

Public Alerts in O3b

LIGO-Virgo Low-latency Analysis Group
Oct 24, 2019

Last events from O3a

- S190928c

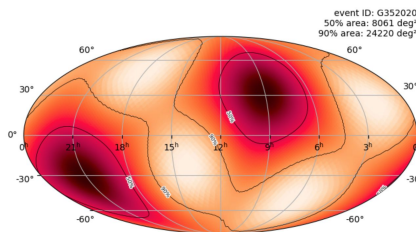
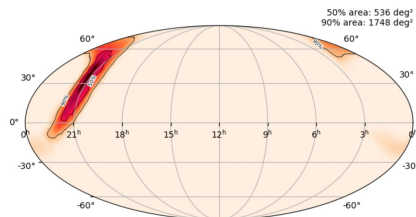
- Retracted: not considered a gravitational-wave event candidate
- GCN was down, so no public preliminary notice was distributed
- Retraction: <https://gcn.gsfc.nasa.gov/gcn3/25883.gcn3>

- S190930s:

- Detected in H1, L1
- 95% P(MassGap), 5% P(Terrestrial)
- <1% P(HasNS), <1% P(HasRemnant)

- S190930t

- L1 single-detector event
- 74% P(NSBH), 26% P(Terrestrial)
- >99[^] P(HasNS), <1% P(HasRemnant)



Multiple preliminary alerts in O3b

- Multiple searches: 4 CBC searches; 3 Burst searches; Multiple alerts
- Two preliminary alerts (for most of the events) sent via GCN to observing partners.
 - The first will be sent out as soon as we have a publishable event with all relevant data products that we share.
 - Upon receipt of first preliminary, the second preliminary alert generation process will be launched after a timeout.
 - Accumulating and revising the preferred event.
 - A second preliminary GCN will then be sent, even if the preferred event did not change.
- If the event is retracted before second preliminary, no further *second* preliminary notice will be sent. Only a retraction GCN will be sent.
- Unexpected/Exceptional situation: A manual preliminary alert triggered by human before Initial Notice. Help potential time-sensitive cases.

RAVEN alert system online

- Automated alerts for coincident GW candidates associated with a GRB or SNEWS event (RAVEN pipeline).
 - GW candidates that may not be significant on their own
 - Have an associated GRB or supernova
 - Resulting increases in joint significance to meet the current established threshold.
- RAVEN-specific preliminary GCN Notice under work; expected development by November.
- Until then a preliminary LIGO-Virgo GCN notice would be sent.
 - Containing usual data products: GW sky-maps; classification & properties.
- The association will be clarified in the following GCN circular.

GCNs with non-detection statements for GRBs

- Not immediate deliverable in the O3b.
 - To be implemented later in the O3b.
- Non-detection GCN *circular* for GRB triggers from Fermi and Swift for which there was no GW event.

Routine EM-Bright results from parameter estimation

- There is going to be no change in the low-latency data-products from what we have provided in O3a.
- Parameter estimation based EM-Bright source-properties provided for some interesting candidates during O3a.
- Formalising this update for all public events in the O3b when we have approved posterior samples ready.
- These results will supersede the low-latency results we provide along with the preliminary/initial GCN.

Updated User Guide (v12), <https://emfollow.docs.ligo.org/>

Observing Capabilities

- Update ranges and rates based on up-to-date O3 analysis. Add BBH and NSBH ranges. Update range and observing schedule figures.
- Generalize the definition of the range so that it is unambiguous at high redshift. It is now defined as in arXiv:1709.08079.
- Add the end date of Observing Run 3 (O3) on 2020-04-30.

Data Analysis

- Document the false alarm rate threshold for public alerts.

Alert Contents

- Remove the documentation for the Fluence parameter from burst alerts because it is not currently present in the VOEvents.
- Update the list of pipeline names that can appear in GCN Notices.

Additional Resources

- Created a new section for additional and contributed tools. The ligo.skymap and Aladin pages have been moved into this section.
- Add instructions for cross-matching sky localizations with galaxy catalogs in Aladin Desktop.
- Add the unofficial iOS Gravitational Wave Events app.