Tests 4 March 2010

Objective: understand quenching of magnets after power converter off during ramps and electromagnetic transients across magnet string

Tests and analysis performed by MP3, QPS and HCC

- Lots of test have been done, still to be analysed

- FPA from 2kA for all sectors done – being analysed
- There are 3 different methods to stop a converter: PC Fault, PC off and PC Idle
  - produces different transient

- Sector 12: QPS triggered quench for one magnet from the oQPS from 2kA
  - first quench, then EE
- Sector 45: QPS triggered quenches for two magnets from the oQPS from 2kA
  - first EE, then quench
- Sector 23: QPS triggered quenches for 2 magnets when decreasing the current by 10A/s and then provoking a PC Fault at 4000A
  - first, global bus bar opened switches, then quench
  - in such case (down ramp) the sunglasses would not work

sector 34 quenches

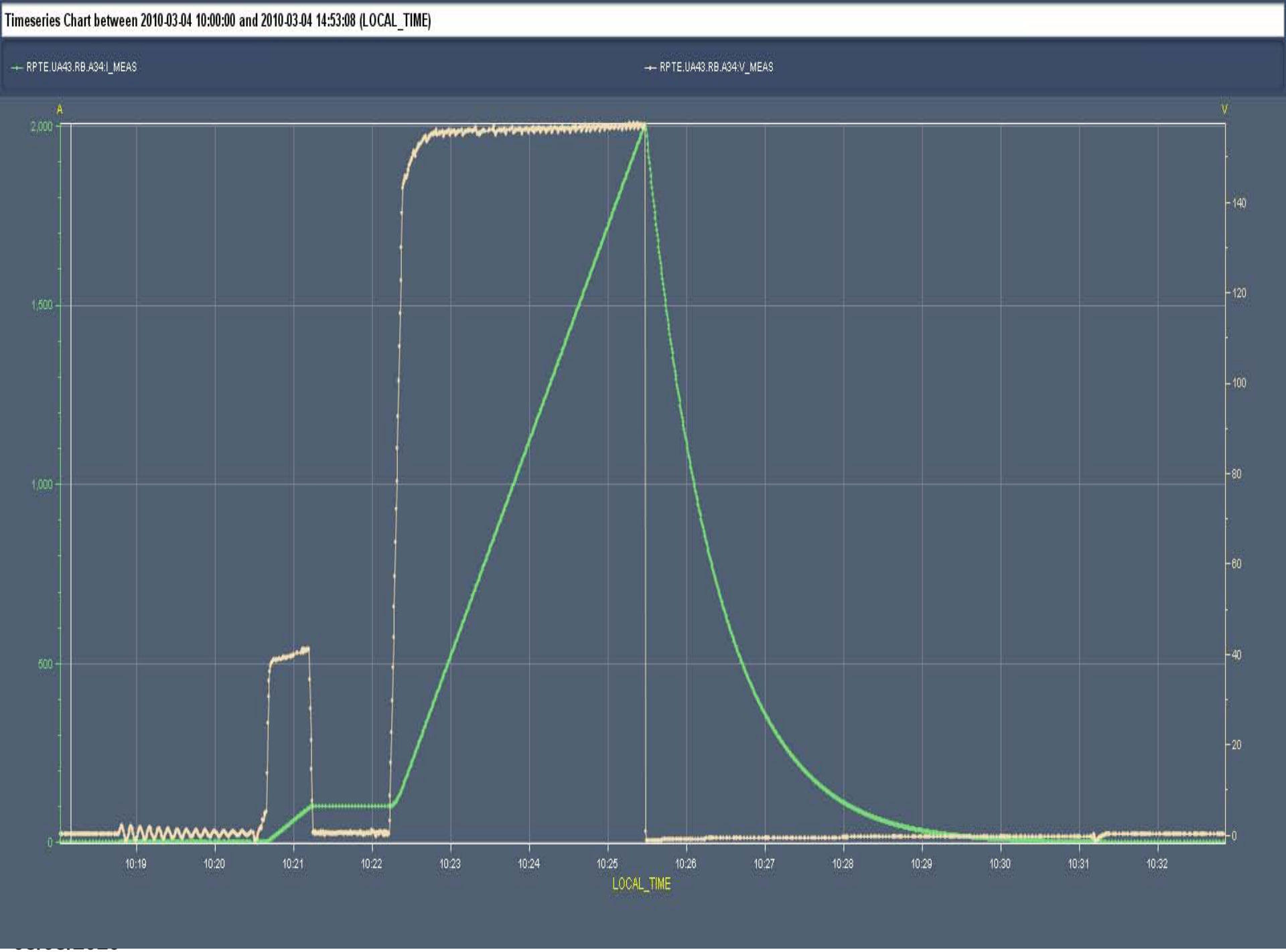
- Sector 34, test 1: PC Fault provokes the opening of switches, no quench

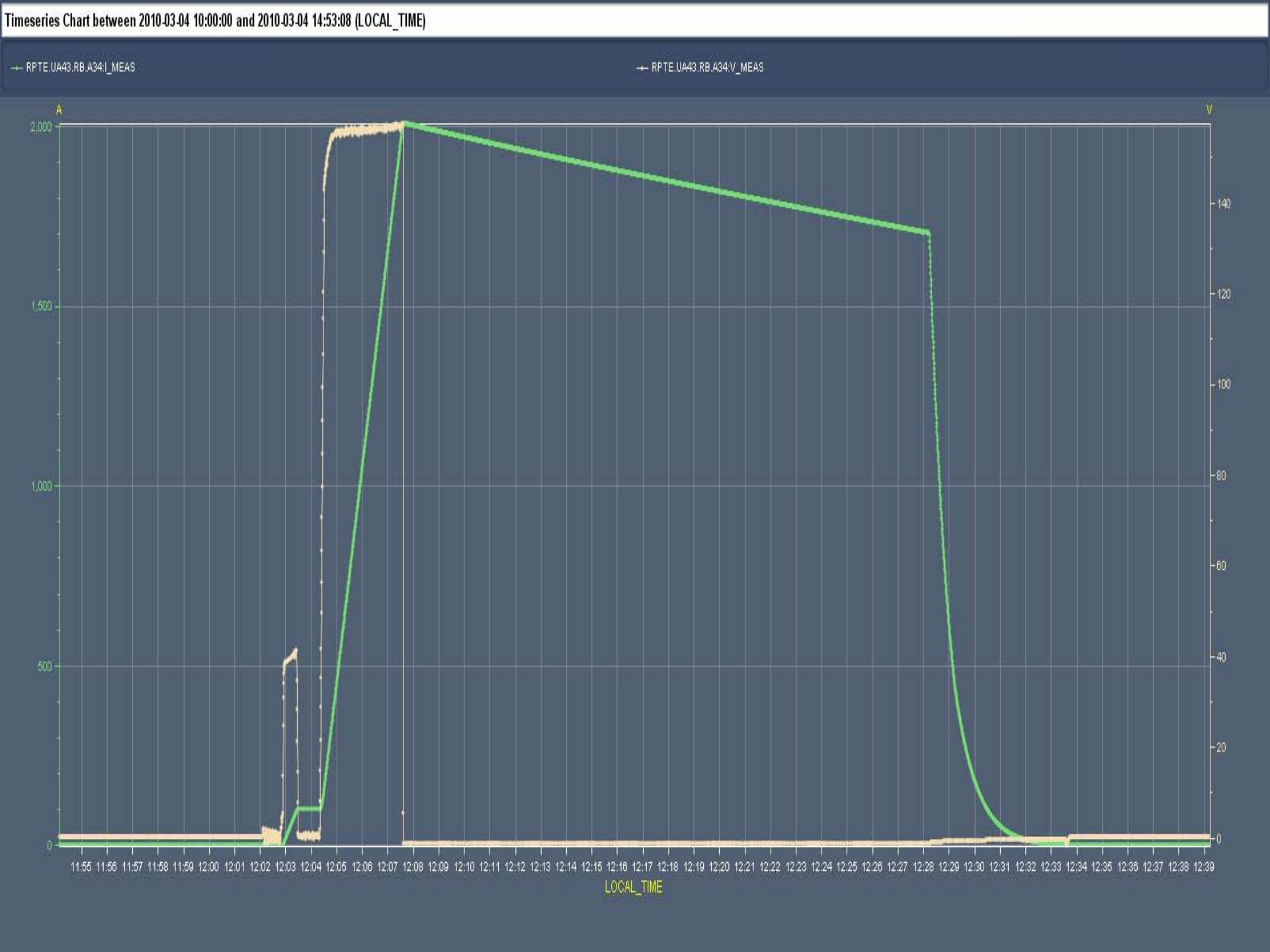
- Sector 34: test 2: PC Fault, no opening of switches, opened by operator later – nQPS triggered quenches for 14 magnets at 1.7kA
  - first PC off, no EE, then later switch opened, then quenches

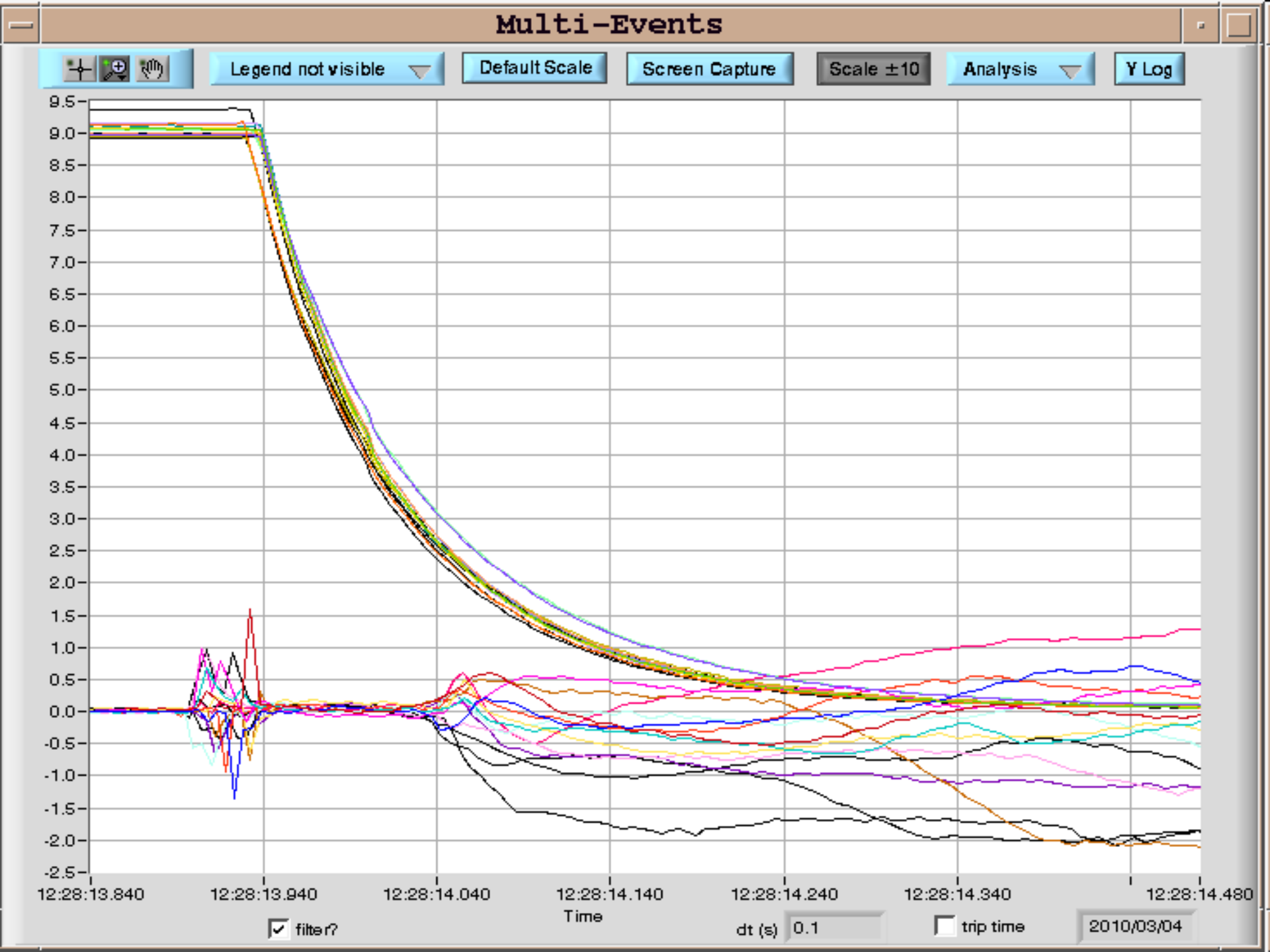
- Should not happen since threshold in nQPS should have been high
- Indications that threshold in the nQPS was not high (1.8V), but only 200mV, being investigated

- Switching off the power converters creates **electromagnetic transients across magnet string** that can trigger the QPS (old and new)
- For the nQPS (Qsym), a threshold of 200mV will not allow efficient operation

- **Meeting this afternoon to discuss the results and further strategy**


Timeseries Chart between 2010-03-04 10:00:00 and 2010-03-04 14:53:08 (LOCAL_TIME)
RPTE.UA43.RB.A34:I_MEAS
RPTE.UA43.RB.A34:V_MEAS
A
V
2,000
1,500
1,000
500
0
140
120
100
80
60
40
20
0
10:19
10:20
10:21
10:22
10:23
10:24
10:25
10:26
10:27
10:28
10:29
10:30
10:31
10:32
LOCAL_TIME

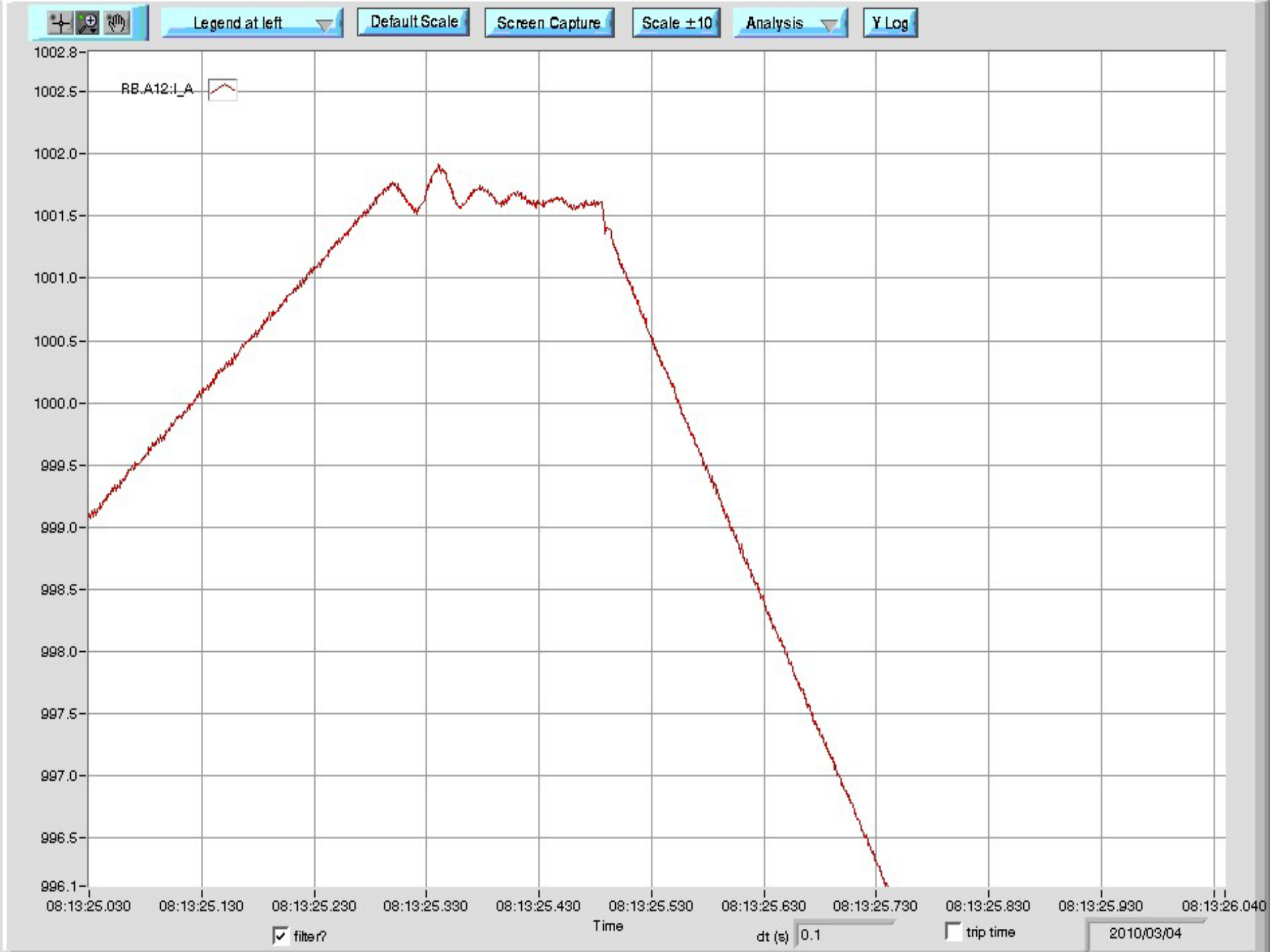

Timeseries Chart between 2010-03-04 10:00:00 and 2010-03-04 14:53:08 (LOCAL_TIME)
RPTE.UA43.RB.A34:I_MEAS
RPTE.UA43.RB.A34:V_MEAS
A
V
2,000
1,500
1,000
500
0
140
120
100
80
60
40
20
0
11:55 11:56 11:57 11:58 11:59 12:00 12:01 12:02 12:03 12:04 12:05 12:06 12:07 12:08 12:09 12:10 12:11 12:12 12:13 12:14 12:15 12:16 12:17 12:18 12:19 12:20 12:21 12:22 12:23 12:24 12:25 12:26 12:27 12:28 12:29 12:30 12:31 12:32 12:33 12:34 12:35 12:36 12:37 12:38 12:39
LOCAL_TIME


Multi-Events
Legend not visible
Default Scale
Screen Capture
Scale ±10
Analysis
Y Log
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
12:28:13.840
12:28:13.940
12:28:14.040
12:28:14.140
12:28:14.240
12:28:14.340
12:28:14.480
Time
filter?
dt (s)
0.1
trip time
2010/03/04

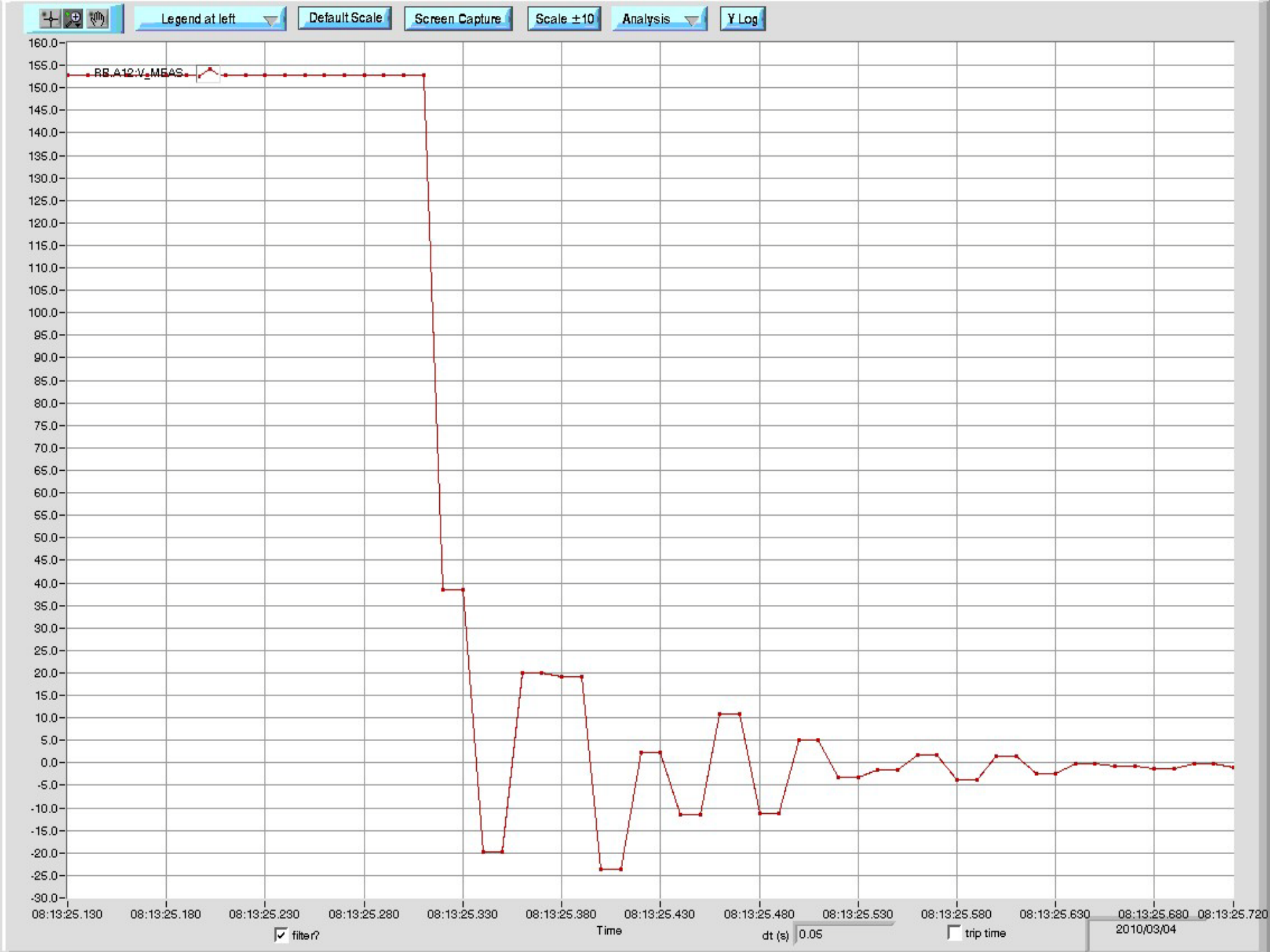
Tests 4 March 2010

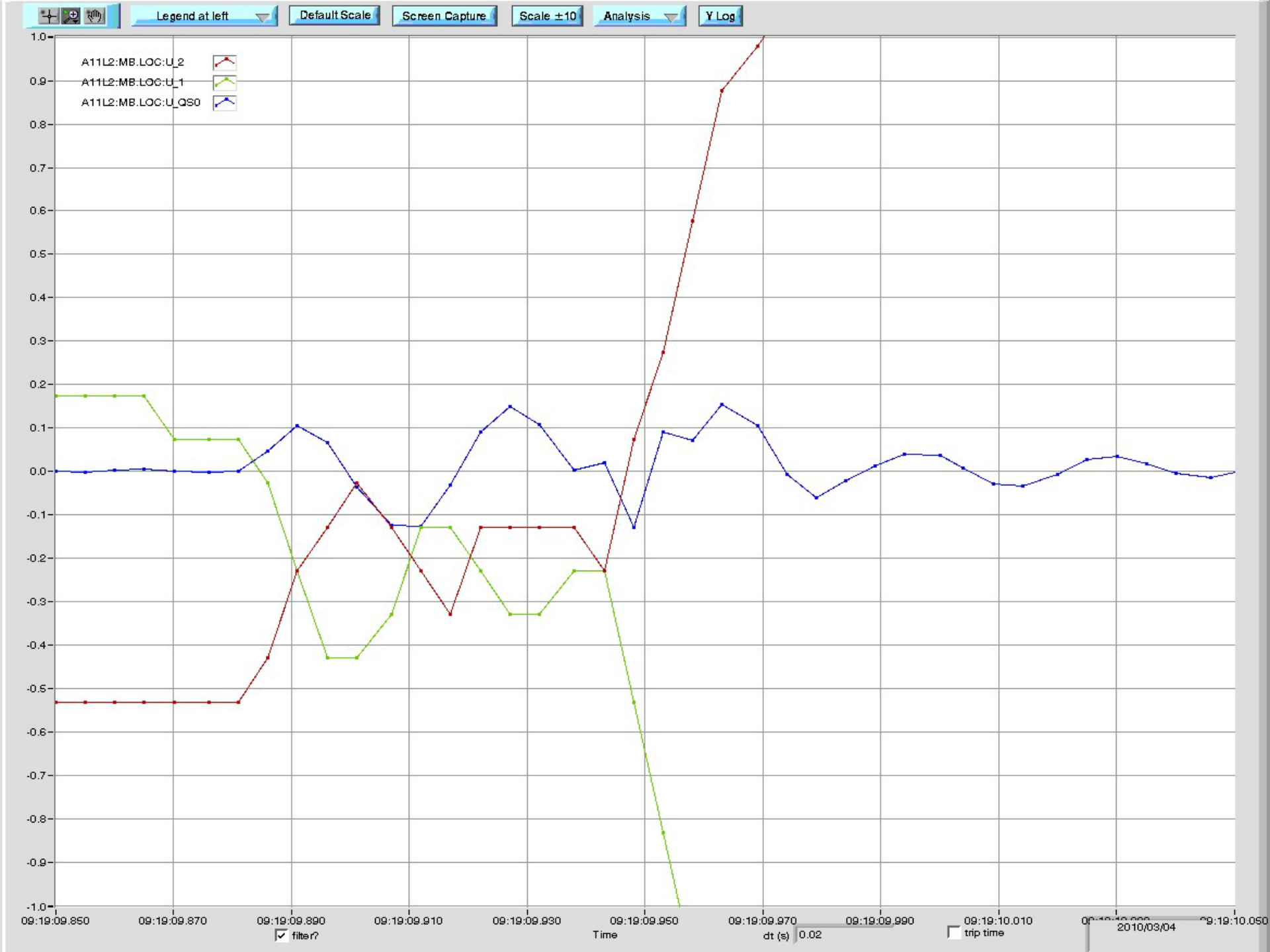
Objective: understand quenching of magnets after power converter off during the ramp and electromagnetic waves across magnet string

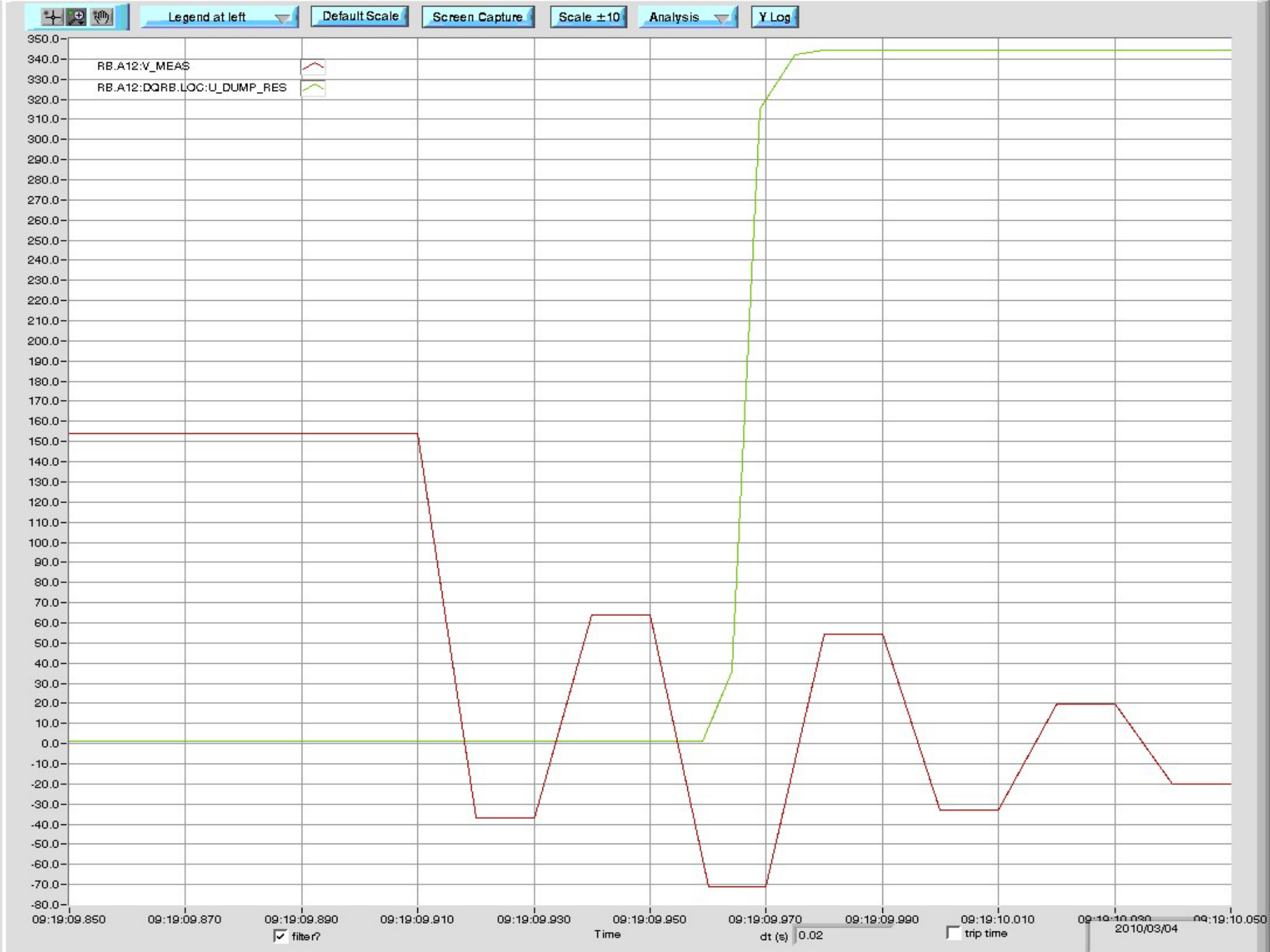
- FPA from 2kA for all sectors done
- There are 3 different methods to stop a converter: PC Fault, PC off and PC Idle
  - Idle seem to be softer, tbc
- PC Fault done at 2kA for several sectors (data to be analysed)
- Sector 12: quench of one magnet from the oQPS from 2kA
  - first quench, then EE
- Sector 45: quench of two magnets from the oQPS from 2kA
  - first EE, then quench
- Sector 23: quench of 2 magnets when decreasing the current by 10A/s and then provoking a PC Fault at 4000A
  - first, global bus bar opened switches, then quench
  - in such case (down ramp) the sunglasses would not work
- Sector 34, test 1: PC Fault provokes the opening of the switches in one case, in another case it did not open the switches
- Sector 34: test 2: opening of the switches – 14 magnets quenched from nQPS at 1.7kA
  - first PC off, no EE, then later switch opened

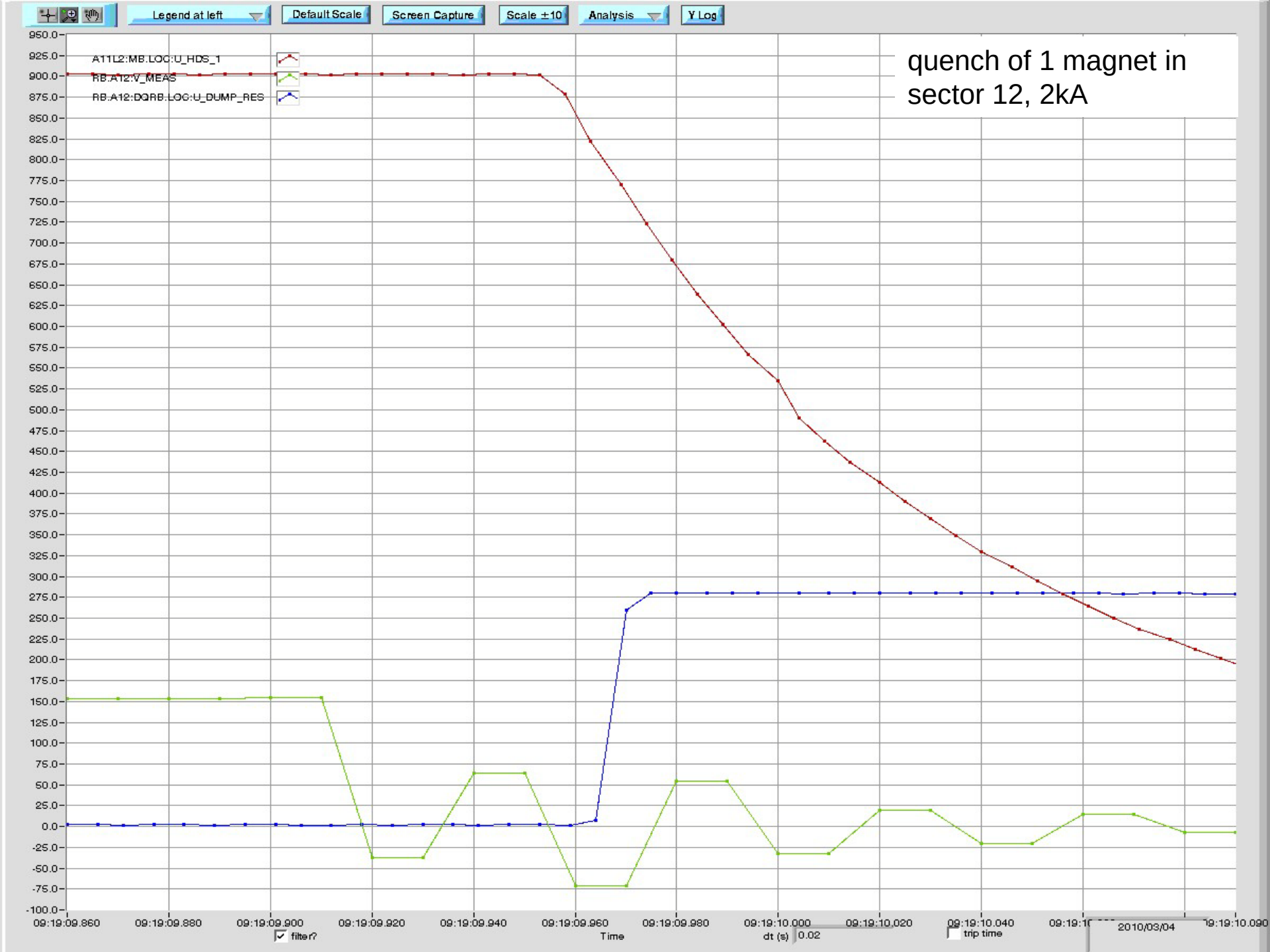

Legend at left
Default Scale
Screen Capture
Scale ±10
Analysis
Y Log
RB.A12:I_A
1002.8
1002.5
1002.0
1001.5
1001.0
1000.5
1000.0
999.5
999.0
998.5
998.0
997.5
997.0
996.5
996.1
08:13:25.030
08:13:25.130
08:13:25.230
08:13:25.330
08:13:25.430
08:13:25.530
08:13:25.630
08:13:25.730
08:13:25.830
08:13:25.930
08:13:26.040
Time
filter?
dt (s)
0.1
trip time
2010/03/04

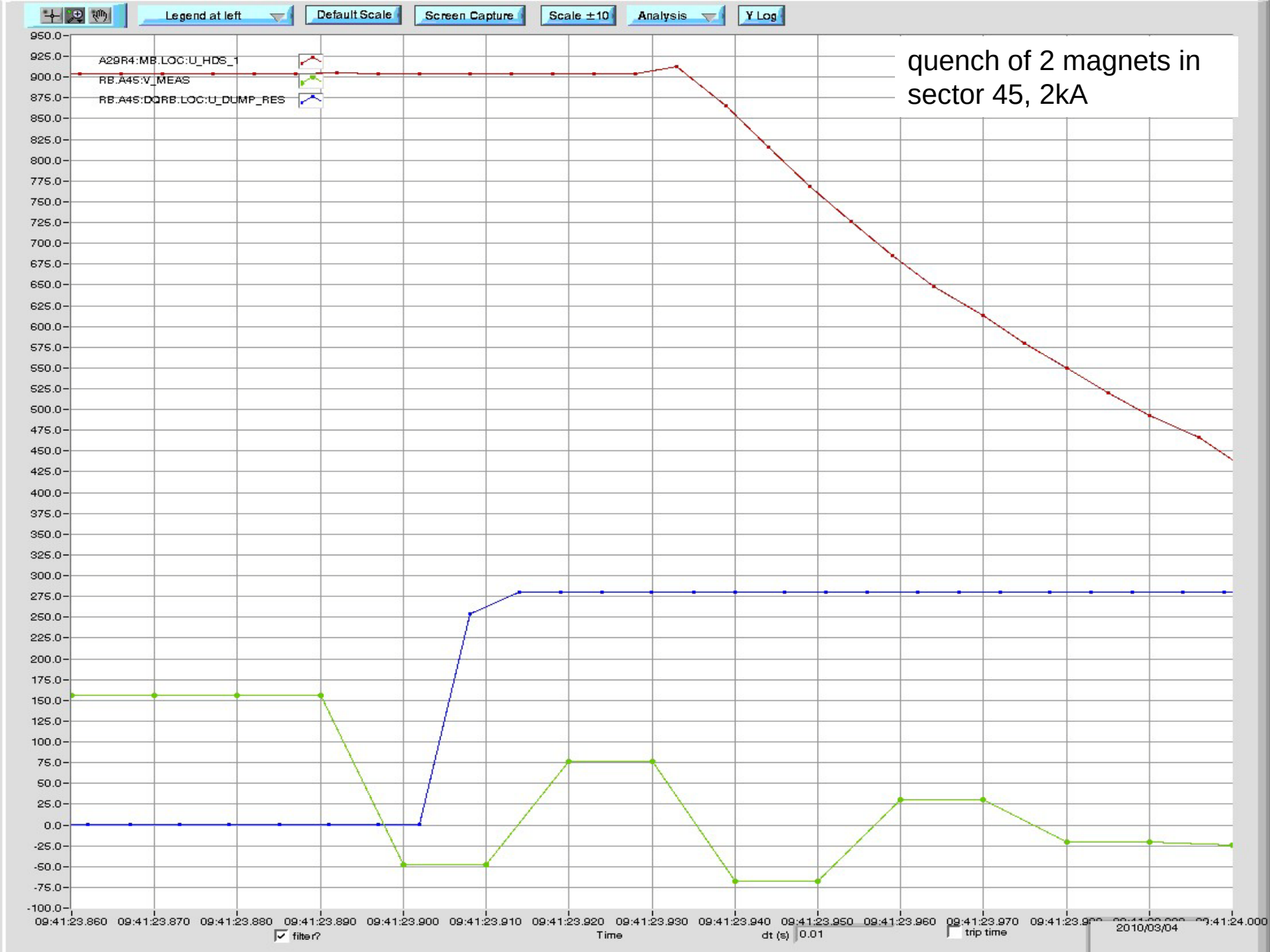
Legend at left
Default Scale
Screen Capture
Scale ±10
Analysis
Y Log
RB.A12:I_A
2012.2
2012.1
2012.0
2011.9
2011.8
2011.7
2011.6
2011.5
2011.4
2011.3
2011.2
2011.1
2011.0
2010.9
2010.8
2010.7
2010.6
2010.5
2010.4
2010.3
2010.2
2010.1
2010.0
2009.9
2009.8
2009.7
2009.6
2009.5
2009.4
2009.3
2009.2
2009.1
2009.0
2008.9
2008.8
2008.7
2008.6
2008.5
2008.4
2008.3
09:19:09.850
09:19:09.870
09:19:09.890
09:19:09.910
09:19:09.930
09:19:09.950
09:19:09.970
09:19:09.990
09:19:10.010
09:19:10.050
filter?
Time
dt (s)
0.02
trip time
2010/03/04

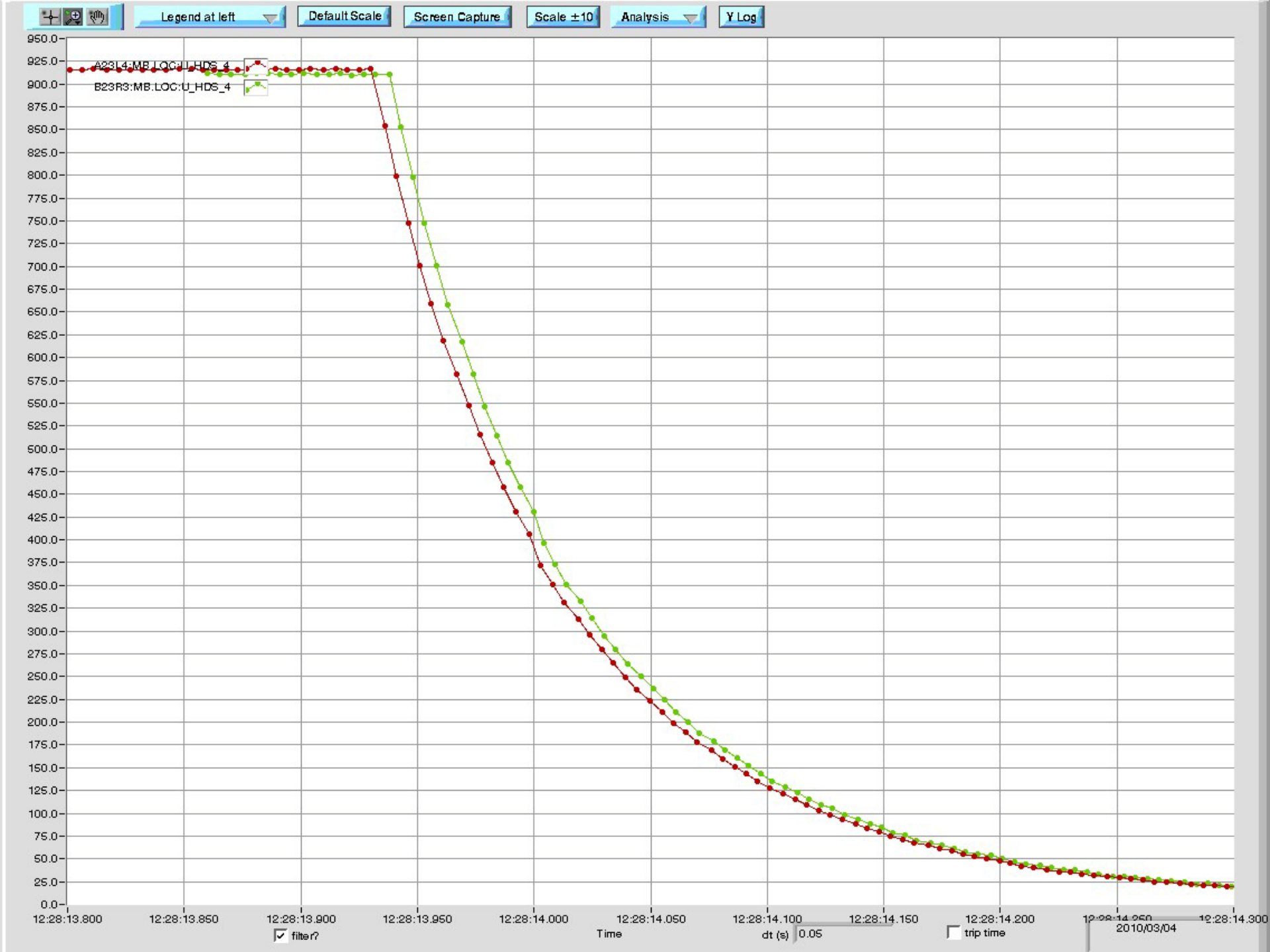

Legend at left
Default Scale
Screen Capture
Scale ±10
Analysis
Y Log
RB.A12:V_MEAS
160.0
155.0
150.0
145.0
140.0
135.0
130.0
125.0
120.0
115.0
110.0
105.0
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
08:13:25.130
08:13:25.180
08:13:25.230
08:13:25.280
08:13:25.330
08:13:25.380
08:13:25.430
08:13:25.480
08:13:25.530
08:13:25.580
08:13:25.630
08:13:25.680
08:13:25.720
filter?
Time
dt (s)
0.05
trip time
2010/03/04

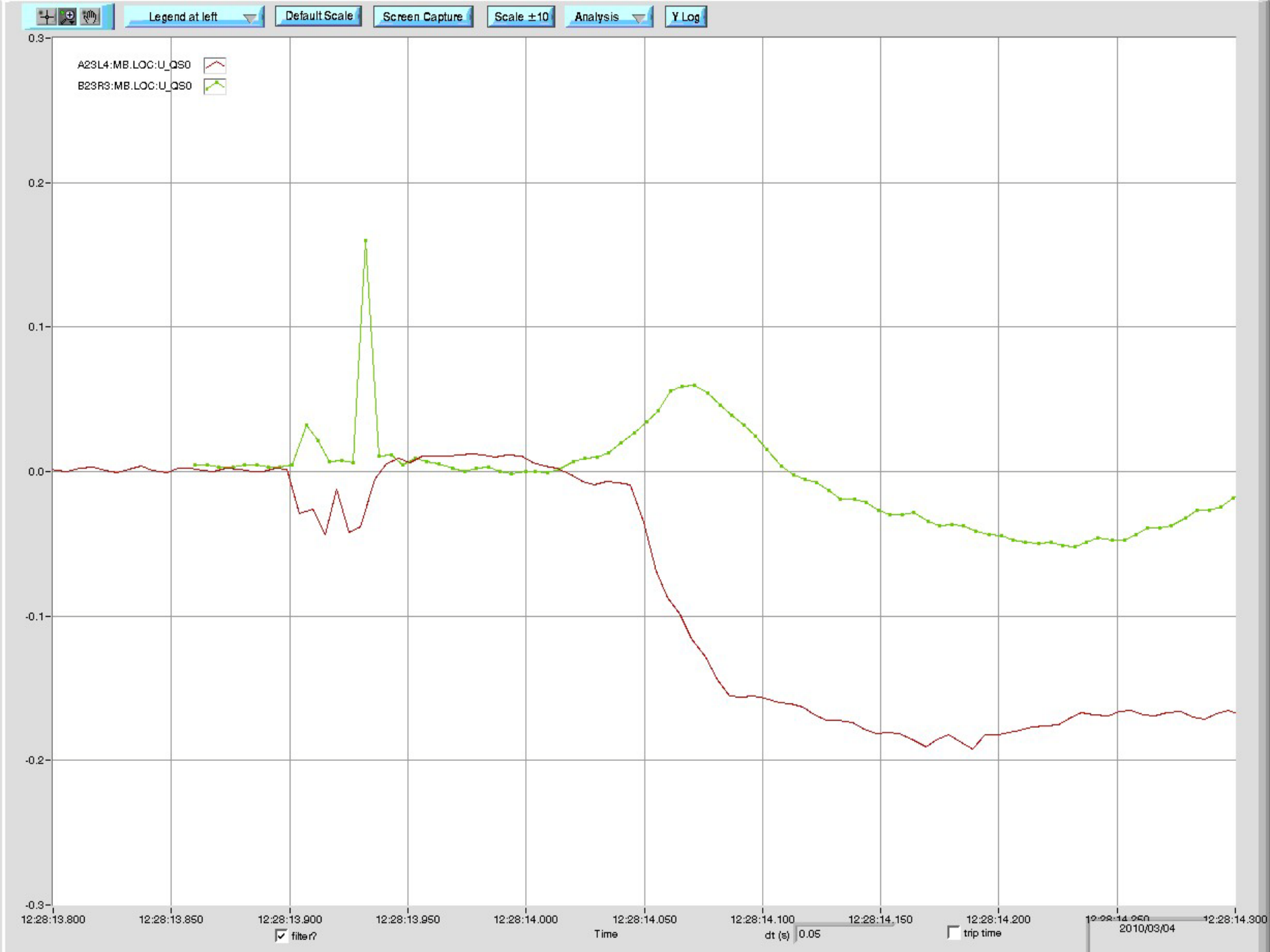

Legend at left
Default Scale
Screen Capture
Scale ±10
Analysis
Y Log
A11L2:MB.LOC:U_2
A11L2:MB.LOC:U_1
A11L2:MB.LOC:U_QS0
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
-0.9
-1.0
09:19:09.850
09:19:09.870
09:19:09.890
09:19:09.910
09:19:09.930
09:19:09.950
09:19:09.970
09:19:09.990
09:19:10.010
filter?
Time
dt (s)
0.02
trip time
2010/03/04


Legend at left
Default Scale
Screen Capture
Scale ±10
Analysis
Y Log
RB.A12:V_MEAS
RB.A12:DQRB.LOC:U_DUMP_RES
350.0
340.0
330.0
320.0
310.0
300.0
290.0
280.0
270.0
260.0
250.0
240.0
230.0
220.0
210.0
200.0
190.0
180.0
170.0
160.0
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
09:19:09.850
09:19:09.870
09:19:09.890
09:19:09.910
09:19:09.930
09:19:09.950
09:19:09.970
09:19:09.990
09:19:10.010
09:19:10.050
filter?
Time
dt (s)
0.02
trip time
2010/03/04


Legend at left
Default Scale
Screen Capture
Scale ±10
Analysis
Y Log
A11L2:MB:LOC:U_HDS_1
RB:A12:V_MEAS
RB:A12:DQRB:LOC:U_DUMP_RES
quench of 1 magnet in sector 12, 2kA
950.0
925.0
900.0
875.0
850.0
825.0
800.0
775.0
750.0
725.0
700.0
675.0
650.0
625.0
600.0
575.0
550.0
525.0
500.0
475.0
450.0
425.0
400.0
375.0
350.0
325.0
300.0
275.0
250.0
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
-25.0
-50.0
-75.0
-100.0
09:19:09.860
09:19:09.880
09:19:09.900
09:19:09.920
09:19:09.940
09:19:09.960
09:19:09.980
09:19:10.000
09:19:10.020
09:19:10.040
09:19:10.090
2010/03/04
filter?
Time
dt (s)
0.02
trip time


Legend at left
Default Scale
Screen Capture
Scale ±10
Analysis
Y Log
A29R4:MB:LOC:U_HDS_1
RB:A45:V_MEAS
RB:A45:DQRB:LOC:U_DUMP_RES
quench of 2 magnets in sector 45, 2kA
950.0
925.0
900.0
875.0
850.0
825.0
800.0
775.0
750.0
725.0
700.0
675.0
650.0
625.0
600.0
575.0
550.0
525.0
500.0
475.0
450.0
425.0
400.0
375.0
350.0
325.0
300.0
275.0
250.0
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
-25.0
-50.0
-75.0
-100.0
09:41:23.860
09:41:23.870
09:41:23.880
09:41:23.890
09:41:23.900
09:41:23.910
09:41:23.920
09:41:23.930
09:41:23.940
09:41:23.950
09:41:23.960
09:41:23.970
09:41:24.000
filter?
Time
dt (s)
0.01
trip time
2010/03/04


Legend at left
Default Scale
Screen Capture
Scale ±10
Analysis
Y Log
A23L4:MB:LOC:U_HDS_4
B23R3:MB:LOC:U_HDS_4
950.0
925.0
900.0
875.0
850.0
825.0
800.0
775.0
750.0
725.0
700.0
675.0
650.0
625.0
600.0
575.0
550.0
525.0
500.0
475.0
450.0
425.0
400.0
375.0
350.0
325.0
300.0
275.0
250.0
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
12:28:13.800
12:28:13.850
12:28:13.900
12:28:13.950
12:28:14.000
12:28:14.050
12:28:14.100
12:28:14.150
12:28:14.200
12:28:14.300
filter?
Time
dt (s)
0.05
trip time
2010/03/04


Legend at left
Default Scale
Screen Capture
Scale ±10
Analysis
Y Log
A23L4:MB.LOC:U_QS0
B23R3:MB.LOC:U_QS0
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
12:28:13.800
12:28:13.850
12:28:13.900
12:28:13.950
12:28:14.000
12:28:14.050
12:28:14.100
12:28:14.150
12:28:14.200
12:28:14.300
filter?
Time
dt (s)
0.05
trip time
2010/03/04