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Astrophysical gravitational waves in conformal gravity models

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We investigate the gravitational radiation from binary systems in conformal gravity (CG) and conformal Einstein-Weyl gravity (CEWG). CG might explain observed galaxy rotation curves without dark matter, and both models are of interest in the context of quantum gravity. Gravitational radiation emitted by compact binaries allows us to strongly constrain both models.

We derive the linearized fourth-order equation of motion for the metric, which describes massless and massive modes of propagation and we show that the gravitational radiation is due to the time-dependent quadrupole moment of a nonrelativistic source. Further, we derive the gravitational energy-momentum tensor for both models and apply our findings to the case of close binaries on circular orbits.

Our results are that in CG one cannot explain the orbital decay of binary systems via gravitational radiation, and replace dark matter simultaneously. In CEWG with small masses of the graviton, again one cannot reproduce the orbit of binaries by the emission of gravitational waves. On the other hand, for large graviton masses, the orbital period of compact binaries is in agreement with the data, as CEWG reduces to GR in this limit.

Summary

Primary author: HÖLSCHER, Patric

Co-authors: SCHWARZ, Dominik J. (Bielefeld University); CAPRINI, Chiara (Laboratoire APC (Paris))

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