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The Impact of String Thickness on GW Spectrum of Cosmic String Network

The stochastic gravitational wave background predicted by cosmic strings has attracted great attention due to its capability of explaining pulsar timing array observations. However, the vast majority of string network models concentrate on the currently observable frequency range, i.e., 10^{-9} Hz to 100 Hz. Few studies focus on the ultra-high-frequency band because of current observational limitations, even though this regime is closely related to elementary properties of string loops and must be theoretically constrained. In our recent work, we propose a series of assumptions and discuss the relationship among the breakdown of the Nambu-Goto approximation, the termination of GW emission and the resulting ultra-high-frequency GWs. Based on our primary assumptions, we analytically compute the GW spectrum using a modified BOS loop number density. In our analytical calculation, we discover characteristic frequencies of spectrum plateau breaking and harmonic-modes-independent cutoff in ultra-high-frequency range. Ultimately, we discuss the cuspy (kinky) limit of our assumptions and identify the limitations of current numerical simulation of string networks.

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