Eccentric Binary Neutron Stars In Numerical Relativity

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This talk summarizes the recent efforts of the BAM collaboration in pursuing the goal of simulating generic binary neutron star mergers. In particular, I will highlight the recent progress from new simulations of eccentric systems in full general relativity which, for the first time, are based on consistent initial data setting new quality-standard for these simulations. We extract from the simulated waveforms the frequency of the f-mode oscillations induced during close encounters before the merger of the two stars. We find the extracted frequency to be in good agreement with f- mode oscillations of individual stars, which allows an independent measure of the supranuclear equation of state not accessible for binaries on quasi-circular orbits. Furthermore, the energy stored in these f-mode oscillations can be as large as 10^{-3} $M_\odot \sim 10^{51}$ erg (energy released in a supernova), even with a soft EOS. While in general (eccentric) neutron star mergers produce bright EM counterparts, we find that for the considered cases the luminosity decreases when the eccentricity becomes too large, due to a decrease in the ejecta mass.