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## Worldtube excision method for intermediate-mass-ratio inspirals: scalar-field toy model in 3+1D

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Binary black hole simulations become increasingly computationally expensive with smaller mass ratios because the Courant-Friedrich-Lewy condition imposes smaller time steps by the need to resolve the small black hole. Here we propose and explore a method for alleviating the scale disparity in simulations with mass ratios in the intermediate astrophysical range, where purely perturbative methods may not be adequate. A region much larger than the smaller black hole is excised from the numerical domain, and replaced with an analytical model approximating a tidally deformed black hole. We apply this idea to a toy model of a scalar charge in a circular geodesic orbit around a Schwarzschild black hole, solving for the massless Klein-Gordon field in a 3+1D framework using SpECTRE, the new discontinuous Galerkin code of the SXS collaboration.

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