

KSC Newsletter

Issue 5

O3 Started

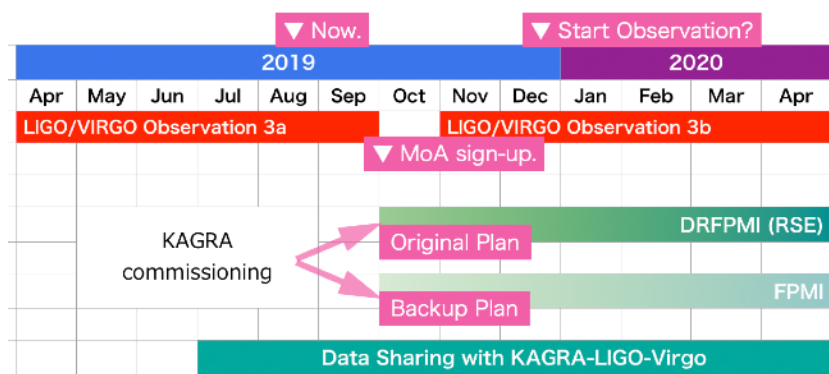
We are in the era of GW detections (almost) every week

LIGO and Virgo started their 3rd Observation Run (O3), April 1. The O3 is planned for 12 months, and since they recently announced a one-month break in October, O3 will continue by the end of April 2020. According to the summary¹ as of August 10, LIGO-Livingston and Hanford reach their sensitivity 140 Mpc and 115 Mpc, respectively, while Virgo reaches 50 Mpc in binary neutron star inspiral range. Three detectors' duty-cycle are 69.5%, 72.8 %, and 76.3 %, respectively, and the network duty-factor is 42.5% for triple interferometers, 37.2% for double, 16.4% for single, and 3.9% for no-observation.

LIGO/Virgo began public alert system (GraceDB)² ; they announced 23 detection candidates for 4 months 20 days, 2 of them may be of binary neutron star mergers, 2 of them may be of binary neutron star-black hole mergers, and rest of them may be of binary black hole mergers or terrestrial errors. The detail analysis are in progress within the LIGO/Virgo collaborations, but we can say definitely that we have entered the era of GW astronomy.

KAGRA finished all the installations, is trying to ready for observation in 2019!

Our System Engineering Office (SEO) announced the end of installation phase when we started pump-down for entire vacuum system (April 13) and started cool-down the last test mass (May 2). The period of installation was only one-month delay from the planned schedule a year ago, and we somehow set up the configuration with dual-recycling system. KAGRA's official announcement so far is to start observation in late 2019, so that we are still working with our back to the wall. KAGRA will celebrate its finishing construction as a ceremony and party on October 4 (Friday) at Toyama. On that day, with spokespersons of LIGO and Virgo, we plan to sign up our new MoA (memorandum of agreement) regarding the joint observation.



After started commissioning, we faced many troubles. However, we made the first test run on June 6 in which we locked X-arm with 5.5 hours of 6 hours (duty cycle 94.8 %), then on June 19 we succeeded to lock a dual-recycling short Michelson interferometer (sDRMI) within 10 seconds (and keep the lock status for couple of minutes). The current big problem is the unbalanced features of reflected light (absorption/birefringence, polarization), which is due to the coating and bulks of Sapphire mirrors. Detector groups are discussing a way to resolve the problems with many ideas, and the final conclusion will be set in the end of August. 🍏

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¹ <https://summary.ligo.org/O3/>

² <https://gracedb.ligo.org/superevents/public/O3/>

On Our Very Near Future

The board of KSC changes this summer. The past two years we experienced much of transitions of KAGRA from construction phase to real observation phase (though actually we have not yet started). Our organization style has been updated, and we are gradually changing our discussion to science-oriented ones.

MoA with LIGO/Virgo

Before starting observation, we have to make MoA (Memorandum of Agreement) with LIGO/Virgo for exchanging observational data and for making scientific progresses. Due to the requirement of the funding agency of LIGO, all the observation data of $h(t)$ will be released to public after 18 months of analyzing period. (say, O3a data [April-September 2019] will be in public by April 2021). LV spent two years to agree on this point, and our working group of MoA also has decided to follow this rule. The draft was circulated in [[kagra 03024](#)][[JGW-M1910535](#)], and the KSC board plans to have approval of the collaboration at the face-to-face meeting in Toyama.

Change of research style

The MoA also define how the joint papers will be realized in detail, so we also need to revise our style along to theirs. For example, data analysis teams should prepare white paper every summer, together with publication plans for joint researches. Even for short-author analysis, we need to report these progresses in weekly telecon at each analysis group. The KAGRA data analysis groups are working on this line, and now proposing our original analysis plans to LV, which will be in the white paper for O3b.

According to the current organization of LIGO and Virgo, KAGRA also need to assign chairpersons of each analysis group (and deputy co-chair if necessary) [this style is already ready in KSC Data Analysis Committee], Program Committee for refereeing publication plans, Joint Review Committee (JRC) for evaluating scientific impacts of paper drafts. We might need to change our publication policy for such processes.

CPC will be under KSC

The committee of publication control (CPC) is currently under EO. However, concerning the activity of KSC, EO is planning to move CPC under KSC. The idea will be shown at F2F and be discussed. New CPC is supposed to work also for Joint Editorial Board with LV for approval, coordinate, and reviewing presentation.

New KSC board & new EO this summer

This year is for exchanging the board of KSC. At the KSC telecon July 5, the rules for KSC election was revised. We will select four board members by vote; two from data analysis and theory, and two from experiment category [[JGW-M1706956](#)]. We've heard five and four candidacies in each category respectively, and now in the voting period for KSC members [[kagra 03029](#)]. The ballots will be opened in the first day of the F2F meeting. With three regional representatives, one student, one postdoc, and one EO, total 10 members will work for new KSC board.

EO also decided to enhance members adding four regional (non-Japanese institutions) representatives this summer.

Observation Shift

We all are supposed to help observation shift. We collected shift-candidate list, and now the list has 260 colleague names. Suppose to have 5 months of observation with 8 hours (3 shifts a day) with expert and non-experts, everyone is expected to appear 3-4 days at the KAGRA site for monitoring and checking the status of the detectors at the site.

Whew! Let's enjoy our busy days a bit more.

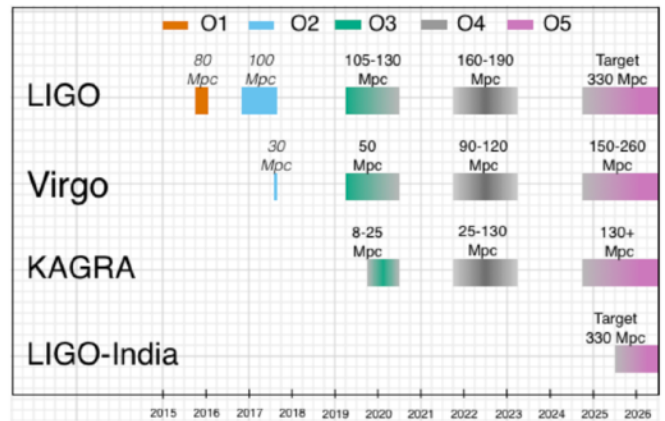
Hisaaki Shinkai 

Collaboration

Observing Scenario Paper

Submission of the updated version of Observing Scenario Paper [Living Rev. Relativ. (2018) 21:3] (<https://doi.org/10.1007/s41114-018-0012-9>) has been postponed. However, a short summary has been released in public at: <https://dcc.ligo.org/LIGO-P1900218/public> in order to facilitate proposals by astronomers for observing time we present our current best estimate of the plausible observing scenarios for the Advanced LIGO, Advanced Virgo and KAGRA gravitational-wave detectors over the next several years. [JGW-P1808427][kagra 03030]

Particularly, Figure 2 (above right) shows the official and updated version of planned sensitivity evolution and observing runs over the coming years including the O5 upgrades. [Sadakazu Haino](#) 🍏



Author-list 2018 is fixed

The author-list committee (Yosuke Itoh (Chair), Yoichi Aso, Kazuhiro Hayama, Feng-Li Lin, John J. Oh, and Takashi Uchiyama) finalized the list. In February, we called applicants who had made contribution to KAGRA more than 30% of each research time in 2018. The number of the applicants were 226. After anonymous referees (at least two referees for each) checked one’s activities (and applicants had chances to respond to them), the committee summarized the author-list of 200 collaborators [JGW-P1910338].

KAGRA author-list members

	2015	2016	2017	2018	
applicants	160	157	165	226	
author-list	118	149	162	200	
both 17+18			*	*	129
both 16+17		*	*		116
both 15+16	*	*			97
all 16+17+18		*	*	*	93
all 15+16+17	*	*	*		79
all 15-18	*	*	*	*	70
ref JGWdoc	1605922	1707170	1708211	1910338	

Statistics of KAGRA collaboration (August 1, 2019)

	collaborators	O3 commitment form	KSCmembers	shift candidate	Collaboration MoU
Japan	258	218	67	172	21
China	59	40	11	26	5
Taiwan	56	49	9	21	16
Korea	32	24	12	21	9
Italy	21	5	4	11	8
USA	8	3	2	12	1
Australia	5	1			
Hong Kong	4	4			1
India	3				
France	2	2	1		
Poland	2	1			
UK	2				
Russia	1				
Germany	1				
Vietnam	1				
total	457	347	106	263	61

Collaboration statistics

This year, we asked all KAGRA collaborators to file signed “O3 commitment form” in order to treat confidential observational facts. We also asked each institutions to sign up “Collaboration MoU” in order for confirming the collaborative works of observation and also for future upgrades. We also asked group leaders to file the list of shift candidates and check who are KSC members.

The board appreciate your reactions. All the statistics are summarized in the table left.

Outreach

Public talk at Kamioka Lab, June 2 by Takaaki Yokozawa

「重力波とニュートリノの同時観測?! 超新星爆発の謎に迫る」

On Sunday, June 2, ICRR's project assistant professor **Takaaki Yokozawa** gave a public event talk entitled "Simultaneous observation of gravitational waves and neutrinos?! Approaching the mystery of supernova explosion" at KamiokaLab, science museum in Kamioka town.

Dr. Yokozawa conveyed his expectations to observe gravitational waves and neutrinos from supernova explosion simultaneously with two underground telescopes in Kamioka while mixing stories about his researcher life in Super-Kamiokande and KAGRA experiments. The event was reported in news of a local television (NHK Gifu) and a local newspaper (Gifu Shimbun).



See <https://www.gifu-np.co.jp/news/20190604/20190604-144033.html> for web article of Gifu Newspaper. KamiokaLab's blog also reports about the talk event. <https://www.city.hida.gifu.jp/site/kamiokalab/13457.html>

Public talk at Kamioka town, June 16 by Keiko Kokeyama

「地下望遠鏡・KAGRAではじめる重力波天文学」

On Saturday, June 13, ICRR's Assistant Professor, **Keiko Kokeyama** gave a public lecture entitled "Gravitational wave astronomy begin with KAGRA underground telescope" at the public hall of Kamioka town. This lecture is a part of Kamioka town's event "Geo Space Adventure (GSA)," which thousands of visitors from all over Japan explore underground facilities and mine tunnel. While KAGRA cannot accommodate such big number of visitors, KAGRA is asked to give a lecture instead. Hundreds of audience heard her lecture in fascination and in the Q&A session, pitched plenty of interesting questions.



"I was quite interested in the story that gravitational waves warp the space and time," Mr. Takuto Endo, a high school student attending GSA with his family from Shizuoka prefecture, told as an impression of the lecture. He continued

"In a future, if we will be able to control the emission of gravitational waves, we may realize a time machine."

Yoshihisa Obayashi 🍏

Global Outreach

Forum lecture in Washington DC, June 7 by Takayuki Tomaru

On Friday, June 7th, NAOJ's professor **Takayuki Tomaru** presented about gravitational wave observation of KAGRA in the 24th "Science in Japan" Forum, held in Cosmos Club in Washington DC, USA. The series of "Science in Japan" Forum has been held annually on variety of themes since Dr. Masatoshi Koshiha inaugurated the series when he was the director of JSPS Washington office. The theme of this time was "New Eyes on the Universe." The audience ranging from students to government officers listened to the forum programs started from our PI, Professor Kajita's message followed by gravitational waves and high-energy cosmic ray talks and discussion session on new astronomy. Report on the forum will be posted on JSPS Washington office webpage soon: <https://jpsusa.org/wp/sijforum/>.

KAGRA is propagating to the world

As the date of KAGRA's observation start is approaching, a number of science TV crews and science magazine photographers from Japan and overseas visit KAGRA to shoot KAGRA's instruments and interview researchers. Bunch of KAGRA reports on worldwide media is expected to appear soon.



The U.Tokyo's international public relations team also visited KAGRA and published an article for foreign readers in UTokyo Focus webpage: https://www.u-tokyo.ac.jp/focus/en/features/z0508_00111.html

as well as lovely designed printed version. **Yoshihisa Obayashi** 🍏

Cover page of the printed version of UTokyo Focus's article on KAGRA

Column

S-study and Y-study

It is often said that the English names for studies are mainly categorized into the one ends with Y (e.g. astronomy, biology), and the one ends with S (e.g. physics, mathematics, genetics). The formers are the study of detection, collection of data, and classification of them. The latter are the study of reduction and systemization, which intend to explain the nature with minimum assumptions and laws. (I heard this classification from my postdoc adviser, Toshikazu Ebisuzaki. He says he knew this classification in the lecture by Keiichi Kodaira, an astronomer.)

Look back to the history, the normal studies followed the stream that first Y-study collects the data, then S-study explains the background and finalized with a theory or law. As you know, like the Newtonian physics, the quantum physics, ...

The theory of relativity, however, the order is reverse; from S to Y. That is, the theory is always advanced, and astronomers have been following the prediction of the theory. The most of the current theoretical physics are far advanced from experiments and observations, and such origin can be reached at the era of Albert Einstein. When we work on blackholes, cosmology, and gravitational waves, we are always struck with awe of Einstein.

(A part of the article, *Theories of blackhole and their around*, Hisaaki Shinkai)

Next F2F

Face-to-Face 23 at U. Toyama, August 22-24

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

We will come and meet together in Toyama, as the normal summer event. Our preparation for joining O3 will be the main topic of this Face-to-Face meeting, Especially, we need to approve our directions as the draft of MoA, and to set up the observation-shift system for O3. The future-planning committee organizes their satellite meeting on August 21 at Univ. Toyama, and they try to finalize KAGRA white paper for future upgrade.

This year is for exchanging the board of KSC. We will select four board members by vote; two from data analysis and theory, and two from experiment category. We are now in the voting period for KSC members. The ballots will be opened in the first day of the F2F meeting.

The registration was already closed, and the number of participants is already 137 (37 from outside of Japan), which is the largest registration ever. Toyama City will provide us financial support for our meeting dinner, so that we will enjoy FREE meal (aka banquet) again. On August 21 and 24, KAGRA site tours are organized; 33 colleagues will visit the site. 🍏

Previous F2F

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

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

The 22nd F2F meeting was held at Institute of Cosmic Ray Research, the University of Tokyo; KAGRA's main host institute. We had 138 participants, the largest number ever. The invited speaker was Hiroaki Yamamoto from LIGO. Three satellite meetings was held; 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). Quite tight schedule.

Two new institutes joined to the collaboration; National Chiao-Tung Univ. (Yi Yang), and National Astronomical Observatories of China (Hong-Bo Jin).

We thank LOC, Hideyuki Tagoshi, and ICRR members. 🍏

**KAGRA MEETING SCHEDULE**

Mark your calendar now for the following meetings.

The 23rd KAGRA Face-to-Face meeting at U. Toyama, **August 22-24, 2019.**

The 24th KAGRA Face-to-Face meeting at U. Tokyo, RESCEU, **December 4-5, 2019.**

The 25th KAGRA Face-to-Face meeting at somewhere, **Spring, 2020.**

The 7th KAGRA International Workshop, at National Central U., Taoyuan City, Taiwan, **May 29-31, 2020**

call for a host univ./institutes

date fixed

OTHER RELATED GW MEETINGS

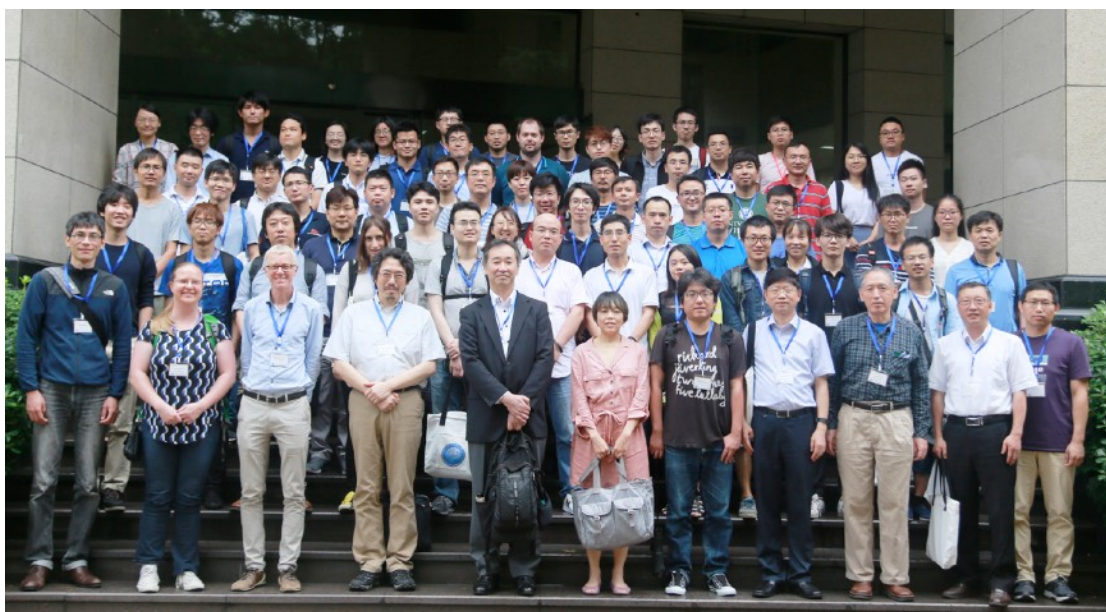
Check out <http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/KAGRA/KSC/O3#Schedule> for KAGRA related one or more generally <https://wiki.ligo.org/LSC/UpcomingConferencesAndMeetings> (Please check them before you plan to organize a meeting, in order not to conflict the schedule.)

Previous KIW

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

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

The 6th KAGRA International Workshop (KIW6) was organized by Wuhan Institute of Physics and Mathematics (WIPM), Chinese Academy of Sciences in June 2019. We had more than hundred participants, and had quite dense discussion for three days, including the introduction of ZAIGA (Zhaoshan long-baseline Atom Interferometer Gravitation Antenna), and space-borne GW projects. Jenne Driggers from LIGO Hanford made a public talk in the first evening for young generation. In the second day, the diversity tour was organized and we enjoyed walk and cycle-ride at the Wuhan East Lake. We definitely broaden our connections for promoting science.



We really appreciate the LOC members: Wei-Tou Ni, Mingsheng Zhan, and other staffs and students of Wuhan Institute of Physics and Mathematics (WIPM), Chinese Academy of Sciences.

I should confess that I had never drunk so much in my life as the banquet of KIW6. 😊

Hisaaki Shinkai 🍏



Poster Award Winners

"Most Outstanding Presentation Prize" for two

At the face-to-face meeting ICRR April 2019, we awarded Mr. Yuhang Zhao and Mr. Koji Nagano. (Two received a certification signed by Kajitasan. H.Shinkai donated his new book as the winner's prize.) Here are the abstracts of the winner's presentations.

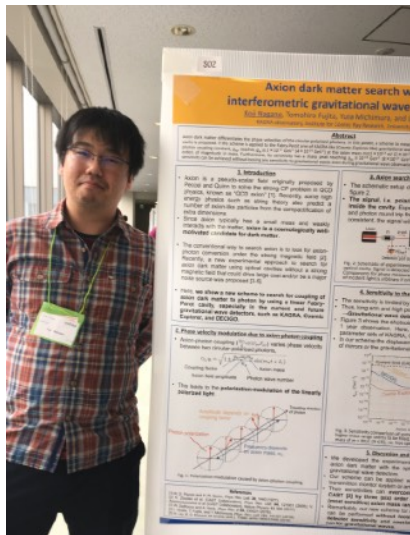
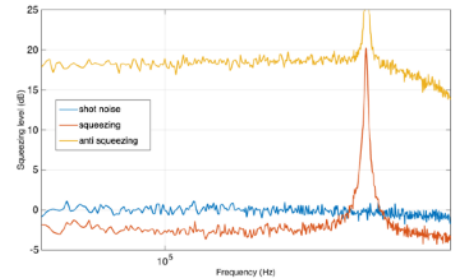
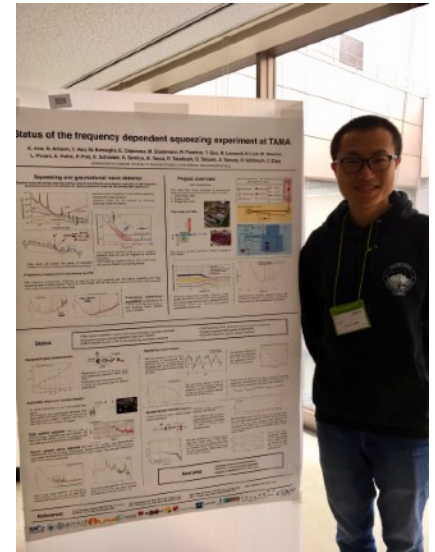
Yuhang Zhao (NAOJ)

Status of frequency dependent squeezing experiment at TAMA

In the current and future generation of gravitational wave detectors, quantum noise will be one of the main limiting noise. Frequency dependent squeezing was proposed to achieve broadband quantum noise reduction. It can be realized by the combination of frequency independent squeezing and detuned Fabry-Perot cavity, usually addressed as filter cavity. A cavity length of 300m was proven to be optimal in terms of round trip loss per meter and detector's sensitivity improvement.

At NAOJ, we are testing the production of frequency dependent squeezing, by using one 300m arm of former TAMA detector as a filter cavity. We have already integrated and locked the cavity and we set up a frequency independent squeezing source in the central area of TAMA. Up to now, we have achieved 3dB of squeezing and 18dB of anti-squeezing above 50 kHz. We are currently working to improve the frequency independent squeezing performance and preparing the injection of the

squeezing into the filter cavity. 🍏



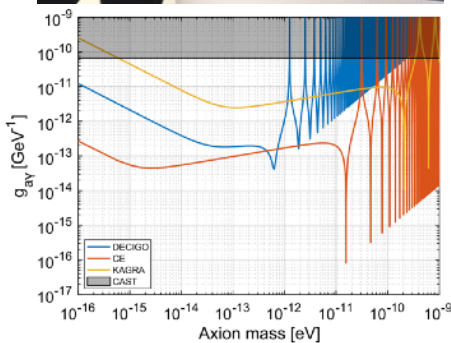
Koji Nagano (ICRR, U. Tokyo)

Axion Dark Matter Search with Interferometric Gravitational Wave Detectors

Axion dark matter differentiates the phase velocities of the circular-polarized photons. Recently, we proposed a scheme to measure the phase difference by using a linear optical cavity (arXiv:1903.02017).

Figure shows the shot-noise limited sensitivity to the axion-photon coupling constant, $g_{a\gamma}$, of the Fabry-Perot arm of KAGRA, DECIGO, and Cosmic Explorer, to which our scheme is applied.

All detectors can improve the upper limit provided by CAST. KAGRA can overcome the CAST limit by one order of magnitude in broad axion mass range around between 1×10^{-14} and 3×10^{-10} eV. At the most sensitive axion mass $m = 2.084 \times 10^{-10}$ eV, the improvement from CAST limits is about 4 orders of magnitude. Remarkably, our new scheme for axion dark matter search can coexist with observation run for gravitational waves of the detectors. We expect that this scheme becomes a new approach to search for axion dark matter. *Shall we carve out the future of axion dark matter search with KAGRA?* 🍏



Sensitivity comparison of some parameter sets. Although the higher mass range seems to be filled, they have sensitivity peaks at axion mass of $m = N\pi/L$ ($N \in \mathbb{N}$, and L is cavity length). The gray band expresses the parameter region excluded by CAST.



Newly Joined

National Chiao Tung University

Yi Yang

It is our great pleasure to join KAGRA Collaboration in the last face-to-face meeting held at Institute of Cosmic Ray Research (ICRR), University of Tokyo at Kashiwa. Through the abundant discussion with the KAGRA members, we learned a lot about the KAGRA construction, data analysis, O3 collaboration, etc. Hopefully we will make our own contribution to KAGRA soon.

National Chiao Tung University (NCTU) was founded in 1896 in Shanghai, and moved to Hsinchu, Taiwan in 1958. NCTU is one of the top research funded universities in Taiwan, especially in science, engineer and computer. NCTU comprises 12 colleges in 6 campus. There are around 15,000 students including 800+ international students, and about 900 faculty. The Electrophysics department was established in 1964, one of the first two departments founded in NCTU. Currently, there are about 40 faculty, 268 UnderGrad students, 163 Master students and 89 PhD students. The high energy theoretical group focuses on the topics of string amplitudes, holographic correspondence, QFT, cosmology, gravitational wave, black hole physics, mathematic physics, etc.

Yi Yang received his PhD degree in 2003 from the Dept. of Physics at Simon Fraser University, Canada. After several years' experience of postdoc and researcher, he joined the faculty of the Dept. of Electrophysics at NCTU in 2008. Yi Yang has worked on various topics of high energy physics. He has published more than 50 journal papers on holographic correspondence, black hole physics and string theory etc. Recently, Yi Yang started to be interested in gravitational wave physics and finished a paper, *Imprints of Early Universe on Gravitational Waves from First-Order Phase Transition in QCD*, to study the gravitational wave generated by the confinement-deconfinement phase transition in QCD during the early universe expansion.



There are several other members in our group. Sheng-Hong Lai received his PhD degree in 2018 from the Dept. of Electrophysics at NCTU, and became a postdoc in our group. Chia-Jui Chou, En-Jui Chang and Hans Lao are PhD students in our group. Chia-Jui Chou will finish his PhD program this year and become a postdoc in our group from Feb. 2020. Meng-Wai Li is the assistant researcher and Yi-Hsuan Huang is a master student in our group. In addition, we have three 4th year UnderGrad students (Yu-Hsuan Lo, Pin-Chi Liao and Po-Jung Lu) in our group. One of them, Yu-Hsuan Lo, will enter the PhD program and stay in our group.

Our current research interests include three directions. One is to test the violation of GR from the gravitation wave data by using the Bayesian method. We have begun to collaborate with Feng-Li Lin, who is the KAGRA member in NTNU (Taiwan) and Tjonnie Li, who is the KAGRA member in CUHK (HongKon) and the chair of the Testing GR project in LIGO. So far we are focusing on the topics of Test infrastructure of GR, Lorentz Invariance Violation Test, No Hair Theorem Test and Template-based or Morphology-Independent Echoes Search. The other direction is the rapid detection and the parameters estimation of the gravitational wave by using the stratagem of deep learning. The third direction is the theoretical research on gravitational waves. We will continue our study in the gravitational wave generated during the universe expansion, and study the equation of the state of the compact stars.

During the next years, we aim to bring up some young researches on gravitational physics in Taiwan and hopefully to make important contributes in the long term perspective. 🍏



Newly Joined

National Astronomical Observatories, Chinese Academy of Sciences

Youjun Lu

It was our great pleasure that we joined the KAGRA collaboration at the 22nd KAGRA face-to-face meeting held at ICRR on April 18-21, 2019. In that meeting, we interacted with KAGRA colleagues and exchanged views and ideas with them on multi-messenger astronomy and GW related astrophysics. We are looking forward for collaborations and hoping to make contributions to KAGRA soon.

We would like to first introduce our institute, National Astronomical Observatories of China (NAOC), as a new member of KAGRA. NAOC is one of the major institutes supported by Chinese Academy of Sciences. NAOC conducts cutting-edge astronomical studies, operates major national facilities (including the well known LAMOST and FAST), and develops the state-of-the-art technological innovations. NAOC has now about 500 faculty members, 30 postdocs, and 300 graduate students. In NAOC, there are a number of research groups working on GW related astrophysics and multi-messenger astronomy, including: (1) searching for electromagnetic counterparts of GW sources; (2) stellar mass compact binary coalescence and their astrophysical origin; (3) space GW facility such as Taiji; and (4) pulsar timing array experiments to detect nano-Hertz GW emission from massive binary black holes. Our group, the gravitational wave astrophysics research group, is one of these groups, and is mainly working on the GW related astrophysics studies.

This time, four faculty members and five students have joined the KAGRA from NAOC (all from the gravitational wave astrophysics research group): Youjun LU (group leader); Hongbo JIN (associate professor); Changshuo YAN (associate professor); Junqiang GE (Research associate); Di LU (student); Yuetong ZHAO (student); Qingbo CHU (student); Xiao GUO (student); Hao MA (student). We have been working on the formation and evolution of stellar mass compact binaries and their contribution to the GW background in both high- and low-frequency band (from 10^{-4} to 1000Hz). We plan to use the observational data of KAGRA O3-O4 to obtain statistical information on the properties of GW sources, such as the mass and spin distributions of binary black hole mergers, the mass and host galaxy property distributions of double neutron stars. By combining such information with cosmological formation models for binary black holes and double neutron stars, we aim at obtaining strong constraints on the physical processes involved in the formation models. GW observation data has all kinds of noise, which disturb the matching between the GW observations with the GW templates. LIGO has released more than ten GW sources, of which the identification and physical parameter extraction depend on the data analysis. We have been working on the data analysis method and will continue to develop software, based on our methods. We attempt to construct models to describe the noise sources in the GW observation data, which may help in searching of the stochastic GW background. We plan to use the KAGRA O3-O4 observations to constrain the GW stochastic background. We also plan to investigate the ability of constraining cosmological parameters by using those GW sources with and without redshift measurements. With the operation of KAGRA and several other future GW detectors under plan, many binary black hole mergers with better localizations are expected, which may improve the constraint on cosmological parameters.

We have had a meeting with Prof. Takaaki Kajita, ICRR director, during his visit to NAOC on June 11, 2019, on our joining the KAGRA and possible future collaboration between NAOC and KAGRA.

After that meeting, our group members took a photo with Prof. Kajita as the souvenir of the collaboration between the NAOC and ICRR. 🍏



Report

Life in Cambridge and Boston

Kentaro Komori (MIT, US)

I am working on a filter cavity experiment in LIGO MIT as a JSPS overseas research fellow after graduating from Ando laboratory in University of Tokyo. Here I write a memoir in Cambridge and Boston. Three years ago, I used to come to LIGO MIT as a visiting student. That visit was a lot of fun and a great experience, which resulted in my application to JSPS overseas research fellowships. Fortunately, the application was accepted while I intended to draw a lot, and decided to go back.

A couple of tens people work in LIGO MIT, and mainly they do experimental and data analysis researches. Experiments in this laboratory aim at measurement and demonstration of advanced techniques for gravitational wave detectors, such as precise evaluation of coating thermal noise, optomechanical squeezing with a cantilever, and a 16-m filter cavity for frequency-dependent squeezing. The filter cavity is put in huge vacuum chambers amazing me at the size. With regards to details of the experiment, please look forward to my talk in the coming F2F meeting.



My first impression on LIGO MIT is the high-level research and activity as you thought. I feel accumulation of efforts for over a half century, and researchers are the case. Many people hired by MIT or LIGO come from all over the world. Some members have a title of “research scientist”, who is majority as well as postdocs. Moreover, postdoc candidates are awesome. Sometimes a postdoc job interview is held with a weekly meeting, and the candidates are active researchers who wrote famous papers (the first broadband measurement of quantum radiation pressure noise, the first ground state cooling with feedback control, etc). The postdoc position is too competitive for me to be hired by LIGO and there would be no chance to come here if it were not for the JSPS overseas fellowship system, so I appreciate it.

As for my daily life, I enjoy swimming in a huge and deep pool a few times once a week, playing Ping-Pong with colleagues in office building(!), and playing sailing at Charles river. Also, I often walk around Cambridge where there are MIT and Harvard University and Boston city. My favorite place is walking areas along Charles river with the spectacular view.

In summary, I feel it is a really nice opportunity to work in MIT with a lot of valuable experiences which would never be gained in Japan. I hope coming back to Japan after this precious training. 🍏



Awarded

The Sudang Prize for Hyung Mok Lee

Samyang Foundation in Korea announced three winners of the 28th Sudang Prize, including KAGRA's collaborator Professor Hyung Mok Lee at Korea Astronomy and Space Science Institute (KASI). The award ceremony was held at the Lotte Hotel in Sogong-dong, Seoul on May 9 and a prize of 100 million won was given to each winner.

The Samyang Group's web page notes the Prizes are presented to individuals who have made exemplary contributions in basic sciences, applied sciences and humanities & social sciences categories. Professor Hyung Mok Lee leads Korean Gravitational Wave Group (KGWG) which is a member of both KAGRA and LIGO Scientific Collaboration. Financial News in Korea says Lee's outstanding research achievements in various fields of astronomy, especially the contribution to the first detection of gravitational wave in 2015, are highly regarded. Congratulations!

<http://www.samyang.com/eng/Contribute/sudanggroup>

<http://www.fnnews.com/news/201905091007320874>

<http://www.fnnews.com/news/201904101349208742>



Photo from Financial News in Korea

Awarded

IUPAP-TIFR Homi Bhabha Medal for Takaaki Kajita

The 5th IUPAP-TIFR Homi Bhabha Medal and Prize was given to Takaaki Kajita, Institute for Cosmic Ray Research, University of Tokyo, Japan. This prize was established by the International Union of Pure and Applied Physics (IUPAP) and the Tata Institute of Fundamental Research (TIFR), Mumbai, India in 2010 to honor Dr. Homi Jehangir Bhabha, a cosmic ray physicist well-known for the Bhabha-Heitler cascade theory and relativistic positron-electron scattering also known as Bhabha scattering.

The award citation and medal were presented to Prof. Kajita during the inaugural function of the 36th International Cosmic Ray Conference in Madison, WI, USA on 25 July 2019. Congratulations!

<http://grapes-3.tifr.res.in/homibhabhaaward.html>



Photo from the award website

Awarded

Student Presentation Award of JPS for Yutaro Enomoto

Yutaro Enomoto (U. Tokyo) was awarded the Student Presentation Award of the Physical Society of Japan in the annual meeting 2019 March, for his talk on "Main interferometer control of the Large-Scale Cryogenic Gravitational Wave Telescope KAGRA".

<https://www.jps.or.jp/activities/awards/gakusei/2019a-student-presentation-award.php>



Photo from Yuta Michimura

Links

How much are you ready for O3?

When you reveal yourself that you are working on gravitational wave, then people will get excited (hopefully) and ask you what are the latest results which are not known in public. The expected answers are something like “Yeah, of course. I heard a new event candidate last night”, “Well, now in this moment, both LIGO and Virgo are down for maintenance.”, etc. [Please note that the official answer is: “If you join to the KAGRA collaboration, then I will let you know any confidential matters”.]

The event alerting system

LIGO and Virgo provide open alert system for follow-up astronomers, which we are supposed to join when we begin observation. The user guide is available (<https://emfollow.docs.ligo.org/userguide/>), with EM follow up tutorial (<https://dcc.ligo.org/public/0118/G1500442/010/ligo-virgo-emfollowup-tutorial.html>). These page suggest to subscribe mailing list for alerts (<https://emfollow.docs.ligo.org/userguide/quickstart.html>) or to check out *GraceDB*

GraceDB – Gravitational-Wave Candidate Event Database

Latest — as of 19 August 2019 22:13:41 UTC

Test and MDC events and supernovae are not included in the search results by default; see the [query help](#) for information on how to search for events and supernovae in those categories.

Query:

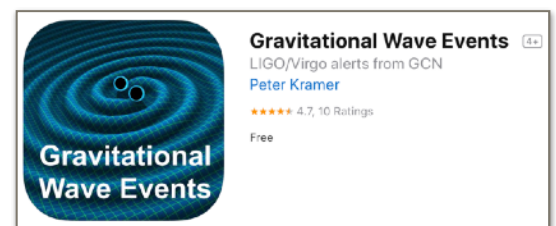
Search for:

UID	Labels	L_start	L_O	L_end	FAR (Hz)	UTC Created
S190816	PE_READY ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DOOK GCN_PRELIM_SENT	1249995888.757789	1249995889.757789	1249995890.757789	1.436e-08	2019-08-16 13:05:12 UTC
S190816br	PE_READY ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DOOK GCN_PRELIM_SENT	124985255.996787	124985257.012957	124985258.021731	2.033e-33	2019-08-14 21:11:18 UTC
S190806se	ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DOOK GCN_PRELIM_SENT	1249338098.496141	1249338099.496141	1249338100.496141	3.366e-08	2019-08-08 22:21:45 UTC
S190728q	PE_READY ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DOOK GCN_PRELIM_SENT	1248331527.497344	1248331528.546797	1248331529.706055	2.527e-23	2019-07-28 06:45:27 UTC
S190727b	ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DOOK GCN_PRELIM_SENT	1248242630.976288	1248242631.985887	1248242633.180176	1.378e-10	2019-07-27 06:03:51 UTC
S190726a	PE_READY ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DOOK GCN_PRELIM_SENT	1247616533.793127	1247616534.704102	1247616535.860840	3.801e-09	2019-07-20 00:08:53 UTC
S190719c	ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DOOK GCN_PRELIM_SENT	1247495729.067865	1247495730.067865	1247495731.067865	3.648e-08	2019-07-18 14:35:34 UTC

[Gravitational-Wave Candidate Event Database] (<https://gracedb.ligo.org/>), where you can find the list of event candidates since April 1, 2019.

iOS application

If you are lazy enough to check such information regularly, then there is an iOS application, *Gravitational Wave Events*, (<https://apps.apple.com/app/id1441897107>), which notices you when an event detected.



The status of LIGO/Virgo/KAGRA monitoring system

If you want to know the status of LVK detectors at this moment, check out *GW detector network*, (<https://das-jobs.ligo.caltech.edu/~gwistat/gwistat/gwistat.html>), or <https://monitor.ligo.org/gwstatus>. You will feel guilty if KAGRA is off.

LIGO Hanford NOHIFT Duration: 0d 02:48:00 (green: science)	LIGO Livingston SCIENCE Duration: 0d 07:21:59 (green: health)	Virgo SCIENCE Duration: 0d 12:11:43 (green: health)	Kagra NOHIFT Duration: 1d 18:34:59 (green: unknown)	Thu Aug 15 2019 17:11:59 1249891937	LDAS 14 OK
DMT 14 OK	Low-latency Data 1 / 45 MONITORING	LIGO Data Replicator 3 / 14 CRITICAL	DetChar Summary 23 OK	DetChar Jobs 14 OK	DetChar-Omicron Jobs 103 OK
GraCEDb 1 OK	LVAAlert 2 OK	GraCEDb Playground 6 OK	DQSegDB 1 / 12 UNRECOVERED	NDS 33 OK	ligoDV Web 7 OK
gstLAL Inspiral 1 / 2 CRITICAL	CIS 3 OK	EMFollow 2 OK	PyCBC Live 1 OK	Auth 38 OK	iDQ 38 OK

The actual data for research

For your research purpose, LV provide data-releasing website as *GW Open Science Center* (<https://www.gw-openscience.org>). There you can find both O1 (<https://www.gw-openscience.org/O1/>) and O2 (<https://www.gw-openscience.org/O2/>). Data of O3? If you filed “O3 commitment form” and have an account to KAGRA main data server, you can access them. KAGRA data managing group receives LV data every second, and they began stock them for engineering purpose from July 31. (KAGRA is not allowed to make use these data for scientific purpose before we have MoA with LIGO/Virgo).

All such information is in our wiki and maintained regularly. You need to bookmark only the page <http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/KAGRA/KSC/O3#Links>

Good luck. 🍏

WE FOUND THAT ...

Mariko Takahashi, a journalist, wrote an article in Ronza web (論座) titled, “続々見つかる重力波、高まる KAGRAへの期待” (Gravitational Wave was detected one after another: Rising expectation to KAGRA).

<https://webronza.asahi.com/science/articles/2019052300007.html>

KAGRA COLLABORATION ARTICLES

First cryogenic test operation of underground km-scale gravitational-wave observatory KAGRA

T. Akutsu et al. (KAGRA Collaboration, author-list 2016+2017)

Classical and Quantum Gravity 36 (2019) 165008 [JGW-P1809289] [arXiv:1901.03569]

<https://iopscience.iop.org/article/10.1088/1361-6382/ab28a9>

Application of the independent component analysis to the iKAGRA data

T. Akutsu et al. (KAGRA Collaboration, author-list 2015+2018), submitted to PTEP

[arXiv:1908.03013] <https://arxiv.org/abs/1908.03013>

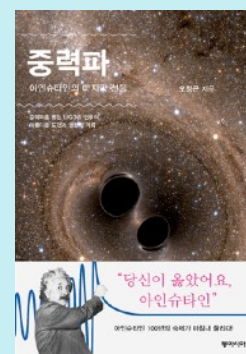
[JGW-P1910218] <https://gwdoc.icrr.u-tokyo.ac.jp/cgi-bin/private/DocDB/ShowDocument?docid=10218>

A public book, **Gravitational Wave (The Last Gift of Albert Einstein)** originally by **John J. Oh** in Korean was translated into Chinese and released from Posts and Telecom Press, 180 pages, \$19.99. ISBN-978-7115504036

<https://www.amazon.com/Gravitational-Wave-Albert-Einstein-Chinese/dp/7115504032/>

The original version: ISBN- 9788962621310

<https://www.aladin.co.kr/shop/wproduct.aspx?ItemId=74920520>



The Asakura Publishing Co. announced that “Encyclopedia of Relativity and the Universe” (相對論と宇宙の事典) will be published in November 2019. The one of the main editors is **Masaki Ando**, and many KAGRA collaborators were contributed as volunteers. 448 pages in A5 size, 10000yen + Tax. ISBN978-4-254-13128-4

<http://www.asakura.co.jp/books/isbn/978-4-254-13128-4/>

The magazine “Bungei-Shunju”, (Bungei-Shunju Publishing Co.) features *The Era of Reiwa future chronological table* in their June 2019 issue. **Takaaki Kajita** contributed an article, titled “The plan of science-and-technology nation will collapse if this continues”.



The magazine “Gendai-Shisou”, means “Contemporary Ideology”, (Seido Publishing Co.) features *Einstein* in their August 2019 issue. **Hisaaki Shinkai** contributed an article, titled “Theories of black-holes and their around”.



RECENT KAGRA STATUS TALKS

meeting/conferences

speaker

JGWdoc

KIW6 in Wuhan, China

June 2019

Takaaki Yokozawa

[JGW-G1910225]

GR22/Amaldi 13, Valencia, Spain

July 2019

Hisaaki Shinkai

[JGW-G1910410]

New Collaborators (*= New Groups)

Aoyama Gakuin University

Misako Noguchi (Graduate Student)
 Shuto Sei (Graduate Student)
 Kento Aihara (UnderGrad Student)
 Shotaro Ide (UnderGrad Student)
 Kazuki Mita (UnderGrad Student)
 Yoshihiro Okutani (UnderGrad Student)
 Yuri Sato (UnderGrad Student)
 Kazuyoshi Tanaka (UnderGrad Student)

Beijing Normal University

Ping Guo (Professor)
 He Wang (Graduate Student)

Chungnam National University

Kwangmin Oh (Graduate Student)

Hirosaki University

Naoya Era (Graduate Student)
 Yuki Hagihara (Graduate Student)
 Daisuke Iikawa (Graduate Student)

Kavli Institute for the Physics and Mathematics of the Universe (IPMU)

Shi Pi (Postdoc)

Nagaoka University of Technology

Saki Kobayashi (UnderGrad Student)

National Astronomical Observatories, Chinese Academy of Sciences *

Youjun Lu (Professor)
 Hong-Bo Jin (Associate Professor)
 Chang-Shuo Yan (Associate Professor)
 Junqiang Ge (Assistant Professor)
 Qingbo Chu (Graduate Student)
 Xiao Guo (Graduate Student)
 Di Lu (Graduate Student)
 Hao Ma (Graduate Student)
 Yuetong Zhao (Graduate Student)

National Central University

Wu-Cheng Chiang

National Chiao Tung University *

Yi Yang (Professor)
 Sheng-Hong Lai (Postdoc)
 En-Jui Chang (PhD student)
 Chia-Jui Chou (PhD student)
 Hans Brynner Lao (PhD student)

Meng-Wei Li (PhD student)
 Yi-Hsuan Huang (Graduate Student)
 Yu-Hsuan Lo (Graduate Student)
 Pin-Chi Liao (UnderGrad Student)
 Jiou-Cing Liao (UnderGrad Student)
 Po-Jung Lu (UnderGrad Student)

National Taiwan Normal University

Ting-Wai Chiu (Professor)

Osaka City University

Kazumasa Okabayashi (Graduate Student)
 Kazuma Takahashi (Graduate Student)

Peking University, Kavli Institute for Astronomy and Astrophysics

Junjie Zhao (Graduate Student)

Shanghai Astronomical Observatory, Chinese Academy of Sciences

Chengkai Wan (Graduate Student)
 Shuo Xin (Graduate Student)
 Qianyun Yun (Graduate Student)
 Xinyu Zhong (Graduate Student)
 Shucheng Yang (PhD student)
 Chen Zhang (PhD student)

Tamkang University

Kin-Wang Ng (Research Fellow)
 Parisi Alessandro (Postdoc)

Tsinghua University

Zhongda Yuan (Senior Engineer)
 Zeqing Xiao (Postdoc)

University of Notre Dame

In-Saeng Suh (Associate Professor)

University of Toyama

Takuro Nishio (Graduate Student)
 Kanta Hattori (Undergrad Student)
 Yota Nakayama (Undergrad Student)
 Shun Nozaki (Undergrad Student)
 Kanta Yamashita (Undergrad Student)

Wuhan University

Gang Yu (Assistant Professor)
 Quan Cheng (Postdoc)
 Shaoqi Hou (Postdoc)
 Pengbo Li (PhD student)
 Zhiqiang You (Graduate Student)
 Dongze Sun (Undergrad Student)

April 16–July 31, 2019

Collaboration-list committee made their mailing address kagraros@icrr.u-tokyo.ac.jp; ros from a roster.

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 . . .

Osamu Miyakawa (ICRR) became an associate professor at ICRR, April 2019.

Takaaki Yokozawa (ICRR) became a project assistant professor at ICRR, May 2019.

Mark Barton moved to University of Glasgow as a Senior Research Fellow from NAOJ, June 30, 2019.

Yutaro Enomoto (U. Tokyo) was awarded the Student Presentation Award of the Physical Society of Japan in the annual meeting 2019 March. (see p11).

Hyung Mok Lee (KASI) was awarded the 28th Sudang Prize from the Samyang Foundation in Korea. (see p11).

Takaaki Kajita (ICRR) was awarded the 5th IUPAP-TIFR Homi Bhabha Medal from the International Union of Pure and Applied Physics (IUPAP) and the Tata Institute of Fundamental Research (TIFR). (see p11).

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

KSC board From Aug. 2018 to Aug. 2019

Thanks for your cooperations, supports, & suggestions.

Hisaaki Shinkai (OIT, chair)
 Chunglee Kim (Ewha Womans U, vice chair)
 Sadakazu Haino (Academia Sinica)
 Yuta Michimura (U Tokyo)
 Nobuyuki Kanda (OCU, EO)

Zong-Hong Zhu (BNU, China region)
 Hyung-Won Lee (Inje U, Korea region)
 Ray-Kuang Lee (NTHU, Taiwan region)
 Takahiro Yamamoto (ICRR, post-doc)
 Koji Nagano (ICRR, student)

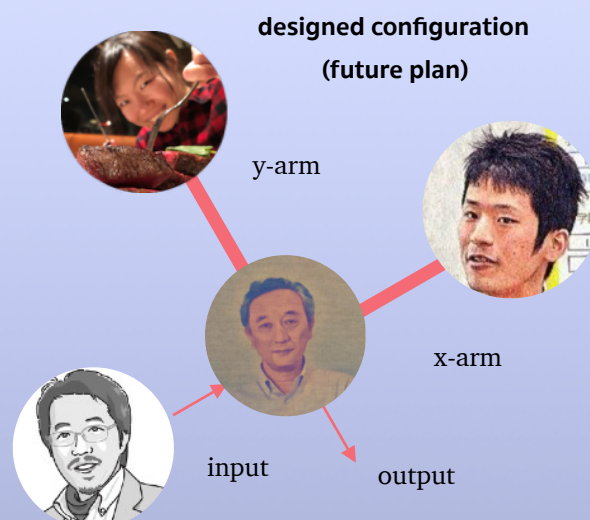
FROM EDITORS

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@oit.ac.jp
 Ayaka Shoda (NAOJ) ayaka.shoda@nao.ac.jp
 Yoshihisa Obayashi (ICRR) ooba@icrr.u-tokyo.ac.jp
 Kentaro Komori (MIT) kentarok@mit.edu

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



KSC Newsletter backnumbers

this issue [\[JGW-L1910543\]](#)

<https://gwdoc.icrr.u-tokyo.ac.jp/cgi-bin/DocDB/ShowDocument?docid=10543>

No. 4 (2019/4) [\[JGW-L1910057\]](#) <https://gwdoc.icrr.u-tokyo.ac.jp/cgi-bin/DocDB/ShowDocument?docid=10057>

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>