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## Gravitational-wave polarizations in generic higher-curvature gravity

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We study the polarizations of gravitational waves (GWs) in generic higher-curvature gravity (HCG) whose Lagrangian is an arbitrary polynomial of the Riemann tensor. On a flat background, the linear dynamical degrees of freedom in this theory are identified as massless spin-2, massive spin-2, and massive spin-0 fields. Employing a fully gauge-invariant formalism, we demonstrate that (i) the massless spin-2 is the ordinary graviton with 2 tensor-type (helicity-2) polarizations, (ii) the massive spin-2 breaks down into 2 tensor-type (helicity-2), 2 vector-type (helicity-1) and 1 scalar-type (helicity-0) polarizations, and (iii) the massive spin-0 provides 1 scalar-type (helicity-0) polarization. Therefore, GWs in generic HCG exhibit 6 massive polarizations on top of the ordinary 2 massless ones. In particular, we find convenient representations of the scalar-polarization modes connected directly to the theory parameters of HCG. They are utilized to discuss methods to determine the theory parameters by GW-polarization observations.

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