

Proposal for a Device to Generate Branching

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Abstract

According to reference [1], it has been shown through experiments utilizing quantum entanglement phenomena that the real world is not described by a wave function, but is instead a branching universe that splits into multiple worlds. By improving this experimental method and equipping it with a type of random number generator, such as dice, and incorporating a mechanism to determine the presence or absence of slit removal operations based on the number rolled, it is demonstrated that this experimental device can not only prove the existence of branching universes but also serve as a device to generate new branching universes where a specific number on the dice continues to appear. Furthermore, it is suggested that there may be interactions between such physical devices and human consciousness, leading to the Global Consciousness Project which was initiated in 1998. This paper also considers the relationship with experiments in parapsychology.

Keywords

Many-Worlds Interpretation, Non-Local Long-Range Interactions (Quantum Entanglement), Bell's Inequalities, Double-Slit Experiment, Random Number Generator

1. Introduction

In quantum mechanics, the existence of non-local long-range interactions has been demonstrated by Alain Aspect and many other studies. This phenomenon, known as “quantum entanglement”, occurs when two quantum systems are in an inseparable state, such that when one quantum takes a specific state, that information is instantly conveyed to the other, thereby determining its state. This phenomenon is being utilized in the development of technologies for quantum computers and cryptographic communication. The existence of branched universes and other phenomena is also being considered, suggesting through [1] that the many-worlds interpretation, rather than the Copenhagen interpretation, is correct.

2. Random Number Generator [2]

Random numbers are values generated randomly without specific rules or patterns. Therefore, it is believed that there must be some cause for a significant bias to appear in a random number generator. One possible cause is thought to be human consciousness, and the Global Consciousness Project [3] is a study scientifically investigating this possibility.

3. Global Consciousness Project

In a study where a random number generator was brought to an event called “Burning Man” held in Nevada, a significant bias in the random numbers was observed when the giant statue known as “The Man” was set on fire at the climax of the event. Furthermore, it has been reported that global events such as the Olympics and New Year’s often lead to biases in random numbers. Notably, extreme fluctuations were observed on the day of the terrorist attacks on September 11, 2001.

First, the correlation of the fluctuations of all RNGs was highest on that day throughout the year.

Second, the cumulative fluctuations swung extremely positively from the time of the terrorism, then subsequently fell into negative territory. This fluctuation reached as high as 6.5 times the standard deviation.

Third, a peak in the moving average was observed near the time of the terrorism, and the probability of this occurrence was one in ten million.

These results were analyzed independently by six statisticians who arrived at consistent conclusions.

4. History of Evidence for Quantum Entanglement

Phenomenon Experiments such as Wheeler’s delayed choice experiment and Alain Aspect’s Bell’s inequality violation experiment, [4] [5] along with many other studies, [6]-[9] have demonstrated the existence of non-local long-distance interactions. This phenomenon implies that, for example, when creating pairs of photons using devices (down-converters) that convert high-frequency light signals to lower frequencies through nonlinear crystals like beam splitters or optical parametric oscillators, the behavior of one photon affects the far-away other photon. Incidentally, Alain Aspect received a Nobel Prize for his research.

5. Characteristics of the Copenhagen Interpretation and the Many-Worlds Interpretation

1) Copenhagen Interpretation

Quantum states can only be determined probabilistically, and the state of a particle is described by a “wave function”, existing only in probabilities until observed. In other words, before observation, an electron has “multiple possibilities”, but at the moment of observation, it collapses into one result. Therefore, it cannot be said to “exist” until it is observed.

2) Many-Worlds Interpretation

The wave function does not collapse upon observation. When an observation is made, it is not that just one possibility is chosen, but rather that “all possibilities continue to exist in parallel”. Each time an observation occurs, the universe branches. Quantum mechanics progresses deterministically. It is not determined by probability; instead, all possibilities actually happen and branch into separate worlds.

6. Bell's Inequality

Measurements are made at two different locations A and B. The measurements yield only two results: +1 or -1. Each of the measurement devices at A and B has two different settings, and for each measurement, the settings are randomly switched to measure the corresponding physical quantities. In the measurement at A, either the physical quantity A0 or A1 is measured, while in the measurement at B, either the physical quantity B0 or B1 is measured, with both measurement results being either +1 or -1. Under local realism, the following holds:

$$|S| \leq 2$$

$$S = (A0B0) + (A0B1) + (A1B0) - (A1B1)$$

but in experiments, S has been observed to exceed 2, confirming the violation of this inequality. Many studies related to this violation of Bell's inequality have been published [10]-[15].

7. Quantum Entanglement

Quantum entanglement, a phenomenon proven by the violation of Bell's inequalities, is a state in which two quantum systems cannot be separated. When one quantum takes on a specific state, the information is instantaneously transmitted to the other, and its state is determined. This quantum entanglement continues to have correlations regardless of how spatially apart the particles are, as long as they are in an entangled state [16] [17].

New technology developments are underway using particles in such quantum entangled states.

1) Quantum Computers [18]

The existence of quantum entanglement has become clear, and various quantum technologies such as quantum communication and quantum sensing are being researched worldwide, with a particular focus on quantum computers. Their ability to perform calculations at high speeds compared to digital computers is also due to the utilization of quantum behaviors like quantum superposition and quantum entanglement.

2) Quantum Entanglement Based Cryptographic Communication [19]

In addition to quantum computers, it is utilized in communication. Photons that are entangled, regardless of how far apart they are, can have their state instantaneously determined by measuring one of them. By combining this property

with classical communication, it is possible to achieve “quantum teleportation” to transfer quantum states, allowing for applications in quantum communication. In theory, quantum communication is possible regardless of the distance, and there is no concern about interception or eavesdropping like in conventional communication, making secure communication feasible.

3) Branching Universes

The reference paper [1] shows that the phenomenon of quantum entanglement can be used not only in this microscopic world but also in the macroscopic world, specifically to understand whether the entire universe is a multiverse. This proposed paper aims to demonstrate that not only can we know the existence of a multiverse utilizing quantum entanglement, but it is also possible to conduct an experiment to create a device that allows experimenters to generate desired branching universes in the macroscopic world.

8. Quantum Interference Patterns

When conducting a double-slit experiment using quantum entities such as electron beams, interference patterns appear on the screen. These interference patterns demonstrate the wave nature of particles, as the same results can be obtained even when electrons are emitted one at a time. However, it has been proven that these interference patterns disappear if the particle’s path can be determined through observation [20] [21].

From Young’s experiment, the condition for the occurrence of bright fringes at position x_m for integer m is as follows: $(d/L) \cdot x_m = m\lambda$ ($m = 0, \pm 1, \pm 2, \dots$) where d is the distance between the light sources, L is the distance between the downconverter and the screen, and λ is the wavelength of light.

9. Experimental Method

It is possible to generate two photons in a quantum entangled state [22], and experiments such as the following can be conducted using the photons.

1) Experiment 1.

When the light source is weakened to the point where photons are emitted one at a time, as shown in **Figure 1**, each photon will take either the path along the solid line to the upper left or the path reflected by the semi-transparent mirror along the dotted line to the lower right. The photon probabilistically takes one of these paths, but which path it takes is uncertain. Thus, when it passes through a down-converter (1), (2) using a nonlinear optical crystal such as lithium niobate (LiNbO₃) and is divided into two quantum entangled photons with half the frequency through a process called the optical parametric process, they enter their respective interference detectors. Since the paths of the photons are uncertain, interference occurs. This interference can occur in both detectors due to non-local long-range interactions (quantum entanglement) of the pair of photons, even if the distances from the down-converter to each interference detector are different. Therefore, if a laser pulse, which is a collection of photons, is used as the light

source, interference fringes can be observed at each interference detector.

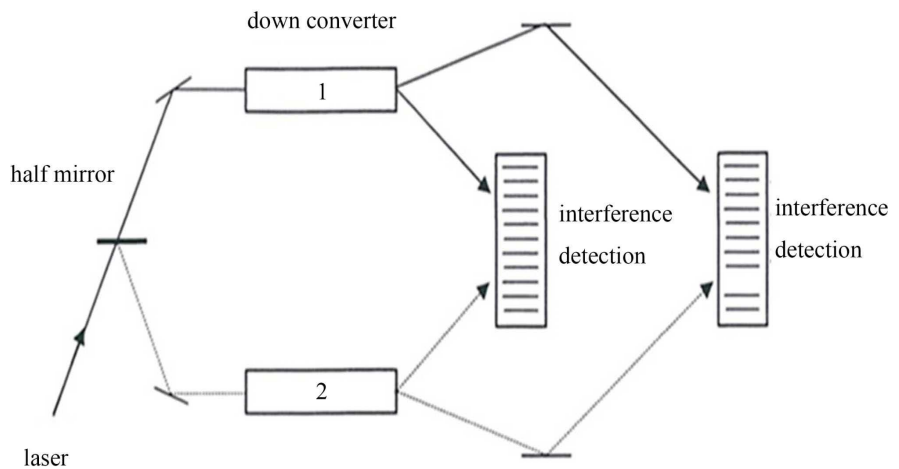


Figure 1. Experiment 1.

2) Experiment 2.

Next, as shown in **Figure 2**, when one of the interference detectors is removed and replaced with a particle detector, the photons that pass through either path via the beam splitter are detected by either particle detector (1) or (2). In other words, since the path is determined, only photons from one side enter the interference detector, and therefore, even if it is illuminated by a laser, the interference pattern disappears. This disappearance of the interference pattern occurs due to nonlocal long-distance interactions (quantum entanglement), even if the particle detector is positioned farther away than the interference detector.

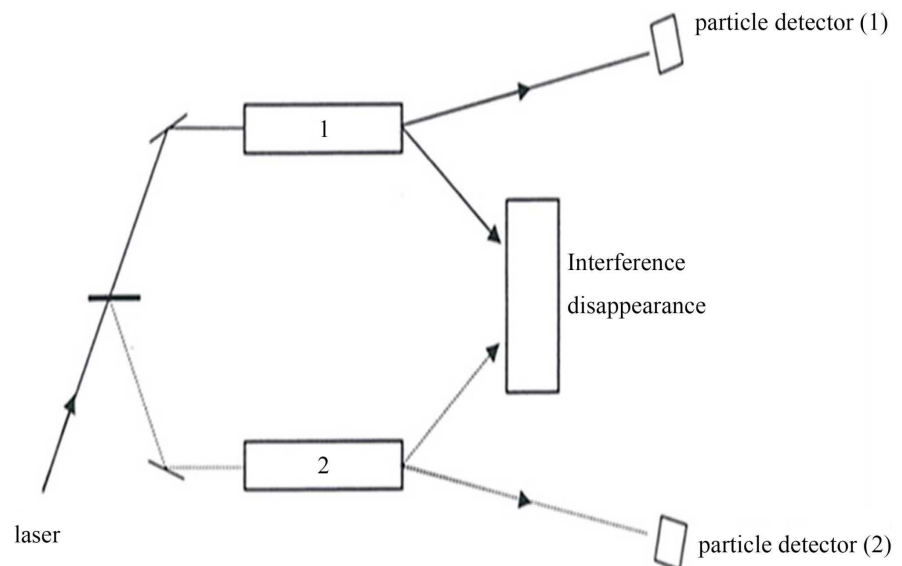


Figure 2. Experiment 2.

3) Experiment 3.

Furthermore, as shown in **Figure 3**, once the paths of the photons are set for

interference to occur at both interference detectors, if interference fringes are observed at detector A, the device is set to immediately remove detector B, allowing photons to be detected by the particle detector. The interference detector will use a liquid crystal light modulating film to ensure that no vibrations occur during the removal process. This film functions as an opaque screen when not powered, generating interference fringes on its surface.

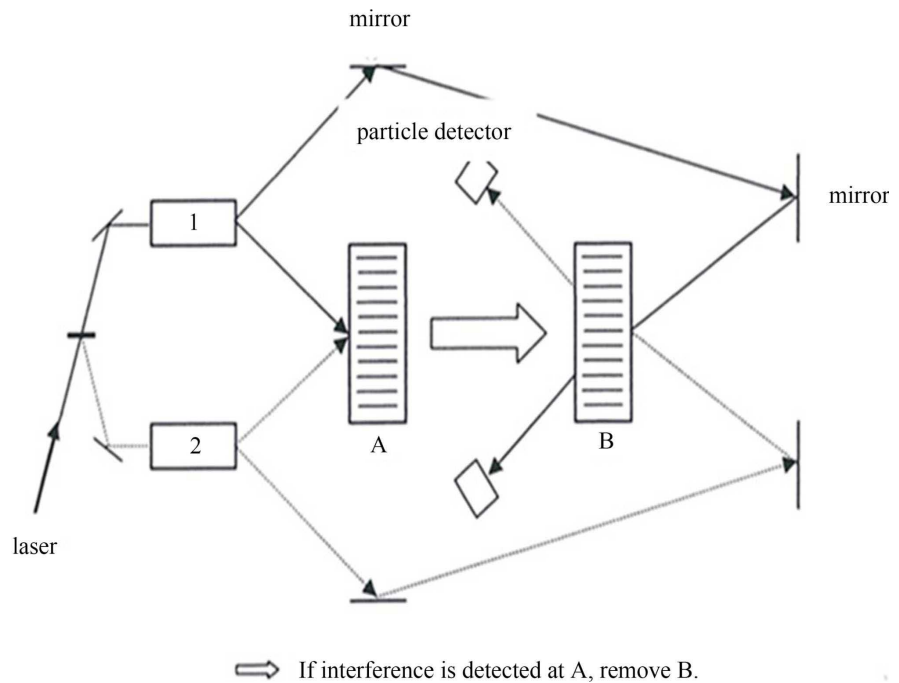


Figure 3. Experiment 3.

However, when powered, the film becomes transparent, allowing the photons to pass through and be detected as photons by the particle detector behind it. At detector A, a camera is installed to automatically sense and determine if interference fringes are generated on the screen, and since these fringes are the same as those generated in Experiment 1 and Preliminary Experiment 3, the determination is easy. This camera is linked to the power supply system of the liquid crystal light modulating film, so when interference fringes are detected, the film is immediately powered to become transparent. However, since it takes 0.1 seconds for the film to become transparent after powering, the time for the photons to reach detector B due to reflection between the mirrors must exceed this duration. Therefore, it is considered to place distant mirrors on a satellite in a geostationary orbit at an altitude of 3,600 km.

10. Results Expected from Conventional Devices

1) In this case, if interference is actually detected at A and the interference detector at B is moved, the photons from B would be observed as particles, leading to different results for the pair of photons in a quantum entangled state, contra-

dicting the experiment shown in **Figure 2**.

b) Furthermore, if interference is not detected at A and the interference detector at B is also not removed, then no interference would occur at the other interference detector, which would contradict the experiment shown in **Figure 1**.

c) However, if the mirror is placed on a stationary satellite, there could be a situation where particles do not reach the particle detectors due to the effects of vibrations from the environment and fluctuations in the air. Therefore, as a preliminary experiment, even if interference fringes are detected at A, experiments will be conducted multiple times without removing the interference detector at B to determine the probability of observing interference fringes at B. By comparing this probability to the particle detection probability after the removal of the interference detector at B in the current experiment, we can verify the correctness of the experiment.

Therefore, simply setting up an interference detector removal device utilizing liquid crystal dimming film can only lead to contradictory results. If there were no contradictions in the experiment, the results of the experiment shown in **Figure 3** would be expected to be as follows: that is, either the interference detector B is not removed due to device failure, or the experiment is not conducted for other reasons. In other words, in experiments where the interference detector B is not removed, interference fringes can be observed, but in experiments attempting to remove the interference detector, it is observed that the probability of detecting particles in either particle detector placed in the path of the photons suddenly becomes zero due to unknown environmental causes. Multiple attempts to conduct the experiment have failed to yield results, which includes diverse phenomena in the macro world that are statistically improbable and such anomalous phenomena cannot occur without reason. The attempt to remove the interference detector must have led to some event occurring, resulting in strange observations, and that event could be considered as, for example, vibrations caused by truck traffic, sudden power outages, earthquakes, atmospheric disturbances, or meteorite impacts on satellites, and it is believed that these events occur with each experiment.

In the proposed device, a random number generator or a die and a camera for observing the die's face are additionally installed, and the electrochromic film becomes transparent when the die's face shows a number other than one. Therefore, when the die shows a face of one, there is no power supplied, and the film remains opaque, with interference fringes observed on the surface.

11. Expected Results with the Proposed Device

In the case of the proposed device, random number generators or dice and an observation camera for the dice faces are additionally installed. This random number generator or observation of the dice is set so that the liquid crystal light modulation film becomes transparent when the dice shows a number other than one. Therefore, when the dice shows a one, it is not powered, and the film remains

opaque, with interference fringes observed on the surface.

In this case, just like in Experiment 1, interference fringes occur on Screen B and no contradictory results arise. When the random number generator (dice) shows numbers other than one, the screen becomes transparent, photons pass through, and photons should be detected by the particle detector. However, this leads to results that contradict Experiment 2, so such numbers other than one do not appear in this random number generator (dice).

In other words, in this device, specific numbers of the random number generator (dice) are limited, but the probability of this number occurring can be set to a much higher probability than that of rare events occurring in experiments without using a random number generator. Therefore, it is expected that the experiment will not be conducted due to this number occurring, resulting in no contradictions.

12. Conclusions

The experiments in reference paper [1] confirm and prove that the many-worlds interpretation is correct, rather than the Copenhagen interpretation, and that branching universes actually exist.

Additionally, if we improve the apparatus from reference paper [1] as in this proposed experimental setup and conduct experiments using an interference detector removal device equipped with a random number generator such as a die, we could generate a branching universe where only the number one appears on the die. This is because the probability of the die showing a one is considered to be far higher than the occurrence rates of events such as the sudden power outage or atmospheric disturbances exemplified.

13. Discussion

If it can be proven that the generation of branching universes through such physical methods is possible, it may explain the observational results from the Global Consciousness Project, which suggest that human consciousness can interfere with matter, particularly observed through random number generators. In other words, the patterns of randomness observed in random number generators during events such as festivals could be due to the generation of branching universes that cause biases in randomness, similar to the experiments using dice in this setup. The mechanism by which human consciousness interferes with matter is highlighted by the simulation results demonstrating the generation and utilization of quantum entanglement in neural tissues, as seen in the paper “Generation of Entangled Biphotons in Myelin Sheath” [23]. That is, the fact that the physicists conducting this experiment can choose the world they desire suggests that not only does quantum entanglement phenomena within the brain contribute to information transmission, but if we assume that the same mechanisms causing effects in this experiment are present in the neural tissues of the brain, it implies that the neural functions of many event participants may unconsciously select the universe

they wish to experience.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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