EuPRAXIA @ SPARC_LAB

Project Management

TDR- Review Committee, 06/06/2022

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EuPRAXIA @SPARC_LAB Follow up

- EuPRAXIA@SPARC_LAB – Short introduction
- EuPRAXIA Activities post ESFRI 2021 Roadmap Inclusion
- Short general status
- Milestones status and updated baseline
- R&D and financial status 2021/2022
- RF power station X-Band
- Quality assurance & System engineering
- Manpower recruitment plan 2022-2026
- Update risk management
- Response from previous meeting reccomendations

EuPRAXIA @SPARC_LAB Short introduction

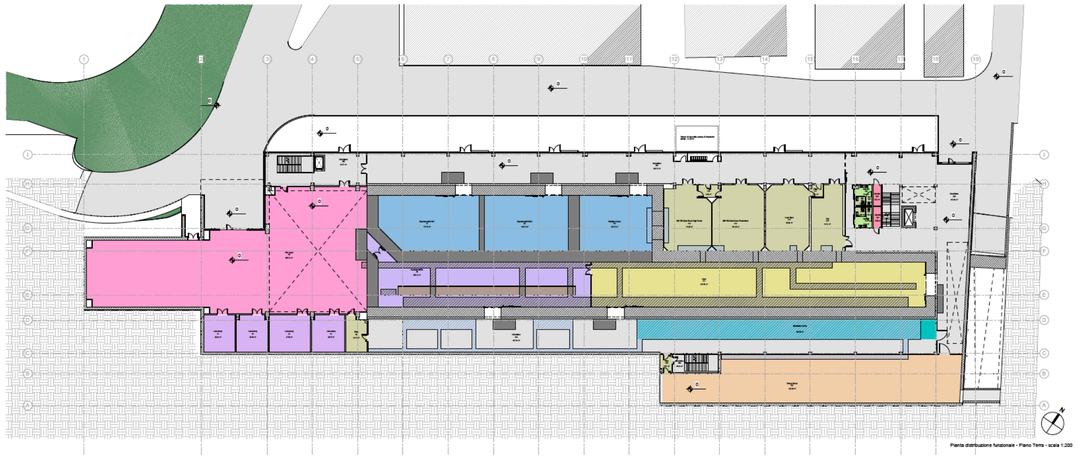
EuPRAXIA@SPARC_LAB must be intended as the first step for the realization of a European Distributed Research Infrastructure on plasma acceleration application.

EuPRAXIA@SPARC_LAB is then one of the 2 pillars. Fully funded by Italian Government (108M€).

EuPRAXIA has been included in the ESFRI 2021 Roadmap → Preparatory phase to be started in Nov. 2022 (48months).

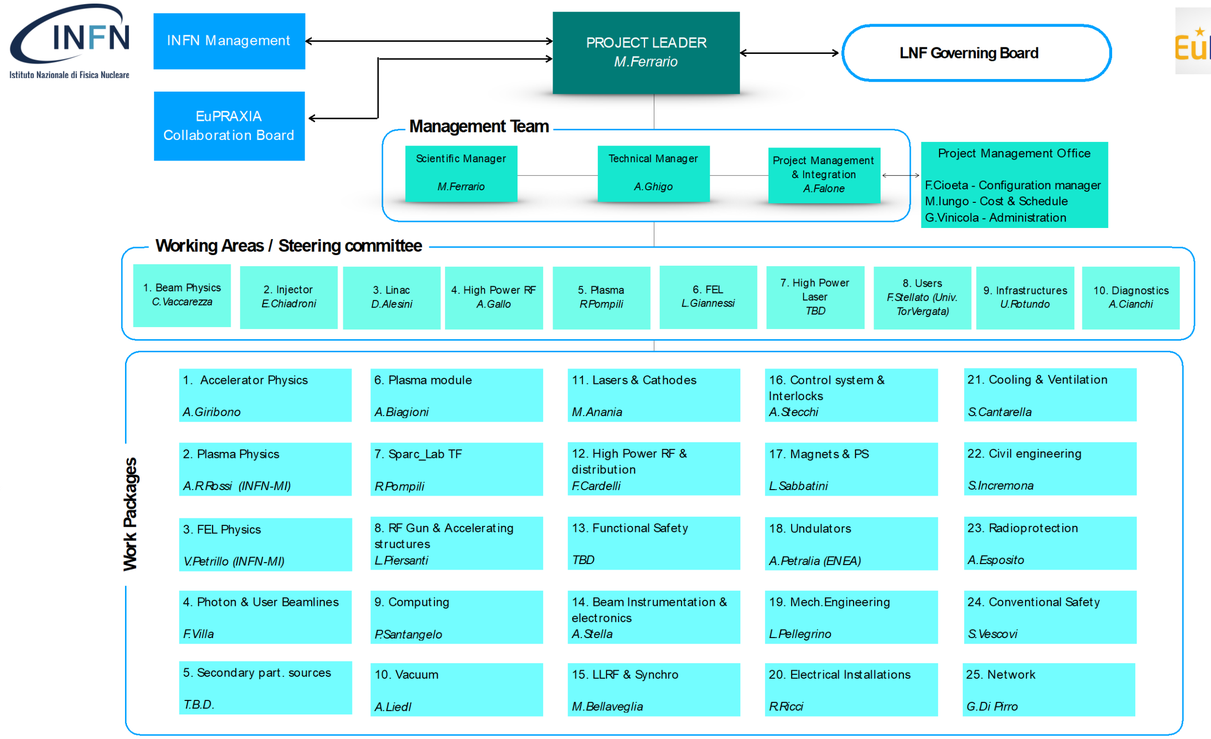
EuPRAXIA@SPARC_LAB comprises:

- Building
- 1GeV X-Band RF Linac
- Plasma module
- 1 (or 2) FEL beamline
- 1 (or 2) user end station : 4nm and 50-180nm



EuPRAXIA @SPARC_LAB Short introdcution

- Conceptual Design Report published in 2020.
- At the moment we are in the Technical Design Report phase.
- R&D funding has been secured.
- Project Management Plan in place
- GOAL → Produce a full technical design report ready for the implementation phase
- Aligned with the EuPRAXIA Preparatory Phase
- Aligned with building construction



EuPRAXIA-EU Framework activities

- June 2021- Approved ESFRI Roadmap 2021

- Jan 2022 – Application to the ESFRI Preparatory Phase, 2,5M€ (750k€ @ INFN) – Approved 12/04/2022 – Grant Agreement Phase
  Offical starting date of the EuPRAXIA Preparatory Phase 01/11/2022 (48months)

- Feb 2022 – Rome Technopole, 2.8M€ . PNRR for consolidation of Research Infrastructure. Not directly related to EuPRAXIA but in sinergy. Approved - Now in negotiation phase

- Feb 2022 – EuAPS, EuPRAXIA Advanced Photon Source. PNRR, 27M€ (1° ranking- negotiation phase to be started in the next days)

- Apr 2022 – CREATE, Plasma and X-Band technology. Infradev - Horizon Europe, 10 M€ (?)

- Apr 2022 – Marie Curie PhD Program , 2 PhDs in Accelerator Physics

- More to come…

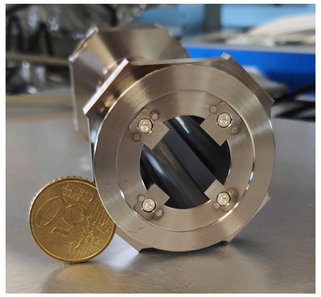
Technical Status

- Significant progress on the beam dynamics studies approaching the intermediate layout critical milestone
- Realization of mechanical and RF X-Band section prototype (on-schedule)
- Injector layout – Cost Benefit Analysis performed for different options
- Several prototypes: Compact Diagnostic Chamber, Compact Beam Position Monitor, 1° X-Band acc. Structure prototype, X-Band WG components (on schedule)
- Studies on 400Hz options → beyond the state of the art.
- Full Upgrade (EuPRAXIA-Like) of the Low Level RF System ready to be commissioned (on schedule)
- Long plasma capillary (40cm) production and testing (under-schedule)
- User workshop (Oct 2021)
- Ondulator strategy concluded (on schedule) -> Possible 2 beamlines- Second Beam Line to be approved

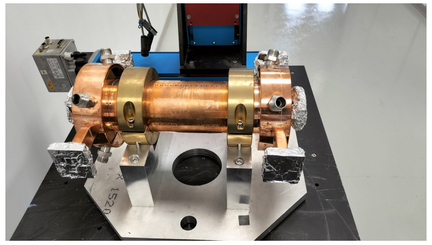
Significant progress for ALL working areas and working packages

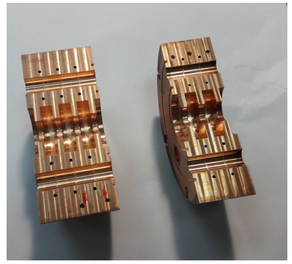
Prototyping activities

Compact BPM

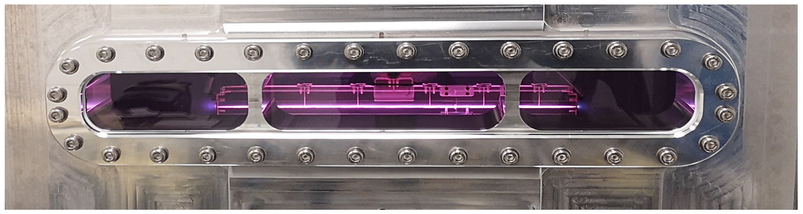


X-Band section prototype

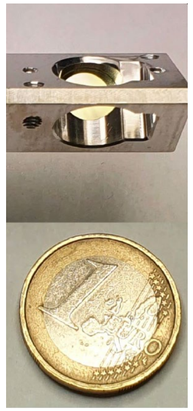


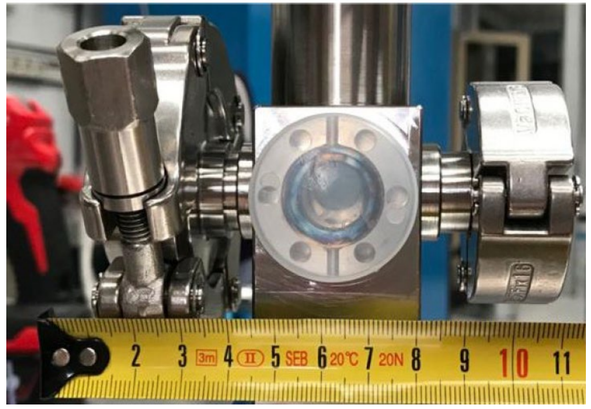


40 cm long plasma capillary

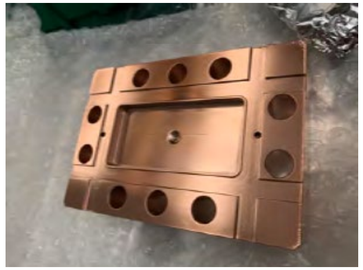


Compact Diagnostic Chamber





DESY Type – RF Flanges



Reviews

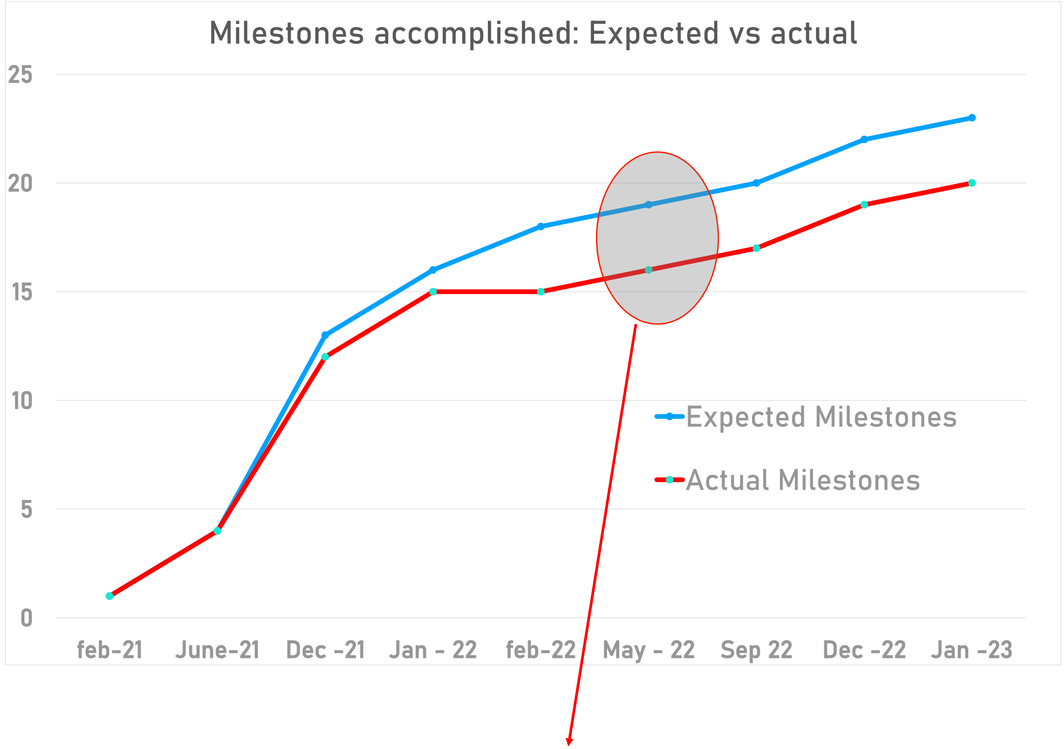
- MAC – EuPRAXIA@SPARC_LAB Special Session
- Sci-Com, 2 sessions
- EuPRAXIA Building technical review
- INFN Management Board –GE- 18/05/2022

MAIN FINDINGS & RECCOMENDATIONS

- Project Management Plan reasonable but to be upgraded
- R&D requests are sound and appropriate
- Necessity to elaborate a recruitment plan
- Some changes in the R&D Financial Requests (see next slides)
- New schedule baseline needed in order to:
  - Be aligned with building advancement
  - Be aligned with EU-Preparatory Phase
  - Resource loading
  - Reasonable contingencies (mainly due to delays hardware procurement & delivery)

Past & Upcoming milestones overview

Id	Milestone	Due Date	Status	Comment
M1.1	Preliminary machine baseline approved	June-21	DONE	
M1.2	Intermediate machine baseline approved	Dec – 21	DELAYED	See next slide
M2.1	Injector preliminary design developed	June – 21	DONE	
M3.1	Magnets specifications & Quadrupole design	Dec - 21	DONE	
M3.2	Design Waveguide system S-Band	Dec - 21	DONE	
M3.3	Design Waveguide system X-Band	Dec - 21	DONE	
M3.4	X-Band mech. Prototype ready	Dec - 21	DONE	
M3.5	X-Band RF prototype ready	Dec - 21	DONE	
TEX	TEX Fully Operational	Dec - 21	DONE	
M5.1	***Long plasma characterization***	***Dec-22***	***GOOD STANDING***	Prototype already done
M6.1	FEL Strategy	Jan -22	DONE	
M8.1	Design optical element	Dec -21	DELAYED	Almost completed
M10.1	***Test on BPM Prototype***	***Jan -23***	***GOOD STANDING***	Prototype already done
M10.3	Test on compact diag chamber	May - 22	DONE	
M10.4	***Diagnostic design***	***Sep- 22***	***GOOD STANDING***	
PO.1	Project Management Plan TDR	Feb-21	DONE	
PO.2	PMP Implementation Phase	Feb -22	DELAYED	To be realigned
PO.3	Cost book implementation phase	Feb - 22	DELAYED	RF source still pending
EU.1	Outcome Roadmap application	Jun - 21	DONE	
EU.2	Deadline Preparatory Phase Application	Jan -22	DONE	
BLDG	Final design Ready	Jan - 22	DONE	
BLDG	***Authorization Ready***	***Dec -22***	***GOOD STANDING***	Authorization process just started



This can be recovered easily except 1 critical milestone.

Implementation phase related milestones shifted.

Milestone Status

Overall progress on schedule with marginal deviations so far.

- Milestones accomplishment performance index is close to 90%.

- A critical milestone (intermediate machine layout) is delayed due to:
  Shortage of manpower (2 persons left + 1 maternity leave).
  Delay in the definition of the RF source baseline option.
  Iterative simulations more tricky than expected.
  Computing cluster speed up x4 time needed for full 3D simulation will mitigate the risk of further delays.

- Implementation phase plan (and related milestones) shifted 1 year to be consistent with building advancement, layout maturity and EuPRAXIA- Preparatory Phase project (48months instead of 36 originally planned).

- Prototyping production is going as predicted.

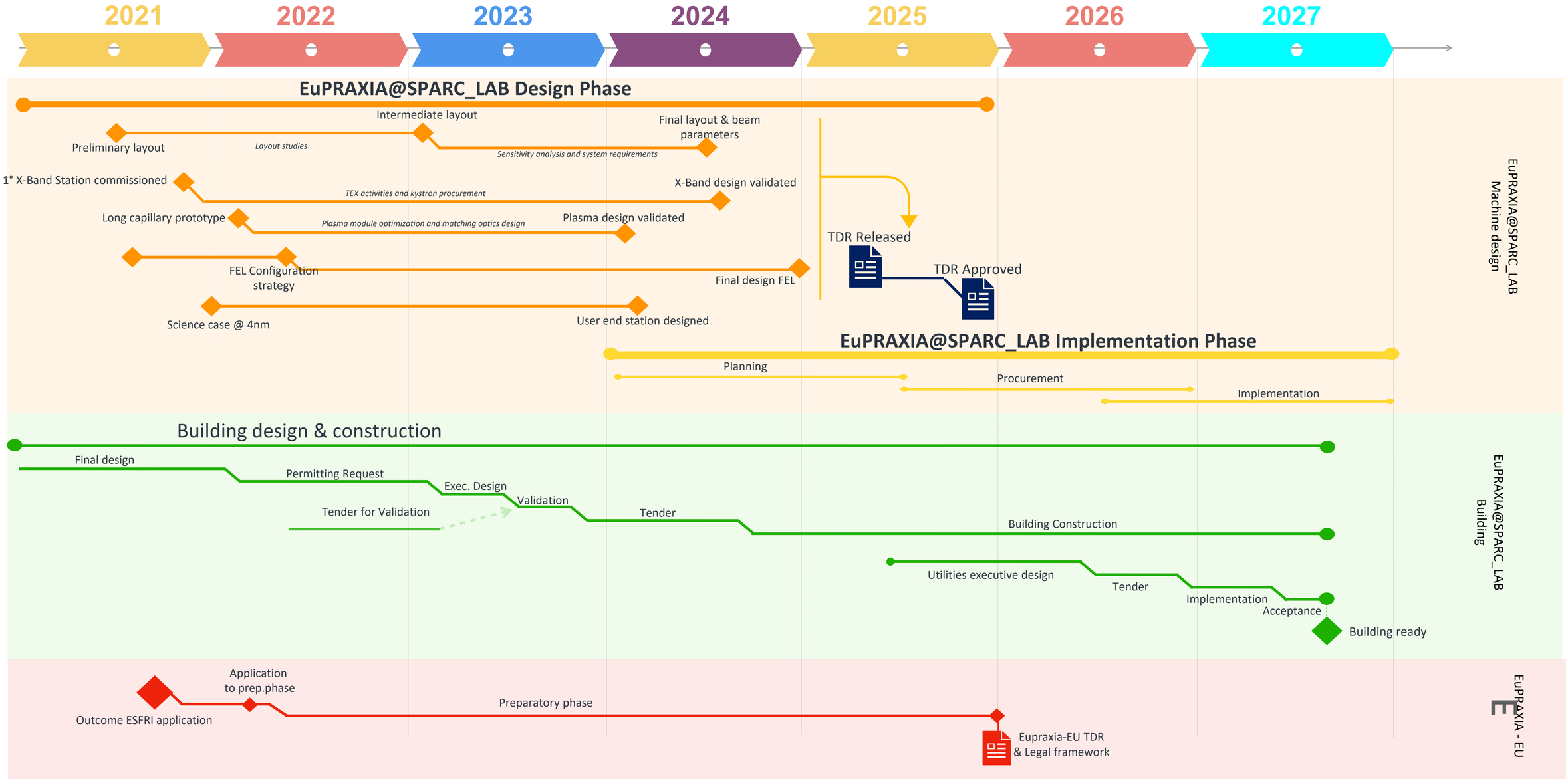
- New Baseline is needed anyway (see next slide).

Schedule update

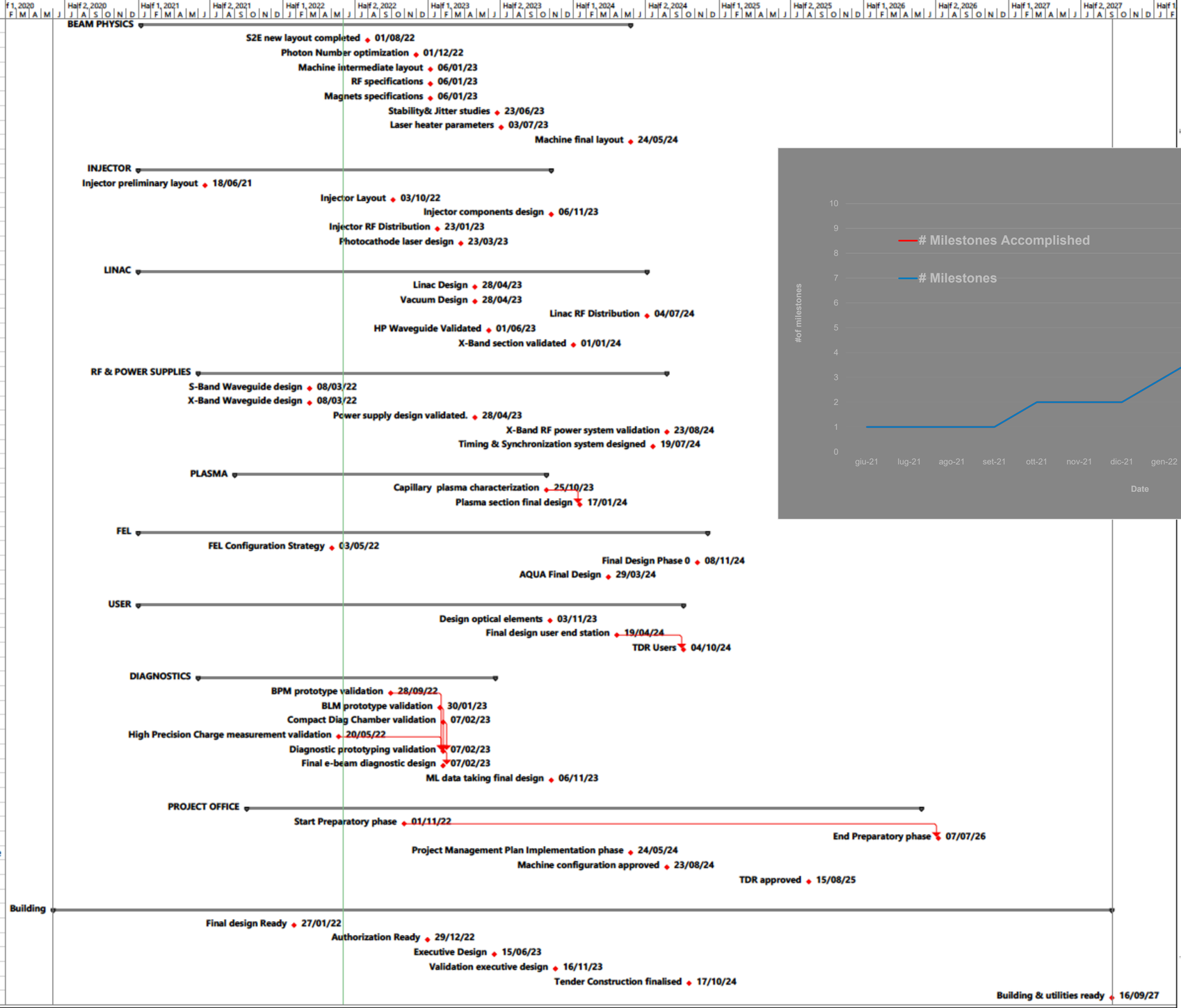
New Baseline needed to take into account the following:

- Hardware delivery delayed → Milestones must be fine-tuned accordingly. -_> Prototype assessment will drive the finalization of the TDR phase, therefore hardware procurement delays can lead to general delays.
- Reasonable contingencies to mitigate risks of delays in procurement
- Additional intermediate milestones added to have a better control on the progress
- Some adjustments (e.g. Diagnostics is now a WA).
- Better alignment with respect to the building timeline
- Aligned with respect to the EuPRAXIA Preparatory Phase
- Resource Loaded schedule | Considering the current amount of resources available and other projects / activities
- Cover the shortage of manpower in some areas

Schedule update – critical milestones



ID	WA ID	Task Name
1	**WA1**	**BEAM PHYSICS**
6	M1.1	S2E new layout completed
7	M1.2	Photon Number optimization
8	M1.3	Machine intermediate layout
9	M1.4	RF specifications
10	M1.5	Magnets specifications
11	M1.6	Stability& Jitter studies
12	M1.7	Laser heater parameters
13	M1.8	Machine final layout
14		
15	**WA2**	**INJECTOR**
25	M2.1	Injector preliminary layout
26	M2.2	Injector Layout
27	M2.3	Injector components design
28	M2.4	Injector RF Distribution
29	M2.5	Photocathode laser design
30		
31	**WA3**	**LINAC**
49	M3.1	Linac Design
50	M3.2	Vacuum Design
51	M3.3	Linac RF Distribution
52	M3.4	HP Waveguide Validated
53	M3.5	X-Band section validated
54		
55	**WA.04**	**RF & POWER SUPPLIES**
67	M4.1	S-Band Waveguide design
68	M4.2	X-Band Waveguide design
69	M4.3	Power supply design validated.
70	M4.4	X-Band RF power system validation
71	M4.5	Timing & Synchronization system designed
72		
73	**WA.05**	**PLASMA**
80	M5.1	Capillary plasma characterization
81	M5.2	Plasma section final design
82		
83	**WA.06**	**FEL**
97	M6.1	FEL Configuration Strategy
98	M6.2	Final Design Phase 0
99	M6.3	AQUA Final Design
100		
101	**WA.08**	**USER**
110	WA8.M1	Design optical elements
111	WA8.M2	Final design user end station
112	WA8.M3	TDR Users
113		
114	**WA.10**	**DIAGNOSTICS**
126	M10.1	BPM prototype validation
127	M10.2	BLM prototype validation
128	M10.3	Compact Diag Chamber validation
129	M10.4	High Precision Charge measurement validation
130	M10.5	Diagnostic prototyping validation
131	M10.5	Final e-beam diagnostic design
132	M10.6	ML data taking final design
133		
134	**PO**	**PROJECT OFFICE**
144	MPO.1	Start Preparatory phase
145	MPO.2	End Preparatory phase
146	MPO.3	Project Management Plan Implementation phase
147	MPO.4	Machine configuration approved
148	MPO.5	TDR approved
149		
150	**BLDG**	**Building**
169	BLDG.M1	Final design Ready
170	BLDG.M3	Authorization Ready
171	BLDG.M4	Executive Design
172	BLDG.M5	Validation executive design
173	BLDG.M6	Tender Construction finalised
174	BLDG.M7	Building & utilities ready



Cost update

Procurement on overall as planned but with some issues.

- Several procurement in 2021 :

  Computing cluster
  TEX Upgrade (see next slides)
  Several prototypes and ancillary equipments (as shown before).

- Fund allocation procedure a bit tricky. Problem to be solved soon.

- Usual lags for administrative procurements but no major issues.

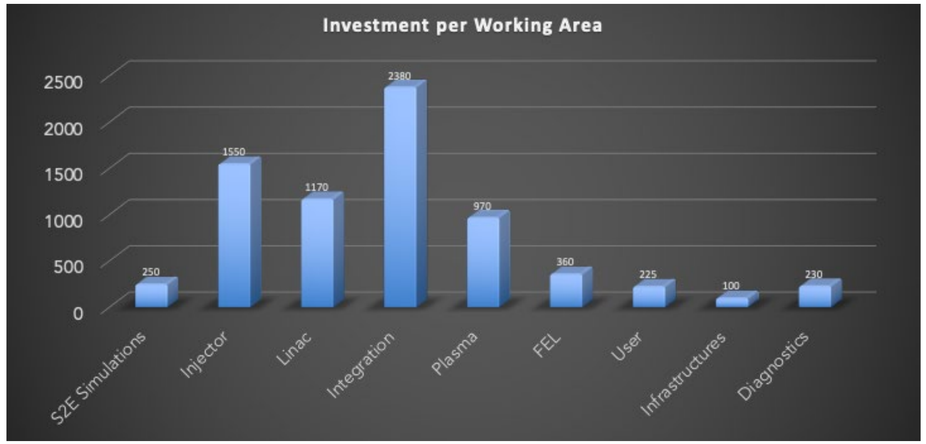
- On average delivery time much longer than expected.

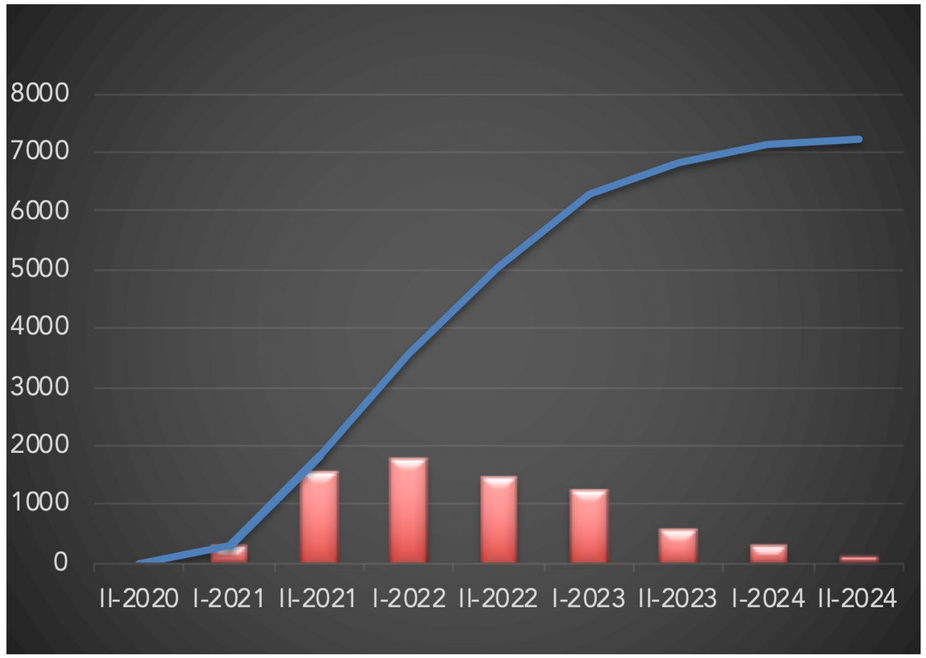
- Procurement of X-Band klystrons very complicated → Very long negotiation phase:

  . CPI – Higher costs than expected, long negotiations to lower about 20%
  . CANON – Not possible to deal directly with the supplier (found after months of discussion) only feasible solution is to buy through the modulator supplier (Scandinova) - Issues to be solved!

Cost-Baseline @ Feb 2021

Working Area	Amount (k€)
WA1- Beam Physics	250
WA2 - Injector	1550
WA3 - Linac	1170
WA4 - Integration	2380
WA5 - Plasma	970
WA6 - FEL	360
WA8 - Users	225
WA9 - Infrastructures	100
WA.10 - Diagnostics	230
Subtotal	7235
Contingencies	360
TOTAL	7595





- Procurement is on-going as expected. On the overall is slower due to a single procuremenet which have been delayed for long negotiation phase.
- Additional items for computing cluster will be needed (40k€ mainly for storage).
- Some adjustment due to the actual cost w.r.t. planned cost.
- Additional RF source changes the amount already presented

Cost update @ May 2022

Working Area	Planned Amount (k€)	Actual Amount procured (k€)
WA1- Beam Physics	250	246,7
WA2 - Injector	1550	72,7
WA3 - Linac	1170	72,5
WA4 - Integration	2380	1600 (+1700*)
WA5 - Plasma	970	6
WA6 - FEL	360	-
WA8 - Users	225	-
WA9 - Infrastructures	100	55
WA.10 - Diagnostics	230	33,7
Subtotal	7235	2087 (+1700)
Contingencies	360	
TOTAL	7595	

*2° RF power source working at 400 Hz (see next slides)

Spending rate is a bit slower than expected but it is progressing steadily.

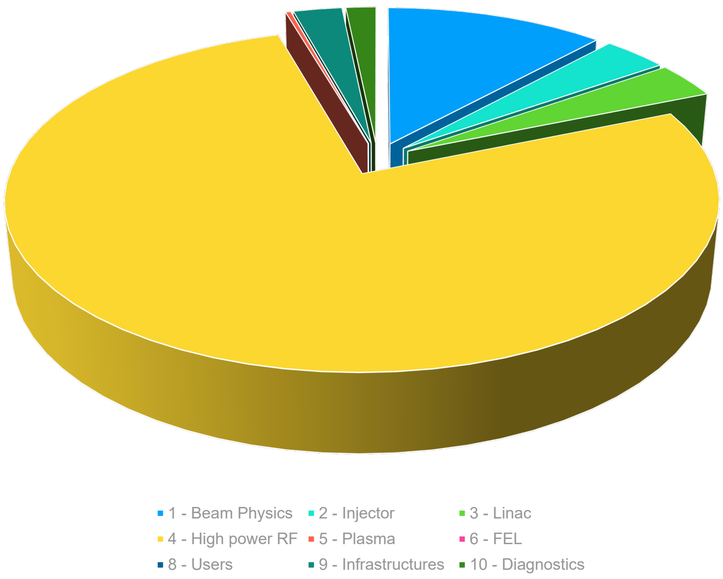
Some component procured with other funds (SPARC_LAB) e.g. Plasma module chamber, some diagnostics devices.

At the moment some deviations in terms of expected costs but not critical (contingencies).

Overloading : technical & administrative work makes the whole process slower.

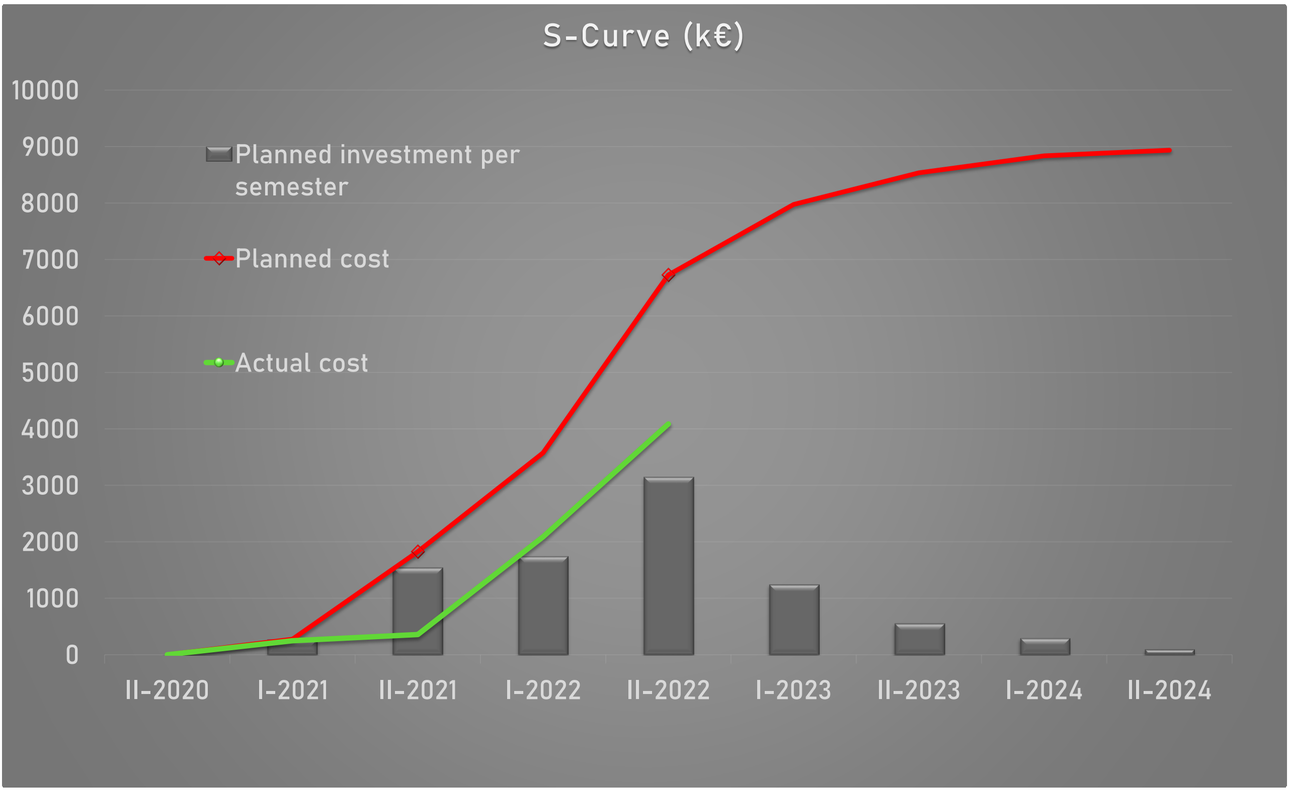
Cost update @ May 2022

WA	Planned Value (€)	Concluded	Awarded (€)	In progress(€)	Tot. (€)
1 - Beam Physics	250.000,00	215.325,22	31.422,32	0	246.747,54
2 - Injector	1.550.000,00	0	0	72.687,60	72.687,60
3 - Linac	1.170.000,00	6.041,22	42.504,60	24.003,50	72.549,32
4 - High power RF *	2.380.000,00	26.003,08	30.000,36	1.544.711	1.600.714
5 - Plasma	970.000,00	0	0	5.929,20	5.929,20
6 - FEL	360.000,00	0	0	0	0
8 - Users	225.000,00	0	0	0	0
9 - Infrastructures	100.000,00	0	0	54.900,00	54.900,00
10 - Diagnostics	230.000,00	0	5.368,00	28.487,00	33.855,00
Contingencies	360.000,00	0	0	0	0
Tot	7.595.000,00	247.369,52	109.295,28	1.730.718	2.087.383



*2° RF power source working at 400 Hz (see next slides)

Cost update @ May 2022



- Additional 1700k€ for 2° RF station to be procured
- Expected 300 k€ until the end of the year for additional componets to be acquired (2nd prototype X-band section, plasma components etc..).
- Procedure for the allocation of funds is a bit tricky. This has been reported to the management board and it will be solved.
- Discrepancy due to delays in the long negotiation of X-Band tubes. It took almost 1 year to come up to a final decision and formal offer from supplier.

RF Power Source

EuPRAXIA@SPARC_LAB has two main technological challenges:

- PLASMA Module
- **X-Band RF Technology**

TEX facility is currently working with a CPI Klystron on loan from CERN. An additional (at least) klystron is needed in order to guarantee continuity.

Opportunity to explore other solutions, better performances and possible upgrades in order to choose the baseline option.

TEX is also becoming a EOSC facility under FAIR principles (as requested by ESFRI for EuPRAXIA).

Collaboration with CNAF for data archiving

Development of a configuration tool (with LNL).

Cost & Performances comparison analysis

Parameter	Unit	Canon	CPI
Max Peak Power	MW	25	**50**
Max Repetition Rate	Hz	**400**	100
Number of station	#	20	10
Efficiency	%	40	**60**
Unit Cost	k€	320	1085
RF Station Cost *	k€	975	1800
Cost / Peak power	k€/MW	39	35,6
Cost / Avg Power	k€/kW	**65**	237

* For CANON case the number of total RF Stations is twice the CPI case.

- **CANON : 350k€ but additional K300 modulator + auxiliary utilities needed - tot. 1700k€**
- **CPI : 1250 k€. Can be marginally co-funded through CERN collaboration**

RF Power Source SWOT Analysis

	STRENGTH	WEAKNESS	OPPORTUNITY	THREAT
CPI	1 High Effiency 2 Lower Running cost 3 Longer life time 4 Smaller number of units	1 Higher cost per avg power 2 More complicated WG Network 3 Rep.Rate 100Hz maximum 4 Too high EM field in the WG. 5 Demanding HV Modulator	1 CERN Collaboration	1 Monopolistic approach as result of being a unique supplier.
CANON	1 Higher Repetition Rate 2 Simpler Configuration 3 Lower Peak field in the WG 4 Unit cost lower 5 Smaller footprint	1 Larger number of RF Station 2 Limited in peak power	1 Towards high rep.rate LINAC - Beyond the state of the art 2 Other R&D activities related to EuPRAXIA	1 Difficult relationship with CANON

Procurement in progress for both options.

CPI - Signature expected in 1 month.

CANON – Signature expected in September

Slight preference to the CANON options, nevertheless it is worth to point out that NONE of them have been tested so far (i.e. they are essentially prototype).

General consensus among the reviewer and colleagues to explore and test experimentally the two solutions before choosing which one will be the baseline.

In addition this will make TEX a unique facility in the world:

- 2 X-Band tubes at different repetition rate
- Possible extension to other frequency band (e.g. C-BAND)
- Dedicated bunker, beam irradiation up to 20 MeV also possible (electron beam diffraction?)
- Other R&D activities can be performed and therefore becoming attractive for users and additional funding schemes.

Quality Assurance & System Engineering

- Development of documenting system and deliverables approval cycle - Still in progress to be finalised soon
- Consolidation of a machine parameters baseline – Still in progress to be finalised soon
- Functional Layout & PBS - Aligned with machine development further development are ongoing.
- Project Dashboard : Cost & Schedule – In place. Cost analysis follow up and milestone accomplishement

Quality Assurance & System Engineering

Areas	
LNT	Linac Tunnel
FTN	Fel Tunnel
USR	User Room
MHS	Modulator Hall S-Band
MHX	Modulator Hall X-Band
PWS	Power Supply Area

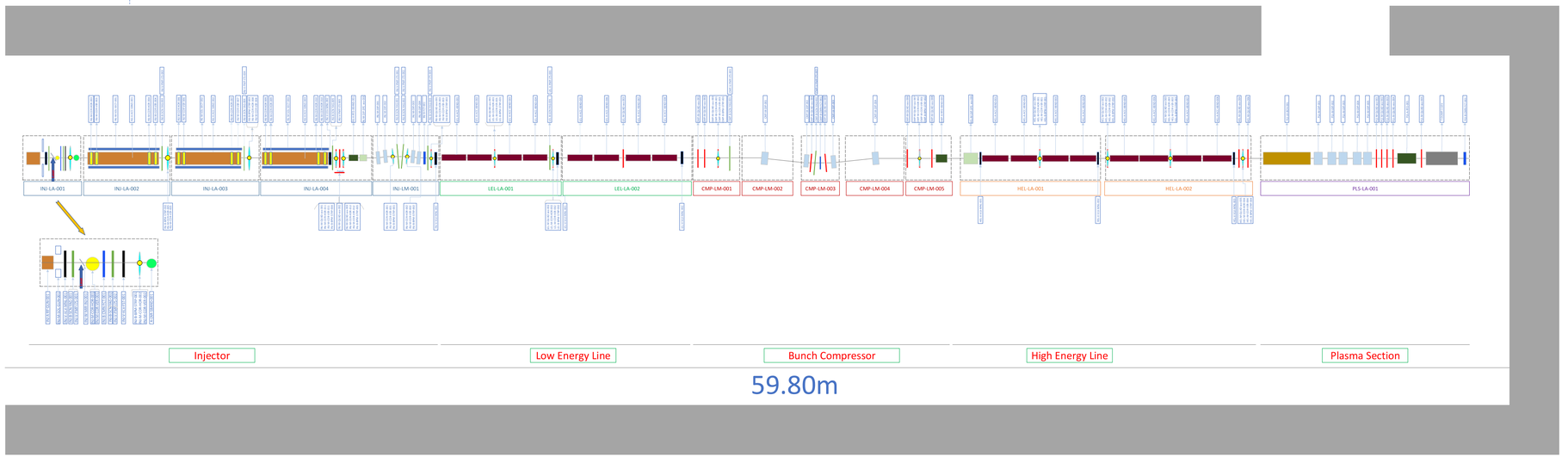
Module	
LA	Accelerating Module
LM	Magnetic Module

System Zones	
INJ	Injector
LEL	Low Energy Line
CMP	Bunch Compressor
HEL	High Energy Line
PLS	Plasma Section
FEL	Undulator Line

Component Legend

- BPM
- Corrector Magnet
- BPM with Corrector Magnet
- FAST Current Transformer (FCT)
- YAG/OTR Beam Screen
- Vacuum Valve
- S-Band Accelerating Structure
- X-Band Accelerating Structure
- Transverse Deflecting Cavity
- Linearizer
- Quadrupole Magnet
- Sextupole Magnet
- Special Dipole
- Dipole Magnet
- Vacuum Chamber
- Radiation Stop
- Beam Dump

MHS MHX PWS



Functional Layout correlated with a Project Breakdown Structure Database components.

Framework now well articulated and ready to be »popolated» with all the relevant information.

In house configuration Management tool is now under development.

GEMINI - Generate Experimental Machine Interface Naming Items

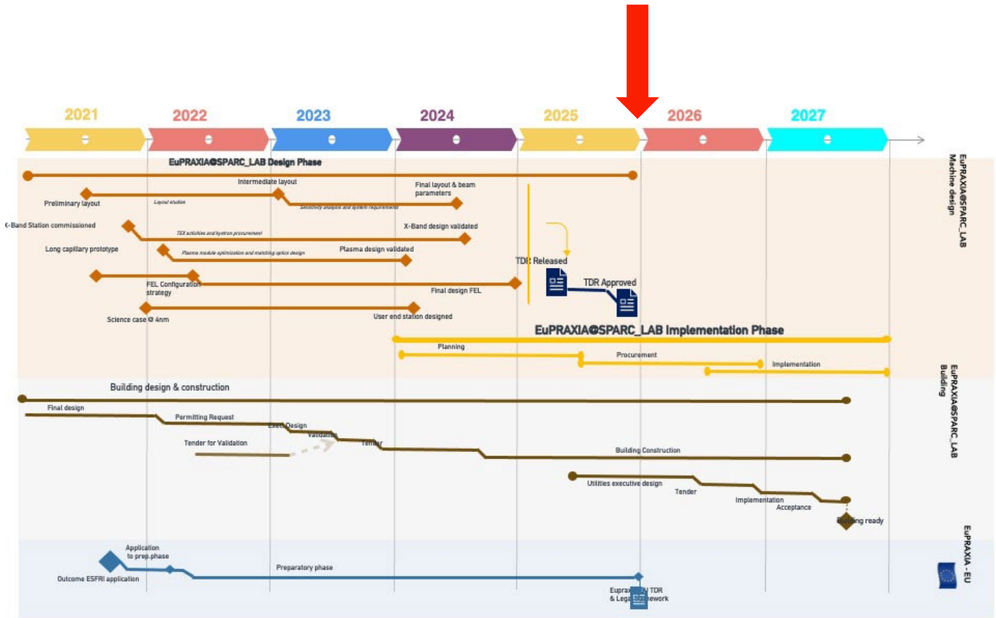
- In-house tool for configuration management under development (in collaboration with LNL):

Gemini is an asset Management tool for LINACs for:

- Track instruments history and user actions over those instruments
- Web-based interface
- Stores data used by different clients
  - Graphical user interfaces
  - Finite state machines
  - IOCs
  - Utility management tool
  - Beam dynamic management tools
  - Automatic Logbook creation.
- Handle UUID device identification
- Provide Information on utility metrics:
  - Schematic (equipment name, description, accelerator module, room, vacuum region, sub-system, …)
  - Cabling (routing, destination rack & controller, cable type, connector type, …)
  - Archived PV values stored with EPICS Archiver Applliance over EOSC infrastructure (ESFRI roadmap)
- Enabling fast DB query from operation team (QR-code on each device)
- Manage user permissions (create, edit, visualize)

Manpower plan (2022-2026)

General reccomendation from different reviewers (TDR-RC, MAC, Sci-Com) to elaborate a staffing plan to make the (still) aggressive schedule feasible.



Time Frame: 2022 / 2026 → Transition from TDR Phase to Implementation Phase / Critical interface.

Estimation of ADDITIONAL resources to be hired, considering:

- Turnover in place (substitution due to retirement does not count as additional resource).
- Positions already opened do not count as additional resources.
- Overall workload of the lab as it is now (additional projects/activities might have an impact to be assessed).

Manpower plan (2022-2026)

At the moment around 25 FTE (R&T) are currently working in EuPRAXIA-Like activities (eg. EuPRAXIA, SPARC_LAB, TEX, Building, General Services) at LNF. Additional FTEs (~15) are allocated from other INFN-Sections, Universities and Institutions (ENEA).

Raise up to 60 FTE – Synergies with other group within the Lab has been considered.
A substantial amount of skilled people needs to be hired anyway because missing (e.g. Laser Engineer, Plasma physicist, Radioprotection expert).

Manpower allocation plan has been reported to the INFN Management Board and will be refined for final approval.

Note that this manpower plan is developed in view of the implementation phase. For the TDR phase a smaller fraction of personnell to be hired is needed.

Manpower plan (2022-2026)

AREA	Staff increment	Temporary contract / Fellow Increment
Accelerator Division		
High Brightness / Plasma acceleration	2	1
FEL Physics	2	2
Beam line design & Maintenance	2	-
Plasma cell & Diagnostics	1	1
Beam Diagnostics	-	1
Laser	2	1
Magnets	1	1
Control system	2	1
Mechanics		2
Vacuum	2	1
RF	2	1
Linac / Power RF	1	1
Project Management	1	1
-TOTAL Accelerator Division	14+4	11+2
Technical Division		
Cooling & Electrical Plant	2 engineers + 2 technicians	-
Civil Engineering	1 engineer	-
Safety & Radioprotection	2	-
-TOTAL Technical Division	7	

Note: in RED personell already present in the lab, but currently working in other projects.

- Acc.Div 90 → 104 15% increment
- Tec.Div 40 → 45 12,5% increment
- LNF → 7% total increment

60 FTE | 120M€
In line with other similar facilies.

This table will be further detailed for final approval from Management Board

Risk Management

All the mitigation actions have been implemented so far but in the meanwhile:

- Post Pandemic recovering
- War
- Inflation (especially raw materials)
- Cost of energy

Significant cost increment and hardware delays are expected.

At the moment we cannot make final assumption on the total cost increase.
Comprehensive cost analysis will be made at:

- Finalization machine layout
- Building executive design.

Quite obvious statement: The sooner we spend the money the better!

Risk Management

Procurement phase for critical items (e.g. ondulators and RF power sources) is critical.
Delivery time for most critical items is expected to be around 2 years.

Cost

- Raw material increase - Critical items:
  Copper / Stainless steel / Aluminum
- Energy Cost increase → Manufacturing cost increase
- Building construction increase

Possible mitigation actions to be discussed

- Cost estimation for the implementation phase to be started in Jan 2023 with the goal of a precise assessment and possible savings area (if possible).
- Other funding schemes could in principle compensate this extra-cost.

Schedule

- Material supply chain uncertainties makes schedule more risky.
- Industries do not committ to buy material in advance → delivery time longer.

Possible mitigation actions to be discussed

- Start procurement of critical items earlier than expected (i.e. after prototyping validation and not after full TDR approval).
- Buy raw material in advance (this is risky if prices oscillate wildly).

Reccommendations from previous meeting

- Chapter 7 of the document should be improved and called ”risk management” …

An updated version of the Project Management Plan is currently in progress and expected to be issued within June 2022.

A simplified version of the risk management section will be implemented, taking into account the following assumptions:

- Geopolitical context has been drastically changed.
- All mitigation actions are now in place and additional mitigation strategies are about to be implemented.
- Schedule is now fully resource loaded and therefore a more precise contingency allocation can be done.
- Workload due to other projects/activities is changing over time and not always under our control. This means that a dynamic resource loading and risk assessment must be implemented.

Reccommendations from previous meeting

- The RC recommends to formalize the cost, schedule and scope baseline for the TDR phase.

Project Management Plan has been approved by the main sponsor of the project (management board a.k.a. Giunta Esecutiva). This formalizes cost, schedule and scope.
An additional section of the PMP include a better definition scope baseline which is then implemented in the configuration management with parameter table. Each WA has a clear set of intermediate deliverables, cost and scope defined. Tracking of the progress is made on regular basis and reported in the project dashboard. An updated version will be released soon to better define scope and schedule of each WA (also as consequence of the re-baselining of the project).
RF & Synchronization is now fully integrated in the baseline (a specific WP is assigned). Additional manpower to be recruit covers this topic.

- The RC recommends that missing personnel resources be found very soon.

A comprehensive analysis of the missing personnel has been submitted to the GE. Schedule is now resource loaded.
Recruitment is quite difficult: in general we are not very attractive for young engineers. Collaboration with universities to recruit fresh-graduate will be reinforced.

- The RC also recommends that meetings be held to inform all INFN-LNF members of the importance and of the advancement of the project.

A communication plan was in the PMP and it has been implemented as planned. Working Area meetings are held on 6 weeks basis approximately: general meeting for reporting advancement and general discussion. WP meetings are held on weekly basis. Communication within project member can be certainly improved especially in the area of tracking changes in the machine layout. Project relevant informations (baseline, approved layout, cost&schedule dashboard) are easily available in the internal repository. Note that most of the people are also working in other projects/activities.

An update of the Project Management Plan is implementing all these reccomendation

Conclusions

- ESFRI 2021 Roadmap inclusion
- Several successfull applications to strenghten and consolidate EuPRAXIA EU Initiative

- Significant progress on design and prototyping activities
- Milestone accomplishment rate satisfactory even if with some delays
- Re-baselining needed to align the project with external constraints

- R&D procurement bit slower than expected but progressing
- Manpower requirement plan is in place and aligned with similar facility. Recruitment effort is needed.
- Cost & Schedule risks due to current global situation must be monitored and eventually mitigation actions must be implemented in the future.