

600 A circuits resistance measurements

Edward Nowak

Wrap-up of hardware commissioning 2011

8th of Mars 2001

MP3 Procedure - LHC-MPP-HCP-0003 ver. 3.0 #EDMS 874716

PCS: SPLICES VERIFICATION ($\pm I_{PCS}$)

This test is to verify the low-current integrity of the splices.

PNO.A3: BIPOLAR CYCLE

This test is to verify the correct functionality of magnet and Current Leads at nominal current level as well as the high-current integrity of the splices.

NOTA BENE:

This test must be analysed by MP3 with the PCS Analysis Tool in the PM Event Analyser, to automatically transfer data to MTF

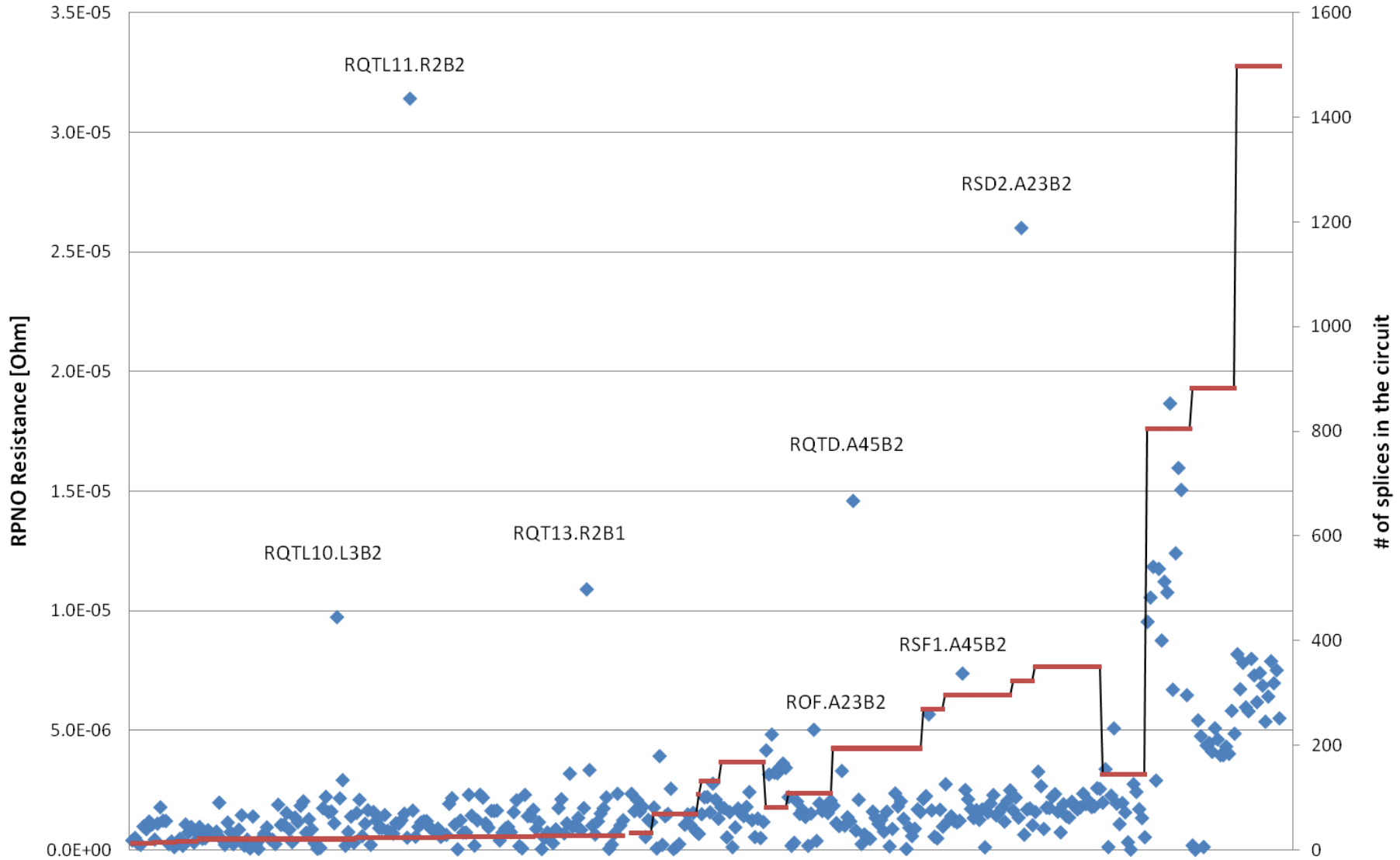
The screenshot shows the MTF Equipment Management Folder interface. At the top, there is a green header with the MTF logo and navigation links: Home, Help, EDMS Portal, News, Log. Below the header, there is a blue bar with the text 'Actions : Load criterium' and a search bar with options: Equipment, Location, Slot, System. The main content area is titled 'Create Slots Properties Report' and contains a numbered list of steps: 1 Select Part Number ... 2 Select Properties ... 3 Filter Slots ... 4 View Report. A dialog box titled 'Select Part Number' is open, prompting the user to 'Select the Part Number and Version of the slot you want to create the report for.' It includes a 'Search' button and two input fields: 'Profile Part Number' and 'Profile Description'. At the bottom of the dialog box, there are 'Cancel' and 'Continue >' buttons.

RC03 - Superconducting 600 A Without EE Circuit

RC06 - Superconducting 600 A With EE Circuit

RC17 - Superconducting 600 A Without EE With Crowbar Circuit

Resistance at nominal current measured during HC 2011



PCS Main v2.7.1.vi:1 (clone)

PCS Auto Pass ● Screen Capture Graph To File Table To text File HELP OFF BACK

ev_110212-052232.720_RPMBU.UJ33.RQTL10.L3B2
 ev_110212-060414.720_RPMBU.UJ33.RQTL10.L3B2

DB selector Voltage
 Inlog U_RES

Shift START Time Event (minutes) Shift END Time Event (minutes)
 100 20 Set Time Shift Default Scale

L_MEAS U_RES

Slot Folder: Properties

Slot Identifier: RQTL10.L3B2
 Other Identifier: None
 Description: Superconducting 600 A With Crowbar Circuit

Group	Object	Property	Value	Comment
PND.a3	Infos	Date	2011-02-12	
		Time	05:22:32	
		Circuit	RQTL10.L3B2	
		Description	Dispersion suppressor trim	
		Description	quadrupole circuit, next to Q10	
		Magnets in Circuit	1	
		Magnets type	MQTLI	
		Splices Number	13	
I_45	V45		392.837E-6 V	
	I45		45 A	
	SIGMA_45		1.68E-3 V	[x] <5.00E-3
	# spikes pts removed		0	
I_400	V400		121.13E-6 V	
	I400		400 A	
	SIGMA_400		1.40E-3 V	[x] <5.00E-3
	# spikes pts removed		0	
I_-45	V-45		-482.922E-6 V	
	I-45		-45 A	
	SIGMA_-45		1.62E-3 V	[x] <5.00E-3
	# spikes pts removed		0	
I_-400	V-400		-933.378E-6 V	
	I-400		-400 A	
	SIGMA_-400		1.42E-3 V	[x] <5.00E-3
	# spikes pts removed		0	
R_CIRCUIT	R±45		9.731E-6 Ohms	
	R±400		1.318E-6 Ohms	
	R±45/N		748.51E-9 Ohms	[x] <200.00E-9
	R±400/N		101.40E-9 Ohms	[x] <200.00E-9
	R±400-R±45/N		-647.12E-9 Ohms	x <100.00E-9
OFFSET DRIFT	OFFSET DRIFT		873.482E-6 V	
	R±45/N Spurious		1.493E-6 Ohms	
	R±400/N Spurious		167.977E-9 Ohms	
	R±45/N Spurious %		199.5 %	
	R±400/N Spurious %		166.7 %	

SIGN and NCR

MP3 Workshop 08/03/2011, Edward Nowak, TE/MPE-EI

Slot Identifier: RQTL10.L3B2
 Other Identifier: None
 Description: Superconducting 600 A With Crowbar Circuit

Property	Nominal Value	Value	Unit
ERR_IQPS			A
I_EARTH_PCC	0.001739502		A
I_EARTH_PCS_NEG	0.0017089843		A
I_EARTH_PCS_POS	0.0016479492		A
I_ERR_PCC	0.10079193		A
I_ERR_PCS_NEG	0.0010375977		A
I_ERR_PCS_POS	0.0020446777		A
PM_CROWBAR_PCC_NEG	ev_091003-103328.280_RPMBU.UJ33.RQTL1...		
PM_CROWBAR_PCC_POS	ev_091003-103328.275_RQTL10.L3B2		
PM_CYCLE_PCS_NEG	ev_091004-093251.200_RPMBU.UJ33.RQTL1...		
PM_CYCLE_PCS_POS	ev_090630-103714.220_RPMBU.UJ33.RQTL1...		
PM_STARTUP_PCC	ev_091003-102524.160_RPMBU.UJ33.RQTL1...		
RMID	4.607E-06		ohm
RPCS	1.553E-06		ohm
RPNO	9.731E-06		ohm
TEST_PROCEDURE_VERSION			
VMID-	-0.000182335		V
VMID+	0.0005548		V

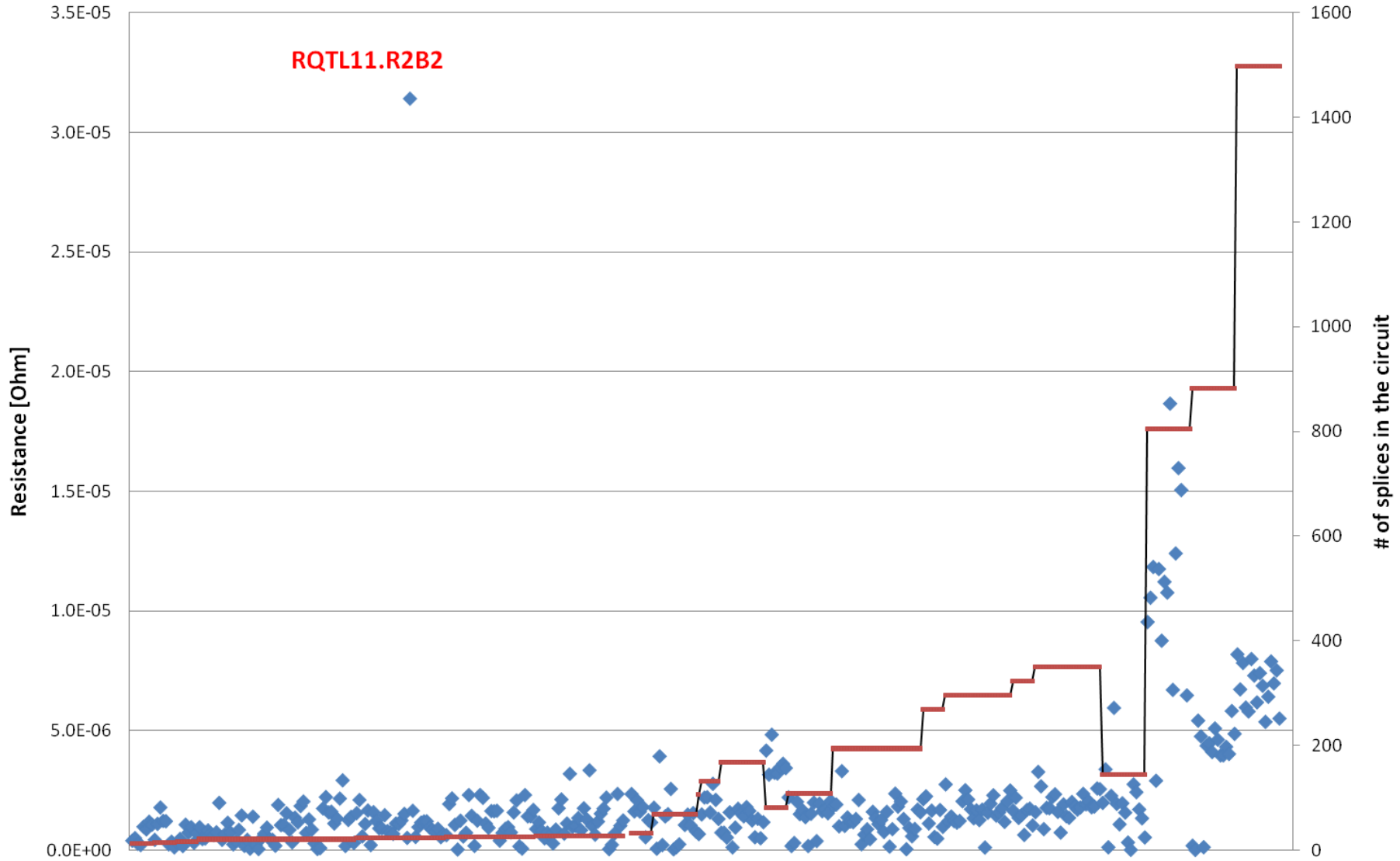
RPNO
 9.731E-06
 Ohm



R±45
 9.731E-06
 Ohm

Should be : RPNO = R± = 1.318E-06 Ohm

Resistance at nominal current measured during HC 2011



PCS Main v2.7.1.vi:1 (clone)

PCS Auto Pass ● Screen Capture Graph To File Table To text File HELP OFF BACK

ev_110212-052412.740_RPMBA.UA27.RQTL11.R2B2
 ev_110212-055844.720_RPMBA.UA27.RQTL11.R2B2

DB selector: lhclg Voltage: U_RES

Shift START Time Event (minutes): 100 Shift END Time Event (minutes): 0

L_MEAS U_RES Set Time Shift Default Scale

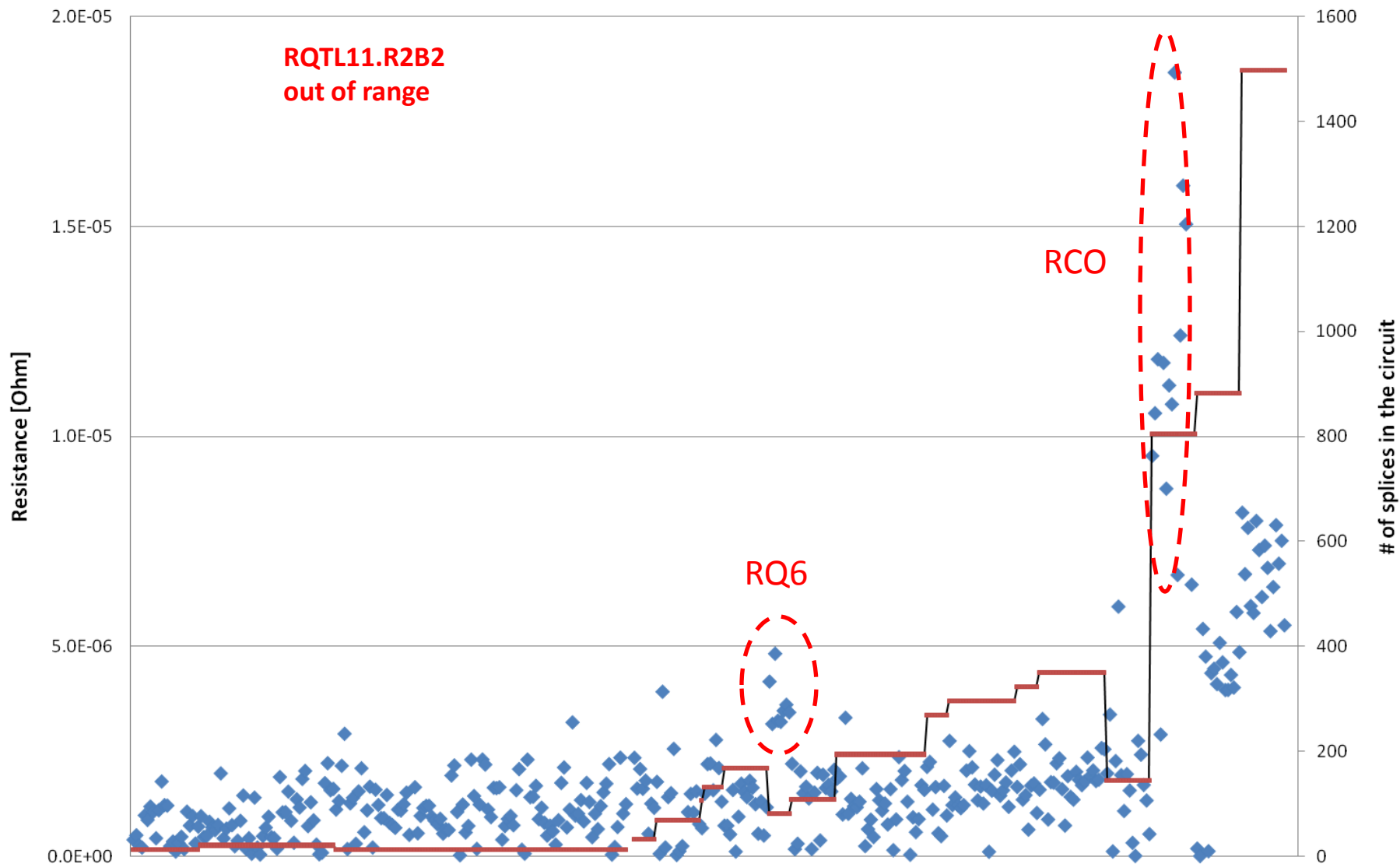
03/07/11 13:46:12 Loading data please wait...
 03/07/11 13:46:27 L_MEAS data loaded from: lhclg
 03/07/11 13:46:29 ev_110212-052412.740_RPMBA.UA27.RQTL11.R2B2 -> Loaded
 03/07/11 13:46:56 Loading data please wait...
 03/07/11 13:46:59 L_MEAS data loaded from: lhclg
 03/07/11 13:46:59 ev_110212-052412.740_RPMBA.UA27.RQTL11.R2B2 -> Loaded

Group	Object	Property	Value	Comment
PNO.a3	Infos	Date	2011-02-12	
		Time	05:24:12	
		Circuit	RQTL11.R2B2	
		Description	Dispersion suppressor trim	
		Description	quadrupole circuit, next to Q11	
		Magnets in Circuit	1	
		Magnets type	MQTL1	
		Splices Number	13	
L_45		V45	-646.915E-6 V	
		I45	45 A	
		SIGMA_45	1.15E-3 V	x <5.00E-3
		# spikes pts removed	0	
L_350		V350	-0.01087 V	
		I350	349.996 A	
		SIGMA_350	1.06E-3 V	x <5.00E-3
		# spikes pts removed	0	
L_-45		V-45	1.264E-3 V	
		I-45	-45 A	
		SIGMA_-45	0.86E-3 V	x <5.00E-3
		# spikes pts removed	0	
L_-350		V-350	0.01112 V	
		I-350	-349.996 A	
		SIGMA_-350	1.00E-3 V	x <5.00E-3
		# spikes pts removed	0	
R_CIRCUIT		R±45	21.228E-6 Ohms	
		R±350	31.41E-6 Ohms	
		R±45/N	1.63E-6 Ohms	x <0.20E-6
		R±350/N	2.42E-6 Ohms	x <0.20E-6
		R±350-R±45/N	783.23E-9 Ohms	x <100.00E-9
OFFSET DRIFT		OFFSET DRIFT	209.979E-6 V	
		R±45/N Spurious	358.938E-9 Ohms	
		R±350/N Spurious	46.15E-9 Ohms	
		R±45/N Spurious %	22.0 %	
		R±350/N Spurious %	1.0 %	

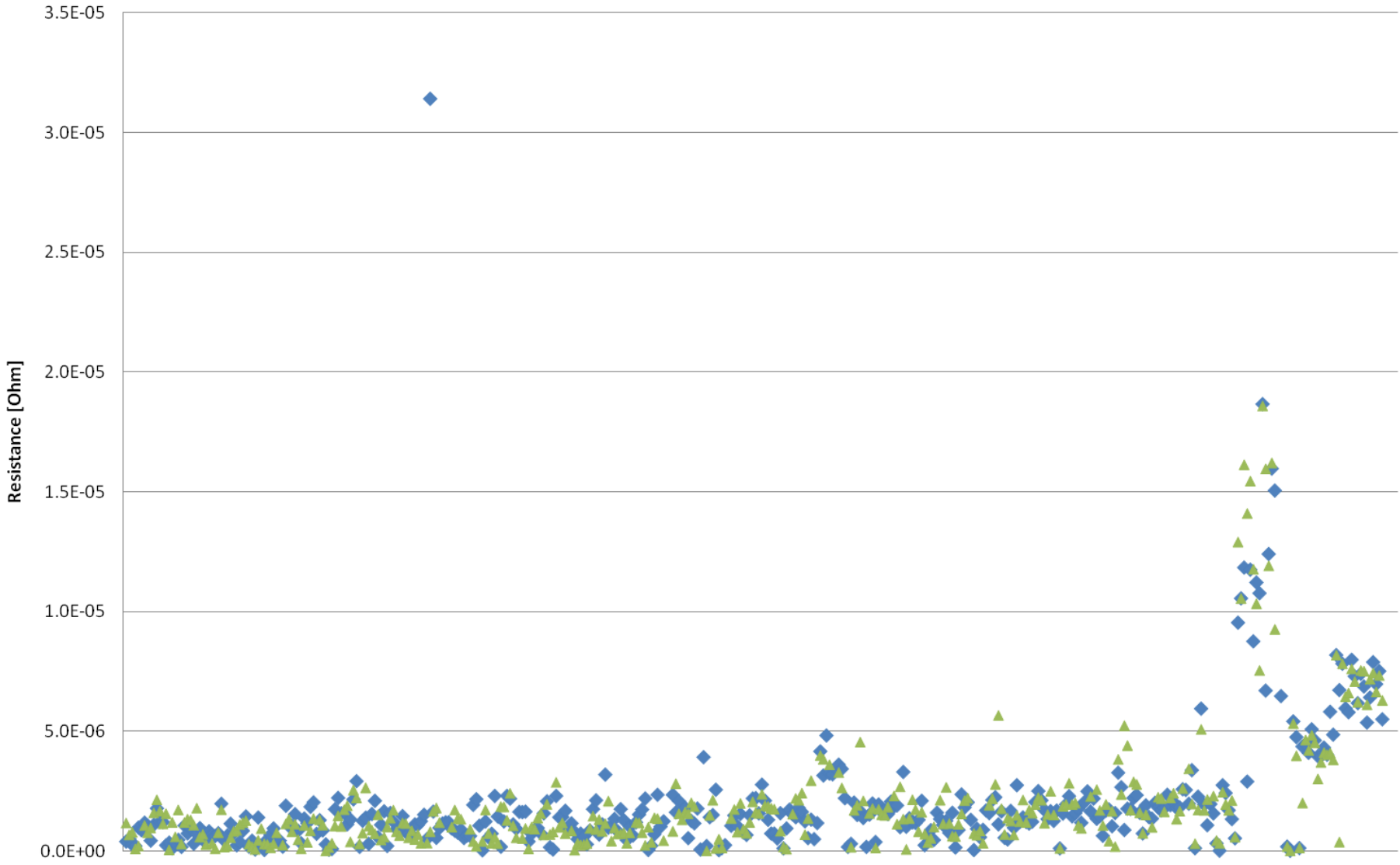
SIGN and NCR

R±45 21.228E-06 Ohm < R±350 31.41E-06 Ohm Test passed ☹

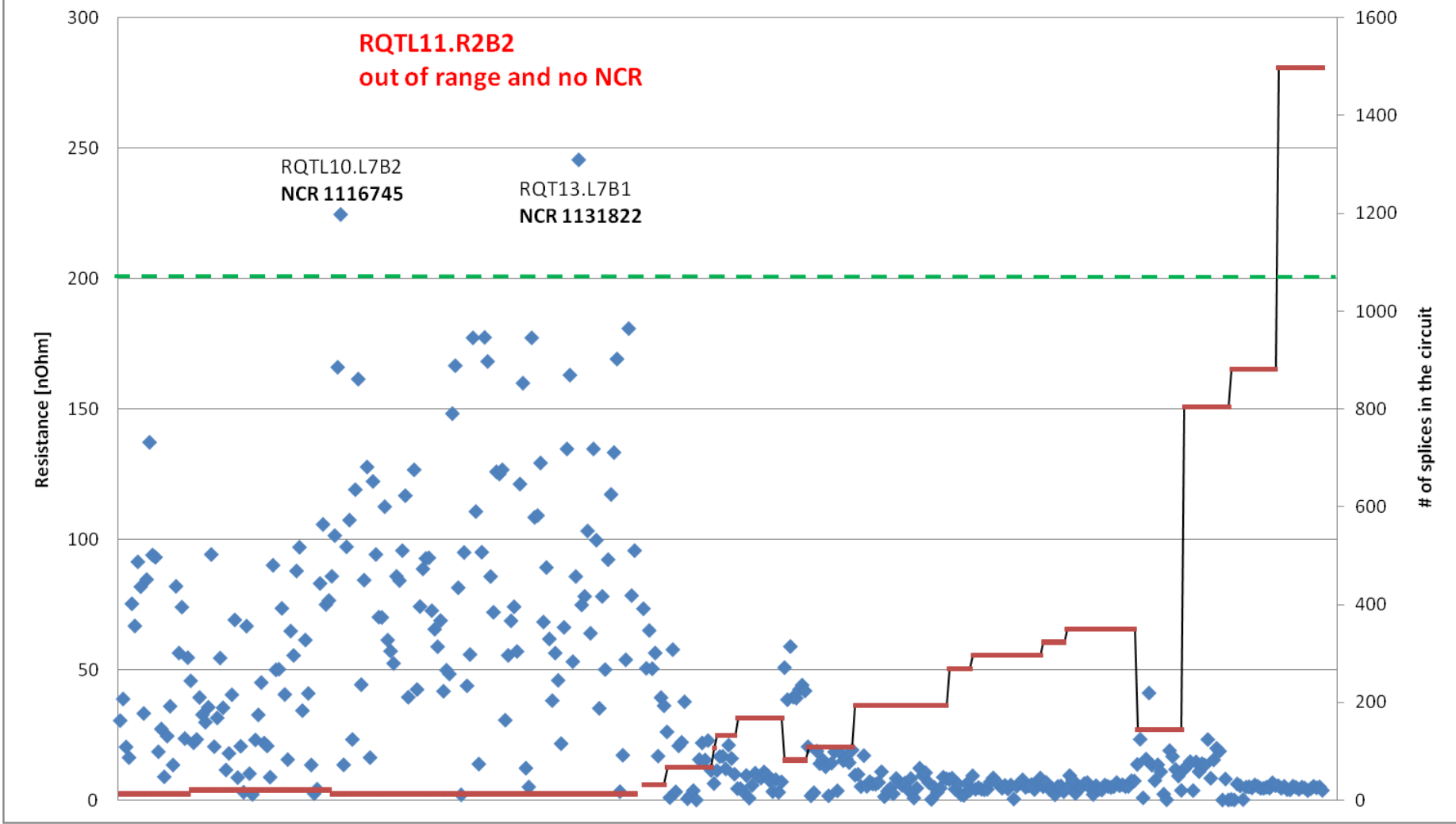
Resistance at nominal current measured during HC 2011



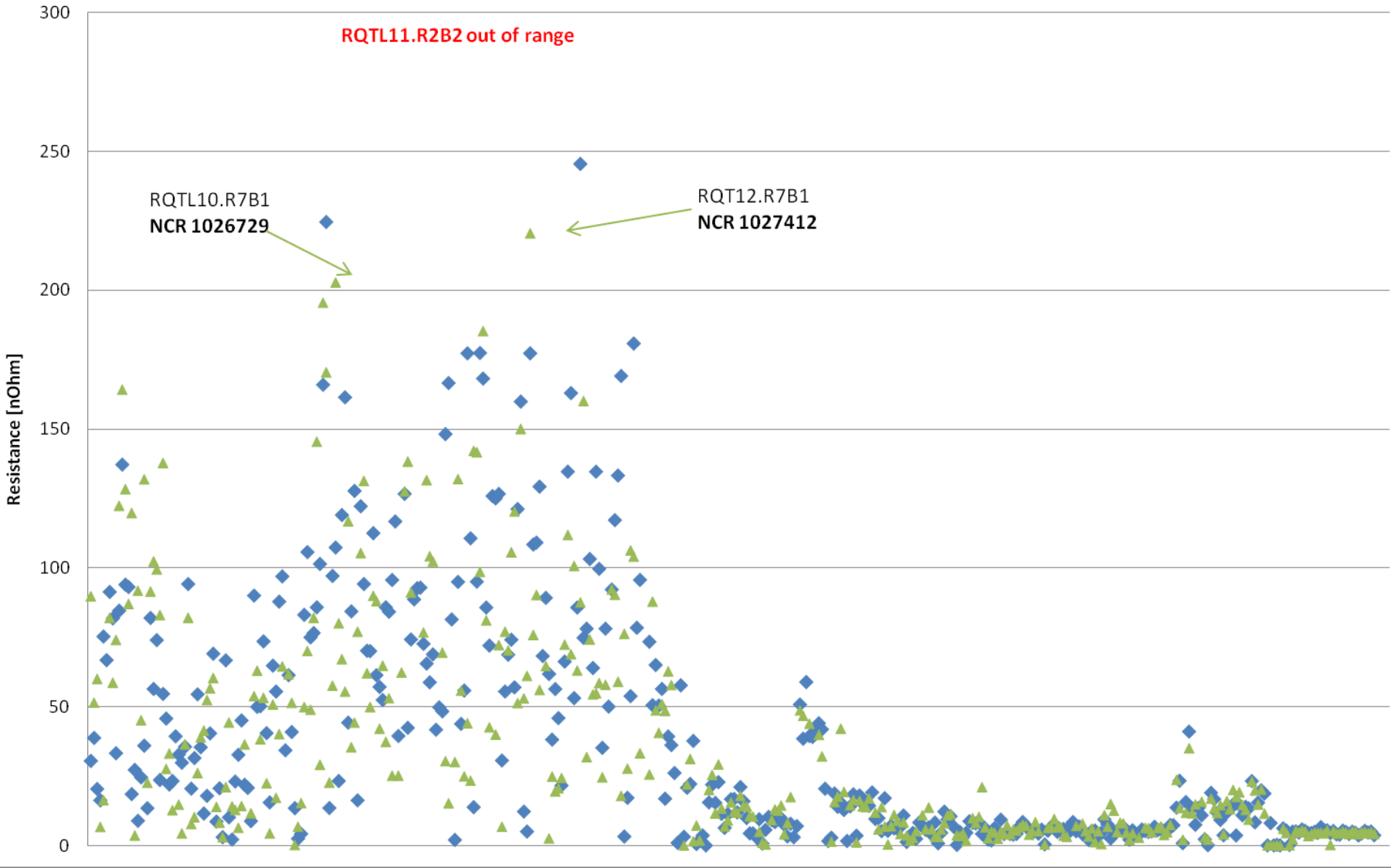
Resistance at nominal current measured during HC 2011 and 2009

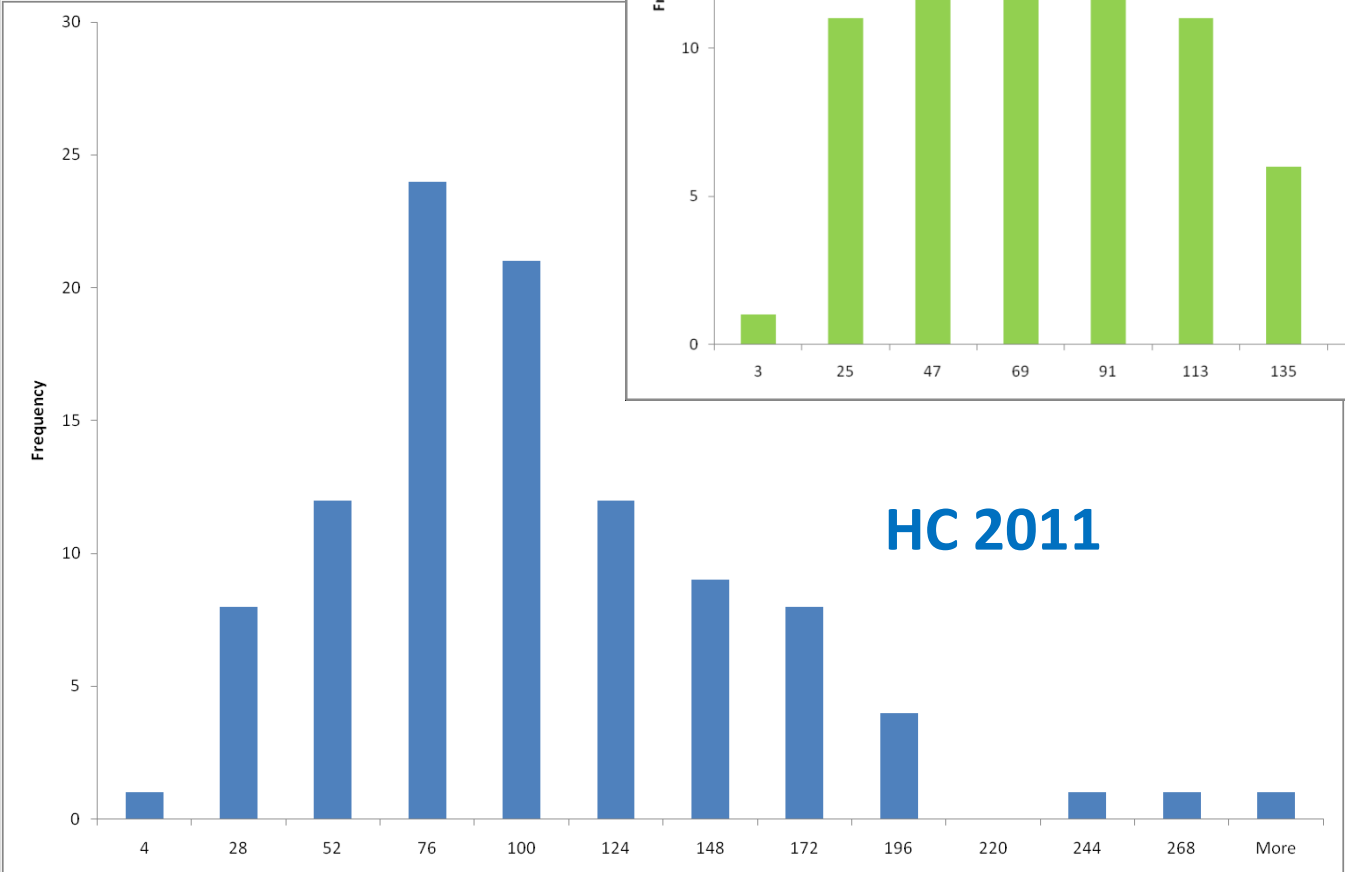
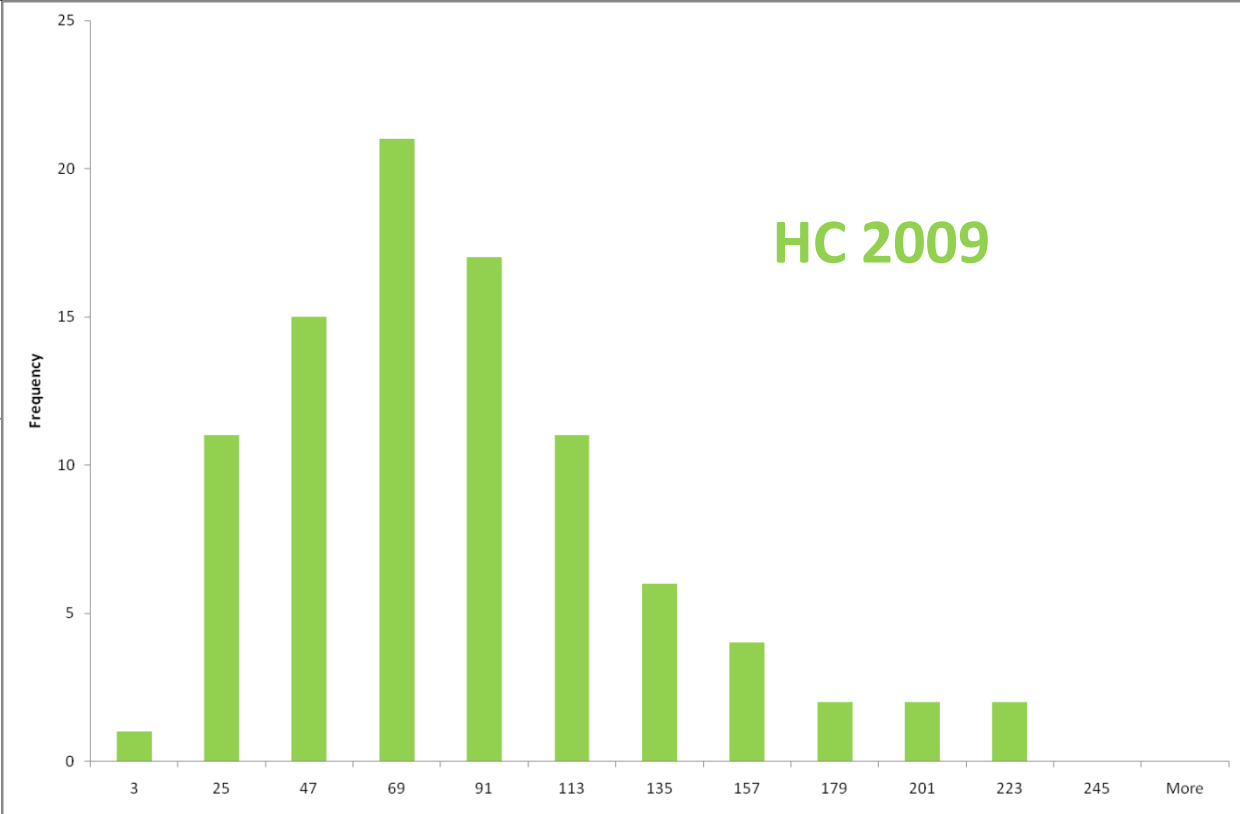


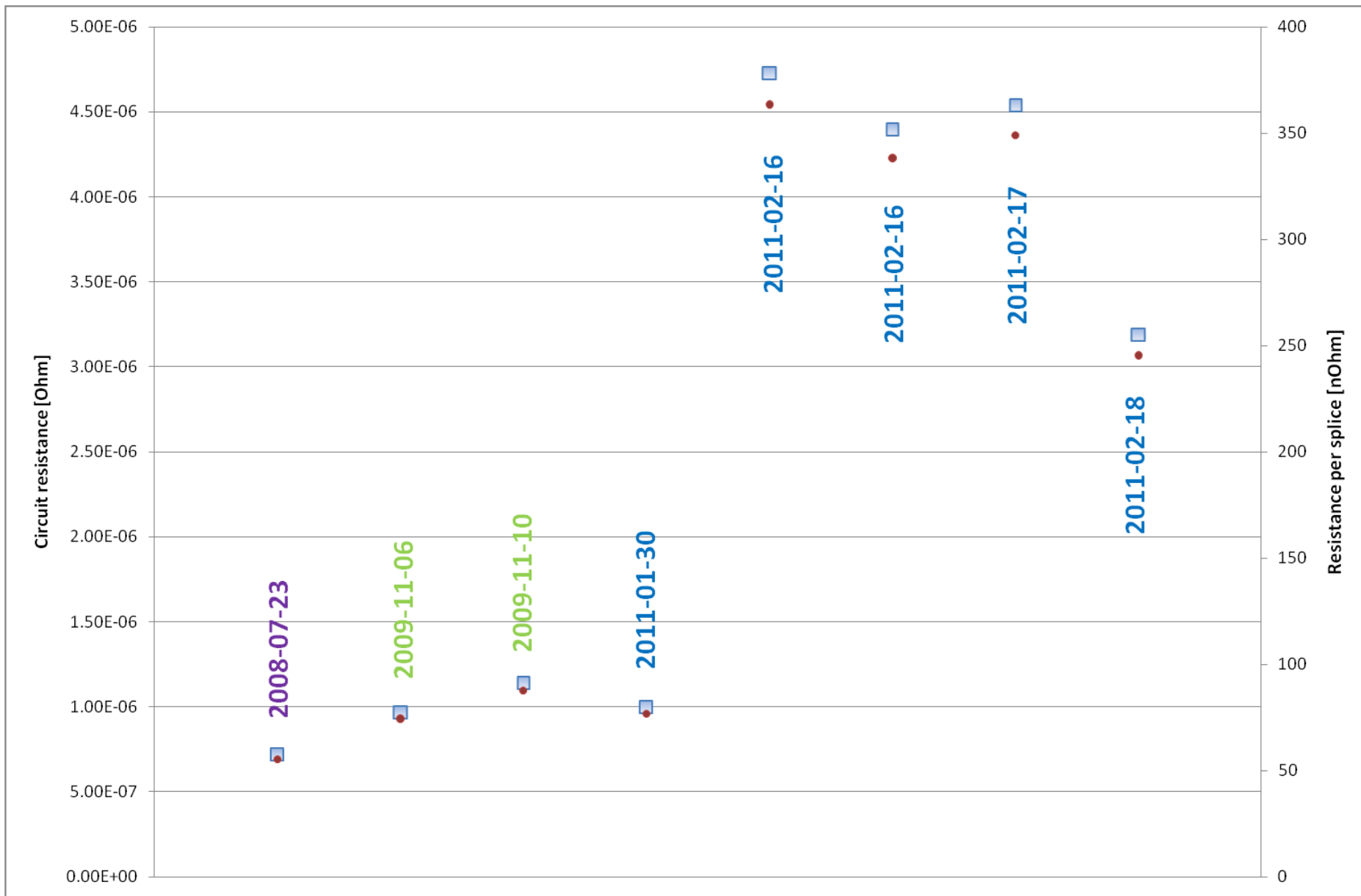
Average resistance per splice HC 2011



Resistance per splice at nominal current measured during HC 2011 and 2009







- Transfer data from PCS application to MTF
 - Operator mistake
 - Application bug (PCS or MTF)
- Re-measure a resistance of **RQTL11.R2B2** circuit
- Do we really know how many and what kind of splices is in measured 600A circuit?
- Does PCS application take proper number of splices?

THANK YOU

600 A circuits resistance measurements

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8th of Mars 2001

Difference of resistance at nominal current measured during HC 2011 and 2009

