

Alternative to Doppler Effect for Red Shift in Cases of Long Distant Celestial Objects

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Abstract: Red Shift and intensities of illumination are the only observable parameters in case of long distant celestial objects like galaxies, quasars etc., which are visible in their ancient past. The Red Shifts, observed in these cases have been so far interpreted on the basis of Doppler Effect and gravity. It is postulated here that the celestial bodies were in a different stage of evolution, in remote past, when they have emitted the signals that are received now by terrestrial observers. The properties of space governing speed of light, such as permeability and permittivity were assumed to be different in that stage of evolution; which yields Red Shifts.

Keywords: Speed of light, permeability, permittivity, stage of evolution

I. Introduction

Evidence, that speed of expansion of Universe was much higher in its inflationary phase, than the present speed of light is recently gathered by the international experiment on BICEP (Background Imaging of Cosmic Extra Galactic Polarization) conducted at South Pole [1]. It was proposed, since long, by Piero Caldirola and Erasmo Recami [2] also by Stephen Hawking [3], that the speed of light would also have been higher in remote past, than its present value. This indicates the possibility that the speed of light might not have instantaneously reduced but it would have come down gradually. The long distant celestial objects, while in primitive stage of evolution, hence might have sent faster than light signals which could now be detectable with the help of modern equipment. Possibility of superlight signals was already reported, radio-astronomically in case of Quasar 3C 273 and Micro-quasar GRS 1915+105 by Falla and Floyd [4], also by Jayant Narlikar in case of radio galaxy 3C120 [5]. Explanations within the present speed limit of light are put forth, however, alternatives may also be considered. Production of superluminal photons, artificially, is also claimed by "Quantum Tunnelling" by Gunter Nimtz and colleagues at the University of Cologne, Steven Chu and Stephen Wong in Bell Labs in New Jersey, Raymond Chiao and his team in California University at Berkeley [6].

Neutrino is yet another candidate entity which may exhibit superluminal motion. Recently there has been a controversy over flux of superluminal neutrinos, detected astronomically by Ereditato Antonio in case of Supernova 1987a [7] and observed in CERN [8].

An alternative to Doppler Effect, for explaining Red Shift, based on the assumption that properties of early Universe might be such that its contents could have been able to emit superluminal entities [9] is put forth in this paper. There is, however, a qualitative difference between superluminal photon and a mathematical entity named as Tachyon by Gerald Feinberg [10], The Tachyon, according to E.C.G. Sudarshan, Bilaniuk, P. Caldirola, R.Mignani contains $i = \sqrt{-1}$ during its faster than light motion [11] hence it is an imaginary quantity. It is supposed to move backwards in time with negative energy as per Erasmo Recami and Piero Caldirola [12] while the observations pertain to real superluminal motion, aligned with the Arrow of time.

II. Postulates

- (i) **Speed of light** in vacuum, which was believed to be **higher in early Universe**, is postulated to reduce gradually to its present value along with increase in entropy, during cosmological evolution that causes variation in so called Hubble's constant.
- (ii) There is a **quantitative variation** in properties of matter and space including its magnetic **permeability** and **permittivity over a period of time**. They were different in remote past when the long distant celestial objects have emitted signals which are received now by the observers in present stage of evolution.

1. A Signal from Remote Past

Gradual deviation from straight line is being observed in Hubble's diagram of 1929, by subsequent researchers [13] as the range of distance of observers has increased to radio-galaxies, quasars, pulsars etc. Variation in Hubble's constant, for far away objects could be due to increase in speed of light, as

$$\text{Hubble's constant} = H = \frac{cz}{D} = \frac{(\text{Speed of light}) \times (\text{Red Shift})}{(\text{Distance})}$$

In superluminal case, $H' = \frac{c'z}{D}$ where $c' > c$ therefore $H' > H$, causing upward deviation at higher magnitude of D.

III. Hubble Diagram

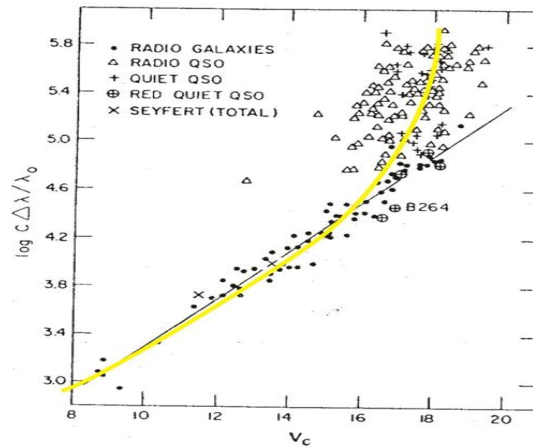


Figure 1. Hubble diagram for quasars with Δ and without + radio emission, radio galaxies \bullet , Seyfert and N galaxies etc \oplus . The velocity of recession $v = c\Delta\lambda/\lambda_0$ in km/s is plotted logarithmically against the apparent magnitude V_c , which is corrected in the case of galaxies for interstellar absorption, reddening due to the redshift, etc., but is uncorrected in the case of quasars.

Yellow line is by author.

Courtesy : Albrecht Unsöld, The New Cosmos, 2nd Revised and enlarged edition, 1977, Springer Verlag, New York, page-383, Fig-30.2

Let permeability and permittivity of free space in remote past be μ'_0 and ϵ'_0 respectively so that the speed of light at that time would have been

$$c' = \frac{1}{\sqrt{\mu'_0 \epsilon'_0}} \tag{1a}$$

While the speed of light reaching the observer in present stage of evolution is

$$c = \frac{1}{\sqrt{\mu_0 \epsilon_0}} \tag{1b}$$

$$\therefore \frac{c'}{c} = \sqrt{\frac{\mu_0 \epsilon_0}{\mu'_0 \epsilon'_0}} = \sigma, \text{ say .}$$

Therefore,

$$c' = \sigma c \tag{2}$$

Now,

$$\lambda = \frac{c}{\nu} \text{ and } \lambda' = \frac{c'}{\nu'}$$

$$\frac{c'}{c} = \sigma = \frac{\nu' \lambda'}{\nu \lambda}$$

$$\therefore \lambda = \left(\frac{\nu'}{\nu}\right) \frac{\lambda'}{\sigma} \tag{3}$$

$$\lambda_{\text{observed}} = \left\{ \frac{\nu'}{\nu} \sqrt{\frac{\mu'_0 \epsilon'_0}{\mu_0 \epsilon_0}} \right\} \lambda'_{\text{emitted}} \tag{4}$$

Shifting of spectral lines towards Red or Blue ends occurs depending upon whether the quantity

$$\left\{ \frac{\nu'}{\nu} \sqrt{\frac{\mu'_0 \epsilon'_0}{\mu_0 \epsilon_0}} \right\} \text{ is } \begin{matrix} > \\ < \end{matrix} 1.$$

From observed Red Shift $\{\nu' \sqrt{\mu'_0 \epsilon'_0}\} > \{\nu \sqrt{\mu_0 \epsilon_0}\}$.

Alternatively it may also be assumed that $c' = \frac{k}{\sqrt{\mu'_0 \epsilon'_0}}$, where k could be yet another constant depending upon stage of evolution.

IV. Discussion

Shifting of spectral lines would naturally occur even if the observer and the object are at a constant “physical” distance from one another. It would be more rational to rely on Maxwell’s formulation of which one of the outcomes is $c = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$; rather than farfetched application of Doppler’s Effect to the remote celestial

objects so as to interpret that they are receding. Explaining red-shift on the basis of **enhancement in wavelength** due to difference in degrees of evolution appears **more rational** than the so called expansion of the entire universe in void. It is urged in this paper, to differentiate, qualitatively between matter and space within the solar system and the one belonging to far away celestial objects. Explaining Red Shift on the basis of Doppler Effect is hence urged not to take it for granted as an evidence for expansion of Universe. The naturally occurring Doppler Effect due to variation in the celestial distances is dominated by Evolutionary Red-Shift so that the net result is ubiquitous red-shift thereby creating illusion of expansion of universe. The Doppler contribution, towards Red or Blue end, could, however, be very less than the Red Shift due to difference in degrees of evolution so that the **net observed** effect is a **Red Shift**.

Besides natural variation in permeability and change in speed of light accordingly, there could also exist a probability that some superlight entities may overtake the barrier of permeability, naturally or artificially, resembling quantum tunnelling and arrive at earth with superlight velocity.

Scope of this paper is **limited to the Doppler interpretation** of the Component of Red-Shift observed for very long distant celestial objects .It is neither intended to comment nor infer anything about gravitational, anomalous or any other types of Red-Shifts nor about the probable expansion of Universe.

V. Conclusion

The difference in degrees of evolution between long distant celestial objects and the observer results into enhancement of the observed wavelength so as to cause perceptible Red Shift. Farther the distance more the difference in degree of evolution leading to higher magnitude of Red Shift, meaning that the universe need not physically expand to yield Red Shift. Red Shift is an indication that the light coming from remote past has been carrying ancient degree of evolution. Interaction of an observer in present stage with an ancient photon may also be defined as **Relativity of Stages of Evolution**.

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