

Correct interpretation for “Harvard Tower Experiment” Or Law of energy conservation for “free fall” photon

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Introduction [1]

You have mirror on table top, reflective side up. Now you have one photon, 100 m above that mirror, going straight down. As photon “fall down” its frequency is bigger and bigger, until it hits a mirror. Then it starts to go straight back up, now its frequency is getting smaller and smaller. When it passes 100 m mark, it will have same frequency as before.

My statement:

During all that voyage photon have same energy, REGARDLESS of its change in frequency.

In other words:

Total energy of photon is product of photon frequency and Planck's “constant”. [1]

Or otherwise:

“Planck's constant” must be gravitational field dependent, VARIABLE, in order to accommodate law of energy conservation. (See page 14, 15 in [1])

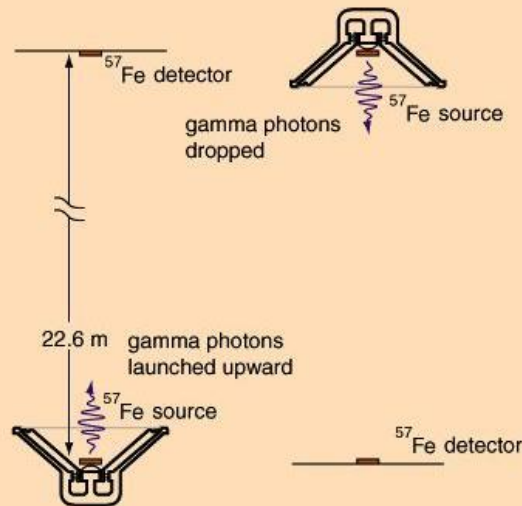
Experiment [2], [3]

In “Harvard Tower Experiment” photon energy is different

I will try to explain “Harvard Tower Experiment” in my own view, and compare that with current standard explanation.

Harvard Tower Experiment

[2]



In just 22.6 meters, the fractional [gravitational red shift](#) given by

$$\nu = \nu_0 \left[1 + \frac{gh}{c^2} \right]$$

is just 4.92×10^{-15} , but the [Mössbauer effect](#) with the 14.4 keV gamma ray from [iron-57](#) has a high enough resolution to detect that difference. In the early 60's physicists Pound, Rebka, and Snyder at the Jefferson Physical Laboratory at Harvard measured the shift to within 1% of the predicted shift.

By just using the expression for [gravitational potential energy](#) near the Earth, and using the m in the [relativistic energy expression](#), the gain in energy for a photon which falls distance h is

$$\Delta E = mgh = \frac{E}{c^2} gh = \frac{14.4 \text{ keV}}{c^2} g \cdot 22.6 \text{ m}$$

$$\Delta E = 3.5 \times 10^{-11} \text{ eV}$$

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In picture you see two identical, gamma photon sources.

- 1) When they are next to each other, they photons will have same frequency and same energy.
- 2) When you leave one at the earth surface, and take other and lift it 22,6m above the first one: [1]
 - You need to work to do that
 - You will increase energy of every constituent part
 - You will increase every constituent mass, and size.
 - You will increase energy of the process that will radiate gamma photon.
 - Therefore you will have gamma photon of greater energy.
 - That gamma photon will have SAME frequency as one radiated at earth surface, but it will have GREATER energy.

In other words:

If you stand back and look at the sources of gamma photons in picture [2].

You will see that they have same frequency as they leave the source, but they ALREADY have different energies.

Standard interpretation is: [2]

- a) Energy of gamma photon from source above is the same as energy from gamma photon, originated out of source below, because they have same frequency.
- b) Energy of photon from source above is getting bigger and bigger as it falls down.

My interpretation is: [1]

- a) Energy of gamma photon from source above is already greater from energy of gamma photon, originated out of source below, regardless of same frequency.
- b) Energy of photon from source above is constant as it falls down...

Reference

- [1] Oliver R Jovanovic, *Gravity, Planck constant, structure of elementary particles*, <http://vixra.org/abs/1209.0087> (2012)
- [2] Harvard Tower Experiment, <http://hyperphysics.phy-astr.gsu.edu/hbase/relativ/gratim.html>
- [3] Harvard Tower Experiment, ^ Pound, R. V.; Rebka Jr. G. A. (November 1, 1959). "Gravitational Red-Shift in Nuclear Resonance". *Physical Review Letters* 3 (9): 439–441. Bibcode:1959PhRvL...3..439P. doi:10.1103/PhysRevLett.3.439.