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The Control and Possible Eradication of HIV/AIDS Using Electromagnetic (EM) Radiation

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Some waves in nature behave parasitically when they interfere with another one. Such waves as the name implies have the ability of transforming the initial characteristics and behavior of the host wave to its own form and quality after a period of time. Under this circumstance, all the active constituents of the host wave would have been completely eroded and the resulting wave which is now parasitically monochromatic will eventually attenuate to zero, since the parasitic wave does not have its own physical parameters for sustaining a continuous independent existence. If the vibration of anything is known, then its characteristics can be predicted and be destroyed by an anti-vibrating component. In this work, we calculated the latent Human vibration and that of the HIV vibration. We also show quantitatively how regulated dose of electromagnetic (EM) wave, can be used for the control and possible eradication of HIV/AIDS infection from the Human system. The spectrum of the interception of the applied EM wave with the HIV vibration in the Human system shows a zero amplitude and frequency in the interval when the raising multiplier [0, 892] with a corresponding time interval [0, 0.008897s]. It is shown in this study that the actual time of exposure of the HIV/AIDS patient to EM radiation therapy is about 0.56 seconds. This study also shows that

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the time it takes the applied EM wave to destroy the HIV vibration completely from the human system is also determined by the path difference between the phase angle of the applied oscillating EM wave and the phase angle of the HIV latent vibration. It is pertinent to note that radiation therapy is already being applied in treatment of HIV/AIDS patients, but more with regards to associated cancer morbidity. What this study is bringing to focus is that electromagnetic radiation may potentially eradicate HIV.

Keywords: EM wave; human vibration; HIV vibration; 'host wave'; 'parasitic wave'; carrier wave and the raising multiplier.

1. INTRODUCTION

The role of Human-Immunodeficiency Virus (HIV) in the normal circulating blood system of man (host) has in general been poorly understood. However, its role in clinical disease has attracted increasing interest. Anything that has life and performs the characteristic of existence is not permanent. It is constrained by space and time. Scientists, therefore, seek to investigate what could be responsible for the non-permanent behaviour of every living matter. The HIV fatal effect stems from the attack on a person's CD4 cell counts. This attack of the HIV on the human system result to the progressive depletion of the CD4 cell counts which play a pivotal regulatory role in the immune response to infections and tumours [1,2].

The human immunodeficiency virus (HIV) is among the most pressing health problem in the world today. Since its discovery, AIDS has caused nearly 30 million deaths as of 2009. It has been estimated that as of 2010 approximately 34 million people have contracted HIV globally and greater proportion of the population coming from Africa and Asian countries [3,4].

In addition to the knowledge of the medical experts about HIV/AIDS, is the understanding that Man and the HIV are both active matter, as a result, they must have independent peculiar vibrations in order to exist. It is the vibration of the HIV that interferes with the vibration of Man (host) in the human blood circulating system after infection. The resultant interference of the two vibrations is parasitically destructive and it slows down or makes the biological system of Man to malfunction since the basic intrinsic parameters of the 'host wave' would have been altered and destroyed after a specified time [5].

In physics, a wave is a disturbance or oscillation that travels through matter and space, accompanied by a transfer of energy. Wave motion transfers energy from one point to another, often with no permanent displacement of the particles of the medium, that is, with little or no associated mass transfer. Instead, they consist, of oscillations or vibrations around almost fixed locations [6].

If a wave is to travel through a medium such as water, air, steel, or a stretched string, it must cause the particles of that medium to oscillate as it passes. For that to happen, the medium must possess both mass (so that there can be kinetic energy) and elasticity (so that there can be potential energy). Thus, the medium's mass and elasticity property determines how fast the wave can travel in the medium [7]. Every material contains particles. When a wave travels through a material, the oscillating field in the wave will set some of these particles into forced vibration, and the vibrating particles will generate new waves of their own. The initial energy of the propagating wave is attenuated due to absorption and scattering by the medium as it passes [8].

Electromagnetic (EM) wave is a transverse wave and which as the name suggests is made up of the electric field ($\vec{E}$), which is radial and perpendicular to the direction of propagation and the magnetic field ($\vec{B}$), which is circumferential to the direction of propagation. For simplicity, we shall assumed that the electric field and the magnetic field always lie in the same plane, that is, it is linearly polarized. Both $\vec{E}$ and $\vec{B}$ lie in the same plane perpendicular to the direction of propagation. The character of the EM wave depends on the nature of the amplitudes in this plane; we can concentrate on the electric field since the magnetic field can always be found from the electric field [9,10].

The Navier-Stokes equations are always solved together with the continuity equation. The Navier-Stokes equations represent the conservation of momentum, while the continuity equation represents the conservation of mass. In that case, the density is assumed to be constant and the continuity equation reduces to divergence $\nabla.u = 0$. The motion of a non-turbulent, Newtonian fluid is governed by the Navier-Stokes equation [11,12]. The Navier-Stokes equations are only valid as long as the representative physical length scale of the system is much larger than the mean free path of the molecules that make up the fluid. The Navier-Stokes equations govern the motion of fluids and can be seen as Newton's second law of motion for fluids. The Navier-Stokes equations are a set of nonlinear partial differential equations that describe the flow of fluids. They model weather, the movement of air in the atmosphere, ocean currents, water flow in a pipe, as well as many other fluid flows [13,14].

The aim of this present work is to determine the biomechanics of human blood circulating system and to report the methodology developed in our laboratory to characterize the dynamics of the resident host wave and those of HIV parasitic wave in the human blood circulating system. Finally, we also want to compare our present result where we applied Navier-Stokes approach with those of the previous work where we used Newtonian mechanics approach [15].

The organization of this paper is as follows. In section 1, we discuss the nature of the work under study. In section 2, we show the mathematical theory of fluid dynamics and 2D Navier-Stokes equation. The results emanating from this study and discussion of the results are shown in section 3. Conclusion of this work is presented in section 4. The paper is finally brought to an end by a few lists of references.

1.1 Research Methodology

In this work we first superpose a parasitic wave on a host wave. The parasitic wave represents the HIV latent vibration while the host wave represents the human latent vibration all resident within the human system. The constitutive carrier wave produced by the two superposed waves is effectively studied using 2D Navier-Stokes equation. Consequently, the attenuation process of the parasitic wave as one of the constituents of the constitutive carrier wave is eventually studied by discriminately subjecting it to a regulated dose of electromagnetic EM radiation.

2. MATHEMATICAL THEORY AND SCIENTIFIC RESEARCH PROCEDURE

- If the wave characteristics of any given active system are known, then its behaviour can be predicted, altered and destroyed by means of anti-vibratory component.
- That the HIV kills slowly with time shows that the wave-functions of the HIV and that of the host were initially incoherent. As a result, the basic features of the Human vibration were initially greater than those of the HIV.
- The wave properties of HIV are independent of intrinsic variables such as the number, size, mass and of course mutation.
- Since the immune system of AIDS patient is almost zero, the measured wave function shall depend entirely on the vibrating property of the HIV only as every other active wave characteristics of the Human blood system would have been completely eroded.
- The wave characteristic of HIV infected candidate is the same everywhere within the resident host (Man). That is, irrespective of the occupation of the HIV in the host system, the activity is the same.
- The wave properties of HIV cannot be directly measured since it does not have its own independent existence outside the host system. As a result, the wave function of HIV can only be deductively measured.
- If HIV exists it must have its own peculiar vibration which must be independent of the vibration of the Human (host) system.
- The wave and vibrating characteristics of blood in the circulating system of a normal individual free from HIV/AIDS infection shall be assumed to be measured and the four independent variables following the observations about the wave recorded function are: (i) the amplitude, a (ii) the phase angle, ε (iii) the angular frequency, n and(iv) the wave number, k .
- The wave and vibrating characteristics of blood in the circulating system of HIV/AIDS infected candidate, whose immune count rate is very low or almost zero is also assumed to be measured and the four independent variables following the observations of the recorded wave functions are: (i) the amplitude, b (ii) the

phase angle, ε' (iii) the angular frequency, n' and (iv) the wave number, k' .

- Now, suppose we consider the wave function of the human vibration as the 'host wave' which can be described by the cosine sinusoidal function

$$y_1(\vec{r},t) = a\,\beta\cos\left(\vec{k}\,\beta.\vec{r} - n\beta t - \varepsilon\beta\right) \quad (2.1)$$

Where $\vec{k} = ki + kj$ and the position vector $\vec{r} = xi + yj$ are two dimensional (2D) vectors and t is the time. Although, in 2D polar coordinate system $x = r\cos\theta$ and $y = r\sin\theta$. The equation contains an inbuilt raising multiplier β which is capable of raising the intrinsic wave characteristics of the host wave. Thus β (β = 0, 1, 2 $,\dots,\beta_{\max}$) and $\vec{k}\,\beta.\vec{r} = k\beta r\,(\cos\varepsilon\beta + \sin\varepsilon\beta)$ .Also, suppose we consider the wave function of HIV vibration as the 'parasitic wave' which we can also described by the cosine sinusoidal function

$$y_2(\vec{r},t) = b\lambda\cos\left(\vec{k}'\lambda.\vec{r} - n'\lambda t - \varepsilon'\lambda\right) \quad (2.2)$$

As it is from the equation, the 'parasitic wave' has an inbuilt raising multiplier λ (λ = 0, 1, 2 $,\dots,\lambda_{\max}$)and $\vec{k}'\lambda.\vec{r} = k'\lambda r\,(\cos\varepsilon\lambda + \sin\varepsilon\lambda)$. The inbuilt multiplier is dimensionless and as the name implies, it has the ability of gradually raising the basic intrinsic parameters of the HIV 'parasitic wave' with time. Let $y(\vec{r},t)$ be the resultant of $y_1 + y_2$, that is

$$y(\vec{r},t) = y_1(\vec{r},t) + y_2(\vec{r},t) = a\,\beta\cos\left(\vec{k}\,\beta.\vec{r} - n\beta t - \varepsilon\beta\right) + b\lambda\cos\left(\vec{k}'\lambda.\vec{r} - n'\lambda t - \varepsilon'\lambda\right) \quad (2.3)$$

After a lengthy algebra the superposition of the parasitic wave on the host wave yields the equation below.

$$y = \sqrt{a^2\beta^2 + b^2\lambda^2 + 2\,a\,\beta\,b\,\lambda\cos\begin{pmatrix}(\beta\varepsilon - \varepsilon'\lambda)\\ +(n\beta - n'\lambda)\,t\end{pmatrix}} \times \cos\left((\vec{k}\beta - \vec{k}'\lambda).\vec{r} - n\beta t - E\right) \quad (2.4)$$

$$E = \tan^{-1}\left(\frac{a\beta\sin\beta\varepsilon + b\lambda\sin(\varepsilon'\lambda - (n\beta - n'\lambda)t)}{a\beta\cos\beta\varepsilon + b\lambda\cos(\varepsilon'\lambda - (n\beta - n'\lambda)t)}\right) \quad (2.5)$$

Hence (2.4) is the resultant wave function which describes the superposition of the 'parasitic wave' on the 'host wave'. Equation (2.4) represents a resultant wave equation in which the effects of the constitutive waves are additive in nature. However, without loss of dimension we can recast (2.4) as

$$y = \sqrt{(a^2\beta^2 - b^2\lambda^2) - 2(a\beta - b\lambda)^2\cos\begin{pmatrix}(n\beta - n'\lambda)\,t\\ -(\varepsilon\beta - \varepsilon'\lambda)\end{pmatrix}}\;\cos\left(\vec{k}_c.\vec{r} - (n\beta - n'\lambda)t - E\right) \quad (2.6)$$

Here the wave number and the position vector are 2D in character and respectively given as $\bar{k} = k_x i + k_y$, $\bar{k}' = k'_x i + k'_y$ and $\vec{r} = r\,(\cos\alpha\, i + \sin\alpha\, j)$, where $\alpha = (\varepsilon - \varepsilon'\lambda)$ and eventually $\vec{k}.\vec{r} = (k\beta - k'\lambda)\,r\,(\cos\varphi + \sin\varphi)$, $\alpha = (\varepsilon\beta - \varepsilon'\lambda)$ where $k_x = k_y = k$. However, with the assumption that the effects of the resultant waves are subtractive and with the view that the basic parameters of the 'host wave' are constant with time, that is, $\beta = 1$ and leave its variation for future study, then we get

$$y(\vec{r},t) = \sqrt{(a^2 - b^2\lambda^2) - 2\left(a - b\lambda\right)^2\cos\left((n - n'\lambda)\,t - (\varepsilon - \varepsilon'\lambda\right)}\;\cos\left(\vec{k}_c.\vec{r} - (n - n'\lambda)t - E(t)\right) \quad (2.7)$$

$$E(t) = \tan^{-1}\left(\frac{a\sin\varepsilon + b\lambda\sin\left(\varepsilon'\lambda - (n - n'\lambda)t\right)}{a\cos\varepsilon + b\lambda\cos\left(\varepsilon'\lambda - (n - n'\lambda)t\right)}\right) \quad (2.8)$$

- Equation (2.7) is regarded as the constitutive carrier wave (CCW) necessary for our study. It is the equation that governs the dynamical behaviour of the coexistence of the HIV parasite in the human micro-vascular blood circulating system. It is a corrupt wave function, in which it is only the variation in the intrinsic parameters of the parasitic wave that determines the life span of the physically active system which it describes. This equation describes a propagating carrier wave with non-stationary and frequency dependent amplitude modulated by a spatial oscillating cosine function. Note that a, ε, n and k are assumed to be constant with time in a normal human system, except for some fluctuating factors, e.g. illness, which of course can only alter them slightly and temporarily.

  The wave mechanics of HIV in the Human Blood circulating system is two dimensional (2D) in character since it is a transverse wave, the position vector of the whole blood (particles and fluid) in motion can be represented as $\vec{r} = r(\cos\theta\, i + \sin\theta\, j)$ and hence the motion of the CCW in the human system is constant with respect to the z-axis, hence $\vec{k}_c = (k - k'\lambda)\, i + (k - k'\lambda)\, j$.

- While on interpretation that $\vec{k}_c.\vec{r} = (k - k'\lambda)\, r\,(\cos\varphi + \sin\varphi)$ is the coordinate of two dimensional (2D) position vector, the azimuthal angle $\varphi = \pi - (\varepsilon - \varepsilon'\lambda)$,the total phase angle of the CCW is represented by $E(t)$. By definition, $(n - n'\lambda)$ is the modulation angular frequency, the modulation propagation constant is $(k - k'\lambda)$, the phase difference δ between the two interfering waves is $(\varepsilon - \varepsilon'\lambda)$, and of course we have that the interference term is $2\left(a - b\lambda\right)^2 \cos\left((n - n'\lambda)\,t - (\varepsilon - \varepsilon'\lambda\right)$, while waves out of phase interfere destructively according to $\left(a - b\lambda\right)^2$, however, waves in-phase interfere constructively according to $\left(a + b\lambda\right)^2$.
- Driving forces in anti-phase $(\varepsilon - \varepsilon' = \pm\pi)$ provide full destructive superposition and the minimum possible amplitude; driving forces in phase $(\varepsilon = \varepsilon')$ provides full constructive superposition and maximum possible amplitude.

The total phase angle of the CCW given by (2.7) is not constant with time. The variation as a function of time is

$$\frac{d\,E(t)}{dt} = \left(1 + \left(\frac{a\sin\varepsilon - b\lambda\sin((n - n'\lambda)\,t - \varepsilon'\lambda)}{a\cos\varepsilon - b\lambda\cos((n - n'\lambda)\,t - \varepsilon'\lambda)}\right)^2\right)^{-1} \times \frac{d}{dt}\left(\frac{a\sin\varepsilon - b\lambda\sin((n - n'\lambda)\,t - \varepsilon'\lambda)}{a\cos\varepsilon - b\lambda\cos((n - n'\lambda)\,t - \varepsilon'\lambda)}\right) \qquad (2.9)$$

$$\frac{d\,E(t)}{dt} = \left\{\frac{\left(a\cos\varepsilon - b\lambda\cos((n - n'\lambda)t - \varepsilon'\lambda)\right)^2}{\left(a\cos\varepsilon - b\lambda\cos((n - n'\lambda)t - \varepsilon'\lambda)\right)^2 + \left(a\sin\varepsilon - b\lambda\sin((n - n'\lambda)t - \varepsilon'\lambda)\right)^2}\right\} \times \frac{d}{dt}\left(\frac{a\sin\varepsilon - b\lambda\sin\left((n - n'\lambda)\,t - \varepsilon'\lambda\right)}{a\cos\varepsilon - b\lambda\cos\left((n - n'\lambda)\,t - \varepsilon'\lambda\right)}\right) \qquad (2.10)$$

$$\frac{d\,E(t)}{dt} = -\,Z(t) \qquad (2.11)$$

Where we have introduced a new variable defined by the symbol $Z(t)$ to simplify our work. That is

$$Z(t) = (n - n'\lambda)\left(\frac{b^2\lambda^2 + ab\lambda\cos\left((n - n'\lambda)\,t + (\varepsilon - \varepsilon'\lambda)\right)}{a^2 + b^2\lambda^2 + 2ab\lambda\cos\left((n - n'\lambda)\,t + (\varepsilon - \varepsilon'\lambda)\right)}\right) \qquad (2.12)$$

This is the characteristic angular velocity of the constitutive carrier wave. It has the dimension of *rad./s.* Note that we used the trigonometric identity $\cos(x \pm y) = \cos x\,\cos y \mp \sin x\,\sin y$ to reduce the work. Also for the purpose of further application we may also determine the variation of the characteristic angular velocity of the constitutive carrier wave $Z(t)$ with respect to time. Thus

$$\frac{d\,Z(t)}{dt} = Q(t) = \frac{(n - n'\lambda)^2\left(ab^3\lambda^3 - a^3b\lambda\right)\sin\left((n - n'\lambda)t + (\varepsilon - \varepsilon'\lambda)\right)}{\left(a^2 + b^2\lambda^2 + 2\,ab\lambda\cos\left((n - n'\lambda)t + (\varepsilon - \varepsilon'\lambda)\right)\right)^2} \qquad (2.13)$$

Hence $Q(t)$ is the characteristic group frequency of the CCW and it has the dimension of rad/s^2.

2.1 The Pressure-force Law Obeyed by the CCW in 2D Navier – Stokes Equation

The Navier-Stokes equation can be viewed as an application of Newton's second law, $f = ma$, which states that force is the product of the mass of an object times its acceleration. (Note, we will now be using f to represent forces, not scalar or vector fields). The Navier-Stokes equations are the fundamental partial differentials equations that describe the flow of incompressible fluids. Using the rate of stress and rate of strain tensors, it can be shown that the components of a viscous force f in a non rotating frame are given by the Navier-Stokes equation

$$\rho\left(\frac{\partial u}{\partial t} + u\,.\nabla u\right) = \nabla.\sigma + f \qquad (2.14)$$

Whereρ denotes the density of the fluid and is equivalent to mass, $\frac{\partial u}{\partial t} + u.\nabla u$ is the acceleration and u is velocity, and $\nabla\cdot\sigma + f$ is the total force, with $\nabla\cdot\sigma$ being the shear stress and f being all other forces. The Navier-Stokes equations are always solved together with the continuity equation:

$$\frac{\partial \rho}{\partial t} + \nabla.(\rho u) = 0 \tag{2.15}$$

Now consider the irrotational Navier-Stokes equations in a particular coordinate systems. In Cartesian coordinates with the components of the velocity vector given by $\mathrm{u} = (u, v, w)$, the continuity equation is

$$\left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z}\right) = 0 \tag{2.16}$$

In cylindrical coordinates with the components of the velocity vector given by $\mathrm{u} = (u_r, u_\varphi, u_z)$, the continuity equation is

$$\left(\frac{\partial U_r}{\partial r} + \frac{U_r}{r} + \frac{1}{r}\frac{\partial U_\varphi}{\partial \varphi} + \frac{\partial U_z}{\partial z}\right) = 0 \tag{2.17}$$

In spherical coordinates with the components of the velocity vector given by $\mathrm{u} = (u_r, u_\theta, u_\varphi)$, the continuity equation is

$$\left(\frac{\partial U_r}{\partial r} + \frac{2U_r}{r} + \frac{1}{r}\frac{\partial U_\theta}{\partial \theta} + \frac{U_\theta \cot\theta}{r} + \frac{1}{r\sin\theta}\frac{\partial U_\varphi}{\partial \varphi}\right) = 0 \tag{2.18}$$

We may also write equation (2.13) as

$$\rho\left(\frac{\partial u}{\partial t} + u.\nabla u\right) = -\nabla p + \eta\nabla^2 u + f \tag{2.19}$$

Where p is pressure and η is dynamic viscosity. *Viscosity* is defined as the measure of the resistance of a fluid which is being deformed by the shear stress. The different terms correspond to: (i) the inertial forces (ii), pressure forces (iii), viscous forces and (iv), external forces applied to the fluid. In unidirectional flows such as blood, all nonlinear terms in the Navier-Stokes equations vanish: the convective term $u.\nabla u = 0$.

Navier-Stokes explicitly models changes in the directional velocity using four components: (i) The first of these is $-(u\cdot\nabla)\cdot u$, which is the divergence on a velocity, or in simpler terms, it is how the divergence affects the velocity.(ii) The factor $-\nabla p$ may be thought of as how the particles move as pressure changes, specifically, the tendency to move away from areas of higher pressure.(iii) Next we consider the term $\eta\nabla^2 u$. The two key parts are viscosity (η) and Laplacian ∇^2 . It may be a little hard to make sense of this part, but think of it as the difference between what a particle does and what its neighbours do. (iv) finally we have *f*, which again, is any other forces acting on the substance.

Here, u and p are the time-averaged velocity and pressure respectively. However, in this work we shall only focus on the cylindrical coordinate system since we assume that the Human blood vessels have a similar geometry with that of the cylinder. Now in cylindrical coordinate system, the radial pressure and the angular pressure in Navier-Stokes representation are respectively given by

$$\rho\left\{\frac{\partial U_r}{\partial t} + \left(U_r\frac{\partial U_r}{\partial r} + \frac{U_\varphi}{r}\frac{\partial U_r}{\partial \varphi} + U_z\frac{\partial U_z}{\partial z} - \frac{U_\varphi^2}{r}\right)\right\} = -\frac{\partial P}{\partial r} + \eta\begin{pmatrix}\frac{\partial^2 U_r}{\partial r^2} + \frac{1}{r}\frac{\partial U_r}{\partial r} + \frac{1}{r^2}\frac{\partial^2 U_r}{\partial \varphi^2} - \frac{U_r}{r^2} + \frac{\partial^2 U_r}{\partial z^2} \\ - \frac{2}{r^2}\frac{\partial U_\varphi}{\partial \varphi}\end{pmatrix} + F_r \tag{2.20}$$

$$\rho\left\{\frac{\partial U_\varphi}{\partial t} + \begin{pmatrix}U_r\frac{\partial U_\varphi}{\partial r} + \frac{U_r U_\varphi}{r} + \frac{U_\varphi}{r}\frac{\partial U_\varphi}{\partial \varphi} \\ + U_z\frac{\partial U_z}{\partial z}\end{pmatrix}\right\} = -\frac{1}{r}\frac{\partial P}{\partial \varphi} + \eta\begin{pmatrix}\frac{\partial^2 U_\varphi}{\partial r^2} + \frac{1}{r}\frac{\partial U_\varphi}{\partial r} - \frac{U_\varphi}{r^2} + \frac{1}{r^2}\frac{\partial^2 U_\varphi}{\partial \varphi^2} + \frac{\partial^2 U_\varphi}{\partial z^2} \\ + \frac{2}{r^2}\frac{\partial U_r}{\partial \varphi}\end{pmatrix} + F_\varphi \tag{2.21}$$

Since our work is restricted to 2D we have to ignore the z - axes or assume that the motion of the CCW is constant with respect to the z - axes. We also take the body forces $F_r = F_\varphi = 0$. Consequent upon this the Navier-Stokes equation becomes

$$\rho\left(\frac{\partial u}{\partial t}\right) = -\nabla p + \eta\nabla^2 u + f \tag{2.22}$$

Both equations (2.20) and (2.21) eventually reduces to

$$P_r = \frac{\partial P}{\partial r} = \eta\left(\frac{\partial^2 U_r}{\partial r^2} + \frac{1}{r}\frac{\partial U_r}{\partial r} + \frac{1}{r^2}\frac{\partial^2 U_r}{\partial \varphi^2} - \frac{U_r}{r^2} - \frac{2}{r^2}\frac{\partial U_\varphi}{\partial \varphi}\right) - \rho\left(\frac{\partial U_r}{\partial t}\right) \tag{2.23}$$

$$P_\varphi = \frac{\partial P}{\partial \varphi} = \eta\left(r\frac{\partial^2 U_\varphi}{\partial r^2} + \frac{\partial U_\varphi}{\partial r} - \frac{U_\varphi}{r} + \frac{1}{r}\frac{\partial^2 U_\varphi}{\partial \varphi^2} + \frac{2}{r}\frac{\partial U_r}{\partial \varphi}\right) - \rho\left(r\frac{\partial U_\varphi}{\partial t}\right) \tag{2.24}$$

Thus the bulk pressure of the CCW as it propagates in the human micro-vascular blood circulating system is the addition of the radial pressure and the angular pressure. Hence

$$\nabla P = \left(\frac{\partial P}{\partial r} + \frac{\partial P}{\partial \varphi}\right) = \eta\left(\frac{1}{r}\frac{\partial U_r}{\partial r} + \frac{\partial^2 U_r}{\partial r^2} + \frac{1}{r^2}\frac{\partial^2 U_r}{\partial \varphi^2} - \frac{U_r}{r^2} - \frac{2}{r^2}\frac{\partial U_\varphi}{\partial \varphi} + r\frac{\partial^2 U_\varphi}{\partial r^2} + \frac{\partial U_\varphi}{\partial r} - \frac{U_\varphi}{r} + \right.$$
$$\left.\frac{1}{r}\frac{\partial^2 U_\varphi}{\partial \varphi^2} + \frac{2}{r}\frac{\partial U_r}{\partial \varphi}\right) - \rho\left(\frac{\partial U_r}{\partial t} + r\frac{\partial U_\varphi}{\partial t}\right) \tag{2.25}$$

The reader should note that we have ignored the terms in the brackets of the left hand side of (2.20) and (2.21) since they are equal to zero base on the continuity equation of (2.17) as compare with (2.15). Hence we have two independent pressure gradients, the radial pressure gradient and the angular pressure gradient associated by the propagation of the CCW in the Human micro-vascular blood circulating system. However, if the pressure gradients are zero then $\nabla P = 0$ and (2.25) becomes

$$\eta\left(\frac{1}{r}\frac{\partial U_r}{\partial r} + \frac{\partial^2 U_r}{\partial r^2} + \frac{1}{r^2}\frac{\partial^2 U_r}{\partial \varphi^2} - \frac{U_r}{r^2} - \frac{2}{r^2}\frac{\partial U_\varphi}{\partial \varphi} + r\frac{\partial^2 U_\varphi}{\partial r^2} + \frac{\partial U_\varphi}{\partial r} - \frac{U_\varphi}{r} + \right.$$
$$\left.\frac{1}{r}\frac{\partial^2 U_\varphi}{\partial \varphi^2} + \frac{2}{r}\frac{\partial U_r}{\partial \varphi}\right) - \rho\left(\frac{\partial U_r}{\partial t} + r\frac{\partial U_\varphi}{\partial t}\right) = 0 \tag{2.26}$$

2.2 Determination of the Bulk Velocity U, Radial Velocity U_r and the Angular Velocity U_φ of the CCW

The bulk velocity is related to the constitutive carrier wave (2.7) according to the equation below.

$$U = \frac{\partial y}{\partial t} = \frac{(n-n'\lambda)\,(a-b\lambda)^2 \sin\left((n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)\cos\left((k-k'\lambda)\,r\,(\cos\varphi+\sin\varphi)-(n-n'\lambda)t-E(t)\right)}{\sqrt{\left(a^2-b^2\lambda^2\right)-2(a-b\lambda)^2\cos\left((n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)}} +$$
$$\sqrt{\left(a^2-b^2\lambda^2\right)-2(a-b\lambda)^2\cos\left((n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)} \times$$
$$\left((n-n'\lambda)-Z(t)\right)\sin\left((k-k'\lambda)\,r\,(\cos\varphi+\sin\varphi)-(n-n'\lambda)-E(t)\right) \tag{2.27}$$

The radial velocity and the angular velocity of the CCW as it propagates in the micro-vascular blood circulating system are given by the equation below.

$$U = U\ (r,\ \varphi):\ dU\ = \frac{\partial U}{\partial r}dr\ +\ \frac{\partial U}{\partial \varphi}d\varphi\ :dU\ =\ U_r\ dr\ + U\varphi d\varphi \tag{2.28}$$

$$U_r\ =\frac{\partial U}{\partial r} = -\ \frac{(n-n'\lambda)\left(a-b\lambda\right)^2(k-k'\lambda)\sin\left(\ (n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)}{\sqrt{\left(a^2-b^2\lambda^2\right)-2\left(a-b\lambda\right)^2\cos\ \left((n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)}}\times$$
$$(\cos\varphi+\sin\varphi)\sin\left(\ (k-k'\lambda)\ r\ (\cos\varphi+\sin\varphi)-(n-n'\lambda)t-E(t)\right)+$$
$$\sqrt{\left(a^2-b^2\lambda^2\right)-2\left(a-b\lambda\right)^2\cos\left((n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)}\times\left(\ (n-n'\lambda)-Z(t)\ \right)(k-k'\lambda)\ (\cos\varphi+\sin\varphi)\times$$
$$\cos\left(\ (k-k'\lambda)\ r\ (\cos\varphi+\sin\varphi)-(n-n'\lambda)t-E(t)\right) \tag{2.29}$$

$$U_\varphi\ = \frac{\partial U}{\partial \varphi}\ =-\ \frac{(n-n'\lambda)\left(a-b\lambda\right)^2(k-k'\lambda)\sin\left(\ (n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)}{\sqrt{\left(a^2-b^2\lambda^2\right)-2\left(a-b\lambda\right)^2\cos\ \left((n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)}}\times$$
$$r\ (\cos\varphi-\sin\varphi)\sin\left(\ (k-k'\lambda)\ r\ (\cos\varphi+\sin\varphi)-(n-n'\lambda)t-E(t)\right)+$$
$$\sqrt{\left(a^2-b^2\lambda^2\right)-2\left(a-b\lambda\right)^2\cos\left((n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)}\left(\ (n-n'\lambda)-Z(t)\ \right)\ (k-k'\lambda)\ r\ (\cos\varphi-\sin\varphi)\times$$
$$\cos\left(\ (k-k'\lambda)\ r\ (\cos\varphi+\sin\varphi)-(n-n'\lambda)t-E(t)\right) \tag{2.30}$$

The radial velocity and the angular velocity of the CCW as it propagates in the micro-vascular blood system are related to each other according to the equation below. That is the radial and angular velocities components of the CCW are related to each other by the stream-function given below.

$$U_r\ = \frac{1}{r}\frac{\partial U}{\partial \varphi}\quad ;\ U_\varphi\ =\ -\ \frac{\partial U}{\partial r}$$
(2.31)

$$U_r\ = -\ \frac{(n-n'\lambda)\left(a-b\lambda\right)^2(k-k'\lambda)\sin\left(\ (n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)}{\sqrt{\left(a^2-b^2\lambda^2\right)-2\left(a-b\lambda\right)^2\cos\ \left((n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)}}\times$$
$$(\cos\varphi-\sin\varphi)\sin\left(\ (k-k'\lambda)\ r\ (\cos\varphi+\sin\varphi)-(n-n'\lambda)t-E(t)\ \right)+$$
$$\sqrt{\left(a^2-b^2\lambda^2\right)-2\left(a-b\lambda\right)^2\cos\left((n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)}\left(\ (n-n'\lambda)-Z(t)\ \right)\ (k-k'\lambda)\times$$
$$(\cos\varphi-\sin\varphi)\quad\cos\left(\ (k-k'\lambda)\ r\ (\cos\varphi+\sin\varphi)-(n-n'\lambda)t-E(t)\ \right) \tag{2.32}$$

Thus radial velocity of the constitutive carrier wave U_r has a unit of rad/s. Also

$$U_\varphi\ = \frac{(n-n'\lambda)\left(a-b\lambda\right)^2(k-k'\lambda)\sin\left(\ (n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)}{\sqrt{\left(a^2-b^2\lambda^2\right)-2\left(a-b\lambda\right)^2\cos\ \left((n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)}}\times$$
$$(\cos\varphi+\sin\varphi)\sin\left(\ (k-k'\lambda)\ r\ (\cos\varphi+\sin\varphi)-(n-n'\lambda)t-E(t)\right)-$$
$$\sqrt{\left(a^2-b^2\lambda^2\right)-2\left(a-b\lambda\right)^2\cos\ \left((n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)}\left(\ (n-n'\lambda)-Z(t)\ \right)\ (k-k'\lambda)\times$$
$$(\cos\varphi+\sin\varphi)\times\quad\cos\left(\ (k-k'\lambda)\ r\ (\cos\varphi+\sin\varphi)-(n-n'\lambda)t-E(t)\right) \tag{2.33}$$

Thus the angular velocity of the constitutive carrier wave U_φ has a unit of rad/s.

2.3 Determination of the Latent Wave Characteristics Man (Host) (a , n ε , k)contained in the CCW

Now let us subject the constitutive carrier wave given by equation (2.7) to the 2D constant velocity-pressure gradient of Navier-Stokes equation given by (2.26). The differential equations we have derived for the conservation laws are subject to boundary conditions in order to properly formulate any problem.

After a careful operation with the various derivatives of U with respect to r and φ in the radial and angular pressure equation of (2.26) by applying (2.7), the resulting equation can further be simplified and rearranged by eliminating equal and oppositely related terms. However, we have also imposed the following boundary conditions to reduce the complexity of the resulting equation. Now the boundary conditions require that at, $t = 0$, $\lambda = 0$, and for even and symmetric function $\cos(-\varepsilon) = \cos(\varepsilon)$ while for odd and anti-symmetric function $\sin(-\varepsilon) = -\sin(\varepsilon)$, $\varphi = 0$, $E(t) = \varepsilon$, $Z(t) = Q(t) = 0$.

$$\eta\left\{-\frac{2nak^3\sin(\varepsilon)\sin(kr-\varepsilon)}{\left[1-2\cos(\varepsilon)\right]^{1/2}} - 2\left[1-2\cos(\varepsilon)\right]^{1/2} nak^3\cos(kr-\varepsilon) - \frac{4\left[1-2\cos(\varepsilon)\right]^{1/2} nak\cos(kr-\varepsilon)}{r^2} + \frac{nak^2\sin(\varepsilon)\cos(kr-\varepsilon)}{r\left[1-2\cos(\varepsilon)\right]^{1/2}} + \frac{4nak^2\left[1-2\cos(\varepsilon)\right]^{1/2}\sin(kr-\varepsilon)}{r} + \frac{2nak^3r\sin(\varepsilon)\sin(kr-\varepsilon)}{\left[1-2\cos(\varepsilon)\right]^{1/2}} - 3nak^2\left[1-2\cos(\varepsilon)\right]^{1/2}\sin(kr-\varepsilon) - \frac{nak\left[1-2\cos(\varepsilon)\right]^{1/2}\cos(kr-\varepsilon)}{r}\right\} -$$
$$\rho\left\{\frac{n^2ak\sin^2(\varepsilon)\sin(kr-\varepsilon)}{\left[1-2\cos(\varepsilon)\right]^{3/2}} - \frac{n^2ak\cos(\varepsilon)\sin(kr-\varepsilon)}{\left[1-2\cos(\varepsilon)\right]^{1/2}} - \frac{2n^2ak\sin(\varepsilon)\cos(kr-\varepsilon)}{\left[1-2\cos(\varepsilon)\right]^{1/2}} + n^2ak\left[1-2\cos(\varepsilon)\right]^{1/2}\sin(kr-\varepsilon) + \frac{n^2akr\cos(\varepsilon)\sin(kr-\varepsilon)}{\left[1-2\cos(\varepsilon)\right]^{1/2}} - \frac{n^2akr\sin^2(\varepsilon)\sin(kr-\varepsilon)}{\left[1-2\cos(\varepsilon)\right]^{3/2}} + \frac{2n^2akr\sin(\varepsilon)\cos(kr-\varepsilon)}{\left[1-2\cos(\varepsilon)\right]^{1/2}} + n^2akr\left[1-2\cos(\varepsilon)\right]^{1/2}\sin(kr-\varepsilon)\right\} = 0$$

(2.34)

To make our work easy we may need to adopt the "third world approximation" to linearize (2.34) by removing the term $\left[1-2\cos(\varepsilon)\right]^{\pm n}$. The "third world approximations is the differential minimization of the resulting binomial expansion of a given variable function. The approximations have the advantage of converging results easily and also producing expected minimum value of results. Now the 'third world approximation' states that

$$\left(1+\xi f(\phi)\right)^{\pm n} = \frac{d}{d\phi}\left(1+n\xi f(\phi)+\frac{n(n-1)}{2!}\left(\xi f(\phi)\right)^2+\frac{n(n-1)(n-2)}{3!}\left(\xi f(\phi)\right)^3+\ldots\right) - n\frac{d}{d\phi}\left(\xi f(\phi)\right) \quad (2.35)$$

$$\left[1-2\cos(\varepsilon)\right]^{-3/2} = -15\sin\varepsilon\cos\varepsilon \quad (2.36)$$

$$\left[1-2\cos(\varepsilon)\right]^{-1/2} = -3\sin\varepsilon\cos\varepsilon \quad (2.37)$$

$$\left[1-2\cos(\varepsilon)\right]^{1/2} = \sin\varepsilon\cos\varepsilon \quad (2.38)$$

Equations (2.36), (2.37) and (2.38) can now be substituted into (2.34). After rearrangement we have that

$$\eta\left\{6nak^3r^2\sin^2\varepsilon\cos\varepsilon\sin(kr-\varepsilon) - 2nak^3r^2\sin\varepsilon\cos\varepsilon\cos(kr-\varepsilon) - 4nak\sin\varepsilon\cos\varepsilon\cos(kr-\varepsilon) - 3nak^2r\sin^2\varepsilon\cos\varepsilon\cos(kr-\varepsilon) + 4nak^2r\sin\varepsilon\cos\varepsilon\sin(kr-\varepsilon) - 6nak^3r^3\sin^2\varepsilon\cos\varepsilon\sin(kr-\varepsilon) - 3nak^2r^2\sin\varepsilon\cos\varepsilon\sin(kr-\varepsilon) - nakr\sin\varepsilon\cos\varepsilon\cos(kr-\varepsilon)\right\} -$$
$$\rho\left\{-15n^2akr^2\sin^3\varepsilon\cos\varepsilon\sin(kr-\varepsilon) + 3n^2akr^2\sin\varepsilon\cos^2\varepsilon\sin(kr-\varepsilon) + 6n^2akr^2\sin^2\varepsilon\cos\varepsilon\cos(kr-\varepsilon) + n^2akr^2\sin\varepsilon\cos\varepsilon\sin(kr-\varepsilon) + 3n^2akr^3\sin(\varepsilon)\cos^2(\varepsilon)\sin(kr-\varepsilon) + 15n^2akr^3\sin^3\varepsilon\cos\varepsilon\sin(kr-\varepsilon) - 6n^2akr^3\sin^2\varepsilon\cos\varepsilon\cos(kr-\varepsilon) + n^2akr^3\sin\varepsilon\cos\varepsilon\sin(kr-\varepsilon)\right\} = 0 \quad (2.39)$$

- **Calculation of the phase angle (ε) of the latent Human vibration (host wave)**

From the clinical literature, blood leaves the Human heart at a rate of about 5 litres per minute (0.08333 litres per second or 0.00008333 cubic meters per second) since $1\,m^3 = 1000$ *litres* . Also from clinical literature, it is given that the cross-sectional area A ($A = \pi r^2$) of the Human Aorta is about $3 - 5\,cm^2$ [16]. In this work, we used the maximum value of the radius from the given range which is $5\,cm^2$ ($0.0005\,m^2$). Now from these data $r = 0.01262\,m$ where r is the radius of the Human Aorta assumed to be a circular cylinder. Now, we know from the clinical literature that the elasticity σ of the Human blood is domicile in the red blood cells. Therefore the quantity of blood that leaves the Human heart can be found from the equation below.

$$Quantity(volume) = rate\,(m^3/s) \times time(s) \quad (2.40)$$

$$Quantity(volume) = 0.000083333\,m^3/s \times 1\ s = 8.333 \times 10^{-5}\ m^3 \quad (2.41)$$

Thus the Human heart pumps a volume of $8.333 \times 10^{-5}\ m^3$ or 8.333×10^{-5} cubic meter of blood per second.

Now there are several possible ways of determining the wave characteristics of the host vibration, although, the results obtained may also be different. However, the careful choice we make must be relevant and applicable to the problem under study. Suppose we select our choice from the first, second and the forth terms of the equation with coefficient ρ then we get

$$\begin{pmatrix} -15n^2 a\,k\,r^2 \sin^3\varepsilon \cos\varepsilon + 3n^2 a\,k\,r^2 \sin\varepsilon \cos^2\varepsilon \\ + n^2 a\,k\,r^2 \sin\varepsilon \cos\varepsilon \end{pmatrix} \tan(kr - \varepsilon) = 0 \quad (2.42)$$

$$\left(15\sin^2\varepsilon - 3\cos\varepsilon - 1\right)\tan(kr - \varepsilon) = 0 \quad (2.43)$$

$$\left(15\,\varepsilon^2 - 3\,(1 - \frac{\varepsilon^2}{2})\right) = 1 \quad (2.44)$$

$$\varepsilon = 0.4924\,rad. \quad (2.45)$$

Where we have used the fact that at the critical point, which is at time $t = 0$ the critical value of any time dependent variable at the origin is given by

$$\sin\theta \cong \theta;\ \cos\theta \cong \left(1 - \frac{\theta^2}{2}\right);\ \tan\theta \cong \theta \quad (2.46)$$

- **Calculation of the spatial frequency (k) of the latent Human vibration (host wave)**

Now to determine the spatial frequency or the wave number of the host vibration we can also combine the first four terms of the coefficient of ρ in equation (2.39).

$$-15n^2 a\,k\,r^2 \sin^3\varepsilon \cos\varepsilon \sin(kr - \varepsilon) + 3n^2 a\,k\,r^2 \sin\varepsilon \cos^2\varepsilon \sin(kr - \varepsilon) + 6n^2 a\,k\,r^2 \sin^2\varepsilon \cos\varepsilon \cos(kr - \varepsilon) + n^2 a\,k\,r^2 \sin\varepsilon \cos\varepsilon \sin(kr - \varepsilon) = 0 \quad (2.47)$$

$$-15\sin^3\varepsilon \cos\varepsilon \tan(kr - \varepsilon) + 3\sin\varepsilon \cos^2\varepsilon \tan(kr - \varepsilon) + 6\sin^2\varepsilon \cos\varepsilon + \sin\varepsilon \cos\varepsilon \tan(kr - \varepsilon) = 0 \quad (2.48)$$

$$\left(15\sin^2\varepsilon - 3\cos\varepsilon - 1\right)\tan(kr - \varepsilon) = 6\sin\varepsilon \quad (2.49)$$

$$\left(15\,\varepsilon^2 - 3\left(1 - \frac{\varepsilon^2}{2}\right) - 1\right)\tan(kr - \varepsilon) = 6\sin\varepsilon \quad (2.50)$$

$$\left(30\,\varepsilon^2 - 6 + 3\varepsilon^2 - 2\right)\tan(kr - \varepsilon) = 12\sin\varepsilon \quad (2.51)$$

$$\tan(kr - \varepsilon) = \frac{12(0.4924)}{33(0.4924)^2 - 8} = \frac{5.9088}{0.00110608} = 5342.1091 \quad (2.52)$$

$$(kr - \varepsilon) = \tan^{-1}(5342.1091) = 1.570609 \quad (2.53)$$

$$k = 163.4714\,rad./m \quad (2.54)$$

- **Calculation of the angular frequency (n) of the latent Human vibration (host wave)**

In other to calculate the angular frequency or the angular velocity of the host wave we select the first two terms from coefficient of η (viscosity of blood) and the first four terms from the coefficient of ρ (density of blood).

$$\eta\left(6\,n\,a\,k^3\,r^2\sin^2\varepsilon\cos\varepsilon\sin(kr-\varepsilon) - 2n\,a\,k^3 r^2\sin\varepsilon\cos\varepsilon\cos(kr-\varepsilon)\right) = \rho\left(-15n^2 a\,k\,r^2\sin^3\varepsilon\cos\varepsilon\sin(kr-\varepsilon) + 3n^2 a\,k\,r^2\sin\varepsilon\cos^2\varepsilon\sin(kr-\varepsilon) + 6n^2\,a\,k\,r^2\sin^2\varepsilon\cos\varepsilon\cos(kr-\varepsilon) + n^2 a\,k\,r^2\sin\varepsilon\cos\varepsilon\sin(kr-\varepsilon)\right) \tag{2.55}$$

$$\eta\left(6\,k^2\sin\varepsilon\tan(kr-\varepsilon) - 2k^2\right) = \rho\left(-15\,n\sin^2\varepsilon\tan(kr-\varepsilon) + 3n\cos\varepsilon\tan(kr-\varepsilon) + 6n\sin\varepsilon + n\tan(kr-\varepsilon)\right) \tag{2.56}$$

$$n = \frac{\eta\left(6\sin\varepsilon\tan(kr-\varepsilon) - 2\right)k^2}{\rho\left(-15\sin^2\varepsilon\tan(kr-\varepsilon) + 3\cos\varepsilon\tan(kr-\varepsilon) + 6\sin\varepsilon + \tan(kr-\varepsilon)\right)} \tag{2.57}$$

$$n = \frac{\eta(2.6401806)k^2}{\rho(2.95352)} = \frac{0.004kg/ms \times (2.6401806) \times (163.4714)^2 rad./m^2}{1060\,kg/m^3\,(2.95352)} = 0.09014\,rad./s \tag{2.58}$$

- **Calculation of the amplitude (a) of the latent Human vibration (host wave)**

It is not very possible to calculate the amplitude or the maximum displacement a of the host wave from the available equation (2.39). As a result, we are going to use a slightly different approach to calculate it. Now, the radial acceleration has a unit of $rad./s^2$ and the angular acceleration has a unit of m/s^2. These two concepts can be verified from the density ρ part of (2.39) respectively so that the units are at variant with one another. However, we are going to calculate the amplitude from the radial acceleration. Now, if we multiply the radial acceleration by mass m then the result is radial force which produces a change in the motion of the CCW along the radius of the cylindrical blood vessels. The radial force will cause a change in the elasticity μ of the blood which is stored in the red blood cell. Accordingly, we shall select the first four terms in the coefficient of ρ (density) in (2.39) that has no radial term so that the equation becomes

$$m\left(\frac{\partial U_r}{\partial t}\right) = \mu \tag{2.59}$$

$$m\left\{\frac{n^2 a\,k\sin^2(\varepsilon)\sin(kr-\varepsilon)}{\left|1-2\cos(\varepsilon)\right|^{3/2}} - \frac{n^2 a\,k\cos(\varepsilon)\sin(kr-\varepsilon)}{\left|1-2\cos(\varepsilon)\right|^{1/2}} + n^2 a\,k\left[1-2\cos(\varepsilon)\right]^{1/2}\sin(kr-\varepsilon) - \frac{2n^2\,a\,k\sin(\varepsilon)\cos(kr-\varepsilon)}{\left[1-2\cos(\varepsilon)\right]^{1/2}}\right\} = \mu \tag{2.60}$$

$$m\left\{-15n^2 a\,k\sin^3\varepsilon\cos\varepsilon\sin(kr-\varepsilon) + 3n^2 a\,k\sin\varepsilon\cos^2\varepsilon\sin(kr-\varepsilon) + 6n^2\,a\,k\sin^2\varepsilon\cos\varepsilon\cos(kr-\varepsilon) + n^2 a\,k\sin\varepsilon\cos\varepsilon\sin(kr-\varepsilon)\right\} = \mu \tag{2.61}$$

$$m\{-15\sin^3(0.4924)\cos 0.4924)\sin(1.5706) + 3\sin(0.4924)\cos^2(0.4924)\sin(1.5706) +$$
$$6\sin^2(0.4924)\cos(0.4924)\cos(1.5706) + \sin(0.4924)\cos(0.4924)\sin(1.5706)\}n^2 a\, k = \mu \quad (2.62)$$

$$m\{-2.47164 + 1.79166 + 1.123408 + 0.679608\}n^2 a\, k = \mu \quad (2.63)$$

$$a = \frac{\mu}{mn^2 k\,(1.123036)} = \frac{\mu}{\rho V n^2 k\,(1.123036)} \quad (2.64)$$

$$a = \frac{6.92\times 10^{-7}\, kg s^{-2}}{1060 kg m^{-3}\times 8.333\times 10^{-5}\, m^3 \times (0.09014)^2\, s^{-2}\times 163.4714\, m^{-1}\times(1.123036)} \quad (2.65)$$

$$a = 5.252\times 10^{-6}\, m \quad (2.66)$$

The reader should note that we have also used the critical value equations as stipulated by (2.46).

2.4. Determination of the Latent Wave Characteristics HIV/AIDS (b, n', ε', k') and the Raising Multiplier λ contained in the CCW

Let us now determine the basic parameters of the ‘parasitic wave’ which were initially not known before the interference from the calculated values of the resident ‘host wave’ using the below method. We can do this by understanding that the gradual depletion in the physical vibrating parameters of the Host system would mean that after a sufficiently long period of time all the active constituents of the resident ‘host wave’ would have been completely attenuated and the residual of the constituents CCW is the predominance of the destructive influence of the ‘parasitic wave’. On the basis of these arguments, we can now write as follows.

$$\left.\begin{aligned} a-b\lambda=0 &\Rightarrow 5.252\times 10^{-6} = b\lambda \\ n-n'\lambda=0 &\Rightarrow 0.09014 = n'\lambda \\ \varepsilon-\varepsilon'\lambda=0 &\Rightarrow 0.4924 = \varepsilon'\lambda \\ k-k'\lambda=0 &\Rightarrow 163.4714 = k'\lambda \end{aligned}\right\} \quad (2.67)$$

Upon dividing the sets of relations in (2.67) with one another with the view to eliminating λ we get

$$\left.\begin{aligned} &5.826492\times 10^{-5}\, n' = b \\ &1.066612\times 10^{-5}\, \varepsilon' = b \\ &3.21279\times 10^{-8}\, k' = b \\ &0.1830625\, \varepsilon' = n' \\ &0.00055141\, k' = n' \\ &0.00301214\, k' = \varepsilon' \end{aligned}\right\} \quad (2.68)$$

Suppose we equate the forth and the fifth terms of (2.68), then based on simple proportion rule it shows that

$$k' = 0.1831\, rad./m : \ \varepsilon' = 0.0005514\, rad. :$$
$$n' = 0.0001009\, rad./s : \ b = 5.881\times 10^{-9}\, m \quad (2.69)$$

Any of these values of the ‘parasitic wave’ shall produce a corresponding value of lambda $\lambda_{\max} = 892$ upon substituting it into (2.67). Hence the interval of the multiplier is $0 \le \lambda \le 892$.

2.5 Interception of Electromagnetic Wave with the 2D Navier-Stokes Equation

Now let us intercept the pressure gradient equation (2.25) responsible for the propagation of the CCW in the Human micro-vascular blood circulating system by an electromagnetic EM wave or radiation. However, the nature of the EM radiation should also be two-dimensional so that it can easily be applied to solve the 2D Navier-Stokes equation.

Let us assume that the external intercepting EM radiation or force be given by

$$\vec{E} = 2E_0 \sin(\vec{k}\,.\,\vec{r} - \omega t - \theta) \quad (2.70)$$

Where we have defined the wave number as a 2D vector of the form $\vec{k} = k_x i + k_y j$, and the position vector of any quantum particle of the EM wave as having 2D coordinate $\vec{r} = \cos\varphi i + \sin\varphi j$ and we get that the product

$$\vec{k}.\vec{r} = (k_x i + k_y j).r(\cos\varphi i + \sin\varphi j) .= k_x r\cos\varphi + k_y r\sin\varphi = k\, r(\cos\varphi + \sin\varphi) \tag{2.71}$$

$$\vec{E} = 2E_0 \sin\left(k.r(\cos\varphi + \sin\varphi - \omega t - \theta\right) \tag{2.72}$$

The displacement of the EM wave $\vec{E}$ comprises of the amplitude E_0 , wave number or spatial frequency k , radial distance expected to travel by the EM wave r , the angular frequency ω , the phase angle θ and the total time of exposure t , and where $\varphi = \pi - (\varepsilon - \varepsilon'\lambda)$. Thus the radial distance has its own independent angular displacement. Now let us equate the EM wave with the 2D Navier-Stokes equation.

$$\nabla P = 2E_0 \sin\left(k.r(\cos\varphi + \sin\varphi) - \omega t - \theta\right) \tag{2.73}$$

$$\eta\left(r\frac{\partial^2 U}{\partial r^2} + \frac{\partial^2 U}{\partial r^2} + \frac{1}{r^2}\frac{\partial U}{\partial r} + \frac{1}{r}\frac{\partial U}{\partial r} + \frac{\partial U}{\partial r} + \frac{1}{r^2}\frac{\partial^2 U}{\partial \varphi^2} + \frac{1}{r}\frac{\partial^2 U}{\partial \varphi^2} - \frac{2}{r^2}\frac{\partial U}{\partial \varphi} - \frac{1}{r^3}\frac{\partial U}{\partial \varphi} + \frac{2}{r}\frac{\partial U}{\partial \varphi}\right) -$$

$$\rho\left(\frac{\partial U}{\partial t} + r\frac{\partial U}{\partial t}\right) = 2E_0 \sin\left(k.r(\cos\varphi + \sin\varphi) - \omega t - \theta\right) \tag{2.74}$$

Equation (2.74) is a second order inhomogeneous differential equation whose general solution is expected to have both complementary function $CF\ (y_C)$ and particular integral $PI\ (y_p)$.

2.6 Determination of the Complementary Function (CF) of the 2D Navier-Stokes Equation

Now to solve for the complementary function we assume that the 2D Navier-Stokes equation is equal to zero and after that we disengage the equation to become

$$\eta\left(r\frac{\partial^2 U}{\partial r^2} + \frac{\partial^2 U}{\partial r^2} + \frac{1}{r^2}\frac{\partial U}{\partial r} + \frac{1}{r}\frac{\partial U}{\partial r} + \frac{\partial U}{\partial r}\right) + \eta\left(\frac{1}{r^2}\frac{\partial^2 U}{\partial \varphi^2} + \frac{1}{r}\frac{\partial^2 U}{\partial \varphi^2} - \frac{2}{r^2}\frac{\partial U}{\partial \varphi} - \frac{1}{r^3}\frac{\partial U}{\partial \varphi} + \frac{2}{r}\frac{\partial U}{\partial \varphi}\right) -$$

$$\rho\left(\frac{\partial U}{\partial t} + r\frac{\partial U}{\partial t}\right) = 0 \tag{2.75}$$

Now we invoke the method of separable variables to make the function independent of one another. Hence let us assume that a solution U to the second order differential equation (2.75) is of the form $y_C = U$, that is

$$U = R(r)\theta(\varphi)T(t) \tag{2.76}$$

Where R a function of only r , θ is a function of only φ and T is a function of only t .

$$\eta\left(r\frac{d^2R}{dr^2}\theta T + \frac{d^2R}{dr^2}\theta T + \frac{1}{r^2}\frac{dR}{dr}\theta T + \frac{1}{r}\frac{dR}{dr}\theta T + \frac{dR}{dr}\theta T\right) +$$

$$\eta\left(\frac{1}{r^2}\frac{d^2\theta}{d\varphi^2}RT + \frac{1}{r}\frac{d^2\theta}{d\varphi^2}RT + \frac{2}{r}\frac{d\theta}{d\varphi}RT - \frac{1}{r^3}\frac{d\theta}{d\varphi}RT - \frac{2}{r^2}\frac{d\theta}{d\varphi}RT\right) - \rho\left(\frac{dT}{dt}\theta R + r\frac{dT}{dt}\theta R\right) = 0 \tag{2.77}$$

Now that we have done the substitution we can now re-divide through (2.77) by $R\,\theta\,T$.

$$\eta\left(\frac{r}{R}\frac{d^2R}{dr^2}+\frac{1}{R}\frac{d^2R}{dr^2}+\frac{1}{Rr^2}\frac{dR}{dr}+\frac{1}{Rr}\frac{dR}{dr}+\frac{1}{R}\frac{dR}{dr}\right)+$$

$$\eta\left(\frac{1}{r^2\theta}\frac{d^2\theta}{d\varphi^2}+\frac{1}{r\theta}\frac{d^2\theta}{d\varphi^2}+\frac{2}{r\theta}\frac{d\theta}{d\varphi}-\frac{1}{r^3\theta}\frac{d\theta}{d\varphi}-\frac{2}{r^2\theta}\frac{d\theta}{d\varphi}\right)-\rho\left(\frac{1}{T}\frac{dT}{dt}+\frac{r}{T}\frac{dT}{dt}\right)=0 \quad (2.78)$$

Since the function in (2.78) are independent of one another we can simply equate them separately to some constant say: ζ, ξ and ϑ respectively. Accordingly, this condition will yield

$$\eta\left(\frac{r}{R}\frac{d^2R}{dr^2}+\frac{1}{R}\frac{d^2R}{dr^2}+\frac{1}{Rr^2}\frac{dR}{dr}+\frac{1}{Rr}\frac{dR}{dr}+\frac{1}{R}\frac{dR}{dr}\right)=-\zeta \quad (2.79)$$

$$\eta\left(\frac{1}{r^2\theta}\frac{d^2\theta}{d\varphi^2}+\frac{1}{r\theta}\frac{d^2\theta}{d\varphi^2}+\frac{2}{r\theta}\frac{d\theta}{d\varphi}-\frac{1}{r^3\theta}\frac{d\theta}{d\varphi}-\frac{2}{r^2\theta}\frac{d\theta}{d\varphi}\right)=-\xi \quad (2.80)$$

$$\rho\left(\frac{1}{T}\frac{dT}{dt}+\frac{r}{T}\frac{dT}{dt}\right)=\vartheta \quad (2.81)$$

Now let us use some simple algebra to simplify (2.79). When this is carefully done the result is as follows.

$$\left(\frac{d^2R}{dr^2}+\left(\frac{1+r+r^2}{r^2(r+1)}\right)\frac{dR}{dr}+\left(\frac{\zeta}{\eta(r+1)}\right)R\right)=0 \quad (2.82)$$

Equation (2.82) can be solved by using any known and applicable method for solving 2D order homogeneous differential equation. However, any intended applicable method should take cognizance of the fact that the coefficients are also functions of the variable R .The solution is given as

$$R=\frac{1}{\sqrt{(r+1)}}\,e^{\frac{1}{2r}}\left(C_1\exp\left[\sqrt{\left(\frac{\zeta}{\eta(r+1)}-\left(\frac{3r^4+7r^3+11r^2+6r+1}{4(r^3+r^2)^2}\right)\right)}\,r\right]\right)+$$

$$\left(C_2\exp\left[-\sqrt{\left(\frac{\zeta}{\eta(r+1)}-\left(\frac{3r^4+7r^3+11r^2+6r+1}{4(r^3+r^2)^2}\right)\right)}\,r\right]\right) \quad (2.83)$$

Also from equation (2.80) after a careful rearrangement we get

$$\frac{d^2\theta}{d\varphi^2}+\left(\frac{2r^2-2r-1}{(r^2+r)}\right)\frac{d\theta}{d\varphi}+\left(\frac{r^2\xi}{\eta(r+1)}\right)\theta=0 \quad (2.84)$$

We may use a different approach but similar in principle to the one above since the coefficients are not connected to the variables θ and φ . Thus we can solve (2.84) directly by quadratic method.

$$\theta = \exp\left(-\left(\frac{2r^2-2r-1}{2(r^2+1)}\right)\varphi\right) \times \left\{C_3 \cos\left(\frac{1}{2}\sqrt{\left(\frac{2r^2-2r-1}{(r^2+1)}\right)^2 - 4\left(\frac{r^2\xi}{\eta(r+1)}\right)}\right)\varphi + C_4 \sin\left(\frac{1}{2}\sqrt{\left(\frac{2r^2-2r-1}{(r^2+1)}\right)^2 - 4\left(\frac{r^2\xi}{\eta(r+1)}\right)}\right)\varphi\right\} \quad (2.85)$$

Finally, we recall equation (2.81) and also with further simplification and rearrangement we get.

$$\left(\frac{dT}{dt} + r\,\frac{dT}{dt}\right) - \frac{T\vartheta}{\rho} = 0 \quad (2.86)$$

The solution to (2.86) is trivial and very direct since the coefficients are also not connected to the variables T and t. Thus we can solve (2.86) directly.

$$T = \exp\left(\frac{\vartheta}{\rho(1+r)}\,t\right) + C_5 \quad (2.87)$$

Thus the complementary function y_c which is given by the general solution (2.76) can now be found by direct substitution of (2.83), (2.85) and (2.87) into (2.76). The substitution will yield

$$U(r,\varphi,t) = \frac{1}{\sqrt{(r+1)}}\,e^{\frac{1}{2r}}\left(C_1 \exp\left[\sqrt{\left(\frac{\zeta}{\eta(r+1)} - \left(\frac{3r^4+7r^3+11r^2+6r+1}{4(r^3+r^2)^2}\right)\right)}\;r\right]\right) + \left(C_2 \exp\left[-\sqrt{\left(\frac{\zeta}{\eta(r+1)} - \left(\frac{3r^4+7r^3+11r^2+6r+1}{4(r^3+r^2)^2}\right)\right)}\;r\right]\right) \times \exp\left(-\left(\frac{2r^2-2r-1}{2(r^2+1)}\right)\varphi\right) \times$$
$$\times\left\{C_3 \cos\left(\frac{1}{2}\sqrt{\left(\frac{2r^2-2r-1}{(r^2+1)}\right)^2 - 4\left(\frac{r^2\xi}{\eta(r+1)}\right)}\right)\varphi + C_4 \sin\left(\frac{1}{2}\sqrt{\left(\frac{2r^2-2r-1}{(r^2+1)}\right)^2 - 4\left(\frac{r^2\xi}{\eta(r+1)}\right)}\right)\varphi\right\} \times \left\{\exp\left(\frac{\vartheta}{\rho(1+r)}\,t\right) + C_5\right\} \quad (2.88)$$

Now let $U(r,\varphi,t)$ be the steady state time at any point $P(r,\varphi,t)$ which is satisfied by $U(r,\varphi,t)$. The boundary conditions are $U(r,\varphi,t) = 0$ when, $r=0$, $\varphi=0$ and $t=0$. That is, most generally, $U(0,0,0) = 0$ as a result

$$0 = \left(C_1 + C_2\right) \times \left(C_3 + C_4\right) \times \left(1 + C_5\right) \quad (2.89)$$

$$C_1 = -C_2 = A;\quad C_3 = -C_4 = B\;;\quad C_5 = -1. \quad (2.90)$$

$$U(r,\varphi,t) = \frac{1}{\sqrt{(r+1)}}\, e^{\frac{1}{2r}}\, A \left\{ \exp\left(\sqrt{\left(\frac{\gamma}{\eta(r+1)} - \left(\frac{3r^4+7r^3+11r^2+6r+1}{4(r^3+r^2)^2} \right) \right)}\; r \right) + \right.$$

$$\left. \exp\left(-\sqrt{\left(\frac{\gamma}{\eta(r+1)} - \left(\frac{3r^4+7r^3+11r^2+6r+1}{4(r^3+r^2)^2} \right) \right)}\; r \right) \right\} \times$$

$$B \exp\left(-\left(\frac{2r^2-2r-1}{2(r^2+1)} \right) \varphi \right) \times$$

$$\left\{ \cos\left(\frac{1}{2} \sqrt{\left(\frac{2r^2-2r-1}{(r^2+1)} \right)^2 - 4\left(\frac{r^2\gamma}{\eta(r+1)} \right)} \right) \varphi + \right.$$

$$\left. \sin\left(\frac{1}{2} \sqrt{\left(\frac{2r^2-2r-1}{(r^2+1)} \right)^2 - 4\left(\frac{r^2\gamma}{\eta(r+1)} \right)} \right) \varphi \right\} \times$$

$$\left(\exp\left(\frac{\gamma}{\rho(1+r)}\, t \right) - 1 \right)$$

(2.91)

Let us use some method of approximation to minimize the first two terms in the right side of (2.91).

$$\frac{1}{\sqrt{(r+1)}} = \frac{d}{dr}\left(\frac{1}{\sqrt{(r+1)}} \right) = \frac{d}{dr}(1+r)^{-1/2} = \frac{d}{dr}\left(1 - \frac{r}{2} \right) = -\frac{1}{2} \qquad (2.92)$$

$$e^{\frac{1}{2r}} = \left(1 + \frac{1}{2r} \right) = 1 \qquad \text{(for large } r\text{)} \qquad (2.93)$$

$$U(r,\varphi,t) = A\left(-\frac{1}{2} \right) \left\{ \exp\left(\sqrt{\left(\frac{\gamma}{\eta(r+1)} - \left(\frac{3r^4+7r^3+11r^2+6r+1}{4(r^3+r^2)^2} \right) \right)}\; r \right) + \right.$$

$$\left. \exp\left(-\sqrt{\left(\frac{\gamma}{\eta(r+1)} - \left(\frac{3r^4+7r^3+11r^2+6r+1}{4(r^3+r^2)^2} \right) \right)}\; r \right) \right\} \times \exp\left(-\left(\frac{2r^2-2r-1}{2(r^2+1)} \right) \varphi \right) \times$$

$$\left\{ \cos\left(\frac{1}{2} \sqrt{\left(\frac{2r^2-2r-1}{(r^2+1)} \right)^2 - 4\left(\frac{r^2\gamma}{\eta(r+1)} \right)} \right) \varphi + \sin\left(\frac{1}{2} \sqrt{\left(\frac{2r^2-2r-1}{(r^2+1)} \right)^2 - 4\left(\frac{r^2\gamma}{\eta(r+1)} \right)} \right) \varphi \right\} \times$$

$$\left(\exp\left(\frac{\gamma}{\rho(1+r)}\, t \right) - 1 \right) \qquad (2.94)$$

Also note that for large value of r, terms like $\left(\frac{2r^2-2r-1}{2(r^2+1)} \right) = \left(\frac{2r^2(1-2/r-1/r^2}{2r^2\,(1+1/r^2)} \right) \approx 1$.

$$U(r,\varphi,t) = A\left(-\frac{1}{2}\right)\left\{\exp\left(\sqrt{\left(\frac{\gamma}{\eta(r+1)}-1\right)}\,r\right)+\exp\left(-\sqrt{\left(\frac{\gamma}{\eta(r+1)}-1\right)}\,r\right)\right\}\times B\exp(-\varphi)\times$$
$$\left\{\cos\left(\frac{1}{2}\sqrt{1-4\left(\frac{r^2\gamma}{\eta(r+1)}\right)}\right)\varphi+\sin\left(\frac{1}{2}\sqrt{1-4\left(\frac{r^2\gamma}{\eta(r+1)}\right)}\right)\varphi\right\}\times\left(\exp\left(\frac{\gamma}{\rho(1+r)}t\right)-1\right) \tag{2.95}$$

Basically we have succeeded in reducing the initial six constants of integration to two, which is A and B. However, from the nature of the problem under investigation the amplitude must be equal to one another $A=B$ since $C_1=-C_2$. The reader should note that we did not bother to use A^2 if $A=B$ but just A. Hence, by applying hyperbolic function we get

$$U(r,\varphi,t) = 2A\left(-\frac{1}{2}\right)\cosh\left(\sqrt{\left(\frac{\zeta-\eta(r+1)}{\eta(r+1)}\right)}\,r\right)\times\exp\left(-\varphi\right)\times\left\{\exp\left(\frac{\vartheta}{\rho(1+r)}t\right)-1\right\}\times$$
$$\left\{\cos\left(\frac{1}{2}\sqrt{\left(\frac{\eta(r+1)-4r^2\xi}{\eta(r+1)}\right)}\right)\varphi+\sin\left(\frac{1}{2}\sqrt{\left(\frac{\eta(r+1)-4r^2\xi}{\eta(r+1)}\right)}\right)\varphi\right\} \tag{2.96}$$

Now let us try to eliminate the constants ζ, ξ and ϑ which we have compulsorily introduced at the beginning of the solution. This can be done by simply comparing equation (2.96) with the constitutive carrier wave CCW given by (2.7). The comparison is meaningful and tolerable since it is the equation of motion of the constitutive carrier wave that is under study. From the comparison it can be argued that

$$A = \sqrt{\left(a^2-b^2\lambda^2\right)-2\left(a-b\lambda\right)^2\cos\left((n-n'\lambda)\,t-(\varepsilon-\varepsilon'\lambda)\right)} \tag{2.97}$$

$$\left(\frac{\zeta-\eta(r+1)}{\eta(r+1)}\right) = (k-k'\lambda)\,r\,(\cos\varphi+\sin\varphi) \Rightarrow \zeta = \eta(r+1)(k-k'\lambda)\,r\,(\cos\varphi+\sin\varphi)+\eta(r+1) \tag{2.98}$$

$$\left(\frac{r^2\xi}{\eta(r+1)}\right) = (k-k'\lambda)\,r \Rightarrow r^2\xi = \eta(r+1)\,(k-k'\lambda)\,r \Rightarrow \xi = \frac{\eta(r+1)(k-k'\lambda)}{r} \tag{2.99}$$

$$\left(\frac{\vartheta}{\rho(1+r)}\right) = (n-n'\lambda) \Rightarrow \vartheta = \rho(1+r)\,(n-n'\lambda) \tag{2.100}$$

Now by substituting (2.87) – (2.100), that is the values of A, ζ, ξ and ϑ into equation (2.96) we shall get

$$U(r,\varphi,t) = \sqrt{\left(a^2-b^2\lambda^2\right)-2\left(a-b\lambda\right)^2\cos\left((n-n'\lambda)\,t-(\varepsilon-\varepsilon'\lambda)\right)}\times\exp(-\varphi)\times\left\{1-\exp\left((n-n'\lambda)\,t\right)\right\}\times$$
$$\cosh\left(\sqrt{(k-k'\lambda)\,r\,(\cos\varphi+\sin\varphi)}\;r\right)\times\left\{\cos\left(\frac{1}{2}\sqrt{(1-4(k-k'\lambda)\,r)}\;\varphi\right)+\right.$$
$$\left.\sin\left(\frac{1}{2}\sqrt{(1-4(k-k'\lambda)\,r)}\;\varphi\right)\right\} \tag{2.101}$$

However, the exponential part of the velocity-pressure gradient solution of the CCW may impose complications particularly as the power index becomes very large. As a result there is need for us to expand it in power series, that is

$$e^{x} = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots \quad (2.102)$$

$$\exp\left((n - n'\lambda)\, t\right) = e^{(n-n'\lambda)\, t} = 1 + (n - n'\lambda)\, t \quad (2.103)$$

Where we have neglected higher powers of x in the expansion. Hence

$$U(r,\varphi,t) = \sqrt{\left(a^2 - b^2\lambda^2\right) - 2\left(a - b\lambda\right)^2 \cos\left((n - n'\lambda)\, t - (\varepsilon - \varepsilon'\lambda)\right)} \times \exp(-\varphi) \times$$
$$\left\{ -\exp\left((n - n'\lambda)\, t\right)\right\} \times$$
$$\cosh\left(\sqrt{\left(k - k'\lambda\right) r\,(\cos\varphi + \sin\varphi)}\;\, r\right) \times \left\{ \cos\left(\frac{1}{2}\sqrt{\left(1 - 4(k - k'\lambda)\, r\right)}\;\varphi\right) + \right.$$
$$\left. \sin\left(\frac{1}{2}\sqrt{\left(1 - 4(k - k'\lambda)\, r\right)}\;\varphi\right)\right\} \quad (2.104)$$

Thus equation (2.104) is the complementary function y_c of the 2D homogeneous Navier-Stokes equation. The unit is metres m . The azimuthal angle φ is given by $\varphi = \pi - (\varepsilon - \varepsilon'\lambda)$ and $r = 0.01262\, m$. We want to state that the values of the square root terms are sometimes imaginary and in the circumstance where they are imaginary, we used the absolute values.

2.7 Calculation of the Particular Integral PI

Now to solve for the **particular integral** PI we assume that the 2D Navier-Stokes equation is not equal to zero but equal to the assumed applied EM wave. For the particular integral we assume a trial wave of the form

$$y = e^{-\omega t}\left(A\cos\left(\vec{k}'.\vec{r} - \omega t - \theta\right) + B\sin\left(\vec{k}'.\vec{r} - \omega t - \theta\right)\right) \quad (2.105)$$

$$y = e^{-\omega t}\left(A\cos\left(k\,.\,r\,(\cos\varphi + \sin\varphi) - \omega t - \theta\right) + B\sin\left(k\,.\,r\,(\cos\varphi + \sin\varphi) - \omega t - \theta\right)\right) \quad (2.106)$$

Now let us subject the trial wave function to solve the 2D inhomogeneous Navier-Stokes equation. The first operation is to determine the bulk velocity or the average velocity of the trial wave function. This can be found from the equation below.

$$U = \frac{\partial y}{\partial t} = -\omega e^{-\omega t}\left(A\cos\left(k.r(\cos\varphi + \sin\varphi) - \omega t - \varphi\right) + B\sin\left(k.r\,(\cos\varphi + \sin\varphi) - \omega t - \varphi\right)\right) +$$
$$\omega e^{-\omega t}\left(A\sin\left(k.r\,(\cos\varphi + \sin\varphi) - \omega t - \varphi\right) - B\cos\left(k.r\,(\cos\varphi + \sin\varphi) - \omega t - \varphi\right)\right) \quad (2.107)$$

All these sets of equations emanating from the action of (2.107) when substituted into (2.74) may be very difficult to handle at the same time. As a result we need to do some approximation in other to limit the space of our work and also to minimize the chance of running into unnecessary error during computation. Now we would like to consider a situation when the radial distance is large then most of the terms in the resulting equation will go to zero. Also for the amplitude of the interception of the EM wave with CCW to be maximum, the azimuthal angle $\varphi = 0$.

$$
\begin{aligned}
&\eta\Big\{ -k^2 r e^{-\omega t} A\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) - k^2 r e^{-\omega t} B\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\\
&- k^2 e^{-\omega t} A\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) - k^2 e^{-\omega t} B\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\\
&- k\, e^{-\omega t} A\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) + k\, e^{-\omega t} B\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\\
&+ \omega k^2 e^{-\omega t} A\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) + \omega k^2 e^{-\omega t} B\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\\
&- \omega k^2 e^{-\omega t} A\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) + \omega k^2 e^{-\omega t} B\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\\
&- \omega k\, e^{-\omega t} A\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) + \omega k^2 r e^{-\omega t} A\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\\
&+ \omega k\, e^{-\omega t} B\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) + \omega k^2 r e^{-\omega t} B\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\\
&- \omega k\, e^{-\omega t} A\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) - \omega k^2 r e^{-\omega t} A\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\\
&- \omega k\, e^{-\omega t} B\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) + \omega k^2 r e^{-\omega t} B\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\\
&+ 2\omega k\, e^{-\omega t} A\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) - 2\omega k\, e^{-\omega t} B\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\\
&+ 2\omega k\, e^{-\omega t} A\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) + 2\omega k\, e^{-\omega t} B\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\Big\}\\
&- \rho\Big\{ -2\omega^2 e^{-\omega t} A\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) + 2\omega^2 e^{-\omega t} B\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\\
&\quad -2\omega^2 r e^{-\omega t} A\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) + 2\omega^2 r e^{-\omega t} B\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\Big\}
\end{aligned}
\tag{2.108}
$$

Again let us discuss some possibilities associated with (2.108) since we know that stochastic or random variables are bound to come into the differential equation thereby creating inconsistent units.

Case1: The first 6 terms have the unit of m^{-1} and m^{-2} such that even if we multiply it by the unit of the dynamic viscosity η which is $kg\,m^{-1}s^{-1}$ we may still have irregular combination of units.

Case 2: The 7th, 8th, 9th and 10th terms have a units of $m^{-2}s^{-1}$ so that when we multiply it by the unit of the dynamic viscosity η which is $kg\,m^{-1}s^{-1}$ we get $kg\,m^{-3}s^{-2}$ and this unit corresponds with the first two terms of the density part.

Case 3: The 11th – 22nd terms have a units of $m^{-1}s^{-1}$ so that when we multiply it by the unit of the dynamic viscosity η which is $kg\,m^{-1}s^{-1}$ we get $kg\,m^{-2}s^{-2}$ and this unit does not correspond with the unit of the rest two terms of the density part which is $kg\,m^{-3}s^{-1}$.

Generally, with these cases at hand it will be justified to work with only case 2 since the applied electromagnetic EM radiation will not depend on the radial distance associated with the Human blood circulating system.

$$
\begin{aligned}
&\eta\Big\{ \omega k^2 e^{-\omega t} A\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) + \omega k^2 e^{-\omega t} B\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\\
&- \omega k^2 e^{-\omega t} A\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) + \omega k^2 e^{-\omega t} B\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\Big\}\\
&- \rho\Big\{ -2\omega^2 e^{-\omega t} A\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) + 2\omega^2 e^{-\omega t} B\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\\
&\Big\} = 2E_0\sin\left(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta\right)
\end{aligned}
\tag{2.109}
$$

$$
\begin{aligned}
&\Big\{ \omega\eta k^2 e^{-\omega t} A + (\omega\eta k^2 e^{-\omega t} - 2\rho\,\omega^2 e^{-\omega t})B \Big\}\cos(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta) +\\
&\Big\{ \omega\eta k^2 e^{-\omega t} B - (\omega\eta k^2 e^{-\omega t} - 2\rho\,\omega^2 e^{-\omega t})A \Big\}\sin(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta)\\
&= 2E_0\sin\left(k.r(\cos\varphi+\sin\varphi)-\omega t-\theta\right)
\end{aligned}
\tag{2.110}
$$

Suppose we now equate coefficients of like terms on either side of the equation (2.110) to one another, then

$$\left\{ \omega\ \eta\ k^2\ e^{-\omega t}\ A + (\omega\ \eta\ k^2\ e^{-\omega t} - 2\rho\ \omega^2\ e^{-\omega t})\ B \right\} = 0 \tag{2.111}$$

$$\left\{ \omega\ \eta\ k^2\ e^{-\omega t}\ B - (\omega\ \eta\ k^2\ e^{-\omega t} - 2\rho\ \omega^2\ e^{-\omega t})\ A \right\} = 2E_0 \tag{2.112}$$

We have from (2.111) and (2.112) respectively that by making A and B the change of the subject formula, then

$$A = -\frac{\left(\eta k^2 - 2\rho\omega\right)}{2\left(\rho^2\omega^3 - \rho\eta\,\omega^2 k^2\right)e^{-\omega t}}E_0 \tag{2.113}$$

$$B = \frac{\eta k^2}{2\left(\rho^2\omega^3 - \rho\eta\,\omega^2 k^2\right)e^{-\omega t}}E_0 \tag{2.114}$$

$$y_P = \frac{\eta k^2}{2\left(\rho^2\omega^3 - \rho\eta\,\omega^2 k^2\right)}E_0\ \sin\left(k\,.\,r\,(\cos\varphi+\sin\varphi) - \omega t - \theta\right) - \frac{\left(\eta k^2 - 2\rho\omega\right)}{2\left(\rho^2\omega^3 - \rho\eta\,\omega^2 k^2\right)}E_0\ \cos\left(k\,.\,r\,(\cos\varphi+\sin\varphi) - \omega t - \theta\right) \tag{2.115}$$

Thus equation (2.115) is the solution of the 2D inhomogeneous Navier-Stokes equation. Hence the general solution will now be the sum of the CF and the PI .

$$y = y_c + y_p \tag{2.116}$$

$$y = \sqrt{\left(a^2 - b^2\lambda^2\right) - 2\left(a - b\lambda\right)^2 \cos\left((n - n'\lambda)\,t - (\varepsilon - \varepsilon'\lambda)\right)} \times \exp(-\varphi) \times \left\{-\left((n - n'\lambda)\,t\right)\right\} \times$$
$$\cosh\left(\sqrt{\left(k - k'\lambda\right) r\,(\cos\varphi + \sin\varphi)}\ r\right) \times \left\{\cos\left(\frac{1}{2}\sqrt{\left(1 - 4(k - k'\lambda)\,r\right)}\ \varphi\right) + \sin\left(\frac{1}{2}\sqrt{\left(1 - 4(k - k'\lambda)\,r\right)}\ \varphi\right)\right\}$$
$$+ \frac{\eta k^2 E_0 \sin\left(k\,r\,(\cos\varphi + \sin\varphi) - \omega t - \theta\right)}{2\left(\rho^2\omega^3 - \rho\eta\,\omega^2 k^2\right)} - \frac{\left(\eta k^2 - 2\rho\omega\right)E_0 \cos\left(kr\,(\cos\varphi + \sin\varphi) - \omega t - \theta\right)}{2\left(\rho^2\omega^3 - \rho\eta\,\omega^2 k^2\right)} \tag{2.117}$$

However, equation (2.117) still contain the parameters of the Human vibration which is not supposed to be since we are subjecting only the HIV wave characteristics to the electromagnetic EM radiation and not the wave characteristics of the Human vibrating system. This is so because we do not want any of the wave properties of the Human system to be damaged by the EM radiation. Thus in equation (2.117) we have to neglect the wave characteristics of the Human system by putting them equal zero ($a = n = \varepsilon = k = 0$) and work with only the absolute values of the HIV vibration or wave characteristics which we are exposing to the danger of the EM radiation.

$$y = \sqrt{\left(-b^2\lambda^2\right) - 2\left(b\lambda\right)^2 \cos\left((-n'\lambda)\, t - (-\varepsilon'\lambda)\right)} \times \exp(-\varphi) \times \left\{ - \ (-n'\lambda)\, t \right\} \times$$

$$\cosh\left(\sqrt{(-k'\lambda)\, r\, (\cos\varphi + \sin\varphi)}\ \ r\right) \times \left\{ \cos\left(\frac{1}{2}\sqrt{\left(1 - 4(-k'\lambda)\, r\right)}\ \varphi\right) + \sin\left(\frac{1}{2}\sqrt{\left(1 - 4(-k'\lambda)\, r\right)}\ \varphi\right)\right\} +$$

$$\frac{\eta k^2 E_0 \sin\left(k\, r\, (\cos\varphi + \sin\varphi) - \omega t - \theta\right)}{2\left(\rho^2\omega^3 - \rho\eta\, \omega^2 k^2\right)} - \frac{\left(\eta k^2 - 2\rho\omega\right) E_0 \cos\left(k\, r\, (\cos\varphi + \sin\varphi) - \omega t - \theta\right)}{2\left(\rho^2\omega^3 - \rho\eta\, \omega^2 k^2\right)} \tag{2.118}$$

$$y = \sqrt{(b^2\lambda^2) - 2\,(b\lambda)^2 \cos\left(n'\lambda t - \varepsilon'\lambda\right)} \times \exp(-\varphi) \times \left((n'\lambda)\, t\right) \times \cosh\left(\sqrt{(k'\lambda)\ r\, (\cos\varphi + \sin\varphi)}\ \ r\right) \times$$

$$\left\{ \cos\left(\frac{1}{2}\sqrt{\left(1 + 4(k'\lambda)\, r\right)}\ \varphi\right) + \sin\left(\frac{1}{2}\sqrt{\left(1 + 4(k'\lambda)\, r\right)}\ \varphi\right)\right\} + \frac{\eta k^2 E_0 \sin\left(k\, r\, (\cos\varphi + \sin\varphi) - \omega t - \theta\right)}{2\left(\rho^2\omega^3 - \rho\eta\, \omega^2 k^2\right)} -$$

$$\frac{\left(\eta k^2 - 2\rho\omega\right) E_0 \cos\left(k\, r\, (\cos\varphi + \sin\varphi) - \omega t - \theta\right)}{2\left(\rho^2\omega^3 - \rho\eta\, \omega^2 k^2\right)} \tag{2.119}$$

In this case the azimuthal angle is $\varphi = \pi + \varepsilon'\lambda$. The reader should also note that $\cos(-x) = \cos(x)$ since cosine is an even and symmetric function. Steady-state flow Characteristics of the general equation of motion of the interception of the EM wave and the HIV parasitic wave. Now let us vary the general solution of equation (2.119) with respect to time. Now at a steady- state $\frac{dy}{dt}$ = 0, and

$$E_0 = \left(\frac{2(\rho^2\omega^3 - \rho\eta\omega^2 k^2)}{\left(\eta\omega k^2 \cos\left(k\, r\, (\cos\varphi + \sin\varphi) - \omega t - \theta\right) + (\eta k^2 - 2\rho\omega)\, \omega\, \sin\left(k\, r\, (\cos\varphi + \sin\varphi) - \omega t - \theta\right)\right)}\right) \times$$

$$\left\{\frac{(b\lambda)^2 (n'\lambda) \sin\ (n'\lambda t - \varepsilon'\lambda)}{\sqrt{(b^2\lambda^2) - 2\,(b\lambda)^2 \cos(n'\lambda t - \varepsilon'\lambda)}} \times \exp(-\varphi) \times \left((n'\lambda)\, t\right) \times \cosh\left(\sqrt{(k'\lambda)\ r\, (\cos\varphi + \sin\varphi)}\ \ r\right) \times\right.$$

$$\left(\cos\left(\frac{1}{2}\sqrt{\left(1 + 4(k'\lambda)\, r\right)}\ \varphi\right) + \sin\left(\frac{1}{2}\sqrt{\left(1 + 4(k'\lambda)\, r\right)}\ \varphi\right)\right) +$$

$$(n'\lambda)\sqrt{(b^2\lambda^2) - 2(b\lambda)^2 \cos\ (n'\lambda t - \varepsilon'\lambda)}\ \exp(-\varphi) \times \cosh\left(\sqrt{(k'\lambda)\ r\, (\cos\varphi + \sin\varphi)}\ \ r\right) \times$$

$$\left.\left\{ \cos\left(\frac{1}{2}\sqrt{\left(1 + 4(k'\lambda)\, r\right)}\ \varphi\right) + \sin\left(\frac{1}{2}\sqrt{\left(1 + 4(k'\lambda)\, r\right)}\ \varphi\right)\right\}\right\} \tag{2.120}$$

$$E_0 = \left(\frac{2(\rho^2\omega^3 - \rho\eta\omega^2 k^2)\sqrt{(b^2\lambda^2) - 2(b\lambda)^2 \cos\left(n'\lambda t - \varepsilon'\lambda\right)}}{\left(\eta\omega k^2 \cos\left(k\, r\, (\cos\varphi + \sin\varphi) - \omega t - \theta\right) + (\eta k^2 - 2\rho\omega)\, \omega\, \sin\left(k\, r\, (\cos\varphi + \sin\varphi) - \omega t - \theta\right)\right)}\right) \times$$

$$\left\{\frac{(b\lambda)^2 (n'\lambda) \sin\left(n'\lambda t - \varepsilon'\lambda\right)}{\left((b^2\lambda^2) - 2\,(b\lambda)^2 \cos\left(n'\lambda t - \varepsilon'\lambda\right)\right)}(n'\lambda\, t) + (n'\lambda)\right\} \times \cosh\left(\sqrt{(k'\lambda)\ r\, (\cos\varphi + \sin\varphi)}\ \ r\right) \times \exp(-\varphi) \times$$

$$\left(\cos\left(\frac{1}{2}\sqrt{\left(1 + 4(k'\lambda)\, r\right)}\ \varphi\right) + \sin\left(\frac{1}{2}\sqrt{\left(1 + 4(k'\lambda)\, r\right)}\ \varphi\right)\right) \tag{2.121}$$

Let us now apply the addition formula for trigonometric identity to redefine the denominator of equation (2.121). That is

$$A\cos x + B\sin x = \sqrt{A^2+B^2}\,\cos\left(x \pm \xi\right)\,;\quad \tan\xi = \frac{\sin\xi}{\cos\xi} = \mp\frac{B}{A} \tag{2.122}$$

Where ξ is the epoch of the motion or the period of the motion of the applied EM wave.

$$\left(\eta\omega k^2\cos\left(k\,r\,(\cos\varphi+\sin\varphi)-\omega t-\theta\right) + (\eta k^2-2\rho\omega)\,\omega\sin\left(k\,r\,(\cos\varphi+\sin\varphi)-\omega t-\theta\right)\right) = \sqrt{\left(\eta\omega k^2\right)^2+\left((\eta\omega k^2-2\rho\omega^2)\right)^2}\;\cos\left(k\,r\,(\cos\varphi+\sin\varphi)-\omega t-\theta-\xi\right) \tag{2.123}$$

$$E_0 = \left(\frac{2(\rho^2\omega^3-\rho\eta\omega^2k^2)\sqrt{(b^2\lambda^2)-2(b\lambda)^2\cos\,(n'\lambda t-\varepsilon'\lambda)}}{\sqrt{\left(\eta\omega k^2\right)^2+\left((\eta k^2-2\rho\omega)\,\omega\right)^2}\;\cos\left(k\,r\,(\cos\varphi+\sin\varphi)-\omega t-\theta-\xi\right)}\right)\times \left\{\frac{(b\lambda)^2\,(n'\lambda)\sin\left(n'\lambda\,t-\varepsilon'\lambda\right)}{\left((b^2\lambda^2)-2\,(b\lambda)^2\cos\,(n'\lambda t-\varepsilon'\lambda)\right)}(n'\lambda\,t)+(n'\lambda)\right\}\times\cosh\left(\sqrt{(k'\lambda)\,r\,(\cos\varphi+\sin\varphi)}\;r\right)\times\exp(-\varphi)\times \left(\cos\left(\frac{1}{2}\sqrt{(1+4(k'\lambda)\,r)}\;\varphi\right)+\sin\left(\frac{1}{2}\sqrt{(1+4(k'\lambda)\,r)}\;\varphi\right)\right) \tag{2.124}$$

Thus equation (2.124) gives the amplitude of the applied electromagnetic (EM) radiation in combination with the vibration of HIV. Thus the amplitude has a dimension of length which is $metres\ m$.

$$\vec{E} = \left(\frac{4(\rho^2\omega^3-\rho\eta\omega^2k^2)\sqrt{(b^2\lambda^2)-2(b\lambda)^2\cos\,(n'\lambda t-\varepsilon'\lambda)}}{\sqrt{\left(\eta\omega k^2\right)^2+\left((\eta k^2-2\rho\omega)\,\omega\right)^2}\;\cos\left(k\,r\,(\cos\varphi+\sin\varphi)-\omega t-\theta-\xi\right)}\right)\times \left\{\frac{(b\lambda)^2\,(n'\lambda)\sin\left(n'\lambda\,t-\varepsilon'\lambda\right)}{\left((b^2\lambda^2)-2\,(b\lambda)^2\cos\,(n'\lambda t-\varepsilon'\lambda)\right)}(n'\lambda\,t)+(n'\lambda)\right\}\times\cosh\left(\sqrt{(k'\lambda)\,r\,(\cos\varphi+\sin\varphi)}\;r\right)\times\exp(-\varphi)\times \left(\cos\left(\frac{1}{2}\sqrt{(1+4(k'\lambda)\,r)}\;\varphi\right)+\sin\left(\frac{1}{2}\sqrt{(1+4(k'\lambda)\,r)}\;\varphi\right)\right)\sin\left(k\,r\,(\cos\varphi+\sin\varphi)-\omega t-\theta\right) \tag{2.125}$$

Thus equation (2.125) gives the applied oscillating electromagnetic (EM) radiation in combination with the vibration of HIV. Thus the EM wave has a dimension of length which is $metres\ m$.

2.8 Determination of the Parameters of the Applied EM Wave

It can also be argued that the applied EM wave does not take cognizance of the radial distance r of the Human Aorta or the nature of the Human blood vessels since the HIV is not centred only along the radial cylindrical blood vessels but even in the Human brain and bone marrow. In other words the radial distance cannot hinder the interception of the EM wave. As a result, we are still in good position to set $r = x$ and assume any arbitrary value for it during computation. Here x will represent the linear distance between the output of the EM wave electronic device and the HIV/AIDS patient who is undergoing the radiation therapy.

Note that the assumed azimuthal angle which was initially $\varphi = \pi - (\varepsilon - \varepsilon'\lambda)$ is now $\varphi = \pi + \varepsilon'\lambda$ because $\varepsilon = 0$, since we are not tempering with the Human vibration but exposing only the HIV vibratory characteristics to EM radiation.

We can set the spatial frequency k of the applied EM radiation to be equal to that of the HIV spatial frequency or any arbitrary value since we know that it is the path difference that is basically responsible for complete destructive interference between any two waves. Hence we can set $k = 150$ rad/m a value that is less than the Human vibratory spatial frequency but greater than the HIV/AIDS vibratory spatial frequency.

Case 1: Determination of the angular frequency or angular velocity ω of the applied oscillating EM wave.

Now one of the reliable possibilities that would make the oscillating amplitude of the EM wave given by(2.124) to be zero is when the numerator of the first term is zero. That is

$$2(\rho^2\omega^3 - \rho\eta\omega^2 k^2)\sqrt{(b^2\lambda^2) - 2(b\lambda)^2\cos\,(n'\lambda t + \varepsilon'\lambda)} = 0 \quad (2.126)$$

$$\sqrt{(b^2\lambda^2) - 2(b\lambda)^2\cos\,(n'\lambda t + \varepsilon'\lambda)} \neq 0 \quad (2.127)$$

$$(\rho^2\omega^3 - \rho\eta\omega^2 k^2) = 0 \quad (2.128)$$

$$\omega = \frac{\eta k^2}{\rho} = \frac{0.004\,kg\,m^{-1}s^{-1} \times (150)^2\ rad\ m^{-2}}{1060\,kg\,m^{-3}} = 0.0849\,rad/s \quad (2.129)$$

Case 2: Determination of the epoch of the motion ξ associated with the amplitude of the applied EM wave.

The epoch of the motion ξ which appears in (2.125)can be calculated by applying (2.122). This is given by

$$\tan\,\xi = \frac{(\eta k^2 - 2\rho\omega)^2}{(\eta k^2)^2} \quad (2.130)$$

$$\tan\,\xi = \frac{(0.004kgm^{-1}s^{-1} \times 150^2\,rad/m^2 - 2\times 1060\,kg/m^{-3}0.0849\,rad/s)^2}{(0.004kgm^{-1}s^{-1}\times 150^2\,rad/m^2)^2} = 0.99973 \quad (2.131)$$

$$\xi = \tan^{-1}(0.99973) = 0.7853\,rad \quad (2.132)$$

Case 3: Determination of the exposure time t and the actual time of exposure τ of the applied EM radiation.

It is evident from (2.125) that another reliable possibility that would make the oscillating amplitude of the EM wave to be zero is when the term

$$\left\{ \frac{(b\lambda)^2\,(n'\lambda)\sin\left(n'\lambda\,t - \varepsilon'\lambda\right)}{\left((b^2\lambda^2) - 2\,(b\lambda)^2\cos\,(\,n'\lambda t - \varepsilon'\lambda)\right)}(n'\lambda\,t) + (n'\lambda) \right\} = 0 \quad (2.133)$$

However, the raising multiplier is quantized, $\lambda = 0, 1, 2, 3, \ldots, 892$ or $0 \leq \lambda \leq 892$. The exposure time is related to the several values of the raising multiplier by the given equation below.

$$\left(b\lambda\right)^2(n'\lambda)^2 t\sin\left(n'\lambda\,t - \varepsilon'\lambda\right) + (n'\lambda)\left((b^2\lambda^2) - 2\,(b\lambda)^2\cos\,(\,n'\lambda t - \varepsilon'\lambda)\right) = 0 \quad (2.134)$$

$$(n'\lambda)t\sin\left(n'\lambda\,t - \varepsilon'\lambda\right) + \left(1 - 2\,\cos\,(\,n'\lambda t - \varepsilon'\lambda)\right) = 0 \quad (2.135)$$

At the critical value: $\sin\ (x) = x$ and $\cos(x) = 1 - \frac{x^2}{2}$ (2.136)

$$(n'\lambda)t\ \left(n'\lambda\, t - \varepsilon'\lambda\ \right) + \left(1 - 2\left(1 - \frac{(n'\lambda t - \varepsilon'\lambda)^2}{2}\right)\right) = 0 \quad (2.137)$$

$$t^2 - \left(\frac{2\,(n'\lambda\,\varepsilon'\lambda)}{2\,(n'\lambda)^2}\right)t + \left(\frac{(\varepsilon'\lambda)^2 - 1}{2\,(n'\lambda)^2}\right) = 0 \quad (2.138)$$

Thus equation (2.136) is quadratic in t and for positive values of the time corresponding to various values of the raising multiplier $0 \le \lambda \le 892$ ($\lambda = 0, 1, 2, \ldots, 892$) we get

$t_{\max} = 0.055411$ seconds and $t_{\min} = 0.0000713$ seconds; $0 \le t \le 0.055411$ (2.139)

The reader should note that the raising multiplier does not have a constant value but varies between $0 \le \lambda \le 892$,as a result the time must also vary according to the varying multiplier. Thus the total time of exposure is $t = t_0 + t_1 + t_2 + t_3 + \ldots + t_{\max} = 26.62$ seconds or the total time of exposure must be in the interval $0 \le t \le 27$.

Case 4: Determination of the phase angle (θ) of the applied oscillating EM wave from the path difference.

The oscillating phase of the applied electromagnetic EM wave may not depend on the azimuthal angle φ or the radial distance r associated with the Human blood circulating system. Upon this argument we can set $r = x = 2\,m$ (arbitrary value) in the oscillating phase of the EM wave. Let the path difference of the oscillating EM wave be δ_1 and the path difference of HIV vibration is δ_2, then for complete destructive interference between the applied EM wave and the HIV/AIDS their path difference δ must be equal to $180^0\ (\pi)$.

From the CCW equation given by (2.7), it is obvious that the oscillating phase of the CCW is of the form

$$f(\phi) = \delta_2 = \left(\ (k - k'\lambda)\, r\,(\cos\varphi + \sin\varphi) - (n - n'\lambda)\, t - E(t)\ \right) \quad (2.140)$$

Please do not confuse the symbol k to that of the applied EM wave. Now we can equate to zero the wave characteristics of the Human system since that is not our region of interest, that is: $a = n = \varepsilon = k = 0$. Hence,

$$f(\phi) = \delta_2 = \left(\ (-k'\lambda)\, r\,(\cos\varphi + \sin\varphi) + (n'\lambda)\, t - E(t)\ \right) \quad (2.141)$$

$$E\ (t) = \tan^{-1}\left(\frac{b\lambda \sin\left(\varepsilon'\lambda + (n'\lambda)\, t\right)}{b\lambda \cos\left(\varepsilon'\lambda + (n'\lambda)\, t\right)}\right) = \tan^{-1}\left(\frac{b\lambda \sin\left(\varepsilon'\lambda + (n'\lambda)\, t\right)}{b\lambda \cos\left(\varepsilon'\lambda + (n'\lambda)\, t\right)}\right) \quad (2.142)$$

$$E\ (t) = \tan^{-1}\left(\tan\left(\varepsilon'\lambda + (n'\lambda)\, t\right)\right) = \left(\varepsilon'\lambda + (n'\lambda)\, t\right) \quad (2.143)$$

$$f(\phi) = \delta_2 = \left(\ (-k'\lambda)\, r\,(\cos\varphi + \sin\varphi) + (n'\lambda)\, t - \varepsilon'\lambda - (n'\lambda)\, t\ \right) \quad (2.144)$$

$$f(\phi) = \delta_2 = k'\lambda\, r\,(\cos\varphi + \sin\varphi) - \varepsilon'\lambda \quad (2.145)$$

Note that $r = 0.01262\,m$ and $\varphi = \pi + \varepsilon'\lambda$. Now the oscillating phase of the applied EM wave is given by

$$\delta_1 = \sin\left(k\, r\,(\cos\varphi + \sin\varphi) - \omega t - \theta\right) \quad (2.146)$$

Now to differentiate the radial distance r covered by the applied EM wave from that of the HIV vibration resident in the Human blood circulating system we simply set $r = x$. The reader should also understand that the HIV/AIDS patient that is undergoing the radiation therapy will either stand on the electronic machine that is generating the EM wave or stand at a distance x away from the generating EM wave machine. Hence this argument will enable us to write

$$\delta_1 = \left(k\, x\,(\cos\varphi + \sin\varphi) - \omega t - \theta\right) \quad (2.147)$$

Now from the knowledge of geometrical optics or physical optics that for complete destructive interference to occur between any two interfering waves then the path difference between them must be equal to 180^0 (π).

$$\delta = \delta_1 - \delta_2 = \pi \quad (2.148)$$

$$\left(k\, x\,(\cos\varphi + \sin\varphi) - \omega t - \theta\right) - \left(k'\lambda\, r\,(\cos\varphi + \sin\varphi) - \varepsilon'\lambda\right) = \pi \quad (2.149)$$

$$\theta = (k\, x - k'\lambda r)(\cos\varphi + \sin\varphi) - \omega t + \varepsilon'\lambda - \pi \quad (2.150)$$

$$-407 \le \theta \le -304 \quad (2.151)$$

Consequently, the HIV/AIDS candidate that is undergoing the radiation therapy may either stand on or stay away from the EM radiation device. As we all know the height of an individual cannot exceed 2 metres. Hence, in this work we are going to set or assume the value of x = 2 metres as the expected radial distance covered by the EM wave, $r = 0.01262\,m$ (the radius of the aorta of the Human heart)

3. RESULTS AND DISCUSSION

In consideration of Figs. 1 and 2 the frequency and the amplitude of the human latent vibration (host wave) are much greater than those of the HIV latent vibration (parasitic wave). Actually both spectrum shows that they are from the same source having a common origin. However, at the origin both latent waves are oppositely related and they are out of phase, while the host wave has a crest at the origin, the parasitic wave has a trough. This factor satisfies the fact that both vibrations are actually incoherent. It is the phase difference in their respective source function that causes the carrier wave to attenuate to zero after a specified time when they interfere with one another. The spectrum of the bandwidth of both waves increases proportionally as they progresses away from the origin. The reader should understand that we used the conditions for the two raising multipliers.

The spectrum of the constitutive carrier wave as shown in Fig. 3 is similar to that of the host vibration. However, the edges of the amplitude show irregular non-smooth behaviour at various intervals and reduced frequency. This anomalous behaviour is due to the effect of the destructive interference of the HIV vibration on the human vibration. The reader should understand that based on the value of the raising multiplier λ = 0 –892and the computing time t = 0 – 26.62 s used in the various equations, that is why the Host wave also go to zero around 26.62seconds as shown in Fig. 3. Note that this is not the expected age of Man. However, the expected age or life span of Man can be predicted or determined if the values of the raising multipliers are suitably adjusted in (2.6).

Fig 5. Shows the spectrum of the interception of the applied oscillating EM wave with the HIV vibration which is resident in the human system. It is obvious from the spectrum that the interference between the applied EM wave with the HIV vibration show a-zero frequency in the coordinate interval $\lambda\,[0, 127]$ with a corresponding coordinate time interval of $\lambda\,[0, 0.008897s]$. The total time taken for the zero amplitude and frequency is $t = t_0 + t_1 + t_2 + \ldots + t_{0.008897} = 0.5612$ seconds. This is the region of destructive interference between the applied oscillating EM wave and the HIV vibration.

Hence when the EM wave interferes with the HIV vibratory characteristics in the Human micro-vascular system, all the formation of the HIV/AIDS vibration will be completely destroyed within 0.5612 seconds from the human system. After this time the applied EM wave now oscillates with a well behaved increasing frequency and spectral bandwidth to a maximum value of $\pm 5.5 \times 10^{-11}$ m. The coordinates of this maximum value attained as a function of time and the raising multiplier are $(\lambda, t) \Leftrightarrow (578, 0.03897)$ and the total time to attain this maximum value is about $t = t_0 + t_1 + t_2 + \ldots + t_{0.03897} = 11.5515$ seconds. After this time, the monochromatic frequency dependant – EM radiation finally attenuates to zero after a period of 26.62 seconds.

Table 3.1. shows the summary of the calculated values of the latent Human vibration (host wave) and latent HIV vibration (parasite wave). The table also show comparison of our present work with a previous one

S/N	Physical Quantity Human wave characteristics	Symbol	Navier-Stokes Approach (Present work) Value / unit	Newtonian Approach (Previous work) Value/units
1	Amplitude	a	$5.252\times10^{-6}\ m$	$2.1\times10^{-6}\ m$
2	Angular velocity	n	$0.09014\ rad/s$	$2.51\times10^{-7}\ rad/s$
3	Phase angle	ε	$0.4924\ rad\ (radians)$	$0.6109\ rad\ (radians)$
4	Spatial frequency	k	$163.4714\ rad/m$	$166\ rad/m$
S/N	**HIV Parasitic wave characteristics**	**Symbol**	**Value**	**Value**
1	Amplitude	b	$5.881\times10^{-9}\ m$	$1.6\times10^{-10}\ m$
2	Angular velocity	n'	$0.0001009\ rad/s$	$1.91\times10^{-11}\ rad/s$
3	Phase angle	ε'	$0.0005514\ rad\ (radians)$	$0.0000466\ rad\ (radians)$
4	Spatial frequency	k'	$0.1831\ rad/m$	$0.0127\ rad/m$
Raising Multiplier		λ	$892\ (0 \le \lambda \le 892)$ Dimensionless constant	$13070\ (0 \le \lambda \le 13070)$ Dimensionless constant

Table 3.2. Shows how the generating EM wave device should be calibrated based on the present work of Navier-Stokes approach

Physical Quantity	Symbol	Range / Unit	
		Present work Navier-Stokes approach	**Previous work Newtonian Approach**
The phase angle of the Applied EM wave	θ	$-407 \le \theta \le -304$ (radians)	$-457 \le \theta \le 373$ (radians)
The spatial frequency of the Applied EM wave	k	150 radian/m	150radian/m
Angular frequency of the applied EM wave	ω	0.0849 rad./m	0.00003267 rad./s
The total time of exposure Before EM goes to zero	t	$0 \le t \le 27$ s	$0 \le t \le 1500$ s
Actual time of exposure	τ	0.5612 seconds	0.0208 seconds
Total distance to be covered by the EM wave	x	2 metres	2.5 metres
Spatial oscillating phase of the Applied EM wave	ϕ and ϑ	$0 \le \phi \le 1$	$-1 \le \vartheta \le +1$
The applied EM wave	$\vec{E}$	$-6 \times 10^{-11} \le \vec{E} \le +6 \times 10^{-11}$ (metres)	$-120 \le \vec{E} \le +120$ (metres)

$\phi = \sin(\vec{k}.\vec{r} - \omega t - \theta) = \left(k\, x\,(\cos\varphi + \sin\varphi) - \omega t - \theta\right)$ and $\vartheta = \sin(k x - \omega t - \theta)$

Note that the total value of the raising multiplier λ and time t can be found from the addition of successive values. That is

$\lambda = \lambda_0 + \lambda_1 + \lambda_2 + \ldots + \lambda_{\max}$; $t = t_0 + t_1 + t_2 + \ldots + \lambda_{\max}$. *Hence,*

$$\lambda = \lambda_0 + \lambda_1 + \lambda_2 + \ldots + \lambda_{892} = 398278\ ;\quad t = t_0 + t_1 + t_2 + \ldots + t_{0.055411} = 26.62\ s$$

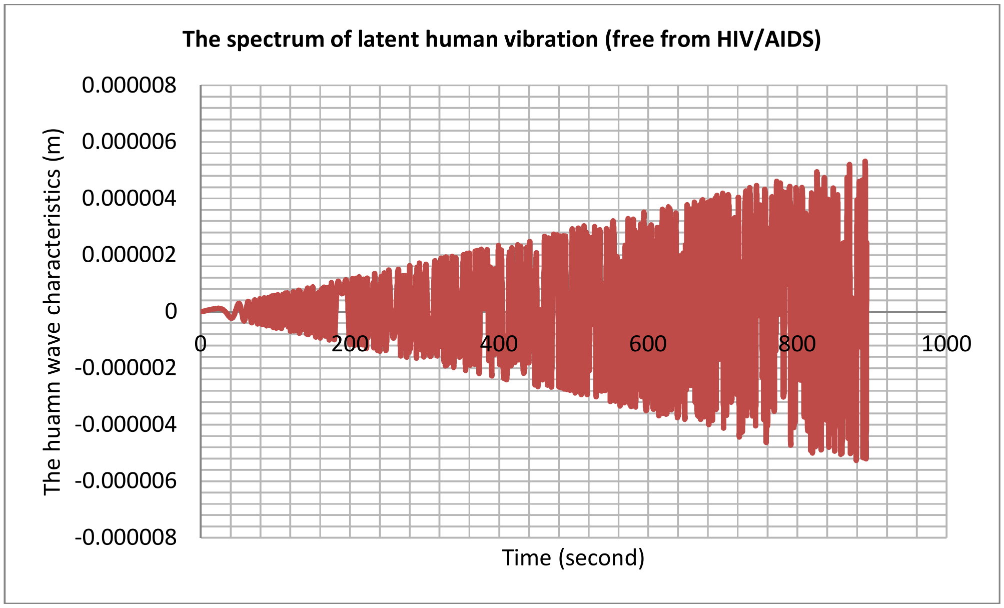

Fig. 1. Shows the spectrum of the latent human vibration(host wave) as a function of time and the multiplier. The initial and final coordinate (λ, t) **are respectively,** $[0, 0]$ **and** $[892, 0.055411s]$**. The total time taken is** $t = t_0 + t_1 + t_2 + \ldots + t_{0.055411} = 26.62\ s$ **. The graph represents equation (2.1). Note that** r **=0.01262 m (radius of the human Aorta)**

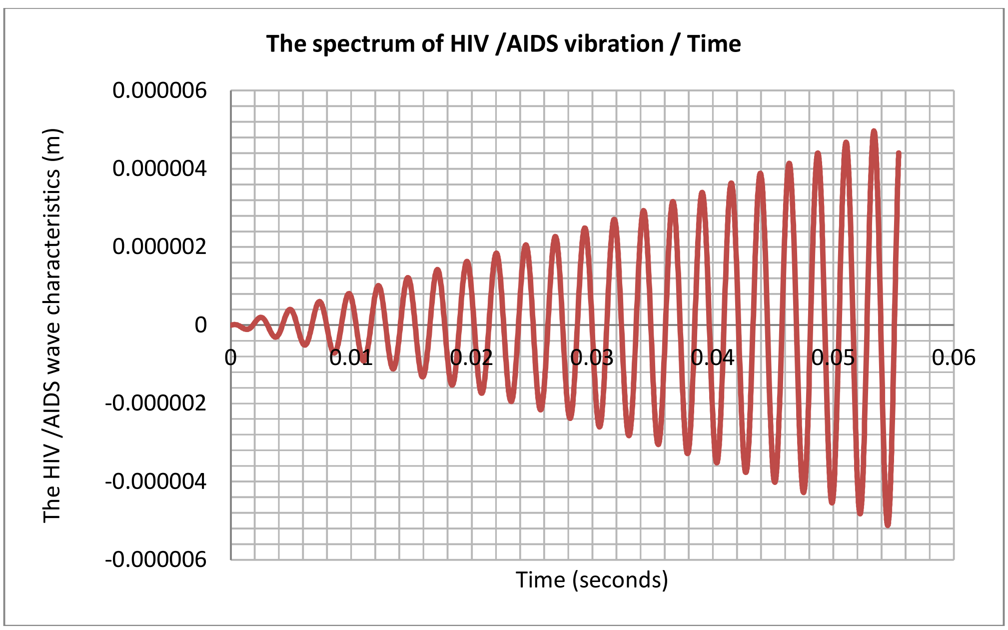

Fig. 2. Shows the spectrum of the latent HIV/AIDS vibration(parasitic wave) as a function of time and the multiplier. The initial and final coordinate (λ, t) **are respectively,** $[0, 0]$ **and** $[892, 0.055411\,s]$**. The CCW lasted for a total time of about** $t = t_0 + t_1 + t_2 + \ldots + t_{0.055411} = 26.62\ s$ **. The graph represents equation (2.2). Note that** r **=0.01262 m (radius of the human Aorta)**

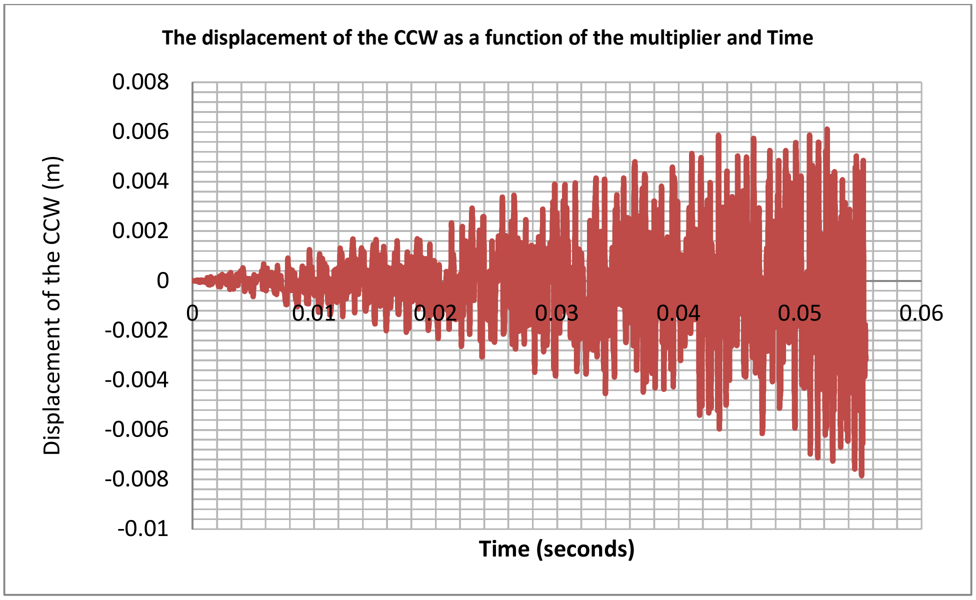

Fig. 3. shows the spectrum of the CCW (combination of the host and parasitic wave) as a function of time and the multiplier. The initial and final coordinate (λ, t) are respectively, $[0, 0]$ and $[892, 0.055411\, s]$. The CCW lasted for a total time of about $t = t_0 + t_1 + t_2 + \ldots + t_{0.055411} = 26.62\, s$. The graph represents equation (2.6). Note that r =0.01262 m. and in the circumstance where the square root of the oscillating amplitude is imaginary, then the absolute value is used

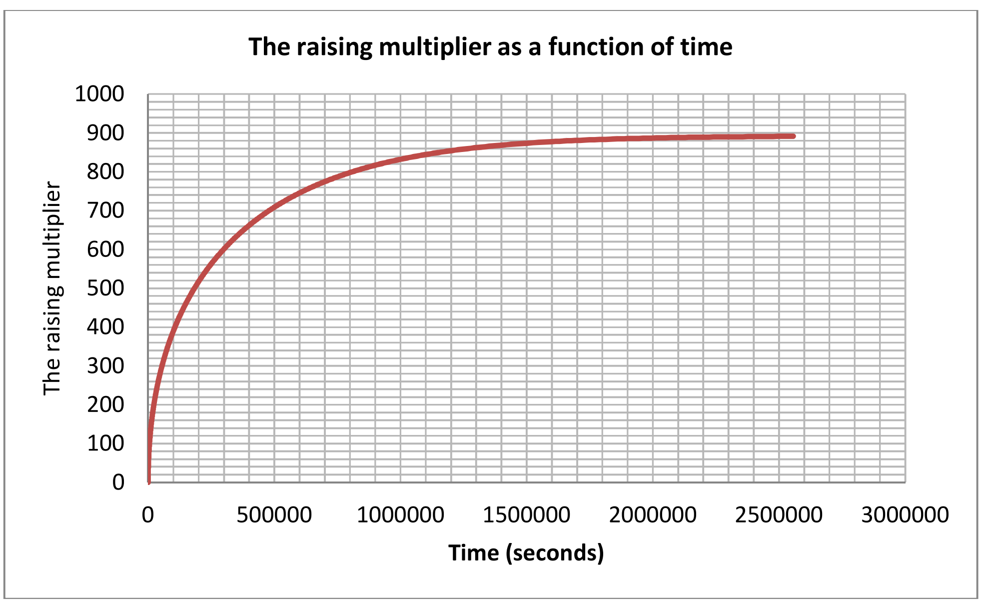

Fig. 4. Shows the spectrum of the raising multiplier λ as a function of time t. The spectrum is parabolic in shape and the multiplier increases as the time is increased and it tends to stabilize beyond $\lambda \geq 800$. The stabilization is as a result of the highly reduced values of the constituents of the host wave contained in the CCW after a long period of time. The CCW is almost becoming monochromatic with the predominance of the parasitic wave in this region

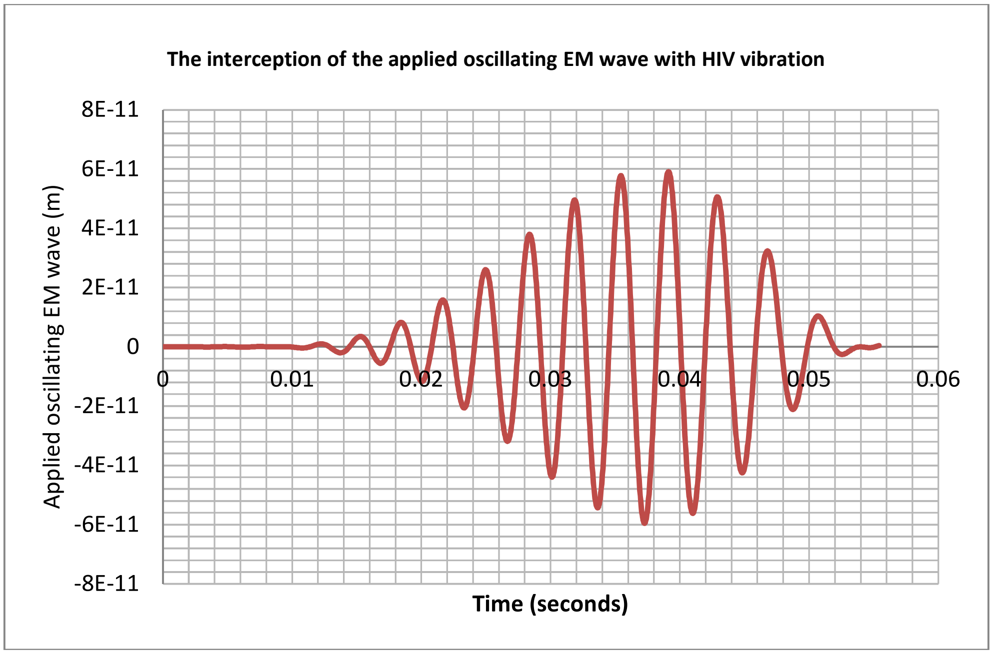

Fig. 5. Shows the spectrum of the interception of the applied oscillating EM wave with the HIV vibration

3.1 Medical Practice Implication

Perhaps, it is worth acknowledging or bringing to focus the fact that radiation therapy is already a major valid treatment option for patients with HIV, but mainly for associated cancer, and the toxic side-effects of radiation remains a concern [17] There is fact that such radiation therapy attenuates CD4 count without changing CD4% [18], but this seems yet to be likened to use radiation therapy in liver diseases [19] [20] with their own associated side-effects.

4. CONCLUSION

It is evident from this work that when the HIV vibratory characteristics within the human system are undergoing attenuation due to the influence of the applied EM wave, the HIV vibration instantaneously goes to zero without putting or posing and resistance to the incoming EM radiation. It is clear from this study that the actual exposure time for the HIV/AIDS patient who is undergoing the radiation therapy is about 0.56 seconds. Thus this study has to some extent provided the means of determining the basic activity and performance of HIV/AIDS infection in the human system. Consequently, when the HIV/AIDS vibratory characteristics are known, it can then be selectively destroyed from the human system by anti-vibrating component. This work thus identifies the matrix of scientific priorities that should bring us measurably closer to our vision of developing a permanent cure to HIV/AIDS infection which has been the global problem for several decades running.

5. SUGGESTION FOR FURTHER WORK

The general technique advanced in this work can also be extended for assessing and understanding the formation process of other related diseases that affects the Human system whose activity is either localized or non-localized. For instance, HIV/AIDS and Ebola are non-localized diseases while Syphilis, Gonorrhea and Tuberculosis are localized diseases of the Human system.

6. MAJOR CHALLENGES AND TASK OF THE RESEARCH

The great task remaining in this research work on the permanent cure to HIV/AIDS disease is as follows:

- To confirm by laboratory measurement the classical values of the independent characteristic vibrating variables for both

Man - the resident host; a , n , ε , k and those of the HIV 'parasitic wave' which are; b , n' , ε' , k' .

- The possibility of fabricating an electronic device that will generate the electromagnetic EM wave whose output will obey the given equation.
- To establish the effect of electromagnetic EM wave on the Human tissues, if at all, during and after the exposure of the HIV/AIDS infected person to the regulated dose of the EM radiation.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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