The Research Council of Norway

# Evaluation of Mathematics, ICT and Technology 2023-2024

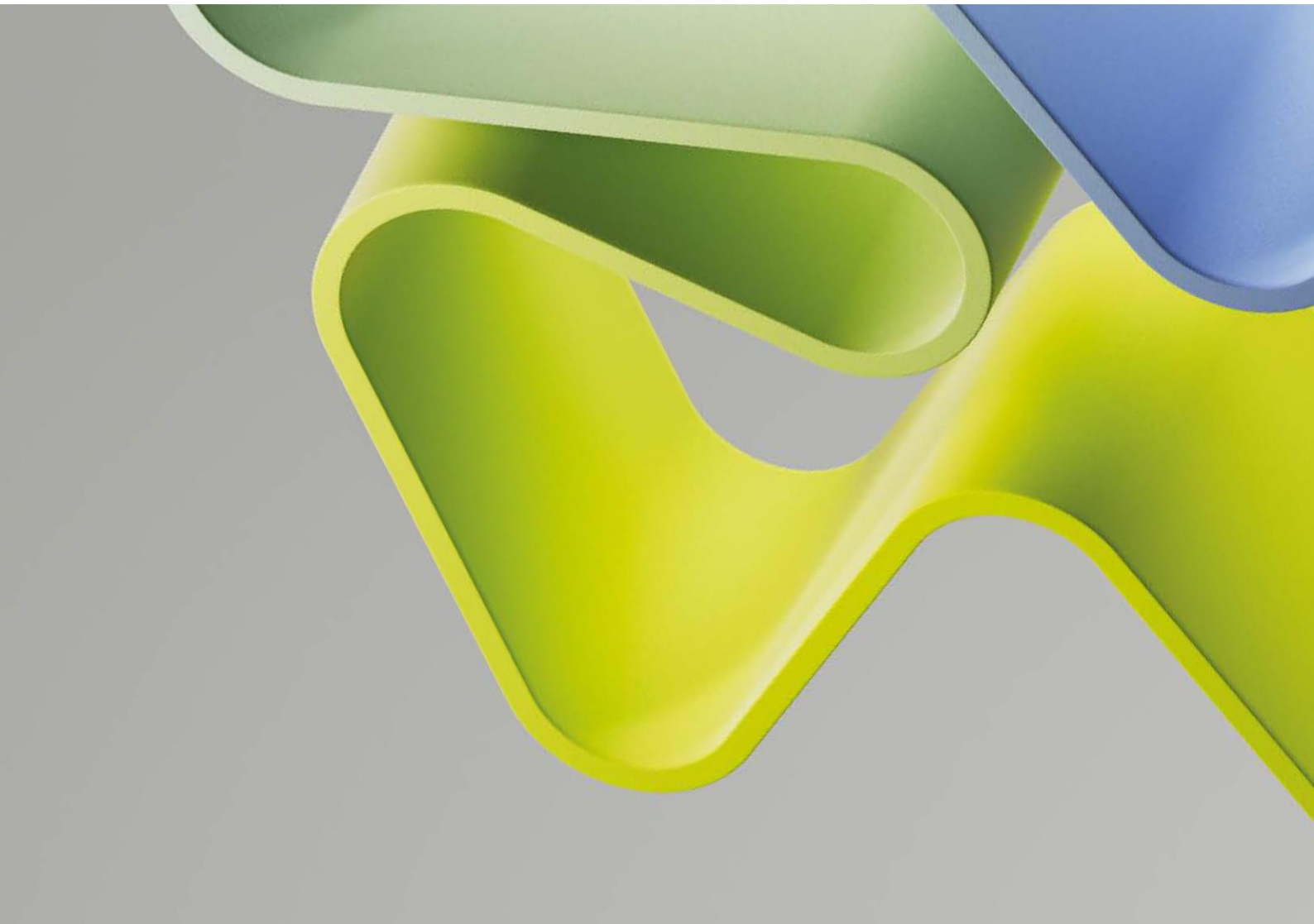
## Evaluation Report for Administrative Unit

Administrative Unit: **Department of Mathematics and Physics (IMF)**

Institution: **University of Stavanger (UiS)**

Evaluation Committee Higher Education Institutions 1

December 2024



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# Statement from Evaluation Committee Higher Education Institutions 1

The members of this Evaluation Committee have evaluated the following administrative units at the higher education institutions within Mathematics, ICT and Technology 2023-2024 and has submitted a report for each administrative units:

- Department of Informatics, University of Bergen (UiB)
- Department of Mathematics, University of Bergen (UiB)
- Department of Informatics, University of Oslo (UiO)
- Department of Mathematics, University of Oslo (UiO)
- Department of Computer Science (IFI), UiT The Arctic University of Norway
- Department for Mathematics and Statistics (IMS), UiT The Arctic University of Norway
- Department of Mathematical Sciences (IMF), Norwegian University of Science and Technology (NTNU)
- Department of Computer Science (IDI), Norwegian University of Science and Technology (NTNU)
- Department of Mathematics and Physics (IMF), University of Stavanger (UiS)
- Faculty of Engineering and Science (TekReal), University of Agder (UiA)
- Department of Electrical Engineering and Computer Science (IDE), University of Stavanger (UiS)

The conclusions and recommendations in this report are based on information from the administrative units (self-assessment), digital meetings with representatives from the administrative units, bibliometric analysis and personnel statistics from the Nordic Institute for Studies of Innovation, Research, and Education (NIFU) and Statistics Norway (SSB), and selected data from the National survey for academic staff in Norwegian higher education and the National student survey (NOKUT). The digital interviews took place in the autumn 2024.

The members of the Evaluation Committee are in collective agreement with the assessments, conclusions and recommendations presented in this report. None of the committee members has declared any conflict of interest.

The Evaluation Committee consisted of the following members:

Professor Rebecka Jörnsten (Chair),

Univ. Gothenborg/Chalmers

Professor Matthias Schütt,
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École Polytechnique Fédérale de Lausanne

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Professor Tiziana Margaria,
University of Limerick

Dr. Joanna Staneva,
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Professor Björn Engquist,
University of Texas at Austin

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Lancaster University

## Description of the Administrative Unit

The department comprises 23 permanent scientific staff and approximately the same number of postdocs and Ph.D. students, with individual work plans defining responsibilities across research, education, administration, and outreach. As of the end of 2022, the permanent staff includes 13 professors and 11 associate professors, with one female professor and two female associate professors, reflecting a gender imbalance that is common in science and technology fields. In Autumn 2022, there were 2 researchers, 4 postdocs, and 16 Ph.D. students, of which six were female, reflecting a slight improvement in gender balance among temporary staff.

The department focuses its research on six areas: algebraic geometry, real and complex analysis, mathematical physics, mathematical statistics, materials physics, and theoretical subatomic physics and cosmology. This diverse research portfolio contributes to the advancement of knowledge in both mathematics and physics.

The research is organised in the following research groups:

- Geometry and Analysis (GeoAna)
- Statistics
- Theoretical Subatomic Physics and Cosmology (TSPC)1
- Materials Physics (MP)[2]

The administrative unit aims to conduct excellent research in mathematics and physics, striving for publication in highly-ranked international journals to achieve national and international recognition. It focuses on strengthening existing research groups and acquiring external funding from national and international agencies, aligning with broader strategic goals at the university and faculty level. The unit supports key national initiatives in STEM education, particularly in areas such as Energy and Health, which are crucial for the Green Transition. It emphasizes cultural, ethnic, and gender diversity within its research community while ensuring its research activities contribute to foundational skills in STEM education. The unit has successfully secured national funding, achieving nine NFR grants over the past decade, while also working to improve visibility and brand recognition through public dissemination efforts, including school visits and hosting international conferences.

The unit maximizes synergies between research and education by prioritizing research-based education, strategically aligning student assignments with ongoing research to enhance their understanding of research processes. It actively engages in outreach activities, such as school visits and public media events, to bridge the gap between the university and the community. The department’s diverse staff, with 16 from nine different countries, each contribute to a rich international network that supports collaborative research efforts. Formal and informal collaborations are essential for supplementing in-house expertise, facilitating deeper knowledge and opportunities for Ph.D. and Master’s students, while also enhancing the Norwegian scientific ecosystem through global partnerships and consortia.

[1] Evaluated in the Evaluation of Natural Sciences 2022-2024, EVALNAT.

[2] Evaluated in the Evaluation of Natural Sciences 2022-2024, EVALNAT.

## Overall Assessment

The Department of Mathematics and Physics (IMF) at the University of Stavanger demonstrates exceptional research excellence across a broad range of fields, particularly in theoretical subatomic physics, cosmology, and materials physics. The department's strategic vision is well-aligned with national and international priorities, contributing significantly to societal challenges, such as health and sustainable energy. Through impactful initiatives like the "Safer Births" project and the "Skolebesøk" outreach program, IMF has made tangible contributions to both local and global communities, saving lives and inspiring future scientists. The department's strong network of international collaborations, with nearly 70% of publications co-authored internationally, highlights its global engagement and influence. Additionally, IMF effectively utilizes advanced research infrastructure, including high-performance computing and access to prestigious facilities like CERN and LIGO, to bolster its research capabilities. The department also excels in integrating research with education, preparing students to contribute meaningfully to both academia and industry.

Minor Weaknesses:

Despite its numerous strengths, IMF faces a few challenges. There is a noticeable gender imbalance, particularly among senior academic staff, which could impact diversity and inclusivity. While the department has secured substantial funding, there is some reliance on key projects, highlighting the need to diversify funding sources to ensure long-term sustainability. Additionally, while the department has strong short-term impacts from its projects, there is room to develop more robust methods for assessing their long-term societal and educational outcomes.

Future Prospects:

IMF is well-positioned to capitalize on its strengths and continue its trajectory of success. By addressing the minor challenges of enhancing diversity, diversifying funding, and improving impact assessment, the department is poised to achieve even greater accomplishments in the future.

The Evaluation Committee considered the points raised by the unit in their Terms-of-Reference document and have commented on those throughout the report where applicable.

*The Terms of Reference for the administrative unit is attached to the report.*

## Recommendations

1. Implement targeted recruitment and mentorship programs aimed at improving gender diversity, especially at senior academic levels.
2. Explore new funding opportunities, including EU grants and industry partnerships, to reduce reliance on current major projects.
3. Develop frameworks for tracking the long-term impact of research initiatives to ensure sustained societal relevance and continuous improvement.
4. Continue to support and promote interdisciplinary research, leveraging the department's strengths in both fundamental and applied sciences.
5. Strengthen Outreach and Visibility: Expand public engagement and dissemination activities to increase the department's visibility and societal impact, especially in underrepresented areas.
6. Increase PhD and postdoc positions in emerging research fields and provide strong mentoring programs to support career development. Recommendations to the

administrative unit on how to improve its performance and develop future research strategies to ensure high quality of research and research output relevant both to national and international development.

## 1. Strategy, Resources, and Organisation of Research

The evaluation of the IMF demonstrates that the administrative unit operates with a strong foundation in research, showing significant achievements in several areas, particularly in interdisciplinary research, societal impact, and international collaboration. The department aligns well with the Terms of Reference, focusing on key areas such as research quality, societal relevance, and strategic alignment with national and international priorities.

IMF is **strategically aligned with both national and international research priorities**, particularly in areas that address critical societal challenges. The department's research strategy is well-organized, focusing on core strengths in fundamental and applied research, while also fostering interdisciplinary collaboration. The unit's research strategy **emphasizes both excellence in scientific inquiry and relevance to societal needs, as demonstrated by projects like "Safer Births" and the ongoing school outreach programs**. The department is supported by a solid organizational structure, with clear processes for resource allocation and research management. However, to fully realize its potential, the department should address gaps in diversity and resource distribution and enhance its mechanisms for long-term impact assessment.

Strengths:

The department exhibits strong research output, with notable contributions in fundamental physics, mathematics, and applied fields such as medical statistics and energy storage. The collaboration with international institutions and active participation in global research networks enhance the quality and impact of their research.

The department's commitment to societal relevance is evident in impactful projects like "Safer Births" and the "Skolebesøk" initiative. Note for all groups however. These projects demonstrate the department's ability to translate research into practical applications that address global challenges and contribute to the UN Sustainable Development Goals.

The department effectively engages in interdisciplinary research, integrating insights from physics, mathematics, and statistics to address complex societal issues. This approach not only strengthens research outcomes but also broadens the scope of the department's impact.

Weaknesses:

Despite efforts to improve diversity, there is a noticeable gender imbalance, particularly among the senior academic staff. This could hinder the department's ability to foster an inclusive research environment and attract a diverse range of talent.

While the department has secured significant research funding, there appears to be a reliance on a few key projects and collaborations. Diversifying funding sources and ensuring equitable resource distribution across research groups could enhance sustainability.

The department's projects have demonstrated short-term success, but there is a need for more robust methods to assess the long-term impact of their initiatives, particularly in relation to student engagement and societal change.

Future Prospects:

The department is well-positioned to continue its success, with clear strategic goals and a strong foundation in interdisciplinary research.

Recommendations

- Implement targeted recruitment and mentorship programs to address gender imbalance, particularly at the senior academic level.
- Explore new funding opportunities and diversify collaborations to reduce reliance on key projects.
- Establish frameworks for tracking the long-term impact of research projects, particularly in terms of societal relevance and student engagement.
- Continue to promote and support interdisciplinary research, particularly in emerging areas that align with the department's strengths and global research trends.

### 1.1 Research Strategy

IMF at the University of Stavanger has a well-defined research strategy that aligns well with both the university's goals and national priorities. The department focuses on six key areas: Algebraic Geometry, Real and Complex Analysis, Mathematical Physics, Mathematical Statistics, Materials Physics, and Theoretical Subatomic Physics and Cosmology. These areas help the department maintain a diverse and impactful research portfolio.

The IMF's strategy significantly contributes to the advancement of the research environment by integrating all permanent staff into one of the designated research groups. This organizational structure fosters collaboration and intellectual synergy within the department while ensuring strategic allocation of resources, guided by structural needs, alternative funding opportunities, and the quality of applicants for both temporary and permanent positions. The department's notable success in securing national research grants, particularly from the Norwegian Research Council (NFR), attests to the effectiveness of its strategic initiatives.

The department's research strategy is also well-aligned with the overarching goals of the University of Stavanger, particularly in relation to the Green Transition, Health, and Lifelong Learning. For instance, the research undertaken by the Materials Physics group on battery technologies, hydrogen cells, and CO2 storage directly supports the university's emphasis on energy sustainability. Similarly, the Mathematical Statistics group's focus on medical diagnostics and risk management aligns with strategic themes related to health and societal safety.

About the four groups in the department:

Geometry and Analysis (GeoAna): This group is well-organized and focuses on producing high-quality research, securing funding, and hosting international conferences. They have a collaborative approach, making decisions by consensus, which supports their research and teaching goals.

Statistics: The Statistics group, though small, is recognized as one of the leading groups in Norway. They collaborate with other fields, especially medicine and economics. However, they need a clearer internal strategy and possibly a leader to help them stay aligned with the department's overall goals.

Theoretical Subatomic Physics and Cosmology (TSPC): This group has grown significantly and has been successful in attracting both funding and international collaborations. They

have a flat structure, sharing responsibilities equally among staff, which works well for their collaborative research environment.

Materials Physics: This group has made good progress, especially in areas related to energy transition and circular economy. However, they could improve their internal collaboration, especially between modelling and experimental teams, to produce more impactful research.

The department's research aligns closely with the University of Stavanger's strategic priorities, particularly in energy, health, and education. The department's focus on providing high-quality education in STEM fields and its commitment to diversity further strengthen its position within the university and the wider academic community.

Recommendations

- Encourage more collaboration within and between research groups, especially in the Materials Physics group.
- Consider appointing a leader in smaller groups like Statistics to help with strategic planning and coordination.
- Focus on producing more high-impact publications, especially in the Materials Physics group, by encouraging joint projects and collaborations.
- Continue to build and formalize international partnerships, especially where the department already has strengths, like in the TSPC and GeoAna groups.
- Target more EU funding opportunities and ensure resources are allocated to support the most promising research areas.
- Despite significant improvements in research quality, the department's visibility and brand recognition could be further strengthened. Continued emphasis on public dissemination, along with hosting international symposia and conferences, will be essential for establishing a more prominent reputation within the global academic community.

### 1.2 Organisation of Research

IMF has established a robust and strategically aligned organizational structure that effectively supports its research activities, education, and outreach initiatives. This structure is well-suited to advancing both the department's and the university's broader strategic objectives.

The department's resources, including access to High-Performance Computing (HPC) facilities and advanced laboratory equipment in the Materials Physics group, further enhance its research capabilities. The substantial institutional investment over the past five years has modernized research infrastructure, enabling the initiation of new PhD projects and supporting the department's growing research output. The use of large-scale facilities for experiments, such as synchrotron light and neutron scattering, underscores the department's commitment to cutting-edge research.

Each permanent staff member has a clear and balanced workload encompassing research, teaching, administrative duties, and outreach activities. This equitable distribution ensures that all members contribute meaningfully to the department's objectives, including the provision of high-quality education and the advancement of research. Teaching responsibilities are rotated among staff members, which allows them to maintain active research agendas and participate in other departmental activities.

The department places a strong emphasis on integrating research with education, particularly through its 5-year Master's program in Mathematics and Physics and its PhD

specialization. The TSPC group, along with others, plays a vital role in these programs, contributing to teaching and the supervision of postdocs and Ph.D. students. This close integration of research and education is a key strength of the department, ensuring that students receive a rich, research-based educational experience.

PhD and postdoctoral training is also a priority, with most permanent staff involved in supervising PhD students. The allocation of PhD positions is managed strategically, taking into account alignment with departmental and faculty priorities. This ensures that resources are directed toward research areas with high potential impact. The department's mentoring and training programs provide PhD students with excellent opportunities for international collaboration and mobility, particularly through partnerships with institutions such as SINTEF, NORCE, and the European Spallation Source.

The department's use of HPC resources, both nationally (sigma2 at HPC Oslo) and internationally, further enhances its research output, particularly in areas requiring intensive computational resources. This access to advanced computing power is crucial for maintaining the high quality of research within the department, especially in the Materials Physics group.

The organizational structure of the IMF is closely aligned with the University of Stavanger's broader strategic goals, including enhancing research excellence, fostering interdisciplinary collaboration, and supporting the university's focus on areas like the Green Transition and Health. The department's participation in Institute Strategic Programs (ISPs) in mathematics and materials physics highlights its commitment to interdisciplinary research and its contribution to the university's strategic objectives.

The department's strong network of national and international partners further supports its research activities. Collaborations with industry (e.g., EQUINOR) and academic institutions (e.g., universities in India and Japan via DIKU) are key to securing research funding and advancing the department's research agenda. The successful attraction of external funding from diverse sources, including the Research Council of Norway and international research institutions, underscores the department's effectiveness in leveraging its resources and partnerships to achieve its research goals.

Outreach activities, such as public lectures, school visits, and media engagement, are also integral to the department's strategy. These activities not only enhance the department's visibility but also contribute to the university's mission of promoting lifelong learning and societal impact.

<u>Recommendations</u>

- Foster more structured collaboration between research groups, particularly in areas where scientific overlap exists, to enhance the integration of research efforts.
- Increase the number of PhD and postdoc positions, particularly in emerging research fields aligned with institutional priorities.
- Continue providing support for staff in securing research funding, such as offering resources for writing competitive grant applications and reducing teaching loads during critical periods.
- Further develop and expand outreach activities to increase the department's visibility and public engagement, particularly in areas that address global challenges.
- Continue to align student research projects with ongoing departmental research to maintain strong connections between education and research, benefiting both students and faculty.

### 1.3 Research Funding

IMF has shown good success in securing research funding. This funding reflects the high quality of research that the department produces. Over the last five years (2018-2022), the department has managed to obtain important funding from both national and international sources, which has helped to grow and improve its research activities.

Overall, the department has secured significant funding from various sources, including the Research Council of Norway (RCN), European programs, and industry partnerships, such as with EQUINOR. This funding has been essential for expanding research infrastructure and starting new PhD projects, particularly in groups like TSPC and Materials Physics. These groups have benefited from strong institutional support and have leveraged their research outputs to secure important grants, which further enhance their capabilities. However, the Statistics group has not been as successful in obtaining external grant funding. Despite producing outstanding research papers, the group has not secured external research grants. The department does provide administrative support for grant writing, as well as some resources for travel and PhD students, but it is unclear whether the Statistics group has actively pursued external funding opportunities. This lack of external funding is a concern, given the high quality of the group's research output.

Research groups in the department also benefit from good resources, such as High-Performance Computing (HPC) and advanced lab equipment. For example, the Materials Physics group uses large-scale facilities for experiments, which contributes to their high-quality research outputs. This access to resources shows that the department is capable of producing excellent research.

The department provides good support to its researchers when they apply for external funding. The administrative unit encourages researchers to apply for competitive grants and helps them by reducing teaching loads during busy periods. This support has proven effective, as shown by the department's success in obtaining various grants.

Moreover, the department's strong connections with national and international partners have helped in securing funding. Collaborations with institutions like SINTEF, NORCE, and international universities have made the department's research proposals stronger and more likely to be funded.

From 2018 to 2022, the department has successfully received several important grants. For example, the TSPC group has been very successful in getting external funding, which has allowed it to grow and increase its international presence. The GeoAna group has also obtained significant grants that have supported their high-level research activities.

The funding has not only supported research but also strategic initiatives, like the Institute Strategic Programs (ISPs) in mathematics and materials physics. These programs are designed to encourage interdisciplinary research, which aligns well with the university's strategic goals.

<u>Recommendations</u>

- Continue providing strong support to researchers when they apply for external funding, including helping with grant writing and preparation.
- Use international partnerships more to access European and global funding opportunities, especially in new research areas.
- Look for more partnerships with industry to diversify funding sources and increase the practical impact of the department's research.

- Consider adding gender diversity initiatives in grant applications to make the department more competitive, especially in programs that value diversity.
- Encourage the Statistics group to develop a clear strategy for obtaining external funding, including applying for grants and exploring collaborations with industry.

### 1.4 Research Infrastructures

IMF is actively involved in important national and international research infrastructures that significantly support its research activities. While the department does not host any national infrastructures, it plays a key role in several international consortia and projects that are critical to its research goals.

The department participates in national research infrastructures primarily through the use of the SIGMA2 national supercomputing system, which has been used extensively since 2013. This system is crucial for supporting the department's computational research, especially in fields like quantum field theory and cosmology. The SIGMA2 infrastructure provides the high-performance computing power needed to carry out complex simulations and data processing. In addition to SIGMA2, the department is involved in national consortia that connect to significant international infrastructures. For example, the Swiss-Norwegian Beamlines (SNBL) at the European Synchrotron Radiation Facility (ESRF) and NcNeutron, which is linked to the European Spallation Source (ESS), are both crucial for the department's research, particularly in Materials Physics. These facilities provide the advanced experimental capabilities required for the department's work in materials science, energy, and environmental research.

Internationally, the department has strong connections with several major research infrastructures. For example, the department collaborates with CERN's Theory Division, with staff members having spent time working at CERN. The department is also involved in the LISA (Laser Interferometer Space Antenna) mission under the European Space Agency (ESA), which focuses on detecting gravitational waves. The department contributes to various aspects of the mission, including management, theory, signal analysis, and computing, showing its involvement in cutting-edge space research. Moreover, the department uses other international facilities like ESRF and Nordic Neutron Scattering facilities through the SNBL consortium and other collaborations. These facilities are essential for conducting high-quality research, particularly in materials physics, and are key to the department's success in these areas.

The department follows the FAIR principles in managing its research data, as required by UiS policies. The department ensures that all research data is managed according to the guidelines provided by the Norwegian Center for Research Data (NSD) and complies with the open access policies of the Research Council of Norway and the EU. The University Library provides support to ensure that all research data is handled according to these principles, making the data available and useful for the broader scientific community.

<u>Recommendations</u>

- The department could explore opportunities to host or co-host national research infrastructures in the future, which would further strengthen its research capabilities.
- Continue to expand participation in international research infrastructures, particularly in new scientific areas that match the department's research strengths.
- Regularly review data management practices to ensure ongoing adherence to the FAIR principles, optimizing the availability and usability of research data.

- Encourage broader use of national and international research infrastructures across all research groups to fully leverage these resources and increase research productivity.

### 1.5 National and international collaboration

The department developed a strong network of collaborations, both nationally and internationally. These collaborations align well with the department's goals and significantly improve the quality of its research. The department uses both formal agreements and informal partnerships, which are essential for reaching its research objectives and contributing to the wider Norwegian research community.

The department has worked hard to build a diverse and international research team. Among the 23 permanent staff members, there are people from 10 different countries. This diversity has led to a broad network of international collaborators. The department actively supports these collaborations through regular travel, seminars, workshops, and by hosting international conferences in Stavanger. These efforts are crucial for bringing in external expertise, especially since the department is not very large.

The GeoAna group benefits from strong scientific exchanges and collaborations with members of the theoretical physics groups in the same department. These collaborations have resulted in joint publications, which have strengthened the research output of both groups. The GeoAna group members often attend conferences and go abroad for short-term research stays. The group also regularly hosts national and international visitors, with recent visits supported by the ISP project. These collaborations are vital for maintaining the group's research quality and international presence.

The Statistics group collaborates with several international groups and four non-academic groups. However, the depth and impact of these collaborations are not entirely clear. The group is involved in the SaferBirth project, which is a transdisciplinary effort. While this project is likely challenging, the complexity of the methods used seems limited. To maximize the potential of these collaborations, the group might need to focus on making their partnerships stronger and more methodologically advanced.

The TSPC group has strong international connections and has published many papers in high-quality peer-reviewed journals. The group also hosts international conferences and workshops, contributing significantly to the global scientific community. Besides research, the TSPC group is involved in teaching students and conducting outreach activities to educate the public. However, there is potential for the group to have a broader impact on society, such as by transferring knowledge to private sector companies.

The Materials Physics group is involved in international collaborations that add value to their research. However, their work is often organized into small, focused projects with low risk. The group's connections with Norwegian research institutes like SINTEF and the Norwegian Research Centre ensure effective knowledge transfer within Norway. Internationally, the group contributes to improving research capabilities through method development, such as in crystallographic computing and data analysis methods for neutron research. These contributions also improve research possibilities at large-scale facilities for in-situ and operando characterization.

The department's collaborations have significantly enhanced its research quality. Involvement in large international consortia, like LIGO and LISA, has placed the department at the forefront of gravitational wave research, leading to high-impact publications and increased international recognition. Nationally, collaborations with institutions like SINTEF,

the University of Oslo, and Stavanger University Hospital have strengthened interdisciplinary research, contributing to both academic and applied scientific advancements. The department also coordinates the national network on Particle, Astroparticle, and Cosmology Theory (N-PACT), which helps scientists across Norway collaborate on publications, funding applications, and student supervision. This network boosts the department's research output and impact.

The department is actively engaged in cross-sectoral and interdisciplinary collaborations, especially with non-academic partners. A prime example is the longstanding collaboration with Stavanger University Hospital, involving research, education, and co-supervision of PhD students. This partnership shows the department's commitment to interdisciplinary research that connects academia with practical applications.

Regionally, the department collaborates with other UiS departments on projects like developing new materials for carbon capture and modeling commodity markets. These interdisciplinary collaborations demonstrate the department's ability to tackle complex societal challenges through a mix of scientific and practical approaches.

Recommendations

- Continue developing both formal and informal collaborations, ensuring they align with the department's long-term research goals.
- Increase efforts to build partnerships with industry and public sector organizations to provide additional resources and practical applications for the department's research.
- Encourage more projects that involve multiple departments within UiS and external partners to tackle complex, interdisciplinary research questions.
- Better use existing international networks to secure joint funding and enhance the department's global research presence.
- Encourage the Statistics group to strengthen its collaborations by focusing on more methodologically advanced projects and exploring partnerships that require more complex methodologies.
- Support the TSPC group in finding ways to have a broader societal impact, such as through knowledge transfer to private sector companies.

### 1.6 Research staff

IMF has a well-structured profile of research staff, but there are some challenges in achieving gender balance and in addressing the distribution of positions. The department consists of 23 permanent scientific staff members, including 13 professors and 10 associate professors, with two adjunct positions. The gender balance among permanent staff is skewed, with only one female professor and two female associate professors, reflecting the broader national trend of fewer women in science and technology fields. However, the gender balance is better among temporary staff, including postdocs and PhD students, where a higher percentage of women are represented. The department's recruitment policy focuses on attracting talented researchers, but there is still room for improvement in terms of gender diversity. The unit's efforts to bring in international staff have been successful, as evidenced by the diverse background of its temporary research staff.

However, the lack of female representation at the senior level indicates a need for a more targeted approach to gender-balanced recruitment and succession planning. This could involve actively encouraging applications from qualified women and creating supportive environments for career development. Research time distribution among staff appears to be well managed, with clear criteria for allocating research leave and sabbaticals. The

department allows for mobility options, enabling staff to engage in research stays and collaborations abroad, which is crucial for maintaining a dynamic research environment. However, it is important to ensure that these opportunities are equally accessible to all staff members, regardless of their gender or seniority, to promote balanced career progression.

Recommendations

- Implement targeted recruitment strategies to improve gender balance, particularly at the senior level, and support career development for women in science.
- Develop a clear succession plan that includes gender diversity as a key consideration, ensuring a balanced and sustainable academic workforce.
- Monitor the distribution of research time, leave, and mobility opportunities to ensure all staff have equal access, supporting balanced career advancement.

### 1.7 Open Science

IMF is committed to promoting Open Science practices, in line with institutional and national policies. UiS has adopted several key principles and agreements, such as the DORA declaration, the FAIR principles, and the NOR-CAM agreement, which guide the department's approach to open access and data management. UiS established its general policy on Open Science in 2016. The department adheres to these guidelines by supporting open access to publications and promoting the FAIR principles for data management. The university allocates annual funding to support open access publishing, managed by the university library, which also offers platforms for open-access journals and e-books. However, the institution does not yet support open peer review.

The department's approach to open access is reflected in its publication practices. In 2022, approximately 40% of the department's publications were archived or available through gold open access, slightly above the national average. This shows a strong commitment to making research outputs publicly available, contributing to the broader goals of Open Science.

The department's researchers contribute significantly to Open Science, particularly through their adherence to open access publishing practices. The availability of research data in compliance with the FAIR principles is another important aspect of the department's contribution. The department also emphasizes the importance of open-source software and tools in research, ensuring that these resources are accessible to the wider scientific community. The department follows UiS's policy on data ownership, management, and confidentiality. All research data is managed according to the FAIR principles.

Recommendations

- Expand support for open peer review and explore ways to involve more stakeholders in Open Science activities, including citizen science.
- Continue to encourage and support open access publishing to ensure that a greater percentage of the department's research outputs are freely available.
- Strengthen the implementation of FAIR principles by providing more targeted training and resources to ensure all researchers are equipped to manage data according to these standards.
- Consider expanding the department's involvement in Open Science beyond publications and data, potentially exploring areas like open-source software development and educational resources.

# 2. Research production, quality and integrity

IMF has a dynamic research environment, focusing on several key areas within mathematics and physics. The department is organized into research groups that work on a range of topics, including algebraic geometry, analysis, mathematical physics, mathematical statistics, materials physics, and theoretical subatomic physics and cosmology. The department's research output is reflected in its publication volume and citation impact. The available data shows that the department consistently produces high-quality research, contributing to both national and international scientific communities. In 2022, the department maintained a steady level of publications, which highlights its commitment to producing valuable research.

### 2.1 Research quality and integrity

The research at IMF covers both fundamental and applied aspects of mathematics and physics. The main focus areas include:

Algebraic Geometry and Analysis: Research in these areas involves deep theoretical work, often intersecting with other mathematical fields. The group produces high-impact journal articles that contribute significantly to the field.

Mathematical Physics and Theoretical Subatomic Physics: This group focuses on theoretical models that explain fundamental physical phenomena. They are strongly involved in international collaborations, contributing to major projects like LIGO and LISA, which study gravitational waves.

Materials Physics: This group conducts experimental research focused on developing and characterizing new materials. Their work often involves using large-scale research facilities, such as synchrotron radiation sources, which helps ensure their publications are of high quality and impact.

Mathematical Statistics: This group focuses on developing statistical methods with applications in fields like health and engineering. Their research is published in reputable journals, though there is potential to increase external funding.

The quality of research at IMF is reflected in the publication of work in high-impact journals and the number of citations these works receive. Citation analysis shows that the department's publications are well-regarded in the scientific community, indicating the relevance and influence of their research.

The department's involvement in large international projects, such as those at CERN and the European Space Agency, further strengthens the quality and impact of its research. These collaborations not only enhance the department's reputation but also provide valuable opportunities for researchers to engage in cutting-edge global research.

IMF is committed to maintaining high standards of research integrity. The department follows the University of Stavanger's policies on research ethics, ensuring that all research activities are conducted with honesty, transparency, and respect.

The department has a strong publication record, with the number of peer-reviewed articles increasing significantly over the last decade. This demonstrates the department's strong contribution to the scientific community.

The department produced 55 publications in 2022, with a three-year average of 60.3. This is a solid output.

The department's mean normalized citation score (MNCS) of 119 is above the average, indicating that their research is influential. This is slightly higher than the national average for mathematics and physics departments. Notably, around 40% of these publications are in level 2 journals, indicating high-quality research.

The department has a strong citation impact, with a mean normalised citation score of 119, above the world average. Additionally, 11.1% of the department's publications rank among the top 10% most cited globally, indicating high-quality research that is well-regarded by the scientific community.

The department has a strong international collaboration rate, with 69.1% of publications involving international coauthors. This is a positive indicator of the department's global engagement and This demonstrates the department's strong global connections and influence. This is significantly higher than the average for Norwegian departments, which is around 56.9%.

The department has made progress in open access publishing, with 40% of publications available through open access. While this is slightly below the national average of 42.5%, it shows a commitment to transparency. There is still room for improvement in increasing the share of openly accessible publications, especially in comparison to the leading institutions in Norway.

**Research group Geometry and Analysis (GeoAna) overall assessment**

The group's research is of very high quality and has a strong impact, as indicated also by the excellent publications. The group has several relevant international collaborations and the research of the group has been supported by several relevant grants, like "Young Research Talent" and "ToppForsk Research". Overall, the organisation and the research group contribution are both excellent.

The contribution of the group to the societal and cultural development in Norway is very considerable, as demonstrated by the engagement in many relevant activities in relation to engineering education.

Strengths:

The research of the group is on various aspects of pure and applied mathematics, obtaining excellent results in mathematical physics, algebraic geometry and complex analysis. The group has constructed a strong network of scientific collaborations.

The quality of the group's research is excellent compared to the international environment.

The research of the group has been supported by several strong national and international grants. The group has supervised a high number of PhD students.

Weaknesses:

The number of students in the master program is decreasing in the past years. Despite the excellent research, the group has a low success rate of national grant proposals in foundational mathematics research. The number of postdocs has been decreasing in the recent years.

**Research group Statistics overall assessment**

The panel finds the group not well organised. There seems to be no structure for strategy development and joint planning. Also, the self-assessment is not well written and often hard to follow. The level of the interdisciplinary collaboration of the group is satisfactory to good. The number of PhD students is small. On the other hand, the contribution of the group to education is large. The group is responsible for a BSc and a MSc programme in statistics and teaches in several service courses. The panel has the impression that the amount of external funding which the group members have obtained is low. The listed methodological papers are of international high standards. The listed applied paper has limited impact. The economic and societal impact of the group seems to be restricted to software packages and articles on pitfalls in statistics

**Research group Theoretical Subatomic Physics and Cosmology (TSPC) overall assessment**

The research group in Theoretical Subatomic Physics and Cosmology (TSPC) has aligned its benchmarks with the overall strategy of the Department of Mathematics and Physics to produce outstanding research and research-based education in mathematics and physics. The group has transformed significantly since the 2010 Research Council of Norway (RCN) National Evaluation of Physics, growing, and attracting competitive external and internal funding. Their research primarily focuses on QCD at finite temperature and density and Cosmology and Gravitational waves, with additional research strands adjacent to these topics. They have a coherent recruitment strategy and intend to pursue external funding, particularly from EU/ERC. The group contributes to excellent research-based education in Physics and Mathematics at various levels and has strong international connections, collaborating with colleagues worldwide and hosting international conferences and workshops. The group's publications are of high impact and have received wide recognition. However, the group's societal impact rests on students' education and outreach events to educate the wider public. Thus, a broader outlook on impacting society beyond education and outreach is lacking. There is little information on the training opportunities for PhD students and postdocs, as well as how the career development of staff is supported.

**Research group Materials Physics (MP) overall assessment**

The Materials Physics group has just moved out of the starting phase of the restructured constellation. It is developing very positively: the productivity has increased; the funding record is very good; the scientific output is of good quality that meets international standards but could be more substantial; the research themes chosen are timely and connections to partners outside academia both nationally and internationally are solid and productive. There is good potential for increasing the scientific output and attracting more PhD students. The group is matching the strategic goals concerning conducting research to international standards but could aim also for higher impact publications. Being in the starting phase has presumably prevented the group from organising workshops or conferences, which is also among the strategic goals, but such activities should be possible soon.

## 3. Diversity and equality

IMF is committed to creating an inclusive and fair environment for all employees. This commitment aligns with the broader policies of the university, which emphasize the importance of diversity and the prevention of discrimination in both the workplace and academic settings.

It is positive to mention that the department strictly follows the University of Stavanger's zero-tolerance policy against discrimination. There are clear and accessible procedures in place for reporting any issues, which are available to all staff members, including PhD candidates and administrative personnel. These reporting mechanisms ensure that any incidents can be addressed promptly and fairly. The department also follows national and institutional guidelines for admissions, promotions, and evaluations, which are designed to ensure impartiality and fairness in all processes.

While the department is making efforts to improve gender balance, there is still a noticeable imbalance, especially in senior academic positions. This reflects a broader challenge within the fields of science and technology in Norway. To address this, the department is involved in initiatives like the "Women to the Top" project, which aims to support female staff in reaching higher academic ranks, such as full professorships. The department also values the recruitment of international staff, which brings diverse perspectives and enriches both research and teaching. The presence of staff from various cultural backgrounds is seen as a key strength, contributing to the department's overall academic excellence.

The department has successfully attracted a significant number of international researchers, which enhances its global outlook and academic diversity. This inclusion is viewed as essential for fostering innovation and maintaining competitiveness in the international academic community.

Recommendations:

- Focus on strategies to increase the number of women in senior academic positions, including mentorship and targeted recruitment initiatives.
- Continue to develop and promote the reporting mechanisms for discrimination, ensuring they are well-known and easily accessible to all staff.
- Strengthen programs that help integrate international staff and support cultural diversity within the department, such as language courses and cultural exchange activities.
- Regularly assess the effectiveness of diversity and inclusion initiatives, using clear metrics, and make necessary adjustments to improve these efforts continuously.

## 4. Relevance to institutional and sectorial purposes

The Department is strongly committed to promoting diversity and ensuring equality for all staff. The department follows UiS's policies, which emphasize respect for diversity, zero tolerance for discrimination, and creating an inclusive work environment. Job advertisements actively encourage applications from all genders, cultural backgrounds, and abilities, and the department adheres to the European Charter for Researchers (HRS4R) to ensure fair recruitment practices.

It is nice to notice that the "Women to the Top" initiative at UiS is a key effort to improve gender balance, particularly in higher academic ranks. The department also provides accessible digital channels for reporting any discrimination issues, ensuring prompt action is taken. These practices are in line with both internal regulations and national laws.

Recommendations:

- Continue expanding efforts to support underrepresented groups in academia.
- Regularly review and update policies to ensure they meet evolving diversity and inclusion needs.

- Increase awareness and accessibility of reporting mechanisms to ensure all staff feel safe and supported.

## 5. Relevance to society

The department plays a key role in addressing societal challenges, particularly through its contributions to the UN Sustainable Development Goals (SDGs) and Norway's Long-term plan for research and higher education.

Key Contributions in this aspect are:

SDG 3 (Good Health): Through statistical analysis in medical research, leading to better treatments and diagnostic tools.

SDG 7 & 13 (Clean Energy & Climate Action): By developing methods and materials for hydrogen and CO2 storage.

SDG 4 (Quality Education): Through training future teachers and engineers, ensuring the next generation is equipped to tackle technological challenges.

These two Impact Cases are listed (see below):

- Medical Research: Advancing public health through innovative statistical tools.
- Energy Solutions: Contributing to sustainable energy and environmental protection.

Recommendations:

- Strengthen industry and academic collaborations.
- Enhance public engagement efforts.
- Focus on interdisciplinary research addressing societal challenges.

### 5.1 Impact cases

**Comments to impact case 1: Title Safer Births**

The "Safer Births" project is a significant and impactful initiative with a clear societal benefit, particularly in addressing critical health challenges in low-resource settings. The project has made substantial contributions to reducing newborn and maternal mortality in Tanzania, demonstrating the practical application of interdisciplinary research in improving healthcare outcomes.

The project has saved lives, with an estimated two extra lives saved per midwife per year in the participating hospitals. The tangible outcomes are impressive, particularly the estimated 250 newborns saved at Haydom hospital over six years.

The development and implementation of life-saving devices such as digital fetal heart rate monitors and upright bag masks are crucial advancements tailored for low-resource settings. These innovations have not only benefited Tanzania but are also being applied in developed countries, showcasing the project's broader applicability.

The project has successfully trained a new generation of Tanzanian researchers, contributing to long-term sustainability and local ownership. The involvement of Tanzanian PhD students, many of whom are now leading new initiatives, highlights the project's role in fostering local expertise.

The continuation and expansion of the project, through the Safer Births Bundle of Care, underscores its recognized potential for global impact. The project's success in securing further funding and scaling to over 100 hospitals demonstrates its effectiveness and scalability.

Areas for Improvement:

- While the project has gained attention, more strategic dissemination efforts could enhance its visibility, particularly in international academic and policy circles.
- Continued focus on ensuring the sustainability of these interventions post-project is essential. Further emphasis on integrating these practices into national health systems in low-resource settings could strengthen the long-term impact.

Recommendations:

- Increase efforts to publish and present findings in international forums to enhance the project's visibility and influence.
- Ensure that the project's innovations are fully integrated into the local healthcare systems to sustain impact beyond the project's life.
- Utilize the project's success to attract additional funding and partnerships, potentially expanding the model to other regions with similar challenges.

**Comments to impact case 2: Skolebesøk / School Visits**

The "Skolebesøk" project is an exemplary initiative that bridges the gap between academic research and the broader community, particularly among young students. By bringing researchers into secondary schools across Norway, the project directly engages students with cutting-edge research, making complex scientific topics accessible and relevant to their studies.

The project has successfully introduced students to advanced scientific topics, such as renewable energy, particle physics, and medical statistics, making these subjects more tangible and inspiring potential future scientists. The involvement of researchers in classrooms helps demystify scientific careers and provides role models for students.

The topics presented are well-aligned with the Norwegian school curriculum, allowing teachers to integrate these sessions into their lesson plans effectively. This alignment ensures that the content is not only interesting but also directly applicable to the students' academic progress. This case has received strong positive feedback from both students and teachers, as evidenced by repeat invitations to various schools. This indicates the project's success in meeting its goals of engaging and educating students.

Areas for Improvement:

- While the project has had clear short-term success, there is a need to develop methods for assessing its long-term impact, particularly in terms of inspiring students to pursue careers in STEM fields.
- Expanding the project to reach more schools, particularly in underrepresented areas, could increase its impact. Ensuring the project's sustainability through continued funding and support is also crucial

Recommendations:

- Implement surveys or tracking methods to assess the long-term influence of the project on students' career choices and interests in STEM fields.
- Consider strategies to extend the program to more schools, especially in rural or underserved areas, to maximize the project's societal impact.
- Enhance partnerships with educational authorities to integrate these visits more systematically into the national curriculum and ensure sustained support for the initiative.

## Methods and limitations

### Methods

The evaluation is based on documentary evidence and online interviews with the representatives of Administrative Unit.

The documentary inputs to the evaluation were:

- Evaluation Protocol that guided the process
- Terms of Reference
- Administrative Unit’s self-assessment report
- Administrative Unit’s impact cases
- Administrative Unit’s research groups evaluation reports
- Bibliometric data
- Personnel and funding data
- Data from Norwegian student and teacher surveys (only for HEI’s)

After the documentary review, the Committee held a meeting and discussed an initial assessment against the assessment criteria and defined questions for the interview with the Administrative Unit. The Committee shared the interview questions with the Administrative Unit at least two weeks before the interview.

Following the documentary review, the Committee interviewed the Administrative Unit in an hour-long virtual meeting to fact-check the Committee’s understanding and refine perceptions. The Administrative Unit presented answers to the Committee's questions and addressed other follow-up questions.

After the online interview, the Committee attended the final meeting to review the initial assessment in light of the interview and make any final adjustments.

A one-page summary of the Administrative Unit was developed based on the information from the self-assessment, the research group’s evaluation reports, and the interview. The Administrative Unit had the opportunity to fact-check this summary. The Administrative Unit approved the summary.

The Committee judged the information received through documentary inputs and the interview with the Administrative Unit sufficient to complete the evaluation.

## List of administrative unit's research groups

| Institution | Administrative Unit | Research Groups |
|---|---|---|
| University of Stavanger | Department of Mathematics and Physics | Geometry and Analysis |
| | | Materials Physics* |
| | | Statistics |
| | | Theoretical Subatomic Physics and Cosmology* |

* Evaluated in the Evaluation of Natural Sciences (2022-2024), EVALNAT

## Terms of Reference (ToR) for the administrative unit

The board of University of Stavanger (UiS) mandates the evaluation committee appointed by the Research Council of Norway (RCN) to assess the UiS Department of Mathematics and Physics based on the following Terms of Reference.

**Assessment**

You are asked to assess the organisation, quality and diversity of research conducted by the UiS Department of Mathematics and Physics as well as its relevance to institutional and sectoral purposes, and to society at large. You should do so by judging the unit's performance based on the following five assessment criteria (a. to e.). Be sure to take current international trends and developments in science and society into account in your analysis.

a) Strategy, resources and organisation

b) Research production, quality and integrity

c) Diversity and equality

d) Relevance to institutional and sectoral purposes

e) Relevance to society

For a description of these criteria, see Chapter 2 of the mathematics, ICT and technology evaluation protocol. Please provide a written assessment for each of the five criteria. Please also provide recommendations for improvement. We ask you to pay special attention to the following 4 aspects in your assessment:

1. The balance between time spent on research, on teaching, and on administrative tasks, in a national and international context. If possible, suggest actions that may be taken to adjust this balance to national and international standards.
2. The national and international visibility and brand of the group/institution. If possible, suggest actions that may be taken to strengthen the visibility. Does the brand and visibility correctly represent the actual scientific quality?
3. The research group's potential for acquiring EU-funding, in particular ERC-consolidator/advanced grants within the coming 10-year period. If possible, suggest actions that can be taken to develop this potential.
4. The research group's potential for acquiring national public and/or private external funding within the coming 10-year period. If possible, suggest actions that can be taken to develop this potential.

In addition, we would like your report to provide a qualitative assessment of the UiS Department of Mathematics and Physics as a whole in relation to its strategic targets. The committee assesses the strategy that the administrative unit intends to pursue in the years ahead and the extent to which it will be capable of meeting its targets for research and society during this period based on available resources and competence. The committee is also invited to make recommendations concerning these two subjects.

### Documentation

The necessary documentation will be made available by the mathematics, ICT and technology secretariat at Technopolis Group.

The documents will include the following:

a report on research personnel and publications within mathematics, ICT and technology commissioned by RCN

a self-assessment based on a template provided by the mathematics, ICT and technology secretariat

### Interviews with representatives from the evaluated units

Interviews with the UiS Department of Mathematics and Physics will be organised by the evaluation secretariat. Such interviews can be organised as a site visit, in another specified location in Norway or as a video conference.

### Statement on impartiality and confidence

The assessment should be carried out in accordance with the Regulations on Impartiality and Confidence in the Research Council of Norway. A statement on the impartiality of the committee members has been recorded by the RCN as a part of the appointment process.

The impartiality and confidence of committee and panel members should be confirmed when evaluation data from UiS Department of Mathematics and Physics are made available to the committee and the panels, and before any assessments are made based on these data. The RCN should be notified if questions concerning impartiality and confidence are raised by committee members during the evaluation process.

### Assessment report

We ask you to report your findings in an assessment report drawn up in accordance with a format specified by the mathematics, ICT and technology secretariat. The committee may suggest adjustments to this format at its first meeting. A draft report should be sent to the UiS Department of Mathematics and Physics and RCN. The UiS Department of Mathematics and Physics should be allowed to check the report for factual inaccuracies; if such inaccuracies are found, they should be reported to the mathematics, ICT and technology secretariat within the deadline given by the secretariat. After the committee has made the amendments judged necessary, a corrected version of the assessment report should be sent to the board of University of Stavanger and the RCN no later than two weeks after all feedback on inaccuracies has been received from the UiS Department of Mathematics and Physics.

## Appendices

1. Description of the evaluation of EVALMIT
2. Invitation letter to the administrative unit including address list
3. Evaluation protocol
4. Template of self-assessment for administrative unit (short-version)

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