## National Synchrotron Radiation Centre SOLARIS The Synchrotron RI in Eastern Europe

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> Roadmapping Distributed Research Infrastructures in Europe Krakow, Poland, June 9-10, 2025





## **Accelerator based lightsources**





## **Research areas at synchrotron lightsources**





## Synchrotrons & FELs in the World

W KRAKOWIE







## National Synchrotron Radiation Centre SOLARIS

- 3<sup>rd</sup> generation light source **constructed 2010 2015** in close collaboration with MAX IV, Lund, Sweden
- Construction financed from EU Development Funds
- Commissioned between 2016 and 2018
- Open for users since October 2018
- Financed by Ministry of Science and Higher Education
- Operates as a unit of the



JAGIELLONIAN UNIVERSITY In kraków





## **SOLARIS accelerators**



## **Research infrastructure**

SOLARIS offers research at 7 synchrotron beamlines and at 2 Cryo-TEMs

#### Instruments available for users (12)

- IR microspectroscopy (3)
- VUV and soft X-ray spectroscopy at UHV (3)
- soft X-ray microscopy (2)
- tender & hard X-ray spectroscopy
- hard X-ray microscopy & tomography
- Cryo TEM (2)

#### Instruments under construction (5)

- X-ray photoemission at near AP
- o macromocelular crystallography
- tender & hard X-ray micro/nano-beam
- o small angle (hard) X-ray scattering
- hard X-ray spectroscopy, diffraction and inelastic scattering

### Projects (5)

- Hard X-ray photoemission instrument
- Surface scattering instrument
- Operando RXES beamline
- o UV-Vis and irradiation laboratory

SOLARIS

Next generation Cryo TEM





## Highlights





Szpytma et al. Transfer of magnetic anisotropy in epitaxial Co/NiO/Fe trilayers, Scientific Reports 14, 1680 (2024)

UNIWERSYTET Jagielloński W krakowie SOLARIS



X-ray tomography at POLYX beamline





Katarzyna Kopeć et al Institute of Systematics and Evolution of Animals Polish Academy of Sciences



Quantum materials at URANOS beamline

Polaczyński et al., 3D topological semimetal phases of strained  $\alpha$ -Sn on insulating substrate, Materials Today 75, 135-148 (2024)

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## **Cryo-EM facility**

An initiative of 18 Polish research institutes that pursue research in the field of structural biology



Nature Comm. (2023)

Nucleic Acids Research (2024) Conserved structures & dynamics in 5-proximal regions of Betacoronavirus RNA genomes



Single Particle Acquisition





#### Cryo-tomography



I. Koning et al. / Annals of Anatomy 217 (2018) 82–96

#### **Krios** G3i (300kV)

#### Glacios (200kV)







## **SOLARIS partnerships**

## 

Member of the League of European Accelerator-based Photon Sources, which is formed by 16 organizations representing 19 light source facilities in Europe.

LEAPS facilitates TNA access to research infrastructures (**NEPHEWS** & **RIANA** project)



SOLARIS NARODOWE CENTRUM PROMIENIOWANIA

LEAPS Chair in 2025 Jakub Szlachetko SOLARIS





## **SOLARIS partnerships**

# CERIC

Central European Research Infrastructure Consortium



SOLARIS contributes 10% of beamtime to **CERIC-ERIC**, which gathers partner facilities in 8 countries:

- •
- 2.4 GeV synchrotron (IT) 1.5 GeV synchrotron (PL)
- Neutron source (HU) .
- lon source (CR) .
- TEM laboratory (RO) NMR spectrometers (SL)
- Surface science lab (CZ) ٠
- X-ray scattering lab (AT) ٠



## **Access to SOLARIS**

- Free of charge access Ο
- Open calls for **standard** and **long-term** proposals twice a year; peer reviewed
- TNA and twinning via NEPHEWS Ο
- **Rolling call** for short experiments via **rapid access** Ο with mail-in or remote participation feasibile (upon agreement with beamline supervisors)

Trans-national access supported also by:

#### **Since 2018**

- ~ 1600 submitted proposals
- > 380 publications with SOLARIS affiliation
- > 25% of PIs with foreign affiliation
- ~ 50% of acceptance rate of proposals



&









## **Community of SOLARIS users**

Free of charge access offered to worldwide community of researchers



#### 145 20 15 12 10 5 0 Poland Germany Ukraine Beleium Nethetlands 51043413 Switzenland United Kingdom Canada Portugal Ital Austria France USA China hand HUNBY HOLNOY Serbia Wan Uzechia spain

#### 15TH CALL, APRIL 2025, SUBMITTED PROPOSALS

Users in SUN





## Geographical distribution of RIs across Europe

Szwecja Wyspy Owcze Finlandia Norwegia 0 Petersburg Санкт-Петербур Sztokholm Estonia Gotebore Ryga Lotwa Morze Północne Edynburg Litwa Dania Wielka Brytania Gdańsk Mińsk Minck Białoruś Polska Warszawa Kiióy Київ LWOW Kraków Winnica Вінниця Czechy Ukraina Słowacja. lapeszt Mołdawia Węgry Francja Odessa Одеса Lyon Rumunia 0 Chorwar **Bukareszt** Serhia Monako Marsylia Porto Andora-Bułgari Barcelona Tirana Madryt ursa Palma de Mallorca Portugalia Walencia Hisznani Lizbona Algie Antalya

**ERICs seats (source: ERIC FORUM)** 

#### ESFRI roadmap (leaders of: projects/landmarks)



## Geographical distribution of RIs across Europe



#### LENS



## Synchrotrons & FELs in the World

W KRAKOWIE



1. TNA and EOSC are not sufficient solutions to fully address the asymmetry in the distribution of research infrastructures across Europe, as they overlook the role of RIs in developing local socio-economic ecosystems. There is a need to establish a healthy balance between mechanisms supporting access and investments that enable a more balanced geographical distribution of infrastructure

#### New registrations at SOLARIS proposal evaluation system - DUO



## SOLARIS case study: INVESTMENT vs. TNA



Polish Users in SUN — Number of Polish Organizations



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2. The TNA mechanism requires in-depth evaluation and further improvement to truly meet expectations. Incentive mechanisms should be introduced for institutions and countries that significantly contribute to achieving the European Commission's goals set for this instrument.

## Does the distribution of RIs in Europe raise concerns? Does TNA sort this out?



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TNA users @ HORIZON 2020 by country of affiliation (normalized by population = per 100 000 citizens)



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TNA users @ HORIZON 2020 by country of affiliation (normalized by numer of R&D personel in higher education sector *excluded sectors: bussiness, govermental, NGOs*) ( = per 1000 researchers) *Eurostat:2022*)



## LEAPS (the League of European Accelerator-based Photon Sources)



600 000 000 EUR annual cost of access to LEAPS facilities

180 000 000 EUR annual cost of TNA at LEAPS (30%)





1 800 000 EUR annual TNA cost assigned to EU project (1%)



## Advantages of centralized TNA support distribution

#### 1. Creation of a central database of open access RIs allows for:

- easy analysis of the supply of RIs at a pan-European level,
- internationalization of small and distributed RIs that are currently not seen in large TNA projects,
- a comprehensive, centralized offer of open access RIs that facilitates multi-method and interdisciplinary research,
- recognition of national funding contributions and encouragement for greater involvement from the EC,
- harmonization of unit cost calculation methodologies.

#### 2. Creation of the central database of TNA users allows to:

- access to real-time statistical reports, allowing the European Commission to take timely corrective action,
- prevention of multiple support for the same users (currently not possible due to GDPR limitations),
- inclusion of services beyond access such as sample preparation or data analysis
- integration of an e-learning platform for users, regardless of their location.

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3. Distributed infrastructures do not need to be connected solely based on the uniqueness of the research equipment itself; rather, they can form networks of **complementary, unique scientific services and expertise**. This approach allows smaller laboratories with more standard equipment to join specialized systems offering distinctive measurements and expert knowledge.

4. Technological infrastructures operating at intermediate TRL levels may offer specific opportunities for widening countries. They require the establishment of standards that differ from those in research infrastructures.

CENTRAL OFFICE		
Facilities	Unit	Cost
SR1	hour	400
FEL 1	hour	1000
NS1	hour	1000
Supercomputer	PFlop/s/h	200
Lifewatching	1Gb	200
1ghzNMR/AFM/?	hour	100

25% unit cost reimbursement as a base for all
75% if the user is woman returning after maternity leave
75% if the user is a newcomer
75% if the user is an early stage researcher
50% if the user is doing experiment on green energy
50% if the user is affiliated at Africa
25% if the user is a woman

TNA Policy for the Central Office:

+ 50% if the user is from underrepresented communities



## Thank you and welcome to SOLARIS





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