- LIGO SCIENTIFIC COLLABORATION -

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Policies and Procedures of the LIGO Scientific Collaboration		
The LSC Bylaws Committee		

WWW: http://www.ligo.org/

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Contents

1 Introduction

This document contains the policies and procedures of LSC standing committees and working groups which are authorized in the bylaws. It is intended that the chairs and members of these committees maintain, expand, and update the section of the document addressing their committee. Substantive changes in policies and procedures must be proposed to and approved by the Council.

The level of detail in this document is intended to be deeper than in the bylaws. Some working groups or committees will want only a brief overview. Others will choose to describe in detail what they do, when they do it, and how they do it.

2 Membership

2.1 LSC Groups – *Under Development*

The membership of the LSC is made of Groups as outlined in §1.5 of the LSC By-Laws. Each LSC Group is required to abide by the following policies.

2.1.1. **Policies**

2.1.1.1. Each LSC Group is expected to contribute at least 7 x N hours per week, on average, to Infrastructure and Operations activities where N = (group members) - (undergraduates and non-author students and administrative staff and emeritus Members). Infrastructure and Operations activities shall be defined in the LSC Program; detailed work breakdowns shall be provided in the LSC white papers. In exceptional circumstances, the Spokesperson, in consultation with the MOU Review Panel, may approve a smaller contribution to Infrastructure and Operations.

2.2 LSC Members – *Under Development*

LSC Groups are comprised of individuals, known as LSC Members, as outlined in §1.1 of the LSC By-Laws. Each LSC Member is required to abide by the following policies independent of their committee and working group membership.

2.2.1. **Policies**

2.2.1.1. The Computing and Software Working Group (see 6.6) (CompSoft) shall provide a `LIGO.ORG` identity to all members of the LSC to enable controlled access to collaboration information and resources as described in the *LIGO.ORG Onboarding and Offboarding: Policy and Practice* (LIGO-M1900060). This policy shall be maintained and updated as necessary by CompSoft with the approval of the LIGO Directorate.

2.2.1.2. All individuals in possession of LIGO.ORG credentials must accept and abide by the *LIGO.ORG Credential Acceptable Use Policy* (LIGO-M1700044). This policy shall be maintained and updated as necessary by CompSoft with the approval of the LIGO Directorate.

2.2.1.3. All individuals in possession of LIGO.ORG credentials must accept and abide by the *LIGO.ORG Password Policy* (LIGO-M1700045). This policy shall be maintained and updated as necessary by CompSoft with the approval of the LIGO Directorate.

2.2.1.4. All individuals using or providing computing resources to support the Collaboration must abide by the *LSC Computer Security Policy* (LIGO-M1000140). This policy shall be maintained and updated as necessary by CompSoft with the approval of the LIGO Directorate.

2.2.1.5. All individuals wishing to use computing resources made available by CompSoft must accept the *LIGO Data Grid Acceptable Use Policy* (LIGO-M2000008). This policy shall be maintained and updated as necessary by CompSoft with the approval of the LIGO Directorate.

2.2.1.6. All software developed by The Collaboration that is used in preparation of a Collaboration publication must be 'open source' and available to general public no later than The Collaboration publication itself. Here 'open source' is defined as adhering to The Open Source Definition (https://opensource.org/osd).

Additionally, any such software must be made available to The Collaboration under an appropriate OSI-approved license before it can be reviewed according to the policies and procedures of the relevant Division (see e.g. §3.1.4.1 of the LSC By-Laws). Collaboration members who are not authors of the software are not permitted to exercise any right the OSI-approved license may give them to redistribute the software, unless granted explicit approval by the authors of

the software(as per §1.9.2 of the LSC By-Laws). This obligation to not redistribute the software ends with the first Collaboration publication whose preparation used the software.

Any software written by Collaboration members to fulfil a Memorandum-Of-Understanding (MOU) commitment between the author group and The Collaboration, must be open source (by the same above definitions) before the commitment can be considered complete.

Exceptions to this policy may be granted at the discretion of the LSC Spokesperson.

2.2.2. **Procedures**

2.2.2.1. Personal Information provided by individuals to the LIGO.ORG identity management system will be maintained according to the *LIGO.ORG Personal Information Policy* (LIGO-M1800036). That document shall be maintained and updated as necessary by CompSoft with the approval of the LIGO Directorate.

2.3 Emeritus Membership – *Under Development*

Former LSC Members may be granted Emeritus Membership as described in §1.7.8 of the LSC Bylaws [https://dcc.ligo.org/LIGO-M050172].

The procedure for requesting Emeritus status and scheduling a vote are described here:

2.3.1. **Policies**

2.3.1.1. After consulting the LSC Bylaws, the PI of the LSC Group to which the Emeritus member will belong should submit a request using the form: `https://forms.gle/79ZBF5bfKrwjBPad8`.

2.3.1.2. The request will be reviewed for completeness by the LSC Council Chair and the LSC Spokesperson and, if the request meets the criteria in the Bylaws, it will be scheduled for consideration at an upcoming LSC Council meeting.

2.4 Membership in other Collaborations – *Approved by Council, July 2023*

Gravitational-wave astronomy benefits from the close collaboration among a global network of gravitational-wave detectors both in establishing confidence of detection and in maximizing scientific gain from such detections. Hence the LSC wishes to establish and sustain data sharing agreements with all existing gravitational-wave (GW) experimental collaborations whose instruments can provide data of comparable sensitivity to those operated by the LSC. The LSC wishes to hasten the increased scientific return of the global network, and to this end will work with other collaborations to advance the design, installation, and commissioning of other detectors in the network.

Gravitational-wave astronomy also benefits from the work of non-gravitational-wave collaborations engaged in multi-messenger astronomy (MMA) in which electromagnetic and/or particle physics observations correlated with gravitational-wave observations provide additional insight into astrophysics and fundamental physics. The GW170817 binary neutron star merger discovery, for which gamma-ray, X-ray, ultraviolet, visible, infrared and radio counterparts were detected, demonstrated the value of MMA measurements.

In some instances, deeper insight can be gained by sharing proprietary information from gravitational-wave and non-gravitational-wave observations to carry out follow-up analyses beyond information released publicly. Examples in the past have included using gravitational waveforms (prior to public release), private galaxy catalogs, private pulsar ephemerides, and private sub-threshold gravitational-wave and non-gravitational-wave triggers.

One aegis for promoting this program may include LSC members who also belong to other experimental collaborations. However, such multiple membership also carries with it the potential for conflict of interest. The LSC expects its members to carry out fully their commitments to the construction, commissioning, operations, and data analysis of the LSC detectors.

2.4.1. **Policies**

2.4.1.1. Classification of other experimental collaborations:

2.4.1.1.1. **Non-competing collaboration:** An experimental collaboration which is operating or constructing detectors that have sensitive overlapping frequency bands with LSC detectors and/or may provide complementary information about astrophysical sources observable by LSC detectors. The LSC and the other collaboration may or may not have a data-sharing agreement that is approved by the LSC Council. This is the default designation.

2.4.1.1.2. **Competing collaboration:** An experimental collaboration which (1) is operating or constructing detectors that have sensitive overlapping frequency bands with LSC detectors and/or may provide complementary information about astrophysical sources observable by LSC detectors, (2) is pursuing one or more of the same science goals as the LSC, and (3) the LSC and/or the other collaboration have explicitly decided not to collaborate nor coordinate on publications. The designation of *competing collaboration* must be explicitly approved by the LSC Council.

2.4.1.1.3. Other experimental collaborations with detectors that do not have sensitive overlapping frequency bands with LSC detectors and other collaborations studying different areas of astronomy and physics are not subject to dual-membership restrictions.

2.4.1.2. An LSC member may *not* be simultaneously a member of a *competing collaboration*.

2.4.1.3. An LSC member may be simultaneously a member of a *non-competing collaboration* and may accept a leadership position in the LSC or the *non-competing collaboration* with agreement of the LSC Spokesperson that it does not present a significant conflict of interest. An LSC member may not hold simultaneously roles at the LSC-equivalent of Spokesperson or Deputy

Spokesperson in the LSC and a *non-competing collaboration*. Membership in the LSC Council (and equivalent positions in other collaborations) is allowed.

2.4.1.4. LSC members who are also members of any other *non-competing collaboration* must disclose their status, including any leadership positions, in a database visible to all LSC members. Disclosures will be reviewed annually by the MOU review panel which may request further details to understand potential for conflicts of interest. LSC members must ensure that their extra-LSC activities do not prevent them from fulfilling their commitment to the LSC as indicated in their MOU, including the percentage of their research time that they have committed to the LSC. Moreover, LSC members must give priority to the LSC if scheduling conflicts arise between their LSC and extra-LSC commitments.

2.4.2. **Procedures**

2.4.2.1. The Collaboration Standards and Services Division maintains the disclosure database.

Figure 1: The LSC Organization Chart showing working groups and committees as established in the LSC Bylaws.

3 Governance – *Under Development*

3.1 Organizational Chart

The LSC Organizational Chart is shown in Fig 1. As a collaborative organization, LSC Groups and their Members agree to work together to deliver the LSC Program.

Each LSC Group pledges to work on activities and tasks described in each Division's White Paper.

Division, Working Group, and Committee Chairs lead their members and facilitate decision making to deliver their assigned work.

Each committee and working group defines its own decision making procedures.

When the group cannot come to agreement on a Collaboration project or other matter, the Chairs of the working group or committee should approach the Division Chair for assistance in reaching a decision. If the matter cannot be resolved at the Division level, it should be brought to the Spokesperson who will discuss it with the Management Team and make a decision. If the matter requires a change in Collaboration policy, the Spokesperson will ask the LSC Council to consider the matter and implement appropriate policy changes.

3.2 Collaboration Council

The Collaboration Council, its membership, and its responsibilities are described in detail in the LSC Bylaws, Section 2.1. The policies listed here are clarifying and reinforcing of those listed in the Bylaws.

3.2.1. Policies

3.2.1.1. As the Council is the governing body for the Collaboration, its decisions on matters of science, policy, and procedure are binding and represent the position of the Collaboration.

3.2.1.2. The Council has the responsibility to meet and carry out its responsibilities in a timely manner, in order to effectively fulfill the scientific mission of the Collaboration.

3.2.1.3. Council members have a responsibility to actively participate on the Council's governance process, including staying informed of Council business, discussing Council issues with their respective LSC group, representing their group's perspective in the Council, and participating in Council decision making.

3.2.2. Procedures

3.2.2.1. The Council meets fortnightly via online videoconferencing (currently Zoom). The meetings are kept to a 1 hour length in order to maintain focus and efficiency. If additional time is required for a timely matter, an additional meeting is scheduled.

3.2.2.2. The Council makes decisions using an electronic voting application. The Council Chair is responsible for generating each vote and reporting the results back to the Council.

3.2.2.3. Council meeting agendas are posted on the Council Wiki: https://wiki.ligo.org/LSCCouncil/WebHome

3.2.2.4. The Chair keeps a record of the meeting including the primary decisions made by the Council, a video recording, an audio recording, and a list of the public chat messages. Documents referenced in the meeting are linked to the meeting record.

3.2.2.5. The Chair maintains a schedule of items for the Council agenda. People wishing to schedule an item for the Council, should contact the Chair.

3.2.2.6. Agenda items that are Collaboration business with a stated deadline are given highest priority. The Spokesperson establishes the priority of Collaboration business. Other matters are handled in the order they were received. The Chair forms the agenda and decides scheduling in cases of conflict or time limitations.

3.2.2.7. New agenda items may be brought to the attention of the Chair during a meeting. However, these items are placed within the same queue as agenda items submitted at other times. Raising a new agenda item during the meeting does not mean that it is given priority or that it will be addressed at the time it was raised.

3.2.2.8. To aid in clarifying the discussion on a given issue, the Chair may ask certain Council members to represent the various major viewpoints expressed within the Council.

3.2.2.9. For issues requiring extended discussion and/or issues on contentious topics, the Chair may call a separate meeting of the major parties in order to allow a more complete discussion of the issue than is allowed within the standard 1-hour meeting time. These meetings will be designed to formulate a consensus or compromise proposal to bring back to the Council for approval. These meetings are open to Council members.

3.2.2.10. The Council Chair is responsible for working with new candidate LSC groups to familiarize them with the Council approval process, including the presentation to the Council and the subsequent Council vote.

3.2.2.11. The Council Chair is responsible for working with new senior member candidates to familiarize them with the Council approval process, including the presentation to the Council and the subsequent Council vote.

3.2.2.12. The Council Chair is an ex officio member of the Management Team. Currently the Chair does not have voting rights on the Management Team, nor is the Chair asked to take notes or participate in the MT paper review process.

3.3 Voting

The LSC Council approved (on 19 January 2022, https://dcc.ligo.org/M2200005-v1) the following policy on announcing results of elections and votes of the LSC:

- All vote results will indicate the total number of votes cast (including abstentions) and, for Council votes, the number of eligible voters.
- Election results involving named individuals will announce only the names of the elected and unelected candidates, not the candidates' rank order or vote subtotals.
- A candidate who stands in an election will have access only to that individual candidate's vote subtotals.
- Vote results not involving named individuals will announce the vote subtotals, including the head-to-head matrix of votes for rank ordered votes.
- Any exceptions must be approved by a simple majority vote of the Council.
- All elections will clearly indicate which option applies by stating what results will be shared with whom prior to soliciting nominations and opening for votes.

3.4 Management Team

The roles and membership of the Management Team is described in §2.4 of the LSC Bylaws [**?**, XX]

3.4.1. The Management Team holds regular (typically weekly) meetings of its members to coordinate work across the Divisions of the LSC.

3.4.2. The Management Team maintains a wiki (`https://wiki.ligo.org/ExComm/WebHome`)).

3.4.3. Agendas and minutes of the Management Team meetings are posted on the wiki in accordance with the LSC Bylaws.

3.4.3.1. Minutes should include a list of attendees. For discussions, they should capture the essence of the discussion; there is no need to capture everything that is said. Action items should be noted indicating to whom they were assigned and when they are due.

3.4.4. The Management Team maintains a mailing list (`lsc-excomm@ligo.org`) for communication among its members.

3.4.5. Members of the Management Team share the duty of taking minutes, rotating the task among the members of the Management Team according to a schedule maintained on the Management Team wiki.

3.4.6. Decisions of the Management Team are taken as follows:

3.4.6.1. In general, the Management Team operates by consensus in making decisions. Consensus is achieved when every member either agrees or is willing to set aside their points of disagreement on a topic.

3.4.6.2. When a formal vote is needed, either according to LSC policies or due to lack of consensus, the decision is by simple majority vote.

3.4.7. The Management Team may enter closed session to discuss sensitive topics. The minutes will *only* indicate that the Management Team entered closed session.

3.5 Program Committee

4 Observational Science Division – *Under Development*

Initial Council presentation on 20 July 2022. Final presentation pending.

4.1 Basic Structure

The basic structure of the Observational Science division is described in Section 3.1 of the LSC Bylaws.

4.1.1 Procedures

4.1.1. Information on the Observational Science division, meetings, and the mailing list can be found at https://wiki.ligo.org/DAC.

4.1.2. The Observational Science division communicates via the mailing list dac@ligo.org, which is open to subscription for all LSC, Virgo, and KAGRA members at https://subscriptions.ligo.org/mailinglists.

4.1.3. Division online meetings are held weekly. Meetings are open to all LSC, Virgo, and KAGRA members. The time of the meeting is shifted regularly to facilitate regular attendance from all time zones. Agendas and minutes will be available for all meetings.

4.1.4. When needed the Chair of the Observational Science Division may call meetings limited to the Division's Steering Committee, as specified in Section 3.1.7 of the LSC Bylaws.

4.2 Policies common to the Observational Science Working Groups

4.2.1. All LSC groups performing Observational Science research are expected to be members of the appropriate Working Group(s). The scope of each Working Group is defined in the LSC Bylaws.

4.2.2. All groups within a Working Group are expected to participate regularly in Working Group meetings and activities and to report regularly on the status of their research.

4.2.3. All groups within a Working Group are expected to contribute to formulating the research plan presented in the annual instrument science white paper, and to design their research to fulfil the research missions articulated in the white paper.

4.2.4. All Working Group members are expected to work collaboratively, including the free sharing of information and data to further the research goals of the Working Group.

4.2.5. All publications with LSC authors that report on Observational Science Working Group research must be presented to the appropriate Working Group for review before being submitted to the Editorial Board for review. Any exceptions can be stated in the policies of the individual Working Groups.

4.2.6. A Working Group can create a research subgroup to help focus its research in a particular area, following the procedure specific to each Working Group.

4.2.7. Each Working Group is expected to solicit talks and create the agenda for their Working Group session at LVK collaboration meetings; the Working Group chairs carry the responsibility for this effort, which should be done in collaboration with appropriate members of the non-LSC collaborations. The Observational Science division chair is expected to organize Observational Science plenary sessions at collaboration meetings, along with representatives of the non-LSC collaborations.

4.2.8. New groups applying for LSC membership that plan to be members of an Observational Science Working Group(s) are expected to discuss their research plans with the appropriate Working Group chairs prior to their Council presentation; the chairs may require them to also present their plans to the their Working Group(s) prior to the Council presentation.

4.3 Burst Working Group

The scope and objectives of the Burst Working Group are described in Section 3.2 of the LSC Bylaws.

4.3.1 Procedures

4.3.1. Information on the group, subgroups, meetings, and the mailing list can be found at https://wiki.ligo.org/Bursts.

4.3.2. The working group communicates via the mailing list burst@ligo.org, which is open to subscription for all LSC, Virgo, and KAGRA members at https://subscriptions.ligo.org/mailinglists.

4.3.3. Working group online meetings are held weekly. Working group meetings are open to all LSC, Virgo, and KAGRA members. The time of the meeting is shifted regularly to facilitate regular attendance from all time zones. Agendas and minutes will be available for all meetings.

4.3.4. Subgroups play an important role in the efficient operation of the working group. The process for forming a research subgroup is:

4.3.4.1. Subgroups can only be created by the group chairs, taking into account group feedback.

4.3.4.2. Subgroups can have up to three co-chairs, depending on the size of the sub-group and the need for LSC-Virgo-KAGRA balance.

4.3.4.3. Subgroup co-chairs and liaisons are appointed by the group chairs for one year, with the expectation that the position can be renewed. Pipeline leads are appointed by the group chairs in consultation with the pipeline teams for one year, with the expectation that the position can be renewed.

4.3.4.4. Subgroup co-chairs are expected to organize subgroup meetings, set the agenda for the meetings, to report regularly to the main group call, and to lead the development of the subgroup's scientific plan.

4.3.4.5. Subgroup meetings are open to all LSC, Virgo, and KAGRA members.

4.3.4.6. Depending on need, subgroups can be placed in dormancy (existing in name only until its need is restored) or dissolved.

4.3.4.7. The subgroup structure, including names of the co-chairs will be kept up to date and will be public. The same applies for liaisons and pipeline leads. The current version is here: https://dcc.ligo.org/M2100148/.

4.4 Compact Binary Coalescence Working Group

The scope and objectives of the Compact Binary Coalescence (CBC) Working Group are described in Section 3.3 of the LSC Bylaws.

4.4.1 Procedures

4.4.1. Information on the group, subgroups, meetings, and the mailing list can be found at https://wiki.ligo.org/CBC.

4.4.2. The working group communicates via the mailing list cbc@ligo.org, which is open to subscription for all LSC, Virgo, and KAGRA members at https://subscriptions.ligo.org/mailinglists.

4.4.3. Working group online meetings are held weekly. Working group meetings are open to all LSC, Virgo, and KAGRA members. An additional meeting is held regularly at an alternative time to facilitate attendance from Asian/Australian time zones. Agendas and minutes will be available for all meetings.

4.4.4. Subgroups play an important role in the efficient operation of the working group. The process for forming a research subgroup is:

4.4.4.1. Subgroups can only be created by the group chairs, taking into account group feedback.

4.4.4.2. Subgroups can have up to three co-chairs, depending on the size of the sub-group and the need for LSC-Virgo-KAGRA balance.

4.4.4.3. Subgroup co-chairs are appointed by the group chairs for two years, with the expectation that the position can be renewed.

4.4.4.4. Subgroup co-chairs are expected to organize subgroup meetings, set the agenda for the meetings, to report regularly to the main group call, and to lead the development of the subgroup's scientific plan.

4.4.4.5. Subgroup meetings are open to all LSC, Virgo, and KAGRA members.

4.4.4.6. Depending on need, subgroups can be placed in dormancy (existing in name only until its need is restored) or dissolved.

4.4.4.7. The subgroup structure, including names of the co-chairs will be kept up to date and will be public. The current version is here: https://dcc.ligo.org/M2100023/. The roles and responsibilities of the working group and sub-group chairs are detailed here: https://dcc.ligo.org/M2100219.

4.4.5. Placeholder: Could the CBC chairs please detail here any additional publication policies or restrictions used in CBC that are not covered by Section 4.2?

4.5 Continuous Waves Working Group

The scope and objectives of the Continuous Waves (CW) Working Group are described in Section 3.4 of the LSC Bylaws.

4.5.1 Procedures

4.5.1. Information on the group, subgroups, meetings, and the mailing list can be found at https://wiki.ligo.org/CW.

4.5.2. The working group communicates via the mailing list cw@ligo.org, which is open to subscription for all LSC, Virgo, and KAGRA members at https://subscriptions.ligo.org/mailinglists.

4.5.3. Working group online meetings are held weekly. Working group meetings are open to all LSC, Virgo, and KAGRA members. The time of the meeting is shifted regularly to facilitate regular attendance from all time zones. Agendas and minutes will be available for all meetings.

4.5.4. Names of the working group co-chairs, review chairs and named liaisons will be kept up to date and will be public. The current version is here: https://dcc.ligo.org/M2300035/.

4.6 Stochastic Background Working Group

The scope and objectives of the Stochastic Background Working Group (SWG) are described in Section 3.5 of the LSC Bylaws.

4.6.1 Procedures

4.6.1. Information on the group, subgroups, meetings, and the mailing list can be found at https://wiki.ligo.org/Main/StochasticGroup.

4.6.2. The working group communicates via the mailing list stochastic@ligo.org, which is open to subscription for all LSC, Virgo, and KAGRA members at https://subscriptions.ligo.org/mailinglists.

4.6.3. Working group online meetings are held weekly. Working group meetings are open to all LSC, Virgo, and KAGRA members. The time of the meeting is shifted regularly to facilitate regular attendance from all time zones. Agendas and minutes will be available for all meetings.

4.6.4. Subgroups play an important role in the efficient operation of the working group. The process for forming a research subgroup is:

4.6.4.1. Subgroups can only be created by the group chairs, taking into account group feedback.

4.6.4.2. Subgroups can have up to three co-chairs, depending on the size of the sub-group and the need for LSC-Virgo-KAGRA balance.

4.6.4.3. Subgroup co-chairs are appointed by the group chairs for one year, with the expectation that the position can be renewed.

4.6.4.4. Subgroup co-chairs are expected to organize subgroup meetings, set the agenda for the meetings, to report regularly to the main group call, and to lead the development of the subgroup's scientific plan.

4.6.4.5. Subgroup meetings are open to all LSC, Virgo, and KAGRA members.

4.6.4.6. Depending on need, subgroups can be placed in dormancy (existing in name only until its need is restored) or dissolved.

4.6.4.7. The subgroup structure, including names of the co-chairs will be kept up to date and will be public. The same applies for liaisons and pipeline leads. The current version is here: https://dcc.ligo.org/M2200028.

4.7 Procedures for Writing Collaboration Observational Science Papers

DRAFT: work in progress. Both the content and positioning of this section in the document are subject to change.

This section is copied (almost) verbatim from https://wiki.ligo.org/DAC/RolesAndResponsibilities and is a replacement of the same. Strictly, this applies only to Observational Science papers and not, for example, to DetChar or calibration papers. If we wish to apply these procedures generally to all LSC papers then this section should be moved outside of the Observational Science section and into another section such as the Editorial Board section.

4.7.1. Purpose

This section details the roles and responsibilities of the many people involved in the preparation of any collaboration paper with astrophysical content. This guide is meant to facilitate the required coordination within such a complex process and to foster a more homogeneous internal organization model across different paper projects. The framework of rules is set by Attachment A of the LSC-Virgo MoA M060322.

4.7.2. General organization of this section

Section 4.7.3 describes the numerous roles ("actors") involved in the preparation of a collaboration paper. Section 4.7.4 describes the typical list of products of a paper. Section 4.7.5 describes the paper preparation process.

4.7.3. Actors

The following actors are involved in the preparation of a collaboration paper :

4.7.3.1. **Analysis Group**: These are the Burst, CBC, CW, and Stochastic Working Groups.

4.7.3.2. **Analysis Group Chair**: These are the Burst, CBC, CW, and Stochastic Working Groups co-chairs.

4.7.3.3. **Review Chair**: These are the review chairs of the Burst, CBC, CW, and Stochastic Working Groups.

4.7.3.4. **Science Project Team**: This is the team of people which carries on a particular scientific activity inside one or more Analysis Groups. The Science Project Team exists before the starting of the paper writing process, according to the internal organization of the relevant Analysis Groups. Examples may include the *CBC Testing GR* science project team, the *CBC catalog* science project team, and the *Stochastic GW-EM Correlations* science project team.

4.7.3.5. **Science Case Study Team**: Setting up one or more Science Case Study Teams is an optional step that Analysis Groups can implement if deemed useful to perform early investigations on a possible Collaboration paper. Several teams can be appointed, with different expertise, to answer specific questions. These appointments can be made in parallel or sequentially according to the convenience and logic; for example, a first stage case study can be a prerequisite for a second stage case study.

Purpose: The Science Case Study Team is charged with preparing written recommendations to the relevant Analysis Groups on the opportunity to start a paper project as a Collaboration, and the main scientific strengths and/or weaknesses of the paper(s) project. The relevant Analysis Groups may also give more specific charges. The recommendations of the Science Case Study Team will be discussed in the relevant Analysis Groups and shared with the other groups via the

DAC. Once this is done, the team has accomplished its duties.

Composition and Appointment: The composition will be determined by the relevant Analysis Group Chairs in consultation with the relevant Science Project Team.

Coordination: The Science Case Study Team can coordinate their activities in whatever forum is most appropriate, such as https://chat.ligo.org/ or TeamSpeak meetings.

4.7.3.6. **Paper Project Manager**: To each paper project one or more Paper Project Managers are assigned. The Editorial Team Chair may be one (or the only) Paper Project Manager.

Purpose: The Paper Project Manager is responsible for the coordination of the entire paper project from an organisational point of view. They check about milestones and about the status of analysis, review activities, data products and science summary. They maintain the documentation of the paper project status and are responsible to update the DAC about it. This responsibility can be delegated to the members of the Editorial Team. The Paper Project Manager is the primary interface of the paper project toward the Joint Editorial Board.

Composition and Appointment: The Paper Project Manager is appointed by the sponsoring Analysis Group Chairs in consultation with the relevant Science Project Teams, the DAC Chairs and the Spokespersons.

4.7.3.7. **Editorial Team**: The sponsoring Analysis Groups form a paper Editorial Team who will lead the paper preparation. There are no restrictions about the members that can be appointed. If some of them do not belong to the collaboration, an appropriate MOU should rule their participation. This MOU should define in particular the level of visibility of the information belonging to the collaboration to the external members, and the contribution they give to the project.

Purpose: The Editorial Team is responsible for the production and publication of a collaboration paper. It coordinates the Analysis Team data analysis efforts by: collecting their results (numerical data, figures, etc.); selecting the relevant and appropriate ones; asking for additional ones, if needed.

The Editorial Team also assigns writing tasks, maintains the paper draft, reports on paper progress, and shepherds the paper through collaboration review and through the journal production.

The Editorial Team is responsible for the coordination of the entire paper project (analysis, paper writing, data products), from a scientific and editorial point of view. The Editorial Team typically is not responsible for performing the entire analysis, drafting the entire paper, or producing all figures, tables, and other data products. The Editorial Team should leverage Collaboration human resources to perform these tasks as much as possible, and look at the results with a critical attitude with the main objective of obtaining a coherent result.

Philosophy: Collaboration papers are products of the entire collaboration, and so the entire collaboration should be free to participate in the paper analyses and writing. While the Editorial Team is responsible for the production of the paper, we do not wish for the Editorial Team to cloister themselves and emerge will a fully-drafted largely-immutable paper; rather we wish the production of the paper to be a transparent process within the Analysis Groups and for members to feel welcome to participate.

Composition and Appointment: Typically an Editorial Team will evolve from a designated Science Project Team when it comes time to begin drafting a paper. The composition will be determined by the Analysis Group Chairs of the sponsoring Analysis Groups in consultation with the relevant Science Project Team and the Spokespersons. Spokespersons can amend the composition, if they feel that it is not balanced enough. This requires an agreement among

Spokepersons, and a previous discussion inside the DAC.

The Science Project Team members may be augmented by additional members to allow for a broader participation in the editorial process and to bring in experience from other areas of the collaboration. It should be encouraged to include people from outside of the Analysis Groups (DetChar, IS, etc.) to ensure that "Collaboration papers are products of the entire collaboration" and take advantage of experience from other areas of the collaboration.

The Editorial Team is coordinated by the Editorial Team Chair, which is one of their members.

Coordination: The Editorial Team should coordinate their activities in whatever forum is most appropriate. The use of https://chat.ligo.org/ channels is strongly recommended, as it allows to keep a clear track of the history of the discussions. Calls on TeamSpeak (recommended) or other channels which can be used easily by all the collaboration members should be used for general updates and real time discussions.

These should normally be open venues so that interested parties can participate: https://chat.ligo.org/ channels should be open to collaboration members and TeamSpeak meetings should be announced on the DAC and involved Analysis Groups email lists. This should not be seen as a mandatory rule, and additional private meetings can be organized to speed up the process. Both for a public and a private meeting records of conversations (minutes, TeamSpeak recordings) should be made.

At least one member of the Editorial Team should be present on the weekly calls of the relevant Analysis Groups (as much as possible) to give a report about the progress of the Paper project.

4.7.3.8. **Editorial Team Chair**: To each Editorial Team an Editorial Team Chair is assigned.

Purpose: The Editorial Team Chair coordinates the Editorial Team activities.

Composition and Appointment: The Editorial Team Chair is a member of the Editorial Team. They are appointed by the Analysis Group Chairs of the sponsoring Analysis Groups in consultation with the relevant Science Project Team and the Spokespersons.

4.7.3.9. **Writer**: Each member of the collaboration, and in special cases outside the collaboration, can contribute to the draft paper by writing some part of it.

Purpose: The Editorial Team should not be seen as the direct responsible of writing the text of the paper. This can be done instead by the most suited members of the collaboration available, as a consequence of their competence in a particular issue. The typical task is writing some paragraphs or sections in the draft.

Composition and Appointment: The Editorial Team appoints one or more Writers and gives them well defined writing tasks. This can be an autonomous decision of the Editorial Team, or a response to a proposal done by the Writer candidate. After its appointment the Writer is responsible for the accomplishment of the writing task, and to discuss with the Editorial Team about changes that could be required.

4.7.3.10. **Analysis Team**: This is the team working at the data analysis with the goal to provide the results needed by the paper project and in particular requested by the paper Editorial Team. The coordination of the Analysis Team is the responsibility of the Editorial Team.

Purpose: In addition to the data crunching activity, this team is in charge of providing all the results in form of quantitative statements, tables and/or plots accompanied by a suitable explanatory text on the methods used and by comments about the outcomes. All this material is expected to be of suitable quality for inclusion in the paper draft.

It is expected that all methods used have already passed the internal review. If this is not the

case, which is not recommended, they will be reviewed at the same time of the results by the Analysis Review Team members.

Composition and Appointment: Participation in an Analysis Team is generally open to anyone who volunteers for specific activities required by the Editorial Team. The relevant Science Project Team nominates qualified individuals. Analysis Group Chairs of the sponsoring Analysis Groups in consultation with the relevant Science Project Teams check the team for consistency, taking also into account a balance of the involvement of components in other teams and paper projects. The Editorial Team can request further members to be included to cover additional activities believed to be mandatory or relevant for an appropriate paper development. These additional members can be added to the team not only in the initial phase of team creation, but also during all the analysis process if needed. The final decision about these additions is a prerogative of the Chairs of the sponsoring Analysis Groups, who take care to check that this is in agreement with the stated scope of the paper

Coordination: Analysts Team should coordinate their activities in whatever forum is most appropriate.

The use of https://chat.ligo.org/ channels is strongly recommended, as it allows to keep a clear track of the history of the discussions. Calls on TeamSpeak (recommended) or other channels which can be used easily by all the collaboration members should be used for general updates and real time discussions.

It is important for these forums to be transparent, in particular for the Editorial Team which should be able to continuously monitor the activities of the team.

4.7.3.11. **Analysis Review Team**:

Purpose: The Analysis Review Team is responsible for reviewing the codes and the results provided by the Analysts Team. The general principle is that it should be possible for the LVK to trace the origin and trust in the correctness of all LVK results.

A non-exhaustive list of tasks is:

- Verify that the source (code, analytical calculation, external reference) of every result proposed for inclusion in the paper (plots, data tables etc.) is explicitly declared;
- Verify that sources reproduce correctly the result proposed for inclusion in the paper. For example, if a given plot is generated by some code, it must be verified that it can be correctly generated by rerunning it.
- Verify that codes are correct, from the point of view of syntax and semantic;
- Verify that codes does what their authors claim to a satisfactory level of accuracy;
- Verify that codes are conveniently documented;

In particular, each reviewer must explicitly sign off when the review activity is satisfactory. The final sign off must be done by the relevant Analysis Group Chairs.

Composition and Appointment: The Analysis Review Team is appointed by the relevant Review Chairs. The relevant Analysis Groups can suggest members, both when the Analysis Review Team is formed or if/when integrations are needed. The composition of the group must be clearly documented at each time, and the documentation must be visible to all the Review Chairs.

Coordination: The Analysis Review Team should coordinate their activities in whatever forum is most appropriate, e.g., https://chat.ligo.org/, TeamSpeak meetings, etc. The activities of the Analysis Review Team are monitored by the Chairs of the relevant Review Groups.

4.7.3.12. **Analysis Review Chair**:

Purpose: The Analysis Review Chair coordinates the review of the results needed for the project. In particular they:

- check that the Analysis Review Team composition is appropriate;
- monitor the evolution of the reviews, and report about criticalities to the Review Chairs and to the Editorial Team;
- maintains an appropriate documentation of the reviews' status;
- asks Review Chairs for additional members of the Analysis Review Team if they are needed

Appointment: The Analysis Review Chair is appointed by the Review Chairs

Coordination: The Analysis Review Chair keeps in contact with the relevant actors in the form which is considered most appropriate. Communication channels must be maintained with the Analysis Review Team, with the Review Chairs, with the Editorial Team Chair and with the Paper Project Manager.

4.7.3.13. **Internal Referees Team**:

Purpose: The Internal Referees Team members act similarly to a journal referee in the peer reviewing process.

Composition and Appointment: The Internal Referees Team is appointed by the Joint Editorial Board.

Coordination: Internal Referees Team uses the tools provided by the Joint Editorial Board, and interacts among themselves to discuss their findings and coordinate the change requests, especially the major ones. They prepare their reposts and ask for changes using thes Joint Editorial Board tools to interact with the Editorial Board.

4.7.3.14. **Related Data Products and Science Summary Team**:

Purpose: The Related Data Products and Science Summary Team is responsible for preparing the science summary document and the data products (such numerical data associated with the plots) described in Section 4.7.4.

Composition and Appointment: The Related Data Products and Science Summary Team is defined inside the EPO group.

Coordination: The activities of the Related Data Products and Science Summary Team are monitored by the Paper Project Manager and checked by the Editorial Team.

4.7.4. Products

A non-exhaustive list of possible products associated with a paper is the following:

Figures: Figures separate from the paper, in one or more formats suitable for reusability.

Table data: Numerical data for tables that appear in the paper, or additional ones.

Plot data: Numerical data which can be used to reproduce a plot. Possible examples: time series, multidimensional data arrays.

Posterior data: Numerical data for the posteriors of the parameters relevant for the paper. Posterior samples can be given, with or without parametric representations.

Trigger data: Numerical and qualitative (for example, classifications) data relevant for events and catalogs of events.

Software: The numerical products can be given in a numerical form. Another possibility is to give scripts which can reproduce the data. The given scripts can be parametric, i.e. they can be used to produce additional data.

Documentation: All the products should be documented in a convenient form. Dedicated documents can be given, or products can be given, if possible, in a self-documented form.

4.7.5. Paper preparation process

At any given time a paper project will be in one of the following states :

future: This is a general idea for a paper, not yet planned out.

standby: This is a template for an exceptional event or signal, which will be the basis for an actual paper plan if/when one is detected.

planned: In this case the scope, people involved and timeline for the project are roughly known, and a Paper Project Manager has been appointed.

active: In this case the paper is in an active development phase. The involved teams have been defined and milestones are defined and updated regularly when needed.

done: The paper has been accepted by the journal and all associated data products have been released. The science summary has been finished.

setaside: means the paper is unfinished but is no longer being worked on.

The paper project is controlled by two main deadlines. The first is a reasonable period needed for the definition of the scope of the paper. This deadline should be set at the initial stage of the process by the Editorial Team. When the scope of the paper is clear and the required time for analysis, reviews and additional material is known the Editorial Team together with the Paper Project Manager can define and propose a final deadline for the complete project. This one should be compatible with the complete planning, with the estimate of the needed intermediate deadlines.

Some of these, as defined in the current Publication Plan template (see https://pubplan.ligo.org/help.html) are:

i. First (preliminary) results available for review

ii. First complete draft to working group(s)

iii. First (preliminary) results available for review

iv. First complete draft to working group(s)

v. Initial circulation to LVK with nominally correct author list (see the flow chart at https://wiki.ligo.org/PPComm/WebHome)

vi. Final results available

vii. Mature draft circulation to LVK

viii. Date of presentation to LVK

ix. Complete review of final results

x. Seek paper approval by LVK

xi. Final circulation of approved paper

xii. Paper release (as preprint)

xiii. Initial journal submission

xiv. Resubmission after addressing referee comments

4.7.6. Paper Drafting

The paper drafting should be done by the Editorial Team in gitlab under https://git.ligo.org/publications. The relevant Analysis Group Chairs can assist in setting up a blank project in gitlab if needed.

The Continuous Integration (CI) system should automatically build the paper after every commit. This will allow interested parties to review the paper development. Drafting should be a public process.

4.7.7. Review

The Review Chairs should be involved from a formative stage. The paper should have both Technical Reviewers (which are the members of the Analysis Review Team) and Paper Reviewers (which are the members of the Internal Review Team).

The Editorial Team should create a master review wiki page in the paper repository's wiki in gitlab. This should have high-level checkboxes for all items that must pass review and links to subpages in the gitlab wiki (or to external resources, if appropriate). A template review page can be accessed here.

The activity of the Analysis Review Team should begin as early as possible.

Paper review by the Internal Referees Team can begin shortly after the paper drafting begins (though the reviewers may opt to wait until the draft is at a semi-mature stage).

4.7.8. Paper Issues

All issues should be recorded within the gitlab project. The Editorial Team is encouraged to set up pre-defined issue categories. Typical categories include:

- Authorship Petitions
- Intended Journal
- Title
- Abstract
- Section XX, YY, ZZ
- Figure XX, YY, ZZ
- Table XX, YY, ZZ
- Conclusions
- References

The issue list should document in particular the foreseen content of the paper, and is the main reference that allows the collaboration to be aware about the decisions which are taken about this point. Other ad hoc issues can be assigned tags related to the above. While comments in user-defined issues may be allowed during the first circulation period, they should be strongly discouraged during the mature circulation period at which point the scope of the paper should be largely settled.

Non-trivial private change requests must be added to the issues in gitlab so that all requests of the Editorial Teams are made openly. (No back-door channels for certain collaboration members.)

In situations where issue comments are contradictory or controversial, the Editorial Team should attempt to resolve the issue, e.g., by inviting interested parties to an Editorial Team meeting. A synopsis should be recorded by the Editorial Team in the appropriate issue(s).

If an issue needs adjudication, the Editorial Team must meet with the relevant Analysis Group Chairs (and possibly other parties) to come to a resolution. The Analysis Group Chairs will review the cases made in the issue tracker. Any resolution will also be summarized in the issue tracker.

4.7.9. Circulation and LVK Approval

The paper should be circulated to the full LVK at various stages during the writing, and will eventually require approval by the LSC Executive Committee and Virgo Scientific Committee. The procedures for circulation and approval are provided by the *"Flowchart of review process for collaboration papers"* at https://wiki.ligo.org/PPComm/WebHome. Prior to the first circulation, the manuscript should be put in the LIGO Document Control System (DCC) with document type "P" (for Publications) and the Virgo TDS, under the responsibility of the Paper Project Manager. The work of the Internal Review Team can be initiated from these entries.

4.7.10. Pre-Submission

Before submission, the Editorial Team should:

- coordinate the preparation of the public data to be released (see Section 4.7.4); and
- work with the Education and Public Outreach (EPO) team to produce a Science Summary and other EPO resources.

4.7.11. Submission:

The process for the submission of LVK full-author-list papers to the arXiv and to journals is described in https://dcc.ligo.org/LIGO-M1900017. This includes "final touches" to the manuscript, the DCC listing, and to outreach materials.

4.7.12. Journal Processing:

The Editorial Team should share referee reports with the Data Analysis Committee and the relevant Analysis Groups using the appropriate mailing lists when the reports are received. If there are issues in the reports to be addressed, the Editorial Team should translate these into the issue tracker for the paper.

The Editorial Team is responsible for reviewing paper proofs. When the paper is accepted/ published, the Editorial Team should inform the Data Analysis Committee and the relevant Analysis Groups via the relevant mailing lists. Communications by the Journal for fees should be sent to the Spokesperson immediately.

Once the paper is published, the Editorial Team will ensure that an open-access version of the paper is available. This can be done either by publishing in an Open Access journal or by making the accepted version of the paper available on the arXiv.

This is the end of the Editorial Team's duties, unless an erratum is required. In this case the Editorial Team will be reconstituted. A relevant issue will be created in the issue tracker, and the Editorial Team will coordinate the publication of the errata in coordination with the Joint Editorial Board, the Data Analysis Committee, and the relevant Analysis Groups.

5 Instrument Science Division

5.1 Basic Structure – *Approved by Council, July 2022*

The basic structure of the Instrument Science division is described in section 4.1 of the LSC Bylaws.

5.2 Policies common to the Instrument Science Working Groups – *Approved by Council, July 2022*

5.2.1. All LSC groups performing Instrument Science (IS) research are expected to be members of the appropriate IS Working Group(s). The scope of each Working Group is defined in the LSC Bylaws.

5.2.2. New groups applying for LSC membership that plan to be members of an IS Working Group(s) are expected to discuss their research plans with the appropriate IS Working Group chair(s) prior to their Council presentation; the chair(s) may require them to also present their plans to the IS Working Group prior to the Council presentation.

5.2.3. All groups within a Working Group are expected to regularly report on the status of their research.

5.2.4. All groups within a Working Group are expected to contribute to formulating the research plan presented in the annual instrument science white paper, and to design their research to fulfill the research missions articulated in the white paper.

5.2.5. All Working Group members are expected to work collaboratively, including the free sharing of information and data to further the research goals of the Working Group.

5.2.6. All publications with LSC authors that report on IS Working Group research must be presented to the IS Working Group for review before being submitted to the Editorial Board for review. Any exceptions can be stated in the policies of the IS Working Group.

5.2.7. An IS Working Group can create a research subgroup to help focus its research in a particular area, following the procedure specific to each Working Group.

5.2.8. Each IS Working Group is expected to solicit talks and create the agenda for their Working Group session at LVK collaboration meetings; the Working Group chairs carry the responsibility for this effort, which should be done in collaboration with appropriate members of the non-LSC collaborations. The IS division chair is expected to organize IS plenary sessions at collaboration meetings, along with representatives of the non-LSC collaborations.

5.3 Advanced Interferometer Configuration Working Group – *Approved by Council, July 2022*

5.3.1. Procedures

5.3.1.1. AIC working group can find information on the group, subgroups, presentations, and the mailing list access at `https://wiki.ligo.org/AIC`

5.3.1.2. Broader AIC Meetings are held when new publications have been released for review. All members are strongly encouraged to join these meetings and provide feedback.

5.3.1.3. Subgroups of the AIC meet regularly (usually monthly) to discuss specific research areas, see the wiki for who is the current chair:

5.3.1.3.1. IFOsim - development and application of simulations to detector commissioning and design

5.3.1.3.2. Voyager - alternating AU/US and EU/US timezones - research into cryogenic interferometer upgrades

5.3.1.3.3. Newtownian Noise

5.3.1.4. The process for forming a research subgroup is:

5.3.1.4.1. Propose the idea of a research subgroup to the AIC chair

5.3.1.4.2. AIC Chair decides on the subgroup formation

5.3.1.4.3. An initial chair or co-chairs of the research subgroup are either appointed by the AIC chair or voted on by the subgroup depending on the subgroup policies

5.3.1.4.4. New subgroups must include their policies and procedures in this section

5.4 Control Systems Working Group – *Approved by Council, July 2022*

5.4.1. Policies

5.4.1.1. One or more representative from the the commissioning groups at the two observatories are expected to participate in the CSWG activities and meetings.

5.4.1.2. The CSWG organizes tutorial sessions and seminars to cover control-system-related topics, with the aim of providing introductory and pedagogical material for new groups and members

5.4.2. Procedures

5.4.2.1. The CSWG meetings are held monthly, online, at times determined by the group chair, after consultation with the groups.

5.4.2.2. All groups participating in the CSWG are expected to be represented at the meetings on a regular basis.

5.4.2.3. The process for forming a research subgroup is:

5.4.2.3.1. Propose the idea of a research subgroup to the CSWG chair or to the working group during a regular meeting,

5.4.2.3.2. The CSWG chair will schedule a vote on the formation of a research subgroup. All members of the groups involved in CSWG activities can vote.

5.4.2.3.3. A chair of the research subgroup is appointed by the chair or elected by the working group

5.4.2.4. The group communicate via one mailing list cswg@ligo.org open to the LVK. Interested people and group members are invited to subscribe using https://subscriptions.ligo.org/mailinglists

5.4.2.5. All groups are invited to report periodically their activity using the electronic logbook at https://alog.ligo-la.caltech.edu/CSWG and the wiki pages at https://wiki.ligo.org/CSWG

5.5 Lasers & Auxiliary Optics Working Group – *Approved by Council, July 2022*

5.5.1. **Procedures**

5.5.1.1. The LAWG meetings are held on a regular basis or in a timely manner after a request of a group to present. Meetings will be held online, at times determined by the group chair, after consultation with the groups.

5.5.1.2. All groups participating in the LAWG are expected to be represented at the meetings on a regular basis.

5.5.1.3. LAWG research subgroups can be initiated through a motion to form a subgroup by any member of the LAWG to the LAWG chair. In this case the chair shall schedule a vote among all LAWG members. A simple majority is required to form the new subgroup. The chair of the research subgroup is appointed by the chair or elected by the members of the LAWG.

5.6 Optics Working Groups – *Approved by Council, July 2022*

5.6.1. **Procedures**

5.6.1.1. OWG meetings

- The OWG meets regularly every second week.
- OWG meetings are open to Virgo and KAGRA members and to all other LSC members.

5.6.1.2. Mailing lists

- The OWG communicates via two mailing lists: owg@ligo.org and lvc-optics@ligo.org
  - owg@ligo.org is for LSC members only
  - lvc-optics@ligo.org is a joint LSC-Virgo mailing list

5.6.1.3. Presentations/research updates

- Research groups are required to give research status reports several times per year (when requested) at OWG meetings and/or during OWG sessions at LVK meetings.
- Manuscripts presenting OWG-related research have to be presented to the OWG prior to the LSC review procedure at OWG meetings and/or during OWG sessions at LVK meetings.

5.6.1.4. Process of forming OWG subgroups

- Ideas for subgroups should be proposed to the OWG chair or to the working group during a regular meeting. The group is created by a vote of the OWG.
- A chair of the research subgroup is either appointed by the OWG chair, or elected by the OWG, at the discretion of the OWG chair.
- Subgroups can be dissolved by the subgroup chair, by a vote of the OWG or the OWG chair at their discretion.

5.7 Quantum Noise Working Group – *Under Development*

5.7.1. Policies

5.7.1.1. Publications that report on research arising from discussions or collaboration within the LVK, or which makes specific claims about applicability of that research to current and future gravitational wave detectors, must be presented to the QNWG for comments before being submitted to the Editorial Board for review as per instrument science policy 5.2.6.

5.7.1.2. Research that is outside of the scope of the LVK quantum noise research which does not make specific claims about gravitational wave detectors, for example that lists gravitational wave detectors as one of multiple potential applications, does not necessarily require P&P review. Such research can (and should) be shared at the discretion of the authors. Authors should contact the working group chair to clarify if they are uncertain about their scope. Sharing work within the QNWG is encouraged.

5.7.2. Procedures

5.7.2.1. Information about the QNWG and its member research groups can be found at `https://wiki.ligo.org/QNWG/WebHome`. Members should maintain their R&D activities and member lists on a yearly basis.

5.7.2.2. The QNWG mailing list (`lvc-qnwg@ligo.org`) serves as a forum for remote discussions, paper announcements, and requests for dutiful citations or acknowledgments of past work. The QNWG chair will moderate these discussions as needed to maintain respectful and productive conduct, preferring private correspondence to resolve disputes and public correspondence to discuss science.

5.7.2.3. The working group sessions at LVK collaboration meetings will serve as regular meeting times for the QNWG. Additional meetings will be scheduled as needed to conduct business (e.g. white paper development and status reports) and for paper presentations.

5.8 Seismic Isolation and Suspensions Working Group – *Approved by Council, July 2022*

5.8.1. **Procedures**

5.8.1.1. Monthly meetings are nominally held on the third Wednesday or Thursday of the month for US/Europe timezones. All groups are expected to be represented and regularly participate in SWG meetings.

5.8.1.2. Monthly meetings are nominally held on the third Thursday or Wednesday of the month for India/Australia timezones. Each month the India/Australia call either runs on a Wednesday or a Thursday, to allow this call to either lead or lag the US/Europe call. All groups are expected to be represented and regularly participate in SWG meetings.

5.8.1.3. The SWG communicates via the mailing list `swg@ligo.org`

5.8.1.4. Groups are required to give research status reports at SWG meetings using the online logbook `https://alog.ligo-la.caltech.edu/SWG/`.

5.8.1.5. Process of forming SWG subgroups

- Ideas for subgroups should be proposed to the SWG chair or to the working group during a regular meeting.
- A chair of the research subgroup is either appointed by the SWG chair, or elected by the SWG, at the discretion of the SWG chair.
- Subgroups can be dissolved by the subgroup chair, by a vote of the SWG or the SWG chair at their discretion.

6 Operations Division

6.1 Basic Structure – *Approved by Council, June 2022*

The LSC Operations division coordinates LSC activities as they relate to detector operations. The LIGO Laboratory directs the vast majority of the activities related to the assembly, installation, commissioning, and maintenance of the detectors. The larger LSC plays a role in calibrating and characterizing the detector output data, rapidly alerting observers when a gravitational-wave candidate is found, co-ordinating with Virgo and KAGRA on the planning of engineering and observing runs, and preparing the data for release to the public. The Operations division also facilitates visits by members of the collaboration to the LIGO observatories where they work closely with on-site staff.

6.1.1. **Policies**

6.1.1.1. The Operations Division shall hold regular meetings open to all members of the LSC, Virgo, and KAGRA collaborations.

6.1.1.2. Representatives of each Working Group and Committee in the division shall participate in, and report at, the division meetings on a regular basis.

6.1.1.3. Activities in the Operations Division should be coordinated with corresponding members of the Virgo and KAGRA collaborations.

6.1.1.4. Groups within the Operations division shall work collaboratively, freely sharing information and data.

6.1.2. **Procedures**

6.1.2.1. The division chair, and the chairs of the division Working Groups and Committees should be listed on the Operations wiki (https://wiki.ligo.org/Operations/WebHome).

6.1.2.2. A recording of the regular meetings, and associated minutes, should be posted on the Operations wiki (https://wiki.ligo.org/Operations/WebHome).

6.1.2.3. The Operations Division periodically organizes workshops to aid in planning or decision making for future observing runs. These workshops may include joint sessions with colleagues in the Observational Science Division

6.1.2.4. The division leadership occasionally forms ad-hoc committees to investigate and report on an issue of interest. The leadership shall provide a charge to such committees and a reporting schedule.

6.1.2.5. The division leadership may recruit reviewers as needed, typically at the request of Working Group chairs.

6.1.2.6. To facilitate communication between Operations and Observational Science, liaisons to Operations working groups shall be appointed from each Observational Science group. A list of these liaisons shall be maintained on the Operations wiki (https://wiki.ligo.org/Operations/WebHome).

6.2 Detector Characterization Working Group – *Approved by Council, June 2022*

The LIGO Detector Characterization group is charged with characterizing the performance of the LIGO detectors and their data, identifying and mitigating sources of noise that are limiting for the astrophysical analyses, and vetting gravitational-wave event candidates.

6.2.1. **Policies**

6.2.1.1. All LSC groups performing research on or related to detector characterization should be members of the Detector Characterization working group.

6.2.1.2. One or more representatives from each group shall participate in the detector characterization meetings on a regular basis.

6.2.1.3. All groups within the Detector Characterization working group shall regularly report on the status of their research and activities.

6.2.1.4. All publications with LSC authors that report on research within the purview of the Detector Characterization group must be presented to the Detector Characterization working group for review before being submitted to the Editorial Board for review.

6.2.1.5. The LIGO detector characterization co-chairs may add, eliminate, or re-structure DetChar leadership positions within the group as needed, in consultation with the broader detector characterization group. The LIGO detector characterization co-chairs have authority to form ad-hoc committees as needed.

6.2.2. **Procedures**

6.2.2.1. The group's teleconferences are held approximately one to two times weekly online, at times determined by the group chairs in consultation with the group members.

6.2.2.2. The Detector Characterization working group uses the DCC, wiki.ligo.org and, where appropriate, the aLIGO logbook to document research materials, git.ligo.org for software version control.

6.2.2.3. Working group communications are via the group's mailing list detchar@ligo.org and via online communication software, currently DetChar Slack, found at gwdetchar.slack.com.

6.2.2.4. Regular status reports on the group's activities are made in the Operations Division meetings.

6.2.2.5. All institutional LSC groups participating in this working group should contribute to the research plans presented in the annual Operations White Paper and Observational Science White Paper.

6.2.2.6. Activities in this working group are communicated with corresponding members in the Virgo and KAGRA collaborations.

6.2.2.7. Leadership positions appointed by the co-chairs include:

- Instrument characterization leads - lead efforts to characterize the LIGO detectors and liaise with LIGO site staff, including subsystem characterization.
- DetChar review chair - manages the review of critical DetChar code and coordinates code configuration control with other working groups.
- DetChar computing lead - ensures critical tools and software are accessible and deployed for the entire LIGO-Virgo-KAGRA collaboration to utilize.
- Event validation lead(s) - maintain lists of all gravitational-wave candidates to be vetted; maintain an event validation procedure for the RRT and offline event validation stages; coordinate DetChar volunteers to vet event candidates; ensure that the outcomes of vetting procedures are disseminated to analyses.

- Data quality shift coordinator - oversees data quality shift schedule and helps to train data quality shift volunteers.
- Safety studies coordinator - responsible for creating DetChar safety injection waveform files, coordinating and overseeing the analysis of the safety hardware injections, collating the results and keeping the channel lists up to date with new safety information.
- Data quality liaisons - responsible for attending meetings of both groups and communicating relevant developments to each.

6.2.3. **Procedure regarding LIGO DetChar tools**

6.2.3.1. **Requirements for the DetChar group**

6.2.3.1.1. The infrastructure for DetChar software will use a common data format.

6.2.3.1.2. Evaluation metrics and 'mock data challenges' featuring common data sets and training sets to be used for testing will be supported for tools in development, including supervised and unsupervised machine learning work. These mock data challenge data sets must be well documented and well advertised to the group.

6.2.3.1.3. A standardized safety protocol will be used for all tools that use auxiliary channels.

6.2.3.2. **Requirements for tool developers**

6.2.3.2.1. No restrictions or requirements should be made on methods or techniques for development, or input formats to these methods, with the exception of requiring use of standardized auxiliary channel safety information (where applicable).

6.2.3.2.2. All DetChar tool developers are responsible for producing code and technique documentation, including the code itself and usable instructions for running the code.

6.2.3.2.3. All DetChar tools must make results available for use by the DetChar group in the appropriate common data format(s).

6.2.3.2.4. All DetChar tools that make use of auxiliary channels are required to use the standardized auxiliary channel safety protocol from the earliest stages of development.

6.2.3.2.5. All DetChar machine learning and classification tools must produce results for DetChar evaluation metrics and mock data challenges in the common data format.

6.2.3.3. Any tools or techniques that meet requirements may be eligible to be counted as InfraOps for MOU reports (pending agreement by the MOU review committee), and may be eligible to be included in any LIGO DetChar technique comparison papers with a full LSC authorlist. The work may be counted as 'applied to LIGO data' for MOU reports and statements made in talks or papers that go through internal LIGO Editorial Board review.

6.3 Calibration Working Group – *Approved by Council, June 2022*

The main output product from the Calibration working group is the reconstructed $h(t)$ data in each observing run, together with estimates of the associated calibration error and uncertainty.

6.3.1. Policies

6.3.1.1. All LSC groups performing research related to detector calibration should be members of the Calibration working group.

6.3.1.2. All members of the Calibration working group should participate in group meetings and report on the status of their research.

6.3.1.3. All publications with LSC authors that report on calibration research must be presented to the Calibration working group for review before being submitted to the Editorial Board for review.

6.3.1.4. The Calibration working group includes a PCal subgroup, focusing on activities and research that utlilize the Photon calibrator.

6.3.1.4.1. The subgroup chair(s) are appointed by the Calibration co-chairs after consultation with the subgroup.

6.3.1.4.2. The Pcal subgroup should report at the Calibration working group meetings on a monthly basis.

6.3.1.5. The Calibration working group does not guarantee to provide reliable calibration or estimates of calibration uncertainty when the detector is out of the observing mode. In some exceptional cases, where events are observed when the detector is out of the observing mode, additional investigations and procedures may be needed to quantify the calibration accuracy and precision.

6.3.2. Procedures

6.3.2.1. The Calibration meetings are held online regularly, at times determined by the group chairs, after consultation with the group members.

6.3.2.2. The Calibration working group communicates via mailing list calibration@ligo.org and the calibration channel on the LIGO Mattermost chat.

6.3.2.3. The Calibration working group uses the following services:

6.3.2.3.1. Documentation of research materials: LIGO DCC (`https://dcc.ligo.org`), `https://wiki.ligo.org`, and the aLIGO electronic log books

6.3.2.3.2. Software version control: `https://git.ligo.org/calibration`

6.3.2.3.3. Issue tracking: `https://git.ligo.org/calibration`, LIGO Operations and aLIGO Integration Issues System, and the LIGO ECR Ticket System

6.3.2.4. All LSC groups participating in the Calibration working group should contribute to the research plans presented in the Operations White Paper and the Observational Science White Paper.

6.3.2.5. Activities in the Calibration working group are communicated with corresponding members in the Virgo and KAGRA collaborations.

6.3.2.6. The Calibration working group reports research status to the Operations Division meetings on a regular basis.

6.4 Low Latency Working Group – *Approved by Council, June 2022*

The main output product from this group are the low latency alerts corresponding to transient detections of gravitational wave candidates. The group interacts and communicates with the search groups in the Observational Science Division and with all the working groups under the Operations Division in order to integrate contributing elements that make the low latency alerts possible.

6.4.1. **Policies**

6.4.1.1. All institutional LSC groups performing research on or related to low latency alerts should be members of this group.

6.4.1.2. Representatives from LSC groups contributing to this work should participate in the low latency working group meetings and activities on a regular basis.

6.4.1.3. All groups undertaking work pertinent to this working group should regularly report on the status of their research.

6.4.1.4. All publications with LSC authors that report pertinent research must be presented to this working group for review before being submitted to the Editorial Board for review.

6.4.1.5. The working group chairs may create a research subgroup, as needed, in order to help focus research in a particular area.

6.4.1.6. All gravitational-wave event alerts issued publicly or privately among MoU partners on behalf of the LSC (LVK) must be recorded in advance within the collaborations' central event repository (currently, this is GraceDB).

6.4.1.7. All information pertinent to gravitational-wave event alerts issued in real time or offline, up to when the gravitational-wave strain data is released publicly, must be kept up-to-date within the central event repository (GraceDB).

6.4.1.8. All non-public information from MOU partners that may be used for coincidence analyses with gravitational waves candidates must be accessible to all collaboration members.

6.4.1.9. Astrophysical search and annotation pipelines must meet acceptance and compliance requirements established by this group for their inclusion in the low latency alert-generation pipelines.

6.4.2. **Procedures**

6.4.2.1. The group's teleconferences are held weekly online, at times determined by the group chairs, after consultation with the groups members.

6.4.2.2. Working group communications are via the group's mailing list emfollow@ligo.org and the corresponding channel on LIGO Mattermost.

6.4.2.3. The working group uses DCC, and wiki.ligo.org to document research materials, and SVN and git.ligo.org for software version control.

6.4.2.4. The working group reports the research status on a regular basis in the Operations Division meetings.

6.4.2.5. All LSC groups participating in this working group should contribute to the research plans presented in the Operations White Paper and the Observational Science White Paper.

6.4.2.6. Activities in this working group are communicated with corresponding members in the Virgo and KAGRA collaborations.

6.5 Run Planning Committee – *Approved by Council, June 2022*

The Run Planning Committee (RPC) is charged with the strategic planning of engineering and observing runs. It coordinates activities with gravitational-wave detector partners. The run schedules of LIGO detectors are determined by the LIGO Lab's Operations Management Team (OMT). The RPC also supports the Rapid Response Team (RRT) in planning for observing runs.

6.5.1. **Policies**

6.5.1.1. The RPC has a specific responsibility to interface to the OMT so that the position of the committee reflects the LIGO Lab's perspective on run planning.

6.5.1.2. The RPC works closely with Virgo and KAGRA in a Joint Run Planning Committee (JRPC) to develop actions and position papers which are common to the three Collaborations.

6.5.1.3. The JRPC meets on an as-needed basis, with attendance by invitation. The Agenda is developed jointly by LVK RPC chairs. The meetings address the planning for runs, the communication to Observers, and RRT concerns.

6.5.1.4. The JRPC has specific responsibilities as regards communication to the greater Scientific Community:

6.5.1.4.1. Organization of Telecon Meetings with the non-Collaboration Observers ('LVEM').

6.5.1.4.2. Maintenance of public-facing Web Pages which communicate the Observing plans to the scientific community. especially the non-Collaboration Observers.

6.5.2. **Procedures**

6.5.2.1. The LVK Joint Run Planning Committee (JRPC) serves as a contact between the leadership, the Collaborations, and the scientific community. The JRPC meets as needed, paced by updates to the detector readiness, Collaboration planning changes, and the non-GW observing proposal schedule.

6.5.2.2. Each of the LVK Collaborations has internal processes used to develop and refine detector upgrades and observing schedules.

6.5.2.2.1. The Virgo, KAGRA, and LIGO/LSC leadership meets regularly to communicate successes and challenges in preparing for observing runs. This direct connection to the detector resources, constraints, and ambitions provides the point of departure for planning runs.

6.5.2.2.2. The OMT determines the run scheduling that meets the constraints of the instruments for LIGO.

6.5.2.2.3. In Virgo, the Project Management Team (PMT) proposes a run schedule, based on the detector installation and commissioning progress, which is then endorsed by the Virgo Steering Committee.

6.5.2.2.4. The KAGRA SEO (System Engineering Office) proposes a run schedule, based on the detector installation and commissioning progress, which is then endorsed by the KAGRA EO(Executive Office).

6.5.2.3. The JRPC develops and maintains a web-based portal for information useful for Observers and other interested members of the scientific community. The JRPC receives collaboration and support from a number of other organizational elements for this endeavor.

6.5.2.3.1. Commissioners and the Detector Operations teams provide constraints and opportunities with respect to detector operation. The sensitivity and other operational parameters of the detectors are established.

6.5.2.3.2. The contents are developed by JRPC with help from Observational Science groups. Specifically, Skymaps and other measures relevant for Observers will be developed by appropriate groups in Observational Science

6.5.2.3.3. The update is developed in a web markup language in a stand-alone document. It is maintained on a server maintained by a common LVK group.

6.5.2.4. The current half-year rhythm of non-GW observing proposal deadlines provides the need for public statements timed to inform those proposals, as well as the internal Collaboration activities.

6.5.2.4.1. For LIGO, the OMT writes a memo reflecting the LIGO Lab perspective, shares it with the LSC JRPC Chair ASAP, and holds circulation until the JRPC meets.

6.5.2.4.2. For Virgo, the Project Leader reports the PMT proposal to the VSC, informing the Virgo JRPC Chair at the same time.

6.5.2.4.3. KAGRA: the project manager reports the SEO proposal including the status of KAGRA Observatory to KAGRA EO, informing the KAGRA JRPC chair and the KAGRA Scientific Congress Chair at the same time.

6.5.2.5. The JRPC will arrange a meeting-by-invitation any time there is input from one of the Collaborations on readiness and timing, or approximately one month prior to an non-GW Observer deadline. The outcome of the JRPC meeting will be a memo that can be put at the public-facing sites:

- LSC: `https://www.ligo.org/scientists/GWEMalerts.php`
- Virgo: `www.virgo-gw.eu`
- KAGRA: `https://gwcenter.icrr.u-tokyo.ac.jp/en/plan/lvk-run-scheduling`

and shared within the collaborations. Major changes from the previous announcements will also be put as a news item on the LIGO Lab web site in sync with other public announcements. This memo is the common statement of the LVK about upcoming run plans. It should always include the date of the memo and the date of the next update. It will be posted on public web pages of the three Collaborations simultaneously.

6.5.2.6. The JRPC will also ensure the maintenance of information about electromagnetic observing schedules and proposal deadlines that are relevant to the GW observing runs. These should be accounted for in developing and announcing the run schedule. Currently one source is `https://dcc.ligo.org/LIGO-M1900086`.

6.5.2.7. The RPC chair will help to arrange the JRPC meeting and post any resulting JRPC decision memo to the LIGO DCC and on the LSC web site.

6.5.2.8. The RPC chair will ensure that the LSC spokesperson and the OMT chair are aware of the update so that that they may inform the scientific community, the collaboration membership and the LIGO Lab.

6.6 Computing and Software Working Group – *Approved by Council, March 2023*

The Computing and Software Working Group (CompSoft) is responsible for organising and documenting the Collaboration's computing hardware and software infrastructure and for formulating plans for its evolution.

6.6.1. **Policies**

6.6.1.1. CompSoft shall provide computing hardware and software resources as required to support the Collaboration's research mission.

6.6.1.2. CompSoft shall create and manage operation, usage, and other policies for these services as required to ensure the operational effectiveness of the services in question.

6.6.1.3. All groups participating in CompSoft are expected to contribute to the research plans presented in the annual Operations White Paper.

6.6.1.4. CompSoft shall provide `LIGO.ORG` identities to all LSC members according to §2.2.12.2.1.1.

6.6.1.5. CompSoft shall provide `LIGO.ORG` identiies to all Virgo Collaboration members according to §2.2.12.2.1.1.

6.6.1.6. CompSoft shall enable web services to use LIGO.ORG identities for authentication and authorisation according to the *Security Policy for LIGO.ORG Services* (LIGO-M2200049). This policy shall be maintained and updated as necessary by CompSoft with the approval of the LIGO Directorate.

6.6.1.7. Computing Acknowledgements

6.6.1.7.1. The Collaboration will publicly acknowledge contributions of computing resources in two ways: via Collaboration Paper Acknowledgements (CPA), and via periodic Collaboration Computing Acknowledgement (CCA) statements.

6.6.1.7.2. The Collaboration shall acknowledge all contributions of computing resources (processing, storage, etc.), as well as all contributions of human effort and expertise towards Collaboration computing goals. Determination of these contributions shall follow the procedures set out in §6.6.2(6.6.2.7)6.6.2.7.1.

6.6.1.7.3. Collaboration Paper Acknowledgement (CPA)

6.6.1.7.3.1. For significant computing resources provided to the Collaboration and subject to prioritization by the Collaboration, the computing resource's funding agency must be acknowledged in all full-author Collaboration papers. This acknowledgment statement will be maintained by CompSoft according to §6.6.2(6.6.2.7)6.6.2.7.26.6.2.7.2.1

6.6.1.7.3.2. Host institutions or organizations may not be listed (unless the original source of funding for the resource provided is the institution itself, rather than an external funding agency). No other special acknowledgements may be made, nor other references made to specific institutions or computing providers.

6.6.1.7.3.3. Computing resources that are restricted to, or weighted towards, the specific scientific priorities of the provider or local group in advance, rather than subject to dynamic prioritization by the Collaboration as a whole, are not eligible for acknowledgement in full-author Collaboration papers but may be acknowledged in short-author papers to which the resource directly contributed. The suggested acknowledgement in such short-author papers is:

> The authors are grateful for computing resources provided by the [LIST OF INSTITUTIONS] and supported by [LIST OF GRANTS].

An authoritative list of such institutions and grants shall be maintained by CompSoft for reference by paper writing teams, following the self-reporting procedure in §6.6.2(6.6.2.7)6.6.2.7.26.6.2.7.2.2.

6.6.1.7.4. Collaboration Computing Acknowledgement (CCA) statements

6.6.1.7.4.1. Full-author Collaboration papers shall also cite the most recent Collaboration Computing Acknowledgement (CCA). The suggested acknowledgement is:

> The authors are grateful for computing resources provided by the institutions and grants enumerated in our Collaboration Computing Acknowledgement [ref].

The CCA shall be maintained and published online by CompSoft following the procedures in §6.6.2(6.6.2.7)6.6.2.7.3.

6.6.1.7.5. Exceptions to the above policies for the CPA and CCA may be made in extraordinary circumstances by petitioning the Spokesperson, but should avoid unwanted precedent or unfairness.

6.6.2. **Procedures**

6.6.2.1. The CompSoft chairs will organise regular meetings, at times determined by the co-chairs in consultation with the group members.

6.6.2.2. CompSoft meeting agendas will be published on the `Computing` sub-wiki of the LSC Wiki (`https://wiki.ligo.org/Computing`) and visible to all LSC members.

6.6.2.3. CompSoft communicates via the `compsoft@ligo.org` mailing list and via LSC Mattermost (`https://chat.ligo.org`) channels prefixed with `Computing:`.

6.6.2.4. CompSoft supports LVK discussions on computing matters via the `computing-discuss@ligo.org` mailing list.

6.6.2.5. CompSoft reports the research status on a regular basis in the Operations Division meetings.

6.6.2.6. Software management and change control

6.6.2.6.1. CompSoft shall maintain reference computing environments in support of the Collaboration research programme, with changes to those environments controlled by the Software Change Control Board (SCCB).

6.6.2.6.2. The SCCB shall comprise of members of CompSoft across KAGRA, the LSC, and Virgo with one chair, appointed by the CompSoft chairs.

6.6.2.7. Computing Acknowledgement Procedures

6.6.2.7.1. Determining Computing Contributions

6.6.2.7.1.1. Contributions are defined as resources *delivered and used* in service of Collaboration goals over a given period, rather than potential resources pledged, or made available but unused.

6.6.2.7.1.2. CompSoft will develop and document the measurement and accounting techniques used to calculate resource contributions, and may change those techniques when needed.

6.6.2.7.1.3. To the extent that accounting data is deemed to be incomplete or inaccurate, CompSoft may estimate resource contributions.

6.6.2.7.1.4. Although CompSoft may incorporate data from resource providers in its calculations, the final determination of resources contributed will be made by CompSoft, not the resource providers.

6.6.2.7.2. Collaboration Paper Acknowledgement (CPA) procedures

6.6.2.7.2.1. The list of computing acknowledgements will be determined semi-annually, in tandem with each revision to the Collaboration author list, and will be included in all papers published under that author list.

6.6.2.7.2.2. CompSoft shall maintain an authoritative list of institutions and grants providing computing resources. Paper-writing teams may cite such resources in short-author papers provided the criteria in the policy §6.6.1(6.6.1.7)6.6.1.7.36.6.1.7.3.3 are met. Providers may update these lists, and CompSoft may correct missing or inaccurate contributions.

6.6.2.7.3. Collaboration Computing Acknowledgement (CCA) procedures

6.6.2.7.3.1. CompSoft will release and publish online a citable, date-stamped Collaboration Computing Acknowledgement (CCA) in tandem with each semi-annual Collaboration author list, containing a summary accounting of all computing resources contributed to Collaboration science since the last CCA statement.

6.6.2.7.3.2. The CCA statments should attempt to quantify the scale of specific contributions of individual institutions and resource providers at an order-of-magnitude level (e.g., using aLIGO Service Units for computational power, or FTE years for human effort), subject to the availability and accuracy of accounting data, and the human resources available to produce such an accounting.

6.6.2.7.3.3. Previous CCA Statements may be revised if new accounting data is received after their release, or accounting corrections are made, however any such revisions will be versioned and explained.

6.7 Support of Observatories Committee – *Approved by Council, June 2022*

This committee coordinates LSC member contributions to operations at the LIGO observatories, chiefly through the LSC Fellows program.

6.7.1. **Policies**

6.7.1.1. LSC members wishing to contribute to activities at the Observatories are encouraged to coordinate their work with this committee.

6.7.1.2. LSC Fellows Program

6.7.1.2.1. Participation in the LSC Fellows program is open to all LSC members.

6.7.1.2.2. LSC Fellows are expected to work at the observatories for a minimum of three months; longer stays are encouraged.

6.7.1.2.3. A staff member at each LIGO Observatory serves as the LSC Fellows coordinator for that site. The coordinator is appointed by the Observatory Head in consultation with the LIGO Laboratory Director and the LSC Spokesperson.

6.7.1.2.4. The LSC Fellows coordinators shall prepare annual reports for the LSC council. The reports shall list the participants in the program for the prior year, the projects undertaken, and a summary of the overall expenses for the program.

6.7.1.3. **Procedures**

6.7.1.3.1. LSC members wishing to contribute to operations at the Observatories via various avenues that include the LIGO Visitors Program, the LSC Fellows program, or independently-funded visits may contact the committee co-chairs to investigate possibilities and options.

6.7.1.3.2. LSC Fellows Program

6.7.1.3.2.1. Fellows' visits are arranged in consultation with the LSC Fellows coordinators at the LIGO observatories.

6.7.1.3.2.2. LSC Fellows require a Caltech visitor appointment in order to work at the observatories. Processing of visitor appointments, and when necessary visa aplications, can take several months.

6.7.1.3.2.3. Travel arrangements must be made in consultation with the LSC Fellows coordinators and the LIGO travel coordinators.

6.7.1.3.2.4. The program covers the following expenses:

- Airfare or other transportation fees from home location to the sites and back.
- Housing in shared apartments.
- Use of shared rental vehicles.
- A one-time "startup" payment of $500 to cover transportation between home and the local airport, airline baggage fees, and other miscellaneous expenses.
- Support for expenses incurred in obtaining a visa (nominal limit of $350).
- Expenses not listed here will require prior approval from the LSC Fellows coordinators.

6.7.1.3.2.5. Travel related to the Fellows work will require approval from the Fellows coordinators. Approved travel will adhere to the Caltech Travel Policy as regards covered expenses, class of airfare etc.

6.7.1.3.2.6. Incoming LSC Fellows will be required to agree to policies that apply to visitors, staff and Fellows at the observatories.

6.8 Open Data Working Group – *Approved by Council, June 2022*

The Open Data Working Group curates, releases, and documents LVK public data products, as described in the LIGO Data Management Plan and LSC White Paper.

6.8.1. Policies

6.8.1.1. The working group is coordinated by a co-chair from each of LIGO, Virgo, and KAGRA. These co-chairs must closely coordinate with the Gravitational Wave Open Science Center (GWOSC) director, dedicated GWOSC staff, and LVK members to ensure the successful delivery and maintenance of public data products, as described in the LIGO Data Management Plan and LSC White Paper.

6.8.1.2. A review committee, which includes representatives from the LSC, must review all data products curated by the Open Data Working group before release.

6.8.2. Procedures

6.8.2.1. The working group coordinates closely with the Calibration Working Group and other Working Groups in the LSC Operations and Observational Science divisions to ensure strain data delivered to the data analysis working groups are ready for public release.

6.8.2.2. Public data products managed by this group are available at `https://gwosc.org`. Lists of additional GWOSC web resources, mostly not public, can be seen at `https://wiki.ligo.org/LOSC/FAQ#Where_and_How`

6.8.2.3. The working group has regular meetings that are open to all LVK members, with connecting instructions at `https://wiki.ligo.org/LOSC/`

6.8.2.4. The Open Data Working group plans and executes work following an Agile/Scrum model. All contributions to the GWOSC web server should be captured in this model. For details, see `https://git.ligo.org/gwosc/gwoscweb/-/wikis/home`

6.8.2.5. GWOSC staff meet routinely at scheduled times to coordinate progress, including Sprint Planning Meetings (about 1 per month) and Sprint Updates (about 2 per week).

6.8.2.6. Analysis results (e.g. trigger lists, PE samples, etc.) from LVK paper writing teams should be made available by the paper writing teams following guidelines in `https://dcc.ligo.org/LIGO-T2100170`.

6.8.2.7. The Open Data Working group coordinates with Observational Science groups and paper writing teams to plan, review, and deliver public data releases.

6.8.2.8. The working group coordinates an annual Open Data Workshop to help the scientific community learn to work with IGWN data and software. See `https://gwosc.org/workshops`

7 Communications and Education Division

7.1 Basic Structure – *Approved by Council, July 2022*

7.1.1. Policies

The Communications and Education (C&E) Division is responsible for overseeing and documenting the Collaboration's activities in education and public outreach (hereafter EPO). The C&E Division is also responsible for formulating the Collaboration's strategic plans to harness the excitement and enthusiasm generated by gravitational-wave research in order to inspire and educate students and the general public in astronomy and fundamental science.

The C&E Division coordinates communications, education and public outreach projects and activities undertaken across the LSC through its standing committees. The list of committees in the C&E Division and the composition of its steering committee are described in Section 6 of the LSC Bylaws. (See also Fig 1 in this document).

The C&E Division's program of activities and priorities is shaped by the following general goals:

7.1.1.1. To communicate LSC and LVK results in an accessible way to the world – to other physicists, students, and the general public.

7.1.1.2. To develop educational resources that will inspire and train the next generation of scientists and build overall scientific literacy.

7.1.1.3. To advocate for future development and growth in our field, in partnership with LSC/Lab leadership and the broader GW and EM astronomy communities.

7.1.2. Procedures

7.1.2.1. The C&E Division holds regular 'EPO' telecon meetings, open to all members of the LIGO, Virgo and KAGRA collaborations, at which communications, education and public outreach activities and projects are presented and discussed. Agendas and minutes for these meetings can be found on the LSC wiki at https://wiki.ligo.org/EPO/Telecons.

7.1.2.2. These Division-level EPO meetings aim to facilitate sharing of information and best practise across all of the C&E Division's standing committees – recognising also the strong overlaps and synergies between the different committees' activities and projects.

7.1.2.3. Normally the frequency of the Division-level EPO meetings is at least once every two weeks, with a weekly frequency at particularly busy times (e.g. prior to a major detection announcement). The C&E Division's standing committees may hold additional, individual, committee meetings at other times as appropriate.

7.1.2.4. Additionally, an Eastern Longitudes Division-level telecon is normally held once per month at a time that is more suitable for LSC groups in India, Australia and the Far East – as well as Virgo and KAGRA colleagues.

7.1.2.5. The C&E Division is responsible for preparing and maintaining a White Paper relevant to the Collaboration's plans and activities for communications, education and public outreach, with an up-to-date version to be available before the beginning of each LSC MoU review cycle. This White Paper is written in close cooperation with the Virgo and KAGRA EPO teams.

7.1.2.6. The C&E Division Chair provides an update to the Council twice a year, on a cadence normally staggered with collaboration meetings.

7.1.2.7. The C&E Division is responsible for leading the development of press releases on behalf of LSC, and also for coordinating LSC press conference events. The LIGO Directorate will give final approval for these press releases and events.

7.2 LSC Formal Education Committee – *Under Development*

7.2.1. **Policies**

7.2.2. **Procedures**

7.3 LSC Informal Education and Outreach Committee – *Under Development*

7.3.1. **Policies**

7.3.2. **Procedures**

7.4 LSC Web Committee – *Approved by Council, July 2022*

7.4.1. **Policies**

7.4.1.1. The LSC Web Committee (hereafter denoted 'Webcomm') is responsible for maintaining the public-facing www.ligo.org website, including regular updates to the website to publicize LSC and LVK results or other important announcements.

7.4.1.2. The Webcomm Chair is appointed by the Division Chair in consultation with the Spokesperson and the wider Division membership. An appointment is normally made for a duration of 2 years, and is renewable.

7.4.2. **Procedures**

7.4.2.1. In consultation with the Division Chair (and the Spokesperson where necessary) the Webcomm Chair may recruit to the Webcomm a team with the necessary skills required for efficient and timely management of www.ligo.org.

7.4.2.2. Webcomm is responsible for all content updates to the publically-accessible pages of www.ligo.org, especially updates in response to LSC/LVK discoveries or other important news.

7.4.2.3. Webcomm is not primarily responsible for web architecture issues, including login authentication or site security.

7.4.2.4. Webcomm will liaise regularly with LIGO Laboratory staff to ensure that the www.ligo.org and LIGO Lab webpages are consistent and well-aligned, particularly in relation to the timing and content of updates in response to LSC/LVK discoveries or other important news.

7.4.2.5. The Webcomm chair or designee will regularly provide updates and solicit feedback on Webcomm activities and plans at the Division-level EPO meetings.

7.5 LIGO Magazine Committee – *Approved by Council, July 2022*

7.5.1. **Policies**

7.5.1.1. The LIGO Magazine Committee comprises members of the LIGO Magazine Editorial Team, and is chaired by the Editor-in-Chief and Deputy Editor-in-Chief.

7.5.1.2. The LIGO Magazine Editorial Team publishes two issues of the LIGO Magazine a year. The LIGO Magazine is published in print and online (www.ligo.org/magazine) and details the latest research, news and personalities across the diverse group of LSC members and beyond.

7.5.2. **Procedures**

7.5.2.1. The Editor-in-Chief and Deputy Editor-in-Chief oversee the Editorial Team. The Editor-in-Chief and Deputy Editor-in-Chief should normally have had some prior experience of working on the LIGO Magazine before taking on these positions.

7.5.2.2. The Editorial Team shares the draft magazine with the LSC Management Team for review prior to publication.

7.5.2.3. The Editorial Team communicates with the LAAC and the wider membership of the C&E Division for article planning as relevant.

7.5.2.4. Editors are members of the LSC. New editors are welcome and encouraged to volunteer themselves by emailing magazine@ligo.org; however approval from the LSC Spokesperson is required for editorial appointments.

7.5.2.5. Anyone (LVK member or external) is welcome to propose an article for the Magazine, and author it in coordination with the LIGO Magazine editors if their proposal is accepted.

7.5.2.6. The LIGO Magazine produces 2 physical editions per year, of 36 pages. Extended editions can be produced in exceptional circumstances (e.g. the first detection), after negotiating additional budget with the Spokesperson and other stakeholders.

7.5.2.7. Physical copies are normally distributed at in-person LVK meetings and through local centers.

7.6 LSC Professional Outreach Committee – *Under Development*

7.6.1. **Policies**

7.6.1.1. The LSC Professional Outreach Committee (hereafter denoted 'POC') is responsible for promoting and coordinating outreach to scientists, policy makers and other stakeholders at professional conferences, meetings and workshops, both online and face-to-face.

7.6.1.2. The POC Chair is appointed by the Division Chair in consultation with the Spokesperson and the wider Division membership. An appointment is normally made for a duration of 2 years, and is renewable.

7.6.2. **Procedures**

7.6.2.1. In consultation with the Division Chair (and the Spokesperson where necessary) the Webcomm Chair may recruit to the POC a team with the necessary skills required for efficient and timely management of POC activities.

7.6.2.2. POC will coordinate participation at professional conferences and exhibitions, working in collaboration with other gravitational-wave communities where appropriate.

7.6.2.3. POC will coordinate development and distribution of flexible and easily portable resources that can be deployed at professional conferences and exhibitions and other outreach events – including e.g. engagement with politicians and funders.

7.6.2.4. POC will oversee curation of exhibition resources and professional outreach materials, on the EPO wiki, to enable other LSC members to make use of them when participating in other outreach events.

7.6.2.5. Wherever possible, POC will coordinate collection of feedback data from professional outreach events, curating these data on the EPO wiki or other accessible location.

7.6.2.6. Where necessary, POC will liaise with the Division Chair, the Spokesperson and representatives of LIGO Laboratory to expedite payment arrangements for LSC participation in conferences and exhibitions. A record of these payments will be maintained jointly with colleagues from other gravitational-wave communities, in order that exhibition costs may be shared.

7.6.2.7. The POC chair or designee will regularly provide updates and solicit feedback on POC activities and plans at the Division-level EPO meetings.

7.7 LSC Media Relations Committee – *Under Development*

7.7.1. **Policies**

7.7.2. **Procedures**

8 Standards and Services Division

8.1 Basic Structure – *Approved by Council, July 2022*

8.1.1. Policies

8.1.1.1. The Collaboration Standards and Services (CSS) Division addresses tasks and topics related to the climate within the LSC, equity, Collaboration organization issues, and Collaboration administrative functions. The list of committees in this Division and the composition of its steering committee are described in §7 of the LSC Bylaws.

8.1.2. Procedures

8.1.2.1. The CSS Steering Committee holds a monthly meeting as a forum to discuss issues common to the committees. Agenda and minutes of the meetings are available on the division wiki: `https://wiki.ligo.org/CollaborationStandardsAndService`

8.1.2.2. The CSS Division Chair provides an update to the Council twice a year, on a cadence staggered with collaboration meetings.

8.1.2.3. The CSS Division maintains the LSC Governance, Collaboration Standards and Services White Paper.

8.2 Diversity, Equity, and Inclusion Committee – *Approved by Council, July 2022*

8.2.1. Policies

8.2.1.1. The Diversity, Equity, and Inclusion (DEI) Committee oversees and documents the Collaboration's activities relevant to LSC members' diversity, equity, and inclusion, as described in §7.2 of the LSC Bylaws.

8.2.1.2. The DEI Committee normally engages with the broader LSC Diversity Group via the Group's email list (lsc-diversity@ligo.org) and via ad hoc meetings.

8.2.1.3. The Committee membership and its products are specified in §7.2 of the LSC Bylaws. In addition, we add the following:

8.2.1.4. The DEI Committee should have no fewer than 5 members.

8.2.1.5. One member should be an employee of the LIGO Lab.

8.2.1.6. The liaison to the LAAC (§7.3) could be either a member of the DEI Committee or a member of the LAAC.

8.2.2. Procedures

8.2.2.1. DEI Committee activities are organized via a wiki page: `https://wiki.ligo.org/LSC/Diversity`

8.2.2.2. The DEI Committee meets approximately once per month, but at least quarterly. Meeting notes and action items are recorded in the above wiki site.

8.2.2.3. The DEI Committee coordinates DEI activities with the Virgo and KAGRA collaborations.

8.2.2.4. Along with Virgo and KAGRA, the DEI Committee leads the organization of any DEI component of collaboration meetings. The current (2021) practice is for the LSC to lead the organization for the March meeting and for Virgo to lead the organization for the September meeting.

8.3 LSC Academic Advisory Committee – *Approved by Council, July 2022*

8.3.1. Policies

8.3.1.1. According to §7.3 of the LSC Bylaws, the LSC Academic Advisory Committee (LAAC) is responsible for overseeing and documenting the Collaboration's activities in representing and protecting the interests of students and postdocs. The LAAC is also responsible for providing education, training and support for new students and postdocs in the Collaboration.

8.3.1.2. The LAAC consists of two co-chairs, two senior LSC members, two postdoctoral members, and two graduate student members. All members of the LAAC will be elected by the LSC. The term of membership will be two years, and members may run for reelection. The members of the LIGO Directorate (LSC spokesperson, LIGO Laboratory Executive Director, LIGO Laboratory Deputy Director) are ex-officio members of the LAAC.

8.3.1.3. The elections for LAAC membership are conducted by the LSC's Election and Membership Committee. Any current LSC graduate student is eligible for election as a LAAC graduate student member, and to vote in the election for the LAAC graduate student members. Any current LSC postdocs is eligible for election as a LAAC postdoctoral member, and to vote in the election for the LAAC postdoctoral members. All LSC members are eligible to vote for the co-chairs and senior members of the LAAC.

8.3.1.4. The LAAC reports monthly to the CSS division on items relevant to the Collaboration's plans and activities for education and training for students and postdocs in the LSC.

8.3.1.5. At least one of the two LAAC co-chairs are appointed members of the Meetings Committee.

8.3.1.6. One LAAC member acts as liaison to the DEI committee.

8.3.2. Procedures

8.3.2.1. The LAAC meets at least on a fortnightly basis over Zoom. Meeting agendas and minutes can be found at `https://wiki.ligo.org/LAAC/MeetingsTelecons`

8.3.2.2. LAAC holds working meetings over Zoom to make progress on specific tasks as required. One example is mentoring scheme matching meetings.

8.3.2.3. LAAC co-chairs attend monthly CSS division meetings to report on LAAC activities and discuss relevant division business.

8.3.2.4. The main LAAC website can be found at `https://laac.docs.ligo.org/`. LSC internal LAAC (wiki) pages are in many cases linked from main LAAC website, but can also be navigated to directly from here: `https://wiki.ligo.org/LAAC/WebHome`

8.3.2.5. The LAAC organizes a range of Early Career oriented activities at LVK collaboration meetings. These events include tutorials and panel sessions, social events and networking lunches. The LAAC also plays a role in organizing the poster sessions (in-person and online), although responsibility for in-person poster sessions is shared with the local organizing committee.

8.3.2.6. Other examples of ongoing LAAC projects are:

- LSC mentoring scheme: managing a list of applicants, pairing of LSC mentors and mentees, and periodically checking in on the status of pairs.
- LSC Awards: developing and implementing a concept of an expanded LSC Awards scheme, to provide visibility for outstanding Early Career Researchers in the LSC.
- Beginners Guide: Maintaining and updating the LSC Beginner's Guide, which can be found here: `https://dcc.ligo.org/LIGO-P1400033`.

- Thesis database: responsibility for maintaining and advertising the LSC Thesis Database, which can be found here: `https://lscweb.ligo.org/laac/index.php/Thesis_Topics`. At the time of writing we are working on updating the login mechanism for the database.
- Writing or otherwise producing LAAC Corner articles for the LIGO Magazine.
- Coordinating with other Early Career Scientists organizations within the broader scientific community, such as the Virgo Early Career Scientists (VECS), LISA Early Career Scientist Group (LECS) and the Gravitational-Wave Astrophysics for Early Career Scientists (GWAECS).

8.4 Meetings Committee – *Approved by Council, July 2022*

8.4.1. **Policies**

8.4.1.1. The Meetings Committee is responsible for organizing and coordinating the Collaboration meetings, as outlined in §7.4 of the LSC Bylaws.

8.4.1.2. The Meetings Committee maintains a document that describes the scope of a meeting, including the attendance, the number of parallel sessions, the approximate schedule, and other relevant information.

8.4.1.3. The dates of collaboration meetings will be chosen with the view of maximizing attendance, typically by polling Meeting Committee members. Some movement within the calendar will occur so that schedule conflicts are spread equally across the collaboration.

8.4.1.4. Meeting sessions are coordinated by the Scientific Organizing lead and organized by chairs of Working Groups, other committee chairs, by the Observational Science and Instrument Science chairs, by the Spokesperson, and by persons designated by the Spokesperson or the Management Team.

8.4.2. **Procedures**

8.4.2.1. The Meetings Committee will solicit the LSC for proposals to host collaboration meetings twice per year, in line with §2.2.5.2 of the LSC Bylaws. Collaboration meetings are typically held in March and September each year.

8.4.2.2. Any group may propose to host the meeting but the "large" LSC groups (with $\sim$5 or more staff members) are expected to host collaboration meetings. The Meetings Committee assists host institutions in organizing successful and productive meetings. The proposals should specify the date and meeting mode (online or in-person). For in-person meetings, the size of the meeting rooms for plenary sessions, the number of rooms available for working group, the LSC Council meetings lunch/dinners, the banquet, and an estimated cost to participants should be specified.

8.4.2.3. The Meetings Committee will consider the proposals taking into account geographical accessibility, geographical distribtuion of past collaboration meetings and the stregnth of each proposal based on cost estimates and venue facilities.

8.4.2.4. A decision for an LSC-hosted meeting should be made 12 months before the meeting date.

8.4.2.5. The Meetings Committee recommends the institution to host the meetings. The spokesperson approves and announces the location and date of the meeting.

8.4.2.6. The host instituion is responsible for the meeting registration website and should ideally open registration at least 6 weeks prior to the meeting.

8.4.2.7. Successful host instition for in-person meetings will also be responsible for organising an online meeting should unforeseen circumstances prohibit in-person meetings.

8.4.2.8. The Meetings Committee monitors progress in organizing the sessions of the meeting, with the goal of a complete schedule available to the collaboration two weeks before the scheduled start of the meeting.

8.5 Election and Membership Committee – *Approved by Council, July 2022*

As a provision of §7.5 of the LSC Bylaws, the Election and Membership (E&M) Committee is appointed by the LSC spokesperson to organize and oversee elections (working groups, spokeperson, advisory positions, oversight committee positions), elections processes, including nominations, as well as to maintain the Collaboration author lists.

8.5.1. **Policies**

8.5.1.1. Election Schedule

Elections to various posts in the collaboration have to be carried out annually. These are arranged in two Election seasons:

January – March, ending with the Spring LSC meeting
June – August, ending with the Fall LSC meeting

The scheduling of elections to one or other of these seasons takes into account staggering of the terms for the relevant posts as specified in the bylaws.
Thus in every even numbered year (2020, 2022, etc.) the January – March season should contain elections for the following:

- 1 member of the LSC Management Team
- 1 Experimental WG Chair (SWG)
- 4 Data Analysis Working Group Co-chairs (CBC, CW, Burst, Stochastic)
- The position of Council chair

In the intervening odd numbered years (2021, 2023, etc.) the January – March season should contain elections for the following:

- 1 member of the LSC Management Team
- 1 Experimental WG Chairs (OWG)
- 4 Data Analysis Working Group Co-chairs (CBC, CW, Burst, Stochastic)
- The position of collaboration Spokesperson

In every even numbered year (2020, 2022, etc.) the June – August season should contain elections for the following:

- 1 Technical Advisor to the Oversight Committee
- 1 Experimental WG Chair (CSWG)
- Members of the LIGO Academic Advisory Committee: 1 Co-Chair; 1 senior member; 1 postdoctoral member; 1 grad student.

In the intervening odd numbered years (2019, 2021 etc) the June – August season should contain elections for the following:

- 1 Technical Advisor to the Oversight Committee

- 3 Experimental WG Chairs (LAO, AIC, QNG)
- Members of the LIGO Academic Advisory Committee: 1 Co-Chair; 1 senior member; 1 postdoctoral member; 1 graduate student member.

Newly elected members or chairs start their term at the Collaboration meeting immediately following their election.

8.5.1.2. Voting method

Voting takes place using the LSC voting website. In all elections:

- any member of the collaboration may be considered as a nominee for election
- the E&M Committee will accept all nominations for open positions;
- the E&M Committee will poll all nominees, removing from the election slate only those nominees who do not wish to stand;
- every LSC member can nominate, including self-nomination.
- Nomination are blind.

Elections use a ranked-voting procedure. The collaboration has adopted a Condorcet method, wherein each voter provides rankings of candidates in order of preferences. These rankings are used to determine the voter's preference (or indifference, if the candidates are ranked equally) between pairs of candidates, and a candidate who is preferred by a majority to each of the other candidates (the "Condorcet winner") is elected.

In cases where there is no Condorcet winner, the election will be decided using the Schulze method (also known as Schwarz sequential dropping), which is based on successively disregarding the weakest preferences between candidates (those with the fewest supporters) until an unambiguous winner can be chosen.

If the Schulze method does not provide a winner, a runoff or runoffs will be held among the candidates tied at the top until a candidate has a majority of those voting.

8.5.1.3. Right to vote

- The Spokesperson, the Council Chair, Management Team at-large members and the technical advisor to the oversight committee are elected by members of the LSC Council, with secret ballot elections, following the ranked voting procedure described above.
- In elections for working group Chairs or Co-chairs, the solicitation for votes will be sent to all Collaboration members. All Collaboration members are eligible to vote, except for those designated as Short-Term-Undergraduate Students or Administrative Staff in their member institution's MOU. The election will be conducted by secret ballot following the ranked voting procedure outlined here.
- Members of the LAAC are elected by collaborators following the rules in §8.3.1.3.

8.5.1.4. Authorlist policy

8.5.1.4.1. The author list of the scientific publications of LSC/LVK observations will include all members of the LIGO Scientific Collaboration who have earned that status. The author list will normally be alphabetical and will include engineers and technicians who have contributed in an important way to the design, construction, installation, commissioning and operation of the detectors and of major LSC facilities. Specifically, LSC members earn author status by devoting at least 50% of their research effort to the LSC for a period of at least one year (see below) and their LIGO research should amount to an average over a year of at least

1 day (7 hours) per week[1]. Once earned, authorship is retained for at least one year after leaving the collaboration (in good standing) or after the LSC portion of the research falls below 50%, as described in detail below.

8.5.1.4.2. The Elections and Membership Committee (EMC) of the LSC will publish new versions of the author list twice each year, on February 15 and August 15. Each list will be assembled from information provided by an individual in each LSC institution designated as the lsc-group manager (typically the PI). Individuals meeting the following criteria will be included: [2]

8.5.1.4.2.1. The August list will contain the names of current LSC members who joined the LSC prior to Dec 15 of the previous year and who have devoted more than 50% of their research effort toward LIGO since that date. It will also contain the names of past LSC members who had earned authorship but have left the collaboration (or whose research effort fell below the 50% level) after Aug 15 of the previous year.

8.5.1.4.2.2. The February list will contain the names of current LSC members who joined the LSC prior to June 15 of the previous year and who have devoted more than 50% of their research effort toward LIGO since that date. It will also contain the names of past LSC members who had earned authorship but have left the collaboration (or whose research effort fell below the 50% level) after February 15 of the previous year.

8.5.1.4.3. Each list will be approved by the Spokesperson, who may consult with others to arrive at an equitable decision concerning special cases, such as can arise from member employment changes.

8.5.1.4.4. Papers written for the full LSC will use the most recent list published by the EMC at the time of their initial submission to the LSC for review.

8.5.1.4.5. An LSC group PI may petition the Spokesperson for the addition of LSC members to the author list, if those members have less than 50% of their research effort committed to the LSC. The addition of such members to the author lists will be valid until the LSC membership status of the person in question changes, and does not need to be reviewed before the publication of each biannual author list.

8.5.1.4.6. Any special considerations or conflicts concerning collaboration authorship should first be brought to the attention of the author contact from the relevant group (typically the PI) who can bring them to the EMC. The EMC will make a recommendation to the LSC Spokesperson, who will make the final decision, consulting with others as needed. Any conflicts on authorship on LIGO publications will be resolved by the Spokesperson in consultation with the LSC Management Team and the Laboratory Directorate.

8.5.1.4.7. Individual LSC members who have made significant contributions to a particular observational paper, but who are not on the LSC author list, may be added to the author list of that paper. Petitions for such authorship additions should be included by the Analysis Group when presenting the paper to the LSC Management Team for final approval. Consent of the LSC Management Team is required for inclusion of these additional authors.

[1] That's 20% of an FTE during the year or nearly full time in the summer with minimal time in the academic year with an assumed 35-hour work week. The 7 hours per week would come from a product of LSC research, Research, and FTE fractions recorded in the myligo roster system.

[2] The specific dates chosen in this implementation ensure that no member of the collaboration must wait longer than 14 months to appear on the author list, and no member will join the author list with less than 8 months of participation (a six month window skewed slightly in favor of new authors). For authors leaving the LSC, the minimum time authorship is retained is 12 months and the maximum is 18 months (again a six month window skewed slightly in favor of authors leaving the collaboration). Since a large number of LSC members' appointments are synched to an academic year beginning in September, it is expected that the extremes in these ranges will be realized relatively rarely.

8.5.1.4.8. Individual LSC members eligible for authorship may request their names not to be included in specific papers. This request will not be interpreted as a statement that the member does not endorse the paper or the science it represents, unless that reason is explicitly stated.

8.5.2. **Procedures**

8.5.2.1. The Committee meets twice per year.

8.5.2.2. Committee activities are organized via a wiki: `https://wiki.ligo.org/LSC/Elections`

8.5.2.3. Nominations are sought through the LIGO Nominate portal: `https://vote.ligo.org/nominate`

8.5.2.4. Elections are run through the LIGO Vote portal: `https://vote.ligo.org`

8.5.2.5. Details of each election, including the election timeline, nominees, election statements and results, are recorded on the Elections and Membership wiki: `https://wiki.ligo.org/LSC/Elections/`

8.5.2.6. Each election is run by an individual member of the E&M committee, with a shadow (also from the E&M committee).

8.5.2.7. All vote results will indicate the total number of votes cast (including abstentions) and, for Council votes, the number of eligible voters

8.5.2.8. Election results involving named individuals will announce only the names of the elected and unelected candidates, not the candidates' rank order or vote subtotals. A candidate who stands in an election will have access only to that individual candidate's vote subtotals

8.5.2.9. Vote results not involving named individuals will announce the vote subtotals, including the head-to-head matrix of votes for rank ordered votes

8.5.2.10. All elections will clearly indicate which option applies by stating what results will be shared with whom prior to soliciting nominations and opening for votes

8.5.2.11. Spokesperson election procedure

- The E&M committee initiates the process by contacting the LIGO Directorate (including the incumbent Spokesperson), informing them of the upcoming election due to expiration of term (2 weeks before election start).
- The E&M committee then contacts the LSC and solicits nominations for the position of Spokesperson, granting no less than a 1-week period for response.
- The Committee contacts all nominees to verify their willingness to stand for election, and requests a personal statement from those willing to stand.
- The personal statements are posted by the E&M committee on an internal LSC website.
- If no nominee or only the incumbent has agreed to stand, the chair of the E&M committee will re-solicit nominees asking whether they will reconsider standing. Nominations are re-opened for 1 week.
- The slate of candidates will be announced to the LSC, and the candidates will be asked to attend the LSC Council Meeting at the March collaboration meeting, where they will be available to answer questions from the LSC Council. This will be followed by a closed session of Council.
- A vote by the LSC Council opens on the day following the LSC Council meeting, open for one week. Spokesperson elections will be by secret ballot, following the ranked voting procedure described above.

- The E&M committee will announce the winner and the list of voters who participated.

8.5.2.12. Council Chair election procedure

- The E&M committee initiates the process by contacting the incumbent Council chair, informing them of the upcoming election due to expiration of term (2 weeks before election start).
- The E&M committee then contacts the Council and solicits nominations for the position of Council chair, granting no less than a 1-week period for response.
- The Committee contacts all nominees to verify their willingness to stand for election, and requests a personal statement from those willing to stand.
- The personal statements are posted by the E&M committee on an internal LSC website.
- If no nominee or only the incumbent has agreed to stand, the chair of the E&M committee will inform the Spokesperson of the situation, and request that the Spokesperson contact nominees to stress the importance of having members willing to serve in these positions
- A vote by the LSC Council opens for one week. Council chair elections will be by secret ballot, following the ranked voting procedure described above.
- The E&M committee will announce the winner and the list of voters who participated.

8.5.2.13. Working Group Chair/Co-chair elections

- Chair(s) are elected for terms of 2 years; if there are multiple chairs, the elections are staggered to ensure continuity.
- To initiate the election process, the E&M committee contacts the current post-holders, to inform them, their Co-Chairs (where relevant) and the Spokesperson that an election is due because of term expiration (2 weeks before election start).
- The E&M committee (i.e., the person running the election) should next contact the LSC and solicit nominations for the upcoming vacancy, giving no less than a 1-week period for solicitation of nominations, and reminding the LSC of (a) any relevant bylaws and (b) the names of any continuing Co-Chair for the group in question.
- If the number of nominees agreeing to stand for election is two or more the E&M committee should proceed to arrange a vote as specified below.
- If no nominee has agreed to stand, the E&M committee will inform the Spokesperson of the situation, and request that the Spokesperson contacts the remaining working group Co-chair (if appropriate) and working group, explaining the situation and reminding the group of the value and importance to the collaboration of having members willing to serve in these positions, and inform the working group that if no willing candidates have been put forward to the E&M committee after 1 week, then a Co-chair will be appointed by the Spokesperson.
- If only one nominee has agreed to stand, the E&M committee will inform Spokesperson of the situation, and request that the Spokesperson contacts the remaining Working Group Co-chair (if appropriate) and working group, explaining that a named nominee has been the only person willing to stand, reminding the group of the value and importance to the collaboration of having members willing to serve in these positions, and inform the working group that if no second willing candidate has been put forward to the E&M committee after 1 week, then the named nominee will be deemed elected as Co-chair. If no further willing nominee is identified, the single willing nominee will be deemed *elected by acclamation*, and the result announced to the LSC. If a second (or more) willing nominee(s) has/have been identified, the E&M committee will proceed to arrange a vote, following the rules in §8.5.1.4, open for one week.

- In each case the E&M committee will announce the outcome and the list of voters who participated.

8.5.2.14. Management Team elections

- First, the E&M committee should contact the Collaboration Spokesperson and relevant existing post-holders, and make them aware that an election is due, due to expiration of terms (2 weeks before election start).
- The E&M committee should then contact the LSC and solicit nominations for the upcoming vacancies, giving no less than a 1 week period for solicitation of nominations, and reminding the LSC of (a) any relevant bylaws, and (b) the names of the continuing members of the Management Team.
- When the 1 week period ends, the E&M Committee should then contact the nominees, ask them to respond, preferably within 1 week as to whether they are willing to accept the nomination.
- If none, or only one nominee has agreed to stand, the process adopted in the WG elections will be followed to try to get a slate of candidates.
- The E&M committee will hold a vote by the LSC Council, open for one week to determine the 2 candidates preferred by the Council. The vote will use the Condorcet method; see above.
- The E&M committee will announce the winners and the list of voters who participated.

8.5.2.15. Oversight Committee Technical Advisors

- First, the E&M committee should contact the Collaboration Spokesperson and relevant existing post-holders, and make them aware that an election is due, due to expiration of terms (2 weeks before election start).
- The E&M committee should then contact the LSC and solicit nominations for the upcoming vacancy, giving no less than a 1-week period for solicitation of nominations, and reminding the LSC of (a) the relevant statements in the Oversight committee charter, and (b) the names of the continuing members of the LIGO Oversight Committee.
- When the 1-week period ends, the E&M Committee should then contact nominees as to whether they are willing to accept the nomination, and to request, from those who are willing to stand, a personal statement.
- The personal statements provided should be posted by the E&M committee on an internal LSC website.
- The E&M committee will hold a vote by the LSC Council, open for one week. The election will be conducted by secret ballot, following the Condorcet ranked voting procedure outlined above.
- The E&M committee will announce the winner and the list of voters who participated.

8.5.2.16. LAAC elections

- First, the E&M committee should contact the Collaboration Spokesperson and relevant existing post-holders, and make them aware that an election is due, due to expiration of terms (2 weeks before election start).
- The E&M committee should then contact the LSC and solicit nominations for the upcoming vacancies, giving no less than a 1-week period for solicitation of nominations, and reminding the LSC of (a) the relevant bylaws and (b) the names of the continuing members of the LAAC.

- When the 1-week period ends, the E&M Committee should then contact all nominees, ask them to respond, preferably within 1 week as to whether they are willing to accept the nomination.
- The E&M committee will then hold a vote by the LSC for each vacant post, open for one week. The election will be conducted by secret ballot following the ranked voting procedure outlined above.
- In each case, the E&M committee will announce the outcome and the list of voters who participated.

8.5.3. Authorlist Procedures

8.5.3.1. The author list is constructed by one of the E&M co-chairs with input from the keeper of the LSC membership database, and the corresponding liasons from the Virgo and KAGRA collaborations

8.5.3.2. The E&M co-chair reserves DCC M- numbers for the LSC, LVC, and LVK author lists (one each) as well as a DCC T- number for the input files.

8.5.3.3. First, a list is prepared of the author-eligible members (along with ORCIDs where provided) of each LSC group. The E&M co-chair sends this to all of the LSC PIs and group managers for checking and makes corrections based on responses.

8.5.3.4. Through a combination of automated scripts and manual corrections, the list of authors and institutions is converted into an input file containing all the data needed to create the authorlist. Checks are made for errors like duplicated names, incorrect capitalization, non-ASCII characters, etc.

8.5.3.5. Among the adjustments to be made by hand are removal of authors who've chosen to opt-in to the author list for individual papers rather than being included by default, addition of legacy authors, and footnotes for deceased authors.

8.5.3.6. The input file is converted into author lists formatted for commonly-used journals. These currently consist of AAS (*The Astrophsysical Journal* and *The Astrophsysical Journal Letters*), IOP (*Classical and Quantum Gravity*), and APS (*Physical Review D*, *Physical Review X*, and *Physical Review Letters*), as well as a text file for use on arXiv postings.

8.5.3.7. When a version of the author list is created, the E&M co-chair posts it in the corresponding DCC M- document, and updates the tarball of scripts and input files in the DCC T- document. It is a good practice to tag the authorlist git repository with a tag for each DCC version produced, and also to maintain DCC cross-references among the documents.

8.5.3.8. Once the LSC list is ready, it is circulated to lsc-all for individual author corrections, which may continue though several iterations.

8.5.3.9. In general, authors are listed with the affiliation of the LSC/LVC/LVK institution or institutions with which they were affiliated during the six months preceding the date of the author list.

8.5.3.10. Authors are listed with their initials as recorded in the myligo author information section. Initials may be replaced with a first name based on 1) a need to distinguish two authors who would otherwise be listed identically or 2) a good-faith assertion from the author that their name is common enough to be confused with other scientists not on the author list.

8.5.3.11. In parallel with the LSC list circulations, the E&M co-chair collects the Virgo and KAGRA portions of the authorlists and combines them with the LSC list to produce the LVC and LVK author lists.

8.5.3.12. When the lists have stabilized, the E&M co-chair asks the collaboration spokesperson to approve them.

8.5.3.13. The DCC M-documents with the author lists (but not the T-document with the sources) may be made public once one of the author list has been used in a publicly released (preprint or publication) paper.

8.5.3.14. The scripts and files for producing the author list are currently kept under version control at `https://git.ligo.org/elections-and-membership/authorlist`

8.6 Speakers and Awards Committee – *Approved by Council, July 2022*

8.6.1. Policies

8.6.1.1. The Speakers and Awards Committee (SAC), described in §7.6 of the LSC Bylaws, is responsible for promoting LSC scientific accomplishments by actively cultivating opportunities for LSC members to present LSC results to the broader scientific community through invited talks at conferences and meetings. Also, the committee is responsible to broaden participation in these meetings among LSC members.

8.6.1.2. The SAC will select speakers to present invited talks on behalf of the LIGO Scientific Collaboration.

8.6.1.3. LSC members that serve on the organizing committee of a conference or the chair of a session shall inform the SAC of the conference details in order to promote LSC speaking opportunities at the conference.

8.6.1.4. The SAC shall prioritize the following criteria in choosing a speaker:
– The need for high quality of the scientific presentation based on the expertise of the proposed speaker,
– The need for a diverse representation of the collaboration, including all social criteria (gender, race, class, ...), areas of expertise, and collaboration membership, and
– The need to prioritize presentation opportunities for collaboration members at critical junctures in their careers.

8.6.1.5. To maintain accurate and current information in selecting a representative speaker, the SAC shall maintains a database of collaboration members with the information needed to apply the selection criteria for invited talks.

8.6.1.6. As per the bylaws §7.6, the SAC also has the task of actively seeking opportunities for LSC members to be nominated for scholarly prizes, awards, and fellowships. To implement this, the SAC will maintain a list of honors and awards awards related to gravitational wave science and those for which Collaboration members might be eligible and advertise those periodically to the Collaboration, encouraging nominations.

8.6.2. Procedures

8.6.2.1. The SAC will appoint a member each month to timely respond to requests and invitations, coordinating with appropriate partner collaborations. The member will aim for a response within a week, and keep a record of actions, including selected speakers, in `https://wiki.ligo.org/SpeakersBoard/RotationSchedule`. It is the responsibility of a selected speaker to contact the conference organizers regarding details of the talk and the conference, and submit abstract and slides to DCC and the Editorial Board.

8.6.2.2. The SAC maintains a list of upcoming periodic conferences related to gravitational wave science in `https://wiki.ligo.org/SpeakersBoard/RegularConferences`, and will approach the organizing committees as soon as feasible to offer help for topics and names of invited speakers.

8.6.2.3. The SAC will maintain a database of LSC members speaking at past conferences in `https://wiki.ligo.org/SpeakersBoard/PastConferences`.

8.6.2.4. The SAC will maintain a database of potential speakers in `https://wiki.ligo.org/SpeakersBoard/PotentialSpeakers` which shall be reviewed and updated with a frequency at least yearly. The database can be updated by SAC members, Working Group Chairs, and LSC Group PIs.

8.6.2.5. The list of honors and award is available at `https://wiki.ligo.org/SpeakersBoard/ListOfAwards`; it is updated and distributed to the collaboration on a quarterly base.

8.7 Editorial Board (EB) – *Approved by Council, July 2022*

8.7.1. Introduction

8.7.1.1. Implementing policies regarding publications and presentations by LSC members was the responsibility of the Publications and Presentations Committee (P&P) from the beginning of the collaboration. In the 2020 revision of the bylaws, P&P was renamed the Editorial Board, enlarged and given the additional responsibility of direct editorial review of full-collaboration publications.

8.7.1.2. Access to the LIGO data is defined in Memoranda of Understanding between the LIGO Laboratory and the LSC member's institution. Broadly, rights to LIGO data are gained by making a substantial and recognized contribution to LIGO designs, construction, commissioning and/or software development. By signing a Memorandum of Understanding, the participating LSC institution agrees to abide by the LSC Editorial Board policies.

8.7.1.3. The purpose of the LIGO/LSC Editorial Board Policy is to:
1. Ensure scientific integrity of LIGO scientific and technical results
2. Ensure appropriate recognition of individual and institutional contributions

8.7.1.4. The goals in formulating the policy are to:
1. Promote the timely publication of results
2. Promote the visibility of LIGO scientists and engineers, and especially, to encourage younger scientists and engineers to participate in the presentation and publication of results.
3. Provide an efficient mechanism for the internal review and be conducive to publication.
4. Promote open and free exchange of ideas and information within the LSC while research projects are being formulated and carried out.

8.7.1.5. During the course of free scientific exchange in a collaborative effort involving multiple institutions, privileged information is disseminated. It is the intent of this policy to ensure that members of the LSC, the Virgo Collaboration and the KAGRA Collaboration (LVK) can present their work in an environment where that privilege is preserved. LSC reviews are intended to provide a constructive evaluation of publications by the LSC and its participating institutions.

8.7.1.6. Two categories of publication are recognized with different levels of policy restrictions and review applying: those authored by the full LSC/LVK, and those authored by small subsets of the collaboration ("short-author-list publications"), as detailed below.

8.7.1.7. In general, these policies apply to collaborative work of the LSC carried out in the LSC/LVK committees and working groups as it bears on the scientific mission of the LSC. Work within the individual groups of the Collaboration that is not part of the collaborative program, not significantly influenced by interactions in LSC/LVK committees, working groups, or collaboration meetings, or not specifically identified in the Memorandum of Understanding is not subject to these policies. The policies, when applicable, concern scientific articles, presentations at conferences, press releases and other popularizations.

8.7.1.8. As a provision of the LSC bylaws, an Editorial Board (EB) is appointed by the LSC spokesperson in order to:
– carry out editorial review of full-collaboration papers
– manage the reviews of LSC technical publications and conference proceedings
– manage reviews of abstracts and presentations at conferences
– maintain a public archive of publications and presentations
– maintain the publication and presentation policies

8.7.2. Determining Appropriate Authorship of Publications in Archival Journals

8.7.2.1. By default, all archival journal papers reporting on LIGO and GEO observations and astrophysics results based on **non-public LIGO data** shall list all eligible LSC members (the "LSC author list") as authors, but exceptions are permitted as described below. The author list shall be in alphabetical order. If a corresponding author representing the LSC appears in the final journal article, it should be "LSC spokesperson" (lsc-spokespersonligo.org), without any specific name attached to the address.

8.7.2.2. In keeping with the goal of the LSC to promote the visibility of its members to the scientific community at large, there may be cases where a limited author list is more appropriate. The publication policy therefore allows for exceptions to this rule *by petition*, which include publications describing:
– Algorithm development with non-public data
– Data quality veto studies
– Hardware injections
– Calibration studies
Such papers shall contain no new observational results, but related quantities of interest, such as detection efficiencies and background estimations, *e.g.*, using unphysical time shifts may be permitted. Instrumentation papers shall avoid quantifying detector performance over large fractions of an observing run.

8.7.2.3. Decisions on whether or not a petition is granted will rest with the Editorial Board Co-chairs, in consultation with the Spokesperson.
In some cases, instead of granting a limited author petition, the Spokesperson may decide to alter the alphabetical authorship listing by putting the main authors at the front of the list, followed by the remainder of the LSC author list.
Procedural detail(s): A brief written record of the reasoning for such exceptions will be posted on the LSC Editorial Board pnp.ligo.org page for the publication.
If the petition is granted, the paper shall contain an acknowledgment to the LSC for access to the data and the statement of acknowledgment to the funding agencies.

8.7.2.4. Certain projects carried out on the LIGO interferometers are related specifically to commissioning and/or improving detector performance or to exploring instrumental physics that falls outside the realm of the LSC mission. Papers that fall into this category derive from the work of two groups – a set of researchers (Group 1) who conceived and implemented the core research project (typically but not necessarily a small number) and a much larger group of people who built, maintain, and operate the interferometers that enabled the project to be carried out (Group 2). For these classes of papers, the authorship is assigned as follows. Group 1 authors are listed first in the byline in an order determined by the Group 1 authors, followed by Group 2 authors listed alphabetically. The LIGO Laboratory Operations Management Team (OMT) makes the determination, in consultation with the LSC Editorial Board Co-chairs, of which papers fall into this category.

8.7.2.5. The Group 2 author list consists of scientists, engineers, and technicians who made tangible contributions to the design, development, installation, commissioning, and operation of the interferometers. The Group 2 author list will be maintained by the OMT and will include any eligible members of the LSC. As of the O3 Observing Run, these lists are designated as O[N] Detector Author Lists, starting with N=3, which are assembled by the OMT via petition and in coordination with the LSC Editorial Board. To be included on the O[N] ("current") Detector Author List, the author must have performed significant work on the current LIGO detectors, in

one or more of the following areas:
a) R&D, design, or fabrication of detector improvements for the current observing run
b) Installation of components for the current run
c) Commissioning of the current detectors
d) Operation and maintenance of the current detectors.

8.7.2.6. By default, LSC members may write short-author-list publications using **public LIGO data** that have been released in bulk or released in short epochs that include published exceptional events, but publications that would preempt collaboration publication plans are not permitted. The appropriate working group chairs advise the Editorial Board and Spokesperson on potential cases of preemption. If a determination of preemption is made, then the public release of the short-author-list article shall be delayed appropriately.
Procedural detail(s): Preemption determination is normally based on overlap with one or more planned collaboration publications; overlap may occur in scientific goals, analysis approaches and underlying strain data used. As a result, LSC members who are also members of an external collaboration, such as a team observing electromagnetic counterparts to GW detections, may need to decline authorship on that team's publications or on GCN circulars that preempt content in planned LVK publications. For example, in May 2023, in response to queries ahead of the O4 run, the CBC group co-chairs advised the Editorial Board that a determination of the Hubble constant using publicly released LVK information (publication or circular/notice) should list no LSC authors if released prior to the corresponding LVK Cosmology publication based on the same data. Additional guidance and examples for what constitutes preemption for CBC publications can be found in `https://dcc.ligo.org/LIGO-M2100220`.

8.7.2.7. Short-author-list papers originating from individual or collaborating LSC institutions shall assign authorship in accordance with generally accepted principles. Specifically, authorship rights shall be assigned to a paper based upon their participation in the work. Individual groups have the responsibility of properly determining authorship for their papers.

8.7.2.8. In some cases, short-author-list papers originating from a specific working group or involving collaborations between multiple working groups may have a large number of authors. In such cases, the proposed author list shall be circulated to all WG members, and requested changes shall be made before submission for LSC review.

8.7.2.9. Should the author list exceed 10% of the LSC membership, then the paper can reasonably be said to represent the entire LSC in that it significantly advances data analysis or advanced detector development. In this case, all current eligible LSC members will be listed as authors, where with the consent of the Spokesperson, the author list may be split into a main group of authors, followed by an alphabetical list drawn from the LSC Author List. Exceptions may be made when, for example, two working groups collaborate on a paper with a narrow focus, or for O[N] detector author lists described above.

8.7.3. Authorship of Conference Proceedings and Review Articles

8.7.3.1. The authorship of conference proceedings reporting on previously published LIGO observations and observational results should list only the actual speaker(s) as the author(s) and state that the speaker is writing for the LIGO Scientific Collaboration in the byline, *e.g.*, "J. Speaker for the LSC". Adding authors who did not orally present the results described is not permitted.

8.7.3.2. In some cases, the collaboration may decide to publish as a conference proceeding an astrophysics or observational result that will not be published elsewhere. In this case, the paper should use the LSC Author List and should be reviewed as an observational paper.

8.7.3.3. Review articles that do not use non-public LIGO data and cite only public-domain results, such as could be written by a gravitational wave expert outside the LSC, shall carry a short author list.

8.7.3.4. The authorship of conference proceedings reporting on technical and/or methods papers involving LSC instruments and non-public data should follow the same rules as for archival journal articles, with either a short author list (if a petition is granted by the Editorial Board) or the byline. "J. Speaker for the LSC".

8.7.4. Review Procedures for LSC Full-Collaboration Publications

The LSC publication review procedures for full-collaboration papers are meant to ensure appropriate scientific scope and presentation quality.
Procedural detail(s): The information below is an elaboration of and takes precedence over a highly condensed flow chart posted on the P&P wiki page:
`https://pnp.ligo.org/ppcomm/reviewerguidelines.html`.

8.7.4.1. Proposals to write full-collaboration papers may originate in one of the working groups of the Observational Science, Instrument Science, Operations or Communication and Education Divisions of the LSC and are subject to approval to proceed by the LSC Council in consultation with the Program Committee. The procedures below assume that a paper has been approved and that a Paper Writing Team (PWT) has been appointed.[3]

8.7.4.2. There are three required circulations of each full-collaboration paper, each allowing at least one week for LSC comment:

8.7.4.2.1. Initial circulation – The initial draft need not be mature. Not all results may be ready, and text may be missing. The intent of the circulation is to ensure collaboration review of overall scope and relation to other full-collaboration papers. The date of this initial circulation defines the appropriate author list to use:
– February 20nn list for February 16, 20nn to August 15, 20nn circulation or
– August 20nn list for August 16, 20nn to February 15, 20(nn+1) circulation.
Procedural detail(s): Prior to this full-collaboration initial circulation it may be wise to circulate a draft to the appropriate working group(s) for preliminary comment, in keeping with the policies of the working group(s).

8.7.4.2.2. Mature circulation – there should be at least one mature circulation with complete results and polished text, in coincidence with or preceded by a presentation to the full LSC/LVK (in-person at a collaboration meeting or via teleconference).
Procedural detail(s): At the presentation there should also be brief comments provided by one or more representatives of the results reviewers and comments from a representative of the Editorial Board.

8.7.4.2.3. Final circulation – Following approval by the LSC Management Team, a circulation with a final 1-week comment period allows authors to opt out or opt in. At this stage, comments should be limited to serious errors, errors in the author list, etc. It is too late for issues of style or suggestions on what should have been done.

8.7.4.3. Editorial Board members are assigned to each full-collaboration paper, drawn from the EB pool.
Procedural detail(s): Assignments take into account reviewer constraints, preferences and expertise.

[3]The PWT is designated as the "Editorial Team" in some contexts; that terminology is not used here, to avoid confusion with the Editorial Board.

Guest reviewers are recruited when too many papers are in simultaneous circulation for adequate review by the EB or when particular expertise is needed.

8.7.4.4. Editorial Board review is meant to ensure collaborations papers with the following virtues:
– Appropriate emphasis and balance, especially in abstracts, introductions and conclusions
– Clear scientific context for searches or measurements described
– Clarity and concision of text
– Clarity of equations, including notational choices
– Clarity of tables and figures, including captions
– Self-consistency among text, tables and figures
– Consistency among companion publications and with prior publications
– Appropriate citation to previous work, including to publications by non-collaborators on public LIGO data

8.7.4.5. EB reviewers are asked to review each circulated draft carefully and provide comments via the paper's git repository.
Procedural detail(s): Those comments come in graded categories:
– We suggest... (default if not explicit)
– We recommend...
– We urge...
– We insist...
Internal EB discussion should precede comments posted within the last two categories. EB reviewers creating new git issues are asked to alert paper writing teams of the comments, to avoid needless delay.

8.7.4.6. If the paper announces a new discovery, there should be a limited public release on the GWOSC web server of the gravitational strain data relevant to the discovery, *e.g.*, $\sim$1 hour of $h(t)$ containing each transient event or $\sim$1 Hz of $\tilde{h}(f)$ containing each persistent narrowband source.
Procedural detail(s): Preparations for GWOSC data releases should begin early, to allow time for review, preferably before or during the mature paper circulation.

8.7.4.7. The LSC Management Team (MT) acts on behalf of the LSC Council in approving papers for public release. Before that approval is sought, there must be confirmation from the appropriate representative of the results reviewing team that all presented results, including figures, have been validated. There must also be a confirmation from the LSC Editorial Board that the presentation of the results is satisfactory.
Procedural detail(s): The PWT and the EB will be asked to answer a brief survey addressing paper status and recent changes, along with any authorship petitions. The answers are provided to the MT before its review begins.
The MT is asked to respond within one week and may demand further revisions before approval or make suggestions for PWT consideration.

8.7.4.8. Every paper authored by the LSC/LVK will be accompanied by a "science summary": a short text, written in a language suitable for the general public, which complements the paper's scientific abstract.
Procedural detail(s): A draft science summary should be made available before the end of the mature circulation by the PWT for review by the Education and Public Outreach (EPO) Committee.

8.7.4.9. *Procedural detail(s): The MT approval period is also an appropriate time during which relevant data products should be produced for public release via the DCC. Such products may include, for example, data values behind key figures in the paper or posterior samples. If the paper*

announces a new discovery, the associated GWOSC data release should be ready or near ready, including reviewer signoff, by this time.

8.7.4.10. Once the MT approves the paper (and subject to approval from Virgo / KAGRA, as appropriate), the final 1-week circulation can begin.
Procedural detail(s): Normally, arXiv and journal submission, along with public visibility in the DCC, should follow the final week of circulation and incorporate authorship opt-outs and opt-ins. In special cases for which an external time constraint applies, such as presentation of the paper's results at a conference, collaboration management may authorize arXiv and/or public DCC visibility during the final circulation, in which case the initially public author list should display only the collaboration names, e.g., The LIGO Scientific Collaboration, the Virgo Collaboration and the KAGRA Collaboration.

8.7.4.11. *Procedural detail(s): The science summary should be finalized and approved by the EPO before journal submission.*

8.7.4.12. *Procedural detail(s): Detailed instructions on submitting papers to arXiv and to journals are maintained by the Editorial Board in this document:*
`https://dcc.ligo.org/LIGO-M1900017`.

8.7.4.13. When a journal editor requests revisions in response to referees, the referee comments should be circulated to the appropriate working group(s) and posted in the paper's git repository. The drafted response to the referee should also be posted in git and the link circulated to the working group(s) when ready, with at least one business day given for comment.
Procedural detail(s): In the event that major revisions are requested, the Editorial Board should be consulted before resubmission.

8.7.5. Review of Short-Author-List Publications with LSC Authors

The LSC publication review for short-author-list papers is meant to provide constructive feedback to authors, as well as to ensure the authorship is appropriate and the LSC/LVC/LVK work is properly represented. The review process is managed by the Editorial Board. This policy document lists the triggers for a review and general guidelines. Below are descriptions of the triggers for review, procedures for review, including guidelines for authors and reviewers, and special considerations for use of proprietary LIGO data. This information is an elaboration of and takes precedence over a highly condensed flow chart posted on the P&P wiki page.

8.7.5.1. **Triggers for Review**

Given the diverse and overlapping science carried out collectively by the LSC/LVC/LVK and by individual LSC members, it is difficult to delineate precisely which short-author-list publications warrant formal review, but any of the following criteria belong to a core set of review "triggers":
(i) The article has used data from an LSC instrument, be it the detectors or physical monitors.
Examples include, for example, instrumental studies, data analysis or astrophysical interpretation.

(ii) The article presents research described in the LSC Program, in the LSC MOU for an author institution or in an LSC white paper.
Examples include articles describing search methods, parameter estimation or astrophysical interpretation on which full-collaboration publications depend.

(iii) The article has used LSC software or hardware resources made available through the LVK Memo of Agreement for the analysis of data from an LSC instrument, for the design of a future LSC instrument, or for other purposes that bear directly on the mission of the LSC/LVK.

Examples falling into this category include, but are not limited to, DMT, LDAS, and LALsuite software analysis tools, software tools developed for design of interferometer configurations such as e2e, FFT, Melody and Bench.

(iv) The article has used resources to which the LIGO Lab or non-author LSC institutions have contributed significant resources for the purposes of collaborative LSC/LVC/LVK research.
Examples include but are not limited to optical coating and substrate development efforts, LSC laser development programs, and control system development. Any work performed under the auspices of direct funding from LIGO Laboratory or from joint funding with LIGO Lab and/or LSC institutions is subject to the policy.

(v) The article contains statements that can reflect on the LSC. LSC colleagues should have an opportunity to comment on factual statements made about LSC/LVC/LVK results or instruments. Whether or not the papers need a review by the LSC will be at the discretion of the Editorial Board Co-chair. Examples in this category include review articles that discuss LIGO results or performance.

(vi) The article competes with a prior LVC publication.
Examples include but are not limited to refined parameter estimation or astrophysical conclusions drawn from publicly released data and Hubble constant measurements using newly available data sets from electromagnetic astronomy. Drawing conclusions that differ from or even contradict LVC publications, based on new information or analysis, is permitted, but, again, the LSC must be allowed to review statements that characterize its measurements.
Articles that compete with or otherwise preempt upcoming LVC publications are prohibited from public release, including journal submission, as discussed above. Relevant working group or subgroup chairs will be consulted by the Editorial Board when a potential competition or premption question arises.

(vii) The author(s) cannot guarantee that standard review criteria for short-author-list papers are satisfied:
These criteria are the following:
– Is the author list appropriate?
– Are any LSC data used in any point/form? This category includes data from auxiliary channels and ”hidden” usage of data for simulations *etc.*.
– Are there statements of what the LSC will or will not do? (this includes searches and hardware). If so, are those statements accurate?
– Are proper references made to related work within the LSC/LVC/LVK?
– Are references to LIGO instruments/results up to date?
– Is there an acknowledgement of computing resources accessed through the LIGO-Virgo Collaboration?
Procedural detail(s): The Editorial Board maintains lists of key references and other relevant resources on the P&P wiki page.

8.7.5.2. The group leader of any participating LSC institution, including the LIGO Laboratory, has primary responsibility for determining when a scientific work should be submitted to the LSC for review. The group leader here is defined as the signatory on the LSC Memorandum of Understanding or the Director of the LIGO Laboratory. This determination must be made prior to submission for publication or posting on any public archive (*e.g.*, arXiv.org).

8.7.5.3. *Procedural detail(s): Even when the above trigger criteria are not explicitly satisfied, the LSC group leader is encouraged to consult with the LSC Editorial Board Co-Chairs on the need for an LSC review when there is any uncertainty. If a review is warranted, every effort will be made to ensure the LSC review process adds value to the paper without introducing unreasonable*

delays and while protecting the interests of the LSC.

8.7.5.4. *Procedural detail(s): For papers that do not directly overlap with science topics in the LSC/LVK Program, there is still the concern that LSC/LVK work is not properly cited. Authors are strongly encouraged, when they cannot confidently guarantee that the standard review criteria above have been satisfied, to circulate papers for informal comment to the appropriate working group(s) and to give LSC members two business days to comment. Such circulation can be efficient in revealing incomplete citation.*

8.7.5.5. **Procedures for Review**

8.7.5.5.1. *Procedural detail(s): If the above guidelines determine that an LSC review is necessary, a member of the participating LSC institution may submit a manuscript to the Editorial Board Publications & Presentations (P&P) web site (*`https://pnp.ligo.org`*) for review.*
With the exception of review articles, P&P review requires a prior or imminent presentation of the paper to an appropriate LSC/LVC/LVK working group.
Procedural detail(s): Whether the presentation has occurred or is scheduled for a future date, its date, time and venue should be provided in the submission information for inclusion in the circulation announcement email.

8.7.5.5.2. When the paper is submitted, it will be listed on a public LSC database maintained on the LSC home page listing the title of the paper, author list, date and time of submission, and date of completed LSC review. The reviewer(s) will be asked to provide feedback to the authors within one week of the manuscript submission.
Procedural detail(s): In practice, prompt review is more likely when the authors arrange in advance for a qualified expert to agree to serve as a reviewer.

8.7.5.5.3. Concurrent with the formal review, the manuscript will be posted electronically on a secure, password protected web site for general LSC review. A notification will be sent to all LSC members announcing the title, author list, and deadline for receiving comments. Members of the LSC will have a minimum of one week for short-author-list papers to log their comments on the relevant page of the P&P system.

8.7.5.5.4. In the event of disagreement amongst the reviewers or between the reviewers and the authors, the issue is to be resolved by the Spokesperson.
Procedural detail(s): The Spokesperson may choose to bring it to a vote of the Collaboration Council, or of the Management Team on behalf of the Council.

8.7.5.5.5. The Editorial Board, in consultation with the reviewer(s), will approve the final version of the manuscript prior to public release or journal submission .

8.7.5.6. Guidelines for authors

8.7.5.6.1. *Procedural detail(s): Authors are strongly encouraged to submit papers for LSC review only after they are in a 'publishable' state. Premature or incomplete "work-in-progress" drafts will cause unnecessary delays and use up goodwill on the part of the reviewers.*

8.7.5.6.2. *Procedural detail(s): Submissions to the LSC Editorial Board should include information regarding the target journal(s).*

8.7.5.6.3. *Procedural detail(s): To aid the Editorial Board, authors are encouraged to suggest appropriate reviewers within the LSC/LVK. The Editorial Board in turn will inform the authors of the reviewers name(s).*

8.7.5.7. Guidelines for reviewers

8.7.5.7.1. *Procedural detail(s): Reviewers will be selected by the Editorial Board based on expertise in the topic of the submitted paper and on the number of LSC reviews the potential reviewer*

has already carried out for the LSC. This is meant to ensure that the burden of peer review is spread most evenly across LSC members.

8.7.5.7.2. Reviewers are strongly encouraged to complete reviews within 7 calendar days and will be given a strict 14 day period in which the review must be completed.

8.7.5.7.3. The review should evaluate the paper according to the standard criteria above. Comments on the scientific relevance and correctness of the work are also helpful and encouraged.

8.7.5.7.4. *Procedural detail(s): Reviewer's comments should be posted on the P&P review page for the paper.*

8.7.5.7.5. If the reviewer wishes to re-review the paper after reviewer's recommendations are addressed by the authors, the reviewer is asked to complete the re-review within three calendar days.

8.7.5.8. Use of proprietary data (gravitational strain data that are not yet public or auxiliary channel data) is normally prohibited for publicly released short-author-list papers, but there are situations in which such use is allowed, such as papers focused on detector characterization, calibration or other instrumentation topics.

8.7.5.8.1. If no observational results are reported, the author(s) may petition the Editorial Board Co-chairs for a waiver, which can be granted in consultation with the Spokesperson.
Procedural detail(s): Papers that directly support prior or future full-collaboration publications are most likely to receive such a waiver.

8.7.5.8.2. If observational results are reported, then such a waiver requires the unanimous support of the Observational Science co-chairs (including from Virgo and KAGRA, as appropriate) and of the relevant working group co-chairs before seeking the approval of the Spokesperson in consultation with the Management Team.

8.7.5.9. **Timing of review of short-author-list papers containing results based on proprietary data**

8.7.5.9.1. It is common for short-author-list papers to arise based on proprietary knowledge of not-yet-published events, including events for which low-latency public alerts have been issued for electromagnetic or neutrino astronomer follow-up.
Procedural detail(s): Such papers may, for example, address event consistency with gravitational waveform models different from those used in an upcoming full-collaboration publication, or astrophysical interpretations, including formation processes, that are too speculative or new to be included in the full-collaboration publication. Many of the most contentious P&P issues arise from such papers, particularly in cases where LSC authors worry they will be "scooped" by non-LSC authors who are unconstrained by LSC publication policies once data have been made public.

8.7.5.9.2. *Procedural detail(s): The default handling of these papers is simply to require that they be posted on the P&P web site after public release of the corresponding full-collaboration paper. In addition, working groups may impose further conditions, such as the default CBC group requirement that any analysis be started (or re-performed) after public release, starting from the data released on the GWOSC server. An important motivation for these restrictions is deterrence of LSC members from carrying out short-author-list analysis that interferes with their LSC responsibilities to contribute to full-collaboration publications. It can be especially discouraging for busy contributors to LSC publications, working under deadline, to see other colleagues using their own time and their proprietary knowledge of LIGO detections to pursue papers for personal credit.*

8.7.5.9.3. Waivers of the post-release minimum 1-week timeline, however, can be granted by the Editorial Board co-chairs in consultation with the appropriate working group chairs if the short-author-list paper serves as support for a full-collaboration publication and is cited by it.

8.7.6. Theses

PhD and Master theses that use non-public LIGO data differ from publications, as they are, by default, single authors and are bound to a tight schedule that may not be met by the review process. Ideally, an observational result in a thesis should be reviewed to the same standard as an LSC publication. This goal may conflict, however, with review priorities and potentially introduce unwelcome delays in the graduation schedule. Instead, the following guidelines shall be used:

8.7.6.1. An analysis claiming a new detection on proprietary data (not yet released publicly) cannot be published in a thesis until an official announcement has been made by the LSC and the LIGO Directorate.

8.7.6.2. When possible, other new observational results in a thesis based on non-public LIGO data shall be reviewed to the typical standard for presentation of preliminary results at conferences. The fallback scenario, in the case of a controversial analysis, is to only present "playground" results based on using public data. The thesis shall also contain a statement of acknowledgment to LIGO, the LSC and to the funding agencies. A statement that results are under LSC review and potentially subject to change may be appropriate. A written record will be posted by the Editorial Board on its web pages, together with a statement from the advisor and the review committee chair, listing which data were used, and how.

8.7.6.3. If the thesis does not undergo a review or does not meet the above criteria, a disclaimer shall be added to the introduction, stating that the work does not reflect the scientific opinion of the LSC and it has not been reviewed by the collaboration.

8.7.6.4. *Procedural detail(s): Students and advisors uncertain how to proceed should consult the Editorial Board Co-chairs for guidance. In some situations, publication embargo arrangements may suffice.*

8.7.7. Presentations (talks and posters)

The Editorial Board manages the distribution, review and archiving of LSC presentations. An outline of essential procedures are in the DCC document LIGO-G1801787 and mirrored on the P&P wiki `https://wiki.ligo.org/PPComm/WebHome`; detailed timelines and procedures are linked from the P&P wiki. The remainder of this section outlines some specific guidelines for invited and contributed talks/posters.

8.7.7.1. Determining authorship and necessary review of presentations or posters

8.7.7.1.1. Presentation of unpublished or first-time presentation of newly published LSC observational results requires that the authorship be denoted on the title slide as "Firstname Lastname for the LIGO Scientific Collaboration and Virgo Collaboration" or "Firstname Lastname for the LIGO Scientific Collaboration, Virgo Collaboration and KAGRA Collaboration." This authorship designation also applies to presentations by the Spokesperson, by working group co-chairs or for conference presentations when the speaker has been invited to represent the collaboration(s). Any presentation on behalf of the LSC **must** be reviewed.

8.7.7.1.2. Other presentations of LSC results are normally authored by the speaker (and close collaborators), but authors should consult the Editorial Board Co-chairs for guidance when in

doubt. LSC members who do **not** present explicitly for the LSC should acknowledge and thank the LSC (and Virgo / KAGRA if appropriate).
Procedural detail(s): Inclusion of the LSC logos slide is a natural way to insert this acknowledgement and thanks:
`https://dcc.ligo.org/LIGO-G1300394`.
Presentations of LSC results not explicitly on behalf of the LSC do not normally require formal review, but authors should, at a minimum, circulate slides to the appropriate working group(s) for comment, and submission to the P&P web site for review is strongly encouraged for conference presentations. Presentation submissions to the P&P web site are always welcome.

8.7.7.2. Review of presentations

8.7.7.2.1. For presentations on behalf of the LSC, any required abstract should be circulated to the appropriate working group(s) and posted to the P&P site *at least two business days* before submission. Working groups may have policies with additional restrictions.

8.7.7.2.2. For presentations on behalf of the LSC, the draft slides should be posted to the P&P site and circulated to the appropriate working group(s) *at least five business days* before submission. Working groups may have policies with additional restrictions

8.7.7.2.3. Only public observational results or results that have been approved by the working group chairs and results reviewers may be shown publicly at invited talks and appear in proceedings. The preference is that the results will have been written and reviewed as for publication. Working groups may have policies with additional restrictions, such as requiring that an approved paper be publicly available at the time of the presentation.

8.7.7.2.4. *Procedural detail(s): The Editorial Board Co-Chairs will assign a reviewer with appropriate expertise to review submitted abstracts and slides. Reviewers will be asked to respond promptly. As with short-author-list publications, prompt review is aided by pre-arrangement of a qualified reviewer by the author.*

8.7.7.2.5. *Procedural detail(s): Special procedures are available for job interview presentations, in consultation with and at the discretion of the LSC Spokesperson.*

8.8 MoU Review Panel – *Approved by Council, July 2022*

8.8.1. Policies

The MOU Review Panel is described in §7.8.2 of the LSC Bylaws (M050172-v21).

8.8.2. Procedures

8.8.2.1. Prerequisites:

8.8.2.1.1. Update LSC Program. Responsible: Program Committee. Approval: LSC Council. Due date: approximately 2 months before MOU submission deadline.

8.8.2.1.2. Appoint MOU review panel and set meeting dates. Responsible: Spokesperson. Consult: LSC Council. Due date: approximately 2 months before the MOU submission deadline.

8.8.2.1.2.1. The members of the MOU review panel will be comprised of working group and committee chairs

8.8.2.1.3. Update white papers. Responsible: OBS, INS, OPS, COMM/EPO, CSS Division Steering Committees. Approval: Management Team. Due date: approximately 2 weeks before MOU submission deadline.

8.8.2.1.4. Open MOU report/workplan system. Responsible: Spokesperson. Due date: approximately 2 weeks before the MOU submission deadline.

8.8.2.2. Workplan submission. Responsible: LSC Group PIs. Approval: Working group and committee chairs Due date: Workplan submission deadline.

8.8.2.3. MOU review. Responsible: Spokesperson with MOU review panel Due date: approximately 3 weeks after workplan submission deadline.

8.8.2.4. Feedback to LSC Group PIs. Responsible: delegated MOU review panel representatives. Due date: MOU review + 2 weeks

8.8.2.5. Discussion and changes by LSC Group PIs. Responsible: LSC Group PIs and delegated MOU review panel representatives Due date: MOU review + 2 weeks for minor issues, MOU review + 3 weeks for major issues

8.8.2.6. Sign-off by Directorate. Responsible: LIGO Directorate Due date: MOU review + 3 weeks and 3 days

8.8.2.7. Report to Council: Responsible: Spokesperson Due date: Council meeting after sign-off.

8.9 Standards and Conduct Committee – *Under Development*

The Standards and Conduct Committee is responsible for advising the spokesperson, Council, and Collaboration about issues involving the LSC code of conduct. This Committee has one chair. See §7.9.2 of the LSC Bylaws (M050172-v21).

This is a new committee - more time is needed to complete this portion of the document - the following text is only a carryover from discussions in the bylaws committee

8.9.1. Policies

8.9.1.1. Code of Conduct `https://dcc.ligo.org/LIGO-M1900037`

8.9.1.2. LSC Policy for Formal Complaints and Grievances `https://dcc.ligo.org/LIGO-M1300005`

8.9.1.3. Expulsion of an individual or Group for willful and/or egregious violations of Collaboration rules, including the Code of Conduct LIGO-M1900037 as stated in 1.8.4 of the LSC Bylaws.

8.9.1.3.1. The recommendation for expulsion may come from either the LSC Spokesperson or the Chair of the Standards and Conduct Committee, or can arise following an issue brought to the Council for consideration.

8.9.1.3.2. The individual or group being considered for expulsion will have an opportunity to provide a written statement to the Council.

8.9.1.3.3. The Council chair will, at a meeting of the LSC Council, present a recommendation for expulsion. The Council will discuss the recommendation and then a vote will be opened by the Spokesperson. If the recommendation is approved by a 2/3 majority vote of the ballots cast, the Group or individual is expelled from the Collaboration, and they will not retain any further authorship rights under x1.7.5 of the bylaws.

8.9.2. Procedures

8.9.2.1.