RSS.A78B1 quench-like events during PGC

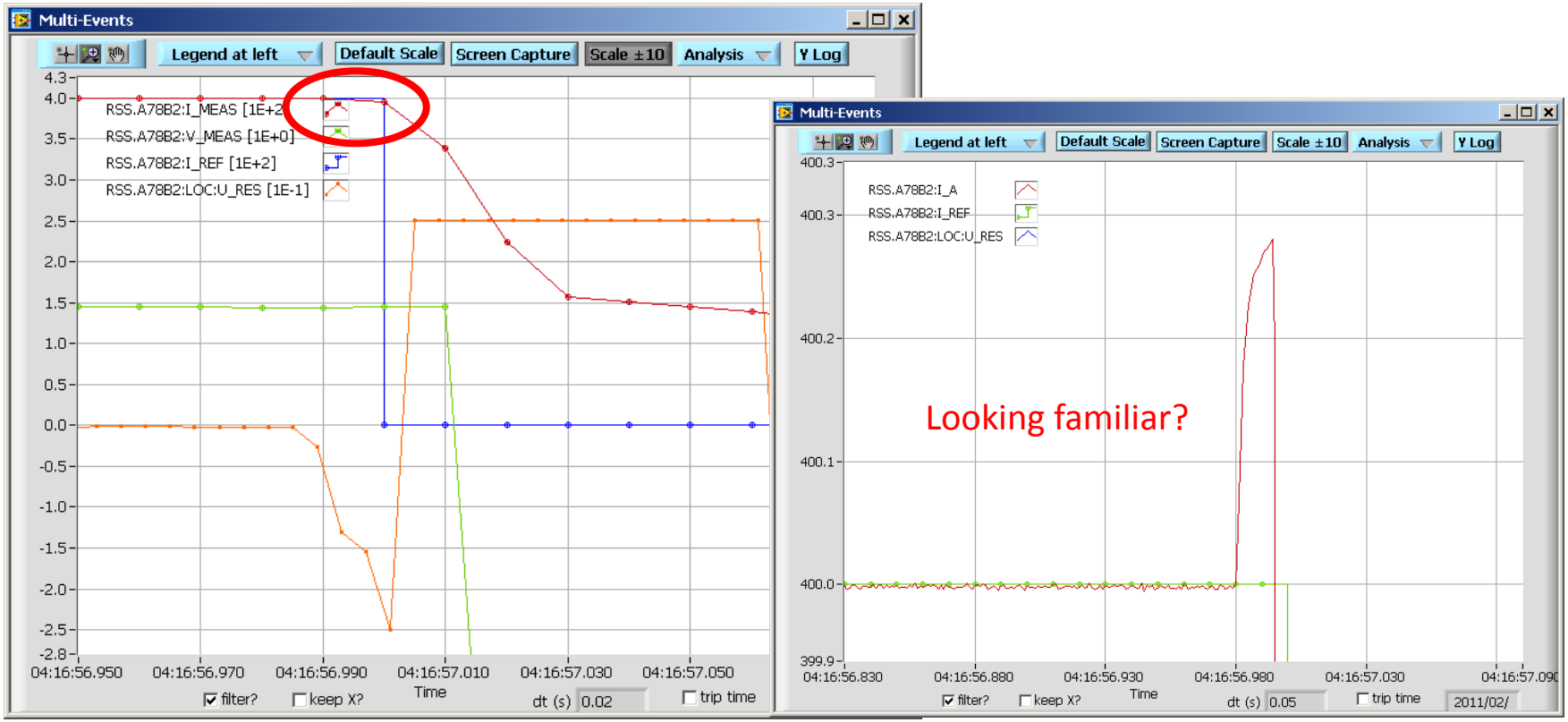
- Complementing Arjans slides for RCO.A45B1

M. Zerlauth MP3 Mini Workshop March 8th 2011

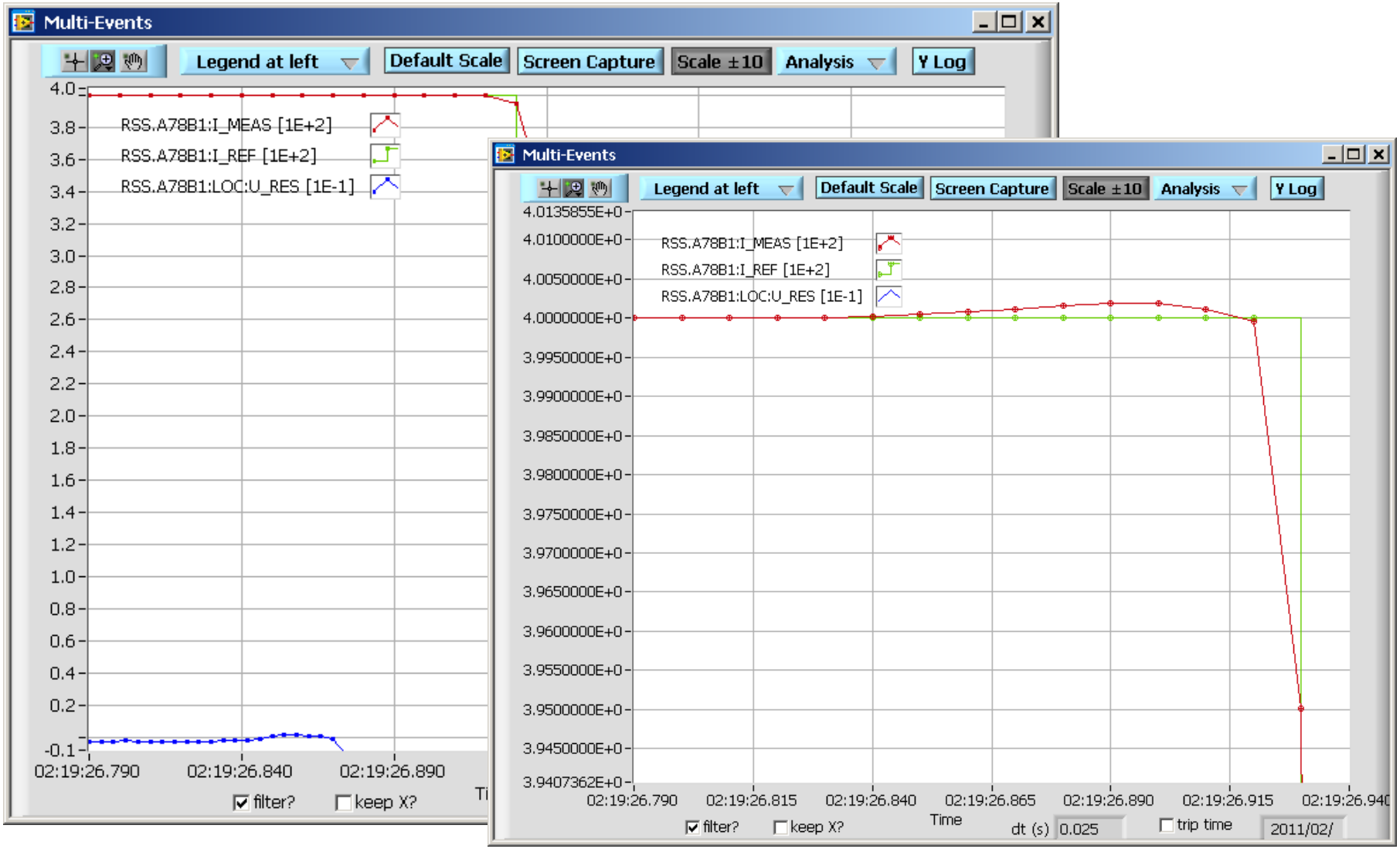
- What caused the problem?
- What are the symptoms ?
- Solution (if any) …?
- Potential existence of same problem in similar circuits?

Quench-like trips of RSS.A78B1/2…

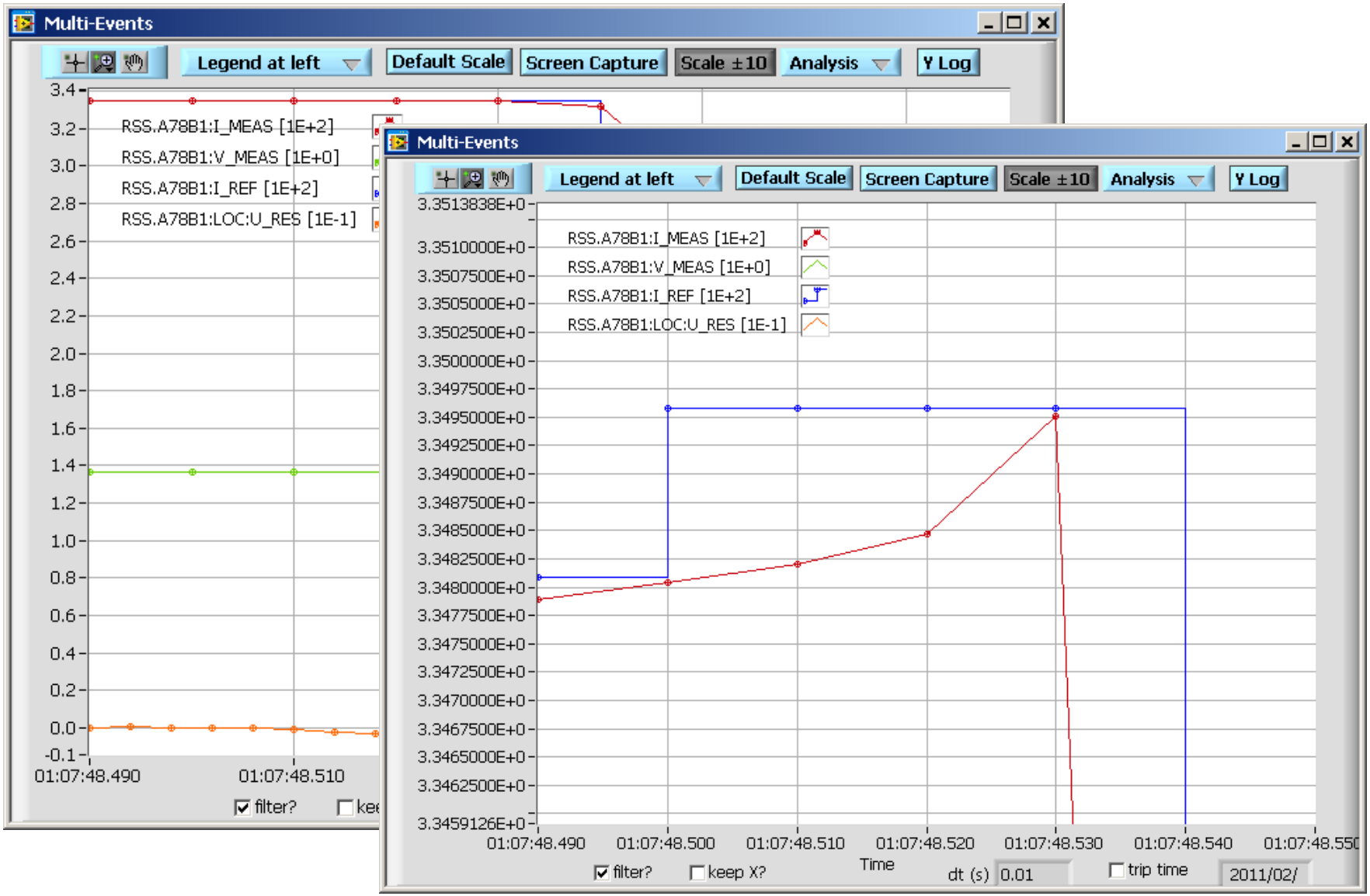
- RSS.A78B1/2 tripped twice during pre-cycling/heat runs, indicating an increase of current just before tripping
  - RSS.A78B2 on 16th of February @ 04:16:56 at 400A during heat run/PGC
  - RSS.A78B1 on 18th of February @ 02:19:26 at 400A during heat run/PGC
  - RSS.A78B1 on 19th of February @ 01:07:48 at ~335A during heat run/PGC
- At first sight -> Looking like (and being mistakenly classified as) a quench, if not…



.. another one @ flat top...

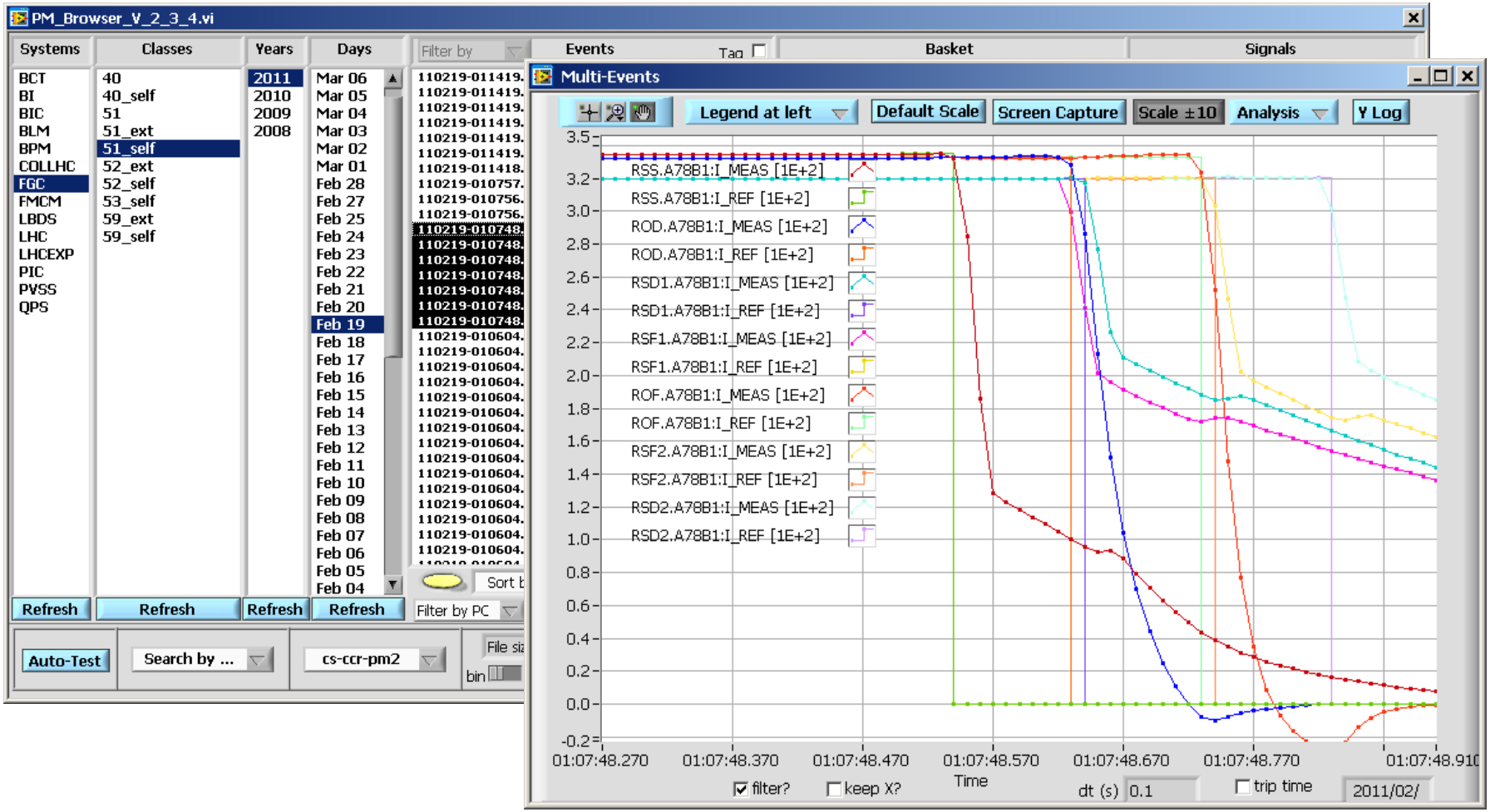


..while ramping...



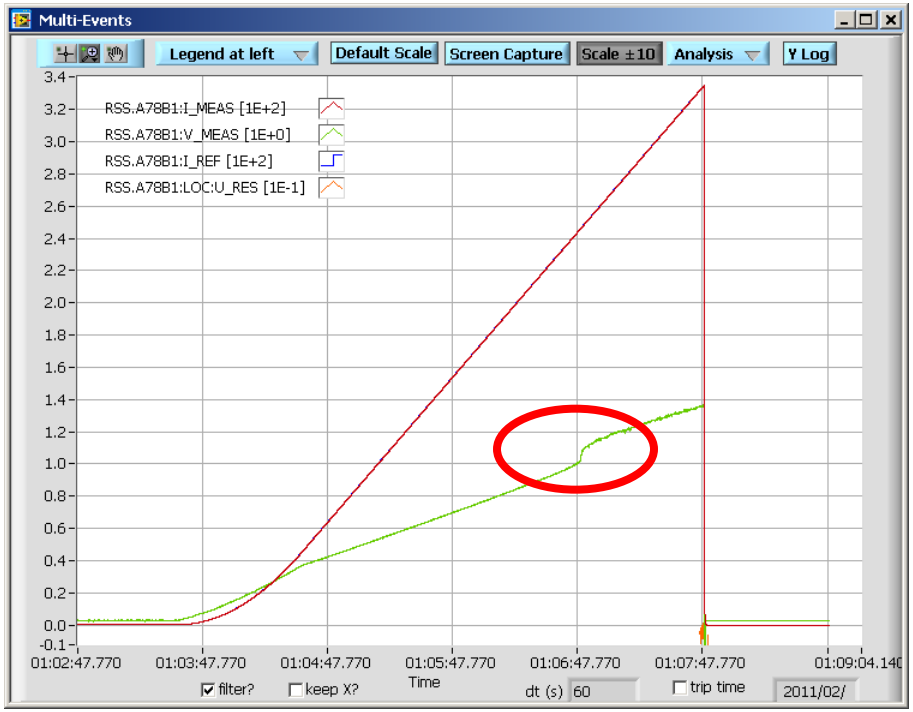
Cross-talk @ 400A

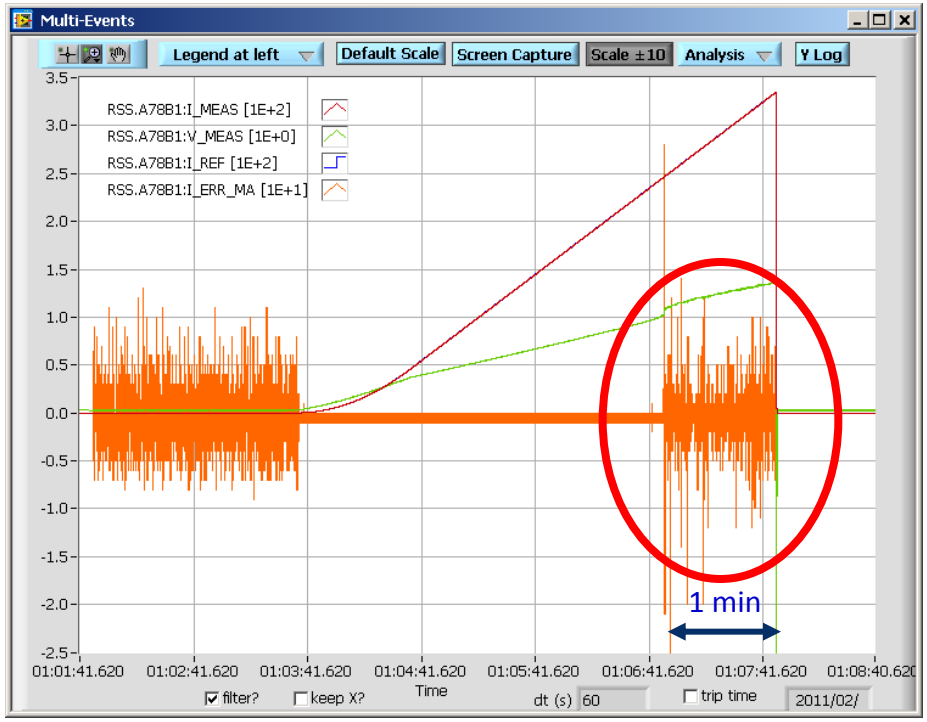
- During heat runs and PGCs, the normal cross-talk can be observed (different to RCO.A45B1..)



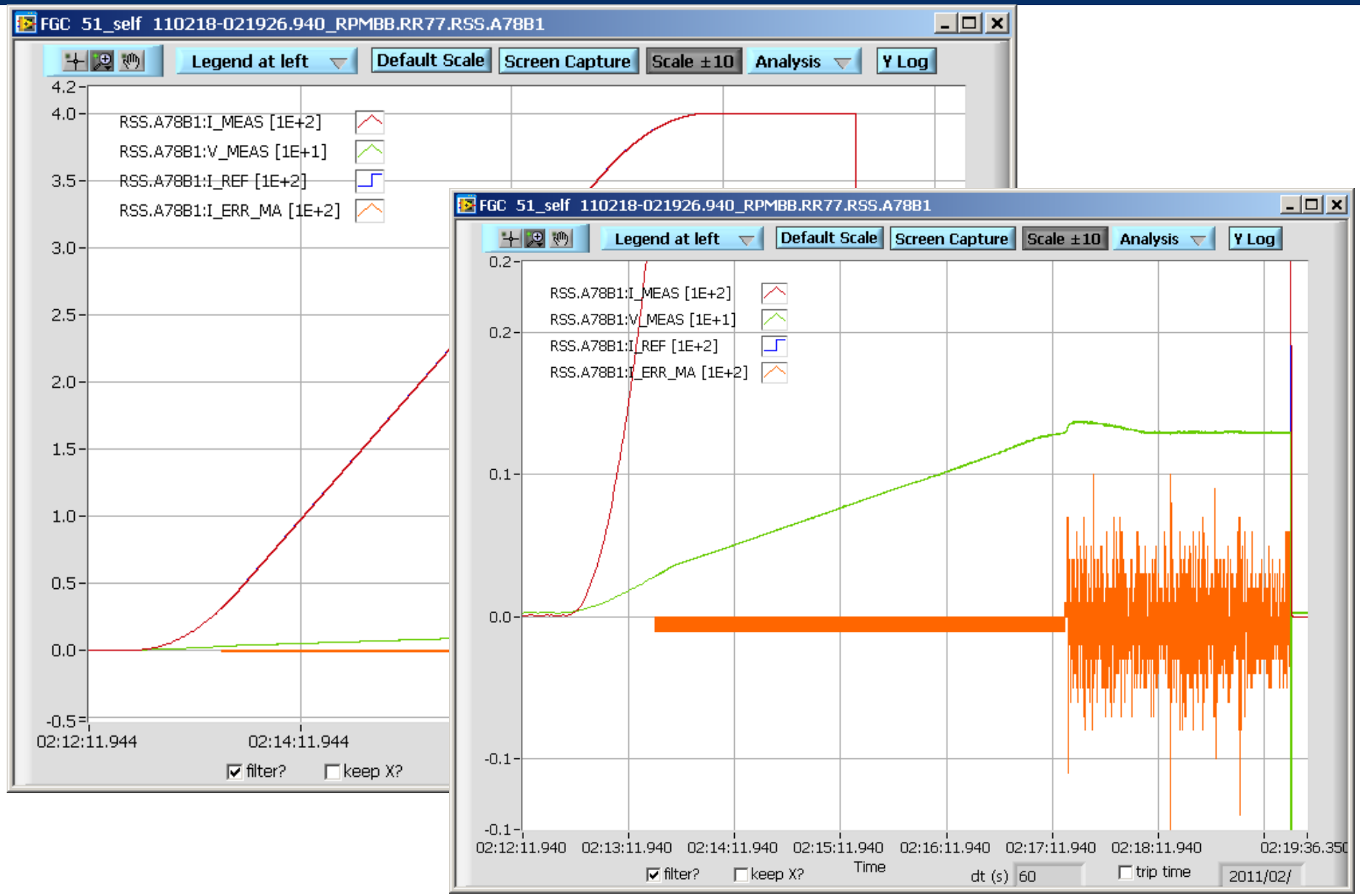
How to diagnose…

- Although not always as clearly visible, V_MEAS is a better signal to observe, suggesting sudden changes of impedance
- With the loosening of the connection, also the I_ERR_MA significantly increases, mostly well before the circuit trip





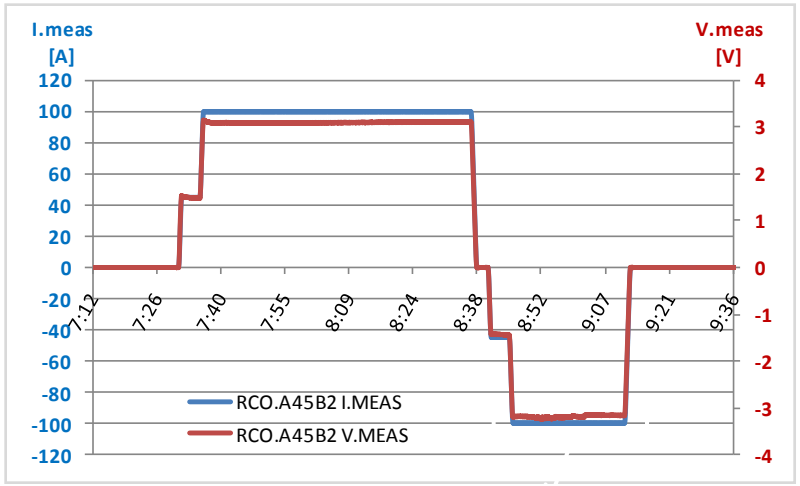
Similar on the flat top…

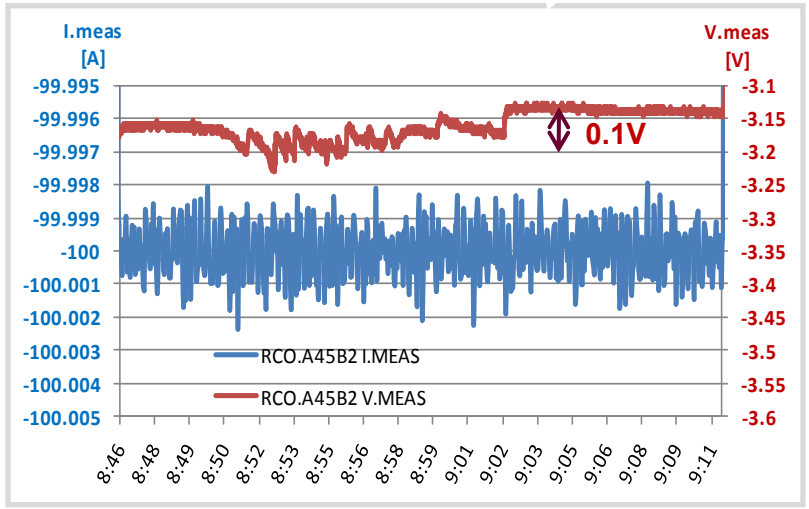


…and the guilty one is…

- Following the repetitive trips, EPC proceeded to exchange the power module and found…
- …a loose bolt on the DCCT head, right next to the thyristor…
- Note: EPC verified that even without the tightening bolt the circuit can NEVER completely open

How to detect other case?





- Are similar cases possible in the machine -> Certainly YES
- Can we detect them? YES, but needs special runs (few hours for the whole machine)…
  - The slower the loop is, the worse the rejection of perturbations will be
  - By putting all loops slower than usual (10 or 100 times), and running the circuit in DC state (80% of nominal current) one should be able to detect bad connection through verification of the I.ERROR (to be confirmed for circuits with >> time constants).

Thanks a lot for your attention