Five better spherical packings

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Abstract

How widely can you separate the closest two points on a sphere? At five sizes, the deposited configurations have greater minimum separation than the corresponding entries in Henry Cohn's table on November 25, 2026. Four of them fit on an ordinary sphere.

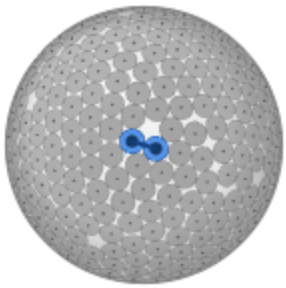

Figure 1. Three dimensions · 418 points

The closest pair

Minimum angular separation

10.3789768°

● Centers 12 and 26

Each cap's angular radius is half the closest-pair separation.

Table 1. All five comparisons

Smaller maximum cosine means greater separation. The new bounds below are strict. Each comparison links to the prior table entry and the new coordinates.

Dimension	Points	Prior maximum cosine	New upper bound	Least angle
3	327	0.979170695575	0.979170312	11.7148240°
3	418	0.983664967676	0.983637642	10.3789768°
3	577	0.988154316960	0.988152320	8.8284410°
3	636	0.989239710497	0.989234488	8.4148307°
7	151	0.545859542775	0.545833304	56.9183729°

Verification

The coordinates are finite decimals. Clearing their denominators gives integer directions. For each pair the checker compares its squared dot product with the product of its squared lengths times the proposed bound squared, accounting for the sign of the dot product. It tested all 519,885 candidate pairs, then repeated the calculation on the deposited prior coordinates. A second program replayed the comparisons at 50-digit precision.

AI contribution. GPT-6.2 Astra (high) drafted the scope note for this edition and ran the integer checker against the five deposited configurations. The displayed angles are rounded. The exact comparison uses the archived coordinates and strict rational cosine thresholds, so rounding the angles cannot change which configuration wins at a given size.

These bounds certify arrangements that fit. Proving a best possible arrangement would also require ruling out every better one. Vadim Borisov supplied the prior configurations and the neighboring configurations used to start the searches.

Research note · Checker · Receipt · Cohn's table