Another Attempt to Reinterpret the Double Slit Experiment

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Abstract: This writing refers to a thought experiment that tries to explain various situations such as interference patterns that appear and disappear in the double slit experiment but without using the concepts of collapse of the wave function or the influence of the human observer.

In a thought experiment with light pulses, the question is to see if it is possible to explain the formation or not of interference patterns, based on the principle of equivalence between two inertial systems that move relative to each other with uniform rectilinear motion. To save words, we will call them immobile and mobile. Einstein’s Special Relativity, Lorentz’s transformations, and Minkowski’s graphs refer to the fact that if 2 simultaneous events are observed within an immobile system, from the mobile system those same events will NOT be observed as simultaneous. The scope of this controversy can be classified into two cases: Case 1): If 2 events are observed as simultaneous within an inertial system, they will not be observed as simultaneous since another inertial system that moves respect to the first. Case 2): If 2 events are NOT observed as simultaneous within an inertial system, this information is not sufficient to know how they will be observed in another system. There will be systems where the Lorentz’s transformations indicate that simultaneity will be observed, and a lot of systems where simultaneity will not be observed.

Our analysis will focus on situations where the context indicates that the Controversy Case 1) is applicable. At first there will be no detectors before the slits. Then, detectors of the passage of light pulses are placed. Except for the placement of detectors, the entire test is automated and the presence of a human observer can be dispensed with during both stages. The results recorded on the screen and those recorded by the sensors can be evaluated after the test ends. Let’s imagine that the Light Pulses acts as Mobile Observers (LPMO). There are no other observers at this stage where the detectors are not positioned. According to LPMOs, if there is interference between the diffracted light pulses coming from the two slits, also according to LPMOs, the diffracted pulses must have started simultaneously from the 2 slits. Diffracted pulses that arrive at the same place but at the wrong time cannot be interfered with. According to LPMOs, the light pulses that reach the two slits arrive simultaneously from their origin at the pulse source, and this agrees with the fact that it was originally a single pulse that was later divided into two. If we are solely under the observations of the LPMOs, we are within a single inertial frame of reference, the mobile, and their observations on simultaneity are not questioned by anyone. But in the second part of the test it is decided to place sensors, each one immediately before each slit, to detect the passage of the pulses and record the instant in which this occurs. These Sensors act as Immobile Observers (SIO). Here we will make changes with respect to a previous writing, assuming that in this specific experiment the sensors will not cancel out interference patterns, and the LPMOs will observe in all his path that they arrive simultaneously at the sensors, the slits and interference points. LPMOs in his mobile system trigger the Controversy Case 1) when they pass through the sensors, and the SIO can NOT observe simultaneity between light pulses. But in other different (physical) experiments with Elementary Particles as Mobile Observers (EPMO) were reported that SIO observed the simultaneity and SIO triggered the Controversy Case 1). In that situation EPMO don’t arrive simultaneously to the slits and the waves can NOT form a interference pattern.