The Graviton as 5D Chamfered Cube

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Abstract

From the perspective of the DGO Standard Model, the graviton is a 5-dimensional chamfered cube. The implications of this geometry are explored in relation to Feynman diagrams, the Kaluza Klein Theory, gravitational excitons and Fundamental Polyhedra.

5-dimensional Bee Hive

In 'The Higgs Boson & the Graviton', we revealed that the Graviton corresponds to a 5-dimensional chamfered cube. This geometry has been little explored in the academic literature and has never before been associated with the graviton. The lack of any visual representation of a 5D, or even a 4D, chamfered cube in online documentation has led me to get creative with my Photoshop skills to produce an accurate model, as possible. Even so, I was only able to produce a partial representation of 6 of the 8 faces of a 4D chamfered cube (Fig. 1).

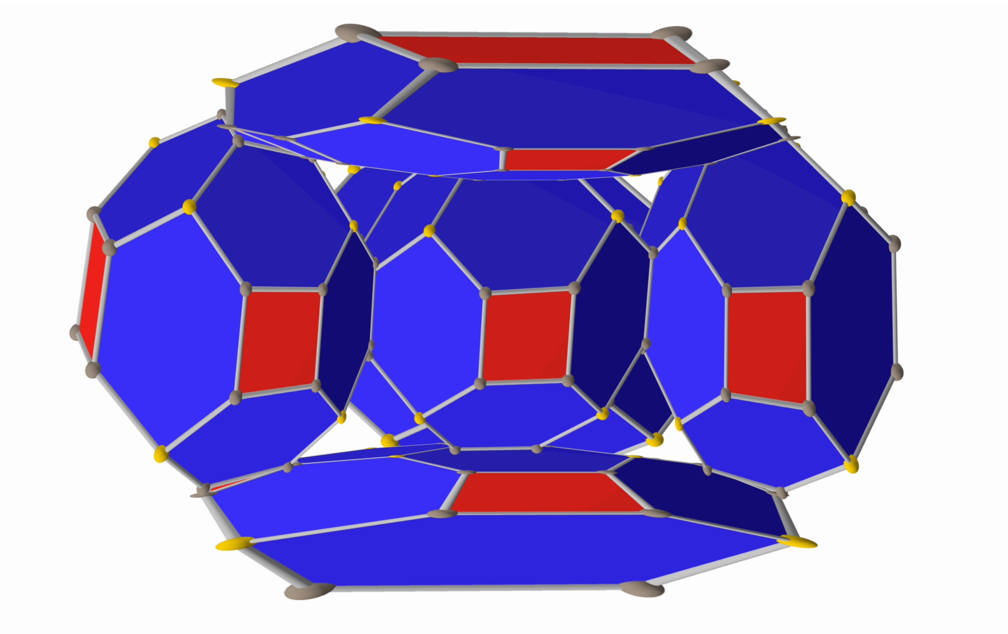

Fig 1: Partial representation of the 4D Chamfered Cube, with its out and front faces have been cut away so that we can see inside more easily.

This, however, is enough to allow us to explore some of the interesting features of its geometry. The 5D chamfered cube is made of 10 4-dimensional chamfered cube faces and 40 chamfered cube cells. There is a lot of 'negative space' inside this polytope. This negative space forms a network of 5-dimensional tunnels comprised entirely of hexagonal shapes — much like the honeycombed passageways of a beehive.

If we examine a detail of Fig 1, we see that the tunnels branch outwards in both directions, in exactly the same way that the lowest order Feynman diagrams do. This suggests that the 5D chamfered cube structure of the graviton encodes all of the graviton Feynman diagrams into itself, just as the rhombic dodecahedron was shown to encode all of the Standard Model interactions. [11]

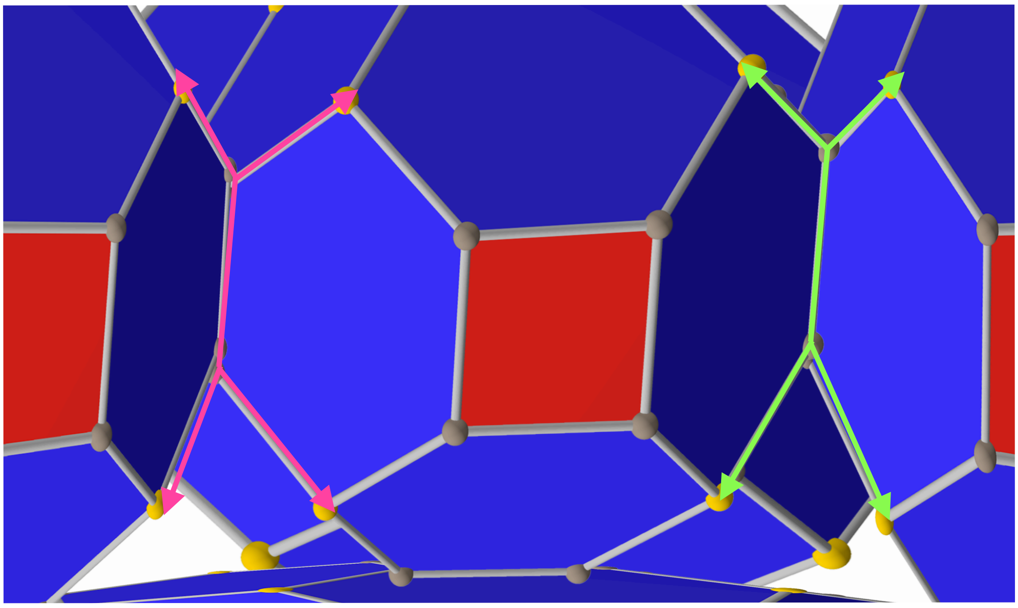

Fig 2: The tunnels of the 5D graviton hive are lined with honeycombed edges that encode the graviton interaction diagrams.

If we were travelling up the green diagram, we would be surrounded on all sides by three hexagons (See Fig. 3, 4 & 5 for how these hexagons come together). The edges where the hexagons are joined represent the mediating boson — in this case it is the graviton. And the particles being absorbed or emitted, represented by the arrows, are the particles the graviton interacts with — any and all of the particles in the Standard Model (SM). Since the 5D cube has 80 edges and since there are three interactions occurring at each of the edges in the 5D chamfered cube, this is 80 x 3 or 240 individual overlapping Feynman diagrams.

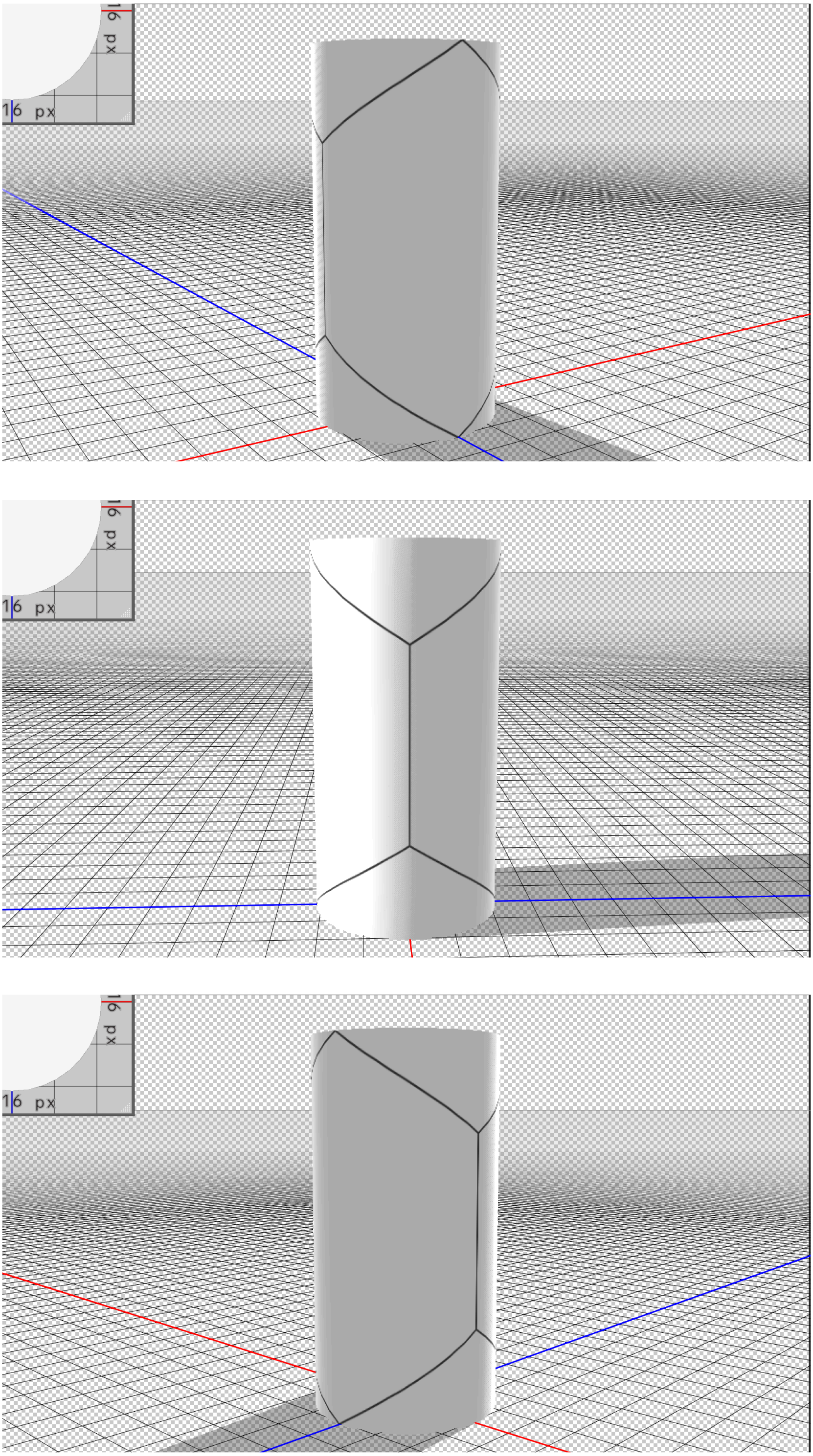

Fig 3, 4, & 5: Three different angles of the honeycombed tubes in the 5D chamfered cube, which encode the 240 Feynman diagrams.

Lobachevskian Space

I decided to search ‘240 Feynman diagrams’ to see if this number of diagrams had appeared elsewhere in anyone else’s research. Sure enough, I found a paper for an ‘Automatic Feynman diagram generation’ that produces 240 5th order diagrams for ‘nonlinear optical spectroscopies’. The paper discusses 3-pulse 5th order spectroscopy of exciton interactions. It goes on to say: “Only a small number of pulse configurations have all three pulses overlapping. In those cases, 240 diagrams must be calculated…”[3]

This corresponds exactly with the 240 diagrams of the three overlapping diagrams in the 5-dimensional chamfered cube version of the graviton. Therefore, there is a clear relationship between this geometry and the exciton interactions found in solid state systems; like crystals and semiconductors. The next obvious search would then examine the relationship between ‘exciton interactions’ and ‘gravitons’.

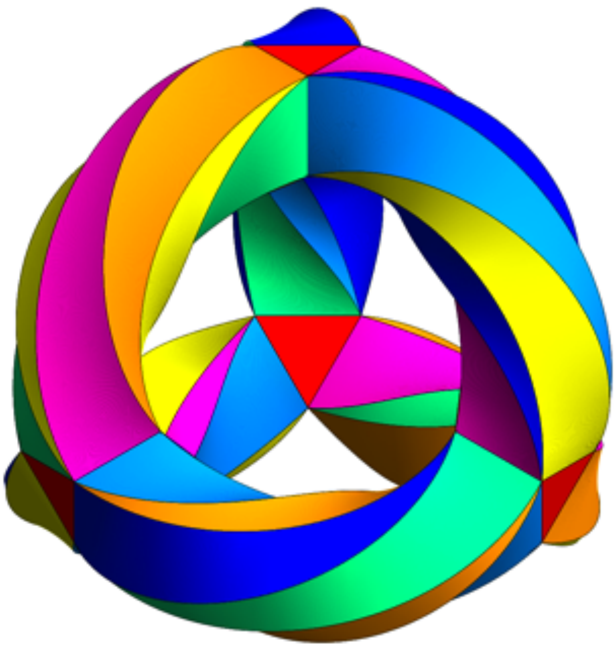

Fig 6: Greg Egan, Klein's quartic curve [3]

This turns up various results for ‘gravitational excitons’: research which suggests that gravitons and the gravitational force are associated with a small curled up fifth dimension that has crystalline properties.[4] These curled up dimensions are usually described by a Lobachevskian ‘Fundamental Polytope’ (FP). Good examples of this kind of geometry are the Calabi-Yau manifold and the Klein Quartic Curve (See Fig. 6).[3][10]

In fact, initially, I was going to use an image of the Klein quartic, as a means of expressing the honeycombed tunnels of the 5D Chamfered Graviton, before I made the model in Fig 1, which serves the purpose better.

Compact Lobachevskian forms feature in 5-dimensional theories of gravity, such as the Kaluza Klein Theory. They are infinitely tiled across space. This is the solid state crystal analogue of the graviton. It was hoped that the graviton would be light enough to dislodge from the 'crystal' resulting in massive scalar fields detected in the external dimensions. [4] However, a lack of positive results from particle colliders like the LHC has eliminated this concern and left us with only two options. Either the gravitons are so massive that they will never be dislodged under any circumstances, or the theory is wrong. In the absence of any way to test the theory, at present, it might as well be the former.

The Blueprint

So far, we have two theories with much in common. They both posit a 5-dimensional polytope as a model for the graviton and they both either indicate or predict gravitational excitons. Does the 5D chamfered cube describe the small dimensions of the Kaluza Klein Theory (KKT) graviton better than any FP? I think so. [9]

For starters, it bridges the divide between theories like the Kaluza Klein Theory and String Theory (both of which require small curled up dimensional spaces) and competing interpretations, which suggest large extra dimensions, like Membrane and Space-Time-Matter Theory.[7]

This is because the 5D chamfered cube is not a tiled fundamental domain, but a 5D polytope that can be both small—on the scale of a graviton —and infinitely large, no matter the angle you are looking at it from. There has been no indication of tiling in any of the other DGO particles — with the possible exception of the photon; but I haven't really looked into that yet in detail. Therefore, it would appear that the relationship between the 240 overlapping diagrams and the excitons of solid state crystals is a mere coincidence.

Then again, there's no reason why the graviton would have to be tiled in order to be considered 'solid state'. It has, after all, a crystalline structure. The 3D chamfered cube is a possible morphology for gold nanoparticles and nanoparticles of various kinds. [5, 6] So, the exciton model may well hold.

But, since we have all but abandoned investigation into gravitational excitons, it is a moot point. Instead, I like to think of it as a blueprint of all the possible interactions the graviton can form. Which means, of course, that the graviton is part of the Chamfered Cube and so is the Higgs. This isn't a surprise, since we know that the graviton creates the Higgs, so current theory suggests it must contain a Higgs like structure (See Fig. 7). [1]

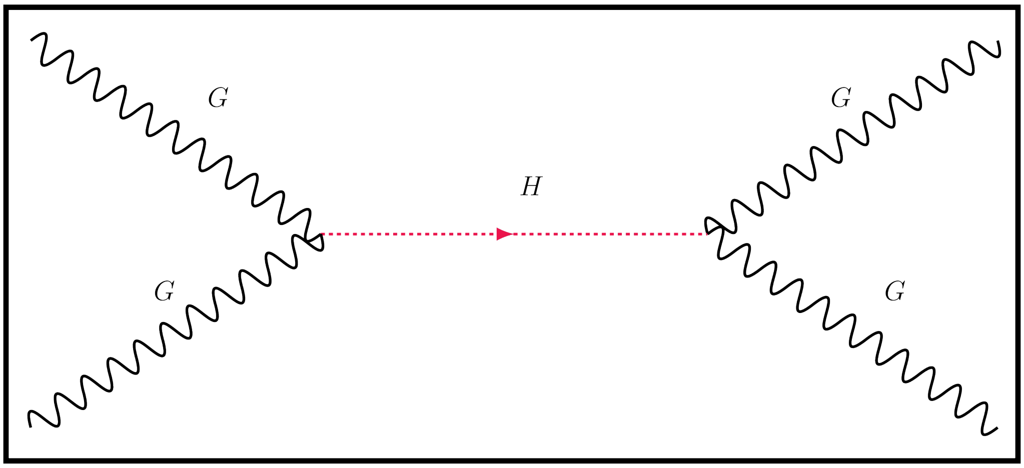

Fig 7: First order graviton diagram

Pair production of the Higgs in the DGO Model, suggests that the different pairs have different masses, with one being considerably lighter than the other. Furthermore, the graviton weighs in somewhere between these two Higgs particles. The Higgs is also believed to have charges of 4 (possibly even 8) different kinds. The combinations and permutations of these 4-8 charges with the 8 charges of the graviton must — presumably — lattice the interior of the 5d Chamfered Graviton model.

G-Balls

The 5D Chamfered Graviton is not limited to the 240 overlapping diagrams, but can also be seen to include 96 glue-ball type diagrams, and 80 graviton-graviton interactions.

This suggests that gravitons should be able to bind together to form the analogue of a glue-ball, which I will call a 'G-Ball' [8]. (See Fig. 8)

This is perhaps not too surprising, since we have already associated the geometry of the gluon colour charge to that of the graviton colour charges.[9]

Graviton-graviton interactions are similar to photon-photon interactions, which create electron-positron pairs. But unlike them — and this according to the DGO Standard Model — they would create two oppositely charged Higgs Bosons.

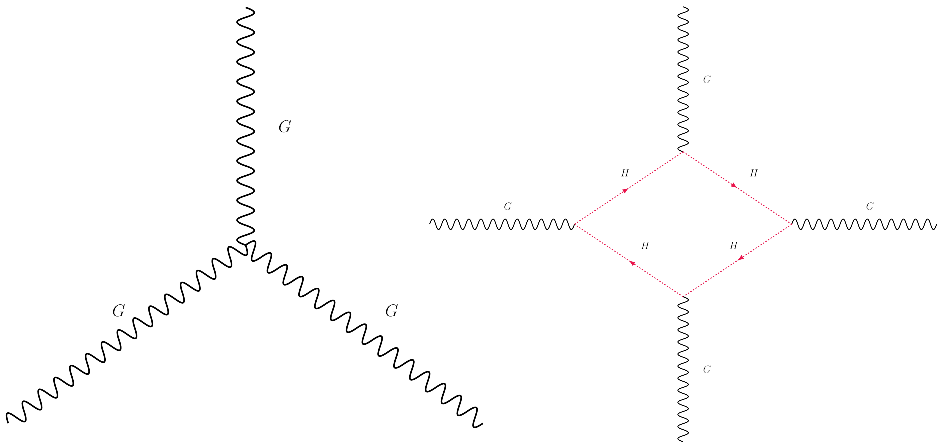

Fig 8: G-Ball and graviton-graviton interaction.

Then again, these extra diagrams may be nothing of the sort. They may simply be continuations of the 240 exciton diagrams, which would mean that the 5D Chamfered Graviton is actually just one perfect Platonic form of graviton interaction diagrams flowing endlessly into themselves.

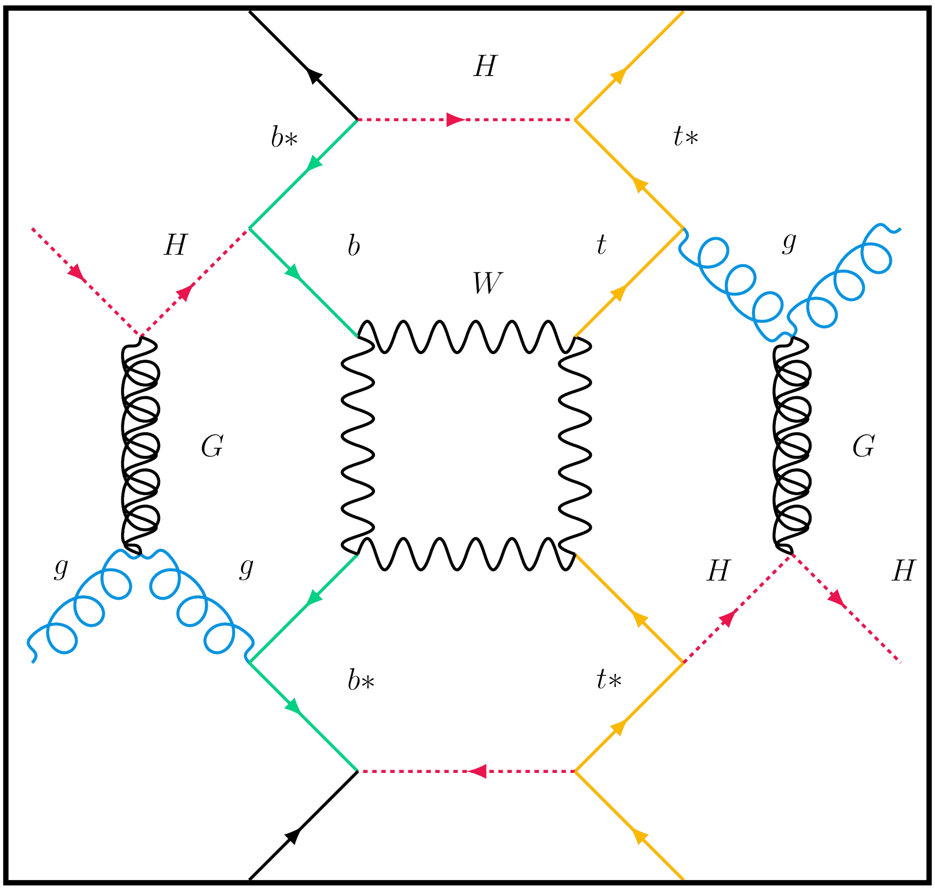

Fig 9: Mock up of complex interactions creating the structure of the 5D chamfered cube.

The best way to test the 5D Chamfered Graviton (5DCG, the acronym came a little late) and the DGO Standard Model as a whole would be to see if significant parts of interactions in Fig. 9 are at least possible. To create a whole face of the graviton interactions would go some way to proving its existence. Although, doubtless, some of these interactions are very unlikely and all together they are certainly highly improbable, which I guess makes the 5D Chamfered Graviton a highly improbable object itself. And that is before we even get into the nitty-gritty of actually quantising gravity, which would be best left to a separate paper given that it such a large subject in itself.

Conclusions

According to the DGO Model, the graviton is a 5-dimensional chamfered cube that is tiled with Feynman diagrams. There are 240 such diagrams on the edges of the 5DCG creating a link between it and the 5D gravitational excitons born out of the Kaluza Klein Theory. These diagrams form complex particle interactions, which may help confirm the existence of the 5-dimensional particle structure of the graviton.

Citations

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