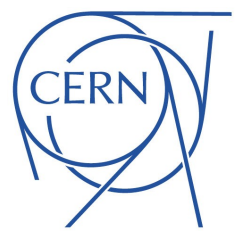
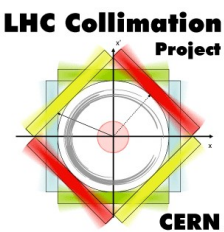


BE note on TCL scans

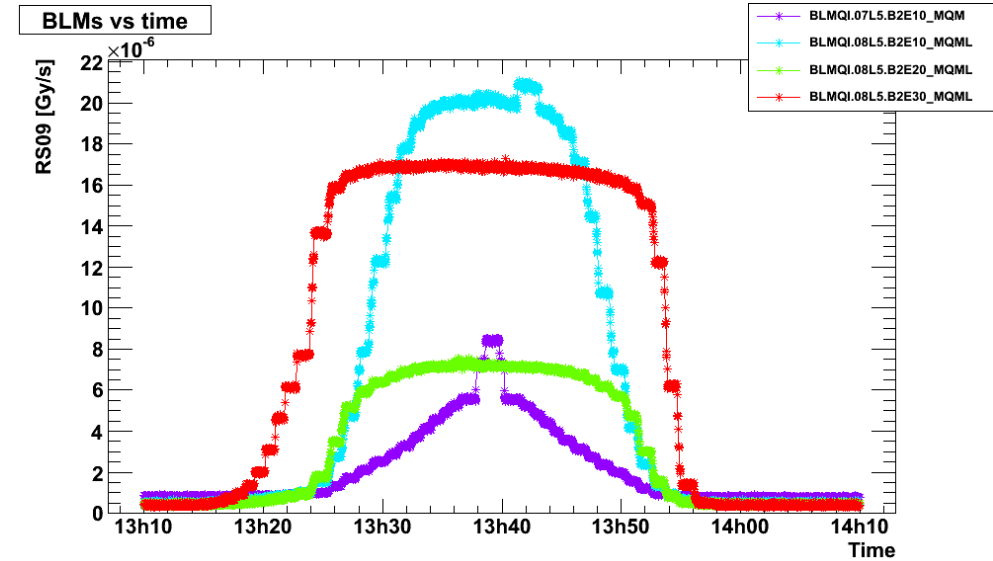
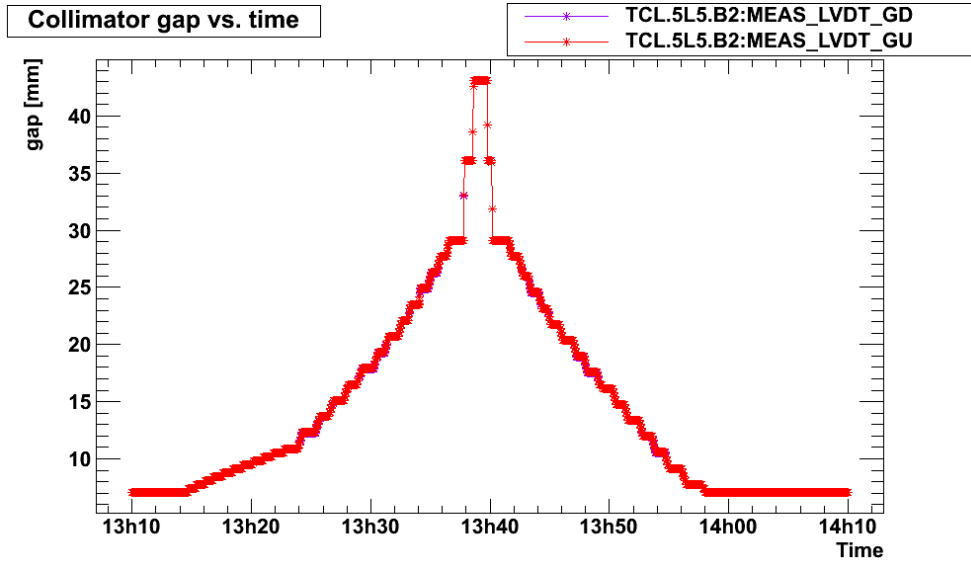
*A. Marsili, R. Bruce, E. Quaranta, S. Redaelli,
B. Salvachua, G. Valentino*



Introduction



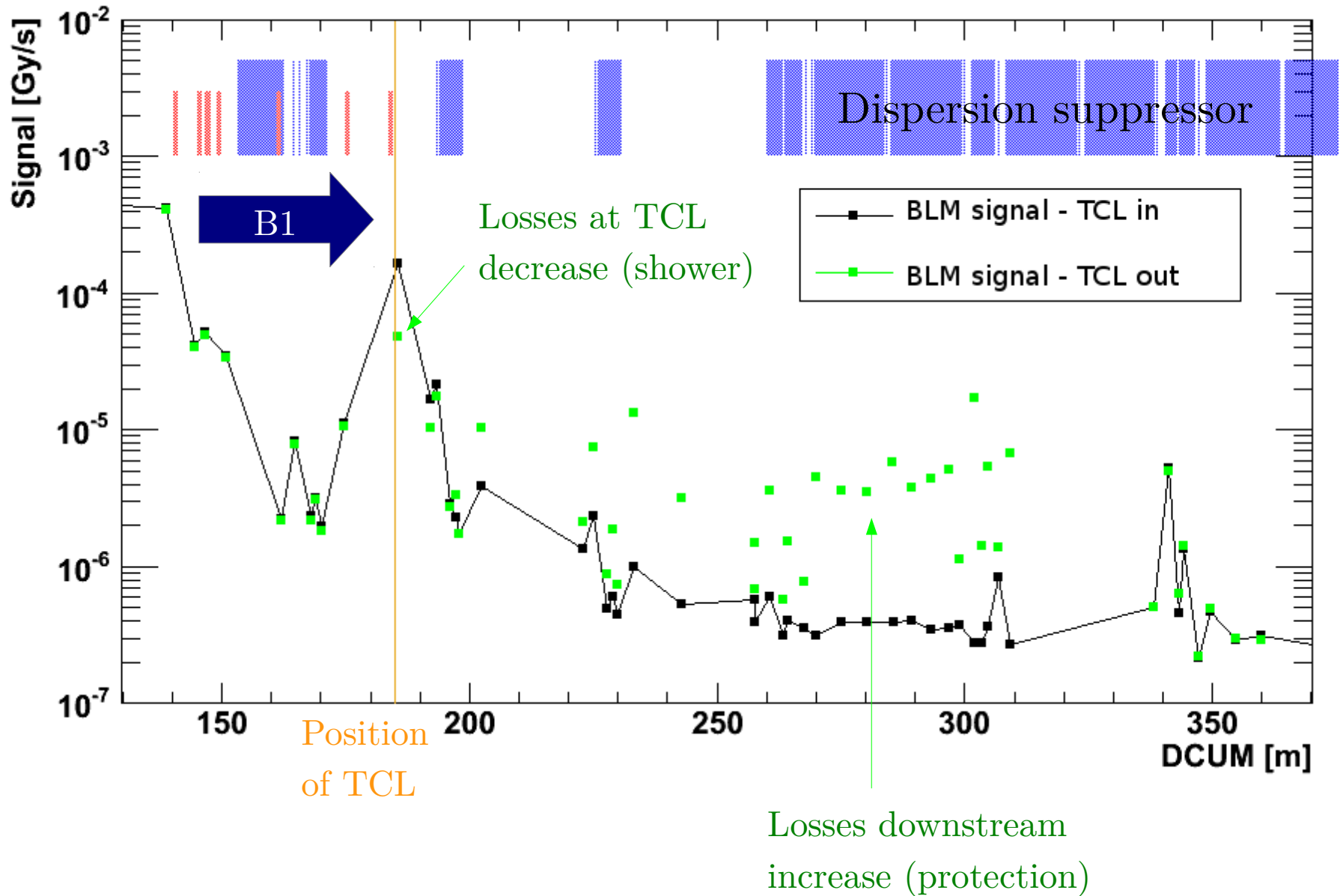
- BE note on TCL scans in 2012 LHC
 - 4TeV, $\beta^*=60\text{cm}$, $X_{\text{ing}} = 145 \mu\text{rad}$
 - Lumi between 1.5 and $6.2 \times 10^{33} \text{ cm}^{-2}\text{s}^{-1}$ ($= \text{nb}^{-1}\text{s}^{-1}$)
 - Gathering all measurement dates
 - Effects of the TCL at different longitudinal positions
 - Symmetric and asymmetric scans
- Simulations: comparison with FLUKA
 - Several rounds of iterations
 - Part of IPAC article



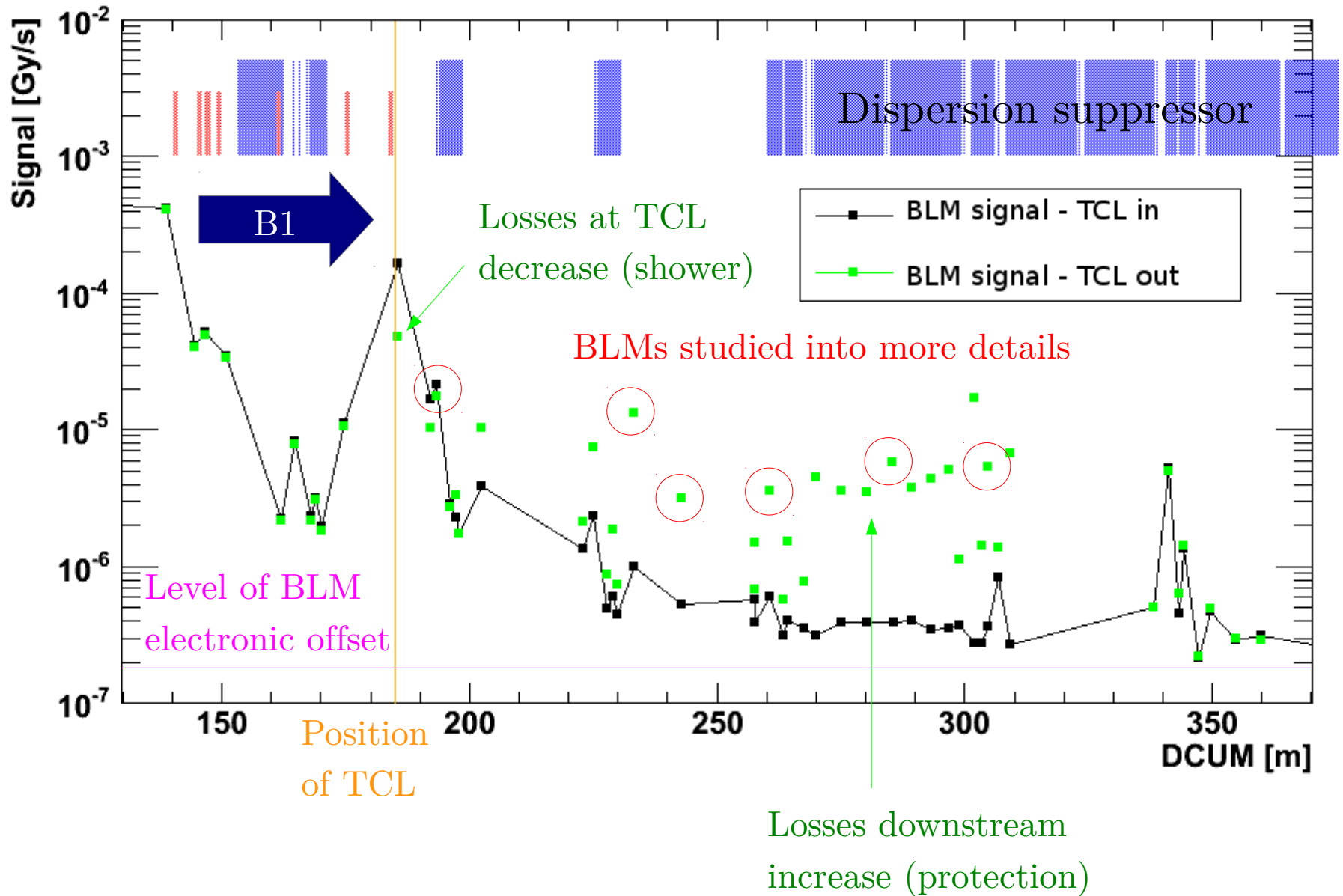
- TCL gap vs. time
- Opened, then closed
- Not too fast to make sure to have several points at each jaw setting (1 Hz DB)

- BLM signal vs. time
- BLMs at different positions see the effect at different times
- Losses have to be normalised by luminosity

Effect of the TCL

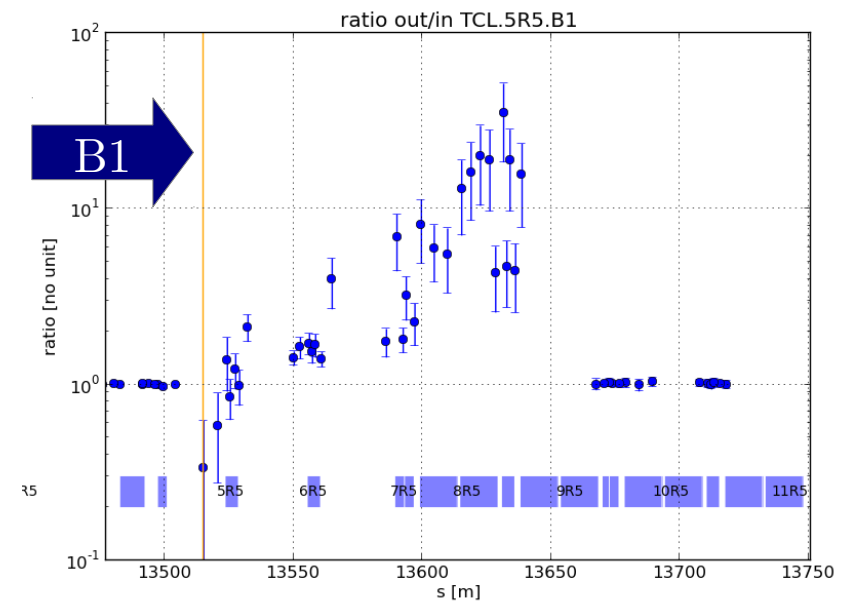
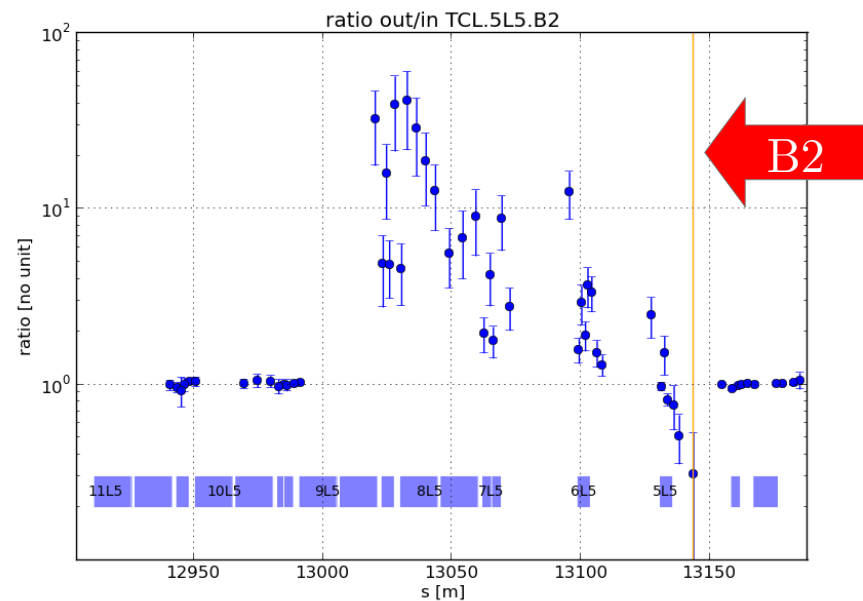
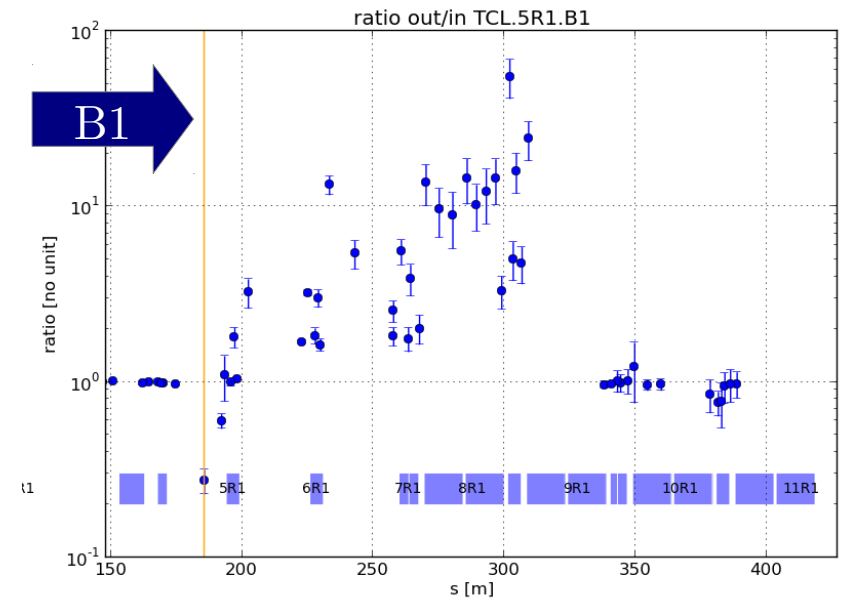
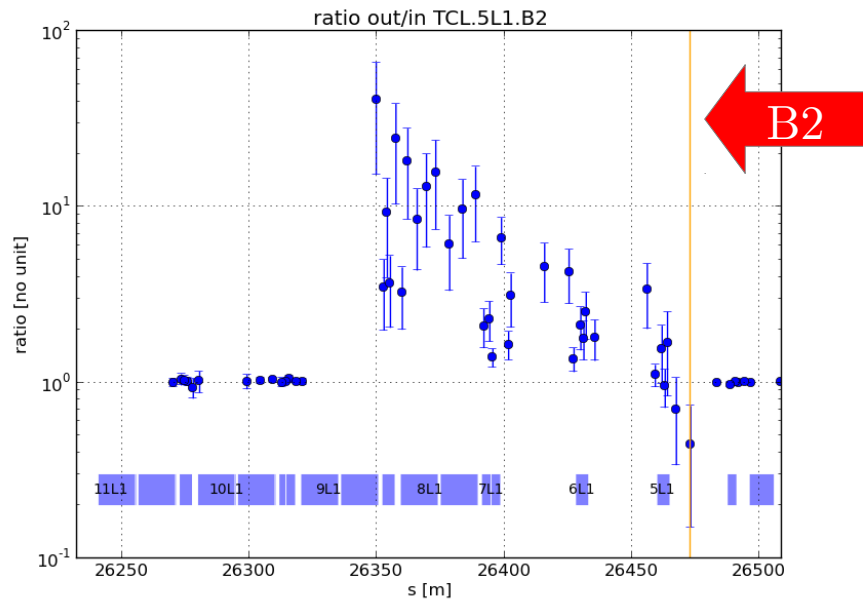


Effect of the TCL



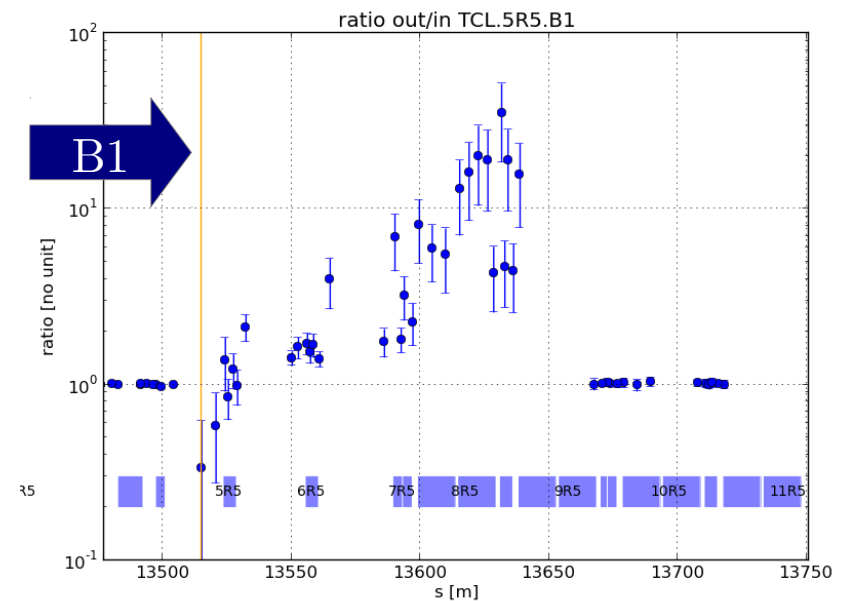
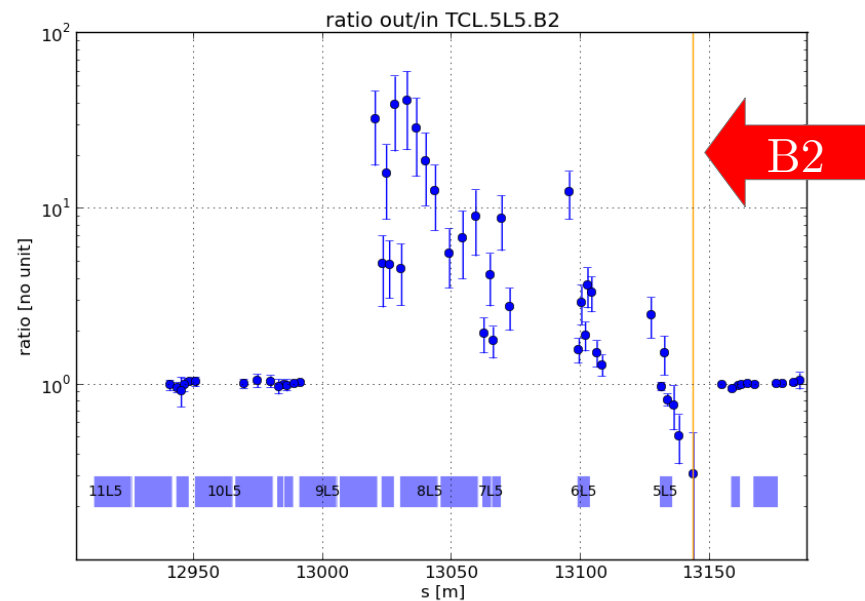
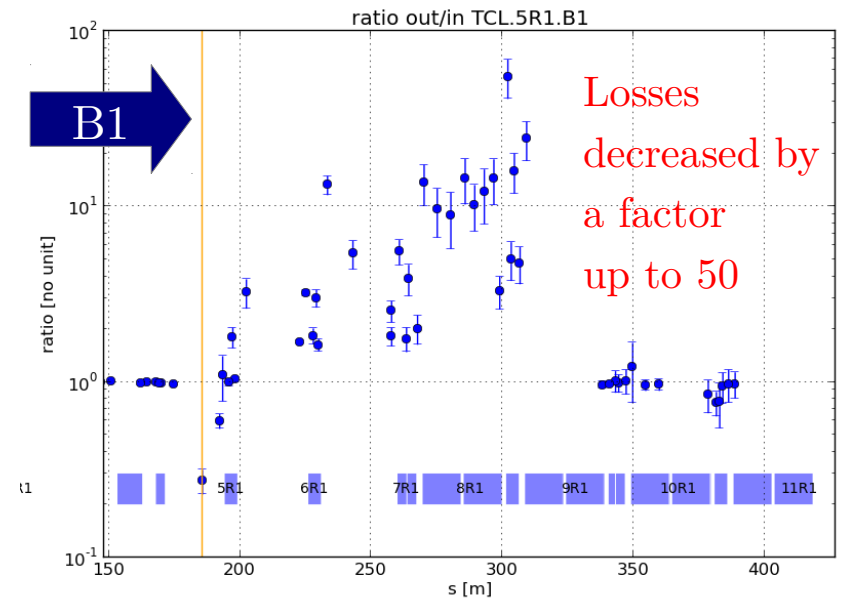
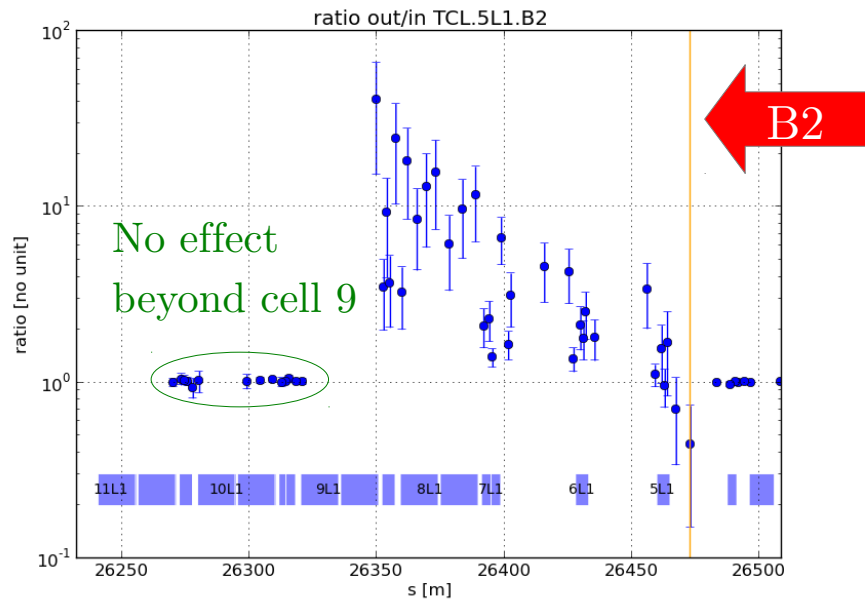
Average ratio out/in

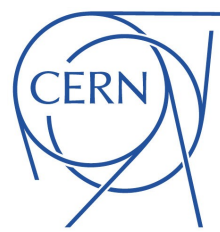
all dates, normalised by luminosity



Average ratio out/in

all dates, normalised by luminosity

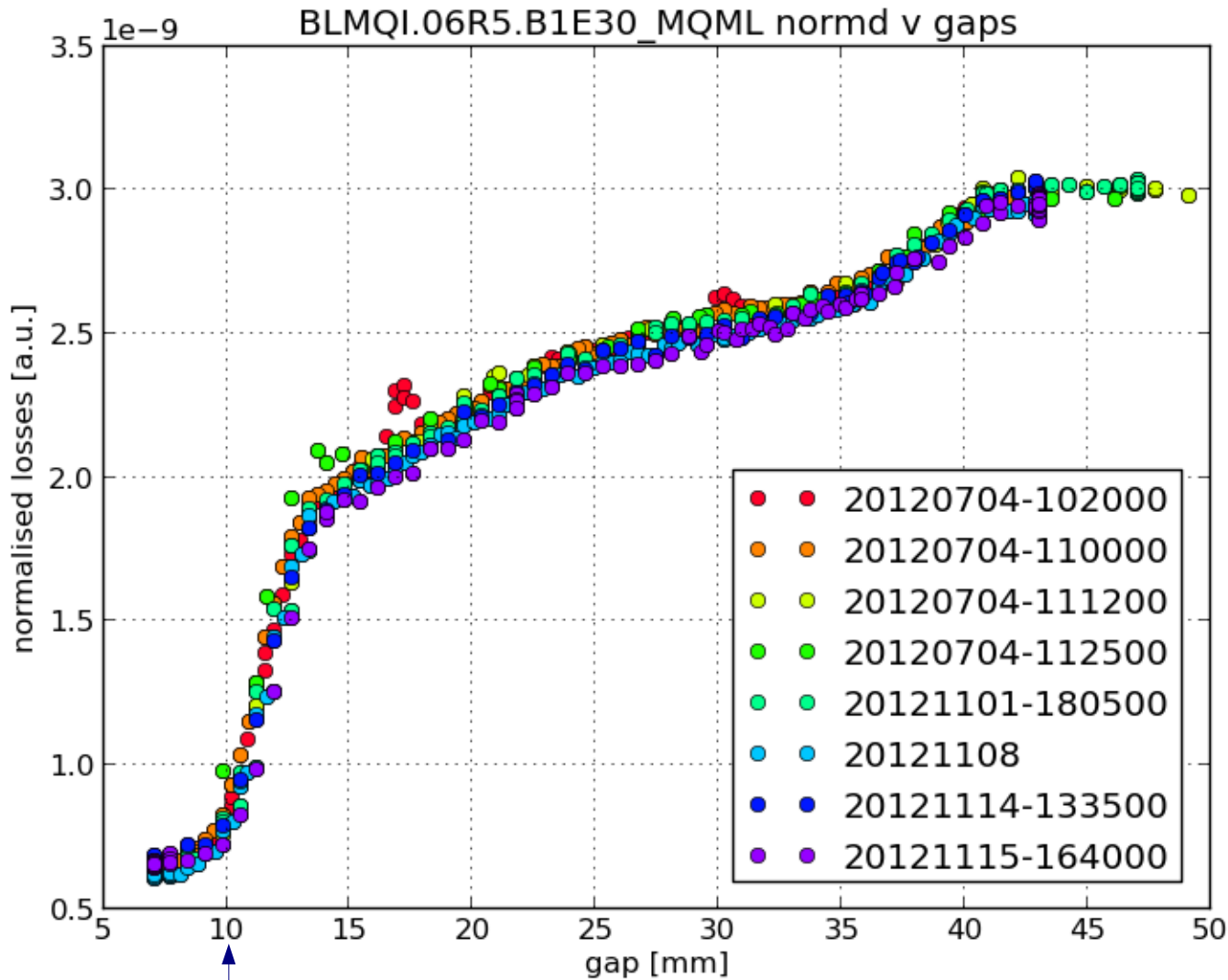




Reproducibility after normalisation by luminosity (example – true for all monitors)



Unit is Gy/b⁻¹

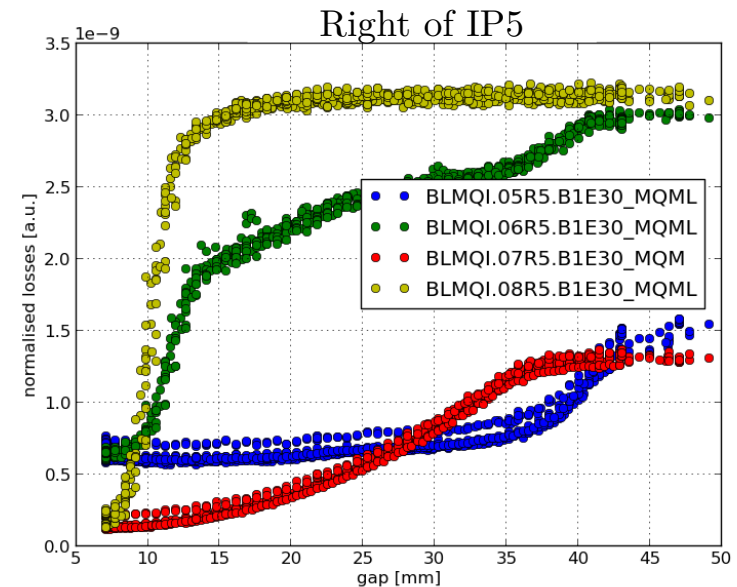
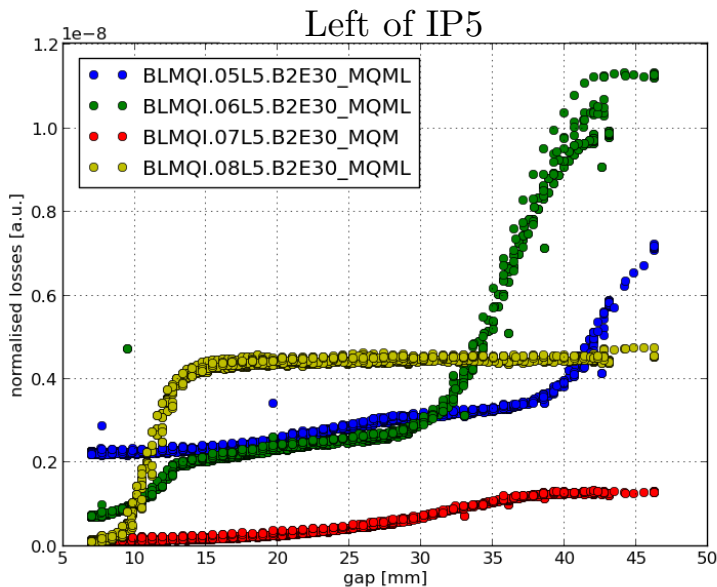
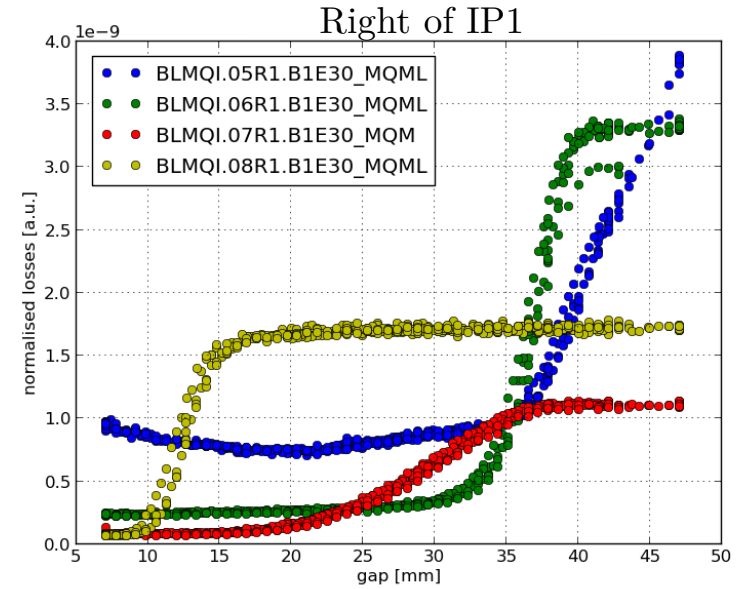
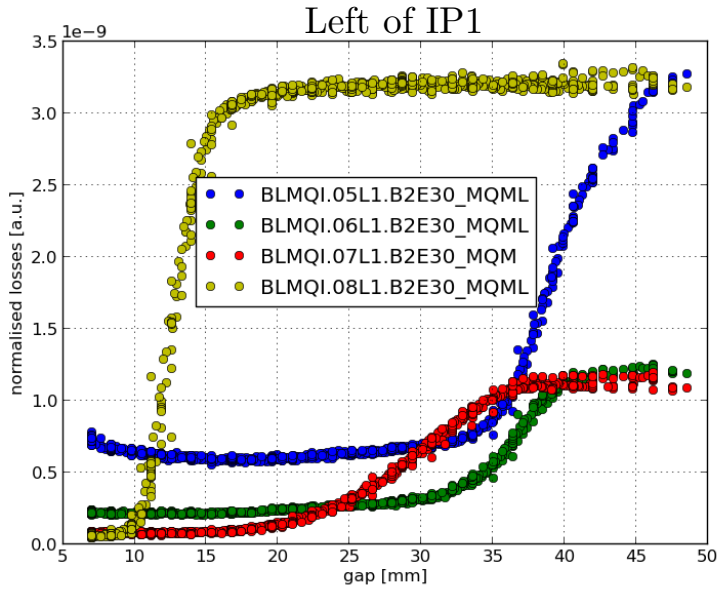


After normalisation by luminosity, the rather complex shape of the curve is reproduced for each measure

$\sigma \simeq 360 \mu\text{m}$

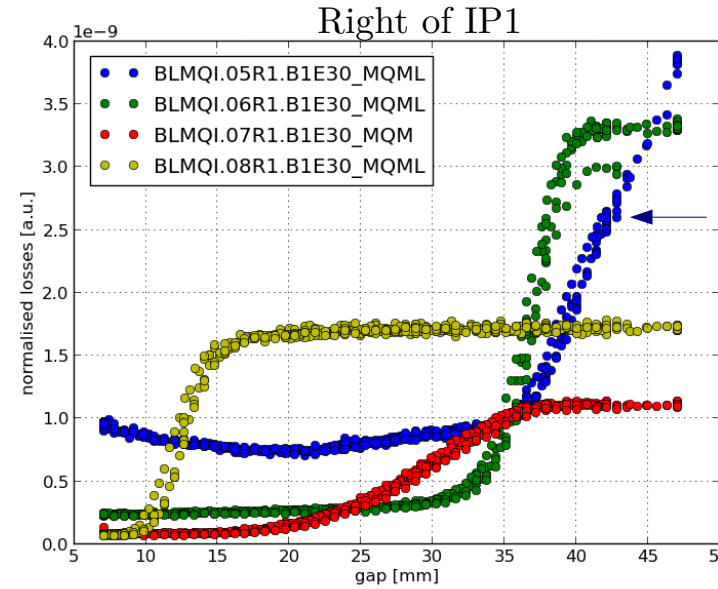
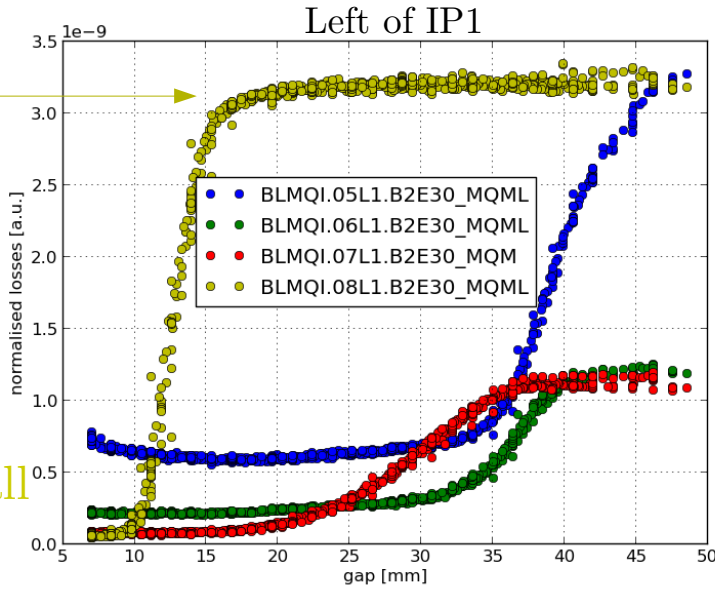
BLM position is protected up to 10 mm / 14 σ

All dates for each considered monitor, by IP

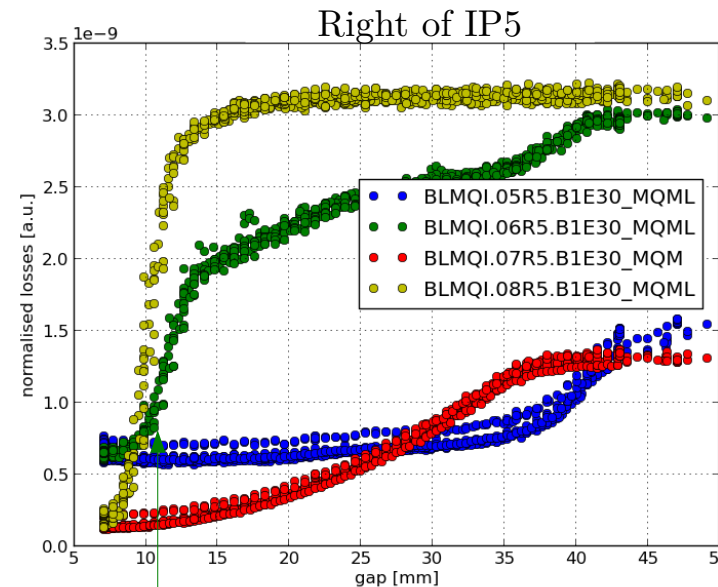
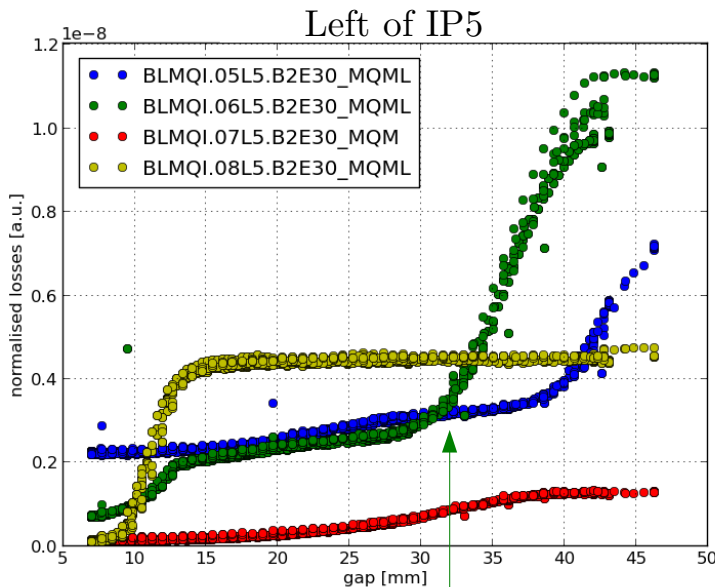


All dates for each considered monitor, by IP

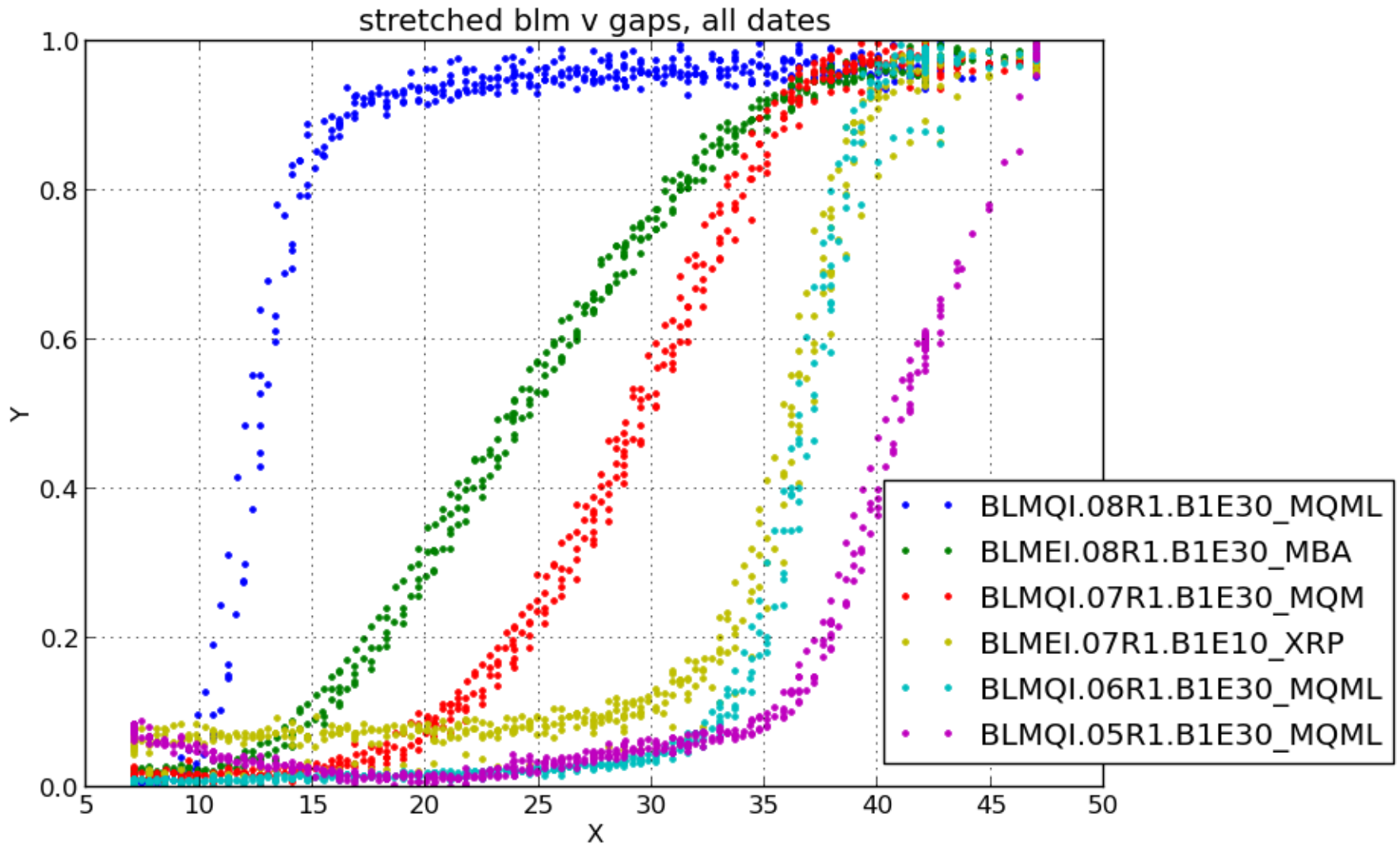
Longit. positions far away from TCL (Q8) are protected only for small settings (14σ)



Longit. positions close to TCL (Q5) are protected even with open TCL (50σ)

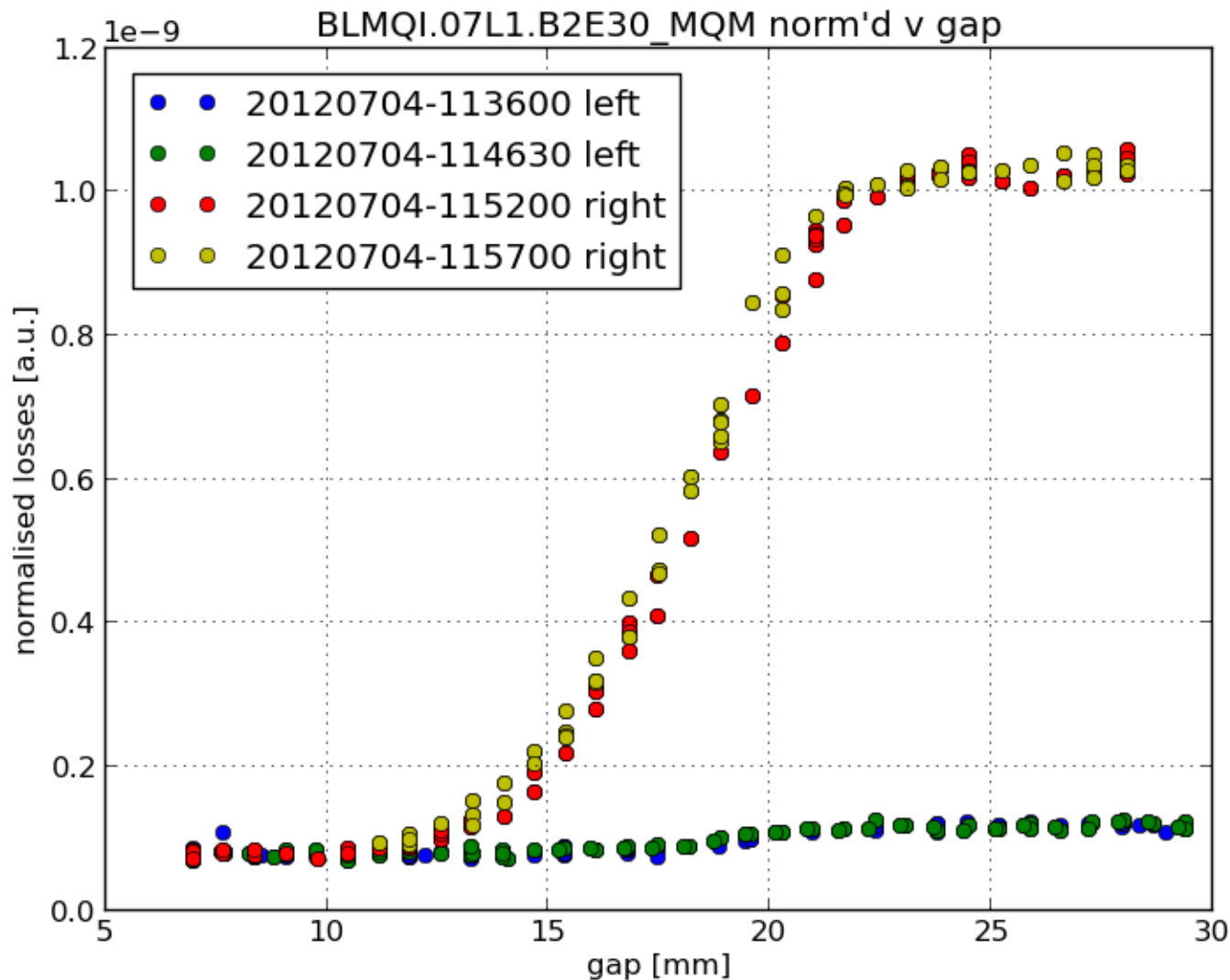


BLMs have same theoretical positions, yet the losses are different from IP to IP



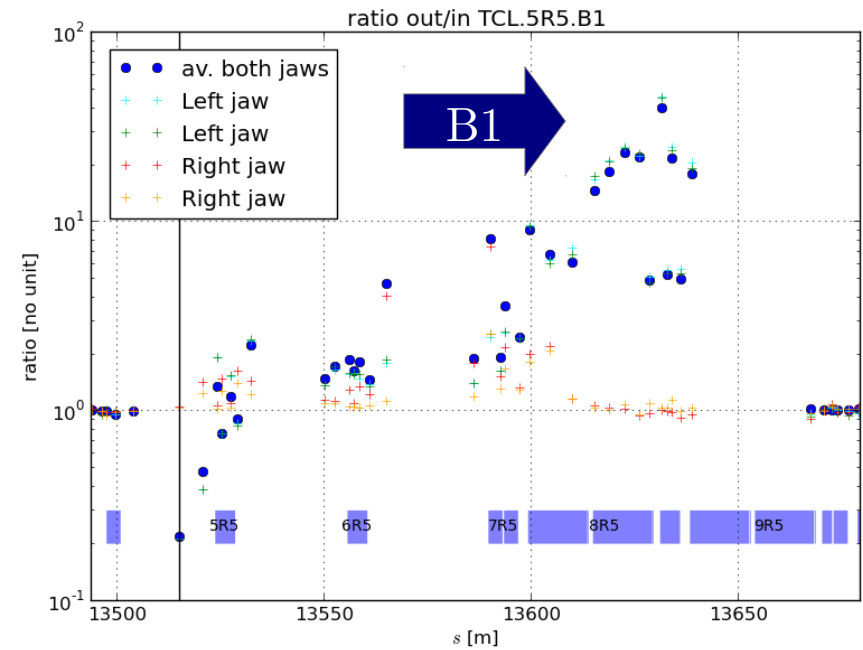
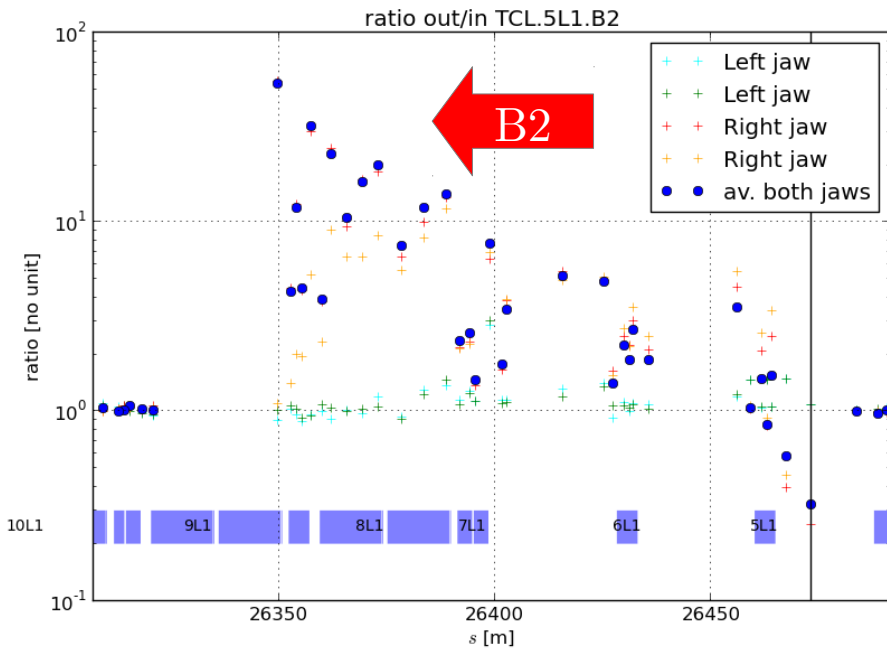
Signals of each BLM start increasing in (reverse) longitudinal order

Asymmetric scans: only one jaw moves

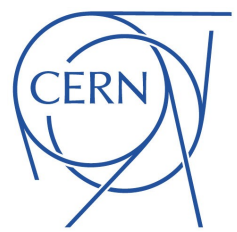


$D_x(\text{TCL}) < 0 \Rightarrow$ particles with $dp/p < 0$ are lost on the outside jaw:
 left jaw for B1, right jaw for B2

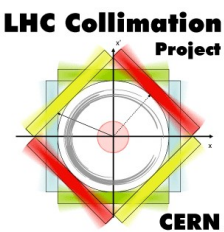
Comparison 1 jaw / 2 jaws



- Similar cleaning can be achieved using only the active jaw
- Way to reduce the impedance?



Conclusion on measurements

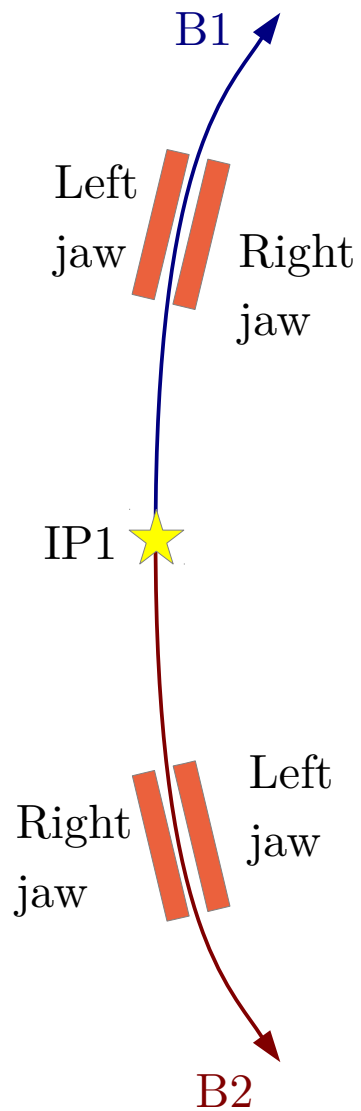


- Excellent reproducibility
- Effect of the TCL measured up to Q8
 - No effect at Q9, no data for MB09 (no BLM)
- TCL decreases losses by a factor up to 50 (at Q8)
- Data give maximum setting required for protection at each BLM position
- According to BLM measurements, TCL5 remains effective for Q5 for up to 25σ
- There are non-negligible differences between IPs / sides of same IP
- Asymmetric scans illustrate the fact that losses are mainly dispersive (debris)
- All data & plots for all dates available in BE note

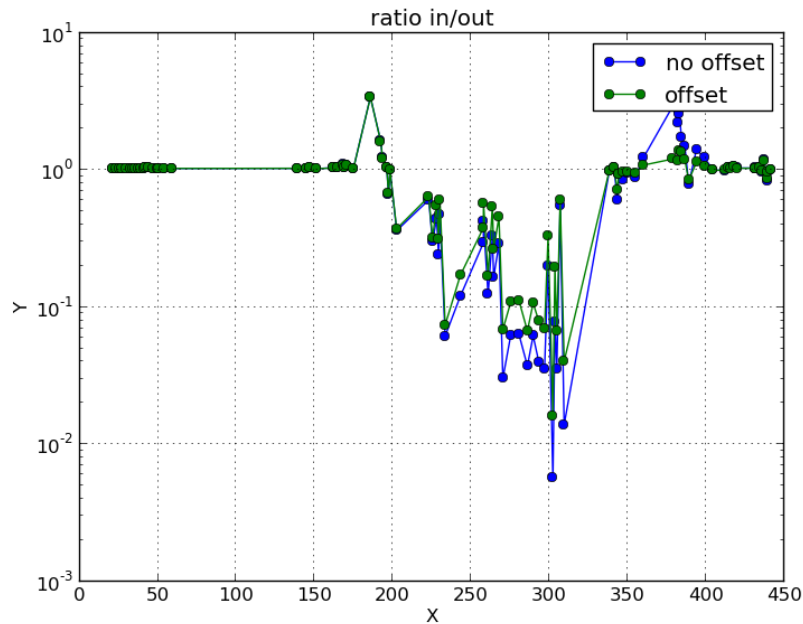


Spare slides

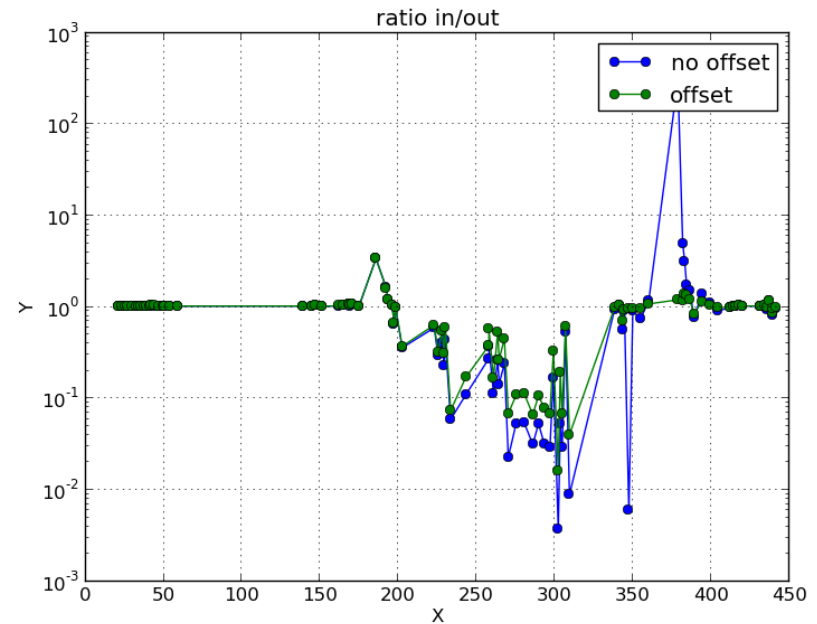
Asymmetric scans



Protons with $dp/p < 0$ would be curved more
 \Rightarrow right jaw
but $Dx < 0 \Rightarrow$ left jaw



BLM offset



Min signal

- Subtracting offset before

Losses vs. gap et TCP IP3

