

Memorandum of Agreement for Participation in VirgoLab

BETWEEN:

- **The European Gravitational Observatory**, a non-profit consortium established under Italian law, performing basic research, having its seat at Cascina (Pisa), Italy, represented by its Director (hereinafter referred to as **EGO**).

AND:

- **Centre National de Recherche Scientifique** having its registered office at (Address), represented by its (Title), (Name) (hereinafter referred to as **CNRS**)
- **Fonds de la Recherche Scientifique** having its registered office at (Address), represented by its (Title), (Name) (hereinafter referred to as **FRS-FNRS**).
- **Fonds Wetenschappelijk Onderzoek** having its registered office at (Address), represented by its (Title), (Name) (hereinafter referred to as **FWO**).
- **Istituto Nazionale Fisica Nucleare** having its registered office at (Address), represented by its (Title), (Name) (hereinafter referred to as the **INFN**).
- **Nederlandse Wetenschappelijke Onderzoek Instituten**, having its registered office at (Address), represented by its (Title), (Name) (hereinafter referred to as the **NWO-I**).
- Missing: Poland, Spain, Austria?

Collectively referred to hereinafter as the “Parties” and individually as “Party”.

Preamble

Considering that:

- EGO manages and operates on its site in Cascina the Virgo Interferometer for the detection of gravitational waves. EGO is a Consortium established in accordance with Articles 2602 and following and Articles 2612 and following of the Italian Civil Code, as defined in its Constitution Act signed in December 2000 by the Founding Members CNRS and INFN. NWO-I has been an Associate Member since March 2021 and FRS-FNRS and FWO since March 2025.
- The Virgo Collaboration is an international scientific collaboration to exploit scientifically the data produced with the Virgo Interferometer and to contribute to the Ligo-Virgo-Kagra Collaboration for producing joint scientific results as well as prepare the evolution of the interferometers. The Virgo Collaboration has been established in the *Agreement for the realization of a laser interferometric antenna for gravitational wave detection* signed in June 1994 by CNRS and INFN. Its organization is specified in the Bylaws of the Virgo Collaboration (VIR-0456C-22). Participation of research groups in the Virgo Collaboration have been specified by MoAs between the Virgo Collaboration and the groups, both are not legal entities.
- VirgoLab is a distributed laboratory of with participants of EGO and laboratories, institutes, and university departments involved in the Virgo Collaboration, hereinafter referred to as Member Labs in charge of operating, maintaining and upgrading the Virgo Interferometer and

deliver its data to the Virgo Collaboration. The aim of VirgoLab is to ensure that the Virgo interferometer reaches sensitivities and produces observational data to be a cornerstone of the worldwide network of gravitational wave observatories. Following the recommendations from the Organizational review EGO and Virgo dated from 29 March 2024 relative to the creation of VirgoLab, the proposed Organization of VirgoLab was endorsed by the EGO Council on 19 March 2025.

WHEREAS,

- The Parties wish to fund and to support research in gravitational waves and the operation of gravitational wave detectors and have an interest in participating in VirgoLab.
- The Parties aim to set forth the terms and conditions which apply to VirgoLab and their collaboration.
- The Parties agree that specific provisions concerning the resources needed for the Virgo Upgrade project, will be dealt in a separate MoA.

NOW, THEREFORE, the Parties agree as follows:

Article 1- Purpose

- 1.1 The purpose of this Agreement between EGO and the Parties is to conclude the creation of VirgoLab and to define the participation within. The organisation of VirgoLab ins detailed in Annex 1.
- 1.2 The Agreement will establish a regulatory framework for the participation of EGO, the Parties and their supported Member Labs in VirgoLab.
- 1.3 This Agreement endorses the process to allocate and review the contributions to VirgoLab by EGO and the Parties in terms of human and financial resources.

Article 2 - Forms of Collaboration

- 2.1 All members of the Virgo Collaboration are invited to participate in the VirgoLab in order to make detector related contributions. Where necessary and appropriate, contributions may also be made by Parties not being previously part of the Virgo Collaboration.
- 2.2 The Parties shall identify and agree upon specific contributions to VirgoLab Projects (e.g., Detector Operations and Maintenance, Detector Upgrades, Detector Commissioning) and VirgoLab Technical Teams (e.g., Sensing & Actuation, Optics & Light sources, Controls & Simulations, Mechanics & Vacuum, Infrastructure, Computing & Software).
- 2.3 These contributions may include the provision of personnel with necessary skills and competence, equipment, and financial resources. The Member Labs and their initial contributions are specified in Annex 2.
- 2.4 Details of specific contributions, required resources, time schedules, and management of implementing actions will be defined and agreed upon through the Annual Resource Review Procedure specified in Annex 3.
- 2.5 All members of VirgoLab engage to contribute constructively to the goals of VirgoLab.

Article 2.a - The Host Laboratory

- 2.a.1 VirgoLab is hosted by EGO, and benefits from its administrative, financial and logistical support.

- 2.a.2 VirgoLab is represented by the EGO director.
- 2.a.3 EGO will be responsible for the whole site infrastructure as stated in the EGO Statues.
- 2.a.4 EGO shall be responsible for all safety and security matters and will issue corresponding rules and instructions.
- 2.a.5 EGO will finance fellowships and secondments for VirgoLab members on site, according to the requests established in the EB and approved by Council.
- 2.a.6 EGO will provide office space to host members of VirgoLab when working at the site, access to state-of-the art technology to organize remote meetings, meeting rooms as well as access to its technical facilities for equipment maintenance and repair.
- 2.a.7 EGO will provide support, through a specific user office, to VirgoLab members for welcoming them on the site and handling administrative procedures.
- 2.a.8 EGO manages computing equipment on-site, including data collection, storage, and low latency analysis.

Article 2.b - Engagement of VirgoLab members

- 2.b.1 The VirgoLab members engage to contribute with their expertise to the installation, commissioning, operation and upgrades of the Virgo gravitational wave antenna.
- 2.b.2 The VirgoLab members engage to spend the allocated financial resources as agreed upon by their supervising institution, to provide the pledged human resources and to commit to deliver the specified contributions to the instrument or the computing.
- 2.b.3 The VirgoLab members engage to provide the agreed equipment to EGO for the installation in the Virgo Interferometer, including all the relevant documents of the equipment currently installed and to be installed in the future.
- 2.b.4 All VirgoLab members subscribe to the Code of Conduct of the Virgo Collaboration (VIR-0222A-19 and subsequent modifications) and non-discrimination and anti-harassment guidelines defined in VIR-0474C-14 and subsequent modifications.

Article 3 - Governance

- 3.1 The Parties will encourage and support the participation of their Member Labs in VirgoLab activities, in line with the procedures defined in the "VirgoLab Organisation and Governance" (Annex 1 and subsequent modifications).
- 3.2 The Parties acknowledge the governance structure of VirgoLab as defined by the EGO Council in Annex 1, including the Executive Board (EB), the Technical Committee (TC), and the Board of VirgoLab Principal Investigators (PIs).
- 3.3 The EGO Council is the governance board of VirgoLab, deciding on the strategic direction and overseeing their implementation, with the help of its subordinated bodies (*STAC*, *AFC*) and a dedicated *Program Officer*.
- 3.4 VirgoLab is directed by the VirgoLab EB, chaired by the EGO director who has the final decision authority.
- 3.5 Participating Member Labs and EGO are represented in the VirgoLab Board of PIs, which does not have executive power, but is a supervising and consulting body. The VirgoLab Board of PIs decides on new VirgoLab Members.

Article 4 - Resources

- 4.1 The Parties will commit to providing financial and/or human resources to VirgoLab through its supported Member Labs, subject to its internal funding procedures and availability of funds and personnel.
- 4.2 The specific amount and nature of the resources will be determined following the Annual Resource Review procedure as specified in Annex 3. EGO and the Parties engage to respect the yearly resource planning exercise and to provide the resources agreed on a yearly basis. The draft of the first resource planning document for the 2026 budget will be in Annex 4.
- 4.3 Financial and human resources for VirgoLab are allocated by EGO Council, national funding agencies, or research organisations to EGO or to the Member Labs. EGO and the Parties will ensure that the financial and human resources allocated to VirgoLab are provided and are spend in an adequate manner, and that the deliveries are provided in time.
- 4.4 The property of instrumental equipment installed in the Virgo Interferometer on site is transferred to EGO as the responsible legal entity. Member Labs who provided the equipment are in charge to document and train the relevant people accordingly and will remain in charge to maintain the equipment they provided, as part of a collaborative effort as all equipment and aspects of the Virgo interferometer are a VirgoLab-wide matter. The maintenance, operation and performance of the equipment is monitored by the EB, with regular reviews, in particular through the annual resource review procedure.
- 4.5 EGO and the Parties will duly report their efforts, results and any other relevant information related to the resources management to the VirgoLab Resource Coordinator.

Article 5 - Personnel

- 5.1 The Parties will ensure that personnel from its supported Member Labs participating in VirgoLab have the necessary skills and competence and comply with the rules of conduct and safety in force at the host Party (EGO).
- 5.2 Each Party shall be responsible for ensuring that its personnel taking part in the collaborations shall have adequate social security and third-party liability insurance.
- 5.3 All expenses, including international and domestic travel, per diem, honoraria and other costs, shall be at the responsibility of the home institute.
- 5.4 EGO will provide to VirgoLab all information, documentation, manuals and training necessary for the daily operation.

Article 6 - Data Access

- 6.1 The handling of data within the VirgoLab, from its collection to preservation and sharing, will be described in details in a separate document (Data Management Plan) annexed to this MoA.

Article 7 - Intellectual Property

- 7.1 Each Party will remain the exclusive owner of the information, know-how, and other intellectual and industrial property rights it has generated prior to the date of entry into force of this Agreement, as well as information, know-how, and other intellectual and industrial property rights it has generated during this Agreement but outside the execution of VirgoLab activities.

- 7.2 Title in intellectual property developed by personnel of Member Labs supported by the "(Acronym of Funding Agency)" in the execution of VirgoLab activities shall be vested in the respective Member Lab (or its Oversight Organisation), who shall grant a free of charge world-wide, irrevocable, non-sublicensable, non-transferable, non-exclusive license to EGO and other participants in VirgoLab's scientific program. for the duration of this Agreement (?) to carry out the VirgoLab activities
- 7.3 Publications resulting from the activities within VirgoLab will follow the publication policy established by the VirgoLab Board of Pls.

Article 8 - Liability

- 8.1 Except in case of gross negligence or willful misconduct, each Party shall bear its own loss and damage in connection with this Agreement.
- 8.2 Subject to article 7.1 above, each Party's entire and aggregate liability for any and all events arising in relation to the Agreement will be limited to [insert amount or percentage of compensation/budget per event and [insert amount or percentage of compensation/budget] er calendar year.

Article 9 - Confidentiality

- 9.1 "**Confidential Information**" is to be understood as any information concerning VirgoLab and any kind irrespective of whether it is provided in writing, orally, electronically, or in the form of samples, models, products or equipment etc., whether or not it is labelled as confidential or a similar nature and exchanged in any form and to which access is given by the disclosing Party to the receiving Party for the purpose of VirgoLab. The receiving Party will maintain strict secrecy with respect to Confidential Information, not disclose it to any third party, take appropriate safety measures to safeguard to the Confidential Information and will use it solely for the performance of its activities in VirgoLab. The obligation of confidentiality ends five (5) years after the termination or expiration of this Agreement. In addition, Confidential Information that qualifies as a trade secret or that the receiving Party should reasonably understand as a trade secret and which meets legal requirements to be a trade secret, shall always be kept confidential, or at least as long as it remains a trade secret.
- 9.2 The aforementioned confidentiality obligation shall not apply, if the receiving Party can proof that:
- a. the Confidential Information is or becomes generally known or accessible, by means other than by breach of this Agreement;
 - b. the Confidential Information of the disclosing Party became known to the receiving Party, independently from this Agreement, through the receiving Party's own research and development work, which can be proven by written records;
 - c. the receiving Party obtained the Confidential Information from third parties independently of this Agreement, without any breach of this confidentiality obligation;
- 9.3 Parties agree to make all reasonable efforts to ensure that the promotion trajectories of PhD candidates affiliated with VirgoLab are not hindered or delayed, regardless of any disagreements or disputes that may arise between the Parties. The Parties further commit to resolving any conflicts in a manner that prioritizes the academic and professional progress of the PhD candidates. In cases of disagreement, the Parties shall cooperate in good faith to minimize any negative impact on the PhD candidates' work and timeline.

Article 10 - Duration and Termination

- 10.1 This Agreement shall take effect on the date of signature by all Parties and shall remain valid for of [x] years the option to extend the Agreement in case all Parties agree in writing.
- 10.2 A Party may withdraw from this Agreement with written notice, subject to agreed-upon written terms for phasing out any ongoing collaborations.

Article 11 - Final Provisions

- 11.1 Disputes arising from this Agreement shall be settled by amicable settlement. If amicable settlement appears to be not possible within 3 calendar months as of its first written referral by any of the Parties, the dispute shall be submitted to the exclusive jurisdiction of [xxx].
- 11.2 Any amendments or additions to this Agreement are only valid in case made in writing and signed by the authorised representatives of all Parties
- 11.3 This Agreement shall be exclusively governed by the law of [xxx].
- 11.4 Include article regarding subcontracting? Is a party allowed to subcontract and if yes, under which conditions?
- 11.5 Except if explicitly otherwise provided in this Agreement, no Party shall be entitled to act or to make legally binding declarations on behalf of any other Parties. Nothing in this Agreement shall be deemed to constitute a joint venture, agency, partnership, interest grouping or any other kind of formal business grouping or entity between the Parties.

SIGNATURES:

For the European Gravitational Observatory (EGO):

Name:

Title: Director

Date:

For (Name of Funding Agency):

Name:

Title: (Title)

Date:

(Repeat the signature section for each funding agency: CNRS, INFN, Nikhef, FWO, and FNRS.)

This template provides a general framework. Specific details regarding the contributions of each funding agency and their supported Member Labs would need to be elaborated in subsequent annexes or specific agreements within the VirgoLab governance structure. The "VirgoLab

organisation proposal" document provides further details on the operational aspects and governance of VirgoLab that would be relevant in implementing this agreement.

Annex 1:

VirgoLab Organisation and Governance

Version 7.5: document endorsed by the EGO Council 19.03.2025

The Council of the European Gravitational Wave Observatory (EGO) put in place an Organisational Review of EGO and Virgo, with a report provided by the review committee in March 2024 including recommendations in seven relevant areas. Following this report, EGO Council mandated the Implementation Committee to follow-up on these recommendations.

The following proposal is taking up on the recommendations related to the Organisation and Governance of EGO/Virgo. In particular, it lays out the organisation of the detector operation, commissioning and upgrade of the Virgo interferometer as a distributed laboratory, called VirgoLab in the following, and specifies its governance. The creation of VirgoLab is inspired by LIGOLab, the operating structure of the US gravitational wave antennas, yet taking into account the differences arising from the European funding structure and research landscape. VirgoLab is also meant to fit into the transition from the Virgo Collaboration to IGWN.

The current draft document reflects the work in progress and is under construction. It addresses the definition of VirgoLab, the outlay of the organisational structure, the governance bodies and the management positions. An additional section laying out some procedures that will be necessary will be amended. The proposal is based on the current structure of the Virgo collaboration.

1. Definition of VirgoLab

1.1 Purpose

VirgoLab is mandated by the EGO Council to operate, commission and upgrade the Virgo interferometer for the production of calibrated, high-quality strain gravitational wave data, to be provided to the Virgo Collaboration^{*1}, in coordination with the LIGO-Virgo-KAGRA* (LVK) Collaboration. The aim of VirgoLab is to ensure that the Virgo interferometer reaches sensitivities and produces observational data in order to be a cornerstone of the worldwide network of gravitational wave observatories. All members of VirgoLab are deeply committed to the purpose of VirgoLab and to the existence and operation of a gravitational wave interferometer in Europe. To fulfil its ambitious mission, VirgoLab requires steady and adequate financial support from its funding bodies.

¹ * Indication where modifications should be introduced with the creation of IGWN.

The data analysis for research in the fields of fundamental physics of gravitation and

threshold of individual and group contributions are represented by their PI in the Board of PIs. Groups with a lower contribution may assemble and be represented by a national Liaison. If the national Liaison represents contributions from different groups above a threshold, he has the same voting rights as a PI. A proposal for the initial thresholds will be made by the Virgo Spokesperson, examined by the protoEB and approved by the EGO Council. After the initial call, new groups will have to follow the procedure described in section 5.3.

1.4 Resources

VirgoLab consists of cross-institutional VirgoLab Projects and VirgoLab Technical Teams with contributions from EGO and the Member Labs.

Financial resources are allocated by EGO Council, national funding agencies or research organisations to EGO or to the Member Labs. VirgoLab benefits from the contributions of the EGO member states to EGO and to payments made to the Common Fund. The contributions are managed through EGO or directly allocated to the Member Labs.

VirgoLab may seek contributions from external parties to the Virgo detector. Such contributions are initiated by the EB, and have to be presented to the Boards of PIs and to be approved by EGO Council. External contributors are not VirgoLab Members and will not be represented in the Governance Instances of VirgoLab.

The contributions of Member Labs to the VirgoLab are defined by a Memorandum of Agreement (MoA) between EGO and their representing legal entities. Member Labs are in charge of maintaining and operating the equipment they provide, as part of a collaborative effort as all equipment and aspects of the Virgo interferometer are a VirgoLab-wide matter. The property of instrumental equipment installed in the Virgo Interferometer on site is transferred to EGO as the sible legal entity. The maintenance, operation and performance of the equipment is monitored by the EB, with regular reviews, in particular through the annual resource review procedure, specified in section 5.1. In case resource allocations should be changed in between the annual resource reviews, the EB and the concerned PIs have to agree on the modifications.

EGO is engaged to allocate the necessary resources to facilitate the local support and logistics for collaborators of Member Labs while coming on site.

2. Organisational structure of VirgoLab

The proposed matrix structure balances the functional responsibilities within each VirgoLab TT with the specific needs of each VirgoLab Project. It enables personnel to contribute their technical expertise to multiple projects while maintaining their development and long-term role in their functional area. The proposed structure implies some complexity and needs therefore to be implemented in the most effective way. Project Coordinators and technical Team Leaders have deputies such that ideally one of them is on-site and the other off-site. This should allow to have a substantial on-site presence of at least one person, while taking into account the needs of off-site teams to contribute efficiently. The conditions under which the Project Coordinators, Team Leaders and the Deputies work will be negotiated between the candidates and the EGO Director before proposing candidates to the EGO Council.

2.1 VirgoLab Projects (Project structure)

The core activities of VirgoLab are proposed to be organised around three major projects:

Detector Operations and Maintenance: Focused on the daily operations of the interferometer, ensuring smooth running and prompt troubleshooting if any issue arises as well as the ordinary maintenance of all the installed subsystems. Operations include the production of calibrated, high-quality strain data as well as the computing infrastructure required to carry out strain data production. Provisionally, Detector Operation is supposed to include all activities in the current Operations Division (low latency, computing, detchar, calibration, open Data...).

Detector Upgrades: Responsible for planning and executing major upgrades to the interferometer's systems, with a focus on improving sensitivity and performance. Innovative long-term R&D is carried out in the scientific collaboration, guided by VirgoLab and becomes part of the Detector Upgrades project depending on its readiness level (e.g. as soon as the baseline design is being established - to be discussed). Detector Upgrades can be represented by one or two Project Coordinators in the EB, one for the current upgrade project, and one for the following one.

Detector Commissioning: Manages the process of bringing new systems online, tuning the interferometer after upgrades or maintenance, noise hunting, and ensuring the detector meets the required operational standards.

This proposed structure will be presented to the Virgo Steering Committee (VSC) and be approved by the EGO Council. Modifications to the project structure at a later stage are presented by the EGO director to the VirgoLab Board of PIs and approved by the EGO Council.

Each of these projects will be led by a Project Coordinator (i.e., Project Manager). The Project Coordinator will manage all aspects of the project, from planning and resource allocation to execution and delivery and is responsible for the execution and the successful completion of the project. These projects require collaboration across the VirgoLab Technical Teams, leveraging expertise and resources from each. The Project Coordinators, will put in place a more detailed project structure, and have the general oversight on the project execution and resource loading in agreement with the MoA with the concerned Member Labs. They will be in charge to assure that project deliverables, deadlines, and milestones are met. VirgoLab members participating in a project will report through the project structure for project-specific work.

The Project Coordinators are proposed by the EGO Director with the input from the Virgo Spokesperson, the VirgoLab Board of PIs and the VirgoLab members concerned by the project. The proposed candidates are presented to the VirgoLab Board of PIs and appointed by EGO Council. The Project Coordinators are appointed for a renewable fixed term (in line with the term of the EGO director), and in case of a change in Project Coordination it is preferable to allow for a reasonable overlap time. If a change should become necessary during the mandate of the

EGO Director, the EGO Director will present the change to the Board of PIs and will seek approval from the EGO Council.

2.2 VirgoLab Technical Teams (Functional Structure)

The VirgoLab technical Teams (VirgoLab TTs) coordinate and support technical activities driven by the needs of the projects. The Virgo Lab TTs can be understood as overarching working-groups on technical subjects, fostering the exchange between the different Member Labs and EGO, as well as enhancing the underlying expertise and facilitating the cross-fertilization of technical aspects between the projects. The VirgoLab TTs are distributed, cross-institutional teams, integrating personnel from EGO and from Member Labs.

The structure of the VirgoLab TTs is elaborated by the Executive Board and presented to the VirgoLab Board of PIs and the EGO Council. Areas of activities proposed to be covered by the VirgoLab TTs are:

- **Project Management:** Expertise on project management, the overall system design and integration, including risk management and quality control, ensuring the coherence of all subsystems.
- **Sensing & Actuation:** Technical aspects of sensors and actuators used in the interferometer, including the associated electronics and cabling.
- **Optics & Light sources:** Technical aspects of optics, crystals, coatings, lasers and other light sources.
- **Controls & Simulations:** Technical aspects of optical and mechanical plant simulation, controls of opto-mechanical plants, and the digital infrastructure or analog hardware implementing the controls.
- **Vacuum & Mechanics:** Technical aspects of vacuum chambers, suspension, optical benches and other large mechanical parts and their finite element simulation.
- **Infrastructure:** Virgo site infrastructure including building, power systems and environmental controls, and the mitigation of noises produced by this infrastructure.
- **Computing & Software:** Computing infrastructure, data management, software development and operation, data visualization, and cybersecurity.

Changes to the VirgoLabTT structure should be presented to the VirgoLab Board of PIs and the EGO Council.

The definition of workmanship standards will be a key responsibility of VirgoLab TTs, ensuring consistency, quality benchmarking, and risk reduction in project outputs. Those standards also form the foundation for training and skill development, guiding personnel to meet quality expectations and supporting continuous improvement in technical capabilities.

Each VirgoLab TT is headed by a Team Leader who will coordinate the functional expertise and resources of the team and put in place a substructure if appropriate. The Team Leaders ensure that the defined workmanship standards are applied in all projects. The Team Leaders will also be responsible, in collaboration with the home institution or EGO departments, for appropriate training and competence development of its members. Team Leaders are particularly in charge to ensure all means that allow members of the Member Labs to contribute efficiently. The

VirgoLab Technical Team Leaders are proposed by the EB, and ratified by the VirgoLab Board of Pls.

VirgoLab members participating in a TT will report through the structure of the TT on their activities and for their technical development and skill training. This ensures that personnel receive the necessary resources and guidance from their technical area.

3. Governance bodies

VirgoLab has three high-level governance bodies:

Executive Board (EB) is responsible for making key decisions on all aspects of VirgoLab, in particular technical decisions, resource allocation, strategic priorities, and long-term planning, ensuring alignment across both functional and project-based activities.

Technical Committee (TC) provides technical guidance to the EB and the VirgoLab Projects. The TC ensures that technical challenges are addressed collaboratively and that resources are deployed effectively to meet project goals.

Board of VirgoLab Pls is in charge of the pledging, allocation and use of resources from their groups, and offers input on the VirgoLab strategy.

3.1 Executive Board

3.1.1. Key responsibilities

The EB is in particular in charge of:

Operational and Upgrade Decisions: The EB takes all decisions concerning the operation, commissioning and upgrades of the Virgo interferometer.

Resource loading: The EB establishes the necessary resources for the projects and manages the available resources to reach the best performances of the Virgo Interferometer.

Organisation and oversight of internal and external project reviews: Internal project reviews will be organised by the projects themselves and the outcome reported to the EB. External project reviews will be organised by the EB and the outcome reported to EGO Council and the VirgoLab Board of Pls.

On-site equipment: The EB oversees the installation and proper functioning of all equipment in the Virgo Interferometer.

3.1.2 Composition

The EB consists of 7-8 individuals, representing the operational and technical leadership of VirgoLab. Its membership includes:

- EGO Director (Chair)
- Upgrades Coordinator
- Commissioning Coordinator
- Detector Operation Coordinator
- Chair of the Technical Committee
- Virgo Spokesperson*
- Chair of the Virgo Lab Board of PIs

The composition has to ensure that all aspects of Virgo's operation and future upgrades are covered by the appropriate expertise. Changes to the composition of the EB will be presented by the EGO director to the VirgoLab Board of PIs and approved by the EGO Council. The members of the EB are on site on a regular basis and as required by the situation.

3.1.3 Meetings

The EB is chaired by the EGO Director, who calls the meetings, proposes the agenda and leads the discussions. Minutes will be made available to VirgoLab. The board meets typically on a weekly basis to assess and make critical decisions regarding both the day-to-day operations and the long-term upgrades of the interferometer. In case of critical and urgent matters, the EB meets as frequently as necessary.

3.1.4 Decision-Making

The EB is committed to striving for consensus in its decisions. In practice, this means that members will work collaboratively to find solutions that everyone can agree upon, leveraging the collective expertise of the board. In the event that the EB cannot reach consensus on a particular issue and no decision by means of discussion, including votes, can be reached, the EGO Director has the final authority. This ensures that the board's deliberations do not lead to operational delays or indecision, with the EGO Director empowered to make the necessary calls for the project's success.

3.1.5 Reporting

The EGO Director, in their capacity as chair of the Executive Board reports to the EGO Council on the decisions of the EB and the activities of VirgoLab. The members of the EB report the relevant decisions to the entities they are responsible for.

3.2 Technical Committee

3.2.1. Key Responsibilities

The TC is in particular in charge of:

Technical Advice: Comments on technical proposals, system performance, and upgrade plans.

Coherent Technical Solutions: Elaborates common technical solutions that may span over several subsystems.

Risk Management: Assesses and advises on technical risks and mitigation strategies.

Oversight of Training and Safety procedures: Is responsible for the adequate training and safety procedures to be in place

3.2.2 Composition

The TC consists of the VirgoLab Team Leaders and the Chair of the Technical Committee (TC Chair), additional Experts are invited as needed. The TC Chair is designated by the TT leaders.

3.2.3 Meetings

The TC Chair calls the meetings, proposes the agenda and leads the discussions. The TC meets typically on a monthly basis, additional meetings can be scheduled as needed, in particular on request of the EB.

3.2.4 Decision-Making

The TC seeks consensus for the advice it provides, but all perspectives are presented to the EB in order to enrich its decisions. The TC also oversees the coordination among the VirgoLab TTs. In case no consensus can be reached, the TC Chair decides on the priorities to be presented to the EB.

3.2.5 Reporting

The TC reports directly to the EB, providing technical recommendations. Final decision-making rests with the EB and the EGO Director. Decisions taken by the EB or the TC are reported by the Team Leaders to their respective teams.

3.3 Board of Pls

3.3.1. Key responsibilities

The board is in particular in charge of:

Resource Review Process: Receives an annual report given by the EGO director, in their capacity as chair of the EB, of the use of the resources provided by the Member Labs to VirgoLab. It reviews the resource requested for the upcoming year and liaises with the funding institutions for pledges of resources to be provided from the Member Labs to VirgoLab.

Membership: The Board of PIs is responsible for examining the participation of new groups to VirgoLab and oversees the establishment of the MoA between EGO and a new group.

Personnel Matters: The Board of PIs is represented in the search committee of the EGO director either through its chair, members or designated persons. In addition, the Board of PIs expresses its vision on a geographically balanced scientific representation in IGWN in advance of the selection of the IGWN Spokespersons.

Publication Policy: The Board of PIs oversees the publication policy and process, as well as the authorship criteria and the authorship list of the VirgoLab activities.

VirgoLab Life: The Board of PIs will organise regular meetings of the VirgoLab community.

While the Virgo Lab Board of PIs is an important advisory and oversight body, it does not take executive decisions. The EGO Director and Executive Board retain ultimate authority over operational and technical decisions. The board's role is to provide informed input, in particular through the Chair of the Board of PIs in the EB, that can help shape these decisions.

3.3.2. Composition

The Board of PIs is the representation of the groups contributing to VirgoLab that fulfil the criteria for minimum participation. The EGO Director, the Virgo spokesperson* and National Liaisons, who are not PI, attend the meetings. Participants or groups who do not reach the minimum participation required, can be represented by a National Liaison with full voting rights. The PIs are appointed by the groups or their Oversight Organisation.

3.3.4 Decision-Making

The Board of PIs strives for consensus in its decision-making. On matters such as the approval of the annual report, membership and personnel matters, as well as for the election of its chair, the following voting rules will be put in place:

- annual report and budget forecast: simple majority of all present and voting. The vote may be held openly unless otherwise requested;
- membership: $\frac{2}{3}$ majority of all members. The vote is held secretly.
- personnel matters: $\frac{2}{3}$ majority of all present and voting. The vote is held secretly.

3.3.3 Meetings

The board elects a chair who calls the meetings, proposes the agenda and leads the discussions. Minutes will be made available to VirgoLab. The Board of PIs typically meets typically three to four times a year.

An electronic voting system will be put in place.

3.3.5 Reporting

While advisory in nature, the board's feedback is communicated to the EB through the Chair of PIs to ensure that the perspective of the groups is considered in strategic decisions. The VirgoLab Board of PIs does not have decision-making authority over the operational activities of the VirgoLab.

3.4 Other committees

VirgoLab will also benefit from the advice of committees already in place, such as the EGO Administrative and Finance Committee for the resources spending and allocation concerning VirgoLab and in particular, the Scientific and Technical Advisory Committee.

The STAC provides periodic reviews of the scientific and technical aspects of EGO to the EGO Council. With the creation of VirgoLab, which will be the major scientific and technical activity of EGO, the STAC should be mandated to review the performance of VirgoLab. The STAC should assess if VirgoLab meets the scientific and technical milestones and even if EGO Council is its primary recipient, the relevant findings will also be made available to the VirgoLab EB and the VirgoLab Board of PIs.

The VirgoLab technical activities are also overseen by the Virgo External Technical Committee.

4 Management Positions

4.1. EGO Director

The EGO Director holds the primary executive authority of EGO as defined in the EGO statutes. They are therefore responsible for all activities conducted at the EGO site, ensuring that the Virgo interferometer meets its operational and technological goals. The EGO Director plays a key role in overseeing the organisation's operations, ensuring the smooth execution of its scientific objectives, and liaising with external advisory bodies. As Chair of the VirgoLab EB, the EGO Director is particularly engaged in VirgoLab, which is the Director's principal activity; other responsibilities may be delegated (e.g site management, non-VirgoLab projects,...): the EGO director may propose up to two deputies who will assist the EGO director during their term in office and who must be approved by the Council.

4.1.1. Key Responsibilities

In view of the organisation of VirgoLab, the EGO Director has the final authority on all decisions concerning the operation and maintenance of the Virgo interferometer. They take ultimate responsibility for the success or failure of Virgo's mission, ensuring that both operational and technological objectives are met.

The EGO Director is the chair of the VirgoLab Executive Board (EB). In this function, they are in particular in charge of establishing a constructive technically driven and consensus-oriented discussion in order to take the strategic technical decisions within the EB. The EGO Director has a pivotal function between EGO Council, the Board of PIs and the Scientific Collaboration. They

are in particular in charge together with the Council representatives, the Chair of the Board of PIs and the Scientific Spokesperson to leverage expertise and resources from the Member Labs.

The EGO Director represents VirgoLab in the EGO Council as well as in the scientific collaborations and attends the VirgoLab Board of PIs. As such, the EGO Director supports the actions of PIs to obtain funding in their respective organisations.

4.1.2 Mandat

The Director's term is fixed and renewable once, with the renewal decision being taken by the EGO Council and in consultation with the Board of PIs.

4.1.3 Appointment

The EGO Director is appointed by the EGO Council after an international recruitment process operated by a search committee (see section 5.2). Selection criteria include leadership capacities, management skills, and expertise in gravitational wave science and interferometry.

4.1.4 Reporting

The EGO Director reports to the EGO Council, at the EGO Council meetings and on a regular basis through the EGO-Virgo Program Officer. As chair of the VirgoLab EB, the EGO Director attends the meetings of the Board of PIs.

4.2. EGO-Virgo Program Officer

The EGO-Virgo Program Officer should insure the liaison between EGO Council and the EGO director. Even though their responsibility is not only focused on VirgoLab, overseeing the activities of VirgoLab would be the major part of their mission.

4.2.1. Key Responsibilities

The Program Officer should act as a strong link between the EGO Council and the EGO director. The main mission of the Program Officer will be to follow the activities and decisions of the VirgoLab EB. The Program Officer will oversee the implementation of EGO Council decisions, in particular concerning VirgoLab. In case of difficulties, the Program Officer could be the first level of information and exchange, before calling EGO Council whenever necessary.

4.2.2 Mandate

The mandate of the Program Officer is defined by EGO Council.

4.2.3 Appointment

The Program Officer will be appointed by EGO Council. The person should have no involvement in the VirgoLab or associated scientific collaboration.

4.2.4 Reporting

The Program Officer exchanges on a weekly basis with the EGO director and reports to the EGO Council President.

5 Procedures

5.1 Resource Review Procedure

A possible outlay of the resource review procedure could look like the following:

The EGO Director, in their capacity as chair of the VirgoLab EB, will present an annual report on the use of the financial and human resources provided to EGO and to the Member Labs and allocated to VirgoLab; a proposal for the resources for the coming year; and a forecast of the resources required for the next five years to the Board of PIs.

After examination by the STAC and the AFC, to the EGO Council for a final approval in a special Council Session where the institutions contributing to the Common Fund are represented and participating.

The role of the PIs is to liaise with their funding body to secure the necessary resources, both financial and human, between presentation to the Board of PIs and final approval by the EGO Council. A document summarising the pledges of each group, will then be approved by EGO Council and is the basis of the commitment for the upcoming year.

In case of non-fulfilment of the pledges by a group, and after discussion with the PI concerned, the EGO Director may inform the concerned Council members or the funding agency representatives of the difficulties encountered in order to find a solution for the missed engagement.

5.2 Selection procedure for the EGO Director

The EGO Council is steering the procedure to select a new EGO director. One year before the end of the term of the EGO director, EGO Council decides on a prolongation. If a new EGO director has to be appointed, EGO Council Chair proposes the composition of the search committee to the EGO Council for approval. The search committee could comprise:

- The Chair of the VirgoLab Board of PIs or someone appointed by the VirgoLab Board of PIs
- The Virgo Spokesperson* or their representative
- The Chair of the EGO Council or a representative from EGO Council
- (The Chair of the STAC and the AFC)
- Between 2 and 4 additional expert members proposed by the Board of PIs to EGO Council

The search committee shall include at least one member who is outside the Virgo and EGO community.

An open, international call for candidates is published by EGO Council.

The search committee receives candidatures, that can be:

- individuals answering the call

- members of EGO Council proposing potential candidates
- members of the VirgoLab Board of PIs proposing potential candidates
- members of the search committee proposing candidates.

From this extended list of potential candidates, the search committee contacts the candidates and invites them to send their application, which should comprise a CV and vision statement.

The received applications are reviewed by the search committee, who establishes a list of candidates to be auditioned.

After the auditions, the search committee presents a list of candidates to the EGO Council.

EGO Council interviews the candidate(s) and designates the EGO DG elect.

The whole process should not take more than 6 months in order to have sufficient overlap time with the incumbent EGO director.

5.3 Process for the admission of new groups

Any new group that would like to join VirgoLab should send an application letter to the EGO Director, the EGO Council Chair, the Virgo Spokesperson and the Chair of the Board of PIs, giving precisions on the involvement they would like to have in VirgoLab.

In the EB, the proposal should be discussed in view of the involvement of a new group in the Projects and the TTs, such that the EGO director has an informed vision on the application.

A dedicated meeting of the PI of the candidate group, the EGO Director, the Virgo Spokesperson and the two chairs should be held, in order to discuss the future contributions.

The PI of the applicant group will then give a presentation of the group and their potential contributions to the Board of PIs.

The Board of PIs will then vote on the interest of VirgoLab on the admission of the new group.

In case of a positive vote, the EGO director and the PI of the new group will then work-out a MoA, or an addendum to an existing MoA for the new group or its funding agency.

The MoA is presented to the EGO Council for approval and is sent to the VirgoLab Board of PIs for information, before being signed by the EGO Director and the relevant institution.

5.4 Publication policy and process

The VirgoLab will maintain an author list for publications concerning the Virgo detector. The VirgoLab author list includes, in alphabetical order, all VirgoLab members who are physicists or engineers. In order to be part of the author list, a person needs to be a member of VirgoLab for at least 1 year.

When leaving the collaboration, authorship is maintained for at least one more year.

The VirgoLab Board of PIs may set up an authorship committee to establish and maintain a list of authors. The author list should be regularly updated.

The VirgoLab Board of PIs may set up an Editorial Committee. All publications on technical description and performance of the Virgo instrument, and data quality characterisation based on non-public strain $h(t)$ Virgo data shall use the VirgoLab author list.

In keeping with the goal of the VirgoLab to promote the visibility of its members to the scientific community at large, there may be cases where a limited author list is more appropriate. The publication policy therefore allows for waivers to the rule by petitioning the VirgoLab Editorial

Committee. However, papers granted an exception should have a methodological purpose, should not include new observational results, or should avoid characterising the detector performance over significant portions of an observing run.

Technical or methodological papers on Virgo components reporting on a part or subsystem of the Virgo hardware (design, construction, commissioning) even when based on non-public data from auxiliary channels (with the exclusion of strain data) can use a short author list.

By default, publications using public Virgo data that have been released can use a limited (or short) author list, unless they would preempt VirgoLab planned publications.

Short author list papers are expected to welcome and include all contributors that made the work possible through an opt-in option which is made available to all the members of the Collaboration when the internal review process is initiated.

Should the author list exceed 10% of the VirgoLab default authors, the paper can be said to represent the entire Collaboration. In this case, the full VirgoLab list should be used.

Short author list papers shall cite standard Virgo detector references and acknowledge the usage of public data.

Decisions on whether or not a petition is granted will rest with the VirgoLab Editorial Committee chair in consultation with the chair of the Board of PIs.

Any author of VirgoLab should be automatically entitled to sign the publications related to the data produced by VirgoLab for the Virgo or LVK Collaborations.

Annex 2:

Member Labs of VirgoLab

Belgium:

- BelGrav Group Universiteit Antwerpen Belgium;
- KU Leuven, Belgium;
- UC Louvain.

France:

- APC - Laboratoire Astroparticule et Cosmologie CNRS/IN2P3 – Université Paris Diderot;
- Institut Fresnel Group, Aix Marseille Université – Ecole Centrale Méditerranée – CNRS;
- IJCLab - Irène Joliot-Curie Laboratory of Physics of the 2 Infinities Université Paris-Saclay, CNRS/IN2P3, Orsay;
- LAUM - Laboratoire d'Acoustique de l'Université du Mans – CNRS;
- LMA-IP2I, Université de Lyon – CNRS/IN2P3;
- LUTh-Caen group, LPC Caen, ENSI Canr, Université de Caen and CNRS/IN2P3;
- Observatoire astronomique de Strasbourg, Université de Strasbourg, CNRS;

Italy :

- Firenze/Urbino Group;
- INFN Genoa – Virgo Genoa Group;
- Milano-Bicocca group c INFN & Università degli Studi di Milano-Bicocca;
- Padova/Trento/Trieste Group;
- Perugia; INFN Sez di Perugia;
- Virgo Pisa Group;
- Sapienza-Roma group;
- Roma Tor Vergata group;
- UniSannio/UniSalerno Group INFN di Napoli, Gruppo Collegato di Salerno.

Poland :

- Polgraw Consortium :
Nicolaus Copernicus Astronomical Center (CAMK PAN);
Computer Centre Cyfronet AGH;
University of Warsaw;
Jagiellonian University;
Funded by: Polish Academy of Science, Polish Ministry of Education and Science, Polish National Science Centre, The Foundation for Polish Science.

Spain :

- CIEMAT - Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas, Madrid ;

Annex 3:

RULES OF PROCEDURE **OF THE VIRGO LAB RESOURCE REVIEW**

11 APRIL 2024

The Rules of Procedure of the VirgoLab Resource Review aim to define the framework in which the Resources of VirgoLab are received, allocated and monitored. After adoption, this procedure is binding for all VirgoLab Members and their Oversight Organisations.

Rule 1

Resource Coordinator

For the preparation of all the bookkeeping and planning documents, VirgoLab should designate a Resource Coordinator.

As most of the financial resources of VirgoLab are allocated through EGO, it would be preferable if the Resource Coordinator is part of EGOs administrative staff or supported by a dedicated person among EGOs administrative staff.

All members of VirgoLab engage to provide the relevant information to the Resource Coordinator upon request.

The Resource Coordinator is nominated by EGO Council for a fixed mandate, which can be renewed.

The Resource Coordinator ensures that the Resource Review Procedure is followed, with the support of the EGO Council, the EGO Director and the VirgoLab Executive Board.

Rule 2

Resource Review Procedure

The proposed schedule of the resource review procedure in the year n looks as following:

During the **July session** of EGO Council in the year n:

1. The Resource Coordinator presents to Council the executed resource plan of the year n-1 for approval after having received the opinions presented by the AFC and the STAC.

The executed resource plan contains:

- The contributions from the EGO budget allocated to VirgoLab in the year n-1 and their executed spending.
- The comparison of the resources pledged and provided by the Member Labs

2. Assessment of the pledged deliverables and in-kind contributions transferred to VirgoLab

The Resource Coordinator presents the budget of the year n with possible updates for information and the AFC and the STAC present their opinions:

- The part of the contributions from the EGO budget and the Common Fund allocated to VirgoLab for the year n and the current spending
- The resources pledged by the Member Labs
- The deliverables and in-kind contributions to be received by VirgoLab

3. The Resource Coordinator presents to Council the prevision of the resources needed for the year n+1 for comments and the AFC and the STAC present their opinions:
 - The resources required for the functioning of VirgoLab;
 - The foreseen part of the contributions from the EGO budget and the Common Fund to be received by VirgoLab in the year n+1 for VirgoLab and their planned spending;
 - The foreseen resources pledged by the Member Labs;
 - The deliverables and in-kind contributions foreseen to be received by VirgoLab;
 - The matching of the required resources with the foreseen resources;
 - The plans to mitigate any missing resources;

These presentations are also given to the Board of PIs.

During the **December session** of EGO Council in the year n:

1. The Resource Coordinator presents the executed budget of the year n with possible updates for information and the AFC and the STAC present their opinions:
 - The part of the contributions from the EGO budget and the Common Fund allocated to VirgoLab for the year n and the current spending;
 - The resources pledged by the Member Labs and the resources currently received,
 - The deliverables and in-kind contributions planned and currently received by VirgoLab
2. The Resource Coordinator presents to Council the prevision of the resources for the year n+1 for approval after having received opinions presented by the AFC and the STAC:
 - The resources required for the functioning of VirgoLab;
 - The foreseen part of the contributions from the EGO budget and the Common Fund to be received by VirgoLab to be received in the year n+1 and their planned spending;
 - The foreseen resources pledged by the Member Labs;
 - The deliverables and in-kind contributions foreseen to be received by VirgoLab;
 - The matching of the required resources with the foreseen resources;
 - The plans to mitigate any missing resources;
3. The Resource Coordinator presents to Council the budgetary strategy for the upcoming three years for information. The AFC and the STAC are presenting their opinions.

These presentations are also given to the Board of PIs.

Rule 3

Document of Resource Pledges

- For the December Council Session, the Resource Coordinator prepares a document summarizing the resources pledged for the year n+1 by EGO and each of the Member Labs. The summary document is based on the data contained in individual resource pledge documents for each Member Lab, which specify the persons involved in VirgoLab and their foreseen SVAC, the financial resources pledged by the group and the expected deliverables.
- The numbers given in these documents must be extracted from or inserted in a collaboration-wide database (e.g. Virgo Members Database), such that summary reports can be created covering all labs.
- The documents relevant for each Member Lab are signed by the EGO director, the Oversight Organisation of the Member Lab and the PI.
- The resource pledge documents for each country's labs are collected by the country's national coordinator, who submits them to the competent Oversight Organization for approval/signature before forwarding them to the Resource Coordinator.
- The documents are the basis for the monitoring of the resource allocations by the Resource Coordinator.
- In case of any shortfall, the Resource Coordinator should be informed on the shortest possible notice and mitigation strategies should be elaborated by the EB upon proposal of the relevant project.

- Non-compliance with the Resources pledged may result in sanctions including voting rights or authorship of the concerned group or individuals.

Rule 4

Resource Loading

- The final authority for the resource loading lies with the EGO director.
- The EGO director together with the members of the Executive Board are responsible for establishing the resource planning of VirgoLab.
- The EGO director together with the members of the Executive Board initiate and lead the discussions with the Oversight Organisations, the National Liaisons and the Member Lab PIs to establish the resource planning.
- The Resource Coordinator is involved in these discussions and duly informed on all relevant aspects concerning the resource allocation and execution.

Rule 5

Additional Council, AFC and STAC Sessions

- If considered necessary, the EGO Director may request an additional Session of the Council, the AFC and the STAC, in particular upon proposal of the Resource Coordinator.

Annex 4:

Resource Pledges

This annex delineates the resource pledges from [Institution Name] (hereinafter referred to as the “Contributing Institution”) to support the operating budget and resource requirements of VirgoLab. Each contributing group/institution shall provide their own appendix with the following sections:

1. Monetary Pledges

This section outlines the financial contributions from the Contributing Institution to support the operating budget and resource requirements of VirgoLab.

Financial Contributions

The Contributing Institution hereby commits to the following financial contributions:

Operating Budget:

Amount: €[Specific Amount]

Duration: Annual contribution for the fiscal year [Year]

Intended Use: General operational expenses, including but not limited to maintenance, utilities, and administrative costs.

Resource Requirements:

- **Item 1:**
 - **Amount:** €[Specific Amount]
 - **Intended Use:** [Description of the item or purpose]
- **Item 2:**
 - **Amount:** €[Specific Amount]
 - **Intended Use:** [Description of the item or purpose]
- **Item 3:**
 - **Amount:** €[Specific Amount]
 - **Intended Use:** [Description of the item or purpose]

2. Personnel

This section details the personnel contributions from the Contributing Institution, including the number of Full-Time Equivalents (FTEs), their roles, and their time commitments both on and off-site.

Personnel Contributions

- **Name:** [Name 1]
- **Role:** [Role 1]
- **Time Commitment:**
 - On-site: [Specific Duration or Percentage]
 - Off-site: [Specific Duration or Percentage]
- **Name:** [Name 2]
- **Role:** [Role 2]
- **Time Commitment:**
 - On-site: [Specific Duration or Percentage]
 - Off-site: [Specific Duration or Percentage]

3. Equipment/Subsystems

This section describes the equipment or subsystems that shall be delivered by the Contributing Institution, including the involved parties, timeline, progress expectations, FTEs, costs, and handover plan.

[Name of Equipment/Subsystem 1]

- **Description:** [Brief Description]
- **Involved Parties:** The Contributing Institution and [Other Parties]
- **Timeline:**
 - **Start Date:** [Date]
 - **Milestones:** [Milestone 1], [Milestone 2]
 - **Completion Date:** [Date]
- **Annual Progress Expectations:** [Details of expected progress each year]
- **FTEs and Costs:**
 - FTEs: [Number]
 - Costs of Goods: €[Specific Amount]

- **Handover Plan:** [Details of the handover process, including responsible parties and timeline]

[Name of Equipment/Subsystem 2]

- **Description:** [Brief Description]
- **Involved Parties:** The Contributing Institution and [Other Parties]
- **Timeline:**
- **Start Date:** [Date]
- **Milestones:** [Milestone 1], [Milestone 2]
- **Completion Date:** [Date]
- **Annual Progress Expectations:** [Details of expected progress each year]
- **FTEs and Costs:**
- FTEs: [Number]
- Costs of Goods: €[Specific Amount]
- **Handover Plan:** [Details of the handover process, including responsible parties and timeline]

This appendix shall be considered an integral part of the Memorandum of Agreement between the European Gravitational Observatory (EGO) and the Contributing Institution.

Annex 5: Data Management Plan

to be established