EGI Council Participant: IICT–BAS

Participating in EGI Impact Report: Bulgaria

2023

egi.eu

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Infographic

+1,100 service users

In 2023, +1,100 researchers from Bulgarian institutions used the services provided by the EGI Federation
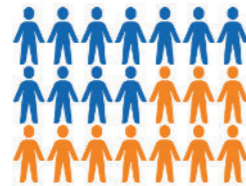
+440 publications

The research communities, projects and scientific collaborations from Bulgaria supported by the EGI led to more than 440 peer-reviewed scientific publications

9 Supported communities

In 2023, the Bulgarian infrastructure supported 9 research communities in the following disciplines: Climate Research, Health and Medicine, Linguistics, Physics

Projects

Bulgarian partners participate in 6 collaboration projects + EGI-ACE

1 HTC Data Centre

Country overview

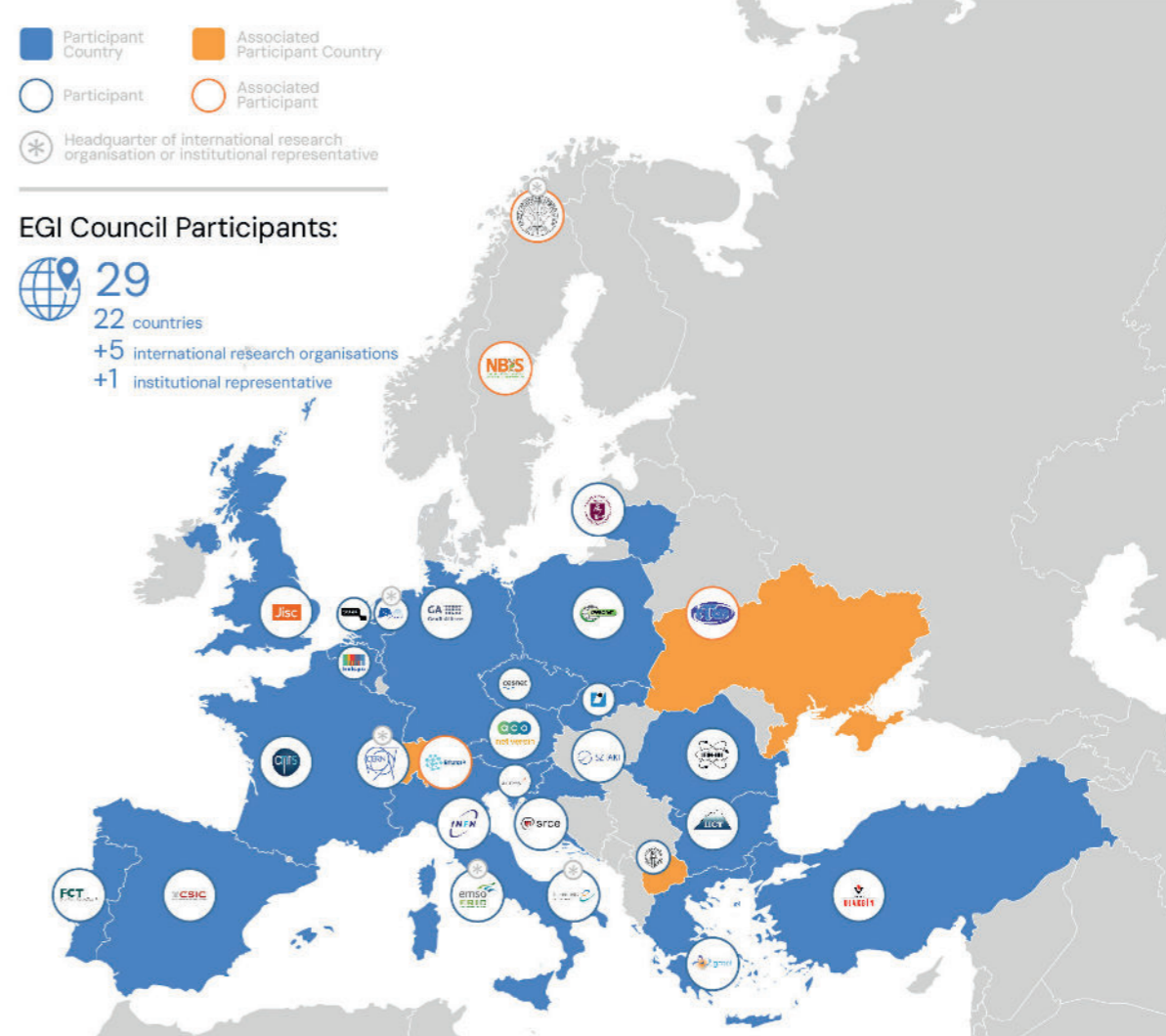|	
Number of supported publications	442
Number of total service users	1,104
Scientific Communities supported	9 (Climate Research, Health and Medicine, Linguistics, Physics)
Data Centres contributing to the Federation	1
Collaboration projects	6

About EGI

EGI is the federation of computing and storage resource providers united by a mission of delivering advanced computing and data analytics services for research and innovation.

The EGI Federation believes that all researchers should have seamless access to services, resources and expertise to collaborate and conduct world-class research and innovation. The EGI Federation is coordinated by EGI Foundation, an organisation with headquarters in Amsterdam. The Foundation offers a service federation and management platform, enabling the data centres to harmonise and integrate their services by connecting to a common hub. Moreover, it engages with international research communities using these services in order to understand and satisfy their demands for advanced computing for research.

The mission of EGI is pursued by coordinating and provisioning an international federated infrastructure that pools together service providers from both the public and private sectors in Europe to develop, integrate and deliver digital services for compute and data-intensive research and innovation. As an open initiative with a global outlook, the EGI Federation also connects service providers beyond Europe, following the collaboration needs of the served communities.

The latest Annual Report provides an extensive overview of the results that have been achieved through our collaborative efforts in 2023.

EGI Council Participants:

29
22 countries
+5 international research organisations
+1 institutional representative

Approved EGI Council map from 2023

About IICT-BAS

Institute of Information and Communication Technologies – BAS is the coordinating entity of NCHDC.

The National Center for High-performance and Distributed Computing (NCHDC) provides computing resources and software services for research and innovation to the individual researchers and scientific groups in Bulgaria.

The main objective of the NCHDC is to provide stable and reliable services in a sustainable way, in the long term, with maximum fl exibility, exceptional cooperativity and understanding of users from different disciplinary fi elds, which pose problems specific to them and need support for the use of electronic infrastructure. This is an extremely difficult task requiring experienced, highly knowledgeble and motivated e-Infrastructure specialists in order to match the NCHDC infrastructure to modern hardware and software developments.

Overall EGI impact

EGI federates hundreds of resource centres that are located at participant countries, organizations and at collaborating e-Infrastructures worldwide. This federated infrastructure supports data- and compute-intensive research across Europe and the world. In 2023, our federation was used by over 260 scientific communities, and has been accessed by around 95,000 users.

The EGI Federation is composed of e-infrastructure providers from national and community initiatives, forming one of the largest distributed computing infrastructures for researchers in the world, integrating about 1,243,400 CPU cores and over 1,4 Exabyte of storage space from hundreds of data centres.

In 2023, the EGI Federation served around 95,000 users (+12%) from over 260 research communities. EGI users consumed 7 Billion HTC CPU hours (–1.04%), 12 Million Cloud CPU hours +17%), ran over

372 M computational jobs (+13.4%) and published over 2,900 open access publications.

As of the previous year, the research community with the largest number of users is Medical and Health Sciences (+43% annual increase in 2023), while the community with most extensive HTC CPU/h consumption is WLCG.

From the scientific communities engaged in 2023, the one with most extensive Cloud CPU/h consumption is Pangeo (+2959% annual increase in 2023).

Moreover, EGI engaged with a total of 265 scientific communities (10 new communities); 19 SMEs and business pilots, and 1 additional Research Infrastructure included in the ESFRI Roadmap, raising the total of number of ESFRI partners/users of EGI to 23.

EGI contribution to Bulgaria excellence in science

The services of the EGI federation have been used by 1104 researchers from Bulgaria in 2023. The estimated annual scientific output in 2023 produced by research communities, projects and scientific collaborations from Bulgaria and supported by the EGI Federation is estimated to amount to more than 440 peer reviewed scientific publications.

The EGI Federation is currently working with over 40 Research Infrastructures, 9 of which include Bulgarian partners. These EGI-enabled research infrastructures, their Bulgarian members and their 2023 scientific output (publications) are detailed in the following pages of the report.

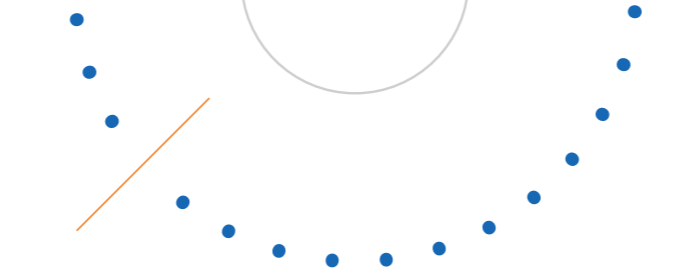| Bulgarian research collaborations in EGI	EGI supported activities and services	Number of scientific papers published in 2023
ALICE (High-Energy Physics) • Institute For Advanced Physical Studies (IAPS), Sofia	ALICE has been supported since 2012 as part of the EGI – WLCG collaboration, formally agreed in an MoU. Federated services delivered in the context of the WLCG MoU, including: • Software support (consultancy to users and system administrators, (software maintenance and validation) >Infrastructure and operations Services (infrastructure catalogue, accounting repository and portal, helpdesk, monitoring, operations portal, AAI) • Software distribution services (UMC, CMD, operations documentation) • Operations coordination (middleware deployment campaigns, procedures, innovation of tools) • Security services and activities (CSIRT, Software vulnerability group, international security coordination, policies, IGTF distribution)	**65**
CMS (High-Enery Physics) • Institute for Nuclear Research and Nuclear Energy (INRNE) • Institute for System Engineering and Robotics, Sofia, Bulgarian Academy of Sciences	CMS has been supported since 2012 as part of the EGI – WLCG collaboration, formally agreed in an MoU. Federated services delivered in the context of the WLCG MoU, including: • Software support (consultancy to users and system administrators, (software maintenance and validation) • Infrastructure and operations Services (infrastructure catalogue, accounting repository and portal, helpdesk, monitoring, operations portal, AAI) • Software distribution services (UMC, CMD, operations documentation) • Operations coordination (middleware deployment campaigns, procedures, innovation of tools) • Security services and activities (CSIRT, Software vulnerability group, international security coordination, policies, IGTF distribution)	**117**
CLARIN (Linguistics) • CLaDA-BG, Bulgarian Academy of Sciences, Kiril Simov	CLARIN thematic services has been supported by EGI since 2018. CLARIN has a Service Level Agreement with EGI, using the following services: • EGI Cloud (Compute + Online Storage) for hosting the Virtual Language Observatory (VLO) • Technical support • Service integration	**38**

Bulgarian research collaborations in EGI	EGI supported activities and services	Number of scientific papers published in 2023
CTA (Astronomy) • Astronomy Department of Faculty of Physics • Sofia University • Institute for Nuclear Research and Nuclear Energy, BAS	The CTA experiment has been using compute resources from EGI partners for more than a decade. The services from the EGI federation that CTA uses include: • EGI HTC services from 9 EGI participant countries (CZ, DE, IT, FR, ES, NL, RO, PT, SI) • Software distribution services (UMC, CMD, operations documentation) • Operations coordination (middleware deployment campaigns, procedures, innovation of tools) • Security services and activities (CSIRT, Software vulnerability group, international security coordination, policies, IGTF distribution)	0
ELI-BEAM (Physical Sciences) • Institute of Electronics, BAS	ELI works with EGI since 2016 on exploring and validating approaches for off-site computing and data management. ELI-Beams setup a High Throughput Compute Service on EGI resources and works with EGI providers on • Refining the user requirements and translating these to e-infrastructure requirements, and • Identifying and validating services from EGI that can be relevant for ELI (besides HTC and compute). • Mobilising already existing HTC compute, cloud compute and storage resources from EGI for ELI piloting and demonstration activities.	37
ELI-NP (Nuclear Physics) • University of Ruse "Angel Kanchev"	ELI has been working with EGI since 2016 on exploring and validating approaches for off-site computing and data management. ELI-NP setup a High Throughput Compute Service on EGI resources and works with EGI providers on: • Refining the user requirements and translating these to e-infrastructure requirements, and • Identifying and validating services from EGI that can be relevant for ELI (besides HTC and compute). • Mobilising already existing HTC compute, cloud compute and storage resources from EGI for ELI piloting and demonstration activities	48

Bulgarian research collaborations in EGI	EGI supported activities and services	Number of scientific papers published in 2023
LifeWatch (Biodiversity and Ecosystem Research) • Agricultural University–Plovdiv	The LifeWatch experiment has been using compute resources from EGI partners since 2018. The services from the EGI federation that LifeWatch uses include: • EGI Cloud services from 2 EGI federated data centres from ES and PT • Software distribution services (UMC, CMD, operations documentation) • Operations coordination (middleware deployment campaigns, procedures, innovation of tools) • Security services and activities (CSIRT, Software vulnerability group, international security coordination, policies, IGTF distribution)	0
SeaDataNet (Oceanography) • Institute of Oceanology, BAS	SeaDataNet has been supported by EGI partners in the EOSC-hub project in the setup and validation of a data access service on federated cloud resources. Since 2021 the SeaDataNet community is represented in the EGI Council by MARIS, and works with several EGI members in the EGI-ACE Horizon 2020 project. In EGI-ACE, SeaDataNet and EGI partners from Spain are setting up and operating a WebOcean Data Analysis service in the EGI cloud federation, and deliver the service in EOSC.	1
WeNMR (Structural Biology) • Medical University of Sofia • Institute of Biophysics and Biomedical Engineering at the Bulgarian Academy of Science	WeNMR is supported by EGI since 2011 and has a Service Level Agreement since 2016. The EGI Services used by the community include: • High-Throughput, Cloud + Online Storage services from 23 EGI federated sites from the Netherlands, Italy, France, Germany, UK, Poland, the Asia Pacific region, IberGrid (Spain and Portugal), Italy, the Latin America region. • EGI Workload Manager • Trust and identity management with Check-in • Technical support: WeNMR benefited from continual support through dedicated support activities in various EGI flagship projects: EGI-Engage, EOSC-hub and EGI-ACE.	136

Participated projects

The EGI Foundation coordinated one Horizon 2020 project, EGI ACE (January 2021–June 2023). Moreover, it leads two Horizon Europe Projects, iMagine (September 2022–December 2025) and interTwin (September 2022–August 2025).

Furthermore, the EGI Federation was involved in 8 additional projects, increasing the innovation potential of its participants.

The EGI Federation participates in Horizon 2020 and Horizon Europe projects together with Bulgarian institutions to facilitate the uptake and use of e-infrastructure services for science. A summary of these projects, the involved institutes and the scope of the collaboration is provided in the next table

Project title	Scope of collaboration	Participating beneficiaries from the country
SoBigData	EGI is one of the main contributors to the design and definition of the EOSC architecture and the federated service management framework, and coordinates service pilots participates by the scientific demonstrators. EGI also contributed to the definition of the governance framework and to the works on Rules of Participation. In the project EGI will enhance the SoBigData platform with two services: Jupyter Notebooks and the Workflow manager Galaxy	• Center for the Study of Democracy
SoBigData++	EGI leads the work on Services Provision, which collects information about the services that the RI can provide and creates a plan for a unified single access point RI, including access policies for the distributed resources. EGI also contributes to the development of the financial aspect of the future RI, defines the business cases and the cost book, supports the strategy and enhance the impact of the RI, contributes to the Dissemination and Communication plans (WP5), and to the creation of the Italian central Hub for the preparation phase.	• Center for the Study of Democracy
PITHIA-NRF	The EGI Foundation supports the project in defining interoperability standards among the participating facilities, and with the broader landscape, including EOSC, and leads the design of sustainable services and activities that will last beyond the project. EGI members deliver a federated cloud environment with a cloud-based 'EGI Notebooks' service for the PITHIA e-science centre to offer a scalable and customisable web environment for writing workflows, exchanging workflows, accessing, analysis and sharing of data.	• Borealis Global Designs Eood
AI4PublicPolicy	EGI Foundation is leading the task which provide technologies to allocate cloud and HPC resources based on the policy under-development, which will be dynamically updated during runtime based on emerging situations; the task which will integrate information, content and demonstrators about the project's outcomes to the on-line portal of the market platform. The task will integrate all the exploitable assets of the project in the market platform.	• Obshtina Burgas

| Project title	Scope of collaboration	Participating beneficiaries from the country
	EGI, as a very active player in the Data Space landscape in Europe, joined the project as Associated and collaboration Partner and participates in the Strategic Stakeholder Group (SSG) that will act as a think-and-do-tank to support the project in delivering to the policy objectives.	• Sofia University
ANERIS	EGI co-leads the activities around technology Integration and validation on large RIs. It leads the work on the computing continuum infrastructure and contributes to the development of a Virtual Research Environment for the analysis of the genomics data, the creation of the imaging-Biooptics gateway and pipeline integration, as well as of the participatory Sciences gateway and pipeline integration. Moreover, EGI coordinates the overall integration and EOSC synergies. Last but not least, EGI leads the project's innovation management and exploitation activities.	• Pensoft Publishers
	EGI is involved in developing a detailed roadmap, analyzing state-of-the-art technology, and designing a modular architecture framework. Morever, It works to improve data monetization strategies for EU companies and define KPIs for fair dataset valuation. EGI will help develop business cases for data sharing platforms, explore non-monetary data value dimensions, and prepare pilots for framework deployment. Demonstration and validation tests will be conducted at pilot sites. Additionally, EGI contributes to disseminating results, managing innovation and sustainability, participating in standardization activities, and coordinating with the Data Spaces Support Centre.	• PRAVO Internet Foundation
Policy Cloud Cloud for Data-Driven Policy Management	PolicyCLOUD aims at delivering an integrated cloud-based environment for data-driven policy management. EGI leads the activities on Cloud Infrastructures Utilization & Data Governance, collaborates to the Use cases Adaptation, Integration & Experimentation and to the project's communication and dissemination activities.	• OKYS – Okys Ltd • Municipality of Popovo – Stolichna Obshtina

Infrastructure contributions

The EGI Federation offers two complementary compute capabilities: the High-Throughput Compute (HTC) federation and the Cloud federation. 1 Bulgarian data centres contribute to the HTC Federation: BG05-SUGrid (Univeristy of Sofia (Faculty of Mathematics and Informatics, Faculty of Physics)

The data centres provided 3 service endpoints. The data centres responded to 9 support tickets through the EGI Helpdesk.
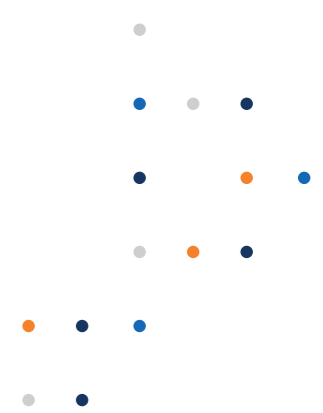
Methodology

Data for this impact report has been collected from the following sources.

- Infrastructure contributions, infrastructure usage by research communities: EGI Accounting System
- List of research publications by supported research communities (table 1)

AMS-02
https://ams02.space/publications

ILC
https://inspirehep.net/literature?sort=mostrecent&size=25&page=1&q=international%20Linear%20Collider%20&earliest_date=2021--2021

ALICE
https://alice-publications.web.cern.ch/publications

INSTRUCT
https://instruct-eric.eu/content/publications-list

ATLAS
https://cds.cern.ch/collection/ATLAS%20Papers?ln=en

JUNO
https://inspirehep.net/

AUGER
https://www.auger.org/science/publications/journal-articles

KM3NET
https://www.km3net.org/about-km3net/publications/pubblication/;
https://inspirehep.net/literature?q=collaboration:KM3NeT year:2021

BELLE
https://belle.kek.jp/belle/publications.html; https://inspirehep.net/literature?q=collaboration:belle year:2021

LifeWatch
https://www.lifewatch.eu/catalogue-of-virtual-labs/medobis/publications/

BIOMED
https://vip.creatis.insa-lyon.fr/documentation/

LOFAR
http://old.astron.nl/radio-observatory/lofar-science/lofar-papers/lofar-papers; https://lofar-surveys.org/publications.html, or https://ui.adsabs.harvard.edu/search/q=full%3A(%22designed%20and%20constructed%20by%20ASTRON%22)%20OR%20title%3A%22LOFAR%22%20year%3A2021-2021%20property%3Arefereed%20-bibstem%3A(%22AN%22%20OR%20%22MNRAS.tmp%22)&sort=date%20desc%2C%20bibcode%20desc&p_=0

CTA
https://www.cta-observatory.org/science/library/

LCHb
https://cds.cern.ch/collection/LHCb%20Papers?ln=en

CLARIN
https://beta.clarin.openaire.eu/search/advanced/research-outcomes?sortBy=resultdateofacceptance,descending&type=publications&year=range2021:2021

LSST
https://ui.adsabs.harvard.edu/ with -> year:2021 author:("LSST*" OR "Vera C. Rubin*") collection:astronomy property:refereed

CMS
http://cms-results.web.cern.ch/cms-results/public-results/publications/CMS/index.html

NA62
https://cds.cern.ch/collection/NA62%20Papers?ln=en

DUNE
https://inspirehep.net/literature?q=collaboration:DUNE year:2021

OPENCOASTS
http://opencoasts.lnec.pt/index_en.php

EISCAT_3D
https://eiscat.se/scientist/publications/

PANOSC
https://www.panosc.eu/publications/

ELI-BEAM
https://www.eli-beams.eu/publikace/

SeaDataNet
https://www.seadatanet.org/Publications/Scientific-publications

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ELI-NP
https://www.eli-np.ro/scientific_papers.php

SKA
https://ui.adsabs.harvard.edu/search/fq=%7B!type%3Daqp%20v%3D%24fq_database%7D&fq_database=database%3A%20astronomy&q=pubdate%3A%5B2021-01%20TO%202021-12%5D%20title%3A(SKA)&sort=date%20desc%2C%20bibcode%20desc&p_=0

EMSO-ERIC
from the community representative; SLA https://documents.egi.eu/document/3539

SNO+
https://snoplus.phy.queensu.ca/results/collaboration-papers.html

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FUSION
https://documents.egi.eu/public/ShowDocument?docid=3484

VIRGO
https://pnp.ligo.org/ppcomm/Papers.html

HESS
https://www.mpi-hd.mpg.de/hfm/HESS/pages/publications/

WeNMR
https://explore.openaire.eu/ –> advanced search –> project outcomes. field to search –> "project" –> enter project name; Citation of HADDOCK web server: https://scholar.google.nl/scholar?hl=en&as_sdt=2005&cites=10355645612647046441&scipsc=&as_ylo=2021&as_yhi=2021; Citations of the AMBER web portal publication: https://scholar.google.com/scholar?as_ylo=2021&hl=en&as_sdt=0,5&sciodt=0,5&cites=6696812766870837905&scipsc=; Citations of the FANTEN web portal publication: https://scholar.google.com/scholar?as_ylo=2021&hl=en&as_sdt=0,5&sciodt=0,5&cites=10578718345045994565&scipsc=; Citations of the DISVIS/POWERFIT web portals publication: https://scholar.google.com/scholar?as_ylo=2005&cites=6482114501244947208&scipsc='; Citations of the SpotON web portal: https://scholar.google.com/scholar?as_ylo=2021&hl=en&as_

Ice-Cube
https://icecube.wisc.edu/science/publications/

XENON
https://inspirehep.net/literature?q=collaboration:XENON year:2021

National institutional members of supported research communities (table 2)

AMS-02
https://ams02.space/collaboration/institute

ILC
https://linearcollider.org/team/

ALICE
https://alice-collaboration.web.cern.ch/General/Members/List_Institutes.html

INSTRUCT
https://instruct-eric.eu/countries

ATLAS
https://atlas.cern/discover/collaboration

JUNO
https://juno.ihep.ac.cn/collaboration.php

AUGER
https://www.auger.org/collaboration/institutions, https://www.auger.org/collaboration/funding-agencies

KM3NET
https://www.km3net.org/about-km3net/collaboration/members/

BELLE
https://belle.kek.jp/bdocs/collaboration.html

LifeWatch
https://www.lifewatch.eu/organisation-governance/

BIOMED
https://vip.creatis.insa-lyon.fr/

LOFAR
https://www.astron.nl/telescopes/

CTA
https://www.cta-observatory.org/about/cta-consortium/

LCHb
https://lhcb-public.web.cern.ch/en/collaboration/Collaboration-en.html

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CLARIN
https://www.clarin.eu/content/participating-consortia

LSST
https://www.lsstcorporation.org/international-contributors

CMS
https://cms.cern/collaboration/cms-institutes

NA62
https://greybook.cern.ch/experiment/detail?id=NA62

DUNE
https://lbnf-dune.fnal.gov/about/countries-and-institutions-participating-in-dune/

OPENCOASTS
http://opencoasts.lnec.pt/index_en.php

EISCAT_3D
https://eiscat.se/wp-content/uploads/2016/12/EISCAT-Organogram-202x.jpg; https://eiscat.se/scientist/document/information/

PANOSC
https://www.panosc.eu/partners/

ELI-BEAM
https://www.eli-beams.eu/about/cooperation/science/

SeaDataNet
https://www.seadatanet.org/About-us/SeaDataNet-AISBL/Members

ELI-NP
https://www.eli-np.ro/scientific_collaborations.php

SKA
https://www.skatelescope.org/participating-countries/

EMSO-ERIC
http://emso.eu/organization/

SNO+
https://snoplus.phy.queensu.ca/collaboration.html

FUSION
https://documents.egi.eu/public/ShowDocument?docid=3484

VIRGO
https://apps.virgo-gw.eu/vmd/public/institutions

HESS
https://www.mpi-hd.mpg.de/hfm/HESS/pages/collaboration/

WeNMR
https://documents.egi.eu/document/2751

Ice-Cube
https://icecube.wisc.edu/collaboration/institutions/

XENON
https://science.purdue.edu/xenon1t/?page_id=27

EGI Membership Impact Report

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