Joint Accelerator Performance Workshop 2024

Report of Contributions

https://indico.cern.ch/e/1439972

Contribution ID: **1** Type: **not specified**

Injectors performance overview and highlights in 2024 (20'+10')

Tuesday 10 December 2024 10:35 (30 minutes)

Keywords: Achievements (FT, LIU), Stand vs. BCMS, protons & ions, equipment needing attention and progress in monitoring, limitations emerged and perspectives, impact on operational efficiency of filling scheme (3x 36b vs hybrid)

Presenter: LI, Kevin Shing Bruce (CERN)

Session Classification: Setting the Scene

Contribution ID: **2** Type: **not specified**

Beam lines, feedback from operations (20'+10')

Tuesday 10 December 2024 11:05 (30 minutes)

Keywords: BSI calibration results, ASM planning proton sharing, electron beam quality in H6/H8 electron users, High intensity muon beam test in M2 (road to have higher intensity post-LS3), record high intensity electrons in H4, operation of H4-VLE (Neutrino Platform), CEDARs operation, user changeovers/preparations/planning, low momentum in East Area, East Area variable spill lengths. Major faults from AFT, feedback on expert availabilities feedback from HiRadMat

Presenter: BANERJEE, Dipanwita (CERN)

Session Classification: Setting the Scene

Contribution ID: **3** Type: **not specified**

LHC performance overview and highlights in 2024 (15'+10')

Tuesday 10 December 2024 12:25 (25 minutes)

Keywords: Achievements and limitations, Standard vs. BCMS (brightness, tails), beam quality from injectors and preservation, high intensity, protons & ions, equipment fault analysis (why was summer such a good production period), operational efficiency, super-smooth injection and filling. Summary of ion operation.

Presenter: JACQUET, Delphine (CERN)

Session Classification: Setting the Scene

Contribution ID: **4** Type: **not specified**

MDs in the CERN accelerator complex (15'+10')

Tuesday 10 December 2024 14:35 (25 minutes)

Keywords: MD threads & requests, MD time allocation & adequacy including preparation (e.g., prep for LHC MDs in injectors), impact of intensity limitations on MD program (injectors, LHC), organisation and execution, relevance to operation

Presenter: SALVANT, Benoit (CERN)

Session Classification: Setting the Scene

Contribution ID: **5** Type: **not specified**

AD/ELENA - ISOLDE - AWAKE - CLEAR, feedback from operations (20'+10')

Tuesday 10 December 2024 11:35 (30 minutes)

Keywords: Operation of facilities, is modeling adequate, e.g., optics, impedance, aperture?, opportunities for automation and test bench new algorithms, critical equipment, integration of operation, need for instrumentation? feedback from experiments (AD/ELENA, AWAKE)

Presenter: GAMBA, Davide (CERN)

Session Classification: Setting the Scene

Contribution ID: **6** Type: **not specified**

Feedback from LHC physics (15'+10')

Tuesday 10 December 2024 14:10 (25 minutes)

Keywords: 2024 highlights of physics results ('where protons are going'), beam quality (client view), upcoming expectations for 2025-6 (physics/infrastructure requirements & beam characteristics)

Presenter: ALESSIO, Federico (CERN)

Session Classification: Setting the Scene

Contribution ID: **7** Type: **not specified**

Consequences and opportunities of Run 3 extension (15'+10')

Tuesday 10 December 2024 15:05 (25 minutes)

- focus on injectors only
- risks to be taken, and difficulties to be encountered
- what could be anticipated in 2025/26 to optimise the post LS3 restart? e.g. needed studies
- proposal for a LIU Reliability Run; additional MDs to explore limits?

Presenter: ZISOPOULOS, Panos (CERN)

Session Classification: Operation <-> Equipment

Contribution ID: **8** Type: **not specified**

Fault tracking in 2024 (20'+10')

Tuesday 10 December 2024 15:30 (30 minutes)

- results of fault analysis per machine (including Exp. Areas)
- how are the results used? what is AFT 'actually' offering? e.g. proactive maintenance
- follow-up structure and reporting?
- features to be added, feedback from users (tools and automation covered in Session 6)

Presenter: HERON, Jack (CERN)

Session Classification: Operation <-> Equipment

Contribution ID: **9** Type: **not specified**

Cryogenics in LHC (10'+10')

Tuesday 10 December 2024 16:00 (20 minutes)

- IR8 cooling capacity and known limitations, available margins
- follow up on delaying of cryo valve opening (resulting in losses and dumps due to fast growing orbit oscillations, in 2023)

Presenter: NAYDENOV POPOV, Boyan-Kaloyanov (CERN)

Session Classification: Operation <-> Equipment

Contribution ID: **10** Type: **not specified**

Noise and regulation in SPS power converters (10'+10')

Tuesday 10 December 2024 16:20 (20 minutes)

- mains regulationa and overshoot follow-up
- 50 Hz noise effects on SFTPRO spill, and on protons and ion LHC flat bottom losses;
- prospects for corrections on the hardware side

Presenter: GENTON, Charles-Mathieu (CERN)

Session Classification: Operation <-> Equipment

Contribution ID: **11** Type: **not specified**

Beam instrumentation (focus up to 2026) (10'+10')

Tuesday 10 December 2024 17:10 (20 minutes)

- equipment from commissioning to operation, exploitation and maintenance of existing instrumentation (focus up to 2026)
- HL preparation, NA-CONS and ECN3, ACC-Cons, feedback from BIFT on upcoming consolidation efforts and items not covered
- BSI, BGC, BGI, wire scanners, ⋯
- ion beams

Presenter: ORTEGA RUIZ, Inaki (CERN)

Session Classification: Operation <-> Equipment

Contribution ID: **12** Type: **not specified**

Experience with SPS RF and outlook (10'+10')

Tuesday 10 December 2024 17:30 (20 minutes)

- Thales plants: high failure rates, limited RF power
- status of understanding, solved and open issues, solutions and prospects

Presenter: Dr PITMAN, Sam (CERN)

Session Classification: Operation <-> Equipment

Contribution ID: **13** Type: **not specified**

ABT Equipment: Operational Insights and Future Perspective (10'+10')

Tuesday 10 December 2024 17:50 (20 minutes)

- KFA71: missing pulses and availability; status, ongoing analysis (including EPA WP8), monitoring and future plans
- MKP: new voltage settings on MKP-L (are losses at flat bottom measurably better; plan towards nominal settings); plans to offset MKP to reduce beam induced heating on MKP-S (margins?)
- MKDH: strategy in case of replacement, options and implications on restart after exchange
- how did 2024 go in terms of high intensity? e.g. possibly new SMH16, LHC AC-dipole⋯

Presenter: FAVIA, Giorgia (CERN)

Session Classification: Operation <-> Equipment

Contribution ID: **14** Type: **not specified**

Lessons learnt, ideas and best practises for new equipment design (15'+10')

Tuesday 10 December 2024 18:10 (25 minutes)

- highlights of recent equipment designs, bright ideas, i.e. the bright side of the session, what was done right

Presenter: FRANQUEIRA XIMENES, Rui (CERN)

Session Classification: Operation <-> Equipment

Contribution ID: **15** Type: **not specified**

Longitudinal modelling and operational optimisation across the complex (20'+10')

Wednesday 11 December 2024 08:30 (30 minutes)

- Control loops modelling and applications across the chain
- LHC power limitation at injection
- BCMS v. std longitudinal evaluation
- Modelling aspects of bunch length control in the ramp and flattop

Presenter: KARLSEN-BAECK, Birk Emil (Sapienza Universita e INFN, Roma I (IT))

Session Classification: Beam dynamics modelling <-> Equipment

Contribution ID: **16** Type: **not specified**

Electron cloud (20'+10')

Wednesday 11 December 2024 09:00 (30 minutes)

- Where do we stand in the SPS and LHC?
- Update on e-cloud modelling, comparison with measurements and projections
- Optimum filling scheme options for 2025-2026 from e-cloud perspective (to be completed in the session 3 talk "LHC: issues, mitigations and plans")

Presenter: METHER, Lotta (CERN)

Session Classification: Beam dynamics modelling <-> Equipment

Contribution ID: **17** Type: **not specified**

Impedance modelling and equipment design (20'+10')

Wednesday 11 December 2024 09:30 (30 minutes)

- Impedance modelling implications on equipment design (WS, BGI, TDIS, kickers, etc.)
- Intensity limitation update for the vacuum modules, any showstopper to start 2025 with 1.8e11 ppb?
- Update on impedance budget for LHC –which affect also HL-LHC?

Presenters: ANTUONO, Chiara (Sapienza Universita e INFN, Roma I (IT)); NERONI, Michela (Sapienza Universita e INFN, Roma I (IT))

Session Classification: Beam dynamics modelling <-> Equipment

Contribution ID: **18** Type: **not specified**

Benchmarking of optics and magnetic models (15'+10')

Wednesday 11 December 2024 10:30 (25 minutes)

- Magnetic model of the PS main magnets, improvement optics and application to other machines
- Control of Q and Q'
- Zero dispersion optics

Presenter: MACLEAN, Ewen Hamish (CERN)

Session Classification: Beam dynamics modelling <-> Equipment

Contribution ID: **19** Type: **not specified**

Beam loss monitor thresholds (15'+10')

Wednesday 11 December 2024 10:55 (25 minutes)

- Changes in 2024 in thresholds (ions, TCPs, IR3 etc.)
- Do we need blindable injection BLMs?

Presenter: MORALES VIGO, Sara

Session Classification: Beam dynamics modelling <-> Equipment

Contribution ID: **20** Type: **not specified**

Fixed target beams and challenges for the future (15'+10')

Wednesday 11 December 2024 11:25 (25 minutes)

Prospect of running ISOLDE with higher intensity per shot in 2025 in view of future proton sharing, and status of upgrade project
Higher intensity for TOF
Fixed-target beams: bunch length/momentum spread/beam size (PSB, PS), spill quality (PS/SPS), losses
Higher intensity requests for North-Area post-LS3 + Beamline acceptance.
Beam for BDF/SHiP and intensity increase to 7e13, future beam sharing (different scenarios for proton sharing in the SHiP-BDF time) MDs related and proposed tests before LS3.
Where do we stand concerning losses and activation for high intensity beams?

Presenter: ARRUTIA, Pablo (CERN)

Session Classification: Beam dynamics modelling <-> Operation

Contribution ID: **21** Type: **not specified**

Beam quality preservation for LHC beams (20'+10')

Wednesday 11 December 2024 12:20 (30 minutes)

Emittance growth and tail generation along the chain: mechanism, mitigation, and impact in LHC itself; influence of PS transition, transfer lines matching, degradation beyond burn-off.
Losses in PS-to-SPS, SPS, and at LHC injection: why is the situation improved in 2024? (blindable BLMs to be commissioned if long trains?)
Optimization of LHC2025 filling scheme in terms of filling time / beam degradation in SPS vs LHC (could be moved to the last talk)
Special beams: MDs, vdM, Impact of LINAC4 Automatic Feed Forward on reproducibility during beam adjustment
LHC beams: longitudinal beam quality across the injectors (splitting reproducibility), have we gained any operational margin with LIU beams during 2024? (injectors topics and on the LHC impact on quality only)

Presenter: KOSTOGLOU, Sofia (CERN)

Session Classification: Beam dynamics modelling <-> Operation

Contribution ID: **22** Type: **not specified**

Collimation aspects in the LHC and SPS (15'+10)

Wednesday 11 December 2024 14:10 (25 minutes)

Phase knob, collimator hierarchy breakage, DA simulations: how models feed into operation settings (theoretical modelling, simulations and understanding)
Tail population from scraping (EoF + MD), LRBB wire compensator effect on tail population, ⋯
Beam studies towards a dedicated SPS collimation system

Presenter: VAN DER VEKEN, Frederik (CERN)

Session Classification: Beam dynamics modelling <-> Operation

Contribution ID: **23** Type: **not specified**

Optics aspects in the accelerator complex (20'+10')

Wednesday 11 December 2024 14:35 (30 minutes)

LEIR - progress / challenges to optics measurement (tools, BPMs, lack of good models)
PS - zero dispersion optics to improve emittance measurement, deconvolution tests, comment on viability to other machines if progress made
LHC - general status of optics studies - what is standard vs expert. What developments of tools are needed.
LHC - AC-dipole status - critical spares.
LHC commissioning with high ATS factors - experience and challenges
LHC vertical dispersion (single pass for alice background, general Dy control becoming relevant e.g. hierarchy
LHC NL corrections and operation (a3 for hierarchy, b4 for kmod, challenges for high-order and a4, new a4 strategy for next year, 3Qy at injection + ecloud losses)
LHC calibration optics (ballistic + 60deg) use and lessons learned

Presenter: CARLIER, Felix Simon (CERN)

Session Classification: Beam dynamics modelling <-> Operation

Contribution ID: **24** Type: **not specified**

Ions: overview and outlook accross the complex (20'+10')

Wednesday 11 December 2024 11:50 (30 minutes)

Overview 2024
LHC oxygen run in 2025
Development for future ions after LS3
Status of the source and LINAC3 accelerator model
ALICE background and crystals stability
Beam quality in the injectors, in particular LEIR and SPS (issue in 2023). What should be improved or done differently?

Presenter: SLUPECKI, Maciej (CERN)

Session Classification: Beam dynamics modelling <-> Operation

Contribution ID: **25** Type: **not specified**

LHC: issues, mitigations (15'+10')

Wednesday 11 December 2024 15:05 (25 minutes)

LHC collimator hierarchy breakage operational response, mitigations
FASER/SND background, cures, compatibility with RP optics
LHC aperture: measurements and performance (beta*/xing angle) reach
Intensity limits at LHC from RF vacuum modules - can we unlock for 2025? RF fingers and bunch intensity limitation? (just a slide on long. Bunch. Control over ramp)

Presenter: CALIA, Andrea (CERN)

Session Classification: Beam dynamics modelling <-> Operation

Contribution ID: **26** Type: **not specified**

LHC: configuration 2025/26, intensity ramp-up, polarity reversal, optics (20'+10')

Wednesday 11 December 2024 15:30 (30 minutes)

RP optics, crossing planes, flat optics, consider the use of flat optics either for necessity in the HV crossing configuration or for performance in the current VH configuration (e.g. 30/20cm). Further improvements: reducing the xing angle at the end of leveling? + wire ⋯?
E-cloud modelling and heat-load in cold magnets (only impact on performance 2025-HL, confirmed trend from previous years?)
Optimal filling scheme
BCMS vs STD (only impact on: which one give us longer levelling?)
usage of the BBLR wires
optimal filling time and lumi predictions
What can / should be tested 'transparently'before LS3 to prepare HL-LHC era (incl. intensity limits)?

Presenter: BUFFAT, Xavier (CERN)

Session Classification: Beam dynamics modelling <-> Operation

Contribution ID: **27** Type: **not specified**

Settings management –status and plans (15'+10')

Wednesday 11 December 2024 16:45 (25 minutes)

2024 report: settings-related issues and improvements
Future plans: what will be done in 2025 and beyond, with resource requests
Settings management in the automation context: online checks for all machines, avoiding trim conflicts (human <-> controller, controller <-> controller)
(Replacement of CESAR)

Presenter: HOSTETTLER, Michi (CERN)

Session Classification: Controls, data and automation <-> Operation

Contribution ID: **28** Type: **not specified**

Dynamic beam scheduling and automated LHC filling (20'+10')

Wednesday 11 December 2024 17:10 (30 minutes)

Beam scheduling: progress in 2024 and future plans
Automatic LHC beam preparation
Progress in 2024 across complex (online beam quality monitoring, optimizers, sequences / orchestration)
Future plans and missing pieces across complex (PSB, PS, SPS)

Presenter: BEECKMAN, Amaury

Session Classification: Controls, data and automation <-> Operation

Contribution ID: **29** Type: **not specified**

Results and plans for integration of automation and optimization in operation (20'+10')

Wednesday 11 December 2024 17:40 (30 minutes)

Frameworks: mostly generic steering (experience in 2024, limitations, plans)
Status & plans for automatic controllers:
What is used operationally, under development? E.g. PS MTE efficiency, SPS spill noise, LEIR progress, automation tests at CLEAR, LHC collimators & procedures for alignment
Where do we want to be by LS3?
Other: continuous optimization vs on-demand, interaction between controllers

Presenter: TRAD, Georges (CERN)

Session Classification: Controls, data and automation <-> Operation

Contribution ID: **30** Type: **not specified**

OP feedback and recommendations as we move towards automation (15'+10')

Wednesday 11 December 2024 18:10 (25 minutes)

Feedback from operation team on usability and integration of automation tools
How to improve interaction with controllers (e.g. manual intervention)
Limitations: diagnostics / monitoring, performance of autopilots
Automatic fault tracking and analysis

Presenter: COTTE, Denis Gerard (CERN)

Session Classification: Controls, data and automation <-> Operation

Contribution ID: **31** Type: **not specified**

Beam physics/simulation software evolution: challenges, opportunities (20'+10')

Thursday 12 December 2024 08:45 (30 minutes)

Xsuite: overview on status and long term plans.
Opportunities from transitioning to modern technologies(e.g. python integration, live simulations in operation and MD, integration of AI)
Integration of (full) simulators in control system - status, challenges, required collaborations
Synergies in modelling and design choices between next generation of accelerators and present ones.

Presenter: LOPACIUK, Szymon (CERN)

Session Classification: Beam dynamics modelling <-> Controls, data and automation

Contribution ID: **32** Type: **not specified**

Integrated management of accelerator models: digital thread (15'+10')

Thursday 12 December 2024 09:15 (25 minutes)

Current status of equipment integration description and configuration across sector and ongoing efforts (E2A)
Where do we want to go?
Are current efforts for cleaning up "digital thread"sufficient?

Presenter: DE MARIA, Riccardo (CERN)

Session Classification: Beam dynamics modelling <-> Controls, data and automation

Contribution ID: **33** Type: **not specified**

Data and computing resources for analysis (15'+10')

Thursday 12 December 2024 09:40 (25 minutes)

NXCALS, JAPC, LSA: overview of users needs and experience
Introduce "Smart and agile equipment paradigm"from EPA WP8: online and offline analysis requirements
Introduce the developments of DPP and timelines
What about GPUs for advanced analysis and integration of active and continual learning schemes?

Presenter: SOBIESZEK, Marcin (CERN)

Session Classification: Beam dynamics modelling <-> Controls, data and automation

Contribution ID: **34** Type: **not specified**

Surrogate models (15'+10')

Thursday 12 December 2024 10:05 (25 minutes)

Why surrogate models and why surrogates with ML?
How to incorporate inductive bias? PINNs, symmetries,⋯
Examples and prospects
Infrastructure requirements for full integration in control room (storage, refer back to previous talk,⋯)

Presenter: VELOTTI, Francesco Maria (CERN)

Session Classification: Beam dynamics modelling <-> Controls, data and automation

Contribution ID: **35** Type: **not specified**

Hysteresis modeling: experience from SPS and prospects for other machines (15'+10')

Thursday 12 December 2024 11:00 (25 minutes)

Status and prospects for required magnetic measurements
Modeling techniques
Timeline and prospects

Presenter: LU, Anton (Technische Universität Wien (AT))

Session Classification: Beam dynamics modelling <-> Controls, data and automation

Contribution ID: **36** Type: **not specified**

Time spent on interventions by equipment experts/piquets (15'+10')

Thursday 12 December 2024 11:30 (25 minutes)

How much time do equipment experts and piquets spend on remote and local interventions?
Is there sufficient data available across the groups to do this analysis?
What kind of data exists across the groups (what is logged?) and what would be needed in addition to extend the analysis?
Can we quantify the potential gain from automating remote interventions?
Can we differentiate between simple local interventions and more complex ones? Can this information be included in AFT or any other centralised tracking tool?
What standards are in place to detail and document interventions in the different groups? What are the similarities and differences?

Presenter: PAPASTERGIOU, Kostas (CERN)

Session Classification: Equipment <-> Controls, data and automation

Contribution ID: **37** Type: **not specified**

Automatic fault analysis and prognostics (20'+10')

Thursday 12 December 2024 11:55 (30 minutes)

How can we avoid that equipment experts spend so much time supporting operations?
How are we using fault data today and what is the vision for the future?
Do we have a full overview of all systems now?
Does the available data allow us to do global prognostics?
What operational solutions exist today for anomaly detection for prognostics (include examples from the different groups, e.g. MKP in SPS, KFA71 in PS, ⋯)
What are the different prospects and ideas to fault recording across the accelerators and groups in the future?
Is there any MD time requested before LS3 related to the points addressed in the talk?

Presenter: ASKO, Anti (CERN)

Session Classification: Equipment <-> Controls, data and automation

Contribution ID: **38** Type: **not specified**

Automation of equipment commissioning, setting up and recovery (20'+10')

Thursday 12 December 2024 13:50 (30 minutes)

How can we avoid that equipment experts spend so much time supporting operations?
Include an overview of which and how interventions are done remotely across groups.
Which interventions can be automated and what has to be considered (robustness of the solutions, extensive pre-studies and risk analysis of possible failure modes, redundancy designed into the system, remote diagnostics and resets, additional hardware requirements, ⋯)
What is the status of automated equipment testing (AccTesting) across the complex?
What is the status of post-mortem and maintenance prediction?
Examples of application: drift correction of crystal channeling orientation in SPS and LHC
EPA WP8 status
MKP/MKDH automatic vacuum analysis
RF automation (automatic gain switching in the SPS LLRF)
⋯
Is there any MD time requested before LS3 related to the points addressed in the talk?

Presenter: MURILLO GARCIA, Raul (CERN)

Session Classification: Equipment <-> Controls, data and automation

Contribution ID: **39** Type: **not specified**

Automation during the equipment design process

Thursday 12 December 2024 14:20 (30 minutes)

Development philosophy of accelerator modelling tools
What tools are available outside of CERN? What do companies do today?
include a good example of the classic approach to hardware design simulations compared to a modern approach using faster and potentially even more precise tools
What needs to and can be done to replace parameter scans with optimisation algorithms? What's the potential benefit to the desing process?
How can surrogate models be used to replace heavy simulations (ANSYS, OPERA, particle tracking, ⋯)
Show examples of design processes across different groups (first automated studies in STI, ABT, what about other groups such as MSC, RF, BI?)
Address the topic of virtual diagnostics
ABT MKP ferrite temperature, STI target temperature
Digital twins - what's the status across groups?
Is there any MD time requested before LS3 related to the points addressed in the talk?

Presenter: HUHN, Francisco (CERN)

Session Classification: Equipment <-> Controls, data and automation

Contribution ID: **40** Type: **not specified**

Introduction

Tuesday 10 December 2024 10:30 (5 minutes)

Presenters: DAMERAU, Heiko (CERN); SOLFAROLI CAMILLOCCI, Matteo (CERN)

Contribution ID: **41** Type: **not specified**

Discussion

Session Classification: Setting the Scene

Contribution ID: **42** Type: **not specified**

Discussion

Session Classification: Beam dynamics modelling <-> Equipment

Contribution ID: **43** Type: **not specified**

Discussion

Session Classification: Beam dynamics modelling <-> Controls, data and automation

Contribution ID: **44** Type: **not specified**

Feedback from FT experiments (10'+10')

Tuesday 10 December 2024 12:05 (20 minutes)

Keywords: 2024 highlights of EA, NA, nTOF, ISOLDE physics results ('where protons are going'), beam quality (client view), upcoming expectations for 2025-6 (physics/infrastructure requirements & beam characteristics)

Presenter: LAZIC, Dragoslav (Boston University (US))

Session Classification: Setting the Scene

Contribution ID: **45** Type: **not specified**

Session 2/3 discussion session

Wednesday 11 December 2024 16:00 (15 minutes)

Presenters: HERNALSTEENS, Cedric (CERN); MIRARCHI, Daniele (CERN); ASVESTA, Foteini (CERN); TIMKO, Helga (CERN)

Session Classification: Beam dynamics modelling <-> Operation

Contribution ID: **46** Type: **not specified**

Close-out

Thursday 12 December 2024 15:20 (10 minutes)

Presenters: DAMERAU, Heiko (CERN); SOLFAROLI CAMILLOCCI, Matteo (CERN)

Contribution ID: **47** Type: **not specified**

Session 5/6 discussion session

Thursday 12 December 2024 14:50 (30 minutes)

Presenters: HUSCHAUER, Alexander (CERN); VELOTTI, Francesco Maria (CERN)

Session Classification: Equipment <-> Controls, data and automation