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Annihilation trails of quark-antiquark pairs in relation to golden mass

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ABSTRACT

Due to the relationship between the golden ratio (Φ) and quark masses, we suggest that the collision paths of quark-antiquark pairs are in the shape of a golden spiral. This is purely theoretical work, however we have data images from annihilations, which we use to show a direct correlation between the mass of the quark, and the trail spiral it leaves behind in annihilation. Using data from CERN, we calculate the relationships between the mass of the particle, and its spiral path linking to Φ.

INTRODUCTION

According to Einstein's law of the conservation of energy – $E=mc^2$[1], when two bodies annihilate, the energy released is equal to the mass of the particles, multiplied by the speed of light squared, however this is for stationary particles. Einstein's law for moving particles is $E^2=m^2c^4p^2+c^2$, which we shall use to calculate the energy released by the pairs of quarks-antiquarks to understand if there is a golden relationship.

GOLDEN RATIO

The Golden Ratio, represented by the Greek letter Φ can explain many natural phenomena. The number Φ is approximately 1.6180339887... which is also represented by the equation $\varphi = \frac{1+\sqrt{5}}{2}$. Φ is significant in the calculation of quark masses, for example, the cosine of summed reciprocals of the masses of the six quarks all divided by 5 are equal to:

$$\cos\left(\frac{\left(\frac{1}{u}\right)+\left(\frac{1}{d}\right)+\left(\frac{1}{c}\right)+\left(\frac{1}{s}\right)+\left(\frac{1}{b}\right)+\left(\frac{1}{t}\right)}{5}\right) = \frac{-1}{\frac{\varphi}{2}} \qquad (1)$$

RELATIONSHIP BETWEEN GOLDEN RATIO AND QUARK MASSES

TABLE 1 : Masses of the six flavours of quarks

Quark flavour	Quark Mass (pm)
Up quark	0.0047
Down quark	0.0074
Charm quark	1.6
Strange quark	0.16
Bottom quark	5.2
Top quark	189

ANNIHILATION PATH OF QUARK-ANTIQUARK COLLISION

In a magnetic vacuum space, where the particles

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collide, the degree of spiral depends on the mass of the particle: the higher the mass, the tighter the curve of the spiral will be. This can be explained by the law of momentum, stating that p = mv, therefore the momentum with which the particles annihilate each other will be based on their mass, and the velocity at which they are moving. We explain this using Einstein's conservation of energy equation. $E^2 = m^2c^4p^2 + c^2$

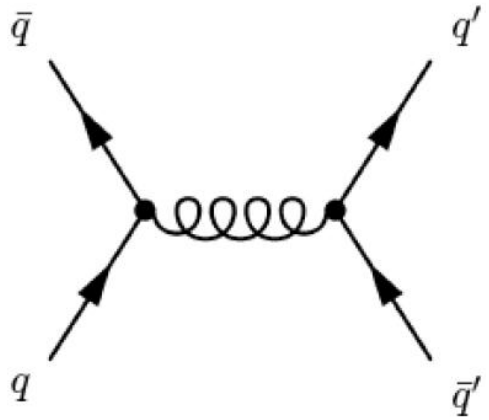

Figure 1 : Feynman diagram modelling quark-antiquark annihilation reaction and products[2]

The image below depicts the trails left behind by annihilated quarks-antiquarks, and a golden spiral has been superimposed on the spirals created by the quarks.

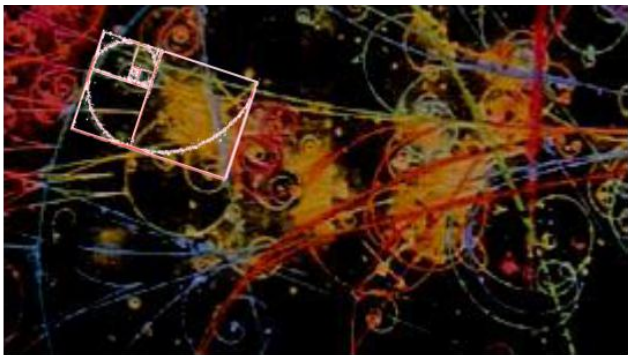

Figure 2 : Golden spiral superimposed over quark-antiquark annihilation path[3]

The image above portrays a perfect correlation between the path of annihilation between quark-antiquark pairs and a golden spiral created by Fibonacci dividents.[4]

According to a study by *Affleck, I*,[5] the golden ratio has appeared in a magnetic vacuum field during the annihilation of particles. In this paper, we have explained the correlation between the golden ratio and particle trails of quark-antiquark annihilations.

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