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Assessing confidence in numerical relativity waveforms of binary neutron star mergers ROLAND HAAS, SHAWN ROSOFSKY, Univ of Illinois - Urbana, SEBASTIANO BERNUZZI, Parma University, TIM DIETRICH, Max Planck institute for Gravitational Physics, BRUNO GIACOMAZZO, University of Trento, RICCARDO CIOLFI, National Institute for Astrophys. INAF-OAPd, Padova, DANIEL JOHNSON, Parma University, ELIU HUERTA, Univ of Illinois - Urbana, LIGO COLLABORATION — The first multi-messenger detection in gravitational waves and the electromagnetic spectrum of a binary neutron star merger GW170817 underlined the need for numerical relativity simulations of the neutron star merger to reliably predict waveforms and to inform astrophysical models of the event that predict the long term electromagnetic signals observed from such an event. Here we present a progress report on work aimed at comparing waveform predictions obtained by different numerical relativity codes to assess whether the codes agree within their stated error bars. To this end we simulate in typical binary neutron star merger using two neutron star equations of state (SLy and MS1b) that bracket the range of realistic equations of state expected in neutron stars. Using multiple independent codes, and involving scientists at different institutions, we independently compute error bars for each code and verify whether the predicted gravitational waveform signal agrees between the different simulations for simulations using realistic computational resources. Only after a reliable error bound on the numerical relativity simulations has been established can their waveform templates be used to construct semi-analytic waveform templates for LIGO data analysis.

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