179th Meeting of the Machine Protection Panel

The meeting took place on **July 05th 2019** in 774/1-079.
Participants: C. Bracco, M. Hermo Serans, G. Kruk, A. Lechner, B. Mikulec, D. Nisbet, F. Roncarolo, B. Salvachua, B. Schofield, F. Tecker, J. Uythoven, C. Wiesner

The slides of all presentations can be found on the website of the Machine Protection Panel and on Indico.

1.1 Minutes, actions, organisation (Jan Uythoven)

- No comments have been received for the Minutes from the 178th MPP. Greg and Federico accepted to be added to the MPP member list.

1.2 External Conditions: plans for LS2 (Miguel Hermo Serans)

- Miguel presented the status of the use of External Conditions and the upgrade plans for LS2 (see slides).
- Parallel to the normal beam cycle, spare cycles are prepared. If the normal cycle is NOT OK, as decided by the External Conditions, the spare cycle is played. If also the spare cycle is NOT OK, the beam is cut.
- The new functionality of the timing system is to read the beam permit from the Front End of the users and adapt the cycle as necessary. This can be done without the use of the SIS.
- The reaction time of the new system will be 3 to 4 basic periods of 1.2 seconds, as for the current system.
- Action: Write down technical specifications and implementation (including list of concerned signals) for the consolidated External Conditions (Brad).
- Action: Write down technical specifications and implementation for the signals migrated to the new timing-system functionality (Miguel/Bettina).

1.3 Management of Critical Settings for LINAC4 (Bettina Mikulec)

- Bettina presented the status of the **management of critical settings for LINAC4**.
- There are **3 main groups of critical settings** (see Slide 3):
  1) Three interlocks (high-loss threshold, low-loss threshold, max. number of bad pulses) for each of the 4 watchdogs measuring the beam transmission between different points in LINAC4.
  2) BLMs thresholds for 2x6 running sums (hardware and software threshold).
  3) Windows/thresholds for selected power-converter settings. This includes the source HV and the MEBT quadrupoles that influence the chopper kick.
- The **proposed implementation** for the protection of the critical settings is the following:
  - Virtual parameters are created for all critical settings (but no MCS) in LSA.

  - For each cycle, the SIS compares the real parameter settings with the virtual parameters in LSA.
  - If real and virtual parameters do not match, the beam will be inhibited by the SIS via the BIC. The SIS interlock is maskable.
  - The change of virtual parameters has to be protected by RBAC roles.
  - Action: Check a) the possibility of using RBAC roles for the change of non-MCS settings and b) the feasibility of using the existing MCS framework, which automatically includes RBAC-role handling, to protect the virtual settings (Bettina/Roman/Greg).
  - Action: Evaluate best implementation to send automatic reminders of all active SIS masks for every shift (Bettina).
- From experience, it is known that the machine can be damaged at low energies, e.g. a bellow located downstream the chopper was damaged twice by continuous beam losses. However, so far, no systematic simulation study has been performed to determine the damage thresholds at LINAC4 at energies below 160 MeV.
  - Actions: Evaluate if there are additional aperture bottlenecks, where damage might lead to longer downtime than required for a bellow replacement (Alessandra).
  - Action: Propose values for BLM hardware settings (Bettina).
  - Action: Identify relevant locations and beam parameters for energy-deposition studies at LINAC4 (Bettina/Alessandra/Anton).
- During **cavity re-phasing**, which is required periodically for recommissioning, high beam losses up to the full beam (but with shorter pulse lengths) are expected. Therefore, the transmission watchdog thresholds have to be masked in the SIS. However, the cavity re-phasing should be performed with shorter pulse length to avoid high absolute losses.
  - Action: Evaluate how the masking of watchdog interlocks in the SIS can be only allowed for short pulse lengths (Bettina).
  - Action: Check feasibility of implementing absolute watchdogs thresholds in hardware (i.e. lost number of particles/charges), which are not scaled with the pulse length (Bettina/Federico).
- For dedicated measurements, **beam instrumentation devices** (e.g. BTV, wire scanner) have to be inserted into the beam, which leads to a local increase of beam losses. The required adjustment of the local thresholds before and after the measurement could be included automatically in sequencer tasks that insert and remove these devices.
  - Recommendation: Implement sequencer tasks for insertion of relevant beam-instrumentation devices, including automatic BLM threshold adaption.
- Recommendation: The overall masking and interlock strategy should be evaluated after the experience of the LBE line run.

1.4 Next MPP meeting dedicated to injector topics

- The next MPP meeting dedicated to injector topics is tentatively planned for **16/08/2019** on **LINAC4 Caesiation**.
  - Action: Organise pre-discussion on LINAC4 Caesiation (Jan).