Evaluation of Mathematics, ICT and Technology (EVALMIT) 2023-2024

Self-assessment for administrative units

Date of dispatch: 19 September 2023
Deadline for submission: 31 January 2024

Institution (name and short name): University of Stavanger, UiS
Administrative unit (name and short name): Department of Mathematics and Physics, IMF
Date: 31.01.2024
Contact persons: Bjørn Henrik Auestad (Head of Department), Hannah Hondebrink (Head of Office)
Contact details (email): bjorn.auestad@uis.no and hannah.k.hondebrink@uis.no

Content

1.Strategy, resources and organisation

1.1 Research strategy

Describe the main strategic goals for research and innovation of the administrative unit. You may include the following:

- How these goals are related to institutional strategies and scientific priorities
- Describe how the admin unit's strategies and scientific priorities are related to the "specific aspects that the evaluation committee should focus on" indicated in your Terms of Reference (ToR)
- Describe the main fields and focus of research and innovation in the unit
- Describe the planned research-field impact; planned policy impact and planned societal impact
- Describe how the strategy is followed-up in the allocation of resources and other measures
- Describe the most important occasions where priorities are made (i.e., announcement of new positions, applying for external funding, following up on evaluations)
- If there is no research strategy – please explain why

The Department of Mathematics and Physics at the University of Stavanger (IMF, the administrative unit) focusses its research into six areas within the fields of mathematics and physics:

*Algebraic geometry
*Real and complex analysis
*Mathematical physics
*Mathematical statistics
*Materials physics
*Theoretical subatomic physics and cosmology

This in itself is the foundation of the department research strategy, and a hiring strategy has been implemented over the past decade, whereby all permanent staff at the department now belong to one of these groups (3+ in each group). Beyond this, resources (travel, Ph.D. positions, other positions,...) are over time distributed equally and by consensus, subject to considerations of structural needs (travel to experiments, ...), alternative funding sources (grants, ...), career development and the quality of applicants to temporary and permanent positions.

We further note that the IMF was only established as a separate department in 2018. Prior to 2018, the activities were part of the Department of Mathematics and Natural Sciences (which also encompassed chemistry and biology). Consequently, reported metrics spanning 2012-2022 (publications, staff, ...) must be interpreted with care, as they may not correctly reflect the IMF component prior to 2018.

The further strategic goals for research of the administrative unit are to:

*Conduct excellent research in mathematics and physics, published in highly-ranked international journals, thereby gaining national & international recognition for the department and institution.
*Strengthen and consolidate the existing research groups. Acquire external funding from both national and international funding agencies and/or private foundations.
*Support the broader strategic goals in research and education nationally, at the University of Stavanger, and at the Faculty of Science and Technology, through research and education in mathematics and physics, and by contributing foundational skills and knowledge supporting the strategic education and research goals of other departments and faculties.
*Ensure a research community that supports cultural, ethnic and gender diversity.

At the National level, STEM subjects are a priority in school and higher education, to support future work-life demand. Enabling the Green Transition is the overarching ambition of the University strategy, with Energy, Health and Lifelong Learning identified as strategic themes. Furthermore, the Faculty has identified Ocean-, Digital- and Health-technology, Energy, Societal Safety and Excellent research and education for strategic emphasis.

The IMF aligns its research activities to strategic goals at all levels:

*Work on Battery related material physics, Hydrogen cells and CO2 storage aligns the Materials physics research with Energy and Green Transition.
*Medical statistics (for diagnosis and treatment), Statistics for risk management and Statistical learning aligns the Mathematical statistics research with Health, Societal Safety and Digital technology.
*The research activities at the department are identified by the Faculty as Excellent through the awarding of internal strategic grants (ISP): Matter and radiation (Theoretical subatomic physics and cosmology/Mathematical physics), UIScatt (Materials physics), Geometry (Algebraic Geometry, Real and complex analysis).
*The research in mathematics and physics underpins the national STEM effort through research dissemination as well as educational activities: the mathematics/physics Master degree, the secondary school teacher training program and through contributing foundational courses to all STEM programs at the Faculty.
*Acquiring external funding to support research activity is implicitly part of the strategy at all levels. The IMF has been very successful with national calls (9 NFR grants over 10 years), less so with EU calls (1 grant), and continues to develop projects suitable for funding from both open and topic-specific calls.

*The department, many of its activities, and the strategic focus on six research areas has been implemented over the past 5-10 years. Quality indicators (competitive grants, publication volume and quality) have improved significantly over this period, and are now comparable nationally to other units in the same fields of study, but visibility and brand recognition is not yet as well established. An important element of the IMF strategy is therefore public and professional research dissemination to colleagues, the broader higher education sector, government agencies, the general public and potential students. Important activities include public dissemination and school visits, and actively seeking out opportunities to host international conferences and workshops.

More informaton can be found at:

https://www.uis.no/en/about-uis/department-of-mathematics-and-physics/EVALMIT

User: tn-imf@uis.no Password: evalmit

Table 1. Administrative unit`s strategies

For each category present up to 5 documents which are the most relevant to the administrative unit

Please delete lines which are not in use.

Research strategy		
No.	**Title**	**Link**
1	Strategy 2030 for the University of Stavanger	https://www.uis.no/en/strategy-2030-university-stavanger
2	Strategy for Faculty of Science and Technology 2021-2030 (Original in Norwegian)	https://www.uis.no/nb/om-uis/strategi-for-det-teknisk-naturvitenskapelige-fakultet-2021-2030
3	Strategy 2030 – Faculty of Science and Technology (automatically translated)	https://www.uis.no/nb/det-teknisk-naturvitskaplege-fakultet
4	**Strategy for Department of Mathematics and Physics**	https://www.uis.no/sites/default/files/2024-01/221127-Strategy%20IMF.pdf
Outreach strategies		
No.	**Title**	**Link**
1	**Strategy for Department of Mathematics and Physics**	https://www.uis.no/sites/default/files/2024-01/221127-Strategy%20IMF.pdf
Open science policy		
No.	**Title**	**Link**
1	Open access policy for the University of Stavanger	Open access policy for the University of Stavanger.pdf (uis.no)
2	RAPPORT: Åpen forskning på UiS	RAPPORT - Åpen forskning på UiS (1) (1).PDF
3	Guidelines for managing research data at the University of Stavanger	Data_management_guidelines_2020.pdf (uis.no)
4	Open Access information from UiS Library	https://www.uis.no/en/open-access

1.2 Organisation of research

a) Describe the organisation of research and innovation activities/projects at the unit, including how responsibilities for research and other purposes (education, knowledge exchange, patient treatment, researcher training, outreach activities etc.) are distributed and delegated.

At the time of the 2010/2012 RCN National Physics/Mathematics Evaluation, Mathematics and Physics were organised together with Chemistry and Biochemistry as the Department of Mathematics and Natural Sciences (IMN). In 2018, the department was split, and the Department of Mathematics and Physics (IMF, administrative unit) created. The department currently comprises 23 permanent scientific staff and approximately the same number of Postdocs/Ph.D. students.

The administrative unit is organised into six research groups based on scientific area which partly overlap: Algebraic geometry, Real and complex analysis, Mathematical physics, Mathematical statistics, Materials physics, and Theoretical subatomic physics and cosmology. Collaboration between the groups is encouraged and supported by the administrative unit. Particularly the Mathematical physics and Theoretical subatomic physics and cosmology groups work closely together. The Mathematical physics group also collaborates with the groups in Algebraic geometry and Real and complex analysis. The groups in Material physics and Mathematical statistics have significant collaboration with other departments at the faculty.

All permanent staff have individual workplans that clearly define the specific distribution of their individual duties and workload allocation. All have defined responsibilities that are split amongst research, education, with some administrative and outreach work. The lecturing load is rotated amongst staff to ensure approximately equal distribution over time. Work in connection with outreach activities (e.g. school visits, popular science events, public media articles) are shared by all scientific staff. Additionally, three permanent staff have extra responsibilities for quality assurance, development and delivery of the department's degree programmes at undergraduate and masters-level.

The majority of the permanent scientific staff are currently supervising PhDs. The faculty distributes PhD positions amongst departments based several factors including publication points, PhD defenses held, externally-funded research activity the number of staff with supervision competence. Within the administrative unit, PhD positions are allocated according to alignment with department & faculty strategy, and advisory board support.

b) Describe how you work to maximise synergies between the different purposes of the unit (education, knowledge exchange, patient treatment, researcher training, outreach activities etc.).

The administrative unit's research activity is, broadly speaking split between theoretical mathematics/statistics and physics and more applied activities in material physics and statistics.

At the unit, we maximize synergies between research and education by prioritizing research-based education. Student assignments are strategically aligned with ongoing research, providing students with valuable insights into the research processes while supporting our endeavors. For this, the master programme in mathematics and physics is very important. It is essential to have students at master level in relevant fields, to obtain this synergy with the active research. The administrative unit therefore puts considerable effort into ensuring and developing the quality and robustness of the master programme in mathematics and physics.

During the last three years the unit has had one ISP (Institute Strategic Program) in mathematics and another in material physics. Faculty-funded for 3 years, these ISPs are strategic initiatives to initiate and stimulate multi discipline and cross departmental collaborative research.

The administrative unit stimulates outreach through a range of activities (e.g. school visits, popular science events, public media articles, …), based on the fields of interest and research profiles of the staff members. Outreach activities create an important bridge between us and the community, ensuring that our impact extends beyond campus, communicating the important role that mathematics, physics and science play in meeting global challenges now and in the future. It also gives visibility to the unit's activities to (among others) potential students.

The researcher training (supervising PhD students) contributes to research production and fosters collaboration, creating a dynamic environment where knowledge is co-created. Staff members at the unit are encouraged to apply for funding for PhD projects. Writing high-quality applications is a demanding task. The unit may facilitate this by reducing lecturing load.

1.3 Research staff

Describe the profile of research personnel at the unit in terms of position and gender. Institutions in the higher education sector should use the categories used in DBH, https://dbh.hkdir.no/datainnhold/kodeverk/stillingskoder.

At the end of 2022 the permanent scientific staff consisted of 13 professors and 11 associate professors, including two adjunct positions. There is one female professor and two associate professors.

Within higher education in Norway, there are still significantly fewer women choosing education within science and technology. This national imbalance is reflected among our scientific staff, where male employees are predominant.

It is notable that gender-balance improves amongst temporary research staff, where the majority of employees are international. In Autumn 2022 there were 2 researchers, 4 postdocs and 16 PhD students at the unit, of which six were female.

Only a subset of the units submitted to the evaluation is directly identifiable in the national statistics. Therefore, we ask all units to provide data on their R&D personnel. Institutions that are directly identifiable in the national statistics (mainly higher education institutions) are invited to use the figures provided in the report delivered by Statistics Norway. Please delete lines which are not in use.

Table 2. Research staff

	Position by category	No. of researcher per category	Share of women per category (%)	No. of temporary positions
No. of Personnel by position	1475 Head of Department	1	0%	0
	1013 Professor	12	8%	0
	1011 Associate Professor	10	18%	0
	9301 Professor II*	1	0	1
	8028 Associate Professor II*	1	0	1
	1109 Researcher	2	50%	1
	1352 Postdoc	4	25%	4**
	1017 PhD student	16	25%	16**
	1019 Scientific Assistant	2	50%	1
	1089 Technical Assistant	6	33%	2

*Professorship (20% / 5% position) as a secondary position alongside other main position outside of UiS.
**Fixed-term positions

1.4 Research career opportunities

a) Describe the structures and practices to support researcher careers and help early-career researchers to make their way into the profession.

UiS has several measures and actions directed towards early-stage career researchers (ESR) such as PhD Get Started, an introductory course held once every semester. The following soft skills workshops are also offered the PhD candidates: Turbocharge your writing, Staying well and being productive, Time and stress management, Planning your next career step, Research dissemination, How to plan your PhD, Academic writing workshops. Autumn 2022 UiS started a new program: Career Development Program for early-stage researchers, organized into 4 modules and a mentor arrangement of nine sessions. UiS research department also organize a supervisor and candidate seminar every second year.

The recruitment process and career opportunities are subject to the Declaration of commitment to the Recommendation of the European Commission on the European Charter for researchers and the Code of Conduct for recruitment of Researcher (Charter & Code) – HRS4R, which UiS signed in 2011. Ref: link to Charter and Code – HRS4R in *table 8*.

UiS has a dedicated research department, as well as a project support and PhD administration team at faculty-level.

b) Describe how research time is distributed among staff including criteria for research leave/sabbaticals (*forskningstermin/undervisningsfri*).

For permanent staff in professor/assoc. professor positions the reference workload distribution is: 40% on education, 40% on research, and 20% on administration (committees, etc). Education duties (teaching and supervision) dictate to what extent this 40% reference is maintained. In order to preserve approximately 40% time for research, each staff member normally teaches two full courses annually (typically 20 ETCS total) and supervises no more than 6 bachelor- and master theses per year.

The faculty annually invites permanent scientific staff to apply for a sabbatical. The faculty's sabbatical regulations help support staff in applying and ensure equal treatment of applicants. Sabbaticals are fully funded (salary, travel, and mobility costs) and granted by the faculty based on a set of well-defined criteria. These criteria include, among others, the quality of the application, a mobility plan, relevance to strategic areas, synergies with other research projects, gender balance, and career development. Within the Administrative Unit, applications are prioritized by the Head of the Department.

c) Describe research mobility options.

Erasmus and sabbatical leave are mobility options for permanent staff. Sabbatical leave is funded by the faculty and allows the researcher to travel and stay at an academic institution abroad. Erasmus funds are quite limited and there are no established funds neither at the department nor faculty level to compensate for the difference, therefore the researcher needs to find funding through external projects. For PhDs, the faculty has mobility funds for in order to study or spend research time in collaborating academic institutions abroad. All PhDs are encouraged to apply, though interest depends on the research area, family situation, etc.

The Research Council of Norway has a mobility/internationalisation program called INTPART – International Partnerships for Excellent Education, Research and Innovation. The INTPART program is part of Norway's efforts to develop world-leading academic environments and strengthen international cooperation in research and higher education. One of our employees has received funding through this program; the project named COOL LONGBOAT. In addition at the unit there is a DUKU/Utforsk funded activity, HyTack, that facilitates mobility for master and phd students.

1.5 Research funding

a) Describe the funding sources of the admin unit. Indicate the admin unit´s total yearly budget and the share of the unit's budget dedicated to research.

The funding of the administrative unit can be divided into two main categories: Funding through the government budget, commonly referred to as basic funding, and external funds, also known as BOA (External Operating Appropriations). Basic funding relies on the institution's achievements in essential areas within education and research, measured by indicators such as student flow, publications etc. This funding is granted to the institution and distributed among administrative units using internal allocation mechanisms at both institutional and faculty levels.

External funding consists of grants from the Research Council of Norway (RCN) and from industry. Given the number of staff, the unit has been very successful in obtaining prestigious grants from the RCN, which dominates the department's research portfolio. Over recent years industry funding has increased and some EU funding has been won. This is described in 1.5 b).

In 2018, the basic funding for the administrative unit was just under 20 MNOK increasing to 27 MNOK in 2022. In 2018 the *overall* budget of the administrative unit was 24 MNOK, steadily increasing to 35 MNOK in 2022. It is difficult to say precisely what share of the unit's budget is dedicated to research. Postdocs, researchers and PhDs spend all time on research. Based on averaged numbers in work plans for the permanent staff, we can estimate that 40% of time is spent on research in category professor/assoc. professor, this gives that approximately 60% of the *overall* budget is directed towards research.

b) Give an overview of the administrative unit's competitive national and/or international grants last five years (2018-2022).

The external funding (BOA) landscape for the administrative unit is diversified, including The Research Council of Norway, other governmental grants (ABFV), and other contributions from various sources, including industry. From 2018 to 2022, the annual cumulative external grants ranged from approximately 4 MNOK to 7 MNOK, with an average of about 5 MNOK/year.

The Research Council of Norway is the cornerstone of our external funding portfolio, having contributed increasingly, from 50% to 85% of the administrative unit's external grants in this period. From industry, the Akademiaavtalen/Equinor contributes significantly.

Table 3. R&D funding sources

Please indicate R&D funding sources for the admin unit for the period 2018-2022 (average NOK per year, last five years).

For Higher Education Institutions: Share of basic grant (*grunnbevilgning*) used for R&D[1] **For Research Institutes and Health Trusts: Direct R&D funding from Ministries (per ministry)**	
Name of ministry	NOK
Ministry of Education and Research	9 300 000 (40% of "Basic funding")

National grants (*bidragsinntekter*) (NOK)	
From the ministries and underlying directorates	
From industry	1 279 037
From public sector	
From The Research Council of Norway	3 852 128
Other national grants	
Total National grants	5 131 165
National contract research (*oppdragsinntekter*)[2] (NOK)	
From the ministries and underlying directorates	
From industry	
From public sector	
Other national contract research	
Total contract research	
International grants (NOK)	
From the European Union	
From industry	
Other international grants	
Total international grants	

[1] Shares may be calculated based on full time equivalents (FTE) allocated to research compared to total FTE in unit

[2] For research institutes only research activities should be included from section 1.3 in the yearly reporting

Funding related to public management (*forvaltningsoppgaver*) or (if applicable) funding related to special hospital tasks, if any	
Total funding related to public management	
Total all R&D budget items (except basic grant)	5 131 165

1.6 Collaboration

Describe the unit's policy towards national and international collaboration partners, the type of the collaborations the administrative unit have with the partners, how the collaboration is put to practice as well as cross-sectorial and interdisciplinary collaborations.

- Reflect of how successful the unit has been in meeting its aspirations for collaborations
- Reflect on the importance of different types of collaboration for the administrative unit: National and international collaborations. Collaborations with different sectors, including public, private and third sector
- Reflect on the added value of these collaborations to the administrative unit and Norwegian research system

As a result of a dedicated recruitment effort over the past decade, the staff at the IMF is fairly young, very active and with diverse, international background. Of 23 permanent staff, 7 are Norwegian, 16 are from 9 other countries over 3 continents. Each of these brings along a unique international network of collaborators, both person-to-person and as part of formal and less formal collaborative organisations. The IMF actively promotes travel to and from Stavanger to maintain and extend these collaborations, and regularly hosts seminar series, workshops and major international conferences in specialist areas in mathematics and physics.

Formal collaborations include the Swiss-Norwegian Beamline for X-ray scattering experiments (SNBL at the ESRF), the LIGO/Virgo collaboration on gravitational wave interferometry, and the LISA mission (ESA/NASA) on space-based gravitational waves observations. One department staff member had a staff position at CERN for 5 year, on leave from the host institution. These large international consortia each count hundreds or even thousands of scientists.

The department has (and has had) several RCN-funded research projects involving collaboration with national and international partners in research: *PHUN - Phonon lifetimes; reconcile inelastic neutron scattering measurements with first-principles calculations*. The project is in collaboration with SINTEF and Helmholtz Zentrum Berlin and the Technical University of Denmark. And in education: *Tackling the Challenges in Hydrogen Economy through Education and Research (HyTack)* (financed by DIKU), partnering University of Southeast Norway, Department of Energy Technology, Norwegian Research Center, Savitribai Phule Pune University, Indian Institute of Science Education and Research, Shibaura Institute of Technology, Tohoku University, BCMaterials (Spain), Chalmers University of Technology and the University of Ioannina.

Some person-to-person collaboration is formalised through co-application for research funding. Recent examples include [*Uncovering the nature of dark matter in the multi-messenger era*] on Dark Matter; [*Neutron Scattering and Atomistic Simulations for a SUPERior Understanding of SUPERionic Conduction*] on ionic diffusion phenomena; [*Strong and Electroweak Matter in Extreme Conditions*] on QCD physics. Over the past decade, such projects supported by public funding include collaboration with most other universities across the country, Oslo, Bergen, Trondheim (NTNU), Tromsø, South-Eastern Norway.

The IMF is managing the national network on Particle, Astroparticle and Cosmology Theory (NPACT), comprising around 40 scientists nationally.

Regionally, substantial and longstanding collaboration exists with the Stavanger University Hospital (in research and education), and within the host institution with the department of chemistry and biotechnology [*New Porous Liquids for Gas Separation and Carbon Capture*], the department of Safety, Economics and Planning [*Modeling and Empirical Evaluation of Commodity Markets*] and the department of Computer science.

At the individual, person-to-person level, research collaboration across the IMF counts scientists from more than 50 institutions from all over the world (see also publication summary).

Further examples of important collaborations with more detailed information about partners and type of collaboration are shown in tables 4a (collaborations with national partners) and 4b (collaborations with international partners).

Formal (contractual, at the department level) as well as informal collaboration is essential for the IMF. As a moderate sized department, it is often necessary to supplement the in-house expertise with external experts. Many groups nationally have similar needs, and together we provide greater depth of knowledge and more options to for instance Ph.D. and Master students selecting their projects. International person-to-person collaboration brings in knowledge of the state-of-the-art to the institution and the Norwegian scientific ecosystem, while the global flagship research consortia provide front-line, high-profile and inspirational contexts to engage with science, for both senior scientists and aspiring students.

Table 4a. The main national collaborative constellations with the administrative unit
Please categorise the collaboration according to the most important partner(s): national institutions (5-10 institutions) and international institutions (5-10 institutions) in the period 2012-2022.
Please delete lines which are not in use.

National collaborations

Collaboration with national institutions - 1	
Name of main collaboration or collaborative project with the admin unit	**SNBL, Swiss-Norwegian Beamlines at ESRF**
Name of partner institution(s)	**NTNU** **University of Oslo** **IFE** **University of Bergen**
Sector of partner/institution(s)/sectors involved	**Higher education and research institutes**
Impacts and relevance of the collaboration	**Joint NFR-project (Researcher Project - KONT-Kontingenter). NTNU is lead (PI).** **SNBL is a single-site X-ray facility located at the European Synchrotron Radiation Facility (ESRF-France). Norway and Switzerland are equally contributing to the total running budget. These beamlines allow the study of the atomic structure of materials.**
Collaboration with national institutions – 2	
Name of main collaboration or collaborative project with the admin unit	**N-PACT**
Name of partner institution(s)	**NTNU, University of Oslo, University of Bergen, University of Agder, Høgskolen på Vestlandet**
Sector of partner/institution(s)/sectors involved	**Higher education**
Impacts and relevance of the collaboration	**The entire Norwegian research community in Particle, Astroparticle and Cosmology Theory have since 2017 been organised in the network N-PACT. The network involves an annual meeting, and person-to-person collaboration on publication, application for funding, supervision of student, visits and seminars (online and in person), and examinations.**

Collaboration with national institutions – 3	
Name of main collaboration or collaborative project with the admin unit	**Stavanger University Hospital, broad research collaboration.**
Name of partner institution(s)	**Stavanger University Hospital**
Sector of partner/institution(s)/sectors involved	**Health**
Impacts and relevance of the collaboration	**Broad research collaboration where researchers from the department in particular are involved on the data analyses side. Teaching of PhD courses for medical researchers and co-supervision of PhD-students.**
Collaboration with national institutions – 4	
Name of main collaboration or collaborative project with the admin unit	**PHUN - Phonon lifetimes; unifying inelastic neutron scattering measurements with first-principle calculations.**
Name of partner institution(s)	**SINTEF**
Sector of partner/institution(s)/sectors involved	**Research institutes**
Impacts and relevance of the collaboration	**Joint NFR-project (Researcher Project for Scientific Renewal). UiS is lead (PI).** **Developing a new experimental and computational methodology to gain accurate insights into thermal conductivity.**
Collaboration with national institutions – 5	
Name of main collaboration or collaborative project with the admin unit	**Metal-organic frameworks for recovery and separation of critical metals, MOFSORBMET**
Name of partner institution(s)	**University of Bergen**
Sector of partner/institution(s)/sectors involved	**Higher education**
Impacts and relevance of the collaboration	**Joint NFR-project (Researcher Project - NANO2021). UiS is lead (IKBM) (PI).** **Developing new materials for the adsorption-enhanced recovery of critical metals from the primary (mining) and secondary sources (e-waste).**

Collaboration with national institutions – 6	
Name of main collaboration or collaborative project with the admin unit	**NTNU-UiS collaboration on student supervision.**
Name of partner institution(s)	**NTNU (Technical University of Norway, Trondheim)**
Sector of partner/ institution(s)/sectors involved	**Higher Education**
Impacts and relevance of the collaboration	**Scientific staff collaborate on supervising Master student projects (several) and Ph.D students (2), in the area of theoretical Subatomic physics and cosmology. This allows for better use of the staff resources and provides a broader range of thesis topics than either of the institutions provide separately. During 2012-2022, several Master students at NTNU have been supervised by staff from the UiS, while 2 Ph.D.-students on the UiS doctoral programme have been co-supervised by staff at NTNU.**
Collaboration with national institutions – 7	
Name of main collaboration or collaborative project with the admin unit	**Tackling the Challenges in Hydrogen Economy through Education and Research (HyTack)**
Name of partner institution(s)	**University of South-Eastern Norway (USN)** **Institute for Energy Technology (IFE)** **Norwegian research centre (NORCE)**
Sector of partner/institution(s)/sectors involved	**Higher education and research institutes**
Impacts and relevance of the collaboration	**Joint UTFORSK (DIKU) - project. UiS is lead (PI).** **Provides students (MSc and PhD) with a common learning environment to foster the knowledge and skills required for hydrogen technology.**
Collaboration with national institutions – 8	
Name of main collaboration or collaborative project with the admin unit	**UiS-Oslo collaboration on Gravitational Waves and Dark Matter:** **NFR project: "Uncovering the nature of dark matter in the multimessenger era."**
Name of partner institution(s)	**University of Oslo.**
Sector of partner/ institution(s)/ sectors involved	**Higher education**

Impacts and relevance of the collaboration	**Joint NFR-project (Research project, Young Talent). UiS is lead (PI). Work on understanding Dark Matter using gravitational wave observations. Ph.D.-student, senior researcher (PI).**
Collaboration with national institutions – 9	
Name of main collaboration or collaborative project with the admin unit	**NcNeutron, Norwegian Center for Neutron Research**
Name of partner institution(s)	**IFE** **UNIVERSITETET I OSLO** **NORGES TEKNISK-NATURVITENSKAPELIGE UNIVERSITET NTNU** **SINTEF**
Sector of partner/institution(s)/sectors involved	**Higher education and research institutes**
Impacts and relevance of the collaboration	**Joint NFR-project (FORINFRA- Research Infrastructure). IFE is lead (PI).** **Norwegian neutron science and technology exchange center, now based at PSI (Switzerland).**

Table 4b. The main international collaborative constellations with the administrative unit
Please categorise the collaboration according to the most important partner(s): national institutions (5-10 institutions) and international institutions (5-10 institutions) in the period 2012-2022.

International collaborations

Collaboration with international institutions – 1	
Name of main collaboration or collaborative project with the admin unit	**UiS-LISA**
Name of partner institution(s)	**LISA/ESA/NASA**
Sector of partner/institution(s)/sectors involved	**International Research Organisation.**
Impacts and relevance of the collaboration	**The UiS is a substantial contributor to the LISA space-based gravitational wave mission of ESA/NASA. Due to launch in 2035, the theory and data analysis development has been underway since 2014 and has been the basis of several Ph.D.-projects, NFR-grants and Master projects at the UiS. The impact of the LISA mission will be global, similar to the 2015 LIGO first discovery of gravitational waves.**

Collaboration with international institutions - 2	
Name of main collaboration or collaborative project with the admin unit	**UiS-LIGO**
Name of partner institution(s)	**LIGO-Virgo-KAGRA collaborations**
Sector of partner/institution(s)/sectors involved	**International Research Organisation.**
Impacts and relevance of the collaboration	**The LIGO Earth-based observatory detected gravitational waves for the first time in 2015, leading to the 2017 Nobel Prize being awarded to the LIGO originators (Barish, Thorne, Weiss). Observations are ongoing, now in collaboration with other similar detectors worldwide (VIRGO, KAGRA, GEO600). UiS contributes to the theory and data analysis side, in particular black hole mergers and tests of general relativity.**
Collaboration with international institutions - 3	
Name of main collaboration or collaborative project with the admin unit	**International research collaboration, person-to-person. Mathematical Physics and Geometry.**
Name of partner institution(s)	**University of Hertfordshire**
Sector of partner/institution(s)/sectors involved	**Higher education and International Research Organisation.**
Impacts and relevance of the collaboration	**Research project in supersymmetric geometry headed by Charles Strickland-Constable at Hertfordshire, with research partner Eirik Eik Svanes at UiS. For more details, see:** https://gow.epsrc.ukri.org/NGBOViewGrant.aspx?GrantRef=EP/X014959/1 **The project serves to boost research collaboration between the UK and Norway – a recent focus of both the RCN and UKRI.**
Collaboration with international institutions - 4	
Name of main collaboration or collaborative project with the admin unit	**New Porous Liquids for Gas Separation and Carbon Capture**
Name of partner institution(s)	**Indian Institute of Technology Guwahati**

Sector of partner/institution(s)/sectors involved	**Higher education**
Impacts and relevance of the collaboration	**Joint NFR-project (Researcher Project - PETROMAKS2). UiS is lead (PI).** **Developing an environmentally friendly and efficient separation technology for CO2**
Collaboration with international institutions - 5	
Name of main collaboration or collaborative project with the admin unit	**International research collaboration, person-to-person. Theoretical subatomic physics and cosmology (TSPC).**
Name of partner institution(s)	**Over the period 2012-2022, regular collaboration with scientists at more than 50 institutions worldwide. Largest collaboration volume with Univ. Bielefeld, Heidelberg, Darmstadt, Nottingham, Dalhousie, Helsinki, Jyväskylä, Brookhaven, Vienna, and CERN**
Sector of partner/institution(s)/sectors involved	**Higher education, National/international labs.**
Impacts and relevance of the collaboration	**The vast majority (>90%) of the ~200 publications in TSPS are written in small scientist-initiated international collaborations.**
Collaboration with international institutions - 6	
Name of main collaboration or collaborative project with the admin unit	**International research collaboration, person-to-person. Mathematical statistics.**
Name of partner institution(s)	**Over the period 2012-2022, regular collaboration with scientists at many institutions worldwide, including: University of Cologne (Germany), University of Göttingen (Germany), Santa Catarina University (Brazil), Seoul National University (South Korea), Tsukuba University (Japan), University of North Carolina at Chapel Hill (USA), Rutgers University (USA), Flatiron Institute (USA), Imperial College (UK), Singapore Management University (Singapore), Haydom Lutheran Hospital (Tanzania).**
Sector of partner/institution(s)/sectors involved	**Higher education and research institutes**
Impacts and relevance of the collaboration	**The majority of the methodological research from the statistics group is done in small scientist-initiated international collaborations.**

Collaboration with international institutions - 7	
Name of main collaboration or collaborative project with the admin unit	**Metal-organic frameworks for recovery and separation of critical metals, MOFSORBMET**
Name of partner institution(s)	**BCMaterials (Spain)** **Chalmers University of Technology (Sweden)** **University of Ioannina (Greece)**
Sector of partner/institution(s)/sectors involved	**Higher education and research institutes**
Impacts and relevance of the collaboration	**Joint NFR-project (Researcher Project - NANO2021). UiS is lead (IKBM) (PI).** **Developing new materials for the adsorption-enhanced recovery of critical metals from the primary (mining) and secondary sources (e-waste).**
Collaboration with international institutions - 8	
Name of main collaboration or collaborative project with the admin unit	**Tackling the Challenges in Hydrogen Economy through Education and Research (HyTack)**
Name of partner institution(s)	**Savitribai Phule Pune University (SPPU)** **Indian institute of science education and research (IISER)** **Shibaura Institute of Technology (SIT) (Tokyo)** **Tohoku University (TU) (Sendai)**
Sector of partner/institution(s)/sectors involved	**Higher education and research institutes**
Impacts and relevance of the collaboration	**Joint UTFORSK (DIKU) - project. UiS is lead (PI).** **Provides students (MSc and PhD) with a common learning environment to foster the knowledge and skills required for hydrogen technology.**
Collaboration with international institutions - 9	
Name of main collaboration or collaborative project with the admin unit	**PHUN - Phonon lifetimes; unifying inelastic neutron scattering measurements with first-principle calculations.**
Name of partner institution(s)	**Helmholtz Zentrum Berlin** **Danmarks Tekniske Universitet**

Sector of partner/institution(s)/sectors involved	**Research institutes and higher education**
Impacts and relevance of the collaboration	**Joint NFR-project (Researcher Project for Scientific Renewal). UiS is lead (PI).** **Developing a new experimental and computational methodology to gain accurate insights into thermal conductivity.**

1.7 Open science policies

a) Describe the institutional policies, approaches, and activities to the Open Science areas which may include the following:

- Open access to publications
- Open access to research data and implementation of FAIR data principles
- Open-source software/tools
- Open access to educational resources
- Open peer review
- Citizen science and/or involvement of stakeholders / user groups
- Skills and training for Open Science

UiS' general policy concerning Open Science dates from 2016. UiS has signed the DORA-declaration and is committed to the FAIR-principles. In 2022, UiS also signed the NOR-CAM agreement. In addition to institutional agreements on national level, the TN-faculty has established yearly funding in the order of magnitude 1 MNOK for coverage of Open Access publications. This is administered by the University library according to a pre-defined application- and approval procedure. In addition, the library has established two local open access publication platforms for scientific literature: "Open Journal Systems (OJS)" for journal-papers and "Open Monograph Press (OMP)" for e-books. Open peer review is however not accommodated at institutional level. The library offers an extensive suite of information, courses and training concerning the various aspects of open publishing.

b) Describe the most important contributions and impact of the unit's researchers towards the different Open Science areas cf. 1.7a above.

The faculty has an open access fund, organised by the university library, to ensure that as many publications as possible are open access.

As is the standard in the field, the department staff deposit all publications in open access channels (mainly arXiv) and share project source code online, e.g. on github.

c) Describe the institutional policy regarding ownership of research data, data management, and confidentiality. Is the use of data management plans implemented at the unit?

UiS has a well-defined policy concerning ownership, management and confidentiality of research data. The institutional regulations, "Retningslinjer for datahåndtering ved Universitetet I Stavanger» was approved and put into action i 2020. They are compliant with the principles adopted by RCN and EU including the FAIR-principles (cf. section 2.1.5.2). It is recommended to use the data management plan of NSD (datahåndteringsplanen fra Norsk Senter for Forskningsdata (NSD). It is however allowed to use other plan-structures, but with the conditional assurance that this is compliant with the RCN- and/or EU-regulations.

1.8 SWOT analysis for administrative units

Instructions: Please complete a SWOT analysis for your administrative unit. Reflect on what are the major internal Strengths and Weaknesses as well as external Threats and Opportunities for your research and innovation activities/projects and research environment. Assess what the present Strengths enable in the future and what kinds of Threats are related to the Weaknesses. Consider your scientific expertise and achievements, funding, facilities, organisation and management.

Internal	**Strengths**	**Weaknesses**
External	**Opportunities**	**Threats**

Internal Strengths	*Fairly young (average age 47) and very active staff: Since 2013 there has been considerable staff renewal; a coherent hiring strategy focusing on excellence in science and education, has resulted in 18 new employees. *Autonomy: Mathematics and Physics groups are since 2018 joined into a dedicated department (Department of Mathematics and Physics). This is also an advantage for research and educational collaboration between mathematics and physics. *Excellent scientific staff who are very successful in acquiring competitive external (primarily RCN) funding and have a high (approx. 40%) rate of level 2 publications. *Major part of the unit's research activity is theoretical and thus low cost. * The unit's experimental research activity aligns well with the organisation's strategic goals for green transition. *Education is of central importance for research and society: The unit has a 5-year Master programme in Mathematics and Physics, a 5-year secondary education teacher program (Lektor i realfag) and a Ph.D. specialization in Mathematics and Physics,

	collectively providing the workforce of the future with both broad and specialised knowledge and skills in natural science. *The organisational structure of the faculty gives inherent closeness/collaboration opportunities between the departments, which facilitates interdisciplinary research activities and good quality development of study programmes. * An excellent psychosocial working environment with openness and good opportunities for participation.
Internal Weaknesses	*Low student recruitment to the five-year Mathematics and Physics programme is a challenge. The programme is important for the research activity at the unit. *Most research is theoretical and thus has few opportunities for industry funding. *Not sufficiently visible nor recognised nationally as a strong community in Mathematics and Physics and provider of study programmes. *Experimental activity (in material physics) is financially dependent upon access to adequate facilities and infrastructure. *Vulnerable size of some of the research groups. The number of permanent staff is close to a minimum. *The university and faculty have a strong professional educational portfolio with an emphasis on applied research and technology. The theoretical research at the unit only partially fits into this. This can result in the employees at the unit being under-recognised for their scientific and educational achievements. *Little flexibility in forming and developing the study programme in Mathematics and Physics program, due to low student numbers and the economic situation at the university.
External Opportunities	*Improved visibility especially national, for better student recruitment. *More successful applications for external funding; for some of the groups at the unit a mixture of joint projects with researchers in other applied fields and/or industry partners. *Stronger focus on funding through EU/ERC schemes. *Better in-house recognition of the value of high quality research activity in theoretical mathematics and physics. *More national collaboration, in particular when teaching advanced courses. Such a shared model could potentially free up teaching resources across institutions, and at the same time allow for a strengthened portfolio of courses in the Mathematics and Physics programme. *The university/faculty strategies focused on green technologies have strengthened the activities in material physics in the unit, especially those related to hydrogen storage and carbon capture materials and materials related to battery technology. Potential to grow this activity further. *Grow collaboration projects with other departments at the faculty.

External Threats	*Reduction of the master's programme in Mathematics and Physics due to low student recruitment, in part due to the introduction of tuition fees for international students from 2023. *While more immediately applicable fields of research have dedicated funding calls from the RCN, all fundamental science (which constitutes a considerable proportion of the unit's research activity) is funded under one common "FRIPRO" scheme. Unfortunately, this scheme is being impacted by government financial cuts, threatening to further reduce access to funding. *Reduced funds for in-house lab infrastructure (procurement & maintenance) *Lack of access to neutron beamtime due to the political/economical European landscape. *Reduced governmental funding may give less funding for e.g. PhD positions, sabbaticals, travel, inviting guests etc. and place an emphasis on teaching and administrative tasks over research activities. This may also make us less attractive as an employer in an international competitive situation. *Norwegian export control regulations are a challenge for international recruitment and collaboration.

2. Research production, quality and integrity

2.1 Research quality and integrity

Please see the bibliometric analysis for the admin unit developed by NIFU (available by the end of October 2023).

a) Describe the scientific focus areas of the research conducted at the administrative unit, including the unit's contribution to these areas.

We remind that prior to 2018, the activities of the unit were part of the Department of Mathematics and Natural Sciences (including biology and chemistry). Consequently, reported metrics (ref. the NIFU report) spanning 2012-2022 (publications, staff, ...) must be interpreted with care. Quality assured information (based on CRIStin) is available on:

www.uis.no/en/about-uis/department-of-mathematics-and-physics/EVALMIT; user: tn-imf@uis.no; Pwd: evalmit

The administrative unit conducts research in the scientific fields of mathematics and physics. Within these fields the focus is on:

Mathematics: Algebraic Geometry: Calabu-Yau-manifolds, Hilbert schemes, moduli theory, degeneration, stability, Donaldson-Thomas theory, tropical geometry, log-structures, Homological algebra and representation theory with applications to Mirror Symmetry.

Differential Equations: Mathematical models used to gain insight into mechanisms within transport and reaction processes.

Analysis: Harmonic analysis, sampling and interpolation of signals, several complex variables and complex geometry, pluripotential theory.

Mathematical Physics: Mathematical relativity, Lie groups/algebras, homogeneous spaces, cosmology, classification of GR solutions and supergravity solutions, supersymmetric geometry, string theory, moduli, topological field theory.

Statistics: Computational statistics, time to event data analysis, statistical shape analysis and complex data, statistical process control and Bayesian analysis of multivariate spatial and temporal data, medical statistics, econometric time series analyses, statistical modelling of meteorological processes and applications in engineering fields like risk analysis and energy research.

Physics: Functional materials' atomic (and magnetic) structure: this includes crystallography (X-ray and neutron methods, including instrumentation and experimental methodology development), ab-initio modelling (DFT), microscopy (SEM/TEM) and X-ray absorption spectroscopy.

Functional materials' lattice and magnetic dynamics: this includes Raman spectroscopy and quasi-elastic and inelastic neutron scattering (including instrumentation and experimental methodology development) as well as DFT modelling.

QCD at finite temperature and density: heavy Ion collisions, lattice field theory, perturbative QCD, effective theory for QCD, quantum dynamics, Neutron stars, QCD at finite chemical potential, numerical field theory methods.

Cosmology and Gravitational waves: compact binaries, stochastic backgrounds, tests of gravity, properties of neutron stars, early Universe physics, phase transitions, inflation, Dark Matter, Cosmological models in extended gravity theories, mathematical foundations of extended gravity theories.

Within all research areas the unit has a very good publication rate, and publications are in international high-quality journals. Both the number of publications and the fraction of level 2 publications have increased significantly during the last decade (Cristin numbers): in 2012, 22 publications in mathematics, physics and statistics in peer reviewed journals increasing to on average above 70 the last years. The fraction of level 2 publications is on average close to 40%.

There is a considerable share of international coauthors, 70% on average (2018-2022). Since 2019 there has been a considerable increase in open access publication; on average approximately 70% during 2019-2022. The unit regularly hosts national and international conferences and workshops. PhD students regularly attend PhD schools and visit international collaborators and partner institutions.

b) Describe the unit's policy for research integrity, including preventative measures when integrity is at risk, or violated.

The unit is bound by the institutional policy: UiS strives to have a high awareness of research integrity and ethics. A well-established set of regulations and guidelines is in place, including the Norwegian Research Ethics Act, the University's regulations for good scientific practice, and regulations from the Norwegian National Research Ethics Committees. UiS has implemented various measures to prevent and manage violations of good scientific practice and research ethics. There is an institutional research ethical committee and an appointed independent Science Ombud. The Ombud addresses issues and disputes concerning good scientific practice, research integrity and research ethics. The Faculty has a well-defined role in the aforementioned regulations. See https://www.uis.no/nb/forskning/forskningsetikk-ved-uis

UiS has an independent science representative (vitenskapsombud). The Science representative is an experienced professor which helps spread awareness of ethical dilemmas and issues related to research at UiS. In addition to raising awareness, employees and students may contact the science representative if they have questions regarding ethics in research.

UiS has a well defined policy concerning ownership, management and confidentiality of research data. The institutional regulations, "Retningslinjer for datahåndtering ved Universitetet I Stavanger» was approved and put into action i 2020. They are compliant with the principles adopted by RCN and EU including the FAIR-principles (cf. section 2.1.5.2). It is recommended to use the data management plan of NSD (datahåndteringsplanen fra Norsk Senter for Forskningsdata (NSD). It is however allowed to use other plan-structures, but with the conditional assurance that this is complient with the RCN- and/or EU-regulations.

2.2 Research infrastructures

a) **Participation in national infrastructures**

Describe the most important participation in the national infrastructures listed in the Norwegian roadmap for research infrastructures (*Norsk veikart for forskningsinfrastruktur*) including as host institution(s).

The administrative unit does not host any national research infrastructures, but has been, and is, significantly involved in two. These are SNBL- The Swiss-Norwegian Beamlines at the ESRF and NcNeutron (and thereby connecting to the ESS). The SNBL-engagement dates back to 1995, whereas the NcNeutron-engagement stems from the establishment in 2016.

The physics group has made extensive use of the SIGMA2/Notur national Supercomputing infrastructure since 2013. Simulations in quantum field theory and cosmology.

Table 5. Participation in national infrastructure

Please present up to 5 participations in the national infrastructures listed in the Norwegian roadmap for research infrastructures (*Norsk veikart for forskningsinfrastruktur*) for each area that are the most important to your administrative unit.

Areas in roadmap	Name of research infrastructure	Period (from year to year)	Description	Link to website
Bioresources				
Biotechnology				
E-infrastructure	**SIgma 2**	**2013-**	**Extensive use of supercomputing infrastructure for**	**https://www.sigma2.no/**
The humanities				
ICT				
Climate and the environment				
Environmentally friendly energy				
Maritime technology				
Medicine and health				
Nanotechnology and advanced materials	**ESRF**	**1995-2024**	**Materials and mechanism characterization**	
Petroleum Technology	**ESRF**	**2007-2018**	**Geological samples, well-integrity materials**	
Social sciences and welfare				
Other infrastructure needs in the				

b) **Participation in international infrastructures**

Describe the most important participations in the international infrastructures funded by the ministries (*Norsk deltakelse i internasjonale forskningsorganisasjoner finansiert av departementene*).

As stated in 2.2 a) the unit's link to active participation in national research infrastructures is to access international infrastructures. By this is meant synchrotrons and neutron large scale facilities. The SNBL-consortium and NcNeutron thus constitute the "backbone" of the research activity within the materials physics group, both directly, but also as a "platform" for the research demanding large scale synchrotron- and neutron facilities. The group conducts experiments also on other beamlines at the ESRF; at DIAMOND, HASYLAB/DESY, ISIS and ILL to mention a few.

The physics has group has ongoing collaborations with colleagues at CERN (theory division). During the period 2015-2020, a member of staff was a staff member the CERN theory division, on leave from UiS.

The physics group is an important contributor to the LISA mission (space based gravitational wave interferometer), which selected as an ESA large-class mission (L3) in 2017 and was adopted by ESA in January 2024. It is due for launch in 2035. The UiS contributes on the management, theory, signal, data analysis and computing side of the mission.

Table 6. Participation in international infrastructure

Please describe up to 5 participations in international infrastructures for each area that have been most important to your research unit.

Project	Name	Period (Year - Year)	Description	Link to infrastructure
CERN	European Organization for Nuclear Research	**2015-2020**	**Staff member at theory division. On leave from host institution.**	
EMBL/EMBC	European Molecular Biology Laboratory			
	The European Molecular Biology Conference			
ESRF	European Synchrotron Radiation Facility	**1995-2024**	**SNBL primarily. Also other BL's**	
IARC	International Agency for Research on Cancer			
ESA	European Space Agency	**(2014-)2017-2024**	**Member of LISA mission consortium**	**LISA became ESA mission in 2017, adopted for construction in 2024.**
OECD Halden	Haldenprosjektet			

c) **Participation in European (ESFRI) infrastructures**

Describe the most important Norwegian participations in European (ESFRI) infrastructures (including as host institution(s).

The connection with two relevant – European Spallation Source and the ESRF-EBS – is through the aforementioned national consortia, NcNeutron and SNBL, respectively. The national participation in ESRF through NORDSYNC is also important, in order to secure beamtime at other beamlines than the SNBL.

Table 7. Participation in infrastructures on the ESFRI Roadmap

Please give a description of up to 5 participations that have been most important to your research unit.

Social sciences and the humanities				
Name	**ESFRI-project**	**Summary of participation**	**Period (from year to year)**	**Link**
CLARIN ERIC	Common Language Resources and Technology Infrastructure			
ESSurvey ERIC	European Social Survey			
CESSDA ERIC	Council of European Social Science Data Archives			
Natural sciences and technology				
Name	**ESFRI-project**			
EISCAT 3D	European Next Generation Incoherent Scatter radar European Incoherent Scatter Scientific Association			
Energy				
Name	**ESFRI-project**			
ECCSEL ERIC	European Carbon Dioxide Capture and Storage Laboratory Infrastructure			
Climate and the environment				
Name	**ESFRI-project**			
Euro Argo ERIC	European contribution to the Argo program			
EMSO ERIC	The European Multidisciplinary Seafloor and water column Observatory			
ICOS ERIC	Integrated Carbon Observation System			

EPOS ERIC	European Plate Observing System			
SIOS Svalbard AS	Svalbard Integrated Artic Earth Observing System			
Biology and medicine (Life sciences)				
Name	**ESFRI-project**			
ELIXIR (EMBL)	European infrastructure for biological information, supporting life science research and its translation to medicine, agriculture, bioindustries and society			
BBMRI ERIC	Biobanking and Biomolecular Resources Research Infrastructure			
EATRIS ERIC	European Advanced Translational Research Infrastructure in Medicine			
EU-OPENSCREEN ERIC	European Infrastructure of Open Screening Platforms for Chemical Biology			
ECRIN ERIC	European Clinical Research Infrastructures Network			
Euro-BioImaging ERIC	Research Infrastructure for Imaging Technologies in Biological and Biomedical Sciences			
EMBRC ERIC	European Marine Biological Resource Centre			
Analysis				
Name	**ESFRI-project**			
European Spallation Source ERIC	European Spallation Source	**2016-2024**	**Part of NcNeutron**	
ESRF – EBS	European Synchrotron Radiation Facility – Extremely Brilliant Source	**1995-2024**	**Both through the SNBL consortium but also through NORSYNC**	

d) **Access to research infrastructures**

Describe access to relevant national and/or international research infrastructures for your researchers. Considering both physical and digital infrastructure.

For High-Performance Computing (HPC) and large-scale data storage, the administrative unit has access to SIGMA2. SIGMA2 and the universities in Bergen, Oslo, Tromsø and NTNU collaborate on providing the Norwegian research infrastructure services (NRIS). Also, in-house computing facilities are available, and we make use of the national and international supercomputing networks NOTUR and PRACE.

The research in experimental material physics at the unit is based on access to e.g. European beam facilities (neutron sources, photon sources, …). Use of these infrastructures is costly and/or have limited access. This limits the use of these types of infrastructure.

ESA/NASA is accessed through the participation in the LISA (Laser Interferometer Space Antenna) consortium and CERN through collaboration with staff at the unit. Membership of the LIGO Scientific Collaboration also provides some access to collaboration computing resources.

e) **FAIR- principles**

Describe what is done at the unit to fulfil the FAIR-principles.

The unit is bound by the institutional regulations adhering to the Research Council's and EU's principles for management of research data: «Open as standard» and «As open as possible, as closed as necessary». All research data is to be published according to the open access-principles – i.e. open and available, unless circumstances dictates restricted access. In such cases this should be accounted for in the data management plan for in a research project's data management plan. It is an institutional prerequisite that research data is treated in a way complying with the FAIR-principles – i.e. available, findable and usable. The University Library will assist and guide the Unit in such matters.

3. Diversity and equality

f) Describe the policy and practices to protect against any form of discrimination and to promote diversity in the administrative unit.

The administrative unit is bound by the overall governing principles concerning diversity and equality practices at UiS. Hence valuing independence, involvement and innovation. Diversity is respected and considered a resource in institution's work- and learning environment. Universal design characterizes physical and digital learning environments, and UiS strives to provide reasonable adjustments for employees with disabilities.

In the job advertisements it is explicitly stated that applications are welcomed regardless of gender, disability or cultural background. UiS has a zero-tolerance concerning discrimination. Mechanisms for reporting issues are in place at institutional level for all groups of employees (including PhD-candidates and technical/administrative personnel). Formal processes concerning admissions, promotions and evaluations are governed by internal regulations of partiality, in addition to the National legislation. In alignment with these principles, UiS has a project called "Women to the Top", aimed at increasing gender balance within the academic sector. This initiative focuses on assisting female employees in attaining full professorship.

UiS signed the Declaration of commitment to the Recommendation of the European Commission on the European Charter for researchers and the Code of Conduct for recruitment of Researcher (Charter & Code) – HRS4R in 2011. This commitment reflects our dedication to aligning our practices with international standards for recruitment. See link to Charter and Code – HRS4R in *table 8*.

UiS has a strict zero-tolerance policy against discrimination, and we have established mechanisms for reporting any issues at an institutional level. This includes digital reporting channels that are accessible both to students and visitors, as well as all employee groups including Ph.D.-candidates. Formal processes concerning admissions, promotions, and evaluations are governed by internal regulations, in addition to the National legislation.

Table 8. Administrative unit policy against discrimination.
Give a description of up to 5 documents that are the most relevant. If the administrative unit uses the strategies, policies, etc. of a larger institution, then these documents should be referred to.
Please delete lines which are not in use.

No.	Title of document	Valid period	Link
1	University of Stavanger - OTM-R Policy / Recruitment policy	2023 - 2030	https://www.uis.no/sites/default/files/2023-06/Recruitment%20strategy%20202
2	University of Stavanger – Charter and Code – HRS4R	2021 -	https://www.uis.no/en/about-uis/charter-and-code-hrs4r

3	University of Stavanger - Action plan for equality and diversity for students and employees	2022 - 2025	https://www.uis.no/sites/default/files/2022-06/Handlingsplan%20for%20likestilling%20og%20mangfold%202022-2025%20styrebehandlet_EN%20%28002%29_0.pdf
4	University of Stavanger - Working at UiS: Application and appointment		https://www.uis.no/en/about-uis/working-at-uis-application-and-appointment
5	National legislation - Equality and Anti-Discrimination Act		https://lovdata.no/dokument/NLE/lov/2017-06-16-51

4. Relevance to institutional and sectorial purposes

4.1 Sector specific impact

Describe whether the administrative unit has activities aimed at achieving sector-specific objectives or focusing on contributing to the knowledge base in general. Describe activities connected to sector-specific objectives, the rationale for participation and achieved and/or expected impacts. Please refer to chapter 2.4 in the evaluation protocol.
Alternatively, describe whether the activities of the unit are aimed at contribution to the knowledge base in general. Describe the rationale for this approach and the impacts of the unit's work to the knowledge base.

The Department of Mathematics and Physics (IMF) contributes to all 4 sector-specific goals for higher education through different aspects of our activities:

1) High quality in research and education
2) Research and education for welfare, value creation and innovation
3) Access to education (esp. capacity in health and teacher education)
4) Efficiency, diversity and solidity of the higher education sector and research system

1) All staff at the IMF regularly publish on topics in mathematics, statistics and physics, in high-impact peer-reviewed international journals, with a high proportion (43%) in journals ranked "Level 2" by the sector (sector-wide fraction of "Level 2" is 20%). The high quality in IMF research is also implied by the number of competitive grants awarded to the IMF staff, and how broadly they are distributed within the department (13 NFR, EU and other grants over 12 persons, 2012-2022). This also supports high-quality education through student project work at Master and PhD level.

The recruitment strategy is focussed on the six prioritized research topics, but is otherwise strictly merit based, international and with a rigorous process for assessing teaching and dissemination strengths of the applicants. As a result, the IMF has two "Distinguished educators" and one recipient of the Olav Thon prize for Excellence in Teaching, also receiving excellent student feedback across the department.

2) The IMF provides all the foundational courses in mathematics, statistics and physics to all the engineering and natural science programs at the UiS. In this way, we provide the natural science basis for the approx. 400 students that graduate each year from the SciTech faculty.

3) In addition to foundational courses and pre-engineering courses (Forkurs), the IMF offers a Master degree in mathematics and/or physics as well as a teacher training program (upper secondary, high-school) in mathematics and/or physics. We also offer continuing education through two 1-year modules and single subjects in mathematics and/or natural science, typically for persons with a prior engineering degree, or high-school teachers pursuing a second or third subject teaching qualification.

4) The IMF is one of 5 institutions offering degree programmes in mathematics and physics nationally. Regionally, the activities support the technology development in the country's largest industrial hub. All of the six research focus topics are nationally and internationally competitive, contributing to a robust and diverse research sector. On at least one research topics, the IMF hosts the largest group in Norway.

The research activities at the IMF are a mixture of applied topics (Materials physics, Mathematical Statistics) and foundational topics (Theoretical Subatomic and Cosmology, Algebraic Geometry, Mathematical Physics, Real and Complex Analysis). Together with the co-location of mathematics and physics, this allows for a moderately sized department to efficiently offer competitive education addressing many different societal needs.

4.2 Research innovation and commercialisation

a) Describe the administrative unit's practices for innovation and commercialisation.

Although a long distance between the major part of he research activities at the unit and innovation and commercialisation, the organisation has useful resources for this: UiS has a close collaboration with Validé AS (ownership 35%), which is our external innovation company comprising TTO services used by UiS. Validé has 5-6 persons employed in the TTO unit of Validé with different scientific background. Several steps of dedicated services supporting the commercialisation path are given for all researchers at UiS. Once a year researchers are informed about Validé. A UiS-Plogen application possibility (1,1 MNok/year) to mature the idea further. General framework agreement with TTO activities of 2,5 MNok/year. Validé administrate local pre-seed funds of approx. 3,5 MNok/year to work with UiS ideas further in addition to accelerator services. Validé also assists researcher to apply for national funds to pursue the commercialisation path. In summary Validé is ranked among the most successful TTO's in Norway. The agreement with Validé is anchored centrally at UiS at the Innovation and external collaboration unit with regular follow-up meetings.

b) Describe the motivation among the research staff in doing innovation and commercialisation activities.

As noted above, the research activities at the unit are a mixture of foundational topics (Theoretical Subatomic and Cosmology, Algebraic Geometry, Mathematical Physics, Real and Complex Analysis) and applied topics (in Materials physics and Mathematical Statistics). The main part of the research is methodological/theoretical andas such, there is normally a long distance to commercialisation and patents.

c) Describe how innovation and commercialisation is supported at the unit.

Initiatives are enthusiastically received and supported with available resources in the organisation. As described in 4.2a)

Table 9. Policies for innovation including IP policies, new patents, licenses, start-up/spin-off guidelines

Describe up to 5 documents of the administrative unit's policies for innovation, including IP policies, new patents, licenses, start-up/spin-off guidelines etc., that are the most relevant. If the administrative unit uses the strategies, policies etc. of a larger institution, then present these documents.

No.	Title	Valid period	Link
1	UiS Strategy	2021-2030	https://www.uis.no/en/strategy-2030-university-stavanger
2	Rettighetspolitikk ved Universitetet i Stavanger	Ongoing	342656.PDF (360online.com)
3	Disclosure of Innovation (DOFI),	Ongoing	https://valide.force.com/s/dofi?language=no
4	Plogen programinformasjon og	Ongoing	https://valide.no/plogen

Table 10. Administrative description of successful innovation and commercialisation results

Please describe up to 10 successful innovation and commercialisation results at your administrative unit in the period 2012-2022. Please delete lines which are not in use.

No.	Name of innovation and commercial results	Link	Description of successful innovation and commercialisation result.
1	NA	NA	NA

4.3 Higher education institutions

a) Reflect how research at the unit contributes towards master and PhD-level education provision, at your institutions and beyond.

Mathematics and Physics education has a high degree of progression. Ever more complex and abstract concepts and methods are introduced step by step, leading up to the state-of-the-art, which is usually reached as the student embarks on the Master project.

All Master projects at the IMF are directly related to research, either reproducing recent results in the literature or contributing in some function to produce original work in collaboration with the supervisor(s). PhD-projects are always embedded in one of the six research groups, and always include original work by the student alone (rare), in collaboration with the supervisor, and/or in collaboration with other international experts (common). In this way, active research groups provide a broad spectrum of specialization options for Master students to refine their skills, while it is essential for all PhD-education.

The Faculty of Science and Technology has one overarching PhD program. One specialization within this program in Mathematics, Physics and Information technology.

b) Describe the opportunities for master students to become involved in research activities at the unit.

All Master students have the option to contribute to some research task (or simulation of a research task), subject to skill level and motivation. Some prefer to reproduce existing results, some opt for reviewing a broader range of literature. Occasionally, Master students co-author papers with their supervisors.

- Within Materials physics Master students often travel to experiments (say ESRF) and participate in data gathering, which is then processed at home.
- In Theoretical subatomic physics, they may be asked to analyse data (or mock data) from observations (say, LIGO or LISA).
- Master projects in statistics usually involve analysing data (or mock data) from medical trials, financial markets and similar, or be asked to write code that generates such data.
- In pure maths projects, the task may be to investigate examples and applications of central theorems, or explicitly study the properties of mathematical structures of interest.
-

4.4 Research institutes

a) Describe more generally how the research and innovation activities/projects at the administrative unit contribute to the knowledge base for policy development, sustainable development, and societal and industrial transformations more generally.

Not relevant for our institution.

b) Describe how users outside of research organisations are involved in research activities at your unit

Not relevant for our institution.

5. Relevance to society

Reflect on the unit's contribution towards the Norwegian Long-term plan for research and higher education, societal challenges more widely, and the UN Sustainable Development Goals.

Mathematics and Physics research and education is the bedrock of modern technology and society.

The societal impact of the activities at the IMF are in part direct, through the statistical data analysis in medical research leading to new treatments and diagnosis tools and through developing methods and materials for hydrogen and CO2 storage, which are later implemented into technology. In part it is indirect through training mathematics and physics teacher who pass on knowledge to next-generation developers, and to hundreds of engineers who use mathematics and physics as tools for technological development. Research in mathematics and fundamental physics paves the way for new technology in the future, but in the process reveals to us principles that govern the world around us and informs and inspires philosophy, religion, the creative arts.

This implies that mathematics and physics contribute the UN goals 1, 2, 3, 6, 7, 8, 9, 11, 12, 13, 14, 15, from the general perspective of teaching knowledge and skills about mathematics and physics to technology developers and the general public, and 3 (Good health and well-being), 4 (Quality education), 7 (Affordable clean energy) and 13 (Climate action) directly through the research undertaken at the IMF.

5.1 Impact cases

Two impact cases are submitted as attachments; file names:
UiS_IMF_ImpactCase_1.pdf
UiS_IMF_ImpactCase_2.pdf