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## A fast and flexible method to detect higher order modes in the inspiral phase of compact binary coalescences.

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As the gravitational-wave interferometers increase their sensitivity, they detect an ever larger number of compact binary coalescences: a small but significant fraction of which contains detectable higher multipoles in addition to the dominant  $(2, 2)$  mode. Such higher multipoles can be identified with a minimally-modeled extension of the coherent WaveBurst (cWB) burst pipeline.

During the inspiral phase, the higher multipoles produce chirps whose instantaneous frequency is roughly a multiple of the dominant  $(2, 2)$  mode: we use the cWB burst pipeline to perform a search for such spectral features within suitable regions of the time-frequency domain. This novel method has already been used in the GW190814 discovery paper (Astrophys. J. Lett. 896 L44) and it is very fast and flexible. Here we describe in full detail the procedure to detect the  $(3, 3)$  multipole in GW190814 within the cWB framework, as well as additional searches for other subdominant modes. We also apply this method on another event that displays possible higher multipoles, GW190412.

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