

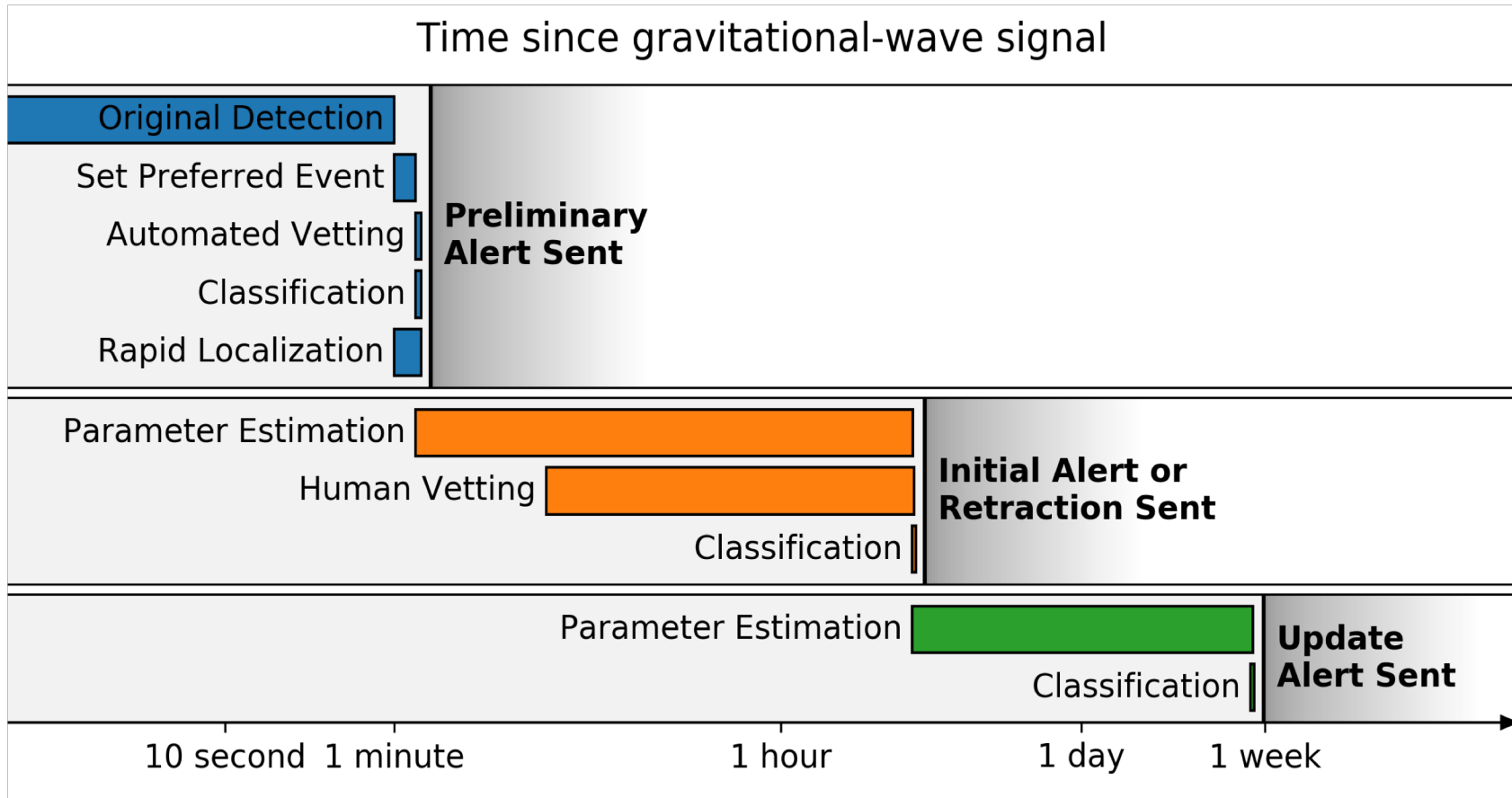


# LSC and Virgo plans for data sharing

David Shoemaker  
For Virgo and LSC  
1 December 2018  
G1802254

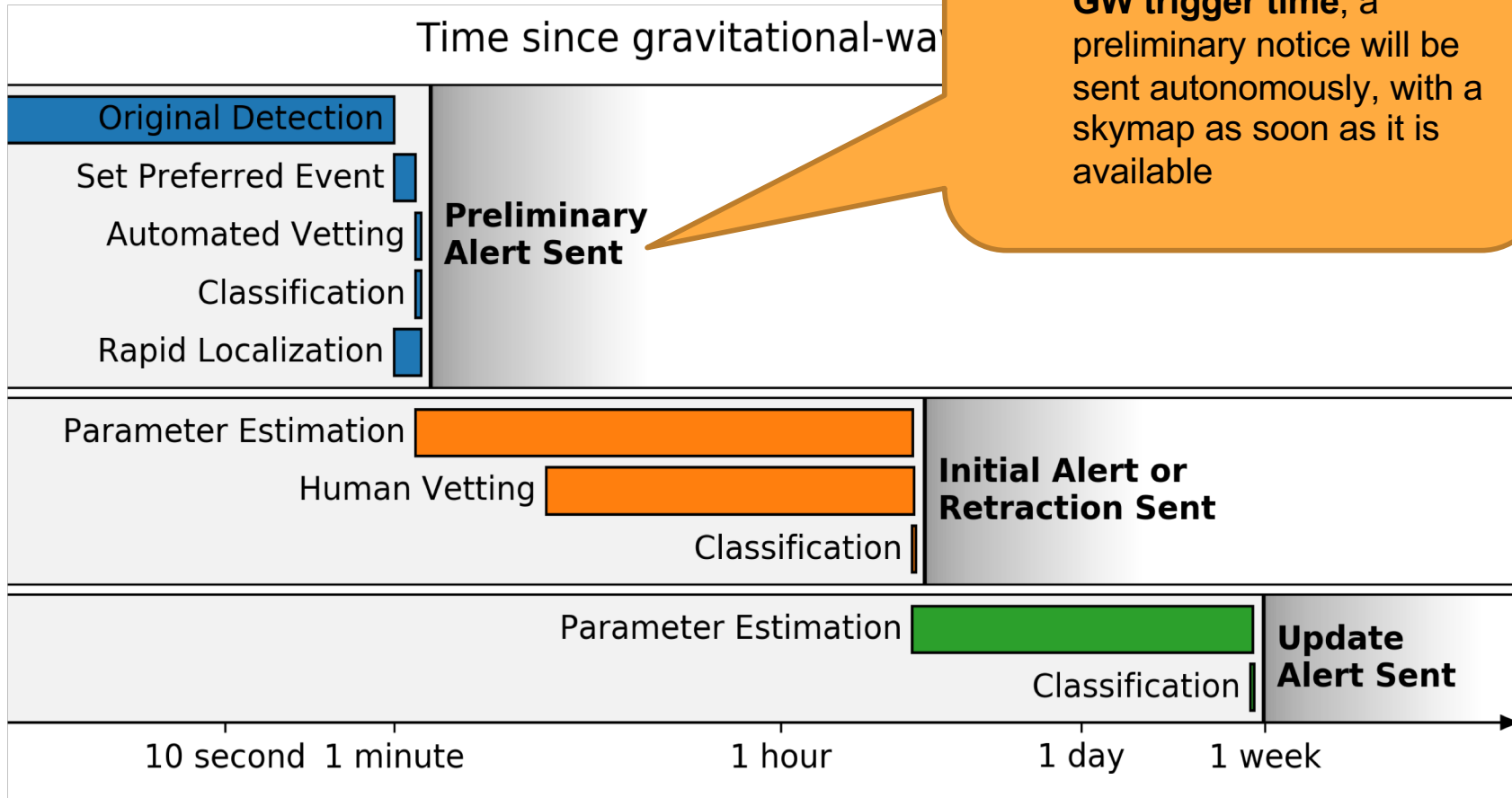


# Alert timeline for O3





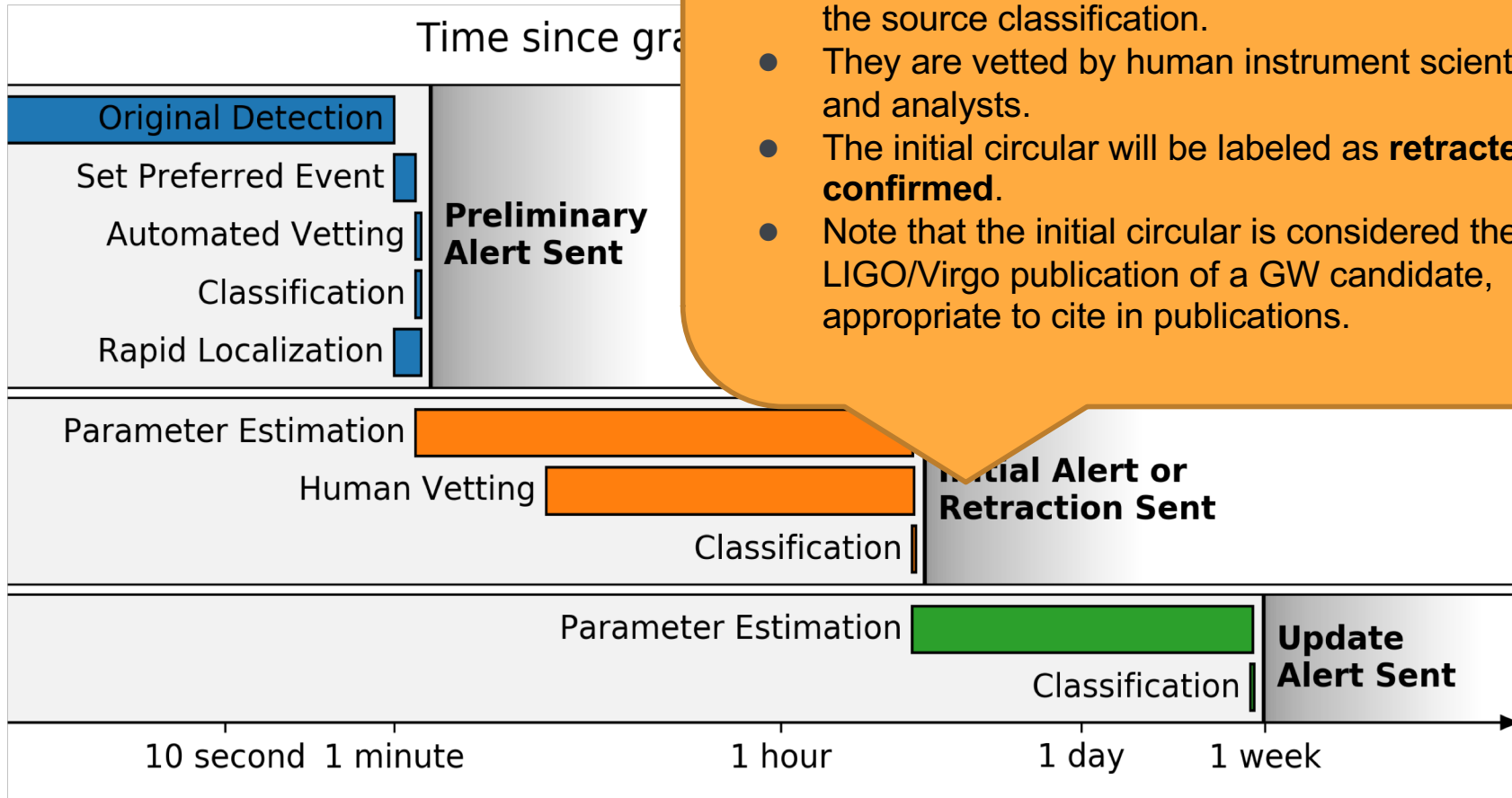
# Alert timeline for O3



- **Within 1–10 minutes after GW trigger time**, a preliminary notice will be sent autonomously, with a skymap as soon as it is available



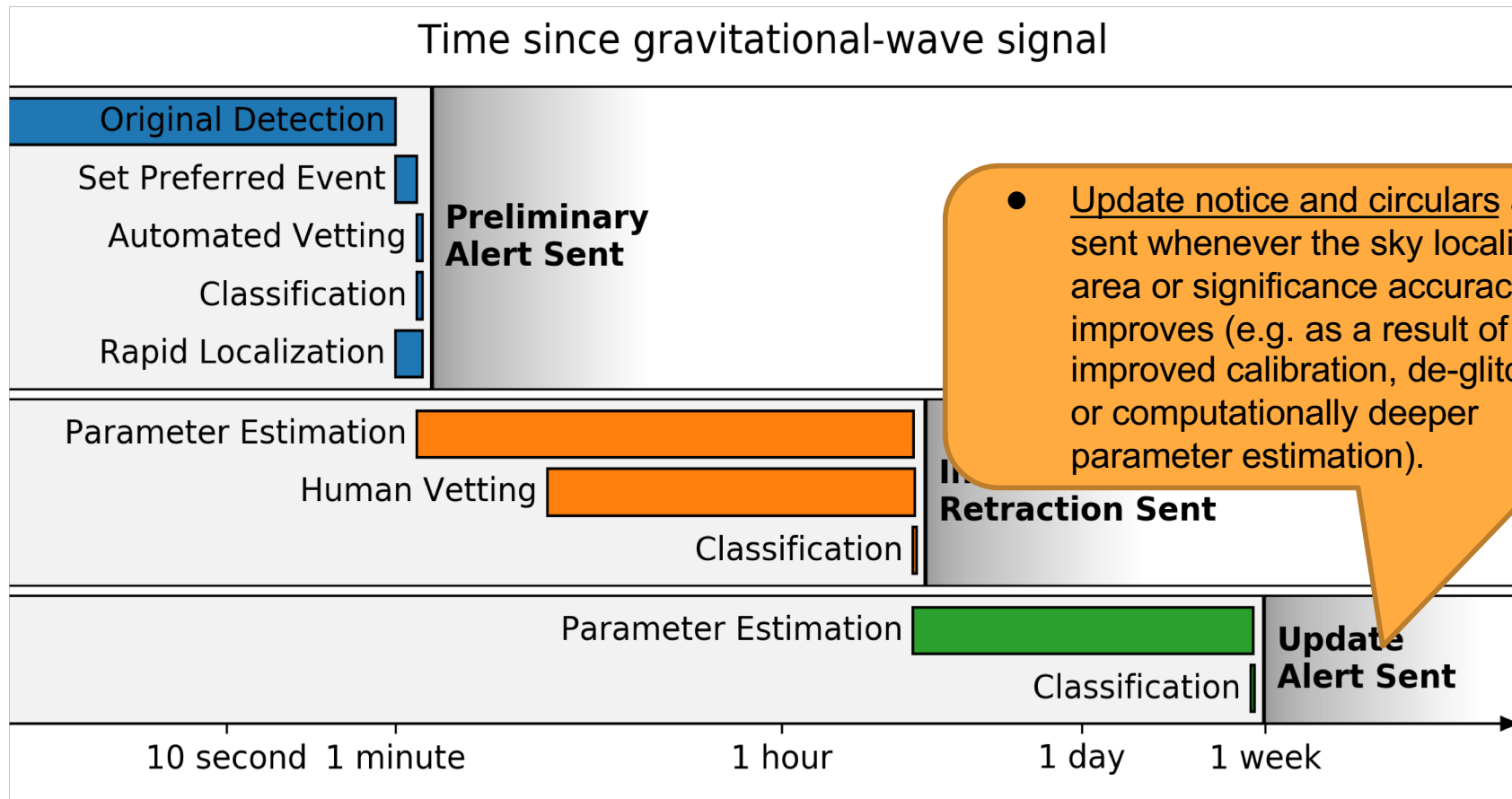
# Alert timeline for



- **Within 24 hours after the GW trigger time** (goal: within 4 hours for BNS or NSBH sources), the Initial notices and circulars will be distributed with an update for the sky localization area and the source classification.
- They are vetted by human instrument scientists and analysts.
- The initial circular will be labeled as **retracted** or **confirmed**.
- Note that the initial circular is considered the first LIGO/Virgo publication of a GW candidate, appropriate to cite in publications.



# Alert timeline for O3





## Notice Contents

- Date, Author, Where/When
- FAR - Estimated false alarm rate in Hz
- SkyMap - URL of HEALPix FITS localization file
- Group -- CBC or Burst; Pipeline
- If Burst: Central Frequency, Duration, Fluence
- If CBC:
  - Probability that the source is a BNS, NSBH, BBH merger, or noise
  - Probability of a neutron star, and ejection of neutron star matter
- The objective is to provide the information needed to find a host
- The circular update available within 24 hours will include text with an expert evaluation of the impact of any data quality issues



# Engineering Runs

- ER13: 08:00 PT 14 Dec → 06:00 PT 18 Dec
- ER14: Earliest start 1 March, up to 4 weeks in duration; O3 follows directly
- We see ERs as a way to fully exercise our instruments, data quality, calibration, pipelines
- During Engineering Runs and other times of stable instruments before the start of O3, **no automatic alerts** will be sent except as non-astrophysical tests.
- **If** triggers of interest during the ERs, we will otherwise follow through as planned for the Observing run for all aspects that are ready
  - GCNs will be distributed with the lowest feasible latency, and (as usual) should be cited by other papers
  - As in O3, retraction will be made if we learn a trigger was not astrophysical
  - If of sufficient interest, LVC will publish as quickly as feasible papers on ER events, releasing (as usual) data around the event and data packages



## Significance

- Target estimated contamination (non-astrophysical triggers): ~10% of public alerts across all categories together
- BNS, NSBH & other transients may individually have higher contamination
- The final significance of the candidate will be estimated in the offline analysis
- False Alarm Rates are currently anticipated to be 1/month for cbc and 1/yr for burst
- These thresholds will change as the sensitivity of the instruments improves if we hold the contamination fixed





## Expected Detection rates in O3

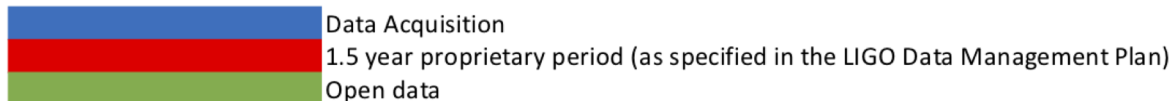
- Binary neutron stars (BNS)
  - 1/month to 1/year
  - Median 90% credible localization 120-180 deg<sup>2</sup>; 12-21% localized < 20 deg<sup>2</sup>
- Binary black holes (BBH)
  - few/week to few/month
- Neutron-star black-hole binaries (NSBH)
  - Uncertain, estimates include zero
- Other transients
  - Unknown



# Bulk Data Releases for O3

- Bulk Releases are planned to be (no later than) 18 months after the end of a 6-month data acquisition period
  - E.g., if O3 starts in April 2019, the first planned bulk data release would be April 2021
  - (O2 data will be public at end-February 2019)

	2019												2020												2021									
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10
O1 Run	Open data																																	
GW150904	Open data																																	
GW151226+LVT151012	Open data																																	
O2 Run	Data Acquisition		Open data																															
GW170104	Open data																																	
GW170814 + GW170817	Open data																																	
GW170608	Open data																																	
O3 Run ( 2 chunks)	Open data			Data Acquisition						1.5 year proprietary period												Open data												





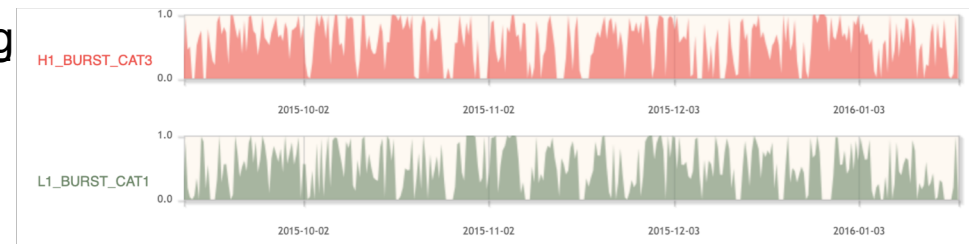
## Bulk Data Releases for O3

- Release will take the same format as previous releases
- The 18-month proprietary period serves to enable preparation of the data for analysis (re-calibration, subtraction of linearly-related auxiliary channels, data quality assessment and flagging) and internal processing by the Collaborations
  - As laid out in the LIGO Laboratory-NSF Data Management Plan
- We will strive to complete these steps as quickly as possible, which could enable an earlier bulk release of data



# Gravitational-Wave Open Science Center

- GWOSC -- <https://www.gw-openscience.org>
- LIGO and Virgo's portal for
  - Bulk data
  - Event 1-hour time-series data, etc.
  - Pointers to papers, data behind figures, posterior samples
  - Pointers to analysis codes
  - Pointers to Workshop materials
- The nominal scope is determined by the LIGO Laboratory-NSF Data Management Plan
  - Some postings beyond the DMP scope
  - Community requests to GWOSC on other elements of interest welcome





## The Network, the Future

- LIGO and Virgo coordinating closely on O3 planning
  - Observing, Analysis and publication, Data releases
- KAGRA hoping to join toward the end of O3
  - Working toward joint analysis
- O4 Currently foreseen for early-2021 to mid-2022, at design sensitivity
  - Hoping it will be the 4-detector network of 2xLIGO, Virgo, KAGRA
  - LSC, Lab, NSF considering shorter periods before release of data
  - Decisions will depend on ability to shorten preparation and analysis times, scope of key core collaboration analysis goals
- A+ Upgrade follows for LIGO, AdV+ for Virgo
  - LIGO-India comes into play
  - Network planning to be done



## In closing,

- Alerts: Please see Public Alerts User Guide for additional information -- that site will continue to be updated
  - <https://emfollow.docs.ligo.org/userguide/index.html>
  - Questions/comments for Public Alerts welcomed at page above
  - Presentation on Alerts for Observers: LIGO-G1802186-v3
- More general Observer/Data access questions/comments to Spokespersons
  - [lsc-spokesperson@ligo.org](mailto:lsc-spokesperson@ligo.org) - [virgo-spokesperson@ego-gw.it](mailto:virgo-spokesperson@ego-gw.it)
- Hope to nourish a flourishing community doing science with GW data