

Tidal effects in the gravitational-wave phase of compact binaries

jeudi 15 octobre 2020 15:00 (15 minutes)

We compute the gravitational-wave (GW) energy flux up to the next-to-next-to-leading (NNL) order of tidal effects in a spinless compact binary system on quasi-circular orbits. Starting from an effective matter action, we obtain the stress-energy tensor of the system, which we use in a GW generation formalism based on multipolar-post-Minkowskian (MPM) and post-Newtonian (PN) approximations. The tidal contributions to the multipole moments of the system are first obtained, from which we deduce the instantaneous GW energy flux to NNL order (formally 7PN order). We also include the remaining tidal contributions of GW tails to the leading (formally 6.5PN) and NL (7.5PN) orders. Combining it with our previous work on the conservative equations of motion (EoM) and associated energy, we get the GW phase and frequency evolution through the flux-balance equation to the same NNL order. These results extend and complete several preceding results in the literature.

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Classification de Session: Groupe de travail: Formes d'onde