

# KSC Newsletter

## Issue 3

### Four Mirrors are ready, Cryogenic payloads completed, X-arm commissioning has started, and ... and ... and ...

As scheduled, so-far.

We are managing to join LIGO/Virgo's observation run 3 (O3), which will start in the end of March 2019 (the delay was announced, Nov 14<sup>1</sup>) and will take scientific data at least for one year continuously. We keep our original plan of DRFPMI (RSE)<sup>2</sup> and also have a backup plan of FPMI<sup>3</sup> (see the previous KSC newsletter). If our schedule is kept, we expect to join the latter half of O3 with RSE.

At the face-to-face meeting at Toyama in August, system engineering office (SEO) announced more details installation plan: whether we switch to the backup plan will be examined at the three checking points, the end of September, December 2018 and March 2019. In order to get better scientific contribution, everyone is working hard with full efforts.



Photo by Y. Obayashi, Nov 27.

Fortunately, installations are so-far going as scheduled. For example, all the input optic systems were successfully locked (September, 2018), all the optics of photon calibrator at X-end was completed (October), the first lock of green laser in X-arm (October 19), the last installation of cryogenic payload (Nov 9), and so on. The commissioning of the X-arm is now ongoing. Some of our celebrating pictures are in the next page. Be happy in 2019!



Oct 19, the first lock of green laser for 10 sec [klog 06624].

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<sup>1</sup> <https://www.ligo.org/scientists/GWEMalerts.php>

<sup>2</sup> DRFPMI (RSE) = dual-recycled Fabry-Perot-Michelson interferometer (resonant sideband extraction)

<sup>3</sup> FPMI = Fabry-Perot-Michelson interferometer

(Right) Photon Calibrator X-end installation completed. July 25. [\[JGW-G1809009\]](#)

In photo, Takaaki Yokozawa, Yuki Inoue, Takahiro Yamamoto, and Chihiro Kozakai.



(Left) Installed the BRT part on the TMS-VIS in the EXT chamber at the X-end! [\[klog 06342\]](#).

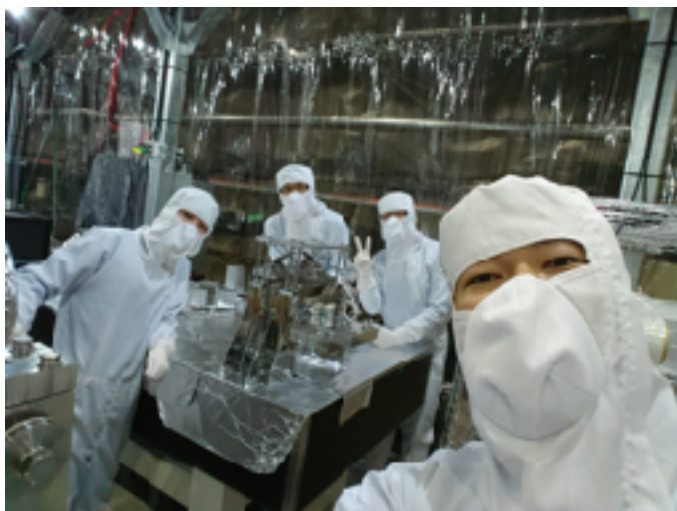
In photo, Fumihiro Uruguchi, Koji Nagano, Kunihiro Hasegawa, Kenta Tanaka, Naoki Kita, and Tomotada Akutsu.



## We did it! in 2018

(Right) SR3 Installation, July 20. [\[klog 05569\]](#)

Panwei Huang, Naoatsu Hirata, Terrence Tsang, Fabian Peña, Mark Barton, Ryohei Kozu, and Enzo Tapia. (plus Guiguo observing)



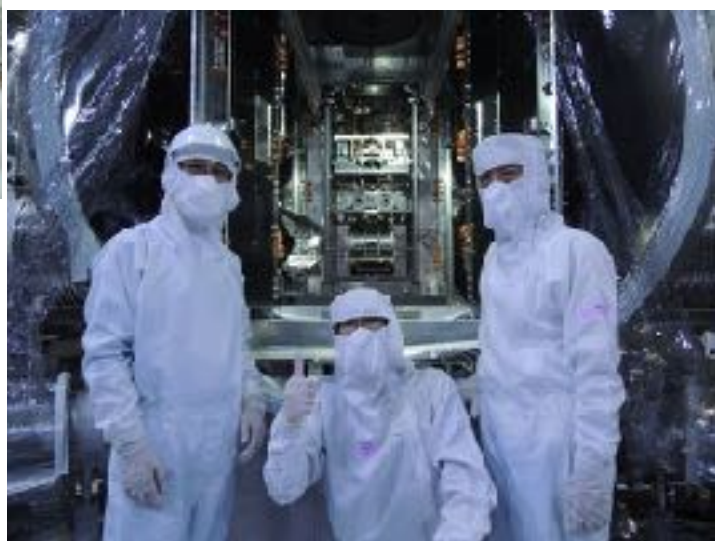
(Above) OMC installation succeeded, October 18.

[\[klog 06612\]](#)

In photo, Sotatsu Otabe, Kohei Kusayanagi, Hiraku Sasaki, and Kentaro Somiya.

(Right) Nov. 9, the last installation of cryogenic payload was completed. The photo at Y-front was distributed in [\[kagra 02500\]](#).

In photo, Masahiro Takahashi, Takayuki Tomaru and Sakae Araki.



Editors thank [Takaaki Yokozawa](#) for his suggestions of photos. 🍏



## Directions

# KSC in the KAGRA organization chart

KSC finally placed parallel with EO. Data Analysis groups started under KSC.

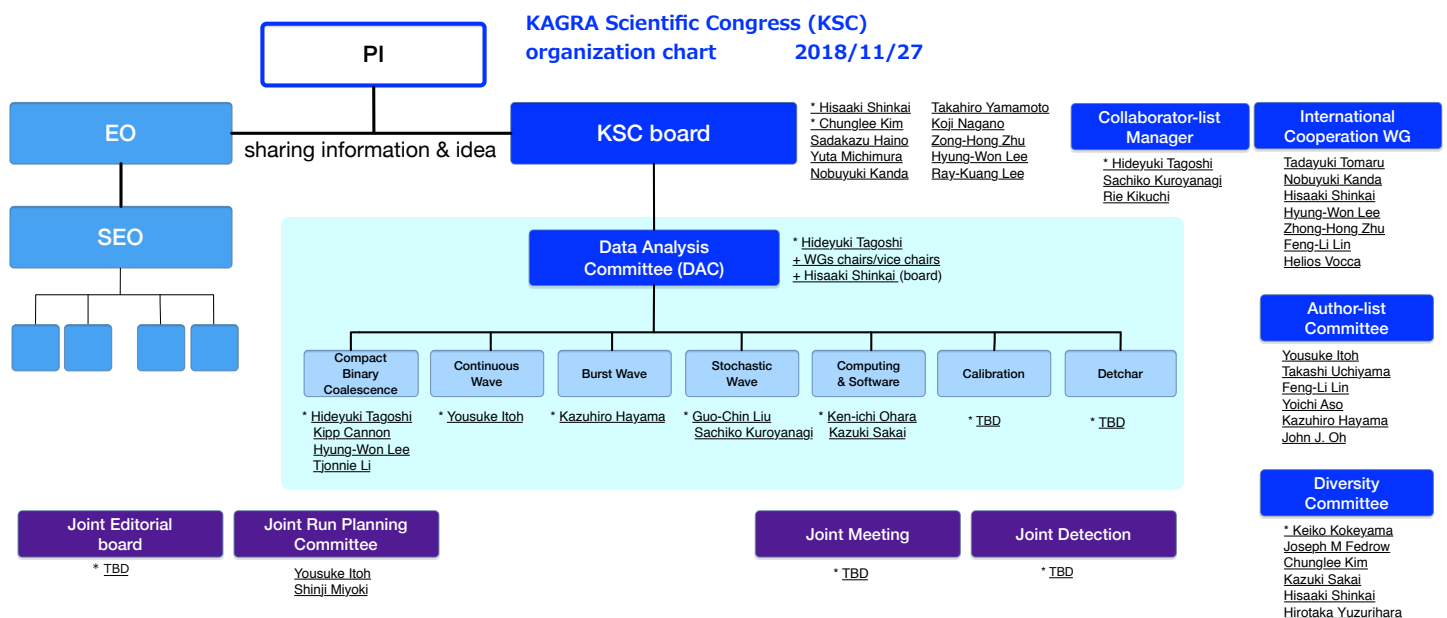
As a part of preparations for joint observation with LIGO/Virgo, we need to assign persons who are in charge for exchanging our activities with theirs, and also to set up our organization how we share such information. KSC was established three years ago as a decision making body on our science, and is regarded to lead this joint collaboration. In this direction, a couple of important agreements were made at Face-to-Face (F2F) meeting August.

First is the placement of KSC in KAGRA organization chart, which had not fixed formally for three years. As was proposed by Kajita-san, KSC is now located in parallel with EO under PI. This means that the collaboration itself is now totally responsible for promoting science and also for mapping future strategies.

Second is the re-organization of data analysis groups in order to match with those of LIGO and Virgo. Former data analysis and data managing groups under SEO are now re-established under KSC, and their headquarter is named “Data Analysis Committee” (DAC) with the chair Hideyuki Tagoshi. Under DAC, five sub-committees (Compact Binary Coalescence, Continuous Wave, Burst Wave, Stochastic Wave, Computing & Software) and two alias groups<sup>4</sup> (Detector Characterization, Calibration) are formulated. Members of data analysis groups are participating with a “Research Unit” in order to clarify responsible person of each group for joint collaboration.

Third is the reinforcement of the KSC board. Responding to a request to tighten international collaboration in KAGRA, and also for performing in various directions more actively, KSC board includes three more members from three regions (China, Korea, Taiwan) with one-year (renewable) appointment.

As a result, the current KSC organization chart is as follows.



At the KSC telecon on November 19, Yoichi Aso proposed to establish Future Planning Committee and Research & Development Committee for our future plans (Super KAGRA?) and for authorizing R&D respectively. We will discuss more at the coming F2F meeting at NAOJ. KSC board expects many people to join also to those new actions.

Hisaaki Shinkai 🍏

<sup>4</sup> The two groups are also remain under SEO.

## Outreach

## KAGRA appeared in many science events in the summer and autumn!



### Café KAGRA

On August 12 (Sun), Hida city and KAGRA Observatory jointly held a science talk event “Café KAGRA” at Hida city’s Kamioka Library. NAOJ’s vice director Jun’ichi Watanabe acted master of the Café. A novelist Ms. Yoko Ogawa, a journalist Ms. Yuri Aono, and KAGRA Observatory’s director **Masatake Ohashi** were invited as guests of the Café and made relaxing talks about ranging from the astronomy and physics to the literature. Ohashi explained the behind story why we invited Ms. Ogawa and Aono. Dr. Watanabe told astronomers can travel the space and time using large telescopes. Ms. Ogawa, then, replied that

novels are also able to travel the Universe using readers’ imagination.

### University of Toyama Science Festival

On September 29 (Sat) and 30 (Sun), Science Festival was held at University of Toyama, Gofuku Campus. On Saturday, **Kazuhiro Yamamoto** gave a lecture entitled “Explore the Universe by Gravitational Wave” as the Faculty of Science’s special lecture. The audience listened the lecture with deep interests. A lot of questions after the talk about gravitational wave physics and even technical detail livened up the session.





## Kashiwa Open Campus

Open Campus was held at the University of Tokyo, Kashiwa Campus in the weekend of October 26 (Fri) and 27 (Sat). In two days, around 2000 guests visited the exhibition of the Institute for Cosmic Ray Research.

Our workshop, “Let’s build gravitational wave telescope!”, was held on Friday, and guests tried to build their own miniature laser interferometer with help of KAGRA **graduate students**. The goal of this experiment was to listen to the music transferred by the interferometers (sounds exciting!).

On Saturday, “Cosmic Café” was held. Young researchers including **Takafumi Ushiba** and **Kyohei Kawaguchi** talked about their research and researchers’ life.

See ICRR Webpage <http://www.icrr.u-tokyo.ac.jp/beta/181028.html> (Japanese page only) for details.



## Kamioka Local

### Underground laboratory opened to 150 KAGRA fans

KAGRA underground facilities were opened for public on Saturday, November 17.

This is the fifth of the series of annual public open event jointly held with Hida City, Hida Academy and KAGRA Observatory. Since KAGRA is planned to start its full operation in the fall of the next year, this year’s open event was announced as the last opportunity to visit the laboratory before start operation and highly attracted KAGRA fans’ interest. About 150 participants, selected among the applicants of more than twice of the capacity, were excited to visit and see KAGRA’s instruments in the center area and the X-arm tunnel.



Yoshihisa Obayashi 🍏

## Recent Meeting **Face-to-Face at U. Toyama, August 24-26**

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



The 20th F2F meeting was held at University of Toyama as usual as our summer event. We discussed the status of phase-2 construction, preparations for joining the LIGO/Virgo's O3, and other urgent issues. There were 124 participants, including 21 people from overseas. A hundred attended the banquet.

On the day before F2F, data analysis/data managing groups held a satellite meeting for re-organization of their structure, while Norikatsu Mio (U Tokyo) gave a lecture about gravitational wave for new graduate students in a separate room.

We had two invited talks: "Gravitational waves and neutron stars" by Hajime Sotani (NAOJ), and "Status of Virgo" by Raffaele Flaminio (CNRS/LAPP and NAOJ). Two new institutes joined to the collaboration; NAOJ, Theoretical Astrophysics group & Ulsan National Institute of Science and Technology.

We thank LOCs, Yoshiki Moriwaki, Kazuhiro Yamamoto, and U. Toyama members. 🍏

## Next Meeting **Face-to-Face at NAOJ, December 5-6**

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

The Mitaka Campus was founded in 1924 (Taisho 13) to host the Tokyo Astronomical Observatory which was founded in 1888 (Meiji 21) and was previously hosted in Hongo Campus. Since the foundation, many telescopes and facilities have been realized and took measurements for decades. Nowadays, most of the telescopes don't collect data anymore and are used as museums to tell everyone the history of the astronomical observatory. However, some features from the time of astronomical observation are still present in the campus: one example is the low level of artificial illumination during the night. For that we recommend you all to have a pocket light to not lose the way!

The campus is easily accessible from Mitaka JR station using bus number 51 and Musashi-Sakai JR station using bus number 91. You can reach the campus coming from Chofu Keio station and taking the bus lines number 51 and 91 as well. In all the cases the bus stop to look for is "Tenmondai Mae (天文台前)".



We all look forward to meeting you at the NAOJ Mitaka Campus next week!

Gravitational Wave Project Office members ([Matteo Leonardi](#)) 🍏

## KAGRA MEETING SCHEDULE

Mark your calendar now for the following meetings.

**The 21st KAGRA Face-to-Face meeting** at NAOJ Mitaka campus, Tokyo, **Dec 5 (Wed) - 6 (Thur), 2018**

**The 5th KAGRA International Workshop**, at Perugia, Italy, **Feb. 14 (Thur) - 15 (Fri), 2019**

**The 1st KAGRA-Virgo-3G detectors Workshop**, at Perugia, Italy, **Feb. 16 (Sat), 2019**

**The 22nd KAGRA Face-to-Face meeting** at ICRR Kashiwa campus, **April 19 (Fri)-21 (Sun), 2019.**

New!

**The 6th KAGRA International Workshop**, at Wuhan, China, **June 21 (Fri) - 23 (Sun), 2019**

**The 23rd KAGRA Face-to-Face meeting** at Toyama??, **August, 2019.**

**The 24th KAGRA Face-to-Face meeting** at somewhere, **December, 2019.**

call a host univ./institutes

**The 7th KAGRA International Workshop**, in Taiwan, **March, 2020**



## Next KIW

**Fifth KAGRA International Workshop, Feb. 14-15,  
First KAGRA-Virgo-3G Detectors Workshop, Feb. 16  
at the University of Perugia, Italy**

<https://indico.ego-gw.it/event/12/>

It is a great pleasure to have the 5th KAGRA International Workshop in Perugia from the 14th to the 15th of February 2019, and to couple it to the 1st KAGRA-Virgo-3G Detectors Workshop the following day (Feb. 16th). The workshops will be organized in one of the most beautiful middle-age halls in Perugia, the Sala dei Notari, right in the central square of the town and close to the University of Perugia.

The University of Perugia is one of the oldest (modern) Universities in the world, founded in 1308 with the formal imperial recognition in 1355, when Emperor Charles IV granted Perugia the permanent right to have a University and to award degrees to students from all nations.

Today, research, education and consulting activities in the various disciplines are organized in 16 departments, with about 23,500 students, 1,100 professors and researchers and 1,000 staff members. The University offers study programs also in two other Umbrian towns: Assisi and Terni.

On the international level, the University of Perugia remains firmly committed to develop collaborative relationships with European and non-European Universities, to facilitate and improve international advanced study opportunities for its students.

In this framework the gravitational wave group founded by prof. Luca Gammaitoni is officially active in Perugia since the late '80s thanks to the INFN. The gravitational wave group of Perugia, led by me since 2012, is one of the historical groups in Virgo and the proposer group of the 3G detector ET with Dr. Michele Punturo, and since the 2016 is part of the KAGRA collaboration.

We want to thank the Comune di Perugia, the University of Perugia, the INFN (Istituto Nazionale di Fisica Nucleare di Perugia) and EGO (European Gravitational Observatory) for supporting the organization of these events.

We will welcome you in Perugia the next February and if you want we could help you to enjoy not only the fantastic food but also the great historical and artistic sites and the wonderful countryside of the region Umbria.

Helios Vocca 🍏



## Poster Award Winners

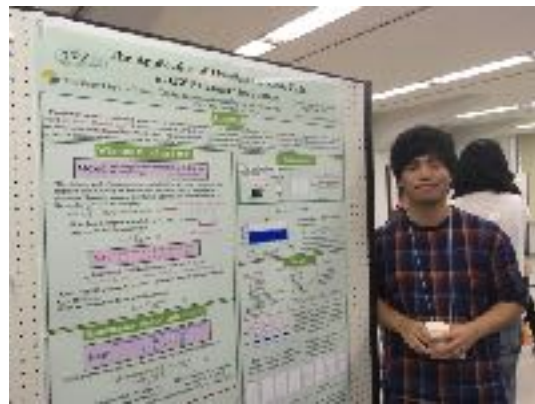
At the face-to-face meeting in Toyama (page 6), we awarded Mr. Kohei Yamamoto and Mr. Yoshinori Fujii. Prof. Wei-Tou Ni kindly donated two sets of his edited books again as the winner's prize. Two received a certification signed by Kajita-san. Here are the abstracts of the winner's presentations.

### “Fruitful Contents” Section

**Kohei Yamamoto** (ICRR, The Univ. of Tokyo)

#### The application of Hamiltonian Monte-Carlo to GW Parameter Estimation

We proposed the new method for GW parameter estimation, which is called Hamiltonian Monte Carlo (HMC). Markov Chain Monte Carlo (MCMC) is one way to estimate the GW parameters. The goal of MCMC is to produce data samples which follow a posterior distribution. For now, the most basic kind of MCMC, called Metropolis-Hastings (MH), is used for our field. While every MCMC sample is generated by random-walk in MH, HMC uses Hamilton equation to propose the next sample. This orderly process leads to efficient samplings and a good conversion on the target distribution.



Now I'm writing the code from scratch, and this code is available for both of MH and HMC. In this code, first, I generate Gaussian noise from the given PSD. The code secondly injects the GW signal into the noise and finally produce samples based on each method.

I compared the results of two methods. The number of HMC steps is  $1e5$  and the calculation time is 774[sec], and for MH,  $1e6$  and 4620[sec], respectively. HMC shows the great conversion, but MH is not enough to converge like HMC does even with such numerous steps. As the future work, I'm going to implement parallel tempering for preventing the steps from being trapped by the local maxima of the posterior distribution. 🍏



### “Beautiful Presentation” Section

**Yoshinori Fujii** (NAOJ)

#### Fast localization with a heterogeneous network of gravitational wave detectors

We present the expected performance regarding fast sky localization of coalescing binaries with a network of three gravitational wave detectors having heterogeneous sensitivities, such as the LIGO-Virgo network. A hierarchical approach can be used in order to make an effective use of information from the least sensitive detector. In this approach, the presence of an event seen in coincidence in the two more sensitive detectors triggers a focused search in the data of the third, less sensitive, detector with a lower signal-to-noise ratio (SNR) threshold. We investigate the benefit for sky localization that can be expected in such an approach, using simulated data and signals.

We find that as the sensitivity of Virgo approaches one third of the LIGO one, the accuracy and precision of the localization can be improved by about a factor 3 when Virgo data are searched with an SNR threshold around 3.5. This hierarchical network also effectively improves the localization accuracy and precision when SNR threshold for the lower sensitivity detector is set to around the threshold provided that the BNS range of that the detector is greater than 20% of more sensitive detectors. Consequently, this hierarchical search will be most useful when adding new less sensitive detectors to the network, as they are undergoing commissioning.



(photos by **Chihiro Kozakai** 🍏)



## Newly Joined

## Ulsan National Institute of Science and Technology (UNIST) and Center for High Energy Astrophysics (CHEA) at UNIST

Kyu Jin Kwak, Lupin Chun-Che Lin, and Young-Min Kim

It was our great honor and pleasure that we joined KAGRA Scientific Congress (KSC) in the last F2F meeting held at Toyama. We enjoyed the meeting a lot. We met and talked to many KSC members and liked the atmosphere of the meeting and friendly colleagues. In particular, we had an opportunity to visit the KAGRA site with the help of Hisaaki Shinkai and Takaaki Yokozawa. It was an amazing experience. By seeing the instruments and the tunnel, we realized that it is really close to detect the first gravitational wave signal with KAGRA. We are looking forward to it and hope to contribute to it with the collaboration with other KAGRA members.

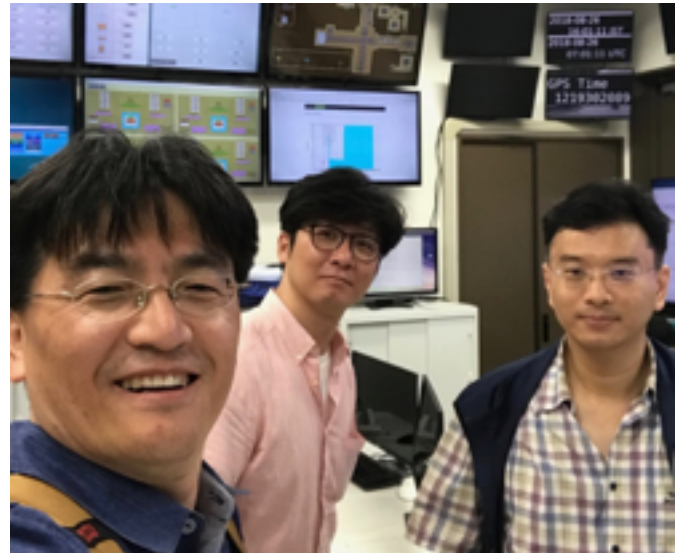
As new members, we would like to introduce our institute, UNIST and CHEA, a research center in the department of physics at UNIST. UNIST is a young but rapidly growing university in South Korea. It was established in 2009 as a government funded, research oriented, science and technology focused university. As the name indicates, it is located in an industrial city in Korea named “Ulsan” which is known as home-city of Hyundai motor company. Ulsan also hosts Hyundai heavy industries, one of the largest shipbuilding companies, and many petroleum refinery companies. A strong motivation to establish UNIST is to sustain Ulsan, the industrial capital of Korea, with the continuous support of science and technology. Since its opening in 2009, UNIST has been jumping to a decent size and beginning to gain world-wide reputation. UNIST has now about 430 faculties and 3300 and 2700 registered undergraduate and graduate students, respectively. From the very beginning, UNIST pursues globalization. All the lectures are taught in English and UNIST has been attracting many international students as well as researchers. As of today, the international community in UNIST reaches more than 400 people. Please visit the UNIST homepage, [www.unist.ac.kr](http://www.unist.ac.kr) for more information.



Out of the current 11 schools in UNIST, school of natural science (SNS) was established lately in 2014 and has three departments, physics, mathematics, and chemistry. Physics department has been also growing quickly. We have now 21 faculties and more than 60 graduate students in our department and we are expecting to grow further by continuing to hire more faculty members. The research areas in the UNIST physics department focus on three fields; plasma physics including astrophysical plasmas, soft matter physics including biology-related materials, and quantum material physics including solid state physics.

CHEA was established in 2016 in the physics department at UNIST as a long-term (7 years), government-funded center for fundamental science. National Research Foundation of Korea (NRFK) selects science research centers (SRCs) for fundamental science very competitively and CHEA is one of selected SRCs. As the name indicates, CHEA aims to understand high energy astrophysical phenomena by utilizing all the available methods, theory, observation, and experiment. Among many high energy astrophysical phenomena, CHEA focuses on those related to (1) clusters of galaxies and (2) compact objects like neutron stars and black holes. Thus, gravitational wave is an important part of CHEA's research activities. In fact, two members of CHEA (Profs. Chang-Hwan Lee at Pusan National University and Maurice van Putten at Sejong University) have been already participating in the KAGRA collaboration before we joined. CHEA is a multi-institute center. While its headquarter with 5 professors is stationed at UNIST, 6 more professors from 4 different universities also participate. Please visit the CHEA home page <http://sirius.unist.ac.kr/SRC-CHEA/> for more information.

Among us, Dr. Young-Min Kim has been already working for the Detector Characterization group in KAGRA for a while. He is a post-doc at UNIST and received his Ph.D with his thesis on the gravitational wave research under Prof. Chang-Hwan Lee's supervision at Pusan National University. Our imminent plan for KAGRA is to contribute to the DetChar research by continuing Dr. Kim's current activities. Since the last F2F meeting, we have recruited a graduate student, Mr. Kihyun Jung at UNIST who will work on the KAGRA-related projects for his Ph.D thesis. In the long term, we plan to work on the data analysis projects by looking into various waveforms from astrophysical gravitational sources and applying machine learning algorithms to parameter estimation. Prof. Lupin Lin is an observational astronomer of high energy (X-ray and gamma-ray) and an expert of timing analysis. Prof. Kyujin Kwak is a computational astrophysicist working on various numerical simulations including hydrodynamics. A new post-doc of CHEA/UNIST, Dr. Ray Kwan-Lok Li, who is a multi-wavelength observer working on compact objects, will also join KAGRA and participate in our group activities. 🍏



Picture taken at the KAGRA control room during the visit to the KAGRA site. From left, Kyujin Kwak, Young-Min Kim, and Lupin Chun-Che Lin.

## WE HEAR THAT ...

**Atsushi Nishizawa** (Nagoya U) received the 13th Seitaro Nakamura prize from Soryushi-Shogakukai. The citation is for his recent paper, "Generalized framework for testing gravity with gravitational-wave propagation. I. Formulation" (Phys. Rev. D 97, 104037 (2018)).

**Yuichiro Sekiguchi** (Toho U) received the 12th Yukawa-Kimura prize from Yukawa Foundation. The citation is for his contributions to "Numerical-relativity simulation of binary neutron star mergers with realistic microphysics".

**Masaru Shibata** (Max Planck Institute/Yukawa Institute, Kyoto U) received the 64th Nishina prize from Nishina Memorial Foundation. The citation is his contribution to "Study of binary neutron star mergers by numerical relativity simulations".

**Atsushi Nishizawa** will move to RESCEU (U Tokyo) from KMI (Nagoya U) as an assistant professor from February 2019.

**Ayaka Shoda** (NAOJ) and **Masaki Ando** (U Tokyo) had a baby on September 9. It's a boy, and was named Kohshiro. (photo)

### Congratulations!

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



Photo from facebook with permission.



## The Laureate

## Yuichiro Sekiguchi, Yukawa-Kimura prize from Yukawa Foundation

**Yuichiro Sekiguchi** (Toho Univ.) received the 12th Yukawa-Kimura prize from Yukawa Foundation. The citation is for his contributions to "Numerical-relativity simulation of binary neutron star mergers with realistic microphysics".

[http://www2.yukawa.kyoto-u.ac.jp/~kimurasho.oj/kimurasho/index\\_e.htm](http://www2.yukawa.kyoto-u.ac.jp/~kimurasho.oj/kimurasho/index_e.htm)

Yuichiro kindly sent his comments and his explanations of his research to us. **Congratulations!** 🍏



Photo from his official webpage.

The merger of neutron stars is a phenomena of time-varying strong gravity so that numerical relativity is essential to understand it. Moreover, the temperature achieved during the merger exceeds several 10 MeV and copious neutrinos are emitted from the merger remnant. Therefore, "realistic microphysics" such as finite-temperature nuclear-matter equations of state which govern the thermodynamical properties of the neutron star and the neutrino transport processes are also required.

The recipient of the prize developed first in the world a framework for "numerical-relativity with realistic microphysics" in an ingenious manner and performed 'realistic' simulations of binary neutron star mergers. Based on this breakthrough, the recipient and his collaborator made considerable contributions in clarifying the dynamics of the binary neutron star mergers, resolving a long-standing problem of the origin of heavy elements, and predicting promising electromagnetic counterparts to gravitational wave from the mergers, as well as calculating gravitational waveforms. The highlight of the study was marked at GW170817 and the following electromagnetic follow-

up observations: The results are consistent with the modeling based on the numerical-relativity simulation with microphysics.

(Yuichiro Sekiguchi 🍏)

## The Laureate

## Masaru Shibata, Nishina prize from Nishina Memorial Foundation

**Masaru Shibata** (Max Planck Institute/Yukawa Institute, Kyoto Univ.) received the 64th Nishina prize from Nishina Memorial Foundation. The citation is his contribution to "Study of binary neutron star mergers by numerical relativity simulations".

<http://www.nishina-mf.or.jp/prize.html>

**Congratulations!**

The editors are waiting to receive a message from Shibata-san. 🍏

### New Book on GW physics



Masaru Shibata published a textbook with Kotaro Kyutoku, "Sources of Gravitational Wave" from Asakura Publishing Co., in August 2018.

ISBN-13: 978-4254138016

220 pages, 3672 yen.

In Japanese.

## The Laureate

## Atsushi Nishizawa, Seitaro Nakamura prize from Soryushi-Shogakukai

**Atsushi Nishizawa** (Nagoya U) received the 13th Seitaro Nakamura prize from Soryushi-Shogakukai. The citation is for his recent paper, "Generalized framework for testing gravity with gravitational-wave propagation. I. Formulation" (Phys. Rev. D 97, 104037 (2018)).

<https://www2.yukawa.kyoto-u.ac.jp/~soryushi.shogakukai/>

Atsushi kindly sent his comments and his explanations of his research to us. **Congratulations!** 🍏

The direct detections of gravitational waves (GWs) from merging compact binaries bring forth new opportunities to test gravity in dynamical and strong regimes. To this end, it is crucial to search for anomalous deviations from general relativity in a comprehensive and model-independent way, irrespective of gravity theories, GW sources, and background spacetimes.

In the paper, we proposed a new universal framework for testing gravity with GW propagation, based on an effective field theory that can be used as the effective description of modification of gravity at cosmological scales. Our framework covers almost all possible modifications on a GW waveform: GW speed, graviton mass, amplitude damping rate, and possible source term for GWs. We studied how each effect comes in GW waveform and then performed a parameter estimation analysis, showing how well the detector network (aLIGO, aVIRGO, KAGRA) can constrain the modification of gravity from GW propagation. After the submission of this paper, the detection of GW170817 was announced and allowed us to measure GW speed at the level of  $10^{-15}$ , proving how powerful the propagation test of GWs is.

([Atsushi Nishizawa](#) 🍏)



Photo from Nagoya U. webpage.

### An issue of GW in popular magazine



December 2018 issue of "Suuri-Kagaku" (Mathematical Sciences) is focusing Gravitational Wave. From KAGRA collaboration, Misao Sasaki, Hisaaki Shinkai, Masatake Ohashi, and Takahiro Tanaka contributed. 1030 yen, in Japanese.

### New Book on GR, QT, & Cosmology for general readers



Hisaaki Shinkai published a textbook for general readers (freshmen level), "Frontiers of Physics: Relativity, Quantum Theory and Cosmology" from Kyoritsu Publishing Co., September 2018. ISBN-13: 978-4320036055 231 pages, 2484 yen.



## WE FOUND THAT ...



This screen shot is from youtube, we are not sure this is legally uploaded one.

KAGRA control room appears in TV Anime “Hisone & Masotan” Story 11 (broadcasted in June 2018), briefly. (info from [Osamu Miyakawa](#))

Editors do not know the story at all, but found that this is partially a story of self-defense force, and the air force Gifu base supports it officially. If someone knows how KAGRA contributes to the story, please explain it to us.

## WE FOUND THAT ...

Latest issue of LIGO magazine, Issue 13 (September 2018) has a status report of KAGRA by [Keiko Kokeyama](#) and [Yutaro Enomoto](#).

<https://www.ligo.org/magazine/>

Don't miss to check it out.



## An essay in popular magazine

In Kyuuri No.10 (July 2018), an essay, “Memory of Prof. Yoji Totsuka”, by [Takaaki Kajita](#) appears. 702 yen, in Japanese.



## Brief history of KAGRA will appear in Nature Astronomy, in January 2019.

If you are not an author, you can read it in advance at [[arXiv:1811.08079](https://arxiv.org/abs/1811.08079)]. We also submitted a photo for competition of the cover of the issue, which is the one in page-1 of this newsletter.



We found melon! (from [Masatake Ohashi](#))



## Gravitational waves from a merged hyper-massive neutron star

For the first time astronomers have detected gravitational waves from a merged, hyper-massive neutron star. The scientists, Muksuwan Puster of Sejong University in South Korea, and Massimo Della Valle of the Osservatorio Astronomico di Capodimonte in Italy, publish their results in *Monthly Notices of the Royal Astronomical Society Letters*.

Gravitational waves were predicted by Albert Einstein in his General Theory of Relativity in 1915. The waves are disturbances in space-time generated by rapidly moving masses, which propagate out from the source. By the time the waves reach the Earth, they are incredibly weak and their detection requires extremely sensitive equipment. It took scientists until 2015 to announce the first observation of gravitational waves using the Laser Interferometer Gravitational-Wave Observatory (LIGO) detector.

Monthly Notice's website introduces an article by [M.H.P. M. van Putten](#) and M. Della Valle, MNRAS: Letters (2019), 482 (1) (DOI: 10.1093/mnrasl/sly166). In the last paragraph, KAGRA briefly appears: “Gravitational wave astronomy, and eking out the data from every detection, will take another step forward next year, when the Japanese [Kamioka Gravitational Wave Detector](#) (KAGRA) comes online.”

<https://ras.ac.uk/news-and-press/research-highlights/gravitational-waves-merged-hyper-massive-neutron-star>

## New Collaborators (\*= New Groups)

Beijing Normal University

Haoyu Wang (visiting researcher)  
Shichao Wu (graduate Student)  
Jie No Zheng (graduate Student)

Fukuoka University

Satoshi Eguchi (Assis. Prof.)  
Man Leong Chan (PD)  
Shota Shibagaki (PD)

JAXA Institute of Space and Astronautical Science

Takuya Midooka (Graduate student)

**National Astronomical Observatory Japan**

**Theoretical Astrophysics\***

Hajime Sotani (Project Assistant Prof.)

National Central University, Taiwan

Chia Ming Kuo (Associate Prof.)  
Harn Fung Pang (Research Assistant)  
Hsuan Yu Chu (Graduate Student)  
Ko-Han Chen (Graduate Student)

National Taiwan Normal University

Zhang Hong (PD)  
Hong Zhang (PD)

Imam Safdar (PhD Student)

Iman Safdar (Graduate Student)

Chia-Wei Yang (Graduate Student)

National Tsing Hua University

Kuo-Chuan Pan (Assistant Prof.)

Tsung Ju Yang (PD)

Shu-Rong Wu (Graduate student)

Osaka City University

Sakumi Sandou (B4)

Genki Sugimoto (B4)

The Chinese University of Hong Kong

Chun Fung (Isaac) Wong (Graduate Student)

The University of Tokyo, ICRR

Shoichi Oshino (Researcher)

Lucia Trozzo (Researcher)

**Ulsan National Institute of Science and Technology,  
Center for High Energy Astrophysics\***

Kyujin Kwak (Assistant Prof.)

Chun-Che (Lupin) Lin (Research Associate)

Young-Min Kim (PD)

Kwan Lok Li (PD)

Kihyun Jung (Graduate Student)

(as of July-November, 2018)

**If your affiliation address (or email) changes:** Contact Ms. Rie Kikuchi (ICRR).

**If your group has new members:** Contact Ms. Rie Kikuchi (ICRR), and member-list admins Hideyuki Tagoshi (ICRR) and Sachiko Kuroyanagi (Nagoya U.).

**If you have a nice photo:** Let the KSC Newsletter share them.

## KSC board From Aug. 2018 to Aug. 2019:

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.

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We thank Simon Zeidler for proof-reading the draft.

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

[JGW-L1808122] (2018/04), [JGW-L1808559] (2018/08)

