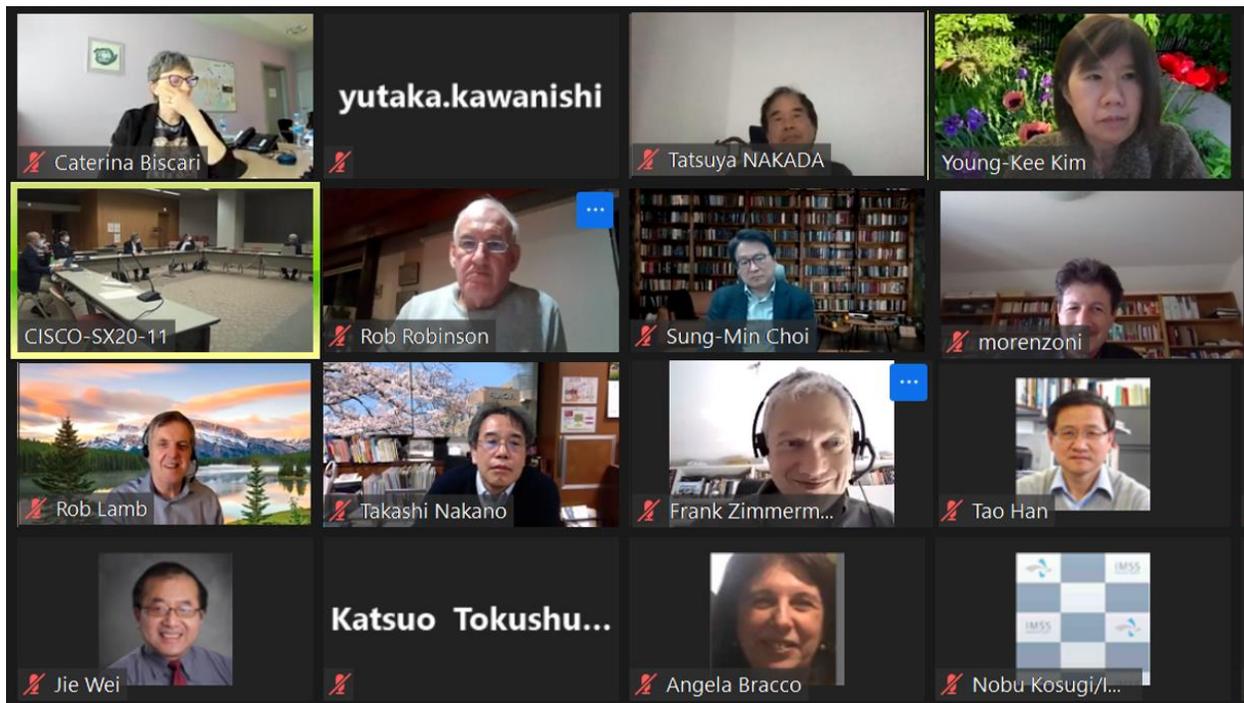


**REPORT:**

**THE SECOND MEETING OF  
THE KEK SCIENCE ADVISORY COMMITTEE**

**April 13, 2021**



## Executive Summary

The KEK Science Advisory Committee's second meeting took place virtually on March 19 - 21, 2021 and March 30, 2021. The agenda of the meeting can be found in Appendix A. The membership of the SAC is provided in Appendix B. The informative presentations to the SAC highlighted recent activities and progress made in the past two years, and the draft roadmap of KEK. At this meeting, the SAC was asked to focus on reviewing the "KEK Roadmap 2021" that describes goals and plans for the fourth medium-range period (from FY2022 to FY2027). The SAC appreciates the KEK team's implementation of its March 2019 SAC recommendations.

KEK provides scientific opportunities for researchers from academia and industry in Japan and abroad, covering accelerator science, particle physics, nuclear physics, cosmology, material science, and life science. KEK operates and develops world-leading electron-based and proton-based accelerator facilities at Tsukuba Campus and Tokai Campus, respectively. Using various types of beams from these facilities, KEK pursues fundamental laws of nature and the origin of function of materials. KEK develops the next generation of accelerator technologies for a wide range of sciences and it collaborates with industry on research aimed at developing useful products for society. KEK strengthens its portfolio by partnering in activities at other world leading research laboratories and facilities, including LHC/ATLAS experiment at CERN, KISS at RIKEN, UCN at TRIUMF, KAGRA at the Kamioka mine and LiteBIRD in space.

Despite COVID-19, a tremendous amount of excellent work has been done on many fronts and KEK should be commended. KEK facilities have not lost much operation time thanks to dedicated work by KEK staff. This pandemic, however, has reduced the number of users in 2020 and has delayed some activities and initiatives including cooperation with Japanese institutions and joint programs with various foreign laboratories. The SAC encourages KEK to continue to monitor the impact of COVID-19 on KEK projects and programs and on mental health of the staff; and to act to mitigate as problems arise.

The SAC is deeply concerned about the steady decrease of KEK staff while KEK's activities have been increasing. This has resulted in some projects and programs that are understaffed and are not competitive to similar programs elsewhere.

The SAC offers the following recommendations pertaining to the Roadmap:

- Emphasize more clear purpose, vision and mission statements of KEK. As a foundation for developing KEK's strategy, this will be critically important especially when various projects and programs are understaffed.
- Provide KEK's lab-wide high-level strategic plan with priorities based on the required human resources and expertise of staff, uniqueness and impacts. This plan should include KEK's approach for balancing appropriately among short-, medium-, and long-term efforts, among accelerator-based and non-accelerator based projects, among KEK-based and non-KEK-based programs, and among large-, medium-, and small-scale projects.

## Accelerator Facilities

Over the past two years, J-PARC RCS beam power was brought up to 600 kW for MLF, while the MR delivered in excess of 55 kW with Slow Extraction (SX) and reached 515 kW with Fast Extraction (FX). During the next Roadmap period from FY2022 to FY2027, the primary goal of the J-PARC MR upgrade is to establish high power operations for the neutrino program (FX) at 1.3 MW, and to achieve stable operation with the hadron program (SX) at 100 kW, giving a boost to experimental programs in hadronic physics and precision measurements of rare decays of kaons and muons. The J-PARC MR operates at an intensity of  $2.66 \times 10^{14}$  particles per pulse, which is a world record among synchrotrons. The MR slow extraction operates with the world's highest extraction efficiency of 99.5%. KEK's long-term plan to realize multi-megawatt class proton beams for neutrino physics includes a new booster synchrotron downstream of the RCS to raise the MR injection energy to 8 GeV and, alternatively, a superconducting linac-based proton driver on the Tsukuba campus. A 30 GeV stretcher ring for SX is also considered. KEK leads the associated R&D efforts, which will continue throughout this Roadmap period.

In 2020 SuperKEKB established a world record peak luminosity of  $2.4 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ , the lowest ever collider collision-point beta function of 0.8 mm, and a novel virtual crab waist collision scheme. Beam stability and emittances from the injectors are being improved. A novel type of low-impedance collimator will be installed. KEK is contributing new SC 5.6 T "D1" separation dipoles for the HL-LHC. For ILC, KEK continues important R&D efforts on nanometre beam control and SRF technology at the ATF2 and STF/CFF test facilities, respectively. Other studies concern cost reduction, positron source, and beam dump, in collaboration with other accelerator laboratories worldwide. A timely decision on the ILC would direct KEK resource allocation and longer-term planning.

An upgrade of the Photon Factory (PF) is underway for improved beam orbit stability and a factor 3 higher brightness. A new beamline for detector development is being set up at the PF-AR. One option for the longer-term future is a hybrid ring, combining probe pulses from a storage ring beam with pump pulses generated by linac bunches passing through the same ring-arc beam pipe. The PF slow positron facility is worldwide unique.

The newly established Center for Applied Superconducting Accelerator (CASA) exploits KEK's cERL and SRF facilities to pursue R&D towards future compact SRF accelerators and higher performance SC cavities, and to engage outside partners to develop compact accelerators for various medical and industrial applications. It has attracted ~5MUSD in external funding over 2 or 3 years.

The number of KEK accelerator physicists and engineers steadily decreases. Continued loss of expertise occurs, while the demands of operating the machines continue to grow. As a mitigation measure, some expertise is being transferred to newly recruited staff and cross-project staffing is expanded.

### *Comments and Recommendations:*

As timeline is not clear for the government's decision on ILC, it is important for KEK to be ready to strategically formulate its long-term vision on major accelerator facilities by the time of the next Roadmap period. For KEK's long-term plan to realize multi-megawatt class proton beams, a comparative study

involving both user needs and accelerator deliverables could help prioritize among the competing scenarios (booster synchrotron, SC proton linac, stretcher ring,.. ). Resources and long lead R&D efforts could then be focused on the preferred scenario to establish a project timeline. A Multi-MW proton driver could also support R&D activities for a possible future muon collider.

For SuperKEKB, the 2026 upgrade, if it takes place, and the subsequent re-commissioning need to be meticulously prepared. The detailed upgrade plan should be guided by a thorough assessment of present performance limitations. Consolidation of aging components from the TRISTAN era is also of high priority. Delivering the target integrated luminosity of  $50 \text{ ab}^{-1}$  by 2031 will be challenging. Enhanced international collaboration could help develop solutions, and bring in new ideas. The operation time may need to be extended beyond 2031 to accomplish the integrated luminosity goal - which might also impact the timeline of the SC proton linac scenario. A future option under consideration for SuperKEKB is an upgrade to polarized electron beams, still requiring significant studies and R&D.

KEK has been one of the world leaders in accelerator theory, cutting-edge technology (e.g. high gradient SRF cavities, magnetic-alloy loaded RF cavity and multi-strand aluminium coil for rapid cycling, crab crossing demonstration), and world-leading major facilities (J-PARC and SuperKEKB). KEK's continued leadership in accelerator science would be essential to the health of the world accelerator community.

The SAC offers the following recommendations pertaining to the accelerator part of the Roadmap:

- Develop a detailed recruitment and succession plan for the accelerator staff. In particular, make a focused effort to maintain all the existing unique and essential expertises required for the present and planned accelerator programs, as experienced staff continue to retire or leave KEK.
- Develop a strategic plan for the long-term future for B and neutrino physics beyond SuperKEKB/BELLE-2 and the MR driven long baseline neutrino beam to HyperK.
- Launch design studies and long-lead R&D for multi-megawatt proton beams, preferably based upon a comparative study prioritizing among competing scenarios.
- Consider taking an initiative on unique advanced-accelerator R&D, which will drive further accelerator science.
- While continuing to improve the performance of PF and PF-AR, further develop a unique option for the longer-term future, 10 year time scale, such as the proposed hybrid ring.

### **Particle and Nuclear Physics**

KEK operates accelerator based world class facilities for nuclear and particle physics experiments. In particle physics, a combination of a high luminosity lepton collider at Tsukuba Campus (SuperKEKB) and a high intensity proton machine complex (J-PARC) at Tokai Campus provides a unique opportunity in physics with K, D and B mesons as well as muon and tau leptons and neutrinos: i.e., looking for physics beyond the Standard Model through precision measurements and testing low energy QCD in nuclei, an alternative way to experiments at high energy frontier that directly search for new particles. Belle II at SuperKEKB and T2K at J-PARC are two flagship experiments in flavor physics and neutrino physics, respectively, with large international participation. Foreign collaborators have been making sizable

contributions to both experiments with a correspondingly high expectation for the machine performances. Considering the compelling physics cases, providing sufficient beam time to Belle II and T2K experiments should have a high priority. Their results are clearly statistics limited; thus the work necessary to increase the SuperKEKB luminosity and J-PARC accelerator intensity should continue in earnest. A suite of high precision experiments with kaons and muons at J-PARC are complementary to similar efforts at CERN and FNAL and with some unique features. J-PARC has been driving nuclear physics with its unique and excellent program on hypernuclei and kaonic atoms. Frontier measurements with a new higher resolution spectrometer are well planned and will further benefit from the increase of beam intensity. Those experiments and the upgrade of the J-PARC hadron hall, in particular, should be well supported.

KEK is also active in participating in particle physics related experiments elsewhere, one of the LHC experiments, ATLAS, at CERN being the most notable one. Many Japanese university groups are participating in the ATLAS experiment and KEK is playing a role of hub for the Japanese detector contribution to the experiment, thanks to its well-developed infrastructure. This is particularly important for the small groups. KEK also contributes to the LHC accelerator with its expertise in superconducting magnet technology. ATLAS will remain as one of the flagship experiments at the energy frontier. The KEK's continued involvement in the ATLAS experiment, together with Japanese university groups, is crucial, not only for the currently ongoing upgrade but also for the longer time scale, as well as the continuous participation in the LHC machine upgrade. KEK participation in non-accelerator based particle physics projects, including those in astroparticle physics and cosmology, is presently at a much smaller level, but KEK provides crucial technical expertise and leadership. In the area of nuclear physics, the research on the origin of heavy elements with the KISS facility at RIKEN has been successful and the future plan for the uncharted region around Uranium is unique and challenging. The Japanese-Canadian TUCAN collaboration, after a successful construction of a very intense ultra cold neutron source, will measure the nEDM with unprecedented precision. Given the important role KEK is playing with a relatively small cost, those activities should continue to be supported. Future participation in projects elsewhere should be strategic and for well justified cases, and KEK should develop a strategy and policy for the long term future.

While the Belle II experiment will remain as a flagship running project for a while, the HyperK experiment will be the long term future of the Japanese neutrino program. Physics based on the accelerator produced neutrinos, where KEK carries a major responsibility, is one of the main components of the project. Successful execution of the HyperK project should be among the highest priorities of the future J-PARC program.

The International Linear Collider (ILC) is a key element in the future of KEK as a whole. Although it is an international project and not considered as KEK's own project, many KEK accelerator experts will have to be engaged as well as experimental physicists, if it is indeed hosted in Japan. There is a clear declaration of interest worldwide, if the ILC can be hosted in Japan in a timely manner, and KEK has been playing an important role for the realization. KEK should continue contributing to the necessary effort for hosting the ILC in Japan in order for a decision to be made on a short timescale. At some stage, KEK should start developing its long term strategies for different scenarios.

Profound and engaging theoretical work is vital for advancing particle physics on all frontiers and for the mission of KEK. The Theory Center at IPNS has been conducting active and impressive research programs.

Its missions are to closely cooperate with the experimental groups at KEK, and to collaborate with researchers at universities in Japan and other institutions across the world. As one of largest theoretical particle physics centers world-wide, their research directions include:

1. Particle physics phenomenology, model-building for physics beyond the Standard Model;
2. Nuclear physics, hadron physics and lattice QCD;
3. Precision measurements for fundamental interactions;
4. Astro-physics, early universe cosmology, and gravitational wave physics; and
5. String theory, AdS/CFT, quantum field theory, quantum gravity and quantum information.

The SAC praises the Theory Center's vibrant activities for healthy publications, organizing topical workshops, hosting visitors, and training a large number of postdocs and students. Further enhancement of the close interactions and mutual support between the Theory Center and experimental groups is strongly encouraged. As one of the world's renowned theory centers, more visible engagements with the theory community at a global level would benefit both the world community and the KEK Theory Center, and further strengthen the status of KEK.

*Comments and Recommendations:*

KEK's priorities should include providing sufficient beam time for Belle II and T2K experiments, KEK's continued involvement, together with Japanese university groups, in the ATLAS experiment and its upgrades, continued contribution to the necessary effort for hosting the ILC in Japan, and successful execution of its contribution to the HyperK project.

In addition, the SAC offers the following recommendations:

- Support the wide-range particle and nuclear physics programs at J-PARC and the upgrade of the J-PARC hadron hall.
- Prepare to develop KEK long term strategies without the ILC.
- Develop a strategy and policy for the longer term regarding future participation in projects elsewhere, including those in cosmology and astro/astroparticle physics.
- Foster common detector R&D efforts among the different projects not only within IPNS, but also in other research areas of KEK.
- Continue to strengthen the close interactions and mutual support between the Theory Center and experimental groups, and include some prospects for the Theory Center in the roadmap.

### **Materials and Life Science**

KEK is in charge of four distinct materials science/biology platforms based on its strong accelerator technology and nuclear expertise: 47 X-ray and UV beamlines at the Photon Factory, 8 neutron beamlines at J-PARC, 4 muon beamlines with 7 instruments also at J-PARC, and a slow positron facility. There are an additional 14 neutron beamlines at the MLF operated by JAEA, CROSS and Ibaraki Prefectural Government.

In the broader international context, the Photon Factory is now an old facility, one of perhaps 50 such light sources worldwide, and perhaps 20 competitive ones. The neutron effort at the MLF is one of ~20 neutron sources, of which perhaps 10 are competitive, and the muon effort is one of four facilities worldwide. The MLF at J-PARC is one of the newest and most powerful facilities in the world and it really should be in the top 5 neutron sources and the top 2 muon sources. But it is not, yet. It has to strive to achieve this, and we believe that this is possible even within existing budgets. The key thing is not to increase the accelerator power, but rather to staff appropriately and to develop the right science culture, and a focus on strong relations with the broader materials community in Japan, which is world-leading.

The SAC observes that all three major platforms are understaffed and, where the SAC has enough evidence, the SAC finds that they are not producing science at an internationally competitive rate, even though there are patches of real excellence. KEK has too many beamlines, and too few staff. It would be better if KEK could identify its best beamlines, or those with the potential to compete internationally, and staff them appropriately, even if this means mothballing or shutting down other beamlines that are less productive or show less potential. We urge KEK to focus on what is important – it is a great pity to have all of this wonderful facility investment, and have it under-produce for the lack of a few people in key places.

The IMSS's strategy of encouraging multi-platform research is a most laudable one. While particle physics and astrophysics have very good 1:1 mappings onto the technologies they need, this is not the case in materials science – one often has to use multiple techniques, and one cannot predict at the beginning which methods or instruments will eventually be most useful. On the other side, many instruments are very broad in their application and their construction/operation cannot normally be justified on the basis of one big blockbuster scientific question. If KEK tries to pursue a science agenda, it risks becoming decoupled from its assets. And if it were really to succeed at making its instruments productive, it may appear to lack scientific focus. This is a problem everywhere. Having said this, KEK should encourage its university users (and those in RIKEN, JAEA, NIMS, AIST, industry and so on) to use the other tools in its portfolio, where appropriate.

The key roles of KEK in materials science can be categorized into three: (1) the development of neutron, muon, SR sources and instruments, (2) operation of user programs for the facilities, and (3) materials research using the facilities.

KEK has excellent track records in Role (1), and the future plans for source and instrument upgrades are being laid out. The PF has made plans to re-define its role in the Japanese and global light-source community which seem to be reasonable. The upgrade plans for the KEK beamlines at J-PARC are well laid out.

Roles (2) and (3) have been hindered by the limited number of staff (compared to the international standards), which are more severe for the KEK beamlines at J-PARC. However, it is unclear what the strategy is to resolve this issue. Considering the volume of investments made in the facilities (especially for the KEK beamlines at J-PARC) so far, it would be most cost effective to increase the number of qualified permanent scientific staff, both instrument scientists (with priority) and materials-research-focused scientists. The top management of KEK should consider this very seriously, as already mentioned above

As PF is part of IMSS there is understandably a desire to keep it going through selective upgrades and deeper integration with other adjacent facilities into what is referred to as CIQuS. There appear to be a number of practical drivers for this. For example:

- The PF has a relatively static budget with no real growth in the past decade at a time when, for example, maintenance costs would be rising rapidly and staff profile is changing significantly (PF is 40 years old).
- The PF user base of 3000 users seems reasonable for 47 beamlines. However, the resulting ~600 papers/year is a bit lower than would be expected particularly given the mix of beamlines and the fact that there are beamlines now operated by University staff.
- In the IMSS and PF reports, it is stated that thin film devices, several kinds of batteries, structural materials, cultural heritages, food, and so will be a focus. This seems perhaps too broad. Referring back to an earlier slide, it is suggested that the rationale for picking a few areas that IMSS could lead in would be the good approach. It is noted for example that the new (under construction) SLiT-J 4<sup>th</sup>-generation light source has made food science and agriculture a priority.
- Similarly, repurposing beamlines to instrument development will be helpful depending on what the measure success is. It would be unlikely to increase scientific publication citations if this is a measure of quality. However, stimulating industry connections is good and Japan has some excellent companies that could take advantage of this.

It will be important to consider the user community's suggestions regarding priorities.

The KEK roadmap presents ambitious plans regarding the muon beamlines encompassing, on the one hand an active and international user program and, on the other hand, the development of very challenging tools using the ultra-slow muons and the  $\mu$ SR technique for depth- and position-resolved surface and material studies (USM muon microscope, transmission muon microscope). The generation of an intense low-emittance source of ultra-slow muons (USM) is crucial for the realization of these ambitious projects. The performance of the USM source is also central for obtaining the required accuracy in the g-2/EDM experiment, a precision measurement intended to address the physics beyond the standard model of particle physics. Maintaining an efficient balance between beam-line availability, upgrades, and new developments appears challenging, given the limited resources especially in man-power.

#### *Comments and Recommendations:*

The SAC offers the following recommendations:

- Leverage Japan's general excellence in new materials, to get leading external groups (in universities, industry, RIKEN, NIMS, AIST, etc.) to use KEK's photons, neutrons and muons.
- Benchmark the scientific performance of KEK's facilities against the competition from similar facilities in Japan, the Asia-Pacific and the world.
- For each quantum beam (i.e. each of photons, neutrons and muons), put its beamlines in rank-order, with a view to mothballing or closing down the least productive ones and shifting staff to the more productive ones (or those with more potential).
  - Prioritize the PF instruments with a view to reinforcement of resources in selected areas in order to increase their competitiveness.

- Work together with JAEA, CROSS and Ibaraki Prefectural Government to optimise the scientific outputs from the full instrument suite at the MLF.
- The Photon Factory should remain as scientifically productive as possible. This will require maintaining its operational budget, but only modest capital investment.
- Continuing the planning of future photon science at KEK is mandatory. As such the SAC sees with interest the start-up of the design of the hybrid ring as a possible future facility. It is recommended to work-out a compelling science case which can take advantage of the future source, with clear relational and risk analysis and in collaboration with the user community. The roadmap should include a schedule of the new project, which should fit the transition between the present PF facility to the new one minimizing the dark period for the users.
- Establish clear priorities with milestones in the time line of the different muon science activities and develop risk management plans and alternative paths for the most ambitious projects at the U and H line of the muon facility.

### **Applied Research**

The Applied Research Laboratory develops technologies and provides technological support in fields ranging from accelerator science, computing, cryogenics, magnet technology, radiation survey and protection, and mechanical engineering. All these activities are essential for realizing and bringing to success of major projects at KEK. For automated or remote experiments at the Photon Factory under the COVID-19 pandemic, for example, a sample exchange robot for metal quenching experiment and protein crystal exchange system were developed.

The Center for Applied Superconducting Accelerator (CASA) was established in order to promote the application of its accelerator technologies to industrial and medical applications, including the superconducting high-frequency accelerator, which can accelerate high intensity beams with high power efficiency. CASA has been promoting the production of medical radioisotope (Mo-99), infrastructure life extension through asphalt modification, and EUV-FEL exposure light sources for next-generation semiconductors. CASA will pursue research and development for improved performance of boron neutron capture therapy (BNCT) using linear accelerators and promote the applied use of such advanced accelerators as induction synchrotrons (digital accelerators). The Applied Superconducting Accelerator Consortium has been established for the promotion of accelerator application through industry-academia cooperation.

### *Comments and Recommendations*

Some of the preceding projects at CASA show that KEK's cutting-edge technologies can solve urgent social issues. However, the scale of the industry-academia collaboration projects is still small compared to the high potential of technological seeds at KEK.

- Strengthen the industry-academia collaboration support and research administration functions in order to develop them into viable products and services in a timely manner, it is necessary to.

## **International Cooperation and Diversity**

The degree of international interaction in KEK depends strongly on the individual activity in its size of global footprint and level of uniqueness. Those facilities that are unique and at the very highest standard (such as for the B physics and neutrino effort, or the involvement at CERN) are the most internationalized. At the other extreme, in areas where KEK may not even be the leader in Japan, there is less international involvement, in part because other countries also have their own facilities. There is generally less international interchange than one might find in Europe, North America or Australia. This could be partly a question of distance, partly due to language and cultural differences, and partly because pan-Asian scientific collaboration is less intensive than in Europe.

The SAC acknowledges that KEK and KEK staff are engaged in several important joint research activities outside Japan, notably at CERN and TRIUMF. The SAC encourages KEK to continue in this way and to widen its strong international connections.

KEK started construction of a new beamline at the PF-AR to test various detector technology concepts and to support an international scientific user community. This will be an important element for KEK to achieve its goal of creating an international hub for detector R&D and to strengthen international collaboration.

The SAC is pleased with KEK's plan to hire more women scientific and technical staff to reduce their current big gender gap and looks forward to the outcome of this plan in the future. Although this plan will help KEK's situation, it may not make much impact on Japan's STEM gender gap issue: the percentage of women in STEM vocations is lower for Japan than for other countries with an equal level of science and technological development. The SAC encourages KEK to strengthen outreach programs for the young generation promoting STEM in general and particularly to women, with an aim to become a successful example for improving the STEM gender gap in Japan. The SAC notes that the percentage of women having leadership positions in KEK is extremely small and that all of the presentations at this meeting were given by men. The SAC hopes to see improvement in the near future. Experience from elsewhere suggests that women in leadership positions serve as important role models for younger women, thereby helping to close the gender gap.

Partly due to lack of resources and the heavy work loads, teams from different KEK projects or sub-projects appear to be relatively isolated and disconnected from each other. Possible synergies and transmission of new ideas might be missed in this mode of operation. The SAC notes that KEK's cross-project staffing effort is an excellent step towards building bridges across projects and bringing experts from different projects together. The SAC recommends KEK to find more ways (such as joint meetings/seminars, topical cross-project working groups, lectures, and social gatherings ) to improve this situation.

## Appendix A: Agenda of the Second Science Advisory Committee

### Day 1 Friday, March 19, 2021

- 20:00 - 20:15 ( 15 ) Executive session
- 20:15 - 20:25 ( 10 ) Welcome and Introduction Masanori Yamauchi (Director General)
- 20:25 - 20:40 ( 15 ) Research program overview and KEK Roadmap 2021 Yasuhiro Okada (Executive Director)

### Session I KEK Roadmap update (I)

- 20:40 - 21:20 ( 40 ) Institute of Particle and Nuclear Studies Katsuo Tokushuku (Director, IPNS)
- 21:20 - 22:00 ( 40 ) Institute of Materials Structure Science Nobuhiro Kosugi (Director, IMSS)
- 22:00 - 22:10 ( 10 ) Break
- 22:10 - 22:40 ( 30 ) Accelerator Laboratory Tadashi Koseki (Director, ACCL)
- 22:40 - 23:10 ( 30 ) Applied Research Laboratory Shinichi Sasaki (Director, ARL)
- 23:10 - 23:30 ( 20 ) Theory center at IPNS Shoji Hashimoto (IPNS)

### Day 2 Saturday, March 20, 2021

#### Session II KEK Roadmap update (II)

- 20:00 - 20:20 ( 20 ) J-PARC I (Particle and nuclear physics) Takeshi Komatsubara (IPNS)
- 20:20 - 20:40 ( 20 ) J-PARC II (Material science) Toshiya Otomo (IMSS)
- 20:40 - 21:00 ( 20 ) HyperKamiokande Takeshi Nakadaira (IPNS)
- 21:00 - 21:30 ( 30 ) SuperKEKB and Belle II Yutaka Ushiroda (IPNS)
- 21:30 - 21:50 ( 20 ) HL-LHC and ATLAS upgrade Kazunori Hanagaki (IPNS)
- 21:50 - 22:00 ( 10 ) Break
- 22:00 - 22:20 ( 20 ) Status of International Linear Collider Masanori Yamauchi (Director General)
- 22:20 - 22:50 ( 30 ) PF and PF-AR (incl. future plan) Nobumasa Funamori (IMSS)
- 22:50 - 23:00 ( 10 ) Detector technology project Kazunori Hanagaki (IPNS)
- 23:00 - 23:10 ( 10 ) Applied accelerator project Shinichiro Michizono (ACCL)
- 23:10 - 23:20 ( 10 ) International cooperation, human resource development, and social contribution Yasuhiro Okada (Executive Director)
- 23:20 - 23:30 ( 10 ) Discussion

### Day 3 Tuesday, March 30, 2021

- 20:00 - 20:10 ( 10 ) Diversity at KEK Junji Haba (Executive Director)
- 20:10 - 20:20 ( 10 ) Other reports from KEK Masanori Yamauchi (Director General)
- 20:20 - 21:00 ( 40 ) Discussion
- 21:00 - < 23:00 (<120) Editing

## Appendix B: Members of the Science Advisory Committee

Field	Name	Affiliation
HEP	Young-Kee Kim	University of Chicago
	Jun Cao	Institute of High Energy Physics, Chinese Academy of Science
	Tatsuya Nakada	EPFL, Ecole polytechnique fédérale de Lausanne
Theory	Tao Han	University of Pittsburgh
Nuclear	Takashi Nakano	Osaka University
	Angela Bracco	INFN, Istituto Nazionale di Fisica Nucleare
Accelerator	Frank Zimmermann	CERN, European Organization for Nuclear Research
	Jie Wei	Michigan State University
PF (Synchrotron Radiation)	Caterina Biscari	ALBA Synchrotron
	Robert Norman Lamb	CLS, Canadian Light Source
Neutron	Robert Alan Robinson	University of Wollongong, Australia (retired, ex ANSTO)
	Sung-Min Choi	KAIST, Korea Advanced Institute of Science and Technology
Muon	Elvezio Morenzoni	PSI, Paul Scherrer Institute