

# **ATS Workshop 2024**

## **Report of Contributions**

Contribution ID: 1

Type: **not specified**

## Intro talk

*Tuesday, 25 June 2024 08:30 (15 minutes)*

**Presenters:** BATTISTIN, Michele (CERN); LAMONT, Mike (CERN)

Contribution ID: 2

Type: **not specified**

## Building an accelerator, from engineering to alignment

*Tuesday, 25 June 2024 08:45 (25 minutes)*

Engineering tools are essential to the construction of an accelerator. They are used from the very early stages in the processes that bring objectives and ideas to a conceptual design, engineering specifications, mechanical models, installation plans and finally installation with fine-tuned alignment.

The talk uses the HL-LHC project to illustrate a selection of tools that are used in the processes that took and are taking place to bring the HL-LHC project to completion.

**Presenter:** DE MARIA, Riccardo (CERN)

**Session Classification:** Engineering Design Tools and Processes

Contribution ID: 3

Type: **not specified**

## Managing physical configurations of CERN accelerators with Layout

*Tuesday, 25 June 2024 09:10 (25 minutes)*

The Layout platform is comprehensive centralised solution designed to manage the physical configuration of CERN facilities over time.

This platform aims to provide a unified, coherent, and controlled source for functional positions and their layouts by uniquely identifying the components, classifying their functions and core properties, assemblies and connections.

The platform is used across ATS to manage the past, present, and future configurations, accessible with a rich graphical web interface –the Layout UI. Over the last 20 years, Layout has evolved significantly, and now delivers a wide range of features and services used daily by many groups across CERN. This presentation highlights the main concepts and some of the major features of Layout.

**Presenter:** LE ROUX, Pascal (CERN)

**Session Classification:** Engineering Design Tools and Processes

Contribution ID: 4

Type: **not specified**

## Developing electronics boards through standardisation, specialised tools and collaboration

*Tuesday, 25 June 2024 11:15 (25 minutes)*

The Beam Instrumentation Group (SY-BI) is responsible for designing, building and maintaining the instruments that allow observation of the particle beams and the measurement of related parameters for all CERN accelerators and transfer lines. Those instruments are often highly specialised and require the design of dedicated electronics, especially but not only for the elements exposed to radiation.

This contribution will illustrate the type of electronics boards and systems designed in SY-BI, the specification and review process in place in the group, the tools used, the CERN services we rely on and the network of collaborations with other groups that supports those designs.

**Presenter:** BOCCARDI, Andrea (CERN)

**Session Classification:** Engineering Design Tools and Processes

Contribution ID: 5

Type: **not specified**

## Bridging physical and digital worlds with a mechanical digital twin

*Tuesday, 25 June 2024 10:00 (25 minutes)*

The Future Circular Collider (FCC) demands extremely stringent vibrational stability and precise alignment of its arc cell components. This workshop contribution focuses on the development of a digital twin for the FCC arc cell mockup to address these critical mechanical challenges. The digital twin integrates comprehensive vibrational analysis data to create an accurate virtual model of the physical structure. The ultimate goal of the Digital Twin is to simulate the behavior of the arc cell under various operational conditions to help predicting and mitigating issues related to vibrational instability and misalignment. This approach not only enhances the predictive capabilities of the model but also provides valuable insights for optimizing the design and operation of the FCC, ensuring it meets the demanding requirements for mechanical performance and stability.

**Presenter:** SACRISTAN DE FRUTOS, Oscar (CERN)

**Session Classification:** Engineering Design Tools and Processes

Contribution ID: 6

Type: **not specified**

## Transforming engineering processes with the new Product Lifecycle Management (PLM) platform

*Tuesday, 25 June 2024 09:35 (25 minutes)*

This presentation will explore the pivotal role of Product Lifecycle Management (PLM) in modern engineering. It will outline the scope and milestones of CERN's PLM Project, aimed at digitalizing engineering workflows and improving process efficiencies. The presentation will also explain how the PLM platform helps managing the Digital Thread, which in turn is fundamental to effectively leveraging technologies such as Digital Twins and AI. Attendees will gain insights into how CERN's new PLM can be used to transform engineering work, facilitate collaboration and provide a scalable platform for the future.

**Presenter:** SCOERO, Claudio (CERN)

**Session Classification:** Engineering Design Tools and Processes

Contribution ID: 7

Type: **not specified**

## Improving future designs by learning from radioactive waste-management experiences

*Tuesday, 25 June 2024 11:40 (25 minutes)*

As CERN operates its accelerator complex with a high-energy charged particle beam, the interaction of this beam with various systems designed to guide, shape, absorb and produce secondary particles, results in production of radioactive components and the activation of nearby equipment.

Consequently, the components need to be safely managed and handled once they are removed from the accelerator complex, either to store or safely and sustainably dispose them as waste. Host-state requirements dictate the specific packaging type, size, composition, and activity levels that these packages shall have.

Moreover, ALARA principles must be included in the design processes for new beam intercepting devices and target production areas, to reduce exposure of personnel to ionizing radiation and to optimally exploit these installations. The experience derives from both CERN internal expertise as well as from worldwide facilities and active collaboration.

This presentation will discuss the experiences gained in the design, implementation, operation, and waste packaging of highly activated radioactive equipment under the responsibility of the CERN STI/TCD. Additionally, it will explain how these lessons learned are being incorporated into the design of new beam intercepting devices components and target stations.

**Presenter:** GRENARD, Jean-Louis (CERN)

**Session Classification:** Engineering Design Tools and Processes



Contribution ID: 8

Type: **not specified**

**TBC**

**Session Classification:** Engineering Design Tools and Processes

Contribution ID: 9

Type: **not specified**

**TBC**

**Session Classification:** Engineering Design Tools and Processes

Contribution ID: 10

Type: **not specified**

## Enhancing Technical Project Management through System Optimisation –Application to FCC-ee design

*Tuesday, 25 June 2024 14:00 (25 minutes)*

This talk introduces the concepts of global system optimization applied to technical projects. This approach is particularly valuable in large-scale projects, such as accelerator designs, where multi-expert teams are involved, and interfaces management is crucial. By adopting a global optimization strategy with simple tools, we can achieve economically optimized systems (considering both CAPEX and OPEX) while effectively managing project resources and priorities.

The efficacy of this methodology is showcased through its application to a segment of the FCCee accelerator design, including power converters, magnets, cooling and ventilation systems, and civil engineering. We demonstrate how this global approach aids in determining the optimal number of alcoves, ultimately minimizing project costs.

**Presenter:** Dr AGUGLIA, Davide (CERN)

**Session Classification:** Project Management Methodologies and Tools

Contribution ID: 11

Type: **not specified**

## Showcasing North Area consolidation project management and its evolution

*Tuesday, 25 June 2024 14:25 (25 minutes)*

NA-CONS adopted an in-house methodology (OpenSE) supplemented by industry-wide acceptable standards (PMI) to establish Project management fundamentals within the Project. The project utilizes a combination of tools & processes to plan, execute, and monitor project deliverables. Briefly outline the benefits and limitations of this approach. Highlight the future paradigm and possible evolution of project management software, starting with the EVM replacement initiative.

**Presenters:** KANDHOL, Deepti; SCAIONI, Etienne

**Session Classification:** Project Management Methodologies and Tools

Contribution ID: 12

Type: **not specified**

## Tracking budget, procurement and risk for High Luminosity LHC

*Tuesday, 25 June 2024 14:50 (25 minutes)*

The HL-LHC is a complex project involving numerous collaborations and diverse funding lines, including HL vs HL-CONS and sources from CERN vs In-Kind contributions. Its organization is based on Work Packages (WP), making it unmanageable without a methodological tool like Earned Value Management (EVM). According to the PMBOK Guide, EVM is “a management methodology for integrating scope, schedule, and resources, and for objectively measuring project performance and progress.” This systematic approach to project management is essential for the effective oversight of the HL-LHC project.

**Presenter:** CRESPO GARRIDO, Irene Del Rosario

**Session Classification:** Project Management Methodologies and Tools

Contribution ID: 13

Type: **not specified**

## Coordinating the High Luminosity LHC project

*Tuesday, 25 June 2024 15:15 (25 minutes)*

The HL-LHC aims to enhance the LHC performance increasing the LHC integrated luminosity by a factor of ten. The project relies on the design, fabrication and installation of cutting-edge systems and equipment. Methodological coordination management is crucial to handle the complex interlinked deliverables and successfully integrate them into the new HL-LHC facilities and LHC tunnel.

This presentation explains the coordination management process and tools implemented to ensure timely equipment delivery, anticipate potential risks, implement mitigation actions and manage baseline changes. Emphasizing the importance of a single source of truth, the presentation exposes the two fundamental pillars for the coordination team. On one hand, the definition of the Master Schedules for each HL-LHC Work Packages and the tracking of established metrics, such as float and trends of ready-to-install dates. On the other hand, the planning and coordination of the new facilities' installations, as well as the integration of the HL-LHC interventions within the LHC programmed stops.

**Presenter:** VERGARA FERNANDEZ, Estrella (CERN)

**Session Classification:** Project Management Methodologies and Tools

Contribution ID: 14

Type: **not specified**

## Defining and executing cryogenic systems for DUNE

*Tuesday, 25 June 2024 16:05 (25 minutes)*

The Deep Underground Neutrino Experiment (DUNE) foreseen to be installed at the Sanford Underground Research Facility (SURF) in Lead, SD, USA, involves Time Projection Chambers housed in four liquid argon cryostats with a total liquid argon volume of about 50,000 m<sup>3</sup>, installed in underground caverns at about 1.5 km below the surface. Largest of its kind, DUNE involves several challenges for the development of the cryostats and the cryogenic system among which the safety, the argon bath stability and the purity. An extensive prototyping programme paved the way towards the design and construction of the DUNE first cryostat and associated cryogenic system due to start operation in 2027.

This presentation gives an overview of the management and development plan implemented for ProtoDUNE which serves as a basis for the development of the management plan for the CERN ATS-TE contribution to the DUNE Project. Specificities linked to the (CERN-DUNE) collaboration framework are highlighted. These practices build on the team past experience on similar cryogenic projects, the approach being to adopt a methodology and a level of formalism appropriate to efficiently deliver the cryogenic system, with the allocated resources.

**Presenter:** FABRE, Caroline (CERN)

**Session Classification:** Project Management Methodologies and Tools

Contribution ID: 15

Type: **not specified**

## Establishing project management workflows for cooling and ventilation projects

*Tuesday, 25 June 2024 16:30 (25 minutes)*

As part of this workshop, the main objective of the “EN-CV Project Management Process” presentation is to expose the means made available by the CV Group to establish a global and unified quality process. This process aims to define the internal organization, clarify the roles of the different stakeholders and detail the progress of CV projects from receipt of user requirements to the installations commissioning.

CV projects management approach consists of developing:

- A detailed workflow for project delivery
- A quality procedure which describes the different phases of the project and the contributions of CV members.
- Templates required at each stage of the project.

The implementation of the CV project management process has promoted communication between CV sections and improved the coordination of interfaces between stakeholders.

**Presenter:** YETTOU, Zohra (Tadeusz Kosciuszko Cracow University of Technology (PL))

**Session Classification:** Project Management Methodologies and Tools



Contribution ID: 16

Type: **not specified**

## Managing the beamline configuration in the experimental areas

*Tuesday, 25 June 2024 17:20 (25 minutes)*

In the last years, the BE-EA Group has applied the configuration management strategy developed by EN-ACE to the experimental areas (North and East Area, AD and ELENA Complex, HiRadMat Facility) to have a clear and coherent picture of any beamline at a given point in time. As an essential tool for quality management, configuration management facilitates an increased physics time for the facilities due to an optimized reliability and availability of the beamline components thanks to its efficient processes. The implementation of this strategy is being deployed in the consolidation/renovations projects lead by EA aiming to improve the conditions of the experimental areas (NACONS, ADCONS, East Area Renovation,..).

The operability and maintainability of the engineering systems is well improved in the last years thanks to the use of databases like EAM, AFT, Layout Database allowing to register and follow the operation faults and providing essential information for future consolidations & upgrades. Management of the documentation and corresponding approval processes are essential part of the quality control based on the use of databases and tools like EDMS, JIRA, CERNbox and Confluence.

**Presenter:** ROMAGNOLI, Giulia (CERN)

**Session Classification:** Project Management Methodologies and Tools

Contribution ID: 17

Type: **not specified**

## Creating high-quality, durable, efficient code: the software development workflow

*Tuesday, 25 June 2024 16:55 (25 minutes)*

Writing code is a skill many possess, but creating high-quality, durable, and efficient code is an art. Would you like to master this art?

In this talk, we will explore the importance of having a well-defined development workflow and how to implement it to ensure each project's success. We will discuss key topics such as Scrum methodologies, software project management, automated testing and quality control, the relevance of accurate documentation, and strategies to promote continuous improvement within the team.

**Presenter:** DE BLASI, Gabriele

**Session Classification:** Project Management Methodologies and Tools

Contribution ID: **18**

Type: **not specified**

## Close out session

*Tuesday, 25 June 2024 17:45 (40 minutes)*

**Presenters:** OLIVEIRA, João (CERN); AVERNA, Melania (CERN); LEFEVRE, Thibaut (CERN); GAHIER, Vanessa (CERN)

Contribution ID: 19

Type: **not specified**

## Developing digital twins for accelerator magnets

*Tuesday, 25 June 2024 10:50 (25 minutes)*

Test and measurement data is collected at various points in the life cycle of an accelerator magnet. By looking at the data through the lens of numerical modelling, e.g. with a numerical simulation at hand, one can exploit structure in complicated inverse problem solving and reverse engineering tasks. For this reason, the Test and Measurement section (TE-MSCTM) is developing digital twins for accelerator magnets, following a methodology called Model-based systems engineering (MBSE), which focuses on models and simulations, rather than documents, for operation, performance evaluation, maintenance, and information exchange. In addition, MBSE enables hybrid modelling of magnets and field transducers where measurement data is integrated in numerical simulations. This is essential for the realization of high-fidelity digital twins, as modelling and approximation errors as well as model uncertainties can be compensated for. In this talk, recent advances made in the Test and Measurement section, related to hybrid modelling are presented and put into context by classifying them in design patterns. This includes the data driven model calibration (e.g. material data, magnetization) for high fidelity magnet models 'as built', the discrepancy modelling for complex 3D fields, as well as the neural network-based prediction of hysteresis effects in online field monitoring systems.

**Presenter:** Mr LIEBSCH, Melvin (TE-MSCTM)

**Session Classification:** Engineering Design Tools and Processes

Contribution ID: 20

Type: **not specified**

## Engineering design tools and processes for cryogenics

*Tuesday, 25 June 2024 12:05 (25 minutes)*

The Mechanical and Engineering support section of the Cryogenics group (TE-CRG-ME) is heavily involved in the design, production, installation and commissioning of a wide range of cryogenic devices and systems for the experiments, accelerators and test facilities at CERN.

To increase the efficiency of our work and improve the standardization to the norms, calculations and methods used for development, a Cryogenic Engineering Tool Kit has been developed.

This presentation will review the main contents of the toolkit and the importance of these methods to TE CRG ME.

**Presenter:** LEES, Andrew John (CERN)

**Session Classification:** Engineering Design Tools and Processes