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On The Unification of Classical Mechanics with Quantum Mechanics: Field-Particle Duality; Why Hawking's Radiation Does Exist

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Abstract: ***What is light? According to classical mechanics, light is an electromagnetic radiation only, in other words, electromagnetic field. According to the quantum mechanics, light is packets of energy called quanta, in other words, light is bombarding of massless particle called photons. At times, light behave like a field, the other time, light behaves like a particle. Another example of particle of dual nature is an electron. At times, electron behaves like a field (interference property) and the other time, electron behaves like a particle. The limitation is that electron or photon is allowed to be one only, either field or particle and at a time both are not allowed. Now, either classical mechanics is correct or quantum mechanics is correct and both are not correct at the same time. In this paper, we will find an analysis that is compatible with both classical mechanics and quantum mechanics. The analysis can be termed as unification of classical mechanics with quantum mechanics. We will also realize that why Hawking's radiation does exist to reduce the mass and size of a black hole.***

Keywords: Light, Quantum Mechanics, Classical Mechanics, Black Holes, Hawking's Radiation

1. Introduction and the Theories

Theory 1: There is a critical mass M_C below which everything can be treated as force carrying particle and above which everything can be treated as ordinary particle. All matters are made of ordinary particle and energy is made of force carrying particle.

Theory 2: $E = mC^2$ is the relation between matter particle and force carrying particle. Energy is a form of mass built with particle below critical mass M_C.

Theory 3: There is a critical mass M_{CC} in the force carrying particle below which everything travels at a speed of light like photon, Higgs Boson and above M_{CC} (but below M_C), everything travels at the very close to speed of light but never at the speed of light, like electron.

Theory 4: Particle above M_C, matter characteristic is dominant and field characteristic is hidden. Similarly, particle between M_C and M_{CC} have dual nature characteristics – energy-particle duality. Particles below M_{CC} have dominant field characteristics and hidden matter characteristics.

Theory 5: Our body and Black Hole are natural oven to produce mass into energy (matter particle into force carrying particle). The same thing makes us to survive and the same thing makes the black holes to evaporate in terms of Hawking's radiation.

Because photons have mass less than the critical mass M_{CC} which is approximately the mass of Higgs Boson, photons go through the Higgs field, in other words, photons do not interact with the Higgs field. Thus, photons do not have any resistance in free space [1, 2] and that is the reason why photons achieve maximum speed limit of the Universe – the speed of light (C) [3, 4]. And the resistance-free photons look like massless to us because of the zero resistance provided by the Higgs field [5, 6]. Anything with zero resistance actually travels at the speed of light. Thus, all particles below critical mass M_{CC} travel at the speed of light and are massless. All particles below critical mass M_{CC} have dominant wave property and hidden matter property. Thus, photons looks like only interfere with each other and do not show particle collision [7, 8]. The lesser the mass, the higher is the degree of interference. The photons display better interference pattern compared to electron in double slit experiment. Figure one shows total interference and zero particle collision of photons.

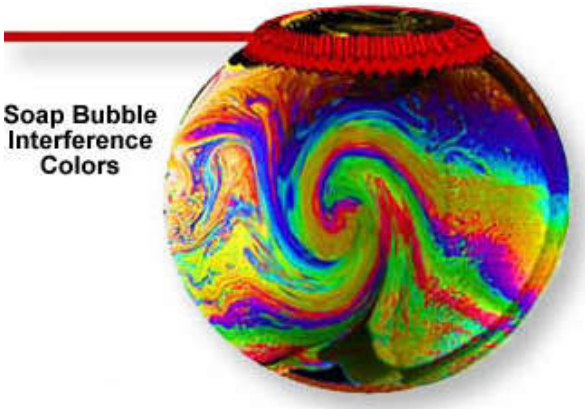

Figure 1: Photons with total interference property and zero matter property.

In phase interference enhance the result which is called constructive interference [9, 10]. And out of phase interference lower the resultant is called destructive interference [11, 12]. Figure 2 and figure 3 shows constructive and destructive interference.

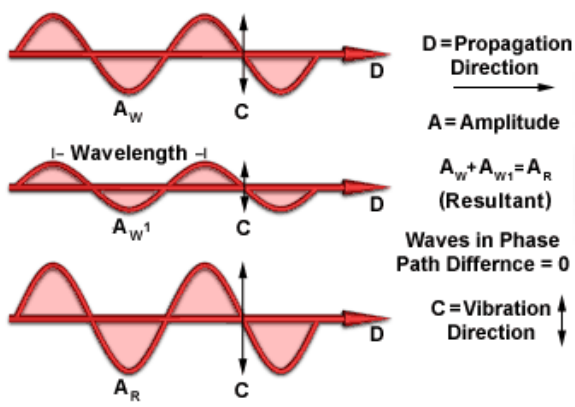

Figure 2: Constructive Interference

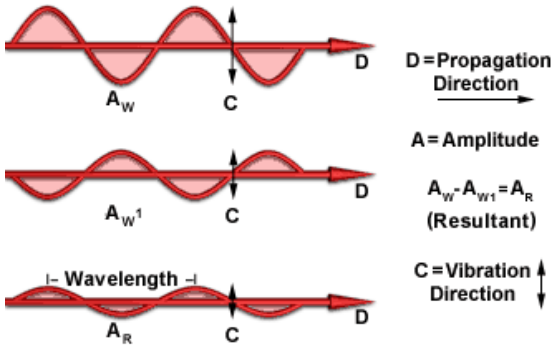

Figure 3: Destructive Interference

The lesser the mass, the higher the degree of Interference; because photons have mass below critical mass M_{CC} and electrons have mass above M_{CC} (between M_C and M_{CC}), photons show better interference compared to electron in double slit experiment.

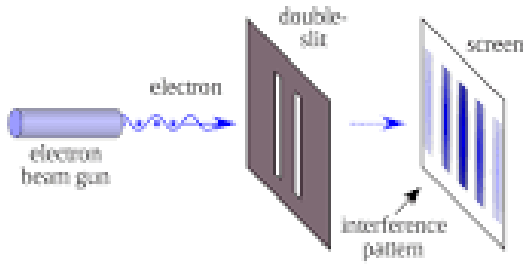

Figure 4: Electron's double slit experiment

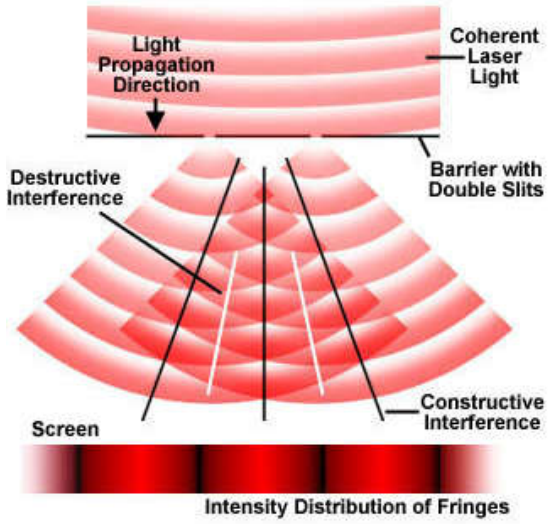

Figure 5: Photon's double slit experiment

We can detect masses of particles above critical mass M_{CC}, in other words, between M_C and M_{CC}, these are also force carrying particles but they have dual property, wave-particle duality. They can be termed as transition mass (between two critical masses M_C and M_{CC}), that is why they behave as energy – particle duality. They travel close to the speed of light but little below the speed of light [12, 13]. This explanation also combines classical mechanics with quantum mechanics and resolve the energy – particle duality problem. All particles above M_C are matter particle, they have dominant matter properties and hidden wave properties.

2. Why Black Holes Are Not So Black: Hawking's Radiation

There is nothing called free space. In the free space, there is constantly producing particle and anti-particle pair and recombination takes place of particle and anti-particle to produce energy again [11, 13]. Pair production is the creation of an elementary particle and its antiparticle from a neutral boson. Examples include creating an electron and a positron, a muon and an anti-muon, or a proton and an anti-proton. Pair production often refers specifically to a photon creating an electron-positron pair near a nucleus.

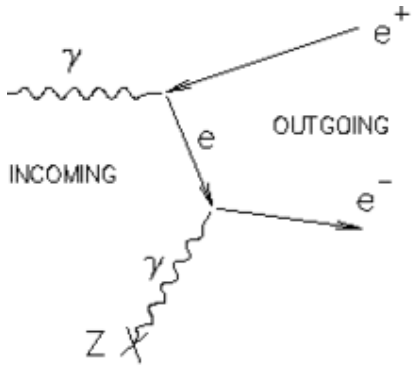

Figure 6: Pair production

Figure shows naturally occurring electron-positron annihilation as a result of beta plus decay [13].

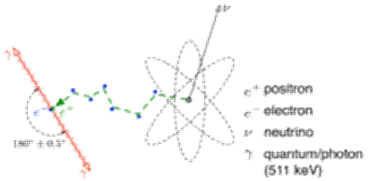

Figure 7: Electron-positron Annihilation

In the vicinity of black holes, all anti-particles (particles with negative mass) fall into the black holes and particles with positive masses escape to produce astronomical bodies like Sun, Earth etc. Because all anti particles fall in the black holes, anti particles collide with particles inside the black holes to produce radiation which we know as Hawking's radiation. Due to the recombination of particle and anti-particle inside the black holes, black holes mass and size gets reduced. Thus, black holes evaporate and they are not so black at all. Although, black holes also take positive masses inside, but they take more negative mass (anti-particle) compared to positive mass and that is why they are getting reduced in size and mass by evaporation in terms of Hawking's radiation. It proves that Hawking's radiation does exist.

3. Conclusion

We found an analysis of energy-particle duality that is compatible with both classical mechanics and quantum mechanics. The analysis can be termed as unification of classical mechanics with quantum mechanics. We also realized that why Hawking's radiation does exist to evaporate black holes to reduce its mass and size. Our body and Black Hole are natural oven to produce mass into energy (matter particle into force carrying particle). Although process is the same, but purpose is different. We use the natural oven to survive and the same thing makes the black holes to evaporate in terms of Hawking's radiation to reduce its size and shape. There is a critical mass M_C below which everything is force carrying particle and above which everything is ordinary particle. All matters are made of ordinary particle and energy is made of force carrying particle. There is a critical mass M_{CC} in the force carrying particle below which everything travels at a speed of light like photon, Higgs Boson and above M_{CC} (but below M_C) , everything travels at the very close to speed of light but never at the speed of light, like electron. Particle above M_C, matter characteristic is dominant and field characteristic is hidden. Similarly, particle between M_C and M_{CC} have dual nature characteristics – energy-particle duality. Particles below M_{CC} have dominant field characteristics and hidden matter characteristics.

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