Measurements of TCL losses 04/07/2012

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Outline

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  - List of scans
  - Jaw movements
  - Losses & luminosity
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  - Correlation losses vs. jaw position
- Conclusion & follow-up

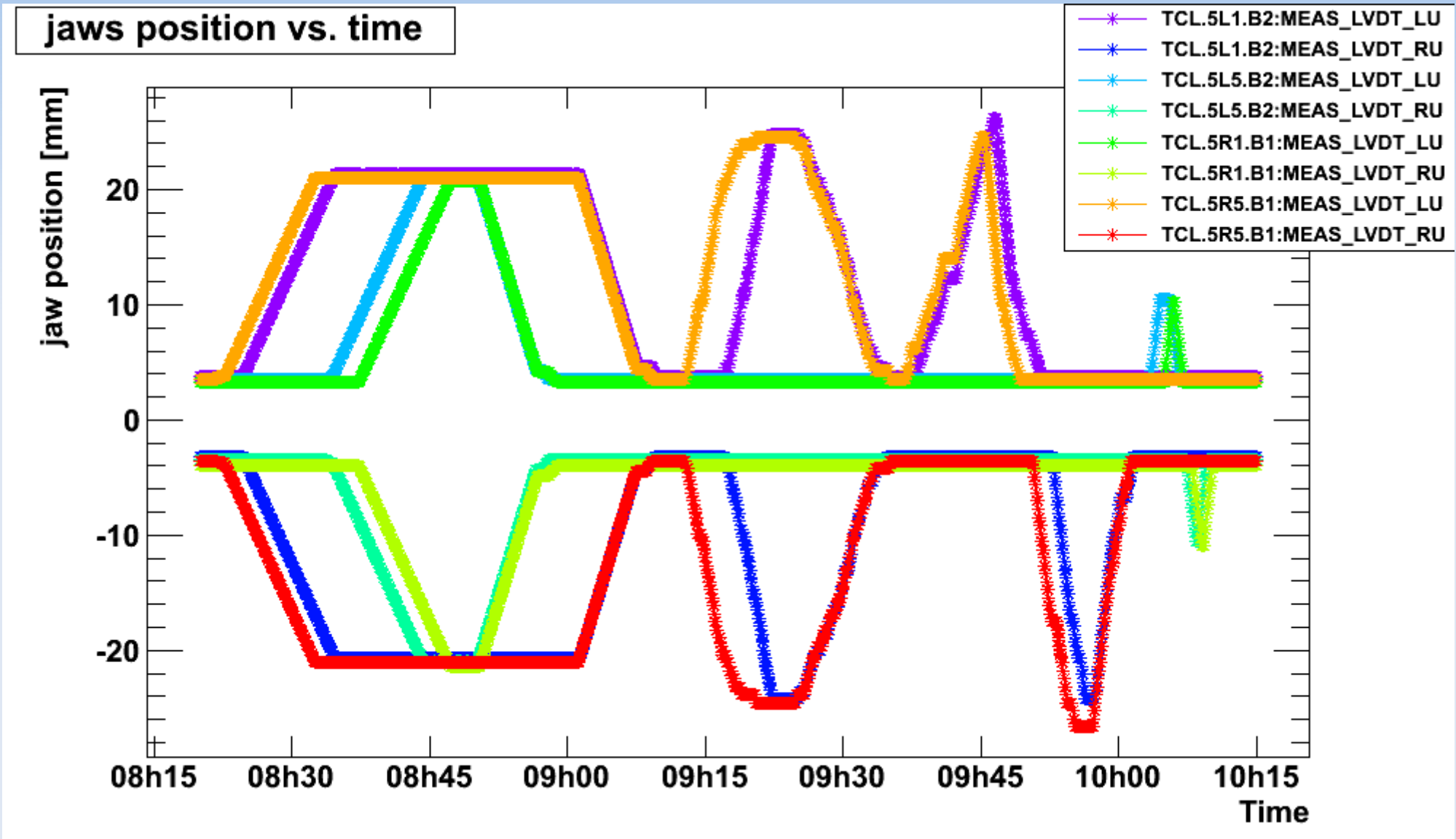
Introduction & motivation

- Goal:
  - Assess the effect of the TCLs during collision
  - Benchmark of simulation tools
  - What to do after LS1?
  - Check losses in DS & which magnets are protected
- TCLs:
  - Absorbers for physics debris (1 m, Cu)
  - Set to 10 σ since the beginning of 2012
  - In cell #5 on both sides of IP1 and IP5
- 2^{nd} series of scans (1^{st}: 15/05/2012, *cf. CWG #141*)
- Beam conditions: nominal physics fill #2806
  - Intensity: B1 = 1.8e14 p, B2 = 1.55e14 p
  - Luminosity at the beginning of study: 5e33 $cm^{2}.s^{-1}$

Principle: list of scans

1) Symmetric scans for all 4 TCLs
   - The jaws are moved symmetrically: out, then back in
   - Regular steps of 0.5 σ, up to 60 σ
2) Faster scan for TCL.5L1.B2 and TCL.5R5.B1
   - Jaws are moved symmetrically
   - Bigger manual steps: 2 σ, up to 70 σ
3) Asymmetric scan for TCL.5L1.B2 and TCL.5R5.B1:
   - Moving only 1 jaw in then out; then same for other jaw
   - Manual 2 σ steps, up to 70 σ
4) Asymmetric scan for TCL.5R1.B2 and TCL.5L5.B1
   - Manual 2 σ steps, up to 70 σ

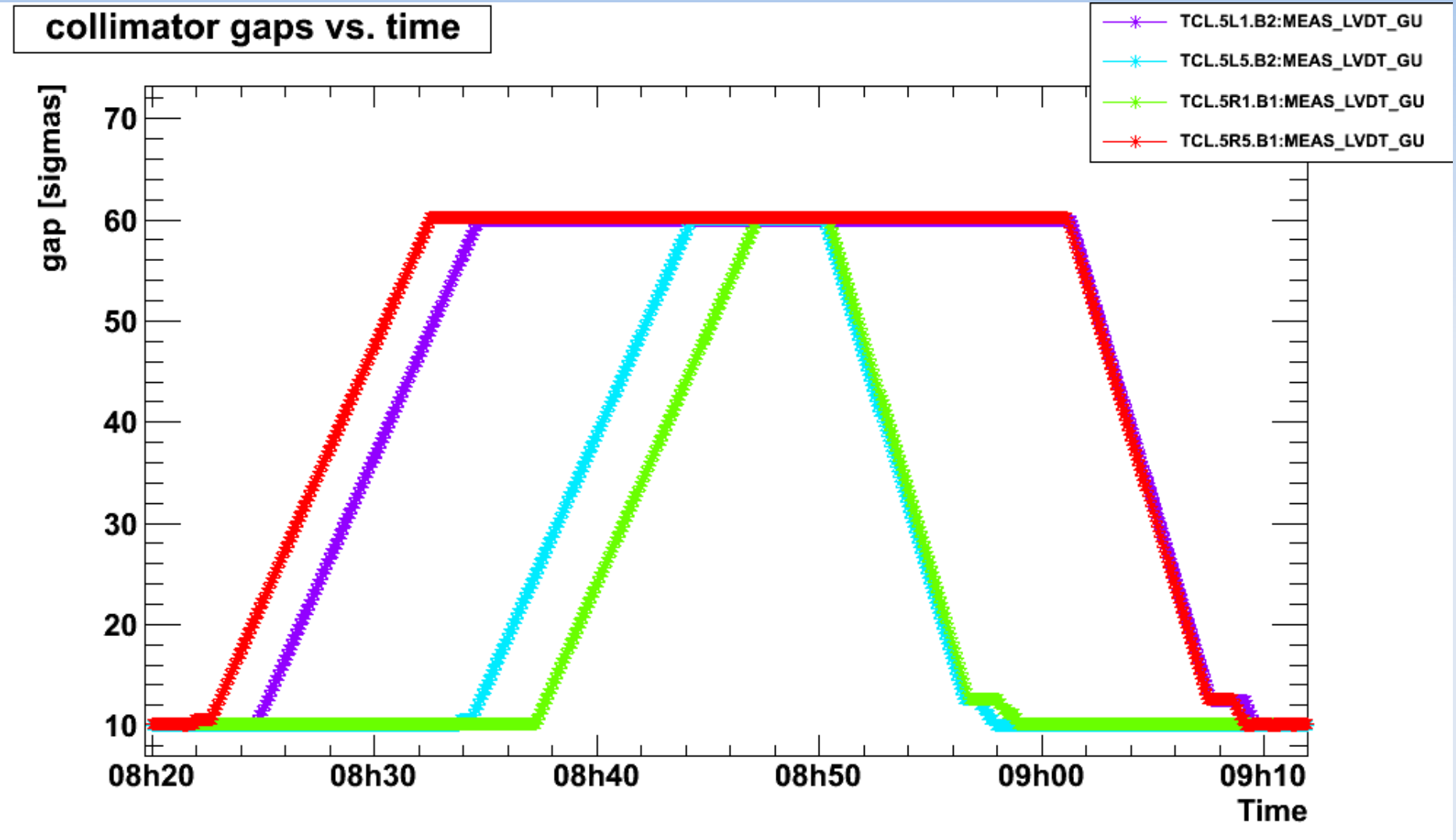
Jaw positions vs. time



Effect of TCL scans & data processing

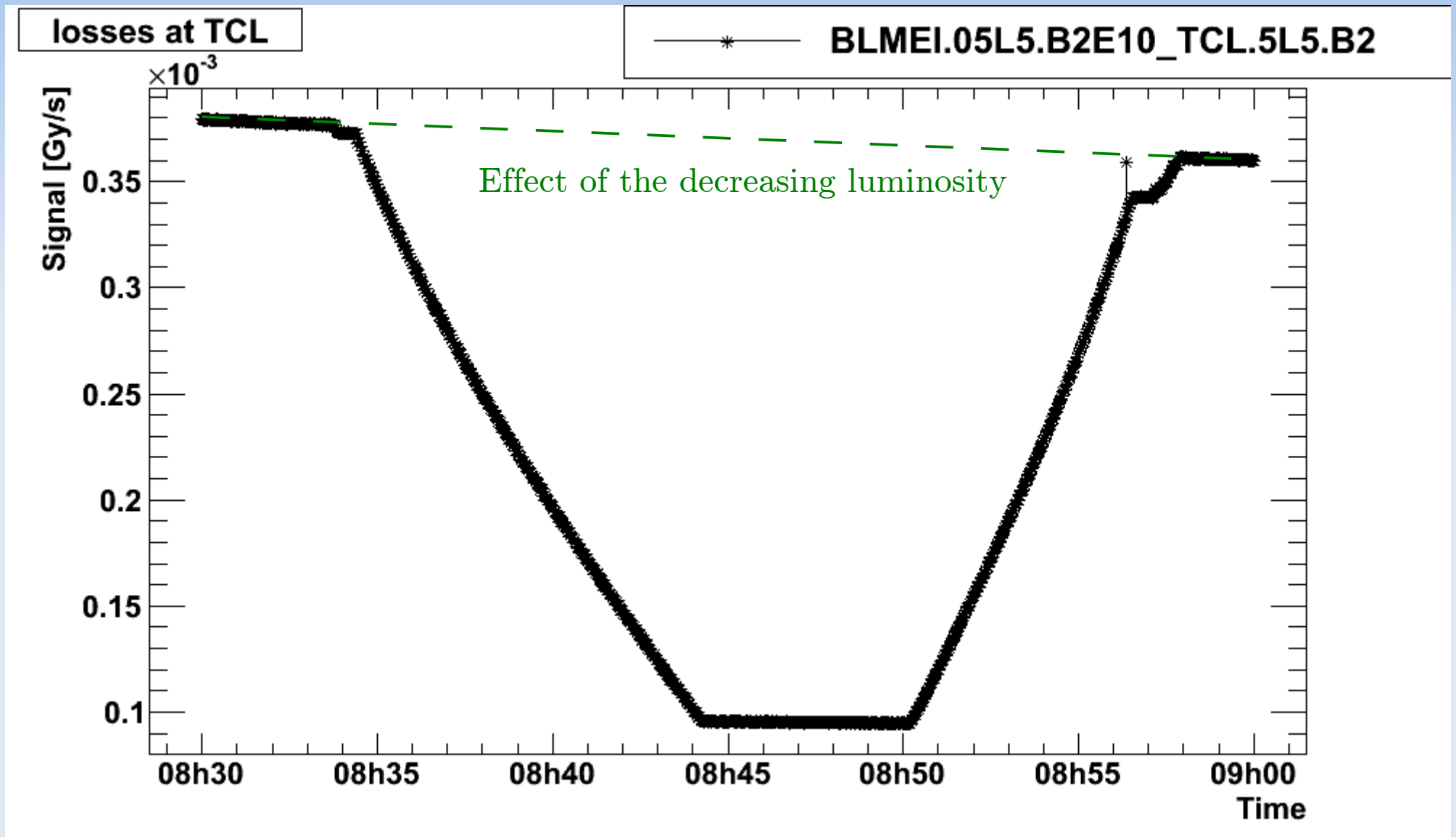
- TCL protects elements up to 200 m downstream
- Effect of TCL moving in:
  - Losses at the TCL increase
  - Losses downstream decrease
- Losses have to be divided by luminosity
  - Exact matching! (second by second)
  - Technical issue with the available timestamps
- Loss profiles with TCL in or out
- Ratio of the normalised losses
- Normalised losses vs. jaw position

Principle: collimator gap

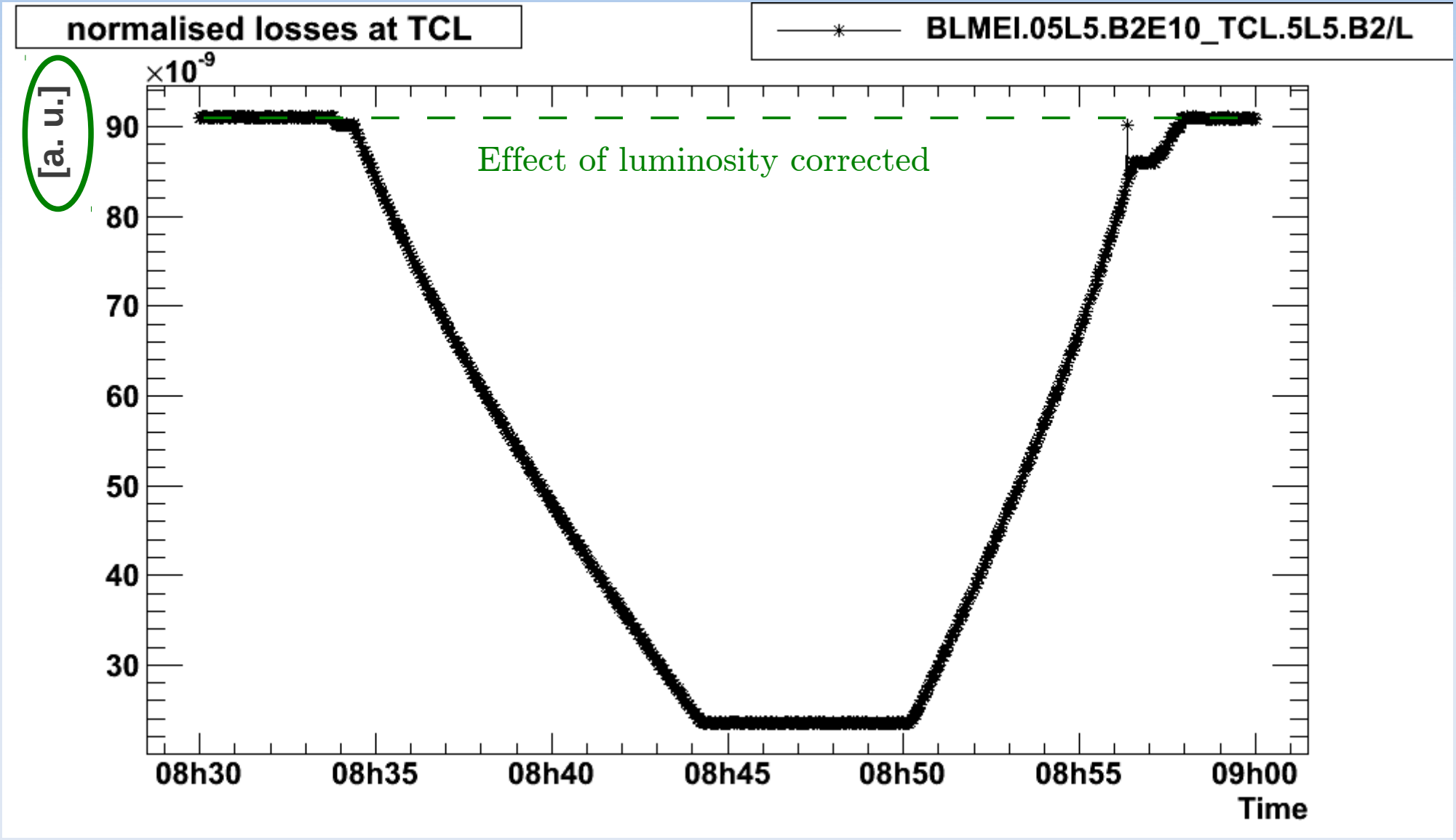


Jaws move symmetrically, $\sigma = 0.35$ mm

Losses at the TCL

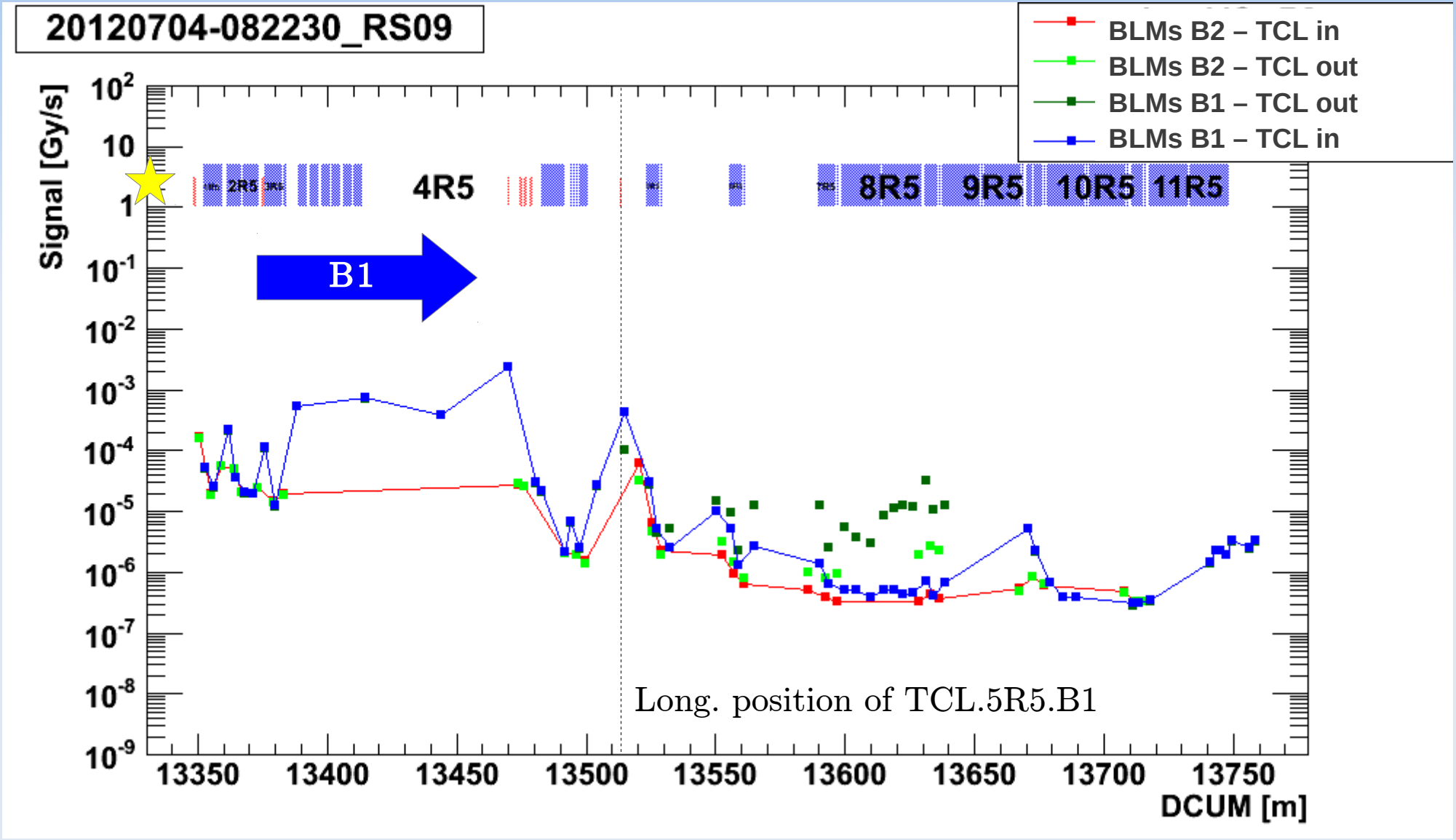


Normalised losses at the TCL

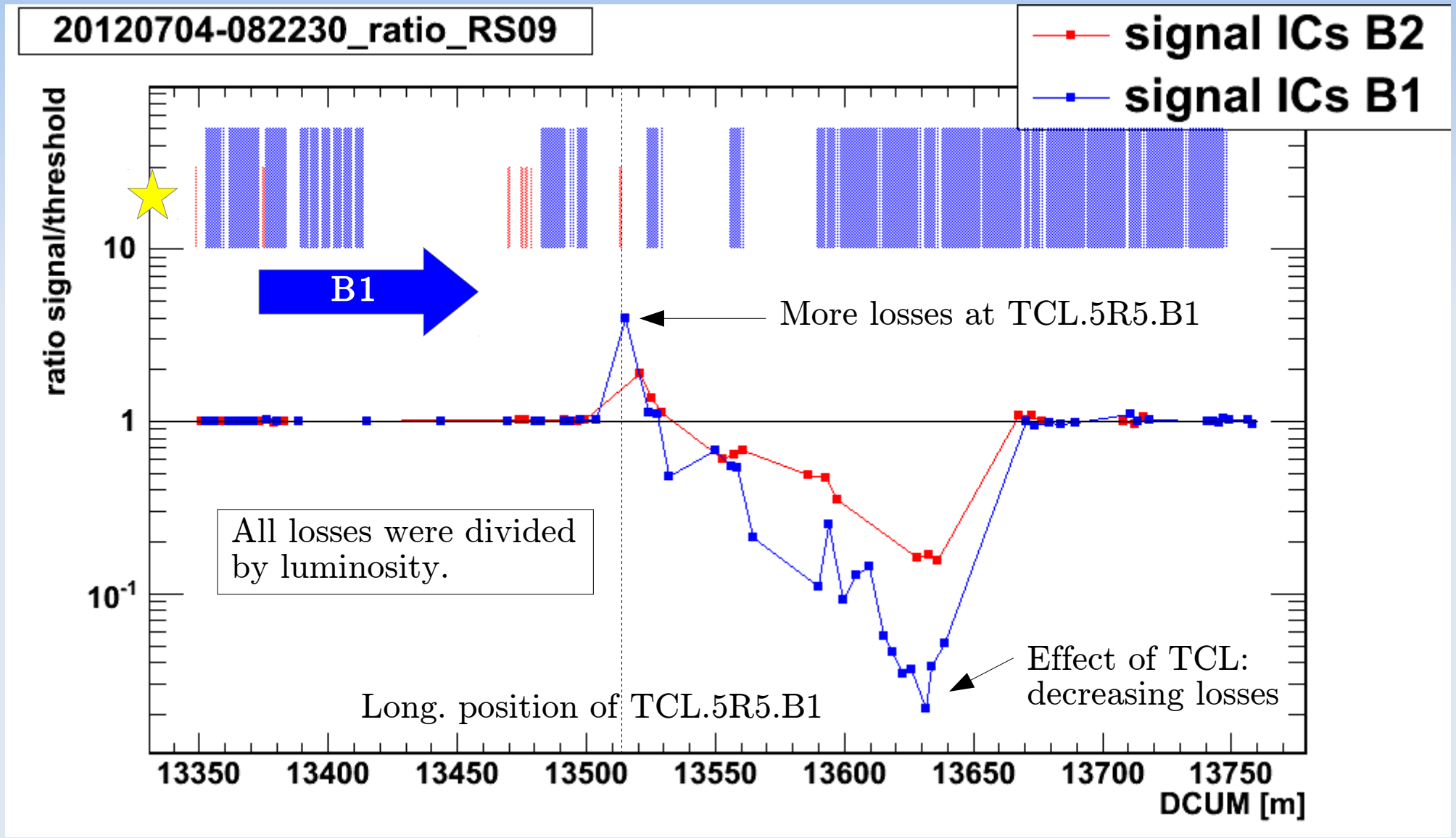


Results

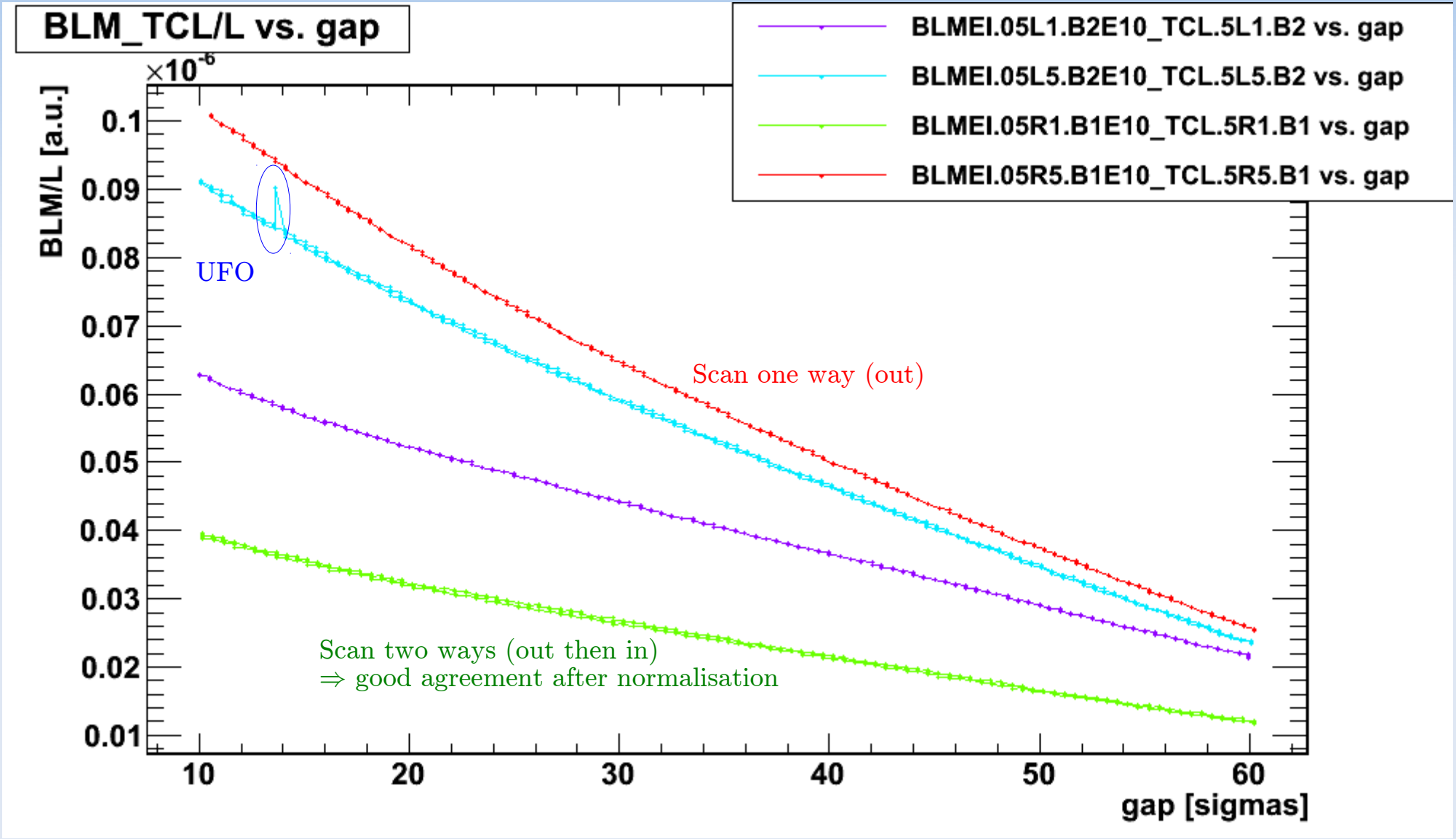
Results: effect of the TCL seen on the loss maps



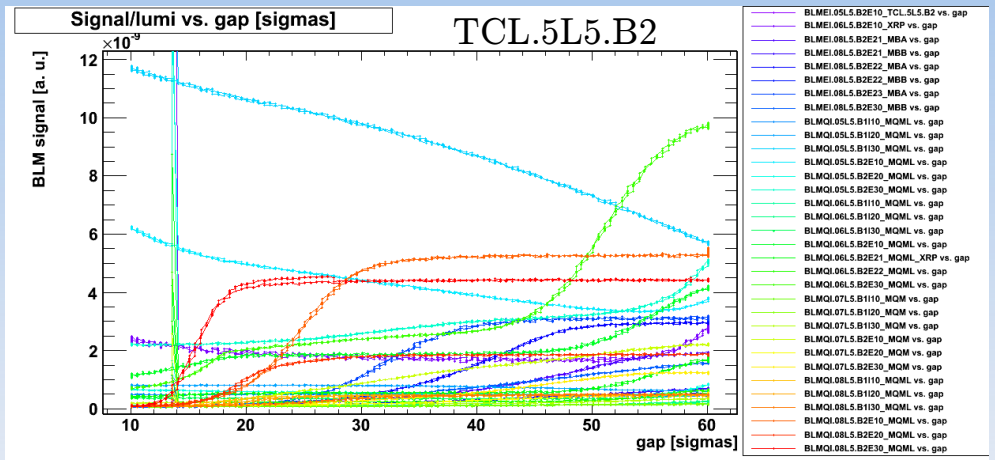
Results: in/out ratios of normalised BLM signal

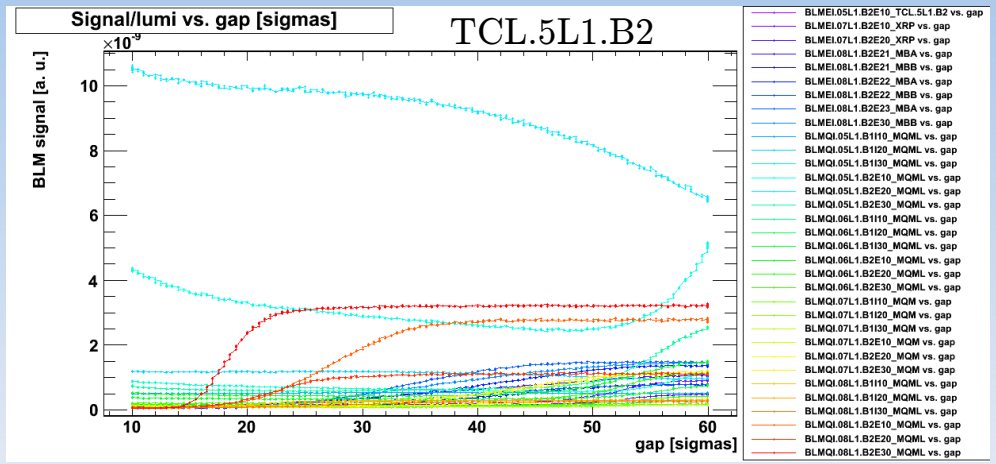


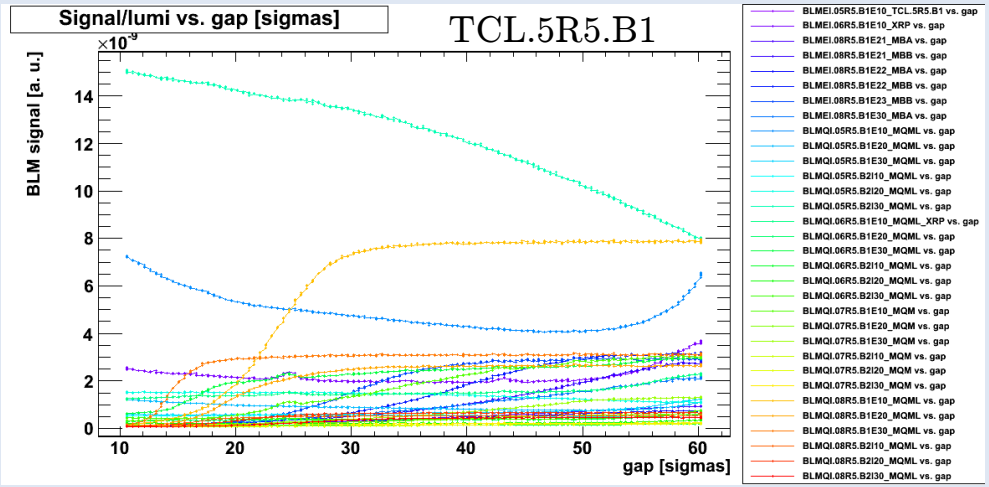
Normalised losses at TCL vs. jaw position

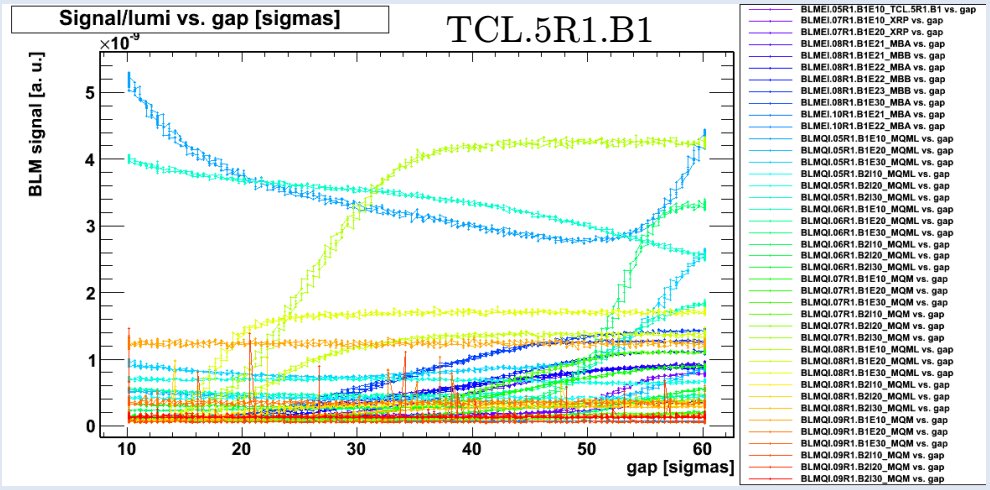


Normalised losses downstream vs. jaw position





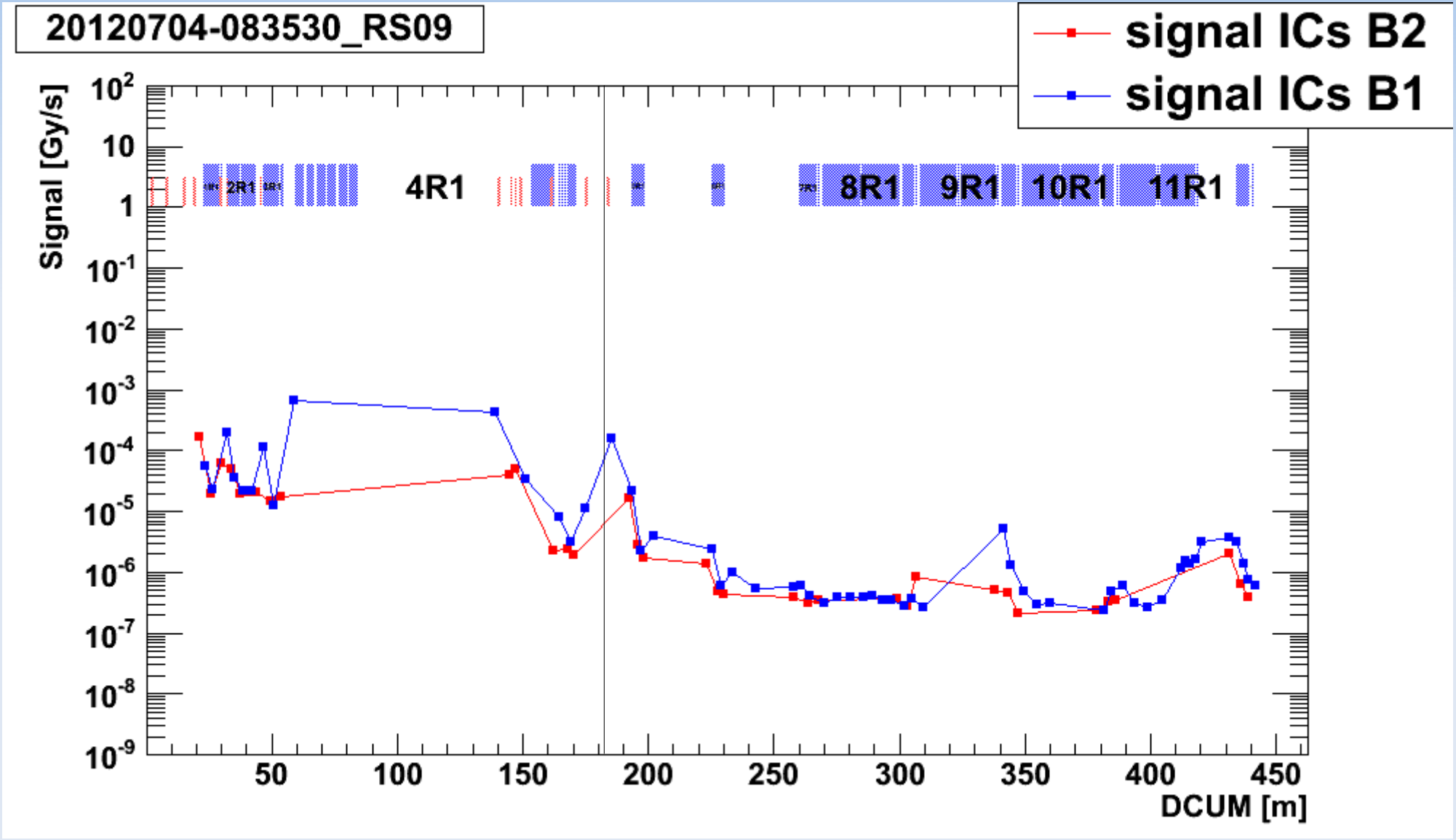




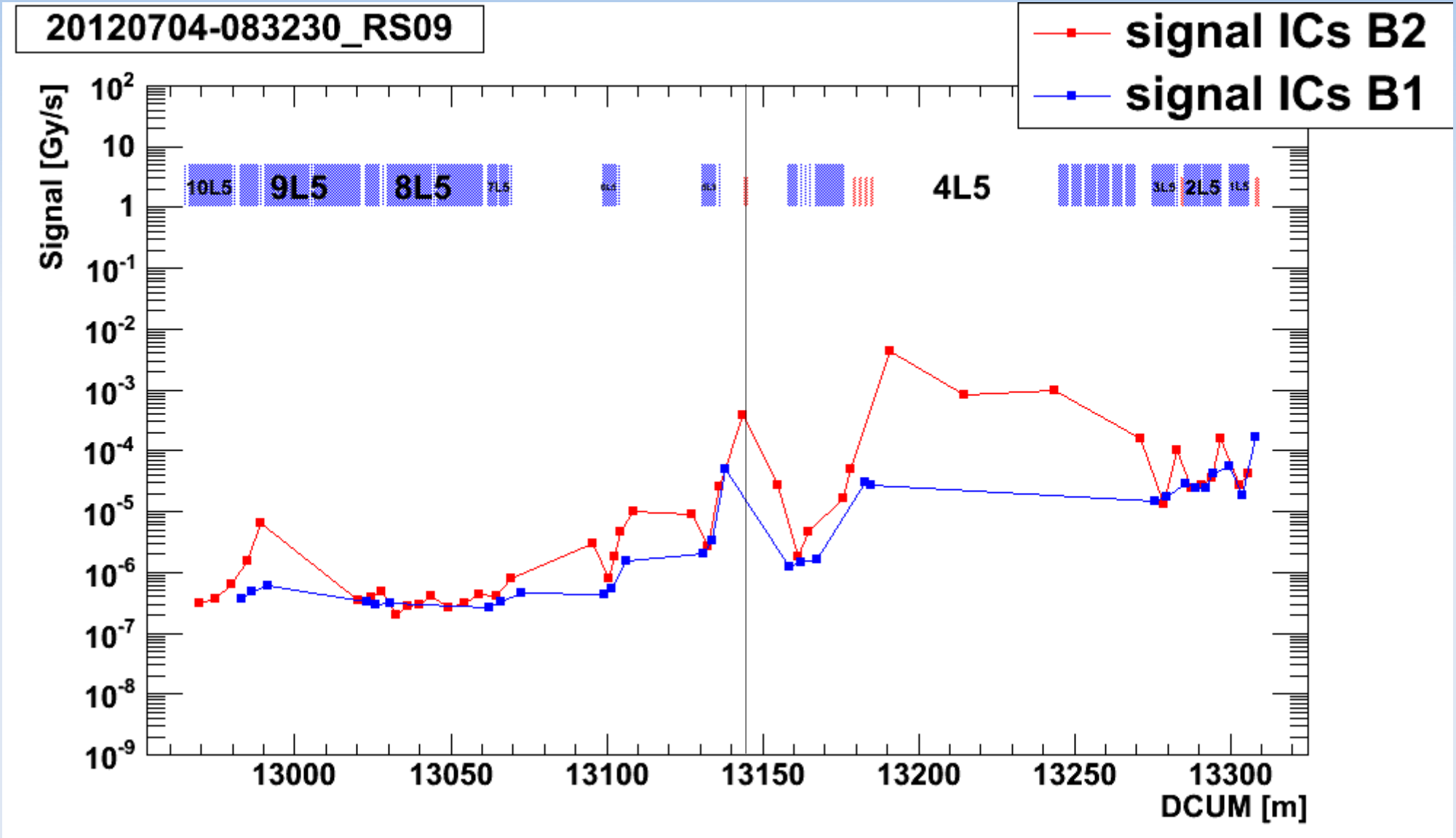
- Most losses increase, then reach a plateau
- Another BLM decreases with TCL opening (first BLM downstream the TCL – sees the shower)

- One BLM first decreases, but starts increasing again at the end of the scan : first cross-talk from another shower (TCL), then "real" losses?

Movie!
Evolution of loss profile 5R1



Evolution of loss profile 5L5



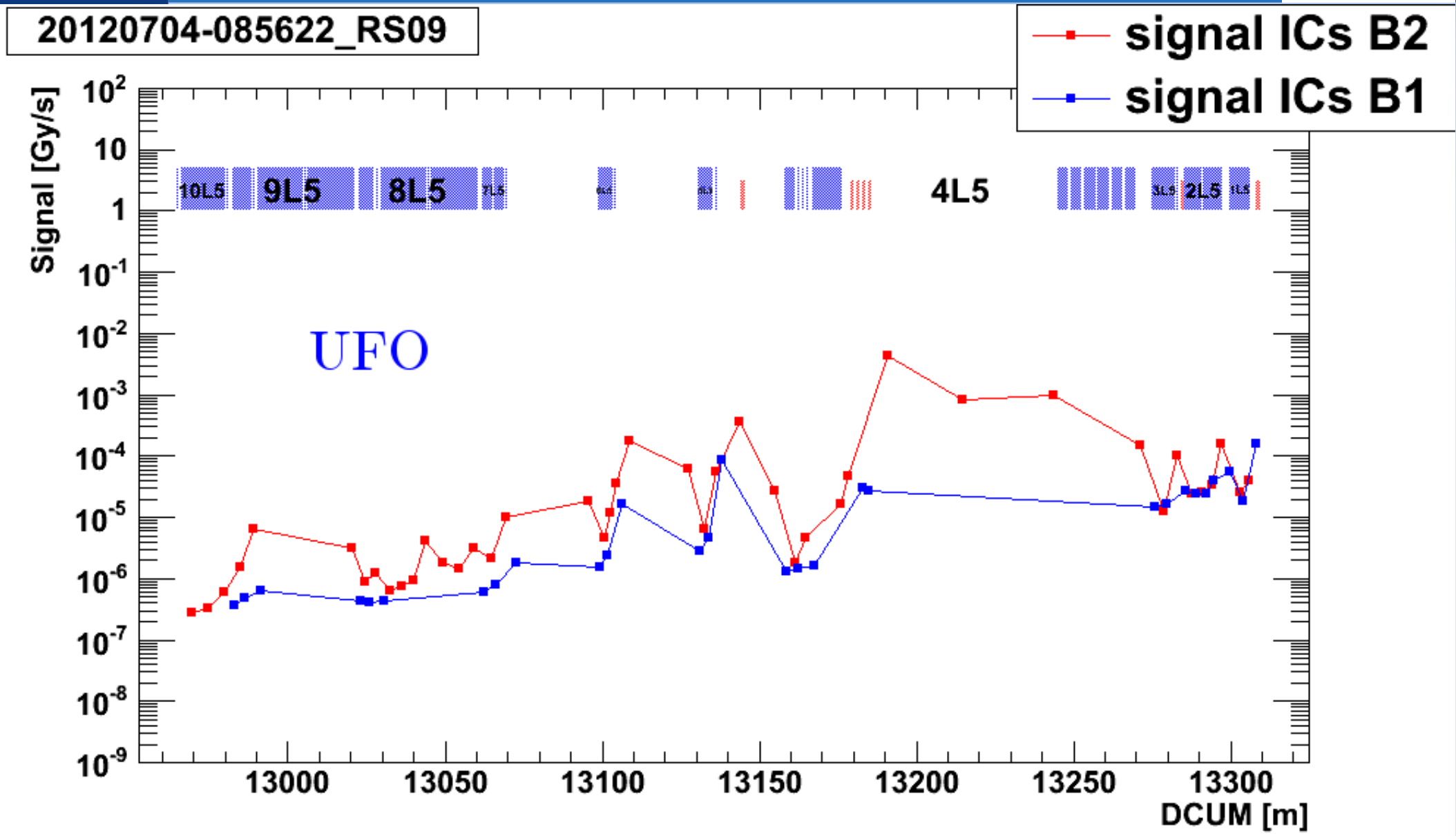
Observations on the scan

- Losses start to appear first the furthest away from the TCL, then get closer.
- We can observe a shower from the TCL.
- Cell #9 might not be protected enough.
- We can measure the effect of the TCL: up to factor 100 in cleaning.

Conclusion & Follow-up

- Compare these results with the ones for the asymmetric scan
- Understand the evolution of the losses
  - Study of the values of slope, plateau, setting at which each plateau starts
  - Dependence on the phase advance?
- Simulate these losses in SixTrack using debris distributions

Extra slide: UFO



Extra slide: before