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Optimizing low latency LIGO-Virgo localization HSIN-YU CHEN, DANIEL HOLZ, University of Chicago — Fast and effective localization of gravitational wave (GW) events could play a crucial role in identifying possible electromagnetic counterparts, and thereby help usher in an era of GW multi-messenger astronomy. We discuss an algorithm for accurate and very low latency ($\ll 1$ second) localization of GW sources using only the time of arrival and signal-to-noise ratio at each detector. The algorithm is independent of distances, masses, and waveform templates of the sources to leading order, and applies to all discrete sources detected by ground-based detector networks. For the two detector configuration (LIGO Hanford+Livingston) expected in late 2015 we find a median 50% localization of 150 deg^2 for binary neutron stars (for SNR threshold of 12), consistent with previous findings. We explore the improvement in localization resulting from high SNR events, finding that the loudest out of the first four events reduces the median sky localization area by a factor of 1.8. We also discuss some strategies to optimize electromagnetic follow-up of GW events. We specifically explore the case of multi-messenger joint detections coming from independent (and possibly highly uncertain) localizations, such as for short gamma-ray bursts observed by Fermi GBM and neutrinos captured by IceCube.

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