Emulating ‘photons’ at microwave frequencies for deterministic predictions: A proposal

By

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Abstract

My study of wave-particle-duality of light, as described in a paper: “Proposed explanations for thewave-particle duality of light and double-slit interference of single photons” (Tank, H. K., 2014)leads aninsight intothe nature of ‘light’; that: the rate of formation of ‘particles’ called ‘photons’ has to be at much slower rate than the frequency of the waves. It was found in the above-cited paper that if light is both ‘wave’ as well as ‘particle’, then a photon should contain a wide ‘band’ of waves, rather than a single frequency; and whenever and wherever all the spectral components of the wide band get coherently added a ‘particle’ gets formed. Now, in this paper It is further shown that‘wavelengths’ and ‘frequencies’ of the actual band of waves, and the ‘distances’ and ‘time-rate’ of successive formations of ‘particle’ are two different phenomena. And the rate of formation of ‘particles’ called ‘photons’ is at much slower rate than the frequency of the wave.This study leads to an interesting new possibility that: it should be possible to emulate photons at microwave frequencies; and make deterministic predictions; by establishing perfect relation between wavelengths of the band of waves, and ‘distance’ between successive formations of ‘particles’.

1. Introduction:

Wave particle duality of ‘light’ and all other ‘particles’ of ‘matter’, and ‘collapse of the wave-function’ have been the century-old puzzles which thousands of physicists, including Einstein, Plank, Feynman, …have been trying to resolve. Albert Einstein once told: “Twenty years of brooding has brought me no closer to the answer, what is the photon. Some rascals think, they know, but they are deluding themselves.” According to Feynman, “The double-slit interference-

pattern of single particles is the biggest puzzle of science." My recent study of wave-particle-duality of light, as described in a paper: "Proposed explanations for the wave-particle duality of light and double-slit interference of single photons" (Tank, H. K., 2014) showed that in the experiments on 'light' performed so far, the red laser contained the line-width of a few kilo Hertz; and single photons derived from incandescent lamp also contained a wide bandwidth; because at the frequencies of light generation and filtering of purely monochromatic wave of one Hertz bandwidth is technically not possible so far. So the spectral components of this wide band get constructively added only at discrete points in space and time, and mutually nullify their amplitudes at rest of the points. And they have been these constructive superimpositions of all the spectral-components of the wide band, which we have been detecting as the 'particles'. Pl. see the graphs of fig.1 below:

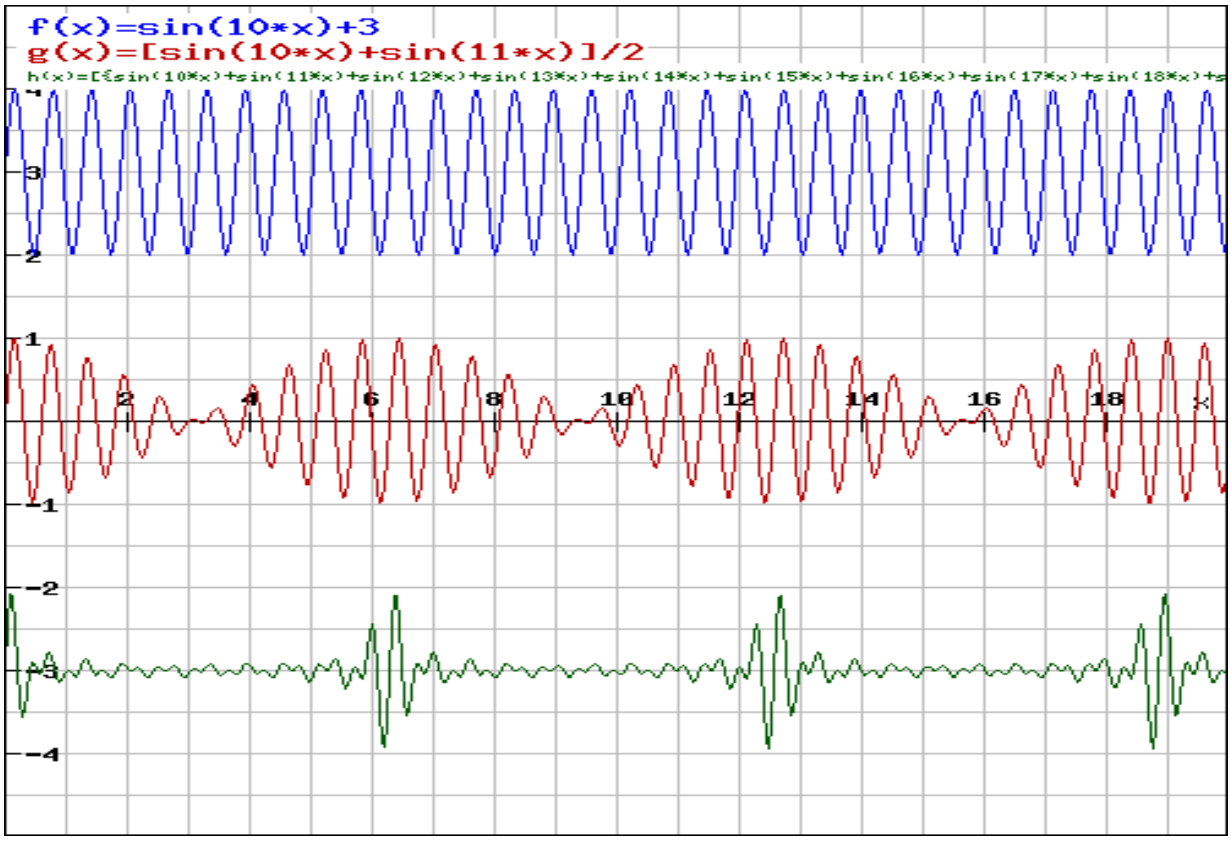

Fig.1: (i) Blue curve, on the top, shows a wave of purely single frequency, Sin (10* x); (ii) the red curve, in the middle, shows that when two waves get added, their amplitude start varying in space and time; and (iii) the green curve, at the bottom, shows that when so many waves of slightly different frequencies get added, e.g: sin(10*x)+Sin(11*x)+sin(12*x)+sin(13*x)+

sin(14*x)+sin(15*x)+sin(16*x)+sin(17*x)+sin(18*x), then they coherently add only at discrete places in space and time; and mutually nullify their amplitudes at other points in space and time. Such packets of waves, formed due to superimpositions of a wide band of waves, are detected by the detector as the ‘particles’.

Based on the above paper an interestingnew insight has emerged, which is described in this paper; that: ‘wavelengths’ and ‘frequencies’ of the actual spectral-components of the wide band involved in the experiments and ‘distances’ and ‘time-rate’ of formation of ‘particle’ are two different phenomena. This insight can help us for emulation of photons at microwave frequencies; and their deterministic predictions; as described in the next section.

2. Difference between ‘wavelength of the wave’ and ‘distance between successive formations of particles’:

As can be seen from the fig.2 below, the wavelength of central component of the wide band of waves is about 5 mm; whereas the distance between two successive formations of ‘particles’ is about 6 cm.

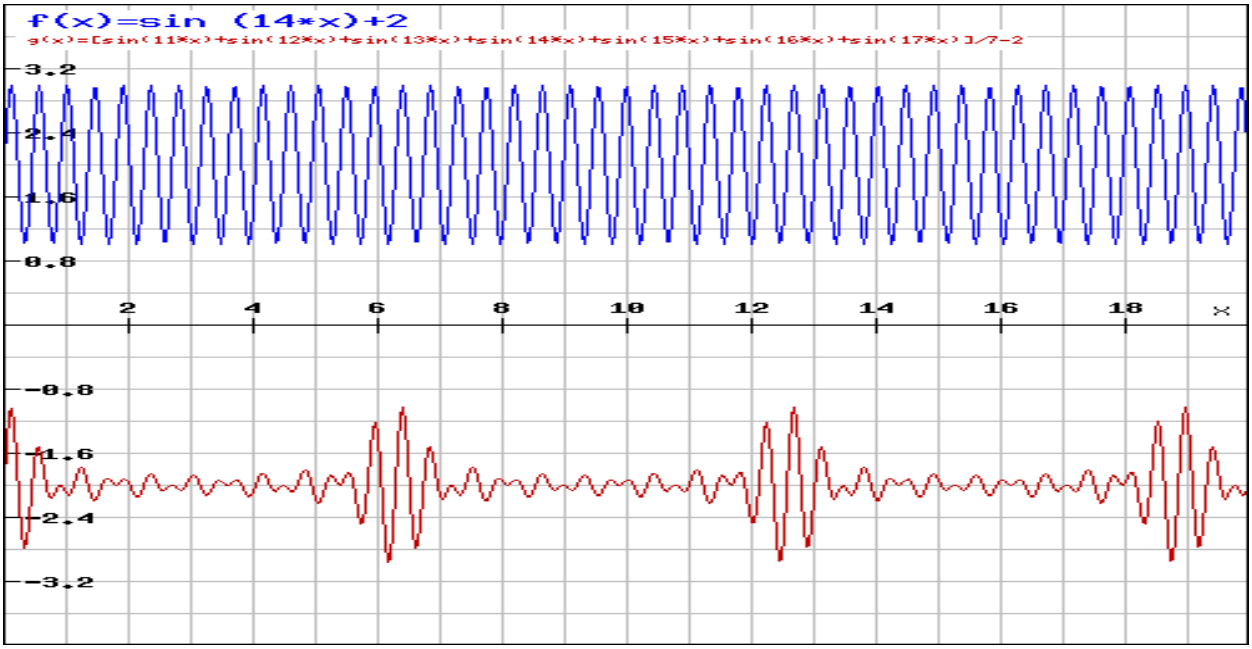

Fig.2: (i) The blue-colored graph at the top shows central spectral-component of the actual band of waves, sin(14*x). (ii) The red-colored graph in the middle shows superimposition of a wide

band of waves: sin(11*x)+sin(12*x)+sin(13*x)+sin(14*x)+sin(15*x)+sin(16*x)+sin(17*x)/7, and we find that constructive superimposition of all the spectral components takes place at much slower rate than the frequencies of the actual waves.

The new insight into the nature of 'light' emerging from the above discussion is that:The wavelengths and frequencies of the actual band of waves, and the 'distances' and 'time-rate' of successive formations of 'particle' are two different phenomena. The 'rate of formation of particles' is much slower, than the frequency of the actual wave. Based on this insight we can emulate 'photons' at microwave frequencies for their deterministic predictions.

3. **Conclusion:**

So far, it was not known to us that there is a wide band of waves involved in the formation of photon; nor we knew about the phase relations of all the spectral components. So we have been thinking in terms of wave-particle-duality and 'collapse' of the wave-function. Now we know that at the frequencies of light generation and filtering of purely monochromatic light of one Hertz bandwidth is technically not yet possible, so there is a line-width and significant bandwidth of waves involved in the double-slit experiments on light. Spectral components of this wide band coherently add only at discrete points in space and time. They have been these discrete points of coherent additions of spectral components, which the detector has been detecting as 'particles'. And there is a difference between 'wavelength of the actual waves' and 'distance between successive formations of particles'.This discussion leads us to a possibility that: it should be possible to emulate 'photons' at much lower microwave frequencies, at which we can establish perfect relation between 'wavelengths of the band of waves', and 'distance between successive formations of 'particles', by carefully selecting the band of waves. And it should be possible to make deterministic prediction of those emulated 'photons'.

References:

[1] Tank, H. K., (2014) "Proposed explanations for the wave-particle duality of light and double-slit interference of single photons" http://vixra.org/pdf/1407.0036v2.pdf