

**LHC intensity increase – check list**

Version 0.2 - 14-Oct-10

<b>Bunch pattern / intensity</b>	248 nominal bunches
<b>Start date</b>	08.10.2010
<b>Fill numbers</b>	1400, 1406, 1408, 1410, 1418
<b>Next intensity</b>	312 nominal bunches
<b>Comment</b>	<b>Ok to proceed</b>

Fill	Int B1/B2 [1E12]	Emittance [um]	Stable beams (h)	Dump reason
1400	25.0/25.0	~2.6	6.5	SIS interlock of TOTEM orbit (no data)
1406	25.0/25.0		0	Beam dump in ADJUST on RS9 losses at TCSG in IR7 – orbit drifting off after rescue attempt with OFB.
1408	25.5/25.5	~2.5	10.5	OP dump
1410	26.0/26.0	~2	0	BLM dump on RS12 (83 s) from losses when putting beams into collision with the small emittance
1418	26.5/26.5	~2.5	8.5	PIC dump on triplet correctors

## Check list

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

<b>Magnet powering</b>	<b>Status</b>	<b>Who</b>
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	JW
No problems with loss of QPS_OK for main circuits following injection process	OK	JW
<b>Comments:</b>		

<b>Beam interlocks</b>	<b>Status</b>	<b>Who</b>
No unexplained IPOC failure in Post Mortem for BIC	OK(1,2,3)	JW/MZ
No unexplained false beam dump from beam interlock system	OK	JW
No failure of BIS pre-operational check	OK	JW
<b>Comments:</b>		
<p>(1) BIC IPOC failures from the time alignment due to GPS problems of the CBCM.</p> <p>(2) In fill 1408 one of the injection BICs is not aligned – residual effect of one de-synchronization of the CBCM. Now all BICs aligned again (but still being investigated and to be solved with improved VHDL code).</p> <p>(3) In fill 1418 there is warning due to the fact that the PIC breaking of the loops on both sides of the IR fools the analysis (difficult to predict on the us level) – Still OK.</p>		

<b>BLM</b>	<b>Status</b>	<b>Who</b>
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	BD
BLM system modification (ECRs) have to be agreed on, EDMS: notified persons signature is needed	n/a	BD
No nonconformities in the energy transmission to the BLM crates	OK	BD
<b><u>Comments:</u></b>		

<b>Collimation</b>	<b>Status</b>	<b>Who</b>
Betatron loss map	--	JW/OP
Off-momentum loss map	To be done next	
No observed violation of cleaning hierarchy	Seems OK	JW/OP
<b><u>Comments:</u></b>		

Post-mortem	Status	Who
Loss leakage to TCTs below 0.5% during beam dump	OK	JW
UFO occurrences	0(1)	JW
No unexplained PM event above 450 GeV	OK(2)	JW
<b>Comments:</b>		
<p>(1) One strong sub-threshold UFO in 1408:  21:33:31 - Warning on: BLMQI.27R7.B2I30_MQ, integration time: 640 us, losses = 9.250231E-02, threshold = 2.192476E-01, ratio = 42%  21:33:31 - Warning on: BLMQI.27R7.B2I30_MQ, integration time: 2560 us, losses = 2.536262E-02, threshold = 5.481189E-02, ratio = 46%  21:33:31 - Warning on: BLMQI.27R7.B2I20_MQ, integration time: 640 us, losses = 9.020587E-02, threshold = 2.192476E-01, ratio = 41%  21:33:31 - Warning on: BLMQI.27R7.B2I20_MQ, integration time: 2560 us, losses = 2.487477E-02, threshold = 5.481189E-02, ratio = 45%  21:33:31 - Warning on: BLMQI.27R7.B2I10_MQ, integration time: 320 us, losses = 3.716156E-01, threshold = 6.445071E-01, ratio = 58%  21:33:31 - Warning on: BLMQI.27R7.B2I10_MQ, integration time: 640 us, losses = 2.699785E-01, threshold = 3.222535E-01, ratio = 84%  21:33:31 - Warning on: BLMQI.27R7.B2I10_MQ, integration time: 2560 us, losses = 7.329793E-02, threshold = 8.056338E-02, ratio = 91%</p> <p>(2) Small orbit oscillation of 50 um amplitude on B1 just before dump of 1418: not worrying.</p>		

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(1)	JU
Orbit at TCTs in tolerance in stable beams ( $\leq 1$ sigma)	OK	JW
<b>Comments:</b>		
(1) OK for 248 bunches, to be done for 312 bunches.		

Feedbacks & operation	Status	Who
OFB operational status / no anomalies	OK	JW
QFB operational status / no anomalies	OK(1)	JW/OP
<b>Comments:</b>		
(1) Fix of the filter (components rated for higher voltage) seems to have done the job. No more problems with QFB.		

<b>Beam dump</b>	<b>Status</b>	<b>Who</b>
Asynchronous dumps understood? Protection worked correctly?	OK	CB/JU
Parasitic asynchronous dump data show no loss of protection (1)	OK	CB/JU
No positioning errors on TCSG/TCDQ	OK	CB/JU
No settings or thresholds mistakes/wrong sequences/unexplained faults on TCSG/TCDQ	OK	CB/JU
No unexplained MKD, MKB kicker, TSU or BETS faults (2)	OK	CB/JU
No potentially dangerous XPOC or IPOC failure on MKD or MKB	OK	CB/JU
No unexplained synchronization problem with TSU	OK	CB/JU
Pressure and temperature rise in TDE block within tolerances (3)	OK	CB/JU
Requalification passed OK at 450 GeV and 3.5 TeV with pilot in case of any important component exchange	n/a	
<b>Comments:</b>		
(1) Checked: loss ratio between 7e-4 to 2e-5		
(2) BETS faults after going into access, which is understood		
(3) Pressure rise of 7 mbar, no temperature rises (< 1 degree)		

Note: some items only relevant for increase injected intensity

<b>Injection</b>	<b>Status</b>	<b>Who</b>
Injection oscillations within tolerance for all injections (1)	OK	CB/JU
No unexplained large beam loss on TCDIs	OK	CB/JU
No issues in injection procedure, settings or tolerances (2)	OK	CB/JU
Orbit in injection region in tolerance wrt reference (tolerance <0.5 mm)		
Resetting of TL trajectories and TCDIs done when needed	OK	CB/JU
No increased rate of MKI flashovers (3)	OK	CB/JU
No increased rate of MKI switch erratics or missings	OK	CB/JU
No unexplained MKI vacuum or temperature activity	OK	CB/JU
No machine-protection related injection system hardware failures	OK	CB/JU
<b>Comments:</b>		
(1) Bumps applied for the injected beam 1 around the obstruction between MSIB and MSIA, bump closed in the LHC. Aperture check around Q5 outstanding (known critical region).		
(2) Injection procedure changed with bump applied at point 2.		
(3) One flashover during injection losses / set-up B1		