

SUMMARY OF SESSION 1: AVAILABILITY

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LIST OF PRESENTATIONS

The first session of the 6th LHC Beam Operation Workshop included the following presentations:

1. **2015 availability analysis** by Andrea Apollonio
2. **QPS - operational aspects** by Mirko Pojer
3. **Cryogenics** by Krzysztof Brodzinski
4. **R2E - is it still an issue?** by Salvatore Danzeca
5. **RF (Hardware)** by Olivier Brunner

2015 AVAILABILITY ANALYSIS (A. APOLLONIO)

M. Solfaroli emphasized that the numbers mentioned in the presentation represent an average of 5.4 faults per day which seems to be quite large. *A. Apollonio* replied that this shows that there are several child faults in parallel.

M. Lamont asked if the large difference in term of machine availability between ion and proton runs are understood. The main explanation is the much lower heat load for ions. *E.B. Holzer* asked for more details about the training organized on reliability. *A. Apollonio* explained that it will be a 3 days training (plus one day of demo) in collaboration with the Stuttgart university for safety critical system designer and oriented to Hardware related issues.

R. Bruce underlined the large contribution of the so-called “Beam losses” system in the fault time and asked if the ULO are included in the chart. Indeed, the ULO are not in the chart and the “Beam Losses” system is mainly comprised of UFO.

G. Arduini asked what is the main contributor in the very long turnaround time. *A. Apollonio* answered that this is mainly due to long time at injection and referred to *D. Jacquet*’s presentation in the following session for details.

B. Mikulec asked if there is a plan to extend AFT to the injectors and to give the possibility to link with the injector fault tracking. *C. Roderick* mentioned that AFT has been designed first for LHC but always keeping compatibility with all CERN accelerators. *V. Kain* added that support from equipment group is needed for the fault review also for the injectors.

QPS - OPERATIONAL ASPECTS (M. POJER)

M. Lamont questioned the speaker about the usage of the macros. *M. Pojer* answered that the macros used were a last minute patch deployed for OP to be used during 2015 but will be improved for 2016. BE/ICS new group will convert it into sequencer tasks.

R. Steerenberg asked if one should not worry about Quench Heaters lifetime after the large number of firing (4000). *M. Pojer* reminded that one should not forget that 2015 was a special year of recommissioning. Most of the QH firing were at zero current during the Individual System Tests. *S. Le Naour* explained that a test carried out in SM18 on the magnet 1007 seems to indicate that the QH lifetime is longer than expected.

B. Goddard asked if MPP is keeping track of which and when QH fired. *Z. Charifoulline* and *R. Schmidt* complemented that every event is carefully analyzed and documented and no problem have been seen so far. The real lifetime of QH is not really known. *A. Siemko* emphasized that the QH are, by design, pretty robust. Weaknesses are due to singularities during production and the risk of singularity is very small. He is convinced that there is no more weak part but as a fraction of the magnet has seen problem during production the risk that the strips may be damaged is high. This is the reason to limit the firing of the heaters.

CRYOGENICS (K. BRODZINSKI)

M. Solfaroli asked if the spares are replaced when used for repairing. *K. Brodzinski* confirmed that they have a new spare for each component which has been exchanged.

M. Lamont questioned the choice of working with only one cold pumping unit considering the cooling capacity limitation. *K. Brodzinski* confirmed that this was the right choice as we were running with twice the nominal capacity with less rotating machine, which means less failure.

R. Tomas remarked that the heat load after test with the 8b4e bunch train was reduced and asked if cryo team would like to repeat operation with this beam in 2016. *K. Brodzinski* confirmed that after the test, heat load was reduced as if this type of beam has a good cleaning and agreed to repeat the test if OP requests it. *G. Arduini* mentioned that there is no reason that the 8b4e beam should give a cleaning effect as it is designed for the opposite (less heat load effect). More tests are needed and check of other parameters as bunch length have to be done to understand the effect and get more statistics.

M. Lamont asked again if there is some understanding of the difference in cleaning between the different sectors and especially why cleaning is slower in the sectors with higher heat load. *G. Arduini* answered that there is no effect on orbit, as a test displacing the beams has been performed and no increase in the heat load was seen. *S. Fartouk* mentioned that one could check the slope of the tunnel and connection with cooling to be related with the different behavior of the sectors. For the moment, the different behavior between sectors is still a mystery.

R. Schmidt emphasized that the relaxed beam screens interlock made the cryo operation more robust and asked

if there are some other interlocks which could also be relaxed. It was reminded that the logic of the CRYOSTART/CRYOMAINTEIN was defined a long time ago, before operation and the tendency was to over protect. Interlocks can now be re-discussed with the experience. Probably the DFBAF interlocking logic should be reviewed as causing a lot of downtime.

R2E - IS IS STILL AN ISSUE (S. DANZECA)

W. Hoefle asked if the scaling of R2E effects for HL-LHC goes with beam current or with luminosity. S. Danzeca answered that both scaling should be considered depending on location: for the Interaction Points it scales with luminosity, for the Dispersion Suppressor regions it scales with beam current.

B. Dehning pointed out the peak in the dose deposition around cell 11 around point 2. S. Danzeca precised that this is the peak we always have in the Dispersion Suppressor

Regions and J. Jowett reminded that we also have this peak in IP1 and 5.

M. Lamont asked for precision about the mitigation method proposed for the power converters R2E related issues. S. Danzeca explained that the installation of FGCLite has been postponed to EYETS, so we will have to cope with FGC2 for 2016 and that a patch has been proposed by EPC group.

RF - HARDWARE (O. BRUNNER)

W. Hoefle mentioned that for RF system the Software Low Level failures is an important part of the downtime and suggested that Software is also included in the training on reliability proposed by MPE . He also asked what is the challenge in the commissioning of the cavities for 300kW operation. O. Brunner answered that there is no technical challenge, just a matter of time needed after each warm-up.