Correlation between Hubble H_0 early-to-late universe, and photon energy/wavelength between the UV and far-infrared region of the electromagnetic spectrum

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Abstract

The intrinsic nonlinear energy/wavelength ratio of electromagnetic radiation between the ultraviolet and far infrared region of the electromagnetic spectrum, is compared to the velocity/distance interpretation of spectral shifts in ancient starlight. The correlation at 8% suggests a review of the velocity-distance interpretation of spectral shifts is warranted. Given the potential impact for the standard lambda CDM cosmological model, and notwithstanding a credible theory to account for photon energy loss over millennia in transit, the correlation nevertheless challenges the current interpretation of redshift for determining the Hubble constant H_0 for the early and late universe and dark energy, the existence of which has been speculatively introduced to account for the increasing rate of redshifts observed in the late universe.

Cosmological Tension

The discrepancy in values of the Hubble constant H_0 that have now been determined for the early and late universe with narrow margins of error, from data (Planck Collaboration et al. 2020; Aiola et al. 2020) cosmic microwave background (CMB), where H_0 was found to be 67.4 ± 0.5 km/s/Mpc [1], at 5σ to 6σ, is in significant disagreement with H_0 for the late universe. (Riess et al. 2021; Di Valentino et al. 2021) via the Supernova H_0 for the Equation of State (SH0ES) project, where H_0 at 73.5 ±1.4 km/s/Mpc, is stated by Nobel astrophysicist Adam Riess, to be a “discrepancy that is increasingly hard to ignore.” [2]
With non-overlapping values robustly defended by both groups, and cosmologists currently unable to explain the 8% discrepancy, new ideas are needed to break the impasse. Should cosmologists now accept the early and late H_0 values as determined thus far, and consider what different values of H_0 at different evolutionary stages of the universe implies.

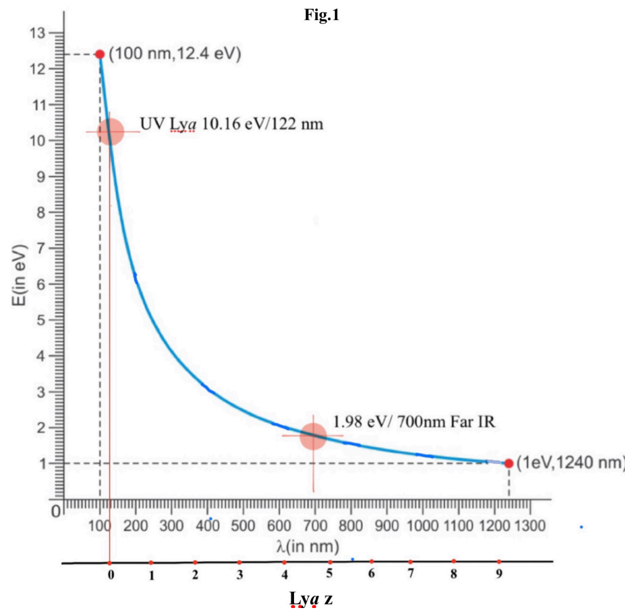
The non-linear Energy/wavelength relationship

A study that adopts different rates of the Hubble constant at different times of cosmological evolution, permits a new and broader range of criteria to be considered in resolving the current dilemma.

One relationship that may have been overlooked, is evident in the energy/wavelength graph Fig.1 right, where the wavelength of photons at 100 nm/12.4 eV or 8 nm/eV, increases disproportionately to 1,240 nm/eV in the far infrared region of the electromagnetic spectrum.

The increase in wavelength with decreasing photon energy exhibits a slope of 8%, that corresponds with the increasing redshift z from the early to late universe, a correlation that surely demands an explanation.

Fig.1



One of the important spectral lines in the Lyman series for neutral hydrogen used to determine redshift, is the (Ly-*a*) UV line that observed from stellar populations and active galactic nuclei, is a powerful diagnostic of high-z objects.
The reference Ly*a* 10.16 eV/122 nm line in the UV region of the energy/wavelength graph sets the origin of the Ly*a* z scale displayed directly below the wavelength scale. If the 1.98 eV/ 700 nm line is observed and identified by astronomers as an Ly*a* redshift, it would then be interpreted as a redshift of $Z = 4.757$, typical of those found in high-redshift dusty star-forming galaxy candidates selected from far-Infrared (FIR)/sub-mm observations by the Atacama Large Millimetre Array (ALMA), where galaxies in the continuum have been spectroscopically confirmed with z =3.62 to 5.85.[3]

Cosmological models revisited

The photon energy/wavelength ratio between the UV and far infrared (10.16 eV/122nm) - (1.98/700nm) indicates a change of 0.0805 or 8.05%, and the difference between the best estimates of the Hubble constant for the early universe at (67.4 km/s/Mpc), and the late universe at (73 km/s/Mpc), at 5.6 km/s/Mpc indicates (a) (5.6 km/s/Mpc)/(67.4 km/s/Mpc) or 8.3% for the early universe, and (b) (5.6 km/s/Mpc)/(73 km/s/Mpc), 7.67% for the late universe. [4]

A recent H_0 value established by W. Freedman via the Tip of the Red Giant Branch, (TRGB) [5] where $Ho = 69.8 \pm 0.6$ (stat) $\pm$ 1.6 (sys) km/s/Mpc, indicates at (5.6 km/s/Mpc)/(69.8 km/s/Mpc) = 8%, a value that is within 0.05% of the difference in the ratio of photon energy/wavelength from the UV to far infrared of the electromagnetic spectrum.

From such a close correlation, the nonlinear energy/wavelength relationship could be perceived to account for the great majority of cosmological redshifts, with the exception of authentic doppler shifts attributable to the orbital velocity of stars in the receding limbs of galaxies, or rotational dynamics of high redshift binary systems.

That the scale of the universe serves as a distinguishing factor between cosmological models, was pointed out by Edwin Hubble in his Rhodes Memorial Lectures, delivered at Oxford in the Autumn of 1936, under the general title, "The Observational Approach to Cosmology", where he considers that the conventional interpretation of redshifts implies… *"a strange and dubious universe, very young and very small"* which contrasts with a plausible conception of a universe, that extends indefinitely without boundaries in space and time*, "a universe vastly greater than the observable region, which seems to imply that red-shifts are not primarily velocity-shifts."*
Hubble also stated that in his view, observers must keep an open mind regardless of theories or speculations, and develop parallel working hypotheses and interpretations, where *"He may assume, first, that red-shifts are velocity-shifts, or, secondly, that red-shifts result from some unknown principle that does not involve actual motion, and always, of course, he will search for some empirical, critical test for distinguishing between the two assumptions, between motion and no motion."*

As technology continues to extend the limits of observations, perhaps through the latest James Webb Space Telescope, a powerful orbiting infrared observatory due to enter service late 2021, capable of finding sources up to and perhaps well beyond observation limits theorised according to the standard Lambda CDM cosmological model. Ultimately, only one of the models according to Edwin Hubble's criteria i.e strange young and small, versus a boundless universe will prevail.

Anomalous Galaxy Velocity Curves

Stars orbiting in the discs of galaxies, are generally perceived to have velocities well in excess of those calculated according to established laws. Dark matter, or modifications to Newtonian laws of gravity (MOND) have been hypothesised to account for the observations, but both currently lack convincing evidence to supports the theories.
The velocity of stars in orbit around the center of galaxies are conventionally interpreted as Doppler redshifts, which as has already been reasoned, may not always be the case, this in addition to other objective analyses, that also challenges the dark matter interpretation of rotation curves. [7]
Taking into consideration the nonlinear $\mathbf{E}/\lambda$ interpretation of redshift, the velocity of stars in the receding limbs of galaxies may be thus be perceived to comprise authentic Doppler redshifts, superimposed on an energy related redshift. Such would then lead to an overestimate of the velocities of those stars, and underestimate of the velocity of stars on the opposite limbs of those galaxies. Additionally, one could also argue that due to a natural decline in photon energy, the observed rates of orbital velocity would increase with space and time, a finding that would tend to support the energy/ wavelength interpretation of redshift.

Comments

Not all cosmological redshift is attributable to nonlinear photon energy/wavelength however, that much is evident in the observed spectral shifts from local sources such as our nearest Andromeda galaxy, which include blueshift as well as redshifted data. What is contended, is that in general, whether from authentic doppler shifts, gravitational redshifts, or in combination, the nonlinear increase in wavelength associated with lower energy photons will ultimately dominate the spectral shifts from the mid to furthermost regions of the universe.

The suggested origin of the microwave background, is based on a boundless steady state universe, and radiation that has been emitted from sources well beyond the currently perceived horizon. The number of sources, predominantly galaxies, evident in the Hubble Ultra Deep Field survey, are rationally considered to increase exponentially beyond that horizon in a boundless universe isotropically in all directions. From the energy/wavelength relationship, at some point, the redshift of radiation leads to a cutoff point, where the starlight falls below the visible horizon, through the microwave, and into the radio frequency region of the spectrum. What is thought to cause the observed peak in the microwave region, is a natural cutoff for what otherwise would be an exponential rise in numbers of sources.

Predictions:

Looking forward, the energy/wavelength curve may actually provide a far more accurate means of determining the distribution of galaxies and any other sources after taking into consideration authentic doppler effects, which in binary systems may broaden the spectra of galaxies and skew the data. The need of Dark Matter to resolve what are at present deemed anomalous rotation velocities of stars orbiting galaxies, is called into question according to the nonlinear E/λ interpretation, and elsewhere in critics of the methods and criteria used to reach that conclusion.

The overwhelming support and scale of research devoted to sustaining the standard Lambda CDM cosmological model, is such, that strong opposition to this energy/wavelength interpretation of redshift is only to be expected. However, as tension between the early and late Hubble rates of expansion continues to increase as seems probable, with credible evidence for dark energy still lacking, at some point, the subtle, yet natural explanation provided by the non-linear energy/wavelength relationship for the spectral shifts of starlight, it is contended, will ultimately prevail, and the Steady State cosmology which has always had supporters, including Hubble, Einstein, Bondi, Hermann; Gold, Thomas (1948). Hoyle, Burbidge, and Narlikar (1994) will in some reinvigorated form re-emerge. What the full impact of an energy/wavelength interpretation of redshift will have remains to be seen, but surveying a universe that is boundless, is undoubtedly an exciting prospect for future cosmologists, with enormous prospects for new discoveries to be made by those who take the new interpretation seriously.

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