GR 17: Gravitational Waves II

Time: Thursday 15:45–16:45 Location: HBR 14: HS 2

GR 17.1 Thu 15:45 HBR 14: HS 2

Gravitational waves from black-hole–neutron star coalescences — •Alejandra Renee Pillado Gonzalez — Friedrich-Schiller-University of Jena, Jena, Germany

In this talk, a brief overview on gravitational waveform templates for black-hole–neutron star mergers is given. I review an effective-one-body model designed for these waveforms, and present preliminary numerical relativity studies to produce accurate templates. The latter can potentially be used to study the dynamics of these binary mergers, among other applications.

GR 17.2 Thu 16:05 HBR 14: HS 2

Correlating Black Hole Recoils with Mode Asymmetries in Gravitational-Wave Radiation — •Jannik Mielke — Max-Planck-Institut für Gravitationsphysik (Albert-Einstein-Institut), Callinstraße 38, 30167 Hannover, Deutschland

Detections of gravitational waves from astrophysical sources such as binary black holes by LIGO and Virgo has attracted widespread attention from the scientific community, the media and the general public. Among these sources, precessing systems with a misalignment of the black hole spin and the orbital angular momentum are of particular interest because of the rich dynamics they offer. For aligned-spin systems, the energy and momentum emitted above the orbital plane is symmetric to the emission below the plane. For mis-aligned systems, however, this is not the case and amplitude and phase modulations will appear in the waveform itself. When the signal is decomposed into modes of spin-weighted spherical harmonics, we can discuss the asymmetry between the negative and positive m-modes by defining an anti-symmetric waveform, which is neglected in most waveform models used in gravitational wave data analysis to date. In this talk, we analyse the phenomenology of the anti-symmetric waveform and relate it to the physics of remnant black hole recoil, which is a consequence of asymmetric linear momentum radiation. Strong correlations were found between the intrinsic system parameters and the amplitude and phase of the anti-symmetric waveform, which in turn affects the magnitude of the out-of-plane recoil velocity.

GR 17.3 Thu 16:25 HBR 14: HS 2

Gravitational scattering with Spinning Generalized Wilson Line operators — Domenico Bonocore[1], Anna Kulesza[2], and •Johannes Pirsch[2] — [1]Theoretische Elementarteilchenphysik, TUM, München, Germany — [2]Institut für Theoretische Physik, WWU Münster, Münster, Germany

Due to the close connection between the classical limit and Regge limit of scattering amplitudes, Wilson Line operators are efficient building blocks of gravitational scattering amplitudes in the classical limit. At higher orders in the Post-Minkowskian expansion subleading corrections to the Wilson- Line operators become relevant and can be computed systematically from a first quantized point particle worldline model.

In this talk I will present the main ideas behind this approach and focus particularly on the implementation of spin in the worldline model. It is well known from the worldline approach to QFT and resummation techniques in QCD that spinning particles can be described by supersymmetric worldline actions, where the spinning degrees of freedom are described by Grassmann valued fields. The resulting path integral expression exhibits a clear separation between classical and quantum contributions to the scattering amplitude. This allows for the efficient calculation of classical observables for scattering of spinning compact astrophysical objects.