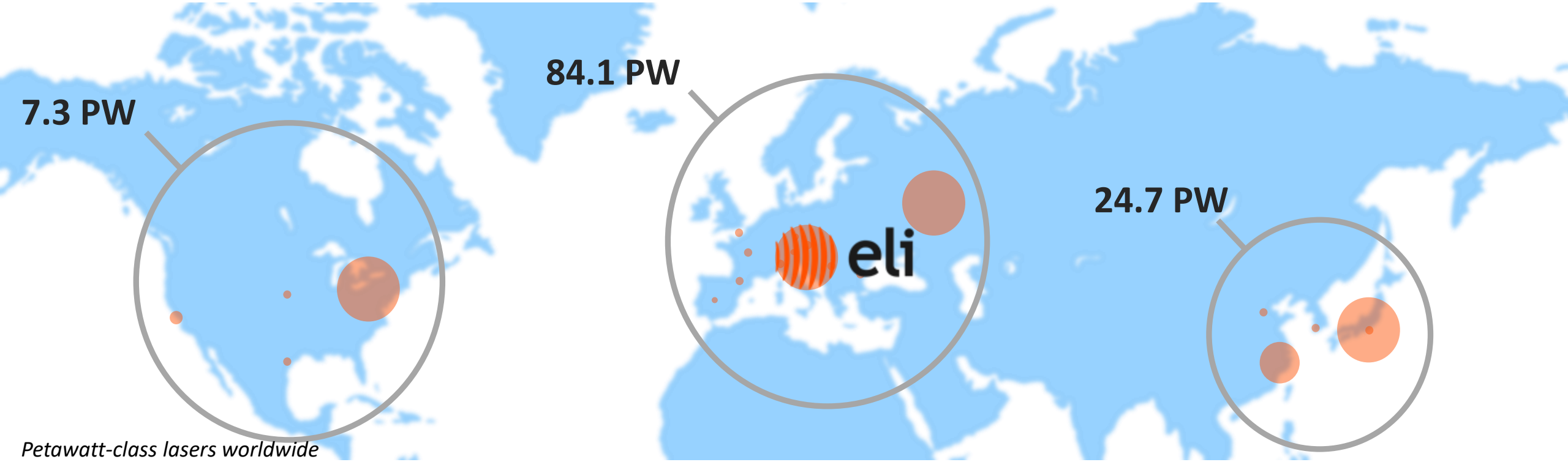
The Extreme Light Infrastructure

EXTREME SCIENCE

A European Research Infrastructure Consortium

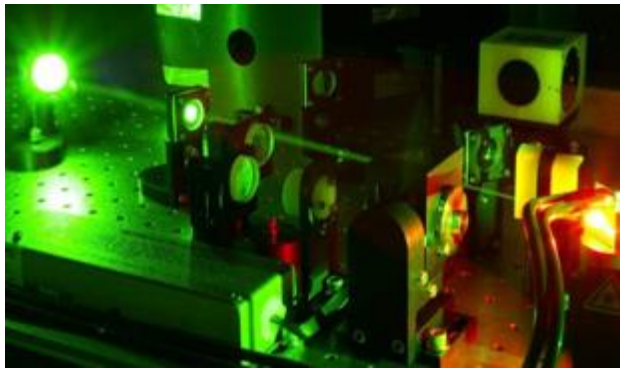
Europe leads the world in laser production and installation, especially state-of-the-art systems.

- **Investment** in high-power laser systems in Europe is connected to **a strong and relatively consolidated** community in Laserlab Europe beginning in 2001.
- **The ELI Facilities** are introducing **5 PW+ lasers, (3x10PW and 2xPW@10Hz)** plus a diverse set of leading atto-second high-repetition systems.



Petawatt-class lasers worldwide
SOURCE: Courtesy of J.L. Collier, CLF RAL, UK

Science Using Lasers



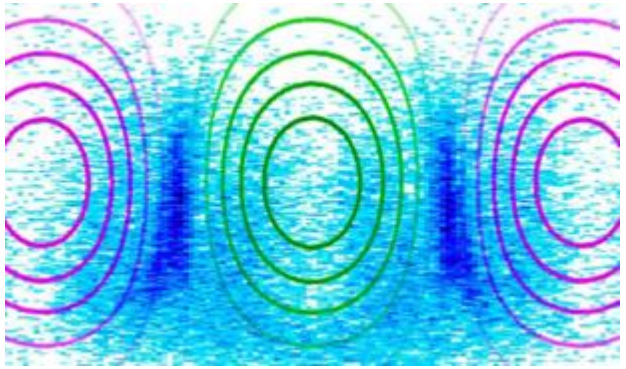
Laser Development

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 ALPS is a world-class centre for :

- Ultrafast physical processes
- Chemical, medical and materials science analysis
- Attosecond measurement techniques
- Biological imaging technologies
- Artificial photosynthesis
- Nanoscience
- 270 international staff
- Area 30,000 m2

ELI Attosecond Laser Pulse Sources

Szeged, Hungary

ELI ALPS Facility Layout

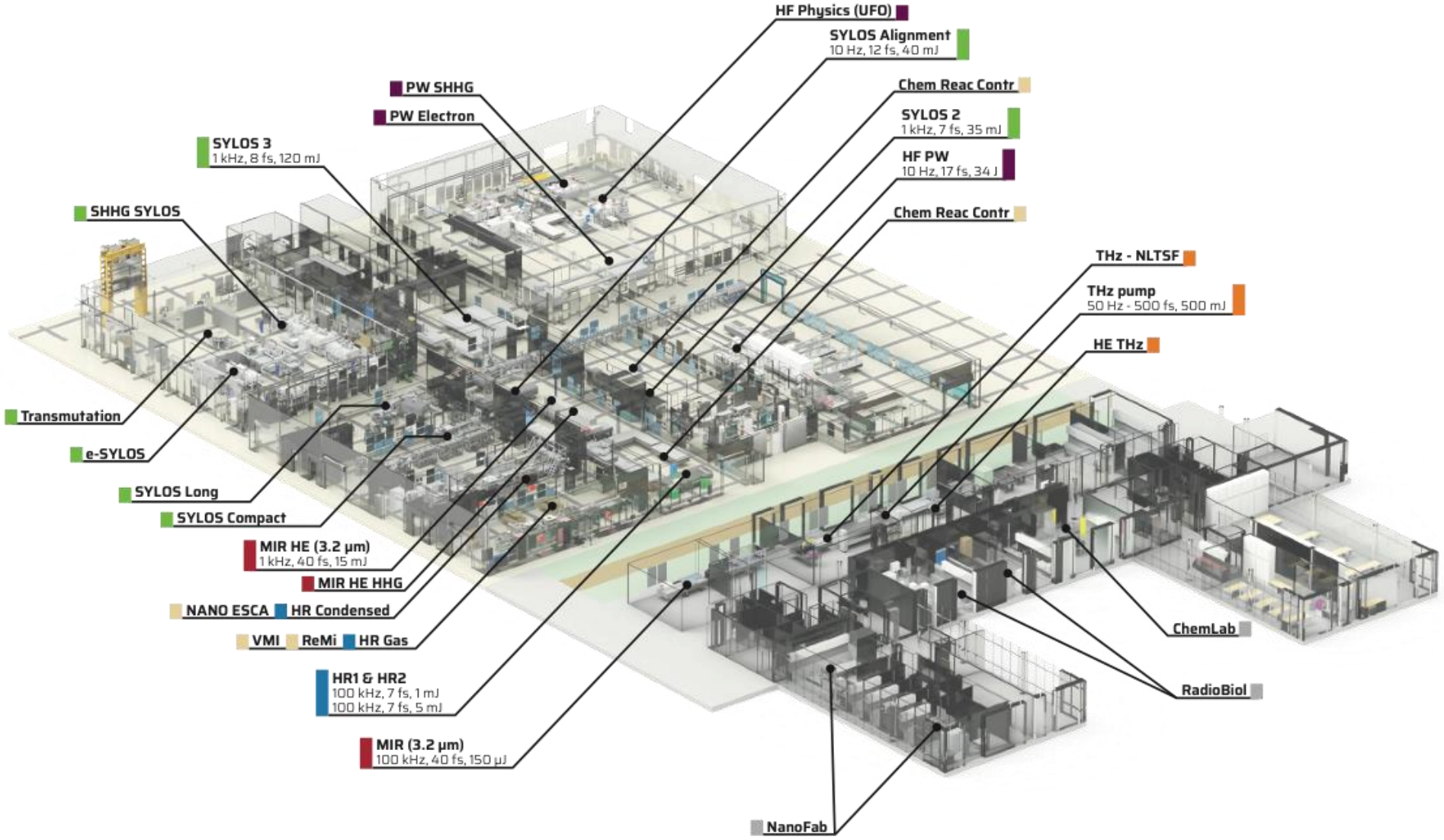
ELI ALPS

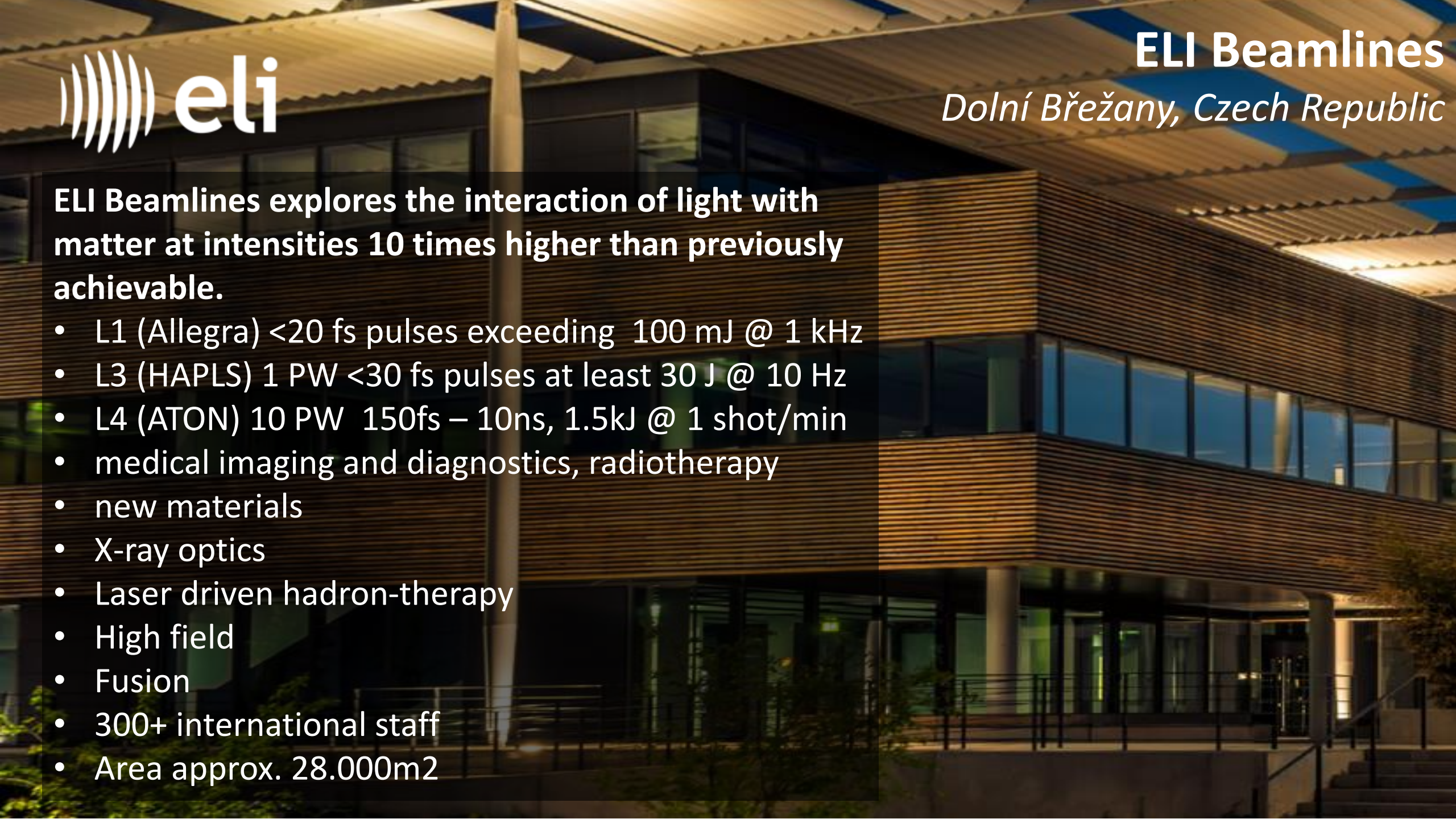
(Attosecond Light Pulse Source)

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

Research fields and applications:

- Development of attosecond light sources and measurement techniques
- Radiobiological applications
- Energy research: solar cells, artificial photosynthesis, transmutation of used nuclear fuels
- High-peak-power photonics
- Information technology, materials science and nanoscience
- Particle acceleration with few cycle laser pulses





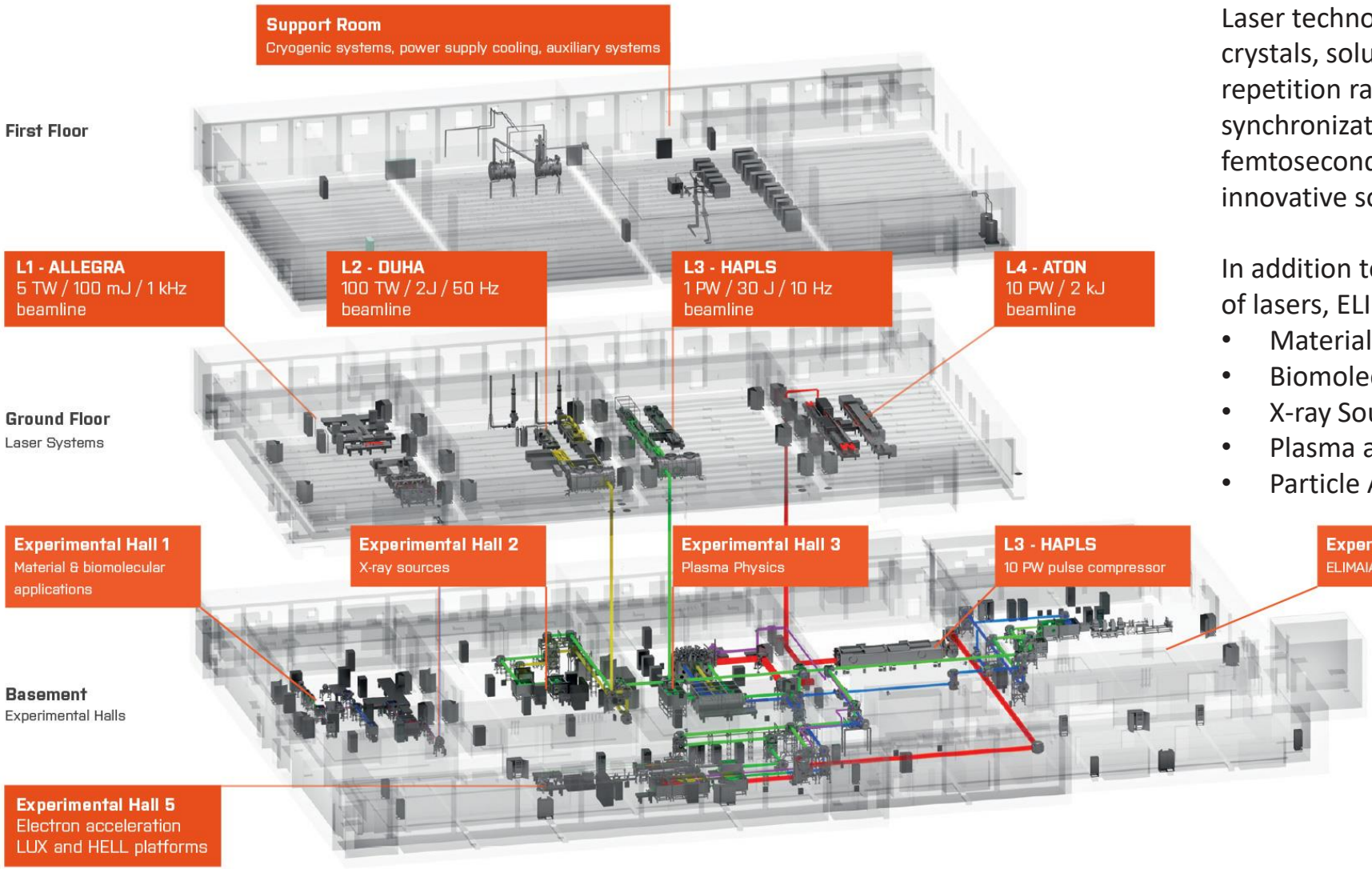
ELI Beamlines

Dolní Břežany, Czech Republic

ELI Beamlines explores the interaction of light with matter at intensities 10 times higher than previously achievable.

- L1 (Allegra) <20 fs pulses exceeding 100 mJ @ 1 kHz
- L3 (HAPLS) 1 PW <30 fs pulses at least 30 J @ 10 Hz
- L4 (ATON) 10 PW 150fs – 10ns, 1.5kJ @ 1 shot/min
- medical imaging and diagnostics, radiotherapy
- new materials
- X-ray optics
- Laser driven hadron-therapy
- High field
- Fusion
- 300+ international staff
- Area approx. 28.000m2

ELI Beamlines Facility Layout



ELI Beamlines

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:

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

A European Research Infrastructure Consortium

A European International Organisation Established in 2021

Construction was possible with European Structural Investment Funds (ESIF)

The Czech Republic, *Host of Seat*

Hungary, *Host*

Italian Republic

Lithuania

Federal Republic of Germany *Observer*

Bulgaria *Observer*

Member countries support ELI ERIC jointly with national funding.

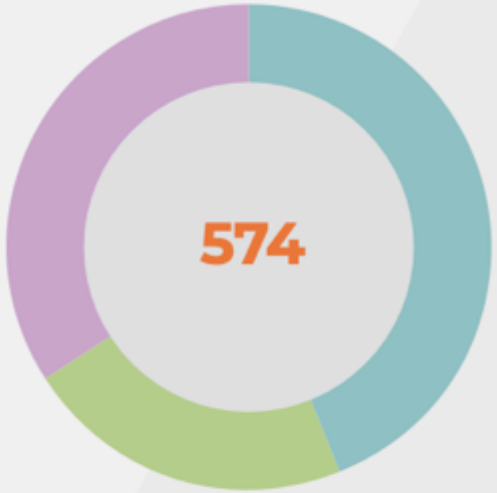
Horizon 2020 (INFRADEV) helps finance the integration of the joint user programme, as well as initial access pilots, flagship experiments

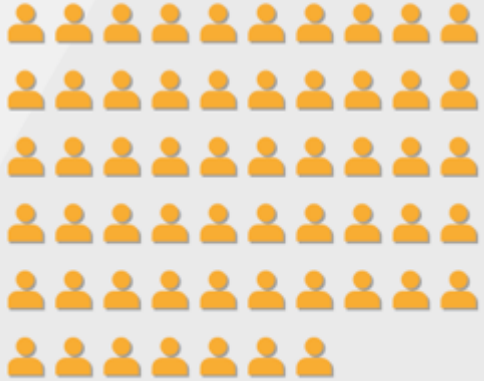
ELI ERIC in Figures

ELI ERIC Facility Staff

Total number of employees **574**

- Researchers 252
- Admin 127
- Technical staff 195





Total number of employees 41

Argentina (2)
Australia (1)
Austria (1)
Bangladesh (1)
Belgium (1)
Brazil (1)
Bulgaria (4)
China (2)
Columbia (1)
Costa Rica (1)
Croatia (1)
Cyprus (1)
Czech Republic (230)
Egypt (1)
France (9)
Georgia (1)
Germany (7)
Greece (4)
Hungary (191)
India (16)
Iran (2)
Italy (13)
Korea (1)
Lithuania (2)
Moldavia (1)
Nepal (3)
Poland (5)
Portugal (1)
Romania* (2)
Russia (17)
Serbia* (1)
Slovakia (11)
South Africa (1)
South Korea (1)
Spain (2)
Sweden (4)
Syria (1)
Turkey (1)
United Kingdom (4)
Ukraine (6)
USA (7)

*incl. dual citizens

International Collaborations and Partnerships

Total Collaborations: 100

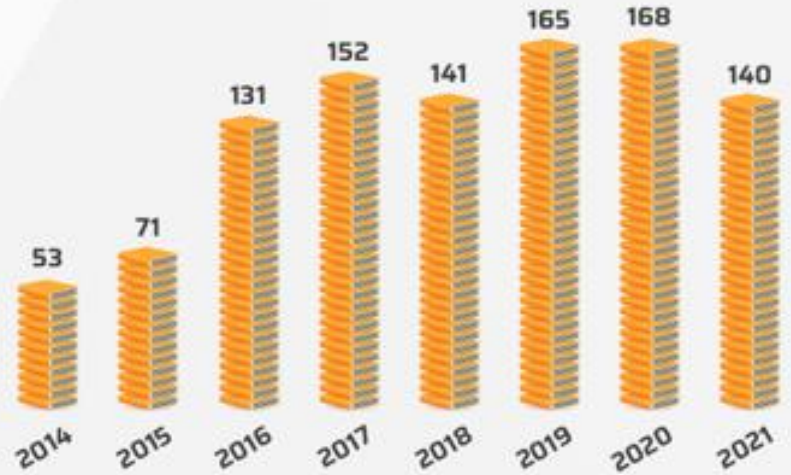
Europea
Czech Republic (6)
France (8)
Germany (15)
Greece (1)
Hungary (10)
Italy (9)
Lithuania (2)
Poland (5)
Portugal (1)
Romania (4)
Serbia (1)
Spain (4)
Sweden (2)
Switzerland (2)
United Kingdom (6)

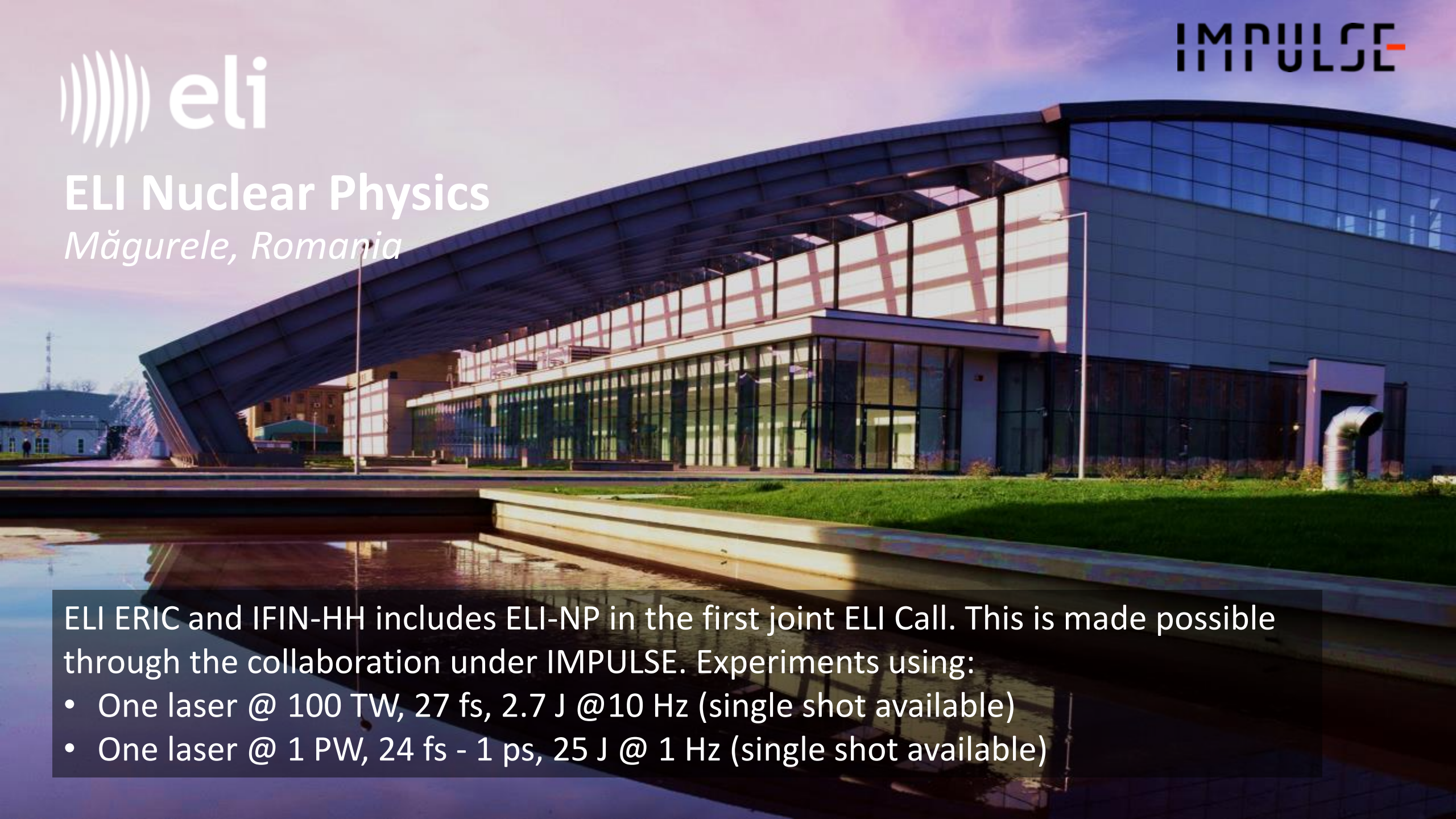
International
Canada (3)
China (2)
Cyprus (1)
India (1)
Israel (1)
Italy (9)
Japan (7)
Republic of Korea (2)
Russia (3)*

*Russian agreements from 2021 and prior

Publications

Total number of publications from the ELI ERIC facilities **961**





ELI Nuclear Physics

Măgurele, Romania

ELI ERIC and IFIN-HH includes ELI-NP in the first joint ELI Call. This is made possible through the collaboration under IMPULSE. Experiments using:

- One laser @ 100 TW, 27 fs, 2.7 J @10 Hz (single shot available)
- One laser @ 1 PW, 24 fs - 1 ps, 25 J @ 1 Hz (single shot available)

ELI ERIC is Open to the World

A user facility with three access modes

- **Excellence-Based Access** – Evaluation of proposals by international peer-review panels. ***Results of experiments published and open.***
- **Mission-Based Access** – Thematic research granted on the basis of scientific missions pursuing challenges. Proposals reviewed by international panels. ***Results published and open.***
- **Proprietary Access** – Paid access for industrial or other users. ***Results are retained by the user,*** consistent with ELI ERIC's Data and IPR Policy.

ELI ERIC Science and User Management

Daniele Margarone
Science Director
Beamlines

Andrew Harrison
Director of Science
ELI ERIC

Katalin Varju
Science Director
ALPS

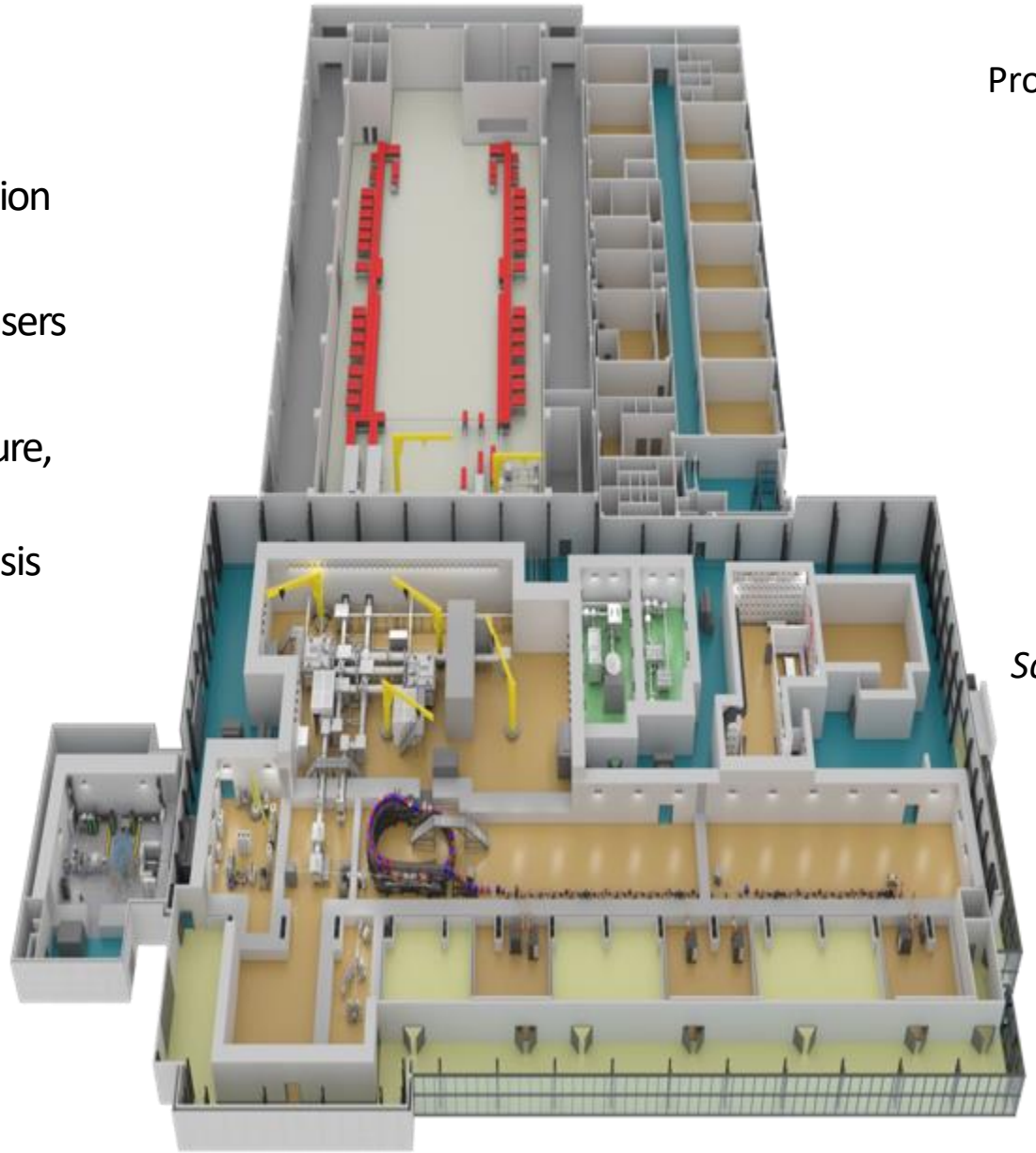
ELI-NP Research Infrastructure

Advanced studies in basic science …

- characterization of laser-matter interaction with nuclear methods
- particle acceleration with high power lasers
- nuclear reactions in plasma
- photonuclear reactions, nuclear structure, exotic nuclei
- nuclear astrophysics and nucleosynthesis
- quantum electrodynamics (QED)

… and applications – developing technologies for:

- medical applications (X-ray imaging, radioisotopes)
- industrial applications (non-destructive studies with !)
- material studies with positrons
- materials in high radiation fields



Calin Ur
Project Director
ELI-NP

Sydney Galès
Science Director
ELI-NP

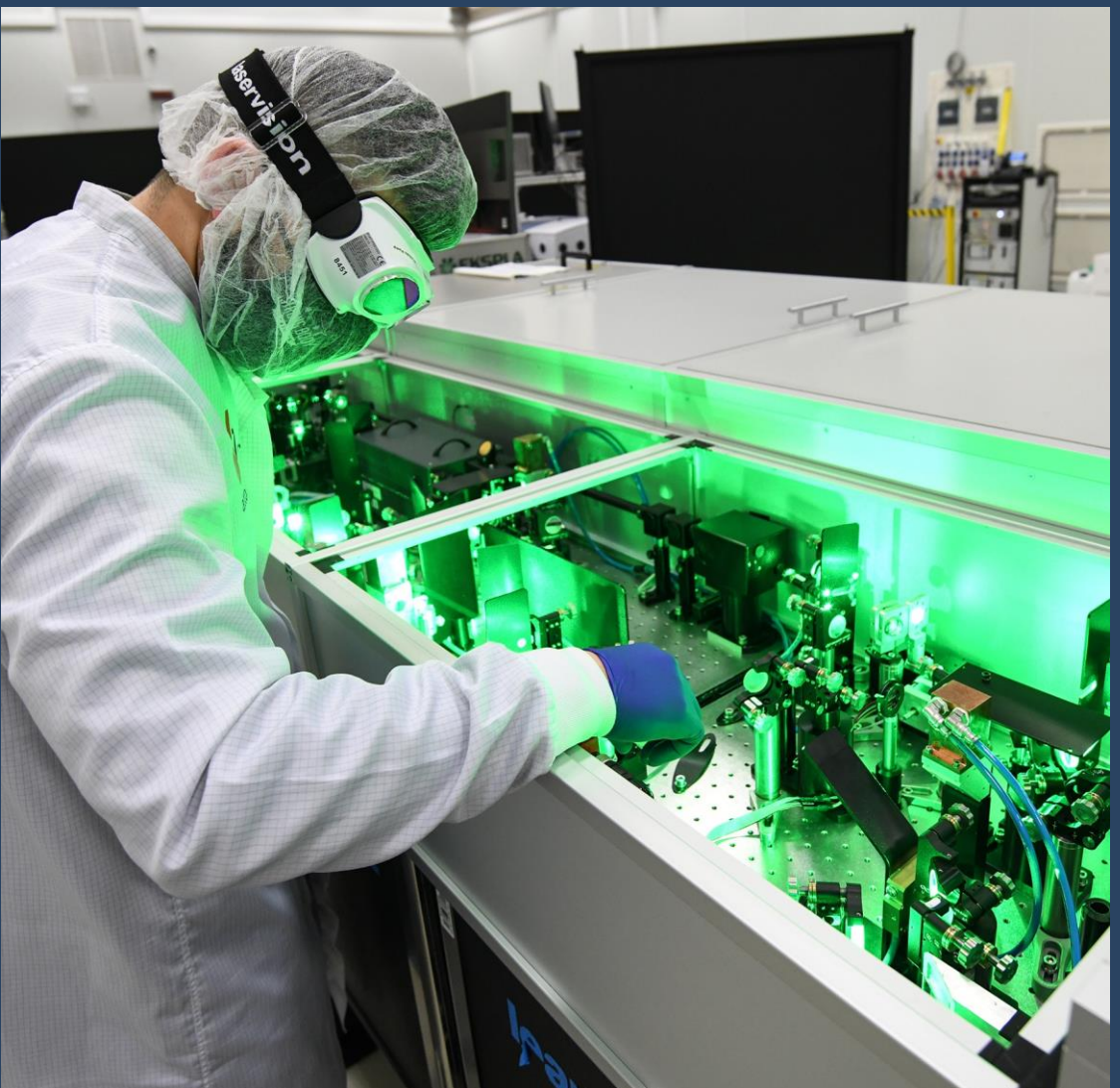
44 proposals from 22 countries:

Bosnia and Herzegovina
Bulgaria
Canada
Czechia (4)
Denmark
Finland
France (2)
Germany (5)
Greece (5)
Hungary
India (4)
Israel
Italy
Japan (3)
Montenegro
Poland (3)
Romania (4)
Spain
Sweden
The Netherlands
UK (4)
USA

First ELI User Call

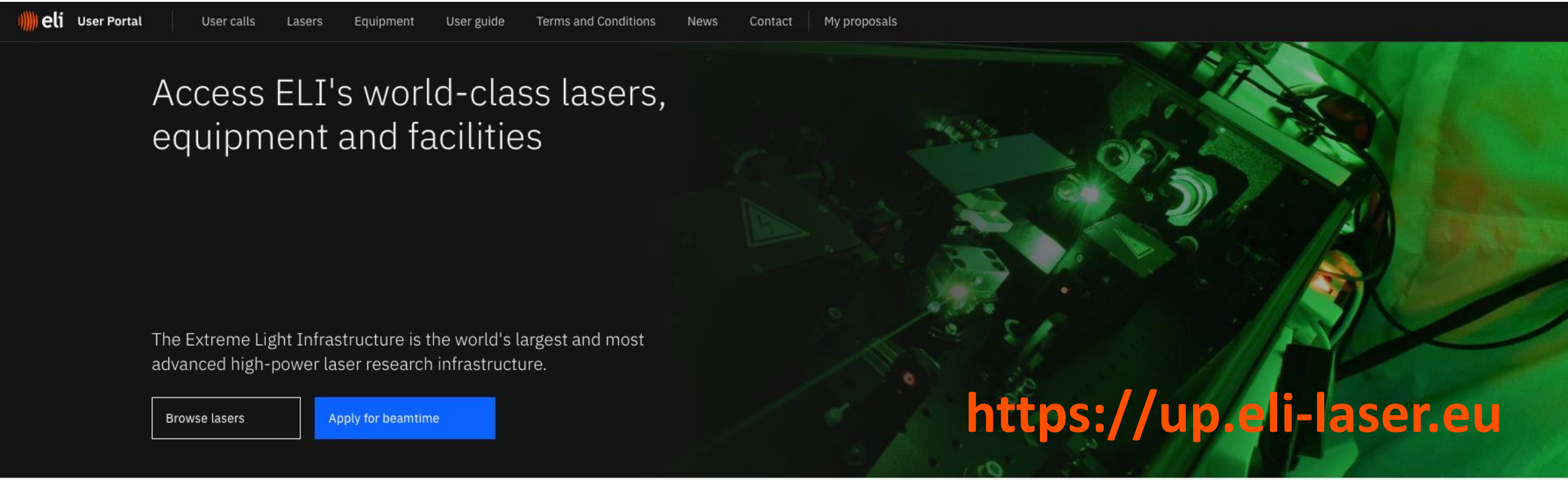
- The experiments **run** through **spring 2023**
- There are **10 different beamlines/sources** at **all three ELI Facilities**
- **All instruments have been tested** during commissioning
- **The 2nd** call was published **February 2023**

2nd Joint ELI User Call



- 3 ELI Facilities
  - ELI ALPS (Deadline 25 April 2023)
  - ELI Beamlines (Deadline 25 April 2023)
  - ELI Nuclear Physics (Deadline 24 March 2023)
- Wide range of complementary equipment for cutting-edge resea
  - 5 Primary Lasers
  - 10 Secondary Sources
  - 11 Endstations
  - 6 Standalone or experimental platforms
- Single point of access https://up.eli-laser.eu
- User Call Webinar: 17 March 2023; 10:00-11:30
- Access is free and based on a peer-reviewed evaluation of scientific excellence
- Contact [user-office@eli-laser.eu] or main contact points listed for technical questions

User Portal



The Extreme Light Infrastructure is an international user facility dedicated to multi-disciplinary science and research applications of ultra-intense and ultra-short laser pulses. ELI provides access to world-class high-power, high-repetition-rate laser systems and a wide range of complementary equipment for cutting- edge research in physical, chemical, materials, and medical sciences, as well as breakthrough technological innovations.

Browse the available equipment and find more information below.

The 7th ELI Summer School

A hybrid event with 183 participants from 28 countries (51 in person, 132 online)

ELISS2022
ELI Summer School | 30 Aug – 2 Sep 2022
Szeged, Hungary

Pillar 1
Excellent Science

- European Research Council
- Marie Skłodowska-Curie Actions
- Research Infrastructures

Pillar 2
Global Challenges and European Industrial Competitiveness

Clusters
- Health
- Culture, Creativity and Inclusive Society
- Civil Security for Society
- Digital, Industry and Space
- Climate, Energy and Mobility
- Food, Bioeconomy, Natural Resources, Agriculture and Environment

- Joint Research Centre

Pillar 3
Innovative Europe

- European Innovation Council
- European innovation ecosystems
- European Institute of Innovation and Technology

Widening Participation and Strengthening the European Research Area

- Widening participation and spreading excellence
- Reforming and Enhancing the European R&I system

a, China, Czech
any, Greece,
nia, Montenegro,
oines, Poland,
ted Kingdom,

ELISS2023

Extreme Light Infrastructure Summer School

SAVE THE DATE

29 Aug – 1 Sep 2023 | ELI Beamlines Facility Dolní Břežany, Czech Republic

The 8th edition of the Extreme Light Infrastructure (ELI) Summer School series aims to provide young scientists with a comprehensive overview of the generation and application of intense laser pulses and laser-driven particle and radiation sources.

More information available: https: //indico.eli-laser.eu/e/ELISS2023

eli IMPULSE

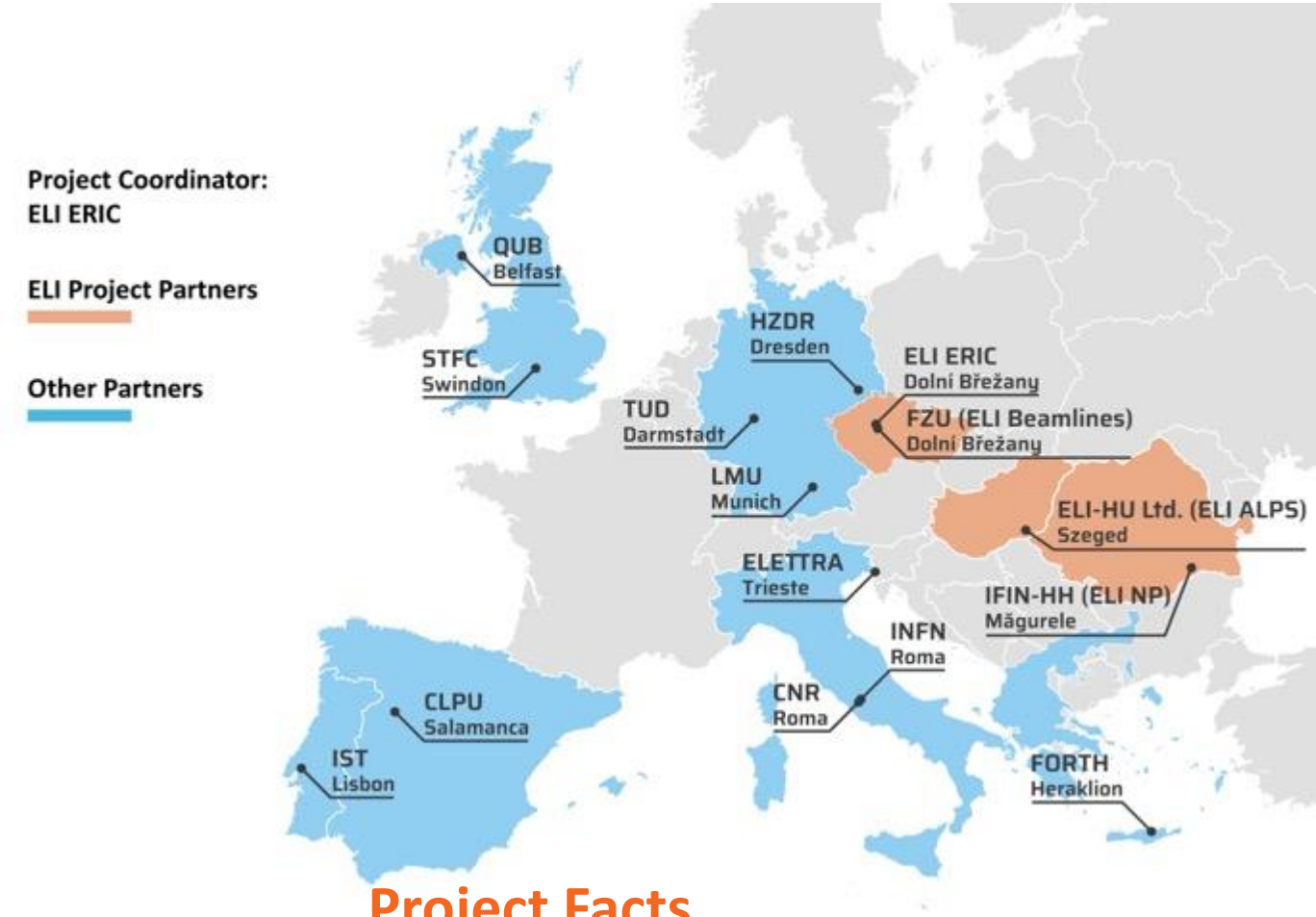
Integrating ELI's Facilities Requires Resources and a Plan.

Project Objectives

IMPULSE focuses on **achieving quick and effective transition of ELI ERIC from construction into sustainable operations** by **uniting the ELI facilities** and making them **accessible for users through one single, high-quality access point**.

IMPULSE addresses the **key scientific, technical, organisational,** and **management requirements** of this **integration**, **building user communities** and **expanding the ELI member consortium.**

https://impulse-project.eu/



Project Facts

- **14 Partners**
- **9 Countries**
- **42 Months**
- **€19.9 Million**

IMPULSE is funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 871161

ELI ERIC Leads Innovation and Technology

Training a new generation of scientists and experts

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

Thank You!

The Extreme Light Infrastructure ERIC
info@eli-laser.eu
tel +420 266 051 109

or visit our website at
https://eli-laser.eu

Za Radnicí 835
Dolní Břežany, 252 41
Czech Republic

Wolfgang Sandner utca 3.
6728 Szeged
Hungary

WP WIDERA 2023 – 2024

Date of publication: 6 December 2022 Overall budget: M€ 900,48

- WP parts:
  - Introduction: Overall description of common policy objectives and rationale based on the specific programme and strategic plan (description of key objectives)
  - Destination 1: Improved access to excellence
    - Introduction including Expected impacts
    - Calls (instruments) description
  - Destination 2: Attracting and mobilising the best talents
    - Introduction including Expected impacts
    - Calls (instruments) description
  - Destination 3: Reforming and enhancing the EU research and innovation system
    - Introduction including 4 strands and Expected impacts
    - Call topics description
  - Other actions not subject to calls for proposals (grants to identified beneficiaries, prizes, experts contracts, public procurement, indirect management)