

# Nodal length fluctuations for arithmetic random waves

Manjunath Krishnapur, Pär Kurlberg and **Igor Wigman**

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Using the spectral multiplicities of the standard torus, we endow the Laplace eigenspaces with Gaussian probability measures. This induces a notion of random Gaussian Laplace eigenfunctions on the torus ("arithmetic random waves"). We study the distribution of the nodal length of random eigenfunctions for large eigenvalues, and our primary result is that the asymptotics for the variance is non-universal, and is intimately related to the arithmetic of lattice points lying on a circle with radius corresponding to the energy.