What is the Space?

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Abstract. By the unified theory of dynamic space has been there a forecast of the follow observation that, parallel moving photons of different frequency, reduce locally the cohesive pressure of space, resulting to move with different speeds. So, the photons with higher frequency slow down against parallel moving photons with lower frequency, as on delay in gamma rays from galaxy Markarian 501 was observed. This observation proves that space contains unseen forces, which are evident as deformations of space, such as in the above theory are described. Accordingly, for the great problem of Physics and Philosophy, "What is the space?", there is the answer-solution: "The dynamic space".

1. Forecast of delay in gamma rays from Markarian 501

In the unified theory of dynamic space[1,2] the speed of light[3]

$$C_0 = \sqrt{\frac{P_0}{d_m}} \tag{1}$$

is determined as the transmission speed of the disturbance into the tense dynamic space. So, the E/M wave-light[4] could be considered as a disturbance of the elastic-dynamic space, where P_0 the cohesive pressure[5] of space in our region and d_m the Universal constant mass density.[6]

Dividing the members of[7]

$$P_{0x} = P_{0p}\frac{x^2}{R_0^2} \tag{2}$$

with d_m and due to Eq. 1, we have

$$P_{0x} = \frac{P_{0p}x^2}{R_0^2} \Rightarrow \frac{P_{0x}}{d_m} = \frac{P_{0p}}{d_m} \cdot \frac{x^2}{R_0^2} \Rightarrow C_{0x} = \frac{C_{0p}}{R_0}x, \tag{3}$$

where C_{0x}, P_{0x} are respectively the light speed and the cohesive pressure of space in a region within a distance x from the Universe center of constant radius R_0[8] and C_{0p}, P_{0p} are respectively the constant speed of light and the constant cohesive pressure at its periphery.

It becomes obvious, that the light speed $C_{0x} = xC_{0p}/R_0$ (Eq. 3) depends on the distance x from the Universe center and therefore it is not a Universal constant, but it is a local constant equal to $C_0 = 3 \cdot 10^3 \text{m/sec}$ in our region.

However, the light speed $C = \sqrt{P/d_m}$ (Eq. 1), where

$$P = P_0 - \Delta P \tag{4}$$

is the remaining[9] cohesive pressure of space, reduced at the pressure difference ΔP, which is caused by the resultant force $F_p = 2f_\tau/\pi$ (Eq. 8) parallel to the motion of photon[4] of a frequency ν and energy[10]

$$E = h\nu. \tag{5}$$

Therefore, parallel moving photons of different frequency, reduce locally the cohesive pressure, resulting to move with different speeds. So, the photons with higher frequency slow down compared to parallel moving photons with lower frequency, as in the follow theoretical proof is described.
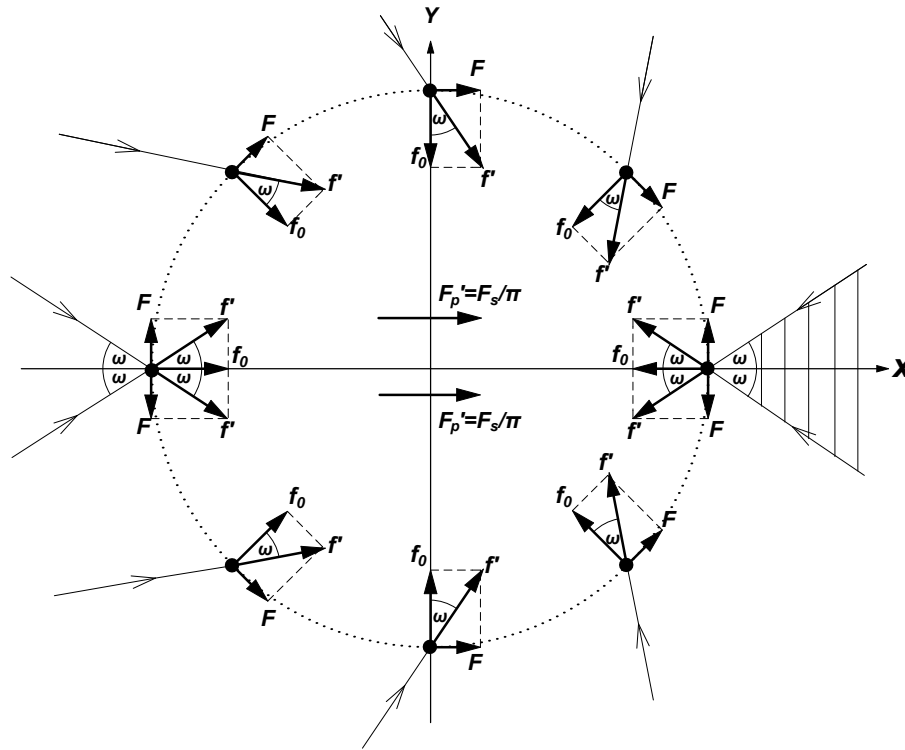
Figure 1. Accumulation of motion force F on the particle spherical zone and parallel resultant force $F_p = 2F'_p = 2F_s/\pi$

This forecast was made by the theory of dynamic space from October 2006.[11] One year later (October 2007), from researchers at the observatory (Magic telescope on La

Palma), it has been recorded a 4 min delay in high-energy photons (gamma rays) from galaxy Markarian 501. Below it follows the theoretical proof of the phenomenon, as formulated by the creator of this theory Professor Physicist N.Gosdas at congress of Hellenic Physicists Society (Kavala, March 2008):

In Fig. 1 the accumulated force[12] $F_s/2$ on the hemisphere and the parallel resultant $F_p' = F_p/2$ are analogous respectively to the semi circumference $\pi d/2$ of the particle spherical zone and to the diameter d, namely it is

$$F_p' = \frac{F_p}{2} = \frac{F_s}{2} \cdot \frac{d}{\pi d/2} = \frac{F_s}{\pi} \Rightarrow F_p = \frac{2F_s}{\pi}. \tag{6}$$

So, $F_p = 2F_s/\pi$ (Eq. 6) is the resultant force parallel to motion of the particle.

The reduction of space cohesive pressure P_0 that is caused by the accumulated force F_s is equal to force talantonion[10] of fundamental E/M wave,[4] by which the photon[4] of frequency ν has been constituted, namely it is

$$F_s = f_\tau. \tag{7}$$

Therefore, the parallel resultant force (Eq. 6) to the motion of photon, due to Eq. 7, becomes

$$F_p = \frac{2F_s}{\pi} = \frac{2f_\tau}{\pi} \Rightarrow F_p = \frac{2f_\tau}{\pi} \tag{8}$$

and exerted on the cross section S of diameter[13] $d = \lambda/2$ (Fig. 2), that it is

$$S = \frac{\pi d^2}{4} = \frac{\pi \lambda^2}{16} \Rightarrow S = \frac{\pi \lambda^2}{16} \tag{9}$$

and due to $\lambda = C_0/\nu$ the Eq. 9 becomes

$$S = \frac{\pi C_0^2}{16\nu^2}. \tag{10}$$

It is noted that the cross section $S = \pi \lambda^2/16$ (Eq. 9) exists, due to the spin[4,14] of the photon around the axis in the motion direction (Fig. 2). The pressure difference ΔP that the force $F_p = 2f_\tau/\pi$ (Eq. 8) causes on the cross section $S = \pi C_0^2/16\nu^2$ (Eq. 10) will be reduced from P_0 and will be then

$$\Delta P = \frac{F_p}{S} = \frac{32 f_\tau \nu^2}{\pi^2 C_0^2} \Rightarrow \Delta P = \frac{32 f_\tau \nu^2}{\pi^2 C_0^2}. \tag{11}$$

So, the reduced speed of photon $C = \sqrt{P/d_m}$ (Eq. 1), due to Eqs 1, 4 and 11, becomes

$$C = \sqrt{\frac{P}{d_m}} = \sqrt{\frac{P_0 - \Delta P}{d_m}} = C_0 \sqrt{1 - \frac{32 f_\tau \nu^2}{\pi^2 C_0^4 d_m}} \tag{12}$$

and

$$C = C_0 \sqrt{1 - \frac{32 f_\tau \nu^2}{\pi^2 C_0^4 d_m}}. \tag{13}$$

Therefore, H/M waves with higher frequency have lower speeds and are slower than those with lower frequency.

We set in Eq. 13 the $f_\tau = 11,87 \cdot 10^{25}$N,[10] $C_0 = 3 \cdot 10^8$m/sec and $d_m = 0,864 \cdot 10^{134}$Kg/m³,[6] so

$$C = 3 \cdot 10^8 \sqrt{1 - \frac{0,55}{10^{141}}\nu^2} \tag{14}$$

and approximately

$$C = 3 \cdot 10^8(1 - \frac{1}{2} \cdot \frac{0,55}{10^{141}}\nu^2) \Rightarrow C = 3 \cdot 10^8(1 - 0,275 \cdot 10^{-141}\nu^2). \tag{15}$$

The reduction, of course, of the photons speed with an increased frequency is very small, but not negligible for the gamma rays from galaxy Markarian 501, which is half a billion light-years away.
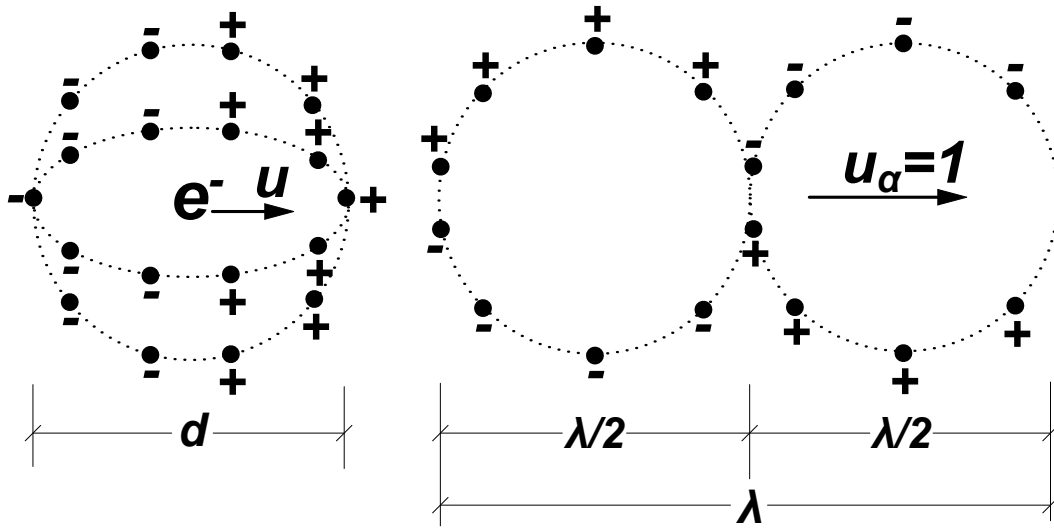
Figure 2. Correlation of a meridians pair (talantonion) with a fundamental E/M wave ($d = \lambda/2$, $s = 1$[4, 14] and $u_a = 1$ the constant timeless speed[15] of light)

This observation proves the high-energy photons was moved in space that is not empty but contains unseen forces, which are evident as deformations of space,[16] such as are described in the unified theory of dynamic space.[1, 2] Accordingly, for the great problem of Physics and Philosophy, "What is the space?", there is the answer-solution: "The dynamic space".

2. References

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