Recommendations of the 93nd Physics Research Committee

May 2022

General remarks

At the 93rd PRC meeting, the new PRC members Julia Thom-Levy (Cornell) and Dave Charlton (Birmingham) were present for the first time. The meeting – the first under the FH leadership of Beate Heinemann – was chaired, for the first time, by Steinar Stapnes (CERN).

A few general points were identified, affecting basically all scientific groups of the FH division:

- The Covid-19 pandemic is still casting a shadow over the work of the groups and, globally, over all projects, national and international. However, recent developments have led to a reduction of home-office and to increased interactions. Getting the division-wide communication up to pre-pandemic levels or higher is a clear priority, and Beate Heinemann has initiated several steps to achieve this (several task forces – see below, the organisation of retreats, etc.). PRC appreciates these initiatives.
- Covid-19 measure relaxation leads to increased travel demands that, however, meet limited travel funds, a fact that is felt in particular in the theory group, but also in the LHC groups who find that they have to spend their entire travel funds on the shift duties at CERN. While sustainability and better tools for video meetings are widely recognised reasons for changes, care should be taken to give priority to travel opportunities and possibly special travel budgets for young researchers.
- In addition, all FH members are encouraged to explore and exploit third-party funding opportunities, and such opportunities are actively being sought by the groups.
- A further common theme is the situation in Ukraine and the restrictions on Russian and Belarus participation in various collaborative projects. These restrictions lead to different problems for different activities, but overall, the groups should be complimented for seeking and finding alternative solutions internally or with other partners to minimize the impact on the group's activities. The situation is still evolving, and in particular more news is expected from the CERN Council session in June affecting, for example, the large LHC experiments. A continued prolonged war in Ukraine will continue to affect collaborations and publication possibilities and will require continued solidarity actions to help Ukrainian scientists.
- A series of task forces is currently being created in the FH division, focusing on scientific opportunities in preparation of strategic and PoF discussions, on technology topics like the organisation of detector R&D activities and technical support across the division, and on organisation and management aspects. These task forces will address several of the topics discussed in the PRC and might also have an impact on the shape and contents of future PRC meetings and PRC recommendations. This will be a topic for the next PRC meeting.
- The need for technical support staff was emphasised by several groups, for the large HL-LHC tracker endcap projects as well as for the increasing local activities on axions and for LUXE. This is being addressed by the division and will be a focus of the PRC in the coming sessions.

- The PRC highly appreciates the support of the distributed detector laboratory (DDL) proposal by the Helmholtz FIS Committee and the HGF members assembly, and it is looking forward to the decision on the proposal that is expected for June 2022.
- Finally, a number of cross-cutting topics were discussed at the meeting (quantum technologies, detector R&D, technical personnel needs, etc). PRC notes that a structural representation of some of these activities does not come naturally given DESY's current organisation chart, and a discussion is needed on how to give these activities sufficient visibility and reviewing opportunities. The above-mentioned task forces will address some of these issues.

ATLAS

The **DESY ATLAS group** continues to make very strong contributions to the ATLAS experiment. Members of the group address a wide range of important physics analysis topics; many analyses are coordinated by DESY scientists. The group plays a leading role in the ATLAS silicon strip tracker upgrade. Several important leadership positions have been added since the last PRC: jets and DM subgroup convenor, e/gamma convenor, software coordination positions. The group is continuously contributing to physics object performance (b-jets, e-gamma), Monte-Carlo simulation, software tools, and computing. Since the last PRC meeting, these efforts resulted in one article with significant DESY contributions published, and eight more submitted to or accepted in peer-reviewed journals. In addition, there are eight public notes from group members and four Ph.D. theses were finished since the last PRC.

Staffing: The number of postdocs is reduced compared to the last PRC, mainly due to the end of several grants and the increased salaries for doctoral researchers (now 66% of a scientist position). The group is working on new grant applications to maintain or build back the staffing level. The ATLAS group strikes a good balance between service, detector, and analysis work for postdocs and students.

The group is involved in Run 3 preparations at many levels (SCT preparation, MC generation / validation / Run 2 comparison, performance studies, analysis preparation). This is a very valuable experience, in particular for **young researchers**, and a good preparation for future success. The group has started new activities in collaboration with the astroparticle physics group in Zeuthen, in particular on QCD and electroweak studies of forward physics and cosmic showers.

The **upgrade of the silicon strip tracker** is progressing well. Both Hamburg and Zeuthen passed the complicated site qualification process for inner tracker (ITk) module production. The group has demonstrated very good progress on larger structures (petals, endcap integration). The level of technical staff needed for the next years requires a close monitoring and possible adjustments.

The group is working on interesting **generic R&D projects** that are important for future directions and help to attract excellent postdoctoral researchers to the group (Helmholtz innovation pool project on novel small-pitch CMOS pixel detectors; support of the DESY Test Beam user community with a new and improved analysis tool; development of a portable, fast and high-throughput DNA analysis tool).

Key comments and recommendations for ATLAS

The PRC commends the DESY ATLAS group on their broad range of achievements, leadership, and creative input to the experiment.

The PRC recommends that care should be taken to maintain postdoc and technical staff levels, especially in light of the high-profile ITk deliverables. The timely delivery of the DESY contribution to the HL-LHC ATLAS upgrade should have very high priority.

CMS

The **DESY CMS group** is large and strong, has grown since the last PRC and is still growing; this is due to the recruitment of Freya Blekman and additional third-party funding. It is a diverse, multinational, team, covering an impressive range of activities (tracker upgrade, operations, alignment, computing, analysis in multiple areas) and holding very important central CMS responsibilities (e.g. deputy chair of CB). DESY also significantly contributes to the CMS HGCAL via the FTX group, see FTX report below.

Working from home of group members is winding down, with return to the campus especially of earlier career researchers. Now there is a clear need to bring back a full set of in-person meetings/gatherings to regain full vitality of the group. Despite all restrictions, publication output continues at a high level. Since the last PRC, there were six CMS papers with substantial DESY work (rate slowed down somewhat – paper submissions were on hold for a time due to the war in Ukraine), seven phenomenology papers involving team members, and two students defended their Ph.D. theses.

Computing: Tier-2 CPU and disk pledges were met in advance of deadlines, and the Tier-2 and NAF were very strongly used. There are developing links to quantum computing efforts, some receiving support from a new funding stream. Helmholtz.AI is funding deep learning projects on simulation.

There are numerous **operations responsibilities** – e.g. BRIL and luminosity, tracker alignment etc. Tracker alignment efforts now include Run-3 commissioning, and there is already an impressive alignment achieved from 2021 test collision data and cosmics.

The group covers a very wide range of **physics analyses** and performance studies, with highlights presented to the reviewers.

PRC also appreciated a detailed summary of the current status and plans for the **CMS endcap outer tracker upgrade**: DESY is to build 1250 “PS” modules (strip/pixel stacks), and the relevant tooling, jigging, test systems, procedures etc. are being developed and exercised (automated assembly planned, driven by DESY). So far three fully-functional prototypes were produced, and a 4^{th} is in progress – production capabilities are still very limited by the CMS-wide low component availability for modules. A two-year production period is foreseen, including a small contingency in time. There are further responsibilities for the overall endcap “TEDD1” “Dee” structures onto which modules will be mounted with the associated supports, tooling, etc, and assembly of pairs of Dees into disks. The relevant procedures are being set up and exercised, problems were and are found and solved – but there is still much to be finalised. Following a proposal to integrate completed TEDD disks together at CERN would simplify operations for DESY significantly.

Project production plans, including resource-loading, are being updated following recent delays to the LHC schedule. This is work in progress; it needs careful analysis and iteration.

The availability of sufficient technical personnel for production and commissioning is not clear at this point.

PRC stresses that the CMS endcap is a flagship DESY-CMS upgrade project and must have sufficient resources to succeed.

DESY also makes contribution to the CMS HGCAL through setting up the assembly and QA chain of tile modules. This is further discussed as part of the FTX group report.

Key comments and recommendations for CMS

The PRC congratulates the CMS team on their impressive and broad work across a wide range of CMS activity. The committee is glad to see more work restarting in the lab, and supports moves to re-establish a full set of in-person meetings and gatherings.

The prototyping, tooling, testing setup, etc, towards the PS module production and testing is impressive and making good progress, but still very limited by component availability. The resource planning for the full scope of the tracker production work at DESY is being developed. As for ATLAS, a close monitoring of the required technical personnel resources is mandatory over the next few years, and adjustments might be necessary.

Belle II

SuperKEKB is currently in its second data-taking period in 2022 (2022b) and has recorded a dataset corresponding to an **integrated luminosity of 370 fb^{-1}** – almost half of the Belle(-I) Y(4S) dataset – so far. The recorded data is of high quality, and several physics analyses with DESY participation are in preparation. The DESY Belle II group is **one of the strongest groups in the collaboration** with a broad range of responsibilities and a leading role in many aspects of detector operations, reconstruction and physics analysis (B→Knunu, radiative penguins, flavour anomalies, tau physics). DESY continues to make **key contributions to Belle II computing**, for example as the host of Belle II collaborative tools. A DESY physicist has been elected the new deputy computing coordinator. A large effort is ongoing at Belle II and SuperKEKB to overcome the present luminosity constraints, with **detailed studies of beam backgrounds** for the Central Drift Chamber (CDC) and the Time-Of-Propagation (TOP) counters.

Future plans: Data taking at SuperKEKB will continue until June 2022, followed by a **15-month long shutdown** (LS1). The data taking period originally planned for late 2022 had to be cancelled due to skyrocketing electricity prices in Japan. A key LS1 project for DESY is the **installation of the new DEPFET pixel detector** (PXD2). The production of detector modules (including spare modules) is progressing well. The first PXD2 half-shell arrived at DESY for commissioning in March 2022. PXD2 is on track to be mounted after the new beam pipe will be available in October 2022. **DESY will take the leading role in the PXD2 installation**, with scheduling and personnel planning ongoing. This will require availability of detector experts as well as sufficient personnel and travel budgets for a strong presence at KEK. The DESY Belle II group has been very active in submitting proposals for third-party funding, with the prospect of further strengthening the group and its portfolio (despite the rather tight personnel budget). Belle II has provided detailed projections of the luminosity as a function of accelerator parameters after LS1, expecting at least double the Belle Y(4S) dataset until 2026. The international task force of accelerator experts continues to provide guidance for the work required in Long Shutdown 2 (LS2), scheduled after 2026, to reach the full SuperKEKB luminosity goal. DESY has engaged in research and development (R&D)

projects for a future Belle II upgrade. As an example, a calorimeter with pure caesium iodide crystals is an option for the Belle II endcap upgrade, but also a very interesting R&D project in itself.

Key comments and recommendations for Belle II

The PRC commends the DESY Belle II group for its strong role in the Belle II collaboration, with responsibilities and leadership positions in several key areas (detector, analysis, collaborative tools, …) and leading contributions to a broad portfolio of flagship analyses.

The PRC takes note that long shutdown 1 of SuperKEKB will already commence in July 2022, with PXD2 installation starting in late October 2022. PRC is very much looking forward to data taking with the new detector, which constitutes a flagship project of German contributions to international large-scale experiments.

The PRC looks forward to an improved understanding of the SuperKEKB and Belle II performance from the ongoing task forces, which should lead to significantly higher integrated luminosities by the end of the decade. The outcomes will also affect the longer-term involvement of DESY in Belle II.

Future Linear Collider Activities and Preparations for Future Experiments (FTX)

The **DESY FTX** group is recognized as one of the key players in the common worldwide international activities to develop future accelerators, detectors and software, for HL-LHC, local experiments, and future colliders. Many aspects of the group's work will require interaction with the newly installed task forces in the FH division (e.g. on scientific computing, on detector development, on local experiments, but also on flavour).

A few points are to be highlighted:

- The DESY Future Collider Forum was established, with the group broadly engaged in all relevant future planning efforts.
- Activities in all areas of the group often depend on only 1-2 key staff, and the software and computing / DTA activities are particularly short of long-term staff. The war in Ukraine with the ensuing consequences for collaboration with Russia further reduced scientific staff contribution in the DTA group.
- The group is exploring and enjoying a wide range of third-party funding sources.
- The LUXE activities are ramping up with FTX playing an important role. The computing activities in FTX are relevant not only for future Higgs factories but also for LUXE, reinforcing the need for staff hiring in this area.
- The test beam is operational and maintains its high availability; the new "R-Weg" beamline is ready, and the activities in the test beam link very closely to detector R&D efforts for future detectors, in line with European and national strategies.
- FTX takes care of a setup for assembly and the QA chain of the CMS HGCAL tile modules for the HL-LHC upgraded detector, covering a full chain of electronics assembly of tileboards, wrapping and placing of tiles, and all necessary QA tests during assembly. While this started mostly as a technology development project there is now an increasing collaboration and common effort with the DESY CMS group.

Members of the group are well represented and often hold lead positions in EU projects and in the ongoing ECFA studies – there are many efforts on many fronts. Staying on top of future plans is a challenge for staff and for the engineering effort. This challenge may require a stronger prioritization, given the somewhat constrained resources. The group also relies strongly on a few postdocs, and there are concerns about a lack of staff positions in software and computing. Also LUXE and other efforts will need sustained support.

In addition to the strong HL-LHC efforts at DESY the FTX group gives DESY visibility in many of the roadmap processes and EU projects that are related to the implementation of the European Strategy for Particle Physics. This covers from Higgs factory physics, detector and software studies to generic R&D in the areas of detector and computing, including the test-beam opportunities at DESY.

The DESY test beam facilities enjoy extremely high visibility both in Germany and worldwide, and clearly contribute significantly to DESY's reputation in all affected scientific communities. A careful development of the facility during the PETRA IV construction and operation period should be secured since the facility is an essential facility for many projects.

Key comments and recommendations for the FTX group

FTX is recognized as one of the key players in the worldwide international activities to develop future accelerators, detectors and software, for HL-LHC, local experiments, and future colliders.

FTX group members hold leadership positions in EU projects and ECFA studies related to detector R&D and Higgs factories, and have established the DESY Future Collider Forum. These activities are very visible internationally and are well recognised contributions to the ESPP implementation.

The group is also central in local research activities, from test beam to plasma accelerator studies and LUXE preparation, all linked to preparation of or R&D for future projects. PRC is aware of staffing shortages, especially in software / computing / DTA (DTA being affected specifically by the consequences of the war in Ukraine) and work should continue to resolve them.

The DESY test beams are essential as an international user facility. The long-term availability during the PETRA-IV era needs to be carefully considered. This facility is also a central part of DESY's ESPP implementation and EU project strategy, as well as an essential part of the DDL.

PRC encourages the group to evaluate strategically the priorities and risks of their wide project portfolio, and welcomes the task forces on detector R&D and technical support which will address several of these issues.

Theory

We congratulate the **Zeuthen Particle Physics Theory (ZPPT)** group for their continued efforts in making highly sophisticated and highly relevant computations in quantum field theory, and particularly on the interface between perturbative and non-perturbative QCD.

Impressive progress has been made in understanding **discretisation effects in quantum field theory**. It is particularly nice to see that for the lattice actions used for large scale simulations of QCD the discretization effects are found to vanish slightly faster than the naive

expectation, where up to recently a much worse behavior was not excluded. Equally, there are important advances in understanding the range of validity of perturbation theory, particularly for gold-plated observables (fully inclusive, no hadronization corrections ...) obtained by lattice QCD.

The ZPPT continues to make an internationally leading impact well beyond that expected for their size. Nevertheless, the ZPPT needs to maintain a critical mass to keep its position as an internationally attractive centre of excellence for quantum field theory applied to particle theory. The PRC is very pleased that Jeremy Green accepted the offer from DESY and that the hiring of a successor of Johannes Blümlein is making good progress.

As discussed below, the PRC strongly supports the **on-site experiments focussed on axions**. This is a very important and active field and is now a core component of the Particle Physics Division. The important contribution from theorists in developing this activity has been crucial. It will be very important to maintain DESY's very enviable world-wide reputation in this area after the planned retirement of Andreas Ringwald in February 2023 and it is essential to start the search for a strong successor in the field of axion theory. This will not be an easy task since many institutions compete for the leading young theorists specifically in the field of astro/cosmo phenomenology, and particularly in axion/ALP theory.

The DESY Theory group is very much looking forward to being able to use the **Wolfgang Pauli Center**. The PRC is extremely pleased to hear that the cooperation agreement between DESY and Hamburg University has been signed, such that the planning of the WPC can proceed. The PRC is also pleased to see that the 2 half-positions for support in coordination office are in the process of being recruited. However, the budget cuts and the related cuts of the space expected to become available are very problematic: It is essential that the two extra ingredients beyond simply replacing the present Theory office building, the Visitor Center and Research Hostel, are realized. Both would contribute very much to the performance of the Theory Group and to its visibility in Germany and world-wide. For example, given the excellent track record of the Theory Group in securing third-party funding (ERCs, Emmy-Noether groups etc.), the Research Hostel will easily be filled with top-quality researchers. On the other hand, assuming that appropriate funding for workshops will be successfully applied for within the extension of the Quantum Universe cluster, the Visitor Center will be positioned in an ideal way to strengthen the visibility of DESY Theory research. Both the Research Hostel and the Visitor Center could also play a key role in fostering interactions between different divisions as well as between Clusters, thereby strengthening an interdisciplinary DESY research community. We very much hope that at least 2700 m^2 will become available instead of the presently discussed number of 2300 m^2, which would simply replace the present office space.

The DESY Theory group has always been and continues to be a place of education for top-level Ph.D. students and young postdocs, many of whom went on to become professors in Germany and around the world. The travel funds for the group are now very limited, potentially hurting the career opportunities of the many young researchers in the theory group. As also already mentioned in the general recommendation a balance has to be found between the necessary reduction and sustainability considerations on the one hand and sufficient travel opportunities particularly for young, researchers on the other hand.

Key comments and recommendations

The PRC supports the vision of the WPC to forge an international center for Theoretical Physics which maintains unique links to experiments. We recommend that every opportunity is taken to maximise the scientific impact and international visibility of the new WPC building by providing sufficient space for the Visitor Center and Research Hostel. The PRC views the Visitor Center as a key component in raising international visibility and in supporting a proposal for the Quantum Universe Excellence cluster, while the Research Hostel will be key in attracting additional third-party funding to DESY.

PRC further recommends that an effort be made to maintain DESY's unique position as a centre for axion/ALPs physics and maintain the crucial on-site theoretical input into the axion program by searching for a strong successor of Andreas Ringwald in the field of axion theory.

ALPS II

The **ALPS II experiment** is continuing its great progress and is expecting a first physics run before autumn 2022. Transition edge sensor (TES) data analysis is progressing nicely, even though some hardware issues are present related to the cryostat.

Recently a new physics motivation has been published, related to the transparency of the universe for large TeV photons that can be tested with model-independent measurements at ALPS II.

A recent successful workshop on physics “Beyond ALPS II” provided opportunities that will be discussed in the autumn meeting of PRC. There might be a push towards making a realistic attempt to measure the vacuum magnetic birefringent, an arguably very challenging measurement. There are also open issues e.g. with the cryo-system.

Personnel (postdocs, fellows, positions) is an issue; in particular PRC wonders if the way fellowship positions are advertised does give sufficient support to ALPS II compared to more traditional HEP experiments pursued at DESY.

Key comments and recommendations for ALPS II

We congratulate the collaboration for completing the magnet string test at full current, including the first cool-down. Fully understanding the optical cavity and developing confidence is also critical.

We strongly encourage the collaboration and DESY to continue their efforts to have a physics run within 2022 as planned. PRC is very relieved that sufficient Helium could be secured for the first science run of the experiment.

We recommend to consider whether postdoc positions should be allowed to be advertised specifically for ALPS II since this is a unique optics facility in the world.

BabyIAXO

The **BabyIAXO collaboration** keeps making impressive progress on many fronts, e.g., detector development, control system, data analysis, MC studies, “optics” ray tracing, additional X-ray telescope, new physics opportunities with axion dark matter, high-frequency gravitational waves, establishment of a technical coordinator, etc. In addition, MPE/PANTER is interested to join the BabyIAXO collaboration, which would be important for the calibration

of the XMM and other optics. Members of the BabyIAXO collaboration have decades of experience in the field of axion helioscopes and the progress made is a reflection of that fact.

There is an important item, namely **the cable for the magnet** that is now the critical path and needs to be dealt with decisively. Furthermore, the CERN commitment towards designing and perhaps building the magnet is perturbed due to the retirement of a leading detector magnet expert at CERN. The collaboration could not finish the TDR with resources loaded timeline even after completing 150 pages of it, but promised to do so by the autumn PRC meeting. The main issue is the developed situation with the magnet cable. By autumn, a dedicated BabyIAXO review will be held by PRC, with the involvement of external experts.

The budget for preparing the DESY south hall seems critical – with the increasing awareness and opportunities for axion physics at DESY budgets and technical support will be essential for success of these projects.

We congratulate the collaboration for reaching critical milestones and for the steady progress.

Key comments and recommendations for BabyIAXO

We congratulate the collaboration on the progress achieved throughout all important systems. Also, we welcome the possibility of being able to do an axion haloscope experiment in the 100-500 MHz, a frequency range that is currently an orphan.

We recommend that the DESY leadership, in close coordination with the collaboration, works with the CERN leadership to secure the timely resolution of the issue of the magnet cable design and construction.

BabyIAXO is a high visibility axion helioscope and (together with ALPS and the future MADMAX programme) will establish DESY as the centre of axion physics in Europe. DESY needs to put the required resources for their timely completion to demonstrate it can support and build small/important axion experiments on-site on time.

Finally, the resource-loaded timeline should be submitted as soon as possible. It will expose all the unfunded required activities.

MADMAX

The interest in **MADMAX physics** keeps being very strong and remains one of the best ways to reach the high-frequency axion dark matter range above 20 GHz.

The collaboration has made significant progress with the **MORPURGO magnet** at CERN and is well on its way to first physics results including dark photons and axions. It is accomplishing critical technical milestones as well as achieving understanding of the cavity modes at around 20 GHz, including radiating modes; the collaboration has come up with ways to suppress the latter. Those issues are typical when operating cavities, and it is critical to flesh them out.

So far, there is a good understanding of the “optics” and the booster factor (beta) based on both simulations and data. Technically, PRC believes the progress is very impressive, and no show-stoppers are found.

The magnet development is still the critical path, and the collaboration needs a plan for it. The cable quench propagation velocity test demonstrated great success.

Key comments and recommendations for MADMAX

PRC is very happy with the collaboration's technical accomplishments. They should completely exploit the MORPURGO magnet as it may be the only source for physics runs until the main magnet becomes available.

PRC encourages DESY to work with the collaboration to come up with a well-defined plan towards materialising the construction of the main magnet since the lead time is long. Also, resources available to the collaboration need to be specified to reach important milestones.

LUXE

LUXE is being reviewed for **CD1 approval by the PRC** – augmented with an extended set of experts, in separate review sessions from the ordinary PRC review. A report is expected within a week.

Well documented detector, laser and beamline descriptions are available, and the further work on physics, background studies and simulations is well understood. Schedules, costs and resource planning are consistent with installation in the extended shutdown in the second half of 2025, in agreement with European XFEL planning.

Very good progress was shown in the PRC open session, including all parts of the experiment (laser, beamline components, detectors, infrastructure, …).

Computing / IT

DESY IT carries out an impressive programme in providing necessary support and resources for current research, and performing own research and development to secure computing capabilities that will be needed for future planned and proposed efforts. Especially in the data management area, this R&D often prepares for issues that will become apparent at scales that will be reached several years from now.

Provision of resources via Grid, NAF, and Maxwell performs admirably and matches well the demands from the user communities. There are new activities to extend the support for CTA at Zeuthen. There is some understandable concern about future funding for hardware investments. The rising inflation is a challenge for all scientific activities, for computing the challenge is even larger as the energy-sector-specific inflation rate far outstrips the general inflation rate. Energy costs form a significant fraction of the total cost of providing computing. More funding towards power means less funding towards infrastructure investments. This is a challenge for DESY to protect both the IT investments and the scientific research these investments will support.

The **consolidation of Grid, NAF, and Maxwell into IDAF** is timely, and can free up effort sorely needed for the wide range of projects being carried out to secure future research capabilities. The IT projects in the data domain are of particular note; preparing photon and neutron science for the scales of the future, enabling data lakes for many data-intensive communities, and supporting a large community of research institutions deploying dCache by developing and rolling out an integration of dCache with the CERN Tape Archive. Similar initiatives are also being carried out by IT for the national research infrastructure.

Attracting skilled research **computing staff** continues to be difficult. The appointment of Kilian Schwarz as head of the Scientific Computing Group is a laudable success. He has

necessary significant and relevant experience for this position. We support the group in appointing a worthy successor to Volker Guelzow.

Key comments and recommendations for computing / IT

The PRC commends the IT group for the continuing development and consolidation of the facilities, both those more external facing (WLCG Tier-2, Belle Tier-1) and more serving local and national users (e.g. NAF). The group is committed to enabling users via new technologies: for now, Jupyter and Gitlab, in the future data lakes and FAIR data.

Hardware investments may come under pressure in the future from rising energy costs; we support the group's efforts to deal with this situation. A sustainable approach could include increased efforts in performance engineering of software, with the aim of accomplishing the same physics with less hardware and reduced CO2 emissions.

Strong progress has been made on the articulation of the group's mission, vision, and strategy. We encourage the group to continue along these lines, developing a portfolio of the group's activities organised along these mission/vision/strategy lines. We believe this has the potential to assist the division in becoming even more effective and generating further impact.

One of these vision lines appears as a theme throughout the group's activities: (FAIR) Data Management and services. This is an excellent choice given DESY IT's superb track record in this area.

PRC encourages DESY IT to provide compute resources and data storage to compensate for resources that became unavailable because of the war in Ukraine (WLCG resources in Kharkiv and Kiev). PRC supports DESY IT's efforts to offer computing cycles and storage to Ukrainian scientists whose computing centers are currently offline due to the war.

IT security becomes an increasingly important area. Security often comes at the cost of usability and flexibility; the committee supports DESY IT's proactive approach in this area.

Final note: This may be Volker Guelzow's last PRC appearance; we thank him for his service to DESY, to German science and also for his contributions to the international research computing domain. We support and encourage DESY in their search for an outstanding leader to succeed Volker as the next Head of IT.

Two topics were presented in the Open Session with links to many of the FH groups, and also across divisions. While these two were not covered by dedicated pre-meetings we nevertheless add some comments to these presentations.

Generic silicon R&D

The presentation and discussions of **generic silicon detector R&D** in the FH division were well received by the PRC. There are very relevant and interesting R&D efforts on pixelated sensors and ASICs, and there are numerous very promising synergies with other DESY activities (photon science, machine division, test beam, industry, …). Within the FH division several groups participate in these efforts with the goal of improving their experiments, and also FTX contributes strongly in the framework of future collider studies and with the test beam facility. This is important also for the training of future scientists. The PRC took note of the on-going task force studies of the future organisation and support of these activities, including the important links to the testbeam and the strategic links to the DDL, EU projects

and future PoF deliberations. The PRC will come back to this topic in future meetings, including the possible role of the PRC in following up the task force recommendations.

Quantum technologies

A brief overview of **quantum technology activities** (quantum machine learning, quantum computing, quantum sensors, …) was given in the open session of this PRC meeting. A task force has collected community input and started to collect synergies; it now prepares for setting up a dedicated seminar series. The PRC appreciated this overview very much and was impressed by the presented examples of using these new methods, in particular related to quantum computing algorithms. The committee would also be interested to learn more on quantum sensors in a future meeting, and the possible links to fundamental physics measurements. As for the detector R&D we will come back to this topic in a future meeting.