LVK Rapid Response Team (RRT) in ER15/O4

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ER15: March 30 statement by Patrick Brady about public alerts

Run plan

- We plan to start the observing run on 24 May 2023
  - this will be preceded by a ~ one-month engineering run.
  - The observing run will be 20 months with up to 2 months of commissioning
- Instrument updates:
  - LIGO commissioning is ongoing. Engineering run ~24 April.
  - Virgo commissioning is ongoing. Decision point in mid April about engineering run start.
  - KAGRA commissioning is ongoing. Decision point in April about engineering run start.
- Important notes:
  - Currently plan to begin streaming alerts during the engineering run
    - Date is subject to internal reviews
    - Use engineering alerts at your own risk

ER15: March 30 statement by Patrick Brady about public alerts

Run plan

ER15: Apr/26 (Started!)
Virgo joined on Apr/26 at 1500 UTC, for a limited fraction of time over the duration of the ER, giving priority to commissioning activities aiming at improving the sensitivity.
KAGRA will continue commissioning up to one week before the start of the O4 to improve sensitivity.

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ER15: What to expect

- GW analysis pipelines WILL start uploading real event candidates, which MAY result in public alerts.
  - Start date MAY differ for different pipelines (“subject to internal reviews”).
- RRT will NOT provide human response to public alerts in ER15 (except when REALLY interesting candidates are identified, e.g. next GW170817).
- But RRT WILL pick at least one BBH candidate and perform an end-to-end test of manual procedure, including the submission of GCN Initial Circular.
  - Will append “: End-to-End Test” to the usual subject, e.g. ”`SUBJECT: LIGO/Virgo/KAGRA S1234: Identification of a GW compact binary : End-to-End Test`”.
  - This will be a legitimate Circular, but please understand that this is only done for testing RRT procedure.

RRT in O3 VS O4

O3: LIGO/Virgo. A small group of experts. 80 public alerts over ~1 year observation. Untenable going forward.

O4: LIGO/Virgo/KAGRA. A group of (many) non-experts in addition to the expert group.

- All *Significant* (G2300752, FAR<1/Mo for CBC, 1/Year for unmodeled burst, after applying trials factors) public alerts will be initially handled by non-expert members.
  - The non-expert group is expected to issue Initial Circulars for the majority of *Significant* candidates (mostly BBH) on its own after the candidates pass automated checks.
  - Only a subset of *Significant* candidates will automatically go under the highest level of scrutiny with the lowest possible latency in human vetting by the experts.
- No human response for *Low Significance* (FAR<2/Day but not *Significant*) candidates.

Cases that will automatically get higher scrutiny by RRT experts

- *Significant* (as in FAR) Multi-Messenger Counterpart coincidence, OR
- Unmodeled burst analysis has the lowest FAR, OR
- More likely to be of astronomical origin, AND (p_BNS>0.1 OR p_NSBH>0.1 OR HasRemnant>0.1 OR 90% Area<100 deg2).

(There is a manual path to convene experts, too, just in case the above criteria misses something.)