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Propagation of the gravitational waves in a cosmological background

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Based on the framework of spatially covariant gravity, we derive the general quadratic action for the gravitational waves in a cosmological background. Special attention is paid to the propagation speed of the gravitational waves. In particular, we identify a large class of spatially covariant gravity theories with parity violation, in which both the polarization modes propagate in the speed of light. Our results imply that there are more possibilities in the framework of spatially covariant gravity in light of the propagation speed of the gravitational waves.

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