

Magnetic field amplification and decay in cosmic string wakes

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We do a detailed study on vortex formation in a magnetized plasma within the spacetime of a moving cosmic string using analytical and numerical methods. The conical spacetime around the cosmic string causes the frozen-in magnetic field to deform due to the fluid flow. We find that the overdensity in the wake region amplifies the magnetic field. This amplification depends on the direction and the lengthscale of the magnetic perturbations. Alfven's theorem of flux conservation explains this result. However, our study also shows that the magnetic field can decay depending on the perturbation lengthscale, due to the breakdown of Alfven's theorem at a certain lengthscale. This lengthscale is the gyroradius of the charged particles in the plasma. Our findings are significant for understanding magnetic reconnection in cosmic string wakes.

Track type

Cosmology

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