

Notes from the first BCWG meeting

The LIU Beam Commissioning Working Group (BCWG), co-chaired by G. Rumolo (BE/ABP) and V. Kain (BE/OP) is mandated to

- Ensure readiness of plans/procedures/tools and establish teams for commissioning of the injectors after LS2
- Organise, execute, analyse beam commissioning from post-LS2 to LS3 (i.e. during Run3), which implies
 - Recover pre-LS2 performance
 - Commission LIU beams to full performance by end of Run3
 - Establish beam milestones roadmap to meet the above two targets

For this purpose, the BCWG will need to rely on

- Past beam commissioning experience (including the upcoming experience after the YETS 2017-18);
- Accurate knowledge of the major changes in the injectors during LS2 with the relative commissioning requirements (also in terms of LS2 dry runs and HW check-out). These changes will have to be carefully listed and documented.

The first main goal is to identify tools, applications, simulations, monitoring, HW checks, controls required for the early beam commissioning phase. Since beam commissioning is a general task, this should cover **not only the LHC but also the Fixed Target (FT) beams**. In a second moment, the beam parameter targets throughout the injectors chain will have to be set and followed up over Run3, again **both for LHC and FT beams**. The stage 1 team is for the moment composed by the people listed on slide 4, but may need to be re-adjusted (participation of TE/ABT, representatives of CO and BI missing, representative from EN/ACE needed if planning is discussed, need more RF representatives for the SPS?). Meetings should take place once a month for now, with the frequency possibly increasing over the next few months.

All this considered, the following 4 aspects will have to be covered within the BCWG meetings

- Integration and test of the new HW keeping in mind the new operational scenarios;
- Preparation of tools (next generation settings management, model based parameter generation and control, new timing approach);
- Planning for HW checkout;
- Beam commissioning planning.

A rough timeline for beam commissioning after LS2 has been also presented and discussed (as it will have to be presented also at the HiLumi Collaboration meeting in Madrid on 13-16 November, 2017). Keeping in mind the LIU beam parameters as from the EDMS tables, the expected steps for LIU/HL-LHC beam commissioning during Run3 are outlined on slide 7. The recovery of all pre-LS2

beams with the newly installed equipment in 2020-21 should obviously only cover the beams needed for 2021 physics. The commissioning of the high intensity/brightness LHC beams will be then achieved in three stages. The possibility of further interventions during the Run3 YETS's must be kept open in the light of the known risks to meet the target parameters.

2018 deliverables

In 2018 it is important to use as much as possible the machine start-up after the YETS as a 'test-bed' for the post-LS2 recommissioning. The people who will have to do the recommissioning in 2021 should be exposed to the machine start up already in 2018 and a few needed tools should be prepared (compatibly with the work load during YETS, it would be advisable to prepare by end 2017 a list of the main desired tools that could be reasonably made available by 2018 start up). If more time is needed for the beam commissioning during the restart, we should try to ask for it. An effort to follow more rigorous procedures per instrument and tool, not based on the idea that things work "because they worked the year before", should be made.

The steps needed before the start up are:

- Complete and clean up HW test check-lists;
- Add Beam Commissioning to check-lists (possibly separated from HW tests and considered as a further step). Procedure and shift planning for Beam Commissioning should also be made available.

Afterwards, there should be a critical review of the start up process and a template for post-LS2 start up should be built. In particular, a prioritized list of tools to be prepared or upgraded per machine will have to be prepared quickly, together with a clear plan of the resources needed (before they become committed on some other task, e.g. work in the tunnel). The steps to commission the new LIU systems will have to be outlined.

Over the 2018 run, a few items will have then time to progress, in particular

- Injectors settings management (with the working group chaired by Delphine, which kicks off on 9 November), clarifying what is included in the new timing system;
- Model based generation of settings;
- Development of on-line beam parameter + performance analysis/tracking.

LS2 deliverables

Before the end of Run2, it would be good to establish a set of standard measurements that should be made before and after the shut-down in all machines (e.g. dependence of some beam parameters – betatron and synchrotron tunes – on intensity) to check the effect of at least some of the interventions made during LS2.

A rough list of BCWG deliverables has been drawn based on the present LS2 master schedule (slides 19-20). One could consider starting up Linac3 and LEIR earlier (to be checked with equipment and resource availability), so that some of the tools and procedures can be tested there before starting up the proton chain. At the moment there is an ambiguity concerning who will lead the LBE commissioning in 2019.

Next meeting: Review of the current start-up procedures by machine (PSB, PS, SPS) and tentative list of desiderata for the 2018 start up (projecting to post-LS2)