

## スピントロニクス研究室 1

1) 当該研究室の研究成果について

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

研究レベルは世界的に見て極めて高く多くの重要な論文が発表されている。

2) 当該研究室構成員の学会活動について

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

多くの学会役員を務めており、されに多くの国際会議等の学術会議の企画運営に貢献している。

3) 当該研究室構成員の社会貢献について

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

大型プロジェクトを通して産業界へ貢献している。多くの学術的成果が新聞報道されており大学のみならず一般社会での教育貢献も大きい。

4) 当該研究室の競争的資金の獲得状況について

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

申し分ない。潤沢な競争的資金を効果的に使用して多くの重要な成果を挙げている。

5) 国際共同研究・連携研究・連携教育活動の実績について

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

多くの国際共同研究の成果が論文として発表されている。さらに世界的に著名な研究者を招へいして毎年スピントロニクス国際会議を電気通信研究所で開催するなど、十分な国際連携・連携教育活動がなされている。

6) 共同利用・共同研究拠点活動の実績について

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

電気通信研究所共同研究プロジェクトを継続的に行い、共同利用・共同研究拠点の活動が活発になされている。多くの共同研究がなされ共著論文として発表されている。

7) その他、総合的なコメント

スピントロニクス分野を牽引する世界的拠点の一つである。極めて重要な業績を継続的に発信している。

## スピントロニクス研究室 2

1. How would you evaluate the research activities in this period?

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

This program has produced high-level results that demonstrate research leadership on a global scale in several critical areas of spintronics research. The quantity and quality of research output is exceptional. The external reputation of the laboratory leadership, based on this research output, puts them at the top of the field.

2. How would you evaluate the activities of the members in the laboratory for the academic societies?

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

The laboratory members demonstrate a high level of commitment to supporting academic societies and the broader scientific community. The research faculty hold fellowship in a number of international professional societies (APS, IOP, IEEE), along with domestic organizations. They have organized at least 38 international conferences and workshops and hosted many of them at Tohoku, including the annual RIEC workshop that has had great impact on the field. RIEC has partnered with international universities and institutions for joint educational activities, and hosts international researchers to enhance community building.

3. How would you evaluate the contribution of the laboratory to society?

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

The laboratory research has a strong focus on developing new technologies with direct benefit to society, including green computing, brain-inspired computing, and advanced device manufacturing. RIEC is seen externally as a global leader in translating fundamental research toward impactful technologies. This naturally also impacts student and postdoc training in activities, knowledge, and skills necessary to meet new technological demands in society.

4. How would you evaluate the lab's level of funding?

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

The laboratory appears to have a very healthy portfolio of funding sources, spread across multiple strategic areas. The funding level is clearly sufficient to support a high quantity of research output and the associated researchers.

5. How would you evaluate the lab's collaborative research, including international joint research and collaborative education?

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

The level of collaborative research is a high point of the RIEC. The laboratory makes extensive efforts to cultivate outside collaborations with individuals and institutions, and facilitates international workshops and projects, and extended stays of visiting researchers, to ensure a high level of collaboration. Institutional collaborations include joint research programs and summer schools that provide important opportunities for new students.

6. RIEC is one of Japan's "Joint usage/Research Center" or "Nation-wide Cooperative Research Projects" institutes. How would you evaluate the achievements of work done under this framework?

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

The level of work and achievements within this framework are strong.

7. Additional or overall comments

RIEC is a global leader in spintronics research, and is a nexus of international collaborative efforts in research and education. The researchers are highly engaged on the global stage and have helped advance the forefront of the field significantly over the review period.

## スピントロニクス研究室 3

1. How would you evaluate the research activities in this period?

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

I consider RIEC has being at the worldwide forefront research in spintronics, especially in terms of transfer of basic knowledge to applications. The proximity of CIES is certainly a great asset in this endeavor. The lab is impressively productive in terms of publications and talks in conferences, in particular invited talks.

2. How would you evaluate the activities of the members in the laboratory for the academic societies?

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

RIEC has produced over the years and in particular in the evaluated period very important results which have inspired the scientific community in spintronics. This is particularly true for their work related to magnetization switching by spin-orbit torque in an antiferromagnetic-ferromagnetic bilayer system and their analysis of the three configurations used in spin orbit torque 3-terminal devices. These studies were particularly inspiring and are highly cited in the literature. The statistics of papers published in journal papers, in proceedings of international and national conferences, of invited talks are truly impressive. This is an outstanding scientific production compared to the size of the lab. The lab is also filling patents which can have an important impact considering the positioning of the lab.

3. How would you evaluate the contribution of the laboratory to society?

( ) Excellent (\*) Very Good ( ) Good ( ) Fair ( ) Poor

It is a bit early to judge of the impact of advanced spintronics (MRAM and magnetic tunnel junctions based devices) on society. It is expected that these devices will reduce power consumption of electronic devices, opening the road towards a greener electronics. It will probably help the development of Internet of Things and can contribute to neuromorphic computing. This should be on the long term beneficial to the society.

4. How would you evaluate the lab's level of funding?

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

The general level of funding in Japan for spintronics and especially at RIEC has been quite high for years compared to other countries especially in Europe. I consider it as being excellent.

5. How would you evaluate the lab's collaborative research, including international joint research and collaborative education?

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

RIEC is actively involved in collaborations with foreign labs. We had the pleasure to host one of RIEC's student at SPINTEC in France. I am aware of collaborative research with York, Kaiserslautern and of agreements signed with University of York and Nancy in which the lab is actively involved

6. RIEC is one of Japan's "Joint usage/Research Center" or "Nation-wide Cooperative Research Projects" institutes. How would you evaluate the achievements of work done under this framework?

(\*) Excellent ( ) Very Good ( ) Good ( ) Fair ( ) Poor

As mentioned in my previous comment, I feel that RIEC is quite open to and involved in international cooperative research. The RIEC International Workshop on spintronics that they organize almost every year are very successful, gathering worldwide renown experts in the field.

7. Additional or overall comments

My overall feeling about this laboratory is excellent. It is really helping microelectronic industry to incorporate spintronic concepts in their technology. The lab should continue to be highly supported to keep on producing this excellent research.