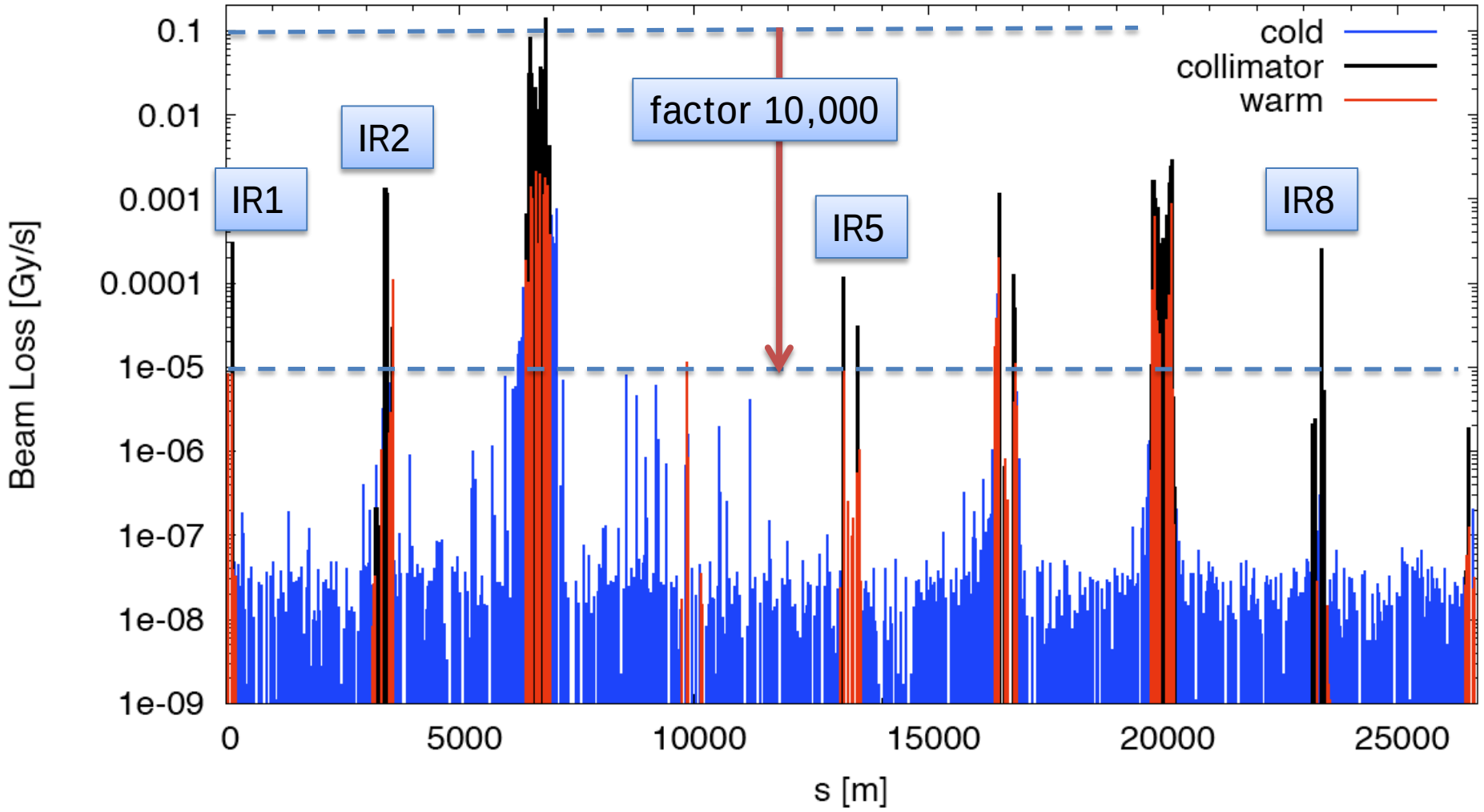
Friday 23/4/2010

Morning

- Ramping – squeezing all IPs to 2 m : excellent – done in 6 steps only
- Last protection qualification test, at 3.5 TeV, squeezed optics: change RF frequency by +1 kHz and performed off momentum dump test and check losses around the machine: losses as expected
- This completes the qualification of the protection systems for 3.5 TeV operation, squeezed optics, 3.5e10/beam

Qualification: Off-momentum collimation

Loss map for off-momentum error. All OK. See expected low leakage to experimental IR's. **OK for stable beams from coll.**



Friday 23/4/2010

Afternoon

Access in the LHC for UPS intervention (RE78, UPS EBS21 for PIC system, electronics card to be changed) and for QPS (quench heater of RB.67) – Access complete at 17:00.

Tripped S 81: RQD/RQF tripped first B22.L1 bus-bar detector crossed the threshold – Noisy card – is planned in next TS work programme

Friday 23/4/2010

Afternoon

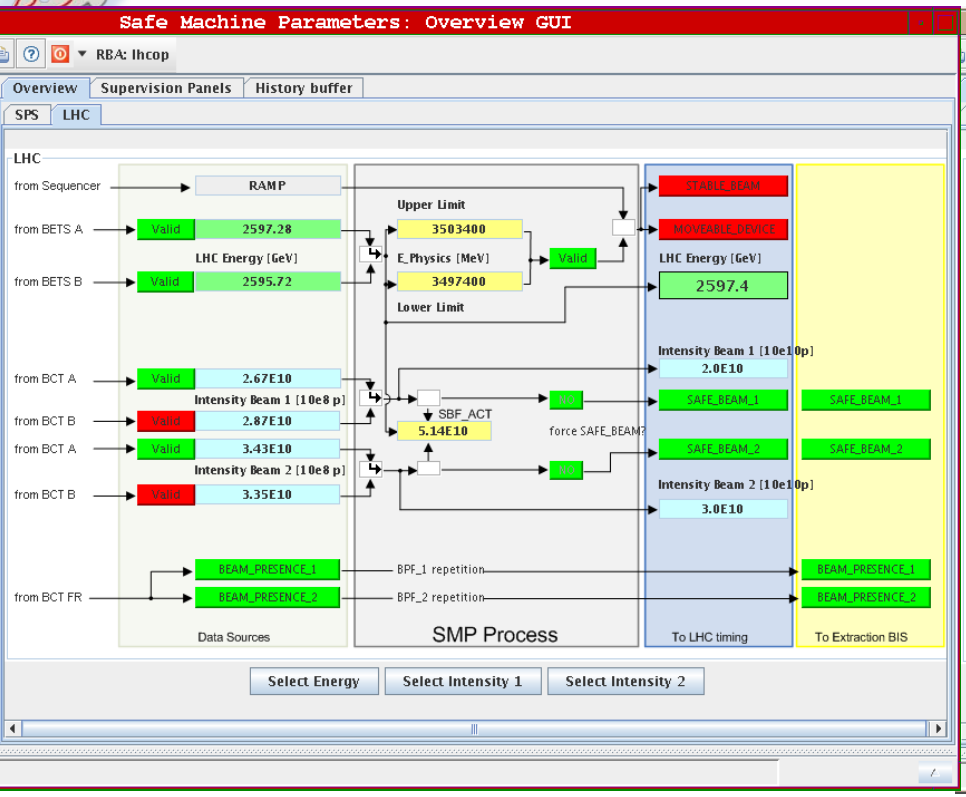
- Access in the LHC for UPS intervention (RE78, UPS EBS21 for PIC system, electronics card to be changed) and for QPS (quench heater of RB.67) – Completed at 17:00.
- 17:10 - Pre-cycling started.
- 17:45: Sector S81 tripped: RQD/RQF tripped first - B22L1 bus-bar detector crossed the threshold- noisy board – Intervention was already part of the w18 TS
- 19:40 : Machine ready for injection – Problem in the SPS, beam is not doing more than one turn. Investigation performed, many equipment checked… Finally traced back to MKD, due to signal noise on a cable from the MKP, which was inhibited MKD. Temporary fixed by an attenuator on a noise, while waiting for w18 TS

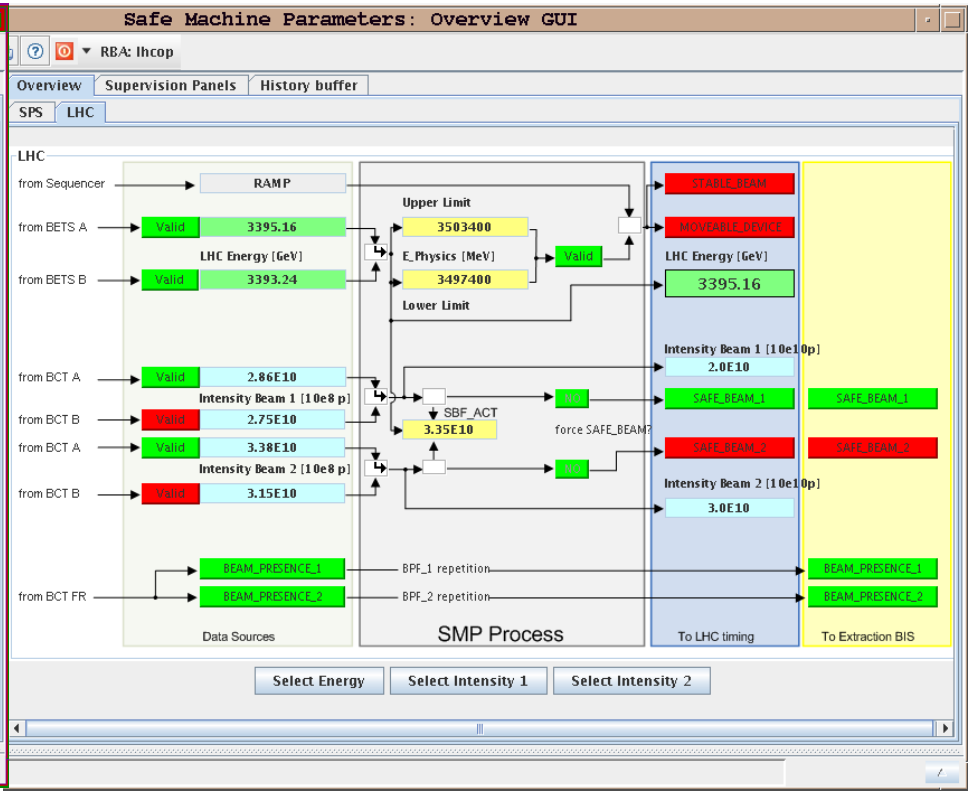
Saturday 24/4/2010

- 00:00 : Injecting again in the LHC, checking beam parameters on pilot b1 and b2. orbit, tune, chrom. corrected
- 00:30 : starting injection of the 3b x 3b
- 00:56 : Start ramping – B1 = 2.8e10 – B2 = 3.3e10

  B1 : H= 0.933 - V= 0.916 - B2 : H= 1.403 - V= 1.877
- Setup beam flag false ➔ all HW interlocks unmasked. No problem. Flag then flickering ON/OFF afterwards: too close to limit.
- 01:45 : End Ramp - correcting orbits, chromaticies, coupling, collapsed separation bumps, re-correct orbits, collimation

Saturday 24/4/2010



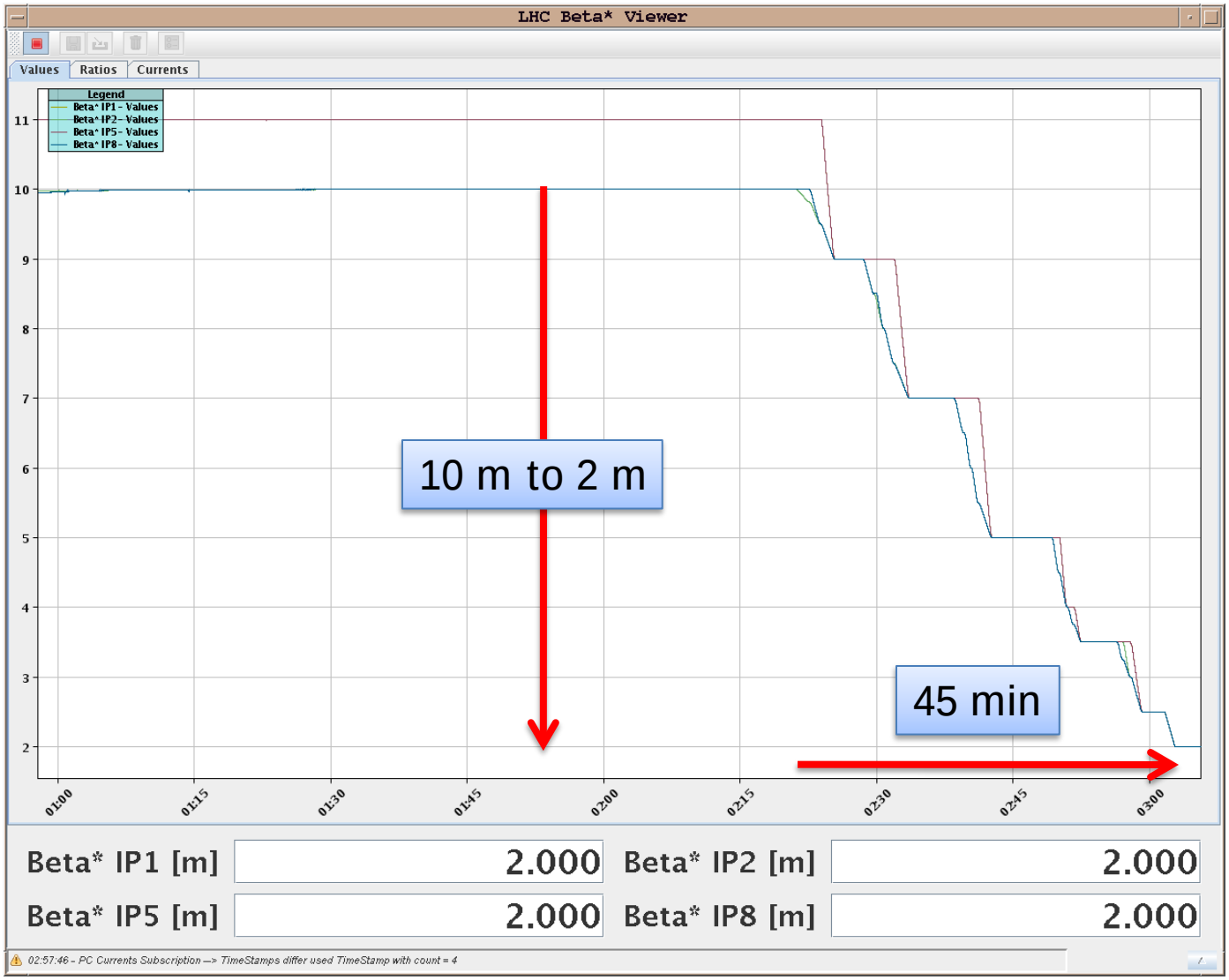


Setup Beam Flag : UNSAFE beam for the 1st time

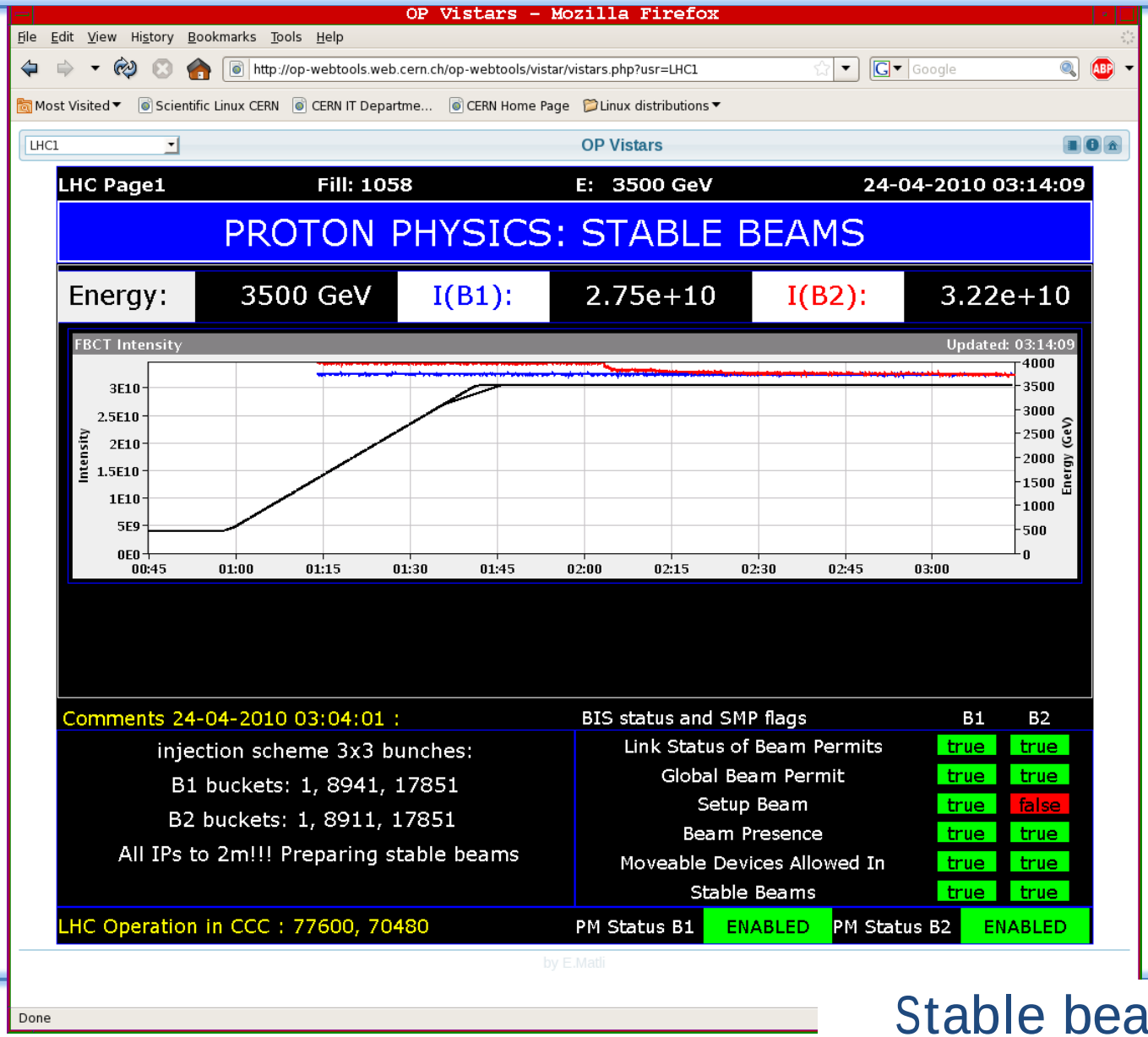
Saturday 24/4/2010

- 02:00 : Start squeezing
- 02:45 : at 5 m – Introducing the collimators for squeezed physics – Good. All collimator thresholds are activated.
- 02:48 : Continuing the squeeze to 2m
- 03:00 : All IPs to 2 m – Introducing Lumi scan values – correcting orbit back to reference orbit
- 03:10 : Stable beams declared. B1 = 2.8 e10 – B2 = 3.3e10
- 03:15 : Luminosity scans starting
- 05:30 : Optimization completed!

Squeeze to 2 m: Fast and Smooth



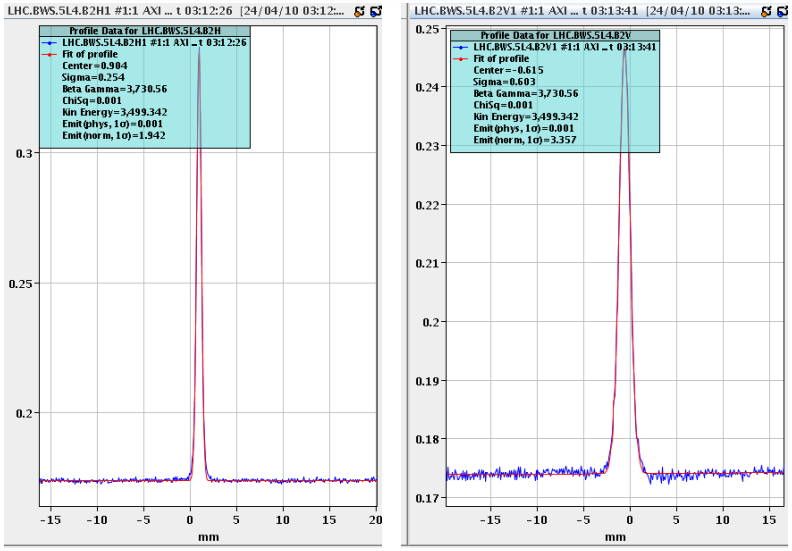
Saturday 24/4/2010



Stable beams

Emittances at Start of Stable Beams

- Normalized emittance beam 1:
  - H= 1.69 μm
  - V= 1.74 μm
- Normalized emittance beam 2:
  - H= 1.94 μm
  - V= 3.31 μm
- All below design emittance!
- Expected luminosity:
  - L ≈ **2×10^{28} cm^{-2} s^{-1}**
- Quick estimate, need to calculate in more detail!



Measured beam 2 emittance

Luminosity after Optimization

24-Apr-2010 05:32:51 Fill #: 1058 Energy: 3500.3 GeV I(B1): 3.28e+10 I(B2): 3.25e+10

	ATLAS	ALICE	CMS	LHCb
Experiment Status	PHYSICS	PHYSICS	PHYSICS	PHYSICS
Instantaneous Luminosity	1.284e-02	1.147e-02	1.444e-02	1.497e-02
BRAN Count Rate	1.966e+02	1.159e+02	3.518e+02	3.810e+02
BKGD 1	0.048	0.014	0.040	0.141
BKGD 2	5.000	24.770	5.608	2.321
BKGD 3	0.000	0.005	0.003	0.045

LHCf PHYSICS Count(Hz): 5.400 | LHCb VELO Position IN Gap: 0.0 mm | TOTEM: STANDBY

All experiments: $L > 1.1 \times 10^{28}$ cm^{-2} s^{-1}

factor ~10 achieved, as predicted

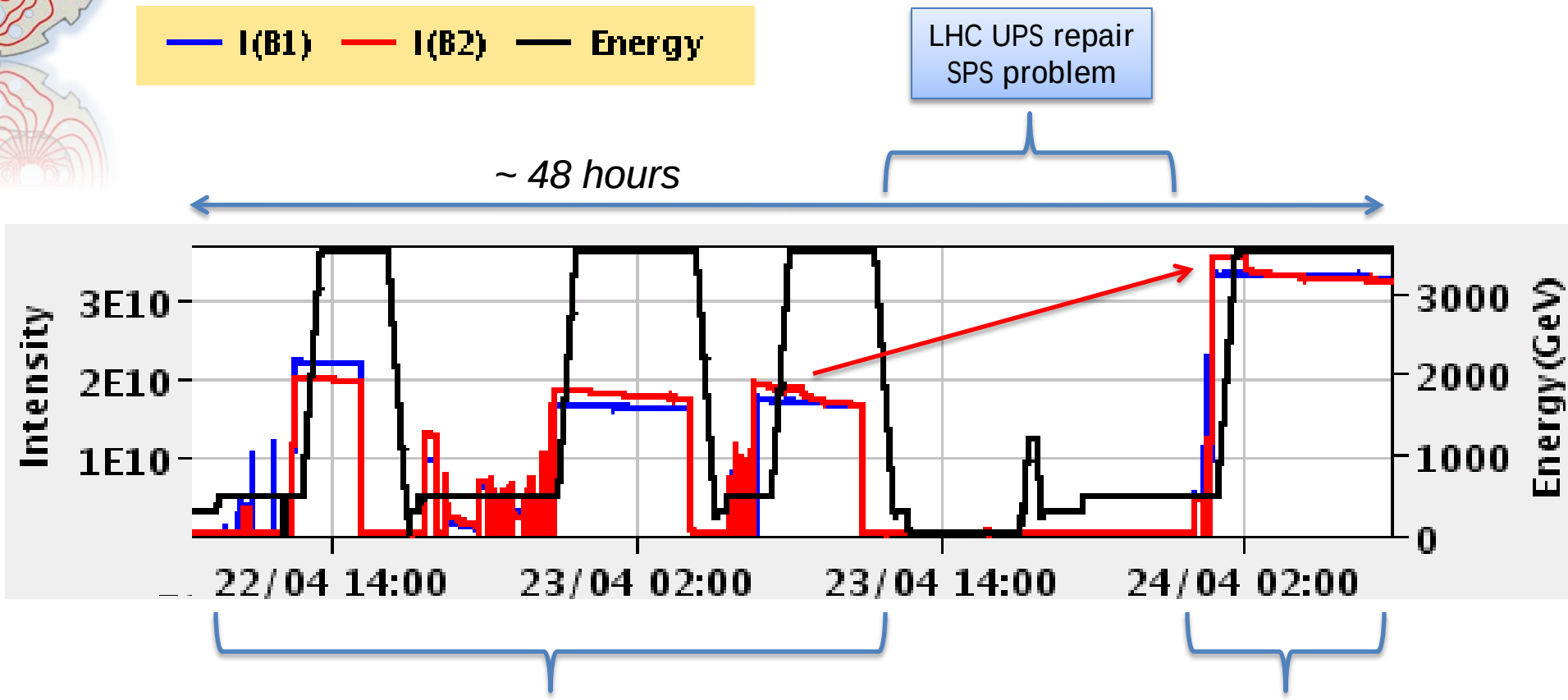
(to be confirmed by experiments)

New golden orbit: "All IP to 2 m and optimized (stable beams)"

Lost 20-30% of luminosity after first 3 hours of physics (5h30 to 8h30)!

(seems consistent with measured emittance growth)

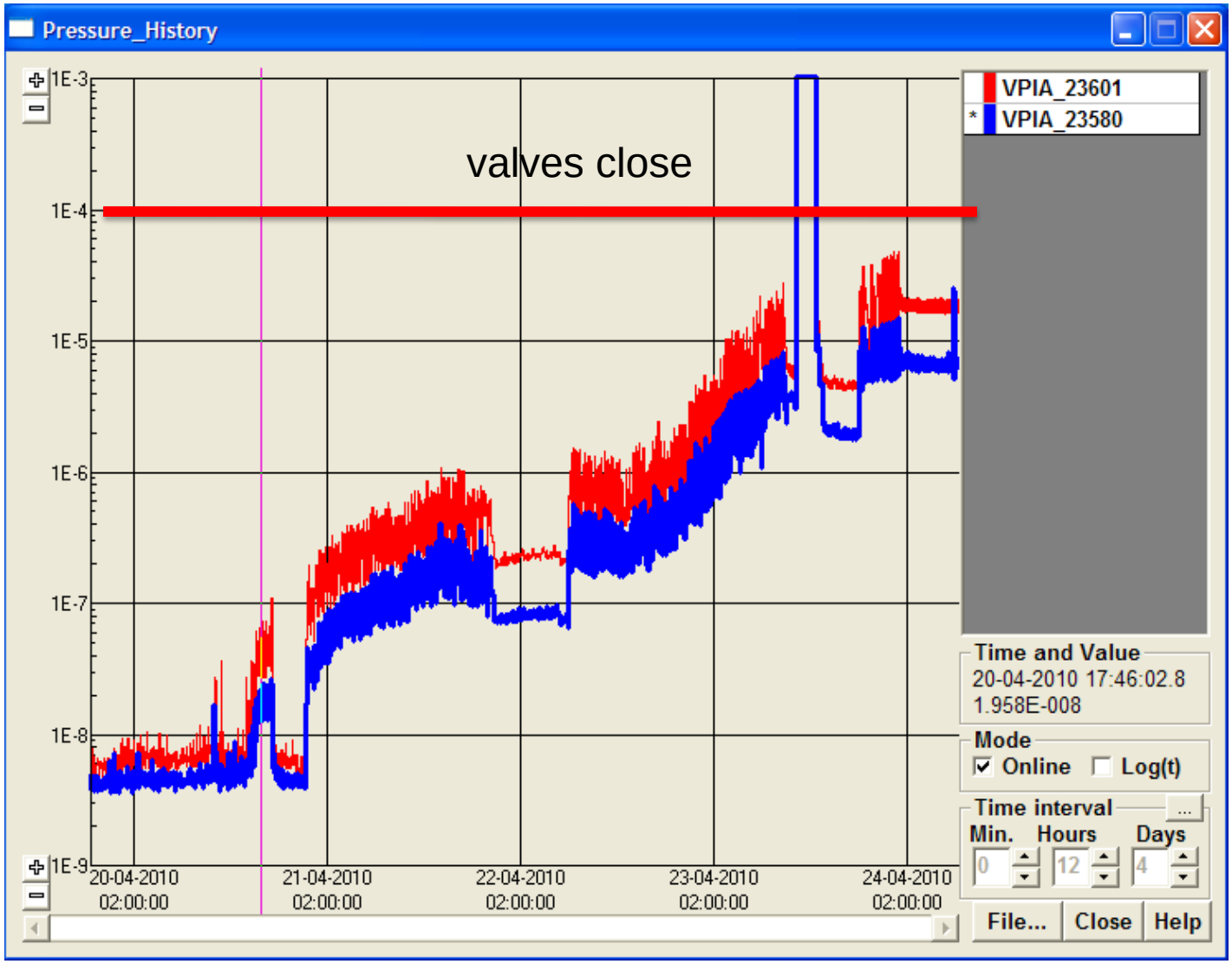
Ramp & Squeeze Start Working Smoothly



Ramp & squeeze @ 3.5 TeV qualification:
…last 2 fills w/o problem, lost on purpose…
Transverse damper commissioning @ 450 GeV

Ramp & squeeze for physics @ 3.5 TeV with higher intensity

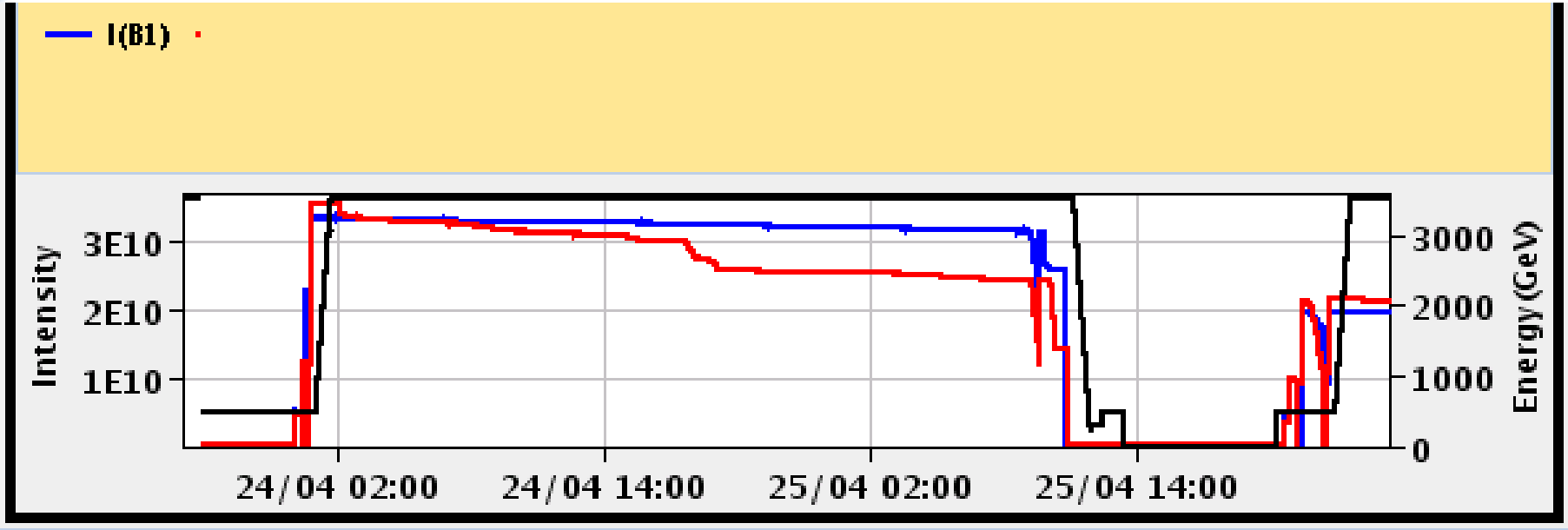
Constraint – SPS Vacuum Problem



Sunday 25/4/2010

- 9:30 – End of stable beams. Start of end-of-fill studies: beta beat and collimation loss map.
- 11:00 – Beam dump
- 14:00 - Problems injection kicker and QPS. Access.
- 20:45 – Beam back.
- 1:35 – Stable beams. 3.5 TeV. All IR's 2 m.
- Van der Meer scans for IR8 and IR1.
- 6:00 – beams dumped

New Record Fill



Fill length:	**30 h**
First time:	**with unsafe beam.**
Luminosity	**> 1.1e28 Hz/cm^2**
First time:	**3 bunch scheme**
First time:	**end of fill studies and dump.**

Performance 3.5 TeV

IP	Beta* (x, beam 1)	Beta* (y, beam 1)	Beta* (x, beam 2)	Beta* (y, beam 2)
1	2.28 m	2.02 m	1.92 m	2.10 m
2	2.07 m	1.85 m	2.09 m	2.12 m
5	2.05 m	2.02 m	1.92 m	2.58 m
8	2.07 m	1.86 m	2.24 m	1.72 m

24-Apr-2010 05:32:51 Fill #: 1058 Energy: 3500.3 GeV I(B1): 3.28e+10 I(B2): 3.25e+10

	ATLAS	ALICE	CMS	LHCb
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Instantaneous Luminosity	1.284e-02	1.147e-02	1.444e-02	1.497e-02
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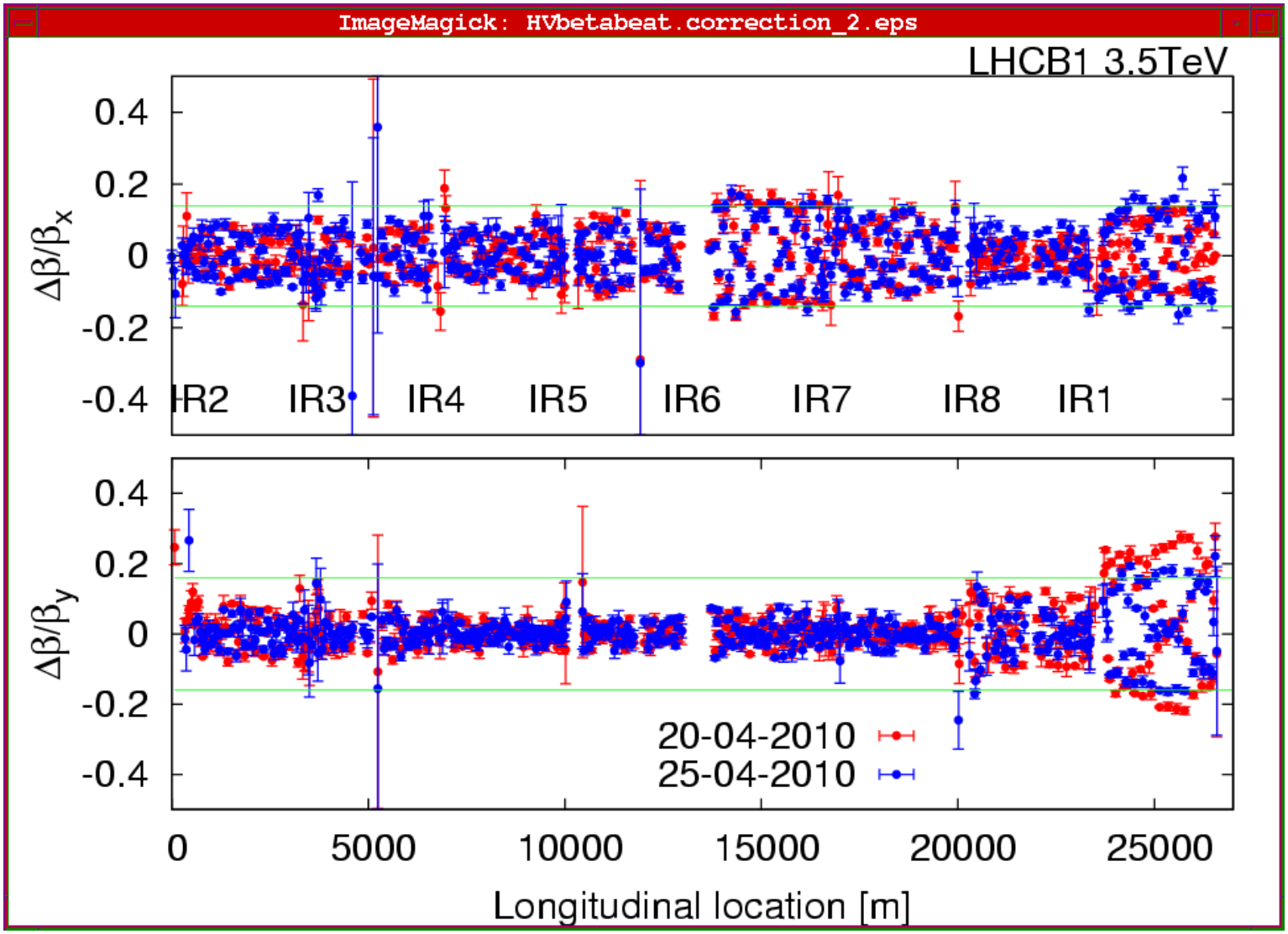
LHCf PHYSICS Count(Hz): 5.400 | LHCb VELO Position IN Gap: 0.0 mm | TOTEM: STANDBY

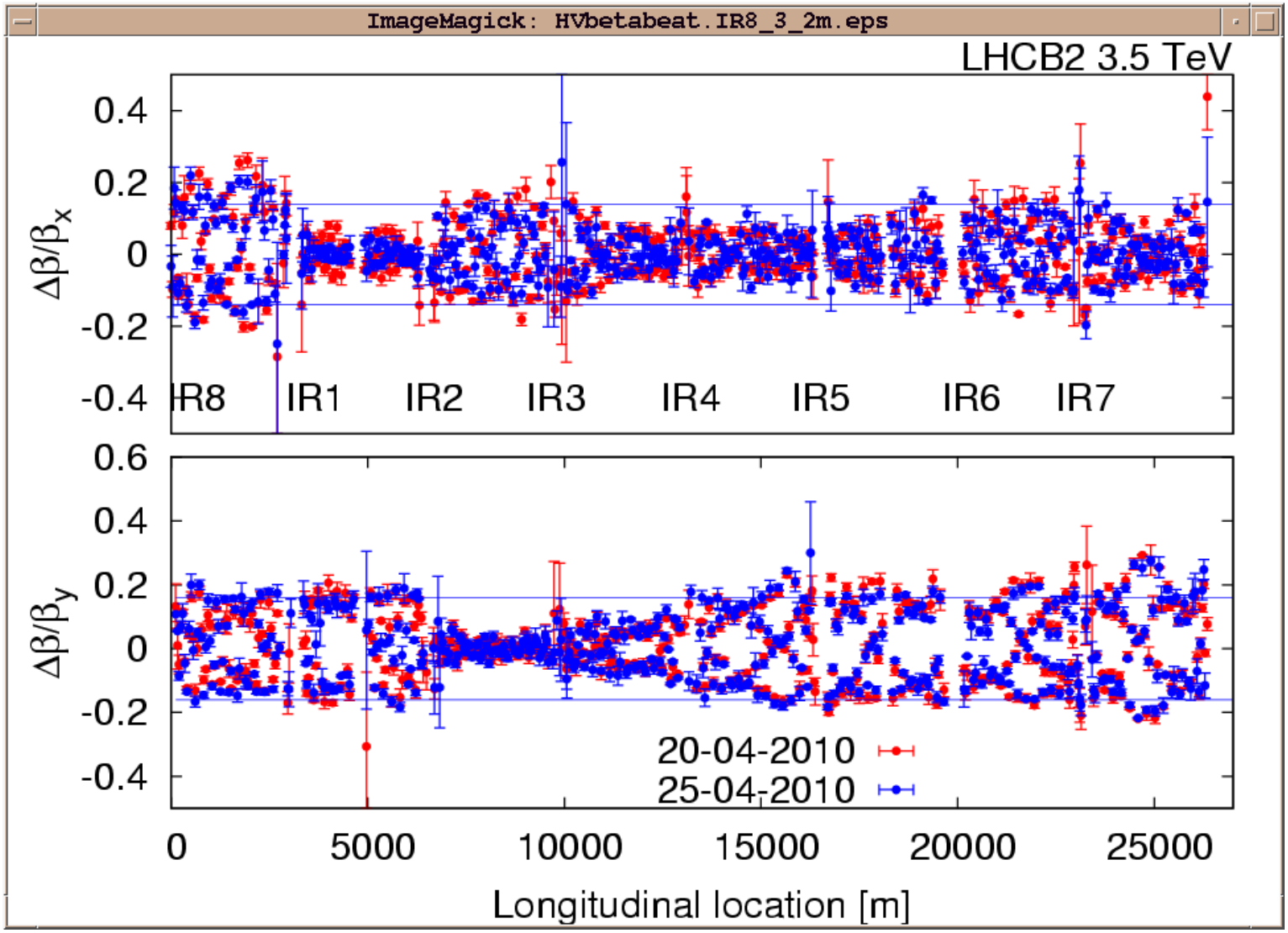
All experiments: $L > 1.1 \times 10^{28}\ cm^{-2}\ s^{-1}$

factor ~10 achieved, as predicted

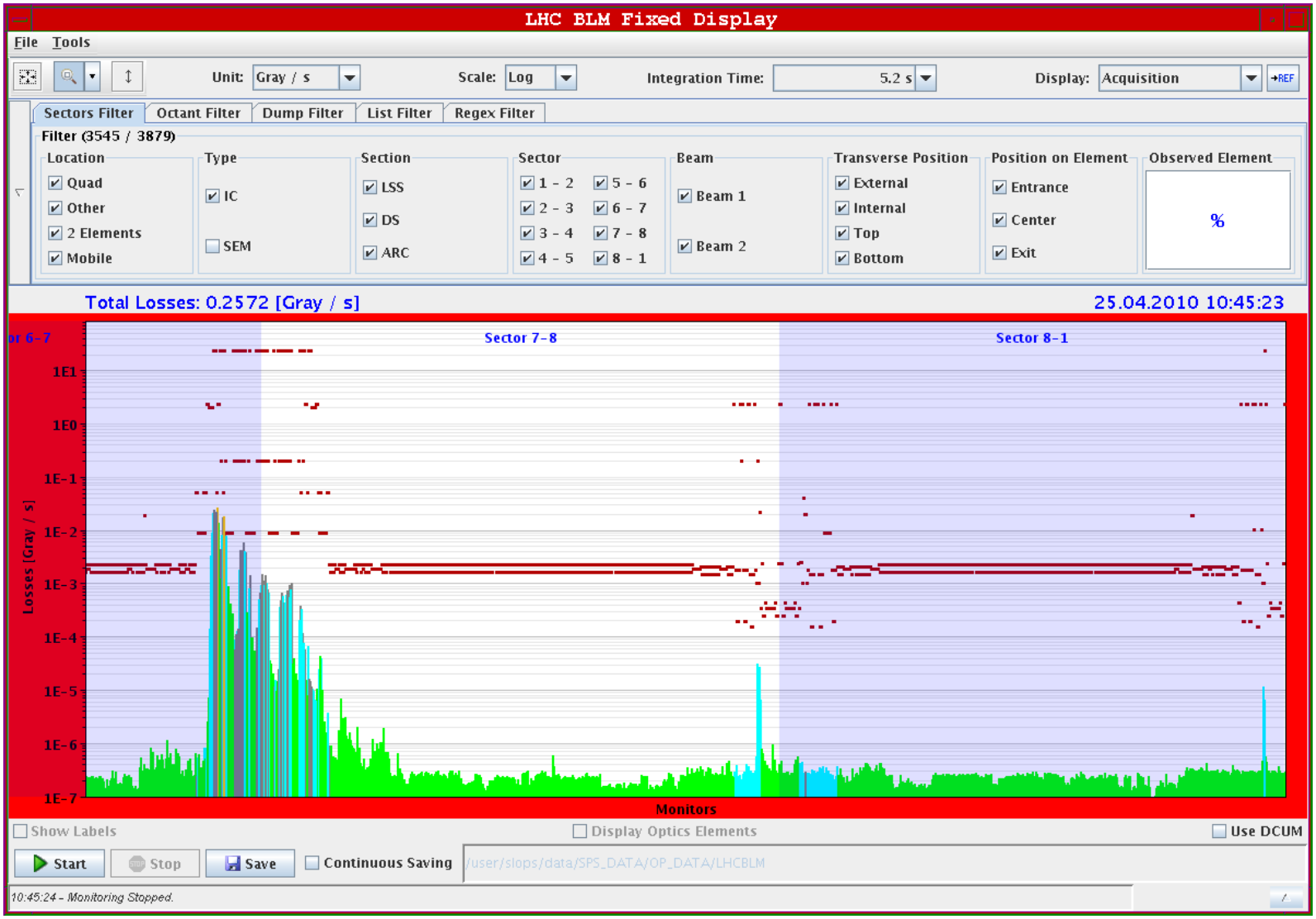
Beta Beat at 3.5 TeV – beam 1



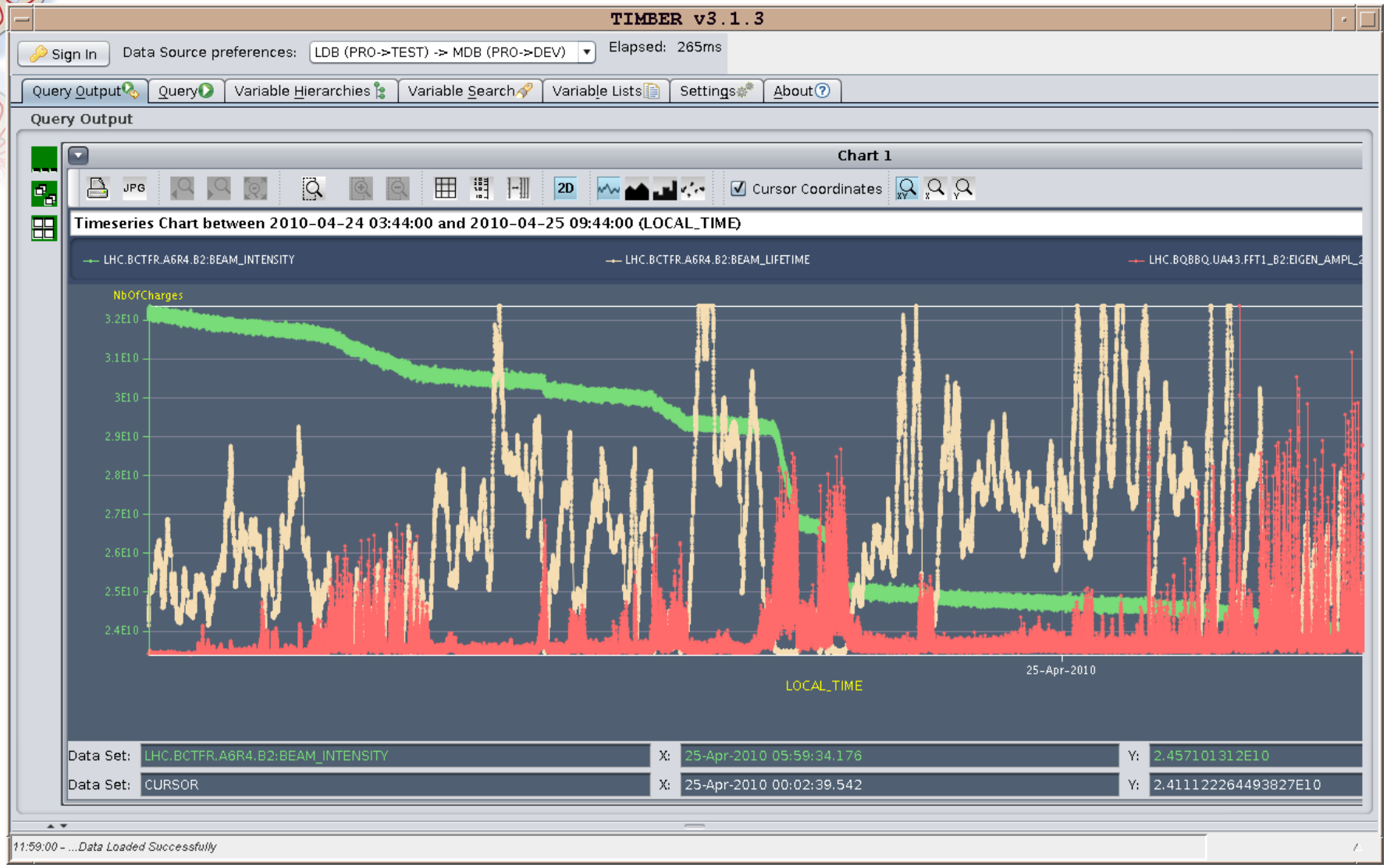
Beta Beat: Beam 2



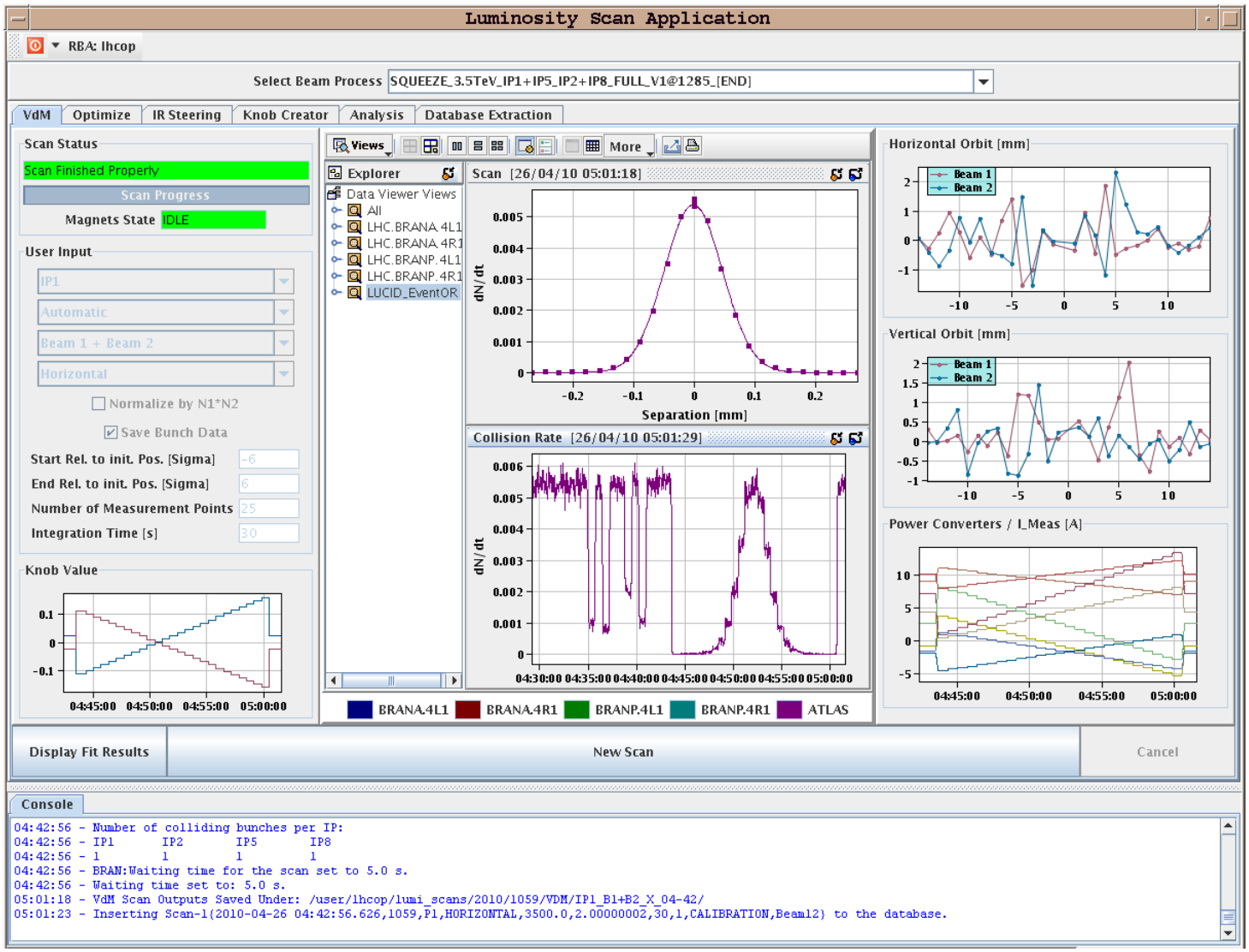
Loss map H, beam 1



Intensity, Lifetime and Spectrum Height



VDM scan


Luminosity Scan Application
RBA: lhcop
Select Beam Process
SQUEEZE_3.5TeV_IP1+IP5_IP2+IP8_FULL_V1@1285_[END]
VdM
Optimize
IR Steering
Knob Creator
Analysis
Database Extraction
Scan Status
Scan Finished Properly
Scan Progress
Magnets State
IDLE
User Input
IP1
Automatic
Beam 1 + Beam 2
Horizontal
Normalize by N1*N2
Save Bunch Data
Start Rel. to init. Pos. [Sigma]
End Rel. to init. Pos. [Sigma]
Number of Measurement Points
Integration Time [s]
Knob Value
Views
More
Explorer
Data Viewer Views
All
LHC.BRANA.4L1
LHC.BRANA.4R1
LHC.BRANP.4L1
LHC.BRANP.4R1
LUCID_EventOR
Scan [26/04/10 05:01:18]
dN/dt
Separation [mm]
Collision Rate [26/04/10 05:01:29]
Horizontal Orbit [mm]
Vertical Orbit [mm]
Beam 1
Beam 2
Power Converters / I_Meas [A]
BRANA.4L1
BRANA.4R1
BRANP.4L1
BRANP.4R1
ATLAS
Display Fit Results
New Scan
Cancel
Console
04:42:56 - Number of colliding bunches per IP:
04:42:56 - IP1 IP2 IP5 IP8
04:42:56 - 1 1 1 1
04:42:56 - BRAN:Waiting time for the scan set to 5.0 s.
04:42:56 - Waiting time set to: 5.0 s.
05:01:18 - VdM Scan Outputs Saved Under: /user/lhcop/lumi_scans/2010/1059/VDM/IP1_B1+B2_X_04-42/
05:01:23 - Inserting Scan-1{2010-04-26 04:42:56.626,1059,P1,HORIZONTAL,3500.0,2.00000002,30,1,CALIBRATION,Beam12} to the database.

Next:
Technical Stop