KAGRA SCIENTIFIC CONGRESS: COLLABORATORS' INFORMATION EXCHANGE 2019/04/18

KSC Newsletter

Issue 4

Einstein Telescope and KAGRA signed agreement
to collaborate on the development of the common technologies

The 5th KAGRA International Workshop (KIW5) was held at Perugia, Italy. The third day of the workshop was named "The first KAGRA-Virgo-3G Detectors Workshop (KV3G)", where we discussed the project of Einstein Telescope (ET), one of the key gravitational-wave observatory plans in the future. The nascent ET collaboration (it will be formulated in April 2019) plans to construct a triangle-shape 10 km-armed laser-interferometer underground, and with cryogenic technology. Its core technologies match with our experiences.

On February 16, 2019, at the gorgeous Sala dei Notari (hall of Notari), our PI, Takaaki Kajita, and the ET steering board chairmen, Michele Punturo and Harald Lück, signed a letter of intent to collaborate on the development of third generation detectors. The scope of the letter is quite general (see JGW-M1909820), but we believe it becomes a certain step forward for both of us.

KIW5 and KV3G workshop had more than a hundred of participants. The meeting continued from the early morning to the late evening, but we enjoyed a small historical old city area, Perugia chocolates, and environment of AC Perugia (Perugia Calcio). We thank LOC members, especially Helios Vocca and Flavio Travasso for giving us this opportunity.

Contents of this issue

Directions

bKAGRA Installation almost finished with 4-week delay !!

we will shift to the commissioning and launching phase

LIGO/Virgo started their observation 3 (O3) on April 1, 2019. Expected event rate of GW from black-hole binary is one per week, and those of neutron stars is one per month. I want to summarize the status of us in this moment.

A month delay?

A year ago, we decided to accelerate our installation schedule in order to join LIGO/Virgo observation run 3 (O3), at least the last part of it. We set the tight schedule of bKAGRA installation, and made March 31 (2019) as the target day of its completion. As was described in KSC Newsletter No.2 (p.2), we made to go with the plan of dual-recycled interferometer (resonant sideband extraction) (say plan A), with a back-up plan of power-recycled type (plan B).

According to Yoshio Saito, the chief of system engineering office (SEO), up to the end of February, all installations had been on schedule. However, since we faced a couple of troubles on the suspension systems, cryogenic coolers, and so on, the total schedule likely to be running one-month late (as of April 12). While the detailed status will be explained in the face-to-face meeting shortly, we heard that SEO planed to hold the decision of plan A or B by the middle of May. We might blame ourselves for such delay as a fatal. However, I would like to mention that when I made a status talk at LIGO/Virgo collaboration meeting (at Wisconsin, middle of March 2019), the reactions of people were quite warm; I received a comment from a big guy in LIGO "Only two-week delay! (as of March 20). You are doing good job!". So keep working, and be happy.

"Commitment form" & "Collaboration Agreement"

As a step for joint observation, KSC decided (at the remote meeting, January 28) to collect "O3 commitment form" [JGWdoc-M1909631] from all of us individually in order to confirm ethical statement for accessing O3-LIGO+Virgo data. KSC board thinks that keeping confidential issues within the collaborations and having cadence for scientific activities as a collaboration is quite important. Although we did not set the deadline, more than 180 members already reacted. I appreciate your cooperation. (If you have not yet done, please go to https://gwcenter.icrr.u-tokyo.ac.jp/o3-commitment-form).

EO decided to collect "KAGRA collaboration agreement" [JGWdoc-M1909818] from all groups in the collaboration, in order to confirm the relationship officially between each group and KAGRA, and to proceed to the next responsible contributions including the observation shift and the future development of the projects. In order to plan our O3 observation shift at the KAGRA site, we also collect the list of shift candidates from each group. We again had not set the deadline, more than 30 groups already reacted, and we have a list of shift candidates more than 180 names. (If you have not yet done, please go to https://gwcenter.icrr.u-tokyo.ac.jp/collaboration-agreement).

Towards MoU (MoA) with LIGO and Virgo

In May, LIGO and Virgo finally signed up to their revised MoA (memorandum of agreement). They agreed to the schedule for releasing data, the new style of publications and organizations, after the long (two-year) discussion. We, KAGRA, started to discuss ourselves towards MoU (or MoA) with LV. We set the target day for signing up as September at the LV meeting, and try to form our total agreement at the face-to-face at Toyama this summer. Current KSC board members will finish their term in coming August, and the board tries to clear up all the issues and pass the baton to the next team.

Hisaaki Shinkai 🍏

Future

Upgrading KAGRA ?

Sadakazu Haino on behalf of Future Planning Committee

Official discussion started

KAGRA Future Planning Committee (FPC) was approved by KSC in December/2018 f2f meeting and started discussion about the possibility of upgrading KAGRA in near (~5 year) to middle (~10 year) terms. In case of LIGO and Virgo they already have concrete plans of A+ and AdV+ and starting the actual work in view of O5 (2024~ ?).

KAGRA's dilemma

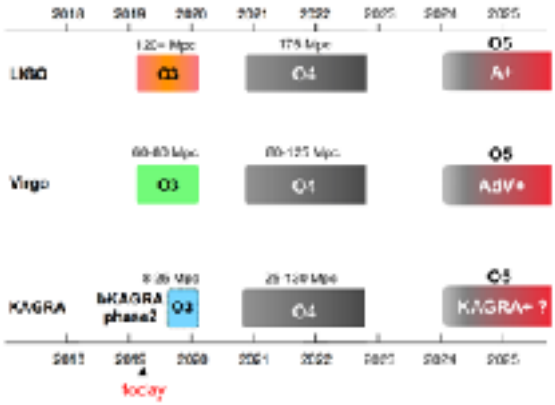
If we want to reduce the shot noise in high (>100 Hz) frequency region we need to increase the laser power. However, the high power laser will increase the radiation pressure noise (<100 Hz), and make it difficult to keep the cryogenic temperature because the heat absorption at the ITM bulk and the ITM/ETM surface increases. Higher ITM temperature will increase the mirror thermal noise at around 100 Hz. Using a thicker fiber suspension is one way to solve, but it will increase the suspension thermal noise below 100 Hz. Frequency dependent (FD) squeezing is a promising way to achieve a broad-band sensitivity improvement given that mirror thermal noise can be suppressed as well.

We consider four upgrade options: LF (Low Frequency), HF (High Frequency), FDsq (Frequency dependent squeezing), and Heavy (test mass).

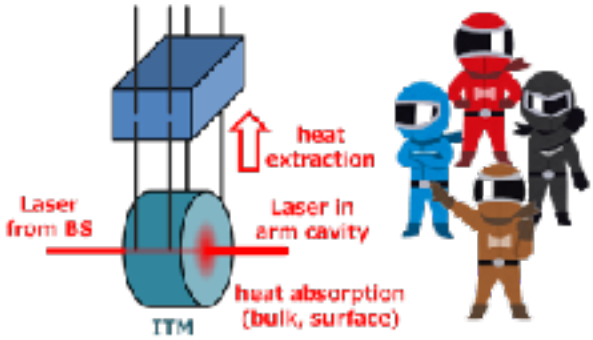
Which physics are you interested in ?

If broad-band upgrade is difficult, we need to focus on which frequency band is most preferred for the KAGRA+ upgrades. Considering the feasibility of available and up-coming technologies is one point. Putting a priority on physics targets is another important point.

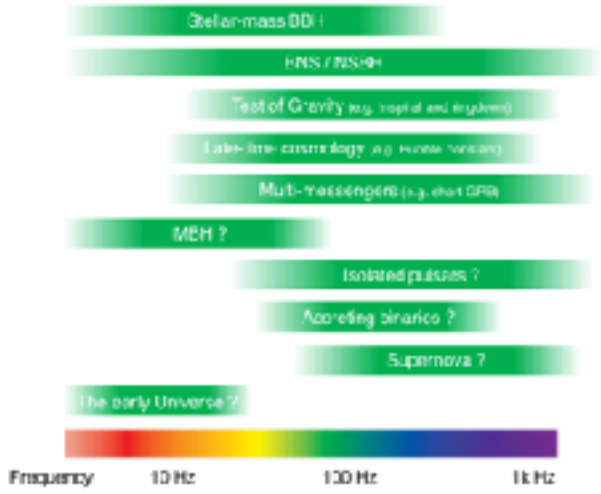
There are several important physics topics. Generally speaking, bigger scale mass emits lower frequency gravitational waves (GW). There are also many sources which have never been detected via GW so the requirements on the sensitivities should differ from sources such that detection-type sources require high SNR or longer observation time, while analysis-type sources may require broadband coverage or some particular frequency ranges. In any cases, KAGRA+ upgrades should be considered as a member of world-wide GW network in the next 5~10 years and beyond. For more details, please check FPC white paper at [JGW-M1909590].



Observing scenario in O3, O4 and beyond [JGW-L1808659, JGW-G1808427]



(Left) Dilemma of cryogenic mirror and (Right) Four candidates to mitigate [Cartoons based on JGW-G1809313]



SH's personal view on the "target" frequency ranges for various science cases. (Please send any complains to SH)

Kamioka Local

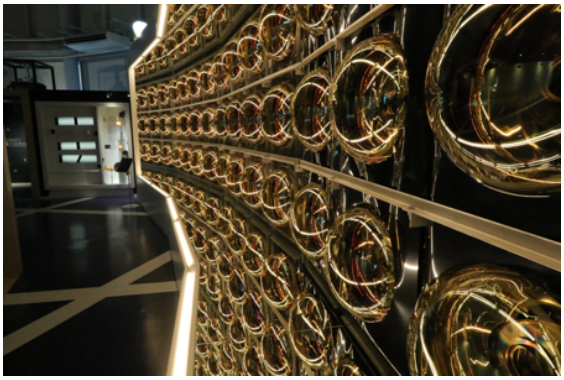
Hida Space Science Museum Kamioka Lab open

KAGRA is located deep underground in Mt. Ikenoyama next to Super-Kamiokande, KamLAND, and so on. Such facilities attract people's curiosities, but there are quite limited opportunities for the public to visit the underground sites. Hida city tackled to solve this dilemma by renewing and expanding the Super-Kamiokande exhibition booth in the Sky Dome roadside park in Kamioka town as "Hida Space Science Museum KamiokaLab."

The renewed KamiokaLab exhibits a huge half-cylindrical screen theater, a real-size replica of Super-Kamiokande detector wall, a video game to catch neutrinos, a KAGRA's miniature model, video clips, and more. Under powerful supervisions by the researchers at the University of Tokyo and Tohoku University, the contents are described in scientifically correct ways in any details. Visitors can enjoy and get to know about the underground astrophysics experiments performed in Hida city.

In the morning of March 27, opening ceremony of KamiokaLab was held at the entrance hall of the museum. Mr. Junya Tsuzuku, the Mayor of Hida city, made a greeting followed by a speech of Professor Takaaki Kajita, our Principal Investigator. Prof. Kajita addressed his hope that KamiokaLab strengthen the connection between scientists and people. More than 150 visitors formed a long queue at the entrance at 1pm, the time for public open of the museum.

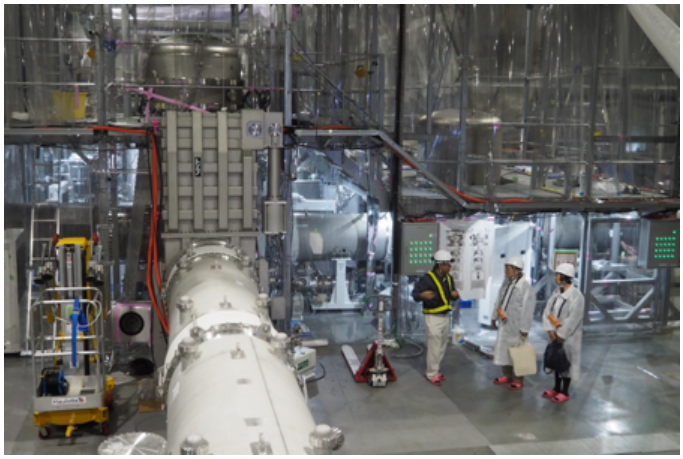
Kajita-san & the Mayer in the center.



An Akutagawa Prize novelist Mr. Natsuki Ikezawa attended the opening ceremony and signed on the message board in the museum. He visited Super-Kamiokande and KAGRA in the afternoon, then had a special lecture about the relationship between cosmology and literature at the Hida-city's Kamioka public hall in the evening. He noted his first visit of KAGRA was really impressive in the reply for an audience's question.

KamiokaLab is admission free and open from 9am to 5pm every day except Wednesday. Science communicators, one of them graduated ICRR Kamioka Observatory, welcome everyone and explain difficult astro-particle physics in easy words. Visit their web https://www.city.hida.gifu.jp/site/kamiokalab/ for details.

Yoshihisa Obayashi



Report

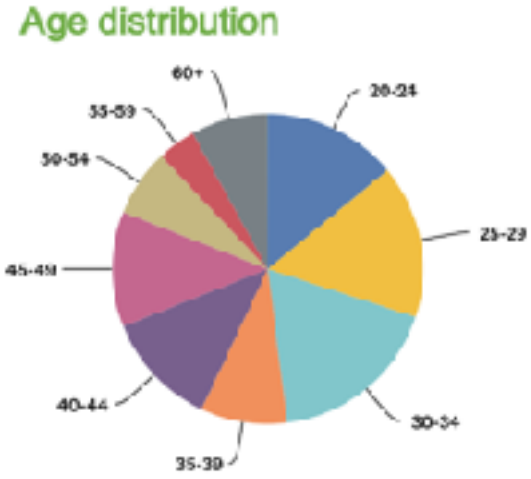
Summary of the demographic survey 2018

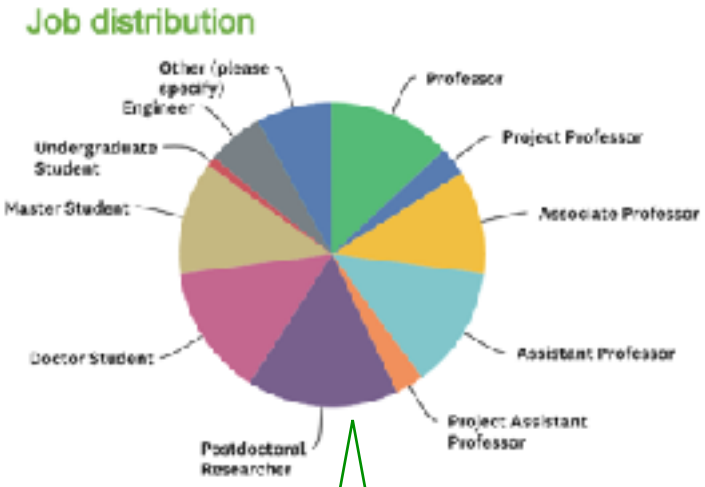
Keiko Kokeyama, Joey Fedrow, and Chunglee Kim on behalf of the KSC diversity committee

KAGRA is a large international collaboration of physicists and astrophysicists. The collaboration has more than 400 members from 97 institutions across 13 different countries, as of February 2019 -- with the list continuing to grow and expand. Among our collaborators, there's a wide spectrum of characteristics that each member has; such as gender, race, religion, physical abilities, etc. Collectively, these differences and characteristics are known as diversity. Having diversity in a society can be advantageous when it is properly managed.

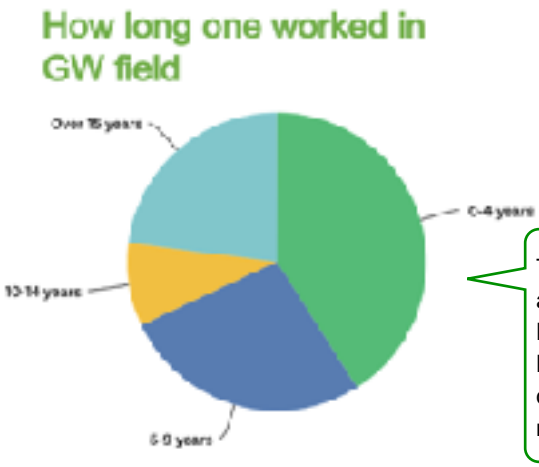
To make diversity advantageous in our scientific society, we need to leverage its power to increase the efficiency of scientific productivity. It is important to understand and respect colleagues' differences at the workplace, so that everyone can work comfortably regardless of one's characteristics. The goals of the KAGRA Scientific Congress (KSC) diversity committee are to create a respectful and comfortable work environment for everyone, minimize unnecessary conflicts between the collaborators, and maximize our efficiency and scientific discovery through diversity.

As a first step toward our goals, we would like to view the demographic landscape of the collaboration. The KSC diversity committee conducted a survey during November 2018 and presented the results in the December face-to-face meeting. The method of survey was an online survey application (https://www.surveymonkey.com/stories/SM-HY996Q6/). In total, 100 answers were analyzed.



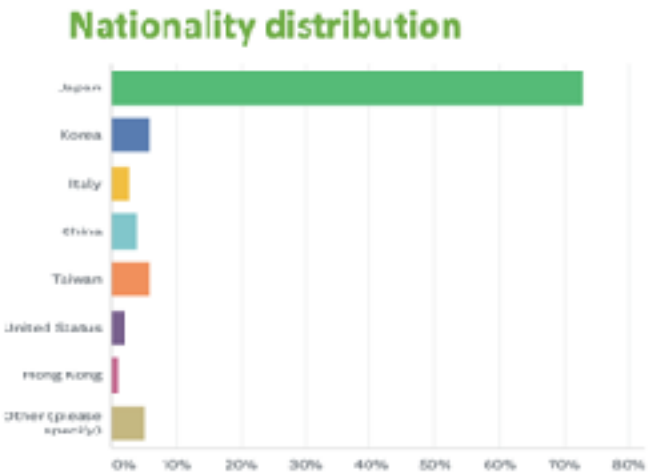


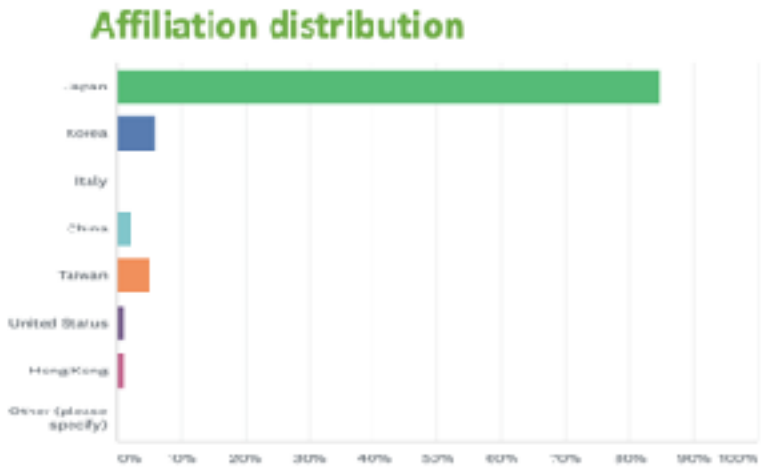
The professor ratio is comparable to the student and postdocs at the moment. We need to recruit and encourage more students and postdocs in GW science, however, this necessitates more grants to secure future researchers and projects.



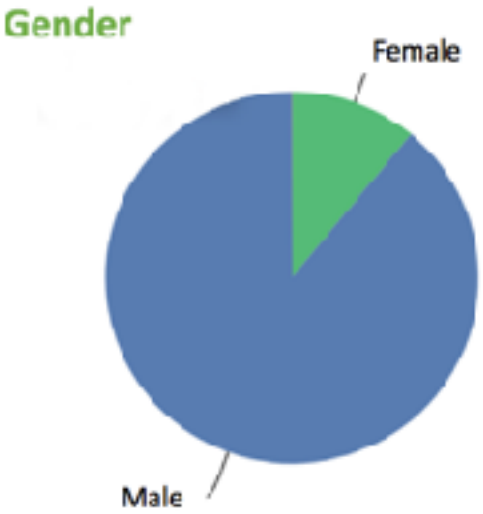
The group of 10-14 years is significantly fewer than the other groups. We assume this is because of the project gap between TAMA300 and KAGRA. Many graduate students, and possibly young researchers, left the field before KAGRA was funded in 2010. Having less of this generation could be disadvantageous for the collaboration, as these generations play an important role both in research and educations.

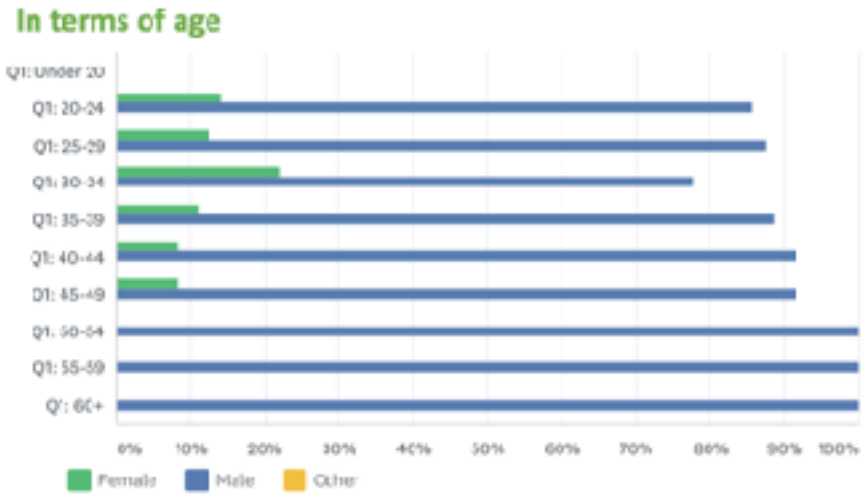
Summary of the demographic survey 2018 (page 2) by Kokeyama, Fedrow & Kim





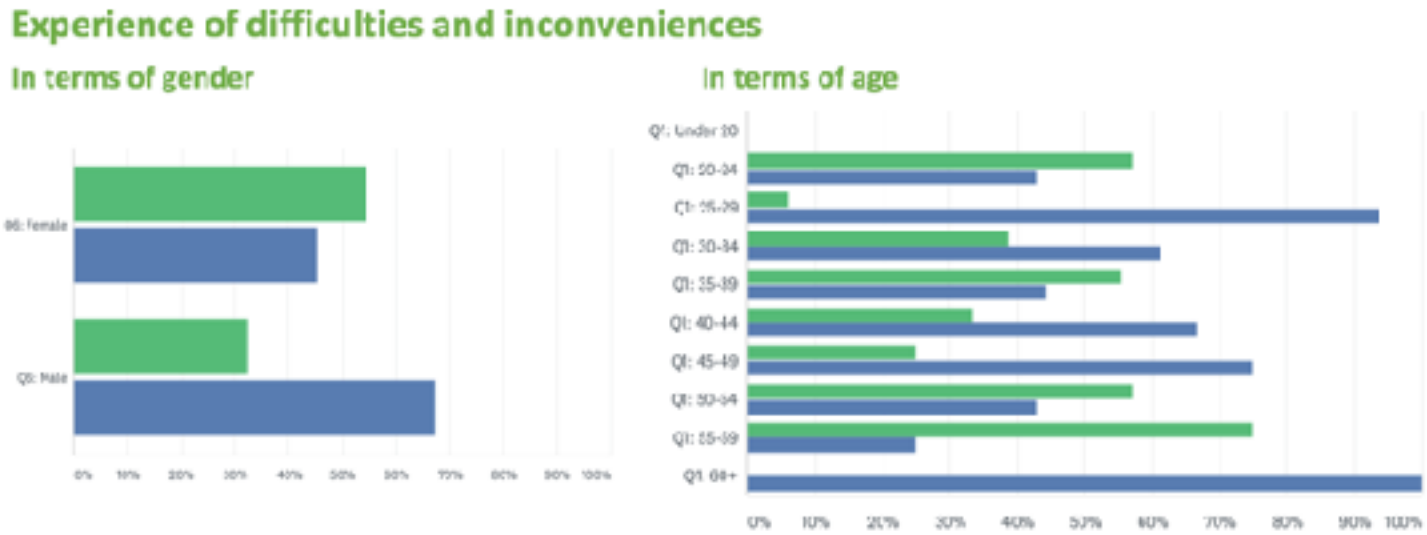
Naturally, the majority hails from Japan, as the detector site is in Japan, and at this moment most of the funding is from Japan. In the future, the collaboration will have more non-Japanese members and the funding should start to diversify as well. Japanese institutions are the majority as the nationality.



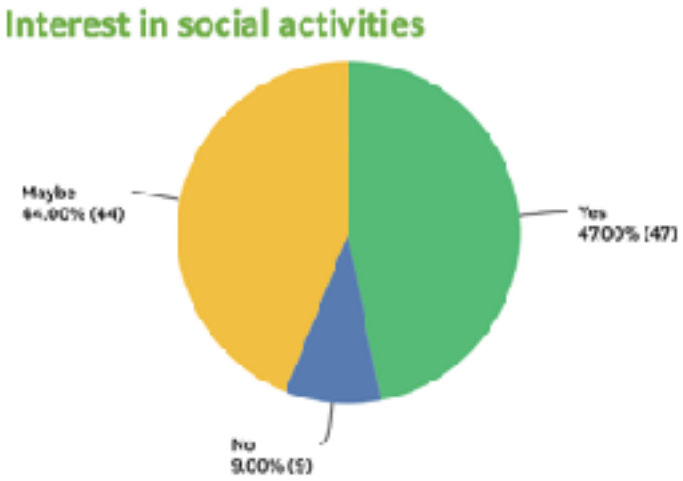


Thirty percentage of the collaborators have experienced difficulties at KAGRA workplaces. According to comments on this question in the survey, most of the difficulties are from language differences, both for Japanese and non-Japanese collaborators. For the non-Japanese collaborators, the Japanese cultures at work are, additionally, often difficult.

Summary of the demographic survey 2018 (page 3) by Kokeyama, Fedrow & Kim



The left figure shows more female members feel difficulty than the male members. The gender unbalanced environment causes not only the leaky pipe effect mentioned in the previous part, but also many other negative effects, e.g, Matilda effect (women scientists are acknowledged less than men due to a gender bias - please google for further information). These issues often arise due to an unconscious bias in people's minds, and may add difficulties at work for female members.



We also note that there are a few comments about harassment, which must be treated very seriously in the collaboration. The diversity committee is happy to work as ombudspersons, if anybody sees or hears anything.

Including "Maybe," more than 90% of collaborators are interested in social events. Social activities would be especially helpful for understanding each other across different groups of job categories, cultures, genders, ages, etc, - related to the experience of difficulties.

Summary

Although the KAGRA telescope might reside within a mountain, in this article we have analyzed the demographic landscape upon which the KAGRA collaboration of 2018 sits. Questions about the difficulties and interest in social activities suggest we have many possible improvements to make in the near future. As the cherry blossoms currently bloom across Japan, demographic information should continue to be collected and tracked regularly for the long term, in order to see the evolution and continued blossoming of the KAGRA collaboration. 🍏

(edited by Ayaka Shoda 🍏)

Recent Meeting

Face-to-Face 21 at NAOJ, December 5-6

Program: http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/LCGT/Meeting/f2f/2018Dec

The 21st F2F meeting was held at National Astronomical Observatory of Japan, December, 2018. There were 118 participants, including 31 people from overseas. We discussed the status of phase-2 construction, preparations for joining the LIGO/Virgo's O3, and other urgent issues.

Three new institutes joined to the collaboration; Aoyama Gakuin Univ.(Ryo Yamazaki), Chungnam National University (David Hui) NAOJ, and Peking University (Lijing Shao & Kohei Inayoshi).

We thank LOCs, Mateo Leonardi, Yoichi Aso, and NAOJ members.

Next Meeting

Face-to-Face 22 at ICRR, April 19-21

Program: http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/LCGT/Meeting/f2f/2019Apr

The next Face-to-Face meeting will be held at Institute of Cosmic Ray Research, the University of Tokyo; KAGRA's main host institute. The campus is in Kashiwa City, Chiba prefecture; the nearest station is "Kashiwano-ha Campus" of the Tsukuba express train, which starts from Akihabara station of the JR Yamanote line. The campus is located at 2.2 km from the station, and not only ICRR, U. Tokyo settles Kavli IPMU (Institute for the Physics and Mathematics of the Universe), ISSP (Institute for Solid State Physics), GSFS (Graduate School of Frontier Sciences), IIS (Institute of Industrial Science), etc in Kashiwa campus. ("Isolated place accelerates the research activities", as the proverb says, :-P)

Our preparation for joining Observation Run 3 of LIGO/Virgo will be the main topic of this Face-to-Face meeting. The invited speaker of this meeting is Hiroaki Yamamoto, one of the legend of LIGO researchers. Three satellite meetings will be held in this Face-to-Face meeting; satellite meeting on future upgrades (April 18, at U. Tokyo Hongo campus), on data analysis (evening of Apr 19), and on calibration and related grants projects (Apr 22).

The registration was already closed, and the number of participants is over 130, which is the largest ever.

KAGRA MEETING SCHEDULE

Mark your calendar now for the following meetings.

The 22nd KAGRA Face-to-Face meeting at ICRR Kashiwa campus, **April 19 (Fri.)-21 (Sun), 2019.**
The 6th KAGRA International Workshop, at Wuhan, China, **June 21 (Fri.) - 23 (Sun), 2019**
The 23rd KAGRA Face-to-Face meeting at U. Toyama, **August 22-24, 2019.** Fixed!
The 24th KAGRA Face-to-Face meeting at somewhere, **December, 2019.**
The 7th KAGRA International Workshop, at National Central U., Taoyuan City, Taiwan, **May, 2020** May be

call for a host univ./institutes

Next Meeting

The 6th KAGRA International Workshop, June 21-23, 2019, Wuhan, China

http://kiw6.csp.escience.cn/

It is a great pleasure to hold the 6th KAGRA International Workshop (KIW6) at Wuhan from the 21st to the 23rd of June, 2019.

Wuhan is the capital of Hubei Province, which has a population of 10 million. Located in the middle of China, Wuhan can be reached by speedy train in 4 hours from Shanghai, 4.5 hours from Beijing, 4 hours from Xi'an, and 4/4.5 hours from Guangzhou/Hong Kong/Sheng Zheng.

The KIW6 workshop will be organized by Wuhan Institute of Physics and Mathematics (WIPM), Chinese Academy of Sciences. WIPM has a history of over 60 years. WIPM conducts frontier and interdisciplinary research that focuses on magnetic resonance in life sciences, atomic, molecular and optical (AMO) physics, atomic frequency standards, and precision measurement physics. During her history, WIPM has been honored with nearly 300 scientific and technological awards.

The Yellow Crane Tower in Wuhan

WIPM now has about 300 students, 300 scientists and 100 staff members. The international cooperation and academic exchange between WIPM and the peer institutes around the world are routine, and long-term cooperative relationship has been developed between WIPM and institutes from over 20 countries and regions.

The group of cold atom physics (GCAP) led by Prof. Mingsheng Zhan is one of the earliest research groups that carry out cold atom physics study in China. This group has realized the first cold atom interferometer in China in 2007, built the biggest atom interferometer around the world in 2012, and achieved a precision test of the equivalence principle with atoms in 2015. In recent years, the group is working on quantum manipulation of single atoms, precision measurement with atom interferometers, application research of atom interferometer in gravity measurement, gravity gradient measurement, rotation measurement and general relativistic test. A project named as ZAIGA (Zhaoshan long-baseline Atom Interferometer Gravitation Antenna [arXiv1903.09288]) is proposed by GCAP. ZAIGA is a new type of underground laser-linked interferometer facility, be equipped with long-baseline atom interferometers, high-precision atom clocks, and large-scale gyros. The ZAIGA facility will be used for experimental research on gravitation and related problems including gravitational wave detection, high-precision test of the equivalence principle of micro-particles, clock based gravitational red-shift measurement, rotation measurement and gravito-magnetic effect.

In the face-to-face meeting on May 18-20, 2018, WIPM joined the KAGRA Collaboration. At present, Panwei Huang (D3), Mingsheng Zhan (Prof.) and Wei-Tou Ni (Prof.) are collaborating on the VIS subsystem; Guiguo Ge (D1), Jing Wang (Prof.) and WT Ni are collaborating on the IOO subsystem, and Dongfeng Gao (Associate Prof.), Wei Zhao (D1), Min Liu (Associate Prof.) and WT Ni are collaborating on the fundamental physics part of Data Analysis.

Welcome to KIW6! Welcome to Wuhan!

Min Liu, Wei-Tou Ni, Jing Wang and Mingsheng Zhan

Poster Award Winners

At the face-to-face meeting in NAOJ, we awarded Mr. Hiroyuki Tahara and Mr. Kazuya Yokogawa. (Two received a certification signed by Kajita-san. H.Shinkai donated his new book as the winner's prize.)
Here are the abstracts of the winner's presentations.

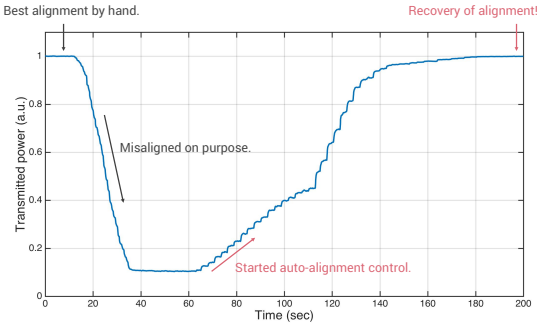
From Left: H.Tahara, K. Yokogawa, & T. Kajita

"Most Outstanding Presentation Prize" for two

Hiroyuki Tahara (The Univ. of Tokyo)

Development of an auto-alignment system by machine learning

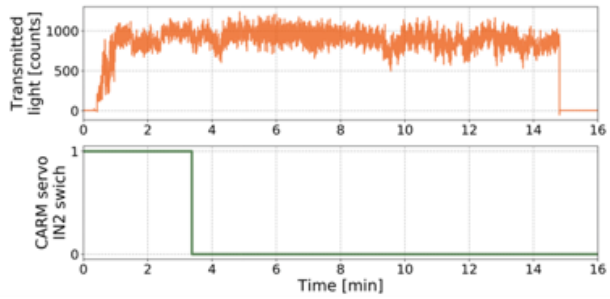
Considering the current situation where the systematic and versatile methods for obtaining good alignment of an optical cavity hardly exist, we are developing an auto-alignment system for the cavity with a wide control range and a simple optical setup by making a good use of the computational resources.
When the cavity is locked to TEM00 of an incident laser beam, its higher-order eigenmode components reflected off at an input mirror of the cavity contains information concerning misalignment. We designed a machine learning system for extracting the misalignment information from reflected light. We adopted a supervised learning scheme for deep neural networks, of which the input data are intensity distributions of the reflected light ray observed at two positions; the outputs of the networks are used to predict the sign of each component of a gradient vector of transmission power expressed as function of four degrees of freedom in two alignment mirrors.



Using the trained deep neural networks which could predict the sign of each component of a gradient vector of the transmitted power, we have accurately operated the auto-alignment system and made the alignment state as good as the best realized by the manual procedure.

Kazuya Yokogawa (U Toyama)

Development of interferometer control system with green lasers in KAGRA



We demonstrated a lock acquisition scheme of KAGRA interferometer using Arm Length stabilization (ALS) system in the X arm commissioning.
KAGRA interferometer consists of 5 length Degree of Freedom (DoF), and it is necessary to control these DoF and bring to each operating point in order to observe gravitational waves. In KAGRA, we use ALS system to control these DoF. ALS system consist of three main parts. First part is the frequency stabilization of the green laser. It is necessary to stabilize the frequency of the green laser in ALS system since the green laser is used to stabilize DoF of 3 km arm cavities.
Second part is to lock the green laser to 3 km arm cavity by Pound-Drever-Hall (PDH) method and stabilize DoF of the arm cavity. Third part is the frequency stabilization of the main laser using CARM (Common ARM) DoF. If the stabilized main laser is locked to arm cavities, KAGRA interferometer is ready for gravitational wave observation.
There were two targets in the X arm commissioning. First was to lock the main laser to the X arm cavity using ALS system. Second was to confirm the performance of the ALS system. As a result, we achieved these targets and got the confidence in the ALS performance.

Newly Joined

Theoretical Astrophysics Laboratory, Dept. of Physics and Mathematics, Aoyama Gakuin University

Ryo Yamazaki, and Shuta J. Tanaka

It is our great pleasure that we joined KAGRA Collaboration at the last F2F meeting held at NAOJ. We are looking forward to seeing the detector instruments, and we hope that we contribute to KAGRA soon.

Our department (College of Science and Engineering, Aoyama Gakuin University) is located at Sagamihara city. The nearest station of our campus (JR Fuchinobe sta.) is the same as that of ISAS/JAXA. Every year, we welcome on average 7 or 8 fourth-grade undergraduate students to our laboratory. This fiscal year, we have 7 undergraduate students, 10 master course students, and a Ph.D student (A lot of students for two staff members R.Y. and S.J.T.!) Some of them will contribute to KAGRA. They also look forward to first visit to KAGRA. We have at present little knowledge on KAGRA, so please allow us to ask you primary questions that may be somewhat trivial for you. Thank you in advance.

Our research interest so far is the high-energy astrophysics. We have studied the particle acceleration and high-energy photon emission at supernova remnants, gamma-ray bursts (GRBs), and so on. In such phenomena, the source energy (maybe gravitational or magnetic) is transferred to the expanding matter in the form of kinetic energy through explosive processes. Then, the outflow is decelerated and the kinetic energy is dissipated into relativistic particles and electromagnetic radiation at the shock that is formed far from the explosion site. The final dissipation process can be observed by electromagnetic telescopes, however, the region of the initial launch of the outflow is too compact and optically thick to be seen. On the other hand, the gravitational wave (GW) is transparent to dense matter, so that GW observations promise to bring us rich information on the central part of the high-energy astrophysical phenomena. So far, we have written several papers related to GW physics. In Sago et al. (Phys. Rev.D, 2004), the GW memory of the GRB jet was studied to clarify the jet structure and launch mechanism, and it was found that the signal from nearby GRBs is detectable. In LIGO O1/O2 era, we have written papers on possible electromagnetic counterparts of BH-BH (R.Y. et al. 2016, PTEP) and NS-NS merger events (R.Y. et al. 2018, PTEP). In near future, we will contribute to KAGRA through the multi-messenger discussions. Indeed, R.Y. is an affiliated member of Fermi/LAT collaboration and R.Y. and S.J.T. participate in CTA consortium, so that we can access gamma-ray data soon. We have also studied the electromagnetic properties of the pulsar magnetospheres. The pulsed electromagnetic radiation from rotating neutron stars and the broadband electromagnetic radiation from pulsar wind nebula are used to study the relativistic plasma that spins down the pulsar. Although gravitational radiation seems the sub-dominant mechanism of the pulsar spin-down, it is interesting to explore the fraction of the spin-down energy leased as gravitational radiation in order to study interior properties of the pulsars.

We will join the data analysis working group of KAGRA, and contribute to KAGRA through not only the theoretical interpretation but also the data analysis of GW events. R.Y. gives lectures on Fourier analysis at Aoyama Gakuin University. For young students (namely our university!), it seems difficult to intuitively understand physics in the wave number space. We expect that GW observations and analysis will greatly help students experiencing general wave analysis. 🍏

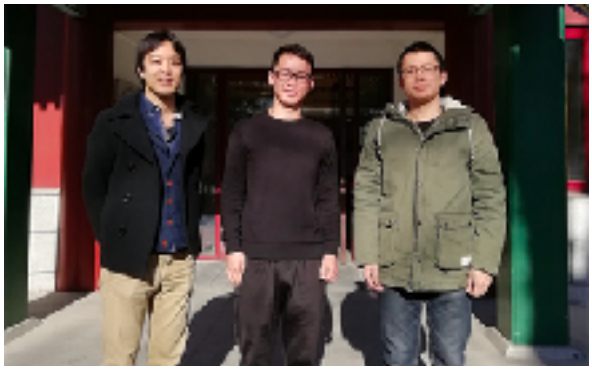
Newly Joined

Kavli Institute for Astronomy and Astrophysics (KIAA), Peking University

Kohei Inayoshi

It was our great honor pleasure that we joined KAGRA Scientific Congress (KSC) in the last face-to-face meeting in National Astronomical Observatory in Japan on December in 2018. In the meeting, we had a good opportunity to meet and talk to a number of KSC members. It was not only fun but also useful to see the atmosphere of the meeting and exchange opinions with new and old colleagues interactively. We also really appreciate the KSC member that we were allowed to join them as a new member. In particular, we thank to Atsushi Nishizawa for suggesting us to contribute to KAGRA Scientific White Paper. We are looking forward to further contributions as a member of KAGRA member.

We would like to introduce our institute, Kavli Institute for Astronomy and Astrophysics (KIAA), as a new member of KSC congress. KIAA jointly supported by Peking University in China and an endowment made possible by a generous gift from the Kavli Foundation, USA. KIAA was established in June, 2006 and started operation in 2007. KIAA's mission is to establish an international center of excellence in astronomy and astrophysics that promotes the development of basic astrophysical research. With English as the working language, KIAA is engaged in theoretical and observational initiatives, development and utilization of astronomical facilities, and training of undergraduate and graduate students and postdoctoral fellows. KIAA has now about 20 faculties, 30 postdocs, 70 graduate students and 110 undergrad students. KIAA regularly sponsors thematic workshops, conferences, and a range of other academic activities to facilitate scientific exchange with the domestic and international astronomy community. It is establishing exchange and visiting programs with other Kavli institutes and a network of universities and astronomy centers worldwide.



Three new members from KIAA. Kohei Inayoshi, Yong Gao, Lijing Shao from left.

In KIAA, there are a number of researchers working on gravitational wave (GW) astronomy related not only to stellar-mass compact objects but also to (1) supermassive/intermediate-mass black holes which are targets for pulsar timing array experiments and next generation GW space-based and ground-based detectors such as LISA, DECIGO, Einstein telescope, (2) multi-messenger GW astronomy with observations of other electro-magnetic signatures and high-energy radiation/particles, and (3) nuclear physics on establishing and probing equation of state of extremely dense matter with GW signals. Collecting all of the research activities and expertise on GW astronomy, we have kicked off a long-term program, PKING, funded by the National Science Foundation of China devoted to new core initiatives in astrophysics (http://kiaa.pku.edu.cn/pking/#about). With a support from the PKING program, we are inviting many of international visitors and will organize conferences to establish platforms for international collaborations. We are looking forward to seeing the KSC member here too. Please visit the website of the PKING gravitational astrophysical group (http://kiaa.pku.edu.cn/GAgroup/) for more information.

This time, three members have joined the KSC member from KIAA; Shao Lijing, Kohei Inayoshi, and Yong Gao. Dr. Shao obtained his PhD degree on Theoretical Physics from the School of Physics at Peking University in 2015, and worked as a postdoc in the Albert Einstein Institute and the Max Planck Institute for Radio Astronomy in Germany, before he joined KIAA as an assistant professor in 2018. Lijing was a LIGO member for two years (2015.9—2017.8). In AEI-Potsdam, he led to develop a new waveform model (SEOBNRv4). The model was coded up in LIGO Algorithm Library (LAL). Later it was used in LIGO's O2 run, and discovered binary black hole events. Lijing is also an expert on testing gravity theories with pulsar timing techniques and interferometric GW detectors. For more information, please check http://friendshao.github.io/about/. Dr. Kohei Inayoshi has received his Ph.D degree in physics from Kyoto University in 2014, and worked as a postdoc at Columbia University in USA before he joined KIAA as an assistant professor in 2018. He is working on the formation channels of stellar-mass binary black holes, considering star formation, stellar evolution and black hole accretion, and model their evolution in a cosmological context. For more information, please visit https://inayoshi0328.wixsite.com/kohei-inayoshi. Yong Gao is a first-year PhD student in the School of Physics at PKU, who is very interested in GW science. Currently he is taking courses in astrophysics and reading literature, but soon Yong will be able to work on the research frontier, and contribute to the KAGRA science. 🍏

WE FOUND THAT . . .

KAGRA was detected and reported.

Science News 195 (2019 Feb) 8

Nature 565 (2019 Jan) 30

KAGRA COLLABORATION ARTICLES

KAGRA: 2.5 Generation Interferometric Gravitational Wave Detector
T. Akutsu et al. (KAGRA Collaboration)
Nature Astronomy, 3 (2019) 35–40. [arXiv:1811.08079]
https://doi.org/10.1038/s41550-018-0658-y

Vibration isolation system with a compact damping system for power recycling mirrors of KAGRA
Y. Akiyama et al. (KAGRA Collaboration)
Classical and Quantum Gravity, 36 (2019) [arXiv:1901.03053]
https://iopscience.iop.org/article/10.1088/1361-6382/ab0fcb

First cryogenic test operation of underground km-scale gravitational-wave observatory KAGRA
T. Akutsu et al. (KAGRA Collaboration)
submitted to *Classical and Quantum Gravity* [JGW-P1809289] [arXiv:1901.03569]

O3 information page http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/KAGRA/KSC/O3

A new link page has started. List of GW conferences, list of your required actions, LIGO/Virgo links, etc.

RECENT KAGRA STATUS TALKS

meeting/conferences		speaker	JGWdoc
KIW5 in Perugia Italy	Feb. 2019	Keiko Kokeyama	[JGW-G1909822]
JPS meeting at Kyushu University	March 2019	Norikatsu Mio	[JGW-G1909942]
LVC meeting in Wisconsin US	March 2019	Hisaaki Shinkai	[JGW-G1909940]
Rencontres de Moriond 2019	March 2019	Tomotada Akutsu	[JGW-G1909985]

New Collaborators (*= New Groups)

Aoyama Gakuin University *
Ryo Yamazaki (Professor)
Shuta J. Tanaka (Assistant Professor)
Beijing Normal University
Jie Zheng (Graduate student)
Chungnam National University
David Chung Yue Hui (Associate Professor)
Ewha Womans University
Chaeyeon Jeon (Graduate Student)
High Energy Accelerator Research Organization (KEK)
Tatsuki Washimi (Postdoc)
JAXA Institute of Space and Astronautical Science
Takuya Midooka (Graduate Student)
Kavli Institute for Astronomy & Astrophysics, Peking University *
Kohei Inayoshi (Assistant Professor)
Lijing Shao (Assistant Professor)
Yong Gao (Graduate Student)
Korea University
Byung Jun Park (Graduate Student)
Myongji University
Sung-Joon Cho (Graduate Student)
National Astronomical Observatory of Japan (NAOJ)
Matteo Leonardi (Assistant Professor)
National Central University
Chia Ming Kuo (Associate Professor)
Harn Fung Pang (Research Assistant)
Ko-Han Chen (Graduate Student)
Hsuan Yu Chu (Graduate Student)
National Tsing Hua University, Department of Physics and Institute of Astronomy
Kuo-Chuan Pan (Assistant Professor)
En-Tzu Lin (Graduate Student)
Yee Xuan Yap (Graduate Student)
National Tsing Hua University, Institute of Photonics Technologies
Tsung Ju Yang (Posdoc)
Shu-Rong Wu (Graduate Student)
Niigata University
Yuta Fujikawa (Graduate Student)
Taiki Murakami (Graduate Student)
Osaka City University
Yuichiro Kobayashi (B4)
Tomoya Ohashi (B4)
Ryosuke Tsuda (B4)
Tamkang university
Chia-Hsuan Hsiung (Student)
Tzu-Ching Lin (Student)
The University of Tokyo, Institute for Cosmic Ray Research (ICRR)
Jishnu Suresh (Postdoc)
Eunsub Lee (Graduate Student)
Takashi Kato (Graduate Student)
Yasuhiro Kariya (Graduate Student)
Takumi Nishimoto (Graduate Student)
The University of Tokyo, Research Center for the Early Universe (RESCEU)
Heather Kin Yee Fong (Posdoc)
Chi Wai Chan (Graduate Student)
Minori Shikauchi (Graduate Student)
Tokyo Institute of Technology
Kenichi Harada (Research Lecturer)
Masafumi Niwano (Graduate Student)
Jun Ogawa (Graduate Student)
Yuting Liu (Graduate Student)
Koki Tachihara (B4)
Makoto Kuribayashi (B4)
Ulsan National Institute of Science and Technology (UNIST)
Kihyun Jung (Graduate Student)
Kwan Lok Li (Postdoc)
University of Rome Sapienza
Eleonora Polini (Graduate Student)
University of Sannio
Rosalba Fittipaldi (Researcher)
Cinzia DiGiorgio (Postdoc)
Veronica Granata (Postdoc)
Ofelia Durante (PhD student)
Elena Mejuto-Villa (PhD student)
Wuhan Institute of Physics and Mathematics, The group of cold atom physics (GCAP)
Min Liu (Associate Prof.)

(as of November 2018 – April 15 2019)

Collaboration-list committee made their mailing address kagraros@icrr.u-tokyo.ac.jp; ros from a roster. Rumor says that on-line version of the collaboration list will be on-line shortly.

If your affiliation address (or email) changes: Contact to kagraros@icrr.u-tokyo.ac.jp
If your group has new members: Contact to kagraros@icrr.u-tokyo.ac.jp
If you have a nice photo: Let the KSC Newsletter share them.

If you are planning to join KAGRA collaboration as a new group: Contact to kscboard@icrr.u-tokyo.ac.jp

WE HEAR THAT . . .

Hideyuki Tagoshi (ICRR) became a professor at ICRR in November 2018.
Takayuki Tomaru moved to NAOJ as a professor from KEK, April 2019.
Koutarou Kyutoku moved to Kyoto Univ. as an associate professor from KEK, May 2019.

Tomoya Kinugawa moved from ICRR to Dept. of Astronomy, Univ. of Tokyo as a JSPS SPD, April 2019.
Chihiro Kozakai moved from KEK to NAOJ (Kamioka) as a JSPS postdoc researcher, April 2019.
Tatsuki Washimi moved from KEK to NAOJ as a postdoc researcher, April 2019.
Koki Okutomi moved from Sokendai (NAOJ) to ICRR as a postdoc researcher, April 2019.
Kentaro Komori is visiting MIT as a JSPS research fellow abroad from April 2019.

❤❤❤❤ ❤❤❤❤❤❤❤❤ and 💙💙💙💙💙💙 💙💙💙💙💙💙💙 got married in January!!

Sachiko Kuroyanagi (Nagoya U.) got a baby boy on November 28. His name is Makoto. (photo)

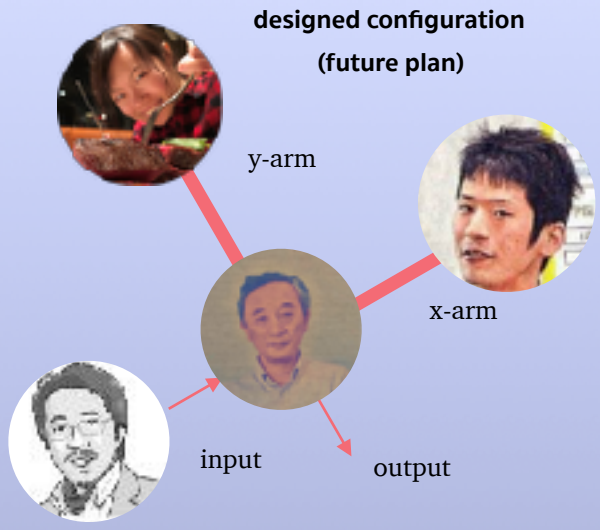
Congratulations!
If you have other news, please notice them to the editors.

FROM EDITORS

We appreciate many contributors again for this issue.
We are always calling editorial volunteers, and we also want your posts and/or leaks of information.

Please send your inquiries the current editorial staff.
Hisaaki Shinkai (Osaka Inst. Tech.). hisaaki.shinkai at oit.ac.jp
Ayaka Shoda (NAOJ) ayaka.shoda at nao.ac.jp
Yoshihisa Obayashi (ICRR) ooba at icrr.u-tokyo.ac.jp
Kentaro Komori (U Tokyo, MIT)
komori at granite.phys.s.u-tokyo.ac.jp

Our dream is still to get the top download counts in JGWdoc.



KSC Newsletter backnumbers

this issue [JGW-L1910057]
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No. 3 (2018/12) [JGW-M1809350] https://gwdoc.icrr.u-tokyo.ac.jp/cgi-bin/DocDB/ShowDocument?docid=9350
No. 2 (2018/8) [JGW-L1808559] https://gwdoc.icrr.u-tokyo.ac.jp/cgi-bin/DocDB/ShowDocument?docid=8559
No. 1 (2018/4) [JGW-L1808122] https://gwdoc.icrr.u-tokyo.ac.jp/cgi-bin/DocDB/ShowDocument?docid=8122