

LIGO SCIENTIFIC COLLABORATION
VIRGO COLLABORATION
KAGRA COLLABORATION

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

The LSC-Virgo-KAGRA Communications and Education Working Groups
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<http://www.ligo.org>
<http://www.virgo-gw.eu>
<https://gwcenter.icrr.u-tokyo.ac.jp>

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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: 2023-10-01

Estimated due date: 2025-01-01

[Optional: Short summary of this project (max two lines).]

[You may modify the names of subsections if that makes more sense for a particular project. What is here is just a suggested framework. And of course, delete these guidelines when you no longer need them.]

Motivation and goals

[Scientific case (goal, motivation,...), i.e.: why are we doing this? What do we intend to do and why is it important? Should be one paragraph. Does not need to cite the literature, unless that will make the case clearer. The WP is not a review article.]

Expected products and/or outcomes

[Deliverables/products and milestones, i.e.: what do we expect to accomplish? This could include one or more papers; if so, describe what will be in the paper(s), e.g. any interpretations for source modeling, astrophysics, tests of GR, etc. On the other hand, it could include services, other data products, or algorithms ready for use by other Activities. Give approximate dates when papers or other significant products are expected. It is OK if some things are contingent on what the data provides, e.g. whether a signal of a certain type is detected or not; in that case outline the most likely scenarios.]

Required inputs

[List data or other products that are required to complete this project. For example, calibrated data, cleaned data, data quality information, etc. Cross-list to the projects where the required inputs are coming from if appropriate.]

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: 2023-10-01

Estimated due date: 2025-01-01

[Optional: Short summary of this project (max two lines).] 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.

Required inputs

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-2 Formal Education Group

EPO-2.1 Primary and Secondary Education

Start date: 2023-10-01

Estimated due date: 2025-01-01

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 LSC 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 LSC 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 LSC 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 LSC 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

EPO-2.2 Post-secondary and Continuing Education

Start date: 2023-10-01

Estimated due date: 2025-01-01

[Optional: Short summary of this project (max two lines).]

Motivation and goals

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 LSC scientists.

Required inputs

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-RELATED RESEARCH EXPERIENCES FOR UNDERGRADUATES

We will organize, promote and deliver the LIGO (I)REU Programs that host undergraduate students undertaking research experiences with LSC 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: 2023-10-01

Estimated due date: 2025-01-01

[Optional: Short summary of this project (max two lines).]

Motivation and goals

Expected products and/or outcomes

Required inputs

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 LSC public outreach presence

Start date: 2023-10-01

Estimated due date: 2025-01-01

[Optional: Short summary of this project (max two lines).]

[You may modify the names of subsections if that makes more sense for a particular project. What is here is just a suggested framework. And of course, delete these guidelines when you no longer need them.]

Motivation and goals

[Scientific case (goal, motivation,...), i.e.: why are we doing this? What do we intend to do and why is it important? Should be one paragraph. Does not need to cite the literature, unless that will make the case clearer. The WP is not a review article.]

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.

[Deliverables/products and milestones, i.e.: what do we expect to accomplish? This could include one or more papers; if so, describe what will be in the paper(s), e.g. any interpretations for source modeling, astrophysics, tests of GR, etc. On the other hand, it could include services, other data products, or algorithms ready for use by other Activities. Give approximate dates when papers or other significant products are expected. It is OK if some things are contingent on what the data provides, e.g. whether a signal of a certain type is detected or not; in that case outline the most likely scenarios.]

Required inputs

[List data or other products that are required to complete this project. For example, calibrated data, cleaned data, data quality information, etc. Cross-list to the projects where the required inputs are coming from if appropriate.]

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: X (FORMERLY TWITTER)

X (formerly Twitter) coordination and posting

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: 2023-10-01

Estimated due date: 2025-01-01

[Optional: Short summary of this project (max two lines).]

Motivation and goals

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

Required inputs

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: DEVELOP 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: 2023-10-01

Estimated due date: 2025-01-01

[Optional: Short summary of this project (max two lines).]

Motivation and goals

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.

Required inputs

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: 2023-10-01

Estimated due date: 2025-01-01

[Optional: Short summary of this project (max two lines).]

Motivation and goals

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.

Required inputs

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)

EPO-4 Professional Outreach

EPO-4.1 Conference and workshop support

Start date: 2023-10-01

Estimated due date: 2025-01-01

[Optional: Short summary of this project (max two lines).]

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Required inputs

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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: 2023-10-01

Estimated due date: 2025-01-01

[Optional: Short summary of this project (max two lines).]

Motivation and goals

Expected products and/or outcomes

Required inputs

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 LSC social media

EPO-5 Web Committee

EPO-5.1 Maintain www.ligo.org

Start date: 2023-10-01

Estimated due date: 2025-01-01

The primary task of the Web Committee is to maintain, update, and develop a web presence for the LSC at 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 website.

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

General web maintenance

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

Updating of webpage design and content

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

Regular updating of webpage content (e.g. science summaries, news items)

EPO-5.2 Develop and deploy a redesigned www.ligo.org

Start date: 2023-10-01

Estimated due date: 2024-06-01

We will develop and transition to a newly designed LSC website based on WordPress.

Motivation and goals

The LSC website (www.ligo.org) predates Advanced LIGO and the first detection of gravitational-waves by several years. That website is showing its age. In addition to its dated look, the website is difficult to edit, does not support modern web elements, and is not suited to display on mobile devices. This project will develop a new LSC website with a modern look and functionality, while retaining much of the information from the original site. The goal is a modernized website that is visually appealing, easier to navigate, and more effective at communicating information and engaging our core audiences.

Expected products and/or outcomes

- A redesigned LSC web site at www.ligo.org built on a modern content management system that is easier to navigate and maintain.

Required inputs

- WordPress hosting platform (currently supplied by WPEngine subscription).
- Regular effort by members of the Web Committee and other volunteers to construct the new site and port over content.

ACTIVITY EPO-5.2-A-**INFRAOPS**: DEVELOP A SITE MAP, SUPPORTING DESIGN AND INITIAL LAYOUT FOR THE NEW WWW.LIGO.ORG

ACTIVITY EPO-5.2-B-**INFRAOPS**: MIGRATE CONTENT TO THE NEW WWW.LIGO.ORG SITE AND DEVELOP NEW CONTENT AS NEEDED

ACTIVITY EPO-5.2-C-**INFRAOPS**: DEVELOP DOCUMENTATION AND TRAINING MATERIALS FOR NEW WEB COMMITTEE MEMBERS

EPO-6 Public Relations and Communications

EPO-6.1 Media relations

Start date: 2023-10-01

Estimated due date: 2025-01-01

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

Required inputs

[List data or other products that are required to complete this project. For example, calibrated data, cleaned data, data quality information, etc. Cross-list to the projects where the required inputs are coming from if appropriate.]

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

EPO-7.1 LIGO Magazine Production

Start date: 2023-10-01

Estimated due date: 2025-01-01

[Optional: Short summary of this project (max two lines).]

Motivation and goals

Expected products and/or outcomes

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

Required inputs

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: EDITOR

Editorial oversight of LIGO Magazine

TASK EPO-7.1-A(ii)-INFRAOPS: WRITER

Production of LIGO Magazine articles

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 publishes twice a year the LIGO Magazine, which details the latest research, news and personalities across the diverse group of LSC members. This Committee has two co-chairs.

Instructions

This \LaTeX template provides a standard framework for documenting the work plans for each division of the Collaboration. Various class, style and macro files are located in the tools subdirectory. In general, any necessary changes to these files should be backported to the template repository so that the modifications can be made available to all of the white paper projects.

There are a number of macros near the top of `WP-template.tex` that will allow you to define the long name of the division, the division acronym, the white paper year, and the document control numbers for LIGO, Virgo and KAGRA.

The Executive Summary provides an overview of the division's work. Each working group should describe the mission of the group and the rationale behind the group's priorities (we strongly recommend keeping this to 2 pages max). The file `ES-template.tex` provides a sample format; each division should decide on a standard format for the working group summaries within their division. The target audience for this section is outside the Collaboration.

Each subsequent section of the white paper documents a set of Collaboration Projects scoped to the working group(s) in the section name, as shown in `AP-template.tex`. A Collaboration Project delivers a product for the Collaboration, e.g. data, software, designs, hardware, publications, services, ... To map this to the language of a work breakdown structure (WBS), as used by some working groups, each project is a level-1 element which is broken down into a complete list of level-2 elements (or **activities**) representing intermediate deliverables of the project. Each level-2 element may be further broken down into a list of level-3 elements (or **tasks**); we strongly recommend including task-level items if a complete list is available at the time of writing.

The file `AP-template.tex` shows how to organize the information about each project. The following \LaTeX commands and environments allow standardized information entry for projects:

Command `\WPproject{Name}{yyyy-mm-dd}{yyyy-mm-dd}`: A `WPproject` is a level-1 WBS element. It takes three arguments: the project name, the project start date (in the format `yyyy-mm-dd`), and the estimated project due date (in the format `yyyy-mm-dd`). If the dates are not known, please use `TBD`.

Environment `\begin{WPactivity}[f]{Name} ... \end{WPactivity}`: A `WPactivity` is a level-2 element of the WBS for the project. It has one optional argument that takes either `t` to indicate the activity is `\InfraOpsTrue` or `f` to indicate the activity `\InfraOpsFalse`. The default is `f`. The first required argument is the name of the activity.

Environment `\begin{WPtask} ... \end{WPtask}`: A `WPtask` is a level-3 element of the WBS for the project. Tasks inherit their `InfraOps` classification from their parent `WPactivity`.

Each `WPactivity` is automatically added to a list of activities that is included at the end of the white paper. The same is true for each `WPtask`. A script is provided to parse this information into a `csv`-file for ingestion into the LSC MOU system.

Required personpower estimates should be added to the central internal spreadsheet

https://docs.google.com/spreadsheets/d/194HOAAE0-Ps6mC3aMVRq4XtcL_mf5CU7RNjauoRYI3E

once the projects, activities, and tasks are defined.

List of Activities

EPO-1.1-A-InfraOps	LIGO Exploration Center (LExC at LHO)	4
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EPO-1.2-B-InfraOps	Observatory professional development programs at LLO	6
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EPO-2.1-A-InfraOps	Standards aligned classroom units	7
EPO-2.1-B-InfraOps	Teacher training materials	8
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EPO-2.1-E-InfraOps	Classroom activities (high school)	8
EPO-2.2-A-InfraOps	Develop LIGO-related classroom activities for undergraduates	9
EPO-2.2-B-InfraOps	Coordinate and deliver LIGO-related Research Experiences for Undergraduates	9
EPO-2.3-A-InfraOps	Design and develop an LVK Summer School	10
EPO-2.3-B-InfraOps	Deliver an LVK Summer School	10
EPO-2.3-C-InfraOps	Review and assess the efficacy of the LVK Summer School	10
EPO-3.1-A-InfraOps	Support the Collaboration social media presence	12
EPO-3.1-B-InfraOps	Develop Collaboration materials to support exceptional event announcements	12
EPO-3.1-C-InfraOps	Maintain and respond to Q&A via question@ligo.org	12
EPO-3.2-A-InfraOps	Produce science summaries and associated material for Collaboration papers	13
EPO-3.2-B-Other	Develop of novel approaches to informal education and public outreach	14
EPO-3.3-A-InfraOps	Develop and maintain Collaboration alert applications for public outreach	14
EPO-3.3-B-InfraOps	Support and promote Collaboration citizen science initiatives	15
EPO-3.4-A-InfraOps	Develop and maintain Collaboration resources for public events	15
EPO-3.4-B-InfraOps	Support, coordinate and deliver Collaboration activities at public events	16
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EPO-4.1-A-InfraOps	Participate in Collaboration outreach at conferences and professional meetings	17
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EPO-5.1-A-InfraOps	Maintain and support the ligo.org website	19
EPO-5.2-A-InfraOps	Develop a site map, supporting design and initial layout for the new www.ligo.org	20
EPO-5.2-B-InfraOps	Migrate content to the new www.ligo.org site and develop new content as needed	20
EPO-5.2-C-InfraOps	Develop documentation and training materials for new Web Committee members	20
EPO-6.1-A-InfraOps	Support communications with the media	21
EPO-6.1-B-InfraOps	Support and coordinate media coverage of newsworthy results	22
EPO-6.1-C-InfraOps	Implement a framework for assessing the media impact of Collaboration activities	22
EPO-6.1-D-InfraOps	Produce public relations materials	22
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