EVE 12 Dynamics. (revised Feb 2015, Jun 2021. Not yet completed)

It is convenient to make first a short review of the main paradigms of the model related with the forces between material particles:

The model of the aether proposed, asserts that the four fundamental forces recognized by mainstream physics (strong, electromagnetic, weak, gravitation) are implemented by aetherinos that collide with the material particles and give “impulse” to them. In other sections of the model it is shown that:
- The material particles create a redistribution of the aetherinos that collide with them. It can be shown that with the *canonical distribution* of speeds of the aetherinos *of the undisturbed aether* assumed by the model (see http://www.eterinica.net/redistribs_eterinicas_en.pdf), the proposed redistribution of aetherinos created by a material particle does not change significantly when the material particle moves through the aether, as long as its speed is not many orders of magnitude bigger than the speed of light c.
In general, the elementary particles (electron, proton, neutron,…) are assumed to have some internal anisotropous structure that would be the cause that the redistributions of aetherinos created by those particles are anisotropous (meaning that the strength of their redistributions varies with the direction relative to the particle itself by which emerge the redistributed aetherinos.
- The **electric force** is ultimately caused by the redistribution of aetherinos created by the more basic elementary particles.
The particles that according to mainstream physics have a net electric charge are interpreted by the model to be either “elementary” particles that create one of the two basic aetherinical redistributions (positive or negative) or “composite” particles (bound aggregations of several elementary particles) in which there is a non equal number of elementary particles of each type of basic redistribution.
A charged particle, considered as *target* of the force, in presence of the redistribution of aetherinos caused by another particle (considered the source of the force), receives from the direction of this “source particle” either an excess or a deficit of impulsion aetherinos and therefore the target particle suffers a net force**.**
(The *magnetic* force is considered just a special case of the electric force when the interacting charged particles move relative to one another).
- The **strong force** takes place between closely spaced material particles that maintain a given relative orientation of their internal structures and redistributions. The anisotropies of their redistributions play in this case an important role in the forces that they exert on each other. (In the electric force instead it is considered that, in general, the interacting particles have their internal structures and redistributions randomly oriented in space).
- The **gravitation force** is considered a residual effect of the electric forces that two neutral bodies exert on each other. In spite of their charge neutrality the attraction and repulsion forces do not exactly cancel because in all ordinary matter the negative charges (electrons) have a bigger internal speed than the positive charges (protons) and it must be remembered that the strength of the electric force depends, according to the model, on the relative velocity between the particles. See the Gravitation section for more details.
- The **weak force** is caused by the fluctuations in the distribution of aetherinos of the local aether. Since the nuclei of atoms, the atoms themselves and the molecules are quasi-stable systems bound by *aetherinical* forces, it must be recalled that, due to the nature of the aether, those internal bounding forces will be subject to fluctuations (in the number and speeds of the aetherinos relative to the average) of the local aether. Furthermore the material particles suffer also the fluctuations of the local aether from those aetherinos coming from all other directions (not directly assignable to the forces exerted by the other particles).
- To the four fundamental forces recognized by mainstream Physics, the model adds another force: **the aether drag force** that is the slow down force that the aether exerts on the material bodies that

move relative to it. The model (see for example its Section 2) shows that this force is proportional to the speed of the body relative to the aether. But in most cases the material bodies are orbiting other bodies (in either gravitational or atomic orbits) and in those cases the aether drag force is counteracted by the "forward component" of the centripetal force suffered by the orbiting body.

The electric force between two elementary particles (with electric charge) has been modeled in the section "Redistribution of aetherinos" (see for example http://www.eterinica.net/redistribs_eterinicas_en.pdf) relying in:

(a) an hypothesis about how are the aetherinos redistributed by the elementary charged particles and, in particular, an hypothesis about the probability of an aetherino to be redistributed by an elementary particle when it collides with the particle at a given relative speed.
(b) an hypothesis about the impulses given by the aetherinos to the particles when they collide with them and, in particular, an hypothesis about the probability of an aetherino to produce an impulsion-type collision when it hits the particle at a given relative speed.

With those hypothesis, the force F_{AB} that a charged particle A exerts on another charged particle B has been calculated in two particular simple cases. In both cases it has been supposed that the particle A remains at rest in the (rectilinear) reference frame of description while the particle B is moving at a velocity $\mathbf{v}_B$ relative to A. But the rectilinear frame of description (in which A is at rest) does not need to be the aether frame (or frame in which the aether can be considered at rest) but may be moving relative to it at any speed not much bigger than the speed of light (because, as said above, the redistribution of aetherinos created by a material particle does not change significantly when the material particle moves through the aether, at speeds not much bigger than the speed of light c).
In a first evaluation it was calculated, for a given distance between A and B, the force F_{AB} suffered by B when it is moving along the straight line AB (either away from A or towards A). The following figure shows the result of that evaluation of the "*frontal*" force F_{AB} for a wide interval of speeds v_B:

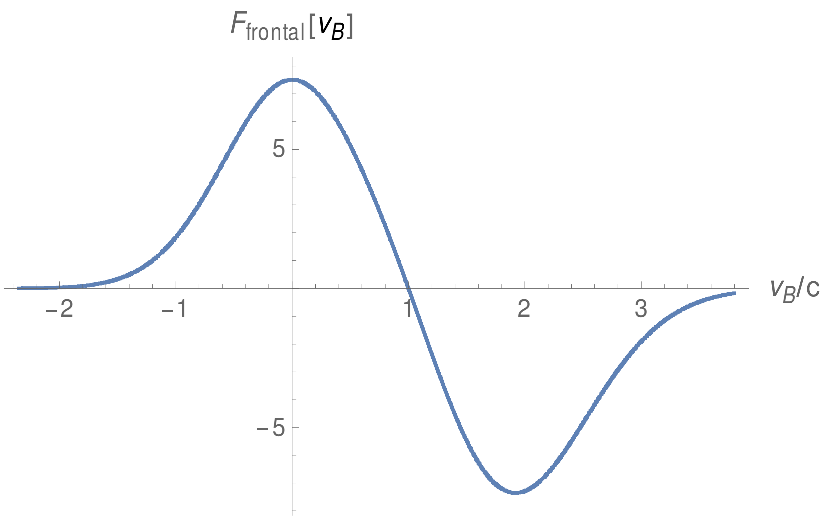

Fig 12-1

The figure 12-1 gives the force exerted by A on B and it must be interpreted that positive values of v_B correspond to B moving *away from* A while negative values of v_B correspond to B moving *towards* A. (Suppose for example that A is at rest at x=0 and B is at the position x=1 (moving either away from A or towards A with a speed v_B) at the epoch in which the force suffered by B is measured).

It can be seen in Fig 12-1 that, for $v_B/c=1$ (i.e. when B moves directly away from A at a speed c), the force F_{AB} is zero. This result implies that particles can not be accelerated in the lab to speeds bigger than c using devices in which the driving force relies on charges "at rest" (or moving at speeds much smaller than c) in the lab. These "non adequate" devices would include emitters of radiation that are at rest in the lab (or more precisely, whose *elementary* radiators are at rest in the lab) if radiation is considered just the effect of an oscillating *electric* force.

In a second evaluation it was calculated, for a given distance between A and B, the component along the direction AB of the force $\mathbf{F}_{AB}$ suffered by B when it is moving "abeam" A, i.e. when $\mathbf{v}_B$ has a direction perpendicular to AB. The following plot shows the result of the evaluation of such component of the "abeam" force:

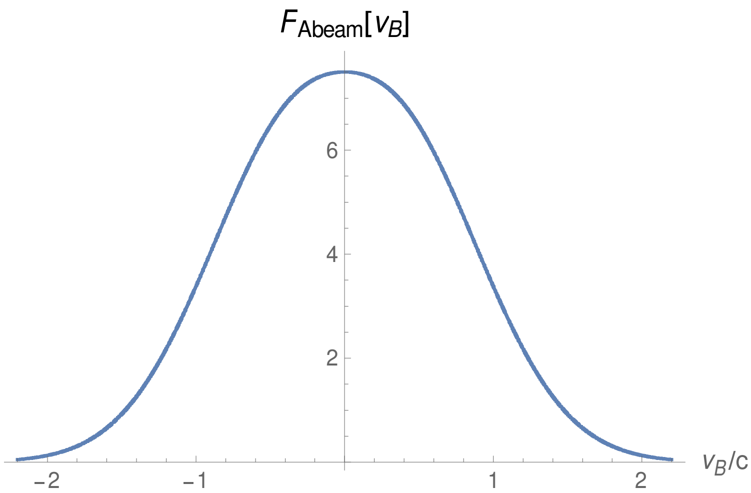

Fig 12-2

The cross sections that implement the hypothesis (a) and (b) (mentioned above) have actually been chosen, between other reasons, so as to predict a frontal force qualitatively similar to that of Fig 12-1, that vanishes at $v_B=c$ (i.e. when the speed of the target particle B *relative to* the source particle A is equal to the speed of light). In the paper *Redistributions* of this model (see http://www.eterinica.net/redistribs_eterinicas_en.pdf) are shown the proposed mathematical functions that could be assigned by hypothesis to those cross sections as well as a deduction of the frontal and abeam forces (between two charged particles) shown in Figs 12-1 and 12-2.

It can be seen that for a given distance AB and for speeds of the particle B (relative to A) not bigger than about c/2, *the frontal force F_{AB} can be approximated by the function*

[12-1b] $$F_{FrontalAprox} = F[0]\,(1-v_B^2/c^2)^{3/2} \qquad (\text{for } -c/2 < v_B < c/2)$$

(where F[0], i.e. the force F_{AB} for $v_B=0$, depends on the parameters of the model, the charges of A and B and on their distance).

In the following figure is represented the function $7.5\,(1-v_B^2/c^2)^{3/2}$ (in red) together with the frontal force (in blue). It can be seen that for v_B in the interval {-c/2, c/2} those forces are approximately the same.

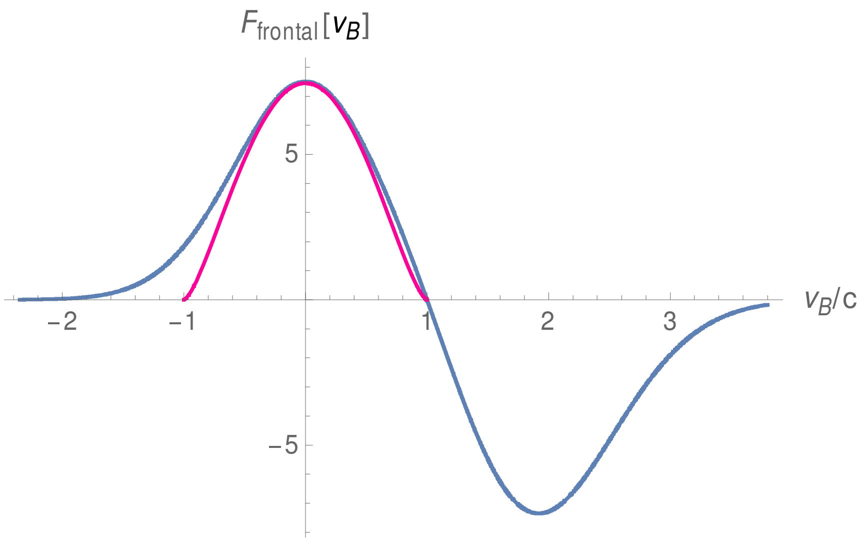

Fig 12-1b

Note: The similitude (in the interval {-c, c}) between the frontal force predicted by the model and the function $F_0\,(1-(v_B/c)^2)^{3/2}$ can be further increased adopting the hypothesis that an elementary charged particle has an impulsion and a redistribution cross section (to collisions with aetherinos of relative speed v_R) of the type σ = a Exp[-b v_R^3] (a and b being constants) instead of the simpler type σ = a Exp[-b v_R^2] which is the function assumed in the deduction of the frontal force shown in Fig[12-1].

It can also be seen that *the so called "abeam force" can be approximated,* for speeds of the particle B (relative to A) not bigger than about c/2, *by the function*

[12-2b] $F_{AbeamAprox} = F[0]\,(1-v_B^2/c^2)^{1/2}$ (for $-c/2 < v_B < c/2$)

(where F[0], i.e. the force F_{AB} for v_B=0, depends on the parameters of the model, the charges of A and B and on their distance).

Notice that the $(1-v_B^2/c^2)^{1/2}$ factor that defines the approximation function [12-2b] is the γ^1 (inverse of the Lorentz factor) widely used in Special Relativity.

In the following figure is represented the function 7.5 $(1-v_B^2/c^2)^{1/2}$ (in red) together with the abeam force (in blue). It can be seen that for v_B in the interval {-c/2, c/2} those forces are approximately the same.

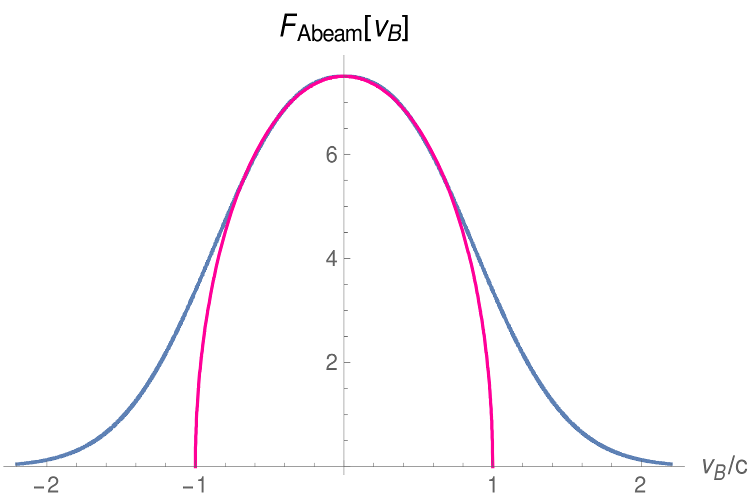

Fig 12-2b

Some simulations have next been made to deduce at any time the position x_B and the speed v_B acquired by a particle B repelled by another particle A that is at rest in the reference frame of description. More precisely, it has been supposed that A is at all times at rest at x=0 and that B is *initially (at t=0) at rest* at the position x_{B0}. The simulation has been done performing a numerical integration of the differential equation that defines the Newtonian movement of a particle that suffers a force.
The (Newtonian) equation of the movement of the particle B is deducible from:

$$[12\text{-}3] \qquad \begin{aligned} \frac{d^2 x_B}{dt^2} &= \frac{F_{AB}}{m_B} \\ v_B[0] &= 0 \\ x_B[0] &= x_{B0} \end{aligned}$$

where the electric force F_{AB} exerted by A on B is approximately given (according to the model. See above the approximation [12-1b] of the frontal force) by:

$$[12\text{-}4] \qquad F_{AB} = \frac{k}{x_B^{\ 2}}\left(1 - \frac{v_B^{\ 2}}{c^2}\right)^{3/2} \qquad \text{for} \quad -c < v_B < c$$

The speed v_B acquired by B at a sample of distances x_B from A has been calculated (with numerical integration of the differential equation) and it has been observed that:

(1) The work W done by the force F_{AB} (given in Eq[12-4]) moving the particle B from its initial position x_{B0} and initial speed v_{B0}=0 to a position x_B (in which its speed has a value v_B deduced from [12-3]), is quantitatively equal to

$$[12\text{-}5] \qquad W \equiv \int_{x_{B0}}^{x_B} F_{AB}\, dx_B \;=\; \frac{m_B\, v_B^{\ 2}}{2}$$

which is the result to be expected in the Galilean-based description adopted by Newtonian mechanics and by this model. This result can be expressed saying that if, in accordance with classical mechanics, one calls "kinetic energy" of the particle B to the expression $K = m_B/2\ v_B^2$ then the work done by a force that acts on the particle B is equal to the variation of its kinetic energy.

(2) If one calls (perhaps unwisely, in this scenario of speed-dependent forces) "potential energy" of the particle B (or more precisely, of the system A+B) to the classical expression:

$$[12\text{-}6] \qquad V = k/x_B$$

therefore assuming that the variation of the potential energy of B when changing its position from x_{B0} to x_B is given by:

$$[12\text{-}7] \qquad \Delta V = k\,(1/x_B - 1/x_{B0})$$

it happens that *the speed* v_B acquired by B at the position x_B when moved by the actual force [12-4] (and not by the force k/x_B^2 believed in mainstream electromagnetism to be acting) is such that calling (unwisely) *kinetic energy of the particle* B to the expression:

[12-8] $$K = m_B c^2 \left(\frac{1}{\sqrt{1 - \frac{v_B^2}{c^2}}} - 1 \right)$$

then it happens that the sum of those two (unwisely called) magnitudes is conserved, i.e:

[12-9] $$\Delta V + \Delta K = \text{constant}$$

i.e. the sum $\Delta V + \Delta K$ is conserved at whatever distance x_B (being $\Delta V+\Delta K = k/x_{B0}$ in this example [12-3,4]).

It is important to note that the expression [12-8] is the same expression that the *theory of Relativity* assigns to the kinetic energy of a particle and that this expression of K has been reached without invoking Lorentz's transformations (nor any contraction of space or dilation of time,…) but working instead in the framework of Galilean's relativity.

To be continued.