A Solution for the "Dark Matter Mystery" based on Euclidean Relativity

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The study of this article suggests an explanation for the "dark matter mystery". This explanation is based on a modification of Newton's law. This modification is conducted from an Euclidean vision of relativity. Concerning the mystery of the velocity of the stars inside a galaxy, the study calculates a theoretical curve which is different from the one obtained using Newton's law. This theoretical curve is very close to the measured one. Concerning the mystery of the velocity of a galaxy inside its group, the explanation is more direct. For this mystery, the study calculates a greater value for G, the gravitational constant.

1. Introduction

This article aims to address an issue yielded by general relativity, which may be explained by "global space's shape determination". This absolute space-time is general relativity space-time, and this space deformation in space-time must be in conformity with Newton's law at least for long distances.

The adopted point of view is an Euclidean relativity. An Euclidean mathematical context is used, with 4 dimensions (three of space, x, y, z, and one of time: ct). This is for restricted relativity. For general relativity of course we use the same and we extend it overall with a tensor. Except that here locally it is an *Euclidean* metric used to represent space-time.

Within this mathematical framework the physics principles are exactly those of relativity: isotropy of space, inertial frames of reference with reciprocities between those inertial frames, constancy of the speed of light in each inertial frames, moving from restricted relativity to general relativity by covariance along the geodetic trajectories of the inertial frames, etc… This for the restricted version, and of course for the general one: deformation of space-time by energy, expression of a force (gravitational …) by a space-time deformation.

There exists however a difference in the physics principles, between relativity and our approach. Indeed, constancy of space-time distance is not an aim, in a global representation of space-time. We do not use Minkowski's representation, and the Lorentz's invariant length is left off.

The method consists to postulate first that Lorentz's equations are simply a consequence of a space-time deformations by energy. In other words we try to express the general relativity "deformation" principle, in the context of restricted relativity.

Once this is done, physics inconsistencies are found. Of course we try to elude them. This leads to finally postulate the existence of indivisible particles, from which matter is made of. Back to our first postulate, we find a space time determination, coherent with Lorentz's equations. This will be our final determination of the shape of the global space inside space-time.

2. Retrieving Lorentz's Equations

Lorentz's physical context is used. Let us point it out. There are two inertial frames, R (O, x, y, z, ct) and R' (O', x', y', z', ct'), in uniform rectilinear motions at the v speed one compared to another, along Ox axis. X is increasing along Ox axis. Here, only x dimension, ct, and x', ct', are important. At $t = x = 0$ there is also $t' = x' = 0$.

In order to find Lorentz's equations within this physics framework, and since our representations are Euclidean, it is necessary to suppose that $O'x'$ axis rocked with an α angle compared to Ox axis, with $\sin(\alpha) = v/c$. See figure 1. In the same way it is necessary to have O' coordinates equal to: ($x = vt$, and $ct = v^2 t/c$).

Conversely under these conditions the reader will be able to calculate that Lorentz's equations are found.

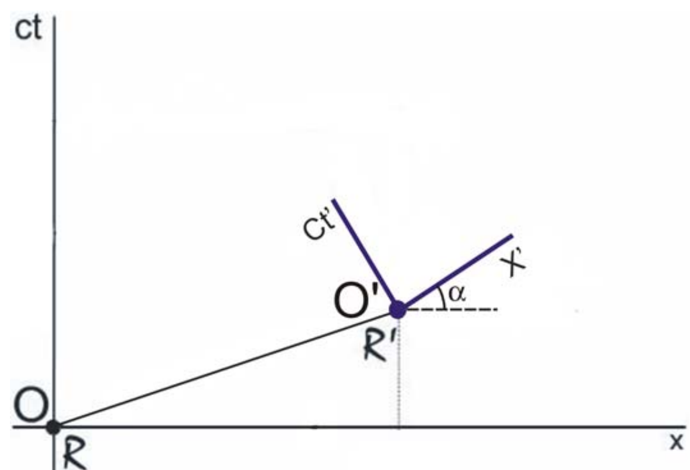

Fig. 1. Lorentz's equations in the context of Euclidean relativity

On the basis of this Euclidean model of restricted relativity, we are tempted to suppose a coherent physics postulate. This postulate is the following.

Postulate 1. *Any particle with a non null mass m, moving with v speed along Ox axis, x increasing, compared to an inertial frame R (O x y z ct), deforms space-time around it with a rotation of the 0x-0ct plan around the 0y0z axis, with an* α *angle between Ox and Ox', such as* $\sin(\alpha) = v/c$.

During the displacement of this particle from O to $A(x=vt,\ ct)$,*a vacuum appeared inside space-time. The location of this vacuum is the (O, O', H) triangle, such as: O' coordinates are* $O'(vt,\ v^2t/c)$, *H coordinates are* $H(vt, 0)$.

In the borderline case of a photon, with $v = c$, the swing becomes maximum: $\alpha = \pi/2$, and the vacuum is the *(O, A, H)* triangle.

Figure 2 below represents the effect of postulate 1. A *P* particle is moving at *v* speed in the inertial reference frame *R*, parallel to *Ox* axis, and in the direction of *x* increasing. At the *t* instant, the particle is located coordinates *x* and *ct* in *R* (*A* point). The inertial frame *R*' centered on *O*' "is attached" to the particle. Hence *R'* is also moving uniformly along *Ox* axis. It is the same case as the one of figure 1, except that here exists the *P* particle on *A* point. On figure 2, the space line rocked with the α angle, locally in *A*.

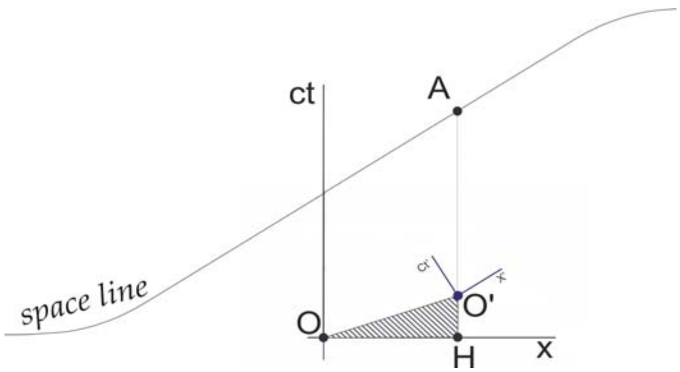

Fig. 2. Postulate 1

On the other hand, far from *A* point this line of space is parallel to *Ox* axis. This is indeed the only realistic possibility! It is difficult to imagine the movement of a particle deforming the entire universe this way along *Ox* axis.

With this postulate, the equations of Lorentz now express a local deformation of space-time, caused by the energy of the moving particle (postulate 1 above). This respect of Lorentz's equations is only *local* to the particle. In other words this respect is done only for *low values* of *x*' and *ct*' (and also for *R'* such as *O'* is close to *A* at the *t* instant).

It will be noticed that this "re-discovery" of Lorentz's equations works thanks to the positioning of *O*' (thus the positioning of *A*) indicated previously ($\left(vt, v^2t/c\right)$ for *O'*). It is known that this position of *O'* explains, noticeably, the asymmetry of the twin paradox of relativity. This position corresponds to a real "vacuum" which appears in space-time. In addition it works thanks to the space-time swing indicated in the postulate above. This swing modifies with the $cos(\alpha)$ ratio, equal to $\sqrt{[1 - sin^2\alpha]} = \sqrt{[1 - v^2/c^2]}$, each temporal values (in *ct*) and space (in *x*). However this swing is only local, not global. Restricted relativity is retrieved with the help of a simple deformation of space in space-time.

Nevertheless, it is necessary to distinguish position of space in space-time, on one hand, and representation of space-time in such or such reference frame, on the other hand. Indeed, space line in space-time became deformed only locally to the particle. It allows localizing space-time events in a comprehensive but complicated view. This vision is complicated because space-time is not Euclidean any more but Riemannian with an Euclidean local base. Thus space lines have the shapes of curves and are no more simple straight lines like *Ox* axis. Otherwise *O*'*x*' and *O'ct'* axis are straight lines. They represent space-time locally but does not represent it overall any more. Broadly the representation of space-time which is done by the inertial frame *R*', allows to see space-time in a "legal" way in the sense of relativity. This representation is the only one respecting, *locally*, the physics principles of restricted relativity: in particular the constant speed of light in each inertial frame.

3. Luminous Points

However at this stage a problem of coherence arises since a particle is constituted of smaller particles. Indeed, how to ensure that space-time deformation generated by the movement of a big particle, composed by a heap of smaller particles, can rise from the deformations of these smaller particles?

To ensure this coherence a solution consists in supposing that matter is made up of a restricted group of very small "indivisible" particles. These small particles must be conceived in such a way that they can explain space-time deformations generated by any other composed particle. For this explanation a simple operation must calculate the final deformation generated by the large particle, from the small particles it is made of.

Thus defined, this operation must allow, by construction, calculation of the shape of absolute curves of space, starting from the positions and energies of these "small indivisible particles". At the same time, this operation must be, of course, compatible with postulate 1 and Lorentz's equations.

From there the second postulate arises, which follows.

Postulate 2. *Each particle consists of a certain number of smaller particles, called the "luminous points". These "luminous points" are moving constantly at the c speed, inside the first particle, and with respect to any inertial frame of reference.*

From this postulate it is possible to determine in a single way any deformation generated by any particle. For that, we apply postulate 1 to these "luminous point" particles. For these luminous points the α angle is equal to its limit value $\pi/2$. The shape of space is thus at any moment the result of successive combinations of these small deformations caused by all these "luminous points".

What remains to be specified is the way of combining those various deformations. This will be specified by the postulate 3 which follows. After that, it will possible to check that the α angle calculated from postulates 2 and 3 is well given by the formula of postulate 1. For that let us return to Lorentz's equations. A first mathematical observation is essential. The energy conservation equations of restricted relativity are found by quantifying the luminous point trajectories lengths, inside *P* particle. It is what we will see.

The particle attached to the *O*' point is modelled as consisting of only one luminous point. Consequently the obtained model is the one described by figure 3. It can be checked that the reasoning remains valid in the general case of a particle made up of several luminous points.

When the *P* particle moves from *O* point (on the figure) to *A* point, along *OA* segment, the luminous point contained follows a trajectory having a "V" shape, that is: **1)** First stage: displacement at the speed +*c* along *Ox*, (milked in fat on the figure). **2)** Second stage: displacement at the speed -*c* along *Ox* (milked in fat on the figure). For the first stage, L_1 is the displacement length, and

L_2, (positive), is the displacement length of the second stage. If x is the position of the A point, we can write: $x = vt = L_1 - L_2$. This x position is also the coordinate of P in R at this time t. Indeed at this time t, in R, the position of P coincides with A point.

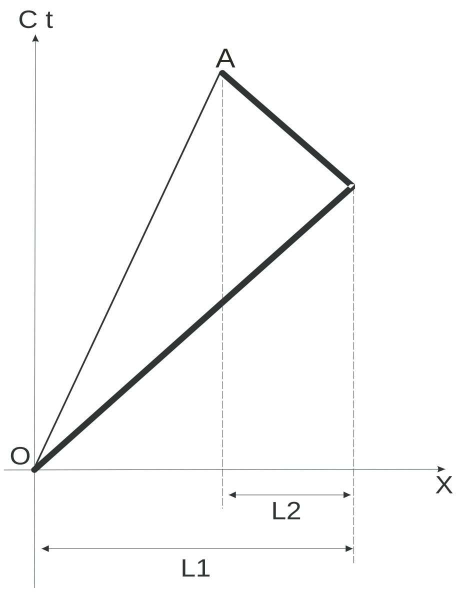

Fig. 3. Luminous point trajectory in a moving particle

Hence:

$$ct = L_1 + L_2 \qquad vt = L_1 - L_2 \tag{1}$$

$$\frac{(L_1 + L_2)^2}{2} = \frac{(L_1 - L_2)^2}{2} + 2\,L_1\,L_2 \tag{2}$$

This last equation is nothing more than relativistic equation of energy:

$$E^2 = E_c^2 + E_m^2 \tag{3}$$

with $E = mc^2/\sqrt{1-v^2/c^2}$, $E_c = mvc/\sqrt{1-v^2/c^2}$, and $E_m = mc^2$. To obtain the equivalent equation for the energy densities, each term of this equation is divided by the value $(L_1 + L_2)^2/2$ which is the value of the total energy of the particle:

$$1 = \frac{(L_1 - L_2)^2}{(L_1 + L_2)^2} + oper(L_1,\, L_2)^2 \tag{4}$$

with

$$oper(L_1,\, L_2) = \frac{2\sqrt{L_1\,L_2}}{L_1 + L_2} \tag{5}$$

The introduced operator is the relationship between the algebraic average and the arithmetic mean. It is equal to the relativistic coefficient $\sqrt{1-v^2/c^2}$. Finally, this last study of Lorentz's equations led us to define an operator. We will use this operator to postulate, finally, the mode of determination of general relativity absolute space-time. By construction, this determination will be compatible with restricted relativity.

4. Relativistic Operator

This is done by the following postulate. It only generalizes the previous observation done about Lorentz's equations.

Postulate 3. *Space shape in space-time is given at any point by the ratio of the infinitesimal space lengths, ds along space line, and dx its length projected on Ox axis. This ratio is equal at any point to the relativistic operator applied to the two following values:*

L_1 *: sum of the heights of vacuum of space-time deformations propagated in Ox direction, x increasing,*

L_2 *: sum of the heights of vacuum of space-time deformations propagated in Ox direction, x decreasing.*

That is to say:

$$\frac{dx}{ds} = \frac{2\sqrt{L_1\,L_2}}{L_1 + L_2} \tag{6}$$

where L_1 and L_2 are the 2 above-mentioned sums.

This operator is neither linear nor associative. But this doesn't matter since it is calculated once, at any point of space. But it must be checked that this operator yields the same result when calculated in different inertial frames. That is to say that, for postulate 3, the choice of the inertial frame has no incidence on the final calculated space's slope. This is the case because of the constancy of the speed of light through Lorentz's transformations. It can be also proven by direct calculation.

It is written above that L_1 and L_2 are the sums of the heights of vacuum of the "propagated deformations". It is necessary to describe how these "space-time deformations" are propagated. The mechanism is very similar to waves propagated by the movement of a boat over a water surface. Let us consider Figure 1. The initial deformation relates to the *Ox-Oct* plan. The propagations of this deformation in space-time are carried out on remaining space dimensions, i.e. *Oy* and *Oz*, more generally on any *Or* direction, half-line based on *O* and contained in the *Oyz* plan. The form of these *propagated* deformations is each time exactly the same as the *initial* deformation. The initial deformation was done on *Ox-Oct* plan (space-time swing represented figure 1). Now the propagated deformation is the same but it relates to the *(Ox+Or)-Oct* plan in place of *Ox-Oct* plan. The height of this propagated deformation attenuates progressively as r increases. The attenuation law, *g*, will be given further. At each moment, the "luminous point" thus emits this deformation. Therefore, like in the case of the boat, the finally overall propagated deformation is the envelope of all these propagations of deformation. (In the case of a boat this envelope has a "V" shape which is the final shape of these waves over the water surface).

Above, the initial deformation of space-time is connected to the existence of a "space-time vacuum". What does become of this vacuum during the deformation propagation? It is propagated too. It relates to *3* dimensions *y*, *z*, and *ct*. Finally the L_1 sum is calculated for all the propagated and received deformations. Each of these deformations is generated by a unique luminous point. A unique deformation dl_1 received is such as $dl_1^2 = k\, d^2V$ where k is a constant and d^2V the vacuum propagated with the space-time deformation. The same holds for L_2, except that the deformations come from the opposite sense of propagation (on the same axis).

Let us study the overall result of all the propagated deformations which are received in the same *M* point at the same moment. The postulate 3 above expresses the length ratio along Ox axis only. But at one M point there are numerous such directions coming to. Hence it is necessary to calculate the relativistic operator of postulate 3 for each space direction. The final deformation is then obtained. The only question is: "What is the mode of contribution of the deformations of all these directions in order to obtain the result?" This result will be the resulting space-time deformation at M point. It will be thus necessary to generalize the above operator with a second more generic operator, which will take into account each space directions. The result given by this second generalized operator must be the famous final space-time deformation at M point. It will be probably useful to use a mathematical base like the quaternion for that. In this article this complexity will not be seen because fortunately not necessary.

We thus found relativity starting from postulates 1, 2, and 3. The α angle of the postulate 1 rotation is calculated, by applying postulates 2 and 3. Overall, we obtained a way for calculating space shape inside space-time. We can now study Newton's law.

5. First Modification of Newton's Law

The studied case is a particle of mass M isolated in a space filled uniformly with an energy density constant and weak in front of M. The particle coordinates are $x = y = z = 0$, which are those of the O point in our usual inertial frame R of reference. The studied case being invariant by any rotation of center O, only the Ox axis with $x>0$, and the axis of times Oct, are important.

How does evolve the local slope $tan(\alpha)$ of space, along Ox axis? The postulate 3 above is applied. Let us consider a space-time P point to which comes at least one deformation from a luminous point pertaining to the M mass. We suppose P x-coordinate positive strict that is $x > 0$. The M mass particle propagates on P point the following deformations, with propagation directions given:

$$L_{1m} = g(x) \quad x \text{ increasing} \tag{7}$$

$$L_{2m} = 0 \quad x \text{ decreasing} \tag{8}$$

There is an attenuation function given further for the first equation, and no deformation propagated in the direction of x decreasing, coming from M, because $x > 0$. The surrounding universe with constant energy density propagates on P point the following deformations, with propagation directions given:

$$L_{1u} \quad x \text{ increasing} \tag{9}$$

$$L_{2u} = L_{1u} = L_u \quad x \text{ decreasing} \tag{10}$$

because space-time is assumed isotropic. Hence:

$$L_1 = L_{1u} + L_{1m} = L_u + g(x) \tag{11}$$

$$L_2 = L_{2u} + L_{2m} = L_u \tag{12}$$

$$\frac{dx}{ds} = oper(L_u + g(x),\ L_u) \tag{13}$$

which is an application of postulate 3. After calculations:

$$\cos(\alpha) = \frac{dx}{ds} \cong 1 - \frac{g(x)^2}{8\,L_u^2} \tag{14}$$

In addition let's apply the formula of the expression of a force, to an m mass moving. The traditional relativistic equation is the following one:

$$F = \frac{mv\dfrac{dv}{dx}}{(1-\dfrac{v^2}{c^2})^{3/2}} \tag{15}$$

This is a very classical relativity result. Now let us take the case of a particle with a negligible mass at rest. It is with this particular case that is applied the principle of general relativity: the trajectory of this particle will follow a space-time geodetic. Moreover, if the particle is located infinitively far at $t = 0$, then we have, for any x, $v = c\tan(\alpha)$, where α is the slope angle of the curve $ct = f(x)$ required. This curve is the searched space curve. From where:

$$F = mc^2\,\frac{\mathrm{d}\tan(\alpha)}{\mathrm{d}x}\,\frac{\tan(\alpha)}{(1-\tan^2(\alpha))^{3/2}} \tag{16}$$

For x large, $F = -mMG/x^2$, which is Newton's equation. After calculation, we have, for x large:

$$g(x) = L_u\sqrt{\frac{8R}{x}} \tag{17}$$

with

$$R = \frac{MG}{c^2} \tag{18}$$

This equation (17) can be justified from a physical point of view, using the model of this document, and conservation of space-time propagated vacuum. However, in this document, the possible justifications of this assumption will be left off, and only its consequences will be studied. We will now postulate that this equation (17) is correct not only for long distances but for any values of x. Therefore, now we can modify equation (16), with the help of equation (13), and equation (14), and the help of equation (17) which is now supposed always correct.

After calculations, the Newton's law is corrected, but this correction appears for relativistic values only ($v = c\tan(\alpha)$ close to c). Those values appear for short distances, that is, for stars in the vicinity of the galactic center.

6. Star Speed Mystery

In order to obtain the explanation of the stars speed in a galaxy it is necessary to take into account these stars masses. For this, the P point is supposed located in the middle of these stars i.e. inside the studied galaxy. We will approximate that the deformation propagated by these stars and received in P is roughly proportional to the matter density of surrounding stars around P. We will suppose that this density of matter in a galaxy evolves following a $1/x^2$ law. (x is the distance from the galactic center). It is possible to add this additional term to L_{1u} (equation (9)). The surrounding stars propagate on P the following deformations:

$$L_{1s} = L_{2s} = \frac{q}{x} \tag{19}$$

where q is a constant.

Hence, a matter density following a $1/x^2$ rule implies that the corresponding symmetric contribution $L_{1s} = g(y)$ follows a $1/x$ rule. (y is the distance between P and a studied star, g is the function of equation (17)). The expressions of the quantities of deformations L_1 and L_2 received in the P point become, written in a homogeneous way, and using the preceding result:

$$L_1 = L_u\left(1+\frac{r}{x}+\sqrt{\frac{8R}{x}}\right) \quad (20)$$

$$L_2 = L_u\left(1+\frac{r}{x}\right) \quad (21)$$

With $R = MG/c^2$, and M is the mass of the galactic center. r is the ray from which the gravitational effect of surrounding stars is noticed. We get a ratio of received "asymmetrical" propagations to received "symmetrical" propagations:

$$e = \frac{\sqrt{\frac{8R}{x}}}{1+\frac{r}{x}} \quad (22)$$

$$\cos(\alpha) = oper(L_1, L_2) = \frac{\sqrt{1+e}}{1+\frac{e}{2}} \quad (23)$$

$$F = mc^2 \frac{\mathrm{d}\tan(\alpha)}{\mathrm{dx}} \frac{\tan(\alpha)}{(1-\tan^2(\alpha))^{3/2}} \quad (24)$$

$$v = \sqrt{\frac{F\,x}{m}} \quad \text{(Centrifugal force)} \quad (25)$$

This "new Newton's law" (expression of F, equation (24)) is complicated. It can be calculated by computer. That is done in [4], and yields figure 4. The red curve (down) represents the evolution of the calculated speed v. It uses: $r = 1$ *kpc*. This value has been adjusted in order to obtain the best possible red curve. It uses the Milky Way value for the galactic center mass. X-coordinate represents, in meter, the distance between the star and the Milky Way center (minus 1 *kpc* $= 3\ 10^9$ m). It varies between *1* and *15 kpc*. The ordinate, y, represents the speed, in meter/seconds.

The blue curve (top) represents the speed resulting from traditional Newton's law.

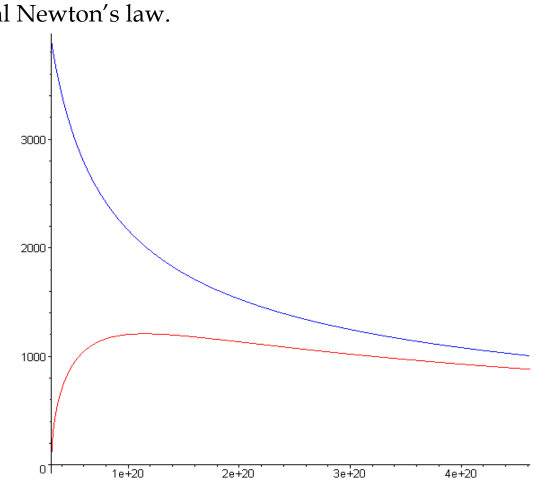

Fig. 4. Theoretical speed profile for the stars in a galaxy, calculated with a $1/x^2$ matter density curve

The variation of the speed of stars in a galaxy is explained. Hence we retrieve the global shape of a galaxy speed profile.

More precisely, a program calculating the NGC 7541 speed profile yields the following curve (Figure 5).

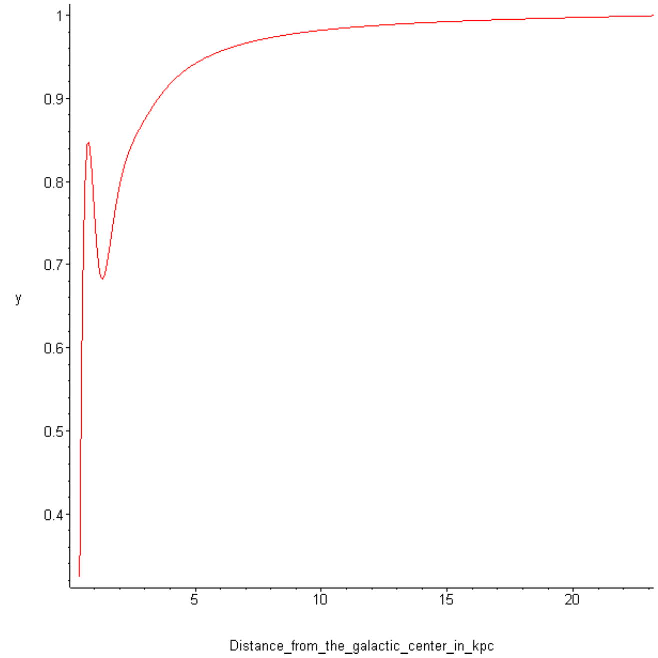

Fig. 5. Theoretical speed curve of the NGC 7541 galaxy

This curve has been computed in [5], by using the matter density profile available in [2]. The corresponding measured speed profile of NGC 7541 is also found in [2]. The shape of this measured curve is the same as the theoretical curve of Figure 5.

X-coordinate is in *kpc*, and y ordinate is a relative speed. The speed value scale has been fitted and speed values have been increased with a fitted constant value.

For some galaxies, it is possible to calculate the exact values of the theoretical speed, for the maximums of the speed profiles. For NGC 3310, the measured value in [1] for the first maximum is around *175 km/s*. The corresponding theoretical value is in the range *[20, 700] km/s*. For NGC 1068, the measured value in [1] is *210 km/s*, the theoretical value is *80 km/s*. For these calculations, the masses of the galactic centers are equal to *0.7 10^10* sun mass and *10^10* sun mass, for NGC 3310 and NGC 1068, respectively, and the extragalactic gravitational constant is supposed to be *10* times greater than the normal one.

7. Galaxy Speed Mystery

Let us study now the case of galaxy groups. We suppose that they are moving around each other, like in the Coma or Virgo galaxy groups.

From the above equations we have, after calculations:

$$G = \frac{c^4}{\left(\sum_p \sqrt{\frac{8e_p}{x_p}}\right)^2} \quad (26)$$

This sum is done for each luminous point, p, along an infinite half-line. This half-line is centered on the location in which we want to calculate G. ep is the energy of each luminous point. xp

is the distance of each luminous point from the location in which we calculate G. Let us write:

$$S_i = \sum_p \sqrt{\frac{8e_p}{x_p}} \qquad S_o = \sum_p \sqrt{\frac{8e_p}{x_p}} \tag{27}$$

Si is for the luminous points *p inside* the Milky Way. *So* is for luminous points *outside* the Milky Way. Then for our case, inside the Milky Way, we can write:

$$\sum_p \sqrt{\frac{8e_p}{x_p}} = S_i + S_o \tag{28}$$

Now for the studied case, which is *outside* any galaxy:

$$\sum_p \sqrt{\frac{8e_p}{x_p}} = S_o \tag{29}$$

If we note G' the G constant located outside any galaxy:

$$\frac{G'}{G} = \frac{(S_i + S_o)^2}{S_o^{\,2}} = (1 + \frac{S_i}{S_o})^2 \tag{30}$$

For example, if we need *10* more mass in order to explain the measured galaxies speeds, then we deduce $G'/G = 10$, and $Si/So = 2{,}1$. Let us approximate very roughly in order to appreciate this value. If we note $Si = \sqrt{[8ei/xi]}$, and $So = \sqrt{[8eo/xo]}$, (with *ei*, *xi*, *eo*, and *xo* the corresponding "pin pointed" energies and distances corresponding to those *Si* and *So* sums) then we have:

$$\frac{e_i}{x_i}\frac{x_o}{e_o} \cong 5 \tag{31}$$

This value order represents the energy ratio, divided by the distances ratio, between the Milky Way, and the outer space, and along a half-line. (This half-line might be represented physically by an infinitely small solid angle). Therefore, this ratio corresponds also to a ratio of linear matter density, along a solid angle, between the two cases (Milky Way and outer space). Of course this linear matter density is much greater inside the Milky Way than in the outer space. A ratio of "5" for this seems possible at "first glance".

Therefore our modelling of relativity explains the "dark matter" mystery for the velocity of the galaxies inside a heap of galaxies. Also, this explanation is the same for the mystery of light beam deviation in the vicinity of a galaxy.

8. Conclusion

As a conclusion, this new modelling of space-time retrieves general and restricted relativity. Nevertheless, it is more than a simple Euclidean version of relativity, as shown by postulate 1 and 2.

It is enough to add a 3rd postulate in order to explain "dark matter mysteries", which are: **1)** star's speed inside galaxies, explained by our Newton's law correction, **2)** speed of the galaxies themselves, inside their group, and deformation of light trajectories in the vicinity of a galaxy. Overall, this third postulate conducts a modification of Newton's law. This modification is conceived in order to find exactly Newton's law in the specific case of pin pointed masses inside an homogeneous universe, and long distances. However, immediately a correction of Newton's law is noticed in the case of short distances. This first correction occurs in fact for relativistic speed.

Nevertheless, the important result of this correction of Newton's law occurs when the galaxy's stars are introduced in the model. After this, a strong difference appears between the calculated force and Newton's law. The shapes of the star speed profiles, obtained with this corrected Newton's law, are very close to experimental measurements. The speed values can be calculated also and are close to the measured ones. That is for "stars speed dark matter" mystery.

For the other "dark matter" mystery, which concerns the case of galaxy groups, the explanation is more direct. This is explained by a different value of G, between our case inside the Milky Way, and the case outside any galaxy. Here again, the "third speaker", which decreases the G constant, is the stars of our galaxy.

That is for the practical results yielded by this modelling. Moreover, and from a theoretical point of view, this study finds a way for space-time determination. At any point in space-time, this determination is based upon the matter density distribution through the whole universe.

It remains also to check if the model described in this article is coherent with other actual physics theories (electromagnetism, quantum mechanics, etc). As an answer to this last question one will notice that this model is in conformity with a unifying theory called "physics theory of the three elements". [3]

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