



General Relativity and Quantum Cosmology

Prospects for early localization of gravitational-wave signals from compact binary coalescences with advanced detectors

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A leading candidate source of detectable gravitational waves is the inspiral and merger of pairs of stellar-mass compact objects. The advanced LIGO and advanced Virgo detectors will allow scientists to detect inspiral signals from more massive systems and at earlier times in the detector band, than with first generation detectors. The signal from a coalescence of two neutron stars is expected to stay in the sensitive band of advanced detectors for several minutes, thus allowing detection before the final coalescence of the system. In this work, the prospects of detecting inspiral signals prior to coalescence, and the possibility to derive a suitable sky area for source locations are investigated. As a large fraction of the signal is accumulated in the last ~10 seconds prior to coalescence, bandwidth and timing accuracy are largely accrued in the very last moments prior to coalescence. We use Monte Carlo techniques to estimate the accuracy of sky localization through networks of ground-based interferometers such as aLIGO and aVirgo. With the addition of the Japanese KAGRA detector, it is shown that the detection and triangulation before coalescence may be feasible.

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