
Cosmic microwave background anisotropies generated by cosmic strings with small-scale structure

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Abstract

We study the impact of kinks on the cosmic microwave background (CMB) anisotropies generated by cosmic string networks. To do so, we extend the Unconnected Segment Model to describe the stress-energy tensor of a network of cosmic strings with kinks and implement this extension in CMBACT to compute the CMB anisotropies generated by these wiggly string networks. Our results show that the inclusion of kinks leads, in general, to an enhancement of the temperature and polarization angular power spectra, when compared to those generated by cosmic string networks without small-scale structure with the same energy density, on scales corresponding to the distance between kinks. This enhancement, that is more prominent in the case of the temperature anisotropies, is essentially caused by a significant increase of the vector-mode anisotropies, since kinks, due to their shape, generate vortical motions of matter - a phenomenon that is not taken into account when resorting to an effective description of wiggly cosmic strings. These results, although derived using a simplified string configuration in which the interkink distance and their sharpness remain fixed, seem to indicate that the explicit inclusion of kinks may be essential to perform more accurate predictions of the CMB anisotropies generated by cosmic strings on small scales.

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