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A Trial for Deminishing Photon's Diameter Existence

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Abstract

In this work we propose an experiment for asking if photons' diameter exists or not for proving that it is not. Initially, the theoretical background for the experiment is provided and in the continuous the experimental procedure is presented in detail. Especially the practical process for performing the proving project requires a transmitting and a receiving antenna device in free space and as explained is straight-forward.

THEORETICAL BACKGROUND

Suppose a transmitting antenna device in free space and a time duration (t) for the first photon's creation by it arbitrarily consider to be the time for the photon to gain its constant velocity due to acceleration when resting, profound enough according to my opinion as any thought on a non-pointless nature of photons has not been proved. Then this time is given as follows t = h*f/TRP (1) where h the Planck's constant, f the frequency of transmission and TRP [1], the total radiated power. Then the acceleration (a) acting to it for gaining his constant velocity in free space (c) is given, using that velocity is expressed as a*t and (1), in the following

a = c*TRP/(h*f) (2)

The distance (d) traveled for the photon to catch his final velocity arbitrarily again with alike spirit as before is supposed to be its volumetric creation distance, namely, its diameter, given simply, using that distance is expressed as 0.5*a*t^2, (1) and (2), as follows

d = c*h*f/(2*TRP) (3)

Explaining, it is like a linear creation of photon takes place as it moves leaving its body behind.

Using some basics of geometry in the continuous, suppose that the volume of the transmission line connected to the receiving antenna for reception to be as follows

V = A*d (4)

where A the cross-section of the transmission line. Then, by dividing this volume (V) with the photon's volume (i.e. (4*π*d^3)/3 in a case of spherical photons, for other volumetric approaches different volumes must be used), one can find the number of photons occupying V (N) given, using (4), in the following

N = 3*A/(4*π*d^2) (5)

Their energy (E) would be as follows

E = N*h*f (6)

Now, for the introduction of that energy to the system a time d/u should pass (u is the photons' speed inside the material of the transmission line). E can also be given again as follows

E=P*T (7)

, where T the time. Using (5)-(7) and that T for this case is d/u, one can get d as follows

d = 3√3*A*h*f*u/(4*π*P) (8)

where 3√ is the third root operator. If d given by (3) and (8), using measurements, are unequal, d cannot justified surely as photon's diameter. Moreover, a logical way for possible trials for hypothetical other theories which suppose a volume for the photon has been provided.

Experimental procedure description: The procedure is two-fold: a) experiment with the transmitting antenna and b) experiment with the receiving antenna.

For the transmitting antenna experiment, a signal generator should be applied to the antenna's port

supplying it with energy at least equal to h*f/η, where η the antenna's total efficiency equal to 1/2 for the generator to achieve the minumum required energy supply for the experiment (however, directly generating and detecting single photons at the specified frequencies for such measurements can be experimentally challenging). This way, TRP is corresponding at least to a single photon transmission from the antenna and can be measured in an anechoic chamber [2]. Then, (3) can be applied for getting the first value of d. For the receiving antenna experiment, the transmitting antenna should lie in the far-field region of the other for TRP to be accurate. By considering A and u as known values from measurement and theory respectively, P can be obtained using the transmission S-parameters [3], and a known value for the ingoing wave vector at transmitter measured measured using a vector network analyzer for producing the same TRP as in the transmitting antenna experiment. Then, again (8) can be applied for getting the second value of d. Having these two values one can easily deduce if a photon has a diameter or it is point-like as assumed by the quantum electrodynamics (QED) theory [4]. This experiment, if realized, will potentially prove that a photon's diameter doesn't exist. However, an uncertainty and error analysis is required but it is outside the scope of this work.

REFERENCES

1. Jiang K, Huang Y, Shen S, Chen X, Xie Y. Source-Stirred Method for Total Radiated Power Measurements in a TEM Cell," in IEEE. Transactions on Antennas and Propagation. 2025; 73: 2192-2203

2. Huang S, Li F, Chen X. An Improved Method for Total Radiated Power Tests in Anechoic Chambers," in IEEE. Transactions on Instrumentation and Measurement. 2022; 71: 1-9

1. Vasilis C. Papamichael, and Constantine F. Soras, "MIMO Antenna Modelling Using the Effective Length Matrices. Progress In Electromagnetics Research C. 2009; 10:111-127

3. Alvarez ETG, Gaioli FH. Feynman's Proper Time Approach to QED. Foundations of Physics. 1998; 28: 1529-1538