Welcome

Meike Arnold, Industrial Liaison Officer, HFML-FELIX/ESRF/ELI Beamlines

BigScience.NL-Industriemiddag

HFML-FELIX: a national collaboration

NWO

University of Amsterdam

Universiteit Leiden
The Netherlands

TU Delft
Delft University of Technology

university of groningen

UNIVERSITY OF TWENTE.

Utrecht University

Radboud Universiteit

Radboudumc
university medical center

Maastricht University

As the newest of **10 national NWO-I institutes, HFML-FELIX** is part of a large network consisting of **NWO**, **Radboud University, 7 other Dutch universities** and **Radboudumc.**

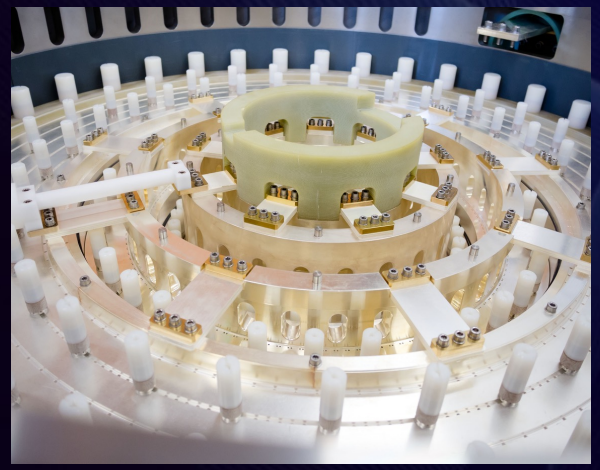
HFML-FELIX: National research infrastructure

Strongest resistive DC-magnets in Europe

+

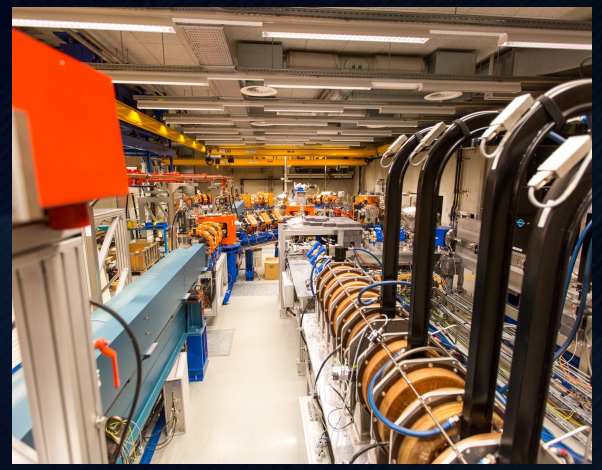
Largest IR/THz wavelength range in one facility

Unique combination of magnets and lasers



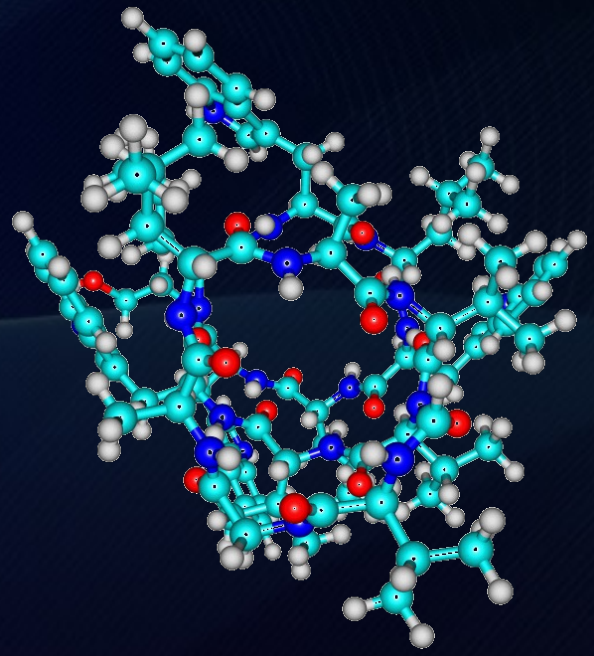
6 magnets with a force-field of 30-38 tesla (45T hybrid magnet in development)

4 free-electron lasers that produce (far) infrared light



A research facility for national and international users,
with a distinguished in-house research and engineering programme.

Material research in extreme conditions

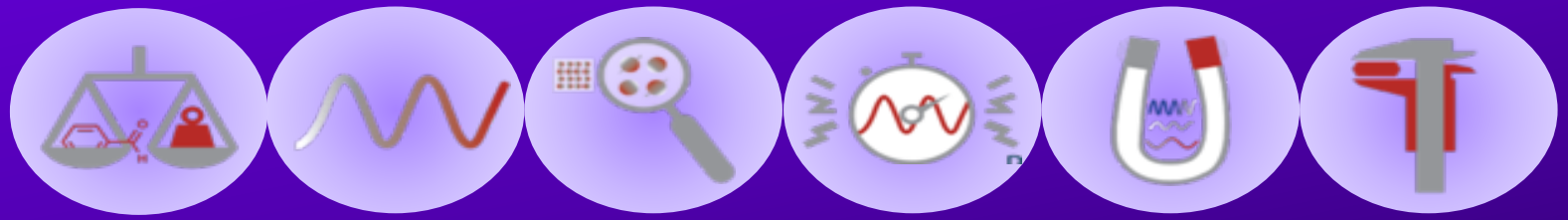


HFML FELIX

Material research in extreme conditions

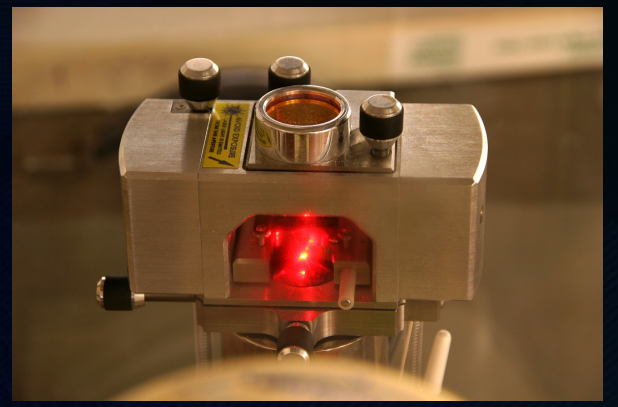
EXTREME CONDITIONS

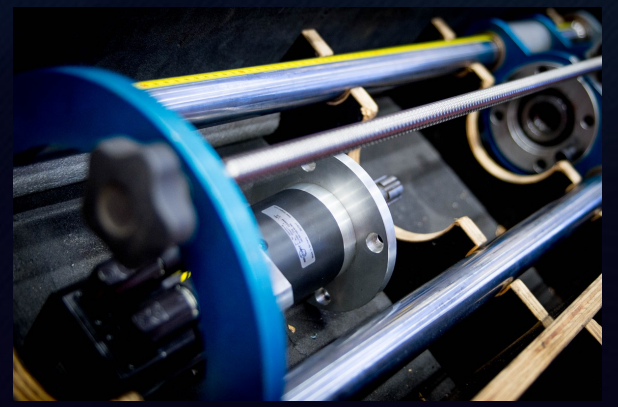
Materials & Molecules



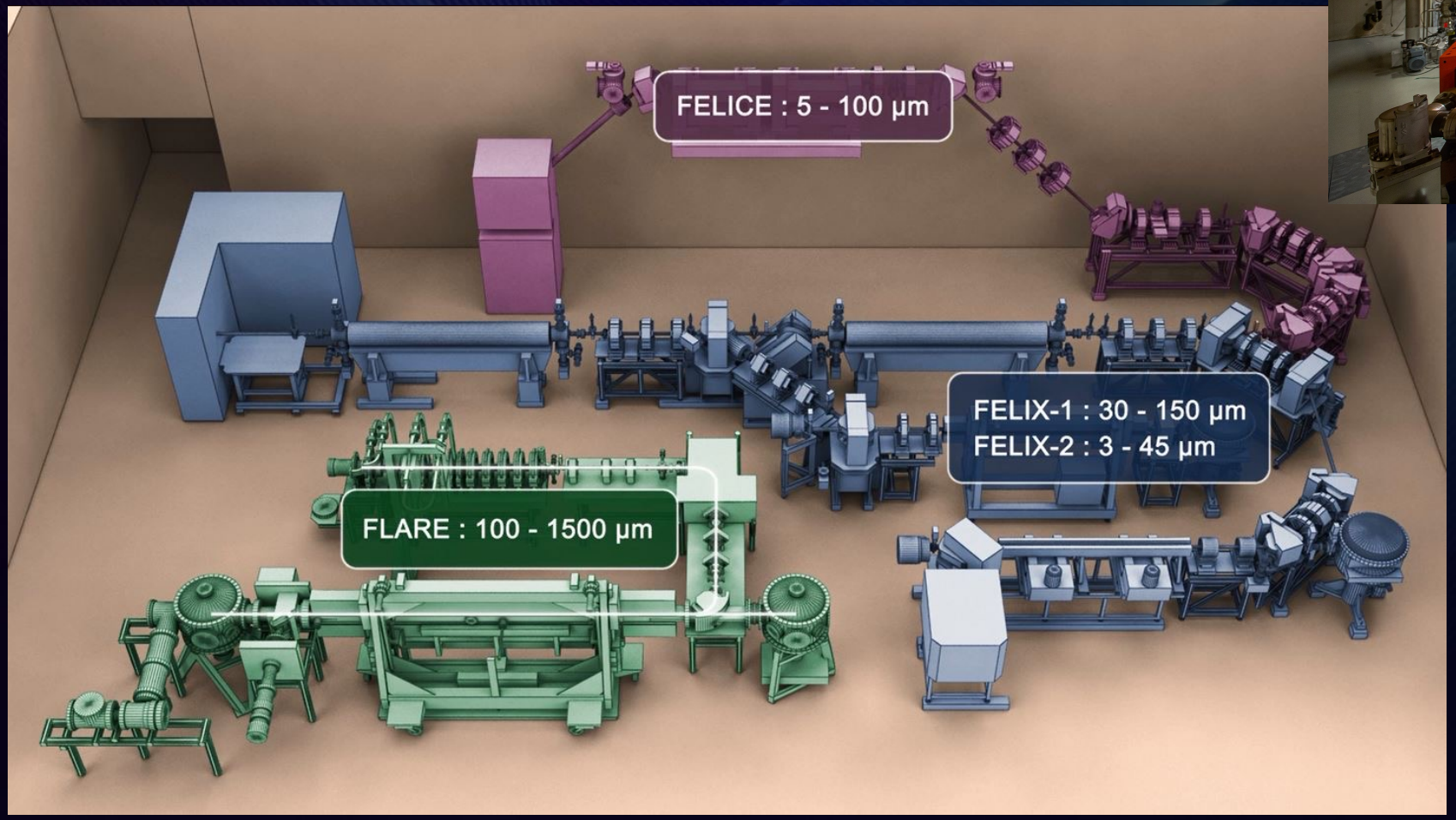
ADVANCED INSTRUMENTATION

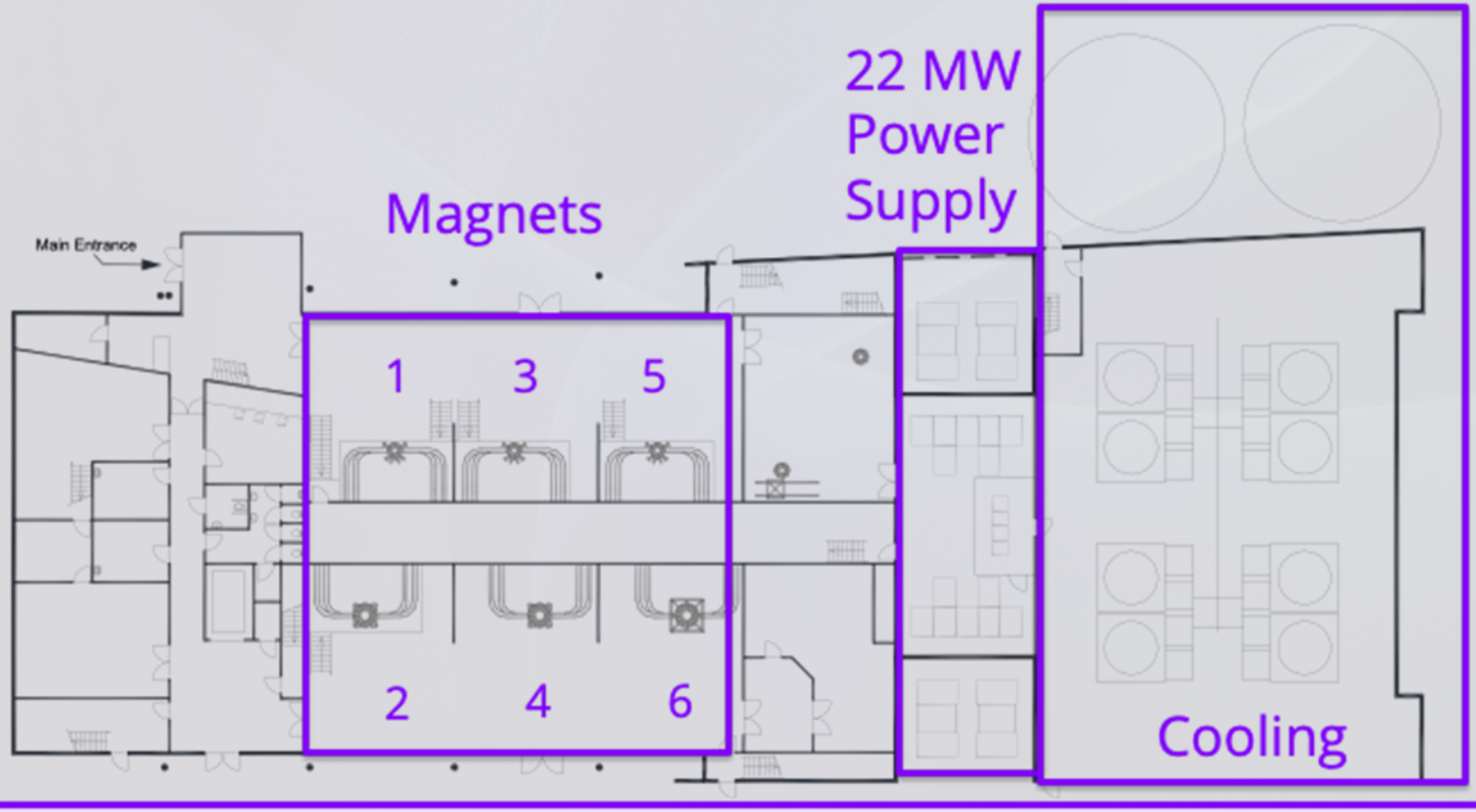
Discovery of new characteristics

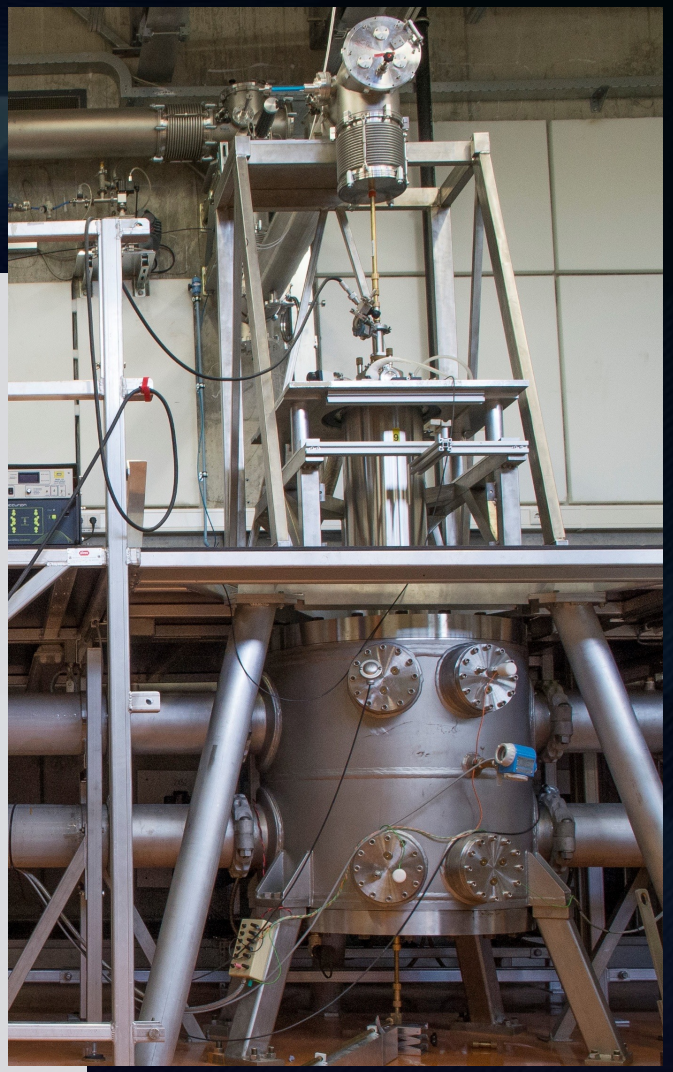




FELIX-Lasers



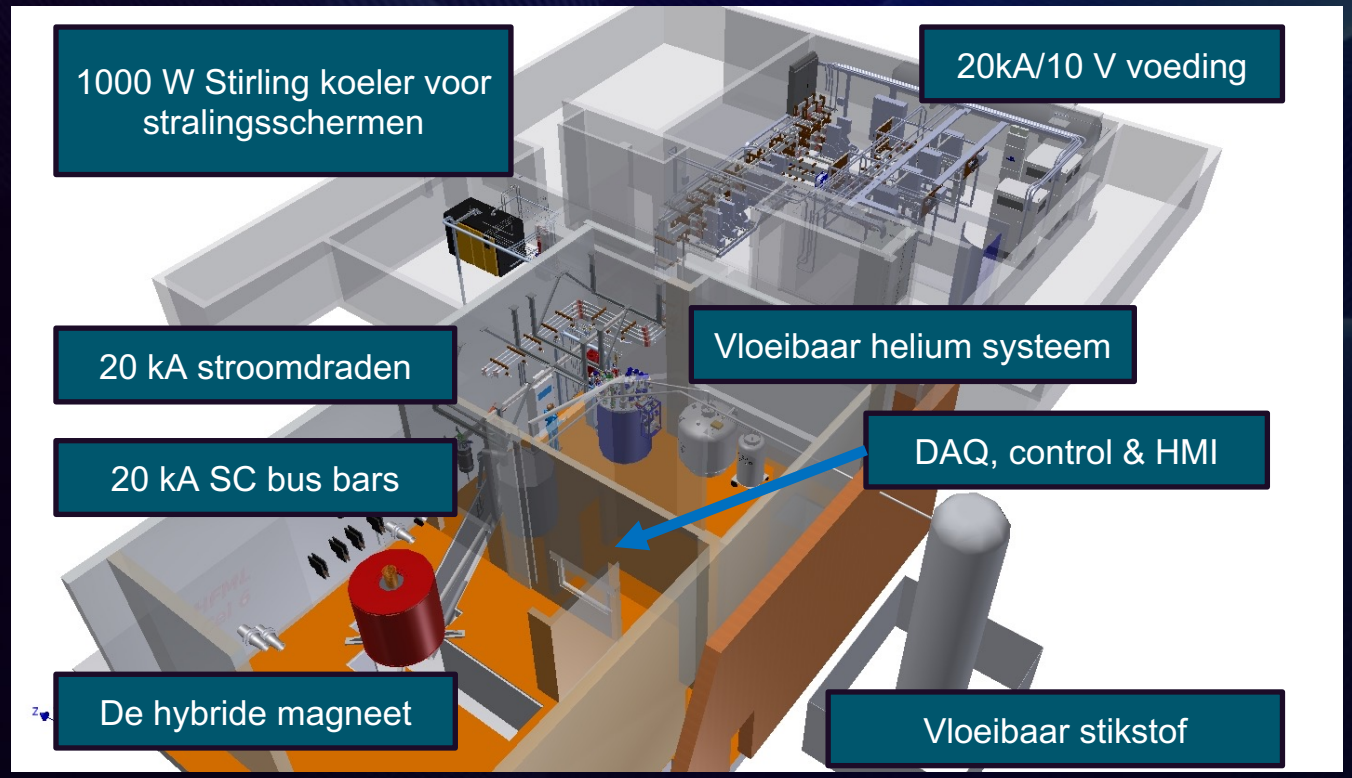


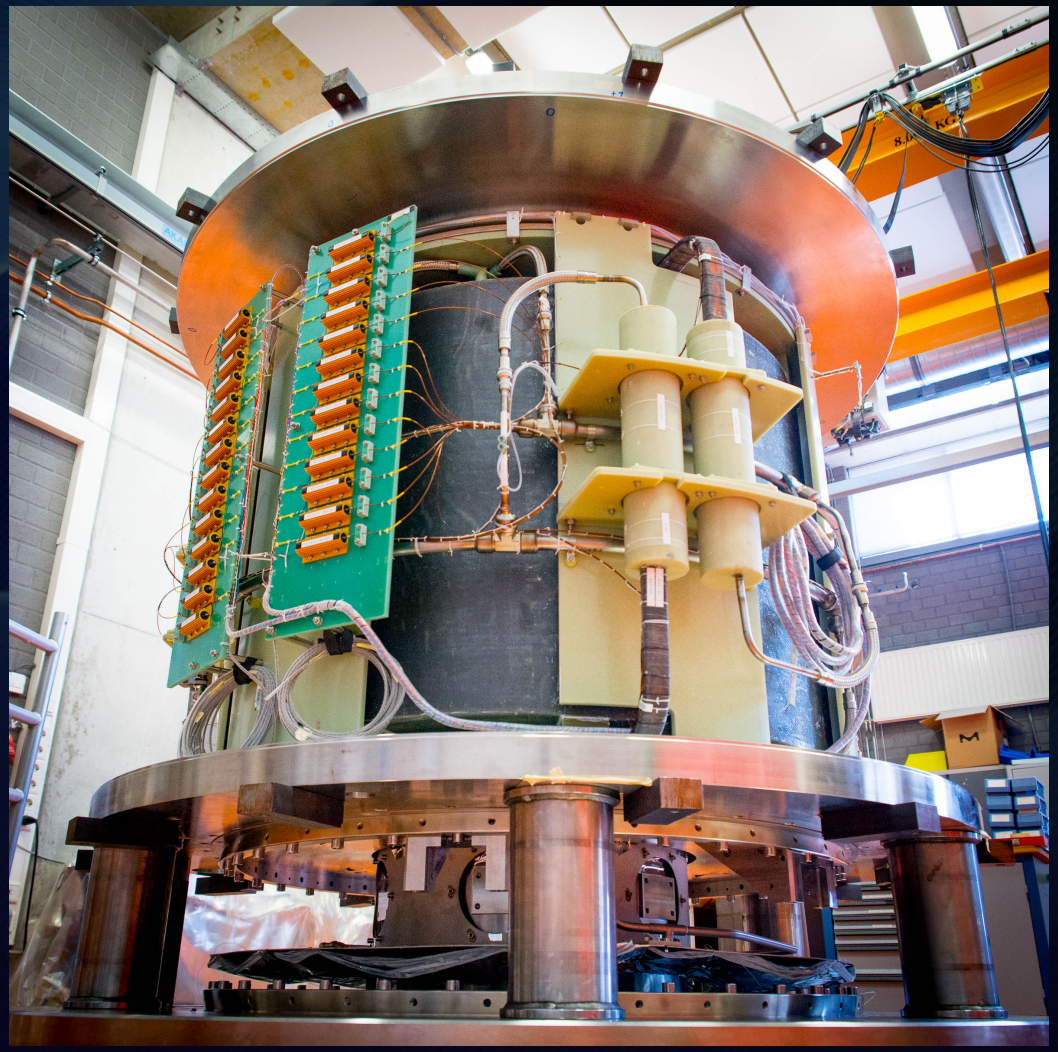


Cell 5

Cell	1	2	3	4	5	6
Magnet	30 T	37.5 T	33 T	38 T	33 T	45 T *
Bore Size	50 mm	32 mm	32 mm	32 mm	32 mm	32 mm

45T-Hybrid magnet

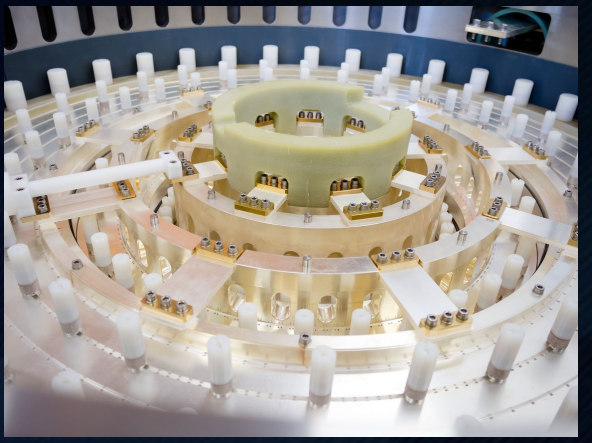




Innovative instruments for advanced spectroscopy in high magnetic fields & with intense infrared/THZ lasers

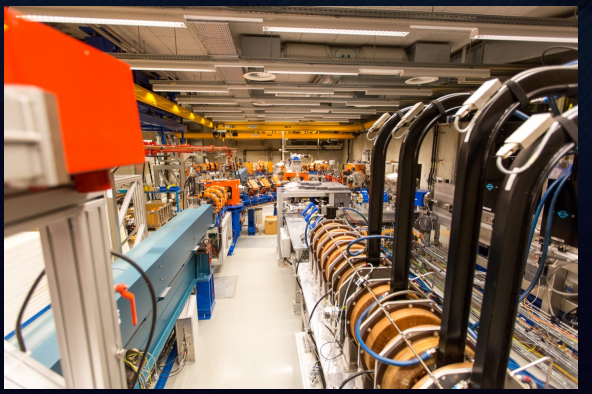
Magnets development program

- 45 Tesla magnet & completing the design of a high gradient-field magnet
- Design of all superconducting and high-temperature-superconductor (HTS) high field magnets



FEL development program

- Increase robustness and versatility of current set of lasers
- Novel accelerating schemes based on beam and laser-techniques.



Expanding experimental setup to operando spectroscopy & imaging

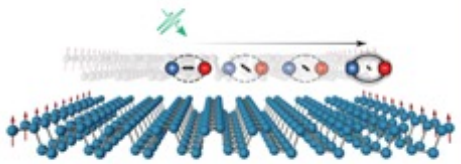
- Dynamic Processes under in situ conditions and in real time
- Real-time monitoring of chemical reactions and structural transformations
- Device functionality based on particle flow (incl. charge transport)

Distiguished inhouse research defined by the research lines

1. Mapping and manipulating quantum phases of matter
2. Molecular structure identification and reactivity in infrared
3. Dynamic self-organization in soft molecular matter
4. Non-equilibrium phases of matter
5. Innovative instruments for advanced Spectroscopy

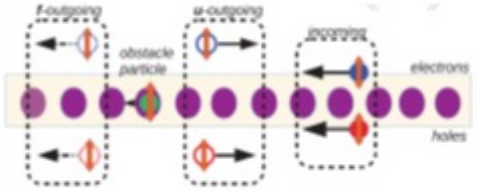
Recent research-topics

Nanoribbons



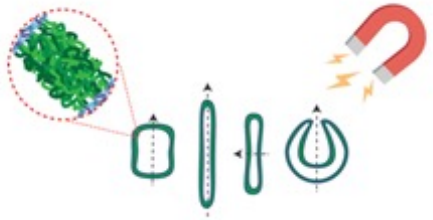
Nature **639**, 8054 (2025)

Superconductivity



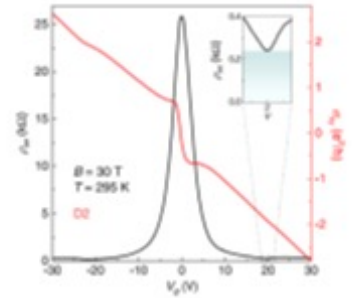
Science **382**, 792 (2024)

Polymer Nanocapsules



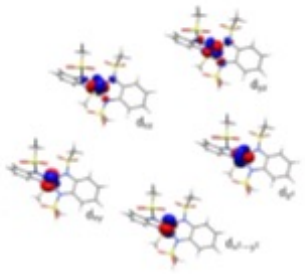
Soft Matter **20**, 730 (2024)

Graphene



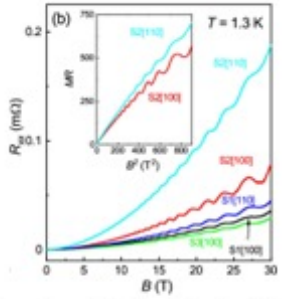
Nature Comm. **14**, 318 (2023)

Molecular Magnets



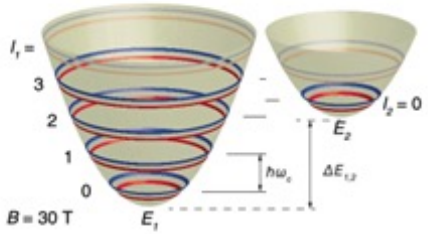
Nature Comm. **16**, 2157 (2025)

Topology



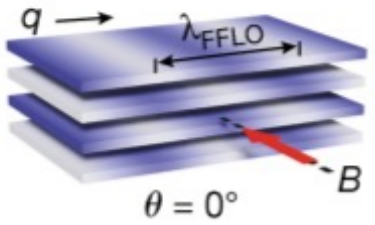
NPJ Quantum Materials **9**, 63 (2024)

Quantum Hall Effect



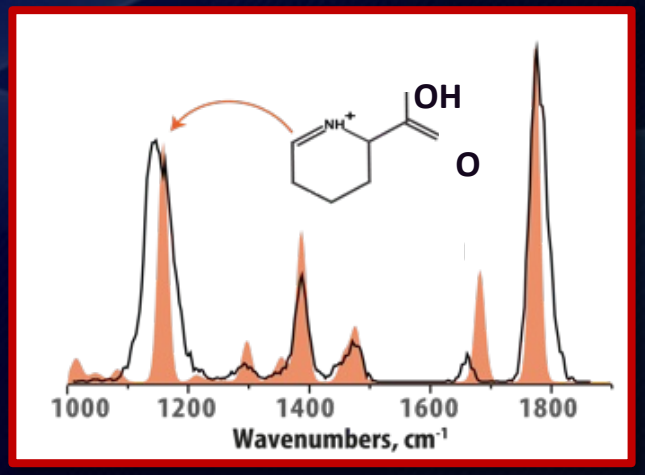
Nature Comm. **15**, 10052 (2024)

Superconductivity



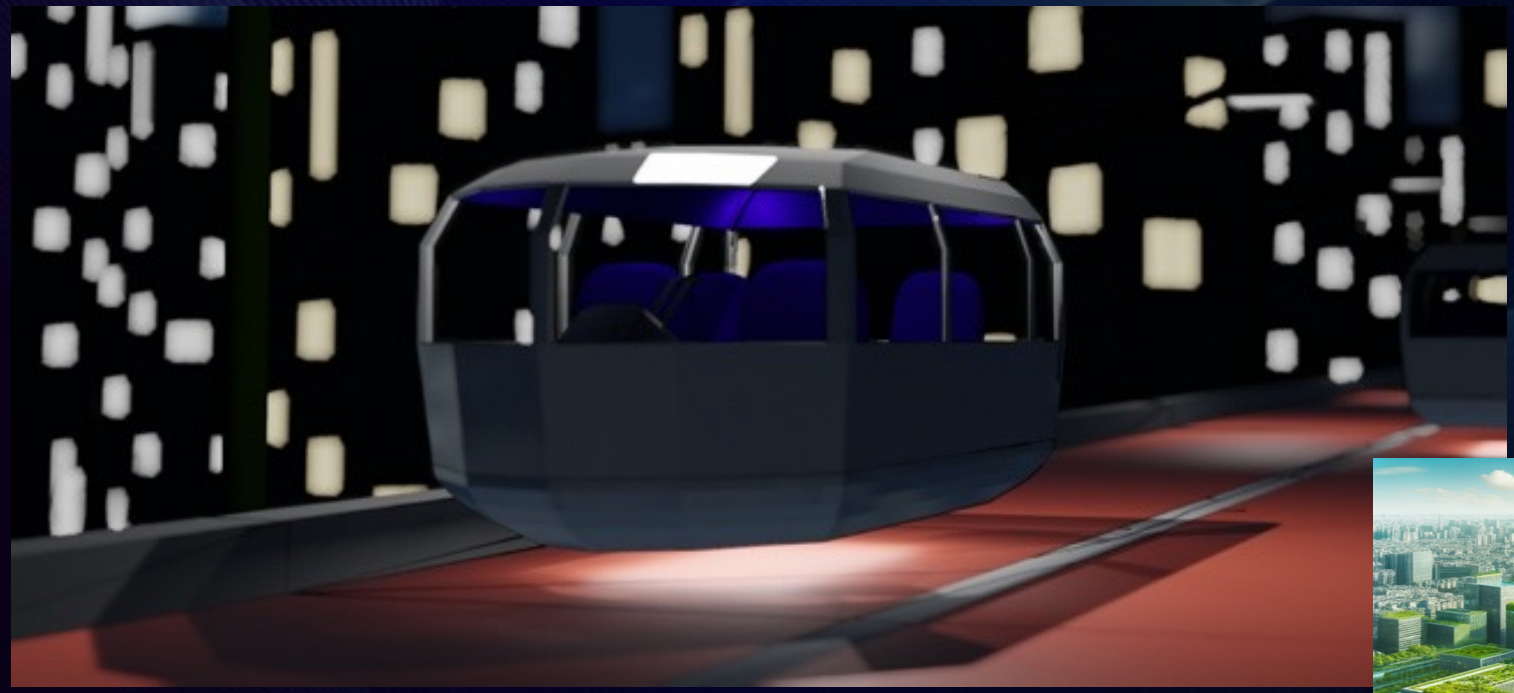
Nature **619**, 7968 (2023)

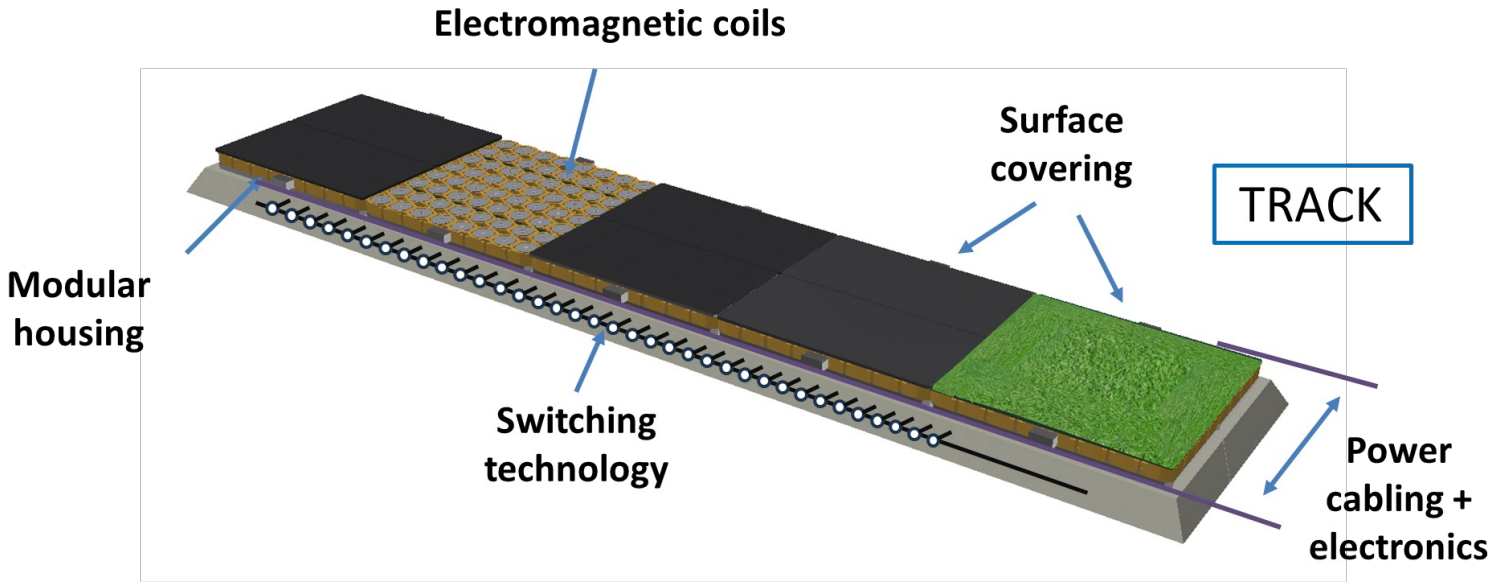
Identification of biomarkers of metabolic diseases

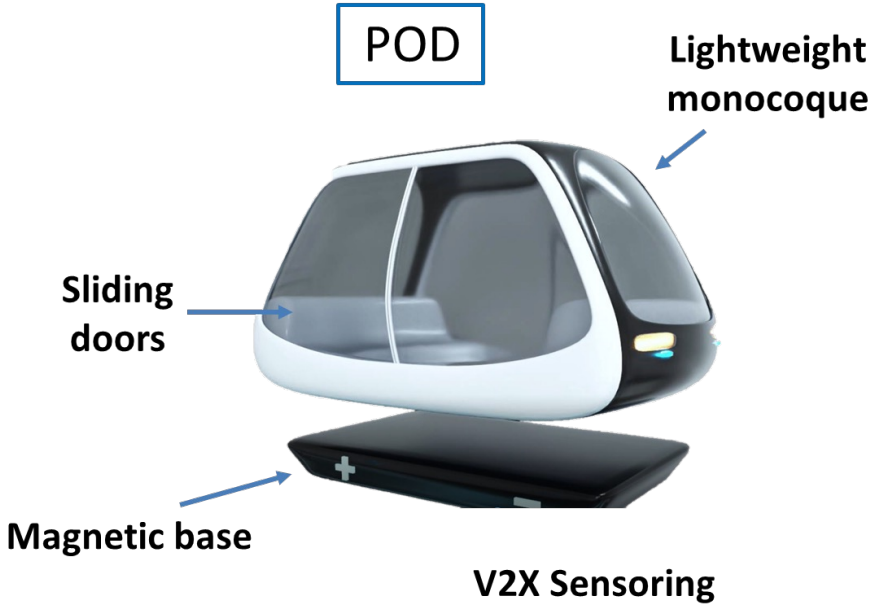


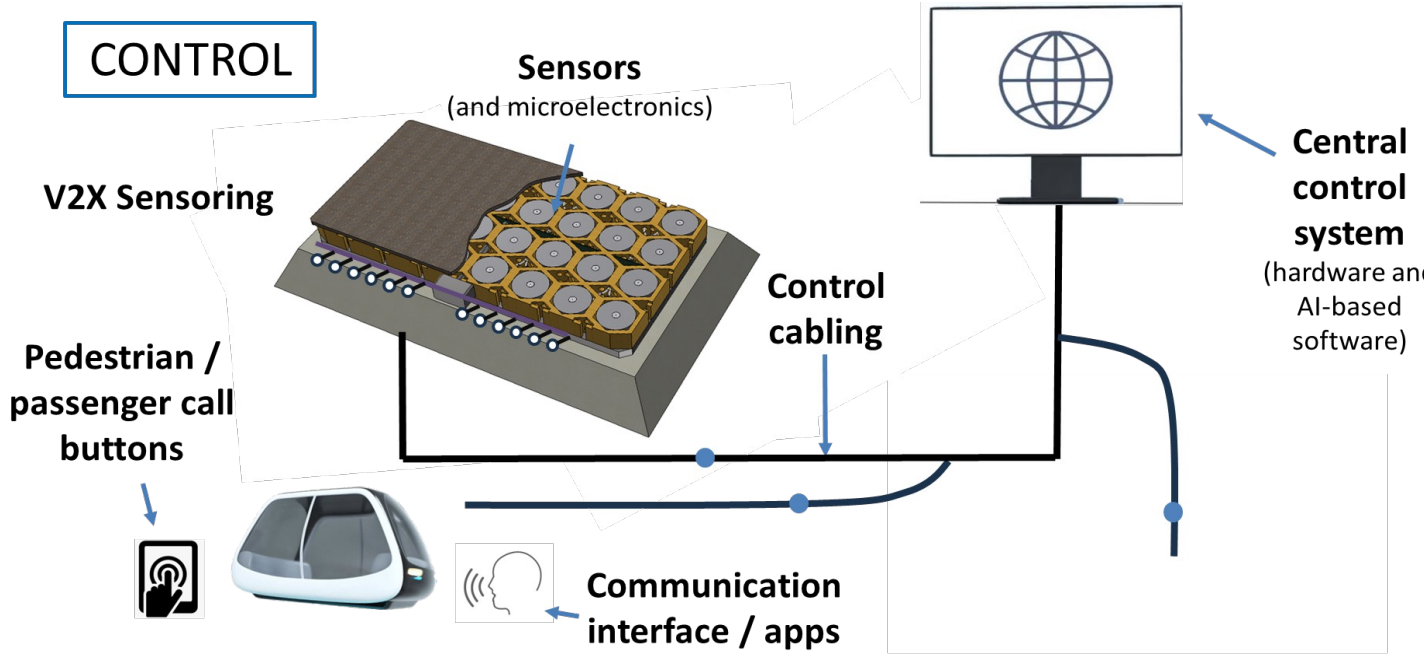
Biomarker identification

NIFTI - National Individual Floating Transport Infrastructure




Electromagnetic coils
Surface covering
TRACK
Modular housing
Switching technology
Power cabling + electronics

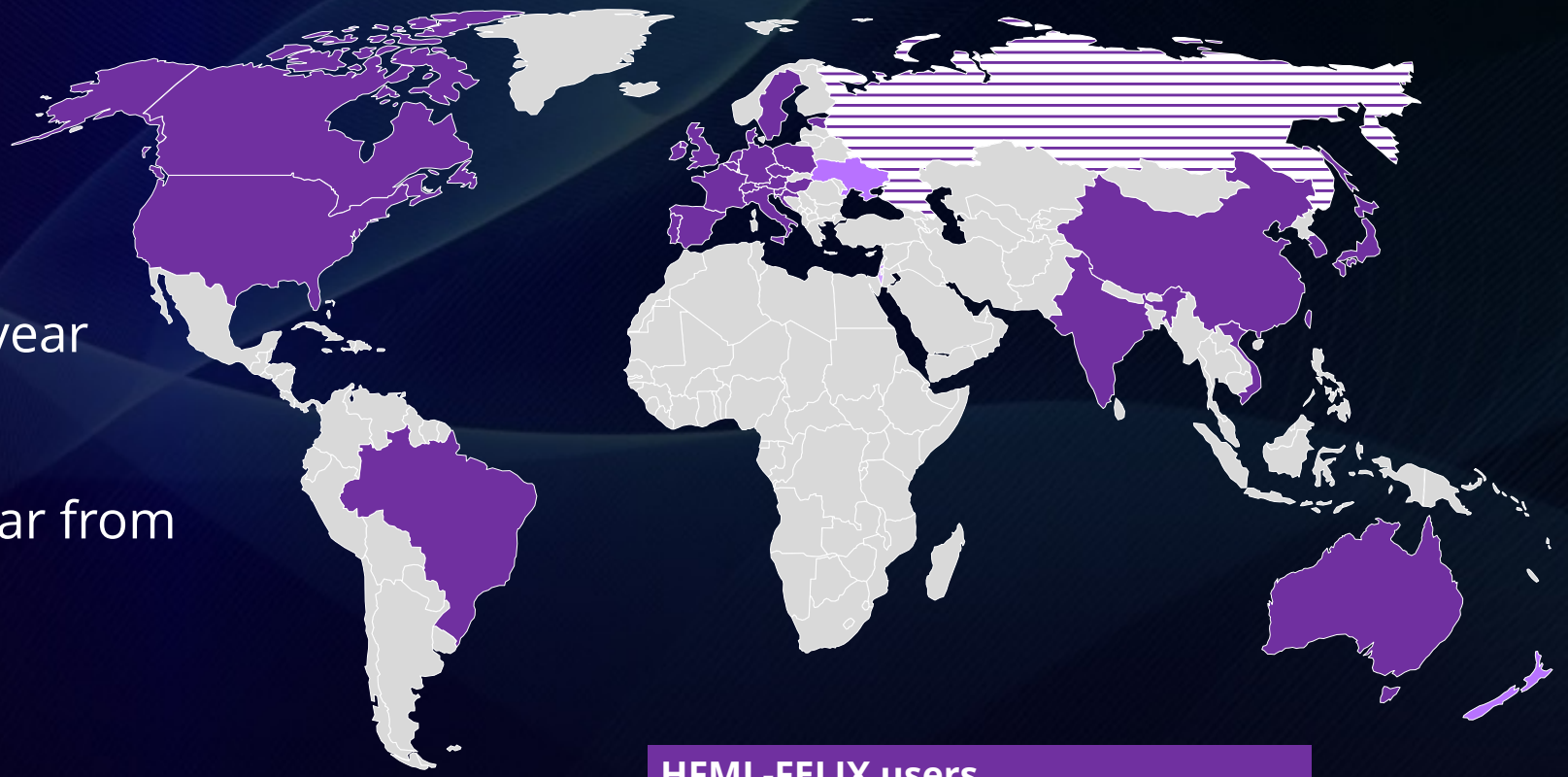

POD
Lightweight monocoque
Sliding doors
Magnetic base
V2X Sensoring


CONTROL
Sensors
(and microelectronics)
V2X Sensoring
Control cabling
Central control system
(hardware and AI-based software)
Pedestrian / passenger call buttons
Communication interface / apps

Open to national and international users

- 6 research groups
- 2 technical groups
- > 80 publications/year

- Up to 3000 magnet hours/year
- Up to 6000 FEL hours/year
- > 150 projects/year
- > 400 guest researchers/year from over 25 countries



HFML-FELIX users	
The Netherlands	38%
EU	44%
Other	18%

2 calls for proposals/year
FELs & combi: www.hfml-felix.nl
Magnets: via EMFL (www.emfl.eu)

Industry collaboration

Industrial research at HFML-FELIX

- Application with scientific proposal at one of the two deadlines (15 May and 15 November)
- Publication of the results in open-access scientific literature and presented at scientific conferences and meetings.
- Paid commercial access without publication is possible on request.

Examples of industrial research conducted at HFML-FELIX

Public Private Partnership

- Holland HighTech: Accelerating Molecular Identification with Advanced Infrared Ion Spectroscopy (starting in 2026)
- Health~Holland-MKB: Biomarker identification platform for metabolic diseases (starting in 2026)

Visit us during the BSBF Friday excursions!

Excursion 7

HFML-FELIX – Nijmegen (NL)

The **High Field Magnet Laboratory (HFML)** designs some of the world's **highest-field magnets**, providing scientists with the tools to explore the properties and functionality of molecules and materials. Together with the **FELIX infrared/terahertz free-electron lasers**, these instruments enable researchers to achieve fundamental scientific breakthroughs and address societal challenges in areas such as **health**, **energy**, and **smart materials**.

HFML-FELIX combines a strong in-house research programme with a **user facility** model, offering the international scientific community access to **cutting-edge instrumentation** for experiments that push the boundaries of science.

Practical information

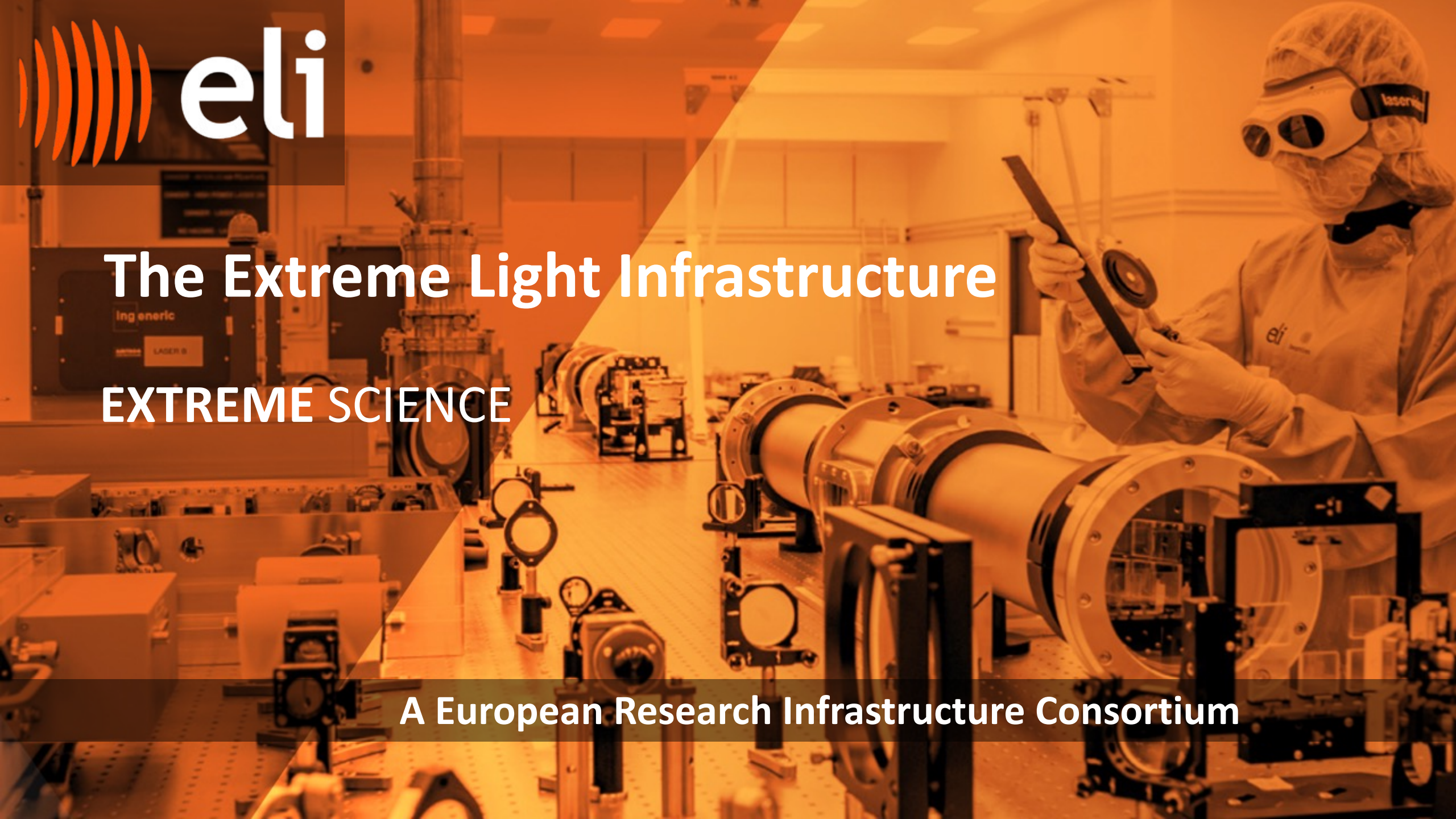
- **Travel duration:** approx. 2 hours (Maastricht – Nijmegen)
- **Departure from Maastricht Central Station:** 07:45 (specific pick-up location to be determined)
- **Arrival at location:** approx. 09:45
- **Start of programme:** 10:00
- **End of programme:** approx. 11:30
- **Lunch:** to be determined
- **Departure from location:** 12:30
- **Arrival at Maastricht Central Station:** approx. 14:30

Friday excursions - BSBF2026

ESRF – European Synchrotron Radiation Facility

BSBF2026 – BSO hosted vitit at ESRF: 4 May 2026

Registration opens soon: BSO hosted visits - BSBF2026



The Extreme Light Infrastructure

EXTREME SCIENCE

A European Research Infrastructure Consortium

ELI ERIC – The World´s Largest Laser Infrastructure

ELI is the world's largest and most advanced **high-power laser infrastructure** and a global technology and innovation leader in **high-power, high-intensity, and short-pulsed laser systems**.

The **international laser user facility** ELI accommodates some of the most intense lasers in the world. ELI's lasers produce ultra-short pulses of high energy **photons, electrons, protons, neutrons, muons and neutrinos in the (sub-)attosecond regimes** on demand.

ELI ERIC IN DATA

Legal status: European Reasearch Infrastructure Consortium (ERIC)

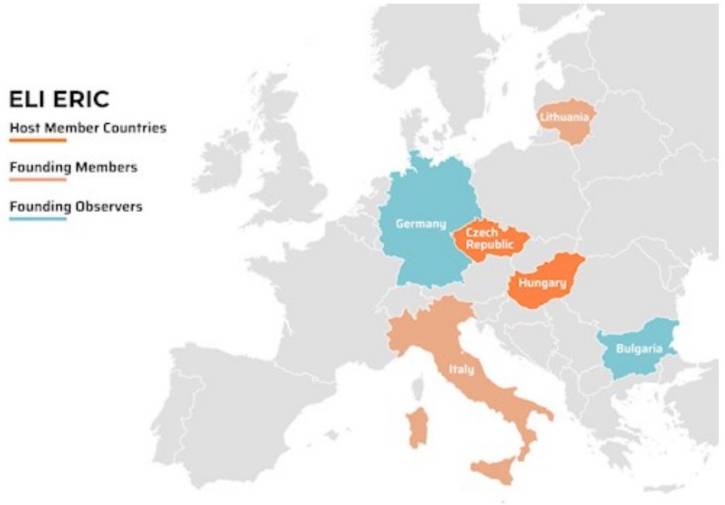
Established: 2021

Founding members: Czech republic, Hungary, Italy, Lithuania, Bulgaria

Founding observes: Germany, Romania

Statutory seat: ELI Beamlines facility, Dolní Břežany, Czech Republic

Staff members: 604 (48 nationalities)



Technological innovations

ELI ERIC operates two major facilities:

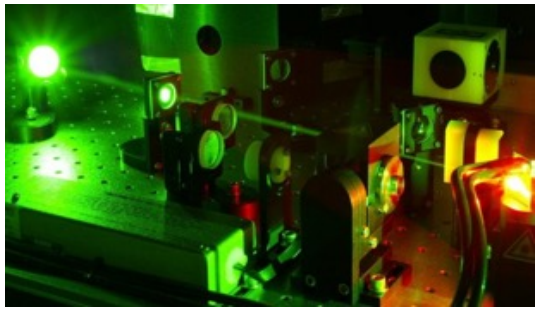
ELI Beamlines (Czech Republic): Focus on particle acceleration, plasma physics and structural dynamics using PW lasers.

ELI Alps (Hungary): Focus on attosecond physics, investigating ultrafast dynamics on the atomic scale

Introduction to ELI ERIC

- ELI ERIC is specializing in **ultra-intense and ultra-short laser pulses**
- ELI ERIC supports both academic and industrial users, offering **open access** to unique laser systems and experimental capabilities.
- Our mission is to enable **world-class research**, promote **technological innovation**, and support **real-world applications** in science and industry.

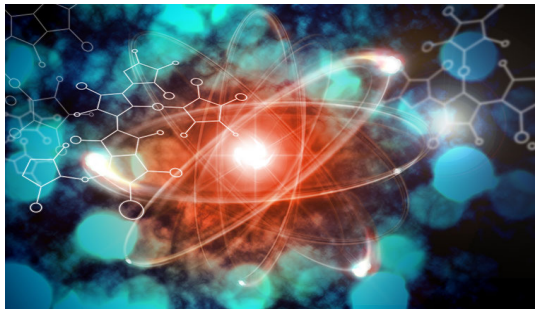
ELI Science Case



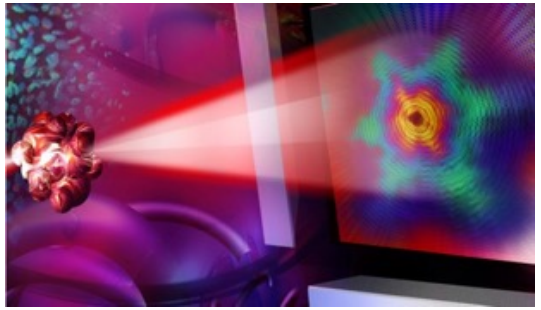
Laser research

Soft to hard x-rays

Particle Acceleration
250 MeV Ions, 10 GeV e^-

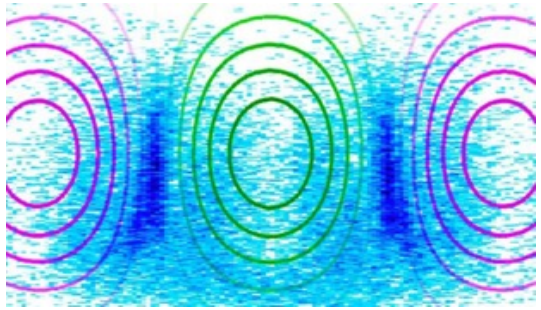


Nuclear Physics and Photonics

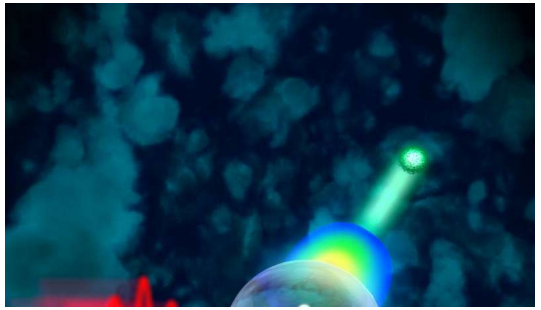


Material Science and Biology

Plasma Physics and High Energy Density, Astrophysics



Ultra High Intensity Interactions
High-field physics and theory



Ultrafast, attosecond dynamics

Collaboration Opportunities

1. Suppliers

- Seeking new suppliers to support scientific and operational needs
- Expanding collaboration with existing suppliers for advanced services and solutions

2. Innovation Partners

- Joint development of research and innovation projects
- Participation in collaborative R&D initiatives

3. Contract Research Clients

- High-precision measurements
- Scientific and engineering calculations
- Feasibility studies
- Licensing of ELI-developed technologies

Technology development areas at ELI

Vacuum systems & components

- Prevac, X-ray Project (PL)
- Fantini, Alca (IT)
- VAT (CH)
- AVS (ES)
- Hositrad (NL)
- Vakuum Praha, Streicher (CZ)

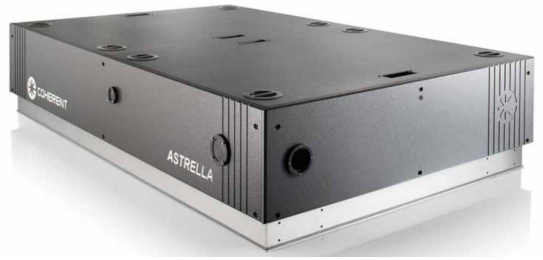
Optics & Photonics

- VIGO, Lambda (PL)
- INFN (IT)
- FEI (NL)
- Crytur, Nuvia (CZ)

Detectors, Sensors, Cameras

- Onefive, PSI (CH)
- Holland Shielding Systems (NL)
- Sphere (ES, PT)
- Delong Instruments (CZ)

Ultrafast electronics, Oscillators



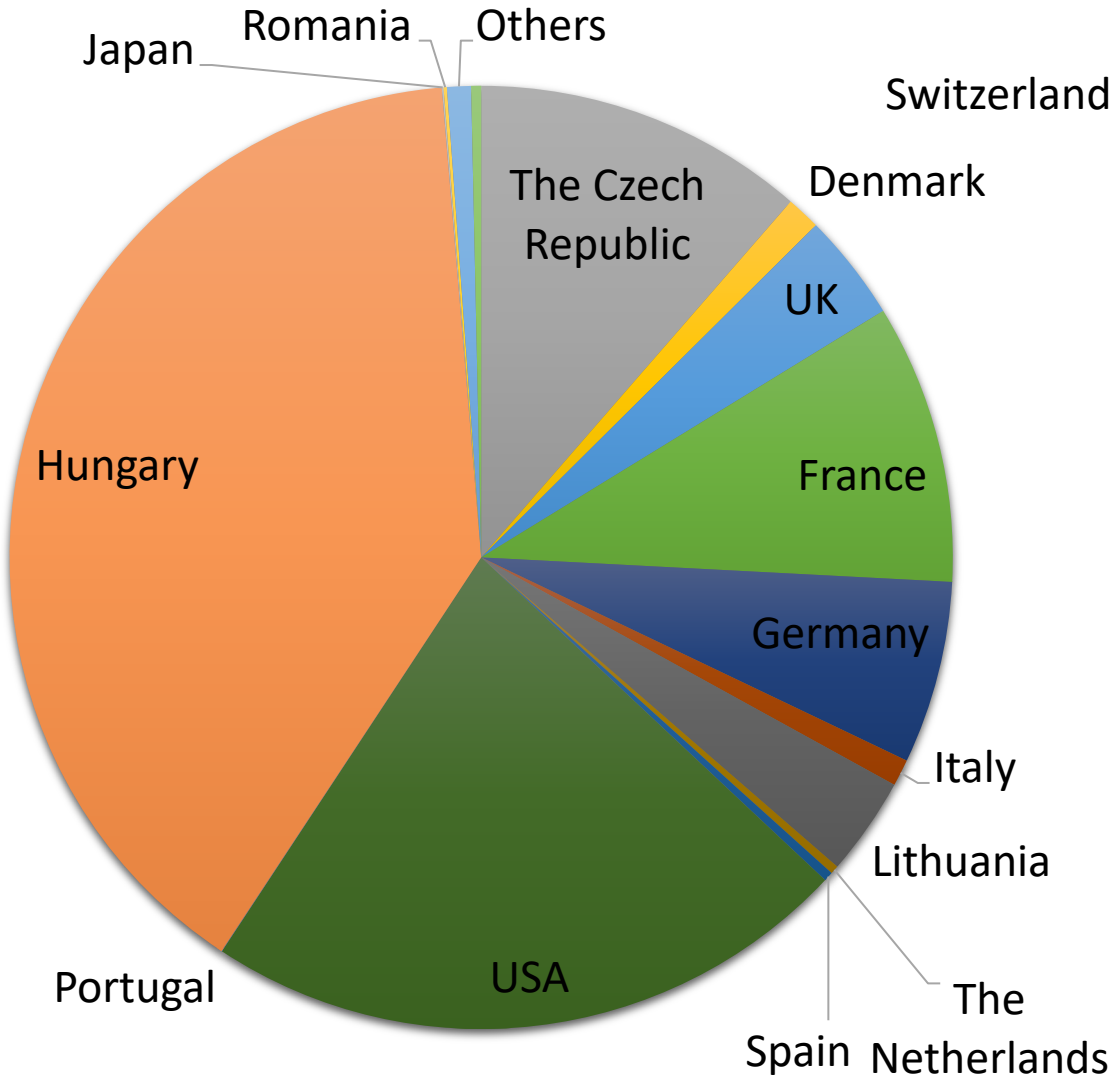
- Creotech, CRI Jolanta (PL)
- Holland Shielding Systems (NL)
- Ateko (CZ)
- Seven (ES)

Overview of existing suppliers to ELI

Contracted value of supplies in 2012 – 2022

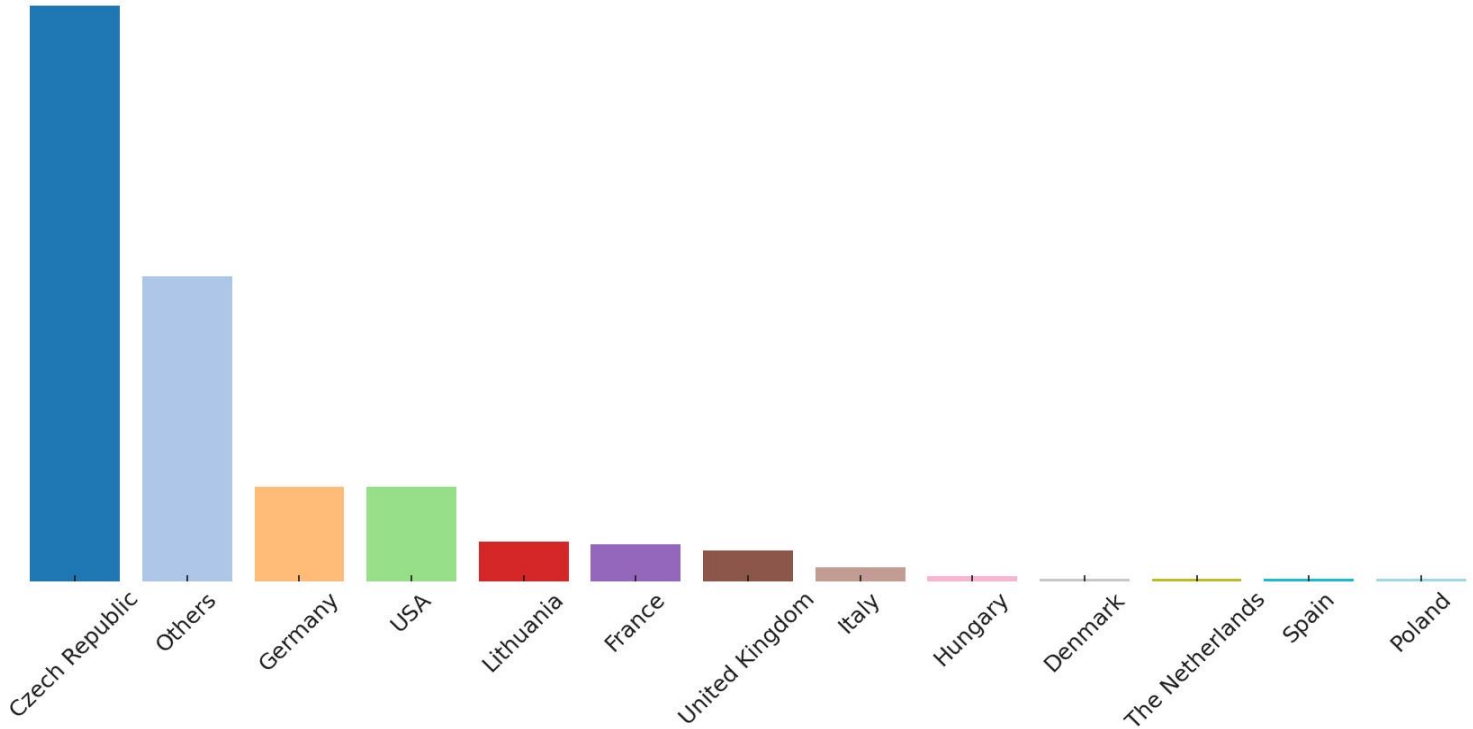
- Total investment **580 million EUR**
- Investment in technologies and instrumentations **415 million EUR**

Country	Contracted value m EUR
Czech Republic	**42.7**
Denmark	4.8
United Kingdom	15.3
France	39.8
Germany	26
Italy	**3.8**
Lithuania	14
The Netherlands	**1.2**
Spain	**1.4**
Portugal	**0.06**
USA	92.4
Poland	**0.8**
Hungary	**163.5**
Japan	0.2
Romania	0.5
Switzerland	**1.4**
Others	3.4
TOTAL	**415**



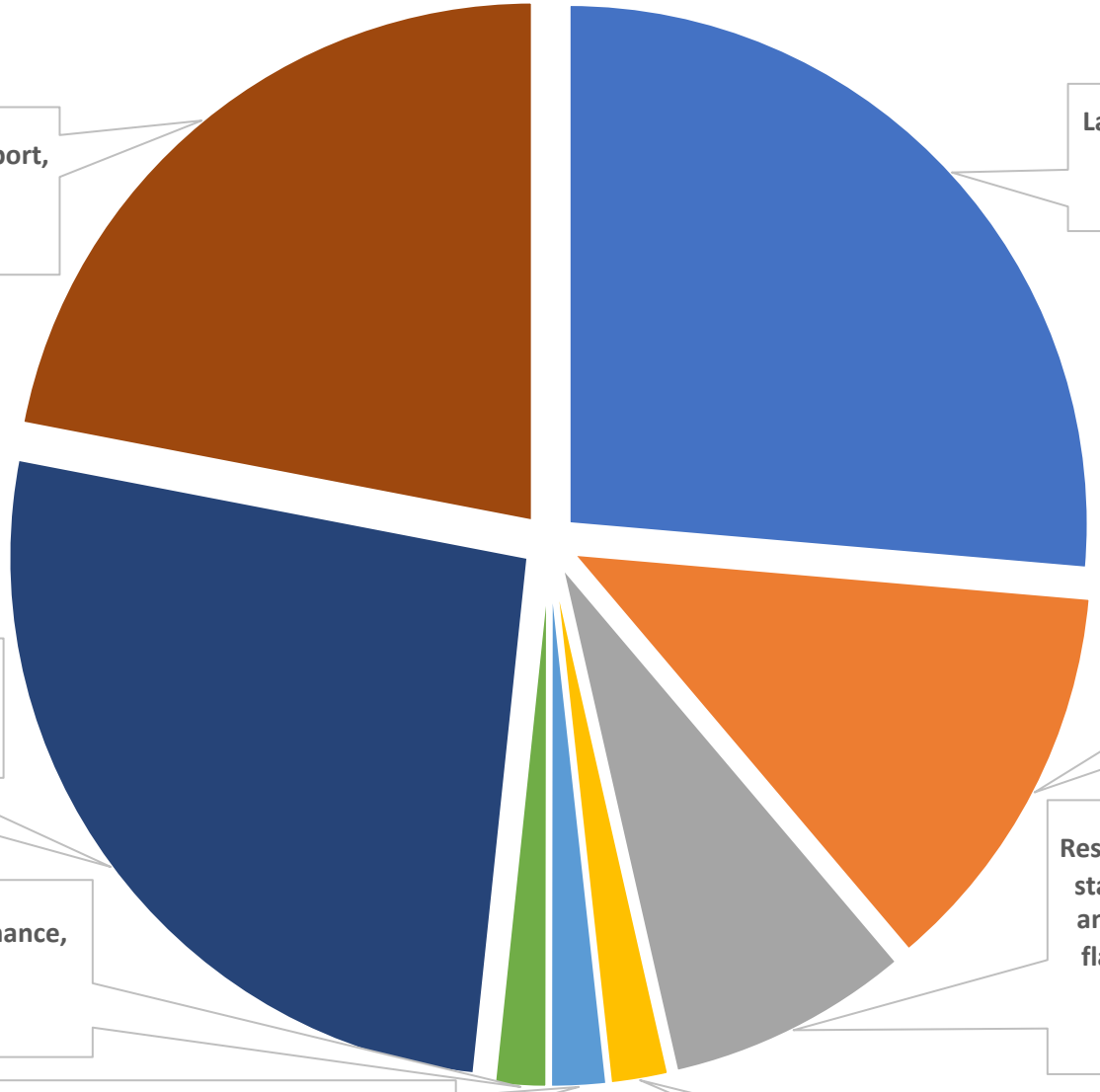
Overview of existing suppliers to ELI Beamlines

Contracted value of supplies in 2023 and 2024



Country	Contracted value m EUR
Czech Republic	**20.0**
Denmark	0.1
United Kingdom	1.1
France	1.3
Germany	3.3
Italy	**0.5**
Lithuania	**1.4**
The Netherlands	**0.1**
Spain	**0.1**
Portugal	**0.02**
USA	3.3
Poland	**0.1**
Hungary	**0.2**
Japan	0.04
Romania	0.001
Switzerland	**0.01**
Others	**10.6**
TOTAL	**42,171**

Strategic procurement areas



Facility - construction works for beam transport, liquid nitrogen duct, cooling unit
22%

Laser systems - mirrors, crystals, laser windows, actuators, oscillators
26%

Laser beam transport - mirror substrates coating, mounts and breadboards, actuator controls, beam dumps, vacuum motors, valves
12%

Research programmes - opto-mechanics and motion stages, sample delivery systems, imaging cameras and photon spectrometers, off-axis parabolic and flat mirrors, data acquisition, master electronics, VUV optics
8%

Coating lab - ion sources
2%

Safety - radiation shielding, passive dosimetry
2%

Workshops, labs - total productive maintenance, vacuum pumps
2%

ICT- computers, licences, service, maintenance
26%

Overview of planning investments 2024-2029 (in KEUR)

Cost category Users Programme	ELI ERIC					
(kEUR)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Instruments and Technology	22 356	12 651	12 777	12 905	13 034	13 165
Infrastructure	20 597	12 739	12 866	12 995	13 125	13 256
External Services and Specific costs	2 983	2 204	2 257	2 312	2 367	2 425
Rolling Investments/Projects	0	8 700	7 500	7 685	7 875	8 069
Cost category Users Programme	ELI BEAMLINES					
(kEUR)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Instruments and Technology	13 672	6 823	6 891	6 960	7 030	7 100
Infrastructure	8 297	6 449	6 513	6 579	6 644	6 711
External Services and Specific costs	771	1 297	1 323	1 349	1 376	1 404
Rolling Investments/Projects	0	6 500	4 000	4 080	4 162	4 245
Cost category Users Programme	ELI ALPS					
(kEUR)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Instruments and Technology	8 684	5 828	5 886	5 945	6 004	6 065
Infrastructure	12 300	6 290	6 353	6 416	6 481	6 545
External Services and Specific costs	2 212	907	934	962	991	1 021
Rolling Investments/Projects	0	2 200	3 500	3 605	3 713	3 825

Categories of supplies with low number of spare parts suppliers

- Optics and opto-mechanics components
- Optics coating
- Detectors
- Electronics
- Data infrastructure
- Cyber security infrastructure
- Vacuum infrastructure
  - Vessels, valves, bellows

ELI tender process and procurement rules

Financial limits

3 financial limits >> increasing formalization of the procurement process

- Contracts **below EUR 25 000**: procurement rules don´t require formalised process, proper level of competition
- Contracts **between EUR 25 000 and 200 000**: simplified open or restricted procedure
- Contracts **above EUR 200 000**: more formalized procedures resembling the EU procurement law

EUR 25 000 – 200 000

2 types of procedure available:

A) Open procedure = Request for Quotations published on ELI ERIC web / certified on-line tool

B) Procedure without publication = At least 3 suppliers invited to bid without publication

- Deadline: typically 10 calendar days
- Tenders submission: paper envelopes/ on-line electronic

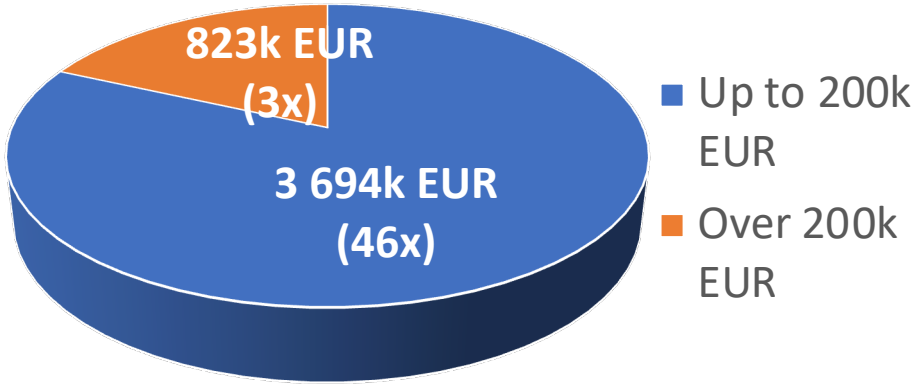
Above EUR 200 000

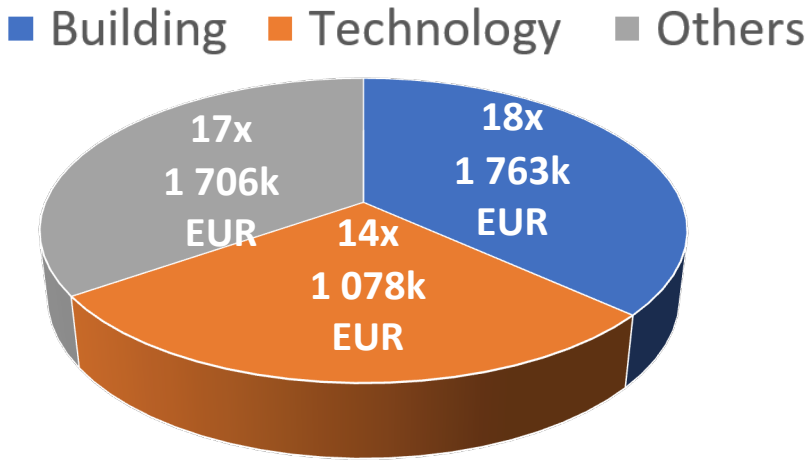
Basic option: **Open procedure** = Call for Tenders published on ELI ERIC web

Other procedures in specific cases: Competitive dialogue, Innovation partnership, Procedure with direct negotiations

- Deadline: 30 calendar days (20 if preliminary notice)
- Tenders submission: paper envelopes / on-line electronic

2024 concluded contracts by price and subject type





Procurement Opportunities

ELI ERIC | Ongoing and Finished Procurements

Thank you

Questions?

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