SGH Warsaw School of Economics

Funded by the European Union

GGP

SHARE SURVEY OF HEALTH, AGEING AND RETIREMENT IN EUROPE

Ministry of Science and Higher Education
Republic of Poland

Poland in European and Global Research Infrastructures

Conference of Polish representatives in European and Global research infrastructures

January 16, 2025, Warsaw, Poland

SCIENCE IN POLAND

Regionalna Inicjatywa Doskonałości

SGH Warsaw School of Economics

Funded by the European Union

GGP

SHARE SURVEY OF HEALTH, AGEING AND RETIREMENT IN EUROPE

Ministry of Science and Higher Education
Republic of Poland

„Tour de table”

Presentation of Research Infrastructures

HEALTH & FOOD

BBMRI ERIC

Joanna Cybińska, Patrycja Gazińska

Łukasiewicz
PORT
Polish Center
for Technology
Development

Łukasiewicz Research Network – PORT Polish Center for Technology Development

Łukasiewicz – PORT in numbers

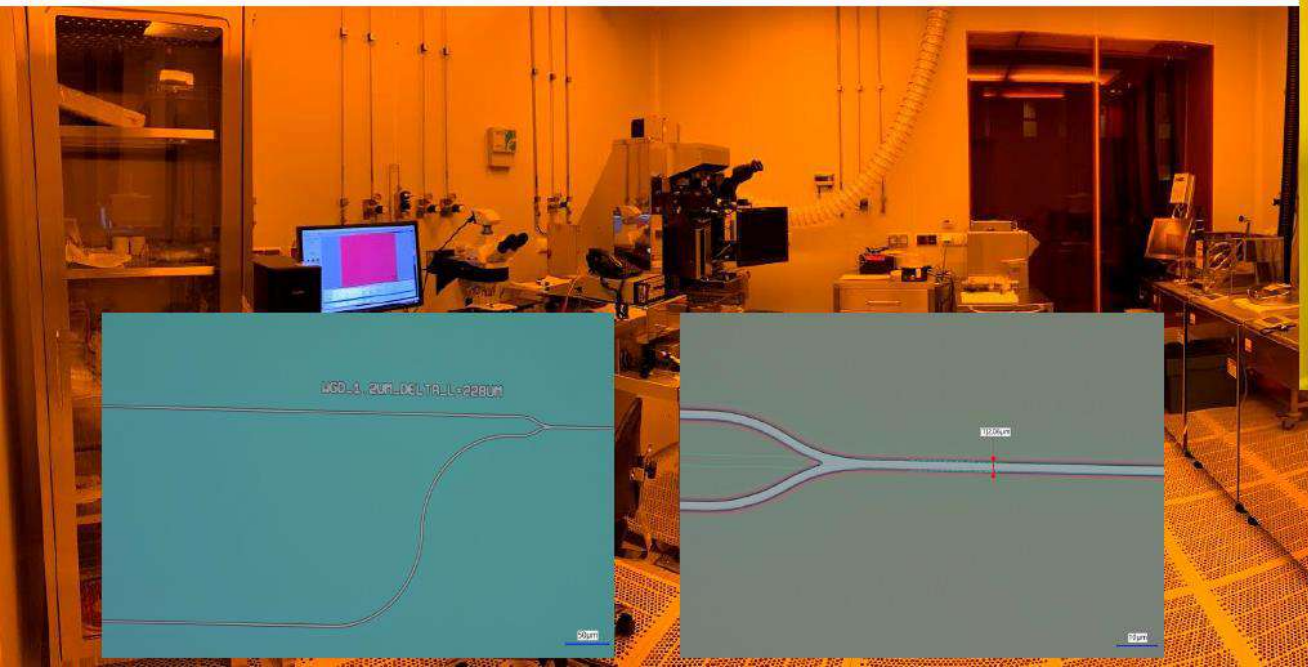
3 Research Centers

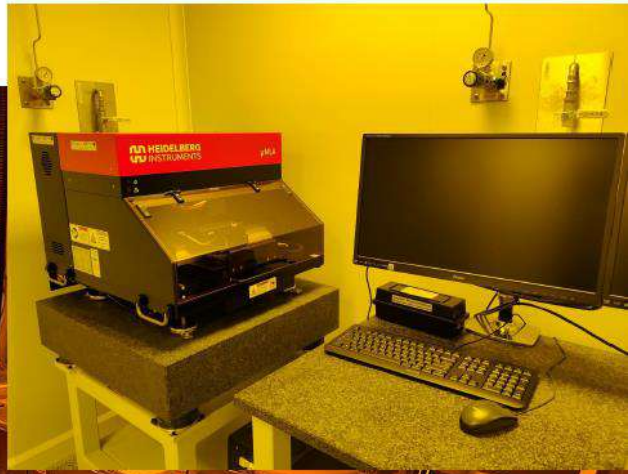
13 international Research Groups

ca. 350 research and supporting staff

Lithography

- Optical lithography with **nanoimprint** (SÜSS MicroTecMaskAligner MA8/BA8) - mask aligner for photolithography with UV mercury lamp.
- We use it for standard lithography with positive or negative photoresists.
- We use photolithography combined with reactive ion etching (RIE, SentechPlasma ICP/RIE SI 500) for producing photonic structures such as waveguides, interferometers, etc.
- For producing more precise structures in nanoscale, for example gratings, we use electron beam lithography and electron beam direct writing.





Chips JU

supporting technological capacity building and innovation in the Union by bridging the gap between the Union's advanced research and innovation capabilities and their industrial exploitation

operational objectives:

1. Setting up a Design Platform

2. Enhancing existing and developing new advanced pilot lines

3. Building capacities for accelerating the development of Quantum chips and associated semiconductor technologies

4. Establishing a network of competence centres across the Union

5. Setting up a Chips Fund to facilitate access to debt financing and equity, in particular for start-ups, scale-ups, SMEs and small mid-caps

SIEC BADAWCZA LUKASIEWICZ - INSTYTUT MIKROELEKTRONIKI I FOTONIKI

SIEC BADAWCZA LUKASIEWICZ - PORT POLSKI OSRODEK ROZWOJU TECHNOLOGII

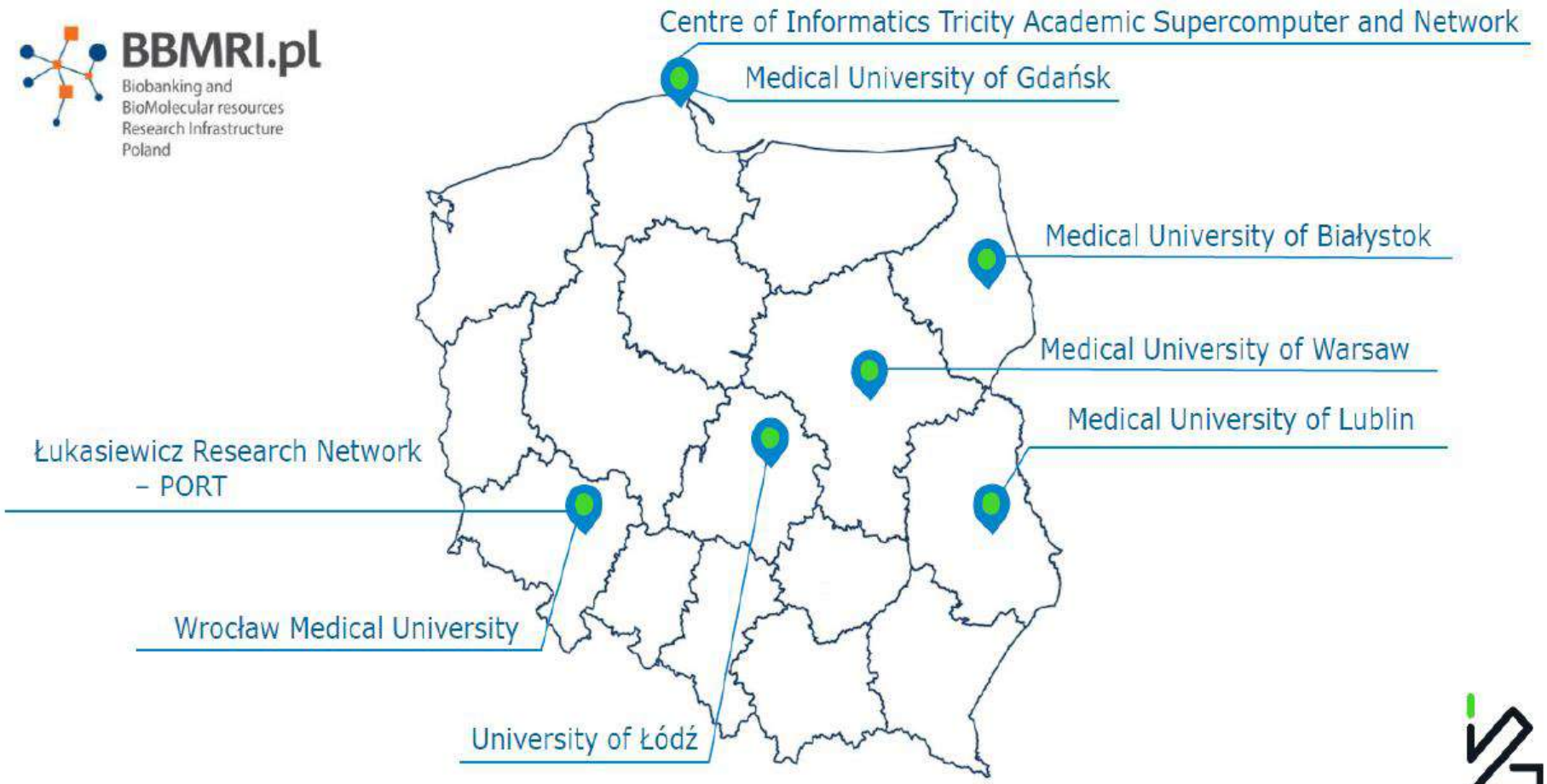
KRAJOWA IZAB GOSPODARCZA ELEKTRONIKI I TELEKOMUNIKACJI

UNIWERSYTET WARSZAWSKI

POLITECHNIKA POZNANSKA

POLITECHNIKA LODZKA

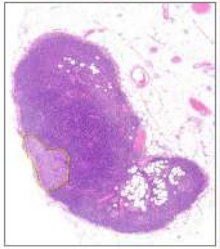
BBMRI.pl
Biobanking and
BioMolecular resources
Research Infrastructure
Poland



Łukasiewicz

Biobank Research Group and Section of the Biobank Medical Facility

PI: Patrycja Gazińska PhD

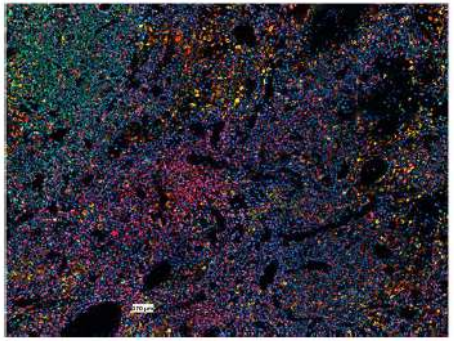


Computational pathology

Digital scanners to convert histological slides into high-resolution digital images of tissue samples for precise analysis (cell counting and tissue segmentation)

Spatial biology & phenotyping

Analyzing the spatial distribution and interactions of different cell types within tissue samples - deeper understanding of complex tissue microenvironments and search for novel disease biomarkers or therapeutic targets.



Integrated into collaborative research programs:

- Breast cancer research with King's College London and the Royal Marsden Hospital, UK
- Own research program focused on head & neck cancer with national clinical and academic centers
- Collaborative work within the Regional Digital Medicine Centre (Project No.2023/ABM/02/00005-00 Medical Research Agency)
- Collaborative work within the Regional Digital Medicine Centre (Project No.2023/ABM/02/00004-00 Medical Research Agency)

P4Health

Center of Excellence for Precise Phenotyping and BioDataBanking

Biobank Research Group & Section of the Biobank Medical Facility

Healthcare	Clinical & Biobanking	Spatial & Computational Pathology	Bioanalytics	Functional Validation in Disease Models	Cell Engineering & Cell-based Therapies
Hospitals Medical Centers Clinical Trials Patients Volunteers Reference databases	Clinical Path PPIE Tumor & Peri-tumour Blood / Urine / Stool AI-assisted data anonymization Legal aspects of material use & sharing	Digital Pathology Spatial transcriptomics Spatial proteomics Production of new in-house antibodies AI-assisted image analysis Legal aspects of AI use for diagnostics	Genomics Proteomics Metabolomics Digital Phenotyping Digital twins AI-assisted data integration Legal aspects of data availability & sharing	Patient-specific cancer cell lines & iPSC-derived 2D & 3D models PDX models Humanized mice models AI-assisted behavioral phenotyping Legal aspects of model exchange & IP protection	Genome manipulation for targeted interventions Optimization of cell cultures AI-assisted cell modifications Legal aspects of AI use for personalized therapy
	Resource for innovative projects with academia & industry	New diagnostic tools & biomarkers & therapeutic targets	Complete personalized biomedical profile of disease dynamics	Personalized drug screens & disease mechanisms	Personalized therapy & ATMP production in GMP standards

Łukasiewicz PORT Polish Center For Technology Development

CERBM gie

KING'S HEALTH PARTNERS

Shared resources
Increased capacity for stable collaboration
Sustainable supply of talents & funds
Improved law
Better management
Increased public awareness / Healthy Society

Science - Informed Personalized Diagnosis & Treatment

CANCER BIOBANK

The ROYAL MARSDEN NHS Foundation Trust

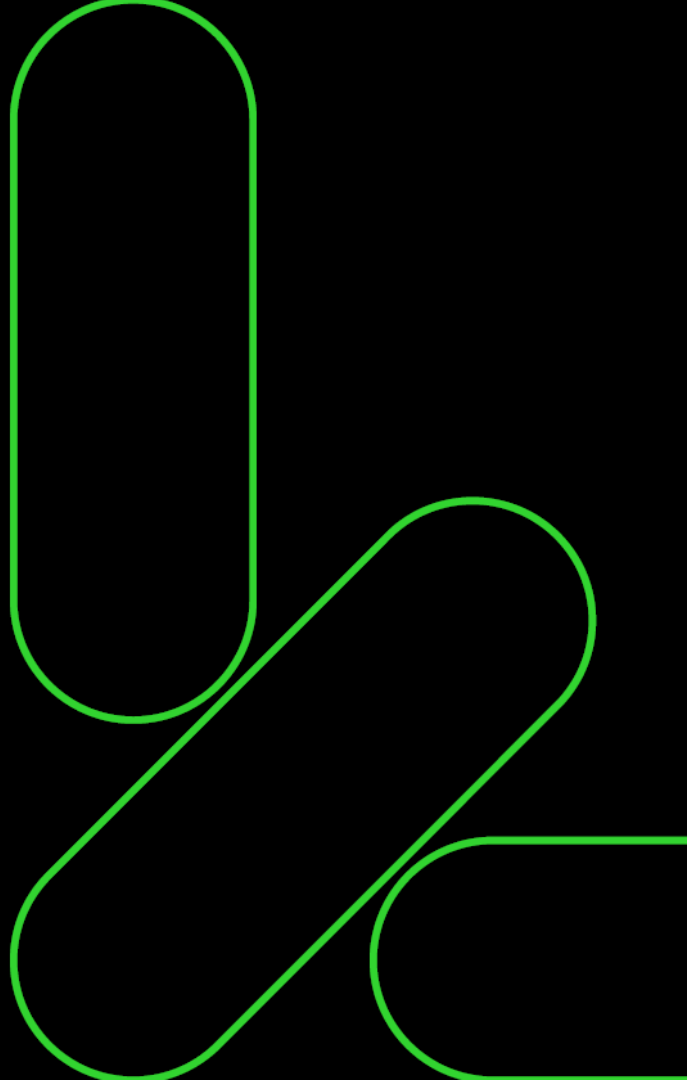
KING'S College LONDON

NHS Guy's and St Thomas' NHS Foundation Trust

Clinical & Biobanking Platform	Spatial & Computational Pathology Platform	Bioanalytics Platform	Functional Validation in Disease Models	Cell Engineering & Cell-based Therapies
P4Health platforms will be applied in an international collaborative research/ biobanking project with KCL, RMH-ICR, and CERBM for BIA-ALCL studies	patient's tumor FFPE tissue block tissue section analyses	multiomic sample profiling Blood Serum	CERBM gie tumor cell cultures Murine avatar with patient's tumor cells TARGET IDENTIFICATION	T lymphocyte cell engineering target-specific cytotoxic T lymphocyte In vitro cell expansion validation Future goal: ATMP production & therapy

Łukasiewicz PORT

Thank you for the attention



ELIXIR

Izabela Makałowska

ELIXIR - European life sciences infrastructure, rooted in bioinformatics, the science of transforming large-scale datasets into insights in the molecular and cellular sciences.

Warsaw, 16.01.2025

Izabela Makałowska

Information
www.elixir-europe.org

- Brings together scientists from over 240 research institutes from 22 Member countries and three Observer countries
- Coordinated by EMBL-EBI
- Founded in December 2013
- ELIXIR.PL is on the Polish Roadmap since 2015, currently coordinated by Adam Mickiewicz University in Poznań
- Bridges life sciences and ICT
- Offers:


Guidelines

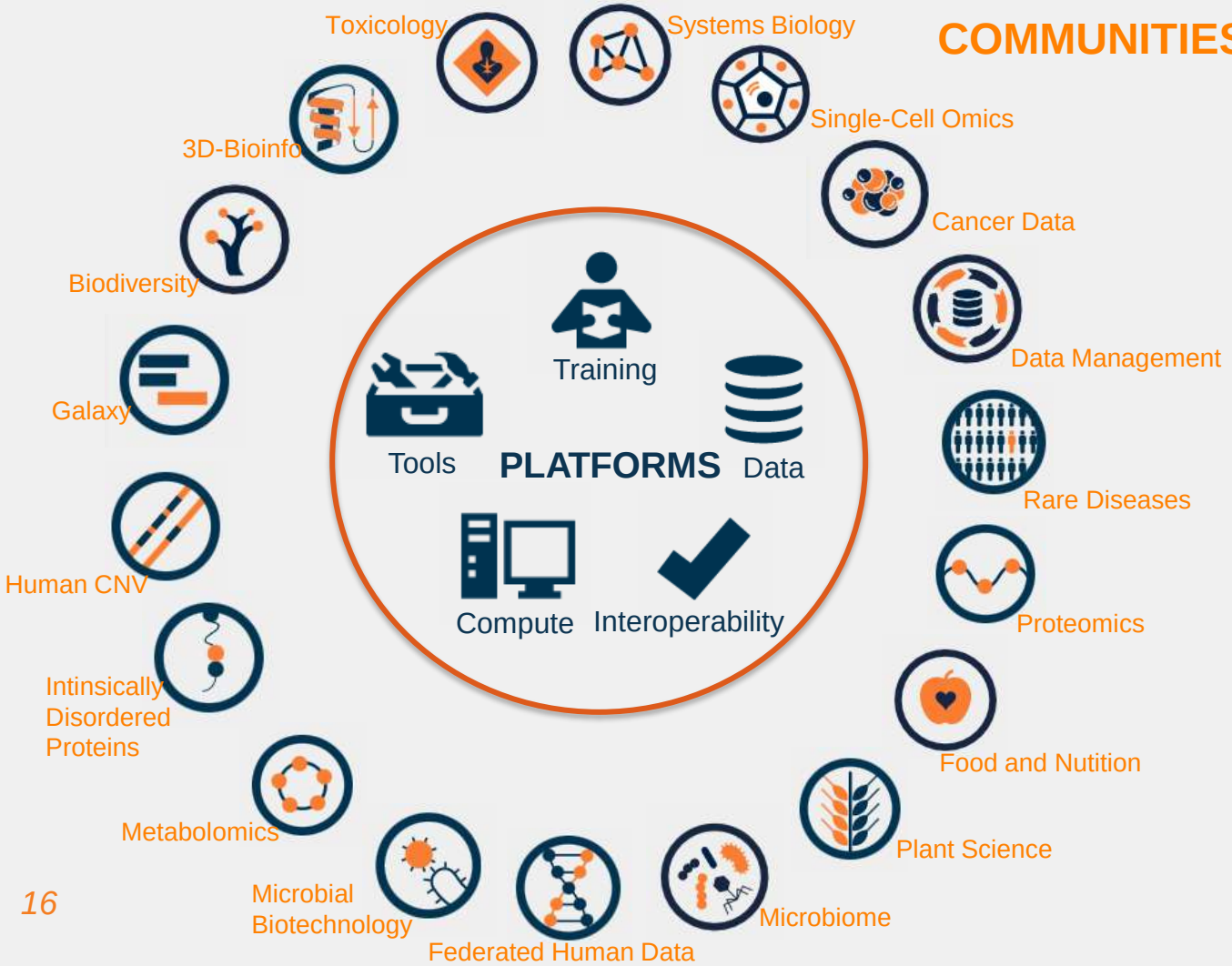

Training


Web portals


Partnership with industry


Tools


Opportunities to work together


COMMUNITIES
Toxicology
Systems Biology
Single-Cell Omics
3D-Bioinfo
Cancer Data
Biodiversity
Data Management
Galaxy
Training
Tools
PLATFORMS
Data
Rare Diseases
Human CNV
Proteomics
Compute
Interoperability
Intinsically Disordered Proteins
Food and Nutition
Metabolomics
Plant Science
Microbial Biotechnology
Federated Human Data
Microbiome

Euro-BioImaging ERIC

Jędrzej Szymański

Polish Euro-BioImaging Node
“Advanced Light Microscopy Node Poland”

Nencki Institute of Experimental Biology PAS, Warsaw
Lider of the Polish Euro-BioImaging (EuBI) Node

amf.nencki.edu.pl
eurobioimaging.eu

2025.01.15

dr Jędrzej Szymański

j.szymanski@nencki.edu.pl

Minister of Science
Republic of Poland

nencki institute
of experimental biology

EURO BIOIMAGING

Polish Node is supported by the project co-financed by the Minister of Education and Science based on contract No 2022/WK/05

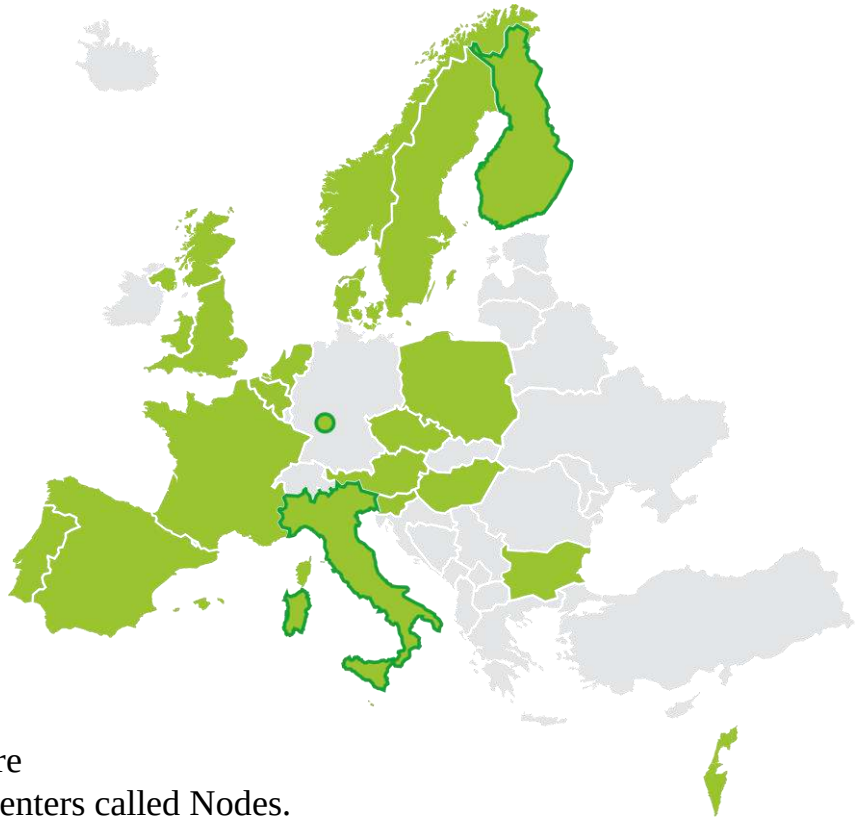
We unite the imaging community in Europe and globally

19 ERIC MEMBERS
(18 COUNTRIES & EMBL)

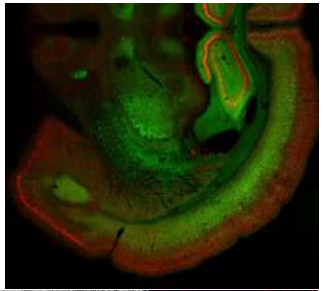
41 NATIONAL
NODES

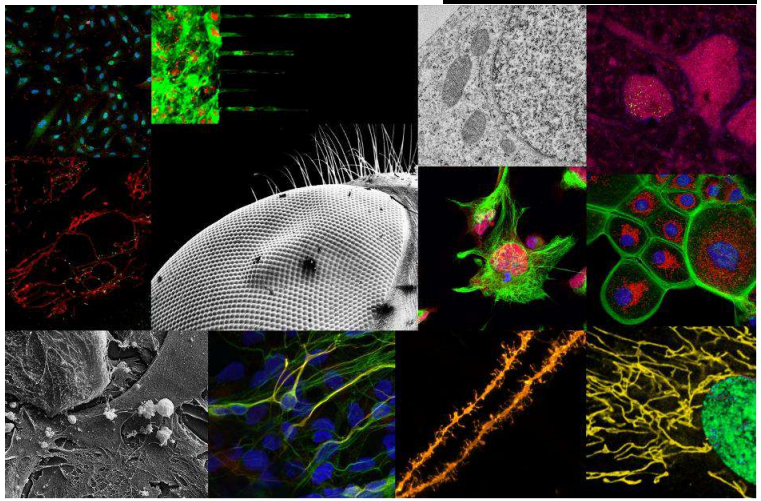
237 SITES IN EUROPE
AND BEYOND

120+ STATE-OF-THE-ART.
IMAGING TECHNOLOGIES



Euro-BioImaging's distributed, international infrastructure
offers its services through globally recognized imaging centers called Nodes.
In 2021, Poland became a member of the Euro-BioImaging ERIC (European Research Infrastructure Consortium)





Minister of Science
Republic of Poland

nencki institute
of experimental biology

EURO BIOIMAGING

EURO BIOIMAGING

EUROPE'S GATEWAY TO **BIOLOGICAL**
& **BIOMEDICAL IMAGING**




www.eurobioimaging.eu

info@eurobioimaging.eu

@EuroBioImaging

EU-OPENSCREEN ERIC

Agnieszka Olejniczak

POL-OPENSCREEN, POLISH SCREENING INFRASTRUCTURE PLATFORM FOR BIOLOGICAL CHEMISTRY EU-OPENSCREEN ERIC

Open access to innovative solutions in search for biologically active compounds

Agnieszka B. Olejniczak
Institute of Medical Biology PAS

POL-OPENSCREEN is part of EU-OPENSCREEN ERIC - Multinational initiative

- Distributed RI with ca. 30 partner sites
- Established in 2018
- Long-term funding from 10 member countries: CZ, DE, DK, ES, FI, LV, NO, PL, PT, SE
- 3 partner site categories:
  - Screening platforms
  - Chemistry groups
  - Database host
- 3-step partner site accreditation procedure:
  - Nomination of site by ministry
  - Evaluation by external experts
  - Approval of sites by all member countries, based on evaluation reports

The Polish Screening Infrastructure Platform for Biological Chemistry, established in 2018-2023 as part of the POL-OPENSCREEN project. On the Polish Roadmap since 2015. Ministerial funding for 2024-2028.
It includes:

- **National Library of Chemical Compounds (NLCC) and Screening Laboratory of Virology-Bacteriology (SLVB) at the Institute of Medical Biology of the Polish Academy of Sciences in Łódź**

- **Chemical Biology Center (CBC) with a high-throughput screening platform (HTS) at the Institute of Bioorganic Chemistry in Poznań**

- **High-throughput screening (HTS) platform *in silico*, ADME and chemical optimization at the Institute of Biochemistry and Biophysics in Warsaw**

PHYSICAL SCIENCES & ENGINEERING

CTAO

Jacek Niemiec

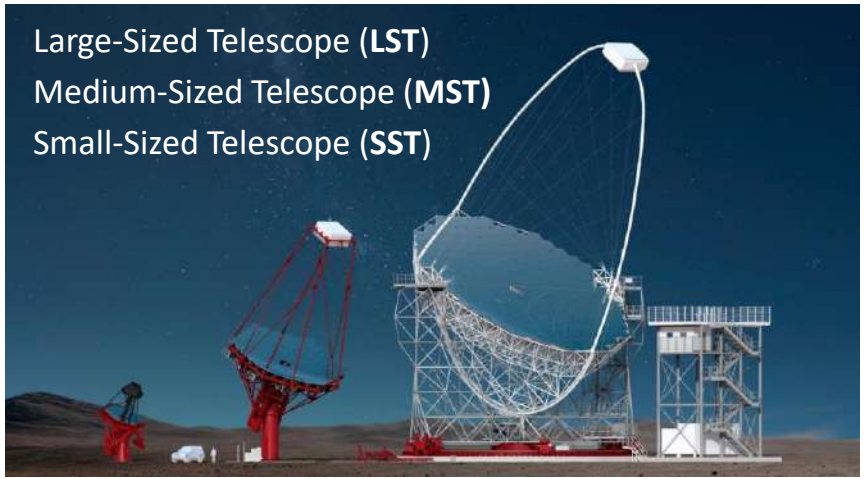
Cherenkov Telescope Array Observatory - ERIC

Jacek Niemiec for the CTAO-PL
Institute of Nuclear Physics Polish Academy of Sciences, Kraków
jacek.niemiec@ifj.edu.pl

CTAO-PL: UJ, IFJ PAN, CAMK PAN, UŁ, UW, UwB, ACK Cyfronet AGH, UMK, NCBJ, UZ, CBK PAN, AGH, PW

- **Largest** ground-based **very-high energy gamma-ray** observatory in the world; over **60 telescopes in two telescope array sites (La Palma and Chile).**
- Unparalleled **accuracy and sensitivity** in **broad energy range** (20 GeV – 300 TeV).
- Main science themes:
  - Understanding the origin of cosmic particles.
  - Probing extreme environments: cosmic explosions, black holes, neutron stars…
  - Exploring frontiers of physics – searching for dark matter and deviations from the theory of relativity.

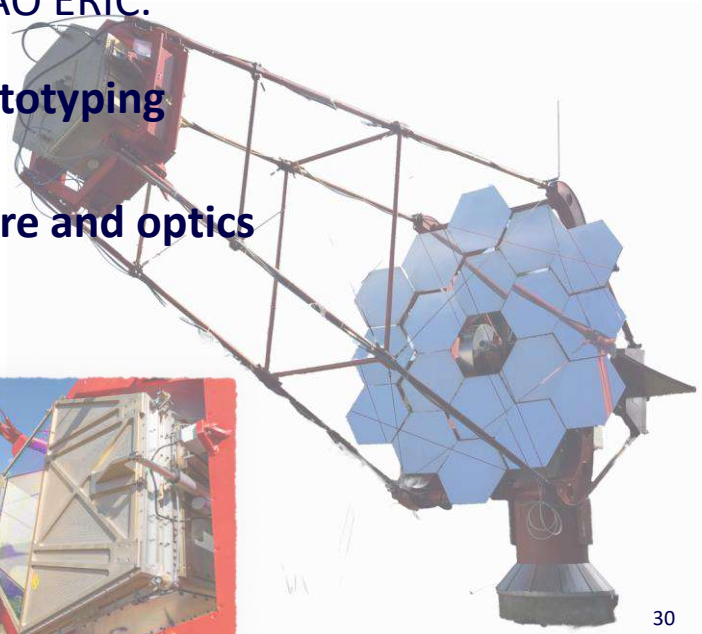
www.ctao.org

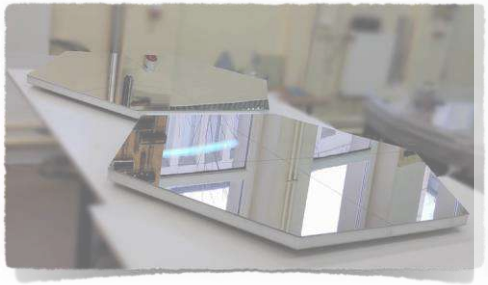


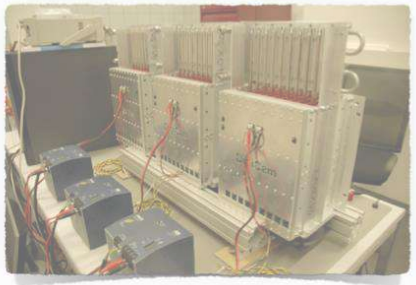
- **CTAO Consortium** established in 2008 – **about 1500 members from 25 countries**.
- On the **ESFRI roadmap since 2008**; **promoted to a "Landmark" in 2018**. **ASTRONET Roadmap 2022-2035. Polish Roadmap since 2020.**

- **CTAO becomes an ERIC on January 7, 2025**.
- **Poland is one of the nine founding members** of the CTAO ERIC.

- **Significant Polish contributions** to **instrumentation prototyping** and **software development**.
- Planned in-kind contributions to **MST telescope structure and optics** and **array control and data acquisition software**.







ELI ERIC

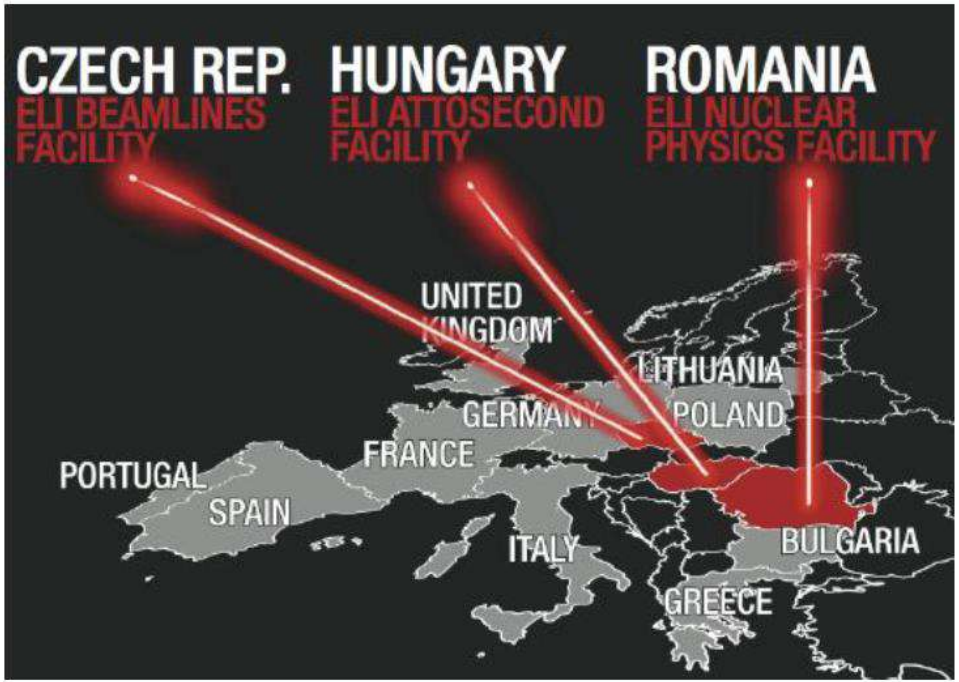
Henryk Fiedorowicz

Extreme Light Infrastructure ERIC (ELI ERIC)

Henryk Fiedorowicz

Institute of Optoelectronics
Military University of Technology
Warsaw, Poland

Laser research infrastructure for science and technology



ELI ERIC facilities

ELI Beamlines (Czech Rep.)

ELI ALPS (Hungary)

ELI NP (Romania)

2006 – ELI proposal
2008 – ESFRI Roadmap
2008-2010 – ELI PP
2014 – ELI listed on PMIB
2010-2018 – ELI parallel implementation
2018-2021 – ELI DC
2021 – ELI ERIC

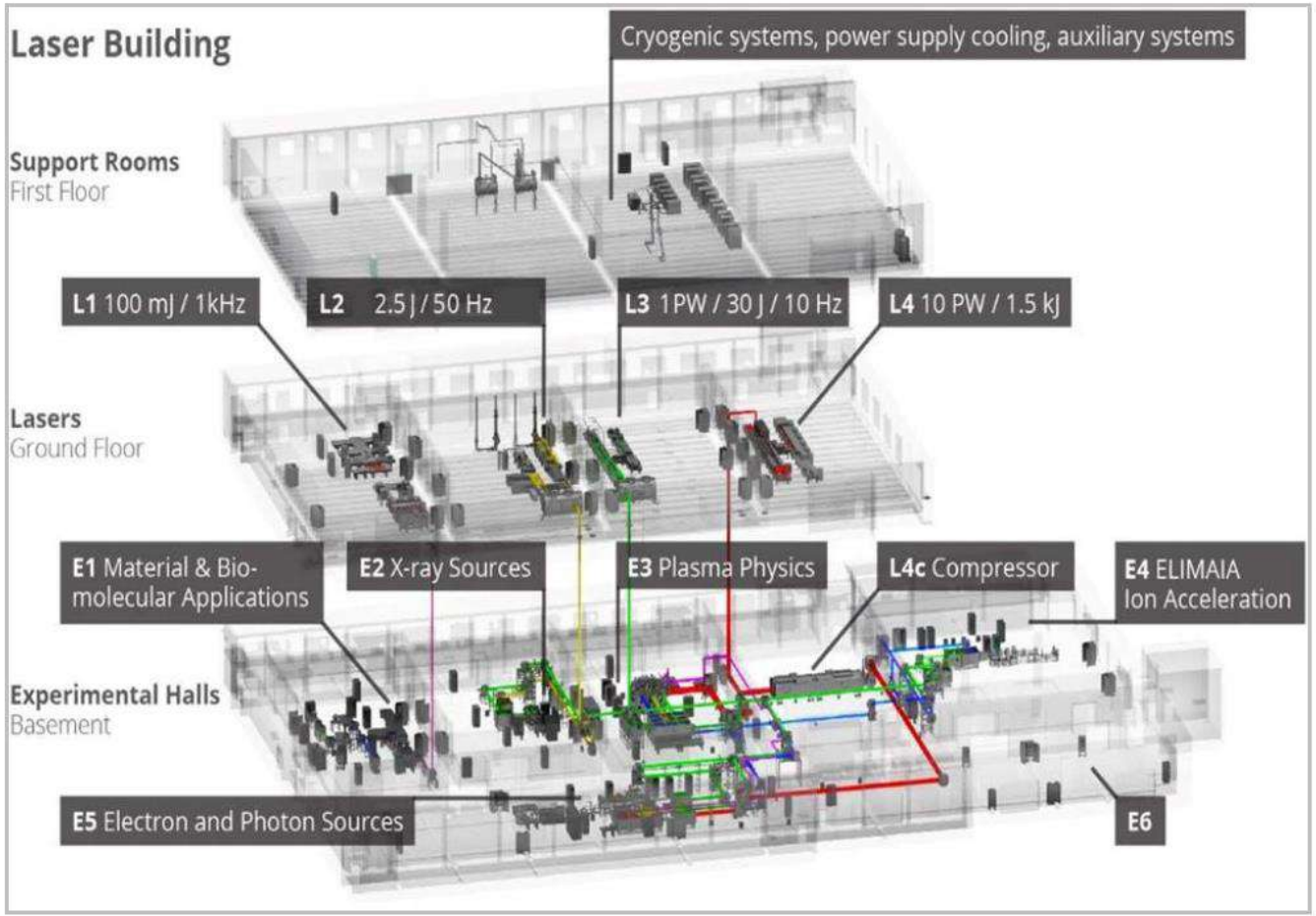
ELI ERIC – location of the ELI facilities

ELI Beamlines (Dolni Brezany - Prague)

ELI ALPS (Szeged)

ELI Nuclear Physics (Magurele)

ELI Beamlines



ELI ALPS (Attosecond Light Pulse Source)

HF Physics (UFO)

SYLOS Alignment
10 Hz, 12 fs, 40 mJ

PW SHHG

PW Electron

Chem Reac Contr

SYLOS 2
1 kHz, 7 fs, 35 mJ

SYLOS 3
1 kHz, 8 fs, 120 mJ

HF PW
2,5 Hz, 25 fs, 10 J

SHHG SYLOS

SYLOS postcompression
10 Hz/1kHz, 4 fs, 10 mJ

Chem Reac Contr

THz

THz pump
50 Hz, 500 fs, 500 mJ

HE THz

LEIA user experiment

e-SYLOS

SYLOS Long

SYLOS Compact

NANO ESCA HR Condensed

MIR HE (3.2 µm)
1 kHz, 25 fs, 10 mJ

NANO ESCA HR Condensed

MIR HE HHG

ReMi HR Gas

HR1 & HR2
100 kHz, 7 fs, 1 mJ
100 kHz, 7 fs, 5 mJ

VMI

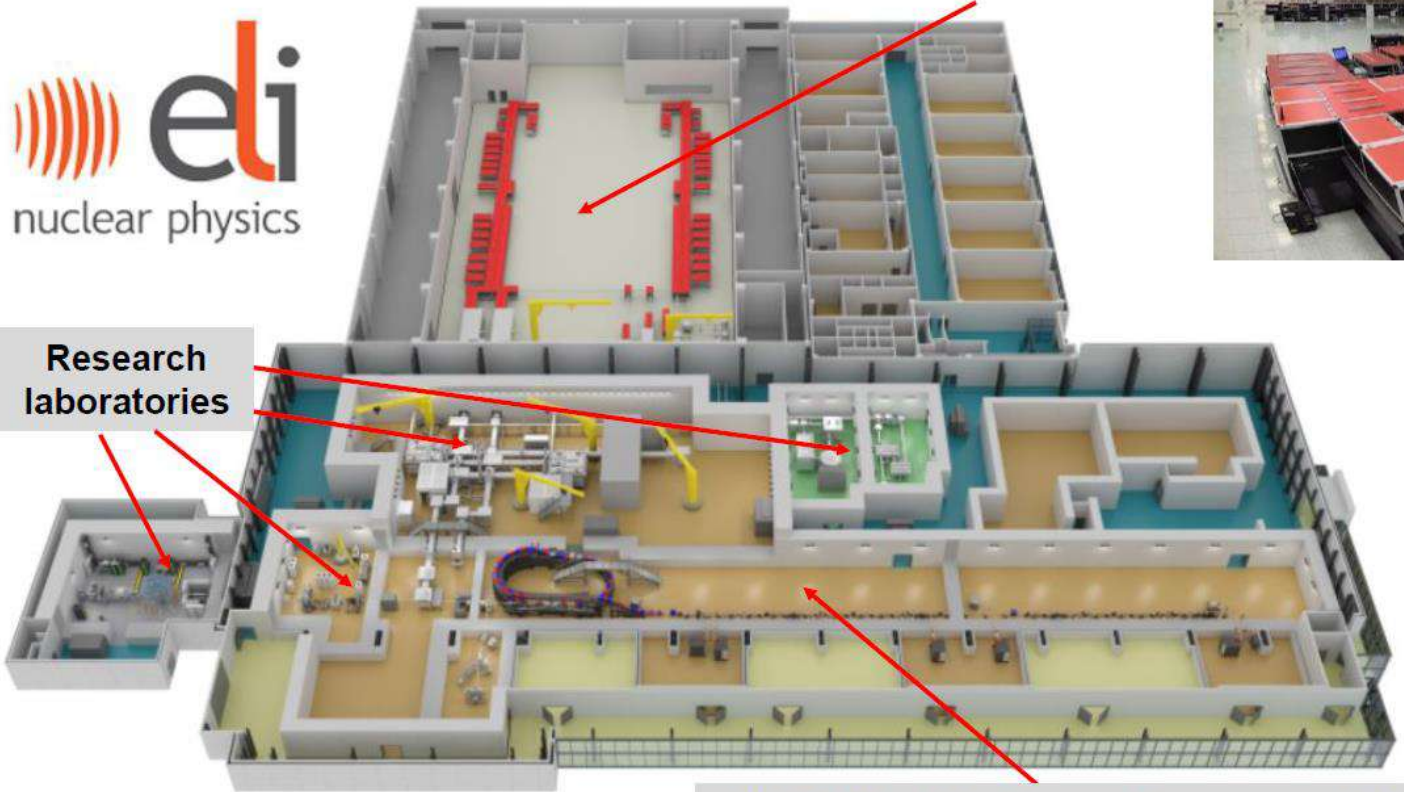
MIR (3.2 µm)
100 kHz, 20 fs, 70 µJ

ChemLab

RadioBiol

NanoScience&NanoFab

ELI NP (Nuclear Physics)



Pulsed power

11.5 PW

(world record)

ELI ERIC – main research fields

- **Attosecond Science:** attosecond is naturally delivered during laser matter interaction at ultrahigh intensities. Snap-shots in the attosecond scale of the electron dynamics in atoms, molecules, plasmas and solids.
- **High Energy Beam Facility:** ELI will provide ultra-short energetic particle (>10 GeV) and radiation (up to few MeV) beams produced from compact laser plasma accelerators.
- **Nuclear Physics:** The event of the laser enabled the study of the atomic structure. The ultra high intensity lasers will make possible the study of the nucleus.
- **Ultra High Field Science:** access to the ultra-relativistic regime, ELI will afford new investigations in particle physics, nuclear physics, gravitational physics, nonlinear field theory, ultrahigh-pressure physics, astrophysics and cosmology.

”ELI-Polska” national consortium

Consortium members

Akademia Górniczo-Hutnicza w Krakowie, Wydział Elektrotechniki, Automatyki, Informatyki i Inżynierii Biomedycznej;

Instytut Fizyki Jądrowej Polskiej Akademii Nauk w Krakowie;

Instytut Fizyki Plazmy i Laserowej Mikrosyntezy w Warszawie;

Instytut Fizyki Polskiej Akademii Nauk w Warszawie;

Narodowe Centrum Badań Jądrowych w Świerku;

Politechnika Warszawska, Wydział Fizyki;

Politechnika Warszawska, Wydział Elektroniki i Technik Informacyjnych;

Politechnika Wrocławska, Wydział Elektroniki, Fotoniki i Mikrosystemów;

Politechnika Wrocławska, Wydział Podstawowych Problemów Techniki;

Uniwersytet w Białymstoku, Wydział Fizyki;

Uniwersytet Jana Kochanowskiego w Kielcach, Instytut Fizyki;

Uniwersytet Warszawski, Wydział Fizyki;

Wojskowa Akademia Techniczna w Warszawie, Instytut Optoelektroniki - **koordynator**

The consortium is open to parties interested in ELI

ELI-Polska consortium agreement

Profesor Gerard Mourou,
laureat Nagrody Nobla w 2018 z fizyki
inicjator projektu ELI

I wish the members of the ELI-Polska consortium and Polish scientists fruitful cooperation and scientific successes achieved in ELI research infrastructures

§ 1.

Misja i cel działalności Konsorcjum

1. Misją krajowego konsorcjum **„ELI – Polska”** jest działanie na rzecz znaczącego udziału Polski w budowie i eksploatacji europejskiej infrastruktury badawczej **Extreme Light Infrastructure - ELI.**

EMFL

Adam Babiński

European Magnetic Field Laboratory- AISBL

(Association Internationale Sans But Lucratif - international non-profit association under the Belgian law)

High Field Magnet Laboratory (HFML) Nijmeghen, NL

Laboratorium Silnych Pól Magnetycznych Helmholtz-Zentrum Dresden-Rossendorf, DE

Laboratoire National des Champs Magnétiques (LNCMI), Toulouse, FR

Laboratoire National des Champs Magnétiques (LNCMI) , Grenoble, FR

ESFRI Landmark Infrastructure

EMFL ordinary members:

- **United Kingdom** since December 2015,
- **The Institute of Research into the Fundamental Laws** of the Universe, Commissariat a l'Energie Atomique et aux Energies Alternatives (**CEA**), France since December 2019,
- **University of Salento** since February 2024, the user community in Italy.
- **University of Warsaw** from January 2019 to December 2023, representing the Polish user community, *possible renewal under evaluation*

EMFL+

=

EMFL

+

Regional Magnetic Field Laboratories in Poland

Uniwersytet Warszawski
Politechnika Wrocławska
Uniwersytet Łódzki
Instytut Fizyki PAN
Instytut Wysokich Ciśnień PAN
Instytut Fizyki Molekularnej PAN
Instytut Niskich Temperatur i Badań Strukturalnych PAN
Instytut Biologii Doświadczalnej PAN
Sieć Badawcza Łukasiewicz – Instytut Mikroelektroniki i Fotoniki

ESRF
Anna Wolska

Ministry of Science and Higher Education
Republic of Poland

Polish contribution to the European Synchrotron Radiation Facility

Anna Wolska
Institute of Physics, Polish Academy of Sciences

coordinator of the

National Consortium of Scientific Institutions Interested in the use of the European Synchrotron Radiation Facility ESRF

which includes 21 scientific institutions from Poland

Polish contribution to the European Synchrotron Radiation Facility

* The ESRF is a modern research infrastructure located in Grenoble (France) open to users since 1994

* The ESRF had been built and operates as an international consortium

* Currently the ESRF consortium consists of 20 countries with:
  13 Member states (contribution equal or above 4 %)
  7 Scientific associates (contribution below 4 %)

*Poland is an Associate Member
  since 2004 with contribution 0.6 %
  since 2006 with contribution 1%

Polish contribution to the European Synchrotron Radiation Facility

* research in the field of physics, chemistry, materials science, cultural heritage, structural biology and medical applications, environmental science, nanotechnology

* diffraction, microscopic and spectroscopic techniques

* microfocusing, nano-imaging, high pressure, low and high temperature, time-resolved experiments

All scientists with Polish affiliation can submit projects!

The access to the ESRF is financed by the Polish Ministry of Science and Higher Education, dec. no. 2021/WK/11.

European Spallation Source ERIC

Dariusz Bocian

INSTYTUT FIZYKI JĄDROWEJ
IM. HENRYKA NIEWODNICZAŃSKIEGO
POLSKIEJ AKADEMII NAUK

Ministry of Science and Higher Education
Republic of Poland

European Spallation Source (ESS ERIC)

INSTYTUT FIZYKI JĄDROWEJ
IM. HENRYKA NIEWODNICZAŃSKIEGO
POLSKIEJ AKADEMII NAUK

EUROPEAN
SPALLATION
SOURCE

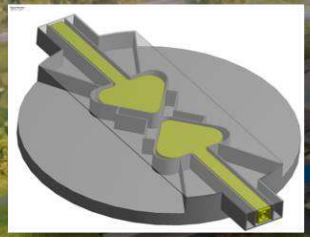
ESS infrastructure

User operation is planned for 2028

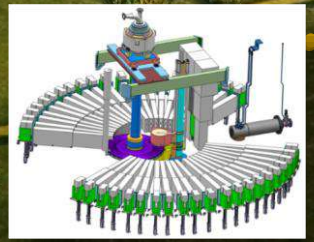
Polish in-cash and in-kind contribution

On the **Polish Roadmap** since 2011

Flat moderator delivering smaller and brighter neutron beams

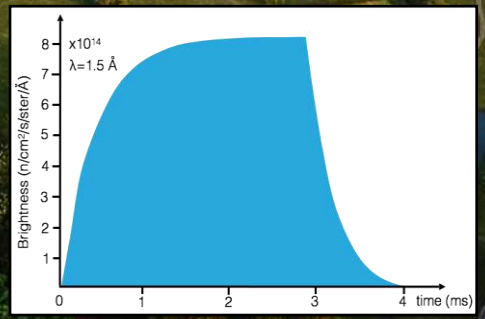


High Power Accelerator means more neutrons



An Innovative Target Station that can host >30 instruments

High brightness and tuneable resolution makes new measurements possible



Czech Republic, Norway, Denmark (host), Poland
Estonia, Spain, France, Sweden (host), Germany
Switzerland, Hungary, United Kingdom, Italy

Range of applications

Macro-molecular crystallography

Neutron detection technologies

Batteries

Polymers

Superconductors

Thermoelectrics
Magnetoelectrics

New materials for chemical and physical sequestration

Better concrete

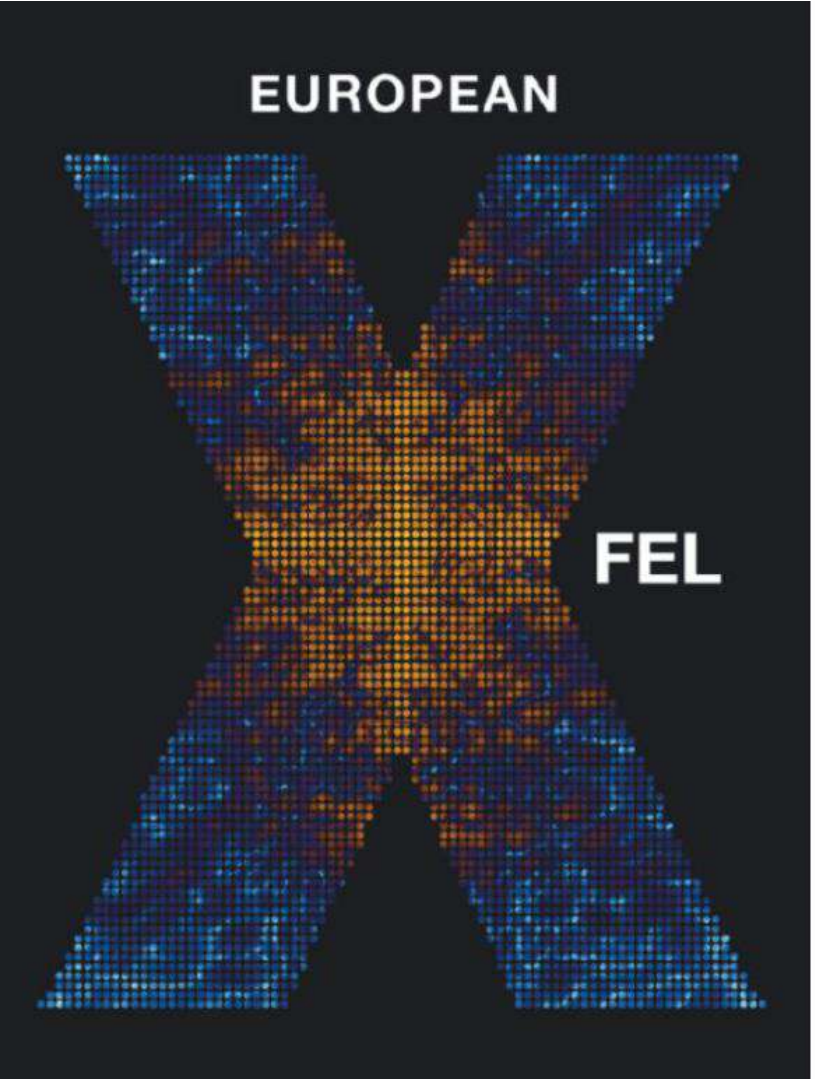
Advanced engineering materials

Spintronics

Radiography/tomography – dynamics of macromolecules – lattice vibrations – spin dynamics

European XFEL

Ryszard Sobierajski



European XFEL

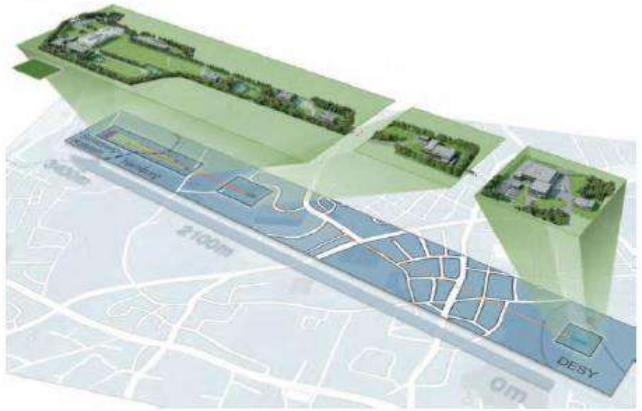
Ryszard Sobierajski, IF PAN

xfel.eu
www.ifpan.edu.pl/cd-xfel

European X-ray Free Electron Laser

EuXFEL HUB-POLAND

EuXFEL is a source of intense coherent ultrashort x-ray pulses combined with the state-of-the-art experimental stations. Since 2017 it provides **unique research opportunities in the fields of medicine, biology, chemistry, physics and material sciences**. Example applications: determining structure of bio-molecules, studying dynamics of chemical reactions, investigating ultrafast magnetism, creating and characterizing extreme states of matter important for planetary astrophysics or laser fusion etc. There are 10 facilities in the world with similar capabilities.



To construct and operate the EuXFEL, international partners - **Denmark, France, Germany, Hungary, Italy, Poland, Russia, Slovakia, Spain, Sweden, Switzerland, and the United Kingdom** - agreed on the foundation of an independent research organization – the **European XFEL GmbH**, a non-profit limited liability company under German law. The company employs more than 500 people and has a budget of above 140 MEUR.

XFEL user community in Poland

Access to the EuXFEL is granted based on the peer review of scientific proposals by international experts (sucess rate ~20-30%). Approximately 100 research projects are conducted each year. **Polish users' contribution has grown above our share level (2.13 %) with several groups involved.**

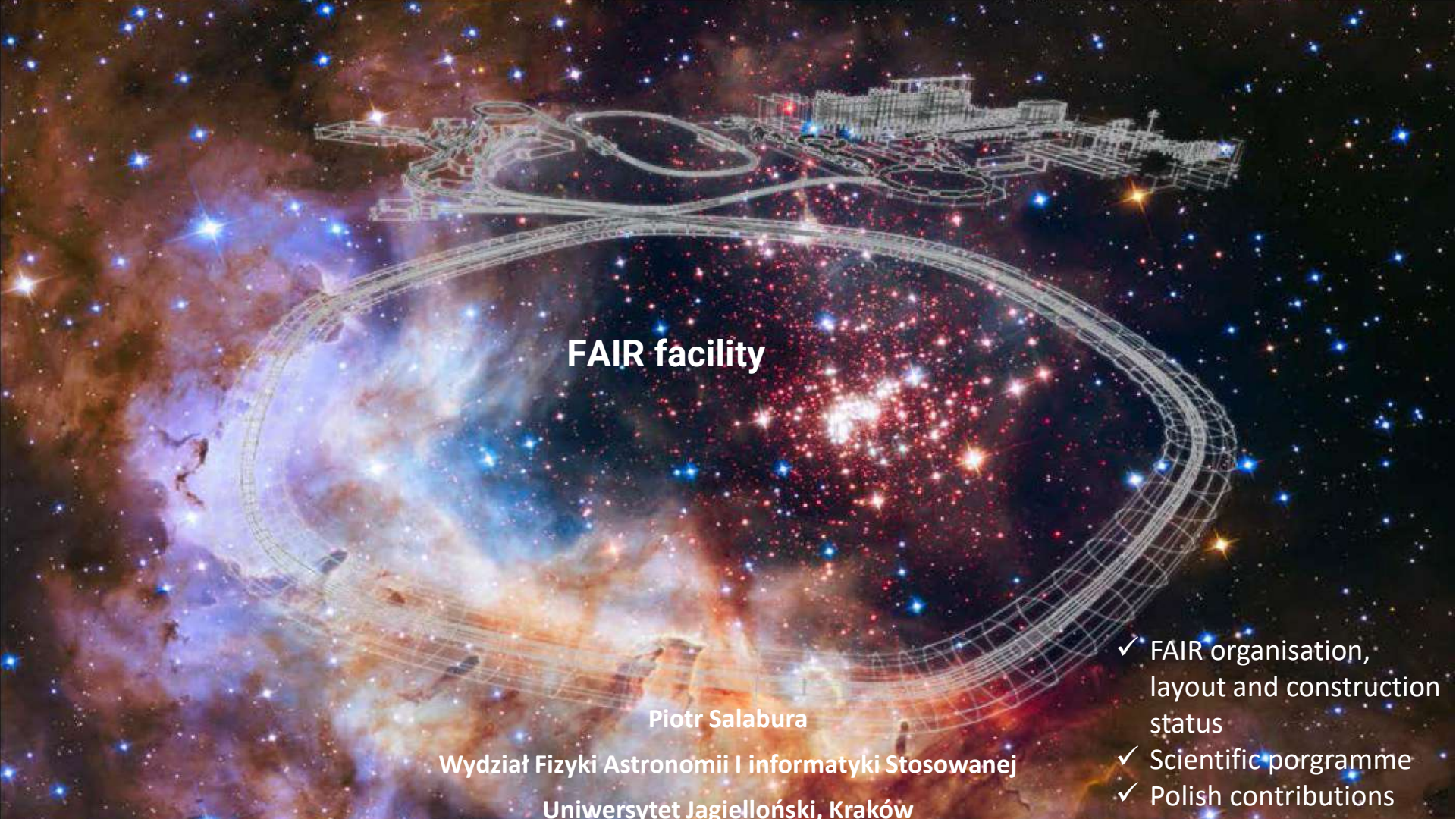
Polish participation in the EuXFEL is supported by the **XFEL-Poland consortium - currently consisting of 28 institutions.**
Within **the MNiSW project, expert support is provided by XFEL-Hub Poland** (**Centra Doskonałości XFEL**):

- XFEL lectures for master's and PhD students
- schools, workshops and scientific sessions devoted to XFEL science
- financial support for the participation of Polish scientists in international XFEL conferences
- internships at the EuXFEL for PhD students and PostDoc
- support in the preparation of research applications for EuXFEL , including complementary measurements

www.ifpan.edu.pl/cd-xfel

FAIR

Piotr Salabura



FAIR facility

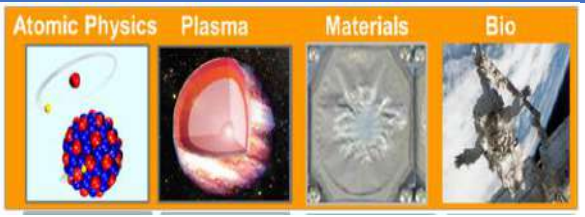
Piotr Salabura

Wydział Fizyki Astronomii I informatyki Stosowanej

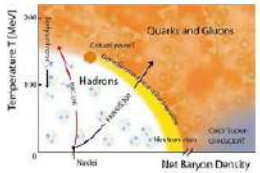
Uniwersytet Jagielloński, Kraków

- ✓ FAIR organisation, layout and construction status
- ✓ Scientific porgramme
- ✓ Polish contributions

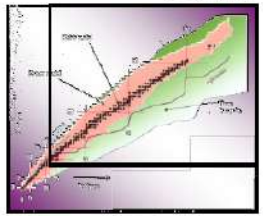
FAIR: Facility for Antiproton and Ion Rearch
Research Pillars



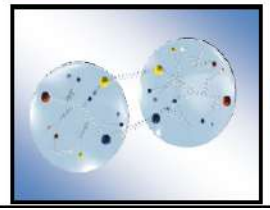
Atomic Physics, Plasma physics and applications **APPA** — Scientists World / Poland: **700 / 13**



Compressed Baryonic Matter **CBM** — **400 / 44**



Nuclear STructure Astrophysics and Reactions **NuSTAR** — **660 / 20**



hadron structure with Antiproton ANihilation (at DArmstadt) **PANDA** — **450 / 20**

+ 46 scientists & engineers contributing to infrastructure

FAIR : organisation and polish participation

Signing of FAIR convention in Wiesbaden 2010

Associated partner aspirant country

- FAIR Launched by Convention signed in 2010 by 9 shareholders financing construction with location near Darmstadt (Germany)
- Poland has 2.3% of FAIR shares and is represented in FAIR government (Council) by Jagiellonian University that is managing and coordinating polish in-kind contributions to FAIR. Financing is provided by Ministry of Science and Higher Education https://fair.uj.edu.pl/
- Krajowe Konsorcjum Femtofizyka is gathering 12 polish Institutions engaged in scientific programme at FAIR https://fair.uj.edu.pl/konsorcjum

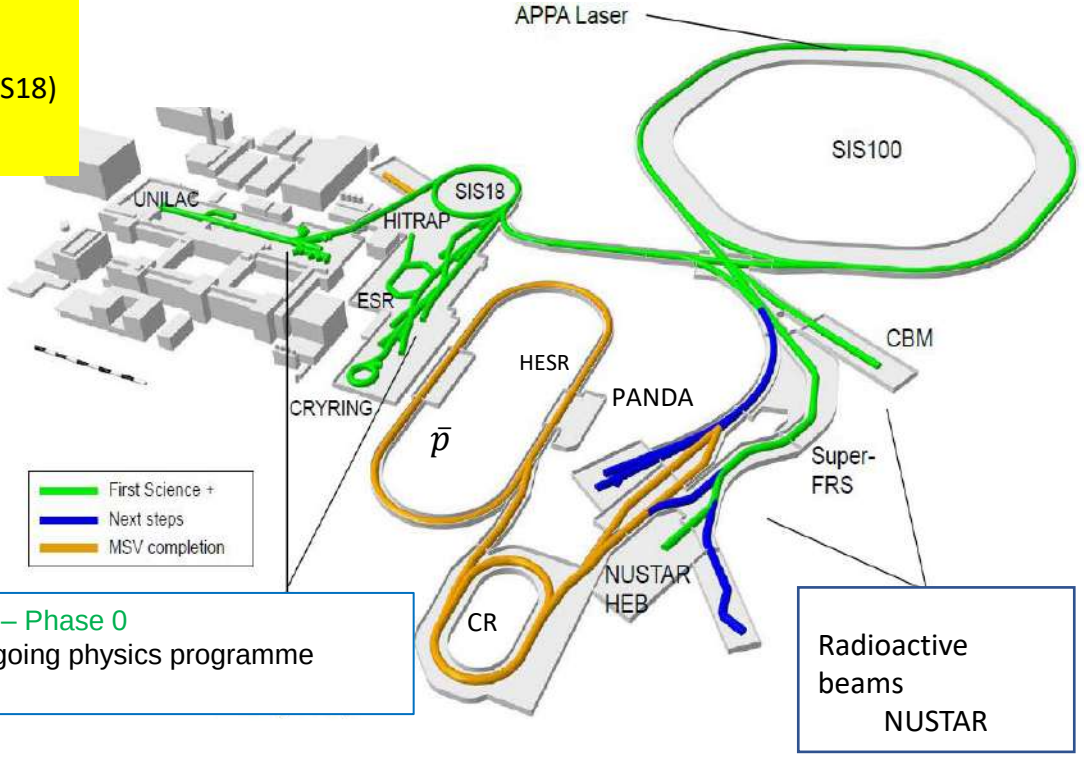
- On the Polish Map of Research Infrastructures (since 2017)
- Recommended with highest priority in Long Range plan for European Nuclear Physics by Nuclear Physics Collaboration Committee (NUPECC)
- Construction started in 2016 and completion of the first step (First Science+) expected by end of 2028.
- Research within FAIR-Phase0 program is ongoing in parallel to construction

FAIR: layout of facility & status

- ✓ FAIR science is driven by accelerator SIS100, storage rings and radioactive beam facility (SFRS)
- ✓ Beams are injected to SIS100 from GSI facility (UNILAC, SIS18) used for reaserch during construction
- ✓ storage rings for ions (ESR, CRYRING) antiprotons (HESR) (>2032)

(~ 250 superc. magnets, 11 ton He, ~140 GWh Energy/year

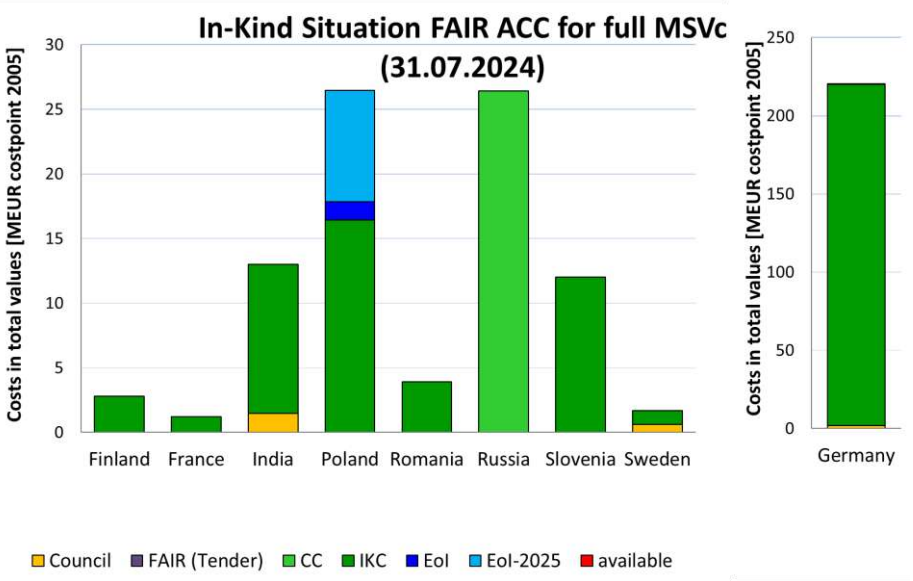
Construction site near Darmstadt'2024



Fair – Phase 0
On-going physics programme

Radioactive beams
NUSTAR

in-kind contributions to FAIR from Poland



Polish in kind contributions to FAIR

- To experiments

detectors, electronics, data processing systems

- To accelerator infrastructure

cryogenic systems : distribution of liquid Helium and current to superconducting magnets

assembly of magnets and development of strategies and quality control processes

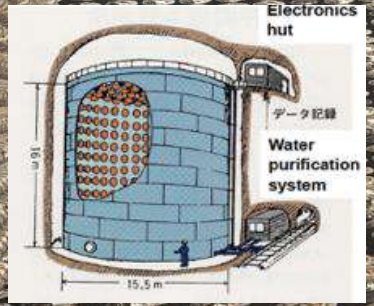
Poland : 2'd country with largest in-kind contribution

Hyper-Kamiokande

Ewa Rondio

Hyper - Kamiokande

Kamiokande 3 kton 1983-1996



Super-Kamiokande 50 kt
1996 -

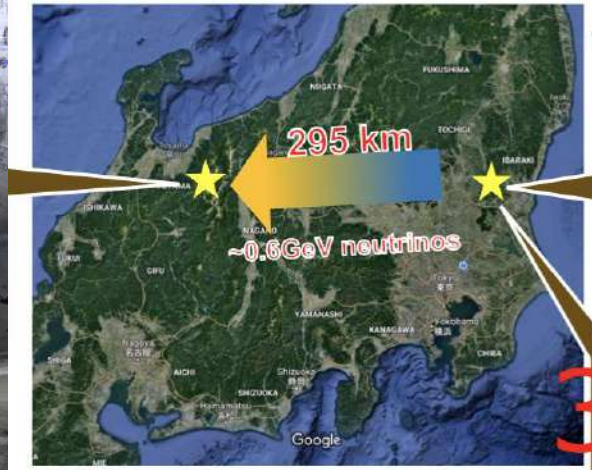
260 kton

8*Super-Kamiokande

World-leading neutrino physics and astrophysics, and nucleon decay

PROJECT IN A NUTSHELL:

Project started in 2020, Operation start in 2027



KEK High power proton beams
J-PARC (hosted by KEK)

INGRID ND280 IWCD: New intermediate water cherenkov detector

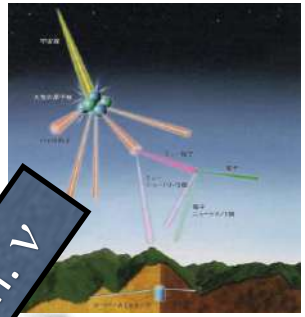
1. World-largest detector for Nucleon-decay and Neutrino experiment

to be built with **8.4 times** larger fiducial mass (190 kiloton) than Super-K and to be instrumented with double-sensitivity photo-sensors

2. World most-intense neutrino beam

J-PARC neutrino beam to be upgraded by **a factor 2.5** from 0.5 (as of 2019) to 1.3 Mega Watt

3. New and upgraded near detectors to control systematic errors



Hyper-Kamiokande International Project

Rich physics
Discovery potential

Solar ν

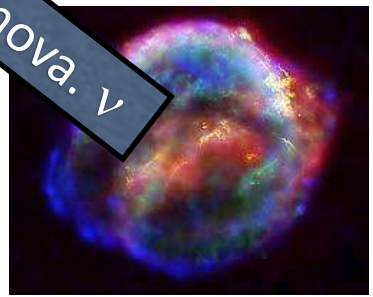
Atm. ν

DM or ??

CP w/ ν beam

Nucl. decay

Supernova. ν



U. Tokyo
&
KEK J-PARC

Polish participation In Hyper-K experiment

Nine High Energy Physics Institutions:

4 from **Warsaw**

- National Centre for Nuclear Research – NCBJ
- University of Warsaw
- Warsaw University of Technology
- CAMK - Astrocent

3 from **Cracow**

- Institute of Nuclear Physics, Polish Academy of Science
- Jagiellonian University
- AGH University of Science and Technology

Katowice

- University of Silesia

Wroclaw

- Wroclaw University

Polish contributions

Multi-PMT light detectors detectors build in Poland

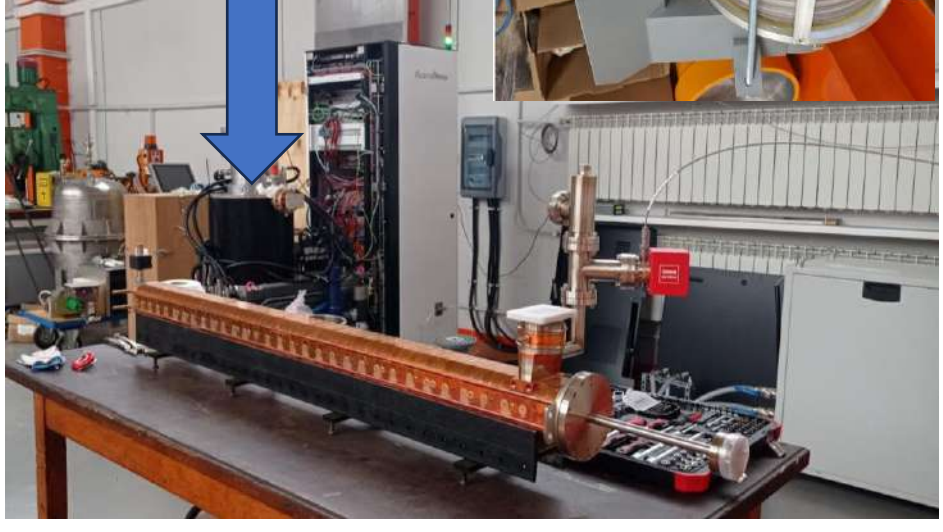
Now used in WCTE tests at CERN

Equipment for mounting under-water cables

and magnet

Liniac for calibration

accelarating structure



ILL

Ewa Juszyńska-Gałązka, Wojciech Zając

International research infrastructure:

Institut Laue-Langevin

NEUTRONS FOR SOCIETY

the world's leading facility
in neutron science & technology

Polish partner since 2006

Neutrony dla Polskiej Nauki

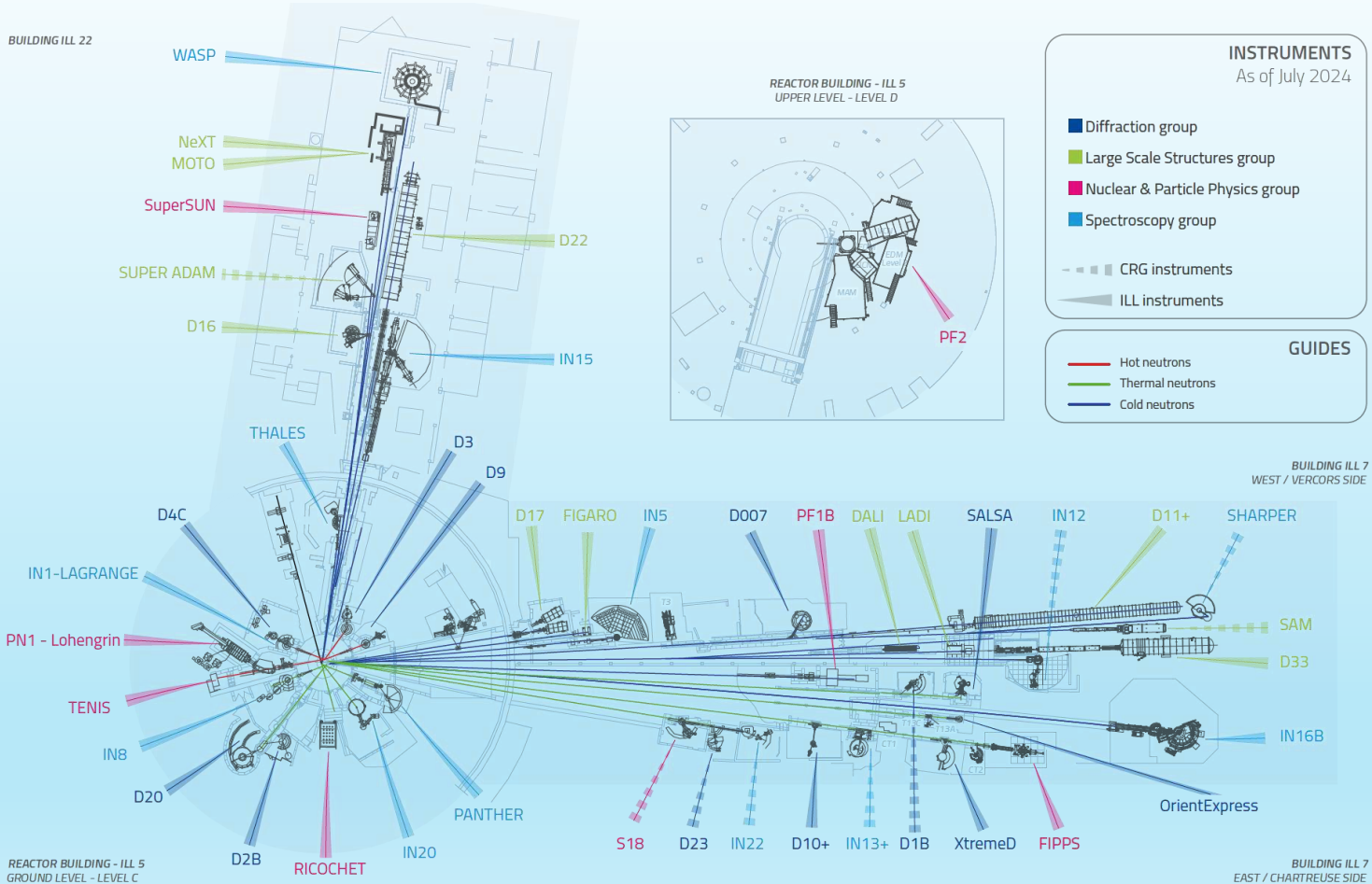
https://neutronydlapolskiejnauki.pl/

«Neutrons for Polish Science»
Consortium of 21 Polish universities and research institutions

Coordinated by:

THE HENRYK NIEWODNICZAŃSKI
INSTITUTE OF NUCLEAR PHYSICS
POLISH ACADEMY OF SCIENCES

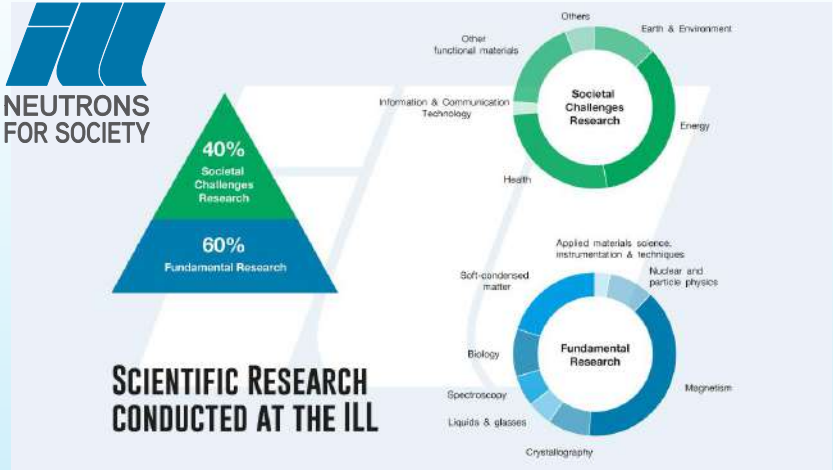
Ewa Juszyńska-Gałązka, Wojciech Zając

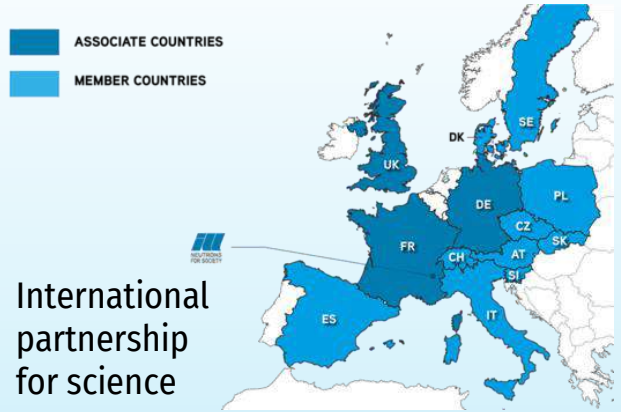


NEUTRONS FOR SOCIETY

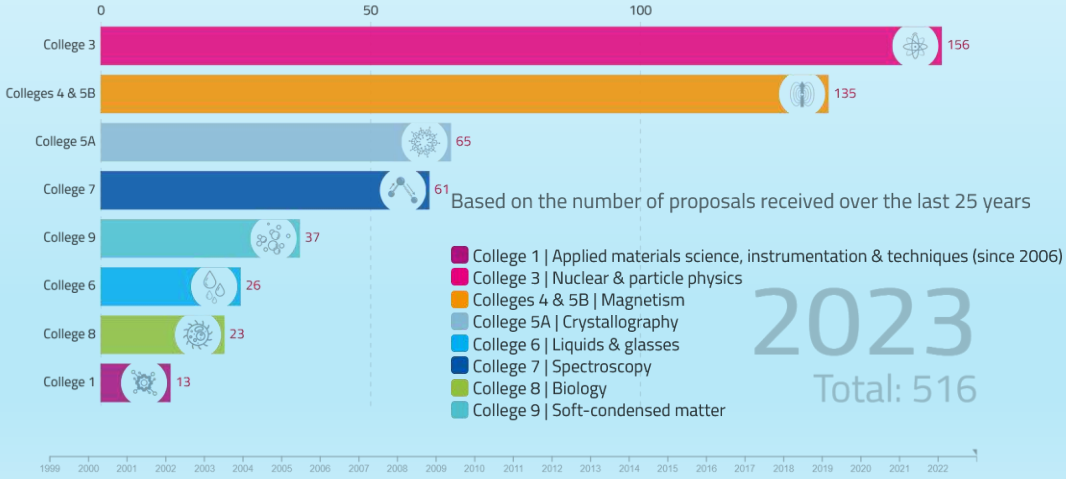
43 scientific instruments of unprecedented performance and quality

NEUTRONS FOR SOCIETY

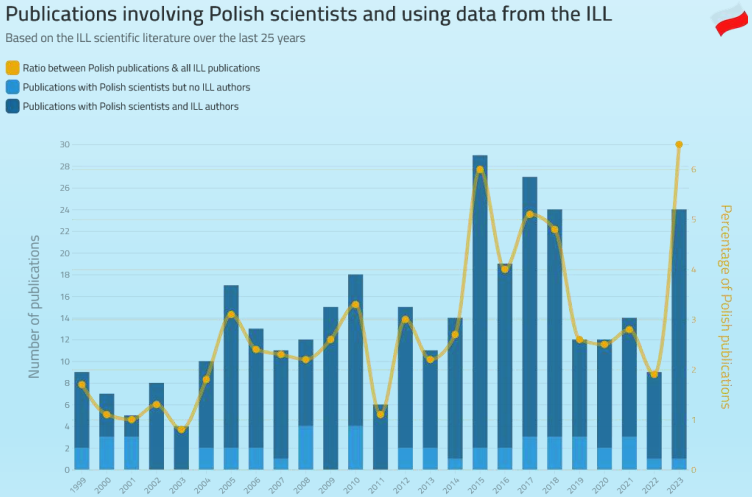




International partnership for science



Disciplines distribution in Polish beamtime requests



Now Poland contributes 0.8% to the ILL budget but delivers 5× more publications.

JIV ERIC

Agnieszka Słowikowska

Agnieszka Slowikowska
Director






















EUROPEAN vlbi NETWORK

Joint Institute for VLBI-ERIC

- The central organization of **European VLBI Network 20+ radio telescopes** (UK, IT, ES, ZA, LV, PL, SE, CN, NL, DE, KR, FI)
- **7 members + 3 participating research institutes**
- **Hosted in the Netherlands (ASTRON/Dwingeloo)**

https://www.evlbi.org/
https://jive.eu/

Assets

Facilitate
Enabling science excellency with the sharpest view of the Universe

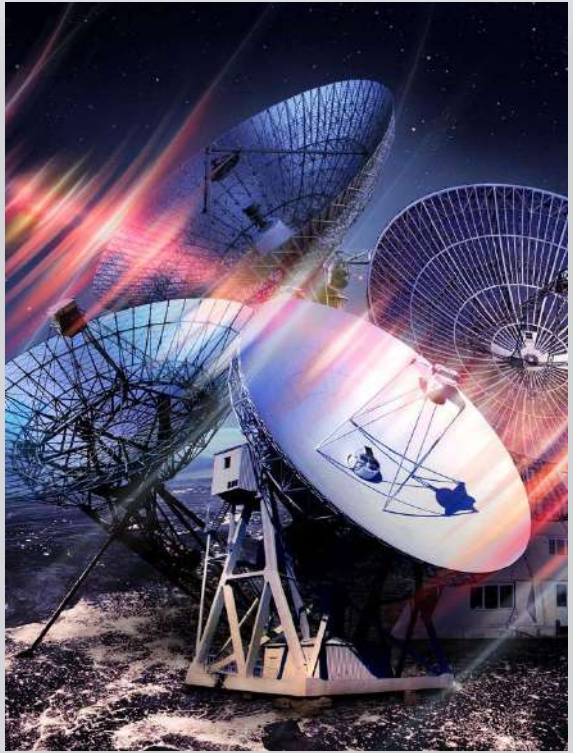
Support
- EVN users
- radio telescopes
- implementation of **new equipment or procedures**
- advocating **new partnerships** and **collaborations**
- **community building** and support

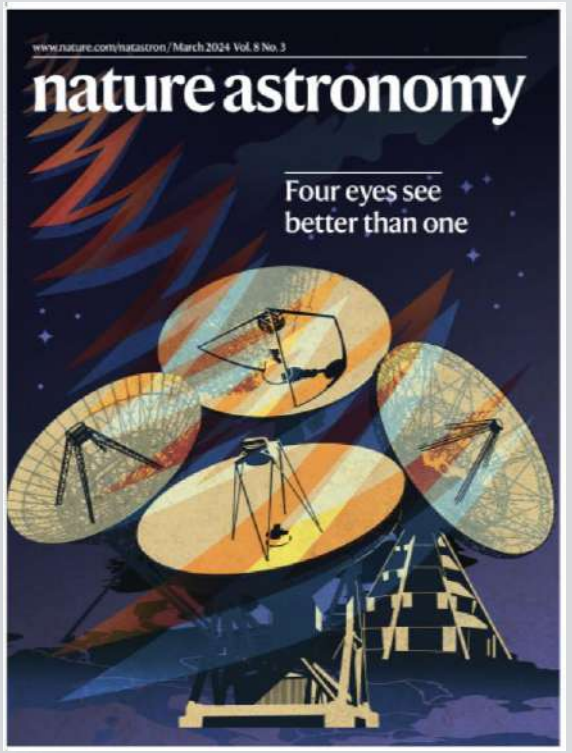
Services
- EVN **Public Data Archive**
- **R&D** for a state-of-the-art computing center
- provide **services** to the EVN/JIVE partners
- **engage** and **represent** partners in relations with the EC and other networks

30 JIVE
Joint Institute for VLBI ERIC

Scan me!

32-m Polish radio telescope on the Nature Astronomy cover page





LOFAR ERIC

Andrzej Krankowski

LOFAR ERIC

Ministry of Science and Higher Education
Republic of Poland

POLFAR

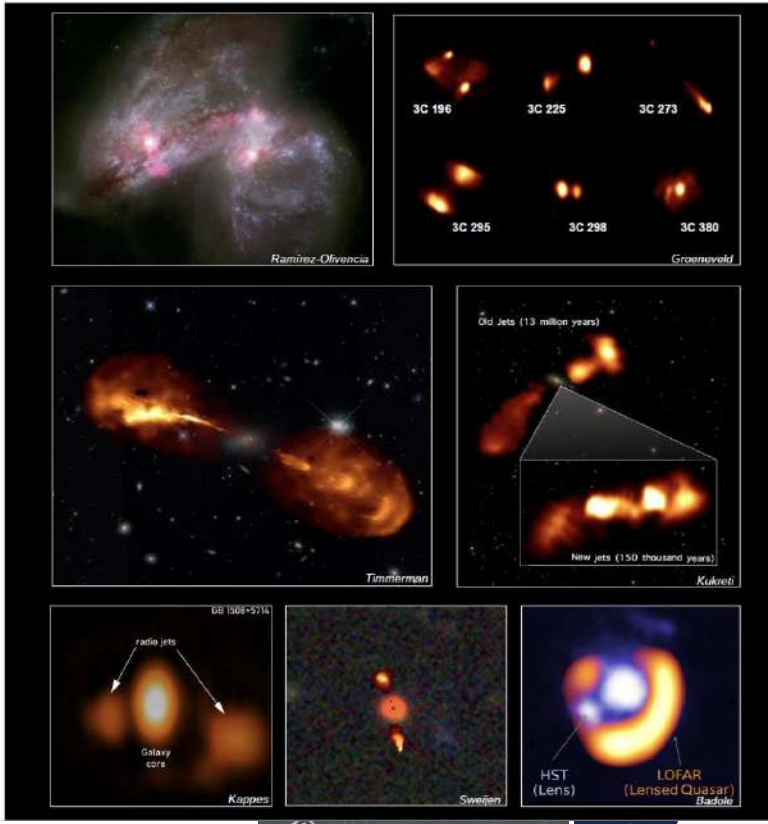
LOFAR ERIC

the **LO**w **F**requency **AR**ray
European **R**esearch **I**nfrastructure **C**onsortium

Commission Implementing Decisions
(EU)
2023/2881 of 20 December 2023

Andrzej Krankowski

University of Warmia and Mazury in Olsztyn
Member of LOFAR ERIC Council
Chairman of POLFAR consorcium



UNIWERSYTET WARMIŃSKO-MAZURSKI W OLSZTYNIE
UNIWERSYTET JAGIELLOŃSKI W KRAKOWIE
CBK PAN
PCSS
UNIWERSYTET MIKOŁAJA KOPERNIKA W TORUNIU
UNIWERSYTET ZIELONOGÓRSKI
Centrum Astronomiczne im. Mikołaja Kopernika Polskiej Akademii Nauk
UNIWERSYTET SZCZECIŃSKI

LOFAR ERIC

Distributed research infrastructure; world-leading low-frequency radio telescope

- **Founding Members:** Bulgaria, Germany, Ireland, Italy, the Netherlands, **Poland**
- **Observers:** France, Latvia, Sweden, United Kingdom
- **Distributed network of antenna stations: condensed in NL, extending >2000 km in Europe**
  - 52 antenna stations in 8 countries: NL (38, 24-core and 14-remote), DE (6), PL (3), IE, UK, FR, SE, LV + 2 stations funded (2025): IT, BG
  - Central observing operations, peer-reviewed access for the research community
- **Centrally operated data combination**
  - GPU-based correlator (NL)
- **Distributed archive and data analysis centres : 80 PB stored**
  - Central operation and open science access for the research community
  - Currently 3 nodes: SURF (NL), FZJ (DE), PSNC (PL)

LOFAR

Cosmic magnetism

Supermassive black holes

Early Universe

Supernovae

Galaxy clusters

Sun

Pulsars

Gravitational wave events

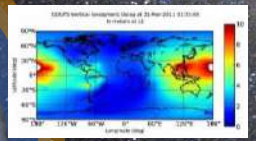
Solar System Planets

Meteors

Nearby galaxies

Cosmic rays

Ionosphere



Interstellar medium

Lightning

Space weather

LOFAR - The Key Science Projects

POLFAR - POlish Low Frequency ARray

established in 2007

POLFAR

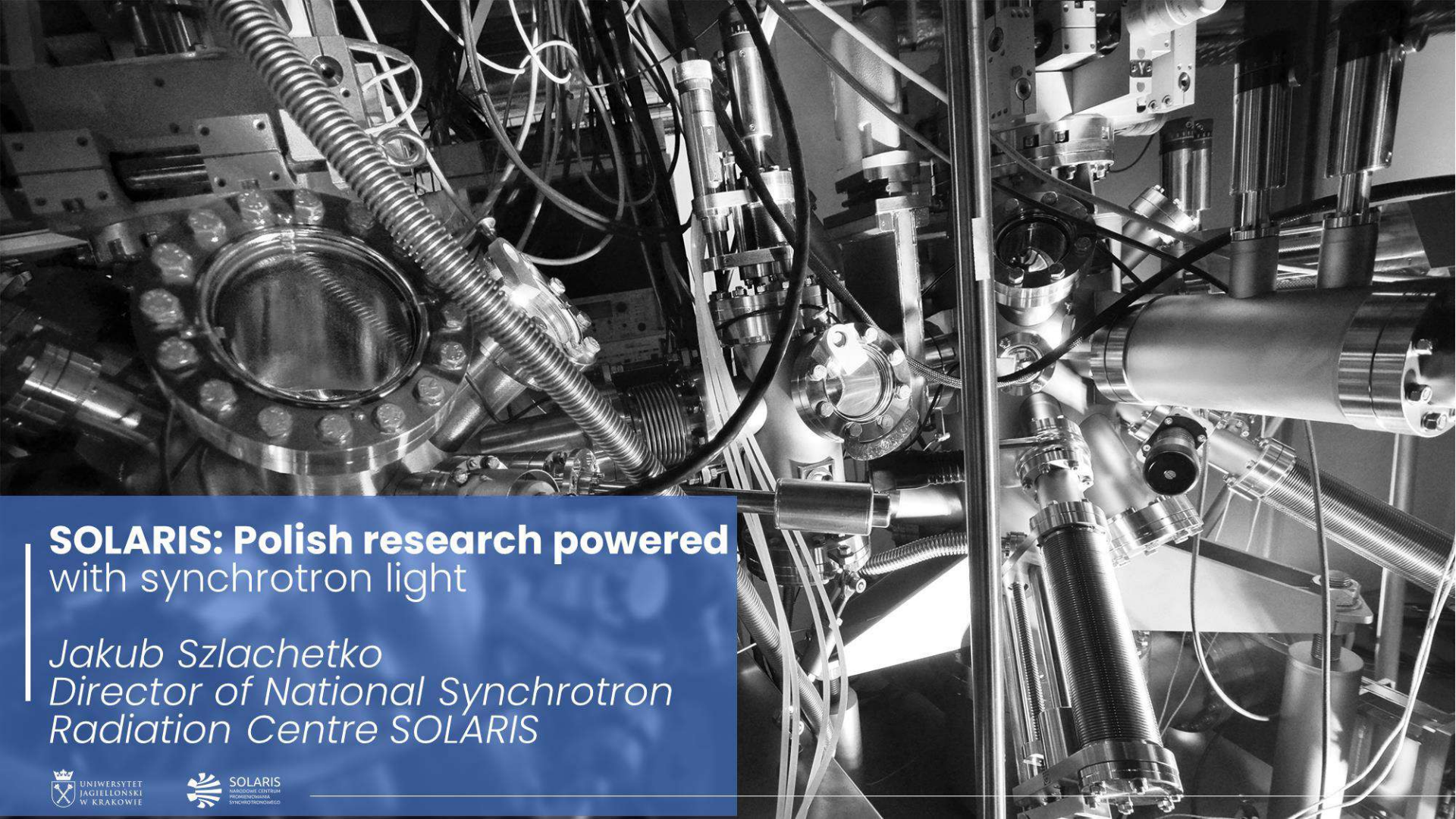
- **Members: (9 institutions)**
  - **University of Warmia and Mazury in Olsztyn**, the leader of the POLFAR Consortium, LOFAR PL-612 Baldy station,
  - **Jagiellonian University, Krakow**, LOFAR PL-611 Lazy station,
  - **Space Research Centre of PAS, Warsaw**, LOFAR PL-610 Borowiec station,
  - **PSNC, Poznan**, IT infrastructure,
  - University of Zielona Góra, Nicolaus Copernicus Astronomical Center of PAS in Warsaw, Torun, The Nicolaus Copernicus University in Torun, Szczecin University, Wrocław University of Environmental and Life Sciences.

- **POLFAR: On the Polish Roadmap since 2010** (2010, 2015, 2020)
- **Ministerial funding for 2013-2028:**
  - Creation of 3 Polish LOFAR stations (2015),
  - Polish contribution to ILT and LOFAR ERIC (since 2016)
  - Maintenance of 3 Polish LOFAR (since 2016)
  - Upgrade of 3 Polish LOFAR stations to LOFAR 2.0 (2023-2025)

UNIWERSYTET WARMIŃSKO-MAZURSKI W OLSZTYNIE
UNIWERSYTET JAGIELLOŃSKI W KRAKOWIE
CBK
PCSS
UNIWERSYTET MIKOŁAJA KOPERNIKA W TORUNIU
UNIWERSYTET ZIELONOGÓRSKI
Centrum Astronomiczne im. Mikołaja Kopernika Polskiej Akademii Nauk

SOLARIS

Jakub Szlachetko



SOLARIS: Polish research powered with synchrotron light

Jakub Szlachetko
Director of National Synchrotron Radiation Centre SOLARIS

UNIWERSYTET JAGIELLOŃSKI W KRAKOWIE

SOLARIS NARODOWE CENTRUM PROMIENIOWANIA SYNCHROTRONOWEGO

SOLARIS as a part of LEAPS

LEAPS

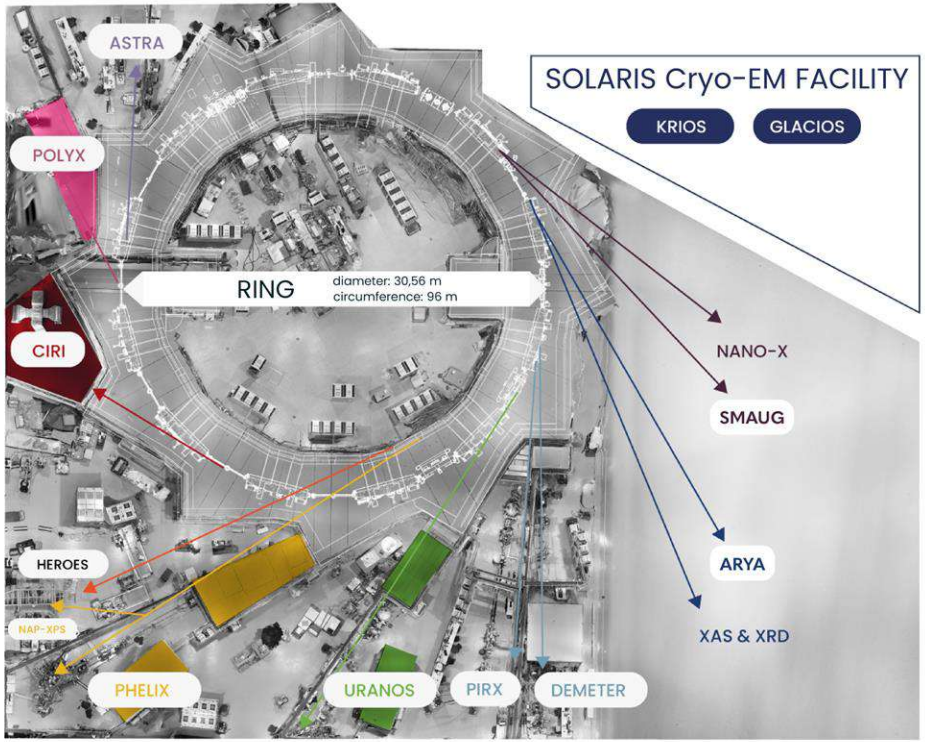
LEAPS - League of European Accelerator-based Photon Sources.

LEAPS is a collaboration that brings together all EU light sources with uniting 16 organisations representing 19 facilities.

In the past 5 years alone, LEAPS members have welcomed 35000 researchers, with 23 400 articles published in peer-reviewed journals.

Research & technology infrastructure in SOLARIS

The National SOLARIS Center is the large shared research infrastructure in Poland implementing open access projects.

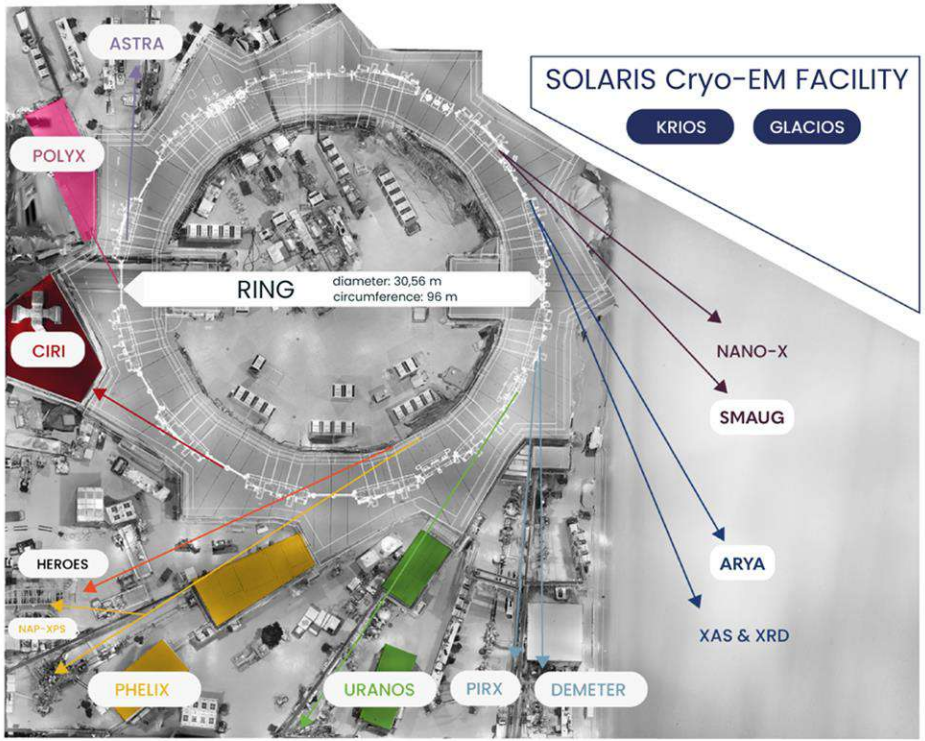


Research & technology infrastructure in SOLARIS

The National SOLARIS Center is the large shared research infrastructure in Poland implementing open access projects.

Direct investments (infrastructure & human resources) from non-SOLARIS entities:

The SOLARIS laboratory operates 24 hours a day. Due to demand, from 2025 we will also provide user service on Sundays.



SOLARIS – research areas

Energy storage

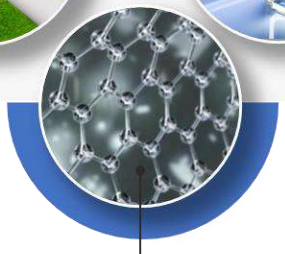
New vaccines

Inteligent drugs

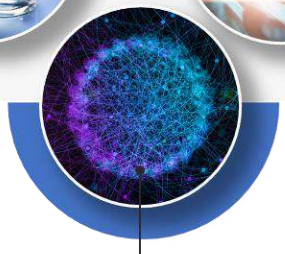
Sources of energy

Medicine and life sciences

Environmental research



Materials research



Quantuum technology

Agriculture

New chemicals

Ecological prodcution

Healthy food

SOLARIS users society

Projects/year:

- ~ 400 access applications
- ~ 200 experiments
- ~ 20 000 research hours
- ~ 1000 researchers
- ~ 100 research units from Poland
- ~ 150 research units from abroad

Thank you for the attention

dr hab. Jakub Szlachetko, prof. UJ
Narodowe Centrum
Promieniowania Synchrotronowego SOLARIS

UNIWERSYTET JAGIELLOŃSKI W KRAKOWIE

SOLARIS
NARODOWE CENTRUM PROMIENIOWANIA SYNCHROTRONOWEGO

Virgo

Andrzej Królak

Virgo-PL: Polish participation in the gravitational-wave observatory Virgo

Andrzej Królak

Institute of Mathematics, Polish Academy of Sciences, Warsaw, Poland &
National Center for Nuclear Research, Świerk, Poland

Virgo-PL: Institute of Mathematics PAS (leader), Academic Computer Centre Cyfronet AGH, CAMK PAS, Jagiellonian University, National Center for Nuclear Research, University of Białystok, University of Warsaw, University of Zielona Góra

Ministry of Science and Higher Education
Republic of Poland

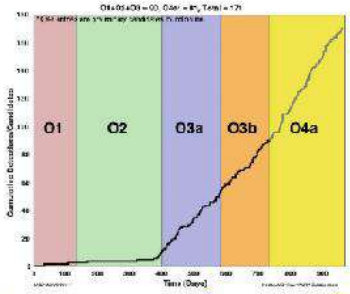
National Science Centre
Poland

Virgo-PL

Virgo - a gravitational wave detection project

Detector located near Pisa, Italy

Part of global Consortium **LVK** of GW detectors



271 GW signals detected including first ever detection of a GW signal in 2015 with participation of Virgo-Polgraw group. Nobel Prize in physics in 2017

- Virgo: 39 group members, 940 scientists from 167 institutions, 20 countries
- Virgo-Polgraw group: 28 scientists from 10 institutions in Poland, member of Virgo since 2008

Virgo-PL contribution to Virgo project

Consortium Virgo-PL: 8 Institutions in Poland

Virgo-PL: on the **Polish Roadmap** since 2011

Ministerial funding for 2024-2026, funding from NCN and FNP

- Participation in the Virgo governance
- Contribution to the common funds (336 kEuro)
- Deployment of seismic sensors at the Virgo site
- Analysis of the LIGO-Virgo-KAGRA data
- Contribution to computing infrastructure
- Astrophysical interpretation of data
- Identification of correlated noise in Virgo
- Participation in the Rapid Response Team (RRT)
- Outreach
- Organization of the LIGO-Virgo-KAGRA meetings

SGH Warsaw School of Economics

Funded by the European Union

GGP

SHARE SURVEY OF HEALTH, AGEING AND RETIREMENT IN EUROPE

Ministry of Science and Higher Education
Republic of Poland

Thank you!

January 16, 2025, Warsaw, Poland

SCIENCE IN POLAND

Regionalna Inicjatywa Doskonałości