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EPD Model of Dark Matter

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Abstract: Electron-Positron Dipole (EPD) model of dark matter was set up initially, and force amongst EPDs, force amongst EPDs and visible matters, and EPDs' space distribution law are given. Electric field, magnetic field, electromagnetic field and gravitational field can be explained reasonably with EPDs' regular polarization, directional deflection, induced oscillation and density gradient. 4 kinds of field substance and physical substance can be unified reasonably. Substance of dark matter had been verified with vacuum friction, EPDs' thermal motion, electron-positron pair creation and annihilation. It is the essential reasons of dark matter invisible that EPDs can transmit but cannot reflect electromagnetic waves, but EPDs' density variation can be observed by detecting velocity variation and direction deflection of electromagnetic wave. Self-consistency of EPDs' electromagnetic wave theory is systematically demonstrated with Michelson-Morley experiment, Fizeau experiment, rotating steel discs, stellar aberration, photoelectric effect, wave-particle duality, gravitational light deflection, gravitational lens and radar echo delay. EPDs are solid substance foundation of gravitational field. Attraction always point to the direction of EPDs' density increase maximally, which is the reason that macroscopic matter only shows gravity and gravity is infinite and extends throughout all of space. Quanta and EPDs interact so frequently and disorderly that the moving trails of quanta can' be calculated accurately. It is the fundamental reason of quantum mechanics' uncertainty and randomness that EPDs and quanta interact mutually at anytime and anywhere. The motion of an electron itself is nothing different with the movement of macroscopic matter. However, the interference pattern should be observed in double-slit experiment no matter whether electrons go through double slit or not. In short, the results show that EPD model of dark matter, which is scientific and reasonable, is worth further study.

Keywords: dark matter; Electron-Positron dipole; field theory; electric field; magnetic field; electromagnetic field; gravitational field; field substance; physical substance; vacuum friction; creation and annihilation of electron-positron pair; relativistic gravity; quantum mechanics.

INTRODUCTION

For decades, it has indicated that dark matter provides main gravity to keep the celestial bodies from flying out of the galaxies *(1)*. There were insufficient visible matters to account for the huge mass of dark matter needed to hold galaxies together to super-clusters *(2)*. Clusters of galaxies are linked up by dark matters on a very large scale. The dark matter halos are found within the filaments *(3)*. Silk *et al. (4-6)* reported that dark-matter particles tangle with visible matters as many models predict. Ostrike *(7)* reported that dark matter clusters with visible matters due to self-attraction and is nearly uniformly spread throughout the universe due to self-repulsion. The most detailed map of dark matter ever made demonstrates that galaxies cluster together where the high-density regions of dark matter. The distribution of dark matter is consistent with the gravitational field. The new study also shows that galaxies attract one another most strongly on the outskirts of these high-density regions *(8)*.

In recent years, the precise cosmic observations have shown us a surprising model of the universe: 83% of the matters in the universe are dark matters; the others 17% are detectable visible matters *(9)*. However, the nature of dark matter has not been known *(10)*. Particle physicists have proposed many possible dark matter candidates

(11). Weakly interacting massive particle (WIMP) is a promising one among them *(12)*. The Cryogenic Dark Matter Search (CDMS II) experiment has provided world-leading sensitivity for the direct detection of WIMP. However, there is no statistically significant evidence for a WIMP signal *(13)*. Visible matters and dark matter tend to accumulate in the same places in the Universe *(14)*. The search for dark matter is being conducted experimentally on Earth with the Large Hadron Collider (LHC) and other elegant direct-detection experiments, and some indirect methods are being pursued through its gravitational effects on astronomical scales *(15)*. However, Dark matter has never been detected *(16)*.

Like Payload for Antimatter Matter Exploration and Light-Nuclei Astrophysics (PAMELA) observed, the data that come from the Advanced Thin Ionization Calorimeter (ATIC) in 2000 and 2002 show the researchers observed about 210 electrons and positrons *(17)*. Chang *et al.* *(18, 19)* believed data of electrons and positrons from ATIC and PAMELA can be explained by dark-matter annihilations. Fermi team members *(20)* announced Fermi Gamma-Ray Space Telescope (FGRST) have measured more than four million of electrons and positrons with higher precision. Many Field Theory have been set up in the last hundred years *(21~24)*, but it hasn't been unified. Some physicists try to unify dark matter and field substance *(25~27)*, but none of them have been very successful. CDMSII reported the dark-matter particles have the characteristic of ionization. So far, many experiments have shown electron-positron pairs can annihilate and can be created from "a vacuum space" *(28-33)*. If ATIC, PAMELA and Fermi are detecting dark matter, then theorists may have to reconsider models of dark matter. Dark-matter particles, which should include one electron e^- and one positron e^+, can attract and repel one another; it can be attract by the visible matters.

Both capturing dark matter and unifying field theory have always been the greatest wish of physicists for decades. However, Physicists never succeeded. Therefore, Electron-Positron Dipole (EPD) model of dark matter was set up initially, and force amongst EPDs, force amongst EPDs and visible matters, and EPDs' space distribution law are given. Electric field, magnetic field, electromagnetic field and gravitational field can be explained reasonably with EPDs' regular polarization, directional deflection, induced oscillation and density gradient. 4 kinds of field substance and physical substance (dark matter) can be unified reasonably.

EPD Model

Known feature of dark matter *(34~37)*: ①mass; ②band connecting galaxies; ③gravitational characteristics; ④particle nature; ⑤polarization; ⑥transferring energy; ⑦the distribution is consistent with the gravitational field; ⑧ creating electron-positron pair.

'Vacuum' can be ionized into electron-positron pairs; electron-positron pairs can combine and disappear in 'vacuum'. Matter cannot be created, nor can it disappear. Similarly, electric charge cannot be created, nor can it disappear. Photons do not contain any electron or positron. Therefore, photons can't be ionized into electron-positron pairs, and electron-positron pairs can't combine into photons. Its essence is that dark-matter particles in 'vacuum' receive large quantities energy once and are ionized into electron-positron pairs. Electron-positron pairs combine into low-energy, stable and unobservable dark-matter particles and release large quantities energy. Based on this, Electron-Positron Dipole (EPD) model of dark matter was set up initially.

Modeling
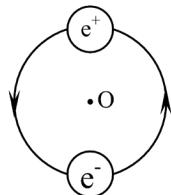
Fig1. *EPD model of dark matter*

The EPD model of dark matter is shown in Fig. 1. One EPD includes one electron e- and one positron e+. e- and e+, attracting each other, rotate around a common center O between them. e+ and e- move in a same plane in a moment. e+ and e- move to any position of the sphere owing to EPDs interacting, and then, Electron-Positron globular cloud is formed.

The Forces amongst EPDs

For convenience's sake, the instantaneous motion orbit of e- and e+ in one EPD can be projected on the parallel and vertical planes of one neighboring EPD, respectively. There are three interacting states amongst EPDs (see Fig. 2). The forces amongst EPDs, which include instantaneous Coulomb force, instantaneous Lorentz force, instantaneous orientation force and instantaneous induction force, include attraction and repulsion forces simultaneously. The interactions amongst EPDs are instantaneous but frequent. Overall, the attraction and repulsion forces are balanced against each other, respectively. Instantaneous orientation force, which is known as dipole-dipole force, results from interaction of the dipole moments of EPDs. EPDs, which absorb and release energy frequently, form instant-oscillation EPDs. The instant-oscillation EPDs induce other EPDs forming instant-oscillation EPDs (see Fig. 3). The attraction forces of instantaneous orientation force and instantaneous induction force play a vital role. The attraction and repulsion forces will balance each other when EPDs reach a certain density.
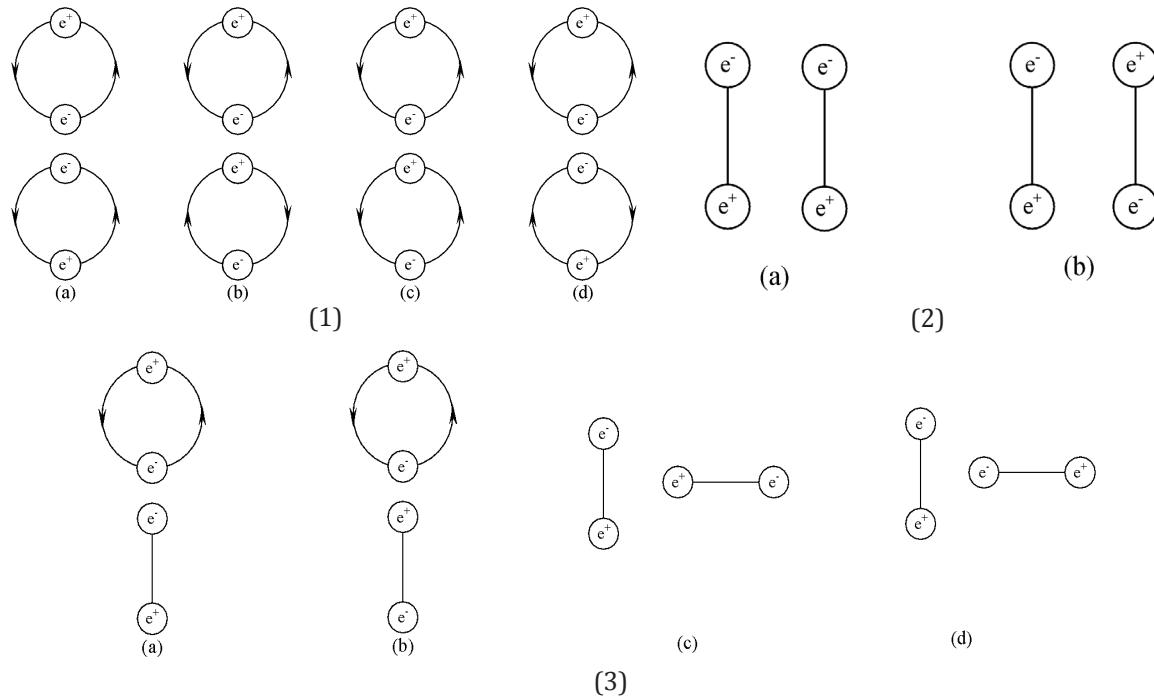
Fig2. *three interacting states of EPDs*
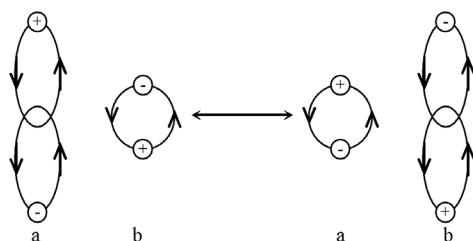
Fig3. *mutual induction of EPDs*

The Forces amongst Visible Matters and EPDs

Like interactions amongst EPDs, the forces amongst visible matters and EPDs, which include instantaneous Coulomb force, instantaneous Lorentz force, instantaneous orientation force and instantaneous induction force, include attraction and repulsion forces simultaneously. Attraction and repulsion forces will balance each other when EPDs around visible matters reach a certain density.

Dark matters aggregate around the visible matters owing to attraction force and distribute the whole universe owing to repulsion force *(7)*. As many models predict, dark matters can enter the interior of stars and planets owing to weak interaction amongst dark matters and visible matters *(38)*.

Spatial Distribution of EPDs

EPDs will distribute evenly without visible matters in a range. The density of EPDs will increase if there are visible matters in a range. The greater a celestial body's mass, the more the density of EPDs will increase. The density of EPDs around the celestial body maintains a certain gradient and decreases with distance increasing. Moreover, astral bodies attract EPDs moving with them in a range. Dark matters and visible matters aggregate in same space and can't be distinguished at large scales, as the result of this, gravitational field is stronger*(6)*. Light will bend through massive dark matter clump *(39)*. Actually, light always bend gradually with the influence of a series of dark matter clumps, and never does light bend and deform largely through one dark matter clump *(40)*.

Unification of Dark Matter and Field Substance

Propagation velocities of electric field, magnetic field, electromagnetic field and gravitational field are light velocity. So far, those field particles haven't been found. There is the same implicit logic that those are all invisible and propagating the same velocity. Therefore, those fields all possible related to dark matter.

Electric Field
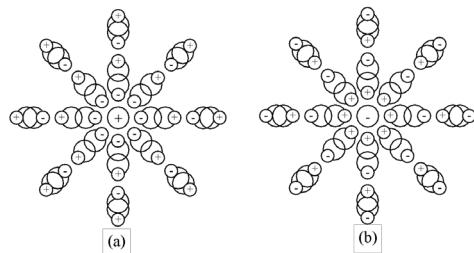
Fig4. *schematic diagram of electric field forming*

If a positive charge appears in a space, the rotating orbits of e⁻ will move to it and the rotating orbits of e⁺ will move away from it. If a negative particle appears in a space, the rotating orbits of e⁻ will move away from it and the rotating orbits of e⁺ will move to it. In other words, EPDs are polarized by charged particles. The polarization degrees of EPDs increase with the charge increasing and with distance decreasing (see fig.4).

EPDs' polarization transfers continuously from electric charges to the distance. The polarization intensity is equal on each concentric sphere of electric charges. Quantity of polarized EPDs on each concentric sphere of electric charge is equal (On the premise that the polarized degree of each EPD is the same). Electric field intensity can be expressed as EPDs' polarization intensity

$$E = k \frac{N}{4\pi} \bullet \frac{Q}{R^2} \qquad (1)$$

Where E denotes electric field intensity; k denotes a constant coefficient; N denotes quantity of polarized EPDs in unit area on each concentric sphere by unit charge, which is constant; Q denotes charges; R denotes a concentric sphere radius.

Electric field intensity can be simplified to

$$E = K \bullet \frac{Q}{R^2} \qquad (2)$$

Where, K is constant coefficient.

In essence, electric field is due to regular polarizations of EPDs. Therefore, the strength of electric field can be expressed as EPDs' polarization intensity. This shows that electric field is the regular variance of physical substance (dark matter), which unifies (electric) field substance and physical substance reasonably.

Magnetic Field

For the convenience purpose, the instantaneous rotating orbits of e$^-$ and e$^+$ in EPDs are projected on the plane which is determined by the direct current and the EPD's common center O, or the plane which goes through the common center O and is perpendicular to the direct current, respectively. The instantaneous rotating orbits of e$^-$ and e$^+$ will not be affected if it is perpendicular to the direct current. When the direction of motion of e$^+$ near the current is consistent with the current direction and the direction of motion of e$^-$ away from the current is in the opposite direction to the current direction, both e$^-$ and e$^+$ will be attracted by the current. The orbit of e$^+$ is stretched and the orbit of e$^-$ is compressed. The direction of motion of e$^+$ and e$^-$ will reverse when the orbit of e$^+$ runs away from the current and the orbit of e$^-$ runs near the current. Both e$^-$ and e$^+$ will be repelled by the current. The orbit of e$^+$ is stretched and the orbit of e$^-$ is compressed. The orbit of e$^+$ deflects to the plane which is determined by the direct current and the common center O; the orbit of e$^-$ deflects to the plane which goes through the common center O. Similarly, when the direction of motion of e$^-$ near the current is consistent with the current direction and the direction of motion of e$^+$ away from the current is in the opposite direction to the current direction, both e$^-$ and e$^+$ will be repelled by the current. The orbit of e$^-$ deflects to the plane which is determined by the direct current and the common center O; the orbit of e$^+$ deflects to the plane which goes through the common center O. Therefore, Clockwise rotation of e$^-$ and anticlockwise rotation of e$^+$ are displayed mainly in the upper part of the current, and clockwise rotation of e$^+$ and anticlockwise rotation of e$^-$ are displayed mainly in the lower part of the current (see fig.5).
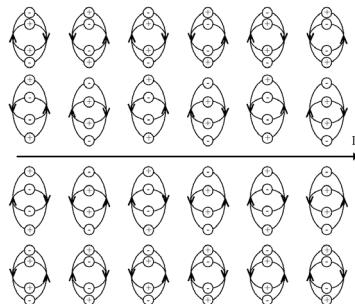
Fig5. *the schematic diagram of magnetic field forming around direct current*

EPDs' directional deflection transfers continuously from direct current to the distance. The directional deflection is equal on each concentric circle of direct current. Quantity of deflected EPDs on each concentric circle of direct current is equal (On the premise that the deflection degree of each EPD is the same). Magnetic field intensity can be expressed as EPDs' deflection intensity
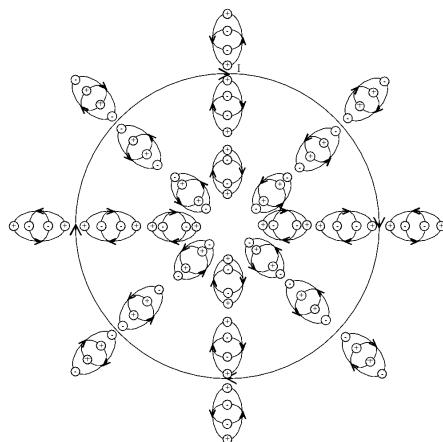
$$B = k \frac{N}{2\pi} \bullet \frac{I}{R} \qquad (3)$$

Where B denotes magnetic field intensity; N denotes quantity of deflected EPDs in unit length on each concentric circle by unit current intensity, which is constant; I denotes current intensity; R denotes concentric circle radius.

Magnetic field intensity can be simplified to

$$B = K \bullet \frac{I}{R} \qquad (4)$$

Fig6. *the schematic diagram of magnetic field forming around loop current*

In the same way, clockwise rotation of e⁺ and anticlockwise rotation of e⁻ are displayed mainly within the loop current and clockwise rotation of e⁻ and anticlockwise rotation of e⁺ are displayed mainly outside the loop current (see fig. 6).

Magnetic field intensity can be expressed as EPDs' deflection intensity

$$B = k \frac{N}{2} \bullet \frac{I}{R} \qquad (5)$$

Magnetic field intensity can be simplified to

$$B = K \bullet \frac{I}{R} \qquad (6)$$

In essence, magnetic field is due to rotations of EPDs. The strength of a magnetic field can be expressed by the rotating rate of EPDs. This shows that magnetic field is the regular change of physical substance (dark matter), which unifies (magnetic) field substance and physical substance reasonably.

Electromagnetic Field

Visible matters absorb and release electromagnetic waves constantly because instantaneous induction force interacts amongst EPDs and visible matters at every moment. EPDs, which absorb energy from visible matters or electromagnetic source, become oscillating EPDs (see fig.7). Electromagnetic field forms because of regular oscillation of EPDs. In fact, EPDs is a kind of optical medium. This is the reason that dark matter is invisible. Dynamic electric field, dynamic magnetic field and propagation direction of EPDs perpendicular mutually. It is the essential reason that electromagnetic wave is transverse wave. Actually, oscillating EPDs are microscopic oscillating electric dipoles, which indicate that oscillating EPDs is physical origin of transmission mechanism of the Maxwell's Equations.

Visible matter
(Electromagnetic source)
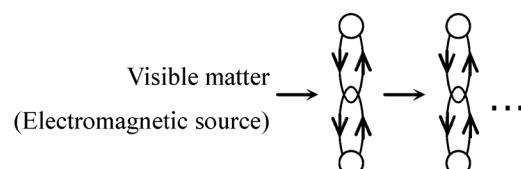
Fig7. *the schematic diagram of electromagnetic field forming*

In essence, electromagnetic field is due to oscillations of EPDs. The strength of an electromagnetic field can be expressed by the oscillating rate of EPDs and the type of electromagnetic wave can be expressed by oscillating frequency of EPDs. This shows that electromagnetic field is the regular change of physical substance (dark matter), which unifies (electromagnetic) field substance and physical substance reasonably.

Gravitational Field

EPDs will distribute evenly without visible matters in a range. The density of EPDs will increase if there is visible matters in a range. EPDs have the trend of moving to visible matters. The greater and closer visible matters, the more the density of EPDs around them will increase. The attraction and repulsion forces will balance each other when EPDs reach a certain density. Gravitational field forms because of density variance of EPDs. That is, if there are no density variances of EPDs, there is no gravitational field. Universe will exist in another form without dark matter *(3)*. As a net, Dark matters keep super massive cluster of galaxies together *(2)*. K Zioutas finds Galaxies and clusters of galaxies keep together owing to attraction of dark matter *(41)*.
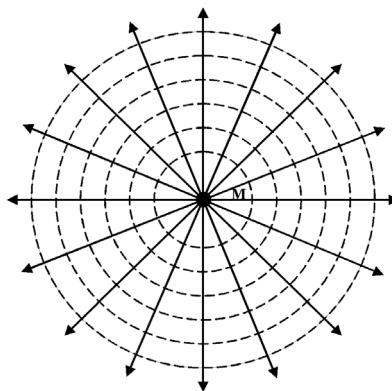
Fig8. *schematic diagram of Gravitational field being formed with EPDs*

EPDs' attraction transfers continuously from celestial body to the distance. The attraction intensity is equal on each concentric sphere of the celestial body (see fig.8). Quantity of attracted EPDs on each concentric sphere is equal (On the premise that the attraction intensity of each EPD is the same). Gravitational field intensity can be expressed as EPDs' attraction intensity

$$F = k \frac{N}{4\pi} \bullet \frac{M}{R^2} \tag{7}$$

Where F denotes Gravitational field intensity; N denotes quantity of attracted EPDs in unit area on each concentric sphere by unit mass, which is constant; M denotes mass; R denotes concentric sphere radius.

Gravitational field intensity can be simplified to

$$F = K \bullet \frac{M}{R^2} \tag{8}$$

In essence, gravitational field is due to density gradient of EPDs. The strength of a gravitational field can be expressed by density gradient of EPDs. Attraction always point to the direction of EPDs' density increase maximally which is the reason that macroscopic matter only shows gravity and gravity is infinite and extends throughout all of space. This shows that gravitational field is the regular change of physical substance (dark matter), which unifies (gravitational) field substance and physical substance reasonably.

Field Theory Based on Dark Matters

In short, electric field, magnetic field, electromagnetic field and gravitational field can be explained reasonably with EPDs' regular polarization, directional deflection, induced oscillation and density gradient. 4 kinds of field substance and physical substance (dark matter) can be unified reasonably.

EPD Model of Dark Matter

Dark matters cannot form fields themself without the influence of visible matters. Various fields are formed by the different potential energies of dark matters.

Electric field is the electric potential energy due to the polarization of dark matter. Magnetic field is the magnetic potential energy due to the directional deflection of dark matter. Gravitational field is the gravitational potential energy due to the density gradient of dark matter.

There is an interchange between kinetic and potential energies of dark matters when electric potential energy and magnetic potential energy transform into each other. Energy is transmitted in the form of waves in the process of transformation. Additionally, changes in dark matter density can form gravitational waves.

Dark matters have internal energy because of constant thermal motion of EPDs, and energy exchanges amongst EPDs through certain electromagnetic waves. Electromagnetic waves that have wavelengths 7.35cm can be received at any time, any position and any direction. Only this frequency of electromagnetic radiation cannot be shielded because it is dark matters' thermal motion.

EPD MODEL SELF-VERIFICATION

Matter-Verification of EPD Model

Cryogenic Dark Matter Search II (CDMS II) finds dark matter candidate can ionize *(13)*. Electron-positron pairs can release energy *(42)* and combine into dark-matter particles. Dark-matter particles receive large quantities energy once and are ionized into electron-positron pairs *(28, 29)*. So far, many experimental studies show that 'vacuum' can be ionized into electron-positron pairs and electron-positron pairs combine into 'vacuum'. All these demonstrate firm matter foundation of EPD model.

'Vacuum' Friction of High-Speed Motion

The speed of light is "the universe's speed limit" according to the theory of relativity. The reason is that mass will increase continuously with speed increasing. However, speed limit of any accelerating field is the speed of light. It is the reason that speed limit of accelerated particle is the speed of light. Action-reaction forces must be used for superluminal particles. The relevant practical technology is unable to achieve unfortunately. Without traction, the speed of high-speed particles will keep decreasing because of 'vacuum' friction of EPDs according to EPD theory.

'Vacuum' Friction of High-Speed Revolution

'Vacuum' friction of high-speed revolution was found in 2017*(43)*, which means the speed of particles can't go up unlimited. 'Vacuum' friction of EPDs exists everywhere and anytime according to EPD theory.

Pair Production in Superstrong Electric Fields

EPDs will be polarized in electric fields, and polarization degree will be improved with electric field intensity increasing. EPDs possessing high energy will be easily ionized into electron-positron pairs in superstrong electric fields. Kluger *et al*. reported that electron-positron pairs could be created in *a strong electric field* in 1991*(44).*

Pair Production in an Alternating Field

EPDs will receive energy polarized from alternating fields, and energy will be improved with electric field intensity increasing. EPDs possessing high energy are unstable and easy to break down into electron-positron pairs in alternating fields. Brezin *et al*. reported that electron-positron pairs could be created in an alternating field in 1970*(45)*.

Pair Production in Superstrong Magnetic Fields

The orbit of both e⁻ and e⁺ of EPDs deflect in magnetic fields, and deflection degree will be improved with magnetic field intensity increasing. EPDs possessing high energy will be easily broken up into electron-positron pairs in superstrong electric fields. Joseph *et al*. reported that electron-positron pairs could be created in superstrong magnetic fields in 1983*(46).*

Electron-Positron Pair Creation and Annihilation

When electron-positron pair creation and annihilation is discussed, it is generally believed that electron-positron pair and photon can transform mutually. However, there are many doubts that need further analysis.

First, electronic transition can absorb or emit photons. It means that no electron or positron is required to emit photons. Secondly, an individual photon is without charge, but an individual photon and an electron-positron pair can transform into each other. It means that transforming process be lack of substance basis and be violation of substance conservation, charge conservation and energy conservation.

Actually, electron-positron pair creation and annihilation have relationship with dark matters. It means that 'vacuum' is full of dark matters.

Dark Matters' Thermal Motion

EPDs have thermal energy and transfer it mutually by instantaneous induction force. Instantaneous induction force amongst EPDs is one kind of electromagnetic wave. Electromagnetic waves that have wavelengths 7.35cm can be received at any time, any position and any direction. Only this frequency of electromagnetic radiation cannot be shielded because it is dark matters' thermal motion.

The Reason of Dark Matters

It is widely believed that dark matters do not interact with the electromagnetic force. However, there is a serious misunderstanding. Actually, dark matters interact with the electromagnetic force. It is the essential reasons of dark matter invisible that EPDs can transmit but cannot reflect electromagnetic waves, but EPDs' density variation can be observed by detecting velocity variation and direction deflection of electromagnetic wave.

Electromagnetic Wave Transmission Theory Self-Verification

Michelson-Morley Experiment

The Michelson-Morley experiment conducted in 1887 was based on the assumed existence of ether the earth was traveling through. The movement was measured was minuscule.

On the basis of EPD theory, EPDs can be dragged by the earth in a certain range; EPDs can't be dragged by the earth out of a certain range; and there is a velocity gradient between full speed pulling belt and no pulling belt. The Michelson-Morley experiment conducted in full speed pulling belt, so light speed is the same in all directions.

Steel Plates Rotating Experiment

Lidge rotated two parallel heavy steel plates and passed light between them in 1893. He could find no change in light speed when the plates were at rest and when they were rotating rapidly.

On the basis of EPD theory, external air of steel plates can't be dragged by small steel plate quality. External EPDs of steel plate is even smaller than air molecules, so high-speed steel plates can't drag any EPD.

Fizeau Experiment

The Fizeau experiment conducted in 1851 measured the relative speeds of light in moving water. The results seemingly demonstrate the partial ether-drag hypothesis of Fresnel.

On the basis of EPD theory, partial EPDs in water and close to water molecules can be dragged. Even internally, not all EPDs can be dragged with water because the water molecules are too small.

Stellar Aberration

Stellar aberration can be proven mathematically that there is an apparent motion of celestial bodies' position dependent on the velocity of the observer.

On the basis of EPD theory, EPDs can be dragged by the earth in a certain range and the speed of revolution around the sun is 30km/s, so 20.5" is dubbed constant of aberration for the annual aberration. EPDs can be dragged by any celestial body in a certain range, so stellar aberration is different when light come from a diverse range.

Photoelectric Effect

The photoelectric effect is that electrons can be emitted when light shines on many metals. Electrons are emitted only when light reach or exceed a threshold frequency. No electrons are emitted below the threshold.

On the basis of EPD theory, electromagnetic waves transmit energy through induced oscillation of EPDs. Electron of a particle can absorb the energy of one EPD oscillating once because EPDs are independent particles. Electrons only transit their tracks and then transfer energy through transiting their tracks. Therefore, energy can't be accumulated. Light just transfer energy of induced oscillation of EPDs but not EPDs themselves. Energy of EPDs is related to oscillation frequency. Only EPDs, whose oscillation frequency is higher than long wavelength threshold, can emit electrons.

Wave-Particle Duality of Light

Wave-particle duality of light proposed by Einstein in 1905 is that light is not only a wave but also a particle. Although the wave-particle duality has worked well in physics, the interpretation has not been satisfactorily resolved.

On the basis of EPD theory, light is an electromagnetic wave transmitted by EPDs' oscillations. EPDs, whose oscillations carry energy, are particles. Therefore, light has particle nature. Like mechanical wave, light transmitted by EPDs' oscillations is an electromagnetic wave due to electromagnetic interaction of many EPDs. Therefore, light has wave nature at the same time. Therefore, there is no essential difference between mechanical wave and electromagnetic wave; both of them have the wave-particle duality.

Gravitational Deflection, Gravitational Lens and Gravitational Time Delay

Gravitational deflection is that light rays can be bent when it goes through a massive object. Therefore, dark matters distribution can be observed with gravitational lens. Gravitational time delay means radar signals that goes through a massive object take slightly longer to travel to a target and longer to return than they would if the massive object were not present.

On the basis of EPD theory, there is EPDs' density gradient around any celestial body. EPDs' density gradually decreases with the radius increasing. The greater the mass of the celestial body, higher the density, the closer to the celestial body, higher the EPDs' density is. The light deflection is serious when EPDs' density is high. In other words, gravitational lens can be used for observing EPDs' density changing. In the same way, Radar echo will delay when it go near a large celestial body.

Logical Argument of Electromagnetic Wave and Photon

On the basis of EPD theory, light is electromagnetic wave due to inducing oscillations of EPDs. There is an irreconcilable contradiction between electromagnetic wave and photon theory.

① There will be no collision between two beams of light under any circumstance. It means that the volume of moving photon is zero.

② The velocity of photon in one kind of media cannot be changed. Velocity only change at interface of different media. Therefore, the reason that the velocity cannot change in one kind of media need to be further verified. in addition. Velocity variation mechanism of an individual photon at interface need to be further verified.

③ Any material plane is high mountain and deep gully relative to photons without volume. It means that photons can't be reflected planarly.

④ Photons can't go into vacuum from glass at an angle. It means that light does not propagate particle but energy.

⑤ The path of an individual particle isn't any wave according to Wilson cloud chamber. It means that strict proof of fluctuation of an individual photon is required.

⑥ An individual photon is without volume, static mass or charge. It means that electromagnetic wave transmission mechanism of an individual photon need to be further verified.

⑦ Light is a transverse wave. It means that the oscillation pattern of an individual photon need to be further verified.

Gravitational Field Theory Self-Verification

Relativistic Gravity

General relativity published in 1915 by Albert Einstein provides a unified description of gravity as a geometric property of space-time. The curvature of space-time is directly related to the energy and momentum of matter, which is specified by the Einstein field equations.

However, it is lack of substance that space-time is gravitational field. There's no force without things which put force. It is worth further discussion that space-time is considered as a source of gravity.① Time only provides event-sequence information. So it requires rigorous demonstration that time is capable of exerting force. ② Space only provides space-location information. So it requires rigorous demonstration that space is capable of exerting force. ③ Movement is mutual and relative, and relativistic mass, space and time are mutual and relative. Therefore, there is no difference of mass, space and time in a whole system. ④Each object has numerous relative motion states to any other object, so the weight of the object cannot be uniquely determined. ⑤ Why space and time deform? How space and time deform? What property of the deformation is? How to validate the deformation? ⑥the deformation of space and time will make them interrupt. However, interrupt of space and time can't be found.

On the basis of EPD theory, gravitational field is due to density variance of EPDs. Attraction always point to the direction of EPDs' density increase maximally, which is the reason that macroscopic matter only shows gravity. The density of EPDs around the celestial body maintains a certain gradient and decreases with distance increasing, which is the reason that gravity is infinite and extends throughout all of space.

Gravitational Wave

Gravitational waves predicted in 1916 by Albert Einstein transport energy as gravitational radiation, which similar to electromagnetic radiation. Classical physics are unable to explain the phenomena associated with relativity. Like electromagnetic waves, gravitational waves are known as a transverse wave and have two polarizations.

On the basis of EPD theory, gravitational waves are disturbances in EPDs' density. There will be no drastic changes in EPDs' density without supernova explosion or collision of super massive bodies, which is the reason that

strong gravitational waves are rare. Gravitational waves, which are completely different from electromagnetic waves, are transmitted by density change. In other words, Gravitational waves are longitudinal waves and have no polarization state. In addition, Gravitational waves, whose energy loses faster, are a body wave but not a surface wave. It is the reason that detecting gravitational waves directly is extremely difficult.

THE ARGUMENTATION OF QUANTUM MECHANICS BASED ON DARK MATTER

Causation in Quantum Mechanics

An effect cannot occur before its cause in classical physics. However, causation in quantum mechanics was never found.

On the basis of EPD theory, like macroscopic matter, any kind of quanta induce EPDs mutually and absorb or emit electromagnetic waves all the time. Instantaneous induction force amongst quanta and EPDs interacts each other everywhere and anytime. Therefore, the movement of quanta in EPDs is more complicated than the random movement of dust in the air. Quanta and EPDs interact so frequently and disorderly that the moving trails of quanta can' be calculated accurately. It only accords with the statistical law of spatial probability distribution.

Matter Waves

Matter waves proposed by Louis de Broglie in 1924, which are an example of wave–particle duality, are a central part of the theory of quantum mechanics. Like light, diffraction of electrons can be observed.

On the basis of EPD theory, the motion of an electron itself is nothing different with the movement of macroscopic matter. However, the motion of an electron can induce EPDs oscillating in the same time. Electromagnetic oscillation frequency is proportional to the speed of electron, so Diffraction or interference pattern can be observed.

Wave Function Collapse

The wave function is connected with classical observables like position and momentum Quantum mechanics. Wave function collapse is that several eigenstates of a wave function appears to reduce to a single eigenstate when it occurs.

On the basis of EPD theory, quanta induce EPDs mutually and absorb or emit electromagnetic waves all the time. Therefore, the movement of quanta in EPDs is more complicated than the random movement of dust in the air. Quanta and EPDs interact so frequently and disorderly that the moving trails of quanta can' be calculated accurately. It only accords with the statistical law of spatial probability distribution. For example, it can only be expressed by probability function of dice points before casting the dice. Probability events of casting the dice become deterministic dice points after cast and stop of the dice. In the same way, it can only be expressed by probability function of any probability event before occurrence. All you can do is adjusting the type of probability function. However, Probability event become a single deterministic result after occurrence.

Hidden-Variable Theories

Some physicists argue that quantum mechanics is ultimately incomplete and a complete theory should provide descriptive categories to account for all observable behavior and thus avoid any indeterminism. Albert Einstein, the most famous proponent of hidden-variable theories, objected to the probabilistic nature of quantum mechanics and declared 'God does not play dice'.

On the basis of EPD theory, EPDs always cast dice with quanta through instantaneous induction force. It is the fundamental reason of quantum mechanics' uncertainty and randomness that EPDs and quanta interact mutually at anytime and anywhere. Therefore, quantum mechanics will be more and more complete through dark matter research.

Double-Slit Electron Diffraction

Double-slit electron diffraction conducted in 1927 is that electrons can display characteristics of both classically defined waves and particles. However, the interference pattern will disappear when particle detectors are positioned at the slits. It means that observation changes the result of the experiment.

On the basis of EPD theory, electrons induce EPDs to oscillate and transfer energy in the form of electromagnetic waves. The interference pattern is not the electron itself but electromagnetic waves of EPDs. The interference pattern should be observed no matter whether electrons go through double slit or not. This further proves that the motion of a single particle is consistent with that of macroscopic matter and the particles themselves do not wave. The interference pattern is produced by EPDs. Observation disturbs electrons and EPDs, which cause oscillation frequency of EPDs to change. Therefore, the interference pattern can't be observed because oscillation frequency of EPDs is inconsistent.

Wilson Cloud Chamber

Wilson cloud chamber made in 1912 by Wilson consists of a sealed environment containing a supersaturated vapor of water or alcohol. An energetic charged particle act as condensation centers around which a mist-like trail of small droplets form. The results show that the charged particles are always particles and their motion trails are not waves whether it is observed or not.

On the basis of EPD theory, a quantum entity can't wave itself. The wave nature only can be observed when many particles interact one another or when one particle induces interaction of many EPDs

Wave-Particle Duality of Quantum Entity

Wave–particle duality is that every quantum entity can be partly described in terms of particles and waves. Although the wave-particle duality has worked well in physics, the interpretation has not been satisfactorily resolved.

On the basis of EPD theory, EPDs are particles, and electromagnetic wave is induced oscillation of EPDs. Therefore, light has wave–particle duality. As for the quanta, there are many reasons for their wave–particle duality. ① Any individual quantum is a particle, so it has particle nature. ② Quanta can transmit wave through mutual interaction, so mutual interaction of quanta show wave nature. ③ Any individual quantum can interact with EPDs, in other words, a quantum can absorb or release light all the time. ④ Charged particles of uniform motion can induce oscillation of EPDs at the same frequency, so an interference pattern of light and dark regions of electromagnetic wave can be observed. All above can explain reasonable the wave–particle duality of light and quanta.

CONCLUSION

EPD model of dark matter is set up initially. One EPD include one electron e- and one positron e+; e- and e+ rotate around a common centre between them. Based on the model, the main results were following as:

(1) The forces amongst EPDs, which include instantaneous Coulomb force, instantaneous Lorentz force, instantaneous orientation force and instantaneous induction force, include attraction and repulsion forces simultaneously. The interactions amongst EPDs are instantaneous but frequent. Overall, the attraction and repulsion forces are balanced against each other, respectively. EPDs will distribute evenly without visible matters in a range. The density of EPDs will increase if there are visible matters in a range owing to attraction force. The density of EPDs around the celestial body maintains a certain gradient and decreases with distance increasing. EPDs will distribute throughout the universe owing to repulsion force and distribute uniformly on a large scale.

(2) Electric field, magnetic field, electromagnetic field and gravitational field can be explained reasonably with EPDs' regular polarization, directional deflection, Induced oscillation and density gradient. This shows that 4 kinds of field is the regular variance of physical substance (dark matter), which unifies 4 kinds of field substance and physical substance (dark matter) reasonably. Dark matters have a lot of internal energy and potential energy of various fields.

(3) 'Vacuum' friction show that 'vacuum' is fulled with 'invisible' dark matter. Electron-positron pair creation and annihilation have relationship with dark matters. EPDs have thermal energy and transfer mutually by instantaneous induction force. Instantaneous induction force amongst EPDs is one kind of electromagnetic wave. Electromagnetic waves that have wavelengths 7.35cm can be received at any time, any position and any direction. Only this frequency of electromagnetic radiation cannot be shielded because it is dark matters' thermal motion. Substance of dark matter had been verified with vacuum friction, EPDs' thermal motion, electron-positron pair creation and annihilation.

(4) Self-consistency of EPDs' electromagnetic wave theory is systematically demonstrated with Michelson-Morley experiment, Fizeau experiment, rotating steel discs, stellar aberration, photoelectric effect, wave-particle duality, gravitational light deflection, gravitational lens and radar echo delay.

(5) It is lack of substance that space-time is gravitational field because there's no force without things which put force. EPDs are solid substance foundation of gravitational field. Attraction always point to the direction of EPDs' density increase maximally which is the reason that macroscopic matter only shows gravity and gravity is infinite and extends throughout all of space. Gravitational waves are disturbances in EPDs' density. Gravitational waves, which are completely different from electromagnetic waves, are longitudinal waves and have no polarization state. In addition, Gravitational waves, whose energy loses faster, is body waves but not surface waves.

(6) Quanta induce EPDs mutually and absorb or emit electromagnetic waves all the time. Quanta and EPDs interact so frequently and disorderly that the moving trails of quanta can' be calculated accurately. It is the fundamental reason of quantum mechanics' uncertainty and randomness that EPDs and quanta interact mutually at anytime and anywhere. The motion of an electron itself is nothing different with the movement of macroscopic matter. However, the motion of an electron can induce EPDs oscillating in the same time. The motion of a single particle is consistent with that of macroscopic matter and the particles themselves do not wave. The interference pattern is produced by EPDs. The interference pattern should be observed in double-slit experiment no matter whether electrons go through double slit or not.

(7) Classical Physics failed to explain high-speed physical phenomena and micro-world physical phenomena. Dark matter can be used to unify classical physics and modern physics. Dark matter is the link between macro-world and micro-world; Dark matter is the bridge between low-speed physics and high-speed physics; Dark matter is an effective tool to bridge the huge gap between classical physics and modern physics.

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