Observational Evidence of a One-Dimensional Universe Comprising a Non-Local frame. *

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Abstract

A model of the universe constituted by a one-dimensional momentum frame and a perpendicular non-local frame is evaluated by reference to astronomical observations available from the literature. Observations of time dilation and CBR heating at remote locations can be understood quantitatively using the theory. The theory also provides an alternative quantitative explanation for what is believed to be the 'acceleration' of the universe's 'expansion' in terms of altered luminosity of remote light sources because of non-locality at the source. The model provides a cosmological equivalence principle of location by avoiding three spatial dimensions and incorporates statistical phenomena such as decay channels into a comprehensive world picture.

1 Introduction

In the previous papers in this series a new geometrical model of the universe has been proposed wherein space-time is defined by two observers, one located in the momentum frame and the other in a non-local frame at origo [1, 2, 3]. This geometry is similar to that of the signaling hydrogen atom perceived by an observer along the photon's momentum axis perpendicular to the electron's orbit. The model inherently provides a line increment, which is interpreted as the apparent Hubble expansion and the inverse of which provides the radius of the universe. Since the line increment fluctuates around zero time there is no literal cosmological expansion in this model and the horizon is well-defined at where the line increments per unit distance add up to the velocity of light [4]. The line increment is calibrated '*ab initio*' by using the Bohr atom, to within close agreement with standard cosmological models [4, 5]. This also yields the age of the universe, 13.7 billion years [4].

Furthermore, use is made of GRT in its property of a well-proven theory of observation to obtain from the radius of the universe its energy and apparent energy density by plain unit conversion. The line increment is regarded as a vacuum instability and, as such using the calibration indicated, can be identified by resonance with the W and Z bosons [7]. Whereas the previous papers mostly have been dedicated to the smaller scales, this one will focus on astronomical observations to demonstrate the applicability of the model at cosmological scales.

2 Results

The purpose of this paper is to consolidate the theory of the universe described here and previously by the same author [1, 2, 3, 4] by comparison with astronomical observations. A brief introduction to the applicable core equations appears in the Appendix. First, consider the measure of time in the laboratory frame, s, as it is observed by the 'yonder' observer;

$$t' = s\sqrt{1 - \frac{v^2}{c^2}}, \tag{1}$$

where v is the velocity of the remote observer and c is the velocity of light. This is the similar to a classical Lorentz transformation [1] except that in the present theory, there is no time axis to account for the empirical fact that all quantum measurements are made at present time only. v is related to the line increment per unit distance along the axis of observation $\overline{\Delta q}$ by

$$\overline{\Delta q} = -vs \tag{2}$$

Since the line increment is proportional to the radial distance from the observer, r, adding an equal amount to every unit length until the cosmological horizon at r_U is reached,

$$r = r_U \frac{\sum \overline{\Delta q}}{c}; \tag{3}$$

and

$$q_0 = \frac{\sqrt{1 - \frac{v^2}{c^2}}}{v} \frac{m^2}{s} \Leftrightarrow \frac{m}{q_0} = \frac{v}{\sqrt{1 - \frac{v^2}{c^2}}} \frac{1}{c} \tag{4}$$

is the tangent of the angle by which an orbiting point seems to be delayed [1, 6], v is at the same time a tangential velocity, a centripetal velocity, and a unique representation of the radial distance from the observer. Geometrized units are used such that $c = 1$ and $\hbar = 2.612 \times 10^{-70}$.

The redshift is defined classically as

$$1 + z = \sqrt{\frac{1 + v}{1 - v}} \tag{5}$$

[1] at distance x; $t = \frac{t' - vx}{\sqrt{(1 - v^2)}}$, taking account of one term in the numerator only

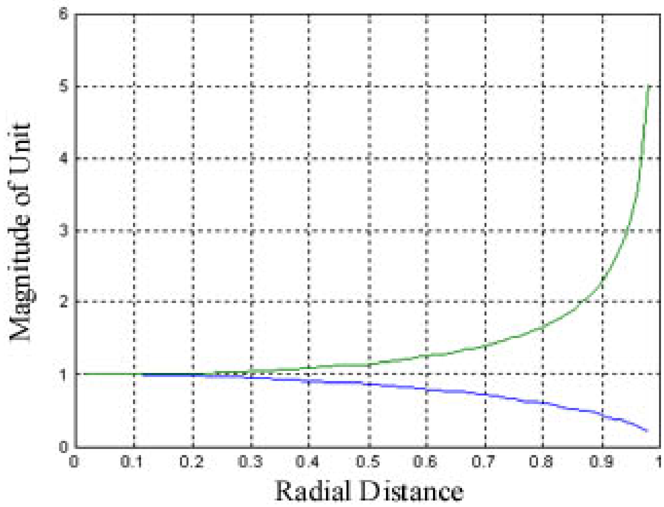

Figure 1: Graphs of Eq. 1 (lower, blue) and Eq. 7 (upper, green).

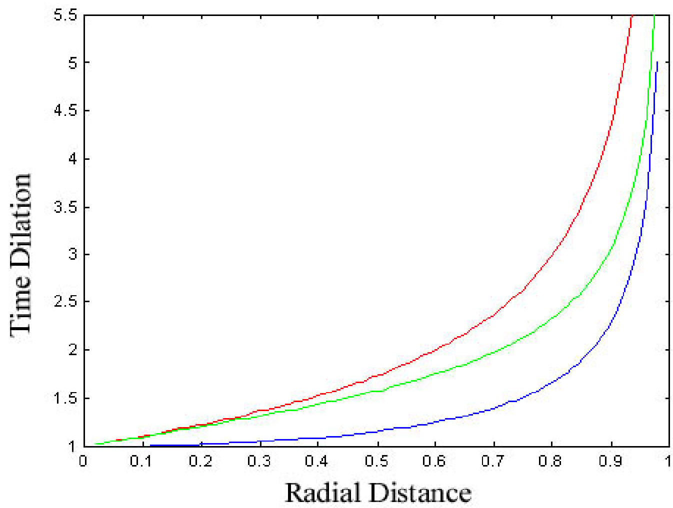

Figure 2: Three measures of time dilation, the classical one (Eq. 5, upper curve, red, this graph also depicts Eq. 9), the measure obtained from Eq. 7 (lower curve, blue), and that obtained from the expression 8 (middle graph, green) when shifted one unit up along the y-axis.

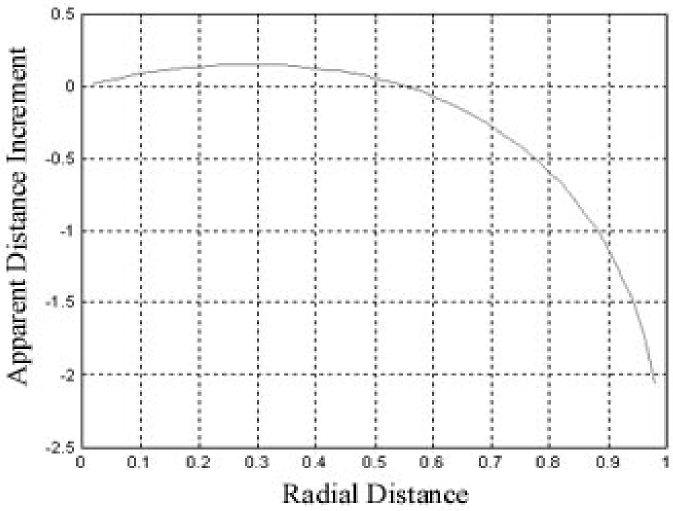

Figure 3: Apparent change of radial distance (arbitrary units) from observer because of light emission effects, plotted as a function of radial distance (units in fractions of r_U by using Eq. 12 The crossover point on the x-axis at 0.55 corresponds to $z = 0.86$. Published observational data yield similar graphs in [10].

which, by plain SRT applied in this linear model of the universe, yields

$$v = 1 - \frac{1}{1 + z + 0.5z^2} \tag{6}$$

The above equation will be used to convert published redshift data into radial distance from the observer. It will be assumed that all published data on redshift referred to is model-independent.

Since, from Eq. 1 and 2

$$s = \frac{t'}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{t'}{\sqrt{1 - \frac{\overline{\Delta q}^2}{c^2}}} \tag{7}$$

where $\Delta\overline{q}$ is the line increment per unit distance m, the unit of time is slow reported to observer s by observer t' and the more so the further away from s,

$$\frac{t'}{\sqrt{1 - \frac{v^2}{c^2}}} \frac{-\overline{\Delta q}}{m}; \qquad \frac{-\overline{\Delta q}}{m} = \frac{m}{\overline{q}} = \frac{m}{r_U}, \tag{8}$$

which, on the coordinate of Eq. 7, yields

$$\sum s = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} + \frac{v}{\sqrt{1 - \frac{v^2}{c^2}}}. \tag{9}$$

Hence, there are three measures of the time dilation, the graphs of which are drawn in Fig. 2. Eq. 9 is equivalent of Eq. 5, the classical definition of time dilation. Therefore, observations in support of proportionality between observed widths of supernova events and classical time dilation [8], do not rule out the present model. However, because of the 'stretch factor' [8] (= an observed further prolongation of the events that is proportional to 1+z) both the classical model and the present one may turn out to be approximations.

Next, consider the apparent heating of the CBR at remote locations deduced from CO absorption lines in diluted gas [9]. At $z = 2.418$ an observed increase of the CBR temperature from $2.73K$ to $9.15 \pm 0.72K$ was reported, which was accredited to the big bang theoretical value of $9.32 \pm 0.007K$. In the present approach however, the energy in the non-local frame transforms like time (Eq. 9) and it is straightforward to solve the velocity by putting the value 2.418 into Eq. 6 yielding $v = 0.8423$ and then apply Eq. 9, yielding $\sum s = 3.418$. Since $2.73K \times 3.418 = 9.33K$ the present theory can be applied to these observations. It may seem perplexing that a receding velocity should increase the apparent energy of the radiation oppositely to the case of SRT but there is also a rotational velocity involved besides the observational evidence that there seems to be more energy per angular segment in remote locations. In the present theory the CBR is regarded more like a property of space-time than radiation from a point-source. The transformation of radiation energy in classical SRT has the same form as Eq 9 apart from the sign:

$$\overline{h\nu} = \frac{h\nu}{\sqrt{1-v^2}} - \frac{h\nu v}{\sqrt{1-v^2}}. \tag{10}$$

Finally, consider the apparent acceleration and subsequent deceleration of the universe's apparent expansion deduced from luminosity measurements that is usually taken as proof of the movement of celestial bodies in accordance with some adjustment of the big bang theory [10]. The present theory offers an alternative explanation, which should be weighted against the difficulties of the big bang theory that are quoted in the next section below. The arguments are based on regarding electromagnetic radiation as a truly non-local phenomenon. A quantitative measure of light's non-locality is sought that would alter the intensity of radiation from a remote point source. It is clear that such a measure can be based on the angle ϕ by which a rotating point source seems to be delayed by an observer located at origo, Eq. 4. Since the yonder non-local frame (providing the quantitative measure of the rotation) is space-like separated from the observer one does not expect to see any factual rotation. One finds that the unit intensity at zero magnitude of non-locality should be diminished because of a process that is least noticeable when equally contributed by two probabilistic events that are out of phase such that $\sin\phi\cos\phi$ is maximized (at $\pi/4$, that is), namely

$$\frac{tan^{-1}\Big(\frac{v}{\sqrt{1-\frac{v^2}{c^2}}}\frac{1}{c}\Big)}{\pi/4}. \tag{11}$$

This suggests that the signal emission requires two events that are out of phase. Since the expression describes probabilistic events in the non-local frame it should be squared into the momentum frame. Hence, the distorted radial distance, R, corrected for a decrease of luminosity because of non-locality at the cosmological scale is

$$R = \left(v - \left(\frac{tan^{-1}\Big(\frac{v}{\sqrt{1-v^2/c^2}}\frac{1}{c}\Big)}{\pi/4}\right)^2\right)r_U. \tag{12}$$

A graph of this equation is drawn in Fig. 3. It looks similar to plots of observational data (cf. [10]). When only supernovae are taken into account the data curve crosses the x-axis at somewhat higher redshifts and radial distances than in Fig. 3 but when gamma ray bursts are included the cross-over points agree.

3 Discussion

The results presented above for the first time show that several cosmological observations that traditionally have been accredited to GRT-big bang cosmology do not necessarily have any connection to it. The time dilation at remote locations, the CBR temperature in the past as well as the apparent accelerated expansion of the universe deduced from luminosity of remote objects can be understood in terms of the model presented here. This model has the additional quality that some of the admitted difficulties of standard cosmology based on GRT are obliterated. Namely, 1) there is no infinite extension of the universe because there is a well-defined horizon, 2) The homogeneity of the CBR in all directions of the sky may be understood in terms of the slow-down of time and various processes at the horizon and in terms of maximized 'non-locality', and 3) the universe's density being close to the critical density is no longer an issue because there is no literal expansion.

This model also circumvents the extension problem by contracting the universe to one dimension, the momentum axis of observation in the laboratory frame. This matter frame may interact with the non-local frame at any arbitrary location, thus providing a kind of cosmological equivalence principle for various locations. In fact, whenever 3 spatial dimensions are taken into account, locality is invoked. Because of the famous 3-body problem, the movement of three or more celestial bodies can not be predicted so locality looses its meaning in remote places, especially when one considers the great number of objects per angular section at large distances and the long time that has passed before information from these remote places reaches the Earth: A likely consequence of Poincaré's discovery might be that the universe not is an object but merely a reference.

Another quality of the present model of the universe compared to other ones is that it defines a non-local frame. In so doing it finds a place for various statistical phenomena such as particle decay channels and classical non-locality of light signals, that would otherwise remain detached from our world picture, in the form of mere mathematical descriptions. GRT neither makes any distinction between remote and local phenomena nor between the source and the sink of the signal. Therefore, and for other reasons [3], it fails in its role as a comprehensive theory of the universe even though it and special relativity theory remain enormously successful and indispensable for evaluating physical measurements. GRT regarded as big bang cosmology also succumbs to the Einstein aestheticity argument because there are so many assumptions and alternatives involved in fitting the theory to measurements.

Contemporary big bang cosmology can explain some evolution of the elements of the periodic table in a scenario with a hot beginning. Presumably, these transitions are inherent to the elements involved and might appear in other scenarios as well. Just to take an example, decay of the Λ_0 particle yields approximately the observed proportions between primordial Helium and Hydrogen. As one looks back in time various physical processes slow down because of the time dilation until they stop. There is also in the early universe an abundance of presumably magnetic celestial bodies, such as quasars. Magnetism arises through circulating charges that represent an ordered state of matter requiring less entropy and lower temperature. In this perspective, might the universe, contrary to current belief, have had a cold start within transient currents? To ask the question quantitatively; can the energy of the universe prevent some orbiting leptons from collapsing because of Casimir forces arising as a result of the vacuum created by the apparent Hubble expansion? Since (with $\overline{\Delta q} = 0.77145 \times 10^{-26}$ per unit distance per unit time, ref [5, 6]) the vacuum energy in this case ($\overline{\Delta q} << radius\ of\ orbit$; planar geometry) is

$$E_C = \frac{\pi^2 \hbar c}{720 \overline{\Delta q}^3} \alpha^3 = \frac{9.8696 \times 2.612 \times 10^{-70}}{720 \times 4.591 \times 10^{-79}} \times 3.886 \times 10^{-7} = 3.031, \qquad (13)$$

almost precisely 3 times the expected value of one unit length and on the spot as far as magnitude is concerned. A decisive breakthrough that should likely divide between big bang -GRT cosmology and alternative models of the universe is going to be that of matter creation, a subject that is still nothing but science fiction from the perspective of our current level of knowledge. [2]

References

[1] E. A. Cerven, *On the Physical Contexts of Lorentz Transformations around Zero Time* In: *Proc. VII Wigner Symposium, Baltimore (2001)*, http://www.physics.umd.edu/rgroups/ep/ yskim/wpro01.html

[2] E. A. Cerven, *Space-Time Geometry of Plain Physical Observation.* http://www. scienceandresearchdevelopmentinstitute.com/cosmoa.html (2004)

[3] E. A. Cerven, *Geometry of the Universe and the Ground State of the Hydrogen Atom.* http://www.scienceandresearchdevelopmentinstitute.com/cosmoa.html (2005)

[4] E. A. Cerven, *Calculation of Cosmological Observables from Constants of Nature.* http://www. scienceandresearchdevelopmentinstitute.com/cosmoa.html (2003) and in: Part II of e-book 'Reaching for the Universe' http://www.scienceandresearchdevelopmentinstitute.com/cosmoa.html (2005)

[5] E. A. Cerven, *Factorization of the Planck Length in Terms of a Line Increment of the order of Hubble's Constant and Magnetic Charge.* http://www.scienceandresearchdevelopmentinstitute.com/cosmoa.html (2004)

[6] A. M. Portis, In: *Electromagnetic Fields: Sources and Media* John Wiley Sons, New York, Chichester, Brisbane, Toronto, Singapore 1978

[7] E. A. Cerven, *Evidence of Resonance between the W-boson and the Apparent Cosmological Expansion Rate.* http://www.scienceandresearchdevelopmentinstitute.com/cosmoa.html (2005)

[2] Acknowledgement:This work was not funded by any public or governmental institutions or by private organizations. Several comprehensive and informative expositions of big bang cosmology freely available to the public over the Internet are gratefully acknowledged.

[8] G. Goldhaber, D. E. Groom, A. Kim, G. Aldering, P. Astier, A. Conley, S. E. Deustua, R. Ellis, S. Fabbro, A. S. Fruchter, A. Goobar, I. Hook, M. Irwin, M. Kim, R. A. Knop, C. Lidman, R. McMahon, P. E. Nugent, R. Pain, N. Panagia, C. R. Pennypacker, S. Perlmutter, P. Ruiz-Lapuente, B. Schaefer, N. A. Walton and T. York, *Timescale Stretch Parameterization of Type Ia Supernova B-band Light Curves.* arXiv:astro-ph/0104382v1 (April 24, 2001)

[9] R. Srianand, P. Noterdaeme, C. Ledoux and P. Petitjean, *First detection of CO in a high-redshift damped Lyman-alpha system.* arXiv:astroph/0804.0116v1 (April 1, 2008)

[10] E. L. Wright, *Constraints on Dark Energy from Supernovae, gamma-ray Bursts, Acoustic Oscillations, Nucleosynthesis and Large Scale Structure and the Hubble Constant.* arXiv:astro-ph/0701584v3 , Fig. 2 & Fig. 3 (April 20, 2007)

4 Appendix (from ref. [1])

Two observers measure distance as respectively $\bar{q}_r = (\sqrt{1 - v^2/c^2}/v)\, m^2/s$ and $\bar{q}_0 = cm/v - vm/c$ at their respective zero time coordinates, $''o''$ and $''r''$, where $''m''$ is the unit of distance, $''s''$ is the unit of time, and $c = m/s$ is the velocity of light. The lapse of one unit of time from $\bar{t}_0 = -s$ defined by

$$(q_0, t_0) = \left(\frac{\sqrt{1 - \frac{v^2}{c^2}}}{v} \frac{m^2}{s},\ 0 \right); \qquad (\bar{q}_0, \bar{t}_0) = \left(\frac{1}{v} \frac{m^2}{s},\ -s \right) \tag{14}$$

to a later time, $\bar{t}_r = 0$, defined by

$$(q_r, t_r) = \left(\frac{\sqrt{1 - \frac{v^2}{c^2}}}{v} \frac{m^2}{s},\ s\sqrt{1 - \frac{v^2}{c^2}} \right); \qquad (\bar{q}_r, \bar{t}_r) = \left(\frac{1}{v} \frac{m^2}{s} - vs,\ 0 \right) \tag{15}$$

yields a line increment, $\Delta\bar{q}$, per unit time

$$\Delta\bar{q} \equiv -vs\ . \tag{16}$$