II Joint Conference of the Belgian, Royal Spanish and Luxembourg Mathematical Societies
Logroño, June 6–8, 2016

Non-Universality of Nodal Length Distribution for Arithmetic Random Waves

Maurizia Rossi[1]

"Arithmetic random waves" are the Gaussian Laplace eigenfunctions on the two-dimensional torus. We are interested in the distribution of the length of their nodal lines. In [1] the authors prove that the asymptotics for the variance is non-universal. Their result is intimately related to the arithmetic of lattice points lying on a circle with radius corresponding to the energy.

In this talk we show that the nodal length converges to a non-universal (non-Gaussian) limiting distribution, depending on the angular distribution of lattice points lying on circles. Our argument has two main ingredients. An explicit derivation of the Wiener-Itô chaos expansion for the nodal length shows that it is dominated by its 4th order chaos component (in particular, somewhat surprisingly, the second order chaos component vanishes - this is closely related to the so-called "obscure" Berry's cancellation phenomenon). The rest of the argument relies on the precise analysis of the fourth order chaotic component.

This talk is based on [2], joint work with Domenico Marinucci (Università di Roma Tor Vergata), Giovanni Peccati (Université du Luxembourg) and Igor Wigman (King's College London).

References

[1] M. Krishnapur, P. Kurlberg, and I. Wigman, Nodal length fluctuations for arithmetic random waves, *Annals of Mathematics* **177** (2013), 699–737.

[2] D. Marinucci, G. Peccati, M. Rossi, and I. Wigman, Non-universality of nodal length distribution for arithmetic random waves, *Preprint, arXiv 1508.00353* (2015).

[1]Unité de Recherche en Mathématiques, Université du Luxembourg, 6, rue Coudenhove-Kalergi, L-1359 Luxembourg
maurizia.rossi@uni.lu