# Expanding the 64-Tetrahedron Grid to 256-Tetrahedron Grid

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**Abstract:** The octahedron appears as a fundamental geometry in the universe at various scales. The expansion of the 64-Tetrahedron Grid is explored through widening of the octahedron network backbone, which leads to a startling 256-Tetrahedron Grid.

## 1. Introduction

The polyhedron commonly known as 64-Tetrahedron Grid (64-TG) has become a mythical and mystical geometric structure of increased interest. It is composed of 64 interlocking tetrahedra with edge=a/2, and "a" referring to the edge of the embedded cuboctahedron[1]. Although without formal mathematical corroboration, the 64-TG is believed to be a fundamental blueprint of the cosmos, intricately weaving together the fabric of space and time [1]. The 64-TG is a remarkable latticework manifesting bipolar, fractal, and seemingly holographic characteristics (Fig.1) [2].

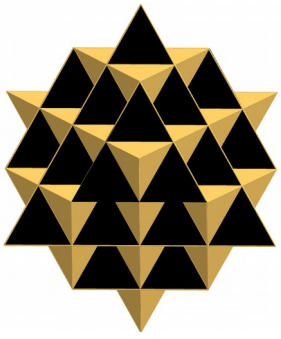
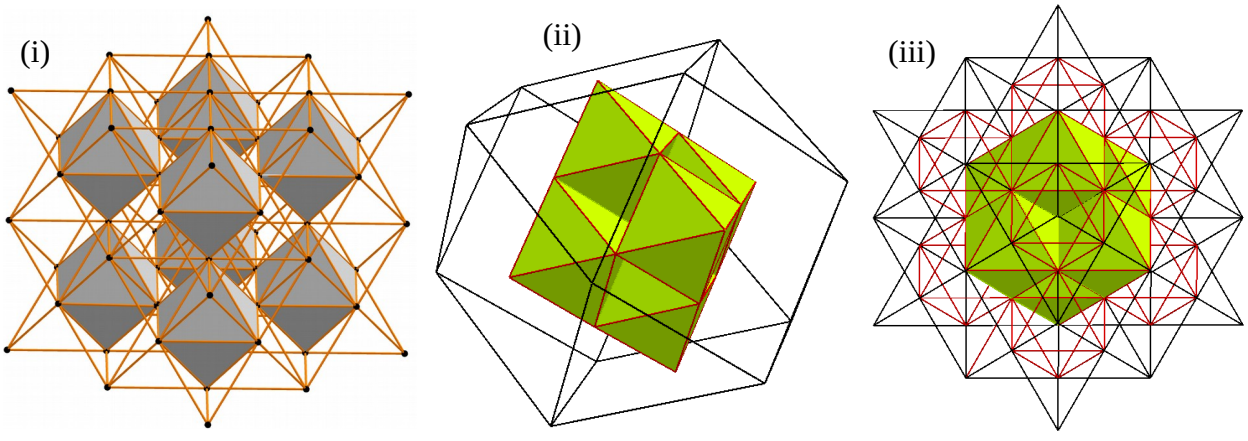


**Figure 1:** 3-D illustration of the 64-TG with its inherent dual "polarity" reflected by two opposite colors

It was shown at [3] that the tetrahedral packing density of the 64-TG was as low as 0.53 due to the presence of 14 interlaced octahedron$_{a/2}$ cavities, which turn out to be the backbone of the structure. Eight of these octahedra$_{a/2}$ make up the eight stellated octahedra$_{a}$ while the other six arise in the central octahedron$_{a}$ from the spatial arrangement of the tetrahedron$_{a/2}$ latticework (Fig.2)

**Figure 2:** Depiction of the 14 octahedron$_{a/2}$ cavities in the 64-TG. Eight of them make up the stellated octahedra$_{a}$ (i), and six of them arise inside the central octahedron$_{a}$ from the stellated octahedra$_{a}$ arrangement (ii & iii).




The 8 octahedra$_{a/2}$ were found to be the pillars of the tetrahedron$_{a/2}$ grid and were logically considered the first step in the construction of the 64-TG. Following this concept, it was attempted to expand the 64-TG through the construction of additional octahedron$_{a/2}$ pillars.

1 *The cuboctahedron (edge=a) nested within the 64-TG is taken as the reference scale. In order to distinguish the different polyhedron scales, an index with edge value is used*

## 2. Construction of the 32-Octahedron Network

The initial octahedral network of the 64-TG (8 octahedra$_{a/2}$) was extended through the 6 square faces of the embedded cuboctahedron$_a$ each of them giving rise to 4 vertex connected octahedra$_{a/2}$ as mirror image with respect to the square face. Hence a total of 24 additional octahedra$_{a/2}$ building up the new 32 octahedron$_{a/2}$ network as shown in (Fig.3 & 4).

**Figure 3:** Expansion of the octahedron network of the 64-TG from 8 (i) to 32 octahedra (ii)

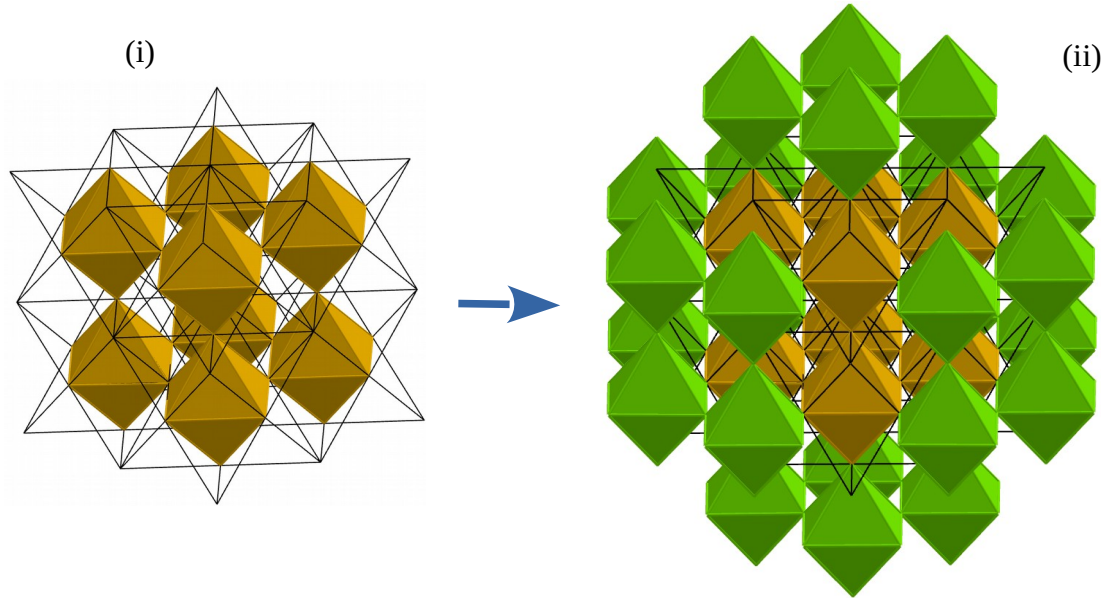
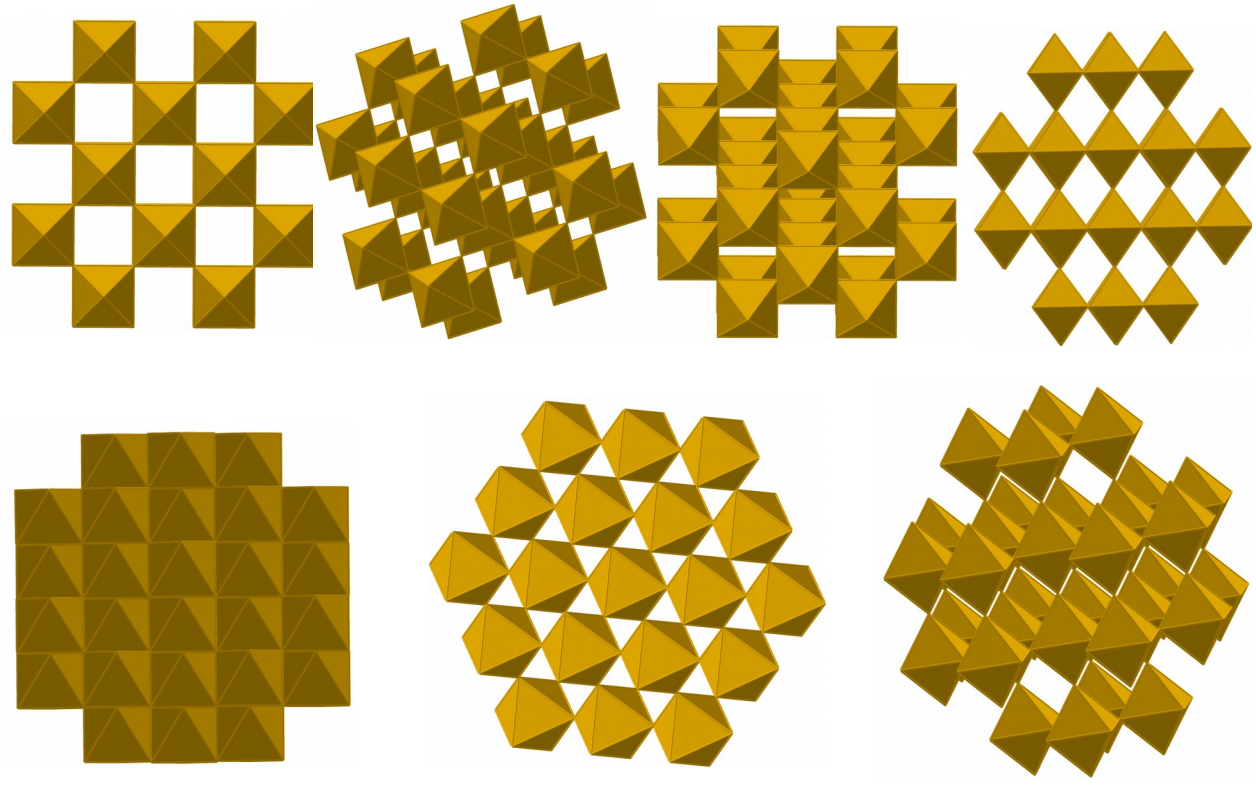


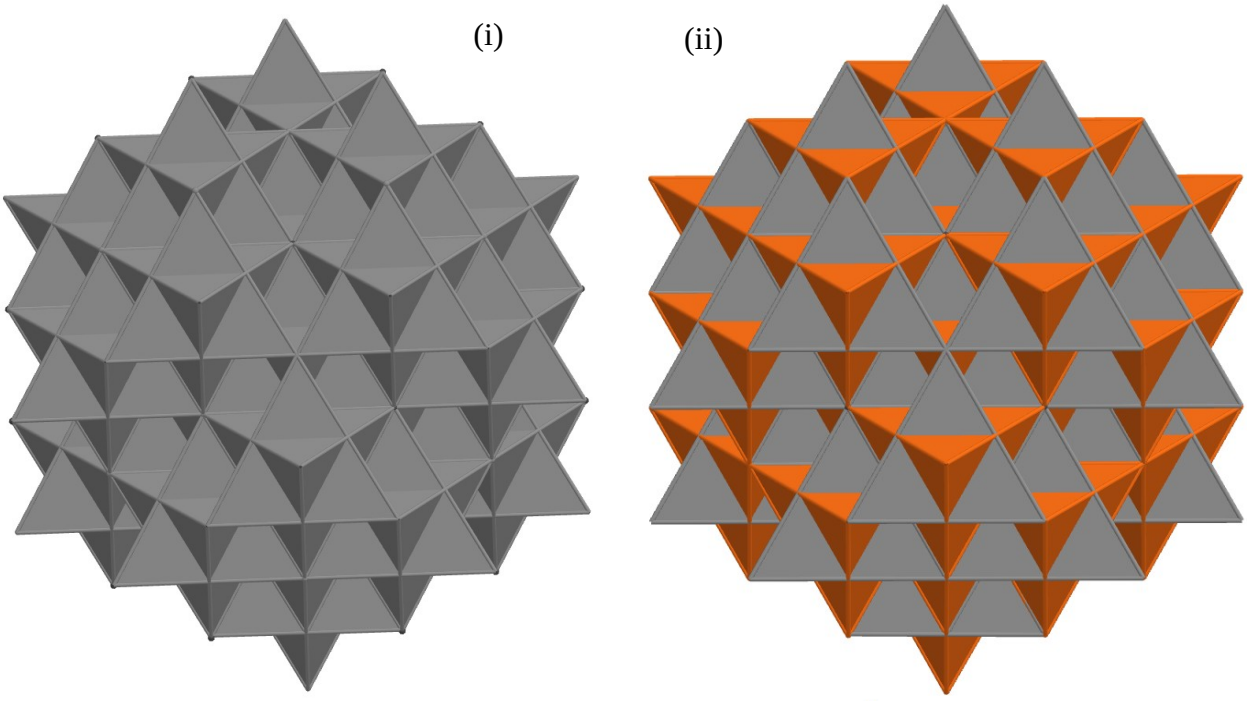

**Figure 4:** Various orthogonal projections of the 32 octahedron$_{a/2}$ network obtained through rotations of the 3-D structure



## 3. Construction of the 256-Tetrahedron Grid (256-TG)

The 32-octahedron$_{1/2}$ network (above) will evolve into 32 stellated octahedra$_a$ that interconnect to generate the 256-Tetrahedron Grid. Figures 5&6 below show various depictions of the complete 256-Tetrahedron Grid, including the dual polarity model.

**Figure 5:** 3-D representation of the 256-TG (i) and its manifested dual polarity (ii) expressed by two opposite colors where every tetrahedron$_{a/2}$ is surrounded by tetrahedra$_{a/2}$ of opposite properties.



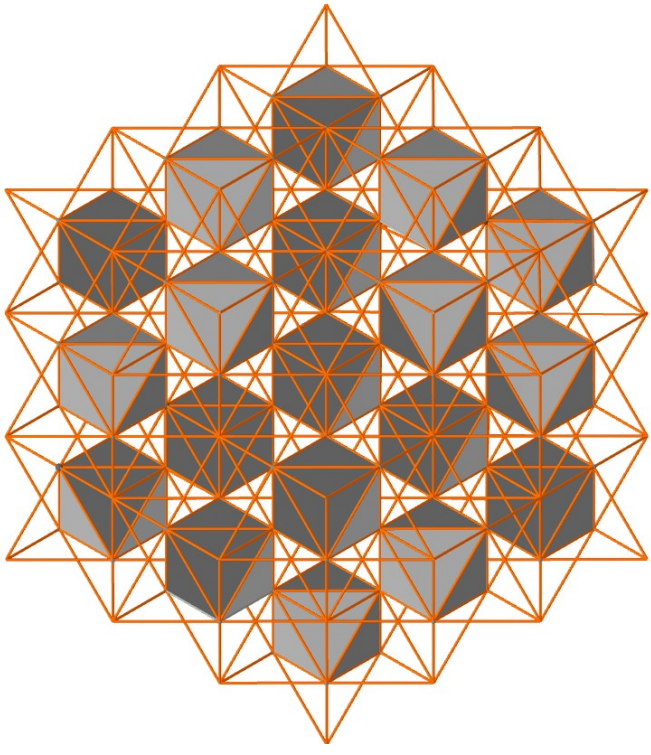
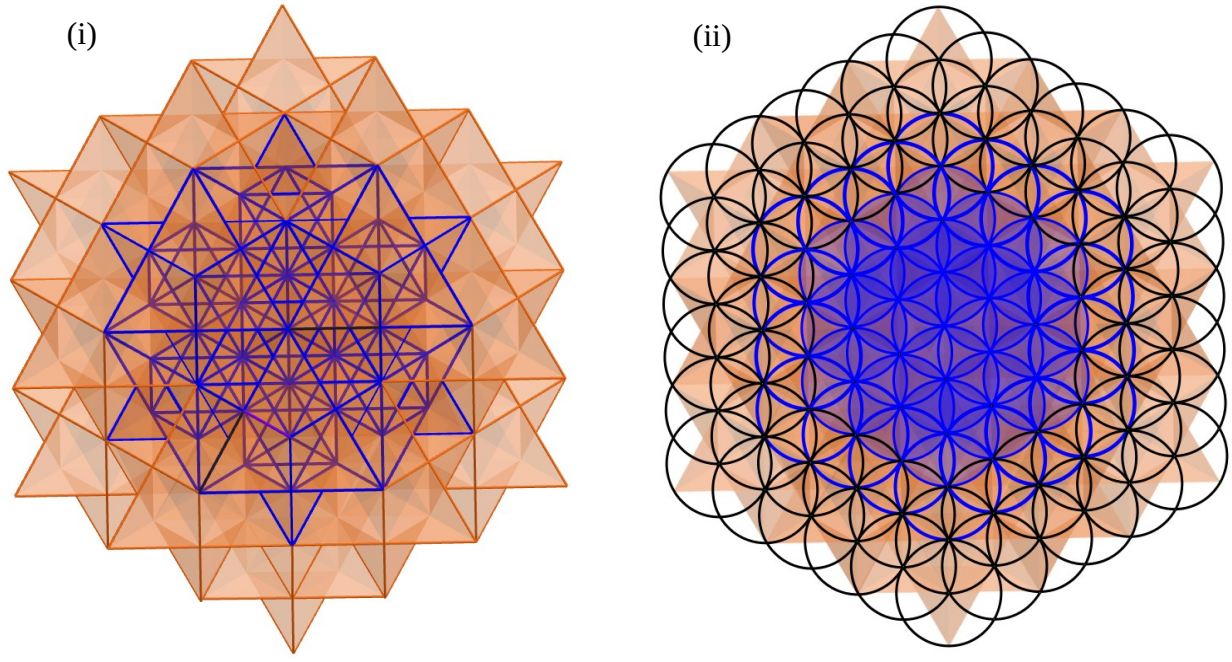



**Figure 6:** Orthogonal projection of the 256-TG with its 32-octahedron$_{a/2}$ network (iii) (missing octahedra$_{a/2}$ are aligned in the back and not visible)

Of interest is the comparison of spatial arrangements between the 64-TG and its expanded version the 256-TG. In Fig.7(i) we can recognize the central blue 64-TG with its nested octahedra$_{a/2}$, stellated octahedron$_{2a}$, and cuboctahedron$_{a}$. In Fig.7(ii) the octahedra$_{a/2}$ are superimposed with their circumsphere, which is common representation for the 64-TG.

**Figure 7:** Spatial comparisons of the 64-TG (blue color) and the expanded structure the 256-TG.




It was found at [3] that the assembling of 8 stellated octahedra$_{1/2}$ to construct the 64-TG gives rise to 6 additional octahedron$_{a/2}$ cavities at the center of the network, therefore a ratio of 8/6 or 4/3. It is also found that the assembling of 32 stellated octahedra$_{a/2}$ to build up the 256-TG gives rise to 24 additional octahedron$_{a/2}$ voids, hence a similar ratio of 4/3. It is therefore concluded that 56 octahedral$_{a/2}$ cavities are nested within the 256-TG.

It can be calculated that the total volume occupied by the 256-TG is equal to

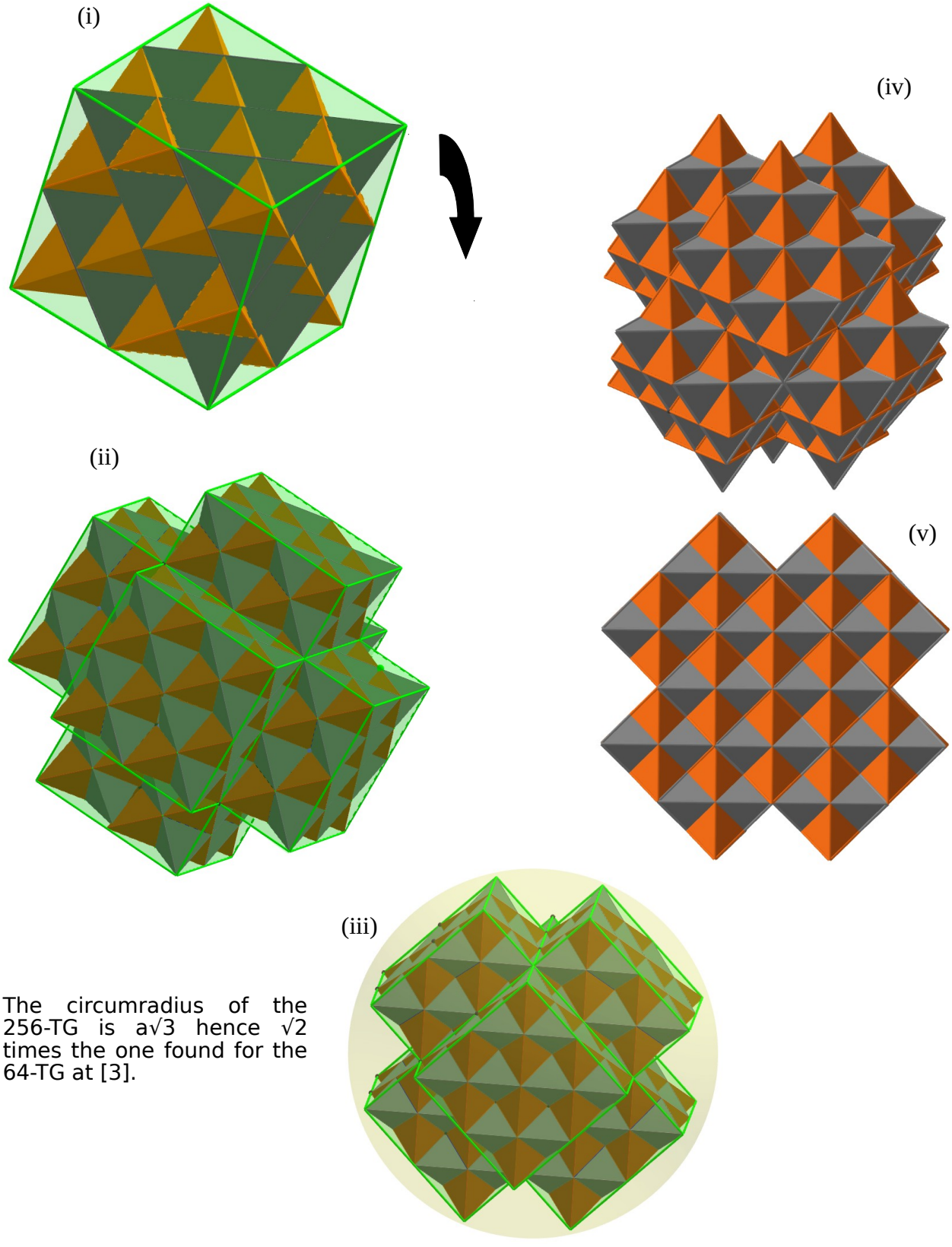
56 octahedra$_{a/2}$ + 256 tetrahedra$_{a/2}$ = $56\frac{\sqrt{2}}{3}\left(\frac{a}{2}\right)^3 + 256\frac{\sqrt{2}}{12}\left(\frac{a}{2}\right)^3 = 5\sqrt{2}\ a^3$

It is therefore 4 times larger than the volume previously found for the 64-TG [3].

## 4. Spatial geometry of the 256-TG

The spatial geometry of the 256-Tetrahedron Grid is peculiar as it evolves away from its precursor, the 64-Tetrahedron Grid. Through close examination, it appears that the initial 64-TG cubic shell expands into an octahedron, with the six faces of the cube being equally pulled away from the center as the number of octahedron$_{a/2}$ increases. Fig.8 depicts different views of the 256-TG.

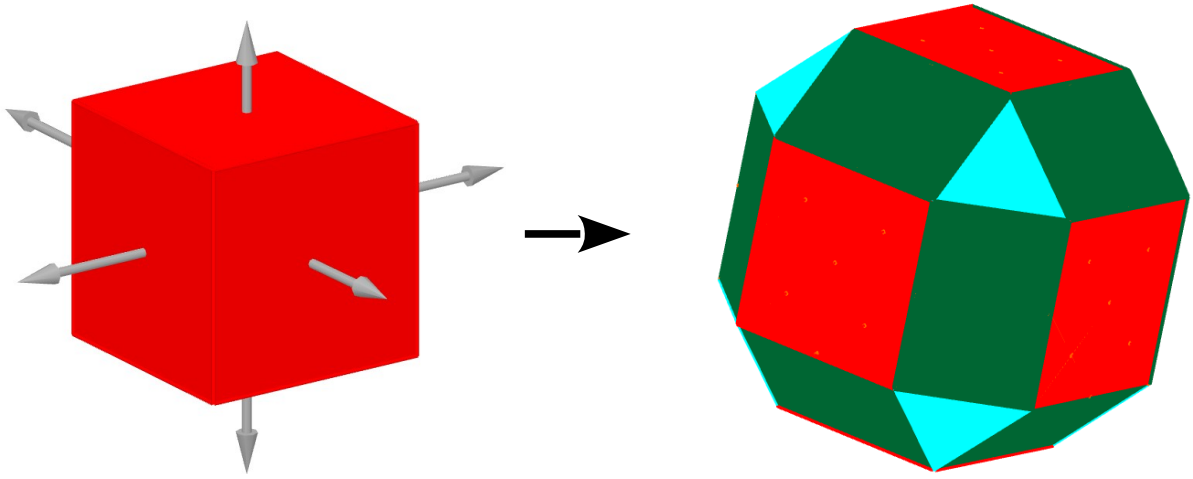
**Figure 8:** Spatial geometry of the 256-TG: from the 64-TG perfectly fitted in a cube (i), to the expanded 256-TG fitted into a polyhedron (ii) and its circumsphere (iii). (iv & v) are projections of the 256-TG viewed from different angles.




The circumradius of the 256-TG is a√3 hence √2 times the one found for the 64-TG at [3].

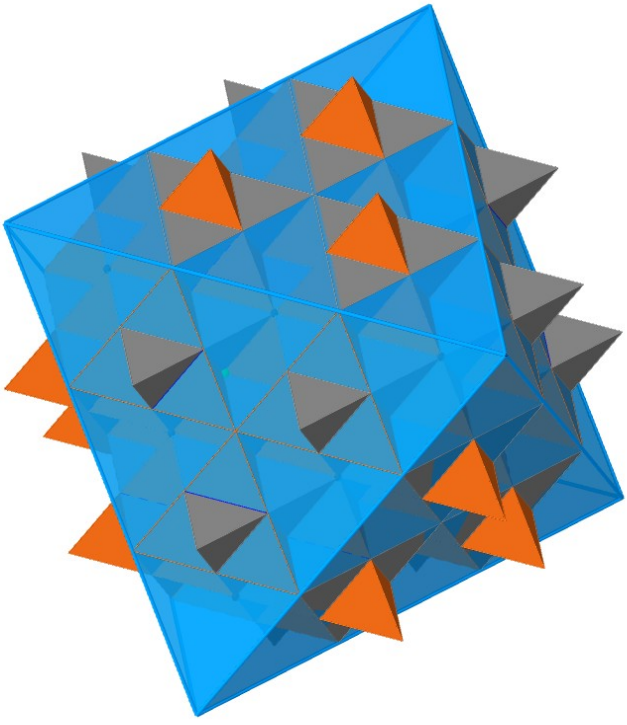
The 256-TG can also be circumscribed with a convex polyhedron containing 6 squares, 12 rectangles, 8 triangles, 24 vertices, and 48 edges. It can be constructed from the cube by pulling the 6 faces equally away from the center as illustrated in Fig.9 below.

**Figure 9:** Fitting the 256-TG into a convex polyhedron, from the expansion of the 64-TG cubic shell



It's also possible to fit the 256-TG into a regular octahedron as illustrated in Fig.10 below. In this particular case, 24 tetrahedra$_{a/2}$ remain exterior to the polyhedron.

**Figure 10:** Fitting the 256-TG into a regular octahedron

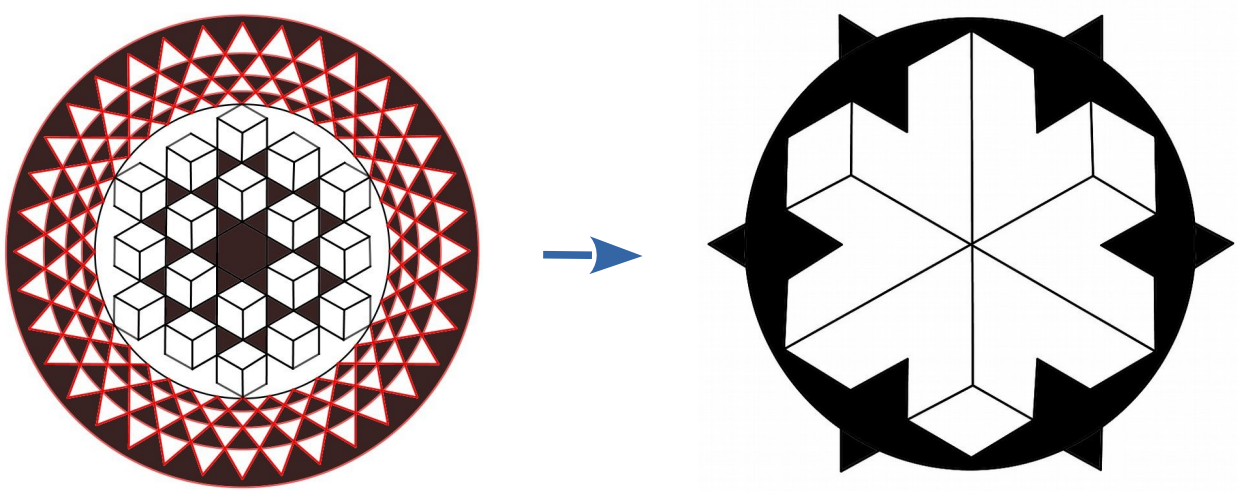


## 5. Conclusion

The octahedron appears as a fundamental pattern in the structure of the vacuum. The Jitterbug helical contraction applied to the 64-Tetrahedron Grid reduces the structure into an octahedron [3]. Likewise, the expansion of the 64-Tetrahedron Grid into the 256-Tetrahedron Grid generates an octahedron as described earlier. Further, both latticeworks dwell on a network of octahedra$_{a/2}$.

It is currently unknown whether the 256-TG expands any further. However, any additional expansion would increase the layers of octahedron$_{a/2}$ expanding further the arms of the octahedral structure as per Fig.11

**Figure 11:** The expansion of the 64-TG operates through increase of the octahedron$_{a/2}$ layers. The overall result expands further the arms of a larger octahedron



## 6. References


[1] Refer to the work of Buckminster Fuller, in particular in “Synergetics” and the work of Nassim Haramein

[2] The 64-TG pattern has been integrated into various theories in physics and cosmology, attempting to describe the fundamental nature of reality. These theories explore the relationship between the grid and phenomena such as quantum gravity, the holographic principle, and spacetime geometry

[3] B.R. Galeffi. “On the 14-Octahedron backbone of the Bimetric 64-Tetrahedron Grid Universe”. http://viXra.org/abs/2412.0104