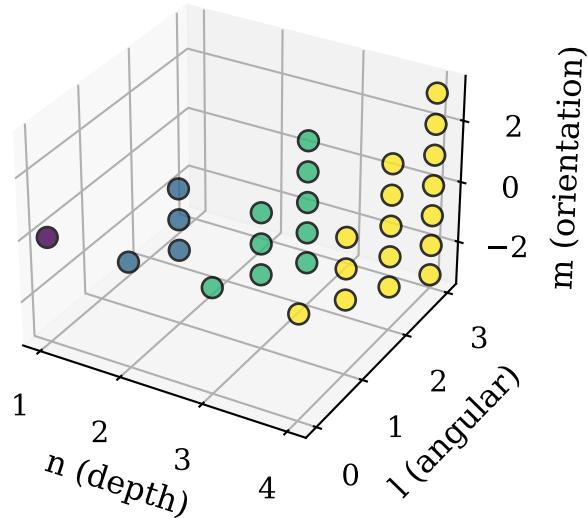


Figure 3: Partition Geometry → Spatial Coordinates

A. Partition Coordinates (n, l, m, s)



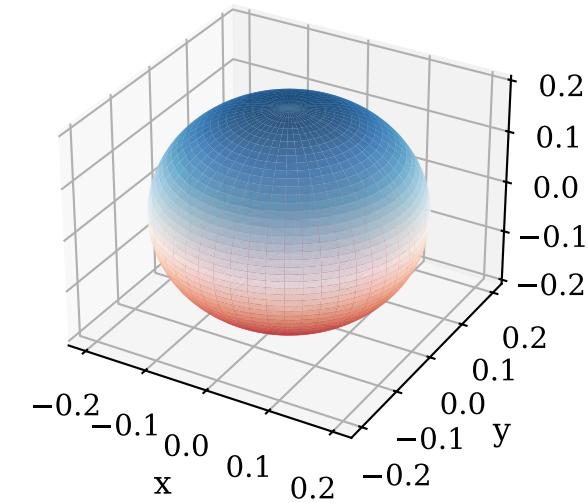
B. Geometric Constraints

PARTITION CONSTRAINTS

$n \in \mathbb{Z}^+$	(depth ≥ 1)
$0 \leq l \leq n-1$	(angular limit)
$-l \leq m \leq +l$	(orientation range)
$s = \pm\frac{1}{2}$	(chirality/spin)

Capacity: $2n^2$ states per shell

C. Angular Structure $Y_2^1(\theta, \varphi) \rightarrow 3D$ Space

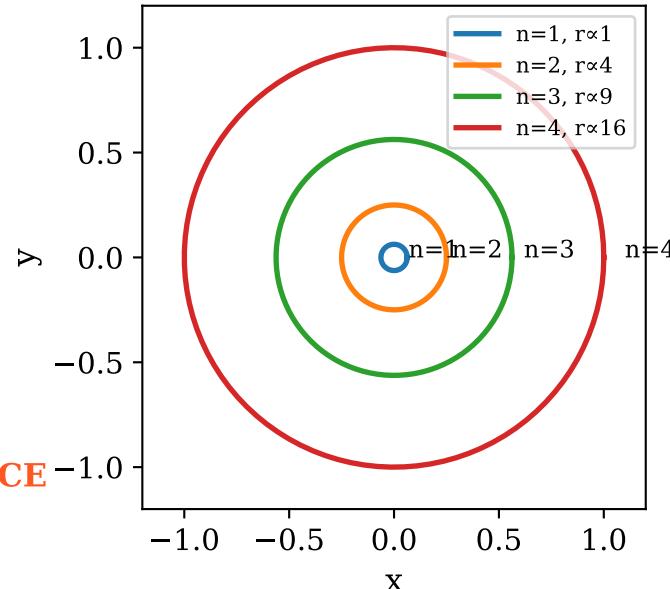


D. Mapping to Space

- $l \in \{0, 1, \dots, n-1\}$ SO(3) representations
- $m \in \{-l, \dots, +l\}$ $(2l+1)$ orientations
- (l, m) together Spherical harmonics
- n (radial) $\rightarrow r \propto n^2$ extension

RESULT: **3D EUCLIDEAN SPACE**

E. Radial Extension $r \propto n^2$ (Bohr-like)



F. Dimensionality Theorem

WHY D = 3?

- The constraint structure:
- $l \in \{0, 1, \dots, n-1\}$
 - $m \in \{-l, \dots, +l\}$

Has exactly 2 angular quantum numbers (l, m).

This is the **UNIQUE** signature of SO(3).

D = 3 is **DERIVED**, not assumed!