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NEW APPROACHE OF EXPERIMENTS ON ENTANGLED PARTICLES IN FRANSON INTERFEROMETERS THROUGH THE EVTD^{2}THEORY

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Abstract:

This paper continues the others [1-3] whose principal consequences are adapted for understanding the results of the experiments on two particles in Franson interferometers. The EVTD^2 entities theory promotes the existence of associated waves (that could further become pilot waves), which are generated by corpuscles in movement in substratum that is a quantic ether. They advocate the pre-oriented direction of the output at the last separator. The associated waves are not "vide" but energetic of electromagnetic type.

Key words:

Franson interferometer, pilot wave, associated wave, quantic ether substratum, EVTD^2 theory.

1. INTRODUCTION

This paper is a logic continuation of the previous ones [1-3] jointly published in this journal. Different results on one particle interference have been explained taking into account the same base hypothesis and applying a relative uniform approach. Here are studied the problems of non-location for two one by one entangled particles in Franson interferometers. There are, in the interferometer, two quantic particles and *the displacements associated waves* will be, also, took into account [1-3]. Moreover, we already shown in ours previous papers, that *for any took path by the mono particle it remains relatively secondary*. Indeed, ***the output was piecemeal programmed by twin associated waves interference [1-3]*** at the level of last separator. They are, in this case, "the visitors" of every path; while the particles do not take only one path (they are not divided). ***Therefore, in this assessment, the indistinguishable of the paths is no longer a real important criterion.*** On the other hand, the principle of non-location of two entangled particles would be questioned or amended in the understanding of these phenomena? Balanced and unbalanced Franson interferometers differ from those of Mach-Zehnder by the fact that the paths are no more initially symmetrical. But they present for every entangled photon long-long (L-L) or short-short (S-S) path for the two highly unbalanced equivalent Mach-Zehnder interferometers (left and right) put together to form the Franson. These two types of path for photons are the only ones to be taken into account, as they are the only indistinguishable. The balanced Franson interferometer is represented in fig. 1. The specificity of the device will introduce new considerations, inside the EVTD^2 theory for the new approach dedicated to explain the obtained experimental results.

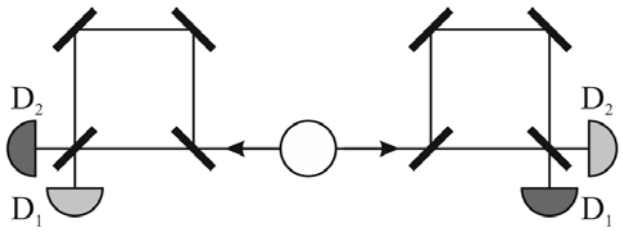

Fig. 1. Balanced Franson interferometer.

The study [4], correlated with the basic EVTD^2 theory, [5-10] allowed also to promote explanations on the interference fringes on Young slits. They result, in this case, from particles (microscopic liquid drops) sent one by one in an adapted experimental device. This was, somehow, a macroscopic indicator of what could be in quantic physics.

2. RESULTATS SUR LES FRANSON EQUILIBRE –DESEQUILIBRE

In the case *of balanced Franson interferometer, the obtained results are in perfect agreement* when it was established that the borrowed path are L-L or S-S (undistinguished). For this case this means that every particle (left or right) arrive in the same time to identical output D_1-D_1 or D_2-D_2. This represents 50 % of arrivals results in every two identical output. From the fact that the arriving couples are always "twins" and give the same result, we can referee to *perfect correlation between the results*.

The non-balanced Franson interferometer has a supplementary and modular elongation of a single path, for example the right component (longer path for the right particle), as in fig. 2.

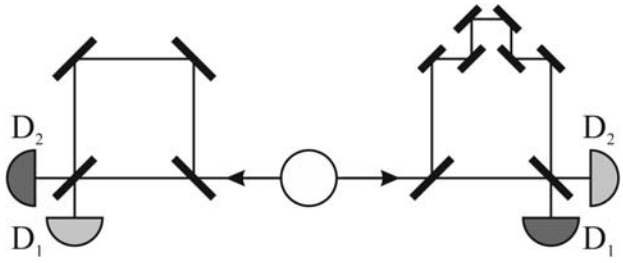

Fig. 2. Unbalanced Franson interferometer by elongation of a single path.

The obtained results, for variable very little elongations (if not, they are no more indistinguishable), are different in comparison with the balanced case. Indeed, the characteristic of uniform arrivals for duets of particles is then more or less important modified. Thus, arrival couples $D_1 – D_2$ and $D_2 – D_1$ are obtained. The percentages of these types of arrivals, in rapport with the number of those registered for the balanced case, are between 0 % and 100 %. So, it is demonstrated that for an established elongation, all output pairs are systematically of types D1 - D2 and $D_2 – D_1$. Every time, the particles caused an asymmetric arrival, named *perfect anti-correlation case.*

3. EXPLANATIONS THROUGH PARTICLES ASSOCIATED WAVES

With regard to obtain mono particle photon or two entangled photon, now, is a laser that generates monochromatic photons. The waves flow of photons generated by a laser have finite length alternating with break times, wherefrom a discontinue emission. Then they are conditioned by specific devices that will allow to release one-photon or a pair of both entangled photons. In a resonant cavity of a laser, the same wave trains browse it several times before being sufficiently intense to spread out through a partly transparent mirror. So, for the EVTD^2 entities theory there are, among other, in these cavities multiple shock-impulses of energetic electrons that descending to inferior levels will generate the photons. But, in addition, electromagnetic associated waves will be simultaneously produced [2-3] by shock-impulses on constitutive EVTD^2 entities of experimental space-time browsed by these photons. These associated browsed waves will propagate to the true photons through output mirror of laser and inside entire experimental device, which guide their spreading to different terminus. Therefore, if you go to the end of this reasoning, it is probably that all paths of different interferometers, will be traveled by these twin associated waves. They will retain the memory of their states of phase fluctuations, provided by the different conditions encountered in each of them. As we already indicated [1-3] that will shape the evolution in phase of twin associated waves,

which arriving on the last separator are, somehow, "analyzed" following their simultaneous states of incidental phases. *The resulting effective output path will be the most energetic and will attract the particles to it.*

It is very probable that the overall device, emitting the two entangled photons, sends at the same time to the left and right of the source, each photon closely coupled with the same associated wave train. Till to the first separator, there is equivalent correlation between each of them and the same associated wave train separated into two. But further, the circumstances are no more equivalent for the long and short path, and the twin waves mandatory travel them. In order to explain, for the case of Franson interferometer, that outputs are 50 % for each output D_1-D_1 or D_2-D_2, it is necessary to study the state of phase of twin waves on output separator. This case was already met in Mach-Zehnder interferometer [2]. As a *state of symmetry is between the right and left sides of this Franson, it is normal to find, for each pair of photons, equivalent states to the last separator*. Thus, in each shot, a same type of output is finalized for each of them. The fact that it is sometimes D_1 - D_1 and other times, resulting D_2 - D_2 *means that there are changing circumstances between every shot of entangled photons.* Taking into account what was above remembered on lasers and associated waves, we could promote the idea that, because the great difference between the short and long paths, there are not the same twin wave trains that interfere at outputs. Continuing and considering the great difference between paths lengths till *the last separator, we can suppose that* there is *the end of one waves train and the start of another. Indeed they do not obey to the same state of phase.* We could also think that there is about *"memory" effects in the situation where the paths are relatively non-correlated for the two cases of wave trains.* This last assumption seems to be the most probable.

Concerning unbalanced Franson, is to bring it closer to unbalanced Mach-Zehnder. [2] As a consequence of special considerations done before, for the understanding of first results, it would be quite easy to understand the results that derive from the only scalable extension of a path. Like what was mentioned in [2] the study is here almost similar, having regard to Franson specificity. Than the results are understood inside the superposed already mentioned bases. The perfect anti-correlation depends here only to a precise value of elongation that causes, for *twin waves, states of perfect phase opposition on the last separator, in the case of right device, while in the same left structure the two twin waves arrive in phase.* Therefore, every time, there are opposite results, as the results in [2]. The entangled particles, in this way of understanding the enigmatic phenomena, do not need hide superluminal communications. In case of path splitting, the particles follow the most energetic one, because the twin associates waves created them by visiting all paths, before the particles.

4. CONCLUSION

As a result of the results on the Mach-Zehnder understanding of work [2] which has been adapted to the case of the Franson and, in addition taking into account the discontinuity of associated waves, we riche explanations in the same logic. The extrapolation, which can be drawn from these understandings, predispose to scrap the concepts of non-location for entangled particles and communications at superluminal speeds in the Franson. The principle of causation is, therefore, being reactivated here.

5. REFERENCES

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Experimente asupra particulelor asociate în interferometrele Franson, reluate în teoria EVTD^2

Rezumat: Această lucrare urmează publicațiilor [1-3] ale căror principale consecințe sunt adaptate în încercarea de înțelegere a rezultatelor obținute asupra a două particule în interferometre Franson. Teoria EVTD^2 preconizează existența undelor asociate (ce pot devenim în continuare, unde pilot), ele fiind generate de corpuscule în mişcare în substratumul care este un eter cuantic. Ele permit să se prevadă direcția pre-orientată de ieşire la ultimul separator. Undele asociate nu sunt „vide" ci energetice, de sorginte electromagnetică.

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