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Quantum gravity and the equivalence principle theory

We consider the scattering of lightlike matter in the presence of a heavy scalar object (such as the Sun or a Schwarzschild black hole). By treating general relativity as an effective field theory we directly compute the nonanalytic components of the one-loop gravitational amplitude for the scattering of massless scalars or photons from an external massive scalar field. These results allow a semiclassical computation of the bending angle for light rays grazing the Sun, including long-range quantum gravity contributions. We discuss implications of this computation, in particular the violation of some classical formulations of the equivalence principle.