

EUROPEAN  
PLASMA RESEARCH  
ACCELERATOR WITH  
EXCELLENCE IN  
APPLICATIONS



## Status of EuPRAXIA\_PP

P. Campana (INFN-LNF)

General Meeting, September 23rd, 2024

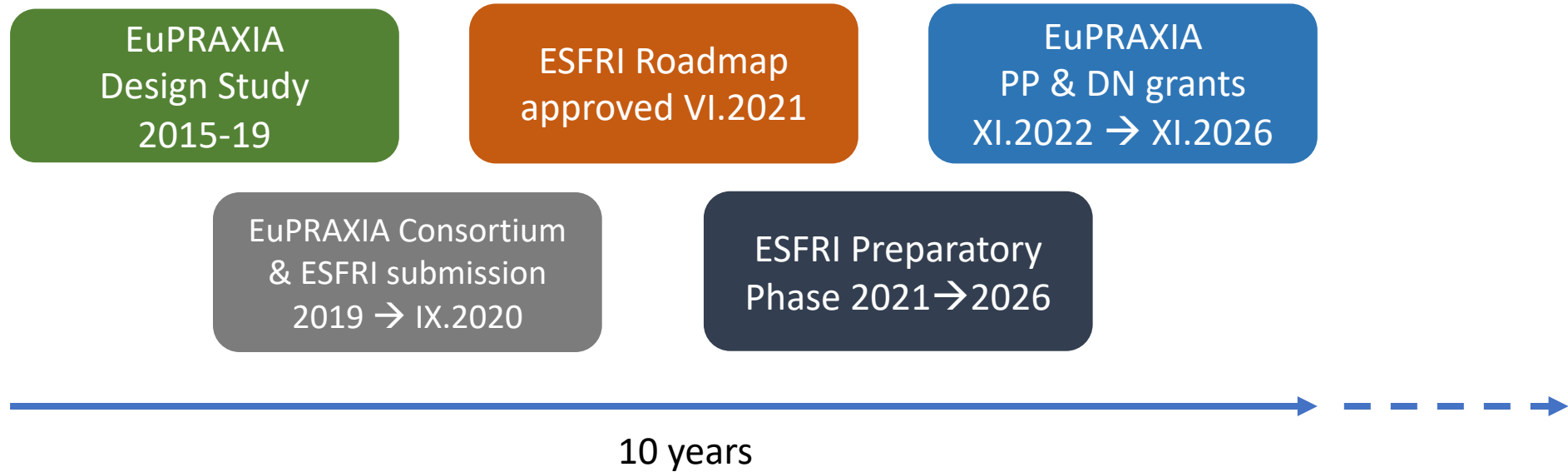


This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No. 101079773

An aerial photograph of a large, mountainous island, likely Crete, with a large black number '767' overlaid in the center. The island is surrounded by deep blue water, and the terrain is rugged with green vegetation and brownish mountain peaks.

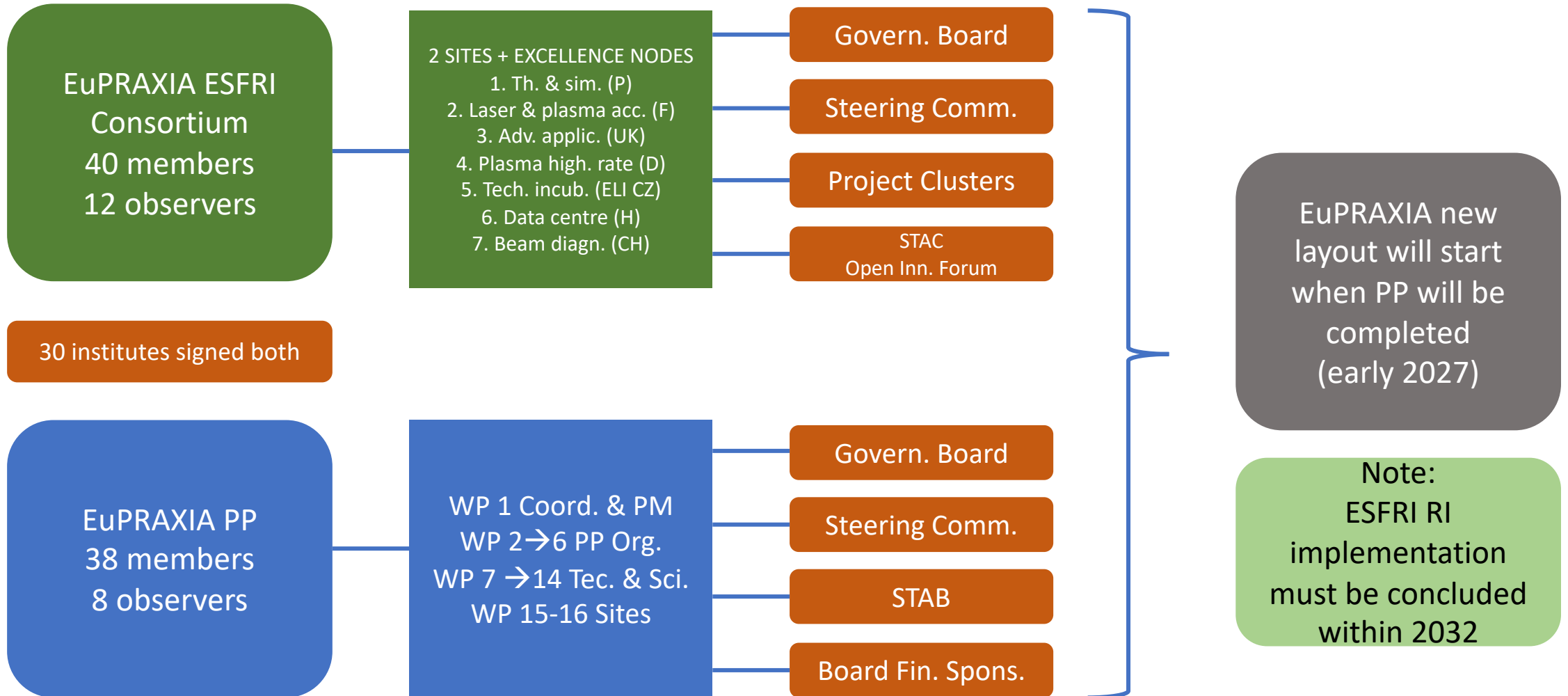
767

(692 days passed since PP Grant's start)

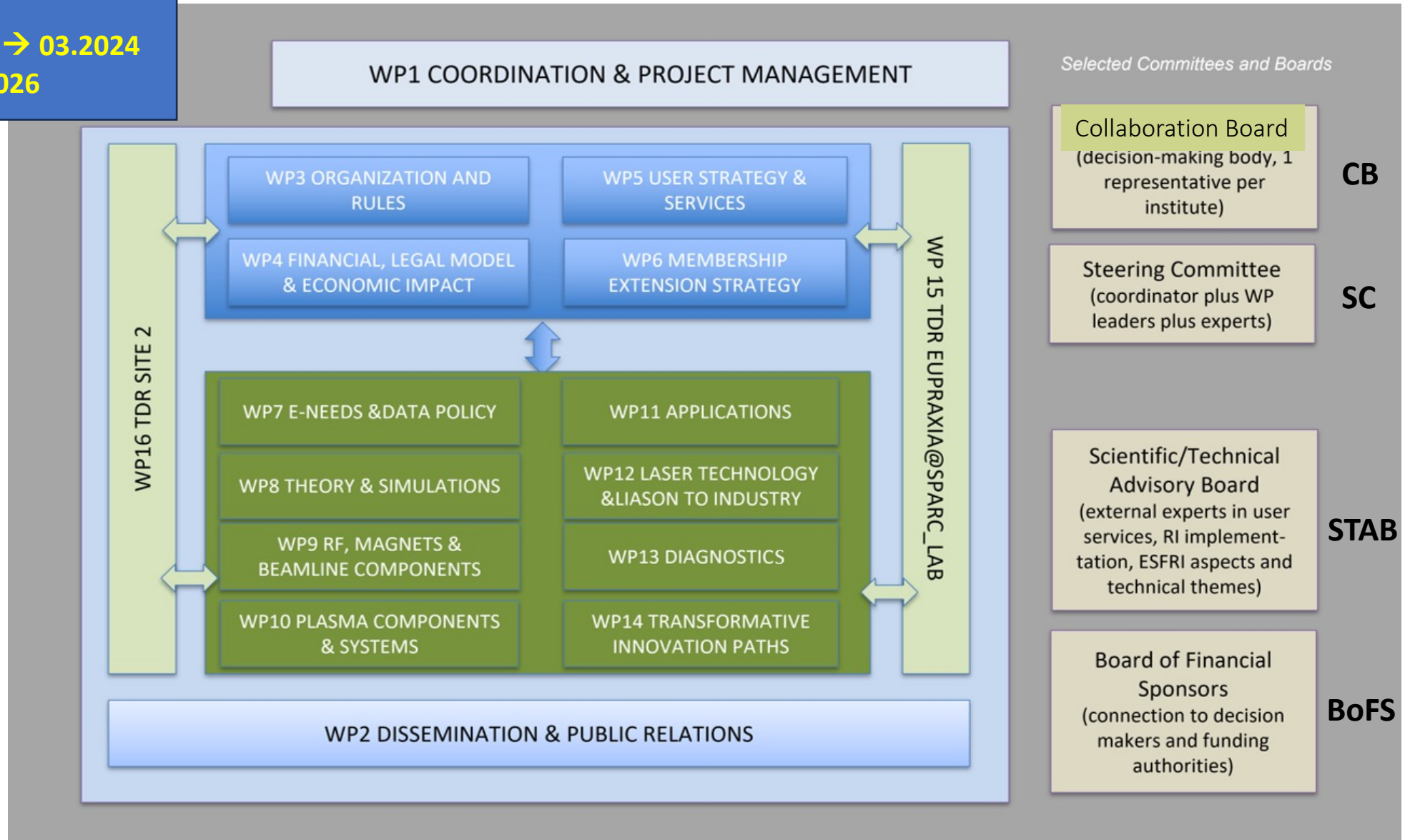


**Grand design** (*R. Assmann et al.*): make EuPRAXIA similar to a HEP-style collaboration, able to setup and manage a Large European Network on advanced particle acceleration technologies (plasma et al.), on lasers and on their industrial and societal applications, thought for academic and industrial users, with two physical sites, and several clusters, *valuing in-kind and cash national contributions*.

Entering ESFRI Roadmap could provide an opportunity to access specific national and EU-based calls for funds. This design is being throughly pursued from the early Design Phase (2015) to the current Preparatory Phase.



**Project coordinators:**  
**R. Assmann (DESY & INFN) → 03.2024**  
**P. Campana (INFN) → 10.2026**



Recent membership entries (CB decision in March):

- PSI (associate), CH
- GSI-FAIR Darmstadt & Uni. Dusseldorf, DE
- AMPLITUDE, FR

Formal acceptance by EU-PO completed.

No further members foreseen.

Complemented by few institutes present in EuPRAXIA ESFRI consortium which did not sign the EuPRAXIA PP Grant Agreement, from FR, DE, PL, SE, UK, CN, JPN, US

## ANCILLARY PROGRAMS

- **EuPRAXIA Doctoral Network**



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**



This publication has been made with the co-funding of European Union Next Generation EU.



**PACRI (recently approved)**

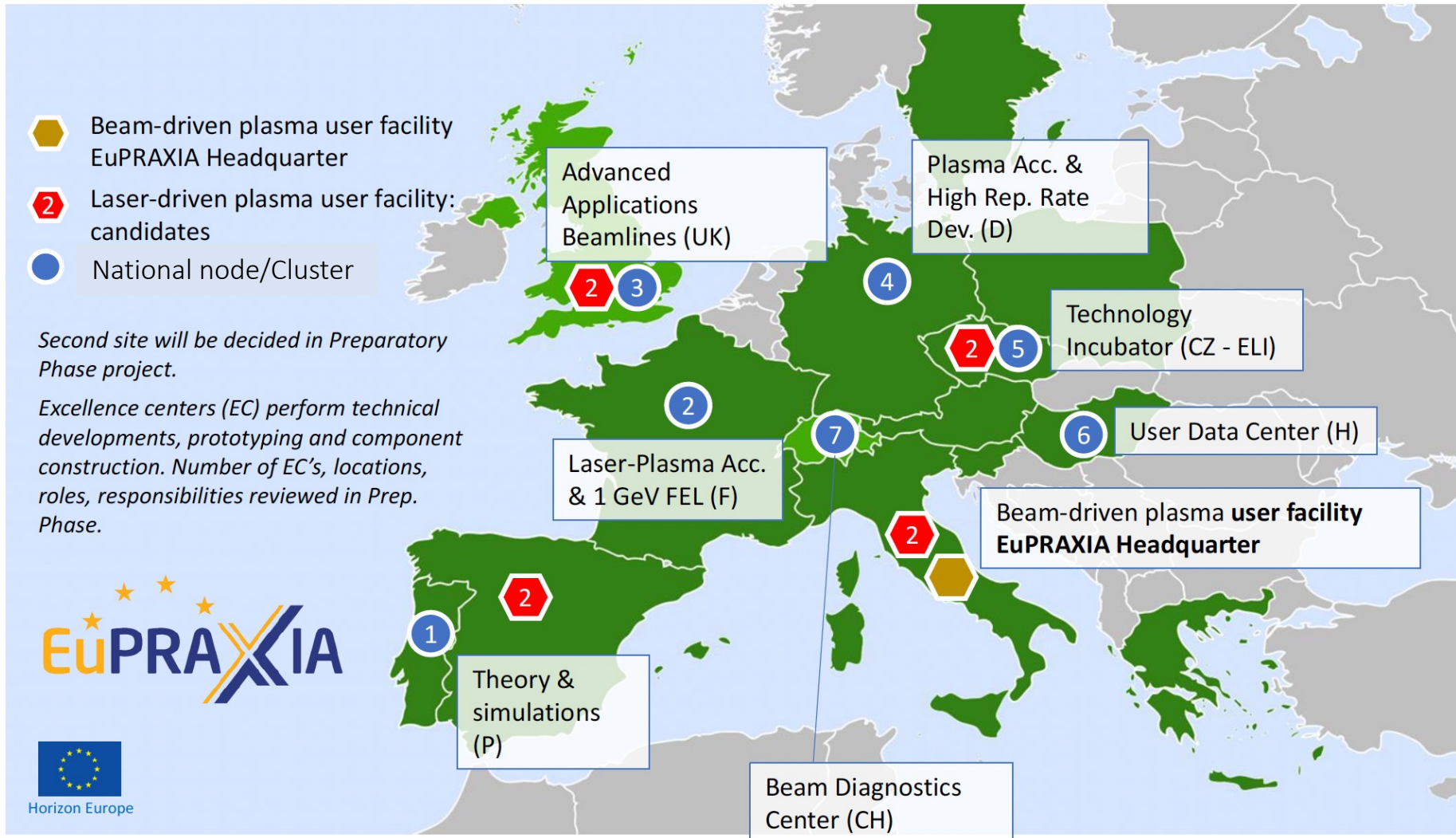
EMPA*	CH	CERN	INT. ORG.
EPFL*	CH	H. Univ. Jerusalem	ISR
PSI*	CH	CNR	IT
DESY	DE	ELETTRA Trieste	IT
FBH Berlin	DE	ENEA Frascati	IT
FHG-ILT Aachen	DE	INFN	IT
FZ Julich	DE	U. Roma Sapienza	IT
HZ Dresden	DE	U. Roma Tor Vergata	IT
LMU Muenchen	DE	IST Lisbon	P
HHU Dusseldorf	DE	ALBA Cells	SP
GSI-FAIR Darmstadt	DE	CLPU Salamanca	SP
ELI Beamline ERIC	CZ	IC London*	UK
CEA	FR	QU Belfast*	UK
CNRS	FR	STFC*	UK
THALES	FR	U. Liverpool*	UK
AMPLITUDE	FR	U. Oxford*	UK
IASA Athens	GR	U. Strathclyde*	UK
WIGNER	HUN	UCLA*	US
Uni. Szeged	HUN		
Uni. Pecs	HUN		

\* associate partners

UJT Shanghai (observer)	CN
HZ Jena (observer)	DE
U. Cote d'Azur Nice (observer)	FR
NTUA Athens (observer)	GR
U. Milano Bicocca (observer)	IT
U. Palermo (observer)	IT
NCBJ Otwock (observer)	PL
U. Manchester (observer)	UK

38 members, 8 observers

- Recently, CERN started the process for the 2026 Update of the European Strategy for Particle Physics (ESPPU): a two-year process involving the whole community and aiming at **developing a common vision for the future of particle physics in Europe within the international context**. The process is expected to be concluded in June 2026, with the approval of the updated Strategy by the Council.
- The process will not only address the issue of what will be the next large machine to be built at CERN, but also plan identify the strategic technologies to be supported at CERN and in Member States' Laboratories: High Field Magnets, high gradient RF structures, **plasma-based accelerators**, energy recovery linacs, etc...
- A similar program ("The 2022 Snowmass process", finalized in the P5 2023 report) has been developed by DOE within the US HEP community for an R&D strategy for future colliders
- The plasma beam driven technology is identified **as one of the main component** for stage 2 future linear colliders (HAHLF proposal): there are plans to set-up a common facility for multi-stage plasma studies. Other large international projects (Petra IV, DESY; CEPC, China) plan to build plasma-based injectors to operate large electron machines complex
- The EuPRAXIA community should make any effort to be involved in the scientific discussion, as the ESFRI RI will represent the first worldwide TANGIBLE example of plasma-based facility



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

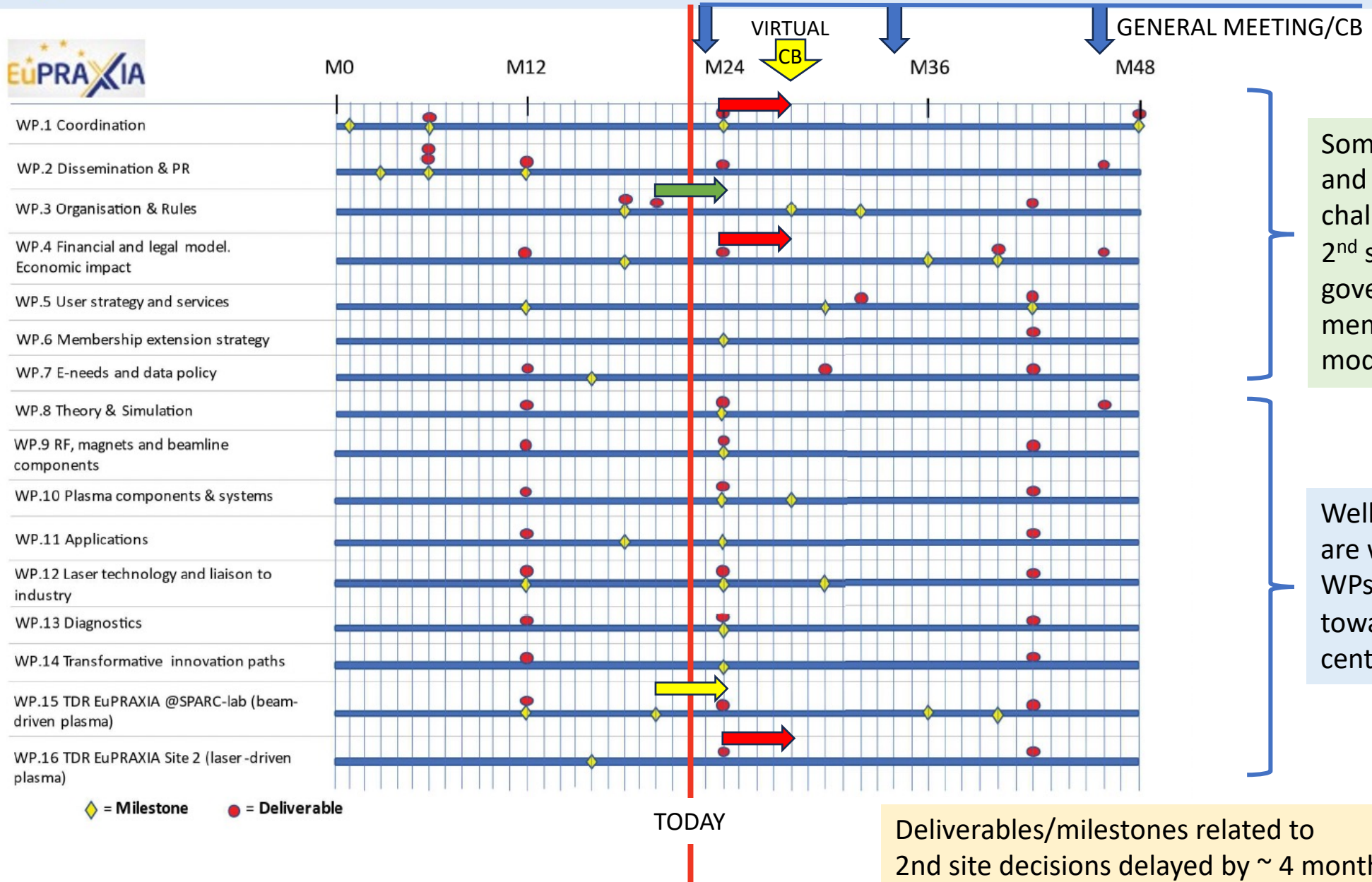
Network organization

- Sites (PWFA/LWFA)
- National nodes
- Technology clusters

4 candidates for LWFA:

- CLPU, Salamanca
- CNR-INO, Pisa
- ELI ERIC, Prague
- EPAC-RAL, UK





Some of the milestone and deliverables are challenging: 2<sup>nd</sup> site choice, governance, membership, finance model, sustainability

Well motivated teams are working in technical WPs to proceed towards sites and centers setup

Deliverables/milestones related to 2nd site decisions delayed by ~ 4 months

- Milestones & deliverables: quite good achievements, so far all requested submitted to EU Proj. Office
- Several crucial ones to be concluded in the next few months:
  - A set linked to WP activities (to be submitted within October): a half-way status report on the Project
  - D3.2 *Report on the decision on the second site* (Jun 24 → Oct 24) → **see later**
  - D16.1 *Update on EuPRAXIA plans for selected site 2* (Oct 24 → Feb 25) **linked to decision on 2nd site**
  - D1.2 *Description of updated implementation scheme after site decision* (Oct 24 → Feb 25) **idem**
  - D4.2 *Cost implementation and service preliminary assessment* (Oct 24 → Feb 25) **idem**
- April-May: “Tour de table” (video) with individual WPs to understand status and advancements (completed). First tour of WPs showed many well advanced conditions of cooperation. In some WPs, further tuning needed *“... collaborative work encounters difficulty to overcome competitive spirit ...” one WP leader said*
- Define procedures toward 2nd site identification (see later)
- Define procedures toward governance model (see later)
- Work on realization/start-up of National Nodes/Technical Clusters (to the benefit of two PWFA/LWFA sites)
- Activation of STAB (done)
- Activation of Board of Financial Sponsors (members list nearly completed, 1st mtg. by the end of the year)

Committee formed by high level scientists, belonging to the area of particle physics, accelerators, plasma and laser technologies, with high expertise in governance of large programs / science policy

The goal is to provide advise to EuPRAXIA for the operation of the Consortium, both in the Preparatory Phase and in the (most important) Implementation Phase. They will have access to General Meetings material, and will be allowed to follow the CB, to get insights in the project

First, **introductory meeting on Sep. 12**; presentations on advancement of Preparatory Phase, technical aspects of beam and laser driven technologies, status of 2nd site choice, preparation of governance scheme

A second meeting is foreseen by early next year, with a more specific list of questions to which the Consortium will be asked to answer

→ Scientific strategy, technical choices, 2nd site, governance, funding, long term sustainability: the main items that will be discussed by STAB

• **Final list of members:**

* Lenny Rivkin - Chair	PSI/LEAPS
* Mike Dunne	SLAC
* Ursula Bassler	CNRS
* Sandro de Silvestri	Politecnico Torino
* László Veisz	UMU Sweden
* Fernando Ferroni	INFN
* Thomas Tschentscher	Eu. XFEL
* Hagen Zimer	Trumpf Laser CEO
* Roland Sauerbrey	ex HZDR director, retired

Committee formed by representatives from Funding Agencies of countries present in EuPRAXIA to advise/support/endorse/control the operation of the Consortium, both in the Preparatory Phase and in the (most important) Implementation Phase

BoFS is expected to ratify 2nd site choice, legal framework, governance, funding scheme (in-kind & cash), together with general EuPRAXIA layout and operation (sites + national nodes + technical clusters). Quite inhomogeneous National Funding Schemes: National Institutes (IT, FR, UK), Ministerial levels, CERN IGO, ELI-ERIC, etc... Difficult recollection of concerned people. **1st meeting expected within year's end**

Country	Name	other info
CERN	Steinar Stapnes	CERN
Czech Rep	Radka Wildova	Director General for Higher Education, Science and Research section
	Marek Vysinka	Research Infrastructures Department
France	Antoine Rousse	CNRS-LOA
	Catalin Miron	CEA-Research Infrastructures
Germany	to be comunicated	
Greece	Emmanuel Varvarigos	Vice-Rector of NTUA
Italy	Sandra Malvezzi	INFN Executive Board
	to be comunicated	Italian Research and University Ministry
Portugal	Marta Fajardo	IPT
Spain	Rebeca Frías Antolín	Grandes Instalaciones Científicas - Ministerio de Ciencia, Innovación y Universidades
UK	John Collier	CLF Director and Executive Director of Laserlab Europe
Hungary	Peter Racsko	NRDIO officier

- 4 candidates: CNR Pisa, ELI-ERIC Prague, CLPU Salamanca, EPAC RAL
  - Milestone 16.1 finalized: candidacy overview (text provided by sites, according to structure template):
 

- *Existing infrastructure towards delivering the LPA-based EuPRAXIA pillar (Phase1)*
    - *Technology readiness for LPA-based EuPRAXIA pillar (Phase1)*
    - *Existing Safety and Control Systems*
    - *Teaming and Management*
    - *User-oriented operation experience*
    - *Identification of pre-investment relevant for the EuPRAXIA development*
    - *Identification of required funding to accomplish EuPRAXIA LPA-pillar Phase1*
    - *Strategy to implement the EuPRAXIA LPA-pillar Phase-2*
    - *Collaboration needed (wish-list from each candidate)*
  - Internal Panel setup. Preparation of template for site bid-book (representing D3.2 *Report on the decision on the second site*) : **more details in WP3 presentation**
    - Bid-book scheme submitted for approval to CB on next Sept. 25th, then call opens (deadline Dec. 20th)  
*(informal support from respective Funding Agency expected as key element)*
    - Evaluation by panel (Jan/Feb, Information provided to STAB & BoFS)
    - Proposal for a choice submitted for approval in a special CB in March 2025
- important: site choice & EuPRAXIA governance must be aligned

- Key inputs to the EuPRAXIA eco-system:
  - Cooperative-oriented consortium with light legal framework
  - Accepted by Funding Agencies & ESFRI
  - Flexible (minimal bureaucracy) and based on MoUs (or Service agreements)
  - Capable of accounting in-kind contributions and fresh resources (assets remains to stakeholder)
  - Operating coherently as a Network + 2 sites + several Centres (specific technologies)
  - Coordinated external user access to EuPRAXIA facilities, following ESFRI regulation (OA, FAIR, etc...)
  - Centralized capability to participate to EU calls (issue of legal entity) as “EuPRAXIA”
  - Sites funding: based on in-kind contributions from institutes/country + regional funding + EU calls
  - Operational costs: relying on host Institution (other schemes possible, although difficult)
  - National nodes/ technology clusters: based on in-kind contributions from institutes/country + regional funding + EU calls. They are expected to contribute to specific technical parts of sites
- ... (plus any other further request from partners)

→ **More details in WP4 presentation**



EuPRAXIA Network is built on the following elements:

- **sites** (beam driven, laser driven): they operate as main EuPRAXIA facilities to users
- **national nodes**: they collect national technological interests, lobbying respective funding agencies to get support for EuPRAXIA, locally and to the sites
- **technical clusters**: they collect specific technological interests from different groups (even in different countries) to support the sites. Logically linked to current WP organization

Next important activity: **develop national nodes** with dedicated meeting with national communities and – hopefully – representatives from funding agencies, explaining EuPRAXIA vision and perspectives (this would also be very useful for first BoFS meeting)

Quite different situations in various countries: some with many/several institutes, from different Funding Agencies, others with 1 or 2 groups.

A challenging step, although necessary for EuPRAXIA future & development

Trying to build an **EuPRAXIA Collaboration** (including a collaborators' list), to work together on the project, especially when PP grant will be over: need to set solid foundations **NOW** !

EuPRAXIA is a challenging and fascinating ESFRI European Research Infrastructure with several “non standards” aspects:

- Effort to merge three very different communities: accelerators, plasma, lasers experts
- Network with real sites, nodes and clusters: **HEP-style collaboration guidance**
- Effort to have nodes/clusters contributing to sites
- Un-conventional way of funding (multi-actors: EU, FA, Universities, etc...), large use of in-kind (HW and personnel)

A little more than 2 years to conclude EuPRAXIA\_PP and several challenging tasks ahead of us: 2nd site choice, governance, legal model, interactions with FAs





**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



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ALBA



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CENTRO DE LASERES MÚLTIPLAS




Empa  
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EPFL



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THE HEBREW UNIVERSITY OF JERUSALEM




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