International Journal of Astronomy, Astrophysics and Space Science
2015; 2(3): 12-29
Published online May 10, 2015 (http://www.openscienceonline.com/journal/aass)

Tachyon- Faster than Light Particle Exist in Our Universe or an Imaginary Mathematical Particle

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To cite this article

Rupak Bhattacharya, Pranab Kumar Bhattacharya, Upasana Bhattacharya, Ritwik Bhattacharya, Rupsa Bhattacharya, Dalia Mukherjee, Oaindrila Mukherjee, Aiyshi Mukherjee, Hindole Banerjee, Arunava Das. Tachyon- Faster than Light Particle Exist in Our Universe or an Imaginary Mathematical Particle. *International Journal of Astronomy, Astrophysics and Space Science*. Vol. 2, No. 3, 2015, pp. 12-29.

Abstract

For the relativistic formula for the kinetic energy, ordinary subatomic particles are confined in an infinite well of velocity of Light [c]. So it may be however considered that Faster than Light Particle (FTL) speed phenomenon may exist in this Universe. On the other hand to day even physicists and particle physicist do not consider that Faster than light particles (FTL) exists. The FTL particle is called “Tachyons” the name coined by G. Feinberg [8] in 1969. There had been many search by various experiments for FTL but most of them showed negative for their existences. It may be that light particles created inside the atomic nuclei which has the nonzero rest mass less than 10^{-32} kg has the probability of almost unity to transfer into FTL. The electron neutrinos and muon neutrinos also have been observed as FTL state but they have mass and if the rest mass of the neutrinos emitted in proton smashing at speed of light is less than 10^{-32} then it may be travelling as FTL and there is possibility of existences of Tachyons.

Keywords

Rest Mass, Faster-than-Light (FTL) Particles, a Zero Rest Mass Particle Possible, Tachyons

1. Particle Physics and the Mysteries of the Early Universe

Over 13 billion years ago, the Big Bang moment (Planck’s moment or Planck’s Time) gave birth to our observable Universe, creating space, time, energy and matter. To understand the laws of the universe, particle physicists wanted to recreate conditions of less of billionth of a second after the Big Bang moment and that could be and can be done by accelerators. There are many such accelerators. One of such was Large Hadron collider or LHC. At LHC, particles were smashing almost at near speed of light (c) following Einstein theory $E=mc^2$ and protons smashing together can produce all sorts of particles, seen in the earliest moments of the universe i.e $E = h\nu$ where h = Planck constant Particle-wave equivalence. Proton is in particle physics also nothing but hadrons. Protons when accelerated by 7 trillion volts, travel at 0.999999991 speed of light and smashed together 600 million times/sec will produce tremendous energy [Total energy stored in LHC superconducting magnets is : 10 GJ i.e [350 mJ stored energy means 10000 tons of snow, sliding down 100 meter]and there to be required many magnets cooled to 1.9 K, colder than outer space

2. About Particles and Sub Atomic Particles Creation and Our Universe

For the longest time as history records, science has held that all matter is composed of fundamental building blocks. Even though they could not see it physically , the ancient Greeks for example presumed that a stone could be ground up into finer and finer grains until it reached single indivisible points of matter which they called it átomos, meaning "un-cuttable". Their suspicions proved later correct, as some two-and-a-half-thousand year later, scientists in the early 20th century discovered that indivisible unit and named it "the atom". This naming turned out to be rather premature as it was later found that these atoms could be further broken into smaller particles, namely the protons, neutrons and electrons. But that was not the end of the tale. Over the following decades next, particle accelerator experiments revealed there to be large number of, what were labeled, sub-atomic particles. This gave birth to a new branch of science called "Particle physics". As time passed and more and more particles were discovered, it became then clear that something was missing with these 'fundamental' units of our Universe. Their numbers ran into tens then to over a hundred. Could nature be so complicated? A study of their properties and interactions led to idea that many of these were made up of still smaller units. This led to the discovery of six(06) types of quarks particles and their anti quarks, which are said to compose protons, neutrons and other particles like W Bosons, Muons, Tau particles, Z particles, Neutrinos, Pions, Poselectrons, Gluons, Gravitons, Higg's particles etc.

While it is true that a large number of particles might pose a philosophical problem, a more fundamental problem must be the way in which they are said to interact. In the world of particle physics, matter is constantly flashing in and out of existence as new particles are created and destroyed. And while this process may seem strange, it is stranger still that many of these interactions appear to occur without regard to mass conservation. Let we take "muons" for example. What are these muons?_: Muons are charged particles that are primarily generated as a result of cosmic bombardment in the upper atmosphere of the earth. They are mostly negatively charged and can be thought of as heavy but unstable electrons. Muons have a short half-life of 2.2 microseconds, after which they decay into an electron and a couple of neutrinos. The decay process of muons can be like this and there is a muon neutrinos:

$$\underset{\text{muon}}{\mu^-} \rightarrow \underset{\text{electron}}{e^-} + \underset{\text{muon neutrino}}{\nu_\mu} + \underset{\text{electron antineutrino}}{\overline{\nu}_e}$$

Decay process of muons to produce muon neutrinos

This reaction is however known to all and it obeys the charge conservation rule in that both muon and electron have an equal negative charge while the neutrinos are neutral. But a muon is 206 times heavier rest mass than an electron is and the neutrinos was considered weigh almost nothing (or next to nothing but it has mass whatever it is neglizable, it carries also a mass of 17,000 electron volts (kev).] The question is where did all that mass go? According to most modern physics theory , mass must either be conserved or converted to an equivalent amount of energy, determined via the $E=mc^2$ equation. This energy must be released in the form of electromagnetic radiation, i.e. as photons. But there is no evidences found in standard texts that photons are released during this process of above equations.

Actually the above equations are incomplete before the present authors here because there should also be a W^- boson particle involved there. This W^- particle weighs in at 157 thousand times heavier than an electron and quickly flashes in-and-out of existence while creating the electron and one of the neutrinos. Here again is another apparent violation of mass conservation, and a huge one at that! But since it quickly disappears, we could give it the benefit of doubt and say that it causes no overall conservation problem. One possibility for mass conservation may have to do with neutrino momentum. we shall discuss this further on.

2.1. Pions

The next question has to do with where muons come from? Muons come from a pion decay, which in turn are generated from high-energy proton collisions in the upper atmosphere. The pion to muon conversion process looks like this:

$$\underset{\text{pion}}{\pi^-} \rightarrow \underset{\text{muon}}{\mu^-} + \underset{\text{muon neutrino}}{\nu_\mu}$$

Pion decay process and pion to muon conversion

Again there is a temporary intermediate W particle involved which we have not shown in above equation. The pion again has a mass of 273 electrons which is only slightly above the muon (at 206) and there are no photons in our sight. Hence again we have a mass conservation problem, albeit only minor. Ignoring the various neutrinos then, the complete process goes something like this:

$$\underset{\text{proton}}{p^+} \rightarrow \underset{\text{pion}}{\pi^-} \rightarrow \underset{\text{muon}}{\mu^-} \rightarrow \underset{\text{electron}}{e^-}$$

The Proton produces a negetive Pion

Notice here something miss? That's right: the positive proton yields a negative pion! This is surely impossible to readers according to charge conservation rules. Now to be fair, the interaction is not stated in full like this. Various literatures on the subject discuss the pion/muon and muon/electron decays separately and each decay process shown preserves charge correctly. But when it comes to the full process the present modern literature search becomes somewhat vague, particularly in regard to the pion's charge. When a cosmic ray proton impacts atomic nuclei of air atoms in the upper atmosphere, pions are created. These decay within a relatively short distance (meters) into muons (the pion's preferred decay product), and neutrinos.

The above excerpt does not say what charge these pions have except they are somehow created from protons. Since protons are positive this indicates the created pions must also be positive, in which case they could not decay into negative muons. The webpage from SLAC[4] helps clear this up when it says in cosmic ray showers, both muons and anti-muons are produced about equally.

That's good. With equal amounts of muons (negative) and anti muons (positive), charge is conserved. But where went than all these anti muons? If they are produced in equal numbers and have equal half-lives, we should observe them equally at sea level. Instead the literature indicates a vast abundance of muons only. An explanation of pion/muon conversions-: The above raises many questions to us! Does the cosmic proton convert directly to pions? Or does it create the pions as part of a collision, while preserving its own existence? And what happened to all that mass? Did the mighty cosmic proton convert itself to a puny electron without releasing the required amount of radiation to account for mass difference?

Given the laws of uncertainty principal over the charge conservation problem in pion creation, it is understandable that the available literature is somewhat vague on details. However we authors believe there is a better explanation for the above reactions that not only preserves charge and mass, but also does away with these mysterious particle disappearance and creation-out-of-nothing conjectures.

Start with the proton, a proton is believed to be made up of two up-quarks (positive) and one down-quark (negative). Is it possible that these quarks are rather really the pions and muons we observe? i.e., is the negative muon really a down-quark and the positive pion an up-quark?

According to scientists, protons are essentially unbreakable and quarks can never be seen on their own. But this seems unlikely. If a proton is made of several parts, and you hit it hard enough, e.g. in a high-energy cosmic collisions, then surely those parts would separate. Scientists have declared that quarks have fractional charges" colors" and, given that we've never seen a fractional charge, we've obviously never seen a broken proton. This idea of fractional charges was initially introduced to explain the composition of the neutron purely in terms of quarks. But as pointed out in previously, neutrons can be more easily explained in terms of a proton joined to an electron. Could it be that quarks in fact have unit charges and have been hiding in plain sight all along?

With this idea in mind, let us assume that our proton has just smashed into some part of the atmosphere, e.g. a nitrogen nucleus, and has split into three quarks: two positive and one negative. What now? There it was postulated than an electron and positron can overlap, creating an effectively invisible composite particle, which may be called a poseltron.

Could a similar event be happening here? The positive quarks are surrounded by electrons. They could quickly absorb one each and become an 'invisible' neutral particle. The pions have apparently decayed!

But the down-quark is negative and cannot absorb electrons so it continues down. This is the muon we see. What will happen to it? – will it absorb a positron and also disappear? Perhaps, but this is unlikely because there are few positrons to be had; they've already been absorbed by available electrons and become poseltrons. Here's instead what happens. The high-velocity muon collides with a poseltron. This causes the electron-positron pair to split. The positron is absorbed into the muon and the electron is ejected. The muon 'decayed' into an electron. Of course the muon is still there but as it's now overlapping a positron, it forms a particle of neutral charge and can no longer be seen.

2.2. Here's the Full Process in Picture Form [Figure-1]

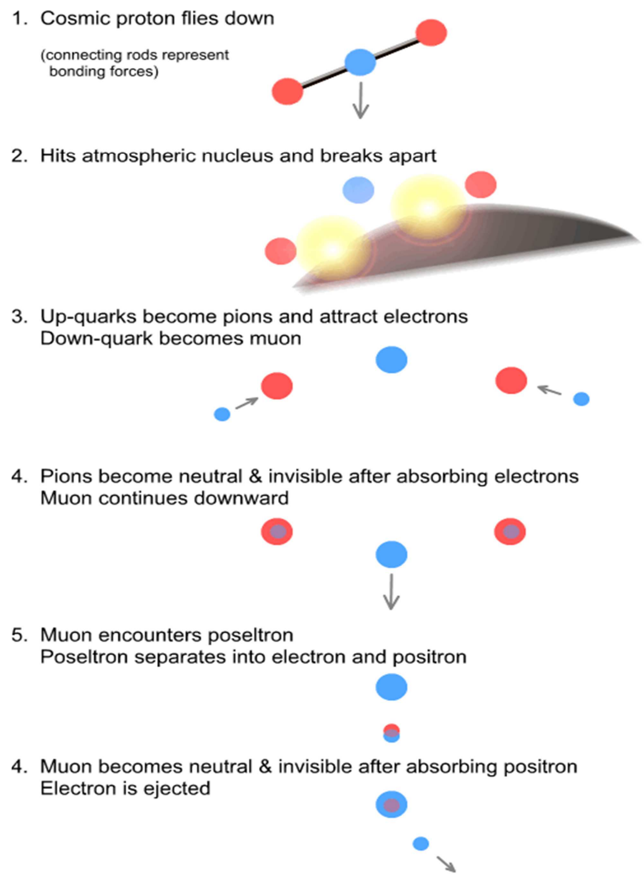

Fig 1. *As can be seen in fig-1, no fundamental particles have been created or destroyed, while charge and mass are conserved throughout.*

Some points on pion/muon lifespan and mass -:The pion has a much shorter lifespan than a muon: about 85 times shorter (0.026 vs. 2.2 microseconds). Based on the above, that's to be expected. Electrons are everywhere and will quickly be absorbed by a pion. But poseltrons and positrons are rare. Hence a pion will only last a few hundred meters before being absorbed, whereas a muon can often make it all the way to sea level. If a muon is really a down quark, this means a down-quark weighs around 206 electron masses, i.e. about one ninth of a proton. Since there are also two up-quarks in a proton this means that an up-quark should weigh (1836-206)/2 = 815 electron masses. There's a problem here because a pion reportedly weighs only 273 electron masses. So either I'm way out on the assumptions or there's something fishy about the way a pion's mass is measured.

Neutrinos: Now some discussion need to be made about these ghost particles "Neutrinos" because we have ignored them in the above interactions. Neutrinos are neutral particles emitted during certain decay processes such as neutron decay and the pion and muon decays described above. The existence of neutrinos particle was first postulated by Wolfgang Pauli NL in 1930s to explain why electrons when leaving a nucleus in the form of beta radiation move more slowly than it is expected. They were later observed/confirmed in bubble chamber experiments [3]. There are broadly three (3) species of 'Neutrinos". 1) Electron neutrinos 2) Muon neutrinos 3) tat neutrinos. During first half of twentieth century, physicists were convinced that all stars including our Sun, shines by converting, deep in its interior, hydrogen into helium. According to this theory, 4 hydrogen nuclei called protons (p) are changed in solar interior into a helium nucleus (^{4}He), two anti-electrons (e^+), positively charged electrons), and two elusive and very mysterious ghostly particles called neutrinos (ν_e). This process of nuclear conversion, believed to be responsible for sunshine and therefore for all life on this planet the Earth. The conversion process, which involves many different nuclear reactions, can be written schematically as:

$$^4p \rightarrow {}^4He + 2e^+ + 2ve \qquad (1)$$

as Bhattacharya Rupak et al [1] wrote once it i.e ,two neutrinos produced each time as the fusion reaction (1) within star. Since four protons are heavier than a helium nucleus, two positive electrons and two neutrinos, reaction (1) releases a lot of energy to Sun, that ultimately reaches earth as sunlight. The reaction occurs very frequently. Neutrinos escape easily from Sun and their energy does not appear as solar heat or sunlight in earth [3]. Sometimes neutrinos are produced with relatively low energies and Sun gets lot of heat. Sometimes neutrinos are produced with higher energies and Sun gets less energy. Neutrinos usually have zero electric charge, interact very rarely with matter, and – according to the particle physics very high standard level textbook version of the standard model of particle physics – they are mass less[3]. About 1000 billion neutrinos from Sun pass through our thumbnail every seconds, but you do not feel them because, they interact so rarely and so weakly with matter. Neutrinos are practically indestructible; almost nothing happens to them. For every hundred billion solar neutrinos passing through Earth every seconds, only about one interacts at all with stuff of which Earth is made [3]. Because they interact so rarely, neutrinos can escape easily from solar interior, where they are created and bring direct information about solar fusion reactions to us on Earth. There are three known types of neutrinos already told. Nuclear fusion in sun produces only neutrinos that are associated with electrons, the so-called electron neutrinos (ν_e). The two other types of neutrinos, muon neutrinos (ν_μ) and tau neutrinos (ν_τ), are produced, for example, in laboratory accelerators or in exploding stars, together with heavier versions of the electron, the particles muon (μ) and tau (τ). But there were some missing neutrinos too[3]. All accepted models in cosmology & in particle physics however accept that neutrinos are mass less or so. But the idea that neutrinos might have mass also was of about 40 years old. The successful unification of the weak and electromagnetic force field implied that there should be as many as kinds of neutrinos, as there are different kinds of electron like particles. There is till no confirmed mass evidences that neutrinos have a non zero mass (Bhattacharjee Rupak and Bhattacharya Pranab Kumar) - The heaviest neutrinos in Gev temperature ranges from í to r electron volts. But scientists found that this wooly mammoth allegedly carries also a mass of 17,000 electron volts (kev). By Radioactive beta decay process- a process in which an unstable nucleus in radioactive isotopes emits both an electron and a neutrino, of decay of electrons. Rupak & I recorded the energy of decay electrons by sending them into a crystal where they knock other electrons creating a current that provided a measure of energy where a big 17Kev regularly appeared, taken from the energy of a few electrons. The energy was then obvious 17 Kev neutrinos and 1% of their emitted neutrinos belonged to heavy neutrinos. Neutrinos can pass through entire Earth almost near or at speed of light without leaving a trace and it is immune to many of forces that bind matter including electromagnetic forces [3]. But not faster than speed of light?. So! They have almost never been observed outside the controlled environment of big accelerator laboratories of USA & CERN in Europe. Neutrinos are even more common in Universe then photons (light particles), only because probably Big Bang left a ocean of very low energy neutrinos that permeated every corner of this Cosmos. In 30th march 2006 from the US laboratory " Fermi lab" reported first result from a neutrinos experiment called "MINOS"(Main injector neutrino Oscillation search) in Soudan mine at a depth of 776 meter in minnestoa 732 Km away. The MINOs experiment showed that there is a short fall in the number of muon neutrinos, if they are detected a long distance away from their point of production, may be called "Missing Neutrinos"- as we authors told earlier, some neutrinos were missing. Solar neutrinos actually have multiple personality disorders. They are created as electron neutrinos in sun, but on way to Earth, they change their type. For neutrinos, the origin of personality disorder is a quantum mechanical process, called "neutrino oscillations .Lower energy solar neutrinos switch from electron neutrino to another type as they travel in vacuum from Sun to Earth. The process can go back and forth between different types. The number of personality changes, or oscillations, depends however upon neutrino energy. At higher neutrino energies, process of oscillation is enhanced by interactions with electrons in Sun or in Earth. Stas Mikheyev, Alexei Smirnov, and Lincoln Wolfenstein first proposed that interactions with electrons in sun could exacerbate personality disorder of neutrinos, i.e. the presence of matter could cause the neutrinos to oscillate more vigorously between different types. The standard model of particle physics assumes that neutrinos are mass less. What we authors could never follow. In order for neutrino oscillations to occur, some neutrinos must have masses- some may not have mass. Therefore, the standard model of particle physics must be revised. Neutrinos are elementary particles where all neutral counterparts of charged leptons namely the electrons, the muons and $_ţ$ leptons all of which take participation in the weak interactions. Determination of neutrinos particles still remain notoriously difficult from the point of view of experiments and got challenges in the particle physics of in depth research. At this moment, there is no information of even values of their individual masses. We authors however proposed their value as m_1<3ev; m_l<190Kev; m_j<18.2 Mev may be the mass of different muon nutrinos numbers. It is worth noted that direct detection of $V_{\hat{j}}$ was reported in 2006 for the first time only from Fermi laboratories USA. The presence of neutrino oscillation in 2006 march experiment by Fermilab .Direct Observation of NUTAU E_{872} [DONUT] experiment implies existence of distant & non vanishing mass for neutrinos flavors [19]. So neutrinos must have a non-zero mass. For electron neutrinos the mass is 10^{-6}ev. A mass in excess of 1ev would then be significant since neutrinos would then contribute mass than stars (stars like Sun) to the mass density of Universe. The Universe would be then closed if mass of neutrinos would be between 25 and 100 eV. So 1) "Electron Neutrinos" had a mass of 20ev, 2)"Muon neutrinos" had a mass of 0.5Mev and 3) Tat neutrinos" had a mass of 250 Mev. Electron neutrinos constituted about a third of the total number of neutrinos. Most of neutrinos produced in interior of Sun, all of which are electron neutrinos when they are produced, are changed into muon and tau neutrinos by time they reach Earth. In QCD, studies suggest that primordial Universe was dominated by neutrinos of non-zero mass rather than by quarks with its color. A natural scale then emerged determined by maximum distance neutrinos that could stream freely as Universe expanded, before neutrinos slowed down on account of their mass below the scale of super cluster i.e. galaxies formation. In this neutrinos theory then no pre-existing fluctuation then survived and the first structure then collapsed and formed galaxies.

That a neutral particle could be observed however comes as a startling claim. By any interpretation of Coulomb's or Maxwell's laws, a purely neutral particle (i.e. containing no charges) could not apply any force on a charged particle, nor could it be affected by a static or electromagnetic field. An answer to this may be that they can be observed when impacting another particle directly. The below image shows the bubble chamber experiment in which a neutrino was first detected [5].

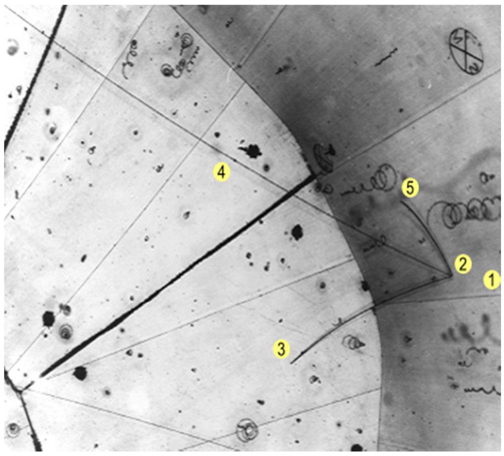

Fig. 2. *First Neutrino Observation-The accepted interpretation of this is: (1) a neutrino came in from the right (it can't be seen due to having no charge). (2) It hits a proton. (3) A positive pion is produced and curves downward. (4) A negative lighter muon is also produced and moves quickly to the left, curving weakly upward. (5) The original heavier proton survives; it moves slowly and curves downward.*

According to the standard particle physics model, when oppositely charged particles (they are called antiparticles) meet with a particle they must annihilate into radiations and energy. Apparently the rules are different for neutral particles; namely that they should bounce off other particles like billiard balls, and this requires sub-atomic particles be slightly elastic. Assuming this is true, how can we calculate the degree of elastic bounce? In any classical situation this would be easily solved in terms of momentum and energy conservation. Knowing the momentum requires knowing the mass and this is a problem because neutrinos are commonly assumed to have none.

Special relativity theory tells us that particles having zero mass, such as photons when at motion, must travel at light speed. This is due to the relativistic rest mass formula, which says an object's mass increases toward infinity as it reaches near light speed. For an object of non-zero rest mass this puts the brakes on acceleration and keeps v below c. But for an object with zero rest mass the acceleration can only stop when the particle hits light speed, at which point the object gains a non-zero relativistic mass? What will this mass be? To determine this we can use the Lorentz Transform equation:

$$m = \frac{m_0}{\sqrt{1 - v^2/c^2}} = \frac{0}{\sqrt{1 - c^2/c^2}} = \frac{0}{0}$$

Where m_0 is the rest mass.

In mathematical terms, when zero is divided by zero is called an indeterminate, meaning that it can have any real-number value, or even an infinite one. Calculating momentum requires multiplying this indeterminate mass by velocity, in this case c, which of course just gives us another indeterminate. This is not helpful! But could a neutrino particle with indeterminate mass/momentum account for the mysteries it is said to solve, such as muon/electron mass-loss and the collision in the above image? After all, if it's indeterminate then we can assign any value we want to it, right? Perhaps, but we'd be hard-pressed to explain why identical objects moving at the same velocity have different relativistic masses. After all, the speed of light is a universal constant; not a universal variable.

So if neutrinos don't account for the above collision what does? Here's our interpretation. "The invisible particle coming from the right (1) is actually a positive pion and negative muon overlapping (similar to the poseltron concept). It strikes the proton (2) and this causes the pion and muon to break apart and become visible. The three particles, pion, muon and proton are then scattered".

A far more interesting aspect of this image arises from measuring the extent of scattering. A simple pixel measurement shows the length of each track to be:

Table 1. *Scatter distance of Proton, Pion and Muon*

Proton	72
Pion	155
Muon	>442

This scatter distance represents velocity which, due to momentum conservation, should be inversely proportional to mass. From this we see the pion has approximately half the mass of the proton. A ratio of the pion/proton track lengths gives 72/155 = 0.465. Now see the paragraph farther up where we speculated that an up-quark weighs 815 electron masses. Taking the ratio of up-quark to proton mass we get 815/1836 = 0.444. That's very close to the pion/proton ratio! Hence it's quite likely that a pion is an up-quark after all.

In the muon's case, it ended up off screen so we can only calculate a ratio of 442/72 = 6.1, which is understandably less than the real muon/proton ratio (about 9) because the track must be longer. But seeing as the muon's mass has already been determined in other experiments by comparing its particle tracks to electrons, we can accept their stated mass as being 206 electrons.

Neutral composite particles: This description of a pion-muon particle (which struck the proton in the above image) as well as the poseltron spoken about in the earlier gives rise to the possibility that there are many neutral composite particles in existence. Here are some charged particles we commonly know of:

Table 2. *Charged particles we commonly know*

Negative charge	Positive charge
Electron	Positron
Muon	Anti muon
Pion-	Pion+

Looking at this table we see there are nine ways that positive and negative charges could combine to make a neutral particle. The electron-positron pair has been discussed already and it is worth considering the evidence for other combinations. One possible combination is the 'neutral pion'. The neutral pion (symbol pi^0) is a type of pion having no charge. It has a very short half life of $8.4x10^{-17}$ seconds and decays into two photons. According to the literature, this pion is made of four quarks: up, down, anti-up and anti-down. By comparison the charged pions are made of only two quarks each. Despite having twice as many quarks, the neutral pion is somehow lighter than a charged pion: 264 versus 273 electron masses. Again, we have another mass conservation problem, and this indicates the assumed particle composition is incorrect. Here is another interpretation of its decay process. The neutral pion is made of two opposite charges particles. The electric field from a passing photon temporarily forces them apart. They quickly come back together. In the process they oscillate through each other and create electromagnetic waves (photons) similar to the poseltron oscillation process. If we know the frequency of these photons this would give a clue as to the particle's masses and allow us to determine which particles were involved. Based on the abundance of particle types, the most likely candidate would be a positive pion and negative muon, i.e., an up/down-quark combination.

A bold Hypothesis _: In the above description of muon to electron conversion, the muon decayed when it met a poseltron. This caused the electron and positron to separate, followed by the muon absorbing the positron and ejecting the electron. Here is a diagram showing a break-down of events:

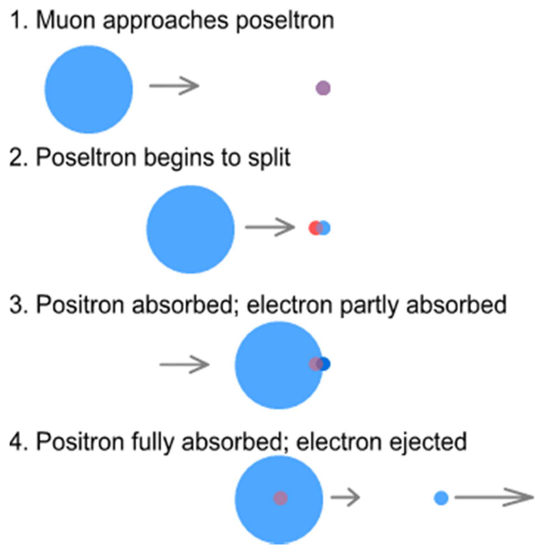

Fig 3. *Break Down events of Muon to electron(muon to electron Conversion) as per hypothesis*

The electron and positron are pictured smaller than the muon because they are lighter. If we assume sub-atomic particles to be made of a similar material of uniform density, this would make the muon/electron diameter ratio proportional to the cube-root of their mass ratio: in this case making the muon about 6 times larger as shown.

The idea that there should be direct correlation between mass and size seems quite logical and this is probably how most would view sub-atomic particles. But this view alas creates a problem for the electron-positron separation shown above. If the electron was much smaller than the muon its charge density would be much higher. Hence the muon would be unable to force the electron and positron to separate because the electron would be using a much higher percentage of its charge to attract and hold the positron. The only way the above could work is for the muon and electron to be very similar in size.

Based on this reasoning we'd like to make a bold hypothesis: All fundamental (indivisible) sub-atomic particles are identical in size. They vary only in mass and charge.

If this is true, everything from an electron to a top quark has the same diameter but different densities. This may turn out to be true only for certain types of particles such as those in the pion/muon/electron interactions. But if this principle can be extended to all particles, it would allow for a much broader range of interactions. Hence many composite particles could be again composed from further small numbers of fundamental sub - particles

Large Hadron Collider-: it is 27 km ring constructed under ground at French-Swiss Boarder. It can accelerates 2800 bunches,10^{11} protons per bunch, at 7 TeV . Protons smashing together can produce all sorts of particles, seen in the earliest moments of the Universe. Protons, if and when accelerated by 7 trillion volts and if travel at 0.999999991 speed of light and smash together 600 million times/sec. Now in the Universe matter is two types called Fermions and Bosons. With the word "Bosons" there are two names Prof. Albert Einstein- who is a NOBEL Laureate & he nomenclature first the particle as "Photon" and "Late Prof. S N. Bose"- of Kolkata whose name Prof. Albert Einstein himself included for the same Photon particle as "Boson". Other group of particles are "Fermions" - as per name of Enrico Fermi-NOBEL Laureate and "Leptons" and these are Quarks, Gluons, Z, W, g, λ and many such particles in Quantum fields (scalar fields) and Higg's particle that gave mass to Fermions & leptons [late Professor S N BOSE had nothing contribution on Fermions or with Leptons]. Ordinary matter [baryons which is about 4% of observable Universe matter including dark matter and 73% of Universe is consisted with Dark energy whose composition we do not know yet . Ordinary Baryons (matter) is made of Fermions, held together by Bosons .Photons and gluons are ripples in the (EM, strong) fields - quantum fields. Z, W particles are for : Weak force carriers .Overall there are so far theoretically, 6 quarks particles [and they are up, down, strange, charm ,bottom], and 6 Leptons[ne, nm, nt, e,t,m] , 4 force carriers particles [w, z,g, λ]. There must be so something (new particle) in the Universe that actually gives rest mass to all particles. And there must be a mass less particle where that particle fused or absorbed to give the rest mass. Mass is really a measure of how difficult it is to accelerate an object (F=ma). A mass less particle must not have a spin. In standard model the W bosons are mass less at very high temperature (at very high speed of C) above the scale of symmetry breaking and two of the four higg's particle at symmetry breaking are also considered as mass less and charged particles. And when symmetry is broken they get absorbed in massive Ws

Higg's field : Particle mass is a measure of the resistance to movements through Higg's field. This finding of Higg's particle is so interesting events and chances were very rare: 1 in 100,000,000,000 (1 followed by 11 zeros) Equivalent to looking for one particular grain in is 2.5 million kg of rice. Higgs events are also very rare. Equal quantities of matter and Anti-matter should have been produced in the Big Bang, then annihilated each other leaving just radiation. Super-symmetry :- it means symmetry between types of particles. Every observed particle has a super-partner, just too (1000 times) massive to have been already seen Super symmetry particles are S quarks, S gravitino, S leptons ,Photinos, Gluons, Wino, zino, Higgsino

How the particles are captured? World's most massive "onion" structure to capture the particles is ATLAS [17] ATLAS Control Room, first beams, 20 November 2009

1. Energy is converted into many quarks, anti-quarks and gluons. 2) QGP lasts for about 10-22 seconds 3) Then thousands of particles are produced The Standard "Big Bang" model successfully could described all of the elementary particles in the particle physics, we know to exist in mathematically at least how they interact with one another.
2. The Standard model could however never answered me nor my youngest brother Mr. Rupak Bhattacharya (1st author here) one most basic question: "Why do most of these elementary particles have masses?" and "where from the mass actually came? And does any particles exist that moves faster than speed of light (FTL Particles)? " Without mass, our universe would be a very different place than this one- we think it so. For example, let we consider a very much hypothetical situation, that if the electron or proton had no mass at all, then there would be no formation of atoms at all. Hence there would be no formation of ordinary matter (we call ordinary matter as hadrons) as we know it, --there would be then no chemistry, no sea, no rocks, no asteroids, no sun, no planets--- then no biology, no people, no reptiles, no trees, no animals, no flowers, no biological substances even no unicellular organism like protozoas, amoebas or virus nor even DNA structure in this planet "the Earth". There would be no planets at all. No sun, No stars, No Galaxies. In addition, look at our sun shines in the blue sky. My thanks to a delicate interplay among the fundamental forces of Nature, which would be completely upset, if some of those force particles did not have large masses! At first sight the concept of mass seems not to fit into the Standard model of particle physics. Two of the forces the model was then described – 1) The electromagnetism and 2) the weak nuclear force – and they can be elementary particles must be mass less or zero rest mass and something gave them mass and before time of nucleosynthesis the particle that was created to gave mass as per professor Peter W Higgs -is Higg's particle and these Higg's particles may be many types. The scalar field in which mass was created is now called Higg's field. Professor Peter W Higgs gave that concept

in 1964. So there was search for Higg's particle in LHC. It was a search for the standard model. Higgs particle was presented in the four-Lepton decay modes in LHC of CERN. Upper limits at 95% confidence level excluded the Higg's mass ranges 134–158 GeV, 180–305GeV, and 340–465GeV. A major fraction of the explored mass range was thus excluded at 95% CL and the exclusion limits extended beyond the sensitivity of previous collide experiments. Excesses of events were observed at the low end of the explored mass range, around masses of 119 and 126GeV, and at high mass around 320 GeV. These excesses, although not statistically significant, make the observed limits weaker than expected in the absence of a signal. At low mass, only the region $114.4 < mH < 134$GeV remained consistent with the expectation for the standard model Higgs boson productions, described by a single theory, that of the electroweak force. Scientists have subjected the electroweak theory to many experimental tests, which it has passed with flying colors. However, according to these authors, the basic equations of that theory seem to require that all. Major breakthrough in particle physics came in the 1970s when theoretical physicists did first realize that there are very close ties between two of the four fundamental forces – namely, the weak force and the electromagnetic force after Professor Abdus Salam the Nobel Laureate in physics of Pakistan. The two forces can be described within the same theory, which forms the basis of the Standard Big Bang Model. This 'unification' implied that electricity, magnetism, light and some types of radioactivity are all manifestations of a single underlying force called, unsurprisingly, the electroweak force. But in order for this unification, to work out mathematically, it requires that the force-carrying particles must have no rest mass. We know from experiments and our knowledge, that this is not true, So Prof. Peter Higgs in UK, Mr. Rupak Bhattacharya of 7/51 purbapalli Sodepur,West Bengal-Kol-110 , one of authors of this article, individually suggested a solution to solve this conundrum. What they suggested was that all particles that moment must had no mass [were of zero rest mass particles] just after the Big Bang moment. As the Universe cooled and the temperature fell below a critical value, an invisible force field called the 'Higgs field' was formed together with the associated 'zero rest mass particles'. The field prevailed throughout the cosmos: any particles that interact with it are given a mass via the Higgs particle or Rupak Particle. The more they interacted, the heavier they become, whereas particles that never interact are left with no mass at all. The zero rest mass particles or the Higgs particles, up to this day, is nothing more than just a theoretical imaginary entity that stems only from particle physics' Standard model. Still, many of the particles that mankind has so far discovered, and in fact, many of the principles that had been proven by experimental data, started out as predictions from mathematical solutions, as for example like quarks. The 'unification theory' implied that electricity, magnetism, light and some types of radioactivity are all manifestations of a single underlying force called, unsurprisingly, the electroweak force and to find out the laws of our universe. But in order for this unification to work mathematically, it requires that the force-carrying particles must have no rest mass. We know from our experiments that this notion is not true, Finding zero rest mass particle and Higgs Particle would give an insight into why particles have certain mass, and help to develop subsequent physics

As, according to Professor Mery Gelman,- a Nobel Laureate in physics, the earliest particles in our universe were quarks and anti-quarks. The gospel of Big Bang is then supposed to have been explosion from zero volume at zero time of a corpuscle containing the cosmic soup of these quarks and anti quarks particles, where in the corpuscle energy were equivalent to mass and radiation and flash. The particles and their anti particles were there in constant annihilation and went into radiation and flash. What we authors wanted to mean that at about trillion and trillion degrees of temperature of cosmic soup (about 10^{15}K) the elementary particles and radiation was just interchangeable. In the primordial fireball or in cosmic soup, the particles and antiparticles were being in constant annihilation and were again created although the total energy of combined radiation and matter of the soup was constant.

However in the quantum chromo dynamics (QCD) another particle was proposed as the earliest particles in the universe. They were neutrinos particles as told above [or positrons]. The neutrinos were also non-zero mass particles though they were first proposed without mass or zero rest mass particles. The idea that neutrinos might have mass was of about 40 years old. The successful unification of the weak and electromagnetic force field implies that there should be as many as kinds of neutrinos, as there are different kinds of electron like particles. The question of mass of the neutrinos had been of great interest since Fremis first analysis of β decay to the present time. There is still no confirmed mass evidence that neutrinos have a non zero mass[1,12] .

All accepted models in the cosmology and in particle physics assumes that neutrinos are mass less or so as told previously. The heaviest neutrinos in Gev temperature range from í to r electron volts. But the scientists later found that this wooly mammoth allegedly carries a mass of 17,000 electron volts (kev). By the radioactive beta decay process- a process in which an unstable nucleus in the radioactive isotopes emits both an electron and a neutrino, of decay of electrons. Rupak Bhattacharya & Professor Pranab Kumar Bhattacharya recorded the energy of decay electrons by sending them into a crystal where they knock other electrons creating a current that provided a measure of energy where a big 17Kev regularly appeared, taken from the energy of a few electrons. The energy was then obvious 17 Kev neutrinos and 1% of their emitted neutrinos belonged to heavy neutrinos.

Neutrinos [3] can pass through the entire Earth without leaving a trace and it is immune to many of forces that bind matter including electromagnetic forces. So Neutrinos are ghostly sub atomic particles, so feebly in their interaction with ordinary matter that they can happily pass through earth without stopping. They have almost never been observed outside the controlled environment of the big accelerator laboratories of USA &CERN in Europe. Neutrinos are even more common in the universe then the photons, only because probably the Big Bang left a sea of very low energy neutrinos that permeated every corner of this Cosmos[1] (Bhattacharjee Rupak and Bhattacharya Pranab Kumar).

In 30th march 2006 from the US laboratory "Fermi lab" reported first result from a neutrinos experiment Called "MINOS"(Main injector neutrino Oscillation search)[18] in Soudan mine at a depth of 776 meter in minnestoa 732 Km away. The MIINOs experiment showed that there is a short fall in the number of muon nutrinos if they are detected a long distance away from their point of production[18]. Neutrinos are elementary particles where all neutral counterparts of charged leptons namely the electrons, the muons and ţ leptons all of which take participation in the weak interactions. Determination of neutrinos particles still remain notoriously difficult from the point of view of experiments and got challenges in the particle physics of highest depth research. At this moment when writing this article, there is no information of even values of their individual masses. Mr. Rupak Bhattacharya, the author here however proposed their value as m_1<3ev;m_l<190Kev; m_j<18.2 Mev may be the mass of different muon neutrinos numbers. It is worth noted that direct detection of Vĵ was reported in 2006 for the first time only from Fermi laboratories USA. The presence of neutrino oscillation in 2006 march experiment by Fermilab .Direct Observation of NUTAU E_{872}[DONUT] experiment[19] implies existence of distant & non vanishing mass for neutrino flavors. In particular, as per Rupak Bhattacharya there are now three mass m_1,m_l,m_j and three angels that mix neutrinos flavours denoted by θ_{12}, θ_{23}, and θ_{13}. In addition according to Rupak, neutrinos may also have particles i.e they are fermions which are their own antiparticles.

But neutrinos might have a non-zero mass. For electron neutrinos the mass is 10^{-6}ev. A mass in excess of 1ev would then be significant since neutrinos would then contribute mass than stars (stars like sun) to the mass density of the Universe. The Universe would be then closed if the mass of neutrinos would be between 25 and 100 eV. There were then three types of neutrinos in the Big Bang moment. 1) "Electron Neutrinos" had a mass of 20ev, 2)"Muon neutrinos" had a mass of 0.5Mev & muon neutrinos were suggested that they are faster-than-light particles [9] and 3) Tat neutrinos" had a mass of 250 Mev. In QCD, studies suggest that the primordial Universe was dominated by neutrinos of non-zero mass rather by quarks with it's colors. A natural scale then emerged determined by maximum distance neutrinos that could stream freely as the Universe expanded, before the neutrinos slowed down on account of their mass below the scale of super cluster i.e. galaxies formation. Neutrino is essential particle to illustrate the symmetry that the Universe must have had at one time. The neutrino, a particle if without mass, travels at the speed of light and can have a clockwise or counterclockwise spin. The neutrino's direction of spin is forever tied to the "direction of motion", and then this would gives it a new property – chirality "– a lovely symmetry." It was then a reflection of the earlier universe, where all particles had no mass and would exhibit the symmetry that is for some unknown reason hidden today, according to what's known from the QCD, QED, and the Standard model. In this neutrinos theory then no pre- existing fluctuation then survived and the first structure then collapsed and formed galaxies.

Those are in favor of neutrinos particles, suggested that the primordial synthesis of nucleon in nucleon synthesis was from neutrinos. Whatever be the long standing debate regarding the quarks or neutrinos particles as the earliest particles in the universe that remained in the corpuscles of cosmic egg, the density fluctuation happened at 10^{-35} second after the initial Big Bang moment within the corpuscle which resulted due to temperature variation to about 10^{11}K when nucleon synthesis probably started. Beyond this temperature only electron and its antiparticles Positrons could evolve and still involved in annihilation and creation exchanged with their equivalent energies in the form of electromagnetic radiation. The temperature further dropped down from an overall 10^{11}K to a temperature of only one hundredth and as great as 10^{9}[1, 00, 00, 00,000 i.e. one Trillion degrees]. This was a practically significant landmark, for bellow that temperature the radiation density became too small for electron, positron pairs were produced [The surface temperature of our sun is only 5000K]. These happened only after100 seconds of Planck Time. But we authors want to mention one important thing that we know what happened in the~1S of planck's time of Big Bang. But we do not still know what happened in the first ten thousandth of a second of Big Bang Singularity. This is probably the big question to all theoretical physicists till now.

So the cosmic soup consisted of quarks and anti quarks, electrons and it's antiparticles anti electrons or positrons. The particles and antiparticles were in constant annihilation and radiation as per Einstein's famous equation E= mC^2. At 10^9K temperature matter were produced and the Universe is today made of matter i.e. hadrons. (Proton, Neutron, Lepton, Electrons). But in the Big Bang moment Universe started it's voyage with equal numbers of matter and antimatters. Electron and Positron were created and were in constant annihilation, liberating burst of energy and radiation. Thanks to the creator [If at all exist] of the Big Bang that during the nucleon synthesis anti proton were not created. If at all antiproton, antineutron were created they were at least in separate compartments and did not come into contact [matter and antimatter as soon as come in contact both are destroyed and their entire rest mass converts into radiation and energy known as entropy or annihilation. Prof, S.W. Hawking in his famous book "The Brief history of Time" nicely said –If you even meet your anti You (Mirror image of You) don't hand shake with him you will turn into flash, radiation and energy at once"

The Universe consists of now large masses of matter and antimatter organized into galaxies, stars, and planets. According to this view about construction of the Universe, the matter and antimatter should co-exist at some early stage in the Big Bang. For it only if the temperature was high enough it should be possible for nucleons and anti nucleons to rub their shoulders with each other's. Simple theory suggests that they should annihilate each other's with production of photons and neutrinos. To account a Universe in which matter and anti matter were separated in separate galaxies it is therefore necessary to explain how such a separation could have taken place at very early stage in the development of primeval fire ball?

It is again one of the most fundamental questions in cosmology. The question of existence of antimatter in significant quantities in the present universe in our galaxy! The question of whether antimatter had an equal role with matter in making up galaxies? In a contemporary Para diagram of Grand Unified Theories (GUT) & Gauge Theories (String Theories) these questions are related to questions of nature of charge, parity variations at high energy, the questions of separating matter and antimatter, proton and antiproton, helium and anti helium The symmetry between matter and antimatter [i. e baryon symmetry in the cosmology] that was once observed at accelerator had forced many scientists and astrophysicists to think that there existed also a similar balance in the Universe of matter and antimatter at most early phase of the Universe. But we don't see or don't find antimatter in our observable Universe. Our observable Universe is made of matter only. Why it is so? Antimatter annihilated with matter. If that was so, then there would not be any matter to make up all galaxies, our observable Universe, our planet and our biology. Was the matter and antimatter at all mixed together? Or was the matter and antimatter were in two separate compartments? If the later was true, then we must have another Universe. That Universe was made of antimatter and there must be some path to communicate with it.(Present author's Theory). Can it be Warm hole? However universe consisted of large mass of matter and antimatter- standard Big Bang model says so. On this view, in present authors opinion, is that matter and antimatter must co-existed all together at some early stage of Big Bang? For it, only when the temperature was high enough, it was possible for nucleons and anti nucleons, quarks and anti quarks to rub their shoulders with each others, and simple theory suggest that these rubbing resulted annihilation with production of both photons and neutrinos. H. Alfeven et al [11] (Alfeven .H – Rev. Mod. Physics Vol37; P652; 1965) did bring out a mechanism which permitted region of matter and antimatter to co-exist together in our galaxy, even without appreciable mixing. Otherwise in early state of universe [when a homogeneous universe] there would have to be also a mechanism for separating matter and antimatter so that galaxies were formed in clusters. Then big questions are 1) what was the mechanism for separation of matter and antimatter? 2) Where went the bulk of antimatter? 3) Does antimatter stars or antimatter galaxies were capable of nuecleosynthesis? Does the antimatter stars or antimatter galaxies exist at all? 5) If at all exists what is the way of communication from our universe made of matter to a Universe made of antimatter? Through warm holes? Theoretically there must be some anti-galaxies in the space. But nobody seen them yet. There is a different gravity there-antigravity between antimatter/antimatter and antimatter/anti antimatter. Antimatter creates cosmic voids (Pranab Kumar Bhattacharya[12] Defining a region of mass M R as a typical unit of matter and antimatter. According to the conventional Big Bang model of the universe, there were small excess of baryon particles (~1 in 10^9) over the anti particles in the early stage of evolution of Universe. At that time the thermal energy "KT" exceeded the rest energy mpc^2 of baryon particles. It was to the excess amount of KT, for that we see the present existence of matter in the Universe. So as the thermal energy dropped below mc^2, the baryons and anti baryons started annihilated and there leaving just excess of baryons intact. Let us consider a model of universe that was initially filled up with the thermal radiations. Its expansion was described by the scale factor R (t) which behaved approximately like $t^{-1/2}$ while the temperature varied like R^{-1}. For the early stage of the universe, the effect of space curvature was negligible. It was known in the history of such a model, the model can be divided in to several periods according to content of thermal radiation. The Hadronic (KT≥100mev), Leptonic(KT≥ 1mev) and Radiative (KT≥300K). Super imposed on division, on evolution of baryons, we have to consider also other periods. The separation period was (KT≥350Mev), annihilation period (KT≥25Kev) and coalescence period was (T>300K). There was some interest in 1970s regarding the existence of the antimatter in the Universe. Stiegman. G [13] in 1969 showed that if the space time were filled with equal mixture of matter and antimatter then gamma ray flux that resulted from nucleon and anti nucleon annihilation would be far above the observed limit. But there were much possibilities that matter and antimatter existed quite separately in large regions consisting solely of one characteristic type, perhaps in the form of galaxies and anti galaxies (Bhattacharjee Rupak and Bhattacharya Pranab kumar) separation, one can assume that a process probably existed in the early Big Bang model. This process could however separate matter and antimatter into contiguous regions at some early epoch of Big Bang. We can also assume that the regions remain separated until and after decoupling would prevent collision between them, owing to the effect of radiation. After decoupling, the material contained in several such regions started to collapse and coalesce. The collapse and coalescence led to an annihilation of particles from regions to anti regions. The rate, at which coalescence occurred, depended on the scale of density fluctuation. Defining a blob of mass MB, as the largest commonly occurring density fluctuation, existing at de-compleing, we know from galaxy forming theory that the minimum mass of the blob was ~10^7 MO jeans mass. It is also well known that any gravitational bound group of blob will eventually undergo collapse. But due to the expansion of the Universe, the collapse would not proceed rapidly until the density contracted. The collision cross section for blob contained in such group became very high once collapse set in. So if both matter and antimatter were present in early Universe, one must expect a considerable amount of annihilation to occur at the time of collapse. So there must be a separation period for matter and antimatter. In the separation period the particles and antiparticles [Quarks and anti-quarks, Neutrinos and anti neutrinos/ Gluons and anti-gluons] separated spatially as a consequence of their statistical repulsion. This was initially induced by fluctuation[12] One can compute the size as "δ," as the individual condensation containing an excess of nucleon and anti- nucleon reached during 10^{-5} S of the period. The total baryonic number in that period was 10^{28}. Near the end of separation period the universe was filled up with emulsion of nucleons and anti nucleons with a topical size $\delta=3x10^{-4}$c.m[12]. The next came annihilation period. When temperature fell below the critical temperature (T) the particles and antiparticles [quarks and anti quarks] started to annihilate. The annihilate process was then controlled by diffusion so that densities D and N (Nucleons) and N^-(anti nucleons) satisfy the equation as given below

$\delta N/\delta T=DV^{-2}N-\alpha N\ N^-$, $\delta N^-/\delta T=\delta V^- N-\alpha NN^-$ (Bhattacharjee Rupak). At the end of this period a typical fraction of 10^{-8} or more nucleon survived. They were still in the form of emulsion with a typical size of 10^5cm and with a typical mass of 10^{10} gram (1000,0000,000 kilogram) within a sphere of radius. This was however far from a galactic mass. During annihilation the process first gave birth chiefly to pions and through their decay to high-energy photons, electrons, positrons, and neutrinos successively. The transfer of momentum by photons and electrons produces an annihilation pressure at boundary between matter and antimatter. To find the behavior of matter and antimatter, which were probably in contact through a common boundary, the effect of high-energy photons and leptons was a dominant feature, because these particles exerted a very strong pressure and kept the heating system on. Radiative pressure was very dominant, so that pressure due to heating tended to balance annihilation. With the possible exception of cosmic gumma rays, observation yielded essentially no information on the relative amount of matter and antimatter beyond our solar system. What the observation told us was that matter and antimatter are rarely, if ever found together. What was the mechanism that matter and antimatter were then separated? Consider a gas of proton, antiproton, electron and positron, which is sufficiently diluted and then annihilation cannot be neglected there. In general, such a gas will be situated in a magnetic field say "B", in a Gravitational field say "G" and in a electromagnetic field of flux "F". Each of the fields will then be assumed static and homogeneous. In particular length scale for variation in "B" must be large enough that particle drifts arising from magnetic in homogenetics are also negligible. The protons and antiprotons will be much more strongly influenced by Gravitational field than by Radiation field. As well as spiraling around the magnetic line of forces the heavy particles will therefore have a drift velocity Vh= $mPxgxB/qB^2$,where mP is the proton mass, q is the particle charge[12]. Because of their small mass, and larger scattering cross section, the electrons and positrons will feel much weaker gravitational force due to radiation pressure. It is however to be noted that just electric current through gas does not heavily result in separation of charges, and the opposed drift of matter need not produce an actual matter-antimatter separation. On the other hand, matter and antimatter in an isolated cloud or in extended medium, with an appropriate field configuration should achieve some degree of separation. This is because proton and antiproton, electron and positron fluxes will not be equal in general. There will be some separation of charge leading to an electrical field "E "and E x B drift. As E x B drift increases, the heavy particles acquire an inertia which tends to remove the original difference between proton and antiproton and electron and positron fluxes. So the big question appeared before us what happened to these antimatter? New York university physics department had isolated a particle that switches back and forth in its anti form spontaneously. Some theories have been then put forth at the antimatter that we have been observing is not the exact opposite of real matter based on hydrogen atom displaying weight. Up until now antimatter was believed only to be created from pure energy as in collision of matter (Gerald Lukaniuk – http://cosmoquest.org/forum/archive/index.php/t-107287.html). It is known that neutral βs meson (β-anti quark & s anti quark) spontaneously transform into its antimatter particles. The current theory of particle physics states that βs meson oscillates very quickly. As a result of their oscillation an very difficult to detect what happens to antimatter. BATAVIA', illinos, scientist of D.Zero collider deflector collaboration at department of energy, Fermi national Accelerator laboratory had announced that their data on the properties of subatomic particles βs meson (βsubs) suggest that particles oscillates between matter and antimatter in one of nature's fastest rapid free process more than 17 trillion times per second. One of the greatest mysteries of the universe is its apparent composition of only matter and not the anti matter. If matter and antimatter were created equally at the time of Big Bang matter and antimatter should have annihilated in to pure energy. In fact in real universe it did not happened. How did our universe of matter survived is a big puzzle. Laboratory evidence made it however possible to observe some form of matter oscillating into antimatter and back. The CP theory states such a story. The CP symmetry- it is the mirror form of matter. It is a measurement of the matter antimatter oscillation of β sub S mesons and it is the first measurement of oscillation of this particular particles. Experiment with beta mesons showed partial violation of CPT invariance. The TRAP experiment found no violates of CPT in cyclotrons frequencies with proton and antiproton level. Shakarov's CP violation theory [Nobel prize winner in peace] gives however some clue to what happened to antimatter. According to this theory the antimatter& most the matter would have annihilated. But CP violation means that matter and antimatter did not always behaved in the same way resulting in a one in billions imbalance of ordinary matter. Symmetry is important mathematical concept used in fundamental physics to describe particles property. Antiparticles mirror their related particles by having opposite sign for several properties, particularly the electrical charges. Particle theory expresses this relationship in terms of mathematical operator or mirror designated as"C" which changes the sign of charge and other properties. In this way operating on a particle with the C mirror yields an antiparticle. Another mathematical mirror "P" reverses particle interaction in the space rather like flipping the right handed gloves into left handed, one "P" changes the sign of a property called "Parity" which according to Dirac equation is opposite for particle and antiparticles. In a particle interaction the sign for "C" and "P" totaled over the particles involved are same before and after the interaction then C and P are each and to be conserved. Now as it happens C&P are not always conserved and there occurs CP violation. This CP violation also explains lack of antimatter in our Universe.

After the Planck epoch, when the age of the universe was t $\leq 10^{-43}$S and the temperature of the universe was T$\geq 10^{9}$Gev , we can be sure enough , that the interactions between the matter and the antimatter at their first quark level or between sub2 quark R^{+}/ R–[R particle level] became unimportant. This was because of that rate for gravitational interaction was much less then the expansion rate of the universe. Although the interactions between matter and antimatter particles kept each of them separately in a thermal equilibrium, probably two worlds were created. These two worlds did not feel each others existence at very microscopic level. During the primordial nucleosynthesis of the early Universe, which started ~1S after the initial Big Bang moment, the yield of the Big Bang depended on the expansion rate of the Universe. The expansion density PT= P+Ps by R^{0}/R= $[(\delta\pi GN/3)(P+Ps)]^{1/2}$ where P and Ps= density of matter and Antimatter, R= Cosmic scale factors. During this early epoch the universe was radiation dominated with P=g $(\pi^{2}/30)^{T}{}_{4}$ where g counts the effective number of degrees of freedom particles (Rupak Bhattacharjee). The temperature of the particle world and that of anti particle world were not the same. The inflation occurred in the two worlds in both the sectors but not necessarily simultaneously. The inflation involved was a random event in the nucleation of a bubble or in the formation of fluctuation regions. At the beginning of the inflation, the universe was in false vacuum state for both the worlds. The bubble nucleated for one world, first say for antimatter world. As the bubble grew exponentially in physical size, both the temperature of matter and antimatter decreased exponentially. At this time the ratio of entropy remained constant. When the antiparticle vacuum energy was converted into radiation, the antiparticle temperature raised and entropy decreased. Eventually a bubble of fluctuation region formed for the matter world within the antimatter bubble. During the second phase of inflation, new bubble grew exponentially. When the vacuum energy of ordinary matter world converted into radiation, the temperature of particle world raised to a temperature, which was exponentially larger than the temperature of the antiparticle world. Thus the entropy was reduced further. To an exponentially small value and the matter dominated the visible universe.

According to Big Bang model of Universe, there was small excess of matter then antimatter (~1 in 10^{9}) in the early stage of evolution, when the thermal energy KT exceeded the rest of energy mpc^{2}. The baryons and anti baryons are annihilated and then left just excess of baryon intact. From a fit of nucleon-nucleon scattering theory, the evidence of π, η7, ω, ρ, and mesons can divide the nucleon and anti nucleon scattering amplitude. There are bound states of nucleon and anti nucleon pairs, which can be identified with mesons π, ρ, ω, and η7. Such a situation in which some particles appear as bound states and act as agent for special forces. Dashen .R[14] summarized a basic formula relating to Gibb's potential Ω to it's value Ω_{0} for free particles and to collision matrix –S Ω =Ω_{0} -KT/2π∫δEc-E/KT trace [clogs (E) ee-$\sum u_{1}n_{1}$]. Analysis of this result drives a phase transition at a temperature of KT of the order of 350 Mev. Above this temperature, nucleon and anti nucleon tended to remain separately from each other's.

PAMELA experiment in2008 [15] saw an unexpected excess of positrons (anti-electrons) whizzing around space. That excess could be from a nearby astrophysical source, or it could be from the annihilation of dark matter—heavy, rarely interacting particles that make up about 85% of the matter in the universe.

Can the LHC Experiment will prove the existence of Sub_{2}quark particles, Zero rest mass particles or Higg's Particle and there antiparticles?

Any powerful particle accelerator of today has probably two main purposes. One purpose is production of new and newer particles sub-particles and the other is scattering of those particles (in 3-D space). Particle scattering is a method of determining what sub atomic (constituent) particles look like and their properties. It is using the collision of energized particles to give a "snapshot" or clear "picture" of the particle being studied, whether a proton, electron, quarks, sub-quarks or a whole bunch of other interesting particles. The Large Hadron Collider (LHC), which was built at the European Centre for Nuclear Research (CERN) near Geneva, Switzerland, using a 27-kilometre underground ring. The LHC will whizz protons, which are far heavier particles than electrons, to energies of up to 14 trillion electron volts. One of its primary goals will be the search for the Standard Model (SM) Higg's particle. The main SM Higgs boson production mechanism at the LHC will be then by gluon-gluon fusion, while the qq!qqH process, or Vector Boson Fusion (VBF), will account for about 20% of the total cross section. Next-to-leading order (NLO) corrections are of major relevance in particular for the gluon-gluon fusion production, with K-factors ranging from 1.7 to 2.0. A review of Higg's production cross sections can be found in. The particle identified in the title is the zero mass particles, and the particle that gave mass in Higg's field. Professor Peter Higgs actually joked that Lederman originally wished to label this particle as "the goddamn particle or God's Particle.

Caption fig [A diagram summarizing the tree-level interactions between elementary particles described in the Standard Model]

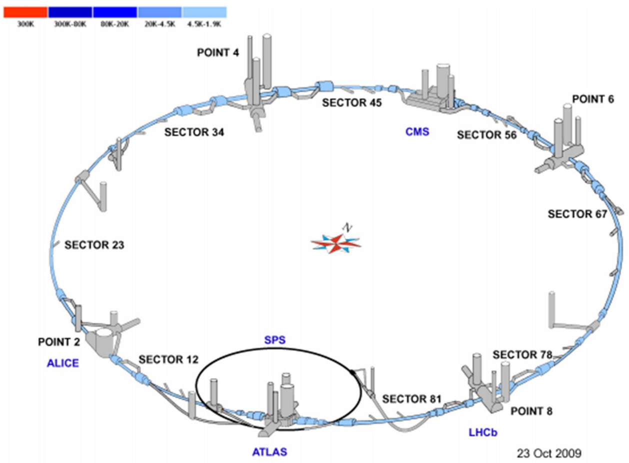

Fig 4.

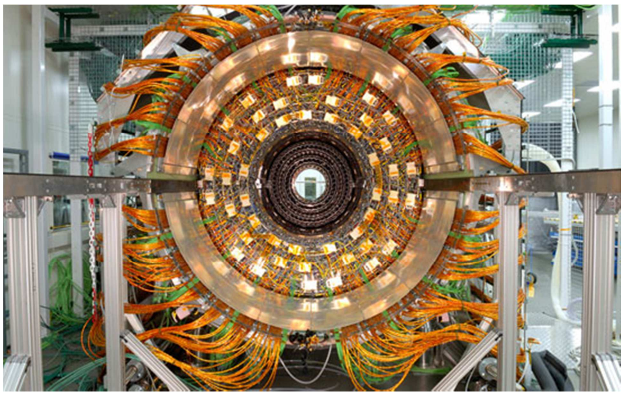

Fig 5.

Fig 4&5. Caption- ATLAS and Large Hadron Colliderhttp//lhc.web.cern.ch/lhc/cooldown_statushtml

The Higgs particles could be as light as 78 GeV without however being detected at LEP, while detection at the LHC is extremely challenging one the present authors thinks so. However many of the super- and global symmetry partners of the Standard model particles should be easily observable at the LHC. Furthermore, the LHC should be able to observe a "wrong" Higgs that is a 300–400 GeV heavy Higgs-like particle with suppressed couplings to W and Z that by itself does not account for electroweak precision observables and the unitarily of WW scattering. At the same time, the true Higgs may be deeply buried in the QCD background. Hopes of finding the boson are pinned on two massive detectors at the LHC: the ATLAS or A Toroidal LHC apparatus and the CMS or Compact Muon Solenoid. These two detectors have the same goals but their designs are radically dissimilar. Professor Stephen Hawking FRS had a bet in 2008 for 100 dollars (70 euros) that a mega-experiment this week will not find an elusive particle seen as a holy grail of cosmic science. Rather the experiment could discover super partners, particles that would be "super symmetric partners" to particles already known about. Their existence would be a however key confirmation of string theory, and they could make up the mysterious dark matter that holds galaxies together. Prof. Hawkings told in 2008 in a meeting with BBC.

In 2013 Professor Peter W Higgs has been awarded Nobel prize for the SM Higgs along with Professor F. Englert, but the question remains yet how the Higgs interacts with standard-model fermions: entities such as electrons, muons and quarks that have an intrinsic angular momentum, or 'spin', of ½ in quantum units. The probability of an interaction with each particle is supposed to be proportional to its mass — not least because, in the standard model, interaction with the Higgs is what creates the mass.

Is there really a Zero Rest mass particle possible at all? What is then Rest mass? In Universe, while matter creation, theories should assume zero rest mass entities (fields). From those zero rest mass entities, massive particles were created as perturbations in a single fundamental field. And how the rest mass originated What were these Zero rest mass particles then ? Electron? Higg's Particle ? Photon? Boson? Gluons? One of the consequences of Eisenstein's special theory of relativity is that mass of an object increases with its velocity relative to the observer; it has the usual mass that we are familiar with. This is called the rest mass of the object. As the speed of the object is increased the inertial mass of the object also increases. For speed significantly less than the speed of light the increase of mass is nearly imperceptible, but as the speed of light is approached, the mass starts to increases very rapidly towards infinity. Theoretically the mass would become infinite if the object could be accelerated all the way to the speed of light [c]. However because of acceleration of an object in response to a given force is inversely proportional to its inertial mass, as the speed of light is approached the force is required actually to reach the speed of the light also become infinite. It is impossible for a particle with mass to reach the speed of light. At Fermilab, for example, when protons were accelerated near close to the speed of light, and it takes a huge amount of energy. The rest mass did not change - however by definition, it is the mass, or equivalent energy, of a particle while at rest. The total energy is the particle's rest mass energy plus it's kinetic energy. Einstein discovered that the total energy of a particle moving at speeds close to the speed of light (relativistic speeds) is given as $mc^2/((1-(v^2/c^2)^{1/2})$. The total energy - rest energy plus kinetic energy - changes and that is what you, as an "external observer" of a relativistic particle, can measure. You can only measure rest mass if you are at rest relative to the particle. A particle with non-zero rest-mass cannot be accelerated to the speed of light. Put in other terms, the energy of a moving particle with rest-mass m equals $E=(r-1)mc^2$, where the factor $r=1/sqrt(1-(v/c)^2)$, with v the speed of the particle and c the speed of light. You can use this formula in an Excel sheet to try different values of rest-mass m and speed v. This equation tells you that you need an infinite amount of energy to accelerate a particle to (exactly) the speed of light, however, you can always take it to, say 99.99999% the speed of light with a finite (but huge) amount of energy. In the world of particle physics, a mass less particle is any particle whose invariant rest mass is zero and in spin zero. Currently, the only known mass less particles are gauge bosons [9] (the Spin is not however zero for gauge bosons): the photon particles (carrier of electromagnetism) and the gluon particles (carrier of the strong force) and Higgs particles. However, gluons are never observed as free particles, since they are confined within hadrons. Neutrinos were considered as mass less but Neutrinos later found not to have zero rest mass. The behavior of mass less particles is understood by virtue of special relativity. For example, these particles must always move at the speed of light (c). In this context, they are sometimes may be called as luxons [9] to distinguish them from bradyons[8]. Mass less particles are known to experience the same gravitational acceleration as other particles (which provides empirical evidence for the equivalence principle) because they do have relativistic mass, which is what acts as the gravity charge. Thus, perpendicular components of forces acting on mass less particles simply change their direction of motion, the angle change in radians being GM/rc2 with gravitational lensing, a result predicted by general relativity. The component of force parallel to the motion still affects the particle, but by changing the frequency rather than the speed. This is because the momentum of a mass less particle depends only on frequency and direction (compare with the momentum of low speed massive objects, which depends on mass, speed, and direction). Mass less particles move in straight lines in space-time, called geodesics, and gravitational lensing relies on space-time curvature. Gluon-gluon interaction is a little different: they exert forces on each other but, because the acceleration is parallel to the line connecting them (albeit not at simultaneous moments), the acceleration will be zero unless the gluons move in a direction perpendicular to the line connecting them (so that velocity is perpendicular to acceleration).

What most physicists call mass (or "rest mass" if they want to be specific) is the absolute value of the four-momentum, which is independent of reference frame. For things traveling at speed is c, this was considered by Einstein as “zero mass” as “Photons”. So if Photons travel at speed c (which, by the way, is not necessary for relativity to work; "the speed of light" is a misnomer), then they have only zero rest mass. But Photon particle bends when it travel near a massive stellar mass say a massive star by its gravity and if photon particle does not have the mass how gravity pull photons towards another massive body?

A photon may be described by the equations $E_\Upsilon = h\,\nu_\Upsilon$, $p_\Upsilon = h/\lambda_\Upsilon$ and $E_\Upsilon = p_\Upsilon c$ where h corresponds with Planck's constant, E_Υ and p_Υ are the energy and momentum of the photon, ν_Υ and p ϒ are its frequency and wavelength, and c is the speed of light. In addition, the rest-mass of a photon is near equal to zero but not exactly the zero. The latter property has been a significant point of ϒ because application of de Broglie's electron relation to a photon yields that Planck's constant or the frequency of a photon must be near equal to zero while the above equation states that a photon's energy is different from zero. And what is when the particle is in Intertia i. e I want to say “Zero Rest mass particles” in super cooled state of the universe. Can any particle have zero mass when its Spin is Zero. We're so used to talking about rest mass, and we people sometimes forget about the very basic properties of the Lorentz group. The photon doesn't really have a rest-mass,(i. e in intertia photon cannot stay at all but boson can stay in interia in form of Boson condensates) since, strictly speaking, the Lorentz group is non-compact and does not contain the transformation required to take one into the "rest frame of a photon." While we can take limiting processes to somewhat make sense of talking about a photon's zero rest-mass, this is not a well-defined transformation in the Lorentz group so far we know. Rather, the only way to talk about the inertia of a particle traveling at speed “ c “ is to determine the 4-momentum in a physical frame of reference (v <c)., This gives the photon a finite, non-zero mass for every physical frame of reference. We authors think it so. Not to mention that when one considers General Relativistic effects, you really start to see how it is energy-density and density of energy flow which determine the inertial properties of particles and fields. This is what John Wheeler called the Geometrodynamic Steering Principle as identifying the determiners of inertia. Photons have a very small mass whatever small it is, and hence move strictly less than "the speed of light" - 'c', there's just no evidence that they don't, and on the contrary, plenty of reason to believe they do.

Then is there at all possible existence of faster-than-light (FTL) phenomena for highly accelerated elementary particles (Tachyons)-: The possible existences of faster-than-light (FTL) particles, which are still forbidden by the known laws of physics, have been studied by many physicists. But the existence of such particles has not been confirmed yet by any experiments. This article will show you that faster-than-light phenomena may be permitted for highly accelerated elementary particles, if they have very small mass compared to that of the electron. It is a well known fact that nothing can travel faster than the speed of light. At best, a mass less particle travels at the speed of light. But is this really true? In 1962, Bilaniuk, Deshpande, and Sudarshan [7], Am. J. Phys. 30, 718 (1962), said "No! It is not Possible". Let us say please you draw a graph, with momentum (p) on the x-axis, and energy (E) on the y-axis. Then draw the "light cone", two lines with the equations E = ±p. This divides our 1+1 dimensional space-time into two regions. Above and below are the "Time like" quadrants, and to the left and right are the "Space like" quadrants. Now the fundamental fact of relativity we know is that

$$E^2 - p^2 = m^2$$

Where E is an object's energy, p is its momentum, and m is its rest mass, which we'll just call 'mass'. In case you're wondering, we are working in units where c=1. For any non-zero value of m, this is a hyperbola with branches in the time like regions. It passes through the point (p ,E) = (0 ,m), where the particle is at rest. Any particle with mass m is constrained to move on the upper branch of this hyperbola. (Otherwise, it is "off shell", a term you hear in association with virtual particles — but that's another topic.) For mass less particles, $E^2 = p^2$, and then particles moves on the light-cone. These two cases were given the names tardyon (or bradyon in more modern usage) and luxon, for "slow particle" and "light particle". Tachyon is the name given here to the supposed "fastest particle" which would move with v > c. Tachyons were first introduced into physics by Gerald Feinberg[6, 8], in his seminal paper "On the possibility of faster-than-light particles" Published in journal Physics Review [Phys. Rev. 159, 1089—1105 (1967)]. A tachyon is a type of theoretical particle, with the unusual property that it moves faster than the speed of light (FTL). The word "Tachyon", was based on the Greek for "swift." & Tachyon have 'imaginary' zero rest mass. The theory of relativity predicts that a particle can never be accelerated to a speed faster than the speed of light, but physicists have long known that (in theory, at least) it would be possible for particles to move faster than the speed of light, as long as they don't have to accelerate to get there. Tachyons, which always move this fast, are sometimes hypothesized in physics theories to serve some useful purposes. Tachyons have never been found in experiments as real particles traveling through the vacuum, but is predicted theoretically that tachyon-like objects may exist as faster-than-light 'quasi particles' moving through laser-like medias. (That is, they exist as particle-like excitations, similar to other quasi particles called phonons and polaritons that are found in solids. 'Laser-like media' is a technical term referring to those media that have inverted atomic populations, the conditions prevailing inside a laser. There are strong scientific reasons to believe that such quasi particles really exist, because Maxwell's equations, when coupled to inverted atomic media, lead inexorably to tachyon-like solutions.

Now another familiar relativistic equation is

$$E = m[\,1-(v/c)^2]^{-½}.$$

Tachyons (if at all they exist in the Universe) must have v > c. This means that E is here imaginary! Well, what if we take the rest mass m, and take it to be imaginary? Then E is negative real, and $E^2 - p^2 = m^2 < 0$. Or, $p^2 - E^2 = M^2$, where M is real. This is a hyperbola with branches in the space like region of space time. The energy and momentum of a tachyon must satisfy this relation. You can now deduce many interesting properties of tachyons. For example, they accelerate (p goes up) if they lose energy (E goes down). Furthermore, a zero-energy tachyon is "transcendent", or moves infinitely fast. This has profound consequences. For example, let's say that there were electrically charged tachyons. Since they would move faster than the speed of light in the vacuum, they should produce “Cherenkov radiation”. This would lower their energy, causing them to accelerate more! In other words, charged tachyons would probably lead to a runaway reaction releasing an arbitrarily large amount of energy. This suggests that coming up with a sensible theory of anything except free (non interacting) tachyons is likely to be difficult. Heuristically, the problem is that we can get spontaneous creation of tachyon-anti tachyon pairs, then do a runaway reaction, making the vacuum unstable. To treat this precisely requires quantum field theory, which gets complicated. It is not easy to summarize results here. However, one reasonably modern reference is Tachyons, Monopoles, and Related Topics, E. Recami, ed. (North-Holland, Amsterdam, 1978). However, tachyons are not entirely invisible. You can imagine that you might produce them in some exotic nuclear reaction. If they are charged, you can "see" them by detecting the Cherenkov light they produce as they speed away faster and faster. Such experiments have been done but, so far, no tachyons have been found. Even neutral tachyons can scatter off normal matter with experimentally observable consequences. Again, no such tachyons have been found.

How about using tachyons to transmit information faster than the speed of light, in violation of Special Relativity? It's worth noting that when one considers the relativistic quantum mechanics of tachyons, the question of whether they "really" go faster than the speed of light becomes much touchier! In this framework, tachyons are waves that satisfy a wave equation. Let's treat free tachyons of spin zero, for simplicity. We'll set c = 1 to keep things less messy. The wave function of a single such tachyon can be expected to satisfy the usual equation for spin-zero particles, the Klein-Gordon equation:

$$(\gamma + m^2)\,\varphi = 0$$

Where γ is the D' Alembertian, which in 3+1 dimensions is just

$$\gamma = \partial^2/\partial t^2 - \partial^2/\partial x^2 - \partial^2/\partial y^2 - \partial^2/\partial z^2.$$

The difference with tachyons is that m^2 is negative, and so m is imaginary.

To simplify the math a bit, let's work in 1+1 dimensions with co-ordinates x and t, so that

$$\gamma = \partial^2/\partial t^2 - \partial^2/\partial x^2.$$

Everything we'll say generalizes to the real-world 3+1-dimensional case. Now, regardless of m, any solution is a linear combination, or superposition, of solutions of the form

$$\Phi\,(t\,,x) = \exp\,(-I\;Et + I\;p\;x)$$

where $E^2 - p^2 = m^2$. When m^2 is negative there are two essentially different cases. Either $|\,p\,| \geq |\,E\,|$, in which case E is real and we get solutions that look like waves whose crests move along at the rate $|\,p/E\,| \geq 1$, i.e., no slower than the speed of light. Or $|\,p\,| < |\,E\,|$, in which case E is imaginary and we get solutions that look like waves that amplify exponentially as time passes!

We can decide as we please whether or not we want to consider the second type of solution. They seem weird, but then the whole business is weird, after all.

(1) If we do permit the second type of solution, we can solve the Klein-Gordon equation with any reasonable initial data — that is, any reasonable values of φ and its first time derivative at t = 0. (For the precise definition of "reasonable", consult your local mathematician.) This is typical of wave equations. And, also typical of wave equations, we can prove the following thing: if the solution φ and its time derivative are zero outside the interval [−L, L] when t = 0, they will be zero outside the interval [−L− | t |, L + | t |] at any time t. In other words, localized disturbances do not spread with speed faster than the speed of light! This seems to go against our notion that tachyons move faster than the speed of light, but it's a mathematical fact, known as "unit propagation velocity".

(2) If we don't permit the second sort of solution, we can't solve the Klein-Gordon equation for all reasonable initial data, but only for initial data whose Fourier transforms vanish in the interval [−| m |, | m |]. By the Paley-Wiener theorem this has an odd consequence: it becomes impossible to solve the equation for initial data that vanish outside some interval [−L, L]! In other words, we can no longer "localize" our tachyon in any bounded region in the first place, so it becomes impossible to decide whether or not there is "unit propagation velocity" in the precise sense of part (1). Of course, the crests of the waves exp (−iEt + ipx) move faster than the speed of light, but these waves were never localized in the first place! The bottom line is that you can't use tachyons to send information faster than the speed of light from one place to another. Doing so would require creating a message encoded some way in a localized tachyon field, and sending it off at superluminal speed toward the intended receiver. But as we have seen you can't have it both ways: localized tachyon disturbances are subluminal and superluminal disturbances are nonlocal. The energy potential of a Tachyon particle -according to Japanese scientist- features several millions of joules per centimeter cube and exhibiting a junction potential of some 800 millions of volts (1000 times more than sun). Tachyon-Energy will be then for free. Tachyon-Energy is limitless available then. Tachyon-Energy is ubiquitary, in other words, accessible to all nations then. Tachyon-Energy can be produced extremely polycentric: on any desired place on earth, on any desired quantity, without deficiency. The wavelength of Tachyons is approximate 10 to the power of 23. Tachyon-Energy does not lead to environmental pollution as no radioactive material, nor toxic waste nor are other toxins involved. There are different ways to use Tachyon-Energy: hereinafter we shall present some of them.

Possible application of Tachyons – 1] Through direct use of gravity-storms “via space-quantum-streams. These type of application suits for transforming the force of gravity into electrical energy: as a substitute for the common nuclear power plants, coal-fired power plants, oil-fired heating systems, car engines, train engines, etc. etc.

Possible application – 2) Time machine and Time Travels in future may be possible then

Possible application – 3) By vacuum-field technology. This type of technology bases on the theory that two opposite energy waves “neutralize” themselves. In such a vacuum-field molecular structures can be transformed from chaotic ones into harmonical ones. This phenomenon is also known as negative entropy order neg-entropie.

By the help of this technology appropriate material qualifies as “antennas” for Tachyon particles. So far we are quite successful using parts of this technology in combination with pure crystalline silicon and some noble metals. Science confirms that Tachyon Energy features anti-entropic properties; an inverse effect to chaos, confusion and decay. Entropy is the definition for the chaos within a system: the bigger the entropy is, the bigger the confusion is. Natural living organisms show tendential anti-entropic behavior, in other words, the intuitively try to diminish any kind of confusion (chaos). Studies prove that imbalance within the energy-fields of beings will -sooner or later- manifest on a material level as ageing , tension, pain and illness. The anti-entropic effects of Tachyon Energy might help in future to balance the subtle energy fields in our physic body. The health implications could be named as holistic use of this type of energy: interactions in between mental and physical aspects may be directly affected .Latest studies prove that the subtle energy fields in our physical body are balanced with Tachyons: an optimization of our homeostasis is achieved. Homeostasis stands for self-regulating functions assuring the maintenance and continuity of a specific system. Homeostasis is the property of a system that regulates its internal environment and tends to maintain a stable, constant condition of properties such as temperature.

In future, one may communicate by a telephone faster than light may be called “Tachyon cell telephone!

Tachyons can be source for energy in future space ship.

3. Conclusion

Question remains till date unsolved whether there is really any particle that moves faster than speed of photon particles [light particles?] We authors however here consider mathematically it may be possible through another particle called “Tachyons Particles”, detected in 1974 by Roger Clay and Ohilip crouch of Adelaide University in Australia. What were Tachyon particles? Of course the Super string theories that evolved from spinning string theories that incorporated supper symmetry and had no Tachyonic ground states. Tachyons are still mathematical quirk of mathematicians with no physical meanings. Can these tachyons be the missing Neutrinos particles with real zero rest mass as found in OPERA Experiment [16]? However Einstein’s equation $E=mc^2$ shows “that nothing in this observable universe, can cross the speed of photons [light particles]”. But tachyons have probably that curious property of going faster than speed of light, as the particle mast loose energy, unlike other ordinary particles. It is still probably unknown, whether within relativity theory ($E=mc^2$] solutions of Einstein, permit also two families of particles to exist -1) which always have a speed less than light and 2) other which always have speed greater than the light. If it permits the second one, then the later particle must be tachyons or a kind of neutrinos whom we do not know yet or called “missing neutrinos with zero rest mass”. If tachyons really exist then many of our normal physical laws, laws of this universe are to be reversed. Physics has to be re-written

The standard description of two families of particles allowed by Albert Einstein equations follows from the requirement that the total energy of a particle is given by a formula ----→ $M_0 C^2 (1-(v/c)^2)^{1/2}$. The key point being that taking the square root (half Power) introduces two families of solutions. For zero velocity, of course the expression reduces to mc^2. Square root of negative numbers although allows mathematically do not have physical significance and obvious interpretations of this expression to give real total energies is the term $(1-(v/c)^2$, must therefore be positive or at least zero so that “v” is always less than or equal to “c” and particles can never travel faster than light. But there may be other ways to think also. Possibility with, imaginary mass (where I is the square root of -1). In that case the situation will be reversed and in order to obtain a real energy, we must take another square root of a negative number in order that the imaginary. “I”s multiply out to-1. In other words for imaginary masses, “v” must exceed “c”, so that $(i-v/c)^2$ is always negative. This is the origin of Tachyon.

But suppose, we allow “v” to exceed “c” while maintain the real mass “m”. Now we are taken into very strong realms-the imaginary part of space time. Might we consider a tachyon particle with imaginary mass moving through the real part of space time at a speed greater than that of light. Tachyons can then provide the link between past and future and Future time travel

The OPERA experiment (The OPERA collaboration 2011)[[16]] reported a neutrinos particle beam traveling faster than light. The experiment measured the distributions of neutrinos time emission/detection over a baseline from the CERN to the Gran Sasso (CNGS) site. Data are collected within runs lasting for several months[1]. In these data, the neutrino beam time of flight (TOF) turns out to be ~60 ns shorter than that calculated by taking the speed of light in vacuum.

Acknowledgement

All authors acknowledge Mrs. Sumita Bhattacharya spouse of Prof. Dr. Pranab Kumar Bhattacharya, late Mrs. Bani Bhattacharya(1935-2006), late Mr. Bholanath Bhattacharya (1926-2009) of residence 7/51 Purbapalli P.O Sodepur, Dist 24 Pargnas(north), Kolkata-110, West Bengal India, who were teachers to authors about the observable Universe started in a Big Bang, Panspermia theory, multiuniverses and about habitable zones & exo-planets, late Mr. Ajit Chakravorty, late Mr. Abani Chakravorty, late Dr. Asit kumar Chakravorty- Opthalmic surgeon, late Mrs. Sudharani Chakravorty, late Mrs. Reba Chakravorty and Mr. Binay Chakraborty.

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