



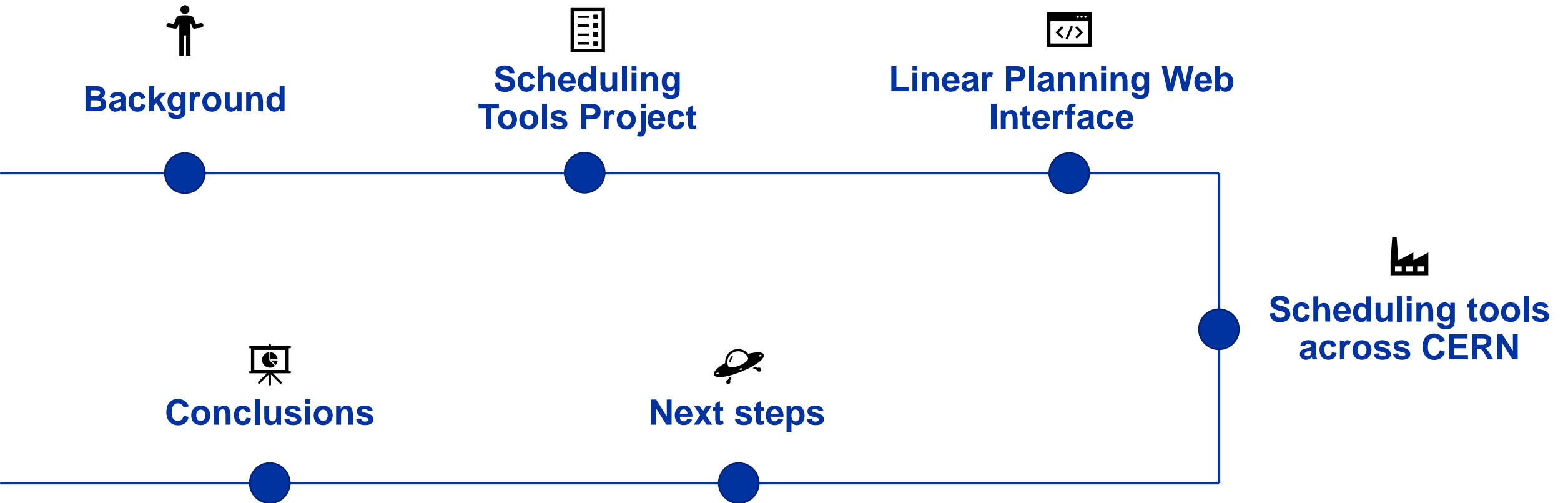
Scheduling Tools development for the next programmed stops

ACE Seminar #29 – Afonso Caiado de Sousa – EN-ACE-OSS

2024-12-06

[INDICO 1451248](#)

Table of Contents





Background

About me - ACE Seminar #17

- Graduated - Degree in Engineering Sciences – Informatics and Computer Engineering @ **FEUP**
- Current - Master's in Informatics and Computer Engineering Student @ **FEUP** (2nd year)
- Master's thesis work @ **CERN**
- **FEUP thesis supervisors:** João Faria, João Moreira
- **CERN supervisors:** Fernando Pedrosa



About me - Today

- Master's in **Informatics and Computer Engineering @ FEUP**
- Master's thesis work about predicting and using Machine Learning in small datasets
- Working for the past ~ 1 year as the lead Scheduling Tools Project **Developer**
- **Supervisor:** Estrella Vergara
- Obsessed with **movies, gym, and traveling**

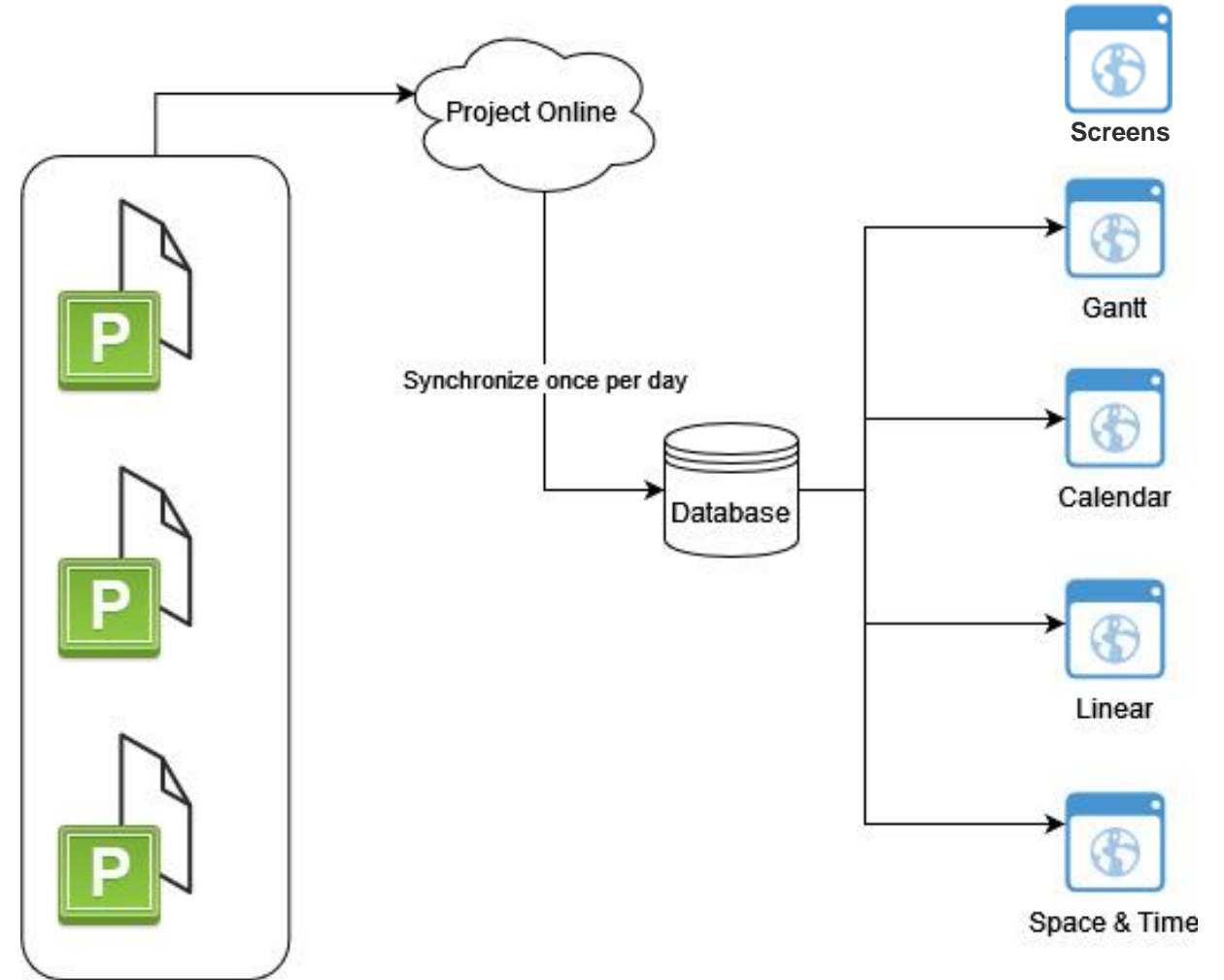




Scheduling Tools Project

What is Scheduling Tools

- Initially developed by EN-IM during the LS2
- **Main goals:**
 - Gather all coordination related data in a **unique repository**
 - Allow the visualization of plannings **without and MS Project License**



What is Scheduling Tools

EN-ACE/EN-IM Scheduling Tools

Afonso Maria Rebordao Caiado De Sousa

Home
Gantt
Calendar
Linear
Synchronization
Visualization
Support / Feedback

Projects
139
Unarchived: 61

Tasks
91157
Unarchived: 40285

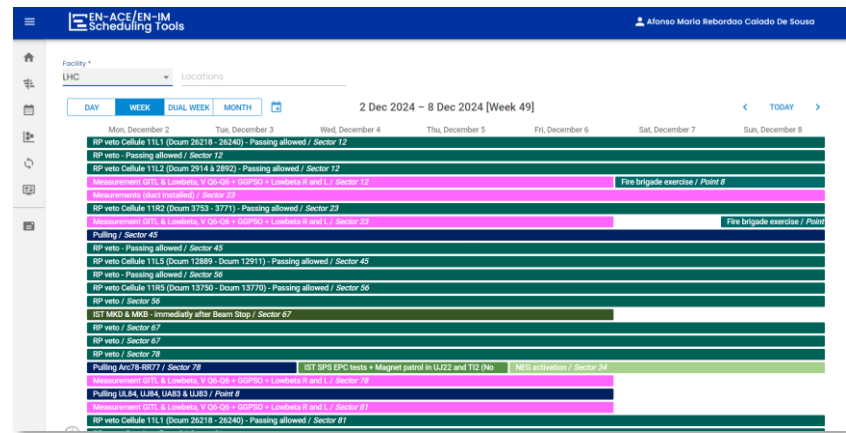
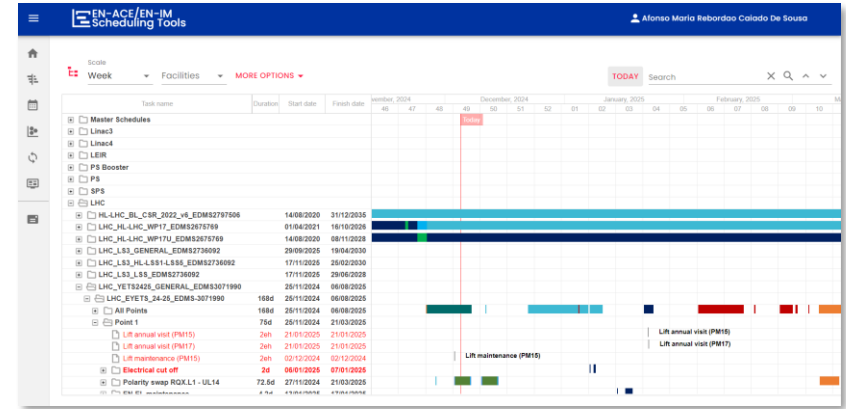
Facilities
19

Groups
54

Number of tasks per facility (incl. archived)

Number of projects per facility (incl. archived)

Last full synchronization on: 2024-12-03 15:33:18



Who uses Scheduling Tools

WHO?

- **EN-ACE Members:** Core contributors and stakeholders in planning activities.
- **End Users:** Individuals who rely on the tool to consult plannings and track ongoing.

WHY?

- **Streamlining Processes:** Automates routine tasks to improve efficiency and reduce manual effort.
- **Time-Saving:** Makes viewing, creating and managing Linear Plannings faster and easier for CERN personnel.

Space & Time

EN-ACE/EN-IM Scheduling Tools Afonso Maria Rebordao Calado De Sousa

Home
Gantt
Calendar
Linear
Synchronization
Visualization
Support / Feedback

Facility visualization

PRESENTATION INTERACTIVE 3D VIEW

Facility: North Area

Building:

Date: 23/09/2024

INTERACTIVE VIEW

Download as: SVG PNG



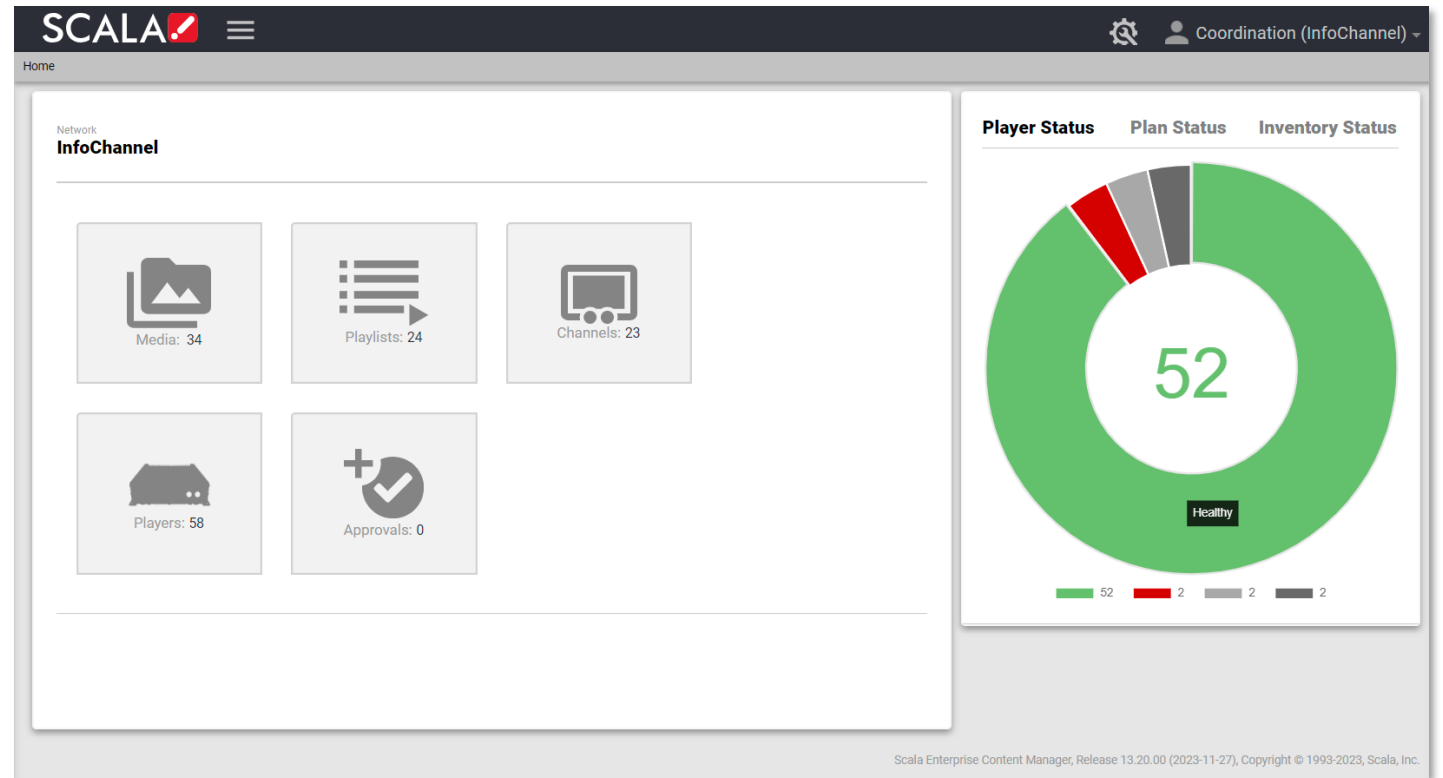
BA80

Date: 23/09/2024

SHOW TASKS

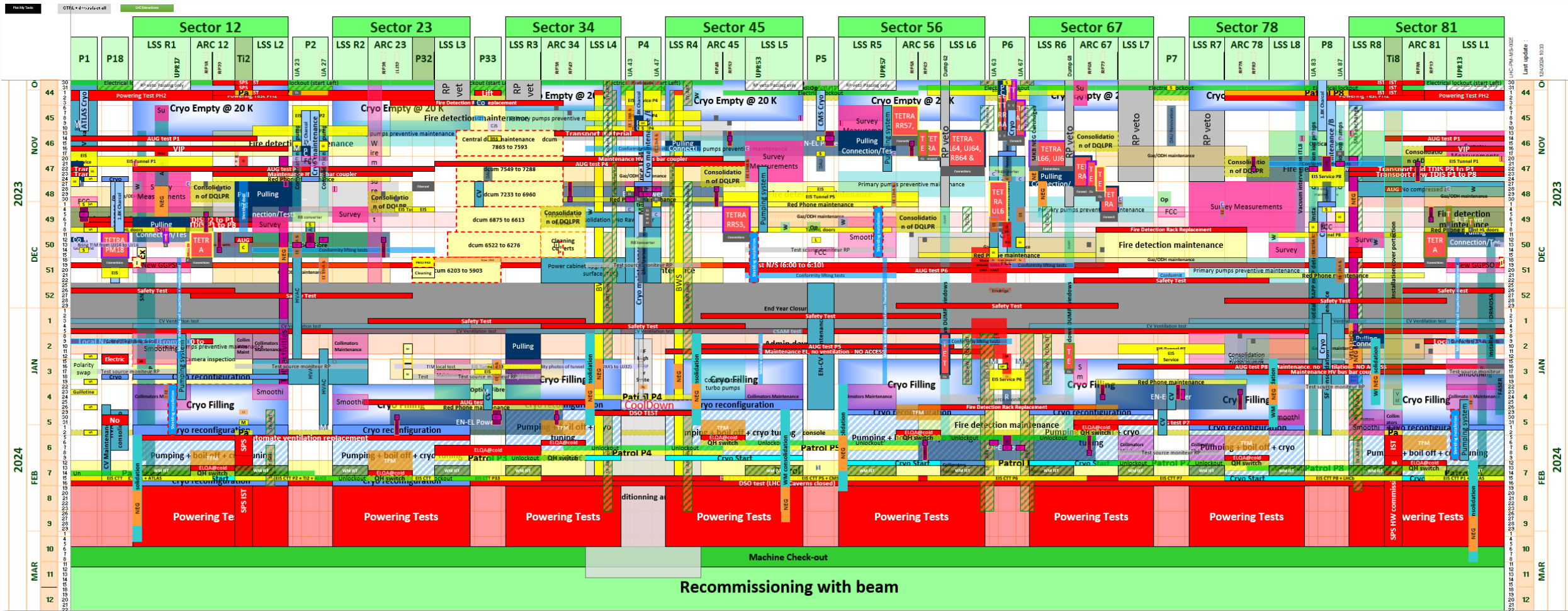
Access screens

- 24 **LHC** screens
- Recent **Injectors** transition:
 - 9 SPS screens
 - 7 PS screens
 - 1 Booster screen
 - 1 Linac4 screen





Excel VBA Linear Planning



Scheduling Tools Home Page

<https://oss-coordination.web.cern.ch/>

EN-ACE/EN-IM Scheduling Tools

Afonso Maria Rebordao Caiado De Sousa

Home
Gantt
Calendar
Linear
Synchronization
Visualization
Support / Feedback

Projects: 141 (Unarchived: 70)
Tasks: 89055 (Unarchived: 39354)
Facilities: 19
Groups: 54

Number of tasks per facility (incl. archived)

Facility	Number of tasks
LEIR	~100
FAIR	~100
ADIELENA	~100
AWAKE	~100
PS Booster	~100
SPS	~100
East Area	~100
North Area	~100
SM18	~100
Linac3	~100
PS	~100
Master Schedules	~100
Linac4	~100
Technical Galleries	~100
LHC	~45,000
HIRadMat	~100
HL-LHC	~100

Number of projects per facility (incl. archived)

Facility	Number of projects
LEIR	~1
FAIR	~1
ADIELENA	~1
AWAKE	~1
PS Booster	~1
SPS	~1
East Area	~1
North Area	~1
SM18	~1
Master Schedules	~1
Linac3	~1
Linac4	~1
PS	~1
Technical Galleries	~1
LHC	~25
HIRadMat	~1
HL-LHC	~1

Last full synchronization on: 2024-09-20 02:17:59

Linear Planning Creation

Linear Planning

ACTIVE | ARCHIVED Create new linear planning

Search...

Name	Facility	Actions
LHC_EYETS_23-24-TEST_2023-07-18	LHC	
LINEAR PLANNING PSB YETS24-25	PS Booster	
LINAC4YETS2425	Linac4	
LHC_YETS_2223_FRAME	LHC	
HL-LHC FACILITY INSTALLATION LINEAR PLANNING	HL-LHC	
LHC_EYETS_FRAME	LHC	
LHC_TS2_2024	LHC	

Rows per page: 50 | 1-16 of 16

Shape Types

Create Linear Planning

Facility:

From: 09/01/2024 To: 09/30/2024

Intervention Periods Select Locations

Back CONTINUE

Create Linear Planning

Tasks

COLUMNS FILTERS DENSITY POTENTIAL CONSTRAINTS VIEW SHAPE TYPES ADD SHAPE TYPE Search...

Uniquid	Task Name	Linear Planning Name	Level	Start	Finish	Location	Worktype	Group	Project	Shape Type
827	LHC_EYETS_24-25_EDMS-307L	LHC_EYETS_24-25_EDMS-307L	1	29/11/2024	15/03/2027				LHC_YETS242...	
1	--All Points	All Points	2	29/11/2024	06/08/2025	LHC	Area	All	LHC_YETS242...	
246	----Hardware commissioning p...	Hardware commissioning ph1	3	06/03/2025	14/03/2025	LHC	Frame	BE-OP	LHC_YETS242...	
247	----Hardware Commissioning p...	Hardware Commissioning ph2	3	14/03/2025	01/04/2025	LHC	Frame	BE-OP	LHC_YETS242...	
248	----Experimental cavern valve...	Experimental cavern valves op...	3	01/04/2025	01/04/2025	LHC	Frame	BE-OP	LHC_YETS242...	
249	----Machine Check-out (Cave...	Machine Check-out (Caverns ...	3	02/04/2025	04/04/2025	LHC	Frame	BE-OP	LHC_YETS242...	
250	----Beam to LHC	Beam to LHC	3	07/04/2025	06/08/2025	LHC	Frame	BE-OP	LHC_YETS242...	
251	----Recommissioning with be...	Recommissioning with beam	3	07/04/2025	29/04/2025	LHC	Frame	BE-OP	LHC_YETS242...	
123A	----LSS auxiliaries (Site A, Ser...	LSS auxiliaries (Site A, Sandra...	3	03/03/2026	14/03/2026	LHC	LSS auxiliaries	EN-AB	LHC_YETS242...	

Rows per page: 100 | 1-100 of 1118

BACK Save Cancel

Create Linear Planning

Projects

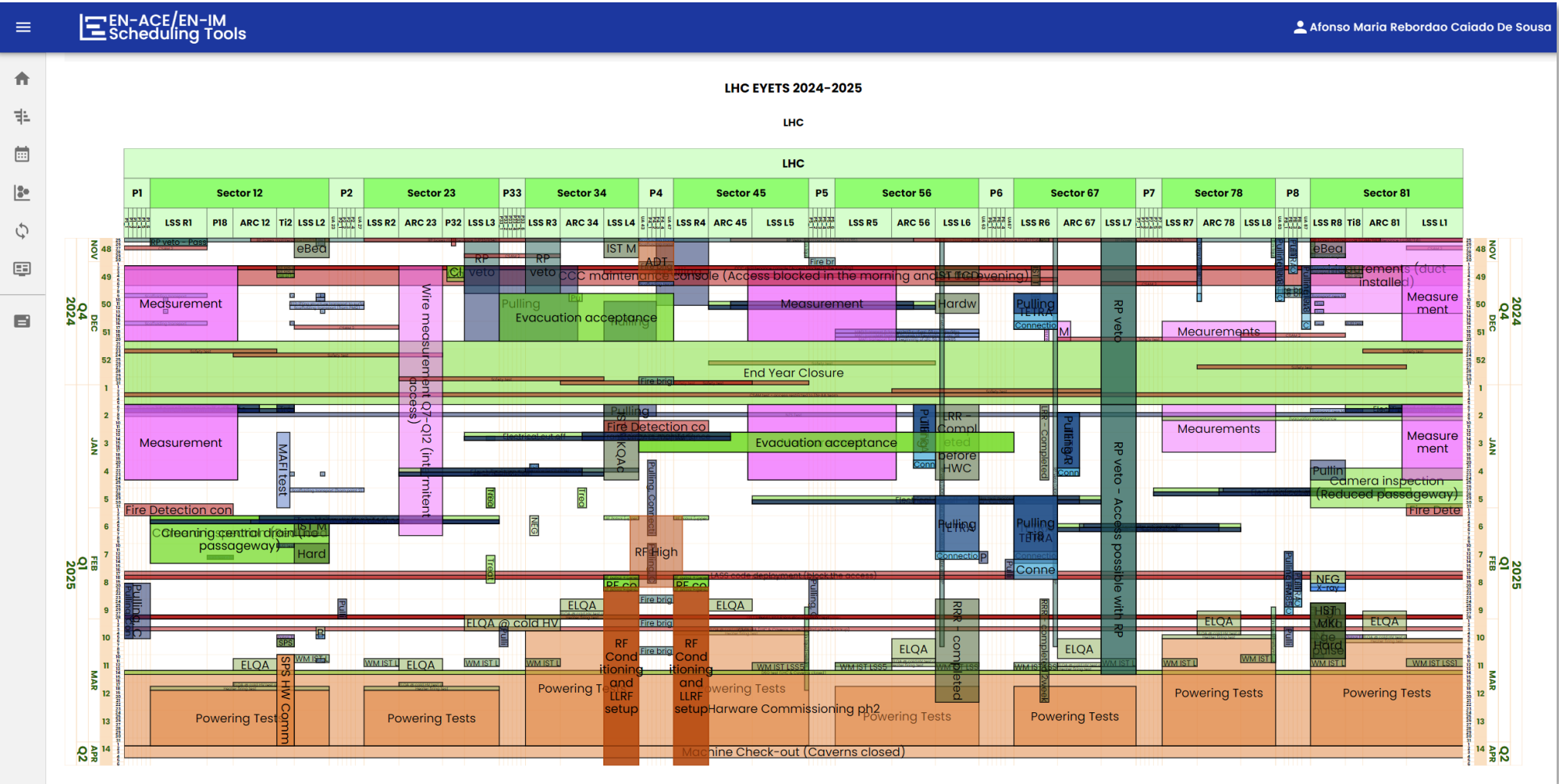
Search...

Name	Start	Finish
HL-LHC_BI_CSR_2022_v6_EDMS2797506	14/08/2020	31/12/2035
LHC_HL-LHC_WP17_EDMS2675769	01/04/2021	16/10/2026
LHC_HL-LHC_WP17U_EDMS2675769	14/08/2020	08/11/2028
LHC_LS3_GENERAL_EDMS2736092	29/09/2025	19/04/2030
LHC_LS3_HL-LSS1-LS55_EDMS2736092	17/11/2025	25/02/2030
LHC_LS3_LSS_EDMS2736092	17/11/2025	29/06/2028
LHC_TS123_EDMS2874185	05/06/2023	28/06/2023
LHC_TS124_EDMS3094038	10/06/2024	17/06/2024

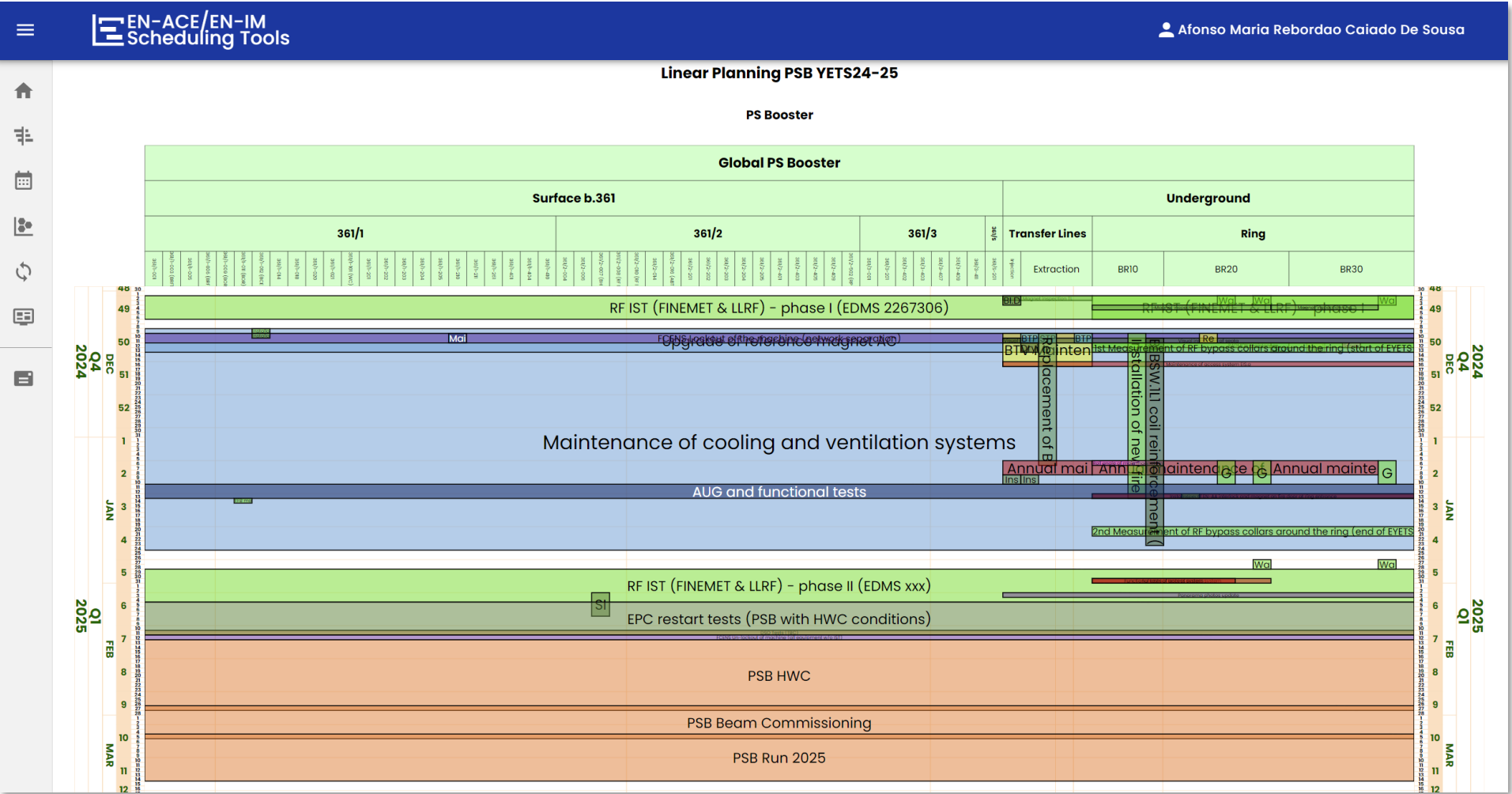
Rows per page: 50 | 1-13 of 13

BACK CONTINUE

Web Interface Linear Planning



Web Interface Linear Planning



Synchronization

The screenshot displays the 'EN-ACE/EN-IM Scheduling Tools' interface. At the top, there are navigation tabs: SETTINGS, EDIT, SYNCHRONIZATION, EXPORT, and ARCHIVE. A sub-menu is open under SYNCHRONIZATION, showing options for Dates, Locations, and All. A modal window titled 'Synchronize all info with the Database' is overlaid on the interface. This modal contains a diagram showing the data flow: Project Online (Last sync: 20-09-2024 02:17:59) feeds into the Database (Last sync: 30-07-2024 12:17:38), which then feeds into Linear Planning. Below the diagram, text explains that clicking the Synchronize button updates tasks with the latest information from the database. An 'Advanced Settings' section is also visible in the modal, with a 'Synchronize' button and a 'Cancel' button.

By clicking the Synchronize button, the tasks from this linear planning will be updated with the latest information **from the database**. For more synchronization options, open the advanced settings.

Advanced Settings

- Update all the tasks in this planning
- Update only the currently plotted tasks
- Update all, add and delete tasks to this planning
- Import data from Project Online first

Synchronize Cancel

Synchronize all info with the Database

Project Online (Last sync: 20-09-2024 02:17:59) → Database (Last sync: 30-07-2024 12:17:38) → Linear Planning

By clicking the Synchronize button, the tasks from this linear planning will be updated with the latest information **from the database**. For more synchronization options, open the advanced settings.

Advanced Settings

Synchronize Cancel

Intervention Periods

Create Linear Planning

Facility Intervention Period

From 09/01/2024 To 09/30/2024

Intervention Periods Show inactive Periods Select Locations

Back

Up-to-date period information

Possibility to show inactive periods



Create Linear Planning

Facility Intervention Period

From 09/01/2024

Intervention Periods Show inactive

Back

- YETS 2024-2025
- LS3
- Run 2024
- LS2
- YETS 2021-2022
- YETS 2022-2023
- EYETS 2023-2024
- TS1 2024
- TS2 2024

CONTINUE

Filtering

Create Linear Planning
Tasks

Columns: COLUMNS FILTERS DENSITY POTENTIAL CONSTRAINTS VIEW SHAPE TYPES ADD SHAPE TYPE Search...

<input type="checkbox"/>	Uniqueld	Task Name	Linear Planning Name	Level	Start	Finish	Location	Worktype	Group	Project	Shape Type
<input type="checkbox"/>	247	----Harware Commissioning p...	Harware Commissioning ph2	3	14/03/2025	01/04/2025	LHC	Frame	BE-OP	LHC_YETS242...	Orange
<input type="checkbox"/>		----Machine Check-out (Cave...	Machine Check-out (Caverns ...	3	02/04/2025	04/04/2025	LHC	Frame	BE-OP	LHC_YETS242...	Orange
<input type="checkbox"/>		----Recommissioning with be...	Recommissioning with beam	3	07/04/2025	25/04/2025	LHC	Frame	BE-OP	LHC_YETS242...	Orange
<input type="checkbox"/>		----LASS code deployment (...	LASS code deployment (block t...	4	14/02/2025	15/02/2025	LHC				Red

Possibility to view only constraints activities

Multi-filters

Linear Planning Create new linear planning

ACTIVE ARCHIVED

Name	Facility	Actions
TEST_SPS	SPS	🗑️ 📄
LHC_TSI_2023	LHC	🗑️ 📄

Shape Types

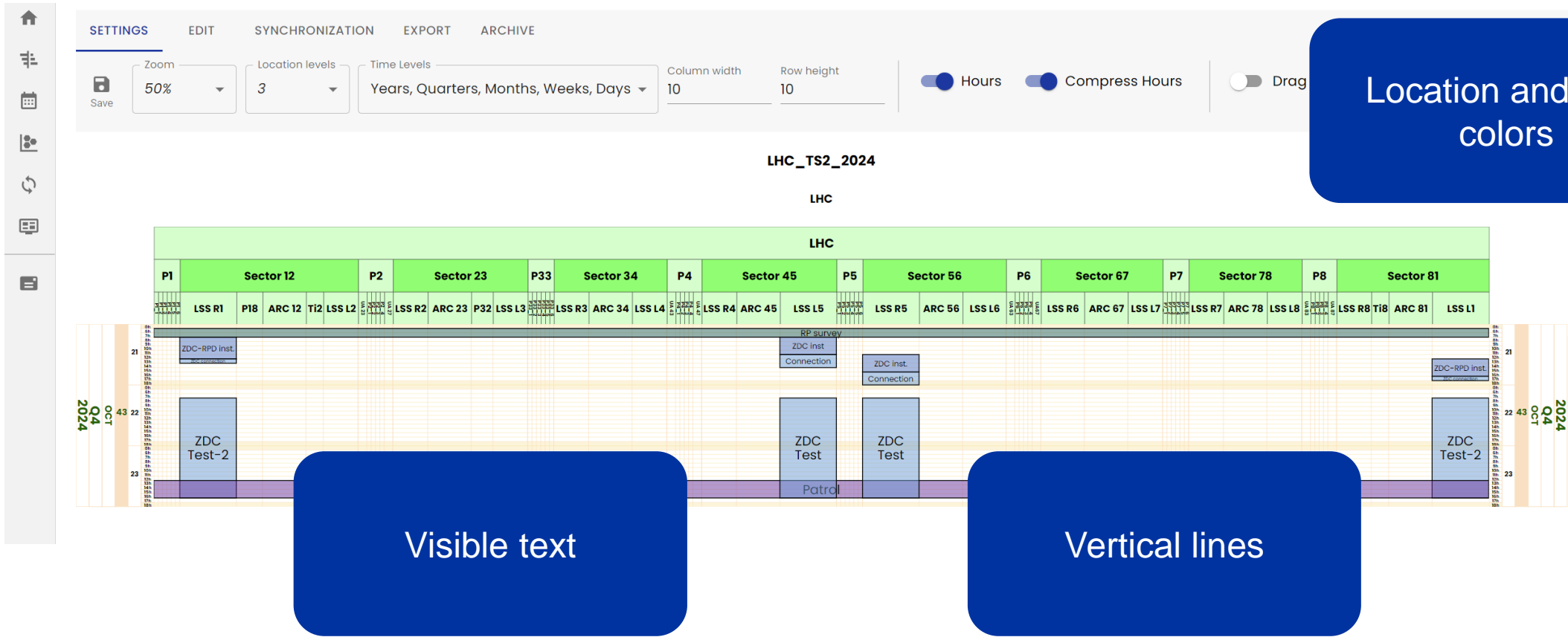
Ability to archive linear plannings

Design

New text font

Compress hours

Location and time colors



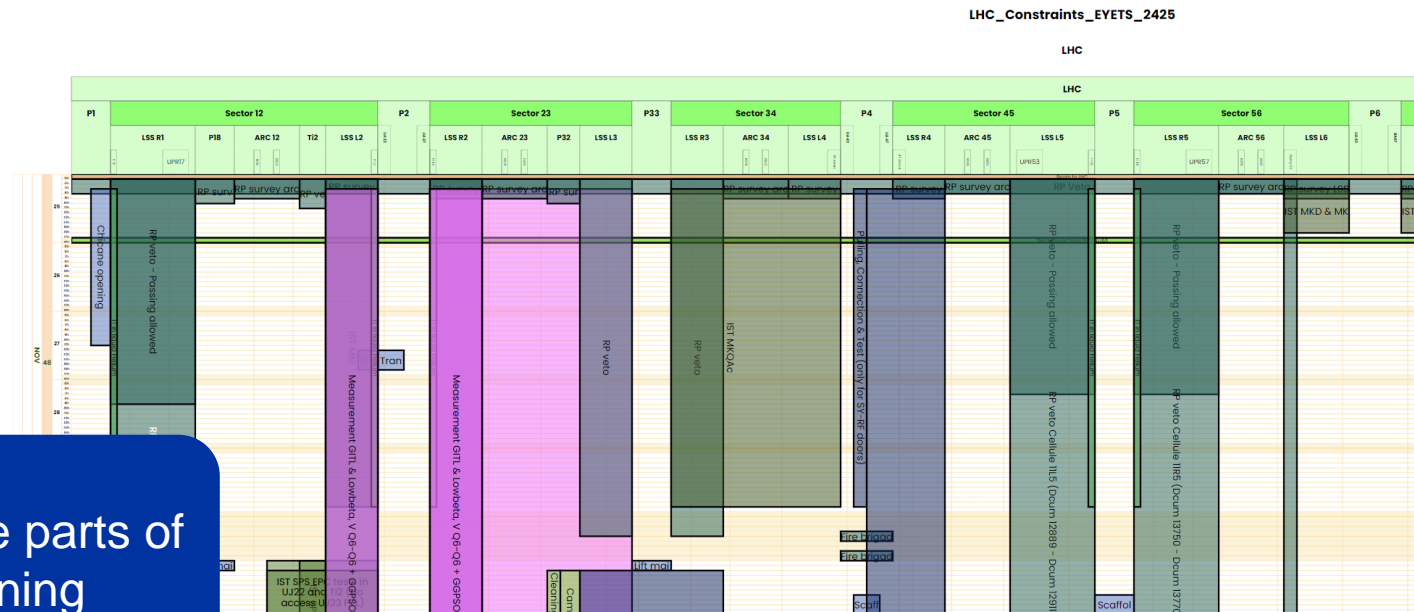
Design

Compress weekend days

SETTINGS EDIT SYNCHRONIZATION BASELINE EXPORT ARCHIVE

Save Zoom 40% Location levels 4 Time Levels Years, Quarters, Months, Weeks, Days Column width 20 Row height 15

Hours Compress Hours Weekends Drag Filter Highlight

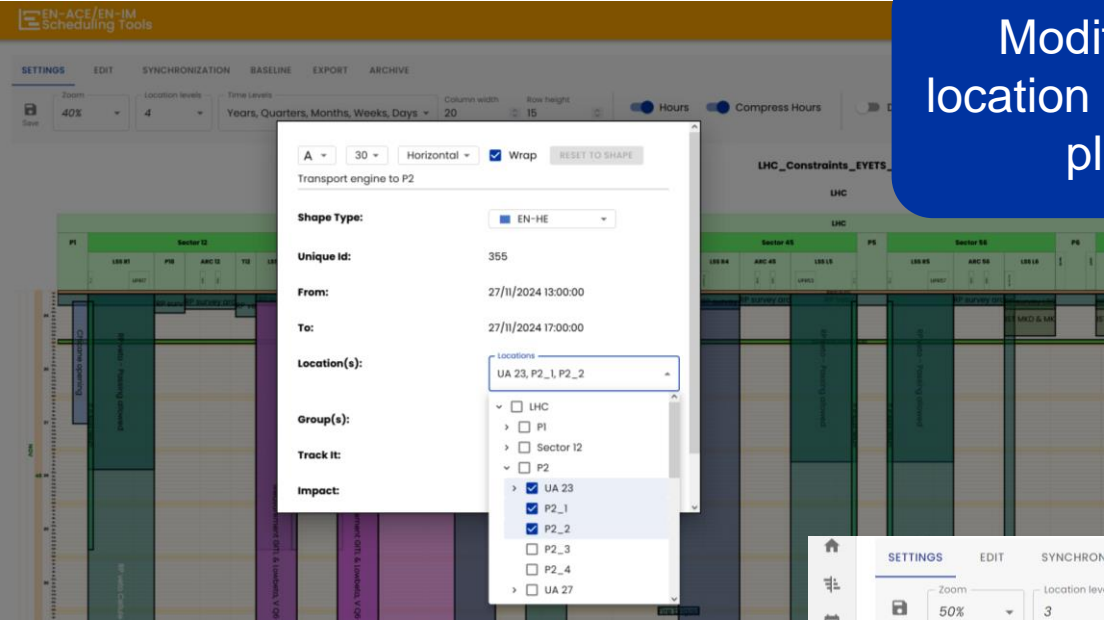


Ability to hide parts of the planning

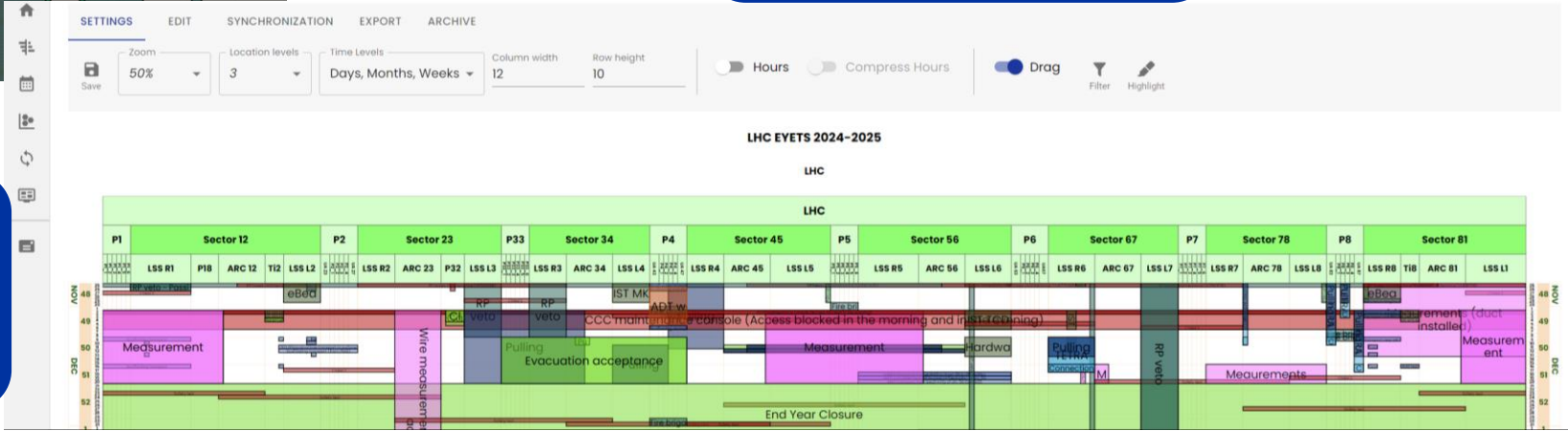
Planning Customization

Modify a task's location directly in the planning

Ability to save the drag and dropped tasks



Save the linear planning settings



Planning Customization

Edit Linear Planning

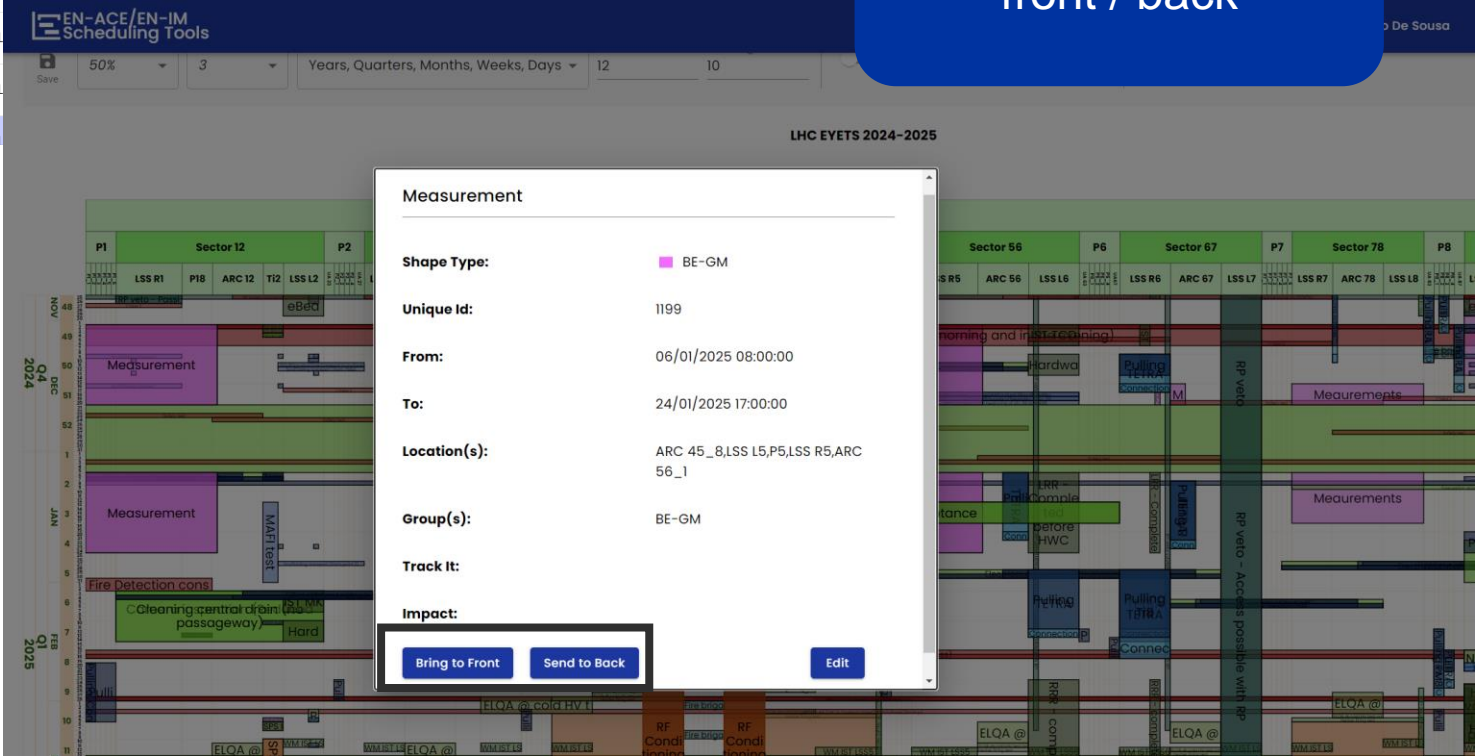
Tasks

COLUMNS FILTERS DENSITY POTENTIAL CONSTRAINTS
 VIEW SHAPE TYPES ADD SHAPE TYPE Search...

<input type="checkbox"/>	Unique Id	Task Name	Linear Planning Name	Level	Start	Finish	Location	Worktype	Group	Project	Shape Type
<input type="checkbox"/>	827	LHC_EYETS_24-25_EDMS-30719...	LHC_EYETS_24-25_EDMS-30719...	1	25/11/2024	15/03/2027				LHC_YETS242...	
<input type="checkbox"/>	1	--All Points	<input type="text" value="New name"/>	2	25/11/2024	06/08/2025					
<input type="checkbox"/>	246	----Hardware commissioning ...	Hardware commissioning ph1 a...	3	06/03/2025	14/03/2025					
<input checked="" type="checkbox"/>	247	----Harware Commissioninga p...	Harware Commissioninga ph2	3	14/03/2025	01/04/2025					

Send a task to the front / back

Change a task name



Planning Customization

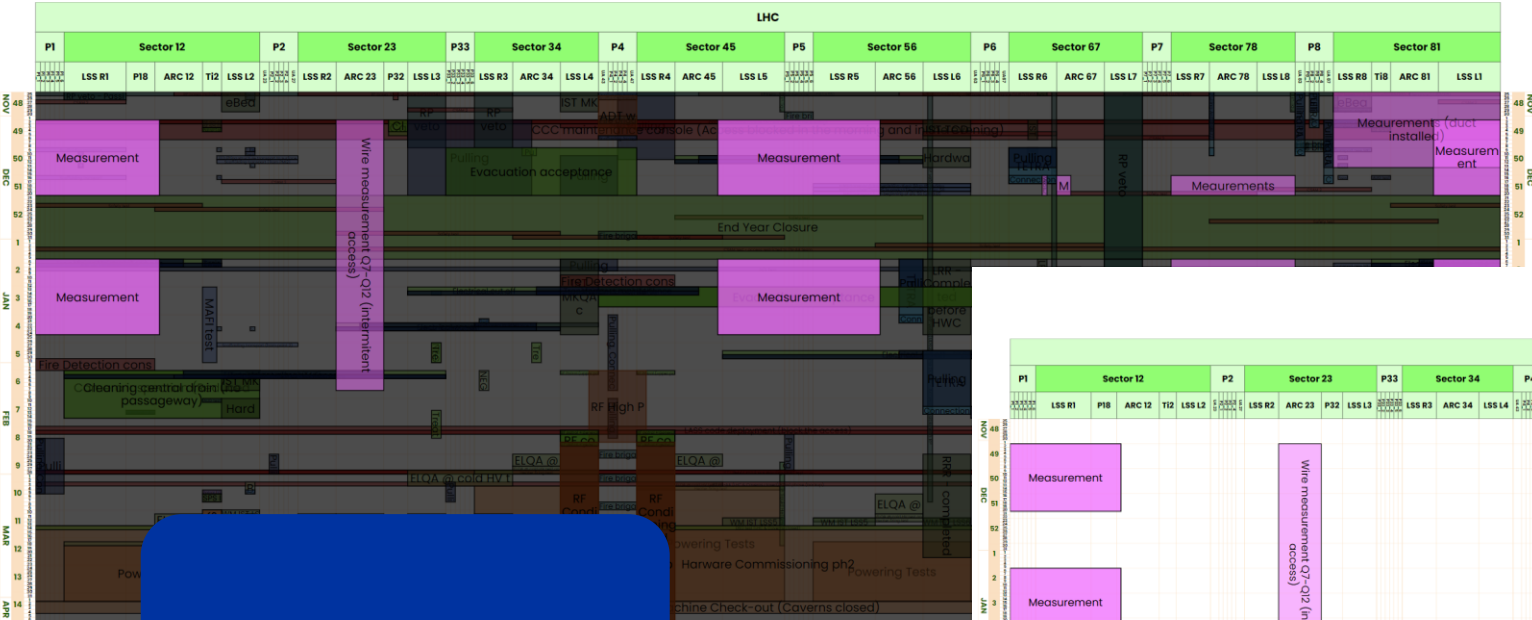
The screenshot shows the 'EN-ACE/EN-IM Scheduling Tools' interface. At the top, there are tabs for 'SETTINGS', 'EDIT', 'SYNCHRONIZATION', 'EXPORT', and 'ARCHIVE'. Below these are various settings like 'Zoom' (50%), 'Location levels' (3), 'Time Levels' (Days, Months, Weeks), 'Column width' (12), and 'Row height' (10). There are also toggle switches for 'Hours', 'Compress Hours', and 'Drag'. A 'Filter' icon is highlighted with a box. The main area displays a Gantt chart for 'LHC EYETS 2024-2025' with sectors like Sector 12, Sector 23, Sector 67, Sector 78, and Sector 81. A 'Filter the tasks' dialog box is open, showing a 'Groups' dropdown menu and 'Filter', 'Remove', and 'Cancel' buttons. A blue arrow points from the dialog to the right-hand menu.

- Select All
- TE-MPE
- BE-OP
- EN-EL
- SY-RF
- DSO
- TE-CRG
- BE-GM
- TE-MSC
- EN-AA
- HSE-FB
- HSE-OHS
- EN-HE
- HSE-RP
- SY-ABT
- SCE-SAM
- BE-EA

Planning Customization

LHC EYETS 2024-2025

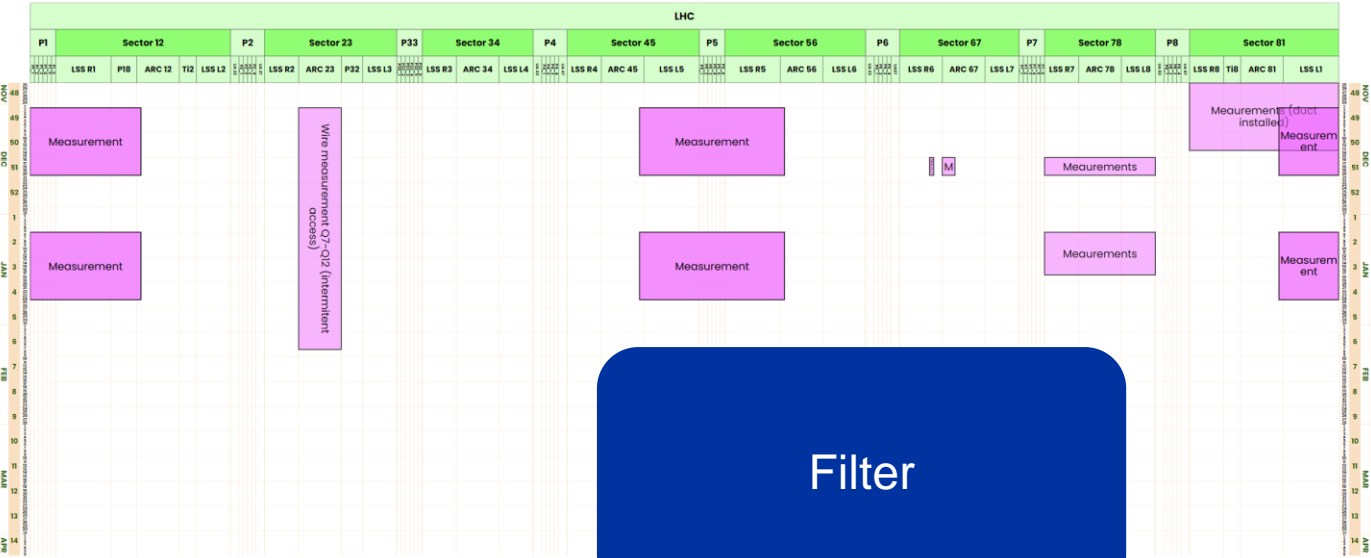
LHC



Highlight

LHC EYETS 2024-2025

LHC



Filter

Planning Customization

Powering Tests

Shape Type: ■ BE-OP

Unique Id: 263

From: 19/03/2025 08:00:00

To: 01/04/2025 17:00:00

Location(s): Sector 23

Group(s): BE-OP

Track It:

Impact:



A Horizontal Wrap

Powering Tests

Shape Type: ■ BE-OP

Unique Id: 263

From: 19/03/2025 08:00:00

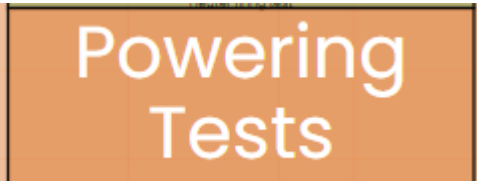
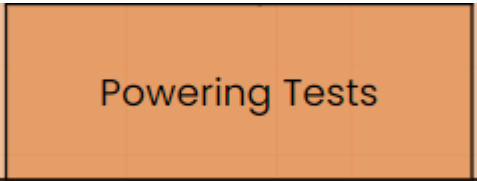
To: 01/04/2025 17:00:00

Location(s): Sector 23

Group(s): BE-OP

Track It:

Impact:



Planning Customization

Linear Planning

ACTIVE ARCHIVED Create new linear planning

Search...

Name	Facility	Actions
LHC_EYETS_23-24-TEST_2023-07-18	LHC	
LINEAR PLANNING PSB YETS24-25	PS Booster	
LINAC4YETS2425	Linac4	
LHC_YETS_2223_FRAME	LHC	
HL-LHC FACILITY INSTALLATION LINEAR PLANNING	HL-LHC	
LHC_EYETS_FRAME	LHC	
LHC_TS2_2024	LHC	

Shape Types

Shape Types

Groups to shape types Add shape type

COLUMNS FILTERS DENSITY Search...

Name	Ty...	Color Hex	Tr...	Border Co...	Bo...	Te...	Text Color	Text Direc...	Facility	Linear Planning	Groups	Co...	Actions
RUN	Re...	#51cf65	50	#51cf65	1	30	#000000	horizontal	Linac4				
HWC	Re...	#c80d0d	50	#000000	1	30	#000000	horizontal	Linac4				
Shutdown	Re...	#282828	50	#000000	1	30	#000000	horizontal	Linac4				
BC	Re...	#e7d427	50	#000000	1	30	#000000	horizontal	Linac4				
DSO	Re...	#9e00ff	50	#9e00ff	1	30	#000000	horizontal	Linac4				
Shutdown	Re...	#282828	50	#000000	1	30	#000000	horizontal	Linac4				
RUN	Re...	#51cf65	50	#51cf65	1	30	#000000	horizontal	Linac4				

Rows per page: 50 1-50 of 64

Back

Planning Customization

Add Shape Type

Shape type name *
Test Shape

Format
Rect

Shape type color:
#ff0000

Transparency (0-100)
20

Border color:
#00ff0a

Border thickness (0-10)
2

Text Color
White

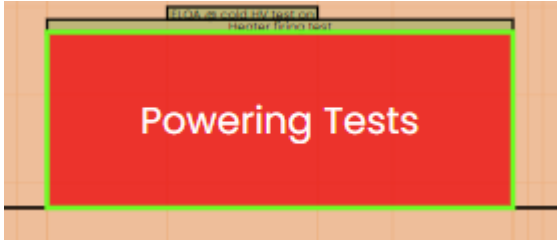
Text Direction
Horizontal

Text Size
30

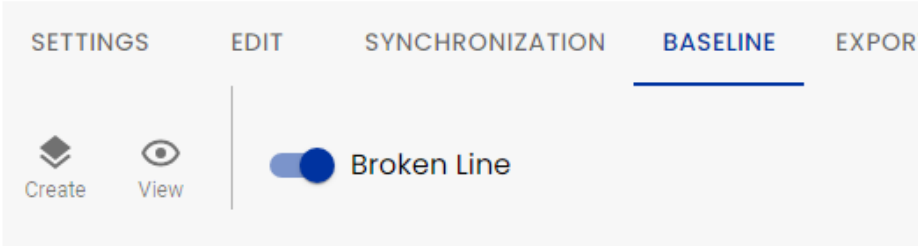
Facility
Group

Preview:
Test Shape

Save Cancel



Baseline & Brokenline



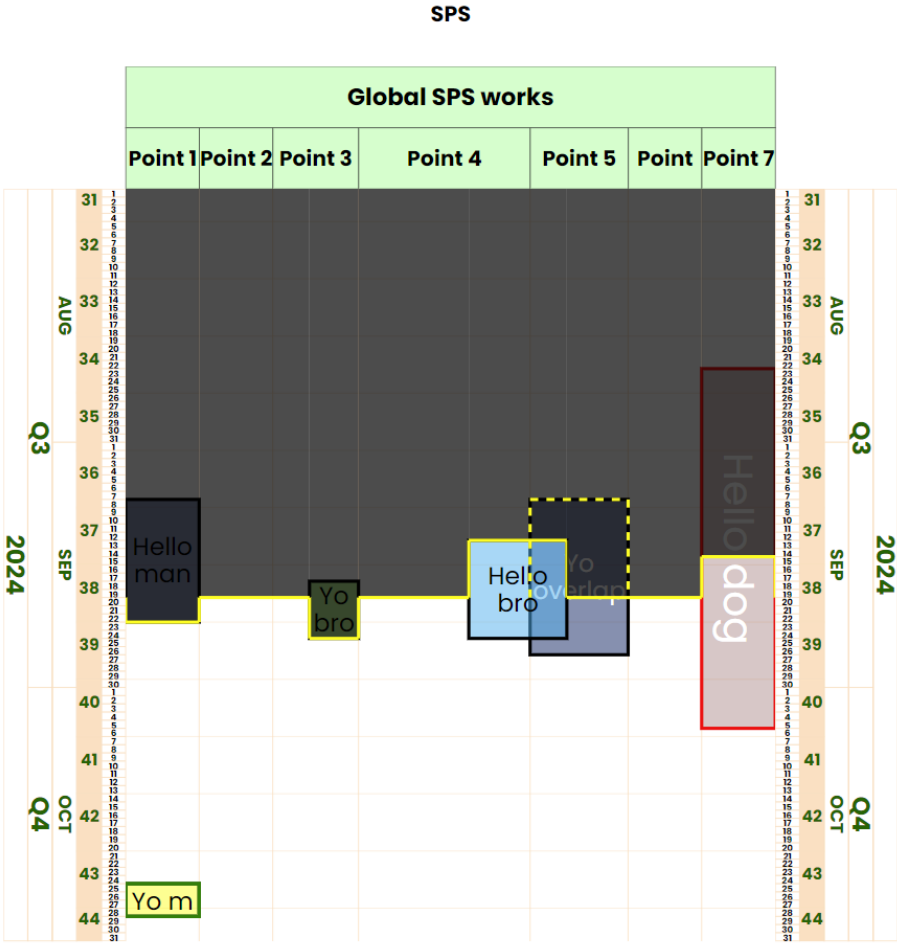
Create Linear Planning Baseline

Linear Planning Baseline:

Choose MS Project Baselines:

SPS_YETS24-
25_General_EDMS3062766:

TEST_AFONSO_SPS - Baseline 0



Export images

The screenshot shows a web interface titled "Export by SVG". It features a dropdown menu labeled "Locations", a date range selector with "From" (11/25/2024) and "To" (04/15/2025) fields, and a toggle switch labeled "All points". Below these are three buttons: "Export", "Export as", and "Cancel".

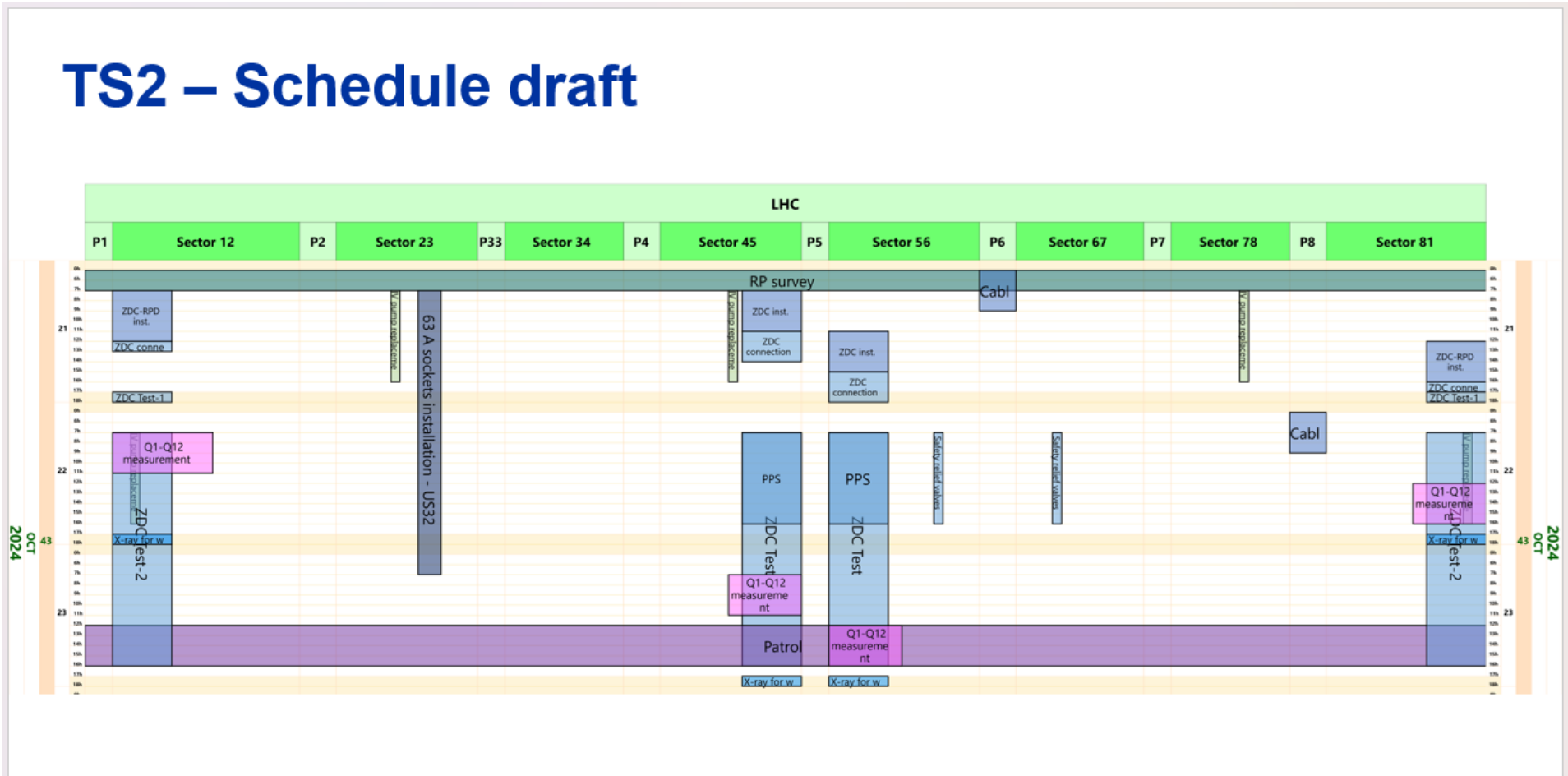
Three blue callout boxes provide additional information:

- Top right: "Possibility to export all 8 LHC points with one click" (pointing to the "All points" toggle).
- Bottom right: "Export the linear planning to SVG or PNG" (pointing to the "Export as" button).
- Bottom left: "Export images with a custom name and location" (pointing to the "Export" button).

LHC – TS2

Preparation was done with the Linear Planning Web Interface

TS2 – Schedule draft



LHC – (E)YETS 24-25

- LHC Constraints planning is being done with the web interface
- Hourly planning for the whole (E)YETS duration
- Exported images that are sent to the LHC access screens

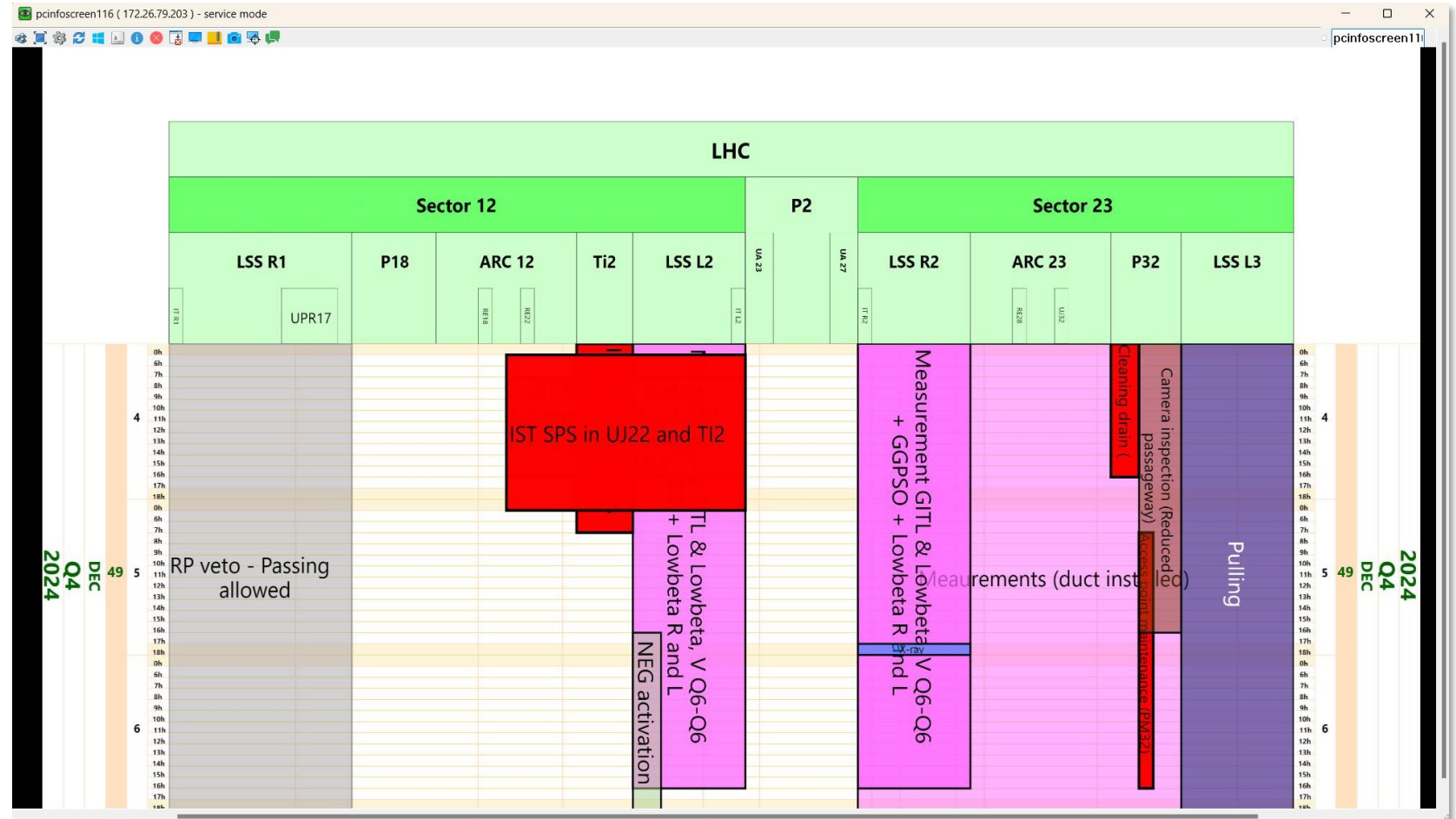
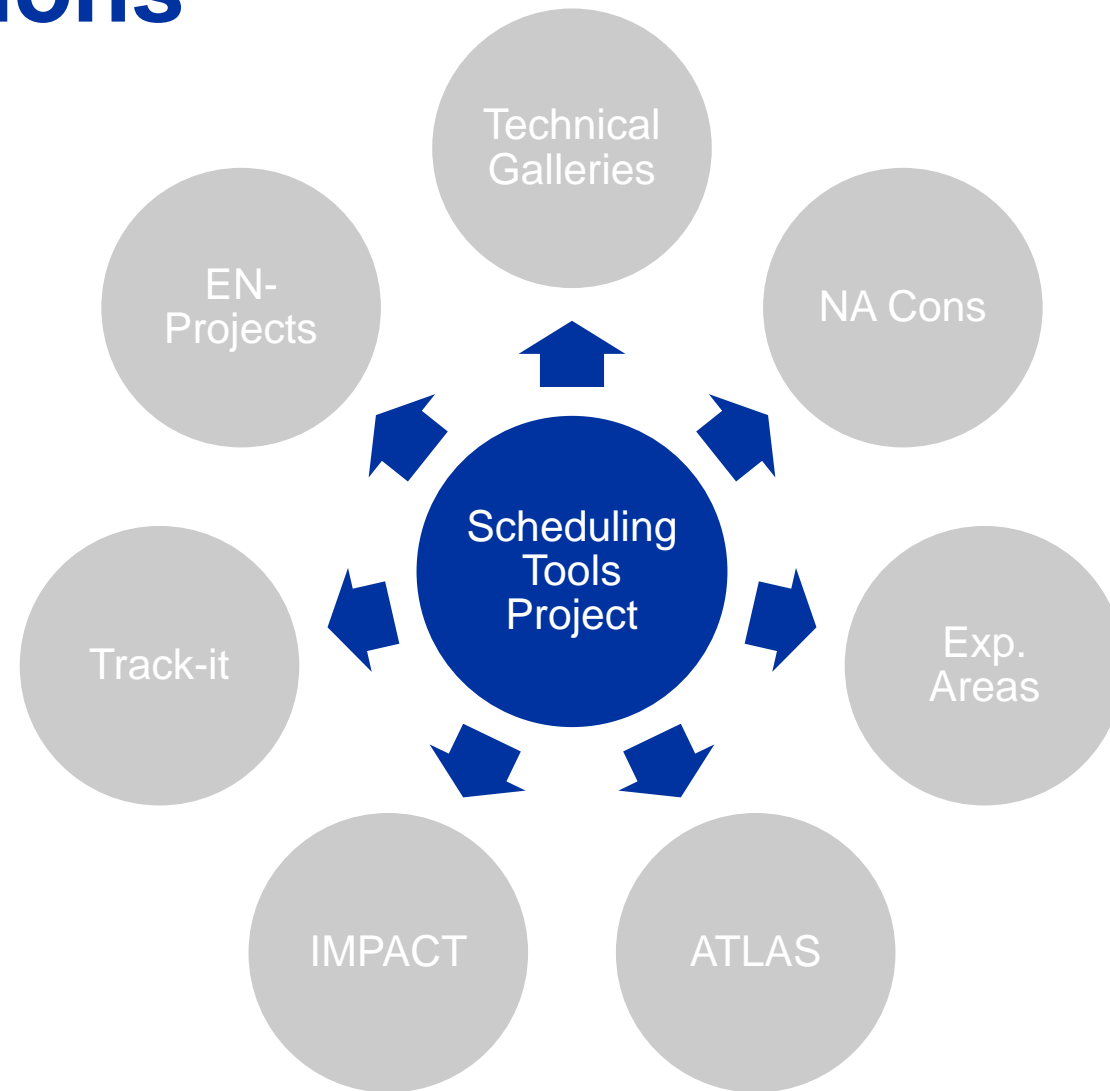


Image shown in LHC Point 2. Images available at: <https://accelerator-dashboard.web.cern.ch/Dashboard-Access-Screens>



Scheduling Tools across CERN

All collaborations



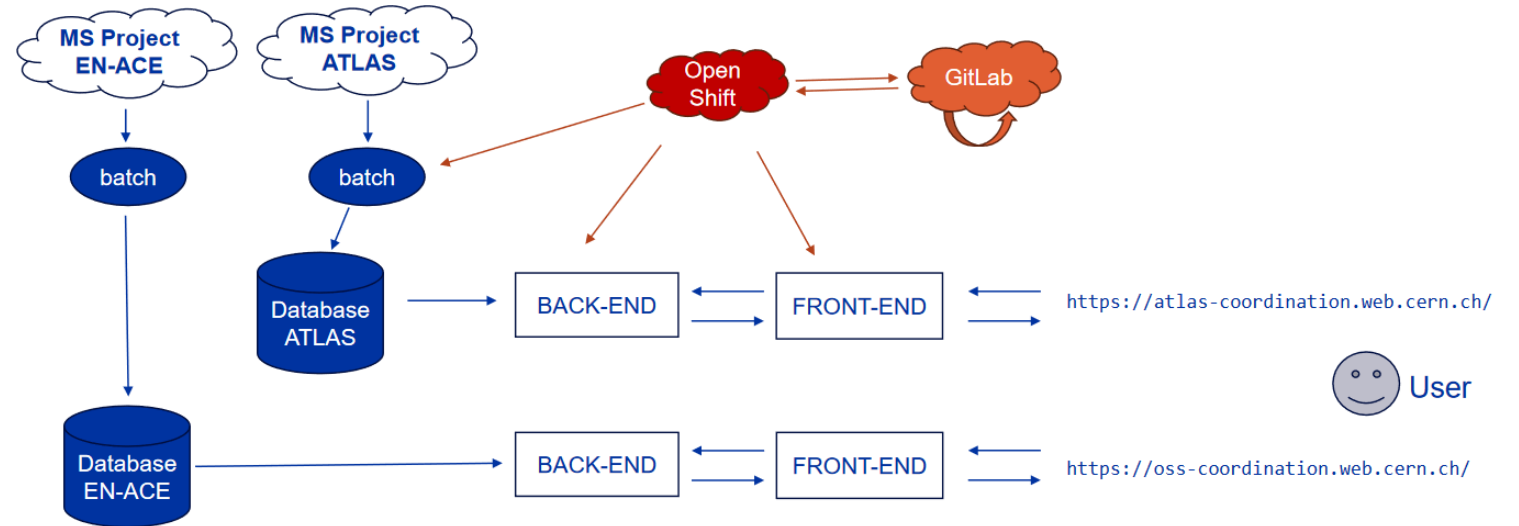
ATLAS Collaboration

ATLAS coordination team needed a visible Gantt viewer without an MS Project license

Solution:

Two-way collaboration that provides a similar Gantt viewer for ATLAS

- ATLAS provides a software developer to reproduce Gantt Viewer for ATLAS
- Scheduling Tools follows the development and remains the owner of the tool

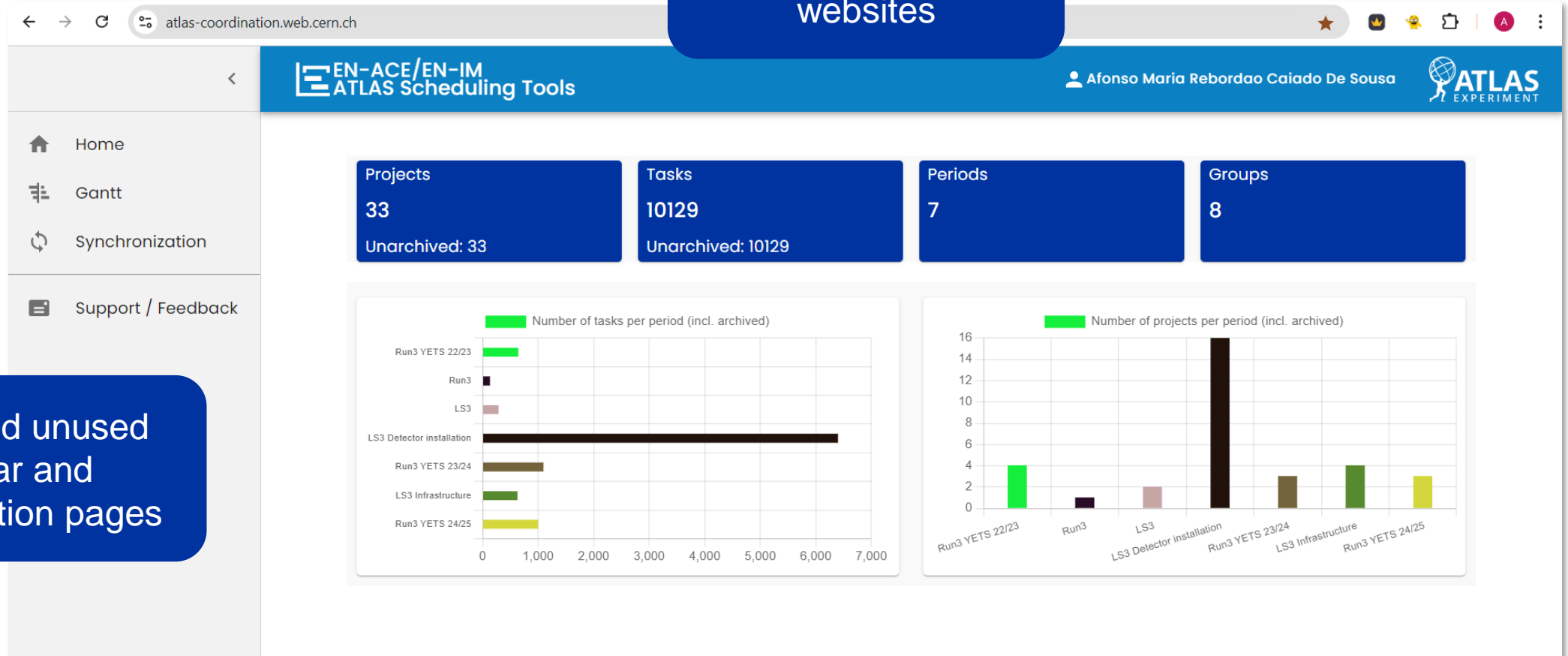


Results:

- Successful export of Gantt Viewer into ATLAS coordination needs, benefiting from ATLAS's resources to implement new functionalities in the tool
- Demonstration of the benefits of **Groups cooperation at CERN**: A unified methodology facilitating seamless data sharing

ATLAS Collaboration

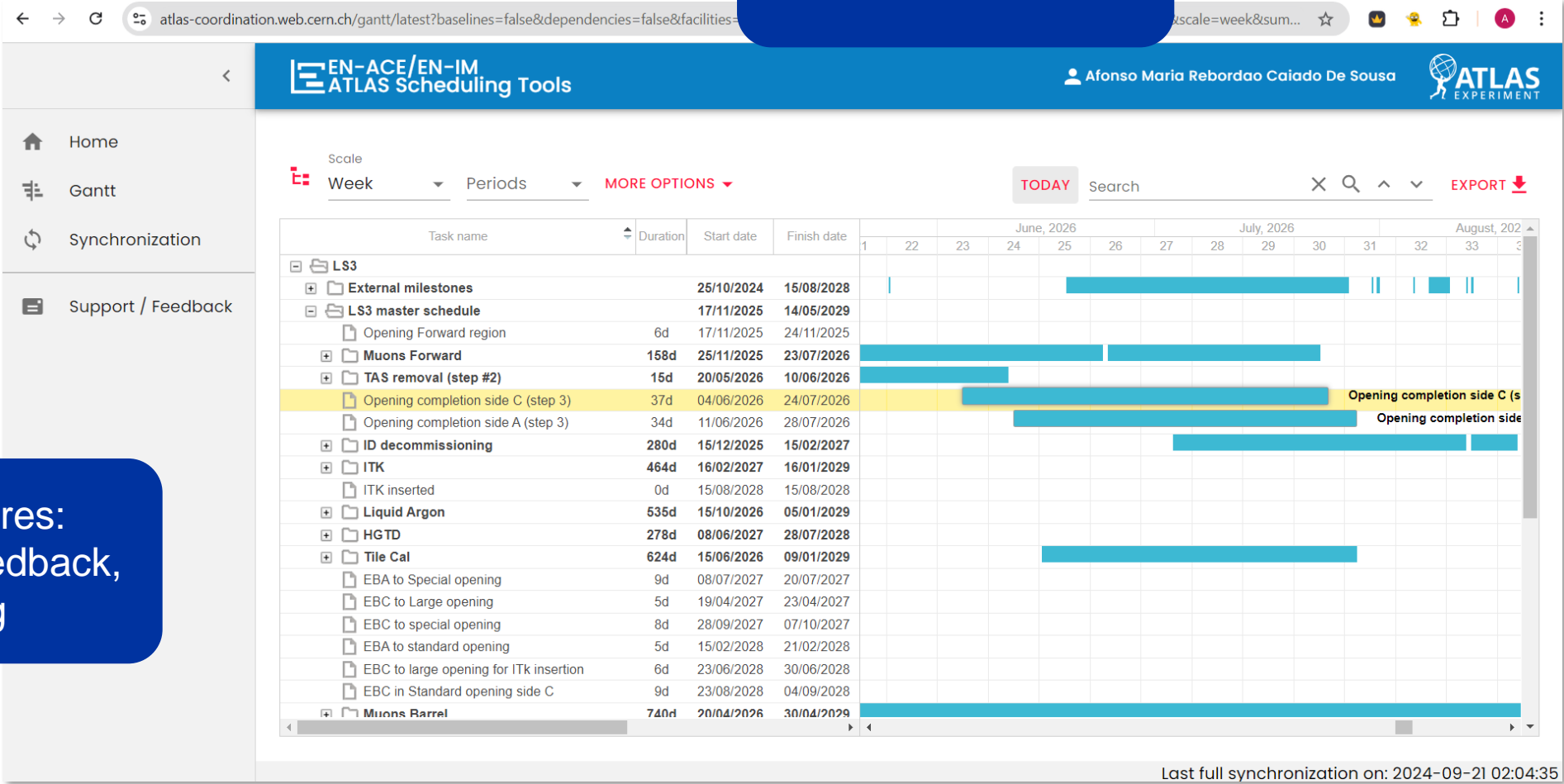
Replicated the Scheduling Tools websites



Removed unused Linear and Visualization pages

ATLAS Collaboration

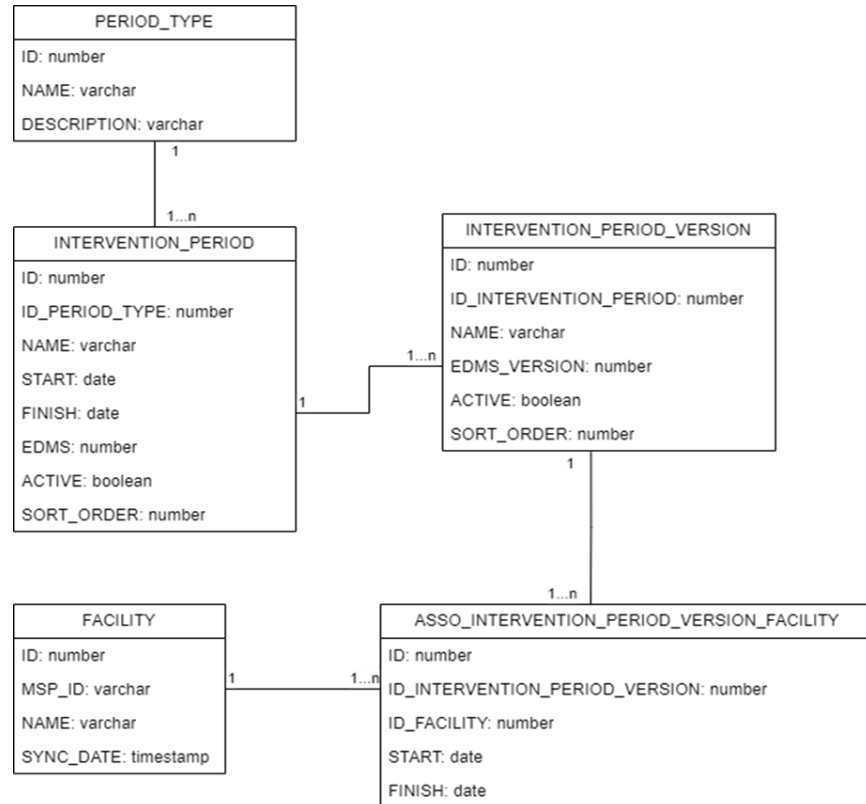
Organization of the Gantt chart by Period



New features:
Support / Feedback,
Sorting

Intervention periods - IMPACT

Intervention Periods Centralization between Scheduling Tools Project and IMPACT Databases EDMS 3064968



Data model for inserting intervention periods information in the STP database

PROCEDURE

Intervention Periods Centralization between Scheduling Tools Project and IMPACT Databases

ABSTRACT:

This document describes the process and roles to centralize the intervention periods used in IMPACT with the Scheduling Tools Project Database

DOCUMENT PREPARED BY: Afonso Caiado de Sousa – EN/ACE Giovanni Chierico – EN/IM Estrella Vergara Fernandez – EN/ACE	DOCUMENT CHECKED BY: M. Bernardini, S. Chemli (EN/ACE) J. Nielsen (BE/OP) A.-L. Perrot (on behalf of the Intervention Management Steering Board)	DOCUMENT TO BE APPROVED BY: R. Steerenberg (BE/OP GL) J.-P. Tock (EN/ACE GL)
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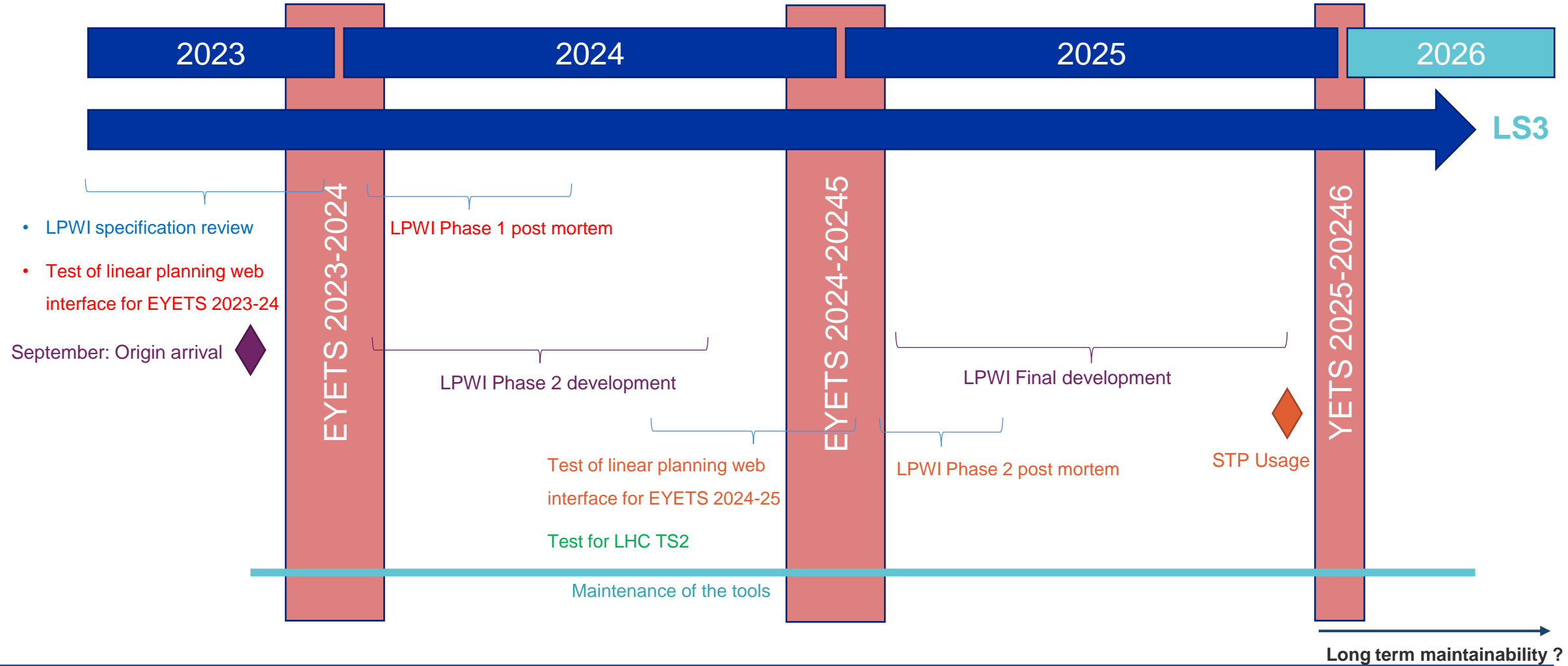
DOCUMENT SENT FOR INFORMATION TO:
Facility Coordinators and Facility Administrators

This document is uncontrolled when printed. Check EDMS to verify that this is the correct version before use.



Next steps

Project Management Plan – Roadmap



What's next

The main objective

Deliver a robust and user-friendly Linear Planning Web Interface for the LS3, ensuring compatibility across all accelerators.

How?

1. Performance Optimization

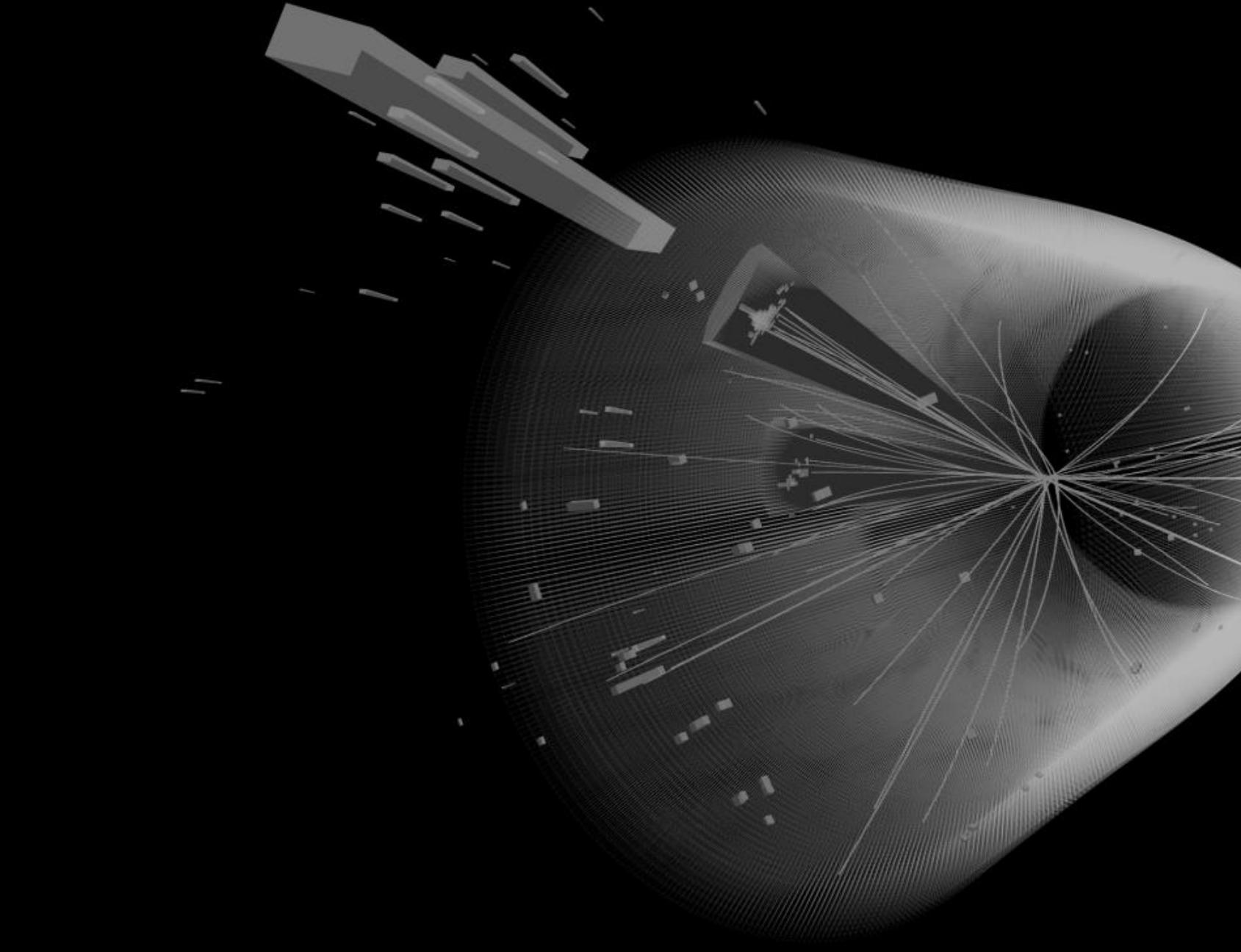
- Enhance app performance by refining backend processes, reducing loading times, and improving overall responsiveness.

2. Feature Refinement and Expansion

- Continuously improve existing features based on user feedback and introduce new functionalities to meet evolving needs.

3. Master Schedule Integration

- Implement the ability to create and view Master Schedule directly into the web interface.



Conclusions

My Conclusions

- The project is progressing well and **remains on track to meet its goals**.
- Despite challenges and constant adjustments, **working closely with end users has proven invaluable**. This collaboration enables rapid feedback and continuous improvements.
- This project helps me grow by managing development, handling user requests, and setting priorities.
- I'm grateful for the **collaboration among ACE developers** that we were able to establish with Victor and Georg. It advances the project, applies industry standards, balances fast development, and fosters creativity.

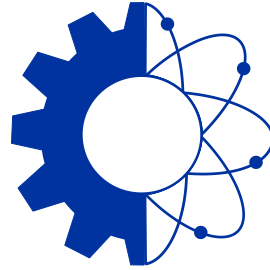
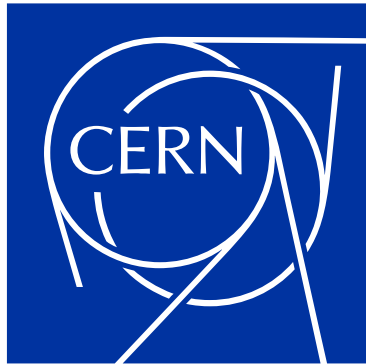
Acknowledgements

Estrella: for your unwavering positivity and help in tackling the challenges we face together.

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Any questions?



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