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Shaken, not stirred: test particles in binary black hole mergers

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In 2015 the advanced Laser Interferometer Gravitational-Wave Observatory (aLIGO) detected the first ever gravitational event, gravitational wave event GW150914, with multiple new gravitational wave events, originating from both binary neutron stars and binary black hole (BBH) mergers, detected in subsequent years. In light of these detections, we simulate the dynamics of ambient test particles in the gravitational potential well of a BBH system close to its inspiral phase. The goal of simulating the associated electromagnetic radiation and resulting spectral energy density distribution of such a BBH system, as this could shed light on possible detection ranges of electromagnetic counterparts to BBH mergers. The potentials are numerically calculated using finite difference methods, under the assumption of non-rotating black holes with the post-Newtonian Paczynski-Wiita potential approximation in tandem with retarded time concepts analogous to electrodynamics. We find that the frequencies of potential electromagnetic radiation produced by these systems (possibly reaching earth), range between a few kHz to a few 100kHz. The bulk of radiation is distributed at frequencies below 100kHz.

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