

# Simple Explanation for the ‘Cosmological red-shift’ And It’s Evidence

By

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## Abstract

Photon is a chunk of energy  $h f$ , where  $h$  Planck’s constant, and  $f$  is frequency. Every chunk of energy or mass must produce a gravitational field around it. Now, when this chunk of energy moves from one to another position, in the manner of ‘quantum jumps’, the gravitational-field around the previous position has to collapse, and new field should keep getting established around the new positions. These productions and collapses of gravitational field should give rise to gravitational waves or ripples. These ripples must carry certain amount of energy with them, and this energy can come only from the kinetic energy of the photon. So the energy of the photon should keep on reducing, which we have been observing as the ‘cosmological red-shift’. And we can express this reduction in kinetic-energy of the photon as deceleration of the photon. If such a deceleration is true for a chunk of energy called photon, then it must be true for every particle of matter too. Strikingly, the decelerations experienced by the space-probes Pioneer-10, Pioneer-11, Galileo and Ulysses, as carefully measured by Anderson J.D. et. Al., match perfectly with the deceleration of the ‘cosmologically red-shifting photons’; thus providing supportive evidence for this simple explanation.

## Derivations:

Linear part of the ‘cosmological red=shift’ is expressed as:

$(hf_0 - hf) / hf = H_0 D / c$  where  $H_0$  Hubble's constant, and  $c$  is the speed of light.

i.e.  $(hf_0 - hf) = (hf/c^2)(H_0 c) D$

That is, the reduction in kinetic-energy of the photon is equal to its mass  $(hf/c^2)$  times the deceleration  $(H_0 c)$  times the distance  $D$  traveled by it.

Numerically, the quantity  $(H_0 c) = 6.67 \times 10^{-10}$  meter/second<sup>2</sup>, and the decelerations experienced by all the space=probes were also of the same order of magnitude  $10^{-10}$  meter/second<sup>2</sup>, thus providing supportive evidence for our simple explanation!

#### **References:**

1. Anderson J.D. et. Al. "Observation of a small, anomalous long-range deceleration of the Pioneer-10, Pioneer-11, Galileo and Ulysses space-probes" *Phys. Rev. Letts.*