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Gravitational waveforms for compact binaries in Einstein-Aether theory

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We use the post-Minkowskian approach to analyze the Einstein-Aether(AE)/Khronometric theories of gravity. These theories add to the spacetime metric a long-range “aether” vector field, constrained to have unit norm. We constrain one of the four free parameters of the theory to guarantee that light and tensor gravitational waves propagate at the same speed, as seen in the multimessenger event GW170817. We study the PN expansion of Einstein-Aether gravity using direct integration of the relaxed Einstein equations and we employ the usual “Eardley” convention for treating non-spinning compact objects whose masses are sensitive to the vector field. We have found a field redefinition that converts the field equations into decoupled, flat-spacetime wave equations for the components of the perturbations of the metric and aether field, with right-hand sides that contain matter terms and field terms that are quadratic and higher order in the small perturbations, precisely paralleling the “relaxed Einstein equations”of general relativity. We report on progress toward obtaining the near-zone metric and the equations of motion for compact binaries to 2.5 PN order. The ultimate goal is to develop gravitational waveforms to 1.5PN order, including the effects of dipole gravitational radiation

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