Contribution ID: **351** Type: **Talk in the parallel session**

The Best Case Scenario: Towards prompt arcminute localization of a GW source with targeted joint sub-threshold GRB searches, intelligent scheduling, and early warning response

Monday, 5 July 2021 19:10 (10 minutes)

The rich EM phenomenology in the first few hours after a compact object merger encodes the nature of the post-merger remnant, and a wide array of other compelling physics. Unfortunately, the requirement to find, and classify a counterpart within the large GW localization regions before followup with sensitive instruments can begin, excludes access to these first few hours, even for the most well localized GW sources. The ability to rapidly localize a GW source to within the field-of-view of a narrow field sensitive facility, would enable extraordinary science, and is uniquely enabled by GRB imagers with arcminute localization, like Swift/BAT. Such a prompt localization is the best case scenario. I will present the Swift/BAT-GUANO rapid spacecraft commanding and targeted sub-threshold GRB search pipeline, which allows significantly deeper searches for faint GRB 170817-like bursts, achieving the farthest detection range for such transients among current instruments. This pipeline has already increased the rate of arcmin localized GRBs by >15%. GW/GRB searches in the joint sub-threshold regime can also significantly extend the BNS detection horizon, and I will discuss methods and results from a joint search during LVC O3. The angular resolution of BAT allows good spatial discrimination and push to higher temporal FARs with the small spatial overlap, further increasing the sensitivity of joint searches. However, Swift/BAT's field of view (1/6 sky) decreases the expected detection yield compared to all-sky instruments, even with the increased horizon. I will discuss biased scheduling techniques that can increase the joint GRB/GW detection rate, and efforts to use GUANO-enabled rapid commanding capabilities to respond to early warning GW alerts and put the GW location within the BAT FoV at merger time. The combination of all of these will increase the chance of a best case scenario, and set the stage for next generation space telescope response.

Primary author: TOHUVAVOHU, Aaron (University of Toronto)

Presenter: TOHUVAVOHU, Aaron (University of Toronto)

Session Classification: Electromagnetic Counterparts of Compact Binary Mergers

Track Classification: Fast Transients: Electromagnetic counterparts of compact binary mergers