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Comparing initial data for rapidly rotating, merging black holes
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— Detecting gravitational waves (ripples of curved spacetime) requires accurate predictions of the expected waveforms. Only numerical simulations can predict the waveforms near the time of merger, because then all analytical approximations fail. These numerical simulations must begin with initial data that satisfy the Einstein constraint equations while yielding a pair of merging black holes of the desired physical configuration. Different methods of constructing initial data yield physically different systems, which lead to different initial bursts of spurious "junk" gravitational radiation as the system relaxes to equilibrium. By extending work by [1] to the case of rapidly spinning black holes, I am using the Spectral Einstein Code (SpEC) to test whether such physically different initial data are nevertheless astrophysically equivalent (i.e., whether the waveforms agree after the initial relaxation). Specifically, extending the work of [2], I am using two different initial data methods to simulate merging black holes with equal masses and equal spins aligned with the orbital angular momentum of the system.

[1] arXiv:1206.2943
[2] arXiv:0805.4192

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