Petar Bosnić Petrus, Langova 35, 10430 Samobor,
Croatia tel. ++385 1 3363 624 mob.: ++385 91 559 2793 and ++385 91 559 2741

Faster than light
CONICAL AND PARABOLOIDAL SUPERLUMINAL PARTICLE ACCELERATORS

Enlarged and corrected article

Theoretical suppositions
In the my previous work: **"How the velocity of light can be exceeded",** I have shown that light is not a special // separate (or positive) physical entity and that velocity of light, *c*, is not the property of light itself but is, in fact, a vacuum or space **transference constant** - the ability or property of vacuum // space to transfer electromagnetic impulses at precisely that and only at that speed.

Using the existing methods and accelerators I have also shown that it was not possible to accelerate the particles to a speed exceeding the velocity of light, *c*, in other words, that this is not possible, not due to the increase the particle mass, *m*, but because the acceleratory effect of force *F*, which affects the particle - and which is transferred exclusively at the velocity of light, *c*, - falls towards zero when at the velocity of the particle *v* that is close to the velocity of light *c*.

This is the result one arrives at from further developing Einstein's key equation of the Special theory of relativity - equation related to this subject-matter.

$$\text{“}Transverse\ mass = \frac{m}{1 - v^2/c^2}\text{”} \qquad (1)^*$$

Once this equation is, at Einstein's own suggestion, taken to its "pure" form suitable for interpretation, the following is obtained:

$$m = \frac{F}{a}, \qquad \frac{m}{1 - v^2/c^2} = \frac{F}{a} \quad (2), \qquad m = \frac{F(1 - v^2/c^2)}{a} \quad (3),$$

or rather $a = \dfrac{F(1 - v^2/c^2)}{m}$ ....(4).

When the velocity of a particle is $v = c$, the **relative velocity**, c_{rel}, of dispersion and effect of the force *F,* which accelerates the particle, is, **in relation to the particle itself**, equal to zero. Consequently, its acceleration is also $a = 0$ // also equals zero. For the $a > 0$ it is necessary that the **relative** velocity of light, $c_{rel,}$ **in relation to the particle,** be higher than zero.

I have also shown that a similar situation occurs with an object that is being accelerated by sound waves, and that in such a case the Lorentz transformation equations, by way of which the acceleration, caused by **force transferred by sound waves,** can be calculated extremely accurately, are also applicable. Therefore, it is not the increase of the

E. Einstein
On the electrodynamics of moving bodies
§ 10, Slowly accelerated electron.

particle mass, *m*, which is calculated using the Lorentz transformation equations (as was stated by Special Reativity), but rather the reduction of the acceleratory effect of force *F*.

A similar phenomenon, which occurs in existing accelerators, also affects a sailing ship which has the wind in it sails coming straight from behind, i.e. from the stern. When the velocity of the sailing ship approaches the speed of the wind, the **relative** velocity of wind at which it hits the sails drops, and with it the force propelling the sailing ship forward. In such a case a sailing ship does not, due to the resistance of water, reach even the velocity of the wind, but a somewhat lower speed.

The reason for choosing the example of a sailing ship lies in its ability to demonstrate a fact of crucial significance for the particle acceleration physics, as the following short text will show.

The following is the said text:

If a sailing ship, which we assume is offering low resistance to moving through water, if therefore, this sailing ship has wind blowing not from behind but from its side - at right angles in relation to the direction of its movement - then such a ship is going to achieve a speed significantly higher than the speed of wind blowing into its sails.

Ships which are particularly suitable for achievement of such supravental velocities are the small, lightweight catamarans, because they can (because of very low resistance) sail much faster than the velocity of the wind propelling them forward.

But let us return to the particle physics.

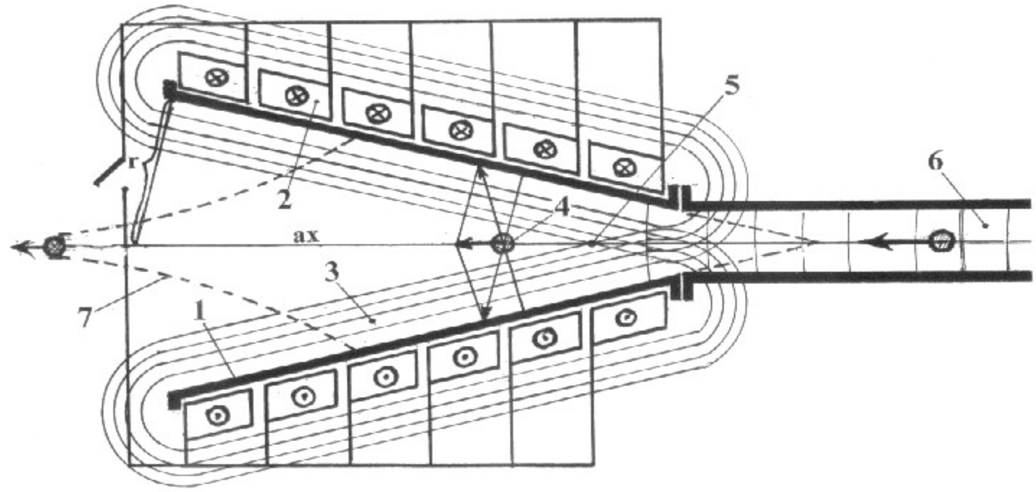
Conical superluminal accelerator

In the common types of particle accelerator (linear or circular), the waves which accelerates a particle comes from behind, just like the wind into the sails of the above mentioned sailing ship comes from its stern. Which is why the particle cannot achieve the velocity of light, let alone exceed it.

However, if we were to bring that same wave to the side of the particle, then it could reach a velocity that would be several times greater than *c*.

Since a particle has no sails, no keel and no rudder which would redirect the force affecting it, we would have to bring the waves from all sides, and do so at an angle slightly over 90^0 in relation to the direction of its movement.

This can be achieved with a conical accelerator – a funnel-shaped accelerator. See **Picture 1**.



Picture 1: ax - axis of conical accelerator and trajectory of accelerated particles; 1 - wall of the conical accelerator; 2 – coils; 3 - electromagnetic waves; 4 - accelerated particle; 5 point of intersection of electromagnetic waves; 6 - standard accelerator tube or cathode tube; 7 - cisoidal cross-section of mantle resulting from the acceleration of particles to the speed exceeding the speed of light - Cherenkov effect.

Procedure

A particle is first accelerated in a standard accelerator to a subluminal velocity close to the velocity *c* and then introduced into the funnel-shaped, or rather the conical, accelerator. Instead of a circular or linear accelerator, *6*, a more powerful cathode tube can be used.

The electromagnetic waves *3* - created by the coils *2* of the conical accelerator, *all of which are turned on at the same time* - moves transversally, i.e. **perpendiculary // vertically in relation to the wall of the funnel**, *1* towards its axis *ax*. At the same time waves approaches both the particle it accelerates, *4* and axis *ax* along which the particle moves, at an angle somewhat greater than 90^0 in relation to the movement direction of the particle. The intersection point of electromagnetic waves *5* which is located on axis *ax*, moves along the axis as many times faster as the axis *ax* is longer than the radius *r*. The particle is propelled and accelerated by the vector sum of all electromagnetic forces affecting it in the funnel (conical accelerator). The ultimate particle velocity *v* depends, as already said, on the ratio between axis *ax*, and radius *r* of the large aperture of the funnel. If axis *ax* is four times longer than radius *r* (as shown in our picture), then the particle velocity at the exit from the funnel will necessarily be four time faster than velocity *c*, due to the fact that the electromagnetic waves which accelerate it along axis *ax*, and the point of their intersection, *5*, must - in the same period of time in which, in their transversal motion, they cover the length of the radius *r* - cover a four times greater distance while moving along axis *ax* in an approximately longitudinal direction. Taken in general, ultimate particle velocity *v* is as many times higher than *c* the axis of the cone is longer than the radius *r*. In the conical accelerator shown in **Picture 1** that ratio is 4:1. With a higher ratio, for instance 5:1, the vector **sum** of forces affecting the particle would be smaller, which would have to be compensated for with a more powerful electromagnetic wave. And if the waves were strong enough, the ultimate velocity of the particle would be 5 times that of velocity *c*.

Still one analogical explanation.

Please do imagine very smooth, but unshapred scissors and try to cut a peace of steel file. You will not be able to cut it. Smooth blades of scissors will pull the steel file towards the its top (top of scissors) by velocity several times larger than is the velocity of movement of the blades itself.

In this example, the blades of scissors are representing the electromagnetic waves of accelerator and its velocity. Steel file is representing charged particle. The charged particle will behaviour just as steel file. This accelerator functions as an electromagnetic scissors.

The difference between the conical accelerator and existing ones lies in its ability to make the relative velocity of the electromagnetic waves c_{rel} – for particles which move at the velocity of light or greater - several times greater than the velocity of the particles themselves, *v*, thus enabling their acceleration above the speed of light. In standard accelerators the relative velocity of waves, $c_{rel.}$ is, in relation to the highly accelerated particle, very close to zero, $c_{rel} \cong 0$. while in a conical accelerator it is $c_{rel.} > 0$, several times over.

The electromagnetic field of a conical accelerator need not be of enormously great power or density since, due to its specific shape, the density of electromagnetic wave - similar to those in nuclear fusion reactors - concentrates and increases the closer it gets to axis *ax*, and consequently, when close to the axis of the electromagnetic field it increases to an very high density. At every point of axis *ax* value od the density of magnetic field Φ_{ax} will increase for the value Φ_0 x $2r\,\pi$. Where the Φ_0 is density of magnetic field onto the surface of coils; r is radius, i.e. distance from coils to certain point onto the axis *ax*.

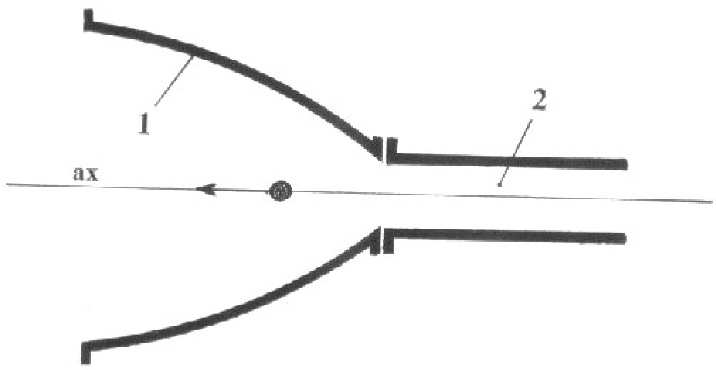
$$\Phi_{ax} = \Phi_0 / mm \cdot 2r\pi \qquad (5)$$

Bearing in mind a certain inertion of the particles it would be necessary, in order to achieve velocities many times greater than the velocity of light, to accelerate them with a battery or row of conical accelerators, the first of which would accelerate the particle to a speed only twice as fast as the speed of light, the second three or four times, the third four, five or six times, and so on.

Paraboloidal supraluminal accelerator

The same effect could be achieved by an accelerator whose axial cross-section that would not be strictly conical and rectiliniar, as the one already shown, but more like a parabola, i.e. similar to a parabolic concave mirror. (See Picture 2.) With such an accelerator the ratio between axis *ax* and radius *r* would be continually increasing from the entry into the accelerator to the exit from it - the large aperture of the cone. The velocity of the electromagnetic waves along axis *ax* would increase at the same rate in relation to speed *c* - from a ratio of, for instance, 2:1 to 10:1.or 20:1 In these relations the figure 1 denotes the length of radius *r* and the velocity of light *c*, while figures 2, 10 and 20 denotes the length of the axis *ax* and the number of times the velocity of the wave traveling along axis *ax* exceeds its transversal velocity *c*.

Picture 2.



Picture 2: *ax* - accelerator axis , 1 - wall of the paraboloidal supraluminal accelerator; 2. - tubes of a standard accelerator or cathode tube.

When measuring the achieved velocity of a particle one should bear in mind the existence of theoretical indications whereby a pure vacuum could, with regard to the supraluminal particles, behave as a diamagnetic medium and therefore decelerate them. Ionized particle would cause a change in the density of a magnetic field - precisely because of the supraluminal speed - *exclusively in the space* ***behind*** *the accelerated particle.* The particle moving faster than light would also cause the Cherenkov cone-effect, i.e. conical mantle of “compressed vacuum”, while due to the **acceleration** of a particle the axial cross-section would not be strictly conical - as demonstrated to date by experiments based on the Cherenkov theory - but would instead be more of a cisoidal shape elongated along axis *ax*.

Theoretical possibility

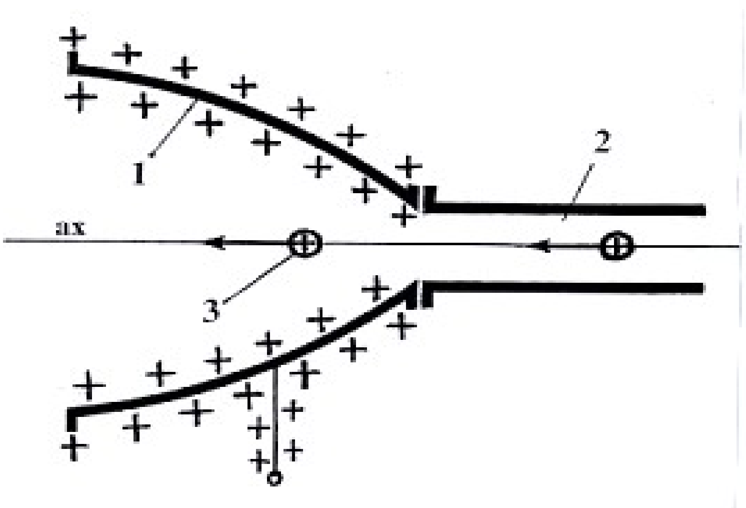
After leaving the field of accelerator, at the *supraluminal velocity*, the space maybe will transform ionized particles into neutral. In addition, because of the same reason, particle moving faster than light could not manifest its electrical or magnetic qualities in the space in front of itself. It could be very important and useful in collision of heavy ions and nuclear fusion.

Additional technical solutions

Electrical, conical and paraboloidal supraluminal, accelerators

Since the electrical field is spreaded in the same, or similar manner as a magnetic field does (shown by picture 1), instead of magnetic accelerators, provided with coils, we are enabled to use electrical accelerators at which the mass of walls, 1 is charged by positive or negative electricity charge or power, as shown by the figure 3. In this, electrical type of accelerators we can also use paraboloidal and conical shape of accelerator and a battery or row of them.

Picture 3



Picture 3: *ax* - accelerator axis , 1 - wall of the paraboloidal supraluminal accelerator charged by positive electrical charge; 2. - tubes of a standard accelerator or cathode tube; 3 – accelerated, positive ion, particle.

How does it functions ?
Supraluminal electrical accelerators are turned on, or charged by electricity, after the charged particle was introduced into the space of conical or paraboloidal accelerators. They are

accelerating the particles by repulsive force along the axis *ax*. Negative charged particles, eg. Electrons, are accelerated by negative charge of accelerator.

Maximal velocity

The largest theoretically possible velocity of accelerated particles at the certain conical or paraboloidal accelerator depends on the ratio between radius *r* and axis *ax*. We can calculate it by the relation:

$$v : c = ax : r, \ldots\ldots v \cdot r = c \cdot ax \qquad (6)$$

$$v = \frac{c \cdot ax}{r} \ldots\ldots\ldots\ldots(7)$$

If that ratio should be 1,6*m* : 0,4*m*, i.e 4 : 1, than would follow:

$$v = \frac{c \cdot 1{,}6m}{0{,}4m} \qquad (8)$$

$$v = 4c \qquad (9)$$

Maximal, theoretical possible velocity of particles at this accelerator would be 4*c*

At which velocity an acceleration of the particle is falling to zero?

It depends of the ratio between the radius *r* and axis *ax* If the ratio is, eg. 1 : 4 , acceleration of particle will fall to zero close the velocity *4c.*That is in accordance with equation based in Lorentz transformation.

$$a = \frac{F(1 - v^2/4c^2)}{m} \qquad (10)$$

If we want to continue acceleration, or increase velocity we can not do it by increasing the accelerative force than rather by increasing ratio between *r* and *ax*. If that ratio should be: eg. 1 : 7 the acceleration of particle will fall to zero close to velocity *7c.* In that case, (case of ratio 1 : 7) maximal theoretically possible velocity also will be slightly less than *7c*

General equation is as follow:

$$a = \frac{F(1 - v^2/nc^2)}{m} \qquad (11)$$

The *n* is ratio between radius *r* and axis *ax*

If the *n* should be to large or ∞, the acceleration will be zero, because in that case the accelerating force would be perpendicular to the line of particles movement.