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Gravitational-wave signatures of gravito-electromagnetic couplings

Gravitational waves (GWs) can undoubtedly serve as a messenger from the early Universe and a novel probe of the underlying gravity theory. In this talk, motivated by one-loop vacuum-polarization effects on curved spacetime, we investigate a gravitational theory with non-minimal curvature-electromagnetic coupling terms of the form $\xi\frac{R}{M_p^2}F_{\mu\nu}F^{\mu\nu}$, where M_p is the reduced Planck mass, R is the scalar curvature and $F_{\mu\nu}$ the Faraday tensor, which can be responsible for the generation of primordial electromagnetic fields. We study then the GW phenomenology of such coupling terms by deriving for the first time to the best of our knowledge the modified tensor modes equation of motion. Notably, we find a universal infrared (IR) frequency scaling f^5 of the electromagnetically induced GW (EMIGW) signal, which, depending on the energy scale of inflation, the duration of inflation and reheating as well as the dynamical behavior of the coupling function ξ, can be well within the detection sensitivity bands of GW experiments such as SKA, LISA, ET and BBO, thus being potentially detectable in the future by GW observatories.

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