Conceptual FrameWorks
Research papers

Electromagnetic waves

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In the past the particle-wave duality of electromagnetic waves dominated the discussions about the nature of light. No consensus had been reached amongst physicists and philosophers of physics concerning which interpretation represents reality best. However, two different concepts for the same phenomenon doesn't really convince about the reliability of the conceptual framework. So what is wrong?

Points of view

Suppose an electromagnetic wave is a particle, a single photon. The photon is a quantum – Planck's constant – and to examine the way the quantum moves from A to B I want to do an experiment. Figure 1 shows vacuum space inside a vessel and at point A I will emit a photon in the direction of B, a detector of photons. It is known that vacuum space is a turbulence space full of quanta thus the quantum of the photon and the quanta of vacuum space are drawn like little red coloured dots.

Every quantum has the same velocity, the constant speed of light. So the question is easy: "*How can the photon – the quantum – arrive at detector B?*"

Figure 1 shows the problem if we describe a photon as a particle with the help of the phenomenological point of view. Because it is impossible the photon can arrive at detector B without being scattered by the quanta between A and B.

Tessellation

Figure 2 shows the same experiment but now I have changed my point of view. Phenomenological reality is exchanged by the general concept that reality is created by the underlying structure of the basic quantum fields (quantum field theory).[1]

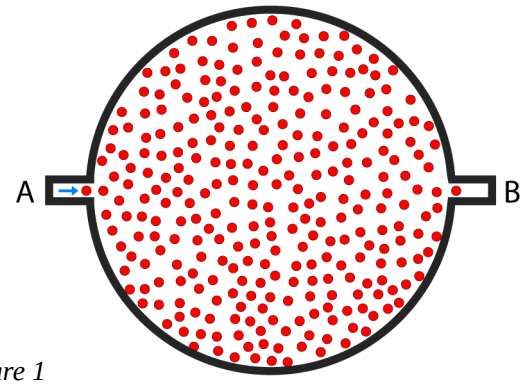

figure 1

Of course, the creating structure is in rest and all the phenomena move in relation to the underlying structure. But this is hard to visualize so figure 2 shows a "screenshot" of a continuous changing reality.

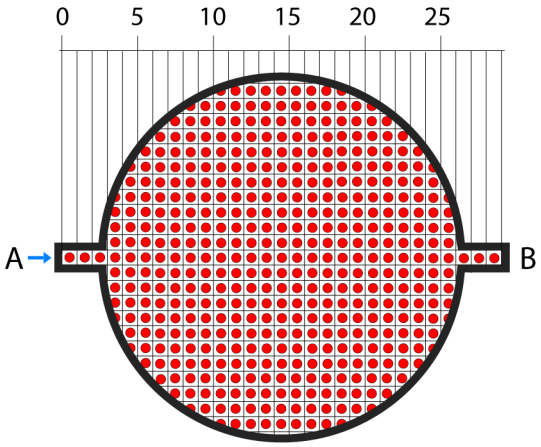

figure 2

The tessellation of the universe by the underlying structure of the basic quantum fields means that all the units of the structure (drawn like squares) transfer 1 quantum at the same time in a synchronous way. In other words, during the transfer of the single photon from A to B all the quanta – red dots – will change their transfer synchronously during 29 successive steps. During these steps the single photon is transferred in a "linear" way from A to B. Actually, the single photon doesn't move from A to B. It starts at position 0 to position 1. The next step a quantum at position 1 is transferred to position 2, etc., etc. Therefore there is no scattering of the single photon by the other quanta in vacuum space inside the vessel.

Single photons are just "free quanta". Therefore both images show a *gedankenexperiment* and not a real situation. Nevertheless figure 2 represents in a schematic

way how phenomena are transferred within the structure of the basic quantum fields. Most phenomena represent a topological deformation that consist of more than 1 quantum thus transferring a phenomenon composed by a number of quanta will have a velocity < *c*.

The wave form

An electromagnetic wave – a stream of quanta – is drawn in figure 3 and the stream of quanta is in line with the Z-vector. This raises a question about the emerging of a synchronous electric and magnetic field at a reciprocal angle of 90 degrees.

Figure 3 is derived from the results of macroscopic experiments. Nevertheless, the wave form of the electric and magnetic field is quite mysterious if we don't rely on these experiments.

For example, why do the electric and magnetic field change their magnitude at right angles to the direction of the stream of quanta? The explanation must emerge from the correct description of the mathematical properties of the structure of the basic quantum fields and not by an empiric founded circular reasoning. So what is this wave pattern?

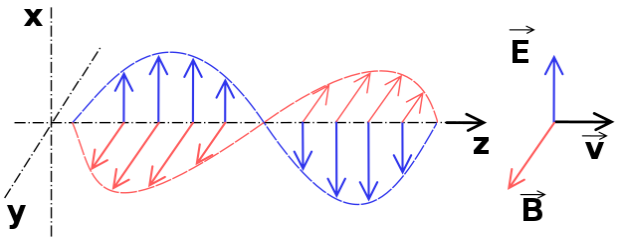

figure 3

First of all, if a electromagnetic wave is emitted it represents a surplus of quanta that quits the volume of a phenomenon, for example the outer electron shell of an atom. The electromagnetic wave propagates in vacuum space and adds and subtracts one quantum at the time in relation to the field structure around. The field structure of an electromagnetic wave is restricted to the synchronized electric and the magnetic field thus the transferred energy by the single photon is half the wave length.

Figure 4 shows the electric part of an electromagnetic wave. To enhance the visibility I made the red dots white because in figure 4 a red dot means a local surplus of energy (1 *h*) and a blue dot a local deficit of energy. In other words, the quantum at position 3 is a local surplus and the blue coloured quantum at position 14 represents a local deficit of energy.

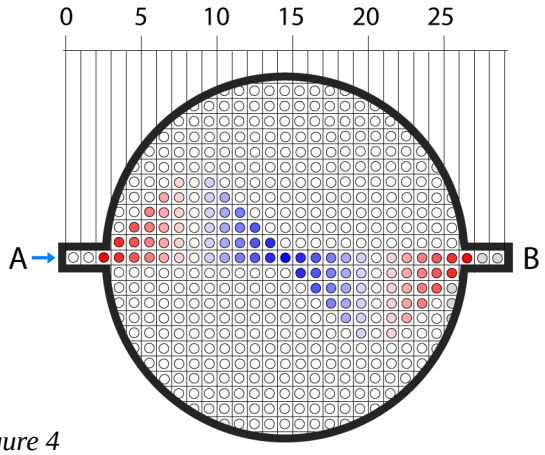

figure 4

In between the surplus of 1 quantum is spreading itself over the other quanta around till it disappears (position 8). Next, at position 9 it "pops up" again till it has become a deficit of energy with the amount of energy of 1 quantum – accumulated by one unit – at position 14. That is why an electromagnetic wave has no mass. Of course 1 quantum represents mass but because it is successively a surplus and a deficit in relation to the energy of the surrounding field units, the net result is zero.

All the dots in figure 4 represent "single quanta" so we have to conclude that the transfer of an electromagnetic wave influences the way individual quanta around the trajectory are transferred.[2]

Nevertheless, how is it possible that the transfer of the electric property of 1 quantum from position 3 to position 26 behaves like a wave form?

The scalar mechanism

The electric field is a topological field. Every unit of the electric field represents a state that envelopes a certain amount of topological deformation. The electric field is not the only basic quantum field because the Higgs field – a scalar field – is the other basic quantum field. Both fields are part of the units of the structure that tessellates the universe. The magnetic field and the field of gravity (Newtonian gravity) are vector fields and the Higgs field mediates the vectors.[3]

The units of the structure are deformed scalars and that is why every unit of the electric field represents a deformed part of the unit. The scalar of the Higgs field is

the undistorted part of the unit, the inscribed sphere of the invariant volume of every unit of the structure.

Every scalar of the Higgs field tries to expand itself to become a “full” scalar, what means that the electric part of the unit must be transformed into volume that is enclosed by the undistorted scalar mechanism. But all the units tessellate space and the result is a continuous “push force” from within all the deformed parts of the units: the scalar mechanism.[4]

In other words, there is a dynamical distribution of mutual relations – spatial configurations – between the units and the result is what we call “probability” in quantum physics.

The consequence is the emerging of phenomena that are unstable in between 2 states that can be considered as the maximum and minimum “exposure” of the properties of the phenomenon: the wave form. A reality that is described by the title of the publication of Art Hobson: “*There are no particles, there are only fields*”.[1]

References

1. Art Hobson (2013): “*There are no particles, there are only fields*”.
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