

Maximising effectiveness by collaboration

**Helsinki Institute of Physics (HIP)
implementation plan of the long-term strategy
for 2025 in the 2025–2028 period**

10 October 2024

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1 STRATEGIC FRAMEWORK

1.1 Changing environment

The Helsinki Institute of Physics (HIP) is jointly operated by five Finnish universities, with the Finnish Radiation and Nuclear Safety Authority (STUK) as a fixed-term interim member. Thanks to its structure as a jointly operated institute, HIP provides an operational and financial framework for the utilisation of large international research infrastructures, which would be impossible if it were operated by a single university. HIP's national role also means that it can serve in the steering and decision-making bodies of international research institutes. The Helsinki Institute of Physics coordinates Finnish cooperation with the European Organization for Nuclear Research (CERN) and the Facility for Antiproton and Ion Research in Europe (FAIR).

HIP receives Ministry of Education and Culture funding for the performance of national duties, earmarked for international activities and related support. The funding for HIP's national duties in 2025 will be 4.8% higher than at the beginning of the 2021–2024 agreement period, but 6.1% lower than in 2024. The funding for national duties in the 2025–2028 period will cover approximately 60% of the Institute's core funding, while the partner universities' funding will cover approximately 40%. External funding is provided by, among others, the Research Council of Finland, Business Finland and the EU.

HIP's operations are guided by its long-term strategy (approved 16 November 2020, updated 21 November 2024) and the strategies of the member universities. Finland's national CERN strategy (Research Council of Finland 13/2002) and the update of the European Strategy for Particle Physics, published on 19 June 2020, provide a foundation for long-term and diverse work in the development of research, doctoral education, technology development and transfer, as well as societal impact. Relevant international documents also include CERN's Medium-Term Plan for the period 2025–2028, the NuPECC Long Range Plan 2024 and APPEC's European Astroparticle Physics Strategy 2017–2026 (mid-term update in 2023).

During the 2025–2028 strategy period, CERN's construction activities will focus on the construction of the High-Luminosity LHC, alongside Run 3. HIP coordinates Finland's contribution to the construction of FAIR, which began in 2011, and to FAIR research operations.

HIP is a key participant in the Centre of Excellence in Quark Matter coordinated by the University of Jyväskylä in the period 2022–2029. From 2024 to 2027, HIP will participate in the Graduate School in Particle and Nuclear Physics pilot, which includes a total of 16 doctoral researcher positions. HIP is also involved in the doctoral education pilot of two research Flagships, the Finnish Quantum Flagship coordinated by Aalto University and FAME – Flagship of Advanced Mathematics for Sensing, Imaging and Modelling coordinated by the University of Eastern Finland. HIP participates in the operations of the Finnish Quantum Institute (InstituteQ).

The most significant challenge for HIP relates to securing long-term funding. Operational risks include unexpected events in major international projects and delays in the construction and operation of research equipment. Russia's attack on Ukraine, launched on 24 February 2022, considerably hinders the operations of CERN and FAIR, as well as, consequently, experimental

activities at HIP. Sudden changes in financing and exchange rate fluctuations pose a significant threat to long-term international operations.

1.2 Mission of the Institute

The Helsinki Institute of Physics is a joint institute of the University of Helsinki, Aalto University, the University of Jyväskylä, LUT University and Tampere University, and it carries out national duties. The University of Helsinki manages the Institute's administration.

HIP maximises its scientific, technological and societal impact by effectively concentrating the extensive and complementary expertise and competencies of its member organisations in research related to accelerators in Finland. The research operations coordinated by HIP encompass a wide range of topics in theoretical physics and experimental subatomic physics.

The Institute carries out and promotes basic and applied research in theoretical and experimental physics, develops technological applications in international particle accelerator centres, and contributes to researcher education. HIP is in charge of Finland's research collaboration with CERN and the country's contribution to the construction of the international FAIR facility and the research conducted there. HIP also participates in other international research collaboration.

1.3 Profiles and focus areas

HIP's primary mission is based on Finland's status as a member state of CERN and FAIR and the full exploitation of this status.

To achieve the goals of its long-term strategy, HIP

1. Coordinates Finland's CERN research and is responsible for Finland's participation in the construction of the FAIR facility and the research conducted there.
2. Prominently contributes to international collaboration in cutting-edge basic research on high-energy physics and nuclear physics as well as neighbouring fields, such as astroparticle physics and cosmology.
3. Promotes applied and basic research related to accelerators, radiation detectors and computing, including material physics and quantum technology.
4. Educates researchers specialising in physics and new technology in a challenging international project-based environment.
5. Promotes the technical expertise of Finnish companies as well as the commercial exploitation of CERN and FAIR projects.
6. Utilises CERN and FAIR in natural science education as well as in the promotion of open science and general knowledge of the natural sciences.
7. Supports a healthy work environment for staff and students, promoting an inclusive and gender-neutral setting.
8. Actively collaborates with other stakeholders and monitors the potential need to expand operations through membership in other institutions.

HIP's operations and research questions are closely connected to the European Strategy for Particle Physics as well as the other strategies and plans referred to in section 1.1. The operations are also guided by the strategies and focus areas of the member universities. HIP's long-term strategic plan will be updated in autumn 2024.

Focus areas for the Institute in 2021–2030

1. LHC experiments at CERN
2. FAIR operations
3. Particle experiments with the highest collision energy
4. Broad-based, internationally high-quality theoretical research
5. Non-LHC experiments at CERN
6. Cosmology and astroparticle physics
7. Technological connections and skills transfer
8. Detector Laboratory operations
9. Outreach
10. Open science and research
11. Wellbeing and diversity
12. Sustainability and responsibility

1.4 National duties and international special responsibilities

Responsibility for the coordination of Finland's CERN activities

Start date: 1 September 1996

Resources: Funding for national duties, core funding of member universities and external funding for construction investments

Description:

CERN is a leading multifaceted research centre globally in particle and nuclear physics. The organisation's 24 member states collaborate in global research projects, which are carried out on a larger scale than would be possible for a single European country and are focused on the basic structure of matter and fundamental interactions in nature. CERN's major project, the Large Hadron Collider (LHC), is the world's largest scientific instrument. It was taken into research use in 2010 and has since contributed to our understanding of the origin of the mass of subatomic particles (Higgs boson). HIP is participating in the LHC experiments CMS, TOTEM, ALICE and MoEDAL. CERN's other experimental activities include the Isotope mass Separator On-Line (ISOLDE) facility, the leading facility dedicated to the production of radioactive ion beams, as well as the CLOUD experiment, which shines new light on climate change. CERN is also a significant technological development platform.

As part of the funding awarded to the University of Helsinki, the Ministry of Education and Culture provides the Helsinki Institute of Physics with significant funding for the performance of national duties so that HIP can engage in CERN activities. CERN is included in Finland's national research infrastructure roadmap. The upgrade of the LHC to the High-Luminosity LHC (HL-LHC) is also an ESFRI Landmark project.

In December 2023, the Finnish Research Infrastructure Committee of the Research Council of Finland decided on FIRI funding totalling €1.5 million for updating LHC experiments in the period 2024–2027.

Responsibility for the coordination of Finland’s FAIR activities

Start date: 1 January 2008

Resources: Funding for national duties, core funding of member universities and external funding for construction investments

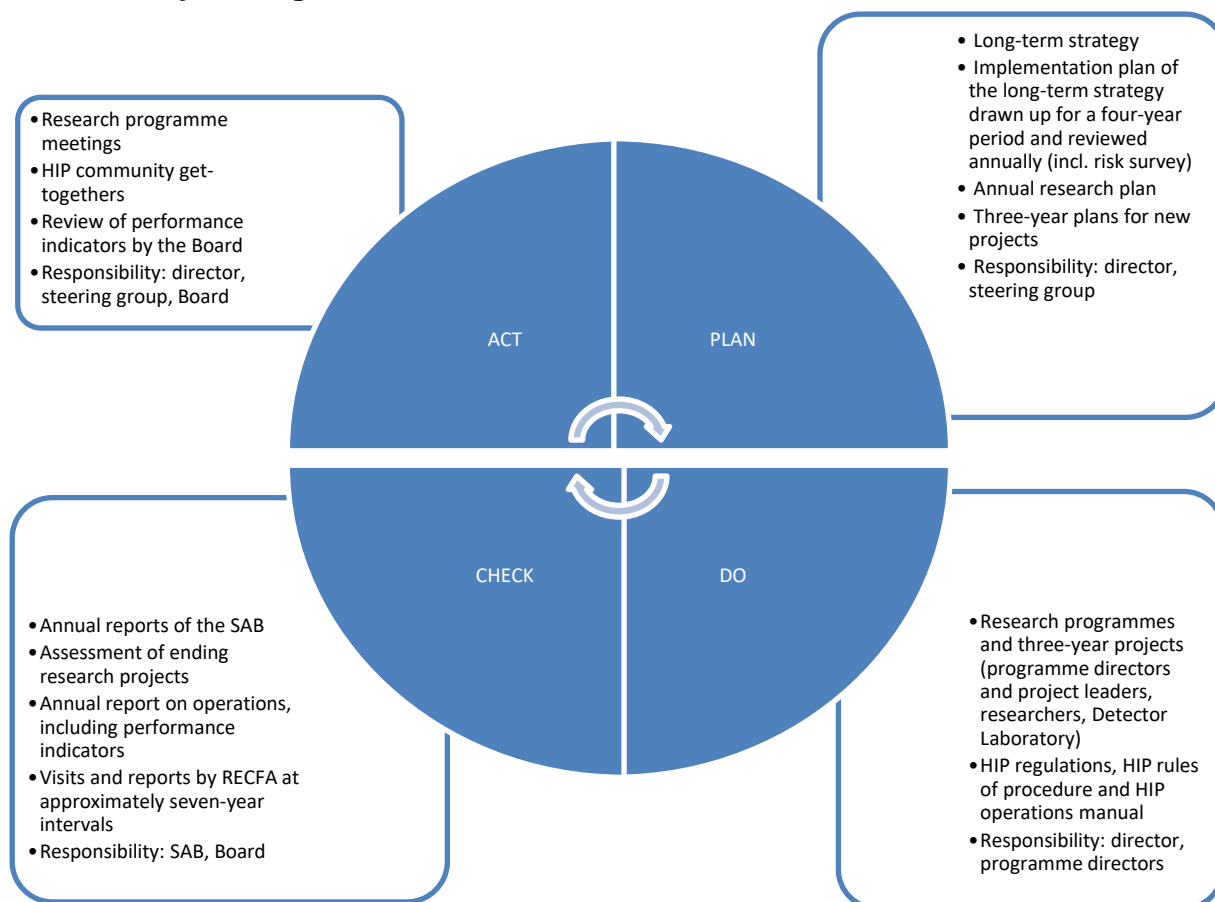
Description:

The Facility for Antiproton and Ion Research (FAIR) is a particle accelerator laboratory established in Darmstadt, Germany, which will produce high-energy and high-intensity ion beams and antiproton beams. The ion beams enable advanced research in four major physics experiments (APPA, CBM, NUSTAR, PANDA). The accelerator complex contains cooler-storage rings for particle beams and enables the use of internal targets for research purposes. Two superconducting synchrotrons generate primary ion beams up to uranium nuclei, along with a wide range of radioactive ion beams.

The mission of the Helsinki Institute of Physics is to coordinate Finland’s contribution to the construction and research activities. The Ministry of Education and Culture has granted the project €5 million in construction funding. In addition, the Research Council of Finland’s Finnish Research Infrastructure Committee made a policy decision in September 2015 concerning the allocation of FIRI funding for the FAIR construction expense payments due in 2019 and 2022. In December 2018, the committee awarded €840,000 for the first instalment and €400,000 for the second instalment in January 2022. In 2023, the Research Council of Finland awarded €9.1 million to cover the increased construction costs of FAIR.

Phase 0, the first FAIR research phase, began in 2019, utilising the GSI Helmholtzzentrum für Schwerionenforschung infrastructure. FAIR is included in Finland’s national research infrastructure roadmap. It is also an ESFRI Landmark project.

1.5 Quality management



Quality management supports the achievement of the objectives set for the Helsinki Institute of Physics. The achievement of objectives is assessed through reporting and monitoring as a part of the operations management process. HIP's operations are guided by its regulations (8 January 2020), rules of procedure (7 October 2020) and operations manual (30 June 2023).

The director of HIP is responsible for the quality of the Institute's operations and results. The research programme directors are responsible for the scientific content of the programmes. A research coordinator serves as the contact person for matters related to quality and coordinates quality management at HIP. The director and the Board are supported in research quality issues by a 6–10-member international Scientific Advisory Board (SAB), which monitors the progress and scientific quality of research projects. The SAB meets at least once a year, and its members can also be consulted in specific questions.

Research operations are organised into projects that usually last three years. The SAB and the Board will have access to the three-year plans for projects proposed to the Board. Projects are assessed by an assessor or group of assessors before the Board decides on the approval or continuation of projects. The reports of external assessors are also provided to the SAB. The Board takes the SAB's recommendations into account when deciding on new projects.

During their final year, projects are assessed by the SAB or other external assessors. The implementation of assessment is discussed with the SAB in the second project year.

HIP's research operations are also evaluated in research assessments carried out by the member universities. In the research assessment carried out by the University of Helsinki in 2019, the contribution of the University to HIP received the highest grade (excellent) for all areas assessed (scientific quality, societal impact, research environment and unit viability). In the follow-up research assessment carried out in 2023, HIP was found to have implemented the recommendations given in the 2019 assessment and to have strong operations that are recognised on an international scale.

The European Committee for Future Accelerators (ECFA) is an advisory body to CERN management, the CERN Council and its committees, and it assesses the state of particle physics in the CERN member states and more broadly. The Restricted European Committee for Future Accelerators (RECFA), the board of the ECFA, last assessed research related to particle physics in Finland in 2017 and will do so again in spring 2025.

A large part of HIP's research operations take place at international accelerator laboratories, particularly at CERN. The operations are based on quality management systems, such as the ISO 9000 system.

The Detector Laboratory at Kumpula Campus has a quality manual based on the ISO 17025 standard. The laboratory's operations are assessed every strategy period, with the next assessment in 2025.

Publishing in peer-reviewed journals guarantees the continued high quality of research. Internal monitoring of international joint projects, such as experimental collaborations at CERN, maintains the quality of research.

1.6 Strategic focus areas and measures

HIP's strategic roadmap for 2025–2028 (drawn up on the basis of the University of Helsinki's strategic roadmap):

1. Research, infrastructures and innovations

- We will advance the renewal of research as well as multi- and interdisciplinary approaches in research and education.
- We will develop the content of doctoral education and increase the number of completed doctoral degrees.
- We will take a long-term approach to strengthening research infrastructures.
- We will increase business collaboration ventures, boost innovation and commercialisation activities, and foster innovation capabilities and a culture of innovation.

2. Teaching, supervision and guidance, and learning

- We will develop teaching as well as student guidance and supervision.

3. Sustainability and responsibility

- We will enhance supervision, supervisory skills, and leadership and management practices that support diversity and sustainable wellbeing.
- We will strengthen an operating culture that supports sustainability, responsibility, wellbeing, and overall safety and security.

4. Global collaboration and impact

- We will invest in strategic national, Nordic, European and global collaboration.
- We will bolster our societal impact on the national level by advancing scientific literacy and popularising research.

5. Operating conditions

- We will promote balanced finances and increase funding intake, particularly from external and private sources.
- We will develop our facilities to be more efficient and fit for purpose.

2 MEASURES IN 2025

The key measures to be carried out in 2025:

2.1 Research, infrastructures and innovations

Performance of national duties

The role of Finland as a CERN and FAIR member state will be comprehensively coordinated and utilised. The main duty of the Helsinki Institute of Physics will be to coordinate the cooperation between Finland and CERN. This duty is based on Finland's national CERN strategy (Academy of Finland 13/2002). The Helsinki Institute of Physics will coordinate Finland's contribution to the construction and research activities of the FAIR research infrastructure.

Comprehensive research activities relating to CERN experiments

The focus of research during the current period is on physics research using the Large Hadron Collider (LHC) and on the comprehensive exploitation of the results. In the period 2022–2025, the LHC experiments are in the Run 3 stage, during which new particle collision data are collected. Physics analyses will concentrate on determination of the properties of the Higgs

boson, jet studies, forward physics and relativistic heavy-ion collisions in the CMS, TOTEM, ALICE and MoEDAL experiments.

From 2026 to 2029, the LHC will be upgraded to the High-Luminosity LHC (HL-LHC), increasing the quantity of data acquired roughly tenfold. At the same time, the second phase of upgrading the CMS detector will be completed.

Radioactive ion beams will be produced at CERN's Isotope mass Separator On-Line facility (ISOLDE) for research on the nuclear structure.

HIP will continue its successful participation in CERN's CLOUD experiment, which focuses on climate change. The 10-year plan for the CLOUD experiment extends to 2030.

Increasing utilisation of Finland's FAIR membership

The construction of the FAIR accelerator facility in Darmstadt, Germany, is expected to be completed in 2028. FAIR's research activities have been gradually initiated during the construction period. Finland is strongly involved in the construction of the facility, including in-kind deliveries, participation in the responsibilities associated with the construction and experiments, as well as in physics experiments carried out in Phase 0.

In 2025, as the completion of FAIR approaches, a key focus will be on increasing awareness of the potential of the research infrastructure for the wider academic community, both within physics and in other fields of science. Among other things, communications will be enhanced by organising seminars and visits, as well as by publishing blog entries and other articles to a wider audience.

Research in astroparticle physics: Euclid, LISA and COSINUS

HIP researchers are central to the Euclid space telescope mission of the European Space Agency (ESA). Since the launch of the telescope in July 2023, data from the mission have been analysed and measured at HIP. The Research Council of Finland awarded consortium funding for the Euclid Cosmology Mission – Mapping the Dark Universe project of the University of Helsinki and the University of Oulu for the period 2022–2026.

HIP is contributing to the preparation of the LISA mission of the ESA and the National Aeronautics and Space Administration (NASA). The Laser Interferometer Space Antenna (LISA) is a probe for investigating gravitational waves. According to a preliminary timetable, the probe will be launched in 2034.

An institution called Cosmology Data Centre has been established in Finland, for which Aalto University, the University of Helsinki, the University of Oulu, the University of Turku and CSC – IT Center for Science will receive FIRI funding from the Research Council of Finland from 2024 to 2026. The centre provides the computing and storage services for the Euclid and LISA projects carried out in Finland. The Cosmology Data Centre is one of nine Euclid data centres in total.

In 2021, HIP joined the COSINUS experiment, a facility for searching for dark matter, constructed in the Laboratori Nazionali del Gran Sasso in Italy and inaugurated in 2024. The measurements

are expected to begin in 2025. HIP will participate in theoretical dark matter simulations and preparations for experiment analyses.

Design, construction and upgrade of large detectors at CERN and FAIR

The second phase of the upgrading of the CMS and ALICE experiments will be carried out from 2016 to 2025 with other members of these experiment collaborations. Research infrastructure funding for the upgrades has been secured from the Research Council of Finland.

In the period 2026–2029, after Run 3, the LHC experiments CMS and ALICE will be upgraded, as will the LHC accelerator for the HL-LHC phase. The Research Council of Finland has granted FIRI funding for upgrading the CMS and ALICE detectors for the period 2024–2027.

Detector and accelerator components will be built and supplied for the FAIR facility, if possible collaboratively with Finnish companies.

HIP's FAIR operations have expanded thanks to Phase 0 experiments, and will increase as the Early Science phase of FAIR to be launched in 2028 approaches.

The activities of the Detector Laboratory as an independent infrastructure that supports research programmes cost efficiently and professionally will be further developed.

The computation systems required by the LHC experiments will be further developed together with CSC and Nordic operators. The utilisation of high-performance computing in analysing the data of LHC experiments is actively being investigated, in Finland particularly using the LUMI supercomputer.

Pioneer of open science

HIP researchers play a pioneering role in the publication of open data concerning CERN's CMS experiment. HIP supports the provision of open access to the CMS data, the use of these data for scientific and societal purposes, and the long-term preservation of the data. Kati Lassila-Perini, who leads HIP's project for school activities and the use of open data, has led the Data Preservation and Open Access project of CERN's CMS experiment from its beginning, from its establishment in 2012 to 2024. As of 2024, Lassila-Perini chairs the Data Lifecycle Panel of the International Committee for Future Accelerators (ICFA).

Providing open access to the CMS data will strengthen the connection between theoretical and experimental research. Theoretical experimenters and researchers outside the experiment collaborations can use the open experimental data in their research.

Roughly 97% of HIP publications are published openly.

Promotion of business collaboration and CERN/FAIR procurements

HIP will continue to promote technology development and transfer in the 2025–2028 period. HIP will develop Finnish industrial cooperation with CERN and FAIR and will promote their technological and commercial utilisation.

In 2022, Business Finland resumed its efforts to boost national industries by appointing an industrial liaison officer for CERN and FAIR procurement. As a result of Business Finland's organisational restructuring, a new liaison officer was appointed in 2024. Due to changes at Business Finland and in government administration, particularly in the Ministry for Foreign Affairs, funding for the position remains unclear. The in-kind deliveries of Finnish industry could grow significantly if the industrial liaison officer is able to carry their duties on a full-time basis.

HIP will continue to support the industrial liaison officer in their duties. The return coefficient is a clear indicator of Finnish industrial supply contracts with CERN.

Thanks to HIP collaboration, Finnish universities have launched and are preparing several Business Finland projects related to CERN.

In the period 2021–2023, HIP's Detector Laboratory carried out, together with LUT University, a Business Finland project entitled Detector for Nuclear Safety, Decommissioning and Diagnostic Applications for the commercialisation of research. Collaboration on the topic will continue between LUT University and the VTT Technical Research Centre of Finland.

The activities under HIP's technology programme support CERN's and FAIR's experiments and accelerator development, and also have application potential in other major scientific projects, such as ESRF, ITER and XFEL. External funding and new partners (e.g., IAEA and CEA) will be actively sought for projects. Collaboration with VTT will be strengthened.

2.2 Teaching, supervision and guidance, and learning

Guidance of students in the adoption of a research-based work method in an international environment

The Helsinki Institute of Physics provides excellent opportunities for doctoral education in a demanding international, project-based environment. In accordance with Finland's CERN strategy, doctoral education relating to CERN and FAIR will be intensified together with degree programmes at the member universities. The topics of doctoral education will cover both basic research and the development of research-related equipment and methods as well as applications. HIP researchers will participate actively in doctoral education.

Each year, approximately 15 students from Finnish universities and other higher education institutions participate in HIP's summer traineeship programme at CERN and ESRF. The summer trainees typically acquire three months of international work experience and have the opportunity to participate in top-level scientific lectures aimed at the trainees.

Every year, Finnish students also participate in CERN's summer traineeship programme. The aim is to take more advantage of FAIR's GET_INVolved programme geared to students and junior researchers.

The CERN Bootcamp, intended for master's students, was organised together with three universities of applied sciences in the summers of 2018, 2019 and 2022–2024. The bootcamp will also be organised in the summer of 2025, provided that funding is secured. During the bootcamp, students work in groups to resolve current social problems that often relate to sustainability.

CERN Accelerator Schools will be organised in Finland in collaboration with HIP. HIP will actively contribute to the organisation of Nordic laboratory workshops in instrumentation. HIP researchers will coordinate participation in the European School of Instrumentation in Particle & Astroparticle Physics (ESIPAP).

2.3 Sustainability and responsibility

Sustainability and responsibility in research and other operations

HIP conducts research on themes of sustainability and responsibility, including materials research on energy production technologies and CERN's CLOUD experiment related to atmospheric sciences, which investigates atmospheric processes and mechanisms contributing to climate change.

Open access to research results is part of the sustainability and responsibility of scientific work. Research results and data are openly available for everyone to use and exploit, which maximises the impact of research. The principles and practices of open science have been key to HIP's research activities since the Institute's establishment. Ways of processing and preserving open data are continuously developed. CERN's CMS experiment will make data openly available in an easy-to-use format, which means that the data can be used not only in research but also in teaching in Finnish schools and other contexts. HIP researchers teach the use of open science tools to Finnish school teachers and, through workshops, to general upper secondary school students.

In HIP's operating culture, sustainability and responsibility are considered in all its activities, for example, when organising events that require mobility. HIP strives to make its seminars and other events available to remote participants. HIP flexibly supports telecommuting.

As part of responsible human resources management, the focus is on the equal and fair treatment of staff, responsible decision-making, interactive supervisory work, workplace wellbeing and staff skills development. HIP's human resources policy takes equality and diversity into account. High-quality internal communication is also a priority, alongside open interaction between the leadership and staff as well as more generally within the work community.

The focus of social sustainability is on inclusivity, participation and the integration of individuals into the research community.

Support for supervisory work

For its programme directors and project leaders, HIP organises on a regular basis HIP Leaders' Afternoon sessions, with a broad focus on leadership themes.

HIP encourages supervisors to participate in supervisory training organised by its member universities.

HIP provides individual guidance for all summer staff. Summer staff working at CERN participate in CERN's summer lecture programme. Networking sessions are organised for summer staff both in Finland and at CERN. In addition, summer staff have the opportunity to attend a seminar at the end of their employment to discuss the results of their summer work.

Objectives and measures of the workplace wellbeing group for physics at Kumpula Campus

As the workplace wellbeing group of HIP and the Department of Physics at the University of Helsinki, we promote, support and ensure the wellbeing as well as equity, diversity and inclusion of our academic community. We wish to ensure that the University is a safe space where we behave professionally and respect others, while maintaining a pleasant atmosphere that encourages communication and inspires friendship.

New ideas and strategies are needed to tackle problems associated with wellbeing, such as harassment and inappropriate behaviour, large workloads and stress, as well as a lack of workspaces that promote concentration and quiet work.

The goal of the workplace wellbeing group is to establish a supportive, inclusive and well-informed community focused on both current and future wellbeing challenges.

1. Expanding and maintaining the workplace wellbeing group

We will increase community representation by encouraging more people to join the workplace wellbeing group. This also reduces member turnover resulting from short-term agreements and graduation. We will improve engagement, approachability and openness, and we will intensify collaboration with the leadership to help tackle wellbeing problems.

2. Increasing our commitment to the community and our approachability

We will visit various HIP groups to introduce the workplace wellbeing group and its activities, as well as collect feedback on how best to support members of the community.

Every year, we will organise an event introducing the workplace wellbeing group as well as its low threshold contact persons and their role.

Once a term, we will organise an informal meeting that provides a safe space and a discussion forum for peer support and communication. The inaugural session will be organised on a trial basis in 2025.

3. Openness of practices

We will revitalise and maintain the wellbeing pages in Xwiki and use them as a communication forum to provide the community with up-to-date information on our activities.

We will establish a newsletter to be sent every few months, providing the community with updates on our meetings and other matters pertaining to wellbeing, equity, diversity and inclusivity (EDI).

4. Addressing questions related to wellbeing, equity, diversity and inclusivity

We will increase the number of easily approachable contact persons to whom members of the community can turn in cases of violations of the rules of conduct, poor supervision or a lack of communication.

We will strive to promote the training of supervisors and persons who provide guidance and supervision on the rules of conduct and address related violations. We will encourage units to draw up precise and practical guidelines for violations of the rules of conduct.

We will assess and contribute to improving the support provided to doctoral researchers.

We will collaborate with human resource management and the teaching resource group to manage workloads and promote ways of recovering from work.

5. Providing leisure time activities and promoting social interaction with colleagues

We will continue to offer light events and activities that promote a pleasant atmosphere, and opportunities for socialising, such as recreation days and physics colloquia.

Use of digital solutions by a geographically distributed research institute

Mobility is emphasised in HIP's decentralised organisation structure. HIP provides researchers working in Finland with access to leading international research centres, such as CERN and FAIR. Digital tools are used appropriately to strengthen the synergies and inclusivity of research, and to reduce the Institute's carbon footprint.

2.4 Global collaboration and impact

National research cooperation at the heart of HIP

As a research institute jointly operated by five universities, HIP enables its researchers to engage in close research cooperation and promotes the shared use of research infrastructures at the member organisations. HIP invests actively in interuniversity projects, of which good examples include the theory programme's projects. National cooperation increases research synergy between universities. As a rule, HIP's research activities are based on networks, thanks to which new employees can also immediately use existing national and international networks.

Access to major international projects and research infrastructures

HIP provides researchers working in Finland with access to leading international research centres, such as CERN and FAIR.

European strategic cooperation in the fields of particle physics, nuclear physics and astrophysics

HIP has a significant role in Finland's national participation in the European ECFA, NuPECC and APPEC committees in the fields of particle physics, nuclear physics and astrophysics, carrying the voice and boosting the impact of Finnish researchers in the committees' multinational strategic planning efforts. Membership in the three key scientific committees increases national cohesion as well as the synergy and impact of HIP's research.

HIP contributes to the preparations for updating the European Strategy for Particle Physics, for which the Finnish input is expected by March 2025. HIP channels the views of the Finnish research community to the strategic planning process, thus affecting decisions on CERN's next flagship project, the accelerator following the LHC. The CERN Council will decide on the update of the strategy in 2026. The director of HIP is a scientific delegate of the CERN Council, while the other delegate representing Finland on the Council is from the Research Council of Finland.

The European Committee for Future Accelerators (ECFA) is an advisory body to CERN management, the CERN Council and its committees, and a key operator in preparations for updating the European Strategy for Particle Physics. ECFA also monitors the implementation of the strategy and assesses the state of particle physics in the CERN member states and beyond. The ECFA board RECF will visit Finland next in spring 2025.

In 2019, HIP joined the Astroparticle Physics European Consortium (APPEC) as Finland's national representative. HIP took part in the mid-term update of the European Astroparticle Physics Strategy 2017–2026 and will actively contribute to drawing up the next APPEC strategy. HIP is also a member of the European Consortium for Astroparticle Theory (EuCAPT) established by APPEC in 2019.

Finland has been a member of the Nuclear Physics European Collaboration Committee (NuPECC) through the Research Council of Finland. In 2025, HIP will apply to join NuPECC as the Research Council of Finland relinquishes its membership. As a research institute coordinating research in the field, this responsibility is a more natural fit for HIP than the Research Council of Finland. HIP's membership will increase opportunities to influence the strategic planning of European nuclear physics.

Social impact of cooperation with the Radiation and Nuclear Safety Authority

The participation of the Radiation and Nuclear Safety Authority (STUK) in the Helsinki Institute of Physics increases HIP's engagement with and impact on Finnish society. Shared areas of research and other operations with STUK include radiation detector development and instrumentation, technology transfer and accelerator-based therapy.

The cooperation is important for STUK's main themes (Safety, Security and Safeguards): the social acceptance of nuclear energy and radiation use relies on safety, security against illegal activities and safeguards.

Financial impact

Financial impact will be enhanced by further developing industrial cooperation between Finland, CERN and FAIR, and working actively with new collaboration parties for the exploitation of research results.

School activities and the use of open data

At CERN, the Helsinki Institute of Physics organises continuing education periods for Finnish subject teachers and science camps for Finnish general upper secondary school students. A HIP project covering both school activities and the use of open data is in charge of these operations and their further development. The project uses CERN's open data in comprehensive and general upper secondary education and trains Finnish teachers throughout Finland in the use of open data and open science tools. The project also investigates the use of open data in teaching. During the coronavirus pandemic, the project organised workshops for general upper secondary school students on the use of open data and produced training material for remote teaching.

Before participating in CERN's science camps, general upper secondary school pupils visit the University of Helsinki or the University of Jyväskylä for lectures and a laboratory tour. Annually, some 370 general upper secondary school students and 60 teachers participate in the camps. Numerous school groups visit the Detector Laboratory each year, and HIP researchers lecture at schools.

HIP researchers also organise annual International Masterclass courses coordinated by CERN for Finnish general upper secondary school students. In addition, HIP annually hosts pupils completing work experience periods.

Outreach

HIP researchers actively and versatily contribute to outreach activities and science education, popularising research, inspiring young people to engage in science and research, and increasing science literacy and knowledge of the natural sciences.

2.5 Operating conditions

A sound financial standing

The objective is to have sustainable finances, based on long-term funding for national duties and the commitment of the member universities. The goal is to significantly increase the level of funding for national duties, as HIP's international and national responsibilities have grown and are still growing, for example, as the FAIR facility is completed and its research operations are launched in stages.

The aim is to increase external funding by supporting related applications, especially with regard to the Research Council of Finland, Business Finland, the EU and foundations. The quality of applications will be improved through mentoring and with the help of Research Services.

3 RESOURCES

3.1 Short- and long-term financial prospects of the Institute

In the period 2025–2028, funding for national duties from the Ministry of Education and Culture constitutes roughly 60% of the core funding for the Helsinki Institute of Physics, while the contributions of member universities constitute roughly 40% of the funding. In 2025, HIP will receive €2,619,000 in funding for its national duties, while the funding provided by the member universities will amount to €1,744,000.

Investments, including upgrades to experimental equipment, will be covered with external funding. The share of external funding varies considerably from year to year because of fluctuations in research infrastructure funding.

Since 2017, HIP's core funding has remained almost unchanged without following the trend of rising costs, which hinders the completion of its core duties. The impact of the war in Ukraine also significantly affects the costs of experiments.

In the medium term, the level of core funding should increase to comprehensively exploit Finland's FAIR membership, particularly as FAIR research operations increase. Important in the long term are the continuity and sufficient level of funding for national duties.

The HIP budget for 2025 will be decided on in the third Board meeting of 2024.

3.2 Human resources plan

The general objective of HIP's human resources plan is to create the conditions required for successful and internationally visible research, based on the development of equal staff recruitment and research career advancement. HIP has a workplace wellbeing group together with the University of Helsinki's Department of Physics. The development of workplace wellbeing focuses on career development, the balance of work and leisure, internal communications and working conditions. HIP is committed to the activities of the workplace wellbeing group and the promotion of workplace wellbeing. The goals and measures of the workplace wellbeing group for physics at Kumpula Campus are described in section 2.3.

The career development of junior researchers is advanced through support, advice and project responsibilities. The Helsinki Institute of Physics is a significant platform for the acquisition of additional scientific qualifications, and HIP's researchers have often progressed to university professorships.

HIP's research activities are organised into fixed-term research projects, which are continuously monitored. The Scientific Advisory Board assesses HIP's activities each year.

For research projects, HIP recruits high-quality research staff, usually using an open international application procedure. HIP supports international mobility.

The integration of international researchers is supported through HR policy measures. Research staff working in projects have fixed-term employment contracts concluded, where possible, for the whole duration of the project. If possible, research support staff who are included in the category of ‘other staff’ are employed on a permanent basis. In September 2024, HIP had a permanent staff of eight (seven in 2023, nine in 2022).

In long-term HR planning, HIP cooperates with the coordinating units of the member universities.

3.3 Facilities plan

The Helsinki Institute of Physics operates in established facilities in the Physicum building at the University of Helsinki Kumpula Campus and at CERN. The Kumpula facilities include the Detector Laboratory operated jointly by HIP and the University of Helsinki’s Department of Physics. HIP’s researchers also work at other member universities. HIP makes proactive plans for the efficient use of facilities.

3.4 Communications plan

The communications plan for the period 2024–2027 drawn up by HIP’s communications working group is available at <https://www.hip.fi/about-us/>.

4 MONITORING, REPORTING AND INDICATORS

The director of HIP is responsible for the realisation of the implementation plan as well as related reporting. The director discusses the achievement of objectives with community members.

The director reports on the realisation of the long-term strategic plan and implementation plan to the Board and the international Scientific Advisory Board, which monitor and assess HIP’s activities.

HIP draws up an annual report on its operations, describing the previous year’s operations both qualitatively and with quantitative indicators. In addition, the results of HIP’s operations are published in its annual reports.

The indicators pertaining to HIP operations are continuously monitored and developed, taking into consideration HIP’s long-term strategic plan and those of the member universities.

Indicators in the HIP annual report:

- Finances
 - o Division of income into core funding and external funding
 - o Division of costs into staff, facilities, depreciations, machinery, equipment and supplies, procured services, travel, other costs and overheads
- Staff
 - o Number of contractual employees and total number of employees

- Contractual employees by staff group
- Contractual employees, men and women by staff group
- Contractual employees, Finns and nationals of other countries by staff group
- Publications
 - Refereed publications
 - Publications by research programme, including publications from external projects
 - Publications stored in the Tuhat research portal and reported to the Ministry of Education and Culture
 - Publications by the Finnish Publication Forum classification
 - Share of co-authored publications
 - Publications by language of publication
 - Open access and parallel storage of refereed articles
- Responsibilities associated with CERN and FAIR
 - Responsibilities in physics experiments
 - Responsibilities in administration
- Degrees (master's and doctoral degrees linked to HIP research operations)
 - Number of degrees
 - Gender distribution among graduates
- Research programmes and projects
 - Programme directors and project leaders by member organisations
- Summer traineeships at CERN and ESRF
 - Summer trainees by member university
 - Gender distribution among summer trainees
- Science studies of Finnish schools at CERN
 - Number of general upper secondary school visits
 - Number of students in general upper secondary school groups and number of teachers accompanying the groups
 - Number of week-long teacher courses
 - Number of teachers completing teacher courses

5 RISK MANAGEMENT

1. Name of risk: Threat to the continuity and level of funding for national duties

Description of risk: The continuity and level of funding for national duties from the Ministry of Education and Culture granted for four-year terms may be threatened. The aim is to agree on the funding contributions of HIP's member universities separately for each agreement period. At the beginning of the period 2021–2024, the Ministry funding was cut by roughly 25% from the 2017–2020 period. In the period 2021–2024, this reduction was compensated for with increased contributions by the member universities. The funding for HIP's national duties in 2025, the beginning of the strategy period 2025–2028, will be 4.8% higher than at the beginning of the 2021–2024 agreement period, but 6.1% lower than in 2024.

Risk category: Finances and funding
Risk class: Financial
Development area: Operating conditions
Likelihood: 3 (possible)
Consequence: 5 (very significant)
Risk level: 15
Risk level classification: High

Risk owner: HIP Board

Measures: Long-term planning and justification for operations through national duties based on Finland's status as a member state of CERN and FAIR, HIP's long-term strategy, Finland's national CERN strategy, the coordination of FAIR operations, as well as the strategic plans and collaboration of the member universities.

Persons in charge: Board, director and vice-director of HIP

2. Name of risk: Sufficiency of funding for and technical implementation of the CERN and FAIR infrastructures

Description of risk: Experimental research at CERN and the FAIR facility construction project are sensitive in terms of both financial and technical solutions. The funding for equipment upgrades needed for CERN experiments depends on infrastructure funding provided by the Research Council of Finland. The long duration and unforeseen delays of projects pose challenges in terms of the timing of and indexing need for funding acquisition. International funding and staff are essential for experiments, while international crises, such as Russia's attack on Ukraine, can cause serious operational problems.

Risk category: Finances and funding
Risk class: Operative
Development area: Global collaboration and impact
Likelihood: 4 (likely)
Consequence: 4 (significant)
Risk level: 16
Risk level classification: High

Risk owner: Director of HIP

Measures: Flexibility in the use of the Institute's balance sheet is a necessary measure. Appropriate applications for and administration of infrastructure funding from the Research Council of Finland, taking into consideration changes in costs (indexing)

Persons in charge: Director and vice-director of HIP, programme directors, project leaders

3. Name of risk: Maintaining research staff at a critical level

Description of risk: The Institute's operations are based on collaboration among units of the member universities, with supporting the later career advancement of junior researchers at the

universities as one of its key duties. The number and quality of academic staff in the field must remain at a sufficient level in all of the universities to ensure that research at the Institute remains of high quality and research groups remain attractive. The Institute also has obligations to CERN and FAIR, which require a sufficient number of skilled staff.

Risk category: Staff

Risk class: Strategic

Development area: Research, infrastructures and innovations

Likelihood: 3 (possible)

Consequence: 3 (moderate)

Risk level: 9

Risk level classification: Intermediate

Owner: Members of the HIP Board representing the member universities and director of HIP

Measures: A critical level of academic staff throughout the member universities will be ensured through long-term human resources planning and high-quality doctoral education.

Persons in charge: Director and vice-director of HIP, programme directors, project leaders

4. Name of risk: Continuity of technical support for research

Description of risk: Skilled technical research support staff are essential to HIP's successful and internationally visible research operations. The importance of laboratory equipment and IT systems to research at HIP make it necessary to ensure the availability of sufficient technical support.

Risk category: Staff

Risk class: Operative

Development area: Research, infrastructures and innovations

Likelihood: 3 (possible)

Consequence: 3 (moderate)

Risk level: 9

Risk level classification: Intermediate

Owner: Director and vice-director of HIP

Measures: Long-term human resources planning, development and documentation of the deputy system, anticipation of skills needs and training

Persons in charge: Director and vice-director of HIP, director of the Detector Laboratory, programme directors, project leaders

5. Name of risk: Effectiveness of University Services

Description of risk: The Institute strives to establish the conditions necessary for successful and internationally visible research operations. This will be achieved through effective support provided by financial and human resources management to ensure that research and teaching staff can concentrate on research as much as possible. HIP administration is composed of the on-site services provided by University Services in Kumpula, centralised University Services operations, and the administrative staff working at CERN. The risk is that University Services will not sufficiently support HIP's core operations.

Risk category: Organisation and operations

Risk class: Operative

Development area: Operating conditions

Likelihood: 2 (unlikely)

Consequence: 4 (significant)

Risk level: 8

Risk level classification: Intermediate

Risk owner: University Services management, director and vice-director of HIP

Measures: Close and flexible collaboration between the University of Helsinki's University Services and HIP is essential. Service provision will take into consideration the significantly different role of HIP as a national project-based research institute with extensive international operations compared to other University of Helsinki units. Collaboration will be continuously developed on the basis of identified needs, taking into consideration the administrative structures and needs of other member universities as well. In addition to close cooperation between the HIP leadership and University Services, joint training and development sessions will be organised for University Services and HIP. HIP Leaders' Afternoon sessions will be held on a regular basis for HIP programme directors and project leaders in cooperation with University Services. The HIP leadership and the University Services on-site team will convene on a monthly basis.

Persons in charge: responsible persons in the University Services, director and vice-director of HIP

6. Name of risk: Safety and security risks

Description of risk: The operations of the Detector Laboratory located in the Physicum building of the Department of Physics, University of Helsinki, are associated with risks in the handling of chemicals as well as the use of radioactive isotope sources, X-ray equipment and laser equipment.

Risk category: Staff; Organisation and operations

Risk class: Safety and security

Development area: Sustainability and responsibility

Likelihood: 2 (unlikely)

Consequence: 3 (moderate)

Risk level: 6

Risk level classification: Intermediate

Risk owner: Director of HIP

Measures: HIP will ensure the appropriate safety and security training and guidance of the relevant staff. HIP will collaborate with the Radiation and Nuclear Safety Authority (STUK) and other supervisory authorities, as well as with occupational healthcare.

The Detector Laboratory has a quality manual based on the ISO 17025 standard, which contains up-to-date instructions on laboratory safety. Attention will also be paid to safety and security in regular assessment carried out at the Detector Laboratory. The Detector Laboratory also has its own risk management plan.

Persons in charge: Director and radiation protection officer of the Detector Laboratory

7. Name of risk: Functionality of facilities

Description of risk: Appropriate and sufficient office and laboratory facilities are essential for HIP. Facility costs and their share of overall funding must remain moderate, as increases in facility costs will take place at the expense of research funding. The sufficiency of facilities must also be ensured as operations grow.

Risk category: Facilities and properties

Risk class: Operative

Development area: Operating conditions

Likelihood: 3 (possible)

Consequence: 3 (moderate)

Risk level: 9

Risk level classification: Intermediate

Risk owner: Director of HIP

Measures: HIP will proactively plan the efficient use of its facilities and use them flexibly. HIP will actively contribute to facility planning at Kumpula Campus through the efforts of the campus facility and security committee.

Persons in charge: Vice-director of HIP

RISK MANAGEMENT IN GENERAL

CONSEQUENCES AND LIKELIHOOD OF RISK:

Consequence		
Value	Definition	Explanation
5	Very significant	Prevents reaching the strategic goal
4	Significant	Considerably hinders reaching the strategic goal
3	Moderate	Hinders reaching the strategic goal
2	Slight	Somewhat influences reaching the strategic goal
1	Negligible	Does not markedly influence reaching the strategic goal

Likelihood			
Value	Definition	Explanation	% probab.*
5	Very likely	Might happen within 12 months	>90%
4	Likely	Might happen within 1-2 years	70-80%
3	Possible	Might happen within 2-5 years	40-60%
2	Unlikely	Might happen within 5-10 years	20-30%
1	Very unlikely	Not likely to happen in the immediate future	<10%

* During the time interval the risk assessment refers to

RISK LEVEL:

Risk Probability	Consequence				
	1 Negligible	2 Slight	3 Average	4 Great	5 Extreme
5 Very likely	5	10	15	20	25
4 Likely	4	8	12	16	20
3 Possible	3	6	9	12	15
4 Unlikely	2	4	6	8	10
5 Very unlikely	1	2	3	4	5

Risk level	Actions needed
High (10-25)	Actions and people responsible drafted immediately
Intermediate (5-10)	Recommended that actions and people responsible drafted
Low (1-5)	At least follow the risk when updating the risk review

RISK CATEGORY AND CLASS:

RISK CATEGORIES

Research
Teaching and students
Staff
Estates and facilities
Information and IT
Financial issues
Organization and operations
Commercialization
Reputation

RISK CLASSES

Strategic
Operative
Financial
Security
External