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Measuring luminosity distance and redshift using only gravitational wave observations of binary neutron star coalescences JOCELYN READ, University of Mississippi, CHRIS MESSENGER, Cardiff University — Detection of gravitational waves from the inspiral phase of binary neutron star coalescence will allow us to measure the effects of the tidal coupling in such systems. Tidal effects provide contributions to the gravitational wave signal that break a degeneracy between the system's mass parameters and redshift and thereby allow the simultaneous measurement of both the effective distance and the redshift for individual sources. These effects will be measurable using 3rd generation gravitational wave detectors, e.g. the Einstein Telescope, which will be capable of detecting inspiralling binary neutron star systems out to redshift z=4. The Einstein Telescope is predicted to measure a population of O(10^3-10^7) binary neutron star systems, allowing the luminosity distance–redshift relation to be probed independently of the cosmological distance ladder and independently of electromagnetic observations. We will discuss current work on cosmological constraints from these effects.

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