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Estimating the computational efficiency of frequency– and time–domain calculations of gravitational waveforms from EMRIs[1] JONATHAN L. BARTON, DAVID J. LAZAR, University of Alabama in Huntsville, GAURAV KHANNA, University of Massachusetts Dartmouth, DANIEL J. KENNEFICK, University of Arkansas, LIOR M. BURKO, University of Alabama in Huntsville —
We estimate the computation time for the frequency-domain (FD) calculation of gravitational-wave fluxes and waveforms for EMRIs modeling a compact object in an equatorial orbit around a super-massive black hole. We determine the number of k modes (associated with harmonics of the orbital radial frequencies) necessary to achieve a desired accuracy for each m mode (associated with harmonics of the azimuthal frequencies) for orbits of varying eccentricity. We then model the time required to compute single k modes and then find the computation time to sum over all the k modes for a given accuracy level. Next, we compute the energy flux and the waveform in the time domain (TD), and estimate the computation time required to achieve the same accuracy level for the same orbital parameters, and estimate the parts of the parameter space for which the TD approach becomes computationally more efficient than the FD method. We plan to extend this study also to non-equatorial and finally generic Kerr orbits.

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