Turbulent Dynamo as Spontaneous Symmetry Breaking: α-Effect

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We investigate developed turbulence in stochastic magnetohydrodynamics (MHD) in the absence of mirror symmetry. In our study, the model is formulated as a certain statistical field theory, within which a general scenario of generation and renormalization of a homogeneous magnetic field arising in the turbulent regime (the turbulent dynamo) is formulated. This scenario is associated with the instability of the initial turbulent system and consists of its stabilization through the generation of an average homogeneous magnetic field B_0 via the mechanism of (dynamic) breaking of rotational symmetry. For the model in this regime, the turbulent electromotive force (EMF) is proportional to B_0 (the so-called α-effect), and the corresponding proportionality coefficient α is calculated in the one-loop approximation.

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