

# Energy Tanks and Young`s double Slit dark Fringes .

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**Abstract :** Waves need a media to travel and carry energy. A standing wave is an oscillation pattern with a stationary outline (*envelope*) that results either from the superposition of two identical waves travelling opposite directions or from an inner equilibrium vibration . A given particle that is bound (*confined*) in a certain region of space is a standing wave and vibrates within the constraints of the envelope function  $y = 2A.\sin(kx).\cos(\omega t)$  . Light is both , a particle and a wave. [39]-(7-9) . Since quaternion, as work is constant then  $\mathbf{W} = \mathbf{q} = (\lambda, \pm \lambda x \nabla i) = \text{Force } (\mathbf{P}) \text{ acting on wavelength } (\lambda) = \text{Normal stress } \boldsymbol{\sigma} \text{ acting on area } A$  is  $(\boldsymbol{\sigma} \cdot \mathbf{A}) \times \lambda$ , and for  $A = 0$  then becomes the linear Momentum =  $\bar{\mathbf{v}} \times \lambda$  (*since Stationary energy becomes Kinetic*) and  $\mathbf{W} = \bar{\mathbf{v}} \times \lambda$  , i.e. Work = Travelling Energy and because when converted into , velocity ,  $\bar{\mathbf{v}}$ , in wavelength  $\lambda$  as background media , then this is the reason that doesn`t collapse by radiating away its or their energy . Work as Vibration is confined in its wavelength as a Damper , *absorber* , and is retained unchanged when travelling . The Why , When and How is widely analyzed.

Since also a stationary wave consists of two transverse waves then is not interpreted as an equal mixture of the two, but an inner equilibrium on monad  $\lambda$  . It was shown that Energy-Space universe (*the beyond Planck`s length , Gravity`s and Spaces` levels*) is [PNS] and Space Anti-Space as work is  $\rightarrow W = \int P.ds = 0$  , which is the cause of Spaces existence with the only two quantized magnitudes  $\lambda, \bar{\lambda}$  , on Monads  $\bar{A}B$  as the breakages  $[s^2 = \pm (\bar{\omega}.r)^2]$  in Inertial systems consisting the {MFMF = Background medium Field and  $[\nabla i = 2.(\bar{\omega}.r)^2]$ } the Gravity force . Momentum as velocity  $\rightarrow$  [velocity =  $\bar{V}.g$  = the breakage  $[2.(\bar{\omega}.r)^2]$ ], *is the cross product of two velocity vectors* ,  $\bar{v}_1, \bar{v}_2$ , which form with the two side-by-side Medium breakages  $\rightarrow [ | +(\bar{\omega}.r)^2 | \leftrightarrow | -(\bar{\omega}.r)^2 | = |\lambda| ] \leftarrow$  the Intrinsic and Stationary Electromagnetic Field of gravity`s ( The Electric  $E \perp$  Magnetic  $P$ , following the cycloid motion) in Medium  $|\lambda|$  . Breakages and Particles with velocity ,  $\bar{v}$ , *being the units of matter with Electric charge* ,  $q = \lambda m$ , as their physical property is, when placed in prior referred Electromagnetic Field  $E \perp P$  , where like charges repel and unlike charges attract , experience a force as Lorentz force , and this is called Gravity-Force , and equal to  $\rightarrow F_g = q.[E + \bar{v} \times P]$   $\leftarrow$  while Background-medium , is the Gravity-Field =  $G_f = [E + \bar{c} \times P]$  in the medium  $\{ ds = |\lambda| = |2.(\bar{\omega}.r)^2| = | +(\bar{\omega}.r)^2 | \leftrightarrow | -(\bar{\omega}.r)^2 | \}$  , i.e. the Quantized-Space is the medium  $ds$  , which is also Quantized-Energy of two ( $\pm$ ) breakages =  $|\lambda|$  , on which is exerted a Thrust as Velocity  $\bar{c}$  which is decomposed into the two equal velocity vectors ,  $\bar{v}_1, \bar{v}_2$  and moving on two transverse cycloid trajectories , which create an Intrinsic Stationary Electromagnetic wave  $E, P, \rightarrow$  the Gravity field  $[E + \bar{c} \times P]$   $\leftarrow$ , { into where motion (E,P) and spin is balanced from the anti- cycloid motion (evolute) of the Anti -Quantized-Space ( $- ds$ ) } . Gravity force is exerted on breakages  $\{ \leftrightarrow \pm (\bar{\omega}.r)^2 = \text{The Material points forming dipoles} \}$  as velocity vector ,  $\bar{c}$  , which is decomposed into two reverse velocities following the cycloidal motion , and consisting the intrinsic Stationary Electro-magnetic Wave of gravity, and which is binding the points of this Rest and mass-less nature Field .The infinite tiny volumes caves (Spaces  $V = \frac{4\lambda^3}{3\pi} = \frac{4(\omega^2 r^2)^3}{3\pi}$ ) of inner Electromagnetic field of particles are the tanks in where Energy of dark points and dark fringes of two interference waves, is conserved .This is the Space-Energy unification Universe in Inertial systems consisted of this [MFMF] Field and Gravity`s inner Displacement current force and consist the Absolute frames in nature .The known relation  $c^2.\epsilon.\mu = 1$  between the speed of light , and Permittivity - Permeability in free space is proved ,and the immense confusion in the basic ideas regarding the Quantized Energy-Space , *The Quanta* , vanishes.

**Keywords :** Young`s Double slit experiment , The origin of Maxwell`s-Gravity`s Displacement current , the inner structure of gravity and of moving particles , Particle and Wave-like of Photons ,The Quanta of Space and Energy .

## 1. Introduction

Point, which is nothing and has not any Position may be anywhere in Space, therefore , the Primary point A being nothing also in no Space, is the only Point and nowhere, i.e.

Primary Point is the only Space and from this all the others which have Position , therefore it is the only Space and so to exist point A at a second point B somewhere else point A must move towards point B, where then  $A \equiv B$ . Point B is the Primary Anti-Space which Equilibrium point A ,  $[PNS] = [A \equiv B]$  .The position of points in  $[PNS]$  creates the infinite dipole and all quantum quantities which acquire Potential difference and an Intrinsic moment  $\pm \bar{\Lambda}$  in the three Spatial dimensions ( x , y , z) and on the infinite points of the ( i ) Layers at these points , which exist from the other Layers of Primary Space , Anti-Space and Sub-Space , and this is because Spaces = monads = quaternion [9]. Since Primary point A is the only Space then on this exists the Principle of Virtual Displacements  $W = \int P.ds=0$  or  $[ds.(PA + PB) = 0]$  , i.e. for any  $ds > 0$  Impulse  $P = (PA + PB) = 0$  ,  $[ds. (PA + PB) = 0]$  , Therefore, Each Unit  $AB=ds > 0$  , exists by this Inner Impulse (P) and so  $PA + PB = 0$

i.e. The Position and Dimension of all Points which are connected across the Universe and that of Spaces exists , because of this equilibrium Static Inner Impulse , on the contrary should be one point only ( Primary Point A= Black Hole  $\rightarrow ds = 0$  and  $P = \infty$  ).

All points may exist with  $P=0 \rightarrow (PNS)$  and also with  $P \neq 0$  , (  $PA + PB = 0$  ) , for all points in Spaces and Anti - Spaces, therefore  $[PNS]$  is self-created , and because at each point may exist also with  $P \neq 0$  , then  $[PNS]$  is a ( perfectly Homogenous , Isotropic and Elastic Medium ) Field with infinite points which have a  $\pm$  Charge with  $P=0 \rightarrow P = \Lambda \rightarrow \infty$

Since points A,B of  $[PNS]$  coincide with the infinite Points , of the infinite Spaces , Anti-Spaces and Sub-Spaces of  $[PNS]$  and exists rotational energy  $\pm \bar{\Lambda}$  and since Motion may occur at all Bounded Sub - Spaces ( $\pm \Lambda$  ,  $\lambda$ ), then this Relative motion is happening between all points belonging to  $[PNS]$  and to those points belonging to the other Sub-Spaces ( $A \equiv B$ ) . The Infinite points in  $[PNS]$  form infinite Units (monads)  $AiBi = d\bar{s}$  , which equilibrium by the Primary Anti-Space by an Inner Impulse (P) at edges A, B where  $PiA + PiB \neq 0$  , and  $ds = 0 \rightarrow N \rightarrow \infty$ .

Monad(Unit)  $\bar{A}\bar{B}$  is the ENTITY and  $[A,B - \bar{P}\bar{A}, \bar{P}\bar{B}]$  is the LAW , so Entities are embodied with the Laws.

Entity is quaternion  $\bar{A}\bar{B}$ , and law  $|\bar{A}\bar{B}| =$  length of points A,B and imaginary part forces ,  $\bar{P}\bar{A}, \bar{P}\bar{B}$  or fields .

By definition  $i = \sqrt{-m.1}$  and  $(-m1)^2 = -1m$  i.e.

$[Energy]^2 = - [Space] =$  Anti-space and since also exists  $\Lambda$  x  $\Lambda = - (-m.1)^2 = \pm \Lambda.\nabla i$  , the basic equation of quaternion becomes  $[-(\Lambda x \Lambda)/m \pm \Lambda x \nabla i] = [\lambda , \pm \Lambda x \nabla i]$

i.e. wavelength  $\lambda = - (\Lambda x \Lambda)/m$  where  $m$  = a constant depending on reactions to present or other conditions .

Applying this in energy cavities then  $e^{\wedge} - i [(\pi/2).b]^2 = e^{-i.(2\pi).b} = e^{-i.(\pi).b} \rightarrow$  i.e.The massive mechanism

Diffraction and the Energy mechanism Diffraction are Interchangeable ,  $e^{-i.(1,78.10/7)^2} = e^{-i.(3,56.10/14)^2}$  , and for

Relativity massive Energy  $(\Lambda x \Lambda) = (-m.i) x (-m.i) = m (i)^2 = -m.(\bar{v})^2 = -m\bar{v}^2$  , where imaginary part  $i = \bar{v}$  , i.e. Space acquires energy as velocity .

Applying quaternion equation  $[-\nabla \Lambda , \nabla x \Lambda] = 0$  for point ,O, and constant velocity ,  $\bar{c}$ , then  $[-\nabla c , \nabla x c] = 0$  where  $[-\nabla c] \perp [\nabla x c]$  meaning that it is a mechanism that instantly

transports breakage masses dynamically and perpendicularly to all Inertial frames Layers . [26]

## 2. Complex Numbers – Quaternion

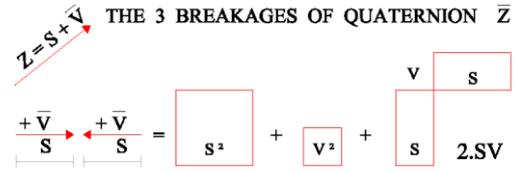


Fig.1. The Action of quaternion  $\bar{z}.\bar{z} = [s + \bar{v}.\nabla i]^2 \rightarrow \bar{z}.\bar{z} = [s + \bar{v}.\nabla i]^2 = s^2 - |\bar{v}|^2 + [2\bar{w}].|s|/|r|. \nabla i . \bar{w} .$

Quaternion Actions: Action (©) of a quaternion  $\bar{z} = s + \bar{v}i$  =  $s + \bar{v}.\nabla i$  on point P (a, x,y,z) is  $a\bar{z}' = \bar{z}p\bar{z}'$  (screw = helicoidally motion) and for  $a \neq 0$  then  $z$  and  $a \circ z = az$  which have the same action  $\bar{z}p\bar{z}'$ , meaning that quaternion is homogeneous in nature . Action of a Unit quaternion on a scalar ,s, is  $\bar{z} = \bar{z}s\bar{z}' = s$ . Action of a Unit quaternion  $\bar{z}$  on a vector ( $\bar{v}\nabla i$ ) is  $\bar{z}\bar{v}\bar{z}'$  i.e. another vector  $\bar{v}'$  (quaternion)  $\bar{v}' = (0, \bar{v}'\nabla i)$ , and of vector type  $\bar{v}'.\nabla i = \bar{z} + 2\bar{v}.\bar{v}x\bar{z} + 2\bar{v}x(\bar{v}x\bar{z})$ .

Every quaternion ,q, is equal to its versor ,  $V(q)$ , multiplied by its tensor (norm) , and for versor  $V(q) = e^{(0+\pi i)} \rightarrow$  then  $|V(q)| = \sqrt{3}$  and  $q = V(q).\sqrt{3}.\pi$  .

Action (©) of a quaternion  $\bar{z} = s + \bar{v}i = s + \bar{v}.\nabla i$  on itself is the Binomial type i.e.

$$(s + \bar{v}.\nabla i)(©)(s + \bar{v}.\nabla i) = [s + \bar{v}.\nabla i]^2 = s^2 + |\bar{v}|^2.\nabla i^2 + 2|s|.\bar{v}.\nabla i = s^2 - |\bar{v}|^2 + 2|s|.\bar{w}.\nabla i = s^2 - |\bar{v}|^2 + [2\bar{w}].|s|/|r|. \nabla i$$

where,

$s^2 \rightarrow$  is the real part of the new quaternion and it is a Positive Scalar magnitude.

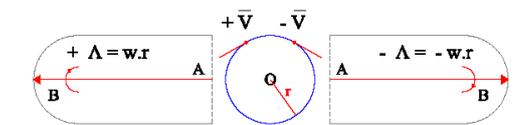
$-|\bar{w}|^2 \rightarrow$  the always negative Anti-space which is always a Negative Scalar magnitude.

$[2\bar{w}].|s|/|r|. \nabla i \rightarrow$  the double angular velocity term which is a Vector magnitude.

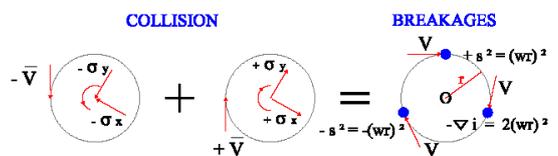
## 3. The Method

THE BALANCING OF SPACE  $\rightarrow$  ANTI -SPACE, IN SUB-SPACE COMMON - CIRCLE.

THE TWO OPPOSITE EQUILIBRIUM MOMENTUM ELLIPSOIDS



+ Biaxial Ellipsoid COMMON - CIRCLE - Biaxial Ellipsoid



$$[\rightarrow \mathcal{U} \mathcal{U} \leftarrow] = [\rightarrow \mathcal{U} + \mathcal{U} \leftarrow] = \mathcal{U} \mathcal{U} \rightarrow \mathcal{U} \mathcal{U}$$

Fig. 2. Equilibrium vorticity (vortices)  $\pm \Lambda$  (Rotating energy)  $\mathcal{U}\mathcal{U}$  Collision on common circle  $[CC] \rightarrow \mathcal{U}\mathcal{U} \leftarrow$  Thrust on Breakages =  $\bar{v}$ ,  $\mathcal{U}\mathcal{U}$ .

The work  $W$ , of the two opposite dipole  $\overline{AB}$ ,  $\overline{BA}$  with planes is equal to  $W = [n.P.ds] = [\lambda = \Lambda\Lambda, \Lambda x \Lambda]$  where,

$\lambda$ . = displacement of A to B and it is a scalar magnitude called wavelength of dipole  $A|B$ .

$\Lambda$  = the amount of rotation on dipole  $\overline{AB}$ , (this is angular momentum  $\overline{L}$ , and it is a vector parallel to ,a, axis .

Momentum  $\pm \Lambda = r.m.v = r.m.wr = mr^2.w$ , where ,r, is the radius and angular velocity  $\overline{w} =$  (spin) which maps velocity vector  $\overline{v}$ , on the perpendicular to ,a, axis plane with the two components  $\overline{v} \perp \overline{v} B$ . Tangential velocity  $\overline{v} E = \overline{w}.r$  is a quaternion  $\overline{v} E = \overline{w}.r = \overline{z} = [s + \overline{v}. \nabla i]$  where  $s = |\overline{v}.E| = |\overline{r}.\overline{w}|$  and  $\overline{v}. \nabla i = |\overline{w}x\overline{r}| = |\overline{w}|.|r| \perp |\overline{w}|.r$  where the two opposite biaxial ellipsoid equilibrium .

In a spherical cave the Biaxial Ellipsoid ( $\sigma x = \sigma y$ ) exists as momentum  $+\Lambda$  on caves of diameter  $2r$  with parallel circles  $\rightarrow 0$ . The Biaxial Anti-Ellipsoid ( $-\sigma x = -\sigma y$ ) exists as equal and opposite momentum  $-\Lambda$  on the same diameter  $2r$  with anti-parallel circles  $\rightarrow 0$ . Equilibrium of the two Ellipsoids  $\pm \Lambda$ , presupposes a Stabilizer system attached to Ellipsoids such that opposite Momentum is distributed to the Center of Mass of the total system and, recover equilibrium, which is the center of the spherical cave. The Biaxial Ellipsoid and Anti-Ellipsoid are inversely directed and rotated in the same circle, so the two opposite velocity vectors collide. This collision of the two opposite velocity vectors is the Action (Thrust) of the two quaternion and it is, Action of quaternion's

$$(s + \overline{v}. \nabla i)(\odot)(s + \overline{v}. \nabla i) = [s + \overline{v}. \nabla i]^2 = s^2 + |\overline{v}|^2. \nabla i^2 + 2|s|x\overline{v}. \nabla i = s^2 - |\overline{v}|^2 + 2|s|x|\overline{w}.r|. \nabla i = s^2 - |\overline{v}|^2 + [2\overline{w}].|s| |r|. \nabla i \dots(3-a)$$

where,

$[+s^2] \rightarrow s^2 = (w.r)^2$ , is the real part of a new quaternion which is, the positive Scalar product , of Space from the same scalar product ,s,s, with  $\frac{1}{2}, \frac{3}{2}, \dots$ , spin , and represents the , Space , part of quaternion , *the min. Space - Quanta* .

$[-s^2] \rightarrow -|\overline{v}|^2 = |\overline{w}. \overline{r}|^2 = -[|\overline{w}|.|r|]^2 = -(w.r)^2 \rightarrow$  is the always , the negative Scalar product , of Anti-space from the dot product of  $\overline{w}, \overline{r}$  vectors ,with  $-\frac{1}{2}, -\frac{3}{2}, \dots$ , spin , and represents the , Anti-Space , part of quaternion , *the min. Anti-Space Quanta* ..

$[\nabla i] \rightarrow 2.|s| x |\overline{w}. \overline{r}|. \nabla i = 2|wr|.|(wr)|. \nabla i = 2.(w.r)^2 \rightarrow$  is a vector of , the velocity vector product , from the cross product

of , $\overline{w}, \overline{r}$  vectors with double angular velocity term and represents the , Velocity vector product , of quaternion giving 1,3,5, spin , *the min. Energy - Quanta* . i.e.

In the recovery equilibrium (a surface of a cylinder with  $2r$  diameter), and because velocity vector is on the circumference, the infinite breakages Identify with points A,B,C (of the extreme triangles ABC of Space ABC) and with points AE , BE, CE (of the extreme triangles AE.BE.CE of Anti-Space) all, on the same circumference of the prior formulation and are rotated with the same angular velocity vector  $\overline{w}$ .The inversely directionally rotated Energy  $\pm \overline{\Lambda}$  equilibrium into the common circle, so Spaces and Anti-Spaces meet in this circle which is the common Sub-space. Extreme Spaces (the Extreme triangles ABC) meet Anti-Spaces (the Extreme triangles AE.BE.CE), through the only Gateway which is the Plane Geometrical Formulation Mechanism (mould) of the [STPL] line, or as cylinder .[17]

The  $\rightarrow$ [ Space, Anti- Space equilibrium ,  $\pm \overline{\Lambda}$ , Absolute System [S]  $\leftarrow$ ] , as Angular momentum  $\overline{\Lambda} = \Omega = m.v.r$  ,is Crushed out into Fragments and , becoming the three Breakages [  $s^2 = (wr)^2$  ] , [  $-s^2 = - (wr)^2$  ] , [  $\nabla i = 2(wr)^2$  ] ,and after clashed with the velocity vector  $\overline{v}$  of [S] , (unless succeed to escape unclashed through centre O in STPL line and this because  $\overline{v} = 0$ ) , are Thrown OFF this System [S] , conveyed into the Linear momentum , the Inertial and Energy-Space , the Relative [STPL] System [ R] as Particles

Fermions  $\rightarrow [\pm \overline{v}.s^2]$  and Bosons  $\rightarrow [\overline{v}. \nabla i]$  .

## 4. Geometrical Moulds

### 4.1. STPL $\rightarrow$ The Navel Cord of Galaxies

It was shown [16] that Projective and Perspective geometry are Extrema in Euclidean geometry and [STPL] line their boundaries , becoming from common Space and Anti-space. Energy, *Motion*, follows this Euclidean mould, because this Proposition , *Principle* , belongs to geometry's , *and not to Energy's which is only motion* .

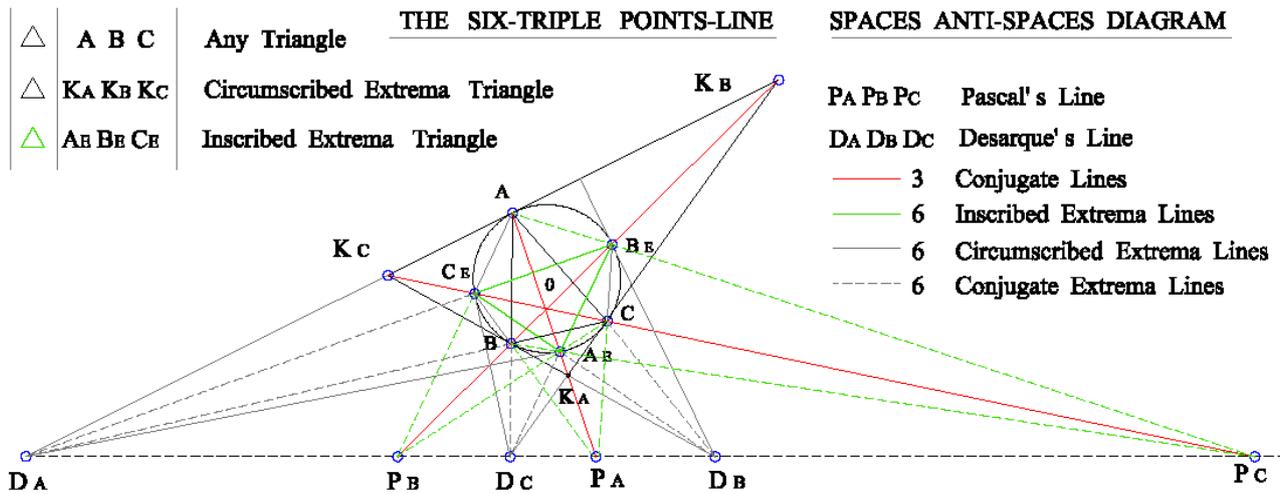


Fig. 3. DA, DB, DC,  $\leftrightarrow$  PA, PB, PC = The Six Triple Points Line [STPL].

Un-clashed Fragments through center O , consist the Medium-Field Material-Fragment  $\rightarrow [\pm s^2] = [\text{MFMF}]$  as base for all motions , and Gravity as force  $[\nabla i]$  , while the clashed with the constant velocity ,  $\bar{c}$  , consist the Dark matter  $[\pm \bar{c}.s]$  and the Dark energy  $[\bar{c}.\nabla i]$  , or from ,

Breakages  $[\pm s^2 = \pm (wr)^2]$  and  $[\nabla i = 2(wr)^2]$

A..  $[\pm \bar{v}.s^2] \rightarrow$  Fermions ---  $[\bar{v}.\nabla i] \rightarrow$  Bosons

B..  $[\pm s^2] \rightarrow [\text{MFMF}]$  Field -  $[\nabla i] \rightarrow$  Gravity force

C..  $[\pm \bar{c}.s^2] \rightarrow$  Dark matter  $[\bar{c}.\nabla i] \rightarrow$  Dark energy

$\rightarrow$  A..  $[\pm \bar{v}.s^2] \rightarrow$  Fermions ---  $[\bar{v}.\nabla i] \rightarrow$  Bosons

Thrust  $(\bar{v} = \bar{w}.r)$  continually acting on the Breakages  $[s^2, -|\bar{v}|^2, [2\bar{w}].|s| |r| = 2(\bar{w}.r)^2]$  produces the  $[1-1+2].\bar{w}^3.|\bar{r}|^3$  magnitudes  $(w.r)^3$  , which is a Positive Scalar magnitude, with Positive or zero electric charge and with ,  $\frac{1}{2}$  or 1, spin. [30]  $[2\bar{w}].|s|.|\bar{r}|\nabla$

1. Positive breakage Quantity  $|\bar{v}|^2 = |\bar{w}x\bar{r}|^2 = |\bar{w}.r|^2 \rightarrow$  Being at Space points A,B,C then Action magnitudes Q at coinciding points DA,DB,DC - PA,PB,PC Produces Leptons and Quarks, and carry them on [STPL] line.

2. Negative breakage Quantity  $-|\bar{v}|^2 = -|\bar{w}x\bar{r}|^2 = -|\bar{w}.r|^2 \rightarrow$  Being at Space points A,B,C then Action magnitudes Q at coinciding points DA,DB,DC-PA,PB,PC Produces Anti-Leptons and Anti-Quarks, and carry them on [STPL] line.

3. Positive breakage Quantity  $[2\bar{w}].|s|.|\bar{r}|\nabla i = 2w.(sr).\nabla i = 2w.(r^2.w).\nabla i = 2w.r^2w.\nabla i \rightarrow$  Bosons , being at Space points A,B,C then Action magnitudes Q at coinciding points DA,DB,DC -PA,PB,PC Produces Bosons , and carry them on [STPL] line.

4. Breakage Quantities  $[\pm s^2 = \pm (wr)^2]$  , being at ,O, commons` circle center and shacked OFF into [STPL] , and this because of  $v=0$  , formulate the [MFMF] Field , which consist the base of all motions .

5. Breakage Quantities  $\nabla i = 2(wr)^2$  being at ,O, commons` circle center and shacked OFF into [STPL] , and this because of  $v=0$  , formulate the Gravity force .

6..Breakage Quantities  $[\pm \bar{c}.s^2]$  and  $[\bar{c}.\nabla i]$  , the clashed with the constant velocity,  $\bar{c}$  ,formulate in [STPL] cylinder Dark matter and Dark Energy respectively .

#### 4.2. Cycloid $\rightarrow$ The Inner motion of monads .

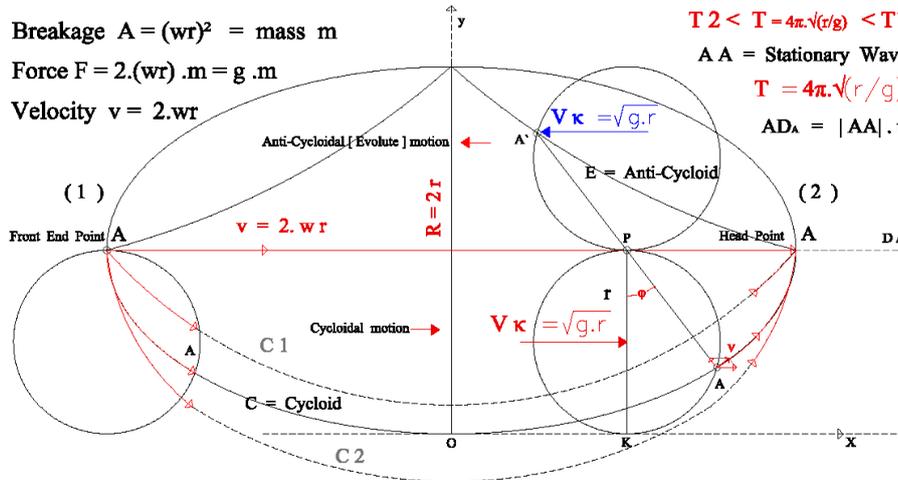


Fig. 4. The Cycloid motion of material point  $A1 \rightarrow A2 = |AA|$ , The Brachistochrone Curve  $A1 \rightarrow A2$ .

#### Properties:

Cycloid is the curve described (traced) by a point on the circumference of a circle of radius, r, as this rolls along a straight line without slipping. In an orthogonal coordinate system (x,y) the equations of motion are  $x = r.(t-\sin.t)$  ,  $y = r(1-\cos.t)$  where t = time .

The area between the curve and the straight line is  $A=3\pi r^2$  and the arc length  $l = 8r$  .Differential equation of the curve  $(dy/dx)^2 = y/(2r-y)$  is also satisfied .

Motion on a cycloid is such that, as long as a particle moves under gravity, g, then the total period of oscillation is  $T = 4\pi\sqrt{r/g}$  which does not depend on speed of rolling, (Huygens cycloid pendulum). The arc length  $l=8r$  is completed for

faster ,as one revolution in less time than the slower one , meaning that , On cycloid all points of y axis reach x-x axis at the same time , regardless of the height from which they begin (isochrones) .This property is used for breakages to reach STPL line isochrones. Evolutes also of a cycloid are a cycloid itself,(apart from coordinate shift). Velocity vector of a motion is directed along the tangent and is the sum of the velocity vectors of the constituent motion, thus at each point of a cycloid, the line joining that point, to the point that circle is , then at the top of the generative circle is tangent to the cycloid and the line joining point that is to that of bottom (of circle) is normal to the cycloid . [5]

Evolutes of a cycloid is the balancing cycloid, Anti-cycloid.

For trajectory element  $ds^2 = dx^2 + dy^2$  and  $ds = \sqrt{2r/y} \cdot dy$  and  $s = 2 \cdot \sqrt{2ry} + C$  and with a coordinate system ( $y=0, s=0$ ) then  $C=0$  and  $s = 2\sqrt{2ry} = 4r \cdot \sin\phi$ . (F-4)

Since velocity  $\bar{v}$  is tangent to the point then component  $\bar{v} \cdot \sin\phi = \sin\phi = s/4r$ , and then equation of motion becomes  $\rightarrow [ds^2 / dt^2] = - (g/4r) \cdot s$  which is a harmonic oscillation with total time period  $T = 4\pi\sqrt{r/g}$  which is independent of any amplitude (Displacement, Energy). i.e. On cycloid, all moving points on y axis reach x-x axis at the same time (isochrones motion) regardless of the height from which they begin ( they do not depend on the oscillation amplitudes), or if, a particle of mass  $m = (wr)^2$  tied to a fix point A executes a Simple harmonic motion under the action (Thrust) of the tangential velocity  $\bar{v} = \bar{w} \cdot \bar{r}$ , and since  $\rightarrow$  linear momentum  $\bar{p} =$  Breakage x Velocity =  $|\bar{w} \cdot r| \cdot 2(\bar{w} \cdot r) = 2(\bar{w} \cdot r) = g$ .  $[(\bar{w} \cdot r)^2 = m] = 2 \cdot g \cdot m$ , then it follows a cycloids trajectory with a Total time period  $T = 4\pi\sqrt{(r/g)} = R_c \cdot \gamma / c$  which is dependent on angular velocity only and it is the Spin of particle |AA|.

Remarks :

Breakage (times) Velocity =  $m_c v = (\bar{w} \cdot r)^2 \cdot (\bar{w} \cdot r)$  and force

$$F = [(\bar{w} \cdot r)^2 \cdot (\bar{w} \cdot r)] = 2 \cdot (\bar{w} \cdot r)^2 \cdot (\bar{w} \cdot r) = 2mg$$

This property is used to show that the wavelength of norm  $|\bar{v}|$ , of vectors  $\bar{v}$ , is a Stationary wave, with the two edges as Energy material nodes, Cycloidally carried on wavelength  $|\lambda| = 2|A1-A2|$  twice the norm.

This rolling circle has a constant velocity  $\bar{v}r = \sqrt{rg}$

$$\text{Period } T = \frac{2\pi r}{\sqrt{gr}} = \frac{2\pi\sqrt{r}}{\sqrt{g}} = 2\pi \frac{\sqrt{R}}{\sqrt{2g}} = \pi \cdot \sqrt{2} \cdot \sqrt{\frac{R}{g}} \text{ and}$$

$$\text{Area of moving circle } A = \pi \cdot r^2 = \pi \cdot (2r \cdot \cos\phi)^2 = \pi R^2 \cdot \cos^2\phi.$$

Thrust is the velocity vector  $\bar{v} = \bar{w} \cdot r$  on the circumference of common circle of the inversely rotating Space, anti-Space becoming from the rotational energy vector  $\pm\Lambda$  of PNS. The wavelength of norm of velocity  $|\bar{v}|$  is the static equilibrium

$$\Delta = OAD_A \gg OA = 1, AD_A = V, OD_A = C$$

$$\sec.\phi = 1 / \sqrt{1 - \sin^2\phi} = 1 / \sqrt{1 - (v/c)^2}$$

$$\text{Lorentz factor } \gamma = \sec.\phi =$$

$$1 / \sqrt{1 - \sin^2\phi} = 1 / \sqrt{1 - (v/c)^2}$$

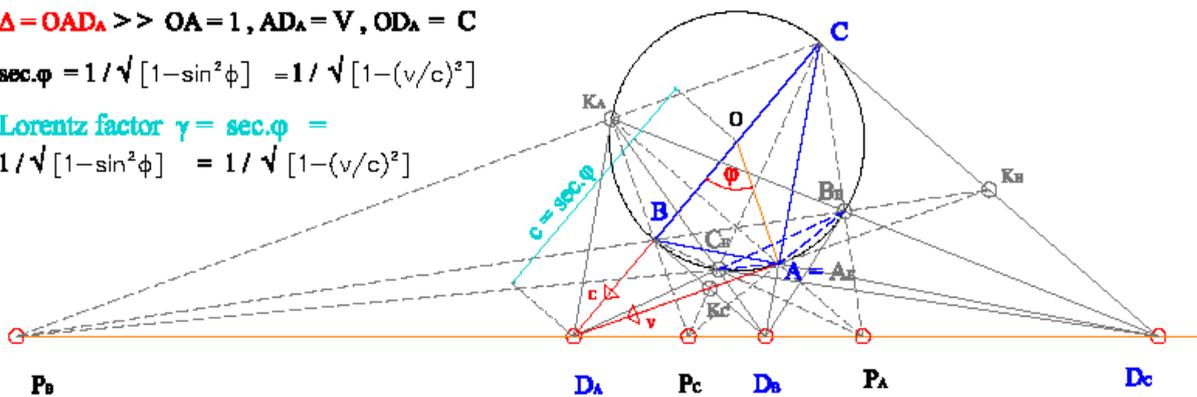


Fig.5. The Geometrical expression of Lorentz factor  $\gamma$ , where  $\sec.\phi = \gamma = ODA : ADA = \pm 1 / \sqrt{1 - (v/c)^2}$ .

Geometry does not need the meter, time, to perform any logic because it is the logic. Motion (quantization of energy) occurs as mould (Tensor) on a geometrical formation, because in motion interferes the meter of time, so material points [ real, imaginary] =  $[x,y,z - \nabla i = \Lambda = r \cdot mv = r^2mw = r \cdot m \cdot (s/t)]$  acquire different meters of time independently of any system.

Since in, common circle, exist the constant tangential to, circle velocities  $\bar{v}$ , and on center O where  $r = 0$ , Coriolis, Centrifugal and Centripetal forces are present, then the

position vector of amplitude, ds, of dipole  $|AB| = |\bar{v}| = ds$  and in terms of the static deflection, ds, then  $T = 1/f = 2\pi/w$  where  $ds =$

$$z = \bar{v} = A \cdot e^{i \cdot wt} = \bar{v} \cdot \cos.wt + i \cdot \bar{v} \cdot \sin.wt.$$

i.e. Breakages acquire different velocities and different energy, and because are following cycloid trajectories, thus, need the same time (isochrones) to reach [STPL] line. Simultaneity is a property of Absolute system and the intrinsic property of vectors and Poinso's ellipsoid now becomes a  $\rightarrow$  < Cycloidal ellipsoid >, since on  $c1(T1) > c(T) > c2(T2)$ .

Any material point [Medium-Field Material-Fragment]  $\rightarrow [\pm s^2] = |\bar{w}x\bar{r}|^2 \rightarrow$  [MFMF] Field following trajectory, in=(c1), or, out=(c2), Cycloid=(c)=|A1-A2| needs more or less time  $T(2) < T = 4\pi\sqrt{(r/g)} < T(1)$  to reach end A2.

And since frequency  $f = 1/T$  and energy  $E = h \cdot f$  then Cycloid motion Controls constancy of Energy by changing velocity,  $\bar{v} = \bar{w} \cdot r = 2\pi r / T = 2\pi r \cdot f$ , and period, T, of monads. Breakage quantity  $2 \cdot (wr)^2$  under the tangential action  $\bar{v} = wr$  becomes  $2 \cdot (wr)^3$  acting on point A  $\rightarrow 2wr \cdot m$  of common circle. The same also for points A,B,C of Space and AE,BE,CE of Anti-Space. Because all velocity vectors AA,BB,CC carry material points A,B,C at points DA,DB,DC in time, t, isochrones, then material points follow a cycloid with period the norm of wavelength of velocities  $|AA|, |BB|, |CC|$ .

This Simultaneity is succeeded by Lorentz factor where transformations between Inertial frames that preserve the velocity of light will not preserve simultaneously. The Geometrical expression of this transformation ( it is the base Mould, of natural Universe ) follows.

### 4.3. $OD_A = \sec\phi \rightarrow$ Lorentz Factor $\gamma$

The Absolute's System constancy of velocity, c, and Simultaneity.

corresponding velocities equilibrium and Centrifugal velocity,  $\bar{v} = \bar{w} r$ , is a constant,  $\bar{c}$ , because acceleration  $[d\bar{v}/dt = d(\bar{w}r/dt) = 0]$  is zero, i.e. constancy exists A Priori in all Inertial Systems and is not needed any other propositions. Breakages  $[\pm(w \cdot r)^2, 2(w \cdot r)^2]$  on circumference  $\rightarrow$  formulate Particles which are deported in STPL line, while on center O breakages  $\rightarrow$  vanish and deported in STPL cylinder are formulating the Rest Medium Field and Gravity force, the Dark matter and Dark energy, as follows,

Consider O( x,y,z, c = O.DA) being an Absolute Cartesian coordinate system with constant velocity ,  $\bar{c}$ , due to the tangential velocity  $\bar{v} = A.DA$  of the same system and O'(x',y',z', $\bar{v}$  ') being another one Cartesian coordinate system on [STPL] line and as direction DA,PA . F-5 , F-8

Question?? *When and how the two systems keep Centrifugal velocity |O.DA|= constant independently of any changes of velocity , $\bar{v}$ , of the system ??*

A first answer is that the two vectors  $|\bar{O}.DA|, |\bar{A}.DA|$  must have the same edge DA with not any set restrictions , or their interior period  $T = 4\pi \sqrt{(r/g)}$  to be the same for all equal vectors , which happens to the Cycloid motion on wavelength of norm  $|\bar{c}|$  and  $|\bar{v}|$  of their stationary wave with common period T . A second is the prior referred , where Centrifugal velocity,  $\bar{v} = \bar{w}r$ , is always a constant  $\bar{c}$ , because acceleration  $[d\bar{v}/dt=d(\bar{w}r/dt)=0]$  is zero since  $\bar{w}$  is always constant .

Since  $r=OA$  maybe any cave of rotation, then is considered a unit length (OA=1) and circle (O,OA) as unit circle . In triangle  $\Delta [O,A,DA]$ ,  $\{OA=1\}$  ,  $\{A,DA = \bar{v}\}$ ,  $\{O,DA = \bar{c}\}$  and  $\sin\phi = (\bar{v}/\bar{c})$  and  $O,DA = \sec.\phi = 1 : (\cos.\phi) = \pm 1/(\sqrt{1 - \sin^2\phi})$  and issues,  $\sec.\phi = \pm 1/[\sqrt{1 - (v/c)^2}] = c/[\sqrt{c^2 - v^2}]$  , i.e. velocity  $\bar{O}.DA$  is constant independently of the position [either circle (O,OA) or magnitude  $\bar{A}.DA$  and direction]  $\rightarrow A.DA$  of velocity  $\bar{A}.DA = \bar{v}$  and this mould valid for all points on [STPL] line , cylinder , so  $\sec.\phi$  is identical to the  $\gamma$ , Lorentz's factor or  $\rightarrow \sec.\phi = \gamma = \pm 1/[\sqrt{1 - (v/c)^2}] = c/[\sqrt{c^2 - v^2}]$  , and represents the Geometrical expression of Lorentz's factor , the master key of all universe , and STPL line - cylinder is the Navel Cord of Galaxies .

Remarks:

a. The two velocity vectors  $\bar{v}, \bar{c}$  coincide at ,DA, point, therefore , the meter of their changes is the same and equal to ,t, and  $\bar{O}.DA = c$  ,  $\bar{A}.DA = \bar{v}.t$  , i.e. on constant velocity vector  $\bar{O}.DA$  point O removes from position O to position DA. The same also for point A which removes from position A to DA. This removal is <Isochrones> because the two velocity vectors coincide at edge DA , which means that points O,A of this System remove to point DA at the same time (isochrones), independently of oscillation amplitude on the cycloid. This is the concept of < Simultaneous > in Geometry i.e. the distances of velocity vectors  $\bar{O}.DA = c$  ,  $\bar{A}.DA = \bar{v}.t$  , are traced with the same time factor  $[c(T)]$  by following cycloid motion (c).

Since acceleration ,a, for a quaternion  $z = (s+\bar{v}.\nabla i)$  is  $a = [d^2z/dt^2] = (d/dt, \bar{w}).(-\bar{w}z, dz/dt + \bar{w}xz) = 0$  , and this because  $\bar{w} = constant$  , therefore velocity  $\bar{v} = constant$  .

When the element  $d\bar{s} = \bar{A}.DA = \bar{v}.t = \lambda T = constant = \bar{c}.T$  then spatial length with its coordinates is  $ds^2 = dx^2 + dy^2 + dz^2 = (\bar{c}.T)^2$  which is Lorentz Group invariant combination.

Since for energy quaternion  $[\nabla i] = [Energy]^2 = [\nabla i]^2 = -1 = -[Space] = Anti-space = [-(\Lambda x \Lambda)/m, \pm \Lambda x \nabla i] = [\lambda, \pm \Lambda x \nabla i]$   $\rightarrow$  then this means that the massive mechanism Diffraction and the Energy mechanism Diffraction are Interchangeable .

A Particle with wavelength  $\lambda = (1)-(2)$  and spin say , $h/2$ , is consisted of two parts , The one because of the translational motion of speed  $\bar{v}$ , and the second of the , *common circle* , self-rotation velocity  $V_c = \lambda^2/T = \lambda^2.f = [\sqrt{1-(v/c)^2}].f = f.[1-(v/c)^2]$  . Energy  $[\Lambda x \nabla i] = (J1)$  as velocity vector ,  $\bar{v}$ , is the

cross product of two perpendicular velocity vectors  $\bar{v}1, \bar{v}2$  or  $\rightarrow \bar{v} = \bar{v}1 \times \bar{v}2$ , with head at point (1) and analyzed , in a perpendicular to (1)-(2) directional , plane , into the two orthogonal velocity vectors  $\bar{v}1, \bar{v}2$  which heads are at point (1). Energy J1 is carried to point (2) by following the cycloid motion in  $\lambda=(1)-(2)$  as follows , (F-4).

b.. Following the above logic, the vector-quaternion Norm is kept constant by an intrinsic ( in wavelength norm) isochrones ( harmonic oscillation) because of the cycloid motion , and independently of amplitudes ( displacements , or strengths).

i.e. Quaternion  $q = [\lambda, \pm \Lambda \nabla i]$  with norm , wavelength  $|\lambda|$  is a Standing wave (a plane Stationary wave) which preserve the constant position of magnitude  $|\lambda|$  with the two edges as nodes independently of amplitude , with a period  $T = L/v1 = \lambda/v1 = [\gamma.\lambda / 2c]$  and energy  $\Lambda = r.m\bar{v} = r\bar{p} = r.m(\bar{v}r)^2 = mr^2.\bar{v}^2$  depending on , $\bar{w}$ , only (it is spin) and thus forming the spherical standing waves . F-5.

Conclusion:

Applying all equations of Mechanics and Physics in Common circle (c) of radius  $r_c$  , angular velocity  $\bar{w}c$  , then velocity on radius is  $\bar{v}c = \bar{w}c.r_c$  , and the reaction to this motion which is mass  $m_c$  , is ,  $m_c = v_c . v_c = v_c^2 = (w_c r_c)^2$ . Linear momentum  $\bar{p} = m\bar{v}c$  and the resultant rotational energy  $\Lambda = r_c . p_c = r_c . m_c . \bar{v}c$  , and then since work on circle is  $W = p_c . L = p_c.(2\pi.r_c) = m_c . v_c . 2\pi . r_c = \Lambda$  , by solving to ,  $r_c$ , and for constant velocity  $v_c = c$  then,

$$r_c = \Lambda / 2\pi . m_c . v_c = \Lambda / 2\pi . m_c \quad \dots(a)$$

Applying equation (a) for the fundamental particles (monads) OFF the common circle , then conversion factors magnitudes mass ,m, and time ,t, are transformed as ,

$$mass (m) \rightarrow m_c . \gamma = m . [\sqrt{1-(v/c)^2}] \quad \dots(b)$$

radius ,  $r_c$  , of cycloid helix  $\rightarrow r_c = \Lambda/2\pi.\gamma.m_c \dots(c)$  which is the quantization of  $\rightarrow$  Energy as Space and Energy cavity .

Since ,  $m = E/c^2 = hf/c^2 = h/T.c^2$  (Einstein's de Broglie's), Radius  $R_c = 2 r_c = 2 . \Lambda / 2\pi . \gamma . m . c = [ h / 2\pi . c \gamma ( m = E/c^2 = hf / c^2 ) ] = c / 2\pi . \gamma . f = [ c . T / 2\pi . \gamma ] = [ 2 c / w . \gamma ] [ 2c^3 / w(c^2-v^2)$

$$and (r_c) = c / w . \gamma \quad \dots(d)$$

$$Period T_c = 4\pi . \sqrt{r_c} / g = \pi . \sqrt{R_c} / g \quad \dots(e)$$

Length  $L_c = \bar{v}r . T_c = [\sqrt{g} . r_c] . [4\pi . \sqrt{r_c} / g] = 4\pi . (r_c) = 4\pi(c/w.\gamma) = A1-A2$  , is the wavelength  $\lambda = L_c \rightarrow$  from which Constant velocity  $\rightarrow \bar{c} = w.\gamma . r_c = w.\gamma . (\lambda/4\pi) = \gamma L_c(f_c)/2 \dots(f)$

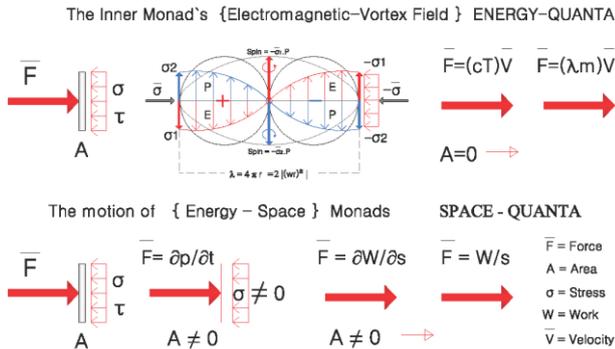
Where ,

- $\Lambda = h = Rotational Energy (Spin)$  ,
- $\bar{v} = Velocity of particle in Inertia System [R]$  ,
- $\bar{w}r = \sqrt{g} . r_c = The Rolling circle center constant velocity$  ,
- $\bar{c} = The constant velocity of the System, (of Light)$  ,
- $R_c = 2 . (r_c) = The radius of, Cycloid helix$  ,
- $g = Gravity's force \rightarrow 2 . (wr)^2$  , acceleration ,
- $T_c = The intrinsic Cycloid period , \pi . \sqrt{Rc/g}$
- $\bar{c} = \gamma . L_c(f_c)/2 = The relation between constancy (c) of$

Light , Laurence factor is ( $\gamma$ ) , Wavelength ( $\lambda = L_c$ ) , and the Cycloid helix rolling circle frequency( $f_c$ )  $\rightarrow [39]$  .

**4.4. Material Points and Energy Fields [ QUANTA ].**

The Quantization of **Energy** in space is the stationary Electromagnetic wave in monad and quantization of **Space ds** is the work W in breakage  $s^2 = \lambda$  ,The Energy-Space Quanta.



**Fig. 6. The Quantization of Work as Force , (Energy) = [ E , P ] and as Space (Wavelength) = [ λ ] .**

From work equation  $W = [\lambda, \pm \Lambda \nabla i]$  where,  $\lambda$  = the **Wavelength** of quaternion=monad and  $\pm \Lambda \nabla i = \Lambda = p = M \cdot \vec{c} = [\lambda|\Lambda|]$ .  $\vec{c} = (\lambda m) \cdot \vec{c} = (\lambda m) \cdot \vec{w} \cdot r = \vec{w} \cdot [\lambda(m \cdot r)] = \vec{w} \cdot [\lambda(\vec{v})] = \vec{w} \cdot [(cT) \cdot \vec{v}]$  = the **Energy** ,  $\vec{w}$ , is the angular velocity or **the spin**,  $\vec{c}$  is the **constant** velocity equal to that of light,  $\vec{v}$  is the **velocity of monad** ,T is the period in wavelength's monad.

**Quantization of Energy** confined in a monad say ( $\vec{v}$ ), (it is the inner structure of monad) is the Stationary wave of the Real part  $|\lambda|$  of  $\vec{v}$ , due to the Electric Displacement field ( $|\vec{v}| = \epsilon \cdot E + P$ ), alternately in terms of The Electric field  $E = (\partial P / \partial t)$  and The Magnetic field  $P = (\partial E / \partial t)$ ,  $\epsilon$  is the Permittivity as a measure of how much the wavelength opposes E-field .

Object in mechanics, is the **Quantized Material point** (1) at Euclidean point (1) , which is now Breakage  $\pm [(\vec{w} \cdot r)^2]$  magnitude , in the Rest ,Homogenously ,Quantized mass-less Field  $\{ \pm [(\vec{w} \cdot r)^2] \}$  and consists the required coordinate System and the base for all motions and forces. This rest Space system (the Base) is [MFMF] Field with the less space distance  $ds = |\vec{w} \cdot \vec{r}|^2$  extended beyond Planck's length , the **Space Quanta**.

Object in mechanics may be also the **Quantized Energy** as wavelength  $\lambda = (1) - (2)$  in [Medium-Field Material Fragment  $\rightarrow [\pm s^2] = |\vec{w} \cdot \vec{r}|^2 = [MFMF]$  Field  $\leftarrow$ ] which is a standing wave in cavity (1)-(2) with scalar breakage  $\{ | +(\vec{w} \cdot r)^2 | \leftrightarrow | -(\vec{w} \cdot r)^2 | \}$  as medium (1)-(2) field , and (J1=  $\vec{v}$ ) the Energy as velocity at point (1) and carried to point (2) by following the isochrones cycloid motion from point (1) to (2) . Velocity , $\vec{v}$ , during shifting , and because  $A=0$  , is analyzed into two transverse velocity vectors  $\vec{v}_1, \vec{v}_2$ , which undergo vibrations and cause two waves which are the two **Quantized Electric and Magnetic** isochrones components because follow cycloid trajectories. **The Energy Quanta , in Space Quanta**

General Relativity is dependent on one axiom, that of Galilean Relativity and on doubtful non-Euclidean geometries without any physical meaning and reality , and this because these are extreme of the Euclidean [38]. Now , the immense confusion in basic ideas regarding Quantized Energy-Space , **The Energy and Space Quanta**, vanishes.

Question ,, When maximum velocity occurs in Common circle ?? . From Fig-5 maximum velocity occurs when the two velocities  $\vec{c}, \vec{v}$  are perpendicular between them , where then dispersion follows Pythagoras theorem and the consultant Quantized Space ,r, becomes  $r = |(\vec{c} \cdot T)| = \sqrt{v^2 + c^2}$  .

The total Rotating energy is  $\rightarrow \pm \bar{\Lambda} = \vec{p} \cdot r = (M \cdot c) \cdot r = (M \cdot c) \cdot \sqrt{v^2 + c^2}$  and  $[\pm \bar{\Lambda}]^2 = p^2 \cdot r^2 = M^2 \cdot c^2 \cdot (v^2 + c^2) = (M^2 \cdot v^2) \cdot c^2 + M^2 \cdot c^4 = (p^2 \cdot c^2) + M^2 \cdot c^4 = [p \cdot c]^2 + [m_0 \cdot c^2]^2$  ,

**4.5. Cavities in nature <Planck's Length>**

It was shown in [31] that *Nature has not any < meter > to measure quantized quantities (that of Space and of Energy) except these of the Geometry constants , one of which is number  $\pi$  ( Archimedes number  $\pi$  ) so quantization of Points ( $\lambda$ ) follows geometry constant ( $\pi$ ) and for Energy  $Wd$  , which is the quantized Energy of the Quantity dissipated per cycle ,[ and this because monads follow sinusoidal oscillation on wavelength = monads as the  $w$ .th power and the  $n$ .th root of this monad where  $w \cdot n = 1$  as above **on and in the same monad** ] and which energy is equal to,  $Wd = \int \dot{x} \cdot dx = \int C \dot{x}^2 \cdot dt = (\pi C w) \cdot \lambda^2 / 4 = (2\pi^2 C \cdot \lambda^2 / 4) \cdot f = (m\pi \cdot \lambda^2 / 2) \cdot f = C \cdot f$  i.e.*

From above monads  $(s + \vec{v} \nabla i)^{1/w} = |z|^{-w} \cdot e^{\lambda} \cdot i \cdot (\varphi + 2k\pi) \cdot w$  where  $\cos \varphi = s/|z|$ , and for Rotated Energy case where  $s = 0$  and also  $\cos \varphi = 0$  exists for angle  $\varphi = \pi / 2$  , the quarternion  $(s + \vec{v} \nabla i)^{1/w}$  as **dimension power  $w=b$  and it is as**  $e^{-i \cdot (\frac{\pi}{2} + 2k\pi) \cdot w} = e^{-i \cdot (\frac{5\pi}{2}) \cdot b} = e^{-i \cdot (\frac{5\pi}{2}) \cdot 10}$  where  $L_p = e^{i \cdot (-\frac{5\pi}{2}) \cdot 10}$

is the basic Geometrical interpretation of < **Planck scale meter** > based on the two **Geometry constants  $e, \pi$**  where  $k = 1$ , and **base  $b = 10$**  , and this from logarithm properties with different bases on the same base  $e$  as it is  $e^w = (b^{\log(b)e})^w =$

$b^{w \cdot \log(b)e}$  and  $\sqrt[w]{e} = e^{1/w} = e^{-w} = x^{\frac{1}{w} \cdot \log(b)e}$  which are **monads in monads and is of Wave motion with angular velocity  $w = 4 \cdot Wd / (\pi \cdot C \cdot \lambda^2)$  , i.e. Space and Energy is quantized and measured on the two Constant and Natural numbers  $e, \pi$  . where for base the natural logarithm ,e, and exponent the decimal base ,  $b = 10$  , then issues  $\rightarrow$  During Diffraction , $d\delta$  , frequency ,f, doesn't change and only the velocity , $\vec{v}$ , and wavelength , $\lambda$ , changes and the Total Energy  $[\vec{z}^{-1/w} = |\vec{z}|^{-w} \cdot L_0]$**

Again  $\rightarrow z^{1/w} = (s + \vec{v} \nabla i)^{1/w} = |z|^{-w} \cdot [\cos(\varphi + k\pi)/w + i \cdot \sin(\varphi + k\pi)/w] = |z|^{-w} \cdot e^{\lambda} \cdot i \cdot (\varphi + k\pi) / w$  **For  $\cos(\varphi + k\pi)/w = 0$**  then exists only the Imaginary part of monad ,  $(\vec{v} \nabla i) \neq 0$  , where  $\varphi = \pi / 2$  and then  $z^{1/w} = |z|^{-w} \cdot e^{i \cdot (\varphi + k\pi) / w} = \pm i \cdot (\pi / 2 + k\pi) \cdot 10$  and it is the

**Diffraction Energy mechanism** for all Space Levels of quantization which are **Energy Particles only** i.e. Energy particles where  $z^{1/w} = |z|^{-w} . Lv = \rightarrow$  **Energy Monads** . For  $\sin.(\varphi+k\pi)/w = 0$  then exists only the Real part of monad  $,s, \neq 0$  , where  $\varphi = -\pi \pm k.\pi$  and then  $z^{1/w} = |z|^{-w} . e^{i.(\varphi+k\pi)/w} = \pm i . (-\pi \pm k\pi) . 10$  and it is the **Diffraction Massive mechanism** for all Space Levels of quantization which are particles with mass only.

Extending  $Lv = e^{i.(\frac{\pi}{2}+2k\pi).b} = e^{i.(\frac{\pi}{2}+2k\pi).10}$  then ,

For base  $e = 2,71828$  and  $k = 0$   $Lv = e^{i.(\pm \pi/2) b}$  then  $e^{(-15,7079)} = 1,78118 . 10^{-7}$  m **Energy Balanced**

For base  $e = 2,71828$  and  $k = 1$   $Lv = e^{i.(-3.\pi/2)b}$  then  $e^{(-47,12389)} = 5,344 . 10^{-21}$  m **Energy Balanced**

For base  $e = 2,71828$  and  $k = 2$   $Lv = e^{i.(-5.\pi/2)b}$  then  $e^{(-78,5398)} = 8,906 . 10^{-35}$  m **Planck's Length**

For base  $e = 2,71828$  and  $k = 3$   $Lv = e^{i.(-7.\pi/2)b}$  then  $e^{(-109,9956)} = 2,295 . 10^{-48}$  m **Layer Length**

For base  $e = 2,71828$  and  $k = 4$   $Lv = e^{i.(-9.\pi/2)b}$  then  $e^{(-141,372)} = 3,969 . 10^{-62}$  m **Gravity Length**

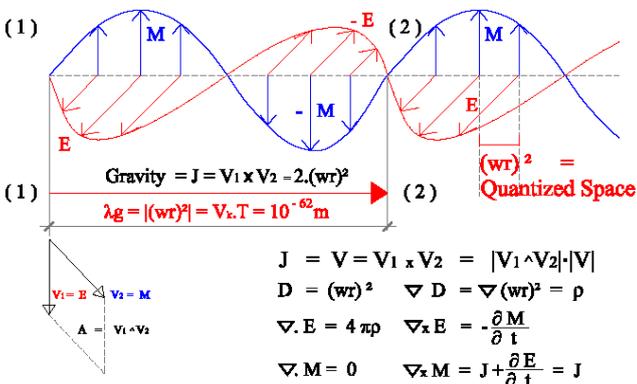
For base  $e = 2,71828$  and  $k = 5$   $Lv = e^{i.(-11.\pi/2)b}$  then  $e^{(-172,7876)} = 9,593 . 10^{-76}$  m **Layer Length**

For base  $e = 2,71828$  and  $k = 6$   $Lv = e^{i.(-13.\pi/2)b}$  then  $e^{(-204,2040)} = 7,155 . 10^{-89}$  m **1st Layer Length ...**

For base  $e = 2,71828$  and base  $b = 10$  then  $e^{-(78,5398)} = 8,906 . 10^{-35}$  m and divided by  $2\pi = 1,616199 . 10^{-35}$  m , since cave is a versor and then  $\rightarrow$

Planck's Length  $Lp = e^{i.(\frac{\pi}{2}+2k\pi).b} = e^{-i.(5\frac{\pi}{2}).b} = e^{i.(-5\frac{\pi}{2}).10}$   
 $= e^{-(78,5398)} = 8,906 . 10^{-35}m = \{ \sqrt{3} . \pi 1,616199 . 10^{-35} \text{ m} \}$   
 Conservative Planck's constant  $L\text{-Planck} = 1,616 . 10^{-35} \text{ m}$   
 $= \sqrt[3]{h.G/c^3}$  is consisted of the three compromising constants  $h,G,c$ , instead of geometry cave  $Lp = e^{i.(-5\pi/2).10}$  , which is based on the two natural constants  $e , \pi$  .

**GRAVITY `S STATIONARY WAVE -LENGTH**



**5. Beyond Gravity Forces**

**5.1. Gravity's Medium Field – Gravity Force Fig-7**

$[\pm s^2] \rightarrow$  [MFMF] Field ,  $[\nabla i] \rightarrow$  Gravity force . Gravity Transport mechanism in cave  $\lambda=10^{-62}$  m and through breakage  $\lambda g = (1)-(2) = [\pm s^2 = \pm |(\bar{\omega}.r)^2|]$  as the Medium Field of Material Fragment, [MFMF]  $\rightarrow(1)-(2)$  ,  $\bar{\omega}$  , Properties:

Since, Distance = Velocity. Time, then  $\lambda = v.T$

The un-clashed through center ,O, Fragments  $s^2 = \pm |(\bar{\omega}.r)^2|$  occupy the minimum quantized space  $|s^2|$  and fill all [STPL] cylinder and thus consist the Rest , Homogenous , Isotropic Base of all motions . On this Base moves force  $[2. |(\bar{\omega}.r)^2 | \nabla i]$  , the rotational Gravity Momentum force and all other clashed or un-clashed fragments of the cylinder consisting the Relative System [R] to Absolute ,Space, Anti-Space,  $\pm \bar{\Lambda}$ , System [S].

Time T interfere with the calculations in reference frame only and *does not* into the motionless frame .[26]

Since work in [PNS] is  $W = [ \int_A^B P. ds ] = 0$  and is stored on points A,B as quaternion  $\bar{z}o = [\lambda, \bar{\Lambda} \nabla i]$  then forces (*the spin*  $\bar{\Lambda}$ ) are conservative and because work from conservative forces between points is independent of the taken path and on a closed loop is zero , curl = 0 and Force becomes from the Potential function gradient , and also from the equilibrium of Spaces Anti-spaces , where then Spin rotations ,  $\bar{\Lambda} - \bar{\Lambda}$  , are in inverted order of rotation and vice-versa , and then even function  $f(\Lambda) = f(-\Lambda)$  , odd function is  $-f(\Lambda) = f(-\Lambda)$  and their sum  $f(\Lambda) + f(-\Lambda) = 0$  , i.e.

Mapping (graph) of Even function  $f(\Lambda)$  , is always symmetrical about  $\Lambda$  axis ( i.e. a mirror) and of Odd symmetrical about the origin and this is the interpretation of the Wave Nature of Spaces , [PNS].

Differential operator of even order quaternion plus differential operator of odd order quaternion is zero :

It is the Mapping (graph) of Even function  $f(\Lambda)$  and of Odd  $f(-\Lambda)$  and is the interpretation of the Wave nature of Spaces and all the others ( i.e. The Physical Universe behaves as a simple harmonic oscillator ) . Because functions  $f(\Lambda)$  ,  $f(-\Lambda)$  are Stationary and only their sum creates their conjugation operation through mould  $\bar{z}o$  , so their sum is zero and independently of time (negation truth) as , even function

$f(\Lambda) \rightarrow (\partial/\partial t, \nabla) \odot (\lambda = s^2, \Lambda \nabla) = -\nabla, \times \Lambda = eo$

odd function  $f(-\Lambda) \rightarrow (\partial/\partial t, \nabla) \odot (\lambda = s^2, -\Lambda \nabla) = \nabla \Lambda, -\nabla \times \Lambda = eo$   
 even + odd = 0  $\rightarrow (-\nabla \Lambda, \nabla \times \Lambda) + (\nabla \Lambda, -\nabla \times \Lambda) = [0, 0 + 0] = 0$   
 even-odd = 0  $\rightarrow (-\nabla \Lambda, \nabla \times \Lambda) - (\nabla \Lambda, -\nabla \times \Lambda) = 2.[-\Lambda \nabla, \nabla \times \Lambda]$   
 i.e. is doubled .

In Calculus when a function is recognized in terms of the Even and Odd functions then  $x(\tau) = E(\tau) + O(\tau)$  . Because an even function  $E(\tau)$  is symmetric about the origin then  $E(\tau) = E(-\tau)$ , i.e.  $\cos(\omega t) = \cos(-\omega t)$  and because an Odd function satisfies the relationship  $O(\tau) = -O(-\tau)$  then  $\sin(\omega t) = -\sin(-\omega t)$  and then  $\int_{\tau/2}^{\tau/2} E(\tau) . \sin . \omega t . dt = 0$  and  $\int_{-\tau/2}^{\tau/2} O(\tau) . \cos . \omega t . dt = 0$

Quaternion of the Primary Space dipole is  $\bar{z}o = [s, \bar{\nu}n . \nabla i] = [\lambda, \bar{\Lambda} \nabla i]$  and it is the only one Physical existing truth monad

( $\bar{z}_0 = 1$ ) and ( $e_0 = 0$ ) the only Physical non-existing equilibrium monad , This negation truth = the equilibrium of the two equal and opposite momentum  $\bar{p} = \pm \bar{\Lambda}$  , on points and by using the additive form of Binary quaternion then

$$[\nabla\lambda, 0] + [0, -\nabla x \bar{\Lambda}] = [\nabla\lambda, -\nabla x \bar{\Lambda}] = 0 \quad \text{i.e.}$$

non-existence (0) becomes existence with [PNS] motionless dynamic mould ( $\bar{z}_0 = 1$ ), and it is Done everywhere , following Boolean logic operations with all combinational rules and laws , as follows ,

→ Element [ $\bar{z}_0 = 1$ ] ,Element [ $e_0 = 0$ ] ←

Conjunction [ $z \times \bar{z}_0 \rightarrow 0$ ] - Conjugation [ $\bar{z}_0 \odot 0$ ] -

Quaternion [ $\bar{z}_0 \equiv e_0$ ] → 0 ,  $z_0, 0, z_0 - 0, 0, z_0, z_0 - z_0, 0, z_0, z_0 - 0, z_0, z_0, 0 - z_0, 0, 0, z_0$ , so Quaternion`s ↔  $\bar{z}_0 = [\lambda, \pm \Lambda \nabla i]$ ,  $\bar{z}_0' = [\lambda^2 - |\bar{\Lambda}|^2]$ ,  $e_0 = [\Lambda \nabla, -\nabla x \bar{\Lambda}]$  . All above are the three fundamental equations of [PNS] , unifying the known homogenous Euclidean geometry ( $\lambda = \lambda \nabla$ ) and the source term Energy ( $d\bar{s} \cdot dP = \lambda \cdot \Lambda = \text{constant } K_{1,2,3}$  with motion  $\Lambda$ ) , and imbedding in them all conservation physical laws with the only two quantized magnitudes , $\lambda$  ,  $\bar{\Lambda}$  on Monad  $\bar{A}\bar{B}$  which are , $\lambda$  = the length of geometry primary dipole (wavelength of dipole  $\bar{A}\bar{B}$ ) which is a scalar magnitude ,

$\bar{\Lambda}$  = the spin of dipole , source term , the amount of rotation on dipole  $\bar{A}\bar{B}$ , equal to angular momentum vector  $\bar{p} = \bar{\Lambda} = \bar{w} \cdot \lambda = m \cdot \bar{v} = d/ds \{ [\int_A^B P \cdot ds] \}$  , and

Time = The conversion factor ,t, equal to Zero.

The mechanism of Energy Transport as ( $\bar{v}$ ) through its quantized wavelength  $|\lambda = \bar{v} \cdot T|$ , is a property of any standing wave, into the Medium  $|\lambda| = (1)-(2)$ , and involves the Absorption and Reemission of the wave quantized energy  $J = (J_1) = (J_2)$  by the two neighbor edges (1) and (2) of the medium . The Absorption of energy causes , $J_1$ , within edge (1) to undergo vibrations as  $[ds^2/dt^2] = - (g/4r) \cdot s$  which causes a new wave with the same frequency (because  $f = E/h$ ) as the first wave but delaying the motion through the medium until Reemission by travelling ,  $J_1$  to  $J_2$ , through this small region of space between edges (1) and (2) and once the energy of wave is reemitted by its neighbor edge (2) then mechanism is recycled . This mechanism is succeeded by the intrinsic property of the waves ( → quaternion`s , monads , vectors , Tensors ) which is , the Stationary wave nature of Spaces, and works as follows, → It was shown in [27] that on dipole  $\bar{A}\bar{B} = [\lambda m, \Lambda]$  under the influence of Space Anti-Space forces  $dP = P\bar{B} - P\bar{A}$  are created from forces  $dP \perp$  Space lines the Static Force Field ,E, from forces  $dP \perp$  Space lines the Static Force Field ,P, where  $P \perp E$  , which then experience on any moving dipole  $\bar{A}\bar{B}$  with velocity  $\bar{v}$ , a total force  $F = F_E + F_P = (\lambda m) \cdot E + (\lambda m) \cdot \bar{v} \times P$  which combination of the two types result in a helical motion ,with stability demand →  $E = - (\bar{v} \times P) = - (\bar{v} \cdot P) \perp$  which is the alternative conservation of momentum  $\Lambda^2/2\lambda m$  , in the two perpendicular fields  $E$  ,  $P$  .

In case ( $\lambda m$ ) = q then total force  $F = F_E + F_P = q \cdot E + q \cdot \bar{v} \times P = q \cdot [E + \bar{v} \times P]$  →

which is Lorentz force in the Electromagnetic crossed fields  $E$  and  $P$  with electric charge  $q = \lambda m$  and are the two beyond Gravity Fields, interpreting the fundamental cause (effect) of motion , in small and large scales .

Gravity Force  $F_g$ , Gravity field  $G_f$  :

Equilibrium of Space Anti-space forces creates energy as velocity vector  $\bar{v}$  which is decomposed in two cross product velocity vector fields (Electric and Magnetic) into which breakage  $2(\bar{w} \cdot r)^2$  as charge ,q, causes the Lorentz force in this small scale [27] .

The standing waves in cavity (1) - (2) with the scalar breakage  $|\pm(\bar{w} \cdot r)|$  as medium (1)-(2) =  $|\pm(\bar{w} \cdot r)|$  Field , and Energy  $[\Lambda x \nabla i] = (J_1) = 2 \cdot (\bar{w} \cdot r)^2$  as velocity  $\bar{v}$  only at point (1) , [ and this because Work as Force in extreme case where zero area ( $A=0$ ) becomes velocity  $\bar{v}$  ] , need the same time ( different velocities and different energy on (1) are isochrones and this because are following cycloid trajectories in medium (1)-(2) ) to reach edge (2) . Energy ( $J_1$ ) as velocity vector , $\bar{v}$ , is the cross product of two velocity vectors  $\bar{v}_1, \bar{v}_2$  or →  $\bar{v} = \bar{v}_1 \times \bar{v}_2$  ,with head at point (1) and analyzed , in a perpendicular to (1)-(2) directional , plane , into the two orthogonal velocity vectors  $\bar{v}_1, \bar{v}_2$  which heads are at point (1) . Energy  $J_1$  is carried to point (2) by following the cycloid motion (1)-(2).

During contracting (shifting), velocity vectors  $\bar{v}_1, \bar{v}_2$ , being vectors ,undergo vibrations ( expand as oscillation ) which causes two waves that represent the two Electric and Magnetic perpendicular components ( The combination of vibration (O) and oscillation (→) is what determines the frequency rate , the cyclic pattern of scalar waves ) until reaching point (2) which is the Reemission of the wave and it is the new head of velocity , $\bar{v}$ , where then mechanism is recycled . These scalar waves are standing waves that flash on and off. Since wavelength,  $\lambda$ , as distance (1)-(2) is equal to product velocity (v).period (T) then  $\lambda = \bar{v} T$ .

Medium in cavity  $\lambda = (1)-(2)$ , is breakage  $|\pm(\bar{w} \cdot r)|$  and Energy ( $J_1$ ) is momentum as velocity vector  $\bar{v} = 2(\bar{w} \cdot r)^2$ , so this velocity vector fits to the scalar magnitude  $[|(\bar{w} \cdot r)| = (1)-(2)]$  which is the force in all Inertial systems and is called GRAVITY or Momentum  $GM$  . Because any particle of mass,  $m = 2(wr)^2$  tied to a fix point (1) executes a Simple harmonic motion in Medium (1)-(2) which is breakage  $|\pm(\bar{w} \cdot r)|$ , then  $GM = 2(\bar{w} \cdot r)^2$ , is a Force also and it is the intrinsic Stationary velocity vector , which is binding points of this Homogenous-Isotropic, Rest and mass-less nature Field  $\pm(\bar{w} \cdot r)^2$ .

What is then Force of Gravity  $F_g$ , and what is Gravity field  $G_f$  ?? Since Gravity , momentum , is →  $2(\bar{w} \cdot r)^2$  and medium  $|\pm(\bar{w} \cdot r)|$ , then is consisted of very penetrating material in the same material where dipole breakage  $\pm(\bar{w} \cdot r)^2$  formulate infinite dipole that rotate and thus configuration becomes attractive and , is the why Gravity is always attractive .

Since Gravity Force is equally scattered in all universe and as a Rest force is affective, attractive to massive Energy , (matter → Dark matter, Dark energy, the fundamental particles Fermions and Bosons etc.) as Gravitational Force is differing from, Electromagnetic Force , which is one of the interaction of other forces of the [STPL] cylinder , so Gravity Force is as → The Effective process of Gravity Force  $F_g$  → Breakage  $[|s^2 = \pm(\bar{w} \cdot r)|^2]$  represents the Infinite Space , Anti - Space and is spread in all dimensions as the Rest and simple harmonic Oscillating Dipole → (1)-(2) =  $\{ |[s^2]| \leftrightarrow 2[s^2] \leftrightarrow [ -s^2] \}$  where,  $[|\pm s^2|]$  → is the Field-Length of Medium, and  $2[s^2] \leftrightarrow$  is the Gravity as momentum ( $m \bar{v} \cdot g$ )  $m = 1$  → and this because exists zero resistance to motion and happens ,

a.. Momentum as velocity  $\bar{v}.g =$  the breakage  $2(\bar{w}.r)^2$ , is the cross product of two velocity vectors  $\bar{v}_1 \perp \bar{v}_2$  and is forming the two Fields on Medium  $|(\bar{w}.r)^2|$ , which is a Stationary Wave in medium length  $s^2 = |(\bar{w}.r)^2|$ .

b.. Velocity  $\bar{v}.g$ , is binding the Medium ,the breakage  $|+(\bar{w}.r)^2| \leftrightarrow |-(\bar{w}.r)^2|$  , through the Electric (E) and Magnetic (P) curled fields , following the cycloid motion .

c.. Breakages and Particles with velocity  $\bar{v}$ , being the units of matter with Electric charge  $q=\lambda m$ , as their physical property is, when placed in prior referred Electromagnetic Field  $E \perp P$  experience a force as Lorentz's Force and this is called Gravity equal to  $\rightarrow$  Gravity - Force  $F_g = q.[E + \bar{v} \times P] \leftarrow$  and the Homogeneous Gravity - Field  $G_f = [E + \bar{v} \times P] \leftarrow$

**5.2. Dark matter – Dark Energy**

$C.[\pm \bar{c}.s^2] \rightarrow$  Dark matter and  $[\bar{c}.\nabla i] \rightarrow$  Dark energy

Thrust  $(\bar{v} = \bar{w}.r)$  on circumference of ,common circle, is continually acting on the three Breakages  $+ [(\bar{w}.r)^2]$  ,  $- [(\bar{w}.r)^2]$  ,  $2[(\bar{w}.r)^2]$  , producing the fundamental particles

Leptons and Bosons with  $1/2$  and 1 spin.

It has been referred that in case Thrust  $(\bar{v} = \bar{w}.r)$  is not acting on the Breakages, (it is the case where  $r=0$  where then Thrust  $= \bar{v} = \bar{w}.r = 0$ ) the un-clashed through center ,O, Fragments  $s^2 = \pm |(\bar{w}.r)^2|$  which occupy the minimum quantized space  $|s^2|$  are deported and fill all [STPL] cylinder which is the Base of all motions .

Constant velocity  $\bar{c}$  is acting in [R] system only, off the common circle and when acting on Breakages  $\pm [(\bar{w}.r)^2]$  produce Dark matter  $\pm \bar{c}.[(\bar{w}.r)^2]$  being the opposite in

Relative [R] system and this because of equilibrium of masses , and when acting on Breakages  $2[(\bar{w}.r)^2]$  produce Dark energy  $2\bar{c}[(\bar{w}.r)^2]$  which is an active force in all Relative parallel frames which are the Inertial frames. Because it is of the same homogenous material, is interacting with gravity only and since is of negative pressure is acting repulsively.

On the same Base,  $([(\bar{w}.r)^2] \rightarrow$  moves force  $[(\bar{w}.r)^2 \nabla i] = 2[(\bar{w}.r)^2]$  as Intrinsic Stationary wave in  $2[(\bar{w}.r)^2]$  cavity, and it is the Gravity and all other clashed or un-clashed fragments of the cylinder , consisting the Relative System [R] to the Absolute ,Space, Anti- Space,  $\pm \bar{\Lambda}$ , System [S].

In case that Thrust ,  $\bar{c}$ , is not acting on the Breakages they are then resting in STPL cylinder and continually existing as Gravity Field  $\pm [(\bar{w}.r)^2]$  and force called Gravity  $2.[(\bar{w}.r)^2]$  .

Because power of  $(\bar{w}.r)^2$  is 2 so is a homogenous form of repulsively acting energy, not very dense, in STPL cylinder which permeates all of space interacting with gravity only and following acceleration of universe . Because of the velocities retardations (birefringence of STPL) red shifts must be observed at distance. Dark matter  $\bar{c}.[(\bar{w}.r)^2]$  having energy density properties defects in STPL cylinder .

**5.3. Relative Motion**

Because properties in and on [STPL] line are relative to the only one equilibrium and Absolute system  $\pm \Lambda = r.m\bar{v} = r.m.\bar{w}.r = m r^2.\bar{w}$ , so exists that what is called Relativity. As Absolute System let it be [S]  $\equiv \{DA-O\}$  and as the Relative (Reference, Affine) System, [R]  $\equiv \{DA-PA\}$  . Fig-8

Relative motion of [S] $\equiv\{DA-O\}$ , [R] $\equiv\{DA-PA\}$  Systems

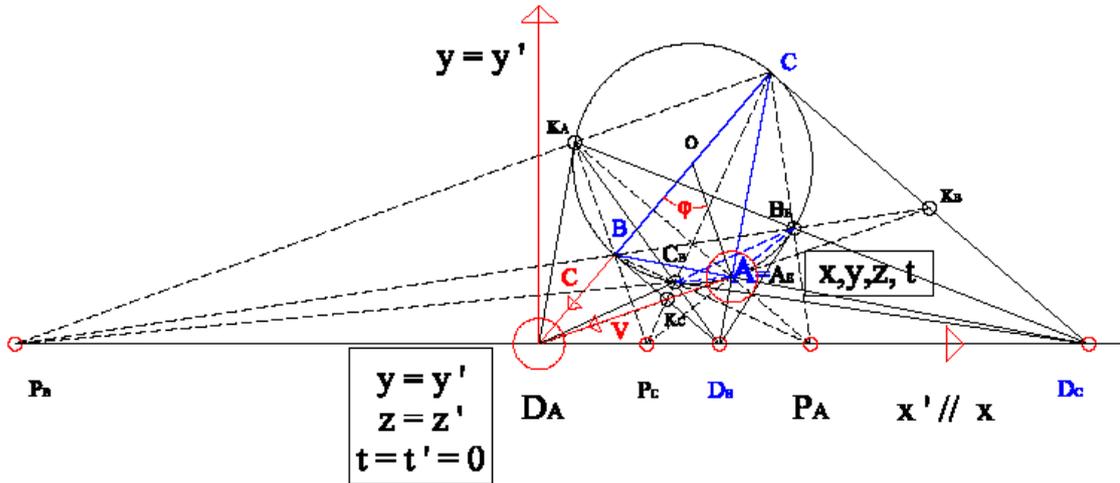


Fig.8. Reference System {DA-PA} $\equiv$ [R] (x',y',z', t') moves with velocity  $\bar{v}$ , parallel to ,x-x', axis with respect to the fixed and Absolute System {DA-O}  $\equiv$  [S](x,y,z, t) .

It was shown (4-2) , that in {DA-O},(x,y,z, t) , System  $\bar{c}.\bar{v}$ , vectors are isochrones i.e. period  $T = L/V = 2\pi R/V = 2\pi/[c/r_c] = 2\pi/[v/r_c] \rightarrow c/r_c = v/r_v \rightarrow c.r_v = v.r_c$  , where  $r_v, r_c$  are the radius of their intrinsic rolling circles .This relation is geometrically expressed as  $\sec.\phi = O.DA : A.DA = \gamma = \pm 1/\sqrt{1-(v/c)^2} = c/\sqrt{c^2 - v^2}$  and it is a Cycloid property equal to Lorentz's  $\gamma$ , factor.

Newton's laws are true into Reference System {DA-PA} Considering {DA-O},(x,y,z, t) , as the fixed frame [S] of the

coordinate system in the Gravity cave ( $d=2r$ ) and point A(x,y,z) is fixed on circle (O,OA) and is rotating with a velocity  $\bar{v} = \bar{w}r$  and of angular velocity  $\bar{w} = 2\pi/T$  where period of rotation ,T, is constant also.

Since acceleration for a quaternion  $z = (s + \bar{v}.\nabla i)$  is  $a = [d^2z/dt^2] = (ds/dt.\bar{v}.\nabla i) + s.d(\bar{v}.\nabla i)/dt = 0 + s.d(wr)/dt = 0 + 0$  , and this because  $\bar{w} =$  constant for both , therefore , velocity  $\bar{v} =$  constant, i.e.  $\rightarrow$  Centrifugal velocity of Absolute system [S] is any constant ,  $\bar{c}$  , and thus is not needed to accept a priori

this constancy of velocity  $\bar{c} = 0 \rightarrow \bar{v} \rightarrow \infty$  on circle (O,OA) to exist in frame , so automatically is defined the conversion factor  $t = \text{time}$  , between the conventional time units (second) and length units (meter = A.DA) or as  $\bar{c} \cdot r_v = \bar{v} \cdot r_c$  ,  $\rightarrow \bar{c} (v)(T/2\pi) = \bar{v} (c)(T/2\pi) \rightarrow \bar{c} (v)/w = \bar{v} (c)/w$  which is happening with the same ,w, without any restrictions .

This is why conversion factor,  $t = \text{time}$ , has not any essence in all universe but this aim only .

Because [STPL] line of the fixed frame is becoming from this system [S] , then this relative frame [R] is common to the fixed one (common DA) and let it be [R](x',y',z', t') .

From figure F-8 ,  $\sin\phi = (\bar{v}/\bar{c})$  meaning that the Relative system ,[R](x',y',z', t') , ( Affine Frame) is the projection of Absolute Frame [S]  $\equiv \{DA-O\} - (x,y,z, t)$  where exists as Simultaneity for all motions ,i.e.

$$[R] \equiv \{DA-A\} \equiv [(x',y',z', t')] = [S] \equiv \{DA-O\} \equiv (x,y,z, t) \cdot \gamma$$

Considering point DA as the common center and [STPL] as the x-x axis of the two systems , then becomes DA( x ,y=y' , z = z' , t) and for all linear systems DA( x' , y'= y , z' = z , t') respectively .

This specific state of constancy , i.e., the Centrifugal velocity of Absolute system [S] to be a constant , $\bar{c}$ , and the rectilinear motion with respect to one another , defines the natural Inertial frames , uniformity of Space and motion and the same meter of their changes (Time).

Since points O,A remove to point DA isochrones by their intrinsic property motion , which is  $\rightarrow$  wavelengths are a Stationary wave  $\leftarrow$  , following Lorentz's factor , $\gamma$ , then this following , happens also to all frames which make this motion , and so issues  $\{DA-0\} = \gamma \cdot \{DA-A\}$  ... (F-8)

On this system DA( x' ,y'=y , z' = z , t') are conveyed , the Breakages [  $\pm (wr)^2$  ,  $2(wr)^2$  ] of (O,OA) circle after the colliding with the rotating velocity  $\bar{v} = \bar{w} \cdot r$  of [S] system , and are the fundamental particles ,Fermions and Bosons, or by escaping consisting the Rest Field and Gravity, or Dark matter and Dark Energy , as analytically is shown .

Remarks:

a. Material point A  $\equiv \pm |(\bar{w} \cdot r)^2|$  of the Fixed System {DA-O} travels with velocity  $\bar{v}$  at point DA , so geometrical distance A.DA in the Relative System [R]  $\equiv \{DA-PA\}$  is A.DA = x'+  $\bar{v}t'$ , and because of the isochrones motion in the Fixed System [S]  $\equiv \{DA-O\}$  it is

$$x = (x' + \bar{v} \cdot t') \cdot \gamma \text{ or } x = (x' + \bar{v} \cdot t') \gamma = [x' + \bar{v} \cdot t'] : [\sqrt{1-(v/c)^2}] \dots (7a)$$

Inversely , using (7a) where [S]  $\equiv \{DA-A\} \equiv \{DA-0\} / \gamma$  , then if Material point A of the Fixed System {DA-O} travels with velocity  $\bar{v}$  at point DA , the geometrical distance A.DA in the Fixed System [S]  $\equiv \{DA-O\}$  is  $\rightarrow$  A.DA = x -  $\bar{v} \cdot t$  and in the Relative System [R]  $\equiv \{DA-PA\}$  it is

$$x' = (x - vt) \cdot \gamma = [x - vt] : [\sqrt{1-(v/c)^2}] \dots (7b)$$

b..Conversion factor t=time, between the conventional time units (second) and length units (meter) and because of the isochrones motion of vectors  $\bar{c} = O,DA$  and  $\bar{v} = A,DA$  , then vectors O,  $\bar{D}A = \bar{c} \cdot t$  and A,  $\bar{D}A = v \cdot t'$  reach point DA simultaneously. This Geometrically means that conversion factor ,t, on , $\bar{c}$  , is projected on , $\bar{v}$ , and so ,

$$t - t \cdot \sin\phi = t - t(v/c) = (1-v/c) \cdot t = (c - v) \cdot t / c .$$

From above Question , and because  $\bar{w} = \text{constant}$  where then Centrifugal velocity  $\bar{v} = \bar{c}$  is also constant and such that velocity , $\bar{c}$ , is kept the same in two reference frames , valids  $\rightarrow$

$$c = x/t = x' / t' , \text{ and time } t = x / c , t' = x' / c$$

$$\text{or } t = (x' + vt') / c \cdot (\sqrt{1-(v/c)^2}) = (x'/c) + (v/c) \cdot t' : N$$

$$= [(t' + (v/c^2) \cdot x') : N = [t' + (v/c^2)x'] : [\sqrt{1-(v/c)^2}] \dots (7c)$$

$$\text{From relation } t' = x' / c = (x-vt) \cdot \gamma / c = [t - (v/c^2)x] : N = [t - (v/c^2) \cdot x] : [\sqrt{1-(v/c)^2}] \dots (7d)$$

i.e. equations ,

$$x = (x' + v \cdot t') \cdot \gamma = [x' + v \cdot t'] : [\sqrt{1-(v/c)^2}] \dots (7a)$$

$$t = (x' + vt') \cdot \gamma / c = [t' + (v/c^2) \cdot x'] : [\sqrt{1-(v/c)^2}] \dots (7c)$$

$$y = y' , z = z'$$

$$x' = (x - vt) \cdot \gamma = [x - vt] : [\sqrt{1-(v/c)^2}] \dots (7b)$$

$$t' = (x - vt) \cdot \gamma / c = [t - (v/c^2) \cdot x] : [\sqrt{1-(v/c)^2}] \dots (7d)$$

$$y' = y , z' = z$$

which are the known equations of Relativity .

c.. For constant velocity  $c = \infty$  equations become

$$x = x' + v \cdot t' , y = y' , z = z' , t = t' ,$$

and inversely

$$x' = x - v \cdot t , y' = y , z' = z , t' = t .$$

issuing in [PNS] Spaces .

In this way velocity , $\bar{v}$ , may have any value greater than ,c, and agree with Galilean mechanics .

Breakages  $[(wr)^2 , - |wr|^2 , 2(\bar{w} \cdot r)^2]$  , being masses off the system [S] , under the Action of the constant velocity  $\bar{c}$ , which is not changed , are multiplied by Lorentz factor , $\gamma$  , where then the new masses are ,

$$m' = m \cdot \gamma = 2(wr)^2 \gamma = 2(wr)^2 / [\sqrt{1-(v/c)^2}] = 2m / [\sqrt{1-(v/c)^2}]$$

The embedded energy to Breakages, masses, is as

$$E = mv^2/2 = \{2m / [\sqrt{1-(v/c)^2}]\} \cdot c^2/2 = mc^2 / [\sqrt{1-(v/c)^2}]$$

which is the known formula of Einstein in GR .

c1... For  $t = 0$  then  $\sin\phi = vt/c = 0$  independently of velocities ,v,c, where  $\sec.\phi = \pm 1 / [\sqrt{1 - 0^2}] = \pm 1$  and since  $\sin\phi = vt/c = 0$

and when  $c = \infty$  also , then Systems

$$[S] \rightarrow x = x' + v \cdot t' , y = y' , z = z' , t = t' ,$$

$$[R] \rightarrow x' = x - v \cdot t , y' = y , z' = z , t' = t$$

$$m' = m \cdot \gamma = 2m / [\sqrt{1-(v/c)^2}] \text{ and } E = mc^2 / [\sqrt{1-(v/c)^2}]$$

i.e. [PNS] Space is such that ,velocities,  $\bar{v}$  ,  $\bar{c}$  , exist independently of the Zero conversion factor ,t, and of the constant velocity being  $c = \infty$  , and mass  $M = 2m$  , that of Space and the equilibrium Anti-Space , and infinite energy  $E = mc^2 = \infty$  equilibrium from opposite energy of Anti-Space.

c2... For  $t = c/v$  or,  $v = c$ , then  $\sin\phi = vc/vc = 1$  and  $\sec.\phi = \pm 1 / [\sqrt{1 - 1^2}] = \pm \infty$ , and the Systems  $\rightarrow$

$$[S] \rightarrow x = x' + v \cdot t' , y = y' , z = z' , t = t' ,$$

$$[R] \rightarrow x' = x - v \cdot t , y' = y , z' = z , t' = t$$

$m' = m \gamma = \infty$  and  $E = \infty$ , independently of velocities v,c but from their relation only , i.e. it is a NEW Space where velocities ,v,c, dependent on their relation only and conversion factor ,t, also . In all inertial Systems the conversion factors, mass m , time t , are altered by the , $\gamma$ , factor.

**c3...** For  $t = 1$  then  $\sin\phi = vt/c = v/c$  and  $\sec.\phi = \pm 1 / [\sqrt{1 - (v/c)^2}] = \pm 1$  and the Systems  $\rightarrow$

$$\begin{aligned} [S] &\rightarrow x = [x' + v.t'] / [\sqrt{1-(v/c)^2}], y = y', z = z', t = t', \\ [R] &\rightarrow x' = [x - vt] / [\sqrt{1-(v/c)^2}], y' = y, z' = z, t' = t \\ m' &= m.\gamma = 2m / [\sqrt{1-(v/c)^2}] \text{ and } E = mc^2 / [\sqrt{1-(v/c)^2}] \end{aligned}$$

i.e. it is a Space where velocities,  $\bar{v}, \bar{c}$ , exist and dependent on the conversion factor,  $t$ , and the constant velocity  $\bar{c}$  mass  $m' = 2m / [\sqrt{1-(v/c)^2}]$  and energy  $E = mc^2 / [\sqrt{1-(v/c)^2}]$ .

**c4...** For  $t = \text{any } t$ , then  $\sin\phi = vt/c$  and  $\sec.\phi = \pm 1 / [\sqrt{1 - (vt/c)^2}]$  and the Systems are  $\rightarrow$

$$\begin{aligned} [S] &\rightarrow x = [x' + v.t'] / [\sqrt{1-(vt/c)^2}], y = y', z = z', t = t', \\ [R] &\rightarrow x' = [x - vt] / [\sqrt{1-(vt/c)^2}], y' = y, z' = z, t' = t \\ m' &= m.\gamma = 2m / [\sqrt{1-(vt/c)^2}] \text{ and } E = mc^2 / [\sqrt{1-(v/c)^2}] \end{aligned}$$

i.e. it is a Space where velocities  $\bar{v}, \bar{c}$ , exist and dependent on the conversion factor,  $t$ , and the constant velocity,  $\bar{c}$ , and mass  $m' = 2m / [\sqrt{1-(v/c)^2}]$  and energy  $E = mc^2 / [\sqrt{1-(v/c)^2}]$ . Momentum  $\bar{p} = m\bar{v} = \bar{h}$  and Energy  $E = mc^2 = h.f$  possess the double helix structures (the screw motion).

General Relativity as referred is dependent on one axiom, that of Galilean Relativity and also on dispute non-Euclidean geometries (*parallel to parallel is not parallel*) without any physical meaning and reality.

Gravity force is exerted on breakages  $[\pm (\bar{w}.r)^2 = \text{Material points} = \text{Dipole of the two } \pm \text{quantized energy-spaces } (\bar{w}.r)^2]$  as velocity vector,  $\bar{c}$ , which is then decomposed into two reverse velocities following the cycloidal motion, and consisting the intrinsic Stationary Electro-magnetic Wave of gravity, and which is binding points of this Homogenous-Isotropic, Rest and mass-less nature Field. The total dispersion Rotating energy of dipoles is  $[\pm \bar{\Lambda}]^2 = [p.c]^2 + [m_o.c^2]^2$ , which is the known relativistic energy- momentum equation of Lorentz transformation equations.

## 6. Photoelasticity

In Photo elasticity, the speed of light (vector  $\bar{v}$ ) through a Homogenous and Isotropic material, (transparency, outstanding toughness, dimensional stability, mold ability, very low shrink rate, etc.), varies as a function of the direction and magnitude of the applied or residual stresses.

Light through a Polarizing filter (a Plane cavity of thickness  $L$ ) blocks spatial components except those in the plane of vibration, (the norm of stationary wave) and if through a second Plane cavity, then the components of the light wave vibrate in that plane only. Polarized light passing through different Flat caves (stressed material), splits into two wave fronts travelling at different velocities, each parallel to a direction of principal stress but perpendicular to each other. (This is the Birefringence property of stress material with two indices,  $n_1, n_2$ , of refraction).

The components of the light waves interfere with each other to produce a color spectrum as this happens in < common circle >.

[Retardation,  $\delta$ , ( $1.nm = 10^{-9}$ ) is the phase difference between the two light vectors through the material at different velocities (fast, slow) and divided by the material thickness ( $L$ ) is proportional to the difference between the two indices of

refraction i.e.  $\delta/L = n_2 - n_1 = C.(\sigma_1 - \sigma_2)$  where,  $\sigma_1, \sigma_2$ , are the Principal stresses.

Retardation,  $\delta$ , determines color bands or fringes (A fringe  $N$  is each integer multiple of the wavelength) where the areas of lowest orientation and stress appear black followed by gray and white and as Retardation and stress ( $\sigma$ ) go up then the colors cycle through a more or less repeating pattern and the Intensity of the colors diminishes (decreases).

Because the colors repeat at different levels of retardation and stress, then is tracked as color band sequence from the black (very high energy) or white (very low energy) regions and are repeated periodically following the whole fringe of the colors, as Black Gray, Violet [ $f=668-789\text{THz}$  and  $\lambda=380-450\text{nm}$ ], Blue  $\equiv [f = 606-668\text{THz}$  and  $\lambda=450-495\text{nm}]$ , Green  $\equiv [f = 526 - 606 \text{ THz}$  and  $\lambda=495-570\text{nm}]$ , Yellow  $\equiv [f = 508 - 526 \text{ THz}$  and  $\lambda=570-590\text{nm}]$ , Orange  $\equiv [f = 484 - 508 \text{ THz}$  and  $\lambda=590-620\text{nm}]$ , Red  $\equiv [f = 400 - 484 \text{ THz}$  and  $\lambda = 620-750\text{nm}]$  as the (1<sup>st</sup> order fringe), Blue-green, -yellow,

Orange (dark-yellow), Red, Violet (2<sup>nd</sup> order fringe).

Meaning that White light is the Mixture (Diffraction) of all frequencies, a vector with Low energy  $E = h.f$  at Red (Red-shift)  $\rightarrow$  low  $f = 400-484\text{THz}$ , long  $\lambda = 620-750\text{nm}$  (Blue-shift)  $\rightarrow$  high  $f = 606-668 \text{ THz}$ , short  $\lambda = 450-495\text{nm}$  and High energy since  $E = h.f$  at Blue.

The total intensity of light, *the carried Energy*, is calculated as  $J = [E_x^2 + E_y^2] / 2n$  where  $E_x, E_y$  are the x,y amplitudes of light and  $n$ , the material refractive index.

Wave nature of light is proved by Young's Double Slit experiment where energy is carried by the dark fringes and Particle nature by Compton's Photoelectric Effect experiment with energy carried through the emission of electrons.

**In this way Light is PARTICLE as Photon**,  $\lambda = 380-780\text{nm} = (3,8-7,8). 10^{-7}\text{m}$  and **WAVE**, as *The Stationary Wave in*,  $\lambda$ , meaning that, since Photon is the only Electric **Displacement field**  $D = \epsilon.E + B$ , then in the rate of change is alternately in terms of The Electric field ( $\partial B/\partial t$ ) and The Magnetic field ( $\partial E/\partial t$ ). This is called the Dual Nature of light or Wave-Particle Duality.

Because GR was confined in Planck's length cavity (cleft, slit) of  $\bar{h} \equiv 1,054.10^{-34} \text{ Js}$  failed to perceive the infinite cavities of nature being beyond Planck's level and which are wavelengths,  $\lambda$ , of monads  $\equiv$  quaternion  $\equiv q = [s+ \bar{v}.Vi]$ . [31-36]

Energy confined in a monad [*The inner structure of monad*] is the Stationary wave on the Real part [ $|s| = \lambda = \text{wavelength}$ ], and the Electric Displacement field ( $\bar{v} = \epsilon . E + B$ ), alternately in terms of The Electric field  $E = (\partial B/\partial t)$  and The Magnetic field  $B = (\partial E/\partial t)$  (F-12)

Common circle is not empty space because of different angular velocity vector,  $\bar{v} = \bar{w}.r$ , and because of the malty refractivity and birefringence behaves as crystal with single or double or multi refractivity and in the absence of applied Torques produces a color Spectrum which is, the Color Forces  $\rightarrow$  Gluon Red, Gluon Green, Gluon Blue...

Stability is obtained by the opposite momentum  $-\bar{\Lambda}$  where  $E = -(\bar{v} \times B) = -(\bar{v}.B) \perp \rightarrow$  or and  $B \perp E$  and for monad Evolutes.

The two perpendicular Static force fields E and Static force field B of Space-Anti-Space, experience on any moving dipole  $\vec{AB} = [\lambda, \Lambda]$  with velocity  $\vec{v}$  (momentum  $\vec{\Lambda} = m \cdot \vec{v}$  only is exerting the velocity vector  $\vec{v}$  to the dipole  $\lambda$ ) a total force  $F = F_E + F_B = (\lambda m) \cdot E + (\lambda m) \cdot \vec{v} \times B$  which combination of the two types result in a helical motion and generally to any Space Configuration (the Continuum) extensive property, as Kinetic (the 3-current motion) and Potential (the perpendicular Stored curl fields E,B) energy, by displacement (the magnitude of a vector from initial to the subsequent position) and rotation of equation as [25].

The Total Energy State of a quaternion is  $\rightarrow ET = \sqrt{[m \cdot vE]^2 + [\Lambda \cdot vB + \Lambda \times vB]^2} = \sqrt{[m \cdot \vec{v}E]^2 + E^2} = \sqrt{[m \cdot \vec{v}E]^2 + |\sqrt{p1 \cdot vB1}|^2 + |\sqrt{p2 \cdot vB2}|^2 + |\sqrt{p3 \cdot vB3}|^2}$ . i.e. a moving Energy cuboids (axbxc), rectangular parallelepiped, with the space diagonal length equal to  $E = \sqrt{a^2 + b^2 + c^2}$  where  $\rightarrow a = |p1 \cdot \vec{v}B1|$ ,  $b = |p2 \cdot \vec{v}B2|$ ,  $c = |p3 \cdot \vec{v}B3|$  and when  $\vec{v} \cdot E = 0$  then  $ET = \Lambda \cdot \vec{v}B + \Lambda \times \vec{v}B \rightarrow$  which is the accelerating removing energy  $\Lambda$  towards  $\vec{v}B$  is  $m = 0$ , and then  $ET = \Lambda \vec{v}B + \Lambda \times \vec{v}B \rightarrow$  which is the linearly removing energy  $\Lambda$  towards  $\vec{v}B$ , and for  $\vec{v}B = 0$ , then  $ET = m \cdot \vec{v}E^2 \rightarrow$  which is the Kinetic energy in Newtonian mechanics towards  $\vec{v}E$ . [23-26].

### 6.1. Conclusions

Any moving monad  $[z = s + \vec{v}]$  is transformed into  $\rightarrow$

1. In Elastic material Configuration, as Strain Energy and is absorbed as Support Reactions and displacement field  $[\nabla \epsilon (\vec{u}, \vec{v}, \vec{w})]$  upon the deformed placement, (where these alterations of shape by pressure or stress is the equilibrium state of the Configuration [26], and then equations of Elasticity are,  $G \cdot \nabla^2 \epsilon + [m \cdot G / (m-2)] \cdot \nabla[\nabla \cdot \epsilon] = F$ ) or in isotropic material  $[\mu \cdot \nabla^2 \epsilon + (\lambda + \mu) \cdot \nabla(\nabla \cdot \epsilon)] + F = 0$ . [22-23]

2. In Solid material Configuration, as Kinetic (Energy of motion  $\vec{v}$ ) and Potential (Stored Energy) energy by displacement (the magnitude of a vector from initial to subsequent position) and rotation, on the principal axis (through center of mass of the Solid) as ellipsoid, which is mapped out, by the nib of vector  $(\delta \vec{r} \cdot c) = [\vec{v} \cdot c + \vec{w} \cdot \vec{r}n] \delta t$ , as the Inertia ellipsoid [Poinso's ellipsoid construction] in [S] frame which instantaneously rotates around vector axis  $\vec{w}, \phi$  with the constant polar distance  $\vec{w} \cdot Fe / |Fe|$  and the constant angles  $\theta_s, \theta_b$ , traced on, Reference [R] cone and on [S] cone, which are rolling around the common axis of  $\vec{w}$  vector without slipping, and if  $Fe$ , is the Diagonal of the Energy Cuboids with dimensions a,b,c which follow Pythagoras conservation law, then the three magnitudes (J,E,B) of Energy-state follow Cuboids (Cycloid), Plane, or Linear Diagonal direction, and If Potential Energy is zero, then vector  $\vec{w}$  is on the surface of the Inertia Ellipsoid. [23-27-28].

3. In Quaternion Extensive Configuration, as New Quaternion's (with Scalar and Vector magnitudes). Points in Primary Space [PNS] carry A priori the work  $W = \int A \cdot B [P \cdot ds] = 0$ , where magnitudes P, ds can be varied leaving work unaltered. The Diffusion (decomposition) of Energy is as the mechanism of Energy Transport as  $(\vec{v})$ , through its quantized wavelength  $|\lambda|$ , which is a property of any standing wave, into the Medium  $|\lambda| = (1) - (2)$ , and involves the Absorption and Reemission of the wave quantized energy  $J =$

$(J1) = (J2)$  as Electric and Magnetic field of Electric Displacement by the two neighbor edges (1) and (2) of the medium following Cycloid motion. [37-39]

4. In Space conserved Extensive property Continuum (Spatial Configuration caves), as Kinetic (3-current motion) and Potential (perpendicular Stored curl fields) Energy by Cycloid motion (the magnitude of wavelength vector  $|\lambda|$ ), from initial (1) to subsequent position (2), as  $|\lambda| = (1) - (2)$ . During shifting Energy as velocity vector  $\vec{v}$ , (and this because extreme case happens for zero application area) is decomposed into two velocity vectors  $\vec{v}1, \vec{v}2$ , being vectors, undergo vibrations which causes two waves that represent the two Electric and Magnetic perpendicular components until reaching point (2) which is the Reemission of the wave and it is the new head of velocity  $\vec{v}$ , where then mechanism is recycled. [39-40]

5. The dynamics of any System = Work = Total Energy, is transferred as generalized force  $Q_n$  as,  $Q_n = \partial W / \partial (\delta \vec{q}_n)$ ,  $(\delta \vec{q}_n) = \vec{v} \cdot n \cdot \delta t = [\vec{v} \cdot c + \vec{w} \cdot \vec{r}n] \delta t = (\text{Translational} + \text{rotational velocity}) \cdot \delta t$  as velocity and  $Q_n = [\vec{v} \cdot c \cdot (\partial T / \partial t) + \vec{w} \cdot \vec{r}n] \cdot (\partial T / \partial t) \rightarrow$  Translational kinetic energy + Rotational kinetic energy as Energy. [40]

6. The ultimate Constituents of Monads ( $s, \vec{v} \cdot \nabla i$ ) is the real part  $|s|$ , and the Magnitude of Imaginary part as Vector  $\vec{v} = \nabla i$ , decomposed into velocity vectors  $\vec{v}1, \vec{v}2$ . [STPL] cylinder is a Geometrical Mechanism (Mould) which transfers the two Quantities of the breakable monads from one Level (Confinement) to another Level using Quantities or the Breakages of collision between monads. This Mechanism is not the Origin of monads, but it is the Mould (the Regulative Universe Valve). It was shown that into Gravity cave  $L_g = 2 \cdot r = e^{-i \cdot (-9 \cdot \pi / 2) \cdot b} = 3,969 \cdot 10^{-62} m$ , is inversely balancing the Common circle, of Space, Anti-Space.

For rotations Space, with velocities  $[\vec{v}g = \vec{w}r = \vec{c}]$  that of light,  $\vec{c}$ , tending to zero in cave  $L_c > L_g$  then exist velocities  $[\vec{v}c > \vec{c}]$  tending to infinity. The hidden pattern of universe is, STPL line, which is off the Spaces and connect them (it maintains, conserve and support all universe), so may say, *it is The Naval Cord (string) of Galaxies*. [33-34]. i.e.

In Common Circle (the Sub-Space) of the rotating Space Anti-Space  $[\pm \Lambda]$ , with maximum angular Velocity Vector,  $\vec{v} = \vec{w} \cdot r$  on circumference, [in the absence of applied Torques and because of the Birefringence property of stress continuum with different indices, n, of refraction, which this creates the Retardation,  $\delta$ , and determining Color Bands or Fringes] is Produced a color Spectrum which is, the *<Color Forces>*  $\rightarrow$  Gluon Red, Gluon Green, Gluon Blue.

When tangential velocity  $\vec{v} = \vec{w} \cdot r$  on circumference of a cave, r, is in another of radius  $R > r$ , then the new tangential velocity  $\vec{v} = \vec{w} \cdot R$  is greater than  $\vec{v}$  and when  $\vec{v}$  is the speed of light, then the new  $\vec{v}$  are velocities greater than that of light and this is a way of succeeding these velocities.

7. In Black holes Energy scale  $[\lambda] \cdot \Lambda = k \cdot 1$ ] there are infinite high frequency small amplitude vacuum fluctuations at Planck energy density of  $10^{113} J/m^3$  that exert action (pressure) on the moving Spaces dipole and their Stability is always achieved by Anti-space in the rotational equilibrium.

8. Dipole vectors are quaternion's (versors) of *waving nature*, i.e., one wavelength  $|\lambda|$  in circumference in energy levels, that conserve energy by transferring the Total kinetic energy T into angular momentum  $L = \bar{r}m\bar{v} = \bar{r}.\bar{p} = \bar{r}\Lambda$ , as the Stationary Electromagnetic wave  $[\mathbf{E} \perp \mathbf{H}]$  in constant mass  $m = \pm [(\bar{w}.r)^2]$ . Different versors with different Energy (scalar) possess the same angular momentum. A Composition of Scalar Fields (s) and Vector Fields ( $\bar{v}$ ) of a frame to a new unit, maps the alterations of Unit by rotation only and transforms scalar magnitudes (particle properties) to vectors (wave properties) and vice-versa, and so, all particle-like properties are both of waves and particles. In Planck Scale, when the electron is being accelerated by gravity which exists in all energy levels as above, gravity is still exerting its force, so Electrodynamics can be derived from Newton's second law. [31-36].

### 6.2. General Remarks

From breakages  $\rightarrow v.[(\bar{w}.r)^2]$ ,  $-v.[(\bar{w}.r)^2]$ ,  $2.(\bar{w}.r)^2$  on, *common circle*, are produced *Particles*  $\rightarrow$  *The Fermions*  $\pm(\bar{w}.r)[(\bar{w}.r)^2]$  and *Bosons*  $\pm 2.(\bar{w}.r)[(\bar{w}.r)^2]$  which are conveyed in STPL cylinder. [35]

From the constant velocity  $\bar{c}$ , on centre, O, of *common circle*, are produced  $\rightarrow$  *Dark matter*  $\rightarrow [\pm c.(\bar{w}.r)^2]$  and  $\rightarrow$  *Dark Energy*  $\rightarrow [(2c)x(\bar{w}.r)^2]$  in STPL cylinder,

From breakages  $\rightarrow [\pm[(\bar{w}.r)^2]] \rightarrow$  *The Medium Field material*  $\rightarrow \pm[(\bar{w}.r)^2]$  and  $\rightarrow$  *the Gravity force*  $\rightarrow [2.(\bar{w}.r)^2]$ . [36]

From, vector analysis, multiplication of a Scalar (s) magnitude and a vector ( $\bar{v}$ ) magnitude is  $\rightarrow s.\bar{v} =$  vector,

Dot product of two vectors  $v1.v2 =$  yields a scalar  
Cross product of two vectors  $v1 \times v2 =$  yields a vector

Breakage  $(\bar{w}.r)^2 = |(\bar{w}.r)|.|(\bar{w}.r)|$  is the *massive real part* therefore is a Scalar magnitude. *the min. Space-Quanta*.

Breakage  $-(\bar{w}.r)^2 = -(\bar{w}.r).(\bar{w}.r)$  is the *massive energy part* therefore is a Scalar magnitude. *the min. Anti-Space Quanta*.

Breakage  $2.(\bar{w}.r)^2 = 2|(\bar{w}.r)|.|(\bar{w}.r)|$  is a *Force* acting on the *minimum quantized quantity of rotating Energy* (i.e. the *Spin*), and it is a *Vector*. *the min. Energy Quanta*.

Two perpendicular vectors produce zero work and since Dark-energy vector is perpendicular to, Gravity - vector, then Gravity is affecting on all particles except that of Dark-energy

Gravity is affecting on (-) Field-Medium only for the equilibrium of spaces.

Electromagnetic waves are created by the vibration of an electric charge. This vibration creates a wave which has both an Electric and a Magnetic perpendicular component.

Work as Energy is Quantized, converted, in Space monads, caves, cells,  $\bar{x} = d\bar{s} = \lambda m$ , as pressure  $\sigma, \tau$ , the pressure is converted as velocity in caves and a Standing Electromagnetic Wave E,P which consists the Standing monad (Displacement current) and the moving Energy monad (by altering the inner wavelength or Period of monad) in Gravity's field medium [MFMF] and is dissipated as Quaternion monads (Particles or Waves, matter or vectors) as Forces (displacements,

masses, pressure etc.) using modulus, coefficients, reactions to the motion and all other geometrical indices.

Stability In-Out wavelength is obtained by the Isochronous Anti-Standing Electromagnetic Wave E,P which happens on Anti-cycloid, Evolute, and whirling, Curl, by the equality of the two transverse Complex Envelope displacements, Amplitudes, that consist the Standing monad (Displacement current in monads).

The mechanism, of Energy Transport through a Medium, involves the Absorption and Reemission of the wave energy by two neighbor atoms (1) and (2) of medium. The Absorption of energy causes the electrons within the atoms (1) to undergo vibrations which causes a new wave with the same frequency (because  $f=E/h$ ) as the first wave but delaying the motion through the medium until Reemission by travelling through a small region of space between atoms (1) and (2) and once the energy of wave is reemitted by its neighbor atom (2) then mechanism is recycled. This mechanism is succeeded by the intrinsic property of waves (= quaternion's, monads, vectors) which is the Stationary wave nature of spaces.

Breakage  $\pm(\bar{w}.r)^2 = s^2$ , is the Medium, mediator, filling all Space (STPL cylinder) is massive, massless without viscosity, incompressible and continuous in very small scale, motionless because inactive, without exerting any pressure on other breakages, Homogenous and Isotropic i.e. Breakage  $\pm(\bar{w}.r)^2$  is a Rest, Neutral, Homogenous and Isotropic material and also the mediator of all fields - changes such that these cannot exceed the constant velocity  $\bar{c}$ , on which motions may happen.

Assuming the postulate of Relativity was valid without restrictions, this would imply that all forces of nature must be invariant under Lorentz transformations in order that principle be rigorously and universally true.

Since acceleration for a rotating quaternion  $z = (s + \bar{v}.\nabla i)$  is  $a = [d^2z/dt^2] = (d/dt, w).(-wz, dz/dt + wxz) = 0$ , and this because  $\bar{w} =$  constant, therefore velocity  $\bar{v} =$  constant a priori.

### 6.3. Properties of Space-Energy Configuration

1. All universe is Isotropic and Homogenous in all reference frames of points (in spatial and Temporal domain) and work (W) is quantized on material points as spin  $\pm(\bar{p})$  and from this equilibrium of the quantized angular momentum  $\Lambda$ , independently of time, is capable of forming the wave nature of Spaces, following the Boolean logic and distorting momentum  $\bar{p} = \Lambda$  as energy, on the intrinsic orientation position of points, on all points of the microscopic and macroscopic homogeneity, and since also in common circle rotational velocity, w, and momentum,  $\Lambda$ , are constants and thus consist a Pure quaternion, so conjugation of the two is as  $(\partial/\partial t, \bar{w}) \odot (0, \Lambda) = (-\Lambda, w \times \Lambda) = (-\bar{H}x\bar{P}, \nabla x \Lambda) = [\lambda, \nabla x \Lambda]$ .

2. Momentum  $\bar{p} = \Lambda$  on the infinite dipole  $AiBi$  with a momentum lever equal to zero(0) or equal to wavelength  $\lambda$  create linear motion, while with a momentum lever  $\neq 0$  creates the rotational motion (Euler, Coriolis, Centrifugal)  $\rightarrow m.[(d^2\bar{r}/dt^2) + m.[d\bar{w}/dt|x\bar{r} + 2\bar{w}x(d\bar{r}/dt) + \bar{w}x(\bar{w}x\bar{r})]$  where momentum  $\bar{p} = m.r\bar{w}$  and mass m is a constant equal

to , *the Reaction to the motion* , or as Inertia ( I ) which are a natural property of dipole and both are conserved vice versa. Forces  $dP = PA-PB$  parallel to the Space, Anti-Space lines  $[S] \perp [AS]$ , create a Static force field B , and when Forces  $dP$  are perpendicular to the Space Anti-Space lines , create a Static force field E , which experience *Lorentz force* and it is the fundamental interpretation cause of motion , in small and large scales .On all dipole of wavelength  $\lambda$ , and momentum  $\Lambda$ , their product  $\lambda \cdot \Lambda = k_{1,2,3}$  constant for each energy level. The fundamental force in universe is the total kinetic energy  $T = 1/2 \bar{w}L = \Sigma(L^2/2.I)$  , a repulsive force following Pythagoras conservation law such that both T and L be conserved (when T decreases then this lost energy is transferred to angular momentum L and vice versa , *in L by changing angular velocity vector  $\bar{w}$* , differently is needed a speed faster than that of light . *Energy is conserved on three perpendicular fields J,E,B, on dipole such that the total kinetic energy to be the diagonal of the cuboids .*

3. The action of a quaternion on point is equivalent as - *energy density and pressure* - the state of stress at a point on the deformed placement or new configuration which is on the directional axis of the point. *Gravity* exists upon the point axis as  $[(d\bar{w}/dt)x \bar{r} + 2\bar{w}x(d\bar{r}/dt) + \bar{w}x(\bar{w}x\bar{r})]$  where angular velocity is  $\bar{w} = |\bar{\Lambda}| / |\bar{r}| = k/(\lambda m)$  and so exerts a direct action between two events, *i.e. Stationary points of [PNS] are rotating dipole and may be pictured as wave existing in the infinite points of Spaces and exerting an action(pressure) on the moving Spaces , dipole . The Stability is achieved by the Anti-space .*

4. In Black hole Energy scale (  $\lambda \cdot \Lambda = k 1$  ) there are infinite high frequency small amplitude vacuum fluctuations at Planck energy density of  $10^{113}$  J/m<sup>3</sup> that exert action (pressure) on the moving Spaces dipole and their Stability is achieved by

Anti-space also . A wide analysis for gravity force and gravity medium is shown in Maxwell's Displacement field which follows.

5.. Dipole vectors are quaternion's (versors) of waving nature , i.e., one wavelength in circumference in energy levels, that conserve energy by transferring Total kinetic energy T into angular momentum  $L = \bar{r}m\bar{v} = \bar{r}p = \bar{r}\Lambda$ , where mass  $m =$  is a Constant . Different versors with different Energy (scalar) possess the same angular momentum. A Composition of Scalar Fields (s) and Vector Fields ( $\bar{v}$ ) of a frame , to a new unit which maps the alterations of Unit by rotation only and transforms scalar magnitudes (particle properties) to vectors (*wave properties*) and vice-versa , and so , has all particle-like properties of waves and particles . In Planck Scale, when the electron is being accelerated by gravity which exists in all energy levels as above, the gravity is still exerting its force . Matter is only built out of the primary dipole  $AiBi$  .

## 7. Maxwell's Electric Displacement Field

### 7.1. General

{Quaternion  $\leftrightarrow$  dipole as work}  $\bar{z}o = [ds = \lambda, \pm \Lambda x \bar{v}i]$  ,  $\bar{z}'o = [ \lambda^2 - |\bar{\Lambda}|^2 ]$  ,  $\bar{e}o = [ \Lambda \bar{v}, -\bar{v}x \Lambda ]$  are the three fundamental equations of [PNS] . In dipole AB ,  $\bar{A}B = \lambda m$  is considered as Matter ( *the reaction to velocity motion while acceleration is the reaction to the change of velocity*) and it is the always communicator (*medium*) of the Bounded Impulses  $P\bar{A}$ ,  $P\bar{B}$ ,

*The equilibrium and Bounded Primary Space-Anti-Space of Monad AB* or as  $P.[A \rightarrow (\lambda = \bar{v}.T) \leftarrow B] = 0$ , and thus unifying the known homogenous Euclidean geometry ( $\lambda \bar{v}$ ) and the source term energy ( $d\bar{s}.dP = \lambda \Lambda = W$ ) with motion  $\Lambda$  imbedding in them all conservation physical laws with the only two quantized magnitudes,  $\lambda, \bar{\Lambda}$  of Monad  $\bar{A}B$  and equal to the angular momentum vector  $\bar{p} = \Lambda = \bar{w} \cdot \lambda = m\bar{v} = d/ds \{ [A-B[P.ds]] \}$ , and Time ,T, to be the conventional factor ,t, equal to zero. The three jointed cases of ,**ESM** , Energy-Space -**Monads** are inter-transformed ( *converted* ) in space as follows ,

**Energy E**  $\rightarrow$  { for  $\bar{P}A > 0$  and  $dF > 0$  } is transformed into  $\rightarrow \sigma$  ,  $\tau \neq 0$  and for  $ds = 0$  then  $\bar{P}B = 0$  and it is as Quanta , *Stationary Energy* , of the normal stresses  $\sigma, \tau$  .

**Space S**  $\rightarrow$  { for  $\bar{P}A > 0$  and  $dF = 0$  } is transformed into  $\rightarrow \sigma, \tau \equiv m\bar{v}$ , and for  $ds = \lambda > 0$  and when  $\bar{P}B = 0$  it is as Quanta of Space wavelength  $\lambda$ , as *the Electromagnetic Wave = (E $\perp$ H)* of Energy due to normal stresses  $\sigma, \tau$  transformed into velocities  $v1 \perp v2 = v1$  .

**Monad M**  $\rightarrow$  { for  $\bar{P}A > 0$  and  $dF = 0$  } is transformed into  $\rightarrow \sigma, \tau \equiv m\bar{c}$ , and for  $ds = \lambda > 0$  and  $\bar{P}B > 0$  ,  $\sigma, \tau = M\bar{v}$  and it is the Quaternion composed of Space wavelength  $\lambda$ , as the Electromagnetic Wave=(**E $\perp$ H**) of Energy due to normal stresses  $\sigma, \tau$  transformed into velocities  $v1 \perp v2 = v1$  and Moving Energy as momentum , with the generalized mass M and velocity  $\bar{v}$  .

For the constant linear momentum  $Mv_i = (\Sigma \gamma_i . m_i) . v_i$  where  $P = \bar{P}A =$  Force executed at point A of area  $dF$  , space  $d\bar{s} = |\lambda| m =$  displacement of point A to B and equal to work done  $= \int_A^B P ds$  , and equal to main stresses  $\sigma, \tau$  on area  $dF$ , and equal to velocity  $\bar{v}$  ,t, is the conventional factor of time (t) , and factor (m)  $\rightarrow$  mass = the reaction to the motion .

Quantities and Measurements :

Length  $\rightarrow$  m (meter) - Surface  $dF = m.m$  (meter<sup>2</sup>)  
 Mass  $\rightarrow$  m , Kg (Kilogram) Time  $\rightarrow$  s (second)  
 Electric Charge  $\rightarrow$  A (Ampere) Temperature  $\rightarrow$  K (Kelvin)  
 Intensity  $\rightarrow$  Cd (Candela) Frequency  $\rightarrow$  Hertz (f= 1/s)  
 Force  $\rightarrow$  Newton (N= m.Kg/s<sup>2</sup>) Work-Heat  $\rightarrow$  Joule (J=N.m)  
 Power-Flux  $\rightarrow$  Watt (W=J/s) Velocity  $\rightarrow$  v = m/s  
 Pressure-Stress  $\rightarrow$  Pascal (Pa= N/m<sup>2</sup>) - Stress  $\sigma = KN/mm^2$   
 Electric charge  $\rightarrow$  Coulomb (C= A.s)  
 Electric Potential  $\rightarrow$  Volt (V= W/A=J/C)  
 Electric Resistance  $\rightarrow$  Ohm ( $\Omega = V/A$ ) - Density  $\rightarrow$   $\rho$ (Kg/m<sup>3</sup>)  
 Electric Capacity  $\rightarrow$  Farad (F= C/V)  
 Electric Field  $\rightarrow$  (E= V/m) - Magnetic Field  $\rightarrow$  (H= A/m)

All bodies possessing mass, *the reaction to the velocity motion*, and Elasticity E,G, are capable of vibration and are of two main classes.

**Free vibration** takes place when a system oscillates under the action of forces inherent in the system itself with frequencies established by its mass and stiffness distribution.

The basic vibration model of a simple oscillatory system consists of a mass (m) a massless spring (x) and a damper (k) . Quantity **Force F** , has the measurements =  $[\sigma.A] = (\sigma.m.m =$

$\sigma.m.m/s = (\sigma.m.s).(m/s) = (\bar{c}.T).(\bar{v}) = (\mathbf{E} \perp \mathbf{H}).(\bar{v}) = (\lambda.m).(\bar{v})$   
 i.e. the Electromagnetic Stationary Wave **times** Velocity, and **Work measurements**  $W = (N.m) = (\lambda.m).(\bar{v}).m = M. \bar{v}.m$  , i.e. the Torsional momentum  $\bar{r}.M.\bar{v}$ .

**Forced vibration** takes place under the excitation of external forces in the system , and if the frequency of excitation coincides with one of its natural frequencies , < a condition of resonance > is encountered , resulting to any oscillation.

**Periodic motion** is when motion is repeated in equal intervals of time T (period of oscillation) and is designated by the time function  $x(t) = x(t+T) = x = A.\sin(2\pi.t/T) = A.\sin.wt$  , ....

where A = the amplitude of oscillation measured from equilibrium position and motion is repeated when  $t = T$  .  
 Quantity  $(2\pi/T) = w$  = circular frequency ,  $f = 1/T$  = frequency.  
 Velocity  $\dot{x} = wA.\sin(wt+\pi/2)$  and  $\ddot{x} = w^2A.\sin(wt+\pi)$  , the

Acceleration which are also harmonic with the same frequency of oscillation ,and when evaluated lead to the displacement ,x, by  $\pi/2$  and  $\pi$  radians respectively and the system reveals at  $\ddot{x} = -w^2A$  , so that *In harmonic motion acceleration* to be proportional to the displacement and directed to the origin , and because also Newton's second law of motion states that the acceleration is proportional to the force , then harmonic motion can be expected with force varying as  $kx$ . (which is Hook's law  $F = kx$  and  $k$ , the stiffness coefficient , directed in centrifugal velocity vector  $\bar{v}r$ , on radius r ) .Vibrations of several different frequencies exist simultaneously by their fundamental frequency ,f, and its harmonics 2f, 3f, ..Generally any periodic motion can be represented by a series of sines and cosines that are harmonically related as [Fourier series] and if  $x(T)$  is the periodic function of period T , then displacement

$$x(t) = (a_0/2) + a_1 \cos w_1.t + a_2 \cos w_2.t + \dots + b_1 \sin w_1.t + b_2 \sin w_2.t + \dots \quad \text{where } w_t = 2\pi/T \text{ and } w_n = n.w_1$$

Because velocity vector is composed of the centrifugal velocity  $\bar{v}r$ , and the rotational velocity  $\bar{v}q$ , perpendicular to displacement ,x, and because viscous damping represented by a dashpot , is described by a force proportional to the velocity as holds  $F = c\dot{x}$  where ,c, is the damping coefficient , then it is directional to velocity  $\bar{v}q$ .

**The Plane Wave :**

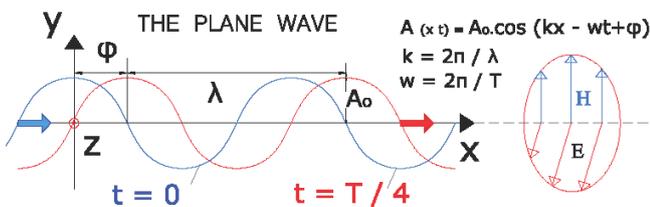


Fig. 9. Energy in the Plane Transverse Wave  $[\bar{E} \times \bar{H}]$ .

A plane wave , in the physics of wave propagation is a constant frequency wave whose surface of constant phase (wavefronts) are infinite parallel planes of constant peak-to-peak amplitude normal to the phase velocity vector.

The wave equation is  $A_{x,t} = A_0.\sin(kx - \omega t + \phi) = A_0.\sin[2\pi(\frac{x}{\lambda} - \frac{t}{T}) + \phi] = A_0.\sin[\frac{2\pi}{\lambda} \cdot (x - ct) + \phi]$ ... (a) where ,

- $A_{x,t}$  = The magnitude (disturbance) of the wave at a given point.
- $A_0$  = The pick magnitude of the oscillation .
- $x$  = A point on x axis of equation while y-z planes have the same magnitude and phase .
- $\lambda$  = The Wavelength of the wave .
- $T$  = The Period of the wave equal to  $1/f$  .
- $k$  = The Angular wavenumber equal to  $2\pi/\lambda$  and is a measure of how rapidly the disturbance changes over a given distance at a point in time .
- $\omega$  = The wave's angular frequency equal to  $2\pi/T$
- $\mu$  = The permeability of free space is a measure , a scalar field, of the inner vortex density  $w[\nabla \times \bar{v}]$  opposing the external B-field due to a moving electric charge ,q, on x axis.
- $\phi$  = The phase shift  $\rightarrow$  and where is  $2\pi$  radians then  $\phi = \lambda$

Since on y-z plane of a position point ,x, on axis x is possible to exist infinite orthogonal coordinate systems where  $\bar{x} = \bar{y}\bar{x}\bar{z} = |\bar{y}||\bar{x}||\bar{z}| = \rightarrow$  then work for any arbitrary combinations of ,w, and ,k, that satisfy the dispersion relation of the medium.

Equation of an Electromagnetic wave E,H and because are in phase then  $E_{x,t} = E_0.\cos(kx - \omega t)$  ,  $H_{x,t} = H_0.\cos(kx - \omega t)$

Energy carried by Electromagnetic waves is < energy density vector  $\bar{S} = [\bar{E} \times \bar{H}] / \mu >$  perpendicular to both E , H and in  $\bar{x}$  direction equal to  $\bar{S} = [|\bar{E}||\bar{H}|.H_0.\cos^2(kx - \omega t)]$

Because  $\bar{x}, \bar{y}, \bar{z}$  vectors are perpendicular between them and in phase , no Resonance occurs and Work not executed .

**7.2. The Electromagnetic fields E,P of monads (S) :**

**Free vibration** on monads  $AB = q = [s + \bar{v}\nabla i]$  oscillating under the action (thrust) inherent in itself , subject to *damping* because energy is dissipated by the *stiffness* ,k, of monad and *constant of proportionality* ,c, regarding motion of *mass* ,m, when placed into motion , oscillation will take place at the natural frequency ,  $f_n$ , which is a property of monad. Viscous damping force  $F_d = c\dot{x}$  ,where c is a constant of transverse proportionality and this because  $\dot{x} \perp dx$  , so

The homogenous differential equation  $m\ddot{x} + c\dot{x} + kx = 0$  ... (1) corresponds physically to the free damped vibration , where is x = the displacement ,  $\dot{x}$  = velocity of monad with general solution given by the equation  $\rightarrow x = A.e^{s_1.t} + B.e^{s_2.t}$  where

$$s_{1,2} = -[c/2m] \pm \sqrt{[c/2m]^2 - (k/m)} \quad \text{and } S = \sqrt{[c/2m]^2 - (k/m)}$$

and for initial conditions  $x(0), \dot{x}(0) \rightarrow A, B$  then displacement  $x = e^{-i.(c/2m)t} [ A.e^{S.t} + B.e^{-S.t} ]$  and oscillatory  $x = e^{\pm i\sqrt{[(c/2m)^2 - (k/m)]}t} = \cos \sqrt{[c/2m]^2 - (k/m)} t \pm i \sin \sqrt{[c/2m]^2 - (k/m)} t$  ..(2)

- For  $[c/2m]^2 > [k/m]$   $\rightarrow$  No oscillations are possible ,over-damped ,
- For  $[c/2m]^2 < [k/m]$   $\rightarrow$  exponent becomes an imaginary number and terms are oscillatory ,under-damped, and this because  $\cup$
- For  $[c/2m]^2 = [k/m]$   $\rightarrow$  then oscillatory, non-oscillatory and radical

motion is zero, *critical dumping*  $C_c=2m\sqrt{\frac{k}{m}}=2mw_n=2\sqrt{k}m$  . Equalization of mass  $m$  from pairs  $C_c=2\sqrt{k}m \rightarrow C_c^2=4km$  and  $m=C_c^2/4k$  , and from  $2m\sqrt{\frac{k}{m}}=2mw_n \rightarrow k=mw^2$  then  $m=k/w^2=C_c^2/4k$  , or  $\rightarrow 2k=w.C_c=2\pi.f.C_c$  ,  $k=\pi.f.C_c$  a relation between linear Stiffness ,circular frequency

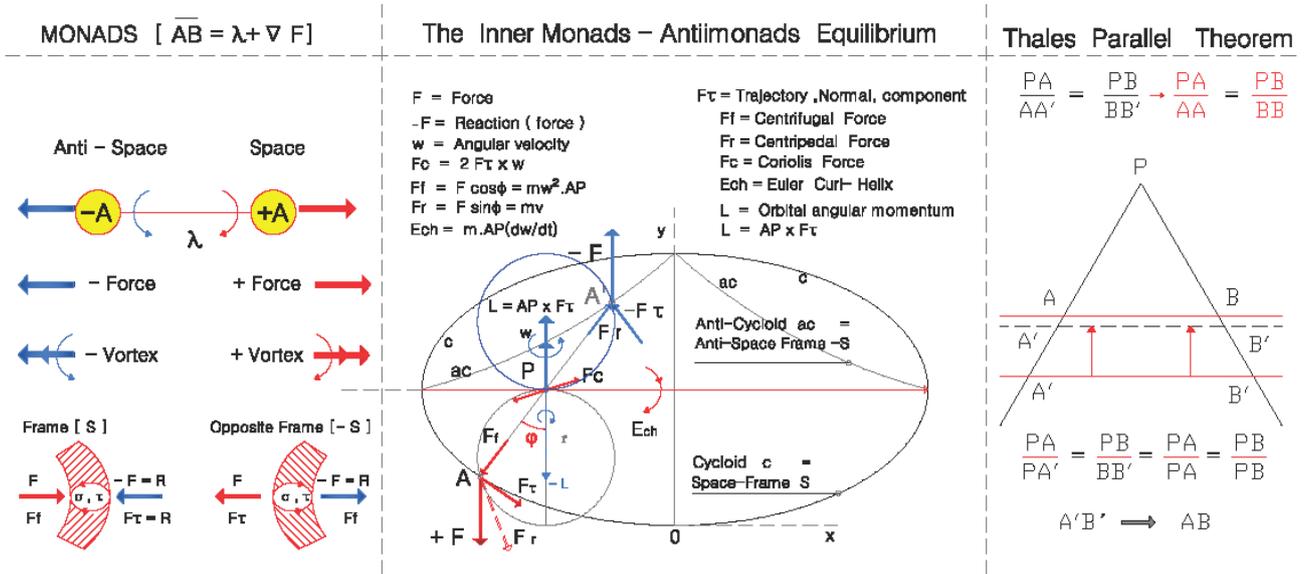
and the transverse damping coefficient , *the critical mass* . For  $k=C_c$  then  $w=2$  , while for  $\zeta=0$  then  $c=0$  . These cases of Critical damping controls the existence of monads and the behavior of their oscillatory to be a particle or a wave .

The Electromagnetic fields of monads :

1 : Monads

2 : Equilibrium of Plane Cycloidal motion

3 : Thales theorem



(1) (2) Fig. 10. The inner structure of a Stationary Wavelength  $\lambda=2\pi r$  executing a Free vibration , and under Equilibrium of forces in Cycloid , Anti-cycloid .

Any damping can then be expressed in terms of the critical damping by the non-dimensional number  $\zeta = C/C_c$  and S in terms of  $\zeta$  ,  $[\frac{C}{2m}] = \zeta [\frac{C_c}{2m}] = \zeta w_n$  , is  $S = [-\zeta \pm \sqrt{(\zeta^2-1)}].w_n$  and differential equation of motion becomes  $\ddot{x} + 2\zeta w_n \dot{x} + w_n^2 x = 0$  and the general solution is given by the three equations ,

For  $\zeta < 1$  is the Oscillatory motion , *Under-damped case* .  
 $x = e^{-\zeta.w_n.t} . [A.e^{i\sqrt{(1-\zeta^2)}.w_n.t} + B.e^{-i\sqrt{(1-\zeta^2)}.w_n.t}] = e^{-\zeta.w_n.t} . \{ [(\dot{x}(0) + \zeta.w_n.x(0)).\sin\sqrt{(1-\zeta^2)}.w_n.t] / [w_n.\sqrt{(1-\zeta^2)}] + [x(0).\cos\sqrt{(1-\zeta^2)}.w_n.t] \}$  ... (3a)

which indicates that the frequency of the damped oscillation is equal to  $w_d = \frac{2\pi}{\tau_d} = w_n.\sqrt{(1-\zeta^2)}$

For  $\zeta > 1$  is the Non-oscillatory motion , *Over-damped case* with the two roots increasing and decreasing with general solution  $x = A.e^{[-\zeta + \sqrt{\zeta^2-1}].w_n.t} + B.e^{[-\zeta - \sqrt{\zeta^2-1}].w_n.t}$  where  
 $A = \{ \dot{x}(0) + [\zeta + \sqrt{(\zeta^2-1)}].w_n.x(0) \} / [2w_n.\sqrt{(\zeta^2-1)}]$   
 $B = \{ -\dot{x}(0) - [\zeta - \sqrt{(\zeta^2-1)}].w_n.x(0) \} / [2w_n.\sqrt{(\zeta^2-1)}]$  ... (3b)

For  $\zeta=1$  is the Internally Isochronal oscillatory motion , *This is the critical damped motion case* (the two equal roots  $S_1 = S_2 = -w_n$  with the general displacement solution ,x, as  
 $x = e^{-w_n.t} . [A + B.t] = e^{-w_n.t} . \{ x(0) + [\dot{x}(0) + x(0).w_n].t \}$

i.e. a double root  $S_1 = S_2 = -w_n$  which is according to the Newton's second law , the deformation of the real part ,|s|, which is  $k.|s| = -w = -mg$  and frequency  $f_n = (1/2\pi).\sqrt{g/|s|} = 2\pi\sqrt{m/k}$  depending on the mass and stiffness of monad ,being

its properties. For  $k = C_c$  then  $w=2$  and this critical damping occurs on monads , which is their outer motion.

From relation  $[\frac{C}{2m}] = \zeta.w_n$  ,  $\zeta = [\frac{C}{2m.w}] = [\frac{C.T}{4\pi m}] = 1$  then  $c=2mw$   
 $2m\sqrt{k/m} = 2\sqrt{k}m$  .

For  $\zeta = 0$  differential equation reduces to  $S_{1,2}/w_n = \pm i$  , and the roots on the imaginary axis correspond to un damped case and are the conjugate complex points ,  $+i$  ,  $-i$  .

From relation  $c/2m = \zeta(C_c/2m) = \zeta.w_n \rightarrow \zeta = c/(2m.w_n)$  becomes zero when  $c = 0$  .

It was shown that for critical mass ,m, issues  $m = \frac{k}{w^2} = \frac{C^2 c}{4k} = \frac{C^2}{4k}$  or  $2k = w.c = 2\pi.f.c$  and  $k = \pi.f.c$  . From equation  $\frac{C}{2m} = \zeta$  .  $[\frac{C_c}{2m}] = \zeta.w_n$  then  $\zeta = \frac{C}{2w.m}$  . Damping ratio  $\zeta = 0$  when  $c = 0$  and from  $C_c = c = 2\sqrt{k}m = 0$  then  $k$  is also zero , meaning that when  $\zeta = 0$  then both , Stiffness and Damping coefficients  $k,c$  are also zero. Question ?? where this happens ?

A first answer is that this happens in a space without mass , (the reaction to the velocity motion) and this because , motion in a space with mass where kinetic energy is proportional to  $v^2$  , and equation of motion is as  $m\ddot{x} + c\dot{x}^2 + kx = 0$  , with different amplitudes  $A_1 = -A_0 [1 - \frac{1-2kA_0/3m}{1+2kA_0/3m}]$  with quite different periods which then should not be isochronous and is contradicting to the cycloid inner motion , **therefore , and because of the isochrones motion of all inner vectors , motion follows cycloid trajectories and both , stiffness and damping , coefficient ,k,c are zero . (Zero Impedance)**

Since monads = quaternion =  $AB = q = [s + \bar{v}.v]$  , where  $s$  = the real part developing mass and equal to zero , and  $\bar{v}v$  = the imaginary part developing wave, then  $\bar{v}v = \pm i$  , is the inner wavelength  $\lambda$  , the Quanta , Electromagnetic field of monads .

Such a space is found in PNS space where exist the imaginary part of quaternion and massless points . Solution  $S_{1,2}/w_n = \pm i$  implies Imaginary part only in opposite directions without any projections in real axis and then issues equation of a standing wave as  $\rightarrow Y = [2A \cdot \sin kx] \cdot \cos wt = [2A \cdot \sin 2\pi/\lambda] \cdot \cos wt$  where ,

$A = v1 = v2 = |v|/\sqrt{2} \rightarrow$  Wave's Amplitude ,  
 $kx = \pi/2, \pi, 3\pi/2, 2\pi, \rightarrow$  The Wave's number , location ,  
 $w = 2\pi f = 2\pi/T \rightarrow$  Oscillating frequency, angular frequency  
 and equations of inner Electromagnetic waves become,

$$E = 2A \cdot \sin kx \cdot \cos wt = \sqrt{2} \cdot |(wr)^2| \cdot \sin\left(\frac{2\pi}{\lambda}\right) \cdot \cos wt$$

$$P = 2A \cdot \sin kx \cdot \cos wt = \sqrt{2} \cdot |(wr)^2| \cdot \sin\left(\frac{2\pi}{\lambda}\right) \cdot \cos wt \dots(a)$$

Equation (a) is valuing in all principle monads.

**Conservation of energy in an, free vibration un-damped system**, energy is partly kinetic T (stored in the mass by virtue of its velocity and for mass-less in velocity vector) and partly potential U (stored in the form of strain energy in elastic deformation of work done in a force field ),and is Quantized.

**The principle of virtual work** states that , in an equilibrium system under the action of a set of forces is given a virtual displacement , the virtual work done by the forces will be zero.

**Coulomb damping** results from the sliding of two dry surfaces where dumping force is equal to the product of the normal force and the coefficient of friction  $\mu$ , independent and opposite of the velocity valuing only for half-cycle intervals. Viscous damping force  $F_d$  determines an decay of amplitude  $X_2 - X_1 = 4 \cdot F_d / k$  and the frequency of oscillation  $w_n = \sqrt{k/m}$  equal to that of the un-damped system , and in case of two masses with stiffness  $k_1, k_2$  then  $k = k_1 + k_2$  .

**Energy dissipated by damping** is the amount of loss of energy from the oscillatory system which results in the decay of amplitude of free vibration determined under conditions of cyclic oscillations. The force displacement curve will enclose an area ,hysteresis loop ,that is proportional to the energy lost per cycle . Considering the simplest case of energy dissipation, , that of a spring-mass system with viscous damping , then is Damping force  $F_d = c \cdot \dot{x} = \pm c \cdot w \cdot [\sqrt{A^2 - x^2}]$  with steady-state displacement ,x, and velocity  $\dot{x}$  , natural frequency  $w_n = \sqrt{k/m}$  and constant  $c = 2\zeta\sqrt{k/m} = 2\zeta w_n$ , where  $\zeta$  = the dumping ratio . For A = maximum amplitude , then Dumping Force is graphically represented as  $\rightarrow [F_d / c \cdot w \cdot A]^2 + [x/A]^2 = 1$  , i.e. an Ellipse with  $F_d$  , x , plotted in vertical and horizontal axis of velocity vector and equal to the area enclosed by the ellipse , and if added to  $F_d$  the force , k.x , of the lossless spring ( pressure) then the hysteresis loop is rotated through  $F_d$  axis. (Voigt model) . Quantized Energy is the enclosed by ellipse.

### 7.3. Power of a Free force .

The Power (Flux) developed by a free force  $F = F_0 \cdot \sin(wt + \phi)$  acting on a displacement  $x = x_0 \cdot \sin(wt)$  , where Power P (in Watt=J/s) is the rate of doing work, which is the product of the force ,F, and velocity , $\bar{v} = w \cdot r$  , so Power is ,

$$P = F \cdot (dx/dt) = (w \cdot X_0 \cdot F_0) \cdot \sin(wt + \phi) \cdot \cos wt = (w \cdot X_0 \cdot F_0) \cdot [\cos \phi \cdot \sin wt \cdot \cos wt + \sin \phi \cdot \cos^2 wt] = w \cdot X_0 \cdot F_0 / 2 [\sin \phi + \sin(2wt + \phi)]$$

where  $\rightarrow$  The first term  $w \cdot X_0 \cdot F_0 / 2 [\sin \phi]$  is a constant , representing the steady flow of work per unit time as Power(flux) = J/s=N.(m/s) = N.v.

The second term  $w \cdot X_0 \cdot F_0 / 2 [\sin(2wt + \phi)]$  is a sine wave of twice the frequency which represents the fluctuation component of power, the average value of which is zero over any interval of time that is a multiple of the period .

### 7.4. Lagrange's Equations .

In reviewing the method of virtual work , the equation is  $\delta W = \sum_i [F_i \cdot \delta \bar{r}_i] = 0$  where  $F_i$  are applied forces excluding the constraint forces and internal forces of frictionless joints and  $\delta \bar{r}_i$  are the virtual displacements. By including D'Alembert's inertial forces  $-m \cdot \bar{r}_i$  , the procedure is extended to dynamical problems by the equation  $\delta W = \sum_i [F_i - m \bar{r}_i] \cdot \delta \bar{r}_i = 0$  .

This equation leads to Lagrange's equation when the displacement , $\bar{r}$ , is expressed in terms of the generalized coordinates . The difference between , $\delta \bar{r}_i$ , and , $d\bar{r}_i$ , takes place in the time ,dt, whereas , $\delta \bar{r}_i$ , is an arbitrary number that maybe equal to , $d\bar{r}_i$ , but is assigned instantaneously irrespective of time , ensuring compatibility of displacement .

For kinetic Energy ,E, as a function of the generalized coordinates displacements ,x, and the generalized velocity , $\dot{x}_i$ , whereas Potential energy ,U, is a function of ,x, is ,  
 $(d/dt)(\partial E / \partial \dot{x}_i) - (\partial E / \partial x_i) + (\partial U / \partial x_i) = 0$  and for  $i=1$  and for a system without potential (U=0) then ,  
 $(d/dt)(\partial E / \partial \dot{x}) - (\partial E / \partial x) = 0 \dots(L1)$

Note : The elastic behavior of a system can be expressed in terms of the stiffness ,k, or the flexibility ,af, as ,

#### Stiffness formulation :

Force ,F, = Stiffness ,k, .displacement ,x,  $F = k \cdot x$  and  $[k = N/m]$

#### Flexibility formulation :

Displacement ,x, = { Flexibility ,af,} . { force ,F,}  $\rightarrow x = af \cdot F$  and in measures  $[af = m/N]$

### 7.5. Work .

Work ,W, by a force ,F, exerted on an object which moves with distance times ,dx, in the direction x-x of the force is  $W = F \cdot dx$  , and in the special case of a constant force , the work maybe calculated by multiplying , the distance times dx . the component of force  $F \cdot \cos \phi$  or  $W = (F \cdot \cos \phi) \cdot dx$  .

Since the component  $F \cdot \cos \phi$  of force F when acting in the perpendicular direction y-y ( $dy \perp dx$ ) of the motion x-x , produces zero work , therefore ,

Work ,Kinetic Energy, produced as Stiffness ,k, in the dx Formulation , is stored in the perpendicular y-y direction as Flexibility ,af, in the ,dy, Formulation .

The Analogues in Gravity :

Work W by a constant force  $F = 2(wr)^2$  , or by the constant velocity ,c, exerted on an object [breakage  $(wr)^2$ ] which moves with a distance times  $dx = |(wr)^2|$  ,and because Surface is zero is calculated in two perpendicular Formulations ( $dx \perp dy$ ) as ,

Stiffness  $k = N/m \rightarrow$  velocity vector  $v1 \rightarrow$  Electric field E  
 Flexibility  $af = m/N \rightarrow$  velocity vector  $v2 \rightarrow$  Magnetic field P

The why Energy is transformed into velocity , and velocity to a field is explained through Extrema Principle .

### 7.6. Gravitational field and Newton's 2<sup>nd</sup> Law in a Non-inertial rotating Frame : [25-26]

When conjugation is done between  $\mathbf{e}_0 = [-\nabla\lambda, \nabla\mathbf{x}\Lambda] = 0$  and a quaternion of the differential time operator  $\partial/\partial t$  and 3D angular speed vector  $\bar{\mathbf{w}}$ , then  $\rightarrow (\partial/\partial t, \bar{\mathbf{w}}) \odot (-\lambda\nabla, \nabla\mathbf{x}\Lambda) = d/dt(-\nabla\lambda) + \bar{\mathbf{w}} \cdot \nabla\mathbf{x}\Lambda, d/dt(\nabla\mathbf{x}\Lambda) + \bar{\mathbf{w}} \cdot \nabla\lambda - \bar{\mathbf{w}}\mathbf{x}\nabla\mathbf{x}\Lambda = 0 - \bar{\mathbf{w}} \cdot \Lambda, 0 + \bar{\mathbf{w}} \cdot \lambda + \bar{\mathbf{w}} \cdot \Lambda = \mathbf{0}, \bar{\mathbf{w}} \cdot \lambda$  or,

$$(\partial/\partial t, \bar{\mathbf{w}}) \odot (-\lambda\nabla, \nabla\mathbf{x}\Lambda) = (\mathbf{0}, \bar{\mathbf{w}} \cdot \lambda) = [\mathbf{0}, \Lambda]$$

Equation implies that the new quaternion which maps the alterations of , *negation truth Unit* , by rotation only , transforms only vector term magnitudes and since  $\bar{\mathbf{w}}$  is velocity then  $\bar{\mathbf{w}} \cdot \lambda$  is momentum  $\bar{\mathbf{p}}$ , i.e. *negation truth Unit*  $\mathbf{e}_0 = [-\lambda\nabla, \nabla\mathbf{x}\Lambda] = 0$  is a machine that instantly transfers Inertial mass as *momentum*  $\Lambda = \bar{\mathbf{w}} \cdot \lambda = \mathbf{p} = \mathbf{m} \cdot \bar{\mathbf{v}} = \mathbf{m} \cdot (\bar{\mathbf{w}}\bar{\mathbf{r}}) = (\mathbf{m}\bar{\mathbf{r}}) \cdot \bar{\mathbf{w}} = (\mathbf{m}\lambda) \cdot \bar{\mathbf{w}} = (\mathbf{J}) \cdot \bar{\mathbf{w}}$  to all points, in Inertial or not , frames Layers  $\mathbf{K}_{1,2,3} = \lambda \cdot \Lambda$  and over spaces, **NOT as said with Big-Bang** , but of this reason only .

Since  $\Lambda$  is constant and Wavelength ( $\lambda$ ) may be equal to  $\mathbf{0}$ , then angular velocity  $\bar{\mathbf{w}} \rightarrow \infty$  meaning that, this is also happening to all Inertial or not Frames. Label 'gravity' probably is referred to something heavy. Conjugation between the quaternion of the differential time operator  $\partial/\partial t$  and 3D angular speed vector  $\bar{\mathbf{w}}$  and the Position quaternion  $\bar{\mathbf{z}} = (\mathbf{r} = 0, \bar{\mathbf{z}})$  is the velocity  $(\partial/\partial t, \bar{\mathbf{w}}) \odot (0, \bar{\mathbf{z}}) = (-\bar{\mathbf{w}} \cdot \bar{\mathbf{z}}, \bar{\mathbf{w}}\mathbf{x}\bar{\mathbf{z}} + d\bar{\mathbf{z}}/dt)$  and

$$\begin{aligned} & (\partial/\partial t, \bar{\mathbf{w}}) \odot (-\bar{\mathbf{w}} \cdot \bar{\mathbf{z}}, \bar{\mathbf{w}}\mathbf{x}\bar{\mathbf{z}} + d\bar{\mathbf{z}}/dt) = \\ & (-d\bar{\mathbf{w}}/dt \cdot d\bar{\mathbf{z}}, d^2\bar{\mathbf{z}}/dt^2 + 2\bar{\mathbf{w}}\mathbf{x}d\bar{\mathbf{z}}/dt + d\bar{\mathbf{w}}/dt \mathbf{x}\bar{\mathbf{z}} - \bar{\mathbf{w}} \cdot \bar{\mathbf{z}} \cdot \bar{\mathbf{w}}) \end{aligned}$$

and which is the acceleration transforming both scalar and vector parts. Time (t) , which is a phenomenological reference concept of alterations and it is the only element in the scalar of an event of a Position quaternion , does not exist in , $\mathbf{e}_0$ , unit, where Energy is related as momentum  $\Lambda$  , so  $\rightarrow$  **Universe is a Space-Energy Configuration Frame**  $\leftarrow$  and not Space-Time as in GR believed .

Because Space-Energy is quaternion composed of Stationary quantities, the *scalar* position  $\bar{\mathbf{r}}(t)$  and the *vector* kinematic quantities velocity  $\bar{\mathbf{v}} = d\bar{\mathbf{r}}/dt$  and acceleration  $\bar{\mathbf{a}} = d\bar{\mathbf{v}}/dt = d^2\bar{\mathbf{r}}/dt^2$ , then exists a complete Physical equivalence of all magnitudes either in gravitational fields or in corresponding Reference acceleration systems. A net proof is referred in Equivalence principle concerning Gravitational and Inertial acceleration in §.8-2 . Force field is the derivative of the potential of Newton's scalar field equation  $\nabla^2\Phi = 4\pi G\rho$

and for vacuum is

$\Phi = GM / \sqrt{(x^2 + y^2 + z^2)}$  which is the same as the square quaternion of  $\mathbf{e}_0 \rightarrow (\mathbf{e}_0)^2 = [\nabla\lambda, \Lambda\mathbf{x}\nabla]^2 = [\lambda^2 - \Lambda^2 \pm 2\lambda \cdot \Lambda \nabla^2] = \lambda^2 - \Lambda^2 \pm 2\lambda \cdot \Lambda = \lambda^2 - \Lambda^2 \pm 2\lambda \cdot \mathbf{x}\Lambda = [\lambda^2 - \Lambda^2] = [\lambda^2 - (i^2 + j^2 + k^2) |\Lambda^2|]$  since  $\lambda, \Lambda$  are axially. *The upper relation was used by Special relativity [Minkowski metric (g<sub>μν</sub>)] for Events to be represented as 4-vectors*

*for all scalar operations, without knowing that this is (e<sub>0</sub>)<sup>2</sup>, which equilibrium the two opposite and spherical rotations of Space , Anti-space transformations vorticity magnitudes ± |Λ| to all other 4-vectors  $\bar{\mathbf{z}} = [\mathbf{s}, \bar{\mathbf{v}} \cdot \nabla i]$ .*

Conjugation of  $\bar{\mathbf{z}} \mathbf{n} \odot (\mathbf{e}_0)^2 = [\mathbf{s} \mathbf{n}, \bar{\mathbf{z}} \mathbf{n} \cdot \nabla i] \cdot [\lambda^2 - \Lambda^2] = \lambda^2 \cdot \mathbf{s} \mathbf{n} - \Lambda^2 \mathbf{x} \bar{\mathbf{v}} \mathbf{n} \cdot \nabla i, -\lambda^2 \cdot \mathbf{s} \cdot \Lambda^2 - \lambda^2 \cdot \bar{\mathbf{v}} \mathbf{n} \cdot \nabla i - (\bar{\mathbf{v}} \mathbf{n} \mathbf{x} \Lambda^2) \nabla i$  may give an explanation to linear central force and to Newton's inverse square law . Newton law of motion for a material point is - Force = mass  $\mathbf{x}$  acceleration (a) - in an Inertial frame  $\mathbf{a} = d^2\mathbf{r}/dt^2$ . By twice applying the transformation from stationary to rotating frame , absolute acceleration  $\mathbf{a}$ , is written as  $\mathbf{a} = d^2\mathbf{r}/dt^2 = |d/dt| \cdot |d\mathbf{r}/dt| = |d/dt| \cdot [(d\mathbf{r}/dt) + \mathbf{w}\mathbf{x}\mathbf{r}] = (d^2\mathbf{r}/dt^2) + |d\mathbf{w}/dt| \mathbf{x} \mathbf{r} + 2\mathbf{w}\mathbf{x}(d\mathbf{r}/dt) + \mathbf{w}\mathbf{x}(\mathbf{w}\mathbf{x}\mathbf{r})$  or

$$\mathbf{a} = |d\mathbf{w}/dt| \mathbf{x} \mathbf{r} + 2\mathbf{w}\mathbf{x}(d\mathbf{r}/dt) + \mathbf{w}\mathbf{x}(\mathbf{w}\mathbf{x}\mathbf{r}) = [\mathbf{a} - d^2\mathbf{r}/dt^2] \rightarrow \text{i.e.}$$

*Apparent acceleration's terms of , a , are independent of mass and a first interpretation is because acceleration is the hypothetical external reaction to the motion* which does not happen in the stationary [PNS] but of action on points only. Momentum  $\bar{\mathbf{p}} = \mathbf{m} \cdot \bar{\mathbf{v}}$  , on points in [PNS] is expressed by constant  $\mathbf{m}$  and angular velocity  $\bar{\mathbf{w}}$ , and since  $\mathbf{m}$  is hypothetical magnitude *representing the reaction to the motion* , then  $\bar{\mathbf{p}} = \mathbf{m} \mathbf{x}$  angular velocity =  $\mathbf{m} \mathbf{x} \bar{\mathbf{w}}$ .

Conjugating on points then  $[0, \Lambda] \odot [\bar{\mathbf{r}}, i] = 0 - \Lambda\bar{\mathbf{r}}, 0 + \Lambda\mathbf{r} + \Lambda\mathbf{x}\bar{\mathbf{r}} = -|\bar{\Lambda}| \cdot |\bar{\mathbf{r}}| , \mathbf{r}\bar{\Lambda} + \bar{\Lambda}\mathbf{x}\bar{\mathbf{r}}$  and Rearranging then becomes  $\rightarrow [0, \bar{\Lambda}] \odot [\mathbf{r} + \bar{\mathbf{r}}, i] =$

$$-|\bar{\Lambda}| \cdot |\bar{\mathbf{r}}| + |\bar{\mathbf{r}}| \cdot \bar{\Lambda} + \bar{\Lambda}\mathbf{x}\bar{\mathbf{r}} = |\mathbf{r}| \cdot \bar{\Lambda} + |\bar{\Lambda}| \cdot |\bar{\mathbf{r}}| + \bar{\Lambda}\mathbf{x}\bar{\mathbf{r}} = \bar{\mathbf{w}} \cdot |\mathbf{r}| + |\bar{\Lambda}| \cdot |\bar{\mathbf{r}}| + \bar{\Lambda}\mathbf{x}\bar{\mathbf{r}}$$

and because by replacing  $\Lambda = m\bar{\mathbf{w}}$  then Velocity on Points  $P(\mathbf{r}, \bar{\mathbf{r}} \cdot \nabla i) = \mathbf{m} [\bar{\mathbf{w}} \cdot |\mathbf{r}| + \bar{\mathbf{w}} \cdot \bar{\mathbf{r}} + \bar{\mathbf{w}}\mathbf{x}\bar{\mathbf{r}}]$  and since for points in motionless Frame [PNS] momentum  $\Lambda$  and the position vector of point vector  $\bar{\mathbf{r}}$ , apply on the same stationary point , then  $\bar{\mathbf{w}} \cdot |\mathbf{r}| = 0$  (*this in motionless [PNS] only*) and the variation at point which is the same as the variation of  $\bar{\mathbf{r}}$ , therefore  $|\bar{\Lambda}| \cdot |\bar{\mathbf{r}}|$  is equal to  $d\bar{\mathbf{r}}$ , else  $+ |\bar{\Lambda}| \cdot |\bar{\mathbf{r}}|$  , i.e. Angular velocity  $\bar{\mathbf{w}} = |\bar{\Lambda}|/|\bar{\mathbf{r}}| = \mathbf{k}/(\lambda m)$  , is the effect of momentum  $\Lambda = m\bar{\mathbf{w}}$  on points as velocity magnitude, and so

quaternion of the differential time operator  $\partial/\partial t$  to 3D angular speed vector  $\bar{\omega}$  is the Apparent acceleration at Point and as ,  $\gamma = \partial/\partial t [ d\bar{r} + \bar{\Lambda} \cdot \bar{r} + \bar{\Lambda} x \bar{r} ] = \partial/\partial t [ d\bar{r}/dt + \bar{\omega} \cdot \bar{r} + \bar{\omega} x \bar{r} ] . m = m \cdot (d/dt) [ d\bar{r}/dt + \bar{\omega} \cdot \bar{r} + \bar{\omega} x \bar{r} ] = m \cdot (d/dt) [ d\bar{r}/dt + \bar{\omega} x \bar{r} ]$  , which is  $\rightarrow \gamma = \mathbf{m} \cdot d/dt [ d\bar{r}/dt + \bar{\omega} x \bar{r} ] = \mathbf{m} \cdot [ (d^2\bar{r}/dt^2) + \bar{\omega} \cdot d|x\bar{r} + 2 \cdot \bar{\omega} x (d\bar{r}/dt) + \bar{\omega} x (\bar{\omega} x \bar{r}) ]$  where exists ,

- $\mathbf{m} \cdot (d\bar{r}/dt) \cdot \bar{v} =$  Centrifugal Energy (  $m \cdot \omega^2 r$  ) ,
- $\bar{v} =$  Position Velocity =  $[ d\bar{r}/dt + (\bar{\omega} \cdot \bar{r}) + (\bar{\omega} x \bar{r}) ]$
- $\mathbf{m} \cdot (d\bar{r}/dt) \times \bar{v} =$  Coriolis Energy (  $2m \cdot \omega \cdot v = 2m\omega^2 r$  ) ,
- $\bar{a} =$  Position Acceleration =  $d\bar{v}/dt$
- $\mathbf{m} \cdot \bar{r} \times \bar{a} =$  Euler's Energy (  $m \cdot \omega \cdot r$  ) ,
- $\mathbf{m} =$  Constant  $\Rightarrow$  The hypothetical Reaction to  $\mathbf{m} \cdot \bar{r} x \bar{a} =$  Any other Energy in the motion .

$(d^2\bar{r}/dt^2) =$  Linear acceleration of position point.  
 $|d\bar{\omega}/dt|x\bar{r} =$  Euler intrinsic acceleration of position point  
 $2\bar{\omega} x (d\bar{r}/dt) =$  Coriolis intrinsic acceleration of position point  
 $\bar{\omega} x (\bar{\omega} x \bar{r}) =$  Centrifugal intrinsic acceleration of position point.

Remarks :

**The effection ,( $\gamma$ ), is The Gravity in Inertial Frames of Planck's Scale matter conjugation , of momentum ( $\Lambda = m\bar{v}$ ) on Points  $\mathbf{P}(r, \bar{r}, \nabla i)$  of [PNS]  $\rightarrow \mathbf{z} \mathbf{o} = [ \lambda , \pm \Lambda \nabla i ] = |z\mathbf{o}| \cdot \mathbf{e}^{\text{arc.cos}[\lambda/z\mathbf{o}]} \cdot [ \bar{\Lambda} \cdot \nabla i / |\Lambda| ] = |z\mathbf{o}| \cdot \mathbf{e}^{\theta} \cdot \bar{\Lambda} \nabla i$  it is the Gravity in Scale Frames , which is harmonically oscillated to all points of infinite spaces in [PNS] as New Quaternion ( - |  $\bar{\Lambda}| \cdot |\bar{r}|$  ,  $r\bar{\Lambda} + \bar{\Lambda} x \bar{r}$  ) and oriented on the directional axis of the points ( is on the unit quaternion of the points ) as the Diagonal of an Energy Cuboid ( Poinso't's ellipsoid ) or Cube, which decomposition follows Pythagoras conservation law, Total Energy  $\rightarrow W = [A \cdot B [P \cdot ds] = T = \sqrt{J^2 + E^2 + B^2}$  where the three orthogonal magnitudes (J,E,B) ,  $\mathbf{J} \approx d\bar{r}/dt = \bar{r}$  ,  $\mathbf{E} \approx \bar{\omega} \cdot \bar{r} = \bar{v}E$  ,  $\mathbf{B} \approx \bar{\omega} x \bar{r} = \bar{v}B$  of Energy-state follow Cuboidal , Plane, or Linear Diagonal direction as the normal quaternion  $\rightarrow [ - [ |\bar{\Lambda}| \cdot |\bar{r}| , r[\bar{\Lambda} + \bar{\Lambda} x \bar{r} ] ] / ( \Lambda r \sqrt{3} )$  .**

**Stability** is obtained by the opposite rotational momentum  $-\bar{\Lambda}$  where  $E = -(\bar{v} x B) = -(\bar{v} \cdot B) \perp \rightarrow$  or  $\mathbf{B} \perp \mathbf{E}$

The two perpendicular Static force fields  $\mathbf{E}$  and Static force field  $\mathbf{B}$  of Space-Anti-Space , *experience* on any moving dipole  $\bar{AB} = [ \lambda , \Lambda ]$  with velocity  $\bar{v}$  (only the momentum  $\bar{\Lambda} = m\bar{v}$  is exerting the velocity vector  $\bar{v}$  to the dipole  $\lambda$ ) a total force  $\mathbf{F} = \mathbf{F} \mathbf{E} + \mathbf{F} \mathbf{B} = (\lambda m) \cdot \mathbf{E} + (\lambda m) \cdot \bar{v} x \mathbf{B}$  which combination of the two types result in a helical motion and generally to any Space Configuration ( Continuum ) extensive property , as **Kinetic** (3-current motion) and

**Potential** ( the perpendicular Stored curl fields  $E , B$  ) **energy** , by **displacement** (the magnitude of a vector from initial to the subsequent position) **and rotation** .

**7.7. Equations of motion of a , Plane frame , [R] :**

Space is quaternion composed of Stationary quantities , the position  $\bar{r}(t)$  and the kinematic quantities velocity  $\bar{v} = dr/dt$  and acceleration  $\bar{a} = d\bar{v}/dt = d^2r/dt^2$ . Kinematic quantities are also tiny energy volume caves ( *cycloid in  $\lambda$  of  $\bar{v}$  and  $\bar{a}$  consist in gravity's field the infinite tanks in where energy is conserved* ) .

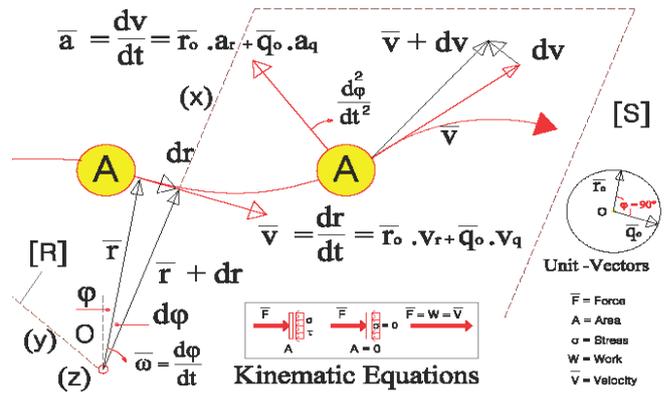


Fig. 11. The Kinematic equations of motion in a Plane Frame and the Extreme case where Area is Zero , Point motion .

Let be point O the origin and radius  $\bar{r}(t)=OA$  the instantaneous position of the moving Point A of a frame S ,  $\bar{v} = v(t)$  the instantaneous velocity and  $\bar{a} = a(t)$  the instantaneous acceleration having the general coordinate independent definitions ,  $\bar{v} = dr/dt$  ,  $\bar{a} = d\bar{v}/dt = d^2r/dt^2$ .

$\bar{r}_o =$  The unit-vector in direction r and  $\bar{q}_o =$  the unit vector in tangential to the angle  $\phi$ (transverse), so  $\bar{r} = \bar{r}_o \cdot r$ .

Differentiating radius,  $d\bar{r} = \bar{r}_o \cdot dr + d\bar{r}_o \cdot r$  and since  $\bar{v} = d\bar{r}/dt$  then  $\bar{v} = d\bar{r}/dt = \bar{r}_o \cdot dr/dt + d\bar{r}_o/dt \cdot r$  ... (1)

Since motion in the transverse position is  $d\bar{r}_o = \bar{q}_o \cdot d\phi$  , so  $\bar{v}$  becomes  $\bar{v} = d\bar{r}/dt = \bar{r}_o \cdot dr/dt + \bar{q}_o \cdot r \cdot d\phi/dt = \bar{r}_o \cdot \bar{v}_r + \bar{q}_o \cdot \bar{v}_q$  .... (2) where  $\bar{v}_r = dr/dt$  ,  $\bar{v}_q = r \cdot d\phi/dt$ .

**i.e. the total velocity ,  $\bar{v}$  , is composed of the centrifugal velocity  $\bar{v}_r$ , on radius r, and the rotational velocity  $\bar{v}_q$  , perpendicular to OA , ( the tangential to the angle ) . F-10**

Derivative of (2) is acceleration  $\bar{a} = d\bar{v}/dt = \bar{r}_o \cdot r \cdot d\bar{v}_r/dt + dr/dt \cdot \bar{v}_r + \bar{q}_o \cdot \bar{v}_q/dt + d\bar{q}_o/dt \cdot \bar{v}_q$  and since  $d\bar{q}_o = -\bar{r}_o \cdot d\phi$  , and  $d\bar{v}_q/dt = (dr/dt) \cdot (d\phi/dt) + r \cdot (d^2\phi/dt^2)$  then ,  $\bar{a} = d\bar{v}/dt = \bar{r}_o \cdot \bar{a}_r + \bar{q}_o \cdot \bar{a}_q$  , where ,  $\bar{a}_r = d^2r/dt^2 - r \cdot (d\phi/dt)^2$  and

$$\mathbf{a}_q = r \cdot d^2r/dt^2 + 2(dr/dt)(d\phi/dt) = d/dt(r^2 \cdot d\phi/dt) \bar{v}$$

**i.e. the total acceleration,  $\bar{a}$ , is composed of the centrifugal acceleration,  $\bar{a}_r$  on radius  $r$  and the rotational acceleration,  $\bar{a}_q$ , perpendicular to OA (tangential to angle).**

where,  $\bar{a}_r = |v| \cdot (d/dt)[\frac{\bar{v}}{|v|}]$  and  $\bar{a}_q = [\frac{\bar{v}}{|v|}] \cdot d|v|/dt$

Considering a moving frame [R] with center point O and  $\bar{r}$  as the direction axis ,x,y, axis in the plane of motion and ,z, axis perpendicular to x,y then the absolute velocity  $\bar{v}$  is composed of the following elements  $\rightarrow$

$\bar{r}_o \cdot (d\bar{r}/dt) \rightarrow$  Is a part of the absolute velocity  $\bar{v}$  relative to system [S] on OA axis , where  $(d\phi/dt) = 0$ , with which point A, participates in [R] frame centrifugal motion .

$\bar{q}_o \cdot r \cdot d\phi/dt \rightarrow$  Is a part of the absolute velocity  $\bar{v}$  relative to system [S] perpendicular to OA axis where  $(dr/dt) = 0$ , with which point A, participates in [R] frame rotational motion , and absolute acceleration  $\bar{a}$ , which is composed of ,

$\bar{r}_o = r \cdot (d^2r/dt^2) \rightarrow$  The relative to system [S] component acceleration where  $(d\phi/dt) = 0$ , with which point A , participates in [R] frame centrifugal motion.

$\bar{q}_o \cdot r \cdot (d^2\phi/dt^2) - \bar{r}_o \cdot r \cdot (d\phi/dt)^2 \rightarrow$  The relative to system [S] component rotational and centrifugal acceleration where  $(dr/dt)=0$ , with which point A participates in [R] frame motion

$\bar{q}_o \cdot 2 \cdot (dr/dt) \cdot (d\phi/dt) \rightarrow$  Coriolis acceleration ,The relative to system [S] supplementary acceleration components of both centrifugal and rotational acceleration  $\bar{a}$ , where  $(dr/dt) \neq (d\phi/dt) \neq 0$ , of point A participation in [R] frame.

**Coriolis force  $\rightarrow$  [Cf] .i.e. this force Cf is perpendicular to  $\bar{w}, \bar{v}_r$  vectors and thus perpendicular to radius  $\bar{r} = OA$  which also is acting in the Plane of the motion and is equal to  $\rightarrow Cf = \bar{q}_o \cdot 2 \cdot (dr/dt) \cdot (d\phi/dt) = 2[\bar{w} \cdot \bar{v}_r] = 2[|\bar{w}|^2 \cdot r]$  .**

From equation  $d\bar{v} = \bar{a} \cdot dt$  then  $v \cdot dv = \bar{a} \cdot \bar{v} \cdot dt = a \cdot d\bar{r} = d(v^2/2)$  and when multiplied with mass becomes  $m \bar{a} \cdot d\bar{r} = d(mv^2/2) = P \cdot d\bar{r} = dL$  and  $L = mv^2/2 =$  kinetic energy.

i.e. work W executed on a material point A by a force  $\bar{P}$  on instantaneous displacement  $d\bar{r}$ , is manifested as change of kinetic energy and since also centripetal force  $m \cdot \bar{a}_r$  is perpendicular to the trajectory then executes zero work .The executed work is produced by force  $P =$  thrust = velocity in any time moment and is equal to the time change of kinetic energy , or  $\rightarrow dL/dt = \bar{P} \cdot (dr/dt) = (\bar{P} \cdot \bar{v} = \bar{P} \cdot [\bar{r}_o \cdot v_r + \bar{q}_o \cdot v_q]) = \bar{P} \cdot \bar{q}_o \cdot a_q$ . **Work executed by Coriolis force is conserved as a curl helix on a surface perpendicular to the plane of motion**

## 7.8. Extremes Principle or Extrema :

All Principles are holding on any Point A. For two points A, B not coinciding, exists Principle of Inequality which consists another quality. Any two points exist in their Position under one Principle, *Equality of Stability*, (Virtual displacement which presupposes Work in a Restrained System ).[16-17]. This Equilibrium presupposes

homogenous Space and Symmetrical Anti-Space .

For two points A, B which coincide , exists the *Principle of Superposition* which is a Steady State containing Extrema for each point separately.

**Extrema** , for a point A is the Point , for a straight line the infinite points on opposite line , either these coincide or not or these are in infinite, and for a Plane the opposite infinite lines and points with all combinations and Symmetrical ones , **i.e. all Properties of Euclidean geometry, compactly exist in Extreme opposite , Points , Lines , Planes , circles by following anode or descend sequence .**

Since Extreme is holding on Points, lines, Surfaces, Volumes , bodies etc., therefore all their compact Properties (Principles of Equality, Arithmetic and Scalar, Geometric Segments and Vectors, Proportionality, Qualitative, Quantities, Inequality, Perspectivity etc.), exist also in the common opposite context

**magnitude to direction** , therefore in Superposition the magnitude AB is equal and constant in both directions , or any other direction  $\neq 0$  ,  $[|A,B| - P\bar{A}, P\bar{B}]$  i.e.

**Any Segment  $\bar{AB}$  between two points A,B consist a Vector , described by the magnitude ,AB, and directions  $\bar{A}B, B\bar{A}$  and in case of Superposition  $\bar{A}A, A\bar{A}$  , where Properties of Vectors, Proportionality, Symmetry, etc. exist either on edges A,B or on segment AB as  $\rightarrow$**

A quantity to Anti-quantity, a monad to Anti-monad, and since it is either a scalar or a vector and by their distinct definitions, **Scalars** , are quantities that are fully described by a magnitude or numerical value alone in **Anti-Scalars**. **Energy** which is motion to Anti-motion, i.e. to the Anti-trajectory.

According to Thales theorem , F-9.3 if two intersecting lines PA, PB are intercepted by a pair of Parallels  $AB//A'B'$  , then ratios  $PA/AA'$  ,  $PB/BB'$  ,  $PA/PA'$  ,  $PB/PB'$  of lines, or ratios in similar triangles PAB ,  $PA'B'$  are equal or ratio  $\lambda = [PA/AA'] = [PB/BB']$  . In case line  $A'B'$  coincides with AB , then  $AA' = AA$  ,  $BB' = BB$  , i.e. exist **Extreme** and then  $\lambda = [PA/AA] = [PB/BB]$  , ( Principle of Superposition ) , where property of scalar exists on common segment AB.

**Vectors are Imaginary** quantities that are fully described by a constant magnitude and change direction in order to keep their constant numerical value or move to **Anti -Space**.

**Strain ( $\epsilon$ )** = change of length / length  $\rightarrow$  It is the relative change in shape or size of an object due to externally-applied forces . Young modulus (E) = tensile stress / tensile Strain . Stress ( $\sigma$ ) = E . Strain = E .  $\epsilon$ , Strain = Stress / E =  $\epsilon = \epsilon(u,v,w)$  G = shear modulus = E.m2(m + 1) where m= Poisson's ratio =  $1/\mu = 10/3$  . [26-27]

Volume and, Surface, Plane stress :

A material is said to be under Plane stress if the stress-vector is zero across a particular surface, i.e.  $\sigma_3 = 0$  or  $\sigma_z = \tau_{yz} = \tau_{xz} = 0$

From mathematical theory of Elasticity a surface  $F$ , under pressure  $p$ , due to a transverse force  $P$ , is  $p=P/F$  pervaded in all, and around surface and if force direction forms an angle  $\theta$ , then Principal stresses  $\sigma_1, \sigma_2$  and Shear stresses  $\tau_{12}$  are as,  $\sigma_{1,2} = (\sigma_1 + \sigma_2) / 2 \pm (\frac{1}{2}) \cdot \sqrt{(\sigma_1 - \sigma_2)^2 + 4 \cdot (\tau_{12})^2}$  and  $\rightarrow \tan(2\theta) = 2 \cdot \tau_{12} / (\sigma_1 - \sigma_2)$  .... (a)

When surface becomes a point [ **This is extreme case where surface is interchanged as line or line-segment, it is the same as the infinite small, ds, in Calculus** ], then  $\sigma_2 = 0$  and  $\tau_{12}$  very small. Since force  $P$  is a vector, then as in cross-product to a right-handed coordinate system where exists  $\sigma_2 = 0$  and  $\tau_{12} = \sigma_1$ , equation (a) becomes

$$\sigma_{1,2} = \sigma_1 / 2 \pm (\frac{1}{2}) \cdot \sqrt{\sigma_1^2 + 4 \cdot \sigma_1^2} = \sigma_1 / 2 [ 1 \pm (\sqrt{5}) ] \dots (b)$$

i.e. **Stress  $\sigma$  on a point** is manifested as  $\sigma = P / dF$  and as  $dF = 0 \rightarrow \bar{\sigma} = P / [dF \rightarrow 0]$  becomes **momentum  $M \cdot \bar{v}$**  because energy  $mv^2/2$  as motions becomes only rotational.

Since Stationary force  $P$  exists independently of the acting area then for zero surface (a point) stresses  $P/F$  vanish, and **Stationary force  $P$**  becomes a **Moving force  $\bar{P}$**  and exists as momentum  $m\bar{v}$  with  $m=M=1$  (Extreme hypothetical Reaction to the motion) i.e. the velocity  $\bar{v}$  at this point and which is decomposed in the two perpendicular velocities  $\bar{v}_1, \bar{v}_2$ , where then equation (b) is transformed as,

$$\sigma_1 = \bar{v}_1 = (\sigma_1) / 2 ( 1 + \sqrt{5} ) \text{ and } \sigma_2 = \bar{v}_2 = (\sigma_2) / 2 ( 1 - \sqrt{5} ) \dots (c)$$

$$\sigma = P / dF = 0 \rightarrow \bar{P} = m \cdot \bar{a} \rightarrow \bar{v} = \{ \bar{v}_1 \perp \bar{v}_2 \} = \{ \bar{\sigma}_1 \perp \bar{\sigma}_2 \} = \text{Constant,}$$

where,

$\bar{v}_1 \rightarrow$  represents the **Inward compressible** radial velocity and  $\bar{v}_2 = \bar{v}_1 \rightarrow$  represents the **Transverse Outward stretchable** radial velocity of point, which is transformed into,

$\sigma_1 \rightarrow$  representing the **Inward compressible** radial pressure  $\sigma_2 = \sigma_1 \rightarrow$  representing the **Transverse Outward stretchable** radial pressure of material point,

$m =$  the reaction to the change of velocity motion (the mass),  $\bar{a} =$  the change of velocity motion ( the acceleration ),(F10) i.e.

**Force  $P$**  in a material body appears as Kinetic energy, in an elastic surface is appearing as **Principal and Shear stress**, in a material line or segment as **tension, in Euclid line becomes velocity on line or, a Free Velocity moving Line-Segment, or a moving Vector (quaternion = monad)**. The **minimum Quantized Energy, Quanta=2s<sup>2</sup>**, is diffused through the **minimum Quantized Space, Quanta s<sup>2</sup>**, in all quantized spaces, which are Particles, [MFMF] Field, moving Vectors, free velocity monads, Material lines  $\rightarrow$  Surfaces and Bodies.

Since also it is a moving energy then diffusion (decomposition) of stored energy follows Pythagoras theorem in a New Configuration with Scalar and Vector magnitudes such that satisfy the principle of conservation of linear momentum.

Points in Space carry A priori the work  $W = [A-B [P \cdot ds] = 0$ , where magnitudes  $P, d\bar{s}$  can be varied leaving work unaltered. Using the work formulas of elasticity then **In** and **On** Surface work  $W$  is,

$$W = [ (\sigma_1^2 + \sigma_2^2) / 2 - (\sigma_1 \cdot \sigma_2) / m ] / EF$$

$$W_v = [ (\sigma_1^2 + \sigma_2^2 - \sigma_1 \cdot \sigma_2) / 6 \cdot GF ] \text{ where,}$$

$\sigma_1, \sigma_2,$  Are the Principle stresses,

$W,$  Is the work Inward radial surface,

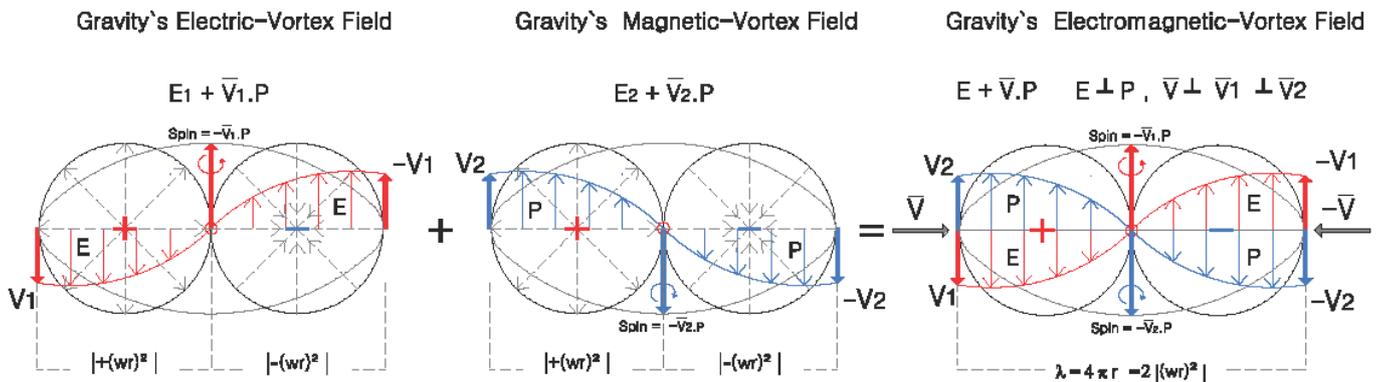
$W_v,$  Is the work Onward radial surface (the transverse)

Placing equation (c) in above work equations then become,

$$W = [P^2/4 \cdot EF^2] \cdot (6+4/m), W_v = [2P^2/3 \cdot GF^2] \text{ and for } m=4 \text{ and } G = 2E/5 \rightarrow W = (7/4) \cdot [P^2/EF^2], W_v = (5/3) \cdot [P^2/EF^2] \dots (d)$$

Gravity's Stationary Displacement Current  $[E \perp P]$  : Fig.12

Fig.(12) The two opposite signed, Fragments  $s^2 = \pm [(\bar{w} \cdot r)^2]$  consist the under Gravity primary Dipole, where on this, Force  $[\nabla_i = 2(wr)^2]$  as velocity  $\bar{v} = \bar{c}$ , **The Thrust, cause Gravity's Electromagnetic Field  $E \perp P$**



**Fig. 12. Fragments  $[+|wr|^2] \leftrightarrow (-|wr|^2)$  as Dipole are joined by Gravity Force that causes the Electromagnetic Gravity-Field  $E, P$**   
 Since principal stresses  $\sigma_1, \sigma_2$  are equal to the corresponding transverse velocities  $v_1, v_2$  which are the Cross product of a vector  $\bar{v}$ , so,  $\bar{v}_1 = (\bar{v}_1 / 2) \cdot [ 1 + \sqrt{5} ] \rightarrow$

$\bar{v}_2 = (\bar{v}_2 / 2) \cdot [ 1 - \sqrt{5} ]$  being Odd and Even functions of points.  
 The Norm is  $|\bar{v}_1| \cdot |\bar{v}_2| = \bar{v}^2 = (v_1 / 2) \cdot [ 1 + \sqrt{5} ] \cdot (v_2 / 2) \cdot [ 1 - \sqrt{5} ] = (v_1 \cdot v_2 / 4) \cdot (1-5) = -v_1 \cdot v_2$  or,  $\bar{v}^2 = -\bar{v}_1 \cdot \bar{v}_2$  and the analogous,  $\sigma^2 = -\sigma_1 \cdot \sigma_2$  ..... (e)

*i.e. Extreme equation (e) , joints at points the Principal stresses ,σ, and velocities ,v̄, into the quaternion type z̄ = σ̄ = v̄ which is z̄ = [ λ , ± Λ∇i ] , in real (λ) and imaginary part [ ± Λ∇i ] either as massive particle [λm] , or as Wave [ Energy ± Λ∇i = λ ] or both , and the conjugate quaternion z̄' = [λ²-|Λ|²] with equation e,o becoming,*

*e,o = [|Λ|∇, -∇xΛ] and defines the deep relation between , Energy as velocity (v̄) and stress (σ) and into both , Space as velocity |v̄1| ⊥ |v̄2| or stresses |σ1| ⊥ |σ2| , and into the transverse equilibrium Anti-space as velocity - |v̄1| ⊥ -|v̄2| or stresses - |σ1| ⊥ - |σ2|.*

This property of equation (e) in inner monad's wavelength (λ) where dF=0 results to the equation  $c^2 = \sigma^2 = \sigma_1 \cdot \sigma_2 = v_1 \cdot v_2$  and it is a relation between constancy of velocity and main stresses. Furthermore  $\sigma_1$  is a measure of how much in medium, the wavelength λ of monads where with (+),(-) dipole moment creates the inner Electric and Magnetic Fields E ,P , opposes to any external E ,B field and  $\sigma_2$  is a measure of the inner vortex density (w) of medium which opposes also to any external E ,B field. The inner Electromagnetic field of monads is produced from the two transverse moving velocity vectors v̄1 , v̄2 on the two cycloids and consist Space-Quanta. Fig.13

From electromagnetic theory,

Permittivity (ε), is a Dielectric constant multiplier which affects the propagation of Electric fields , and it is a measure of how much the molecules oppose the external E-field due to a single point charge q[C] at a distance R and exists , Electric flux density D = multiplier (ε) . Electric field E . Permeability (μ) , is a measure (a scalar field) of the inner vortex density w[∇xv̄] oppose the external B-field due to a moving electric charge q and exists ,

H = The pure vorticity (Spin) ,

B = The weighted vorticity that is weighted for the density of the vortex [MFMF] field, and issuing B = μ H .

By definition ε = 1/q = 1/σ1 and μ = 1/w = 1/σ2 where then  $c^2 = v^2 = \sigma^2 = \sigma_1 \cdot \sigma_2 = v_1 \cdot v_2 = (1/\epsilon) \cdot (1/\mu) = \frac{1}{\epsilon \cdot \mu}$  or,  $c^2 \cdot \epsilon \cdot \mu = 1$  which is the known relation between the speed of light and Permittivity , Permeability , in free space medium ... [40]

**Stability of Whirling in monads :**

The two perpendicular velocities v̄1, v̄2 (The thrusts) F.12-13 follow the cycloid axis , shaft (1)-(2) with center O , and are synchronous and acquire equal speed of rotation ,w, and equal to the whirling speed θ̇ and thus exist θ̇ = w . Equilibrium of whirling presupposes the balancing of Space , Anti-space opposite equal motion .On intergrading the speed is obtained φ = wt , where φ is the phase angle between moving shaft center O , of AA' , OA is the eccentricity from (1)-(2) axis , and O the geometric center of |v̄|= r→R which is constant. Since θ̇=w=constant then θ̈=ṙ=ṛ=0 and the problem reduces to that of one degree of freedom with mass m = ε = μ = 1 for monads. By using the general equations of whirling then →  $(\frac{k}{m} - w^2) \cdot R = e \cdot w^2 \cdot \cos \phi$  ,  $\frac{c}{m} \cdot w \cdot R = e \cdot w^2 \cdot \sin \phi$  ← and by division the next equation is obtained ,

$$\tan \phi = (\frac{c}{m} \cdot w \cdot R) : (\frac{k}{m} - w^2) = [2\zeta \frac{w}{w_c}] : [1 - (\frac{w}{w_c})^2] \quad \text{where}$$

$w_c = \sqrt{k/m}$  is the critical speed,  $\zeta = \frac{c}{c_c}$  , e = OA' is the eccentricity and from Pythagoras theorem Phase ,φ, is from

$$\cos \phi = (\frac{k}{m} - w^2) : \sqrt{(\frac{k}{m} - w^2)^2 + (\frac{c}{m} \cdot w)^2}$$

and the Amplitude equation becomes ,

$$AO = e \cdot (\frac{w}{w_c})^2 : \sqrt{[1 - (\frac{w}{w_c})^2]^2 + [2\zeta (\frac{w}{w_c})]^2} \quad \dots\dots(s1)$$

Remarks : Equation indicates that eccentricity line e = OA' leads the displacement line OA =0→R by the phase φ , which depends on the amount of damping and the rotation speed ratio  $\frac{w}{w_c}$  , and in critical ratio  $w_c = \sqrt{k/m}$  frequency in lateral vibration , the amplitude is restrained by the damping ε = μ = 1 . Point O is always on axis ,shaft, and point A rotates about it on circle of radius OA. The existing force is equal to → m.e.w² = m.OA.w² . In wavelength's monad AO : e =AO: OA' =  $\frac{w}{w_c}^2 : \sqrt{[1 - (\frac{w}{w_c})^2]^2 + [2\zeta (\frac{w}{w_c})]^2}$  and for ζ = 0 then AO: AO' =  $(\frac{w}{w_c})^2 : [1 - (\frac{w}{w_c})^2]$  with unbalanced static and because of the Space , Anti-space equilibrium in monads  $w_c = \sqrt{k/m}$  , then AO:AO' = (± i) ,i.e. Space , Anti-space are interchanged having equal eccentricity because for AO : AO' = 1 →  $(\frac{w}{w_c}) = 1/\sqrt{2}$  which happens at point (1) of Stationary Electromagnetic wave .

**Forces, Pressure, Velocity, Work(EnergySpace), equivalence**

A- Equations of Elasticity : Principle stresses σ1 = σ/2 [1+√5] , σ2 = σ/2 [1-√5] , σ1.σ2 = σ² where, σ1 = E.ε(u) = The inward compressible pressure (in radial displacement distance).

σ2 = G.ε(v) = The transverse stretchable pressure ( the perpendicular to radial displacement distance).

E = Young's modulus (linear stress/strain)

G = Shear modulus (transverse stress/strain) and holds E ⊥ G

B- Equations of motion -Viscously Damped Free Vibration - Homogenous equation mẍ+cẋ+kx = 0 is composed of

x = A.sin.wt, ẋ = wA.sin(wt+π/2), ẍ = w²A.sin(wt+π) ,where m = mass = a Reaction coefficient proportional to velocity change and directed to velocity vector v̄r,

c = The Damping coefficient directional to velocity vector v̄q,

k = The stiffness coefficient directed to velocity vector v̄r, and holds between coefficients , m // k ⊥ c .

C- Equations of Maxwell's Displacement Current : Electric Displacement field D = ε.E + P , Magnetic field B = μ.H where , ε = Permittivity = Dielectric constant multiplier , i.e. a measure opposing displacement distance between electric field E and electric flux density D .

μ = Dielectric constant multiplier , i.e. a measure opposing the perpendicular to displacement rotation between the inner vortex density H and the external weighted vorticity density B i.e. Dielectric constant multiplier ε ⊥ μ .

Remark .:

**Work as Energy is Quantized , converted ,in Space monads , caves ,cells, x̄=dṡ=λm , as pressure σ ,τ , the pressure is converted in caves as a Standing Electromagnetic Wave E,P which consists the Standing monad ( Displacement current ) and the moving Energy monad ( by altering the inner wavelength or Period of monad ) in Gravity's field medium**

[MFMF] and is dissipated as Quaternion monads (Particles or Waves , matter or vectors) as Forces ( displacements , masses , pressure etc.) using modulus , coefficients , reactions to the motion and all other geometrical indices. Stability In-Out wavelength is obtained by the Isochronous Anti-Standing Electromagnetic Wave E,P which happens on Anti-cycloid , Evolute , and whirling , Curl , by the equality of the two transverse Complex Envelope displacements, Amplitudes , that consist the Standing monad (Coriolis force curl helix Displacement current in monads).

The Work Quantization process as → Energy and Space ← is as follows [ F6,10] ,

- W = F.ds - [ds=0 , t=0 , F≠0 ] → Force and Displacement ,
- W = (σ.dF).ds - [ds=0 , t=0 , dF≠0 ] → Stresses on Area ,
- W = (c[εμ].ds) - [dF=0 , ds=0 , t=0] → Permittivity-Permeability
- W = (E⊥H).ds - [dF=0 , ds=0 , t=0] → Electromagnetic Wave
- W = (λm).ds - [dF=0 , ds≠0 , t=0 ] → Moving Field Vector
- W = (p).ds - [dF=0 , ds≠0 , t=0 ] → Angular Momentum ,
- W = (h/v).ds - [dF=0 , ds≠0 , t=0 ] → Cycloidal Spin ,
- W = (λm).(v.t) - [dF=0 , ds≠0 , t=t ] → Kinematic Vector
- W = (M).v.dt - [dF=0 , ds≠0 , t=t ] → General mass-Velocity
- W = (p).dt - [dF=0 , ds≠0 , t=t ] → Linear Momentum

7.9. Gravity's Displacement Current (S) . (F-12)

It was referred that Fragments  $s^2 = \pm |(\bar{w}.r)^2|$  occupying the minimum quantized space  $|s^2|$  are deported and fill all [STPL] cylinder which is the Rest Quantized Field  $\pm [(\bar{w}.r)^2]$  or it is, **the material point in mechanics** , as the base of all motions where force  $[(\bar{w}.r)^2 \nabla i] = 2.[(\bar{w}.r)^2]$  is vibrating on length

$2.[(\bar{w}.r)^2] = \lambda$  as a Stationary Wave, and creates the curl Electromagnetic Field  $E \perp P$  , on which is the Universal Quantized force called Gravity. The Gravity - Force is equal to  $Fg = q.[E+\bar{v} \times P]$  and is exerted on any movable particle with charge  $q$  . Gravity - Field is  $Gf = [E+ \bar{v} \times P]$ , the unmovable, forced welded spinning dipole, and because jointed with force, means that Newton's laws issue in both , Absolute System [S] and Relative System [R] . (F-12)

On cycloid [Fig-13], Thrust → g = Force F = velocity, where Velocity  $\bar{v} = [\sqrt{g/4r}].\rho = [\sqrt{g/4r}].(1)-(2)$ . Acceleration  $\bar{a} = (d^2s/dt^2) = -(g/4r) .s$  Trajectory acceleration  $\bar{a}q = g.\sin\phi = [g/4r].s$  Centripetal acceleration  $\bar{a}r = (v^2/\rho) = [g/4r].\rho = [g/4r].AA'$  Ratio  $v/\cos.\phi = \sqrt{4gr} = \text{constant}$  and velocity of center K of rolling circle is,  $\bar{v}k = v.r/PA = (1/2).v/\cos\phi = \sqrt{gr} \rightarrow$  i.e. motion ,the velocity, of the rolling circle center is linear.

Force  $2.[(\bar{w}.r)^2]$  as velocity  $\bar{v}$  is acting at point (1) and since  $dF=0$  then is analyzed into the two equal velocity vectors  $\bar{v}x = \bar{v}1 = (\bar{w}.r)^2 \sqrt{2}$  ,  $\bar{v}y = \bar{v}2 = (\bar{w}.r)^2 \sqrt{2}$  as the cross-product  $\bar{v} = \bar{v}1 \times \bar{v}2$  i.e. in two perpendicular plane motions.

Energy as the horizontal constant velocity  $\bar{v}1 = (\text{thrust})$  , is transported at point (2) by following the tangential trajectory A , forming on cycloid the Electric field ,E, and for stability the anti-trajectory A` on Evolute , the Anti-Electric field , -E , both decomposed in a velocity  $\bar{v}1r$  perpendicular to the trajectory and thus executing zero work. and  $\bar{v}1q$  tangential

Fig.13. The Moving Electromagnetic Fields of Monads in their Stationary Cycloidal wavelength ( $\lambda=2\pi r = |(\bar{w}r)^2|$ )

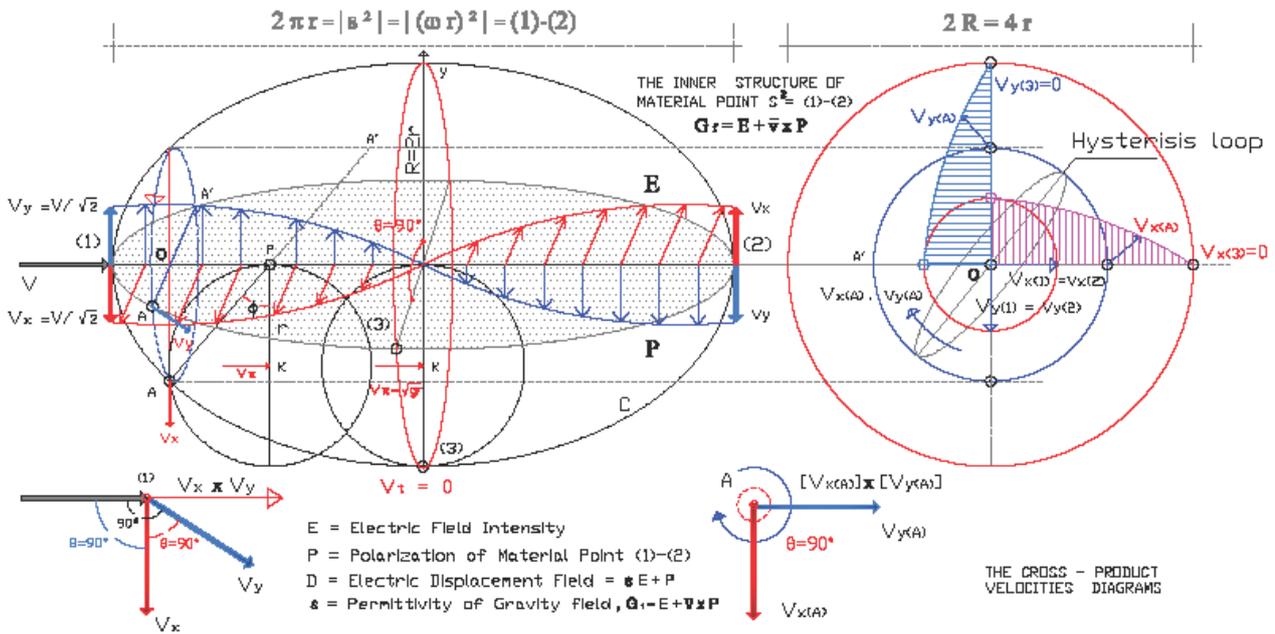


Fig. 13. The Stationary Velocity's wave-length , $|V|=\lambda$  , as the Intrinsic Electromagnetic field  $E \perp P$  and for Gravity  $\lambda=s^2= |(\bar{w}r)^2|$ .

to the trajectory executing the work .The equation of Gravity's Standing waves E,P is from Wave function ,

$$Y = [2A \sin kx] . \cos \omega t = [2A \sin \left(\frac{2\pi}{\lambda} \right) . x] . \cos 2\pi \left(\frac{t}{T}\right) \text{ where}$$

$A = v1 = v2 = |v|/\sqrt{2} \rightarrow$  Wave's Amplitude ,  
 $kx = \pi/2, \pi, 3\pi/2, 2\pi \rightarrow$  The Wave's number , location ,  
 $\omega = 2\pi f = 2\pi/T \rightarrow$  Oscillating frequency, angular frequency and equations become

$$\begin{aligned} E &= 2A . \sin kx . \cos \omega t = \sqrt{2}.|(\bar{w}r)^2| . \sin kx . \cos \omega t \\ P &= 2A . \sin kx . \cos \omega t = \sqrt{2}.|(\bar{w}r)^2| . \sin kx . \cos \omega t \quad \dots (g1) \end{aligned}$$

**which consist Monad's Electromagnetic wave equations ,**  
and mapping as below ,

At points (1),(2) ,  
 $\bar{v}1\mathbf{r} = \bar{v}1$  ,  $\bar{v}1\mathbf{q} = 0$  ,  $\bar{a}1\mathbf{r} = \bar{r}o.v^2/2r$  ,  $\bar{a}1\mathbf{q} =$  ,  $\bar{q}o.v^2/2r$  ,  $CoF = 0$   
 At point (A= x) ,  
 $\bar{v}1\mathbf{r} = \bar{v}1.\sin kx.\cos wt$  ,  $\bar{v}1\mathbf{q} = \bar{v}1 \sin kx.\cos wt$  ,  $\bar{a}1\mathbf{r} = \bar{r}o.(d/d\bar{r})(v^2/2).\sin kx$  ,  $\bar{a}1\mathbf{q} = \bar{q}o.(d/d\bar{r})(v^2/2).\sin kx$  ,  $CoF = VP$

The energy of a particle which is the intrinsic stored work ,  
is the Energy flow  $Sp=ExH$  along the direction of motion.  
Particles have either rest or motional mass or both .

From Lagrange's equations of the first kind,  $2E = mv^2 = (mv).v = p.v = p.(wr) = (pr).w = (pr).[2\pi/T] = 2\pi(pr).[c/\lambda] = hc/\lambda$   
since  $\lambda = cT$  , and  $2\pi(pr) = h =$  Planck's constant **i.e.**  
 $\rightarrow$  mass  $m = (pr).w/v^2 =$  the meter of reaction to the motion  $\leftarrow$   
 $\rightarrow$  momentum  $p = 2\pi(pr).[c/\lambda]$  the Anti-reaction  $\leftarrow$  and  
 for  $v = c =$  velocity of light , then Planck's equations for

mass  $\mathbf{m} = (pr).w/c^2 = \frac{h.w}{2\pi.c^2}$  - momentum  $\mathbf{p} = \frac{h}{2\pi\lambda}$   
 $w =$  Particle's oscillation frequency which is that of inner  
common circle and it is constant , and  $r$ , the rolling circle's  
radius . All waves oscillate with energy  $2E = p.v = [pr].w$  ,  
which awareness translational motion (pr) at light ,c  
and rotational at spin(w) motion in helical behavior .

The Work Quantization process occurs as this compound  
helical motion and is conserved in  $< translational motion (pr)$   
 $and rotational motion at spin(w) >$  wavelength of particles  
(monads) following all known physical laws.

Plane wave's Energy is stored as Stationary wave's Energy in  
case (knot points) of wave Interference .

The equal phase , Plane Wave equations

$A_{x,t} = A_o.\cos(kx - wt + \varphi)$  where  $k = 2\pi/\lambda$  ,  $w = 2\pi/T = 2\pi f$   
 $\varphi = kx$  ,  $c = \lambda/T = \lambda.f = w/k$

$E_{x,t} = E_o.\cos(kx - wt)$  Electromagnetic waves .

$H_{x,t} = H_o.\cos(kx - wt)$

$S = [\bar{E}x\bar{H}]/\mu = [|\bar{E}|x|\bar{H}|].[S_o/\mu].\cos^2(kx - wt)$  Energy density  
with translational outer velocity  $\bar{v}(t) = p / m = \bar{\Lambda} / m$  .

The equal phase , Stationary Wave equations

$E = 2A .\sin kx.\cos wt = 2.A.\sin(\frac{2\pi}{\lambda}).\cos wt$

$P = 2A .\sin kx.\cos wt = 2.A.\sin(\frac{2\pi}{\lambda}).\cos wt$  where

$A = v1 = v2 = |v|/\sqrt{2}$  ,  $kx = \pi/2, \pi, 3\pi/2, 2\pi$  ,  $w = 2\pi f = 2\pi/T$   
with inner velocity  $v(i) = \lambda/T = \lambda.f = w.r$  and phase velocity  
 $\bar{v}(r) = w / k = w\lambda/2\pi$  .

Remark :

When the same frequency (phase  $\varphi=0$ ) particles interfere (i.e.  
the action of two quaternion) each other then occurs [Fig.14],

1.. In the same direction Apparent energy  $S = 2E.2H = 4.(EH)$   
and work  $W$  is stored as a new wave  $S1 = S$  and becomes ,  
 $\bar{E}(0,0,z,t) = |\bar{E}_x|.e^{i(kz-\omega t)}$  ,  $\bar{H}(0,0,z,t) = |\bar{H}_y|.e^{i(kz-\omega t)}$

2.. In opposite direction Apparent energy  $S = [\bar{E}x\bar{H}] - [\bar{E}x\bar{H}] = 0$   
and work is stored in the New Stationary wave  $S2 = S = [\bar{E}x\bar{P}]$ .

3.. By an angle  $0 < \theta < 360^\circ$  , between the two directions ,  
Apparent energy  $S = [\bar{E}x\bar{H}] - [\bar{E}x\bar{H}].\cos.\theta$  . An elliptic  
polarized light is composed of two orthogonally waves .

Inertia of a cycloid is  $I = 2.m.r^2/5$  Kg.m<sup>4</sup> thus the angular  
momentum of the particles is  $I .w = \frac{h}{2\pi} =$  Spin and  $Ix = \frac{2}{5} m b^2$

where  $b^2 = \frac{5.Ix}{2m}$  and  $b = \sqrt{5 \frac{Ix}{2m}} = (1/4) . \sqrt{5 \frac{mc^2}{mw^2}} = \frac{c}{4w} = \frac{h.c}{4E} = \frac{\lambda}{4}$

since  $\sqrt{Ix/m} = \sqrt{mc^2/mw^2} = c/w = 1/k = \lambda$  , and energy  $E = hf = h(c/\lambda) = hw/2\pi$  **i.e.**

Particles wavelength size is inverse proportional to their  
frequency and for high frequencies , *the particle-like for a*  
*particle* and the field Intensity estimation  $S = h.f$  then is ,

$S = [\bar{E}x\bar{H}] = [\frac{\epsilon.E^2}{2} + \frac{\mu.H^2}{2}].[ \frac{4}{3} \pi\lambda.(\frac{\lambda}{\pi})^2 ] = h.f$  (since Cycloid volume  
 $V = \frac{4}{3} \pi.a.b^2$  and axis  $a = \lambda$  ,  $b = \lambda/\pi$  ) and energy  $E = H$  , so,

$E^2 = \frac{3\pi}{2.(\epsilon+\mu)} \frac{h.f}{\lambda^3} = \frac{3.hw^4}{4.(\epsilon+\mu)c^3}$  and  $\rightarrow E = H = \sqrt{\frac{3h}{c(\epsilon+\mu)}} . [ \frac{w^2}{2\pi c} ]$

This Intensity estimation  $S = h.f$  is kept unaltered so that no  
violation of energy conservation. For Photons issues ,Fig.14  
The visible bright bands of higher energy exist as the compact  
bright fringes which carry energy of the wave.

The visible lighter bands of lower energy exist as the wider but  
lighter fringes which carry the energy of the wave .

The Dark points and fringes carry energy in standing waves  
because only so is possible to exist (because for two equal  
phase waves through the two slits the energy transfer from one  
part of the wave which is a non-interactive interfering  
destructively to another part which is potentially distant and  
interfering constructively) , and the question is what happens  
to the energy ? . The first answer is that it is conserved  
somewhere. Using Gauss' and Ampere's law for continuity  
equation then in a tiny volume  $dV$  exists

$\partial\rho/\partial t + \nabla \cdot \mathbf{j} = \sigma$  ,  $\partial\rho(\text{energy})/\partial t + \nabla \cdot \mathbf{j} = 0$  where ,

$\nabla$  = Divergence ,  $\rho$  = the amount of the quantity , $\mathbf{q}$ , per unit  
volume ,  $\mathbf{j}$  = the flux of , $\mathbf{q}$ ,  $\mathbf{t}$  = time ,  $\sigma$  = the generation of , $\mathbf{q}$ ,  
per unit volume per unit time , and for  $\rightarrow \sigma > 0$  generate , $\mathbf{q}$ ,  
(sources) ,  $\rightarrow \sigma < 0$  remove , $\mathbf{q}$ , (sinks) ,  $\rightarrow \sigma = 0$  conserve , $\mathbf{q}$ ,  
(not created - not destroyed) . Since energy of waves is  
conserved then whenever the energy decreases from a small  
volume  $dV$  , it is accompanied by the flow of the same energy  
through the boundary of the small volume and the current , $\mathbf{j}$ ,  
ensures conservation of energy until elsewhere .

**This tiny energy volume for wave's case , is the Cycloidal  
volume  $V = 4/3.\pi.ab^2 = \frac{4\lambda^3}{3\pi}$  , [ because  $a = \lambda$  ,  $b = \lambda/\pi$  ] of the  
Electromagnetic stationary field  $[\bar{E}x\bar{H}]$  where Intensity  $S_c =$   
 $[\frac{\epsilon.E^2}{2} + \frac{\mu.H^2}{2}]$  and  $\epsilon,\mu$  the Permittivity ,( the Dielectric constant  
multiplier) , Permeability (the Dielectric constant multiplier).**

**Conclusion** : All particles are characterized by their  
quantized cave the Space  $[ V = \frac{4\lambda^3}{3\pi} = \frac{4(w^2r^2)^3}{3\pi} ]$  composed of  
an inner Electromagnetic wave constituent  $[E \perp H]$  ,  $h=2\pi/\lambda$  , the  
reaction to these velocity motions [the mass  $m = (pr).w/c^2 =$   
 $\frac{h.w}{2\pi.c^2}$  ] , the external energy momentum  $p = \frac{h}{2\pi\lambda}$  and Spin  
(the helically rotating electric field vector corresponding to a  
circularly polarized Electromagnetic wave propagating with  
attenuation to the right). Conservation laws of energy linear  
and angular momentum are satisfied by the inner

Anti-cycloidal motion , (on the evolute curve) .This interpretation applied to Young`s interference and Polarizer experiments is shown the unified understanding between the classical Electromagnetic field and the quantum particle of light

### 7.10. Young`s interference and Polarizer experiment :

It was shown that equation of a space wave is  $\rightarrow A_{x,t} = y = A_o \cdot \sin(kx - \omega t + \varphi) = A_o \cdot \sin[2\pi(\frac{x}{\lambda} - \frac{t}{T}) + \varphi]$   
 $= A_o \cdot \sin[(\frac{2\pi}{\lambda}) \cdot (x - ct) + \varphi]$  where  $\varphi$  is the phase and T the period of the wave. Wave`s velocity  $\bar{v} = \dot{y} = (-\omega A_o) \cdot \cos[(\frac{2\pi}{\lambda}) \cdot x - \omega t] = (-\omega A_o) \cos[(\frac{2\pi}{\lambda}) \cdot (x - ct)]$  and Energy of the wave  $E = m \cdot \dot{y}^2 / 2 = (m/2) \cdot (-\omega A_o)^2$  .

By definition  $\rightarrow$  Pressure (p) = Intensity of a force (/per) area , Density( $\rho$ )=Intensity of a mass(energy)/volume and Intensity of waves is Intensity (I) = Power delivered / unit area so,

$$\begin{aligned} & \text{Intensity of a Wave} \\ & = \frac{\text{Power}}{\text{Area}} = \frac{\text{Energy} \cdot \text{Length}}{\text{Time} \cdot \text{Volume}} = \frac{(\text{Energy}) \cdot \text{Length}}{(\text{Volume}) \cdot \text{Time}} = \frac{\text{Energy}}{\text{Volume}} (\text{speed}) = \\ & (m/2) \cdot (-\omega A_o)^2 \cdot \bar{v} / \text{volume} = (\frac{\rho \cdot c}{2}) \cdot (\omega A_o)^2 = \frac{[2\pi^2 \cdot \rho \cdot c^3] \cdot A^2}{\lambda^2} \rightarrow \\ & \text{since } \omega = (2\pi/T) = 2\pi \cdot c/\lambda \text{ , and in case of the tiny volume } V \\ & = \frac{4\lambda^3}{3\pi} \text{ , then } A^2 = [\frac{\epsilon \cdot E^2 + \mu \cdot H^2}{2}]^2 = [\epsilon E^2 + \mu H^2] / 4 \text{ and } m/\text{volume} \\ & = \rho = \epsilon, \mu \text{ of inner cycloidal structure and intensity } I = \\ & (m/2) \cdot (-\omega A_o)^2 \cdot \bar{v} / \text{volume} = \frac{\rho \pi^2 c^3}{2\lambda^2} [\epsilon E^2 + \mu H^2] \text{ and so for } \lambda = (\omega r)^2 \end{aligned}$$

**The pressure Amplitude**  $P_d = \rho \cdot c \cdot \omega \cdot A_o = \rho \cdot c \cdot \omega \cdot [\epsilon E^2 + \mu H^2] / 2$   
**Intensity of Dark-Fringes**  $I_d = \frac{\rho \pi^2 c^3}{2\lambda^2} \cdot [\epsilon E^2 + \mu H^2] \dots (d-f)$

The Impedance (Resistance is attributed to resting bodies and Impetus to moving bodies) of the medium is defined by the product of density and wave speed as  $z = \rho \cdot c$  with a unit of  $\rightarrow$  Pa.s.m<sup>-1</sup> and Pressure amplitude  $P_o = \rho \cdot c \cdot \omega \cdot A_o$

**a.** From the principle of Linear superposition , if two waves of equal amplitude are in-phase then they meet crest-to-crest and trough-to-trough and their amplitudes add to each other (*the Constructive Interference*) and the difference in distance they travel is an integer , n=order , of wavelength  $\lambda \rightarrow [DDT = n\lambda]$  and if the two waves are out-of-phase then they meet crest-to-trough and have zero amplitudes which cancel each other (*the Destructive Interference*) and the difference in distance they travel must differ by an odd integer ,n, of wavelength  $\lambda/2 \rightarrow [DDT = (n+1/2) \cdot \lambda]$ .

**b.** For double slit interference pattern central fringe at  $\theta=0$  is the brightest of the Bright fringes (*high pressure*) from which start Dark fringes (*low pressure*) and light fringes in order. This interference pattern provides the *Wave nature of light* differently would get only two fringes for a complete *Particle like* .

**c.** Diffraction is determined by the ratio  $\lambda/d$  and thus for more diffraction of the waves is needed longer wavelengths and smaller opening . A standing wave is generated by the superposition of two waves with the same frequency and wavelength travelling in opposite direction. The standing wave does not carry energy from one point to another but serves to store energy (*associated*) since there is no energy transferring away , with specific wavelengths. Vibrations of the medium

parallel and or perpendicular to the direction of the motion defines the type of waves as Longitudinal and as Transverse.

**d.** Diffraction is determined as a source on an unknown background medium of propagation and is a dense damper medium for storing the energy  $I_d = (\frac{\rho \cdot c}{2}) \cdot (\omega A_o)^2$  of a wave in it , and then transformed as  $I_d = \frac{\rho \pi^2 c^3}{2\lambda^2} \cdot [\epsilon E^2 + \mu H^2]$  in electromagnetic field E,H . This medium is dipole Fragments medium  $\{ds = |\lambda| = |2 \cdot (\bar{\omega} \cdot r)^2| = |+(\bar{\omega} \cdot r)^2| \leftrightarrow |-(\bar{\omega} \cdot r)^2|\}$  , in Spaces  $[V = \frac{4(\omega^2 r^2)^3}{3\pi}]$  of Gravity`s medium [MFMF] field and consists the infinite tiny dipole *volumes caves* with their inner Transverse Electromagnetic field E,H and which are the tanks in where Energy of dark points and dark fringes of any two interference waves is stored . **Electromagnetic waves are able to transmit energy through a vacuum (empty space) by storing their energy in a Standing Transverse Electromagnetic dipole wave as above, and thus considered completely particle like , and in transverse interference pattern to be considered as completely wave , so**

**Energy**  $I_d = \frac{\rho \pi^2 c^3}{2\lambda^2} [\epsilon E^2 + \mu H^2]$  in volume  $V = [\frac{4(\omega^2 r^2)^3}{3\pi}] \rightarrow$  **Particle**  
**Energy**  $I_d = (\frac{\rho \cdot c}{2}) \cdot (\omega A_o)^2$  in Interference pattern  $\rightarrow$  **Wave**

This is the Wave-Particle duality unifying the classical Electromagnetic field and quantum particle of light

Considering Planck`s length  $L = 1,616 \cdot 10^{-35} \text{m}$  filled with the two only breakages  $s^2 = \pm |(\bar{\omega} \cdot r)^2|$  then  $(1) \leftrightarrow (2) = L = \lambda = 2 \cdot |(\bar{\omega} \cdot r)^2|$ . Using Planck`s work equations connecting

particles and wave properties  $W = \Lambda \cdot ds = p \cdot \lambda = h$  then  $p = \frac{h}{\lambda}$  and from Kinetic energy  $E = mv^2/2 = (m \cdot v^2) / 2m = \frac{p^2}{2m} = \frac{h^2}{\lambda^2}$  , and since also is  $E = hf$  ,  $p = h/\lambda$  ,  $\bar{v}r = \sqrt{g \cdot r_c}$  . In gravity level,  $\bar{p} = m\bar{v} = (m \cdot v_k)$  and  $|\bar{p}|^2 = |m \cdot v_k|^2 = m^2 \cdot g \cdot r_c$  and  $E = \frac{p^2}{2m} = m \cdot \frac{g \cdot r}{2} = \frac{h^2}{\lambda^2}$  , where  $r = r_c$   
 For Planck`s length then  $\lambda = 1,616 \cdot 10^{-35}$  and constant velocity  $c = 2,9979 \cdot 10^8$  then Period  $T = \lambda/c = 5,3867 \cdot 10^{-44}$  s and frequency  $\omega = 2\pi/T = 1,16 \cdot 10^{44}$  cycle/sec.

For a material point, *electron*,  $\lambda = 1,616 \cdot 10^{-9} \text{m}$  it is  $m \cdot \frac{g \cdot r}{2} = \frac{h^2}{\lambda^2} = [6,626 \cdot 10^{-34}]^2 / [1,616 \cdot 10^{-9}]^2 = 1,681 \cdot 10^{-49}$  and for  $g = 9,81 \text{m/s}^2$  then  $r = 1,681 \cdot 10^{-49} \cdot (2/9,81) \text{m} = 3,427 \cdot 10^{-50} \text{m}$ , which is the rolling circle`s radius in electron wavelength .

For a material point under Planck`s length then  $\lambda = L/2 = 2\pi r$  and  $r = L/4\pi = 1,616 \cdot 10^{-35} / 4\pi = 1,286 \cdot 10^{-36} \text{m}$  . Kinetic energy  $E = mv^2/2 = h \cdot f = h/T = h/(4\pi r/v) = hv/(4\pi r)$  and since also  $p = h/\lambda = h/(L/2) = 2h/L$  then  $p = 2(6,626 \cdot 10^{-34}) / (1,616 \cdot 10^{-35}) = 82$  .

From energy relation  $p = h/(2\pi r) = m \cdot v = m\sqrt{gr}$  or,  $h^2 = 4\pi^2 r^2 \cdot (g \cdot r) \cdot m^2 = 4\pi^2 r^3 \cdot g \cdot m^2$  then  $m^2 = h^2 / [4\pi^2 r^3 g] = (6,626 \cdot 10^{-34})^2 / [4\pi^2 \cdot (1,286 \cdot 10^{-36})^3 \cdot 9,81] = (4,264 \cdot 10^{-4} \cdot 10^{-68}) / 10^{-111} = 5,3303 \cdot 10^{38}$  and  $m = 2,3067 \cdot 10^{19} \text{Kg}$ .

From constancy of  $\bar{v}k = \sqrt{gr}$  then  $v^2 = (9,81 \cdot 1,286 \cdot 10^{-36}) = 12,61566 \cdot 10^{-36}$  and  $\rightarrow \bar{v}k = 3,552 \cdot 10^{-18} \text{m/s}$

Period  $T = \lambda / \bar{v}k = (1,616.10^{-35}) / (2. 3,552. 10^{-18}) = 2,275. 10^{-18} \text{ s}$

Frequency  $f = 1/T = 1/ (2,275.10^{-18}) = 4,396.10^{-17}$

Momentum  $p = m.v = 2,3067.10^{19}.2,9979. 10^8 = 6,915.10^{27} \text{ Kgm/s}$ . From energy equations Energy  $E = p^2/2m = (6,915.10^{27})^2 / (2.2,3067.10^{19}) = 1,0364. 10^{36} \text{ Kgm}$ .

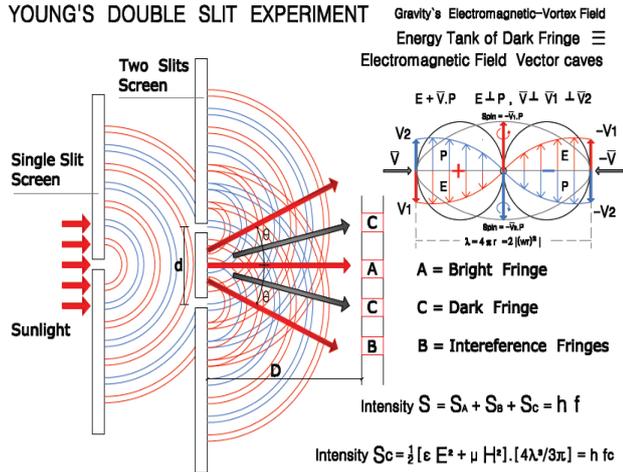


Fig. 14. The destructive Interference creates Dark fringes ,C, which conserve energy in wavelength's Electromagnetic field  $E \perp P$ .

Considering Planck's length  $L = 1,616.10^{-35} \text{m}$  filled with infinite breakages  $s^2 = \pm |(\bar{w}.r)^2|$  then  $(1) \leftrightarrow (2) = \lambda = 2. |(\bar{w}.r)^2|$ . These tiny energy volumes caves (cycloids in  $\lambda$ ) consist in gravity's field , the infinite tanks in where energy of dark points and dark fringes of any two interference waves , is conserved .

**Stability** is obtained by the inner and opposite rotational momentum in Anti-cycloid motion .

**Remarks :**

Radiation of Energy is enclosed in a cavity of the tiny energy volume  $\lambda = [\frac{4(w^2.r^2)^3}{3\pi}]$  , (cycloidal) with perfect and reflecting boundaries and this cavity may become infinite in every direction and thus getting in maxima cases (the limits) the properties of radiation in free space. The electromagnetic vibrations in this volume is analogous to vibrations of an Elastic body (the stresses) in this volume and thus Fringes are a superposition of standing vibrations.

This Energy radiation system of particles maybe represented in Space by the three states of interaction or and positions ,

- a) The position of the particle by means of any system to general coordinates or in Cartesian coordinates ,
- b) The state of radiation field is determined by the values of the components of the Electric and Magnetic vectors at points of the space , or the field by means of a scalar and a vector potential (the values of scalar potential) and ,
- c) The action of the Particle as a whole on this inside Field (the coupling energy of the inner constraints with , evolve ) .

**8. A Summary of Newton Euler-Lagrange Einstein, Lorentz , Equations of motion**

**8.1. Newtonian Mechanics**

Start with the three laws that define the behavior of Objects to, *Stand Still, when Moving, and when Forces act upon them.*→

It is required mainly a rectangular coordinate system on which are considered all constraint forces .The laws,

a. Everybody persists in its state of Rest or uniform Motion in a straight line unless it is compelled to change that state by forces impressed on it ,( The Inertia law ) ,

b. Force is equal to the change in momentum (r.m.v → Rotational, mv→ Linear) per change in time. For a constant mass, force equals < mass times acceleration  $F = ma$  >, or  $F = dp/dt = d(mv)/dt = m(dv/dt) = m.a$  ,

c. For every Action, there is an equal and opposite Reaction, Remarks : In Euclidean logic , Points follow Principles as follows ,

$A = B$  The Principle of Equality,

$A \neq B$  The Principle of Inequality,

$PA + PB = 0$  The Principle of Stability,

$A \equiv B$  Principle of infinite Superposition ( extreme )

$A/B = C/D$  The Principle of Proportionality

And in Mechanics one is,  $A \leftrightarrow B = \infty$  The Principle of Virtual Displacements  $\sum [ P_i + H_i ].\delta \bar{r}_i = 0 \rightarrow W = \int P.ds = 0$  ,

1).The state, is the reaction to the change of motion (in magnitude and direction) which presupposes force only.

Applying this logic in Principle of Stability then →

As in geometry the same in Physics ,  $PAB = -PBA$  or  $PAB + PBA = 0$  ,or as , The Infinite points in [PNS] form infinite Units , monads  $AiBi = d\bar{s}$  , which equilibrium by the Primary Anti-Space by an Inner Impulse (P) at edges A,B where  $PiA + PiB = 0$  , and  $ds = 0 \rightarrow N \rightarrow \infty$  and where Monad  $\bar{A}\bar{B}$  is the ENTITY and Elements=Breakages  $[|A,B| - P\bar{A}, P\bar{B}]$  is the LAW of monad AB , and also →The { Space , Anti-Space equilibrium ,  $\pm \bar{\Lambda}$ , Absolute System [S] } is at Rest , as Angular momentum  $\bar{\Lambda} = \Omega = m\bar{v}.r$  , and is Crushed out into Fragments , becoming the three Breakages  $[s^2=(w.r)^2]$ ,  $[-s^2=-(w.r)^2]$ ,  $[\nabla i=2(w.r)^2]$  and after clashed with the velocity vector  $\bar{v}$  of [S] , (unless succeed escaping un clashed through center O of [S] into  $[R]=[STPL]$  and this because  $\bar{v}=0$ ), are Thrown OFF this System [S] , (in order to avoid scattering ,in STPL line) conveyed into the Linear momentum ,the Inertial and Energy-Space ,the Relative [STPL] System [R] as the Particles Fermions →  $[\bar{v}.s^2]$  and Bosons→  $[\bar{v}.\nabla i]$  with momentum ,  $m\bar{v}$  , which behave , as Mass and as Force, in Relative System [R] , The Un-clashed through center ,O, Fragments  $s^2 = \pm |(\bar{w}.r)^2|$  occupying the minimum quantized space  $|s^2|$  are deported and fill all [STPL] cylinder which is the Rest Quantized Field  $\pm [(\bar{w}.r)^2]$  or , The material point (1) in mechanics , as the base of all motions and the force  $[|(\bar{w}.r)^2|\nabla i]=2. [(\bar{w}.r)^2]$  , is vibrating on  $[|(\bar{w}.r)^2|] = \lambda$  as an Stationary Wave creating a curl Electromagnetic Field  $E \perp P$  which is the Universal Quantized force called Gravity , meaning that Newton's laws issue in both , Absolute System [S] and Relative System [R] .

2). Object in mechanics, may be the Material point (1) at Euclidean point (1) , which is now Breakage  $\pm [(\bar{w}.r)^2]$  magnitude in this Rest Homogenously – Isotropically and ,

Quantized , mass-less Field  $\pm [(\bar{w}.r)^2]$  and consist the required coordinate System and base for all motions and forces . This rest Space system [PNS] (the Base) is the [MFMF] Field with the less space distance  $ds = |\bar{w}.r|^2$ , *Minimum Space-Quanta* .

3). Object in mechanics may be also the Material wavelength  $\lambda = (1)-(2)$  in the {[Medium-Field Material Fragment]  $\rightarrow [\pm s^2] = |\bar{w}.r|^2 =$  [MFMF] Field  $\leftarrow$ } which is a standing wave in cavity (1)-(2) with scalar breakage  $|\pm(\bar{w}.r)^2|$  as medium (1)-(2) field , and (J1) as energy at point (1) and carried to point (2) by following the cycloid motion from (1) to (2) which is isochrones. Velocity  $\bar{v}$ , during shifting is analyzed into two velocity vectors  $\bar{v}_1$  ,  $\bar{v}_2$  , which undergo vibrations causing two waves that represent the two Electric E, and Magnetic P, perpendicular components following the trajectory ,  $in=(c1)$  ,  $out=(c2)$  . On cycloid  $= (c)=|A1-A2|$  is needed the isochrones time  $T = \pi \cdot \sqrt{Rc/g} = \pi v T / \lambda$  to reach end  $A2 < \text{Fermat's Principle of Least time} >$  is the Extreme in  $< \text{Isochrones Principle} >$  which is embedded in all wavelength vector monads , *Minimum Energy-Quanta* .F-12 end  $A2 < \text{Fermat's Principle of Least time} >$  is the Extreme in  $< \text{Isochrones Principle} >$  which is embedded in all wavelength vector monads , *Minimum Energy-Quanta* .F-12

## 8.2. Lorentz Ether Theory [ LET ]

It was shown in 5.3-Relative motion that because properties in and on [STPL] line are relative to the only one equilibrium and Absolute system  $\pm \Lambda = r.m\bar{v} = r.m.\bar{w}.r = mr^2.\bar{w}$ , so exists that what is called Relativity. It was also shown (4-2) , that in {DA-O},{x,y,z, t } , System  $\bar{c},\bar{v}$ , vectors are isochrones i.e. period  $T = L/V = 2\pi R/V = 2\pi/[c/r_c] = 2\pi/[v/r_c] \rightarrow c/r_c = v/r_v \rightarrow c.r_v = v.r_c$ , where  $r_v, r_c$  are the radius of their intrinsic rolling circles .This relation is geometrically expressed as  $\sec.\phi = O.DA : A.DA = \gamma = \pm 1/[\sqrt{1-(v/c)^2}] = c/[\sqrt{c^2 - v^2}]$  and it is a Cycloid property equal to Lorentz's  $\gamma$ , factor.[F-8].

1..Length contraction : The above referred Lorentz's  $\gamma$ , factor is the is geometrical expression of the constancy of velocity in Space , Anti-Space equilibrium Absolute system and plays the role of immobile ether and leads to the complete Lorentz transformations. How was it possible in an immovable ether to detect motion since constancy of light is the maximum speed ? As was referred , it is possible only , in a rotating frame where constant velocity of the system is greater than that of light Centrifugal velocity, $\bar{v}=\bar{w}r$ , is a constant, $\bar{c}$ , because acceleration  $[d\bar{v}/dt=d(\bar{w}r/dt)=0]$  is zero , i.e. constancy exists a Priori in all Inertial Systems and is not needed any other propositions. 2..Time dilation : From figure F-8 , $\sin\phi = (\bar{v}/\bar{c})$  meaning that the Relative system ,[R](x',y',z', t') , ( Affine Frame) is the projection of Absolute Frame [S]  $\equiv \{DA-O\} - (x,y,z, t)$  where exists as *Simultaneity for all motions ,i.e.*

$$[R] \equiv \{DA-A\} \equiv [(x',y',z', t')] = [S] \equiv \{DA-O\} \equiv (x,y,z, t) \cdot \gamma$$

Time is designated as the meter of changes , or as the conversion factor , between time (s) and space (m) units and not essence of Space-energy Configuration .This age-old question , *of what is time* ,was standing for many centuries in Philosophy , and was wrongly settled by GR , by considering

Time, as an essence of Space-time and not stepping aside the wrong base which is Non-Euclidean geometries ( *where the parallel of parallel is not parallel ??*) [38] . A direct intuition of simultaneity for equal time intervals say for ,a of two periods ,b of two durations ,c of two events or the order of their succession are to be so defined that the enunciation of the natural laws may be as simple as possible . Since in absolute system [R] no translational motion exists so  $t=0$  and because (FMFM) cylinder consists of infinite parallel relative systems therefore the conversion factors , $t'$ , between different times (s) and spaces (m) units is proportional to  $\gamma$  . Since time  $t = s/v$  is dependent on length ,s, and the change of length in time (velocity) then it is a meter of changes of space .

## 8.3. Einstein's General Relativity [ GR ]

A. The, *Laws of Physics*, are the same for all Inertial reference frames .

B. Light always propagates through a Vacuum at a , *definite velocity* ,c , which is independent of the state of motion of the emitting body.

a.. *Maxwell's Displacement current*  $\rightarrow Dc$  :

$Dc$  is a quantity appearing in Maxwell's equations of Electromagnetism and is defined in terms of the rate of change of, *electric displacement fields* D , in a dielectric medium and is defined as  $D = \epsilon .E + P$  *where ,*

$\epsilon =$  The permittivity of the free space,

$E =$  The electric field intensity ,

$P =$  The polarization of the medium . By differentiating above equation then ,

$$dD/dt = JD = \epsilon . (\partial E/\partial t) + (\partial P/\partial z)$$

where, $(\partial E/\partial t) =$  The Magnetic field  $\rightarrow B \leftarrow$

$$(\partial P/\partial t) = \text{The Electric field} \rightarrow E \leftarrow$$

and in Isotropic dielectric case ( $P=0$ ) then  $D = \epsilon .E$  and Maxwell's equations become :

$$\nabla .D = \rho \rightarrow \text{Gauss's law for Electrostatic}$$

$$\nabla .B = 0 \rightarrow \text{Gauss's law for Magneto static}$$

$$\nabla .B = \rho / \epsilon_0 \rightarrow \text{Gauss's law for Magnetism.}$$

$$\nabla \times D = J \rightarrow \text{Ampere's law}$$

$$\nabla \times E + (\partial B/\partial t) = 0 \rightarrow \text{Faradays' law where}$$

$$D = \epsilon .E , \quad H = B / \mu \rightarrow \text{in SI units,}$$

$$\rho = \text{The free charge density}$$

$$\epsilon_0 = \text{Electric constant}$$

For the origin of Maxwell's equations [41].

Relativity considers such a current could be very directly connected to empirical phenomena, *< Speculation had proved itself superior to empiricism >*

Remarks (a) :

Since wavelength,  $\lambda$ , as distance is equal to product velocity (v).period (T) then  $\lambda = \bar{v}.T$ . Displacement current is a current like the conduction current and produces a magnetic field . It is a stationary wave in individual charges in motion as this is velocity vector  $\bar{v} = \bar{w}.r$  being wavelength which is connected to angular momentum  $\bar{L} = r.m\bar{v} = m.\bar{w}.r^2$  in Planck's or beyond Planck's length  $L_p = 1,616. 10^{-35} \times \pi.\sqrt{3} =$

$8,906.10^{-35}$  m , decomposed into the two perpendicular velocity vectors  $\bar{v}_1, \bar{v}_2$  which create Electric (E) and Magnetic field (P). The same also for macroscopic bound current circulation around a material's (monad) surface. [29]

Velocity describes the origin of magnetic in the law field as variation of Electric Flux. Since Dc had never been directly detected, *proof is the following reasonable logic.*

Displacement current density ,D, is Energy in cavity (1)-(2) =  $\lambda$  which is a standing wave following cycloid trajectories in cavity to reach edge (2). Medium of cavity is breakage  $|\pm(\bar{w}.r)^2|$  of Gravity Field and Energy on (1) is the density velocity vector  $\bar{v} = |D1|$  . *In stationary wave conservation of energy (charge) is assembled in Anti-cycloid (Evolute).(7.9)*

Force  $2.[(\bar{w}.r)^2]$  as velocity  $\bar{v}$  is acting at point (1) and since  $dF = 0$  then is analyzed into the two equal velocity vectors  $\bar{v}_x = \bar{v}_1 = (\bar{w}.r)^2\sqrt{2}$  ,  $\bar{v}_y = \bar{v}_2 = (\bar{w}.r)^2\sqrt{2}$  as the cross-product  $\bar{v} = \bar{v}_1 \times \bar{v}_2$  in two perpendicular plane motions

Velocity vector  $\bar{v} = \bar{v}_1 \times \bar{v}_2$ , with head at point (1) is analyzed , in a perpendicular to  $\lambda=(1)-(2)$  directional plane into the two orthogonal velocity vectors  $\bar{v}_1, \bar{v}_2$  which heads are at point (1) , is carried to point (2) by following the cycloid motion (1)-(2) . During shifting ,velocity vectors  $\bar{v}_1, \bar{v}_2$  ,being vectors, undergo vibrations which causes the two waves that represent the Electric [E] and the Magnetic [P] perpendicular components until reaching point (2) which is the Reemission of the wave and it is the new head of velocity ,  $\bar{c}$  , where then mechanism is recycled .

Source is constant Force  $2[(\bar{w}.r)^2]=\bar{c}$  , because of angular velocity vector  $\bar{w}$ , in Stationary wave .

The two velocity vectors  $\bar{v}_1 \perp \bar{v}_2$  form the Electrical and Magnetic field ,E,P, as sink follow cycloid Isochrones motion. *i.e.* Electric Displacement density (field) ,  $D = \epsilon.E + P$  ,in an dielectric medium , *of any moving charge of wavelength ,  $\lambda$  , in the rate of change* , is alternately in terms of *The Electric field ( $\partial P/\partial t$ ) and of The Magnetic field ( $\partial E/\partial t$ ) in phase with each other in the wavelength , $\lambda$  ,  $\rightarrow$*

and generally means that velocity vector  $\bar{v} = \lambda T = \lambda f$  ,and **for Photon** (or any other moving charge) is a Stationary Electromagnetic wave in Photon's wavelength  $\lambda$ , and a self-propagating transverse oscillating wave producing a changing Magnetic field ( $\partial E/\partial t$ ) around itself and according to the second of Maxwell's equations (Ampere-Maxwell law) . The resulting Magnetic field creates an Electric field ( $\partial P/\partial t$ ) around itself according to the first of Maxwell's equations (Faraday's law of the Electromagnetism Induction) .

This alternative Electromagnetic wave travels as velocity vector,  $\bar{v}$ , (charge = momentum, or the assembled conserved unaltered energy, is internally interchanged on wavelength).

*The Duality Principle of Photon is the Intensity of light vector  $|\bar{v}| = \text{real part}$  , which is Particle and since light is also quaternion  $\rightarrow [q = s + \nabla i \times D i]$  then photon is represented as Particle by the intensity (s) of light, and as Wave , by the Electromagnetic fields  $\{ \mathbf{E} , \mathbf{P} \} = [ \nabla i \times D i ]$  in Wavelength  $|q|$  as energy , where  $\nabla i = \bar{c} = \lambda f = \lambda/T$  , and this also occurs for all moving monads . This interpretation of Wave-Particle duality [7-10] is unifying the classical Electromagnetic field theory and quantum particle of light .* General Relativity

ascribes the wavelike of photon to its spin motion and the particle-like to its translation motion, proposes photon as the quantum of light (  $E = h\nu$  ,  $\vec{p} = h\vec{k}$  ) and thus to be particle . Nothing in GR explained that Particles display interference and the inherent wave property giving darkness and changes in their polarization direction through a polaroid.

The fact that speed of light is constant and travels at the same speed regardless of any direction is because rotational energy  $\bar{\Lambda} = r.m.\bar{v}$  and centrifugal velocity  $\bar{v} = \bar{w}.r$  are constant and acceleration  $[d\bar{v}/dt=d(\bar{w}.r/dt)=0]$  is zero and when (Integrated) exported to STPL is also constant . When tangential velocity  $\bar{v} = \bar{w}.r$  on circumference of a cave, r, is in another of radius  $R > r$ , then the new tangential velocity  $\bar{v} = \bar{w}.R$  is greater than  $\bar{v}$  and when  $\bar{v}$  is the speed of light, then the new  $\bar{v}$  are velocities greater than that of light .

Michelson's-Morley experiments cannot prove reality because in Planck's cave occurs isochrones motions , and Gravity is the force (energy) which is connecting Material points of the Medium with the constant light velocity  $\bar{c}$  .

Numerical value ,s, and Imaginary  $\nabla i = E \times P$  are variant in Invariant rotational energy  $\bar{\Lambda} = r.m.\bar{v} = m.wr^2$  as velocity  $\bar{v} = \bar{w}r$ , meaning that quaternion = energy ,travels by changing velocity  $\bar{v}$  and angular velocity  $\bar{w} = 2\pi/T$  , and the Period T of vibration and because of Isochrones motion of Fields on cycloids trajectories , automatically distribute themselves uniformly ( Electromagnetic wave  $E=P$  due to  $\bar{c}$  ) across the whole wavelength  $\lambda$ , of monad .

*Relativity being confined in Planck's length* , { and because Maxwell's Displacement current  $\rightarrow$  Displacement current is equivalent to an Intrinsic Electromagnetic Wave with two perpendicular velocities forming Fields } ,could not perceive this Intrinsic property of monads or quaternion (velocity vector  $\bar{v}$ ) to be Wave and Particle .The above experiment and the Non-Euclidean geometries (the parallel to parallel is not parallel ???) initiated the line to Relativity . The Monads in monads is a characteristic expression of this property.

*Einstein failed to see this reality ( zero acceleration of rotational velocity  $\bar{w}$  ) and to explain the WHY speed of light is constant and where , considering constancy of light as an axiom from which derived the rest of his theory of GR.*

Galileo Galilei arguing that the mechanical laws of physics are the same for every inertial observer (those moving uniformly with constant speed in a straight line) , and so one cannot distinguish , a state of rest , from , a state of constant velocity, was in reality .

Increasing-Decreasing of a Removal Source  $F(14)$

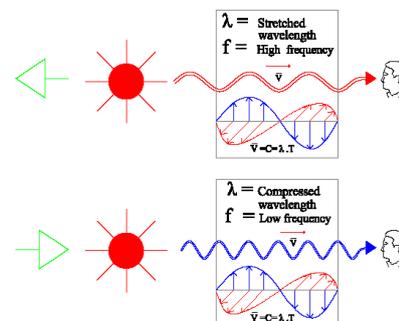


Fig. 15 Increasing-Decreasing  $\lambda$  of a Removal Source  $V(f)$

### b.. Equivalence Principle :

In a uniformly and non-uniformly accelerated reference frame with acceleration ,a, situated in a Gravitational field of gravity ,g, then  $g = -a =$  Intensity of gravity field i.e. All particles have the same acceleration in a gravitational fields and is not possible with experiment to distinguish the effect of gravity from that of an accelerated reference frame using local observations.

This is a fundamental principle of GR and gravitational mass is identical to inertial mass . This implication of the principle is that , since photons have momentum and therefore must be attributed an inertial mass , they must also have a gravitational mass and thus photons should be deflected by gravity and also be impeded in their escape from a gravity field , leading to the gravitational red shift , the concept of a black hole , and to the gravitational lens effect . Above is , the Why charge of gravity is the Inertia of a body , or equivalency between Inertial mass and Gravitational mass .

Remarks (b) :

Galileo's Principle of Equivalence states that Inertial mass is equal to the gravitational mass and acceleration

$a = d\bar{v}/dt \rightarrow$  equal to acceleration due to gravity, g,

Gravity is the Stationary force  $\rightarrow [\nabla i = 2(wr)^2] \leftarrow$  on the base for all motions  $\rightarrow$  The Medium-Field Material-Fragment,  $[\pm s^2] = (wr)^2 = [MFMF] \leftarrow$  in all universe and so Newtonian theory of gravity , acting instantaneously between two separated masses , is correct .

Maxwell's equations predict Electromagnetic waves in and out of monads, while Einstein's equations of GR predict Gravitational waves that travel at the speed of light in order to explain Simultaneity. GR failed to conceive Gravity force as a Stationary force ,restraining the breakages for monads beyond Planck's length  $[10^{-62} - 10^{-35}]$ .

Breakages acquire different velocities and different energy and because follow cycloid trajectories, thus need the same time (isochrones) to reach [STPL] line.

Fermat's Principle of Least time in Isochrones Principle is embedded in all wavelength , $\lambda$ , as vector monads.

During Intrinsic Diffraction,  $d\bar{s} = \lambda$ , of isochronous motion of vectors, frequency ,f, doesn't change and only the velocity , $\bar{v}$ , and wavelength,  $\lambda$ , changes so from equation

$\lambda = \bar{v}.T = \bar{v} / f$ ,  $\bar{v} = \lambda f$  and  $a = d\bar{v}/dt = (d\lambda/dt).f + \lambda(df/dt)$  then  $\rightarrow a = g = d\bar{v}/dt = (d\lambda/dt).f$  since  $f = \text{constant}$  ,  $\rightarrow$  **or**

Let  $\lambda \rightarrow$  be the wavelength of a moving monad,  $t = \lambda / c \rightarrow$  is the needed time to cross length , $\lambda$  ,

$s = at^2 / 2 \rightarrow$  Deflection due to acceleration, a,

$H = gt^2 / 2 \rightarrow$  Deflection due to acceleration of, g, ....(h)

For  $s = \lambda$  then  $s = at^2 / 2 = c.T$  ,where T is the period of Isochrones displacement , and  $t^2 = 2. cT / a$  .... (1)

From equation (h)  $t^2 = 2. H / g$  ..(2) and by equating (1) and (2) then  $cT/a = H/g$  and since in gravity field where cycloid motion (**Simultaneity**) defines the same displacement,  $cT$  , **H then**  $ct = H$  **and consequently**  $a = g$  ,

*Therefore all particles have the same acceleration , g, in our gravitational field with frequency unchanged, and  $\rightarrow$  velocity,  $\bar{v}$ , with wavelength,  $\lambda$  , to be changed  $\leftarrow$  so light being a particle also, is deviated in gravity field.*

### c.. Mercury's Perihelion advance :

The perihelion of the orbit of the planet advances, 2 degrees per century , 80s, accounted by the perturbations from the other planets and ,43s , by Einstein's GR theory .

Remarks (c) :

The  $\rightarrow$  [Space, Anti-Space equilibrium ,  $\pm \bar{\Lambda}$  , Absolute System [S]  $\leftarrow$ ] , as Angular momentum  $\bar{\Lambda} = \Omega = mvr$  ,is Crushed out into Fragments and , becoming the three Breakages  $[s^2 = (wr)^2]$  ,  $[-s^2 = -(wr)^2]$  ,  $[\nabla i = 2(wr)^2]$  .,and after clashed with the velocity vector  $\bar{v}$  of [S] , (unless succeed to escape un-clashed through center O in STPL cylinder and this because of  $\bar{v} = 0$  ) , are Thrown OFF this System [S] , conveyed into the , Relative [STPL] System [R] , with Linear momentum and Inertial Energy-Space , as the Particles Fermions  $\rightarrow [\pm \bar{v}.s^2]$  and Bosons  $\rightarrow [\bar{v}.\nabla i]$  .

The un-clashed through center ,O, Fragments  $s^2 = \pm |(\bar{w}.r)|^2$  occupy the minimum quantized space  $|s^2|$  and consist the Medium-Field Material-Fragment  $\rightarrow [\pm s^2] = [MFMF]$  as base for all motions , fill all [STPL] cylinder and thus consist the Rest , Homogenous , Isotropic Base of all motions .On this Base, force  $[\nabla i] = [2. |(\bar{w}.r)|^2 \nabla i]$  called Gravity is connecting material points of Medium , while all the other clashed or un-clashed fragments of the cylinder move , consisting the Relative System [R] to Absolute , Space, Anti- Space ,  $\pm \bar{\Lambda}$  , System [S] . Un-clashed Fragments through center O , clashed with the constant velocity , $\bar{c}$ , consist the Dark matter  $[\pm \bar{c}.s^2]$  and the Dark energy  $[\bar{c}.\nabla i]$  , or in summary,

A.  $[\pm \bar{v}.s^2] \rightarrow$  Fermions  $[\bar{v}.\nabla i] \rightarrow$  Bosons

B.  $[\pm s^2] \rightarrow [MFMF]$  Field  $[\nabla i] \rightarrow$  Gravity force

C.  $[\pm \bar{c}.s^2] \rightarrow$  Dark matter  $[\bar{c}.\nabla i] \rightarrow$  Dark energy

Since  $[MFMF] = [\pm s^2 = (wr)^2]$  is the base for all motions and Gravity force  $[\nabla i] = [2. |(\bar{w}.r)|^2 \nabla i] = 2.(\pm s^2) = 2(wr)^2$  then forces (from anywhere) is twice the Base , i.e. Base is half (1/2) of Gravity force , (or since perturbations from other planets is 80s ) , so Base is  $\rightarrow 80 / 2 = 40s$  , **which are the Unaccounted last 40 seconds of arc** .

### d.. Gravitational deflection of light by the Sun :

In GR indicated that light from a star, which just grazed the sun , should be deflected by 1,75 seconds of arc.

Remarks (d):

Monads, as an Electromagnetic Standing wave move in Field  $[MFMF] = s^2 = \pm |(wr)^2|$  which is the smallest quantized space of this level . Let, L, be the length of an undergoing constant acceleration monad in gravity field,

$t = L / c \rightarrow$  is the needed time to cross length L,

$s = at^2 / 2 = aL^2/2c^2 \rightarrow$  is Deflection due to acceleration, a,

1.. For a monad in Planck's length  $10^{-35}$  m then  $T = 8,906. 10^{-35} / 3. 10^8 = 2,968. 10^{-35}$  and  $s = aT^2 / 2 = 9,81.8,809.10^{-70} = 4,32.10^{-69}$  m

2.. For Photon wavelength  $\lambda = 6,21.10^{-7}$  m as Monad in monad Photons  $= 9,81(\lambda/c)^2 / 2 = 2,101. 10^{-14}$  m corresponding to an angle  $\theta = s/3600 = 5,386. 10^{-18}$  degrees of second .

3.. For an arc on earth surface  $\pi.(Km)^2 = 3142. 10^3$  m then  $s = 9,81.(9,872/9).(10^{12} / 10^{16}) = 5,38. 10^{-4} = 0,53810^3$  mm , which corresponds to an angle  $\theta$  arc-sec  $\rightarrow 3600.s = 1,883$ - arc.sec.

**e.. Gravitational red-shift and Time Dilation :**

Gravitational red-shift is the Phenomenon where low frequencies of light [long T=620-750 nm] shifted to red (red-shift  $\rightarrow f = 400 - 484$  THz) and higher frequencies of light [short T=450-495 nm ] are shifted to blue (blue-shifted  $\rightarrow f = 606 - 668$  THz) and Time Dilation the opposite Phenomenon for time . Both are the included intuitive deductions of the constancy of light.

**Remarks (e):**

The answer is as below using the intrinsic property of Constant light velocity vector  $|\vec{v}|$ , which is a Stationary wave in Photon's wavelength  $\lambda$ , as  $\rightarrow \vec{v} = \lambda / T = \lambda f$

In a Stress-Strain System , the State of Principle Stresses ,  $\pm \sigma$  at each point, is the double refraction in Photo-Elasticity and expressed as the Isochromatic lines  $[(\sigma_1 - \sigma_2) = J.k/d]$  or as Isochromatic surfaces , depending on the direction of force (pressure) which is the same in gravity field as length-contracted and length-expanded in a given piece of quantized space .

Stretching Removal of  $\lambda$ , creates ,  $-\sigma_1$ , while , Compressed Removal of  $\lambda$ , creates ,  $+\sigma_1$ , and since velocity ,  $c$ , is constant , long and short period T , or low and high ,  $f$ , varies and a vector with Low energy  $E = h.f$  at Red , (Red-shift)  $\rightarrow$  low  $f = 400-484$ THz , long  $\lambda = 620-750$ nm (Blue-shift) $\rightarrow$  high  $f = 606-668$ THz , short  $\lambda = 450-495$ nm and High energy since  $E = h.f$  at Blue .

In this way Light is

1)..  $s = \text{Particle}$  , is the Photon, and wavelength  $s = \lambda = 380-780$  nm =  $(3,8-7,8). 10^{-7}$ m and as,

2).. **as Wave** , is the Stationary Electromagnetic fields  $E,P = \nabla i \times D_i$  and it is of the Wave nature force where  $\nabla i = \vec{v} = \lambda f = \lambda / T$  , and since also Light is quaternion  $\rightarrow [q = s + \nabla i]$ . The Stationary Wave in wavelength ,  $s = \lambda$  , means that , since Photon is the only Electric Displacement field  $D = \epsilon.E + P$  , then in the rate of change is alternately in terms of The Electric field  $(\partial P / \partial t)$  and The Magnetic field  $(\partial E / \partial t)$  , i.e. for Low energy Red-shift and for High energy Blue-shift as Wave, and then wavelength  $\lambda = s =$  the Particle .

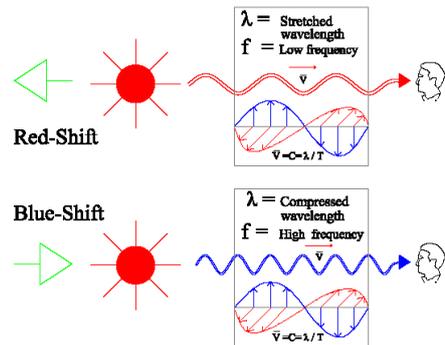
Since also frequency  $f = 1/T$  and energy  $\vec{v} = E = h.f$  , then Cycloid motion Controls constancy of Energy by changing velocity,  $\vec{v} = \vec{\omega}.r$  , and period ,T, of monads.

Young's double slit Interference and Polarizer experiment shows that Diffraction (when light passes through a small opening and starts to spread) explains the pattern as being the result of the interference of light waves from slit. So energy of Photon in the same direction Apparent energy  $S = 2E.2H = 4.(EH)$  and work W is stored as a new wave  $S1 = S$  and becomes  $\vec{E}(0,0,z,t) = |\vec{E}|.e^{i(kz - \omega t)}$  ,  $\vec{H}(0,0,z,t) = |\vec{H}|.e^{i(kz - \omega t)}$  In opposite direction Apparent energy  $S = [\vec{E} \times \vec{H}] - [\vec{E} \times \vec{H}] = 0$  and work is stored in the New Stationary wave  $S2 = S = [\vec{E} \times \vec{P}]$  as the knots points of interference , however the energy flow of each photon still proceed forward . By an angle  $0 < \theta < 360^\circ$

between the two directions , Apparent energy  $S = [\vec{E} \times \vec{H}] - [\vec{E} \times \vec{H}].\cos.\theta$  . **Cycloid motion Controls constancy of Energy by changing wavelength and frequency.**

Einstein failed to see this reality and to explain the WHY  $\rightarrow$ Wave nature ,is the Intrinsic Electromagnetic Wave of Particles and speed of light is constant in a Stress-Strain System with (Red-shift , as low , $f$ , and-Blue-shift , as high , $f$ .) Photon to be as Particle and Wave also , but considering constancy of light as an axiom from which he derived the rest of his theory of GR. . The Basic reason is the Hyperbolic geometry which defines , great circles as lines , and thus deeply induced in Planck's cavity. [38]

**Intrinsic Stationary Wave of a Removal Source F(15)**



**Fig. 16 .Intrinsic Stationary Wave of a Removal Source V(f)**

**f.. Gravity as Curvature :**

GR of Einstein assimilates gravity as the curvature in space-time and not as Force and this based on Elliptic geometry, by contrast, stating that , all lines through a point M and parallel to a line AB intersect line .

In Elliptic geometry the two lines “curve toward” each other and eventually intersect. The simplest model for Elliptic geometry is a sphere, where lines are “great circles”. For any great circle (which is not a straight line)and a point M which is not on the circle all circles through point M will intersect the circle. In elliptic geometry the three angles of a triangle add greater than 180°, without referring that triangle is not in Plane, but in the Sphere (spherical triangle) .This omission created the wrong elliptic geometry and all others that follow.

Assuming the postulate of Relativity,  $c =$  constant, was valid without restrictions, this would imply that all forces of nature must be invariant under Lorentz transformations in order that principle be rigorously and universally true.

Also say that an object flying pass a massive object, the space time is curved by the massive object.

**Remarks (f) :**

It is was proved in [32-39] that from any point, M, not on line AB can be drawn one and only one parallel to AB, [39]

which parallel doesn't intersect line , so the Elliptic Geometry must be revised and also in [36-37] Gravity is force  $[\nabla i = 2(\omega r)^2]$  in the Medium-Field Material-Fragment  $|\pm s^2| = (\omega r)^2 = [MFMF]$  which is the base for all motions .

This force is acting on Medium Field by having as wavelength the Stationary Breakage  $(1-2) = \pm [(\omega \cdot r)^2]$  which consist the Material points , and on all moving Material wavelength  $\lambda = (1)-(2)$  massive or not Particles.

1). Object in mechanics, may be the Material point (1) at Euclidean point (1), which is now Breakage  $\pm [(\bar{w} \cdot r)^2]$  magnitude in the Rest Homogeneously – Isotropically Quantized massless Field  $\pm [(\bar{w} \cdot r)^2]$  and is the required coordinate System and base for all motions and forces.

2). Object in mechanics may be also the Material wavelength  $\lambda = (1)-(2)$  in the {[Medium-Field Material Fragment]  $\rightarrow [\pm s^2] = |(\bar{w} \cdot r)^2 = [MFMF] \text{ Field} \leftarrow$ } which is a standing wave in cavity (1)-(2) with scalar breakage  $|\pm(\bar{w} \cdot r)^2|$  as medium (1)-(2) field , and (J1) as energy at point (1) and carried to point (2) by following the cycloids motion from (1) to (2) which is isochrones .Velocity ,  $\bar{v}$ , during shifting is analyzed into two velocity vectors  $\bar{v}1$  ,  $\bar{v}2$  , which undergo vibrations causing two waves that represent the two Electric and Magnetic perpendicular components following the trajectory , in=(c1) , out=(c2) . On cycloid = (c)=|A1-A2| is needed the isochrones time  $T = \pi \cdot \sqrt{Rc/g}$  to reach end A2.

So, Gravity is the minimum attractive and biding Force  $\nabla i = 2(wr)^2$  on [MFMF]=|(wr)<sup>2</sup> Base ,which interact with all other particles , and also since acceleration  $a = d\bar{v}/ dt = (d\lambda/dt).f$  then for ,  $\lambda = \text{any constant ( or zero) and } \bar{v} \rightarrow 0$  , then  $f \rightarrow \infty$  . This is the why the very strong gravitational fields are present and close to black holes where there  $\bar{v} = \bar{c} = 0$ .

Appealing space-time a Priori of G-Relativity accepts the two elements, Space and Time, as the fundamental elements of universe without any proof for it , so anybody can say that this stay on air . It has been proofed [22-26] that any space AB is composed of points A,B which are nothing and equilibrium by the opposite forces  $PA = - PB$  following Principle of Virtual Displacement. In [39] is everything proved and not accepted.

Time (t) is the conversion factor between the conventional units (second) and length units (meter) . By considering the moving monads (particles etc. in space) at the speed of light, pass also through Time, this is an widely agreeable illusion .

**g.. Tidal Forces :**

Falling between small particles with very small mass and a rigid body with a large mass , change its shape with time , by stretching in the direction of the fall and press in the direction perpendicular to it , are what is called Tidal forces .

**Remarks (g) :**

According to Bernoulli equation of energy conservation in , non-viscous , incompressible fluid in steady flow , Potential and Kinetic Energy per unit volume is constant at any point as ,  $p + \rho v^2/2 + \rho gh = \text{constant}$  , where, p = pressure ,  $\rho$  = the density , v = the velocity , h = the elevation and g = the gravitational acceleration , and (1)-(2)points lie on a stream line. The one-dimensional continuity equation gives ,  $p1-p2 = (\rho/2) \cdot (v^2_2-v^2_1)$  and  $A1v1=A2v2$  , therefore  $A2 < A1$  ,  $v2 > v1$  and  $v2 > v1$  ,  $p2 < p1$  or, decreasing area = increasing velocity and increasing velocity = decreasing pressure(Force).Spinning ball in airflow is a characteristic example, where velocity stretches in the velocity direction, and pressures are shrinking in perpendicular to velocity direction.

**g.. Equilibrium of Forces in monads :**

Inner stability of wavelength is obtained by Evolute line.

**RESULTANCE'S EQUILIBRIUM IN EVOLUTE - TRAJECTORIES**

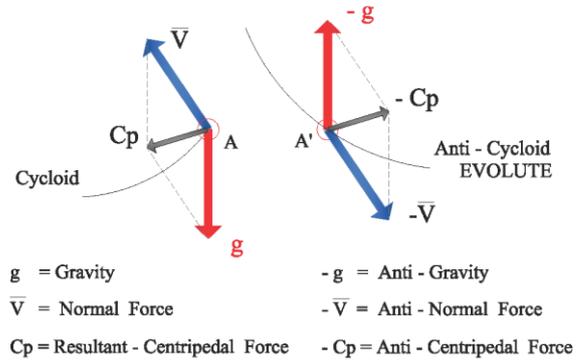


Fig. 17 . Equilibrium of the Resultant Forces ,in the Cycloid Intrinsic motion Wavelength , and of any Removal Monad.

It was shown in [25-30] that

The mechanism of Energy Transport as ( $\bar{v}$ ) through its quantized wavelength  $|\lambda = \bar{v} \cdot T|$  , is a property of any standing wave, into the Medium  $|\lambda| = (1)-(2)$  , and involves the Absorption and Reemission of the wave quantized energy  $J = (J1)=(J2)$  by the two neighbor edges (1) and (2) of the medium . The Absorption of energy causes ,J1, within edge (1) to undergo vibrations as  $[ds^2/dt^2] = -(g/4r).s$  which causes a new wave with the same frequency (because  $f=E/h$ ) as the first wave but delaying the motion through the medium until Reemission by travelling , J1 to J2 , through this small region of space between edges (1) and (2) and once the energy of wave is reemitted by its neighbor edge (2) then mechanism is recycled . This mechanism is succeeded by the intrinsic property of the waves (  $\rightarrow$  quaternions , monads , vectors , Tensors) which is , **the Stationary wave nature of Spaces** , and works as follows ,

It was shown in [27] that on dipole  $AB = [\lambda m, \Lambda]$  under the influence of Space Anti-Space forces  $dP = PB-PA$  are created from forces  $dP //$  Space lines the Static Force Field ,**E**, from forces  $dP \perp$  Space lines the Static Force Field ,**P**, where  $P \perp E$  , which then experience on any moving dipole AB with velocity  $\bar{v}$  , a total force  $F = F E + F P = (\lambda m).E + (\lambda m). \bar{v} \times P$  which combination of the two types result in a helical motion ,with stability demand  $\rightarrow E = -(\bar{v} \times P) = -(\bar{v}.P) \perp$  which is the alternative conservation of momentum  $\Lambda^2/2\lambda m$  , in the two perpendicular fields E , P .

In case  $(\lambda m) = q$  then total force  $F = F E + F P = q.E + q\bar{v} \times P = q.[ E + \bar{v} \times P ] \rightarrow$  which is Lorentz force in the Electromagnetic crossed fields E and P , with electric charge  $q = \lambda m$  and both are the two beyond Gravity Fields interpreting the fundamental cause (effect) of motion , in small and large scales .

Since frequency  $f = 1/T$  and energy  $E = h.f$  then Cycloid motion Controls constancy of Energy by changing velocity,  $\bar{v} = \bar{w} \cdot r = 2\pi r/T = 2\pi r.f$  , and period ,T, of monads. Evolutes of a cycloid is the balancing cycloid, Anti-cycloid . Generally centripetal forces could be termed centrifugal meaning the forces tend to drive the objects away from the instantaneous

center of rotation .In celestial mechanics Planets follow conic sections trajectories with the central point at one focus and if this centripetal force is turned into a centrifugal force , then bodies will move in the opposite branch of the conic in Anti – conic (the evolute line ) .i.e. The motion of Spaces corresponds to the instantaneous motion in Anti-Spaces . [16]

Remarks :

Since velocity  $\bar{v} = \bar{w} \cdot \mathbf{r}$  and acceleration for a quaternion  $\mathbf{z} = (s + \bar{v} \cdot \nabla i)$  is  $\mathbf{a} = [d^2z/dt^2] = (d/dt, w) \cdot (-wz, dz/dt + wxz) = 0$  and , and this because  $\mathbf{r}$  and  $\bar{w}$  are constant , therefore velocity  $\bar{v} = \mathbf{constant}$  .

When element  $d\bar{s} = A \cdot DA = \bar{v} \cdot t = \lambda T = \mathbf{constant} = \bar{c} \cdot T$  then  $ds^2 = dx^2 + dy^2 + dz^2 = (cT)^2$  which is the spatial equation of Space{  $d\bar{s}$  } and Energy {  $\bar{v} \cdot t = \lambda T = d\bar{s}$  } .

Since quaternion  $= (i)^2 = [\text{Energy}]^2 = - [\text{Space}] = \text{Anti-space} = [-(\Lambda x \Lambda) / m \pm \Lambda x \nabla i] = [\lambda, \pm \Lambda x \nabla i] \rightarrow$  it is meaning that the massive mechanism Diffraction , $\lambda$ , and the Energy mechanism Diffraction,  $\pm \Lambda x \nabla i$ , are Interchangeable.

A Particle with wavelength  $\lambda = (1)-(2)$  and spin say ,  $h/2$ , is consisted of two parts , The one because of the translational motion of speed  $\bar{v}$  , and the second of the , common circle , self-rotation velocity  $V_c = \lambda^2 / T = \lambda^2 \cdot f = [\sqrt{1 - (v/c)^2}]^2 \cdot f =$

$[1 - (v/c)^2] \cdot f$  . Energy  $[\Lambda x \nabla i] = (J1)$  as velocity vector ,  $\bar{v}$ , is the cross product of two velocity vectors  $\bar{v}1, \bar{v}2$  or  $\rightarrow \bar{v} = \bar{v}1 \times \bar{v}2$  , with head at point (1) and analyzed , in a perpendicular to (1)-(2) directional , plane , into the two orthogonal velocity vectors  $\bar{v}1, \bar{v}2$  which heads are at point (1). Energy J1 is carried to point (2) by following the cycloid motion in  $\lambda = (1)-(2)$  . Following the above logic, the vector-quaternion Norm is kept constant by an intrinsic ( in wavelength norm) isochrones (harmonic oscillation) because of the cycloidal motion , and independently of amplitudes ( displacements , or strengths ) .

i.e. Quaternion  $q = [\lambda, \pm \Lambda \nabla i]$  with norm , wavelength  $|\lambda|$  is a Standing wave (a plane Stationary wave) which preserve the constant position of magnitude  $|\lambda|$  with the two edges as nodes independently of amplitude , with a period  $T = [\gamma \lambda / 2c]$  and  $\Lambda = r \cdot m \cdot \bar{v} = r \cdot \bar{p} = r \cdot m (\bar{w} \cdot r)^2 = m r^2 \cdot \bar{w}^2$  depending on , $\bar{w}$ , only (it is the spin) and thus forming the spherical standing waves .

Einstein's theory of relativity , assumes the equivalence of all Inertial frames as well as that of constancy of light which needs experimental verification of all the intuitive including deductions.

General Relativity is depended on one axiom , that of Galilean Relativity and on non-Euclid geometries without any physical meaning and reality, and this because all these are the extreme cases which are in inner nature of Euclidean .

The present article using the Euclidean geometry without any assumptions and definitions clearly *shows that* ,

- 1).. The origin of Space, through the Principle of Virtual Displacements, as the Inner distance of Space and Anti-Space.
- 2).. The origin of Energy, through the Principle of Virtual Displacements , as the Work of the Inner Impulse distance of Space and Anti-Space.
- 3).. The *minimum Quantized Space, Quanta*  $s^2$ , in all quantized spaces, i.e. Particles , [MFMF] Field , moving vectors, free velocity monads , Material lines  $\rightarrow$  Surfaces and bodies .
- 4).. The *minimum Quantized Energy, Quanta*  $2s^2$ , diffused in all quantized spaces.
- 5).. The definition of Material Point as  $(\pm)$  Dipole Breakage in [MFMF] medium .
- 6).. The definition of Material Object as the Wavelength  $\lambda$ , of the  $(\pm)$  Dipole of [MFMF] Field which is a standing Electromagnetic wave in beyond Planck's cavity .
- 7).. The time in Euclidean geometry is not distinguished, because time is a conversion factor existing only in its confined-Planck's length level - and neither Space from Energy because -Energy exists as quanta on any first dimensional Unit AB - which connects the only two fundamental elements of Universe, that of points and that of energy.
- 8).. The STPL line as the passage of particles from Absolute [S] Frame to all Relative [R] Frames is the Navel cord , the string of galaxies.
- 9).. The geometrical Reasoning of Planck Length .
- 10). Time is designated as the meter of changes , or as the conversion factor , between time (s) and space (m) units and not essence of Space-energy Configuration .This age-old question ,*of what is time* ,was standing for many centuries in Philosophy , and was recently settled by GR , by considering Time, as an essence of Space-time and by stepping aside the wrong base which is Non-Euclidean geometries.
- 11). Work as Energy is Quantized , converted , in Space monads , caves ,  $\bar{x} = d\bar{s} = \lambda m$  , as pressure  $\sigma, \tau$  , the pressure is converted in caves as a Standing Electromagnetic Wave E,P which consists the Standing monad ( Displacement current ) and the moving Energy monad ( by altering the inner wavelength or Period of monad ) in Gravity's field medium [MFMF] and is dissipated as Quaternion monads ( Particles or Waves , matter or vectors) as Forces ( displacements , masses , pressure etc.) using modulus , coefficients , reactions to the motion and all other geometrical indices.
- 12). The Geometries related to Euclidean by Lorentz factor  $\gamma$ , consist ,*Geometrical expression of Spaces and Anti-Spaces*.
- 13). The Cause and Events as the Energy quantization and the velocity Breakages as , masses , and velocity  $\bar{v}$ , only as the Thrust of masses, (changes).
- 14). The Origin and the base of Gravity from [S] to [R] frame, and the Equations of the inner Electromagnetic wave.

15). The Structure of the Energy - Space Universe with the boundaries of General Relativity.

16). The Origin of Particles as velocity – Thrust - on Breakages and the Breakages as the Fragments of the Space, Anti-Space collision.

17). The Origin of Color - forces from the Retardation and the Birefringence of Spaces .

18). The Dual nature of Monads, of wavelength  $|\lambda|$  as Particle , and Wave as the Stationary Electromagnetic Wave in  $|\lambda|$  , which is an intrinsic property of the Cycloid motion of velocity  $\bar{c}$ , and Spin , forming the plane and spherical standing waves which are <The Inner structure of Particles> .

19).The Cycloidal motion as the intrinsic property of vectors which is a Stationary wave on wavelength of vector, where < Poinso'ts ellipsoid > becomes  $\rightarrow$  cycloid Ellipsoid ,

20).The mechanical relation between the speed of light and principal stresses , guided to ,Permittivity, Permeability, in free space medium .

21). Michelson`s-Morley experiments cannot prove reality because in Planck`s cave occurs isochrones motions , and Gravity is the force (*energy*) which is connecting the Material points of the Medium with the constant light velocity  $\bar{c}$  . The Relative motion of moving systems through Stationary system can be detected only by the Tangential velocities  $\bar{v} = \bar{w}.r$  on circumference of a cave ,r, with radius  $R > r$  .

22). The equations of inners Structure of Gravity field and the stability of the whirling Space , Anti-space , the Spin , extended to monads.

23). The immense confusion in the basic ideas regarding the Quantized Energy-Space , *The Quanta*,  $\rightarrow$  vanishes.

24). Manifold of mathematics from Astrophysics to Quantum mechanics have been progressively developed on Non-Euclid Geometries, resulting to Relativity`s Space-time confinement, unable to conceive the under Planck`s cavity energy existence ,

is the content of this article.

## 9. General Remarks .

**Applying all equations of Mechanics and Physics in Common circle (c) of radius ,  $r_c$  , angular velocity  $\bar{w}c$  ,** then velocity on radius is  $\bar{v}c = \bar{w}c.r_c$  and the reaction to this motion which is mass ,  $m_c$  , is  $m_c = v_c .vc = v_c^2 = (wr)^2$ . Linear momentum  $p_c = m_c.\bar{v}c$  and the resultant rotational energy  $\Lambda = r_c.\bar{p}c = .r_c.m_c.\bar{v}c$  and then since work on circle is  $W = p_c.L = p_c.(2\pi.r_c) = m_c.v_c.2\pi.r_c = \Lambda$  , by solving to ,  $r_c$  , and for constant velocity  $v_c = c$

$$\text{then, } r_c = \Lambda / 2\pi.m_c.v_c , r_c = \Lambda / 2\pi.m_c.c \quad \dots (a)$$

Applying equation (a) for the fundamental particles (monads) OFF the common circle , then magnitudes are transformed as , mass (m) $m_c.\gamma = m_c.[\sqrt{1-(v/c)^2}] \dots(b)$

**radius ,  $r_c$** , of cycloidal helix  $\rightarrow r_c = \Lambda / 2\pi.\gamma.m.c \dots(c)$

Since ,  $m = E/c^2 = hf/c^2 = h/Tc^2$  (Einstein`s de Broglie`s),

$$\text{Radius } R_c = 2.r_c = 2.\Lambda / 2\pi.\gamma.m.c = [ h / 2\pi.c.\gamma ( m = E/c^2 = hf / c^2 ) ] = c / 2\pi.\gamma.f = [ c.T / 2\pi.\gamma ] = [ 2 c / w.\gamma ] [ 2c^3 / w(c^2- v^2) ] \text{ and } r_c = c / w.\gamma \quad \dots(d)$$

$$\text{Period } T_c = 4\pi.\sqrt{r_c/g} = \pi.\sqrt{R_c/g} \quad \dots(e)$$

Length  $L_c = \bar{v}r.Tc = [\sqrt{g.r_c}].[4\pi.\sqrt{r_c/g}] = 4\pi.r_c = 4\pi c/w.\gamma = A1-A2$  , is the wavelength  $\lambda = L_c \rightarrow$  from which Constant velocity  $\rightarrow c = w.\gamma.r_c = w.\gamma.\lambda/4\pi = \gamma.L_c.f_c / 2$   $\Lambda = h =$  Rotational energy (Spin) , where  $\rightarrow$

$\bar{v}$  = Velocity of particle in Inertia System [R] ,

$\bar{v}r = \sqrt{g||.||r|c| =$  The Rolling circle center const-velocity

$c =$  The constant velocity of the System (and of Light )

$R_c = 2r_c =$  The radius of , Cycloidal helix ,

$g =$  Gravity`s force  $2.(wr)^2$  , acceleration ,

$T_c =$  The intrinsic Cycloidal period ,  $\pi\sqrt{R_c/g}$

$c = \gamma.L_c.f_c/2 =$  The relation between constancy (c)

of Light , Laurence factor ( $\gamma$ ) , Wavelength ( $\lambda=L_c$ ) and

Cycloidal helix rolling circle frequency ( $f_c$ )  $\rightarrow$  [39] .

Monad (Unit)  $\bar{A}B$  is the Entity and [ A,B -  $\bar{P}A$  ,  $\bar{P}B$  ] is the Law , so Entities are embodied with the Laws.

Entity is **quaternion**  $\bar{A}B$  , and law  $|AB| =$  length of points A,B and imaginary part forces  $\bar{P}A$  ,  $\bar{P}B$  or fields

By definition  $i = \sqrt{-m.l}$  and  $(-ml)^2 = -1m$  i.e.

$[Energy]^2 = - [ Space ] =$  Anti-space and since also exists  $\Lambda \times \Lambda = - (-m.l)^2 = \pm \Lambda.\nabla i$  , the basic equation of quaternion becomes  $[-(\Lambda \times \Lambda)/m \pm \Lambda \times \nabla i ] = [ \lambda , \pm \Lambda \times \nabla i ]$

i.e. wavelength  $\lambda = - (\Lambda \times \Lambda)/m$  where  $m =$  a constant depending on reactions to present or other conditions .

Applying this in energy cavities then  $e^{-i[(\pi/2).b]^2} =$

$$= e^{-i(\frac{2\pi}{2}).b} = e^{-i(\pi).b} = \rightarrow \text{i.e.}$$

The massive mechanism Diffraction and the Energy mechanism Diffraction are Interchangeable as follows ,

$$e^{-i[1.78.10^7]^2} = e^{-i[3.56.10^{14}]}$$

and for Relativity massive Energy  $(\Lambda \times \Lambda) = (- m.i) \times (- m.i) = m (i)^2 = - m (\bar{v})^2 = - m\bar{v}^2$ , where the imaginary part  $i = \bar{v}$  , i.e.

### Space acquires energy.

Applying quaternion equation  $[-\nabla\Lambda , \nabla \times \Lambda] = 0$  for

point ,O, and constant velocity ,  $\bar{c}$  , then  $[-\nabla c , \nabla \times c] = 0$

where  $[-\nabla c] \perp [\nabla \times c]$  meaning that, it is a mechanism that instantly transports breakage masses dynamically and perpendicularly to all Inertial frames Layers . [26]

In extrema , paragraph (7.8) ,was found the relation  $c^2 . \epsilon . \mu = 1$  which is the known relation between the speed of light and ,Permittivity, Permeability, in free space medium.

## 10. Conclusions

Energy Space universe is Quantized into Spaces as Energy , Spaces maybe stationary or moveable and conserve energy  $W$ , in an Intrinsic tiny Space called Wavelength  $\lambda$ , or in an Outer space called velocity vector  $v$ , or both as,

$$\begin{aligned} \mathbf{W} &= F.ds , [ ds=0 , t=0 , F \neq 0 ] , \rightarrow \mathbf{W} = (\sigma.dF).ds , [ ds=0 , t=0 , dF \neq 0 ] , \rightarrow \mathbf{W} = (c.[\varepsilon.\mu]).ds , [ dF=0 , ds=0 , t=0 ] , \rightarrow \mathbf{W} = (E \perp H).ds , [ dF=0 , ds=0 , t=0 ] , \mathbf{W} = (\lambda.m).ds , [ dF=0 , ds \neq 0 , t=0 ] , \rightarrow \mathbf{W} = (p).ds , [ dF=0 , ds \neq 0 , t=0 ] , \rightarrow \mathbf{W} = (h/v).ds , [ dF=0 , ds \neq 0 , t=0 ] , \rightarrow \mathbf{W} = (\lambda\mu).(v.t) , [ dF=0 , ds \neq 0 , t=t ] , \rightarrow \mathbf{W} = (M).v.dt , [ dF=0 , ds \neq 0 , t=t ] , \rightarrow \mathbf{W} = (p).dt , [ dF=0 , ds \neq 0 , t=t ] , \end{aligned}$$

The dynamics of any system = Work = Total energy, is transferred as generalized force  $F_e \rightarrow$  to  $\rightarrow$

$$F_e = \partial W / \partial (\delta \bar{r}.c) , (\delta \bar{r}.c) = \bar{v}_i . \delta t = [ = \bar{v}c + = \bar{w}.r\bar{n} ] \delta t = (\text{Translational} + \text{rotational velocity}) . \delta t \text{ and } F_e = \bar{v}c . (\partial W / \delta t) + \bar{w}.r\bar{n} . (\partial W / \delta t) \rightarrow \text{Translational kinetic energy} + \text{Rotational kinetic energy} \rightarrow$$

1. To the Elastic material Configurations, as Strain energy and is absorbed as Support Reactions (*for stationary forces*) and displacement field  $[\nabla \varepsilon (\bar{u}, \bar{v}, \bar{w})]$  upon the deformed placement , (where these alterations of shape by pressure or stress is the equilibrium state of the Configuration  $G.\nabla^2 . \varepsilon + [m.G / (m-2)] . \nabla [ \nabla . \varepsilon ] = F$  ) , [5] and [14-16].

2. To Solid material Configuration , as Kinetic (Energy of motion  $\bar{v}$  ) and Potential ( the Stored Energy ) energy by displacement (the magnitude of a vector from initial to subsequent position) and rotation , on the principal axis ( through center of mass of the Solid) as ellipsoid , which is mapped out , by the nib of vector  $(\delta \bar{r}.c) = [\bar{v}c + \bar{w}.r\bar{n}] \delta t$  , as the Inertia ellipsoid [Poinot's ellipsoid construction] in [S] frame which instantaneously rotates around vector axis  $[\bar{w}.\phi]$  with the constant polar distance  $\bar{w}.Fe / |Fe|$  and the constant angles  $\theta_a , \theta_b$  , traced on, Reference [R,F] cone and on Absolute frame [S,F] cone , which are rolling around the common axis of  $\bar{w}$  vector , without slipping , and if  $Fe$  , is the Diagonal of the , *Energy Cuboids* , with dimensions a,b,c following Pythagoras conservation law, where the three magnitudes (J,E,B) of Energy-state follow Cuboids , Plane , or Linear Diagonal direction and If Potential Energy is zero then vector  $\bar{w}$  , is on the surface of the Inertia Ellipsoid . From the theory of elasticity the equilibrium of a surface Configuration, in an Isotropic material, obeys the equilibrium equation  $\mu . \nabla^2 u + (\lambda + \mu) . \nabla . [\nabla . u] = 0$  ..[23]

3. To Quaternion's Extensive Configuration, as New Quaternion's (with Scalar and Vector magnitudes).Points in Space carry A priori the work  $W = \int A-B [P.ds] = 0$  , where magnitudes  $P$  ,  $d\bar{s}$  can be varied leaving work unaltered . Diffusion (decomposition) of energy follows Pythagoras conservation law where the three magnitudes ( J,E,B ) of Energy-State follow the Cuboids, Plane , or Linear Diagonal

4. To Space conserved Extensive property Configuration ( Continuum ) , as Kinetic ( 3-current motion ) and Potential ( the perpendicular E,P Stored as curl fields *for moving forces*) energy by displacement ( the magnitude of a vector from initial to the subsequent position) and rotation .

Energy is thus conserved in ,E and P, curled Stationary fields of monad's wavelength , and on quaternion's norm . For more extension [40].

5. The STPL line as the passage of particles from Absolute [S] frame to all Relative [R] Frames is the Navel cord , string of galaxies [28] .

## Acknowledgment

The reason of writing this scanty articles is because *I am Engineer*, and my deep intuition contradicts to some very acceptable conceptions. *The Natural Constants in Physics become from the Laws and Geometry constants are the meters of Laws. Physical constants represent the quantization of Energy in the different levels of Spaces.*

*Sequence that Space was created before matter  $\rightarrow$  Human mind , in front of this dilemma created the outlet in Religious and the myth of Big-Bang. Because in [S] System Centrifugal velocity is constant , Simultaneity in [R] System is such that is possible to exists in them , the geometrical expression of Lorentz factor ,  $\gamma$ , and the related System-Spaces of Relativity to be placed as a part of the whole Euclidean geometry . For a rotating system like the reference [R] with constant velocity ,c, is possible to be  $c < c' \rightarrow \infty$  and then this would move faster than ,c, velocity of light . [27-29]*

By Considering breakages as ,*masses*, being off the system [S] and under the constant velocity ,c, as Action, then Dark matter and Dark energy is produced and the known formulas of GR for masses and Energy are Geometrically produced without any set restrictions , but from  $\rightarrow \sec.\phi = \gamma$  only.

Because breakages travel in [R] $\equiv$ {DA-PA} system (frame) with the constant velocity ,c, and so are in rectilinear motion between them, they occupy zero acceleration and thus can be converted to measurements in another by the simple Galilean transformations , because physical laws and electrodynamics take the same form in all inertial systems .

By contrast Inertial frame [R] is the frame of reference which describes the Energy-Space universe ,homogeneously and isotropically and in an genius manner , where arbitrary number , t = time is defined as the convention factor between time units (second) and length units (meter) , and this because of the geometrical proportionality relation which is existing in Space , Anti-space Mechanism [STPL]  $\rightarrow \sec.\phi = \gamma = (ct / vt)$ .

In summary , my personal confidence is that nature is produced from Euclidean Geometry only, following Principle of Virtual work and not any other logical starting point .

The essential difference between Euclidean and the non-Euclidean geometries has been attentive in the very specially written article (ordered) [32] and recently in [38] for the nature of the parallel lines , a unique Postulate directly connected to the physical world . Now , [STPL] line (doubled cylinder in spatial CS) is the creation mould for Particles which are created between all Space-Levels. Since Spaces are directly connected and consist only one Monad , the present article is the proof to what is above referred .

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