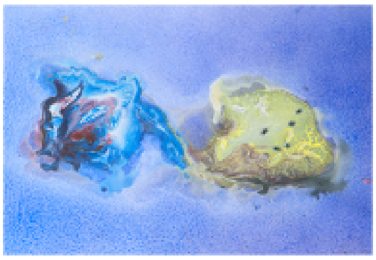

Contribution ID: **105** Type: **Poster**

Logarithmic violation of scaling in strongly anisotropic turbulent transfer of a passive vector field

Tuesday 9 September 2014 18:50 (1h 30m)

Inertial-range asymptotic behavior of a vector (e.g., magnetic) field, passively advected by a strongly anisotropic turbulent flow, is studied by means of the field theoretic renormalization group and the operator product expansion. The advecting velocity field is Gaussian, not correlated in time, with the pair correlation function of the form $\propto \delta(t-t')/k_{\perp}^{d-1+\xi}$, where $k_{\perp} = |\mathbf{k}\,|$ and $\mathbf{k}$ is the component of the wave vector, perpendicular to the distinguished direction ("direction of the flow") - the d-dimensional generalization of the ensemble introduced by Avellaneda and Majda [*Commun. Math. Phys.* **131**: 381 (1990)]. The stochastic advection-diffusion equation for the transverse (divergence-free) vector field includes, as special cases, the kinematic dynamo model for magnetohydrodynamic turbulence and the linearized Navier-Stokes equation. In contrast to the well known isotropic Kraichnan's model, where various correlation functions exhibit anomalous scaling behavior with infinite sets of anomalous exponents, here the dependence on the integral turbulence scale L has a logarithmic behavior: instead of power-like corrections to ordinary scaling, determined by naive (canonical) dimensions, the anomalies manifest themselves as polynomials of logarithms of L. The key point is that the matrices of scaling dimensions of the relevant families
of composite operators appear nilpotent and cannot be diagonalized. The detailed proof of this fact is given for correlation functions of arbitrary order.

Author: Mr ANTONOV, Nikolay (Saint-Petersburg State University)

Presenter: Mr ANTONOV, Nikolay (Saint-Petersburg State University)

Session Classification: Poster Session

Track Classification: Poster Session