

QUESTION : For a circular cylinder of height t , $C = \mathbb{D}^2 \times t\mathbb{I}$, it is clear that this can achieve the circle packing density and this

$$\delta(C) \geq \pi/\sqrt{12}.$$

Show that this is an equality for all t or describe a denser packing. (Wilker, Kuperberg ...)

QUESTION : Tell me something about the packing density of objects like

$$\prod_i \lambda_i \mathbb{D}^i.$$

(Kusner ...)

QUESTION : Consider the translative packing density δ_T and the lattice packing density δ_L . Is it true that

$$\delta_T(K) \cdot \delta_T(K') = \delta_T(K \times K')?$$

What about

$$\delta_L(K) \cdot \delta_L(K') = \delta_T(K \times K')?$$

(Oberwolfach Problem book, Cohn, Kenyon ...)

QUESTION : Show that the Reinhardt hyperbolic smoothed octagon is the minimizer of the maximum density in the space of convex centrally symmetric bodies in \mathbb{R}^2 . Do the same for the regular heptagon in the space of convex bodies. (Reinhardt, Nazarov, Hales, Kallus, Blind, Kuperberg ...)

QUESTION : Show that the sphere is the minimizer of the maximum density in the space of convex centrally symmetric bodies in \mathbb{R}^3 . Or even show that a global minimizer exists. Is the sphere the global minimum in the space of convex bodies? (Ulam, Gardner, Torquato, Kallus)

- QUESTION : Find a body or collection of bodies that has its maximum packing/translative packing density achieved at only non-lattice/non-periodic configurations. (e.g. aperiodic tilings.) Find a collection of disks with distinct radii that pack denser in an aperiodic manner than in a periodic one (Lagarias ...)
- QUESTION : Describe the configuration space of kissing configurations of radius r spheres on a sphere of radius 1. (SPLAG, ... Lagarias ...)
- QUESTION : Describe the densest packing of congruent regular pentagons in the plane.
- QUESTION : Describe the densest packing of congruent regular heptagons in the plane.
- QUESTION : Find a compact body for which a sharp non-trivial upper bound on the packing density can be determined. (Pach?)
- QUESTION : Find a better lower bound on the packing density of spheres in high dimensions. (Cohn, Vance, Venkatesh)
- QUESTION : Search for high density lattices in high dimensions ($>\approx 30\dots$).