ELI-ALPS in Hungary

A Unique, Open User Facility for Laser-based Research

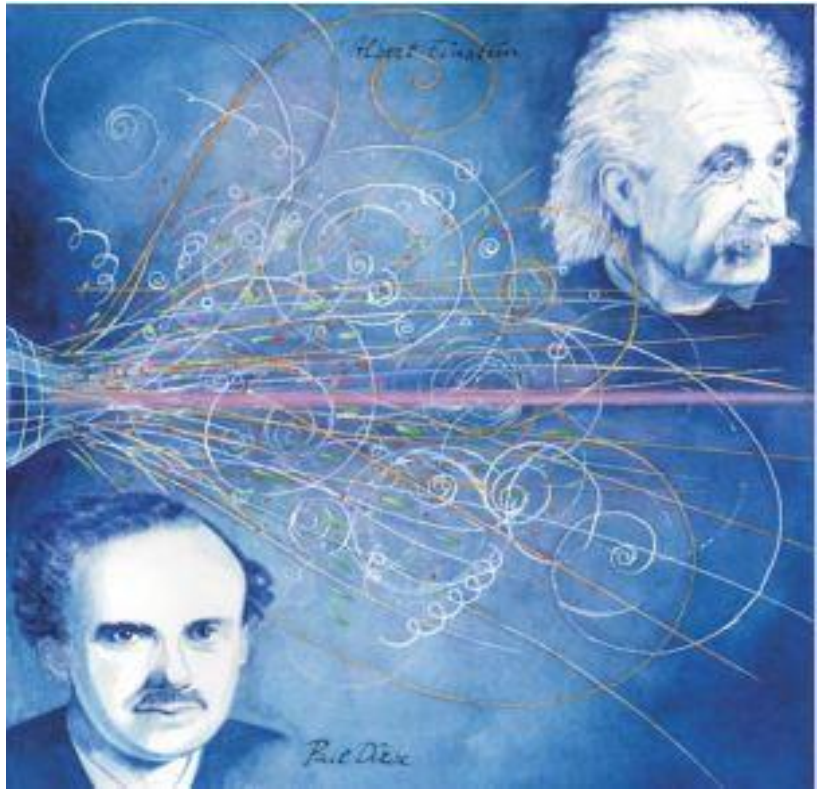
SZÉCHENYI 2020
MAGYARORSZÁG KORMÁNYA
Európai Unió
Európai Regionális Fejlesztési Alap
BEFEKTETÉS A JÖVŐBE

ELI – A World Leading Laser User Facility Network in CEE

Megalasers to pulse in several new EU countries

As the world celebrates 50 years since the invention of the laser, a European facility approaching exawatt power is expected to stimulate new research areas and communities.

Physics Today
June 2010

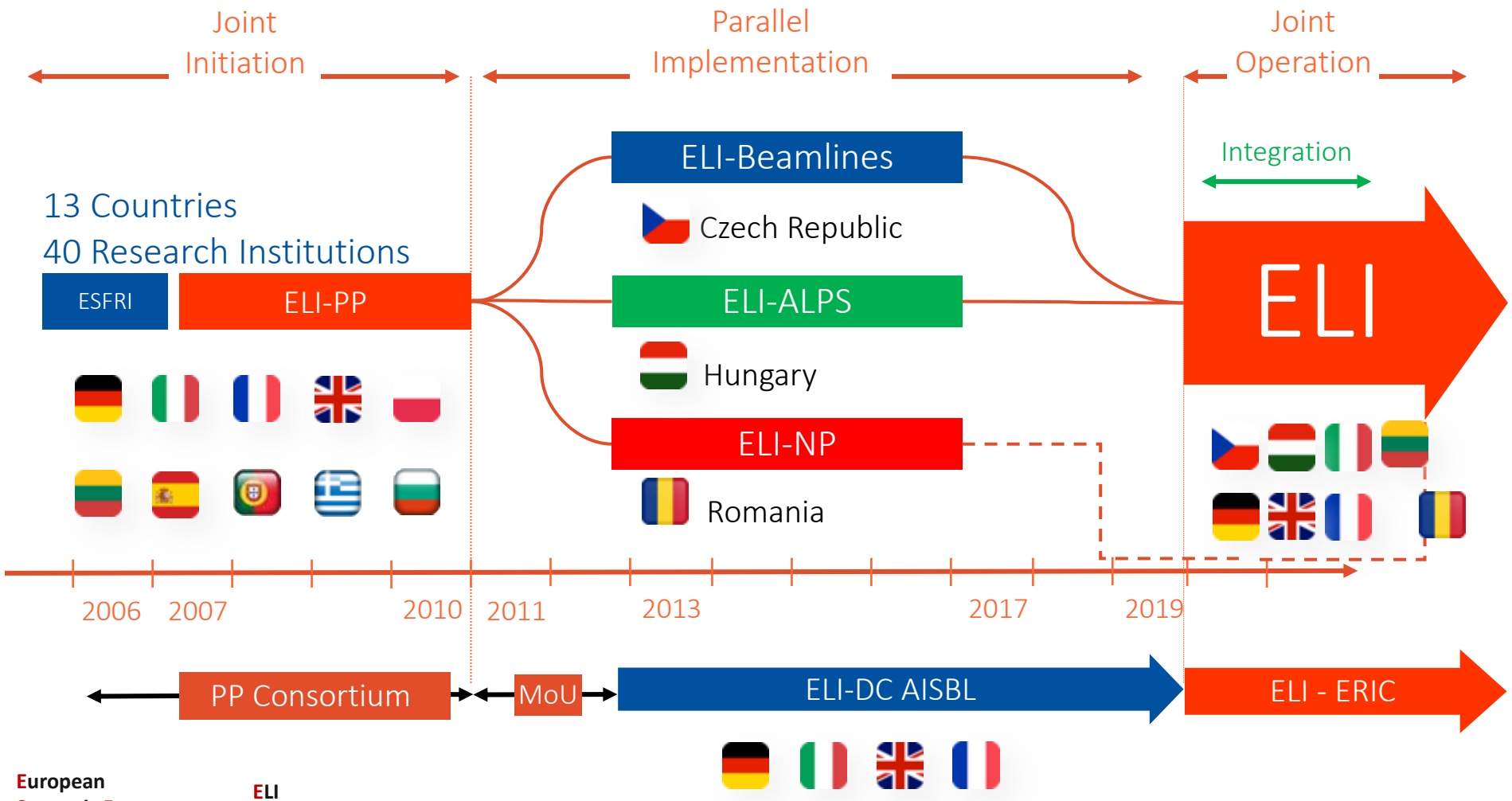


ELI – A World Leading Laser User Facility Network in CEE

ELI:

- The world's **first international laser user facility**, providing unique research opportunities for the future
  "The CERN of laser research"
- A **distributed research infrastructure** based initially on 3 facilities in Hungary, the Czech Republic and Romania
- The first ESFRI project to be **implemented in the CEE EU Member States**
- **Pioneering a novel funding model** combining Structural Funds (ERDF) for the implementation and contributions to an ERIC for the operation

The ELI Project
International Context



European
Strategic **F**orum
for **R**esearch
Infrastructures

ELI
Preparatory
Phase

ELI ERIC – status

- **ELI ERIC founding members**
  - Hungary
  - Czech Republic
  - Italy
  - Lithuania
- **ELI ERIC founding observers**
  - United Kingdom
  - Germany
  - Bulgaria (IoI received)

ELI-ERIC application submitted, waiting for approval
Seat: Dolní Břežany, Czech Republic

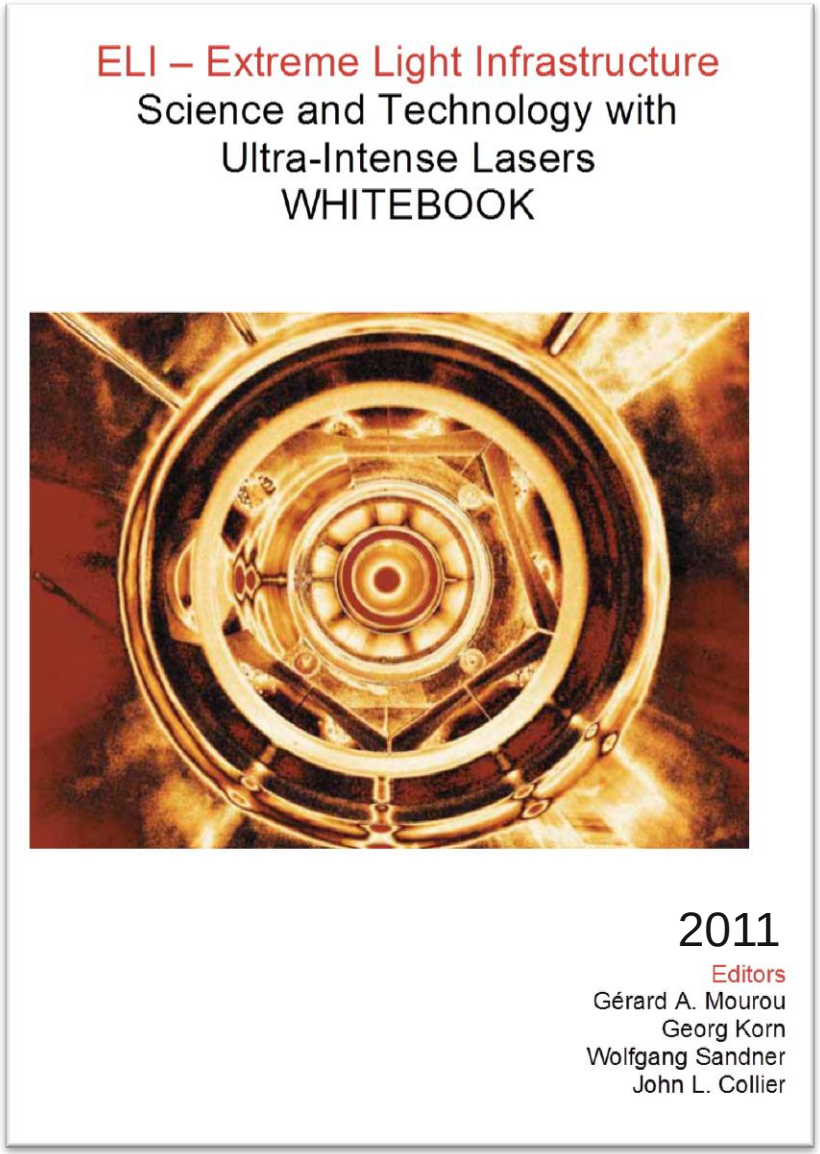
Initial operations (ramping-up period): 2020-2021
Full operation starts in 2022

Integration of the pillars will take place during the full operation period:
all user-related activities will be governed by ELI ERIC

The Szeged Site

- Szeged, Dél-Alföldi Régió (South Great Plain Region)
- Brownfield site of 100 / 10 ha
- 165 km from Budapest – pan-European Motorway M5, 1.5-hour drive
- 5 km from the city center

Scientific Mission of ELI-ALPS



1) To generate X-UV and X-ray femtosecond and attosecond pulses, for temporal investigation at the attosecond scale of electron dynamics in atoms, molecules, plasmas and solids

2) Source developments (towards high average power, high peak intensity pulses)

USER FACILITY offering access to few cycle electromagnetic pulses (atto- and THz beamlines)

ELI-ALPS Project
Implementation is ongoing

Laser sources
(HR, MIR, SYLOS, HF, THz)

Secondary sources (atto, THz, electron, ion)

Endstations

Research technology equipment

Building

Project Management

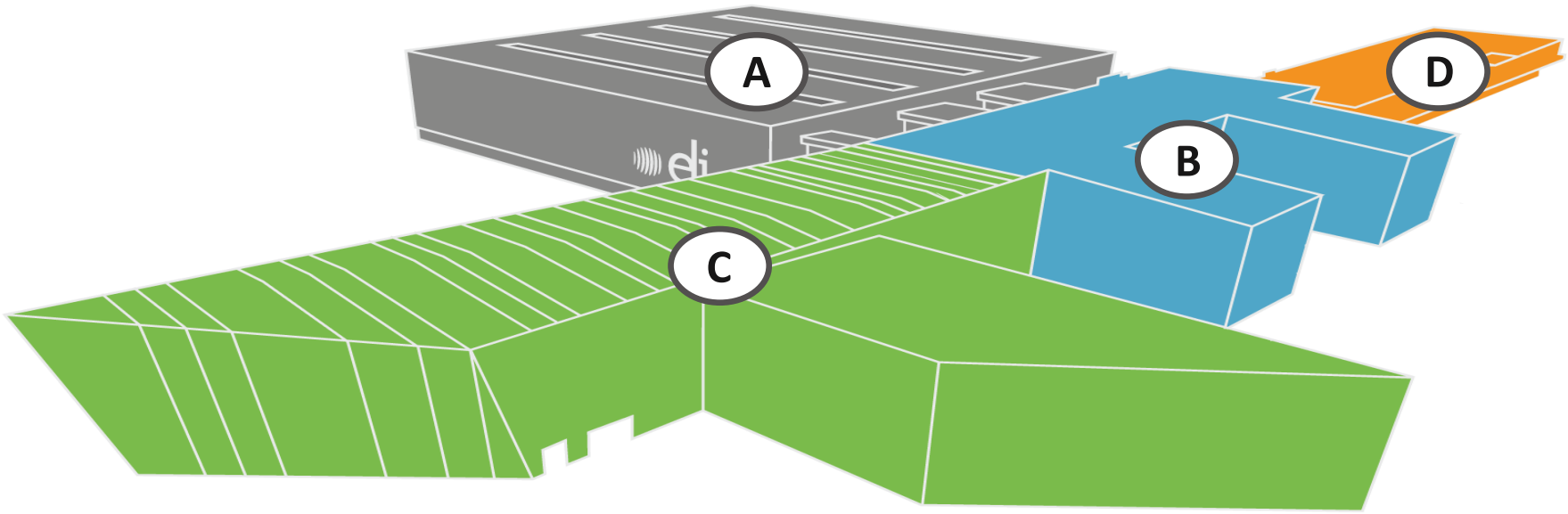
Labs, workshops, IT

ELI-ALPS Research Technology

Laser Parameters

Laser source	Central Wavelength	Pulse Energy	Pulse duration	Repetition rate	Peak power	Average power
HR 1	1030 nm	1 mJ	7 fs	100 kHz	200 GW	100 W
HR 2	1030 nm	5 mJ	6.7 fs	100 kHz	1 TW	500 W
SYLOS 2	900 nm	35 mJ	7 fs	1 kHz	5 TW	35 W
SYLOS AL	850 nm	40 mJ	12 fs	10 Hz	3 TW	0.4W
HF PW	800 nm	34 J	17 fs	10 Hz	2 PW	340 W
MIR	2.8-4 µm	150 µJ	40 fs	100 kHz	3 GW	15 W
THz pump	1 µm	500 mJ	500 fs	50 Hz	1 TW	25 W

The ELI-ALPS building complex



Building „A”

laser bay & experimental area ~ 6200 m²

Building „B”

direct service to A (labs, preparatory workshops, researcher offices, ~ 8000 m²

Building „C”

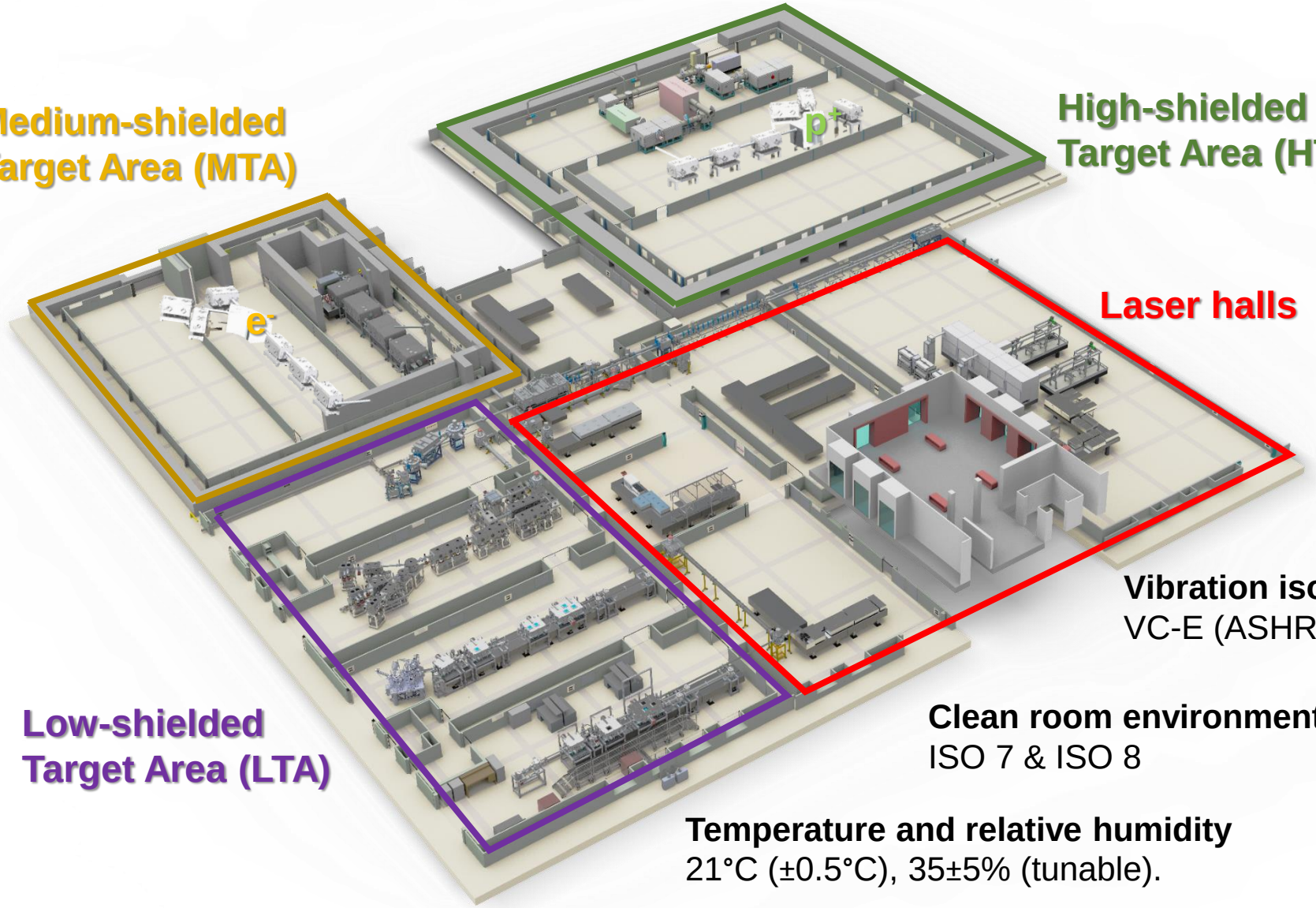
back office, meeting rooms, visitor center etc. ~ 7400 m²

Building „D”

machine shops, maintenance ~ 3000 m²

ELI-ALPS Research Technology

Experimental areas



Vibration isolation
VC-E (ASHRAE)

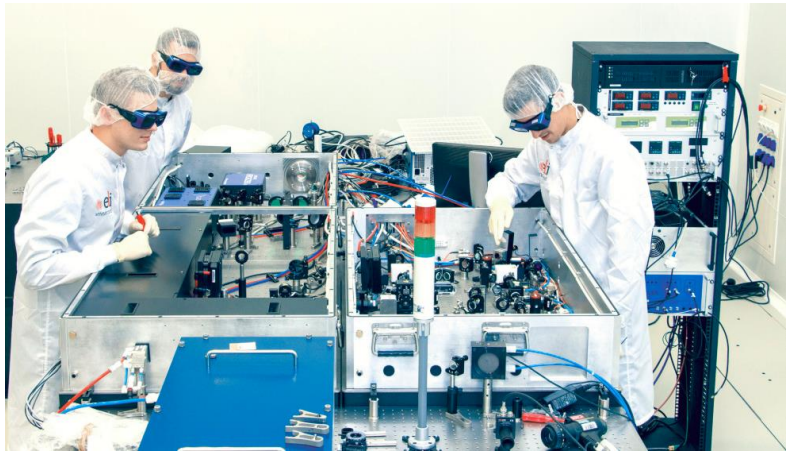
Clean room environment.
ISO 7 & ISO 8

Temperature and relative humidity
21°C (±0.5°C), 35±5% (tunable).

Users

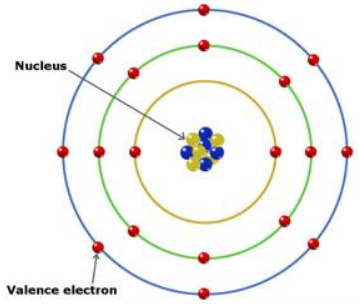
Individuals, teams, consortia and **institutions** from academia, business, industry and public services

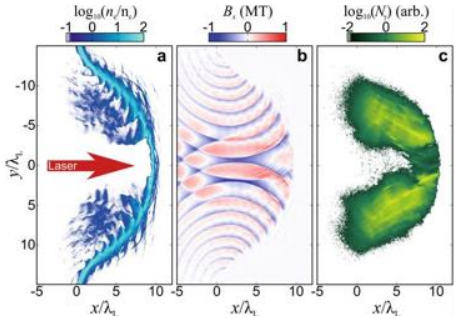
- **Excellence-driven access (*non-proprietary*):**
- **Market-driven access (proprietary): 20% of the users' access time. Owner of the created IP is the industrial partner.**

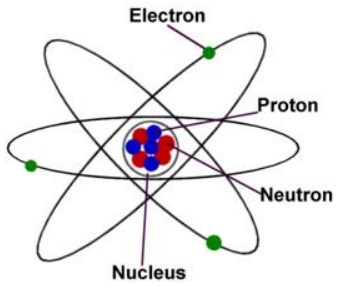


Main Research and Application Areas

- **Valence and Core Electron Science**
- **4D Imaging**
- **Relativistic Interactions**
- **Biological, Medical, Industrial Applications**







ELI-ALPS Achievements to Date

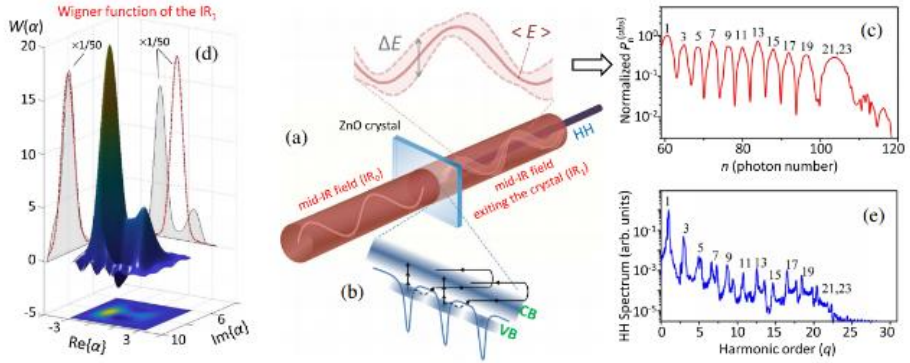
4 Laser systems commissioned

4 of 7 lasers
user operational

1st attosecond pulses

2 of 9 secondary
source user op

1st User paper from ELI-ALPS



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Quantum Optical Signatures in a Strong Laser Pulse after Interaction with Semiconductors

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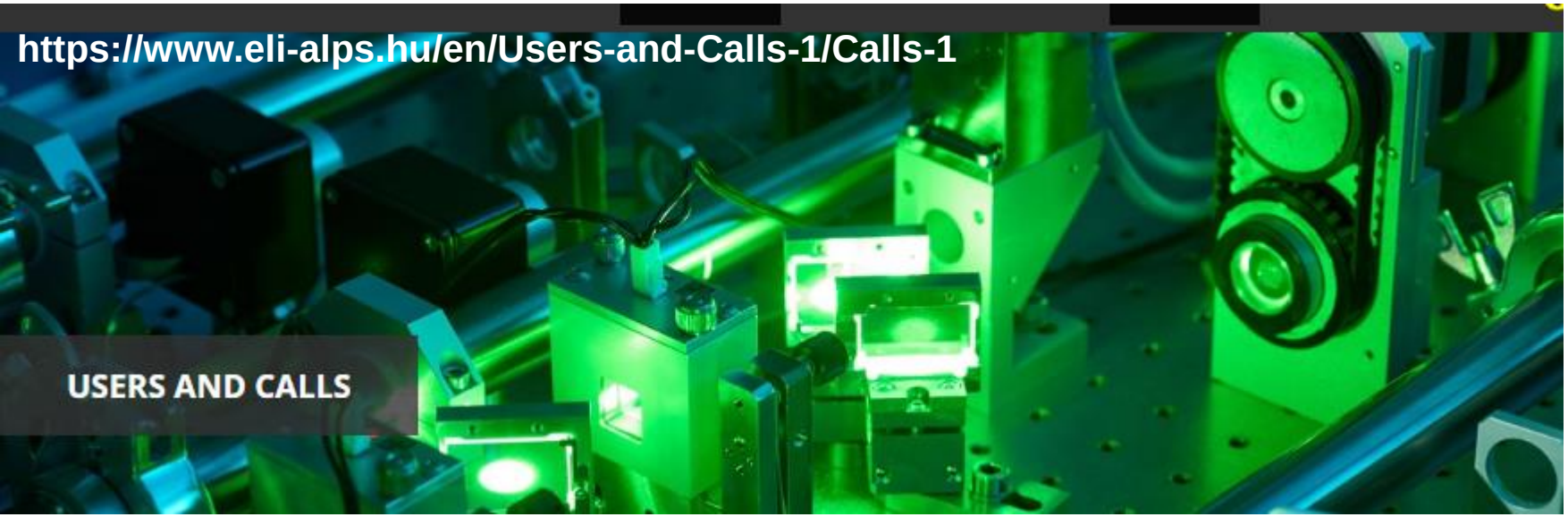
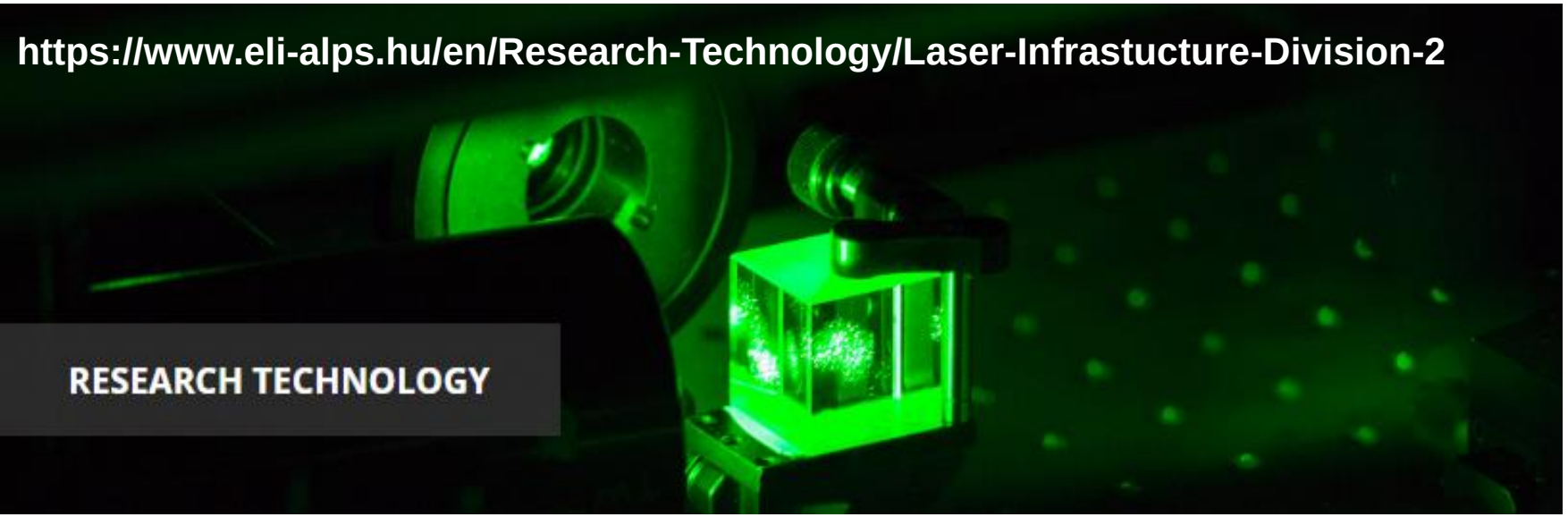
16 completed
user campaigns
2000+ user hours

ELI-ALPS User Calls & Research Technology Information





Next commissioning user call will be announced on 20/11/2020.

For more information please visit our website.

eli attosecond

Thank you for your attention!

For further information please visit:
https://www.eli-alps.hu/
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SZÉCHENYI 2020

HUNGARIAN GOVERNMENT

European Union
European Regional Development Fund

INVESTING IN YOUR FUTURE