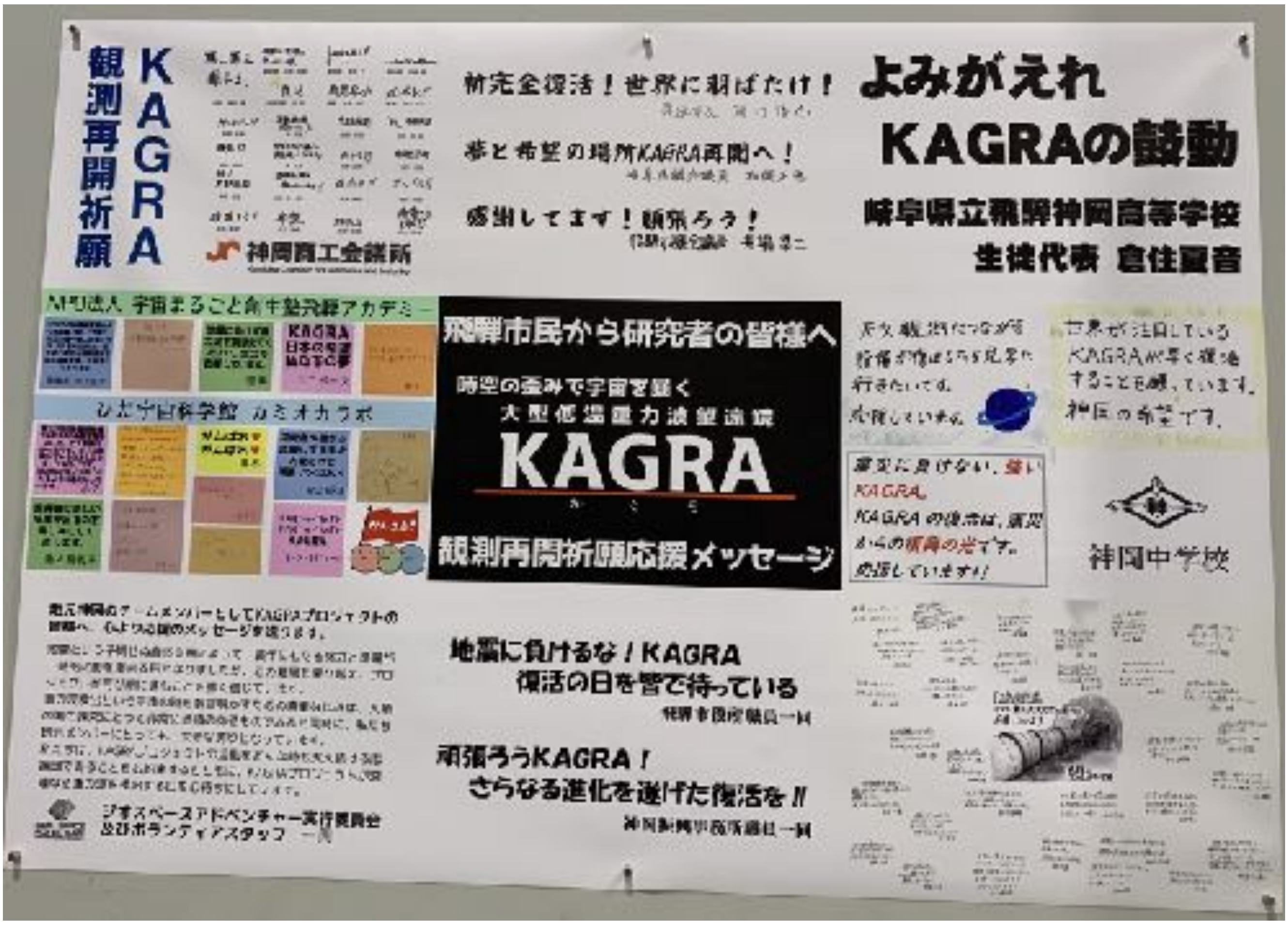
KAGRA SCIENTIFIC CONGRESS: COLLABORATORS' INFORMATION EXCHANGE 2025/JAN 27

KSC Newsletter

Issue 11

Overcoming the earthquake

It's been one year since the Noto earthquake. KAGRA is recovering from the earthquake and preparing to join the O4 run. Here are the messages of support we have received from Hida citizens!



Youth Perspectives at KAGRA: Recovery from the Earthquake and Beyond

[This article was published in LIGO Magazine September 2024]

Masahide Tamaki (The University of Tokyo)

On the first day of 2024, an earthquake struck the Noto Peninsula, causing significant damage to the residents celebrating the New Year. This earthquake, the largest in the Hida-Takayama area in the past 100 years, also had a substantial impact on our research facility located approximately 120 km away. The 'shindo' (the Japanese seismic intensity scale of 0 to 7) was 5 minus, a level that induces fear and makes people feel the need to hold onto something for stability. Indeed, staff who were in the analysis building on the ground during the New Year's shift reported that the shaking was so severe that it was difficult to stand.

However, as some of you may have seen during the tour at last year's LVK meeting, the KAGRA site is located underground. Consequently, the shaking there was less intense than at the surface, with the 'shindo' of 3 at the site. This demonstrates the advantage of having the facility underground. Had it been constructed above ground, there could have been catastrophic consequences, such as the test masses falling.

That said, there was still damage. I usually work around the Type-A suspension (ITMX, ITMY, ETMX, ETMY) that holds the sapphire mirrors, so I will comment on that. For example, the LVDT signal cables for ITMX and ETMY had been severed at the bottom filter damper. Additionally, we discovered that most of the magnets used to actuate the test masses fell off and needed to be re-glued. Especially in the lower part of the suspensions, where cooling had progressed, we needed warming up and venting for repair work. I don't know whether due to this, we also found that the viewports for the optical levers were dirty or foggy, necessitating additional cleaning work. Since we cannot use organic solvents inside the cryostat, we had to painstakingly remove and clean each of the many viewports one by one. I remember thinking, "When will this ever end?" (At the same time, though, it was a good opportunity to talk about various things with the staff I work with…)

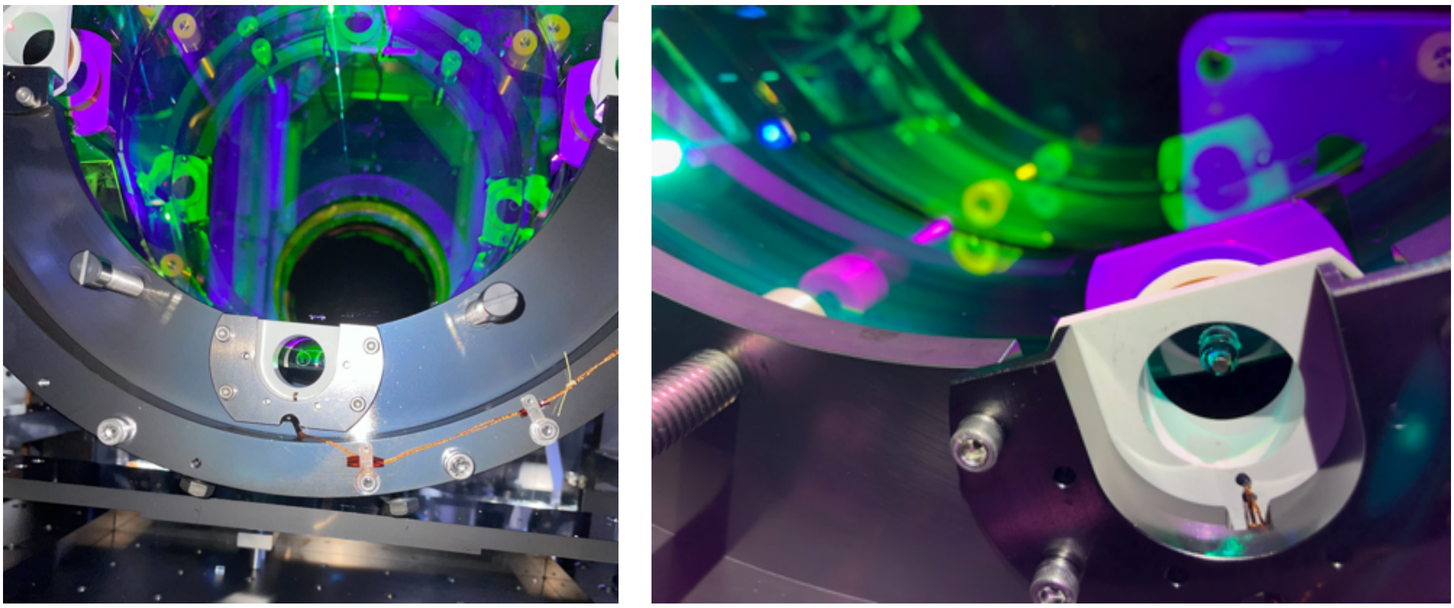


Fig.1. Test mass with the magnet removed (left) and glued (right)

This is only a part of the damage; many other suspension systems also suffered significant damage. Most of the repair work has now been completed, and we have resumed commissioning. Although I was unable to participate in many of the repair activities due to my frequent absences from Kamioka, there were staff members working day and night, and I have great respect for them. Moving forward, I would like to put in more effort to participate in the observations with significantly improved sensitivity.

We will also be introducing upgrades for O4b. It is safe to say, however, that the recovery work from the earthquake has largely been completed and the commissioning by the site members has only resumed in earnest in July. As of the end of July, when I am writing this manuscript, the commissioning of the vibration isolation system seems to have been the most active. Routine health checks, such as measuring transfer functions to verify the state of the suspensions, were conducted. Additionally, fine-tuning of the controllers for each suspension and degree of freedom was carried out to reduce the suspension local control noise, which had been a low-frequency wall for KAGRA.

Moving into August, work around the LSC will intensify as we aim to lock the PRFPMI. Moreover, adjustments to the ASC, including phasing of the WFS QPD and the tuning of DHARD/DSOFT loops, are planned.

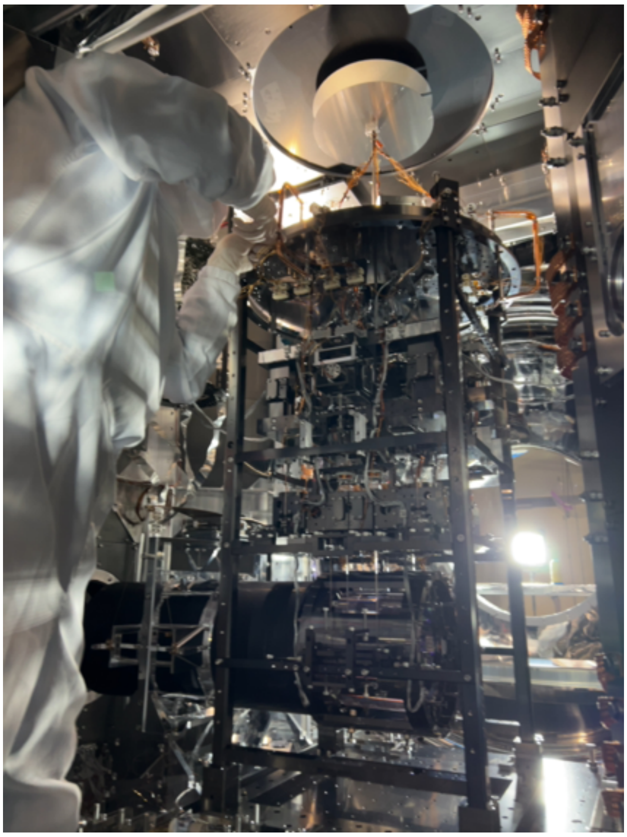


Fig.2. Work in Cryostat

While such upgrades undoubtedly contribute to improved sensitivity, I believe there are even more significant changes happening at KAGRA. This is entirely my personal impression, but one that seems to reflect reality: there appears to be a substantial increase in the number of people participating in commissioning activities in the control room compared to before O4a.

The rise in the absolute number of hands-on personnel is certainly notable, but what's truly exciting is the renewed energy and enthusiasm it brings. Given that KAGRA has been lamenting a decrease in staff over the past few years, this influx of motivated individuals is a welcome change.

As for myself, despite my earlier claims about contributing to sensitivity improvements (a sentence that begins with "Movingfoward..."), upon reflecting on this month's activities while writing this article, I realize that I haven't been able to participate on-site as much as I would have liked due to my own experiments or trip for conference.

As one of the youngest members, I am eager to actively engage in this enjoyable (and challenging) work, which is arguably one of the most crucial aspects of the KAGRA project.

ASPIRE GW Project

Kentaro Somiya (Institute of Science Tokyo)

Japan Science and Technology Agency (JST) started a new program called ASPIRE that stands for Adopting Sustainable Partnership for Innovative Research Ecosystem in 2023. It is a bilateral program aiming at an increase of international research visibility and promotion of early career researchers. JST provides 500M JPY to each project and the grant should be mostly used for the travel and promotion of early career researchers. We applied to the first call of the program for a bilateral program between Australia and Japan in the research category of "quantum" with David McClelland at ANU as the PI of the Australian side and Masaki Ando as the Co-I of the Japanese side. The title of the project is "Quantum Control for Gravitational Wave (GW) Astronomy." The primary goal is to develop various types of intracavity quantum filters including Long Signal-Recycling Cavity (LSRC), intracavity OPA, etc., which is expected to enhance the sensitivity of high-frequency GW telescopes like NEMO or KAGRA+, but the project supports a broad range of GW-related activities including KAGRA commissioning and data analysis. Let us call this project "ASPIRE GW Project."

In the spring-summer of 2024, ASPIRE GW supported 5 events, two long-term visitors from Japan to Australia, and one short term visitor from Australia to Japan. Let us briefly report some of the events.

(i) GWADW2024 in Hamilton Island

Gravitational Wave Advanced Detector Workshop (GWADW) this year was hosted by colleagues in Australia and it was held at Hamilton Island, a resort in the Great Barrier Reef. From Japan, 26 people including 6 non-KAGRA researchers attended the meeting, enjoying discussions and snorkeling. The reception started with the Aboriginal smoking ceremony. Everyone was asked to cleanse their feet before entering the beach later in the week. Like the other GWADWs, morning sessions started early, and afternoon sessions started late with 3-4 hours of lunch break when people can go to the beach, animal life park, shopping, etc. Most people stayed at the Reef View Hotel or the Palm Bangalow. Around the hotel and anywhere we saw wallabies and cockatoos. The workshop was very well organized to keep "workshop style" rather than the conference style meeting; we sat at round tables of about eight people each with pastries and light meals at the center in the entire afternoon. In some sessions, we had a group work with people at the same table. Most of the presentations were given in the poster session and oral sessions were mostly panel discussions. I heard many people say, this is the best workshop ever.

(ii) The 1st ASPIRE Workshop

We invited 9 researchers from the OzGrav collaboration and had a workshop at the Australian Embassy in Tokyo. From Japan, we had 32 people including one from JST, two from Embassy, and 17 from the GWADW participants. Shalika, Iden-kun, and Nishino-kun gave a talk about their experience of visiting Australia this year. Tanaka-kun gave a talk on the prospect of KAGRA's going to high frequencies in the future.

After the workshop, the OzGrav visitors attended the face-to-face (F2F) meeting at Tokyo City University. Dr. Daniel Brown gave a talk on FINESSE3 and LIGO commissioning. Most of them stayed longer, visiting KAGRA, NAOJ, U Tokyo, and Sci Tokyo*. One of the young visitors said in the travel report, "this trip was a great opportunity to establish international professional relationships."

* Tokyo Institute of Technology merged with Tokyo Medical and Dental University and the name of the new university is "Institute of Science Tokyo" or Sci Tokyo in short.

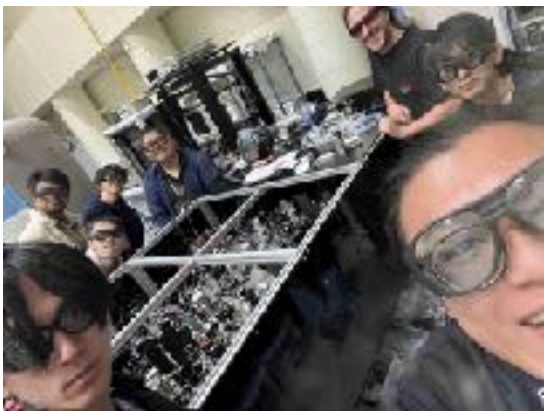
(iii) Financial support of F2F and student workshop

ASPIRE GW supported travel for the F2F meeting and the KAGRA student workshop. We invited 12 researchers, mainly those working at the KAGRA site, for the F2F meeting, and we supported the travel expense of 15 domestic students attending the student workshop. These events were held after the ASPIRE workshop, so people had a good communication with the OzGrav colleagues.

(iv) Short-term and long-term visitors

After GWADW, 7 people visited University of Western Australia (UWA) and Australian National University (ANU) for a few days each. Nishino-kun, one of the 7 visitors, stayed at ANU for 5 weeks, working on squeezing-related experiments with Dan Gould, Jonas Junker, etc. In July, James Gardner, a PhD student at ANU who is currently studying at Caltech, visited Sci Tokyo for 2 weeks and we had fruitful discussions. Iden-kun visits ANU from August 2024 through February 2025, working on squeezing experiments. Felix Wojcik at UWA visited KAGRA in October. (We appreciate kind supports from the staff members in Kamioka for helping the visits.) In autumn 2024, we sent 6 people from Sci Tokyo and NAOJ to Adelaide and UWA, mainly working on the birefringence measurement.

If you are interested in visiting institutes in Australia for the GW related research or quantum related research, we can probably support your travel, so let us know by email or via the application form in the ASPIRE webpage (https://aspire-gw.com/). Scope of ASPIRE GW is shown in the table at the end of the article. You can contact coordinators if you are interested in specific research subjects. People working on data analysis or on theoretical work are also welcome to apply. We are afraid that in principle we support travels of people working in Japan, but we will also consider overseas KAGRA collaborators so let us know if you are interested.



The ANU team is well-known worldwide for their squeezing technology. They develop LSRC, quantum expander, and other new quantum noise reduction techniques. Besides squeezing, ANU people work on various instrumental science themes including low frequency sensor developments, silicon flexture experiment, space telescope related research, optics development, data analysis, etc. The UWA team also works on various subjects. They have the 80m Gingin prototype that tests 123K silicon interferometer techniques. They develop various kinds of suspensions. They also work on the optomechanics with tiny mirrors. The Adelaide team develops a thermal compensation system prototype to test thermal lensing effects in LIGO. Dan Brown in Adelaide is the person who develops FINESSE3, a modal model simulation tool that has been used for the commissioning in LIGO, Virgo, and KAGRA. As for the data analysis and theory, people are also studying in Swinburne, Monash, U of Queensland, Sydney, Melbourne, etc.

In the next 4.5 years, we would like to bring about a major paradigm shift in bilateral exchange. Many of the graduate students in Australia visit LIGO for commissioning, and they go to LIGO after their PhD. A major reason for this flow is certainly the requirement for being in the LSC, which may be changed after the formulation of IGWN (this is just my personal hope), but the human network between Australia and Japan has not been active enough regarding the geographical distance. We shall now excavate a tunnel between the two countries and promote the exchange of early career researchers. We also found that there are a lot of things we can learn from the OzGrav collaboration, such as outreach, diversity, etc. They succeeded in increasing the number of members from 50 to 250 in the last several years. We can do the same in the GW community in Japan.

Paper

Vector dark matter search with KAGRA – "Mottainai" in fundamental physics –

"Ultralight vector dark matter search using data from the KAGRA O3GK run"

https://doi.org/10.1103/PhysRevD.110.042001

Jun'ya Kume (UNIPD, INFN, RESCEU)

Introduction

Gravitational wave (GW) interferometers, renowned for their precision in detecting the displacements of the test masses, are at the forefront of exploring the universe through the observations of merging compact binaries. However, it has been suggested that GW interferometer's capabilities can be extended beyond GWs to the search for dark matter (DM)—a substance that remains one of the greatest enigmas in modern physics[1]. In particular, KAGRA can efficiently probe a specific type of DM interaction making use of its unique feature.

This initiative resonates deeply with the Japanese concept of "*mottainai*", a term encapsulating the idea of avoiding waste and making the most of what is available. Originally tied to environmental conservation, *mottainai* has evolved into a broader philosophy of sustainability and efficient resource use. In this context, applying KAGRA's advanced technology to multiple scientific endeavors embodies the spirit of *mottainai*. The interdisciplinary use of KAGRA not only honors its original mission on GW science but also opens up new frontiers in the quest to understand DM, ensuring that no scientific potential goes to waste.

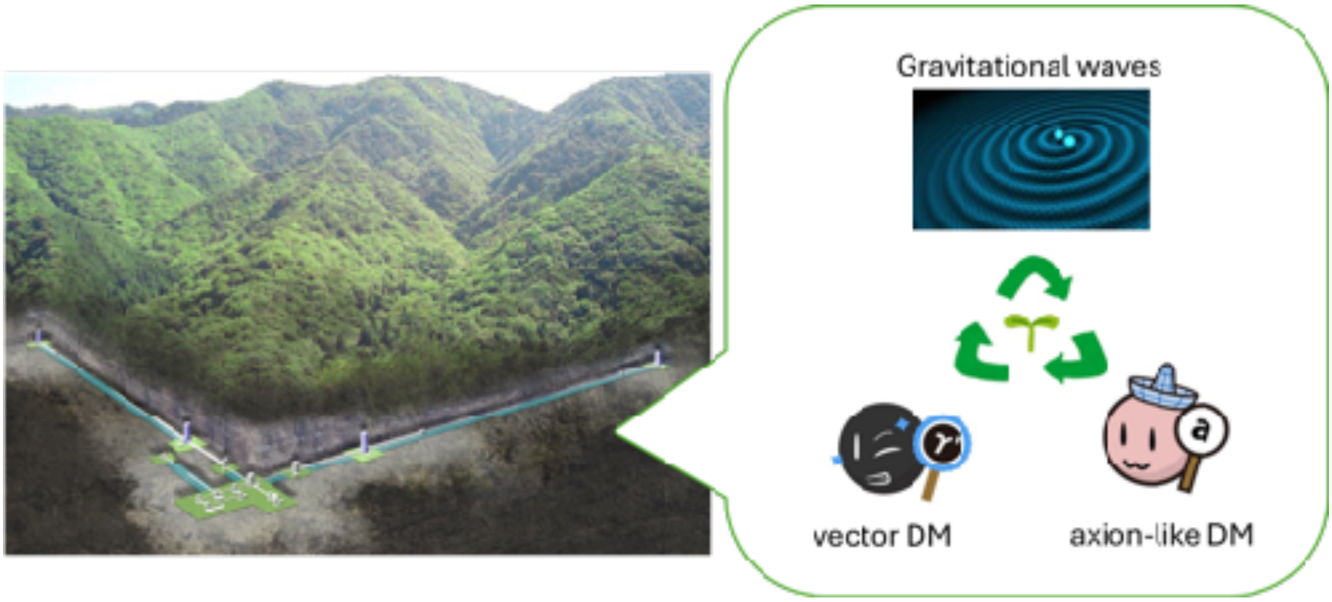


Fig.1. Interdisciplinary use of KAGRA, fully making use of its technology

Ultralight DM search with KAGRA interferometers

Dark matter is an unknown substance that is believed to make up XX% of the mass of the universe. Although it cannot be seen directly, its existence has been indicated through the observations of its gravitational effects, for example, on the motion of galaxies. Conventionally, weakly interacting massive particles (WIMPs) have been considered the most likely candidates for DM, and experiments have been conducted to search for WIMP-DM. However, the detection of WIMP-DM has yet to be achieved. In recent years, various experiments have been carried out to search for various DM candidates, ranging from ultralight bosons to primordial black holes.

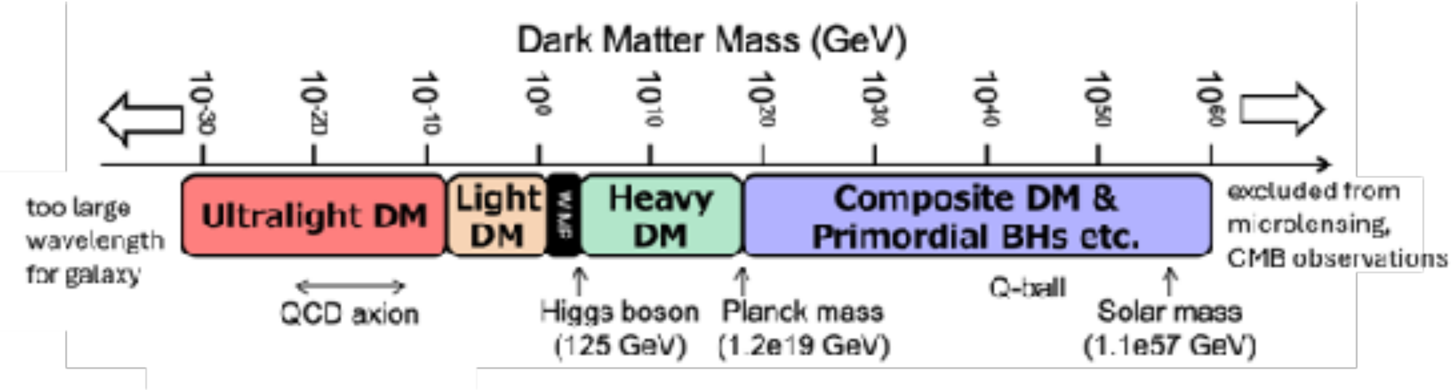


Fig.2. Discovery space of DM. It spans over 90 orders of magnitudes!

In this context, GW interferometers are useful to search for a tiny coupling between ordinary matters and ultralight DMs (ULDMs) that behave as classical waves. This includes spin-0 particles (dilaton, axion-like particles(ALPs), ...) and spin-1 particles. The latter may originate from a hidden U(1) symmetry that spontaneously breaks to yield a massive vector A_μ. This vector field, often called as “dark photon”, can couple to ordinary matters similarly to electromagnetism. In other words, vector ULDM mediates the 5th force acting on the test masses of GW interferometers and the displacement due to this force might be visible in the GW strain data! From the LIGO-Virgo O3 data, the stringent bound on the vector DM coupling constant ε has been derived for $U(1)_B$ and $U(1)_{B-L}$ in the mass range 10^{-13} eV ≪ m_A ≪ 10^{-11} eV [2]. Here B is the Baryon number and B-L is the Baryon minus Lepton number.

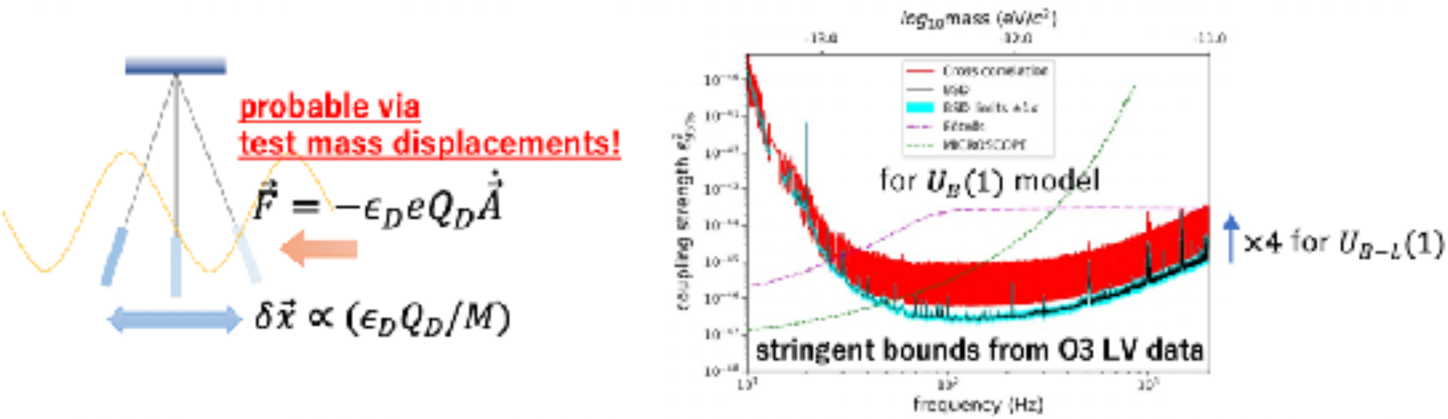


Fig.3. (Left panel) Schematics of how vector DM acts on test masses.
(Right panel) Bounds on coupling constant of U_B(1) vector DM derived from O3 LV data.

Among the possible U(1) symmetries, $U(1)_{B-L}$ is highly motivated since it can be naturally embedded in the unified theories. In fact, KAGRA can be the best detector to probe the direct interaction between the $U(1)_{B-L}$ vector ULDM and ordinary matters (for specific masses)! This is due to the fact that KAGRA employs sapphire mirrors for the main test masses and fused silica mirrors for the others. As shown in the figure below, this difference in the composition, or the charge-to-mass ratio enhances the vector ULDM signal in the length change at the particular parts of the KAGRA interferometer [3]. These parts are monitored by the auxiliary channels called MICH and PRCL (also SRCL, which will be formed in the future). It has been shown that with the design sensitivity and 1yr observation time, KAGRA can probe the unexplored parameter region. Under this motivation, we built a dedicated analysis pipeline and conducted the first-time DM search with KAGRA from the O3GK KAGRA data.

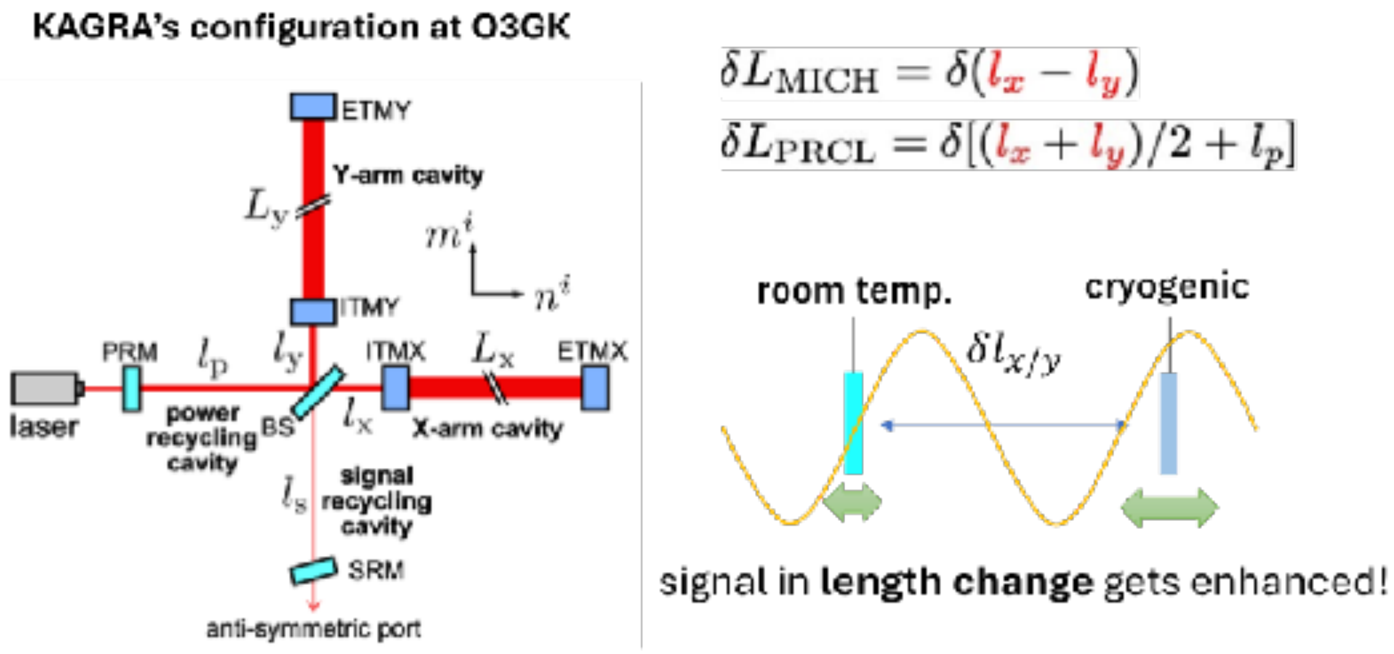


Fig.4. Due to the difference in $Q_{B-L/M}$, KAGRA can efficiently probe $U(1)_{B-L}$ vector DM with auxiliary length channels.

New analysis pipeline and the latest result from O3GK KAGRA data

There are two specific features in ULDM signal. The first one is the narrow band spectrum of signal non-relativistic velocities of DM particles (or partial waves). This feature motivates us to adopt "incoherent sum" method, which is conventionally used in the continuous GW searches. In contrast to continuous GW, however, the field amplitude of ULDM inherits statistical fluctuation characterized by the coherent time scale $\tau \propto 1/m_A$. Depending on the masses of DM and the duration of data, this second feature requires careful treatment in deriving the upper limits on the coupling constant (Fig.5)[4].

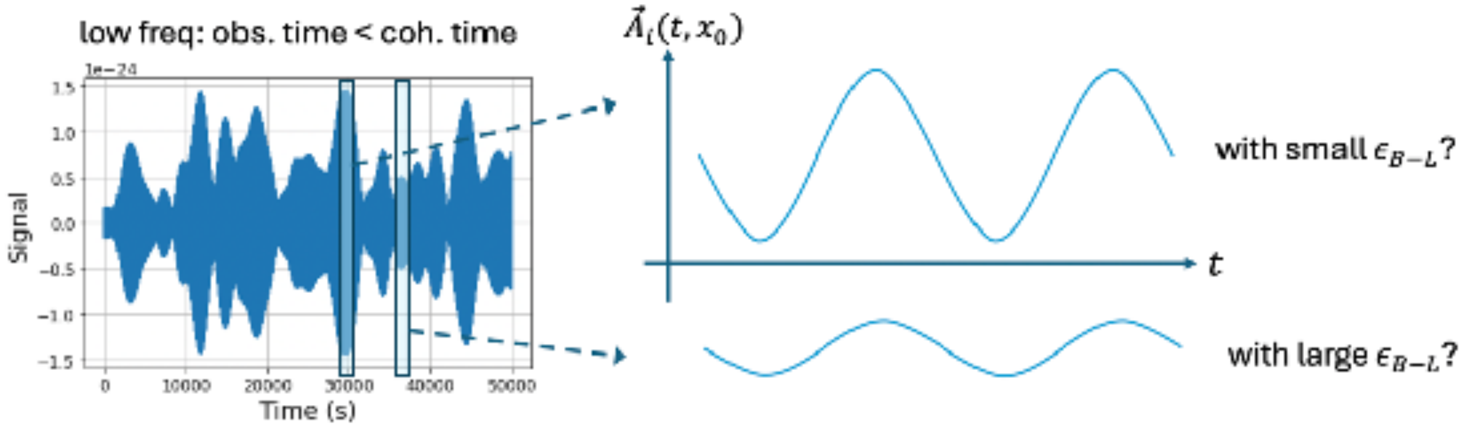


Fig.5. Schematics of how ULDM stochasticity affects the coupling constant determination.

Based on our study on the stochasticity of ULDMs, we have constructed a new analysis pipeline that properly takes into account the randomness of ULDM field amplitude. Applying this pipeline to the O3GK KAGRA data, we have derived proper upper limits on the coupling constant of $U(1)_{B-L}$ gauge boson (Fig.6). Our pipeline based on ULDM covariance nicely works regardless of data length and masses of DM. These results are published as the LVK collaboration paper [5].

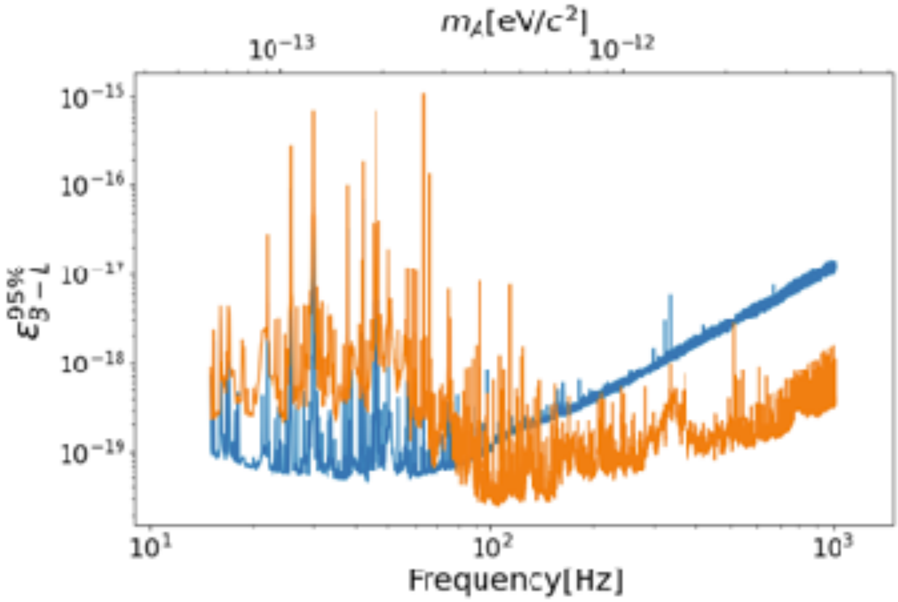


Fig.6. Upper limits on the coupling constant of B-L vector DM. It is derived from O3GK KAGRA data.

Future updates

We continue to develop our analysis pipeline as it can be generalized to other ULDM searches (see Ref.[6] for an application of our pipeline to the ALP search experiment). Indeed, additional polarization optics has been installed to the ends of KAGRA's arm to probe the interaction between ALP DM and photon. Our group plans to conduct the simultaneous search for $U(1)_{B\text{-}L}$ vector DM and ALP DM in O4c, which would definitely enrich the science scope of KAGRA experiment. Exploration of both GWs and DM—resonating with the *mottainai* mindset—maximizes the potential of KAGRA's advanced technology.

References:
[1] A. Pierce, K. Riles, and Y. Zhao, Phys. Rev. Lett. 121, 061102 (2018)
[2] R. Abbott et al. (LIGO Scientific, KAGRA, Virgo), Phys. Rev. D 105, 063030 (2022)
[3] Y. Michimura, T. Fujita, S. Morisaki, H. Nakatsuka, and I. Obata, Phys. Rev. D 102, 102001 (2020)
[4] H. Nakatsuka, S. Morisaki, T. Fujita, J. Kume, Y. Michimura, K. Nagano, and I. Obata, Phys. Rev. D 108, 092010 (2023)
[5] A. G. Abac et al. [KAGRA, LIGO Scientific and VIRGO], Phys. Rev. D \textbf{110} (2024)
[6] Y. Oshima, H. Fujimoto, J. Kume, S. Morisaki, K. Nagano, T. Fujita, I. Obata, A. Nishizawa, Y. Michimura, and M. Ando, Phys. Rev. D 108, 072005 (2023)

KIW11

The 11th KAGRA International Workshop at NMNS, Taichung

Ray-Kuang Lee (National Tsing Hua University)

The 11th KAGRA international workshop (KIW-11) was held on 16-17 April 2024 in National Museum of Natural Science (NNMS), Taichung City, Taiwan. This is the first KIW in the museum. This time, we have more than 90 participants on site.

Recently LVK have also completed the early operational run in the 4th observation (O4a) in January, KIW-11 provided the great opportunity to welcome all the people to join the new venture of gravitational waves. In KIW-11, we had reports on the status of KAGRA (delivered by Masaki Ando), LIGO (by Begüm Kabagoz) and Virgo (by Yuhang Zhao), as well as the earthquake effects on KAGRA (by Tatsuki Washimi) and the Recovery of KAGRA from the earthquake disaster (by Shinji Miyoki).

↑ Fig. 1. KIW-11 on 16-17 April 2024 in National Museum of Natural Science (NMNS), Taichung City, Taiwan.

→ Fig. 2. Photo with Prof. Takaaki Kajita and the artist Muxiang Kang, on his artwork made by renewing the elevator steel cables of Taipei 101 building.

↓ Fig. 3. black-hole donuts, exclusive dessert for KIW-11.

Fig. 4. During KIW-11, Prof. Takaaki Kajita delivered a public talk at NMNS.

Fig. 5. Photo of high school students and Prof. Takaaki Kajita, after his public talk.

In addition to Science, Instrumentation, and EPO sessions, on the evening of April 16th, Prof. Takaaki Kajita, also gave a public talk as the PI of the KAGRA project, entitled "Exploring the Universe with Neutrinos and Gravitational Waves." A special forum was organized during KIW-11, discussing the overseas contributions to KAGRA.

To encourage more participants to join the GW studies, we also hosted the Open Data Workshop (ODW) in the same venue on April 18-20th, 2024, directly following the KIW-11. The ODW not only provides the study hub for the participants to join the training lecture on-line, but also encourages the researchers to visit Taiwan to have the interaction with the top scholars around the world.

More details about the KIW-11 can be found via the link below:
https://indico.phys.sinica.edu.tw/event/92/

EPO

Black Holes and Gravitational Waves: Exhibition Tour in Japan

Ray-Kuang Lee (National Tsing Hua University), **Hisaaki Shinkai** (Osaka Institute of Technology)

The exhibition "Black Holes and Gravitational Waves" is now under preparation at several science museums in Japan, coordinated by KAGRA-EPO Japan group. The series will start from Osaka Science Museum and Akashi Municipal Planetarium on July 19, 2025, and the plan is to end at National Museum of Nature and Science (Ueno, Tokyo) in 2029. Please refer the table below for the current planning schedule.

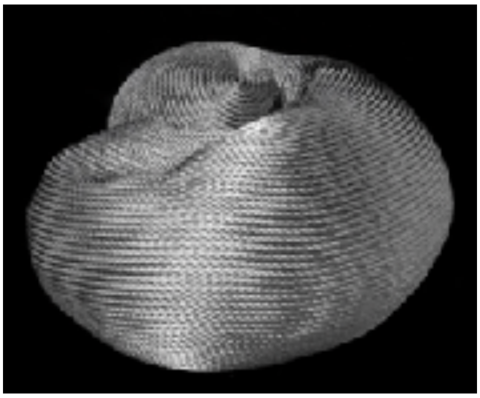
The right poster is a draft. One keyword in the center is 「極限時空」 (extreme spacetime). The contents of the exhibition will be based on those prepared by Taiwan group, but we will prepare also the latest research results of LVK group and EHT (Event Horizon Telescope) group.

We got the official approvals of the cooperation from ICRR U. Tokyo, NAOJ, and Osaka Institute of Technology. KAGRA will provide sapphire mirrors, NAOJ will provide a miniature model of radio telescope, and OIT will provide a server for maintaining softwares during the exhibition. The public release of this series of exhibition is planned to be made at Osaka, April 2025.

period	place		official URL
July 19 — Aug. 31, 2025	Osaka Science Museum	大阪市立科学館	https://www.sci-museum.jp/
July 19 — Sep. 7, 2025	Akashi Municipal Planetarium	明石市立天文科学館	https://www.am12.jp
Winter 2026	Hamagin Space Science Center	はまぎんこども宇宙科学館（横浜）	https://www.yokohama-kagakukan.jp
2026	Sendai Astronomical Observatory	仙台市天文台	https://www.sendai-astro.jp
March — May, 2027	Toyama Science Museum	富山市科学博物館	http://www.tsm.toyama.toyama.jp
Fall 2027	Ehime Prefectural Science Museum	愛媛県総合科学博物館	https://www.i-kahaku.jp
Dec, 2028 — March 2029	National Museum of Nature and Science	国立科学博物館	https://www.kahaku.go.jp

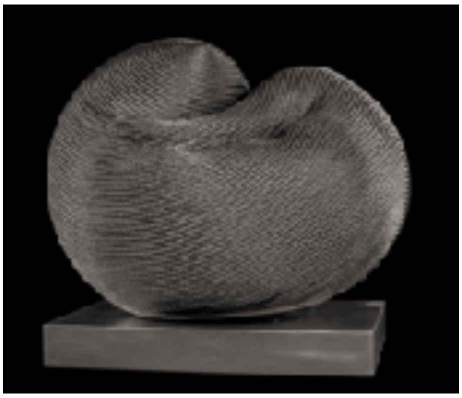
KAGRA-EPO is now preparing three versions of the booklets: for kids, for adults, and for research-oriented students. When the exhibition starts, several invited lectures will be held. We may ask cooperation to you. Please be prepared.

Associated to this event, a Taiwan wire-art artist, Master Kang, will provide us at least three of his sculptures: including 安靜 (Serenity), 宇宙的生命 (Life of the Universe) and 如意生命 (Ruyi Life). In particular, Serenity was inspired by a black hole merger. Kamioka Town, Hida City, agreed to set one of them in front of the Kamioka Lab (Science Museum at the parking area Sky-Dome Kamioka along the route 471) after 2029.



安靜
(Serenity)
by Muxing Kang

Year: 2018.
Material: Renewed steel Cable
Size: H100*W200*D200 (cm)
Weight: 1220(kg)



宇宙的生命
(Life of the Universe)
by Muxing Kang

Year: 2022
Material: Renewed steel Cable
Size: H450*W200*D150 (cm)
Weight: 1220(kg)

如意生命
(Ruyi Life)
by Muxing Kang

KAGRA meeting

KAGRA Summer Workshop

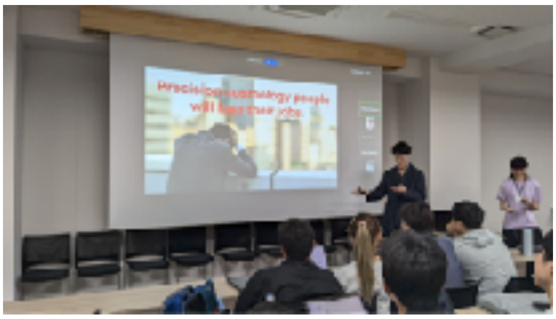
Marc Eisenmann (NAOJ)

The first KAGRA Summer Workshop was held from August 25th to August 31st, 2024, on KAGRA site. Thanks to the support of ASPIRE GW grant, ICRR, many on-site peoples and lecturers, 24 Master students from various institutes in Japan, China, Taiwan took part to lectures and hands-on experiment on and in KAGRA detector! For all students, it was the first time to directly work inside KAGRA mine and with KAGRA data. On the evening of the first day, a BBQ was organized for all involved in the workshop to socialize around a local specialty; Hida beef! It was a nice chance to discover and discuss with many participants while enjoying delicious local food.

The next two days were devoted to lectures introducing gravitational waves science, detection techniques, and the KAGRA detector, commissioning, and safety. This was also the first opportunity for many to enter KAGRA mine.

For the rest of the weeks, the participants were split into groups of 4 people to work on KAGRA VIS, PEM, Commissioning, CAL, DetChar or DGS with the supervision of KAGRA on-site experts. After working on a given task for one day, each group spent the next day working on another sub-system of KAGRA.






Due to the arrival of the typhoon No.10 that could disrupt the trains or planes needed for all to go back home, the workshop duration was shortened by one day and part of the activities related to the use of LIGO-Virgo-KAGRA was postponed to a later date, online. The workshop finished with the participants' presentation on Friday morning. While the unpredictable typhoon's path made a tricky organization of the last days, everyone could finally safely reach home.

The participants' feedback was overall extremely positive. All appreciated lectures, experiments, and social gathering. They noted that it was a great opportunity for research, and also better communicating with each other. So much so that there should be a regular workshop from now?

LVK meeting

LVK meeting in Barcelona

The September 2024 LVK meeting was held at Hotel Catalonia Barcelona Plaza, hosted by IFAE-Barcelona. There were many interesting discussions on the ongoing O4 data analysis and publication plans. The coming year promises to be exciting, with many O4 results set to be released!

↓ Fig. 1. Ando-san giving a speech at the banquet.

→ Fig. 2. Fireworks of La Mercè Festival, just in front of the hotel.

KAGRA MEETING SCHEDULE

LVK collaboration meeting, 24-27 March, 2025; Hybrid style, held at the Pullman Melbourne Albert Park Hoteltion meeting, hosted by OzGrav. Only for collaborators.

The 12th KAGRA International Workshop, 26-27 May, 2025; Mainly on-site. Hosted by Shanghai Astronomical Observatory and Tongji University. Open to all.

The 35th KAGRA Face-to-Face meeting, Augusgt, 2025; Hybrid style. Hosted by Toyama University. Only for collaborators.

New group

Tongji University, Shanghai

Yingli Zhang (Tongji University)

We are very pleased to join the KAGRA collaboration. We are confident that the KAGRA membership will offer us much chance to explore the mysteries of the universe under the collaboration with other KAGRA members.

Yingli Zhang is a professor in the School of Physics Science and Engineering of Tongji University. He obtained the PhD degree from Yukawa Institute for Theoretical Physics, Kyoto University. Later he worked in National Astronomical Observatories of Chinese Academy of Science, Institute of Cosmology and Gravity at the University of Portsmouth, Tokyo University of Science and Tokyo Institute of Technology. He joined Tongji University from October 2020. Now he has established a group for cosmology which consists of 1 postdoc, 5 graduate students and 8 undergraduate students. He is also an affiliated member of Kavli IPMU at the University of Tokyo.

Yingli's main research interest is the investigation of cosmology with Primordial Black Holes (PBHs), which belong to a class of black holes that may form during radiation-dominated era. It has been known that PBH is a candidate of the origin of gravitational waves (GWs). He is currently investigating the formation mechanism and merger process of PBH binaries, which may provide information of late stage of inflation and hints of the existence of PBHs, respectively.

Especially, the emission of GWs from the merger of PBH binaries may contribute to the GW signals detected by KAGRA. On the other hand, PBHs may also produce the induced gravitational waves (IGWs) which can be captured by detectors with low frequencies such as NanoGravs, EPTA and CPTA. Hence, we expect that an associated detection by KAGRA and other detectors will provide us a comprehensive understanding of the existence of PBHs in the nature.

Fukui Prefectural University

Ataru Tanikawa (Fukui Prefectural University)

We are pleased to join the KAGRA collaboration in the face-to-face meeting held summer 2020. We hope that we will contribute to the KAGRA collaboration. Our research group is in Fukui Prefectural University, close to Fukui city. Fukui city is located 100 km north of Kyoto city. Because Fukui city is connected to Tokyo by Hokuriku Shinkansen very recently, it takes only 2.5 hours to get from Tokyo to Fukui city. Our university is also close to the Fukui Prefectural Dinosaur Museum, and Eiheiji temple, one of the two biggest temples of Japanese Zen Buddism. If you are interested in these things, it is worth visiting our university at least once. In Fukui Prefectural University, students major in Biotechnology, Nursing science, Economics, or Dinosaurology, not Astrophysics. The number of faculty staff member who researches Astrophysics is only one (Ataru Tanikawa). He will join the KAGRA collaboration.

Ataru Tanikawa studies binary black hole formation in isolated binaries and star clusters including open clusters and globular clusters. He hopes that he will make clear the origin of binary black holes observed by the current gravitational wave observatories, and that he will also utilize gravitational wave observations to understand the cosmic star formation history, and star cluster dynamics. He also tries to discover black hole and neutron stars from public data released by astrometric telescope Gaia. He believes that these discoveries will help modeling binary black hole formation. Furthermore, he is interested in astronomical transients related to thermonuclear explosion of white dwarfs, such as type Ia supernovae and tidal disruption events. These transients are also promising gravitational wave sources for space-borne gravitational wave observatories.

As described above, we are theoretical astrophysicists. We are happy if our studies are helpful for interpreting gravitational wave observations.

Astroparticle Physics Group at Phenikaa Institute for Advanced Study (PIAS), Phenikaa University

Quynh Lan Nguyen (PIAS)

We are grateful to have participated in the KAGRA collaboration's face-to-face meeting in the fall of 2024. Phenikaa University, located in the Hanoi area of Vietnam, established the Institute for Advanced Study on June 12, 2018. The institute currently hosts four research groups focusing on high-energy physics, nuclear physics, astrophysics and cosmology, and condensed matter physics, with most members under forty.

I joined PIAS in the fall of 2024 and established the Astroparticle Physics focus to contribute to research on gravitational wave physics and multi-messenger astrophysics as the KAGRA members with a team of five members, include myself, one junior faculty member, one postdoc, one graduate student, and one undergraduate honors program student.

Phenikaa University is located near the center of Hanoi. The university features two 30-story buildings that house research labs, faculty offices, an auditorium with a seating capacity of 1000 seats, and numerous conference and discussion rooms. Established in 2007, the university has grown steadily over the past decades and now serves more than 25,000 students and employs approximately 1,300 faculty and staff members. PIAS and Phenikaa University are expected to host the next KAGRA International Workshop and will be ready for the event.

Quynh Lan Nguyen earned her Ph.D. in Theoretical Physics and Mathematical Physics. Before joining PIAS, she was faculty at the University of Notre Dame and Hanoi National University of Education. Her research focuses on binary neutron star mergers, dark matter, and magnetic fields in the universe. In her spare time, she enjoys gardening, playing pickleball, and studying piano.

Peter Lott is an alumnus of Howard University, where he graduated magna cum laude with a B.S. in Physics and a minor in Mathematics. He earned his Ph.D. in Physics at Georgia Tech under the supervision of Professor Laura Dadonati, specializing in gravitational wave data analysis. His research focuses on binary black hole mergers, hyperbolic encounters, and other highly eccentric phenomena. In his spare time, Peter enjoys playing chess, weightlifting, and watching films.

Tan Hai Ngo earned her Ph.D. in Nuclear Astrophysics. She is an expert on the neutron star equation of state.

Thao Trang is interested in using the velocity gradient technique to trace the magnetic fields of merging galaxies to better understand their dynamics.

Lan Anh is interested in developing code to calculate the Love number and analyze how dark matter impacts gravitational waves from binary neutron star mergers.

We are seeking new editorial members. Please let us know if you can volunteer!

If you have any inquiries regarding the KSC newsletter: Please contact sachiko.kuroyanagi [at] csic.es

If your affiliation address (or email) changes: Contact kagraros [at] icrr.u-tokyo.ac.jp

If your group has new members: Contact kagraros [at] icrr.u-tokyo.ac.jp

If you have news / nice photos to share: Let the KSC Newsletter editorial team know.

If your neighbor is planning to join the KAGRA collaboration: Please suggest checking out our wiki FAQ http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/KAGRA/KSC/FAQ

KSC Newsletter

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