Hyperlogarithms in the theory of turbulence of infinite dimension

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Parametric integration with hyperlogarithms is a promising method for multiloop calculations [1], which was successfully applied in problems of high energy physics and critical statics [2]. In this work, we investigate its applicability to critical dynamics by studying the stochastic model of fully developed turbulence of infinite dimension within the framework of renormalizationg group and ε-expansion [3]. The adaptation of the hyperlogarithm method is carried out by choosing a proper renormalization scheme and introducing an effective dimension of the space. Consideration of the infinite dimension case leads to significant simplifications of the Feynman diagrams, making it possible to advance to the fourth order of the perturbation theory. Analytical calculation of the renormalization group functions is performed up to the four-loop approximation, which allows to obtain the ε-expansion of the critical exponent ω responsible for the infrared stability of the fixed point. Results obtained open possibilities for further multiloop investigations of dynamic models with the parametric hyperlogarithm approach.

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References

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