Istituto Nazionale di Fisica Nucleare

WA9 - Infrastructures

TDR Review Committee – Second meeting

Outline

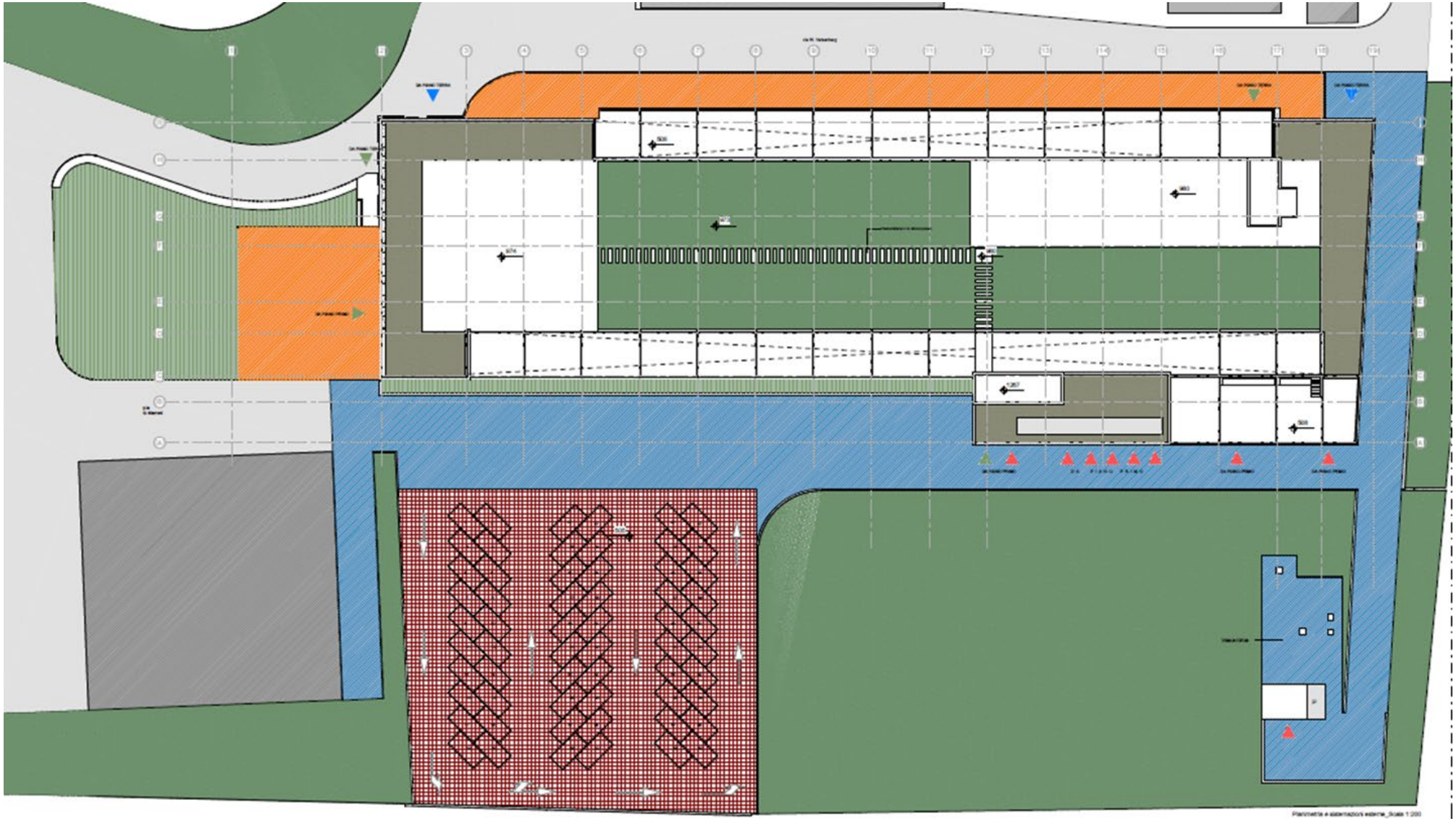
- WA 9 since last time
- Building Final Draft status
- Planning
- R.C. F&R from previous meetings
- WA 9 R&D Financial requests

WA 9 since last time

- Building Final Draft was officially delivered by the engineering company (Mythos)
- INFN review process was carried out and there's a meeting scheduled for tomorrow with Mythos for the final "rigging" and approval (see next on planning and costs)
- After FD validation the building permitting request process will start (already started preliminary activities, in order to accelerate and save time)
- A dedicated review meeting with an expert panel (chaired by L. Scibile) will take place by the end of the year to validate the main technical choices for civil works and plants

Building Final Draft status

Building Final Draft status



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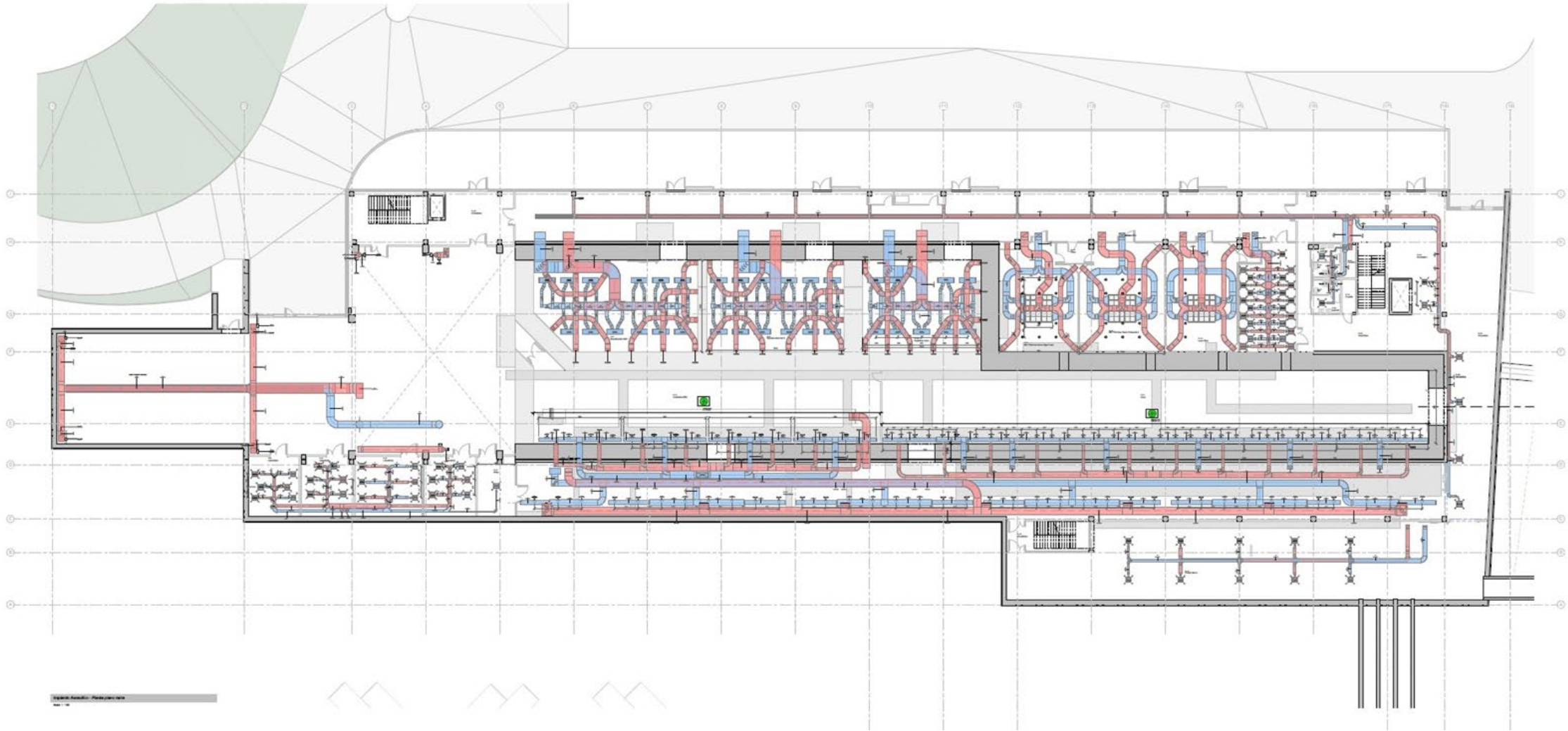

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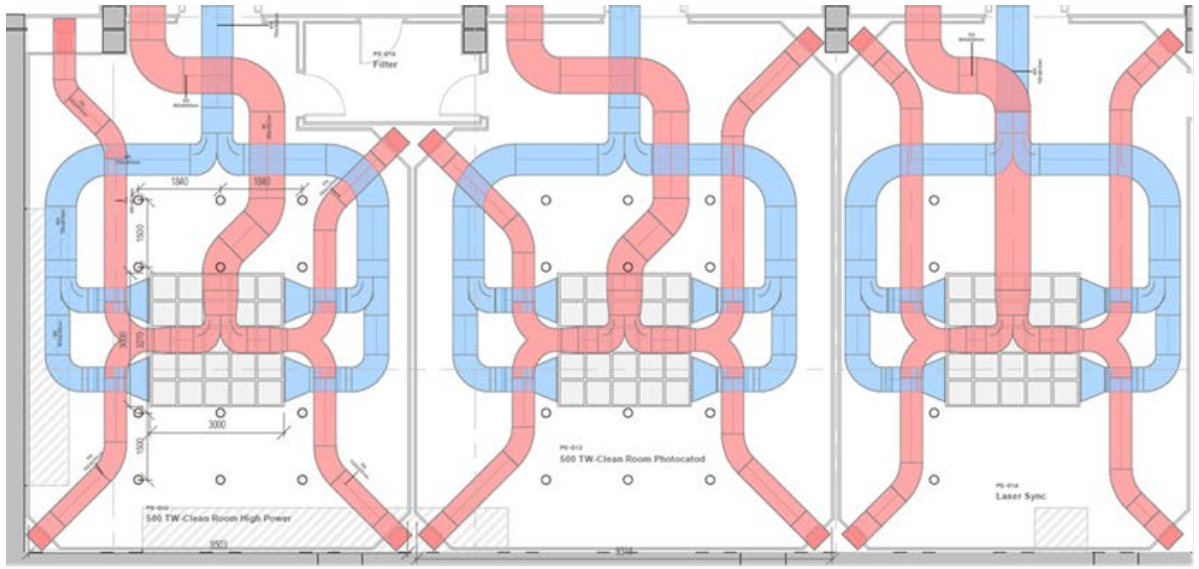

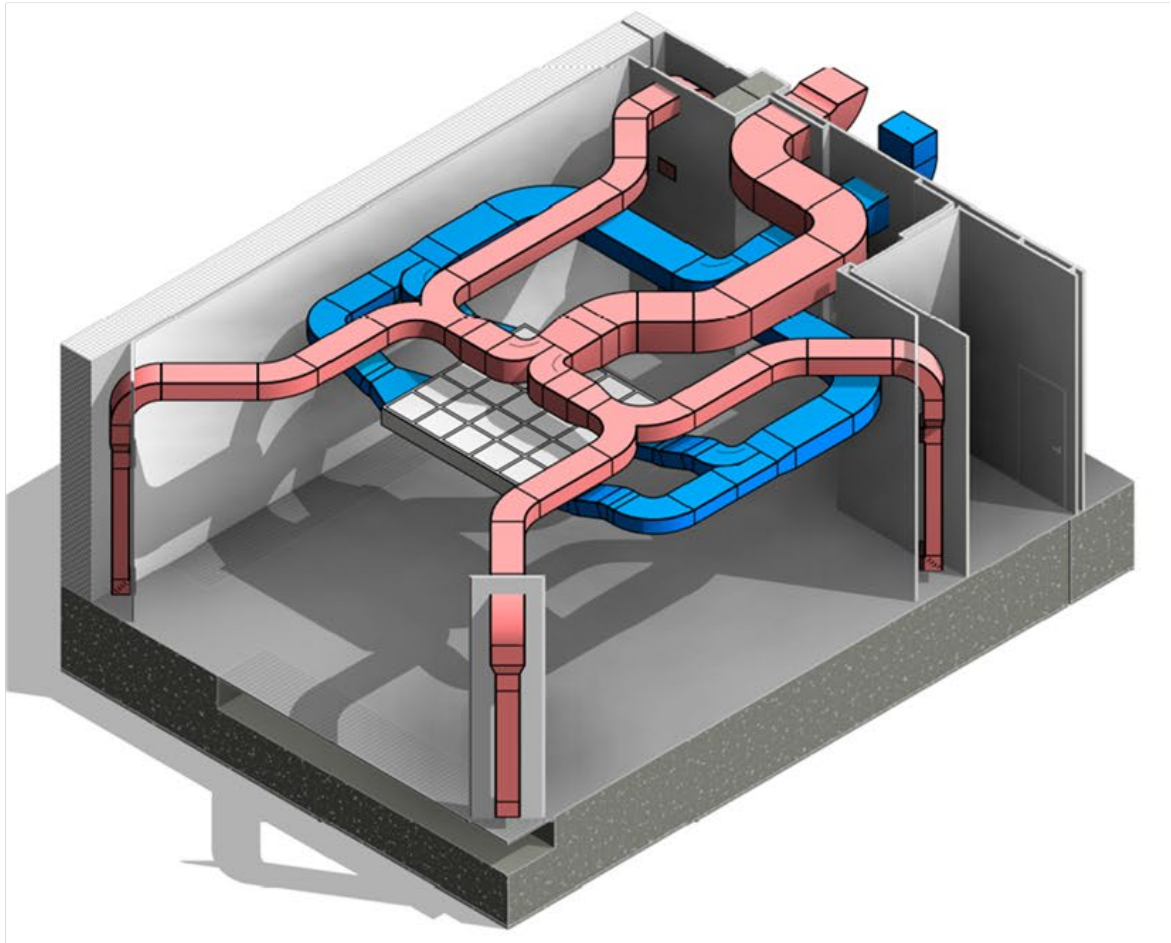

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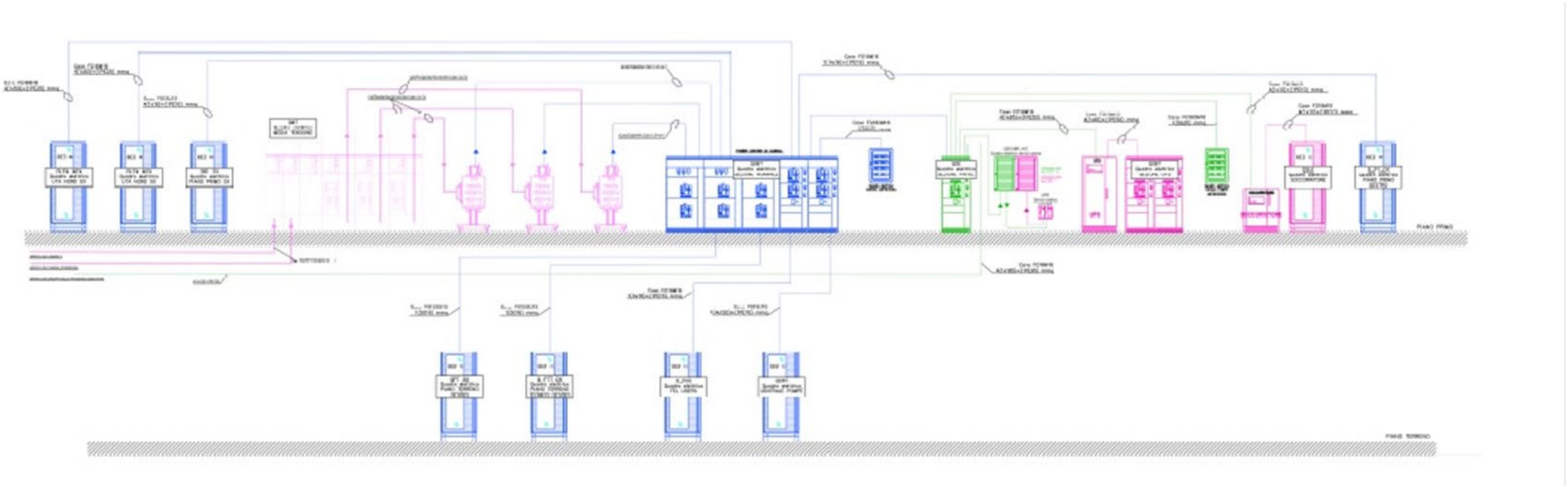

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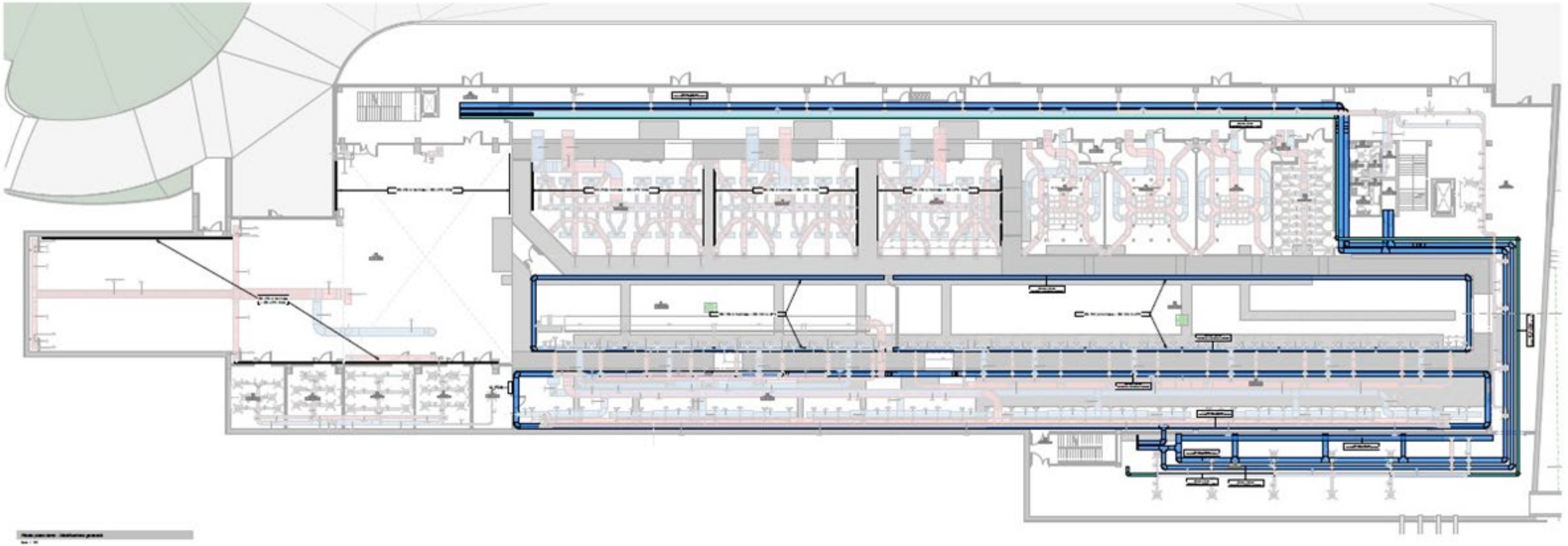

Planning

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32		**6**	**HI-TECH ELECTRICAL INSTALLATIONS [HARMONIC REJECTION FILTERS]**	**800 days**	**Thu 15/06/23**	**Wed 08/07/26**	
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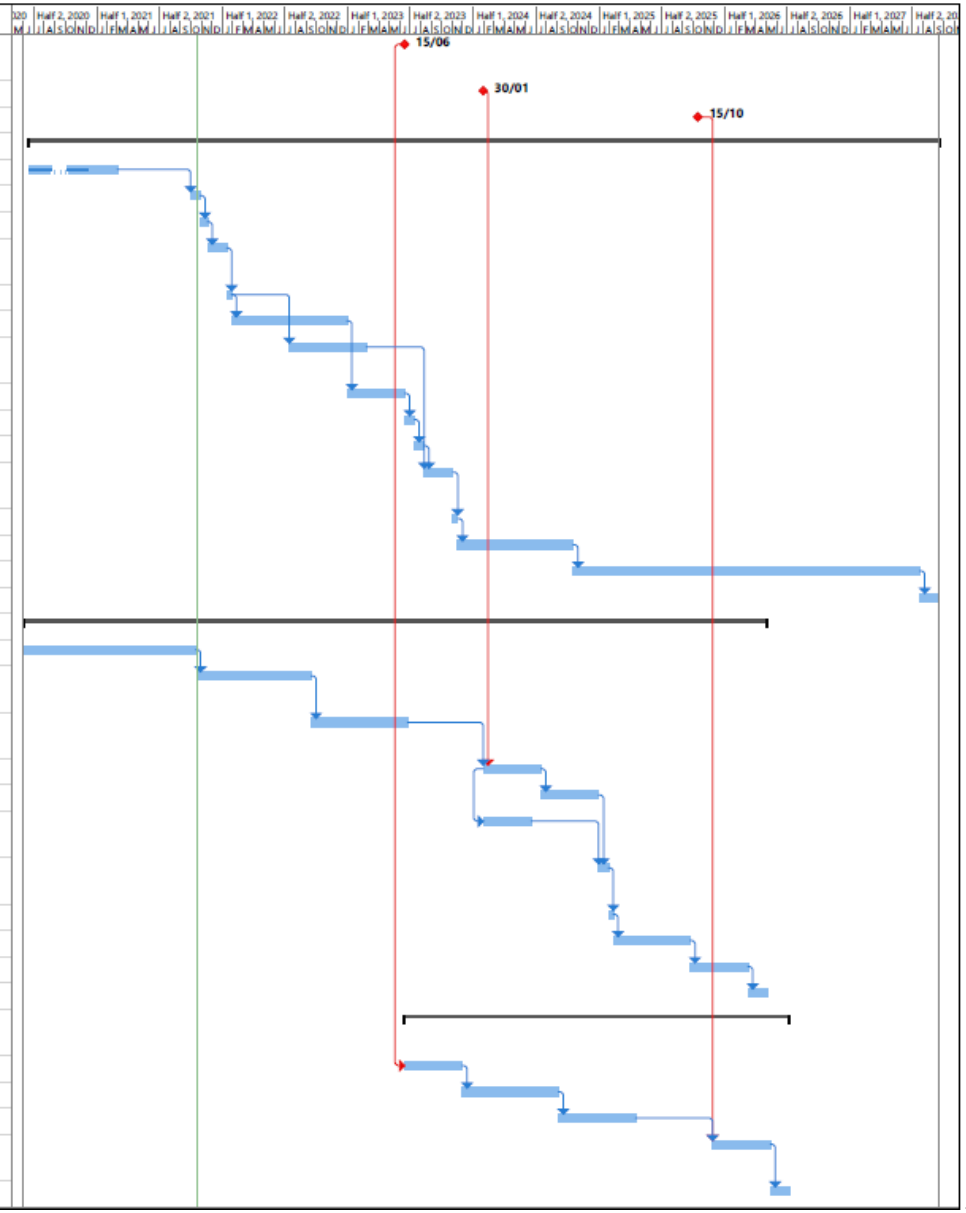
36		6.4	Supply and Installation + Machine Components' Hookup	6 mons	Thu 27/11/25	Wed 13/05/26	35FS+8 mons;3
37		6.5	Commissioning and Start-up	2 mons	Thu 14/05/26	Wed 08/07/26	36



Planning

- As we are running late (accumulated during FD phase), we considered changing the building baseline trying to recover time
- The tender for the external administrative check was postponed only for the DED. This can make us recover 3-4 months
- We considered adding some contingency to the construction phase of the building, in order to be more adherent to current Civil Works time spans
- A cost review of the Building with the LNF Steering Committee and INFN GE is foreseen after the meeting with Mytos

Planning

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Final Draft Administrative Check (appointed professional)

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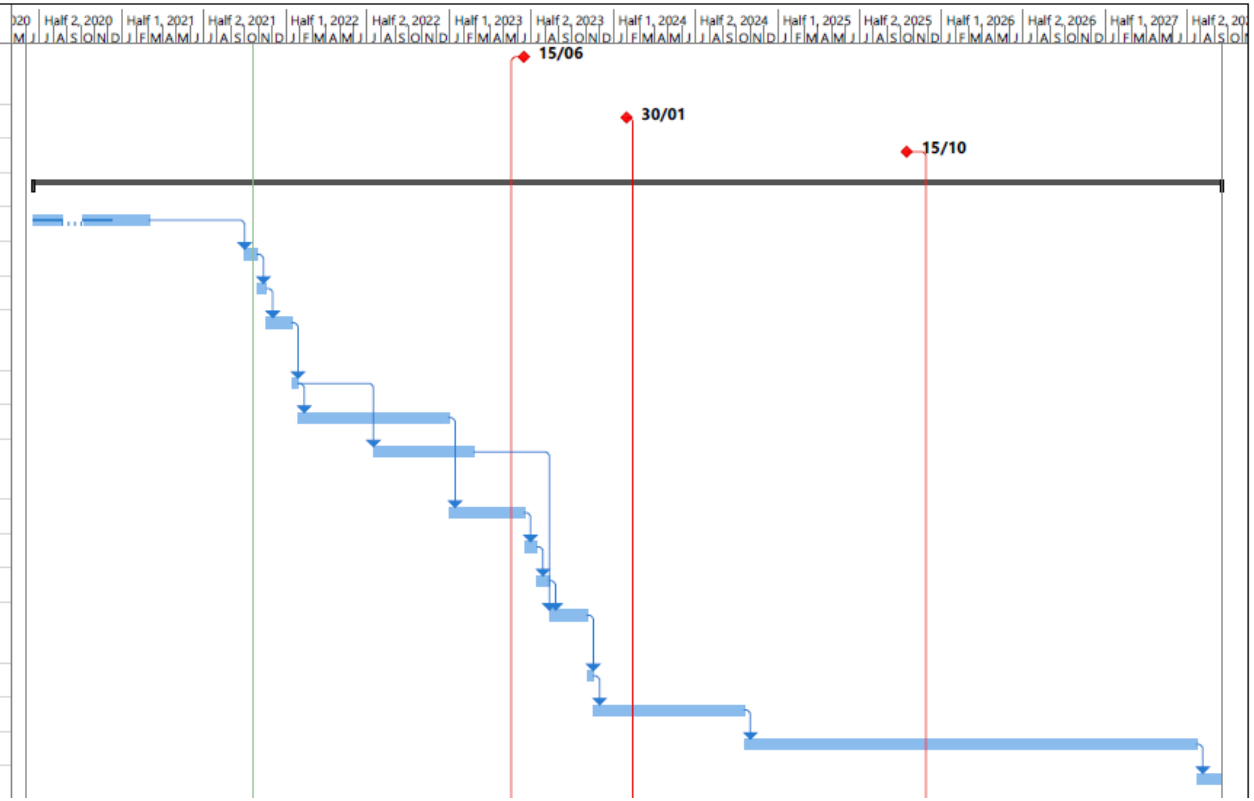

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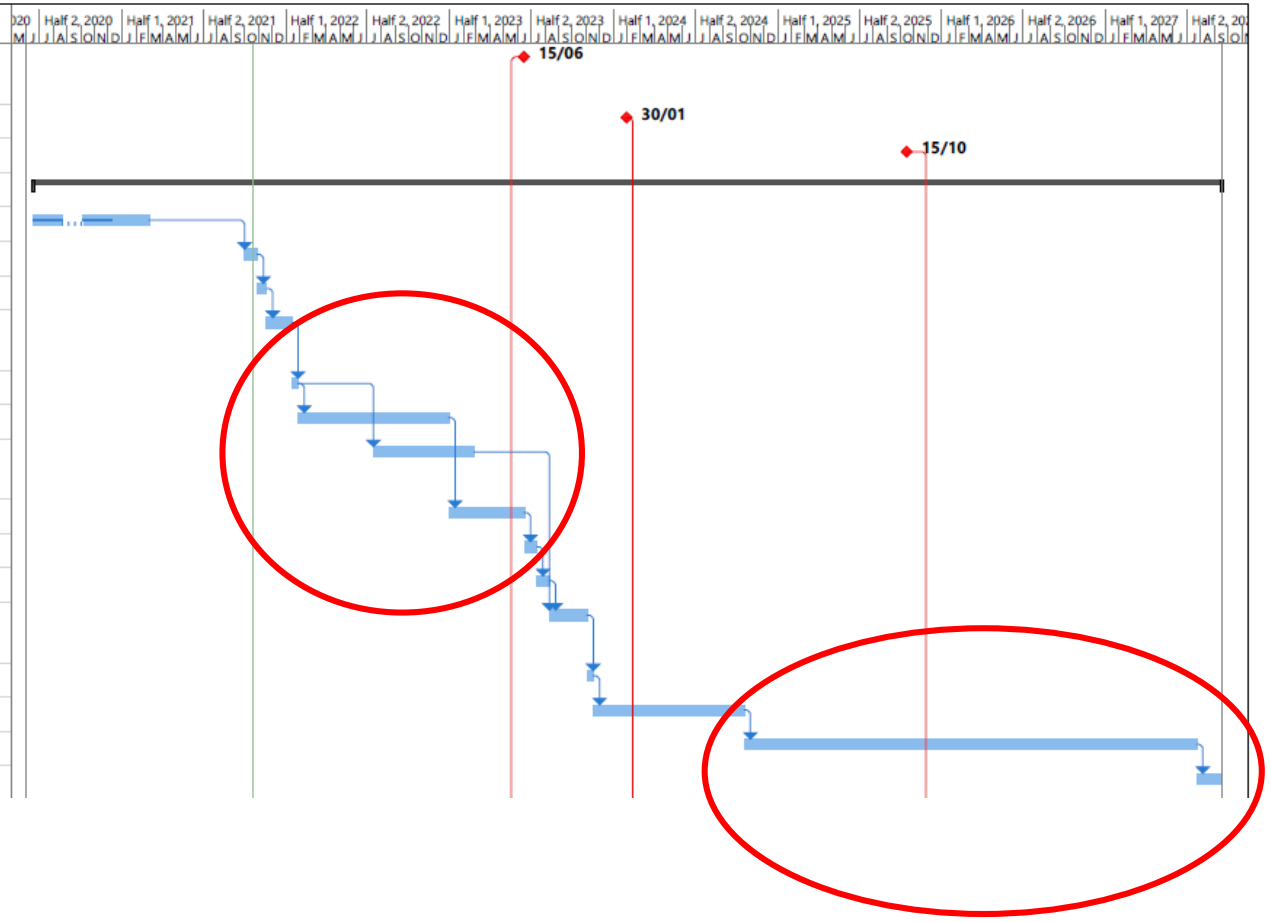


R.C. F&R from previous meetings

RC: *"The chapter on the electrical power distribution shall include the summary of the actual power requirements for each equipment to be able to judge the proposed design"*

Electrical detailed design is based on the base-line of RF and Magnets power supply estimation:

	Power demand	Max Power Available
RF Power supply: 2 S-band modulators 4 X-Band modulators 1 X-Band modulators	700 kVA	1000 kVA
Magnet Power supply:		
Baseline: E_TL2=1GeV - E_TL3=1 GeV	562 kVA	1000 kVA
Upgrade: E_TL2=2GeV - E_TL3=5 GeV	773 kVA (total)	

Courtesy Ruggero Ricci

R.C. F&R from previous meetings

	KVA
RF power Units	700
Magnet PS (included upgrade @5 GeV)	773
Laser	150
Experiemental users	300
Vacuum, electronics and controls	100
Tot machine	2023
Process Cooling	360
HVAC	400
Lighting	30
Services	30
Tot AUX	820
Total Power demand	2843

MV/LV substation: 3 TR 1600 kVA	4800
Load/installed	59%

Potential extensions

- 4th Transformer space and box and power available
- Harmonic compensation Filter, depending on the design of modulators
  - to be defined after modulator design approval -> see WA 4
- Voltage dip compensator

Courtesy Ruggero Ricci

R.C. F&R from previous meetings

RC: *"Detailed radio-protection calculations shall be carried out before detailed design of the civil engineering structures."*

In order to perform detailed calculations machine layout, as per components and their position, should be fixed

As this is part of the TDR issuing, calculations have been carried out taking into account safety margins and worst case assumptions

As preliminary calculations have been carried out for the dumps, these can be evaluated exploiting the possibility to validate them for the STAR Project ongoing in Calabria, for which same dumps are in use

Courtesy Adolfo Esposito

R.C. F&R from previous meetings

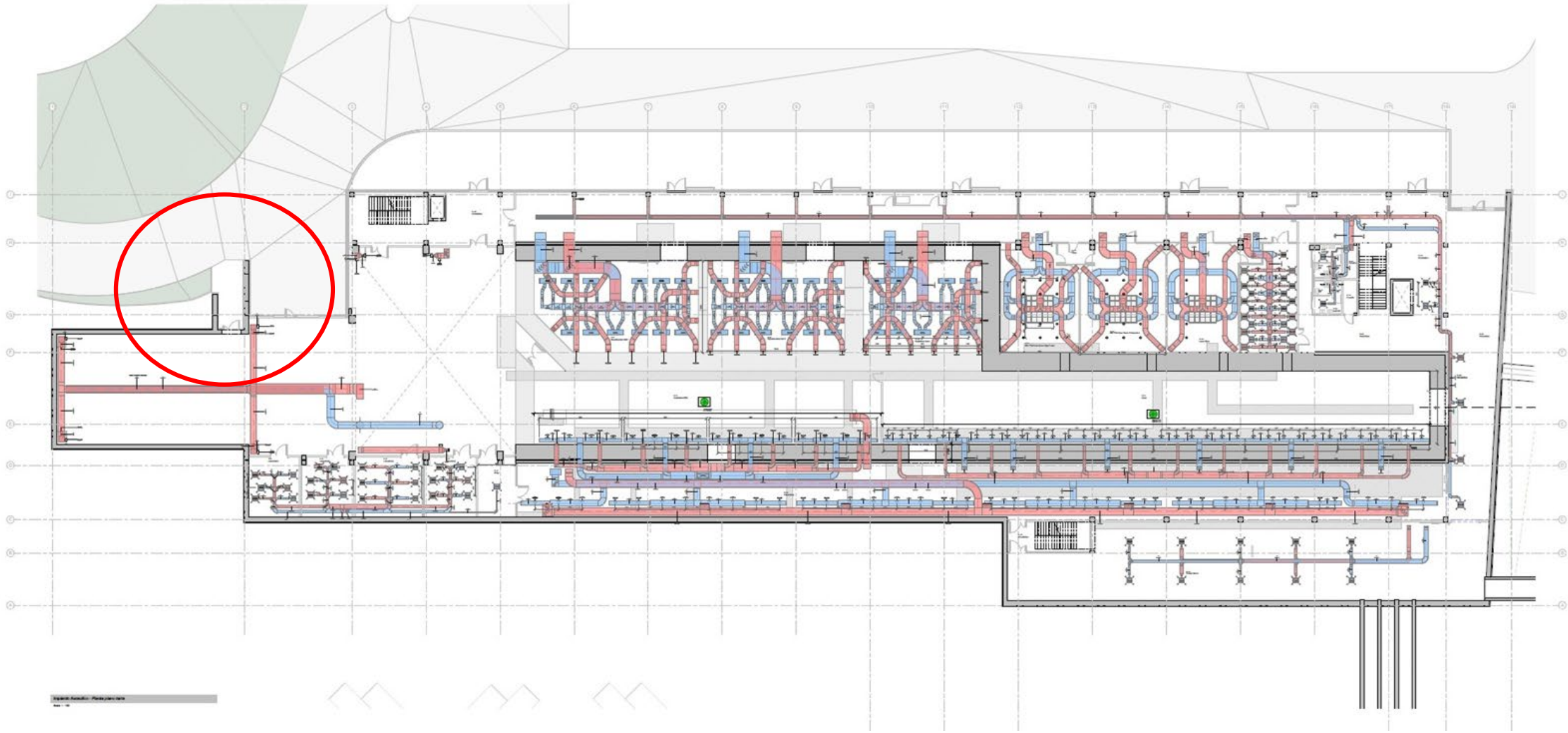
RC: *"Fire protection concept adopted for the buildings and the infrastructure (sectorisation, fire escapes, smoke extraction, type of the ventilation, etc.)"*

The study and verification of the project parameters are the results of the application of a legislative framework that falls within the scope of the Presidential Decree n. 151 of 2011. Nuclear accelerator machines fall under activity no. 58 of the same decree. For the Eupraxia complex, both for the building and for the infrastructures, the specific rules will be applied in a prescriptive manner, because their applicability already provides for the verification of a risk scenario and its containment

Dr. S. Vescovi is conducting the authorization process at the institutional bodies delegated to carry out legal checks

Courtesy Sandro Vescovi

R.C. F&R from previous meetings



WA 9 R&D Financial requests

- **RadioProtection studies 50k€ for 2022**

This request is for the purchase of instrumentation needed to characterize the components and test the dumps for RP purposes

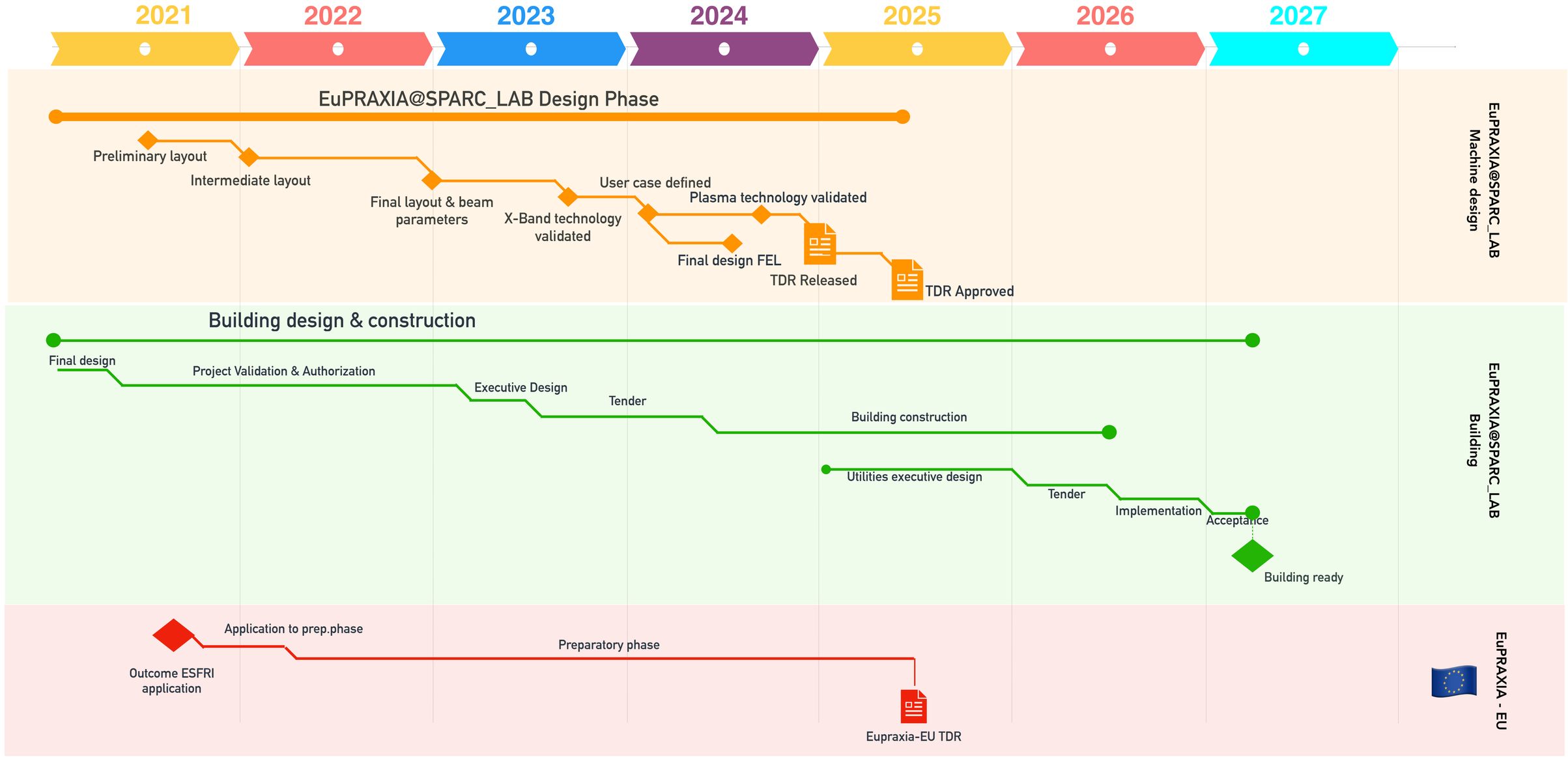
- **High stability cooling skid 50k€ for 2022**

This request is for the installation of a test bench to characterize, from a thermal and hydraulic point of view, the main and most demanding components of the accelerator as soon as prototypes are available

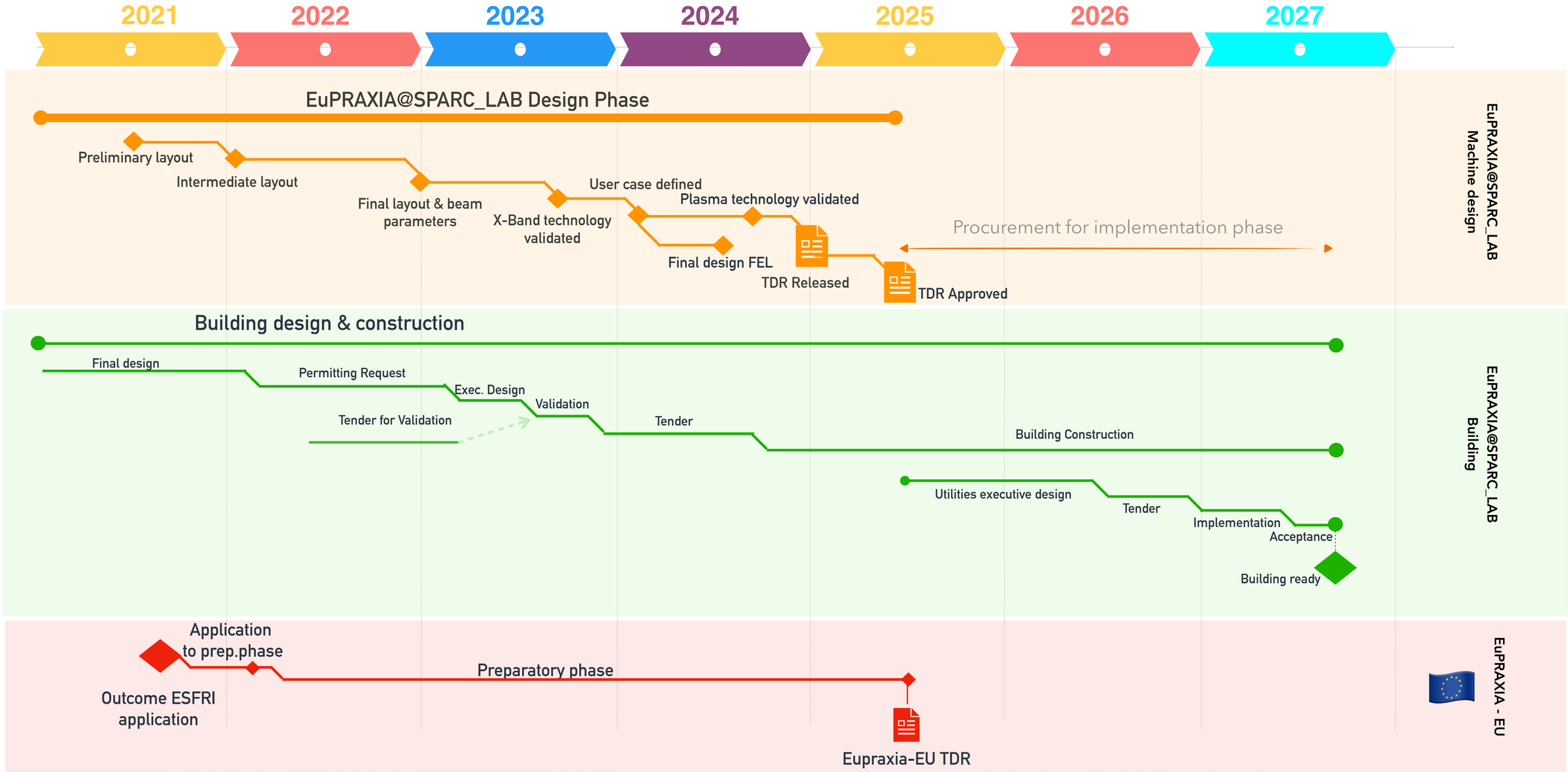
Thank you for your attention

SPARE SLIDES

Roadmap towards TDR - Old Baseline



Roadmap towards TDR - new baseline



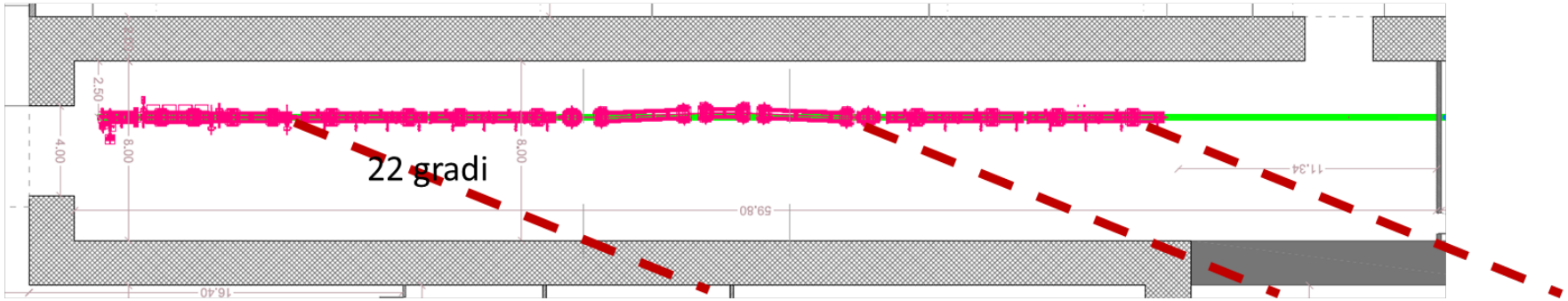
Beam DUMPs

Max Values	DUMP_1.1	DUMP_1.2	DUMP_1.3	DUMP_2	DUMP_3
Location	Injector Exit	Compressor Exit	Plasma Exit	FEL Exit	Compton/Positron Sources Exit?
Energy [GeV]	0.3	0.8	1.2	1.2	5
Q [pC]	500	500	500	500	50
Peak Current [kA]	3	3	3	3	3
Rep. Rate [Hz]	100	100	100	100	100
Average Current [nA]	50	50	50	50	5
Beam Power [W]	15	40	60	60	25

All the five dumps foreseen at the present serve to avoid that the primary beam hits the shielding walls and to absorb the electromagnetic cascade.

Dumps layout are mainly determined by parameters of the impinging beam as listed in table as well as by angle of electron deflection and dose constraints for external areas.

Main features of a dump:
Absorption efficiency, lifetime, compactness, simple fabrication method, induced radioactivity, thermal characteristics of dump materials, dump handling



Courtesy A. Esposito

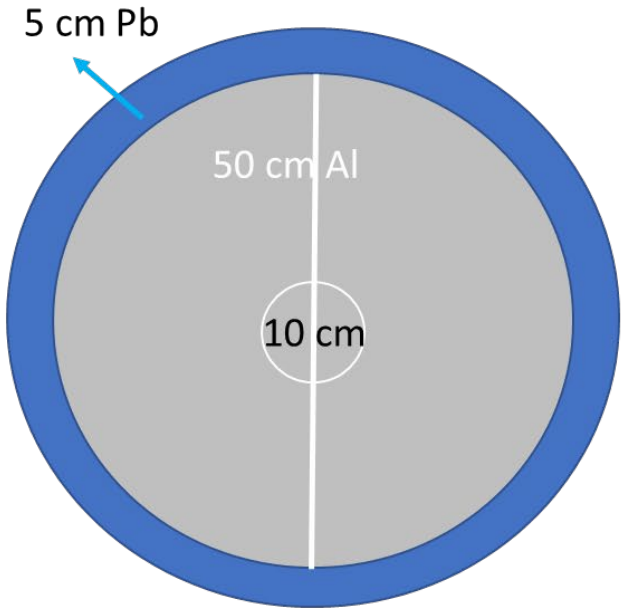
Beam DUMPs

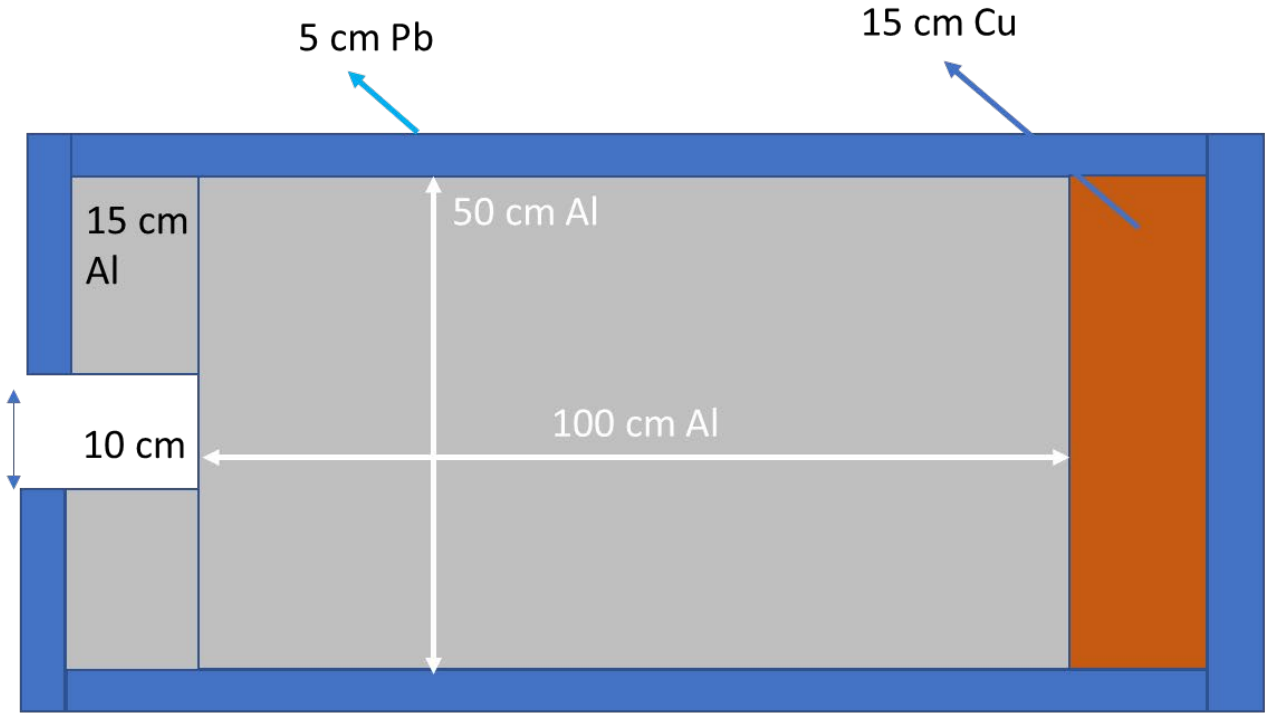
Energy 1GeV power 60 watt

Energy 5 GeV power 25 watt

Dumps with graphite instead the aluminum are also being considered

No cooling should be necessary considering the powers involved but a calculation with Ansys should be done





Total weight kg 2400

In the lower energy cases, a thickness of Al equal to 50 cm and 25 cm was used. Total weight 1680 and 1300 kg

Courtesy A. Esposito

Permitting

- For authorization purposes, as far as the IAM – FD area is concerned, the Eupraxia complex design, both from the architectural point of view and from the accelerating machine point of view was analysed in accordance to the requirements of the new Fire Prevention Code issued by the D.M. of 03/08/2015 and s.i. .
- Preliminary contacts with the Command were already made in order to obtain, by means of the Certified Report, the Start of the Activity to operate the Machine pursuant to the D.P.R. 151/2011
- At present, no problems in obtaining the necessary authorizations are envisaged.

Courtesy S. Vescovi

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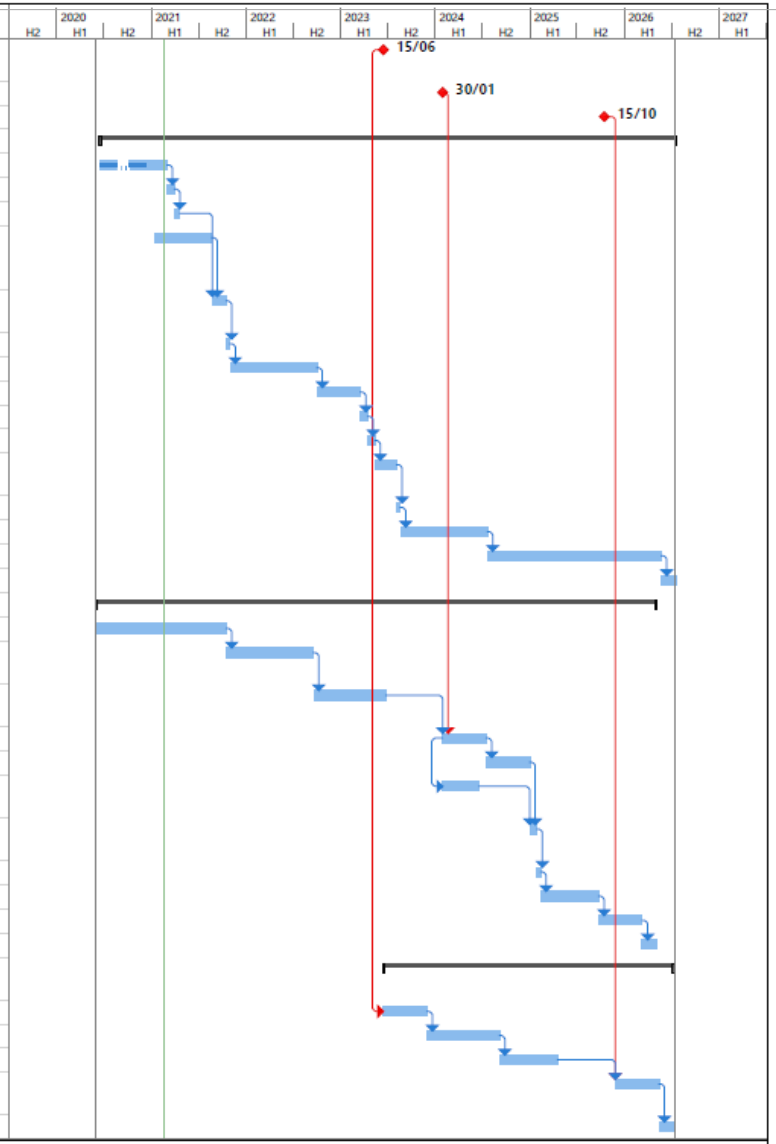
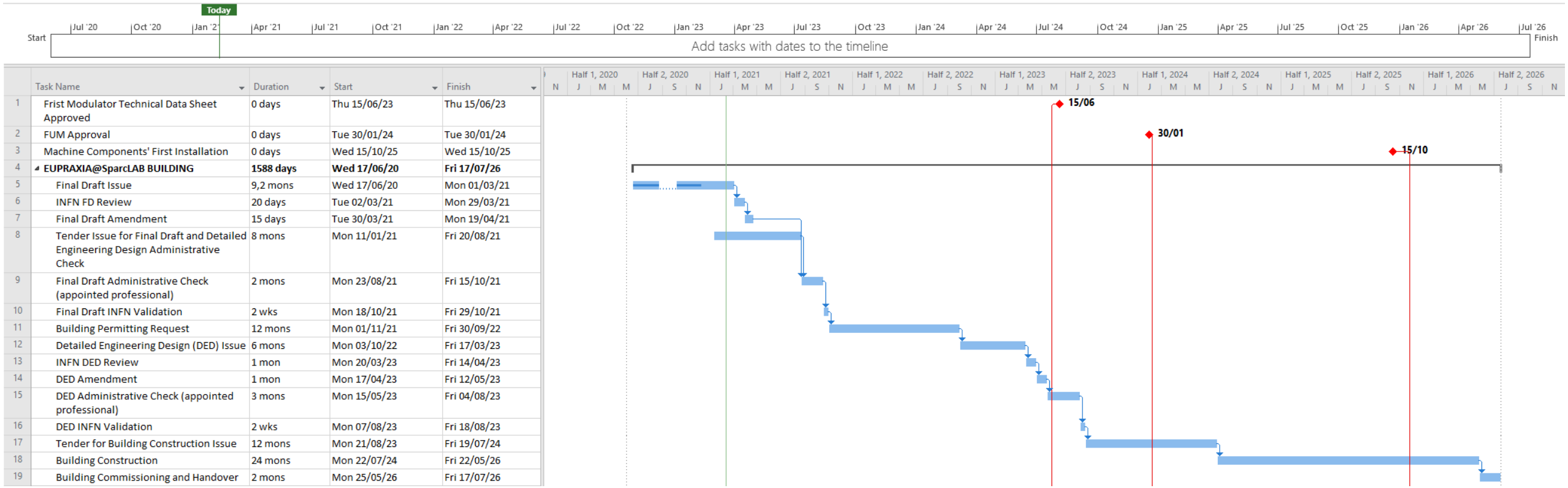
35		6.3	Tender for Installation	8 mons	Thu 05/09/24	Wed 16/04/25	34
36		6.4	Supply and Installation + Machine Components' Hookup	6 mons	Thu 27/11/25	Wed 13/05/26	35FS+8 mons;3
37		6.5	Commissioning and Start-up	2 mons	Thu 14/05/26	Wed 08/07/26	36



Project: WA9 Road to TDR_v3_e
Date: Sat 20/02/21

Task | Split | Milestone | Summary
Project Summary | Inactive Task | Inactive Milestone | Inactive Summary
Manual Task | Duration-only | Manual Summary Rollup | Manual Summary
Start-only | Finish-only | External Tasks | External Milestone
Deadline | Progress | Manual Progress

Planning



	Task Name	Duration	Start	Finish
1	Frist Modulator Technical Data Sheet Approved	0 days	Thu 15/06/23	Thu 15/06/23
2	FUM Approval	0 days	Tue 30/01/24	Tue 30/01/24
3	Machine Components' First Installation	0 days	Wed 15/10/25	Wed 15/10/25
4	**EUPRAXIA@SparcLAB BUILDING**	**1588 days**	**Wed 17/06/20**	**Fri 17/07/26**
5	Final Draft Issue	9,2 mons	Wed 17/06/20	Mon 01/03/21
6	INFN FD Review	20 days	Tue 02/03/21	Mon 29/03/21
7	Final Draft Amendment	15 days	Tue 30/03/21	Mon 19/04/21
8	Tender Issue for Final Draft and Detailed Engineering Design Administrative Check	8 mons	Mon 11/01/21	Fri 20/08/21
9	Final Draft Administrative Check (appointed professional)	2 mons	Mon 23/08/21	Fri 15/10/21
10	Final Draft INFN Validation	2 wks	Mon 18/10/21	Fri 29/10/21
11	Building Permitting Request	12 mons	Mon 01/11/21	Fri 30/09/22
12	Detailed Engineering Design (DED) Issue	6 mons	Mon 03/10/22	Fri 17/03/23
13	INFN DED Review	1 mon	Mon 20/03/23	Fri 14/04/23
14	DED Amendment	1 mon	Mon 17/04/23	Fri 12/05/23
15	DED Administrative Check (appointed professional)	3 mons	Mon 15/05/23	Fri 04/08/23
16	DED INFN Validation	2 wks	Mon 07/08/23	Fri 18/08/23
17	Tender for Building Construction Issue	12 mons	Mon 21/08/23	Fri 19/07/24
18	Building Construction	24 mons	Mon 22/07/24	Fri 22/05/26
19	Building Commissioning and Handover	2 mons	Mon 25/05/26	Fri 17/07/26

Planning

20	**HI-TECH COOLING & HVAC**	**1546 days**	**Mon 01/06/20**	**Mon 04/05/26**
21	Requirements Collection	18 mons	Mon 01/06/20	Fri 15/10/21
22	Feasibility Study [HI Stability Cooling R&D]	12 mons	Mon 18/10/21	Fri 16/09/22
23	INFN Front End Engineering Design (FEED)	10 mons	Mon 19/09/22	Fri 23/06/23
24	Tender Issue for Design Finalization	6 mons	Tue 30/01/24	Mon 15/07/24
25	FD & DED Issue	6 mons	Tue 16/07/24	Mon 30/12/24
26	Tender Issue for Design Administrative Check	5 mons	Tue 30/01/24	Mon 17/06/24
27	DED Administrative Check (appointed professional)	1 mon	Tue 31/12/24	Mon 27/01/25
28	DED INFN Validation	2 wks	Tue 28/01/25	Mon 10/02/25
29	Tender for Construction Issue	8 mons	Tue 11/02/25	Mon 22/09/25
30	Construction	6 mons	Tue 23/09/25	Mon 09/03/26
31	Commissioning and Start-up	2 mons	Tue 10/03/26	Mon 04/05/26
32	**HI-TECH ELECTRICAL INSTALLATIONS [HARMONIC REJECTION FILTERS]**	**800 days**	**Thu 15/06/23**	**Wed 08/07/26**
33	Feasibility Study [R&D]	6 mons	Thu 15/06/23	Wed 29/11/23
34	INFN DED Issue	10 mons	Thu 30/11/23	Wed 04/09/24
35	Tender for Installation	8 mons	Thu 05/09/24	Wed 16/04/25
36	Supply and Installation + Machine Components' Hookup	6 mons	Thu 27/11/25	Wed 13/05/26
37	Commissioning and Start-up	2 mons	Thu 14/05/26	Wed 08/07/26