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Testing gravity with binary black hole coalescences: results and prospects

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Gravitational waves from the coalescence of compact binary systems carry a wealth of information about the merging objects, the remnant object as well as their interaction with space-time. During the coalescence of extremely compact objects such as binary black holes, the typical curvature and velocity at play are such that, from the observation of the gravitational wave signal, we can access the most extreme dynamical regimes of gravity.

These are ideal conditions for testing our understanding of gravity by looking for potential departures between the solutions of general relativity and the dynamics of space-time. The LIGO observations GW150914 and GW151226 provided wonderful testing grounds for general relativity in the, up to now inaccessible, strong-field dynamical regime of gravity. In this presentation I will review and discuss several of the tests that have been devised to detect violations of the predictions of general relativity from the observation of gravitational waves from coalescing binary systems. The discussion will be centred on the results of the analysis of GW150914 and GW151226. Finally, I will conclude by discussing some of the future prospects of extending the current state-of-the-art methodologies to further aspects of general relativity.

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