

# Status on Public Alerts

LIGO-Virgo Low-latency Analysis Group  
May 23, 2019

# GraceDB — Gravitational Wave Candidate Event Database

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## Latest — as of 23 May 2019 03:10:39 UTC

Test and MDC events and superevents are not included in the search results by default; see the [query help](#) for information on how to search for events and superevents in those categories.

Query:

Search for:

UID	Labels	t_start	t_0	t_end	FAR (Hz)	UTC	Created
<a href="#">S190521r</a>	ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK GCN_PRELIM_SENT	1242459856.453418	1242459857.460739	1242459858.642090	3.168e-10	UTC	2019-05-21 07:44:22
<a href="#">S190521g</a>	PE_READY ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK GCN_PRELIM_SENT	1242442966.447266	1242442967.606934	1242442968.888184	3.801e-09	UTC	2019-05-21 03:02:49
<a href="#">S190519bi</a>	PE_READY ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK GCN_PRELIM_SENT	1242315361.378873	1242315362.655762	1242315363.676270	5.702e-09	UTC	2019-05-19 15:36:04
<a href="#">S190518bb</a>	ADVNO SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK GCN_PRELIM_SENT	1242242376.474609	1242242377.474609	1242242380.922655	1.004e-08	UTC	2019-05-18 19:19:39
<a href="#">S190517h</a>	PE_READY ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK GCN_PRELIM_SENT	1242107478.819517	1242107479.994141	1242107480.994141	2.373e-09	UTC	2019-05-17 05:51:23
<a href="#">S190513bm</a>	ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK GCN_PRELIM_SENT	1241816085.736106	1241816086.869141	1241816087.869141	3.734e-13	UTC	2019-05-13 20:54:48
<a href="#">S190512at</a>	PE_READY ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK GCN_PRELIM_SENT	1241719651.411441	1241719652.416286	1241719653.518066	1.901e-09	UTC	2019-05-12 18:07:42
<a href="#">S190510g</a>	ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK GCN_PRELIM_SENT	1241492396.291636	1241492397.291636	1241492398.293185	8.834e-09	UTC	2019-05-10 03:00:03
<a href="#">S190503bf</a>	ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK GCN_PRELIM_SENT	1240944861.288574	1240944862.412598	1240944863.422852	1.636e-09	UTC	2019-05-03 18:54:26
<a href="#">S190426c</a>	PE_READY ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK GCN_PRELIM_SENT	1240327332.331668	1240327333.348145	1240327334.353516	1.947e-08	UTC	2019-04-26 15:22:15
<a href="#">S190425z</a>	ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK	1240215502.011549	1240215503.011549	1240215504.018242	4.538e-13	UTC	2019-04-25 08:18:26
<a href="#">S190421ar</a>	PE_READY ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK GCN_PRELIM_SENT	1239917953.250977	1239917954.409180	1239917955.409180	1.489e-08	UTC	2019-04-21 21:39:16
<a href="#">S190412m</a>	PE_READY ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK GCN_PRELIM_SENT	1239082261.146717	1239082262.222168	1239082263.229492	1.683e-27	UTC	2019-04-12 05:31:03
<a href="#">S190408an</a>	PE_READY ADVOK SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK GCN_PRELIM_SENT	1238782699.268296	1238782700.287958	1238782701.359863	2.811e-18	UTC	2019-04-08 18:18:27
<a href="#">S190405ar</a>	ADVNO SKYMAP_READY EMBRIGHT_READY PASTRO_READY DQOK	1238515307.863646	1238515308.863646	1238515309.863646	2.141e-04	UTC	2019-04-05 16:01:56

- Compact binary and unmodeled burst pipelines are running
  - a. Background estimation is reasonably stable.
  - b. Robust identification of candidates according to false-alarm-rate criteria.
- <https://gracedb.ligo.org/latest/>
  - a. 1 sent in error and immediately retracted (S190405ar)
  - b. 1 attributed to noise and retracted (S190518bb)
  - c. 13 remaining events of interest

# Current status of low-latency analysis system

- System encountered additional technical issues that prevented automatic generation of alerts.
- Many of the detection candidates (and public alerts material) involve multiple individual “triggers” corresponding to a combination of multiple search pipelines and how templates/signal parameter space are treated by them.
- Timing (time stamp of notifications within our system) and additional analysis tasks required to be completed before alerts can be sent out automatically may result to race conditions and overall stability issues that proved to be complex and unlike what we have seen in previous testing.
- End-to-end system continues to operate under human supervision with people on-shift and experts typically responding to (internal) notifications within  $O(1\text{min})$ .

# S190518bb -- First automated GCN Notice (retracted later)

- S190518bb
  - <https://gracedb.ligo.org/superevents/S190518bb/>
  - <https://gcn.gsfc.nasa.gov/other/GW190518bb.gcn3>
- Notes:
  - An automated GCN Notice went out in ~5 minutes
  - Event retracted within ~30 minutes following manual inspection (H1 displayed noise over tens of seconds prior to candidate's merger time)

# S190521g and S190521r -- Also automated GCN Notices

# Event updates: S190510g and S190426c

- Updated information on skymaps and classification for previous alerts follows as soon as it is vetted by the search groups
- S190510g:
  - <https://gracedb.ligo.org/superevents/S190510g/>
  - <https://gcn.gsfc.nasa.gov/other/GW190510g.gcn3>
  - [https://gcn.gsfc.nasa.gov/notices\\_I/S190510g.lvc](https://gcn.gsfc.nasa.gov/notices_I/S190510g.lvc)
  - P<sub>astro</sub> calculation shifted from 98% to 42% for p(BNS)
- S190426c:
  - <https://gracedb.ligo.org/superevents/S190426c/>
  - <https://gcn.gsfc.nasa.gov/other/GW190426c.gcn3>
  - [https://gcn.gsfc.nasa.gov/notices\\_I/S190426c.lvc](https://gcn.gsfc.nasa.gov/notices_I/S190426c.lvc)
  - Initial P<sub>astro</sub> calculation updated from parameter-estimation samples

# Compact Binary Publication Plans

Paper releases in 2<sup>nd</sup> and 4<sup>th</sup> quarter of 2020 for O3a and O3b respectively.

## **CBC Catalogs & Companions**, including (O3a: 2<sup>nd</sup> quarter 2020; O3b: 4<sup>th</sup> quarter 2020)

- Compact binary catalog
- Tests of GR
- $H_0$  measurement
- Characterization of astrophysical distributions
- GRB follow-up

## **Exceptional events**, including (4 months after detection)

- New classes (e.g., NSBH)
- Outside previously observed region, e.g.,
  - High spins
  - Spin precession
  - Large mass ratio
  - Large/small component masses

# Outlook

- Ongoing work to allow single interferometer triggers to create public alerts
- Automated response to external triggers (GRBs) still in the works
- LIGO-Virgo Public Alerts User Guide & Support
  - <https://emfollow.docs.ligo.org/userguide/>
  - Feedback or requests for information to: [emfollow-userguide@support.ligo.org](mailto:emfollow-userguide@support.ligo.org)
- Mailing list
  - Please sign up to the public openlvem mailing list; anyone can subscribe
  - Instructions at <https://wiki.gw-astronomy.org/OpenLVEM>
  - We will use it to announce changes of configuration, plans, etc