Week 24

- Main aim: Preparation for high bunch intensity operation with β^*=3.5 m and crossing angle (-100 μrad in IR1 and +100 μrad in IR5)

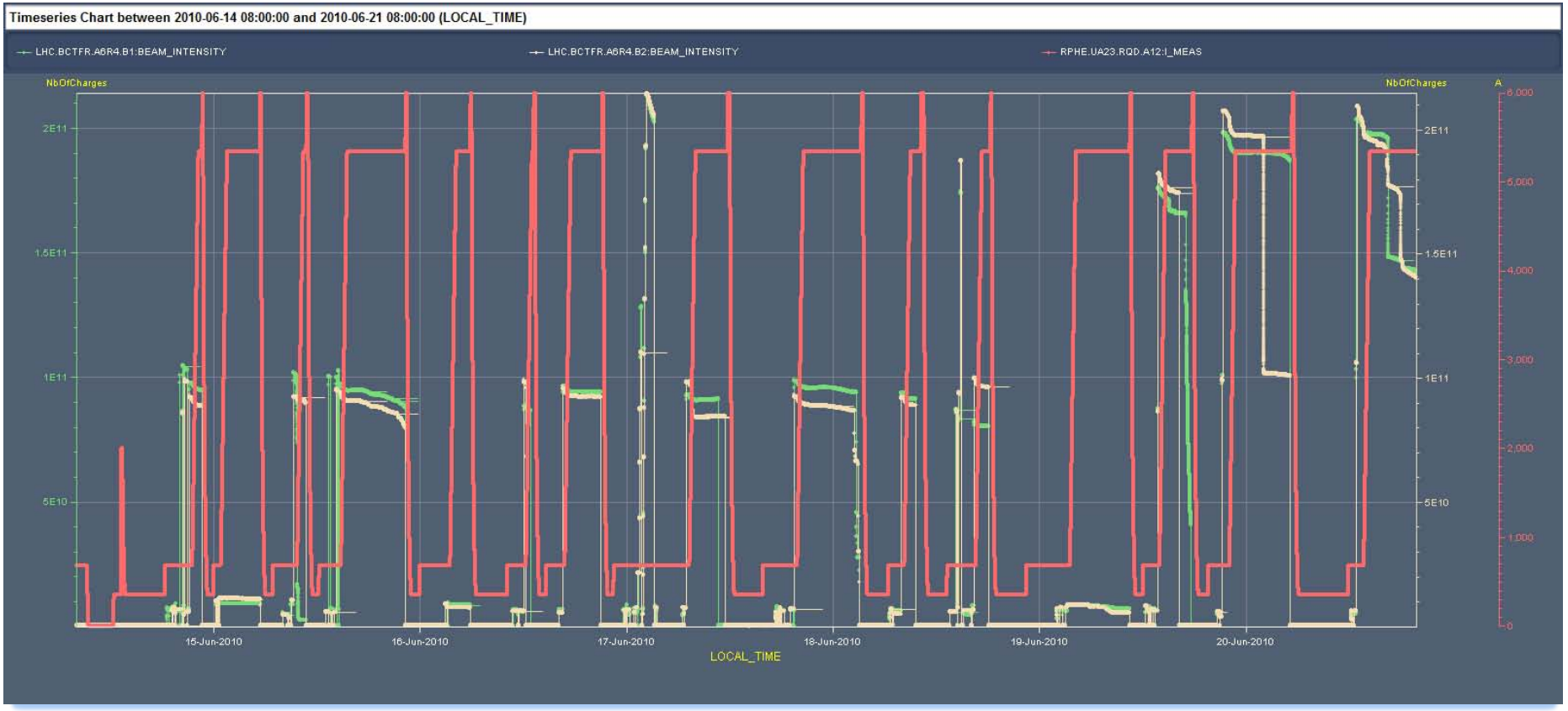
- Commission systems required for guaranteeing beam stability as expected from design with single nominal bunch and more than one bunch:
  - Transverse feedback
  - Controlled longitudinal emittance blow-up
  - Octupoles at 3.5 TeV

- Setting-up for high intensity operation and consolidation of the beam parameters control during ramp and squeeze:
  - Squeeze with separated beam, orbit and tune feedback
  - Chromaticity correction and minimization

- Optimization and qualification of the machine protection with higher intensity:
  - Collimation setting-up at 3.5 TeV
  - Dump protection setting-up

Week 24

- Progress in spite of several interruptions disrupting the setting-up activity
- Turn-around time at 3.5 TeV squeezed is longer…
- ~2 ramps+squeeze/day



Week 24

Week 24	
Mon 14/6	Access to fix problems encountered during the WE Commissioning of the ramp with damper and tune fdbk
Tue 15/6	Squeeze commissioning with separation ON Controlled longitudinal blow-up Collimation setting-up at 3.5 TeV unsqueezed
Wed 16/6	Chromaticity measurement during the ramp Access for World FIP repeater problem Collimation setting-up at 3.5 TeV un-squeezed and at 7m Alice dipole trip and thunderstorms
Thu 17/6	Longitudinal emittance blow-up with more bunches Access (World FIP communication problem and Collimation setting-up at 3.5 TeV at 3.5 m separated Collimation qualification
Fri 18/6	Test of the collimation sequence after setting-up Trips of RB.A78 requiring access Transverse damper setting-up for operation with >1 bunch

Week 24

Week 24	
Sat 19/6	Chromaticity measurement and optics qualification through the squeeze Beam dump internal fault while squeezing
Sun 20/6	Ramp and squeeze for setting-up of the beam in collision (luminosity scans) Longitudinal blow-up during the ramp commissioned with >1 bunch Loss of cryo maintain in Sector 34 (World Fip repeater) Ramp and squeeze for setting-up of the beam in collision (luminosity scans, crossing angles) and collimation setting-up completion
Mon 21/6	Quench heater power supply repair Dump protection qualification at 450 GeV

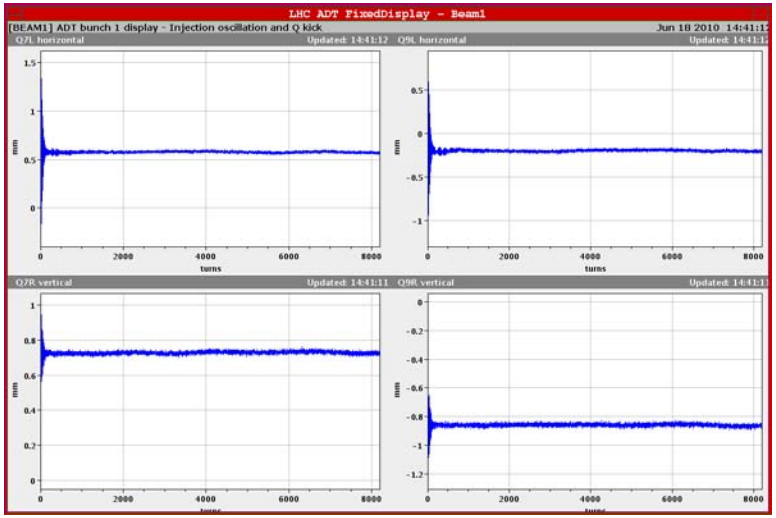
Injection

- Robust over-injection of 2b of 10^{11} p with all TDI BLMs unmasked
- Transverse damper ON, at 450 GeV: very effective

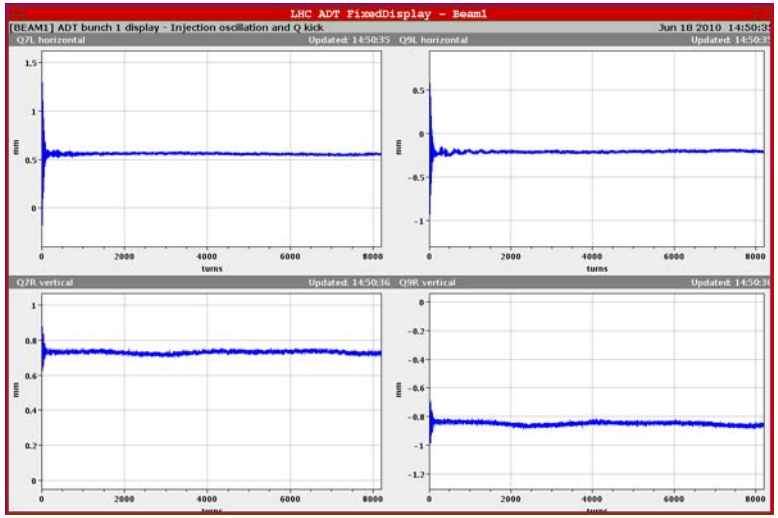
  B1: H= 2.4 & V= 2.5 B2: H= 3.8 & V= 3.1 after injection

  RF damper synchronisation: to sort out (piquet to be called each time) ➔ RF controls
- Chromaticity at injection set to 2 for both planes both beams

- 1st injection



2nd injection



Injection

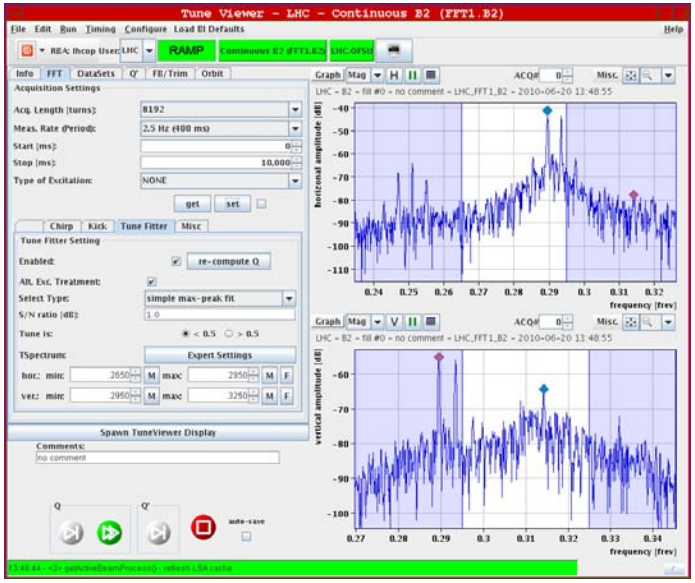
Remaining to further improve performance

- Injection systems: Brennan + team + OP
  - Injection steering clean-up, followed by TCTL verification
  - TDI checks wrt beam loss measurements
  - MKI8 kicker delay jitter to be fixed (access)

- ADT: W. Höfle
  - 1 remaining PU to be commissioned
  - Noise reduction
  - Vector sum mode of operation to increase bandwidth of the system

Ramp

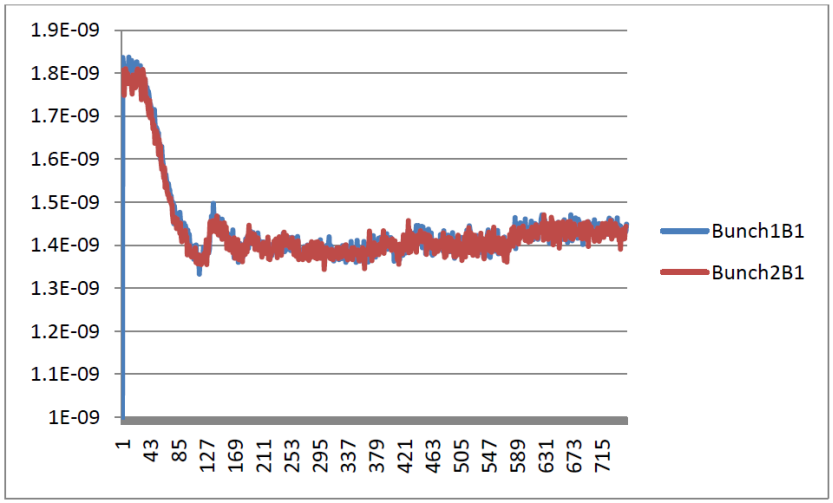
- Ramp now repeated several time with reproducible performance – still some blow-up
- Potential issue observed yesterday with peaks appearing on the tune spectrum at ~50 Hz multiples perturbing tune tracking with damper ON. No additional blow-up observed (instrumental issue?)



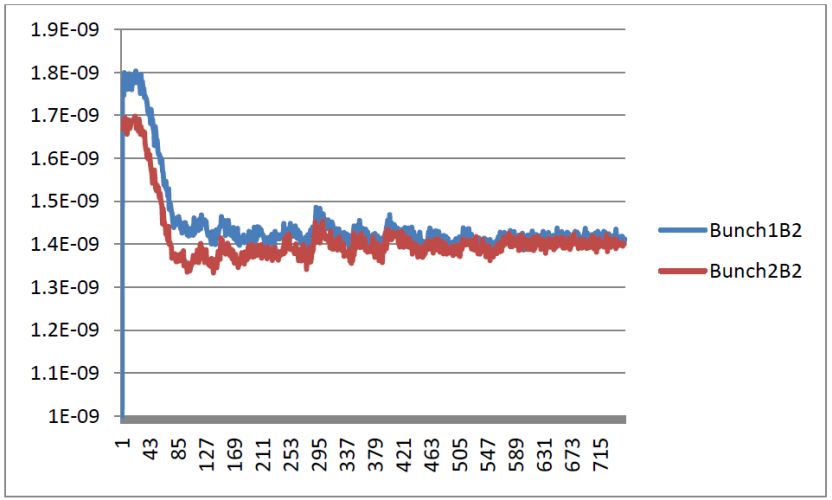
Ramp

- Chromaticity measured and feed-forward corrections applied (3 systematic iterations). Now chromaticity controlled to 2 at injection, along the ramp and at 3.5 TeV
- Transverse damper, long. blow-up, tune and orbit feedbacks ON trough the ramp
- Longitudinal beam blow-up during the ramp with nominal bunches (A. Butterworth, E. Shaposhnikova, P. Baudrenghien) some more beam time in parallel with the regular operation to fine tune

B1 both bunches

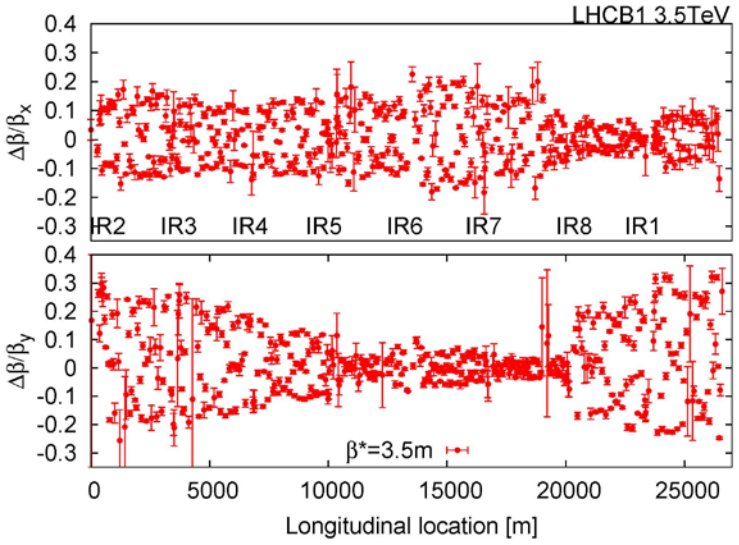


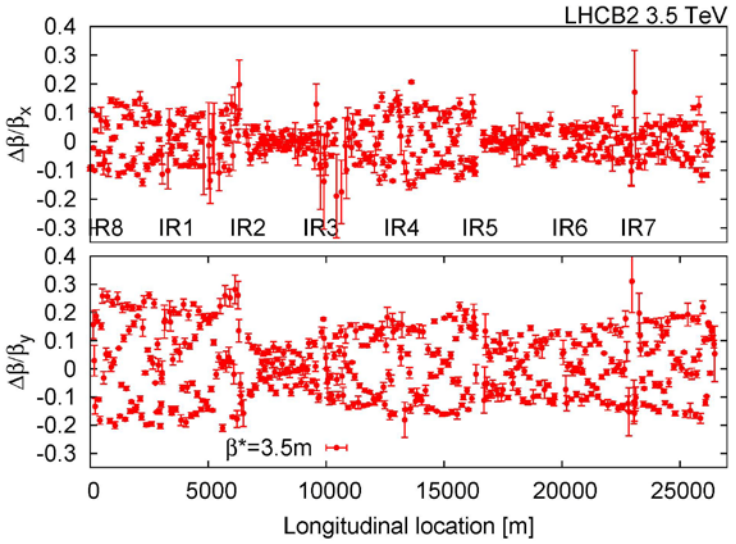
B2 both bunches



Squeeze & Collision

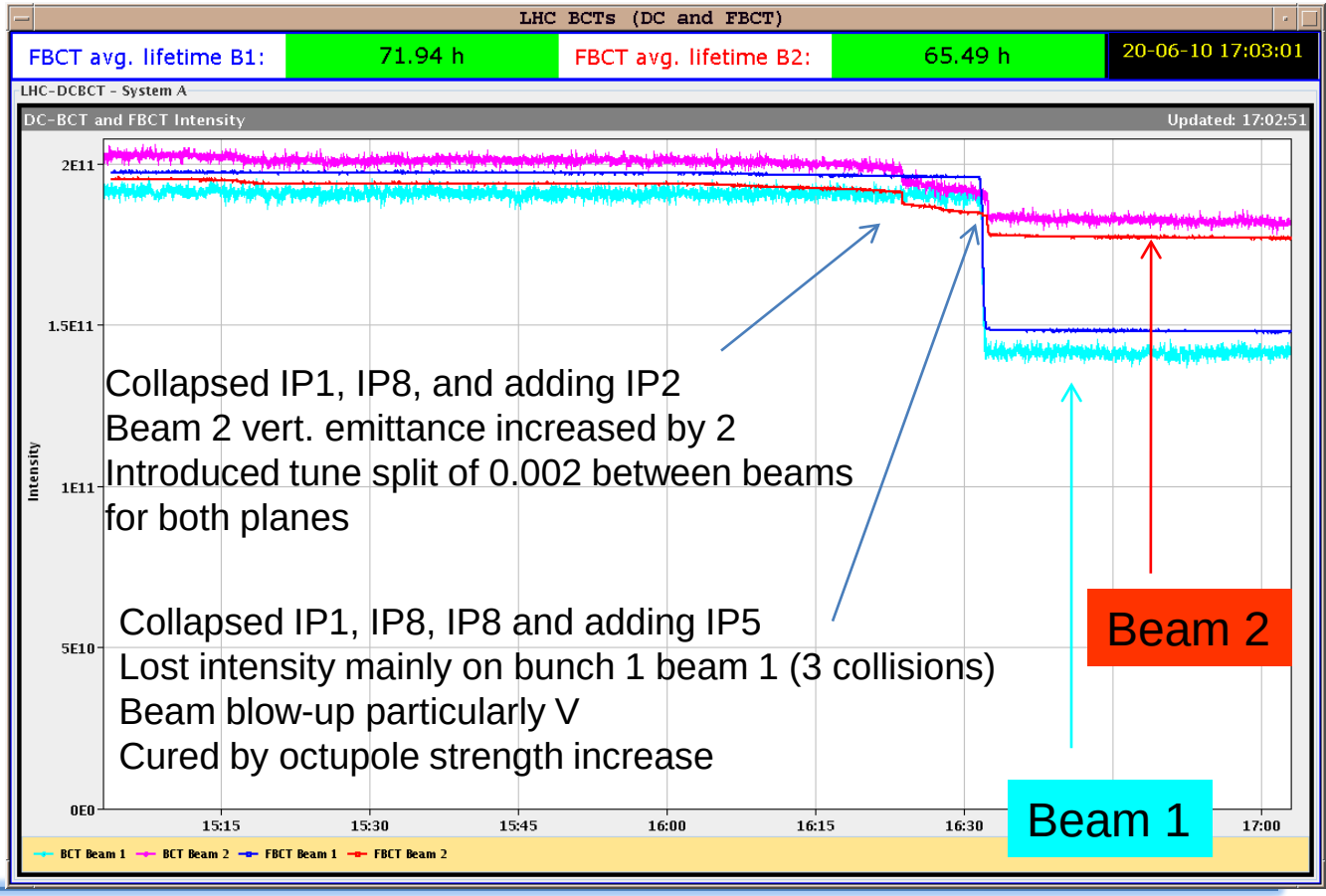
- **Beta beating measurements**: R. Tomas, R. Miyamoto, G.Vanbavinckhove
- Beta beating below 20 % in H plane and below 30 % in the V-plane (similar to 2 m after correction) ➔ possible localized errors in IP2 and IP8





Squeeze & collision

- Robust squeeze to 3.5 m – Tune, orbit FB on
- One stop at 7 m to drive the collimators
- Collapse of the separation bumps
  - IP1: 1x1
  - IP8: 17851 x 8911
  - IP2: 1x 8911
  - IP5: 1x1



Squeeze & collision

- Non-closure was corrected with the separation's knob correctors –thanks Jorg for the new YASP release
- Luminosity scans performed for all IPs – Introduced after the bump collapse action
- Introduced the crossing angle in IP1 (-100 μrad) and IP5 (+100 μrad)
- Saved a new reference orbit
- Cures found included in the procedure for next fill (tune split, octupoles)

Machine Protection

- Collimation setup and qualification: R. Assmann, R. Bruce, S. Redaelli, D. Wollmann
  - Completed the setting-up of the collimators at 3.5 TeV, unsqueezed and squeezed (with separation ON and OFF)
  - Loss maps showed correct hierarchy for the collimation system
  - Beam-based work finished for collimation, given golden orbits and optics. Will be ready for stable beams from collimation side, as soon as we have finished the sequences.
- Beam dump protection qualification:
  - 450 GeV qualification with nominal bunch intensity ongoing
  - Qualification at high energy remaining (asynch. dumps) – 2 to 3 ramps

Today

21	**Mon**	**M**	**LBDS 450 GeV setting up and qualification with nominal bunch intensity**
21	**Mon**	**A**	**Inject 2bx2b, 1e11, with longitudinal blow-up in the LHC ramp - squeeze - collapse separation in 1/5/2/8 , switch on crossing angle in IP1/5 - Simulation of asynchronous dump**
21	**Mon**	**N**	**Inject 2bx2b, 1e11, with longitudinal blow-up in the LHC ramp - squeeze - collapse separation in 1/5/2/8 , switch on crossing angle in IP1/5 - Simulation of asynchronous dump**

Issues

- Access requests:
  - C26.R2 (heater 3) because of a quench heater discharging/charging
  - Water pump in point 7 (sump)
  - QPS noisy card (B21R8)➔ threshold increased. To be replaced.
  - MKI8: timing instability of the injection kicker pulse.
  - RR17: ventilation
  - QTL7.L7 current lead temperature measurement (we had the same problem on the same circuit during the past week-end but on a different current lead)
  - BPM giving wrong sign (BPMSY.4L1.B2)
  - Power converter problems
    - RCBH14.R1B2 to be replaced
    - RCBH27.R1B1 to be replaced
- To be understood:
  - 3 failures of World FIP repeaters in the tunnel in the last few weeks