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Three-Hair Relations, Orbital Motion and Gravitational Waves from Neutron Star Binaries¹

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Neutron stars are one of the most relativistic objects in the Universe. The gravitational waves they emit when two of them spiral into each other and merge are one of the primary targets of ground-based gravitational wave observatories, such as LIGO and Virgo. In this talk, I will describe a new set of three-hair relations (analogous to the no-hair relations of black holes) that prescribe all multipole moments of the external gravitational field of neutron stars in terms of only the mass, the spin angular momentum and the quadrupole moment. I will then describe how these relations allow us to construct more accurate gravitational waveform for neutron star inspirals. Such waveforms may allow us to better measure certain combinations of the neutron star's individual spins, as well as the tidal Love number, from which one may be able to infer the neutron star equation of state.

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