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*Densest sphere packing in four dimensions.*

The main goal of this talk is to discuss reasonable approaches for solutions to problems related to densest sphere packings in 4-dimensional Euclidean space. We consider two long-standing open problems: the uniqueness of maximum kissing arrangements in 4 dimensions and the 24-cell conjecture. Note that a proof of the 24-cell conjecture also proves that the lattice packing  $D_4$  is the densest sphere packing in 4 dimensions. (Received January 16, 2018)