Organisation of Commissioning Activities

V. Kain, S. Albright, A. Huschauer, G. Rumolo on behalf of the LIU Commissioning Coordination Committee
LIU commissioning – 4 aspects to cover

- **New hardware**: RF, BI, new injection systems, transfer, EPC,…
  - How to integrate, what to prepare, how to test
  - New operational scenarios

- **Tools**: How to meet the HL-LHC requirements in terms of beam quality, availability/efficiency and flexibility taking the constraints of the other physics programs into account

- **Planning for hardware checkout**
  - with controls, special test tools, new hardware, operational scenarios, DSO tests

- **Beam commissioning time line**
  - What, how, tools, in which order
  - **Milestones for LHC and FT beams**
Current structure

LIU Commissioning Coordination Committee
Chair team: V. Kain, G. Rumolo, A. Huschauer
Scientific Secretary: S. Albright

SPS Commissioning WG
PS Commissioning WG
PSB Commissioning WG
LEIR / Linac3 Commissioning WG
Linac4 Commissioning WG
Current structure

LIU CCC → define strategy, milestones, approach, priorities; coordinate across machines (interfaces, …)

Commissioning WGs → integrate new equipment, prepare the detailed planning for hardware and beam commissioning; establish commissioning teams

- SPS
- PS
- PSB
- LEIR / Linac3
- Linac4
LIU commissioning preparation - 2018

- Start-up 2018 was used as test bed for post-LS2 start-up
  - Tools: check lists, planning tool
  - Formalize beam commissioning: prepare check lists, procedures
  - Review procedures, technique transfer across machines

- Reference measurement campaign end of 2018

- First version of system integration proposal for LIU equipment

- First versions of standalone beam commissioning planning post-LS2 per machine
Finalize system integration definition

Tools:
- Evolution of check list and planning tool
- Beam quality tracking, automatic optimizers, HL-LHC timing requirements,...

LINAC4 – LBE line test 2019
- Use as test bed for tools: check lists, optimisers, power converter interlocking,...
- Review commissioning and testing – input for post-LS2 commissioning of other machines
2019 Deliverables – LIU CCC and working groups (2)

- Prepare first version hardware commissioning planning
  - Including FESA deliverable and dry run dates

- Beam commissioning planning next version: start-up dates for facilities and readiness of beams
  - → 2021 injector schedule
A propos beam commissioning post-LS2...

- Yellow periods = **standalone beam commissioning**
  - No clients
  - **Priority 1:** Commission commissioning beams of downstream machine + LHC probe
  - **Priority 2:** Start LHC multi-bunch beam commissioning and already some FT beams

- → not all beams will be commissioned at the end of standalone beam commissioning period
- 2021 will be a commissioning year
- Goal 2021: commission **all** LIU equipment in 2021
Time line for commissioning to LIU performance

- **2021** will have to be fully devoted to
  - Protons: recovery of the pre-LS2 beams with LIU equipment, both for LHC and FT physics
  - Pb ions: recovery of pre-LS2 performance and commissioning of slip stacking in SPS

- **2022** should be devoted to accelerating nominal $2 \times 10^{11}$ p/b injected in the SPS

- **2023-2024**: further intensity/brightness steps (additional 15% and 10%)
  - Uncharted territory: will require dedicated scrubbing runs in the SPS and fine transverse and longitudinal optimisations
  - While high intensity is being commissioned, corrective actions compatible with YETS could be applied, if needed.
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