On the Density of Sets Avoiding Parallelohedron Distance 1.

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In this joint work with C. Bachoc, T. Bellitto and A. Pêcher, we study the density of sets avoiding distance 1.

We consider the so-called unit distance graph G associated with a norm: the vertices of are the points of R^n, and the edges correspond with the pairs of point x and y such that the distance between x and y is 1.

The number m1 measures the supremum of the densities achieved by independent sets of G. The best known estimates for m1 in the Euclidean plane present relations with Euclidean lattices, in particular with the sphere packing problem.

We study this problem for norms whose unit ball is a convex polytope. More precisely, if the unit ball tiles R^n by translation, for instance if it is the Voronoi region of a lattice, then it is easy to see that m1 is at least 2^-n.

C. Bachoc and S. Robins conjectured that equality always holds. By solving discrete packing problems in lattices We show that this conjecture is true in dimension 2 and for some families of Voronoi regions of lattices in higher dimensions.