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Applying the effective-source approach to frequency-domain self-force calculations for eccentric orbits

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Extreme mass-ratio inspirals (EMRIs) are expected to have considerable eccentricity when emitting gravitational waves (GWs) in the LISA band. Developing GW templates that remain phase accurate over these long inspirals requires the use of second-order self-force theory. Practical second-order self-force calculations are now emerging for quasi-circular EMRIs. These calculations rely on effective-source regularization techniques in the frequency domain that presently are specialized to circular orbits. In this talk we make a first step towards more generic second-order calculations by extending the frequency domain effective-source approach to eccentric orbits. We use a new method of extended effective-sources to overcome the slow convergence of the Fourier sum. We develop our computational technique within the context of a toy scalar-field problem which is conceptually similar to the gravitational case.

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