EQUATIONS OF MOTION OF THE UNIVERSE:

XPXP LIGHT WAVES - MEASURING UNIVERSAL DISTANCES

41AA M.D. Earl 2023

Light waves are constantly emitted and received throughout the universe, providing a method of measurement for astronomers. It is submitted that the measuring techniques currently in use, although appearing to be correct, produce results that are invalid. Recognition of the XPXP character of the universe presents an opportunity to correct erroneous measurements of distances and velocities in space.

The Relativistic Doppler Shift is a tool that astronomers currently use to determine the velocities of very distant galaxies. The logic is: When light from a source having a known wavelength has a shift in wavelength toward either end of the spectrum when received, the source is moving toward or away from the observer. The wavelengths are changed due to the relative motion (just like on earth). A red shift indicates that the waves are stretching, and the source is receding. A red shift of light from virtually all of the cosmic galaxies is proof of an expanding universe.

In the late 20th century, it was discovered that the cosmic expansion was inexplicably accelerating. It is submitted that this universal acceleration is exponential (at Hoco e^Hot) and should be expected in an XPXP universe.

Currently, to determine the velocity of a distant galaxy, redshift ("z") is measured, then the Lorentz factor γ is used to calculate the "relativistic doppler shift". Thereafter, solving for v in the formula establishes the velocity of the galaxy. The measurement of the redshift is essentially determined by detecting the wavelength of light received, then comparing that wavelength with the wavelength of light emitted at the source. The λCDM relative velocity = z • c

The Lorentz factor, gamma (γ), was derived on earth, <u>using standard math</u> (Pythagoras). It <u>wrongly assumes a constant universal light speed</u>: where:

$$\gamma = \sqrt{\frac{1}{1 - {v^2}/{c^2}}}$$

γ is applied to detected light to determine the velocity of very distant galaxies. XPXP states that this leads to an erroneous galactic velocity. Amending this error requires a total reconsideration of the nature of light.

A light wave produced by a source at rest in the λCDM model is shown in Figure 41-1. The wave propagates unchanged through space until detected.

Figure 41-2. shows a receding source in the λCDM model, producing a "stretched" wave of identical period. Standard math states that the length of a wave is produced at the source and from that location remains unchanged until hitting a detector. i.e. the recessional velocity of the source determines the wavelength. Note that the (non-exponential) distance formula is used, where . $\lambda_o = c \cdot \mathbf{T}$.

Figure 41-1. Creation and propagation of a λCDM light wave (stationary source):

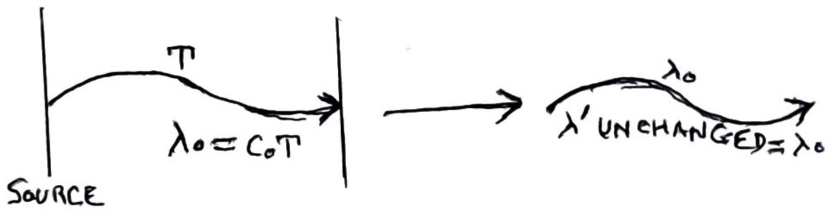
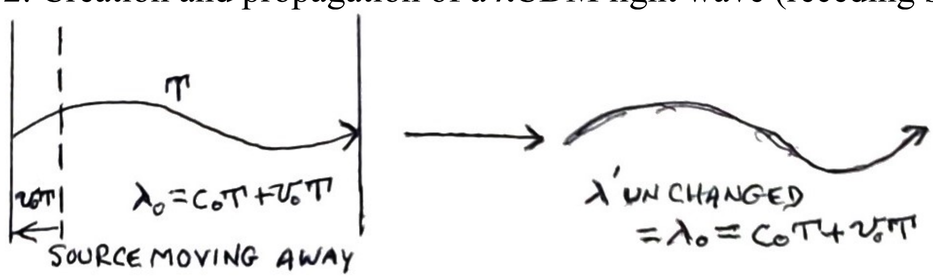


Figure 41-2. Creation and propagation of a λCDM light wave (receding source):



This wave model fundamentally differs from that of the XPXP model, in that an XPXP wave, like any length, exponentially expands during its "time of flight".

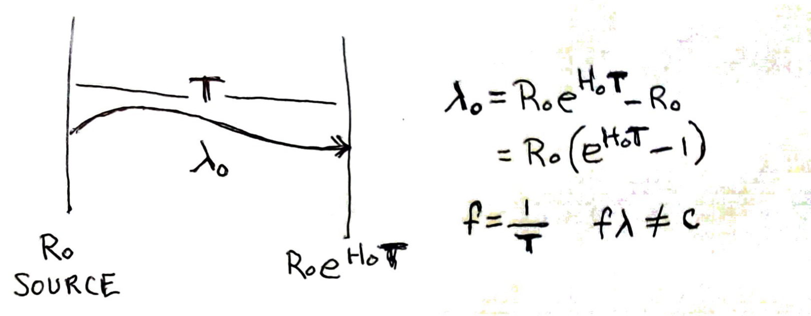
THE XPXP STRUCTURE OF AN ELECTROMAGNETIC WAVE :

To understand of the properties of an XPXP light wave, the logic and math is similar to that of the standard model - but exponential expansion principles must be applied.

The proposed method for determining the length of a light wave is the same as for any <u>length</u> in an XPXP universe, i.e. specify the two known exponential end positions, then subtract. By recognizing the XPXP nature of light, new astronomical principles may be applied to correct and simplify the measuring process as it now exists.

In Figure 41-3., an XPXP wave of light is shown being emitted from a properly moving source. It moves at light speed and goes through one cycle during the time interval **T** (the period). **T** remains constant for the life of the wave, but the length of the wave exponentially expands during the time of flight of the wave. It must be considered that a light wave moves at light speed relative to the expanding proper flow, and thereby increases in length relative to the flow. It is eventually detected (from the flow perspective) and has a longer wavelength.

Figure 41-3. An XPXP light wave with a period **T**



Note that a Maclaurin expansion of the expression for **λo** produces an expression **λo** ~ c · **T** , which is an approximation currently used in the λCDM model and is erroneously thought to be exact.

The wave moves at light speed ***<u>relative to the flow .</u>*** (see the propagation of light formula) It is defined by the period, the time interval necessary to traverse from Ro to R′. The frequency is 1/**T**. Once a light wave is created, it moves off at light speed and exponentially expands during its "time of flight" until it arrives at a detector where it is measured. The expansion of a light wave is **λo · e^2Hot**, while the proper expansion is **e^Hot**, so <u>light waves expand at e^Hot relative to the proper expansion</u>. To a proper observer, any light wavelength will expand by e^Hot until it is detected. THIS ALSO INDICATES THAT **<u>THE EXPANDED WAVELENGTH OF LIGHT RECEIVED BY A PROPER GALAXY FROM ANOTHER PROPER GALAXY WILL NOT CHANGE OVER TIME, SINCE THE LIGHT-TIME BETWEEN THEM IS UNCHANGING.</u>** "e^Hot" (where t = "time of flight") is unchanging because the light-time interval between proper objects is unchanging (see previous work). This also suggests that, in an XPXP universe, <u>the night sky will not fade to black as predicted in the standard model universe.</u>

The light wavelength increases with respect to the Hubble flow during the time between the emission and the detection. At the detector, the wavelength received (λ′) will be shifted toward the red end of the spectrum where λ′ = λo e^Hot . Since the expansion occurs in all directions, the redshift will apply in all cases, except rare peculiar sources.

If the source and the detector are both moving properly, the “time of flight”, Δt, does not change(shown previously). This means that the redshift between proper galaxies does not change. However, the “time of flight” for light emitted from galaxies in <u>peculiar</u> motion will change with the v/c component of the exponent. Stars revolving in a spiral galaxy are peculiar relative to that galaxy and therefore the wavelength of light from those stars within the galaxy will shift. This corresponds to a “Doppler shift”, in that it appears to be velocity dependent. Stars revolving around a galactic center will exhibit a blue or red shift relative to that center’s galactic movement. (Figure 41-4 and Figure 41-5.) Stars moving away from the observer on one side will show a redshift, with a longer time of flight. A blueshift will occur on the opposite side. Obviously, the shift of the starlight within the galaxy is minimal in comparison to the cosmic shift of the galaxy as a whole.

Figure 41-4. A PECULIAR XPXP SOURCE RECEDING FROM DETECTOR

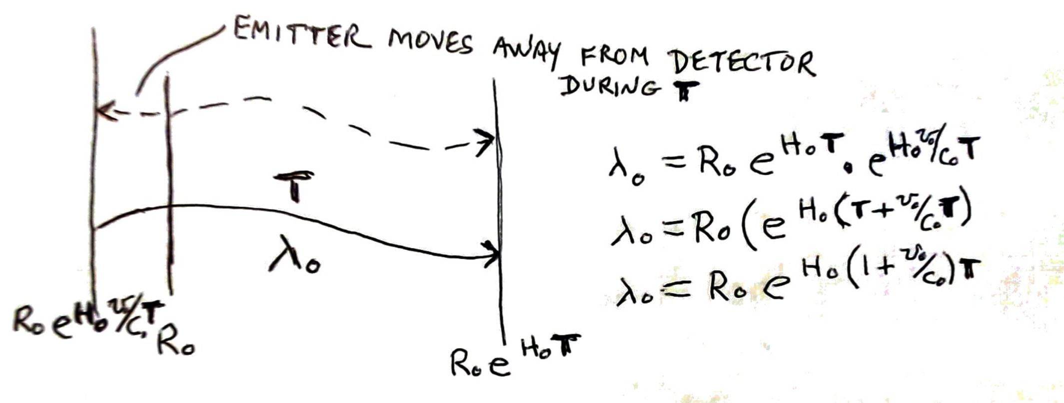
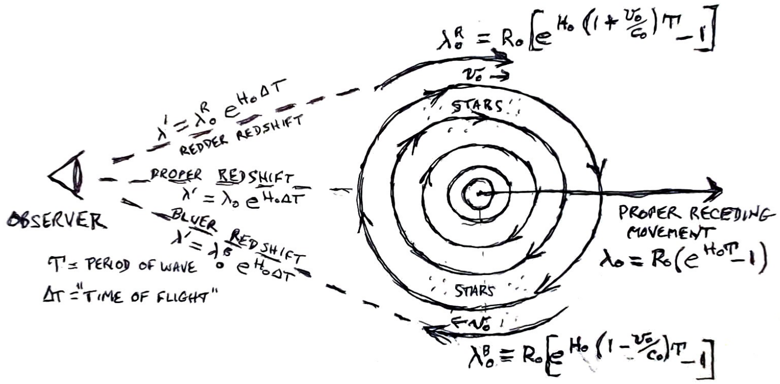


Figure 41-5. Peculiar shift in wavelength of Stars within a Galaxy



The relationship between wavelength **λ** and frequency **υ** are not as perceived in an inertial frame, i.e. : $\boldsymbol{\lambda \cdot \upsilon \neq c}$ **and** $\boldsymbol{c \cdot \tau \neq \lambda}$ ($\boldsymbol{\tau}$ = period). These equations are approximations of the exact XPXP relationships.

Because the formula for XPXP light wavelength is:

$$\boldsymbol{\lambda_0 = R_0\,(e^{H_0\tau} - 1)}$$ where τ is the period,

the frequency (**υ**) and wavelength (**λ**) are not as straightforwardly related as thought today where **υ** x **λ** = c. Instead, **υ** x **λ** =1, and the relationship is as shown below. A MacLaurin approximation shows how the incorrect formula used today is an approximation of the correct XPXP formula:

MacLaurin:

$$\boldsymbol{\lambda = R_0\,(e^{H_0\tau} - 1)}$$

$$\boldsymbol{\lambda \approx R_0\,(H_0\tau + 1 - 1)}$$

$$\boldsymbol{\approx H_0 R_0\,\tau \approx C_0\,\tau}$$

$$\boldsymbol{\upsilon = 1/\tau} \quad \text{therefore} \quad \boldsymbol{\lambda\,\upsilon \approx C_0}$$

This demonstrates the distinction between (exact) XPXP values and the current (approximate) values for light waves. Approximate λCDM measurements are adequate for most astronomical purposes, but as technology improves, astronomers and cosmologists are dealing with increasingly large distances, times, and velocities. In order to thoroughly understand our universe, the XPXP model must be adopted. Such acceptance requires major mathematical changes in astronomy and physics in general, possibly leading to a better understanding of everything.