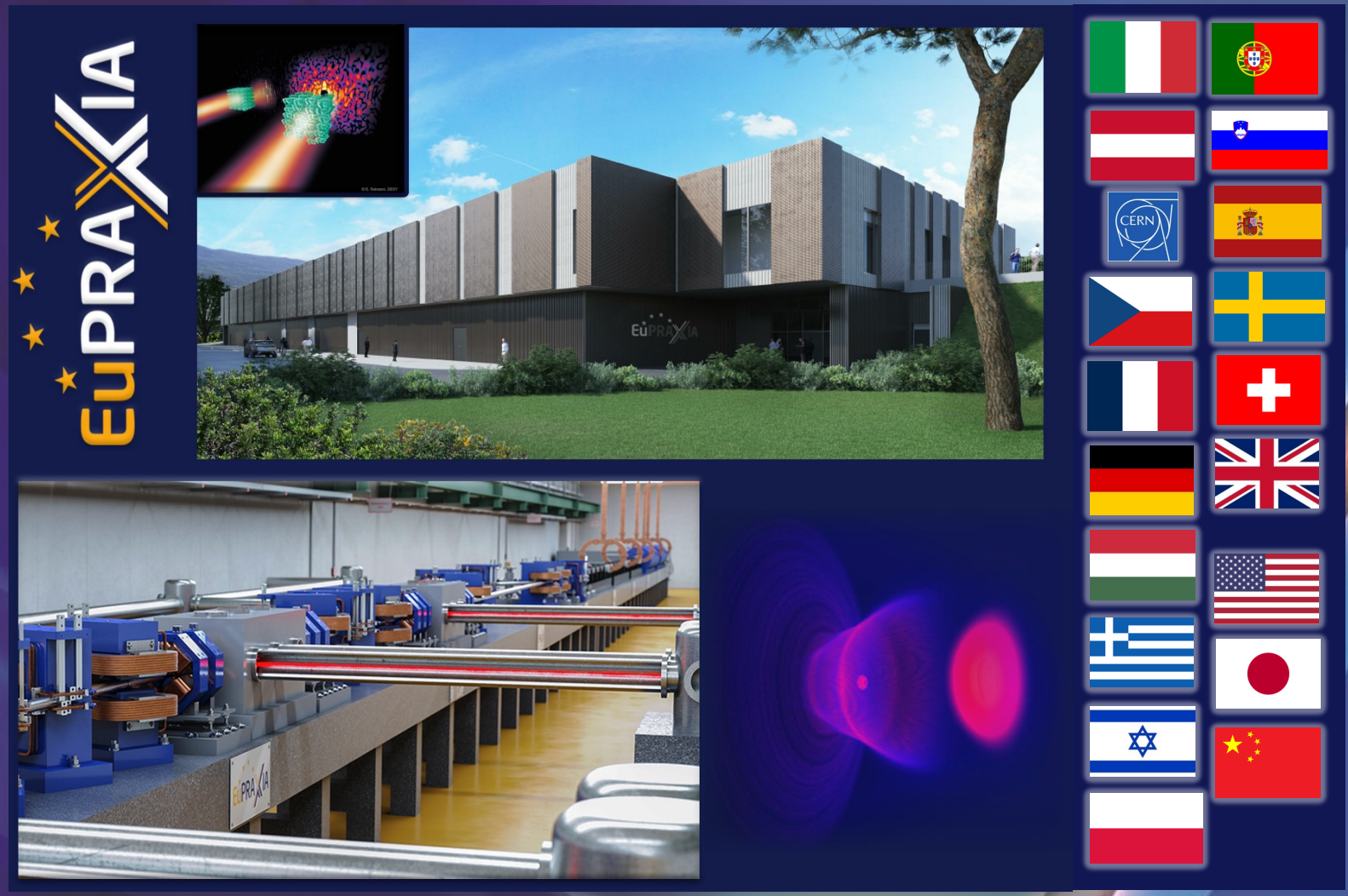
EUROPEAN
PLASMA RESEARCH
ACCELERATOR WITH
EXCELLENCE IN
APPLICATIONS

EuPRAXIA Advanced Photon Sources – Integration into EuPRAXIA

Ralph W. Aßmann, Coordinator
(INFN and DESY)

EuPRAXIA APS Kick-Off Meeting, Rome

28 February 2023



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

http://www.eupraxia-facility.org

The EuPRAXIA Project

http://www.eupraxia-project.eu/

Funded by the European Union

- First ever design of a **plasma accelerator facility**.
- **Conceptual Design Report for a distributed research infrastructure** funded by EU Horizon2020 program.
- Our common, substantiated EuPRAXIA goal:
  - Building the **first plasma-based facility that delivers** pulses of photons, electrons and positrons for users in Europe
  - **Competitive parameters in a factor 3 reduced size**
- Next phase consortia in operation: **54 institutes**
- Preparatory Phase project: **2022 – 2026** (just started)
- Incremental **readiness as distributed European RI**: from **2028**

Conceptual Design

600+ page CDR, 240 scientists contributed

Contractual Reference Documents

Funded by the European Union

ESFRI Consortium Agreement

Consortium Agreement

between research institutions and organisations

for the Preparatory Phase of the EuPRAXIA infrastructure

Preamble:

Istituto Nazionale di Fisica Nucleare (INFN), Via Enrico Fermi 40, Frascati 00044, Italy,

Commissariat à l'Énergie Atomique et aux Énergies Alternatives (CEA), rue Leblanc 25, Paris 15, 75015, France,

European Organization for Nuclear Research (CERN), an Intergovernmental Organization having its seat at Geneva, Switzerland and its address at Esplanade de Particules 1, 1217 Meyrin, Switzerland,

Consiglio Nazionale delle Ricerche (CNR), Via Moruzzi, 1, 56124 Pisa, Italy,

Centre National de la Recherche Scientifique (CNRS), Rue Michel-Ange 3, 75794 Paris, France,

Deutsches Elektronen-Synchrotron DESY (DESY), Notkestraße 85, Hamburg 22607, Germany,

Elettra – Sincrotrone Trieste S.C.p.A., Strada Statale 14 – km 163,5 in AREA Science Park, 34149 Basovizza, Trieste, Italy,

Institute of Physics of the Czech Academy of Sciences, a public research institution, Na Slovance 2, Prague 8, post code 182 21, Czech Republic (Extreme Light Infrastructure – Beamlines Facility),

Swiss Federal Laboratories for Materials Science and Technology (EMPA), Überlandstr. 129, 8600 Dübendorf, Switzerland,

Agenzia Nazionale per le Nuove Tecnologie, l'Energia e lo Sviluppo Economico Sostenibile (ENEA), Via Enrico Fermi, 45, Frascati 00044, Italy,

Ecole Polytechnique Fédérale de Lausanne (EPFL), Bâtiment CE- 3.316, Station 1, CH-1015 Lausanne, Switzerland,

Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik within the Forschungsverbund Berlin e.V. (FBH), Gustav-Kirchhoff-Straße 4, 12489 Berlin, Germany,

Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V., Hansastr. 27c, 80686 München acting as legal entity for and on behalf of its **Fraunhofer Institute for Laser Technology**, Steinbachstraße 15, 52074 Aachen, Germany,

Forschungszentrum Jülich GmbH (FZJ), Wilhelm-Johnen-Straße, 52425 Jülich, Germany,

Hebrew University of Jerusalem, Jerusalem, Israel,

Helmholtz-Zentrum Dresden-Rossendorf e.V. (HZDR), Bautzner Landstr. 400, 01328 Dresden, Germany,

Institute of Applied Physics of the Russian Academy of Sciences, 46 Ul'yanov Street, Nizhny Novgorod, 603950, Russia,

Imperial College of Science, Technology and Medicine, South Kensington Campus, London SW7 2AZ, United Kingdom,

Institute of Plasma Physics and Laser Microfusion (IFPiLM), ul. Hery 23, 01-497 Warszawa, Poland,

Preparatory Phase

Consortium Agreement

HORIZON EUROPE GRANT AGREEMENT N. 101079773

Final Version – Date 15/11/2022

Based on DESCA – Model Consortium Agreement for Horizon Europe

AP Version 1

July 2022

Preparatory Phase

1,542 person months

EUROPEAN RESEARCH EXECUTIVE AGENCY (REA)

REA.C – Future Society

C.4 – Reforming European R&I and Research Infrastructures

GRANT AGREEMENT

Project 101079773 — EuPRAXIA

PREAMBLE

This **Agreement** ('the Agreement') is **between** the following parties:

on the one part,

the **European Research Executive Agency (REA)** ('EU executive agency' or 'granting authority'), under the powers delegated by the European Commission ('European Commission'),

and

on the other part,

1. 'the coordinator':

ISTITUTO NAZIONALE DI FISICA NUCLEARE (INFN), PIC 999992789, established in Via Enrico Fermi 54, FRASCATI 00044, Italy,

and the following other beneficiaries, if they sign their 'accession form' (see Annex 3 and Article 40):

2. **CONSIGLIO NAZIONALE DELLE RICERCHE (CNR)**, PIC 999979500, established in PIAZZALE ALDO MORO 7, ROMA 00185, Italy,

3. **ELETTRA - SINCROTRONE TRIESTE SCPA (ELETTRA)**, PIC 999589851, established in SS 14 KM 163.5 AREA SCIENCE PARK, BASOVIZZA TRIESTE 34149, Italy,

4. **AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE (ENEA)**, PIC 999988521, established in LUNGOTEVERE GRANDE AMMIRAGLIO THAON DI REVEL 76, ROMA 00196, Italy,

5. **UNIVERSITA DEGLI STUDI DI ROMA LA SAPIENZA (UNI SAPIENZA)**, PIC 999987745, established in Piazzale Aldo Moro 5, ROMA 00185, Italy,

6. **UNIVERSITA DEGLI STUDI DI ROMA TOR VERGATA (UNITOV)**, PIC 999844864, established in VIA CRACOVIA 50, ROMA 00133, Italy,

7. **COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES (CEA)**, PIC 999992401, established in RUE LEBLANC 25, PARIS 15 75015, France,

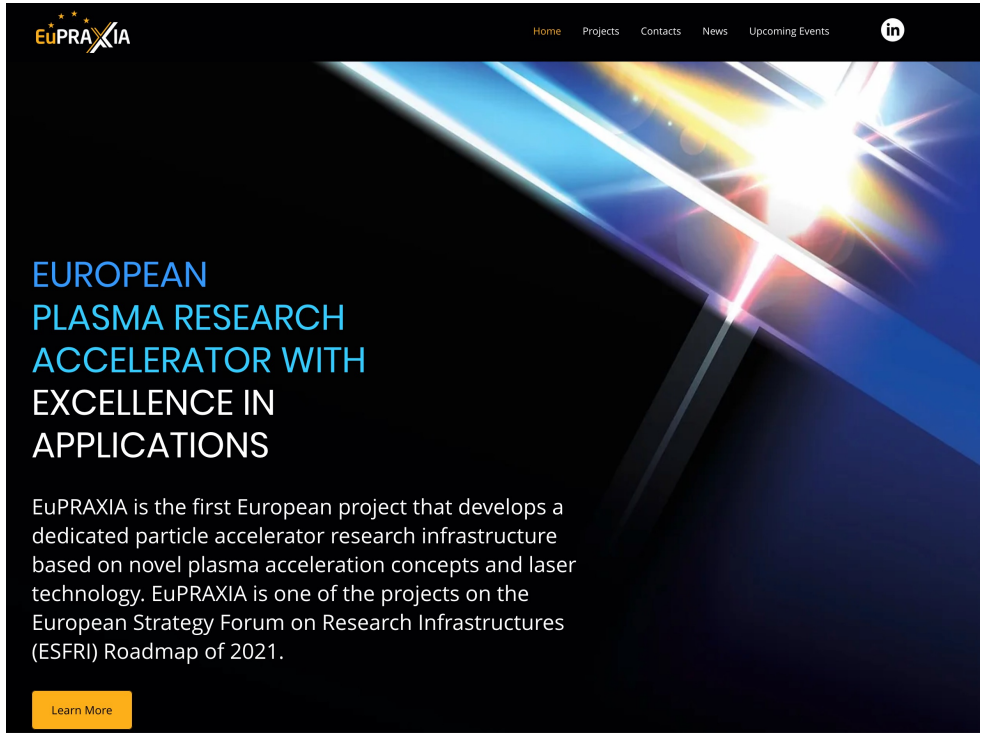
8. **CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS (CNRS)**, PIC 999997930, established in RUE MICHEL ANGE 3, PARIS 75794, France,

plus Consortium and Grant Agreements for EuPRAXIA doctoral network

EuPRAXIA Data Management Plan

New website structure in place including intranet, cloud, …

Funded by the European Union



Central EuPRAXIA entry page:

https://www.eupraxia-facility.org/

EuPRAXIA project websites:

https://www.eupraxia-pp.org/

https://www.eupraxia-dn.org/

https://sparclab.lnf.infn.it/sparc_lab-home/eupraxiasparc_lab/

Link to euaps website to be added

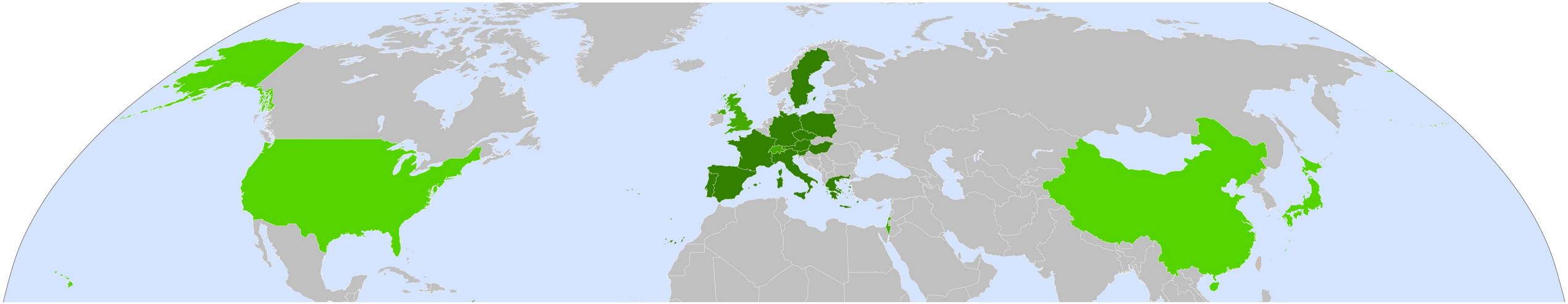
Conceptual design website:

http://www.eupraxia-project.eu/

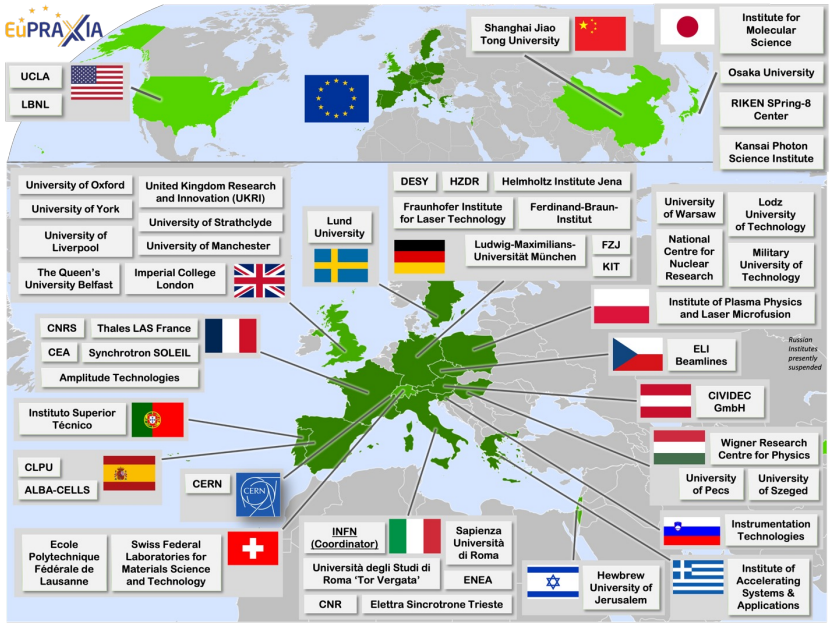
First contractual deliverables for WP1 and WP2 of EuPRAXIA-PP

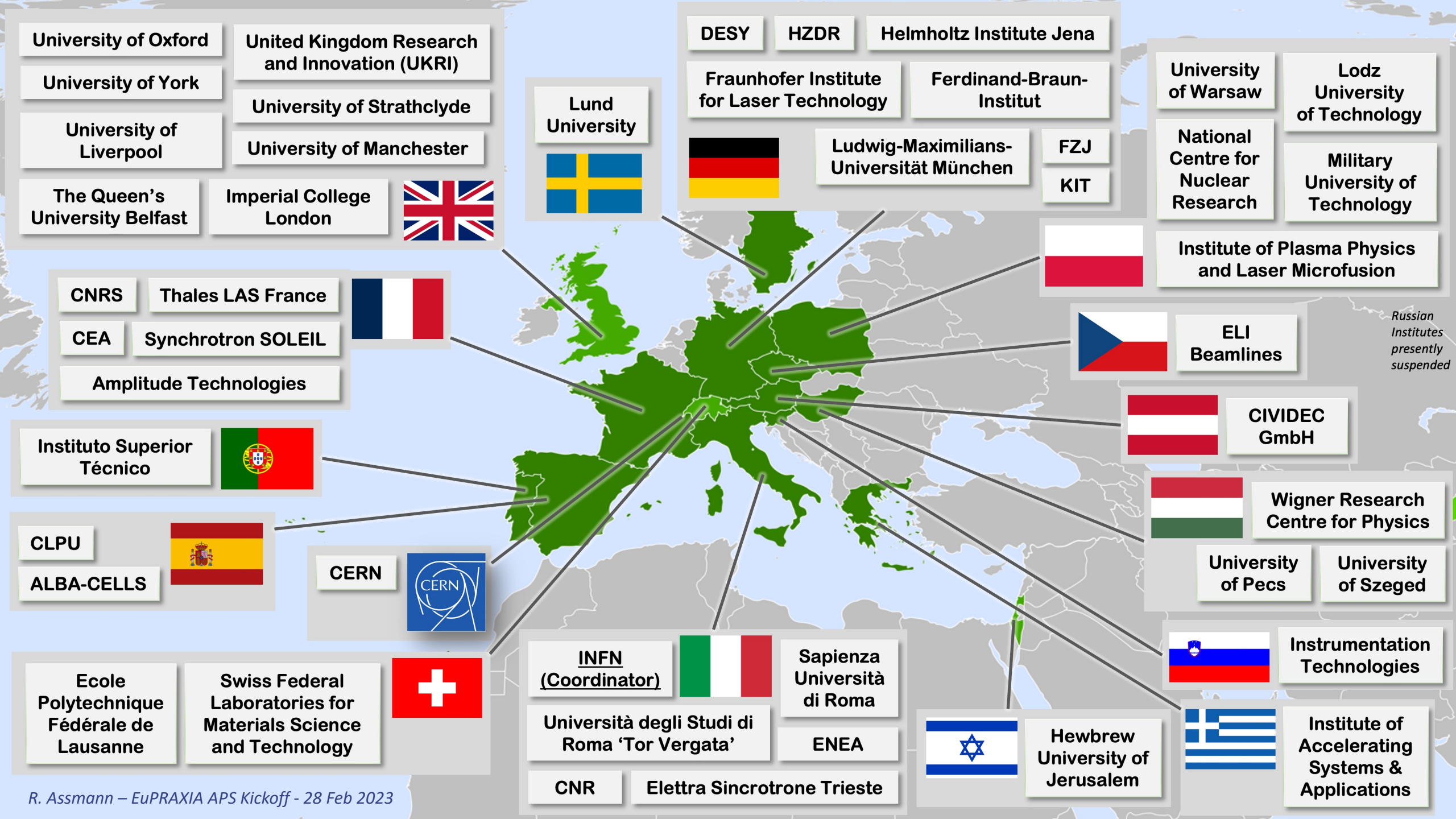
The EuPRAXIA Consortium Today

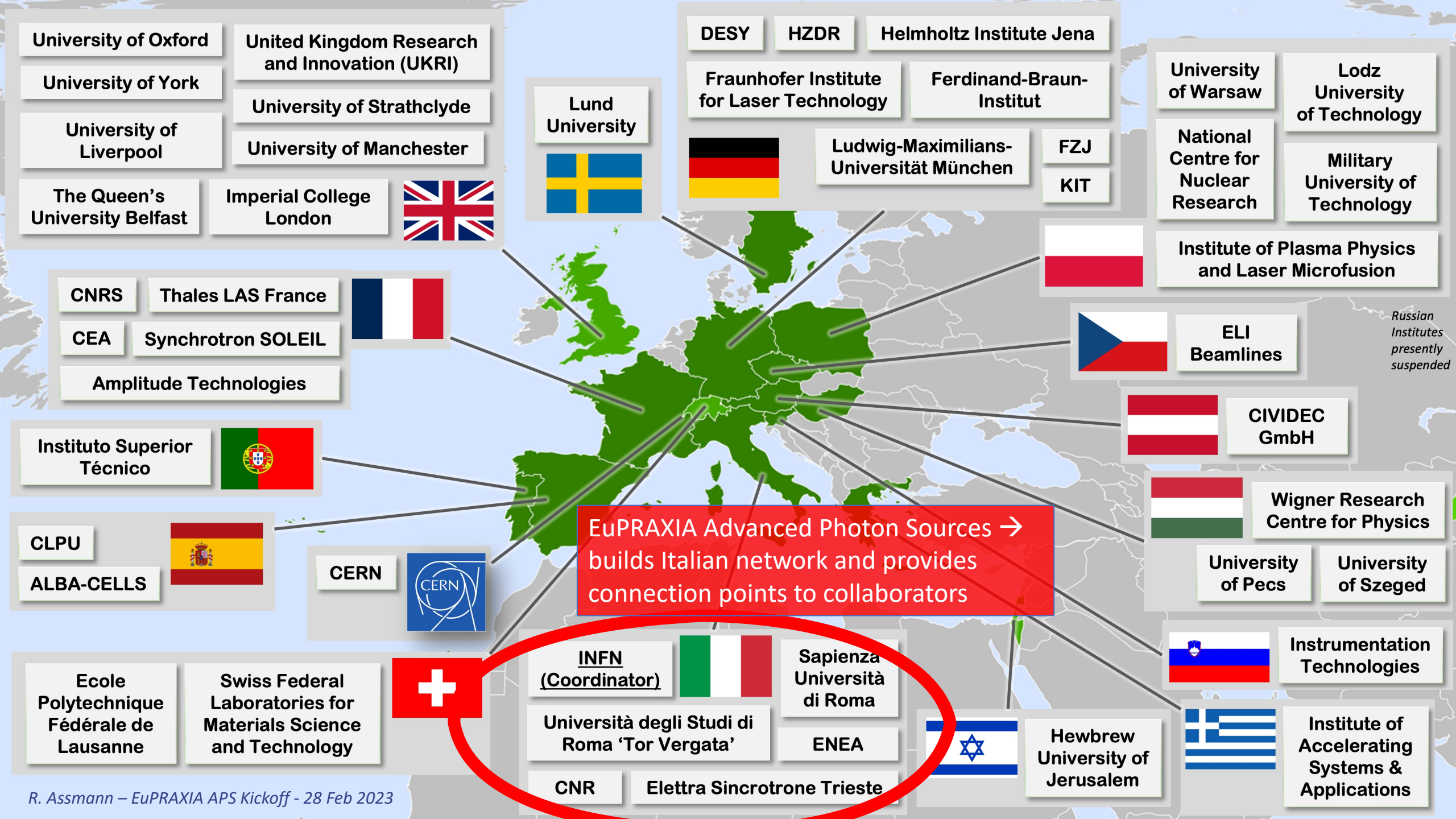
Funded by the European Union



- **54 institutes** *(in addition > 2 asked to join us presently)*
- from **18 countries** plus CERN
- signed on one or several presently **active EuPRAXIA consortia**:
  - **ESFRI** consortium (funding in-kind)
  - **Preparatory Phase** consortium (funding EU, UK, Switzerland, in-kind)
  - **Doctoral Network** (funding EU, UK, in-kind)




University of Oxford
United Kingdom Research and Innovation (UKRI)
University of York
University of Strathclyde
University of Liverpool
University of Manchester
The Queen's University Belfast
Imperial College London
Lund University
DESY
HZDR
Helmholtz Institute Jena
Fraunhofer Institute for Laser Technology
Ferdinand-Braun-Institut
Ludwig-Maximilians-Universität München
FZJ
KIT
University of Warsaw
Lodz University of Technology
National Centre for Nuclear Research
Military University of Technology
Institute of Plasma Physics and Laser Microfusion
CNRS
Thales LAS France
CEA
Synchrotron SOLEIL
Amplitude Technologies
Russian Institutes presently suspended
ELI Beamlines
CIVIDEC GmbH
Instituto Superior Técnico
Wigner Research Centre for Physics
University of Pecs
University of Szeged
CLPU
ALBA-CELLS
CERN
Instrumentation Technologies
INFN (Coordinator)
Sapienza Università di Roma
Università degli Studi di Roma 'Tor Vergata'
ENEA
CNR
Elettra Sincrotrone Trieste
Ecole Polytechnique Fédérale de Lausanne
Swiss Federal Laboratories for Materials Science and Technology
Hewbrew University of Jerusalem
Institute of Accelerating Systems & Applications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CNRS
Thales LAS France
CEA
Synchrotron SOLEIL
Amplitude Technologies
Russian Institutes presently suspended
ELI Beamlines
CIVIDEC GmbH
Instituto Superior Técnico
Wigner Research Centre for Physics
University of Pecs
University of Szeged
CLPU
ALBA-CELLS
CERN
EuPRAXIA Advanced Photon Sources → builds Italian network and provides connection points to collaborators
Instrumentation Technologies
Ecole Polytechnique Fédérale de Lausanne
Swiss Federal Laboratories for Materials Science and Technology
INFN (Coordinator)
Sapienza Università di Roma
Università degli Studi di Roma 'Tor Vergata'
ENEA
CNR
Elettra Sincrotrone Trieste
Hewbrew University of Jerusalem
Institute of Accelerating Systems & Applications

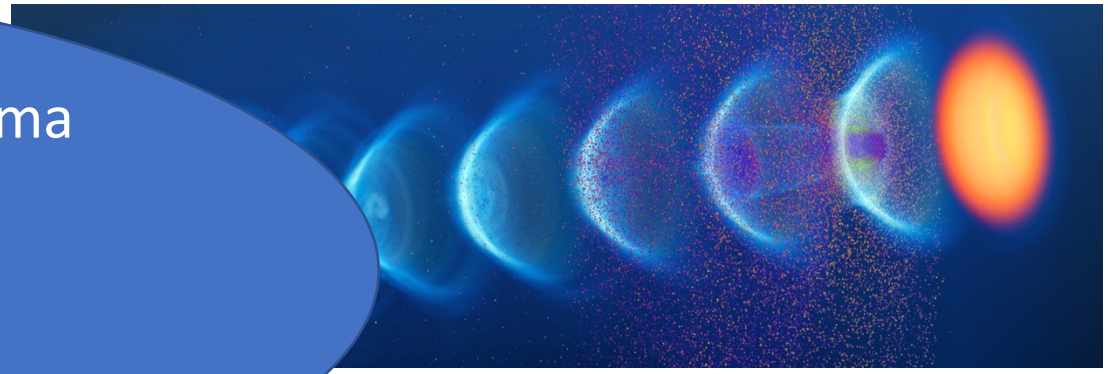
A New European High-Tech Research Facility Delivering Frontier Science

Funded by the European Union

1

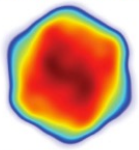
Building a facility with very high field plasma accelerators, driven by lasers or beams
1 – 100 GV/m accelerating field

Shrink down the facility size

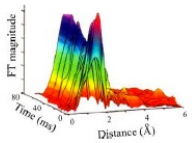


Experimental techniques and typology of samples

Coherent imaging



X-ray absorption spectroscopy



Raman spectroscopy

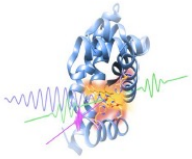
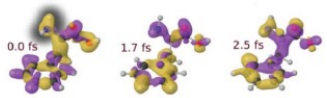


Photo-fragmentation of molecules

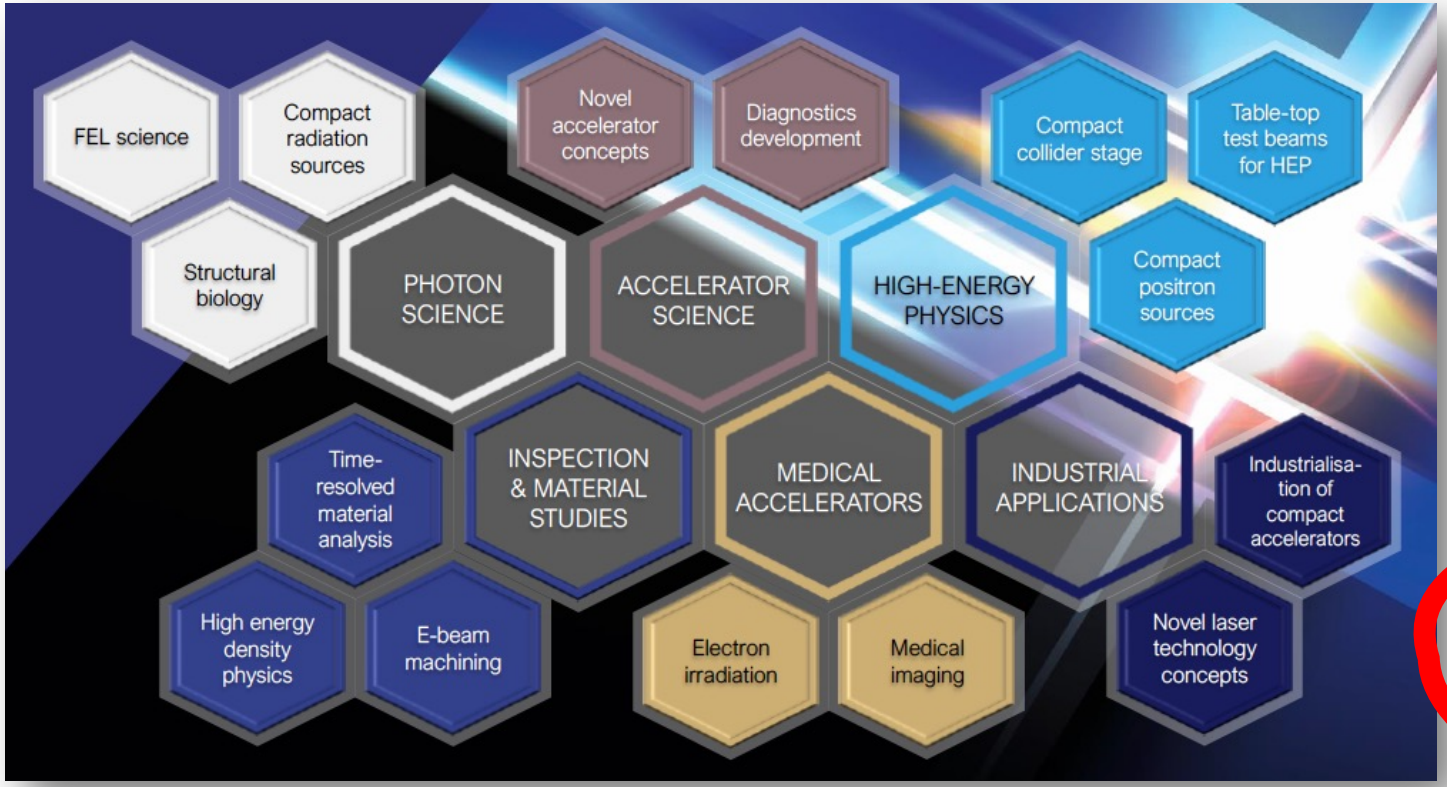


2

Producing particle and photon pulses to support several urgent and timely science cases

Enable frontier science in new regions and parameter regimes

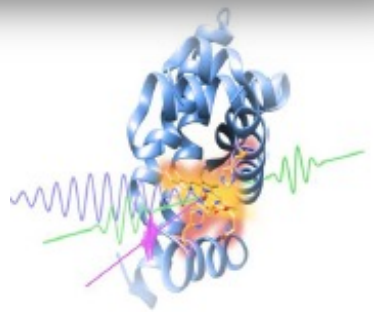
Versatile – Designed for Users in Multiple Science Fields



*Delivers 10-100 Hz **ultra-short** pulses*

- **Electrons** (0.1-5 GeV, 30 pC)
- **Positrons** (0.5-10 MeV, 10^6)
- **Positrons** (GeV source)
- **Lasers** (100 J, 50 fs, 10-100 Hz)
- **Betatron X rays** (1-110 keV, 10^{10})
- **FEL light** (0.2-36 nm, 10^9-10^{13})

Topics of research: proteins, viruses, bacteria, cells, metals, semiconductors, superconductors, magnetic materials, organic molecules

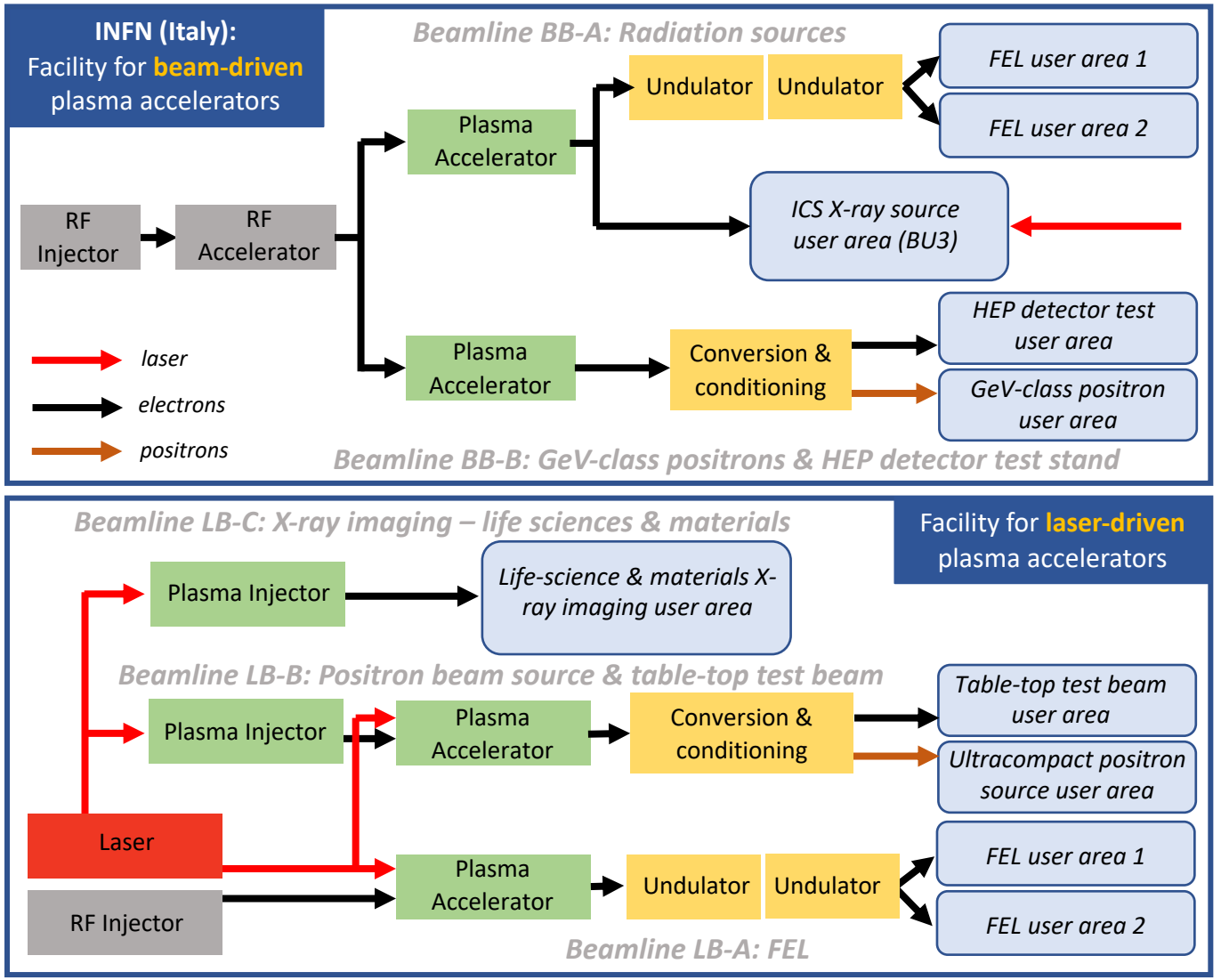


EuPRAXIA Advanced Photon Sources

Phased Implementation

Funded by the European Union

	Laser-driven	Beam-driven
Phase 1	✓ FEL beamline to 1 GeV + user area 1 ✓ Ultracompact positron source beamline + positron user area	✓ FEL beamline to 1 GeV + user area 1 ✓ GeV-class positrons beamline + positron user area
Phase 2	✓ X-ray imaging beamline + user area ✓ Table-top test beams user area ✓ FEL user area 2 ✓ FEL to 5 GeV	✓ ICS source beamline + user area ✓ HEP detector tests user area ✓ FEL user area 2 ✓ FEL to 5 GeV
Phase 3	✓ High-field physics beamline / user area ✓ Other future developments	✓ Medical imaging beamline / user area ✓ Other future developments



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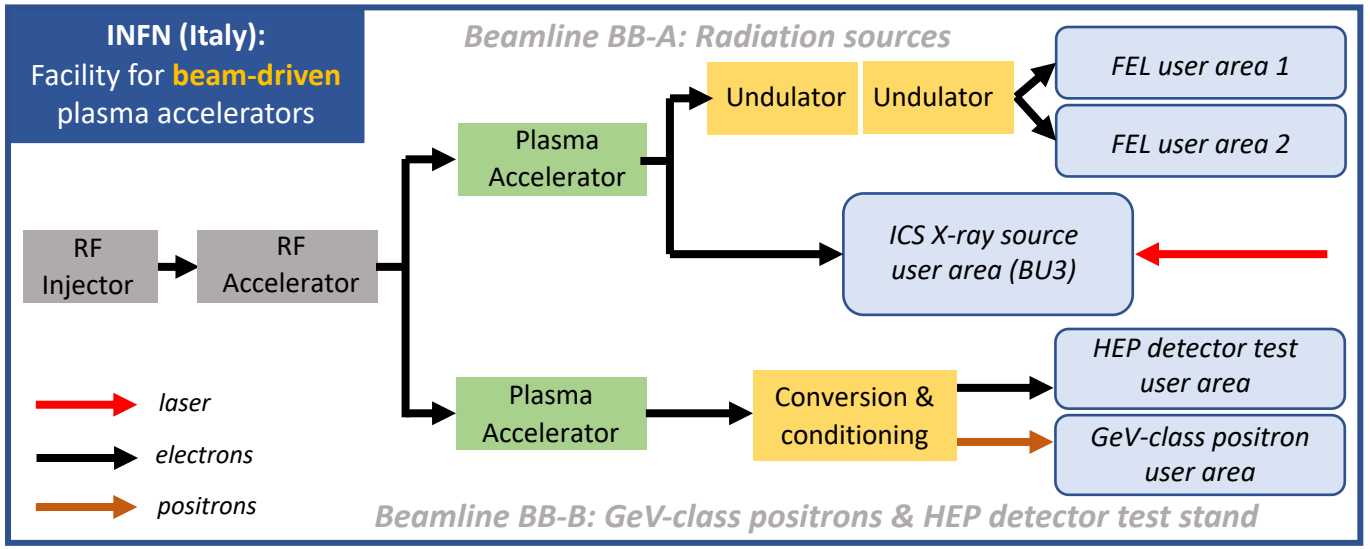
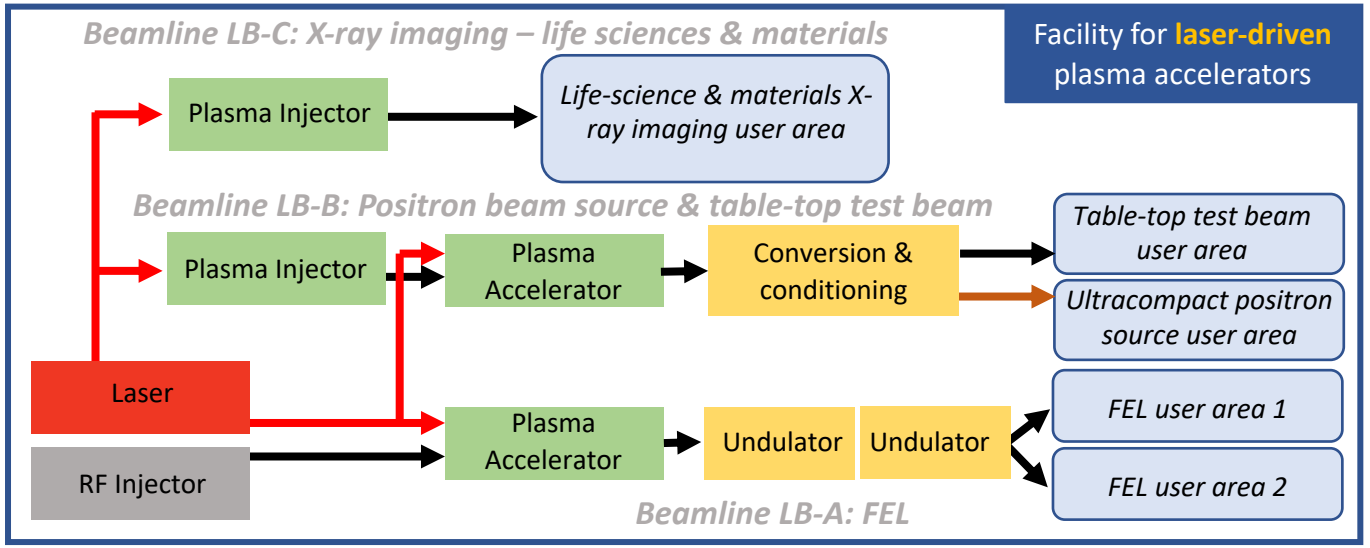
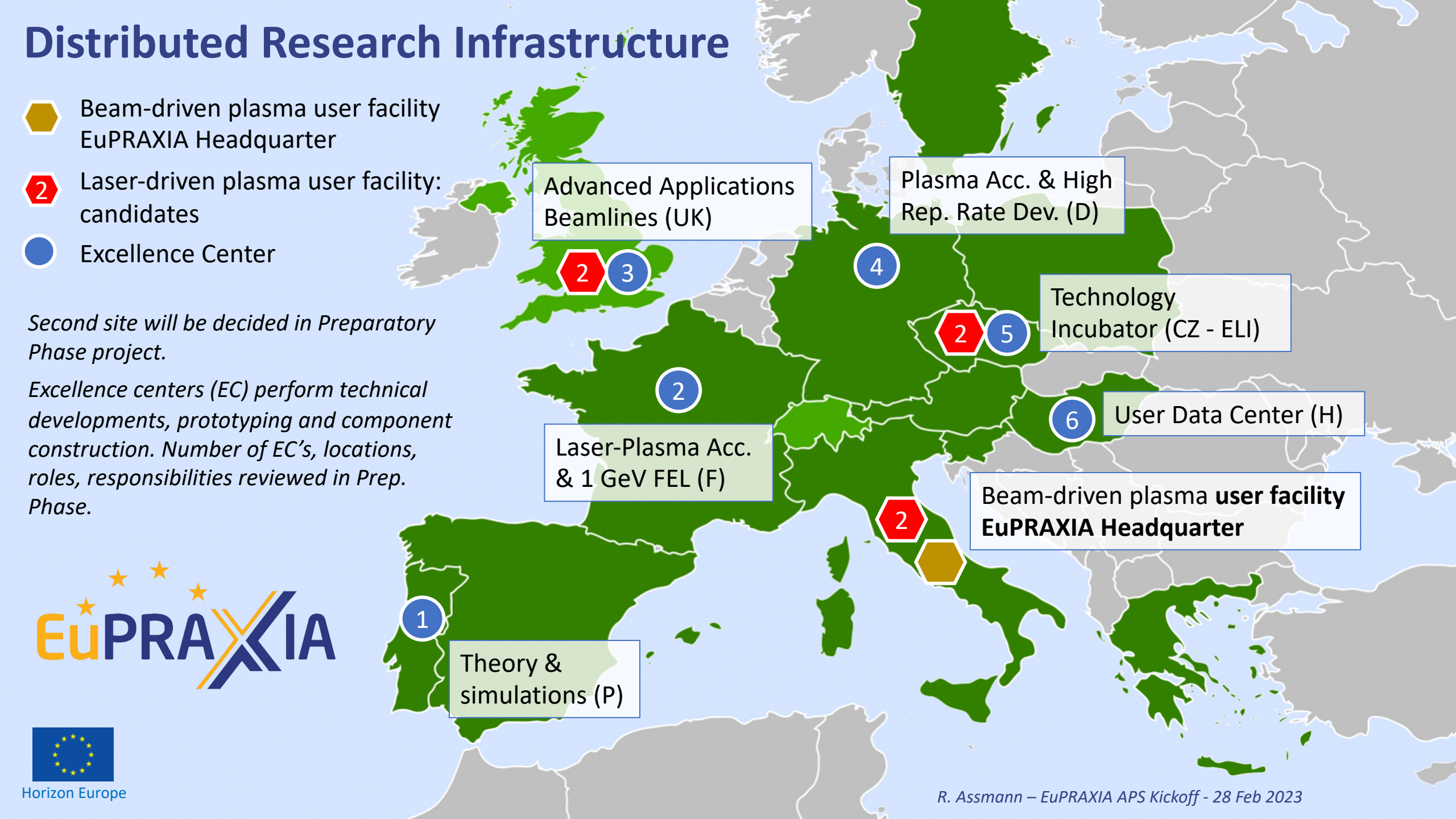
EuPRAXIA Advanced Photon Sources





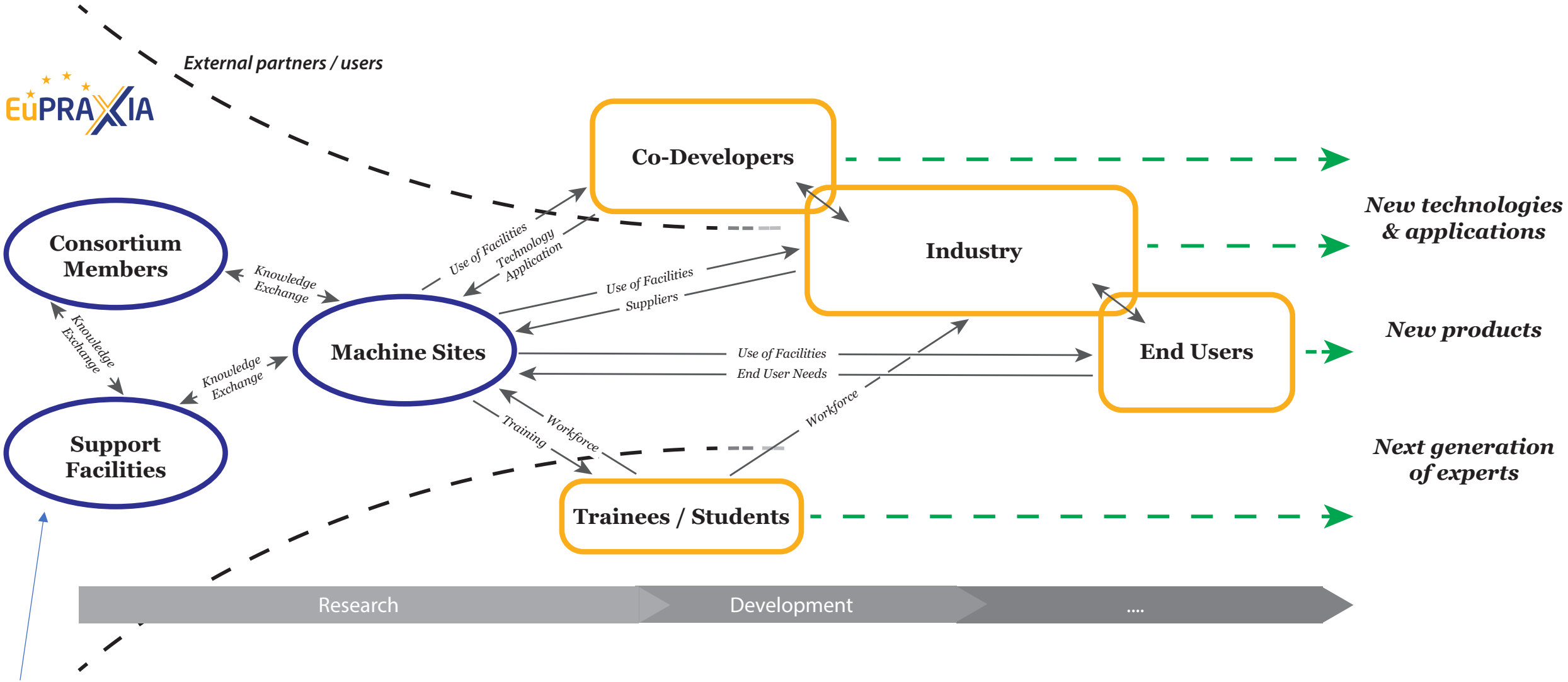
Distributed Research Infrastructure



EuPRAXIA Open Innovation Concept

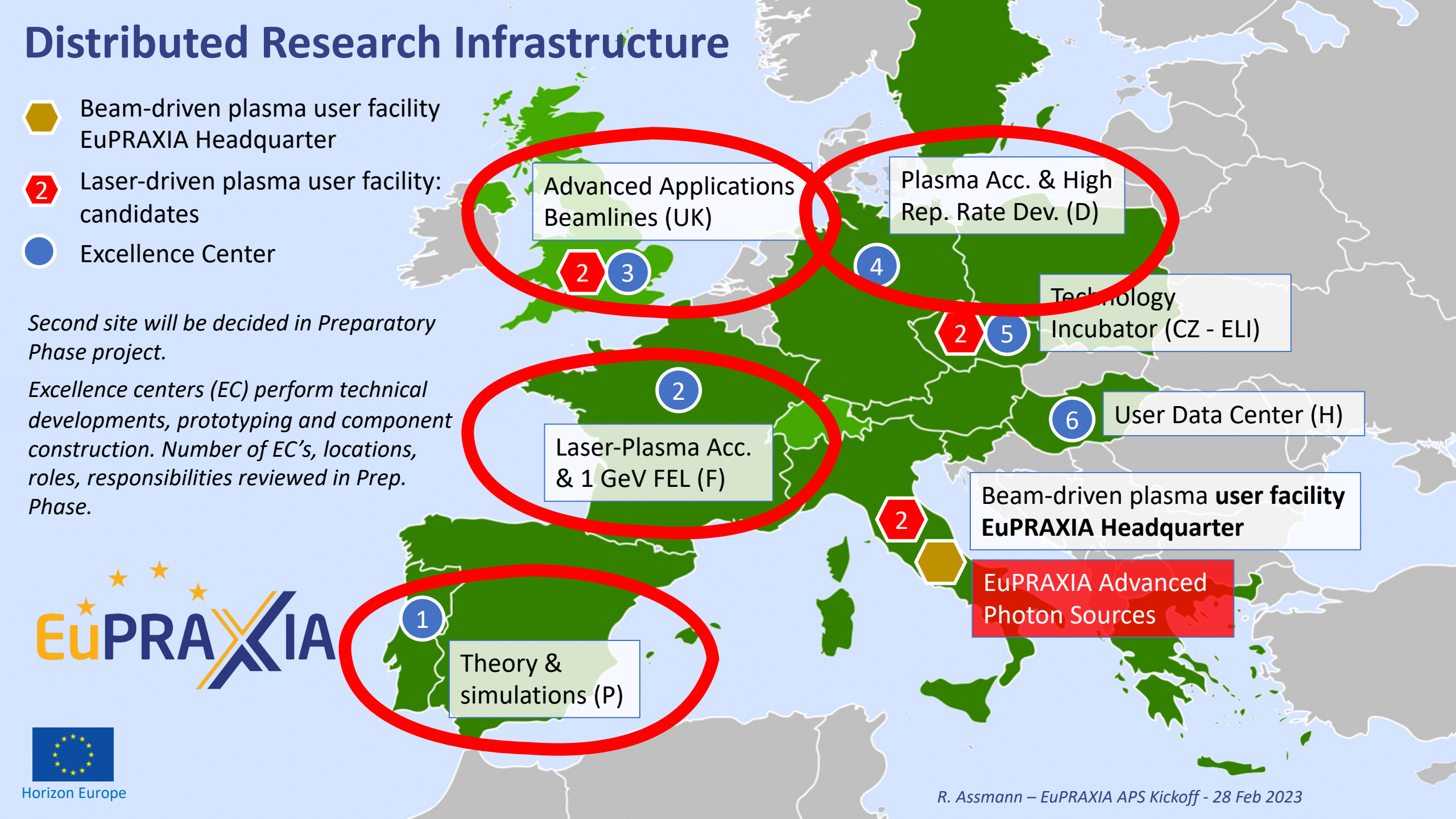
From ESFRI application: Long-term knowledge exchange between all RI nodes

Funded by the European Union



Excellence centres (support facilities) as continuous R&D sites to **develop and prototype technologies** for EuPRAXIA

Distributed Research Infrastructure

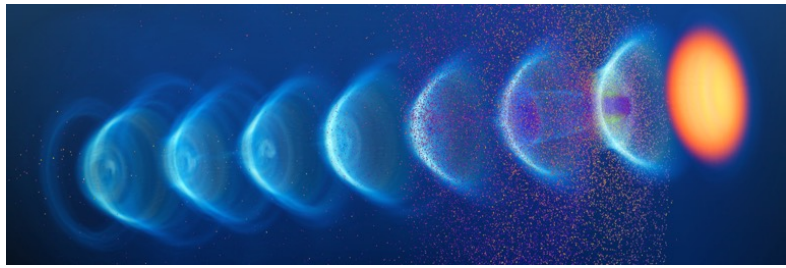


EuPRAXIA-PP (Preparatory Phase) Key Facts

Funded by the European Union

Prepares the implementation of the full RI in Europe

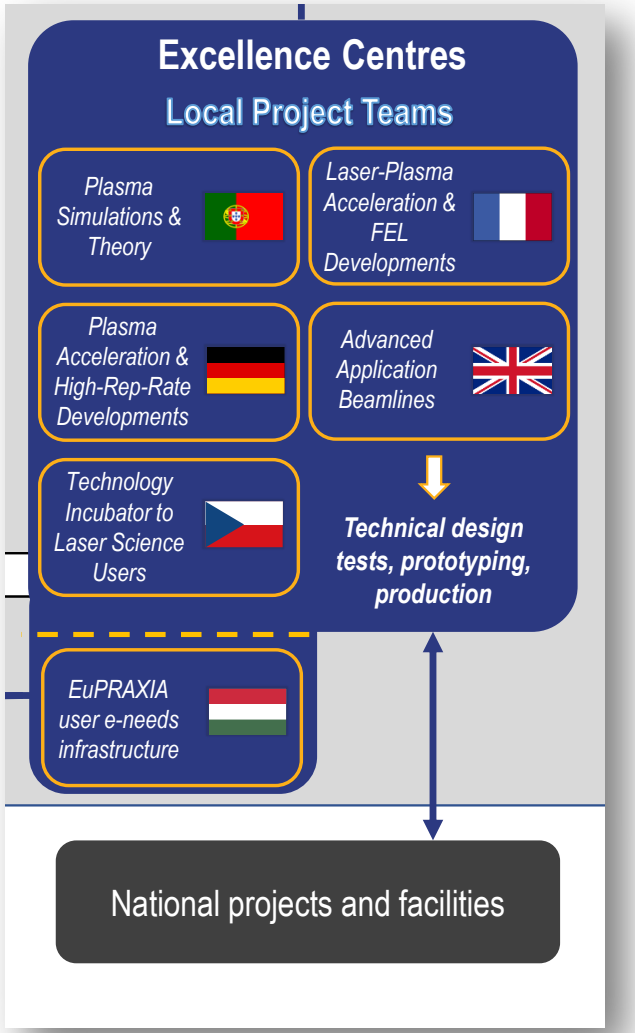
- Total project volume (including in-kind): **8.3 M€**
  - EU funding: **2.49 M€** (EU without in-kind)
  - Outside EU **0.69 M€** (Switzerland)
    0.51 M€ (UK)
- Work organized in 16 Work Packages
- Project dates: **1 Nov 2022 – 31 Oct 2026**
- Coordinator and location of headquarters: **INFN**
- **34** participating organizations from 12 countries
- Will establish a “Board of Financial Sponsors“ with representatives of funding agencies.
- Making excellent progress towards full implementation but more work/funding required



Relevant Questions for Preparatory Phase

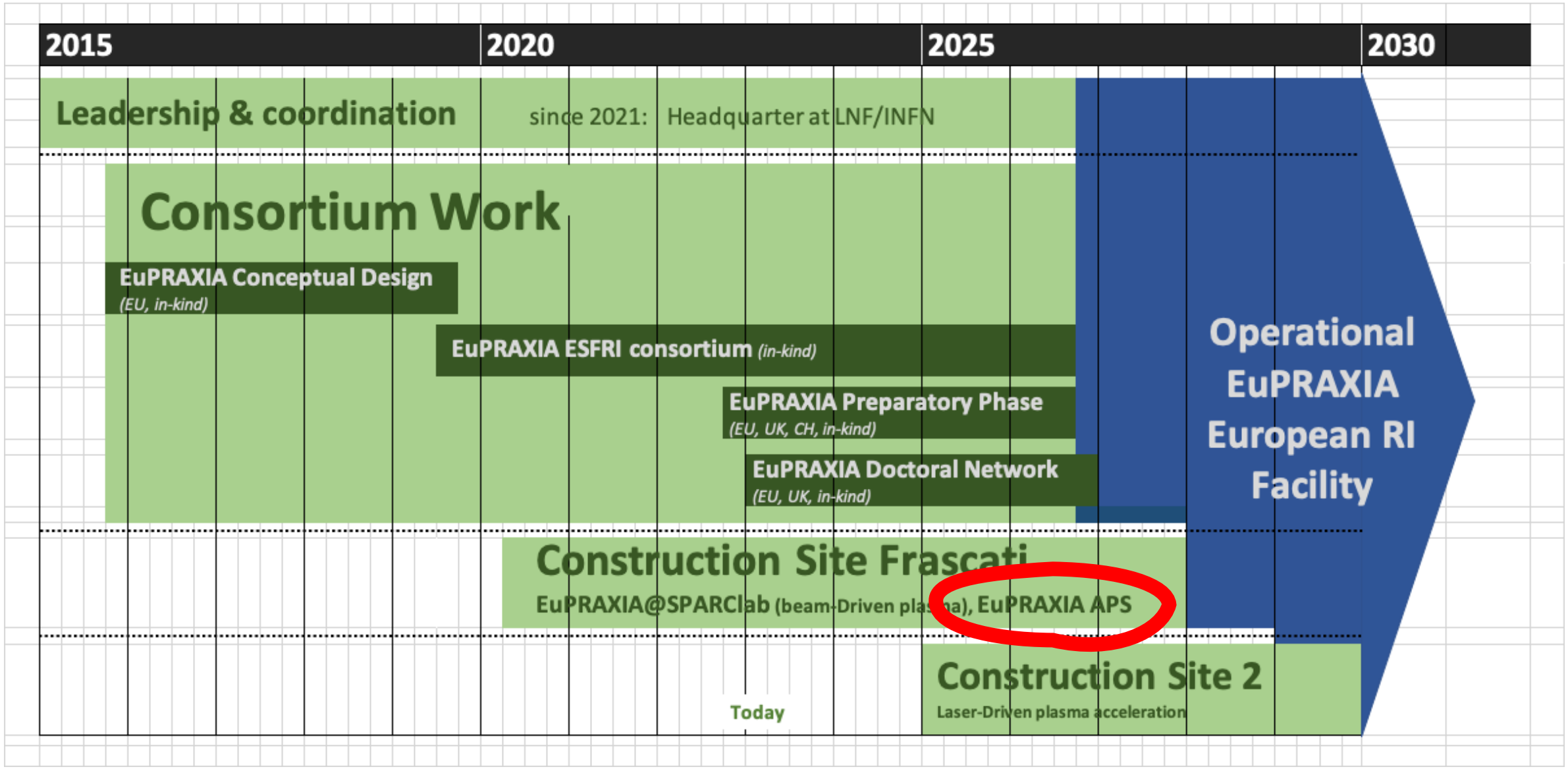
Funded by the European Union

- Updates to **CDR concepts – towards a TDR**
- Second **site on LWFA**: Location and definition.
- Excellence centres *(add excellence centre lines to project overview and funding lines)*:
  - Define final number and concepts (single hub, multi hub, connections)
  - Can be cross-WP or single WP → **EuPRAXIA PP workshop in first year**
  - Specify R&D, prototyping, testing and possible **deliverables** (baseline or upgrades) to construction sites for each excellence center
  - Determine required budget and discuss implementation possibilities
- **User** services and access models
- **E infrastructure** requirement and integration
- **Legal** and **financial** models. **Open** science and open innovation.
- Rules and **organization**. **Extension** of membership.
- …



EuPRAXIA Project

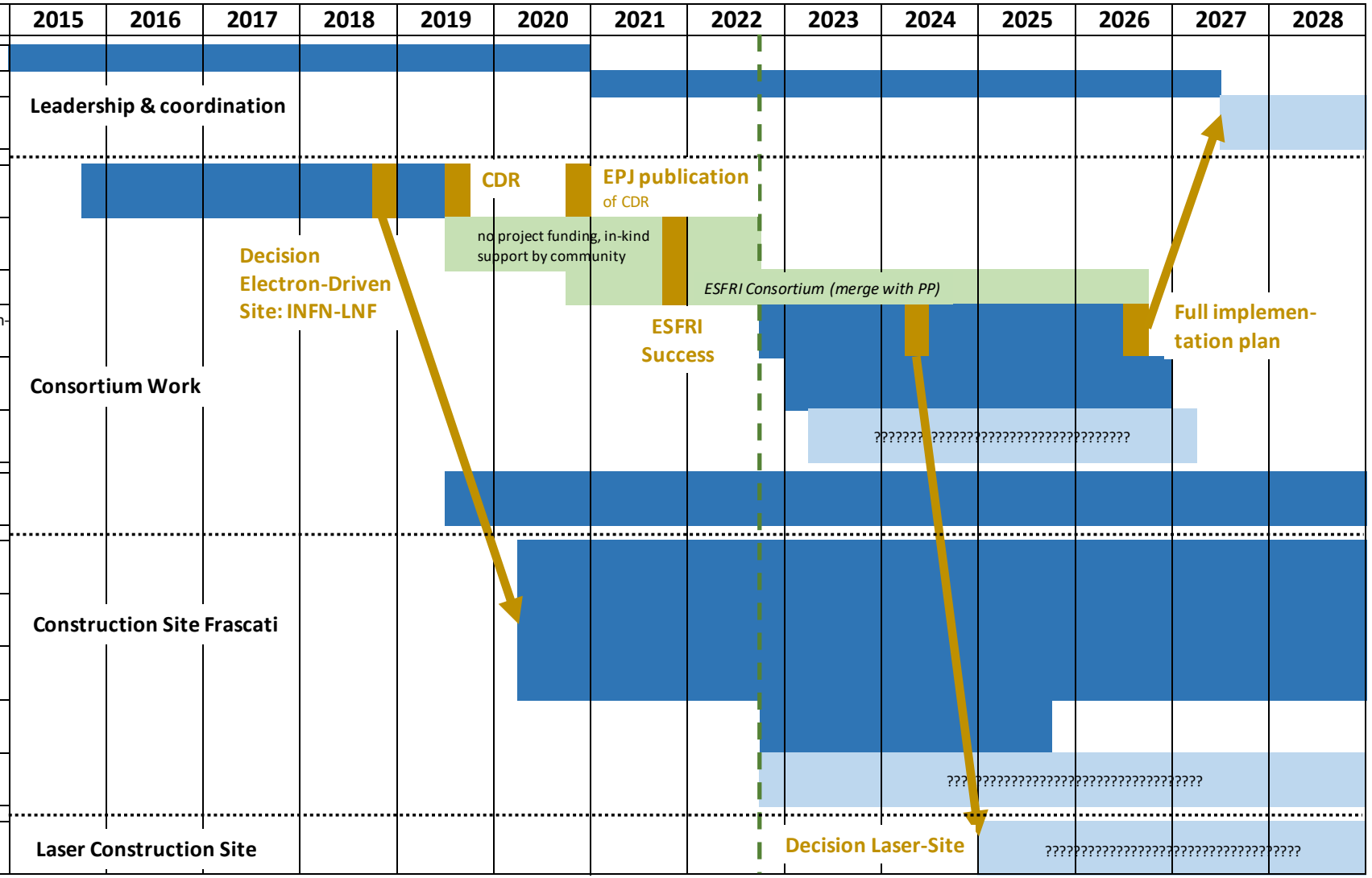
Funded by the European Union



EuPRAXIA Project Overview & Funding Lines

Funded by the European Union

Activity	Resources	Origin
Headquarter Hamburg/DESY	**0 €**	In-kind DESY
Headquarter Frascati INFN-LNF	**0 €**	In-kind INFN and DESY
*EuPRAXIA **Legal Structure of European RI***		*Defined in Preparatory Phase*
Conceptual Design Project	**6.000.000 €**	EU + in-kind (included here)
Application ESFRI Roadmap, Funding applications	**0 €**	In-kind DESY, INFN and EuPRAXIA consortium
ESFRI Consortium		
Preparatory Phase Project	**8.310.000 €**	EU, UK,Switzerland + in-kind (included here)
EuPRAXIA Doctoral Network	**2.600.000 €**	EU
CREATE (includes EuPRAXIA R&D) - proposed - reserve list	*15.000.000 €*	EU INFRATECH
CNRS project PALLAS (letter J.L. Biarrotte 30.3.2021)	**1.670.000 €**	CNRS France
EuPRAXIA **Construction in Frascati LNF-INFN** (EuPRAXIA@SPARCLab)	**108.000.000 €**	Italian government invest (plus personnel)
Local EuPRAXIA support projects	**7.000.000 €**	Regional Lazio funding
Confinancing Regional Funds, preparation building project	**7.000.000 €**	INFN direct funds
EuPRAXIA Advanced Photon (EuAPS)	**22.000.000 €**	PNRR (EU/Italian recovery funding)
EuPRAXIA beamline support - in discussion	*10.000.000 €*	Regional Lazio funding
Site 2 (laser site) implementation		Defined in Preparatory Phase
Total (available)	**162.580.000 €**	
Total (applied)	**25.000.000 €**	



162.6 M€ resources approved, *25 M€ applied for*

Preparatory Phase Steering Committee

Leaders Behind EuPRAXIA

Funded by the European Union

WP1 - Coordination & Project Management
R. Assmann, INFN & DESY
M. Ferrario, INFN

WP2 - Dissemination and Public Relations
C. Welsch, U Liverpool
S. Bertellii, INFN

WP3 - Organization and Rules
A. Specka, CNRS
A. Ghigo, INFN

WP4 - Financial & Legal Model. Economic Impact
A. Falone, INFN

WP5 - User Strategy and Services
F. Stellato, U Tor Vergata
E. Principi, ELETTRA

WP6 - Membership Extension Strategy
B. Cros, CNRS
A. Mostacci, U Sapienza

WP's on coordination & implementation as ESFRI RI (organization, legal model, financing, users)

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F. Stellato, U Tor Vergata
E. Principi, ELETTRA

WP6 - Membership Extension Strategy
B. Cros, CNRS
A. Mostacci, U Sapienza

WP7 - E-Needs and Data Policy
R. Fonseca, IST
S. Pioli, INFN

WP8 - Theory & Simulation
J. Vieria, IST
H. Vincenti, CEA

WP9 - RF, Magnets & Beamline Components
S. Antipov, DESY
F. Nguyen, ENEA

WP10 - Plasma Components & Systems
K. Cassou, CNRS
J. Osterhoff, DESY

WP11 - Applications
G. Sarri, U Belfast
E. Chiadroni,U Sapienza

WP12 - Laser Technology, Liaison to Industry
L. Gizzi, CNR
P. Crump, FBH

WP13 - Diagnostics
A. Cianchi, U Tor Vergata
R. Ischebeck, EPFL

WP14 - Transformative Innovation Paths
B. Hidding, U Strathclyde
S. Karsch, LMU

WP15 - TDR EuPRAXIA @SPARC-lab
C. Vaccarezza, INFN
R. Pompili, INFN

WP16 - TDR EuPRAXIA Site 2
A. Molodozhentsev, ELI-Beamlines
R. Pattahil, STFC

WP's on coordination & implementation as ESFRI RI (organization, legal model, financing, users)

WPs on technical implementation and sites

PP Work Matrix and Available Person Power

WP1 – WP10

Funded by the European Union

Staff effort per participant

Grant Preparation (Work packages - Effort screen) — Enter the info.

Participant	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	WP10
1 - INFN	108.00	6.00	10.00	54.00			6.00	6.00	6.00	6.00
2 - CNR		2.00						4.00		2.00
3 - ELETTRA	4.00				30.00					
4 - ENEA									4.00	
5 - UNI SAPIENZA						30.00			6.00	
6 - UNITOV					48.00					
7 - CEA								37.00		
8 - CNRS			6.00			22.00		22.00		21.00
9 - THALES										
10 - DESY			6.00					6.00	18.00	12.00
11 - FBH										
12 - FZJ										
13 - HZDR										
14 - LMU MUENCHEN										
15 - Wigner RCP	3.00	6.00								
16 - USZ										
17 - UP										
18 - IST ID							30.00	72.00		
19 - IP-ASCR								24.00	6.00	24.00

Staff effort per participant

Grant Preparation (Work packages - Effort screen) — Enter the info.

Participant	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	WP10
20 - CERN				2.00					2.00	
21 - IASA		8.00	8.00	8.00					8.00	
22 - CLPU								2.00	2.00	
23 - HUJ										2.00
24 - Fraunhofer	2.00									1.00
25 - ALBA-CELLS									4.00	
26 - UCLA								6.00		
27 - EPFL										
28 - EMPA					18.00		24.00			
29 - Imperial										
30 - QUB	6.00				6.00					6.00
31 - UKRI									10.00	
32 - ULIV		46.00								
33 - USTRATH										
34 - UOXF										
Total Person-Months	123.00	68.00	30.00	64.00	102.00	52.00	60.00	179.00	66.00	74.00

Preparatory phase project defined through milestones and deliverables, according to EU project standards.

PP Work Matrix and Available Person Power

WP1 – WP10 and totals per institute and WP

Funded by the European Union

Staff effort per participant

Grant Preparation (Work packages - Effort screen) — Enter the info.

Participant	WP11	WP12	WP13	WP14	WP15	WP16	Total Person-Months
1 - INFN		12.00		6.00	120.00		340.00
2 - CNR	2.00	48.00	2.00			3.00	63.00
3 - ELETTRA							34.00
4 - ENEA							4.00
5 - UNI SAPIENZA	18.00						54.00
6 - UNITOV			24.00	6.00			78.00
7 - CEA							37.00
8 - CNRS	4.00		14.00	6.00			95.00
9 - THALES		4.00					4.00
10 - DESY		12.00					54.00
11 - FBH		8.00					8.00
12 - FZJ				38.00			38.00
13 - HZDR				7.00			7.00
14 - LMU MUENCHEN				7.00			7.00
15 - Wigner RCP							9.00
16 - USZ	6.00	6.00					12.00
17 - UP				6.00			6.00
18 - IST ID							102.00
19 - IP-ASCR	6.00	24.00	6.00			12.00	102.00
20 - CERN			2.00				6.00
21 - IASA	8.00				8.00	8.00	56.00
22 - CLPU		2.00	2.00				8.00

Staff effort per participant

Grant Preparation (Work packages - Effort screen) — Enter the info.

Participant	WP11	WP12	WP13	WP14	WP15	WP16	Total Person-Months
23 - HUJ			2.00				4.00
24 - Fraunhofer		1.00				1.00	5.00
25 - ALBA-CELLS			4.00				8.00
26 - UCLA			6.00	6.00			18.00
27 - EPFL			53.00				53.00
28 - EMPA		56.00	56.00				154.00
29 - Imperial				6.00			6.00
30 - QUB	36.00						54.00
31 - UKRI	6.00	12.00	12.00			6.00	46.00
32 - ULIV							46.00
33 - USTRATH				18.00			18.00
34 - UOXF				6.00			6.00
Total Person-Months	86.00	185.00	183.00	112.00	128.00	30.00	1542.00

Preparatory Phase Steering Committee

Leaders Behind EuPRAXIA

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- Governing Board (Decision-making body)
- Steering Committee
- Scientific Advisory Board
- Technical & Industrial Advisory Board
- Board of Financial Sponsors

WP1 - Coordination & Project Management
R. Assmann, INFN & DESY
M. Ferrario, INFN

WP2 - Dissemination and Public Relations
C. Welsch, U Liverpool
S. Bertellii, INFN

WP3 - Organization and Rules
A. Specka, CNRS
A. Ghigo, INFN

WP4 - Financial & Legal Model. Economic Impact
A. Falone, INFN

WP5 - User Strategy and Services
F. Stellato, U Tor Vergata
E. Principi, ELETTRA

WP6 - Membership Extension Strategy
B. Cros, CNRS
A. Mostacci, U Sapienza

WP7 - E-Needs and Data Policy
R. Fonseca, IST
S. Pioli, INFN

WP8 - Theory & Simulation
J. Vieria, IST
H. Vincenti, CEA

WP9 - RF, Magnets & Beamline Components
S. Antipov, DESY
F. Nguyen, ENEA

WP10 - Plasma Components & Systems
K. Cassou, CNRS
J. Osterhoff, DESY

WP11 - Applications
G. Sarri, U Belfast
E. Chiadroni,U Sapienza

WP12 - Laser Technology, Liaison to Industry
L. Gizzi, CNR
P. Crump, FBH

WP13 - Diagnostics
A. Cianchi, U Tor Vergata
R. Ischebeck, EPFL

WP14 - Transformative Innovation Paths
B. Hidding, U Strathclyde
S. Karsch, LMU

WP15 - TDR EuPRAXIA @SPARC-lab
C. Vaccarezza, INFN
R. Pompili, INFN

WP16 - TDR EuPRAXIA Site 2
A. Molodozhentsev, ELI-Beamlines
R. Pattahil, STFC

- EuAPS Operating Units Board
- EuAPS Scientific & Technical Board
- EuAPS Scientific Advisory Committee

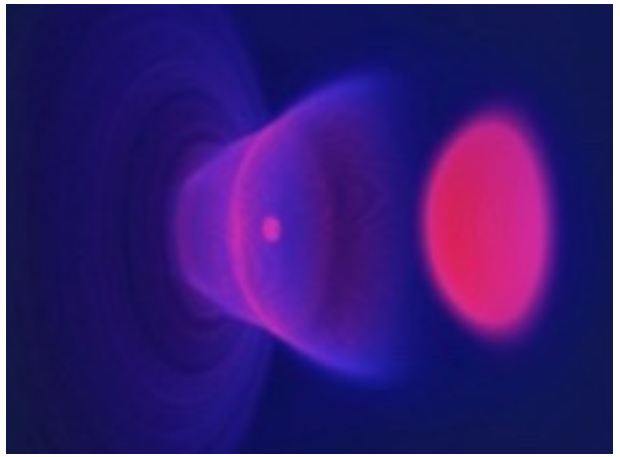
WP's on coordination & implementation as ESFRI RI (organization, legal model, financing, users)

EuPRAXIA Advanced Photon Sources strongly linked

WPs on technical implementation and sites

Conclusion

- EuPRAXIA Advanced Photon Sources are another very important **building stone of the EuPRAXIA distributed research infrastructure**
- Builds further a very solid Italian network and basis, leverages existing Italian investments, drives innovation and **delivers first science**.
- Draws from the EuPRAXIA conceptual design and our overall European network. Naturally connects to other nodes in Europe.
- EuAPS structure has put integration into EuPRAXIA in its project design – task in WP1.
- Enthusiastic support from EuPRAXIA consortia seen through
  - **collaborations** discussed → open innovation approach in EuPRAXIA
  - and **external experts/representatives/EuPRAXIA-PP WP leaders of major facilities taking roles in advisory bodies**.



Thank You for Your Attention

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