LEAPS League of European Accelerator-based Photon Sources

Vision 21st century
„LEAPS benefits all EU researcher “

Helmut Dosch

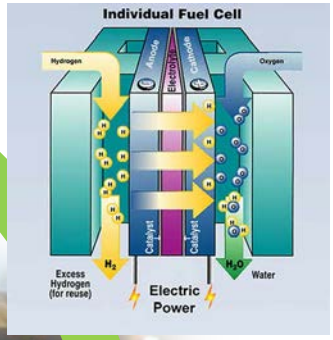
LEAPS 2nd Plenary Meeting, Session III

PSI, Switzerland, November 18-20, 2019

21st Century - Era of Complexity

Aerospace Technologies

Energy Technologies



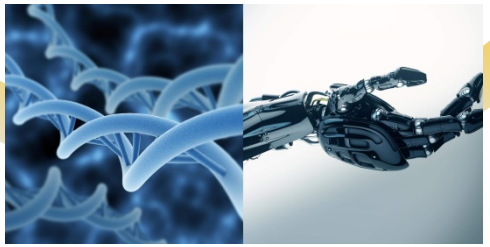
Materials
Made to Measure

Climate change
Quantum technologies

Digital Future **EOSC**

IT Technologies

Biomedical Technologies



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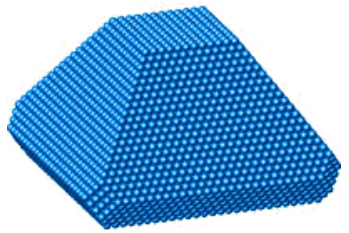
Challenges and Opportunities for Europe

"When the going gets tough"

Catalysis
Tuning the performance
of individual nanostructures



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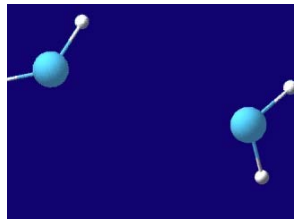
Quantum world
formation and breaking
of bonds



21st Century - Era of Complexity

Challenge

- design of multifunctional materials with **molecular control**
- **operando/ in vivo** analytic with highest precision
- accessing the **length- and time-scale of quantum phenonema**: **QT**

Structural, chemical, electric, magnetic properties and performance
of **individual nanostructures** +
their interaction within the **mesoscopic environment**

→ **3D x-ray microcopy of nano-properties and -processes (SR)**
→ **Insitu realtime interrogation of ultrafast phenomena (FEL)**
→ **Transformative data management systems (SR+FEL)**

Disruptive technologies
24.000 researchers from academia
and industry all over Europe

European Synchrotron and FEL facilities ready to deliver

- getting prepared for shaping the future
- joining forces for Science and Technology in Europe

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Pushing scientific excellence

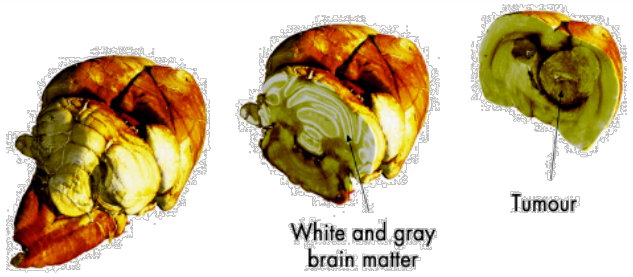
Serving and integrating **24.000** users
- from all scientific disciplines
- from academia and industry

Over **23.700** unique articles published in peer reviewed journals in the last **5** Years

5 Nobel Prices linked to LEAPS facilities

In 2016 more than **500.000** hours of beamtime

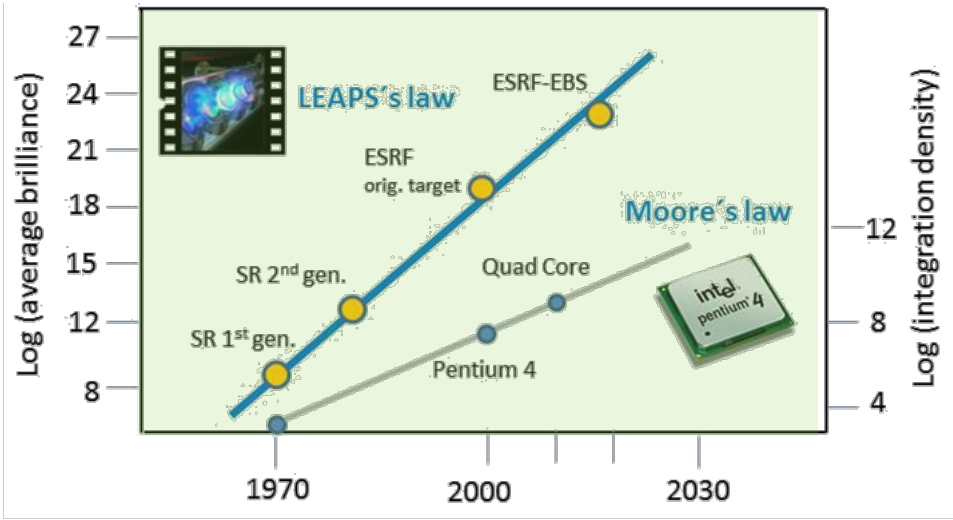
220 beamlines with more than **300** operational experimental stations



Pushing technology limits

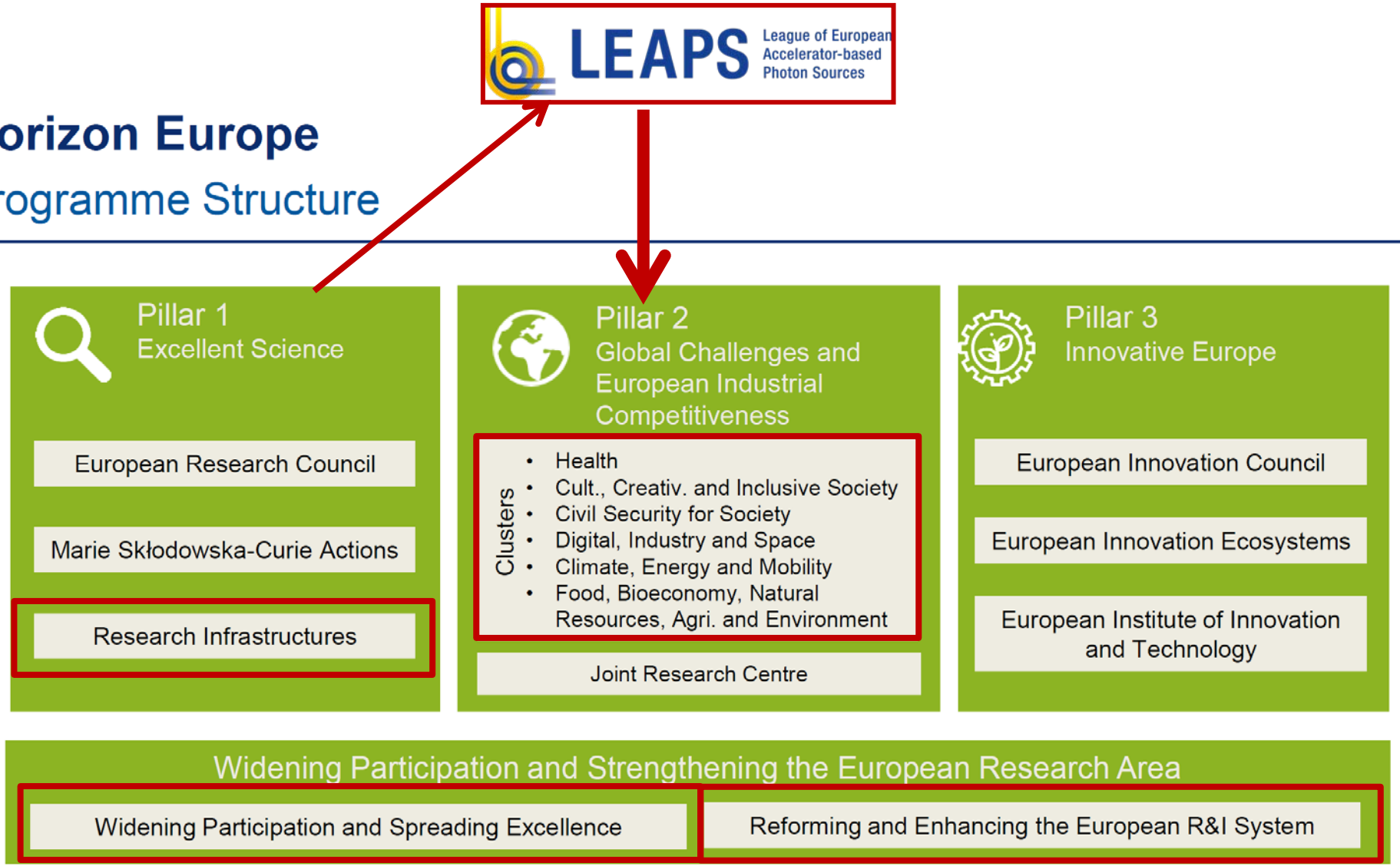
Storage Rings as Ultimate Microscopes:
Breakthrough HMBA Technology

Free Electron Lasers as High Speed Cameras
Merging Laser Tech with X-ray Tech



Horizon Europe

Programme Structure



LEAPS …… goes Horizon Europe

"ready to take off"

The LEAPS Co-creation proposal

Facility Roadmaps
transforming European X-ray landscape

Competence Programs
integrating 24.000 researchers and emerging communities

Technology Roadmaps
integrating European industry

Pillar 1
Excellent Science

Research Infrastructures

European Research Council

Marie Sklodowska-Curie actions

Pillar 2
Global Challenges & European Industrial Competitiveness

Clusters

- Health
- Cult. Creativ. & Inclusive Society
- Civil Security for Society
- Digital, Ind. & Space
- Climate, Energy & Mobility
- Food, Bioeconomy, Natural Resources Agri. & Environment

Missions

- Adaptation to Climate Change
- Paediatric Cancer
- Healthy Oceans, …
- Climate-Neutral & Smart Cities
- Soil Health

Pillar 3
Innovative Europe

European Innovation Council

European Innovation Ecosystem

European Institute of Innovation and Technology

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LEAPS - Scientific Instruments addresses users research areas from PILLAR 2: HE 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*
Health Throughout the Life Course	Democracy & *Governance*	Disaster-Resilient Societies	Manufacturing Technologies	Climate Science and Solutions	Environmental Observation
Environmental and Social Health Determinants	Cultural Heritage	Protection and Security	*Key* Digital Technologies	Energy Supply	Biodiversity and Natural *Resources*
Non-Communicable and Rare Diseases	Social and Economic Transformations	Cybersecurity	*Emerging Enabling Technologies*	Energy Systems and Grids	Agriculture, Forestry and Rural Areas
Infectious Diseases, *including Poverty-Related and Neglected Diseases*			Advanced Materials	Buildings and Industrial Facilities in Energy Transition	Seas, Oceans *and Inland Waters*
Tools, Technologies and Digital Solutions for Health and Care, *including Personalised Medicine*			Artificial Intelligence and Robotics	Communities and Cities	Food Systems
Health Care Systems			Next Generation Internet	Industrial Competitiveness in Transport	Bio-based Innovation Systems *in the EU Bioeconomy*
			Advanced Computing and Big Data	Clean, Safe *and Accessible* Transport and Mobility	Circular Systems
			Circular Industries	Smart Mobility	
			Low Carbon and Clean Industries	Energy Storage	
			Space, *including Earth Observation*		

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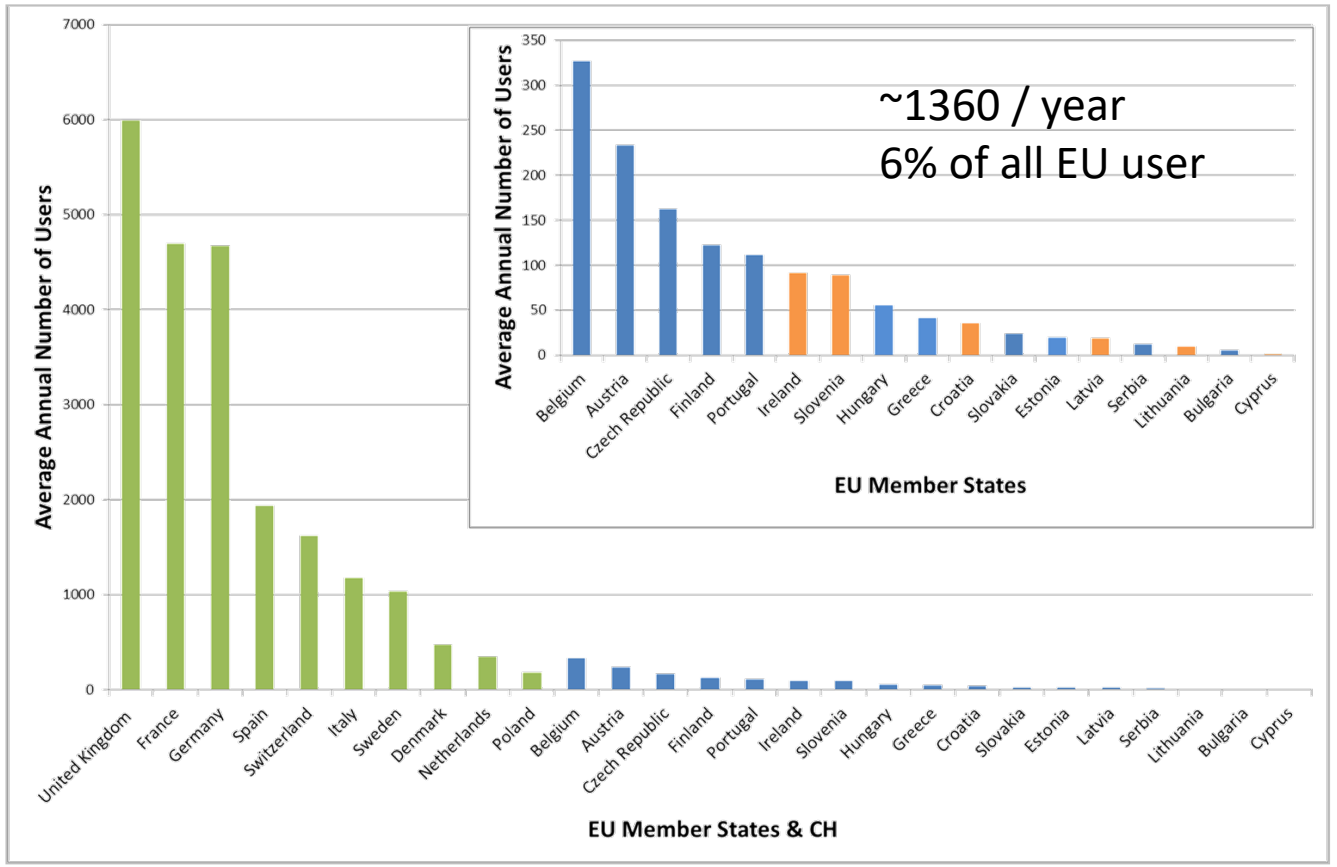
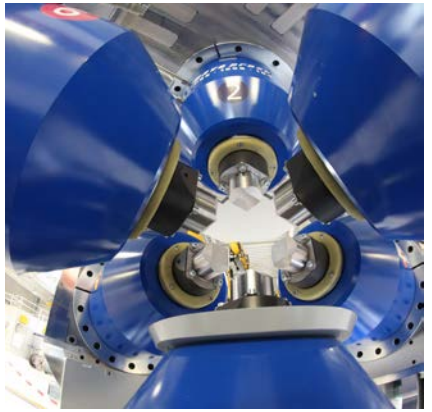
Offering Transnational Access to all European Researchers

"Gateway for Discovery Science"

EU Member States :
- Hosting LEAPS facilities (9 of 10)
- Financially contributing to LEAPS facilities (11 of 12)
- Not financially contributing to LEAPS facilities (6 of 7)





CALIPSOplus

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Benefit to all European Member States

"Gateway for Discovery Science"

- **Beamtime of EU users from non LEAPS MS**

  ~ 60 000 hrs per year

  ~ 32 M€ beamtime free of charge

- **21 member states are investing into LEAPS Facilities thru**

  - Membership in ESRF, EU.XFEL

  - Investments in National Facilities

  e.g.: BESSY II, ELETTRA, FELIX, MAX IV, PETRA III, SOLARIS, …..

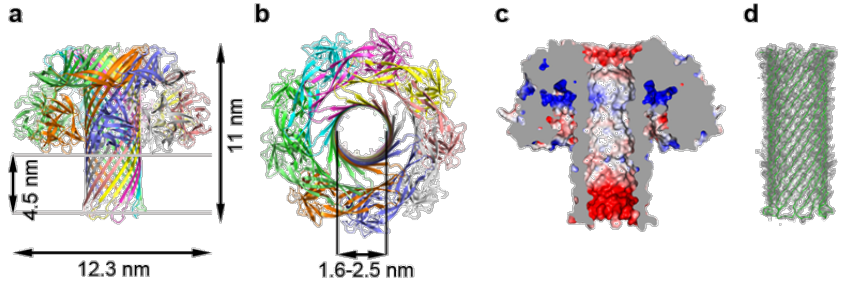
- **Publications of EU users from non LEAPS MS**

  ~ 690 per year

  ~ 14.5% of LEAPS user publications

Example Slovenia @Elettra

Molecular Structure of Toxin Complex



M. Podobnik et.al. *Nature Comm.*,**7**,(2016); DOI: 10.1038/ncomms11598

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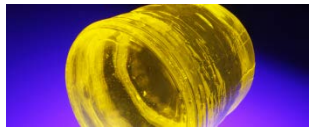
Benefit to all European Member States

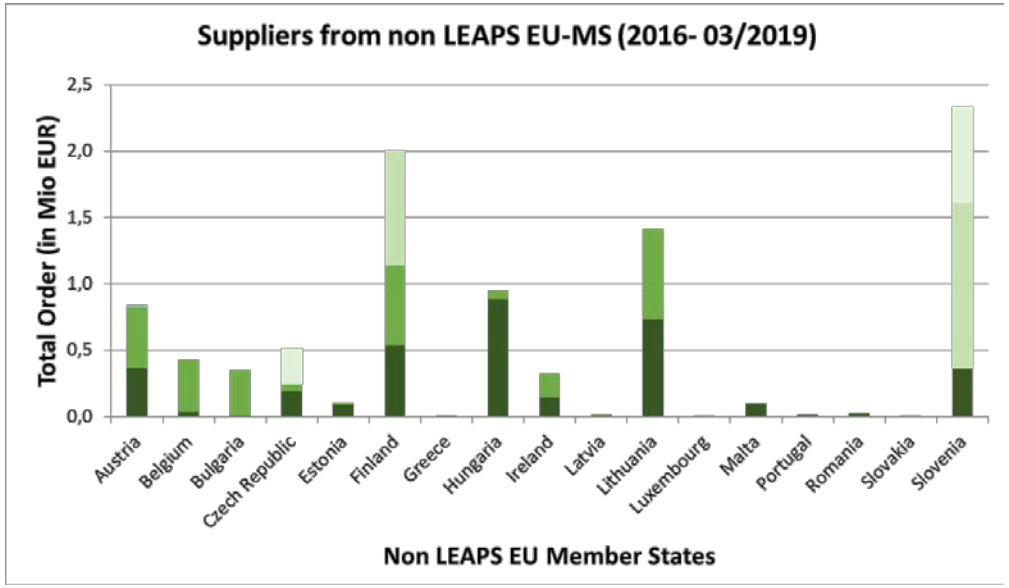
"Opportunities for European Industry"

- **National Investments made**
  ~ 9 Bn €

- **Future National High Technology Investments**
  ~ 2.3 Bn € for approved & planned upgrades (2020-30)

- **Procurement info from 6 LEAPS facilities**





Examples:

Czech Republic	Detectors
Finland, Bulgaria	Printed Circuit Board
Hungaria	Multilayer Devices
Ireland	Software
Lithuania	Laser Technology
Slovenia	RF and Digital control systems
	Undulator Systems

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European Landscape 2020+

"A new vision for Europe "

LEAPS will be the world´s most advanced science consortium

- boosting **science and innovation** in Europe
- **integrating all European member states** in the development of **novel materials** and **state-of-the-art technologies**
- enabling **new ways of cooperation** with industry
- **sharing expertise and resources** for technology developments (incl. EOSC)
- offering a European **platform for the education** of the next generations of scientists and engineer
- devising **robust roadmaps** for the further development of European RIS
- offering **one voice for advice** to European and national decision makers
- **International cooperation** with Russia, China, US, South Africa & Latin America

→ **providing the maximum return on the substantial investments made**

agreed by LEAPS NFA-EC roundtable on 4th April 2019

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LEAPS - Global competiveness of European large scale RIs

- The **EU is world leader** in the construction and operation of complex large scale RIs and high tech projects, currently outrunning the US and China.

  This needs to be protected and expanded in future.

- Large scale RIs of LEAPS serve as interdisciplinary **training platforms** for students, future scientists and technicians and are paradigms for **European collaboration** in large high tech projects developing technologies and doing cutting edge science.

- LEAPS devises a fundamentally new way in **shaping the European RI landscape** for future challenges by **joining forces** in user service and the development of advanced technologies.

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Tak

Tack

Thanks

Bedankt

Danke

Dziękuję

Merci

Grazie

Gracias

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