JAP23 Workshop debrief – Session 1

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Summary of FT operation and issues (F. Velotti)

Key messages: *KPIs in general improved compared to 2022*

- KPI intensity: high-intensity MD Linac4/PSB, intensity increase for EAST_T8 to 8e11 ppp, flux increase for n_TOF, intensity increase for AD to 2e13 ppp
- KPI spill quality: improvements for EAST slow-extraction spill, empty bucket channelling operational in SPS
- KPI losses: introduction of barrier-bucket operation in PS very beneficial; in SPS SFTPRO loss reduction 30% through local crystal shadowing
- Improvements for secondary NA beam lines: loss understanding and mitigation, electron beam quality, introduction of stand-by service
- Automated steering very beneficial for T9/T10, AD target, TT20 target symmetry and sharing
- Successful implementation of SPS optimisers (spill quality, loss reduction) – share solutions and avoid duplication

Follow-up actions:

- Controller for crystal shadowing + mask for downstream quad, make non-local shadowing operational
- Request beam position monitors in FTN and FTA for loss control (finalise specification document)
- Study and improve transmission PS-to-AD and LEIR-to-PS
- Keep losses under control → monitor loss/p in all machines and transfer lines
- Review optics for transfer to n_TOF (hot spots); cycle with longer bunch length during certain periods?
- Test introduction of crystal to reduce TT20 splitter losses; in the meantime define ideal V emittance independent of intensity and where it will be adjusted (PSB or SPS?)
- Investigate automatic settings change e.g. with changing intensity; instrumentation with auto-configuration
- Implement autom. steering for TT2/TT10 (incl. independent steering for SFTPRO 1st and 2nd inj.), for TT2/FTN and TT2/FTA
- Improve monitoring along the chain of longitudinal beam quantities

Three years with upgraded injectors: LIU beam ramp-up and benefits to FT beams (H. Bartosik)

Key messages:

- Linac4: Tests with new ISO4 source in 2023 demonstrated up to 35 mA to the PSB
- PSB delivered LIU brightness (and beyond) quickly after LS2; tail reduction effort ongoing
- PS: LIU intensity and brightness as of 2022
- SPS: Successful commissioning of upgraded RF system all through 2021-23; improved understanding and control of transverse and longitudinal instabilities
- SPS scrubbing: 4 weeks scrubbing, successful conditioning of MKDH and upgraded MKP-L
- SPS: LIU brightness target achieved for standard beam
- LIU ions: slip stacking successfully commissioned and LIU intensity reached

Follow-up actions:

- All machines: study and mitigate tail development (e.g. PS transition) for SPS scraping not larger than 3%
- PS: establish operational margins at high intensities and potentially increased reliability of RF systems
- PS: study benefits of smaller longitudinal emittance to improve SPS transmission
- All machines: improve monitoring of longitudinal parameters
- Further improve losses at PS-to-SPS and in SPS (slow FB losses and working point optimisation)
- SPS: continue intensity ramp-up and explore margin above LIU target
- SPS: failure rate of solid-state amplifier modules to be understood; push Siemens cavities to full power???
- Need to work on improved reproducibility both for proton and ion operation
- Could SPS kicker conditioning time be reduced? External pumping, sectorisation etc.?
- Set up BCMS beam in 2024 and once ready, compare performance to standard beam

Summary of LHC operation: issues and prospects for Run 3 (M. Solfaroli)

Key messages:

- Eventful year, several issues with long downtime impacting physics production, e.g. crystal goniometer non conformity, RF burst disk, RF finger in IR1, IT.L8 leak, TDIS leak
- Reaction was good and impact of downtime mitigated thanks to innovative solutions and flexibility
- Reliable prediction of luminosity production, excluding long faults
- Special runs successfully completed and rest of Run3 focused on p and Pb physics production, with no limitations foreseen
- Many new concepts deployed operationally during Pb run and good luminosity production despite many challenges, e.g. QPS induced quenches due to SEU, 10Hz events, losses during ramp, crystal goniometer stability, ALICE background

Follow-up actions:

- RF disks still burst at lower pressure than expected. Additional mitigation identified in new faster release valves, any safety concern?
- Identify possible mitigations of impact of electrical glitches (p&Pb), SEU in IR2 (Pb), 10Hz events (Pb) and crystal goniometer stability (Pb)

LHC experiments feedback from 2023 and desiderata 2024 (F. Moortgat)

Key messages:

- Huge physics community behind LHC experiments, >15000 members with >3500 publications
- Challenging year for p physics production but very happy with beam quality
- Large variety of luminosity levelling strategies, identified desiderata for next year
- Crossing angle adjustment provided flexibility to equalise instantaneous luminosity in low β IPs
- About 200 fb^{-1} expected to be produced in 24+25 to provide good Run3 dataset
- Good production during Pb run despite challenges but beam quality worse than expected

Follow-up actions:

- Identify why the non-factorization biases are so much larger in Run 3 than in Run 2 (VdM)
- Provide luminous region within 24h during commissioning for potential crossing angle tuning
- Improve communication between machine and detectors for an early identification of potential issues linked to detectors upgrade

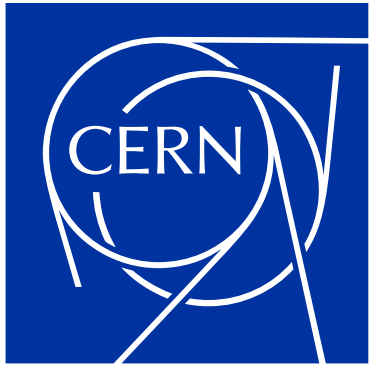
FT experiments feedback from 2023 and Run 3 outlook (E. B. Holzer)

Key messages:

- Lots of praise from the users for the beam quality and availability and the phantastic responsiveness and support from all the teams
- Increased focus on the injector complex user beams showed its fruits

Follow-up actions:

- Improve communication via page 1 and OP logbooks
- PS and PSB Vistar: add a page with statistics of, e.g.: number of cycles per user (now and last 1 hour) and the number of free cycles; add to NXCALS
- Make easily accessible: beam-line summary table with beam characteristics and estimation of the number of spills/week
- Create a repository for secondary beam parameters and compositions
- NA experiments: several individual wishes for improvements in slides
- Improve stability and reproducibility → continue implementation of automatic optimisation



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