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Gravitational waves from compact binaries in an effective field theory approach

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I review developments and progress using the effective field theory (EFT) approach for modeling compact binary sources of gravitational waves for observations with LIGO. EFT is a powerful paradigm that naturally incorporates the effects from tidal deformation, spin angular momentum, and others that are associated with extended bodies like black holes and neutron stars. In addition, EFT provides a systematic "turn-the-crank" approach for well-organized perturbative calculations based on Feynman diagrams. I review results and progress in modeling astrophysical gravitational wave sources with EFT, including recent work on gravitational radiation reaction and on tail effects from gravitational wave back-scattering among others. I briefly outline how to build an EFT and use Feynman diagrams for practical calculations. In addition, I discuss a crucial development for applying EFT to compact binary inspirals, which leverages work that naturally generalizes Lagrangian and Hamiltonian mechanics to generic systems having nonconservative processes.