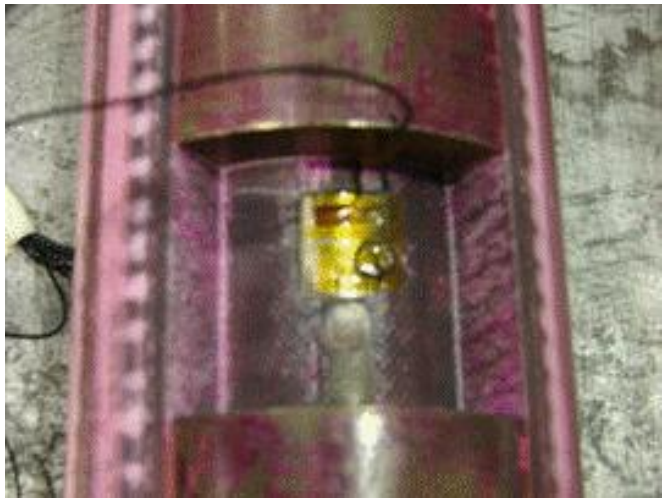
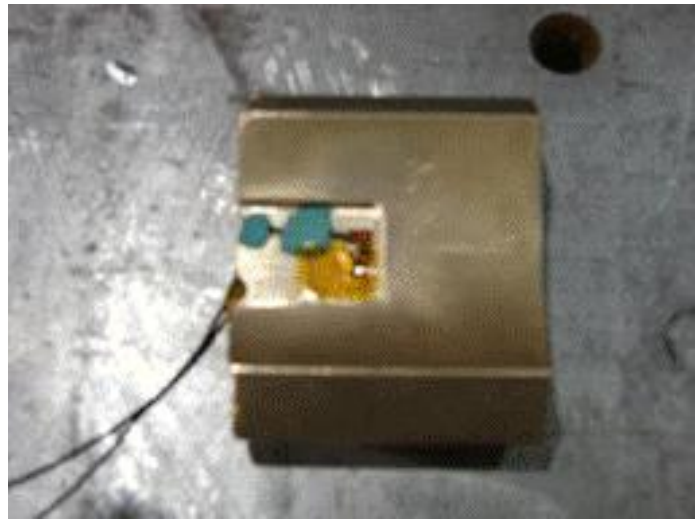
HFDM-06 Test
Strain Gauge Data

I.Novitski

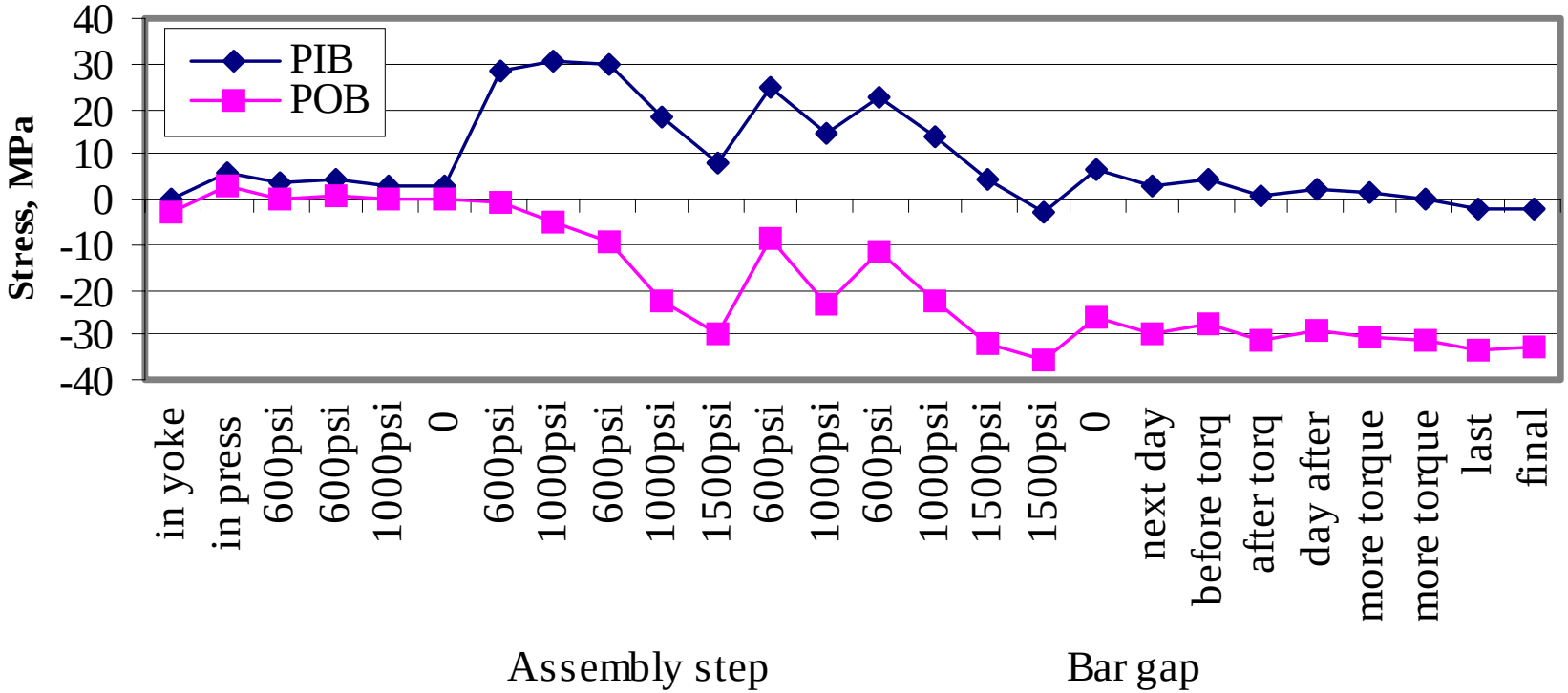
1/3/07

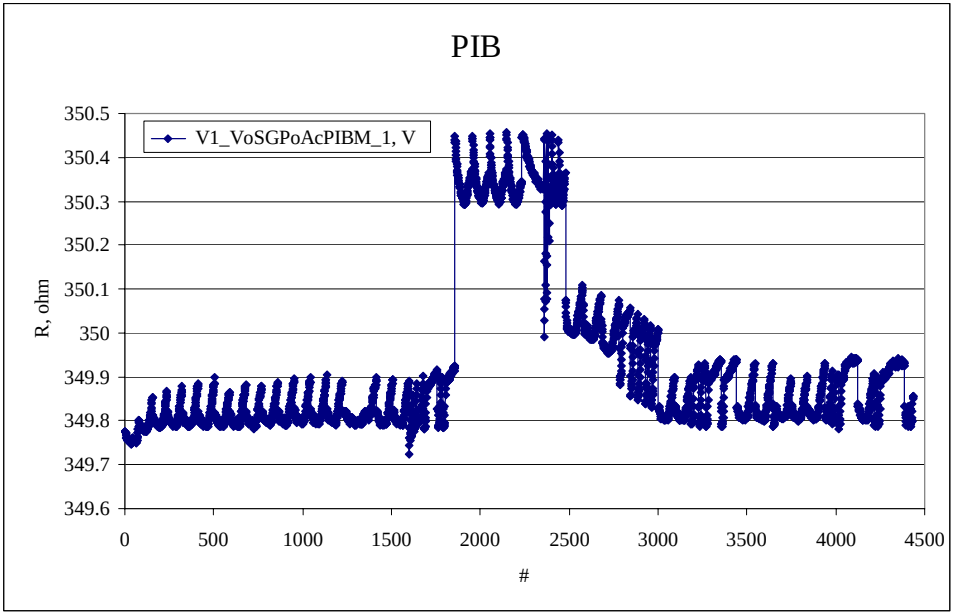
TD-07-017

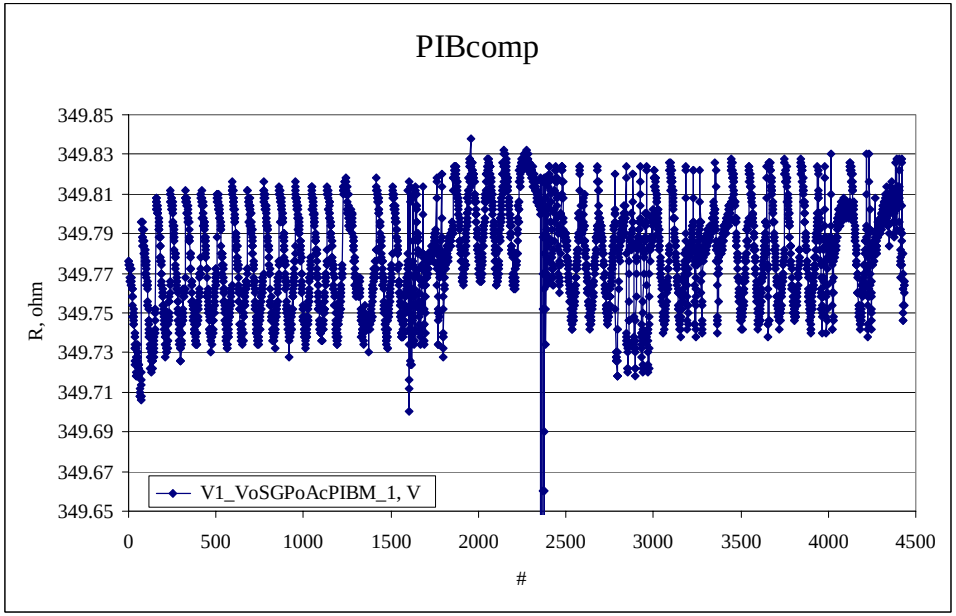


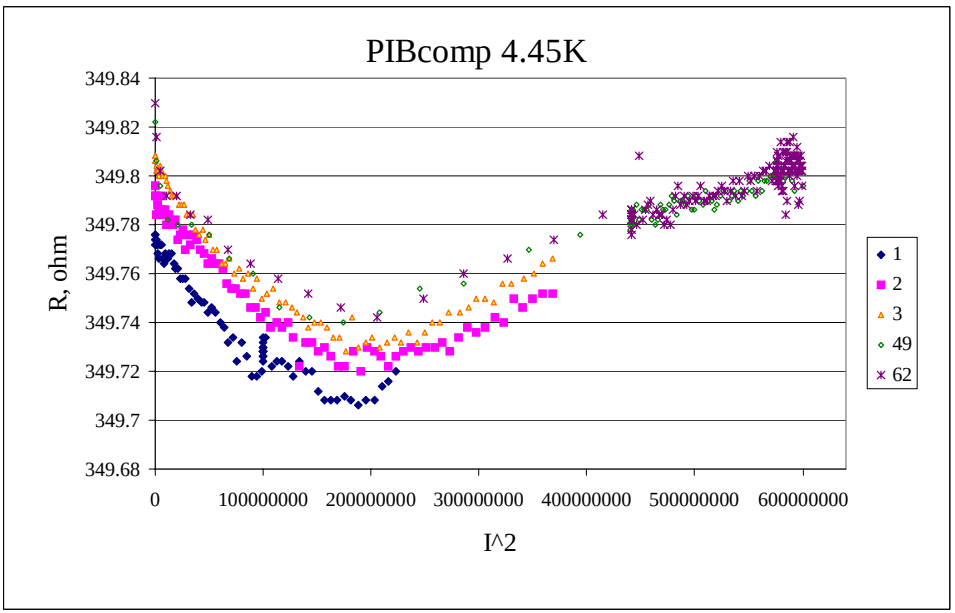


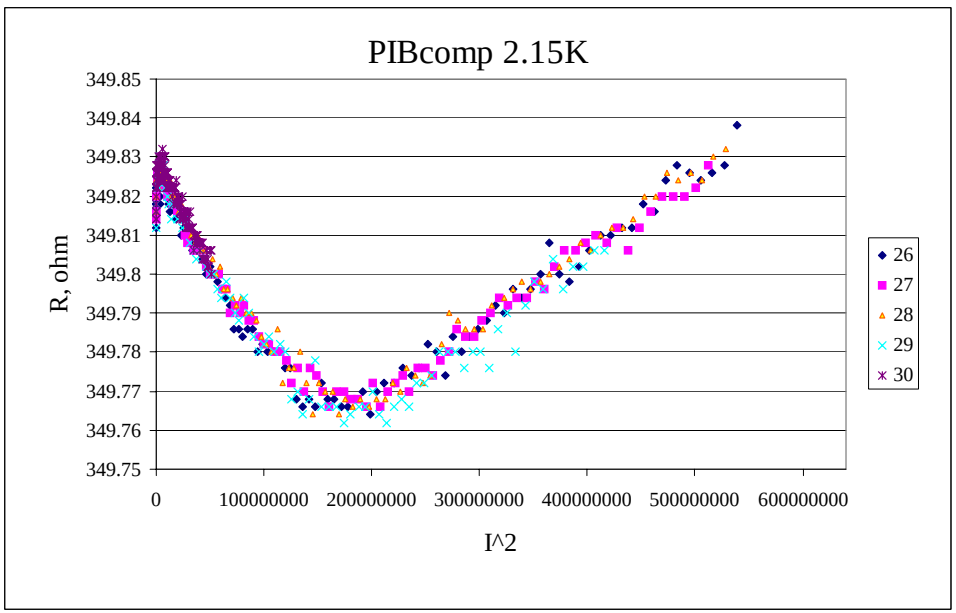
SG assembly history

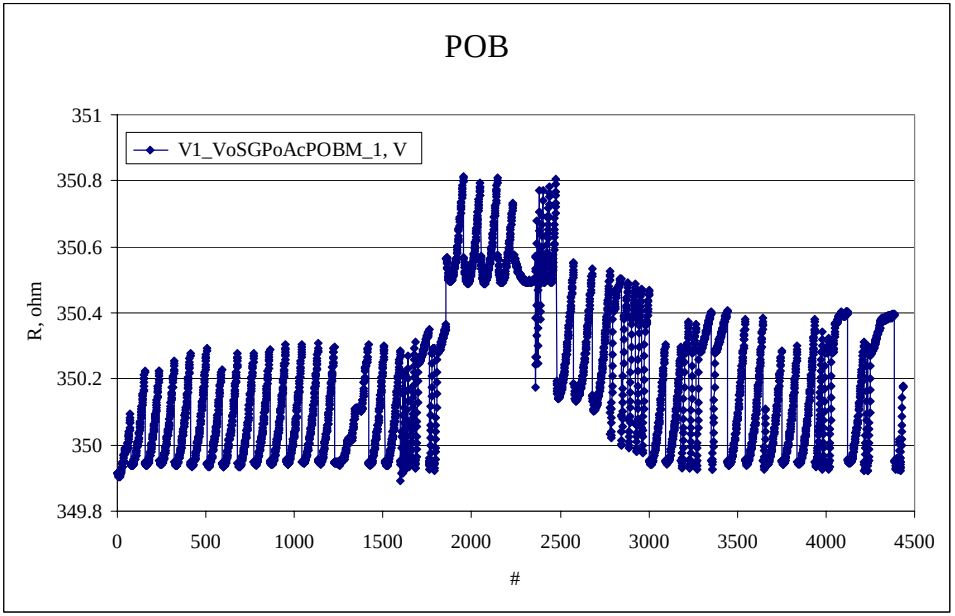


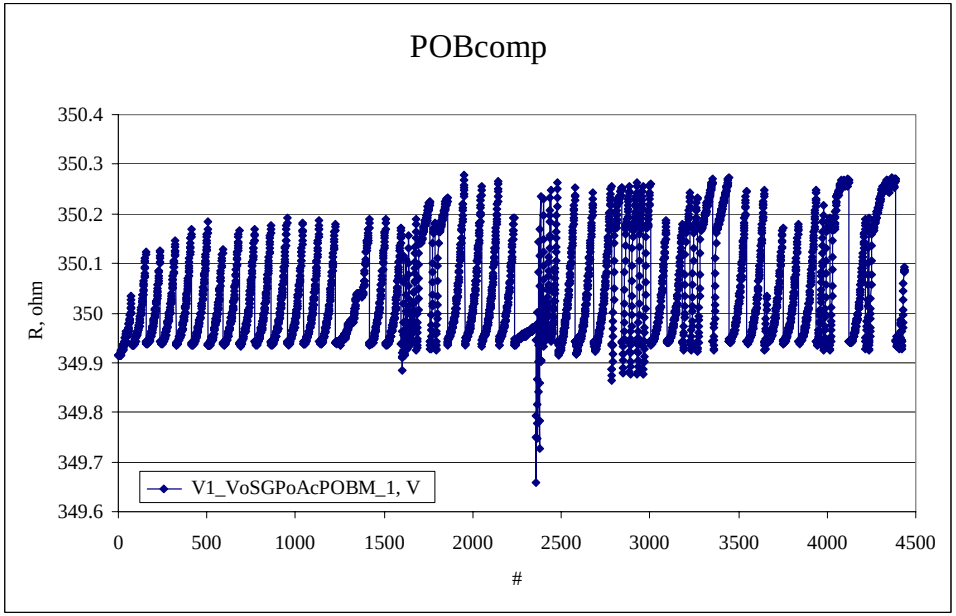

PIB
V1_VoSGPoAcPIBM_1, V
R, ohm
#
350.5
350.4
350.3
350.2
350.1
350
349.9
349.8
349.7
349.6
0
500
1000
1500
2000
2500
3000
3500
4000
4500

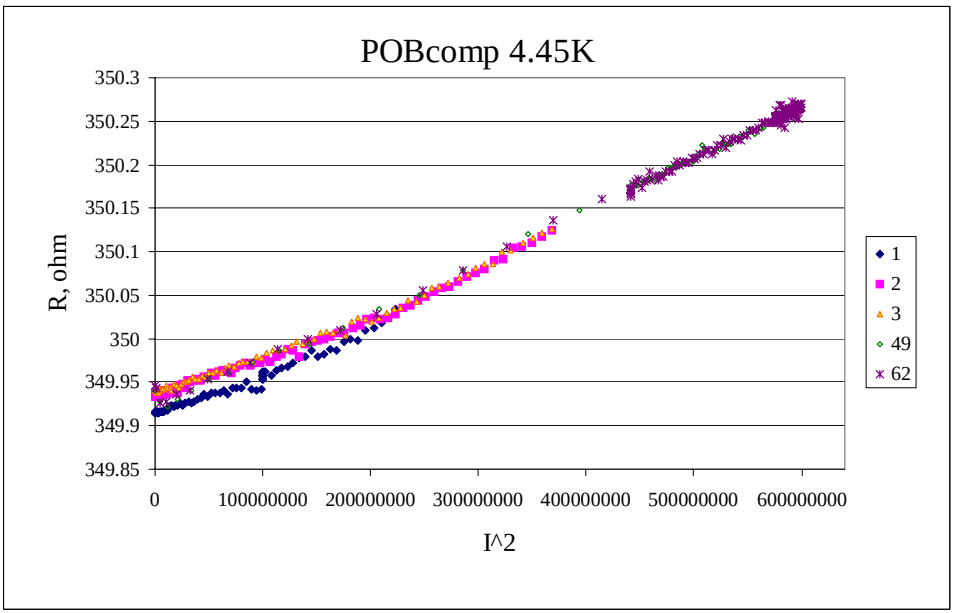

PIBcomp
V1_VoSGPoAcPIBM_1, V
R, ohm
#
349.85
349.83
349.81
349.79
349.77
349.75
349.73
349.71
349.69
349.67
349.65
0
500
1000
1500
2000
2500
3000
3500
4000
4500

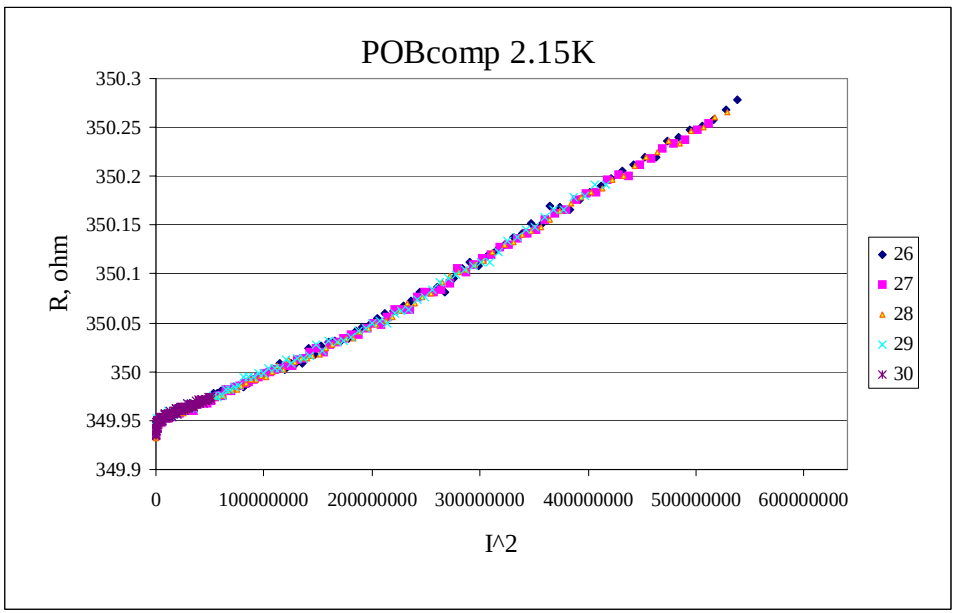

PIBcomp 4.45K
R, ohm
I^2
349.84
349.82
349.8
349.78
349.76
349.74
349.72
349.7
349.68
0
100000000
200000000
300000000
400000000
500000000
600000000
1
2
3
49
62


PIBcomp 2.15K
R, ohm
I^2
349.85
349.84
349.83
349.82
349.81
349.8
349.79
349.78
349.77
349.76
349.75
0
100000000
200000000
300000000
400000000
500000000
600000000
26
27
28
29
30

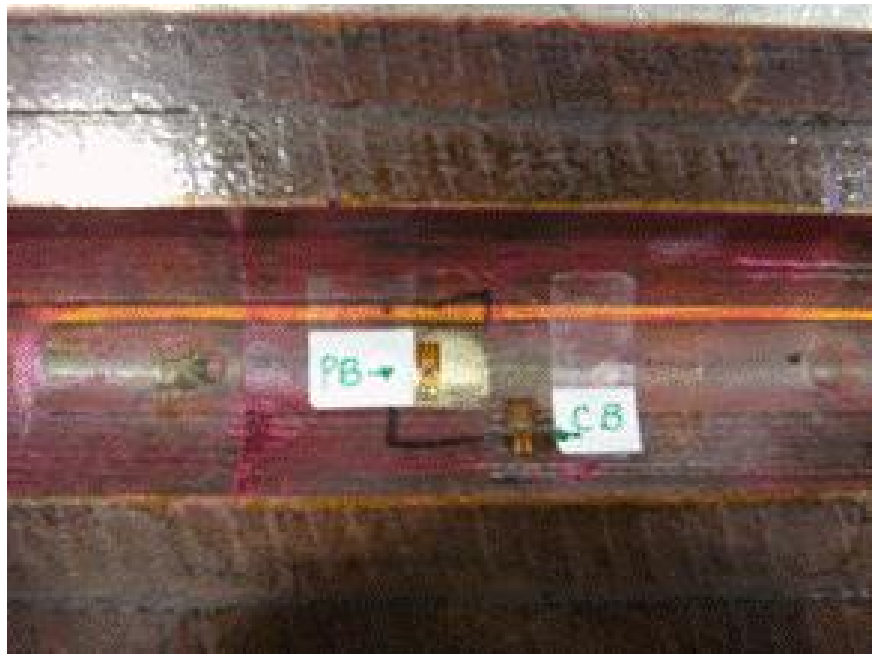

POB
V1_VoSGPoAcPOBM_1, V
R, ohm
#
351
350.8
350.6
350.4
350.2
350
349.8
0
500
1000
1500
2000
2500
3000
3500
4000
4500

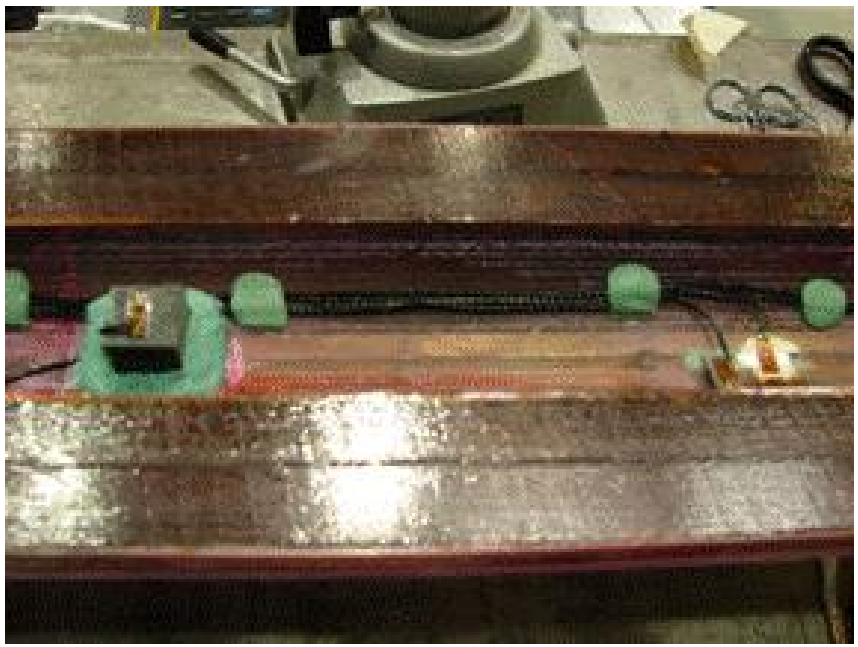

POBcomp
V1_VoSGPoAcPOBM_1, V
R, ohm
#
350.4
350.3
350.2
350.1
350
349.9
349.8
349.7
349.6
0
500
1000
1500
2000
2500
3000
3500
4000
4500

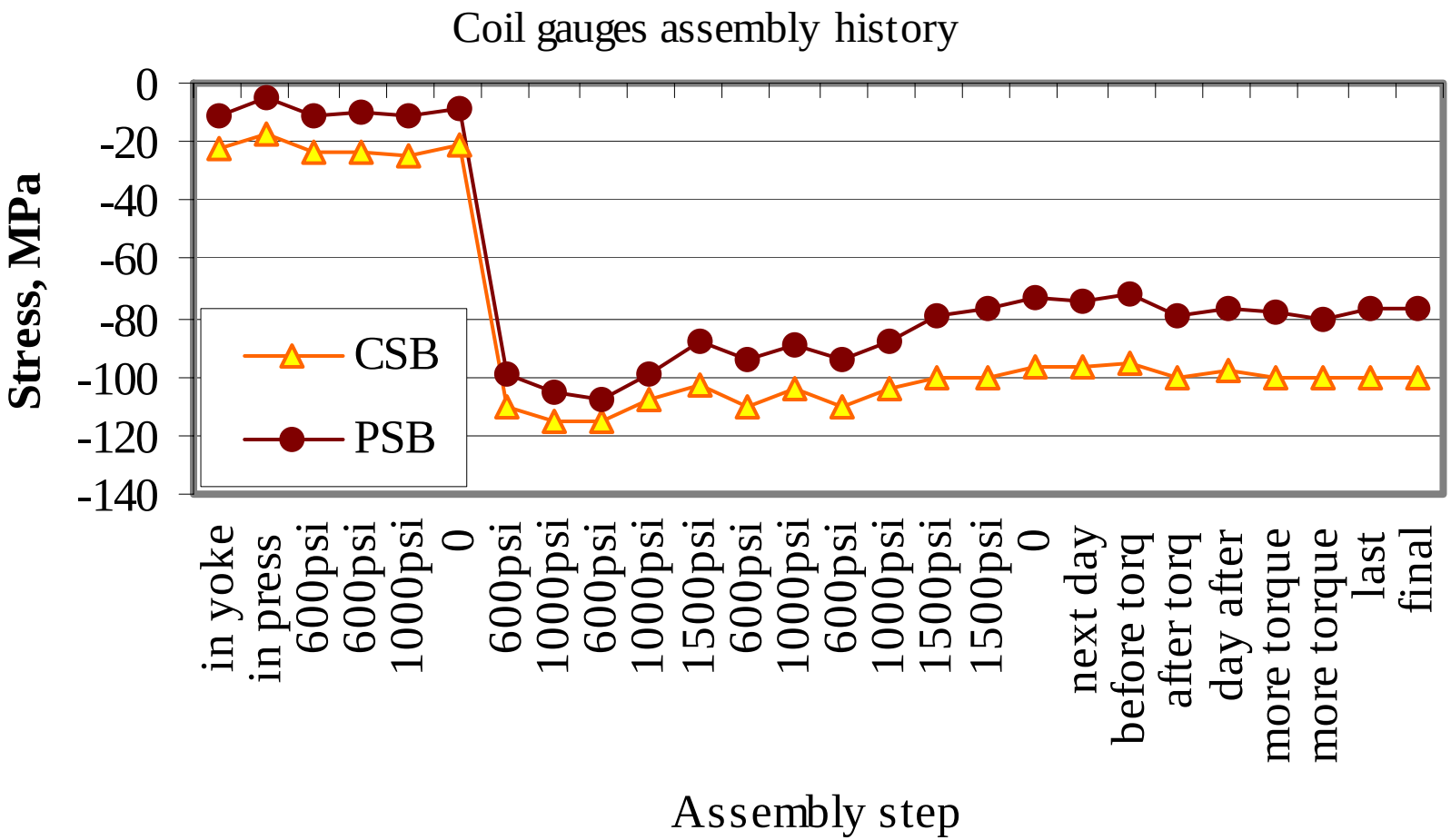

POBcomp 4.45K
R, ohm
I^2
350.3
350.25
350.2
350.15
350.1
350.05
350
349.95
349.9
349.85
0
100000000
200000000
300000000
400000000
500000000
600000000
1
2
3
49
62

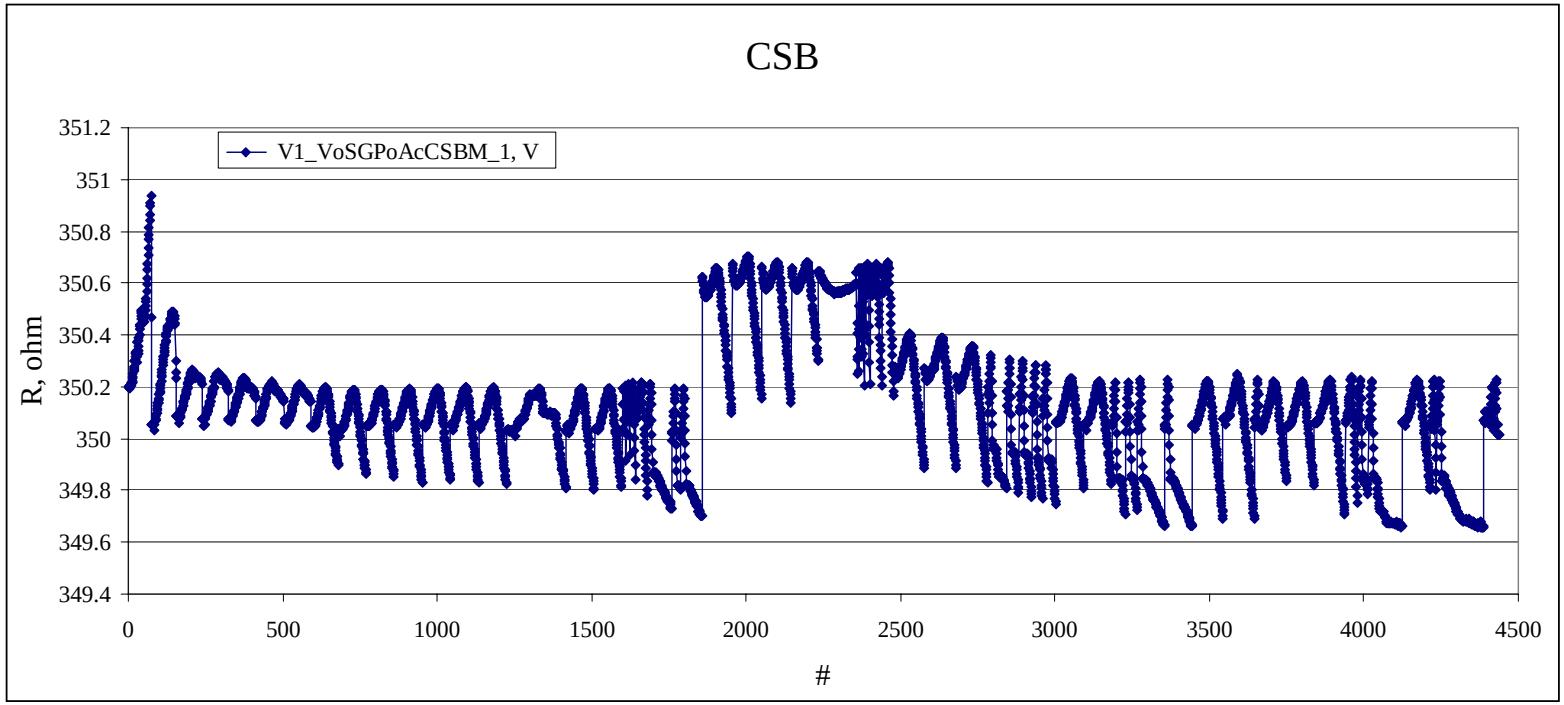

POBcomp 2.15K
R, ohm
I^2
350.3
350.25
350.2
350.15
350.1
350.05
350
349.95
349.9
0
100000000
200000000
300000000
400000000
500000000
600000000
26
27
28
29
30

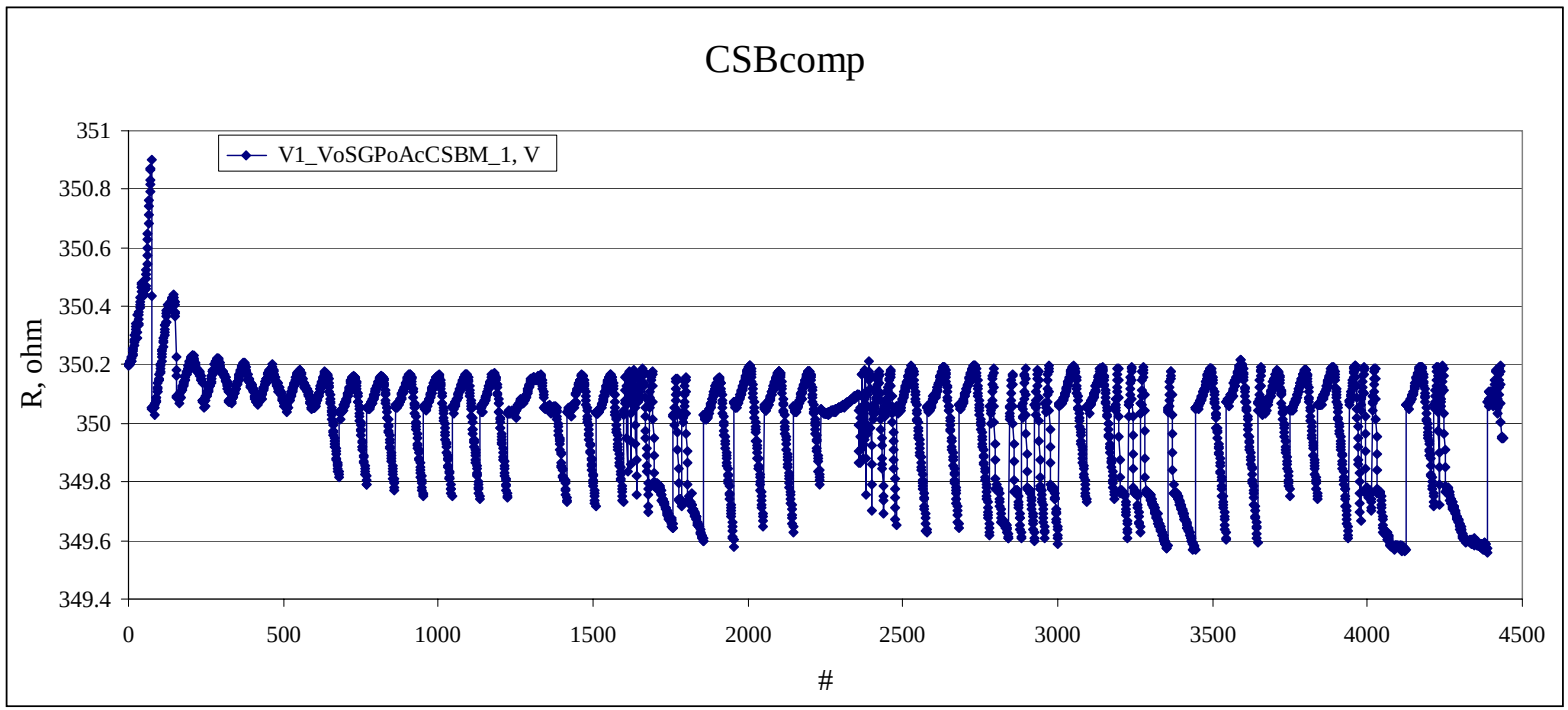
ÇSB
PSB
CSA
PSA
ÇCA

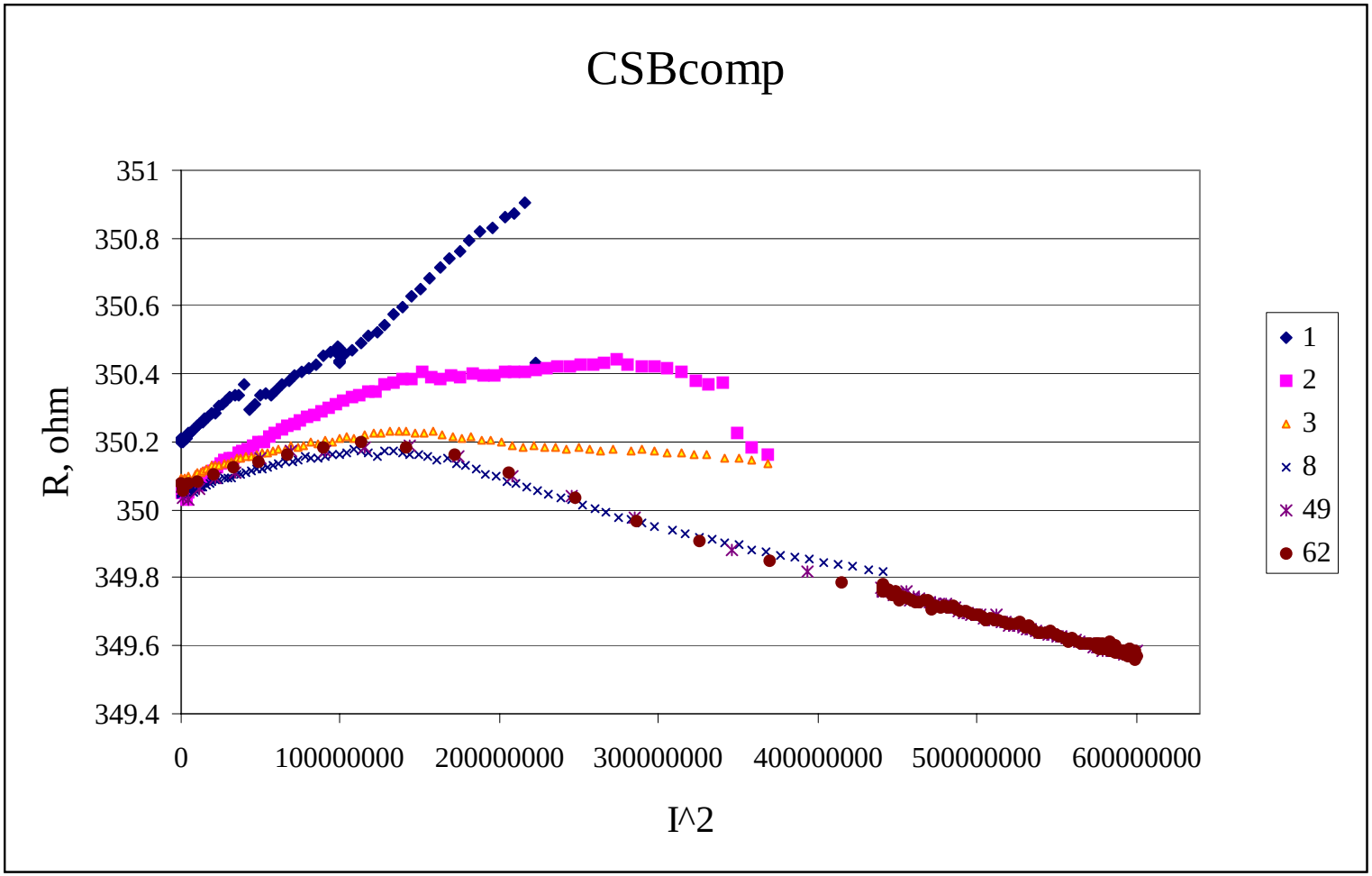

PB
ÇB

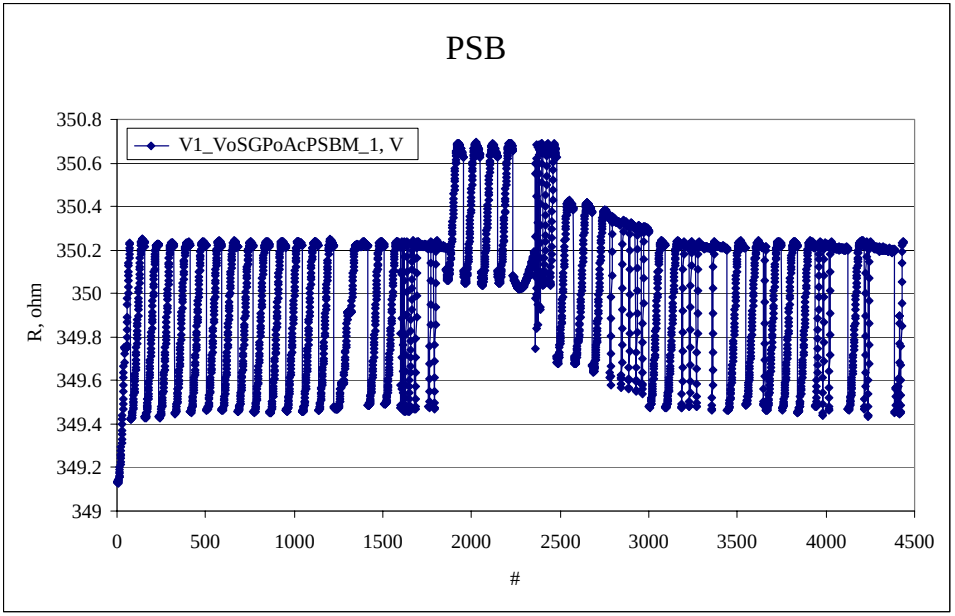


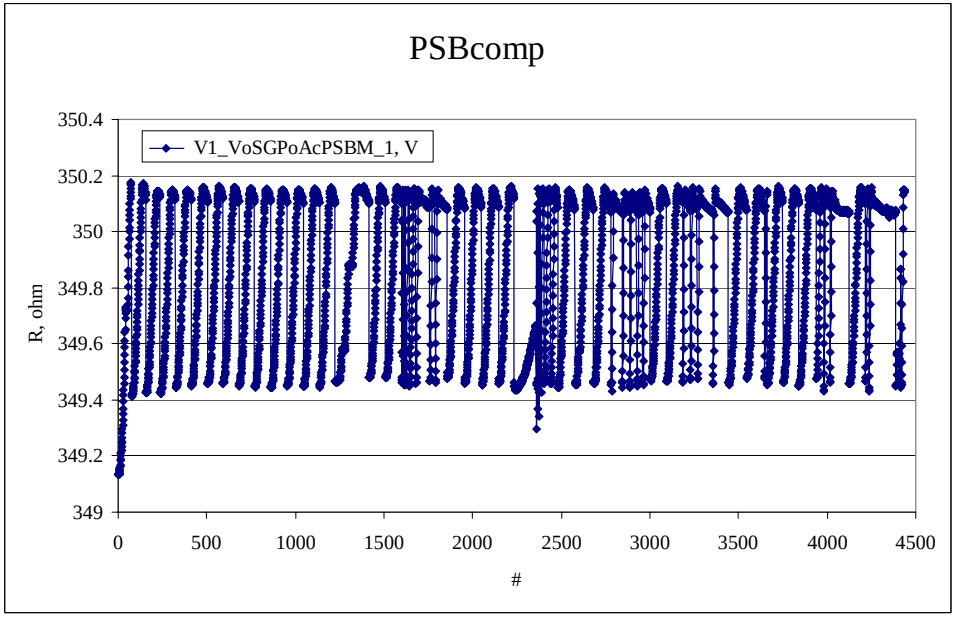

Coil gauges assembly history
Stress, MPa
0
-20
-40
-60
-80
-100
-120
-140
CSB
PSB
in yoke
in press
600psi
600psi
1000psi
0
600psi
1000psi
600psi
1000psi
1500psi
600psi
1000psi
600psi
1000psi
1500psi
1500psi
0
next day
before torq
after torq
day after
more torque
more torque
last
final
Assembly step

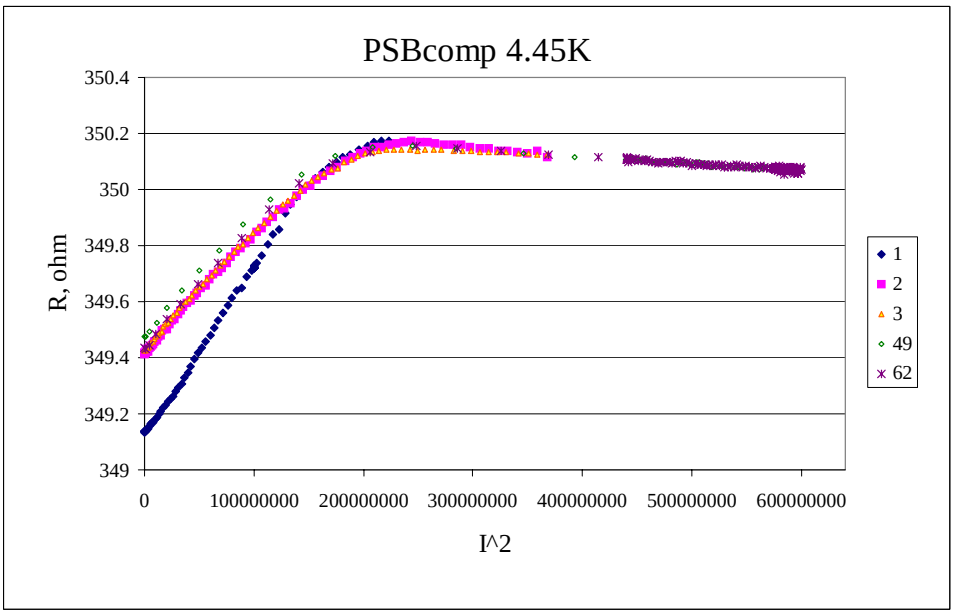

CSB
V1_VoSGPoAcCSBM_1, V
R, ohm
#
351.2
351
350.8
350.6
350.4
350.2
350
349.8
349.6
349.4
0
500
1000
1500
2000
2500
3000
3500
4000
4500

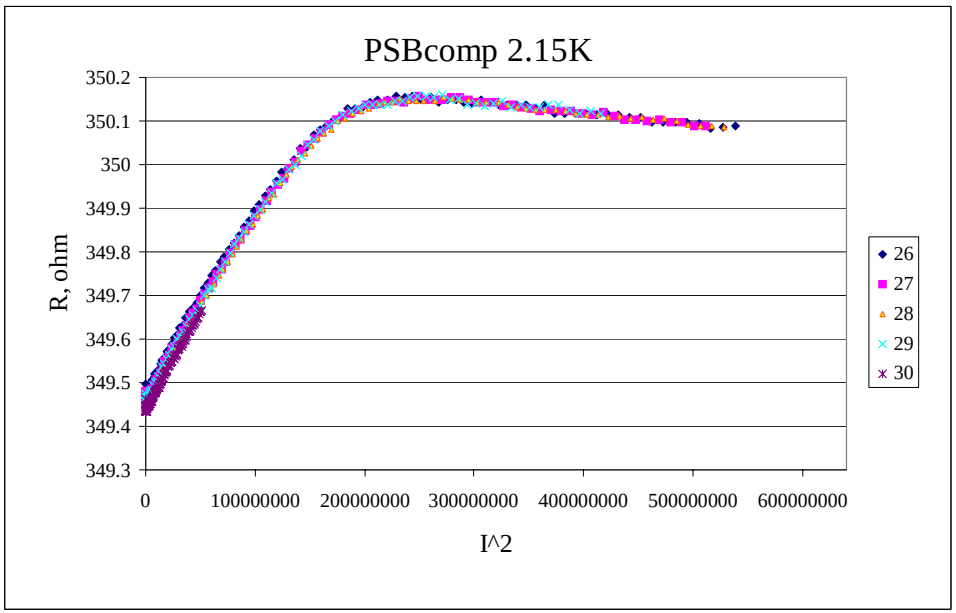

CSBcomp
V1_VoSGPoAcCSBM_1, V
R, ohm
#
351
350.8
350.6
350.4
350.2
350
349.8
349.6
349.4
0
500
1000
1500
2000
2500
3000
3500
4000
4500

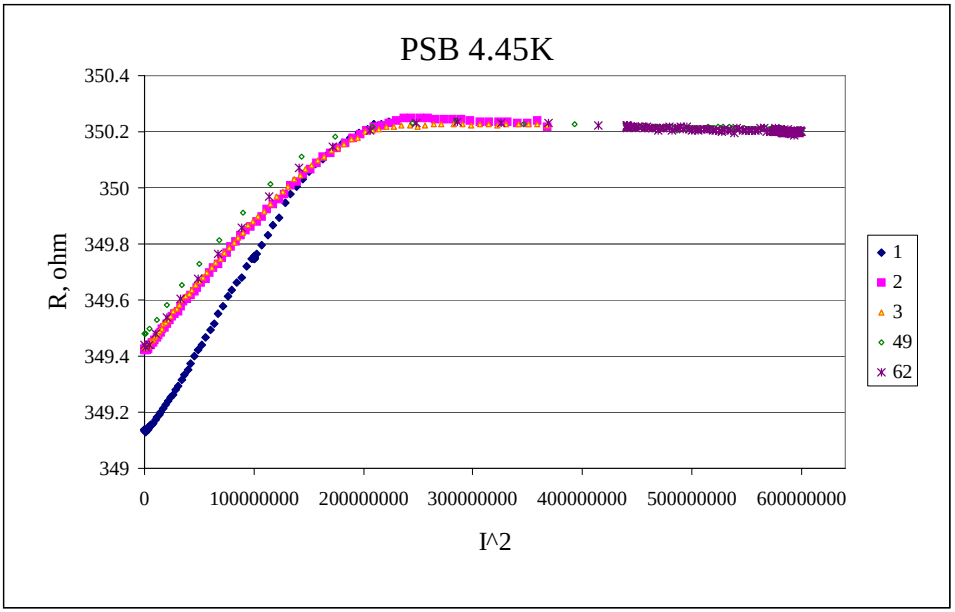

CSBcomp
R, ohm
351
350.8
350.6
350.4
350.2
350
349.8
349.6
349.4
0
100000000
200000000
300000000
400000000
500000000
600000000
I^2
1
2
3
8
49
62

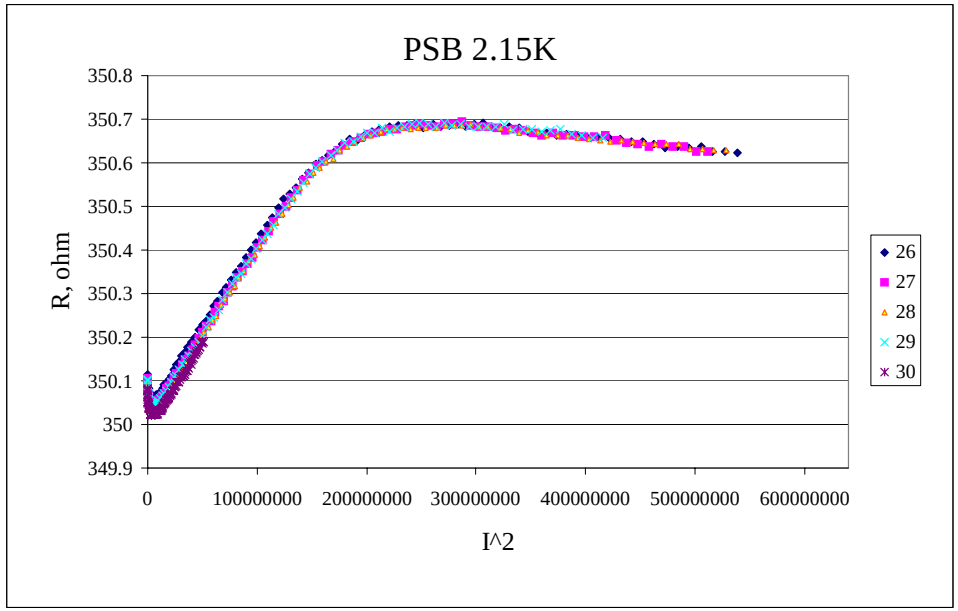

PSB
V1_VoSGPoAcPSBM_1, V
R, ohm
#
350.8
350.6
350.4
350.2
350
349.8
349.6
349.4
349.2
349
0
500
1000
1500
2000
2500
3000
3500
4000
4500

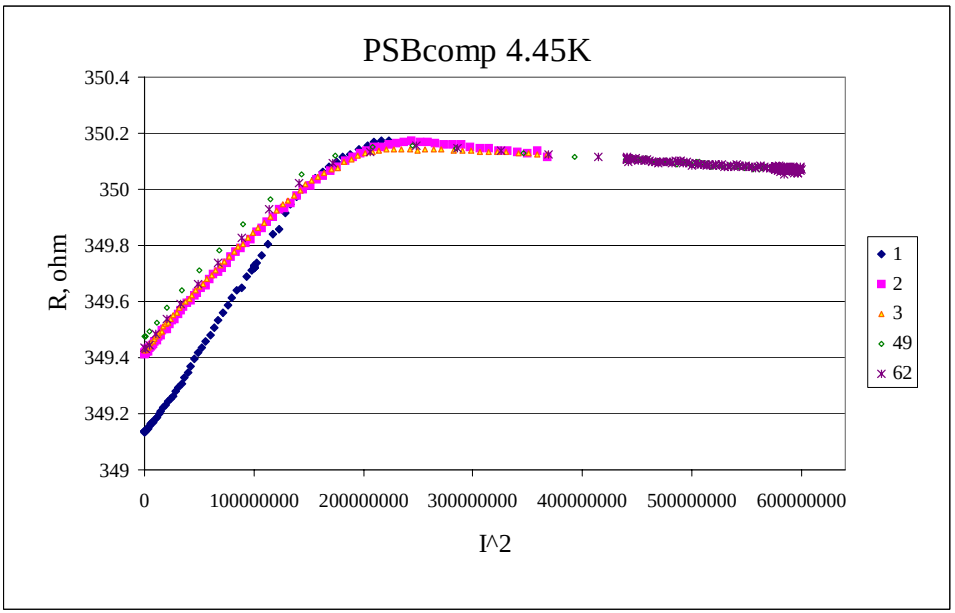

PSBcomp
V1_VoSGPoAcPSBM_1, V
R, ohm
#
350.4
350.2
350
349.8
349.6
349.4
349.2
349
0
500
1000
1500
2000
2500
3000
3500
4000
4500

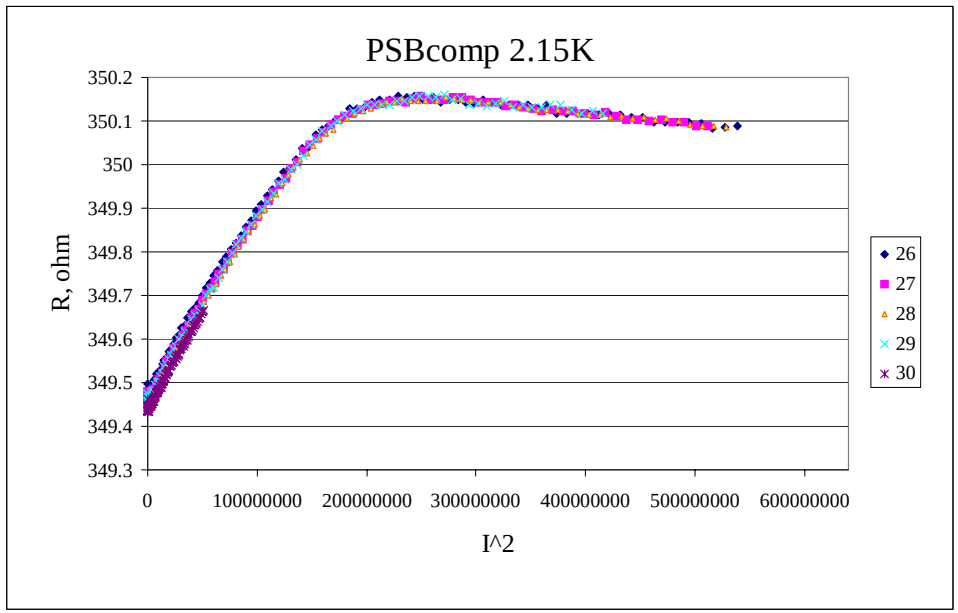

PSBcomp 4.45K
R, ohm
I^2
350.4
350.2
350
349.8
349.6
349.4
349.2
349
0
100000000
200000000
300000000
400000000
500000000
600000000
1
2
3
49
62


PSBcomp 2.15K
R, ohm
I^2
350.2
350.1
350
349.9
349.8
349.7
349.6
349.5
349.4
349.3
0
100000000
200000000
300000000
400000000
500000000
600000000
26
27
28
29
30


PSB 4.45K
R, ohm
I^2
350.4
350.2
350
349.8
349.6
349.4
349.2
349
0
100000000
200000000
300000000
400000000
500000000
600000000
1
2
3
49
62


PSB 2.15K
R, ohm
I^2
350.8
350.7
350.6
350.5
350.4
350.3
350.2
350.1
350
349.9
0
100000000
200000000
300000000
400000000
500000000
600000000
26
27
28
29
30


PSBcomp 4.45K
R, ohm
I^2
350.4
350.2
350
349.8
349.6
349.4
349.2
349
0
100000000
200000000
300000000
400000000
500000000
600000000
1
2
3
49
62


PSBcomp 2.15K
R, ohm
I^2
350.2
350.1
350
349.9
349.8
349.7
349.6
349.5
349.4
349.3
0
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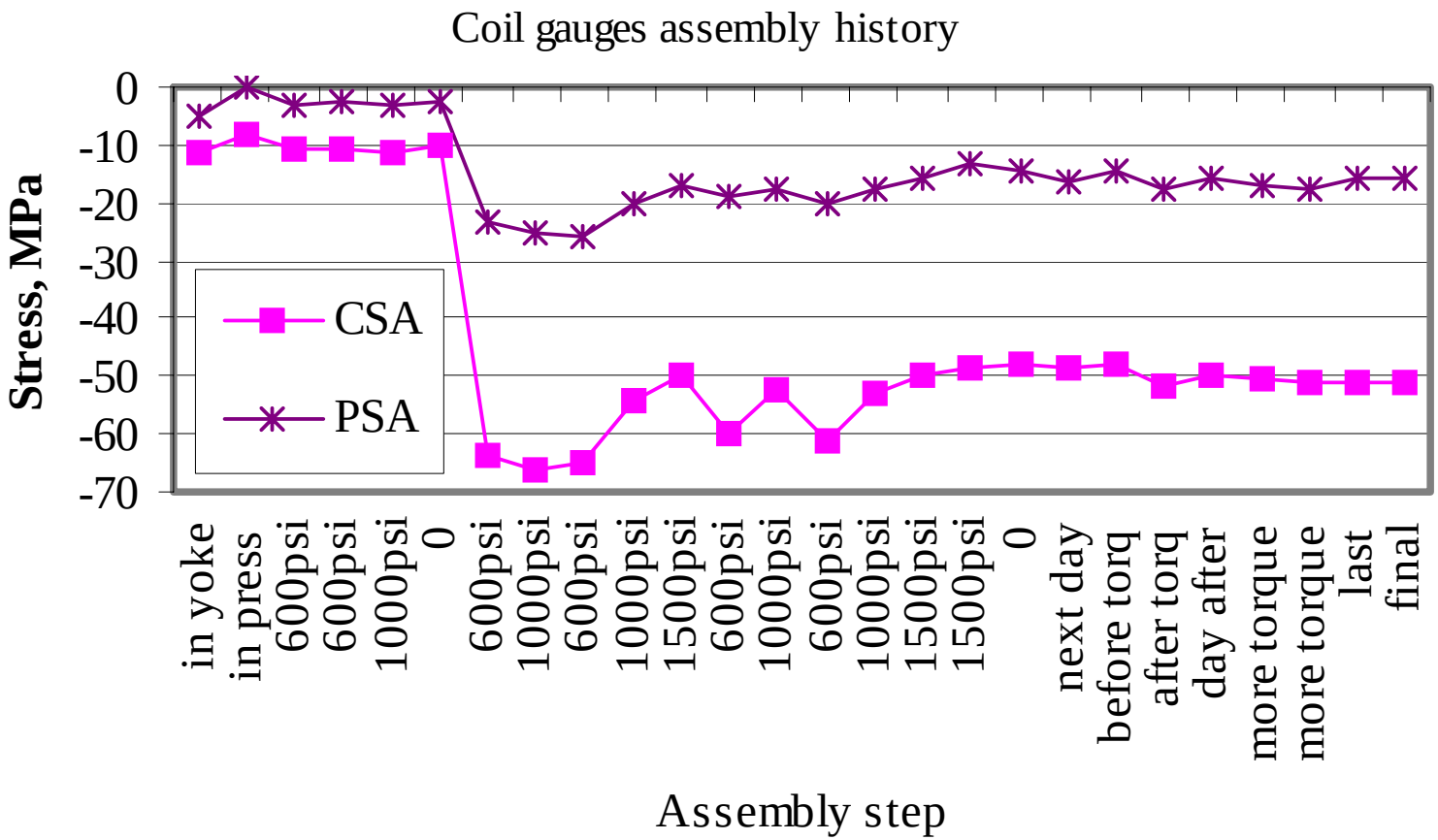
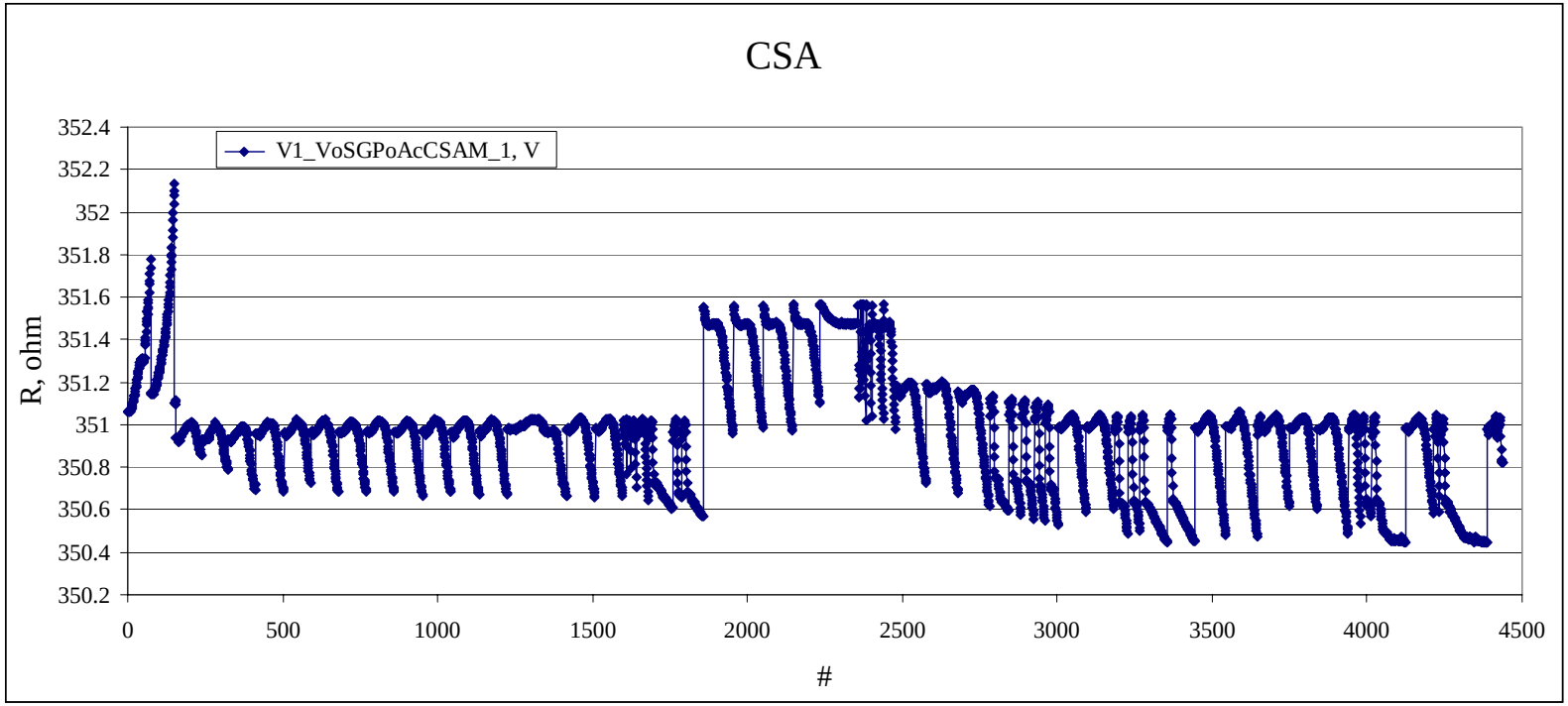
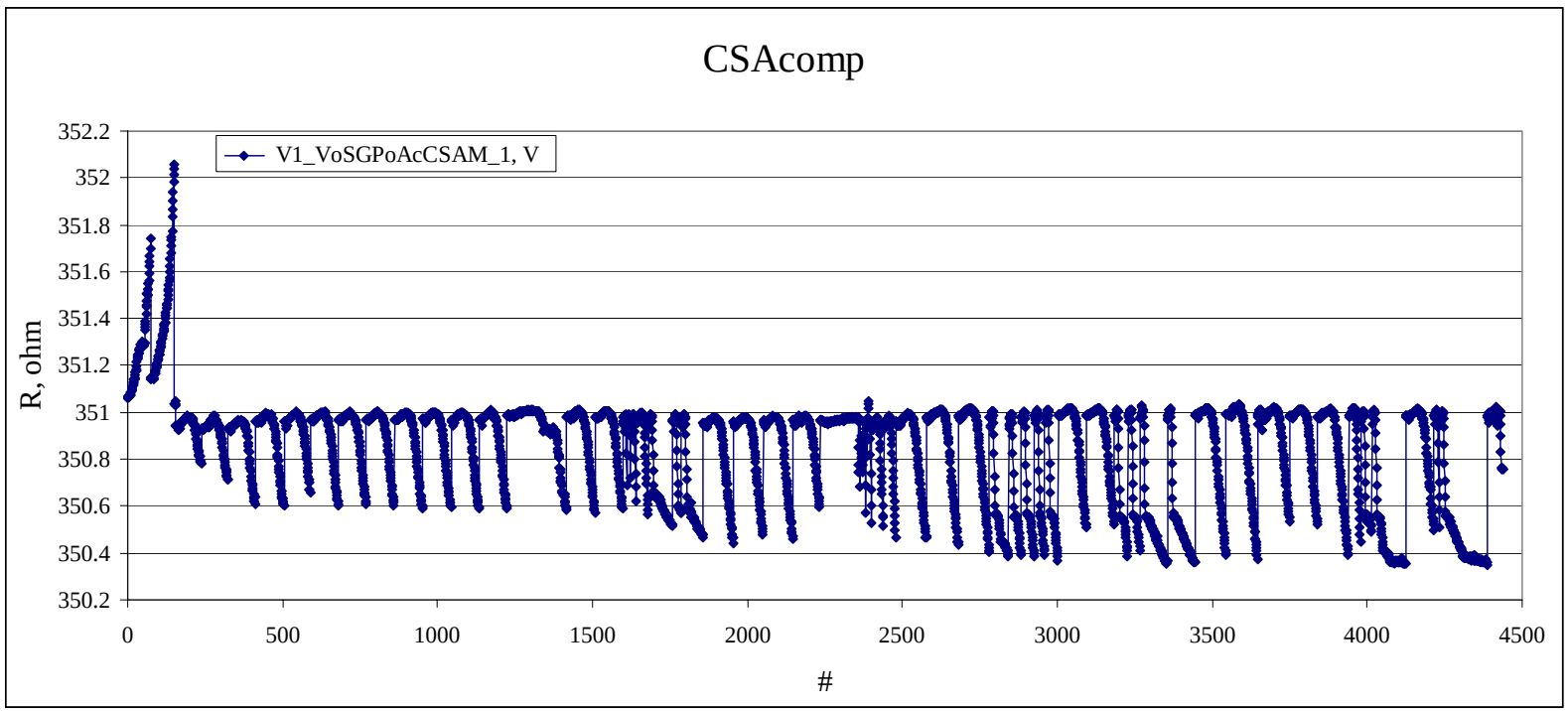
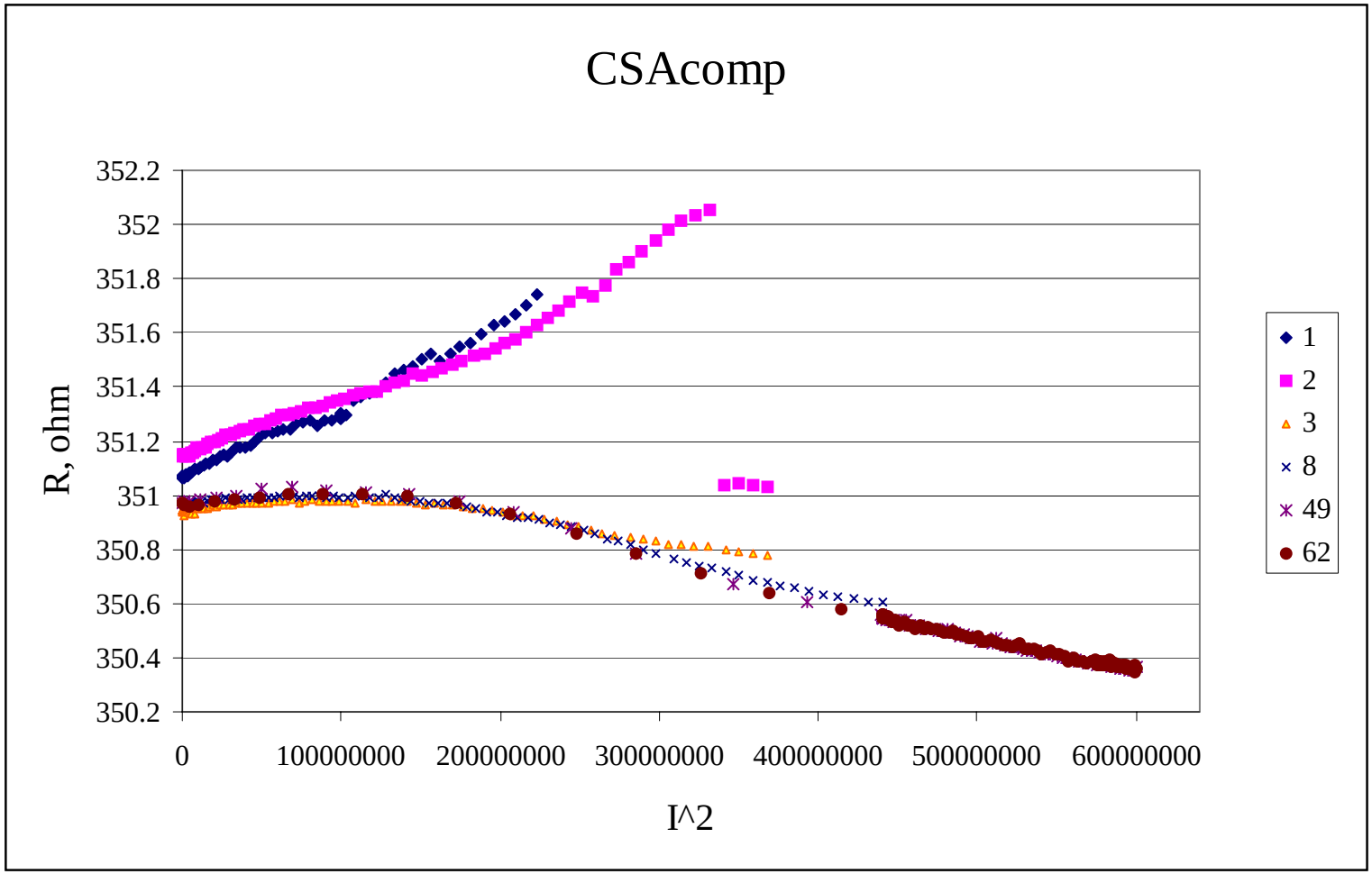
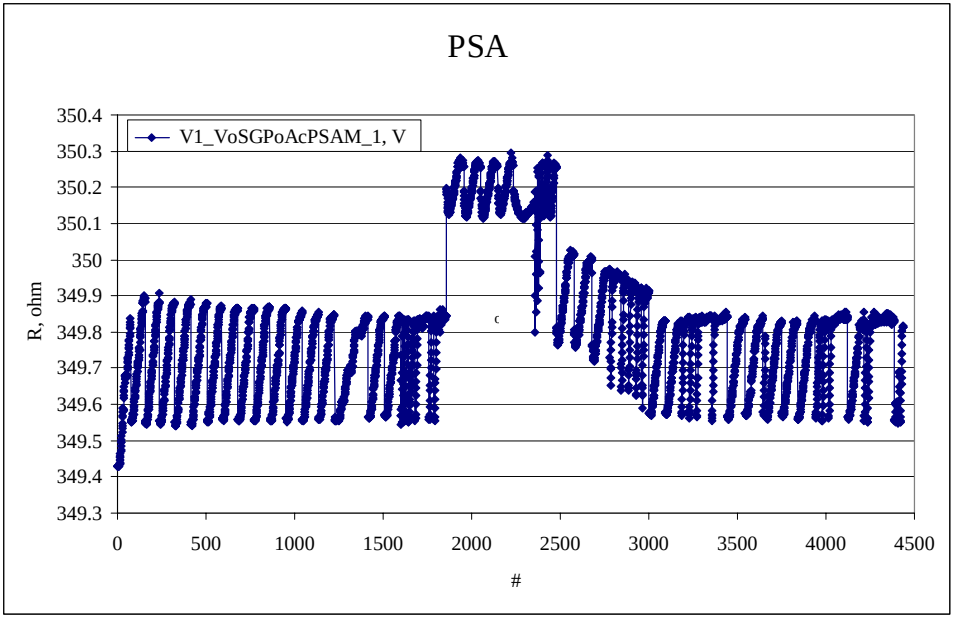
200000000
300000000
400000000
500000000
600000000
26
27
28
29
30

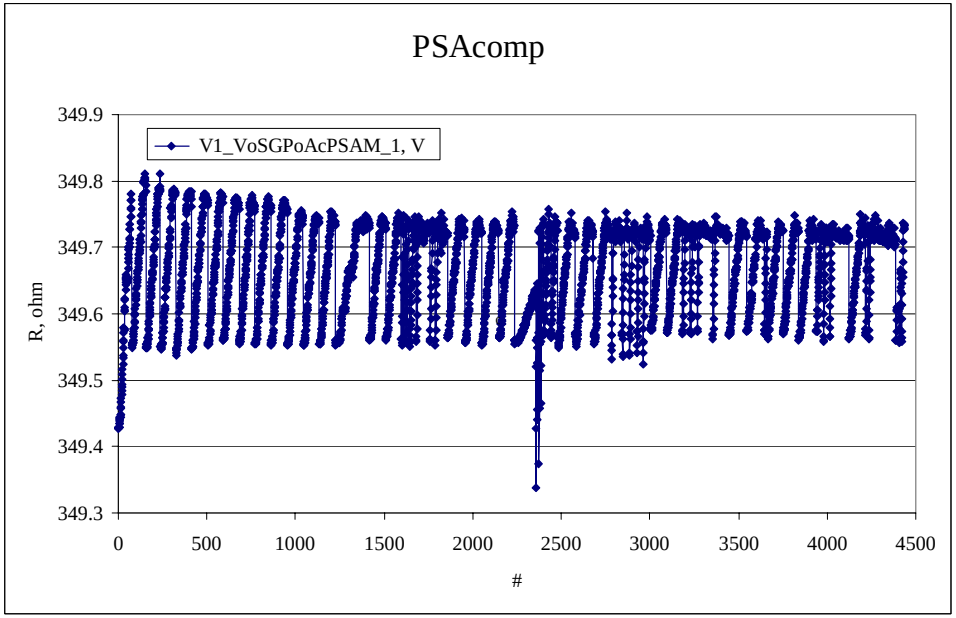

Coil gauges assembly history
Stress, MPa
0
-10
-20
-30
-40
-50
-60
-70
CSA
PSA
in yoke
in press
600psi
600psi
1000psi
0
600psi
1000psi
600psi
1000psi
1500psi
600psi
1000psi
600psi
1000psi
1500psi
1500psi
0
next day
before torq
after torq
day after
more torque
more torque
last
final
Assembly step

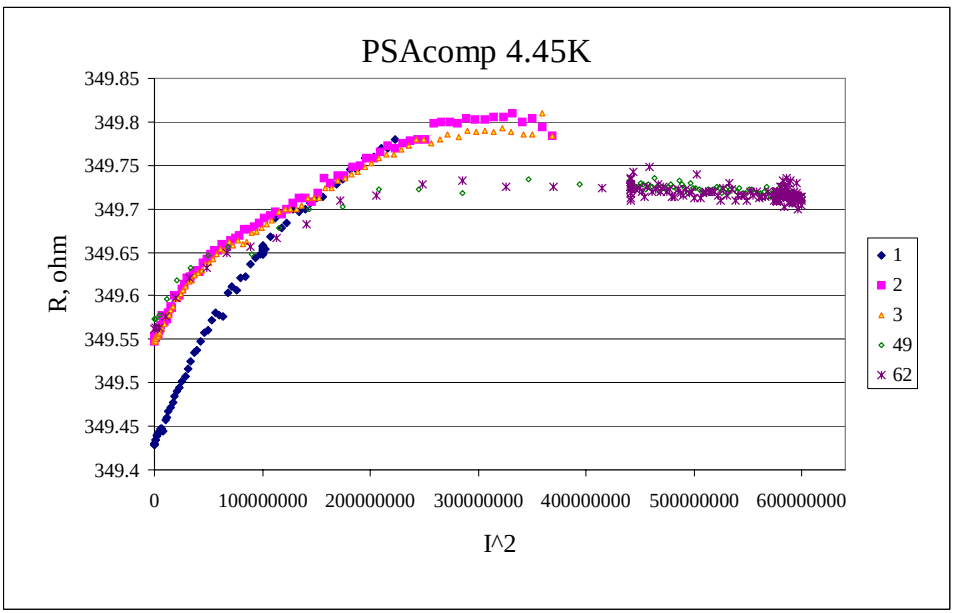

CSA
V1_VoSGPoAcCSAM_1, V
R, ohm
352.4
352.2
352
351.8
351.6
351.4
351.2
351
350.8
350.6
350.4
350.2
0
500
1000
1500
2000
2500
3000
3500
4000
4500
#


CSAcomp
V1_VoSGPoAcCSAM_1, V
R, ohm
352.2
352
351.8
351.6
351.4
351.2
351
350.8
350.6
350.4
350.2
0
500
1000
1500
2000
2500
3000
3500
4000
4500
#


CSAcomp
R, ohm
352.2
352
351.8
351.6
351.4
351.2
351
350.8
350.6
350.4
350.2
0
100000000
200000000
300000000
400000000
500000000
600000000
I^2
1
2
3
8
49
62


PSA
V1_VoSGPoAcPSAM_1, V
R, ohm
#
350.4
350.3
350.2
350.1
350
349.9
349.8
349.7
349.6
349.5
349.4
349.3
0
500
1000
1500
2000
2500
3000
3500
4000
4500


PSAcomp
V1_VoSGPoAcPSAM_1, V
R, ohm
#
349.9
349.8
349.7
349.6
349.5
349.4
349.3
0
500
1000
1500
2000
2500
3000
3500
4000
4500


PSAcomp 4.45K
R, ohm
I^2
349.85
349.8
349.75
349.7
349.65
349.6
349.55
349.5
349.45
349.4
0
100000000
200000000
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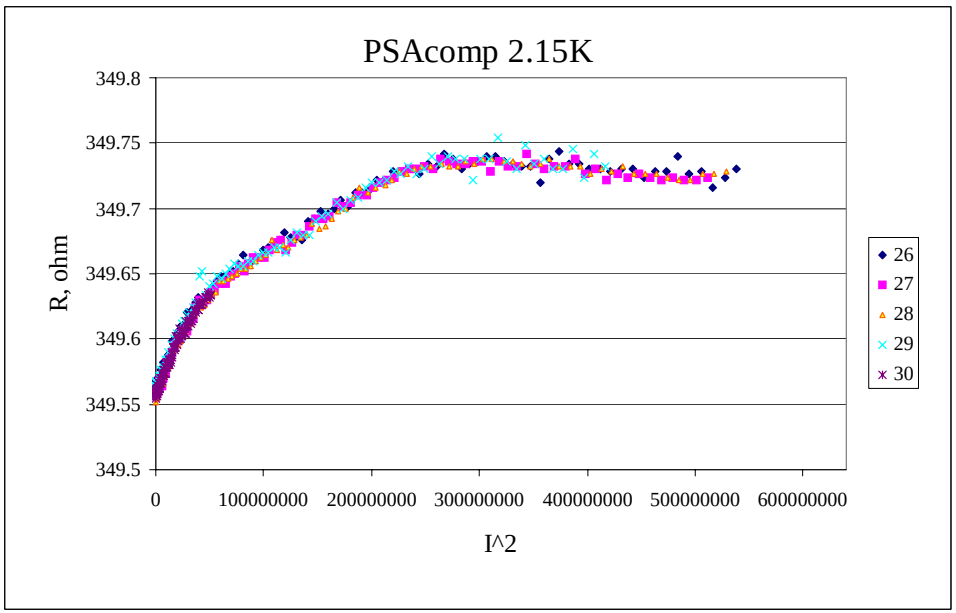
1
2
3
49
62


PSAcomp 2.15K
R, ohm
I^2
349.8
349.75
349.7
349.65
349.6
349.55
349.5
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100000000
200000000
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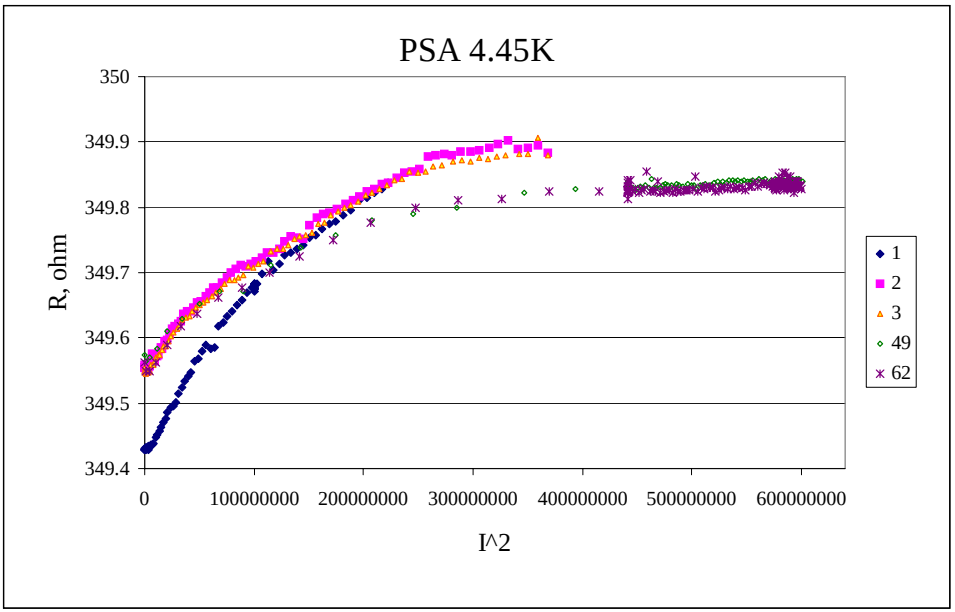
27
28
29
30


PSA 4.45K
R, ohm
I^2
350
349.9
349.8
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349.6
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349.4
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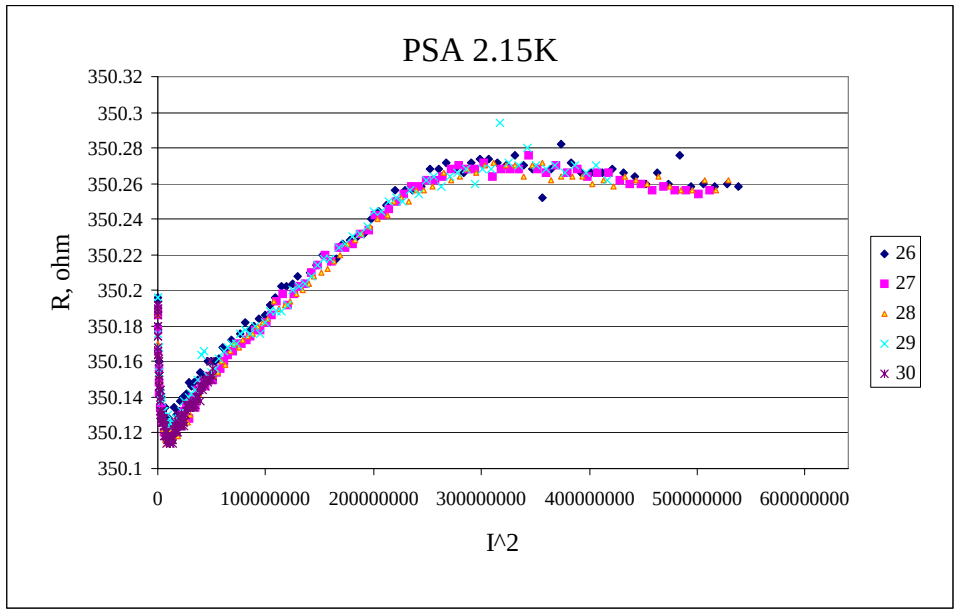
600000000
1
2
3
49
62


PSA 2.15K
R, ohm
I^2
350.32
350.3
350.28
350.26
350.24
350.22
350.2
350.18
350.16
350.14
350.12
350.1
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500000000
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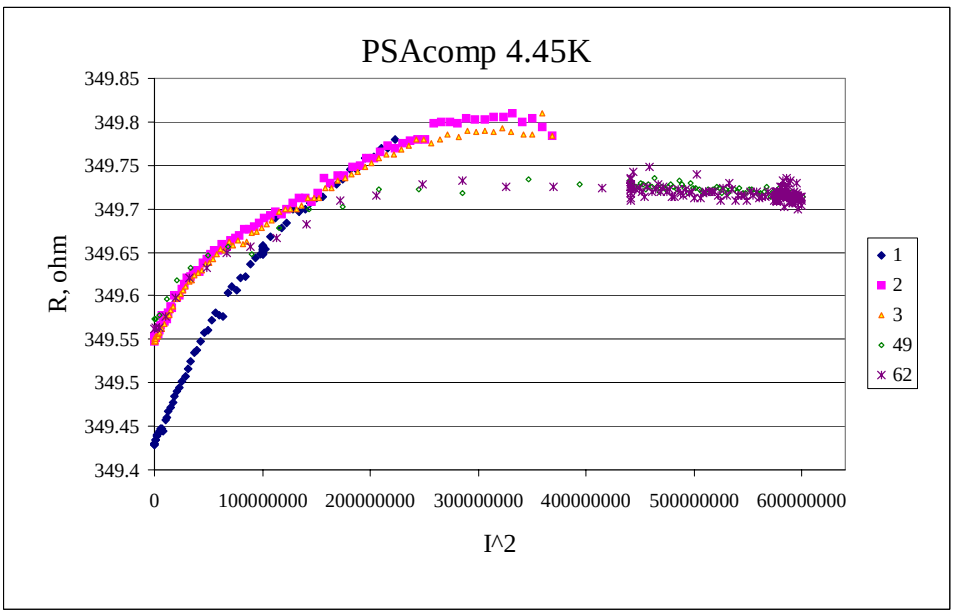
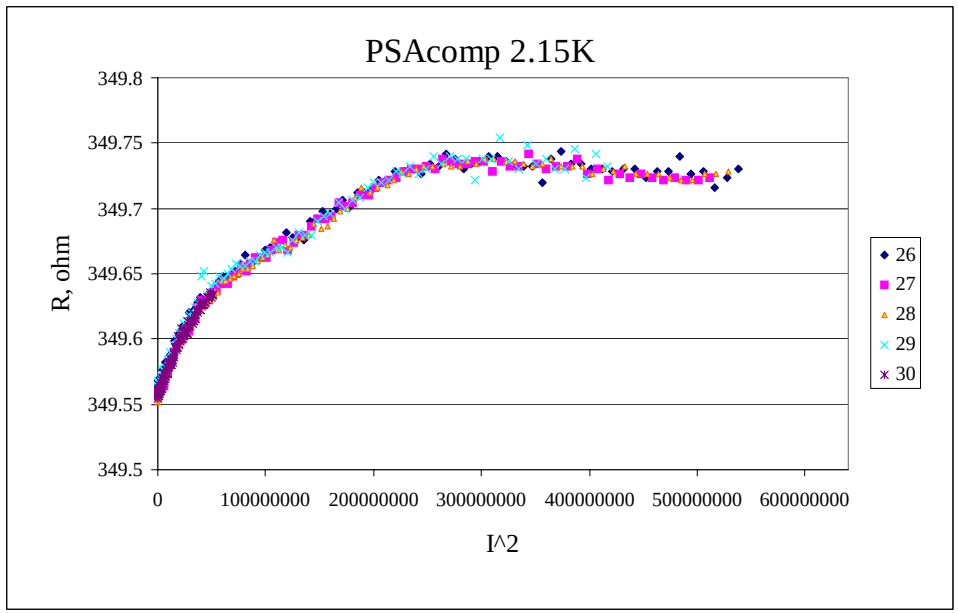
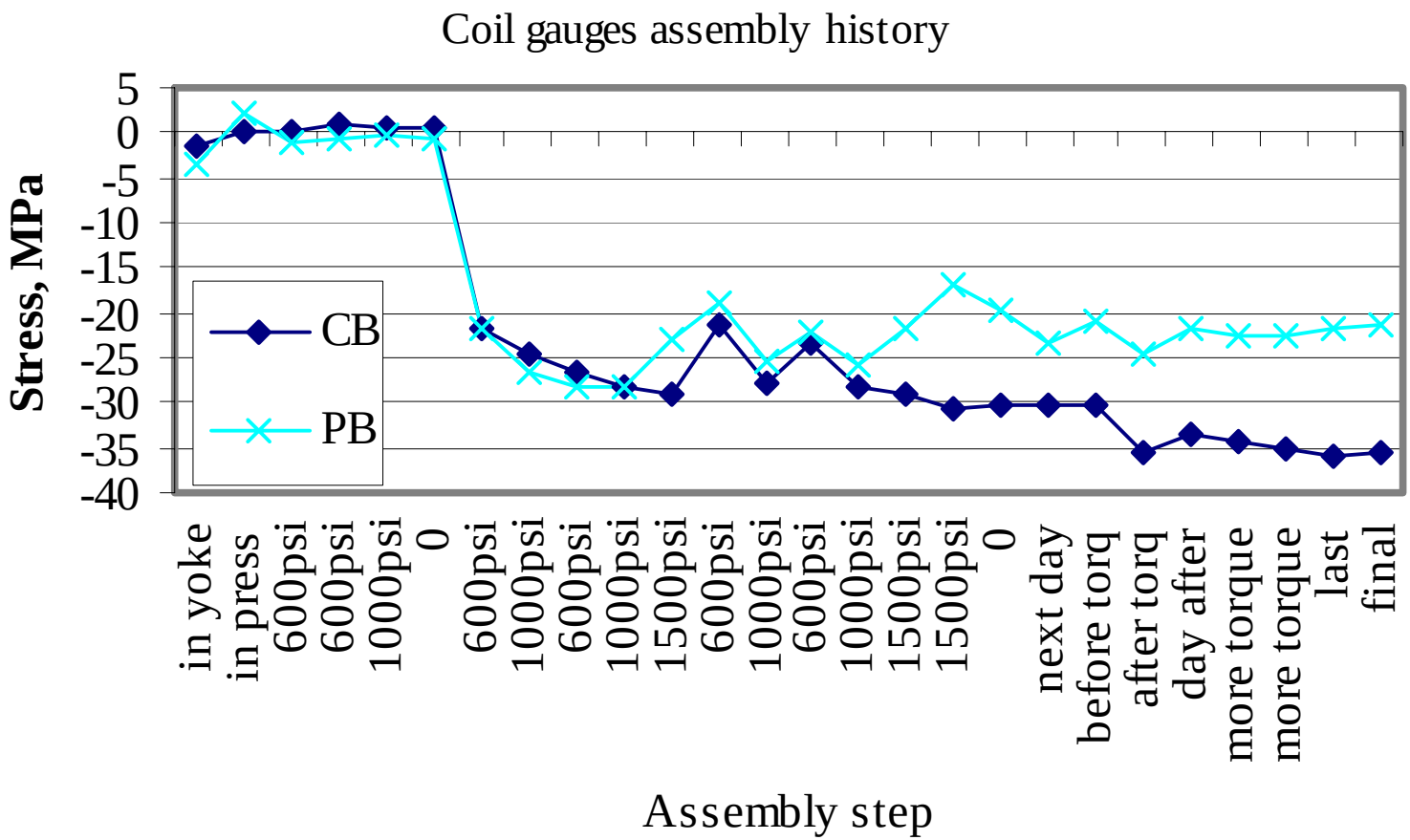
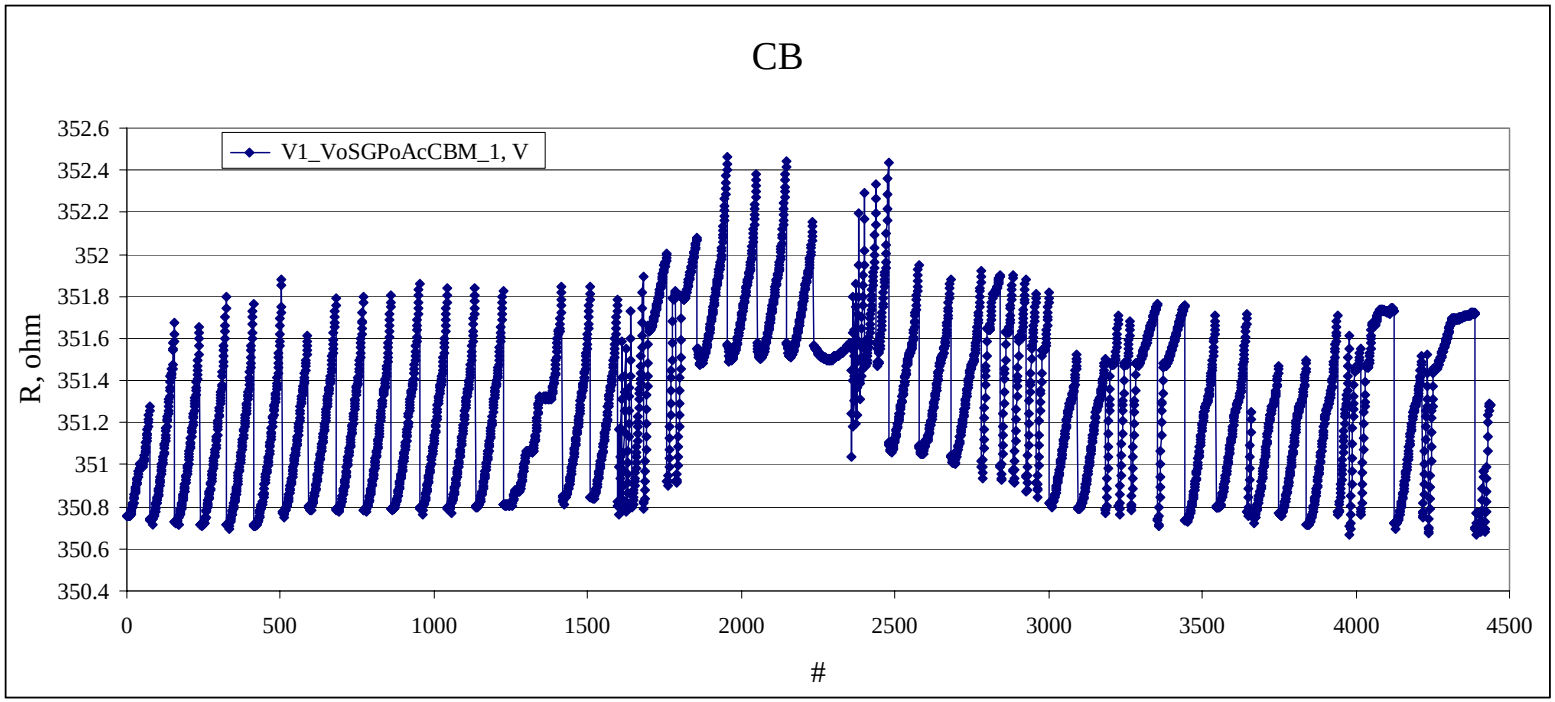
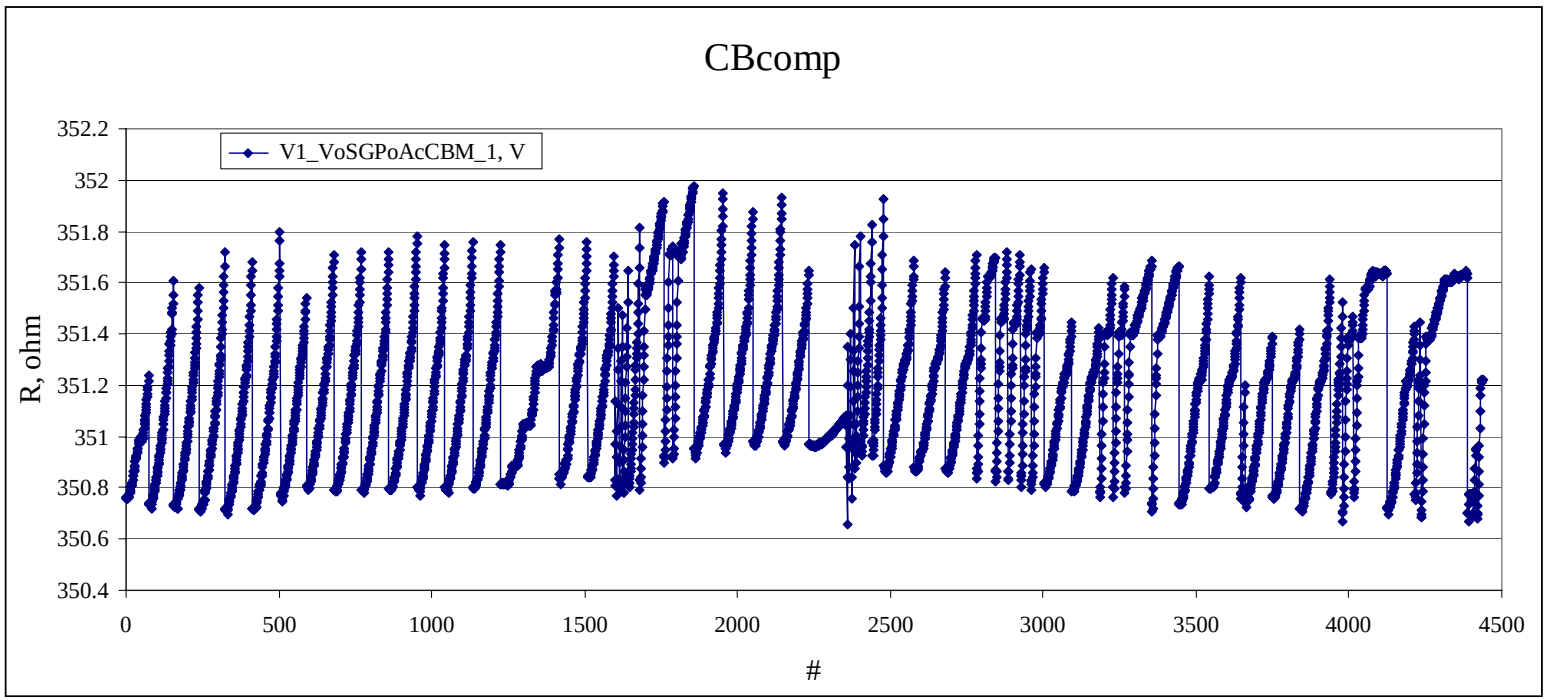
27
28
29
30

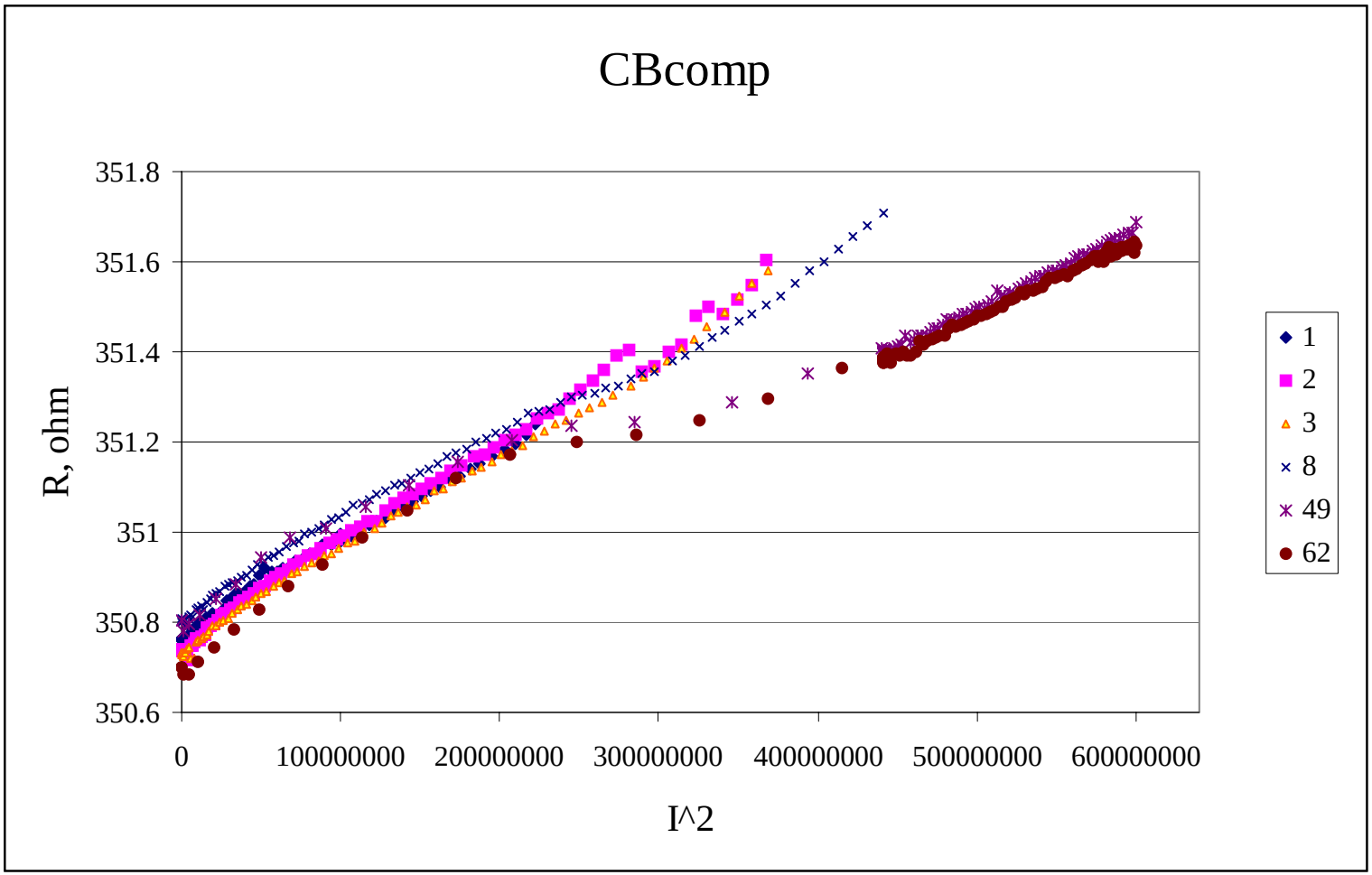

PSAcomp 4.45K
R, ohm
I^2
349.85
349.8
349.75
349.7
349.65
349.6
349.55
349.5
349.45
349.4
0
100000000
200000000
300000000
400000000
500000000
600000000
1
2
3
49
62

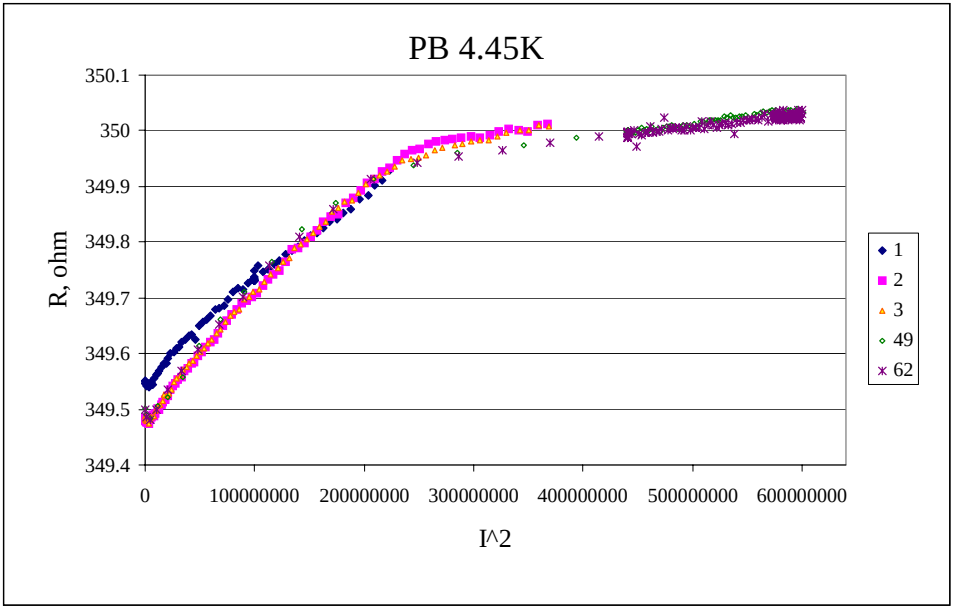

PSAcomp 2.15K
R, ohm
I^2
349.8
349.75
349.7
349.65
349.6
349.55
349.5
0
100000000
200000000
300000000
400000000
500000000
600000000
26
27
28
29
30

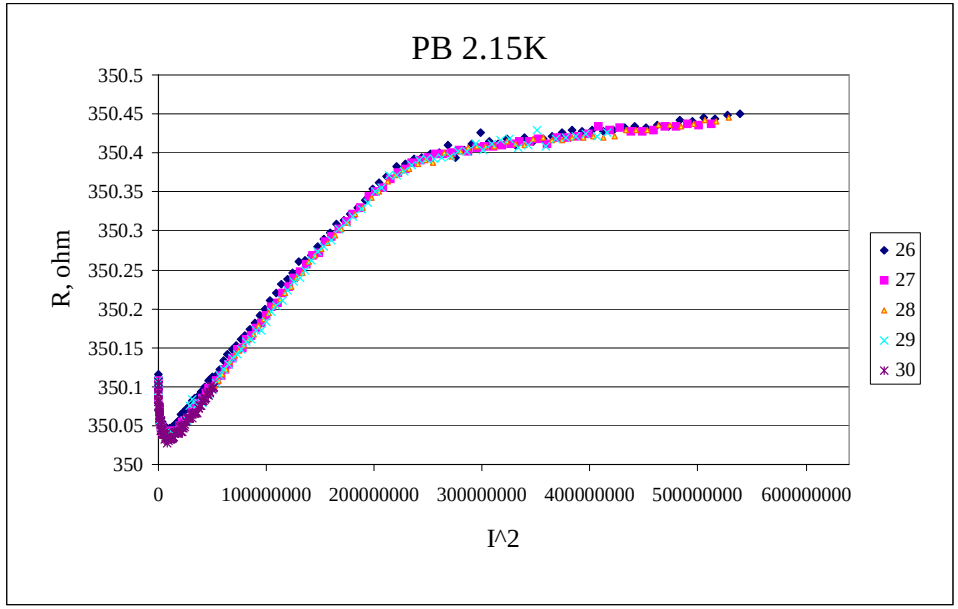

Coil gauges assembly history
Stress, MPa
5
0
-5
-10
-15
-20
-25
-30
-35
-40
CB
PB
in yoke
in press
600psi
600psi
1000psi
0
600psi
1000psi
600psi
1000psi
1500psi
600psi
1000psi
600psi
1000psi
1500psi
1500psi
0
next day
before torq
after torq
day after
more torque
more torque
last
final
Assembly step

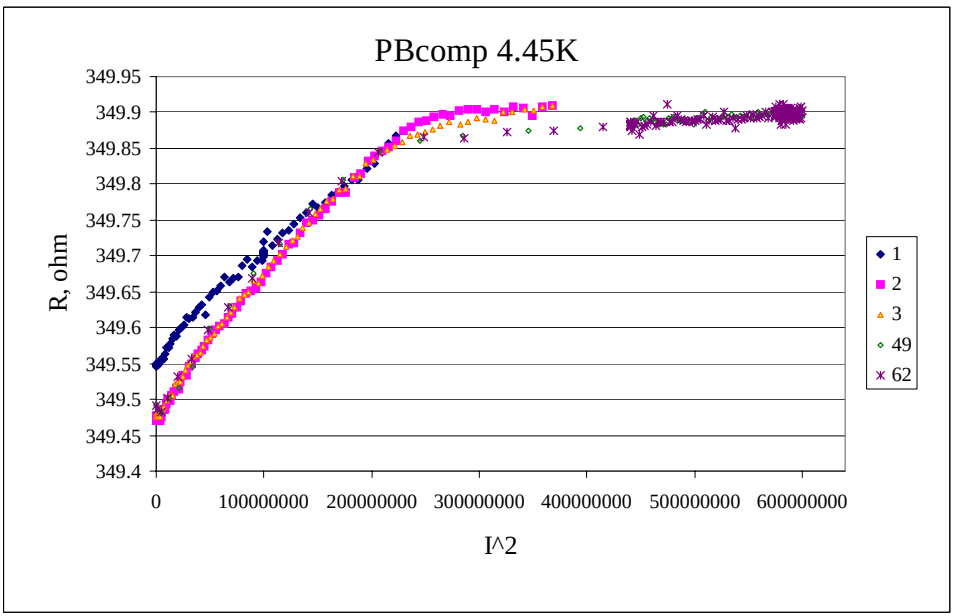

CB
V1_VoSGPoAcCBM_1, V
R, ohm
#
352.6
352.4
352.2
352
351.8
351.6
351.4
351.2
351
350.8
350.6
350.4
0
500
1000
1500
2000
2500
3000
3500
4000
4500

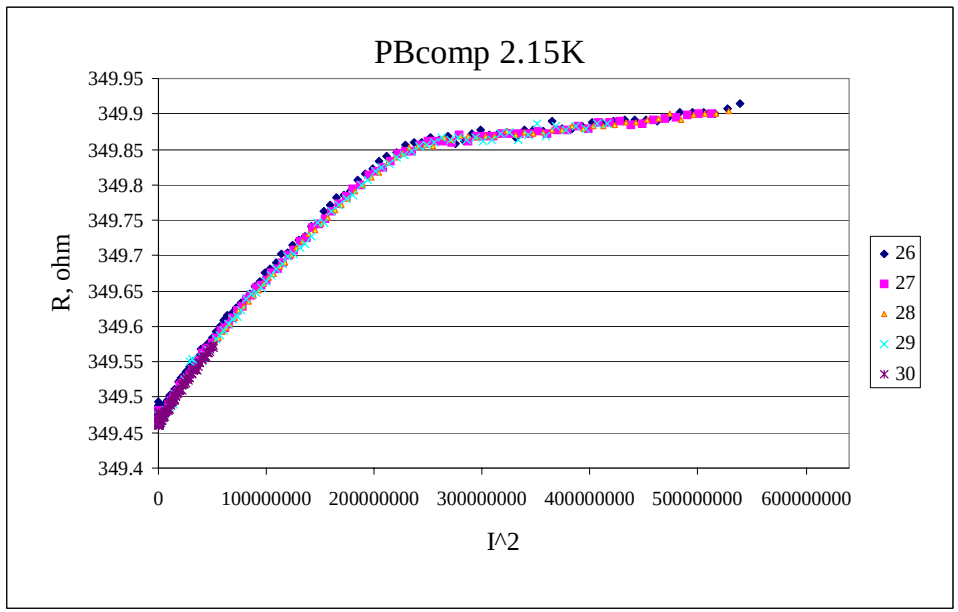

CBcomp
V1_VoSGPoAcCBM_1, V
R, ohm
#
352.2
352
351.8
351.6
351.4
351.2
351
350.8
350.6
350.4
0
500
1000
1500
2000
2500
3000
3500
4000
4500

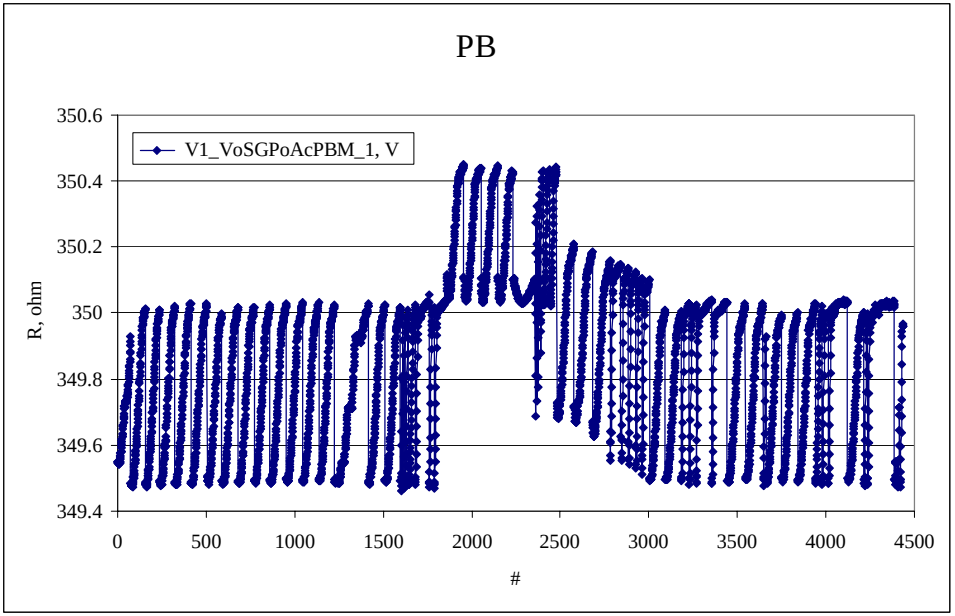

CBcomp
351.8
351.6
351.4
351.2
351
350.8
350.6
R, ohm
0
100000000
200000000
300000000
400000000
500000000
600000000
I^2
1
2
3
8
49
62

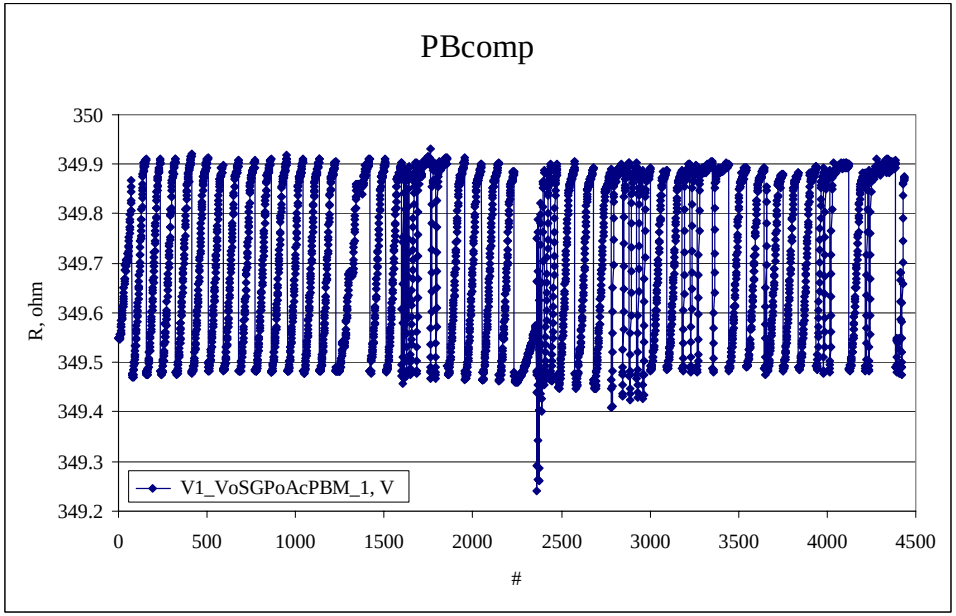

PB 4.45K
R, ohm
I^2
350.1
350
349.9
349.8
349.7
349.6
349.5
349.4
0
100000000
200000000
300000000
400000000
500000000
600000000
1
2
3
49
62

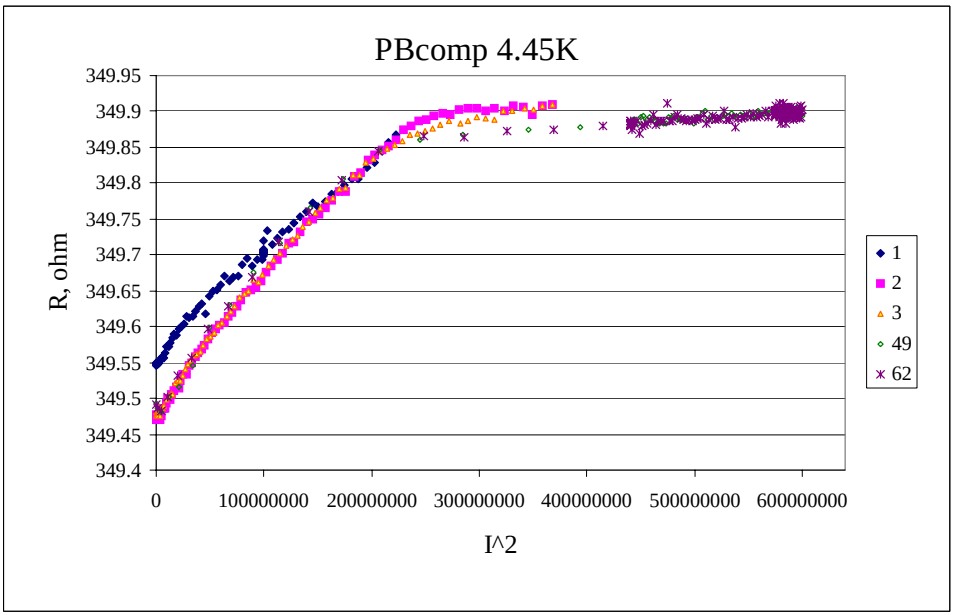

PB 2.15K
R, ohm
I^2
350.5
350.45
350.4
350.35
350.3
350.25
350.2
350.15
350.1
350.05
350
0
100000000
200000000
300000000
400000000
500000000
600000000
26
27
28
29
30

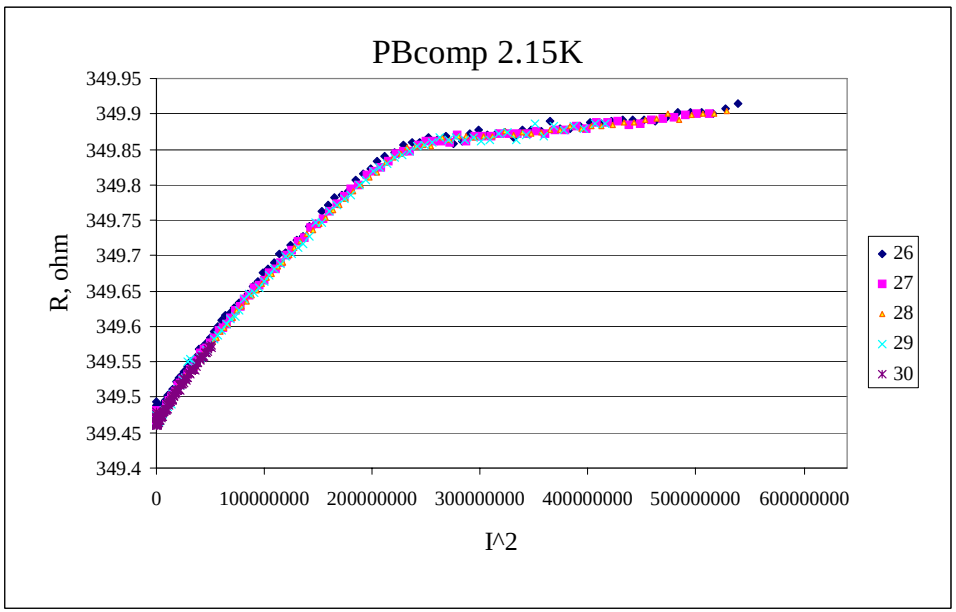

PBcomp 4.45K
R, ohm
I^2
349.95
349.9
349.85
349.8
349.75
349.7
349.65
349.6
349.55
349.5
349.45
349.4
0
100000000
200000000
300000000
400000000
500000000
600000000
1
2
3
49
62

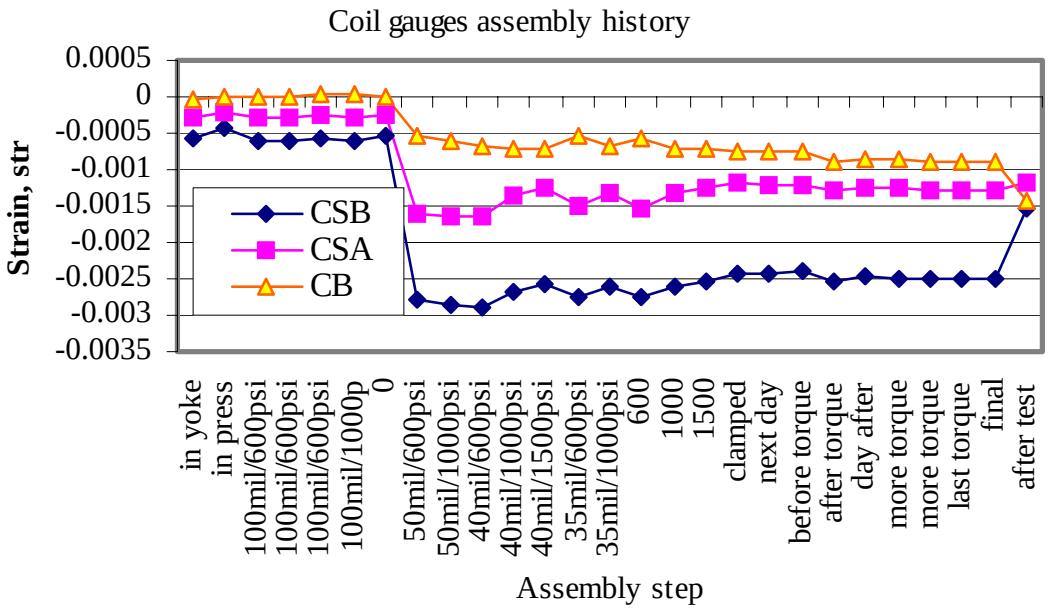

PBcomp 2.15K
R, ohm
I^2
349.95
349.9
349.85
349.8
349.75
349.7
349.65
349.6
349.55
349.5
349.45
349.4
0
100000000
200000000
300000000
400000000
500000000
600000000
26
27
28
29
30

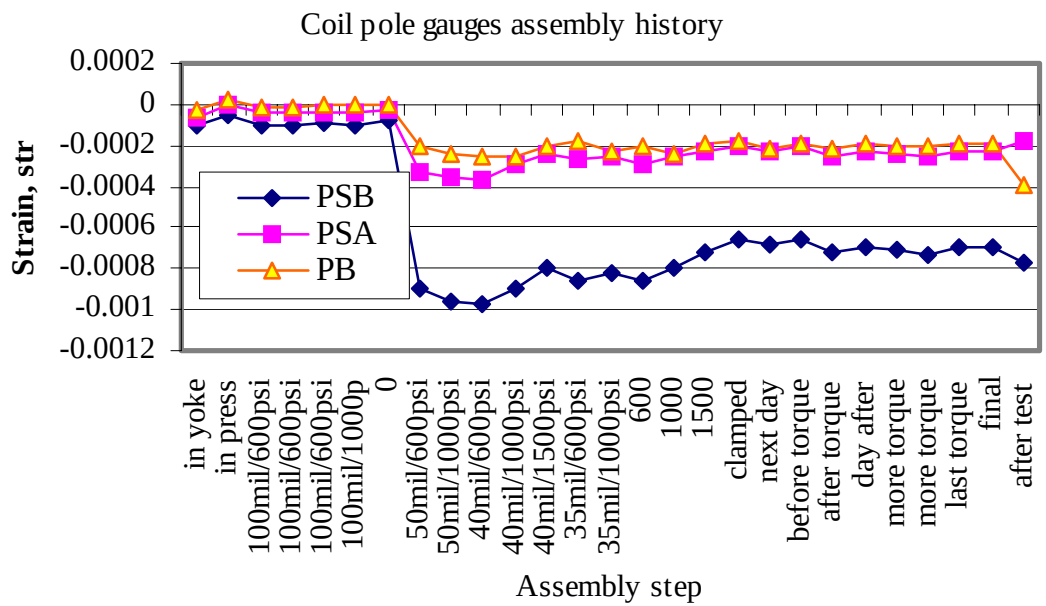

PB
V1_VoSGPoAcPBM_1, V
R, ohm
#
350.6
350.4
350.2
350
349.8
349.6
349.4
0
500
1000
1500
2000
2500
3000
3500
4000
4500

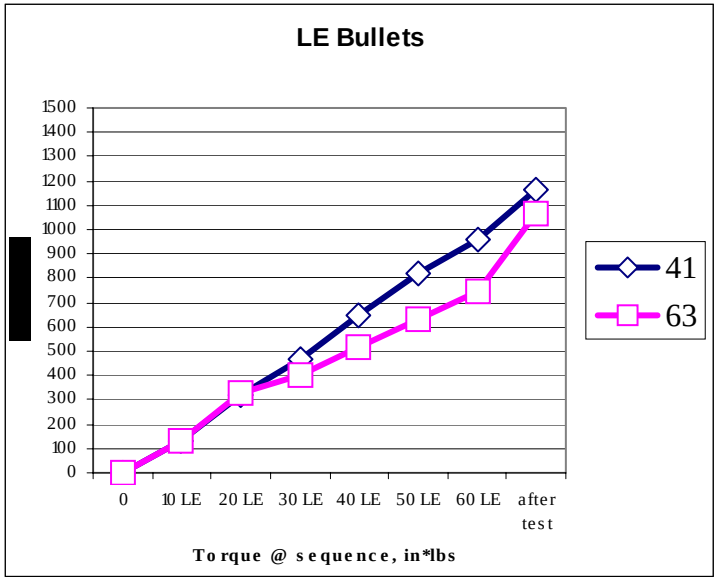

PBcomp
V1_VoSGPoAcPBM_1, V
R, ohm
#
350
349.9
349.8
349.7
349.6
349.5
349.4
349.3
349.2
0
500
1000
1500
2000
2500
3000
3500
4000
4500

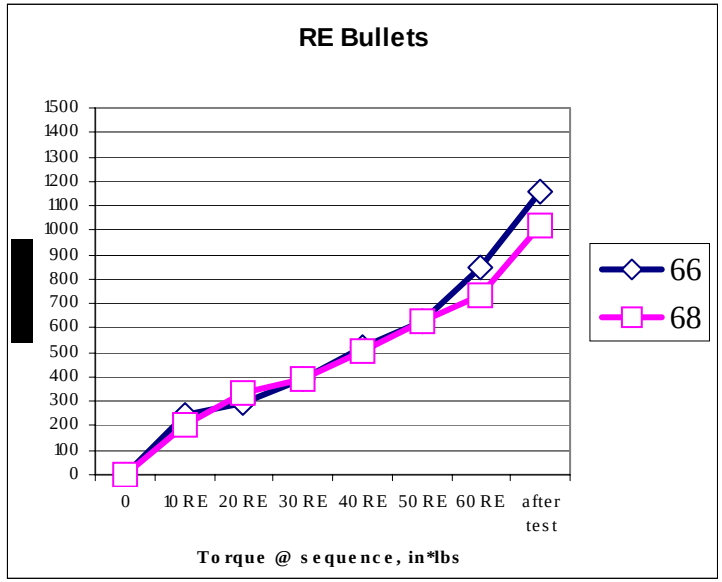

PBcomp 4.45K
R, ohm
I^2
349.95
349.9
349.85
349.8
349.75
349.7
349.65
349.6
349.55
349.5
349.45
349.4
0
100000000
200000000
300000000
400000000
500000000
600000000
1
2
3
49
62


PBcomp 2.15K
R, ohm
I^2
349.95
349.9
349.85
349.8
349.75
349.7
349.65
349.6
349.55
349.5
349.45
349.4
0
100000000
200000000
300000000
400000000
500000000
600000000
26
27
28
29
30


Coil gauges assembly history
Strain, str
0.0005
0
-0.0005
-0.001
-0.0015
-0.002
-0.0025
-0.003
-0.0035
CSB
CSA
CB
in yoke
in press
100mil/600psi
100mil/600psi
100mil/600psi
100mil/1000p
0
50mil/600psi
50mil/1000psi
40mil/600psi
40mil/1000psi
40mil/1500psi
35mil/600psi
35mil/1000psi
600
1000
1500
clamped
next day
before torque
after torque
day after
more torque
more torque
last torque
final
after test
Assembly step

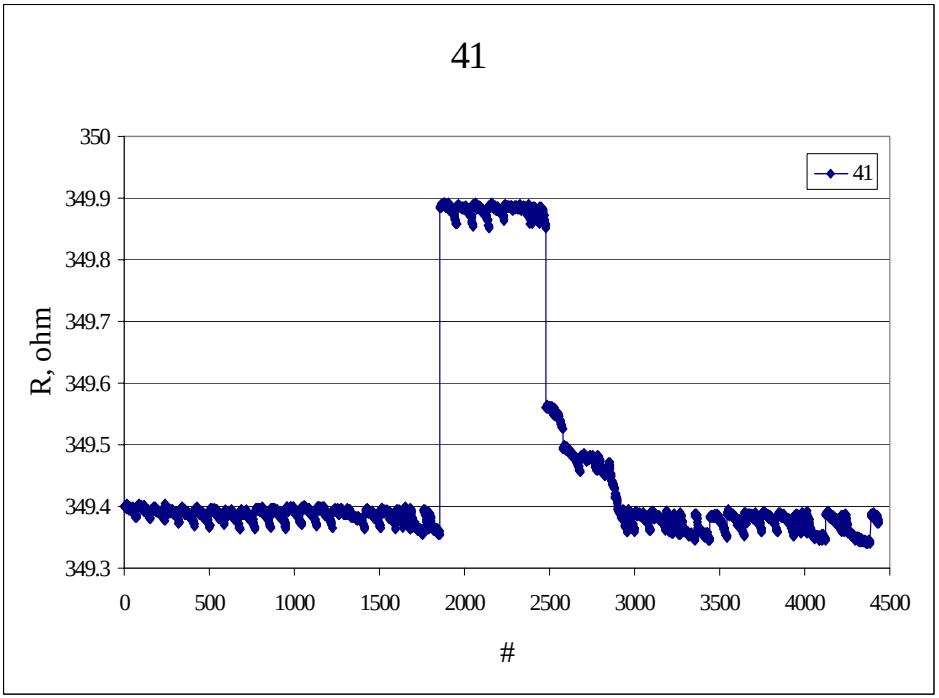

Coil pole gauges assembly history
Strain, str
0.0002
0
-0.0002
-0.0004
-0.0006
-0.0008
-0.001
-0.0012
PSB
PSA
PB
in yoke
in press
100mil/600psi
100mil/600psi
100mil/600psi
100mil/1000p
0
50mil/600psi
50mil/1000psi
40mil/600psi
40mil/1000psi
40mil/1500psi
35mil/600psi
35mil/1000psi
600
1000
1500
clamped
next day
before torque
after torque
day after
more torque
more torque
last torque
final
after test
Assembly step

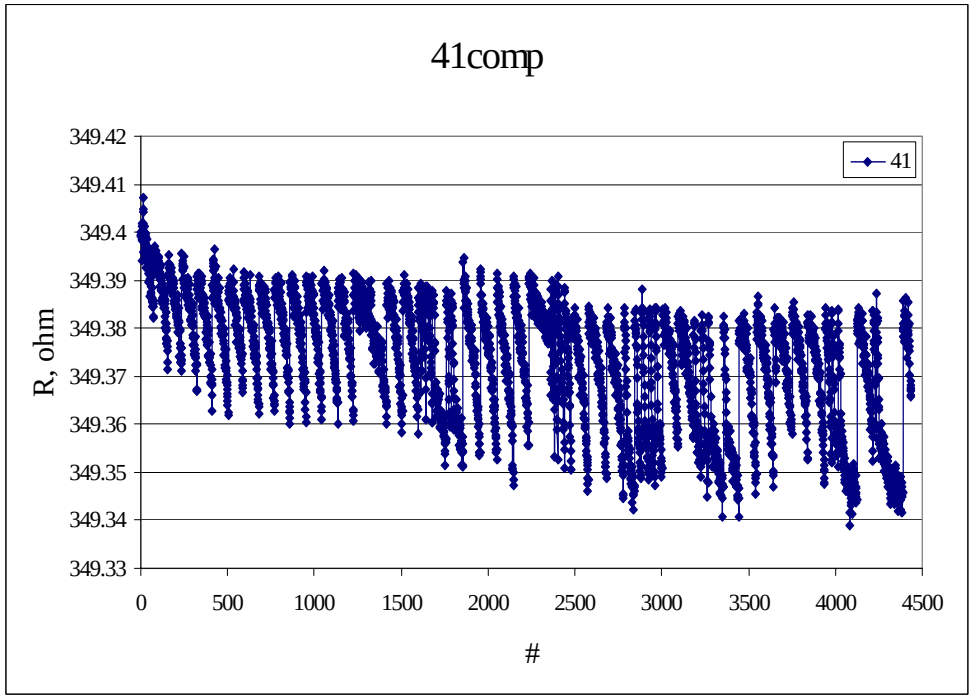


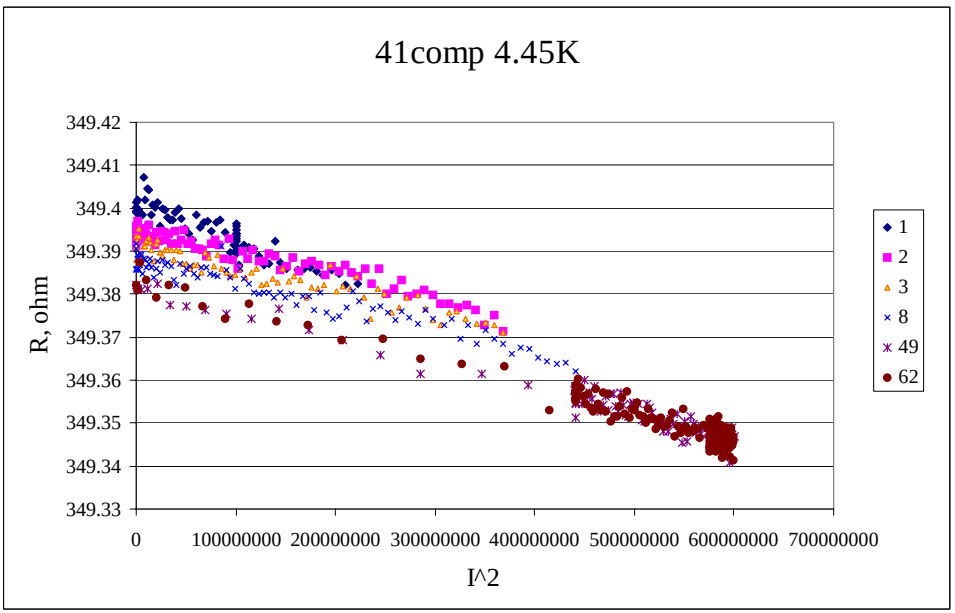


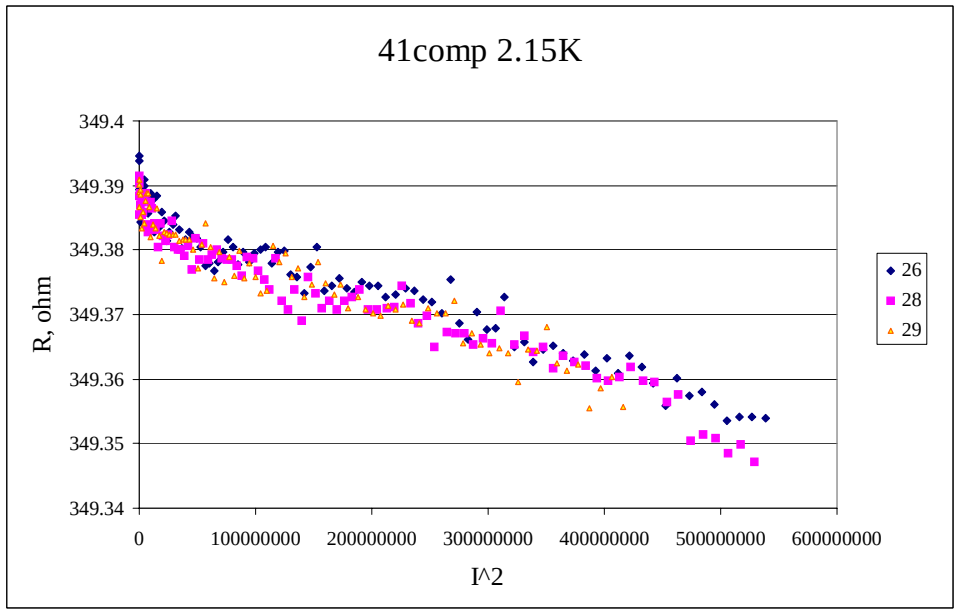
	LE	
	Coil	
Bullet#41		Bullet#63
Active		Active
Bullet#71		Bullet#9
Comp	Mirror	Comp

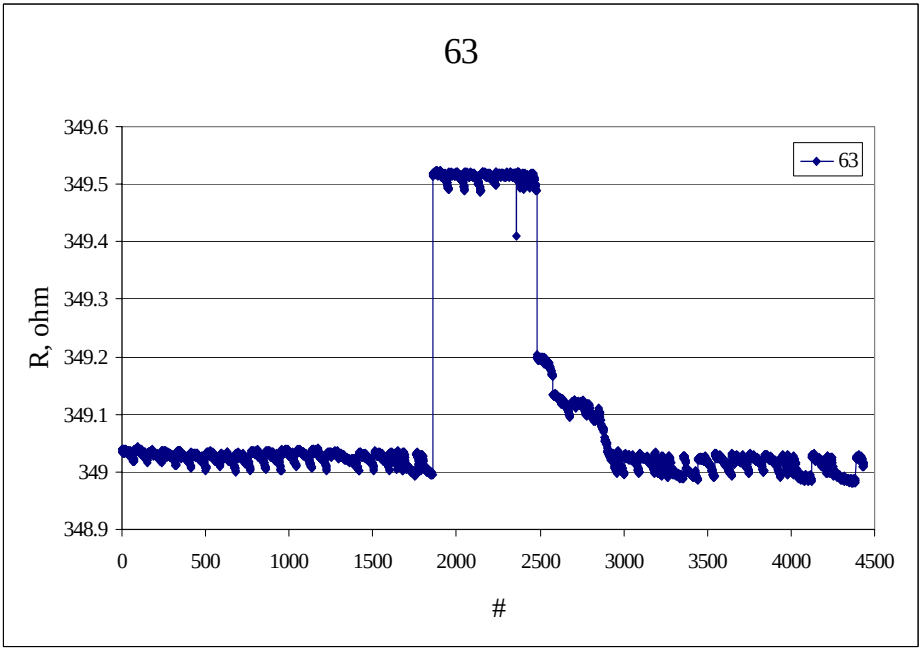
	RE	
	Coil	
Bullet#66		Bullet#68
Active		Active
Bullet#2		Bullet#65
Comp	Mirror	Comp

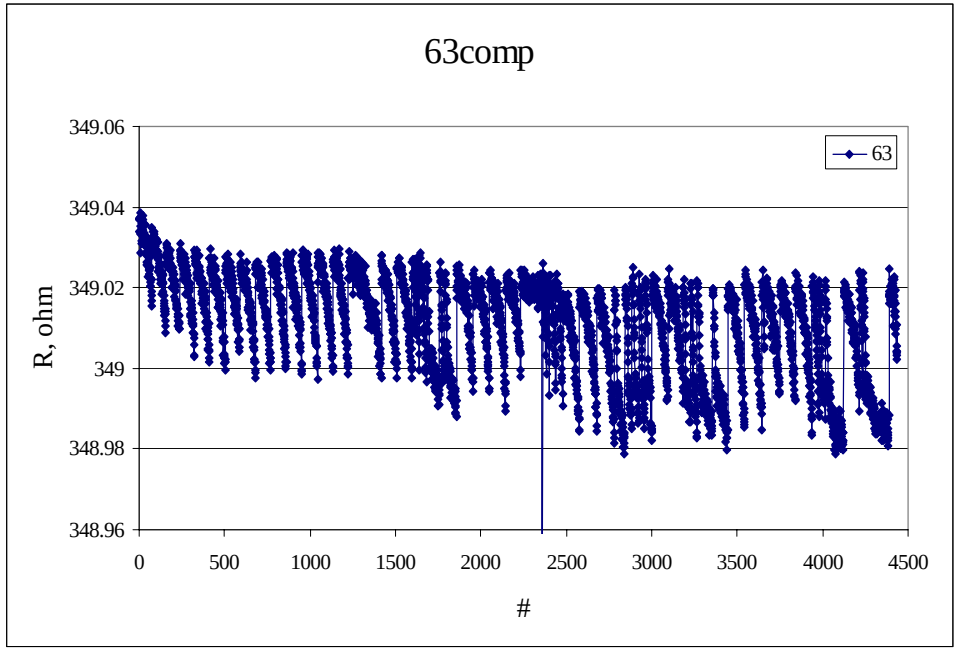

41
R, ohm
#
41
350
349.9
349.8
349.7
349.6
349.5
349.4
349.3
0
500
1000
1500
2000
2500
3000
3500
4000
4500

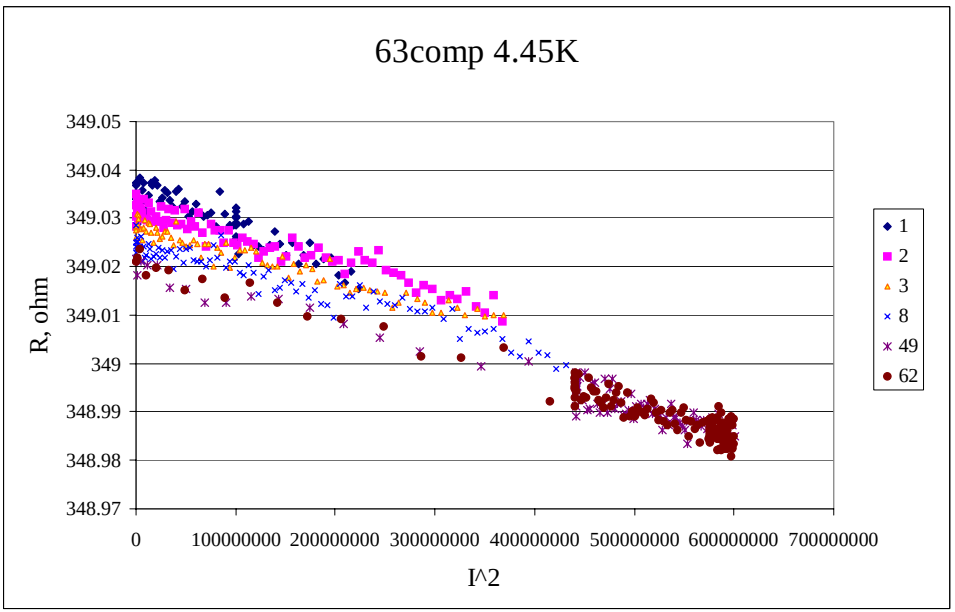

41comp
R, ohm
#
41
349.42
349.41
349.4
349.39
349.38
349.37
349.36
349.35
349.34
349.33
0
500
1000
1500
2000
2500
3000
3500
4000
4500

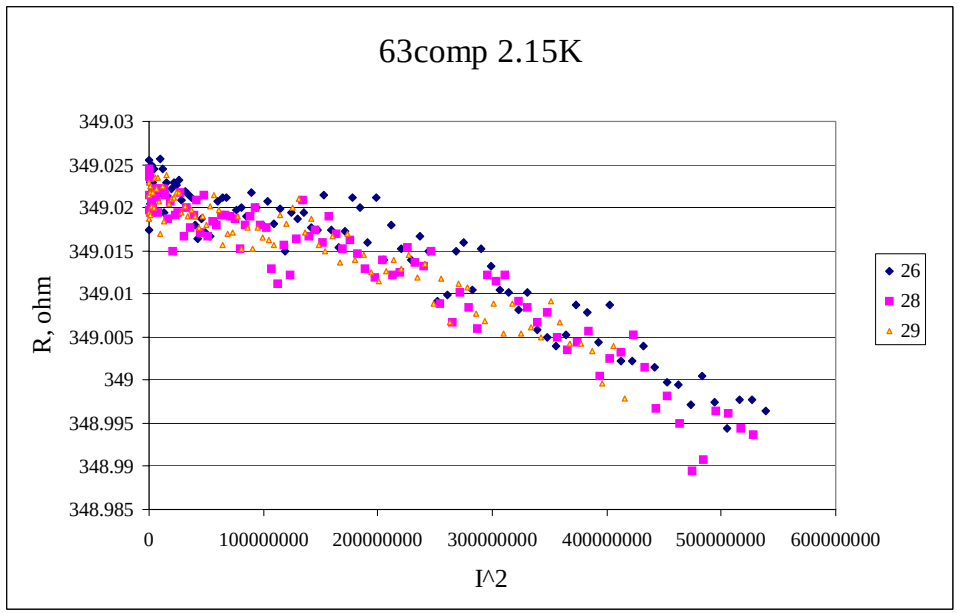

41comp 4.45K
R, ohm
I^2
1
2
3
8
49
62
349.42
349.41
349.4
349.39
349.38
349.37
349.36
349.35
349.34
349.33
0
100000000
200000000
300000000
400000000
500000000
600000000
700000000

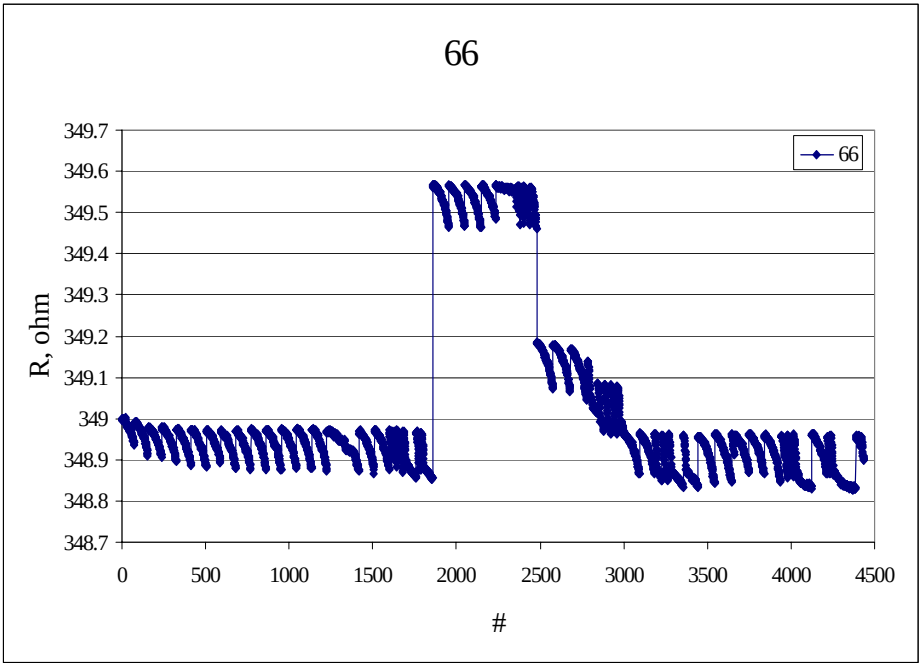

41comp 2.15K
R, ohm
I^2
26
28
29
349.4
349.39
349.38
349.37
349.36
349.35
349.34
0
100000000
200000000
300000000
400000000
500000000
600000000

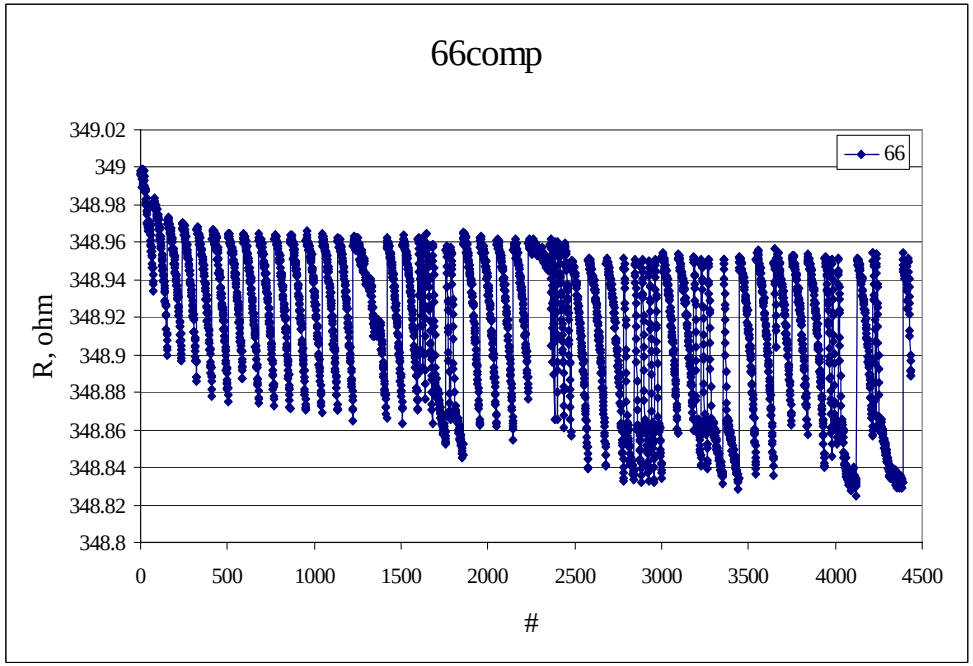

63
R, ohm
#
63
349.6
349.5
349.4
349.3
349.2
349.1
349
348.9
0
500
1000
1500
2000
2500
3000
3500
4000
4500

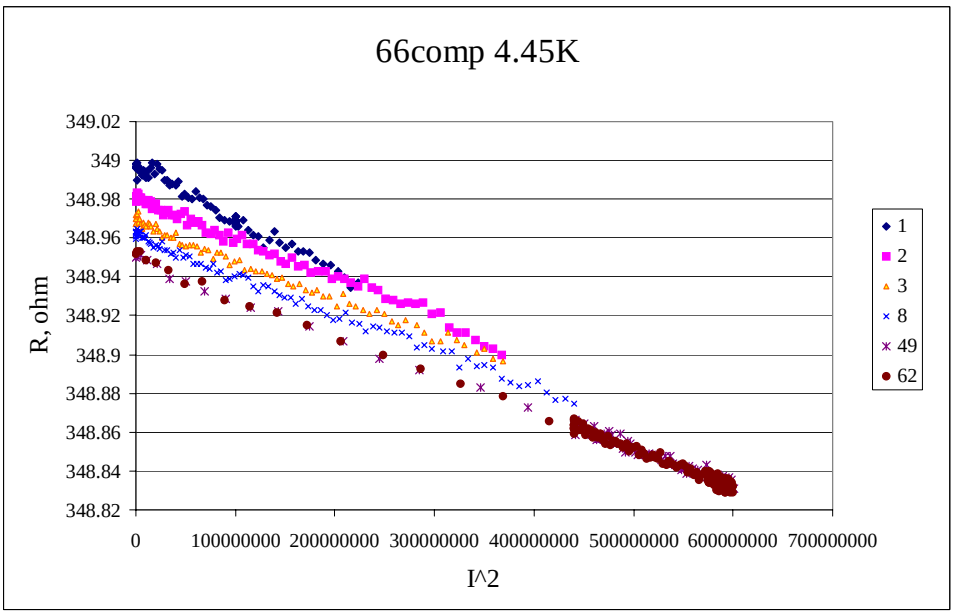

63comp
R, ohm
#
63
349.06
349.04
349.02
349
348.98
348.96
0
500
1000
1500
2000
2500
3000
3500
4000
4500

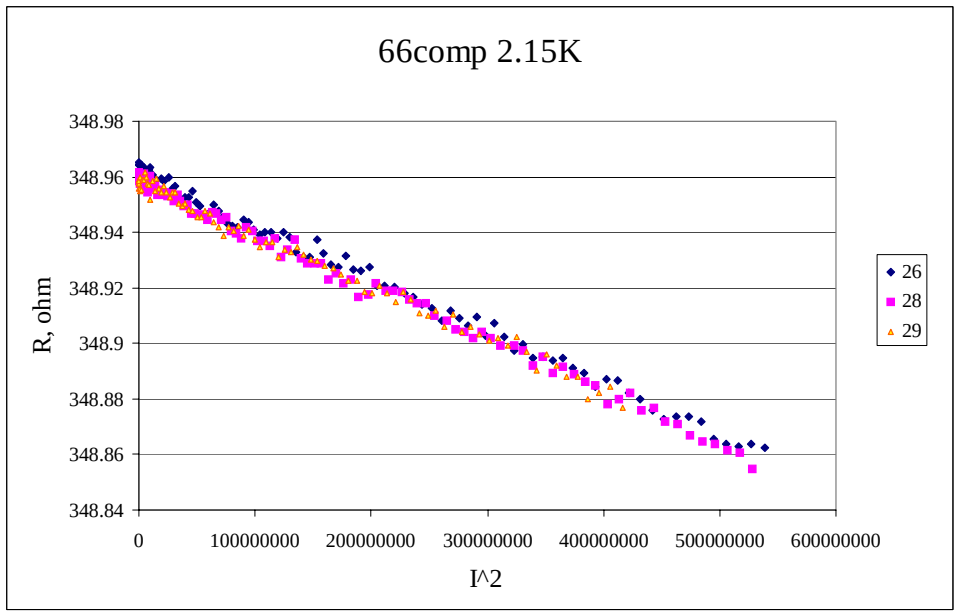

63comp 4.45K
R, ohm
I^2
1
2
3
8
49
62
349.05
349.04
349.03
349.02
349.01
349
348.99
348.98
348.97
0
100000000
200000000
300000000
400000000
500000000
600000000
700000000

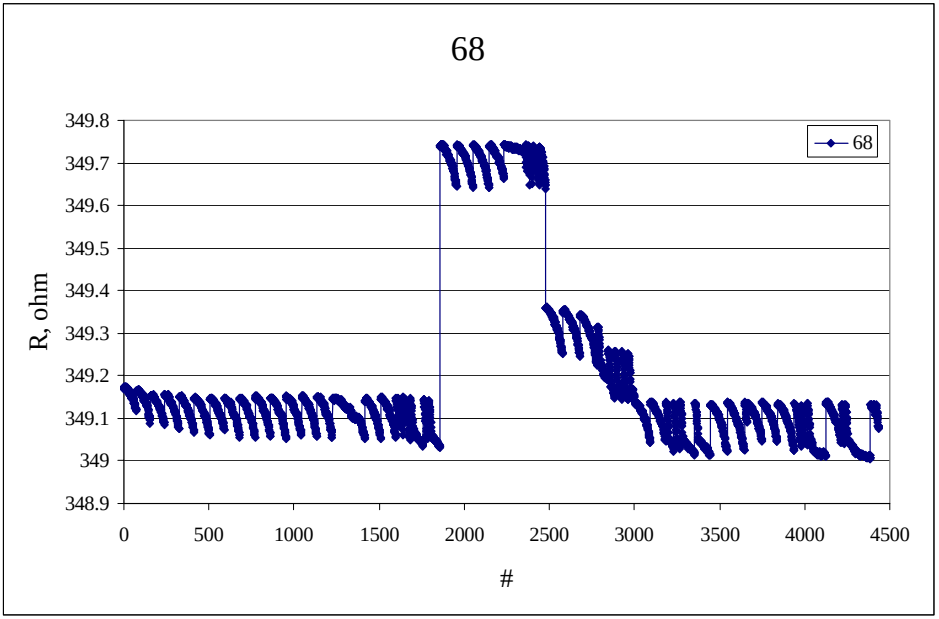

63comp 2.15K
R, ohm
I^2
26
28
29
349.03
349.025
349.02
349.015
349.01
349.005
349
348.995
348.99
348.985
0
100000000
200000000
300000000
400000000
500000000
600000000

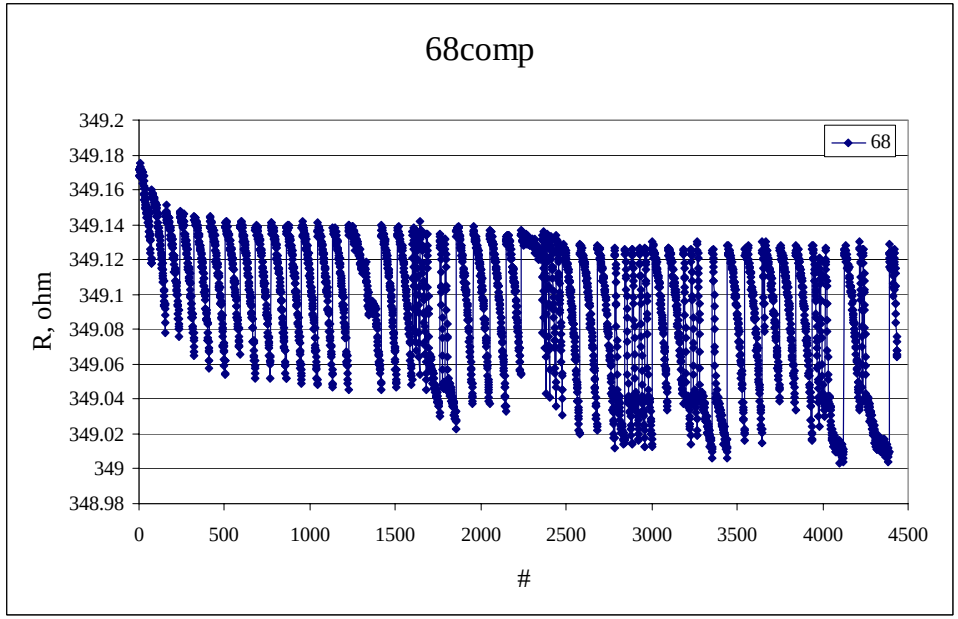

66
R, ohm
#
66
349.7
349.6
349.5
349.4
349.3
349.2
349.1
349
348.9
348.8
348.7
0
500
1000
1500
2000
2500
3000
3500
4000
4500

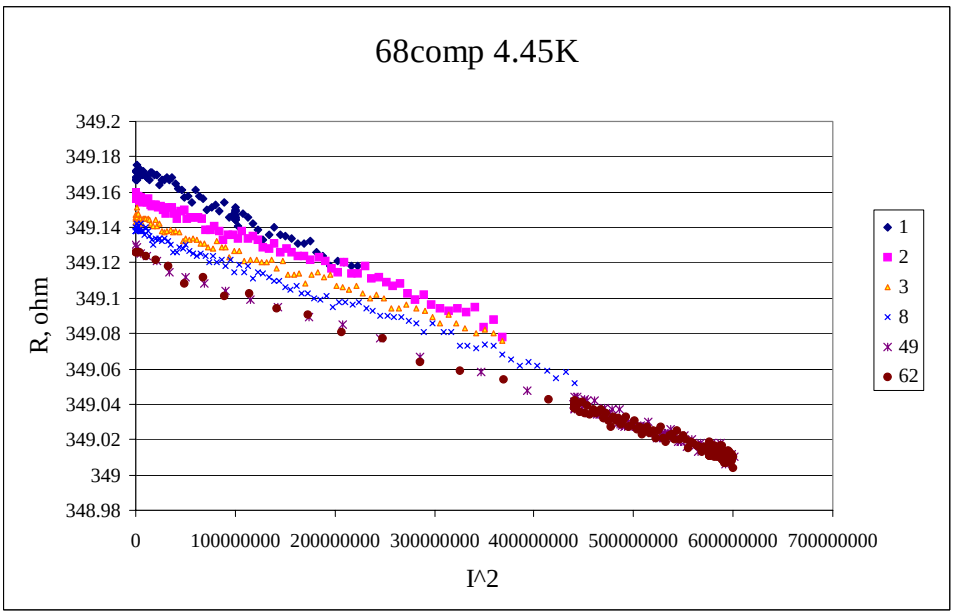

66comp
R, ohm
#
66
349.02
349
348.98
348.96
348.94
348.92
348.9
348.88
348.86
348.84
348.82
348.8
0
500
1000
1500
2000
2500
3000
3500
4000
4500

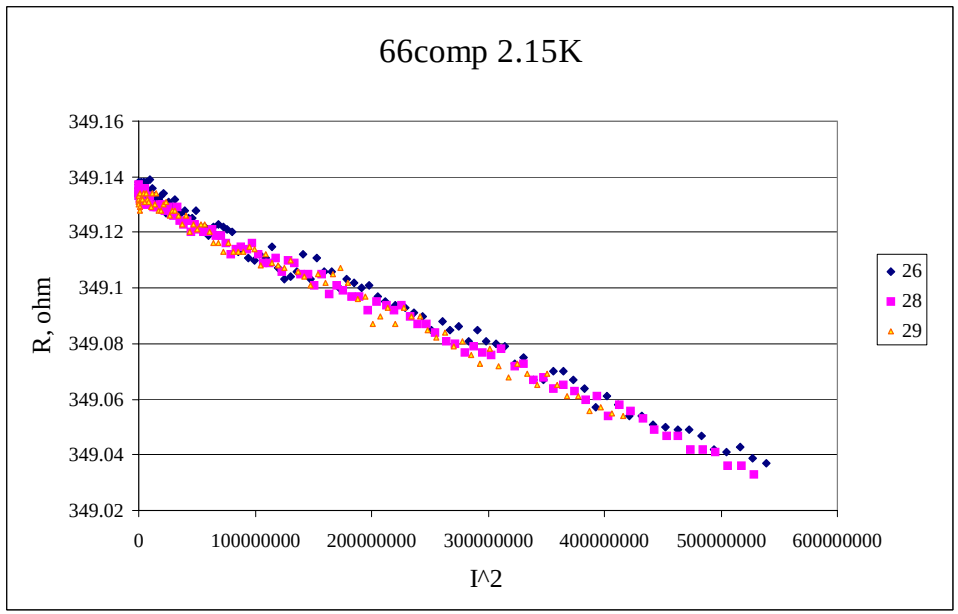

66comp 4.45K
R, ohm
I^2
1
2
3
8
49
62
349.02
349
348.98
348.96
348.94
348.92
348.9
348.88
348.86
348.84
348.82
0
100000000
200000000
300000000
400000000
500000000
600000000
700000000


66comp 2.15K
R, ohm
I^2
26
28
29
348.98
348.96
348.94
348.92
348.9
348.88
348.86
348.84
0
100000000
200000000
300000000
400000000
500000000
600000000

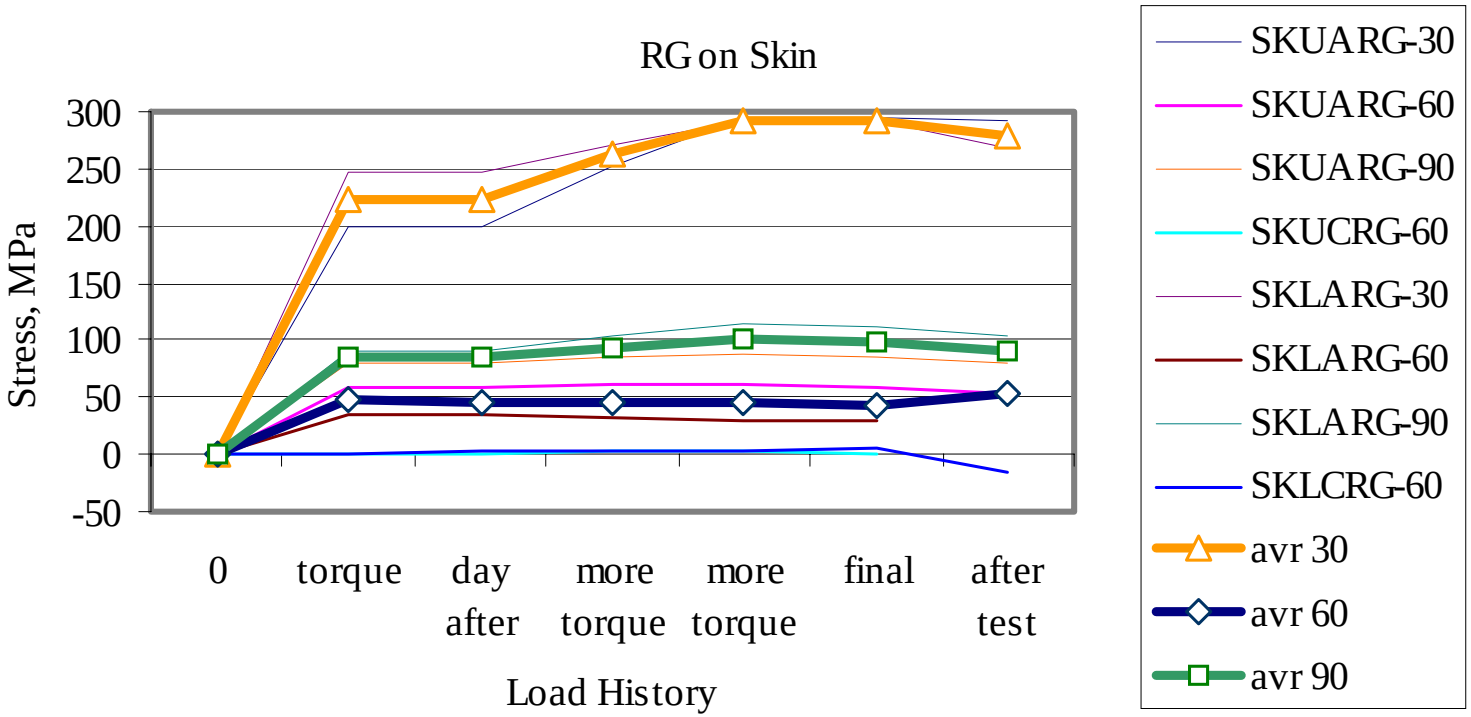

68
R, ohm
#
68
349.8
349.7
349.6
349.5
349.4
349.3
349.2
349.1
349
348.9
0
500
1000
1500
2000
2500
3000
3500
4000
4500

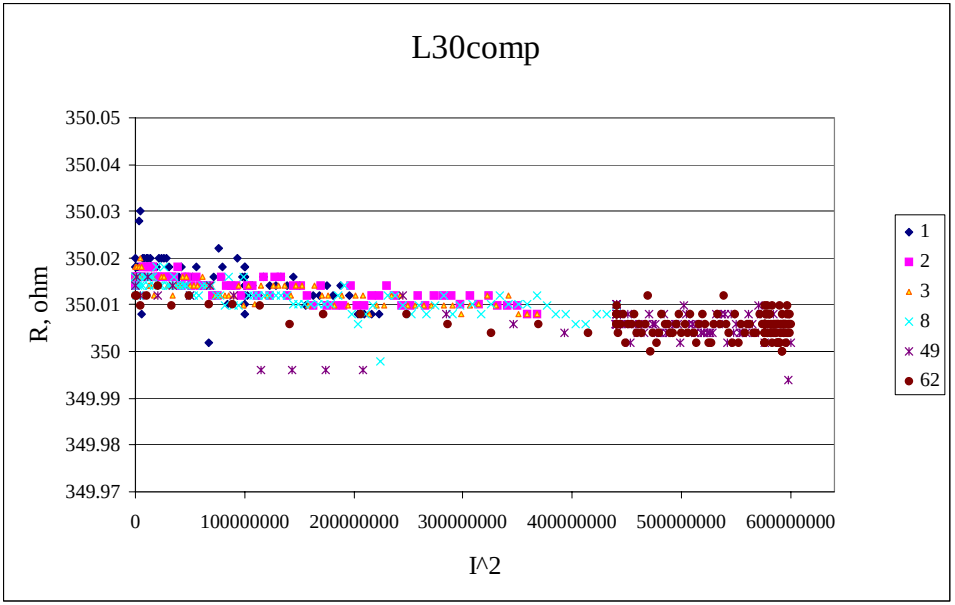

68comp
R, ohm
#
68
349.2
349.18
349.16
349.14
349.12
349.1
349.08
349.06
349.04
349.02
349
348.98
0
500
1000
1500
2000
2500
3000
3500
4000
4500

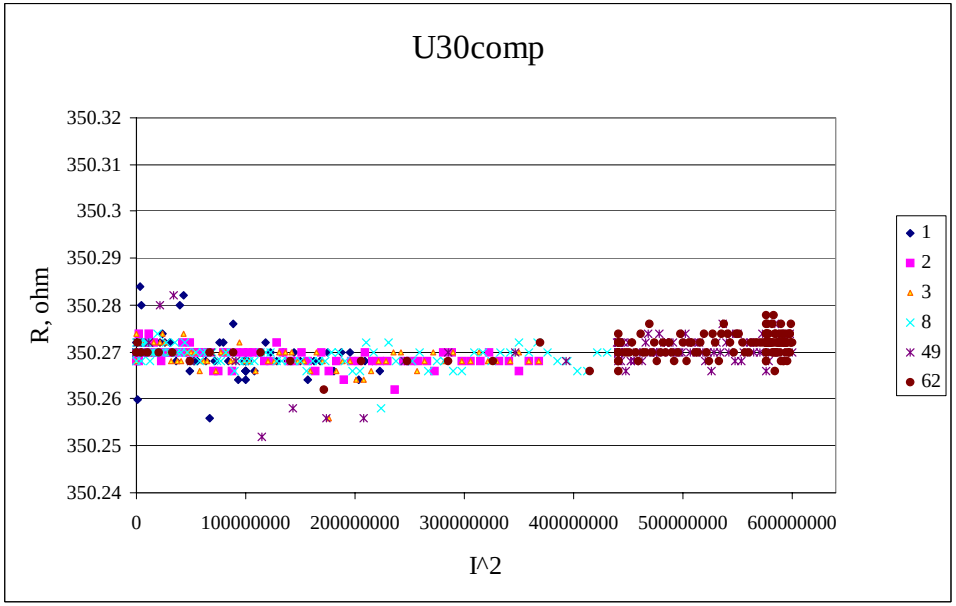

68comp 4.45K
R, ohm
I^2
1
2
3
8
49
62
349.2
349.18
349.16
349.14
349.12
349.1
349.08
349.06
349.04
349.02
349
348.98
0
100000000
200000000
300000000
400000000
500000000
600000000
700000000

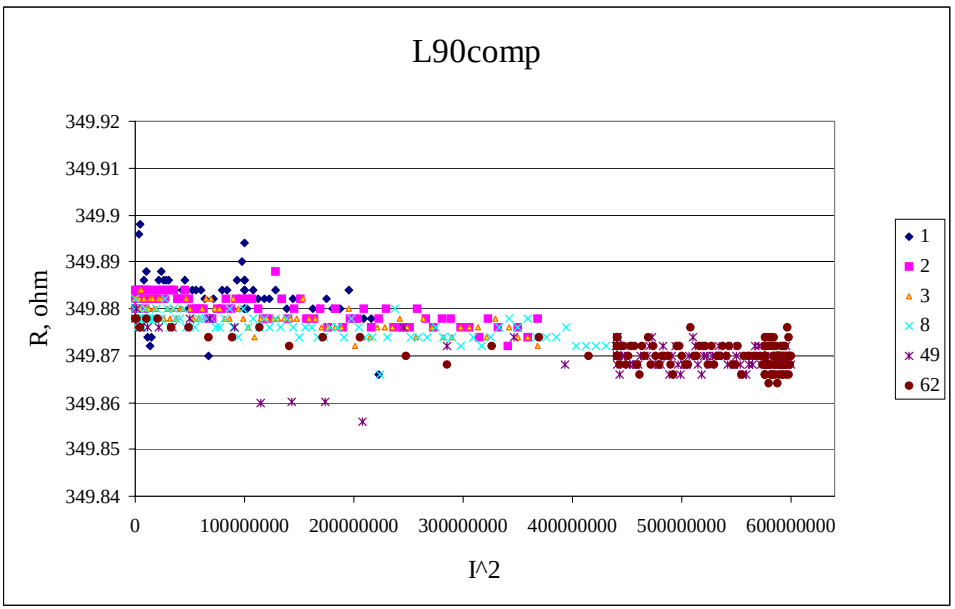

66comp 2.15K
R, ohm
I^2
26
28
29
349.16
349.14
349.12
349.1
349.08
349.06
349.04
349.02
0
100000000
200000000
300000000
400000000
500000000
600000000

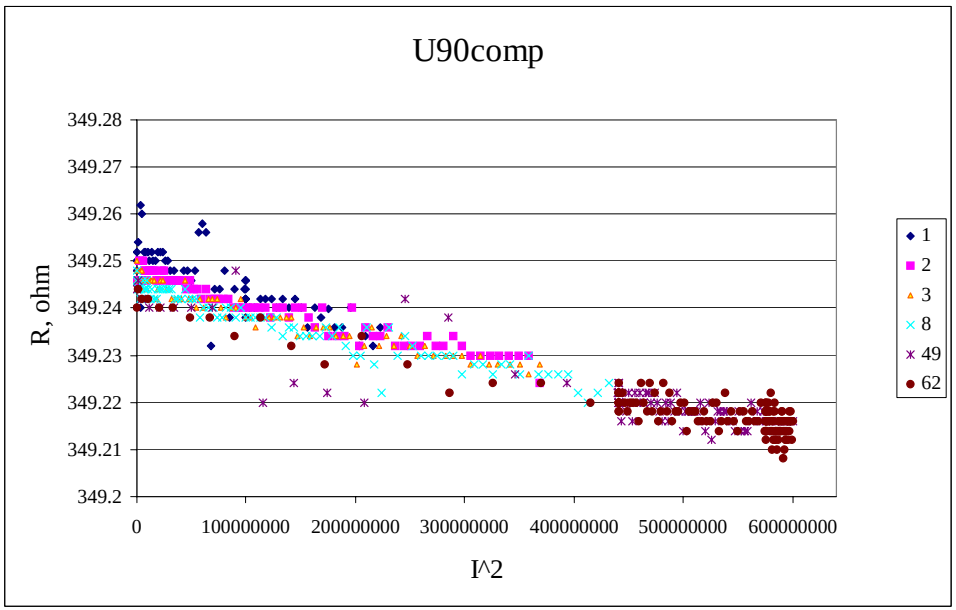
Skin

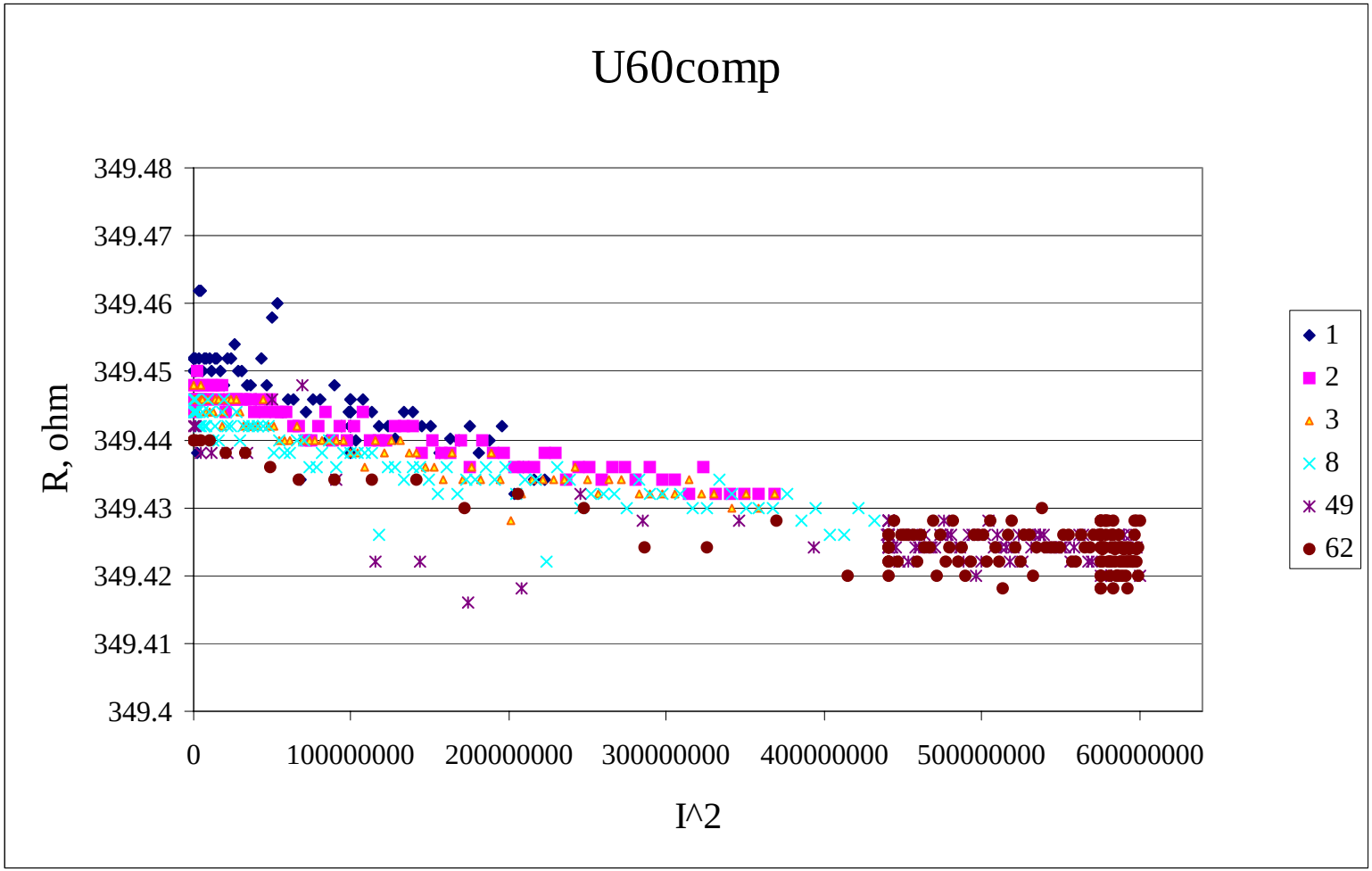

RG on Skin
Stress, MPa
300
250
200
150
100
50
0
-50
0
torque
day after
more torque
more torque
final
after test
Load History
SKUARG-30
SKUARG-60
SKUARG-90
SKUCRG-60
SKLARG-30
SKLARG-60
SKLARG-90
SKLCRG-60
avr 30
avr 60
avr 90

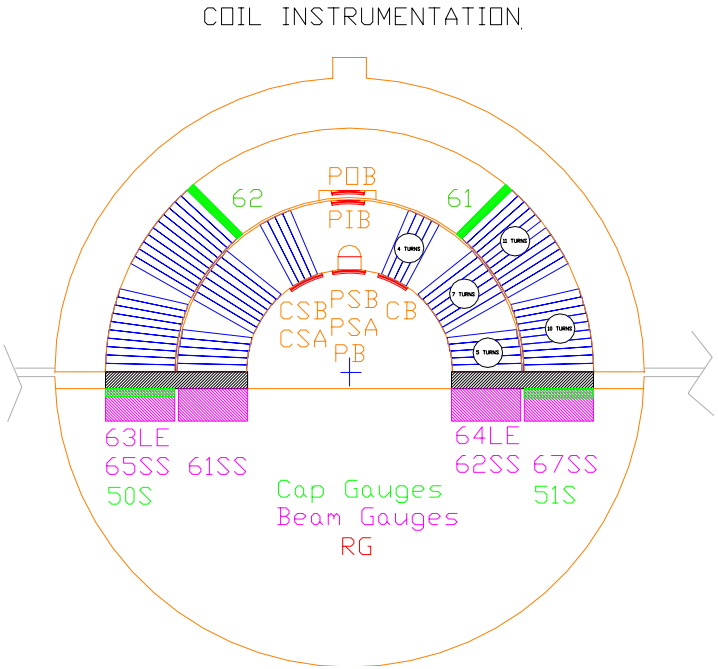

L30comp
R, ohm
I^2
350.05
350.04
350.03
350.02
350.01
350
349.99
349.98
349.97
0
100000000
200000000
300000000
400000000
500000000
600000000
1
2
3
8
49
62

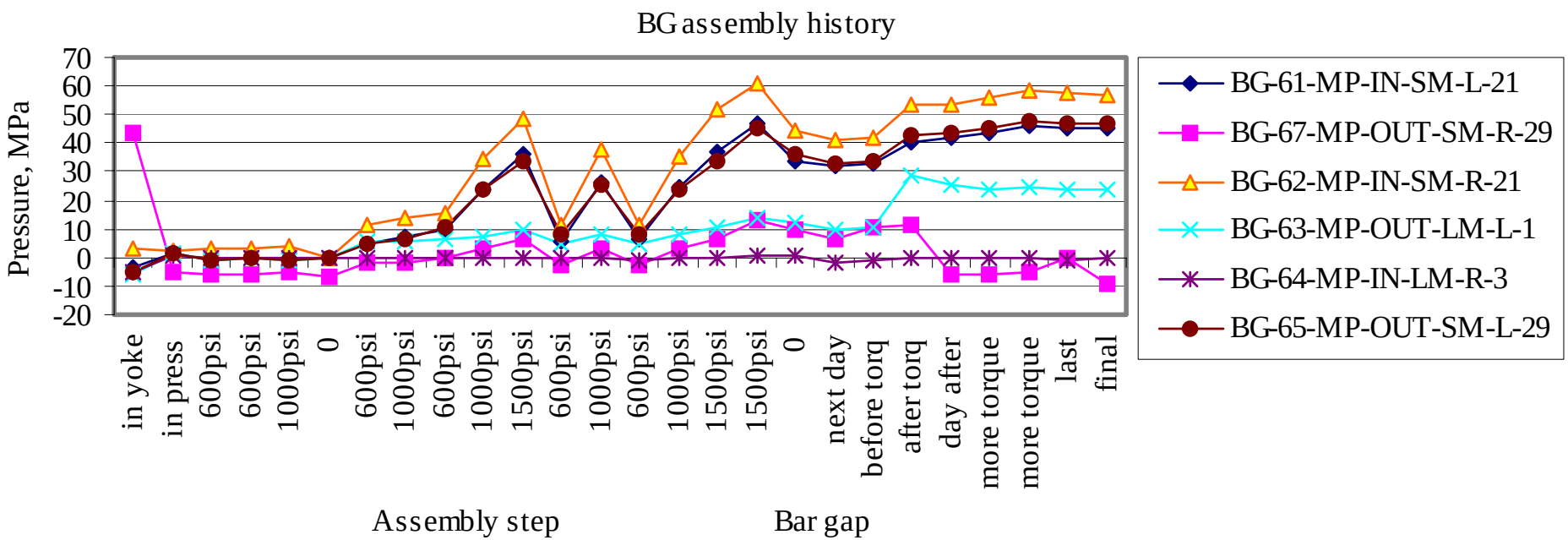

U30comp
R, ohm
I^2
350.32
350.31
350.3
350.29
350.28
350.27
350.26
350.25
350.24
0
100000000
200000000
300000000
400000000
500000000
600000000
1
2
3
8
49
62

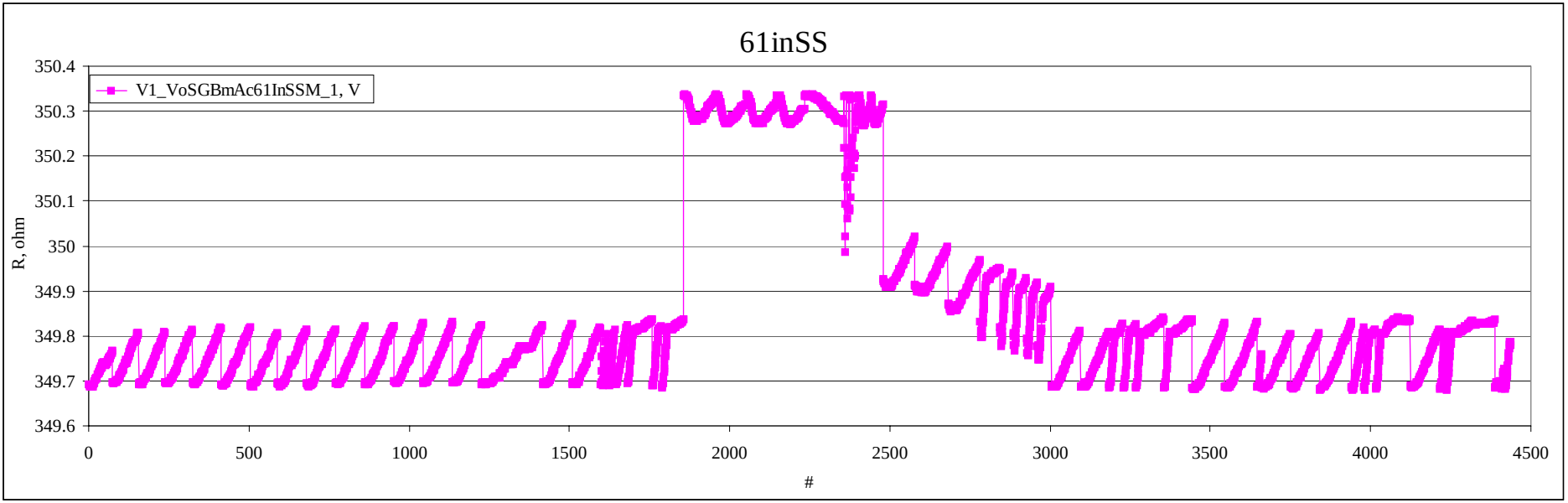

L90comp
R, ohm
I^2
349.92
349.91
349.9
349.89
349.88
349.87
349.86
349.85
349.84
0
100000000
200000000
300000000
400000000
500000000
600000000
1
2
3
8
49
62

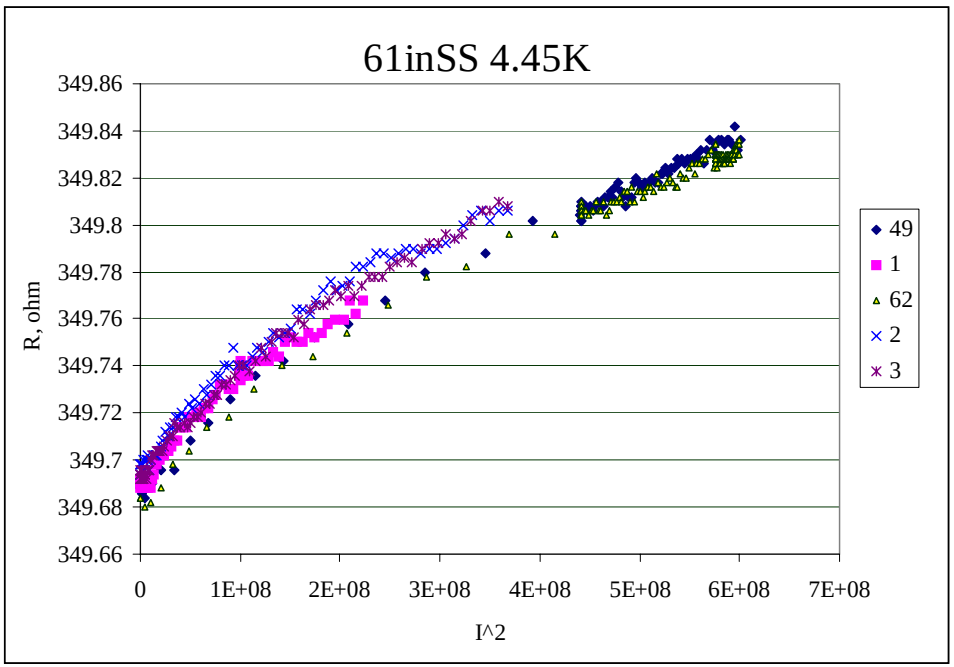

U90comp
R, ohm
I^2
349.28
349.27
349.26
349.25
349.24
349.23
349.22
349.21
349.2
0
100000000
200000000
300000000
400000000
500000000
600000000
1
2
3
8
49
62

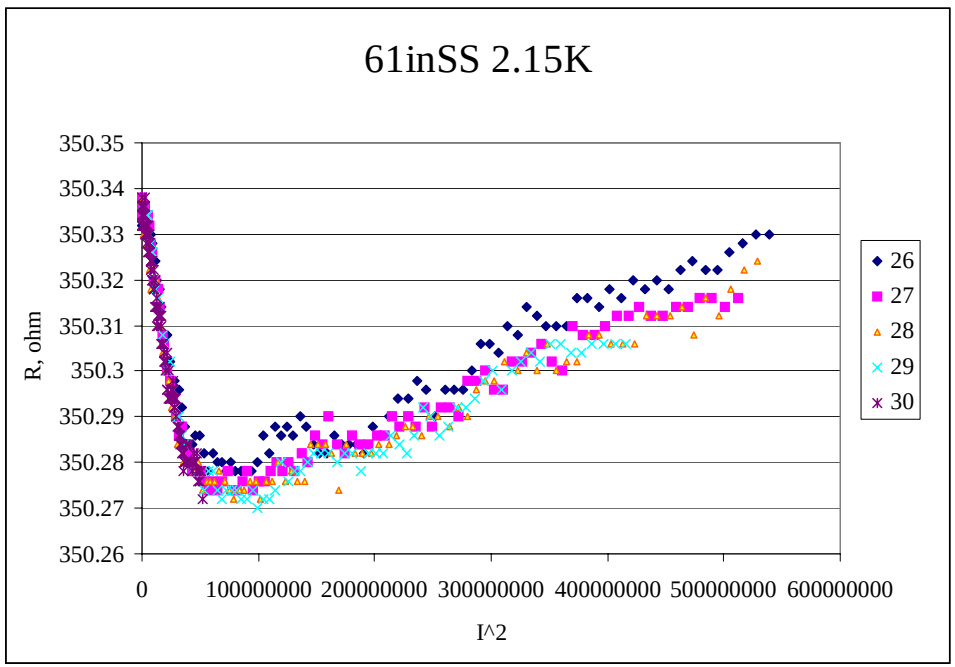

U60comp
R, ohm
349.48
349.47
349.46
349.45
349.44
349.43
349.42
349.41
349.4
0
100000000
200000000
300000000
400000000
500000000
600000000
I^2
1
2
3
8
49
62

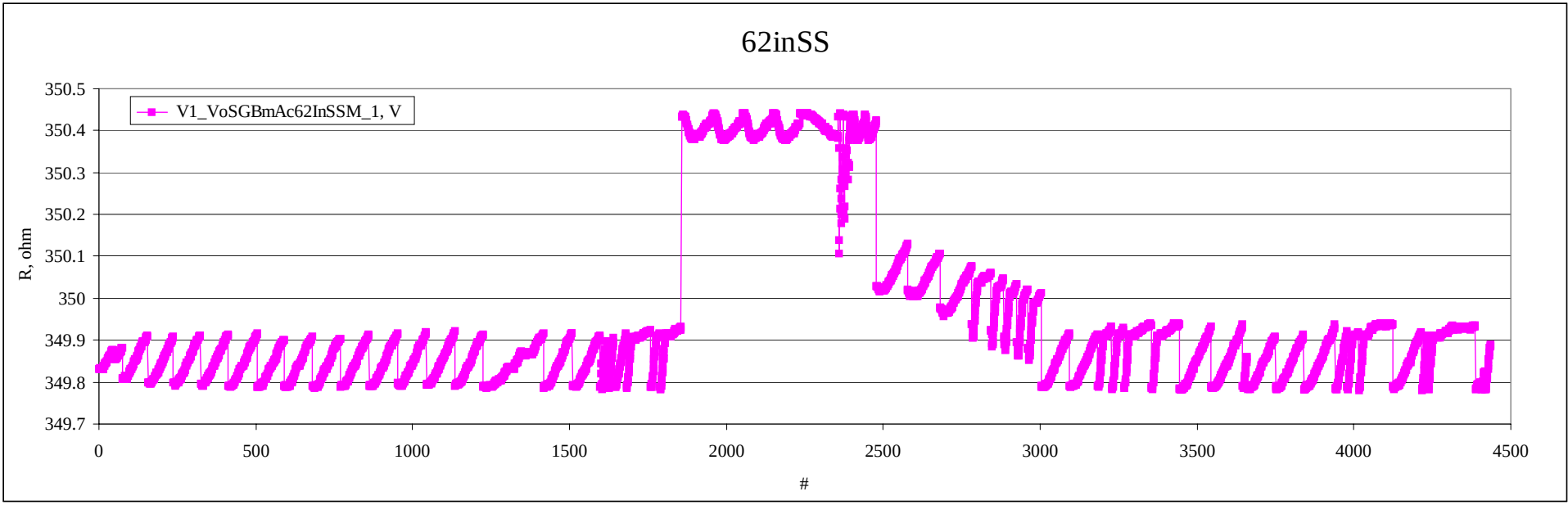

COIL INSTRUMENTATION
POB
PIB
62
61
CSB
CSA
PSB
PSA
PB
CB
63LE
65SS 61SS
50S
64LE
62SS 67SS
51S
Cap Gauges
Beam Gauges
RG

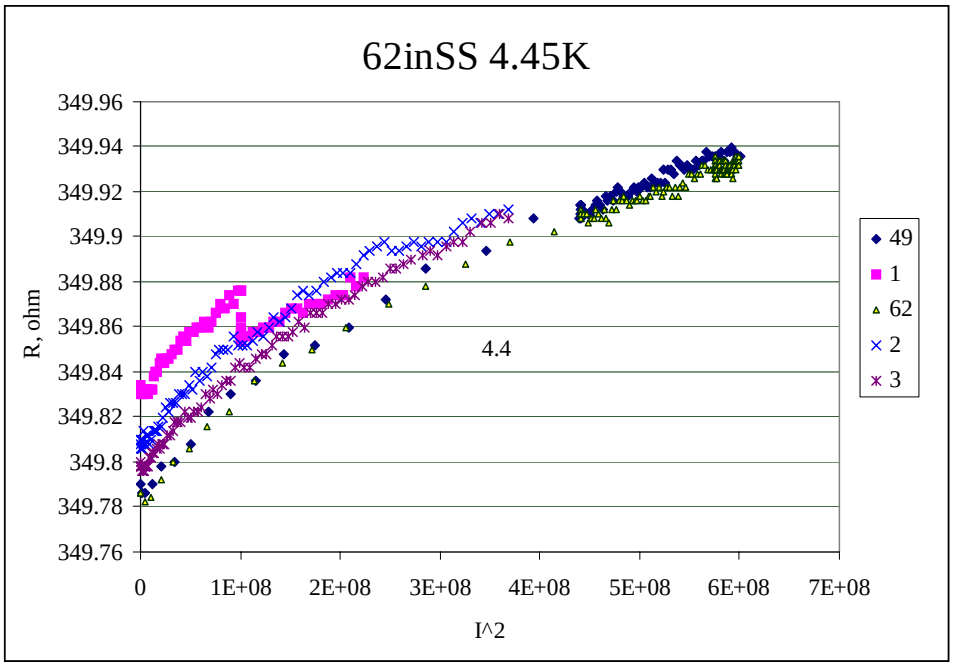

BG assembly history
Pressure, MPa
70
60
50
40
30
20
10
0
-10
-20
in yoke
in press
600psi
600psi
1000psi
0
600psi
1000psi
600psi
1000psi
1500psi
600psi
1000psi
600psi
1000psi
1500psi
1500psi
0
next day
before torq
after torq
day after
more torque
more torque
last
final
Assembly step
Bar gap
BG-61-MP-IN-SM-L-21
BG-67-MP-OUT-SM-R-29
BG-62-MP-IN-SM-R-21
BG-63-MP-OUT-LM-L-1
BG-64-MP-IN-LM-R-3
BG-65-MP-OUT-SM-L-29

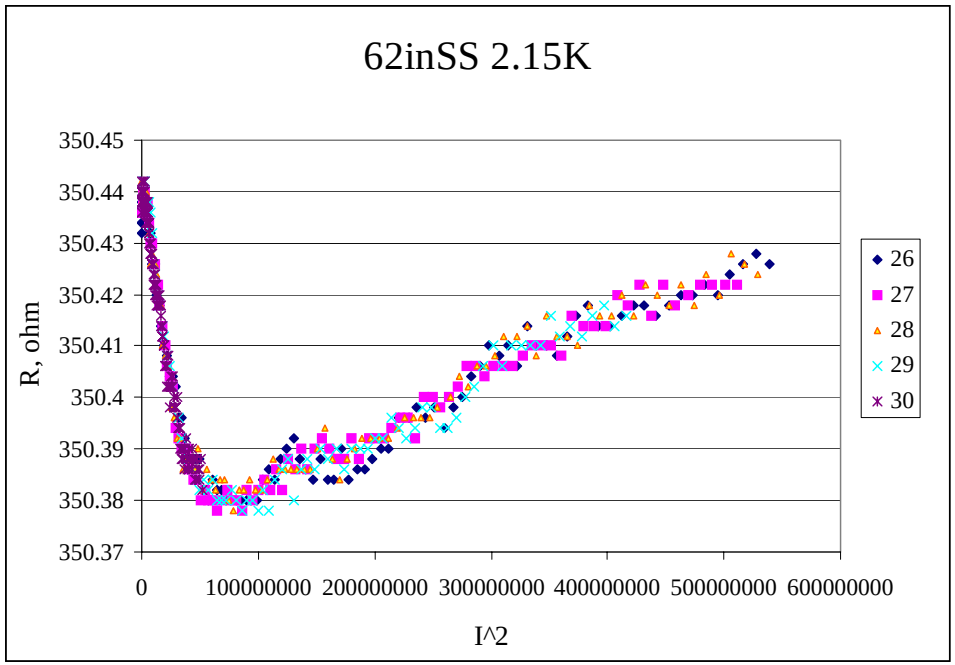

61inSS
V1_VoSGBmAc61InSSM_1, V
R, ohm
350.4
350.3
350.2
350.1
350
349.9
349.8
349.7
349.6
0
500
1000
1500
2000
2500
3000
3500
4000
4500
#

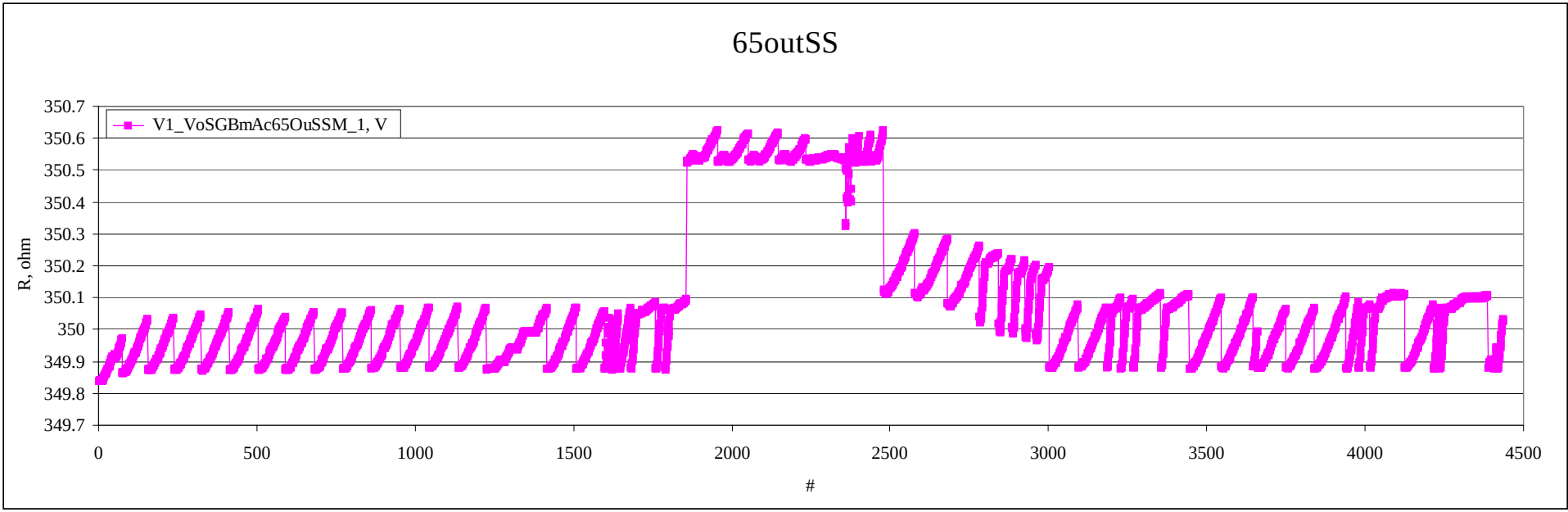

61inSS 4.45K
R, ohm
349.86
349.84
349.82
349.8
349.78
349.76
349.74
349.72
349.7
349.68
349.66
0
1E+08
2E+08
3E+08
4E+08
5E+08
6E+08
7E+08
I^2
49
1
62
2
3

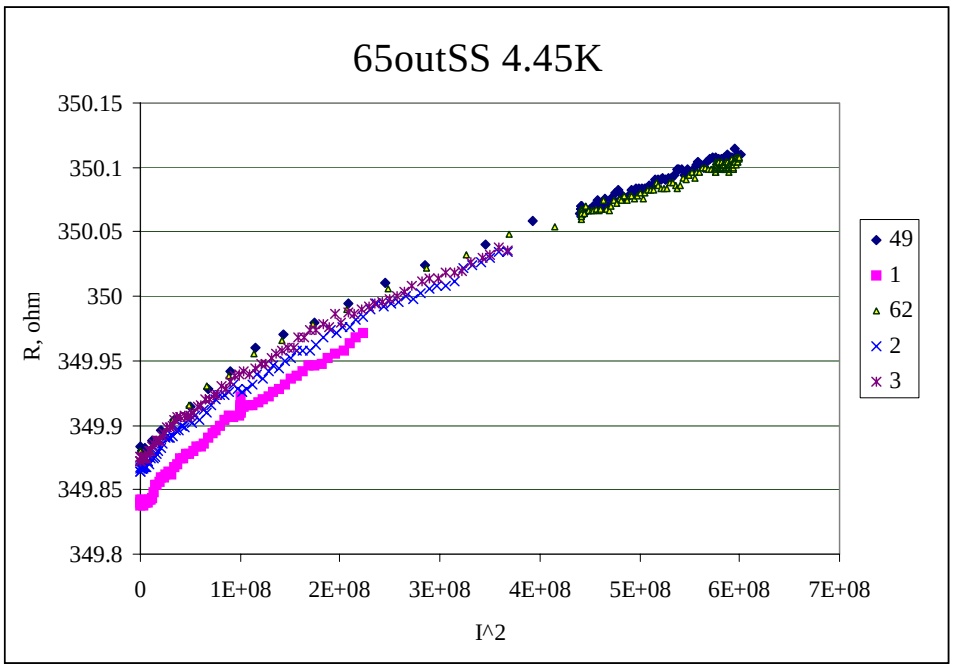

61inSS 2.15K
R, ohm
350.35
350.34
350.33
350.32
350.31
350.3
350.29
350.28
350.27
350.26
0
100000000
200000000
300000000
400000000
500000000
600000000
I^2
26
27
28
29
30

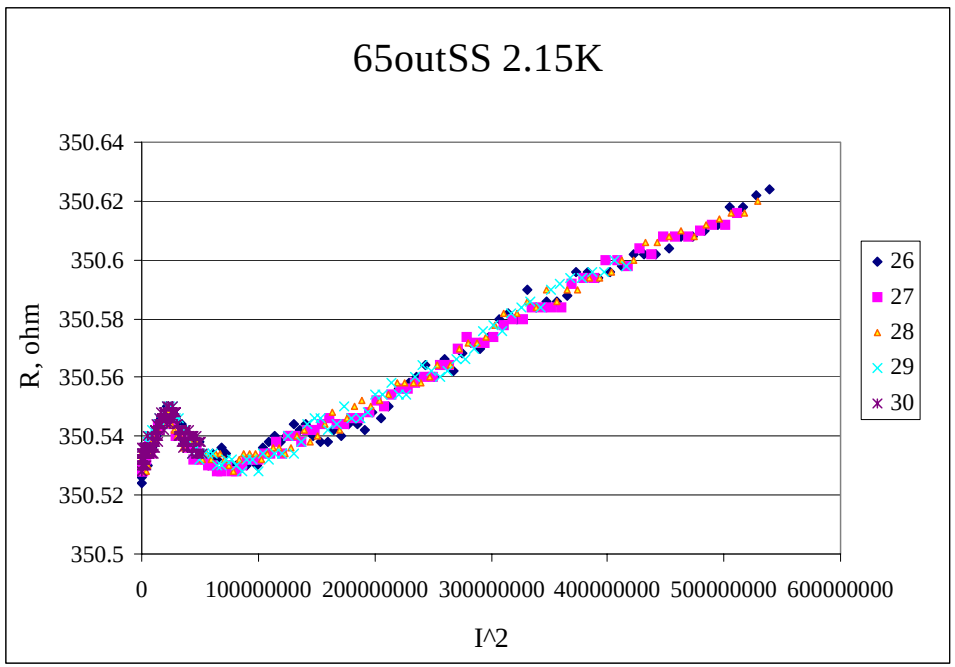

62inSS
V1_VoSGBmAc62InSSM_1, V
R, ohm
350.5
350.4
350.3
350.2
350.1
350
349.9
349.8
349.7
0
500
1000
1500
2000
2500
3000
3500
4000
4500
#

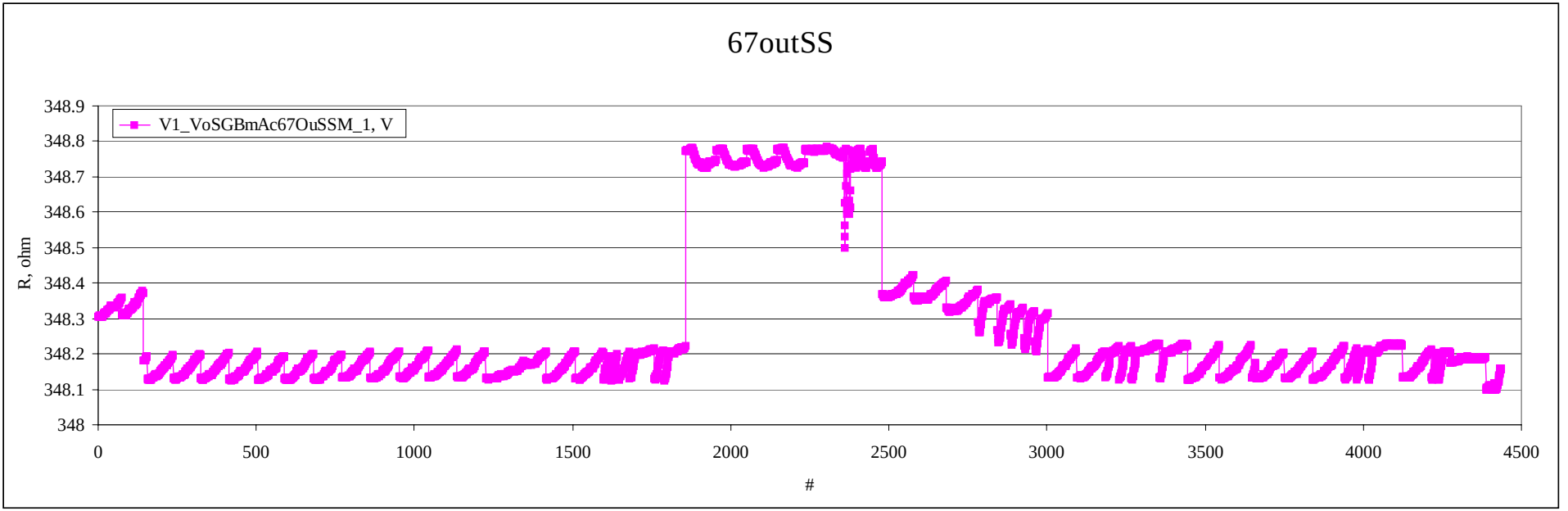

62inSS 4.45K
R, ohm
349.96
349.94
349.92
349.9
349.88
349.86
349.84
349.82
349.8
349.78
349.76
0
1E+08
2E+08
3E+08
4E+08
5E+08
6E+08
7E+08
I^2
4.4
49
1
62
2
3

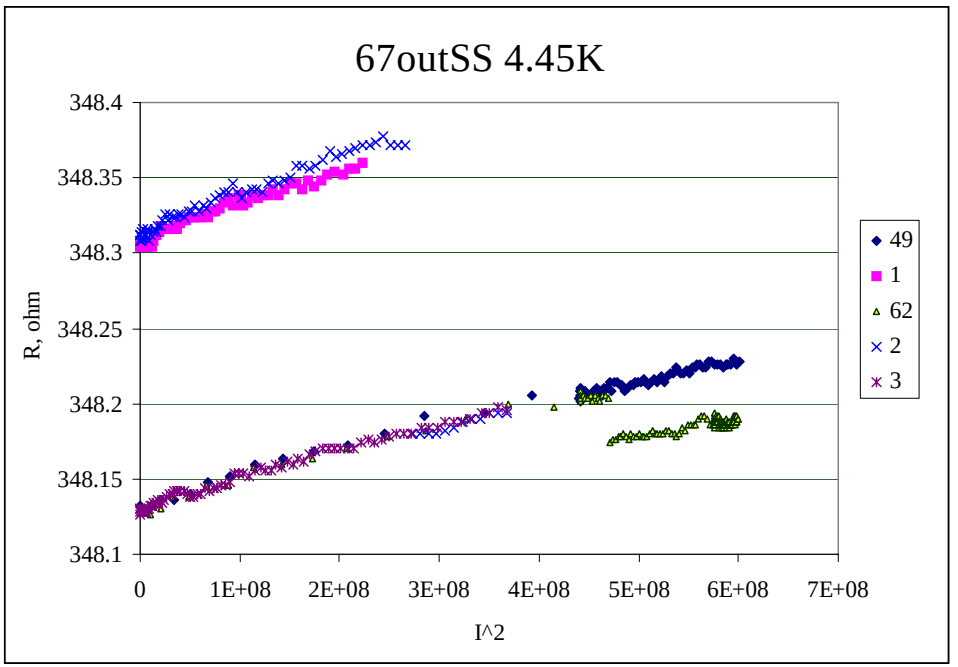

62inSS 2.15K
R, ohm
350.45
350.44
350.43
350.42
350.41
350.4
350.39
350.38
350.37
0
100000000
200000000
300000000
400000000
500000000
600000000
I^2
26
27
28
29
30

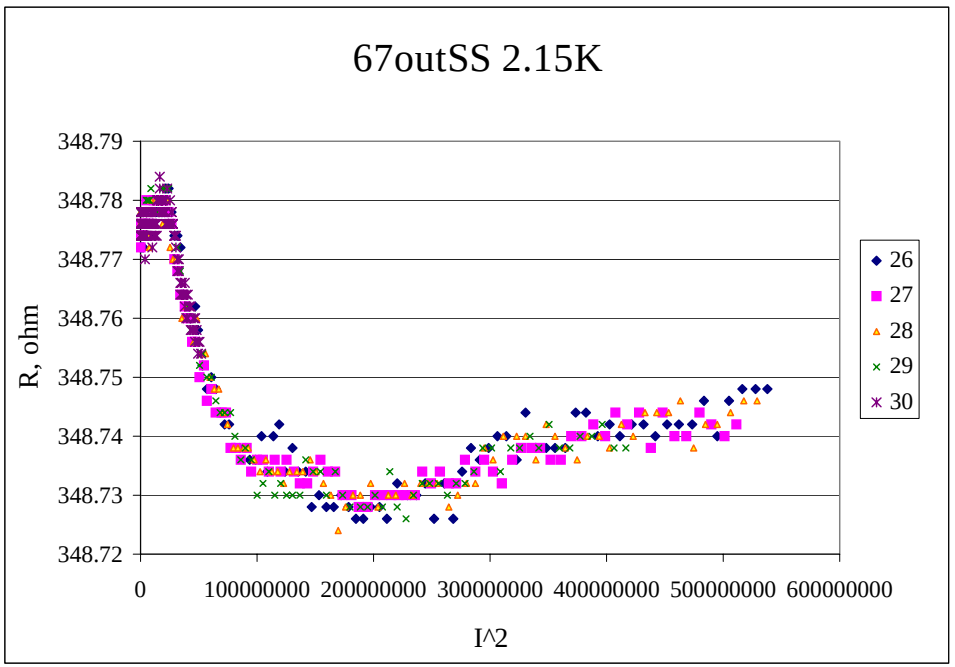

65outSS
V1_VoSGBmAc65OuSSM_1, V
R, ohm
350.7
350.6
350.5
350.4
350.3
350.2
350.1
350
349.9
349.8
349.7
0
500
1000
1500
2000
2500
3000
3500
4000
4500
#

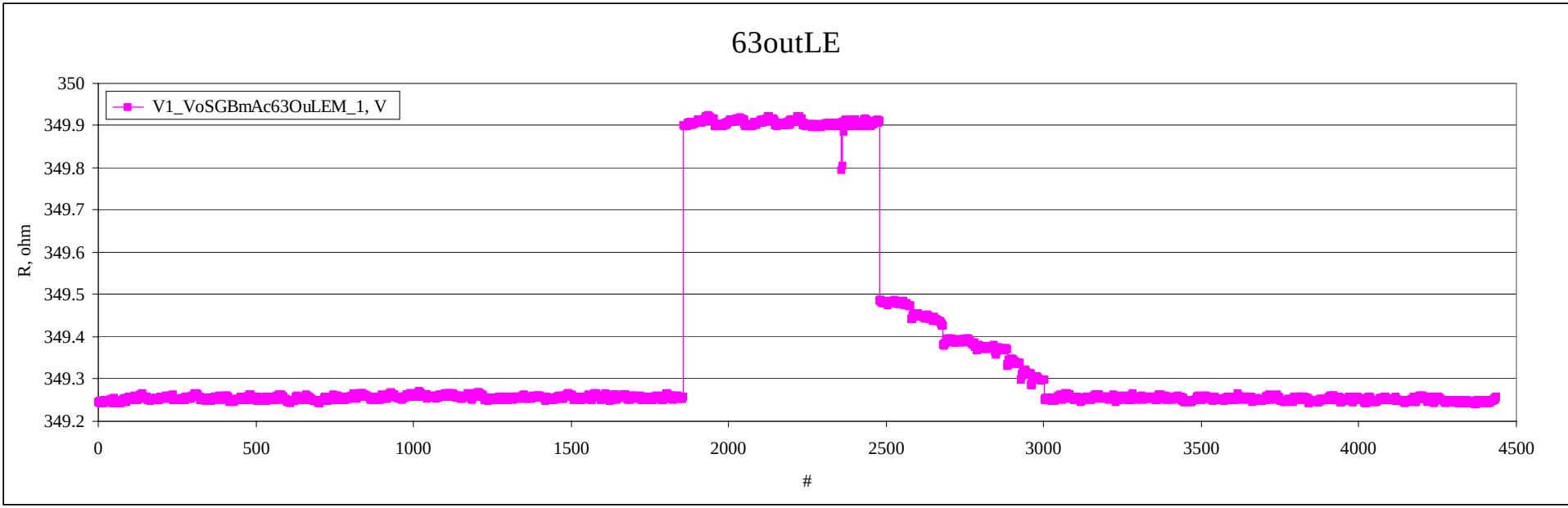

65outSS 4.45K
R, ohm
350.15
350.1
350.05
350
349.95
349.9
349.85
349.8
0
1E+08
2E+08
3E+08
4E+08
5E+08
6E+08
7E+08
I^2
49
1
62
2
3

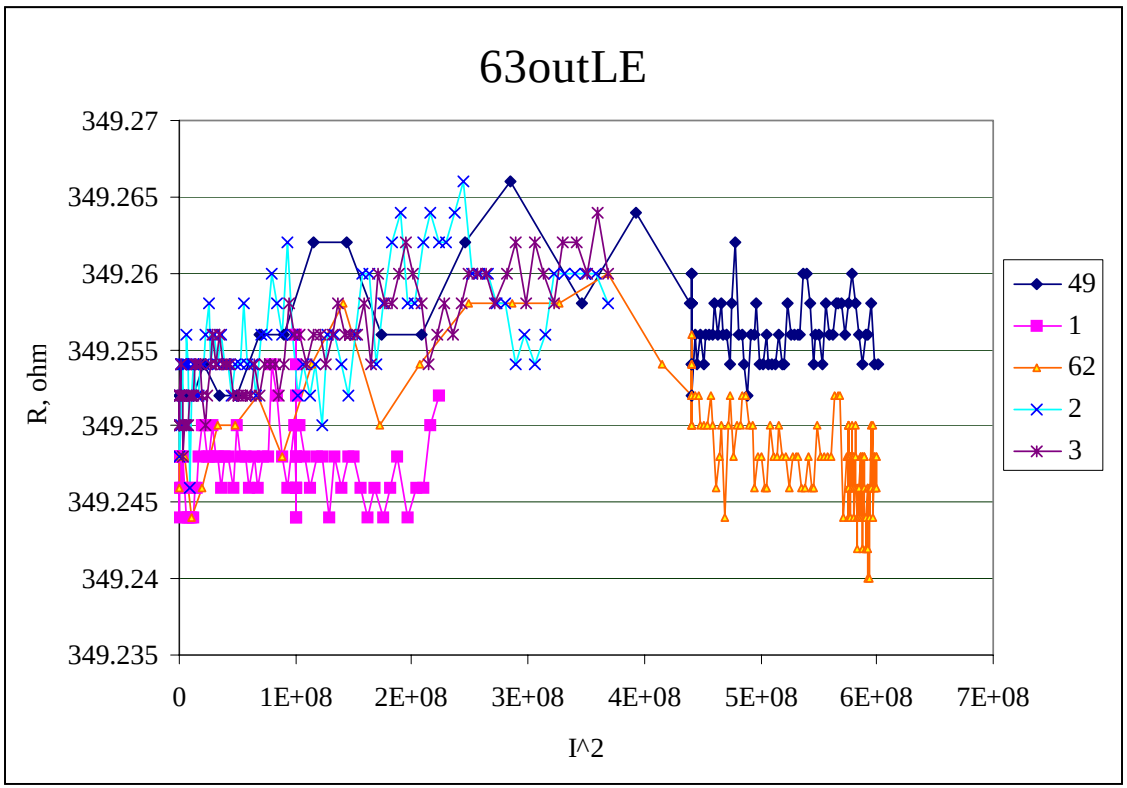

65outSS 2.15K
R, ohm
350.64
350.62
350.6
350.58
350.56
350.54
350.52
350.5
0
100000000
200000000
300000000
400000000
500000000
600000000
I^2
26
27
28
29
30

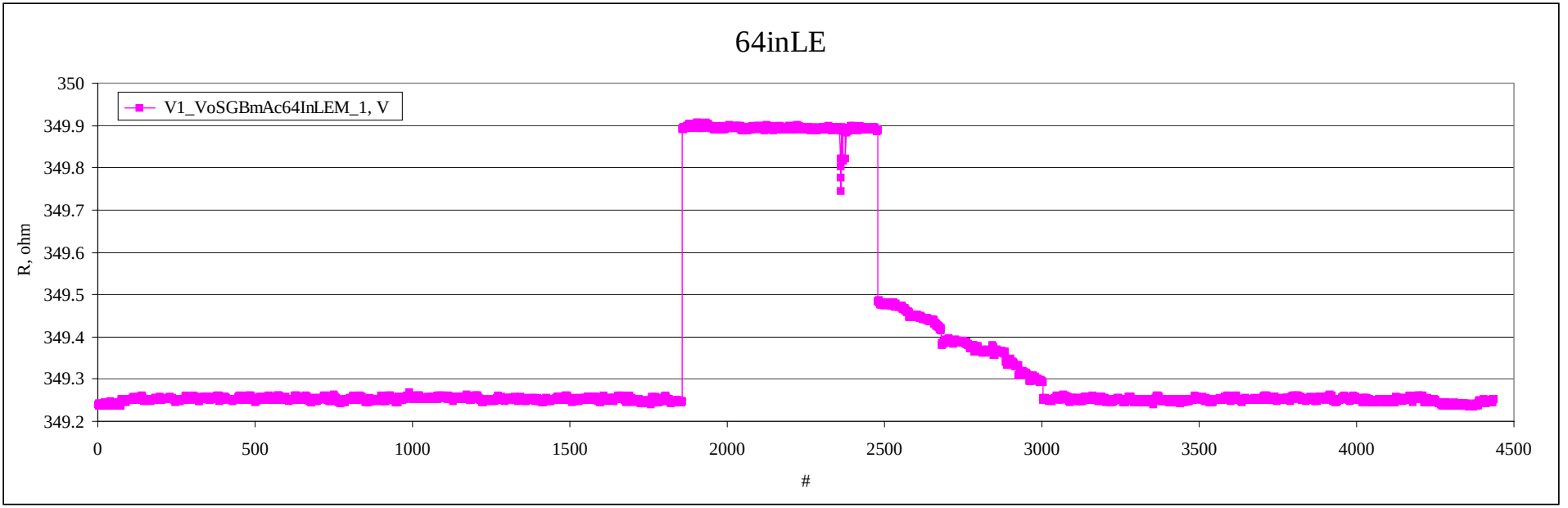

67outSS
V1_VoSGBmAc67OuSSM_1, V
R, ohm
348.9
348.8
348.7
348.6
348.5
348.4
348.3
348.2
348.1
348
0
500
1000
1500
2000
2500
3000
3500
4000
4500
#

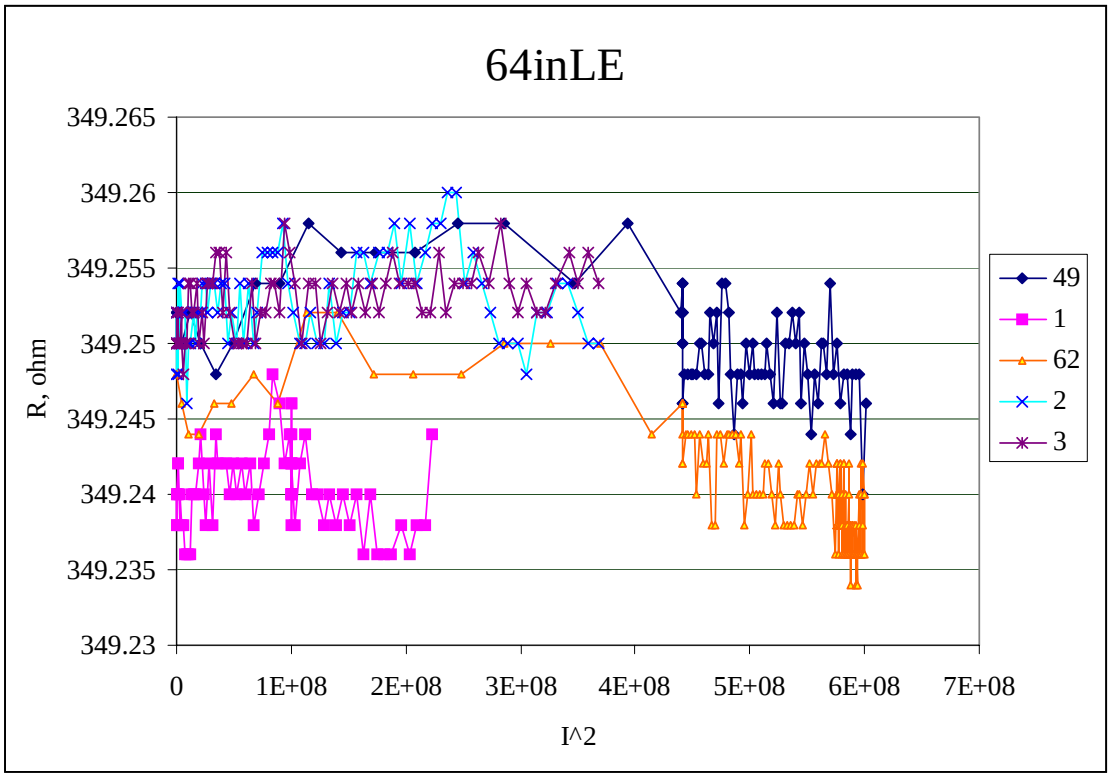

67outSS 4.45K
R, ohm
348.4
348.35
348.3
348.25
348.2
348.15
348.1
0
1E+08
2E+08
3E+08
4E+08
5E+08
6E+08
7E+08
I^2
49
1
62
2
3

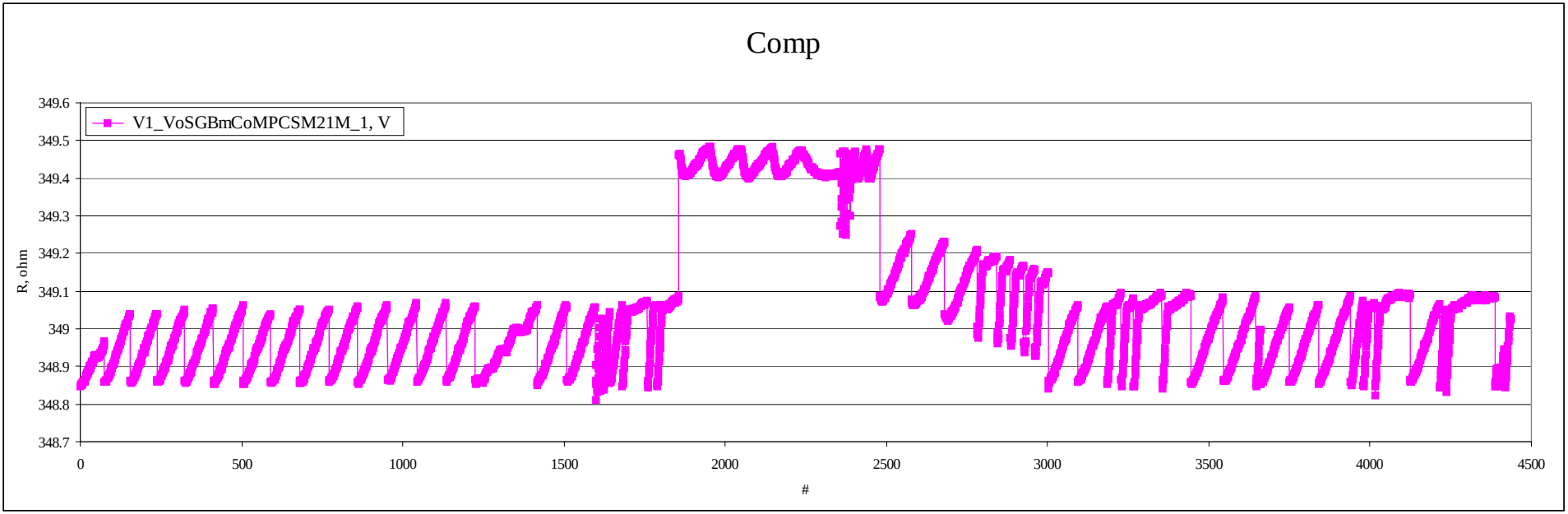

67outSS 2.15K
R, ohm
348.79
348.78
348.77
348.76
348.75
348.74
348.73
348.72
0
100000000
200000000
300000000
400000000
500000000
600000000
I^2
26
27
28
29
30

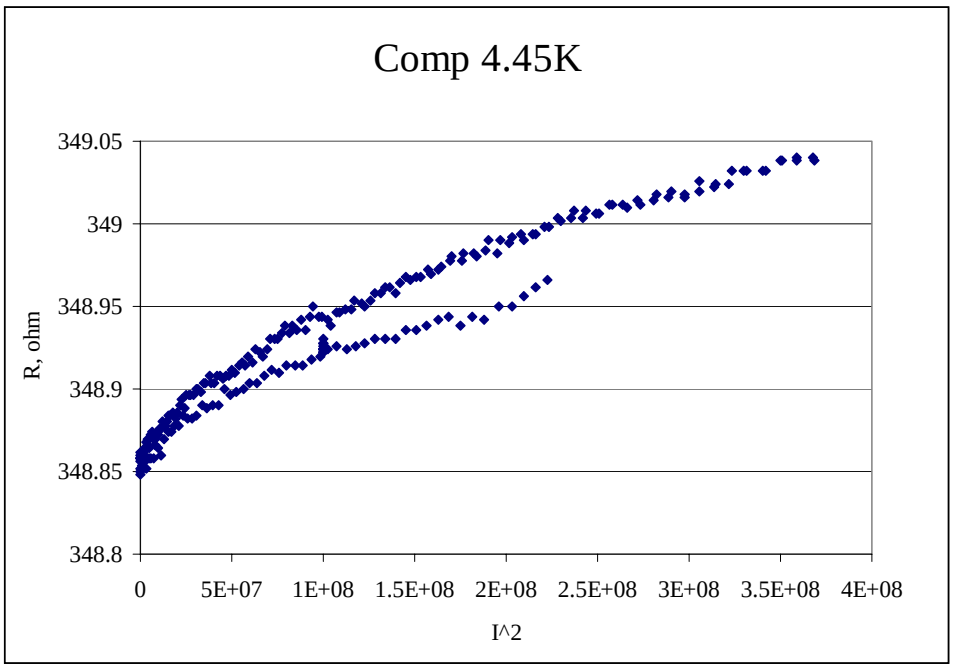

63outLE
V1_VoSGBmAc63OuLEM_1, V
R, ohm
350
349.9
349.8
349.7
349.6
349.5
349.4
349.3
349.2
0
500
1000
1500
2000
2500
3000
3500
4000
4500
#

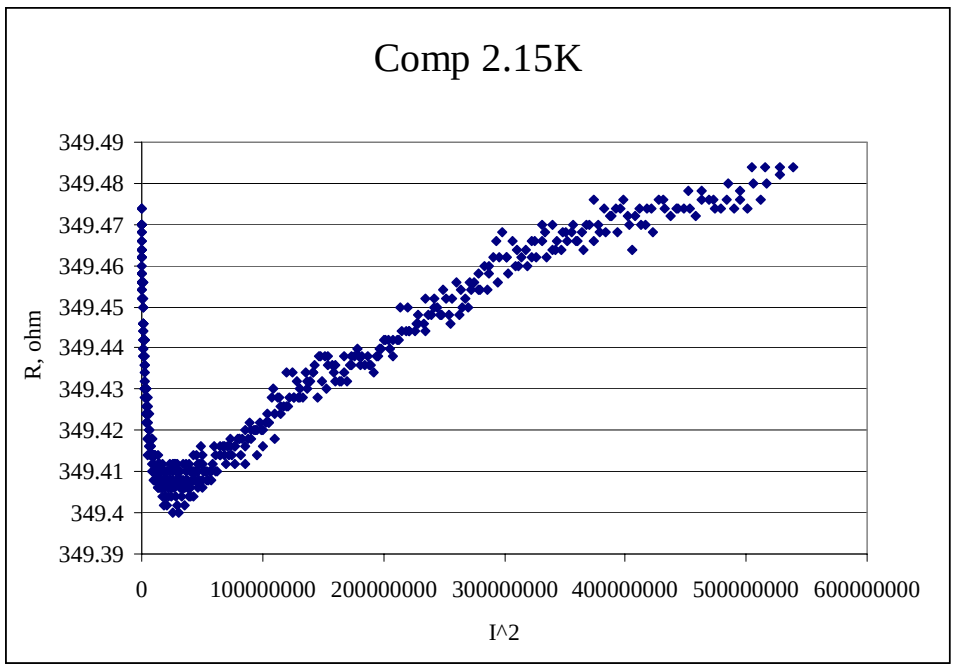

63outLE
R, ohm
349.27
349.265
349.26
349.255
349.25
349.245
349.24
349.235
0
1E+08
2E+08
3E+08
4E+08
5E+08
6E+08
7E+08
I^2
49
1
62
2
3


64inLE
V1_VoSGBmAc64InLEM_1, V
R, ohm
350
349.9
349.8
349.7
349.6
349.5
349.4
349.3
349.2
0
500
1000
1500
2000
2500
3000
3500
4000
4500
#


64inLE
R, ohm
349.265
349.26
349.255
349.25
349.245
349.24
349.235
349.23
0
1E+08
2E+08
3E+08
4E+08
5E+08
6E+08
7E+08
I^2
49
1
62
2
3


Comp
V1_VoSGBmCoMPCSM21M_1, V
R, ohm
349.6
349.5
349.4
349.3
349.2
349.1
349
348.9
348.8
348.7
0
500
1000
1500
2000
2500
3000
3500
4000
4500
#


Comp 4.45K
R, ohm
349.05
349
348.95
348.9
348.85
348.8
0
5E+07
1E+08
1.5E+08
2E+08
2.5E+08
3E+08
3.5E+08
4E+08
I^2


Comp 2.15K
R, ohm
349.49
349.48
349.47
349.46
349.45
349.44
349.43
349.42
349.41
349.4
349.39
0
100000000
200000000
300000000
400000000
500000000
600000000
I^2