EUROPEAN PLASMA RESEARCH ACCELERATOR WITH EXCELLENCE IN APPLICATIONS

EuPRAXIA Preparatory Phase

Status of EuPRAXIA_PP

P. Campana (INFN-LNF)

GM meeting, Prague, October 29-31, 2025

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No. 101079773. It is supported by in-kind contributions by its partners and by additional funding from UK and Switzerland.

Updates since last GM meeting in Elba (Sept. 24)

Funded by the European Union

- **CB decision** on second site Mar 2025

- Intense set of EuPRAXIA_PP meetings
  - **SC** Dec 2024, Mar 2025, June 2025
  - **STAB** Feb 2025, Sept 2025
  - **BOFS** Mar 2025
  - **EU Project Office** July 2025 (Reporting Period #2)

- **Implementation Group** established, to help sites in providing support through technical discussions, proposals on contributions, etc. (first "sites alignment" meeting INFN-ELI in May, second, enlarged to nodes, in July, more to come regularly)

- EU launching **HORIZON-INFRA-2025-01-DEV-02** dedicated to ESFRI 2021 Roadmap RIs. EuPRAXIA takes this opportunity to support its Early Implementation Phase, especially concerning **establishing governance, securing funds, finalisation of architecture, ICT and data management, development of access policies, internalization**, etc…

  EuPRAXIA proposal submitted in September → *more info from Antonio F.*

2^{nd} site: CB approved proposal (25.3.25)

Funded by the European Union

ELI Beamlines – EuPRAXIA CB officially adopted ELI Beamlines as EuPRAXIA`s second user site: pillar for a laser driven, plasma-based Free-Electron Laser for users (Phase 1 at 1 GeV beam energy). Europe’s most compact, most high tech and most Eastern FEL!

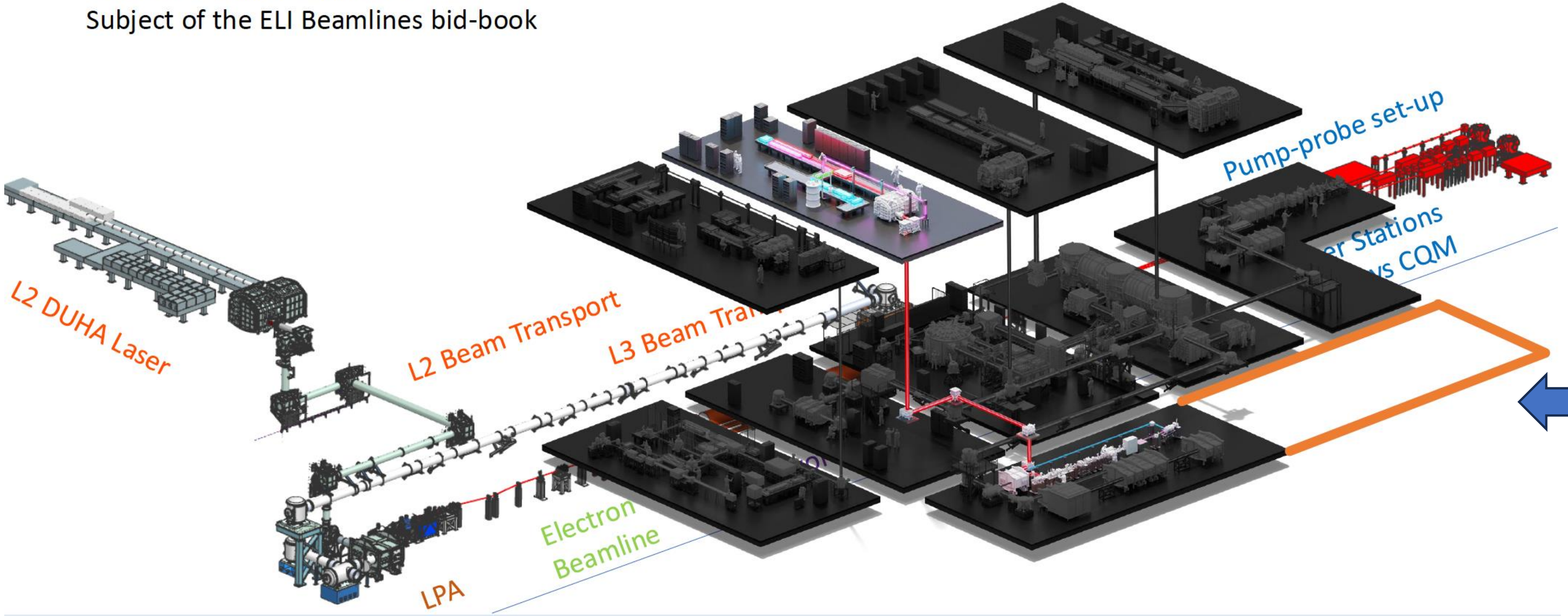
- The ELI facility today provides sufficient room for installing a 1 GeV FEL (phase 1) including undulators and a user station, without requiring building extensions or new buildings. The other sites require more invests.
- The ELI Beamlines bid provides an in-kind contribution which, in a relatively short time scale, represents a decisive asset for the construction of the EuPRAXIA 2^{nd} site.
- Some more resources are needed, both from ELI Beamlines and supporting institutions.
- ELI Beamlines organizational structure is fit to provide support to the 2^{nd} site installations, to operation and management of the infrastructure and to users. Formal support from ELI-ERIC management is present.

STFC EPAC - Officially support EPAC as EuPRAXIA Facility for R&D on a 5 GeV electron beam that is produced in a compact laser-plasma accelerator and that has sufficient beam quality for the FEL application.

CNR INO - Officially support CNR-INO as the EuPRAXIA National Node in Italy for Laser R&D and as an additional formal link between the two EuPRAXIA pillars in Italy and Czech Republic.

ELI Beamlines, Prague (CZ)

Conceptual model of the EuPRAXIA Phase-1
1GeV electron LPA scheme
Subject of the ELI Beamlines bid-book



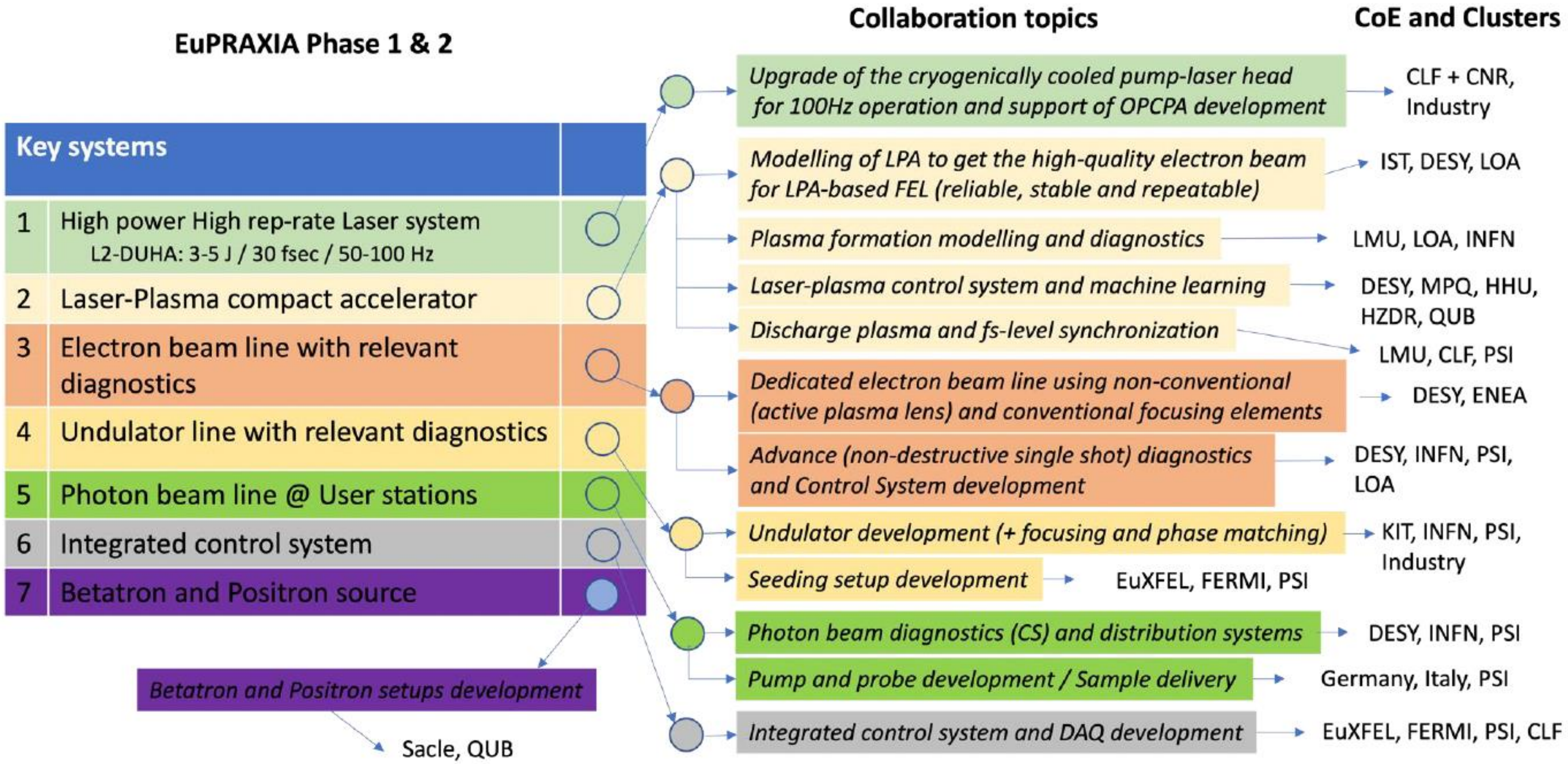
Area available for 1 GeV FEL (Phase 1)

Prep + Phase 1 + Phase 2	mEUR	In-kind
Total Cost of Existing Infrastructure	54	54
Total Budget to Complete Phase 1 Scope	58	23
Total Estimated Budget for Phase 2	112	67
Total additional cost	**224/170**	**144/90**

~ 30-40 ME to be found to complete Phase 1 ELI site (cash or IK)

ELI Beamlines, Prague (CZ)

Funded by the European Union



Intense collaboration among sites, nodes, groups, started to activate collaboration/contributions

Reports to Project Office & ESFRI EU bodies

- Reporting activities to EU Project Office and ESFRI Monitoring group (April to June)
  - **Policy brief** (mid-term review, to EU Project Office, a 4 pages status of the PP grant)
  - **Reporting period no. 2 to EU** & hearing meeting with PO Office and review rapporteur, enlarged to WPs **(**~ 50 pages). RP no. 3 will be held at the end of the grant (Oct. 2026)
  - **Monitoring report to ESFRI** (~ 60 pages document which is part of RI ESFRI 2026 Roadmap monitoring process held on the about 70 Landmarks and Roadmap projects). This document was reviewed by 4 rapporteurs (2 scientific, 2 for the implementation). The next monitoring, deeper, with interview, will be held in 2030-31 and will be **decisive** for the passage of EuPRAXIA from Roadmap to Landmark.

- Thanks for contributions from WGs !

- Positive outcomes with some recommendations, material distributed to CB, STAB, and BOFS bodies

1. Overall assessment
⦿ The project has fully achieved its objectives and milestones for the period.

3. Recommendations
National nodes and clusters: As the project has entered its final 15 months, it is recommendable to intensify the engagement with governmental institutions to collect national technological interests and to lobby funding agencies in order to set up the national nodes. Similarly, the activity of collecting specific technological interests from groups in different countries in order to set up the clusters should be intensified. To this purpose, the roles of national nodes and clusters should be clearly defined. Non-host partners: The role of non-hosting partners should be clearly defined. The status of codeveloper-user as opposed to end-user in a future collaboration has to be clarified as well. To integrate contributions from the non-hosting partners an implementation engineering team in each site will be needed. Plasma components and systems: Several common challenges exist for all plasma components and systems. In addressing these challenges, further standardization of plasma components and systems as well as simulation tools and diagnostics, would be useful. The requirements on plasma components and systems envisaged for EuPRAXIA go often beyond the state of the art. Given that the necessary technological advances should be achievable in a similar timeframe to that required for the development of the EuPRAXIA facilities, a roadmap for the development of plasma sources would be beneficial, to help identify key challenges and a holistic approach to address them. Funding strategy: The first site is already nearly fully financed by the hosting country (Italy), together with a commitment about operation costs. The funding strategy for the second site, beyond the available in-kind contribution that is 50% of the total investment needed, and the determination of commitments for operation costs when the two sites and nodes will be fully operational are still a challenge. Therefore, strong efforts toward obtaining support for the full implementation from national governments together with any EU or regional support coming from grant programs are required in the near future.

ESFRI European Strategy Forum on Research Infrastructures

StRESFRI 3

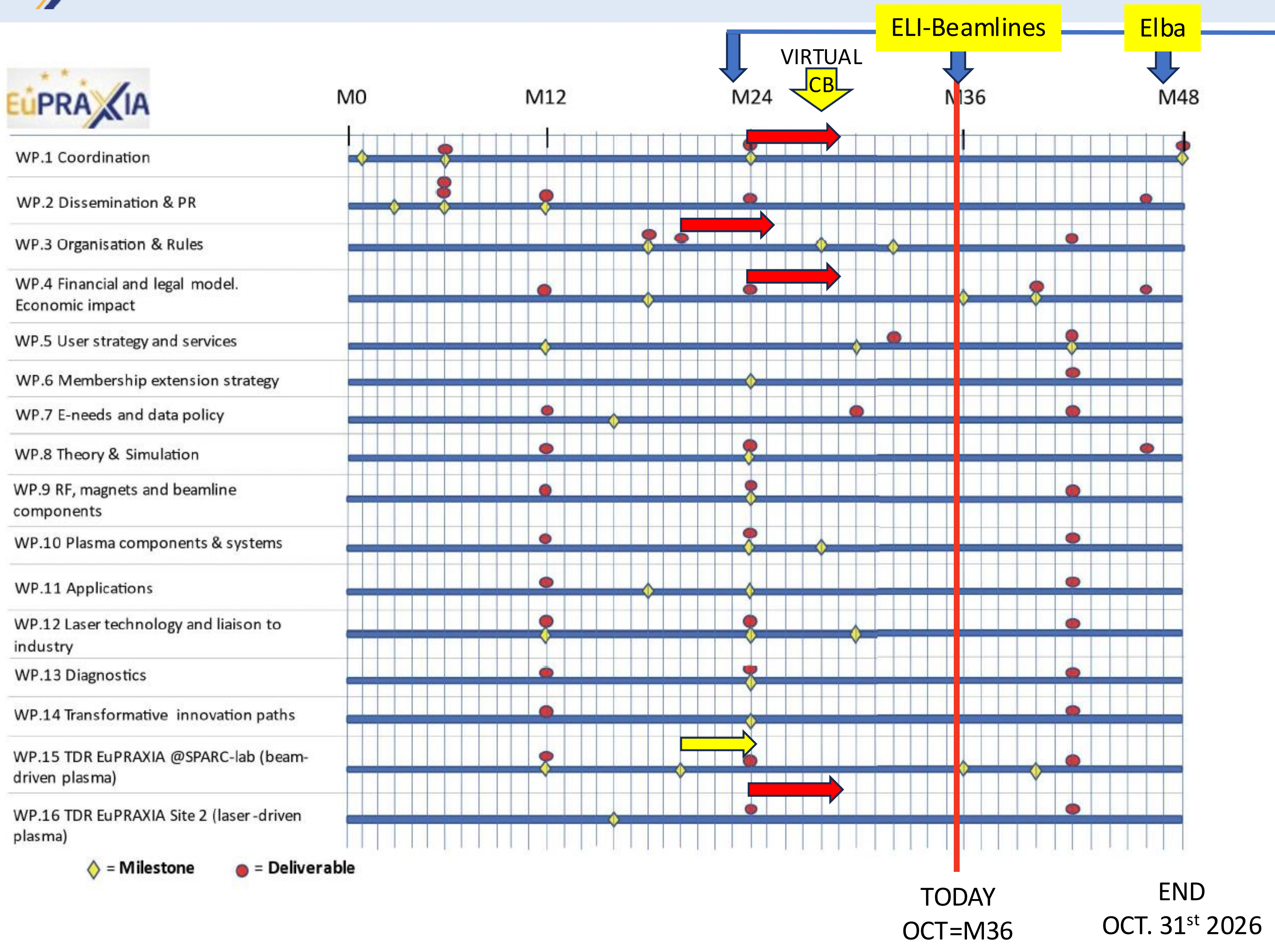
SWG & IG, 02/07/2025

The evaluation of EuPRAXIA's progress has revealed both strengths and areas for improvement.

While the project has made significant progress in establishing a governance structure, with a clear plan for the implementation and operation of the RI, there are concerns regarding the project's financial sustainability and the need for more detailed information on several key areas (the selection and the financial commitments of national nodes as well as the relation with the central hub, clarity on line of responsibilities and authorities within the central Hub and with the national nodes). Addressing these aspects will be crucial for the successful implementation and long-term viability of EuPRAXIA.

The recommendations listed above concerning clarifications in the governance structure, more information on the integration of new sites and nodes, a focus on financial long-term sustainability, the development of a quantified risk register also answering to increasing running costs and the implementation of a human resources plan, will enhance EuPRAXIA´s implementation process.

Status of Milestones & Deliverables



All milestones and deliverables linked to 2nd site choice, **delayed but completed**

All milestones and deliverables so far on track

Technical WPs

ESFRI PP next main ML & DL

- **October 2025**

M 4.2 **Approval by the Collaboration Board of drafts for the legal and financial packages**
M 15.3 Report on R&D achievements supporting EuPRAXIA@SPARC_LAB technical design

- **February 2026**

D 4.3 **EuPRAXIA Socio-economic Impact assessment**

Started for INFN-LNF, to be replicated at ELI-ERIC

M 4.3 **Approval by the Board of Financial Sponsors of the legal and financial packages**

- **April 2026**

D 3.3 **Report on the distributed RI concept including organization and rules**
D 5.2 Report (R) on EuPRAXIA-RI terms of services
M 5.3 Service Catalog & Organizational requirements for user services
D 15.3 Report on TDR status for EuPRAXIA@SPARC_LAB
D 16.2 Report on TDR status for EuPRAXIA@Site 2, laser driven

HELP FROM WP LEADERS NEEDED !

- **August 2026**

D 4.4 Report (R) on final EuPRAXIA financial and legal model incl. RI governance and management

- **October 2026**

D 1.3 **EuPRAXIA-RI Implementation Plan**
M 1.4 **Agreement on legal and financial packages**

Board of Financial Sponsors

Funded by the European Union

FROM EU GRANT AGREEMENT: *Within the EuPRAXIA-PP project, a Board of Financial Sponsors will be created to meet regularly with potential sponsors of the research infrastructure. This Board will be composed of representatives of research funding bodies and other potential sponsors.*

BoFS is expected to endorse 2nd site choice, legal framework, governance, funding scheme (in-kind & cash), together with general EuPRAXIA layout and operation (sites + national nodes + technical clusters).
Heterogeneous composition: National Institutes, Universities, Ministries, Int. Org., ERIC, etc.

Country	**Name**	**other info** **Updated 25.10.2025**
CERN	Steinar Stapnes	CERN lead scientist (interim)
Czech Rep	Allen Weeks	ELI ERIC Director General
	Marek Vysinka	Research Infrastructures Department
France		CNRS (attending nomination)
	Catalin Miron	CEA, Director - Research Infrastructures, European & Intern. Affairs
Germany	Andreas Maier	DESY, lead scientist (interim)
Greece	Emmanuel Varvarigos	Vice Rector of Nat. Technical Univ. Athens
Hungary	Peter Stefan	National Research, Development and Innovation Office
Italy	Sandra Malvezzi	INFN Executive Board
	Roberto Cimino	Italian Research and University Ministry
Portugal	Marta Fajardo	Instituto Superior Tecnico, Physics Department
Spain		
Switzerland	Mike Seidel	Head PSI Center for Accelerator Science and Engineering
UK	John Collier	CLF Director and Executive Director of Laserlab Europe

Board of Financial Sponsors

First informative meeting (17.3.2025)

Attending: representatives from CERN, Czech Rep., France (CEA, CNRS), Germany, Greece, Hungary, Italy (MUR, INFN), Portugal, UK (STFC).

Spain so far not yet represented. CERN & Germany ad interim names.

Prof. **Radka Wildova** (DG for Higher Education Czech Min.) was nominated Chair of the Board (**early September she resigned**, due to other commitments, position still vacant)

Questions about second site, funding supporting strategy, AISBL option.

Request to define a **Term of Reference** for the Board (scope, composition, operation, etc.).

So far not existing in ESFRI or EU agreements

At the next meeting (planned at ELI-Beamlines) the EuPRAXIA National Node Representatives will be also present, to support the discussion with corresponding funding agencies

Composition: L. Rivkin (PSI, chair), S. De Silvestri (PoliMI), N. Ferroni (INFN), M. Dunne (SLAC), L. Veisz (Umea Univ.), T. Tschentscher (XFEL), H. Zimer (Trumpf), R. Sauerbrey (HZDR), *U. Bassler (CNRS)* (now replaced by E. Geschwentner, CERN)

Sept 2025 meeting

5 Agenda topic: "Discussion"

After reviewing and discussing the progress of the EuPRAXIA PP project, the STAB unanimously agreed that the overall organization is advancing well, with the responsible institutions demonstrating outstanding performance.

Concerns were raised about the DUHA Laser at the ELI site, since its commission was planned for 2024, but it's not ready yet. Molodozhentsev reassured the committee saying the laser is under preparation, its energy has been increased step by step, and it will reach 3J by the end of the year. Commissioning can be foreseen for the beginning of 2026. Beam diagnostic is also a key point, with both Molodozhentsev and Campana saying that ELI and INFN will collaborate on the matter (and on the undulators).

The STAB identified the National Nodes definition as a key issue. It's fundamental to define who these nodes are, how they will interact with the implementation sites and what kind of contribution they'll bring to the effort. This will have a strong impact on governance.

During the meeting, it was clarified that, while the preparatory phase is a phase where money is distributed among partners, the operational costs will be paid by the chosen sites. It was pointed out also that there will be no money for hiring personnel coming from the Early Phase Implementation grant, therefore it will be necessary relying on in-kind contributions.

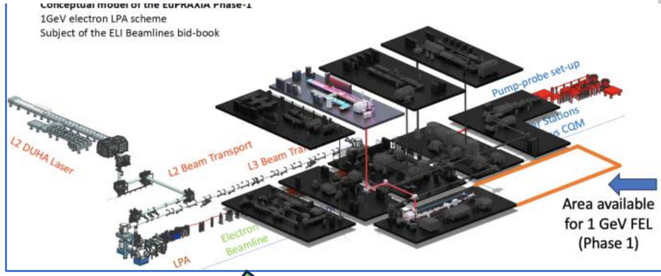
EuPRAXIA Consortium Networking

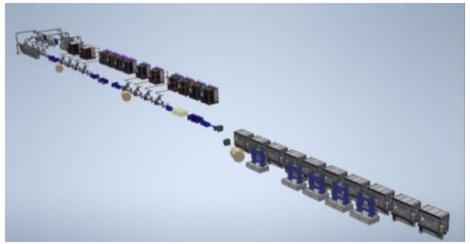
Funded by the European Union

2 Implementation Pillars
@ INFN – LNF & @ ELI-ERIC

Several National Nodes. Roles to be fully defined

Project Clusters





A large collection of European know-hows in accelerators, lasers and plasma technologies

Network organization
- **Sites (PWFA/LWFA): new users facilities**
- **National nodes**
- **Technology clusters**

Status of national node/cluster network

National nodes represent the National efforts (in-kind and cash). They participate to the implementation of site facilities, develop technologies for further future constructions of these instruments. Furthermore, there are **technological clusters** of participating Laboratories and Universities that work together on specific research and development topics of interest for sites. **The current effort is to implement this system.**

Current best guess

Country	other info
CERN	Interest in X-band technology - collab. with INFN
Czech Rep	**ELI ERIC second site**
France	LPA, national roadmap ongoing
Germany	LPA, coordination of national activities
Greece	NTUA, interest in applications
Hungary	Wigner, interest in data storage - collab. with PT
Italy	**INFN LNF second site** **CNR Pisa, site for development of laser technology**
Portugal	**IST, interest in computing & simulation**
Spain	CLPU, development of laser technology
Switzerland	**PSI, interest in diagnostics - collab. with INFN**
UK	**EPAC, site for 5 GeV e-beam FEL quality - Coord. LPA groups at RAL & Daresbury** **Liverpool - Outreach and Communication centre**

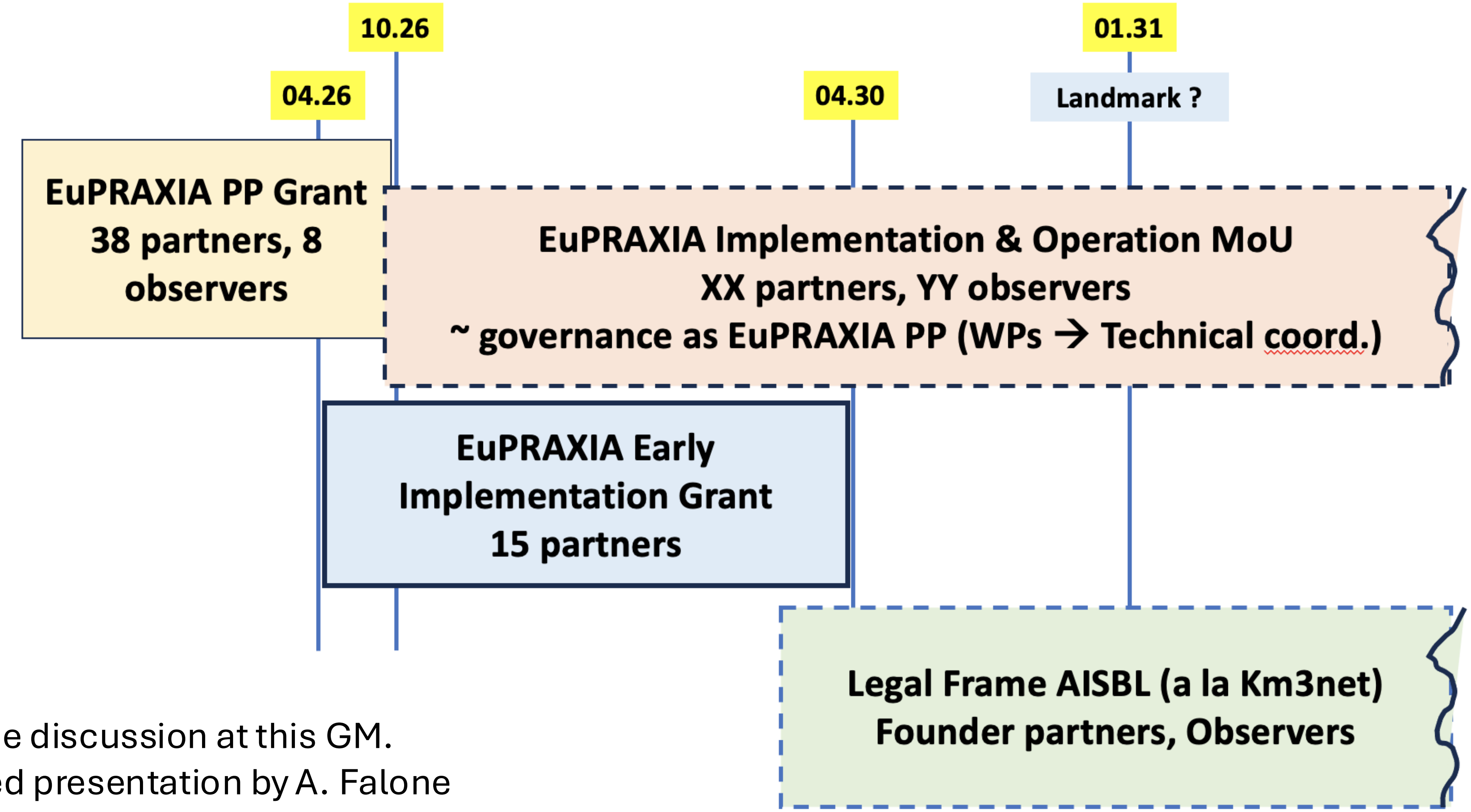
Organizational matters

- New assistant to Project Office (A. Pesce, LNF, replacing C. Pelliccione)
- H. Acton and his team replacing R. Torres (leaving) in EuPRAXIA Files maintenance and on the rest (many thanks !)
- **EMPA no longer in EuPRAXIA_PP Consortium**. New Amendment to Grant nearly completed.

  New Swiss institution entered the Grant Agreement: **Eastern Switzerland University of Applied Sciences** (OST, P.I. D. Bleiner)
- A complete EuPRAXIA_PP researchers list prepared (344 names, provided by local PIs).

  Want to keep it updated and operative for effective communication

What next for EuPRAXIA ?



Part of the discussion at this GM.
Dedicated presentation by A. Falone
and extensive treatment at CB

Summary

The selection procedure for 2nd site choice was completed with the CB decision in March 2025

Together with ELI-ERIC, STFC-EPAC and CNR-INO will play a well identified role in EuPRAXIA Network, allowing, possibly, the bidding for new resources. All sites agreed with foreseen EuPRAXIA governance (likely AISBL) and for providing access to EuPRAXIA users

ELI Beamline site will be required to provide TDR timely, and to setup an Int. Review Committee for it.
Fresh resources are needed for 2nd site will have to be negotiated with Czech Rep., ELI ERIC, EuPRAXIA partners, and possibly from EU funding, etc… with the support of EuPRAXIA management.
Operation costs strategy: each site/node will take care of its operation costs

Relevant bodies (BOFS, STAB) started their activities; BOFS representations not yet completely filled

National node network preparation is ongoing with difficulties to find fresh resources. Governance model being sketched

Planning layout of EuPRAXIA after the conclusion of Preparatory Phase, while targeting AISBL

Acknowledgements

EuPRAXIA Preparatory Phase

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No. 101079773. It is supported by in-kind contributions by its partners and by additional funding from UK and Switzerland.

EuPRAXIA Doctoral Network

Funded by the European Union

This project has received funding from the European Union´s Horizon Europe research and innovation programme under Grant Agreement No. 101073480 and the UKRI guarantee funds.

EuAPS

Co-funded by the European Union

This project has received funding with the co-funding of European Union Next Generation EU.

PACRI

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement n. 101188004

EuPRAXIA-PP Consortium

EuPRAXIA

Coordinator

INFN Istituto Nazionale di Fisica Nucleare

Consiglio Nazionale delle Ricerche

Elettra Sincrotrone Trieste

ENEA Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile

SAPIENZA Università di Roma

Università di Roma Tor Vergata

Imperial College London

Queen's University Belfast

UK Research and Innovation

University of Liverpool

University of Oxford

University of Strathclyde Glasgow

CERN

DESY.

FBH Leibniz Ferdinand Braun Institut

Fraunhofer ILT

GSI

hhu Heinrich Heine Universität Düsseldorf

HZDR Helmholtz Zentrum Dresden Rossendorf

Jülich Forschungszentrum

LMU Ludwig-Maximilians-Universität München

Amplitude

cea

cnrs

THALES

eli

Técnico Lisboa

ALBA

CLPU Centro de Láseres Pulsados

OST Eastern Switzerland University of Applied Sciences

EPFL

Paul Scherrer Institut PSI

The Hebrew University of Jerusalem

IASA

Pécsi Tudományegyetem University of Pécs

SZTE University of Szeged

Wigner

The University of California UCLA