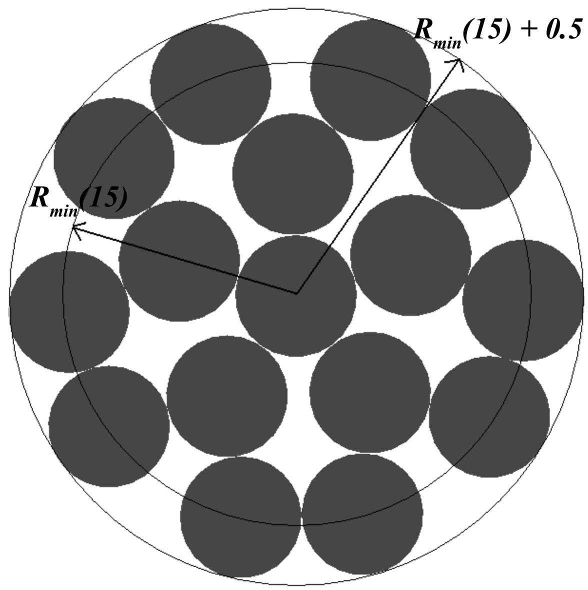

FIG. 1: A conjectured DLP optimal packing (point group D_{5h}) for $N = 15$, $d = 2$, $R_{min}(15) = 1.873123\ldots$, with encompassing sphere of radius $R_{min}(15) + 0.5 = 2.373123\ldots$.

explained by observing that in the limit as $N \to \infty$, the boundary of radius $R_{min}(N) \to \infty$, and that in this limit the ratio of the number of spheres within a fixed finite distance of the boundary to the number in the bulk is zero.

The densest local packing problem is relevant to the realizability of functions that are candidates to be the pair correlation function of a packing of identical spheres. For a statistically homogeneous and isotropic packing, the pair correlation function is denoted $g_2(r)$; it is proportional to the probability density of finding a separation r between any two sphere centers and normalized such that it takes the value of unity when no spatial correlations between centers are present. Specifically, no function can be the pair correlation function of a point process (where a packing of spheres of unit diameter is a point processes in which the minimum pair separation distance is unity) unless it meets certain necessary, but generally not sufficient, conditions known as realizability conditions [14–16]. Two of these conditions that appear to be particularly strong for the realizability of sphere packings [17] are the nonnegativity of $g_2(r)$ and its corresponding structure factor $S(k)$, where

$$S(k) = 1 + \rho \tilde{h}(k) \tag{1}$$