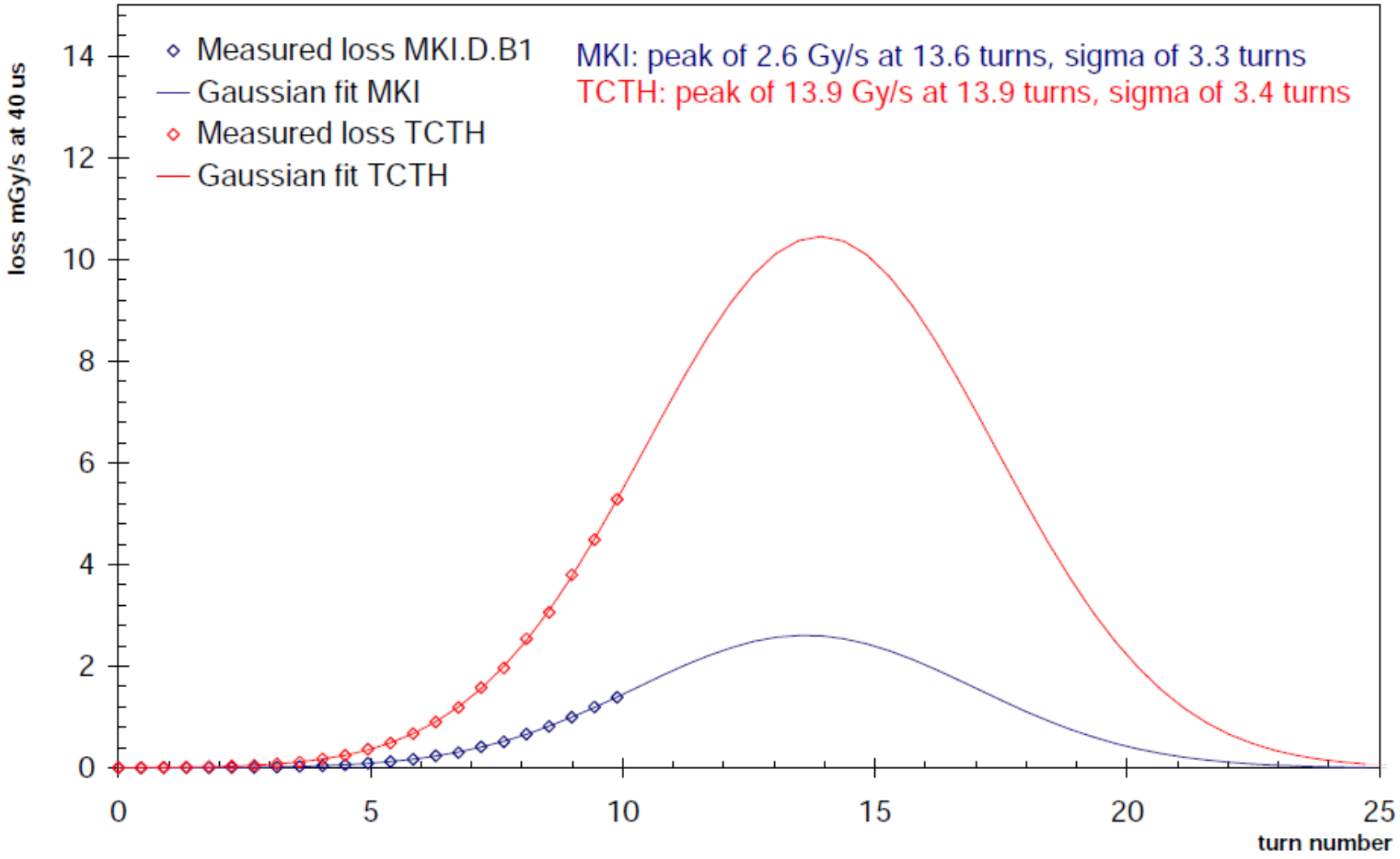
beam dump from P2 losses this morning

- Some observations on the beam dump from P2 losses this morning 29.10.10 at 01:26:39:
  - - single bunch intensity (average) was ~1.3e11 - significantly higher than previous fills
  - - as a result vacuum in MKI from beam related effects was higher than previously, but stable
  - - no sign of a vacuum spike in any of the B1 MKI at the moment of the beam loss; we are very sensitive to vacuum changes and did not see anything.
  - - beam losses started in MKI - factor 100 smaller signal in upstream Q5, which is probably cross-talk to BLMs
  - - loss evolution as function of turn number in MKI (and TCTH downstream which catches a lot of the scattered beam) is perfect Gaussian which would have peaked after about 13-14 turns at 2.6 Gy/s (or 14 Gy/s on the TCTH).
  - - sigma of loss profile is about 3.4 turns, and beam size at MKI.D is 0.14 mm vertically, 0.33 mm horizontally (assuming 2.5 um in both planes).
  - - velocity of alleged UFO would therefore be between 0.15e-3/(3.4*89e-6) m/s and 0.33e-3/(3.4*89e-6) m/s, i.e. 0.46-1.08 m/s.

Brennan Goddard



Brennan Goddard

EOF onwards

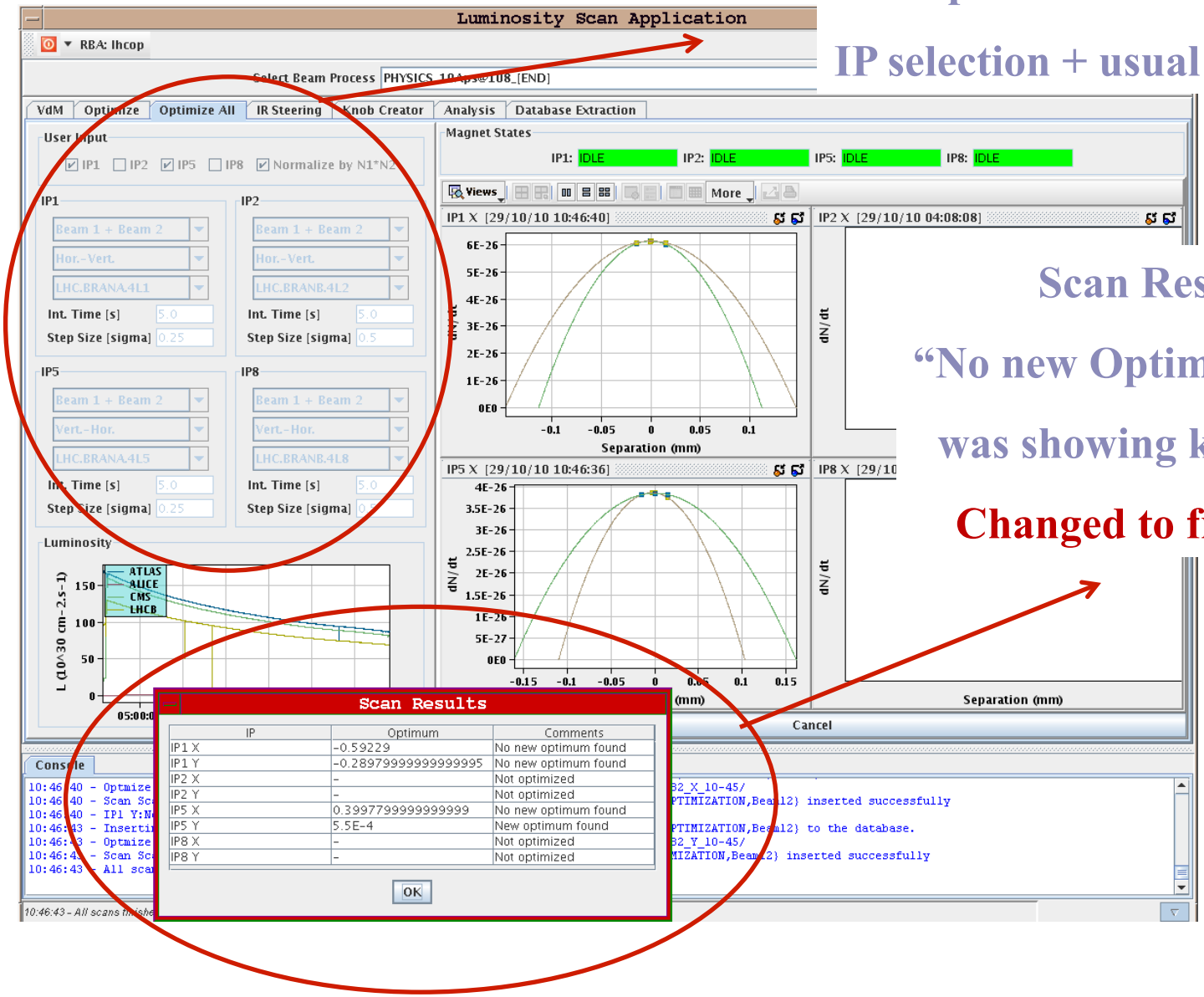
- Alice length scale measurement
  - only partially successful
- 10:35 ADJUST
  - quick test of parallel optimization
  - successful
- 11:00 beams dump

- 12:40 onwards
  - Damper guys working on 50 ns setup
  - leading into injection studies
- Some issues with extracting from SPS with LHC4 (50 ns. cycle) during the afternoon
  - Stephen page in full debug mode

Parallel IR Optimization Panel

Input Parameters:

IP selection + usual inputs



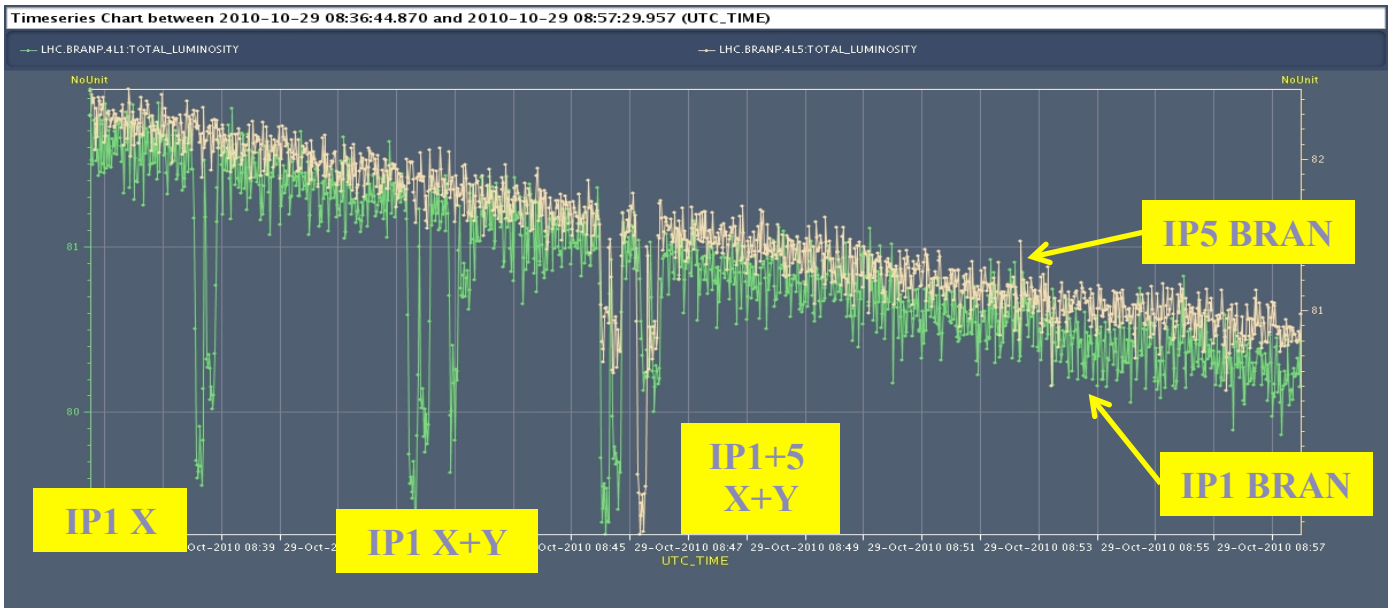
Scan Results:

"No new Optimum found"

was showing knob value

Changed to fit results.

Test with Beam



BRAN data:

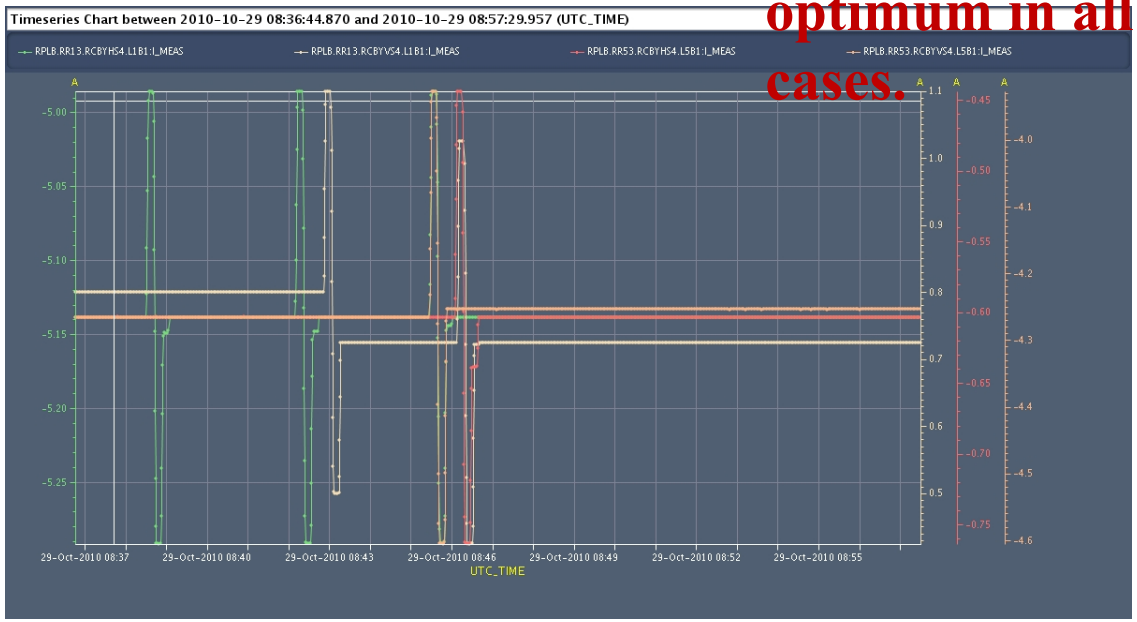
No initial separation, scan around peak luminosity to test routine.

Back to optimum in all cases.

Power Converters data:

Scan X / Y in serie. Automatic re-centering.

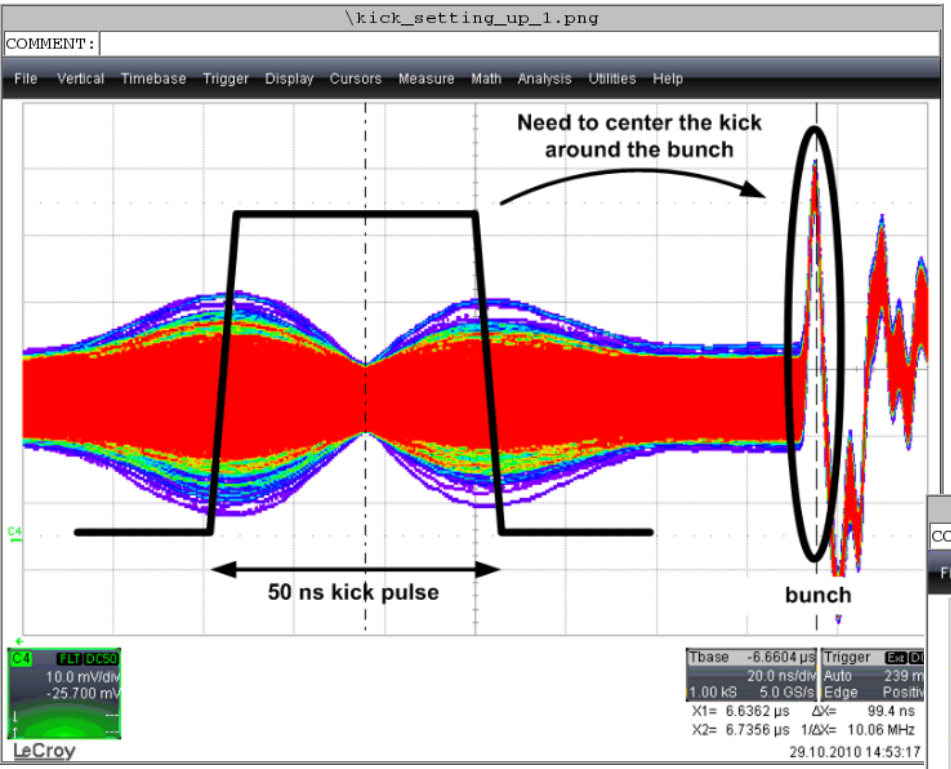
Different IPs are driven simulaneoulsy.

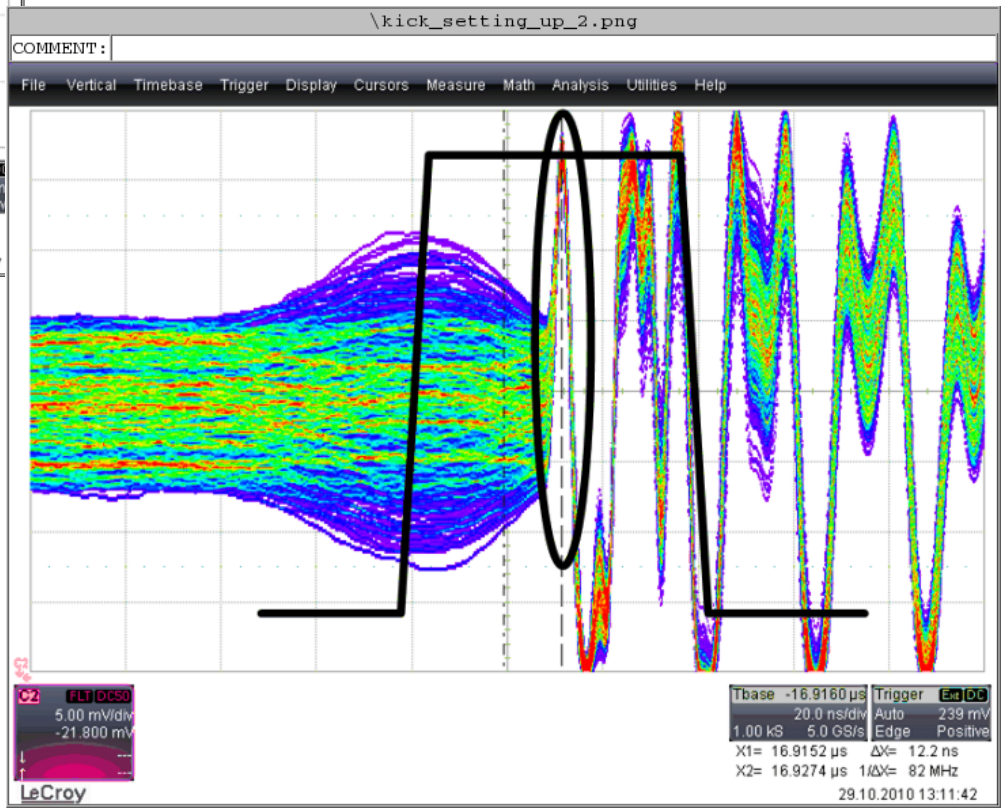


Transverse damper progress

- We have already found and optimized the loop parameters (phase advance between the pickup and the kicker, gain etc.) earlier this year.
- Switching to a shorter bunch spacing needed to shorten the pulse stretching time constant (was 150ns, now 50ns) and re-adjust the one turn (kick) delay.
- So far (150ns operation) we were using only the "coarse" delay with a delay granularity of 25ns what was sufficient for the 150ns operation. However now, when the bunch spacing is more dense we needed to commision also the fine delay adjustment with a granularity of 100ps. The total one-turn delay needs to be fine adjusted within a nanosecond in order to avoid "crosstalk" between the bunches.
- The delay was pre-adjusted looking at the HOM (higher order mode) port of the ADT kicker plates where we can see the bunch induced signal and a derivative of the kick signal (see attached pictures).
- The settings should be later refined by a precise measurement of the loop/beam transfer function with multiple bunches circulating.

- All 8 units for both planes and both beams were set-up and tested with single, nominal bunch. The performance still needs to be checked with a full 50ns train.


\kick_setting_up_1.png
COMMENT:
File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help
Need to center the kick around the bunch
50 ns kick pulse
bunch
C4 FLT DC50
10.0 mV/div
-25.700 mV
Tbase -6.6604 µs
20.0 ns/div
1.00 kS 5.0 GS/s
Trigger Ext DC
Auto 239 m
Edge Positiv
X1= 6.6362 µs ΔX= 99.4 ns
X2= 6.7356 µs 1/ΔX= 10.06 MHz
LeCroy
29.10.2010 14:53:17


\kick_setting_up_2.png
COMMENT:
File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help
C2 FLT DC50
5.00 mV/div
-21.800 mV
Tbase -16.9160 µs
20.0 ns/div
1.00 kS 5.0 GS/s
Trigger Ext DC
Auto 239 mV
Edge Positive
X1= 16.9152 µs ΔX= 12.2 ns
X2= 16.9274 µs 1/ΔX= 82 MHz
LeCroy
29.10.2010 13:11:42

50 ns injection studies

- First try of injection with 50 ns bunch separation
- - Injected 12 bunches per shot for the two beams (96 bunches injected)
- - Tried to steer trajectory in TL to improve losses at the TCDI and reduce injection oscillations ==> losses stay high (20-30 uGy), inection oscillations do not look bad (new trajectory saved in the catalog)
- - High cross talks at MQ8 for Beam 1, debunched beam losses for Beam 2
- - Need to recheck centering of TCDI
- - Vacuum activity monitored during all injections: no activity recorded for B1, a big spike, slowly decaying, observed during first injection of B2.

- 21:15 Injecting for TOTEM run
  - very small emittances (1.2 – 1.5)
  - 00:04 Vertical primary to 4.5 sigma
  - 01:15 after some discussion…
    - Final settings in unit sigma for the vertical pots:
      XRPV.A6R5.B1 7.66
      XRPV.B6R5.B1 6.53
      XRPV.B6L5.B2 6.46
      XRPV.A6L5.B2 6.50
- 05:18 Roman pots out
- TCP back to normal, stable beams

Night shift continued

- 07:00 Alice length scale calibration successfully completed
- Start longitudinal scan

- 08:00 Abort gap cleaning study starting...

Today - provisional planning

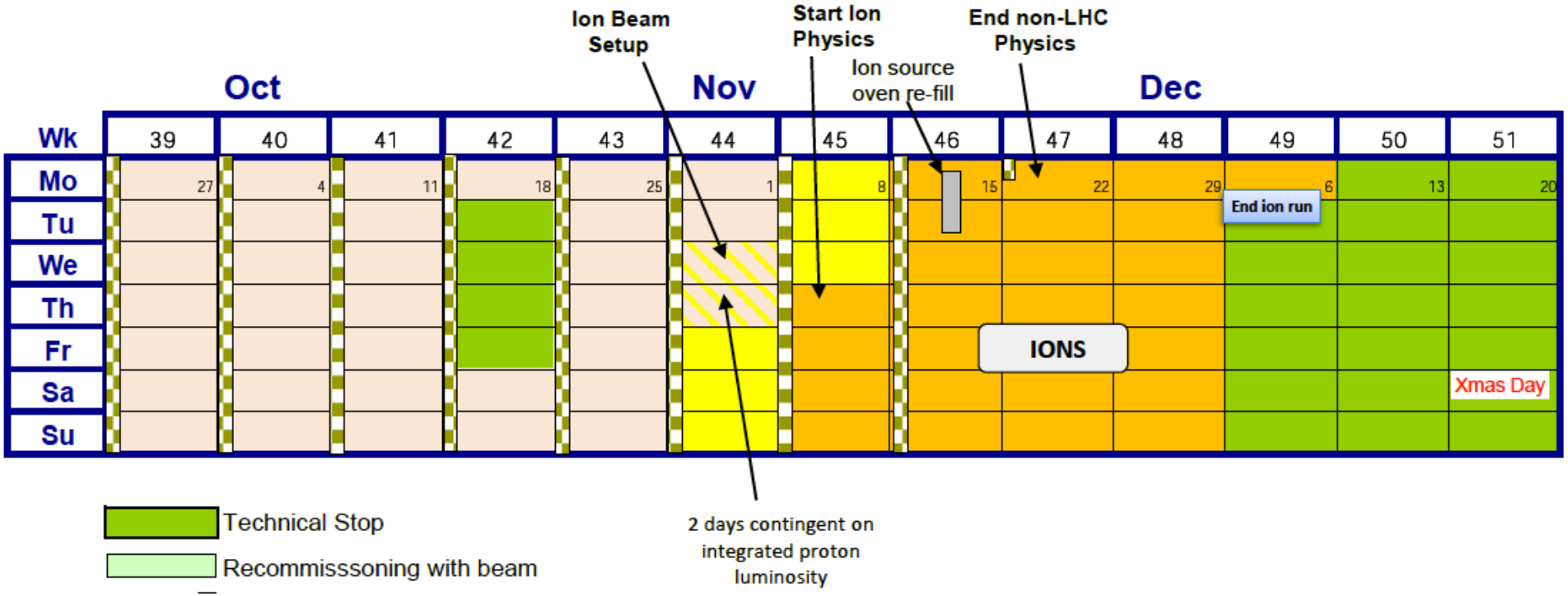
- Finish abort gap cleaning studies at 3.5 TeV
- Dump, cycle, re-inject

- Damper studies phase 2
- Injection studies continued
  - with RF in closed attendance

- 100b 50 ns ramp/squeeze/collide/stable beams

- End-of-fill studies
  - TFB off (gently), BBQ, separate in LHCb

Next few days



Today was…

08h00	6h	Inj up to 72b per shot if possible in time constraints, RF, transv. damper, inject 100b with 50ns for ramp	B. Goddard et al, P. Baudrenghien, D. Valuch
14h00	5h	Ramp 100b, stable beam, end-of-fill studies for beam-beam	OP, R. Steinhagen, M. Gasior, R. Jones,
19h00	15h	Inject 200b with 50ns, ramp 200b, stable beam, end-of-fill studies for beam-beam	B. Goddard et al, OP, W. Herr, E. Metral, T. Pieloni, R. Steinhagen, M. Gasior, R. Jones

running 3-4 hours late

50 ns

- Start injection with 12 bunches (all fills will have the first injection with 12 bunches).
- The first physics fill will be done with 1·12 bunches and 4·24 bunches (from 2 PH injections), in total 108 bunches.
  - This gives not yet the full beam-beam effect.
- Further fills will be done with 200 bunches, 300 bunches and 400 bunches if there is sufficient time.
  - To be re-discussed if priority should be given to MD studies.
- The fill with 200 bunches will be done with batches of 24 bunches, from 2 booster rings.

ABT

- test of injection gap cleaning - 4h at 450 GeV, high priority (potential limit for 2011 operation). This we are ready to do 'any day, any time' at relatively short notice. ✓

- abort gap cleaning at 3.5 TeV - 1 ramp with low intensity beam, high priority - we assume this can be fitted into the final MD period.

RF

- **1. RF noise induced beam diffusion with nominal LHC beam:**
- Beam conditions: End of fill study.
- Method: We reduce phase noise gain and let "natural" noise blow-up the bunches. We measure lengthening and noise PSD.
- Time needed: 1-2 hours at end of a physics fill. Preferably wk 43

- **2. RF noise induced beam diffusion with pilot LHC beam:**
- continuation of measurements done last week (see below)
- Beam conditions: 4 bunches fat pilots ramped to 3.5 TeV (no blow-up, no squeeze)
- Time needed:a 4 hours block
- Preferably during wk 44

- **3. Ramping the klystron High Voltage on flat bottom, with beam:**
- Beam conditions: ~100 bunches nominal at 450 GeV
- Goal: vary the HV with circulating beam and confirm no effect on beam.
- Motivation: Prepare for High Intensity 2011 operation
- Time needed: 1-2 hours, preferably second half wk 43 ✓

Philippe Baudrenghien

OP etc.

- Orbit shift versus TCT check:
  - collide 1 bunch and check the TCT center change as compared to predicted orbit change.
- Quench tests
  - 450 GeV with injected beam
  - 3.5 TeV with wire scanners
- Aperture in IRs at 450 GeV

BI studies – list to be updated

- Check the linearity of the fast BCT's in the new configuration for nominal bunches
- Tune the High BW/Low Gain fast BCT calibration for the coming ion run
- Measure the High BW/Low Gain fast BCT sensitivity limit and linearity for low intensity bunches (ion run)
- Re-check BPM sensitivity limit
- Calibrate the abort gap over the whole ramp
- Check the abort gap acquisition gate timing resolution and stability
- Commission BGI in preparation to ions
- Check BSRT/BGI/BWS cross-calibration including corresponding emittance logging
- Test and compare bunch/bunch profile measurement via BWS and/or BSRT
- PLL studies during ramp continued

- For all this, we would need the 2 rings for a few hours at 450 GeV then a ramp and again a few hours at 3.5 TeV. This would be really difficult to fit in a 4 hour slot. 8 would be perfect but we could try with 6.

TFB

- 1) multi-bunch acquisition of the damper pick-ups signals, update: Verena released her software, but some changes need to be still done for the drivers and the fesa class, see schedule below. We would like a slot on Wednesday (at the earliest) to reboot crates
- 2) gain in ramp: I have discussed with Delphine the specs to be seen if after she has implemented and tested the new scheme an LSA release should be done
- 3) abort gap cleaning @450 GeV: should be used from re-start onwards. Needs to be disabled for clean tune measurement. A beam based measurement is probably the best approach to identifying why we pollute the tune measurement; we have some ideas, could be done during the weekend during some of the test ramps.
- 4) injection cleaning: we suggest a manual test first, after that, implementation in sequencer

Wolfgang Hofle

TFB

- 5) abort gap cleaning in ramp: following discussion with Elena, convinced we would NOT need this; time scales can be found in Elena's papers (EPAC 2004 for example), start of ramp: beam lost after ~ 20 s, at full ramp rate used now lost after < 2 s; for more accurate numbers one would need to take into account the actual voltage, ramp rates, start-of ramp function and function for the momentum collimation.
-
- 6) abort gap cleaning at 3.5 TeV, probably advised for higher intensity as there is little energy loss at 3.5 TeV (7 TeV -> synch. radiation !), in particular during a long fill we may accumulate beam in abort gap. We should allocate some time to study this and make the cleaning operational at 3.5 TeV.

- 7) some time needed for the 50 ns set-up (2x4 hours)

Wolfgang Hofle

Experiments

- 40 - 50 pb^{-1} - done
- Alice – fill without dipole
- Totem – dedicated fill - done
- Totem – 90m
- Longitudinal scan - done