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Gravitational observables from quantum scattering amplitudes

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Since the first detection of gravitational waves, the need for precise prediction of waveform templates has pushed to develop modern approaches to compute gravitational observables. One of the most promising programs is based on treating gravity as an effective field theory and extracting classical observables from quantum scattering amplitudes. The systematic approach lies on the eikonal expansion, in which the perturbative series in the Newton constant is organized in loop amplitudes computations. While most of the efforts are focused on on-shell scattering amplitudes, seems that exploiting the Kerr-Schild gauge in an off-shell approach can lead to new theoretical insights for a better understanding of gravity, as well as phenomenological applications, as the computation of the scattering angle of an external charged probe off a Kerr-Newman black hole at every order in the angular momentum.

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