Update on Chromaticity Measurements
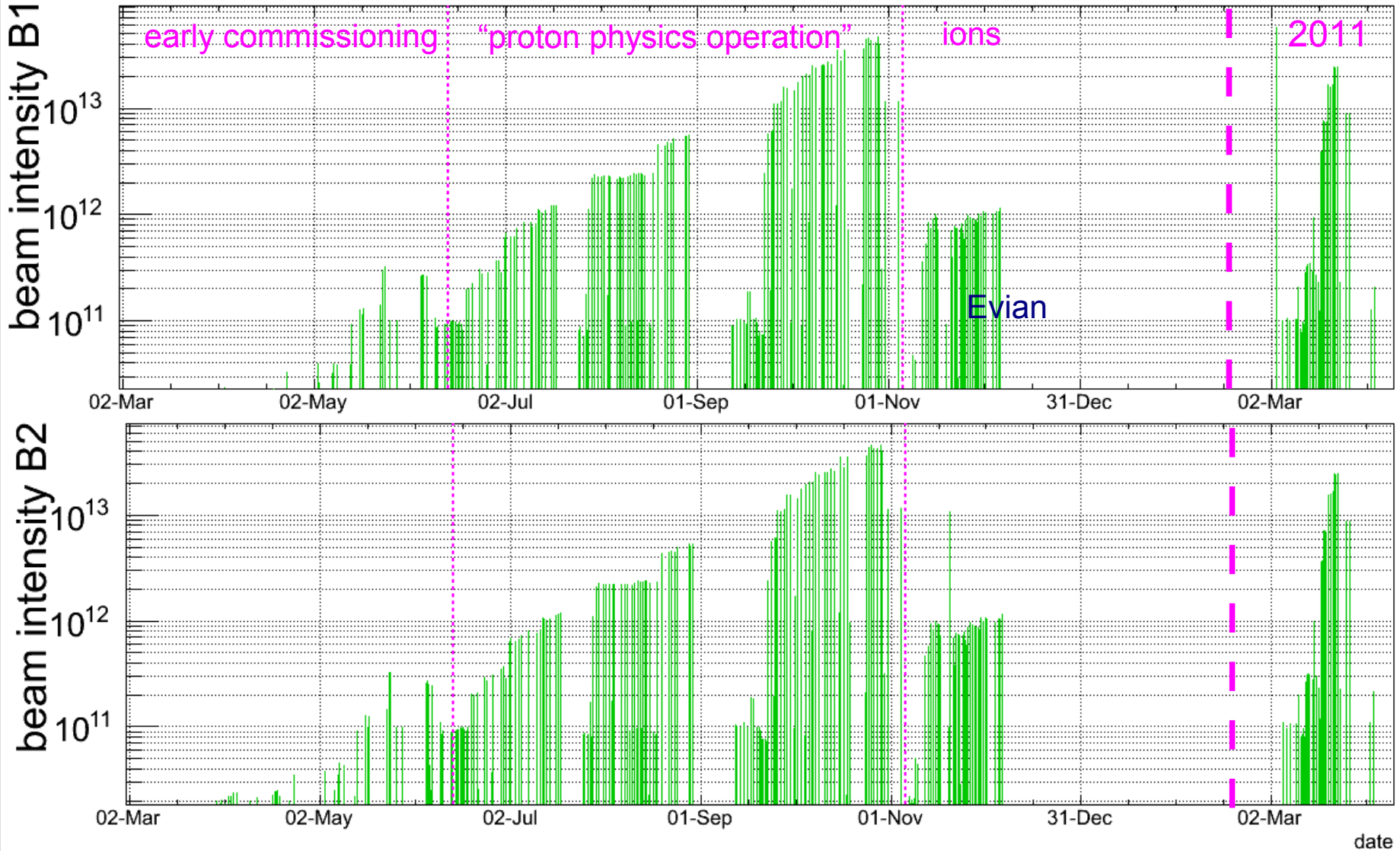
Ralph J. Steinhagen, BE-BI

- Stability Overview during 2011 vs. 2010

- Q'(t) during the Ramp
  - Same as beginning of last year: not too many ramps with Q'
  - Three periods/categories:
    - "Naked Ramp" → raw time scales, magnitude
    - Reproducibility ↔ as done during ion run
    - Final feed-forward and last measurement

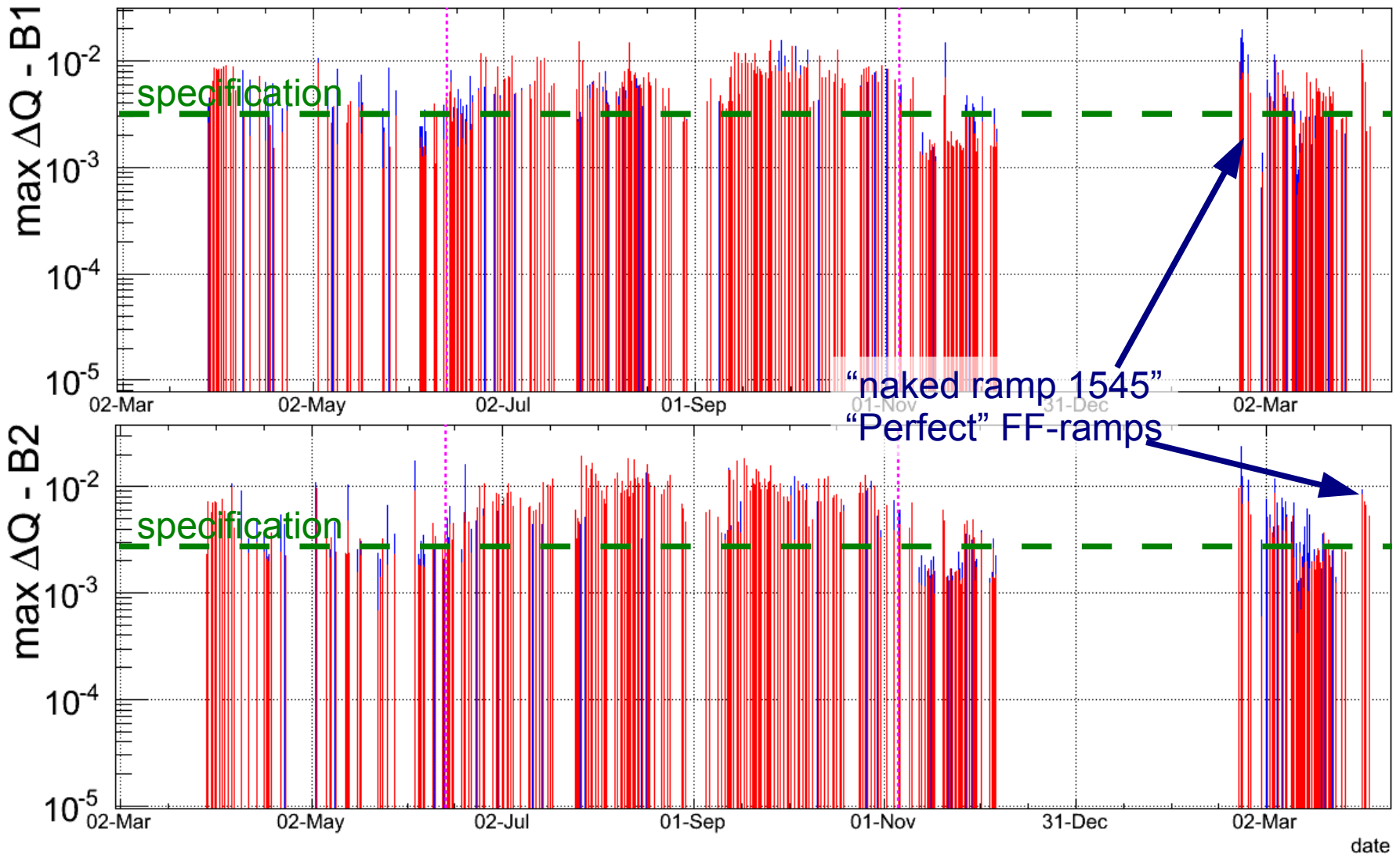- (Presume that Decay is covered by Nichola's analysis/presentation)

- Updated since Evian, so far: 10 months in 2010 → 1 month in 2011

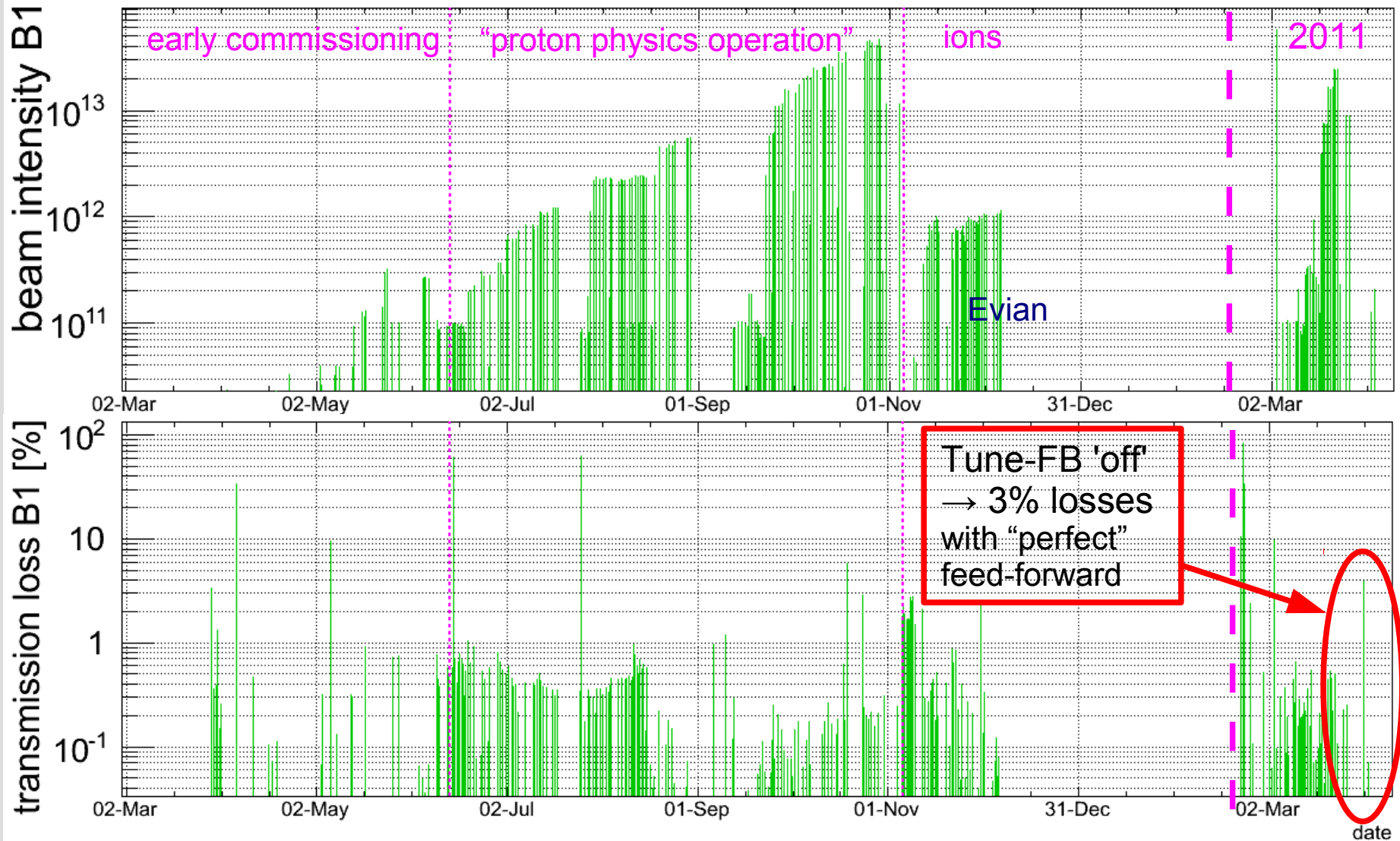- Tune stability as one but maybe not the only contributing factor...

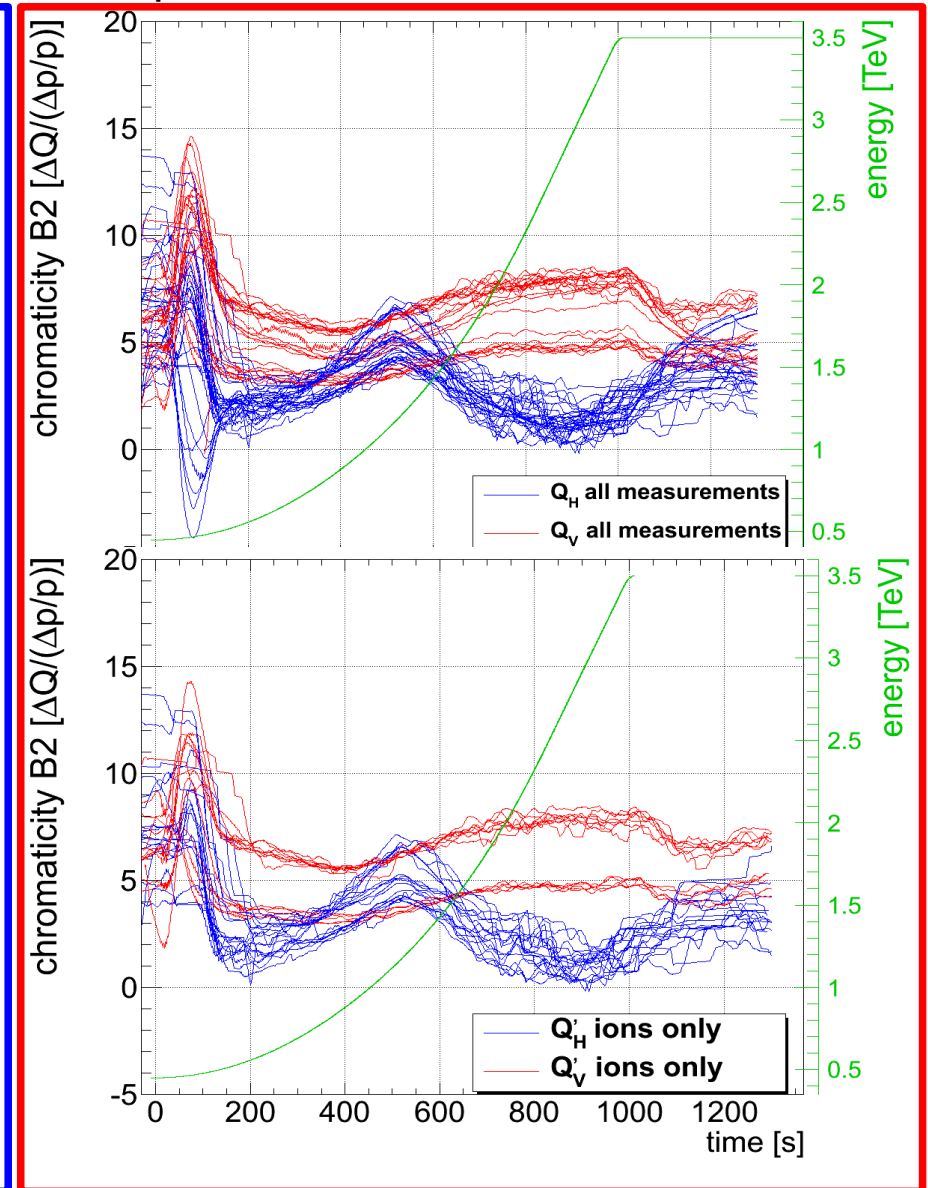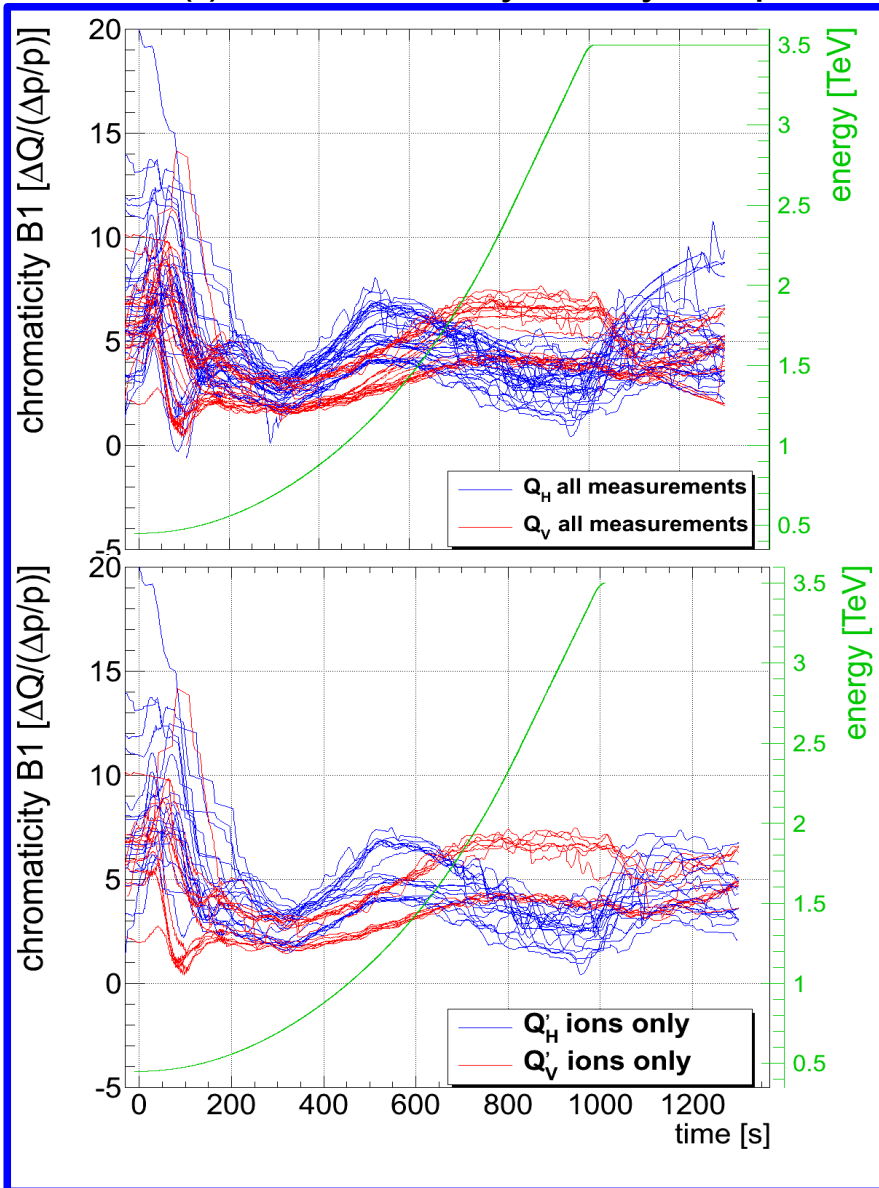"naked ramp 1545"

"Perfect" FF-ramps

FiDeL: Update on Q' Measurements in 2011, Ralph.Steinhagen@CERN.ch, 2011-04-12

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- Much less diagnostics/explorative ramps with Q'(t) in 2011
  – Most ramps with Tune-FB → indications of impact of running without:

early commissioning · "proton physics operation" · ions · 2011 · Evian

Tune-FB 'off'
→ 3% losses
with "perfect"
feed-forward

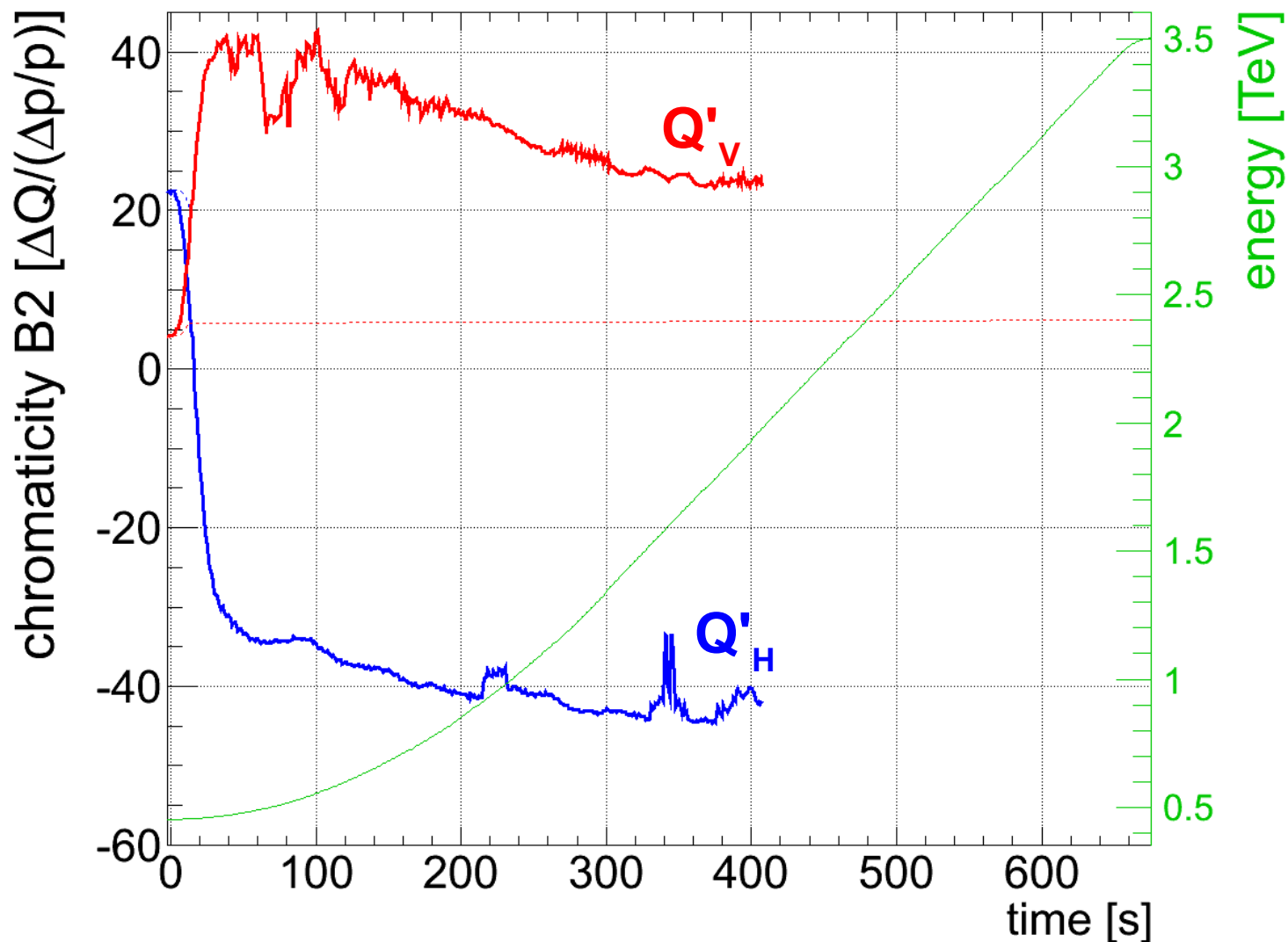FiDeL: Update on Q' Measurements in 2011, Ralph.Steinhagen@CERN.ch, 2011-04-12

- Q'(t) dominated by decay/snapback at ramp start and end→ Ezio's talk

- Three waves on Q'(t)...

  I   Initial "naked ramp →

  II status-quo ↔ ion reference period

  III b_3 re-iteration, tune feed-forward
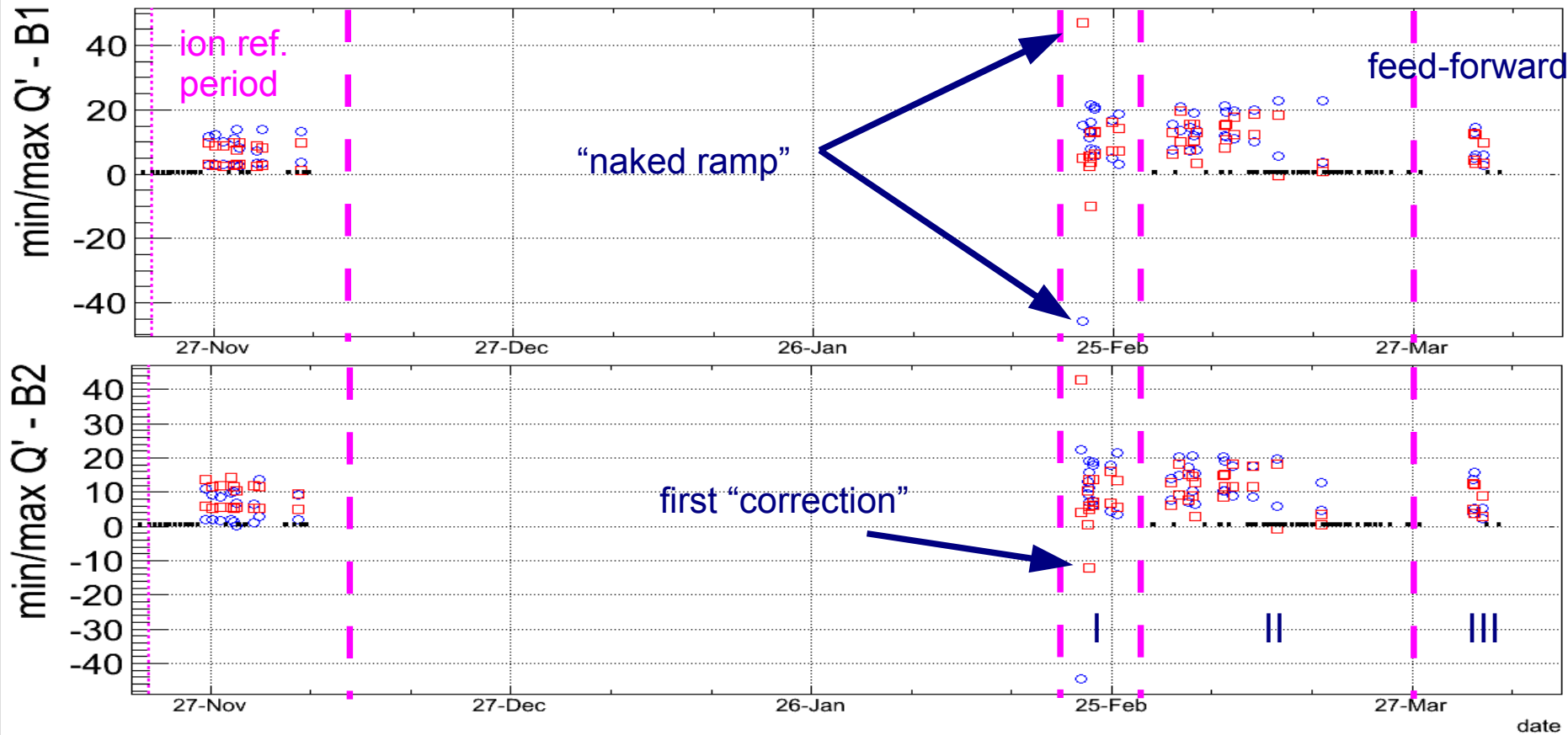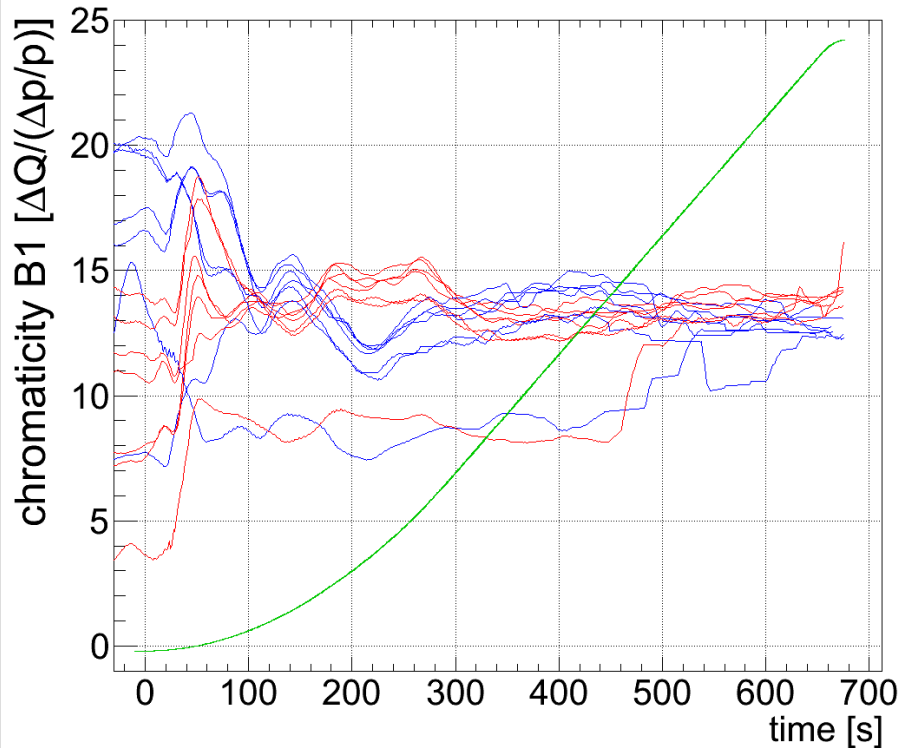
- Initial analysis limited by "-10<Q'<+25" (rejecting outlier), 10 s average (noise)

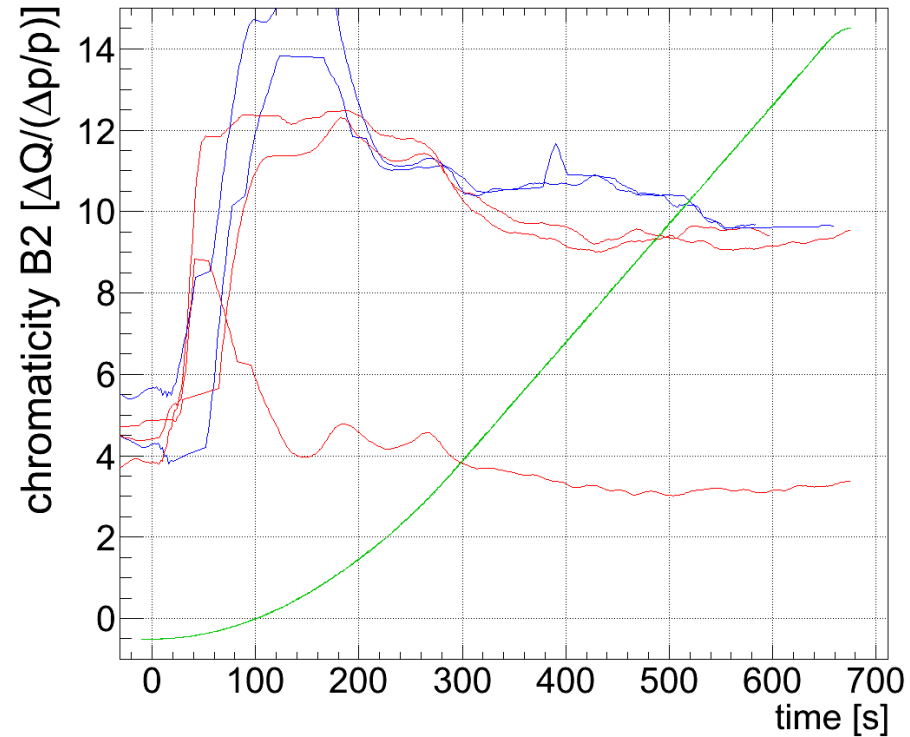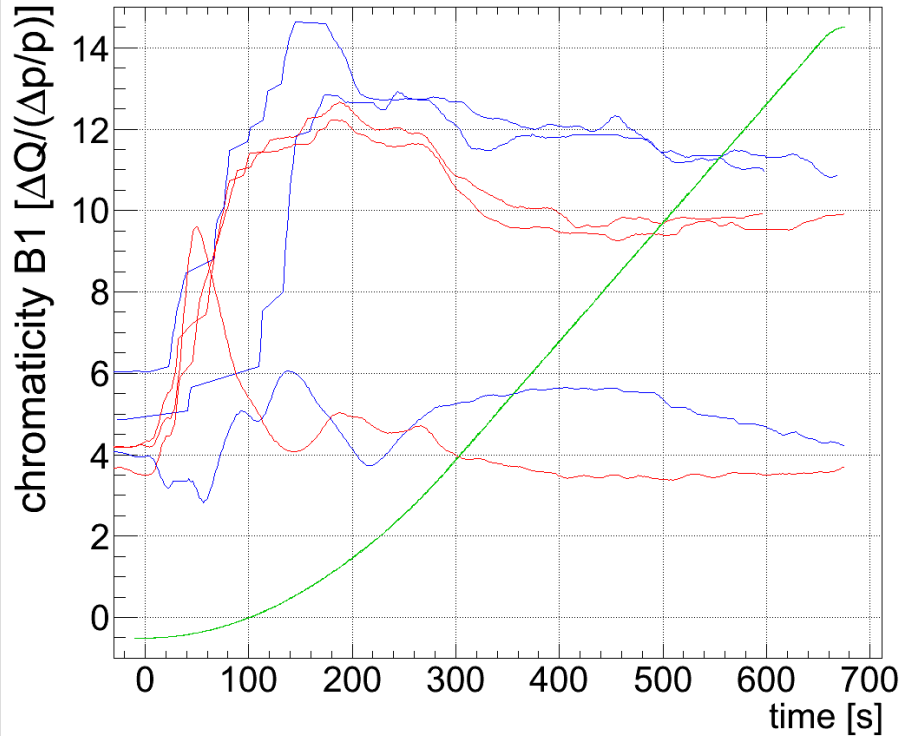 – Re-fined de-modulation over 1.6 seconds:

- Effective snap-back over in less than 16 seconds → further shorten the ramp?
  - Assymmetric: $\Delta Q'_H \approx -64$ (-50) & $\Delta Q'_V \approx +36$ (+36) for B1 (B2)
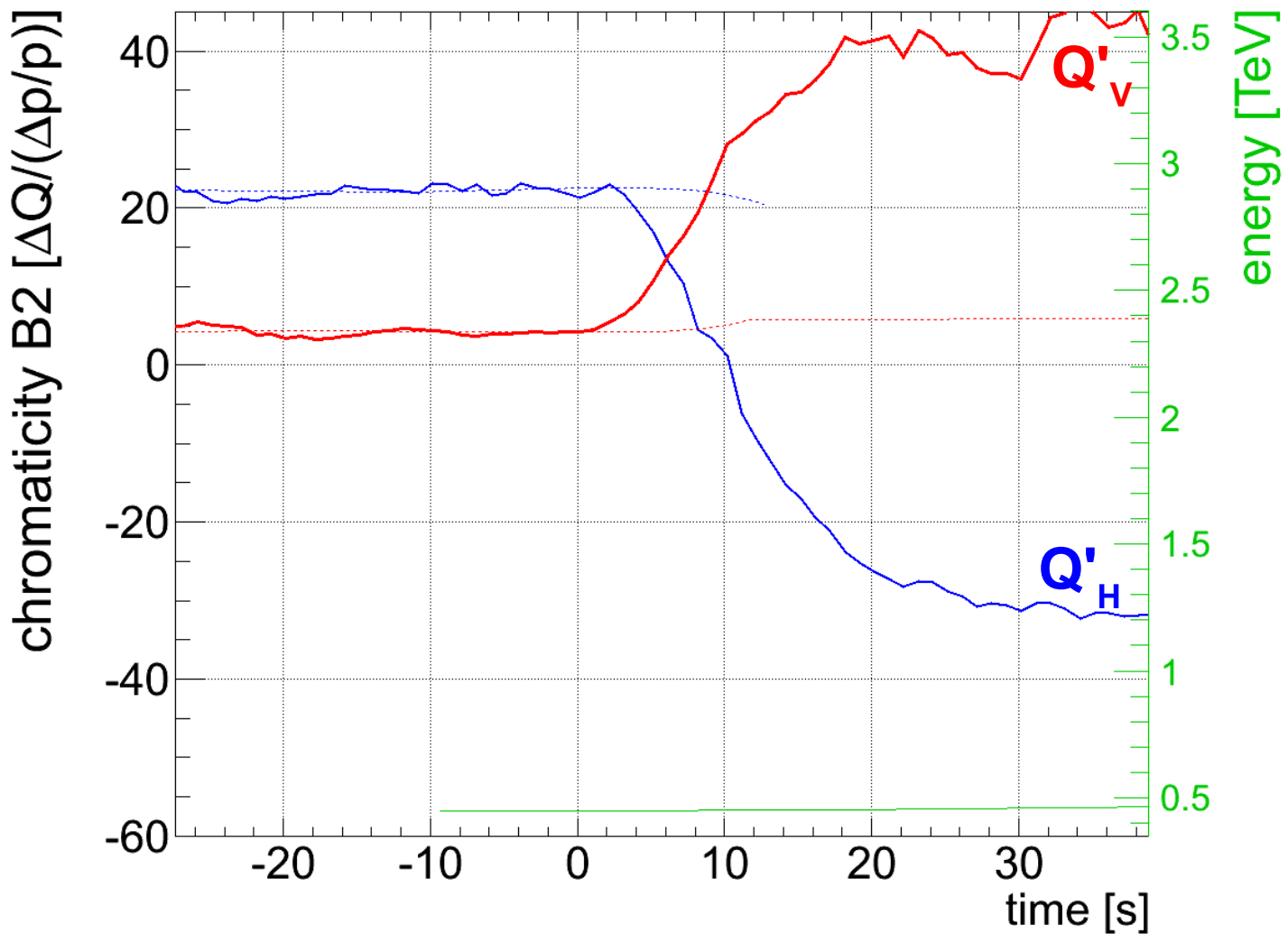
- Constant feed-forward via lattice sextupoles and gradual-out at … seconds
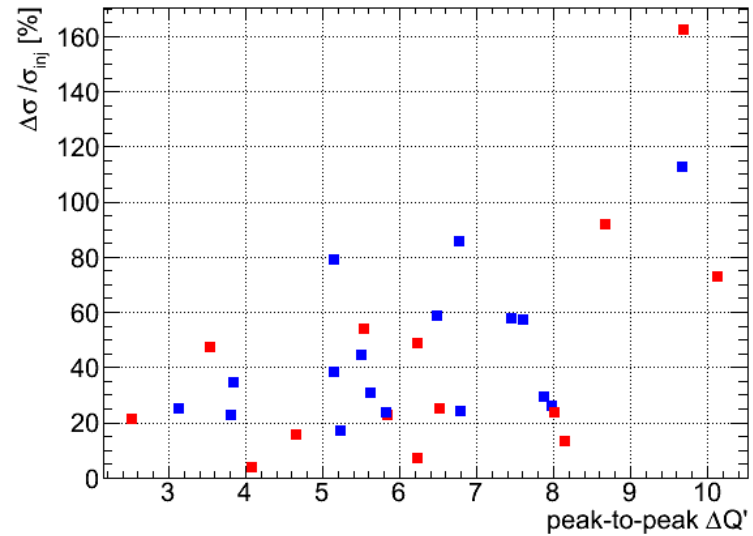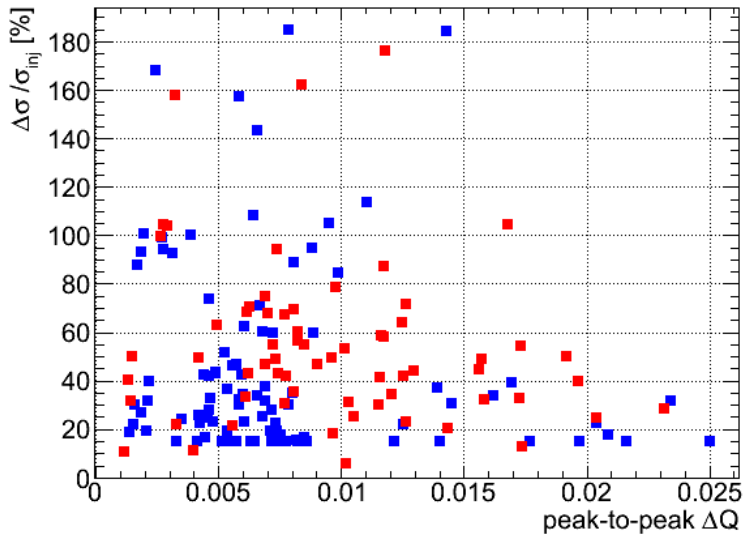- Reproducibility of ΔQ' ≈ ± 2 (most of the times)
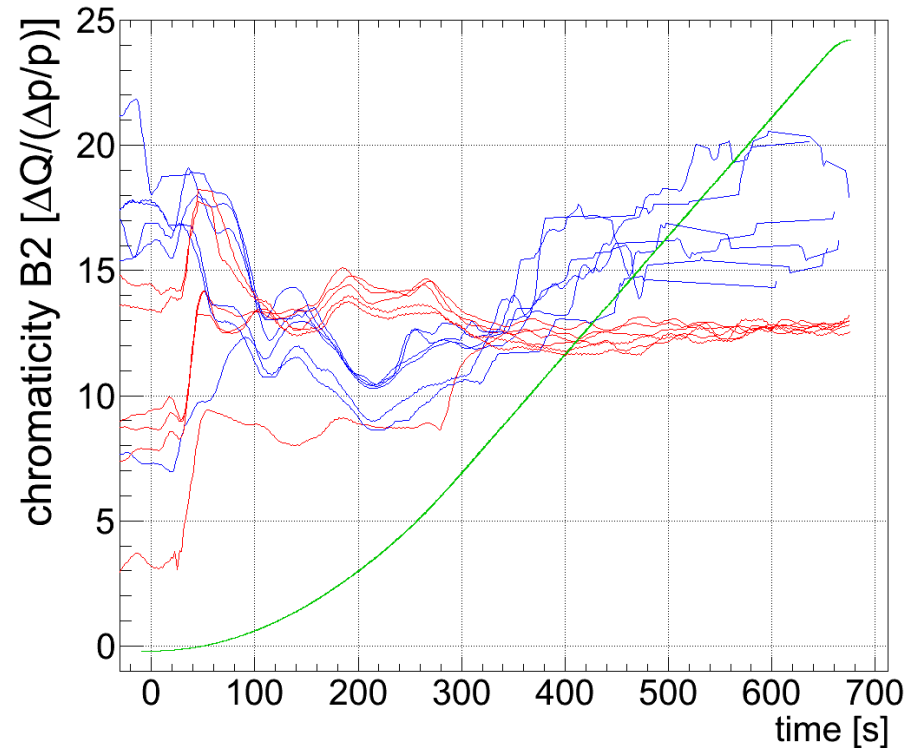
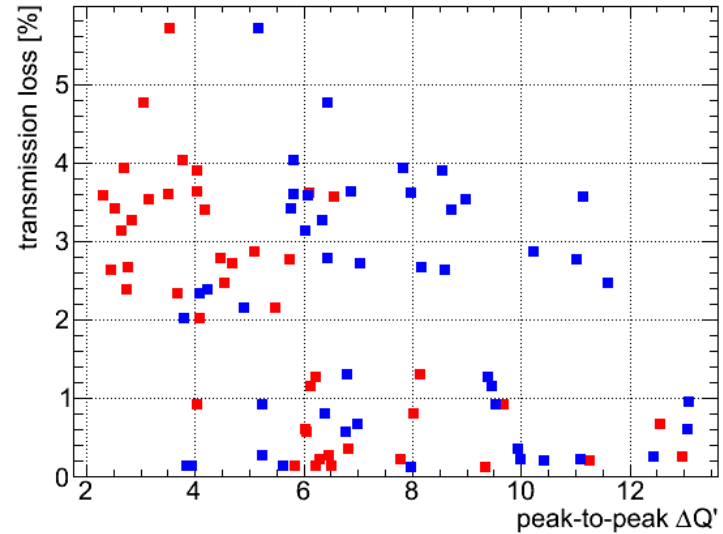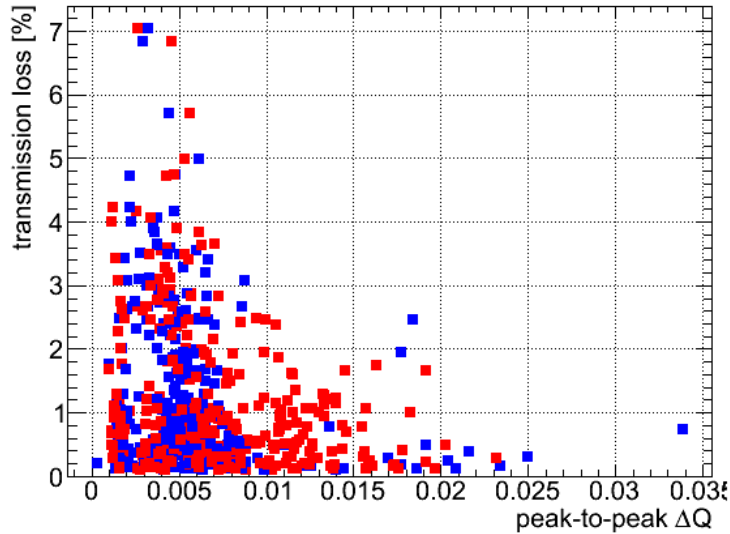- Last beam-based feed-forward iterations
  - Remaining variations during snap-back

- ...need control measurement of last iteration.

- 2011: still not enough statistic yet for strong confirmation → MDs
  – Biggest error: emittance growth estimates, too few ramps with Q'(t)

- 10 month in 2010 → one month in 2011
    - Still, not everything improved by a factor of ten

- Impressive Machine reproducibility – enforcing magnetic pre-cycle pays off
    - Q(t) reproducible to 0.01
    - Q' stable to ± 2 units
    - Most of the remaining (recurrent) perturbations during snap-back
    - Can we get a control on the decay amplitude/time-constant?

- Gretchen Frage: how well do we need to control Q/Q'?
    - Got some indications for Q(t) but less for Q'(t)
        - Beam survives without Tune-FB but with percent level losses
        - Chromaticity appears to impact rather beam sizes than life-times
    - Impact on emittance and life-time needs more systematic investigation
      → two MDs proposed to answer/tackle this issue
        - You are most welcome to join and help!
        - Please help to push the priority of this task