LHC intensity increase – check list

Version 0.2 - 4-Oct-10

Bunch pattern / intensity	152 nominal bunches
Start date	28.09.2010
Fill numbers	1377, 1381, 1387, 1388, 1389
Next intensity	200 nominal bunches
Comment	**Peak bunch charge should stay below 1E11 as this seems to improve the situation for the tune measurement.** **Betatron loss maps done in collision conditions.** **Ok to proceed despite lack of 5 hours of stable beams (but 4 fills reaching stable beams).**

Fill	Int B1/B2 [1E12]	Emittance [um]	Stable beams (h)	Dump reason
1377	17.0/16.5	~2.5	0	UFO in the squeeze, B1
1381	15.4/15.4	~3.0	3	UFO in Q25.R8.B1
1387	15.0/15.0	~3.0	2.2	UFO in Q5.R2.B2
1388	15.0/15.0	~3.0	2.2	QPS trigger in Sector 56 (due to faulty power supply in PC controlling main busbar detectors for RB/RQD/RQF.A56)
1389	17.5/17.5	~3.0	7	Dump on MQX BLM with long (> 0.6 s) RSs. Investigating, but in any case a very slow loss (if it was a real loss).

Check list

Non-conform points: the intensity increase is put on hold pending a satisfactory understanding / resolution of the issue.

Magnet powering	**Status**	**Who**
No unexplained IPOC failure in Post Mortem for FMCM and PIC	OK	JW
No magnet quench after beam dump in RQ4.R/L6	OK	JW
No unexplained quench of a magnet	OK	JW
No unexplained abort of the 3 previous fills by magnet powering system	OK(1)	JW/MZ
No problems with loss of QPS_OK for main circuits following injection process	OK	JW
Comments:		
(1) Fill Nr. 1388 was aborted by a short circuit in the PC power supply controlling the main circuits RB/RQD/RQF.A56. The short-circuit tripped the AC breaker of the whole rack and consecutively communication with some 9 600A units was lost as well as the WorldFIP repeater is located in the same rack. PC has been exchanged plus an additional DQAMGS card which was damaged during repair process.		

Beam interlocks	**Status**	**Who**
No unexplained IPOC failure in Post Mortem for BIC	OK (1)	JW/MZ
No unexplained false beam dump from beam interlock system	OK	JW
No failure of BIS pre-operational check	OK	JW
Comments:		
(1) IPOC warning for fill 1381 (due to sequence of BPL slightly exceeding thresholds due to multiple triggering). Known issue and only considered as a warning.		

BLM	**Status**	**Who**
Internal test (sanity checks) results must be true	OK	JW/BD
Rise time (10 to 90%) of fast losses must be larger then 200 us	OK	JW/BD
No unexplained BLM check failures	OK	JW/BD
Expected losses for the to be injected beam must be 30 % below threshold level	n/a	JW/BD
BLM system modification (ECRs) have to be agreed on, EDMS: notified persons signature is needed	n/a	JW/BD
No nonconformities in the energy transmission to the BLM crates	OK	JW/BD
Comments:		
(1) BLM threshold MFs increased from 0.1 to 0.3 for arc + DSS before fill 1387. (2) BLM thresholds in most of the machine to 0.3 for SC elements (exception triplet and channels with already modified MF).		

Collimation	**Status**	**Who**
Betatron loss map	Done	JW/OP
Off-momentum loss map	To be done next	JW
No observed violation of cleaning hierarchy	Seems OK	JW/OP
Comments:		
(1) Betatron loss map done in stable beams conditions (4-10-2010).		

Post-mortem	**Status**	**Who**
Loss leakage to TCTs below 0.5% during beam dump	OK(1)	JW
UFO occurrences	3	JW
No unexplained PM event above 450 GeV	~OK(2)	JW

Comments:

(1) Significant losses on TCTH.L1.B2 for UFO at Q5.R2.B2 on fill 1387. It seems the TCTH was the first aperture restriction beyond the UFO. TCTs in IR2 show no increase.

(2) The PM on fill 1389 due to a slow loss on a triplet BLM is still under investigations. It is strange that a single channel responded so strongly, while the neighboring BLMs had basically no signal (or even < 0).

Orbit	**Status**	**Who**
Global orbit in tolerance in stable beams (< 0.2 mm rms)	OK	JW
Orbit IR3/IR7 collimators within $\pm$ 0.2 mm in stable beams	OK	JW
Check that orbit is correctly measured	OK	JW
BPM IP6 (interlock BPM) during first beam with higher intensity and different bunch pattern	OK	JU
Orbit at TCTs in tolerance in stable beams (≤ 1 sigma)	OK	JW

Comments:

(1) IR2 TCTH on B2 stable at -1 sigma (or just below). It seems that the separation was adjusted for ALICE using mostly B2 instead of an equal change for B1 and B2. This will be fixed in the next fill with 200b.

(2) There is now a systematic negative vertical offsets in all IRs (BPM calibration?) so far at the level of a fraction of a sigma. To be followed closely – TCT alignment check in the most prominent zone to be done during the next week if possible.

Feedbacks & operation	**Status**	**Who**
OFB operational status / no anomalies	OK	JW
QFB operational status / no anomalies	Worrying	JW/OP

Comments:

(1) In fill 1389 even chirping seemed not to help. An analysis by RS seems to indicate that the only difference to 2 good ramps with 152 b was the bunch intensity above 1.1E11. For the next fills the bunch intensity must be limited below 1E11.

Beam dump	**Status**	**Who**
Asynchronous dumps understood? Protection worked correctly?	OK	BG
Parasitic asynchronous dump data show no loss of protection	OK (1)	BG
No positioning errors on TCSG/TCDQ	OK	BG
No settings or thresholds mistakes/wrong sequences/unexplained faults on TCSG/TCDQ	OK	BG
No unexplained MKD, MKB kicker, TSU or BETS faults	OK	BG
No potentially dangerous XPOC or IPOC failure on MKD or MKB	OK	BG
No unexplained synchronization problem with TSU	OK	BG
Pressure and temperature rise in TDE block within tolerances	OK (2)	BG
Requalification passed OK at 450 GeV and 3.5 TeV with pilot in case of any important component exchange	n/a	
Comments:		
(1) For the two fills with the UFO dumps, the ratio TCT/TCDQ is around 1e-2 for the affected beam: but the time structure is clearly due to the UFO not the dump – otherwise all in the few e-4 range,		
(2) about 4-5 mbar pressure rise in dump blocks for 8 MJ – corresponds to average delta T of 1 K		

Note: some items only relevant for increase injected intensity

Injection	**Status**	**Who**
Injection oscillations within tolerance for all injections	OK	BG
No unexplained large beam loss on TCDIs	OK	BG
No issues in injection procedure, settings or tolerances	OK	BG
Orbit in injection region in tolerance wrt reference (tolerance <0.5 mm)		
Resetting of TL trajectories and TCDIs done when needed	OK (1)	BG
No increased rate of MKI flashovers	OK	BG
No increased rate of MKI switch erratics or missings	OK (2)	BG
No unexplained MKI vacuum or temperature activity	OK	BG
No machine-protection related injection system hardware failures	OK	BG
Comments:		
(1) Adjustments made to TI2 on Wed 29th September, injection oscillations below 0.7mm everywhere		
(2) Some IQC failures for MKID.B1 on pulse length – trending shows noisier signal since about 1 week		