



The Abdus Salam
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**Advanced Workshop on
"Anderson Localization, Nonlinearity and
Turbulence: A Cross-Fertilization"**

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TITLE:

“FREEZING TRANSITION IN DECAYING BURGERS TURBULENCE and RANDOM MATRIX DUALITIES”

(based on the joint work with Pierre Le Doussal and Alberto Rosso arXiv:1004.5025)

ABSTRACT:

We reveal a phase transition with decreasing viscosity in one-dimensional decaying Burgers turbulence with a power-law correlated random profile of Gaussian-distributed initial velocities $\langle v(x,0)v(x',0) \rangle \sim |x-x'|^{-2}$. The low-viscosity phase exhibits non-Gaussian one-point probability density of velocities, continuously dependent on viscosity, reflecting a spontaneous one step replica symmetry breaking (RSB) in the associated statistical mechanics problem. We obtain the low orders cumulants analytically. Our results, which are checked numerically, are based on combining insights in the mechanism of the freezing transition in random logarithmic potentials with an extension of duality relations discovered recently in Random Matrix Theory. They are essentially non mean-field in nature as also demonstrated by the shock size distribution computed numerically and different from the short range correlated Kida model, itself well described by a mean field one step RSB ansatz. We also provide some insights for the finite viscosity behaviour of velocities in the latter model.