Einstein's Assumption Fails A Simple Test

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In the development of General Relativity Einstein was at a juncture point in which he had to choose one of two paths. He chose the path of constancy of the speed of light *c*, chose the space-time metric, and allowed photons to change frequency while in flight. This choice violates the conservation of wavefronts. The other option is that the speed of light is a measured constant, not a universal constant, photons do not change frequency in flight, and the gravity potential is proportional to the speed of light rather than expressed as a metric. This frees up Maxwell's equations to now model space as a nonlinear entity rather than as a lifeless form with *c* held as a constant in a vacuum.

For over 30 years I have wondered about the constancy of the speed of light when observed from direct measurements. I constructed a hypothetical generalized speed of light experiment and imposed a variable speed of light. I let the clock oscillator frequency be proportional to the variable speed of light. Sure enough, the speed of light measurement always resulted in the same value *c* being observed on the equipment instruments, even as *c* was varied. My experiment showed that direct speed of light measurements are not capable of detecting any variation in *c*. I discussed this finding with John Wheeler while he was at The University of Texas at Austin and he said, "Gene I see what you are saying, but our committees believe the speed of light should be treated as a universal constant."

Since that time I have looked for a more convincing experiment that is harder to discredit and ignore. I have found what I am looking for in the conservation of wavefronts. After talking with physicists about the conservation of wavefronts in a vacuum, I find they all believe wavefronts are conserved. Considerable loss of spectral information would occur if distant galaxy light wavefronts were not conserved. So the <u>belief</u> is that wavefronts are conserved and also <u>we are told</u> that photons change frequency. Can these beliefs coexist?

With the conservation of wavefronts in mind, I began to review where we might have run astray in past assumptions. I found what I was looking for in Wikipedia under the topic "gravitational redshift." Einstein's thought process in developing the general relativity theory is described in the Wiki quotes below[1].

Factual: "Once it became accepted that light is an electromagnetic wave, it was clear that the frequency of light should not change from place to place, since waves from a source with a fixed frequency keep the same frequency everywhere. One way around this conclusion would be if time itself were altered—if clocks at different points had different rates. This was precisely Einstein's conclusion in 1911."

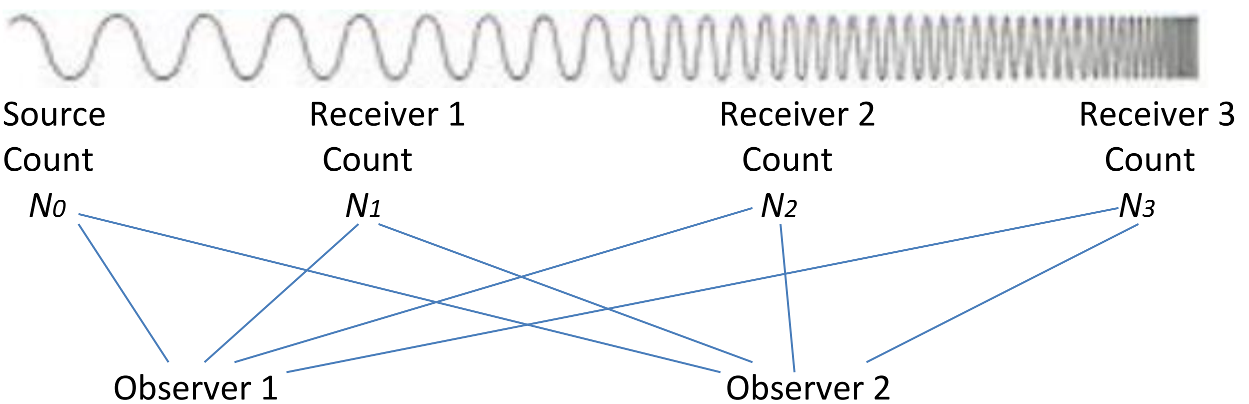
Assumption: "The changing rates of clocks allowed Einstein to conclude that <u>light waves change frequency as they move</u>, and the frequency/energy relationship for photons allowed him to see that this was best interpreted as the effect of the gravitational field on the mass-energy of the photon. To calculate the changes in

[1] http://en.wikipedia.org/wiki/Gravitational_redshift

frequency in a nearly static gravitational field, only the time component of the metric tensor is important." I have underlined Einstein's problematic assumption.

Conservation of Wavefronts Proves Photon Frequency Remains Constant:

The experiment below covers a large amount of vacuum space in which a constant carrier electromagnetic wave leaves a source in an area of one gravity potential and travels to another area of different gravity potential. Along the route are receivers that continuously count *N(t)* waves passing by and digitally retransmit their rapidly changing *N* values so observers can see the digital counts from anywhere in space. Note that there are no clocks used in this experiment.



What the observers see in the steady state streaming of wavefront counts N_0 N_1 N_2 *and* N_3 is that they are all synchronized with constant differences. This is true as long as the receivers and observers are stationary relative to each other.

This experiment is in direct conflict with Einstein's assumption that the photons change frequency while in flight. If the photons changed frequency while in flight, then the rate of counts from each receiver would not be synchronized. This non synchronization would be easily observed. Any differences in the rate of counts would cause the number of wavefronts between receivers to change with time until there is either an impossibly large number between receivers or a negative number of wavefronts, which is nonsense.

The correct interpretation is realizing that the gravity potential only affects the observer's clocks, not photons in flight. This new interpretation means that the frequency observed is the frequency that left the source. Time flows more slowly at that red shifted source than for us, thus creating the red shift. There is no additional frequency shifting once the red shifted wave leaves the source. What we see in our telescope is actually the color as it was radiated from that source, i.e. a measure of the source gravity potential compared to our gravity potential, assuming there is no motion creating an additional Doppler red shifting.

Suppose we want to prove wavefronts are conserved by direct experiment. It may not be possible to construct such a large scale elaborate experiment as has been suggested with receivers spread over great distances in space. We can ask, what kind of experiment can we conduct here on Earth? Here is one example.

The time standard transmitter at WWV in Boulder, Colorado sends out a tick signal every second. We observe that each tick is composed of a very large number of oscillations from a very stable oscillator. We know that every one second tick radiated from WWV is (later) received by all stations (that can hear the signal) regardless of gravity potential. No transmitted ticks are lost (red shift) or gained (blue shift) regardless of the gravity model used. The one second ticks could be divided into ten per second, and all those would be received also. This division process could be continued, and we would observe all the ticks received everywhere are conserved. We keep dividing until the time clock oscillator waves themselves are radiated, and all those waves would also be received everywhere (we might need line of sight propagation at extremely high frequencies). No loss or gain of wavefronts or ticks over any amount of extended time for any frequency transmitted would ever be observed, even for stronger gravity fields.

So let's revisit the variable speed of light. Einstein in 1911 had these two choices: he could fix the speed of light as a constant and then use metric stretching of space, which is what he chose, or he could have chosen to allow the speed of light to be variable but hidden from our view. His choice to fix the speed of light as a constant forced him to have the frequency of the waves or photons vary with gravity potential. However, this violates the conservation of wavefronts. If we choose a variable speed of light we can still explain why the measured speed appears as a constant. Einstein's choice to hold *c* as a universal constant cannot be reconciled with the conservation of wavefronts.

Here is an interesting experiment with a surprising conclusion. We construct a speed of light experiment on Earth that uses a clock with an oscillator running at frequency f_o. We count N_o oscillations from the clock as our test wave travels over a distance. If we take our experiment to a stationary point very high on the Earth, a mountain top, the clock frequency will shift to a higher frequency, such as by this function $f = (f_o)(1+p)$, where p a function of the height. However, we notice that when we move the equipment to the top of the mountain we still see the value of N_o being displayed on our digital readout. We know, however, that the N value should be inversely proportional to the speed of light c and directly proportional to the frequency of the clock. In formula form:

$$(N/N_o) = (f/f_o)(c_o/c) \quad (1)$$

We observe that $N = N_o$ at both locations, i.e. no change in measured c.

$$(N_o/N_o) = [(f_o)(1+p)/f_o](c_o/c) \quad (2)$$

Solving for the speed of light c.

$$c = c_o(1+p) \quad (3)$$

The clock frequency is increasing as the speed of light is increasing, which causes the measured speed of light to appear as a constant on our N counter. Oddly, the speed of light <u>has to be variable</u> in order for it to appear as a constant.

In this new interpretation, the photon does not lose or gain energy when traveling through space. This is a very important difference compared to Einstein's model. Momentum and energy conservation will need reworking in this interpretation. Also, a gradient in the speed of light can be shown to be the gravity field instead of Einstein's metric stretching of space.

The interpretation of constancy of speed of light experiments presented in this essay has important consequences when considering that very distant gravity red shifted objects may have had slower rates of time flow in the past (lower gravity potentials for a more compact universe), further shifting them into the red in the distant past. This effect could account for the so called dark energy acceleration observed for distant and old objects. It might explain the additional red shifting now being observed for distant objects billions of years old.