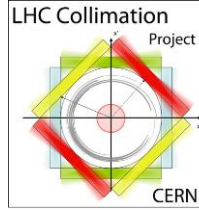


Collimator Hierarchy Limits MD

**G. Valentino, R. Bruce, M. Cauchi, D. Deboy, L. Lari, A. Marsili,
D. Mirarchi, V. Moens, V. Previtali, E. Quaranta, S. Redaelli,
A. Rossi, B. Salvachua, D. Wollmann**



Planned Studies (09.10.2012, 16:00 – 00:00)



- **Loss maps during ramp** ✓

- Cleaning inefficiency as a function of energy and collimator positions.
- Measurement data comparison with SixTrack simulations (E. Quaranta).

Completed
from 17:00 to
20:40

- **Hierarchy Limits at 4 TeV (nominal optics, colliding beams)** ✓

- Loss maps with tight settings, then move in IR6 + IR7 collimators to 7 TeV nominal settings in mm.
- Repeat loss maps and check for hierarchy breakdown.

- **Recovery from Hierarchy Breakdown**

- Re-align the 40 IR7 + IR6 TCSG collimators in both beams (~50 % of LHC collimation system). ✓
- Repeat loss maps. ✗

Beams dumped at 20:40
due to cryogenic valve

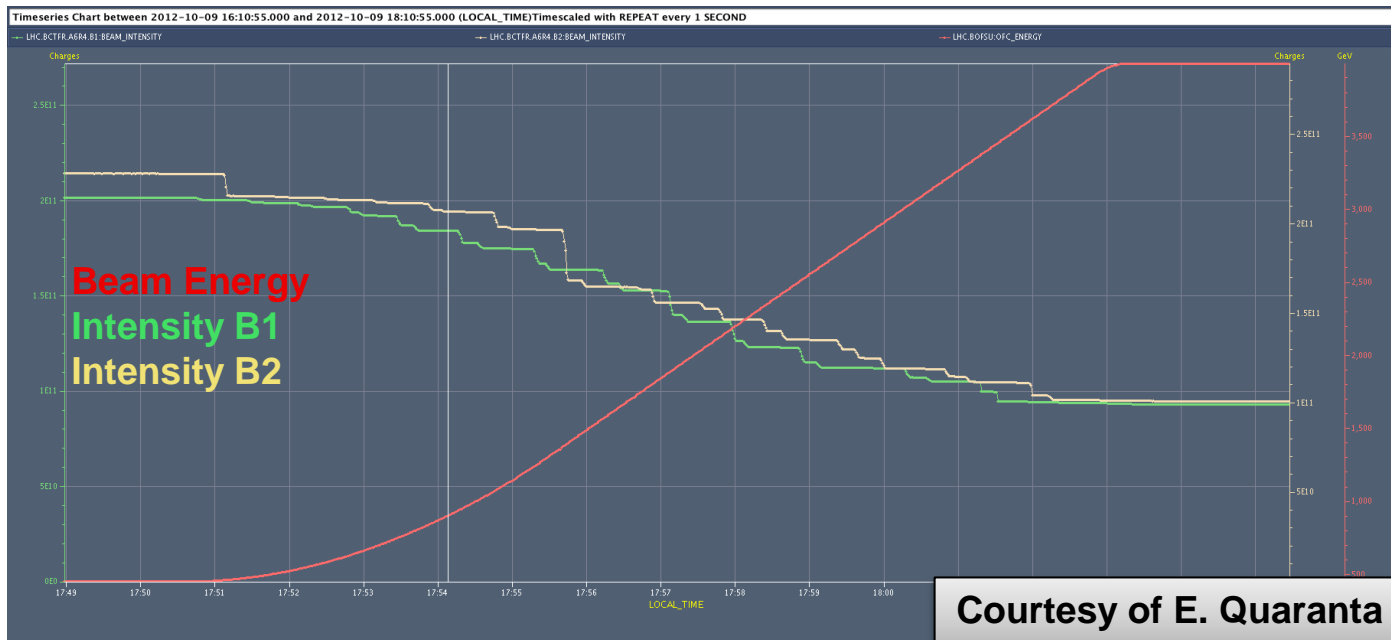
- **Impedance Studies** ✗

- Collimators back at tight settings, transverse and tune feedbacks off.
- High enough octupole current to stabilize beam, move IR7 collimators back and forth, measure corresponding tune shift.

Less than 4
hours of beam!

Loss Maps during the Ramp

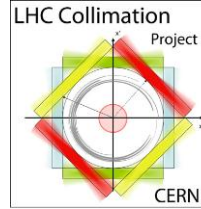
- Parasitic study to extrapolate collimation system performance to higher energies.
- Injected 3 nominal proton bunches → during ramp, periodic ADT excitation of both beams (2 bunches).
- One excitation every 10 seconds for B1/B2 H/V alternatively, excitation duration = 3 seconds.



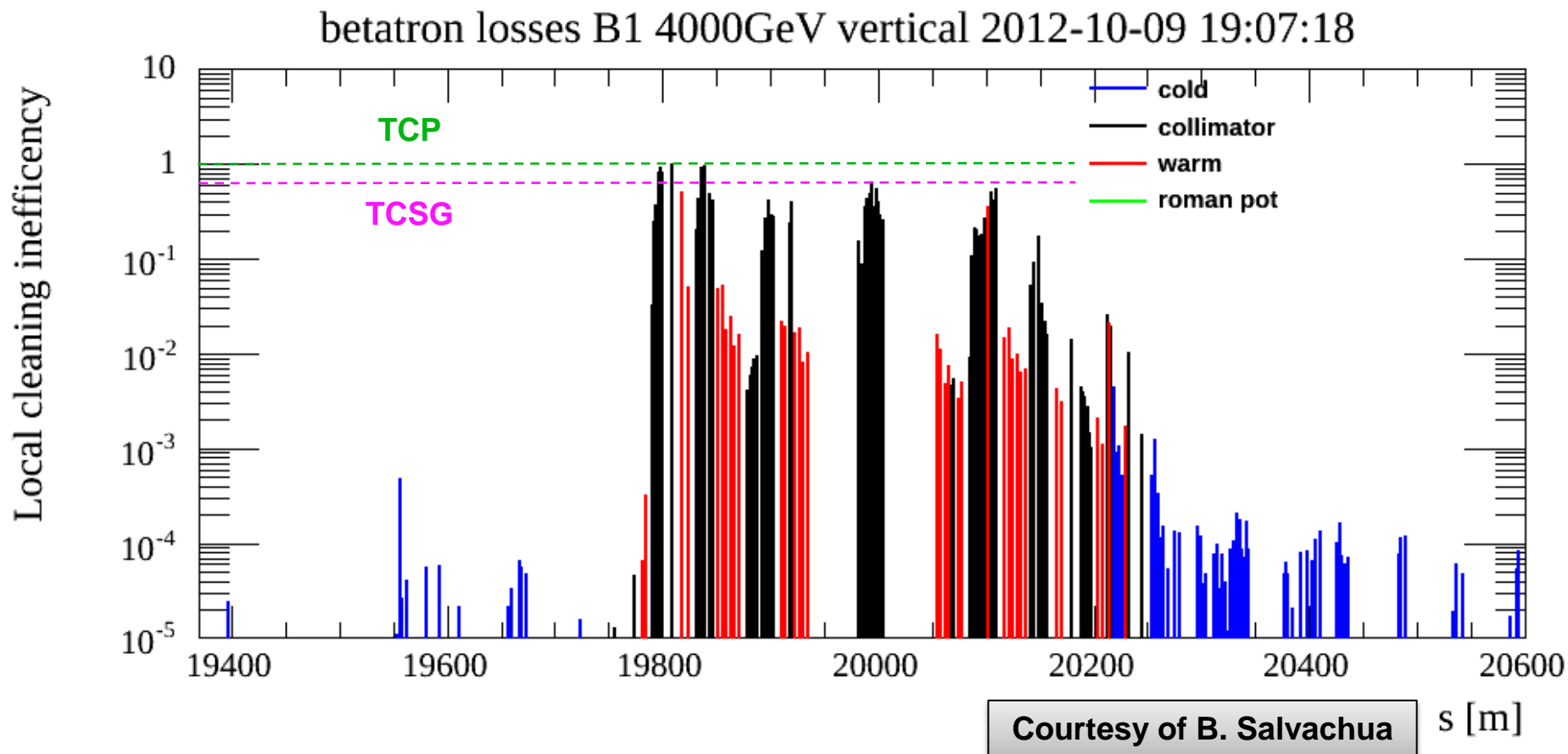
- **Work in progress:**
 - Evaluate the LHC collimation system cleaning inefficiency as a function of the energy from BLMs.
 - Comparison with SixTrack simulations at different energies during the ramp to assess the reliability of the simulations.



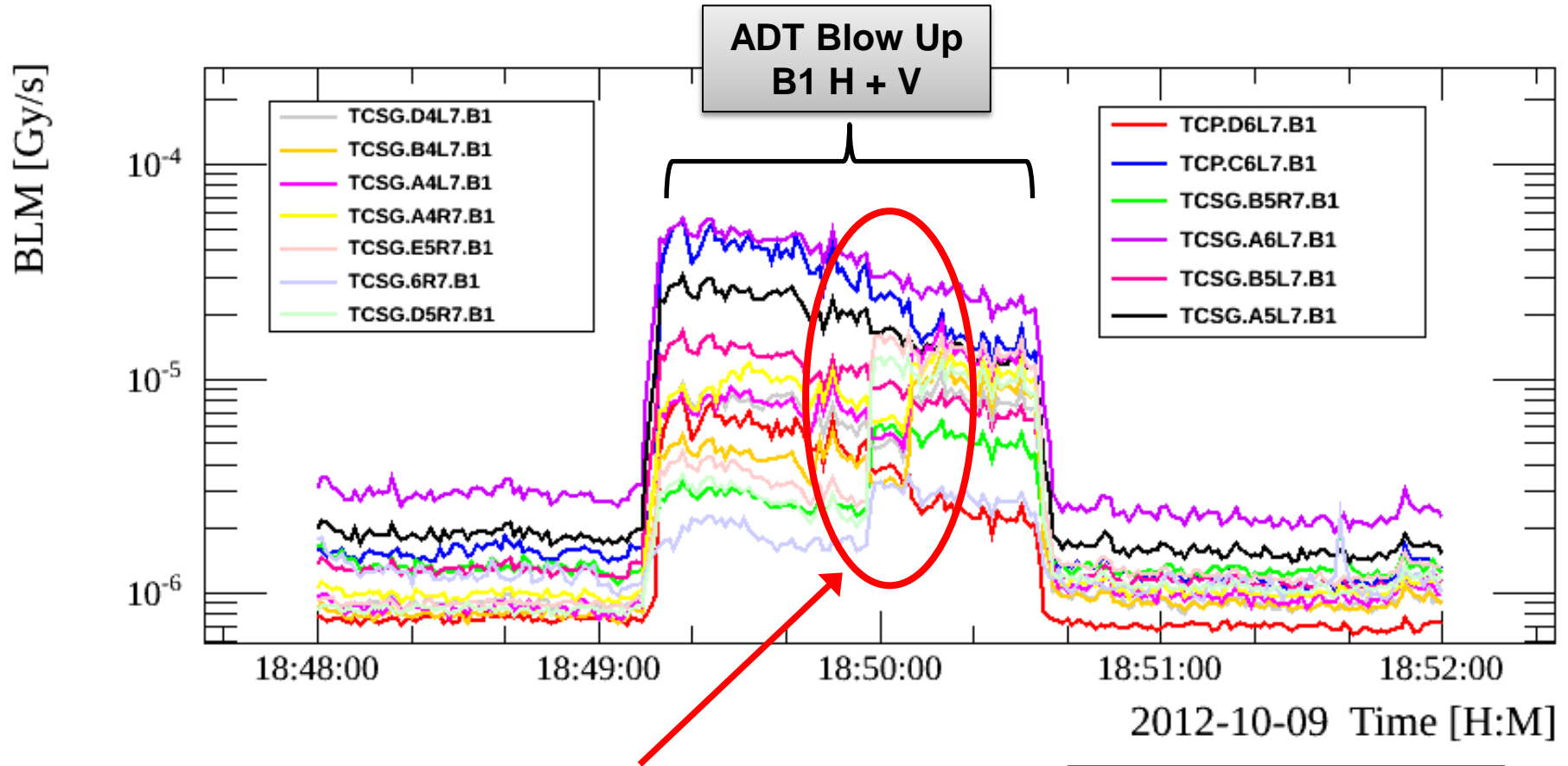
IR7 Collimator Hierarchy Limits



- B1 and B2 collimators in IR6 & IR7 moved to 7 TeV nominal settings in mm.
- 4 TeV beam sizes \longrightarrow IR7: TCP = 4.3σ , TCSG = 5.1σ , TCLA = 7.6σ ; IR6: TCSG = 5.7σ , TCDQ = 6.0σ



IR7 Collimator Hierarchy Limits



**Increase in losses after moving in a TCSG
(secondary halo + showers?)**

Courtesy of B. Salvachua

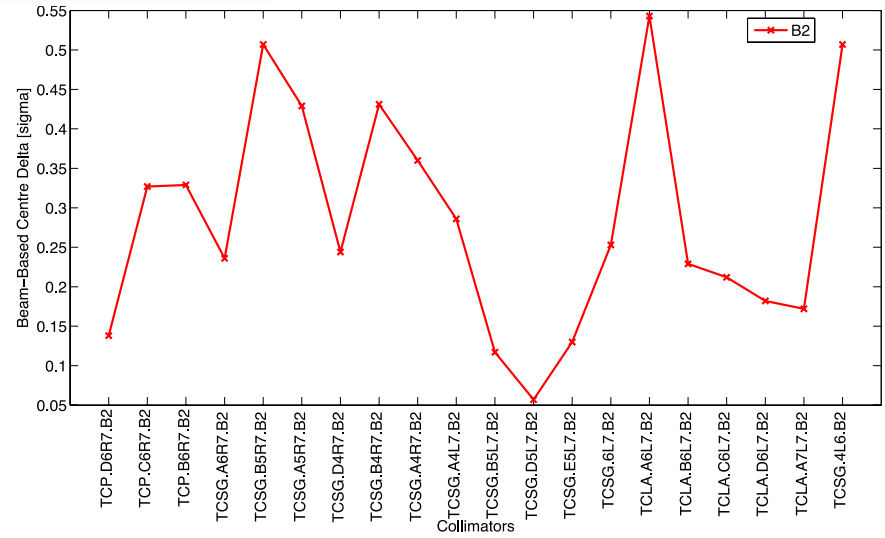
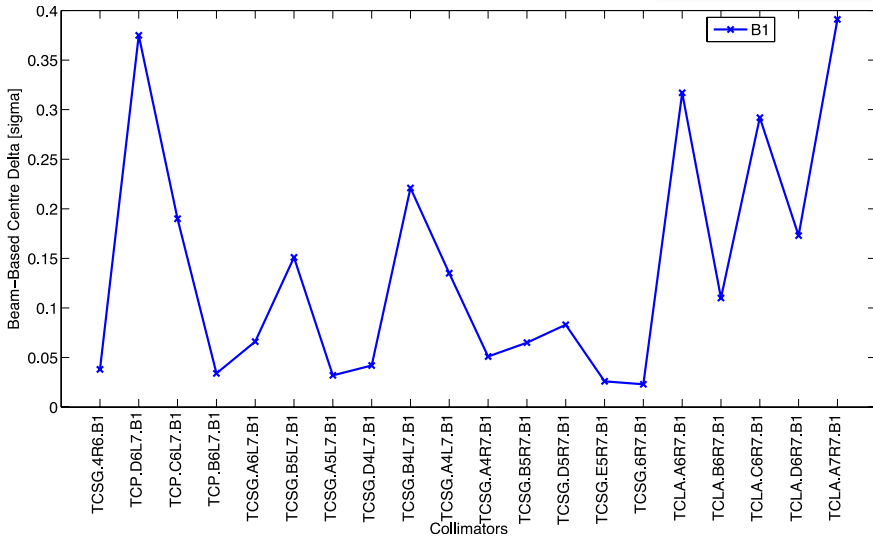
Hierarchy Recovery after Breakdown

- IR7 + TCSG IR6 collimators re-aligned for both beams using automatic alignment tool.
- 40 collimators aligned in 50 minutes:** fastest time achieved yet (collimators already close to the beam).

**Measured Centre Delta in σ
March vs. October 2012**

Largest Delta = 0.40 σ

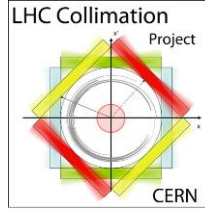
Largest Delta = 0.55 σ



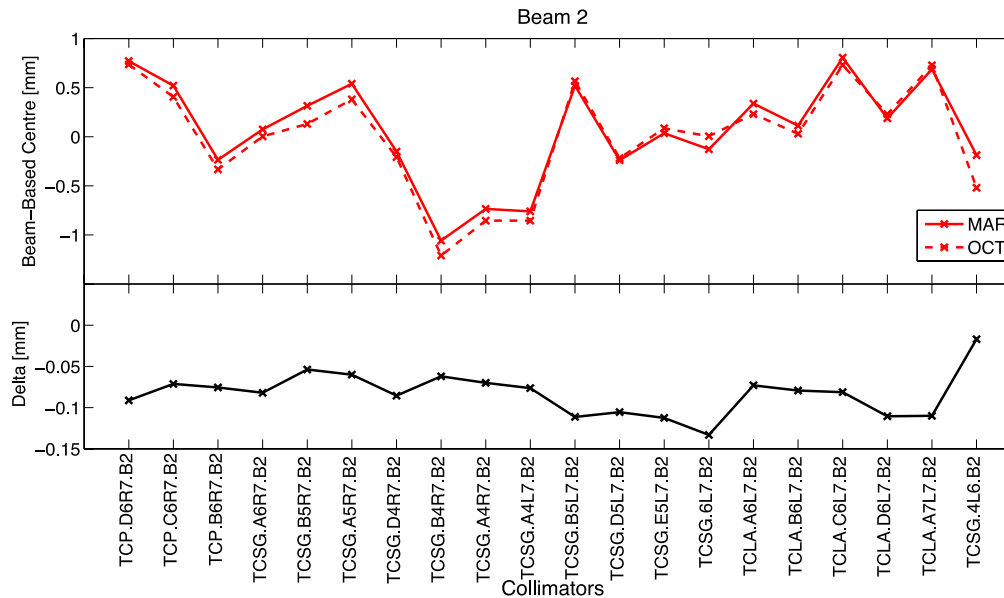
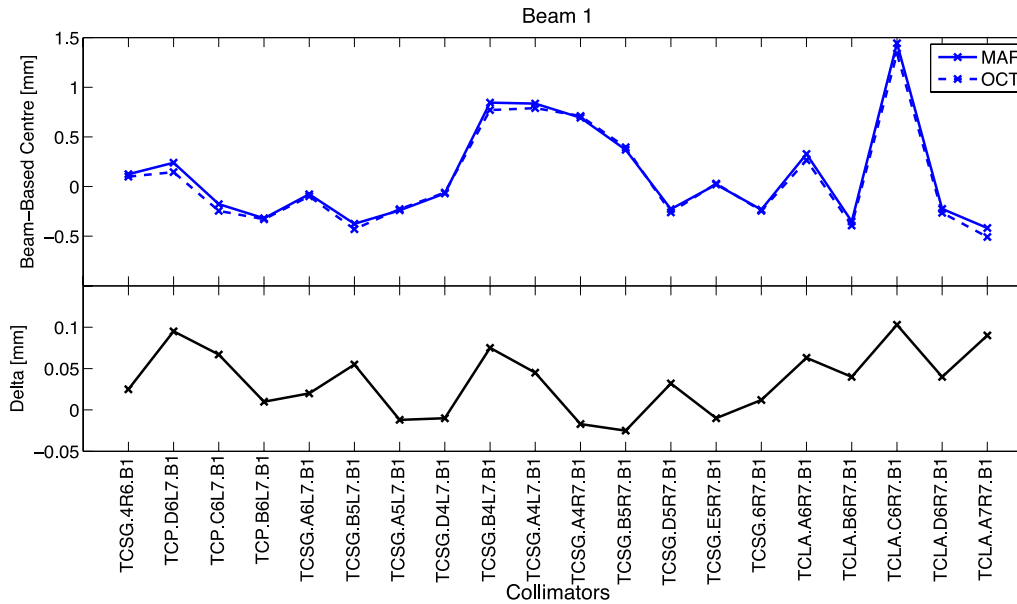
- Due to low intensities, new collimator settings could not be qualified using loss maps.
- Work in progress:** Measured rather than nominal beam sizes might have to be used.
- Possibly repeat loss maps with measured beam sizes in a future MD (~1 hour at flat top incl. re-alignment).



Reserve Slides



Comparison of Beam Centres



Comparison of Beam Size Ratios

