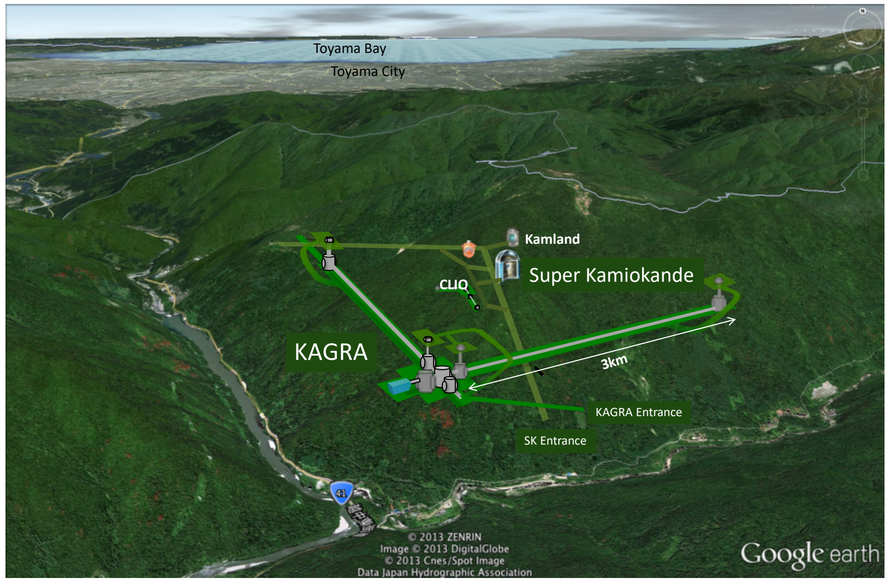
Brief Introduction of KAGRA collaboration



岐阜県神岡町

KAGRA Scientific Congress (KSC)

Chair of the Board

Hisaaki SHINKAI (Osaka Inst. Tech.)
真貝 寿明（大阪工業大学）

KSC = decision making body of KAGRA collaborators
science, organization, meetings, future plans,
interface of GW network

- **Our activities, organization, ···**
- **How to join KAGRA**

photo: Face-to-Face meeting @ICRR, April 2019

KAGRA collaboration

110 groups, 14 countries
380+ active members

Japan 250+
China 59
Taiwan 56
Korea 32
Italy 22
……

Main host institutes:

- **ICRR** Institute for Cosmic Ray Research, Univ. Tokyo
- **NAOJ** National Astronomical Observatory Japan
- **KEK** High Energy Accelerator Research Organization

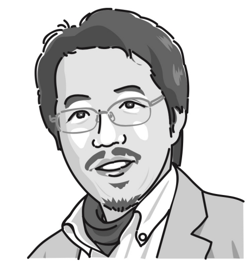
KSC organization

KAGRA

Takaaki Kajita
梶田隆章(PI)

Masatake Ohashi
大橋正建(vice PI)

KAGRA Scientific Congress (KSC) organization chart 2019/May 15



PI

Executive Office

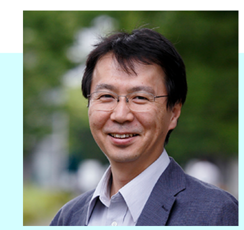
EO — sharing information & idea — KSC board

KSC board:
* Hisaaki Shinkai
* Chunglee Kim
Sadakazu Haino
Yuta Michimura
Nobuyuki Kanda (EO)
Takahiro Yamamoto (PD)
Koji Nagano (Student)
Zong-Hong Zhu (region)
Hyung-Won Lee (region)
Ray-Kuang Lee (region)

SEO

Yoshio Saito 齊藤芳雄
(Sys. Engineering Office)

Data Analysis Committee (DAC)
* Hideyuki Tagoshi
+ WGs chairs/vice chairs
+ Hisaaki Shinkai (board)



- **Compact Binary Coalescence**: * Hideyuki Tagoshi, Kipp Cannon, Hyung-Won Lee, Tjonnie Li
- **Continuous Wave**: * Yousuke Itoh
- **Burst Wave**: * Kazuhiro Hayama
- **Stochastic Wave**: * Guo-Chin Liu, Sachiko Kuroyanagi
- **Computing & Software**: * Ken-ichi Oohara, Hirotaka Takahashi, Kazuki Sakai
- **Calibration**: * Yuki Inoue
- **Detchar**: * Keiko Kokeyama

Author-list Committee
*Yousuke Itoh
Takashi Uchiyama
Feng-Li Lin
Yoichi Aso
Kazuhiro Hayama
John J. Oh

Collaborator-list Manager
* Hideyuki Tagoshi
Sachiko Kuroyanagi
Rie Kikuchi

Future Planning Committee (FPC)
*Sadakazu Haino
Chunglee Kim
Kentaro Komori
Matteo Leonardi
Atsushi Nishizawa
Yuta Michimura
+ Kentaro Somiya (chair of PRDC)

Project R&D Committee (PRDC)
*Kentaro Somiya
Yosuke Itoh
Shinji Miyoki
+ Sadakazu Haino (chair of FPC)

Diversity Committee
* Keiko Kokeyama
Joseph M Fedrow
Chunglee Kim
Kazuki Sakai
Hisaaki Shinkai
Hirotaka Yuzurihara

International Cooperation WG
Tadayuki Tomaru
Nobuyuki Kanda
Hisaaki Shinkai
Hyung-Won Lee
Zhong-Hong Zhu
Feng-Li Lin
Helios Vocca

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

KAGRA collaboration papers

KAGRA

PTEP

Prog. Theor. Exp. Phys. **2018**, 013F01 (23 pages)
DOI: 10.1093/ptep/ptx180

Construction of KAGRA: an underground gravitational-wave observatory

T. Akutsu[1], M. Ando[1,2,3], S. Araki[4], A. Araya[5], T. Arima[6], N. Aritomi[3], H. Asada[7], Y. Aso[1], S. Atsuta[8], K. Awai[9,10], L. Baiotti[11], M. A. Barton[1], D. Chen[9], K. Cho[12], K. Craig[9], R. DeSalvo[13,14], K. Doi[9,10,15], K. Eda[2,3], Y. Enomoto[9], R. Flaminio[1], S. Fujibayashi[16], Y. Fujii[1], M.-K. Fujimoto[1], M. Fukushima[1], T. Furuhata[15], A. Hagiwara[4], S. Haino[17], S. Harita[8], K. Hasegawa[9], M. Hasegawa[18], K. Hashino[15], K. Hayama[9,10], N. Hirata[1], E. Hirose[9,10], B. Ikenoue[1], Y. Inoue[17], K. Ioka[19], H. Ishizaki[1], Y. Itoh[2,*], D. Jia[18], T. Kagawa[15], T. Kaji[6], T. Kajita[9,10], M. Kakizaki[15], H. Kakuhata[18], M. Kamiizumi[9,10], S. Kanbara[15], N. Kanda[6], S. Kanemura[15], M. Kaneyama[6], J. Kasuya[8], Y. Kataoka[8], K. Kawaguchi[19], N. Kawai[8], S. Kawamura[9,10], F. Kawazoe[20], C. Kim[21,22], J. Kim[23], J. C. Kim[24], W. Kim[25], N. Kimura[4,9], Y. Kitaoka[6], K. Kobayashi[15], Y. Kojima[26], K. Kokeyama[9,10], K. Komori[3], K. Kotake[27], K. Kubo[28], R. Kumar[4], T. Kume[4], K. Kuroda[9], Y. Kuwahara[3], H.-K. Lee[29], H.-W. Lee[24], C.-Y. Lin[30], Y. Liu[9], E. Majorana[31], S. Mano[32], M. Marchio[1], T. Matsui[15], N. Matsumoto[33,34], F. Matsushima[15], Y. Michimura[3], N. Mio[35], O. Miyakawa[9,10], K. Miyake[18], A. Miyamoto[6], T. Miyamoto[9,10], K. Miyo[9], S. Miyoki[9,10], W. Morii[36], S. Morisaki[2,3], Y. Moriwaki[15], Y. Muraki[8], M. Murakoshi[28], M. Musha[37], K. Nagano[9], S. Nagano[38], K. Nakamura[1], T. Nakamura[16], H. Nakano[16], M. Nakano[18], M. Nakano[9,10], H. Nakao[6], K. Nakao[6], T. Narikawa[6], W.-T. Ni[39,40], T. Nonomura[28], Y. Obuchi[1], J. J. Oh[25], S.-H. Oh[25], M. Ohashi[9,10], N. Ohishi[1,10], M. Ohkawa[41], N. Ohmae[35], K. Okino[42], K. Okutomi[43], K. Ono[9], Y. Ono[44], K. Oohara[41], S. Ota[28], J. Park[12], F. E. Peña Arellano[1], I. M. Pinto[13,14], M. Principe[13,14], N. Sago[45], M. Saijo[46], T. Saito[41], Y. Saito[9,10], S. Saitou[1], K. Sakai[47], Y. Sakakibara[9], Y. Sasaki[48], S. Sato[28,†], T. Sato[41], Y. Sato[4], T. Sekiguchi[9,10], Y. Sekiguchi[49], M. Shibata[19], K. Shiga[41], Y. Shikano[50,51], T. Shimoda[3], H. Shinkai[52], A. Shoda[1], N. Someya[28], K. Somiya[8,‡], E. J. Son[25], T. Starecki[53], A. Suemasa[37], Y. Sugimoto[15], Y. Susa[8], H. Suwabe[41], T. Suzuki[4,9], Y. Tachibana[8], H. Tagoshi[6], S. Takada[54], H. Takahashi[48], R. Takahashi[1], A. Takamori[5], H. Takeda[3], H. Tanaka[9,10], K. Tanaka[6], T. Tanaka[16], D. Tatsumi[1], S. Telada[55], T. Tomaru[4,9], K. Tsubono[3], S. Tsuchida[6], L. Tsukada[2,3], T. Tsuzuki[1], N. Uchikata[6], T. Uchiyama[9,10], T. Uehara[56,57], S. Ueki[48], K. Ueno[58], F. Uraguchi[1], T. Ushiba[3], M. H. P. M. van Putten[59,60], S. Wada[3], T. Wakamatsu[41], T. Yaginuma[8], K. Yamamoto[9,10], S. Yamamoto[52], T. Yamamoto[9,10], K. Yano[8], J. Yokoyama[2,3,61], T. Yokozawa[6], T. H. Yoon[62], H. Yuzurihara[6], S. Zeidler[1], Y. Zhao[63], and L. Zheng[64]

(KAGRA Collaboration)

Prog. Theor. Exp. Phys. (2018) 013F01
[arXiv:1712.00148]

Construction & iKAGRA operation (2016)

Nature Astronomy, 3 (2019) 35.
[arXiv:1811.08079]

introduction
& history

nature astronomy

PERSPECTIVE

https://doi.org/10.1038/s41550-018-0658-y

KAGRA: 2.5 generation interferometric gravitational wave detector

KAGRA collaboration

The recent detections of gravitational waves (GWs) reported by the LIGO and Virgo collaborations have made a significant impact on physics and astronomy. A global network of GW detectors will play a key role in uncovering the unknow
sources in coordinated observations with astronomical telescopes and detectors. Here we introduce KAGRA, a
tor with two 3 km baseline arms arranged in an 'L' shape. KAGRA's design is similar to the second generations of
and Advanced Virgo, but it will be operating at cryogenic temperatures with sapphire mirrors. This low-temper
advantageous for improving the sensitivity around 100 Hz and is considered to be an important feature for the th
GW detector concept (for example, the Einstein Telescope of Europe or the Cosmic Explorer of the United S
KAGRA is often called a 2.5-generation GW detector based on laser interferometry. KAGRA's first observation r
in late 2019, aiming to join the third observation run of the advanced LIGO–Virgo network. When operating along
ing GW detectors, KAGRA will be helpful in locating GW sources more accurately and determining the source p
higher precision, providing information for follow-up observations of GW trigger candidates.

Seeing is believing. We were reminded of this proverb when we received the news of the discovery of GW150914, the first direct detection of gravitational waves (GWs)[1]. The existence of GWs has been believed since Russel Hulse and Joseph Taylor discovered the binary pulsar PSR B1913 + 16 in 1974 (ref. [2]). The long-term radio observation of this system has shown that the observed orbital decay is well described by the energy/angular momentum loss due to GW emission as predicted by Einstein in 1915 (ref. [3]).

Figure 1 shows the location of KAGRA in Kam
interferometer shares the area with the well-known
tors Super-Kamiokande and KamLAND. Kamioka
located 1.5 hour driving distance from the city of
biggest claim to fame being an old mine.
Compared with existing laser interferometers,
nologically unique in two features. Firstly, it is loca
ground site to reduce seismic noise. Secondly, KAG

Vibration isolation

CQG accepted
[arXiv:1901.03053]

IOPscience Journals Books Publishing Support Login Search IOPscience c

Classical and Quantum Gravity

ACCEPTED MANUSCRIPT

Vibration isolation system with a compact damping system for power recycling mirrors of KAGRA

Ayaka Shoda[1]

Accepted Manuscript online 14 March 2019 • © 2018 IOP Publishing Ltd

What is an Accepted Manuscript?

CQG accepted
[arXiv:1901.03569]

arXiv.org > astro-ph > arXiv:1901.03569

Search or Arti
(Help | Advanced s

Astrophysics > Instrumentation and Methods for Astrophysics

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

KAGRA Collaboration: T. Akutsu, M. Ando, K. Arai, Y. Arai, S. Araki, A. Araya, N. Aritomi, H. Asada, Y. Aso, S. Atsuta, K. Awai, S. Bae, L. Baiotti, M. A. Barton, K. Cannon, E. Capocasa, C-S. Chen, T-W. Chiu, K. Cho, Y-K. Chu, K. Craig, W. Creus, K. Doi, K. Eda, Y. Enomoto, R. Flaminio, Y. Fujii, M.-K. Fujimoto, M. Fukunaga, M. Fukushima, T. Furuhata, A. Hagiwara, S. Haino, K. Hasegawa, K.

phase-1 operation (2018)

articles on KAGRA

NEWS IN FOCUS

PHYSICS Tantalizing signs of superconductivity at near-room temperature p.12 | POLITICS Violence in Nicaragua engulfs scientists p.11 | NEW YEAR Gene-editing, open access and seals with sensors to shape 2019 p.13 | MATERIALS The scramble to understand a twisted form of graphene p.15

Japan's Kamioka Gravitational Wave Detector is scheduled to start up in 2019, joining a global network of interferometers.

PHYSICS

Japan to begin pioneering hunt for gravitational waves

The underground KAGRA detector will deploy ambitious technology to improve sensitivity.

BY DAVIDE CASTELVECCHI

Inside a house-sized scaffolding wrapped in thick plastic sheets, Takayuki Tomaru is in full clean-room attire. The physicist, who works at the High Energy Accelerator Research Organization (KEK) in Tsukuba, Japan, is performing one of the most delicate and crucial tasks in the construction of a gravitational-wave observatory: installing one of the machine's four mirrors, each a 23-kilogram cylinder of solid sapphire known as a test mass.

When operations begin later this year, their job will be to bounce infrared laser beams back and forth along two 3-kilometre, high-vacuum pipes, ready to sense the passage of gravitational waves (see 'Japan's wave hunter').

The ¥16.4-billion (US$148-million) observatory — Japan's Kamioka Gravitational Wave Detector (KAGRA) — will work on the same principle as the two detectors of the Laser Interferometer Gravitational-Wave Observatory (LIGO) in the United States and the Virgo solo machine in Italy. In the past few years, these machines have begun to detect gravitational waves — long-sought ripples in the fabric of space-time, created by cataclysmic cosmic events such as the merging of two black holes or the collision of two neutron stars.

With the addition of KAGRA, the growing global network of detectors will enable astrophysicists to locate the position of these feeble cosmic signals in the sky with greatly increased precision. They will be able to dissect the waves' properties, such as how they are

3 JANUARY 2019 | VOL 565 | NATURE | 9

© 2019 Springer Nature Limited. All rights reserved.

Nature 565 (2019 Jan) 30

ScienceNews
MAGAZINE OF THE SOCIETY FOR SCIENCE & THE PUBLIC

SCIENCE NEWS NEEDS YOU
Support nonprofit journalism
Subscribe now
SUBSCRIBE

Search Science News...

MENU TOPICS BLOGS EDITOR'S PICKS MAGAZINE

LATEST | MOST VIEWED

NEWS IN BRIEF
Scientists have chilled tiny electronics to a record low temperature
BY EMILY CONOVER MARCH 08, 2019

SCIENCE VISUALIZED
How droplets of oil or water can glow vibrant colors
BY MARIA TEMMING MARCH 08, 2019

MYSTERY SOLVED
Microwaved grapes make fireballs, and scientists now know why
BY EMILY CONOVER MARCH 08, 2019

REVIEWS & PREVIEWS
'Skeleton Keys' unlocks the history and mysteries of bones
BY SID PERKINS MARCH 08, 2019

NEWS IN BRIEF
Merging magnetic blobs fuel the sun's huge plasma eruptions
BY LISA GROSSMAN MARCH 07, 2019

SOCIETY UPDATE
The latest stories from *Science News for Students*

NEWS
Human encroachment threatens chimpanzee culture
BY SUJATA GUPTA MARCH 07, 2019

NEWS
How helpful gut microbes send signals that they are friends, not foes

NEWS PHYSICS, ASTRONOMY, GRAVITATIONAL WAVES

A new gravitational wave detector is almost ready to join the search

Japan's KAGRA experiment tests new techniques for spotting ripples in spacetime

BY EMILY CONOVER 7:00AM, JANUARY 18, 2019

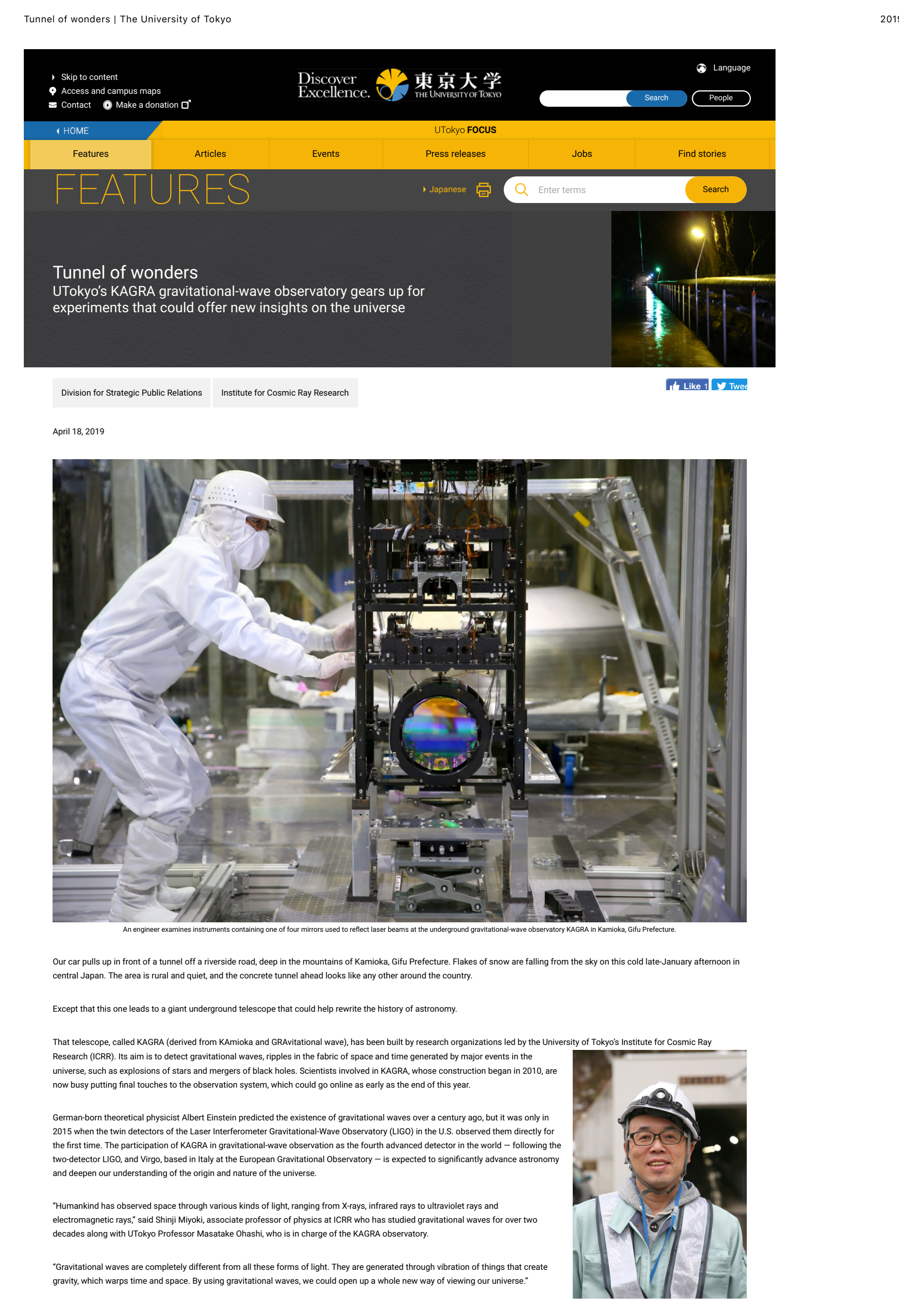
DEEP AND COLD Chilled mirrors and an underground hideout (shown) should help the KAGRA experiment in its upcoming search for gravitational waves.

ICRR, UNIV. OF TOKYO

Magazine issue: Vol. 195, No. 3, February 16, 2019, p. 8

Science News 195 (2019 Feb) 8

https://www.sciencenews.org/



Tunnel of wonders | The University of Tokyo

Skip to content
Access and campus maps
Contact Make a donation
Discover Excellence. 東京大学 THE UNIVERSITY OF TOKYO
Language
Search People
HOME
UTokyo FOCUS
Features | Articles | Events | Press releases | Jobs | Find stories

FEATURES

Japanese
Enter terms Search

Tunnel of wonders

UTokyo's KAGRA gravitational-wave observatory gears up for experiments that could offer new insights on the universe

Division for Strategic Public Relations | Institute for Cosmic Ray Research

April 18, 2019

An engineer examines instruments containing one of four mirrors used to reflect laser beams at the underground gravitational-wave observatory KAGRA in Kamioka, Gifu Prefecture.

Our car pulls up in front of a tunnel off a riverside road, deep in the mountains of Kamioka, Gifu Prefecture. Flakes of snow are falling from the sky on this cold late-January afternoon in central Japan. The area is rural and quiet, and the concrete tunnel ahead looks like any other around the country.

Except that this one leads to a giant underground telescope that could help rewrite the history of astronomy.

That telescope, called KAGRA (derived from KAmioka and GRAvitational wave), has been built by research organizations led by the University of Tokyo's Institute for Cosmic Ray Research (ICRR). Its aim is to detect gravitational waves, ripples in the fabric of space and time generated by major events in the universe, such as explosions of stars and mergers of black holes. Scientists involved in KAGRA, whose construction began in 2010, are now busy putting final touches to the observation system, which could go online as early as the end of this year.

German-born theoretical physicist Albert Einstein predicted the existence of gravitational waves over a century ago, but it was only in 2015 when the twin detectors of the Laser Interferometer Gravitational-Wave Observatory (LIGO) in the U.S. observed them directly for the first time. The participation of KAGRA in gravitational-wave observation as the fourth advanced detector in the world — following the two-detector LIGO, and Virgo, based in Italy at the European Gravitational Observatory — is expected to significantly advance astronomy and deepen our understanding of the origin and nature of the universe.

"Humankind has observed space through various kinds of light, ranging from X-rays, infrared rays to ultraviolet rays and electromagnetic rays," said Shinji Miyoki, associate professor of physics at ICRR who has studied gravitational waves for over two decades along with UTokyo Professor Masatake Ohashi, who is in charge of the KAGRA observatory.

"Gravitational waves are completely different from all these forms of light. They are generated through vibration of things that create gravity, which warps time and space. By using gravitational waves, we could open up a whole new way of viewing our universe."

https://www.u-tokyo.ac.jp/focus/en/features/z0508_00111.html

Univ. Tokyo Features (2019 Apr)

https://www.u-tokyo.ac.jp/focus/en/features/z0508_00111.html

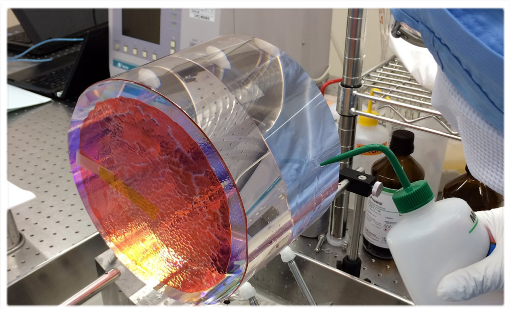
KSC Newsletter

linked from https://gwcenter.icrr.u-tokyo.ac.jp/en/

KAGRA SCIENTIFIC CONGRESS: COLLABORATORS' INFORMATION EXCHANGE 2018/04/01

KSC NewsLetter

The premiere issue



What is this NewsLetter?
Nobody knows if this is the first issue of a series of information letters, or just a April fool's day joke.

Phase-1 operation starts on April 23

irst cryogenic interferometer test will start soon.

fter two years from the iKAGRA run, we will start phase-1 operation on April 23
May 6. Due to the ti
ngineering office (SEO)
rm), and the other at n
utcomes. So it might be
he run is at page-3.
he above photo, taken in
apphire mirror for X-end
ryo-payload at X-end is
enter now 😊.

Three words

1 GW

Find GW.
Here GW is not "Gravitational Wave", but "Golden Week".

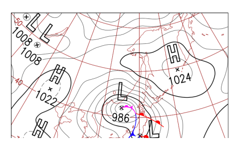
KAGRA SCIENTIFIC CONGRESS: COLLABORATORS' INFORMATION EXCHANGE 2018/08/01

KSC Newsletter

Second Issue

From Phase 1 to Phase 2

Nine-day operation with wild weather & earthquakes

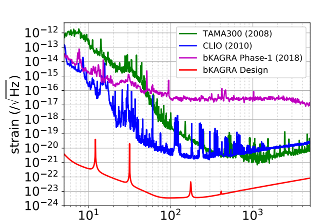


KAGRA now has the world's tallest vibration isolation systems (13.5 m) which help to reduce seismic noise at low frequencies. The volume of the vacuum system is third largest in the world. Two 23-kg sapphire mirrors have been installed at each end, and one of them was kept for 30 day cryogenic temperature (18K).

A leakage of the vacuum system was found in April 2018, therefore Phase-1 experimental activity was delayed for 5 days. Despite difficulties, the phase-1 operation was a success: it lasted from April to May 6, 2018, and during this period many injection tests w performed.

The interferometer duty cycle during the Phase-1 operation reached 88.6% between April 28 and May 2, while it dropped to 26.8% on May 3 and 4. Finally it slightly improved to 59.8% over the final days (May 5 & 6). The longest lock was over 10 hours. The low duty cycle on May 3 and on the following days was mainly attributed to the high micro-seismic noise caused by a heavy storm, local earthquakes, volcano eruptions in Hawaii, and visits of theorists.

The achieved sensitivity during Phase 1 was still worse than the final sensitivities of TAMA and CLIO, except at the lower frequencies (40 Hz), where KAGRA's sensitivity was better than that of TAMA. KAGRA started Phase 2 from May 7: the final installation work before the real observation run.



Conte
p-2 Di
p-3 K
p-5 M
p-8 Vi
p-9 W

1

KAGRA SCIENTIFIC CONGRESS: COLLABORATORS' INFORMATION EXCHANGE 2018/12/01

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[1]) and will take scientific data at least for one year continuously. We keep our original plan of DRFPMI (RSE)[2] and also have a backup plan of FPMI[3] (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.

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

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!

Contents of this issue

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

KSC Newsletter

Issue 4

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

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

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

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

Contents of this issue

1

Hisaaki Shinkai (Osaka Inst. Tech.

KAGRA meetings 2018-2019

<only for KAGRA collaborators >

Face-to-Face meeting

May 2018 @ Osaka City Univ.
3 days, 103 attended

Aug. 2018 @ Univ. Toyama
3 days+satellite, 124 attended

Dec. 2018 @ NAOJ
2 days+2 satellites, 118 attended

Apr. 2019 @ ICRR
3 days+3 satellites, 138 attended

Aug. 22-24, 2019 @ Univ. Toyama
3 days

Dec. 4-5, 2019 @ RESCEU, U.Tokyo
2 days

<open-type workshops >

International Workshop

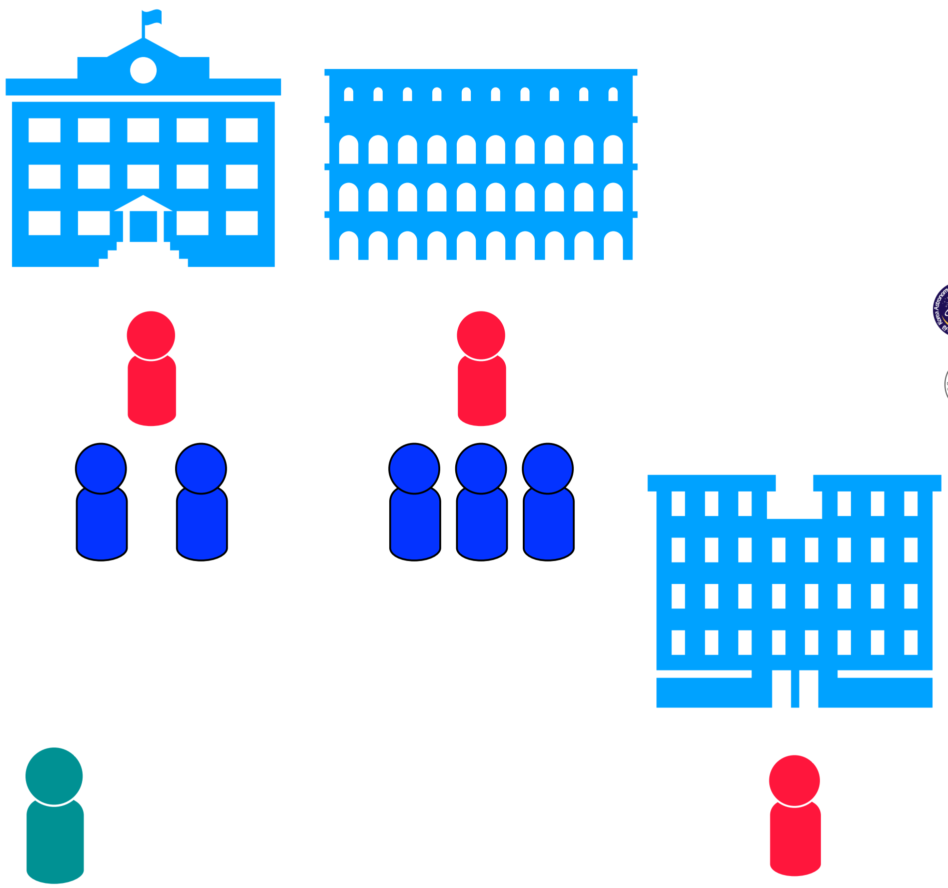
June 2018 @ Seoul, Korea
2 days, 100 attended

Feb. 2019 @ Perugia, Italy
2 days + future, 100 attended

Jun. 2019 @ Wuhan, China
3 days

May 2020 @ Taiwan
3 days

If you plan to join the KAGRA collaboration, ……



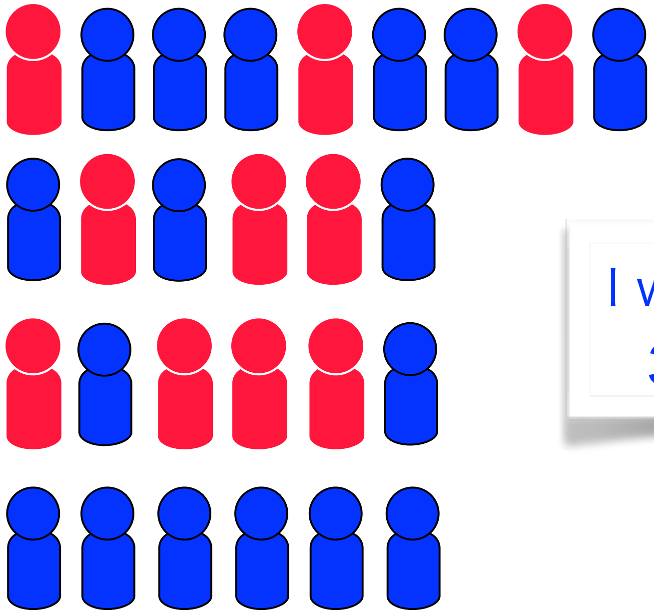
If you are totally new to KAGRA, then you need to make your presentation at our face-to-face meeting; how you will contribute to KAGRA.
KSC members will vote for decision.

If you are in the group of KAGRA collaboration,
just ask to the group leader.
The leader will contact the roster.
Done.

contact to **KSC board**, kscboard@icrr.u-tokyo.ac.jp

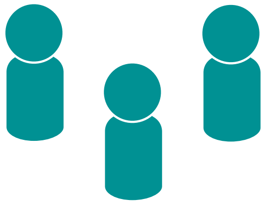
consult **the guidelines for joining KAGRA collaboration**
https://gwdoc.icrr.u-tokyo.ac.jp/cgi-bin/DocDB/ShowDocument?docid=7082

Authorship of Collaboration Papers



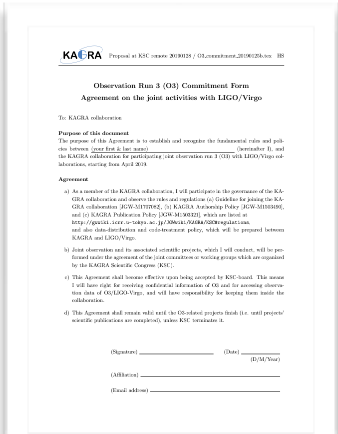
Application for the authorship **every year.**

I worked for KAGRA more than **30% of my research time.**



Anonymous referees judge. “OK”, or “NO”.

Latest paper has 197 authors.
227 members applied for the authorlist 2018



KAGRA Proposal at KSC remote 20190128 / O3_commitment_20190125b.tex HS

Observation Run 3 (O3) Commitment Form
Agreement on the joint activities with LIGO/Virgo

To: KAGRA collaboration

Purpose of this document
The purpose of this Agreement is to establish and recognize the fundamental rules and policies between (your first & last name) ____________ (hereinafter I), and the KAGRA collaboration for participating joint observation run 3 (O3) with LIGO/Virgo collaborations, starting from April 2019.

Agreement

a) As a member of the KAGRA collaboration, I will participate in the governance of the KAGRA collaboration and observe the rules and regulations (a) Guideline for joining the KAGRA collaboration [JGW-M1707082], (b) KAGRA Authorship Policy [JGW-M1503490], and (c) KAGRA Publication Policy [JGW-M1503321], which are listed at http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/KAGRA/KSC#regulations, and also data-distribution and code-treatment policy, which will be prepared between KAGRA and LIGO/Virgo.

b) Joint observation and its associated scientific projects, which I will conduct, will be performed under the agreement of the joint committees or working groups which are organized by the KAGRA Scientific Congress (KSC).

c) This Agreement shall become effective upon being accepted by KSC-board. This means I will have right for receiving confidential information of O3 and for accessing observation data of O3/LIGO-Virgo, and will have responsibility for keeping them inside the collaboration.

d) This Agreement shall remain valid until the O3-related projects finish (i.e. until projects' scientific publications are completed), unless KSC terminates it.

(Signature) ____________ (Date) ____________
(D/M/Year)

(Affiliation) ____________

(Email address) ____________

O3 commitment form

for accessing LV data
after joining O3

O3 commitment form

KAGRA Proposal at KSC remote 20190128 / O3_commitment_20190125b.tex HS

Observation Run 3 (O3) Commitment Form
Agreement on the joint activities with LIGO/Virgo

To: KAGRA collaboration

Purpose of this document
The purpose of this Agreement is to establish and recognize the fundamental rules and policies between (your first & last name) ____________ (hereinafter I), and the KAGRA collaboration for participating joint observation run 3 (O3) with LIGO/Virgo collaborations, starting from April 2019.

Agreement

a) As a member of the KAGRA collaboration, I will participate in the governance of the KAGRA collaboration and observe the rules and regulations (a) Guideline for joining the KAGRA collaboration [JGW-M1707082], (b) KAGRA Authorship Policy [JGW-M1503490], and (c) KAGRA Publication Policy [JGW-M1503321], which are listed at `http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/KAGRA/KSC#regulations`, and also data-distribution and code-treatment policy, which will be prepared between KAGRA and LIGO/Virgo.

b) Joint observation and its associated scientific projects, which I will conduct, will be performed under the agreement of the joint committees or working groups which are organized by the KAGRA Scientific Congress (KSC).

c) This Agreement shall become effective upon being accepted by KSC-board. This means I will have right for receiving confidential information of O3 and for accessing observation data of O3/LIGO-Virgo, and will have responsibility for keeping them inside the collaboration.

d) This Agreement shall remain valid until the O3-related projects finish (i.e. until projects' scientific publications are completed), unless KSC terminates it.

(Signature) ____________ (Date) ____________
(D/M/Year)

(Affiliation) ____________

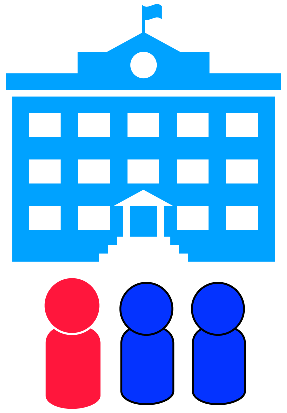
(Email address) ____________

I will observe the rules & regulations
(a) Guideline for joining KAGRA collaboration
(b) KAGRA authorship policy
(c) KAGRA publication policy
+
data-distribution and code-treatment policy which will be prepared between LVK.

I will conduct joint observation & scientific projects under the agreement of the joint committees or WGs of KSC.

Up to now, over 360 members filed
http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/KAGRA/KSC/O3#Commit

KAGRA collaboration MoU (agreement)



“KAGRA collaboration MoU”

Each groups are asked to file "Collaboration MoU” together with a "List of O3-Shift candidates". Filing this agreement is necessary for getting a local support for observation shift, which will begin in late 2019. JGWdoc-M1909818

[JGW-M1909818v3] (XXX Group)

Memorandum of Understanding

Between XXX Group and KAGRA
on the KAGRA Collaboration

Contents

1 Purpose

The purpose of this Memorandum of Understanding (“MoU”) is to exchange the mutual understandings between

XXX Group (hereinafter **Group A**) and **KAGRA**

in connection with starting the KAGRA scientific observation in 2019, jointly with LIGO (in United States) and Virgo (in Europe).

While each individual member of Group A had once agreed with KAGRA to work together towards common our scientific goals when he/she joined the KAGRA collaboration, this MoU is to confirm that **Group A** will hereafter participate as a unit in all the aspects of the project, including KAGRA’s future upgrade plans.

Group A is defined as the representative of the following group and its members.

- Department of XXX, University of XXX, XXX, Japan
  Representative: XXX YYY, Professor

KAGRA is defined in Section 3 of this MoU.

KAGRA Collaboration MoU [JGW-M1909818v3] (XXX Group) 2

2 Background

KAGRA is a 3-km laser-interferometer gravitational wave observatory located in Kamioka, Gifu, Japan. The goals of the experiment include observations for gravitational wave, and studies of their physical and astronomical processes.

The KAGRA project was initially planned by the Japanese gravitational wave community in the 1990s as the successive project of TAMA, a 300-m laser-interferometer gravitational wave observatory located in Mitaka, Tokyo. After many years of intense effort, in 2010, the full project was funded by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan Society for the Promotion of Science (JSPS) Leading-edge Research Infrastructure Program.

Its on-site construction began in 2012, and two test operations were performed in March-April 2016 (*iKAGRA*), and April-May 2018 (*bKAGRA phase-1*). KAGRA will finish its full installation in the end of March 2019, and will begin the real observation in late 2019, jointly with LIGO and Virgo.

Before starting the scientific observations, the KAGRA collaboration has decided to establish this MoU with each of the participating groups in order to confirm their mutual understandings with respect to the forthcoming tasks of the observations and also to start plans for the future upgrade of KAGRA.

3 Organization of the KAGRA collaboration

The KAGRA collaboration is composed of core organization:

1) Principal Investigator (PI)
The PI will have overall responsibility of the project.

2-A) Executive Office (EO)
The EO will handle all issues associated with financial matters of the construction and experiment. The PI will serve as the chair of the EO. A System Engineering Office (SEO), which takes controls of all the KAGRA construction, commissioning and operation tasks, is organized under the EO.

2-B) KAGRA Scientific Congress (KSC)
The KSC is the decision making body of KAGRA collaborators regarding its scientific direction and strategy. A board is formed under the KSC, whose members are elected every two years by vote of the members of KSC. The KSC board organizes the collaboration meetings and coordinates the joint observation with LIGO/Virgo, and other groups.

Currently, the KAGRA collaboration is composed of 90 institutions/universities from 15 countries, and has over 200 active research colleagues. The three host institutions are

- Institute for Cosmic Ray Research (ICRR), The University of Tokyo,
- National Astronomical Observatory in Japan (NAOJ), and

KAGRA Collaboration MoU [JGW-M1909818v3] (XXX Group) 3

- High Energy Accelerator Research Organization (KEK).

The main rules and regulations of the KAGRA collaboration are comprised of (a) Guideline for joining the KAGRA collaboration [JGW-M1707082], (b) KAGRA Authorship Policy [JGW-M1503490], and (c) KAGRA Publication Policy [JGW-M1503321], which are listed at `http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/KAGRA/KSC#regulations`. All members of the KAGRA collaboration will have the responsibility to observe these rules and regulations, including data-distribution policy, which will be prepared between KAGRA and LIGO/Virgo.

4 Understandings on the observations at KAGRA

Group A and **KAGRA** share a mutual understanding on the following issues regarding the upcoming observations (Observation 3 and 4 together with LIGO/Virgo; starting 2019 and 2021 respectively, and also for any other succeeding observations that are scheduled after Observation 4).

1. **Group A** is expected to provide the technical and scientific personnel required to fulfill the observation. This requirement includes participation into the data-taking shifts at the KAGRA site, approximately in proportion to the number of the members in **Group A**, and to complete physics/astrophysics analysis jointly. Details of these activities will be determined separately.
2. KAGRA will privide the on-site operation cost. KAGRA will support the local expenses of the members of **Group A** within limits of the the available budget under the ICRR Inter-University Research program.
3. All members of the KAGRA collaboration members will have the responsibility to observe the safety rules at the KAGRA site. In order to be covered by the worker’s accident insurance, all collaboration members are required to participate in the joint research program of ICRR in advance before taking part in any shift work.

5 Understandings on the future upgrade of KAGRA

Group A and **KAGRA** share a mutual understanding on the following issues regarding the future upgrade of KAGRA facilities.

1. After the originally-planned observation (up to the Observation 4 together with LIGO/Virgo) is over, KAGRA will proceed with its upgrade for better sensitivity, which will be conducted in accordance with the discussions and conclusions made by the KSC and EO.
2. **Group A** will join the upgrade processes from the planning stages, and if Group A were to be in charge of a certain part, it will accept responsibility in performing such upgrades.
3. EO and KSC will help **Group A** to obtain funding from the place or country of **Group A**’s origin, for carrying out the related R&D, preparation and installation of the new equipment for KAGRA.

KAGRA Collaboration MoU [JGW-M1909818v3] (XXX Group) 4

6 Effective Period

This MoU will commence as of the date it is signed by both the PI of KAGRA and the representative of **Group A** .

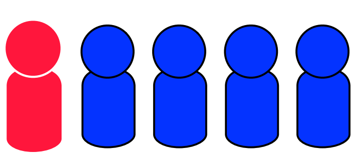
This MoU will remain effective for the duration of the project and can be automatically extended or modified as long as **Group A** and KAGRA agree. By signing below, all of the participating members of **Group A** acknowledge and agree to abide by the conditions of the KAGRA collaboration as described in this MoU.

Takaaki Kajita Date
Institute for Cosmic Ray Research, The University of Tokyo
Principal Investigator of KAGRA

XXX YYY Date
Professor, University of XXX
The representative of XXX Group

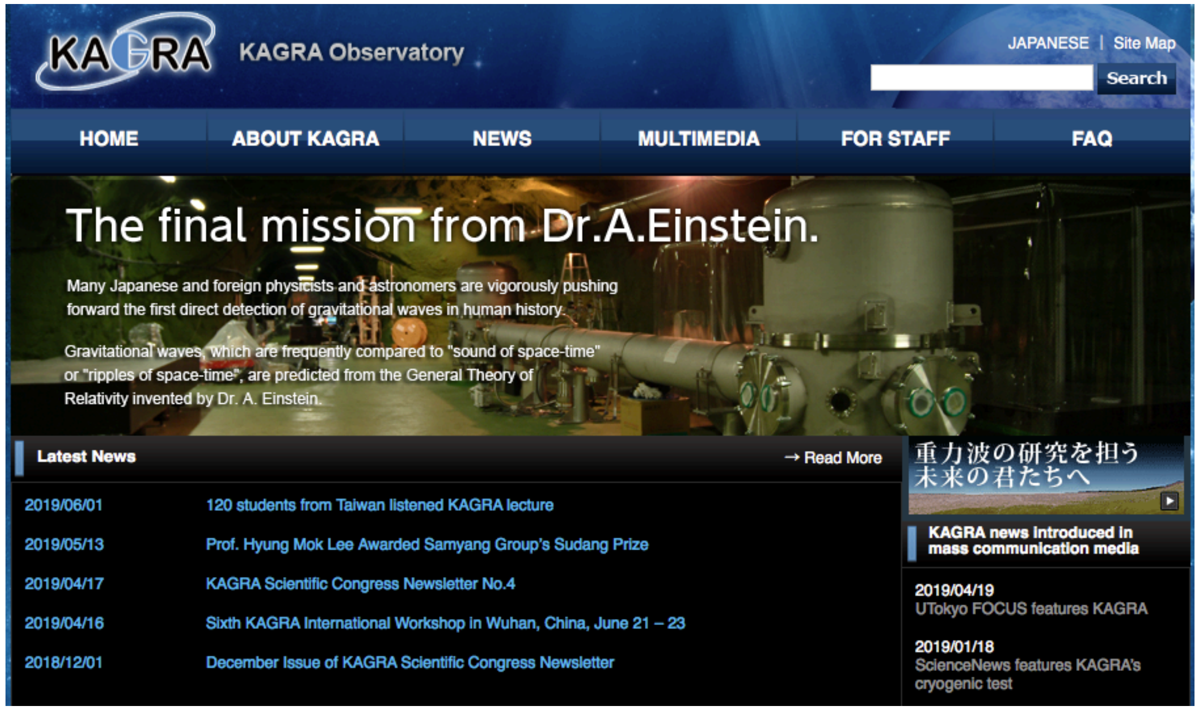
Up to now, 59 groups filed it (with 250 shift candidates)

http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/KAGRA/KSC/O3#MOU



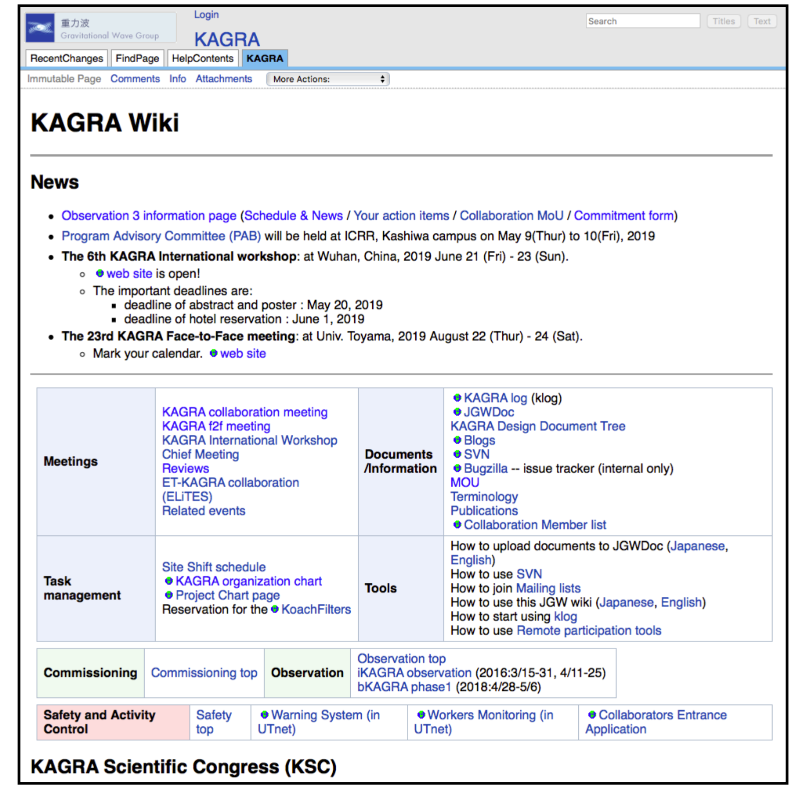
obs. shift at the KAGRA site
around 8 hours x 5 for O3

We welcome your join to KAGRA



https://gwcenter.icrr.u-tokyo.ac.jp/en/

general information



http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/KAGRA

technical information

https://yumenavi.info/lecture_sp.aspx?GNKCD=g008563

https://gwdoc.icrr.u-tokyo.ac.jp/JGWDoc/

document server

<some pages are restricted>

http://klog.icrr.u-tokyo.ac.jp/osl/

technological updates