

LIGO SCIENTIFIC COLLABORATION  
VIRGO COLLABORATION  
KAGRA COLLABORATION

<b>Technical Document</b>	<b>LIGO-T2200382-v1</b> <b>VIR-1175A-22</b> <b>JGW-T2214589</b>
<b>The LSC-Virgo-KAGRA Communications and Education White Paper (2024 edition)</b>	
The LSC-Virgo-KAGRA <b>Communications and Education</b> Working Groups	

<http://www.ligo.org>  
<http://www.virgo-gw.eu>  
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## Overview and Executive Summary

The Collaboration program committees review and establish the goals of the Collaboration on an annual basis. The LSC Program is documented in DCC-NNNNN. Each Division of the Collaboration identifies the work needed to achieve the Collaboration's goals and documents them in a white paper. This is the white paper for the Communications and Education [EPO] Division.

## EPO-1 Observatory EPO

### EPO-1.1 LHO Outreach

**Start date:** ongoing

**Estimated due date:** ongoing

LHO operates the LIGO Exploration Center (LExC), runs the International Physics and Astronomy Educator Program, and supplements in-person outreach activities with virtual experiences.

#### *Motivation and goals*

LHO uses its outreach efforts to inspire a sense of wonder, engage curiosity and diversify the future STEM workforce.

#### ACTIVITY EPO-1.1-A-**INFRAOPS**: LIGO EXPLORATION CENTER (LExC AT LHO)

With the opening of the LIGO Exploration Center (LExC) in June of 2022 we will work to take full advantage of Washington States investment in the center. To do this we will focus on increasing program attendance and acquiring additional exhibits.

#### ACTIVITY EPO-1.1-B-**INFRAOPS**: INTERNATIONAL PHYSICS AND ASTRONOMY EDUCATOR PROGRAM AT LHO

We will continue to organize a yearly International Physics and Astronomy Educator Program at LHO

#### TASK EPO-1.1-B(i)-**INFRAOPS**: IPA LECTURES

Delivery of lectures or workshops at IPA program.

#### ACTIVITY EPO-1.1-C-**INFRAOPS**: VIRTUAL LHO EXPERIENCES

We will change our virtual offerings, primarily targeting local schools with virtual tours and classroom oriented experiences in order to help deal with the current pandemic and to adapt to post-pandemic constraints and opportunities

#### TASK EPO-1.1-C(i)-**INFRAOPS**: VIRTUAL OUTREACH

Assisting with virtual outreach events

### EPO-1.2 LLO Outreach

**Start date:** ongoing

**Estimated due date:** ongoing

LLO operates LIGO's science education center which reaches out to the local community to use the inspiring science from LIGO to inspire the scientist within everyone.

#### *Motivation and goals*

LLO uses its outreach efforts to inspire a sense of wonder, engage curiosity and diversify the future STEM workforce.

*Expected products and/or outcomes*

LLO engages its local community through a series of in-person and virtual field trips, teacher professional development opportunities, and community events. When recruiting field trip and teacher PD participants, we ensure that under-represented groups are well-represented. By engaging underrepresented 4th - 12th grade students in experiences featuring LIGO, and supporting their STEM teachers we seek to diversify the local STEM pipeline.

**ACTIVITY EPO-1.2-A-INFRAOPS: SCIENCE EDUCATION CENTER (SEC AT LLO)**

We will build upon LLO Science Education Center's (SEC) past outreach efforts to engage K-16 school audiences, with goals of recruiting K-12 students that reflect the diversity of Louisiana. We will expand on our ability for evaluating the impact the programs have on students participating.

**TASK EPO-1.2-A(i)-INFRAOPS: ONSITE FIELD TRIPS**

Field trips to LIGO designed for grades 4-12

**TASK EPO-1.2-A(ii)-INFRAOPS: OFFSITE FIELD TRIPS**

LIGO visits local schools

**TASK EPO-1.2-A(iii)-INFRAOPS: DOCENT PROGRAM**

Training and supporting university STEM and Education undergraduates to do STEM outreach

**TASK EPO-1.2-A(iv)-INFRAOPS: PUBLIC VISITS**

Support of families visiting the observatories primarily on Science Saturdays

**TASK EPO-1.2-A(v)-INFRAOPS: COMMUNITY OUTREACH**

Participating in local STEM-oriented events

**ACTIVITY EPO-1.2-B-INFRAOPS: OBSERVATORY PROFESSIONAL DEVELOPMENT PROGRAMS AT LLO**

We will continue to organize annual professional development opportunities for teachers.

**TASK EPO-1.2-B(i)-INFRAOPS: MISE**

LLO will continue conducting the project MISE (Modeling Inquiry Science Education) teacher workshops targeting middle and high school teachers during the summer and across the year in conjunction with Southern University of Baton Rouge.

**TASK EPO-1.2-B(ii)-INFRAOPS: LIGO GNO-STEM**

LLO will continue conducting a week-long teacher workshop targeting middle and high school teachers for the Greater New Orleans area in conjunction with the GNO-STEM.

**TASK EPO-1.2-B(iii)-INFRAOPS: LIGO LA-STEM**

LLO will continue conducting a Louisiana-wide week-long teacher workshop targeting middle and high school teachers in conjunction with the LA-STEM initiative.

**TASK EPO-1.2-B(iv)-INFRAOPS: SMALL WORKSHOPS AND SESSIONS**

LIGO will support small teacher workshop sessions through conferences and individual requests.

**ACTIVITY EPO-1.2-C-INFRAOPS: VIRTUAL LLO EXPERIENCES**

Virtual offerings will continue, targeting local schools with virtual tours and classroom oriented experiences, and expanding to non-local schools as time allows.

**TASK EPO-1.2-C(i)-INFRAOPS: VIRTUAL TOURS**

Live, virtual tours of LLO.

**TASK EPO-1.2-C(ii)-INFRAOPS: VIRTUAL FIELD TRIPS**

Live, virtual classroom activities offered in conjunction with LIGO question and answering sessions, connecting the classroom activities to the LIGO Observatory.

## **EPO-1.3 LAO Outreach**

**Start date:** ongoing

**Estimated due date:** ongoing

LAO will engage its local community at the future site for the LIGO India detector. Since this program is still nascent, these activities are meant to cover a broad range of activities similar to those covered at the LHO and LLO sites.

**ACTIVITY EPO-1.3-A-INFRAOPS: SITE-BASED EDUCATION CENTERS AT LAO**

A broad activity covering on-site outreach efforts in the local communities in and around the future detector site.

**ACTIVITY EPO-1.3-B-INFRAOPS: OBSERVATORY PROFESSIONAL DEVELOPMENT PROGRAMS AT LAO**

Teacher and professional training activities performed in conjunction with the development of LIGO India.

**ACTIVITY EPO-1.3-C-INFRAOPS: VIRTUAL LAO EXPERIENCES**

Virtual activities developed by the LAO outreach team to support education and outreach efforts for LIGO India.

## **EPO-1.4 KAGRA Site Outreach**

**Start date:** ongoing

**Estimated due date:** ongoing

*Motivation and goals*

Due to the lack of human resources, most of the KAGRA collaborators are not interested in or do not have time for EPO activities sufficiently. The target activities of KAGRA EPO are not only to appeal our products to public, but also encourage collaborators to participate outreach activities. Since LVK will announce many new scientific results in 2025, this year is the key to change the awareness of outreach activities in KAGRA.

**ACTIVITY EPO-1.4-A-INFRAOPS: KAGRA SITE TOUR (REAL TOUR / VIRTUAL TOUR)**

Using the break between O4 and O5, KAGRA site will re-open the site tour both in person and virtual. The programs should be re-modeled with the explanation contents (panels, videos, display models, etc). The educations of “tour conductors” are also planned.

**TASK EPO-1.4-A(i)-INFRAOPS: KAGRA SITE TOUR**

We remodel the tour programs. The task includes both of organizing tours (plannings, contents making, educations, preparations) and of conducting tours (guiding, after caring).

**ACTIVITY EPO-1.4-B-INFRAOPS: KAMIOKA LAB**

Local town Kamioka of KAGRA site has a small science museum, KAMIOKA LAB (Sky-Dome KAMIOKA), where KAGRA and Super-K have exhibitions with panels and also real-time monitors. We will update the contents along with the LVK O4 results.

**TASK EPO-1.4-B(i)-INFRAOPS: KAMIOKA LAB EXHIBITION**

We update the exhibition. The task includes also local lectures.

## **EPO-2 Formal Education Group**

### **EPO-2.1 Primary and Secondary Education**

**Start date:** ongoing

**Estimated due date:** ongoing

Develop resources that are useful for students in grades K-6 and 7-12. May include working with teachers of these grades.

#### *Motivation and goals*

Gravitational waves are not a subject that is taught in primary or secondary education. However gravity is discussed in US middle and high schools, and conceptual learning about General Relativity and GWs can be useful for these teachers.

#### *Expected products and/or outcomes*

- We will develop new classroom units for high schools aligned with accepted standards (e.g. Next Generation Science Standards) and other appropriate international school standards, including updates and revisions of existing classroom activities.
- We will develop high-school teacher training materials that can be tested and evaluated prior to use.
- We will conduct professional development with high school teachers at local, regional, national, and international venues – online and face-to-face.
- We will develop new classroom and laboratory activities on LIGO-related data analysis, astrophysics, and experimental topics, suitable for use in high school and undergraduate introductory astronomy and physics classes.
- We will help to promote the Gravitational-Wave Open Science Center, in order to encourage and facilitate the use of the public strain data and other analysis data products that are curated there by the public, in educational settings, and by professional scientists.

### *Required inputs*

Since the development of high school curricular materials is a major undertaking, that requires 1-2 years including classroom testing and revision, significant funding is required in order to carry out most of these activities.

#### ACTIVITY EPO-2.1-A-**INFRAOPS**: STANDARDS ALIGNED CLASSROOM UNITS

We will develop new classroom units for high schools aligned with established standards (e.g. Next Generation Science Standards) and other appropriate international school standards, including updates and revisions of existing classroom activities

##### TASK EPO-2.1-A(i)-**INFRAOPS**: MATERIAL DEVELOPMENT

Development of new educational materials (see also 1.4.1) (Note: this is a major task that requires dedicated long-term effort, but there may be shorter-term programs to which LVK groups can contribute)

##### TASK EPO-2.1-A(ii)-**INFRAOPS**: MATERIAL EVALUATION

Delivery and evaluation of new educational materials (see also 1.4.1) (Note: this is a major task that requires dedicated long-term effort, but there may be shorter-term programs to which LVK groups can contribute)

#### ACTIVITY EPO-2.1-B-**INFRAOPS**: TEACHER TRAINING MATERIALS

We will develop high-school teacher training materials that will be tested and evaluated prior to use

##### TASK EPO-2.1-B(i)-**INFRAOPS**: TEACHER TRAINING DEVELOPMENT

Developing teacher training sessions and proposing to present these sessions at national, regional or local educator's conferences.

##### TASK EPO-2.1-B(ii)-**INFRAOPS**: TEACHER TRAINING EVALUATION

Evaluating teacher training materials through field testing with existing networks

#### ACTIVITY EPO-2.1-C-**INFRAOPS**: PROFESSIONAL DEVELOPMENT FOR TEACHERS

We will conduct professional development with primary and secondary teachers at local, regional, national, and international venues - online and face-to-face

##### TASK EPO-2.1-C(i)-**INFRAOPS**: TEACHER CONDUCT PROFESSIONAL DEVELOPMENT

Producing resources and support materials for teacher professional development (5 FTEs proposed for wide global coverage)

#### ACTIVITY EPO-2.1-D-**INFRAOPS**: MULTI-MESSENGER MASTER CLASS

We will continue to work with collaborators from across astronomy to produce a multi-messenger astronomy masterclass

##### TASK EPO-2.1-D(i)-**INFRAOPS**: DEVELOPMENT

Development of new educational materials (Note: this is a major task that requires dedicated long-term effort, but there may be shorter-term programs to which LVK groups can contribute)



**TASK EPO-2.1-D(ii)-INFRAOPS: EVALUATION**

Delivery and evaluation of new educational materials (Note: this is a major task that requires dedicated long-term effort, but there may be shorter-term programs to which LVK groups can contribute)

**ACTIVITY EPO-2.1-E-INFRAOPS: CLASSROOM ACTIVITIES (HIGH SCHOOL)**

We will develop new classroom and laboratory activities on LIGO-related data analysis, astrophysics, and experimental topics, suitable for use in high school astronomy and physics classes

**TASK EPO-2.1-E(i)-INFRAOPS: ADAPTING GWOSC MATERIALS**

Developing and adapting GWOSC materials to be suitable for high school

**TASK EPO-2.1-E(ii)-INFRAOPS: LABORATORY DEVELOPMENT**

Developing new laboratory exercises on GW related science suitable for high school and college

**ACTIVITY EPO-2.1-F-INFRAOPS: COORDINATE AND DELIVER LIGO-VIRGO-KAGRA-RELATED RESEARCH EXPERIENCES FOR SECONDARY SCHOOL STUDENTS**

We will organize, promote and deliver programs that host high school students undertaking research experiences with LVK scientists. Note that this activity is intended to cover formally organized research programs (in the style akin to Research Experience for Undergraduate programs) directly relevant to collaboration activities, not generic or informal involvement of secondary school students in local research programs.

**TASK EPO-2.1-F(i)-INFRAOPS: COORDINATION**

Coordination of secondary school research programs

**TASK EPO-2.1-F(ii)-INFRAOPS: SUPERVISION AND MENTORING**

Mentoring/supervision of secondary school research program students

## **EPO-2.2 Post-secondary and Continuing Education**

**Start date:** ongoing

**Estimated due date:** ongoing

Formal education does not stop with the completion of secondary education. This project encompasses higher- and professional continuing-education products.

*Expected products and/or outcomes*

- We will develop new classroom and laboratory activities on LIGO-related data analysis, astrophysics, and experimental topics, suitable for use in high school and undergraduate introductory astronomy and physics classes.
- We will help to promote the Gravitational-Wave Open Science Center, in order to encourage and facilitate the use of the public strain data and other analysis data products that are curated there by the public, in educational settings, and by professional scientists.

- We will organize, promote and deliver the LIGO (I)REU Programs that host undergraduate students undertaking research experiences with LVK scientists.

**ACTIVITY EPO-2.2-A-INFRAOPS: DEVELOP LIGO-RELATED CLASSROOM ACTIVITIES FOR UNDERGRADUATES**

We will develop new classroom and laboratory activities on LIGO-related data analysis, astrophysics, and experimental topics, suitable for use in undergraduate introductory astronomy and physics classes

**TASK EPO-2.2-A(i)-INFRAOPS: ADAPTING GWOSC MATERIALS**

Developing and adapting GWOSC materials to be suitable for college and UGs

**TASK EPO-2.2-A(ii)-INFRAOPS: LABORATORY DEVELOPMENT**

Developing new laboratory exercises on GW related science suitable for college and introductory UG audiences

**TASK EPO-2.2-A(iii)-INFRAOPS: COURSE DEVELOPMENT**

Developing specific GW-related course materials suitable for college and UG astronomy teaching

**ACTIVITY EPO-2.2-B-INFRAOPS: COORDINATE AND DELIVER LIGO-VIRGO-KAGRA-RELATED RESEARCH EXPERIENCES FOR UNDERGRADUATES**

We will organize, promote and deliver the LIGO (I)REU Programs that host undergraduate students undertaking research experiences with LVK scientists

**TASK EPO-2.2-B(i)-INFRAOPS: COORDINATION**

Coordination of (I)REU programs

**TASK EPO-2.2-B(ii)-INFRAOPS: SUPERVISION AND MENTORING**

Mentoring/supervision of (I)REU students

## **EPO-2.3 LVK Summer School**

**Start date:** 2025-01-01

**Estimated due date:** 2027-09-01

The LIGO-Virgo-KAGRA collaboration is a significant scientific enterprise involving thousands of people in numerous countries around the globe. We recognize this environment can be challenging for new members, and so we seek to establish a summer school to provide professional development training for new collaboration members.

**ACTIVITY EPO-2.3-A-INFRAOPS: DESIGN AND DEVELOP AN LVK SUMMER SCHOOL**

We will develop and organize a summer school to provide hands-on training for students, postdocs, and others in practical aspects of LIGO-Virgo-KAGRA collaboration activities. This activity covers design, development of materials, and administrative organization prior to the summer school itself.

**TASK EPO-2.3-A(i)-INFRAOPS: MATERIALS AND CURRICULUM DEVELOPMENT**

Develop and prepare materials, and design work for the curriculum of the summer school.

**TASK EPO-2.3-A(ii)-INFRAOPS: ADMINISTRATIVE COORDINATION**

Coordinate organizational tasks such as enrollment, location, travel, lodging, and other administrative needs for successful on-time delivery of the LVK summer school.

**ACTIVITY EPO-2.3-B-INFRAOPS: DELIVER AN LVK SUMMER SCHOOL**

We will run an intensive summer school session that will provide lessons, lectures, workshops, etc, designed to train students postdocs, and others, in practical aspects of LVK collaboration activities. This activity covers the actual delivery of content during the summer school.

**TASK EPO-2.3-B(i)-INFRAOPS: RUNNING LESSONS, LECTURES, OR WORKSHOPS**

Delivering the summer school, providing on-site (or virtual) lessons, lectures, etc.

**TASK EPO-2.3-B(ii)-INFRAOPS: PROVIDING ON-SITE SUPPORT**

Organizational support tasks for the smooth delivery of content.

**ACTIVITY EPO-2.3-C-INFRAOPS: REVIEW AND ASSESS THE EFFICACY OF THE LVK SUMMER SCHOOL**

We will annually review the efficacy of the LVK summer school program, and suggestions for improvements will be made for subsequent offerings. This activity covers review activities that will occur after completion of the summer school.

## **EPO-3 Informal Education and Public Outreach Group**

### **EPO-3.1 Maintain and develop content related to the LVK public outreach presence**

**Start date:** ongoing

**Estimated due date:** ongoing

*Expected products and/or outcomes*

- We will continue worldwide outreach and communication through social media (Twitter, Facebook, Instagram, Reddit) and other informal educational materials that showcase our community, our observational and instrument science and the importance of multi-messenger astronomy.
- We will provide educational materials and social media support for exceptional event announcements.
- We will continue answering question@ligo.org queries, developing efficient approaches to curate and organize them.

**ACTIVITY EPO-3.1-A-INFRAOPS: SUPPORT THE COLLABORATION SOCIAL MEDIA PRESENCE**

We will continue worldwide outreach and communication through social media (Twitter, Facebook, Instagram, Reddit) and other informal educational materials that showcase our community, our observational and instrument science and the importance of multi-messenger astronomy. This activity includes the identification and selection of topics, the development of appropriate content, and the delivery to the selected social media platform.

**TASK EPO-3.1-A(i)-INFRAOPS: MICRO-BLOGGING PLATFORMS**

Coordination and posting for micro-blogging platforms including X (formerly Twitter), Mastodon, Bluesky, etc.

**TASK EPO-3.1-A(ii)-INFRAOPS: FACEBOOK**

Facebook coordination and posting

**TASK EPO-3.1-A(iii)-INFRAOPS: INSTAGRAM**

Instagram coordination and posting

**TASK EPO-3.1-A(iv)-INFRAOPS: YOUTUBE**

Maintaining the LIGO-Virgo YouTube Channel

**TASK EPO-3.1-A(v)-INFRAOPS: REDDIT**

Organization and delivery of content on reddit (e.g. AMAs)

**TASK EPO-3.1-A(vi)-INFRAOPS: HUMANS OF LIGO**

Humans of LIGO coordination and posting

**TASK EPO-3.1-A(vii)-INFRAOPS: WIKIPEDIA**

Adding and/or improving Wikipedia articles on GW-related science and technology

**ACTIVITY EPO-3.1-B-INFRAOPS: DEVELOP COLLABORATION MATERIALS TO SUPPORT EXCEPTIONAL EVENT ANNOUNCEMENTS**

We will provide educational materials and social media support for exceptional event announcements.

**TASK EPO-3.1-B(i)-INFRAOPS: SOCIAL MEDIA SUPPORT**

Additional social media support for exceptional events.

**TASK EPO-3.1-B(ii)-INFRAOPS: FACT SHEETS**

Producing fact sheets

**TASK EPO-3.1-B(iii)-INFRAOPS: INFOGRAPHICS**

Producing infographics

**TASK EPO-3.1-B(iv)-INFRAOPS: OTHER MULTIMEDIA**

Producing other graphics and multimedia

**ACTIVITY EPO-3.1-C-INFRAOPS: MAINTAIN AND RESPOND TO Q&A VIA QUESTION@LIGO.ORG**

We will continue answering question@ligo.org queries, developing efficient approaches to curate and organize them

**TASK EPO-3.1-C(i)-INFRAOPS: FAQ CURATION**

Curating existing questions and extracting material suitable for a new FAQ page

**TASK EPO-3.1-C(ii)-INFRAOPS: FAQ MAINTENANCE**

Updating new FAQ page on a regular basis

**TASK EPO-3.1-C(iii)-INFRAOPS: QUESTION MANAGEMENT**

Overseeing and managing rota system for team answering new questions

**TASK EPO-3.1-C(iv)-INFRAOPS: QUESTION ANSWER**

Contributing to team answering new questions

## **EPO-3.2 Informal educational resources**

**Start date:** ongoing

**Estimated due date:** ongoing

*Expected products and/or outcomes*

- We will develop printable material and multi-lingual resources, including science summaries for all collaboration papers.
- We will promote development of innovative approaches that communicate LVK science, such as audio, video, virtual reality, web and phone apps, video games and planetarium shows

**ACTIVITY EPO-3.2-A-INFRAOPS: PRODUCE SCIENCE SUMMARIES AND ASSOCIATED MATERIAL FOR COLLABORATION PAPERS**

We will develop printable material and multi-lingual resources, including science summaries for collaboration papers. All collaboration papers should be covered by a science summary

**TASK EPO-3.2-A(i)-INFRAOPS: PRODUCTION**

Writing, editing, reviewing science summaries

**TASK EPO-3.2-A(ii)-INFRAOPS: TRANSLATIONS**

Translating science summaries

**TASK EPO-3.2-A(iii)-INFRAOPS: NEWS TRANSLATIONS**

Translating news items and other materials

**TASK EPO-3.2-A(iv)-INFRAOPS: NEW MATERIALS**

Developing new printed and online materials

**ACTIVITY EPO-3.2-B-OTHER: DEVELOPMENT OF NOVEL APPROACHES TO INFORMAL EDUCATION AND PUBLIC OUTREACH**

We will promote development of innovative approaches that communicate LVK science, such as audio, video, virtual reality, web and phone apps, video games and planetarium shows

**TASK EPO-3.2-B(i)-OTHER: MULTIMEDIA RESOURCES**

Developing new audio, video, VR resources

**TASK EPO-3.2-B(ii)-OTHER: APP DEVELOPMENT**

Developing new apps

**TASK EPO-3.2-B(iii)-OTHER: VIDEO GAMES**

Developing new video games on GW science

**TASK EPO-3.2-B(iv)-OTHER: PLANETARIUM**

Developing GW content for planetarium shows

**TASK EPO-3.2-B(v)-OTHER: YOUNG LEARNERS**

Developing outreach materials suitable for young children, including quizzes, games, coloring books pop-up books, comics

**TASK EPO-3.2-B(vi)-OTHER: ACCESSIBILITY**

Developing outreach materials aimed at vision & hearing impaired & other hard-to-reach audiences

### **EPO-3.3 Enabling community science**

**Start date:** ongoing

**Estimated due date:** ongoing

*Expected products and/or outcomes*

- We will develop and maintain tools to share explain the content of LVK public alerts to the general public.
- We will explore innovative approaches to generating and disseminating this content that will be scalable to the candidate event rates expected for O4.
- We will support and promote Gravity Spy and other citizen science projects.

**ACTIVITY EPO-3.3-A-INFRAOPS: DEVELOP AND MAINTAIN COLLABORATION ALERT APPLICATIONS FOR PUBLIC OUTREACH**

We will develop and maintain public-facing applications for smartphones and other modern platforms to share and explain the content of LVK public alerts to general public.

**TASK EPO-3.3-A(i)-INFRAOPS: ALERT APPLICATIONS**

Developing and maintaining alert apps

**TASK EPO-3.3-A(ii)-INFRAOPS: ALERT GRAPHICS**

Developing and maintaining graphics and other software (e.g. constellation skymaps) to support low-latency alerts

**TASK EPO-3.3-A(iii)-INFRAOPS: ALERT SCALABILITY**

We will explore innovative approaches to generating and disseminating this content that will be scalable to the candidate event rates expected for O4 developing software to support automatic social media, graphics etc in response to low latency alerts, appropriate to O4 event rates

**ACTIVITY EPO-3.3-B-INFRAOPS: SUPPORT AND PROMOTE COLLABORATION CITIZEN SCIENCE INITIATIVES**

We will support and promote citizen science projects such as Gravity Spy, Kaggle competitions, and others, in an effort to raise public awareness and increase engagement.

**TASK EPO-3.3-B(i)-INFRAOPS: GRAVITY SPY**

Supporting Gravity Spy volunteers and promoting Gravity Spy

**TASK EPO-3.3-B(ii)-INFRAOPS: KAGGLE COMPETITIONS**

Promotion and coordination in support of LVK Kaggle competitions

**TASK EPO-3.3-B(iii)-INFRAOPS: OTHER CITIZEN SCIENCE**

Developing and supporting other citizen science initiatives

## **EPO-3.4 Public events and exhibitions**

**Start date:** ongoing

**Estimated due date:** ongoing

*Expected products and/or outcomes*

- We will support LVK members communicating our science through public talks at local or national community events, including science festivals, museums, science centers, astronomy societies etc.
- We will support LVK presence at major science festivals, exhibitions, and other high-profile public events that attract large audiences—both online and face-to-face.
- We will develop flexible and easily portable resources that can be used at exhibitions as well as other informal education and outreach events.

**ACTIVITY EPO-3.4-A-INFRAOPS: DEVELOP AND MAINTAIN COLLABORATION RESOURCES FOR PUBLIC EVENTS**

We will support LVK members communicating our science through public talks at local or national community events, including science festivals, museums, science centers, astronomy societies etc

**TASK EPO-3.4-A(i)-INFRAOPS: MULTIMEDIA RESOURCES**

Developing and maintaining bank of approved graphics and multimedia

**TASK EPO-3.4-A(ii)-INFRAOPS: ACTIVITY DEVELOPMENT**

Developing resources for event activities - e.g. explainers, quizzes, posters, demonstrations

**ACTIVITY EPO-3.4-B-INFRAOPS: SUPPORT, COORDINATE AND DELIVER COLLABORATION ACTIVITIES AT PUBLIC EVENTS**

We will support LVK presence at major science festivals, exhibitions, and other high-profile public events that attract large audiences - both online and face-to-face

**TASK EPO-3.4-B(i)-INFRAOPS: OUTREACH EVENTS**

Delivering GW science outreach at local or national community events

**TASK EPO-3.4-B(ii)-INFRAOPS: MAJOR EVENT COORDINATION**

Coordinating participation in high-profile events that attract large audiences (e.g. science festivals).

**TASK EPO-3.4-B(iii)-INFRAOPS: SCIENCE FESTIVALS**

Participating in major science festivals.

**TASK EPO-3.4-B(iv)-INFRAOPS: SCIENCE-ART EVENTS**

Participating in exhibitions, science-art events

**ACTIVITY EPO-3.4-C-INFRAOPS: DEVELOP AND MAINTAIN COLLABORATION RESOURCES FOR OUTREACH EXHIBITIONS**

We will develop flexible and easily portable resources that can be used at exhibitions as well as other informal educational and outreach events.

**TASK EPO-3.4-C(i)-INFRAOPS: EXHIBIT MATERIALS**

Producing and maintaining display materials and handouts for use in festivals and exhibitions

**TASK EPO-3.4-C(ii)-INFRAOPS: DEMONSTRATION DEVELOPMENT**

Developing re-usable resources (e.g. hands-on demonstrations, experiments, activities)

**ACTIVITY EPO-3.4-D-INFRAOPS: EXHIBITION “EXTREME SPACE-TIME” IN JAPAN**

KAGRA EPO and Event Horizon Telescope group in Japan will start the series of exhibition in several science museums in Japan. The title is “Extreme Space-time: Black Holes and Gravitational Waves”, and the contents include the latest scientific products. In 2025, the exhibitions will be held at Osaka Science Museum (Osaka City, Osaka Pref.) and Akashi Municipal Planetarium (Akashi City, Hyogo Pref.)

**TASK EPO-3.4-D(i)-INFRAOPS: EXHIBITION AT OSAKA/AKASHI**

Contents preparations (panels, leaflets, display models, programs, etc) and their maintenances, lectureships to publics, helping events at museums.



## EPO-4 Professional Outreach

### EPO-4.1 Conference and workshop support

**Start date:** ongoing

**Estimated due date:** ongoing

**ACTIVITY EPO-4.1-A-INFRAOPS:** PARTICIPATE IN COLLABORATION OUTREACH AT CONFERENCES AND PROFESSIONAL MEETINGS

We will promote outreach to scientists / policy makers at professional conferences and meetings, both online and face-to-face, working in collaboration with other gravitational wave communities where appropriate. This activity does not include invited or contributed presentations at conferences.

**TASK EPO-4.1-A(i)-INFRAOPS:** CONFERENCE COORDINATION

Coordinating participation in conferences

**TASK EPO-4.1-A(ii)-INFRAOPS:** CONFERENCE EXHIBITION PARTICIPATION

Participating in the outreach exhibition booths at major scientific meetings, both online and in-person.

**ACTIVITY EPO-4.1-B-INFRAOPS:** DEVELOP AND MAINTAIN COLLABORATION RESOURCES FOR CONFERENCE EXHIBITIONS

We will develop flexible and easily portable resources that can be used at professional conferences and exhibitions as well as informal educational activities and other outreach events, including e.g. engagement with politicians and funders (see also 3.12)

**TASK EPO-4.1-B(i)-INFRAOPS:** CONFERENCE MATERIALS

Producing and maintaining display materials and handouts for use in conferences / exhibitions

**TASK EPO-4.1-B(ii)-INFRAOPS:** CONFERENCE DEMONSTRATIONS

Developing re-usable resources (e.g. hands-on demonstrations, experiments, activities)

**ACTIVITY EPO-4.1-C-INFRAOPS:** DEVELOP AND MAINTAIN COLLABORATION RESOURCES FOR PRESENTATIONS

We will aim to enable our collaboration members to present the science of our latest results at conferences in talks and panel discussions, through online presentations, and at seminars and colloquiums at individual institutions (see also 3.10)

**TASK EPO-4.1-C(i)-INFRAOPS:** FACT SHEETS

Producing fact sheets

**TASK EPO-4.1-C(ii)-INFRAOPS:** INFOGRAPHICS

Producing infographics

**TASK EPO-4.1-C(iii)-INFRAOPS:** SOUND FILES

Producing sound files

**TASK EPO-4.1-C(iv)-INFRAOPS:** MULTIMEDIA

Developing and maintaining bank of approved graphics and multimedia

## EPO-4.2 Promotion and other support of the Gravitational Wave Open Science Center

**Start date:** ongoing

**Estimated due date:** ongoing

ACTIVITY EPO-4.2-A-**INFRAOPS**: SUPPORT AND PROMOTE THE GRAVITATIONAL WAVE OPEN SCIENCE CENTER (GWOSC)

We will help to promote the Gravitational-Wave Open Science Center, in order to encourage and facilitate the use of the public strain data and other analysis data products that are curated there by the public, in educational settings, and by professional scientists (see also 2.5)

TASK EPO-4.2-A(i)-**INFRAOPS**: QUESTIONS

Answering GWOSC online questions

TASK EPO-4.2-A(ii)-**INFRAOPS**: SOCIAL MEDIA

Promoting GWOSC on LVK social media

## EPO-5 Web Committee

### EPO-5.1 Maintain [www.ligo.org](http://www.ligo.org)

**Start date:** ongoing

**Estimated due date:** ongoing

The primary task of the Web Committee is to maintain, update, and develop a web presence for the LSC at [www.ligo.org](http://www.ligo.org).

#### *Motivation and goals*

The LSC website is a primary avenue for the dissemination of information about the LSC. This includes information about the LSC's structure, our science, publications, detections, and news or events. The audience for the website includes the general public, researchers, LSC members, media organizations, and students or teachers at all levels. The website should provide easily accessible and clearly presented information relevant for those audiences. Along with journal publications, conference presentations, and the LSC's various outreach activities, a strong web presence is important for communicating our discoveries and providing a repository of information (general and specific) about the LSC and its work.

#### *Expected products and/or outcomes*

A well-maintained, updated, and visually-pleasing website that addresses audience needs and disseminates appropriate information related to the LSC and its science.

*Required inputs*

- Web hosting and WordPress management subscription.
- Regular communication with EPO group and LSC leadership on needed updates or changes.

**ACTIVITY EPO-5.1-A-INFRAOPS: MAINTAIN AND SUPPORT THE LIGO.ORG WEBSITE**

We will maintain and update the [www.ligo.org](http://www.ligo.org) website. This site underwent a significant redesign in 2024, and is now hosted using WP Engine.

**TASK EPO-5.1-A(i)-INFRAOPS: WEB MAINTENANCE**

General web maintenance. This includes most interactions on the WP Admin dashboard that is not directly published content. This could include tasks like organizing the media library, adding alt-text to multimedia, managing installed plugins, modifying redirects, and so on. Note that the publishing of content (e.g. science summaries, news items, new static pages) is not included in this task.

**TASK EPO-5.1-A(ii)-INFRAOPS: WEB DESIGN**

Updating of webpage design and user experience. This includes managing themes, implementing design language, modifying the way users interact with content on the website, and other design tasks accessible via the WP Admin dashboard. Note that the generation of multimedia content may only be associated with this task only if it is implemented on the website as part of web committee activities. Generation of multimedia content for specific news items, science summaries, or other published articles (e.g. infographics) is covered by other tasks and activities.

**TASK EPO-5.1-A(iii)-INFRAOPS: WEB UPDATES**

Regular updating of content including science summaries, news items, and other published articles or webpages on the site. This includes all other content creation activities not covered by maintenance or design.

**EPO-5.2 Maintain and support the official LIGO Laboratory / Observatory websites**

**Start date:** ongoing

**Estimated due date:** ongoing

Each laboratory site maintains their own public-facing web presence, including the LIGO Laboratory and the LIGO India sites. While distinct from the public webpages of the LSC, Virgo, and KAGRA scientific collaborations, the laboratory sites nevertheless collaborate with the broader Web Committee.

**ACTIVITY EPO-5.2-A-INFRAOPS: MAINTAIN AND SUPPORT THE LIGO LABORATORY WEBSITE AT [WWW.LIGO.CALTECH.EDU](http://WWW.LIGO.CALTECH.EDU)****ACTIVITY EPO-5.2-B-INFRAOPS: MAINTAIN AND SUPPORT THE LIGO INDIA WEBSITE AT [WWW.LIGO-INDIA.IN](http://WWW.LIGO-INDIA.IN)**

### **EPO-5.3 Maintain and support the official KAGRA website**

**Start date:** ongoing

**Estimated due date:** ongoing

KAGRA EPO does not currently have right to update KAGRA webpages due to the policy of KAGRA Executive Office. However, KAGRA EPO expects to change this policy after KAGRA made actual observations.

#### **ACTIVITY EPO-5.3-A-INFRAOPS: KAGRA WEB-PAGE UPDATES**

Content will be prepared for the eventual transition to a KAGRA EPO-managed website.

#### **TASK EPO-5.3-A(i)-INFRAOPS: KAGRA WEB-PAGE CONTENT**

We prepare the webpage of outreach entrance in various languages.

## **EPO-6 Public Relations and Communications**

### **EPO-6.1 Media relations**

**Start date:** ongoing

**Estimated due date:** ongoing

This group works on the development, coordination and implementation of public relations and communication activities to inform about the LSC and to help solicit broad support.

#### *Motivation and goals*

Communications is essential for building trust in a project, for soliciting long-term support and attracting new members for the team. It also helps building the community and keeping it together.

Goals of this group are

- To develop, implement and frequently evaluate a communications strategy.
- To develop a communications plan and budget based on the strategy.
- To coordinate with LIGO Lab, Funding Agencies and other partners.
- To provides services for internal and external communications.
- To advise leadership in all areas of communications.

#### *Expected products and/or outcomes*

In order to speak with one voice, convey coherent messages and sketch a consistent picture of the LSC we are planning to develop a communications strategy. Expected products associated with this goal are:

- An analysis of the current situation
- The definition of key goals, target groups, key messages, appropriate activities, policies and procedures

- An implementation plan including schedule and budget.
- Evaluation of the Public Relations and Communications activities.
- Regular update of the strategy and the implementation plan.

While we are working on the Communications Strategy, we are continuing to

- Work on a joint LVK Communications Plan that outlines the procedures and work flow for various occasions.
- Develop content for media activities

**ACTIVITY EPO-6.1-A-INFRAOPS: SUPPORT COMMUNICATIONS WITH THE MEDIA**

We will continue to support regular communication with media contacts and liaisons and we will provide media guidance and training for collaboration members

**TASK EPO-6.1-A(i)-INFRAOPS: PRESS EVENTS**

Communication liaison for press events

**TASK EPO-6.1-A(ii)-INFRAOPS: MEDIA CONTACTS**

Communication with media contacts

**TASK EPO-6.1-A(iii)-INFRAOPS: MEDIA TRAINING**

Delivery of media training events

**ACTIVITY EPO-6.1-B-INFRAOPS: SUPPORT AND COORDINATE MEDIA COVERAGE OF NEWSWORTHY RESULTS**

We will support and coordinate preparations for LVK public announcements of scientific results, particularly (but not only) O4 exceptional event papers and webinars

**TASK EPO-6.1-B(i)-INFRAOPS: ANNOUNCEMENT COORDINATION**

Support coordination of LVK announcements

**TASK EPO-6.1-B(ii)-INFRAOPS: NEWS TRANSLATION**

Translating news items and press releases

**TASK EPO-6.1-B(iii)-INFRAOPS: WEBINAR ORGANIZATION**

Organization and promotion of LVK webinars

**TASK EPO-6.1-B(iv)-INFRAOPS: SOCIAL MEDIA SUPPORT**

Social media in support of LVK announcements

**ACTIVITY EPO-6.1-C-INFRAOPS: IMPLEMENT A FRAMEWORK FOR ASSESSING THE MEDIA IMPACT OF COLLABORATION ACTIVITIES**

We will help to develop a framework, appropriate for O4, for deciding when LVK papers are worthy of announcement as exceptional event papers and/or webinars, and for effective and efficient and effective management of these announcements

**TASK EPO-6.1-C(i)-INFRAOPS: COMMUNICATIONS COORDINATOR**  
Coordination of LVK Communications Subgroup

**TASK EPO-6.1-C(ii)-INFRAOPS: COMMUNICATIONS PLANNING**  
Support planning of LVK communication strategy

**TASK EPO-6.1-C(iii)-INFRAOPS: GENERAL COMMUNICATION**  
Support planning of LVK communication strategy

**ACTIVITY EPO-6.1-D-INFRAOPS: PRODUCE PUBLIC RELATIONS MATERIALS**

We will maintain and produce public materials as needed to support specific public relations activities and projects.

## **EPO-7 LIGO Magazine Committee**

The LIGO Magazine is published twice a year. Each edition features updates from around the gravitational wave community and beyond with a focus on the human stories behind the science. The LIGO Magazine Committee is responsible for the overall direction and focus of the LIGO Magazine series. The LIGO Magazine Editorial Team is responsible for the production of each consecutive edition of the LIGO Magazine.

### **EPO-7.1 LIGO Magazine Production**

**Start date:** ongoing

**Estimated due date:** ongoing

*Expected products and/or outcomes*

- March edition of the LIGO Magazine
- September edition of the LIGO Magazine

**ACTIVITY EPO-7.1-A-INFRAOPS: PRODUCE THE LIGO MAGAZINE**

Planning, content development and production of the March and September editions of the LIGO Magazine.

**TASK EPO-7.1-A(i)-INFRAOPS: EDITORIAL LEADERSHIP**  
Editorial oversight of current edition of the LIGO Magazine.

**TASK EPO-7.1-A(ii)-INFRAOPS: EDITOR**  
Editing LIGO Magazine articles/content.

**TASK EPO-7.1-A(iii)-INFRAOPS: WRITER**  
Production of LIGO Magazine articles.

**TASK EPO-7.1-A(iv)-INFRAOPS: GRAPHICS**

Production of graphics for the LIGO Magazine.

**TASK EPO-7.1-A(v)-INFRAOPS: DESIGN**

Production of the LIGO Magazine layout and design.

**TASK EPO-7.1-A(vi)-INFRAOPS: PRODUCTION**

Production of the printed and online edition of the LIGO Magazine

## **EPO-8 Leadership and Service Roles**

### **EPO-8.1 Communications and Education Division Leadership**

**Start date:** ongoing

**Estimated due date:** ongoing

The Communications and Education Division is responsible for coordinating, overseeing, and reviewing communications, education and training work.

**ACTIVITY EPO-8.1-A-INFRAOPS: COMMUNICATIONS AND EDUCATION DIVISION CHAIR**

The Communications and Education Division Chair coordinates the activities of the Division.

### **EPO-8.2 Formal Education Committee Leadership**

**Start date:** ongoing

**Estimated due date:** ongoing

**ACTIVITY EPO-8.2-A-INFRAOPS: SERVING AS FORMAL EDUCATION COMMITTEE CHAIR**

The Formal Educational Committee coordinates educational activities taken on by LSC entities. This Committee has one chair.

### **EPO-8.3 Informal Education and Public Outreach Committee Leadership**

**Start date:** ongoing

**Estimated due date:** ongoing

**ACTIVITY EPO-8.3-A-INFRAOPS: SERVING AS INFORMAL EDUCATION AND PUBLIC OUTREACH COMMITTEE CHAIR**

The Informal Education and Public Outreach Committee supervises the Collaboration's informal education and public outreach activities. This Committee has one chair.

## **EPO-8.4 Professional Outreach Committee Leadership**

**Start date:** ongoing

**Estimated due date:** ongoing

ACTIVITY EPO-8.4-A-**INFRAOPS**: SERVING AS PROFESSIONAL OUTREACH COMMITTEE CHAIR

The Professional Outreach Committee manages the collaboration's interaction with the scientific community, such as at conferences and meetings. This Committee has one chair.

## **EPO-8.5 Web Committee Leadership**

**Start date:** ongoing

**Estimated due date:** ongoing

ACTIVITY EPO-8.5-A-**INFRAOPS**: SERVING AS WEB COMMITTEE CHAIR

The LSC Web Committee maintains and hosts internal LSC web pages (ligo.org) as well as the LSC public pages. This Committee has one chair.

## **EPO-8.6 Media Relations Committee Leadership**

**Start date:** ongoing

**Estimated due date:** ongoing

ACTIVITY EPO-8.6-A-**INFRAOPS**: SERVING AS MEDIA RELATIONS COMMITTEE CHAIR

The Media Relations Committee is the LSC forum for coordinating media activities, particularly those associated with formal announcements of scientific results. This Committee has one chair.

## **EPO-8.7 LIGO Magazine Committee Leadership**

**Start date:** ongoing

**Estimated due date:** ongoing

ACTIVITY EPO-8.7-A-**INFRAOPS**: SERVING AS LIGO MAGAZINE COMMITTEE CHAIR

The LIGO Magazine Committee co-chairs coordinate the activity of the LIGO Magazine Committee with collaboration leadership, other committees and the wider community. They work on the continuous development of the LIGO Magazine and ensure that it represents the evolving consortium and science while integrating into the general strategy and direction of consortium communication where appropriate. The co-chairs include communications specialists as well as representatives of the editorial leadership.



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