KoF/ÖB 2024

Faculty of Science and Technology

Department Self-Evaluation

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| Department: | Department of Physics and Astronomy |
| Section: | Physics |
| Head of Department: | Richard Brenner |

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| **Goals:**   * Maintain and strengthen our **research quality**   + Through program and department self-reflection on strengths and weaknesses   + Through developing program and department priorities for the next 5 years   + Through internal and external feedback on our performance and plans * Strengthen our **collegial culture**   + By involving all research staff in the process and ensuring everyone is aware of the results   + By being respectful of everyone’s time at the faculty, department, and program levels   + By communicating clearly as to why we are doing this and how we expect everyone to contribute * Improve our **internal understanding**   + By collecting information on the different ways programs and departments are funded and operate   + By collecting explanations of why we work that way and how it supports our research * Improve our **resource usage**   + By generating bottom-up prioritized research plans at the program, department, section, and faculty-levels   + By allocating and re-allocating resources based our priorities and the potential to significantly improve research   + By identifying opportunities for intra- and inter-program/department/section collaboration and re-organization |

**Introduction**

Be sure to regularly [check the faculty KoF24 and ÖB webpage](https://www.uu.se/en/staff/faculty/science-and-technology/the-facultys-research-evaluation---quality-and-renewal---kof24) for updates, clarifications, details, timelines, and answers to common questions.

**Background on KoF and ÖB**

This evaluation combines two processes: the university-wide Quality and Renewal (KoF) process and the faculty-level Review of Base Financing (ÖB). These are being combined to avoid significant duplication of effort. However, they have different goals which makes combining them a challenge. For example, the first three goals above are KoF-focused while the last is ÖB-focused. Most importantly, KoF is a reflective process where we strive to identify both our strengths and weaknesses, while ÖB is an evaluative process where we strive to identify the best opportunities for using our resources.

This causes an inherent concern: will admitting to weaknesses in KoF make us less likely to get resources from ÖB? While there is no way to completely eliminate this concern, this evaluation has been designed with the ÖB portion focusing on identifying Priorities to improve/strengthen/broaden research while the KoF portion focuses primarily on reflecting on our processes.

This provides the ability to be open about weaknesses while ensuring prioritization of high-quality ideas, as

1. Using Priorities allows us to identify concrete opportunities to improve our research, thereby allowing reflection on not just where we are currently excellent but where we can become better, and,
2. Using an internal, bottom-up prioritization process at the program, department, section, and faculty-levels allows us to identify the most promising and high-quality proposal for potential funding at each level.

**Expectations**

There is understandably a strong focus on the “new” funds that will be allocated as part of the ÖB process. However, these funds are small in comparison to the yearly budget, and the Faculty strongly encourages everyone to look to the four goals listed on the first page for the main value of this process. Please be aware that this report will be a public document and will be placed on the faculty website for all employees to access.

**Time period**

This evaluation pertains to the period since the last evaluation: 2019-2023 inclusive. Descriptions provided by the programs should cover the full evaluation period. However, centrally provided statistics on bibliometrics (2017-2021/2022) and financial data (2022-2023) cover slightly different time periods.

**Responsibility**

The Head of Department (HoD) has the overall responsibility for the department self-evaluations and the Program Responsible Professor (PAP) has the overall responsibility for program self-evaluations. This includes ensuring that the information provided is both sufficiently accurate and not misleading. It is important to be open, even about activities that are not as successful as we may wish.

The HoD/PAP is responsible for coordinating meetings with the appropriate people, collecting input, leading appropriately broad and inclusive discussions, prioritizing among suggestions, and summarizing and producing the final text. Most economic and HR data will be provided centrally, but for the information that needs to be collected locally, the HoD/PAP is responsible for coordinating with the appropriate people. The HoD is responsible for ensuring that the programs provide drafts to the department early enough that the department can use them as input to the department’s self-evaluation.

**Panels**

The panels will provide input on how programs and departments can improve, provide new perspectives on potential organizational changes across programs and departments, help in identifying good examples that can be shared across the faculty, and place our research quality in the international context. While this input is extremely helpful for identifying directions, decisions and prioritization will be done within the faculty using the panel’s feedback as one input.

**Instructions**

**Base data**

Base data such as bibliometrics, HR and financial data will be provided centrally. Details on how the data was collected and how to interpret it will be found in the Base Data Information document on the Faculty KoF webpage.

**Note**

While it is understandable that every program and department will want to look as good as possible, this process is most valuable when everyone is open and honest. In particular, please try to avoid the following:

1. Activities (funding, projects, publications, hires etc.) that ended before the evaluation period or started after it should not be included. If it is extremely important to include such, e.g., very recent recruitments that significantly affect future plans, the text must clearly indicate that the activity falls outside the evaluation period and why it is being included.
2. Cramming in more text by changing the font size, layout, margins, text box sizes, etc. will not be accepted. It is understood that the space limitations will lead to the need for careful prioritization.

The four answer sizes used are:

* Very short – 1.4cm tall box, approximately 250 characters
* Short – 3cm tall box, approximately 600 characters
* Medium – 4.7cm tall box, approximately 950 characters
* Long – 10cm tall box, approximately 2000 characters

Do not change the ordering or labeling of the questions in the document, as the final answers will be extracted from the document based on that ordering and labeling.

**Before submission**

[Check the KoF/ÖB webpage on the employee portal for any important updates](https://www.uu.se/en/staff/faculty/science-and-technology/research).

**Hide instructions**Modify the “Instructions” style so all colored text is hidden in the submitted document. First, check that you have the “Show/Hide Formatting Marks” turned off then right-click on the style “Instructions” in the ribbon at the top of the window. Then select “Modify” and then “Format” at the bottom left. Choose “Font” and turn on the “Hidden” option and click the OK button.

**Navigation panel**

To quickly navigate through the document, you can use the Navigation panel. To see the Navigation panel, click the “View” tab in the ribbon and then check the “Navigation Panel” checkbox in the “Show” button group or choose “SidebarNavigation” from the “View” menu. In the Navigation Panel you can view the outline of the document and search for specific words or phrases.

**Submission**

Last day for submission is May 15 2024. It is important to submit the document as a Word file as we will be extracting text from the tables to put all answers in a database. How to submit the document will be detailed later.

**Updates**

* V3
  + Revised bibliometrics table (3.5) as data in the first two rows were in the wrong row.
  + Clarified in table 3.1 that Top-10 external funding shows the amount spent on each financier during the year.
  + Corrected data for some programs with regard to “UL, promoted from an adjunct” being included in the category “Other Research”. Those concerned have been informed by e-mail.
  + Added a box where the department can ask questions to the panel.
* V2   
  Revised bibliometrics table to have only one coverage statistic (3.5). This statistic reflects the proportion of DiVA publications used for citation statistics calculations by CWTS Leiden, instead of reporting the Web of Science coverage (WoS coverage). For WoS coverage statistics, see the base data document. The intended goal is to put increased focus on the impact indicators and their validity. An earlier reference to reflect on trends has also been removed (3.5.1).
* V1   
  Initial version

# General information

Responsibility: HoD in discussion with department leadership.

## Process for creating this self-evaluation

**Instructions**: Describe the process to generate this self-assessment, how it was collegial, and list which categories of employees (e.g., Professors, ULs, BULs, postdocs, PhDs, researchers, etc.) were significantly involved.

Motivation: To emphasize that this is to be a collegial process and the department should work to include a wide range of input.

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| Dept leadership (1 HoD, 7 assistant HoDs, Physics dean) took overall responsibility, from congregating input from all 14 programs to writing the report. Process and priorities discussed at several dept retreats (also incl PhD students and dept board). Priorities were identified already in 2023 in a dept wide strategy process. |

## Personnel (data provided centrally)

**Instructions**: Postdocs who are on stipend need to be listed separately in parentheses. (Example: if there are 4 postdocs on salary and 3 on stipend, please enter “4 (+3)”.)

Motivation: To understand the department’s personnel distribution by career stage and gender. This data shows the number of FTEs (full-time equivalent) employees in each category.

Responsibility: Data provided centrally; HoD to review to ensure no significant mistakes are made. Note that stipend postdocs are not present in the university salary system and will need to be manually accounted for if they are to be included. If this table is changed to add stipend postdocs, please note the changes in the “other important department-specific comments” section below as well.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Faculty FTEs** | | | | **Non-Faculty FTEs** | | | | | |
|  | **Professor** | **Associate (UL)** | **Assistant (BUL)** | **Total** | **PhD** | **Postdoc** | **Researcher** | **Other**  **Research** | **Other** | **Total** |
| **Female** | 4.6 | 8.5 | 0.0 | 13.1 | 28.6 | 4.0 | 8.9 | 3.4 | 15.4 | 60.3 |
| **Male** | 28.3 | 26.0 | 2.7 | 57.0 | 56.8 | 18.9 | 60.5 | 26.8 | 11.0 | 173.9 |

## Finances

### Overall research funding in MSEK (data provided centrally)

Motivation: To understand how a department is funded across the main sources of income.

Responsibility: Data provided centrally; HoD to review to ensure no significant mistakes are made.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **FFF+SFO Internal Research** | **Other Internal Research** | **Total Internal Research** | **External Research** | **Total Research** | **External Research %** | **Teaching** | **Teaching %** |
| **2023** | 76.7 | 57.2 | 133.9 | 207.3 | 341.2 | 52% | 61.2 | 15% |
| **2022** | 75.3 | 65.3 | 140.6 | 196.6 | 337.1 | 49% | 66.6 | 16% |
| **Average** | 76.0 | 61.2 | 137.3 | 201.9 | 339.2 | 50% | 63.9 | 16% |

### Research program sizes and research funding in MSEK and percent (data provided centrally to the programs)

**Instructions**: Data will be provided centrally either pre-filled in the form or in an external document. The data will list the research programs in the department and the number of FTE faculty (Prof/UL/BUL, but not adjunct or guests), as well as the internal funding (FFFs, SFOs, and other 210) and External (220 and 230) for 2022. These numbers should be taken from the data provided centrally to the programs.

Motivation: To understand the department’s research areas and relative sizes.

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| --- | --- | --- | --- | --- |
| Research program | FTE Faculty | FFF+ SFO Internal (Long-Term) (FFF+SFO) | Internal total | External |
| Condensed Matter Physics of Energy Materials | 5.7 | 7.5 (29%) | 10 (39%) | 15.8 (61%) |
| Physics Education Research | 1.5 | 3 (58%) | 4.7 (91%) | 0.4 (9%) |
| High Energy Physics | 7.3 | 11.1 (50%) | 12.9 (58%) | 9.5 (42%) |
| Instrumentation and Accelerators | 3.3 | 1.2 (2%) | 14.4 (28%) | 36.6 (72%) |
| Nuclear Physics | 4.4 | 7.7 (47%) | 12 (73%) | 4.5 (27%) |
| Chemical and Biomolecular Physics | 5.2 | 6 (32%) | 8.7 (46%) | 10.2 (54%) |
| Quantum Matter Theory | 4.4 | 4.3 (26%) | 8.3 (51%) | 8.1 (49%) |
| Materials Physics | 5.3 | 5.6 (28%) | 7.3 (37%) | 12.6 (63%) |
| Materials Theory | 6.5 | 9.1 (24%) | 12.2 (32%) | 26.2 (68%) |
| Observational Astrophysics | 4.8 | 3.8 (21%) | 5.5 (30%) | 12.6 (70%) |
| Space and Plasma Physics | 0.3 | 0.7 (75%) | 1 (100%) | 0 (0%) |
| Theoretical Astrophysics | 2.9 | 3.4 (24%) | 5.3 (38%) | 8.6 (62%) |
| Theoretical Physics | 9.9 | 6.5 (20%) | 11.5 (35%) | 21.8 (65%) |
| Applied Nuclear Physics | 8.2 | 5.3 (17%) | 7.8 (26%) | 22.6 (74%) |

### Basic funding expectations and policy for using internal resources

**Instructions**: Explain the standard funding distribution between internal research funding (FFFs, department resources, and other 210 funds), external grants, and teaching that faculty (Assistant, Associate, Professor) and non-tenure staff (researchers, adjuncts) receive. Describe the policy for distributing internal resources (FFFs, department resources, and other 210 funds, including studiestöd, startbidrags, and co-funding). Include a description of how faculty members at each level (Assistant, Associate, Professor) receive research support and are funded. Explain any implicit or explicit policies regarding holding external grants and allocation of internal resources. Include a brief overview of other uses of internal resources, for example: extra support for particular roles (e.g., PAP, FUAP), startup packages (for new faculty), allocation of studiestöd, department policies for FFFs or institution resources, funding of joint facilities/infrastructure, co-funding for grants, paying for PhDs/postdocs, etc. If these policies are left to the programs, describe what the department sees as strengths and weaknesses in having a different policies in the same department.

Motivation: To understand how departments view the use of internal resources and teaching to support members and activities.

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| The funds from faculty to programs (FFF) are distributed according to the distribution in the faculty work program (VP). The department tax the program resources by a small amount for common strategical investments. The department resources are used strategically for start-up packages, support for co-funding excellence grants, support to infrastructure investments etc. but also to support assistant heads of departments and unit leaders. The support for PhD students (studiestöd) are distributed 50% based on accomplishment and 50% on research programs’ FFF allocation. |

### Use of internal research funds in MSEK (data provided centrally)

Motivation: To understand how the department is using internal research funding.

Responsibility: Data provided centrally; HoD to review to ensure no significant mistakes are made.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Faculty Salary | Non-Faculty Salary | Other Personnel Costs | Premises | Equipment Depreciation | Overhead | Running Costs | Total |
| 2023 | 43.2 (30%) | 39 (27%) | 2.2 (2%) | 20.8 (15%) | 5.2 (4%) | 24.6 (17%) | 8.1 (6%) | 143.1 |
| 2022 | 43.1 (30%) | 40.4 (28%) | 2.3 (2%) | 21.4 (15%) | 5 (3%) | 24.1 (17%) | 9 (6%) | 145.2 |
| Average | 43.1 (30%) | 39.7 (28%) | 2.2 (2%) | 21.1 (15%) | 5.1 (4%) | 24.3 (17%) | 8.6 (6%) | 144.1 |

### Personnel funding (data provided centrally)

Motivation: To understand how funding is used across different employment categories and genders. This data shows how staff are funded on average across internal and external research funding as well as teaching.

Responsibility: Data provided centrally; HoD to review to ensure no significant mistakes are made.

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| --- | --- | --- | --- | --- | --- | --- |
|  | Female | | | Male | | |
|  | Internal | External | Teaching | Internal | External | Teaching |
| Professor | 73% | 13% | 14% | 62% | 17% | 21% |
| Associate (UL) | 39% | 32% | 29% | 46% | 25% | 29% |
| Assistant (BUL) | 100% | 0% | 0% | 62% | 11% | 27% |
| PhD | 37% | 57% | 6% | 32% | 58% | 10% |
| Postdoc | 15% | 85% | 0% | 11% | 89% | 0% |
| Researcher | 26% | 66% | 8% | 18% | 70% | 12% |

### Major infrastructure support

**Instructions**: Identify the five most significant research infrastructures supported by (e.g., paid for by) the department from the department’s perspective, which may or may not coincide with the programs’ own prioritization. For this purpose, infrastructures are resources that are too expensive for an individual PI to afford and are therefore organized and funded as shared resources. Specify the level of sharing (program, department, university, national, or international) and whether it is located at Uppsala or elsewhere. Provide the approximate amount spent to support the infrastructure directly by the department (e.g., from department funds and not from the programs’ own funds or FFFs) and by others in the department (e.g., program funds and PI grant expenditures) as x.xM SEK. Infrastructure costs should not include travel to the infrastructure (as travel for research is not infrastructure-specific) nor salary time while using the infrastructure (as research time is not infrastructure-specific), but can include salary costs of engineering staff and explicitly agreed upon in-kind salary contributions. (Departments with more than 200 employees – IT, Physics and Astronomy, Chemistry Ångström, and Earth Sciences – may list up to nine significant research infrastructures.)

Motivation: To understand what important infrastructure is being supported by the department and how much it costs, and to support the faculty’s ongoing work on developing an infrastructure policy

Responsibility: HOD in discussion with programs, economic administrator for costs.

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| --- | --- | --- | --- | --- |
| Infrastructure | Sharing | Location | Dept. Funding | Prog/PI Funding |
| FREIA laboratory | IFA | UU |  |  |
| Ångström machine workshop | IFA | UU |  |  |
| The Swedberg Laboratory | IFA | UU |  |  |
| Infrastructures in programs supported by department infrastructure funds that can be applied for. |  |  |  |  |
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## Other important comments

**Instructions**: Explain any important issues not addressed above or misrepresented by the above data that need to be clarified for the panel to give valuable feedback. If the department has an important role in supporting the university or nation, such as a mandate from the government or university, please describe it here. Please keep these precise and relevant.

Motivation: To bring important and special issues to the view of the panel and faculty.

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| I addition to the tree local infrastructures, the department is involved in many local/national/international infrastructures trough programs. The support to investments in infrastructures can be applied from the department infrastructure funds. |

# Follow up on goals set in the last evaluation

Responsibility: HoD in discussion with department leadership.

## Reflections on accomplishments and setting goals this time

**Instructions**: Reflect on whether the goals from the last evaluation (ÖB Section D1 for programs and KoF17 Section 1b for departments) were appropriate in retrospect, what has been accomplished towards them since the evaluation, and what we can learn from them about setting effective goals this time. The previous evaluations [are ailavable on the faculty KoF webpage](https://www.uu.se/en/staff/faculty/science-and-technology/the-facultys-research-evaluation---quality-and-renewal---kof24) to support this reflection for the programs, departments, and panels.

Motivation: Try to learn from what we did last time to be able to set more effective goals this time.

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| The departmental structure was identified to be complex and the cooperation between divisions to be improved. The department started in 2019 a project “Styr&Led” to improve the leadership of the strategic processes and cooperation between divisions and programs. The project resulted in a new organization with 3 topical research units and an infrastructure unit that was started in 2024. The administration was also reorganized to better meet the needs of the divisions and programs. During the last 5 years we have also split 2 large programs into 4 new programs, as discussed in ÖB19. |

# Area 1: Research Quality (evaluation of outcomes and processes)

Responsibility: HoD in discussion with department leadership.

## Top external funding sources (data provided centrally)

Motivation: To see the amount spent on each financier during the year.

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| --- | --- | --- | --- |
| Funding Agency | 2022 | Funding Agency | 2023 |
| Swedish Research Council (VR) | 70.7 | Swedish Research Council (VR) | 74.5 |
| Other private companies (Swedish) | 36.7 | Wallenberg Foundation (KAW) | 33.0 |
| Wallenberg Foundation (KAW) | 27.3 | Other private companies (Swedish) | 18.6 |
| European Research Council (H2020) | 17.5 | European Research Council (H2020) | 16.1 |
| Swedish Energy Agency | 7.1 | Swedish Energy Agency | 8.7 |
| Swedish Foundation for Strategic Research (SSF) | 6.0 | Olle Engkvist Foundation | 4.9 |
| Swedish Radiation Safety Authority | 4.4 | Other non-profit (outside the EU) | 4.1 |
| Swedish National Space Agency | 3.7 | Swedish Radiation Safety Authority | 3.2 |
| Regeringskansliet (se även UD) | 3.0 | Swedish National Space Agency | 3.2 |
| EU Commission (Other) | 2.6 | Swedish Foundation for Strategic Research (SSF) | 2.8 |

## Reflections on external funding

**Instructions**: Reflect on what the department generally expects from its staff (at the postdoc, researcher, Assistant, Associate, and Professor levels) in regards to applying for and receiving external funding, how the department communicates those expectations, how the department supports staff in applying for funding through feedback and mentoring, and what opportunities and challenges the department sees in the future for continued and new external funding. Describe initiatives the department takes to form consortia to apply for larger grants and what groups in the department organize those initiatives. (Departments with more than 200 employees – IT, Physics and Astronomy, Chemistry Ångström, and Earth Sciences – may provide up to 800 characters.)

Motivation: Connect how the department works with external funding to the achieved funding results.

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| Large part of research paid by external grants: we are top-4 dept in TekNat in relative external grant income, despite majority being basic science, also reflected in high success rates at VR,ERC,KAW. All active research staff is expected to apply for grants, communicated and supported primary through the programs. Grouping programs within 3 thematic units now allows for more cross-program coordination. Also, monthly PAP meetings and an assist dept head (0.1 FTE) focusing on research for coordination. Challenges: keep top researchers with excllence grants (3 ERC,2 WAF,1 VR CoG grantees recently left us), plan large grant applications (basic: KAW, ERC, and applied: EU consortia, SSF etc.) across programs and outside UU, navigate EU funding for more applied research and infrastructure, cover the OH locally that is not paid by funding agencies. Contract research is important, but needs to be balanced with our basic and applied free research. |

## Reflections on encouraging and supporting major excellence grants

**Instructions**: Describe the initiatives and support the department provides for applying for major excellence grants such as ERC, KAW project, and KAW scholar. Reflect on how these are communicated and how successful they have been in producing, prioritizing, and improving applications. Describe who is targeted, what criteria are used to assess if particular applicants are competitive, and how feedback is provided.

Motivation: Learn how the department works to encourage applying for the most prestigious grants.

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| During evaluation period: 11 ERC, 14 KAW projects, 7 WAFs, and 5 KAW Scholars 2024, likely making us most successful dept (and section) at UU. All faculty encouraged to apply for ERC, KAW. As TekNat stopped supporting unfunded OH cost, the dept now covers part of this for ERC, KAW Scholar and project for further encouragement. KAW applications are prioritized in programs, units, and dept before sent to TekNat, allowing us to strengthen applications in several steps. Centralized process to encourage/coordinate ERC,WAF applications from young researchers w/o a faculty position (internal and external), viewing it as an excellent way to renew our activities. Lack of long-term faculty support for grantees is a however a problem. |

## Department level PhD students (data provided centrally)

**Instructions**: The data will include the number of active PhD students, the gender balance, the number admitted/graduated, and the net study time at graduation during the evaluation period.

Motivation: To see the overall graduate student education throughput and the

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| --- | --- | --- | --- | --- | --- |
|  | 2018 | 2019 | 2020 | 2021 | 2022 |
| Active | 207 | 192 | 160 | 146 | 144 |
| % Female | 27% | 8% | 28% | 32% | 13% |
| Admitted | 29 | 24 | 27 | 15 | 23 |
| Graduated | 26 | 26 | 18 | 28 | 15 |
| Net study time at graduation | 4.8 | 4.9 | 4.5 | 4.8 | 4.7 |

### Reflections on PhD student trends

**Instructions**: Reflect on the trends shown in the data for PhD students for the department as a whole over the past 5 years. Comment on both the absolute numbers today and the relative changes over time, as well as the gender balance and whether and why the net study time deviates significantly from the standard 4-years (5-years with 20% teaching or service).

Motivation: Understand the department’s overall PhD situation and the department’s perspective on it.

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| (Note that the numbers of active and % females are wrong). The number of PhDs is rather stable (130-160) with a slow increase in female students since 2018, up to around 30% FTEs (32% for individuals), which reflects the gender balance in physics. The dips in degrees 2020 and in admissions in 2021 are mainly due to Covid. An overall downward trend in new admissions is seen at the faculty, but for our department admissions are more constant. The net study time, which is monitored annually by the faculty, is above 4 years. The uncertainty in actual net time is largely due to error-inducing reporting routines (faculty and university level). PhDs tend to report less teaching and departmental duties than they actually do. |

## Department bibliometrics for 2017-2021/2022 (data provided centrally)

Motivation: Provide an overview of how the department is performing that is reasonably comparable to other programs and departments. (See the Base data information document for the meaning of each statistic.)

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|  | Type of Indicator | 2017-2022 |
| Number of publications, full publication set (full / fractional counts) | Quantity | 4944 / 2240 |
| Proportion of publication fractions at the Norwegian model level 2 (%) | Impact | 38% |
|  |  | 2017-2021 |
| Coverage (fractionalised): Proportion of publications from DiVA included in citation statistics, weighted by fractional counts | Coverage | 44% |
| Mean normalized number of citations per publication (MNCS) | Impact | 1.05 |
| Proportion of frequently cited publications (top 10%) (PP(top 10%)) | Impact | 10% |

### Reflections on bibliometric statistics

**Instructions**: Reflect on PP(top 10%) and MNCS for the department. If the department’s coverage is low, comment on why that is the case, and reflect on the Norwegian model statistics instead.

Motivation: Understand the department’s overall publication output and the department’s perspective on it.

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| Bibliometric for whole dept is hard to interpret as the publication cultures varies widely: from CERN-sized collaborations to single-author theory work, and sometimes also with alphabetical author lists. This leads to by far most publications in TekNat, but also low coverage and errors in the statistics in some fields, as well as a locking to the publication conventions in the field or collaboration. Still, looking at the provided publication statistics per program, many of our programs perform very well internationally in their field, e.g. all top-3 programs in the faculty for Norwegian model 2 are from our dept. |

## Reflections on research program sizes

**Instructions**: Research programs require a reasonable size to be large enough to drive a research direction while not being so large that shared priorities and directions become difficult to achieve. Reflect on the range of research program sizes in the department and how the current sizes help or hinder research. (Departments with more than 200 employees – IT, Physics and Astronomy, Chemistry Ångström, and Earth Sciences – may provide up to 800 characters.)

Motivation: A reasonable number of faculty members is required for research programs to achieve their purpose of providing a collegial environment that can develop and support diverse ideas and knowledge around a shared core research direction. For research programs with very few faculty, or very many, it is important to reflect on how this can be achieved.

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| We have several small programs (FFFs and/or faculty), but most are organized in divisions with other programs, which gives a larger and broader environment (e.g. Astronomy and Space Physics, Materials Theory, X-ray Photon Science) not making the program size a problem. Further recent organization in 3 thematic units also enhances cross-program communication and activities. For some programs with little FFF, extra internal funding has also been available (as grant co-funding or special arrangements), however it makes the financial situation not long-term stable. Several programs have pointed out an unbalance between FFFs and number of faculty, resulting in uneven research salary support for faculty members. The reasons behind this are complex, in part driven by different recruitment strategies. No program is perceived as being too large, the dept split 2 large programs into 4 in the last 5 years. |

## Reflections on cooperation across the section

**Instructions**: Reflect on how the department cooperates with others within its section (e.g., regular joint meetings/discussions, specific projects/initiatives, teaching collaboration, etc.) and how that cooperation could be strengthened, or, if the cooperation is unlikely to yield benefits, how it should be reduced. For sections with a single department, reflect instead on how cooperation within the department.

Motivation: Understand how the department works within its section and what it sees as the benefits.

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| IFA is the only dept in the Physics section. When TekNat prioritizes at dept level we become underrepresented, but at section level we are appropriately represented. IFA: 14 programs (organized in 10 divisions) and grouped into 3 thematic units + infrastructure unit since 2024. Units level aims to provide intermediate-level collegial discussions and prioritization, between programs and dept leadership, which has so far worked well for prioritization of grant applications and in KoF. PAPs also meet monthly for discussions. Lunch-to-lunch strategy retreats with PAPs, division heads, board, and dept leadership every semester. |

## Reflections on ensuring good research ethics

**Instructions**: Reflect on the department’s initiatives and challenges with regards to ensuring good research ethics. Describe the formal and informal initiatives the department takes to teach and promote good research ethics across all research staff, and what particular challenges the department faces in these regards.

Motivation: Understand how the university’s priority for ensuring good research ethics is addressed.

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| All PhD students take compulsory ethics course. Half-day course for supervisors in dept in 2024. The programs take the majority of the responsibility for informal and recurrent discussions, see program KoF reports. |

## Reflections on creating and ensuring research freedom

**Instructions**: Reflect on the department’s initiatives and challenges to create and ensure research. Describe the formal and informal initiatives the department takes to create opportunities for research freedom across all research staff, and what particular challenges the department faces in this regard.

Motivation: Understand how the university’s priority for ensuring research freedom is addressed.

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| FFF funding is used for (part of) faculty salaries and gives freedom to choose research topics (but has to also be used to fund teaching). As long as practical/financial constraints are solved, all staff are encouraged to apply for all external research grants. Staff fully on external grants have their projects restricted to the grant. |

## Reflections on what is working well

**Instructions**: From the above, reflect on what is working well and should be continued over the next 5 years. (Departments with more than 200 employees – IT, Physics and Astronomy, Chemistry Ångström, and Earth Sciences – may provide up to 1200 characters.)

Motivation: Require departments to identify where current activities are successful. This will provide the panel with insights into our own self-assessment.

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| During evaluation period: 11 ERC, 14 KAW projects, 7 WAFs, and 5 KAW Scholars 2024, likely making us the most successful dept and section at UU, e.g. 5 out UUs 20 KAW Scholars are from dept. Dept process for KAW prioritization with higher level of coordination during last few years (by centralized process, unit discussions, and dept co-funding of unfunded OH), for overall encouragement and better applications, in addition to support and feedback given already within programs. Centralized process within dept to encourage and coordinate ERC,KAW grants from non-faculty applicants has also resulted in successful renewal of several programs using external funding (new faculty hires). VR StG are also regularly used to provide an independent researcher position for young researchers to later qualify for faculty positions. Overall our department have high success rates and willingness to apply for external grants. Substantial funding from VR and other national/international bodies for large-scale infrastructure also supports and enables many advanced experimental activities. Contract research is used to keep on-site competence within applied fields. Program organizational structure is currently appropriate and the new organization into units will help coordinate and lead our large dept, as well as make us better at exploring cross-program collaborations. |

## Reflections on what needs to be improved

**Instructions**: From the above, reflect on what needs to be improved over the next 5 years. Please focus on areas that need improvement and do not list areas that could be improved but where it is not needed. (Departments with more than 200 employees – IT, Physics and Astronomy, Chemistry Ångström, and Earth Sciences – may provide up to 1200 characters.)

Motivation: Require departments to identify where they feel that they need to invest. This will both provide the panels with insights into our own self-assessment as well as help us improve.

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| Lack of full coverage of OH from grant agencies is a large problem on many grants (ERC,KAW,EU,SSF etc) as it strains program budgets, even preventing applications. Co-funding of at least excellence grants from TekNat is needed and/or a more flexible implementation of OH outtake. Rather static FFF distribution but varying grant success rates creates long-term imbalances, and also leads to faculty, especially younger successful researchers, leaving us. The # of running VR free project grants is also slightly decreasing: 42 in 2017, 45 in 2020, 38 in 2024, and improving this is important for long-term stability of the department. Overall, we should become better at going beyond the program for advice/encouragement/feedback/collaborations on grant applications, since evaluation panels are broad and large applications require multiple competencies. Here the units may be able to contribute. Moreover, there is a lack of both awareness and administrative support for applying for EU funding (beyond ERC) and our total amount of EU funding can clearly be increased. Other challenges involve supporting high-risk activities within methodology and experimental developments, due to the long time period and lack of salary support on VR infrastructure grants. Furthermore, we need to be better to further identify opportunities for collaboration with industry and applied research (also connected to exploring more applied EU funding). |

# Area 2: Career Paths (evaluation of processes)

Responsibility: HoD in discussion with department leadership.

## Career stage distribution implications and plans for the next 5 years

**Instructions**: Describe the implications of the current distribution of faculty across career stages (e.g., Assistant, Associate, Professor from Section 1) for the department currently and in the next 5 years. In particular, identify up-coming faculty retirements and/or recruitments and discuss how the department plans to work with those changes to maintain the department’s core strengths as well as evolve in new directions. Identify programs that may require particular planning or efforts during this time.

Motivation: Provide perspective on the current status and planned future changes in personnel in the department.

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| The department has a poor gender balance in all faculty categories. The management is aware of this and is continuously working on methods to improve the balance (see 4.3). The recruitment of BUL is difficult because of the candidate should have received the PhD degree no more than 5 years before the deadline for application. This leads to us often instead hiring at the UL level, while younger researchers are employed as researchers. We have identified several important retirement replacements, esp programs professors( Material Physics, Observational Astronomy, Materials Theory, and Applied Nuclear Physics), where the department actively participates in planning, including using small external expert groups to guide decisions. |

## Process for identifying the need for faculty recruiting

**Instructions**: Describe how the department works to identify the need to recruit new faculty members, including who is involved and how such discussions are initiated. Be sure to clarify which activities and responsibilities the department takes and which the research programs take.

Motivation: Recruitments define the research direction for the next several decades. Therefore, taking care in how we identify the direction and finding the best people is the most important thing we can do to enable future success. This question encourages reflection on how structured the department is in this process.

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| The department board appoints a strategy committee with the task of following the development of the department's research and teaching with regard to direction and quality. The committee's task is to, in consultation with the program professors and directors of studies, make strategic assessments of the department's future needs for resources in research and teaching. With the recently formed 3 thematic units, we aim to have a useful intermediate level between individual programs and department in this process, where also the unit leaders are part of the dept leadership group. |

### Balancing renewal and continuation in faculty recruiting

**Instructions**: Discuss how the department works to balance recruiting in the directions where there are already significant research activities (e.g., “replacing” a professor upon retirement) vs. identifying new directions. Include who is involved in the discussions, how formalized the discussions are, and what challenges the department faces in balancing. Be sure to clarify which activities and responsibilities the department takes and which the research programs take.

Motivation: It is easy to see the motivation for continuing in the same research direction based on previous success, but research is constantly developing and we need to continually re-evaluate where we should focus. This question encourages reflection on how the department works with that difficult balance.

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| Well in time before retiring program professors, the department appoints an expert group with typically 3 members (1 is experienced local and 2 external). The task is to advise us on the way forward for the research program, taking into account the personnel and financial situation. The expert group can e.g. advise merging of activities, appointing an internal candidate to the position, or external recruitment. The department extensively discusses the recommendations with the program before proceeding. We have also been able to achieve substantial renewal by young faculty members joining through large external grants (ERC,WAF). As long as long-term financial conditions allow, we continue to encourage such recruitments. |

### Balancing external recruitment vs. internal promotion

**Instructions**: Discuss how the department works to balance external recruiting with promoting existing staff. For example: when a program responsible professor retires, how does the department decide whether to recruit a new professor externally or assign the role to a promoted professor? Describe who is involved in the discussions, how formalized these discussions are, and what challenges the department faces in balancing these. Be sure to clarify which activities and responsibilities the department takes and which the research programs take.

Motivation: The idea of bringing in a star is always appealing, but must be balanced with our responsibility to help develop our younger faculty into stars. This question encourages reflection on how (and how formally) the department considers this tradeoff.

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| The department has no target for balancing external and internal recruitment. In case of using an expert group, it evaluates all internal candidates as an input in the process and the dept leadership discuss the options with the research programs. The faculty is then contacted if the recommendation is a faculty recruitment, but the dept has little influence later in this faculty process, only providing the announcement text, where job duties, requirements and assessment of the candidates are specified. With continued encouragement of recruitment of young faculty through excellence grants and/or strong recruitment at the (B)UL level, we foresee a better track record of new faculty integrating well into our activities over time. |

## Ensuring competitive faculty candidates

**Instructions**: Describe what the department does to ensure that there are enough competitive candidates for each faculty position. For example: How does the department identify promising candidates and encourage them to apply, and who is responsible for those activities? What does the department do if there are too few strong candidates or too poor a gender balance in the applicant pool? Be sure to clarify which activities and responsibilities the department takes and which the research programs take.

Motivation: Having competitive and diverse (in terms of gender, research focus, educational background, etc.) candidates in a recruitment significantly increases the likelihood that we will hire excellent researchers. However, we do not always get this result, and more frequently than we wish, we end up with candidate lists that lack diversity in either educational background (e.g., the top candidates may all have educational backgrounds from Uppsala University or Sweden) or gender. This question encourages the department to identify what concrete actions it is taking to attain sufficiently many strong candidates, and how it can handle the situations where this does not occur.

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| When hiring faculty, university rules require that an external search committee is appointed to find suitable candidates. The dept requires that the candidates are contacted and encouraged to apply. The dept also requires that there are strong under-represented gender candidates. We monitor the received applications when the application deadline is approaching and if there are too few strong applicants or the gender balance is poor, we can decide to extend the application deadline or cancel the process. We often also have young researchers on VR StG who are very competitive for our announced faculty positions. |

## Ensuring competitive non-faculty candidates (PhDs, postdocs, researchers, adjuncts)

**Instructions**: Describe what the department does to ensure that there are enough competitive candidates for each non-tenure position. For example: How does the department work/contribute towards identifying promising candidates and encouraging them to apply, and who is responsible for those activities? What is done if there are too few strong candidates or too poor a gender balance in the applicant pool? How does the difficulty in evaluating educational credentials for foreign vs. Swedish students affect recruiting? Be sure to clarify which activities and responsibilities the department takes and which the research programs take.

Motivation: Having competitive and diverse (in terms of gender, research focus, educational background, etc.) candidates in a recruitment significantly increases the likelihood that we will attract excellent researchers. However, we do not always get this result, and more frequently than we wish, we end up with candidate lists that lack diversity in either educational background (e.g., the top candidates may all have educational backgrounds from Uppsala University or Sweden) or gender. This question encourages the department to identify what concrete actions it is taking to obtain sufficiently many strong candidates, and how it handles the situations where this does not occur.

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| All positions are publicly announced trough the university. To open a researcher and adjunct positions a decision by the dept board is required. The job profiles for these positions are typically narrower than for faculty positions. The programs are responsible for finding strong candidates suitable for the position. For PhD and postdoc positions the profile is written by the prospective supervisors. The dept has guidelines for forming interview groups that include staff outside the research group. Using colleagues with experience from non-Swedish environments for assessing foreign credentials is encouraged. A written summary of the PhD recruitment process is required by the dept for admission. |

## Balancing tenure-track (Assistant Professor) and non-tenure track (researcher) recruitments

**Instructions**: Describe how the department uses the tenure-track (Assistant Professor/BUL) and non-tenure track (researcher and adjunct) employment categories and what motivates these choices. If the department has very many or very few of either category, reflect on what benefits there might be to changing the balance and what obstacles there are to doing so.

Motivation: Our tenure-track system is designed to provide a career path for young researchers and an opportunity for us to take risks on people with limited track records. However, the potential permanent commitment of a faculty position and the age-limit for applying make these positions difficult to motivate in some cases. This question encourages the department to reflect on how it is assessing these risks and whether the resulting balance is beneficial in the long run.

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| As pointed out in 4.1 the recruitment of BUL is difficult because of the narrow time window. For this reason we have fewer BULs than we wish. Another motivation for hiring ULs over BULs is to offer permanent researchers, often funded on their own grants, a career path (in competition with external candidates). When initiating the recruitment process by applying to the dept board for a position the level of recruitment needs to be motivated in the application letter. The level of recruitment is also judged by the strategy committee. |

### Career paths for non-tenure-track permanent staff

**Instructions**: Describe how the department works with long-term career paths for non-tenure-track permanent staff (researchers and adjuncts). In particular, how is long-term financing handled and how do staff in these positions affect tenure-track recruiting decisions.

Motivation: This question encourages the department to reflect on what it does to help build the careers for permanent staff who do not have tenure-track positions. This is important as an imbalance in support can lead to non-tenure-track employees feeling undervalued.

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| Our non-tenure permanent staff primarily consists of researchers categorized as such for various reasons: lack of available faculty positions in their field, unsuccessful attempts to secure tenure, or being labeled researchers under Swedish employment regulations but working as senior postdocs. We aim to provide researchers the opportunity to apply for tenure positions, whenever available but always in external competition and also to apply for Docent status. If a researcher secures a highly competitive grant (ERC,WAF), a faculty position may be created without external competition thanks to uni rules. We regularly use this as a successful way of renewal, as the new faculty comes in with good (external) start-up funds. |

## Career support

### Addressing Swedish/English language barriers

**Instructions**: Describe how the department works with language challenges, in particular with regards enabling staff to be able to teach introductory (Swedish-language) courses and participate in department-, faculty-, and university-level leadership roles. Describe how these challenges are addressed for current employees and how they are described during recruitment.

Motivation: Understand how we balance the need for Swedish-speaking staff with the challenges of recruiting and retaining staff and encourage the department to reflect on how it can work with the implicit Swedish language requirement at leadership levels.

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| The department informs about available language training through the university (also in the job announcements). Additionally, the equal opportunity group hosts a language café. Personnel are encouraged to engage in Swedish conversation with foreign colleagues when suitable. |

### Career support activities for non-tenure-track staff (beyond standard employee dialogs)

**Instructions**: Describe the activities for supporting non-tenure-track (PhDs, postdocs, researchers, adjuncts, etc.) staff in their careers and development. For example: financial support for personal development, mentoring, grant assistance, feedback, career planning, help with job searches, etc.. Explicitly address what support is provided for obtaining the docent and distinguished teacher qualifications for post-PhD staff. Specify if activities are informal (e.g., expected as part of advising/mentoring) or formal (e.g., part of a regular process).

Motivation: Provide details as to how the department works with career development for non-tenured staff and encourage the department to reflect on whether it is providing the right type and amount of support.

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| Career support primarily occurs at the program and division levels. Overall, the department aims to assist non-tenure-track staff in enhancing their CVs, including teaching involvement, pedagogical courses, PhD supervision, and encouragement to pursue the Docent degree. Pedagogical talks with the Director of Studies are offered for all employees. There's no active program or organization for junior faculty at the department level, but it exists at the faculty level. In addition to university-provided language training, the department offers a language café. |

### Career support activities for tenure-track staff (beyond standard employee dialogs)

**Instructions**: Describe the activities for supporting tenure-track staff (Assistant Professors/BULs) in their careers and development. For example: financial support for personal development, startup packages, mentoring, grant assistance, feedback, career planning, co-advising, etc. Include discussions of support for promotion (Assistant to Associate) as well as docent and distinguished teacher qualifications. Specify if activities are informal (e.g., expected as part of advising/mentoring) or formal (e.g., part of a regular process). If the department has very few staff in this category, please reflect on why that is and if that is something the department wishes to address.

Motivation: Provide details as to how the department works with career development for tenure-track staff and encourage the department to reflect on whether it is providing the right type and amount of support.

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| The department currently has very few BULs (currently only 1). Support for them is akin to that provided for non-tenure-track staff and primarily organized through the division/program. The primary focus is on assisting them in understanding and meeting the qualification requirements for tenure in a timely manner. |

### Career support activities for tenured staff (beyond standard employee dialogs)

**Instructions**: Describe the activities for supporting tenured staff (Associate and Professor) in their careers and development. For example: financial support for personal development, mentoring, grant assistance, feedback, career planning. Include discussions of support for promotion (Associate to Professor) as well as docent and distinguished teacher qualifications. Specify if activities are informal (e.g., expected as part of advising/mentoring) or formal (e.g., part of a regular process).

Motivation: Provide details as to how the department works with career development for tenured staff and encourage the department to reflect on whether it is providing the right type and amount of support.

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| Mentorship primarily occurs within divisions and programs. The department actively encourages tenured staff to enhance pedagogical and leadership skills through university training and courses. It also supports pedagogical projects and promotes applications for Distinguished Teacher qualification. Staff are encouraged to pursue promotion to Professorship when appropriate. Selected staff participate in Nobel lunches when laureates visit Uppsala in December. Through information and earlier coordination we have recently started to more actively encourage collaborative grant applications, incl KAW projects. |

## Reflections on what is working well

**Instructions**: From the above, reflect on what is working well and should be continued over the next 5 years. (Departments with more than 200 employees – IT, Physics and Astronomy, Chemistry Ångström, and Earth Sciences – may provide up to 1200 characters.)

Motivation: Require departments to identify where current activities are successful. This will provide the panel with insights into our own self-assessment.

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| Since the KoF evaluation in 2017, the department underwent a reorganization based on panel recommendations to bolster strategic efforts. This reorganization involved the entire department, resulting in improved interdisciplinary connections and communication. Since start of 2024 we are now actively working in thematic units for intermediate-level research strategy planning and coordination, meaning that the collegial strategic planning now aligns well with the line management, which eg facilitates prioritization of funding applications for excellence grants. Engaging personnel in departmental operations is relatively straightforward. The pedagogical aspect thrives, evident in well-attended seminar series and high teacher engagement. PhD and postdoc positions attract numerous applicants. Despite challenges in national funding, the department continues its research requiring costly infrastructure and instrument development over extended periods. Efforts to enhance infrastructure and instrumentation support through synergies are progressing positively. Successful renewal of activities through excellence grants recruitments. |

## Reflections on what needs to be improved

**Instructions**: From the above, reflect on what needs to be improved over the next 5 years. Please focus on areas that need improvement and do not list areas that could be improved but where it is not needed. (Departments with more than 200 employees – IT, Physics and Astronomy, Chemistry Ångström, and Earth Sciences – may provide up to 1200 characters.)

Motivation: Require departments to identify where they feel that they need to invest. This will both provide the panels with insights into our own self-assessment as well as help us improve.

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| The gender imbalance remains significant. Our female faculty are therefore asked to do disproportionate amount of academic service. However, since 2020, our tenure position hires have at least achieved a 50-50 gender split. Yet, the challenge still lies in the low hiring rate for tenure-track staff, which we believe is adversely affecting gender balance (women seem less likely to apply for non-tenure positions than men). Extending the time between PhD graduation and BUL application deadlines from 5 to 7 years may alleviate this issue. Also, the number of qualified applicants for tenured positions falls short of expectations due to less favorable conditions in Sweden compared to other countries and in some fields, stiff competition from industry. Overall, funding for tenured staff (including the majority their own salaries in many cases) relies on successful external grants, posing a challenge within the Swedish system. Teaching is also underfunded, necessitating support from research funding, while stability in funding for technical staff is lacking, particularly due to short-term infrastructure project funding from FA and difficulty securing co-funding from the university. Centralizing infrastructure development into a portfolio approach could facilitate co-funding and ensure continuity in FA support. The department has not been able to sustain a Colloquium program, but efforts are underway to revive the colloquium series, addressing this gap. |

# Area 3: Collaboration and Outreach (evaluation of processes)

Responsibility: HoD in discussion with department leadership.

Collaboration and outreach (“samverkan” in Swedish) should be interpreted to mean activities that reach outside of the university to non-academic partners. Specifically, academic collaborations with other research organizations within academia should be considered part of our research and not collaboration and outreach for this evaluation. To help with this section, here is a partial list of the types of collaboration and outreach that we are striving to achieve:

1. Joint research projects, student/PhD/postdoc/researcher/faculty exchanges/sabbaticals, etc.
2. Advising/consulting, spreading research results/insights, popular science outreach and publications, press interviews, expert panels, etc.
3. Interactions with industry, government, schools, society, media, etc.
4. Academic entrepreneurship, including creating, joining, and advising startups and companies, etc.
5. Feedback of external ideas, challenges, relevant questions, etc., into program(s) or departments.

## Examples of collaboration and outreach enabled by the department

**Instructions**: Provide up to five specific examples of collaboration and outreach activities connected to the department’s research that are particularly important from the department’s perspective. These examples should be ones that the department, beyond the programs, has explicitly contributed to enabling through its efforts or policies. Under “Example and connection” describe the activity and person or organization with whom the collaboration or outreach took place. (e.g., “Expert advice on SUBJECT for COMPANY”, “Popular science book on SUBJECT aimed at AUDENICE”, or “Interview on PROGRAM about SUBJECT”.) Specify the value to the program (e.g., “exposure to new challenges and issues that COMPANY experience on a practical level” or “making the SUBJECT expertise of our researchers visible to the nation”) and the value to the partner (e.g., “insight into how COMPANY can model the physical properties from the chemical composition” or “addressing public concern over the impact of SUBJECT on the environment”). Keep in mind the broad range of collaboration and outreach listed above. (Departments with more than 200 employees – IT, Physics and Astronomy, Chemistry Ångström, and Earth Sciences – may provide up to nine examples.)

Motivation: Provide a list of specific examples of collaboration and outreach activities to motivate the self-reflection below and to serve as a source of examples for others.

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| 1 | Example and partner | Organization of the 13 x 13 lecture series, an engaging outreach activity aiming to popularize science at the department with broad attendance from the general public. |
| Value to the department | Attracting public interest in physics and astronomy; Student recruitment; Giving our staff opportunities to practice popularization of difficult topics to a lay audience |
| Value to the partner | A partial answer to the question “Vad får jag för (skatte) pengarna?”; Satisfied curiosity; Spreading scientific Knowledge; Informing about current research topics |
| 2 | Example and partner | Organization of the online course “Klimat och fysik - för nyfikna” (~1300 registered participants) to disseminate science founded information related to climate change. |
| Value to the department | Societal impact on sustainability; Staff has the opportunity to look deeper into the connection between the science we do and sustainability. |
| Value to the partner | Beneficial for a shift to a more sustainable society; Satisfying the curiosity of the public; Allows the public to make more informed decisions. |
| 3 | Example and partner | We are a major contributor the professional development of the Swedish nuclear industry through our contract education (and also BSc program). |
| Value to the department | Information on the current status of knowledge in the nuclear industry impacting our undergraduate education; Connections in nuclear related industry. |
| Value to the partner | Professional development for staff; Knowledge of latest and upcoming nuclear technology; Widened network by interacting with other participants |
| 4 | Example and partner | Multiple high-school students and teachers visit Ångström Laboratory to make common experiments as well as visits the Foucault pendulum (house 10). |
| Value to the department | Student recruitment; Bridging the high-school curriculum to undergraduate university education. |
| Value to the partner | Enabling experiments not possible in a common high-school lab; Professional development for teachers; Developing the students curiosity. |
| 5 | Example and partner | Large-scale testing and commissioning of accelerators and superconducting cavities for e.g. the MINERVA accelerator at SCK CEN (the Belgian Nuclear Research Centre) |
| Value to the department | International societal impact of our expertise; Funding for fundamental research on accelerators and magnets; Retention of key expertise in the area. |
| Value to the partner | Important part of reducing life-time of long-lived nuclear isotopes in nuclear waste by a factor 100 (from 300 000y to 300y). Production of theranostic radio-isotopes. |
| 6 | Example and partner | The department hosts “Fråga en forskare” on our website, where our staff (first and foremost B. Edvardsson) hosting several hundreds of questions from the general public. |
| Value to the department | Visibility for the department’s activities and researchers |
| Value to the partner | Stimulating interest in STEM subjects in society, in particular younger people curious about exotic aspects of physics in space and on earth. |
| 7 | Example and partner | Many contributions to popular scientific journals, e.g. Forsking&Framsteg, Kosmos, and books e.g. “Världen själv”, “Mörkret vid tidens ände”, translated into several languages. |
| Value to the department | Popularizing our research; Reaching an interested national and international public |
| Value to the partner | Education; Satisfying the curiosity of the public, Spreading scientific knowledge. |
| 8 | Example and partner | Expert advice to the government, e.g. expert advice on artificial intelligence for Swedish prime minister, Sagerska huset 2023, and the Swedish parliament, Riksdagshuset, 2024 |
| Value to the department | Influence of public policy; May lead to sound and scientifically founded government decisions; Visibility of the department to government officials and decision makers. |
| Value to the partner | Has the possibility to ask relevant questions needed to take scientifically founded decisions; Direct connection between government spending on science to public policy |
| 9 | Example and partner | Multiple collaborations with industry and government agencies e.g. Höganäs AB, ABB, Hitachi, Sandvik Coromant, Stena Recycling, FOI, Alleima, SWERIM, SKC, Westinghouse … |
| Value to the department | Bridging the fundamental science performed at the department to questions and applications with shorter time horizon relevant to industry and society. |
| Value to the partner | Knowledge of physical/experimental/modeling limitations there are; Outlook of what may be possible in the close future; Ability to make better informed strategic decisions. |

### What is the department doing to support and strengthen these types of collaborations?

**Instructions**: Describe what the department is doing to both support the development of new collaborations and what it is doing to strengthen the existing ones. For example: policies, initiatives, seminars, meetings, incentives, etc.

Motivation: Reflect on what specific initiatives are being taken that have contributed to the results we are proud of.

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| To incentivize our staff to engage in outreach activates an outreach prize was recently created. The prize will be awarded annually, starting Sept 2024. It is too early to assess the result, but the dept leadership ensures that outreach activities will be more visible and acknowledged, thereby inspiring more of these from our staff.; The department funds the 13x13 lecture series, as well as pays for, and encourages, the use of our teaching laboratories for visiting school classes, the regularity of these visits highlights the value to younger students.; The dept provides material for outreach activities such as SciFest, Arbetsmarknadsdagar etc.; The dept has a full-time communications officer, which strongly helps to make our research visible. |

## Challenges in collaboration and outreach

**Instructions**: Describe what the department sees as its challenges in collaboration and outreach (e.g., financial support, research vs. collaboration/outreach prestige, mismatches between research level and partners’ needs, etc.) and what the department can do or is doing to address them.

Motivation: Reflect on what makes collaboration and outreach difficult and how the department is actively approaching this challenge.

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| The lack of directed funding for outreach activities makes it harder for our staff to find time to engage in these activities. The department works with encouragement, e.g. by the instatement of the outreach prize.; Hard to reach certain audiences for outreach activities, in particular to inspire groups in society that are currently underrepresented in our educational programs. Here we often rely on our already established networks with local middle- and high schools.; The difficulty and inexperience in negotiating contracts with industry partners is seen as a hurdle to increase engagement in industry collaboration. |

## How are collaboration and outreach integrated into the department’s management?

**Instructions**: Describe how and where collaboration and outreach are addressed in the department’s management structure. Is this an appropriate level of integration for the importance the department puts on this type of connection?

Motivation: This question encourages us to reflect on how seriously this issue is being considered based on how tightly integrated it is into the management structure.

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| The department has a communications officer working partly on public outreach. The department leadership is engaged in the collaboration with large industry partners, e.g. the FREIA-SKC CEN contract. The section representative in samverkansberedningen receives compensation to be active within the dept. |

## What support would be helpful at the section/faculty/university level?

**Instructions**: Describe what support (if any) would be helpful to coordinate and/or provide at the section/faculty/university level. Also comment on any coordination/support that is currently done at the section/faculty/university level that would be more effectively handled locally.

Motivation: Some issues are broad enough that addressing them together makes sense, while in other cases doing so leads to more overhead than it is worth. This question encourages the department to reflect on whether there are opportunities here to be more efficient.

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| To ensure that we fulfill our mission of collaborating with the wider community, we need to provide proper incentives to our staff to do so. On the “carrot” side, examples are financial resources, lowering hurdles by proactive legal support, salary increase in the spirit of Distinguished University Teacher / Docent, wide acknowledgment/prices at the university/faculty level. On the “stick” side, requirement for outreach and collaboration activities to receive promotion from BUL to UL to Professor could be an example. The faculty can in this regard support the departments with guidance how to assess these merits, preferably in a manner uniform to the faculty. |

## Reflections on what is working well

**Instructions**: From the above, reflect on what is working well and should be continued over the next 5 years. (Departments with more than 200 employees – IT, Physics and Astronomy, Chemistry Ångström, and Earth Sciences – may provide up to 1200 characters.)

Motivation: Require departments to identify where current activities are successful. This will provide the panel with insights into our own self-assessment.

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| The outreach activities at the department spans the entire range, from school visits, TV appearances, popular scientific fairs, books, magazines and talks, to expert panels and advisors. We gain public recognition for frequent appearances on national television, including E. Stempels, A. Black-Schaffer and U. Danielsson, an important factor in recruitment of students, research and teaching staff.  We strive to continue and expand the successful outreach initiatives, such as the *13x13* lecture series, the online course *klimat och fysik – för nyfikna* as well as site visits from schools. Important work on expert panels and advisory committees for external organizations will be maintained.  We also have strong collaborations with industry and government agencies as stated by our programs. Our departmental infrastructure, as well as the Tandem-laboratory scientifically connected to dept and partly run by dept staff, host very successful collaborations, including above mentioned examples, as well as precise dating of materials for e.g. *Riksantikvarieämbetet*, *Rättsmedicinalverket* and materials characterization for many corporations and organizations. |

## Reflections on what needs to be improved

**Instructions**: From the above, reflect on what needs to be improved over the next 5 years. Please focus on areas that need improvement and do not list areas that could be improved but where it is not needed. (Departments with more than 200 employees – IT, Physics and Astronomy, Chemistry Ångström, and Earth Sciences – may provide up to 1200 characters.)

Motivation: Require departments to identify where they feel that they need to invest. This will both provide the panels with insights into our own self-assessment as well as help us improve.

|  |
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| The dept has already identified the need to incentivize outreach activities (instated a prize, starting Sept 2024); Stronger funding for outreach activities, e.g. development of massive informative online courses for the public, such as *klimat och fysik* (where the development was funded by the government through the “livslångt lärande” initiative) would be helpful. Some perks for particularly active staff, e.g. “Distinguishment in outreach and collaboration”; Lowering hurdles to collaborate with companies by proactive legal support and a solutions-oriented attitude; The dept economists need faster response time when asking for support from UU central economists in dealing with complicated contracts.; Make courses such as “Visualize your science” free, host workshops in packaging of messages for popular science and media.; Better appreciation for staff that engages in collaboration and outreach.; Central support for PhD students to engage in outreach as support for collaboration and outreach is most important in the early career stages.; We also need to be better to further identify opportunities for collaboration with industry and applied research. |

# Area 4: Connection between Research and Teaching (evaluation of processes)

Responsibility: HoD in discussion with department leadership.

The types of connections between research and teaching that we are striving to achieve include, but are not limited to:

1. Activities that lead to a scientific approach and student progression in learning how to apply the scientific method within courses and throughout education programs
2. Teachers who are active researchers take opportunities to develop their pedagogical skills
3. Researchers who are active teachers and take opportunities to develop their pedagogical skills
4. Students being trained to find, use, and evaluate research results
5. Students being active in on-going research projects
6. Integration of research results, methods, and facilities in teaching

## Main teaching areas

**Instructions**: List the most important teaching programs, course packages, or contract/continuing education that the department is responsible for. Specify the level (e.g., bachelor’s or master’s), approximately how many courses the department teaches in the program, and the number of full-time students in the program each year.

Motivation: Explain where the department’s teaching is focused.

|  |  |  |  |
| --- | --- | --- | --- |
| Teaching program, course package, or contract/continuing education | Level | Courses Taught | Full-time students |
| Master program in physics, quantum tech, biophysics, materials science | adv | >40 | 100 |
| Bachelor program in physics | Int->adv | >40 | 160 |
| Engineering program in physics (F) | Int->adv | >10 | 500 |
| Engineering program in energy systems (ES) | Int->adv | >10 | 255 |
| Other engineering programmes | Int->adv | >10 | 100 |
| Preparatory year, Science | preparatory | 7 | 200 |
| contract education | adv | 5 | 8 |
| Life-long-learning | Int->adv | 4 | - |
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## Successful research/teaching connections enabled by the department

**Instructions**: Provide up to five specific examples of how research has been incorporated into teaching activities or strengthened courses, and/or how teaching activities have been incorporated into the research activities that are particularly important from the department’s perspective. These examples should be ones that the department, beyond the programs, has explicitly contributed to enabling through its efforts or policies. Under “Example” describe the connection (e.g., “lab exercise using the facility X that exposes students to research technique Y”). Under “Course Info” specify the course name, program, level (introduction/advanced), and the approximate number of students taking it each year. Describe the value to the teaching experience from the research connection (or vice versa). (Departments with more than 200 employees – IT, Physics and Astronomy, Chemistry Ångström, and Earth Sciences – may provide up to nine examples.)

Motivation: Provide a list of specific examples of teaching/research connections to motivate the self-reflection below.

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| --- | --- | --- |
| 1 | Example | Degree projects and project courses |
| Course Info | Master’s degree, bachelor degree, project courses |
| Value to teaching/ research | Research connection by participation in a research environment. Especially Master’s projects often lead to publications, giving students experience of real research and hands-on experience of the publication process. Examples from recent years A. Kordt in papers by D’Odorico et al. (2024, Experimental astronomy submitted, arXiv arXiv:2311.16803), E. Lundqvist, A. Hultquist and A. Kordt in Zackrisson et al. (2024, MNRAS, submitted, arXiv 2312.09289), student W. Li in Nabizadeh et al. (2024, A&A, in press, arXiv2308.07260). |
| 2 | Example | Deep learning courses connect to the research of several program members and equip students with the necessary skills for successful research projects. |
| Course Info | Applied deep learning in physics and engineering (1FA370) |
| Value to teaching/ research | This course is taught by an active researcher in IceCube with expertise in machine-learning techniques and it provides students with knowledge and skills that are transferrable to research projects within the program. |
| 3 | Example | Work on numerical methods relevant to research in materials theory and applications; Radiation damage modeling research and how that connects to materials degradation challenges at nuclear power plants. |
| Course Info | Condensed Matter Physics 1FA526; Beräkningsfysik 1FA573; Kemi, material och bränsle för LWR. KKI |
| Value to teaching/ research | Projects integrating current research topics where students compile a report and present to their peers. Materials modeling using python for optical, thermal and electrical properties. The research provides a rich pallet of examples of relevant research questions and results.  Discussing why these questions and results are relevant enrich the material and inspire, motivate and engage the students. |
| 4 | Example | Infrastructure use (research group’s, dept., faculty, national) |
| Course Info | Nuclear physics, Accelerators and detectors, Surface physics, Condensed Matter Physics, Synchrotron radiation |
| Value to teaching/ research | Use of real research infrastructures and applying methodology to open problems aids the transition to independent subject development and studies. The synchrotron radiation course contains a visit with experiments at the MAX IV synchrotron. |
| 5 | Example | Research data used in courses; data analysis on real research data-sets |
| Course Info | Statistical methods in physics (1FA018), Space physics (1FA255), among others |
| Value to teaching/ research | Expose students to data with more or less open results contained. Analysis methods and research methodology learned must be applied and the results benchmarked. Synergies between physics, data analysis ,and programming, which prepare the students for the methods used in experimental research and data analysis. PhD students who follow the course often learn new methods that they can apply in their own research. One example is a kinematic fitter that has been developed from a hand-in exercise to a full software package and a publication. |
| 6 | Example | Demonstrations and equipment maintained in the ”Teaching demonstrations room” and student laboratories for physics |
| Course Info | All courses |
| Value to teaching/ research | We maintain, procurure, manufacture and update teaching demonstrations and set-ups for the student laboratories. There are demonstrations for all areas of physics and teachers are encouraged to use those both as a vehicle to exhibit phenomena and as a way to convey research methodology and how the set-up resembles something used in research or how it is different. There is also “classical” experiments from the history of physics. A notable one is the Focoult-pendulum in the house 10 donated by a faculty member at IFA. |
| 7 | Example | Electron spectrometer / Mass spectrometer / Particle accelerators as examples of instruments where the Lorenz force from electromagnetism govern the function. |
| Course Info | Introductory Electromagnetism courses |
| Value to teaching/ research | This provides first year students examples of real advanced instrumentation that is used by teachers in the course for research. It highlights that the physics they know have very broad applicability and it is a good conversation starter about what kind of results we try to produce with such instrumentation and infrastructures. We return to those instruments/facilities in later more specialized courses. |
| 8 | Example | Atomic force- & scanning electron-microscopy; conductivity/resistivity measurements; electron spectroscopy, neutron scattering |
| Course Info | Surface Physics, Condensed Matter Physics, Adv. Materials Analysis. |
| Value to teaching/ research | The students have seen a lot of excellent AFM, STM pictures in literature and in courses with us they get a peek behind the curtain. The STM is in air and one needs to cut the tip oneself with a tool: if the STM-tip is not properly cut artefacts show up. It is a great way to connect experimental physics to the theory of AFM and STM. Data on conductivity vs. temperature measured on a 2D TMD-sample; besides getting insight into how it is practically done in a research laboratory they can compare the results to what is given in the course literature on ideal semi-conductors/metals. It gives PhD-students the opportunity to explain physics to bachelor students and it gives the students insight into what an experimental PhD-project could contain early in their education. |
| 9 | Example | Python-based lab where students study how proteins orient in electric fields. |
| Course Info | Mechanics 1 |
| Value to teaching/ research | This has the students applying Python and programming to connect several topics in their education (mechanics, programming, electromagnetism) |

### What is the department doing to support and strengthen these types of connections?

**Instructions**: Describe what the department is doing to both support the development of new connections and what it is doing to strengthen the existing ones. For example: policies, initiatives, seminars, meetings, incentives, etc. Remember that these connections can go both ways.

Motivation: Reflect on what specific initiatives are being taken that have contributed to the results we are proud of.

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| This is included in goals for teaching at the dept. Course reviews organized at the dept. level, dir. of studies giving feedback on course reports. Educational progr. gives feedback to the dept. Encourage Didactic courses (faculty) give formal support - teachers encouraged to attend as part of career development. Dept. organise lunch seminars on teaching and co-fund pedagogical projects. Bachelor and Master programs organize research and feedback lunches with students. Visits to large Swedish infrastructures, MAX IV, NAISS, ESS, Tandem-lab. The Distinguished Teachers at the department are engaged in the teaching organisation for collegial support. |

## Challenges in connecting research and teaching

**Instructions**: Describe what the department sees as its challenges in connecting research and teaching (e.g., financial support, research vs. teaching prestige, mismatches between research- and teaching-levels, etc.) and what the department can do or is doing to address them.

Motivation: Reflect on what makes connecting research and teaching difficult and how the department is actively approaching this challenge.

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| A challenge is to aid the teachers to discriminate between research methods, socialisation into doing research through closed (or open) laborations/simulations, examples of research results and student participation in conducting research with open ended questions.  The majority of the teachers at the dept. are active researchers, hence they use their own research as examples in their courses. Informed about the state-of-the-art. We will start a “Physics didactics" course with our own resources to alleviate this. We would like the thoughts regarding research/teaching nexus to also permeate the standard pedagogical course at UU. |

## How are research and teaching connections integrated into the department’s management?

**Instructions**: Describe how and where supporting connections between teaching and research is addressed in the department’s management structure. Is this an appropriate level of integration for the importance the department puts on this type of connection?

Motivation: This question encourages us to reflect on how seriously this issue is being considered based on how tightly integrated it is into the management structure.

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| Teaching org integrated in dept. management (dir studies part of dept leadership group). Teaching org.  contributes to strategic planning and prepares resource allocation (decision by dept. board). Teachers are active researchers and represent the subject. Teaching assessed via feedback. |

## What support would be helpful at the section/faculty/university level?

**Instructions**: Describe what support (if any) would be helpful to coordinate and/or provide at the section/faculty/university level. Also comment on any coordination/support that is currently done at the section/faculty/university level that would be more effectively handled locally.

Motivation: Some issues are broad enough that addressing them together makes sense, while in other cases doing so leads to more overhead than it is worth. This question encourages the department to reflect on whether there are opportunities here to be more efficient.

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| Financial support for meta-activity e.g. our own didactic course as part of career path for teachers, i.e. teacher skill development through formal courses at departments that conduct their own didactic research on the subject would speed up implementation and promote teacher awareness and skill level. A formal course would also give a benchmark for program evaluations. Inclusion of successful teaching/research integration as a merit for promotion/recruitment would also lend weight to this priority. *The general monetary support for teaching needs to be increased, as it is now internal research funding is de facto used to support teaching time.* |

## Reflections on what is working well

**Instructions**: From the above, reflect on what is working well and should be continued over the next 5 years. (Departments with more than 200 employees – IT, Physics and Astronomy, Chemistry Ångström, and Earth Sciences – may provide up to 1200 characters.)

Motivation: Require departments to identify where current activities are successful. This will provide the panel with insights into our own self-assessment.

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| * Advanced courses attract talented students nationally/internationally, cover most important areas of physics: theoretical, experimental and applied subjects. Dept. strategies help us create and update courses, e.g. including machine-learning/AI. Contract education provide feedback from the industry. * We have successfully included research infrastructures (local, national, international) into the curriculum both at the introductory and advanced levels. * Formal support in place, e.g. via engagement as coordinators for several master and engineering programmes. Informal support is in place, we have many distinguished teachers (10) spread over the dept. * Project- and bachelor/master-thesis courses often lead to article publications in peer-reviewed journals.   \* We attract pedagogical dev. projs. from faculty (TUFF)/centrally (PUDU, PUMA). An ex. is the dev. of a reactor physics lab together with Jožef Stefan-institute in Ljubljana allowing students at UU to remotely steer a TRIGA reactor.   * We teach on all levels: undergrad courses with large student groups to graduate courses with few students. In all cases, the courses are related to our research. This gives the teachers different challenges in their profession research methodology in lab-work included in courses, research ethics and participating in/doing research in project and thesis courses.   We know from alumni-investigations in the educational programmes and our PhD-program that our students get good jobs in industry and academia. |

## Reflections on what needs to be improved

**Instructions**: From the above, reflect on what needs to be improved over the next 5 years. Please focus on areas that need improvement and do not list areas that could be improved but where it is not needed. (Departments with more than 200 employees – IT, Physics and Astronomy, Chemistry Ångström, and Earth Sciences – may provide up to 1200 characters.)

Motivation: Require departments to identify where they feel that they need to invest. This will both provide the panels with insights into our own self-assessment as well as help us improve.

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| --- |
| Financial resources for teaching are not sufficient, also notable for adv courses where goals of providing advanced subjects collide with budgetary constraints. We work creatively to find ways to optimise scheduling, streamline courses so things are done in concert rather than duplicating efforts. However, we are at a point where efficiency gains start to impact course/program quality owing to too many compromises.  Review and update syllabi at the department, e.g. new courses: nucl fission, phys of multi-scale systems. Integrate courses in space and plasma physics. Develop master programme’s tracks in energy phys, math phys relation to exp and theo materials phys. Edu programmes and our free-standing courses need to make the dept. visible nationally & internationally. Edu Programme structure review and dialogue.  Almost complete lack of support centrally to market and inform about Master programs. Our Master programs are not visible and are not even properly visible at the faculty website.  Develop skills and introduce new teachers: “Didactics for physics” about 2 weeks will be offered to all teaching personnel. Physics education research programme will have a key role together with the Distinguished Teachers. The research-teaching connection, reflective practice, subject specific didactics pertaining to laboratories / simulations will be used for didactic inquiry on our courses, which will aid teachers’ scientific approach to courses and improve our courses through a kind of internal peer-review, hence not only through student and programme feedback. |

# 5-year Priorities

**Instructions**: Identify, describe, and motivate specific Priorities that have a high likelihood of meaningfully strengthening or meaningfully broadening research over the next 5 years. The Priorities should be well-motivated and have sufficiently developed plans that it is clear what needs to be done to accomplish them and how to evaluate if they are successful. The Priorities can cover a wide range of activities with the overall goal of strengthen research, and do not need to require additional expenses. These can include, but are not limited to:

* Strengthening existing areas (e.g., to adapt to future challenges in the field or are necessary to maintain high quality, including by investing in new equipment, facilities, or staff, etc.)
* Investing in new areas (e.g., to adapt to changes in the field or new developments, by including investing in new equipment, facilities, or staff, etc.)
* Changing research organization by splitting, merging, closing, or moving research programs/departments (e.g., to improve collaboration or use of facilities or resources, etc.)
* Changing research policies (e.g., to address funding/co-funding, multi-disciplinary work, or recruiting, etc.)
* Changing research support (e.g., to improve grant success rates, recruiting, management, adoption of new techniques/technologies, etc.)

Building upon existing strategic plans is encouraged and co-funding/support from the program or department is expected to demonstrate commitment to the plan. There will be a yearly lightweight follow up process to see what progress has been made for each Priority with an opportunity to revise/change them as needed. The goals are to both ensure that we follow up on our stated Priorities and that we always have clear Priorities at each level in the faculty.

To ensure that all departments have a similar prioritization burden regardless of their size, the number of Priorities each department is allowed is determined by the formula 2+roundup(programs/4), as follows:

Priorities per Department:

* 104 Matematiska institutionen 3
* 106 Inst f informationsteknologi 5
* 113 Inst f fysik och astronomi 6
* 120 Inst f materialvetenskap 4
* 122 Inst f elektroteknik 3
* 124 Inst f samhällsbyggn o ind tek 3
* 130 Inst f kemi - BMC 3
* 139 Inst f kemi - Ångström 4
* 146 Inst f ekologi och genetik 3
* 148 Inst f organismbiologi 3
* 152 Inst f cell- och molekylärbiol 4
* 161 Inst f geovetenskaper 4

To encourage the departments to both identify overarching departmental priorities and prioritize among their programs’ Priorities, the department’s chosen Priorities must include at least 1 Priority developed by the department and at least 1 Priority developed by a research program. The department is free to choose how to balance the remaining Priorities among department-identified Priorities and program-identified Priorities. In addition, to encourage the department to identify Priorities that can be addressed locally, at least 1 Priority must be something that can be accomplished locally (within the department’s and/or programs’ own resources) and does not require faculty resources.

Duplicate the form below for each of the department’s allocated Priorities and identify which come from programs and which can be accomplished using local department and program resources.

Prioritization at the faculty level: For prioritization at the faculty level, each section is allocated a number of Priorities determined by the formula 1+roundup(programs/5). This is to provide a manageable number of proposals for consideration at the faculty level, and to ensure that the departments and sections only send in their most important Priorities. The departments in each section are free to choose their own prioritization process, but they are very strongly encouraged to use their collective domain expertise to review all department-level Priorities together and choose the ones that will most strengthen the section as a whole.

Priorities per Section:

* Mathematics and Computer Science 4
* Physics 4
* Technology 4
* Chemistry 3
* Biology 4
* Earth Sciences 2

Motivation: Identifying Priorities encourages strategic analysis and medium-term planning within the department, and makes it easier for the section, faculty, and panel to understand the department’s own assessments of their needs and opportunities. Requiring at least one of the Priorities to come from programs encourages the department to engage in a meaningful discussion about the programs’ own Priorities as well as the department’s own.

Responsibility: HoD in discussion with department leadership.

# Priority 1 of 6

## Description of the Priority

**Instructions**: Provide the department name (since these will be collected at the section/faculty level) and the program name (if this is a program Priority), the title of the Priority, and whether it may require department support (Yes/No) and/or faculty support (Yes/No).

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| --- | --- | --- | --- | --- |
| Department: | Physics and Astronomy (Note: the 6 priorities are not internally ranked) | | | |
| Program: | Whole department and section (14 programs) | | | |
| Title: | AI4Physics | | | |
| Support: | May require department support: | Yes | May require faculty support: | Yes |

### Goal

**Instructions**: Specify the goal of the Priority, for example, to strengthen a specific existing activity or start a new one.

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| Strengthen all physics research through increased AI literacy, method development, and applications. |

### Expected meaningful research improvement

**Instructions**: Provide a description of the research that investing in this Priority will accomplish over the next 5 years. Explain how it has the potential to significantly strengthen or broaden the program for program proposals or department for department proposals. Specifically, this should go beyond continuing or slightly enlarging current activities by having a clear description of what change it will accomplish.

Motivation: The overall goal is to strengthen our research. As a result, the Priority should deliver meaningful improvements in research quality and/or breadth.

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| Artificial intelligence (AI) is leading to an imminent paradigm shift in physics. New machine learning (ML) methods are already used to reform massive data analysis for experiments across physics, to develop and test new models in theoretical physics, and AI is also profoundly transforming physics education research. IFA has already had many fellows (most outside IT dept) at the university-wide AI4Research initiative, demonstrating early adoption in several fields. But the potential spans all of physics. This initiative, already formulated internally a year ago, will dramatically increase AI use and literacy throughout the department, in all fields. As physicists we have the math and programming background to both be agile users and drivers of the field, and the data that needs advanced analysis. Expected research improvement spans from a natural integration of AI/ML methods throughout our research in fields where it is not yet prominent, to development of physics-inspired AI methods, including exact science, interpretable AI with error estimations, quantum mechanical applications, and incorporating AI in physics education research. |

### Implementation plan

**Instructions**: Provide a brief description of specifically what is planned to be done over the next 5 years to realize the potential of this Priority. For example: new hires, investments in equipment, starting collaborations, closing down existing activities, moving resources from existing activities, etc. Use the limited space provided here to discuss the most important aspects of how this activity will be carried out.

Motivation: For a Priority to be credible, there must be a plausible plan and what needs to be accomplished must have been thought through. It is understood that these plans will change over the next 5 years, however.

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| As a large department with research spanning from theory to large-scale experiments, we have varied needs. Still, we have collegially identified four key components of our AI4Physics initiative: A) Faculty AI courses: 1 course/year for education of faculty members. Progression from intro/basic to more advanced topics with a mentoring program, using internal and external teachers. B) Seminar activity with international speakers/visitors (incl industry) for exposure to state-of-the-art use of AI in physics. C) AI-focused postdocs (PDs) to drive new research projects using AI, tied to identified needs within each of the dept’s 3 units. PDs are distributed across dept but will also form a critical mass together and help with A,B. If needs are identified and FFF funding already exists, recruitment can also be at the permanent research engineer/faculty level. D) Incorporation of AI within both the dept’s teaching and collaboration. Teaching will use the PER program expertise and e.g. TUFF projects, while collaboration will be aimed towards industry, including possibilities of industry PhD students. |

### What previous accomplishments indicate a high likelihood of success?

**Instructions**: Describe what recent (last 5 years) accomplishments make it clear that the there is a good chance of success in this project. Use specific examples (e.g., grant X, collaboration Y, paper Z) and explain how those recent accomplishments are evidence of having the competencies needed to be successful in this project.

Motivation: For a Priority to be credible, the expertise and track record needed to support it must be present.

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| The need for an AI initiative within IFA was identified as a key future priority by all three units already in Spring 2023 within our dept-wide strategy process. IFA has had the most AI4Research fellows (except IT dept), demonstrating already many AI users. Several grants, e.g from WASP and key parts of VR,ERC projects already incorporate AI/ML methods. PER is already studying AI in physics education. This initiative will benefit these and broaden their success to the whole department. Physicists have all the background to be agile AI users: math, programming, and data. They also make mathematical models based on fundamental principles, which can advance the AI field itself towards e.g. exact science and interpretable AI. |

## Current status of the area at Uppsala University

Instruction: Describe the current status of the area at Uppsala University as a whole. Include any existing funding, support, staff, and success in this area. Explicitly identify any overlap with other existing activities at the program(s), department, section, faculty, and/or university levels.

Motivation: To avoid duplicating efforts, it is important to understand the local Uppsala context when enhancing existing activities or starting new efforts. As part of the evaluation process, the panel will try to identify synergies between proposed Priorities.

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| AI4Research exists, but is only available for current AI users, while the majority of our faculty do not yet actively use AI. Further, connections already exist to the IT dept, CIM, and the eSSENCE graduate school, but they all have complementary goals to this initiative. Our dept teaches the AI courses 1FA370, 1FA006. |

### Current and planned contributions to support the initiative

**Instructions**: Describe the current (already in-place and on-going) and planned contributions to this goal from the local level (from the program for program proposals, from the department for department proposals, and from both the program(s) and department, as appropriate, for program proposals selected by the department). For example, co-funding, in-kind support, shared funding of facilities, transfers of FFFs, etc.

Motivation: Evidence of financial commitment from the local environment strongly supports the proposal as being important. Conversely, if the local environment is unable or unwilling to support it, the importance to the environment as a whole is much weaker.

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| Interest from faculty and dept is strong as this is a collegially identified priority. Programs: Faculty time and all local support. Existing external grants with AI components are also important for fast implementation. Dept resources will be used to coordinate and also implement A, B, and support D, starting already 2024-25. |

## Strategic value

### Strategic value of the area in the global context

Instruction: Describe the importance of the area in the global context. For example: fundamental challenges in research; new developments in research; societal challenges and priorities; global impact and importance.

Motivation: To ensure consideration of the larger context.

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| AI is triggering a transformative change in how research and education is done in physics and astronomy. With this initiative the whole department will be in the forefront of this development and we can also pursue new opportunities for AI, explicitly in physics and physics education. |

### Strategic value of the area at the next level

Instruction: Describe the importance of the area to the department (for program proposals) and for the section and faculty (for department proposals). For example: synergies with other activities, connections to teaching and collaboration, both currently and potential for new ones, etc. Explain the value of this activity beyond any overlapping ones identified above.

Motivation: To ensure that there is awareness of where this activity fits in at the next level up in the organization. This is particularly important if support is to be requested at that level.

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| AI4Physics focuses on the need and opportunities of the whole Physics Section. It is fully complementary to AI4Research and national AI initiatives (WASP, DDLS) due to its dual focus on creating AI literacy and physics aspects of AI. Also, AI4Physics creates a common goal for a very large and diverse department. |

## Contributions needed for success

**Instructions**: Identify what contributions are needed for success in terms of time, expertise, resources, facilities, staff, etc. Explicitly include estimates of financial resources needed and where they will come from.

Motivation: To ensure the costs and resources required have been thought through, and that they are reasonable given the scope of the benefit.

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| A) Weeklong yearly course with internal/external teachers: 560kSEK. B) Seminar program: 560kSEK. C) PD program: up to 25MSEK (2 PDs per unit (each unit ~130 employees) for 2 rounds). D) TUFF, teaching. Coordinator: 500kSEK. Dept resources used for A,B,D) and coordination. TekNat support for C) is needed. |

### Success indicators

**Instructions**: Describe specific results that will indicate success in 5 years. For example: increases in publications in top venues X and Y, publications in new field Z, strengthened or new collaborations with university A, new hires in B, new grants from C, etc.

Motivation: To ensure that the local- and faculty-levels will be able to assess whether this Priority was successful at the next evaluation so that we develop a positive cycle of following up on our strategic planning.

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| Dramatically increased AI use in all the Section’s research, necessary for future success both in established fields and for AI-developments in physics. Increased grant income, including excellence grants (VR,KAW, ERC) and AI-initiatives, e.g. WISE-WASP, EU AI funding. Increased AI use in teaching and learning. |

### First steps that can be taken today

**Instructions**: Describe the first concrete steps needed to move in this direction that can be taken today. These should be clear enough that they can be followed up on in a year to see what progress has been made. Identify initial activities that can be started locally to enable progress to help motivate further support for the larger goal. In the exceptional case where no steps can be taken today, explain why a Priority has been chosen that cannot be started.

Motivation: To ensure that there is a clear idea of how to get started and enable easy follow-up of how the Priority is progressing.

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| A),B), and D) will be implemented during 2024-25 on dept resources, including coordination. We are asking TekNat to help with the cost to primarily fund C), which will dramatically increase the impact of introducing and developing AI throughout our Section. |

# Priority 2 of 6

## Description of the Priority

**Instructions**: Provide the department name (since these will be collected at the section/faculty level) and the program name (if this is a program Priority), the title of the Priority, and whether it may require department support (Yes/No) and/or faculty support (Yes/No).

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| --- | --- | --- | --- | --- |
| Department: | Physics and Astronomy (IFA), Mathematics | | | |
| Program: | Theoretical physics (TP), Quantum Matter Theory (QMT), Algebra and Geometry (AG), Analysis and Probability theory (AP) | | | |
| Title: | Center for Geometry and Physics: from geometry to quantum information | | | |
| Support: | May require department support: | Yes | May require faculty support: | Yes |

### Goal

**Instructions**: Specify the goal of the Priority, for example, to strengthen a specific existing activity or start a new one.

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| Strengthen the Excellence Center for Geometry and Physics, incl expansion to quantum information (QI). |

### Expected meaningful research improvement

**Instructions**: Provide a description of the research that investing in this Priority will accomplish over the next 5 years. Explain how it has the potential to significantly strengthen or broaden the program for program proposals or department for department proposals. Specifically, this should go beyond continuing or slightly enlarging current activities by having a clear description of what change it will accomplish.

Motivation: The overall goal is to strengthen our research. As a result, the Priority should deliver meaningful improvements in research quality and/or breadth.

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| The Center for Geometry and Physics (CGP) is an interdisciplinary research center to advance fundamental knowledge in mathematics and theoretical physics in, and at the interface between, geometry and physics, currently funded (2024-29) as an Excellence Center by VR. We want to maintain, increase, and widen its activities, to capitalize on the current excellence and secure strong future development. For this internal FFF funding is necessary for the following identified activities: 1) Strengthen the activities in CGP by linking number theory and physics (amplitudes, enumerative geometry, and number theory). 2) Widen the CGP towards QI. UU has only 1 faculty member in QI, despite the field’s explosive growth. Expanding into QI towards tensor networks as well as topological phases and anyons, provides an indispensable strengthening of QI research while simultaneously allowing us to naturally integrate our already strong quantum matter research and AP program into the CGP. The combination of strengthening and widening will allow the CGP and the programs to continue to be exceptionally successful in attracting external funding. |

### Implementation plan

**Instructions**: Provide a brief description of specifically what is planned to be done over the next 5 years to realize the potential of this Priority. For example: new hires, investments in equipment, starting collaborations, closing down existing activities, moving resources from existing activities, etc. Use the limited space provided here to discuss the most important aspects of how this activity will be carried out.

Motivation: For a Priority to be credible, there must be a plausible plan and what needs to be accomplished must have been thought through. It is understood that these plans will change over the next 5 years, however.

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| The VR Excellence Center in Geometry and Physics (CGP) operates according to plan with increasing number of activities and possible BUL hirings, as stated in the VR application. However, beyond BUL salaries during their tenure track time, the CGP has no long-term resources and thus new FFFs are urgently needed. To continue to be successful 4 BULs are required. 2 BULs will directly strengthen current activities, within TP and GA programs. 2 BULs will widen the Center activity towards QI, which will both build up much-needed QI research and, importantly, link the QMT program to the CGP and also to the AP program thanks to the math-intensive aspects of both tensor networks and topological phases, including anyons. Also, the CGP cannot fund PhD students and we therefore ask for dept resources to partially fund accompanied PhD student positions for the BUL positions to provide sufficient supervision experience. Furthermore, the CGP activities are organized across two departments which pose administrative challenges. Specifically, we need a simpler framework for making joint appointments across different departments. |

### What previous accomplishments indicate a high likelihood of success?

**Instructions**: Describe what recent (last 5 years) accomplishments make it clear that the there is a good chance of success in this project. Use specific examples (e.g., grant X, collaboration Y, paper Z) and explain how those recent accomplishments are evidence of having the competencies needed to be successful in this project.

Motivation: For a Priority to be credible, the expertise and track record needed to support it must be present.

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| Geometry and Physics research was initiated at UU 10 years ago between the Math dept and TP program, then supported by a KAW project grant (Ekholm, Zabzine) and now as a VR Excellence Centre grant (Ekholm, Dimitroglou-Rizell, Minahan, Zabzine, del Zotto). The area has a strong record in hiring of excellent young researchers and producing int’l leading research. QI research is limited but good and we are already strong in related quantum matter theory fields, e.g. topological phases (Black-Schaffer). The programs have (last 5 years) hosted 7 ERC grants, 6 WAFs, 6 KAW projects, and now 3 KAW Scholars, which is an outstanding track-record of excellence funding. To strengthen and widen these activities we urgently need FFF support. |

## Current status of the area at Uppsala University

Instruction: Describe the current status of the area at Uppsala University as a whole. Include any existing funding, support, staff, and success in this area. Explicitly identify any overlap with other existing activities at the program(s), department, section, faculty, and/or university levels.

Motivation: To avoid duplicating efforts, it is important to understand the local Uppsala context when enhancing existing activities or starting new efforts. As part of the evaluation process, the panel will try to identify synergies between proposed Priorities.

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| The CGP joins most of the faculty members in the TP and GA programs. QI research is fully within the QMT program (Materials Theory program has adjacent activities), and there exist unexploited connections to the AP program. Most of our current and planned research is only existing due to external excellence grants. |

### Current and planned contributions to support the initiative

**Instructions**: Describe the current (already in-place and on-going) and planned contributions to this goal from the local level (from the program for program proposals, from the department for department proposals, and from both the program(s) and department, as appropriate, for program proposals selected by the department). For example, co-funding, in-kind support, shared funding of facilities, transfers of FFFs, etc.

Motivation: Evidence of financial commitment from the local environment strongly supports the proposal as being important. Conversely, if the local environment is unable or unwilling to support it, the importance to the environment as a whole is much weaker.

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| The CGP runs 2024-29 on VR funding and co-funding from TekNat (so far 5 postdocs hired). WINQ at Nordita start-up package for 1 incoming BUL in QI (retirement replacement for current faculty). All 4 programs have due to chronic underfunding no FFF to use for faculty recruitments. |

## Strategic value

### Strategic value of the area in the global context

Instruction: Describe the importance of the area in the global context. For example: fundamental challenges in research; new developments in research; societal challenges and priorities; global impact and importance.

Motivation: To ensure consideration of the larger context.

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| UU is the strongest institution in geometry and mathematical physics in Scandinavia, having reached its position through work over more than a decade. Strengthening and widening its activity is a key strategic priority, where including QI research is a natural expansion, also carrying global societal impact. |

### Strategic value of the area at the next level

Instruction: Describe the importance of the area to the department (for program proposals) and for the section and faculty (for department proposals). For example: synergies with other activities, connections to teaching and collaboration, both currently and potential for new ones, etc. Explain the value of this activity beyond any overlapping ones identified above.

Motivation: To ensure that there is awareness of where this activity fits in at the next level up in the organization. This is particularly important if support is to be requested at that level.

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| The synergy between physics and mathematics produces top level research in two depts. Similar centers exist internationally and it is crucial for UU to continue to have a successful activity. Strengthening our limited QI research is necessary for UU (incl teaching), and tying QI to the Center is a win-win arrangement. |

## Contributions needed for success

**Instructions**: Identify what contributions are needed for success in terms of time, expertise, resources, facilities, staff, etc. Explicitly include estimates of financial resources needed and where they will come from.

Motivation: To ensure the costs and resources required have been thought through, and that they are reasonable given the scope of the benefit.

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| The CGP and QI research both need long-term stability, only possible through new FFFs. The plan requires 4 new BUL positions, organizationally placed into 3 programs and research-wise joined in the CGP through their joint focus on mathematical physics. |

### Success indicators

**Instructions**: Describe specific results that will indicate success in 5 years. For example: increases in publications in top venues X and Y, publications in new field Z, strengthened or new collaborations with university A, new hires in B, new grants from C, etc.

Motivation: To ensure that the local- and faculty-levels will be able to assess whether this Priority was successful at the next evaluation so that we develop a positive cycle of following up on our strategic planning.

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| 4 new faculty members with their research grant portfolios, students, and publications, well integrated into the CGP. CGP continues to deliver top level scientific publications, new external grants, and provide an attractive environment for hirings at all levels. Further/new integration of participating programs into CGP. |

### First steps that can be taken today

**Instructions**: Describe the first concrete steps needed to move in this direction that can be taken today. These should be clear enough that they can be followed up on in a year to see what progress has been made. Identify initial activities that can be started locally to enable progress to help motivate further support for the larger goal. In the exceptional case where no steps can be taken today, explain why a Priority has been chosen that cannot be started.

Motivation: To ensure that there is a clear idea of how to get started and enable easy follow-up of how the Priority is progressing.

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| Dialogue with TekNat about the support and coordination of interdisciplinary activities between different depts. Optimizing the use of the existing external resources in the VR Excellence Center and at WINQ at Nordita. Start integrating already existing QI and quantum matter research into CGP. |

# Priority 3 of 6

## Description of the Priority

**Instructions**: Provide the department name (since these will be collected at the section/faculty level) and the program name (if this is a program Priority), the title of the Priority, and whether it may require department support (Yes/No) and/or faculty support (Yes/No).

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| Department: | Physics and Astronomy | | | |
| Program: | Applied Nuclear Physics | | | |
| Title: | ANItA (Academic-industrial Nuclear technology Initiative to Achieve a sustainable energy future) | | | |
| Support: | May require department support: | Yes | May require faculty support: | Yes |

### Goal

**Instructions**: Specify the goal of the Priority, for example, to strengthen a specific existing activity or start a new one.

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| Firmly secure ANItA as a platform for research and development in nuclear technology at the faculty.  Recent developments in new reactor technology such as SMR (small modular reactors) and Gen-IV require improved competence in a range of fields. ANItA coordinates relevant research activities within UU. It is a national center, hosted by Uppsala University, and gathers academic and industrial nuclear technology competence in both technical and non-technical areas. Together with other universities in Sweden and the Nordic nuclear sector, our aim is to solve challenges towards achieving global sustainability goals. |

### Expected meaningful research improvement

**Instructions**: Provide a description of the research that investing in this Priority will accomplish over the next 5 years. Explain how it has the potential to significantly strengthen or broaden the program for program proposals or department for department proposals. Specifically, this should go beyond continuing or slightly enlarging current activities by having a clear description of what change it will accomplish.

Motivation: The overall goal is to strengthen our research. As a result, the Priority should deliver meaningful improvements in research quality and/or breadth.

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| ANItA significantly enhances the Faculty's and the department's multidisciplinary research capabilities, positioning Uppsala University to meet the evolving demands of Sweden's nuclear energy landscape.  The collaboration with industry partners offers real-world applications, access to industry-specific resources, and potential technology transfer opportunities.  Current activities in ANItA focus on Small Modular Reactors. Applied nuclear physics focuses on safety related challenges within nuclear data uncertainties and their propagation through the fuel cycle, fuel technology, technical aspects of nuclear safeguards and related instrumentation. The focus will be broadened and include research into Gen-IV concepts and, with focus on MYRRHA, accelerator-driven systems for transmutation of nuclear waste. |

### Implementation plan

**Instructions**: Provide a brief description of specifically what is planned to be done over the next 5 years to realize the potential of this Priority. For example: new hires, investments in equipment, starting collaborations, closing down existing activities, moving resources from existing activities, etc. Use the limited space provided here to discuss the most important aspects of how this activity will be carried out.

Motivation: For a Priority to be credible, there must be a plausible plan and what needs to be accomplished must have been thought through. It is understood that these plans will change over the next 5 years, however.

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| ANItA receives funding from the Swedish Energy Agency for an initial period of five years, ending in 2027. It is expected that this funding period for SMR research will be extended until 2031. Meanwhile, the program and its partners have secured funding for research in Gen-IV systems.  To support this development and ANItA new internal funding is necessary and allow for staking out a path where both Applied Nuclear Physics and other involved research programs collaborate in order to meet the increased need for expertise in the nuclear technology.  The program currently funds a comparable large part of ANItA in-kind. During the second half of the initial project, ANItA is expected to provide knowledge-based insights on how new reactor technologies such as small modular reactors should be implemented in as efficient way as possible and the program needs to be augmented with new recruitments on the lector and professor levels. |

### What previous accomplishments indicate a high likelihood of success?

**Instructions**: Describe what recent (last 5 years) accomplishments make it clear that the there is a good chance of success in this project. Use specific examples (e.g., grant X, collaboration Y, paper Z) and explain how those recent accomplishments are evidence of having the competencies needed to be successful in this project.

Motivation: For a Priority to be credible, the expertise and track record needed to support it must be present.

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| The national competence center, ANItA, was conceived and is managed by the program. ANItA is currently funded by the Swedish Energy Agency. Significant co-funding is provided from Swedish and Finnish resources; Uppsala University, KTH, Chalmers, Vattenfall, Uniper, Fortum, Westinghouse, and Studsvik Nuclear. The Swedish and Finnish regulators have observer status in ANItA. It is an achievement to gather all relevant Nordic actors within this field. The research program has had leading roles in relevant major European programs like APIS and EURAD. On a national scale, the program has acquired additional funding for nuclear technology research from the Swedish Energy Agency. SSM, and SKC. |

## Current status of the area at Uppsala University

Instruction: Describe the current status of the area at Uppsala University as a whole. Include any existing funding, support, staff, and success in this area. Explicitly identify any overlap with other existing activities at the program(s), department, section, faculty, and/or university levels.

Motivation: To avoid duplicating efforts, it is important to understand the local Uppsala context when enhancing existing activities or starting new efforts. As part of the evaluation process, the panel will try to identify synergies between proposed Priorities.

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| ANItA coordinates research and development work in nuclear power technology and comprises research at Applied Nuclear Physics, Materials Theory, Industrial Engineering and the Department of Business Studies. Funding to expand ANItA to include GEN-IV has been secured from the Swedish Energy Agency. |

### Current and planned contributions to support the initiative

**Instructions**: Describe the current (already in-place and on-going) and planned contributions to this goal from the local level (from the program for program proposals, from the department for department proposals, and from both the program(s) and department, as appropriate, for program proposals selected by the department). For example, co-funding, in-kind support, shared funding of facilities, transfers of FFFs, etc.

Motivation: Evidence of financial commitment from the local environment strongly supports the proposal as being important. Conversely, if the local environment is unable or unwilling to support it, the importance to the environment as a whole is much weaker.

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| While the faculty and the Vice Chancellor financially contribute to ANItA, coordination is funded from the program. Supervision, a research engineer, and some other auxiliary costs connected ANItA is also funded within the program. Limited internal funding puts new undertakings within ANItA at risk. |

## Strategic value

### Strategic value of the area in the global context

Instruction: Describe the importance of the area in the global context. For example: fundamental challenges in research; new developments in research; societal challenges and priorities; global impact and importance.

Motivation: To ensure consideration of the larger context.

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| Affordable and clean energy is one of the 17 sustainable development goals of the UN. An well-established nuclear technology center at UU addresses the challenges for a sustainable fuel cycle, and contributes to innovations in, e.g., SMR-technology, GEN-IV research, and development of accident tolerant fuels. |

### Strategic value of the area at the next level

Instruction: Describe the importance of the area to the department (for program proposals) and for the section and faculty (for department proposals). For example: synergies with other activities, connections to teaching and collaboration, both currently and potential for new ones, etc. Explain the value of this activity beyond any overlapping ones identified above.

Motivation: To ensure that there is awareness of where this activity fits in at the next level up in the organization. This is particularly important if support is to be requested at that level.

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| The center is contributing to cross-disciplinary research, collaboration with authority and industry, and education on all levels. An established and supported center will have excellent chances to compete successfully in future national and international calls in the nuclear technology domain. |

## Contributions needed for success

**Instructions**: Identify what contributions are needed for success in terms of time, expertise, resources, facilities, staff, etc. Explicitly include estimates of financial resources needed and where they will come from.

Motivation: To ensure the costs and resources required have been thought through, and that they are reasonable given the scope of the benefit.

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| For long-term sustainability and ability to develop and expand ANItA, and to support the successful efforts already made by the program, an additional 0.75 FFF from the faculty is requested. We plan a recruitment at the professor level and eventually a startup package from IFA for the successful candidate. |

### Success indicators

**Instructions**: Describe specific results that will indicate success in 5 years. For example: increases in publications in top venues X and Y, publications in new field Z, strengthened or new collaborations with university A, new hires in B, new grants from C, etc.

Motivation: To ensure that the local- and faculty-levels will be able to assess whether this Priority was successful at the next evaluation so that we develop a positive cycle of following up on our strategic planning.

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| We manage to develop ANItA into a long-term platform for national nuclear technology research and education. We secure additional funding and broaden the scope of ANItA.  We managed to make a high-level recruitment. |

### First steps that can be taken today

**Instructions**: Describe the first concrete steps needed to move in this direction that can be taken today. These should be clear enough that they can be followed up on in a year to see what progress has been made. Identify initial activities that can be started locally to enable progress to help motivate further support for the larger goal. In the exceptional case where no steps can be taken today, explain why a Priority has been chosen that cannot be started.

Motivation: To ensure that there is a clear idea of how to get started and enable easy follow-up of how the Priority is progressing.

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| Broaden the current goals of ANItA and involve more programs. Ensure that the evaluation of ANItA in 2026 will be successful and the center will get prolonged support. Actively seek and identify possible candidates for hiring. |

# Priority 4 of 6

## Description of the Priority

**Instructions**: Provide the department name (since these will be collected at the section/faculty level) and the program name (if this is a program Priority), the title of the Priority, and whether it may require department support (Yes/No) and/or faculty support (Yes/No).

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| Department: | Physics and Astronomy | | | |
| Program: | Materials Physics, Condensed Matter Physics of Energy Materials | | | |
| Title: | LigHt, an environment for multi-scale characterization of (energy) materials at Ångströmlab | | | |
| Support: | May require department support: |  | May require faculty support: | Yes |

### Goal

**Instructions**: Specify the goal of the Priority, for example, to strengthen a specific existing activity or start a new one.

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| To coordinate, amplify, and renew research in materials characterization in a new infrastructure platform. |

### Expected meaningful research improvement

**Instructions**: Provide a description of the research that investing in this Priority will accomplish over the next 5 years. Explain how it has the potential to significantly strengthen or broaden the program for program proposals or department for department proposals. Specifically, this should go beyond continuing or slightly enlarging current activities by having a clear description of what change it will accomplish.

Motivation: The overall goal is to strengthen our research. As a result, the Priority should deliver meaningful improvements in research quality and/or breadth.

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| We aim to establish an accessible and broad world-class materials research environment by improved integration of a) the research expertise of the Materials Physics (recently joint by Ion Physics) and the Condensed Matter Physics of Energy Materials programs (MP & CPEM) in multi-scale characterization and materials functionality b) the recently granted WISE-platform LigHT, targeting improved in-situ and in-operando characterization of targeting energy materials with light species (e.g. Li and H) and c) the broad expertise in materials characterization and user base of the Tandem Laboratory (TL) national research infrastructure. We expect improved coordination of materials research targeting hydrogen for both storage and decarbonization of heavy industries, as well as an in-house environment for unprecedented charac-terization opportunities towards electrical energy storage. The environment will lead to cross-departmental PhD-projects, joint development of infrastructure optimizing usability for top-notch research, as well as coordinated teaching efforts, providing broad competence to future researchers and industrial engineers. |

### Implementation plan

**Instructions**: Provide a brief description of specifically what is planned to be done over the next 5 years to realize the potential of this Priority. For example: new hires, investments in equipment, starting collaborations, closing down existing activities, moving resources from existing activities, etc. Use the limited space provided here to discuss the most important aspects of how this activity will be carried out.

Motivation: For a Priority to be credible, there must be a plausible plan and what needs to be accomplished must have been thought through. It is understood that these plans will change over the next 5 years, however.

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| Starting from a merger of ion physics and MP, the Tandem Laboratory research infrastructure gets a broader scientific scope within materials research. Coordinated establishment including planning, procurement, and construction, as well as identification of scientific start-up scenarios of the LigHt infrastructure by several research units with joint lead by MP and CPEM have provided a base with joint science cases, pursued with shared PhD-students and funded by cross departmental funding applications. A joint investment by involved research groups, departments, and infrastructures in equipment to complement the granted funding as well as in personnel (mainly research engineers and senior postdocs) for construction and driving the existing underlying science cases will be conducted. New junior faculty positions will be created for coordinating hitherto separated research activities, start new research activities and establishing new joint teaching portfolios. The equivalent of one senior faculty position taking overarching strategic responsibilities around the environment will be devoted to the activities. |

### What previous accomplishments indicate a high likelihood of success?

**Instructions**: Describe what recent (last 5 years) accomplishments make it clear that the there is a good chance of success in this project. Use specific examples (e.g., grant X, collaboration Y, paper Z) and explain how those recent accomplishments are evidence of having the competencies needed to be successful in this project.

Motivation: For a Priority to be credible, the expertise and track record needed to support it must be present.

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| The three core units (MP, CPEM, former ion physics) have a strong track record of developing research infra-structure and instrumentation/methodology used nationally and internationally. The environments have own research activities towards H and Li in different contexts (energy materials, fundamental thermo-dynamics, nuclear fusion) which enables connecting to many activities at UU and beyond. The recent deve-lopment of TL as a national research infrastructure for materials research and the WISE-funding, as well as the transnational networks of TL for research in nanotechnology and circular societies. MP scientifically de-velops neutron infrastructure at ILL, CPEM lead development of electron spectroscopy beamline at MAXIV. |

## Current status of the area at Uppsala University

Instruction: Describe the current status of the area at Uppsala University as a whole. Include any existing funding, support, staff, and success in this area. Explicitly identify any overlap with other existing activities at the program(s), department, section, faculty, and/or university levels.

Motivation: To avoid duplicating efforts, it is important to understand the local Uppsala context when enhancing existing activities or starting new efforts. As part of the evaluation process, the panel will try to identify synergies between proposed Priorities.

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| Uppsala University houses world-leading materials research specifically targeting questions related to H and Li in materials. Synergies and coordination of can however be developed further, there are some joint educational efforts. Infrastructure usage is often external not benefitting from short internal feedback loops. |

### Current and planned contributions to support the initiative

**Instructions**: Describe the current (already in-place and on-going) and planned contributions to this goal from the local level (from the program for program proposals, from the department for department proposals, and from both the program(s) and department, as appropriate, for program proposals selected by the department). For example, co-funding, in-kind support, shared funding of facilities, transfers of FFFs, etc.

Motivation: Evidence of financial commitment from the local environment strongly supports the proposal as being important. Conversely, if the local environment is unable or unwilling to support it, the importance to the environment as a whole is much weaker.

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| Presently MF and ion physics are merged and scientific involvement in TL is broadened. Strong activities in the H2@U2 activities coordinating H-related research. Cross-departmental employments to enroot cross-disciplinary Li-research (CPEM). Core of LigHt-platform is developed jointly by several units. |

## Strategic value

### Strategic value of the area in the global context

Instruction: Describe the importance of the area in the global context. For example: fundamental challenges in research; new developments in research; societal challenges and priorities; global impact and importance.

Motivation: To ensure consideration of the larger context.

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| Unique research environment for quantification and study of light energy-related elements in matter at an in-house facility. Added benefits due to the complementarity from neutron scattering at MF (neutrons excel in ”seeing” light elements) and photons (in-house & @MAXIV) via CPEM. |

### Strategic value of the area at the next level

Instruction: Describe the importance of the area to the department (for program proposals) and for the section and faculty (for department proposals). For example: synergies with other activities, connections to teaching and collaboration, both currently and potential for new ones, etc. Explain the value of this activity beyond any overlapping ones identified above.

Motivation: To ensure that there is awareness of where this activity fits in at the next level up in the organization. This is particularly important if support is to be requested at that level.

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| Energy materials and holistic approach in combination with neutrons and X-rays. Unique research infrastructure package for academia and industry in contemporary highly critical material and societal questions. The proposed research fits to the Faculty prioritized research areas. |

## Contributions needed for success

**Instructions**: Identify what contributions are needed for success in terms of time, expertise, resources, facilities, staff, etc. Explicitly include estimates of financial resources needed and where they will come from.

Motivation: To ensure the costs and resources required have been thought through, and that they are reasonable given the scope of the benefit.

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| 1 UL position to strategically develop the new infrastructure (0.5 FFF), 1 BUL each for the light element research developed in the core teams (MP & CPEM), resulting in 3 positions and 1.5 FFF. Short term funding for implementation of the platform: 10 MSEK under 3 years shared equally by programs, dept, faculty. |

### Success indicators

**Instructions**: Describe specific results that will indicate success in 5 years. For example: increases in publications in top venues X and Y, publications in new field Z, strengthened or new collaborations with university A, new hires in B, new grants from C, etc.

Motivation: To ensure that the local- and faculty-levels will be able to assess whether this Priority was successful at the next evaluation so that we develop a positive cycle of following up on our strategic planning.

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| A completed physical infrastructure, 2 new docentships for the hired BULs, cross departmental educational activities on H and Li in materials, cross-program and cross-departmental PhD-theses. Joint publications involving researchers from several departments. Increased Industrial collaborations. |

### First steps that can be taken today

**Instructions**: Describe the first concrete steps needed to move in this direction that can be taken today. These should be clear enough that they can be followed up on in a year to see what progress has been made. Identify initial activities that can be started locally to enable progress to help motivate further support for the larger goal. In the exceptional case where no steps can be taken today, explain why a Priority has been chosen that cannot be started.

Motivation: To ensure that there is a clear idea of how to get started and enable easy follow-up of how the Priority is progressing.

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| Merging research units, starting cross-program/departmental PhD-theses, inventory of teaching and overview of educational programs, their potential need for new advanced courses with links to the research infrastructure can be developed. PhD/Master course of materials analysis of light elements. |

# Priority 5 of 6

## Description of the Priority

**Instructions**: Provide the department name (since these will be collected at the section/faculty level) and the program name (if this is a program Priority), the title of the Priority, and whether it may require department support (Yes/No) and/or faculty support (Yes/No).

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| --- | --- | --- | --- | --- |
| Department: | Physics and Astronomy | | | |
| Program: | All dept programs with experimental activity | | | |
| Title: |  | | | |
| Support: | May require department support: | Yes | May require faculty support: | Yes |

### Goal

**Instructions**: Specify the goal of the Priority, for example, to strengthen a specific existing activity or start a new one.

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| Strengthen and further develop infrastructure-related activities within the department (IFA) across multiple scientific domains. |

### Expected meaningful research improvement

**Instructions**: Provide a description of the research that investing in this Priority will accomplish over the next 5 years. Explain how it has the potential to significantly strengthen or broaden the program for program proposals or department for department proposals. Specifically, this should go beyond continuing or slightly enlarging current activities by having a clear description of what change it will accomplish.

Motivation: The overall goal is to strengthen our research. As a result, the Priority should deliver meaningful improvements in research quality and/or breadth.

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| Advances in physical sciences are driven by the continual refinement and innovation of instruments. In addition, the scientific landscape has changed in recent years, with a larger emphasis on international collaboration. Instrumentation development and the participation in large instrument consortia are now prerequisites for obtaining and maintaining access to transformative cutting-edge facilities. This requires substantial R&D efforts in instrumentation. Uppsala University boasts a rich heritage of pioneering instrument development, firmly positioning itself at the vanguard of scientific progress. In particular, IFA has a broad involvement in developing instruments as well as in participating in world-leading instrument collaborations and consortia (CERN, MAX IV, EuXFEL, ESO, Icecube, ESS etc.). Many of these projects rely on substantial external funding, but none can be maintained without a strong departmental commitment. Strengthening IFA’s funding for this activity will bolster existing infrastructure commitments and enable new initiatives, promising groundbreaking research for the next 10+ years. |

### Implementation plan

**Instructions**: Provide a brief description of specifically what is planned to be done over the next 5 years to realize the potential of this Priority. For example: new hires, investments in equipment, starting collaborations, closing down existing activities, moving resources from existing activities, etc. Use the limited space provided here to discuss the most important aspects of how this activity will be carried out.

Motivation: For a Priority to be credible, there must be a plausible plan and what needs to be accomplished must have been thought through. It is understood that these plans will change over the next 5 years, however.

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| IFA is currently employing a number of internationally recognized experts in accelerators and instrumentation. Their endeavors heavily rely on external funding sourced from instrumentation projects. To strengthen this expertise for the long term, we aim to establish IFA as a key national player in the field of instrumentation, streamlining project coordination and optimizing resource utilization. This will be implemented by coordinating instrumentation and infrastructure projects at the department level, by providing support to existing and new instruments and infrastructure projects, either as co-funding or as temporary financial support for key personnel and career developments. To reach the mentioned goals, we estimate that we need additional funding of three full-time equivalents (FTEs) in addition to existing funding from research programs and external sources. This development is in line with the recent restructuring of the department into larger organizational units, removing internal barriers. |

### What previous accomplishments indicate a high likelihood of success?

**Instructions**: Describe what recent (last 5 years) accomplishments make it clear that the there is a good chance of success in this project. Use specific examples (e.g., grant X, collaboration Y, paper Z) and explain how those recent accomplishments are evidence of having the competencies needed to be successful in this project.

Motivation: For a Priority to be credible, the expertise and track record needed to support it must be present.

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| In the last 5 years IFA has made several structural changes to its internal organization, introduced an instrumentation unit, attracted (and retained) highly competent experts at all levels. IFA has a proven track record of delivering cutting-edge instruments enabling research from universe to materials sciences, including equilibrium properties and ultrafast processes at local, national and international facilities (CERN, MAX IV, EuXFEL, ESO, Icecube, ESS etc.). This represents the largest competence center in northern Europe. |

## Current status of the area at Uppsala University

Instruction: Describe the current status of the area at Uppsala University as a whole. Include any existing funding, support, staff, and success in this area. Explicitly identify any overlap with other existing activities at the program(s), department, section, faculty, and/or university levels.

Motivation: To avoid duplicating efforts, it is important to understand the local Uppsala context when enhancing existing activities or starting new efforts. As part of the evaluation process, the panel will try to identify synergies between proposed Priorities.

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| IFA is traditionally world-leading in instrumentation development (see previous KoF reports). Without additional support, IFA risks losing this position due to competition, upcoming retirements and since UU has no systematic career support for staff dedicated to infrastructure development projects. |

### Current and planned contributions to support the initiative

**Instructions**: Describe the current (already in-place and on-going) and planned contributions to this goal from the local level (from the program for program proposals, from the department for department proposals, and from both the program(s) and department, as appropriate, for program proposals selected by the department). For example, co-funding, in-kind support, shared funding of facilities, transfers of FFFs, etc.

Motivation: Evidence of financial commitment from the local environment strongly supports the proposal as being important. Conversely, if the local environment is unable or unwilling to support it, the importance to the environment as a whole is much weaker.

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| The new infrastructure unit at IFA is supported by several programs with personnel or resources. IFA will continue to financially support instrumentation-related projects and enable large external contracts. We also have support from other Swedish universities. |

## Strategic value

### Strategic value of the area in the global context

Instruction: Describe the importance of the area in the global context. For example: fundamental challenges in research; new developments in research; societal challenges and priorities; global impact and importance.

Motivation: To ensure consideration of the larger context.

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| IFA is the right place for an instrumentation development platform today because we have continued to strengthen the local capacity, this relates the innovation potential of the curiosity-driven science in small groups at UU with international research at cutting-edge large-scale facilities. |

### Strategic value of the area at the next level

Instruction: Describe the importance of the area to the department (for program proposals) and for the section and faculty (for department proposals). For example: synergies with other activities, connections to teaching and collaboration, both currently and potential for new ones, etc. Explain the value of this activity beyond any overlapping ones identified above.

Motivation: To ensure that there is awareness of where this activity fits in at the next level up in the organization. This is particularly important if support is to be requested at that level.

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| Strong instrument development and infrastructure involvement has long been a priority at the university and faculty/research domain level. IFA exploits efforts in instrumentation in teaching, research, and the development of future research opportunities. |

## Contributions needed for success

**Instructions**: Identify what contributions are needed for success in terms of time, expertise, resources, facilities, staff, etc. Explicitly include estimates of financial resources needed and where they will come from.

Motivation: To ensure the costs and resources required have been thought through, and that they are reasonable given the scope of the benefit.

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| Necessary contribution to bolster IFAs international position requires a range of efforts, e.g. co-funding and support when hiring and retaining key personnel. We estimate IFA needs a stable base-funding increase corresponding to 3 FTE. |

### Success indicators

**Instructions**: Describe specific results that will indicate success in 5 years. For example: increases in publications in top venues X and Y, publications in new field Z, strengthened or new collaborations with university A, new hires in B, new grants from C, etc.

Motivation: To ensure that the local- and faculty-levels will be able to assess whether this Priority was successful at the next evaluation so that we develop a positive cycle of following up on our strategic planning.

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| IFA expects to enter several new collaborations (see program KoF self evaluations). Recruitment and retention of senior staff in relevant programs. New publications through access to newly developed infrastructures. |

### First steps that can be taken today

**Instructions**: Describe the first concrete steps needed to move in this direction that can be taken today. These should be clear enough that they can be followed up on in a year to see what progress has been made. Identify initial activities that can be started locally to enable progress to help motivate further support for the larger goal. In the exceptional case where no steps can be taken today, explain why a Priority has been chosen that cannot be started.

Motivation: To ensure that there is a clear idea of how to get started and enable easy follow-up of how the Priority is progressing.

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| Review and consolidate existing support efforts in instrumentation and infrastructure participation, identify and share key personnel, develop career plans, retain staff, replace retirements, enhance collaborations (e.g. stationing MAX IV technicians at UU) and prioritize infrastructure support. |

# Priority 6 of 6

## Description of the Priority

**Instructions**: Provide the department name (since these will be collected at the section/faculty level) and the program name (if this is a program Priority), the title of the Priority, and whether it may require department support (Yes/No) and/or faculty support (Yes/No).

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| Department: | Physics and Astronomy (IFA) | | | |
| Program: | All experimental programs | | | |
| Title: | Infrastructure support | | | |
| Support: | May require department support: | Yes | May require faculty support: | No |

### Goal

**Instructions**: Specify the goal of the Priority, for example, to strengthen a specific existing activity or start a new one.

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| Financial support for equipment and infrastructure investments |

### Expected meaningful research improvement

**Instructions**: Provide a description of the research that investing in this Priority will accomplish over the next 5 years. Explain how it has the potential to significantly strengthen or broaden the program for program proposals or department for department proposals. Specifically, this should go beyond continuing or slightly enlarging current activities by having a clear description of what change it will accomplish.

Motivation: The overall goal is to strengthen our research. As a result, the Priority should deliver meaningful improvements in research quality and/or breadth.

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| The experimental research at the department is in continuous need for investments in new equipment. However, the national support to cover cost for medium size equipment was discontinued in 2000 when several funding agencies were merged into Vetenskapsrådet (VR). As a consequence, the responsibility for financing medium size equipment was assigned to the universities. However, no additional funding at the universities was reserved for this. By co-funding investments in medium size equipment the department will support and improve the capacity for experimental research at the department. |

### Implementation plan

**Instructions**: Provide a brief description of specifically what is planned to be done over the next 5 years to realize the potential of this Priority. For example: new hires, investments in equipment, starting collaborations, closing down existing activities, moving resources from existing activities, etc. Use the limited space provided here to discuss the most important aspects of how this activity will be carried out.

Motivation: For a Priority to be credible, there must be a plausible plan and what needs to be accomplished must have been thought through. It is understood that these plans will change over the next 5 years, however.

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| Equipment investments are paid for by depreciation, typically over five or more years. To cover the cost, the department will reserve in the budget 2 MSEK yearly for co-funding this deprecation cost. We will work out rules for how to use the budget in a fair and organized way. However, the need for co-funding cannot always be planned well in advance, which makes it difficult to build a process based on a standard application process once or twice a year. Still, equipment investments need to have a process based on high scientific quality and transparency. We will aim to design a flexible, yet transparent system that improves our capacity for experimental research. |

### What previous accomplishments indicate a high likelihood of success?

**Instructions**: Describe what recent (last 5 years) accomplishments make it clear that the there is a good chance of success in this project. Use specific examples (e.g., grant X, collaboration Y, paper Z) and explain how those recent accomplishments are evidence of having the competencies needed to be successful in this project.

Motivation: For a Priority to be credible, the expertise and track record needed to support it must be present.

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| The department has active experimental groups with well-organized and working laboratory environments. Some years ago we made two rounds for co-funding equipment and infrastructure. The results of the call and financing decisions have not yet been fully evaluated. Moreover, these financing round did not meet urgent needs that fell between the calls. A new, improved strategy will be developed for the future that better meets reality. |

## Current status of the area at Uppsala University

Instruction: Describe the current status of the area at Uppsala University as a whole. Include any existing funding, support, staff, and success in this area. Explicitly identify any overlap with other existing activities at the program(s), department, section, faculty, and/or university levels.

Motivation: To avoid duplicating efforts, it is important to understand the local Uppsala context when enhancing existing activities or starting new efforts. As part of the evaluation process, the panel will try to identify synergies between proposed Priorities.

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| Co-funding equipment and infrastructure is complementary, but still essential to our priority to have funding to cover salary (and provide career paths) for key personnel working with advanced infrastructure development. |

### Current and planned contributions to support the initiative

**Instructions**: Describe the current (already in-place and on-going) and planned contributions to this goal from the local level (from the program for program proposals, from the department for department proposals, and from both the program(s) and department, as appropriate, for program proposals selected by the department). For example, co-funding, in-kind support, shared funding of facilities, transfers of FFFs, etc.

Motivation: Evidence of financial commitment from the local environment strongly supports the proposal as being important. Conversely, if the local environment is unable or unwilling to support it, the importance to the environment as a whole is much weaker.

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| The initiative will be funded from the department budget, which is partly based on taxation of program resources. The decision to do so have already been taken by the department board. |

## Strategic value

### Strategic value of the area in the global context

Instruction: Describe the importance of the area in the global context. For example: fundamental challenges in research; new developments in research; societal challenges and priorities; global impact and importance.

Motivation: To ensure consideration of the larger context.

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| The access to modern state-of-the-art equipment is central for all our experimental research. The co-funding can either be directly used for in-house facilities or for developing and building equipment for large national/international research infra. |

### Strategic value of the area at the next level

Instruction: Describe the importance of the area to the department (for program proposals) and for the section and faculty (for department proposals). For example: synergies with other activities, connections to teaching and collaboration, both currently and potential for new ones, etc. Explain the value of this activity beyond any overlapping ones identified above.

Motivation: To ensure that there is awareness of where this activity fits in at the next level up in the organization. This is particularly important if support is to be requested at that level.

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| A well-equipped and organized experimental environment is not only important for the core research activity at the department, but also for education and cooperation inside and outside academia. |

## Contributions needed for success

**Instructions**: Identify what contributions are needed for success in terms of time, expertise, resources, facilities, staff, etc. Explicitly include estimates of financial resources needed and where they will come from.

Motivation: To ensure the costs and resources required have been thought through, and that they are reasonable given the scope of the benefit.

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| We estimate a yearly depreciation is affordable for the department and will have high impact on the experimental activity at the department. |

### Success indicators

**Instructions**: Describe specific results that will indicate success in 5 years. For example: increases in publications in top venues X and Y, publications in new field Z, strengthened or new collaborations with university A, new hires in B, new grants from C, etc.

Motivation: To ensure that the local- and faculty-levels will be able to assess whether this Priority was successful at the next evaluation so that we develop a positive cycle of following up on our strategic planning.

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| The equipment that is purchased using dept co-funding is available to users and are requested by users. The equipment is used to build scientific instruments or used directly for research. Equipment used both for research and education. |

### First steps that can be taken today

**Instructions**: Describe the first concrete steps needed to move in this direction that can be taken today. These should be clear enough that they can be followed up on in a year to see what progress has been made. Identify initial activities that can be started locally to enable progress to help motivate further support for the larger goal. In the exceptional case where no steps can be taken today, explain why a Priority has been chosen that cannot be started.

Motivation: To ensure that there is a clear idea of how to get started and enable easy follow-up of how the Priority is progressing.

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| The earlier equipment co-funding call will be reviewed and a process for co-funding needs that require fast decisions will be worked out. |

# Questions to the panel

The panel will provide feedback on research quality, strengths and opportunities for improvement, and comment and give feedback on staffing, funding, and all priority areas. They will also provide feedback on career paths, collaboration and outreach and connection between research and teaching.

**Instructions**: If you have specific questions for the panel that are not covered by those areas, please list up to three of them here. Please note that due to time constraints during the visit, not all questions may be answered.

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| (approximately 600 characters)  Question 1:  Question 2:  Question 3: |