

LHC-Beam Commissioning Working Group

Notes from the meeting held on
2 November 2010

1- LHC beam commissioning: progress and issues – Mike Lamont – Ralph Assmann

Monday morning summary of Week 43 - [slides](#) from Mike Lamont and Ralph Assmann

To note:

- Record peak luminosity of 2.05×10^{32}
- 19.5 pb⁻¹ accumulated over week 43
- UFO analysis by Brennan Goddard: velocity of alleged UFO would be between 0.46-1.08 m/s, assuming Gaussian fit of the beam loss. Further analysis most welcome.
- 424 bunch attempt. Beam dump at 3.5 TeV, large vacuum spike at the injection kickers. Distributed losses observed all around the ring. Annika Nordt analysed the losses during this fill and found a clear correlation of the losses with the vacuum spikes.
- Injection studies done for 50ns bunch spacing– Chiara Bracco report : [slides](#)
- TOTEM special run – ALICE length scale calibration done – Longitudinal scan done
- Stable beams (108b) with equally spaced batches of 12b of 50 ns apart– a little rocky, but nothing pathological.
- Moved to 24b and 36 b per injection. Injection optimisation done (see Chiara Bracco's [slides](#)).
- e-clouds has been seen with 150 ns (this is why solenoids were installed)
- 12bx50ns : no problems
- 24bx50ns: rises in pressure
- 36bx50ns : considerable pressure rises
- Cleaning seen for 12-24-24 (factor 2 in four hours) - persists after refilling
- Cleaning with 36 less evident

Updates from the last 24hrs: Joerg Wenninger and Jan Uythoven:

Detailed e-cloud measurement plans: [slides](#)

Detailed scrubbing steps: [slides](#)

Status of e-cloud studies and scrubbing ([slides](#))

- Effect of varying the bunch population for batch of 36 bunches ($4E10$ to $11E10$). Done.
- Comparison of effect of batches of 12, 24 and 36 bunches. Done.
- Effect of 2 batches of 24 bunches as a function of the batch separation (from 20 usec to minimum of 225 ns). Done.
- Scrubbing in progress until tomorrow afternoon.

Plans for the next 2 days:

Wednesday 3/11 – 20:00: Physics fill with 109 bunches (1x12+4x24 bunches)

Thursday 4/11 – 04:00: End of fill beam-beam studies

Thursday 4/11 – 08:00: End of proton run – Start of lead ion beam commissioning

2- Results from injection gap cleaning - Eliana Gianfelice ([slides](#))

Eliana Gianfelice reported on the injection slot cleaning trial. The horizontal transverse dampers are used for this cleaning (Wolfgang Höfle and Daniel Valuch) while the vertical dampers are used for the abort gap cleaning. The test was done using the same bunch

injection sequence, used to fill the LHC with 424 bunches per beam. Three cases were studied for the same injection sequence: 1) injection and abort gap cleaning were switched on; 2) only the abort gap cleaning was on; 3) no cleaning was done. Verena Kain compiled the resulting losses at the TDI through these 3 bunch injection sequences. A clear first improvement is measured when only the abort gap cleaning is switched on. A further improvement is then measured on the losses when both cleanings are turned on. BI colleagues (Andrea Boccardi and Federico Roncarolo) monitored as well the gap population and the emittances during the trials. No visible increase of the transverse emittances was observed and the gap cleaning was observed. This injection slot cleaning result is very encouraging. Verena Kain is now investigating with Wolfgang Höfle and Daniel Valuch how this injection slot cleaning can be used operationally as of next year start-up– it was tested manually during this trial.

Abort gap cleaning at 3.5 TeV: Debunching was done by reducing the RF voltage from 8 MV to 7 MV. The re-population was not symmetric and Elena Shaposhnikova computed that particles needed about 50 s for crossing the abort gap (3 μ s). 1/3 of 3 μ s gap was targeted for the cleaning. The kick amplitude was about 34 times weaker than at 450 GeV. Cleaning was observed, parameters to be optimised.

John Jowett: Could it be used for the ions? To be followed-up by Wolfgang Höfle and Daniel Valuch

Abort gap cleaning commissioning will continue at 3.5 TeV. EOF studies will also be planned, before final deployment. Abort Gap monitoring is deployed but still need some experience before further deployment, in particular for interlocking reasons.

3- Analysis of squeeze performance – Xavier Buffat – Stefano Redaelli ([slides](#))

Xavier Buffat presented the work done on the squeeze optimization. Software has been developed for this purpose and statistical analysis performed on squeeze performance, tune feedback compensation and losses. Xavier Buffat summarized the characteristics of the losses:

- There are no immediate limitations;
- Losses are ~ 10 times bigger for B2 than B1 – some losses are correlated with small orbit distortions;
- Present since squeeze commissioning;
- Some are associated with fast tune changes - Hysteresis in the quadrupoles may be the cause;
- Coupling is not the cause;
- Time scale is 10s;
- No apparent relation to the hump.

In conclusions:

- Squeeze performances are very good;
- Typical transmission factor > 99%;
- Tune feed forward increase operational security;
- Systematic losses are under investigation;
- No immediate worry;

Work in progress: Simulation of shorter squeeze beam process with possible extrapolation to smaller β^* . The present squeeze duration is 1041s. A minimum duration could be 342s - some minutes may be saved by removing matched optics.

Marek Strzelczyk: Hysteresis handling in the squeeze? Changes done at the K-level and fake change of hysteresis branch has been observed. Not yet fine tuned with the optics. Strategy to be re-visited. FiDel team has also been notified.

Stefano Redaelli: If we do not have anymore break points, we cannot stop anymore through the squeeze -cannot stop at unmatched optics points otherwise spikes in the current functions when ramp is re-launched.

Mike Lamont: Orbit corrections are also not smooth for dl/dt. To be changed for next year.

4- Readiness for Ion operation – Django Manglunki– Walter Venturini – Matteo Solfaroli

Django Manglunki ([slides](#)): Ion source problems are fixed. Beams will be ready by Thursday noon.

4 bunches of $8e7$ ions were present at extraction (vs nominal intensity of $9e7$). Emittances are slightly below design. Beam extracted on the TT40 and TT60 TEDs – very small tuning done in the extraction channel. Emittances measured with the screens in the TT lines are not consistent with the SPS measurements. Brennan Goddard: very saturated signals on the screen.

Intensity evolution along the chain: all losses are before LEIR and into the SPS.

Walter Venturini: ([slides](#))

- First couple of fills with clone of proton settings and open collimators (non colliding pilots)
- Trim Collision BP (Xangles) in a second time
- Intermediate Filling scheme for 20 b: 500ns_20b_16_16_0_4bpi4inj_IONS
- Loss map for ions and lowered BLM thresholds in IT to confirm ALICE TCTV setting in HI operation (from MPP and LMC)
- ZDC signals available on Luminosity scan application (test this afternoon)
- Meeting tomorrow morning to finalize detailed program – John Jowett

5- LHC ion commissioning plans – Mike Lamont ([slides](#))

To note:

- LHCb will be OFF
- Single bunch from the SPS to start with
- Latest settings cloned and ionized
- Injection: 1 shift
- 450 GeV: 1 shift for beam parameter and associated BI checks, optics measurements, some collimator set-up, loss maps, asynchronous beam dump
- Ramp+squeeze: blow up off, TFB off, OFB on, QTB on, Frequency modulation off, collimators at injection settings throughout, beam loss and lifetime through the cycle, reference orbit in squeeze, collide but miss
- Subsequent ramp with the same collimator settings as for protons till the end of the squeeze – tbc depending on the reproducibility for protons to ions. IP8 separation and crossing angle kept on.
- Set-up of TCTs around new collision orbit
- Loss maps and synchronous dump at 3.5 TeV
- Shadowing of ZDC

Ralph Assmann: **NO SAFE BEAM FOR IONS – set-up beam only – no parking of beam on collimators.**

Protons / ions switching back and forth: 1hr needed. Elena Shaposhnikova: Not needed for low intensity protons.

6- AOB

Daily 8:30 HWC meeting in the CCC conference room (09:00 at weekends).

Next meeting: **9 November 2010, 15:30, 874-1-01.**

Malika Meddahi

LAST NAME	FIRST NAME	DEP/GROUP	Present
ALABAU PONS	Maria Carmen	BE-ABP-LCU	
ALEMANY FERNANDEZ	Reyes	BE-OP-LHC	
AQUILINA	Nicholas	TE-MSC-MDA	x
ARDUINI	Gianluigi	BE-ABP-LIS	
ASSMANN	Ralph Wolfgang	BE-ABP-LCU	x
BAER	Tobias	BE-OP-SPS	
BAILEY	Roger	BE-OP-LHC	
BARTMANN	Wolfgang	TE-ABT-BTP	x
BAU	Jean-Claude	BE-CO-HT	
BAUDRENGHIEN	Philippe	BE-RF-FB	
BELLESIA	Boris		
BELLODI	Giulia	BE-ABP-HSL	
BHAT	Chandrashekhara	BE-ABP	
BOCCARDI	Andrea	BE-BI-PM	
BOTTURA	Luca	TE-MSC-SCD	
BRACCO	Chiara	TE-ABT-BTP	x
BRUCE	Roderik	BE-ABP-LCU	x
BRUNING	Oliver	BE-ABP	Excused
BRUNNER	Olivier	BE-RF-KS	
BUFFAT	Xavier	BE-OP-LHC	x
BURKHARDT	Helmut	BE-ABP-LCU	
BUTTERWORTH	Andy	BE-RF-CS	
CALAGA	Rama	BE-ABP-LCU	
CALVIANI	Marco	EN-STI-EET	
CARLI	Christian	BE-ABP-LIS	x
CARLIER	Etienne	TE-ABT-EC	
CAUCHI	Marija	BE-ABP-LCU	x
CHAPOCHNIKOVA	Elena	BE-RF-BR	x
CHARRUE	Pierre	BE-CO-IN	x
CIAPALA	Edmond	BE-RF	
CROCKFORD	Guy	BE-OP-LHC	

LAST NAME	FIRST NAME	DEP/GROUP	Present
DEHNING	Bernd	BE-BI-BL	
DENIAU	Laurent	TE-MSC-MDA	
DOMINGUEZ SANCHEZ	octavio	BE-ABP	
DROSDAL	Lene	BE-OP-LHC	x
DUBOURG	Sylvia	BE-ASR-AS	
FARTOUKH	Stephane	BE-ABP-LCU	
FERRO-LUZZI	Massimiliano	PH-LBD	
FORAZ	Katy	EN-MEF-LPC	
FUCHSBERGER	Kajetan	BE-OP-SPS	
GAROBY	Roland	BE	
GIACHINO	Rossano	BE-OP-LHC	
GIANFELICE	Eliana	TE-ABT	x
GIOVANNOZZI	Massimo	BE-ABP-LCU	x
GODDARD	Brennan	TE-ABT-BTP	x
GRAS	Jean-Jacques	BE-BI	
GRUWE	Magali	BE-ASR-SU	
HAGEN	Per	TE-MSC-MDA	
HATZIANGELI	Eugenia	BE-CO	
HERR	Werner	BE-ABP-CC3	
HESSLER	Christoph	TE-ABT-BTP	
HOFLE	Wolfgang	BE-RF-FB	
HOLZER	Bernhard	BE-ABP-LCU	
HOLZER	Eva Barbara	BE-BI-BL	x
IKEDA	Hitomi		
JACQUET	Delphine	BE-OP-LHC	
JEANNERET	Bernard	BE-ABP-CC3	
JENSEN	Lars	BE-BI-SW	Excused
JONES	Rhodri	BE-BI	
JOWETT	John	BE-ABP-LCU	x
KAIN	Verena	BE-OP-LHC	
KOZANECKI	Witold	PH-UAT	

LAST NAME	FIRST NAME	DEP/GROUP	Present
KOZSAR	Ioan	BE-CO-HT	
KRUK	Grzegorz	BE-CO-AP	
KURFUERST	Christoph	BE-BI-BL	
LAFACE	Emanuele	BE-ABP-LCU	
LAMONT	Mike	BE-OP	x
LEVINSEN	Yngve Inntjore	BE-ABP-LCU	
MACLEAN	Ewen	BE-ABP	x
MACPHERSON	Alick	BE-OP-LHC	
MANGLUNKI	Django	BE-OP-SPS	x
MARSILI	Aurelien	BE-BI-BL	
MEDDAHI	Malika	TE-ABT-BTP	x
MERTENS	Tom	BE-ABP-LCU	x
METRAL	Elias	BE-ABP-ICE	
MONTABONNET	Valerie	TE-EPC-OMS	
MUELLER	Gabriel Johannes	BE-OP-LHC	
NEBOT DEL BUSTO	Eduardo	BE-BI-BL	x
NORDT	Annika	BE-BI-BL	x
NORMANN	Lasse	BE-OP-LHC	x
PAPOTTI	Giulia	BE-OP-LHC	x
PIELONI	Tatiana	BE-ABP-ICE	
POJER	Mirko	BE-OP-LHC	
PONCE	Laurette	BE-OP-LHC	
PUCCIO	Bruno	TE-MPE-MI	x
REDAELLI	Stefano	BE-OP-LHC	x
ROESLER	Stefan	DGS-RP-AS	
RONCAROLO	Federico	BE-BI-PM	
ROSSI	Adriana	BE-ABP-LCU	
ROY	Ghislain	BE-ASR-SU	
SAPINSKI	Mariusz Gracjan	BE-BI-BL	
SCHMIDT	Frank	BE-ABP-ICE	x
SCHMIDT	Rudiger	TE-MPE-PE	

LAST NAME	FIRST NAME	DEP/GROUP	Present
SIEMKO	Andrzej	TE-MPE	
SIGERUD	Katarina	BE-CO-AP	x
SIVATSKIY	Gennady	BE-CO-FE	
SLIWINSKI	Wojtek	BE-CO-IN	
SOLFAROLI CAMILLOCCI	Matteo	BE-OP-LHC	x
STEINHAGEN	Ralph	BE-BI-QP	x
STRZELCZYK	Marek	BE-ABP-LCU	x
TERRA PINHEIRO FERNANDES	Mario	BE-OP-LHC	x
THIESEN	Hugues	TE-EPC-MPC	
TODD	Benjamin	TE-MPE-MI	
TODESCO	Ezio	TE-MSD-MDA	
TOMAS GARCIA	Rogelio	BE-ABP-CC3	x
UYTHOVEN	Jan	TE-ABT-BTP	x
VALENTINO	Gianluca	BE-ABP-LCU	x
VALUCH	Daniel	BE-RF-FB	
VANBAVINCKHOVE	Glenn	BE-ABP-LCU	x
VENTURINI DELSOLARO	Walter	BE-OP-LHC	x
VINCKE	Heinz	DGS-RP-AS	
VINCKE	Helmut	DGS-RP-AS	
WENNINGER	Jorg	BE-OP-SPS	
WHITE	Simon	BE-ABP	x
WIENANDS	Uli	BE-OP	
WOLLMANN	Daniel	BE-ABP-LCU	x
ZANETTI	Marco	PH-UCM	
ZIMMERMANN	Frank	BE-ABP-LCU	

