Publications of the Korean Astronomical Society
00: 1 ∼ 99, 2015 January

pISSN: 1225-1534 / eISSN: 2287-6936
http://dx.doi.org/10.5303/PKAS.2015.00.0.1

Cosmic Dust and Cosmology

Thomas V. Prevenslik†
QED Radiations, Discovery Bay, Hong Kong, China; thomas@nanoqed.org

Received October 21, 2014; accepted November 30, 2014

Abstract: Cosmology considers the Hubble redshift of galaxy light by the Doppler effect as proof the Universe has been expanding since the Big Bang. However, cosmic dust that permeates the Universe also redshifts galaxy light that if not corrected over-predicts the velocities of all astronomical measurements inferred by the Doppler effect. Hubble redshifts corrected for cosmic dust suggest the Universe may not be expanding, the consequence of which may allow the outstanding problems in cosmology to possibly be resolved by Newtonian mechanics.

Key words: cosmology, cosmic dust, redshift, quantum mechanics, QED

1. Introduction

Man has always pondered the origin of the Universe. Humans know life has a beginning and an end, and it is only natural to think the Universe also has a beginning and an end. Yet, for thousands of years, the Universe was considered static and infinite - without a beginning and end. However, Einstein in 1916 introduced his field equations that required the Universe to be finite and and either contracting or expanding. Since a static Universe is foreign to human experience, Einstein provided a theoretical basis to suggest the Universe is indeed not static. But lacking experimental proof, Einstein′s theory lay dormant until 1929 when Hubble dismissed a static Universe by showing the light from distant galaxies was redshift. Interpreted by the Doppler effect, the Hubble redshift was taken as proof the Universe is finite and expanding consistent with human experience now supported by Einstein′s field equations.

To this day, cosmologists claim the Doppler redshift proves the Universe is finite and expanding. Whether the Universe is expanding is determined by measuring the Hubble redshift of galaxy light relative to the Earth. By interpreting Hubble redshift by the Doppler effect, the velocity or even the acceleration of the galaxy relative to the Earth is thought measured thereby supporting notions of an expanding or a accelerating Universe. However, not all agreed.

Since Hubble′s discovery, numerous theories have been proposed to explain galaxy redshift without the Doppler effect so as to place in question an expanding Universe, but none have been accepted. Today, cosmologists generally agree the Universe is expanding with the expansion accelerating only because the Doppler effect is the most convenient interpretation of the redshift of galaxy light Corasaniti (2008).

If, however, galaxy redshift could be shown to have a non-Doppler origin, the outstanding problems in cosmology would be resolved by Newtonian mechanics.

Corresponding author: T. V. Prevenslik
†QED Radiations, Discovery Bay, Hong Kong

2. Purpose

Show galaxy light is redshift upon absorption in NPs of cosmic dust. NP stands for a nanoparticle of particulate having sub-micron dimensions. However, the purpose is not to show cosmic dust NPs give the same redshift for ALL wavelengths of galaxy light as in the Doppler effect, but rather to suggest the redshift given by the Doppler effect may need to be corrected for cosmic dust.

3. Theory and Analysis

QED is proposed as the theory by which the EM energy of a galaxy photon is redshift upon absorption in a cosmic dust NP under TIR confinement. QED stands for quantum electrodynamics, EM for electromagnetic, and TIR for total internal reflection. QED induced redshift is a consequence of QM that forbids the atoms in NPs under TIR to have the heat capacity to increase in temperature upon absorbing the EM energy of the galaxy photon. QM stands for quantum mechanics. The TIR confinement of the galaxy photon in cosmic dust NPs is not permanent and only occurs during absorption, i.e., absent TIR there is no QED induced redshift.

Upon absorption, the EM energy of the galaxy photon is redshift by QED depending on the geometry of the NP. Redshift only occurs as the NP absorbs a single galaxy photon, i.e., blueshift requiring EM energy greater than that of the galaxy photon cannot occur as the conservation of energy would be violated. The QM restriction on the heat capacity may be understood from the Einstein & Hopf (1910) expression for the atom as a harmonic oscillator shown in Figure 1.

Unlike classical physics allowing the atom to always have heat capacity from the macro to the nanoscale, QM restricts heat capacity to the macroscale. Figure 1 shows the macroscale by classical physics (noted by dotted lines) at 300 and 2.7 K corresponds to $\lambda > 30$ and 3000 microns, respectively. At the nanoscale, the QM heat capacity vanishes, i.e., for $\lambda < 0.8$ and 1000 microns is reduced > 2000 and 20 X from classical theory.

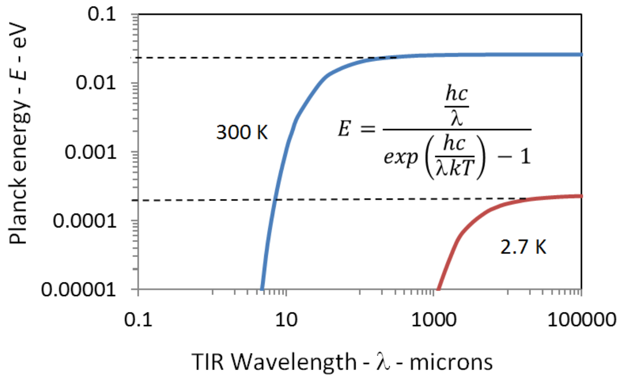

Figure 1. Planck energy of the atom as a harmonic oscillator. In the inset, E is Planck energy, h Planck′s constant, k Boltzmann′s constant, λ the TIR wavelength, T absolute temperature, and c the velocity of light.

Lack of heat capacity by QM precludes EM energy conservation in NPs by an increase in temperature, and instead, conservation proceeds by QED inducing the EM energy of the single galaxy photon to be redshift to the TIR frequency of the NP.

Why is TIR important?

In 1870, Tyndall showed light is confined by TIR to the surface of a body if the refractive index RI of the body is > than that of the surroundings. Since NPs have high surface to volume ratios, absorbed EM energy is therefore confined almost totally in the NP surface thereby directly exciting the TIR mode of the NP. Simply put, QED induces the stretching of the galaxy photon wavelength to fit the NP circumference, i.e., the redshift galaxy photon is observed on Earth at wavelength λ_0,

$$\lambda_0 = 2\pi n a \tag{1}$$

where, n and a are the RI and radius of the NP. For the galaxy photon having wavelength λ, the redshift Z is,

$$Z = \frac{\lambda_0 - \lambda}{\lambda} \tag{2}$$

or

$$\lambda_0 = (1 + Z)\lambda$$

Cosmic dust measurements by Weingartner & Draine (2002) give the range of NP radii from $a = 0.005$ to 0.25 microns. Figure 2 shows the redshift Z of $Ly\alpha$ and $H\alpha$ lines for amorphous silicate NPs. At the upper bound NP radius of 0.25 microns, the $Ly\alpha$ and $H\alpha$ lines are redshift to $Z = 11$ and 1.2, respectively.

4. DISCUSSION

4.1. Expanding Universe

The QED induced redshift is caused solely by the absorption of the galaxy photon in cosmic dust. Given that galaxy light is unequivocally absorbed by cosmic dust on its way to the Earth, the Hubble redshift Z requires correction as galaxy velocities V inferred from the

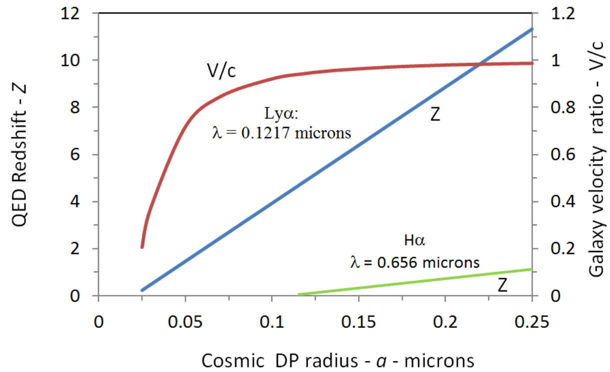

Figure 2. QED Induced Redshift of $Ly\alpha$ and $H\alpha$ lines by cosmic dust for amorphous silicate NPs having $n = 1.5$.

Doppler effect may be meaningless as the galaxy need not be receding at all. Relative to the velocity of light c, the Doppler velocity V of galaxies with redshift Z is,

$$\frac{V}{c} = \frac{(Z+1)^2 - 1}{(Z+1)^2 + 1} \tag{3}$$

and shown for the $Ly\alpha$ line in Figure 2. The galaxy velocity ratio V/c inferred by the Doppler redshift by dust may be a significant fraction of the velocity of light c making any astronomical measurement questionable. Therefore, any implied relation of accelerated Universe expansion suggested by Riess et al. (2004) should be reviewed for the effect of cosmic dust.

What this means is dust affects the accuracy of any astronomical measurement of galaxy velocites inferred from Hubble redshift. Hence, dust places in question Universe expansion by Hubble redshift.

4.2. Corrections of Hubble Redshift

The Hubble redshift by the Doppler effect gives the same Z for ALL wavelengths, but QED redshift in dust depends on wavelength. Historical data by Minkowski & Wilson (1956) supports the Hubble redshift at low $Z < 0.05$, but excludes the $Ly\alpha$ line that gives the largest QED redshift in cosmic dust. Therefore, to assess Hubble redshift validity, measured Z is corrected with the difference in redshifts of $Ly\alpha$ and $H\alpha$ lines,

$$Z_{Hubble} = Z_{meas} - (Z_{Ly\alpha} - Z_{H\alpha}) \tag{4}$$

If redshift measurements of $Ly\alpha$ and $H\alpha$ lines show,

$$Z_{Ly\alpha} = Z_{H\alpha}$$

then

$$Z_{Hubble} = Z_{meas}$$

and the effect of cosmic dust on Hubble redshift by the Doppler effect may be neglected. If not, the validity of the Hubble redshift is questionable in inferring galaxy velocites by the Doppler effect.

4.3. Other Consequences

QED induced redshift in cosmic dust affects ALL astronomical measurements, a summary of which is given by Prevenslik (2014) at the APRIM 2014 Conference having the following consequences:

4.3.1. *Sunyev-Zel′dovich Effect*

The CMB radiation upon interacting with collapsing galaxy clusters is thought to blueshift by the SZE. CMB stands for Cosmic Microwave Background and SZE for Sunyaev-Zel′dovich Effect. Since Z_{meas} is proportional to both galaxy mass M and the SZE, the SZE should be proportional to Z_{meas}. Contrarily, the SZE is found by Carlstrom et al. (2002) to be independent of redshift Z. By QED redshift in cosmic dust, Z_{meas} does not originate in the collapsing galaxy clusters, but rather from dust NPs in the line of sight of the galaxy cluster to the Earth. Redshift in cosmic dust is therefore independent of the SZE consistent with observations.

4.3.2. *Black Hole Mass*

Cosmologists determine the velocity of stars orbiting black holes by redshift measurements Z_{meas} from which the mass of the black hole in inferred using classical mechanics. However, the star velocites may be only a few hundred km/s that by the Doppler effect correspond to Z < 0.005. Therefore, high precision spectroscopy is required as the redshift may only be a fraction of a nanometer. Hence, QED redshift in cosmic dust may grossly exaggerate the star velcocities, especially by the NPs in the trailing debris of stars moving away from the observer. Therefore, the accuracy of the measurement of rotational speed of the star places in question the calculation of of large solar masses in black holes. Accordingly, the validity of Z_{meas} of black holes needs to be reviewed for cosmic dust.

4.3.3. *Supernovae Light Curves*

Studies of SN light curves by Lubin & Sandage (2001) showed time dilation that takes 20 days to decay at low Z will take 40 days to decay at $Z = 1$. SN stands for Supernovae. By QED redshift in dust, Z_{meas} is proportional to the number of NPs that in turn is proportional to the mass M of the SN. Hence, Z_{meas} is proportional to M. At $Z = 1$ the SN having larger M takes a longer time to cool than for smaller M at low Z. What this means is time dilation observed in SN light curves requires review for cosmic dust to avoid interpreting thermal cooling of SN as Universe expansion.

4.3.4. *Tolman Test*

In 1930, Tolman proposed a test to determine whether the Universe is expanding by correlating the brightness B of galaxies with redshift Z, but Tolman did not consider the redshift in cosmic dust. Nevertheless, the Tolman test was interpreted by Lubin & Sandage (2001) as the reality of Universe expansion. Recently, the brightness B of aging SN spectra was shown by Blondin et al. (2008) to drop inversely with $(1+Z)$. By QED redshift, the brightness B_0 at the observer is, $B_0 = hc/\lambda_0$, where λ_0 given by Equation (2) is the wavelength of the galaxy light redshift by cosmic dust. Hence, $B_0 = hc/(1 + Z)\lambda = B/(1 + Z)$ and therefore QED redshift is consistent with the observed reduction in the brightness B of the SN spectra by $(1+Z)$.

4.3.5. *Galaxy Rotation Problem*

The galaxy rotation problem identified by Rubin & Ford (1970) suggested dark mass and energy at the center of the galaxies holds them together under rotational velocities from the Hubble redshift inferred by the Doppler effect. Like calculations for black hole mass, Z_{meas} needs to reviewed for QED redshift by cosmic dust. What this means is dark matter and energy suggested by Riess et al. (2004) as the source of an expanding and accelerating Universe may need to be reviewed. Similarly, there may be no need to modfy gravity in MOND to explain how galaxies stay together during rotation. MOND stands for Modified Newtonian Dynamics by Milgrom (2008). Contrarily, Newtonian mechanics alone may resolve the galaxy rotation problem.

5. CONCLUSIONS

In astronomy, cosmic dust affects the accuracy of velocity measurements of stars and galaxies inferred from Hubble redshift by the Doppler effect.

Accelerated expansion of the Universe may be ocurring, but the proof of which does not appear possible with Hubble redshift based on the Doppler effect.

The validity of Hubble redshift in velocity measurements inferred by the Doppler effect may be assessed by the difference between the redshift of $Ly\alpha$ and $H\alpha$ lines. If the difference vanishes, the Hubble redshif is valid. But if not, the Hubble redshift measurement should be reviewed.

REFERENCES

Blondin, S., et al. 2008, Time Dilation in Type Ia Supernova Spectra at High Redshift, AsJ, 682, 724

Carlstrom, J. E., Holder, C. P., & Reese, E. D. 2002, Cosmology with the Sunyaev-Zel'dovich Effect, Ann. Rev. Astron. Astrophys. 40, 643

Corasaniti, P.S., The Impact of Cosmic Dust on Supernova Cosmology, MNRS, February 2008

Einstein A. & Hopf, L. 1910, Statistische Untersuchung der Bewegung eines Resonators in einem strahlungsfeld, Ann. Physik, 33, 1105

Lubin, L. M. & Sandage, A. 2001, The Tolman Surface Brightness Test for the Reality of the Expansion. IV. A Measurement of the Tolman Signal and the Luminosity Evolution of Early-Type Galaxies, AsJ, 122, 1084

Milgrom,M., The MOND Paradigm, arXiv:0801.3133v2 [astro-ph]

Minkowski, R. & Wilson, O. S. 1956, Proportionality of Nebular Red Shifts to Wave length, AsJ, 123, 373

Prevenslik, T. V. 2014, Cosmology by Cosmic Dust, See APRIM at http://www.nanoqed.org

Riess, A.G., et al. 2004, Type Ia Supernova Discoveries at $Z > 1$ from the Hubble Space Telescope Evidence for Past Deceleration and constraints on Dark Energy Evolution, ApJ, 607, 665

Rubin, V. C. & Ford, W. K. 1970, Rotation of the Andromeda Nebula from a Spectroscopic Survey of Emission Regions, AsJ, 159, 379

Weingartner, J.C. & Draine, B. T. 2002, Dust Grain Size Distributions and Extinction in the Milky Way, Large Magellanic Cloud, and Small Magellanic Cloud, AsJ, 548, 296