



EGI Council Participant: HUN-REN SZTAKI

Participating in EGI Impact Report: Hungary

2023

egi.eu

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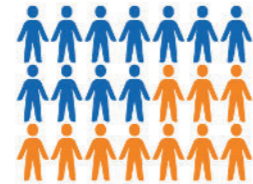
22 National institutional members of
supported research communities (table 2)

Infographic

23

+170 service users

In 2023, +170 researchers from Hungarian institutions used the services provided by the EGI Federation



+520 publications

The research communities, projects and scientific collaborations from Hungary supported by the EGI led to more than 490 peer-reviewed scientific publications

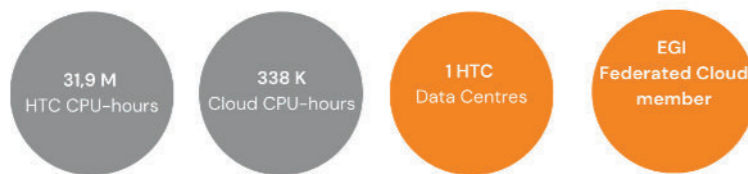
10 Supported communities

In 2023, the Hungarian infrastructure supported 10 research communities in the following disciplines: Linguistics, Health and Medicine, Physics



Projects

Hungarian partners participate in 2 collaboration projects + EGI-ACE



Country overview

Number of supported publications **526**

Number of total service users **176**

Scientific Communities supported **10**

Data Centres contributing to the Federation **2**

Collaboration projects **3**

Total HTC CPU hours delivered **31,915,384**

Total Cloud CPU hours delivered **338,668**

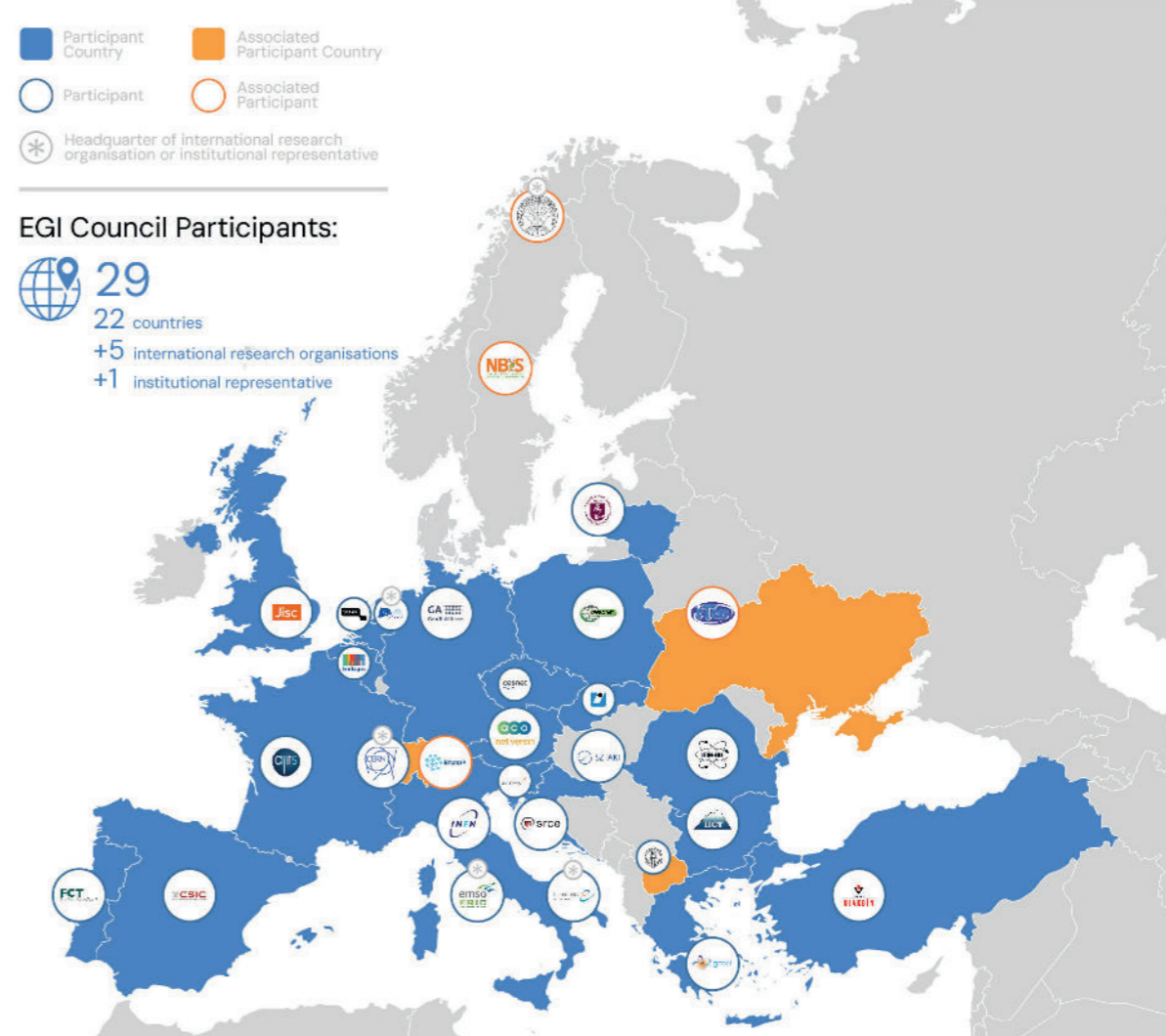
About EGI

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.



Approved EGI Council map from 2023

About HUN-REN SZTAKI

HUN-REN SZTAKI is a research institute, governed by the Eötvös Loránd Research Network. Upon the charge by the Secretary-general of the Academy, the supervision of the scientific activity pursued at the Institute is provided by the Board of the Institute.

The fundamental task of the Institute is to perform basic and application-oriented research in an interdisciplinary setting in the fields of computer science, engineering, information technology, intelligent systems, process control, wide-area networking and multimedia.

Contract-based target research, development, training and expert support for domestic and foreign industrial, governmental and other partners are important activities at the Institute. The mission of SZTAKI includes the transfer of up-to-date research results and state-of-the-art technology to university students.

Overall EGI impact

HUN-REN SZTAKI coordinates the Hungarian participation to the EGI Federation. SZTAKI promotes the building and operation of a multidisciplinary national Distributed Computing Infrastructure open to all sciences and to developing countries in Hungary. This report provides an overview of the activities of HUN-REN SZTAKI in EGI, and the impact that was achieved thanks to this participation. The annual membership fee contributed by HUN-REN SZTAKI to the EGI Foundation in 2022 was 5,000 EUR.

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 Hungarian excellence in science

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.

Research Infrastructures and multi-national research collaborations are the largest adopters of EGI Services, the main contributors of thematic portals, and operate community-specific compute, storage and data systems based on EGI federation

capabilities. The services of the EGI federation have been used by 176 researchers from Hungary in 2023. The estimated annual scientific output in 2023 produced by research communities, projects and scientific collaborations from Hungary and supported by the EGI Federation is estimated to amount to over 490 peer reviewed scientific publications.

The EGI Federation is currently working with over 40 Research Infrastructures, 10 of which include Hungarian partners. These EGI-enabled research infrastructures, their Hungarian members and their 2023 scientific output (publications) are detailed in the following pages of the report

Hungarian research collaborations in EGI

ALICE (High-Energy Physics)

- Wigner Research Centre for Physics (Wigner RCP)

EGI supported activities and services

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)

Number of scientific papers published in 2023

65

CLARIN (Linguistics)

- Hungarian Academy of Sciences

CLARIN thematic services has been supported by EGI since 2018. CLARIN has a Service Level Agreement with EGI, using the following services:

EGI services:

- EGI Cloud (Compute + Online Storage) for hosting the Virtual Language Observatory (VLO)
- Technical support
- Service integration

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CMS (High-Energy Physics)

- MTA-ELTE Lendület
- Karoly Robert Campus, MATE Institute of Technology
- University of Debrecen

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)

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Hungarian research collaborations in EGI

DUNE (Astroparticle Physics)

- Eötvös Loránd University

EGI supported activities and services

The DUNE experiment has been using compute resources from EGI partners for more than a decade. The services from the EGI federation that DUNE uses include:

- EGI HTC services from 6 EGI participant countries (CH, CZ, ES, FR, NL, UK)
- 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)

Number of scientific papers published in 2023

20

Hungarian research collaborations in EGI

ILC (High-Energy Physics)

- Hungarian Academy of Sciences

EGI supported activities and services

The ILC experiment has been using compute resources from EGI partners since 2004. The services from the EGI federation that ILC experiments uses include:

- EGI HTC services from 27 EGI federated sites from IL, DE, FR, ES, NL, PL, UK
- 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)

Number of scientific papers published in 2023

43

ELI-BEAM (Physical Sciences)

- Ministry for Innovation and Technology

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.

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LSST (Astronomy)

- ELTE Eötvös Loránd Tudományegyetem, Gothard Astrophysical Observatory
- Astronomical Institute (Konkoly Observatory) of the Research Centre for Astronomy and Earth Sciences

The LSST survey federates High Throughput Compute (HTC) resources from France and the UK and run an analysis campaign in 2020 to prepare for the opening of the Vera C. Rubin Observatory. The campaign consumed over 11 million CPU-hour in 2020 to analyse generated images, imitating the telescope images that are expected to become available from 2023. The LSST compute federation benefited from the following EGI services:

- 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)

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ELI-NP (Nuclear Physics)

- Institute for Nuclear Research of the Hungarian Academy of Sciences (MTA-Atomki)

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

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Hungarian research collaborations in EGI

VIRGO (Astrophysics)

- Institute for Nuclear Research
- Wigner RCP, RMKI

EGI supported activities and services

The Virgo experiment has been using compute resources from EGI partners for more than a decade. The services from the EGI federation that VIRGO uses include:

- EGI HTC services from 8 data centres from France, Italy, The Netherlands, Spain and UK
- 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)
- Since 2021 Virgo works with EGI in the EGI-ACE Horizon 2020 project to evaluate and adopt data analysis, federated authentication-authorisation and data management services for thematic applications.

Number of scientific papers published in 2023

5

WeNMR (Structural Biology)

- UNIVERSITY OF PECS
- SOTE
- BIOLOGICAL RESEARCH CENTRE
- ELRN BIOLOGICAL RESEARCH CENTRES
- EÖTVÖS LORÁND UNIVESITY
- RCNS
- UNIVERSITY OF DEBRECEN
- SZTE
- HUNGARIAN ACADEMY OF SCIENCES

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, Hungary, 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.

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Participated projects

The EGI Foundation coordinated one Horizon 2020 projects, 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 Hungarian 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



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

Participating beneficiaries from the country

- Közép-Európai Egyetem



EGI leads the processes related to setup and operate of testbed infrastructure, the Edge/cloud/HPC orchestration, to secure resource access and user management. It also works on the commercial exploitation and sustainability plan and on dissemination activities..

- Szamitastechnikai Es Automatizalasi Kutatointezet
- Innomine Digital Innovation Hub Nonprofit Kft
- Dss Consulting Informatikai Es
- Tanacsado Kft
- Caadex Kft

Infrastructure contributions

The EGI Federation offers two complementary compute capabilities: the High-Throughput Compute (HTC) federation and the Cloud federation. 2 Hungarian data centres contribute to these federations:

HTC Federation:

BUDAPEST (Wigner Research Centre for Physics)

Cloud Federation:

HUN-REN

The data centres provided 7 service endpoints and delivered 31,915,384 CPUhours in total to EGI communities in 2023. The data centres responded to 26 support tickets through the EGI Helpdesk.

The most active international user groups of the Hungarian compute resources were:

- ALICE 20.95%
- CMS 79.05%

With the help of the EGI Security Vulnerability Group, the Hungarian site avoided 44 critical vulnerabilities in foundational software systems during 2023.

Storage takes into account both online and archival storage provided by the data centres

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/publication/ ; 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:(%22LSST%22+OR+%22Vera+C.+Rubin%22)+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/

National institutional members of supported research communities (table 2)

ELI-BEAM https://www.eli-beams.eu/publikace/	SeaDataNet https://www.seadatanet.org/Publications/Scientific-publications
ELI-NP https://www.eli-np.ro/scientific_papers.php	SKA https://ui.adsabs.harvard.edu/search/fq=%7B!type%3D%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
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&scioldt=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&scioldt=0.5&cites=10578718345045994565&scipsc= ; Citations of the DISVIS/POWERFIT web portals publication: https://scholar.google.com/scholar?as_ylo=2021&hl=en&as_sdt=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

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
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://bnf-dune.fnal.gov/about/countries-and-institutions-participating-in-dune/>

OPENCOASTS

http://opencoasts.inec.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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