

Beam Commissioning Working Group

Minutes for 18 January 2019

Present: V. Kain, G. Rumolo, A. Huschauer, S. Albright, R. Alemany Fernandez, F. Antoniou, H. Bartosik, C. Bracco J. F. Comblin, D. Cotte, G. P. di Giovanni, A. Findlay, M. Gourber-Pace, K. Hanke, A. Lasheen, K. Li, B. Mikulec, G. Papotti, P. Skowronski, R. Steerenberg, F. Tecker, F. Velotti

Meeting objectives

Presentation and discussion of PSB beam commissioning schedule.

Approval of Minutes and Matters Arising - V. Kain

V. Kain explains the implications of the new LIU structure on the Working Group. There will be a new name to represent the changes, a modified mandate and an additional committee member (A. Huschauer) to include a representative of the CPS.

The minutes of the 14th of December are accepted without comment. V. Kain highlights two points of significance:

1. The impact of the Christmas break on the PS commissioning schedule, which will necessitate Linac4 and the PSB restarting before PS commissioning can continue.
2. External conditions running in parallel to interlocks, which needs discussion with experts to decide how they should relate to each other.

R. Steerenberg asks if the future of interlocks is part of commissioning, V. Kain says this is one of the subjects that has been put under the mandate of this committee due to the connection with commissioning, even though it is not specifically a commissioning requirement.

PSB Beam Commissioning Schedule - G. P. di Giovanni

Presentation

- Originally the 2.5 months beam commissioning was intended to be for LHCPROBE production, but additional steps are being included to also produce the commissioning beams for the downstream machines.
- The schedule is shown in a linear way, in reality due to the different rings some activities will happen in parallel.
- It is pointed out that for some steps (particularly related to injection) there is no precedent on which to base an estimate. In these cases an estimate has been given based on the advice of experts.
- The 1 week allocated for optics measurements is not standalone but is part of the first turn/closed orbit phase of commissioning.

- The final beam delivery order has been determined by the requests of users. The ISOLDE cycles are expected at the end of March, other beams will become available from the end of PSB beam commissioning to the middle of SPS beam commissioning.
- Additional requests for time are still being made, these will need to be included in the schedule so it will become denser before beam commissioning starts.
- EDMS document PSB-OTH-NOT-0002 is being prepared, giving the intended commissioning steps and beam parameters in detail.

Discussion

- V. Kain asks if the short bunch for the first commissioning beam will be achieved by chopping, G. P. di Giovanni says yes. The minimum length comes from the expected minimum length that will be suitable for BI equipment. B. Mikulec says the implications of the short beam on the LEBT-MEBT also need to be confirmed during the upcoming LBE run in 2019.
- V. Kain asks what the original intention for production of LHCINDIV/LHC PROBE was, B. Mikulec says it was with PPM current modifications from the Linac, which will not be possible. G. Rumolo asks what the implications are for injection parameters and if LHCINDIV can still be produced correctly, G. P. di Giovanni says the exact details are being worked on by RF experts but there is no problem expected. G. Rumolo asks if PPM chopping can take the 600 μ s pulse to 150 ns, B. Mikulec says yes.
- V. Kain asks how much time is expected to be required for minimising the injection oscillations and establishing a closed orbit for one ring. G. P. di Giovanni says that if nothing goes wrong it will not take long, but it requires e.g. all BPMs to be available. B. Mikulec says time has to be taken to calibrate BI before the details can be looked at. V. Kain says that whilst it is not a completely valid comparison in the LHC it only takes a few hours if everything is working correctly. B. Mikulec agrees but points out that a lot of sub-steps are not shown in the schedule, and lots of items each taking a few hours can add up to a lot of time.
- V. Kain says that in cases where there is no easy way to estimate the required time a deadline should be set anyway so that there is a target for people to work towards.
- The total allocated time for commissioning is discussed:
 - R. Steerenberg emphasises that the implications of the new injection scheme must be taken into account as it is inevitable that problems will be encountered, for example when new BPMs were installed in the LHC an additional 2 weeks were needed for commissioning in parallel as they did not work correctly. V. Kain agrees but says the target should be to specify how long things should take, rather than building in a lot of contingency, with the knowledge that things may be delayed.
 - G. P. di Giovanni says that it is not uncommon for projects to have time and/or cost over runs in part due to over optimistic scheduling. The restart after LS1 was delayed because of unexpected problems and the schedule not allowing for that. V. Kain says that this was in part due to insufficient testing beforehand, which led to problems.
 - R. Alemany Fernandez says that a lot of potential equipment problems should be caught during the dry runs, rather than being discovered during beam commissioning.

- V. Kain proposes that rather than adding significant contingency time it may be better to modify the schedule during commissioning if problems arise. The risk of adding contingency is that people will work to the schedule leading to things taking longer than necessary.
 - G. P. di Giovanni emphasises that for some equipment there is no way to know accurately how long should be required as there is no prior experience to base it on. B. Mikulec says that the scheduled time in these cases is based on the advice and experience of experts, so whilst it is an estimate it is not unreasonable.
 - K. Hanke says comparisons with LHC commissioning are not reasonable because of the differences between the machines and how the commissioning was organised. F. Roncarlo suggests that the LHC can be used as an example to justify having experts available at all times.
 - R. Steerenberg says that with multiple machines all working in parallel there will be overlapping demands on expert's time. Therefore, for each machine the schedule should be optimised but not over-optimised as this may lead to unrealistic expectations, which then cannot be met. In situations where comparable systems have very different scheduled time it may be useful to compare machines to understand why this is and perhaps identify a more optimum approach.
- R. Alemany Fernandez says that having equipment experts available during beam commissioning is essential. V. Kain says that some kind of review of the planned schedules may be needed, and assistance has been offered by non-injectors experts.
 - V. Kain asks how well the chicane bump and related systems can be tested in advance of beam. B. Mikulec says that there are still a few timing-related issues to sort out before. R. Alemany Fernandez asks what systems are causing the problem, B. Mikulec says it is anything powered by FGCs, G. P. di Giovanni says there are also problems like having OASIS synchronous signals available for some devices, which is not desired by the equipment group.
 - B. Mikulec points out that the commissioning of the PS matching SEM grid and optics measurements of P. Skowronski took a long time as a comparison with the scheduled time for the PSB SEM grid commissioning. P. Skowronski says that the optics part can be fast if everything works correctly, but that it can take a long time.
 - R. Steerenberg asks for confirmation that the Radial Loop is not needed for initial RF commissioning and asks what loops are required for synchronisation, G. P. di Giovanni says just the Phase Loop is required for synchronisation, which will have been tested before.
 - V. Kain asks what is intended in case longitudinal painting is not working in 2021, B. Mikulec confirms that for the beam it should not be a problem, but it needs to be simulated. G. Rumolo asks if the expectation is for ISOLDE to start with longitudinal painting, B. Mikulec says that the preparation of the longitudinal painting has lower priority with respect to the other activities.
 - G. Rumolo asks what is included in the commissioning EDMS document, G. P. di Giovanni explains that it is the same schedule as has been presented but in more detail. B. Mikulec says it gives the details from each set of experts of what will be required for both hardware and beam commissioning. V. Kain asks if other machines are making an equivalent document. K. Hanke says that it has been considered for the PS and that it should be done, V. Kain says that it hasn't been done for the SPS but that it is a good idea.

- R. Alemany Fernandez asks about the delivery dates of different beams as some are delivered after the official end of commissioning. B. Mikulec explains that the beam commissioning is an ongoing process, and the 2.5 months is just the bare minimum to allow the next machine to start. V. Kain says that the same is true for all machines.
- D. Cotte says that because the PS will be in hardware commissioning whilst the PSB is in beam commissioning access may be required, which could interfere with the schedule.
- V. Kain gives three things which should be determined as soon as possible:
 1. The production schemes for LHCINDIV
 2. To what extent synchronisation of injection equipment without beam can be achieved
 3. A table of beam readiness dates for the entire complex
- R. Steerenberg says there is a request to provide delivery dates of beams to each experiment, so a schedule should be prepared by summer with both start date at reduced parameters and expected nominal delivery date.
- V. Kain asks if anything is missing from the current plan. B. Mikulec says there are a few items such as the POPS-B control, which has not yet been defined due to e.g. the new trim converters, this is not a point of concern it just needs to be done.
- R. Alemany Fernandez asks about the problem of synchronisation with the FGCs and if there is a solution. B. Mikulec says there will be a solution, but it is still under discussion. It is complicated by the effect of the dynamic timings of Linac4 in relation to PSB injection. V. Kain asks if it is known how to do it in principle, B. Mikulec says in principle yes but it needs discussing to decide how to do it in practice.

AOB

V. Kain presents a description of the implications of the new LIU structure for this working group.

- The working group will now be a committee, with modified membership to better reflect the changed mandate and structure.
- The committee will cover commissioning activities and so is intended to merge with accelerator performance activities at the end of 2021.
- R. Alemany Fernandez asks if recovery of LHC parameters includes ion beams, and if it refers to 75ns or slip stacking. V. Kain says not slip stacking. R. Steerenberg confirms that the requirement is to have the 75ns as a back up in case slip stacking is not possible for the ion run. R. Alemany Fernandez asks to confirm that the recovery of pre-LS2 performance is the requirement, V. Kain says yes but the intention is to target slip-stacking. G. Rumolo says that the ion requirements have been discussed a lot and it is understood that slip-stacking will be targeted as a best effort with 75ns accepted if not possible. R. Alemany Fernandez requests that the mandate explicitly says that slip-stacking is desired for ions, but not guaranteed.
- R. Steerenberg says that exactly what will happen to the committee at the end of 2021 is not yet determined and may not be a single entity that it merges with.

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- The committee now overlooks 5 separate commissioning working groups for the SPS, the PS, the PSB, LEIR/Linac3, and Linac4. Each commissioning working group will be responsible for the commissioning with this committee acting as a way to bring experience together and work on complex-wide requirements.
 - R. Steerenberg questions why things like the new timing system and parameters are included in this committee. V. Kain says it was in the original mandate to review these aspects of operation, and bringing in new systems during commissioning allows existing systems to be reviewed as well.
 - M. Gourber-Pace asks about the time-line for deciding what an adequate timing system would be, and who will trigger the discussion. V. Kain says that G. Kruk will run the discussions and has been asked to already, but in terms of time line it is not yet known.
 - M. Gourber-Pace asks about the commissioning groups and if they will be responsible for discussion with the CO link person, V. Kain says yes. A specification of persons per working group would be beneficial to avoid putting too much load on specific individuals and where necessary have a representative to take the place of the usual link person.

The next meeting will be dedicated to LIU-days rehearsals on the 4th of February.