Organisation of the operation for the HL-LHC IT String

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Contents

Scope

- This presentation is focused on the organizational aspects during the operation of the IT String test stand.

- It helps to better understand the scope of the following talks of the session.

- The responsibilities for the different roles of the IT String Operation will be reflected.

- It summarizes the information provided in the procedure "HL-LHC IT String hardware commissioning and operation", M. Bajko, EDMS 2956328.

- The document has been approved by the line and project management
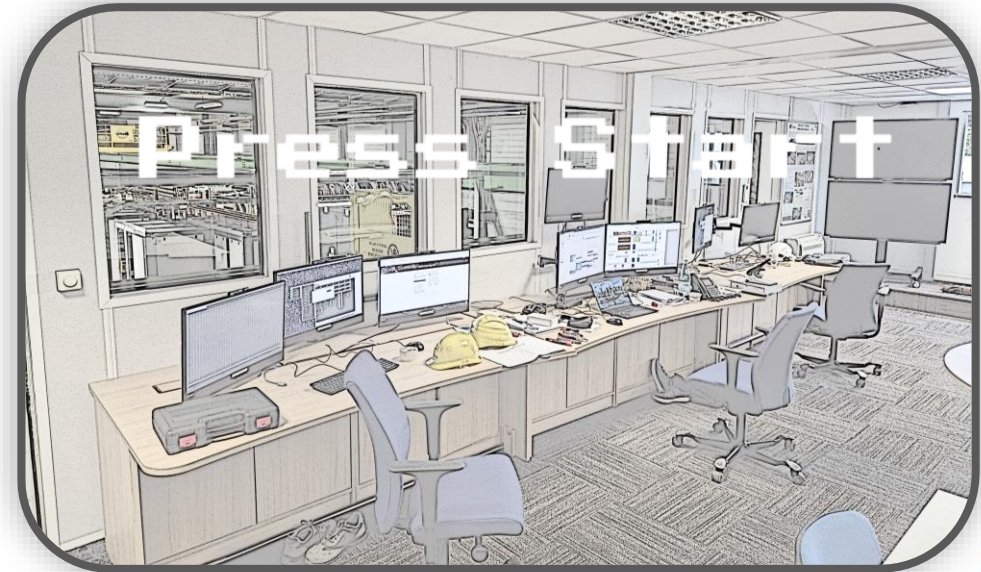
Components of the IT String

The IT String aims to replicate, as best as achievable, an entire Inner Triplet (IT) region of the HL-LHC, to validate the collective behaviour of key components, which will function in conditions close to the ones in the LHC.

- **Magnets:** Q1, Q2a, Q2b, Q3, CP, D1.

- **Cold Powering:** ScLink, DFHX, DFX.

- **Warm Powering:** PCs, CDBs.

- **Cryogenic cooling:** SQXL, PCDS.

- **Circuit Protection:** QDS, QH, EE, bypass diodes, CLIQ.

- **Alignment system:** FRAS.

- **Vacuum system**
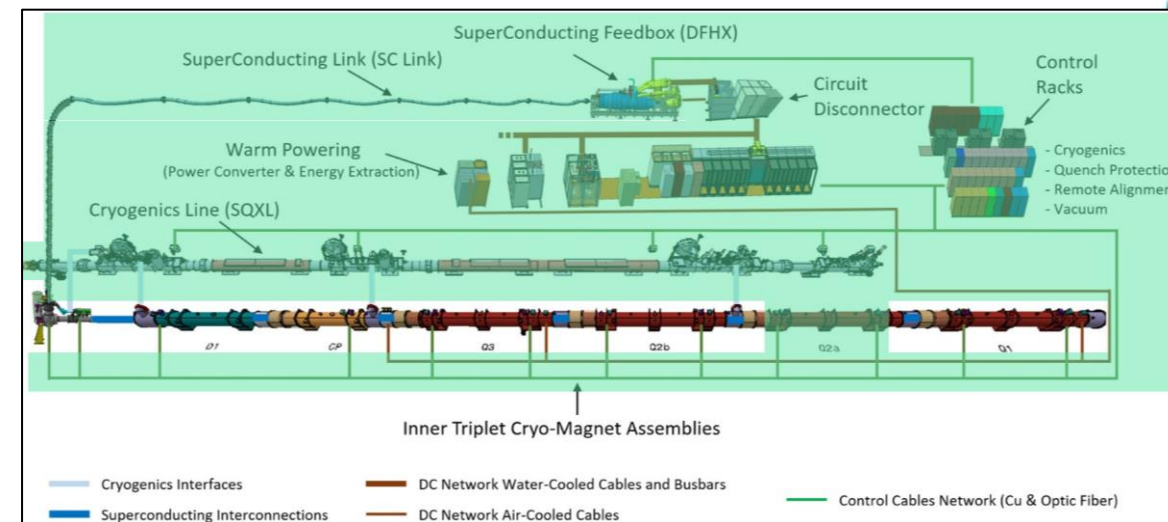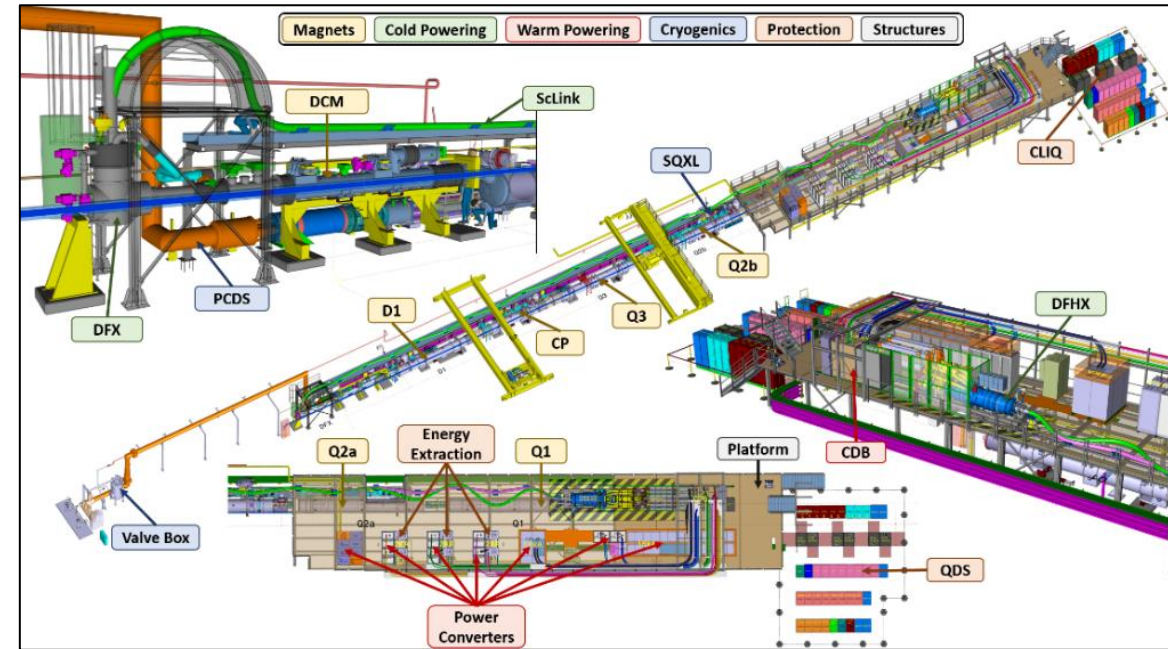
The IT String location

- The SM18 facility (building 2173 at CERN) hosts the HL-LHC IT String as in the case of the String I and II.

- The choice of the place was based on the available infrastructures that would allow such a test.

- Major upgrades were implemented in the demin. water system, in the electrical network and in the cryogenic infrastructure.

- Coordination will be required during operation as the pumping capacity remains limited and common between users .
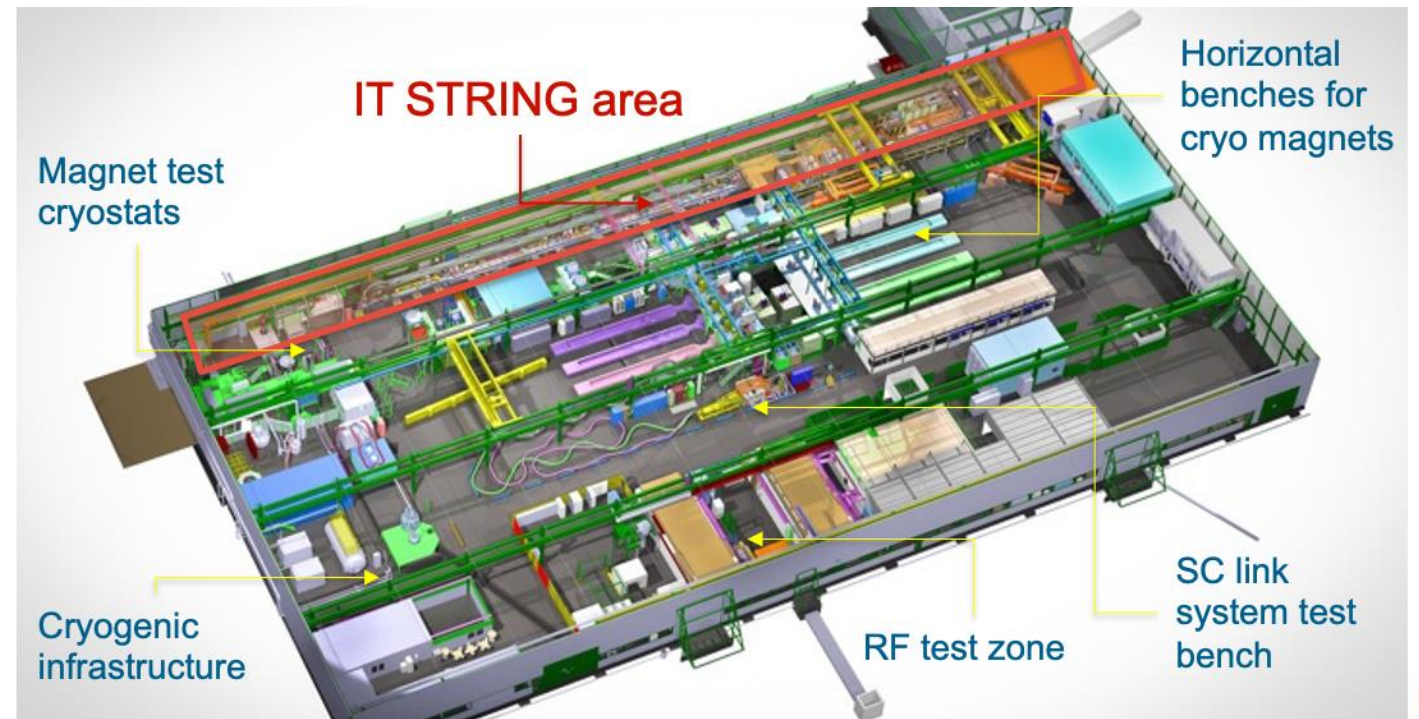
The IT String location

IT String control room

- Located on the first floor of SM18 hall, with direct view over the metallic platform. Optimal communication between teams and intervention times.

- The control room has stands equipped with computers and screens with access to any control system. Also, individual desks to plug-in laptops.

- The control room will serve as the venue for coordination and technical discussions related to the test stand. A videoconference system allows remotely attendance to meetings.
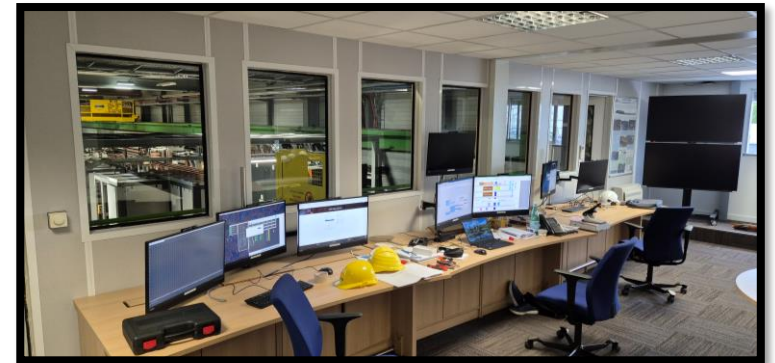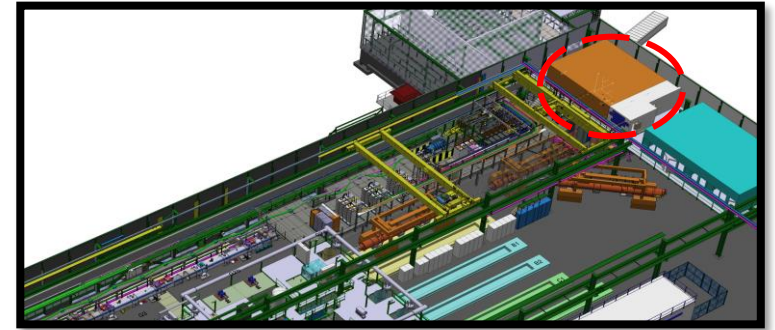
The IT String Validation Program

- The test program was defined in the String Validation Program Meeting (SVPM) among the chair and all WPs involved

- The test program document is released (EDMS 2664290). The test procedures are at an advanced stage

- Test parameters and acceptance criteria are specified by MCF, MP3 and SVP.

Powering interlock tests
- Validation of the HL-LHC interlock, which will integrate and handle, with a given logic, signals from all subsystems.

Electrical circuit integrity test
- Assess insulation integrity of circuits. Verify instrumentation and protection systems wiring. Test ElQA procedures for HL-LHC.

Cryogenic system test
- Get familiar with thermal behaviour of the magnet chain, and how to operate efficiently the cryogenic cooling system.

Controls and software tests
- Debugging of DAQ, control and software systems, aiming to improve the efficiency during hardware commissioning.

Vacuum system test
- The insulation vacuum will be qualified through leak testing.

Alignment system tests
- Validation of full remote alignment and monitoring systems, confirming accuracy and reproducibility of cryostat alignment.

Quench detection and magnet protection tests
- Detection and protection system test is performed, approximately 200 quenches at different energy levels are planned.

Powering of IT magnets
- Validation of crowbar system, lambda plate and connections. Study impact of flux jumps on current regulation.

Performance tests
- Investigate the capability of the different subsystems to work together. A thermal cycle of the circuits is planned.

Operation in the IT String
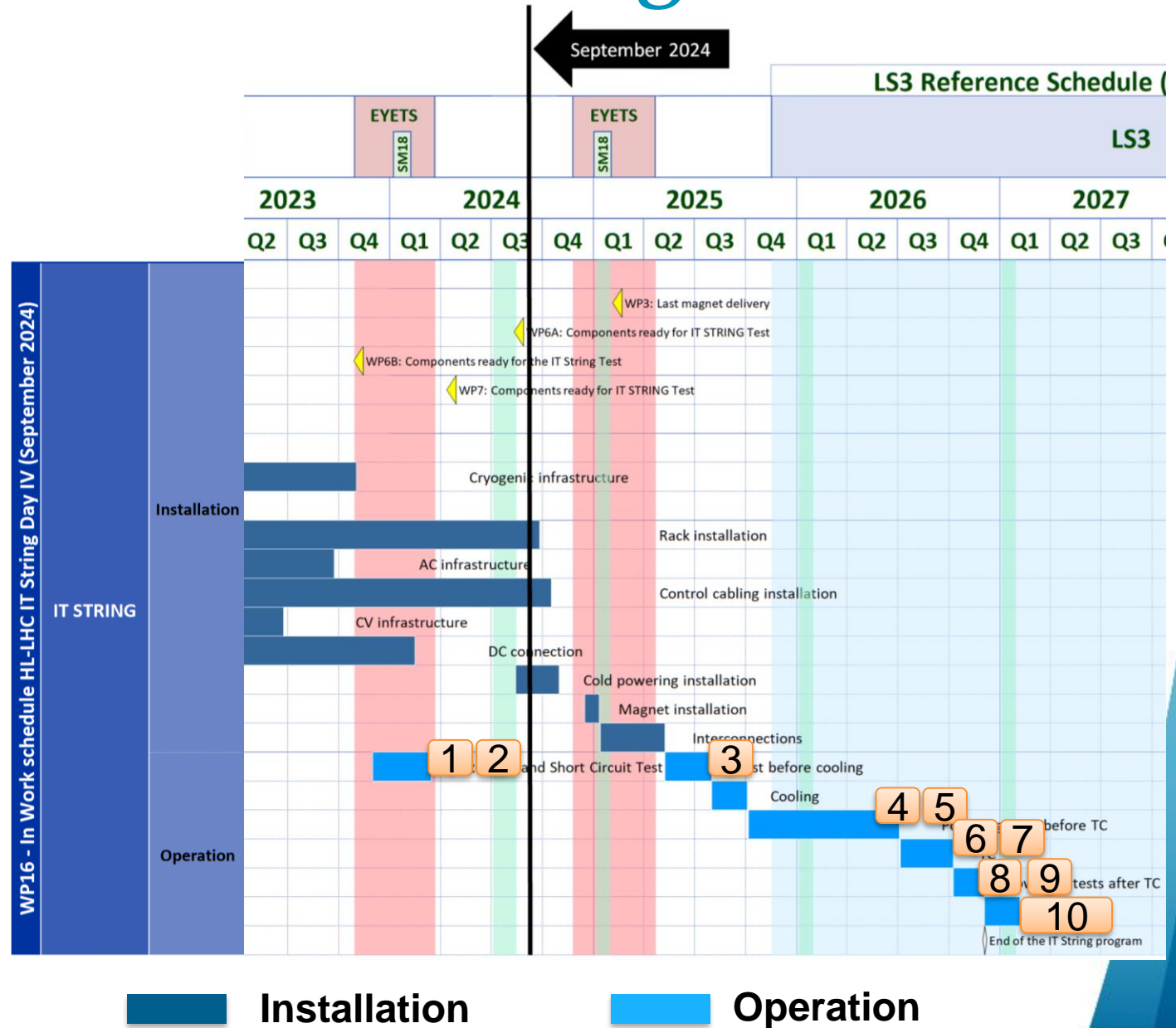
Organization of the IT String operation
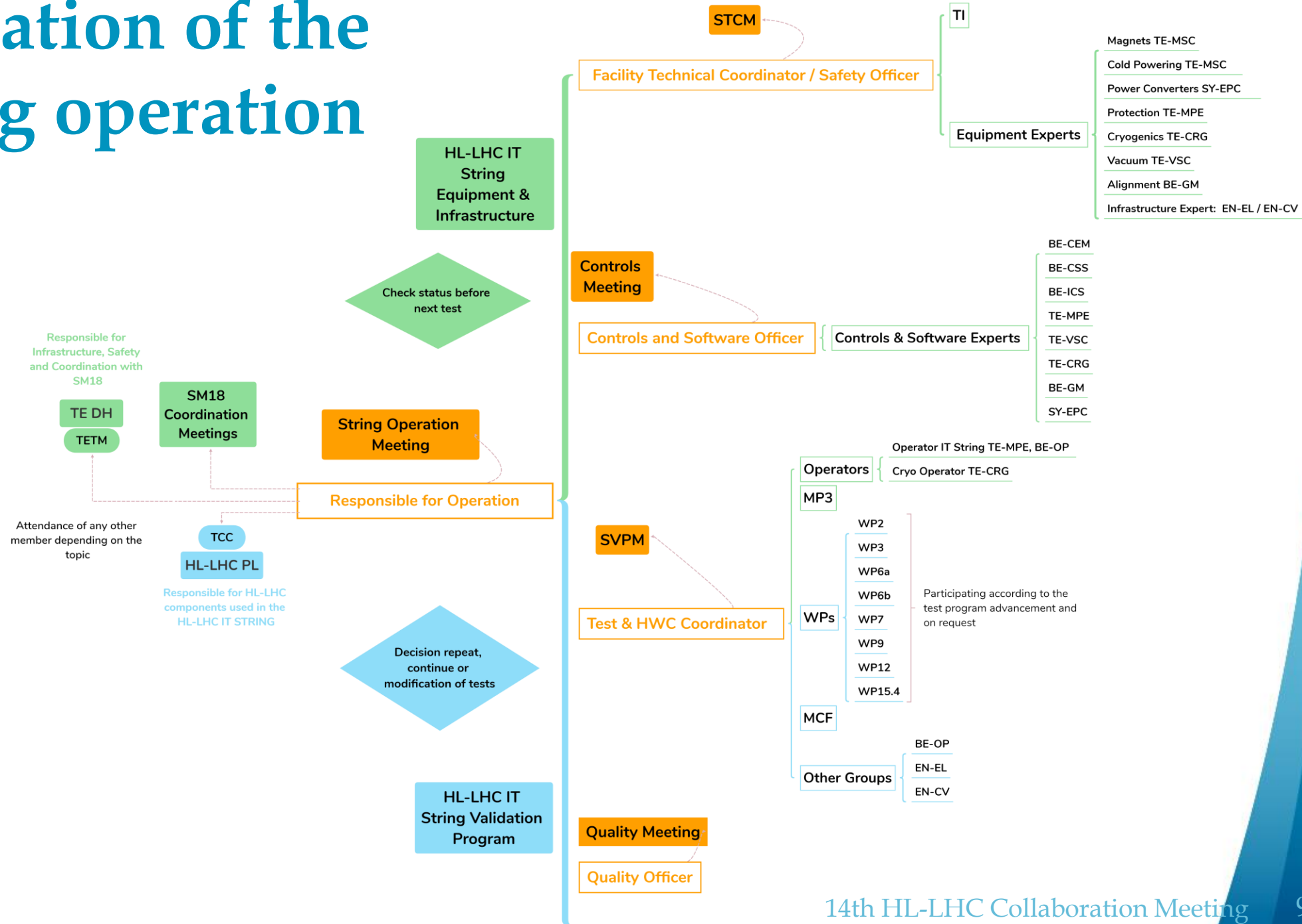
Organization of the IT String operation

Role: Responsible for the HL-LHC IT String Operation
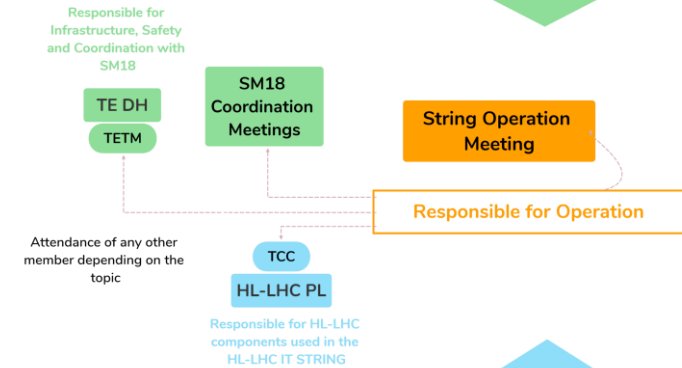
- Work in close collaboration with all the members of the IT String operation team.

- Report the IT String operational needs in the SM18 coordination meeting.

- Seek approval from the HL-LHC Project Leader (PL) and TE department Head (DH) for important decisions, changes or interventions concerning the test stand.

- Provides regular progress reports on the HL-LHC IT String operation to both line and project management.

- Allows the powering after major events in the facility. Approve changes in the test plan and key parameters considering inputs from the String operation team and relevant bodies.

- Chair a meeting where operational aspects of the IT String are discussed.

Organization of the IT String operation

Role: Facility Technical Coordinator
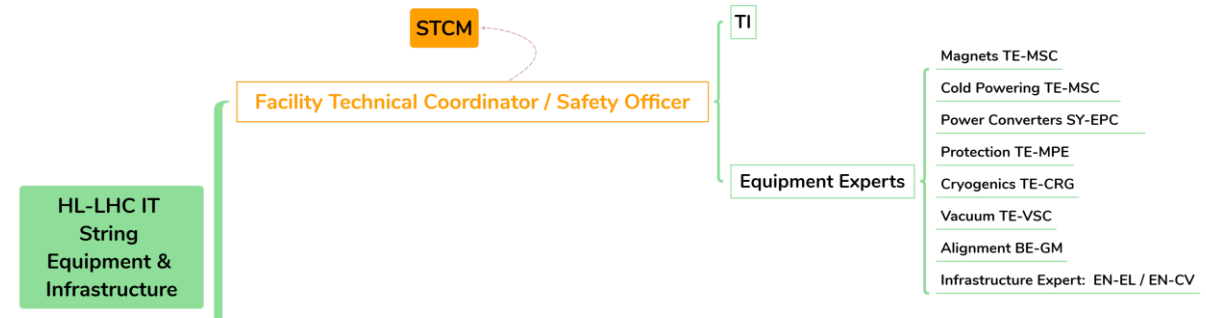
Coordinate interventions requested by stakeholders. Check procedure, monitor the activities onsite, ensure safe environment.

Control access to the String area approving Impact in function of the test stand conditions.

Ensure the compliance of executed lockouts with CERN safety rules and standards.

Follow up status of equipment and confirm with experts the readiness of components and infrastructure for operation.

Report anomalies detected to the responsible of operation. Intervene on request of TI for unexpected incidents.

Chair a meeting where aspects related to interventions and safety are discussed.

Organization of the IT String operation

Role: Test & HWC Coordinator
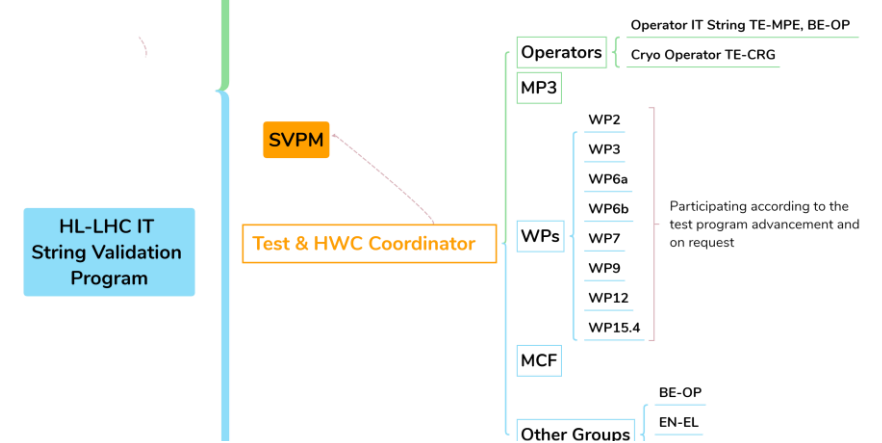
Assume responsibility for day-to-day operations, executing the String Validation Program.

Coordinate the operation team, and centralize the support from the MP3, the MCF and the SVPM.

Ensure adherence to the approved SVP and to the test procedures.

Authorize each test step, checking that the requestors are satisfied with the results of the previous steps.

Discuss with the responsible of the IT String operation: Actions not planned in the SVP, modification of installations, safety related aspects, results that deviate from the expected test outcome.

Follow-up with the Facility Technical Coordinator any alarms or requests from MP3 or MCF.

Chair a meeting where aspects related to the String Validation Program are discussed.

Organization of the IT String operation

Role: Controls and Software Officer

- Ensure software and control systems are conformed with specifications and available during operation phases.

- Coordinate interventions, updates and migrations concerning software and controllers according to schedule.

- Validate communications and interfaces among the different control systems and with services.

- Provide feedback on applications integrity, functionalities and user experience to the corresponding owner.

- Chair a meeting where aspects related to software and controls are discussed.

Organization of the IT String operation

Quality Meeting

Quality Officer

Role: Quality Officer

Ensure that all procedures for the different tests are available, and up-to-date.

Collaborate with the relevant actors to implement any change required in documentation linked to the IT String.

Follow up the test program using the MTF tool, updating the status of the different test steps and attaching the corresponding test result reports.

Verification with the test coordinator of the parameters associated to each test.

Write and follow up the approval process of any non-conformity detected.

Chair a meeting where quality aspects of the IT String are discussed.

Meetings for coordination and reporting

String Operation Meeting (SOM)

NEW

The objectives of the meeting:
   Summarise the activities of the previous week
   Establish the weekly planning
   Discuss urgent matters raised by any team
   Present preliminary results (or summary from MP3 members)

Attendance: IT String Operation team, WPs/groups representative in function of the tests to be executed during the week, MP3 representative, hardware experts on request, controls and software experts on request.

Weekly meeting, Indico agenda available and minutes distributed. Complemented by working meetings chaired by the Test & HWC Coordinator.

Meetings for coordination and reporting

String Validation Program Meeting (SVPM)
- Presentation of analysis results for the executed tests.
- Inform involved WPs about the status of the program.
- Recommendations about the following test steps to be executed.

Magnet Circuit Forum (MCF)
- Validation of circuits performance (based on analysis of the op. team and MP3).
- Adaptation of circuit parameters, if needed.
- Participation for specific test on request from the Test & HWC coordinator.

LHC Magnet Circuits, Powering and Performance Panel (MP3)
- Responsible of powering test procedures and acceptance criteria.
- Report on the analysis and diagnostics of the executed tests.

String Technical Coordination Meeting (STCM)
- Presentation of any intervention to be executed on the test stand, involving equipment or infrastructure installed.
- Discussion of safety matters related to the test stand.

Meetings for coordination and reporting

Controls and Software Meeting	• Coordinate software and controls upgrades to minimize impact on the test stand operation. • Provide feedback to the application owners.
Point 1.8 Coordination Meeting	• Find compromises among the users of the SM18 hall related to critical coactivities, conflicts or for the definition of SM18 shutdown periods.
SM18 Cryogenic Coordination Meeting	• Ensure smooth cryogenic operations within the SM18 hall and manage necessary compromises. Test & HWC Coordinator will actively participate and inform the rest of the operation team.
Project Steering Meeting (PSM)	• Report by the WP16 WPL of any extra costs or delays incurred during operation.
Technical Coordination Committee (TCC)	• Reporting on the advancement and obtained results during operation on the request of the TCC chair.
TE Department Technical Meeting	• Reporting on the test results and/or the status of installation on the request of the TE department.

Conclusions

- A procedure describing the organization during the IT String operation has been approved.

- Some phases of the operation have already been successfully executed.

- The role of the facility technical coordinator and safety officer has been attributed.

- The responsibilities of the different roles have been defined, specifying who does what and who approves/authorize what.

- The meetings and forums that will support the IT String operation are already in place, with the exception of the weekly String Operation Meeting.