CONVERSION OF GRAVITATIONAL FIELD ENERGY TO ELECTROMAGNETIC FIELD ENERGY.

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ABSTRACT: Electromagnetic wave energy increase's while moving toward the direction to the center of a gravitational field and decreases while moving toward the opposite direction to the center of the gravitational field. The amount of the change in energy depends on the wavelength & frequency, the mass of the matter which is creating gravitational field, the radius of the matter, and distance of the wave from the surface of the matter. The only changeable variable is the distance.

Key Words: Electromagnetic, gravitational field, wavelength & frequency, radius, Surface.

INTRODUCTION

Considering light as an electromagnetic wave it has no rest mass. To be more specific it has a negligible relativistic mass (while moving). So in Newtonian gravitation, gravity has no effect on light but through the equivalence principle, we see that gravity has some effect on light. To be more specific from General Relativity we know that mass creates carves on space-time fabric so light has to change its path. If we start from the equivalence principle, if we attach a laser on the top of a box falling freely in a gravitational field in the direction of the center of the field, in order to keep the velocity of the light beam constant, the wave length and frequency of that wave will change respectively.

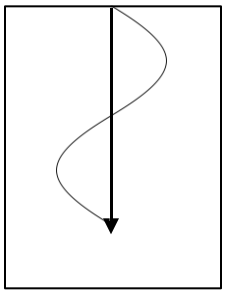


Fig: 1

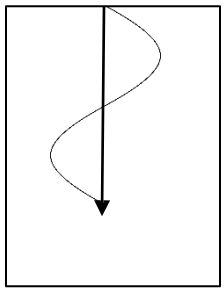
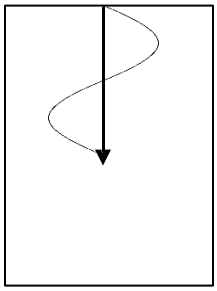


Fig: 2



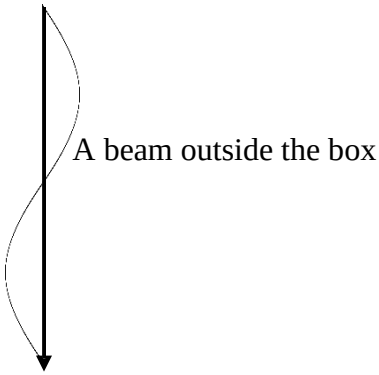


Fig: 4

Fig: 3

Fig 1, 2, 3 represents the state of the light beam inside the box while falling freely respectively & Fig 4 represents a light beam outside the box. The velocity will remain constant for the wavelength decrement and frequency increment. The wavelength will decrease the same amount as the box travels in the time of the light beam's movement. We know the energy of an electromagnetic wave depends on the wavelength (Planks quantum). The change will occur in the wavelength & wave frequency.

MATERIALS AND METHODS

Mathematical materials Introduction:

If the velocity of the light beam is **C**, then in the time **t** it will go **Ct** distance. The gravitational acceleration is **g**. The universal gravitational constant is **G**. Radius is **R**, Distance from the surface is **h** (height), Planks constant is **h**, Mass is **M**, the wavelength is **λ,** the frequency is **f**

The wave period is **T**(initial).

Mathematical prove:

Planks quantum theory says the energy of a photon is,

$$E= \frac{hc}{\lambda}$$

But in the box, we know that the wavelength decreases. So that the equation will be something like this, E= $\frac{hc}{\lambda-k}$ Where k is the decrement. This k depends on the movement of the box in the gravitational field. The displacement of the box in the time **T** [T=t] is,

$$k = \frac{1}{2}gT^2$$

$$\Rightarrow k = \frac{g}{2{f_o}^2} \quad [T(initial) = \frac{1}{f_0}]$$

Now the changed λ equation will be, $\lambda = \lambda_0 - \frac{g}{2{f_0}^2}$

We can substitute the g by $\frac{GM}{(R+h)^2}$ because the box represents the gravitational field. So the finial equation of λ will be,

$$\lambda = \lambda_0 - \frac{\frac{GM}{(R+d)^2}}{2f_0^2}$$

$$\Rightarrow \lambda = \lambda_0 - \frac{GM}{2(R+d)^2 f_0^2}$$

Now we can substitute the λ into the equation E= $\frac{hc}{\lambda}$ and by this we can find the final mathematical equation of this Energy.

$$E = \frac{hc}{\lambda_0 - \frac{GM}{2(R+d)^2{f_0}^2}}$$

In the opposite direction of the gravitational field the equation will be,

$$E = \frac{hc}{\lambda_0 + \frac{GM}{2(R+d)^2 {f_0}^2}}$$

CONCLUSION

I have used Newtonian Gravitational theory to avoid the complexity of General Relativity. Because the energy is a scaler that's why using the Newtonian Gravitational theory would not occur any error. From this, we can see that the gravitational field not only affects on the path of an electromagnetic wave but also the energy of the wave.