RANDOM WAVE MODELS ON HYPERBOLIC SPACE

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Berry's model is a Gaussian random field on Euclidean space describing the high-frequency behaviour of Laplacian eigenfunctions and it was originally introduced in the study of chaotic quantum billiards on flat domains [2, 1, 5]. Gaussian random waves, that is Gaussian random fields whose samples are Laplacian eigenfunctions, have also been the object of extensive research in other geometrical settings, such as on the sphere S^2 and on tori (arithmetic random waves). More generally, results concerning local behaviour of Gaussian random fields on compact manifolds have also been obtained. (Refer to the recent [3, 4, 5] for a broader overview).

After a brief outline of previous results, we will describe how it is possible to define an analogous Gaussian model on hyperbolic plane (and also in higher dimension), moving a step forward towards non-compact negatively curved surfaces, a classical geometric setting for chaotic dynamics. We will outline how high-frequency and large-domain limiting behaviours of random waves in this new setting mirror the ones on Euclidean space, notwithstanding the different underlying geometry. We will in particular discuss nonlinear functionals such as excursion areas and the length of nodal sets, their moments, their Wiener chaos expansions and CLTs they satisfy.

This is a joint work with Giovanni Peccati (Université du Luxembourg).

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