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Polarization Modes of Gravitational Waves

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We establish a unified parameterized framework for analyzing the polarization modes of gravitational waves in some general gravitational theories that satisfy the following conditions: (1) Spacetime is four-dimensional; (2) The theories satisfy the principle of least action; (3) The theories are generally covariant; (4) The action describing a free particle is $\int ds$. We find that the polarization modes of gravitational waves depend on the parameter space in the framework, and a theory may allow for up to all six polarization modes. We also find that the polarization modes of gravitational waves in some general theories have some interesting universal properties.

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