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Random point processes and tilings arising from Gaussian analytic functions

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Getting a grasp of what aperiodic order really entails is going to require collecting and understanding many diverse examples. Aperiodic crystals are at the top of the largely unknown iceberg beneath. Here we present a recently studied form of random point process in the (complex) plane which arises as the sets of zeros of a specific class of analytic functions given by power series with randomly chosen coefficients: Gaussian analytic functions (GAF). These point sets differ from Poisson processes by having a sort of built in repulsion between points, though the resulting sets almost surely fail both conditions of the Delone property. Remarkably the point sets that arise as the zeros of GAFs determine a random point process which is, in distribution, invariant under rotation and translation. In addition, there is a logarithmic potential function for which the zeros are the attractors, and the resulting basins of attraction produce tilings of the plane by tiles which are, almost surely, all of the same area. We discuss GAFs along with their tilings and diffraction, and as well note briefly their relationship to determinantal point processes, which are also of physical interest.

[1] *Baake, M., Koesters, H., Moody, R.V., Diffraction theory of point processes: systems with clumping and repulsion, preprint, 2014.*

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