An Explanation of Redshift in a Static Universe

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A review of the literature on the Lyman alpha forest gives direct evidence on the dynamics of the universe. In an expanding universe one would expect the average temperature of the universe to fall as it expands - but a review of the Doppler parameters of the Hydrogen clouds in Quasar spectra shows that contrary to this, they are increasing in temperature (or at least, becoming increasingly disturbed) as the universe ages. Additionally, in an expanding universe, hydrogen clouds must become further apart with time, so, as redshift increases, the clouds would be closer together. Instead, the evidence is that, on average, they are evenly spaced up to a redshift of one - if not beyond. How can this be so if the universe is expanding? Especially since this range of redshifts includes the supernovae data used to show '*acceleration*' and so called '*time dilation*.' Taking these results in isolation implies that the universe has been static for at least the last billion years or so and therefore a new model of redshift is needed to explain redshifts in a static universe.

The model proposed here is that in a static universe, photons of light from distant galaxies are absorbed and reemitted by electrons in the plasma of intergalactic space and on each interaction the electron recoils. Energy is lost to the recoiling electron (New Tired Light theory) and thus the reemitted photon has less energy, a reduced frequency and therefore an increased wavelength. It has been redshifted. The Hubble relationship becomes '*photons of light from a galaxy twice as far away, make twice as many interactions with the electrons in the plasma of IG space, lose twice as much energy and undergo twice the redshift*.' A relationship between redshift and distance is found and, using published values of collision cross-sections and number density of electrons in IG space, a value for the Hubble constant is derived which is in good agreement with measured values. Assuming that the energy transferred to the recoiling electron is emitted as secondary radiation; the wavelength is calculated and found to be consistent with the wavelengths of the CMB. On the basis that plasma clouds result in periodicity or 'quantised' galaxy redshifts it is shown that the average spacing between hydrogen clouds (z = 0.026) compares favourably with an average spacing between galaxy clusters (z = 0.023). A test of this theory in the laboratory is proposed whereby a high powered laser could be fired through sparse cold plasma and the theories predicted increase in emission of microwave radiation of a particular frequency determined.

1. Introduction

Despite the idea of an expanding universe having been around for almost one hundred years, there is still no direct physical evidence to show expansion. True, there are redshifts that increase in proportion to distance - but to assign these redshift as '*velocities*' is not '*direct evidence*' but an interpretation of these results in terms of an expansion idea. Edwin Hubble purged from his vocabulary the term '*radial velocity*' and instead used '*redshift*' on the basis of '*that's what you measure*'. [1] In the same way, supernovae '*time dilation*' is not direct evidence. What is seen is that the multicolor light curves from distant type Ia supernovae take longer to rise and fall the further away the supernovae are. [2] This is not '*direct evidence*' for relativistic '*time dilation*', but rather an interpretation of these results in terms of an expansion idea.

To find direct evidence, one way or the other, initially, this paper looks at the light from distant quasars which, according to main stream ideas are at vast distances from Earth. This light has been traveling across the universe for almost its entire history. On its way, the light passes through Hydrogen clouds - which have also been there since time immemorial (or so we are told) and each cloud absorbs a particular frequency of photon (Lyman alpha line). This line is then redshifted before the light passes through the next cloud which again absorbs this particular frequency of photon. In this way a whole forest of lines is built up and known as the Lyman alpha forest. By studying the lines in this forest, we can find direct evidence of the dynamics of the universe for the majority of its '*life*'. [3]

2. Line Counting and Average Cloud Separation

As a measure of the spacing of the Lyman alpha lines, the line density (dN/dz) is often quoted. This is the number of lines (N) per unit redshift (z).

In a static, non expanding, universe the Hydrogen clouds, on average, have a constant distance between them and so the absorption lines will be equally spaced with redshift and hence time. Here the line density will be the same for all redshifts. In a universe which is contracting, the Hydrogen clouds and hence the lines will become closer and closer together with time and thus the line density will decrease as the redshift increases. In a universe that is expanding, the hydrogen clouds and hence the absorption lines will become further and further apart with time and thus the line density will increase as the redshift increases.

The line density is usually expressed as:

$$dN/dz = \left(dN/dz\right)_0 \left(1+z\right)^{\gamma} \quad (1)$$

$$dN/dz \propto \left(1+z\right)^{\gamma} \quad (2)$$

where γ is a constant [4] and $(dN/dz)_0$ is the line density at zero redshift. Bechtold states that for $0 \le q_0 \le 0.5$, if $\gamma > 1$ then "*there is intrinsic evolution in the observed number density of absorbers*." From a study of 34 high redshift QSO's with $z > 2.6$, it was found that $\gamma = 1.89 \pm 0.28$ and concluded that there '*must*' be intrinsic evolution [5]. Similar values for γ were reported by other workers [6,7,8,9,10]. Since the Hydrogen clouds appeared to be disappearing at a greater rate than was expected from expansion alone, other, additional, mechanisms put forward were both the thinning out of the clouds due to galaxy formation and the effect of UV radiation from Quasars ionizing the Hydrogen atoms within the clouds. The combined result of these effects would be a reduction in the number density of the clouds and/or a reduction in their collision cross-section and thus a reduction in (dN/dz). For observations in the low redshift region one had to wait until the Faint Object Spectrograph (FOS) on the Hubble Space Telescope came into operation as Lyman – alpha lines in this region are still in the UV and had not been redshifted enough to move into the visible region and be observable by ground based instruments. Weymann et al studied 63 QSO's and 987 Lyman alpha lines in the range 0.0 to 1.5 and when these were analysed it came as quite a surprise that there were many more lines per unit redshift than expected from merely extrapolating the line from high redshift [11]. They found the evolution almost flat giving the value of $\gamma = 0.1\text{-}0.3$ in this region. These results have been supported by other workers [12,13].

Hydrodynamic simulations designed to explain this phenomenon included the assumption that the UV background declines at low redshift in concert with "*the declining population of quasar source*" [14]. However, this is now known not to be the case as many more quasars in this redshift range are known to exist than previously thought [15].

More recently, further studies give more startling conclusions. Janknecht, E et al. [16] looked at the range $0.5 < z \le 1.9$ and stated, quote, "*A comparison with results at higher redshifts shows that it* (dN/dz) *is decelerated in the explored redshift range and turns into a flat evolution for* $z \to 0$." Lehner et al [17] looked at results for the range $z > 0$ and $z \le 0.4$ and stated, quote: "dN/dz *is very similar for either column density range implying no redshift evolution of* dN/dz *between* $z > 0$ *and* $z \le 0.4$." Kirkman et al. [18] looked at 74 QSO's in the range $0 < z \le 1.6$ using the HST FOS but instead of 'line counting' chose to use measurements of the flux decrement (DA) in the Lyman alpha region of the spectra as a function of redshift. They concluded that if the absorption came from lines with fixed rest equivalent widths then there was, quote: "*no change in the number of lines per unit redshift.*" [Fig.1]

Since (dN/dz) is the number of lines per unit redshift then the reciprocal of this quantity (dz/dN) is the average spacing between Hydrogen clouds in redshift space and hence distance (certainly in the local region). Consequently, what these results are saying is that even though these clouds have differing redshifts 'showing expansion effects', they still manage to be, on average, evenly spaced. Taking the Kirkman result by itself shows that the clouds are evenly spaced over a redshift range from 0.0 to 1.6 – a region that includes most of the supernovae used to show time dilation and hence both expansion and acceleration [2].

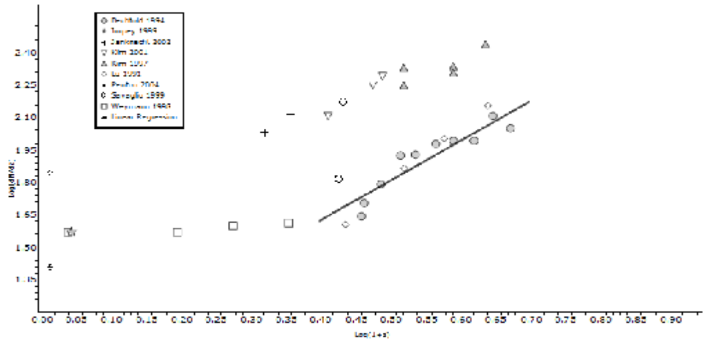

Fig. 1. Graph of log(dN/dz) versus log(1 + z)

Whilst it must be said that these results are consistent with a universe that expanded in the past, but, about one billion year ago (redshift unity) it came to rest, and has been static since; there remains the problem of '*how is it that these Hydrogen clouds can be equally spaced, on average, and yet have differing redshifts?*' Unless, in a static universe, redshifts are caused by another mechanism and the one proposed here is the 'New Tired Light' theory.

3. The Doppler Parameter '*b*' as a Measure of Temperature

This Section looks in detail at the temperature (or at least the temperature and/or degree of disturbance of the Hydrogen clouds) and how it has changed as the universe 'ages.' In an expanding universe the theory predicts that, as the universe expands, it will cool down. One would expect this to be reflected in the data on the Hydrogen clouds themselves. Looking at the width of the Lyman alpha lines gives us a measure of the temperature of the Hydrogen cloud concerned. The higher the temperature of the cloud, the broader the line due to Doppler effects. It must be said that a higher degree of disturbance also broadens the lines but at least the width of a line gives an upper limit to the temperature of the cloud. The Doppler parameter, b, gives an indication of the width (and hence the maximum temperature) of that Hydrogen cloud and is found from the width of the Lyman-alpha lines. The Doppler Parameter (b) is related to the temperature of the gas by:

$$b^2 = b_{th}^2 + b_{nt}^2 \quad (3)$$

where b_{th} and b_{nt} are the thermal and non thermal broadening of the line and so 'b' gives an upper limit to the cloud temperature.

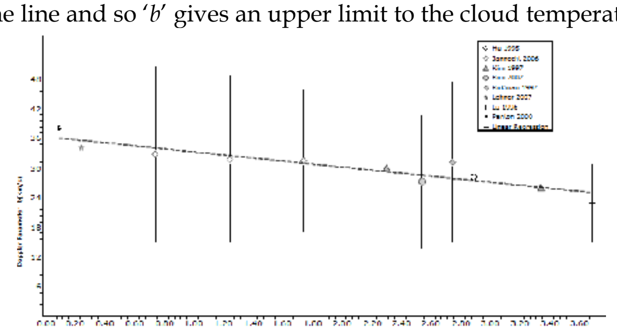

Fig. 2. Mean Doppler Parameter Versus Redshift

From a search of the literature [8,16,18,19,20,21,22,23,24] we can determine how 'b' and hence the upper limit of cloud temperature has changed over redshift and hence time (uncertainties shown where available). [Fig.2.]

It can be seen that rather than decreasing in temperature the clouds are either at a constant temperature or show a gradual increase as time goes on – contrary, it would appear, to the predictions of the big bang theory. Taking all the results together we can smooth the data by eye and find the reciprocal to show how the average separation of the Hydrogen clouds has changed over time and compare this with the Doppler parameters. [Fig. 3]

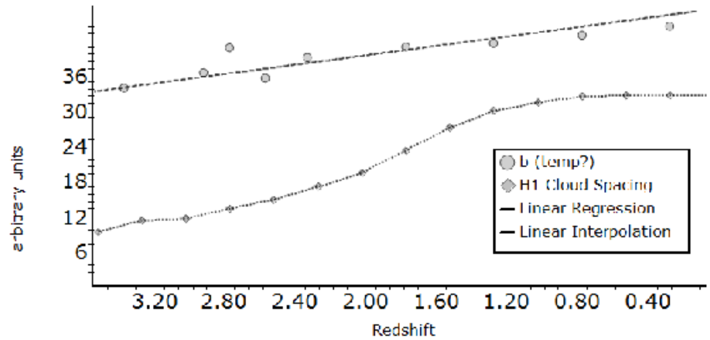

Fig. 3. All Data Versus Redshift

If all these hydrogen cloud observations mentioned above are taken at face value, it would appear that the universe is static, at least out to a redshift of 1.6. This, then, requires a re-examination of the cause of the redshift.

4. Introduction to 'New Tired Light'

In the 'New Tired Light' theory [25], Intergalactic space (IG space) is treated as a transparent medium with the medium itself being plasma. When photons travel through any transparent medium they are continually absorbed and reemitted by the electrons in the medium. French [26] states "*the propagation of light through a medium (even a transparent one) involves a continual process of absorption of the incident light and its reemission as secondary radiation by the medium.*" Feynman [27] describes the transmission of light through a transparent medium simply as "*photons do nothing but go from one electron to another, and reflection and transmission are really the result of an electron picking up a photon, 'scratching its head', so to speak, and emitting a new photon.*" The plasma of Intergalactic space acts as a transparent medium and photons of light, as they travel through space, will be absorbed and reemitted by the electrons in this plasma. Since there is a delay at each interaction where the momentum of the photon is transferred to the electron, the electron will recoil both on absorption and reemission - resulting in inelastic collisions [28].

A double Mössbauer effect will occur during each interaction between photon and electron. Some of the energy of the photon will be transferred to the electron and since the energy of the photon has been reduced, the frequency will reduce and the wavelength will increase. It will have undergone a 'red shift'. On this basis red shift becomes a distance indicator and the distance - red shift relation (Hubble's law) becomes: photons of light from galaxies twice as far away will travel twice as far through the IG medium, make twice as many collisions and thus undergo twice the red shift. Of course, it is not as simple as that as the redshift is invariant with wavelength and, as we shall see later, this is explained by the fact that not all photons have the same collision cross-section.

5. Redshift in Photon-Electron Interactions

Electrons in the plasma of IG space (or any plasma for that matter) can perform SHM and any electron that can perform SHM can absorb and reemit photons of light. [29,30]. To quote, "*The electron just has a natural oscillation frequency equal to the local plasma frequency, and we get a simple picture of resonance absorption in terms of the driving field being in resonance with this natural frequency….*" [31]. The plasma in IG space is known to have a frequency of less than 30Hz [32] and so the driving field i.e. the photon of light, has a driving frequency far above resonance. In consequence, resonance absorption will not take place and the photon will always be re-emitted. In the sparsely populated plasma of intergalactic space the electron will not only absorb and reemit the photon but will recoil each time. The energy lost to the recoiling absorbing/emitting system is well known [33] and given by:

Energy lost to an electron during emission or absorption = $Q^2 / 2m_e c^2$, where Q is the energy of the incoming photon, m_e the rest mass of the electron and c the speed of light.

This must be applied twice for absorption and reemission. Hence, total energy lost by photon = $Q^2 / m_e c^2 = h^2 c^2 / \lambda^2 m_e^2$ (energy before interaction) – (energy after) = $h^2 c^2 / \lambda^2 m_e^2$

$$hc / \lambda - hc / \lambda' = h^2 / \lambda^2 m_e \tag{4}$$

③ = initial wavelength of photon, ③ = wavelength of the reemitted photon.

Multiplying through by $\lambda^2 \lambda' m_e$ and dividing by h, gives:

$$\lambda \lambda' m_e c - \lambda^2 m_e c = h\lambda' \tag{5}$$

Increase in wavelength $\delta\lambda = \lambda' - \lambda$, so:

$$\lambda (\delta\lambda + \lambda) m_e c - \lambda^2 m_e c = h(\delta\lambda + \lambda) \tag{6}$$

=> $$\lambda m_e c \delta\lambda + \lambda^2 m_e c - \lambda^2 m_e c = h\delta\lambda + h\lambda \tag{7}$$

=> $$\delta\lambda \left(\lambda m_e c - h \right) = h\lambda \tag{8}$$

since $h = \lambda m_e c$

$$\delta\lambda = h / m_e c \tag{9}$$

On their journey through IG space, the photons will make many such collisions and undergo an increase in wavelength of $h / m_e c$ each time. On this basis red shift becomes a distance indicator and the distance - red shift relation becomes: photons of light from galaxies twice as far away will travel twice as far through the IG medium, make twice as many collisions and thus undergo twice the red shift. Conservation of linear momentum will ensure the linear propagation of light.

6. The Hubble Law

The process whereby a photon interacts with an electron and gives all its energy to the electron is known as photoabsorption and the photoabsorption cross section, σ, is known from the interaction of low-energy x rays with matter. [34,35,36]

$$\sigma = 2r_e\lambda f_2 \quad (10)$$

Where r_e is the classical radius of the electron and f_2 is one of two semi-empirical atomic scattering factors depending, amongst other things, on the number of electrons in the atom. For 10 keV to 30 keV X-rays interacting with Hydrogen, f_2 has values approximately between 0 and 1. 'One' meaning that the photon has been absorbed and the atom remaining in an excited state and 'zero' meaning that the photon was absorbed and an identical photon reemitted [26].

Collision cross sections have the units of area and represent a probability that the interaction will take place. In a photon-electron interaction there are only two possible outcomes. Either the photon is absorbed and not re-emitted (resonance absorption, f_2 = 1, and probability of re-emission = 0) or the photon is absorbed and a '*new*' photon is emitted (transmission, f_2 = 0 and probability of re-emission = 1). Consequently when the photon frequency is well off resonance the probability of absorption is zero and the probability of re-emission is 'one'. For conditional probability were we need the photon absorbed AND re-emitted, $2r_e\lambda$ is the probability of absorption and f_2 is the probability of re-emission, and so we multiply the two separate probabilities. Since f_2 has the value of unity the collision cross-section for transmission is $2r_e\lambda$. The atomic scattering factor, f_2, only modulates the collision cross-section $2r_e\lambda$ and so this is the term we need.

Electrons in plasma behave in the same way as those in an atom. Since the photon frequency of light from distant galaxies is far removed from the resonant frequency of the electrons in the plasma of IG space, the photons will always be reemitted.

On their journey through the IG medium, photons of radiation at the red end of the spectrum will encounter more collisions than photons at the blue end of the spectrum and thus undergo a greater total shift in wavelength. For a particular source, the ratio $\Delta\lambda/\lambda$ will be constant. The collision cross section for a particular photon will not be constant but will increase every time it interacts with an electron. The photon travels shorter and shorter distances between collisions as it travels further and further and it is this that makes the red shift relation go non-linear for large red shifts.

If the initial wavelength is ③ then it will be (③+ h/m$_e$c) after one collision, (③+ 2h/m$_e$c) after two collisions, (③+3h/m$_e$c) after three collisions and so on.

The mean free path of a photon in the plasma of IG space is given by (n$_e$⑩)$^{-1}$ or (2n$_e$r$_e$③)$^{-1}$ since σ = 2r$_e$λ. If the photon makes a total of N collisions in travelling a distance d, sum of all mean free paths =

{2n$_e$r$_e$③}$^{-1}$ + { 2n$_e$r$_e$(③+ h/m$_e$c)}$^{-1}$ + { 2n$_e$r$_e$(③+2h/m$_e$c)}$^{-1}$

+ {2n$_e$r$_e$(③+ 3h/m$_e$c)}$^{-1}$ + .. +{ 2n$_e$r$_e$(③+ [N-1]h/m$_e$c)}$^{-1}$ = d (11)

Or

$$\sum_{x=0}^{N-1}\left\{\lambda + x\left(\frac{h}{m_e c}\right)\right\}^{-1} = 2n_e r_e d \quad (12)$$

Since N is large and $h/m_e c$ is small (2.43 x 10^{-12}m), this approximates to:

$$\int_0^{N-1}\left\{\lambda + x\left(\frac{h}{m_e c}\right)\right\}^{-1} dx = 2n_e r_e d \quad (13)$$

which solves to give:

$$N = \lambda\exp\left(2n_e h r_e d/m_e c\right)\left(h/m_e c\right)^{-1} + 1 - \lambda\left(h/m_e c\right)^{-1} \quad (14)$$

The total increase in wavelength, $\Delta\lambda = N\delta\lambda$, or $Nh/m_e c$

$$\Delta\lambda = \lambda\exp\left(2n_e h r_e d/m_e c\right) + h/m_e c - \lambda \quad (15)$$

The red shift, z is defined as $z = \Delta\lambda/\lambda$

$$z = \exp\left(2n_e h r_e d/m_e c\right) + h/m_e c\lambda - 1 \quad (16)$$

Since $h/m_e c\lambda$ (= 2.42x10^{-12}③) is small for all wavelengths below X-ray,

$$z = \exp\left(2n_e h r_e d/m_e c\right) - 1 \quad (17)$$

since $v = cz$ and in the Hubble Law, $v = Hd$ we have:

$$H = \left(c/d\right)\left\{\exp\left(2n_e h r_e d/m_e c\right) - 1\right\} \quad (18)$$

For small astronomical distances d, use the approximation:

$$e^x \approx 1 + x \quad (19)$$

Giving: $$H = 2n_e h r_e/m_e \quad (20)$$

Consequently: $$v = c\left\{\exp\left(Hd/c\right) - 1\right\} \quad (21)$$

And: $$z = \exp\left(Hd/c\right) - 1 \quad (22)$$

It should be noted that whilst the actual mechanisms of 'Tired Light' are different, this relationship predicted by the 'New Tired Light' theory between redshift, z and distance, d is identical to that first proposed by Zwicky in 1929 [37].

Fig. 4 shows a comparison of a linear Hubble law (z = (H/c)d and the new Tired Light exponential Hubble diagram. Note that for redshifts up to approximately 0.2, they are the same and give similar results.

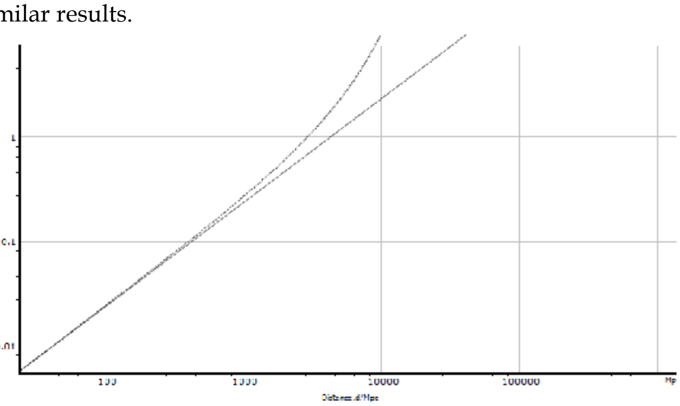

Fig. 4. Exponential and Linear Hubble Diagrams

7. Predicted value of the Hubble Constant

This theory gives a relation between the Hubble constant, H, a number of known constants and the electron density of IG space, n_e and so it is a simple matter to calculate the predicted value. We have:

$$H = 2n_e h r_e / m_e \tag{23}$$

Published values of the Hubble constant are around H = 64±3 km/s per Mpc or, in SI units, $2.1\text{x}10^{-18}$ s^{-1}. An estimated value of n_e in the local universe can be achieved from the WMAP data [38] and gives n_e = $2.2\text{x}10^{-7}$ cm^{-3} or an average of 0.22 electrons per metre cubed. Thus this New Tired Light theory gives a predicted value of H as $0.9\text{x}10^{-18}$ s^{-1} or 27 km/s per Mpc. Thus the theory's predicted value of H from first principles is in good agreement with the observational value.

Some might find the coincidence that hr_e / m_e itself has the value $2.1\text{x}10^{-18}$ per cubic metre of space or 64 km/s per Mpc per cubic metre of space (the measured value of the Hubble constant), but this is purely a coincidence. However, on viewing the New Tired Light Hubble relationship we see it is not that unlikely given that the electron density of IG space is approximately 1 electron m^{-3}.

This Tired Light theory predicts an exponential form to the Hubble diagram. For small values an exponential function is linear and this one is linear up to about z = 0.2. Beyond this the curve 'bends' upwards. However, it has recently been shown [39,40] that data from the Calan/Tololo supernova survey can verify this exponential law with a value of H of 72 km/s per Mpc ie 1.13 hr_e/m_e per m^3 if the data is not 'corrected' for the relativistic effects of expansion first. That is, the data fits this theory's predicted exponential Hubble law provided that we do not assume that the Universe is accelerating and manipulate the data accordingly.

8. Cosmic Microwave Background (CMB)

The recoiling electron will be brought to rest by Coulomb interactions with all the electrons contained within a Debye sphere of radius λ_D. The decelerating electron will emit transmission radiation (TR) i.e. bremstrahlung. There are two emission channels of the system, 'intrinsic emission' by the decelerating electron, and 'emission by the medium' where the background electrons radiate energy.

Intrinsic radiation arises when the recoiling electron exchanges a virtual photon with the external field (set up by the large number of coulomb centers) with momentum q and emits a quantum with momentum k. The medium or external field in which the recoiling electron is moving radiates when the virtual photon of momentum q results in the production of radiation by background electrons contained within the Debye sphere [41].

The interactions between light and the electrons are non-relativistic and the initial and final states of the electron belong to the continuous spectrum. The photon frequency of the transmission radiation f_{cmb} is given by:

$$hf_{cmb} = (1/2m_e)\left(p^2 - p'^2\right) \tag{24}$$

where $p = m_e v$ and $p' = m_e v'$ are the initial and final momentum of the electron [42]. The electron returns to rest after absorption and reemission and so the wavelength of the transmission radiation λ_{cmb} is given by:

$$\lambda_{cmb} = 2m_e \lambda^2 c / h \tag{25}$$

Light of wavelength $5\text{x}10^{-7}$m gives rise to TR of wavelength 0.21m. In IG space, the dominant background photons are microwaves, having peak energy of $6\text{x}10^{-4}$ eV and a photon density of about 400 per cm^{-3} [43,44]. In this theory, these background photons (λ = $2.1\text{x}10^{-3}$ m) would be given off as TR by a photon of wavelength $5\text{x}10^{-8}$ m (i.e. Ultra Violet radiation) interacting with an electron.

Interestingly, the CMB has a black body form of radiation and it is known that plasma emit Black Body radiation as the clouds will be in thermal equilibrium. To quote, "*when every emission is balanced by an absorption by the same physical process – this is the 'principle of detailed balance. The radiation spectrum must have a black body form in thermodynamic equilibrium*." That is when the emission of a photon is due to the absorption of a photon, the emission will be black body. [45]

9. Possible Laboratory Test

One of the many problems in testing cosmological theories in the laboratory is clearly one of size. As seen earlier, the average mean free path in IG space is $\{2n_e r_e \lambda\}^{-1}$, (since $\sigma = 2r_e\lambda$). For light of wavelength $5\text{x}10^{-7}$ m, the average distance between collisions in IG space (using n_e =$2.2\text{x}10^{-7}$ cm^{-3}) is $1.6\text{x}10^{21}$ m – or $1.8\text{x}10^{5}$ light year. Distances on this scale cannot be recreated on Earth. Making the plasma denser will not help since as the plasma becomes denser there are stronger forces between the ions and so the electrons will not recoil. As with the Mössbauer effect, when light travels through glass there is no recoil and therefore no redshift as each electron is fixed in its atom and the atom is fixed in the glass block and so it is the mass of the glass block that has to be taken into account when calculating the recoil (hence, there is effectively none). Additionally, if a high power laser is fired through low density plasma, most of the photons would pass through without interacting with an electron at all - and so it would be impossible to detect any redshift in the overall transmitted beam.

However, a small number of photons will interact and in doing so will give off microwave radiation. It may be possible to detect this radiation - that is, fire a high power laser through a sparsely populated plasma in the laboratory and look for the tell tale signs of secondary microwave radiation. For a laser in the visible region ($\lambda \approx 5\text{x}10^{-7}$ m) the microwave emission will have a minimum wavelength of 0.21m (as in IG space) but longer in the laboratory as the plasma density will be greater and recoil less.

The plasma density is critical. Too high a plasma density and the electrons will not recoil and so no microwave radiation will be emitted. Too low a density and the number of interactions will be so small that the microwave radiation emitted is too weak to be detected. However, this remains a possible test of the 'New Tired Light' theory.

That is, fire a high power laser through plasma of gradually reducing density and look for microwave emission.

10. Conclusion

We have seen that published data from several sources shows that artifacts of the Big bang – hydrogen clouds, are either increasing in temperature or becoming more disturbed as the universe ages. More importantly we have seen that present evidence is that these same Hydrogen clouds (up to at least a redshift of unity and hence for the last billion year or so) are evenly spaced in redshift - even though they have differing redshifts. How can this be? In cosmology we observe 'look back' time. We are seeing the universe as it was then and not as it in now. In the Big bang theory, Hydrogen clouds should have been closer '*then*' than they are '*now*'. But the evidence is that this is not so. The physical evidence of Hydrogen cloud separation is, taken in isolation, that the universe is static and this begs the question, 'just how do redshifts occur in a static universe?' This paper puts forward a new theory whereby in a static universe, redshifts are caused by electrons in the plasma of IG space absorbing and reemitting photons of light. Since the electrons will recoil on absorption and reemission in the sparsely populated plasma, energy will be lost to the recoiling electron. The theory predicts a value for the Hubble constant and this is shown to be consistent with the value observed. The recoiling electrons are brought to rest and the energy of recoil is emitted as secondary radiation and it is proposed that this forms the CMB. Again, the theory predicts a value for this radiation and it is shown to be in the microwave. Plasma is known to emit black body radiation and so each plasma cloud could be the 'clumps' in the CMB. The expansion interpretation of supernovae light curves as time dilation is known to have problems. Firstly Quasar light curves at much greater redshifts show no evidence of 'time dilation' [46] and we now see that these same supernovae are in the same regions in which Hydrogen clouds are, on average, equally spaced. How is it that in the same region where the average spacing of Hydrogen clouds is constant, they manage to have differing redshifts and yet the supernovae in this same region are supposedly showing acceleration? Unless, that is, the expansion interpretation of these effects is erroneous. One possible explanation of supernovae 'time dilation' in a static universe is dispersion. The curves under inspection are multicoloured and it is known that a pulse of white light traveling down a fibre optic suffers pulse broadening due to different colours traveling at different speeds down the fibre. Could it be the same with supernovae multicolour light curves? The theory uses average electron number densities for the plasma and, considering the huge distances involved, consistent values for the Hubble constant will be determined. However, there will be slight differences and this could account for the differing values of H observed depending upon in which direction the measurement is taken. If the universe is composed of plasma clouds or filaments with voids between the filaments, as is evidenced on all scales, there will be few electrons in the 'voids' and so little redshifting of light will occur there. It is only as light goes through a plasma filament that redshifting will occur. This may be one reason why some quantization or 'jumps' in redshifts occur. Interestingly, Colless [47] looks at periodicity in galaxy redshifts listed in the 2df redshift survey and it can be seen that there is an average redshift periodicity of 0.023 ie 42 clusters per unit redshift. The Lyman alpha clouds studied at the beginning of the paper [11] show an average redshift periodicity of 0.026 ie 38 Hydrogen clouds or filaments per unit redshift in this same region. Once again, the New Tired Light theory shows quantitative agreement between observations. The paper then goes on to propose a laboratory test of the theory whereby a powerful laser is fired through sparse plasma and the tell tale signs of emitted microwave radiation looked for.

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