

The Bending of Light Due to Gravity Maintains the Constancy of the Speed of Light of Vacuum. The Fine Adjustments of Wavelength and Time Period make Wave Propagation Close to the Speed of Light of Vacuum in Other Medium

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Abstract: Matter particles can have variable speed depending on the amount of external force applied on these. Force carrying particles have only one fixed speed in vacuum – the speed of light which is the Universal speed limit of the Universe. It means that we cannot accelerate or decelerate the force carrying particles by external force. It implies that every force carrying particle is independent of the influence of other force carrying particles in terms of velocity. But the very speed is a very important property of either matter particles or force carrying particles that relates space with time. Wave propagation of force carrying particle is also independent of gravity too (in terms of acceleration or deceleration of the force carrying particles) as gravity itself is a force resultant of a kind of force carrying particles called gravitons. Under the influence of gravity, the wavelength and frequency deliberately shuffles so that the wave propagation can be close its constant speed at the speed of light in other mediums (like air, water, glass). If we stretch the wave of one period, the straight length of the wave always remains the same for every period disregard of under the influence of gravity (or any other field such as electromagnetic field, Higgs field etc.) or not with no variation in wavelength and frequency but in the other medium there are variations in the wavelength and the frequency (or time period) of the wave. Due to the variations of wavelength and time period (or frequency), the wave looks bent in other medium. The bent of light due to gravity or other force carrying particles makes straight displacement of light for a given time is less and it looks like as if time runs slow there with respect to the free space.

Keywords: Matter Particles and Force Carrying Particles, Higgs Field, Graviton, Wavelength and Frequency (Or Time Period), Wave Propagation – The Speed Of Light In Vacuum As The Universal Speed Limit Of The Universe.

1. Introduction and the Theories

Theory 1: The speed of wave propagation never changes under the influence of gravity because of the bent of wave due to gravity is without internal shuffles of Wavelength and Time period of the wave under the influence of any force carrying particles like graviton.

Theory 2: The wave propagation appears to be more bent in the four dimensional space-time to incorporate the increased mass of a moving body to maintain the constancy of the speed of wave propagation

The speed of wave propagation for free space can be defined as [1, 2]

$$\lambda_0 \nu_0 = C \quad (1)$$

Where, λ_0 is the wavelength of the wave at free space

ν_0 is the frequency at free space

C is the speed of light in vacuum

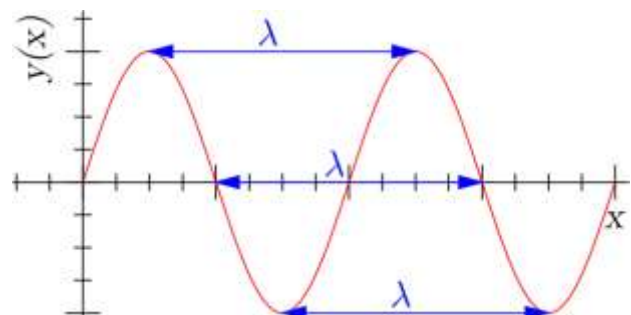


Figure: Wavelength of a sinusoidal wave

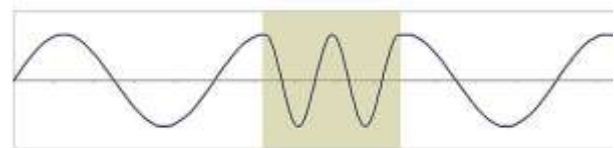


Figure: Wavelength decreases with medium with slower propagation.

The wave is approaching from Body A to Body B with a velocity C with uniform wavelength λ and uniform frequency ν [3, 4]. The wavelength bent inward due to gravitational effect of body A and body B without changing the wavelength λ and frequency ν . CD is the length where wave travels in the free space.

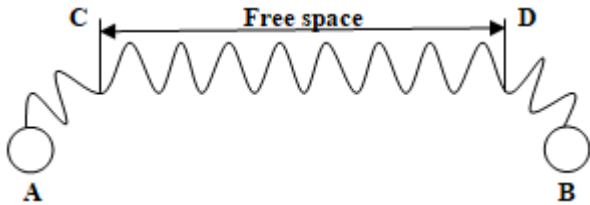


Figure: Wave propagation between body A and body B

If the Body A and body B move on either side [5-10], the wavelength λ and frequency ν shuffles on each other to attain new value at different mediums (like air, water, glass) to slow down wave propagation to C' but to maintain it very close to C where $C' \leq C$. Suppose the new values are λ' ($\lambda' \leq \lambda$) and ν' ($\nu' \geq \nu$).

$$\lambda' \nu' = C' \quad (2)$$

If T is the time period, then the relationship of time period T and frequency ν can be written as [11-16]

$$T = \frac{1}{\nu} \quad (3)$$

$$\text{Or, } \nu = \frac{1}{T} \quad (4)$$

Then, the equations (1), (2) can be written as [17-22],

$$\frac{\lambda}{T} = C \quad (5)$$

$$\frac{\lambda'}{T'} = C' \quad (6)$$

2. The Bending of Light Is the Key to the Constancy of the Speed of Wave To The speed of Light in Vacuum

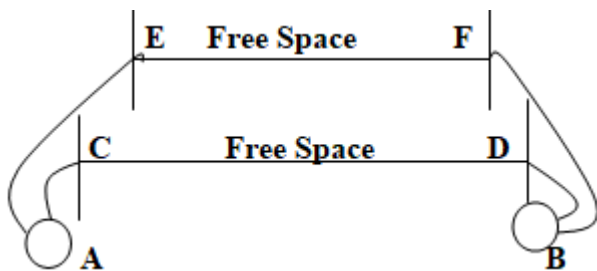


Figure: Variation of bending of light

Suppose, body A and body B have masses m_1 and m_2 respectively. Under normal condition, wave propagation bent little due to gravity of body A and body B with no bending in free space CD. If body A and body B moves on either side [23-26], either moving inward and moving away, the effective masses of both the bodies increases to m'_1 and m'_2 respectively, where, $m'_1 \geq m_1$ and $m'_2 \geq m_2$. Because of the increase of the effective masses, gravity also increases of both the body, thus, the bending of light also increases compared to the above said normal condition with no bent of wave at free space EF. Due to more bending of light, the wave travels less in straight path, for observers in body A or in body B sees time runs slow because the wave travels less straight distance due to higher bending. The bending is

directly proportional to the mass increments of both the body. The internal shuffles between bent of light and masses of the bodies is so fine tuned that for observer in body A or body B, the wave propagation always looks constant disregards of bodies A and B moving inward or away.

3. Conclusion

Matter particles can have variable speeds depending upon the external forces applied. But external force does not have any effect on the speed of the wave propagation. It only effects the direction of wave propagation. Light is bent due to the influence of gravity is an example of change of direction of wave propagation. Lights get bend due to gravity without changing its wavelength and frequency (or time period). Due to the bending of light, straight path travelled by light is less compared to the travel in free space, for an observer on either body (sending body of light or receiving body of light) with gravity sees time has slowed down compared to the free space (inertial frame of reference). Thus, bending of light is the key to the constancy of the speed of light with reference to the speed of light in vacuum- the Universal speed limit of the Universe.

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