EUROPEAN
PLASMA RESEARCH
ACCELERATOR
WITH
EXCELLENCE IN
APPLICATIONS

EuPRAXIA

EuPRAXIA accelerator and facility: a technical perspective

Massimo Ferrario (INFN-LNF)

On behalf of the EuPRAXIA Collaboration

EUROPEAN
PLASMA RESEARCH
ACCELERATOR
WITH
EXCELLENCE IN
APPLICATIONS

EuPRAXIA

A few questions for you

- How many people here never heard of EuPRAXIA?
- Do you know the meaning of EuPRAXIA?

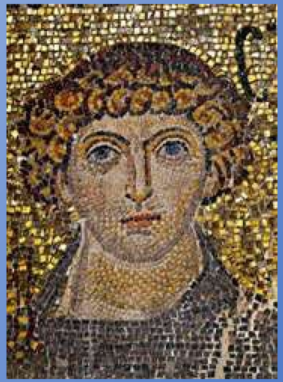
  "good practice"

- Why Saint EuPRAXIA (July 25)?

Saint EuPRAXIA was the daughter of the Constantinople dignitary Antigonos, very close to the Emperor Theodosius the Great (379-395).

Saint Eupraxia, when she reached the age of maturity, intensified her ascetic efforts all the more.

At first she took of food once a day, then after two days, three days, and finally, once a week.



Funded by the European Union

What is EuPRAXIA? ChatGPT reply

- ****EuPRAXIA is** a European research initiative focused on developing a **next-generation particle accelerator based on advanced plasma acceleration technology**.
- **The goal of EuPRAXIA** is to demonstrate a compact, high-performance particle accelerator that **can deliver high-quality electron beams using plasma wakefield acceleration**, which is more compact and cost-effective than conventional accelerators.

- **Key Aspects of EuPRAXIA:**
- **1. **Plasma Wakefield Acceleration**:** EuPRAXIA uses plasma waves created by a laser or particle beam to accelerate particles over shorter distances, making the system more compact and efficient.
- **2. **Applications**:** EuPRAXIA's technology has potential applications in various fields, including high-energy physics, materials science, medical imaging, and cancer treatment. It aims to provide new opportunities for scientific research and industrial applications.
- **3. **International Collaboration**:** The project involves collaboration between research institutions, universities, and industries from multiple European countries.
- **4. **Future Impact**:** The success of EuPRAXIA could pave the way for more accessible, cost-effective accelerators, enabling advanced scientific experiments in a range of fields that require high-energy particle beams. EuPRAXIA is considered an innovative step forward in accelerator technology, with the potential to transform how particle accelerators are built and used.

Funded by the European Union

A New European High-Tech User Facility

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

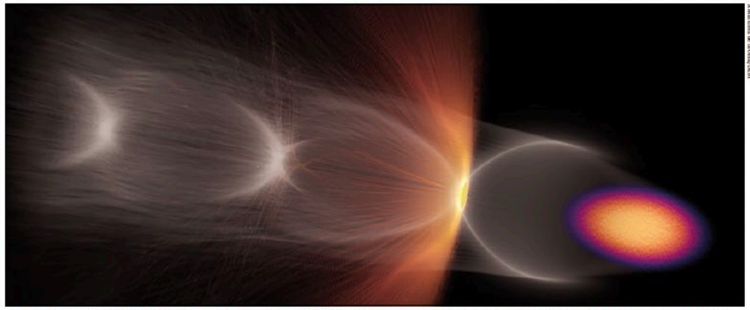
Shrink down the facility size
Improve Sustainability

2

Producing particles and photons to support several urgent and timely science cases

Drive short wavelength FEL
Pave the way for future Linear Colliders

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



Surf's up *Simulation of electron-driven plasma wakefield acceleration, showing the drive electron beam (orange/purple), the plasma electron wake (grey) and wakefield-ionised electrons forming a witness beam (orange).*

EUROPE TARGETS A USER FACILITY FOR PLASMA ACCELERATION

Ralph Assmann, Massimo Ferrario and Carsten Welsch describe the status of the ESFRI project EuPRAXIA, which aims to develop the first dedicated research infrastructure based on novel plasma-acceleration concepts.

Energetic beams of particles are used to explore the fundamental forces of nature, produce known and unknown particles such as the Higgs boson at the LHC, and generate new forms of matter, for example at the future FAIR facility. Photon science also relies on particle beams: electron beams that emit pulses of intense synchrotron light, including soft and hard X-rays, in either circular or linear machines. Such light sources enable time-resolved measurements of biological, chemical and physical structures on the molecular down to the atomic scale, allowing a diverse global community of users to investigate systems ranging from viruses and bacteria to materials science, planetary science, environmental science, nanotechnology and archaeology. Last but not least, particle beams for industry and health support many societal applications ranging from the X-ray inspection of cargo containers to food sterilisation, and from chip manufacturing to cancer therapy.

This scientific success story has been made possible through a continuous cycle of innovation in the physics and technology of particle accelerators, driven for many decades by exploratory research in nuclear and particle physics. The invention of radio-frequency (RF) technology in the 1920s opened the path to an energy gain of several tens of MeV per metre. Very-high-energy accelerators were constructed with RF technology, entering the GeV and finally the TeV energy scales at the Tevatron and the LHC. New collision schemes were developed, for example the mini "beta squeeze" in the 1970s, advancing luminosity and collision rates by orders of magnitudes. The invention of stochastic cooling at CERN enabled the discovery of the W and Z bosons 40 years ago.

However, intrinsic technological and conceptual limits mean that the size and cost of RF-based particle accelerators are increasing as researchers seek higher beam energies. Colliders for particle physics have reached a

THE AUTHORS
Ralph Assmann *DESY and INFN*, **Massimo Ferrario** *INFN*, **Carsten Welsch** *University of Liverpool/INFN.*

The EuPRAXIA CDR

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. Completed by 16+25 institutes.
- Challenges addressed by EuPRAXIA since 2015:
  - **Can plasma accelerators produce usable electron beams**?
  - **For what can we use those beams** while we increase the beam energy towards HEP and collider usages?
- Next phase consortium: **> 50 institutes**
- Preparatory Phase project: **2022 – 2026** (approved)
- Start of 1st operation: **2029**

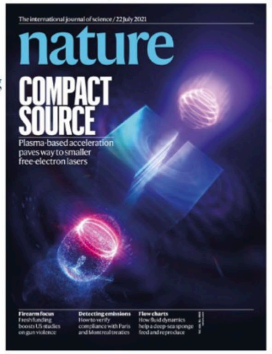
http://www.eupraxia-project.eu

600+ page CDR, 240 scientists contributed

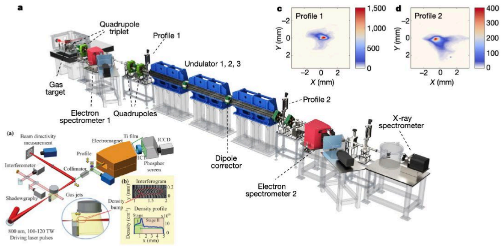
Basic beam quality achieved in pilot FEL experiments

2021 Plasma FEL Feasibility Proven: Laser-driven

EuPRAXIA — Horizon Europe



W. T. Wang, K. Feng, *et al.*, *Nature*, **595**, 561 (2021).



Recent ground-breaking result in China

500 MeV electron beam from a laser wakefield accelerator

FEL lasing **amplification of 100** reached at 27 nm wavelength (average radiation energy 70 nJ, peak up to 150 nJ)

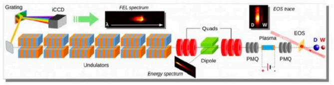
2021 Plasma FEL Feasibility Proven: Electron-driven

EuPRAXIA — Horizon Europe

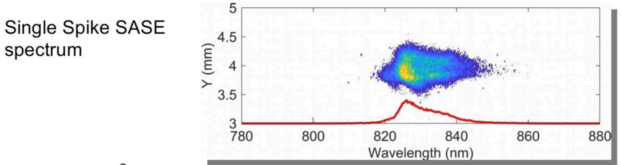
Recent ground-breaking results in Frascati:

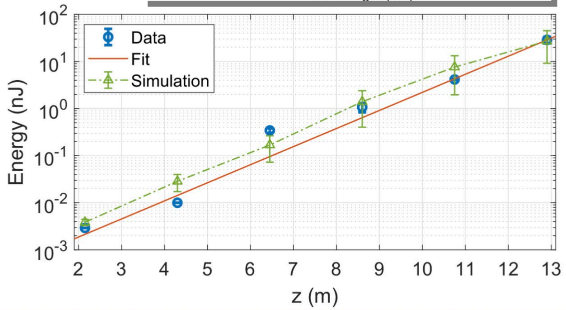
First FEL lasing from a beam-driven plasma accelerator

Pompili et al., Nature **605**, 659–662 (2022)



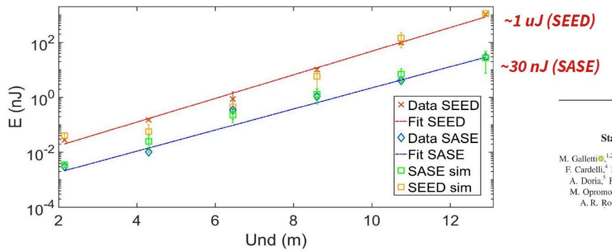
Single Spike SASE spectrum





First Beam Driven SEEDED - FEL Lasing at SPARC_LAB (June 2021)

EuPRAXIA

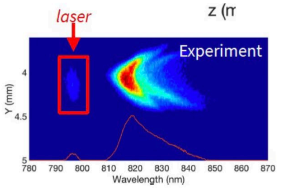


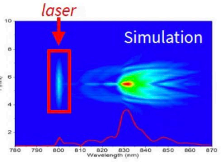
PHYSICAL REVIEW LETTERS **129**, 234801 (2022)

Stable Operation of a Free-Electron Laser Driven by a Plasma Accelerator

M. Galletti,[1,2,3,*] D. Alesini,[4] M. P. Anania,[4] S. Arjmand,[4] M. Behtouei,[4] M. Bellaveglia,[4] A. Biagioni,[4] B. Buonomo,[4] F. Cardelli,[4] M. Carpanese,[5] E. Chiadroni,[4,6] A. Cianchi,[1,2,3] G. Costa,[4] A. Del Dotto,[7] M. Del Giorno,[4] F. Dipace,[4] A. Doria,[5] F. Filippi,[5] G. Franzini,[4] L. Giannessi,[4] A. Giribono,[4] P. Iovine,[8] V. Lollo,[4] A. Mostacci,[6] F. Nguyen,[5] M. Opromolla,[9,10] L. Pellegrino,[4] A. Petralia,[5] V. Petrillo,[9,10] L. Piersanti,[4] G. Di Pirro,[4] R. Pompili,[4] S. Romeo,[4] A. R. Rossi,[10] A. Selce,[5,11] V. Shpakov,[4] A. Stella,[4] C. Vaccarezza,[4] F. Villa,[4] A. Zigler,[4,12] and M. Ferrario[4]

z (m





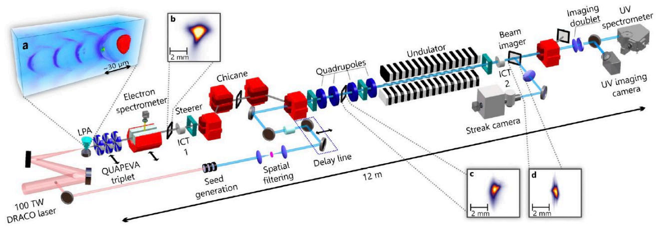
Seeded FEL radiation

- ✓ Pulse energy increased 2 order of magnitude respect to SASE radiation
- ✓ 6% pulse energy RMS fluctuations over 90% of successful shot respect to 17% over 30% of shot for SASE

Seeded UV free-electron laser driven by LWFA

EuPRAXIA — Horizon Europe

Collaboration Soleil/HZ Dresden, published on
Nat. Photon. (2022). https://doi.org/10.1038/s41566-022-01104-w



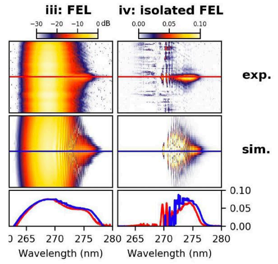
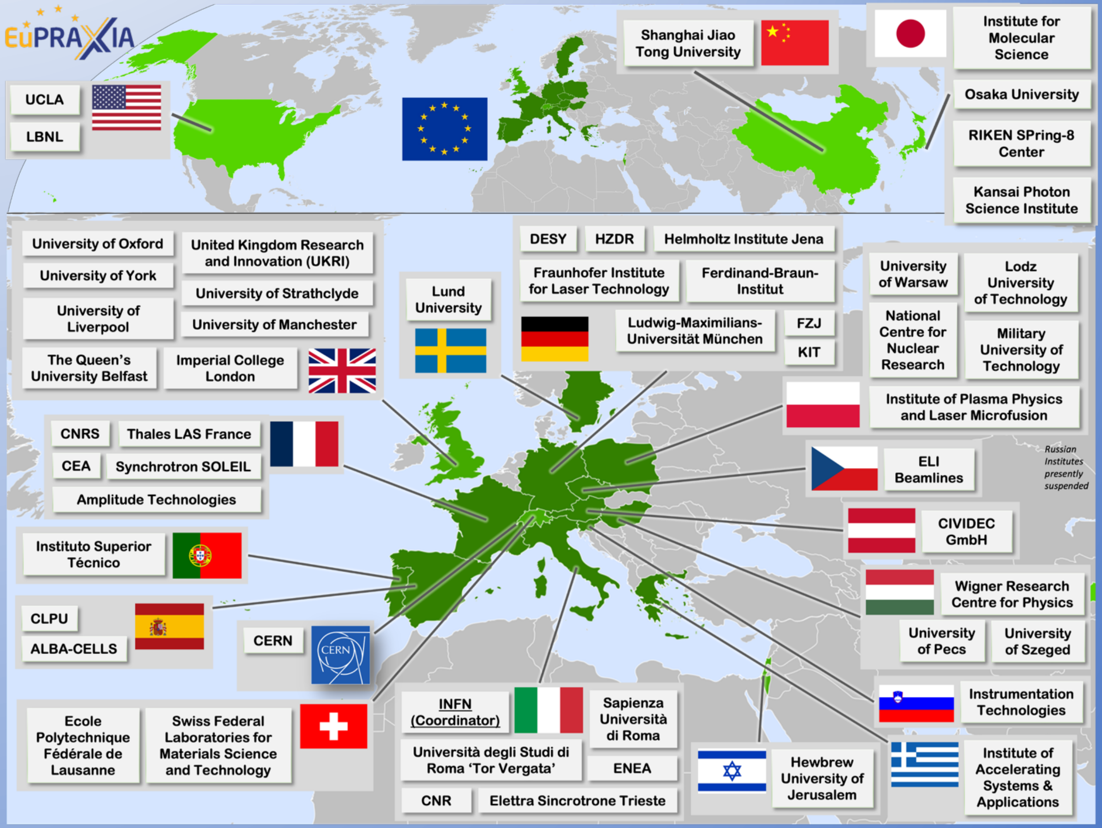


FIG. 1. **Experimental layout.** The electron beam generated in the LPA is first characterized using a removable electron spectrometer and then sent through a triplet of quadrupoles (QUAPEVAs) for beam transport to the undulator and FEL radiation generation. ICTs: Integrated Current Transformers. Non-labelled elements: dipoles (*red blocks*), optical lenses (*blue*), mirrors (*grey circled black disks*). Inset **a**: Particle-in-Cell simulation renders of the accelerating structure driven by the laser pulse (*red*), the electron cavity sheet formed from the plasma medium (*light blue*) is visible in *purple* and the accelerated electron bunch visible in *green*. Insets **b,c,d**: Electron beam transverse distribution measured at LPA exit (**b**), at undulator entrance (**c**) and at undulator exit (**d**).

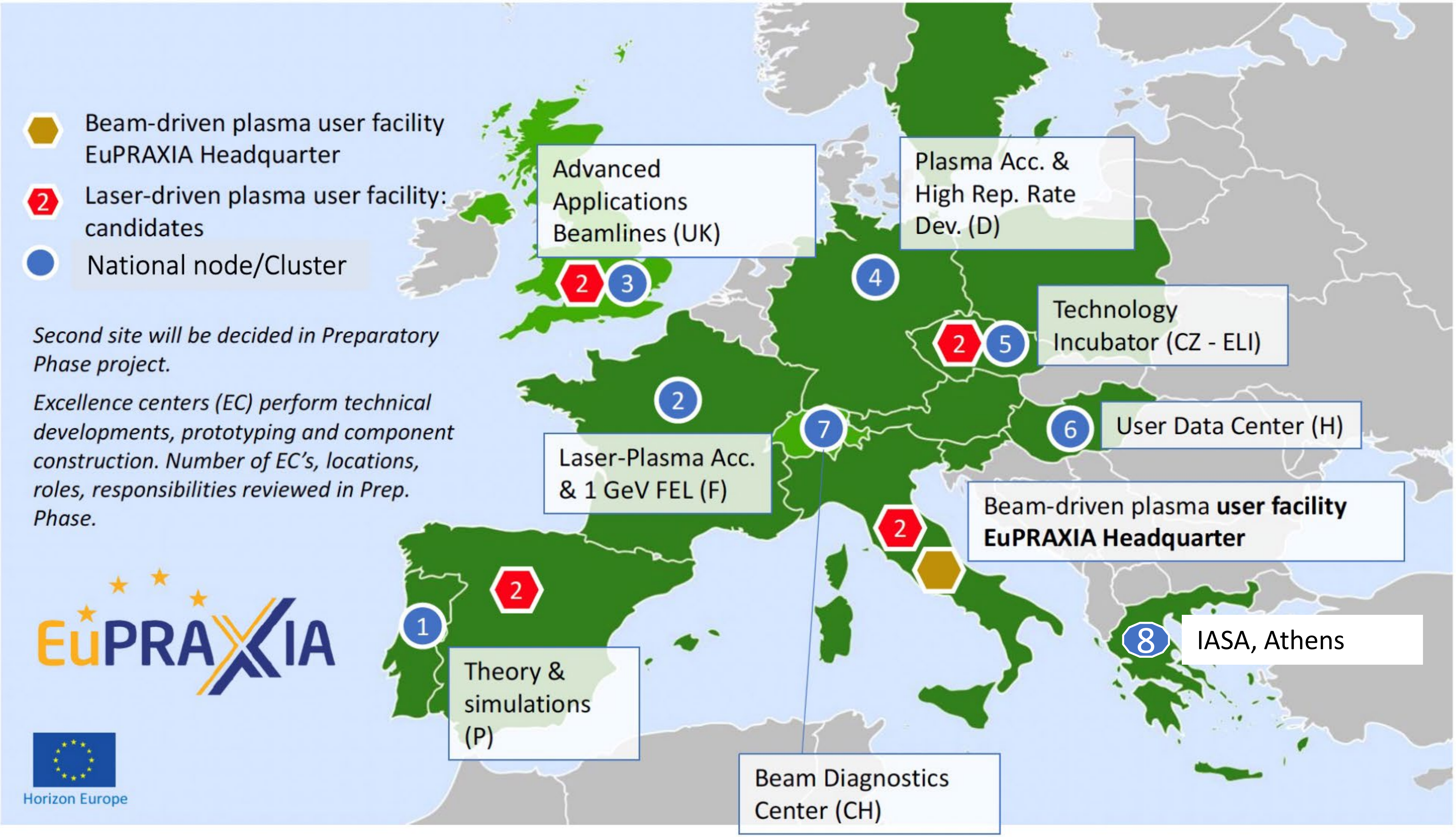
Wide International Collaboration

Funded by the European Union

- **The EuPRAXIA Consortium today: 54 institutes** from **18 countries** plus CERN
- Included in the **ESFRI** Road Map
- **Efficient fund raising:**
  - **Preparatory Phase** consortium (funding EU, UK, Switzerland, in-kind)
  - **Doctoral Network** (funding EU, UK, in-kind)
  - **EuPRAXIA@SPARC_LAB** (Italy, in-kind)
  - **EuAPS Project** (Next Generation EU)
  - **What Next? => PACRI !**



Distributed Research Infrastructure



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

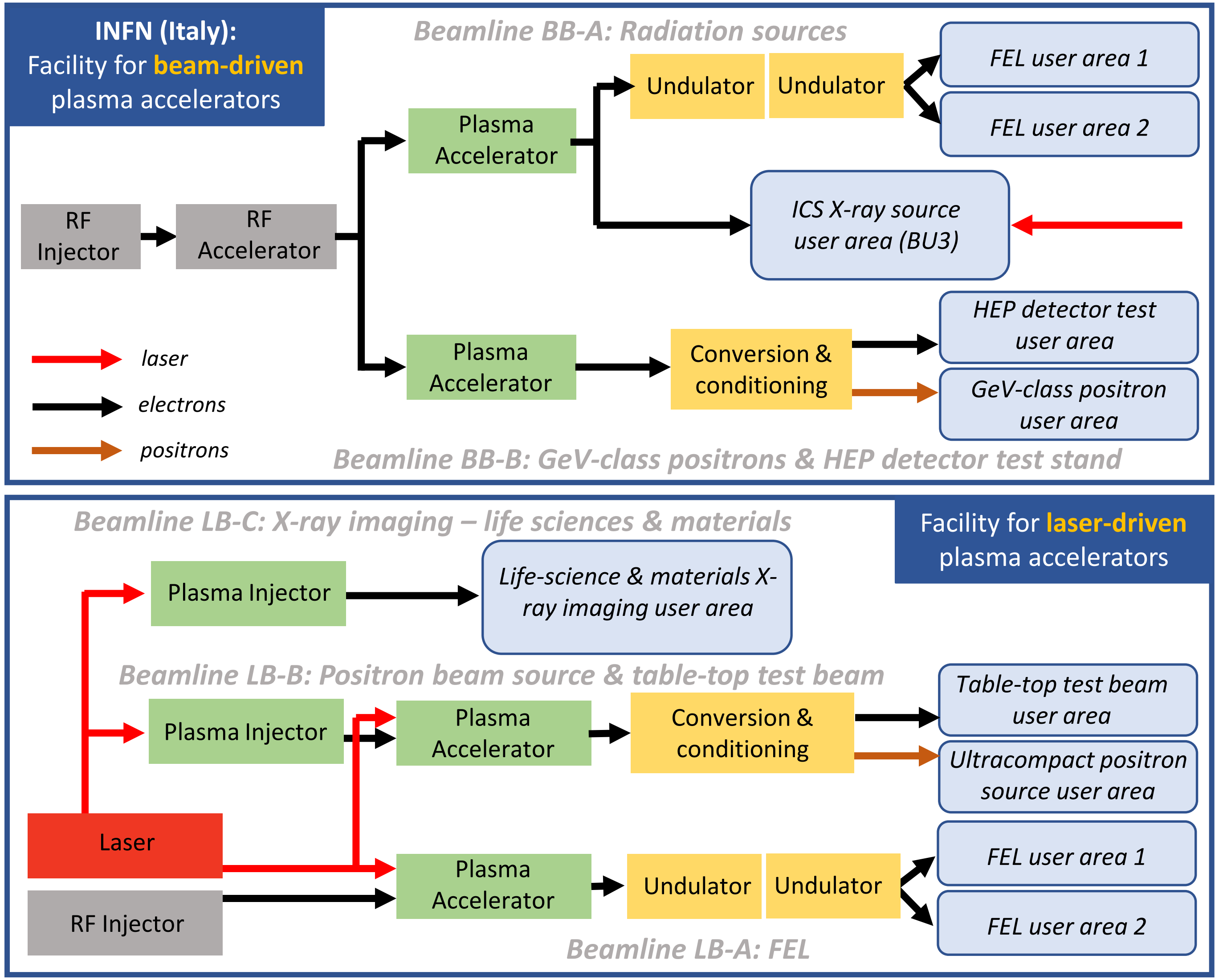
Network organization
- **Sites (PWFA/LWFA)**
- **National nodes**
- **Technology clusters**

4 candidates for LWFA:
- CLPU, Salamanca
- CNR-INO, Pisa
- ELI ERIC, Prague
- EPAC-RAL, UK

Phased Implementation of Construction Sites

Funded by the European Union

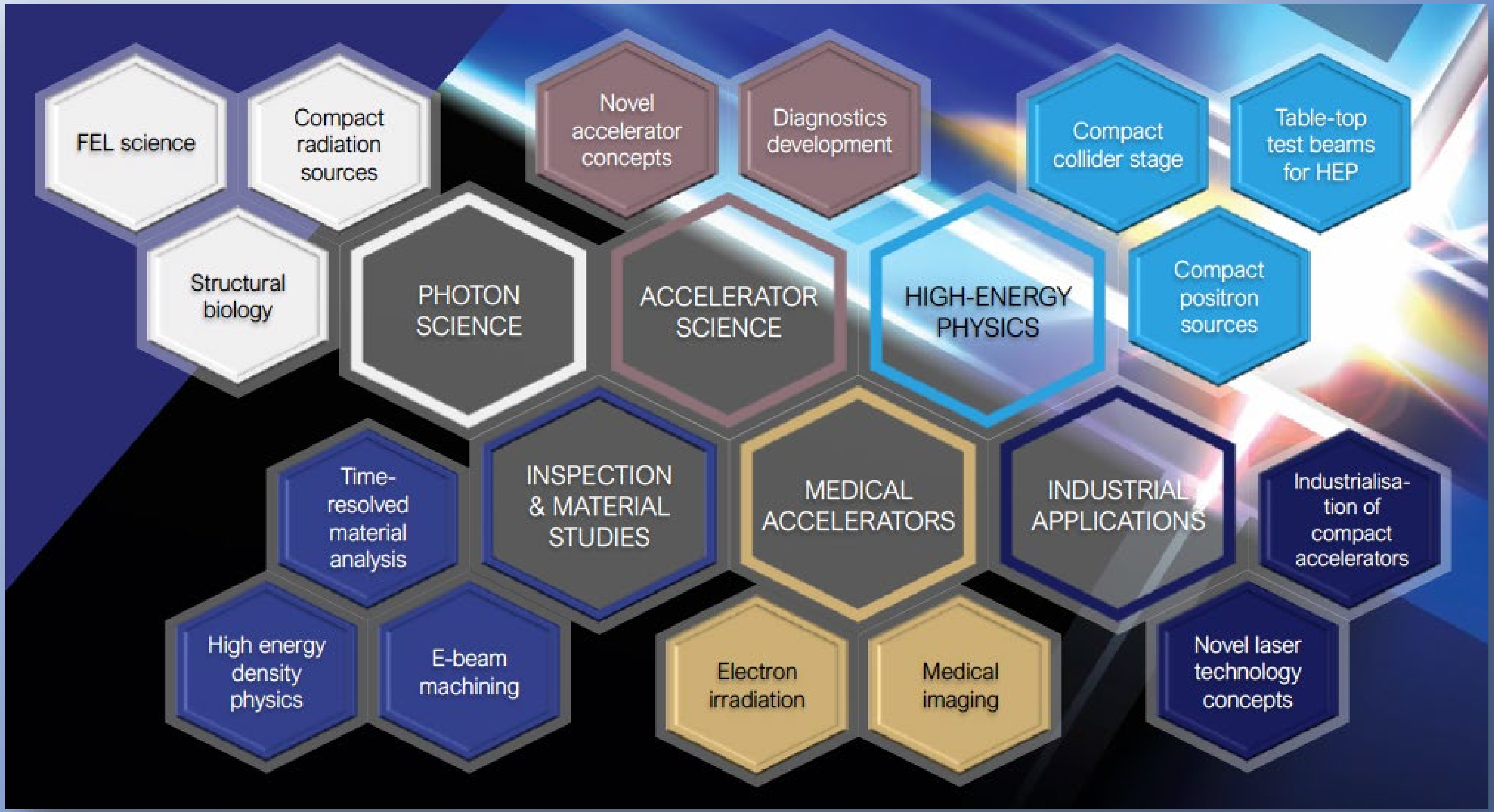
	Laser-driven	Beam-driven
Phase 1	✓ FEL beamline to 1 GeV + user area 1 ✓ Ultracompact positron source beamline + positron user area	✓ FEL beamline to 1 GeV + user area 1 ✓ GeV-class positrons beamline + positron user area
Phase 2	✓ X-ray imaging beamline + user area ✓ Table-top test beams user area ✓ 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



Intense R&D Program on critical components

- **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)
- **X-band RF Linac**
  (60 MV/m , up to 400 Hz)
- **Plasma Targets**
- **Betatron X rays**
  (1-10 keV, 10^{10})
- **FEL light**
  (0.2-36 nm, 10^9-10^{13})

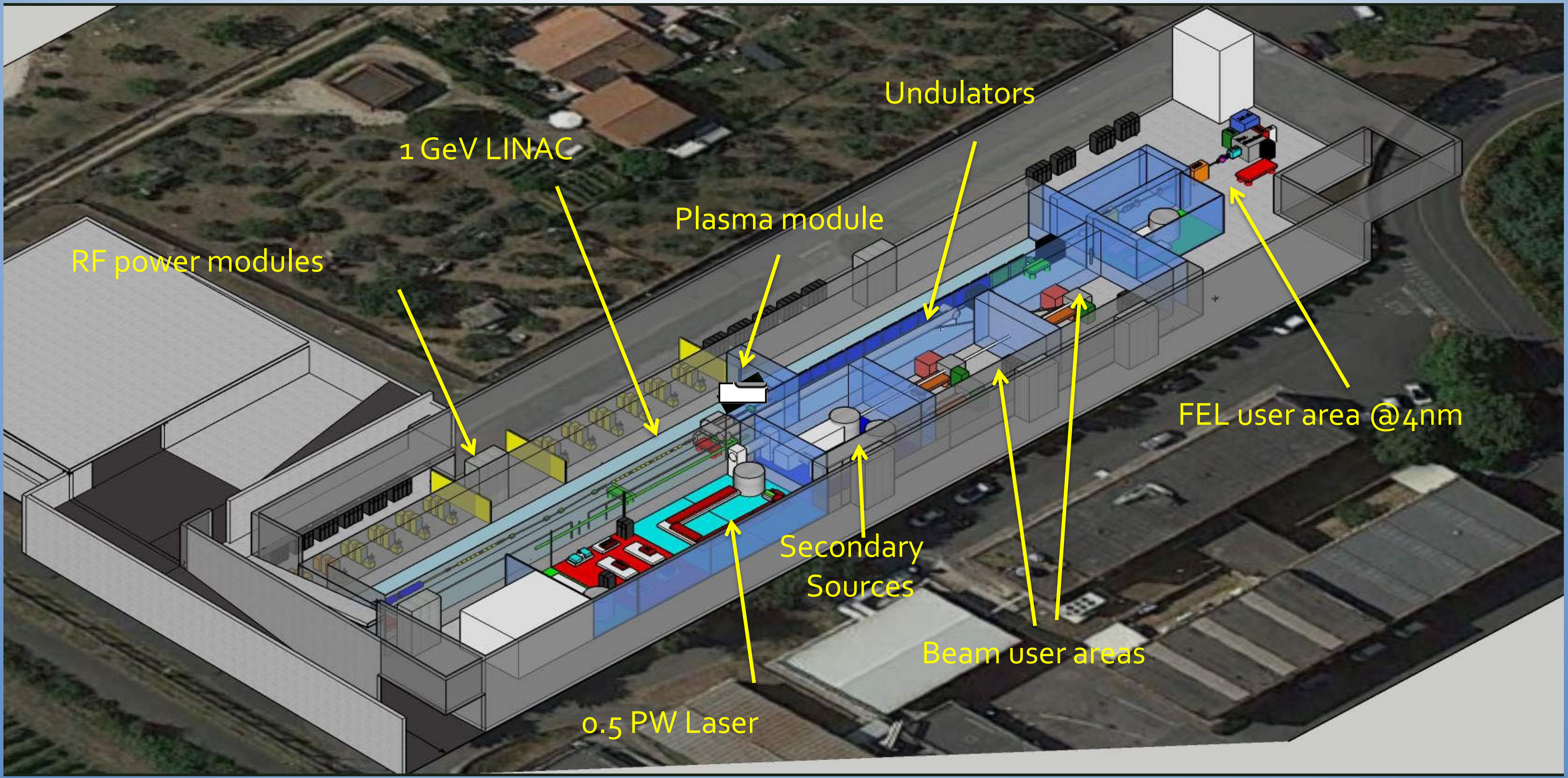
High Acc. Tech. available => not limited to Plasma Acceleration applications on a longer term perspective



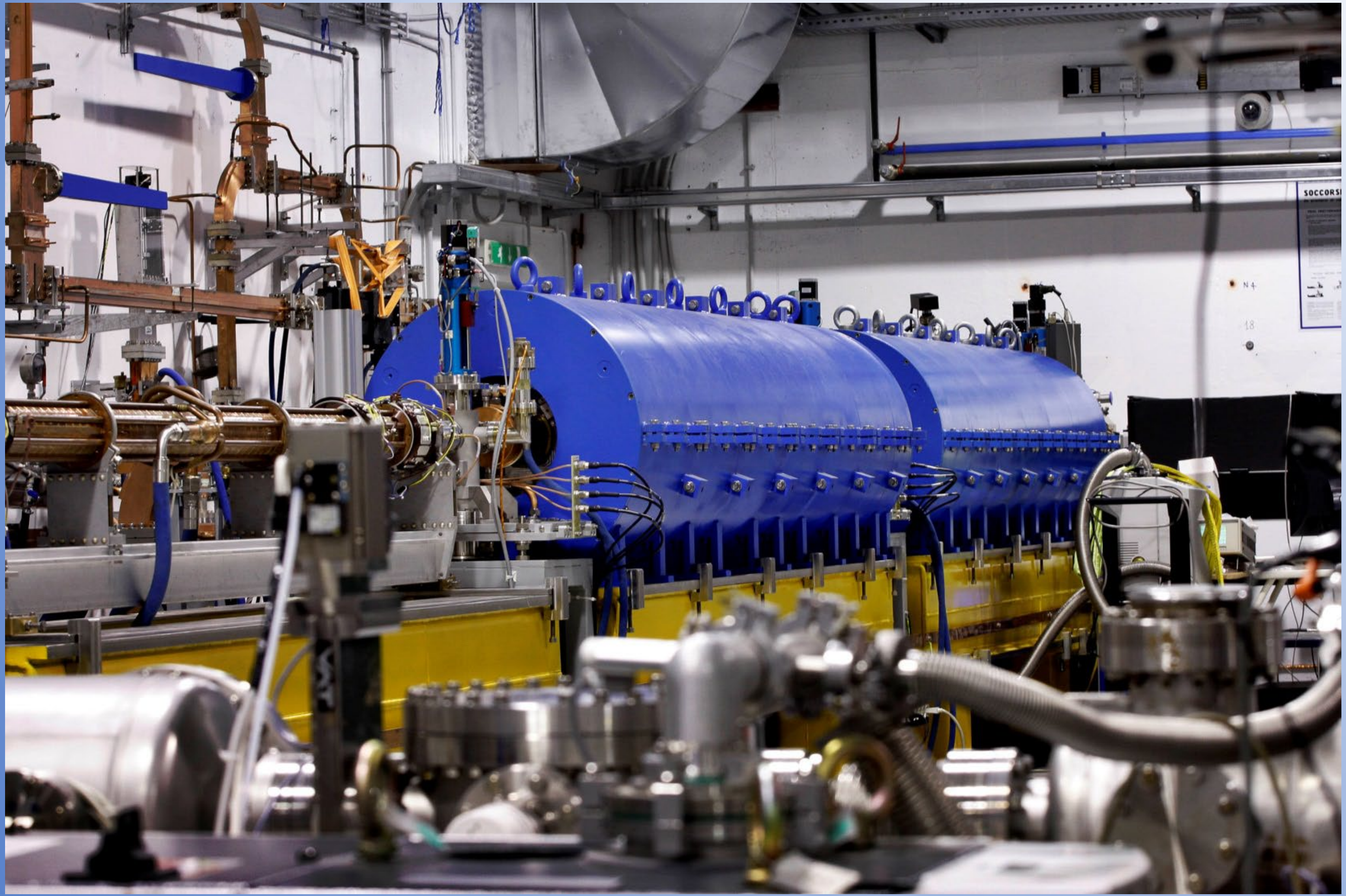
Headquarter and Site 1: EuPRAXIA@SPARC_LAB

- Frascati`s future facility
- > 130 M€ invest funding
- Beam-driven plasma accelerator
- Europe`s most compact and most southern FEL
- The world`s most compact RF accelerator (X band with CERN)

EuPRAXIA@SPARC_LAB

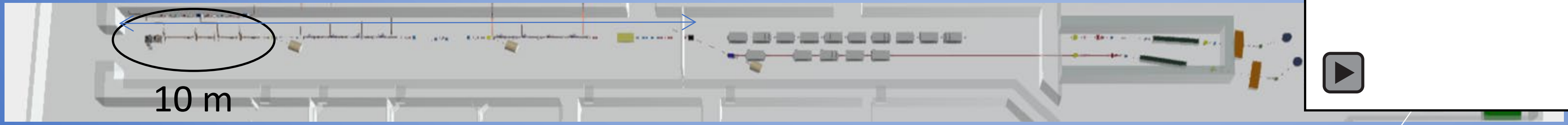


High Quality Electron Beams



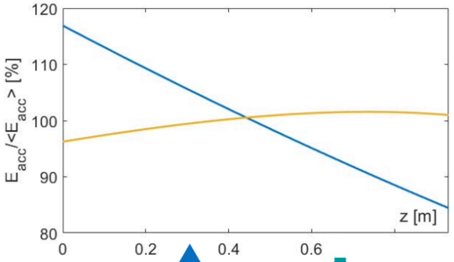
Parameter	Unit	Witness	Driver
Charge	pC	30	200
Energy	MeV	101.5	103.2
RMS energy spread	%	0.15	0.67
RMS bunch length	fs	12	20
RMS norm. emittance	mm mrad	0.69	1.95
Rep. rate	Hz	10	10

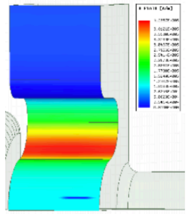
Table 7.2: Driver and witness beam parameters at the end of photo-injector.

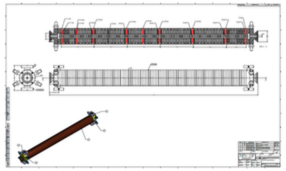


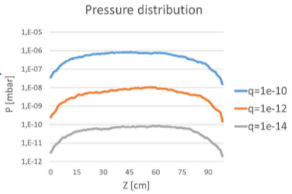
Courtesy E. Chiadroni

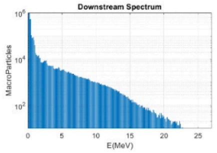
World`s Most Compact RF Linac: X Band





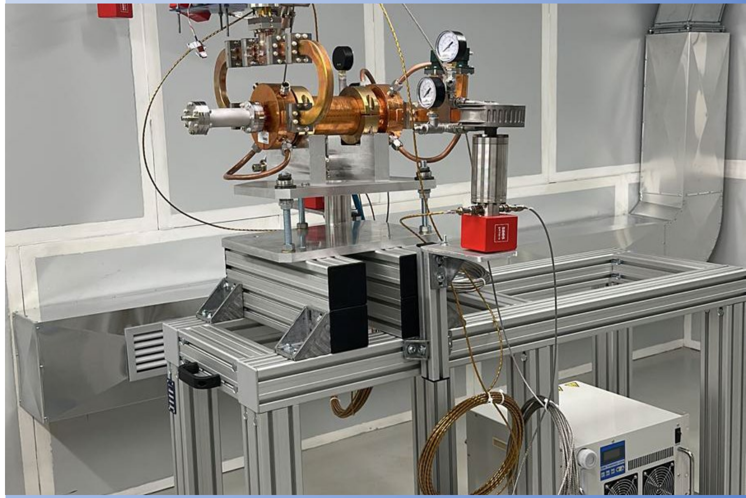


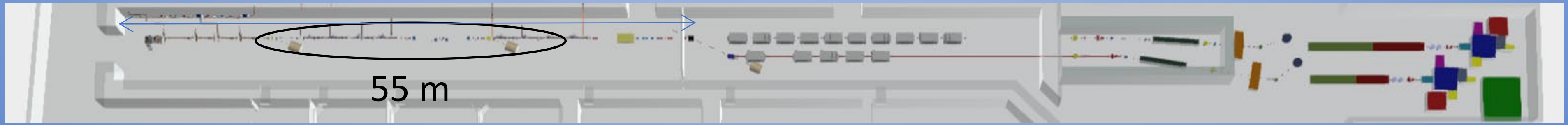




1. **E.m. design**: *done*
2. **Thermo-mechanical analysis**: *done*
3. **Mechanical design**: *done*
4. **Vacuum calculations**: *done*
5. **Dark current simulations**: *done*
6. **Waveguide distribution simulation with attenuation calculations**: *done*

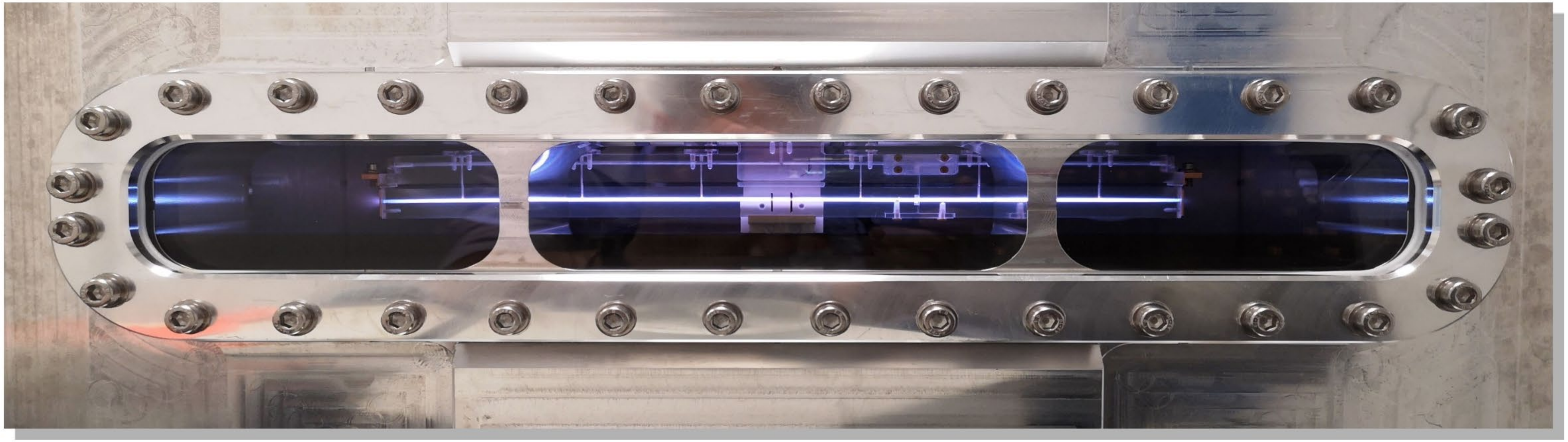
PARAMETER	Value	
	with linear tapering	w/o tapering
Frequency [GHz]	11.9942	
Average acc. gradient [MV/m]	**60**	
Structures per module	2	
Iris radius a [mm]	**3.85-3.15**	**3.5**
Tapering angle [deg]	0.04	0
Struct. length L_s act. Length (flange-to-flange) [m]	**0.94 (1.05)**	
No. of cells	112	
Shunt impedance R [MΩ/m]	93-107	100
Effective shunt Imp. $R_{sh\ eff}$ [MΩ/m]	350	347
Peak input power per structure [MW]	70	
Input power averaged over the pulse [MW]	51	
Average dissipated power [kW]	1	
P_{out}/P_{in} [%]	25	
Filling time [ns]	130	
Peak Modified Poynting Vector [W/μm²]	3.6	4.3
Peak surface electric field [MV/m]	160	190
Unloaded SLED/BOC Q-factor Q_0	150000	
External SLED/BOC Q-factor Q_E	21300	20700
Required Kly power per module [MW]	**20**	
RF pulse [μs]	**1.5**	
Rep. Rate [Hz]	**100**	





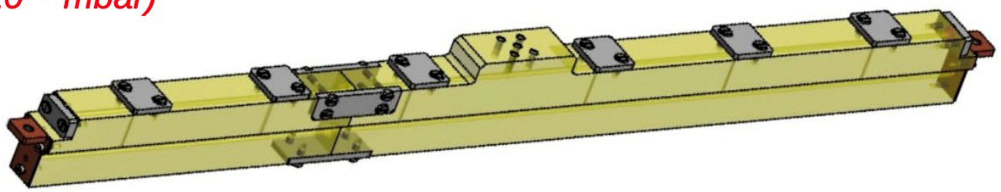
Courtesy D. Alesini

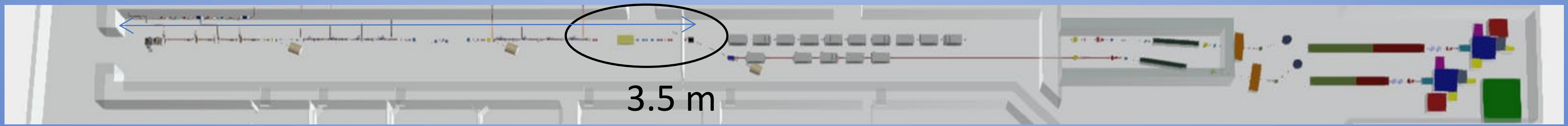
Plasma Module



- 40 cm long capillary → 1st prototype for the EuPRAXIA facility
  - *Made with special junction to allow negligible gas leaks (<10^{-10} mbar)*
- Operating conditions
  - *1 Hz repetition rate (to be increased up to 100 Hz)*
  - *10 kV – 380 A minimum values for ionization*
  - *6 inlets for gas injection. Electro-valve aperture time 8-12 ms*

A. Biagioni, V. Lollo



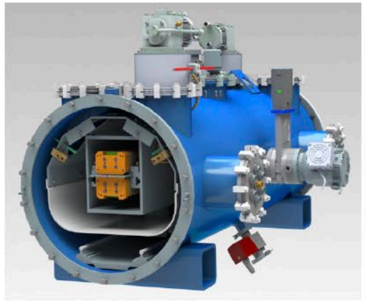


Courtesy A. Biagioni, R. Pompili

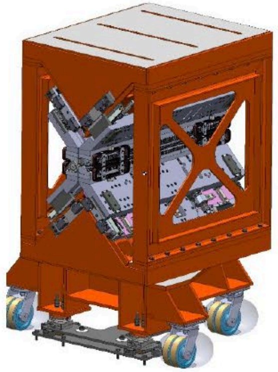
Radiation Generation: FEL

Two FEL lines:

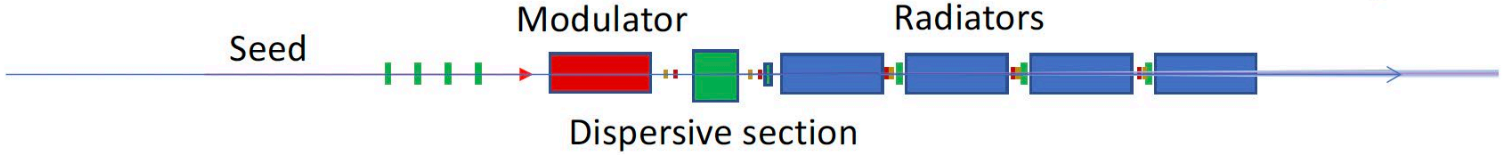
1) ***AQUA*: Soft-X ray SASE FEL – Water window optimized for 4 nm (baseline)**



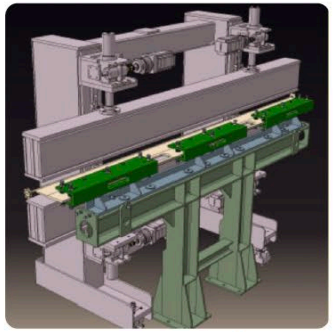
SASE FEL: 10 UM Modules, 2 m each – 60 cm intraundulator sections.
Two technologies under study: Apple-X PMU (baseline) and planar SCU.
Prototyping in progress



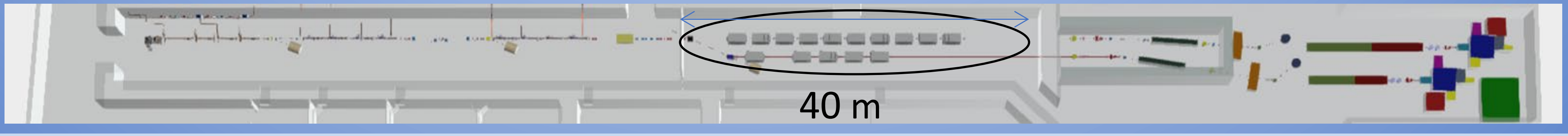
2) ***ARIA*: VUV seeded HGHG FEL beamline for gas phase**



FERMI FEL-1 Radiator



SEEDED FEL – Modulator 3 m + 4 Radiators APPLE II – variable pol. 2.2 m each – SEEDED in the range 50-100 nm (see former presentation to the committee and *Villa et al. ARIA—A VUV Beamline for EuPRAXIA@SPARC_LAB. Condens. Matter 2022, 7, 11.*) – Undulator based on consolidated technology.



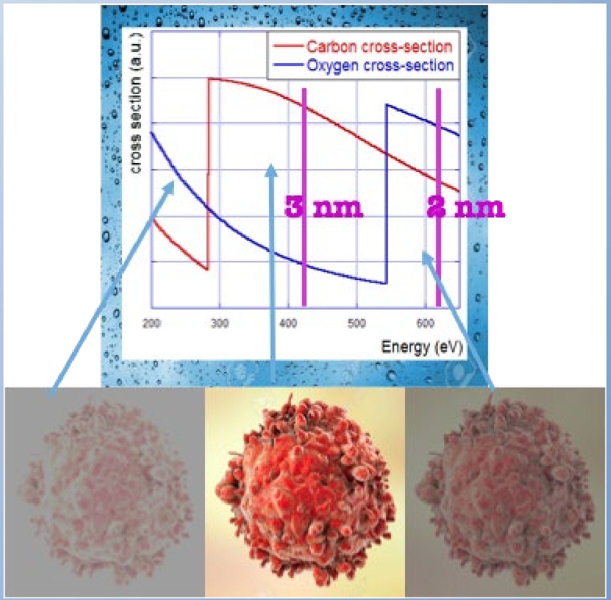
Courtesy L. Giannessi

Expected SASE FEL performances

Parameter	Unit	PWFA	Full X-band
Electron Energy	GeV	1-*1.2*	1
Bunch Charge	pC	30-*50*	200-*500*
Peak Current	kA	1-2	1-2
RMS Energy Spread	%	0.1	0.1
RMS Bunch Length	μm	6-3	24-20
RMS norm. Emittance	μm	1	1
Slice Energy Spread	%	≤0.05	≤0.05
Slice norm Emittance	mm-mrad	0.5	0.5

Parameter	Unit	PWFA	Full X-band
Radiation Wavelength	nm	3-4	4
Photons per Pulse	$\times 10^{12}$	0.1- 0.25	1
Photon Bandwith	%	0.1	0.5
Undulator Area Length	m	30	
ρ(1D/3D)	$\times 10^{-3}$	2	2
Photon Brilliance per shot	$s\ mm^2 mrad^2$ $bw(0.1\%)$	$1-2 \times 10^{28}$	1×10^{27}

In the Energy region between Oxygen and Carbon K-edge 2.34 nm – 4.4 nm (530 eV -280 eV) water is almost transparent to radiation while nitrogen and carbon are absorbing (and scattering)



Coherent Imaging of biological samples protein clusters, VIRUSES and cells living in their native state
Possibility to study dynamics
~10 [11] photons/pulse needed

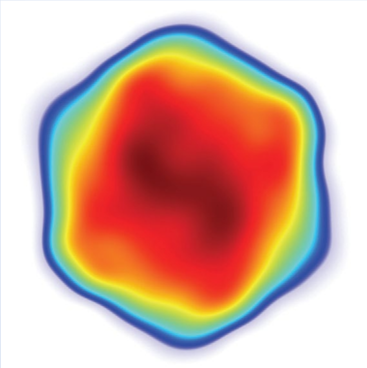
Courtesy F. Stellato, UniToV

Courtesy C. Vaccarezza/L. Giannessi

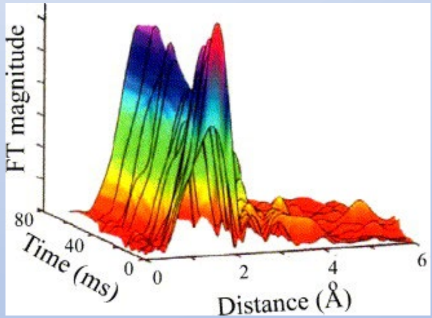
AQUA beamline scientific case

Experimental techniques and typology of samples

Coherent imaging



X-ray spectroscopy



Raman spectroscopy

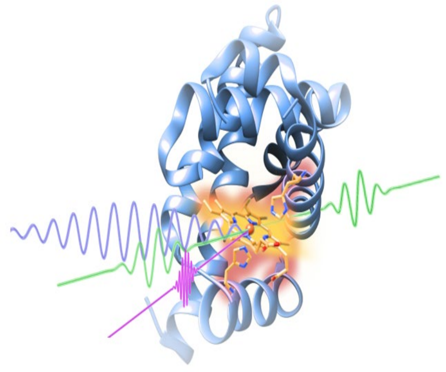
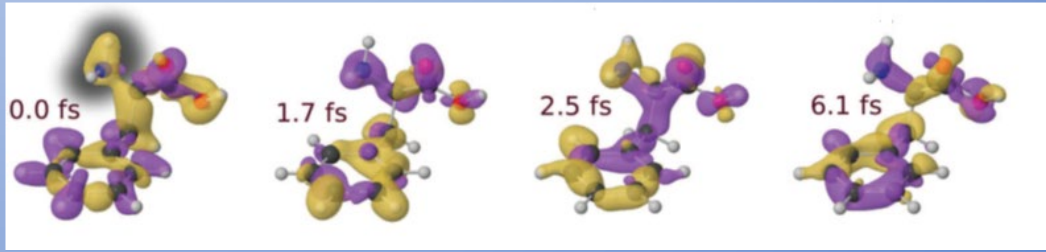


Photo-fragmentation of molecules



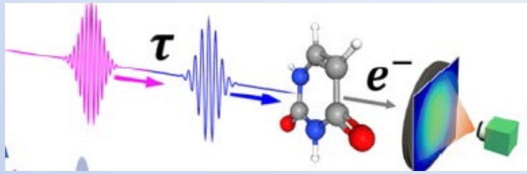
(Large) Viruses
Organelles
Bacteria/Cells
Metals
Semiconductors
Superconductors
Magnetic materials
Organic molecules

Courtesy F. Stellato

ARIA beamline scientific case

Defining experimental techniques and typology of samples (and applications)

Photoemission Spectroscopy



Photoelectron Circular Dichroism

Raman spectroscopy

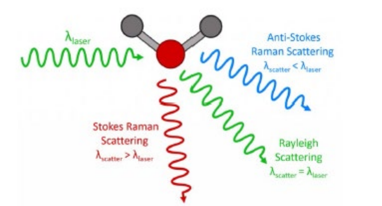
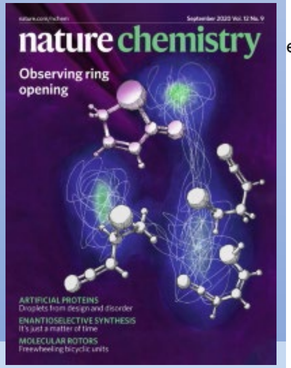
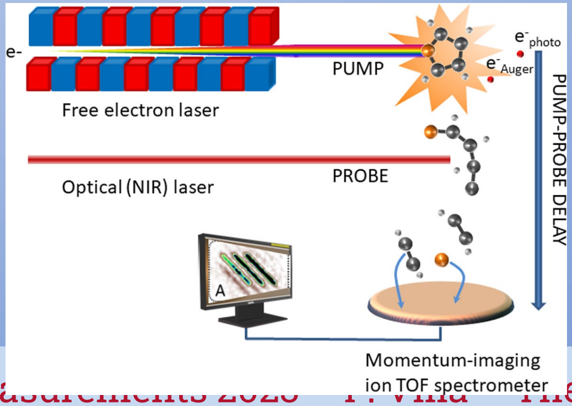


Photo-fragmentation of molecules
Time of Flight Spectroscopy





Gas phase & Atmosphere
(Earth & Planets)
Aerosols
(Pollution, nanoparticles)
Molecules & gases
(spectroscopies, time-of-flight)
Proteins
(spectroscopies)
Surfaces
(ablation & deposition)

Courtesy F. Stellato

Finanziato dall'Unione europea
NextGenerationEU

Ministero dell'Università e della Ricerca

Italiadomani
PIANO NAZIONALE DI RIPRESA E RESILIENZA

EuPRAXIA Advanced Photon Sources

EuAPS: EuPRAXIA Advance Photon Sources

- Principal Investigator: M. Ferrario,
- Infrastructure Manager: C. Bortolin,
- Management and Dissemination: A. Falone

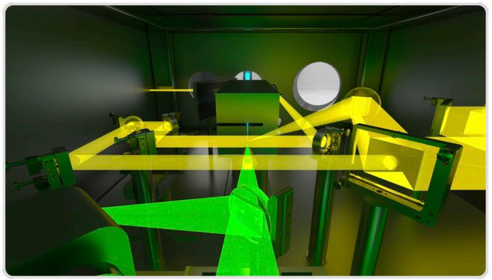
EuPRAXIA Advanced Photon Source

PNRR

Research

The **EuPRAXIA Advanced Photon Sources** (**EuAPS**) project, led by INFN in collaboration with CNR and University of Tor Vergata, foresees the construction of a laser-driven "betatron" X Ray user facility at the LNF SPARC_LAB laboratory. EuAPS includes also the development of high power (up to 1 PW at LNS) and high repetition rate (up to 100 Hz at CNR Pisa) drive lasers for EuPRAXIA. EuAPS has received a financial support of 22.3 MEuro from the PNRR plan on "creation of a new RI among those listed in NPRI with medium or high priority" and has received the highest score for the action 3.1.1 of the ESFRI area "Physical Sciences and Engineering".

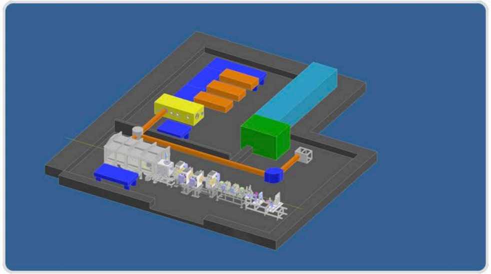
A. Cianchi (Uni ToV)



Betatron Radiation Source

READ MORE

P. Cirrone (INFN-LNS)



High Power Laser Beamline

READ MORE

L. Labate (CNR-INO)

High Repetition Rate Laser Beamline

READ MORE

M. Ferrario et al. INFN-23-12-LNF (2023)

Towards EuPRAXIA Laser Specs

Funded by the European Union

Eupraxia laser development is aimed at delivering more efficient, kW class PW laser driver for plasma acceleration at >100 Hz rate

- EuPRAXIA
- PW class,
- 100 Hz repetition rate,
- multi kW average power,
- diode pumped
- Full thermal load transport

EuPRAXIA Advanced Photon Sources

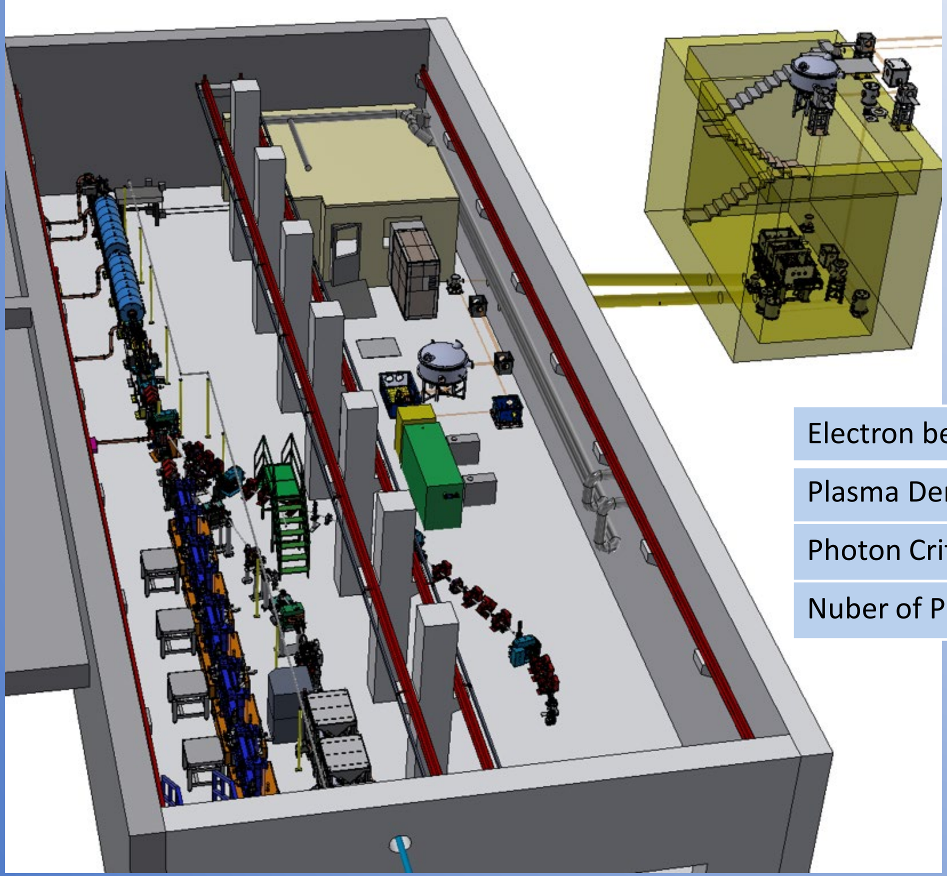
- EuAPS
- 50 TW peak power
- 100 Hz repetition rate
- 100 W average power
- Diode pumped
- Thermal load effects

- CURRENT
- PW class,
- Hz repetition rate,
- ≈10 W average power
- flashlamp pumped
- No thermal load transport

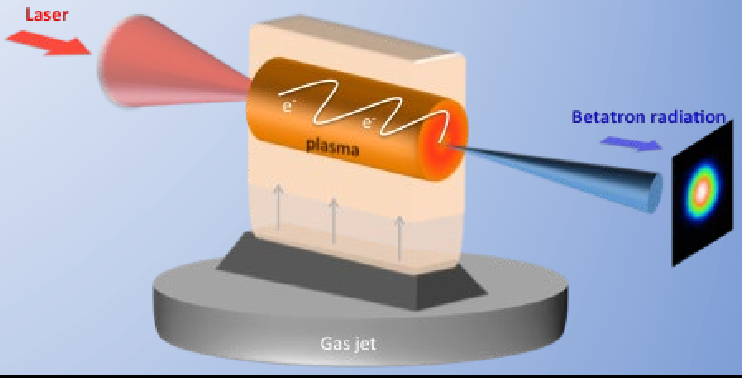
THALES

Amplitude

Betatron Radiation Source at SPARC_LAB



Electron beam Energy [MeV]	50-800
Plasma Density [cm^{-3}]	10^{17} - 10^{19}
Photon Critical Energy [keV]	1 - 10
Nuber of Photons/pulse	10^{6} – 10^{9}



Courtesy J. Vieira, R. Fonseca/GoLP/IST Lisbon

Finanziato dall'Unione europea
NextGenerationEU
Ministero dell'Università e della Ricerca
Italiadomani
PIANO NAZIONALE DI RIPRESA E RESILIENZA
EuPRAXIA
Advanced Photon Sources

Betatron radiation

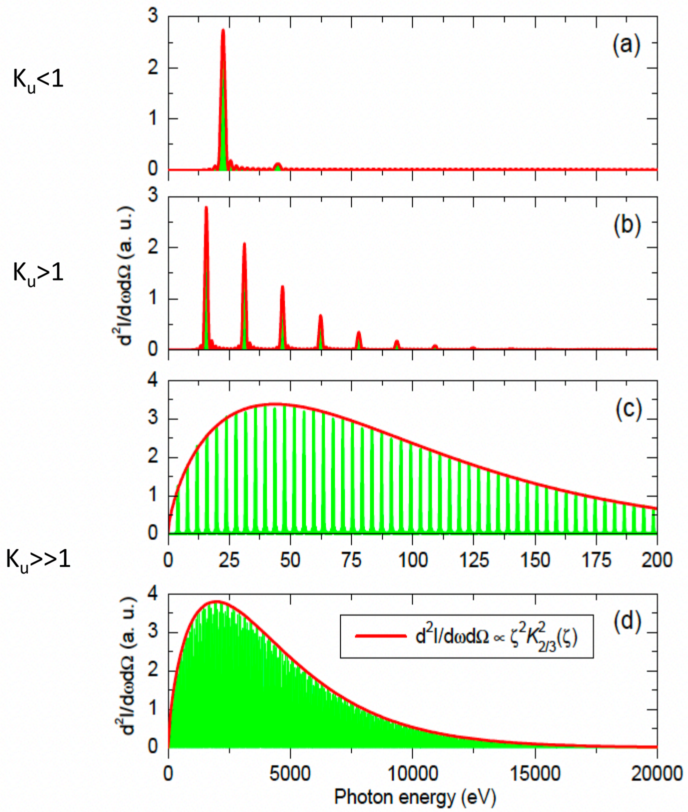


Figure 3.3: *Calculated betatron radiation spectra in a plasma column with density of 7×10^{18} cm^{-3}. The electron energy is 15 MeV, and oscillation amplitudes are (a) 0.1 μm, (b) 0.5 μm, and (c) 1.6 μm. (d) shows the case of a 100 MeV electron with an oscillation amplitude of 1.6 μm.*

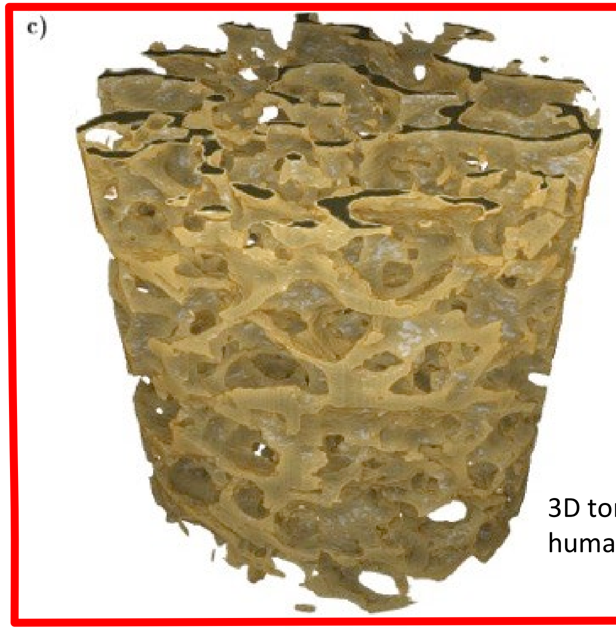
$$\omega_c = 3K_u\gamma^2\omega_\beta$$

$$N_{ph} \propto N_e N_\beta K_u$$

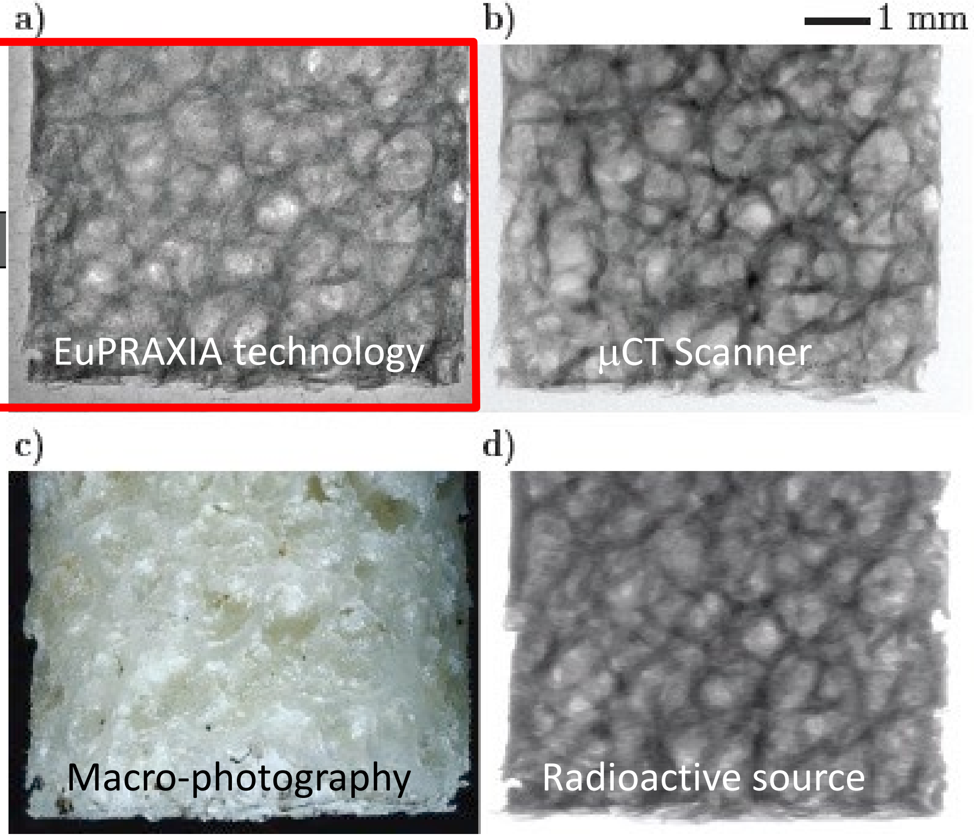
1) **Ultrafast** - laser pulse duration tens of fs useful for **time resolved experiments** (XFEL tens of fs, synchrotron tens to 100 ps).
2) **Broad energy spectrum -** important for **X-ray spectroscopy**.
3) **High brightness** - small source size and high photon flux for **fast processes**.
4) **Large market -** 50 synchrotron light sources worldwide, 6 hard XFEL's and 3 soft-ray ones (many accelerators operational and some under construction).

Betatron X Rays: Compact Medical Imaging

J.M. Cole et al, “Laser-wakefield accelerators as hard x-ray sources for 3D medical imaging of human bone”. Nature Scientific Reports 5, 13244 (2015)



3D tomography of human bone



- **EuPRAXIA laser advance (industry) will push rate from 1/min to 100 Hz.**
- **Ultra-compact source of hard X rays → exposing from various directions simultaneously is possible in upgrades**

Physics & Technology Background:

- Small EuPRAXIA accelerator → small emission volume for betatron X rays.
- **Quasi-pointlike** emission of X rays.
- **Sharper image from base optical principle.**
- Quality demonstrated and published, but takes a few hours for one image.
- Advancing flux rate with EuPRAXIA laser by factor > 1,000!

Added value

Sharper images with outstanding **contrast**

Identify smaller features (e.g. early detection of cancer at micron-scale – calcification)

Laser advance in EuPRAXIA → **fast imaging** (e.g. following moving organs during surgery)

NEXT STEP: PACRI

EuPRAXIA

Funded by the European Union

- **HORIZON-INFRA-2024-TECH-01-01: R&D for the next generation of scientific instrumentation, tools, methods, solutions for RI upgrade**

- **Dead line 12 March 2024**

- **Target Budget ~10 MEuro**

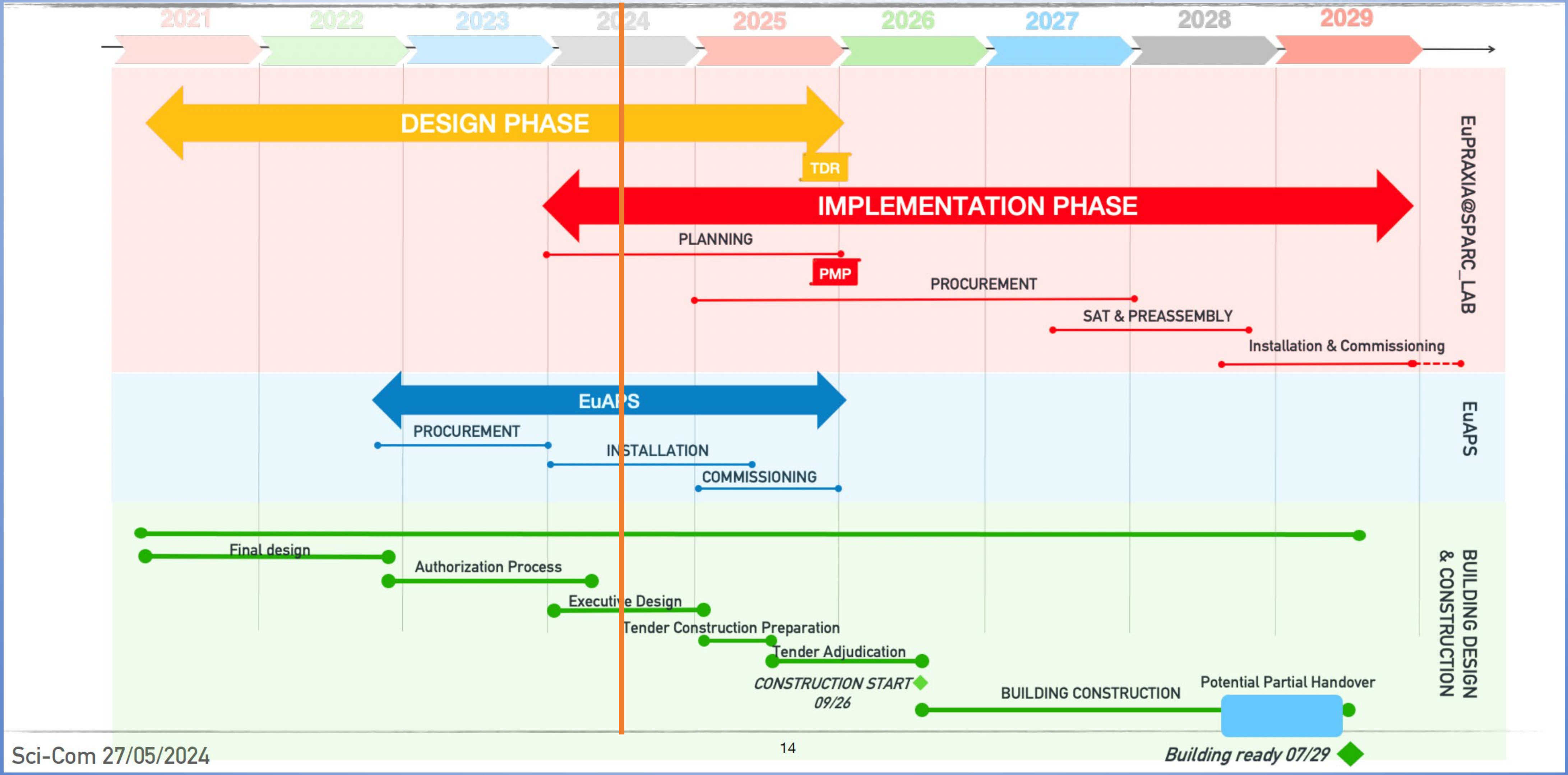
25 Members
+
1 Associated partner

19 Universities and Scientific Labs.
+
7 Industries

#	Partner	Acronym
1	Elettra - Sincrotrone Trieste SCpA (Coordinator)	ST
2	European Organization for Nuclear Research	CERN
3	Istituto Nazionale Fisica Nucleare	INFN
4	University of Liverpool	ULIV
5	Thales-MIS	Th-MIS
6	Scandinova Systems AB	SCND
7	VDL ETG Technology & Development BV	VDL
8	COMEB	COMEB
9	United Kingdom Research and Innovation	UKRI
10	Consiglio Nazionale delle Ricerche	CNR
11	Extreme Light Infrastructure ERIC	ELI-ERIC
12	Centre National de la Recherche Scientifique CNRS	CNRS
13	Thales LAS France SAS	Th-LAS
14	Amplitude	Amplitude
15	Centro de LÁSERES Pulsados	CLPU
16	Ferdinand-Braun-Institut gGmbH, Leibniz-Institut für Hoechstfrequenztechnik	FBH
17	Associacao do instituto superior Tecnico para a Investigacao e Desenvolvimento	IST
18	Università degli Studi di Roma La Sapienza	USAP
19	Heinrich-Heine-Universitaet Duesseldorf	UDUS
20	Deutsches Elektronen-Synchrotron DESY	DESY
21	The Chancellor, Masters and Scholars of the Univ. of Oxford	UOX
22	Ludwig-Maximilians-Universitaet Muenchen	LMU
23	GSI Helmholtz Centre for Heavy Ion Research	GSI
24	Università degli Studi di Roma Tor Vergata	UTOR
25	SourceLAB	SourceLAB
26	Paul Scherrer Institut (Associated partner)	PSI

WP No.	Work Package Title	Lead Partic. Short Name
1	Coordination and project management	ELETTRA
2	Scientific and industrial exploitation	ULIV
3	Plasma accelerator theory and simulations	IST
4	High repetition rate plasma structures	INFN
5	Plasma acceleration diagnostics and instrumentation	CNRS
6	High efficiency RF generator	Thales-MIS
7	High repetition rate modulator	Scandinova
8	X-band RF Pulse Compressor (BOC)	INFN
9	RF tests and validation	CERN
10	High repetition rate high power Ti:Sa amplifier module	UKRI
11	Efficient kHz laser driver modules for plasma acceleration	CNR
12	High-rep rate pump sources for laser drivers	ELI-ERIC
13	Prototype of high average power optical compressor	Thales-LAS
14	Laser Driver System Architecture,transport and engineering	CNRS

EuPRAXIA@SPARC_LAB baseline updating

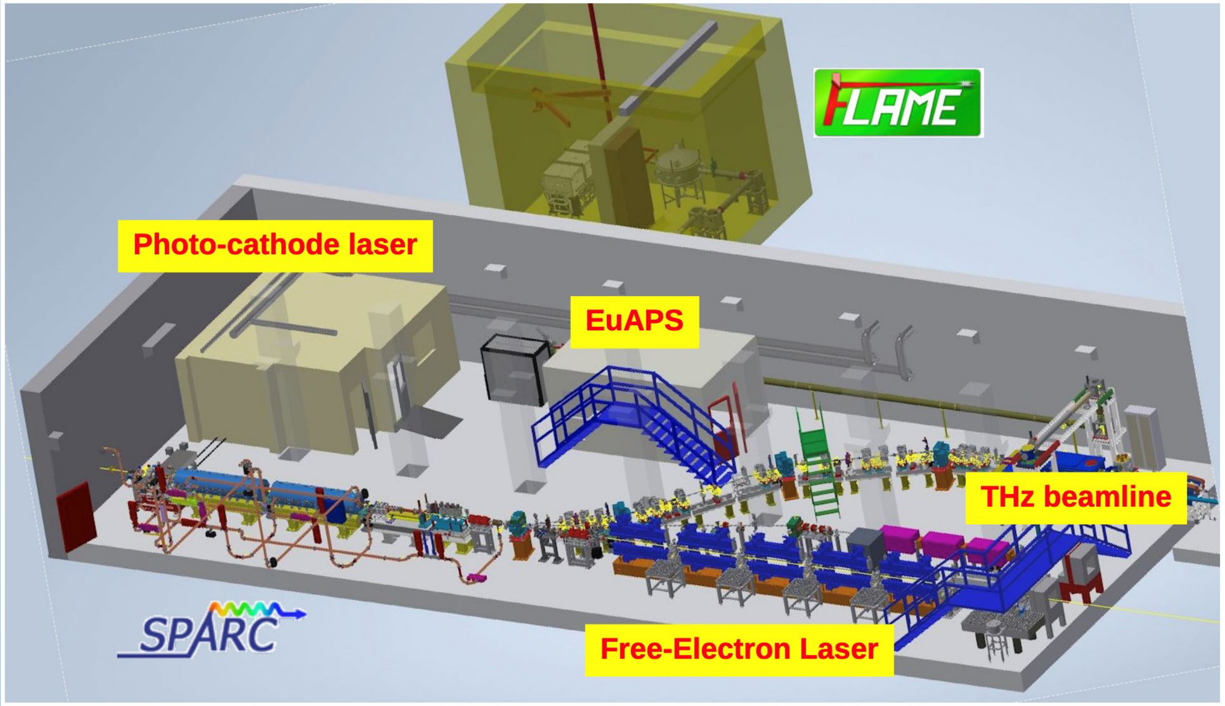


n. 20 POST-DOCTORAL SENIOR LEVEL 3 RESEARCH GRANT IN EXPERIMENTAL PHYSICS at INFN

https://jobs.dsi.infn.it/dettagli_job.php?id=4180

DETTAGLIO DEL BANDO	
Numero :	27077
Anno :	2024
Titolo:	n. 20 POST-DOCTORAL SENIOR LEVEL 3 RESEARCH GRANT IN EXPERIMENTAL PHYSICS
Numero Posti:	20
Tipo:	Assegno di ricerca
Data bando:	12-09-2024
Data scadenza:	15-11-2024 **Dead line: November 15**
Bando:	27077.pdf

Istituto Nazionale di Fisica Nucleare



LPAW 2025 – Ischia Island

The **Laser and Plasma Accelerators Workshop 2025 (LPAW 2025) will be held at Hotel Continental Ischia, in the Ischia Island (Campania, Italy), from Monday 14 to Friday 18 April 2025.**

The Laser and Plasma Accelerators Workshop (LPAW) series is one of the leading workshops in the field of plasma-based acceleration and radiation generation.

The following scientific topics will be the main focus of the conference:

- Plasma-based lepton acceleration (experiments, simulations, theory, diagnostics...).
- Plasma-based ion acceleration (experiments, simulations, theory, diagnostics...).
- Secondary radiation generation and applications (experiments, simulations, theory, diagnostics...).

John Dawson Thesis Prize

"John Dawson Thesis Prize" is awarded on a biannual basis to the best PhD thesis in the area of plasma accelerators driven by laser or particle beams. The prize will be awarded for fundamental (theoretical or experimental) or applied aspects.
Each prize winner will receive a certificate of merit, up to 500 Euros, and financial support to attend the "Laser and Plasma Accelerators Workshop," where the prize will be awarded.

https://agenda.infn.it/event/42311/

Funded by the European Union


Thank for your attention