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Impact of gravitational waves memory on observations

Friday 25 August 2023 08:50 (20 minutes)

Non-linear memory is one of the most intriguing predictions of general relativity which is generated by the passage of gravitational waves leaving the spacetime permanently deformed. A GW signal from for example binary black hole can be thought of having two parts the oscillatory part which is known as the "chirp" and a much fainter non-oscillatory (DC like) part which is the non-linear memory. A non-linear memory is produced by all the sources of GWs and has the peculiarity that even if the oscillatory part of the source lies at high frequency the non-linear memory will be available at low frequency. This property of non-linear memory is what we focus on exploiting here.
There are several cases where we can use memory as a resource for the current and future ground based detectors. To do this I will show examples of how one can use the non-linear memory to probe seemingly inaccessible sources of GWs like ultra low mass compact binary mergers where the oscillatory part lies at outside the reach of any current detectors and only non-linear memory could be detected if these sources exist. Another example will be the matter effects from binary neutron stars and black hole neutron star binaries which are at high frequency but the non-linear memory is accessible. I will also discuss the post-merger neutron star memory and the prospects of its detection. Also I will briefly talk about the how memory can help in constraining binary black hole parameters.

Collaboration / Activity

LIGO Scientific Collaboration

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