

# Beam Commissioning Working Group

Minutes for 3 May 2019

**Present:** V. Kain, G. Rumolo, A. Huschauer, S. Albright, R. Alemany Fernandez, H. Bartosik, D. Cotte, J. Coupard, H. Damerau, G. P. di Giovanni, B. Goddard, A. Lasheen, K. Li, R. Scrivens, R. Steerenberg, F. Tecker, F. Velotti

## Meeting objectives

First of two meetings giving an overview of the requirements for equipment integration across the complex. This meeting covers Linac3/LEIR and the SPS, the second meeting will cover Linac4, the PSB and the PS.

## Approval of Minutes and Matters Arising - V. Kain

The minutes of the 11<sup>th</sup> of April are approved without comment.

- The possibilities for the planning tool will be reviewed again at a future meeting, considering the end of life of the microsoft tool.
- The follow-up points are reviewed, some will be covered in upcoming meetings.
- D. Cotte confirms that the schedule for the ISTs is acceptable for BI in the LINAC3 transfer lines, and the WIC system can be worked on in parallel. The final details need to be checked for Linac4, and this will all be presented as an AOB at a future meeting.

## Equipment Integration Linac3/LEIR - R. Alemany Fernandez

### *Presentation*

- New hardware/features will be found in Linac3, the transfer lines, and the LEIR ring.
- Source tests in 2020 will be used to explore possibilities for improving the extracted intensity, reducing lead oxide build up, and using lead gas injection to avoid oven refills. This may lead to source operation changes longer term.
- The GHOST software will continue to be developed, it is a software based feedback system as opposed to an autopilot to provide support to source operation.
- The new LLRF will be deployed mostly over the course of 2020, with beam commissioning starting in week 43.
- LBE/LBS lines will have a new converter and new software, dry run tests during the Linac4 LBE line run, ISTs in 2020 week 17.
- The new BPM functional specification for the transfer line has been finalised. A new application is required, commissioning will start in 2020 before LEIR beam commissioning.
- ISTs for the LEIR power converters will be at the start of 2021.

- A new, faster longitudinal Schottky will be installed in LEIR, a new FESA class is required and improvements to the high level software are desired. Testing will occur in 2021.
- A selection of new software tools are planned (i.e. improved optimizers), in some cases the responsible person has not yet been defined.

### *Discussion*

- R. Scrivens says the source tests are done with the operational source, which is the only available test bed. Not all of the tests are expected to reach operation, but are worth investigation.
- G. P. di Giovanni asks if the choice not to change power converter was a budget issue, R. Alemany Fernandez says yes. R. Steerenberg asks if keeping the old power converter means there is no spare available, R. Alemany Fernandez says there is a spare, but they won't change it yet as they would have to change back if there was a problem.
- V. Kain asks if all required controls for the power converters will be available. R. Alemany Fernandez says they will keep the previous controls in place for those not being upgraded, and have new controls for the new systems, R. Scrivens says this has been done in other places. R. Alemany Fernandez says they will not be configuring working sets unnecessarily, preferring the trim editor, but will do so if needed.
- R. Scrivens asks if the list of software requests will be possible. V. Kain says that in some cases there is no problem, for the parts requiring beam physicists it is more difficult and these may not all be possible before the end of LS2. R. Scrivens asks if there's a schedule for when responsible persons can be identified, R. Steerenberg says it will be a discussion within OP and they should know more after the summer, but prioritisation will be required from the LEIR side. V. Kain says that some items may have to wait, but in the long term getting all the software will be very valuable.
- V. Kain asks if there is a fellow now in ABP to work on GHOST. R. Scrivens says there is a request for a fellow to work on the Linac3 source in general, one aspect of that will be GHOST. V. Kain asks about the former fellow for the Linac4 autopilot and if there was lost expertise. R. Scrivens says the Linac4 one is being completely rewritten but GHOST is a separate entity, there is a plan to see if they can be combined but this is not yet confirmed.
- V. Kain asks if the Linac3/LEIR will have settings transferred to INCA as much as possible. R. Scrivens says the responsible person is in favour of LSA based control. But he also mentions that there must be a workingset-like application for scalar settings, which will allow using LSA more widely even if it is just for user-friendliness. R. Steerenberg confirms knobs are standard with LSA parameters, and can be integrated with high level software, a request to include the wheelswitch functionality for scalar settings could be made to CO to include it in the LSA trim editor if needed.
- V. Kain asks what will happen to the quad scan application. R. Alemany Fernandez says F. Follin will hopefully have an upgraded version available for tests next year. V. Kain proposes that a meeting should be arranged between those working on quad scan software across the machines to look for synergies and overlap of use cases. R. Alemany Fernandez says she will organise one.

- A. Huschauer asks if the transverse Schottky is used and if it will be upgraded in the same way as the longitudinal one. R. Alemany Fernandez says the transverse Schottky is used in MD, but there is no plan at present to modify it. A. Huschauer asks if the tool is adequate for their current needs, R. Alemany Fernandez says there's been no indication to the contrary. A. Huschauer suggests that long term it might be interesting to treat it the same as the longitudinal system. R. Scrivens says the original proposal included the transverse, but it is lower priority as only used for MD currently, it should be confirmed with BI if it is still intended to be upgraded.
- A. Huschauer asks what the plan is for the application for compensating stray fields from the PS main magnets. R. Alemany Fernandez says that a specific tool is planned, which is in the hands of N. Biancacci. The new tool will be a little more elaborate than the current system implemented in the SIS, and should be more PPM. Tests with the new algorithm at the end of Run 2 gave positive results. R. Scrivens confirms there is a brainstorming plan to see how best to implement the compensation based on trajectory measurements. B. Goddard says the transfer line drift monitoring concept may be of interest more generally including the SPS-LHC transfer line and for AWAKE.

## Equipment Integration SPS - K. Li

### *Presentation*

- There is a list of SPS integration tasks including interlocking with new injection interlocking and beam dump system, BI equipment, new operational tools, and the new LLRF.
- The TED interlock has been defined and work is underway. The test procedure needs to be defined. The BPM system ALPS requires planning for dry runs and implementation, all other aspects are defined. The definition of the method for testing the TED interlock is due at the end of June.
- The new power converter interlocking (FEI) software layer can be tested during the Linac4 run. The developer is defined.
- The beam dump system arming sequence has been defined, the post operational checks (XPOC) with the post mortem tools are under discussion. Novel techniques such as computer vision might be applied.
- The BLM software (no new electronics, nor monitors) will be upgraded enabling faster interlocking due to reduce the integration times as well as working with running sum. A new turn-by-turn BPM interlock has been specified, but requires a dedicated application and an assigned developer. The BCT based di/dt interlock should be straight forward in terms of software, testing needs to be defined.
- An initial test of the ALPS trajectory and orbit system was done in 2018 with YASP (but not with all required functionality yet). An upgraded wirescanner application is required to deal with the new system, and a subset of the software should be made common to all machines.
- Settings management upgrades are underway including improved makerules, JMAD models are being modified, and the SPSQC is being moved to NXCALS. The SPSQC system with NXCALS needs testing as there is a risk of latency being too high for the SPS use case.

- New parameter hierarchies are planned for the RF system to allow more physics driven control. New applications are being written to handle the physics, timing trees, and cavity groups for slip stacking. Several developers are already allocated. Details of the dry-runs still need to be defined.
- The transverse damper high level settings management and application is under investigation and will only be upgraded if time remains.
- All details for testing and software development should to be defined by the end of August.

### *Discussion*

- B. Goddard asks if the SPS will have a post mortem system, V. Kain says it is not quite a post mortem but after each cycle there will be data collected by the services provided by the post mortem system and analysed no matter whether the beams were dumped due to interlocks or programmed dumps.
- B. Goddard asks if the ATIM timing tree will be handled by LSA. K. Li says it is integrated in LSA, without makerules. LKTIMs, which have a similar purpose in the PS, are not standard in LSA and were not recommended by CO to be implemented for other machines. H. Damerau thinks therefore that ATIMs may also be interesting for to the PS in the future and wants to make sure that any SPS developments will not limit what can happen in the PS. K. Li says that no additional development is necessary to work with ATIMs in LSA. V. Kain says that consistency checks are not part of LSA but are rather done in a dedicated SPS specific application.
- A. Huschauer asks if the SPS BGI has an operational application yet. K. Li says there is a FESA class and a first version of an application, but it is not yet very advanced. A. Huschauer says it is similar in the PS, again there is an overlap between machines to be explored.
- A. Huschauer asks if the SPS BGI has any specifics yet. K. Li says there is a FESA class and an application that has started, but it is not yet advanced. A. Huschauer says it is similar in the PS, again there is an overlap between machines to be explored.
- V. Kain says that setting the deadlines for the various integration tasks and states will be very important and a status report at a later date would be useful.

### **AOB**

V. Kain shows a list of upcoming milestone deadlines.

- Lists of all required software are required end of June.
- ISTs will have a template provided, giving relevant detail to allow J. Coupard to make the planning. The details are needed by the end of June so that the schedule deadline of end July can be met.
- The first iteration of the injector schedule to begin defining the availability of FT beams should be done for the end of July.
- Performance tracking requirements will be delayed to the end of July.

Next meeting will be the second part of this series on the 17th of May.