Adding a gravitational waves detector to the double slit experiment

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Abstract

"**We choose to examine a phenomenon which is impossible, absolutely impossible, to explain in any classical way, and which has in it the heart of quantum mechanics" – Richard Feynman**. This paper shows that when an elementary particle (electron, photon and proton) is not measured, it doesn't have a momentum and location. This idea will be proven by a thought experiment combining double slit experiment with gravitational waves measurement.

Introduction

In the double slit experiment [1] and the delayed choice quantum eraser experiment [2] light and matter defer to their particle or wave like characteristics dependent on our ability to know "which way" the particle passed through (which path/which slit it passed through). If we measure which slit the electron (or any other elementary particle including photon) passed through (by a standard electro optic "which way" detector), we will receive a particle behavior on the measurement screen (noninterference pattern). If we do not measure which way or erase this information (even after it reached the measuring screen), we will receive the wave like behavior of the electron on the screen (interference pattern). Let's apply an imaginary thought experiment and add a sensitive gravitational wave detector, that can also detect which way ,meaning, we will know if the electron passed through one slit or both without any dependency on the "which way" standard electro optical detector result . Since the gravitational wave detector can make its decision regarding which way the electron went , it seems as if the standard "which way' detector has no influence on the pattern received on the screen. But, our experience shows that this is not the case. Our experience shows that by turning on the standard which way electro optical detector (figure 1) we will receive a noninterference pattern and by turning off this detector or applying a delayed choice quantum eraser (figure 2) we can reconstruct the interference pattern, without any dependency on the gravitational waves generated by the particle.

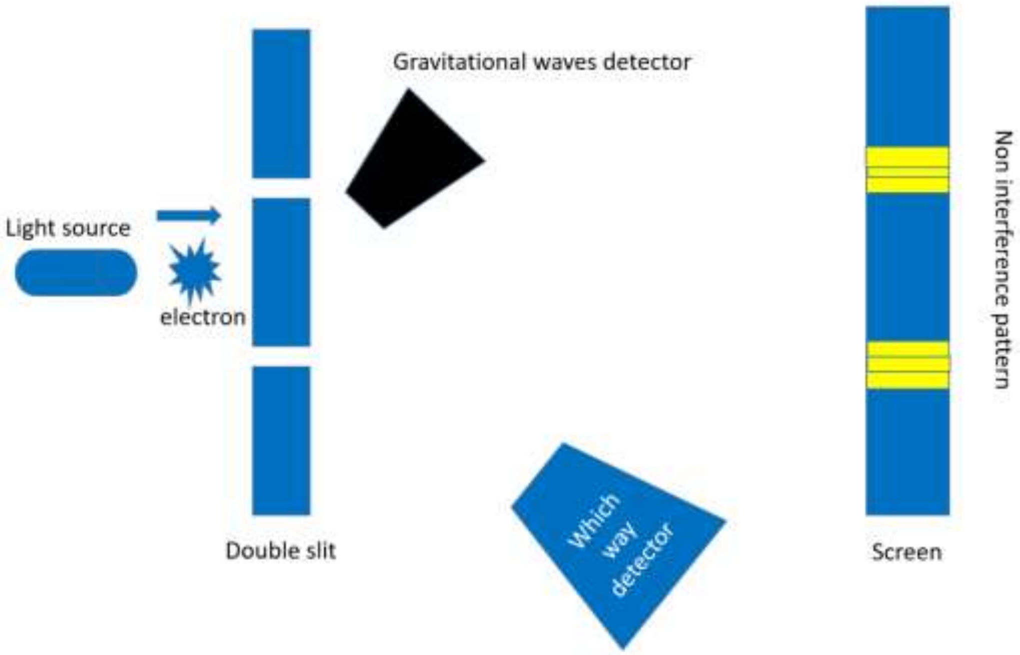

Figure 1: The first group of electrons, that pass only phase A (the which-path detector) without passing through phase B (the quantum eraser). The gravitational waves detector measures the gravitation waves just after phase A. This first group generates a noninterference pattern on the screen (two peaks).

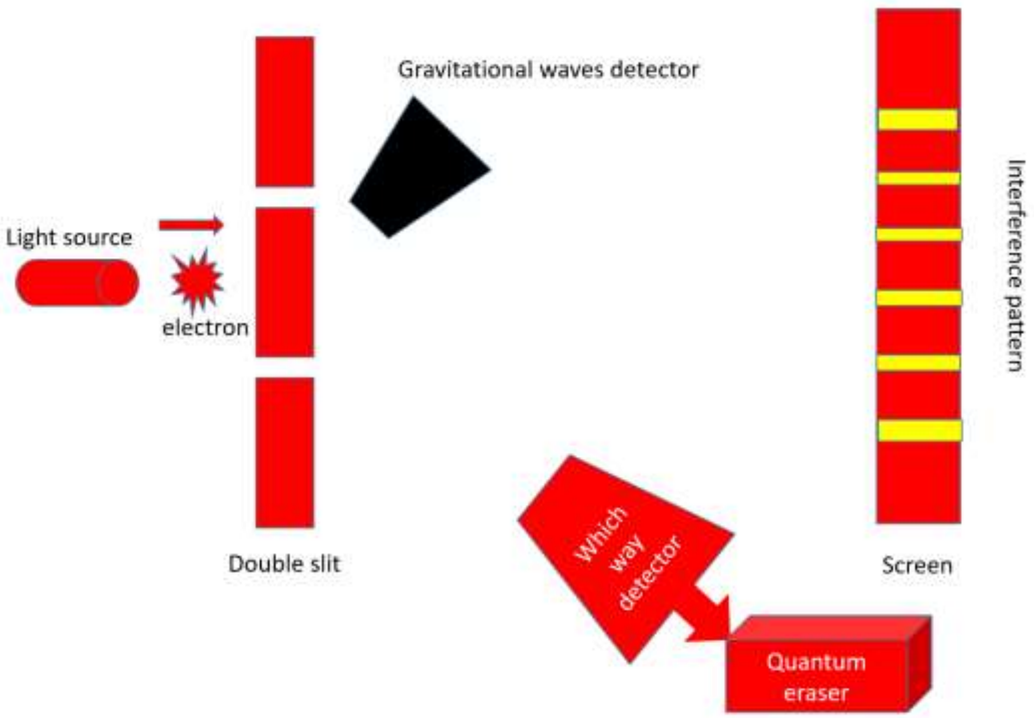

Figure 2: The second group of electrons that is first passing phase A (the which-path detector) and then passing through phase B (the quantum eraser). The gravitational waves detector measures the gravitation waves just after phase A and before phase B. This second group generates an interference pattern on the screen (peaks and valleys).

Conclusion

Alice conducts a delayed choice quantum eraser setup on an electron based double slit experiment. All the electrons at phase A will undergo which path / which slit detection phase (figure 1) and some of them, later on will continue to phase B and will undergo a which-path /which slit eraser phase (figure 2). When Alice will compare the first group that passed only phase A to the pattern on the screen she will find that they generated a noninterference pattern as expected from a particle that has passed through only one of the two slits. When Alice will compare the second group that passed through phase A and later on through phase B, to the pattern on the screen she will find that they generated an interference pattern as expected from a particle that has passed through both slits. All the electrons passed first through phase A where their which path/which slit was detected. As the electrons pass through phase A, they are expected to generate a gravitational wave that indicates the result of the detection. Now let's add Bob to the experiment. Let's imagine that Bob has a very sensitive gravitational wave detector which can theoretically measure through the gravitational waves, the results of phase A (which of the two slits the electron passed through) of all the electrons before some of them undergo the phase B of the which-path/which slit eraser. Bob knows the which-path/which slit information of all the electrons from their gravitational waves pattern, and expects that they all will generate on the screen a noninterference pattern as expected from a particle that passed through only one of the two slits. Alice on the other hand, has two groups of electrons, the first group that generates a noninterference pattern (passed through phase A only and their which slit was measured) and the second group that generates an interference pattern (passed through both phase A and the quantum eraser of phase B that erased the which slit information). The disagreement between Alice and Bob regarding the results of the second group in the experiment, is an inevitable paradox. Since we know that Alice results are accurate, we need to explain why Bob couldn't measure the gravitational waves of the second group. The explanation is that as long as the which-path/which slit information of the second group was not definite and could be erased by Alice delayed choice quantum eraser setup, the electron was a Schrodinger probability wave and not a real particle, and as long as it is not a real particle **it does not generate a gravitational wave** that Bob can measure. Once the electron is measured by Alice in either the first group or the second group, only then, it behaves like a particle with position, momentum and gravitational waves that Bob can measure. That is why Bob will always agree with Alice results and there will be no paradox. The which-way gravitational wave pattern becomes definitive to Bob only when Alice will finalize her measurements and the which-way information of the electron will collapse to either first group or second group. This act of collapse is defined by the Copenhagen interpretation [3] or by the many worlds interpretation [4].

In order to visualize in a 3D symmetrical way, the many worlds interpretation, we can add an extra three dimensional (3D) non local grid like dimensions (grid dimension). Each world is quantized into space voxels in the size of Planck's length in each dimension and the grid dimension is the non-local 3D extra space between these voxels. This enables to stagger many worlds in a symmetric way one next to the other (figure 3).

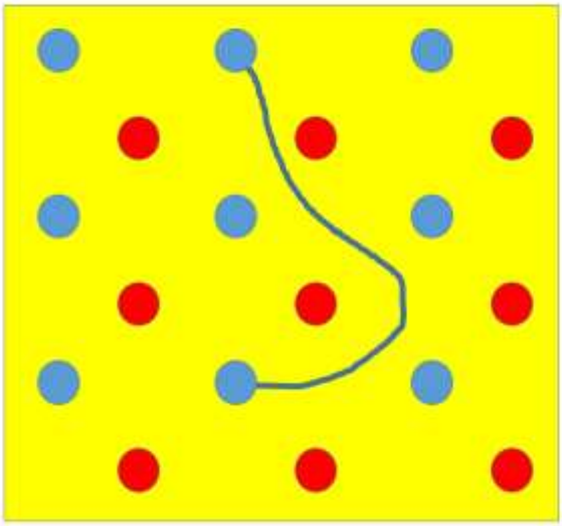

Figure 3: Each circle illustrates a 3D local voxel of quantized space in the size of Planck's length in each dimension. The blue circles represent the world of figure 1. The red circles represent the world of figure 2. Both parallel worlds are quantized and staggered next to each other, floating in an extra 3D non local grid dimension, illustrated by the yellow region between the Planck sized voxels. The blue colored line connecting two blue circles illustrate the non-local connection of entanglement between two far away local voxels of space through the non-local grid dimension ("spooky action at a distance" – Albert Einstein).

REFERENCES:

[1] https://en.wikipedia.org/wiki/Double-slit_experiment

[2] https://en.wikipedia.org/wiki/Delayed-choice_quantum_eraser

[3] https://en.wikipedia.org/wiki/Copenhagen_interpretation

[4] https://en.wikipedia.org/wiki/Many-worlds_interpretation