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The Mechanism Of Light Speed As Ultimate Particle Speed In LHC

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Abstract
Why the ultimate speed of proton and lead ions generated in LHC is 99.9999991% light speed? It can be easily answered by Lorentz factor $1/(1- v^2/c^2)^{1/2}$ derived from special relativity and relativism based on a false postulation that light speed is constant no matter of light source and observation. When the speed of an object approaches to light speed, Lorentz factor becomes infinitive, same as the energy and relativistic mass of the object. It ensures that light speed is the maximum speed of the object. However, this conflicts to Newton's Law of Acceleration, in which an object under external force can be accelerated in theory to a speed of no limit.
Instead of the infinitive energy and relativistic mass fabricated by Lorenz factor based on the false special relativity and relativism, Dynamic Electron Flux and Dynamic Remote Electrical Force based on Equation of Relative Velocity and Electron Radiation and Contact Interaction Theory are used to interpret the speeds of proton and lead ions in LHC.
Proton and lead ions approaching the RF cavity in LHC can be accelerated by the Dynamic Remote Electrical Force generated by the electrons emitted from the negative cathode of a RF oscillator under proper timing. The leading protons and lead ions having passed the negative cathode are decelerated by a pullback force generated by the electrons emitted from the same negative cathode which results in Surfer Effect. Furthermore, when proton and lead ions speeds are close to the light speed ($V \approx C$), $1/r^2$ becomes the dominating factor in the competition between acceleration and deceleration. Because of the strong pullback force due to the smaller r generated by the negative electrode of the RF oscillator, proton and lead ions are decelerated to a speed less than the light speed. This explains why the ultimate proton and lead ions speed driven by RF in LHC is just a little shorter than the light speed.

Keywords: *LHC, Special Relativity, Relativism, Particle Radiation and Contact Interaction, Coulomb's Law, Electrical Force, Static Electron Flux, Static Remote Electrical Force, Dynamic Electron Flux, Dynamic Remote Electrical Force, Equation of Relative Velocity, Equation of Light Speed, Absolute Light Speed, Coulomb's Constant, Permittivity, Permeability, Gravity Dependent Physical Constant.*

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I. Background

Is light speed constant? Is light speed the ultimate speed of all objects? I bet you will get positive answers for both questions from those academic scholars who believe that special relativity is true and light speed is always constant no matter of light source and observation.

In fact, according to Equation of Light Speed, light speed observed at reference point is the vector summation of the light speed observed at light source and the speed of light source observed at reference point. Therefore, it is obvious light speed observed at reference point is not constant. In addition, according to Maxwell Equation that light speed observed at light source (Absolute Light Speed) is constant $3x10^8$ m/s, no matter of frequency. However, based on Principle of Parallelism, the unit quantity m/s is a variable dependent on the local gravitational field and aging of the universe. In other words, light speed observed at light source is also not constant. As a result, both light speeds observed at reference point and that observed at light source are not constant. Therefore both special relativity and relativism are in fact a false theory.

As to why the ultimate speed of proton and lead ions generated in LHC is 99.9999991% light speed which seems to agree to that the light speed is the maximum speed of all objects. Despite the fact that light speeds including both the light speed observed at light source (Absolute Light Speed) and the light speed observed at reference point are not constant, it can be easily answered by Lorentz factor $1/(1- v^2/c^2)^{1/2}$ derived from special relativity and relativism based on the false postulation that light speed is constant no matter of light source and observation. When the speed of an object approaches to light speed, Lorentz factor becomes infinitive, same as the energy and relativistic mass of the object. It ensures that light speed is the maximum speed of the object. However, this conflicts to Newton's Law of Acceleration, in which an object under external force can be accelerated in theory to a speed of no limit.

In this paper, instead of the infinitive energy and relativistic mass fabricated by Lorenz factor based on the false special relativity and relativism, Dynamic Electron Flux and Dynamic Remote Electrical Force based on Equation of Relative Velocity and Electron Radiation and Contact Interaction Theory are applied in

explanation of the Surfer Effect, the mechanism of accelerating proton and lead ions by RF in LHC, as well as why the ultimate proton and lead ions speed driven by RF in LHC is just a little shorter than light speed.

II. Electron Radiation And Contact Interaction And Remote Electrical Force

"Electron Radiation" is the radiation of electrons from a negatively charged parent particle by absorbing thermal or kinetic energy. It is different from electromagnetic wave which is the emission of photon from a parent particle by absorbing thermal or kinetic energy. As an electron emitted from the negatively charged parent particle through electron flux generated by radiation reaches the negatively charged target particle, it makes interactive contact (not necessarily physical contact) with the resident electrons on the surface of the negatively charged target particle where repulsive electrical force is generated between two electrons so as to push the target particle away from the parent particle (Fig. 1). This interaction is called "Contact Interaction" and the entire process is called "Electron Radiation and Contact Interaction" [1].

"Remote Electrical Force" is the repulsive electrical force generated through the contact interaction on the surface of the target particle between two electrons, one from negatively charged target particle and the other one from negatively charged parent particle through electron flux generated by electron radiation. During contact interaction, the electrical potential energy carried by the electron emitted from the parent particle through electron radiation is transferred to the electron on the surface of the target particle, such that the target particle is pushed away by the remote electrical force from the parent particle to a corresponding distance. Meantime the emitted electron after energy transformation becomes a normal electron at the target particle.

In case of two positively charged particles, repulsive remote electrical force can be generated between the two particles. Or one positively charged particle and the other one negatively charged particle, attractive remote electrical force can be generated between the two particles.

Furthermore, there are two types of remote electrical forces: Static Remote Electrical Force generated by Static Electron Flux in which both parent and target charged particles are stationary to each other; and Dynamic Remote Electrical Force generated by Dynamic Electron Flux in which both parent and target charged particles are in relative motion.

Coulomb's Electrical Force is a static remote electrical force generated by Electron Radiation and Contact Interaction between two stationary charged particles. It is not an electrical force generated at the parent particle and propagates from the parent particle to the target particle. In fact, electrical force cannot propagates, only electrons generated at the parent particle through electron radiation can move with electron flux from parent particle to target particle.

In contrast to Remote Electrical Force, "Normal Electrical Force" is the randomly oriented repulsive electrical force generated between two adjacent normal electrons on the surface of the same negatively charged particle.

III. Coulomb's Law Of Electrical Force And Static Electron Flux

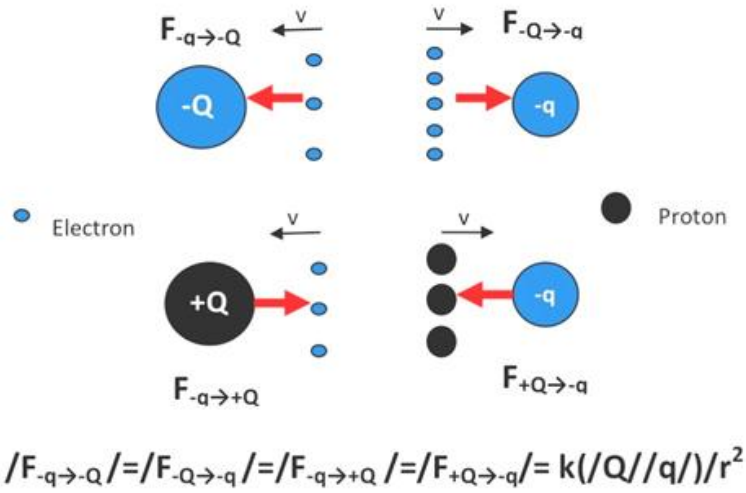
According to Particle Radiation and Contact Interaction Theory, Coulomb's Law of Electrical Force as static remote electrical force illustrated in Fig. 1 [2], can be derived from the static electron flux between two stationary charged particles. Coulomb's electrical force on the surface of target particle is proportional to the charge of parent particle (q_1) and the charge of target particle (q_2), and inversely proportional to the square of the distance (r) between the parent particle and the target particle. Therefore, a formula can be derived as follows:

$|F| = k_e (|q_1 q_2| r^{-2})$

Where F is static remote electrical force, k_e is Coulomb's constant (a gravity and aging dependent physical constant, $k_e = 8.99\times10^9$ N m^2 C^{-2} contains a constant number 8.99×10^9 and a group of variable unit physical quantities N m^2 C^{-2} dependent on the local gravitational field and aging of the universe), q_1 is the charge of parent particle, q_2 is the charge of the target particle and r is the distance between two charged particles. This is called "Coulomb's Law of Electrical Force".

Both q_1 and q_2 are charges which by nature are fixed physical quantities (Absolute Physical Quantities). However, the intensity of the charge on the surface of the object is dependent on the local gravitational field and aging of the universe. Despite that distance r is a fixed physical quantity, based on Principle of Parallelism, k_e is a Gravity and Aging Dependent Physical Constant which contains a constant real number and a group of variable unit physical quantities dependent on the local gravitational field and aging of the universe.

In case q_1q_2 is positive (either both are positively charged particles or both are negatively charged particles), the force between the two charged particles is repulsive. Otherwise, if q_1q_2 is negative (one positively charged and the other one negatively charged particle), then the force between them is attractive.



$$/F_{-q\to-Q}/=/F_{-Q\to-q}/=/F_{-q\to+Q}/=/F_{+Q\to-q}/= k(/Q//q/)/r^2$$

Fig. 1 Coulomb's Electrical Force (Static Remote Electrical Force) between two stationary charged particles.

IV. Equation Of Light Speed

According to Equation of Relative Velocity [3], light speed observed at a reference point $_{O}\mathbf{C}_{P}$ is the vector summation of the speed of light source observed at the reference point $_{O}\mathbf{V}_{S}$ and Light Speed observed at light source $_{S}\mathbf{C}_{P}$.

$$_{O}\mathbf{C}_{P} = {}_{O}\mathbf{V}_{S} + {}_{S}\mathbf{C}_{P}$$

This equation is true at any instant time. In case two of the three velocities are constant then the third one is also constant and the above equation should also be true at all times.

Therefore, Equation of Light Speed [4] can be represented by a vector summation as follows:

$$\mathbf{C'} = \mathbf{C} + \mathbf{V}$$

Where **C'** is the light speed observed at reference point, **C** is the light speed observed at light source and **V** is the speed of light source observed at reference point. For consistency, the same unit quantities at reference point can be applied in the equation.

Equation of Light Speed is true at any instant time. In case any two of the three speeds **C'**, **C** and **V** are constant, then the third one is also constant and Equation of Light Speed is true at all times.

At the time of light emission, light speed observed at light source is frequency independent constant called Absolute Light Speed ($\mathbf{C} = 3\text{x}10^8$ m/s, where m/s is dependent on the local gravitational field and aging of the universe), which is the initial light speed observed at light source. On the other hand, the speed of light source observed at light origin is Inertia Light Speed which is the initial speed of light source observed at light origin. Therefore, at the time of emission, the light speed observed at light origin is the vector summation of Absolute Light Speed and Inertia Light Speed. In fact, the light speed observed at light origin is always constant as the vector summation of Absolute Light Speed and Inertia Light Speed. This is named "Light Origin Constant Light Speed Theory" [5]. In addition, at the time of light emission, light speed observed at a reference point is the vector summation of Absolute Light Speed and the speed of light source observed at the reference point (different from Inertia Light Speed observed at light origin).

In case the speed of light source observed at light origin is constant (equal to Inertia Light Speed), since the light speed observed at light origin is always constant, then according to Equation of Relative Velocity, the light speed observed at light source is also constant (equal to Absolute Light Speed). Furthermore, In case both the light speed and the speed of light source are constant observed at the reference point, then the light speed observed at light source is also constant (equal to Absolute Light Speed) (revised from [3]). Also, In case both reference point speed observed at light origin and the speed of light source observed at the reference point are constant, then the light speed observed at the reference point is constant and light speed observed at light source is also constant (equal to Absolute Light Speed).

Equation of Light Speed is the "Law of Light" which indicates directly that "Light Speed Is Not Constant". In other words, it shows that Einstein's postulation "Light Speed is always constant no matter of light source and observation" is not true and Special Relativity is false. In addition, Equation of Light Speed can be applied to explain many physical phenomena such as Cosmological Redshift, Hubble's Law, Spacetime

Reverse Expansion (Universe Expansion), Gravitational Redshift and Deflection of Light which are affected by Absolute Light Speed and Wavelength dependent on the local gravitational field and aging of the universe. It can also be applied to interpret Axial Redshift, Transverse Redshift, Acceleration Redshift and Event Horizon, which are influenced by Inertia Light Speed and direction due to the relative motions between light source and reference point. As a consequence, these phenomena can also be considered as the nature proofs to Equation of Light Speed, as well as that "Light Speed Is Not Constant" [6].

According to Equation of Light Speed, light speed observed at reference point is not constant. In fact it is the vector summation of the light speed observed at light source ($3x10^8$ m/s where m/s is dependent on the local gravitational field and aging of the universe) and the speed of light source observed at reference point.

V. Physical Constants

Physical constants contain two components: a real number (number component) and a group of unit quantities (unit quantity component) which are combined together by arithmetic operations [7]. There are three types of physical constants [8]:

Universal Physical Constant

Universal Physical Constant such as Gravitational Constant G which is a true constant physical quantity, independent of local gravitational field and aging of the universe. It contains a variable real number and a group of variable unit physical quantities dependent on the gravitational field and aging of the universe at the location of measurement (reference point) [8]. (This is revised from my previous publication [9][10], in which I have mistakenly proposed that all physical constants including Gravitational Constant are gravity and aging dependent physical constants, which contain a constant real number and a group of variable unit physical quantities dependent on the local gravitational field and aging of the universe).

Gravity and Aging Dependent Physical Constant

Gravity and Aging Dependent Physical Constants such as Planck's constant h, Wu's constant K, Coulomb's Constant k_e, Permittivity ε_0, Permittivity Permeability μ_0 and Absolute Light Speed C, are not true constant physical quantities. Instead, based on Principle of Correspondence, they contain a constant real number and a group of variable unit physical quantities which are dependent on the local gravitational field and aging of the universe. Therefore, accordingly Gravity and Aging Dependent Physical Constants are also dependent on the local gravitational field and aging of the universe.

Absolute Physical Constant

Absolute Physical Constant such as Wu's Spacetime Constant γ is a true constant physical quantity. It contains a constant real number and a group of fixed mass and charge unit quantities (Absolute Physical Quantities) which are independent of gravitational field and aging of the universe. Therefore, accordingly Absolute Physical Constant is also independent of the local gravitational field and aging of the universe.

VI. Maxwell Equation And Absolute Light Speed

Based on Maxwell Equations, light speed observed at light source (Absolute Light Speed) is derived from the permittivity ε_0 and permeability μ_0 of free space and can be represented as $C=1/(\varepsilon_0\mu_0)^{1/2}$. Some physicists believe that because ε_0 and μ_0 are absolute physical constants, therefore light speed (Absolute Light Speed) must also be an absolute physical constant, which can change with nothing at all. However, according to Principle of Parallelism, as the local properties of corresponding identical object, both permittivity $\varepsilon_0 = 8.85x10^{-12}$ Farad/meter ($\varepsilon_0 = 1/(4\pi k_e)$ and $k_e = 8.99\times10^9$ N m^2 C^{-2}) and permeability $\mu_0 = 4\pi\times10^{-7}$ H/m contain a constant number and a group of unit physical quantities dependent on the local gravitational field and aging of the universe, therefore, Absolute Light Speed $C = 3x10^8$ m/s should also contain a constant number and a group of unit physical quantities dependent on the local gravitational field and aging of the universe [8]. (All Permittivity ε_0, Permeability μ_0, Coulomb's constant k_e and Absolute Light Speed C contain a constant real number and a group of unit physical quantities dependent on the local gravitational field and aging of the universe, therefore they are named Gravity and Aging Dependent Physical Constants).

As a result, light speed observed at light source (Absolute Light Speed) is a Gravity and Aging Dependent Physical Constant which is dependent on the local gravitational field and aging of the universe. Because both light speed observed at reference point and light speed observed at light source are not constant, therefore, the postulation of special relativity that light speed is constant no matter of observation and light source is totally false, as is the special relativity and relativism.

VII. Special Relativity, Relativism And Light Speed

It is believed by academic scholars that the speed of protons and lead ion in the Large Hadron Collider (LHC) is fundamentally limited by the speed of light in vacuum ($c = 3x10^8$ m/s) according to Einstein's Special Theory of Relativity [11] and Relativism based on a false postulation that light speed is constant no matter of observation and light source. They also believe that this speed limit is an absolute, non-negotiable law of the universe for any particle that has mass, like a proton.

According to Special Relativity, the total energy (E) of a moving particle is related to its rest mass (m_0) and its velocity (v) by the equation:

$E = m_0 c^2 (1 – v^2/c^2)^{-1/2}$

Also, the formula for relativistic mass (m) is:

$m = m_0 (1 – v^2/c^2)^{-1/2}$

As the particle's speed (v) gets closer and closer to c, the denominator approaches zero. This means that both the energy (E) and the relativistic mass (m) tend towards infinity. In other words, to accelerate a particle with mass (like a proton) to the speed of light would increase relativistic mass (m) to infinitive and also require an infinite amount of energy, which is physically impossible to supply. Therefore, according to special relativity and relativism, the speed of a particle cannot exceed light speed.

Because both light speeds observed at reference point and observed at light source are not constant, therefore, the postulation of special relativity that light speed is constant no matter of observation and light source is false, as is the special relativity and relativism. As a result, whether or not the speed of particle is limited by light speed cannot be concluded by special relativity and relativism.

VIII. How LHC Works

The Large Hadron Collider (LHC) [12] accelerates particles, primarily protons and heavy ions (like lead ions), using a highly sophisticated process that relies on a combination of electric fields for acceleration and magnetic fields for steering.

Facilities and Equipments

The acceleration process occurs in two main stages: a chain of pre-accelerators, followed by the main LHC ring.

1. The Accelerator Chain (Getting Started)

The LHC is the final and largest machine in a sequence of accelerators at CERN. The particles start at a near-standstill and are progressively sped up: Protons begin as simple hydrogen gas. An electric field strips the electrons, leaving only the positively charged proton nuclei. The protons are first accelerated in a straight line (Linear Accelerator) to relatively high energy. They are then injected into a series of smaller circular accelerators (like the Proton Synchrotron Booster and the Super Proton Synchrotron) where they are accelerated to much higher energies before finally being injected into the main LHC ring.

2. The LHC Ring Acceleration

Once the protons are in the 27-kilometer (16.8-mile) LHC ring, two key components manage their movement and energy:

(1) Radiofrequency (RF) Cavities (The Accelerator)

This is the component that actually increases the particle speed (energy). The LHC has specially designed, superconducting metallic chambers called Radiofrequency (RF) cavities placed at intervals around the ring. Inside these cavities, powerful electromagnetic fields oscillate at a specific radio frequency. As a charged particle (the proton) passes through, it receives a timed electrical impulse that boosts its energy, pushing it faster. The electric field's polarity is timed perfectly so that every time a bunch of protons passes, they receive another push, continuously increasing their speed. This process ramps up the energy of the protons from 450 GeV up to their maximum energy of 6.5 TeV over about 20 minutes.

(2) Superconducting Dipole Magnets (The Steerer)

This is the component that keeps the particles in a circle. As the protons speed up, they want to fly straight (due to inertia). To bend them into the 27 km circle, the LHC uses over a thousand massive, powerful superconducting dipole magnets. These magnets create a strong, uniform magnetic field that exerts the Lorentz force on the charged protons, forcing them to follow the curved path of the ring. As the protons gain speed and energy, their mass effectively increases (a relativistic effect), making them harder to steer. The magnetic field must therefore be continually and precisely increased to keep the increasingly energetic and "heavier" particles on the same circular track.

The RF cavities deliver a small, repeated electric field push to accelerate the particles, while the superconducting magnets provide a massive magnetic field force to steer them around the enormous ring. The result is two beams traveling in opposite directions at 99.9999991% the speed of light, ready for collision.

Two Protons

The Large Hadron Collider (LHC) primarily collides particles with the same electrical charge. The most common and highest-energy collisions at the LHC involve two beams of protons (also P-Pb or Pb-Pb) accelerated in two different channels till colliding head-on at crossing points. After the collision, the two beams separate again and return to their respective parallel channels to complete the circuit. In short, the LHC is essentially two separate accelerators built side-by-side within the same tunnel and cryostat, with their beams merging only at the detector locations. The beams accelerated and collided in the main LHC ring are always of the same charge (positive) because the magnetic fields of the same magnitude in opposite directions sharing the same yoke is used to steer them in opposite directions around the circular track.

Radio Frequency Cavity

The Radiofrequency (RF) cavities are the primary mechanism used in the Large Hadron Collider (LHC) and other circular particle accelerators for increasing the energy of the particles and maintaining the stability of the beam. Here is a breakdown of why RF is essential:

1. The Need for Repeated Acceleration

To reach the incredible speeds (near the speed of light) required for high-energy physics, particles must be given an energy boost many times. RF cavities use oscillating electric fields (fields that rapidly switch polarity). This dynamic field is crucial because:

(1) If you used a static (non-changing) electric field to push a particle, once the particle passed the negative electrode, the negative electrode would immediately start pulling it backward, decelerating it.

(2) With an oscillating RF field, the field's polarity can be timed to switch exactly as the particle passes, ensuring the particle always receives a forward push and never a backward pull.

2. Synchronization and The "Surfer Effect"

The RF field must be perfectly timed to the particle's revolution frequency. As the particle bunches pass through the RF cavity, the electric field is oscillating at a specific radio frequency (400 MHz in the LHC). The timing is adjusted so that the particle bunch passes through when the electric field is at the optimal phase to push it forward. Even more importantly, the RF phase provides stability to the particle bunches. Particles slightly behind the ideal timing get a stronger kick, allowing them to catch up. Particles slightly ahead get a weaker kick, causing them to slow down slightly. This self-correcting mechanism keeps the millions of protons tightly grouped into stable "bunches" (like surfers catching a wave), which is vital for maximizing the chance of a collision (called luminosity).

3. Length of RF Cavity

The relationship between the length of a cavity (L) and its resonant frequency (f) is governed by the speed of light (c) and the wavelength (λ) of the radio waves.The core rule is that the cavity must act as a resonator, meaning it must "fit" the wave perfectly so that the wave reflects back and forth and builds up intensity (standing waves).For the most basic (fundamental) mode of acceleration, the length of the cavity is typically equal to one-half of the wavelength of the RF wave. Therefore, for LHC's 400 MHz RF wave,

$\lambda = c/f = 300{,}000{,}000$ (m/s) /400,000,000 Hz =0.75 meters

$L = \lambda/2 = 0.75$ m / 2 = 0.375 meters

IX. Ultimate Particle Speed Observed In LHC

The LHC accelerates protons to incredibly high energies, giving them a speed very, very close to light speed C. At its maximum energy of 6.5 TeV (Tera-electron Volts) per beam, a proton moves at approximately 0.999999991 C, or about 3.1 meters per second slower than the speed of light [12]. Despite this minuscule speed difference, the protons have been given an enormous amount of energy, which according to special relativity and relativism, primarily as a huge increase in their relativistic mass (or momentum), makes them thousands of times heavier than their rest mass. This is why scientists accelerate particles in the LHC, to give them huge amounts of kinetic energy for collisions, not to achieve a significantly higher *speed*. However, instead of the false special relativity and relativism, the mechanism of the ultimate proton speed can be more reasonably explained by Dynamic Electron Flux and Dynamic Remote Electrical Force based on Electron Radiation and Contact Interaction Theory.

X. Dynamic Remote Electrical Force And Dynamic Electron Flux

There are two types of remote electrical forces: Static Remote Electrical Force where both parent object and target object are stationary to each other; and Dynamic Remote Electrical Force where both parent object and target object are in relative motion with respect to each other. For examples, Coulomb's Electrical Force is a static remote electrical force (either attractive or repulsive), and the remote electrical force between negative electrode and proton in LHC is a dynamic attractive remote electrical force.

Similar to dynamic graviton flux and dynamic remote gravitational force (Newton's Universal Gravitation) [13][14], the dynamic electron flux and dynamic remote electrical force (Coulomb's Electrical Force) are also proportional to the electron speed observed at target object (proton). Therefore,

$\mathbf{i_d} = k''\mathbf{V_d}\ (q_1/r^2)$

$\mathbf{F_d} = -1C\ q''k''\ \mathbf{V_d}\ (q_1/r^2)$

Where k" and q" are constants, C is coulomb, $\mathbf{i_d}$ is dynamic electron flux vector and $\mathbf{F_d}$ is dynamic remote electrical force vector, $\mathbf{V_d}$ is dynamic electron flux speed vector observed at moving positively charged target object (proton), q_1 is the charge of the negatively charged parent object (negative cathode) and r is the distance between negatively charged parent object (negative cathode) and positively charged target object (proton).

According to Equation of Relative Velocity,

$\mathbf{{}_pV_e = {}_pV_C + {}_CV_e}$

Where p is proton, C is cathode and e is electron. $\mathbf{{}_pV_e}$ is the velocity of electron observed at proton, $\mathbf{{}_pV_C}$ is the velocity of cathode observed at proton and $\mathbf{{}_CV_e}$ is the velocity of electron observed at cathode.

Also,

$\mathbf{{}_pV_e = V_d}$

$\mathbf{{}_pV_C = -\ {}_CV_p = -V}$

$\mathbf{{}_CV_e = C}$

Therefore,

$\mathbf{V_d = C - V}$

$\mathbf{i_d} = k''\ (\mathbf{C\text{-}V})\ (q_1/r^2)$

$\mathbf{F_d} = -1C\ q''k''\ (\mathbf{C\text{-}V})\ (q_1/r^2)$

Where $\mathbf{i_d}$ is dynamic electron flux, $\mathbf{F_d}$ is dynamic remote electrical force, $\mathbf{V_d}$ is the electron velocity observed at proton, **V** is the proton velocity observed at cathode and **C** is the electron velocity (assuming equal to light speed) observed at cathode. The direction of dynamic remote electrical force is determined by **C-V** and the intensity of dynamic remote electrical force are dependent on /**C-V**/ and $1/r^2$.

XI. Mechanism Of Surf Effect

As a group of protons passing through the negative cathode in LHC (Fig. 2), according to dynamic remote electrical force based on Equation of Relative Velocity and Electron Radiation and Contact Interaction Theory, for those leading protons having passed the negative cathode, they are under a pullback force by the electrons emitted from the negative cathode.

Because

$\mathbf{F_d} = -1C\ q''\ k''\ (\mathbf{C - V})\ (q_1/r^2)$

And

$\mathbf{C - V} = (C - V)\ \mathbf{S}$

$\mathbf{C > V}$

Where **S** is the unit vector in proton moving direction.

Therefore,

$\mathbf{F_d} = -1C\ q''\ k''\ (C - V)\ (q_1/r^2)\ \mathbf{S}$

Because $\mathbf{F_d}$ is negative, therefore proton acceleration **a** is also negative, which means that for those leading proton having passed the negative cathode, their speed is decreasing with time in the forwarding direction.

On the other hand, for those following protons having not reached the negative cathode, they are under a pushing force by the electrons emitted from the negative cathode.

Because

$\mathbf{C - V} = -\ (C + V)\ \mathbf{S}$

Therefore,

$\mathbf{F_d'} = 1C\ q''\ k''\ (C + V)\ (q_1/r^2)\ \mathbf{S}$

Because $\mathbf{F_d'}$ is positive, therefore proton acceleration **a'** is also positive, which means that for those following protons having not reached the negative cathode, their speed is increasing with time in the forwarding direction.

The direction of dynamic remote electrical force is determined by **C-V** and the intensity of dynamic remote electrical force are dependent on /**C-V**/ and $1/r^2$. When proton is close to the negative cathode, r is very small and $1/r^2$ becomes very large, such that $1/r^2$ becomes the dominating factor.

In case of LHC, when protons move towards the RF cavity at a speed V slower than electron speed C (light speed). As illustrated in Fig. 2, at time T_0, the following proton P reaches to a point at distance L ($L = \lambda/2 = 0.375$m) from N_1 cathode, N_1 switches to negative cathode and both protons (following proton P and leading proton P_{lead}) are pushed forward by the Dynamic Remote Electrical Force generated by the electrons emitted from N_1 cathode based on Electron Radiation and Contact Interaction theory. At time T close to $T_0 + L/V$, following proton P approaches to N_1 cathode and gains a peak pushing force F_{max} (smaller r), meantime leading proton P_{lead} is pulled back by a medium pullback force F_{back} (larger r) generated by the electrons emitted from N_1 cathode. At time $T_0 + L/V$, N_1 cathode switches off, while the following proton P moves at a larger speed than that of the leading proton P_{lead} in the forwarding direction, such that they are getting closer to each other. This explains the Surfer Effect.

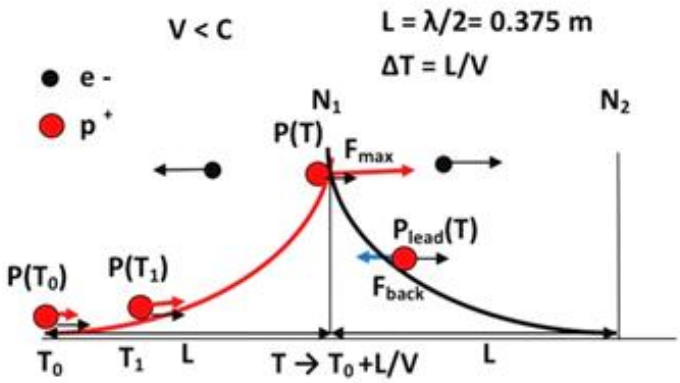


Fig. 2 Protons move towards the RF cavity in LHC at a speed V slower than electron speed C (light speed). At time T_0, the following proton P reaches to a point at distance L ($L = \lambda/2 = 0.375$m) from N_1 cathode, N_1 switches to negative cathode and both protons (following proton P and leading proton P_{lead}) are pushed forward by the electrons emitted from N_1. At time T close to $T_0 + L/V$, following proton P approaches to N_1 cathode and gains a peak pushing force F_{max}, meantime leading proton P_{lead} is pulled back by a medium pullback force F_{back} generated by the electrons emitted from N_1 cathode. At time $T_0 + L/V$, N_1 cathode switches off, while the following proton P moves at a larger speed than that of the leading proton P_{lead} in the forwarding direction, such that they are getting closer to each other. This explains the Surfer Effect.

XII. Proton Acceleration Under RF

In addition, when proton moves towards the RF cavity in LHC at a speed V slower than electron speed C (light speed), as illustrated in Fig. 3, at time T_0, proton P reaches to a point at distance L ($L = \lambda/2 = 0.375$m) from N_1 cathode. N_1 switches to negative cathode and proton is pushed forward by the Dynamic Remote Electrical Force generated by the electrons emitted from N_1 cathode based on Electron Radiation and Contact Interaction theory. At time T close to $T_0 + L/V$, proton approaches to N_1 cathode and gains a peak pushing force F_{max}. At time $T_0 + L/V$, N_1 switches to positive cathode while N_2 switches to negative cathode. Proton is pushed further forward by the electrons emitted from N_2 cathode. As a consequence, proton is continuously accelerated by RF oscillator in each cycle.

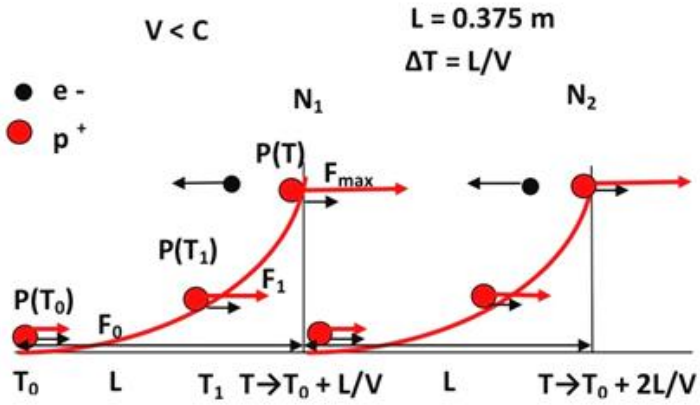


Fig. 3 Proton moves towards the RF cavity in LHC at a speed V slower than electron speed C (light speed). At time T_0, proton P reaches to a point at distance L ($L = \lambda/2 = 0.375$m) from N_1 cathode. N_1 switches to negative cathode and proton is pushed forward by the electrons emitted from N_1 cathode. At time T close to $T_0 + L/V$, proton approaches to N_1 cathode and gains a peak pushing force F_{max}. At time $T_0 + L/V$, N_1 switches to positive cathode while N_2 switches to negative cathode. Proton is pushed further forward by the electrons emitted from N_2 cathode. As a consequence, proton is continuously accelerated by RF oscillator in each cycle.

XIII. Ultimate Proton And Lead Ions Speed In LHC

When the proton speed V is close to electron speed C in LHC, as shown in Fig. 4, there are four possible timing positions between the proton and the cathodes of the RF oscillator at 400 MHz frequency.

1. N_1 switches to positive at time T_0
2. N_1 switches to positive at time between T_0-$\Delta T/2$ to T_0
3. N_1 switches to negative at time T_0
4. N_1 switches to negative at time between T_0-$\Delta T/2$ to T_0

Where N_1 is the first cathode of the two cathodes of the RF passing through by the proton, T_0 is the time of the proton at half wave length ($L = \lambda/2 = 0.375$ meters) in front of N_1, and ΔT is the traveling time of the proton at light speed between two electrodes of the RF oscillator ($\Delta T = L/C = 1.25 \times 10^{-9}$ seconds).

For case 1, slower proton at a speed less than the light speed (V<C) is under strong pullback force and faster proton at a speed higher than the light speed (V>C) is at weak pushing force (in fact, faster proton cannot exist in this case). For case 2, both faster proton at a speed higher than the light speed (V>C) and slower proton at a speed less than the light speed (V<C) are under strong pullback forces (again, faster proton cannot exist in this case). For case 3, faster proton at a speed higher than the light speed (V>C) is under strong pullback force and slower proton at a speed less than the light speed (V<C) is at weak pushing force. For case 4, all protons can have speeds faster than light speed (V>C) driven by the continuous weak pushing force, however once proton runs a little faster, it will reach the negative cathode as that in case 3, and because of the strong pullback force generated by the negative cathode on the faster proton at a speed higher than the light speed (V>C), proton speed will be eventually reduced to a speed less than the light speed.

Although proton and lead ions at a lower speed than the light speed (V < C) can be accelerated continuously by the electrons emitted from the negative cathode by the RF oscillator with proper timing, when their speeds are close to the light speed ($V \approx C$), $1/r^2$ becomes a dominating factor. Because of the strong pullback force generated by the negative electrode due to the smaller r (Fig. 4), proton and lead ions are decelerated to a speed less than the light speed. This explains why the ultimate proton and lead ions speed driven by RF in LHC is just a little shorter than the light speed.

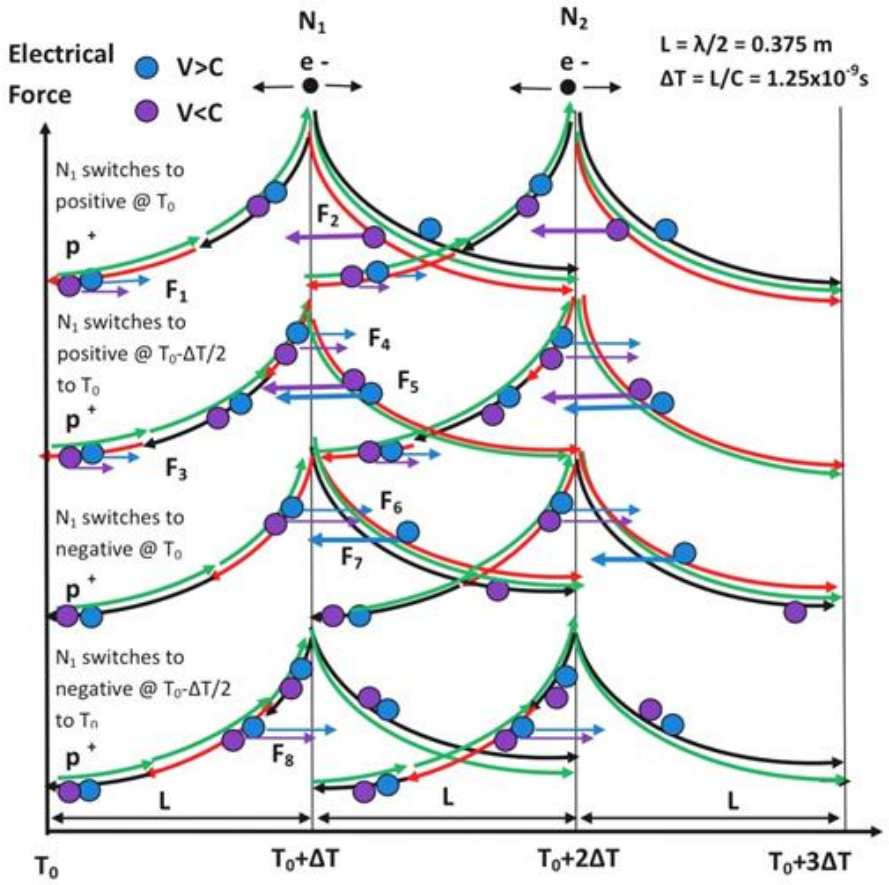


Fig. 4 As the proton speed V is close to electron speed C (light speed) in LHC, there are four relative timing positions between the proton and the cathodes of the RF oscillator at 400 MHz frequency: (1) N_1 switches to positive at T_0, (2) N_1 switches to positive between T_0-ΔT/2 to T_0, (3) N_1 switches to negative at T0, and (4) N_1 switches to negative between T_0-ΔT/2 to T_0. Because of the strong pullback force generated by the negative cathode on both faster (V>C) and slower (V<C) protons, proton speed is eventually reduced to a speed a little less than the light speed (99.9999991% C).

XIV. Conclusion

Why the ultimate speed of proton and lead ions generated in LHC is 99.9999991% light speed? It can be easily answered by Lorentz factor $1/(1– v^2/c^2)^{1/2}$ derived from special relativity and relativism based on a false postulation that light speed is constant no matter of light source and observation. When the speed of an object approaches to light speed, Lorentz factor becomes infinitive, same as the energy and relativistic mass of the object. It ensures that light speed is the maximum speed of the object. However, this conflicts to Newton's Law of Acceleration, in which an object under external force can be accelerated in theory to a speed of no limit.

Instead of the infinitive energy and relativistic mass fabricated by Lorenz factor based on the false special relativity and relativism, Dynamic Electron Flux and Dynamic Remote Electrical Force based on Equation of Relative Velocity and Electron Radiation and Contact Interaction Theory are used to interpret the speeds of proton and lead ions in LHC.

Proton and lead ions approaching the RF cavity in LHC can be accelerated by the Dynamic Remote Electrical Force generated by the electrons emitted from the negative cathode of a RF oscillator under proper timing. The leading protons and lead ions having passed the negative cathode are decelerated by a pullback force generated by the electrons emitted from the same negative cathode which results in Surfer Effect. Furthermore, when proton and lead ions speeds are close to the light speed ($V \approx C$), $1/r^2$ becomes the dominating factor in the competition between acceleration and deceleration. Because of the strong pullback force due to the smaller r generated by the negative electrode of the RF oscillator, proton and lead ions are decelerated to a speed less than the light speed. This explains why the ultimate proton and lead ions speed driven by RF in LHC is just a little shorter than the light speed.

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