# AN ALTERNATIVE TO THE HIGGS FIELD MASS GENERATION MECHANISMBASED ON A DIPOLE WAVE PRESSURE MODEL

POLICARPO Y. ULIANOV

**Abstract.**

This paper is based on John A. Macken´s proposal [1], that the universe is only spacetime. In the context of Quantum Mechanics, Macken defines the spacetime dipole wave (DW) model, where spacetime can be seen as a sea of energetic waves, traveling at light speed.

From this model, the DW pressure (~ $10^{113}$ J/m$^3$) is analyzed in the context of the kinetic gas theory and so DW pressure is used to define a fundamental particle, named by the author as a Ulianov Hole (uhole).

Auhole can be related to an elastic tube connecting two regions of space (or time), generating variations inDW pressure. Two kinds of uholes are presented in this paper: the spatial uhole (uhole-S) that has a property related to mass; and the time uhole (uhole-T) that has a property related to electric charge.

This paper presents a basic analysis of the uholes-S model, that can explain themass generation mechanism of elemental particles, without using the Higgs field model.

The uhole-S has two ends, one related with matter and the other with antimatter. And so, a mass particle is formed when one uhole-S is stretched enough toavoid an annihilation process.

The uhole-S model also relates mass particles to the behavior of micro black holesthat reduce the DW pressure. This model also explains mass attractionforce (gravitational mass) and the resistance of mass movement in space (inertial mass), enabling the deduction of some of Newton's Laws.

## 1 – Introduction

In the book "The Universe is Only Spacetime" John Macken develops a number of theories to explain how our universe works, based on two assumptions [1]:

- *Basic Assumption: The universe is only spacetime.*
- *Second Assumption: Dipole Waves in spacetime are permitted by the uncertainty principleprovided that the displacement of spacetime caused by the dipole wave does not exceedPlanck length or Planck time.*

The Dipole Waves (DW) defined by Macken, in the context of Quantum Mechanics, can be seen as a sea of energetic waves, traveling at light speed [1]:

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2010 Mathematics Subject Classification. 00A69

Keywords: Mass Generation, Dipole Wave Pressure Model

> *"Spacetime: The New Ether? If the universe is only spacetime, it should not be surprising that spacetime is ultimately responsible for all of physics. The description of spacetime offered here is a combination of the energetic vacuum fluctuations described by quantum mechanics and thegeneral relativistic description where spacetime can be curved and time is the fourthdimension. Ultimately energetic spacetime even performs the functions previously attributedto the ether. However, spacetime is much more subtle than the antiquated description of theether. There is no detectable motion relative to spacetime because spacetime is a sea ofenergetic waves which are always forming new wavelets and all of this is propagatingchaotically at the speed of light…*
> *The quantum mechanical model of spacetime has a sea of high frequency, small amplitudevacuum fluctuations at Planck energy density ~ $10^{113}$ $J/m^3$."*

Although Macken could not pinpoint exactly what DWs are, he lists some of their basic properties [1]:

> *"Properties of Dipole Waves in Spacetime: It is important to also understand that dipole waves in spacetime travel at the speed of light but they do not freely propagate like photons orgravitational waves. Since dipole waves affect the rate of time and the proper volume, theyinteract with each other. Here are some other proposed properties of dipole waves in spacetime that are presented here in summary form:*
> *1) Every part of a dipole wave in spacetime becomes the source of a new wave (called awavelet).*
> *2) These wavelets propagate in all directions.*
> *3) The addition of wavelets tends to constructively interfere predominately in the forwardand backward propagation directions of the previously existing wavefronts.*
> *4) These wavelets explore an infinite number of possible trajectories to achieve an*
> *amplitude sum at any point (intensity is amplitude squared).*
> *5) This is proposed to be the physical explanation that is being modeled by Richard*
> *Feynman's path integral."*

From the basic DW model proposed by Macken, the author of this paper developed a model based on the kinetic gas theory. In this model, pressure variations in the DW sea, can be identified as the mass origin of matter particles and also the origin of inertia, as presentedin this paper.

## 1 – Dipole waves and the kinetic gas theory

Although Macken compares Dipole Waves in spacetime toa super fluid liquid, a very interesting analogy can also be obtained from the kinetic gas theory [2].

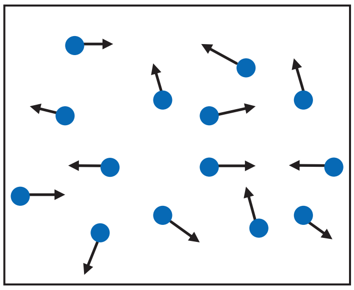

Figure 1 – Gas molecules in a closed volume.

Figure 1 shows a basic example, where gas molecules travel at different speeds. The molecules bounce off the walls, generating forces on the them, that can be seen as pressure $P$, calculated as:

$$P = \frac{N}{V} m \frac{1}{3} \overline{v^2} \tag{1}$$

Where $N$ is the number of molecules, $V$ is the box volume, $m$ is the molecule mass, and $\overline{v^2}$ represents the average squared speed, over $N$ molecules.

To relate one DW to a gas molecule, we can consider that the DW speed is equal to light speed, hence:

$$\frac{\overline{v^2}}{3} = c^2 \tag{2}$$

Note: The constant value of 3 in equation (1) comes from the formula: $v^2 = v_x^2 + v_y^2 + v_z^2 = 3v_x^2$. However, for $v_x^2 = v_y^2 = v_z^2 = c^2$, the value $v^2 = c^2 + c^2 + c^2$ is not 3 times that of light speed, and so, from special relativity the value of $v^2$ remains equal to $c^2$, hence the constant value of 3 does not appear on the right side of equation (2).

One DW occupies a volume equivalent to a small cube with Planck Length ($l_p$) dimension, and so the maximum number of DW in a volume is:

$$N = \frac{V}{l_p^3} \tag{3}$$

Pressure $P$ in this case, where the DWs occupy all the available volume, is related to the energy density of vacuum fluctuations,whichare equal to Planck pressure ( $P_p$ ), calculated using:

$$P = P_p = \frac{c^7}{\hbar G^2} \tag{4}$$

Applying equations (2) (3) and (4) in equation (1):

$$P = \frac{1}{l_p^3} m_{DW} \; c^2 = \frac{c^7}{\hbar G^2}$$

$$m_{DW} = \frac{l_p^3 c^5}{\hbar G^2} \tag{5}$$

Considering that:

$$l_p = \sqrt{\frac{\hbar G}{c^3}} \tag{6}$$

Applying equation (6) in equation (5):

$$m_{DW} = \sqrt{\frac{\hbar^3 G^3}{c^9} \frac{c^{10}}{\hbar^2 G^4}}$$

$$m_{DW} = \sqrt{\frac{\hbar c}{G}} = m_p \tag{7}$$

Where $m_p$ represents Planck mass.

The result of the above equations show that the DWsbehavior can be linked to an ideal gas, where each DW has a Planck mass, and travels at the light speed, generating a tremendously high pressure (Planck Pressure) when bouncing off surrounding DWs.

On the other hand, considering that DW mass is associated with an amount of energy, contained within a volume, defined by Planck length, the energy density of each DW ( $U_{DW}$ ), can be calculated as:

$$U_{DW} = \frac{\text{DW Energy}}{\text{DW} \quad \text{Volume}}$$

$$U_{DW} = \frac{m_{DW}\, c^2}{l_p^3} = \frac{c^7}{\hbar\, G^2} \qquad (8)$$

This result highlights that the energy density, inside of one DW, is equal to the external pressure exerted by neighboring DWs acting as gas molecules. This may mean that there are actually two forms of pressure associated with a DW. An internal pressure generated by waves of energy contained in a Planck volume and an external pressure generated by the collision of the DWs moving at light speed.

Figure 2 shows an artisticrepresentation of DWs in an empty space. Note, that all the DWs aremoving at light speed in random directions,enabling a change in DW volume and energy density.Besides this, some DWs maydisappear or even split depending on the space available.

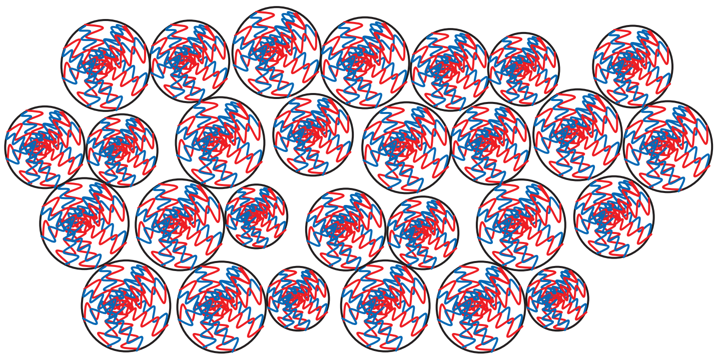

Figure 2 – Artistic representation of Dipole Waves in an empty space.

## 2 – Dipole wave pressure and fundamental particles

Just as we can measure a uniform pressure inside a gas composed primarily of molecules moving at high speed, in an empty space, the external DW pressure becomes constant (equal to Planck pressure), even if the DWs aremoving at light speed andshowsmall changes in their volume and internal pressure.

Figure 3 presents a pressure curve on a spatial axis, which is a straight line defined by Planck pressure. The circle in this figure is an artistic representation of pressure variation in very small distances, close to that of Planck length, for a certain time $t_0$.

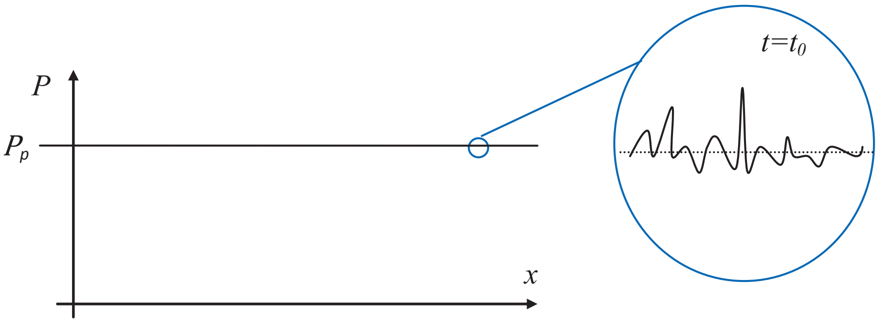


Figure 3 – External pressure of DW in a space axis direction.

Note, that it is also is possible to define a pressure curve on a time axis, as presented in Figure 4, but in this case there is a barrier defined by "present time", beyond which there is no DW and therefore there is no pressure.

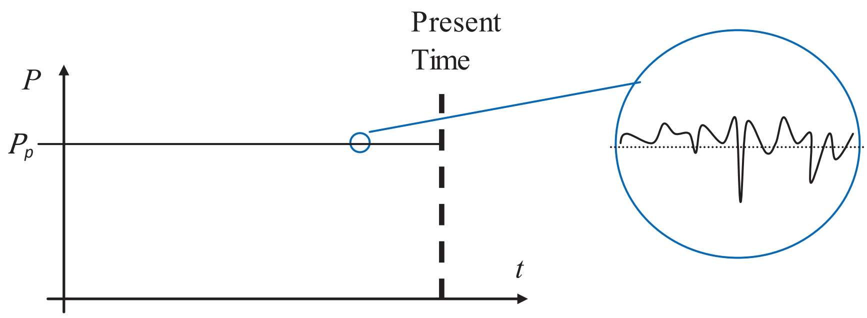


Figure 4 – External pressure of DW in a time axis direction.

The author believes that all particles that exist in our universe, including photons, can be modeled by a variationin DWpressure. These variations originate from a single type of fundamental particle,named by the author as a Ulianov Hole or uhole.

This model has similarities with Macken's fundamental particles model, as can be seen in the following text [1]:

> *"In the spacetime based model of the universe, fundamental particles are dipole waves in spacetime that possess quantized angular momentum. They are living in a sea of superfluidvacuum fluctuations that cannot possess angular momentum. Fundamental particles cannotexist without the support provided by this sea of superfluid vacuum fluctuations."*

In fact a uhole can be associated with a dipole wave that has increased toforman elastic tube that connects two regions of space (or time), generating variations in external DW pressure. A Uhole always has two symmetrical points: a point of increased DW pressure and a point of decreased DWpressure. Figure 5represents two kinds of Uholes placed in a two-dimensional space,in order to facilitate their visualization.

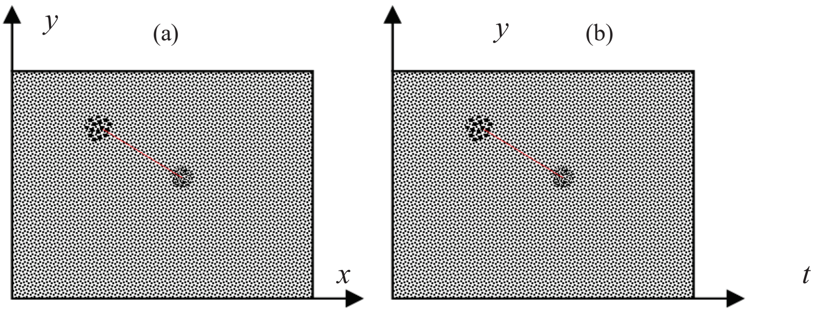


Figure 5 – Two kinds of uholes: a) uhole in space; b) uhole in time.

Figure 6 presents a space Uhole (Uhole-S) in four spacetime coordinates (*x,y,z,t*), moving alongthe *z* axis. These curves show the pressure in a fixed position $z_0$, where the effect of this Uhole-S, on the DW pressure, appears for some time and then vanishes. It is important to observe that Figure 6 displays a process that occurs in five dimensions (*x,y,z,t* and *P*) using only two-dimensional graphs, making it difficult to obtain a truly accurate representation.

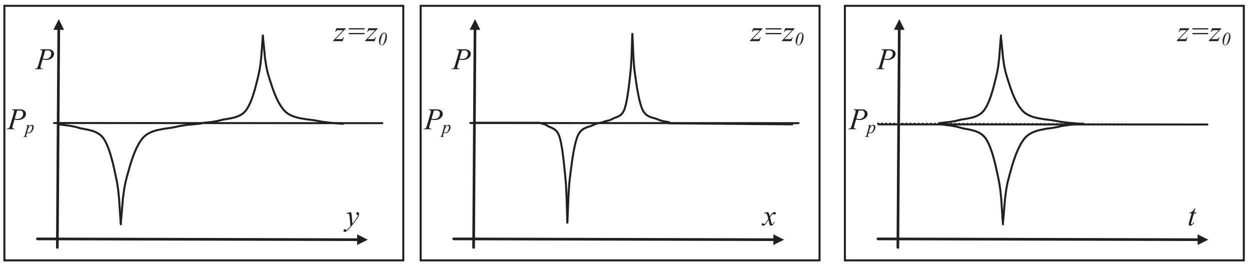


Figure 6 – Pressure in a space uhole (uhole-S).

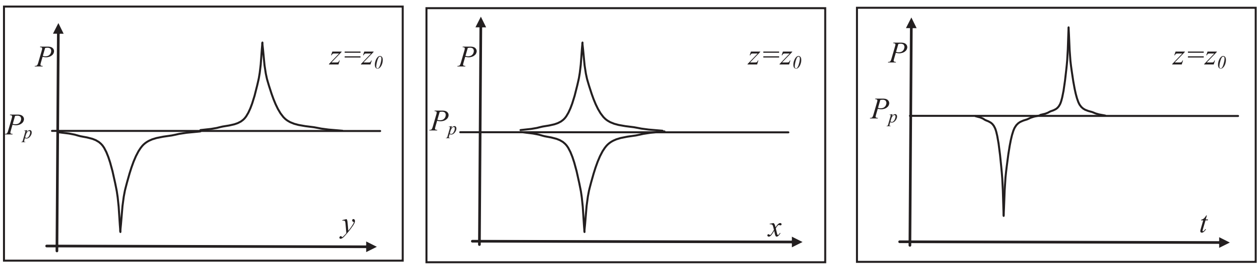


Figure 7 – Pressure in a timeuhole (uhole-T).

Figure 7 displays the same behavior shown in Figure 6, but now a time uhole (uhole-T) moves along axis *z* and *x*, but it is frozen in time, which is a very unusualcase.

Time is usually related to a “time arrow” pointing to the “future”. However, a uhole-T has two possible “arrow directions”, as shown in Figure 8, depending on whether positive pressure is in the “future direction” or in the “past direction”.

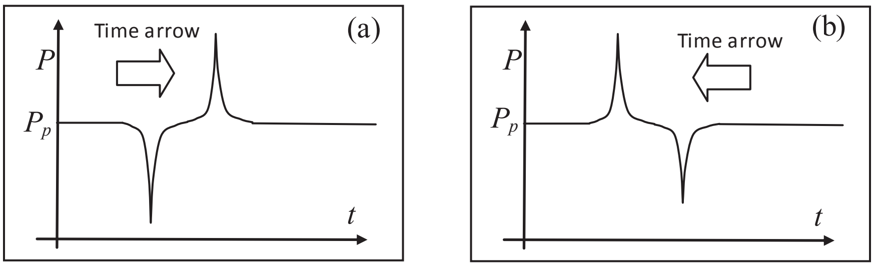


Figure 8 – Two kinds of uhole-T:a) Future direction; b) Past direction.

The author believes that a uhole-T has an electrical charge property. And so, a uhole-T in a “future direction” has a negative electrical charge, and a uhole-T in a “past direction” has a positive charge.

Space uholes do not have this direct distinction, because they present two sides at the same time. Nevertheless, the author believes that one side of a uhole-S has a mass property attached to matter and the other side has a mass property linked to antimatter.

## 3 – Dipole waves pressure and mass properties

The author proposes that one uhole-S has a property related to mass, that appears when the uhole-s is stretched enough so the other uhole end (formed by antimatter) is sufficiently distant to avoid the annihilation process.

It should be noted, that in this model, for each particle of matter that exists in our universe,an antimatter particle continues to exist elsewhere, emphasizing the “matter-antimatter puzzle” (where is antimatter?). One solution tothis puzzle isproposed by author [3], using a new galaxy creation model,where a super massive black hole, which exists at the center of each galaxy,is formed by antimatter.

The first simplification to analyze the uhole-S’s negative pressure is obtainedby observing the smallest possible black hole. This black hole has a mass that is equal to Planck mass, and a Schwarzschild radius (event horizon radius) equal to the Planck length.

If we plot the DW pressure curve for this black hole, we can consider twokinds of curves, as shownin Figure 9. In both curves, the DW pressure in spacetime volume (defined by the black holeevent horizon) drops to zero, but in curve (a) the spacetime is not yet shrunken, and so the pressure on surrounding areas is not affected (being equal to Planck pressure). In curve (b) the black hole shrinks the space and decreases the DW pressure in all the space around it.

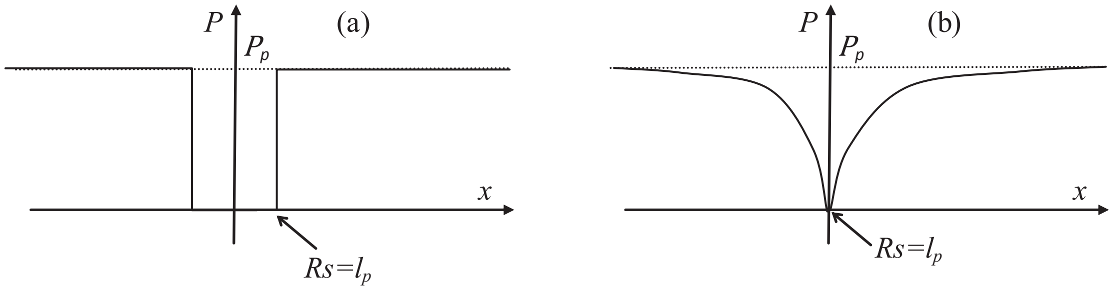


Figure 9 – Two DW pressure curves in a small black hole: a) Before the black hole shrinks the spacetime; b) After the black hole shrinks the spacetime

Note: The curve presented in Figure 9-a can be considered as only a "trick" facilitatingcertain calculations to be presented below, eliminating the need for more complex operations such as curveconvolution functions.

The curve presented in Figure 9-b, starting from zero and going up to Planck pressure for a longer distance ($d$) from the black hole. And so, one good estimativeto this curve (without considering the relativistic effects) is given by:

$$P(d) = \begin{cases} P_p(1 - \frac{l_p}{d}) & ; \quad d \geq l_p \\ 0 & ; \quad d < l_p \end{cases} \tag{9}$$

Therefore, if we take a body with a mass equal to $M_1$, we can consider that the DW pressure (outside of the limits of the body)is equal to the same pressure ofsome small black holes($N_1$), positioned inside the body. With $N_1$ defined as:

$$N_1 = \frac{M_1}{m_p} \tag{10}$$

Considering the combined effect of $N_1$ black holes, equation (9) can be written as:

$$P(d) = P_p(1 - \frac{N_1 l_p}{d}) \;;\; d > N_1 l_p \tag{11}$$

Applying equation (10) in equation (11) gives:

$$P(d) = P_p\left(1 - \frac{M_1 l_p}{m_p d}\right) \quad (12)$$

Figure (10) presents an analogy based on equation (12), where the $M_1$ body is the Earth and the DW pressure is compared to the water pressure in an aquarium.This is a strange picture, as the higher liquid pressure (in the bottom of an aquarium) is linked to the DW pressure in deep space (far from earth), while the lower liquid pressure is connected to the DW pressure on Earth's surface.

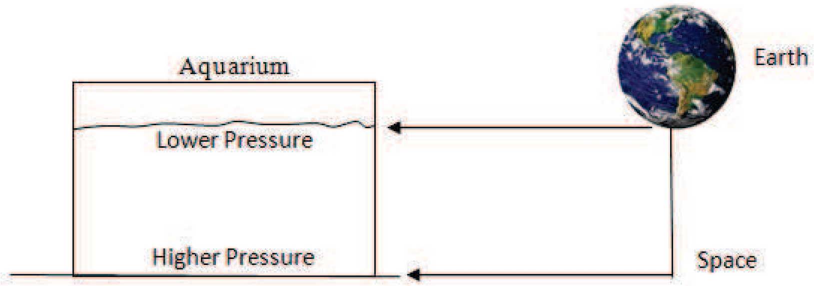


Figure 10 – Analogy of a water pressure in an aquarium with the DW pressure near to the Earth.

Extending this analogy, Figure 11 presents forces acting on two bodies(with different densities) placed in an aquarium, obviously the lower density body tends to float to the water's surface.

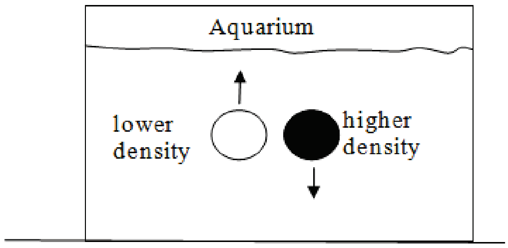


Figure 11 – Forces acting in two bodies with different densities placed in the aquarium.

Based on the analogies above, we can use equation (12) to calculate the forcesactingbetween two bodies with masses $M_1$ and $M_2$, placed at a distance $d_1$, as presented in Figure 12.

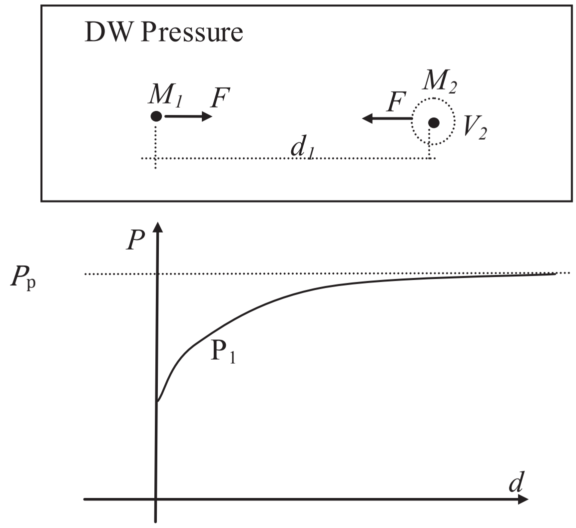


Figure 12 – Forces acting between two masses.

In this calculation, we can use Figure 9-a's pressure representation for the $M_2$ body considering that it can be seen as an empty volume $V_2$, without pressure that can be calculated, based on the small black hole volume:

$$V_2 = N_2 l_p^3$$

$$V_2 = \frac{M_2}{m_p} l_p^3 \qquad (13)$$

The force that appears in $V_2$ can be calculated by:

$$F(d) = V_2 \frac{\partial P}{\partial d} \qquad (14)$$

Applying equations (12) and (13) in equation (14) gives:

$$F(d) = \left(\frac{M_2}{m_p} l_p^3\right)\left(P_P \frac{M_1 l_p}{m_p}\right)\frac{1}{d^2}$$

$$F(d) = \frac{M_2 M_1}{d^2}\left(\frac{m_p c^2}{l_p^3}\frac{l_p^4}{m_P^2}\right)$$

$$F(d) = \frac{M_2 M_1}{d^2}\left(\frac{c^2 l_p}{m_P}\right)$$

$$F(d) = \frac{M_2 M_1}{d^2}\left(c^2\sqrt{\frac{\hbar G}{c^3}\frac{G}{\hbar c}}\right)$$

$$F(d) = \frac{M_2 M_1}{d^2} G \qquad (15)$$

Equation (15) represents Newton's gravitational law, deduced from the DW pressure mass model.

Figure 13 shows anew example of the application of the DW pressure model, where a body with mass *M* is positioned in an empty space. A force *F* is applied to this body, that moves at speed *v*.

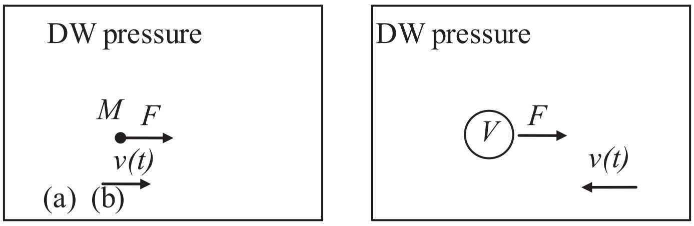


Figure 13 – Mass *M* being moved in an empty space: a) Mass *M* is moving with the application of force *F*; b) Mass *M* is replaced by volume *V* and the space is moving.

In Figure 13-b, we change the reference, assuming that the body is stopped and the space moves at the same speed *v*(t), considered in the opposite direction. Moreover, in this case, mass *M* is replaced by the volume related to *N* small black holes.

The pressure in a liquid can be calculated from Bernoulli's equation:

$$P + \rho_0 \frac{v^2}{2} = 0$$

$$P = -\rho_0 \frac{v^2}{2} \tag{16}$$

Where $\rho_0$ is the liquid density given by the DW mass divided by the DW volume:

$$\rho_0 = \frac{m_p}{l_p^3} \tag{17}$$

In this case, force *F*, shown in Figure 13, can be calculated by:

$$F = V \frac{\partial P}{\partial d} \tag{18}$$

Since the volume *V* is defined by *N* small black holes volume:

$$V = \frac{M}{m_p} l_p^3 \tag{19}$$

The variation in pressure with distance can be calculated using equation (16):

$$\begin{aligned} \frac{\partial P}{\partial d} &= \frac{\partial(-\rho_0 \frac{v^2}{2})}{\partial d} = \frac{-\rho_0}{2}\frac{\partial(v^2)}{\partial d} \\ \frac{\partial P}{\partial d} &= \frac{-\rho_0}{2} 2a = -\rho_0 a \end{aligned} \tag{20}$$

Where $a$ is the fluid acceleration that points in the opposite direction to the applied force. To use an acceleration reference in the same direction of the applied force, equation (20) should be modified to:

$$\frac{\partial P}{\partial d} = \rho_0 a \tag{21}$$

Applying equations (17), (19) and (21) in equation (18) gives:

$$\begin{aligned} F &= (\frac{M}{m_p} l_p^3)(\frac{m_p}{l_p^3}) a \\ F &= Ma \end{aligned} \tag{22}$$

Equation (22) is thesecond ofNewton's laws!

Thus, the DW pressure model allows us to see why inertial masshas the same value as gravitational mass. In both cases, the mass can be related to a volume of small black holes that will be subjected to pressure variations, which may appear due to the proximity of other bodies and also connected to the movement of this volume in the space.

The DW model also enablesus to explain planetary orbits without using gravitational or centrifugal forces.

In Figure 14, body $M_1$ is being orbited by a smaller body $M_2$ that travels at a speed $v$ in a circular orbit having a radius equal to $d_1$.

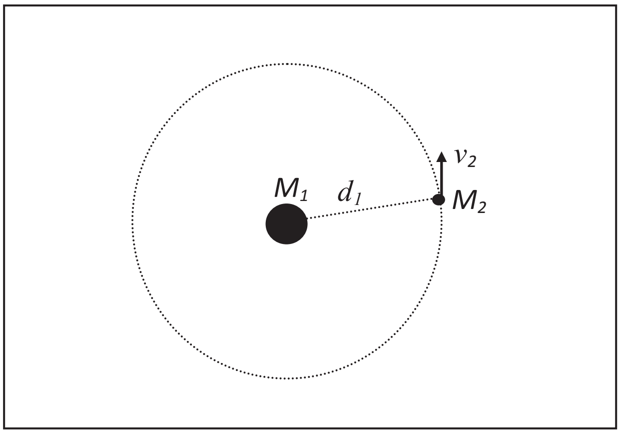


Figure 14 - Body with mass $M_2$ orbiting body with mass $M_1$.

Body $M_1$ generates a pressure drop which varies with the distance and generating regions of constant pressure over spherical shells centered in $M_1$. Thus the dotted circle in this figure represents the orbit of $M_2$, where the pressure will be constant, and can be calculated by equation (12):

$$P_1 = P_p(1 - \frac{M_1 l_p}{m_p d_1}) \quad (23)$$

Besides this, the $M_2$ body moves at a constant speed, generating a pressure that is given by:

$$P_2 = P_p - \rho_0 \frac{v_2^2}{2} = P_p - \frac{m_p}{2 l_p^3} v_2^2 \quad (24)$$

Thus, the $M_2$ body tends to move in a trajectory in which pressure $P_2$ is equal to pressure $P_1$, as shown in Figure 15.

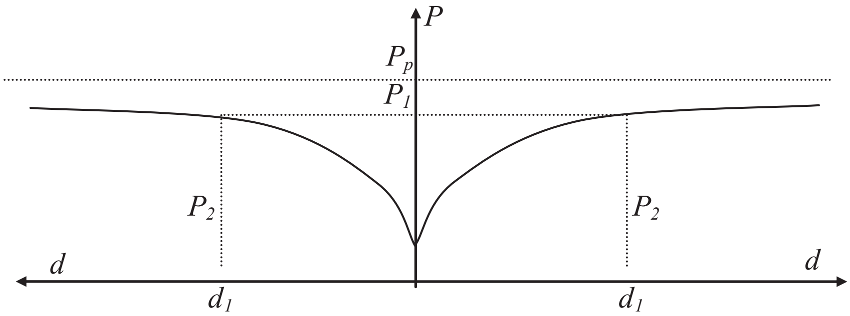


Figure 15 - Pressures along a line drawn from the body $M_1$.

To calculate the relationship between distance and orbital speed we can match equations (23) and (24):

$$P_p - P_p \frac{M_1 l_p}{m_p d_1} = P_p - \frac{m_p}{2 l_p^3} v_2^2$$

$$v_2^2 \frac{m_p}{2 l_p^3} = P_p \frac{M_1 l_p}{m_p d_1}$$

$$v_2^2 = \frac{M_1}{d_1} 2 \frac{l_p^4}{m_p^2} P_p$$

$$v_2^2 = \frac{M_1}{d_1} 2 \frac{l_p^4}{m_p^2} \frac{m_p c^2}{l_p^3} \tag{25}$$

$$v_2^2 = \frac{M_1}{d_1} 2 \frac{l_p c^2}{m_p}$$

$$v_2 = \sqrt{\frac{2GM_1}{d_1}}$$

Equation (25) is the escape velocity equation of a small objectlaunched from a celestial body.Note that in this model, body $M_2$ does not suffer the effect of any force, and therefore it moves along lines with the same level of pressure, forming a circular orbit around the body $M_1$.

## 4 – Conclusion

These papers are based on John Macken´s work that defines a new kind of Ether, where dipole waves (DW) moving at light speed generate a high pressure (Planck pressure) even in an empty space.

The author uses this DW pressure model to define fundamental particles (uholes) that change this pressure connecting two points in time (uhole-T) or two points in space (uhole-S).

The uhole-T has two kinds of polarities and can be related to electric charge properties. Moreover, uhole-S can be related to a pair of matter and antimatter particles. Therefore, a massive body like Earth can be related to a low pressure condition (like the top of an aquarium), whereas deep space can be related to a high pressure condition (like the bottom of an aquarium).

From this new model, it can be said that a massive body, in fact, does not fall to the Earth´s surface, but instead, “floats” in a DW sea towards the center of the Earth where DW pressure is lower. Furthermore, it is possible to consider that one cubic meter of void space weighs more than a cubic meter of matter. Therefore, a black hole is the lightest thing in the universe because there is no DW pressure inside it.

This means that a body of matter is lighter than empty space, because inside this body the mass behaves as if full of micro black holes,like air bubbles in a liquid, reducing its density. This behavior causes mass to floatin the direction ofregions where the DWpressure is lower, and also explains the resistance of mass movementin space.

So it does not make sense to ask where mass goes, when falling into a black hole, because this mass only increases the hole, making it lighter, like small air bubbles in a liquid coming together to form a larger bubble.

The statements above can sound very strange, but in fact, the formulas obtained from the uhole-S model enable simple deductions of Newton´s laws associated with matter. In addition, the uhole-S model opens up a new way to understand what mass is and how black holes are formed. This new model also explains the fact that the inertial mass is equal to gravitational mass, something that has puzzled physicists for hundreds of years.

In conclusion, the uhole-S model can explain the mass generation mechanism with no Higgs field required at all.

## REFERENCES

[1] Macken, J. A.“The Universe is Only Spacetime. Particles, Fields and Forces Derived from the Simplest Starting Assumption.”Available at http://www.onlyspacetime.com/ (2010).

[2] Grad, H, "On the Kinetic Theory of Rarefied Gases." Communications on Pure and Applied Mathematics 2 (4): 331–407 (1949).

[3] Freeman A., Ulianov P. Y. “The Small Bang Model - A New Explanation for Dark Matter Based on Antimatter Super Massive Black Holes.” http://vixra.org/abs/1211.0157 (2012).

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