Correlation between Hubble *H0* early-to-late universe, and photon energy/wavelength between the UV and far-infrared region of the electromagnetic spectrum.

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Abstract

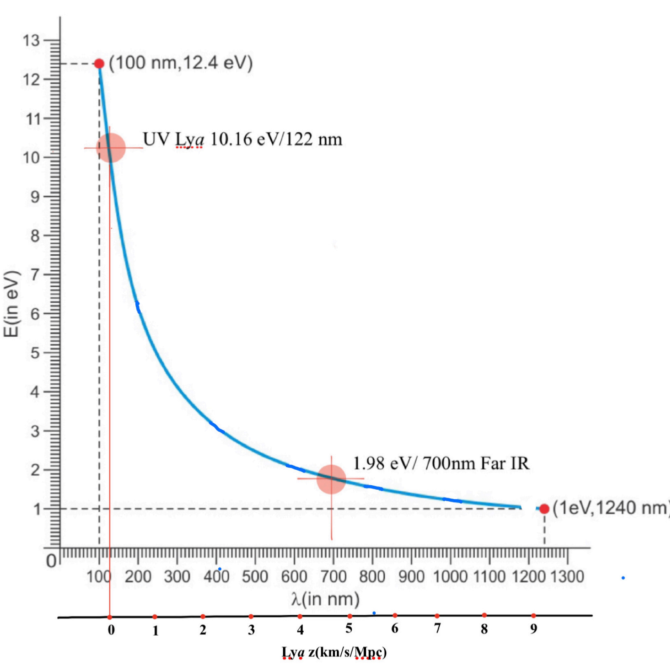
The intrinsic non-linear photon energy/wavelength ratio between the ultraviolet and far infrared region of the electromagnetic spectrum, is compared to the prevailing velocity/distance interpretation of cosmological redshift, to explain the different rates of the Hubble constant *H0* between the early and late universe. An extremely close correlation is found that presents a new challenge for the standard ΛCDM (Lambda cold dark matter model).

Cosmological Tension

The discrepancy in values of the Hubble constant *H0* 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 *H0* was found to be 67.4 ± 0.5 km/s/Mpc [1], that at 5σ to 6σ, is in significant disagreement with *H0* for the late universe (Riess et al. 2021; Di Valentino et al. 2021) via the Supernova *H0* for the Equation of State (SH0ES) project, where *H0* = 73.5 ±1.4 km/s/Mpc "A discrepancy that is increasingly hard to ignore" is one view expressed by Nobel astrophysicist Adam Riess. [2]
With non-overlapping values robustly defended by both groups, and cosmologists currently unable to explain the 8% discrepancy, fresh ideas and perhaps a simpler more direct approach appear necessary to break the impasse.
One suggestion is that cosmologists accept the early and late *H0* values as determined thus far, and consider what the different *H0* values at different evolutionary stages of the universe implies.

The non-linear Energy/wavelength relationship

Fig.1



A study that accepts different rates of the Hubble constant at different times of cosmological evolution, must then seek physical phenomena that could potentially explain such a variation.
One relationship that may have been overlooked is evident in the energy/wavelength graph Fig.1 where the rest wavelength of photons in the ultraviolet region at 100 nm/12.4 eV indicates a ratio of 8 nm/eV, that increases disproportionately to 1,240 nm/eV in the far infrared region of the electromagnetic spectrum.
What is particular significant in this observation with regards the current tension between *H0* at different stages of cosmological evolution, is a remarkable correlation with the 8% difference in energy/wavelength ratio between the UV and far infrared region of the electromagnetic spectrum.

One of the important spectral lines in the Lyman series for neutral hydrogen used to determine redshift, is the (Ly-*a*) UV line observed from stellar populations and active galactic nuclei, 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 (in km/s/Mpc) displayed directly below the wavelength scale.
In the far infrared region of energy/wavelength curve of Fig.1 is the 1.98 eV/ 700 nm line.
If this line is observed and identified by astronomers as an Ly*a* redshift, this would be interpreted as a redshift of *Z* = 4.757, typical of those found in high-redshift dusty star-forming galaxy candidates as 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 remarkable correlation between the energy/wavelength ratio between the UV region and the far infrared of the electromagnetic spectrum and the difference between the Hubble constant for the early and late universe, both at 8% must surely be considered more than just a coincidence.
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%.
The difference in 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), differs by 5.6 km/s/Mpc. The rate of change (5.6 km/s/Mpc)/(67.4 km/s/Mpc) yields 8.3% for the early, or (5.6 km/s/Mpc)/(73 km/s/Mpc), 7.67% for the late universe.

The mean value of H_0 contended by W. Freedman via the Tip of the Red Giant Branch Method (TRGB)[4] is Ho = 69.8 ± 0.6 (stat) ± 1.6 (sys) km/s/Mpc, which at (5.6 km/s/Mpc)/(69.8 km/s/Mpc) = 8%, a value that is within 0.05% of the difference in photon energy/wavelength.

With the overwhelming support and scale of research devoted to sustaining the standard Lambda CDM cosmological model, there will undoubtedly be a great deal of opposition to this energy/wavelength interpretation of redshift, but as the tension between the early and late Hubble rates of expansion continues to mount, one must at some point recognise that alternatives such as the non-linear energy/wavelength of electromagnetic radiation are credible, and furthermore does not depend on hypothetical dark energy to explain the correlation.
This conjecture does not infer that all cosmological redshift is dependent on photon energy, that much is evident in observed shifts from relatively local sources, which includes blueshift as well as redshifted spectra.What is contended, is that the further the sources are in time and space from observers, from doppler, or gravitational redshifts, the natural increase in wavelength associated with lower energy photons ultimately dominates those observed spectral shifts.

Should the energy/wavelength interpretation of redshift gain support, there will be many who question the validity when faced with the evidence from many other studies such as the cosmic microwave background, which has been interpreted in favour of a “Big Bang” cosmological model. The lack of features in the background radiation is already a contentious issue, and although the existence of the radiation is not in doubt, again it is a matter of interpretation. If the universe did not start with a singularity and rapid inflation, where did the background radiation originate?
We recognise that the further we observe, the greater the redshift of sources, and understand that ultimately the ancient light falls below the visible, and into the microwave region and further again into the radio region of the electromagnetic spectrum. What is significant in the cosmic microwave background radiation, is the nature of the sources, which in an infinite steady state universe without boundaries, would include an exponentially rising number of sources with distance, that would continue to increase the overall microwave background if it were not for the inevitable redshift with distance, which reaches a peak before disappearing into the radio frequency band of the spectrum.
The contention is that the cosmic microwave background is a natural consequence of radiation from sources of light in an infinite boundless universe, and not a relic of radiation left after a big bang event.

Looking forward, the energy/wavelength curve may actually provide a far more accurate means of determining how far galaxies and quasars and any other sources of light are from Earth, whilst also taking into consideration doppler effects, which may broaden the spectra of galaxies, due to rotation and true doppler effects that must be evident in all such sources.

Steady State cosmology has always had supporters at one time, from Hubble, Einstein, Bondi, Hermann; Gold, Thomas (1948). Hoyle, Burbidge, Narlikar (1994) What the impact of the energy/wavelength interpretation of redshift will have remains to be seen, but a future cosmology and a universe without boundaries is undoubtedly an exciting prospect, and new horizons for those who take the new interpretation seriously.

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In text References:

[1] Planck Collaboration. “Planck 2018 results. VI. Cosmological parameters”: https://arxiv.org/pdf/1807.06209.pdf

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[3] Jin, Daddi, Magnus et al. “Discovery of four apparently cold dusty galaxies at z = 3.62-5.85 in the cosmos field:” https://arxiv.org/pdf/1906.00040.pdf

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