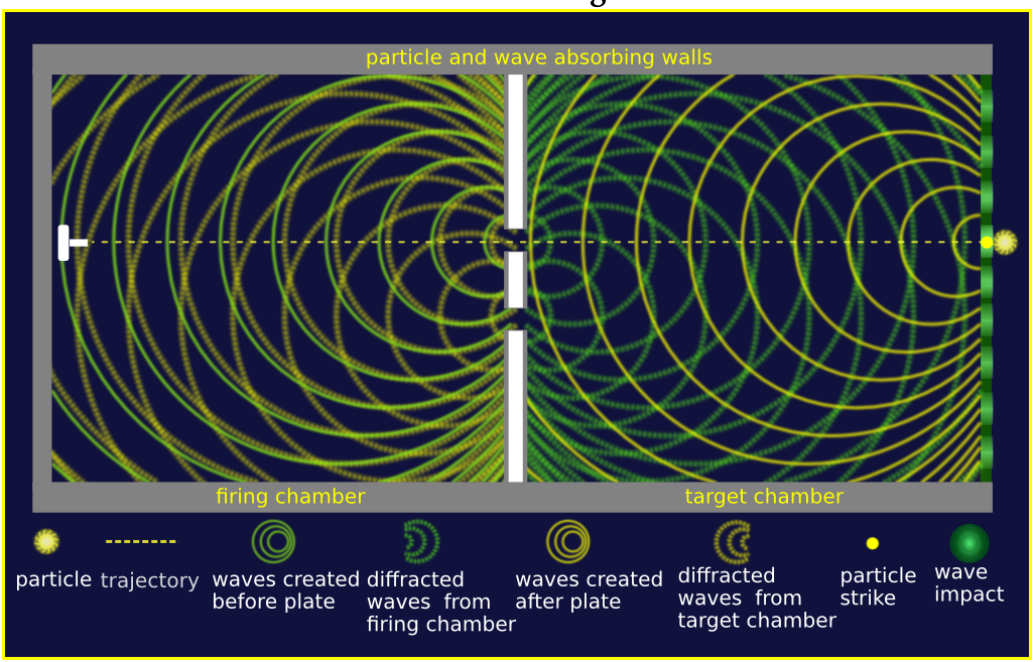
Hidden Truth of Double-Slit Test

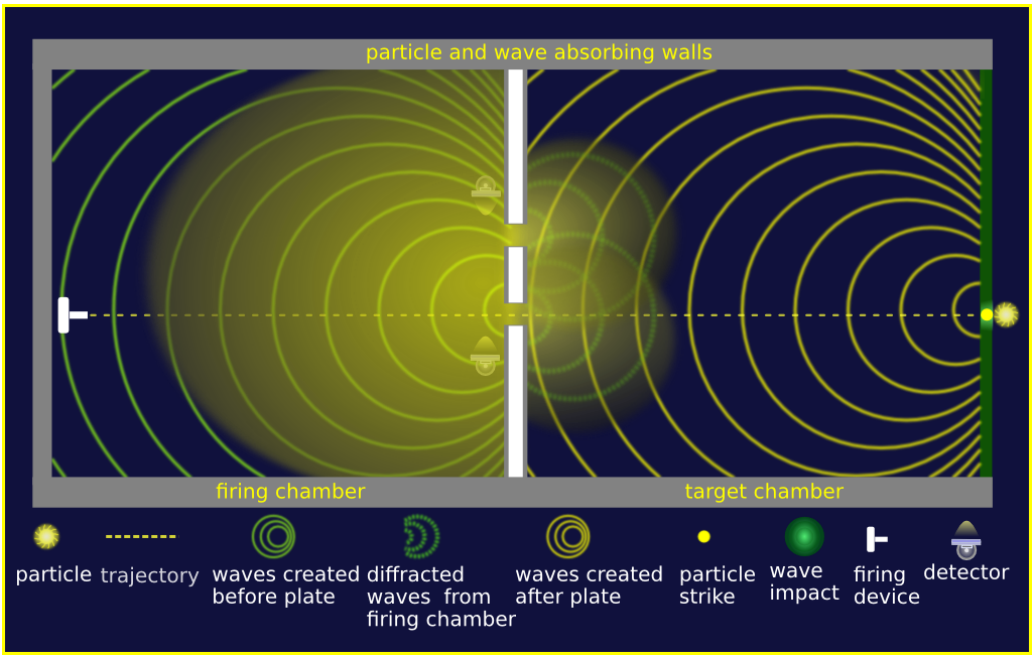
雙縫實驗隱藏的眞相

The Illusion of Multiverse

Cres Huang



Normal multiple strip result



Wave interference of detectors

ISBN 978-957-43-2509-2

Edition: 2016(01)-preview
2016/05
cres@mail.org

Abstract

Double-slit device is but a wave detector than a bullet hole counter. Shooting particles to study their properties is intrusive experiment. The difficulty is not only studying particle in translation, but keeping it still is not any easier. The device falls short of identifying a particle and it's bullet hole. A 1/30,000 second of light flash is about 1 km (3,280 ft) beam of waves in length. However, we don't really know how many particles have been sent at a single shot. The identity of particle is lost.

A particle is considered point-like, and it's trajectory line-like. It can only physically strike the sensor once. On the other hand, it's broadcasting of waves is a sweep. It can be at many places at a time by propagating into the surroundings. Yet, particles can rest and never vanish, but wave has to continue to spread and die out eventually. A visible structure is a collection of invisible particles. It has to inherit the underlaying properties of particles without any contradiction. Particles are micro bullets in double-slit device. Can they behave differently from real bullets, or cannon balls?

Above all, ***the rest of the universe (or environment) is the absolute complement of an object.*** Even a particle, it is impossible for it to be anywhere else at the same time, since anywhere else is it's absolute complement. Action of an object will disturb it's complement, and vise versa. This interaction of an object and it's complement is visible in countless natural phenomena, *e.g.* a synchronized swimmer and her team in water, one sardine and it's school in ocean, rock skipping, ripple tank, sonic boom, and so on.

Particle and wave are fundamentally different. Particle is mass of distinct entity, and wave is the reaction of it's complement, which is wide and complex. The participating entities and their actions can not be fully identified. Isn't it scientifically essential to differentiate particle and wave?

Contents

List of Figures

List of Tables

1 Introduction

Our perception of the universe rarely is direct physical contact. Instead, it is the information of the physical events collected by our sensors. Information is the description of the event, not the source event. The issue is, sometime we can not isolate the event from it's information[**?**]. For example, an apple we see is the reflected light of the apple, not the physical apple itself. Since a red apple takes in all colors, but rejects red from it's surface; Then, can't we say the true color of a red apple is not red, but it's negative? An apple is an apple physically. However, if it is possible to collect the complete information. Even we weight it, touch it, smell it, taste it, slide it, and scan it with different instruments. Let alone the apple is interacting with the surroundings constantly.

Performing atomic experiment in the universe has many limitations, Section 8. The size and swiftness of particle are hardly matched by our technology. Logically, a particle is considered point-like, and it's trajectory line-like. It can only physically collide with a detector once. Yet, the collision is not quarantined. It can penetrate the device without detectable trace. It might not be registered by the detector, even there is a collision. Same question as how many water molecules have to be collected before we feel wet? I doubt we can tell who is who in atomic world. Isn't it the ultimate technology we dream to achieve, being able to work on individual particle?

On the other hand, it's broadcasting of waves is a sweep. It would propagate to fill the space, and delivery impacts to detectors at many locations. It enables waves to exist at many places at the same time. Yet, particles can park and never vanish, but waves have to continue to propagate and die out eventually.

Basically, double-slit device is intrusive wave detector. Shooting particles to study their properties is intrusion. It would not be the same as performing autopsy on tabletop. The difficulty is not only studying a particle in motion, but keeping it still is not any easier. The device falls short of identifying a particle and it's bullet hole. A 1/30,000 second of light flash is about 1 km (3,280 ft) beam of waves in length. However, we don't really know how many particles have been sent in a single shot. We have no way of tagging a particle, it's identity is lost.

Nevertheless, ***the rest of the universe (or environment) is the absolute complement of***

an object. Action of an object will disturb it's complement, and vise versa, Section 9. This interaction of an object and it's complement is visible in countless natural phenomena. For examples, a synchronized swimmer and her team in water, one sardine and it's school in ocean, a galaxy in space, and so on.

Particle and wave are fundamentally different. Particle is mass of distinct entity, and wave is the reaction of it's complement. I believe it is scientifically essential to differentiate particle and wave.

2 Current Contradictory Interpretations

Many theories are based on the famous double-slit experiment. However, it has also caused many confusions. Some of them even challenge the imagination of science fictions.

2.1 Particle-Wave Duality

There are many phenomena in real world resemblance to the double-slit experiments:

1. Electromagnetic radiation shield shows it is possible to isolate waves from particle.

2. Particle is capable of penetrating any wall, but waves can be absorbed in less effort.

3. Shining a light at particle will not reflect enough light for us to see it. Neutrino is highly active particle, however, it does not create or reflect detectable waves. The size and swiftness of particles are hardly matched by the capability of our technology.

4. A real bullet is a collection of particles, it is considered quiet and calm in storage, however, it generates air wave, sound waves, and shock wave when fired. So is the space shuttle, plane, boat, train, and all other objects. Observing a particle by shooting it across the space will not obtain identical data from performing autopsy on tabletop.

5. The Sun is a very large collection of particles. It emits varieties of waves. Can't we say it is duality? Don't you think there would be multiple strip pattern on sensor if the Sun went through a double-slit device?

6. A volcano can be considered a large particle gun. Eruption deliveries large volume of particles. It also create waves in sight, sound, thunderstorms, earthquake, and tsunami. Tsunami waves passing rock slits would show multiple wave patterns. Earth is filled with slits and gaps. Will erupted particles multiply going through slits? Does this fit in the interpretation of duality of particle and waves?

7. Earth is also filled with particles in motion. What would happen when they pass through the slits and cracks in landscape? Will the chain reactions of particles and waves through slits in multiple locations?

8. Doesn't it have to happen in all electronic devices? Electrons and other particles are going in and out of the components, grills, gaps and cracks of the housing and surrounding? Isn't aperture grille of cathode ray tube (CRT) multi slit plate? Will duality and multiple occupations of electrons confuse the computers, communications, and all other signal processors? Isn't the occurrences global, not limited in double-slit device at the laboratory?

2.2 Observation Alters The Outcome

Only intrusive observation would alter the outcome. Intrusive observation is the issue of technology, not the facts of the universe. If intrusion is unavoidable, it's effect has to be isolated from the study. Isn't shooting particles to study their properties intrusive experiment?

Additional detector in double-slit test is not a hidden camera. It is also an intrusive observer. On the other hand, sensor screen can be considered non-intrusive. It does not alter the outcome of the experiment, otherwise the double-slit is a void experiment. The issue is the sensor of double-slit device is incapable of isolating particle strike from impacts of waves. The strike holes of the micro bullets are not marked.

However, additional detector in double-slit device can be used as a filter to control wave interactions. When waves without accompanied particles are removed from the experiment. It reveals the true landing zones of particles.

2.3 Uncertainty

Uncertainty is the smoke screen of insufficiency, inaccuracy, or contamination of information. Observation is collecting the historical data. An event has to happen first before the observation. Past is certain, what happen to individual particle at that moment is a realized event with certainty. Ambiguous interpretations is the result of insufficient observation and/or contamination of information, *i.e.*, lack of ability to observe and measure, intrusive observation, and/or un-isolated variables.

Unfortunately, majority of the events in the universe is too far, too small, too large, too fast, too slow, too strong, or too faint to us. Probability will continue to haunt us, unless our technology can match the precision and swiftness of fundamental particles.

Well-defined trajectory of particle has been verified by Physicist Aephraim Steinberg and his colleagues of the University of Toronto in Canadabelow[2]. We all have seen a school of sardines operating in it's environment. It is not amazing an individual and all sardines as a whole can act in such precision. The bottom line is, a sardine can only operate in precision when all it's substructures and particles are precise. This principle is displayed in natural and our technology. I don't believe anything can match the precision, instant, and commitment of fundamental particles. Particles will always act and react at instant in complete dedication. No holding back, no cheating, and no uncertainty.

Logically, particles can see the most intimate of the universe. Unless we can get down to their world and see what they see; Until we can identify the individuality of particles; Until our technology can match the speed of the happening; It will remain as probability and uncertainty to us.

2.4 Particles Can Be In Different Places At A Time

I consider electron is the most important player in our modern technology. We are able to control electron packets, yet individually, in the circuitry. If this behavior of particles is in a simple double-slit device, wouldn't it be in electronic devices? Considering supercomputer runs on millions of processor cores and petaflops of operations per second, can electrons be somewhere else, and the electrons from somewhere else be in the enormous circuitry?

A photo-finish has to be able to identify the contestants in a high speed race. To verify multiple existences of a particle, individual particle has to be tagged. To us, particles are too fast, too small, and everywhere. Possible body-doubles are limitless. Unless individual particle is tagged, there is no proof of a particular particle is in multiple locations at a time. Even for the easier to detect particle like electrons, we can only catch a blurred image of electron cloud. We are unable to tell one electron from another. However, electrons and other particles do. Logically, particles have to be able to identify each other in order to perform proper interactions. Based on questionable identity of particle, isn't the interpretation overreaching?

Nevertheless, the rest of the universe, or environment, is the complement of an object, Section 9. A particle would be the member of it's complement, if it could be in different

places at a given time. It makes it illogical that an object can be part of it's complement. Furthermore, any action of an object will cause the reaction of it's complement, and vise versa. Isn't it paradox that an object could interact with it's other-self (even other-selves) in it's complement?

3 Anatomy of Double-Slit Device

A shooting range is concentrated on watching the bullets. The reactions of the environment, or generated waves in various forms are ignored. On the contrary, a double-slit device is more of a wave detector than shooting range. The issue is, bullets are invisible, and fired bullets never found. It is unable to tell the difference of wave impact from bullet hole. Shooting it across the device perplexes the data collected, making it an intrusive experiment.

3.1 The Deficiency of Double-Slit Device

- Double-slit device is unable to differentiate particle strike from impact of waves. Particle could pass through the sensor without leaving a trace. However, waves will be faithfully detected. I believe a direct strike by the particle has to be stronger than the diffracted waves, due to these facts:
  - Particle strike has the combined force of mass and the associated waves.
  - Only waves created before the slit plate are diffracted. They are sliced apart by slit plate and travel longer distance to reach the target.
- It studies particle in translation. Observing a bullet in flight will not obtain identical information from studying it on tabletop.
- There is no proof that the device can launch single particle at a time. Multiple particles can leave the particle gun at one shot.
- Partcle can not be tagged, it's trajectory is not observed, and fired bullet never found. The identity of particle is lost in the process.
- Additional detector by the slit plate in the experiment does not collect data but causing interferences, it is also intrusive observer.

The twist is the additional detector is actually significant noise filter. The waves created before the slit plate are canceled or weaken by the detector. It is not intrusive if it is used as noise filter. When the impact of the diffracted waves are filtered, the two-strip result is the distribution of bullet holes. However, it is confused and misinterpreted by some theories.

4 A Look at Current Experiment

A normal test is depicted here in Figure 1. Basically, two kinds of waves are generated. Wave created by the particle, and wave diffracted by the slit plate. Note that waves created in target chamber are also diffracted by the slit plate and propagate back to firing chamber. However, the information is not collected by the device. Here, only one particle through upper slit is shown.

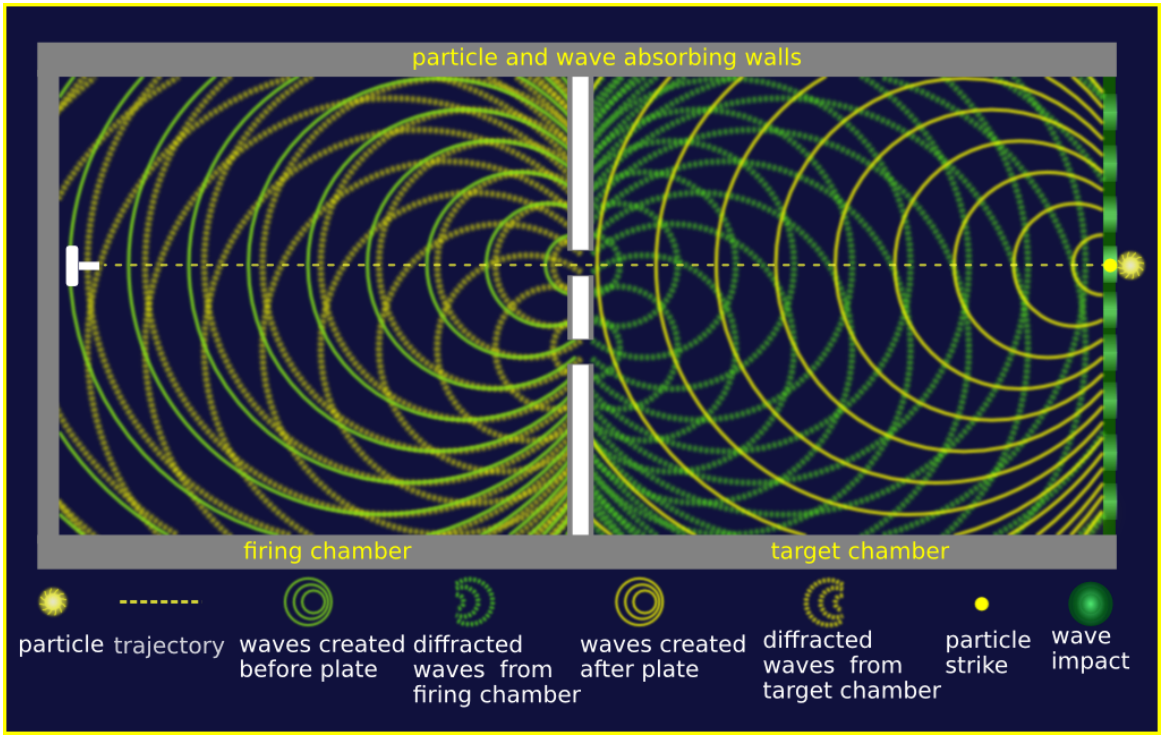


Figure 1: Double-Slit Test

The result is depicted in Figure 2. There would be interference of two overlapping strings of waves diffracted by the slits. Multiple strip detection is the result of superposing waves from both strings. However, I expect there would be two brighter strips aligned with the slits, if the sensitivity of sensor is sufficient. Since they are in the path of particles; It is the combined traces of diffracted waves before the plate, particle strike, and un-diffracted waves after the plate. However, it is not identified by current test.

Figure 2: Normal Result

4.1 Test with Additional Detectors

A test with additional detectors by slit plate is depicted in Figure 3

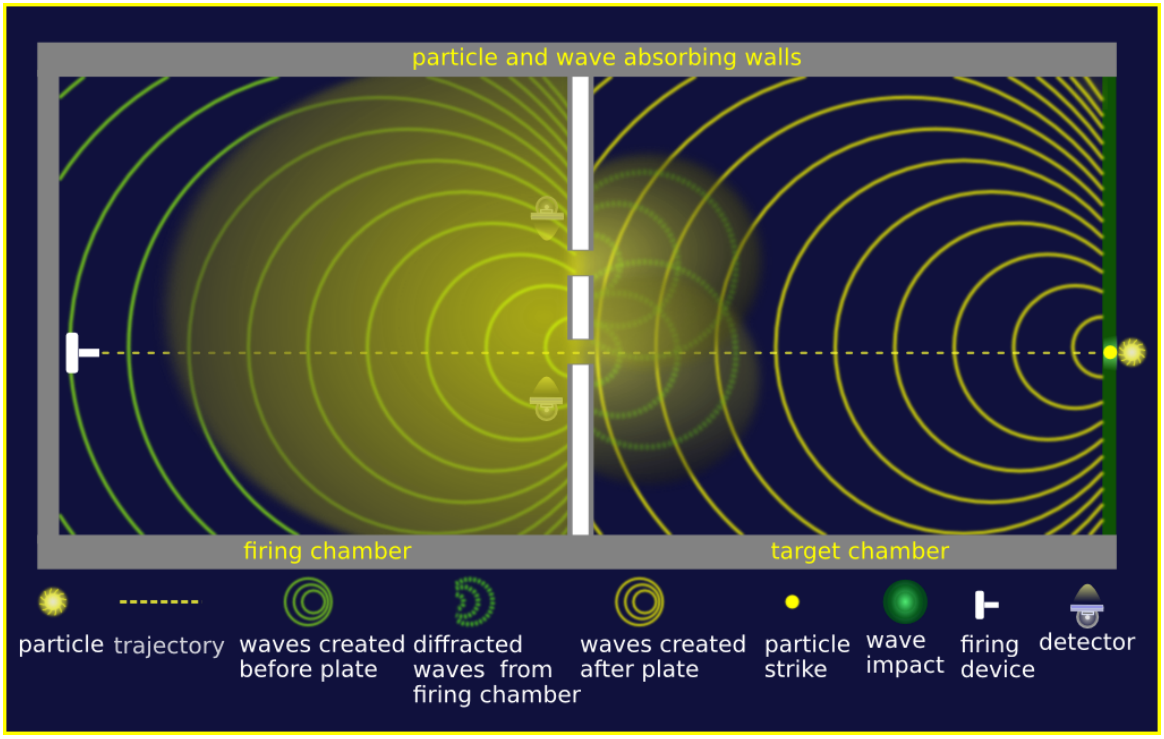


Figure 3: Detector Test

The result is depicted in Figure 4. Waves created before the slit plate are weaken by the intrusive detectors. There is no effect of superposing waves. The result is only two strips aligned with the slits. These are the true landing zones of particles. I also expect two strips would be dimmer than the normal result, Figure 2. It reveals the facts that, particles did not go other places. It also shows that particles and waves can be separated.

Figure 4: Detector Test Result

Launching single particle in current technology is not undoubtedly assured. I believe controlling single particle is the ultimate technology we can reach. A 1/30,000 second of light flash is about 1 km (3,280 ft) beam of waves in length. However, we don't really know how many particles are traveling together in a single shot. A single dot shown on the sensor screen is the result of many wavelet impacts, but doubtfully stroke of one single particle. A double stroke case is depicted in Figure 5. It is rather difficult, if possible, for double-slit to identify this kind of strike by twin particles.

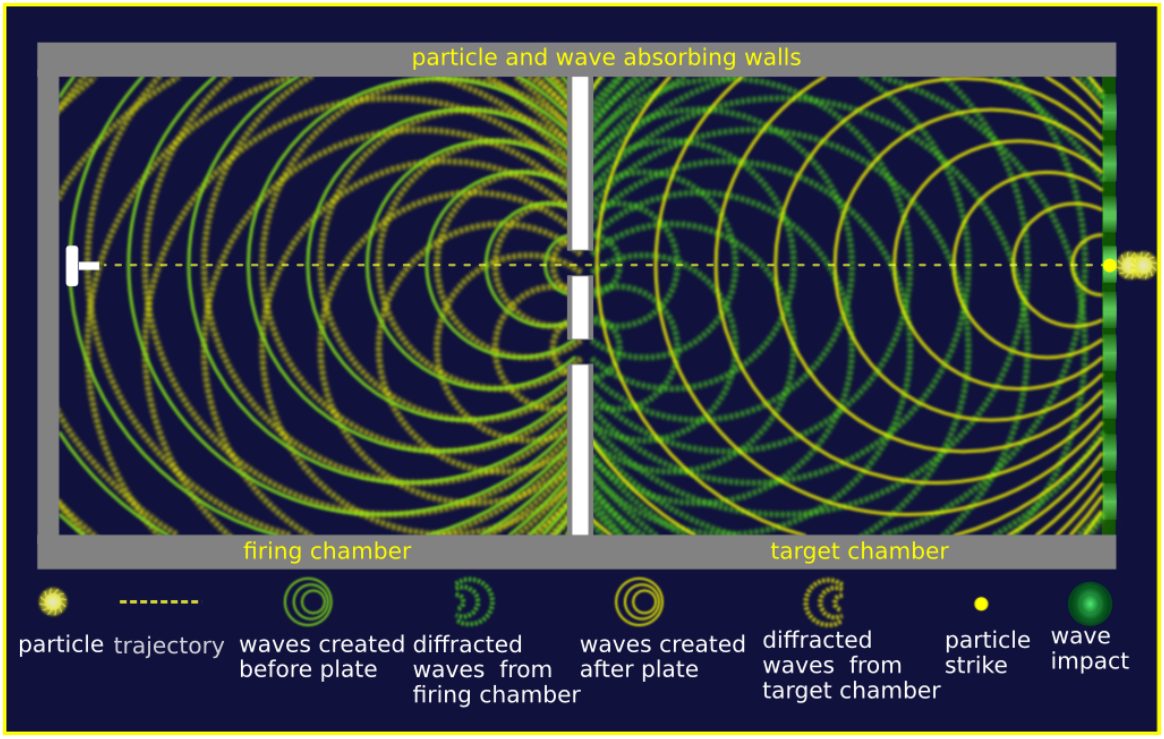


Figure 5: Double Stroke of Particles

4.2 Summary

- Action of particle creates waves. However, the action of waves does not create particle.
- Particle can only delivery it's energy along it's trajectory, it is line-energy which can not be spliced by the slit plate.
- Particle will never disappear. Wave, on the other hand, propagate to fill the device. It can be diffracted by slit plate, and absorbed by the walls.
- Multiple strip pattern is the interferences of two strings of diffracted wave strings from firing chamber, Figure 2.
- With additional detector, waves generated in firing chamber are weaken or canceled, and unable to cause the reaction of sensor on screen. Two strip pattern is the result of direct particle strikes, or bullet holes. They are the true landing zones of particles, Figure 4.
- Additional detector serves no purpose of detection. However, it serves as noise filter. Diffracted waves are isolated from the test. It helps to compensate the device's inability of distinguishing particle strike from impact of waves.

Real world is the extension of atomic world. The properties of particles will pass onto the structure built, despite some properties can be hidden in composition. Any logical interpretation should not cause conflicting between atomic and real world.

5 Anatomy of Particle and Wave

The rest of the universe (environment, or surroundings, Section 9) is the absolute complement of an object, regardless of it's size, from particle to complex structure of galaxy. Action of an object will disturb it's complement, and vise versa. This interaction of an object and it's complement is the fundamental nature of the universe. It is everywhere we look, hear, smell, touch, taste, and detect with instruments. Visual phenomena in our daily life for examples, a synchronized swimmer and her team in water, operating vessel in air or water; one sardine and it's school in ocean, a bird with it's flock in the air, and so on.

A region of absolute zero will receive 'heat' from it's surroundings by thermodynamics, unless it's complement is also absolute zero. However, it is impossible for a region and it's complement being absolute zero. In light of this, there can never be absolute zero in space. It also tells the truth that, there are activities in all regions of the space. It is filled with solid, liquid, gas, particle, radiation, electromagnetic field, or any possible interactions of matter and energy.

Essentially, translation of a particle is comparable to a moving boat. The disturbed water molecules would wave and propagate. The boat has it's set course, however, the reacting wave will sweep across the lake. Waves we see is the choreography of dancing water molecules. It is the reaction of water to force applied. It shows how kinetic force travel through water. Or, it shows how water molecules dissipate the applied force. It is also shown by tsunami in large scale.

Air molecules will also be disturbed by the running boat. The disturbance will spread wide into the environment and cause more interactions. For example, a flock of disturbed birds might take a flight; A sleeping baby is awaken by the noise and starts to cry; Then, parents decide to take the baby out for a drive. Where will they go and do, what encounter of their drive, and thereafter. The consequences are unimaginably complex. Nevertheless, the boat can park, but it's air, water, or sound wave has to continue till fully dispersed.

The point is, the boat has clear definition and identity, however, the reaction of it's complement is wide and complex. The participating entities and their actions can not be fully identified.

5.1 Three States of Particle

To visualize our understanding, a simplified visuals of particle and it's waves is shown in Figure 6:

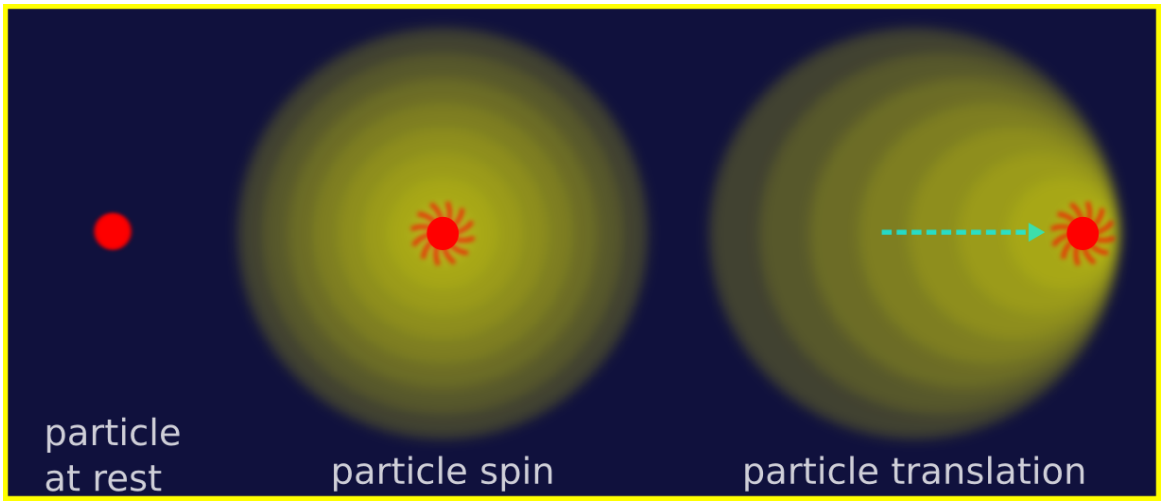


Figure 6: Simplified Visuals of Particle and It's Waves

5.1.1 Particle at Rest

At this state, particle has no properties of motion. No action of any kind. Neither interaction with it's absolute complement. This is the absolute property of a particle at rest, absolute zero.

Logically, existence of a particle creates it's own complement, hence interaction. However, it is impossible to isolate a particle in an universe filled with matter and dynamic actions. Approximation is the best we can achieve in observing the universe. Often we have to perceive beyond observable.

5.1.2 Particle Spin

Here, the location reference to its' environment is unchanged. There is no force of displacement but the rotation action. The oscillating energy is shown as nested concentric spherical waves in Figure 6. It has zero displacement, but the interactions with it's complement would not cease. At this state, atomic particles could remain undetectable. However, the reaction of it's complement could surface. The catch is:

We obtain the information from the detector, it reacts to the interaction of particle and it's complement. The information we obtain is the reaction of interaction, not the true action of the particle.

5.1.3 Particle Translation

When a particle advances, it would cause the translating reaction of it's complement. The disturbance along it's trajectory is depicted as cone shape trace of waves in Figure 6.

Despite we are better in detecting motion, translation of particle can still be beyond our technology. Figure 7 imaginatively depicts a particle in translation when it's interaction with it's complement is beyond detection. We would not be able to collect any information from particle of this kind. Neutrino, for instance, the best we can hope is when there is a collision and cause strong enough reactions of it's complement, that is able to raise the awareness of our detector.

Figure 7: Translating Particle

Figure 8 depicts a particle in translation and it's disturbance to it's complement:

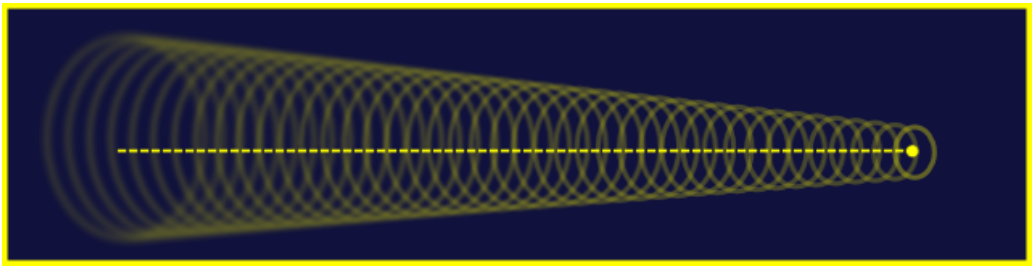


Figure 8: Translating Particle and It's Disturbance

Figure 9 depicts a particle and it's magnetic field in translation:

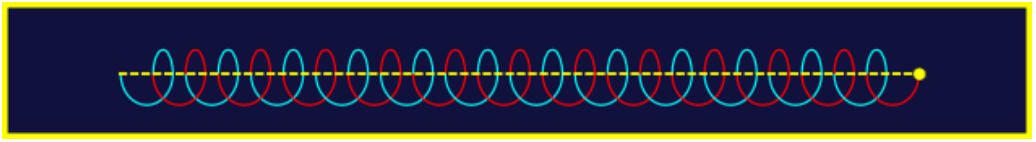


Figure 9: Translating Particle and It's Magnetic Field

Figure 10 depicts the combined actions of particle in translation and it's complement:

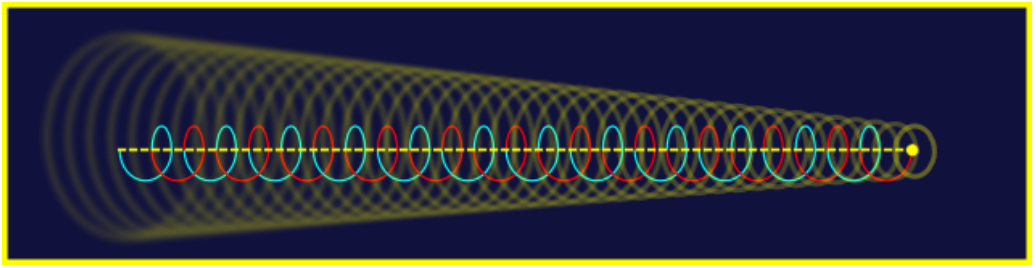


Figure 10: Translating Particle and It's Interactions

Here, I don't expect particle and it's magnetic field will grow larger. However, it's disturbance to it's complement will have to be sorted out. The combined kinetic and magnetic interactions is unimaginably complex. There would be other interactions, such as, friction, surface interaction, electromagnetism, and beyond. Luckily, the wide reactions of it's complement can be detected in less effort.

In visible world, suppose one sardine is just bit stronger than other members. The action of this sardine would cause the whole school to interact. The interactions would spread onto water, air, other creatures, predators, and so forth. Isn't it impossible to collect complete information of the disturbance by a single sardine?

Nevertheless, we have to perceive beyond detectable logically to clarify any confusion. I believe any interpretation shall not contradict with parallel phenomena in real world. And, it shall not cause further contradictory interpretations. It is an issue of physical event and it's information. In this case, existence of particle and action of particle are physical events. The detection of waves is the information. It is studied in my other topic[**?**].

5.2 Shape of Wave

Thanks to Dr. Don Pettit's experiment of water sphere in International Space Station (ISS)[1]. It gives us an excellent view of spherical waves in action, here is a screen shot, Figure 11:

Figure 11: Waves in A Large Free Sphere of Water

Complexity of compound wave energy would be enormous by complex structure. We all can perceive the difference of same note played by different music instruments. Neither would I expect two pianos would play the same note in identical compound waves, nor the same piano consistently.

5.3 Detection of Particle In Motion

Double-slit device is not useful watching particle in translation from the sideline. Shooting it to the sensor will only collect the collision data. Logically, it should contain two kinds of trace on sensor as depicted in Figure 12:

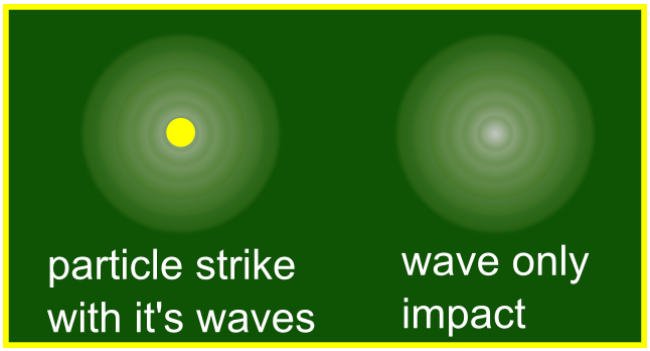


Figure 12: Detector Reactions

1. Collision by particle accompanied by it's associated waves, this is a direct hit. It is considered a point contact. I will call it, particle strike.

2. Collision by waves only. Many wavelets crush onto sensor cell. In double-slit device, there are two strings of wavelets diffracted by slit plate. It is considered a duration of multiple impacts by wavelets.

An atomic particle is considered point-like. The reaction of sensor to this direct strike can not be identified easily. Due to the size of the atomic particle, it could penetrate the sensor without any trace.

Generated waves, on the other hand, is a sweep, a fill. Wavelets are generated continually and propagating to fill the space, therefore, wave contact on sensor is considered an area impact with long duration. It makes it easier to detect due to the nature of wave:

- Wavelet created earlier propagates further. It has less concentration of energy. Wavelets created over a duration will form a concentric cumulation of energy highest at the center.

- Wave is an oscillation, it has crests and troughs. This variation of amplitude can also be detected.

- Crests and troughs of wave would create concentric rings on the sensor, as shown

in Figure 12. This concentric rings, if pass through a single slit, would also display multiple strip pattern.

6 Restudy the Double-Slit Experiment

The ideal devices would be able to assign identifier to each particle; Record it's trajectory and wave actions; Register it's strike location and energy level; Finally, put it back to storage shelf. However, the speed and size of particles are beyond our currently technology. Since I am under the limits of budget and technology, an inexpensive version is used.

6.1 Design

It's typical test is shown in Figure 13:

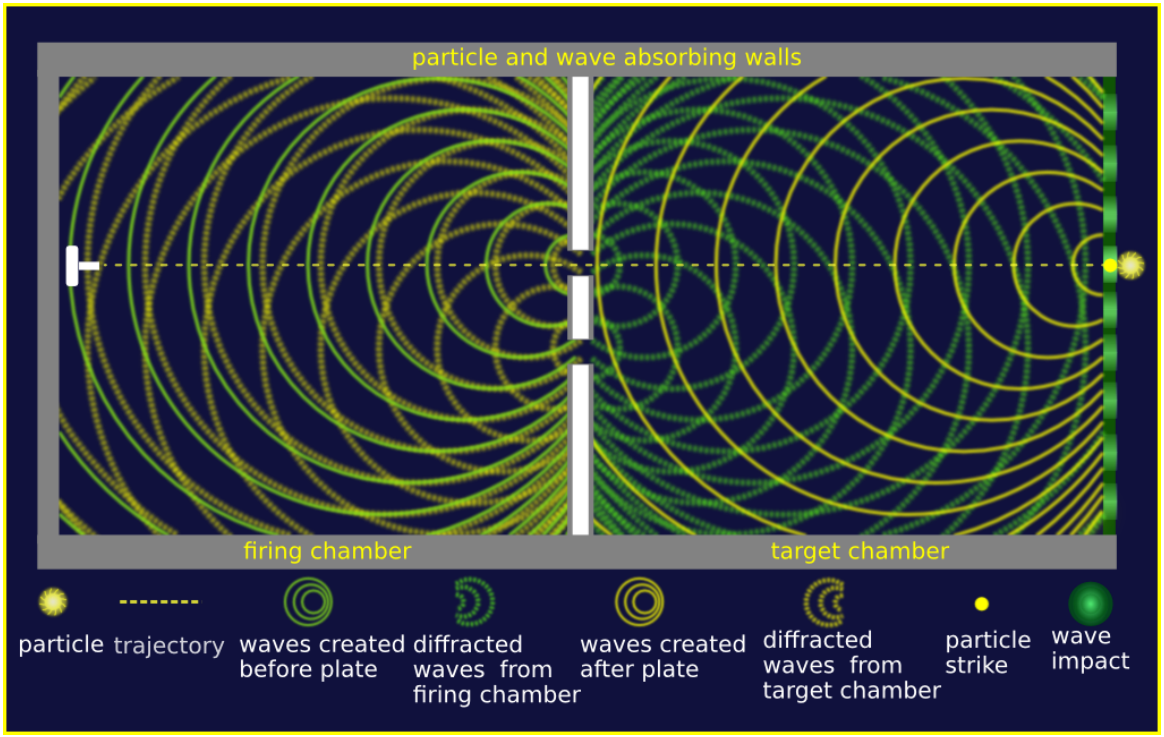


Figure 13: Typical result of double-slit device

A tall double-slit device is used in this experiment. The purpose of tall slits is to have larger landing area for particles. It will allow the firing device to aim high or low to show better separation of bullet holes.

6.1.1 Definitions of the Components

1. Firing chamber is the compartment before double-slit plate where atomic particles are launched.

2. Target chamber is the compartment after double-slit plate where sensor screen is located at end.

3. Particle.
4. Trajectory of particle.
5. Waves generated before slit plate in firing chamber.
6. Waves from firing chamber diffracted into target chamber.
7. Waves generated after slit plate in target chamber.
8. Waves from target chamber diffracted back to firing chamber.
9. Particle strike, landing location of particle.
10. Wave impact, landing location of cumulated wavelets.
11. Firing device, or particle accelerator.

6.1.2 Data Collected

There are two discrete data sets to collect in this experiment:

1. Particle strikes; Point-like particle can only leave a point trace on detector. However, created waves will also be detected since particle and it's immediate wave are inseparable. Here, immediate wave is defined as wavelet generated at a given location on the trajectory of particle. These are waves generated after the double-slit plate. They are not diffracted and always accompanied by particle strikes. This kind of trace will be detected with or without the slit plate.
2. Impacts of diffracted waves; Wavelets generated before the double-slit plate are diffracted into two strings of waves. They will collide with the sensor without accompany particle. Note that the string diffracted through the same slit of the particle will land on the same spot of particle strike, top slit in Figure 13.

6.1.3 Assumptions

The study is under these assumptions:

1. Device sensor is able to differentiate particle strike from wave impact.

2. Device is distill and vacuum. There is no foreign particles to cause interactions among particle and waves.

3. Particles do not ricochet inside. They penetrate sensor screen or been absorbed by device walls if miss fired.

4. Device wall is made of wave absorbing materials. Waves are not trapped inside the device to cause further interferences.

5. To prevent possible ricochet, the firing device is repositioned at each shot. It aims at the slit to launch particle straight through. Upper and lower slits are used alternatively. However, it will aim high or low randomly within the hight of the slit. This would provide better separation of particle strikes.

6. Slit plate is able to stop particles in flight if misfired.

7. Waves diffracted back to firing chamber are not depicted to simplify the figures.

Five tests are performed in this Experiment:

1. Reliability Test; Both slit-doors are closed. The purpose is studying how often atomic particles penetrate the double-slit plate. It is aimed at the plate and fire randomly. The result is a ratio of penetration.

2. Normal Open Slit Test; Both slit-doors are open. The purpose is obtaining discrete distributions of particle strikes and wave impacts. It is under the assumption that device sensor cells are able to differentiate particle strikes from wave impacts.

3. Additional Detector Test; Detectors are added to further study the wave interference.

4. Wave Only Test; Particles are shot off to the side. The purpose is obtaining only wave impacts when particles are not sent to the target chamber.

5. Single slit Test; The upper slit-door is closed. Particles are shot though the lower slit only. The purpose is to isolate the wave interference of two diffracted wave strings.

6.2 Experiment I - Reliability Test

Both slit-doors are closed. The device will be adjusted to the best setting of firing energy level and sensitivity of sensor screen. There are two possible outcomes of this arrangement.

Outcome I-1, penetrate. Particle penetrates the plate. There is a particle strike and waves impact at same spot on sensor screen as depicted in Figure 14.

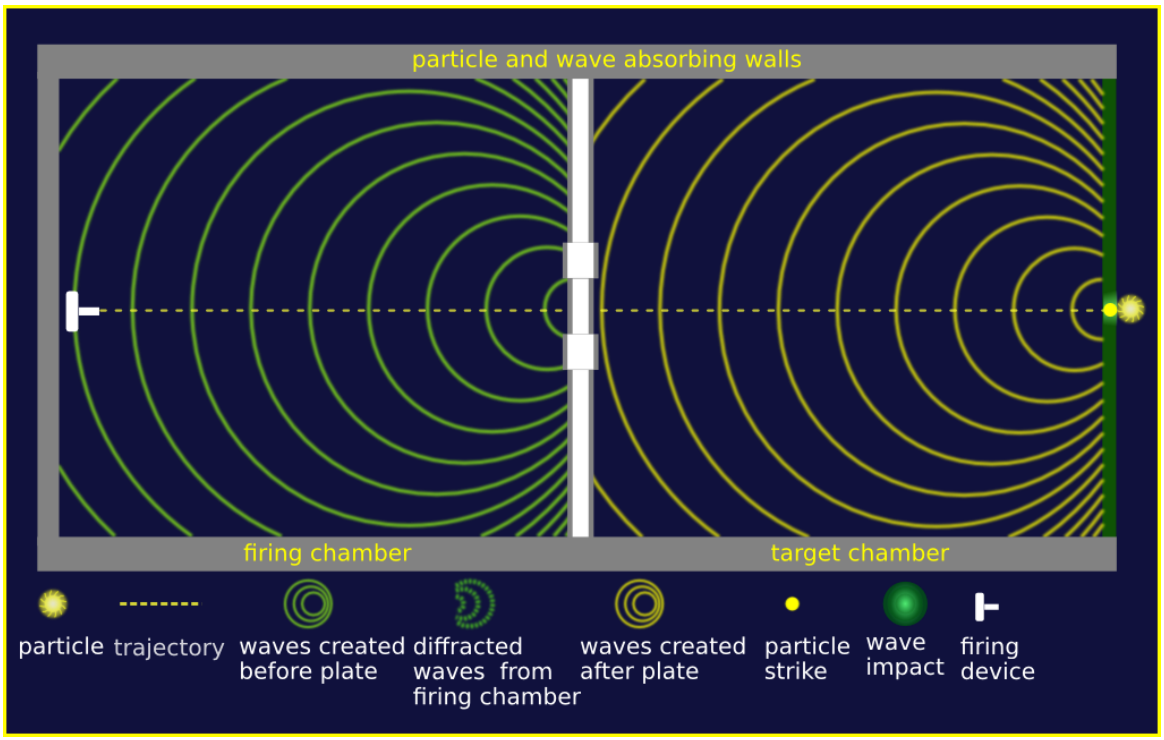


Figure 14: Penetrate

Outcome I-2, trapped. Particle bounces off the plate and absorbed by device wall inside the firing chamber. There is no detection on sensor screen, as depicted in Figure 15. This is the desired result.

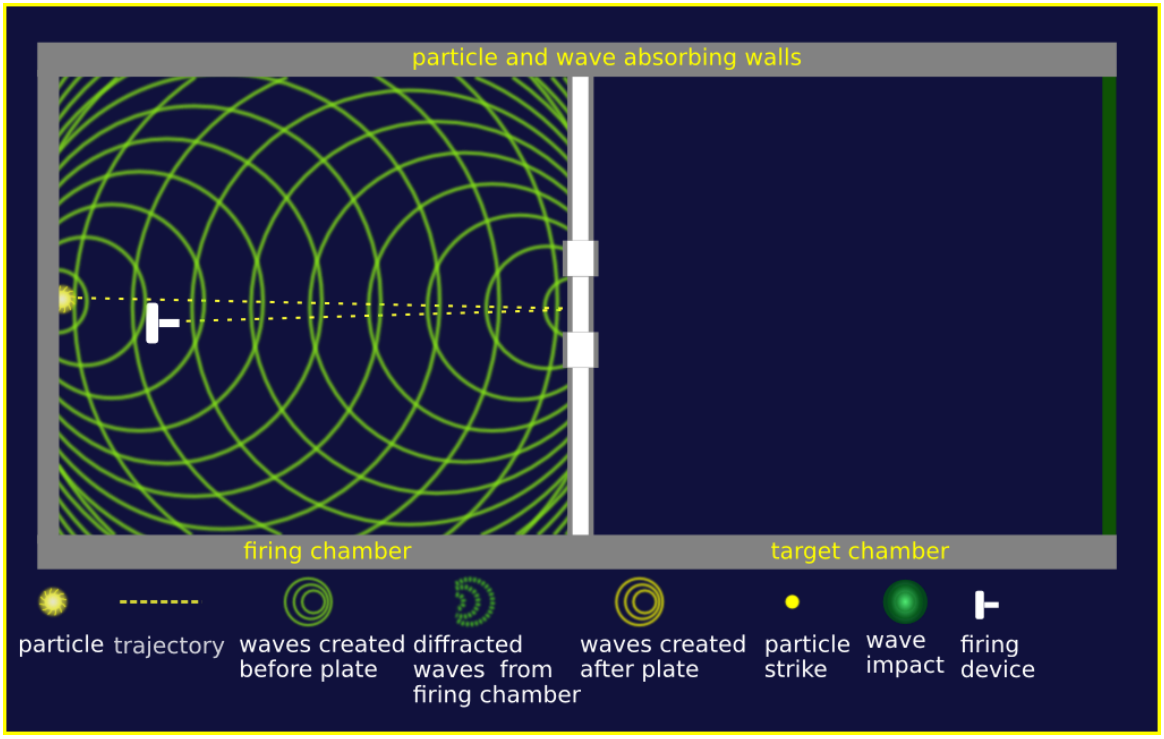


Figure 15: Trapped in firing chamber

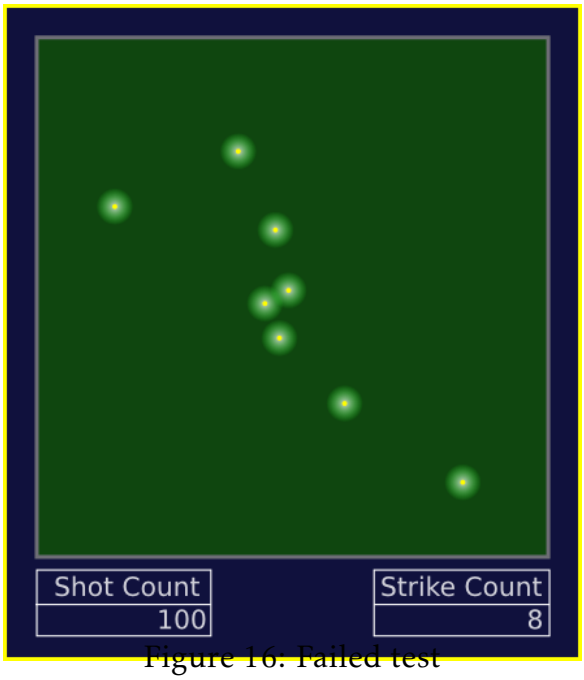


Figure 16: Failed test

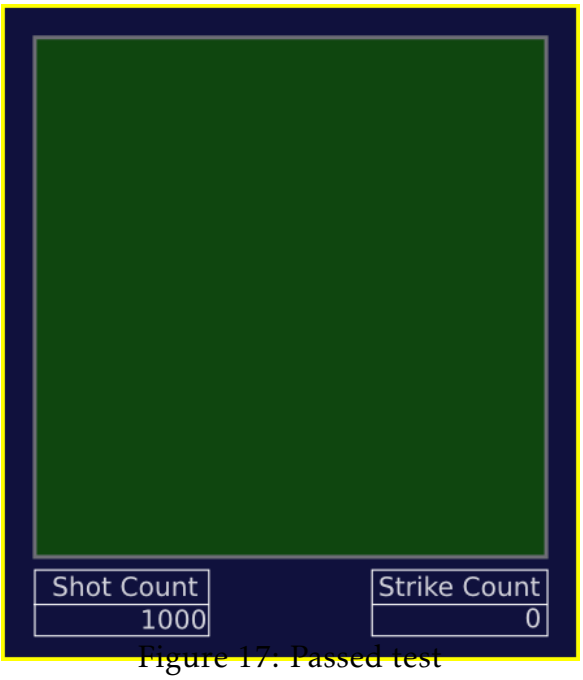


Figure 17: Passed test

The unacceptable result of too many penetrations, shown in Figure 16. The best result is no penetration, Figure 17.

6.3 Experiment II - Normal Open Slit Test

Normal test with open slits is depicted in Figure 18 and 19.

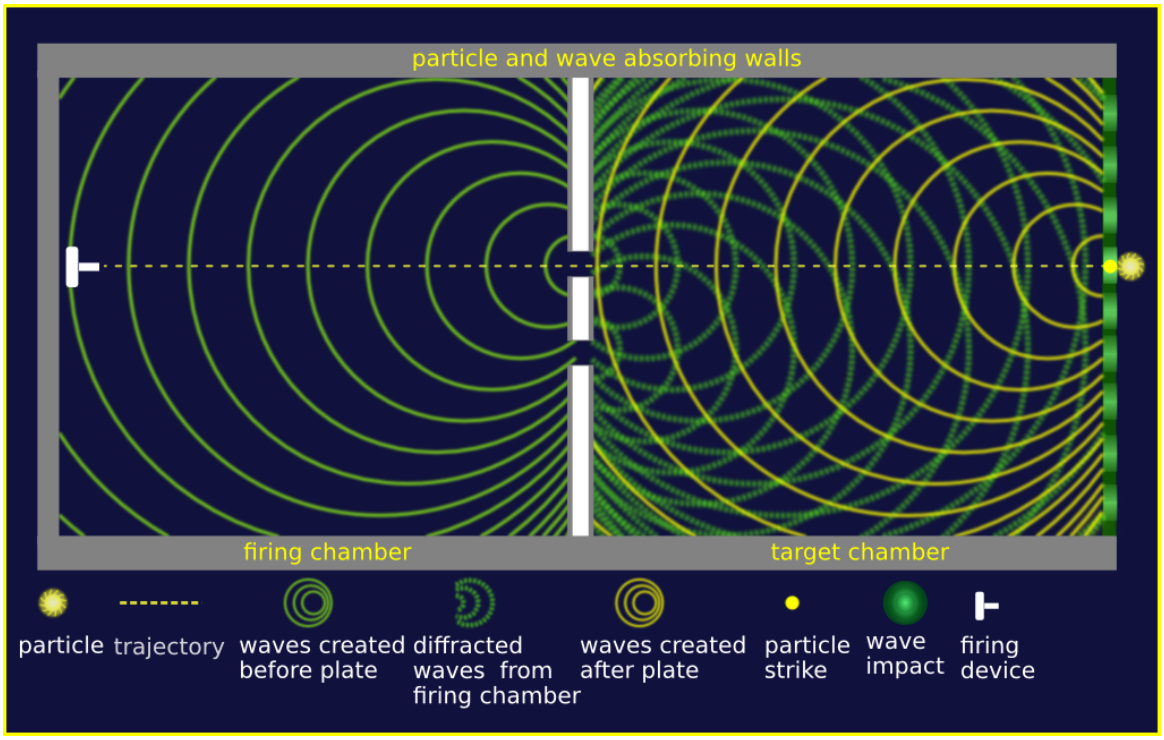


Figure 18: Through upper slit

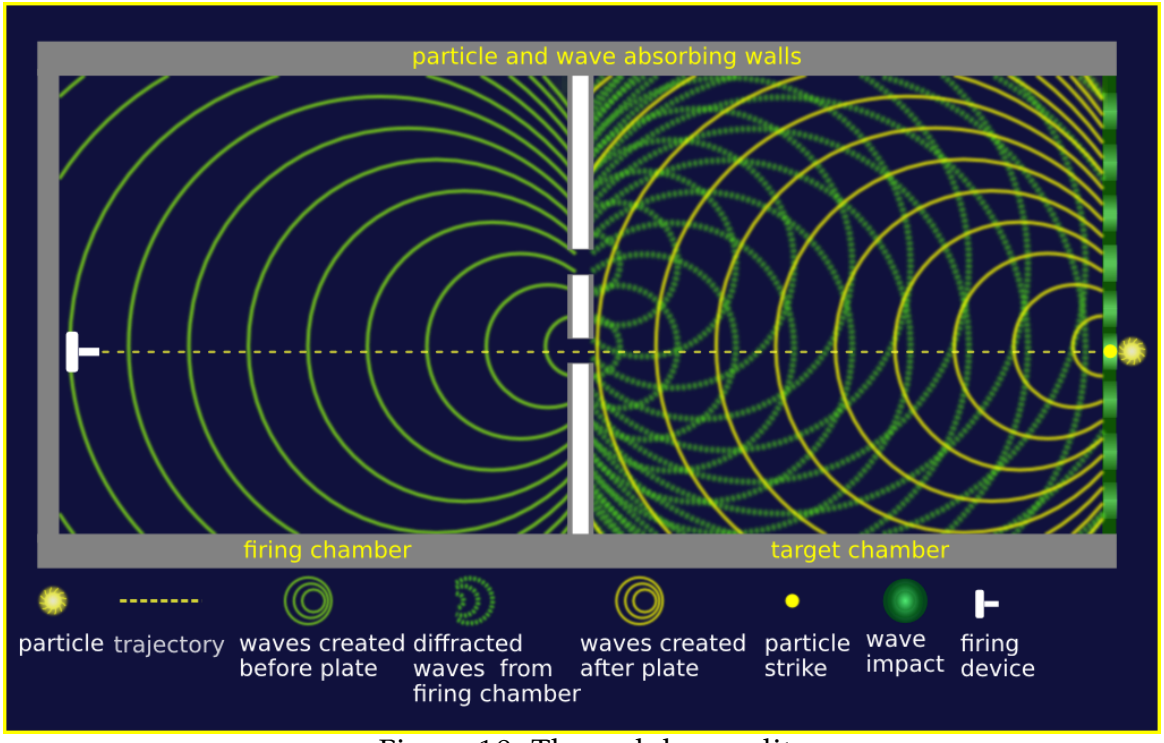


Figure 19: Through lower slit

The possible result of the experiment is depicted in Figure 20.

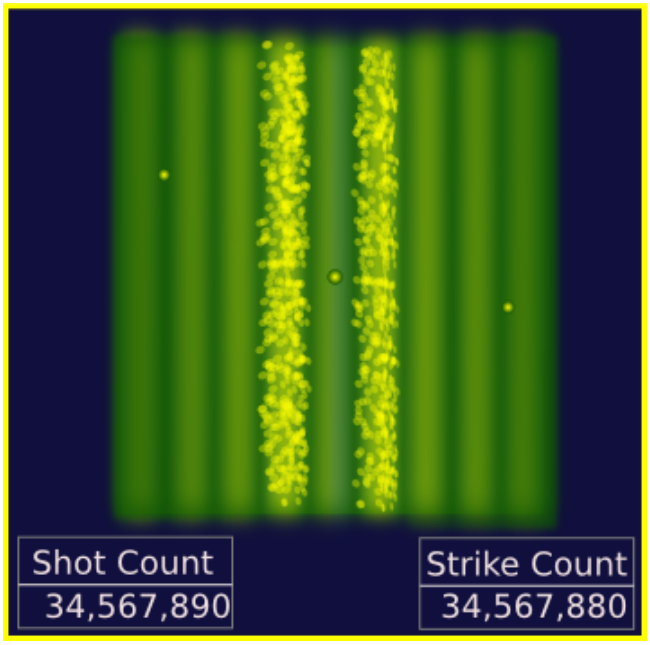


Figure 20: Result of experiment II

1. Particle strikes, two strips.
2. Wave impacts, multiple strips by two strings of diffracted waves.
3. Penetration, random.

Statistics:

1. Total number of particles fired, 34,567,890.
2. Total number of particles passed through slits, 34,567,880.
3. Total number of particle penetrated slit plate due to missed fire, 3.
4. The remaining uncounted 7 particles fired could be:
   - particle bounced off and never reached the sensor.
   - weak particle and wave not registered.
   - faulty sensor cell.

6.4 Experiment III - Additional Detectors

The issue is, any detector emitting electromagnetic radiations can be intrusive. It introduces more wave interferences to the device. The results depend on the level of instruction.

Outcome III-1, non-intrusive detectors. Two weak detectors are placed in the device, as shown in Figure 21.

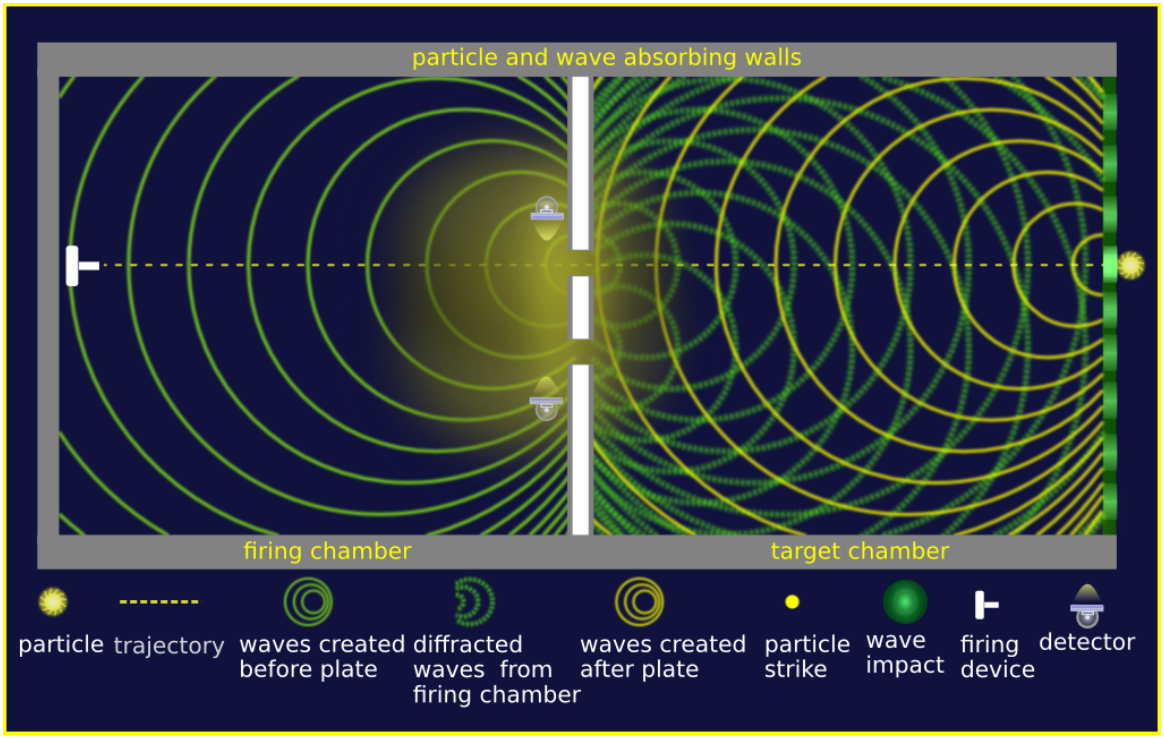


Figure 21: Non-intrusive detectors

The possible result is depicted in Figure 22. When additional detectors are unable to alter the result of the test. Both particle strikes and wave impacts are registered.

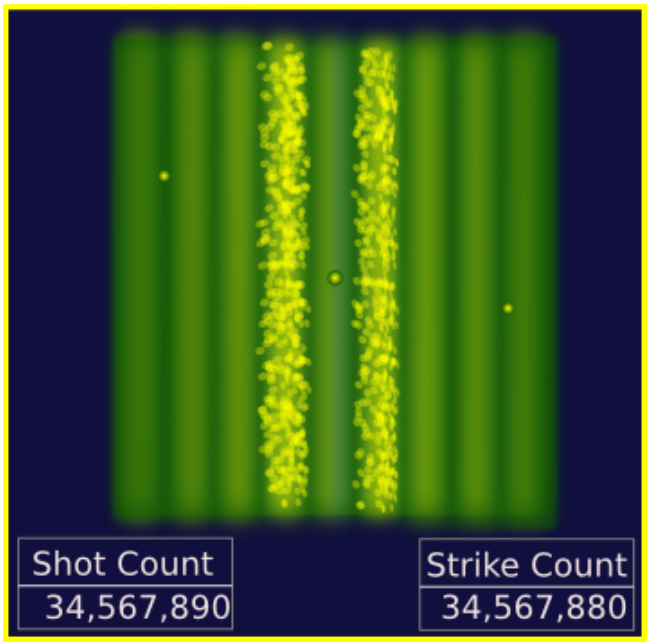


Figure 22: Result of non-intrusive detectors

Outcome III-2, intrusive detectors. Here, two intrusive detectors are placed in the device, as shown in Figure 23.

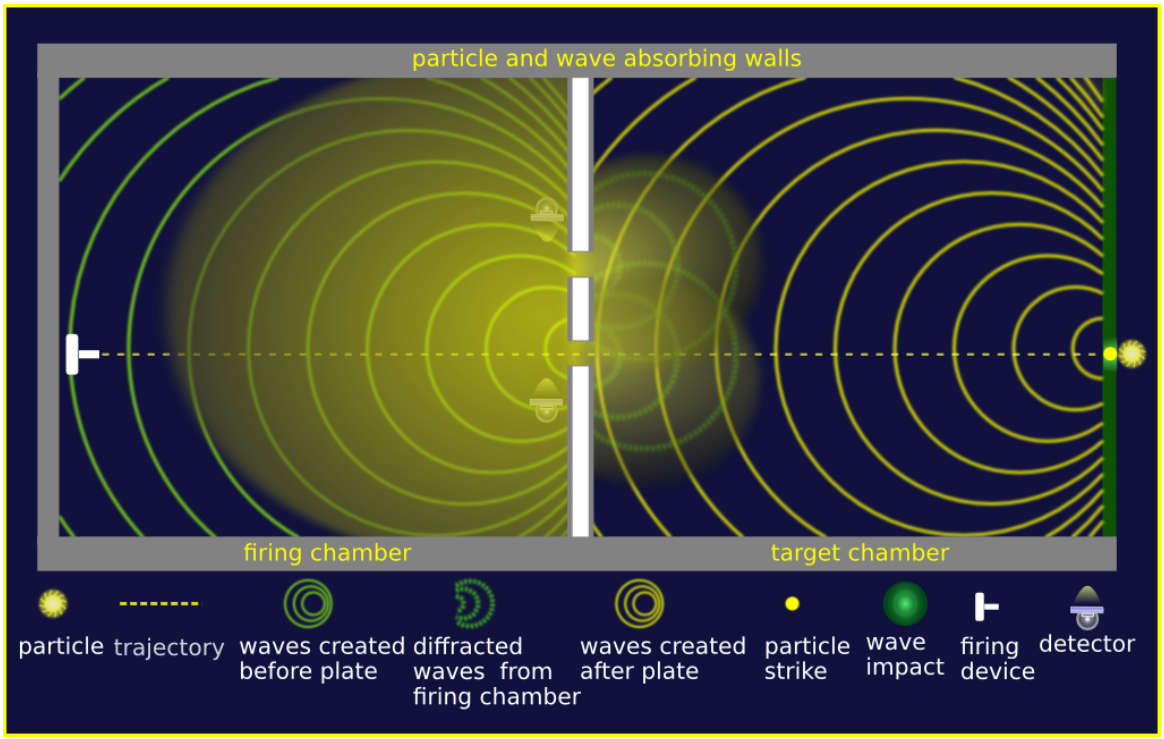


Figure 23: Intrusive detectors

The possible result is depicted in Figure 24. Waves generated in firing chamber are weaken by detectors. The effect of superposing waves are unable to cause the sensor to react.

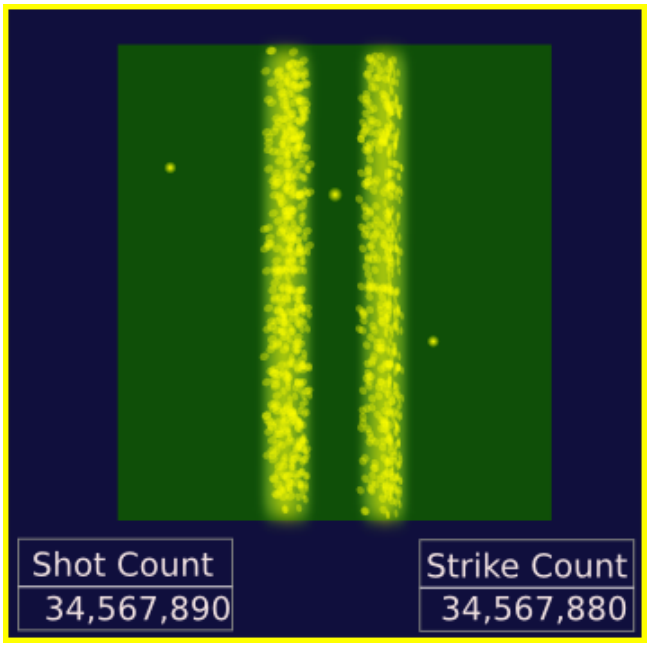


Figure 24: Result of intrusive detectors

The interesting issue here is, the additional detectors serve as an isolator, or filter. Impacts by diffracted waves are removed, and the true distribution of particle strikes is revealed. Two strips are the landing zone of particles. The result shows waves can be affected by detector, but not particles. In other words, particle and it's waves are separable.

6.5 Experiment IV - Wave Only Test

In this test, particles are shot to the side and absorbed by wall. No particles are sent to target chamber, as shown in Figure 25.

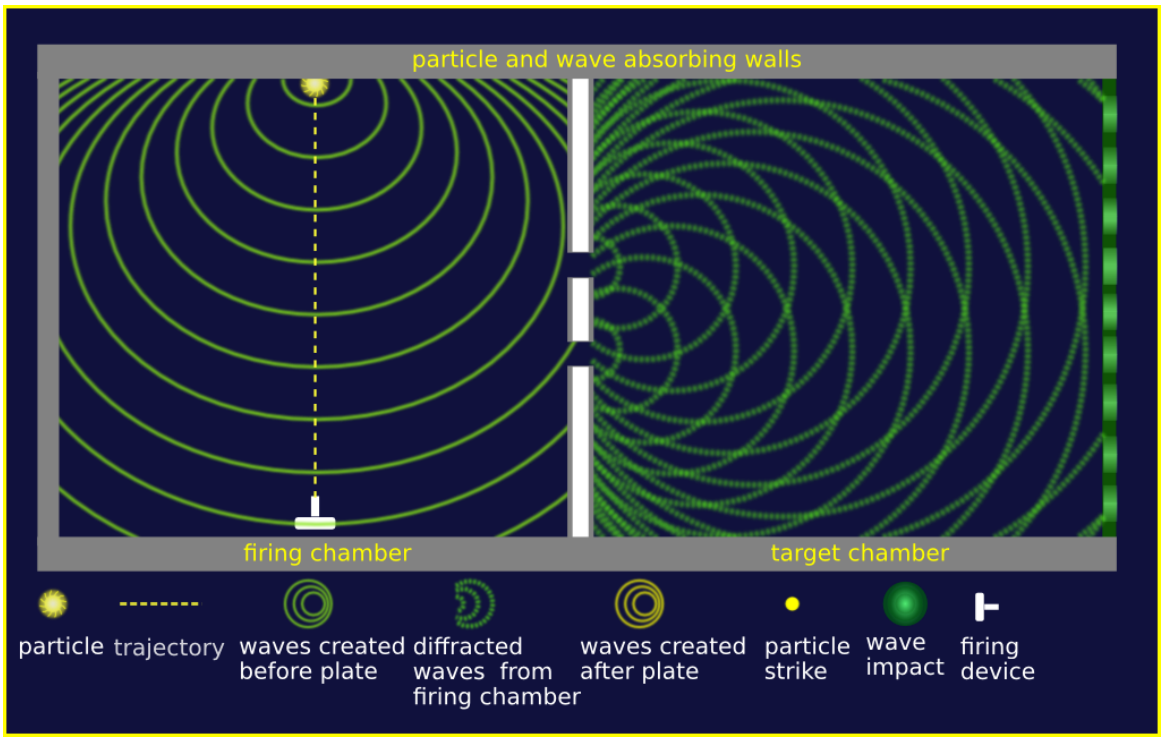


Figure 25: Wave-only test

Even particles do not go to target chamber. However, waves will spread. They would be diffracted by the slit plate and propagate into target chamber. The possible result is depicted in Figure 26. There is no particle strike registered by the sensor, only wave impacts are detected. Here, particles are separated from their waves.

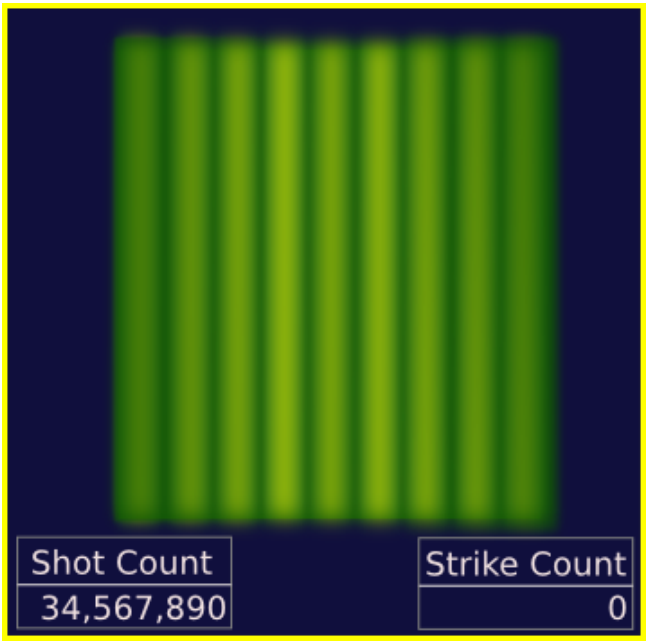


Figure 26: Result of wave only test

6.6 Experiment V - Single Slit Test

In this test, the upper slit is closed. Particles are shot through the lower slit only, as shown in Figure 25.

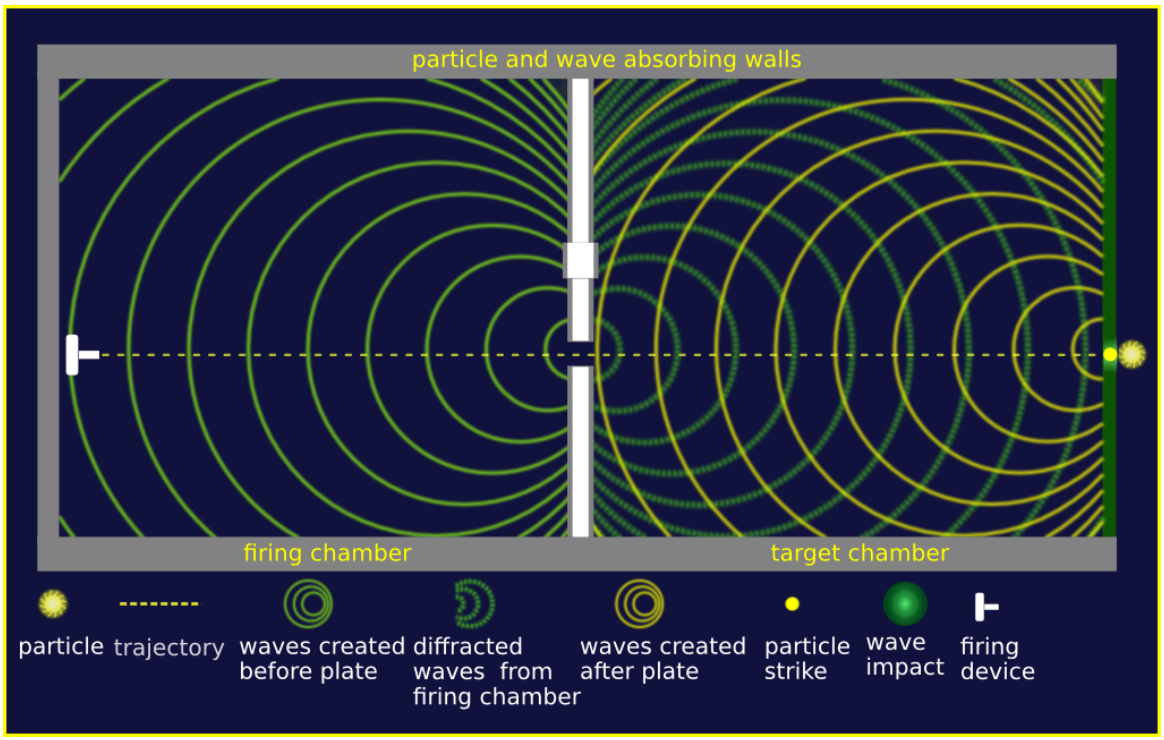


Figure 27: Single slit test

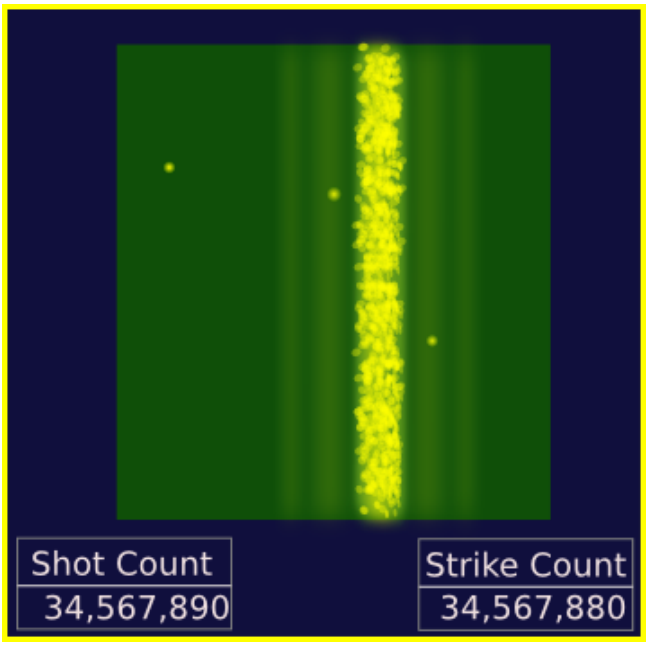


Figure 28: Result of single slit test

If the sensitivity of the detector is set higher, there could be detection of diffracted waves caused by crests and troughs of waves, as depicted in Figure 28. However, there is no overlapping of two diffracted wave strings. The effect of superposing waves would not be present in target chamber.

7 Summary

- An atomic particle in translation, despite it's size, is a micro bullet. It has to share the properties of a real bullet in flight. It's trajectory and energy are fixed at the moment of firing. It can only travel one-way from firing device to it's landing location[2].

- Double-slit device does not show particle can grow larger in size. Logically, it's strike has minute contact with the sensor in instant, which might not be detectable by sensor.

- Waves are created when particle is in action. Waves propagate outward to all directions. It can be sliced apart by slit plate. It's lager size and longer duration is faithfully detected by the detector. In real world, all able observers can detect various kind of waves from a traveling bullet. However, only observer(s) on the trajectory can encounter the instant strike.

- Waves are able to reverse back to firing chamber, however, impossible for particle, Figure 13.

- Multiple strip detection is the result of wave impacts. It is created even particles were not shot into the target chamber, Section 6.5.

- We don't really know how many particles have been sent by one on/off trigger action of the firing device. We have no way of tagging a particle. It's identity is lost, Figure 5.

- Shooting a real bullet into anything does not create another bullet. However, shooting an energized atomic bullet into atomic world could excite many atomic particles. Double-slit device and it's surrounding are atomic particles. Sending an excited atomic particle into this pool of atomic particles could cause identity crisis.

- Shooting an atomic particle into water is unlikely to create visible ripples. However, it is easily observable when shooting a collection of atomic particles, *i.e.*, a real bullet, a stone, or an apple. A structure is a collection of particles, it has to inherit the compound properties of it's particles.

- There are infinite wavelets generated by the action of particle. Waves propagate to fill the surroundings. It makes waves can be in different places at a time.

- Wave can be weakened or canceled by intrusion. It has to propagate and thin out eventually, Section 6.4. However, particle will live on.

- We can only say the multiple strip pattern is the trace of wave impacts. Since individual atomic particle can not be tagged. The test subject is lost in the process. It can not prove single bullet is able to make multiple holes.

I believe the universe has it's utmost logic. Particles will always act in perfect precision. Entanglement is the result of conflicting interpretations. Particle and wave are fundamentally different. Particle is a mass of it's own entity, and wave is the reaction of it's complement. It is scientifically essential to distinguish particle and wave.

8 Appendix - Jeopardy of Atomic Experiments

In summary, the jeopardy of atomic experiments is contamination of unwanted and unidentified particles and waves. However it is unavoidable in our dynamic universe. Just a single touch-and-go particle from outside world could affect the test environment.

A well understood environment is crucial for the success of experiments, for example:

- Test liquid on land without the contaminations of water.
- Test gas in sealed device to prevent the contaminations of other gases.
- In insulated device to control heat or noise.
- In space with reduced gravity.

8.1 Submerged Chemical Laboratory

Just as doing chemical experiments in a stormy submerged laboratory, we are incapable of isolating unwanted particles and waves. Physically, we are limited to perform atomic experiments submerged in the storm of particles and waves.

And there is magnetic field. Complex electromagnetism will be significant as well. Undetectable by our instrument does not mean absent of magnetic field. I don't believe this fundamental force will disappear. It can be micro scale appears absent to our instruments. Particles are not small, they are as big as all particles in their perspective. These micro electromagnetic-fields will be felt by particles and react. There would be electromagnetic waves when they are disturbed by passing particles. The reacting actions of particles and waves will spread wide in atomic world, however, it's detail is beyond our detection.

I don't suppose it is possible to forecast atomic weather. There is no calm moment in atomic world. Our instruments are, by far, matching the scale and speed of atomic events. And devices are made of particles. Analogous to studying water molecules with instrument made of water.

I believe only logical interpretations without contradiction is the key. Real world is the compound structure of atomic world. It can not be made by conflicting atomic attributes.

8.2 Electron Cloud and Entanglement

Even if the activity of particles is detectable, we often unable to obtain clear information. The swiftness of particles is not the only issue. Weak signals from their minute size requires long exposure for the sensor to collect useful data. However, long exposure is also multiple exposures. It produces blurred images as well. Nevertheless, long exposure can only be done if particles will remain in the frame of observation.

I believe time-exposures is the logical explanation of electron cloud. It is the result of their swiftness can not be frame-frozen by our detecting technology. The possibility of confusions can be substantial by their minute size and swift speed. Nevertheless, a blurred vision shall not blur the mind.

9 Appendix - Fundamental Principles

Matter, energy and space represent the very minimum elements necessary for the completion of an event in the universe. Matter is the physical aspect of any object, energy is the motivation of the action, and space is the playing-field allowing the existence of the matter and it's action to play out. All three elements contribute to the dynamic of the universe and none of them can be absent.

It is unlikely we will even know the true beginning and future of the universe. We can only consider the universe is perpetual. The infinite dynamic of the universe is maintained by the natural principles of the fundamental elements. The underlying logic is shown in the natural phenomena we observe. It is summarized below:

- **Infinite Principle**.

  The existence of fundamental elements is forever. Matter will forever exist; Energy will never disappear; The action of matter will never stop; And, space always has room for all matter and action. Since the universe has come to existence, it can only continue. Never-ending

- **Independent Principle**.

  Mass, energy, and space are free and uncommitted to each other. They trade in complete freedom to make the dynamic of the universe.

- **Physical Identity Principle**.

  Physical matter has it's own identity. From single particle to a large structure of galaxy. Separate elements can be indistinguishable but their own uniquenesses can not be denied.

- **Perfect Recycle Principle**.

  All three fundamental elements are able to return to original properties. However only space can be considered absolutely perfect. It is the only element remains at it's original condition and location. Matter and energy, on the other hand, are able to return to their original condition, but unlikely back to the original location.

- **Coherent Principle**.

  Real world is the extension of atomic world. A structure has to inherit the properties

of it's substructures. Despite the sublevel attributes can be hidden by the structure of the complex compound, however, never disappear. Hence, the phenomena observed in real world can not conflict with atomic world.

- **Complement Principle**.

  The environment (or surroundings) is the complement of an object, regardless of it's size, from fundamental particle to large complex structure of galaxy. It has to match precisely and absolutely when it's environment changes, and vise versa. Here the environment is defined as the rest of the universe other than the object itself.

References

[1] Don Pettit; *Science off the Sphere Astro Puffs, episode 13*, International Space Station (ISS)
http://www.physicscentral.com/explore/sots/episode13.cfm

[2] Sacha Kocsis, Boris Braverman, Sylvain Ravets, Martin J. Stevens, Richard P. Mirin, L. Krister Shalm, Aephraim M. Steinberg: *Observing the Average Trajectories of Single Photons in a Two-Slit Interferometer*, Science 3 June 2011, vol. 332 no. 6034 pp. 1170-1173 DOI: 10.1126/science.1202218.
http://www.sciencemag.org/content/332/6034/1170.abstract

Your advice and correction are very much appreciated. Please send your correspondence to: cres@mail.org

ISBN 978-957-43-2509-2