

## Essence of Electric Charge of elementary particles according of New axioms and Laws

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### Abstract

Two new Axioms and eight new Laws have been proposed and developed in previous reports. This report uses both axioms and only four laws.

According to the first axiom (Axiom1), we can replace uniform motion in a closed circle with non-uniform motion in an open vortex. According to the second axiom (Axiom2), there are pairs of vortices that are mutually orthogonal or they tend to work in a system by a special type of resonance.

Of all the variants of vortex pairs, the most probable is the pair: accelerating vortex from the center outwards connected with a delayed vortex from the periphery inwards. This pair is a model of the connected proton-electron pair.

The behavior of a free electron and a proton in an Electromagnetic Field is studied. Actually like a cross vortex from outside to inside the electron will be directed to the positive pole. Therefore, an external observer who does not know what the internal structure of the electron is will think and will be deceived that the electron carries a negative charge. The exact opposite is observed for the proton.

The properties of a system of linked electrons and protons are also studied. It is known that the Electromagnetic Field propagates at a constant speed and when pulsating the waves are only transverse. According to the new Axioms and Laws in the electron-proton system, the internal connections are of variable speed and when pulsating, the waves are not only transverse and longitudinal.

Because the Electromagnetic field is only transverse at a constant speed, it appears that the interaction between the proton and the electron is not Electromagnetic but some other interaction. The interaction between the protons includes cross vortex with variable velocity and longitudinal vortex with variable velocity.

### Current state of knowledge

According Wikipedia: "Electric charge (or amount of electricity) is a physical characteristic of matter that causes a force to appear when it is nearby to another electrically charged substance. The electric charge is a fundamental physical quantity that characterizes internally, inherent property of electrons, protons and other charged particles and is introduced to quantitatively characterize the electrical properties of bodies. The electric charge can be positive or negative. Objects with the same charge are subjected to a repulsive force, and those with different charges - to an attractive force. The electric charge creates an electromagnetic field"...

"The elementary electric charge is a fundamental physical constant, a unit of measurement of electric charge. According to the changes in the definitions of the basic units of SI, the elementary

electric charge is exactly equal to  $1,602\ 176\ 634 \times 10^{-19}$  C. Carriers of elementary negative charge are electrons. This charge is closely related to the constant of the thin structure describing the electromagnetic interaction."

### Let's note that

1. Electric charge is an amount of electricity - *but we don't know what the essence of electricity is.*
2. Electric charge is a physical characteristic of matter - *but we don't know what the essence of matter is.*
3. Negative electric charge is carried by the electron -*but we don't know the structure of on the same one electron.*
4. The elementary electric charge is a constant unit of measurement of electric charge -*but we are not sure what exactly we measure.*

The reason is that we measure the electric charge in Electromagnetic Field. So far it is perceived that the Electromagnetic Field is spreading crossly with constant velocity [1, 2]. More precise we measure electric charge in the interaction between the unknown structure of the moving by Electric Field electron and the Magnetic Field lines provided that the electron crosses in a perpendicular direction these lines of force.

**As a result**

The electron moves along the parabola in a direction perpendicular to the direction of motion of the Magnetic Field lines. By the characteristics of the parabola we judge the magnitude of the charge and of the Electric field provided that the Magnetic Field is known and fixed.

**Conclusion**

We have an equation with 2 unknowns: an electron with an unknown structure and the interaction (collision) between the electron and magnetic line in the form of an impact with a certain force and direction. So far, we have perceived the charge as static units .The reason is that we also perceived the electron as static object - dense or empty but closed in itself. So far we have perceived an electron as a static little ball with a static charge added or placed on a surface of the electron.

**Proposal**

1. According the New axioms and Laws they describes electron as a dynamic and asymmetric object who includes in itself both: direction and magnitude of acceleration from outside to inside [3, 4].
2. If we put such object (electron) between two plates loaded by positive and negative electricity charge, this object (electron) will move to direction of plate with positive charge. So an external observer will think that this object (electron) carries a negative charge.
3. It will look deceptive that this object carries a static added charge. But in fact it has a complex open cross vortex structure with acceleration from outside to inside. The direction of acceleration from outside to inside fixes the sign of the "charge".

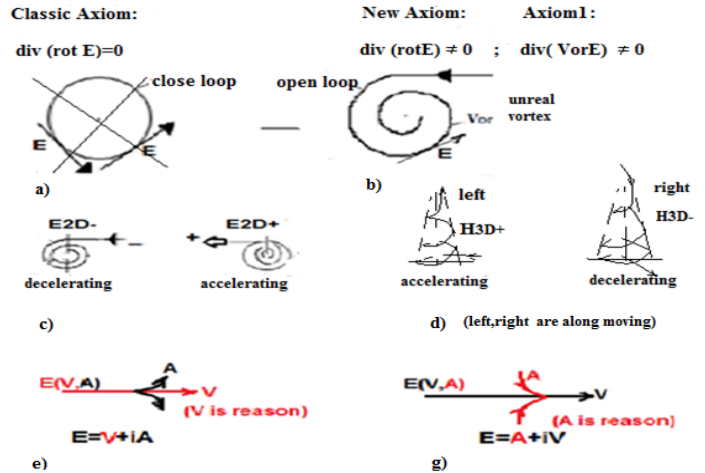
**According new Axiom1  
Open vortex**

It is well known Classic Axiom of Maxuell;s equation [1, 2]. The new Axiom1 replaces the Classic Axiom of Maxuell's equation [3, 4]. The Axiom1 replaces a closed loop of vector E (div rotE =0) (Figure1a) with an open loop of vector E (div vorE ≠0) (Figure1b).

**Axiom 1: The motion of vector with monotone-decreasing or monotone-increasing velocity becomes along an open vortices: div (VorE) ≠ 0 for vector E in 2D or div (VorH) ≠ 0 for vector H in 3D.**

Therefore: div (rot E) ≠ 0, or div (Vor E) ≠ 0, where the motion of the vectors E in 2D, or H in 3D with monotonically- accelerated or monotonically - decelerated motion occurs in the form of an open vortex (Vor), in which:

- div (Vor E) > 0 or div (Vor E) < 0 in 2D, 1a.**
- div (Vor H) > 0 or div (Vor H) < 0 for 3D. 1b.**



**Figure2.** Decelerating vortex ( eccentric in II quadrant)

Axiom1 replaces uniform closed loop motion in closed loop of vector E (div rotE=0) (Figure1a) with an uneven open loop motion in open vortex (div rotE ≠0) (Figure1b). Uneven movement can be accelerating or decelerating (not shown).The direction can be from outside to inside or from inside to outside (Figure1c). The movement can be in a plane (2D) (Figure1c) or in a volume (3D) (Figure1d). The vector E is complex (E=V+iA, E=A+iV). It can has as a real part (as a reason) a velocity V (Figure 1e) or can has as a real part (as a reason) an amplitude A (Figure 1g).

In number of argument n=4, we get minimum 16 variants of movement (2^n = 2^4 = 16).

**Proposal**

The electron model is one of these 16 variants of Axiom1, one is the most likely and the others are less likely. It is most likely because it mimics a negative charge.

Therefore, in this case it is proposed for a model of an electron a vortex consisting of decelerating cross vortex directed from outside to inside that imitate a negative charge.

**Eccentric vortex**

Until now, it was thought that the open vortex had a constant velocity of the vector E, and therefore the open vortex was drawn with the constant step between the turns (Figure 1b). But an uneven open vortex cannot be concentric as previously thought (Figure2a). For example one decelerating open vortex with direction from outside to inside displaces its center in the second quadrant (Figure2b).

**The reason is in acceleration**

Because acceleration is negative (decelerating vortex) in starting in vertical section the vector of velocity E<sub>1</sub> is longer than at the opposite point E<sub>3</sub> : (E<sub>1</sub> > E<sub>3</sub>). This pulls the Geometric Center (to up) to the bigger vector of velocity E<sub>1</sub> (Figure2b).

Then in horizontal section the vector E<sub>2</sub> is longer than at the opposite point E<sub>4</sub> (E<sub>2</sub> > E<sub>4</sub>). This pulls the Geometric Center (to left) to bigger vector of velocity E<sub>2</sub>. That is way the new center is placed in II quadrant and is named Gravity Center (Figure 2b).

## Vector of Eccentricity or Force of Gravity (Fg)

The distance between the Geometric Center (p.O) and the Gravity Center (p.F1) forms the Vector of Eccentricity. It plays the role of the Force of Gravity (F1g), which can be decomposed to the x-axis and the y-axis (Figure 2c).

Result: In the result is actually obtained the model of electron with velocity (V) as a real part ( $E=V+iA$ ) in the plane (2D) and amplitude (A) in the plane (2D) (Figure 1e) and with a decelerating vortex ( $\text{div}(\text{Vor}E)<0$ ) from the outside to the inside (Figure 2c). The imaginary part amplitude of cross vortex (A) are so called internal elementary cross vortices which move to inside (Figure 2c).

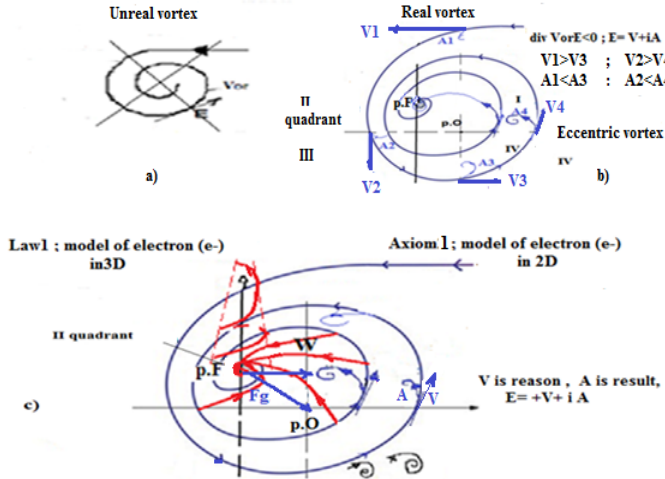


Figure 2. Decelerating vortex (eccentric in II quadrant)

**Law 1 :** The open cross vortex ( $E_{2D}$ ) generates (inward or outward) an open longitudinal vortex ( $H_{3D}$ ) (inward or outward) in its center through a cross-longitudinal transformation  $\Delta 1$ :

$$\text{Vor}(E_{2D}) \Rightarrow -- \text{Vor}(H_{3D}), \quad 2.$$

where Vor (for Vortex, meaning an unevenly vortex) replaces rot (for rotor, meaning opened closed loop); the cross vortex in 2D ( $E_{2D}$ ) (Figure 1c) continues its development in 3D as a longitudinal vortex ( $H_{3D}$ ) (Figure 1d).

**Consequence:** The open decelerating cross vortex ( $E_{2D}$ ) generates inward an open accelerating longitudinal vortex ( $H_{3D}$ ) outward (Figure 2c). This action takes place from the center of decelerating cross vortex ( $E_{2D}$ ) through a particular cross-longitudinal transformation  $\Delta 1$ -:

$$\text{Vor}(E_{2D}) \Rightarrow \text{Vor}(H_{3D}). \quad 3.$$

**Result:** The model of electron (e-): The electron model (e-) is the decelerating open cross vortex in 2D that generates from center to outward accelerating longitudinal vortex in 3D (Figure 2c).

## According new Axiom 2

Axiom 2: Two vortices of one complementary pair in mode of resonance to one direction in 2D:  $E = +A+iV$ ;  $E = +V+iA$  or two vorti-

ces of complementary pair in mode of resonance to opposite directions in 2D:  $E = -A - iV$ ;  $E = -V - iA$ , exist simultaneously in 3D.

**In right direction:**  $E = +A+iV$ ;  $E = +V+iA$ , 4a.

**In left direction:**  $E = -A - iV$ ;  $E = -V - iA$ . 4b.

The Axiom 2 connects two orthogonal vortices in two opposite directions which are in resonance mode. Even more they work in opposite phases.

## A pair of active generators

Because of one object (in right direction) pulls ( $E = +V + iA$ , Figure 2c), the other object have to push ( $E = +A + iV$ , Figure 3). So the both of them are active generators or they form a pair of active generators in complementary mode.

**Consequence:** In the pair of complementary objects, the both of them are active generators. That's why the result efficiency in this pair of objects in such particles field is always more than one.

**Remark:** In the Electromagnetic Field, the electrical circuit contains one generator element and one or several consumers. That's why the result efficiency is always less than one.

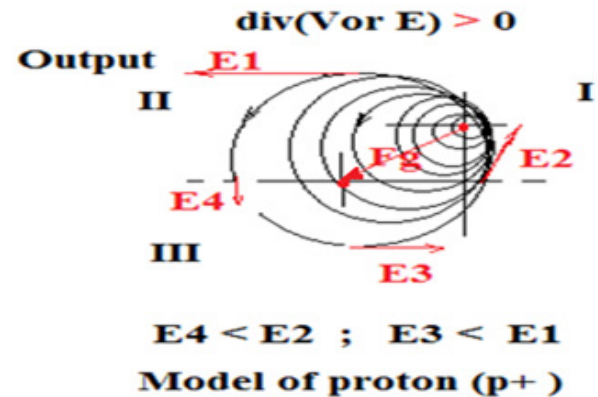


Figure 3. Accelerating vortex (eccentric in I quadrant) Axiom 2.

## Axiom 2.

The model of proton ( $p+$ ): The proton model is one of 16 variants of Axiom 1 (Figure 1). According to Axiom 2 the model of proton ( $p+$ ) have to be orthogonal to the model of electron. Therefore the model of proton ( $p+$ ) have to be an accelerating vortex ( $\text{div}(\text{Vor}E)>0$ ) from the inside to the outside with amplitude (A) as a real part ( $E = +A+iV$ ) in the plane (2D) (Figure 3).

The model of proton ( $p+$ ) (Figure 3) is not symmetric but it is exactly orthogonal to the model of electron (e-) (Figure 2b, c).

**Law 2:** The open longitudinal vortex ( $H_{3D}$ ) generates (inward or outward) an open cross vortex ( $E_{2D}$ ) (inward or outward) in its center through a longitudinal-cross transformation  $\Delta 2$ :

$$\text{Vor}(H_{3D}) \Rightarrow -- \text{Vor}(E_{2D}) \quad 5.$$

**Consequence:** The open decelerating longitudinal vortex ( $H_{3D}$ ) inward generates an open accelerating cross vortex ( $E_{2D}$ ) outward through longitudinal-cross transformation  $\Delta 2$ -:

$$\Delta 2- \text{Vor} (H_{3D}) \Rightarrow \text{Vor} (E_{2D+}). \quad 6.$$

This action takes place from the center of accelerating cross vortex ( $E_{2D+}$ ) which gradually accelerates the transverse vortex in 2D.

**Consequence:** The transformation  $\Delta 2$  is not opposite to the transformation  $\Delta 1$ . Both of them are mutual orthogonal.

### Two directions of pair of complementary objects

**Definition:** A pair of objects that work as they complement each other in resonance, are called pair of complementary objects.

According to Axiom 2 if one object pulls (Figure 4b) but other have to push (Figure 4a). The both of them are active generators or they form a pair of active generators in complementary resonance work.

**Consequences:** The first pair is in *right direction*: amplitude (A) can be the reason but the velocity (V) is the result ( $E = +A + iV$ ) (Figure 1g, Figure 4b) (model of proton). At the same time the velocity (V) can be the reason and the amplitude (A) - the result ( $E = +V + iA$ ) (model of electron) (Figure 1e, Figure 4a).

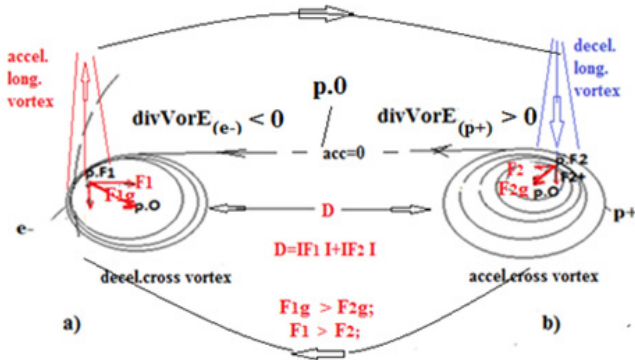


Figure 4. One pair of complex vortices in 3D (right direction)

**Consequences:** The second pair have to be in the opposite direction: amplitude (-A) can be the reason but the velocity (-V) is the result ( $E = -A - iV$ ) (model of antiproton). And the same time the velocity (-V) can be the cause and the amplitude (A) is the result ( $E = -V - iA$ ) (model of positron). *This opposite situation is not depicted in a figure.*

Decelerating vortex in electron and accelerating vortex in proton. Since the electron must be orthogonal to the proton, they must have orthogonal dynamics - not inverse, but orthogonal. This means that if one has a decelerating vortex, then the other has an accelerating vortex and if one vortex is outside-inside, the other is inside-outside.

**Law 5: The velocity (V) of a decelerating longitudinal vortex decreases in (n) portions ( $1/\psi^n$ ) times, while the amplitude (W) of cross vortices increases reciprocally in (n) portions ( $\psi^n$ ) times:**

$$\begin{aligned} I V^2 &= V_0 (V_0 - V), & 7a. \\ I W^2 &= W_0 (W_0 + W), & 7b. \end{aligned}$$

where  $v_n$  and  $w_n$  are periodic roots with period n that fulfill the requirement for orthogonality:  $v_n \cdot w_n = V_0 \cdot W_0$ ;  $n = 0 \div \infty$ ; the roots

$v_n$  and  $w_n$  are expressed as:  $v_n = \psi_n \cdot V_0$ ;  $w_n = (1/\psi)^n \cdot W_0$ ;  $V_0$  is the starting value of  $V_n$ ;  $W_0$  is the starting value of  $w_n$  and  $\psi$  is a proportion which fulfills the requirement:  $\psi - 1/\psi = 1$  and it is called golden proportion.

**Consequence:** Decelerating vortex of electron emits elementary cross vortices from periphery to center inward (and from periphery to environment outward as well) because of sign (+) in second equation (7b).

**Consequence:** The elementary cross vortices which are emitted from periphery to the center are *phased at the Gravitational center* (p.F1) in the second quadrant (II) (Figure 2c, Figure 4a).

**Consequence:** According the Consequence of Law1 (3) as a result of the phasing in the Gravitational center (p.F1) a *vertical acceleration vortex is generated* (Figure 2c). Therefore decelerating cross vortex continues in accelerating longitudinal vortex, *perpendicular to the plane of the transverse vortex* (Figure 2c). This process of transformation is described by the operator  $\Delta 1$  of Law1 (4).

**Consequence:** The process of transformation which is described by the operator  $\Delta 1$  of Law1 (3) is realized through so called *full resonance*. It is resonance of amplitude, frequency and phase or of space and time.

**Law 6: The velocity (V) of an accelerating longitudinal vortex increases in (n) portions ( $\psi^n$ ) times, while the amplitude (W) of cross vortices decreases reciprocally in (n) portions ( $1/\psi^n$ ) times;**

$$\begin{aligned} I V^2 &= V_0 (V_0 + V), & 8a. \\ I W^2 &= W_0 (W_0 - W), & 8b. \end{aligned}$$

where  $v_n$  and  $w_n$  are periodic roots with period n that fulfill the requirement for orthogonality:  $v_n \cdot w_n = V_0 \cdot W_0$ ;  $n = 0 \div \infty$ ; the roots  $v_n$  and  $w_n$  are expressed as:  $v_n = \psi_n \cdot V_0$ ;  $w_n = (1/\psi)^n \cdot W_0$ ;  $V_0$  is the starting value of  $V_n$ ,  $W_0$  is the starting value of  $w_n$  and  $\psi$  is a number which fulfills the requirement:  $\psi - 1/\psi = 1$ ,  $\psi$  and it is called golden proportion.

**Consequence:** Accelerating vortex of proton sucks elementary cross vortices because of sign (-) in second equation (8b).

**Consequence:** According the Law2 (6) vertical decelerating vortex *generates accelerating* cross vortex from Gravitational center (p.F2) to periphery (Figure 4b). Therefore decelerating longitudinal vortex, which is perpendicular to the plane of the transverse vortex, continues into accelerating cross vortex (Figure 4b). This process of transformation is described by the operator  $\Delta 2$  of Law2 (6).

**Consequence:** The process of transformation which is described by the operator  $\Delta 2$  of Law2 (6) is realized through so called *back wave*. It will describe further.

### Free Electron (e-) and free proton (p+) in the Electric Field

According the Consequence of Law 1 (3) the electron is a decelerating vortex and the vortex is rolled up in direction from outside to inside. Therefore the direction of the vortex is from out to in

(Figure 5a). According the Consequence of Law 2 (6) the proton is an accelerating vortex and the vortex is rolled up in direction from inside to outside .Therefore the direction of its vortex is from in to out (Figure 5b).

**For a free electron (e-):**

The acceleration of the electron’s vortex from the outside to the inside creates the eccentricity in II quadrant (Figure 5a).

Let we do the following experiment: to put an electron (e-) between two plate connected to plus (+) and minus(-) poles of Electricity Field .What is the causal algorithm?

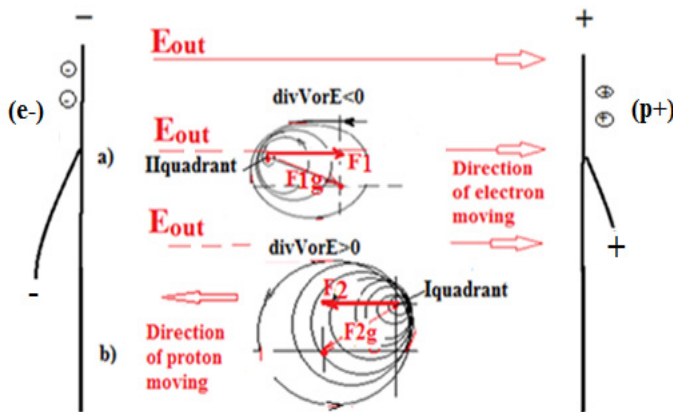
The acceleration of the input flow is the reason for the eccentricity of the open vortex. The eccentricity of the open vortex is the reason for the creation of a Vector of Eccentricity, which is expressed by a Force of Gravity (F1g). The Force of Gravity (F1g), decomposing along the x-axis, causes the Force of Attraction (F1) to appear (Figure 5a).

**Consequence:** The direction of *electron’s input flow* is from outside to inside .The flow in input sucks energy from outside environment from positive plate (+) or this is the reason the electron to move to positive plate(+) in order to suck up positive energy *as if the electron carries* a negative (-) “charge” (Figure5a).

**Consequence:** The eccentricity of electron’s decelerating vortex (in II quadrant) forms a Vector of Eccentricity that is a Force of Gravity (F1g).

**Consequence:** The Vector of Eccentricity that is a Force of Gravity (F1g) derives to x-axis and forms Force of Attraction (F1) that is watching to positive pole (+) of plate. It is the reason for the electron to move to positive plate as if there is a negative “charge”.

**Result:** *An independent outside observer will be deceived that the electron carries or is charged with a negative charge (-) but this conclusion is wrong.*



**Figure 5:** Free electron (e-) and proton (p+) between the Electric Field

**For a free proton (p+):**

The acceleration of the proton’s vortex from the inside to the outside is the reason for the eccentricity in I quadrant (Figure5b).

**Consequence:** The direction of proton’s acceleration (from in to out) is a reason for it to move to negative plate (-) as if there is a positive (+) “charge”.

**Consequence:** The Vector of Eccentricity (F2g) is a Force of Gravity. It derives to x-axis and forms vector of direction (F2) that is watching to negative pole (-) of plate.

**Consequence:** The eccentricity of proton’s accelerating vortex (in I quadrant) is the reason for it to move to negative plate (-) as if there is a positive (+) “charge”.

**Result:** *An independent outside observer will be deceived that the proton carries or is charged with a positive charge (+) but this conclusion is wrong.*

**For a free positron (e+) and antiproton (p-):**

Remark: The situations are opposite to the electron (e-) and proton (p+) (not drawn in figure).

Because  $E = -V - iA$  is a model of positron (e+), it follows that  $E = -A - iV$  is a model of antiproton (p-).This situation is not depicted in a figure and will not be explained in this report.

**Remark:** The Vectors of Eccentricity (F1g and F2g) derives to y-axis as well. But this vector is not used in this report (not drawn). This vectors are not depicted in a figure and will not be explained in this report.

Equality of “charge” of electron (e-) and proton (p+) (Figure4a, b). Around the midpoint point (p.0) acceleration is zero. At this point it depends on which direction the observer will look:

In the direction from outside of electron to its center acceleration is negative ( $\text{div Vor } E_{(e-)} < 0$ ) and acceleration is ( $a_{e-}$ ). In the direction from center of proton to its periphery acceleration is positive ( $\text{div Vor } E_{(p+)} > 0$ ) and acceleration is the same ( $a_{p+}$ ). It turns out that in both relative directions (to the left or right) the two accelerations are the same by module:  $|a_{e-}| = |a_{p+}|$

**Consequence:** In the point of rupture (p.0) the flows of these two fluids have the equal acceleration but in opposite directions (Figure 4a, b). If we tear the connection at point 0 (p.0) a free electron and proton will be obtained. So that the acceleration of free electron is equal to the acceleration of free proton:

$$\text{div Vor } E_{(p+)} = \text{div Vor } E_{(e-)} \text{ or } |a_{e-}| = |a_{p+}| \tag{9}$$

**Consequence:** Because that the acceleration of electron is equal to the acceleration of proton we can say that the “charge” of electron ( $g_e$ ) is equal to the “charge” of proton ( $g_p$ ) in module .The modern measurement method show that the charge equals to:  $1,602 \cdot 10^{-19} \text{ C}$ .

$$|g_e| = |g_p| \tag{10}$$

**Remark:** This is the charge only for” free” electron and proton. It is very likely the electron and proton which are linked in atom to have different and variable charge.

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## Conclusions

- The charge of the elementary particles is not static, it is not placed statically on the elementary particle. Moreover, the elementary particle itself is not a static body with added or extracted static thing.
- The charge of elementary particles is something dynamic and is due to the internal acceleration of the vortex that creates these particles. Moreover, the charge of elementary particles due to the direction of acceleration of the fluid flow that creates these particles.
- Because for electron the direction of fluid is from outside to inside, when it is placed between the poles of an external electromagnetic field the free electron will direct to the positive pole (+) by the external Electromagnetic Field .So an external observer will report that this particle has a negative charge (-). The modern methods measure the charge of only free electrons. Therefore this is an example and demonstration of charge of unconnected (free) electron (e-) only.
- Because for proton the direction of fluid is from inside to outside, when it is placed between the poles of an external electromagnetic field the free proton will direct to the negative pole (-) by the external Electromagnetic Field. So an external observer will report that this particle has a positive charge (+).

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