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Detecting the stochastic gravitational wave background from massive gravity with pulsar timing arrays

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We explore the potential of pulsar timing arrays (PTAs) such as NANOGrav, EPTA, and PPTA to detect the stochastic gravitational wave background in theories of massive gravity. In general relativity, the function describing the dependence of the correlation between the arrival times of signals from two pulsars on the angle between them is known as the Hellings-Downs curve. We compute the analogous overlap reduction function for massive gravity, including the additional polarization states and the correction due to the mass of the graviton, and compare the result with the Hellings-Downs curve. The primary result is a complete analytical form for the analog Hellings-Downs curve, providing a starting point for future numerical studies aimed at a detailed comparison between PTA data and the predictions of massive gravity. We study both the massless limit and the stationary limit as checks on our calculation, and discuss how our formalism also allows us to study the impact of massive spin-2 dark matter candidates on data from PTAs.

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