Секреты эксперимента. Что нельзя купить за деньги.

Богач А.В.

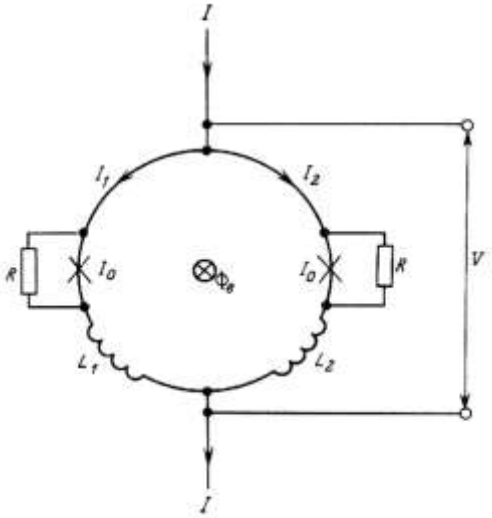
Отдел низких температур и криогенной техники,
Институт общей физики им. А.М.Прохорова РАН

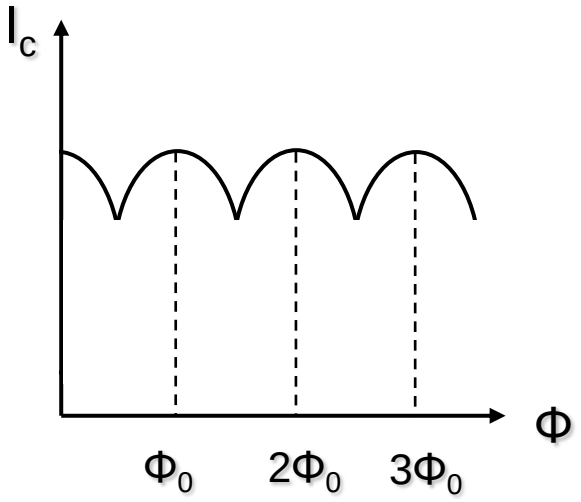
ООО «Криотехника и Электроника» (ООО «КРИОТЭЛ»)

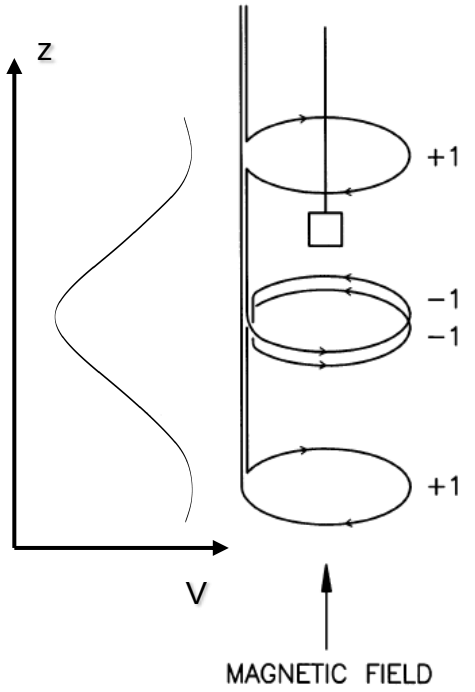
SECOND–DERIVATIVE DETECTION COIL

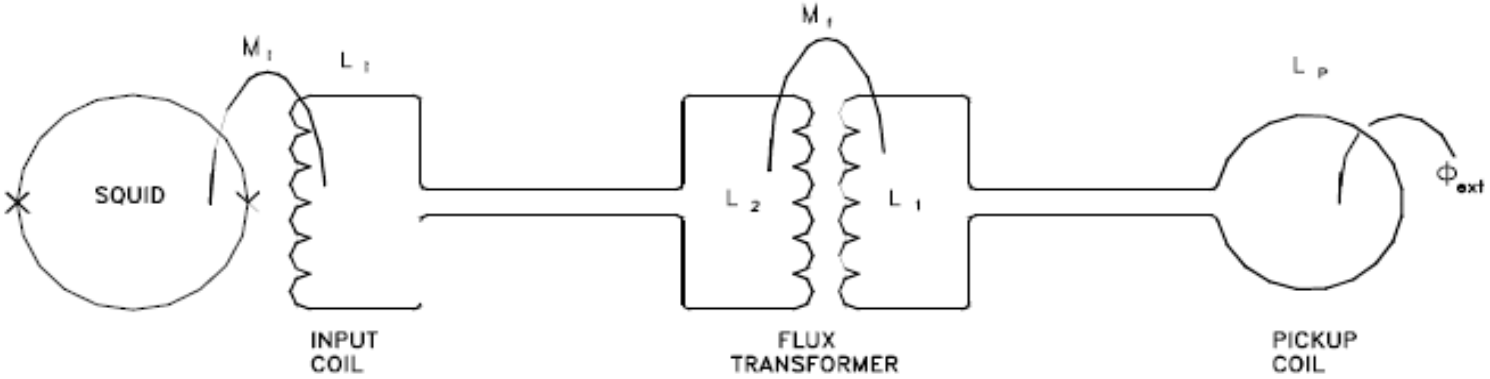
SQUID – Superconducting Quantum Interference Device

$\Phi_0 = h/2e \approx 2 * 10^{-15}$ Wb

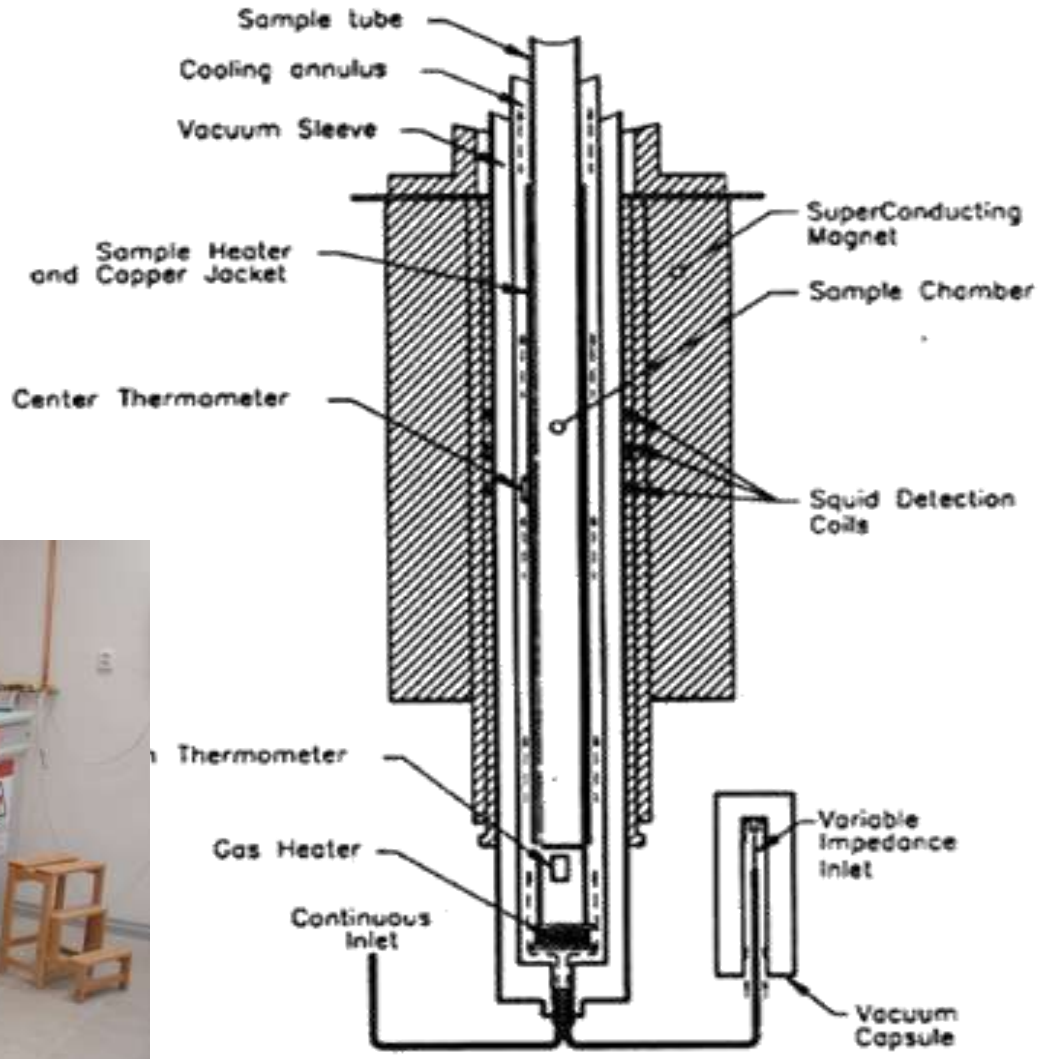




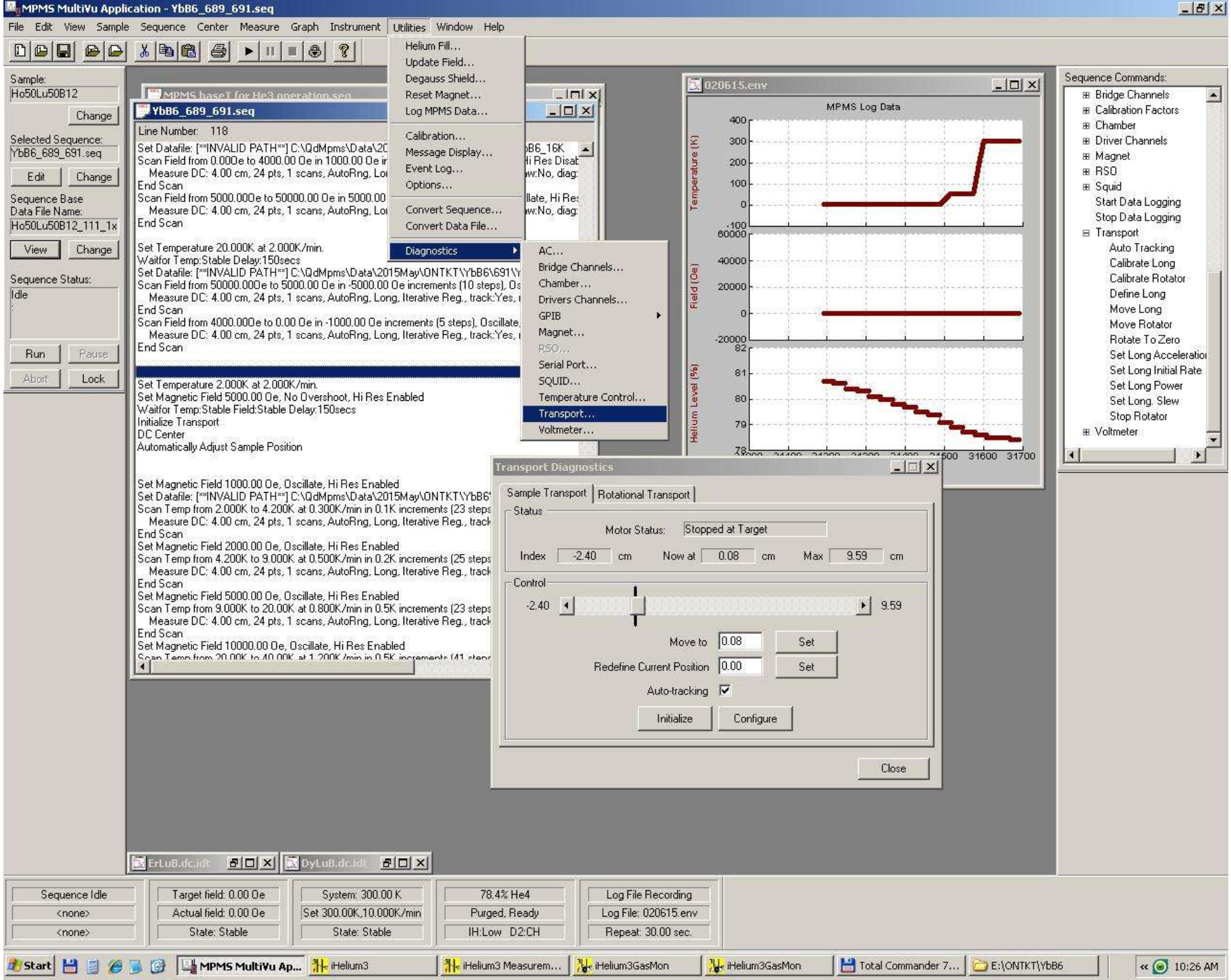


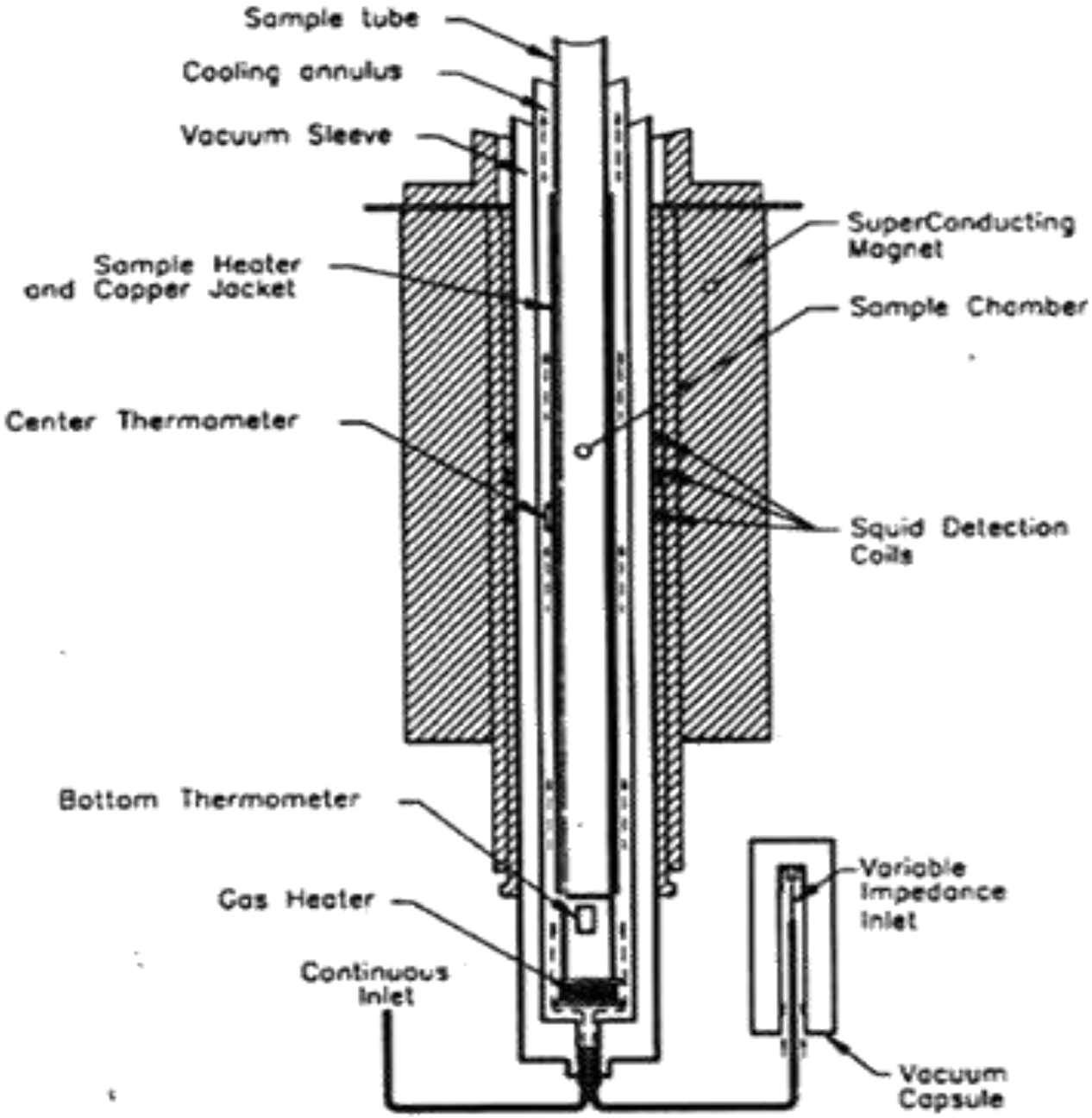


Sensitivity (emu)	10^{-8}
Dynamical range of magnetization measurements	10^{8}
Temperature range (K)	1.8-400
Temperature accuracy (%)	0.5

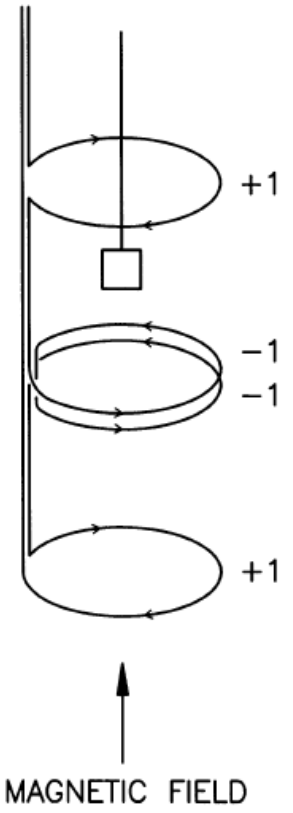


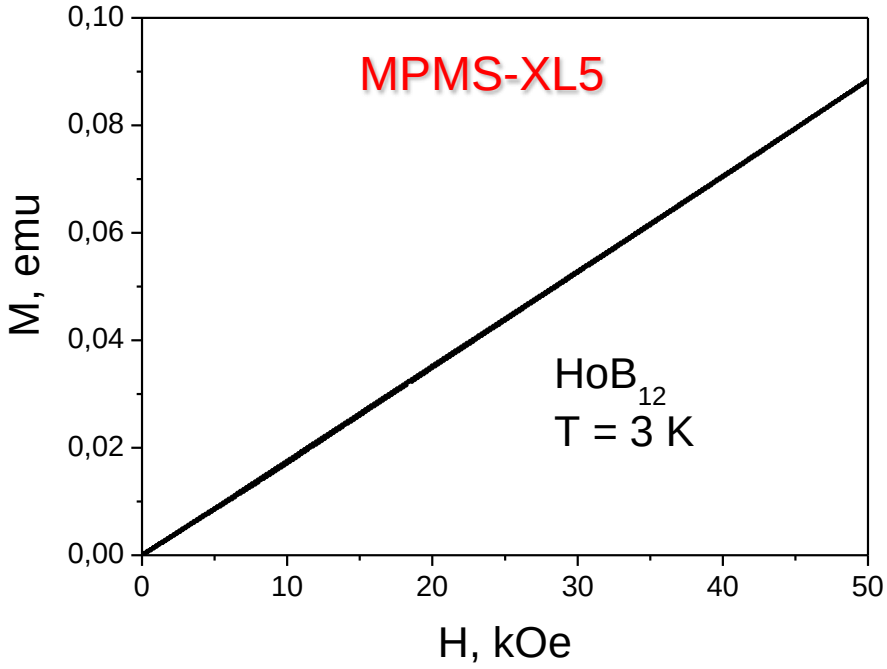
SQUID magnetometer Quantum Design MPMS-5XL


MPMS MultiVu Application - YbB6_689_691.seq
File Edit View Sample Sequence Center Measure Graph Instrument Utilities Window Help
Helium Fill...
Update Field...
Degauss Shield...
Reset Magnet...
Log MPMS Data...
Calibration...
Message Display...
Event Log...
Options...
Convert Sequence...
Convert Data File...
Diagnostics
AC...
Bridge Channels...
Chamber...
Drivers Channels...
GPIB
Magnet...
RSO...
Serial Port...
SQUID...
Temperature Control...
Transport...
Voltmeter...
Sample:
Ho50Lu50B12
Change
Selected Sequence:
YbB6_689_691.seq
Edit
Change
Sequence Base Data File Name:
Ho50Lu50B12_111_1x
View
Change
Sequence Status:
Idle
Run
Pause
Abort
Lock
YbB6_689_691.seq
Line Number: 118
Set Temperature 20.000K at 2.000K/min.
Waitfor Temp:Stable Delay:150secs
End Scan
Set Temperature 2.000K at 2.000K/min.
Set Magnetic Field 5000.00 Oe, No Overshoot, Hi Res Enabled
Waitfor Temp:Stable Field:Stable Delay:150secs
Initialize Transport
DC Center
Automatically Adjust Sample Position
Set Magnetic Field 1000.00 Oe, Oscillate, Hi Res Enabled
Set Magnetic Field 2000.00 Oe, Oscillate, Hi Res Enabled
Set Magnetic Field 5000.00 Oe, Oscillate, Hi Res Enabled
Set Magnetic Field 10000.00 Oe, Oscillate, Hi Res Enabled
020615.env
MPMS Log Data
Temperature (K)
Field (Oe)
Helium Level (%)
Sequence Commands:
Bridge Channels
Calibration Factors
Chamber
Driver Channels
Magnet
RSO
Squid
Start Data Logging
Stop Data Logging
Transport
Auto Tracking
Calibrate Long
Calibrate Rotator
Define Long
Move Long
Move Rotator
Rotate To Zero
Set Long Initial Rate
Set Long Power
Set Long. Slew
Stop Rotator
Voltmeter
Transport Diagnostics
Sample Transport
Rotational Transport
Status
Motor Status: Stopped at Target
Index -2.40 cm
Now at 0.08 cm
Max 9.59 cm
Control
-2.40
9.59
Move to 0.08
Set
Redefine Current Position 0.00
Set
Auto-tracking
Initialize
Configure
Close
ErLuB.dc.idt
DyLuB.dc.idt
Sequence Idle
<none>
<none>
Target field: 0.00 Oe
Actual field: 0.00 Oe
State: Stable
System: 300.00 K
Set 300.00K,10.00K/min
State: Stable
78.4% He4
Purged, Ready
IH:Low D2:CH
Log File Recording
Log File: 020615.env
Repeat: 30.00 sec.
Start
MPMS MultiVu Ap...
iHelium3
iHelium3 Measurem...
iHelium3GasMon
iHelium3GasMon
Total Commander 7...
E:\ONTKT\YbB6
10:26 AM



SECOND–DERIVATIVE DETECTION COIL

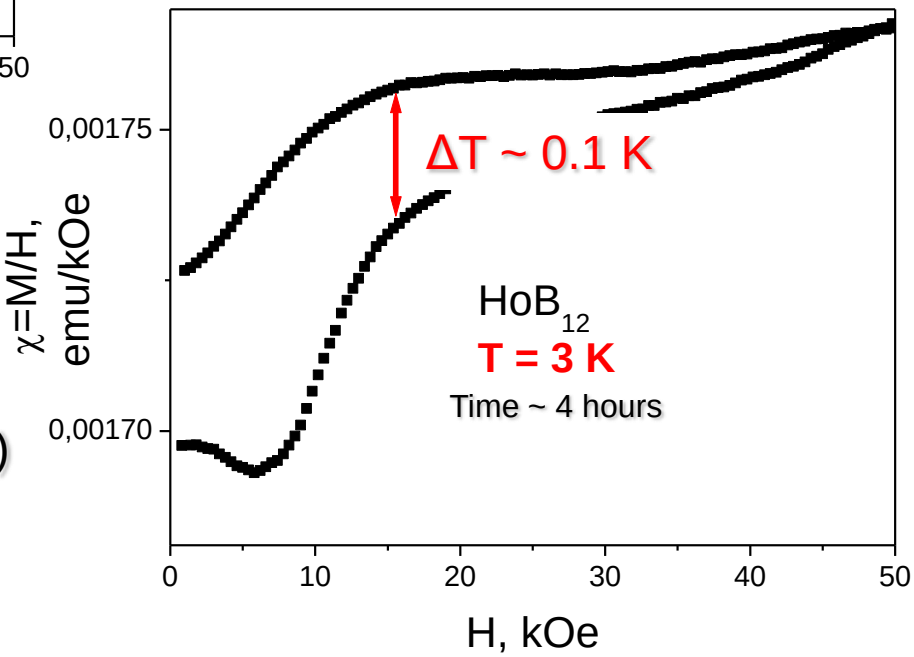




HoB_{12} – AF metal, T_N = 7.4 K

X(H) = M(H)/H

MPMS-XL5



$X(T, H_0)$
ΔX
} $\Delta T \sim 0.1$ K >> 0.5% (T = 3 K)

QuantumDesign

11578 Sorrento Valley Road
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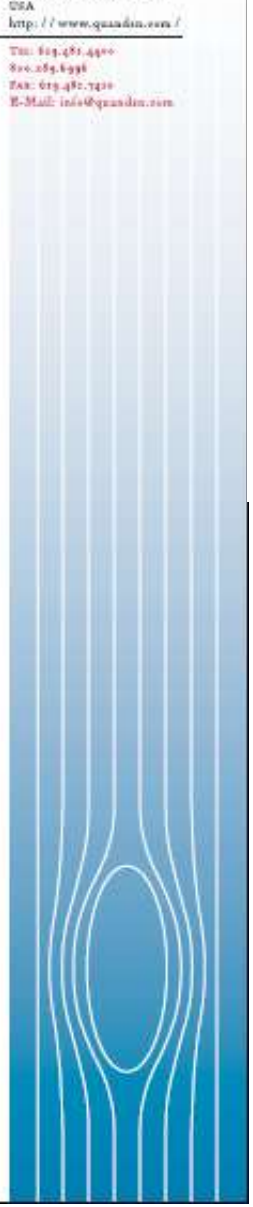
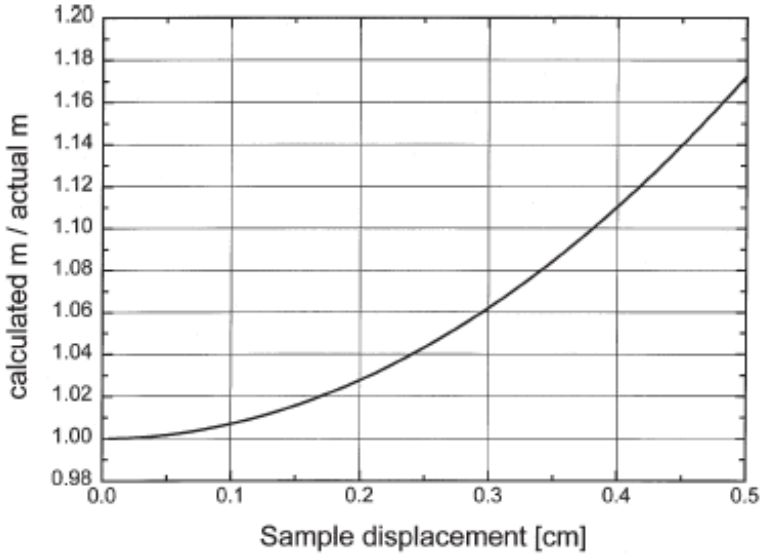
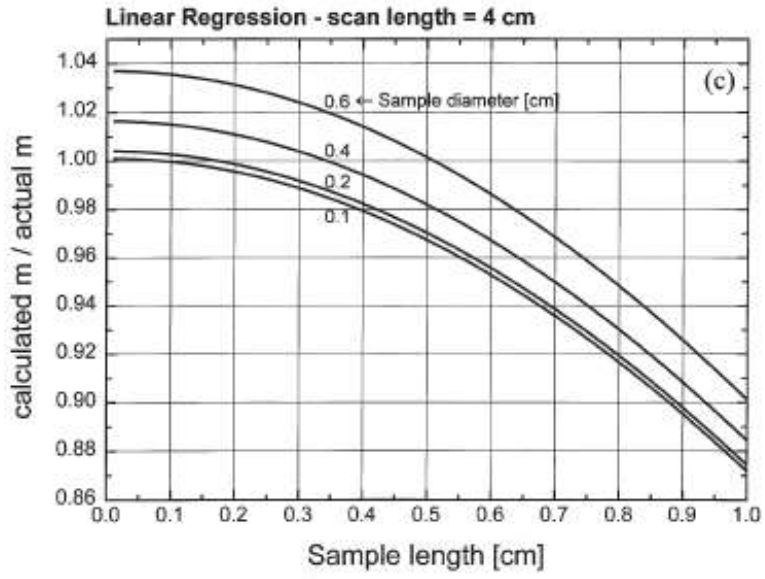
Tel: 619.481.4400
800.289.6996
Fax: 619.481.7410
E-Mail: info@qdusa.com

Effects of Magnetic Field Uniformity on the Measurement of Superconducting Samples

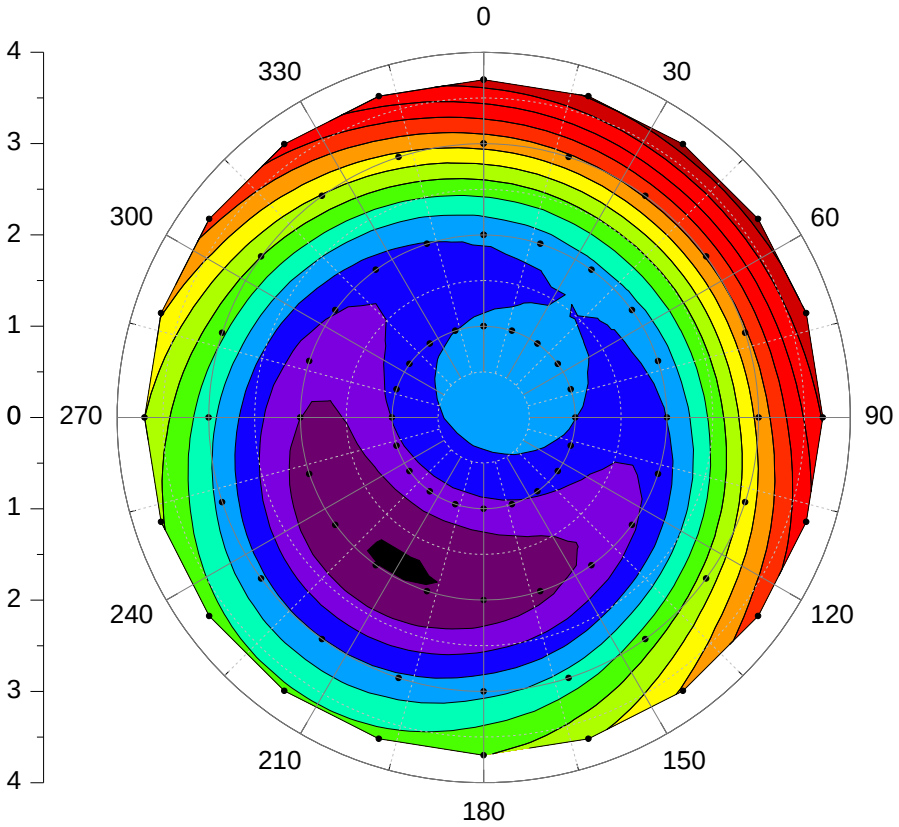
Mike McElfresh and Shi Li of Purdue University
and
Ron Sager of Quantum Design

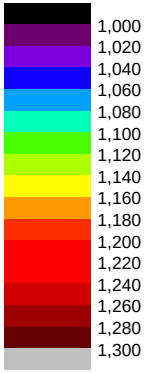


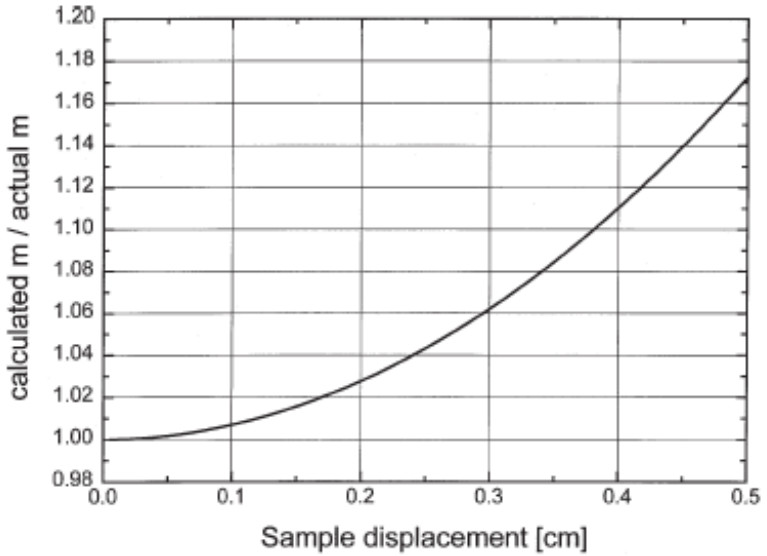


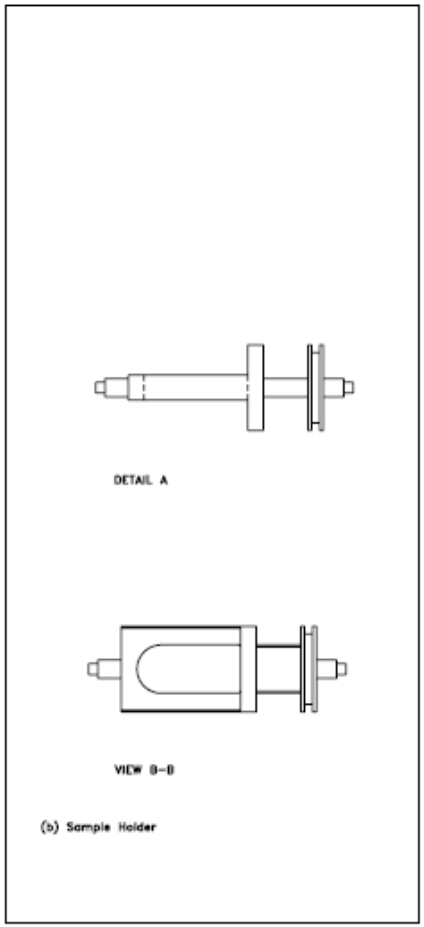


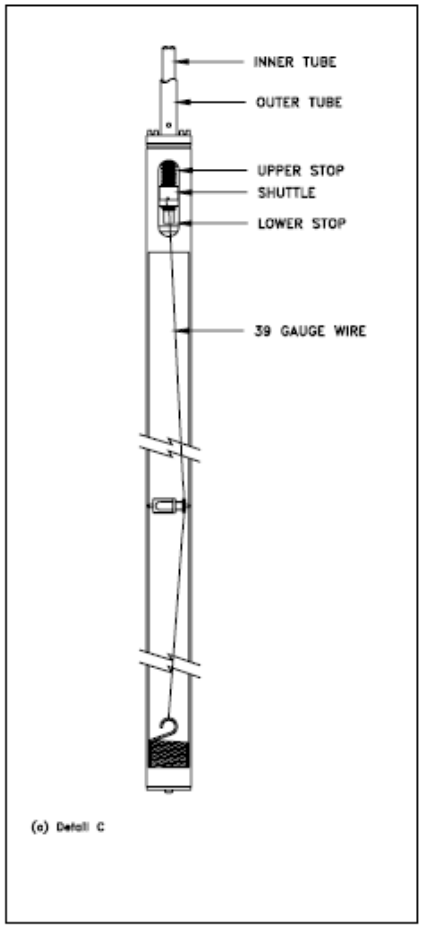
Университет Пердью, Индиана


0
30
60
90
120
150
180
210
240
270
300
330
4
3
2
1
0
1
2
3
4


1,000
1,020
1,040
1,060
1,080
1,100
1,120
1,140
1,160
1,180
1,200
1,220
1,240
1,260
1,280
1,300

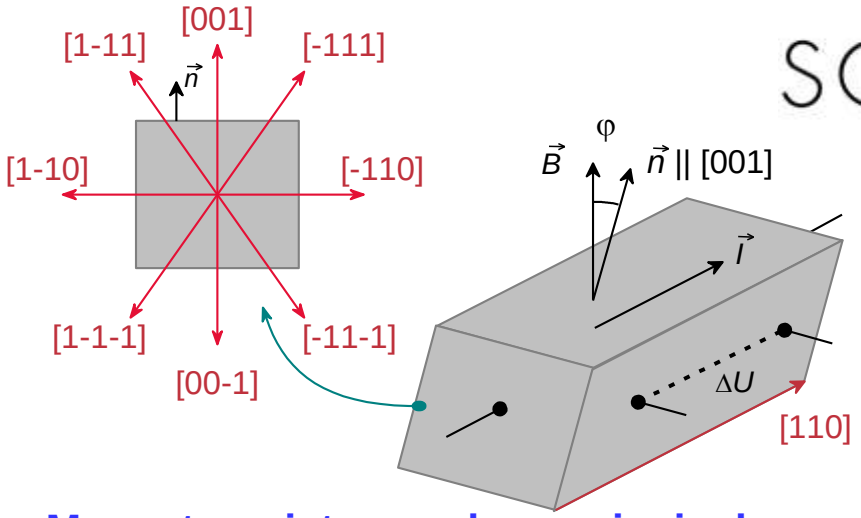

calculated m / actual m
1.20
1.18
1.16
1.14
1.12
1.10
1.08
1.06
1.04
1.02
1.00
0.98
0.0
0.1
0.2
0.3
0.4
0.5
Sample displacement [cm]


DETAIL A
VIEW B–B
(b) Sample Holder


INNER TUBE
OUTER TUBE
UPPER STOP
SHUTTLE
LOWER STOP
39 GAUGE WIRE
(a) Detail C

Experimental results.

Experimental geometry



www.nature.com/scientificreports

SCIENTIFIC REPORTS

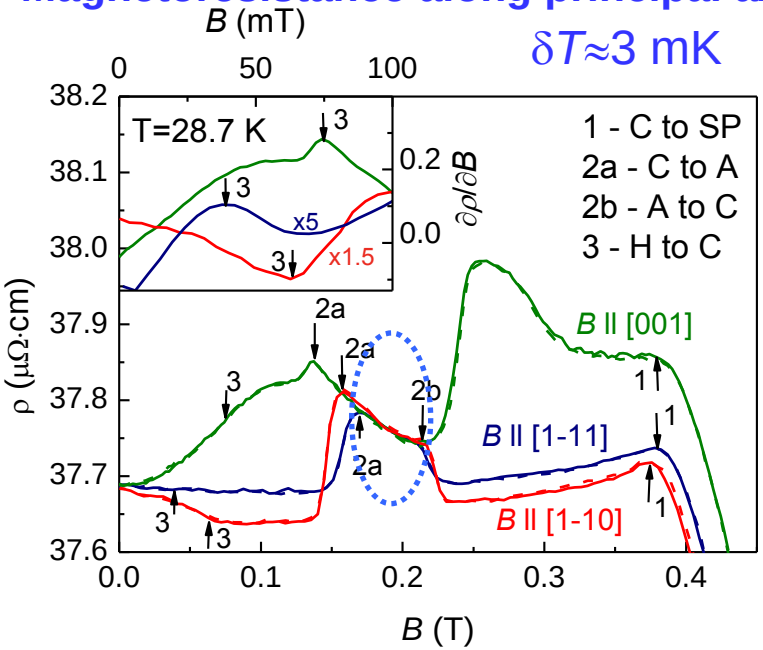
Macroscopic evidence for Abrikosov-type magnetic vortexes in MnSi *A*-phase

I. I. Lobanova[1], V. V. Glushkov[1,2], N. E. Sluchanko[1,2] & S. V. Demishev[1,2]

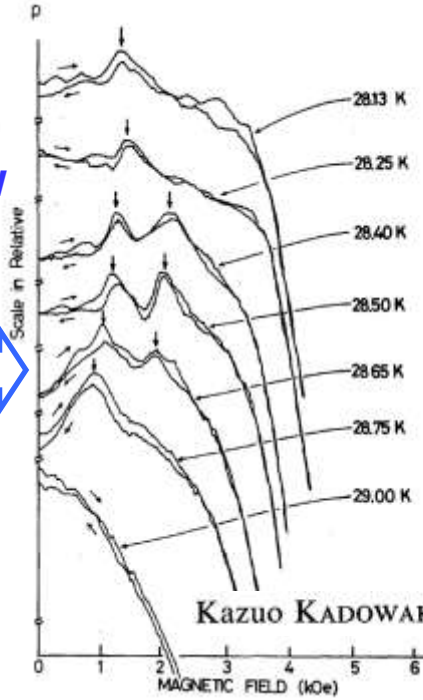
SCIENTIFIC REPORTS | 6:22101 | DOI: 10.1038/srep22101

Magnetoresistance along principal axes

$\delta T \approx 3$ mK



New vs. Old



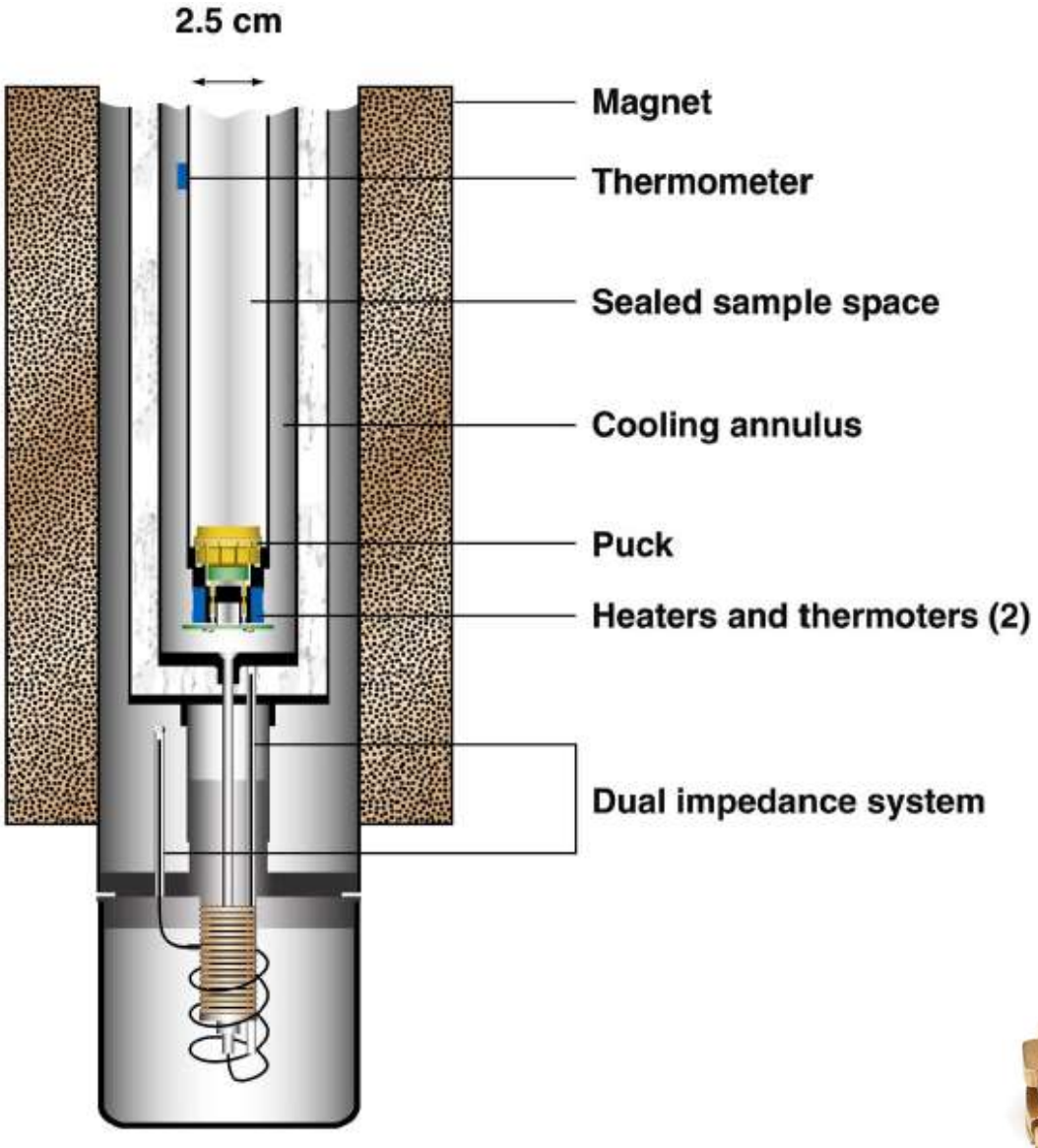
Kazuo KADOWAKI, Kiichi OKUDA* and Muneyuki DATE

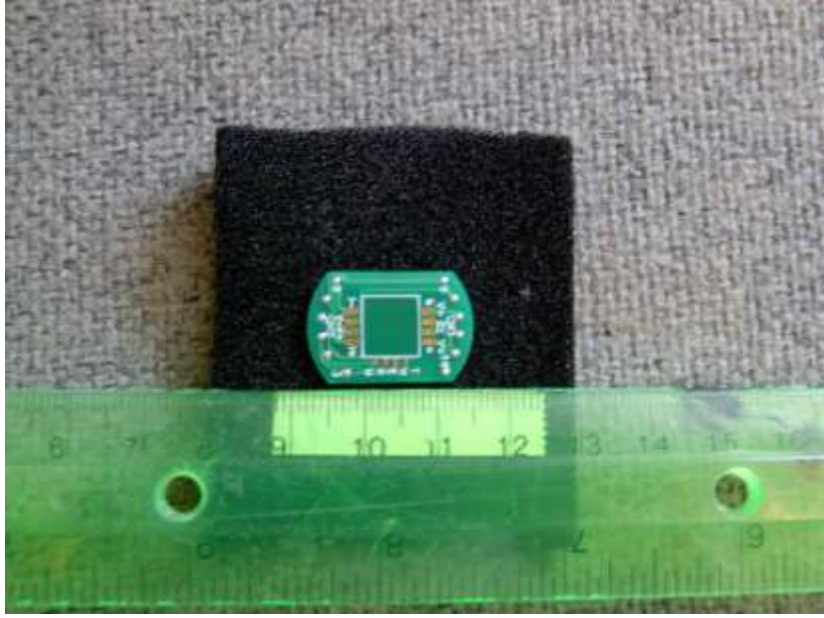
Journal of the Physical Society of Japan
Vol. 51, No. 8, August, 1982, pp. 2433–2438

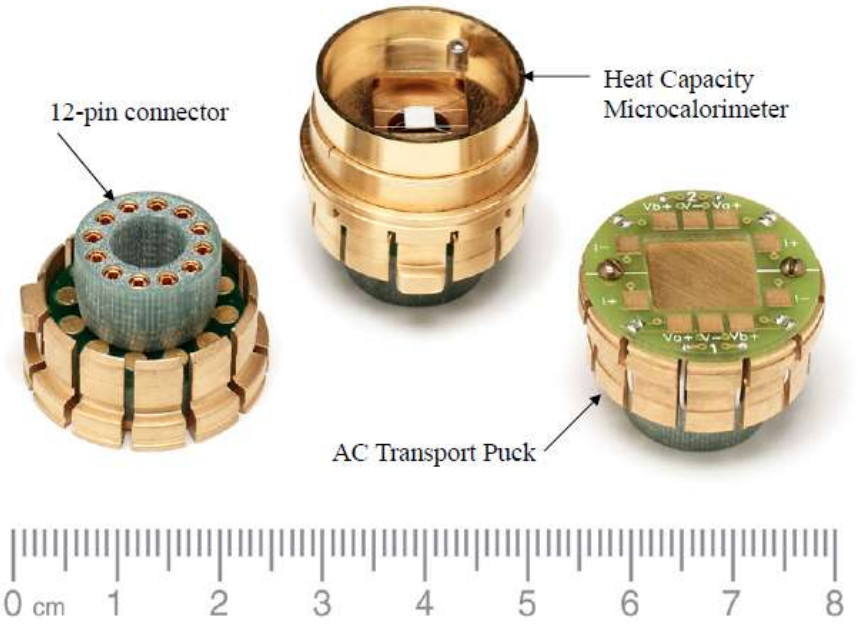
No hysteresis!

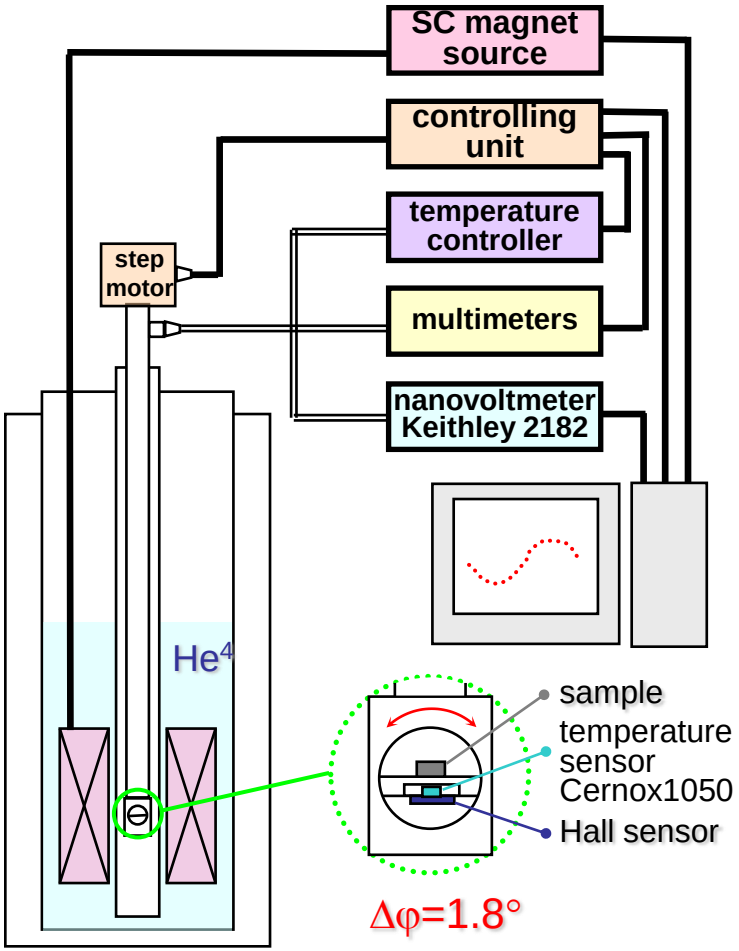
***B-T* region where resistivity coincide for three directions**

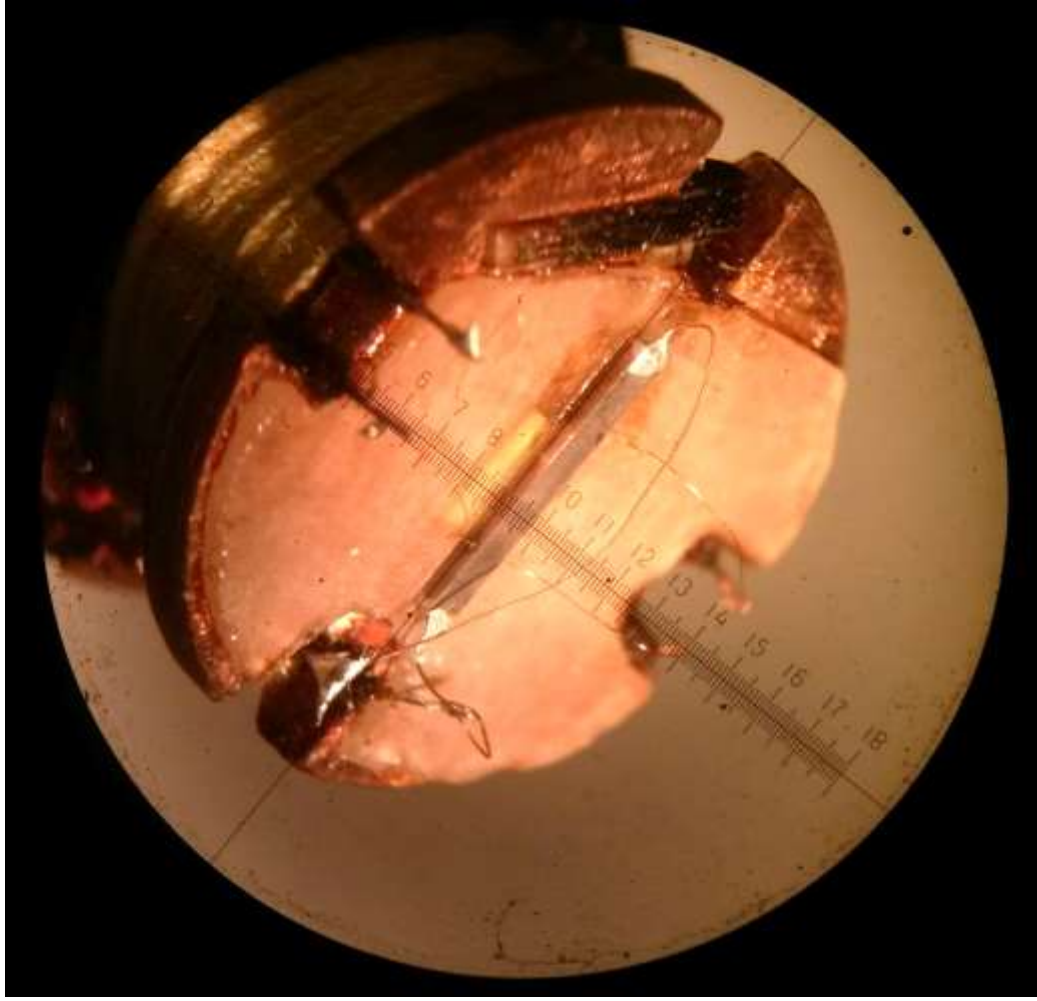
Magnetoresistance kinks may be used for establishing magnetic phase diagram

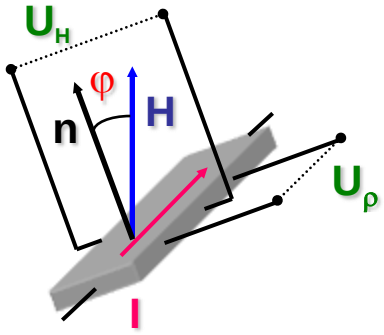

2.5 cm
Magnet
Thermometer
Sealed sample space
Cooling annulus
Puck
Heaters and thermoters (2)
Dual impedance system



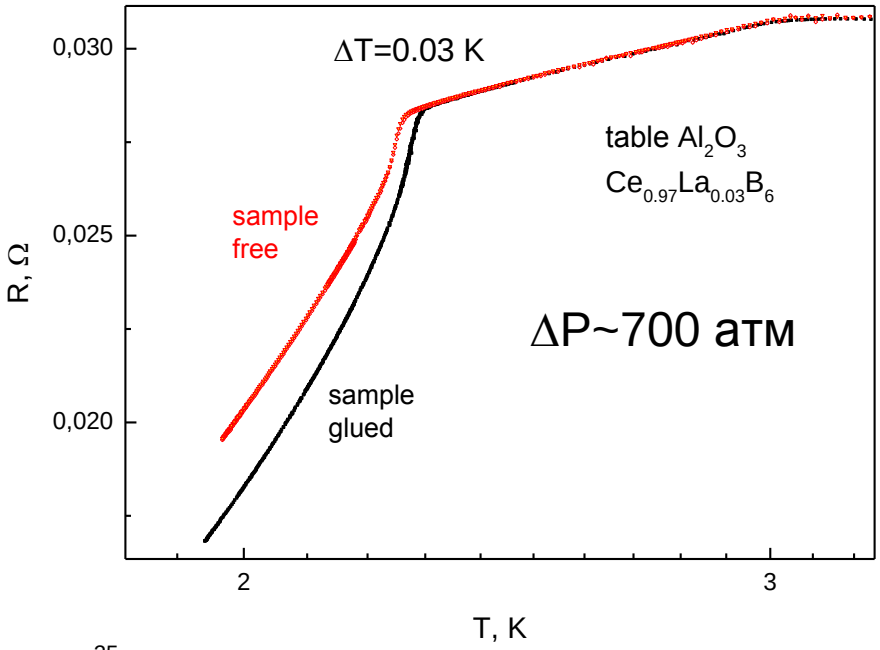

12-pin connector
Heat Capacity Microcalorimeter
AC Transport Puck
0 cm 1 2 3 4 5 6 7 8

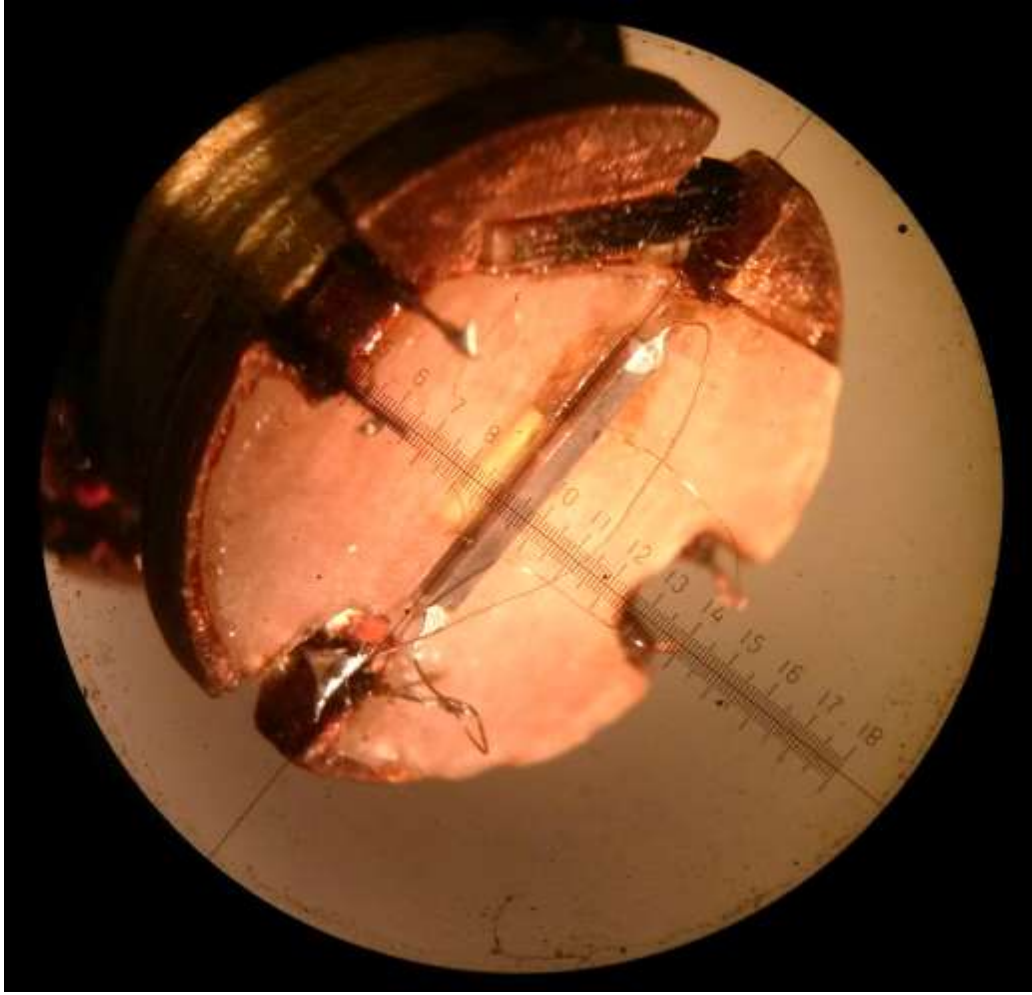


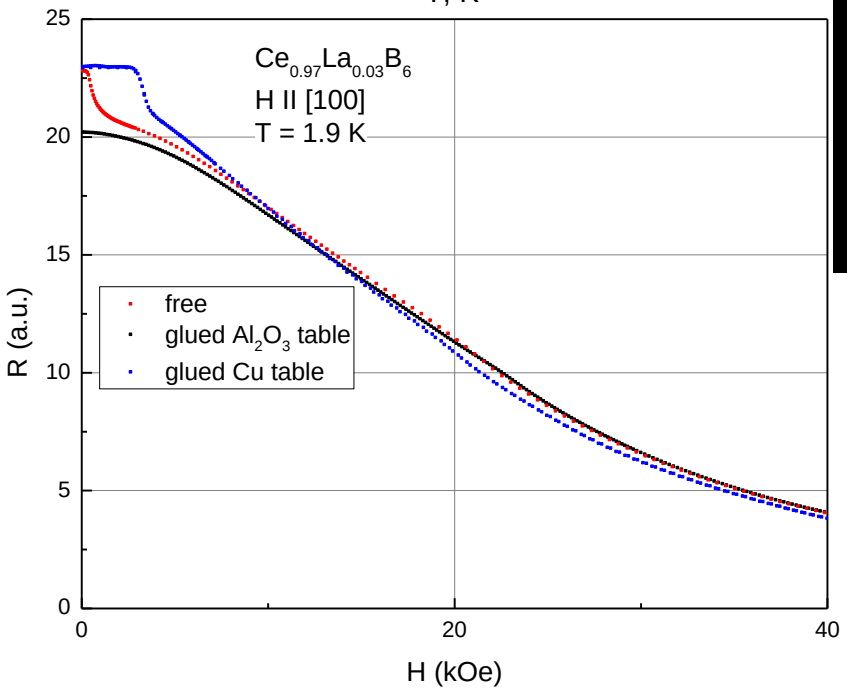




Magnetic field: 8 T (14 T)
Field stability $2 \cdot 10^{-5}$
Temperature: 1.8-300 K
Temperature stability: 1 mK (T<40 K)
Sample rotation: $\pm 360^0$
Resistivity relative accuracy: 10^{-5} (DC) 10^{-6} (AC)

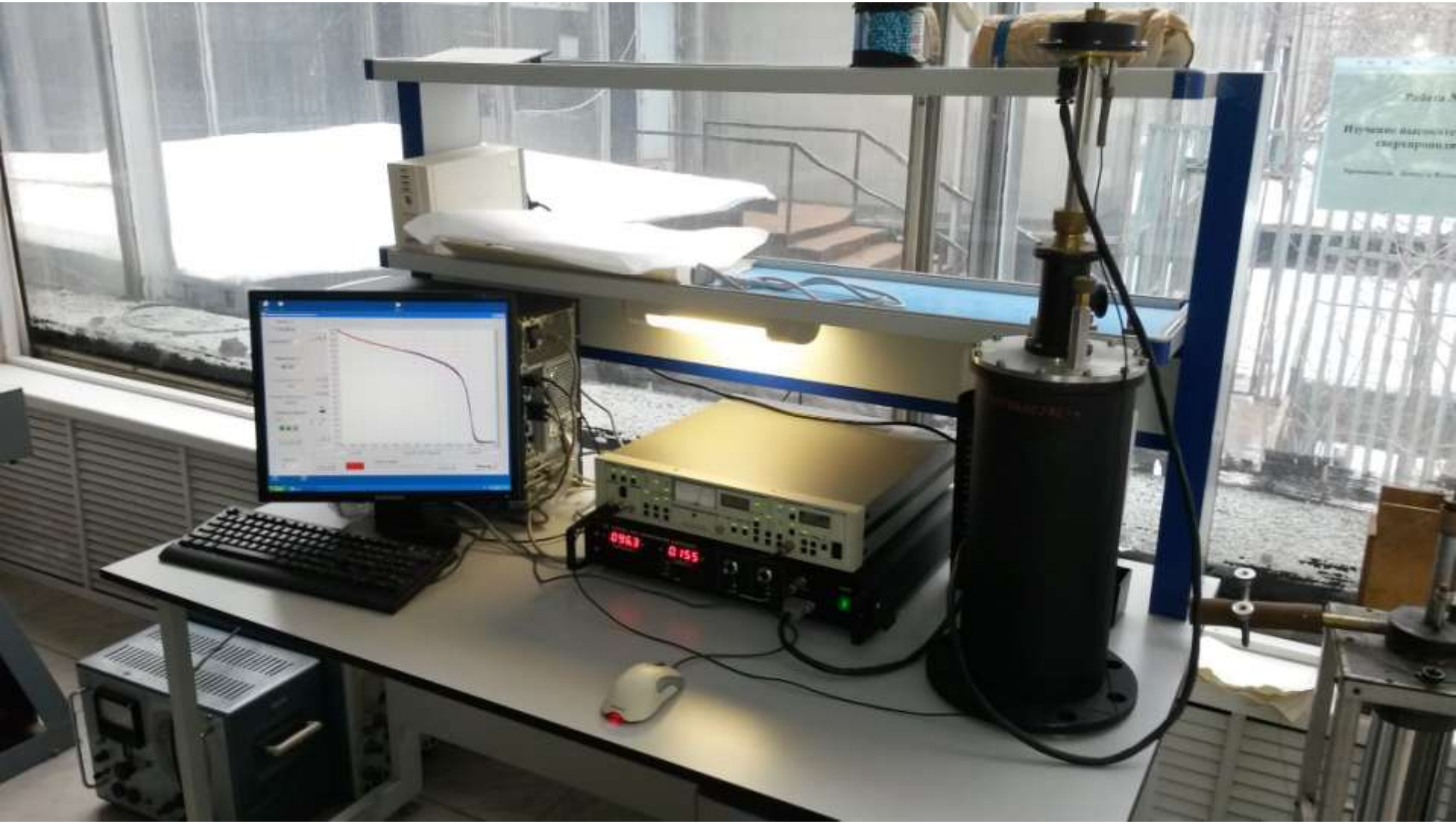

ΔT=0.03 K
table Al2O3
Ce0.97La0.03B6
sample
free
ΔP~700 атм
sample
glued
R, Ω
0,030
0,025
0,020
2
3
T, K




Ce0.97La0.03B6
H II [100]
T = 1.9 K
free
glued Al2O3 table
glued Cu table
R (a.u.)
25
20
15
10
5
0
0
20
40
H (kOe)


EverCool II
PPMS


Включить
Воду !!!



Спасибо за внимание!