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Systematic Errors and Energy Estimates in Binary Black Hole Ringdown[1] VISHAL BAIBHAV, EMANUELE BERTI, University of Mississippi, VITOR CARDOSO, Instituto Superior Tcnico, GAURAV KHANNA, University of Massachusetts Dartmouth — High signal-to-noise ratio gravitational wave observations will enable us to measure the quasinormal frequencies of binary black hole merger remnants. In general relativity, these frequencies depend only on the remnants mass and spin, so they can be used to test general relativity and the Kerr nature of the remnant. To carry out these tests, systematic errors must be subdominant with respect to statistical errors. We determined how accurately ringdown frequencies can be extracted from state-of-the-art numerical simulations from the Simulating eXtreme Spacetimes (SXS) catalog. We found that at least the first overtone must be included to determine quasinormal frequencies (or the remnants spin and mass) within percent accuracy. We also quantified the relative excitation of different quasinormal modes. To address this question one must define a suitable "starting time, e.g. by maximizing the energy content parallel" to a quasinormal mode (as suggested by Nollert). We used Nollert's method to quantify the energy radiated in quasinormal modes for aligned-spin binaries, and we produced post-Newtonian inspired fits of the resulting energy estimates.

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