Beam-beam MDs

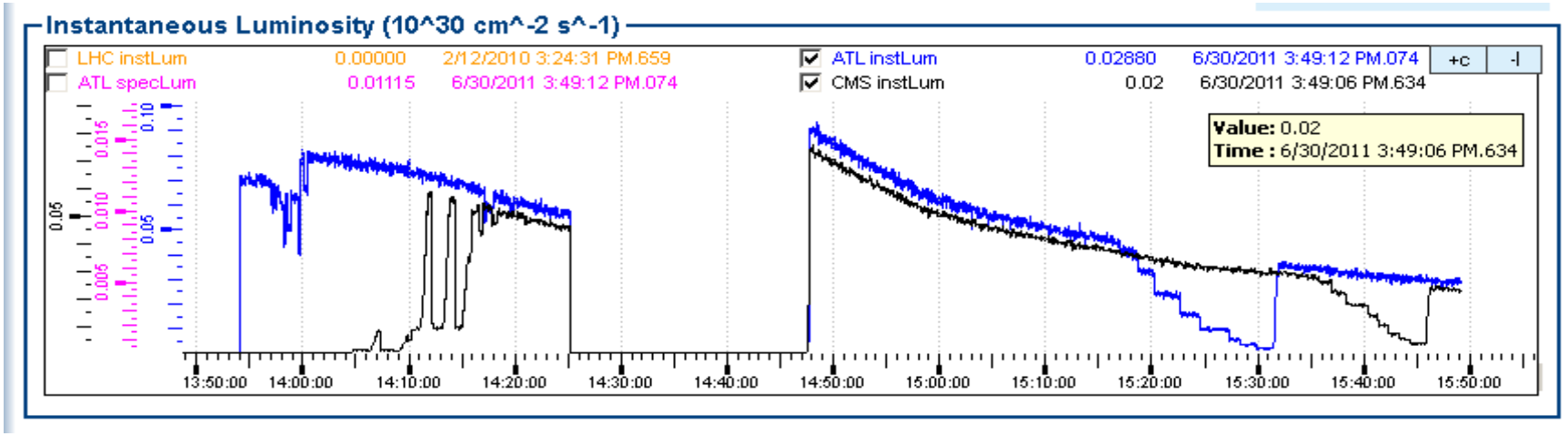
(30.6. and 1.7.)

W. Herr (for MD teams)

Second head-on MD (30.6.), 60% of time lost

- **Main purpose: explore which intensities we can collide, plus more detailed measurements (orbit, tune,...)**
  - → **Bunch intensities initially above 2.2 10^{11} p/b, $\epsilon_n \approx 1.7\ \mu$m**
  - → **Reached $\Delta Q \approx 0.015$ per IP, $\Delta Q \approx 0.030$ for 2 IPs**
  - → **No visible emittance blowup**
  - → **Life time worse, order of 1 - 2 hrs, (but larger initial emittances than 1st MD ?)**
- **Proposal: redo with more collisions (2 on 2) and at 3.5 TeV, possibly study effect of noise !**

ATLAS luminosity*)



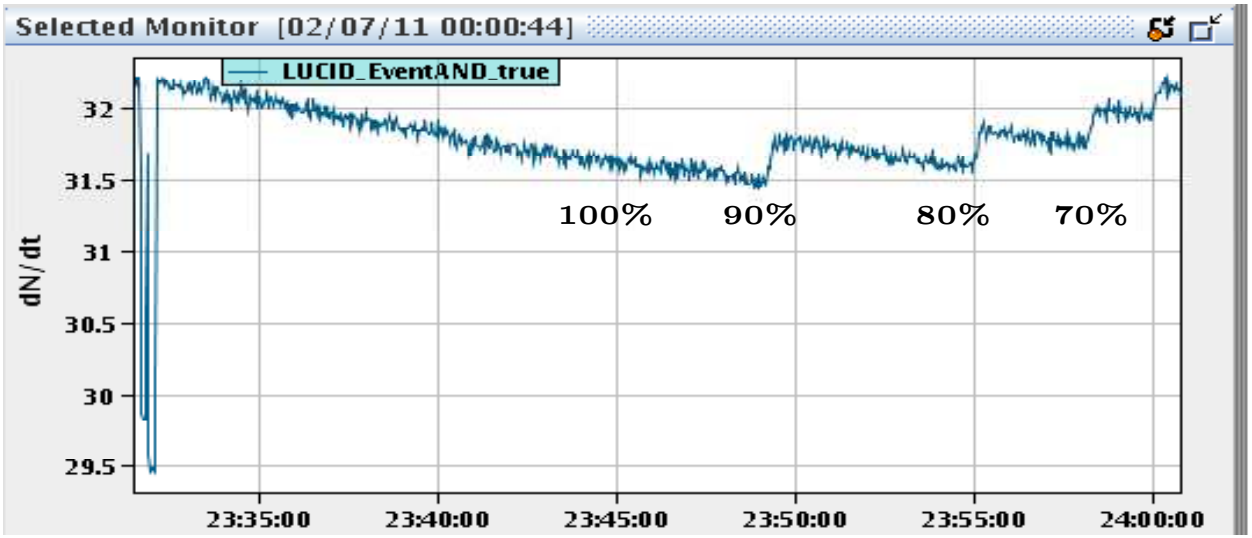
→ **Luminosity in ATLAS during 2nd head-on MD**

*) **Courtesy Witold Kosanecki**

Long range MD, 50% of time lost

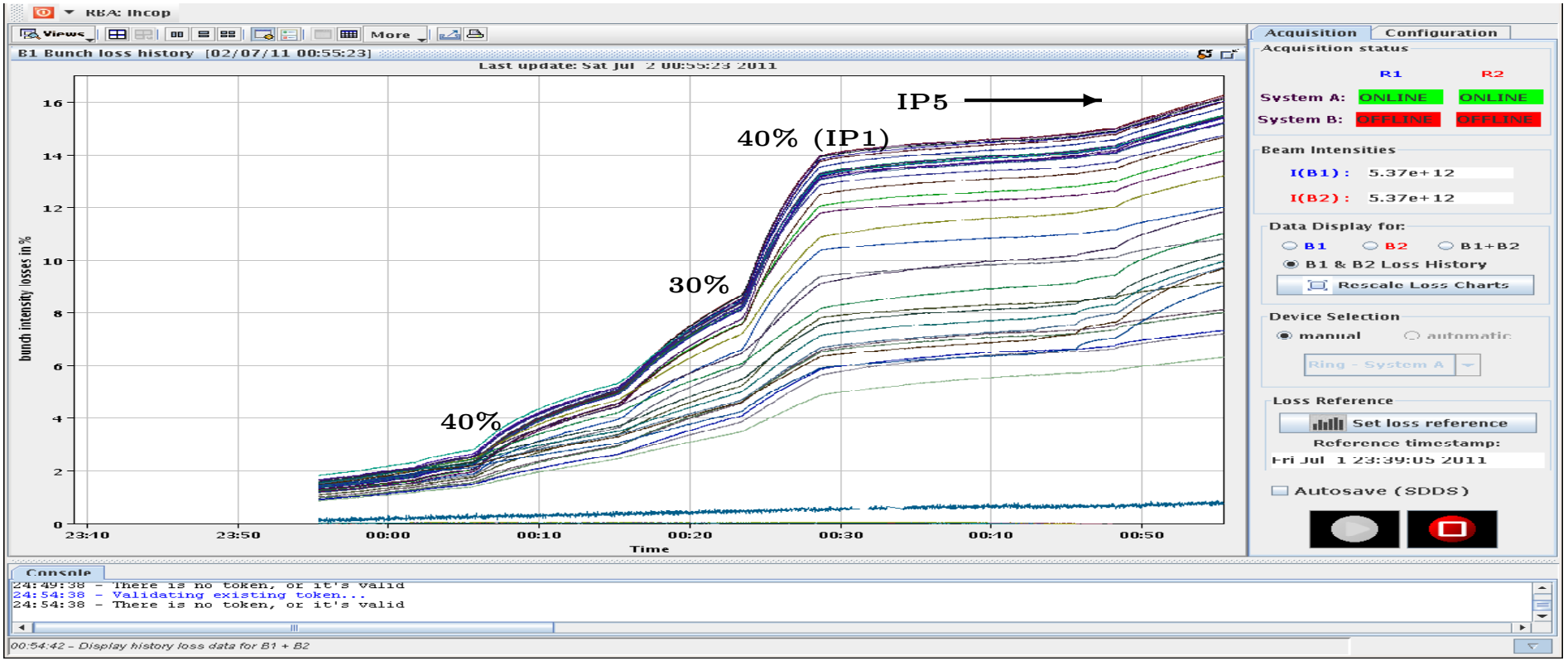
- **Main purpose: study effect of long range interactions**
- **Beam conditions:**
  - **Bunch intensities and emittances standard operational conditions**
  - **One batch (36 bunches) per beam (no time for second fill)**
  - **Squeezed to 1.5 m at 3.5 TeV**
  - **Reduced crossing angle (from $\pm$ 120 μrad) in steps (first IP1, then IP5)**
  - **Adjust collimator settings at every step**

Scan of crossing angle



- Luminosity as function of crossing angle IP1
- Reduction factor exactly as calculated !

Scan of crossing angle

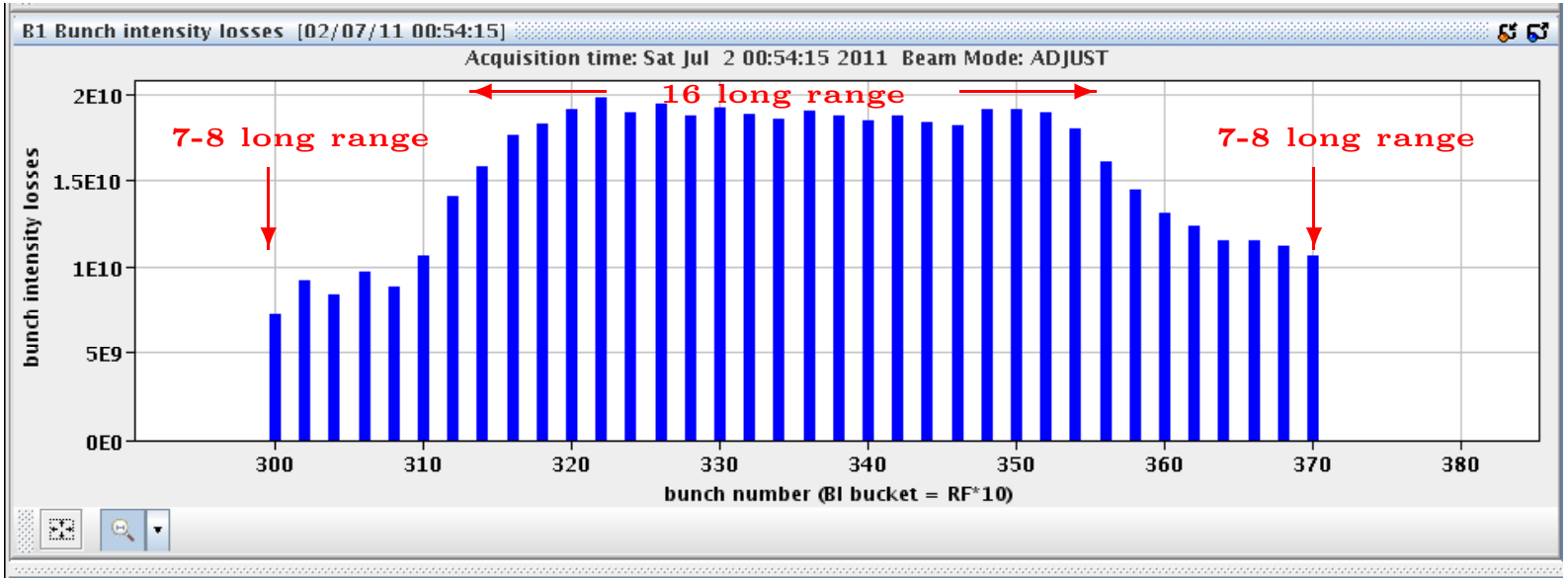


➡ **Loss as function of crossing angle (IP1 and IP5)**

Scan of crossing angle

- **Observations:**
  - **Losses start after some threshold (4 - 5 σ)**
  - **Different bunches have different threshold !**
  - **Strong evidence for PACMAN effects**

PACMAN effects



→ **Losses of the bunches in a batch**

Long range observations

- **Very clear observations:**
  - **Threshold effect around 4 - 5 σ**
  - **Threshold depends on number of long range encounters !!**
  - **Very strong effect on number of long range encounters !!**

→ **Bunches with half the long range:**
$\approx$ 1 σ more "dynamic aperture"

Detailed analysis still ongoing ...

Long range observations

- Remember: we had collisions only in IP1 and IP5 (no IP2/8)

→ Proposal: second part of MD with 2 trains of 36 bunches, collisions in all IPs