Gravitational wave in Einstein-Maxwell-dilaton gravity

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Abstract: LIGO first detection of the binary black hole coalescence GW150914 opened the new window that offering physicists precedented opportunities to explore and test the extended theories of gravity other than the standard general relativity. In this work, we consider the effect of black hole charges on the final black hole spin resulting from the merger, and the corresponding ringdown phase characterized by quasinormal modes. We perform the first-principle type analysis using two techniques, the so-called BKL recipe to estimate the final spin, and the photon-ring approach to estimate the ringdown quasinormal frequencies. Both two techniques utilize test particle motion for final spins and quasinormal frequencies estimations, and are known to provide well approximations in practice for conventional non-charged binary mergers. We further extend these two techniques to the case of charged binary systems, and extract phenomenological behaviors of our interest quantities after mergers. We restrict our analysis to binary coalescences in Einstein-Maxwell-dilaton theory, and make comparisons with relevant settings in the standard Einstein-Maxwell theory.

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