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Optimizing spinning time-domain gravitational waveforms for Advanced LIGO data analysis ZACHARIAH ETIENNE, CALEB DEVINE, SEAN MCWILLIAMS, West Virginia University — The Spinning Effective One Body—Numerical Relativity (SEOBNR) series of gravitational wave approximants are among the best available for Advanced LIGO data analysis. Unfortunately, SEOBNR codes as they currently exist within LALSuite are generally too slow to be directly useful for standard Markov-Chain Monte Carlo-based parameter estimation (PE). Reduced-Order Models (ROMs) of SEOBNR have been developed for this purpose, but there is no known way to make ROMs of the full eight-dimensional parameter space more efficient for PE than the SEOBNR codes directly. So as a proof of principle, we have sped up the original LALSuite SEOBNRv2 approximant code, which models waveforms from aligned-spin systems, by about 280x. Our optimized code shortens the timescale for conducting PE with this approximant to months, assuming a purely serial analysis, so that even modest parallelization combined with our optimized code will make running the full PE pipeline with SEOBNR codes directly a realistic possibility. A number of our SEOBNRv2 optimizations have already been applied to SEOBNRv3, a new approximant capable of modeling sources with all eight intrinsic degrees of freedom. We anticipate that once all of our optimizations have been applied to SEOBNRv3, a similar speed-up will be achieved.

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