The Director of the Institute of Materials Structure Science, Dr. Kosugi, charged the SAC to address a number of questions.

Questions:

1. How does the SAC evaluate the present status of the Solid State Physics Section?

The scientific achievements reported in this document covers a vast area of condensed matter physics (superconductors, topological science, spin-ordered phases, strongly correlated electron system, organic conductors, new ferroelectrics, interface science, and coherent X-ray imaging), and are important results in each of these areas. This is a satisfactory achievement of Solid State Physics Section. Also some pioneer works are performed with the integration of multiple quantum beams, which is specific to KEK, that indicates the superiority of the institute KEK and promising future of quantum beam science in Japan.

2. How does the SAC evaluate research projects in the Solid State Physics Section? Are these research outputs adequate?

As seen in the report, the Solid State Physics section covers a wide range of fundamental condensed matter physics, such as superconductors, multipole strong correlation phenomena, resonant magnetic scattering in the SX region, organic semiconductors, organic dielectrics, coherent x-ray imaging, challenges to x-ray vector wave technology, analysis of the magnetic interface by the complementary use of quantum beams, development of magnetic materials involving theoretical groups, and analysis of new solar cell principles. I think these achievements, including many results in top 10% of scientific journals are very good status.

3. Are the technological development in Solid State Physics Section (eg. complimentary use of quantum beams, coherent soft x-ray diffraction imaging) adequate?

An unquestionable advantage of the KEK facility is the complementary use of quantum beams. Some results of such multiple-beam utilization have been demonstrated in the report. Also coherent X-ray imaging research and trial of the vector wave experiment which should be a key technology in near future has been demonstrated out. These are a normal evolution of quantum beam science and technology, which should be actively pursued. As we all know that the evolution speed of such scientific field is very high, more experimental trial involving new scientific users should be expected.

4. Is the Solid State Physics Section functioning as a hub through cooperation with users?

Most of the research results reported here were conducted with users, and they are considered to be excellent enough. However, because of the existence of so many potential new technologies, as will describe in section (5) below, there is still room for increasing the collaboration with new users and scientific staffs.

5. Any valuable comments for the future perspective of the Solid State Physics Section?

This group has a long history of pioneering work contributing to the development of fundamental condensed matter physics by using advanced experimental techniques of quantum beams. The report is a continuation of the group's achievements, and more work is expected in the future. Their contributions to the basic science suggest that their contributions have had a broad impact on a wide range of fields. In fact, the achievements listed in this report like as superconductor science, correlated electron system, organic conductors, ferroelectricity, and optical science are almost the same to the scientific field lists in the condensed matter area of Japan Physical Society. This fact indicates that we still have further potential of new scientific discoveries and development through the effective use of the entire quantum beam facilitated at KEK.

However, in order to activate such a wide range of disciplines effectively, the absolute number of group members seems to be small. Since excellent research themes of the future will arise from unexpected discoveries, I believe that more flexible and responsive staffing is urgently needed.

Otherwise, there might be a strategy in setting a focused research theme to leverage the current capabilities of research members and providing better support for their research activities, that may lead more advanced and distinctive results.

Also I believe that the existence of a theoretical group is an important advantage. I hope that the cooperation between the experiment group and the theory group will expand. In addition, as overseas rival institutions of synchrotron facilities are establishing the theory group supports on an interpretation of user data, it should be worth to consider the theory group to provide enhanced user support in the future.

In terms of overall trends in the science of Japan, the key word SDGs has become important as seen in the reports of the Scientific Council of Japan. It seems that this group and related users have already made important contributions to the topics relating to SDGs. These should also be publicized and widely recognized, and furthermore, even the setting the research projects by IMSS relating to SGDs might be an potential theme.

Finally, for the sustainable development of quantum beam science, it is also considered to be necessary to establish a proactive system to support the development of young researchers and or students.

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