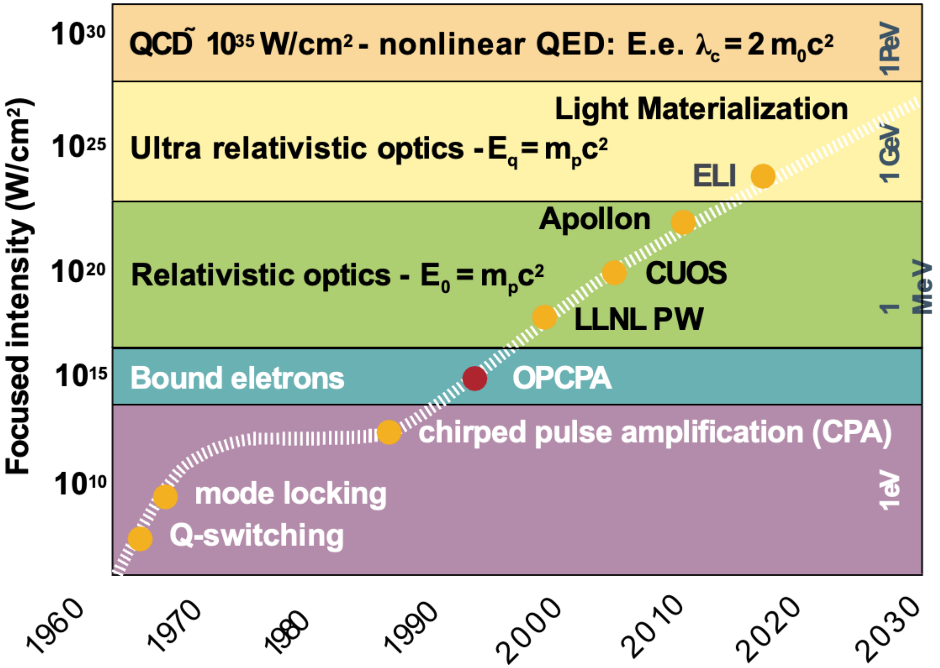
The Extreme Light Infrastructure – ELI

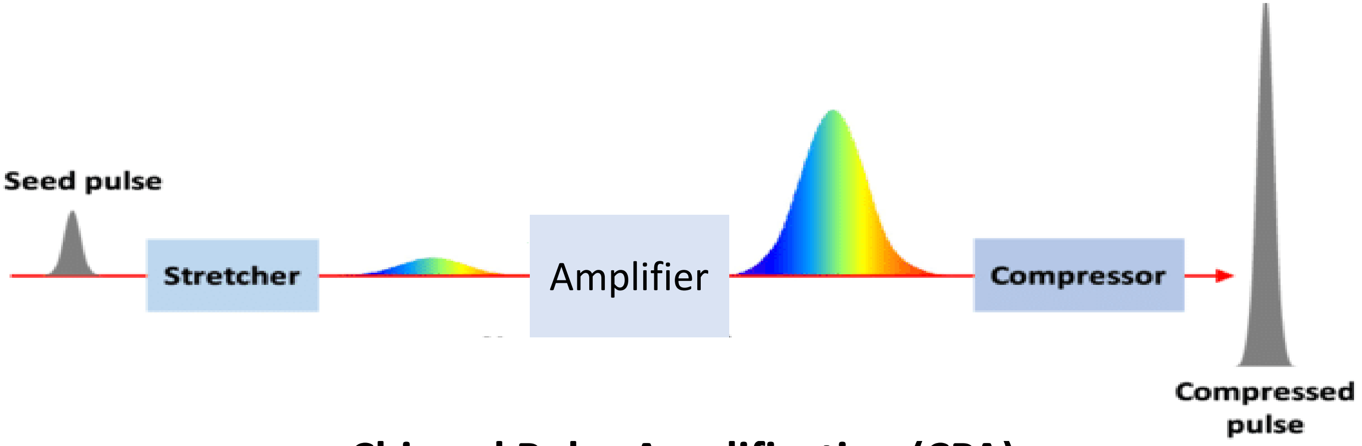
Unleashing the power of Laser technology for science and society

Lithuanian Research Community Meeting
Vilnius April 5th 2024

From Nobel Prize to Extreme Light

A Technological Breakthrough Enables ELI





Chirped Pulse Amplification (CPA)

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, et al proposed ELI in 2004, and from 2007-2010 initial reseach including 15 institutions and € 7.9M from the Seventh Framework Programme.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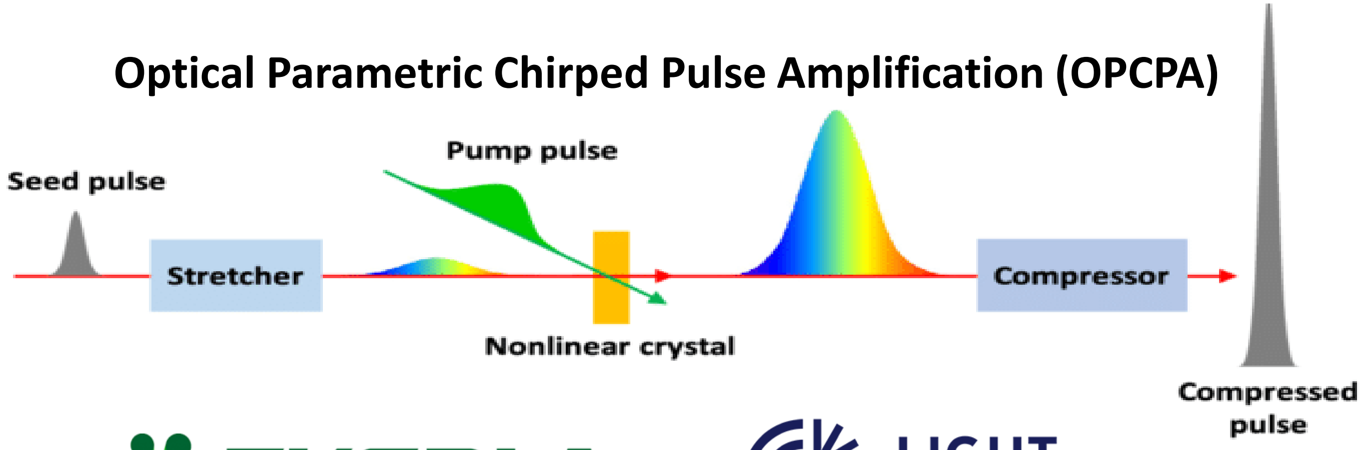
Beyond the (2018) Nobel Prize…

A Technological Breakthrough From Lithuania Enables ELI

Optical parametric chirped pulse amplification (**OPCPA**) technology - combining OPA with CPA and add energy from longer-pulse lasers to short-pulses - was **invented at Vilnius University Laser Research Center** by a Lithuanian research group of Prof. Algis Piskarskas and Prof. Audrius Dubietis.

This technology is implemented in the designs of the consortium of two leading Lithuanian companies – EKSPLA and LIGHT CONVERSION. The Single Cycle Laser **SYLOS is a state-of-the-art system**, employing **OPCPA.** This underlying technology is now a standard in leading laser systems.

Optical Parametric Chirped Pulse Amplification (OPCPA)



EKSPLA

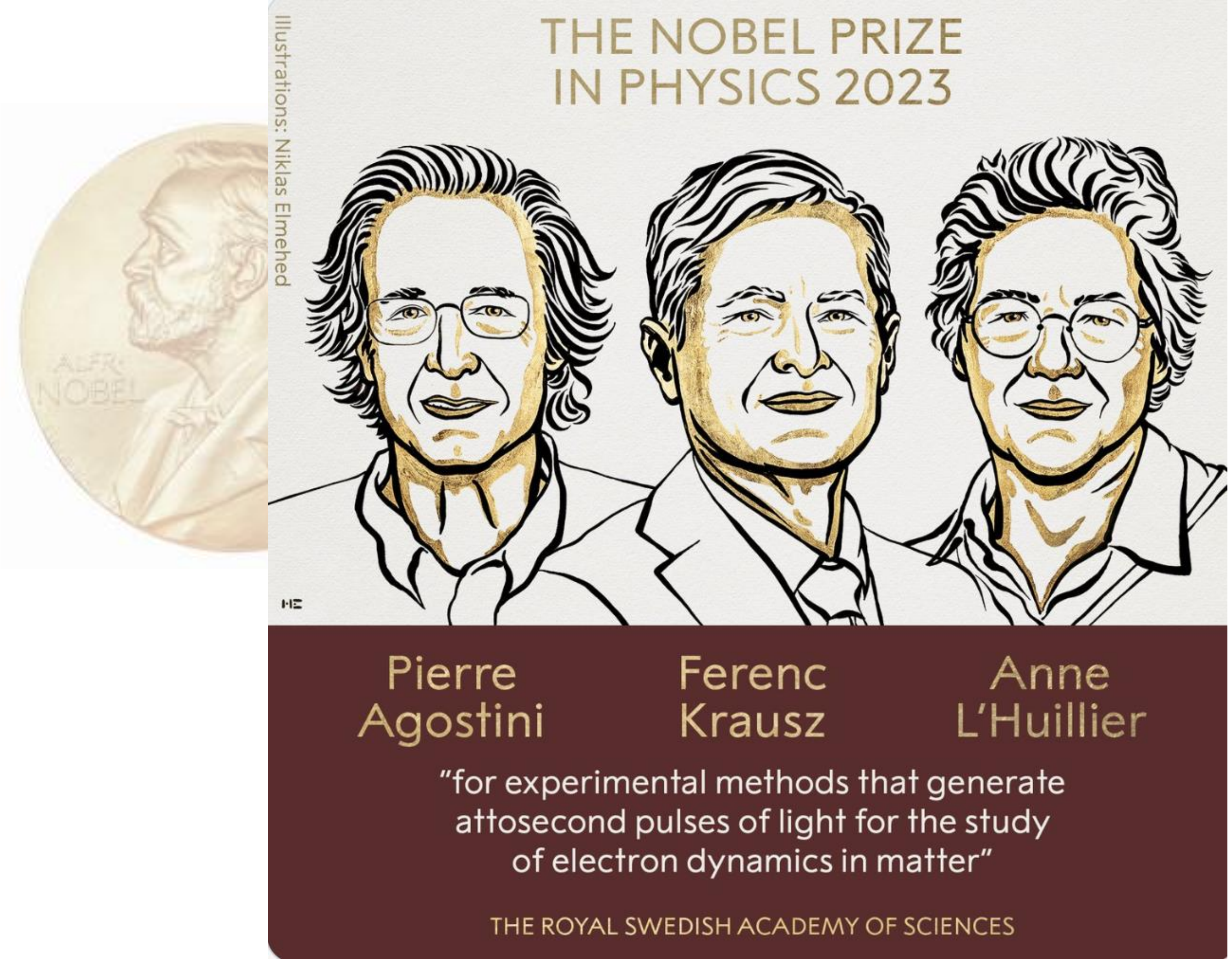
LIGHT CONVERSION

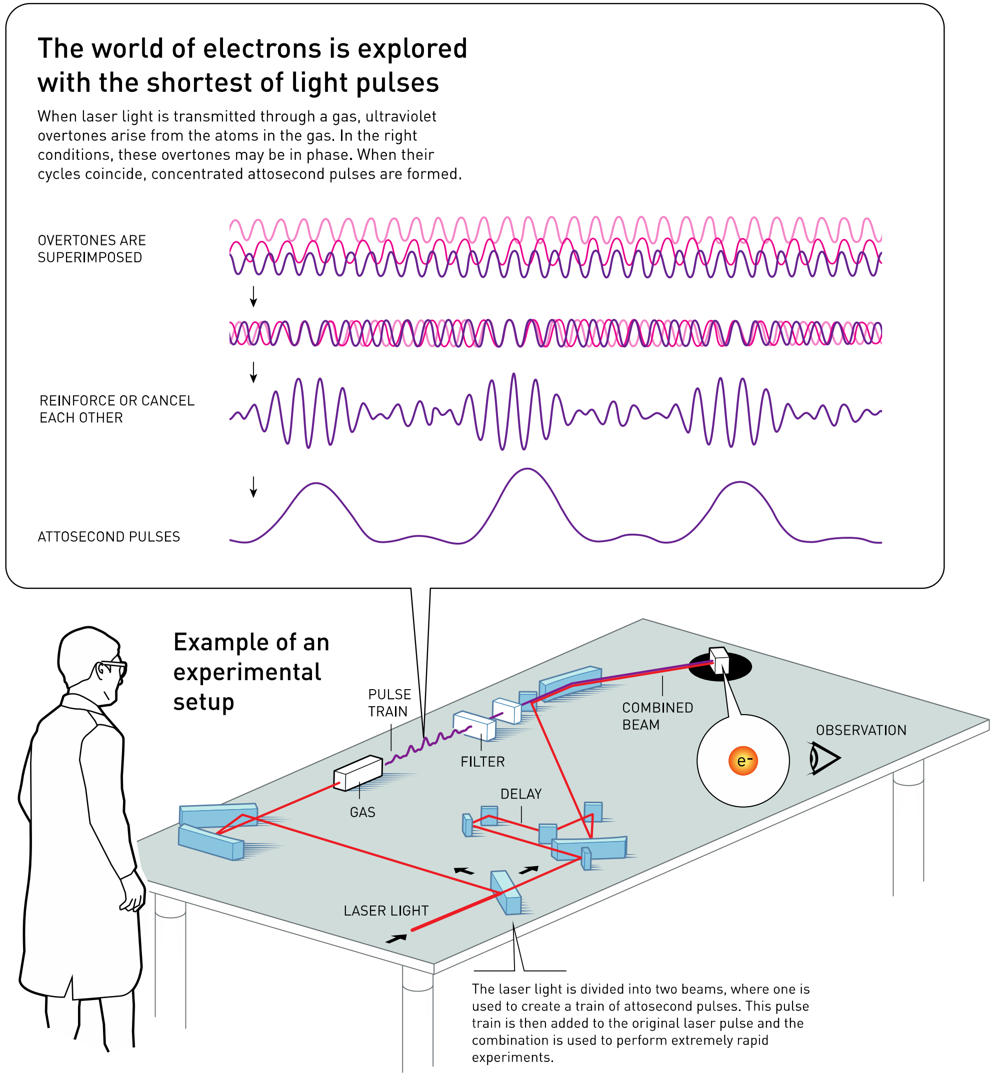
Prof. Algis Petras Piskarskas

Prof. Piskarskas was a pioneer of laser research to Lithuania, helping it to become a leading country in the world for laser science.

2023 Physics Nobel Prize

Experimental Methods Generating Attosecond Pulses





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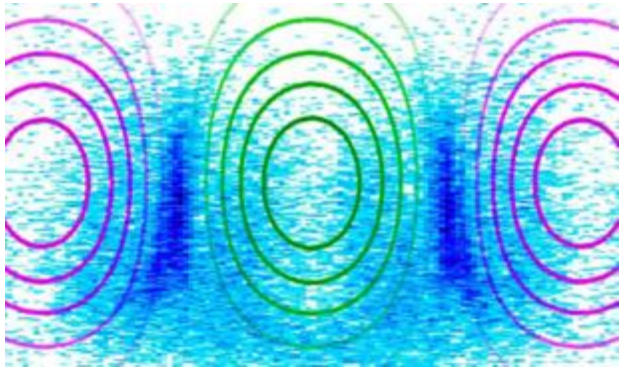
Democratising science using high-performance lasers

Applications in Material Science and Biology – structure and dynamics to attosecs

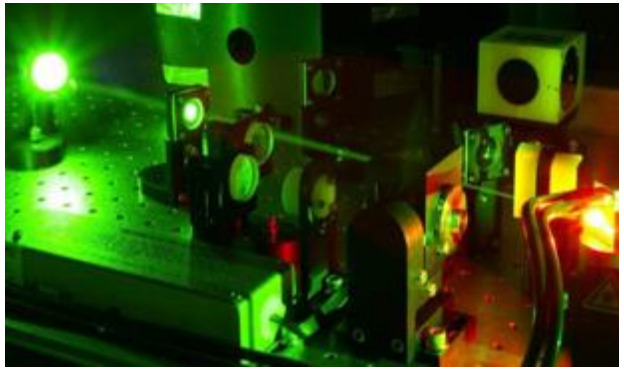
Particle Acceleration
250 MeV Ions Acceleration by lasers

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

Plasma Physics and High Energy Density, Astrophysics, Nuclear Photonics



Ultra High Intensity Interactions
High-field physics and theory

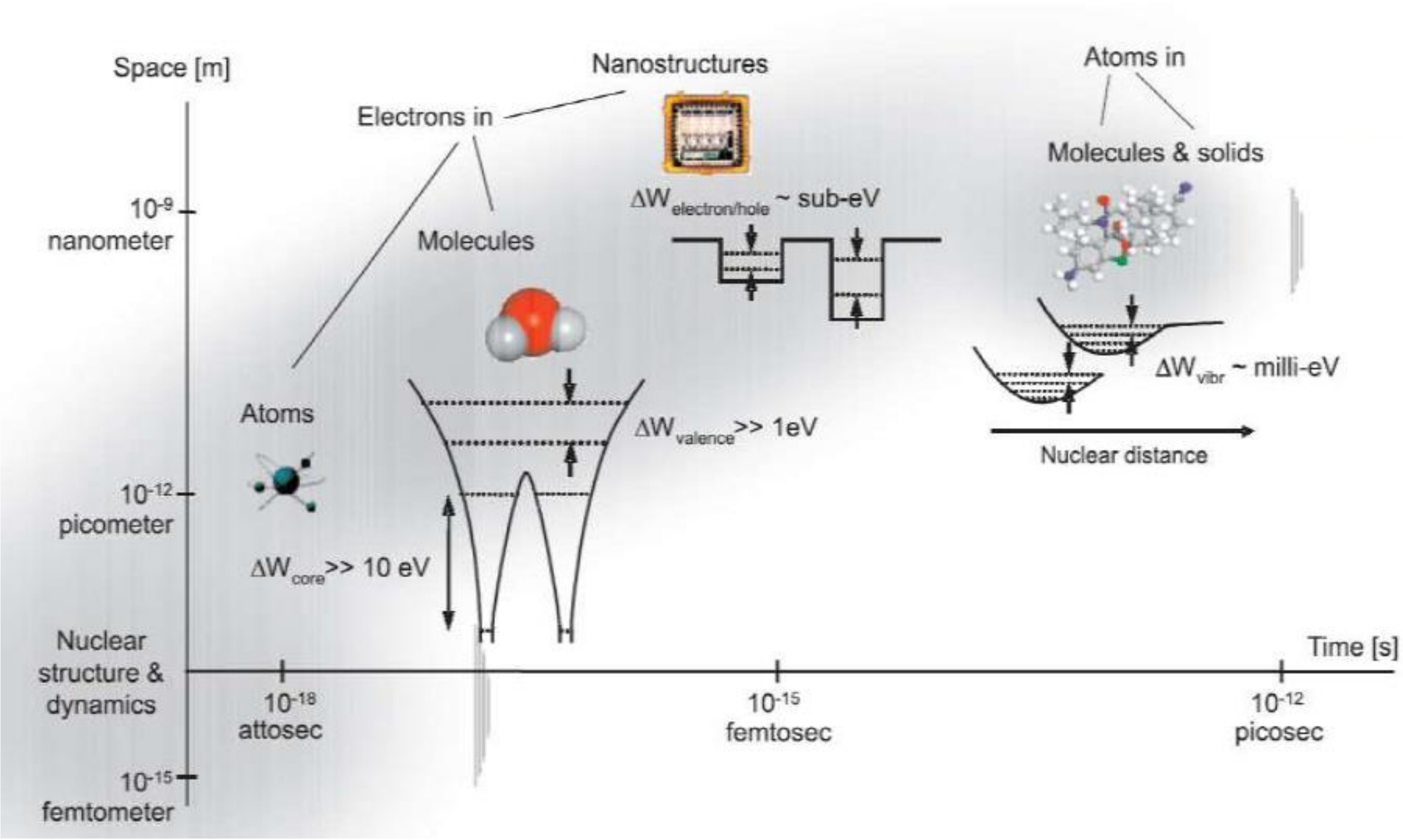


Laser Development

Applications in materials science and biology

Electron dynamics in chemical processes and electronic materials

- Movement of **atoms** in chemical reactions – down to picoseconds
- Movement of **electrons** in chemical reactions and electronic materials – below femtoseconds



milli-	10^{-3}
micro-	10^{-6}
nano-	10^{-9}
pico-	10^{-12}
femto-	10^{-15}
atto-	10^{-18}

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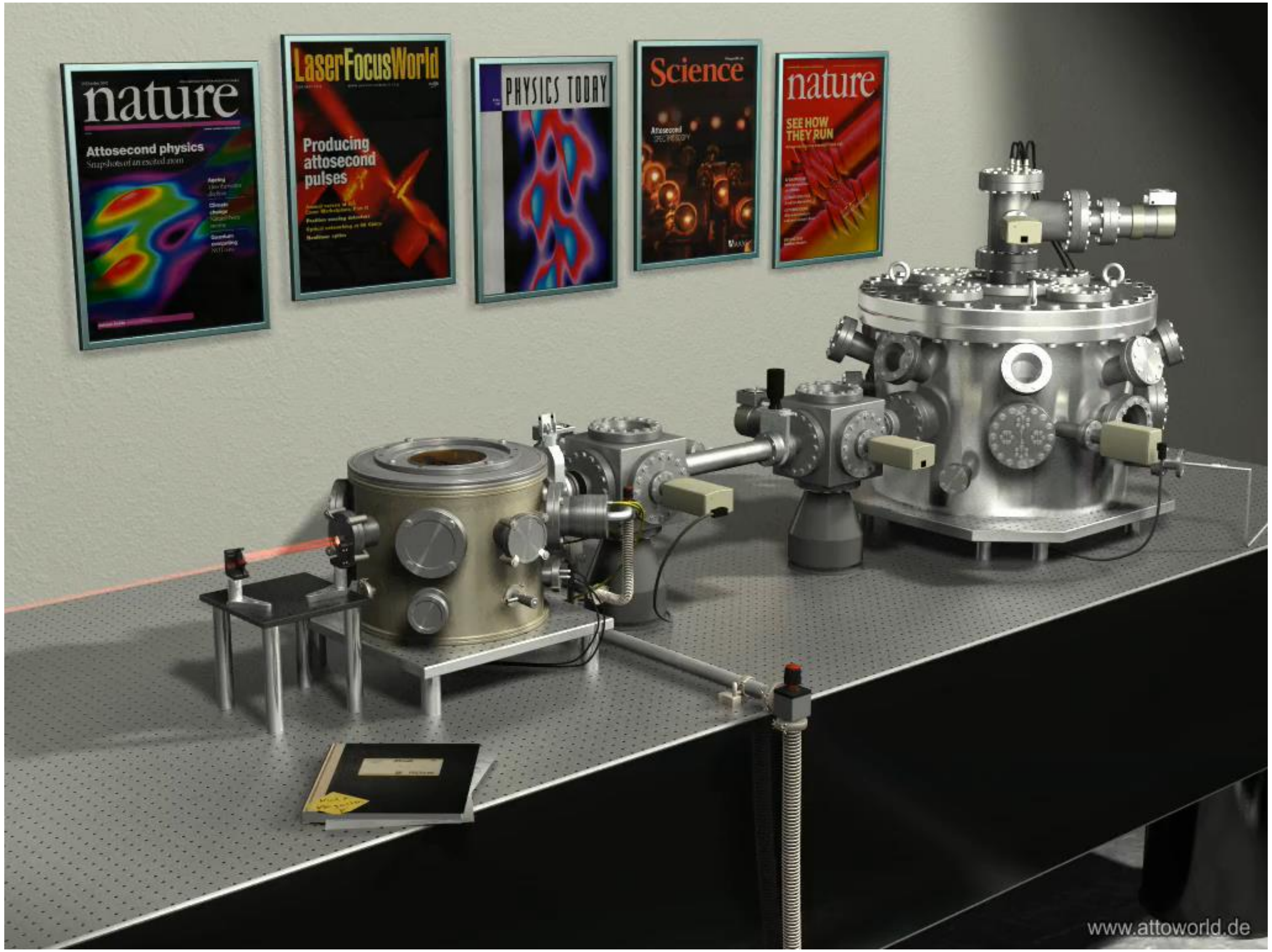
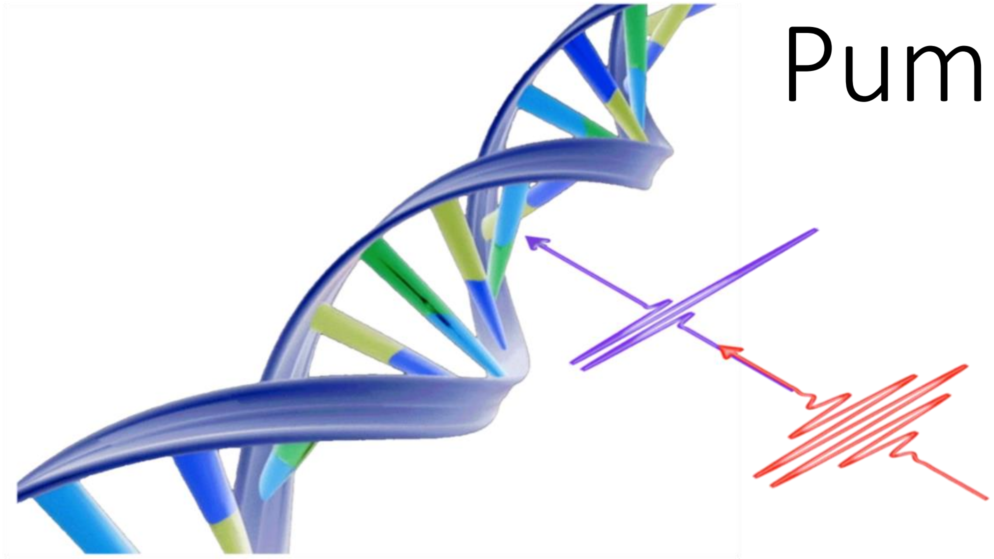
Generation of ultra-short pulses with controlled delay



High intensity driving field(red) ionizes gas to create electron-ion pairs that recombine to produce shorter (<fs), higher-energy (blue) radiation – High Harmonic Generation (HHG)

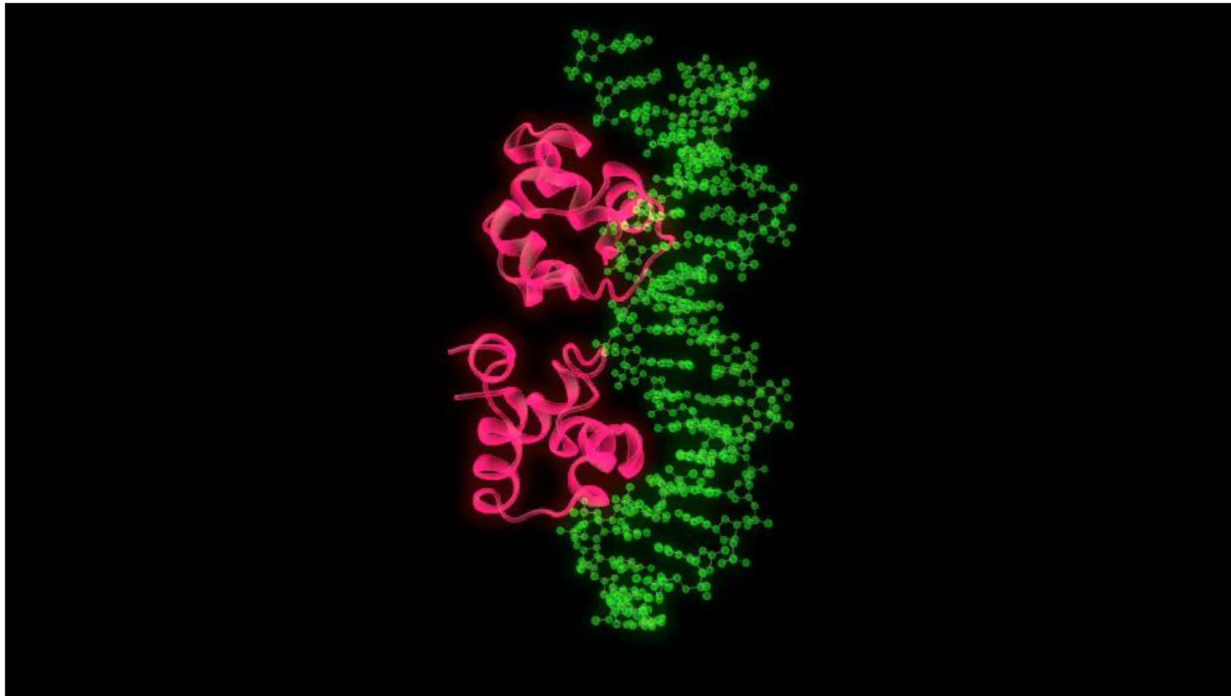
Then introduce controlled time separation between two pulses: pump and probe



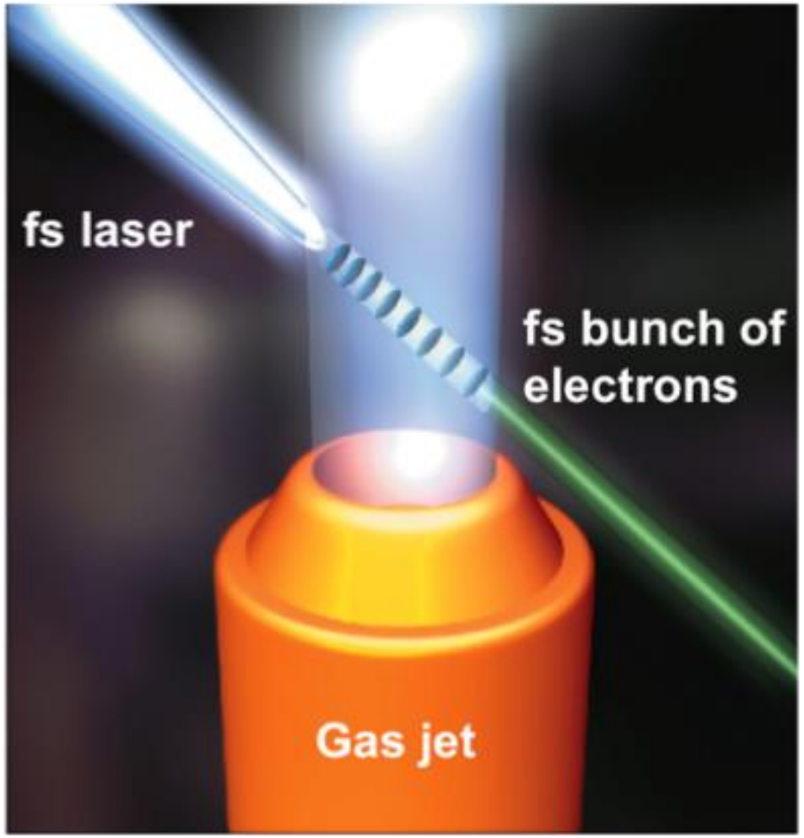
Pump-probe studies of chemical and biochemical processes

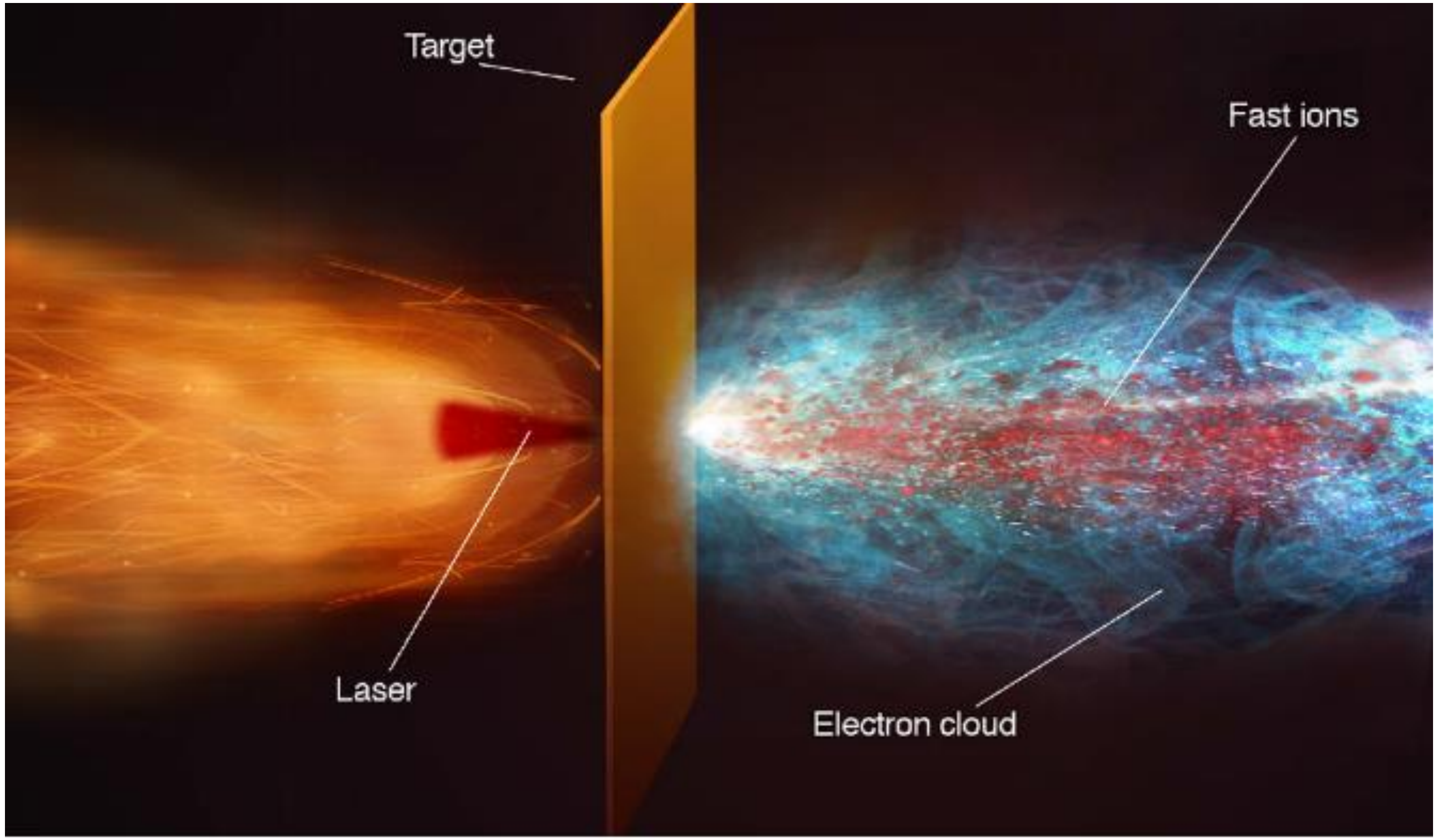
- Induce changes in the electronic configuration with a stimulating pulse of light - the **pump**

- **Probe** the global structural-rearrangement as a function of time delay between pump and probe using IT beam which provides a fingerprint of the vibrational spectrum and though that insights into the structure

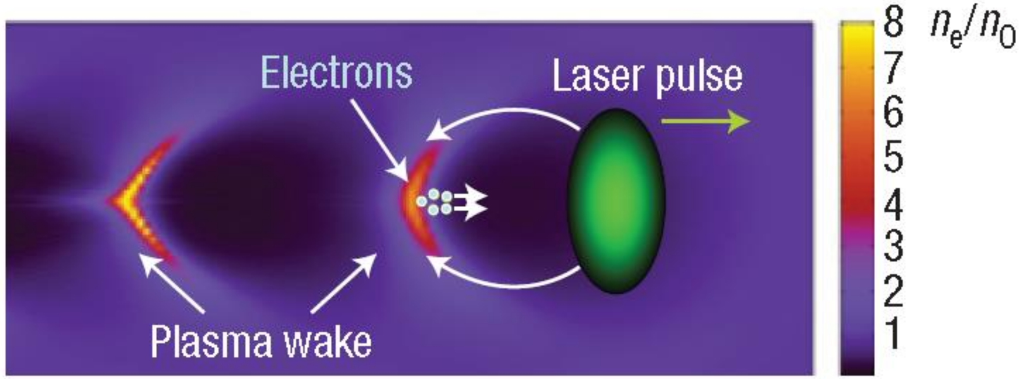


Secondary sources: X-rays and particle beams

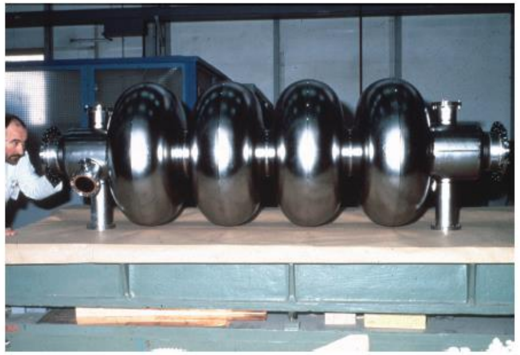




Laser-Plasma Electron Acceleration



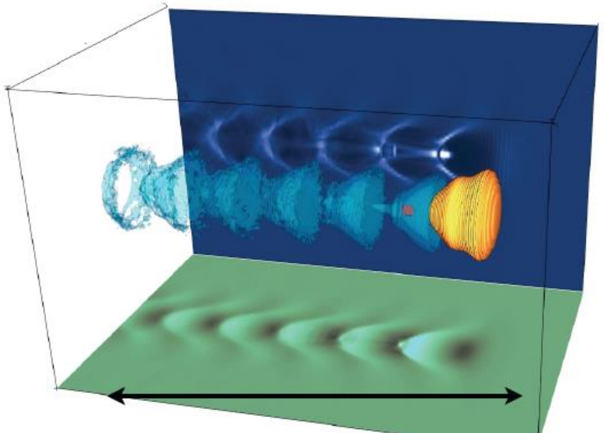
RF Cavity



1 m => 100 MeV Gain

Electric field < 100 MV/m

Plasma Cavity



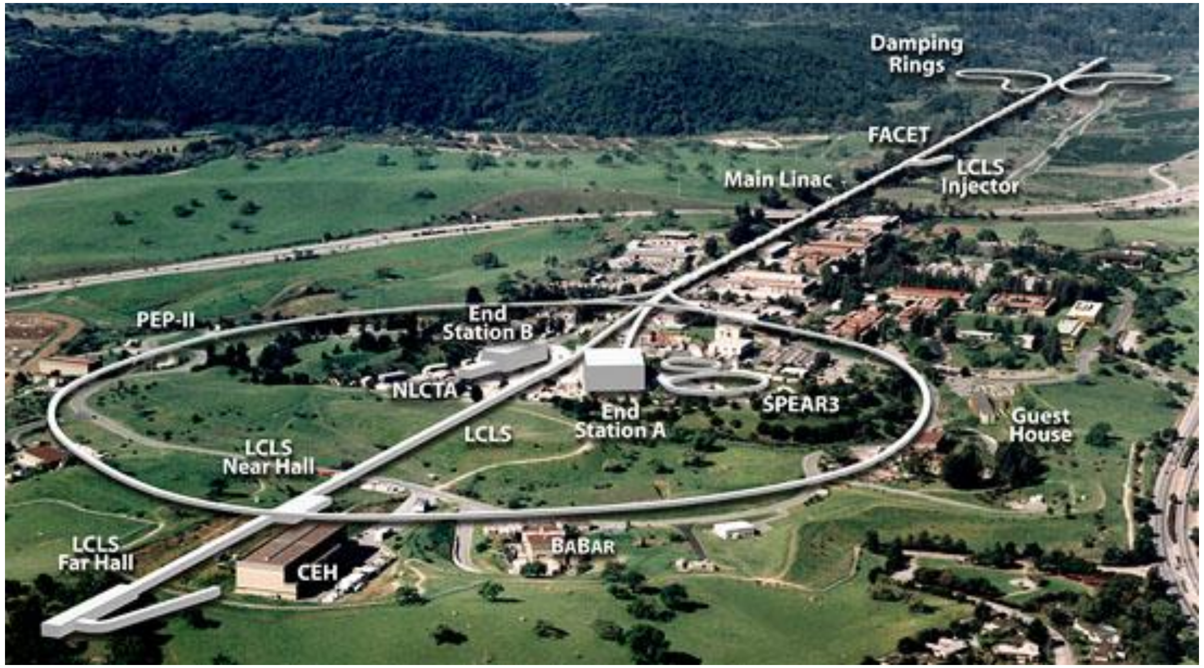
1mm => 100 MeV

Electric field > 100 GV/m

Intense laser pulse ionizes gas, and the separated electrons are dragged in its wake producing a high-energy electron beam - LPA or LPWA – which in turn can produce brilliant X-rays

Laser-Plasma Electron Acceleration

SLAC linear accelerator – 3km long

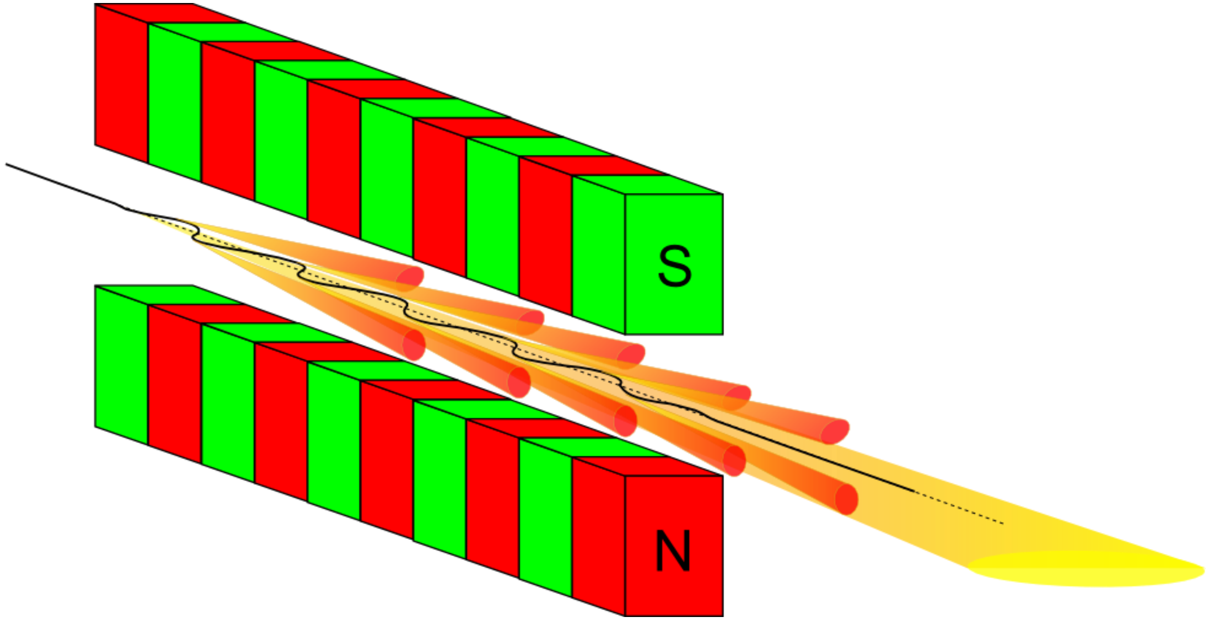


electron energy: 50 GeV

Trailer approx. 15 m long carrying LWFA

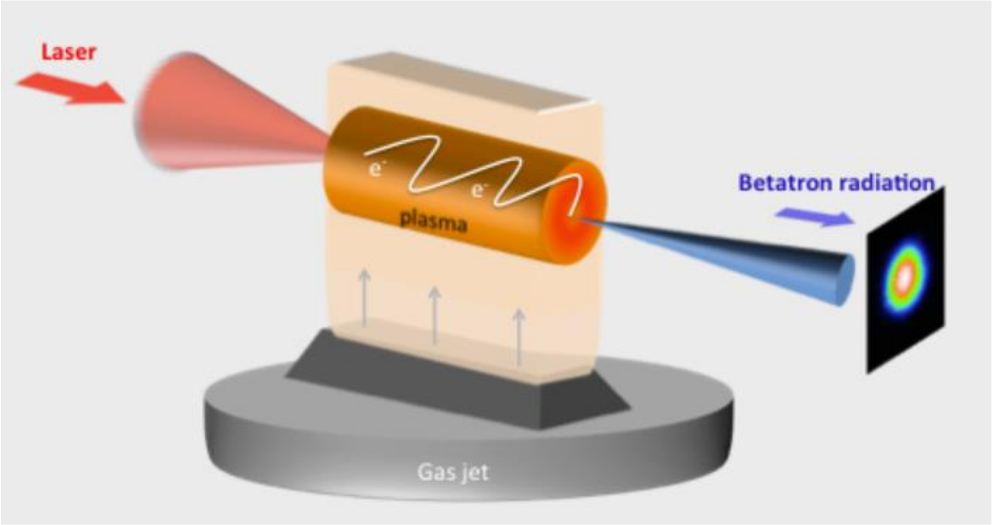
Similar energy electron beam ?

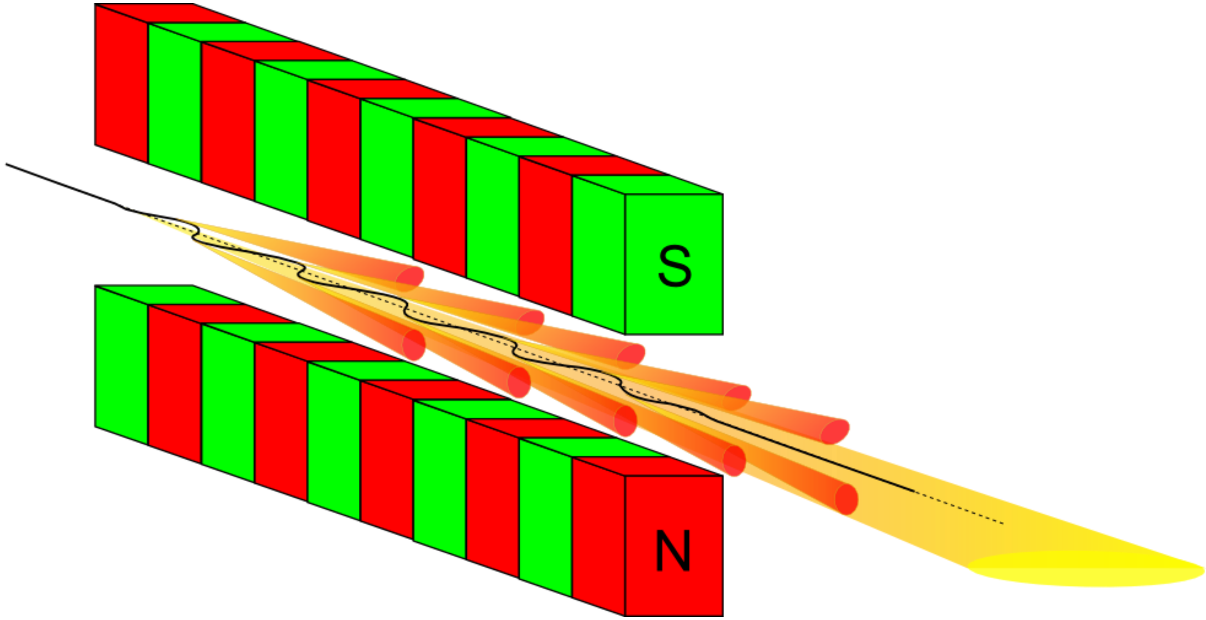
Synchrotrons



A high-energy electron beam emits brilliant radiation if it describes an oscillating path – between alternating magnetic poles in an 'undulator' or 'wiggler' in a synchrotron

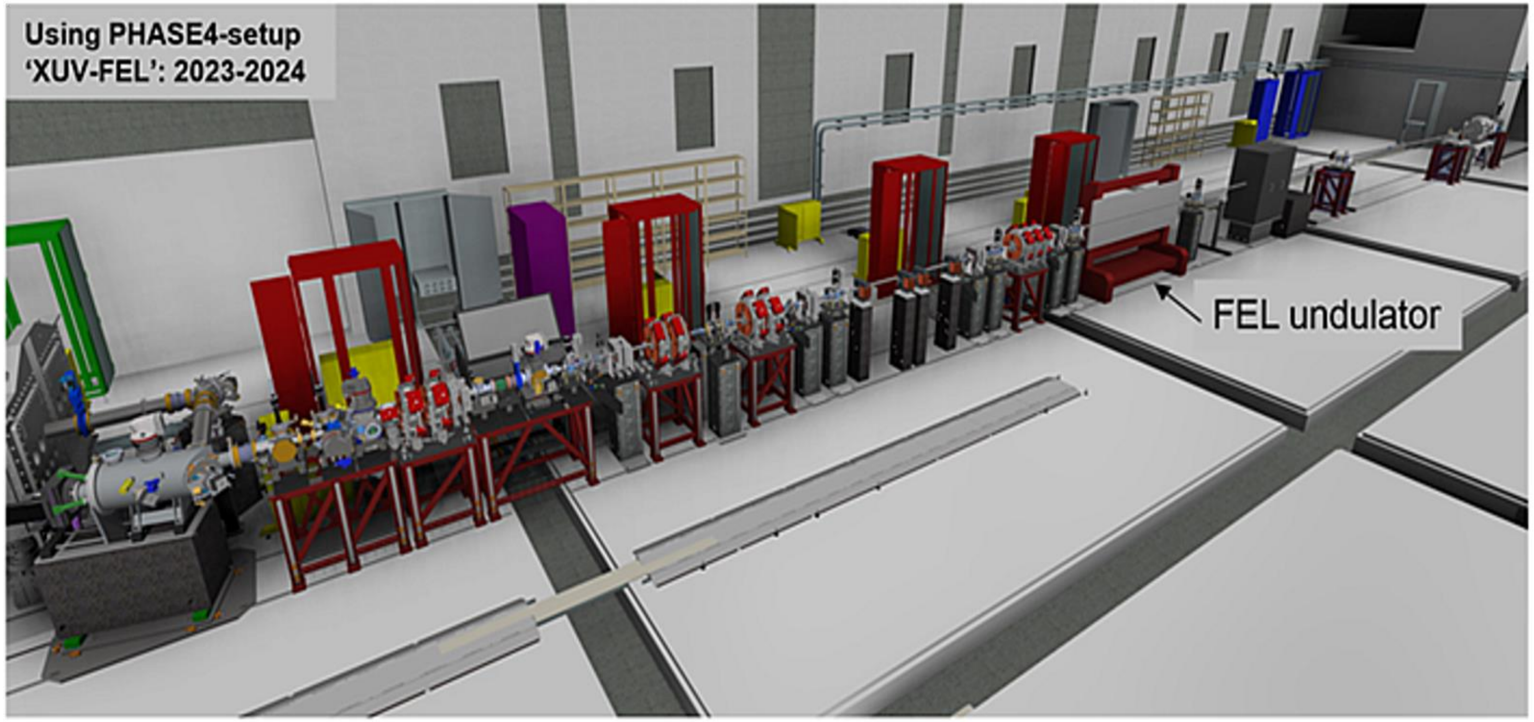
Betatrons





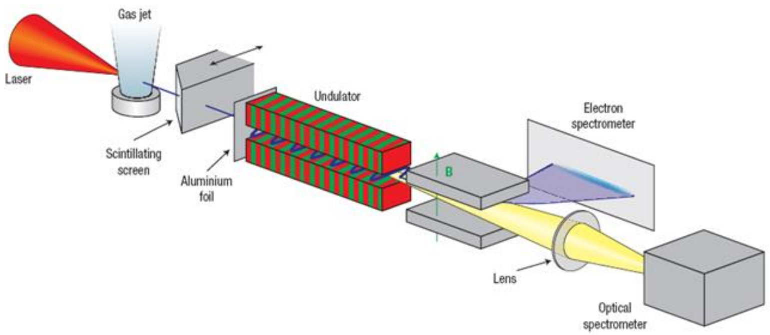
A high-energy electron beam emits brilliant radiation if it describes an oscillating path – between alternating magnetic poles in an 'indulator' or 'wiggler' in a synchrotron or in the oscillating electromagnetic field of a high-intensity laser

Laser-driven undulator X-ray source



Goal: demonstration of the SASE XUV-FEL regime
- We ~ 350 MeV
- saturation in a single undulator (~ 3 m)
- 'seeded' FEL

High-repetition rate operation using the L2-DUHA laser/ELI-Beamlines
10 Hz → 25Hz → 50 Hz

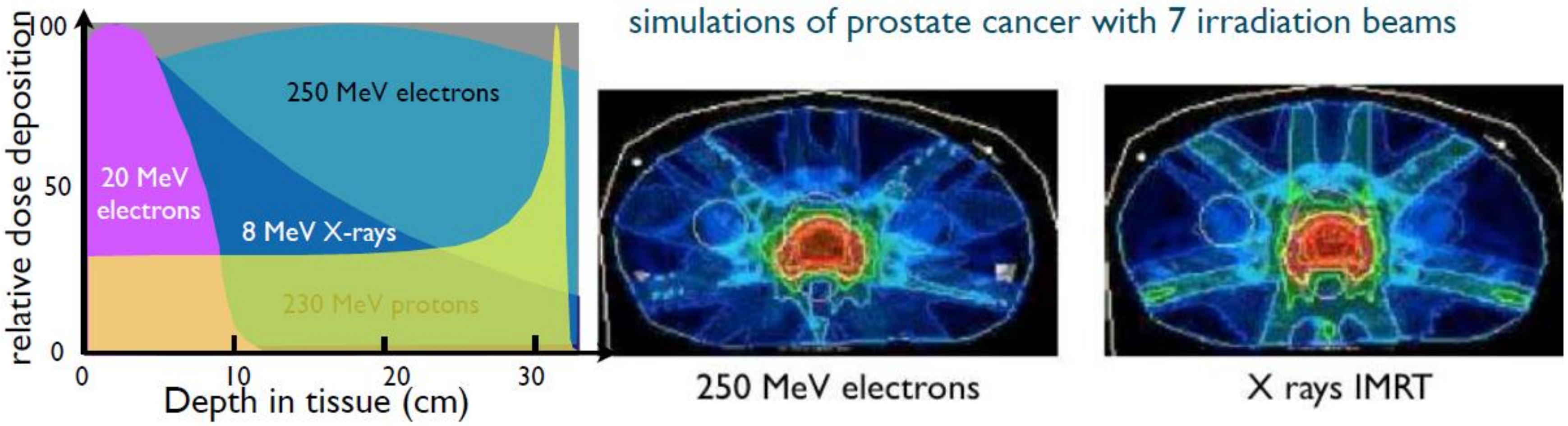


LUIS -
Biomolecular imaging with fs, coherent XUV pulses

L2-DUHA Laser

- 3J / 25fs (> **100TW**) @**50Hz**
- Pump laser uses diode-pumped Yb:YAG slabs (cryogenic cooling)
- OPCPA short-pulse chain (**ultrahigh ps-contrast**)
- Auxiliary MID-IR (2.2 µm) beam @ 1kHz (~5 mJ)

Radiotherapy with very high energy electron beams



High energy electrons (250 MeV) penetrate more deeply than X-rays (6 MeV), and can be focused to deposit their energy to a greater extent in the target area (e.g. tumour) compared to surrounding tissue

Courtesy of V. Malka

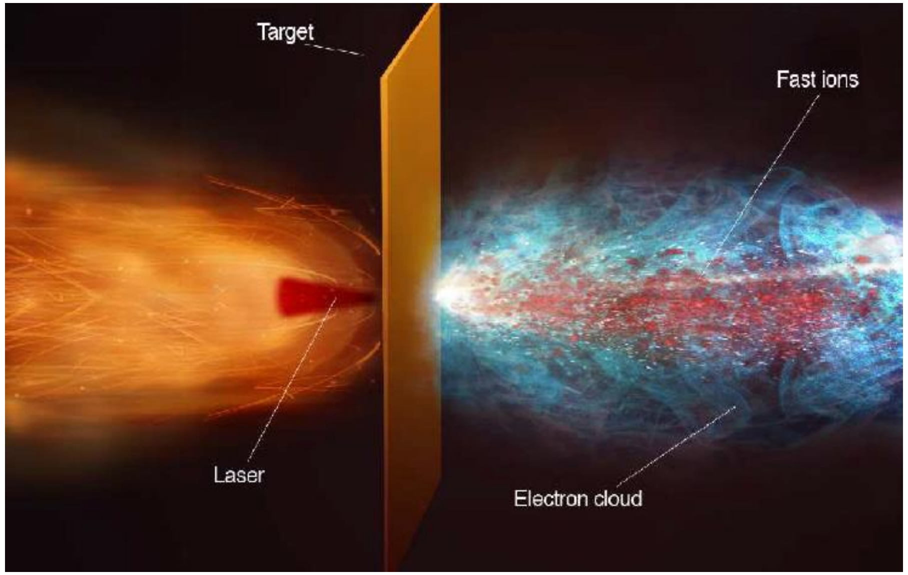
T. Fuchs *et al.* Phys. Med. Biol. **54**, 3315-3328 (2009), in coll. with DKFZ
Y. Glinec *et al.* Med. Phys. **33**, 1, 155-162 (2006),
O. Lundh *et al.*, Medical Physics **39**, 6 (2012)

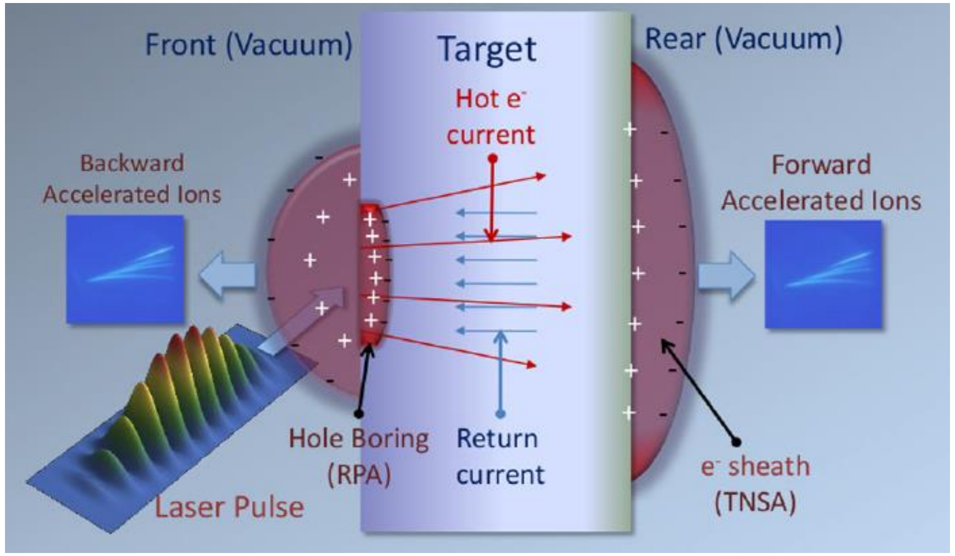
Laser-Plasma Ion Acceleration

Laser pulse hits a thin foil and drives formation of sheath of electrons which in turn accelerates ions out of film: energy gain ~100MeV in ~μm

Target Normal Sheath Acceleration

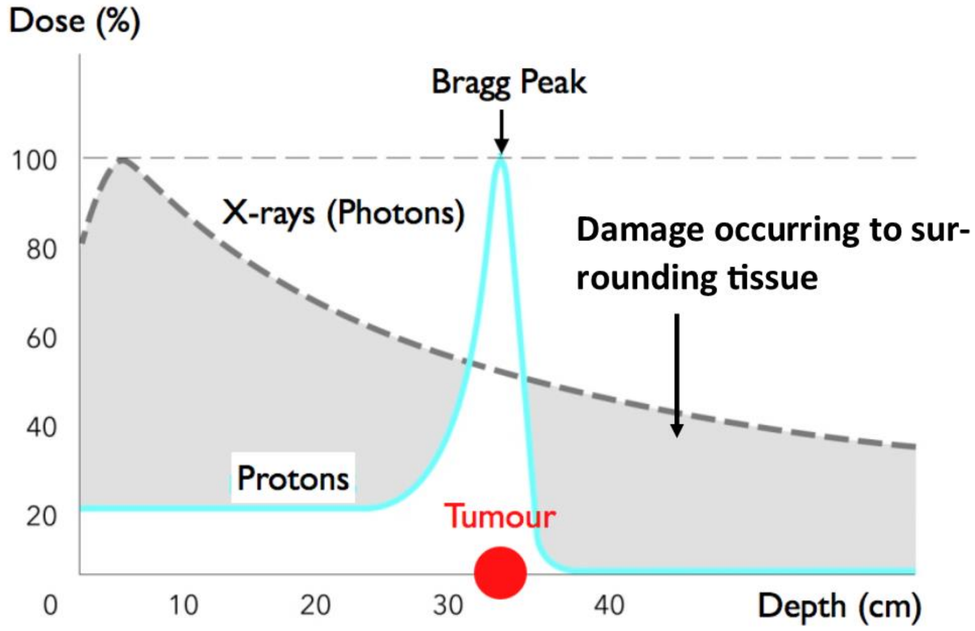
0.1-10 μm long

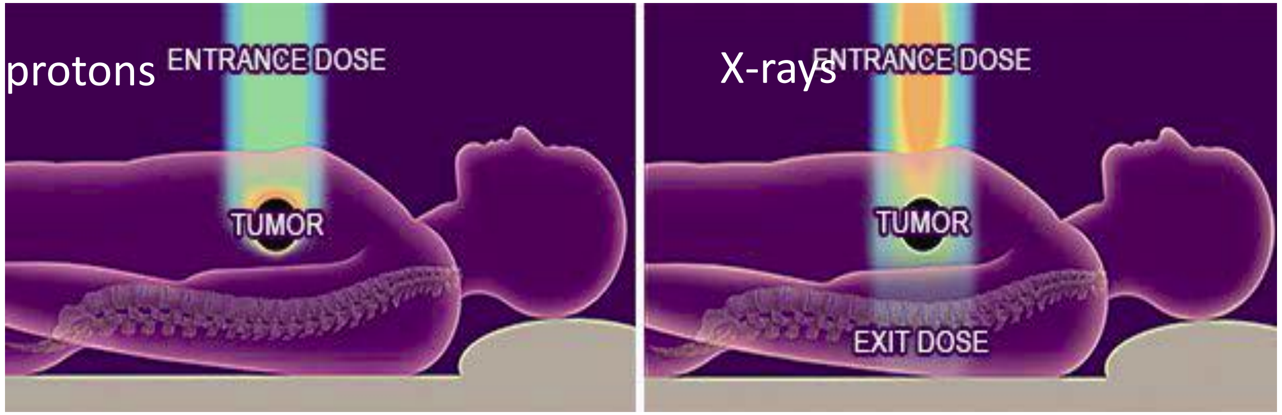




Laser driven ions for radiotherapy

Radiotherapy for cancers using particles containing protons and neutrons (which are forms of hadrons):
Such *hadron therapy* mainly uses protons – heavier carbon ions would be even better - more targeted



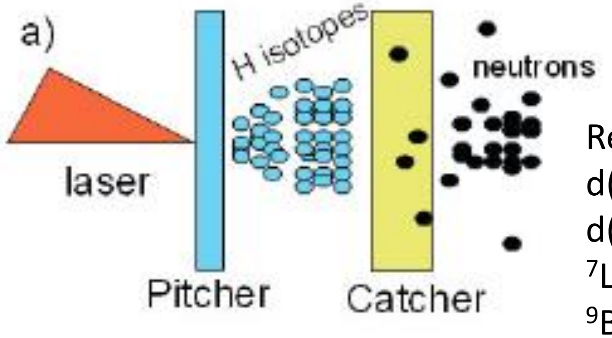


Laser-based sources readily tuned to optimum dosing energy (Bragg peak), would probably be much cheaper and short pulse observed to be much more effective (Flash Effect – not understood!)

Driving nuclear processes

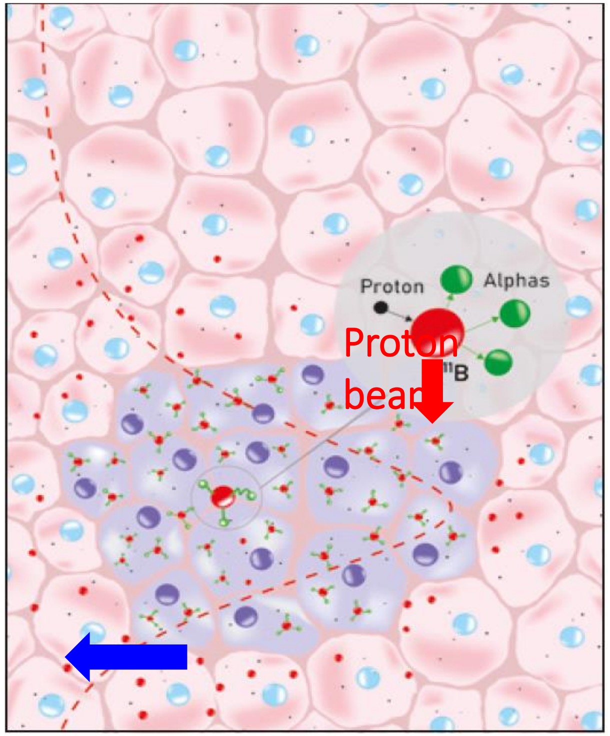
- Proton beam can also drive fusion of ^{11}B nuclei to produce high- energy alpha particles (α).
- These alpha particles have a higher relative biological effectiveness compared to protons, making them more effective at killing cancer cells –around a ^{11}B-containing drug targeting a tumour

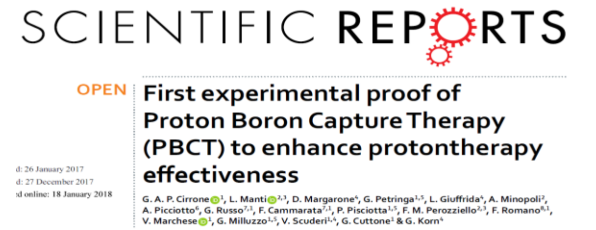
Neutron generation



Reactions:
$d(d,n)^3He$
$d(p, n+p)^1H$
$^7Li(p,n)^7Be$
$^9Be(p,n)^9B$
.....

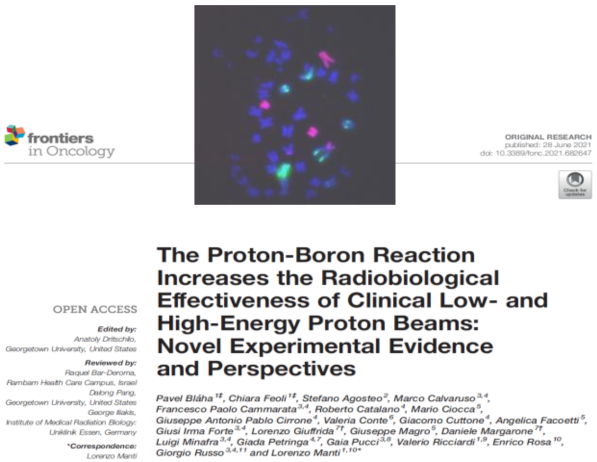
- High energy ions (H isotopes) from the target (TNSA - the pitcher) are used to drive light ion nuclear reactions (fusion) in a suitable converter material e.g. deuterated solid or liquid (the catcher) to produce high brightness fast neutrons




SCIENTIFIC REPORTS

OPEN

First experimental proof of Proton Boron Capture Therapy (PBCT) to enhance protontherapy effectiveness


frontiers in Oncology

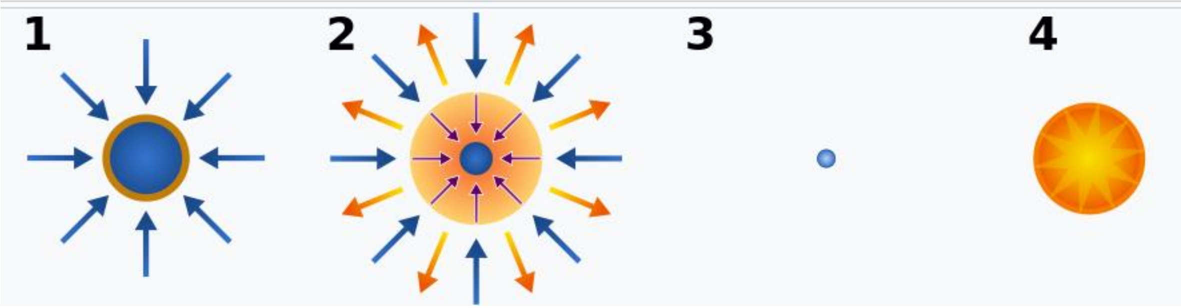
ORIGINAL RESEARCH

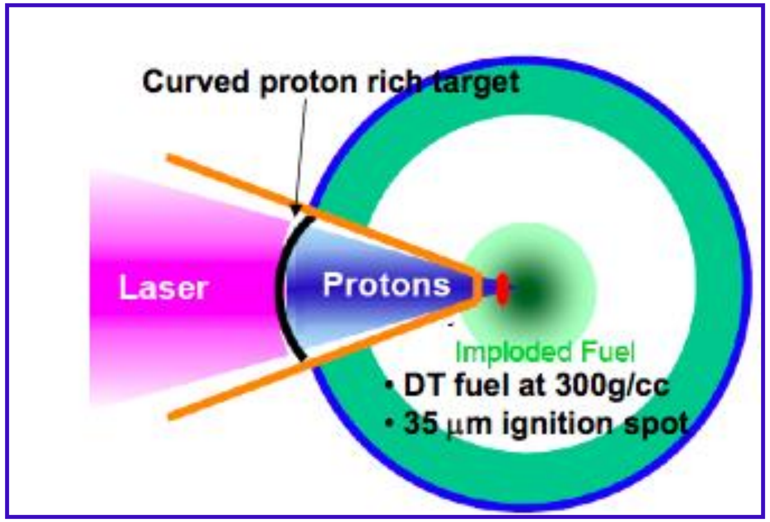
OPEN ACCESS

The Proton-Boron Reaction Increases the Radiobiological Effectiveness of Clinical Low- and High-Energy Proton Beams: Novel Experimental Evidence and Perspectives

Laser-induced nuclear fusion

Fusion fuel can be a combination of H isotopes D and T that are compressed to very high densities and taken to high energy state (temperature) to overcome Coulomb barrier, leading to fusion of nuclei with release of energy

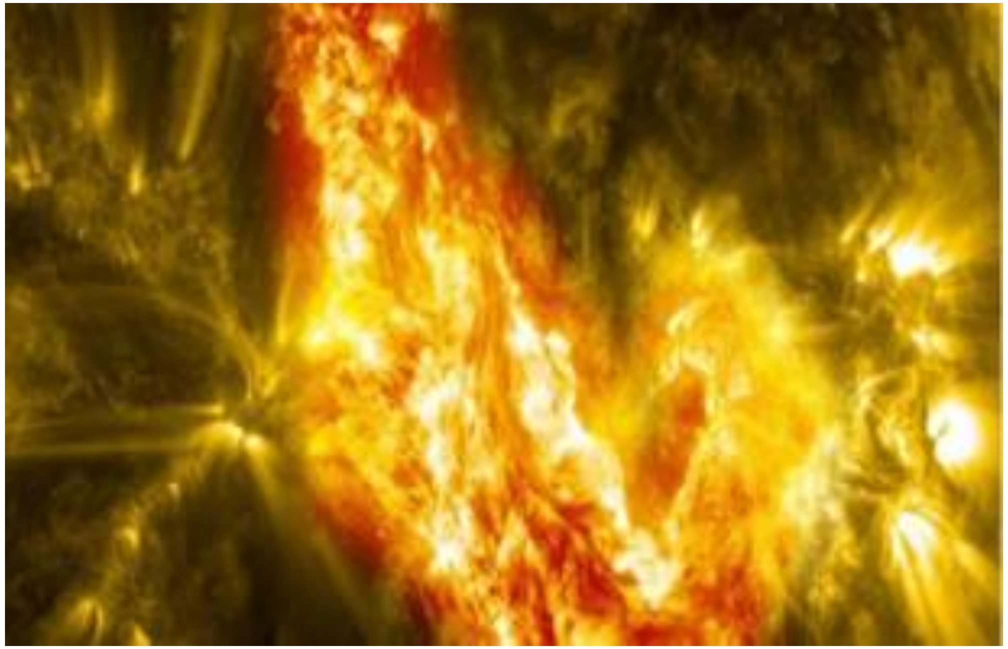




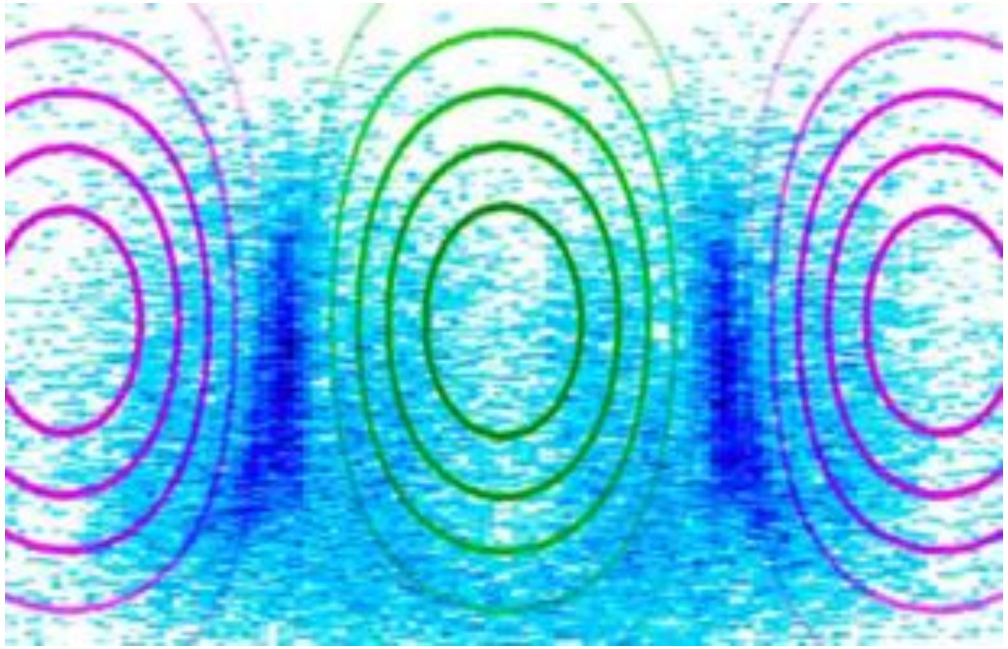
1. Surface of fusion target heated very rapidly to make a plasma envelope.
2. Fuel compressed by rocket-like blowoff of the hot surface material.
3. At the end of the capsule implosion, the fuel core reaches 20 times the density of lead and ignites at 100,000,000 ˚C.
4. Thermonuclear burn spreads rapidly through the compressed fuel, yielding many times the input energy.

ELI will NOT have the energy required to drive this process but it will enable critical studies of the plasma physics needed to produce engineering solutions

Physics in ultra-high EM fields



Plasma Physics and High Energy Density,
Astrophysics, Nuclear Photonics

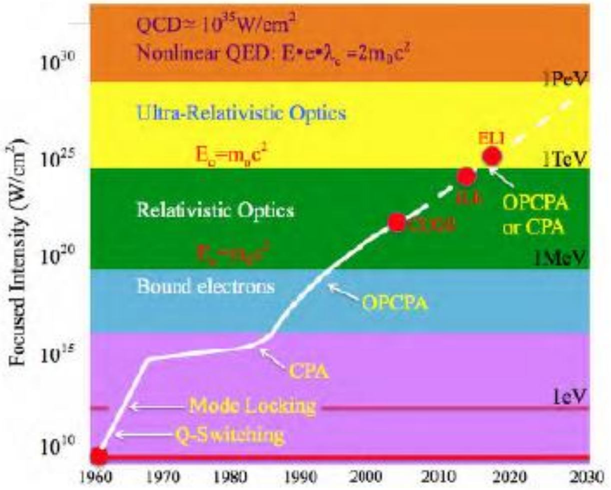


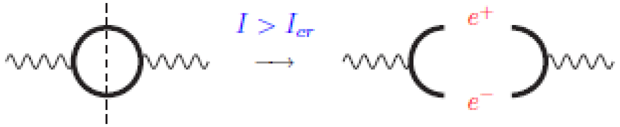
Ultra High Intensity Interactions
High-field physics and theory

Matter (and antimatter) under extreme EM fields

Plasma physics

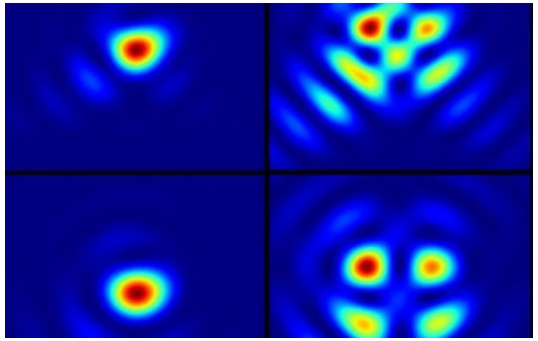
- High energy density physics, inertial confinement fusion, shock physics, development of plasma optics at ultra-high light intensities and energy densities, laboratory astrophysics





Explore vacuum structure

- Strong-field QED and **production of matter-antimatter pairs from a vaccum**, dispersive and absorptive photon propagation processes in ultra-high laser fields - vacuum birefringence and diffraction



eli Democratising science using high-performance lasers

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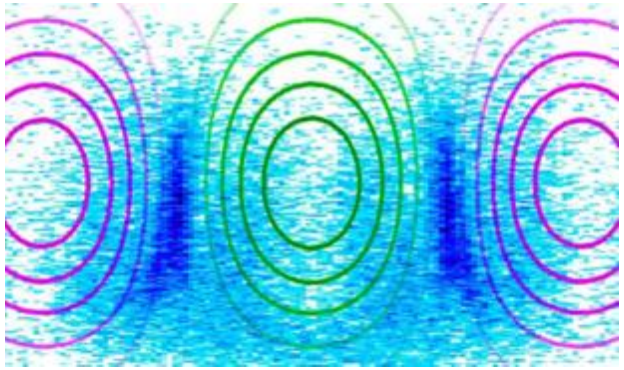

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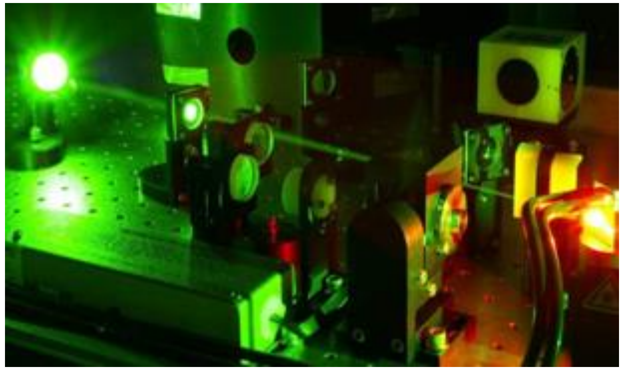


Laser Development

Extreme Light Infrastructure for Europe

3 distributed branches set up as user facilities using European Structural Funds:

- **Attosecond Laser Science**, exploring ultra-fast processes with uniquely high time resolution (atto – a billion, billionth of a second) *(ELI ALPS, Szeged, HU)*
- **High-Energy Beamlines Facility**, developing and applying *very* short pulses of ultra-intense radiation to explore extreme conditions or produce high-energy particles and radiation *(ELI Beamlines, Prague, CZ)*
- **Nuclear Physics Facility** with ultra-intense lasers and brilliant gamma beams to produce and explore new nuclear states or generate neutron beams *(ELI NP, Magurele, RO)*

A European Research Infrastructure Consortium

A European International Organisation Established in 2021 brings together ALPS and Beamlines into one co-ordinated legal entity: ELI ERIC

The Czech Republic,
Host of Seat

Hungary,
Host

Italian Republic

Lithuania

Federal Republic of Germany
Observer

Bulgaria
Observer

Romania
Observer from 1 Jan 2024

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

Member countries support ELI ERIC jointly with national funding.

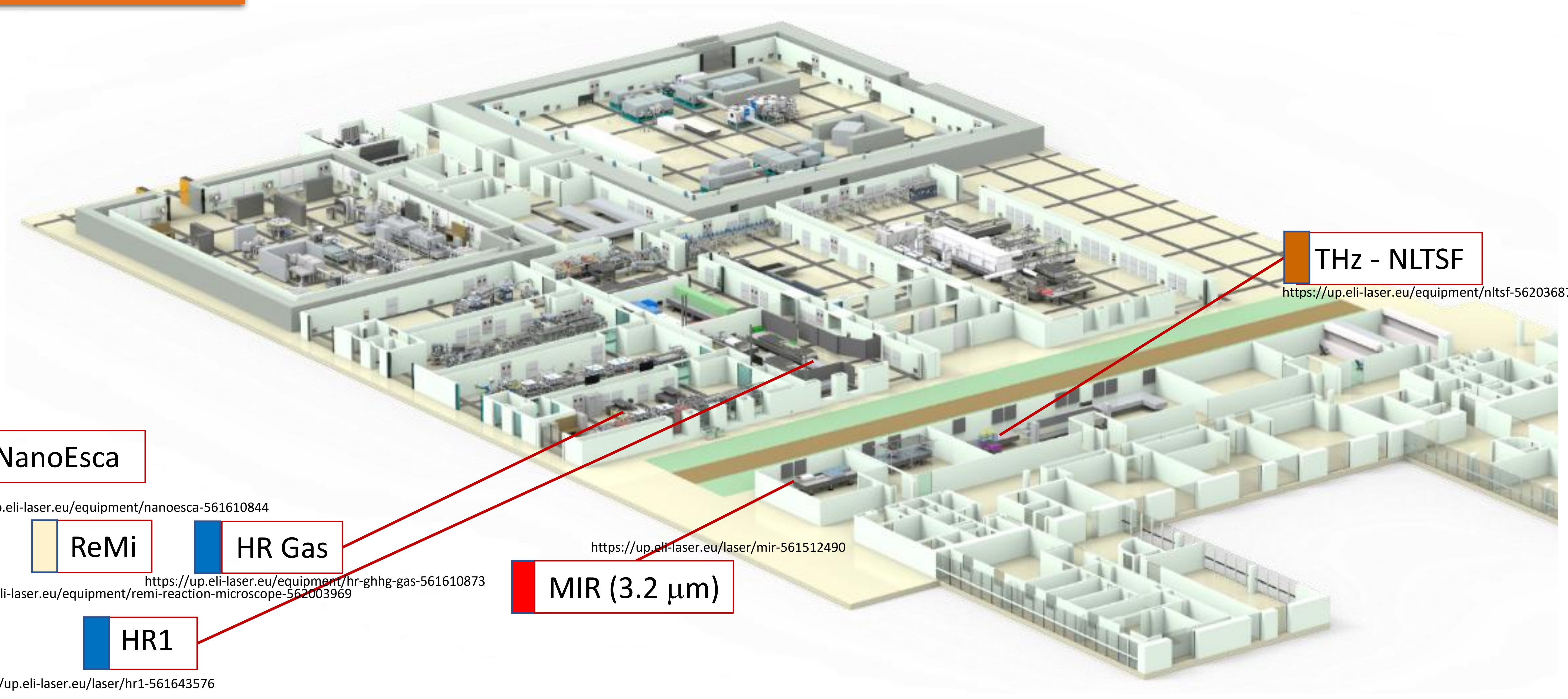
ELI ALPS

Szeged, Hungary

ELI ALPS – Ramping up User Access

Call #1 – Summer 2022

https://up.eli-laser.eu/



ELI ALPS – Ramping up User Access

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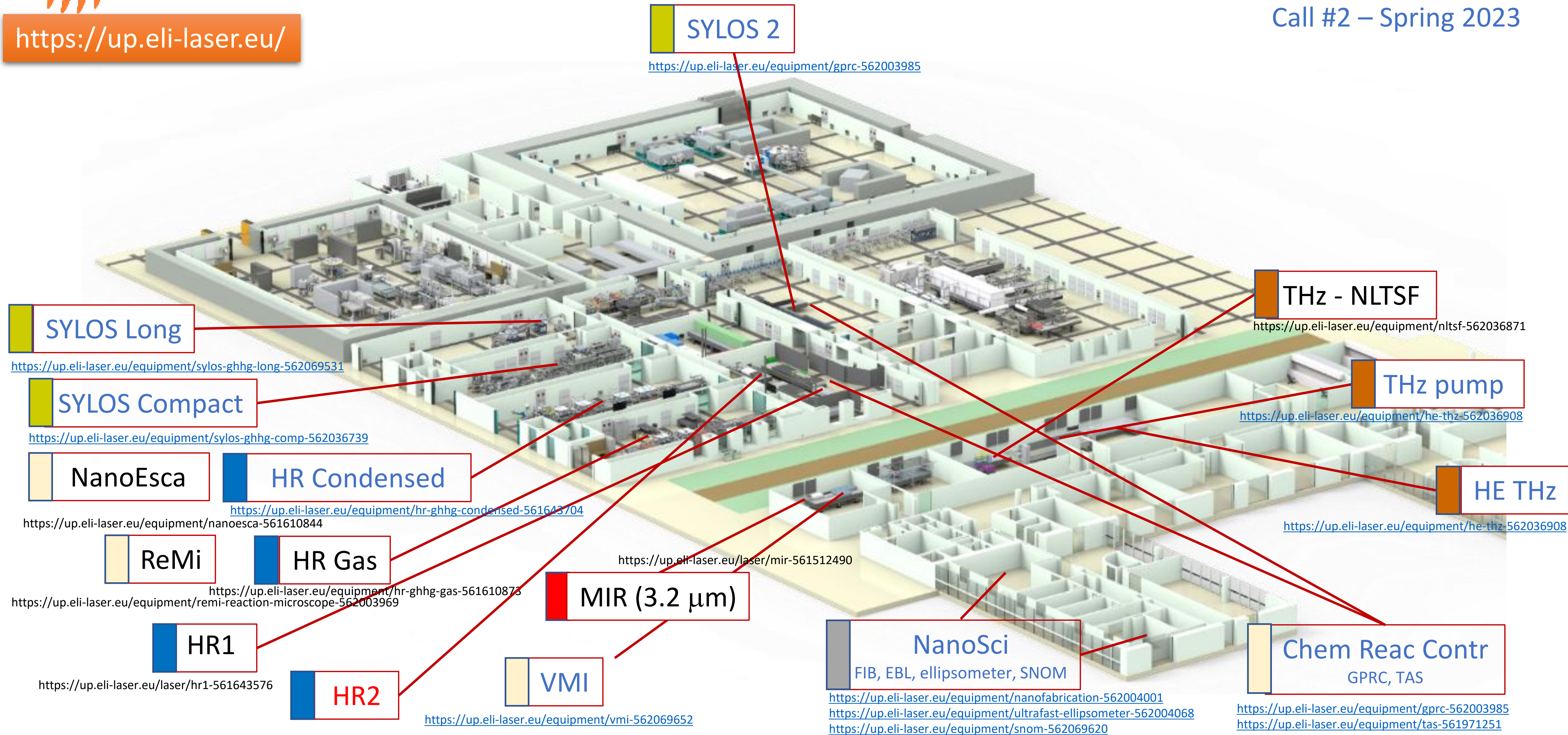
Call #1 – Summer 2022

Call #2 – Spring 2023

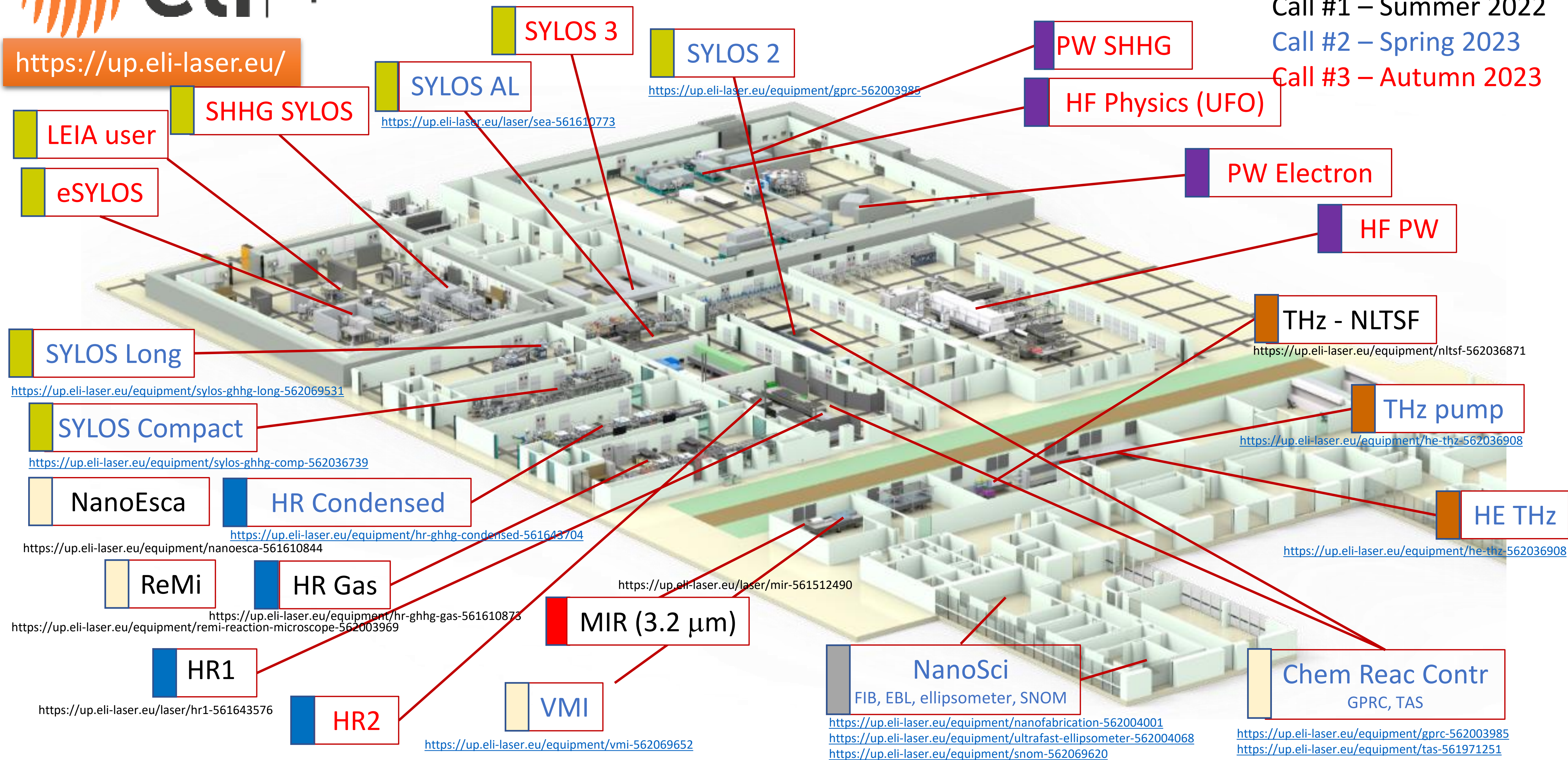


ELI ALPS – Ramping up User Access

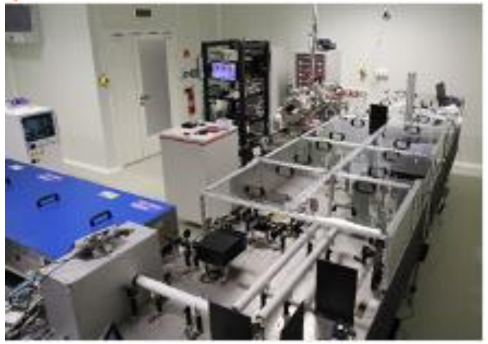
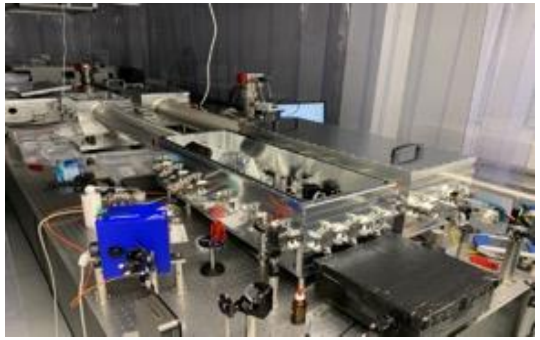
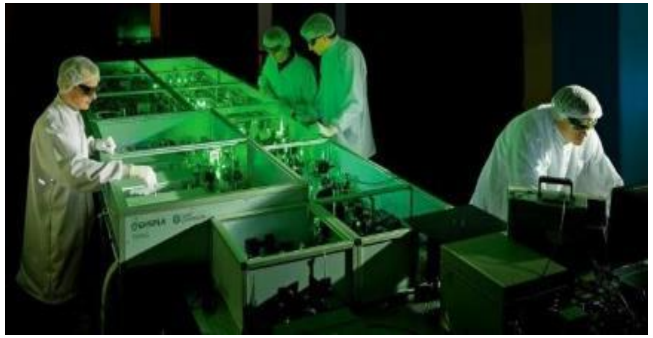
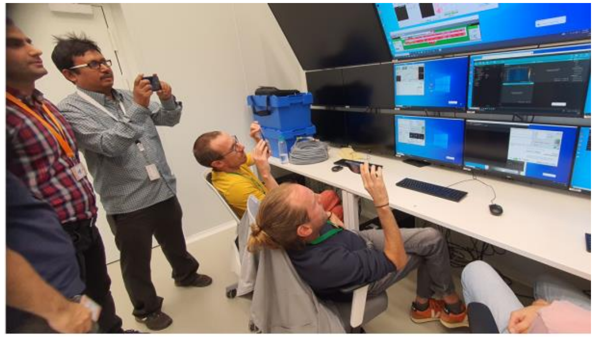
eli | alps

https://up.eli-laser.eu/

Call #1 – Summer 2022
Call #2 – Spring 2023
Call #3 – Autumn 2023

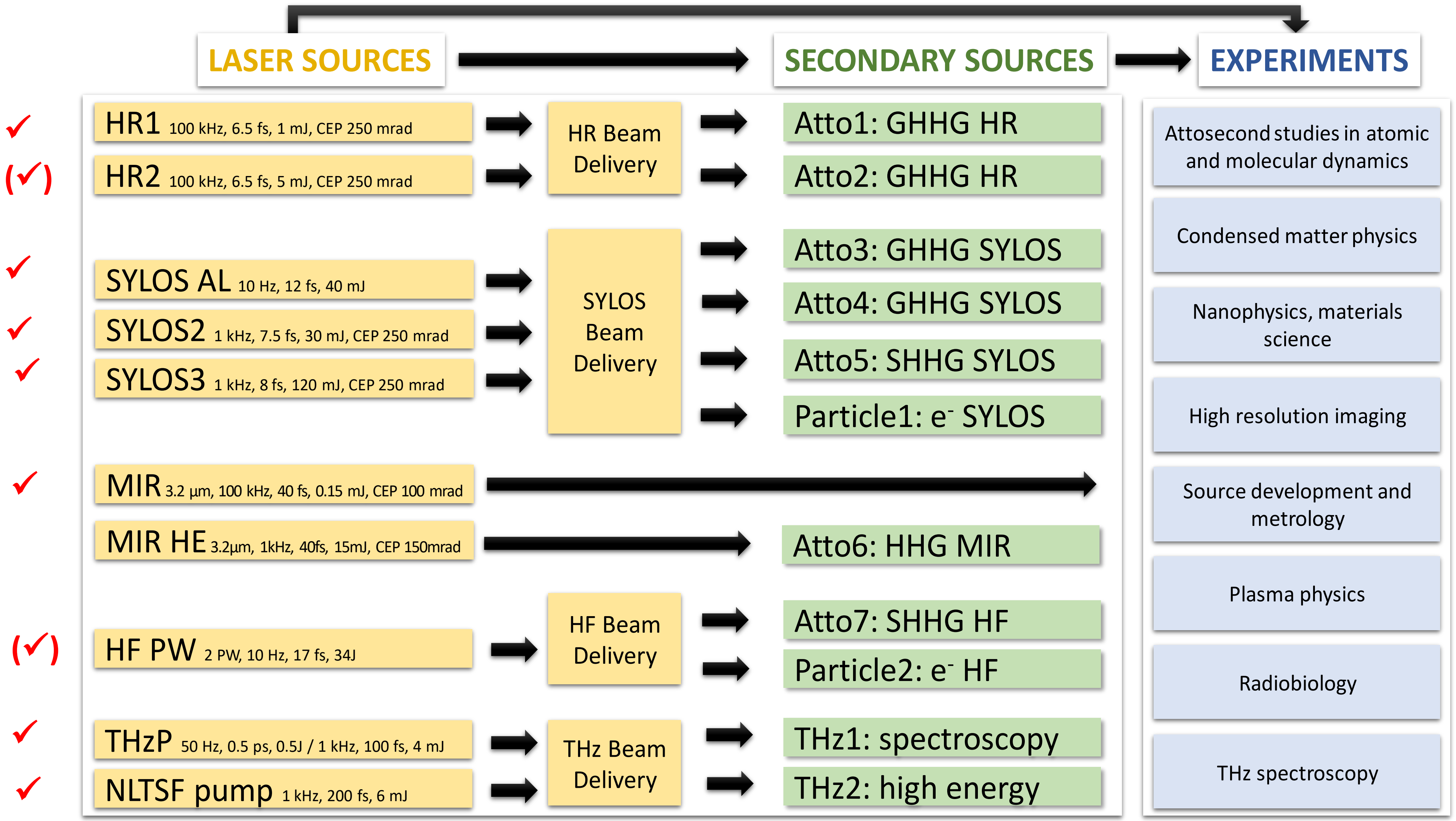


ELI ALPS laser systems

Primary laser	MIR	HR-1 (long/short pulse)	SYLOS (3)	HF PW (design)
Description	Mid-IR with OCPCA and CEP stabilisation	High Repetition Rate Yb-fiber laser, diode pumped	NOPCPA driven by diode-pumped Nd:YAG, CEP	OCPCA Ti:Sa , Nd:YAG amplifiers
Central wavelength	3200 nm (optimal)	1030 nm	825 nm	800 nm
Peak power	>2.4 GW	>25/140 GW	>15 TW	0.48 PW (2 PW)
Average power	12 W	up to 100 W	120 W	10 W (300 W)
Pulse energy	>120 µJ	1 mJ	120 mJ	4 J (28.9 J)
Repetition rate	100 kHz	100 kHz	1 kHz	2.5 Hz (10 Hz)
Pulse duration	<50 fs	<40 fs / <7 fs	<8fs	22 fs (<19 fs)

ELI ALPS experimental chains



HR GHHG & NanoEsca

For energy, spatially, spin and time resolved studies of ultrafast electron dynamics in condensed matter

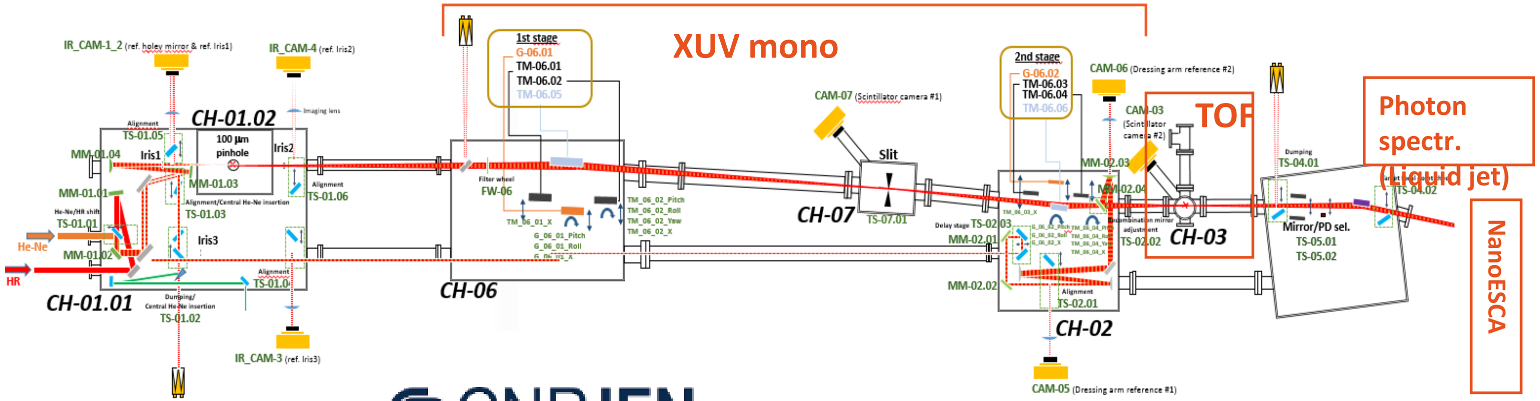
- **Gas phase XUV-IR pump-probe** @ **100 kHz**
- **flexible reconfiguration** according to user needs

Highest flux attosecond pump-probe 100 kHz beamline

51 pJ APT on target (**267 pJ** at generation)

Peng Ye *et al., J. Phys. B: At. Mol. Opt. Phys.* **53** 154004 (2020)

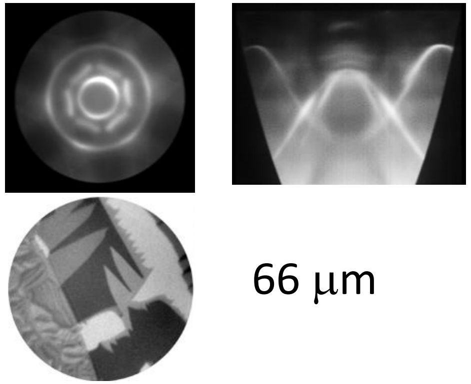
Peng Ye *et al., Ultrafast Science* 2022, 9823783 (2022)



- **Monochromatized XUV pulses with few femtosecond duration**
- **Supports condensed matter end-stations with XUV-IR pump-probe capabilities**

Core capabilities, at 100 kHz XUV – IR / 70 MHz fs CEP oscillator:

- Photoemission Electron Microscopy (PEEM) mode:
- laterally resolved microscopy of the sample surface with time resolution
- Imaging Photoelectron Spectroscopy mode:
- lateral (nm), time (fs/asec) and energy resolution (few tens of meV)
- Momentum microscopy:
- imaging of the momentum space, time and energy resolution
- With a state-of-the-art Au/Ir(100) imaging spin filter (spin resolved detection)



Spin domains on an iron plate

ELI Beamlines

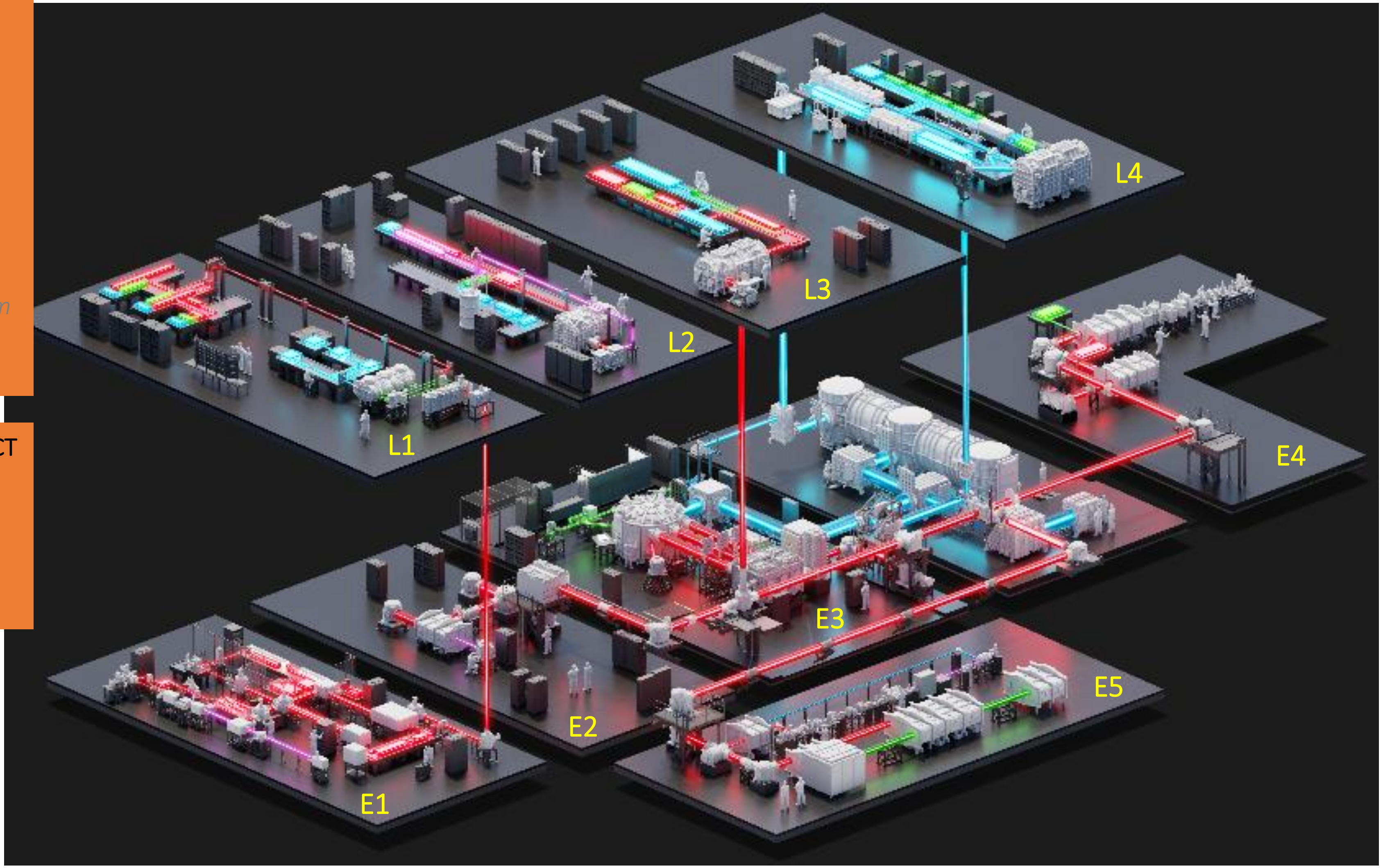
Dolní Břežany, Czechia

ELI Beamlines – Ramping up User Access

Call #1 – Summer 2022

L1 ALLEGRA
5TW (100mJ/20fs), 1kHz, 800nm
0.5TW (10mJ/20fs), 1kHz , 800nm
L2 DUHA
100TW (2J/20fs), 100Hz , 820nm
0.1TW (5mJ/50fs), 1kHz , 2200nm
L3 HAPLS
1PW (30J/30fs), 10Hz , 850nm
L4 ATON
10PW (1.5kJ/150fs), 0.01Hz , 1055nm
1PW (150J/150fs), 0.01Hz , 1055nm
1.5kJ, 0.5-10ns, 0.01Hz, 1w/2w

E1: HHG-MAC, PXS-TREX, trELIps & TCT
L1: ALFA
E2: Gammatron
E3: P3
E4: ELIMAIA-ELIMED
E5: ELBA, LUIS



ELI Beamlines – Ramping up User Access

Call #2 – Spring 2023

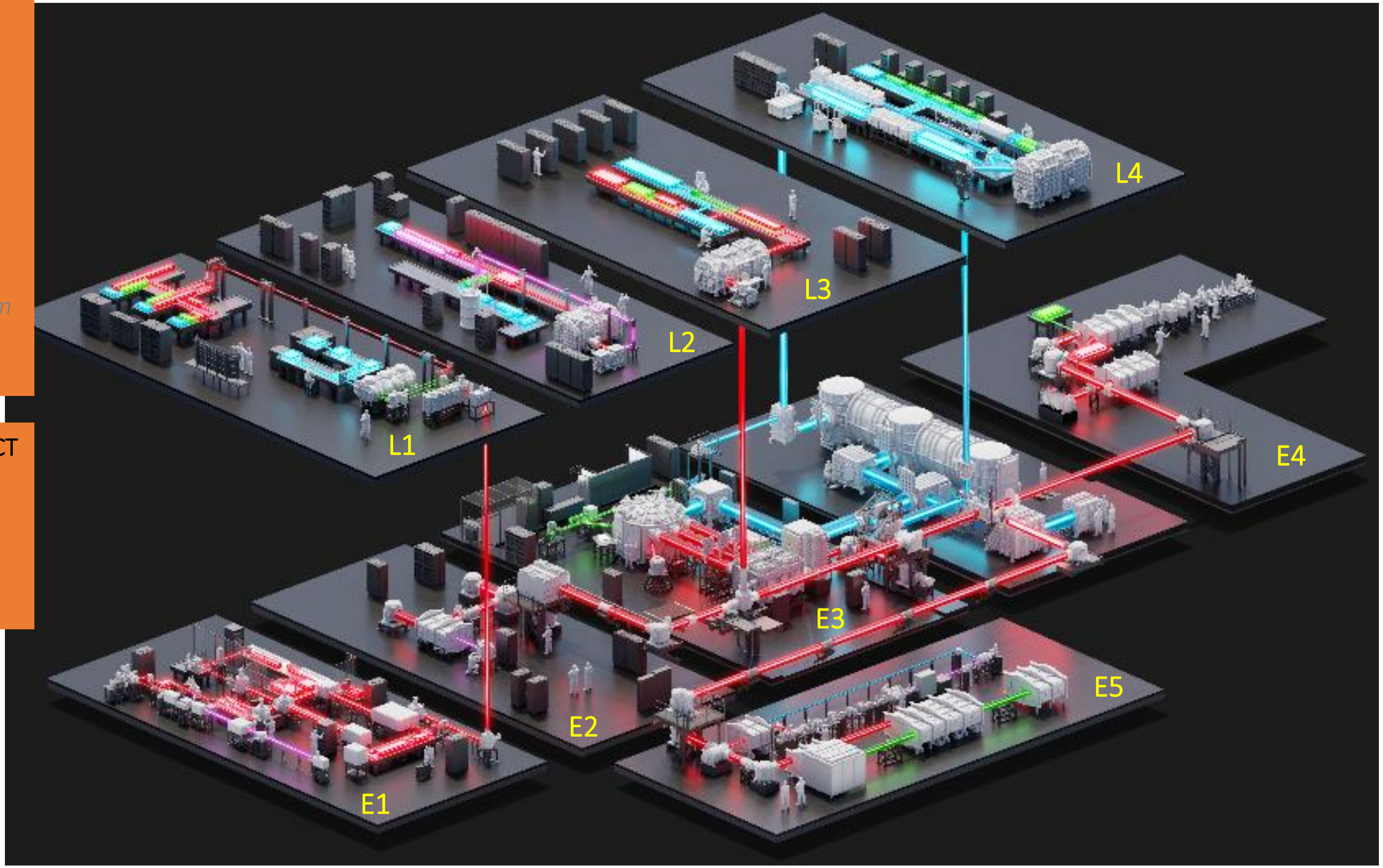
L1 ALLEGRA
5TW (100mJ/20fs), 1kHz, 800nm
0.5TW (10mJ/20fs), 1kHz , 800nm

L2 DUHA
100TW (2J/20fs), 100Hz , 820nm
0.1TW (5mJ/50fs), 1kHz , 2200nm

L3 HAPLS
1PW (30J/30fs), 10Hz , 850nm

L4 ATON
10PW (1.5kJ/150fs), 0.01Hz , 1055nm
1PW (150J/150fs), 0.01Hz , 1055nm
1.5kJ, 0.5-10ns, 0.01Hz, 1w/2w

E1: HHG-MAC, PXS-TREX, trELIps & TCT
L1: ALFA
E2: Gammatron
E3: P3
E4: ELIMAIA-ELIMED
E5: ELBA, LUIS



ELI Beamlines – Ramping up User Access

Call #3 – Autumn 2023

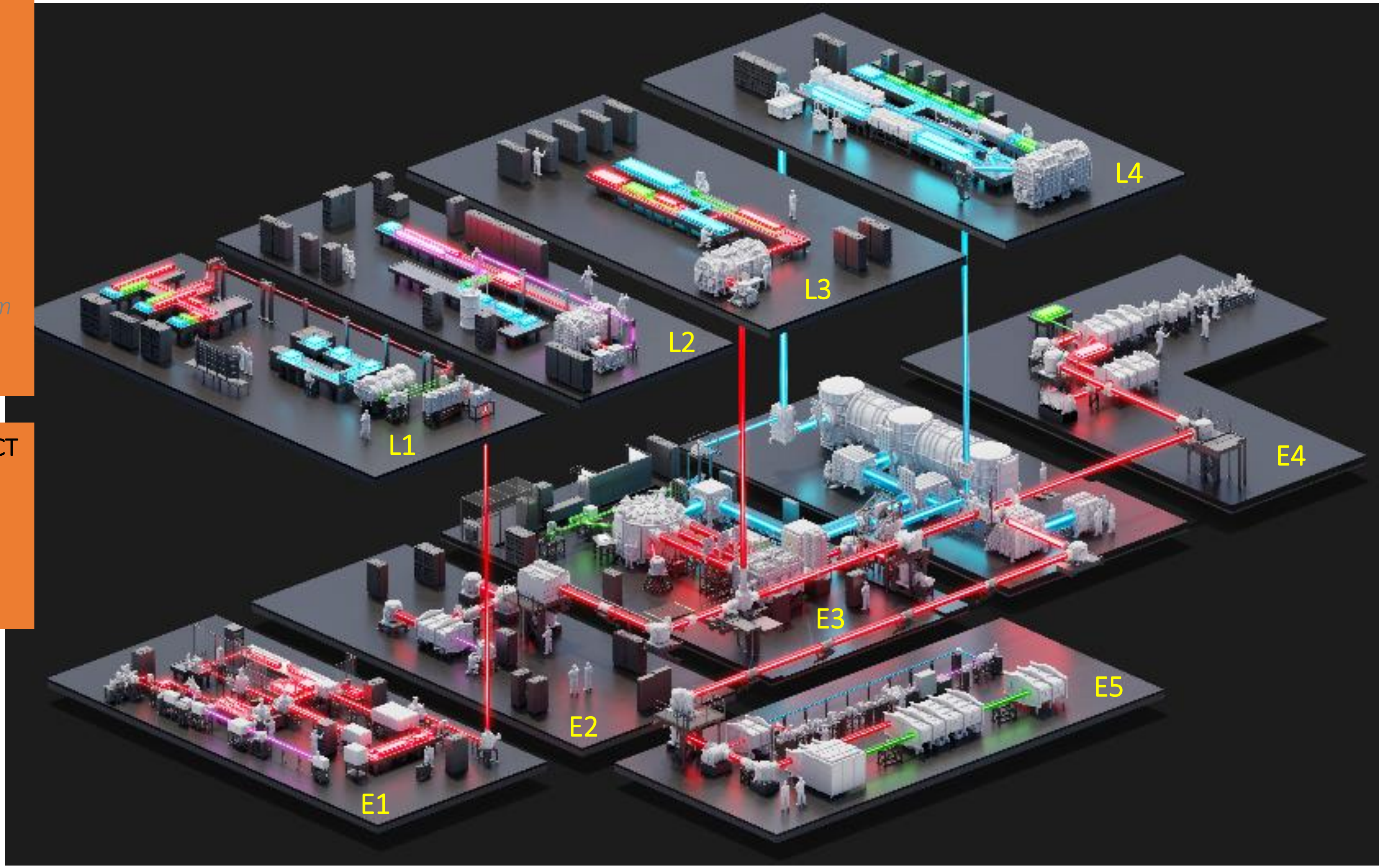
L1 ALLEGRA
5TW (100mJ/20fs), 1kHz, 800nm
0.5TW (10mJ/20fs), 1kHz , 800nm

L2 DUHA
100TW (2J/20fs), 100Hz , 820nm
0.1TW (5mJ/50fs), 1kHz , 2200nm

L3 HAPLS
1PW (30J/30fs), 10Hz , 850nm

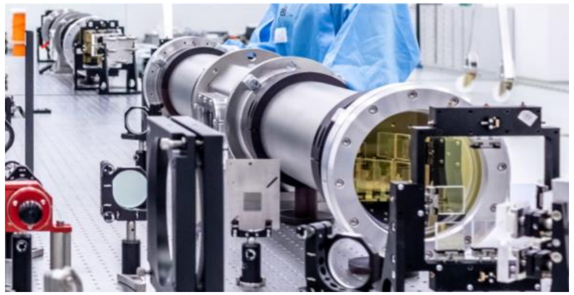
L4 ATON
10PW (1.5kJ/150fs), 0.01Hz , 1055nm
1PW (150J/150fs), 0.01Hz , 1055nm
1.5kJ, 0.5-10ns, 0.01Hz, 1w/2w

E1: HHG-MAC, PXS-TREX, trELIps & TCT
L1: ALFA
E2: Gammatron
E3: P3
E4: ELIMAIA-ELIMED
E5: ELBA, LUIS



Laser systems @ELI BL

including ramp-up/upgrades

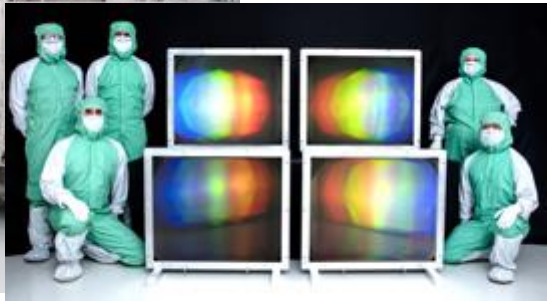



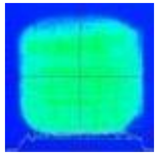
Laser parameters	L1 - ALLEGRA	L2-DUHA	L3 - HAPLS	L4 - ATON
Description	OPCPA, Yb:YAG thin disks, diode pumping	OPCPA, Yb:YAG slabs,diode-pumped	CPA, Ti:Sa, diode pumping	CPA/OPCPA, Nd:glass, flash lamps pumping
Energy	**55 mJ** (100 mJ)	3 J	**13 J** (30 J)	**300 J @2w** (1.5 kJ @1w)
Pulse width	**15 fs**	**25 fs**	**27 fs**	**2-10 ns** (150 fs)
Peak Power	**>3 TW** (>6 TW)	>100 TW	**0.5 PW** (1 PW)	NA (10 PW)
Wavelength	840 nm	820 nm *(5mJ @2.2 μm)*	800 nm	530 nm (1060 nm)
Repetition rate	**up to 1 kHz**	50 Hz *(5mJ @1 kHz)*	**up to 3.3 Hz** (10 Hz)	**1/3min** (1/min)
Intensity contrast	10^{-10}	10^{-11}	10^{-11}	NA (10^{-11})

L4-ATON 10PW/10Hz Laser

high-energy, 10PW laser with long-pulse (ns, kJ) capability

- ✓ Compact 10PW (**1.5kJ**/150fs) at 1 shot/min
- ✓ Most energetic 10 PW laser ever built
- ✓ Generation of ns kJ pulses with programmable temporal shape by the Long Pulse frontend
- ✓ Narrowband and **Broadband** options in the Long Pulse (ns) regime (LPI → LIF)
- ✓ L4P (PW, 150J/150fs) aux beam for **pump-probe** (HED and LIF research) and **pulsed** (~ns), directional, fast **neutron source** (10^{10}/shot → ~10^{19}n/s/cm^2)





ELI-Beamlines Experimental Halls

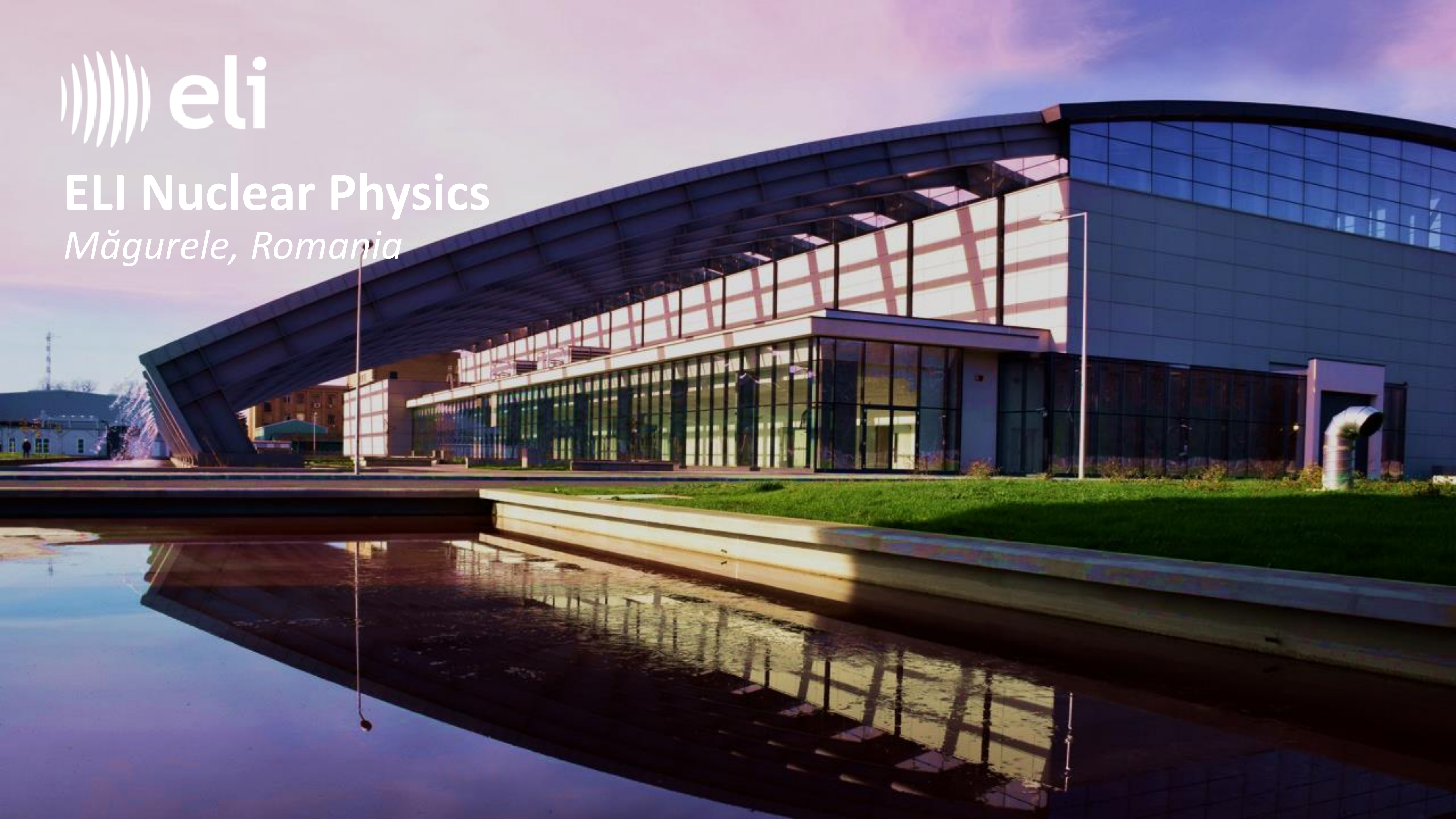
- Mid-IR to Hard X-rays @1kHz
- Pump-Probe techniques for
- fs-ms dynamics

- Betatron combined with Inverse Compton Scattering for hard X-Rays

- kJ-class (2w), ns, high rep-rate, pulse-shaping capability
- Platform for HEDP, ICF, shock physics
- Dedicated targetry & diagnostics

- Ultrahigh intensity laser-matter interaction (>10^{21}W/cm^2)
- Laser-plasma p acc. (>35MeV)
- Tertiary sources (pitcher-catcher)

- ELBA: all-optical laser-electron collider
- LUIS: laser-driven FEL (350MeV; 45 eV photons)


eli
ELI Nuclear Physics
Măgurele, Romania

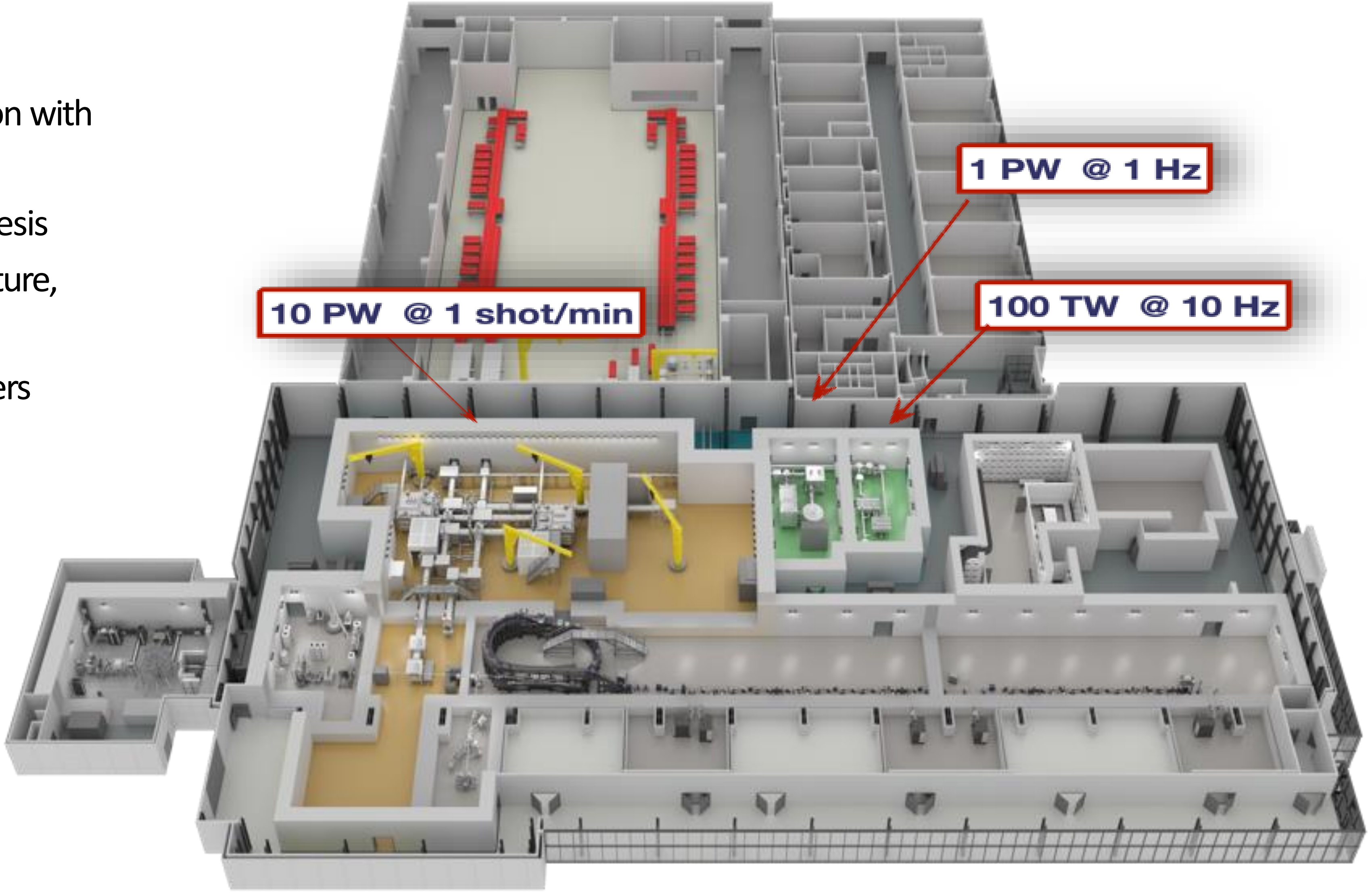
ELI-NP

Advanced studies in basic science

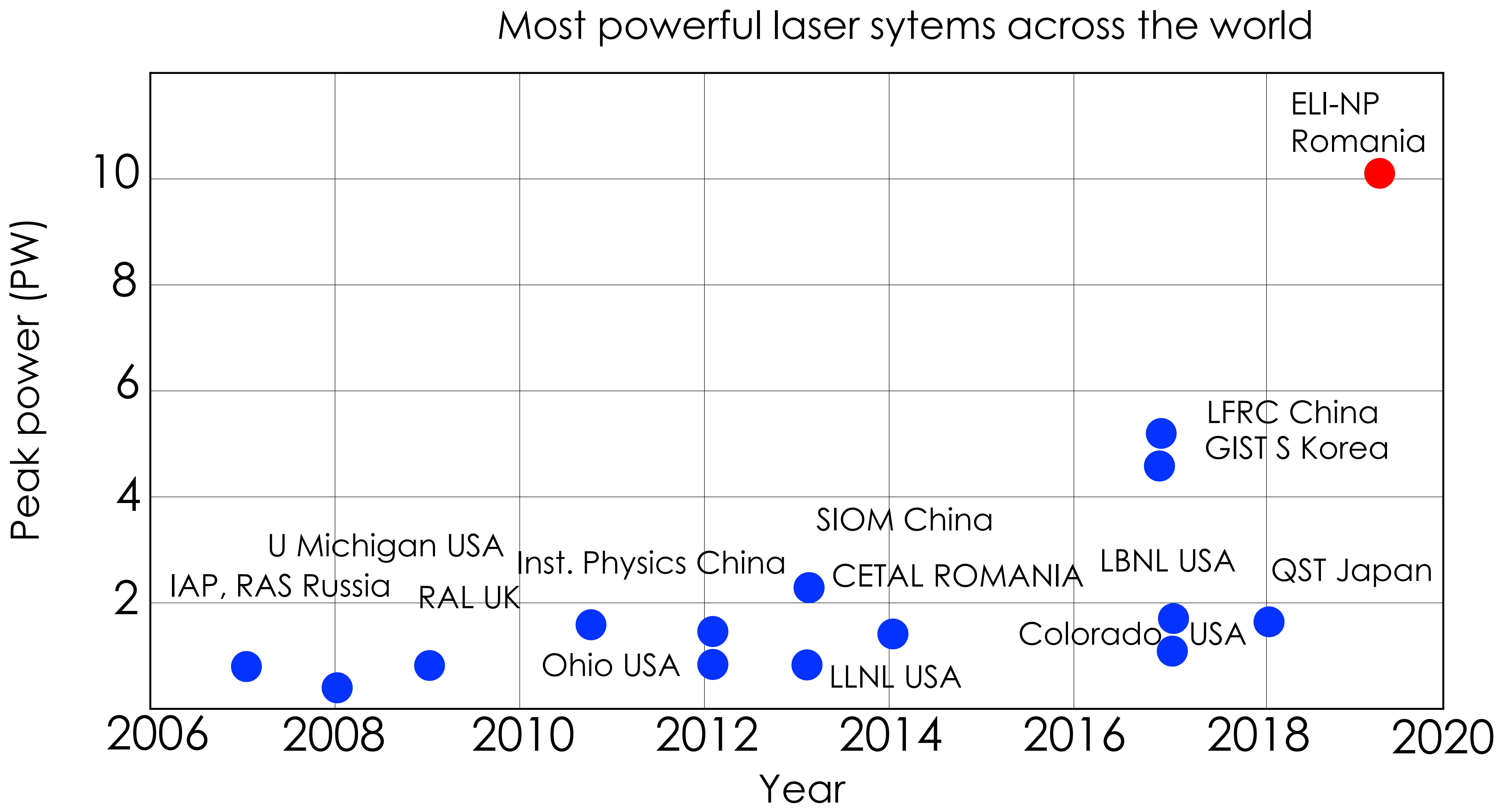
- Characterisation of laser-matter interaction with nuclear methods:
  - nuclear astrophysics and nucleosynthesis
  - photonuclear reactions, nuclear structure, exotic nuclei
- particle acceleration with high power lasers
- quantum electrodynamics (QED)

Developing technologies for:

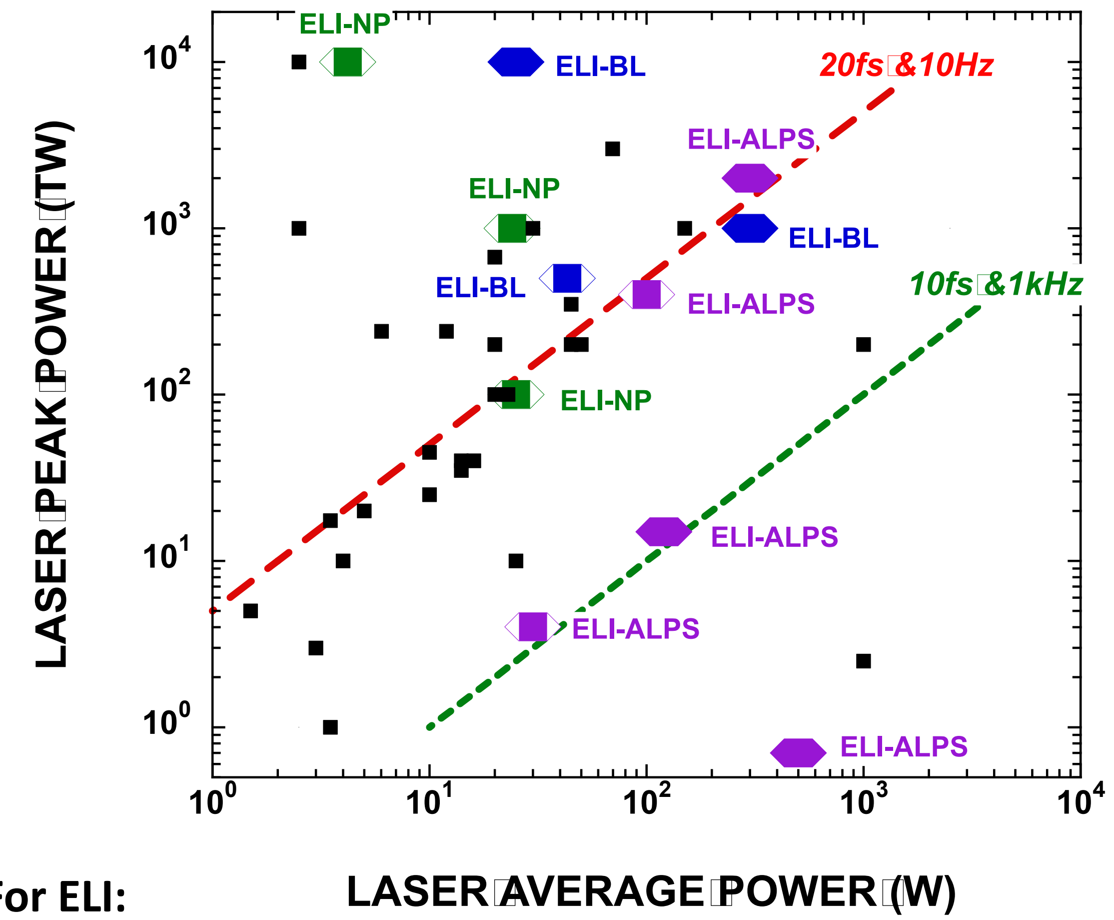
- medical applications (X-ray imaging, radioisotopes)
- industrial applications (non-destructive studies with!)
- material studies with positrons
- materials in high radiation fields



ELI-NP @ 10 PW


Most powerful laser sytems across the world
Peak power (PW)
10
8
6
4
2
2006
2008
2010
2012
2014
2016
2018
2020
Year
ELI-NP
Romania
LFRC China
GIST S Korea
SIOM China
U Michigan USA
Inst. Physics China
CETAL ROMANIA
LBNL USA
QST Japan
IAP, RAS Russia
RAL UK
Ohio USA
Colorado
USA
LLNL USA

ELI's technical standing – now and in the future

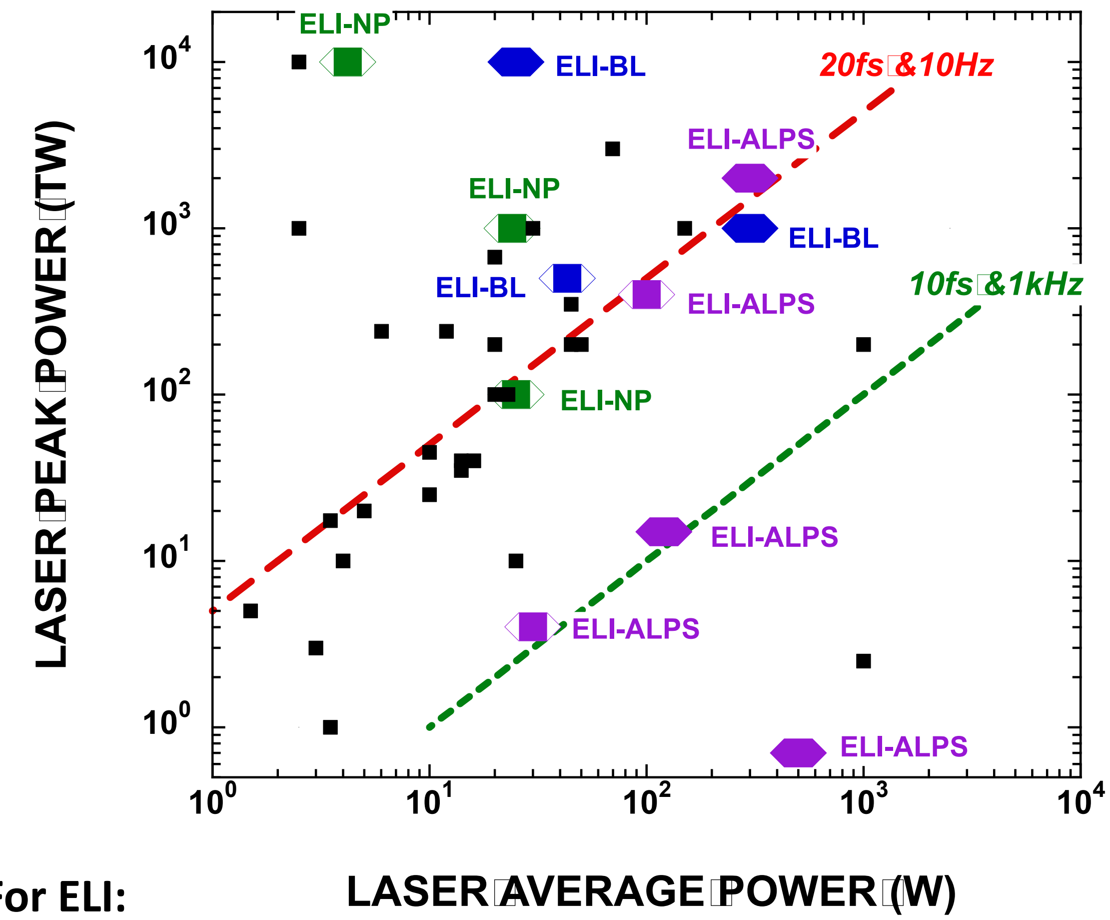


For ELI:

- Full symbol: goal
- Half full symbol: already achieved

Other laser facilities denoted by black squares

ELI's technical standing – now and in the future



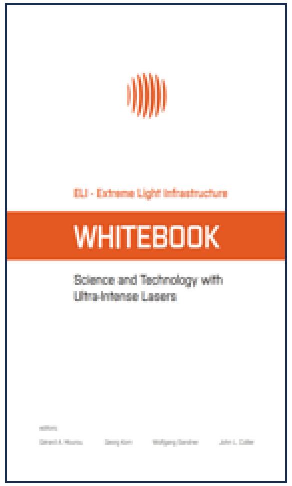
For ELI:
- Full symbol: goal
- Half full symbol: already achieved

Other laser facilities denoted by black squares

A wide range of science with impact

- Medical therapy and imaging
- fs X-ray science for insights into fundamental chemistry, biochemistry and electronics
- Development of ultra-compact sources of particles and photons
- Fundamental studies of high-energy density systems, LIF, approaching NLQED

Complementary developments needed for data and computation facilities and a range of enabling technology (targetry, detectors and diagnostics…) – bringing together expertise across the 3 Facilities



Ultimately revisit the (2011) White Book

The Extreme Light Infrastructure – ELI

Unleashing the power of Laser technology for science and society

Lithuanian Research Community Meeting
Vilnius April 5th 2024

The Extreme Light Infrastructure – ELI

How to access ELI Facilities

Lithuanian Research Community Meeting
Vilnius April 5th 2024

ELI ERIC is Open to the World

A user facility with three access modes

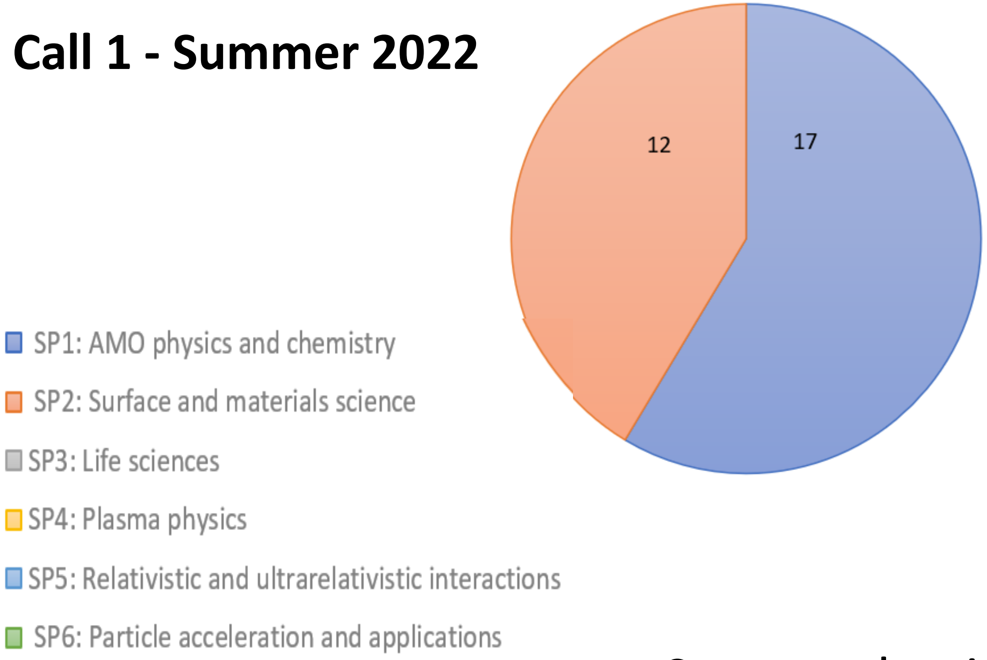
- **Excellence-Based Access** – Evaluation of proposals by international peer-review panels. ***Results of experiments published and open.***
- **Mission-Based Access** – Thematic research granted on the basis of scientific missions pursuing challenges. Proposals reviewed by international panels. ***Results 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.

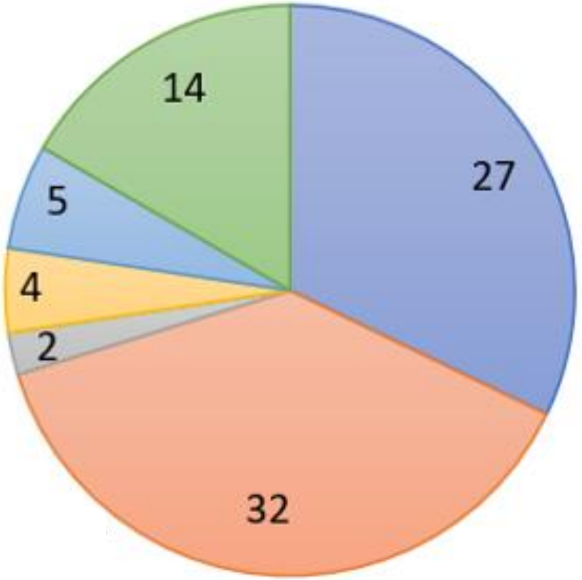
The First 3 ELI User Calls Have 227 Proposals from nearly 800 scientists from 28 Countries

ELI ERIC User Calls - evolution of science areas

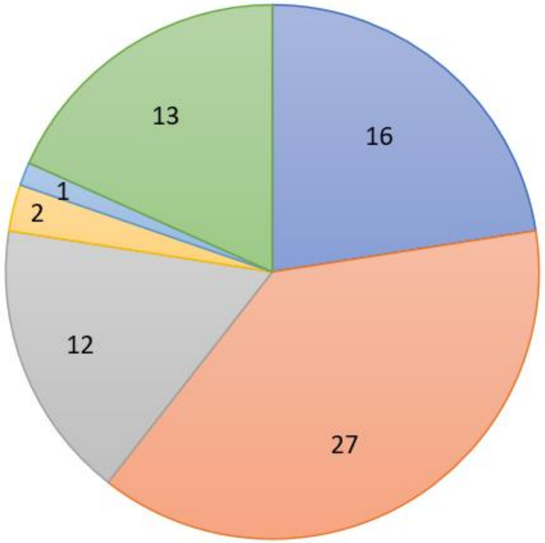
For ELI ERIC - strong increase in ***Life Sciences*** and ***Particle Acceleration Applications*** from the 2nd to 3rd Call, as new accelerator facilities come online

Call 1 - Summer 2022





Call 2 - Spring 2023



Call 3 - Autumn 2023

Some reduction in ***AMO and Chemistry*** and ***Surface and Materials Science*** in 3rd Call due to lower availability of L1 instruments

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4th Joint ELI Call for Users

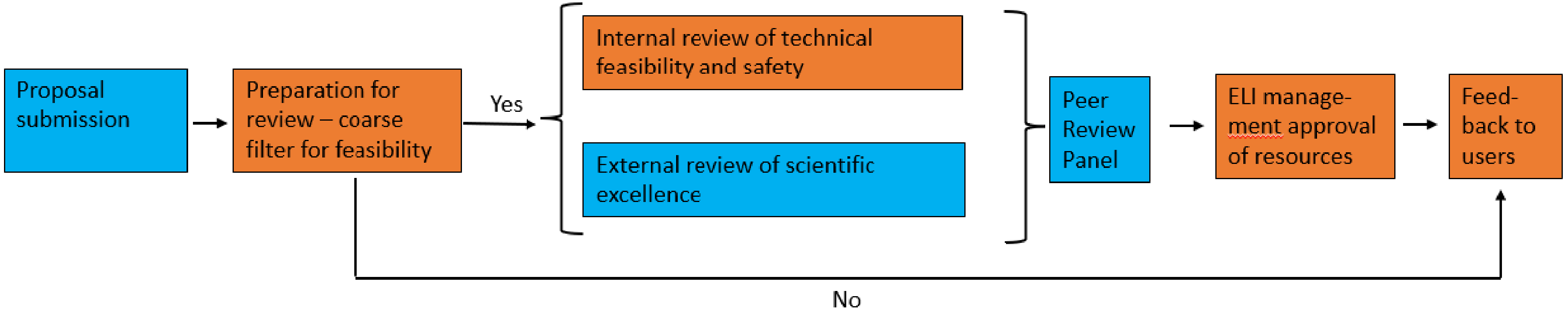
- **ELI Facilities:**
  - **ELI ALPS,** Szeged, Hungary
  - **ELI Beamlines,** Dolní Břežany, Czech Republic
- **4th Call period: 25 March - 29 April 2024**
- **Unique scientific opportunities provided by access to a wide range of 36 complementary instruments**
- **Single point of access** (https://up.eli-laser.eu)
- **Access is free** based on a **peer-reviewed** evaluation of **scientific excellence**
- Contact Integrated **ELI User Office**
  user-office@eli-laser.eu
  or **technical contacts** listed on **User Portal**.

Peer Review Process

- All proposals are assessed internally by the Instrument Responsibles and Safety Experts for feasibility from a technical and safety point of view, indicating resource needed from ELI to enable the experiment to be conducted and how much beamtime is needed

- Proposals are also assessed by an external expert panel to prioritise on the basis of scientific excellence, taking care to avoid conflicts of interest

- Final decision made by ELI Management to ensure sufficient resources are available to support the highest-prioritized proposals



PRP Subpanels and Membership

-

Subpanel	Chair	Proposals [# reviewers]
SP1: AMO physics and chemistry	Majed Chergui	16 [2]
SP2: Surface and materials science	Philippe Delaporte	27 [2]
SP2: Life sciences	Giannis Zacharakis	12 [2]
SP4 + 5: Plasma physics and relativistic and ultrarelativistic interactions	Toma Toncian	3 [All]
SP6: Particle acceleration and applications	Charlotte Palmer	13 [2]

Dates for 4th and 5th User Calls

- There will be two User Calls every year, and two corresponding PRP meetings and allocation periods
- PRP meetings will be held in January (remote) and June (in person) with the latter tied to the User Meeting and the venue alternating between ELI ALPS and ELI Beamlines (for now !).
- For 2024 User Calls please note dates for your diary.

Subpanel	User Call 4	User Call 5
Launch of User Call	March 25th	September 25th
Proposal submission deadline	April 29th	October 29th
PRP meeting	June 24-25th	January 9-10th (2025)
Notification of outcome to users	July 22nd	February 3rd (2025)
Start of scheduled experiments	October 28th	May 5th (2025)
End of scheduled experiments	April 30th (2025)	October 31st (2025)

8th edition of the Joint ELI Summer School 2023

- 120 participants from 24 countries
- 4 day programme
- 32 speakers
- 38 Poster submissions

ELISS 2024

- 2 - 6 September 2024
- Szeged, Hungary
- https://indico.eli-laser.eu/e/ELISS2024

The Extreme Light Infrastructure – ELI

How to access ELI Facilities

Lithuanian Research Community Meeting
Vilnius April 5th 2024