Dimensional Bandwidth of the Gravitational Field Density

by

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Abstract: In my papers "Relationship of the Internal Structure of the Photon with Field and Charge" (https://vixra.org/abs/2301.0148) and "Relationship of the Photon to Cosmology and Origin of the Universe" (https://vixra.org/abs/2303.0083) I computed the Gravitational Field Density (F_{Dg}) for our universe and stated that each other universe (or Field) has a different value for this; a different value of its Field. However, a question arises and that is one of bandwidth. Specifically, given that each value of F_{Dg} is a different universe, down to how many decimal places of accuracy must we go before the values for two different universes amount to being one and the same? What is this bandwidth? Also, is there a limit to how large or small a value of F_{Dg} there can be?

Introduction

Given that my computed value for our own F_{Dg} is 7.4256485 X 10^{-28} (J/Kg)/N, how many decimal places down do we need to go before the value in differing Gravitational Field Densities does not matter and two Field Densities with extremely minor differences are one and the same Field, the same universe. That is, 7.4 X 10^{-28} and 7.5 X10^{-28} probably represent different Fields and hence completely different universes, but what about 7.42 X 10^{-28} versus 7.43 X10^{-28}? Or 7.425 X 10^{-28} versus 7.424 X10^{-28}? How exact do we need to go before the overlap is so great that two or more values of little difference simply default into one another to manifest the same Field?

In other words, what is the bandwidth for a given Field to still be unique from all others?

Finding The Bandwidth

To attempt to solve this problem we must consider what sorts of things would define such a bandwidth; what things would be the limiting factor of such resolution? Obviously this bandwidth could be expressed as a fraction or percentage of the base value, and can be assumed to be quite small, but what else can we say?

We know that force is compressed into energy, that our universe's Energy Density from within the photon is created by the mutual self-attraction and compression of the Gravitational Field Density down into this Energy Density (as represented by Planck's Constant and c^2). From that it sounds reasonable to say that, while each universe's Field is separate from all others, that below a certain numerical value the variously different Field values self-attract and collapse into a single value. This provides a limit as to how many distinctly different Field values (and hence universes) can exist within a given range of Gravitational Field Density numerical values.

A given universe, such as ours, would have its own primary value for the Gravitational Field Density, then any transitional values between this Field and partway to the next re-compress to match up to this primary value as they are attracted to it as well. I should also note the possibility that these transitional values could also manifest as perturbations or sub-harmonics observed within the base value. For our own universe, since I computed the Gravitational Field Density from both the Gravitational Constant and the square of the speed of light, both of which are measured values, then it can be assumed that this computed Gravitational Field Density is the base value for our own universe and not a transitional value.

Moving on, this bandwidth could be viewed as being sort of similar to an angular confinement, or more accurately a maximum compression angle or factor, thus implying that our limit is how closely together the lines of force density can be crammed together before things cut off. The mention of 'compression angle' when applied to lines of force getting crammed together should sound very familiar, suggesting an answer to our bandwidth problem.

The very same compression factor derived in my first paper for photons: $6\pi^5$. Or more specifically, $(1/6\pi^5)$. I showed how this is the smallest angle within the photon as force is compressed into energy, so since we're still talking about force being compressed, it makes sense that this same number applies to the Gravitational Field Density as its bandwidth ratio.

So then, proceeding from this, we can perform a first computation.

$(1/6\pi^5) = (1/1836.1181087) = 5.4462727 \text{ X } 10^{-4}$, or 0.054462727%

Multiplying this by our F_{Dg} then yields our (for lack of a better name) Field Width:

$F_{Dg}/6\pi^5 = 4.0442106991\text{X}10^{-31}$ (J/Kg)/N.

Comparing this to our base value gives us:

$7.4256485 \text{ X } 10^{-28}$ +/- $4.0442106991\text{X}10^{-31}$ (J/Kg)/N = 7.4256485 +/- $0.0040442106991 \text{ X } 10^{-28}$ (J/Kg)/N = $7.4296927107\text{e}^{-28}$ to $7.4216042893\text{e}^{-28}$ (J/Kg)/N.

Just visually comparing either end of our bandwidth range with the base value tells us that we're good up through the second decimal place, i.e., '7.42', which is then our limit as to how accurate we need to compute values for F_{DG} to distinguish one universal Field from the next. Taking double the Field Width then gives us the total Dimensional Bandwidth for any given Field, or in the case of our own Field, a value of $8.0884213982\text{e}^{-31}$ (J/Kg)/N.

Thus, while the range of possible values for the Gravitational Field Density can theoretically go from zero to infinity, implying an infinite number of Fields, the *spacing* between Fields has a definite finite limit, allowing us to compute, for example, the number of different Universal Fields with Densities between 0 and 1.

Gaps and Nodes

Of course, with this bandwidth being a *percentage* of a given Gravitational Field Density, and this F_{DG} being an ever increasing value, that means the bandwidth between stable F_{DG} values is also numerically increasing along with F_{DG}, leading to wider and wider bandwidth gaps between values.

Thus, for a given F_{DG} of value 'X', and using 'P' to represent $(1/6\pi^5)$, then the bandwidth for 'X' is going to be +/-(XP). But that means that the edge of the bandwidth for the *next* point, X_1, is going to begin at (X + XP). The distance from X to X_1 is going to be the sum of their two bandwidths, $(XP + X_1P)$, so the value of X_1 is going to be $\{X + (XP + X_1P)\}$. If you assume that the bandwidth of X_1 is about equivalent to that of X, then $X_1 = \{X + 2XP\}$ and its bandwidth is then $(X + 2XP)P$.

Of course, the bandwidth for X_1 should be a little wider than that for X, since the Field Width for X_1 has increased the value for X_1 itself which in turn increases X_1P, leading us to a recursive relationship; we'll handle that in a bit. The point here is, that the dimensional bandwidths then become wider and wider, with the core, or stable, values of F_{DG} becoming more infrequent. Using our own universe's value for F_{DG} as an origin point, we can derive the mathematical progression to locate these 'Field Nodes' where the value for F_{DG} corresponds to a new Field (or universe).

Now let's deal with that total 'gap' between Fields. Start with a given Field (say, our own) whose Gravitational Field Density is X_i, the next stable Field numerically above it then being denoted as X_{i+1}. The Field Width for X_i would be X_iP plus that for $X_{i+1}P$, where $P = 1/6\pi^5$. The total gap between X_i and X_{i+1} would then be $(X_iP + X_{i+1}P)$, with the final value of X_{i+1} being equal to:

$X_{i+1} = (X_i + (X_iP + X_{i+1}P))$.

For our first iteration, the width of both fields is assumed to be the same, so

$X_{i+1} = X_i + 2X_iP$, which means that $X_{i+1}P = (X_i + 2X_iP)P = X_iP + 2X_iP^2$

Since we now have our new Field Width for X_{i+1} we can go back and insert it into our original formula for X_{i+1} for a second iteration. Thusly:

$X_{i+1} = (X_i + X_iP + X_{i+1}P)= X_i + X_iP + (X_iP + 2X_iP^2) = X_i + 2X_iP + 2X_iP^2$,

and

$X_{i+1}P = X_iP + 2X_iP^2 + 2X_iP^3$.

We can see where this is going with successive iterations, as we are led to the final values for our next Node value being equal to:

$X_{i+1} = X_i + 2X_iP + 2X_iP^2 + 2X_iP^3 + 2X_iP^4 + \dots$

and

$X_{i+1}P = X_iP + 2X_iP^2 + 2X_iP^3 + 2X_iP^4 + 2X_iP^5 + \dots$

But this is just a simple power series (one of the first ones you ever learn on the subject, in fact), all we have to do is add a term to continue. Thus:

$X_{i+1} = (2X_i + 2X_iP + 2X_iP^2 + 2X_iP^3 + 2X_iP^4 + \dots) - X_i$

and

$X_{i+1}P = (2X_iP + 2X_iP^2 + 2X_iP^3 + 2X_iP^4 + 2X_iP^5 + \dots) - X_iP.$

Cleaning things up we then have:

$X_{i+1} = 2X_i\,(1 + P + P^2 + P^3 + P^4 + \dots) - X_i$

and

$X_{i+1}P = 2X_i\,(P + P^2 + P^3 + P^4 + \dots) - X_iP.$

The summation of this power series, for when $P<1$, is long known to be equal to $P/(1-P)$. This allows us to clean things up a lot. First we handle $X_{i+1}P$:

$$X_{i+1}P = 2X_i\,(P + P^2 + P^3 + P^4 + \dots) - X_iP =$$
$$2X_i\,(P/(1-P)) - X_iP =$$
$$X_i\{2P/(1-P) - P\} =$$
$$X_i\,\{2P/(1-P) - P[(1-P)/(1-P)]\} =$$
$$X_i\,\{(2P - P + P^2)/(1-P)\} =$$
$$X_i\,(P^2 + P)/(1-P) =$$
$$X_{i+1}P = X_iP(1+P)/(1-P).$$

We can now handle X_{i+1} similarly:

$$X_{i+1} = 2X_i\,(1 + P + P^2 + P^3 + P^4 + \dots) - X_i = X_i\{2[1 + P/(1-P)]\ -1\} =$$
$$X_i\,\{\,(2-1) + (2P/(1-P))\} =$$
$$X_i\,\{1 + 2P/(1-P)\} =$$
$$X_i\,\{(1-P + 2P)/(1-P)\} =$$
$$X_{i+1}\ = X_i\,\{(1+P)/(1-P)\},$$

which falls in line with our value for $X_{i+1}P$.

If you want to compute the next node numerically *down* from your origin point, then you simply invert the formulas and arrive at the following:

$$X_{i-1} = X_i\,\{(1-P)/(1+P)\}$$

and

$$X_{i-1}P = X_i\, P\{(1\text{-}P)/(1\text{+}P)\}.$$

Finally, to compute the Gravitational Field Density for the N^{th} Field Node above a given X_i, it's exactly like adding percentages to percentages (sort of like compounding interest rates). For a given Field Node, X_N, that is 'N' nodes *above* our origin Node of X_0 (which is basically going to be our own Universe's Field value), we get:

$$X_N = X_0\ \{(1\text{+}P)/(1\text{-}P)\}^N$$

Then to find the value for the N^{th} Node, X_{-N}, numerically *less* than that of X_0, we simply invert this to get:

$$X_{-N} = X_0\ \{(1\text{-}P)/(1\text{+}P)\}^N.$$

Now all you have to do is plug in $1/6\pi^5$ for P, and the F_{Dg} for our own universal Field in place of X_0, to get the final answers. As you can see from that, though, these bandwidths are going to be rather narrow and well defined. Should someone invent a device that allows them to tune into other Gravitational Field Densities then this would provide a means with which to precisely determine the stable values of other such universes. From this one can then derive a coordinate system for locating other universal Fields relative to our own… assuming some day we find a means to travel from one Field to another, of course.

Perhaps something of yet purely theoretical interest and nothing practical for a while yet to come, but I like to be complete in my intellectual meanderings.

Practical Limits For The Gravitational Field Density

We can now ask what are the practical extreme limits for the Gravitational Field Density. At first blush F_{Dg} can range from Zero to Infinity, and with our own universe's rather low value for F_{Dg} it seems that it can get nearly asymptotically close to zero without ever making it, but there might be some practical lower and upper limits; too low or too high a F_{Dg} and matter might not even form, which would make it pointless to explore those ranges of reality (given a means of traveling to such universes, of course). That is what we are going to explore in the last section of this little paper.

Recall from my first paper on Field and Charge that the Field Density and corresponding frequency are inversely proportional; as $F_{D+/-}$ decreases then $\nu_{+/-}$ increases, and visa-versa. This tells us all we need to know to get an idea of our limits.

As $F_{D+/-}$ increases towards infinity, then $\nu_{+/-}$ will decrease in value, until it is down to the point where the frequencies needed to form into protons and electrons are in the same range as the bulk of lower energy photons for a given Universe. So you might, at this extreme, have the $\nu_{+/-}$ in the UV range or even that universe's equivalent of the visible light spectrum. This not only makes it very easy for particles to form but even easier for other more intense radiations to tear them apart. In this instance, you'd have all that range of higher energy photons zipping around, crashing into particles, breaking them apart. Imagine if, say, all it took to form a proton were some photons in the Violet range, then you'd have UVs, X-Rays, Gamma rays, and the rest constantly assaulting any newly formed particle. That in itself would be enough to prevent matter from long forming, but you also have a higher value for the Field Densities now, which means that these photons pack even more of a punch. A point would come where the values for the frequencies of formation for protons and electrons would be so low that every other higher frequency radiation would immediately overcome them and lower frequency photons would be rapidly swamped out.

Thus the practical upper limit for the Field Densities would actually be a range of values over which the existence of particles and matter would become increasingly rare until there is nothing but a wash of radiation. No matter, no life. But there would still be structures of a sort, in that the Gravitational Field Density still provides us with an easily formed frequency at which black hole particles could form (see my paper on black holes– https://vixra.org/abs/2304.0057). These rely solely on gravitational attraction, so high-energy photons could not break them apart but would only add to their number. Thus in this extreme we have a universe with increasing numbers of larger black holes with high-energy arcs surging between them, until we come to a universe that is basically one solid black hole.

Not a place you want to be.

I hesitate to pin a specific number or range on this upper limit save to say that as your frequencies of particle formation slip down to about the middle of the X-Ray range then particle formation will have begun to become unstable, and by the UV range would be close to impossible.

Now for the other extreme. When the F_{Dg} gets too low then the frequencies of light required to form protons and electrons would become unobtainably high, particularly with the energy density in a given photon now being so weak. As the $\nu_{+/-}$ veers towards astronomical values, the number of high-energy photon collisions required for a single photon to obtain such energies would make it increasingly difficult for any particle to form in the first place, until we reach a state where there are no particles and nothing but a soup of weak radiation. At the ultimate end of this extreme it would also be impossible for a black hole to even form. This slide down towards a particle-free Field would likewise be a gradual curve until you'd come to a practical cutoff point beyond which you simply have nothing forming at all.

Thus the range of practical values for the Gravitational Field Density for the various universal Fields would form a sort of a bell curve: a very wide flat-topped center range throughout which stable universes can exist, then both ends sloping down in a steady curve of decreasing presence of matter, until both ends reach a point where you can simply truncate the curve and ignore anything beyond it.

Conclusion

This paper has attempted to add in some details regards the spread of universal Fields by providing a means to define how "wide" a given universal Field is in terms of its Field Density and what gaps may exist in such values between universes. We have also examined the practical upper and lower limits of possible values for the Gravitational Field Density. This latter not only tells us which values of a universal Field could support life, but also implies that the number of parallel Fields for a given Hyper-Field, while still being nearly incomprehensibly large, is indeed *countable.*

We have thus more clearly defined the physical parameters of the Hyper-Field.