

FREQUENCY DRIFT IN DEEP SPACE PROBES

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SIGNIFICANCE OF FREQUENCY SHIFT

The pioneer 10 space probe showed an anomalous frequency shift which was interpreted as a constant deceleration of $\sim 8 \times 10^{-10} \text{ m/sec}^2$. This anomaly was eventually explained and accepted as an on board thermal recoil effect. But the deceleration of the probe accurately matched the (negative) XPXP universal acceleration, -Hoc. **THIS “COINCIDENCE!” IS TOO UNBELIEVABLE!**

The communication radio carrier wave of the probe experienced a steady frequency drift during an eight-year coasting period. After 8 years, the frequency reduction was about 1.5 Hertz. The standard model provides no explanation for such a drift, but it is expected under the XPXP theory. It is an important supporting piece of evidence for the theory. The XPXP model predicts that observers unaware of the proper universal XPXP will perceive an Hoc deceleration of peculiar objects (which space probes are). Proper observers believe that they are at rest. Peculiarly moving objects show that observers are moving in the proper frame. It is also contended in the XPXP theory that an accompanying continuous frequency drift is expected for all radio signals from deep space probes. No additional rules are required. This deceleration of peculiar objects is caused by the unrecognized proper XPXP of space through which the peculiar objects move.

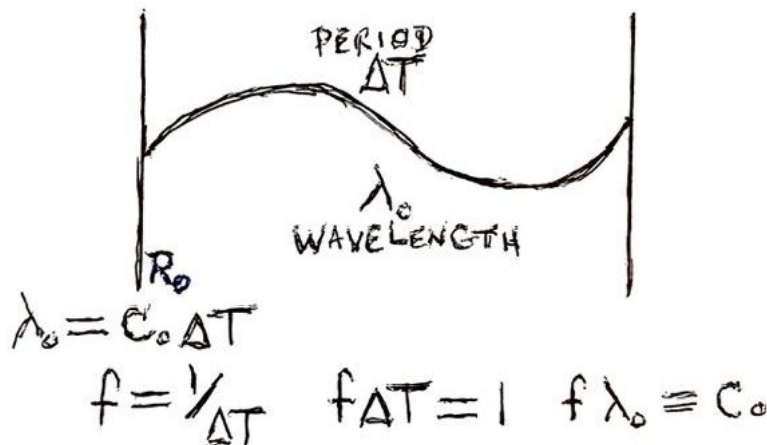
Space probes provide mathematical evidence of exponential expansion because the source of the carrier wave changes gradually as the distance from earth increases, and a drift of the signal is explained by XPXP. XPXP radio signals sent from probes move at light speed relative to the proper flow. Under the λ CDM model, extreme distance measurements are faulty. How the frequency of the radio signals received from space probes drifts due to universal exponentially accelerated expansion is explained below.

LIGHT WAVES IN THE STANDARD MODEL

The Standard Model describes radio waves as in Figure 1. A radio signal from the probe is sent through space at light speed and has a wavelength λ_0 produced at an originating probe position. The probe is moving, so the initial wavelength may be stretched (or compressed) by applying the Doppler effect

calculation to the relative motion. Thereafter, the wave maintains a constant wavelength during its flight. Since the wave frequency is the inverse of the period, a frequency drift is not consistent with the λ CDM model. Standard model relationships in the description of light are shown below. These differ from those relationships in the XPXP theory, but it is notable that the equations for XPXP correspond to standard model equations under “normal” conditions. (See Short -MacClaurin Expansion)

Figure 1. Light wave in the standard model



A light wave is created at position R_0 and propagates at light speed thereafter. The wave proceeds without a change in wavelength or frequency (assuming no local spatial expansions) until received at a detector. Any increase (or decrease) in wavelength is produced at the source as a result of the Doppler effect. The standard Doppler effect occurs due to a relative velocity, and at very high speeds by a relativistic Doppler equation. Light speed is postulated to be constant, contrary to the XPXP theory.

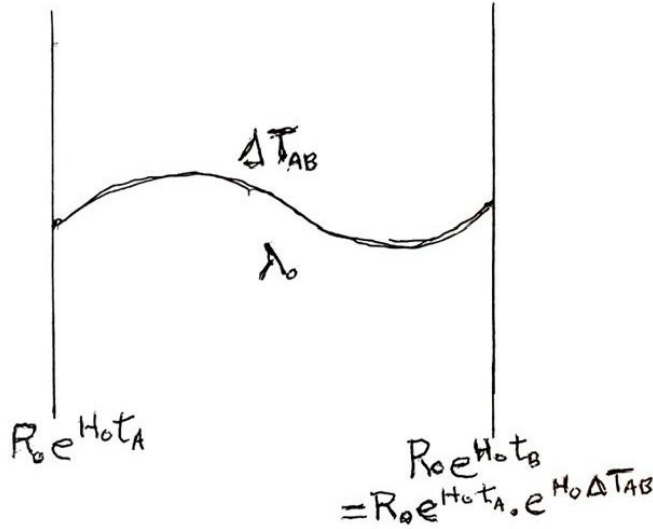
LIGHT WAVES IN THE XPXP MODEL

Space probes launched from the earth provide unique opportunities to explore the true nature of light waves. Because the peculiarly-moving probes are astronomically nearby, the measure of the ever-increasing probe distance is fairly accurate. The effect of the increasing distance shows as a continuous increase in the wavelength of the radio waves returned to the Deep Space Network on earth from the probe. This appears as a lowering “frequency drift” that can only be

attributed to XPXP.

The basic illustration for a light wave in the XPXP model is shown in Figure 2. A light wave produced at position Roe^{Hot_A} , is located in the proper expansion.

Figure 2. Light wave in the XPXP model:



From Figure 2, the derivation of the equation for a light wave produced at the source position Roe^{Hot_A} is:

$$R_A = Roe^{H_0 t_A} \quad R_B = Roe^{H_0 t_B} = Roe^{H_0(t_A + \Delta T_{AB})}$$

$$\lambda_0 = R_B - R_A = Roe^{H_0 t_A} \cdot e^{H_0(\Delta T_{AB})} - Roe^{H_0 t_A} = Roe^{H_0 t_A} \cdot (e^{H_0(\Delta T_{AB})} - 1)$$

$$\lambda_0 = Roe^{H_0 t_A} \cdot (e^{H_0(\Delta T_{AB})} - 1)$$

If $t_A = 0$, then $Roe^{\text{Hot}_A} = Roe^0 = Ro$

H_0 and Ro are universal constants, since we are addressing the cosmic motions of the light and the probe.

Because the time necessary for a wave to traverse the gap between R_A and R_B is ΔT_{AB} :

$$\Delta T_{AB} = t_B - t_A$$

$$\text{and } t_B = t_A + \Delta T_{AB}$$

Then:

$$\lambda_0 = Ro e^{\text{Hot}_A} (e^{\text{Ho } \Delta T_{AB}} - 1)$$

This equation shows the wavelength of light at a position $(Ro e^{\text{Hot}_A})$. From Figure 2, it may be seen that the time interval ΔT_{AB} is the XPXP period of the light wave. This equation represents the wave when it is generated from its

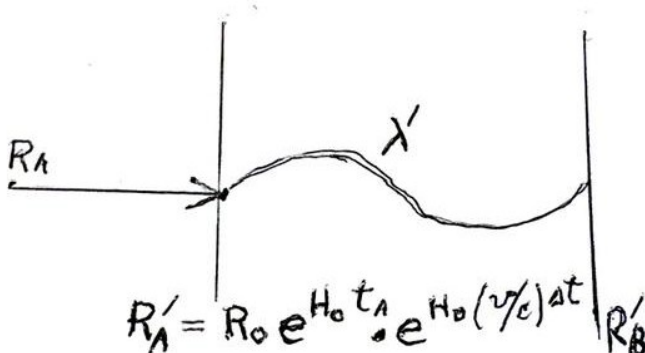
source at R_A . The XPXP wavelength is a function of the source distance.

The wave expands during its “flight time” (Δt) with respect to the proper frame. The exponential expansion in which objects (and waves) expand has been shown previously. All things expand *properly* by $e^{H_0 \Delta t}$ during a time interval Δt . Light waves expand in the same way relative to the proper XPXP frame, and we observers inhabit that frame. Therefore, relative to a stationary universe, light expands by $e^{2H_0 \Delta t}$. (Shown previously)

In Figure 3 below, a space probe launched from the earth moves peculiarly with respect to the proper frame. While it travels, it continuously sends a radio signal back to earth. It reaches a distance R' after a peculiar flight time Δt_{probe} , so that $R' = R_0 e^{H_0 (v_0/c_0) \Delta t_{\text{probe}}}$, where the probe velocity is v_0 , and Δt_{probe} is the peculiar flight time. λ' at that position is equal to the original wavelength λ_0 at $R_A = R_0 e^{H_0 t_A} (e^{H_0 \Delta T_{AB}} - 1)$ but its distance continuously increases in time. All positions along the probe path produce light (or radio) signals of increasing wavelengths relative to the original source. These signals from the probe are continuously sent to the deep space network on earth. The gradual increase in wavelength is received as a gradual decrease in signal frequency (since frequency is the reciprocal of the period) and represents a frequency “drift”. Figure 3. shows a representative position where light of an increased wavelength is created.

$R'_A = R_A e^{H_0 (v_0/c_0) \Delta t_{\text{probe}}}$ is the peculiar position of the probe after some Δt . The probe is moving at a constant velocity which is significantly less than light speed. The probe XPXP light wave is shown, where the period of the wave ΔT_{AB} is initially determined at the source, and as time progresses, the wavelength gradually increases.

Figure 3. A peculiar source for XPXP light.



The wave of Figure 3 is just one wave emitted from a moving source, and

represents the waves as shown below.

$$R'_A = R_0 e^{H_0 t_A} \cdot e^{H_0(v/c)\Delta t}$$

$$R'_B = R_0 e^{H_0 t_B} \cdot e^{H_0(v/c)\Delta t} = R_0 e^{H_0 t_A} \cdot e^{H_0(\Delta T_{AB})} e^{H_0(v/c)\Delta t} = R'_A \cdot e^{H_0 \Delta T_{AB}}$$

$$\lambda' = R'_B - R'_A = R'_A \cdot e^{H_0(\Delta T_{AB})} - R'_A$$

$$\lambda' = R_0 e^{H_0 t_A} \cdot e^{H_0(v/c)\Delta t} \cdot (e^{H_0(\Delta T_{AB})} - 1)$$

$$\lambda' = R_0 e^{H_0 t_A} \cdot (e^{H_0(v/c)\Delta t} \cdot e^{H_0(\Delta T_{AB})} - e^{H_0(v/c)\Delta t})$$

$$R_0 e^{H_0 t_A} \cdot (e^{H_0((v/c)\Delta t + (\Delta T_{AB}))} - e^{H_0(v/c)\Delta t})$$

$$\text{New period at } R'_A = ((v/c)\Delta t + (\Delta T_{AB}))$$

$$\Delta t = \Delta t_{\text{probe}}$$

$$v/c = \text{constant in the diagram} = v_0/c_0$$

This peculiar movement of the wave source therefore causes a wavelength increase, and may be extrapolated to be a cause of the cosmic redshift.