

What comes next for LIGO? Planning for the post-detection era in gravitational-wave detectors and astrophysics

The detection of LIGO's first gravitational wave will be a transformational event, opening new avenues for astrophysical exploration, opportunities to build more powerful detectors directed at known source populations and data analysis enhancements informed by direct detection. Participants in this workshop will discuss how the first few detections might influence which paths offer the best opportunities, and how the community can be prepared with appropriate plans, including international networks and outreach of gravitational wave science to the broad scientific community. We invite gravitational wave scientists, astronomers, and astrophysicists to participate in this discussion. Focus panels will summarize discussions and write up conclusions after the meeting.

Attendance at the workshop will be limited by the venue to approximately 70 people. If the number of applications exceeds the number of places, acceptance decisions will be made by the organizing committee, with the goal of obtaining an appropriate balance of expertise, institutions, career stages and other factors. However, we will make the meeting available for remote attendees who are interested but cannot attend the meeting.

Preliminary Outline Program:

The program is organized into 5 sessions each addressing a particular set of questions. The sessions are organized around breaks, with talks to set the stage and to introduce the important questions, and discussions periods after the break. The breaks are intended as time to discuss the topic among themselves. Individuals or small groups wanting to raise particular ideas or questions during the discussion period are encouraged to contact the session chair or the speakers during the break, to allow them to organize the discussion by grouping similar ideas/topics together. The session chairs and speakers will moderate the discussion portion of each session.

Thursday, May 7

8:30-9:00 Introduction and Purpose of the Workshop (Gabriela González)

Session 1: Multi-messenger Astronomy (Session Chair: Shawhan)

Initially, the LSC and Virgo will share gravitational wave triggers with many astronomy partners. Later they plan to release such triggers publicly, to allow the search of electromagnetic counterparts and greatly increase the astrophysical knowledge about the sources of gravitational waves. Are there scenarios that will make this program challenging after a few GW detections? (Examples: mismatch between required coverage (either FOV or depth) and available resources; a need for much shorter latency for GW alerts; ...)

9:00-10:00 Landscape and possibilities for multi-messenger astronomy

Tentative speakers: Neil Gehrels, Mansi Kasliwal, Jonah Kanner

10:00-10:30 Break

10:30-11:30 Discussion and comments, moderated by panel

Session 2: Data Analysis (Session chair: Laura Cadonati)

The current plans for LIGO/Virgo data analysis leading to discovery in the next few years is summarized in [LIGO-T1400054](#). with anticipated observing schedule in [arXiv:1304.0670](#). How might these plans need to change after the first few sources are detected? What would trigger the need for new analyses or new deeper studies?

11:30-12:30 What is not the current plan, and what might be needed

Tentative speakers: Vicky Kalogera, TBD, TBD

12:30-14:00 Lunch

13:30-14:30 Discussion and comments, moderated by panel.

Session 3: aLIGO Improvements (Session chair: Matthew Evans)

The experimental community has detailed possible upgrades to aLIGO in [LIGO-T1400316](#). The first GW detections are expected to happen in observing runs before Advanced LIGO detectors reach their designed sensitivity [arXiv:1304.0670](#). How might the first detections influence the direction and pace of the upgrade program?

14:30-15:30 Current plans for reaching Advanced LIGO sensitivity and short term upgrades

Tentative speakers: Rana Adhikari, Lisa Barsotti, Stefan Ballmer

15:30-16:00 Break

16:00-17:00 Discussion and comments, moderated by panel

17:00 Small groups are encouraged to continue discussions separately over dinner

Friday, May 8

Session 4: International Network (Session Chair: Stan Whitcomb)

The first few detections with LIGO and Virgo detectors will likely be poorly localized, making the search for electromagnetic counterparts difficult, and lack of full polarization information may leave ambiguities in interpretation. Speeding the growth and robustness of the international network will become a priority in the next decade. Are there ways that LIGO and the LSC can

help speed the completion of the international network? Do we need to encourage funding agencies to talk to each other?

9:00-10:00 Plans for other detectors and potential areas of collaboration

Speakers: Giovanni Losurdo, Takaaki Kajita, Sendhil Raja(TBC)

10:00- 10:30 Break

10:30-11:30 Discussion and comments, moderated by panel

Session 5: Gravitational Wave Science in the broader context of US science (Session chair: Beverly Berger)

The detection of gravitational waves with LIGO detectors will cap a large effort by scientists and funding agencies in building large scale, high precision instruments for a new form of astrophysical observations. Yet, in contrast to other “big science” fields, there is no interagency or NRC advisory group (or subgroup) whose charge is to provide advice on gravitational wave science. In the upcoming era of transition to observation, such advice at the national, interagency level could prove crucial to the future of this science. What are possibly advisory groups to be contacted or created in the post-detection era?

11:30-12:30 Panel Discussion on Current US GW funding sources and advising bodies

Panel Members: Beverly Berger, Jackie Hewitt, Jay Marx, Michael Turner(TBC), Rai Weiss

12:30-14:00 Lunch

14:00-15:00 Panel reports on recommended actions (20 min each)

15:00--15:30 Conclusions, action plan (white paper)

15:30 End