Science-driven opportunities for collaboration

Slides prepared by Erik Katsavounidis for the MIT Town Hall Meeting on March 16th 2018

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Policy fundamentals

1. Objectives must be part of the science program of the LIGO-Virgo Collaborations.
2. Agreements/collaborations with non-LIGO-Virgo partners should not be “exclusive” for any of the science topics pursued.
3. Data/information/results privacy to be maintained at all times.
4. Joint Publications of results upon mutual agreement and with the whole LIGO-Virgo author group.

Data flow models

- GW transient triggers below the detection standard that may improve a specific science/source search when analyzed jointly with the EM/neutrino sectors.
- Several MOUs with similar scope exercised in recent times/still in place:
  - High Energy Neutrinos (Antares, Icecube).
  - Gamma-Ray/X-ray transients sources (Fermi-GBM).
  - Core-collapse Supernova low energy neutrinos (Borexino, Icecube, KamLAND, LVD).
- Generally, not low-latency critical (until now) and with low opportunity cost.

Data flow models

- EM transient/neutrino triggers not in the public domain that may improve a specific science/source search when analyzed jointly in GWs.
- Several MOUs with similar scope exercised in recent times/still in place:
  - High Energy Neutrinos (Antares, Icecube).
  - Gamma-Ray/X-ray transients sources (Fermi-GBM).
  - Fast Radio Bursts (Green Bank Observatory, Parkes Radio telescopes).
  - Core-collapse Supernova low energy neutrinos (Borexino, Icecube, KamLAND, LVD).
- Generally, not low-latency critical (until now) and with low opportunity cost .

Data flow models

- EM transient information not in the public domain that may improve a specific GW search/detection potential.
- Several MOUs with similar scope exercised in recent times/still in place:
  - CCSN light curves, progenitor information (ASAS-SN, DLT40).
- Generally, not low-latency critical.

Data flow models

- Information on GW transient detection from LIGO-Virgo not in the public domain (OPA) that can be used in analyzing EM data jointly and for specific science targets:
  - Inclination, individual masses and spins, tidal parameters for binary mergers.
  - 3-D localization information including full error budget post-EM counterpart identification.
  - Waveform details on GW transient alert when not a binary merger.

Open questions (science)

- What are such areas for collaborative efforts?
  - BNS/NSBH targets:
    - Cosmology (Ho) → See Archisman Ghosh presentation
    - GRB modeling
    - NS physics (broadband modeling, tides)
    - Tests of GR/Fundamental physics
  - Surprise targets:
    - BBH
    - unmodelled (non-binary) transients
  - Other targets:
    - CCSN
    - FRBs, magnetars, …
- What is time-critical (i.e., relevant for low-latency)?
- What is the added value in such science areas the collaborative effort will bring wrt what public data can offer?

Open questions (policy/organization)

- How to start collaborative analyses?
  - A written proposal that presents the idea, analysis, data (EM/nu/GW) and measurement/publication?
- How do we organize such collaborative efforts?
  - Some MOU structure will be needed, peer-to-peer, broader group-structure?
- What happens when multiple parties with overlapping interests/proposals materialize?
- Do we set this up now or after observations/detections take place?

How to proceed: break out sessions

- Thursday 16:00-17:30 Break-out sessions to discuss science cases
  - 16:00-17:30 Cosmology/Hubble constant (location/rapporteur: TBD)
  - 16:00-17:30 NS physics/EM broadband modeling and interpretation (location/rapporteur: TBD)
  - 16:00-17:30 Fundamental physics/GRB (prompt HE emission) (location/rapporteur: TBD)
  - 16:00-17:30 other possible parallel meetings: CCSN/FRB/neutrinos (location/rapporteur: TBD)
- Friday 08:30-09:30 Rapporteur presentations.
- Friday 09:30-10:30 Open mic/discussion/proposals.