

平成 28 年 4 月 4 日

国立研究開発法人理化学研究所  
理事 松本洋一郎

## 平成27年度実施准主任研究員の間接レビューの結果について

准主任研究員制度設置規程(平成 25 年 3 月 28 日規程第 14 号)第 5 条に基づき准主任研究員の間接レビューを踏まえ、レビューアーから送られた評価結果は以下のとおりです。

### 1. 評価対象：玉川高エネルギー宇宙物理研究室 玉川 徹 准主任研究員

#### 1) 評価体制

実施日：平成 26 年 3 月 8 日（火曜日）

4 名の所外有識者を評価委員とするピアリングレビューを実施（内一名は急きょメールレビューにて評価を実施）。

評価者：

Takaya OHASHI, Professor  
Tokyo Metropolitan University

Luigi PIRO, Director  
(INAF) National Institute for Astrophysics

Toru TANIMORI, Professor  
Graduate School of Science  
Kyoto University

Satoshi YAMAMOTO, Professor  
Department of Physics, the University of Tokyo

#### 2) 評価結果の概要等

*General comments:*

##### 【Reviewer 1】

The high energy astrophysics laboratory led by Dr. Toru Tamagawa is working on a wide area of X-ray astrophysics, mainly on the history of nucleosyntheses along the evolution of our universe and physics of compact objects. For better understanding of them, this group is currently elaborating new X-ray detectors for satellite missions.

For these five years, this group successfully developed a tracking type X-ray polarimeter for the PRAXyS mission by employing a time projection chamber technique combining with gas electron multiplier foils (GEM-TPC) to measure X-ray polarization from celestial objects. With this background, Dr. Tamagawa is playing a crucial role in the PRAXyS mission as a co-investigator. This group also contributed to the soft X-ray spectrometer (SXS) onboard *Hitomi*, which has successfully launched in this year. A controlling system of the cryocoolers of SXS was essentially developed by this group. Exciting scientific results from SXS are awaited by fully utilizing the unprecedented spectral resolution ( $R > 1000$ ) at the soft X-ray band. In

parallel to these developmental works, Dr. Tamagawa and colleague conducted extensive X-ray observations with *Suzaku* and *XMM-Newton*, which include discovery of Doppler broadening toward Tycho's SNR and discovery of evidence of the charge-exchange X-ray emission. Dr. Tamagawa is going to extend these studies with the new X-ray instruments provided by themselves in the near future.

Above all, the developmental works and the scientific studies are both high in quality. In addition, Dr. Tamagawa is well managing his group under his management philosophy: good projects and good personnel can produce good scientific outputs. Dr. Tamagawa can apparently be a future leader of the high-energy astrophysics in Japan.

#### **【Reviewer 2】**

- Research objectives are at the forefront of modern physics. Revealing the mechanisms underlying the creation and evolution of elements in the universe and probing physical processes in extreme astrophysical conditions are keys to our understanding of the Universe. These objectives are pursued by implementing novel experiments and techniques for high resolution X-ray spectroscopy and polarimetry, that promise to open new windows in the exploration of our Universe, and thus a transformational advancement in the field.

- Research results are excellent, with impact extending to related fields but also society. The laboratory has gained a crucial role in two missions implementing high resolution spectroscopy and X-ray polarimetry, namely Hitomi and PRAXyS. The experimental activity is complemented with original and very significant results in the field using data of existing facilities.

- Management of the Laboratory is very effective. The laboratory is built on a very good balance between astrophysical observations with experiment development and construction, that is effectively implemented by the team and its leader. The Laboratory is well connected and collaborates with other key research institutions and Universities in the field, this including also a very good capacity to attract and supervise students. The laboratory is also vigorously raising external funds and resources.

- Future research plans were properly planned. In the field of high resolution X-ray spectroscopy *Dios* and then *Athena*, the large X-ray observatory, are mentioned as follow-up projects, with Hitomi hopefully providing data. In the field of X-ray polarimetry, future directions and investments will depend upon the outcome of the NASA downselection of the PRAXyS project by NASA.

- Overall assessment is excellent. The High Energy Astrophysics Laboratory is targeting top science, providing crucial scientific contributions in that regard, follows a sound programmatic approach in managing and distributing resources and activities.

#### **【Reviewer 3】**

Dr. Tamagawa and his group have been very active in developing X-ray polarimetry instruments to be flown on PRAXyS, selected as one of the 3 candidates of the US SMEX program. This mission is a renewed proposal, once accepted as GEMS but then cancelled due to a management problem. Dr. Tamagawa is a co-PI and leading the Japanese contribution to this program, which is regarded as essential for the success of the X-ray polarimetry. The group members also contributed in various forms to the microcalorimeter instrument, SXS, on the Hitomi X-ray satellite, including the driving electronics of the mechanical coolers, the liquid He venting system, and calculation of

temperature variation. These efforts clearly show that Dr. Tamagawa's group has strong ability of hardware development in the international X-ray astronomy community.

As for the observational science, the group has been producing important results for different categories of X-ray objects: supernova remnants, black hole sources, galaxies and clusters of galaxies, and gamma-ray emission from thunderclouds. The research activities of young postdocs (RIKEN SPD) in Dr. Tamagawa's group are outstanding. Dr. Tamagawa himself has been producing important results on SNRs, and we expect that his own research in astrophysics should be further strengthened.

Management is going very well. Laboratory members are happy under Dr. Tamagawa's organization, even with only one staff member. He makes a strong effort to comprehend and to give guidance to young members, which is keeping the spirit of the group high.

Overall, the group has a strong potential in both instrumental and observational studies. If PRAXyS is chosen for the next SMEX mission, the presence of Dr. Tamagawa's group will be very visible and promises to bring new science.

#### 【Reviewer 4】

Now he promotes two projects: X-ray polarization observation by the collaboration of USA in PRAXvS project and fine X-ray spectroscopy in ASTRO-H. He manages very well those two projects and are easily expected to provide some good results soon in both aspects the instrumental development and scientific analysis. In particular, in X-ray polarization project, he concentrates on the development of GEM (one of Micro pattern as detector (MPGD), which is a key technology of this project, and now he is also a leader of the development of MPGD in the world. Thus, his strategy seems very effective for experimental science and also management of the international collaboration considering his small group size. Since he has a good sense both for science and project management as mentioned in Specific comments, he has been relied strongly and widely in X-ray astronomy society, and recently is considered to be one of the next leaders leading this field. Thus, his carrier in these 5years is evaluated to be quite high beyond the level of an Associate chief scientist, and expected to be more active and fruitful in next five years within the projects that he is now managing.

However, considering that he have to step up to a chief scientist or professor in the next five years, he should advance his project to the main contributor of the main project or propose and start the new original project which would lead some field of science. At present he is well settled within the range that he can do now, but when he aim to step up to a Chief Scientist or similar level of scientific position he have to challenge to something new for extending his carrier. Already he needs some idea and preparation for such a purpose, but he has talk nothing about such items. Strongly I would like to ask him to have a concrete plan for the step up.

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