SESSION 8: INCOMING

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EXPERIMENTS - EXPERIENCE AND FUTURE – JAMIE BOYD

Jamie congratulated the accelerator community for the great run in 2016.

In 2017 at pile-up up to 60 events per crossing will be acceptable. The preference is to run with BCMS for performance. There is a request from CT-PPS to improve their physics acceptance with an orbit bump, but this depends on the IP5 re-alignment strategy. In terms of special running conditions in Run-2, the experiments have requested an intermediate beta* run (likely to be scheduled in 2018) and a 5 TeV pp reference run (likely to be scheduled at the end of 2017).

For 2017 there are collection of wishes and requests:

- explore bunch lengths of 0.9ns
- a dedicated fill with higher pile-up by at least about 10% more than nominal
- measurements with zero crossing angle

The hypothesis to explain the luminosity imbalance is via the different horizontal and vertical emittances.

In 2017 one should define crossing angles with the actual beam emittances. This has the complication on how to determine emittance.

Jorg commented that the CTPPS bump with crossing angle leveling will require changing the bump and realigning the pots.

Enrico highlighted that the luminosity imbalance does not go to zero for zero crossing angle. ATLAS is going to recalibrate so the residual might become more important.

Witold confirms that indeed new analysis shows that the previous luminosity was overestimated by 3%.

Mike commented that there are 3 different emittance measurement methods that say beams got more round.

Jamie added that Z counting supports the luminosity imbalance. **Gianluigi** replied that hence the Z counting should be used on-line but **Jamie** argued that this is very hard.

Jamie added that with a crossing angle reduction early in the run experiments could improve luminosity calibration.

BEAMS FROM INJECTORS – HANNES BARTOSIK

The BCMS horizontal emittance is limited by blow-up at injection in the PS, probably due to a dispersion mismatch. The vertical emittance is blown-up in the PS cycle and this was cured in an MD via working point optimization.

The 200 ns MKP kicker gap was tested with 25 ns beam during LHC MDs.

Emittances and intensities of the different beams for 2017 are presented together with highest possible brilliance to be demonstrated in MDs.

Jamie asked about the roundness of the beams in the injectors. **Hannes** answered that the emittance measurement in the injectors probably has worse resolution than in the LHC. Emphasis could be put on this in 2017.

Mike asked Simone about dump status. **Simone** advised to wait until March since delivery of copper blocks is underway.

Elias proposed to test emittance exchange in the injectors via coupling and tune crossings.

FILLING SCHEMES AND E-CLOUD CONSTRAINTS – GIOVANNI IADAROLA

Giovanni presented an overview of the e-cloud experience and observations in 2015-2016. The normalized heat-load has reached a flat bottom with a very slow conditioning. Measurements during MDs show a steep dependence of heat-load versus bunch intensity. BCMS holds the best promise for operation in 2017.

He requests 7 days in 2017 for scrubbing.

Doublet beams will need machine developments plus longer period for scrubbing if successful.

Mirko asked whether we are opening the worst arc concerning e-cloud heat-load. **Giovanni** answered that it looks so, but, since we do not know the source of the heat-load arc-to-arc variation, we cannot predict the effect of opening the arc.

BETA* REACH FOR THE DIFFERENT SCENARIOS – RODERIK BRUCE

Roderik presented the beta* reach for nominal and ATS optics, based on 2016 MDs. Both optics can achieve the same beta* for 2017 in the range between 30-33cm for a TCP gap of 5 sigmas.

Brennan asked for the loss in ATS beta* reach if we kept the same margins as in nominal. This would imply a beta*=37cm. On the other hand, using interlocks in the collimator BPMs, the beta* would recover the 30-33cm range in ATS.

Jorg asked on the required setting, which is 1sigma in the TCTs.

Stefano clarified that this setting would have generated zero dumps in 2016.

Jamie asked about the impact of having a horizontal CTPPS bump. **Riccardo** answered that the Totem bump does not impact the aperture in the triplet, but that we need to look at the combination of all bumps.

SCENARIOS FOR 2017 AND 2018 – YANNIS PAPAPHILIPPOU

Yannis presented the possible scenarios for 2017. The main assumptions are a target beta*=31cm, a crossing angle of 10 sigmas (eventually pushed to 9 sigmas) and the use of BCMS beams. ATS is the favored optics choice regarding the LHC and HL-LHC long-term performance. A flat optics could be operational in 2018.

Chiara mentioned that the heat load is very different between 288 and 144 bunches. Do we know that this is a limitation without testing it? For robustness 192 would be preferred. **Giovanni** clarified that for BCMS we are not so far from the limit and that with the BCMS there is hope, maybe, with a bit of conditioning.

Gianluigi explains that these are considerations for the start of operation in 2017. Additional conditioning is expected during the year. Triplet cryogenics will limit luminosity to 1.75e34 /s/cm^2.

Yannis was asked about the preference for ATS. He replied that ATS is the optics that will enhance machine performance in the near and long-term future, like HL-LHC. **Brennan** expressed disagreement and mentioned that there are two problems: CTPPS and margins in the asynchronous dump.

Jorg mentioned that another option would be to use ATS only in the pre-squeeze.

Jamie supported the importance of building experience for the future but asked to consider implementing ATS in 2018. **Yannis** replied that this could be a compromise approach.

EYETS RECOVERY – MATTEO SOLFAROLI

Matteo presented the training campaign which was carried out in sectors 34 and 45 to try and reach 7 TeV. 20 quenches were done in S45 and 7 in S34, before stopping due to the appearance of a short to ground (solved by a capacitive discharge). The equivalent of 6.82 TeV were reached in S45.

He spoke then about the main interventions to be done during the EYETS and the strategy for the restart.

Oliver asked whether periodic radiographies of the metallic debris are done. **Matteo** confirmed that they were taken afterwards, but they are complicated because of no easy access.

Mike stressed on the fact that the two faulty points (the present one and the one of 2015) are close: is there any correlation? **Mirko** reminded that the first fault appeared in 2007, and it was in S45.

Enrico asked whether the 2 faults appeared in magnets belonging to the same producer. **Mirko** replied negatively.

RUN 3 AND HL-LHC – RICCARDO DE MARIA

Riccardo recalled the objective of Run III and HL-LHC (300 and 3000 fb^{-1}, in summary) and presented the transition parameters between Run II and HL-LHC. Important tests could be done in the coming years to estimate the limits for the future: pile-up, e-cloud, beam-beam effects. It will be important to find the minimum crossing angle with a good lifetime and investigate the potential of flat telescopic optics, by pushing the performance of the ATS in MD. Other important areas to be studied are the improvement of stability of the orbit (also related to the instrumentation), the crab cavities potential and the possibility of pushing the RF to 16 MV in full detuning mode.

John stressed on the need for MDs for the ions, in particular to prove the feasibility of the 2ns-spaced ion bunches.

MACHINE DEVELOPMENT – JAN UYTHOVEN

The planning for the MDs in 2016 was presented by Jan, which foresaw 22 days in 4 blocks. In this amount of time, with an average availability of 84%, 56 MDs could be executed: the most relevant of them were highlighted by Jan.

An inventory of 85 MDs has been for the moment prepared for 2017, which would require 44 days (assuming the same efficiency as in 2016), plus 72 hours of end of fill studies. Unfortunately, only 15 days are presently allocated for MDs, which will require a prioritization, but also improved procedures for recovery and settings clean up.

Enrico stressed on the fact that the procedures should be improved in terms of preparation, since in few MDs the filling scheme and beam type had to be prepared or decided in the last minute.

Jamie suggested to try and limit the number of MDs at the beginning and possibly give more time at the end, according to the progression of data collection. If things go well, in fact, people from the experiments will be more available to free time for the MDs.