Evaluation of Research and Academic Activities

Optical/Infrared Division of NAOJ

1. Summary

1.1 The Optical/Infrared Division of NAOJ is very successful across a broad agenda. The exploitation of Subaru has positioned the group at the forefront of some of the most critical topics of contemporary astrophysics. The performance of the Division over the review period has been good; in many areas world leading or close to it. The Division is the section of NAOJ where new ideas and concepts originate, grow and are transformed into new projects. It is therefore a critical group for the future of the Observatory.

1.2 The committee specifically notes the new opportunities that the Division and Observatory are presented with. The preparatory work for Jasmine, the challenging space astrometry mission, is innovative and imaginative. To be successful this group needs to adopt a systems approach which will require a tighter focus on addressing the specific technical challenges Jasmine poses. More generally the activities of the Division and Observatory will increasingly require co-ordination with Japan's space agencies (ISAS & JAXA). We recommend that a formal agreement should be developed with these agencies that will facilitate a more direct involvement of space agency staff in Observatory projects at an early stage. This will be particularly important for the success of SPICA, a mission that the committee judges to be particularly promising.

1.3 The extra-solar planet group is very successfully exploiting both Subaru and OAO. Imaging the structure in proto-planetary disks has been an outstanding achievement. Greater co-ordination of the OAO and Subaru efforts should be considered as a way of increasing impact in this exciting field. This group is playing a leading role in the preparations for SPICA and when it is timely we recommend that this effort be expanded.

1.4 OAO offers a wide range of facilities, is well supported and has an effective and innovative group developing new instruments which keep the facility competitive despite the limitations of the site and small telescopes. We recommend that the Division consider whether a simpler, more focused operating model for OAO could retain much of the scientific productivity with fewer staff and capital resources that might be redeployed in other areas. The committee expresses concern about the range of motivations the different stakeholders have for building the 3.8m telescope. NAOJ and Kyoto University need to agree to explicit performance requirements, a project schedule and the division of the operating costs so that the project team can focus on specific goals.

1.5 The Gravitational Wave group are moving from the stage when they operated the most sensitive instrument in the world, through global collaboration with other detectors and on to the next generation of GW detector. The group has provided some innovative technical developments that are of value to leading groups worldwide and are well connected with the international GW detection effort. This group stands at a crossroads. To remain at the forefront they should either pursue LCGT or engage formally in one of the other next generation detectors.

1.6 The activities of the ‘Division proper’ are at a high level. They are the glue that holds together much of the other activity. The group is productive and research outputs

are world leading or very close to that level across a broad scientific canvass. They are pursing the ambitious goal of opening a new scientific frontier. The first step for the Division is to reach a consensus on the scientific area or areas to take to that level. We note that almost all the activities we reviewed are being undertaken by small groups of highly committed researchers who, in this context, are making outstanding contributions. We recommend that the Division should consider focusing more resources (both staff and capital) on a smaller number to activities. This will be necessary to achieve the goal of opening a new scientific frontier.

1.7 Our visit involved presentations from all parts of the Division, discussions with staff, postdocs and students and visits to the facilities. Our overall impression is of a contented and enthusiastic group committed to advancing astrophysics. We believe that this is a strong basis on which the Division can continue to succeed at the very highest level.

2. Introduction

The committee met at the Mitaka headquarters of the NAOJ from 29-31 January 2008. The membership of the committee and agenda for the meeting are appended to this report. The evaluation was carried out for four projects: the Jasmine astrometric satellite, the Extra-solar Planet Detection project, the Okayama Astrophysical Observatory and the TAMA gravitational wave detector project. The self-evaluation report of the Division proper was also assessed. In addition the committee evaluated the graduate education programme and met with groups of junior staff, postdoctoral researchers and students. The format of this report follows that outlined in the charge to the committee with the exception that not all facets of the charge are relevant to all activities.

3. Jasmine

This is a pre-proposal phase activity for an infrared astrometric satellite to map an area of 10×20° in the Galactic bulge to measure parallax and proper motions to micro-arcsecond precision (one thousand times more precise than the Hipparcos satellite).

3.1 Research activities, user support and collaborative research activities:

a) An evaluation of the research outputs (SS and S): no such papers were published.

b) The self-evaluation: is the activity correctly rated? The self-evaluation of the overall level of research outputs was 3: competent. We judged this to be acceptable.

c) Quality improvement: The self-evaluation was 2: improving adequately. We judged this to be 2-. The change of concept from the Hipparcos ‘basic angle’ mode, to mapping ‘linked field’ mode, makes this project distinct from GAIA.

The following issues relating to the concept study should be addressed:

i) The scientific case needs to be better developed. The prospect of identifying the star streams that are the remnants from the minor mergers from which the bulge was assembled is exciting but can this be done with 10^6 stars? Could it still be achieved with fewer, or are more required?

ii) The linked field method needs to be simulated and role of quasar fiducials needs to better defined in order to increase confidence that the precision needed will be achieved.

iii) A serious feasibility study for the satellite system should be performed. Critical issues are the temperature stability and attitude control. The required performance

is not yet confirmed.
iv) The Jasmine team is enthusiastic and committed but needs to be more tightly focused. They should work closely with space engineers, adopt a systems approach and systematically retire technical risks. The observatory should establish a series of milestones for the project and identify a critical review date when the decision about whether or not to continue with the project can be taken.

We note that nano-Jasmine will give the Jasmine team valuable experience of a space mission at low cost and that it will assist the planning for GAIA.

There are no Common User Support and Collaborative Research Activities for Jasmine

3.2 Evaluation of the mid-term objectives
a) Research objectives: self-assessment B: we evaluate at C. The original concept was abandoned. The new design takes an approach that is more suited to achieving the scientific goals.
b) User support and collaboration: Not applicable for Jasmine.
c) Graduate school education self-assessment (B): acceptable. Education of graduate students has been successful and there is a healthy co-operation in graduate education with TAMA group. Self-assessment (B) is appropriate.
d) Interaction with the public and international exchange: self-assessment (A) our evaluation is (B).
e) Overall evaluation of the mid-term: The proposed schedule is too optimistic. A more realistic plan should be considered along with a plan for making the best case against the serious competition in ISAS for the approval of Jasmine.

3.3 Space missions are becoming a more important part of the NAOJ programme. Specific space engineering expertise is needed and perhaps NAOJ should seek a formal route to working with ISAS through, for example, a Memorandum of Understanding. This could be particularly important for SPICA, the prospect of which the committee rates highly.

4. Extra-solar Planet Research

This broad programme has had very considerable successes in the development of innovative instrumentation, the specialised exploitation of the Okayama facilities for the GIII programme, and most excitingly from the work undertaken at Subaru.

4.1 Research activities, user support and collaborative research activities:
a) An evaluation of the research outputs: We agree with the self-evaluation of two SS- and two S- papers. The Fukagawa et al paper (2004) is cited 53 times and the Jiang et al paper (2005) in Nature uses a combination of adaptive optics and polarisation measurements to carry out the first direct imaging of a compact circumstellar disk around a massive YSO, strongly supporting the accretion scenario for massive stars. This technique probes higher angular resolution than is available at radio or single dish millimetre wavelengths and this pioneering work is a foretaste of the synergies to come with ALMA
b) The self-evaluation: is the activity correctly rated? We agree that the overall level of the research output is 1: distinguished. The group have published more than 60 papers and carried out significant instrument development.
c) Common user support and collaborative Research Activities
N/A

d) Comment on the improvement
N/A

The detection of structure in proto-planetary disks is a landmark result and illustrates the power of the CIAO instrument on Subaru. The measurement of spiral structure in these disks opens up the prospect of constructing physical models constrained by observations. The upgrade to HiCIAO has great promise. The ESP team also uses the 1.4m IR telescope at Sutherland in South Africa for polarimetric observations of star forming regions.

4.2 An evaluation of the mid-term objectives
a) Research objective: self-assessment A; we agree that the group has sustained exceptional performance towards its mid-term objectives.
b) User support and collaboration
N/A
c) Graduate school education, self-assessment: B. While recognising that there are no students in some years we note that the group supervised several Masters students in universities in Metropolitan area. Some of these students went on the complete PhD degrees thereafter. We have a high opinion of student supervision in this group which brings them close to A. We anticipate an increase in the number of graduate students pursuing both R&D for instrumentation along with astrophysical research.
d) Interaction with the public and international exchange, self-assessment B: agreed
e) Overall evaluation of the mid-term: we rate this group highly : A.

4.3 An evaluation of future plans
The improvements underway to CIAO to enable AO assisted IFU spectroscopy of proto-planetary disks should keep this group at the forefront. This group is already playing a major part in NAOJ's future plans for SPICA and will be influential in the directions the Division pursues. They are a small team. In the context of its future strategic planning the Division should consider expanding this group. These considerations should include an assessment of the effectiveness of connections with the planet finding work underway at OAO and with future work at ALMA. If the efforts of these two teams could be combined in a more coherent approach to planet finding it is possible that they could make a greater impact.

Most of the Subaru based research exploits imaging techniques. The Division should consider whether expanding the range of programmes to expand work using spectroscopic methods of exo-planet detection would produce a more effective research programme.

5. Okayama Astrophysical Observatory (OAO)

Okayama Astrophysical Observatory (OAO) is a common use observatory for domestic and international optical and infrared astronomy.

5.1 Evaluation of Status of Research Activities, User Support and Collaborative Research Activities
a) The outstanding research output is "extra-solar planet search around G-giant stars with precise radial velocity measurement", which is mainly based on high

resolution spectra using the OAO 1.88m telescope. Several planets and brown dwarfs have been discovered since 2004. This is one of most successful research projects searching for extra-solar planets in the world. Some of the resulting papers are highly cited (up to107 in two years). The project involves international cooperation, in particular, the collaboration from Chinese and Korean astronomers.

b) We judge that the self-evaluations by OAO of these activities are correctly rated. The development of instruments by OAO technical team has been, and remains, crucial for retaining a world class scientific endeavour. OAO has developed two new instruments, ISLE and KOOLS for common use. The flair and creativity of the instrument team at Okayama has enabled the observatory to carry out competitive research on a site of modest quality.

The Observatory produced significant research outputs in extra-solar planet searches, and abundance studies using high resolution spectroscopy of bright stars. In addition, the education of graduate students was supported through 1.88m telescope common use program.

The operating model is typical of that for a much larger telescope and the operating costs are high for a 1.8m facility. Hundreds of people travel to and from the observatory in support of just 20 research programmes each year. Only a handful of student theses are produced and these are mostly at Masters level. Only 10 refereed papers are published based on Okayama data. The observatory total operating cost of ~ $1.7M appears to be high and could be significantly reduced if a less comprehensive operations model was adopted.

5.2. Evaluation of Achievement of the Mid-Term Objectives

a) Research activities: self-assessment: B. We agree that OAO has performed well in pursuit of its mid-term objectives and continues to engage in advanced observational research using 1.88m telescope.
b) User support and collaborative research activities: self-assessment B. OAO provide common user support and collaborative research activities across a wide range of research fields and produced high quality research outputs, such as the “extra-solar planet search around G-giant stars with precise radial velocity measurement” project.
c) Graduate school education: self-assessment: B. We recognise that the OAO provides advanced graduate school education through the provision of an inter-university research facility.
d) Collaborations with general public and the international exchange: self-assessment: C. We note that active engagement with the local community and international exchanges are done well by OAO, and we evaluate these as B.
e) Overall evaluation of the mid-term: we rate the OAO as B.

5.3. Evaluation of Future Plans

OAO proposed three projects as its future plan:
a) super-HIDES project will add a fiber-feed and image slicer system and reach one magnitude deeper than HIDES. The wavelength range will be extended to 3,000-10,000A. This will enhance the extra-solar planet search programme.

b) OAO-WFC project and renewal the 91cm telescope will provide a one degree FOV IR camera. This project is aimed at the long-term monitoring of Mira variables in H, K bands to determine the structure of the Milky Way.

These projects are funded and will be finished within two years. The presentations on these instruments revealed that they are driven by a desire to improve technical performance somewhat divorced from the scientific applications they are intended to pursue. The Division should ensure that there is a stronger link between the technical development and the scientific case for both these instruments.

c) A new 3.8m optical-infrared telescope is being planned jointly run with Kyoto University. Okayama is not an internationally competitive site for a 3.8m telescope. The telescope's scientific programme will need to be highly focused if it is to produce world class research. The attraction of a large telescope at Okayama is that it is local.

The motivation for construction the 3.8m telescope with a segmented primary mirror must be clear and shared by all the parties engaged in the project. We are concerned that the collaboration with Kyoto University remains poorly defined in some crucial areas. It seems that Kyoto sees the telescope as a flagship facility for local research, education & outreach, whereas NAOJ's goal appears to be to use the telescope construction as an ELT technical demonstrator. It may be hard to achieve both goals in one project and the management will need to be vigilant to ensure success for both parties.

The operating costs for the 3.8m are potentially a continuing burden on the NAOJ budget. It was not clear whether an agreement on sharing operating costs has been made. We suggest that the Division develops an unambiguous strategy for sharing the costs of OAO facilities in collaborations with national universities.

In the presentation by the OAO director we understood that the 1.88m telescope will be closed after 3.8m new telescope is installed on Okayama in 2012. The 1.88m telescope may still have an important role in specific long-term projects, in particular in the search for extra-solar planets and this might provide an opportunity for sharing operations costs and collaboration with other East Asian astronomical communities.

5.4. Other

Finally the committee feels that the broad portfolio of activities supported by the Observatory is out of proportion to the staff and resources available and recommends that a keener sense of which aspects will lead to the next scientific advances is needed.

6. Gravitational waves

The stated goal of the TAMA Project is the "creation of "Gravitational Wave Astronomy" which will open a new window onto the Universe." We are asked to review the immediate past ~5 year period. In order to put into context our assessment of this period, we note that during the 5 years prior to our review period, TAMA had run, for several years, the world's most sensitive gravitational wave detector. By the end of that period,

TAMA had been replaced by LIGO as its sensitivity increased. However, prior to LIGO establishing the leadership position, TAMA had collected more than 1000 hours of search data. Entering the period reviewed here, the challenge for the NAOJ gravitational wave community has been to leapfrog LIGO by moving on to the LCGT project prior to the start of operation of Advanced LIGO, or to engage in serious collaboration with the international community of detectors LIGO, Virgo and GEO. As LCGT has not emerged as a construction project during the reviewed period, the proper metric is to assess the TAMA project's progress in data publication, technical developments for the future and integration into the global gravitational network with a leading role. By that standard, our assessment is that the TAMA project has succeeded as a first rank participant in the global effort to detect gravitational waves.

6.1 a) an evaluation of the research outputs: the 4 PRL papers referred to in the self-evaluation clearly merit the SS category. The realization of the basis for a displacement noise free interferometer (DFI) is a key insight. The elaboration of the technique into a specific model application to GW measurements and the execution of a first experimental verification complete this pioneering series of 4 papers.
b) the self-evaluation: The committee endorses the evaluation of 2 – 3. The long period required to commission the improved Seismic Attenuation System (SAS) drove the TAMA team to the somewhat conservative '3'. Given the range of activities and accomplishments we make a more positive assessment. The SAS system has succeeded by already demonstrating improved TAMA noise floors while commissioning continues.
c) comment on the improvement: we assess the performance during the reviewed period as a significant improvement. In this period the group succeeded in a number of notable areas: (i) Coordinated data taking with other detectors. This is an essential and positive development for the future of the field. (ii) The start of collaborative data analysis with other groups. The TAMA team discounted their accomplishment somewhat due to the slow pace of the analysis. While we concur with this evaluation, we note that the team is small and pursues a broad program giving lower priority to data analysis compared to pure theoretical or instrumental work. (iii) Technical collaboration with other detector groups has thrived. TAMA collaborators provided the key efforts that made the LIGO Resonant Sideband Extraction program in the Caltech 40 Meter Interferometer succeed. RSE is integral to the design of Advanced LIGO and LCGT. TAMA benefited from the LIGO designs and technical support for soft inverted pendulum-based test mass suspensions that are the TAMA SAS. This is a notably successful bidirectional technical collaboration.

The TAMA group has assumed a front rank role in international collaboration, carrying on the pursuit of opening gravitational wave astronomy in a global collaborative mode, rather than as a solely Japanese national initiative.

Overall, the NAOJ team is well positioned for the ultimate opening of GW astronomy. They have demonstrated a front rank effort, include some of the most respected people in the field, and are producing a sustained record of cutting edge technical innovations.

6.2 Mid-term objectives:

a) Overall, we assess this activity as B – 'exceeds the level expected' as compared to the self-assessment of C of the TAMA group. We base this evaluation on our remarks elsewhere in this review but comment on each of the main program activities during the review period.

Displacement Noise Free Interferometer (DFI) - this is excellent work: A.

Seismic Attenuation System (SAS) implementation is delivering improved low frequency noise performance as intended. The selection of SAS, its adaptation to TAMA 300 and the implementation deserves a B evaluation despite the remedial work required.

GW data collection and observing – The international collaborative effort merits a B rating, though the small amount of actual observing carried out reduces this to C.

GW data analysis – this merits an intrinsic rating of B despite the slow pace of this effort. The team assessed this activity as a C. During the next period of running, the TAMA group should raise the priority of data analysis so as to assure full Japanese involvement in the likely detection of gravitational waves during the Advanced LIGO period.

DECIGO – This space detector concept fills in the low frequency gap between space missions like LISA and the acoustic band addressed by the ground based interferometers. As such, it would rate highly. However, the proposal appears to be premature within Japanese priorities and thus the effort could be assessed as a C. This concept should be kept under consideration for later implementation as the field evolves.

LCGT – This advanced detector could represent the next generation of ground based detector. It did not advance to construction during the review period and appears to be a behind other large project priorities within NAOJ. As we have commented, in the absence of an LCGT initiative, the TAMA group has made good use of the interim opportunities. The LCGT developments are challenging and we rate the progress during the review period to be C.

RSE demonstration at the LIGO 40 meter prototype – This is excellent work and was led by the NAOJ team to a successful demonstration of this crucial technique for Advanced LIGO and LCGT. We rate this A.

b) User support and collaboration – This has been excellent with LIGO and we note that collaboration in interferometric length and angle sensing in the JASMINE project is a promising new example in this area. We rate this activity to be a B.

c) Graduate school education:

This small team has a large number of students ; 6 PhD and 3 Masters. In the course of the review we had a discussion with some students and met a larger group during a laboratory tour. The students are working on very good projects, and are receiving very good mentoring. The self-evaluation was C due to a levelling of student numbers, but we feel that the number of students is appropriate and would assign a higher rating (B).

d) Interaction with the public and international exchange:
There is little general public outreach. The GW community benefited from a very successful Okinawa Amaldi meeting during the reviewed years. The real highlight of this period is the very good international exchange and collaboration across the GW community that is commented upon above.

6.3 An evaluation of future plans:
Future plans are not clear unless LCGT goes forward. For the TAMA group to flourish, a frontier and more sensitive GW detector is essential. In the meantime, the research efforts are excellent or very good and external collaboration is excellent.

7. Division proper

7.1 An evaluation of the research outputs (SS and S):
a) The scientists in the Division have successfully exploited the instruments on Subaru and established themselves as leaders in the field. The work utilising Suprime-Cam on wide field high redshift cosmology has a high impact and is world leading (Iye et al 2006 Nature paper has 50 citations). Other papers in the same area first authored by Ouchi, Kodama, Kashikawa, Taniguchi have had a large impact and are well cited, they are at or close to SS. The work on the chemical evolution of the universe using the high redshift spectrograph is also excellent with the papers by Frebel et al, Aoki et al & Honda et al being widely recognised.
b) the self-evaluation: the committee concurs with the evaluations of each of the papers presented. As noted above some of the papers presented as 'S' are already highly influential.
c) comment on the improvement: The Director presented the committee with an ambitious goal, to create a new scientific frontier and the self-evaluation was '2- improving adequately' on the grounds that this has not been achieved. The improvement, in terms of developing, implementing and exploiting new instruments on Subaru, has been very good. While the improvement perhaps falls short of exceptional it is very good and rating of '1- improving significantly' is more appropriate.

7.2. Mid-term goals:
a) Research: self-assessment A - sustained exceptional level. The committee endorses this assessment. Scientists in the Division use a very broad range of facilities to conduct research: Subaru, OAO, UKIRT, UH88, the 1.4m in South Africa. Over the period of the review the research output has been good and there is no evidence that individual research productivity has been impacted by the transfer of staff to Subaru to release resources for ALMA.

b) Interaction with the public and international exchange: self-assessment B – exceeds the standard expected. The committee endorses this assessment noting that the Division delivers a range of diverse activities education, outreach and international programmes.

c) Graduate school education: the Division is responsible for the Graduate courses for the five year PhD course. This was started in 2006 and so it is too early for a formal evaluation of these activities. Nevertheless the committee was impressed by the wide ranging lecture programme offered to students and the facilities available

to them. Our contact with students, both in discussion and in the laboratories, indicated that they are content with their training and the very high numbers of applicants is very encouraging. The self-assessment of - B – 'exceeds the expected level' seems appropriate.

7.3 Future plans: The committee welcomes the consensus behind the ELT and SPICA projects and recognises these as future priorities for the Division. The committee sees East Asian Telescope network as a good way to strengthen regional collaboration.

7.4 The Division is the 'nursery' for growing new ideas and concepts that will become future projects in NAOJ. However at present a very diverse range of projects and research areas are being pursued. Each activity in the Division has a limited budget and only a handful of staff committed to it. The Division should consider whether a sharper focus on fewer activities might not be a more effective way to reach a new scientific frontier. Could the Division achieve more by doing less?

8. Discussions with staff, postdocs and students

The committee had informal discussion sessions with these three groups to explore their perceptions of the Division. In general each group felt adequately supported in pursuing their research and projects, there was no major dissatisfaction. We summarise here aspects of the discussion where the management of the Division might act to improve matters.

8.1 Communication within the observatory among the different activities could be improved. There is inevitably a tendency for people to focus on their immediate goals but efforts to breakdown this 'silo mentality' will pay dividends. Colleagues with a better appreciation of the Division's wider programme have the potential to contribute more broadly. They may identify synergies and ways of supporting each other through sharing best practice. Everybody is busy and it is always hard to make and take opportunities to engage with colleagues across the programme. This problem may have been made worse by the adoption of a more 'top-down' management structure and some effort to mitigate the problem would be worthwhile. Some suggestions would be daily email shots listing today's talks and visitors, screens at the entrances advertising these, possibly a newsletter. This will always be a challenge and needs to be addressed periodically. The students can be allies in this as they are more likely to engage with colleagues across the silos.

8.2 The number of permanent posts is much less than the number of postdocs competing for them. For the non-permanent researchers there is a tension between the rewards for working on projects & research. The role of service work in securing a permanent post is unclear. The postdocs would benefit from clearer job descriptions and a regular evaluation of performance. Each individual needs a mentor and a clear view of how to achieve success in their role.

8.3 The complement of permanent staff is capped and the Division needs to engage contract researchers (postdocs) in delivering some 'professional functions'. The inherent inefficiencies in this system, (eg. start-up inefficiencies as new staff climb

the learning-curve, followed by the loss of expertise at the end of a contract) are a source of frustration to the postdocs in these roles.

8.4 We met only three students and all were content with their training and support and they were each different! The only topic that emerged relates to locally delivered lectures. It was unclear whether students from universities not in Tokyo could attend these lectures and hopefully this can be clarified. The committee suggests that there should be a system to ensure that all graduate students receive a basic level of training in astrophysics.

Roger Davies, Oxford, UK (Chair).
Toshio Matsumoto, ISAS (Emeritus).
Gary Sanders, Caltech, USA.
Kenichi Wakamatsu, Gifu University.
Gang Zhao, National Astronomical Observatories, China.

28th February 2008

Agenda and Schedule of International Review for Optical and Infrared Division
29-31, January, 2008

Day 1 (29, Jan.)

0900-0930: Introduction (NAOJ Review committee, Toshio Fukushima)
0930-1030: Panel session
1030-1050: Coffee break
Presentation of Projects
1050-1130: Overview of the Division (Hiroyasu Ando)
1130-1200: Division proper (H. Ando)
1200-1300: Hosted Lunch
1300-1340: Okayama Astrophysical Observatory (Michitoshi Yoshida)
1340-1420: TAMA Project Office (Masakatsu Fujimoto)
1420-1430: break
1430-1510: JASMINE Project Office (Naoteru Gouda)
1510-1550: Extra-solar Planet Detection Project Office (Motohide Tamura)
1550-1610: Coffee break
1610-1710: Panel session
1800- : Hosted Dinner

Day 2 (30, Jan.)

0900-1000: Panel session
Presentation of highlighted outputs (10+10)
1000-1200: 6 topics
Galaxies (Nobunari Kashikawa)
Chemical Evolution (Wako Aoki)
Star and Planet formation (M. Tamura) (including HiCIAO)
Extrasolar Planet Search (Bunnei Sato)
Development of Gravitational Wave Detector (Seiji Kawamura)
Development of ISLES (Kenshi Yanagisawa)

1200-1300: Hosted Lunch
1300-1330: Panel session
Interview to division members
1330-1430: Free interview and conversation (about 10 persons)
(younger staffs, PDF, and graduate students)
1430-1440: break
Guided tour to related facilities
1440-1600: TAMA
Advanced Technology Center (JASMINE)
1600-1630: Coffee break
1630-1730: Panel session
1800- : Non-hosted Dinner

Day 3 (31, Jan.)

0900-0930: Business Issues (Reimbursement etc)
0930-1100: Panel session and Additional presentation (if necessary)
1100-1200: Summary report to NAOJ
1200-1300: Hosted Lunch
1300: Closed

List of Reviewers

Toshio Fukushima, Professor, Vice Director General of NAOJ,NAOJ
Hiroyasu Ando, Professor, Division Chief of Optical Infrared Astronomy, NAOJ
Michitoshi Toshida, Associate Professor, Director of Okayama Observatory, NAOJ
Masakatsu Fujimoto, Professor, Chief of TAMA Project, NAOJ
Naoteru Gouda, Professor, Chief of JASMINE Project, NAOJ
Motohide Tamura, Associate Professor, Chief of Extra-solar Planet Detection Project, NAOJ
Nobunari Kashikawa, Associate Professor, NAOJ
Wako Aoki, Assistant Professor, NAOJ
Bunnei Sato, Assistant Professor, Tokyo Institute of Technology
Seiji Kawamura, Associate Professor, TAMA Project, NAOJ
Kenshi Yanagisawa, Assistant Professor, Okayama Observatory, NAOJ