

Magnetohydrodynamics with broken spatial parity: Two-loop calculation and RG analysis

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We investigate the stochastic version of a paradigmatic model of magnetohydrodynamic turbulence. This model can be interpreted as an active vector admixture subject to advective processes governed by turbulent flow, with explicit consideration of the back influence on fluid dynamics. The velocity field is generated through a fully developed turbulent flow that accounts for the violation of spatial parity, introduced via the helicity parameter ρ . We consider a generalized setup introducing parameter A into the model formulation, which is associated with the interaction part of the model and whose value represents different physical systems. The model is analyzed using the field-theoretic renormalization group. Calculations are performed using ε -expansion, where ε is the deviation from the Kolmogorov scaling. We present two-loop numerical calculations of the renormalization constant associated with the magnetic field renormalization. Deviation from Kolmogorov scaling laws is discussed.

References

- [1] Hnatič M, Lučivjanský T, Mižišin L, Molotkov Y, Ovsiannikov A. Renormalization Analysis of Magnetohydrodynamics: Two-Loop Approximation. *Universe*. 2024; 10(6):240. <https://doi.org/10.3390/universe10060240>