

**Workshop on numerical approximations of PDEs.  
Honoring the 60th birthday of Frédéric Hecht.  
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*"The Kolmogorov Law of turbulence: what can rigorously be proved?"*

**Abstract**

We define a mathematical framework in which we can specify the Reynolds decomposition and the correlation tensors of an incompressible locally homogeneous and isotropic turbulent flow. After having fixed the technical background and some probabilistic tools, we focus on the 2-order correlation tensor, which is the covariance matrix of the velocity vectors at two different points of the flow. We perform a Taylor expansion of this matrix when the two points are close to one another. We characterize the principal part of this expansion, for which we prove the law of the 2/3 by a mathematical similarity principle.