

Periodic random tiling models and non-Hermitian orthogonality

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Certain random tiling models show characteristic features that are similar to the eigenvalues of large random matrices. They can be recast as determinantal point process from which limiting laws as the Tracy-Widom distribution at the edge and the Gaussian free field in the bulk can be deduced.

I will discuss a new technique, developed in collaboration with Maurice Duits, to study tiling models with periodic weights. The technique relies on a formulation of a correlation kernel as a double contour integral containing non-Hermitian orthogonal polynomials. In the case of periodic weightings, the orthogonal polynomials are matrix valued.

We use the Riemann-Hilbert problem for matrix valued orthogonal polynomials to obtain asymptotics for the two-periodic Aztec diamond. This model is remarkable since it gives rise to a gaseous phase, in addition to the more familiar solid and liquid phases.