



The Extreme Light Infrastructure

EXTREME SCIENCE

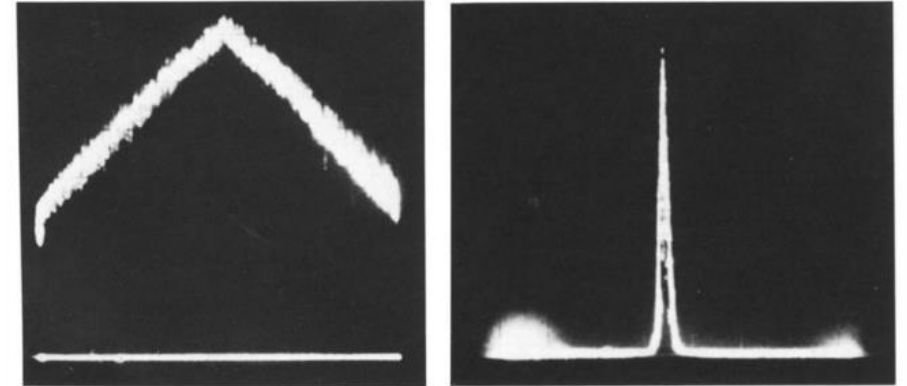
A European Research Infrastructure Consortium



From Nobel Prize to Extreme Light

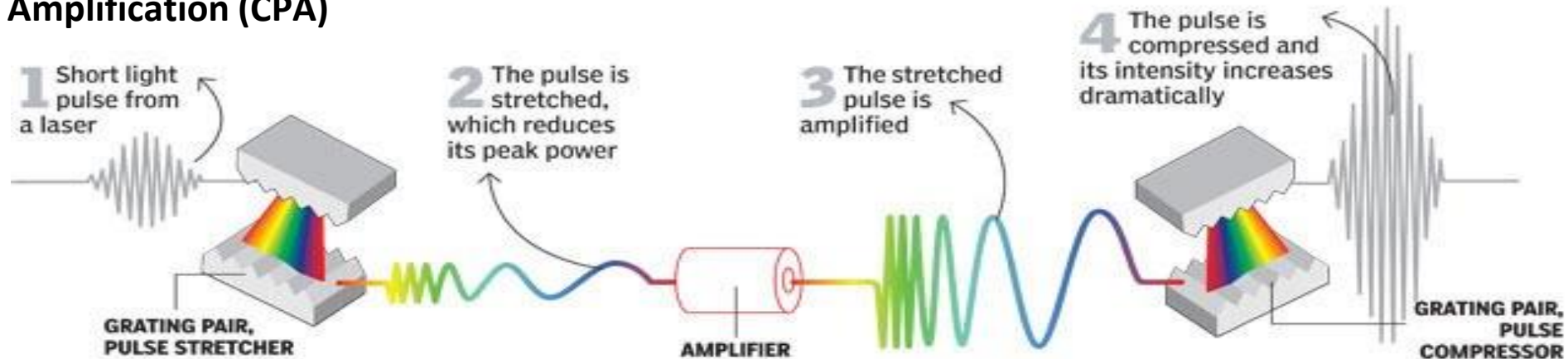
A Technological Breakthrough Enables ELI

Gérard Mourou and Donna Strickland won the **2018 Nobel Prize for Physics** for proposing “**Chirped Pulse Amplification**” for high-power, ultrafast, extremely intense lasers. **Mourou proposed ELI in 2004.**



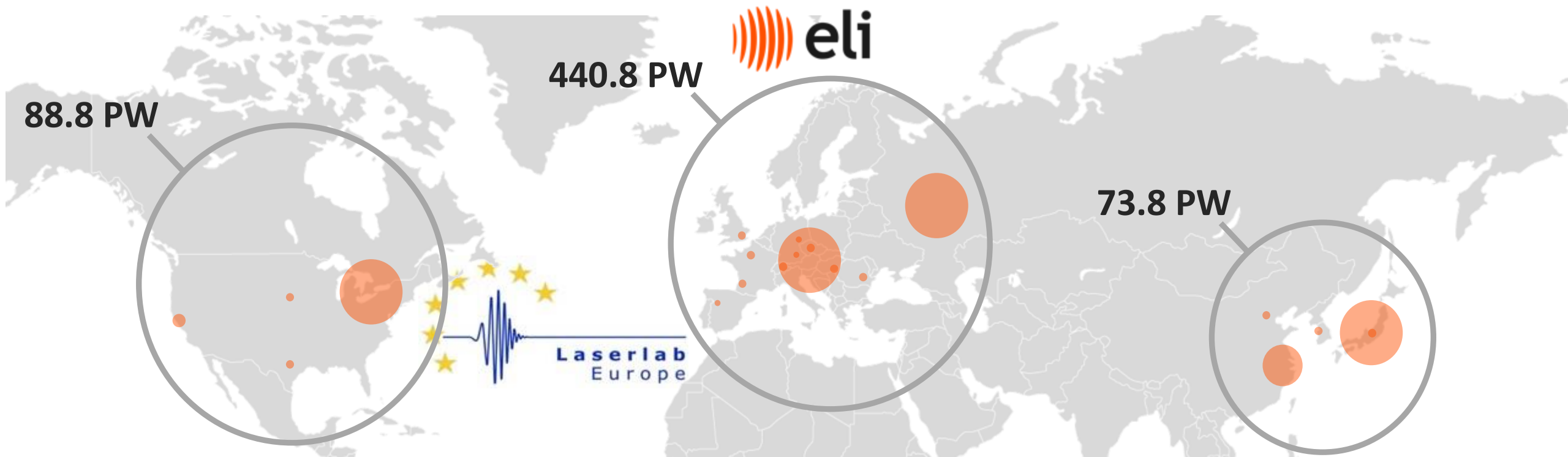
Images of stretched and compressed pulses, from Strickland's 1985 paper on Chirped Pulse Amplification (CPA) which led to petawatt-class lasers

Chirped Pulse Amplification (CPA)



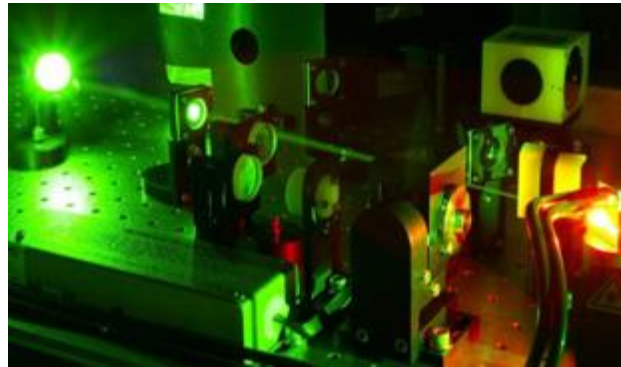
On the ESFRI Roadmap since 2006

- **Europe leads the world** in laser and photonics production and installation, especially state-of-the-art systems
- **Investment** in high-power laser systems in Europe is **world-leading**
- **The ELI ERIC Facilities** are introducing **3 PW-class lasers, (10PW and 2xPW@10Hz)** plus a diverse set of high-repetition systems and secondary systems.





Science Using Lasers



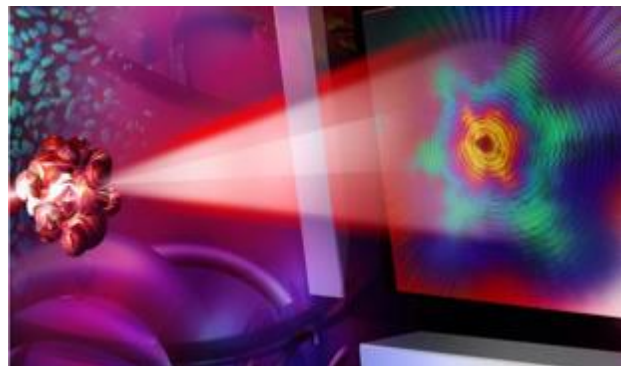
Laser Development



Radiation Physics and Electron Acceleration
Soft to hard x-rays, GeV electrons



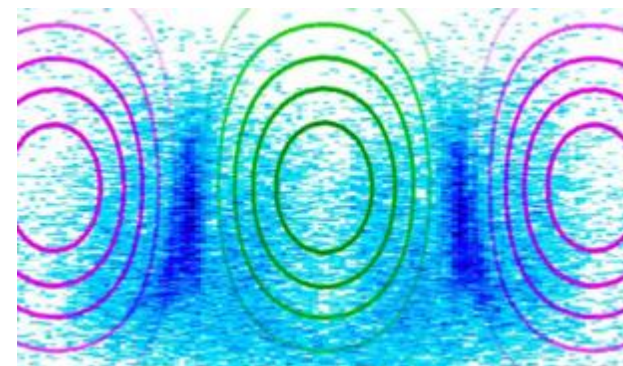
Particle Acceleration
250 MeV Ions Acceleration by lasers



Applications in Material Science and
Biology



Plasma Physics and High Energy Density,
Astrophysics, Nuclear Photonics



Ultra High Intensity Interactions
High-field physics and theory



ELI ERIC is a single, multi-site organisation

A European Research Infrastructure Consortium – an ERIC

This new legal form enables the participation of States as member countries to govern the ELI Facilities jointly and make them available to the scientific community as a single international organisation. Its headquarters are in Dolní Břežany in the Czech Republic.

The Czech Republic, Founding Member
Host of Seat



Hungary, Founding Member
Host



Italian Republic
Founding Member



Lithuania
Founding Member



Federal Republic of Germany
Founding Observer



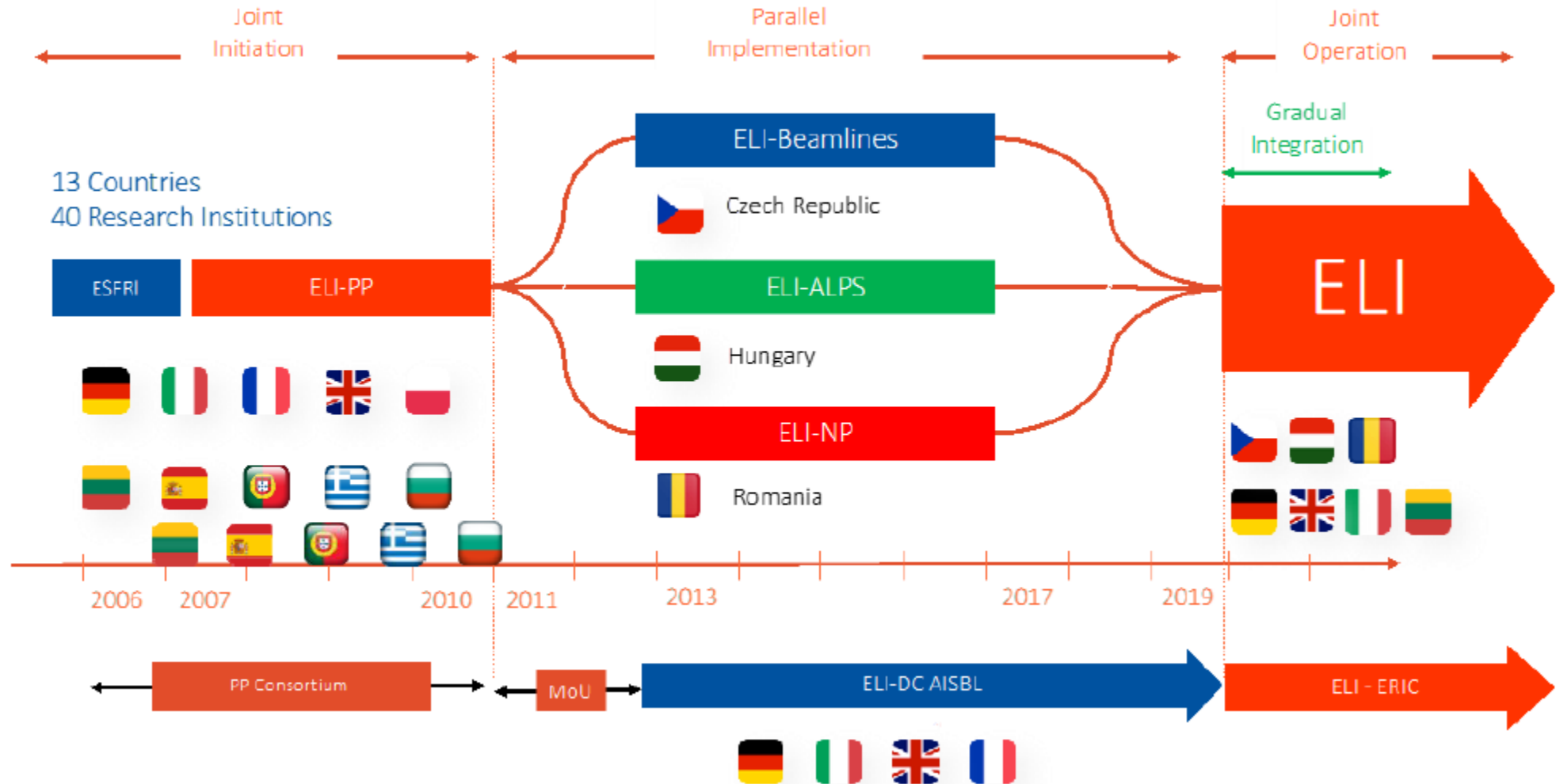
Bulgaria
Founding Observer



ELI ERIC involves the Czech Republic, Hungary, Italy and Lithuania as founding Members. Both Germany and Bulgaria are Founding Observers. ***Romania and ELI-NP are also expected to join the ELI ERIC consortium, which is open to European and non-European countries to join its membership.***

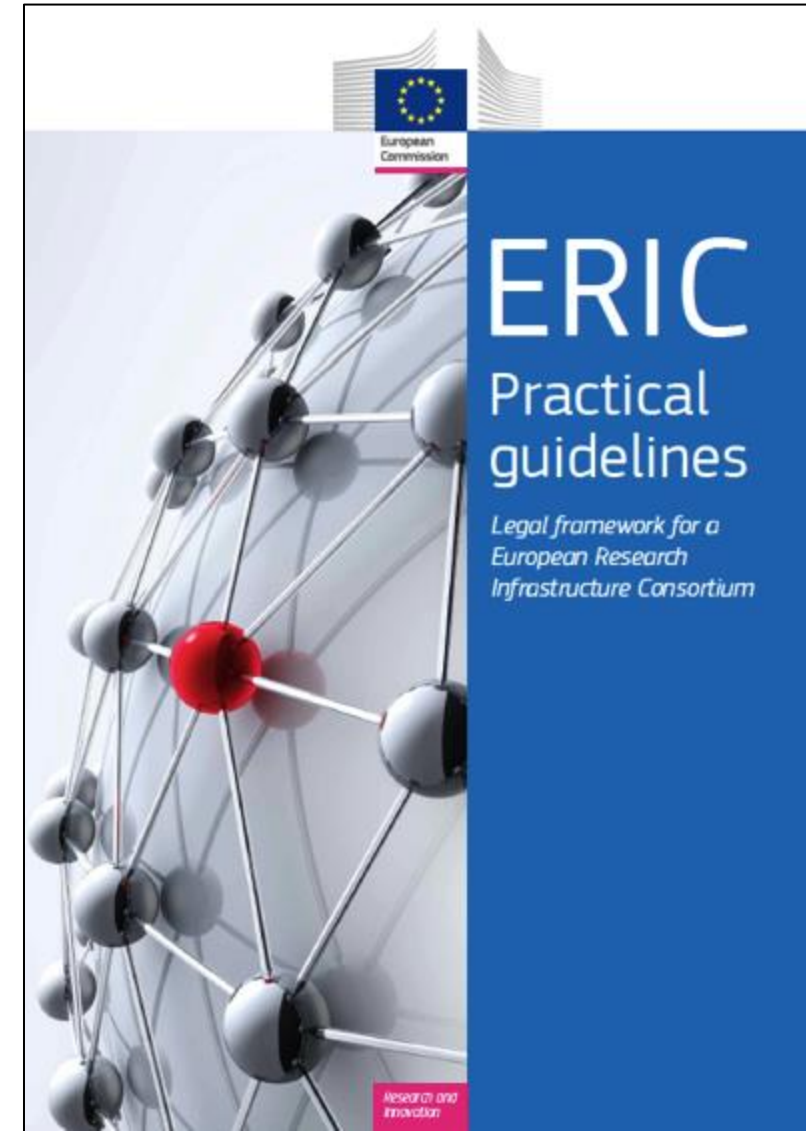


An international endeavor from the beginning



Advantages:

- European legal subject, with full legal capacity in all EU Member States
- Enables the easiest, most legally supported entity for *countries*
- The **Member countries financially support** the operations
- Offers legal **flexibility** and better mobility for staff
- Allows self-determined **Procurement Rules**
- Allows for **VAT and excise tax exemption**
- **Countries outside the EU may join!**



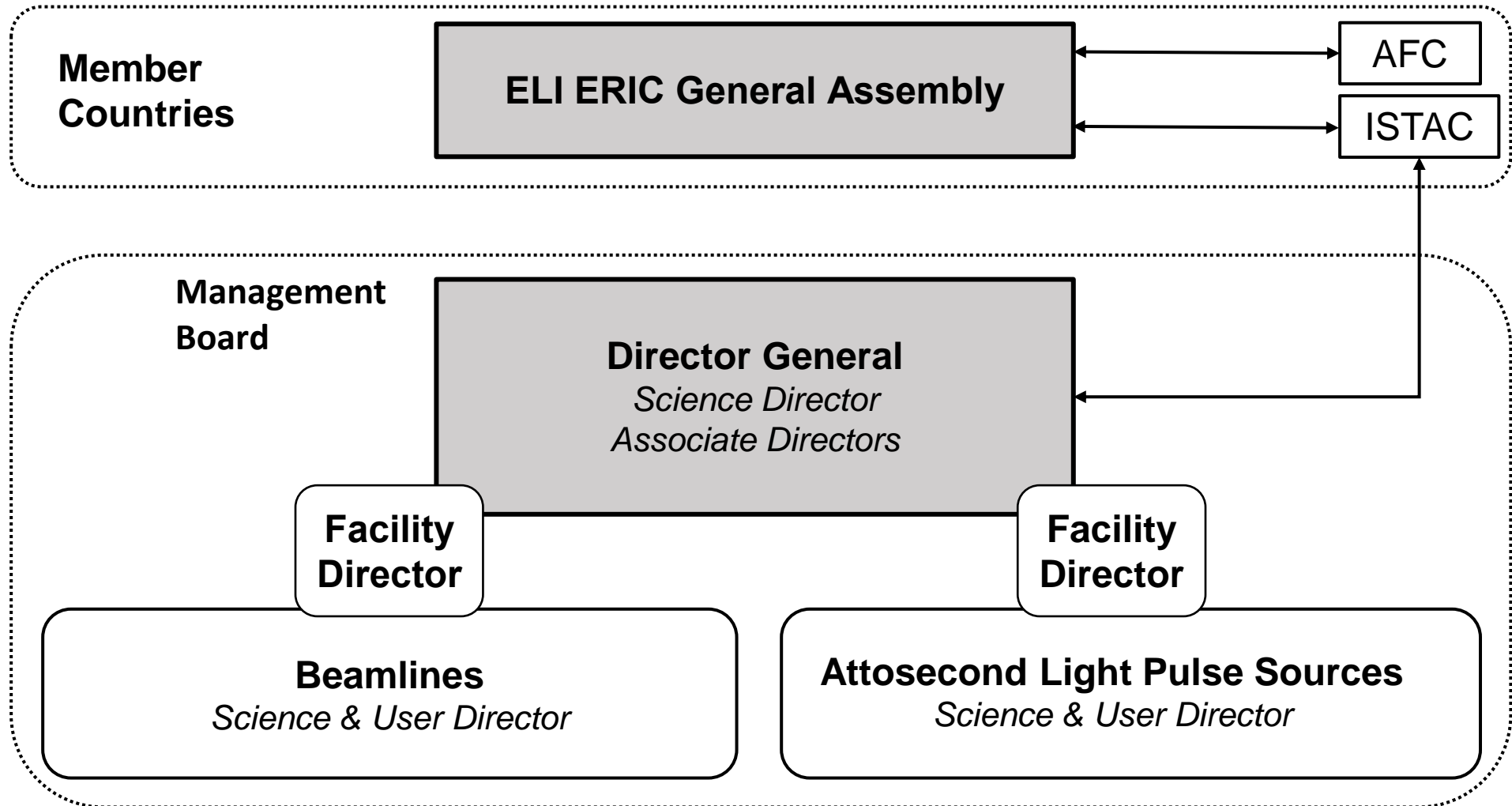


ELI ERIC is a single, multi-site organisation

- ELI ERIC Confirmed by EC on **April 30, 2021**
- ELI ERIC formally began operating on **1 July 2021** as legal successor of ELI-DC
- **ELI ERIC General Assembly (GA)**
 - **Chair Prof. Caterina Petrillo**
 - **Director General Allen Weeks**
- **Advisory Bodies:**
 - **Administrative and Finance Committee (AFC)**
 - **International Scientific and Technical Advisory Committee (ISTAC)**
- Engagement with potential new partner Countries is ongoing, V4 countries one of priorities
- Operating Agreements have been signed with Beamlines and Alps in beginning of 2022, i.e. two entities will transition into ELI ERIC by 2023 and 2024 respectively
- The first ELI ERIC Open Call in preparation (to be launched in May 2022).



The ELI ERIC Governance and Management





- Being setup
- **Why?**
 - To manage the submission of project proposals and implementation of funded projects.
- **What?**
 - In collaboration with existing ELI Grants Offices, the ELI ERIC Grants Office will be responsible for putting in place a process for applying to EU-funded and national grants with the aim of simplifying the life and work of the ELI research teams by supporting them in all aspects of this process.
- **How?**
 - ELI ERIC will be taking strategic decisions about the grants to apply to and all research teams will be able to present their topics of interest for approval.



The ELI ERIC Facilities

The mission of ELI ERIC is to provide effective access to the ELI Facilities, ensuring excellence and interoperability to maximise ELI's impact on science and society.



ELI Attosecond Light Pulse Source
www.eli-alps.hu



*ELI-NP at IFIN-HH
Romania*



ELI Beamlines
www.eli-beams.eu



User Access to ELI ERIC

There are three modes of access

- **Excellence-Based Access** – *Scientific evaluation of proposals* by international peer-review panels composed of qualified scientists. Results of experiments based on excellence must be published and open.
- **Mission-Based Access** – *Thematic areas of research granted on the basis of specific scientific missions* pursuing clearly defined challenges. Results of experiments generally published and open.
- **Proprietary Access** – *Paid access for industrial or other users*, where results are retained by the user, consistent with ELI ERIC's Data and IPR Policy.



High-power ultra-short laser pulses for groundbreaking res



ELI Attosecond Light Pulse Source *[Szeged, Hungary]*

ELI ALPS is leading in ultrafast physical processes as well as a world-class centre for generating outstanding biological, chemical, medical and materials science results.

- Development of attosecond light sources and measurement techniques
- Research into biological imaging technologies
- Medical applications
- Energy research: from solar cells to artificial photosynthesis
- High-peak-power photonics
- Information technology, materials science and nanoscience

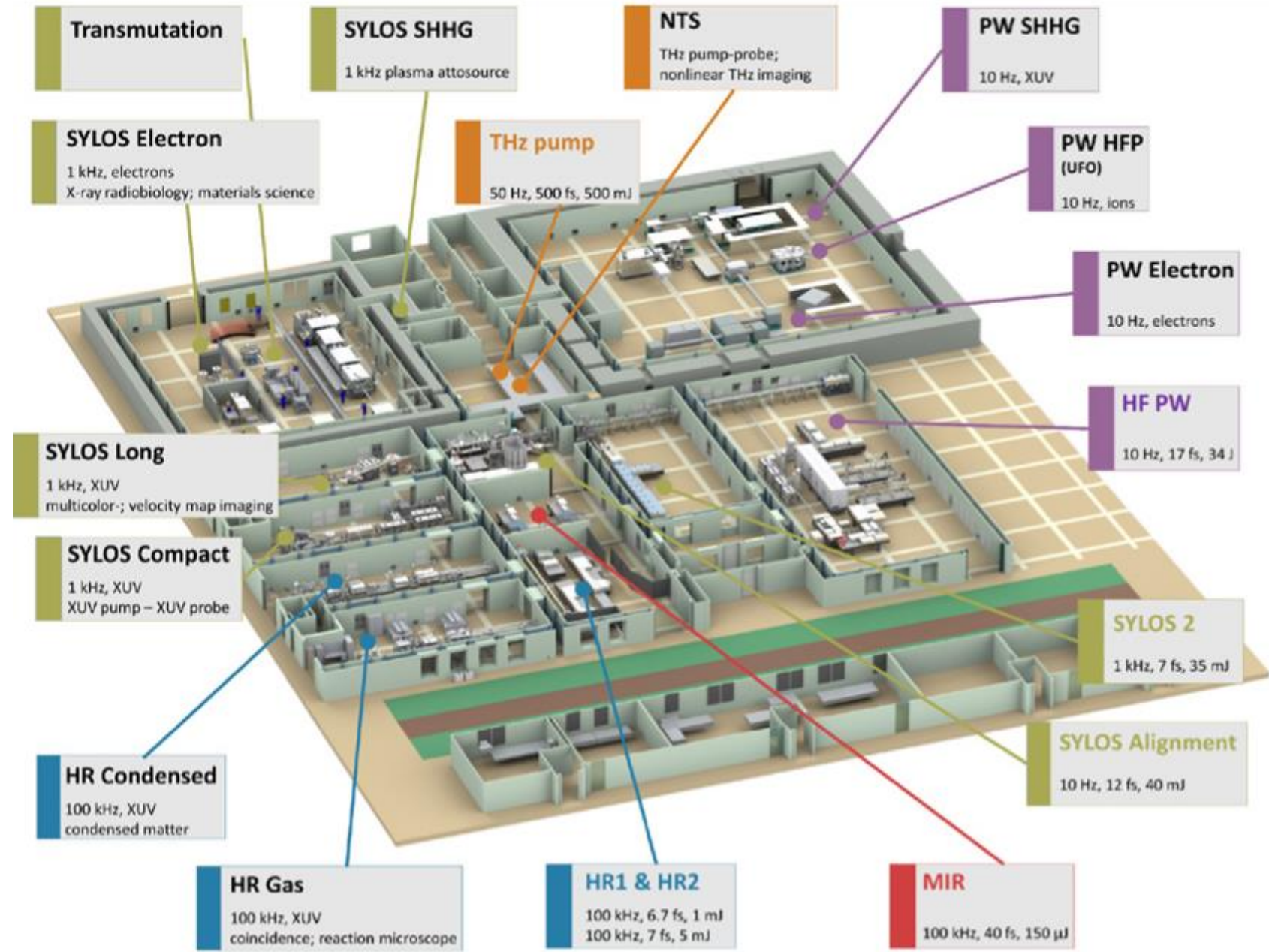


ELI Attosecond Light Pulse Source

Research Fields and Applications

ELI ALPS will be one of the leading lights in ultrafast physical processes as well as a world-class centre for generating outstanding biological, chemical, medical and materials science results.

- Development of attosecond light sources and measurement techniques
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ELI Beamlines

[Dolní Břežany, Czech Republic]

Just outside of Prague, ELI Beamlines covers the interaction of light with matter at intensities that are 10 times higher than previously achievable. Ultra-short laser pulses last only a few femtoseconds with outputs up to 10 PW enables new techniques and tools for research such as medical imaging and diagnostics, radiotherapy, new materials and X-ray optics. Laser driven hadron-therapy, proton-boron nuclear fusion, and non-destructive heritage testing.





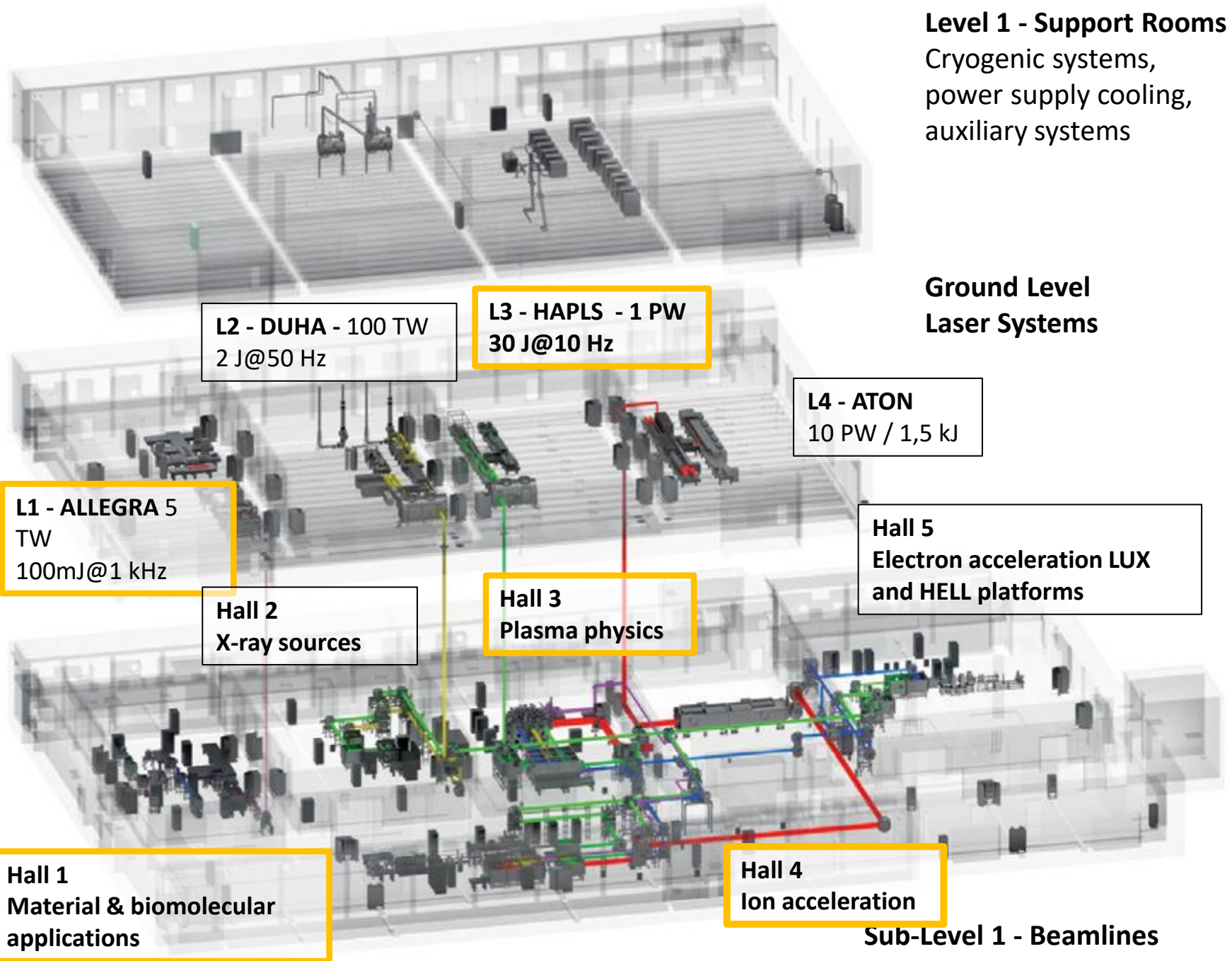
ELI Beamlines

Research Fields and Applications

Laser technologies developing new techniques for laser crystals, solutions for the cryogenic cooling of high-power repetition rate laser amplifiers, femtosecond synchronization, advanced repetition rate diagnostics of femtosecond pulses, advanced control systems, and innovative solutions for petawatt (PW) pulse compressors.

In addition to basic research and development in the field of lasers, ELI Beamlines deals with research in material sciences, electronics and engineering.

- Material science
- Biomolecular Applications
- X-ray Sources Driven by Ultrashort Laser Pulses
- Plasma and High-field Physics
- Particle Acceleration





ELI ERIC Leads Innovation and Technology

We train a generation of scientists and experts

The ELI Facilities have awarded over €455 million in contracts to companies from 19 European countries

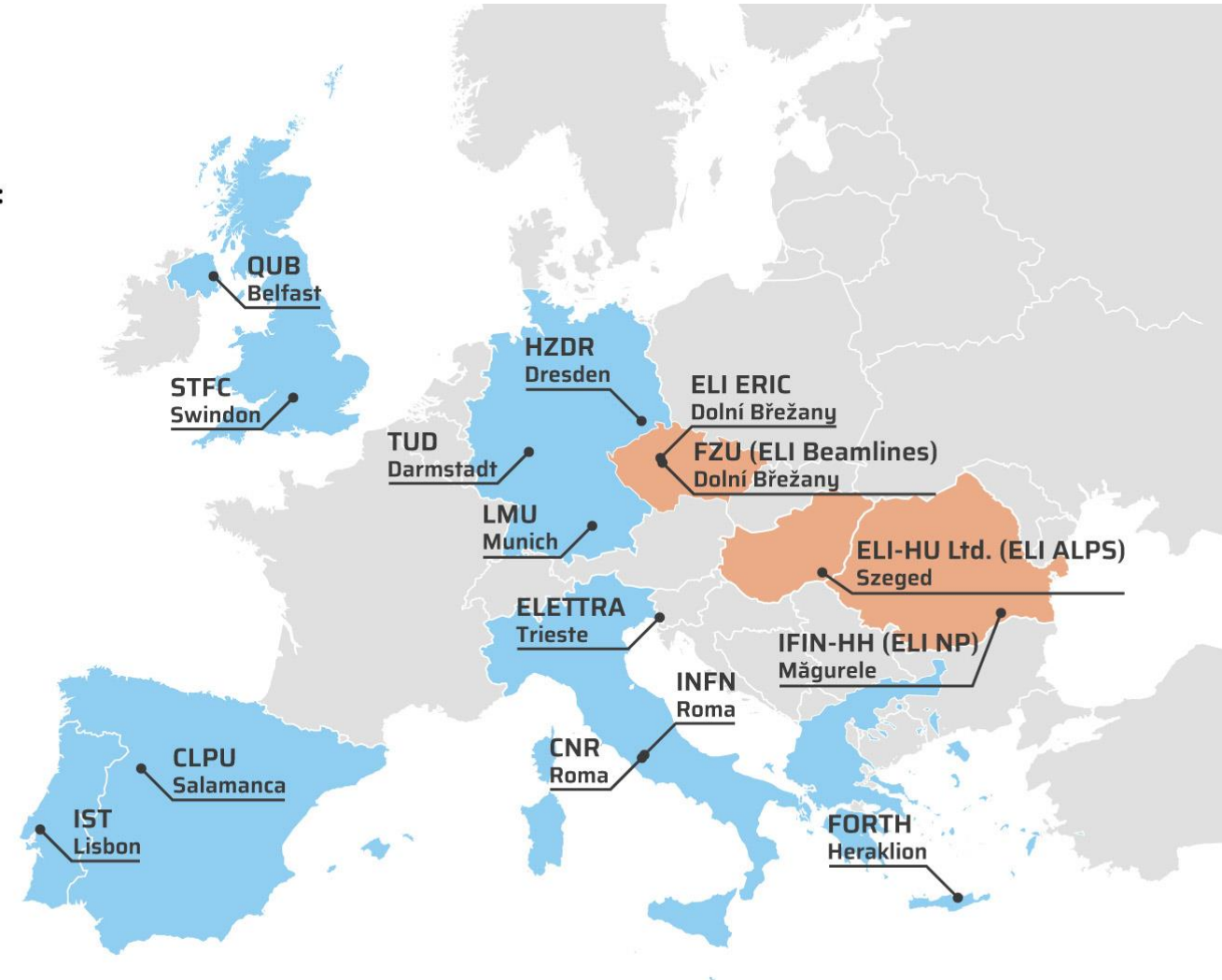
- The global high-power, directed laser market should reach \$14.6 billion by 2024 up from \$8.9 billion in 2019, a compound annual growth rate (CAGR) of 10.3%.
- The global ultrafast lasers market should reach \$8.1 billion by 2022 up from \$2.7 billion in 2017 at a compound annual growth rate (CAGR) of 24.7%.

- Means of integration for the ELI Facilities into ELI ERIC
- Funded by the European Union's **Horizon 2020 programme**, under grant agreement number 871161
- Topic: **INFRADEV-04-2019** Fast track to the implementation of an ESFRI research infrastructure
- Duration: 42 months from **1 November 2020 until 31 May 2024**
- Total budget: ~ **20 million euros**
- **15 project partners from 9 countries**
- **Objective:** *Support the swift and effective transition of the ELI Facilities to sustainable operations within a single organisation as ELI ERIC*
- *IMPULSE has contributed to laying down the foundations for ELI ERIC's governance with key policies being approved*

Project Coordinator:
ELI ERIC

ELI Project Partners

Other Partners





For more information about how to become an ELI user, or if you are interested in how your country can become a member of ELI ERIC, please contact us at

The Extreme Light Infrastructure ERIC

info@eli-laser.eu

tel +420 266 051 109

or visit our website at

<https://eli-laser.eu>

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