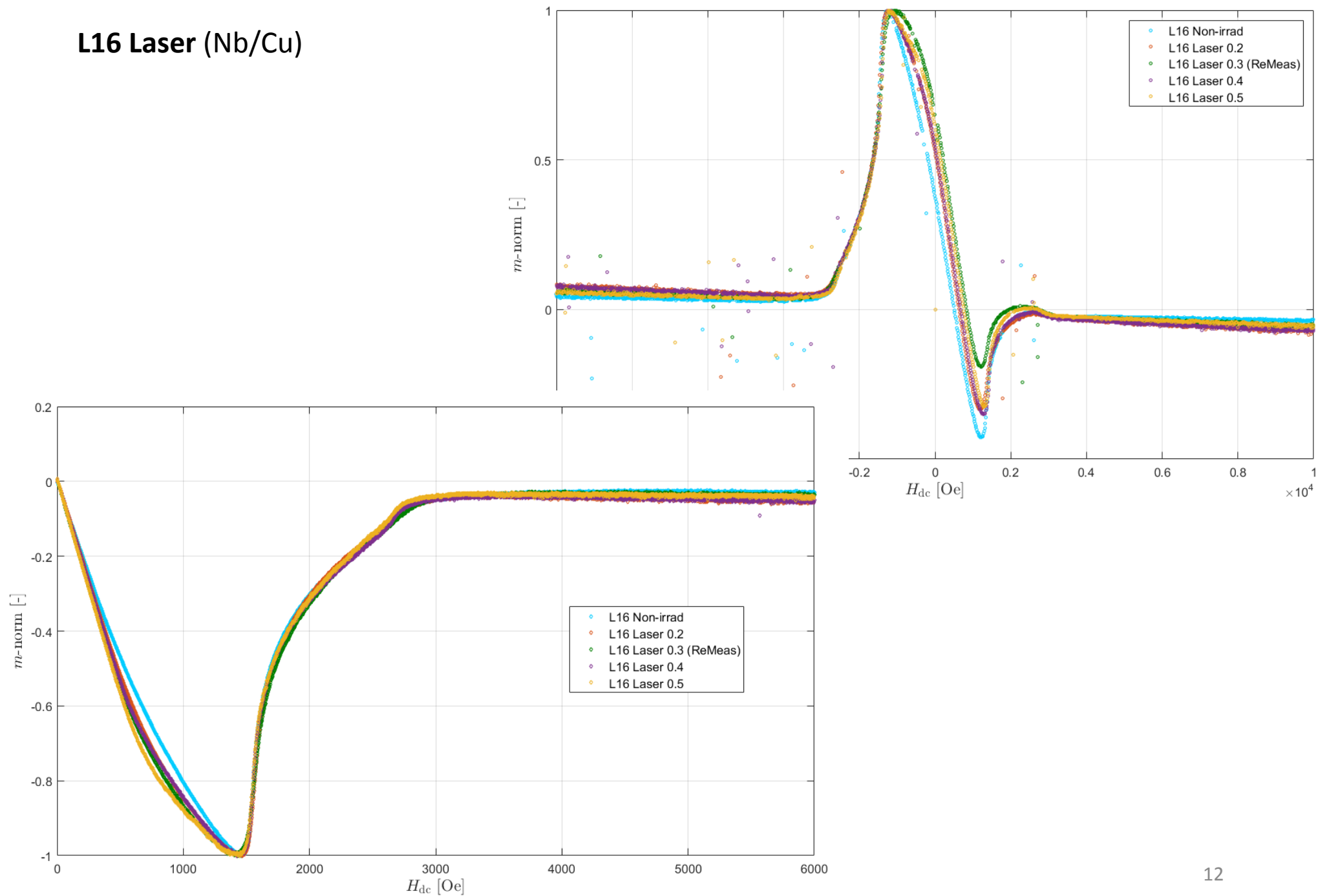
Nb/Cu Siegen Uni



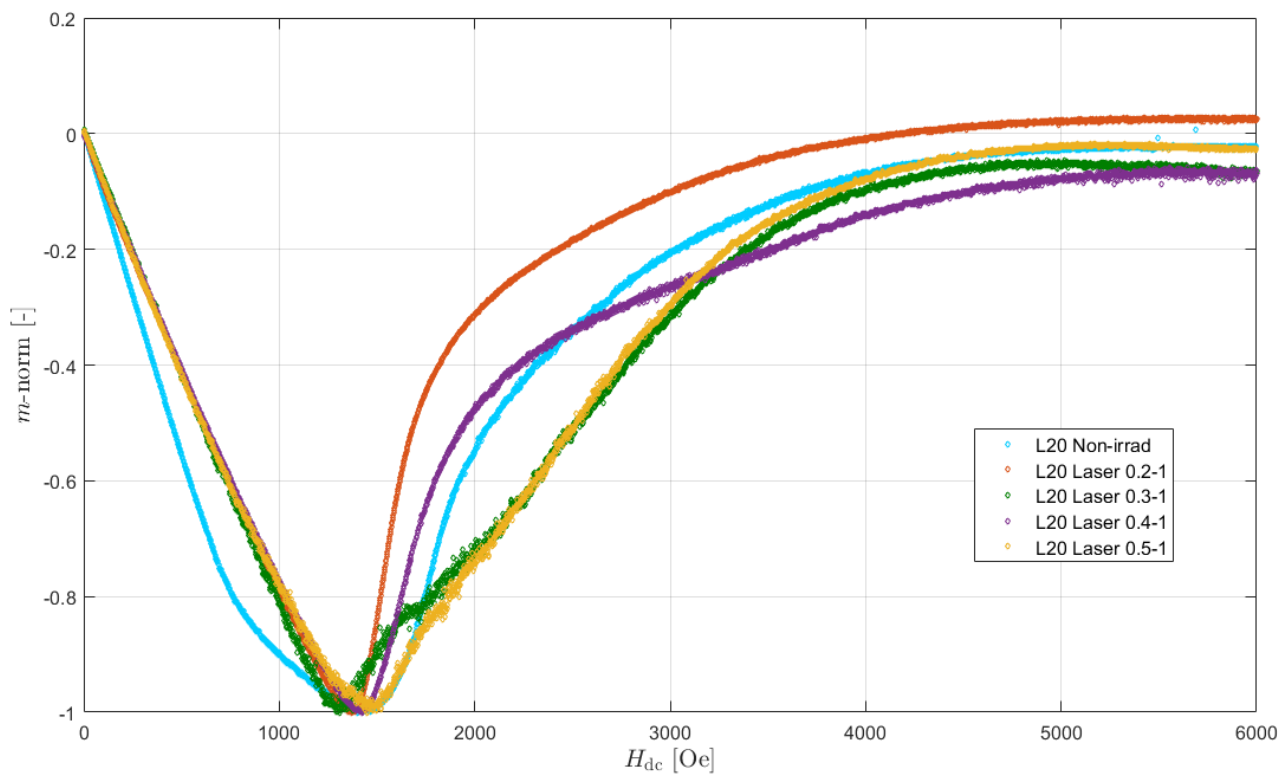
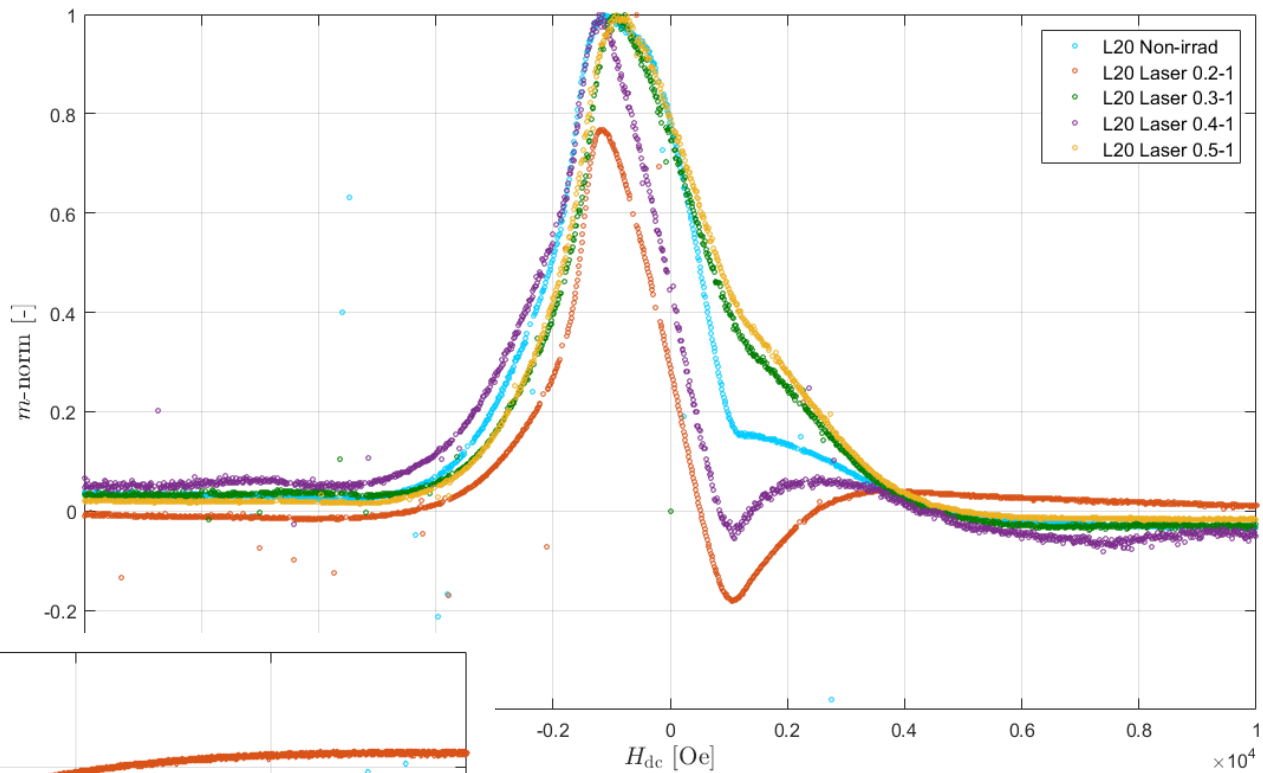
Nb/Cu STFC



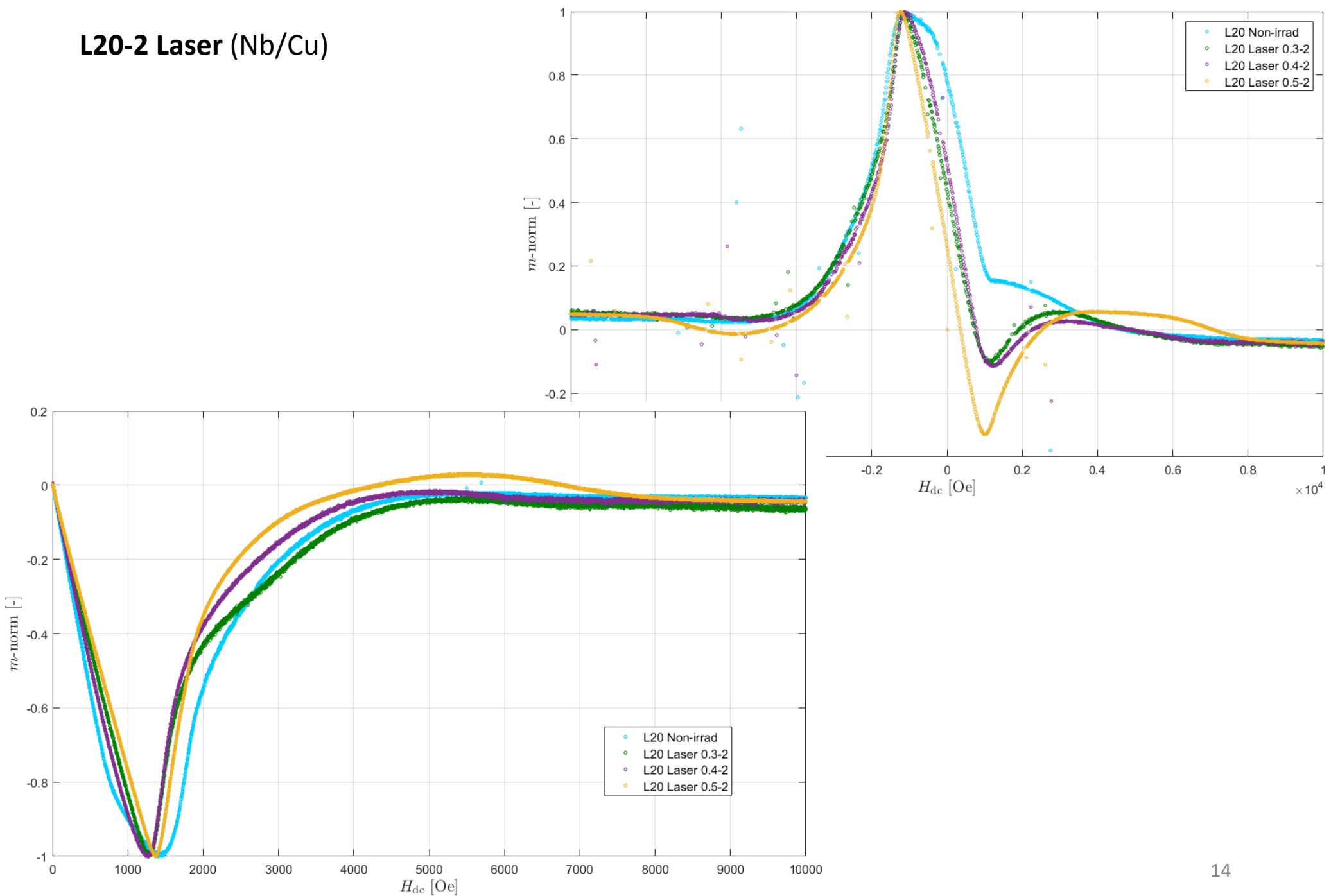
L16 Laser (Nb/Cu)



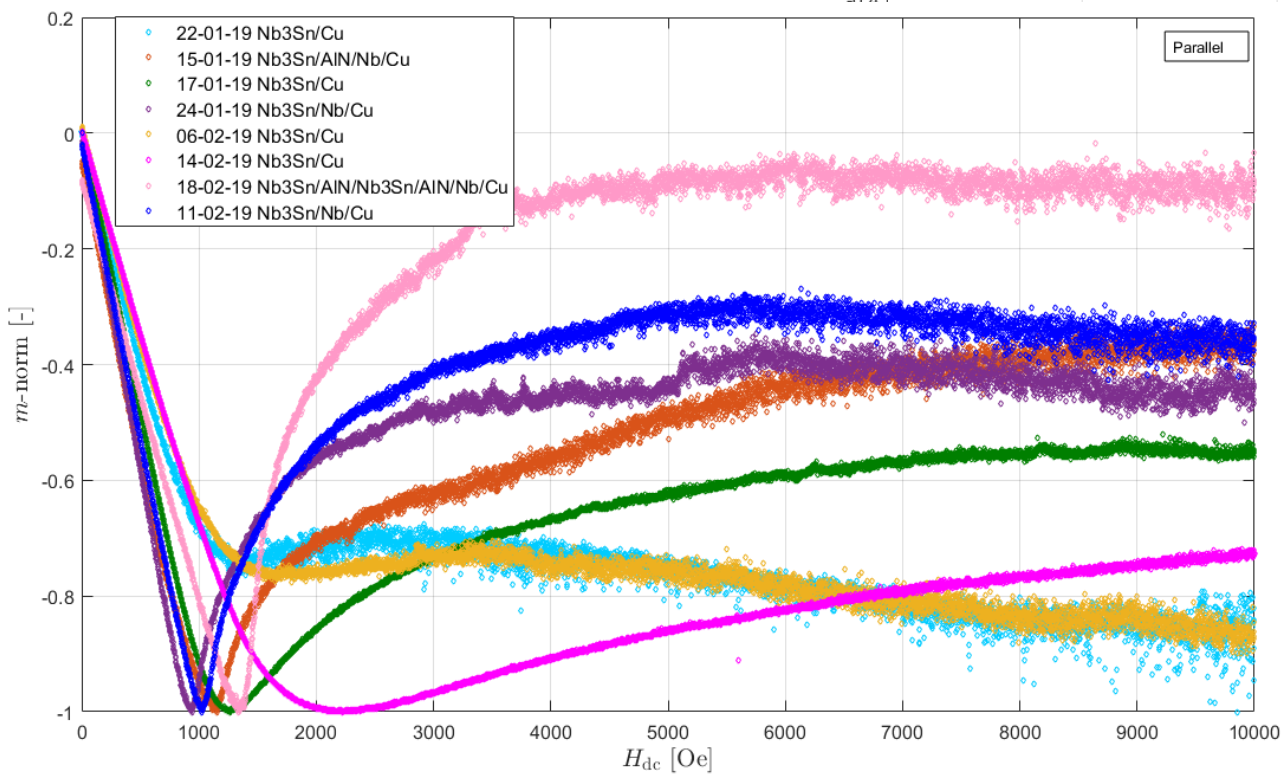
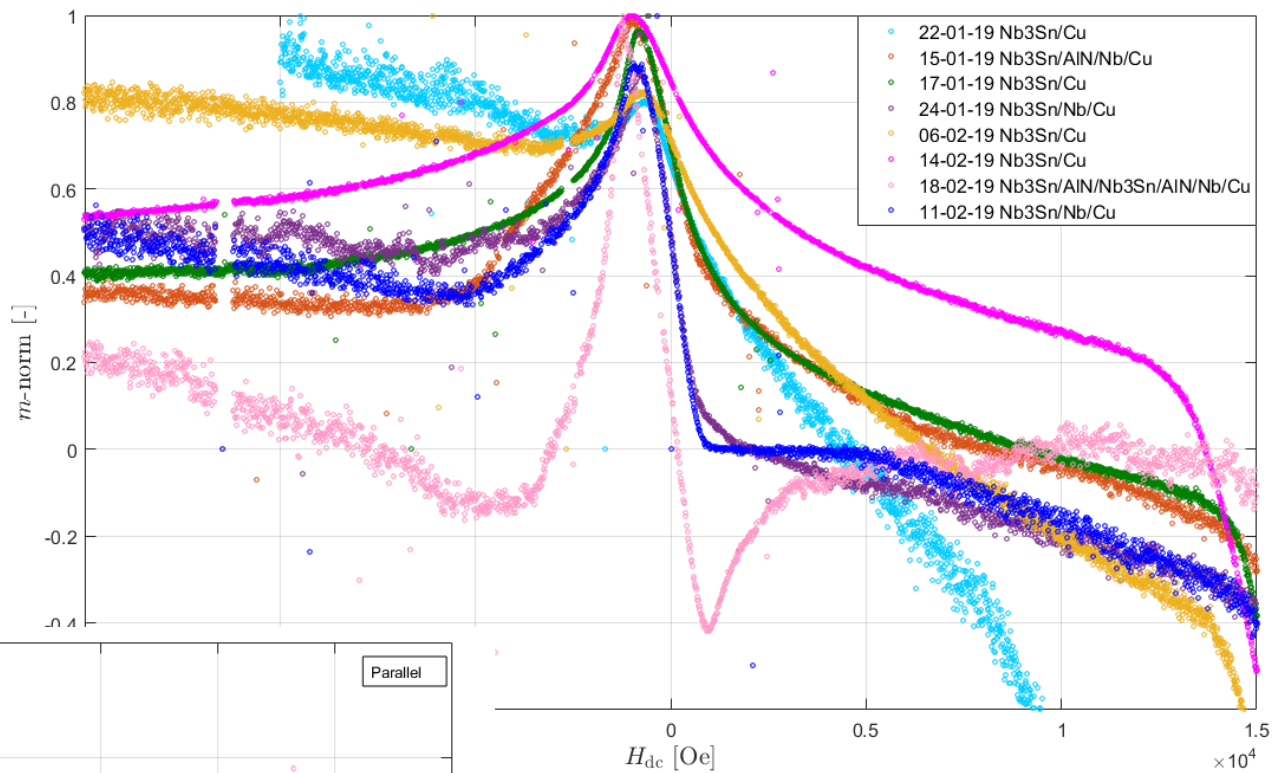
L20-1 Laser (Nb/Cu)



L20-2 Laser (Nb/Cu)

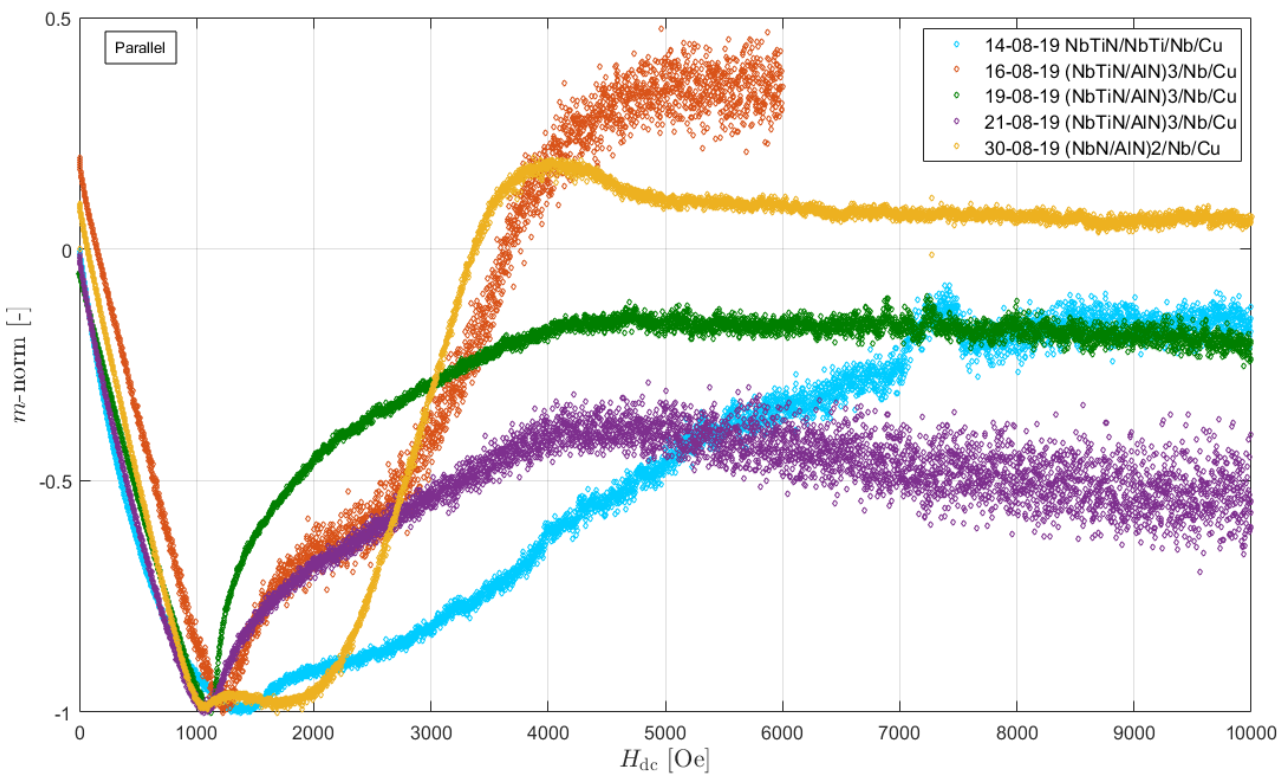
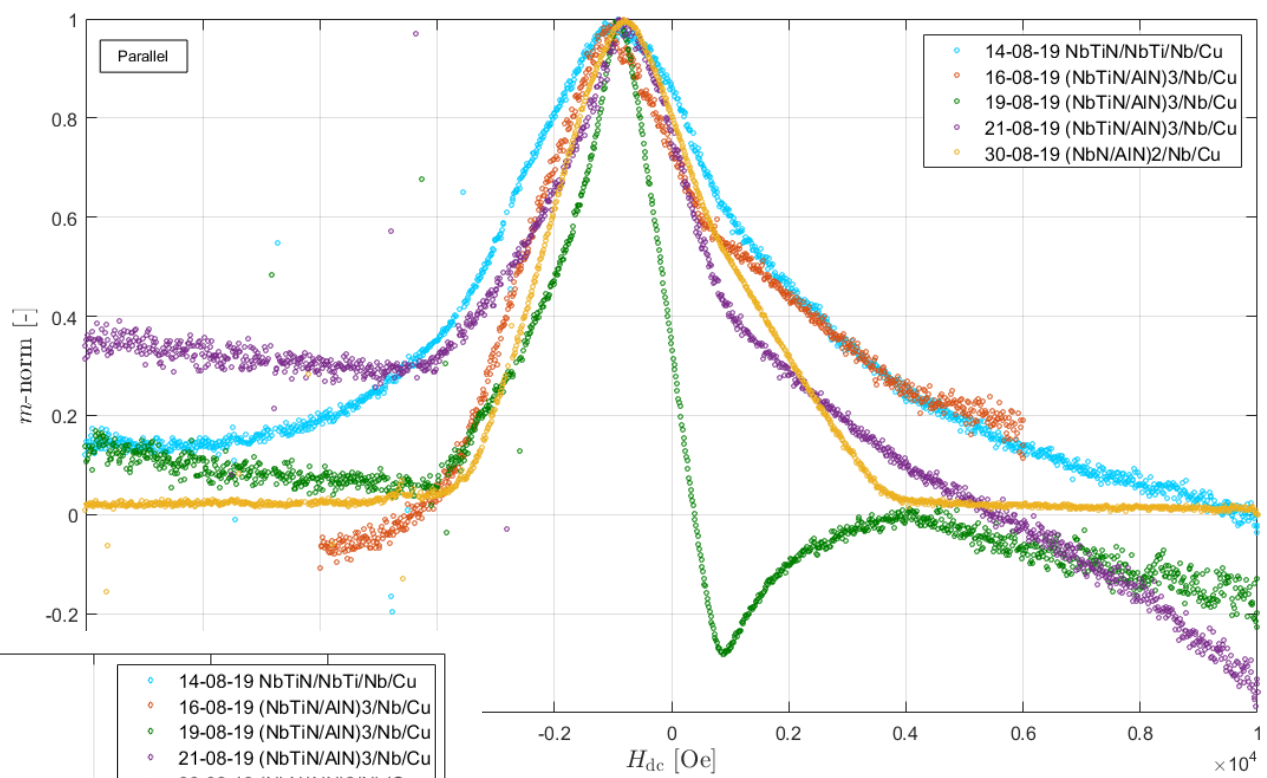


Nb₃Sn/.../Cu STFC



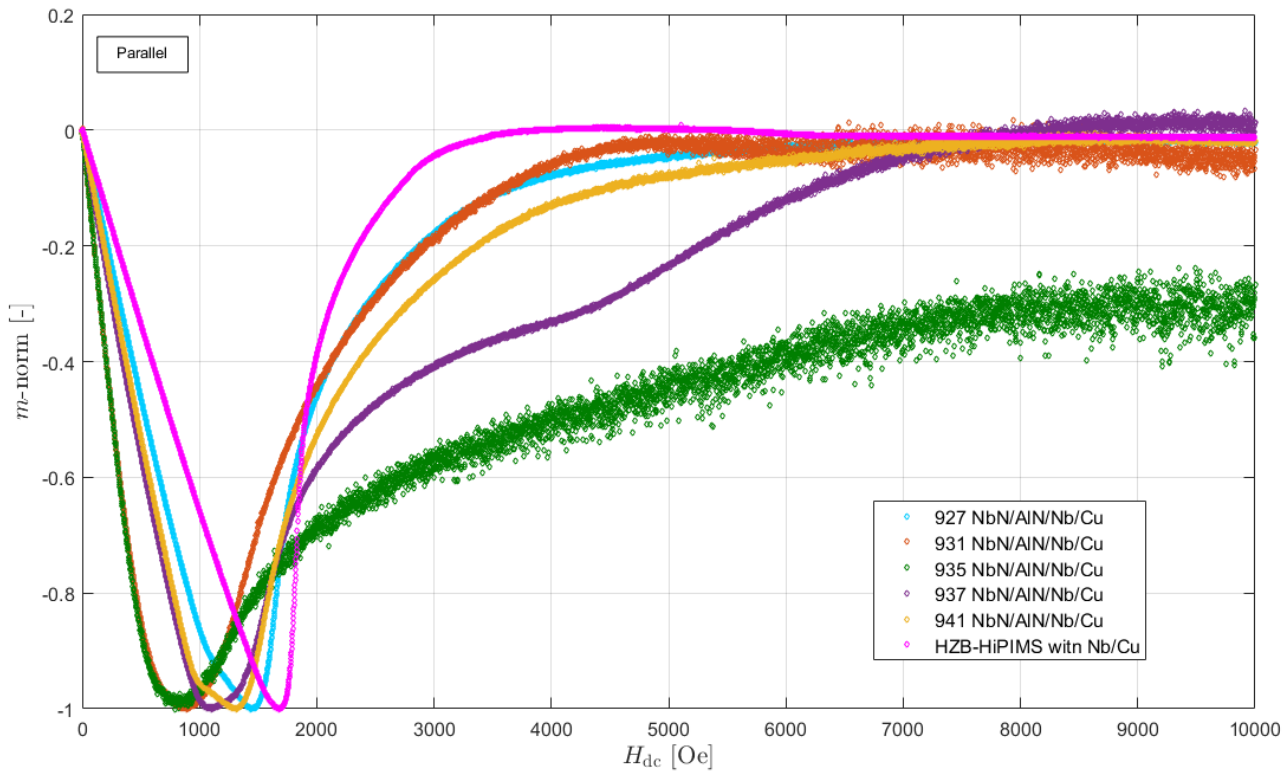
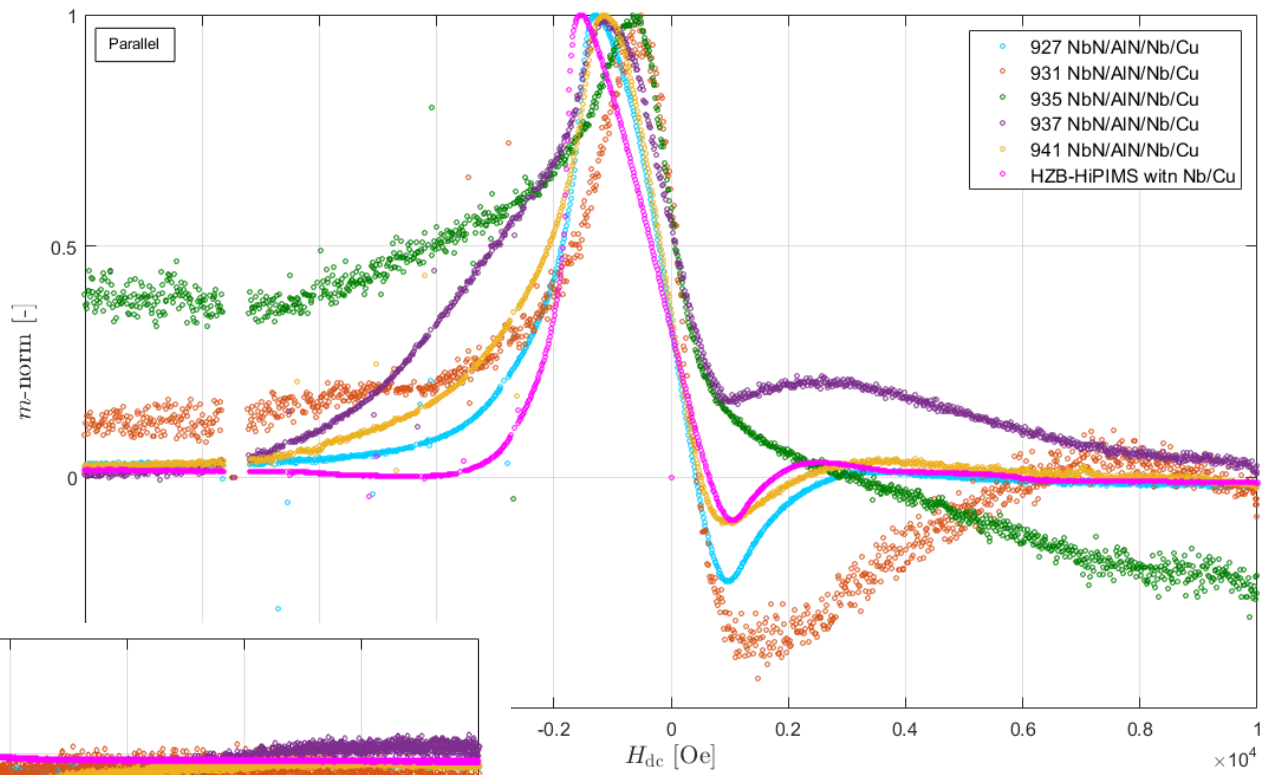
Multilayers STFC

NbTiN (NbN) / AlN / Nb / Cu



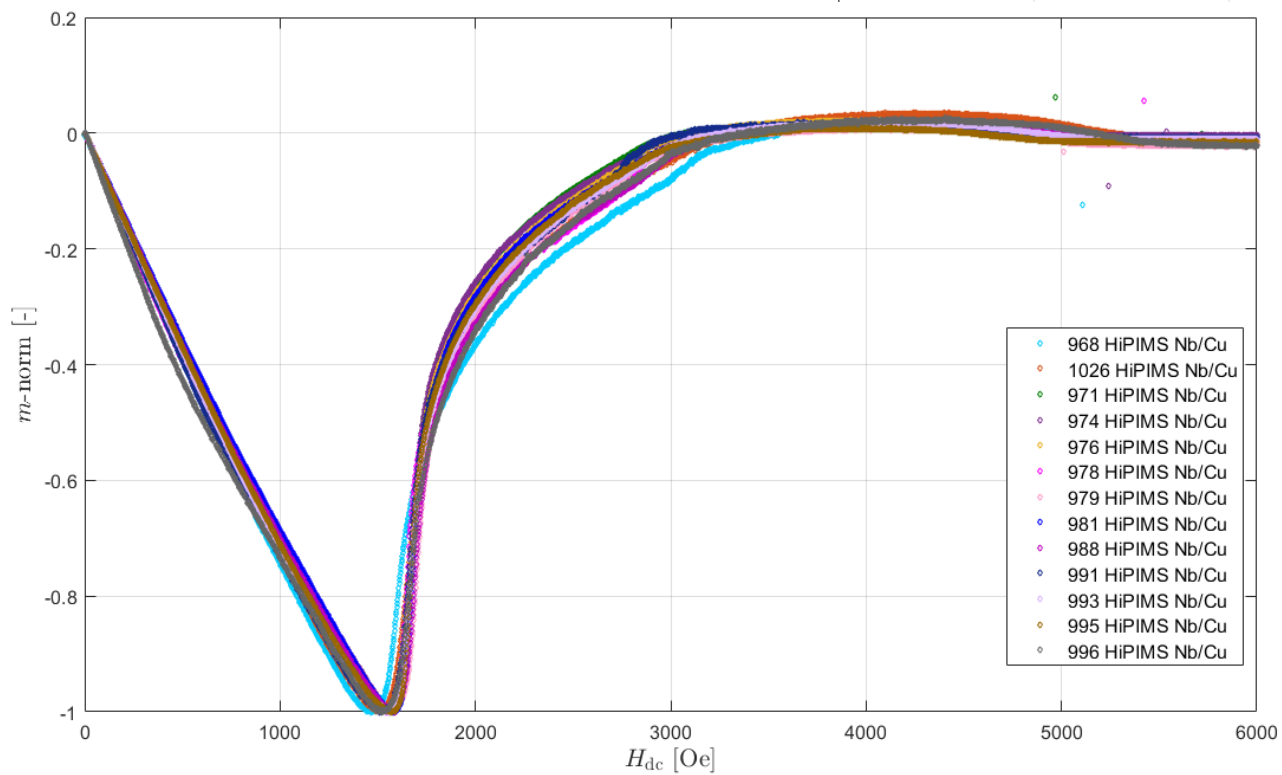
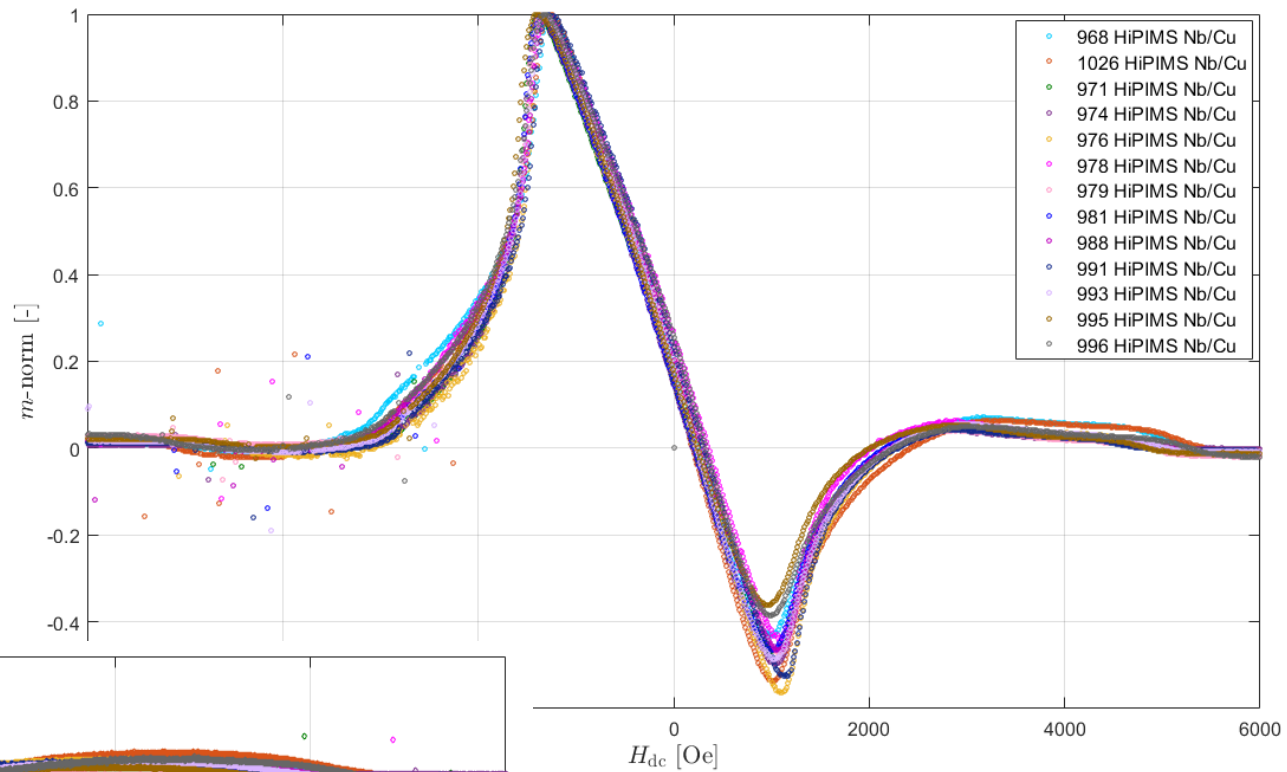
SIS Siegen Uni

NbN / AlN / Nb / Cu



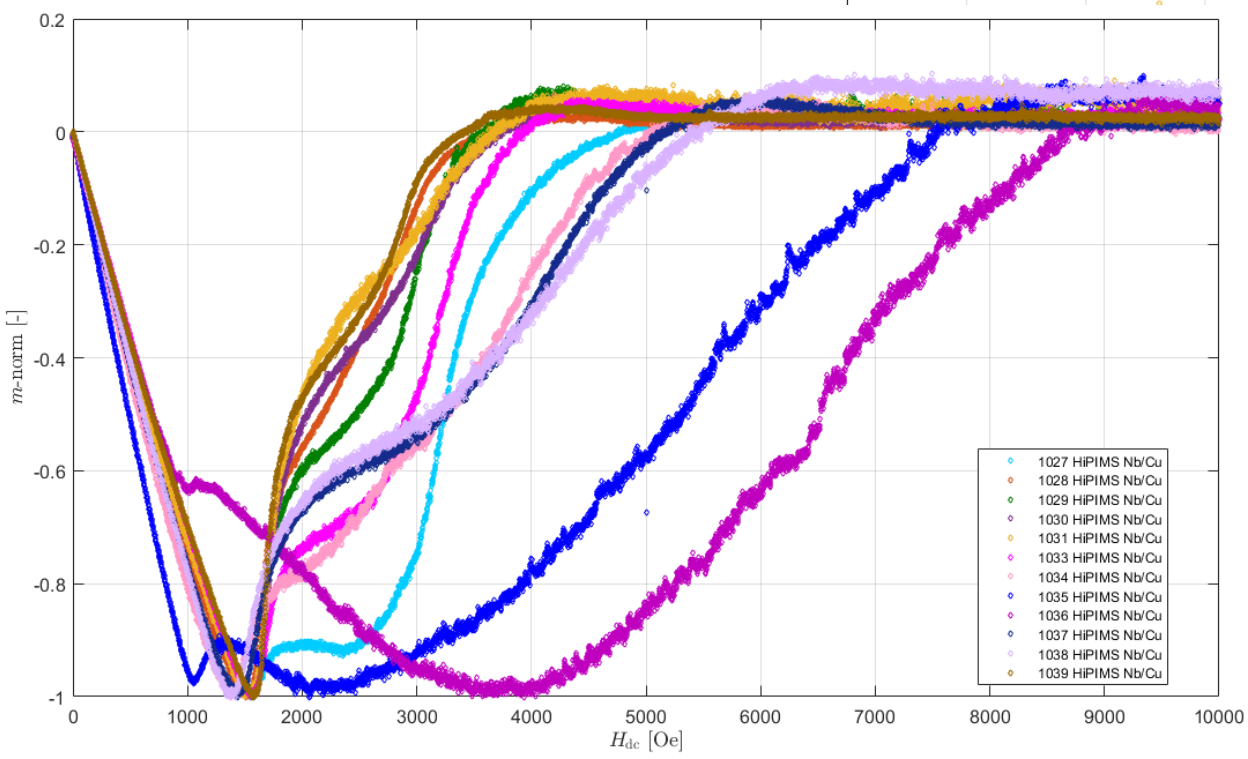
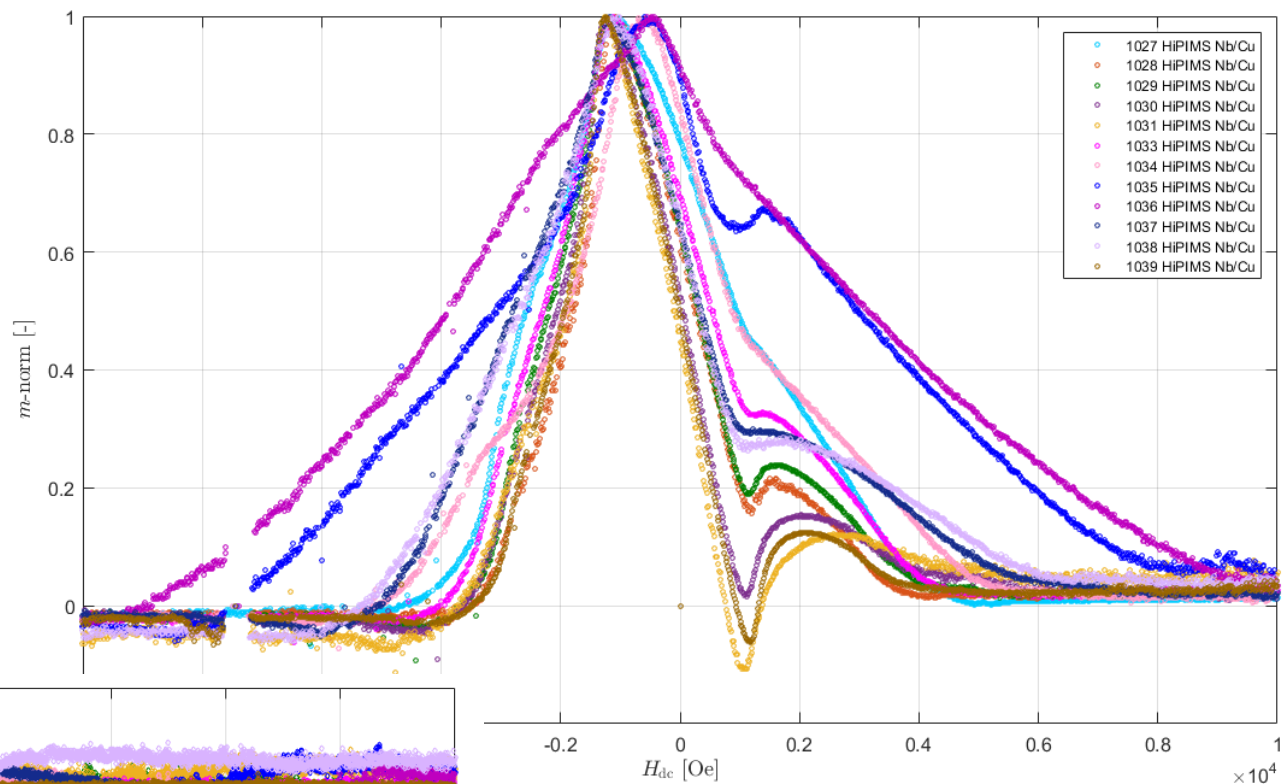
HiPIMS Nb 19.2.2020 series Siegen Uni

Nb / Cu



HiPIMS Nb 4.3.2020 series Siegen Uni

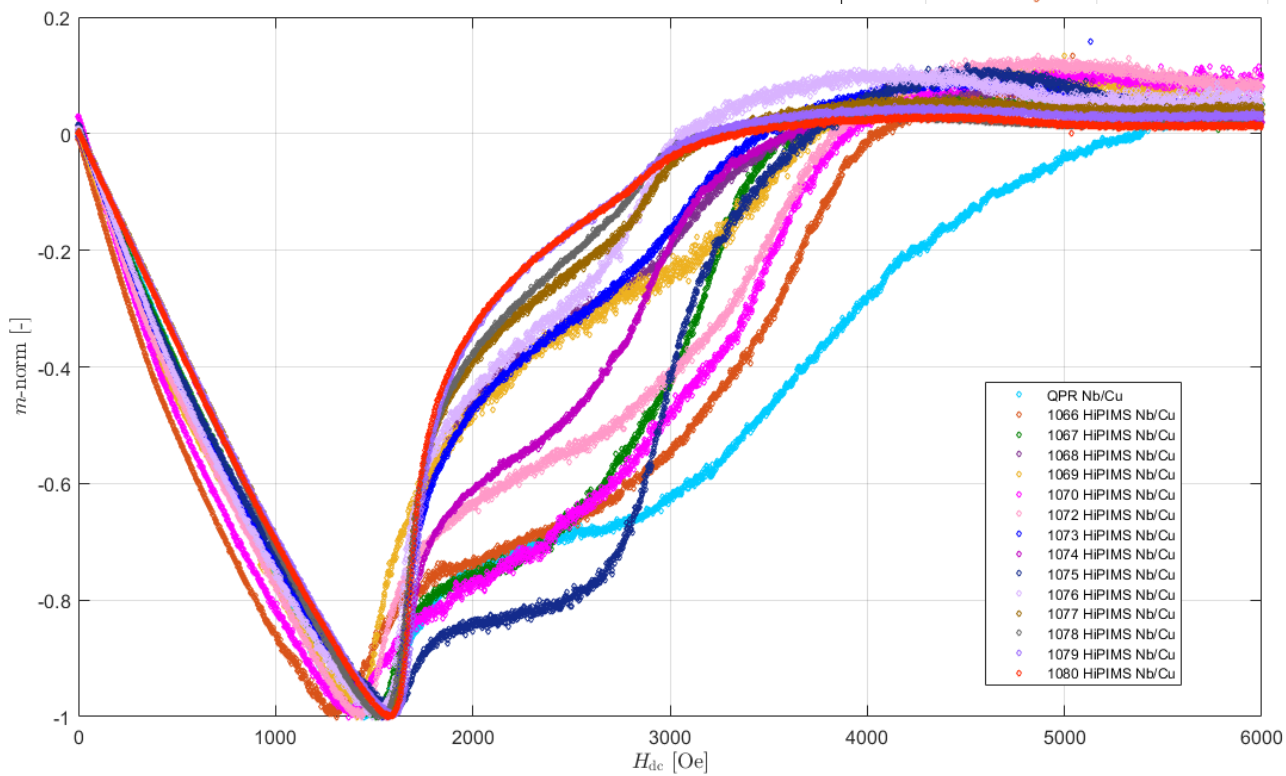
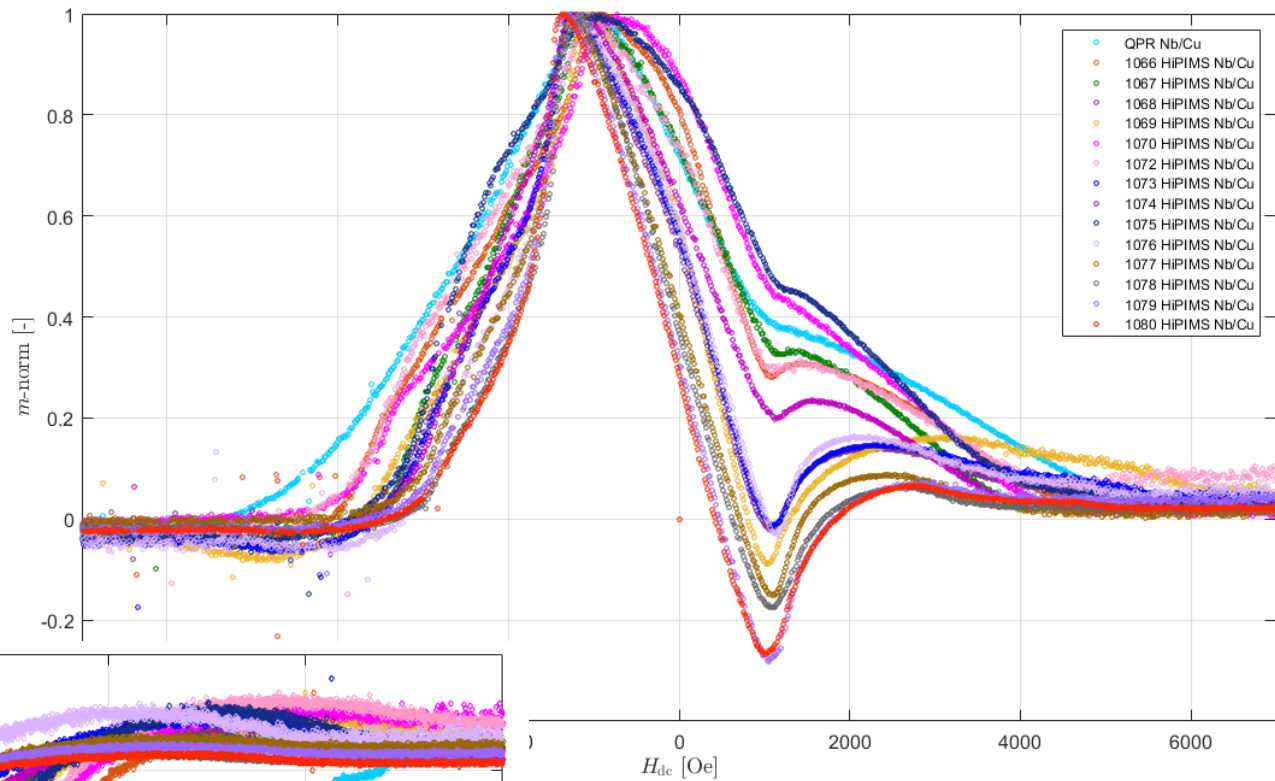
Nb / Cu



HiPIMS Nb 20.5.2020 series

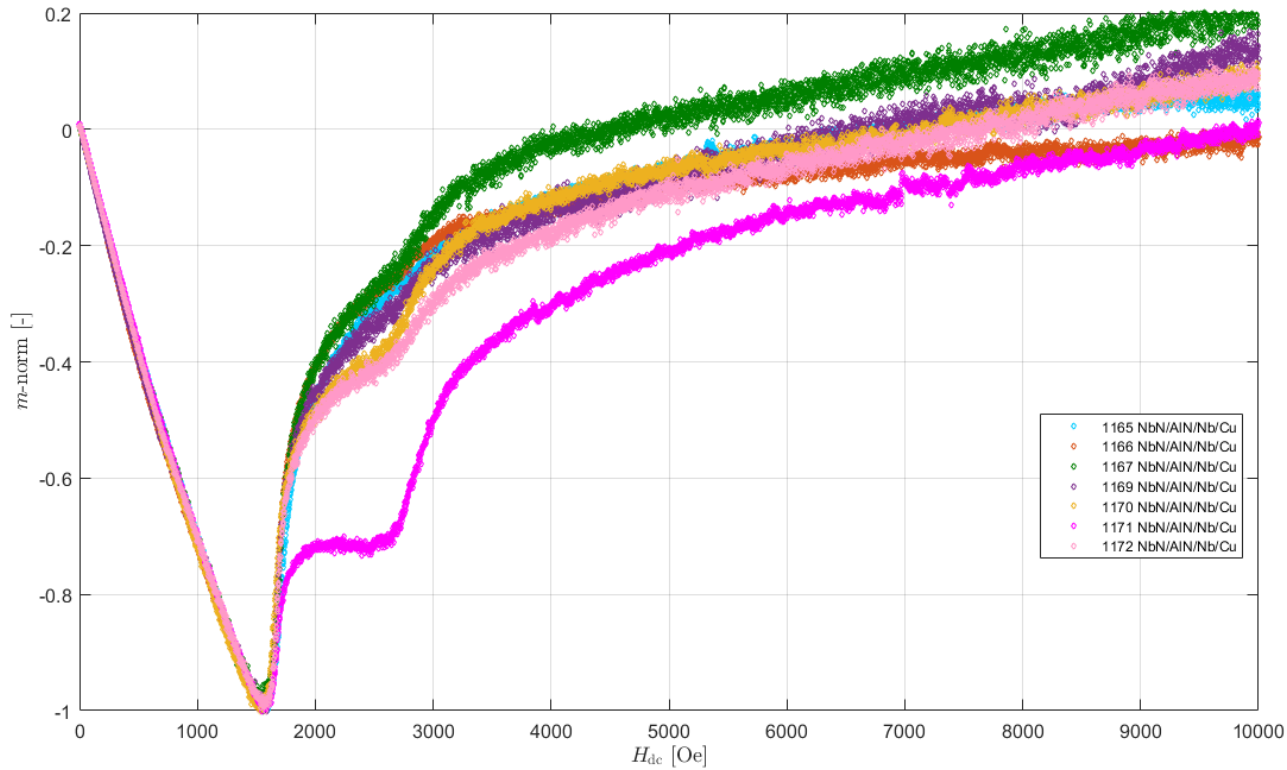
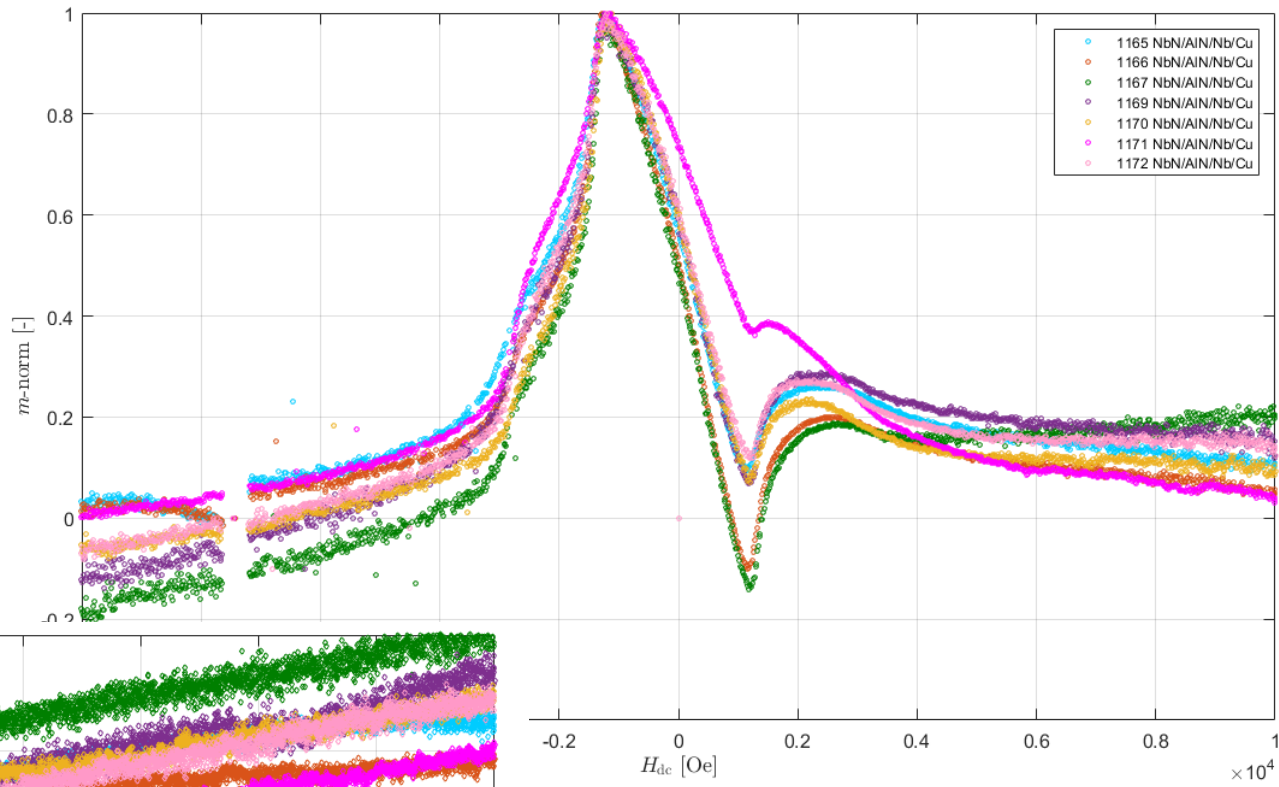
Siegen Uni

Nb / Cu



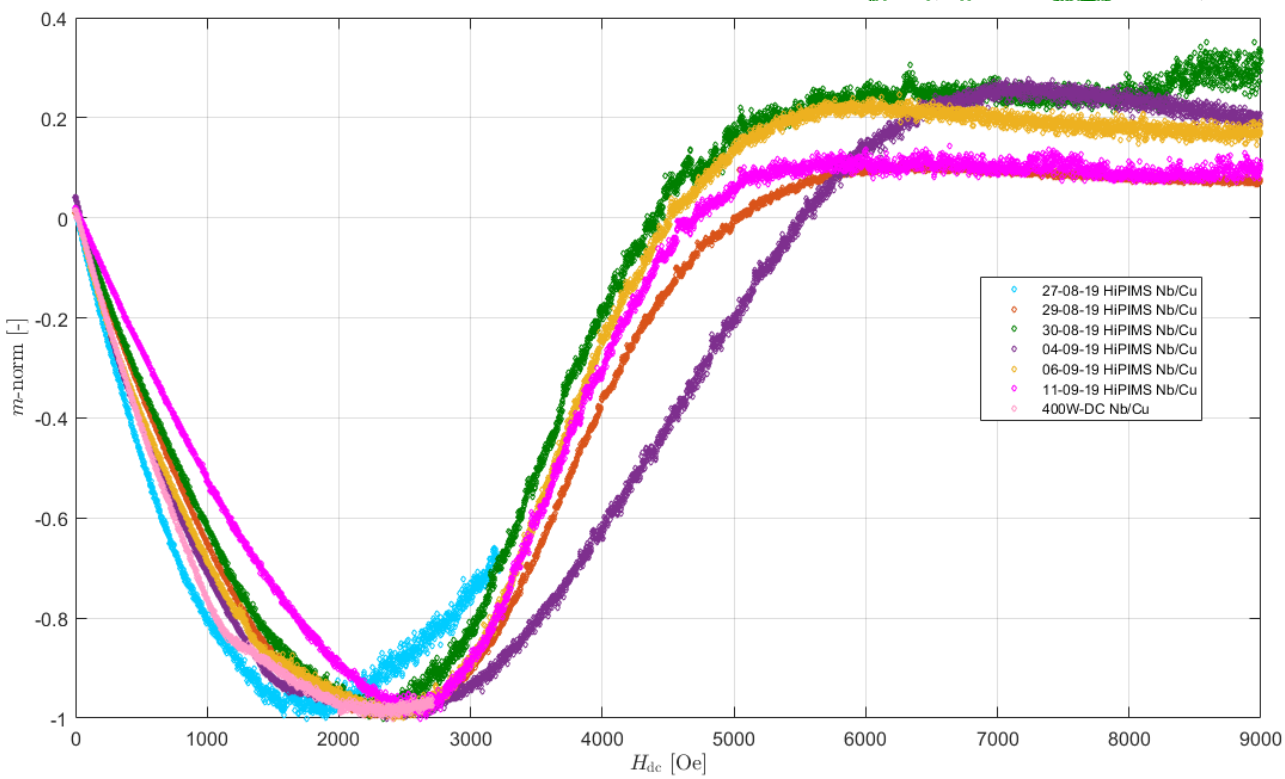
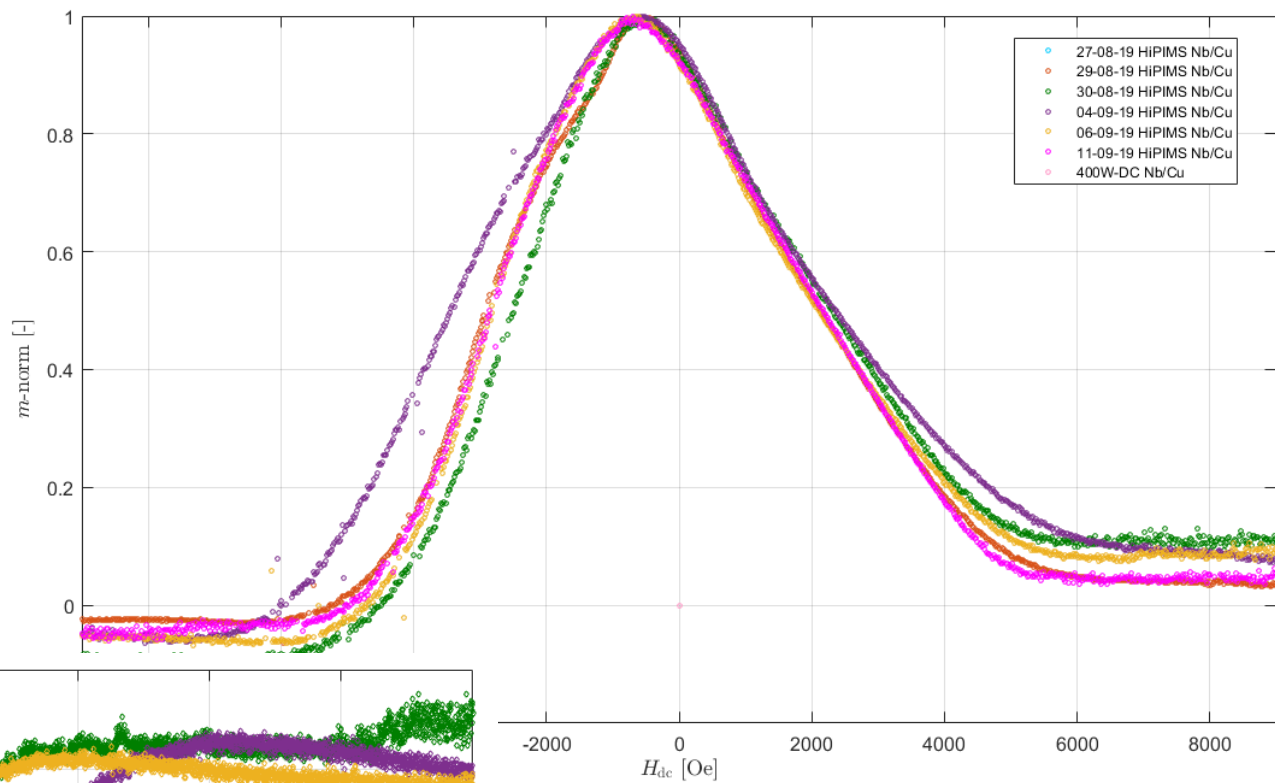
SIS 26.6.2020 series
Siegen Uni

NbN / AlN / Nb / Cu



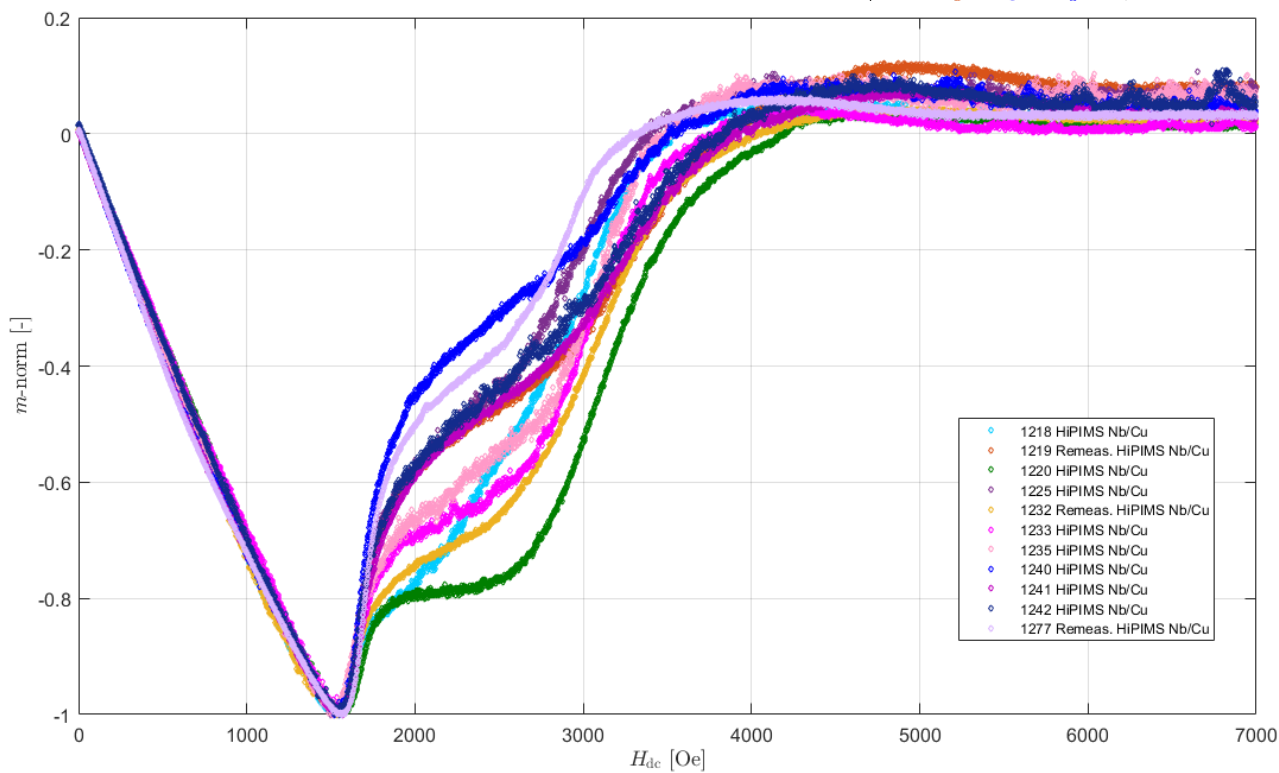
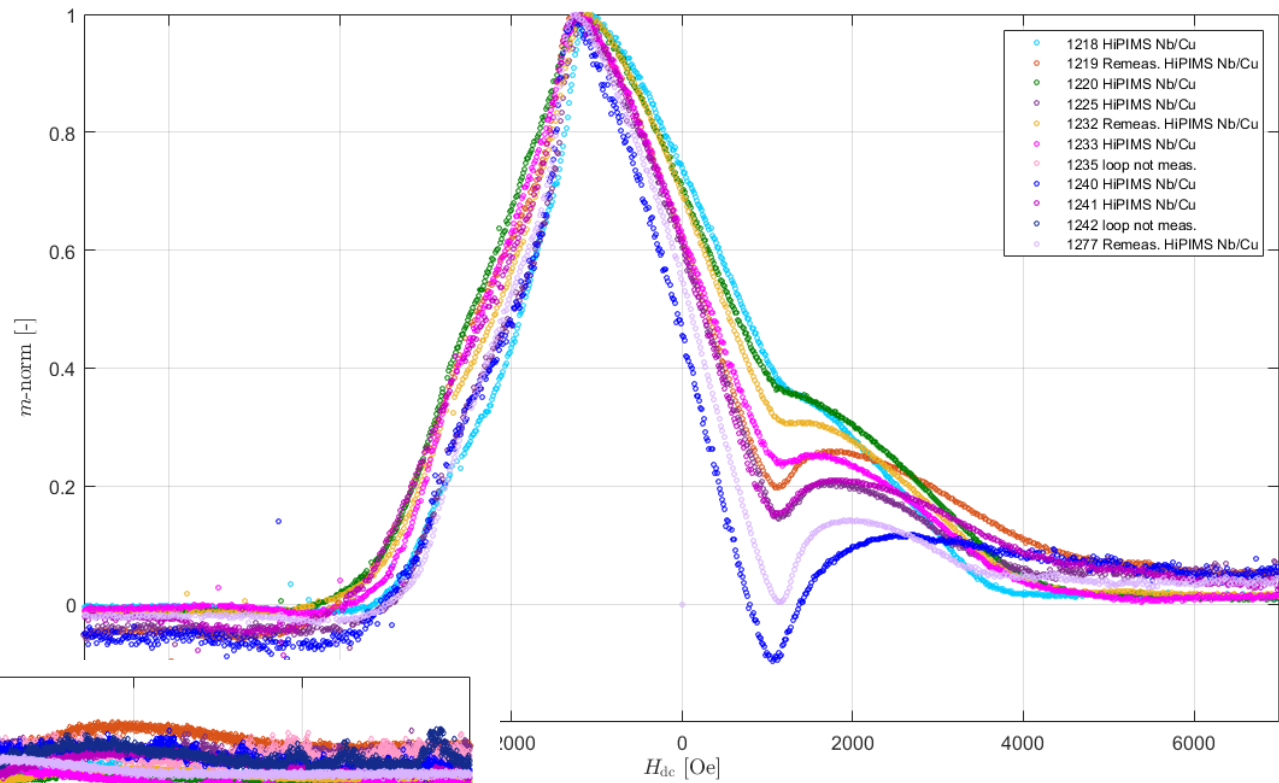
HiPIMS Nb 22.7.2020 series STFC

Nb / Cu



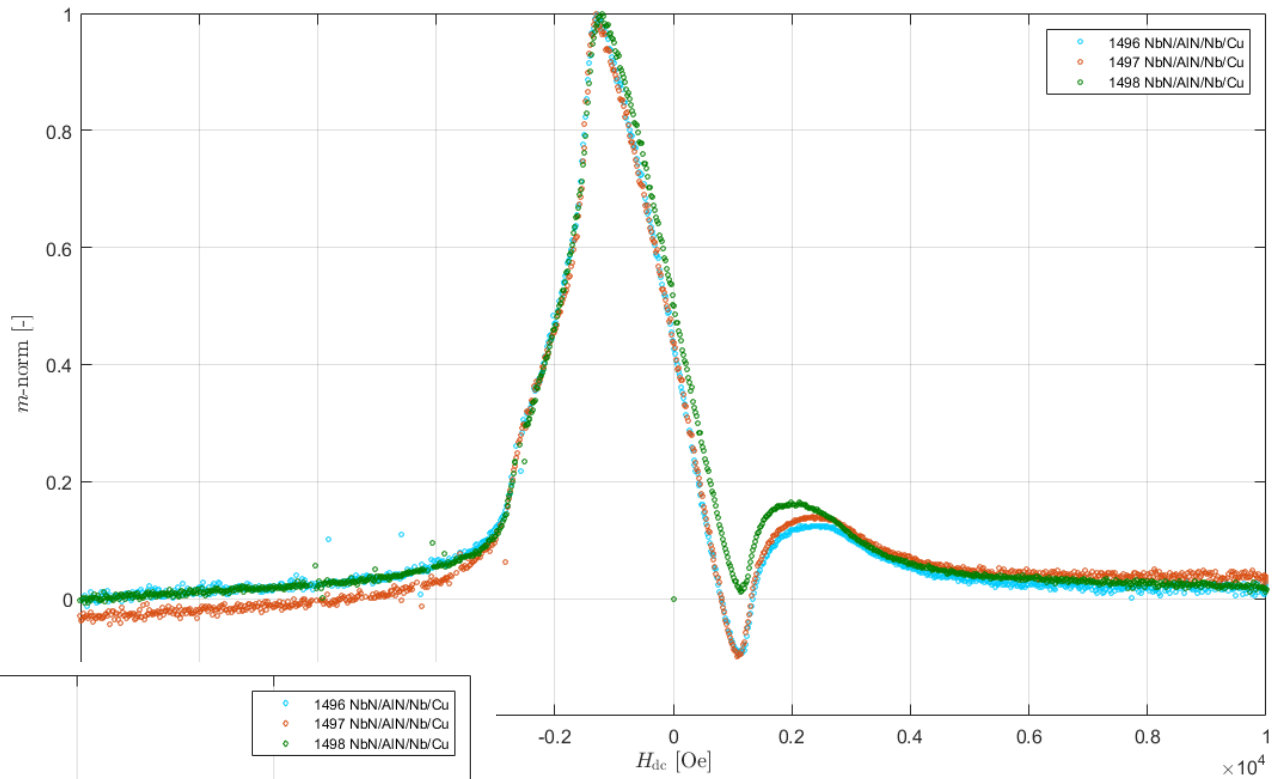
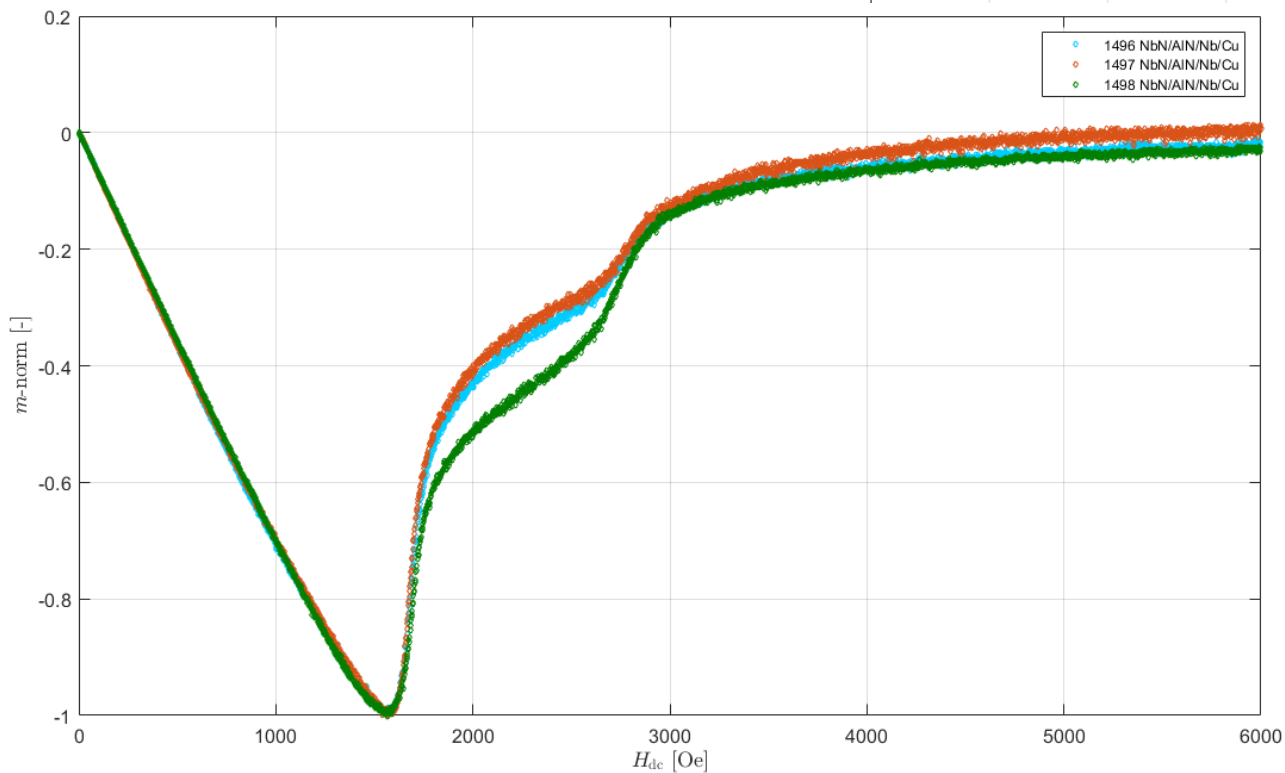
HiPIMS Nb 4.9.2020 series Siegen Uni

Nb / Cu



SIS 3.11.2020 series
Siegen Uni

NbN / AlN / Nb / Cu



SIS 1.12.2020 series
Siegen Uni

NbN / AlN / Nb / Cu

