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Testing Parameterized Theories of General Relativity using Gravitational Waves[1] RADHA MASTANDREA, Massachusetts Inst of Tech-MIT, ALAN WEINSTEIN, Caltech, LIGO SCIENTIFIC COLLABORATION COLLABORATION — The recent detections of gravitational waves (GWs) by the Laser Interferometer Gravitational-Wave Observatory (LIGO) have provided researchers with the first opportunities to test general relativity (GR) in the strong-field and highly-dynamical limit. Qualitative tests of the agreement between LIGO's GW observations and classical GR have already been done; we have carried out more quantitative tests in terms of controlled, parameterized deviations from GR. In this project, we simulate a number of binary black hole (BBH) merger waveforms with known amplitude and phase deviations from those predicted by GR that are governed by the real and imaginary parts, respectively, of a complex parameter λ. We use Bayesian analysis to recover the deviation. We then provide an estimate of the number of GW detections from BBH mergers that are necessary to establish a given deviation from classical GR, notably finding that under 80 events are necessary to determine λ to a precision of 0.025 (a fractional precision of 5% for $\lambda = 0.5$).

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