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An unmodeled search for echoes: probing the post-merger phase of a binary black hole coalescence

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The current catalog of gravitational waves (GWs) from binary black hole (BBH) mergers allows to conduct refined tests to probe the validity of the general relativity (GR) theory against alternative predictions. It has been proposed that black holes (BHs) may have exotic characteristics making them different from GR BH, such as exotic compact objects (ECOs): they would produce repeated GW pulses of widely uncertain morphology (echoes) in the post-merger phase whose detection would also help to infer fundamental properties of the matter itself because strictly related with the nature of such ECOs.
I will present a method for searching echoes and inferring their fundamental observables if any, which is agnostic to the properties of these GW pulses. The methodology is implemented on a dedicated version of coherent WaveBurst (cWB), an unmodelled GW transient search algorithm, developed in the LIGO Scientific Collaboration (LSC) and Virgo Collaboration, widely used on LIGO-Virgo-KAGRA data.
We will discuss the results of the search, performed on LIGO-Virgo open data (O1, O2, and O3), and provide upper limits in terms of the detectable energy of echo-like signals, in an attempt to constrain the parameters space of ECOs models.

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