

## Cosmic Magnetism in Voids and Filaments



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# Cosmological-scale magnetic fields from galactic outflows and search for primordial magnetic field

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Primordial magnetic field, when it confidently discovered, would play as important role in cosmology as CMB or Large Scale Structure. However, its observation can be affected by the presence of the large-scale magnetic field of galactic origin, magnetic bubbles. In the series of works, we study the effects of galaxy formation physics on the magnetization of the intergalactic medium (IGM) using the IllustrisTNG simulations. We demonstrate that large-scale regions affected by the outflows from galaxies and clusters contain magnetic fields that are several orders of magnitude stronger than in unaffected regions with the same electron density. Moreover, like magnetic fields amplified inside galaxies, these magnetic fields do not depend on the primordial seed, i.e. the adopted initial conditions for magnetic field strength. We discuss the effects of these strong magnetic fields on ultra-high energy cosmic rays, gamma rays, and Faraday Rotation Measure. We show that using different observables one should be able to disentangle the effects of magnetic bubbles from the primordial magnetic field and discuss a strategy for future observations.

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