Journal of Scientific Research & Reports
13(3): 1-28, 2017; Article no.JSRR.30870
ISSN: 2320-0227

SCIENCEDOMAIN *international*
www.sciencedomain.org

Quantitative Eradicative Cure Profile of HIV/AIDS Using Electromagnetic (EM) Wave Destruction Technique

Edison A. Enaibe[1], Erhieyovwe Akpata[2*], Ezekiel U. Nwose[3] and Umukoro Judith[1]

[1]Department of Physics, Federal University of Petroleum Resources, P.M.B. 1221, Effurun, Nigeria.
[2]Department of Physics, University of Benin, P.M.B. 1154, Benin City, Edo State, Nigeria.
[3]School of Community Health, Charles Sturt University, Australia.

Authors' contributions

This work was carried out in collaboration between all authors. Author EAE designed the study, wrote the protocol, and wrote the first draft of the manuscript. Authors EA and UJ managed the analyses of the study. Author EUN managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JSRR/2017/30870
Editor(s):
(1) José Alberto Duarte Moller, Center for Advanced Materials Research Complejo Industrial Chihuahua, Mexico.
(2) Luigi Rodino, Professor of Mathematical Analysis, Dipartimento di Matematica, Università di Torino, Italy.
Reviewers:
(1) Bin Xu, Baylor University, US.
(2) Mani Shankar Mandal, Government General Degree College at Kalna-I, The University Of Burdwan, India.
(3) Chinonso Hubert Achebe, Nnamdi Azikiwe University, Awka, Nigeria.
Complete Peer review History: http://www.sciencedomain.org/review-history/18324

Original Research Article

Received 5th December 2016
Accepted 9th March 2017
Published 24th March 2017

ABSTRACT

It is the vibration of an unknown force that causes life and existence. Therefore, for anything to exist it must possess vibration. Vibration produces wave. It is the vibration of the HIV parasite (parasitic wave) that is being superposed on the Human Vibration (host wave) and since the waves are incoherent and out of phase the resultant superposition is destructive. Destructive interference causes a gradual attenuation in the general mechanism of the body system which eventually leads to a general loss of signal if uncontrolled. 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 numerically calculated the wave characteristics of the Human vibration and that of the HIV vibration. In this paper, we show quantitatively how regulated dose of electromagnetic (EM) wave, can be used to eradicate HIV/AIDS condition from the Human system the resident host. The

**Corresponding author: E-mail: akpataleg@hotmail.com;*

spectrum of the interception of the applied oscillating EM wave with the HIV vibration in the Human system shows a constriction in the interval when the raising multiplier [8000, 9000] with a corresponding time interval [1499.8125, 1499.8333] seconds. Therefore, the actual time of exposure of the HIV/AIDS patient who is undergoing the radiation therapy is about 0.0208 seconds. The displacement of the applied oscillating EM wave tends to zero within this interval. This study also shows that the time it would take the applied EM wave to destroy the HIV vibration completely from the human system is also determined by the phase angle between the applied oscillating EM wave and the HIV parasitic wave.

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

1. INTRODUCTION

After several years of intense experimental and theoretical studies of HIV/AIDS, there is still no adequate understanding of the formation of HIV/AIDS and possible cure to the virulent disease. The human immunodeficiency virus (HIV) is still among the most pressing health problems in the world today.

It is therefore sufficient to say that the concepts advanced so far by scientists about HIV/AIDS are inadequate and they lack proper understanding of the HIV/AIDS formation. Advances made so far in medical procedures and devices require a better understanding of the dynamical characteristics of HIV/AIDS and its formation in the human system.

According to the literature of clinical diseases, the HIV feeds on and in the process kills the active cells that make up the immune system [1]. This is a very correct statement but not a unique understanding. There is also a cause (vibration) that gives the HIV its own intrinsic characteristics, activity, formation and existence.

The human **i**mmunodeficiency **v**irus (HIV) and **a**cquired **i**mmunodeficiency **s**yndrome (AIDS) is a condition of the human immune system caused by HIV. The role of Human-Immunodeficiency Virus (HIV) in the blood circulating system of Man (host) has in general been poorly understood. However, its role in clinical disease has attracted increasing interest [2,3].

The HIV fatal effect stems from the attack on a person's CD4 cell counts. This result to the progressive depletion of the CD4 cell counts which play a pivotal regulatory role in the immune response to infections and tumours. During the initial infection a person may experience a brief period of influenza-like illness. This is typically followed by a prolonged period without symptoms [4,5].

Infection by the human immunodeficiency virus (HIV) gradually evolves to acquire immunodeficiency syndrome (AIDS) and which finally leads to death. In the absence of specific treatment, around half of the people infected with HIV develop AIDS within 10 years and the average survival time after infection with HIV is estimated to be 9 to 11 years depending on the subtype. After the diagnosis of AIDS, if treatment is not available, survival ranges between 6 and 19 months [6,7].

In addition to the knowledge of the medical experts about HIV/AIDS condition, 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 system after infection [8].

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 behaviour 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 [9].

The human heart stands as a transducer of this vibration. Fortunately the blood stands as a means of conveying this vibration to all units of the human system. As we all know, the human blood transports oxygen and food nutrients to all parts of the human system. It is the transport property of the blood that provides energy and sustenance of life to the human system [10].

The human cyclic heart contraction (disturbance) generates pulsatile blood flow and latent vibration. The latent vibration is sinusoidal and central in character, that is, it flows along the middle of the vascular blood vessels and in the process it orients the active particles of the blood and sets them into oscillating motion with a unified frequency. Generally, it is the human blood that responds to the latent vibration from the heart with a specified wave form. A sinusoidal time varying flow is used to simulate the pulsation of a heart [11,12].

The propagation of blood away from the region of the disturbance has certain velocity and in the process circulates oxygen and food nutrients to nourish the biological cells of the human system. Any alteration to this process, results into starvation, gradual weakening of the fundamental cells, and subsequent breakdown of the entire human biological system if uncontrolled.

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 [13,14].

In physics, a wave is 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 [15].

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 [16].

The beating of the human heart is associated with a latent vibration. The latent wave generated tends to culture and align the blood particles to assume a specified waveform. Hence the induced latent wave travelling through the blood medium causes the particles of the blood medium to oscillate with the same frequency as it passes.

Thus when an individual contacts HIV, the vibration of the HIV interferes with the latent vibration of the human system. If the interference is out of phase (destructive interference), then, the two waves do not reconstruct. This results to a gradual or rapid damping of the resultant amplitude of the two waves to zero displacement.

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 [17].

This paper is outlined as follows. Section 1, illustrates the basic concept of the work under study. The mathematical theory is presented in section 2. The results obtained and the analytical discussion of the results are shown in section 3. The conclusion of this work is shown in section 4. This is immediately followed by a list of references.

1.1 Research Methodology

In this current study, we first superposed a 'parasitic wave' on a 'host wave' and we used simple differentiation technique to derive the vibrating characteristics of Man (host wave) and the HIV (parasitic wave). Finally, we applied the Fourier series expansion technique to study the behaviour of the applied electromagnetic EM wave as it interacts with the HIV vibration in the Human system.

2. MATHEMATICAL THEORY AND SCIENTIFIC RESEARCH PROCEDURE

- 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 since 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 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 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. 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 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 Vibration Man as the 'host wave' which can be described by the cosine sinusoidal function

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

Where $\vec{k} = ki + kj$ and the position vector $\vec{r} = xi + yj$ are two dimensional (2D) vectors in Cartesian coordinate system and t is the time. Although, in polar coordinate system $x = r\cos\theta$ and $y = r\sin\theta$. But if a, ε, n and k are assumed to be constant with time then $\xi = 1$, as a result we get

$$y_1(\vec{r},t) = a\ \cos\left(\vec{k}.\vec{r} - n\,t - \varepsilon\right) \qquad (2.2)$$

- Also, suppose we consider the wave function of HIV as the 'parasitic wave' which we can also described by the cosine sinusoidal function

$$y_2(\vec{r},t) = b\lambda\cos\left(\vec{k}'\lambda.\vec{r} - n'\lambda\,t - \varepsilon'\,\lambda\right) \qquad (2.3)$$

As it is from the equation, the 'parasitic wave' has an inbuilt raising multiplier λ (λ = 0, 1, 2, . . ., $\lambda_{\max}$). 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.

- The equation (2.3) contains an inbuilt multiplier λ which is capable of raising the intrinsic parameters of the 'parasitic wave' to become equal to those of the 'host wave'. Consequently, once this equality is achieved, then all the active components of the host wave would have been completely eroded and it ceases to exist. A 'parasitic wave' as the name implies, has the ability of destroying or transforming the intrinsic constituents of the 'host wave' to its own form after a sufficiently long time.

- When equation (2.3) is superposed on equation (2.1) after some lengthy algebra we get a resultant wave equation given by,

$$y(\vec{r},t) = y_1(\vec{r},t) + y_2(\vec{r},t) = a\cos\left(\vec{k}.\vec{r} - n\,t - \varepsilon\right) + b\lambda\cos\left(\vec{k}'\lambda.\vec{r} - n'\lambda\,t - \varepsilon'\,\lambda\right) \qquad (2.4)$$

$$y(\vec{r},t) = \left\{(a^2 - b^2\lambda^2) - 2\left(a - b\lambda\right)^2\cos\left((n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda)\right)\right\}^{\frac{1}{2}} \cos\left(\vec{k}_c\,.\hat{r} - (n - n'\lambda)\,t - E(t)\right) \qquad (2.5)$$

$$E(t) = \tan^{-1}\left(\frac{a\ \sin\varepsilon + b\lambda\sin\left(\varepsilon'\lambda - (n - n'\lambda)\,t\right)}{a\ \cos\ \varepsilon + b\lambda\cos\left(\varepsilon'\lambda - (n - n'\lambda)\,t\right)}\right) \qquad (2.6)$$

Equation (2.5) satisfies the required boundary conditions and it is regarded as the carrier wave (CW). Thus (2.5) is the wave equation that governs the coexistence of the vibrations of the HIV 'parasitic wave' and that of Man the 'host wave' within the human system.

- 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 is constant with respect to the z - axis. $\vec{k}_c = (k - k'\lambda)\, i + (k - k'\lambda)\, j$.
- While on interpretation $\vec{k}_c . \hat{r} = (k - k'\lambda)\,(\cos\,\theta + \sin\theta)$ is the coordinate of two dimensional (2D) position vector and $\hat{r} = \vec{r}\,/\,r = \cos\theta\, i + \sin\theta\, j$ is a unit vector, $\theta = \pi - (\varepsilon - \varepsilon'\lambda)$, the total phase angle of the CW 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.

2.1 Calculation of the Phase Angle (ε), Angular Frequency (n), Wavenumber (k) and the Amplitude (a) of the Human Vibration (Resident Host):

The carrier wave CW given by (2.5) can only have a maximum value if the spatial oscillating phase is equal to 1. Hence

$$y_m = \sqrt{\left(a^2 - b^2\lambda^2\right) - 2\left(a - b\lambda\right)^2 \cos\left((n - n'\lambda)\, t - (\,\varepsilon - \varepsilon'\lambda\,)\right)} \tag{2.7}$$

$$\frac{d\,y_m}{dt} = (n - n'\lambda)(a - b\lambda)^2 \sin\left((n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda)\right) \times \left((a^2 - b^2\lambda^2) - 2(a - b\lambda)^2 \cos\left((n - n'\lambda)\, t - (\,\varepsilon - \varepsilon'\lambda)\right)\right)^{-\frac{1}{2}} \tag{2.8}$$

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

$$-\,(n - n'\lambda)^2 (a - b\lambda)^4 \sin^2\left((n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda)\right) \times \left((a^2 - b^2\lambda^2) - 2\,(a - b\lambda)^2 \cos\left((n - n'\lambda)\, t - (\,\varepsilon - \varepsilon'\lambda)\right)\right)^{-\frac{3}{2}} \tag{2.9}$$

The equation of motion obeyed by the carrier wave CW as it propagates along the human blood vessels experiences two resistive factors. Firstly, the resistance pose by the elasticity of the blood vessels and secondly, the resistance of the elasticity of the blood medium. The medium's mass and elasticity property determines how fast the wave can travel in the medium.

Consequently, the equation of motion of the carrier wave in the blood vessels of the human system (host); would be partly Newtonian due to the fluidize nature of the blood medium and non-Newtonian due to the particle constituent of the blood which makes it a non-ideal fluid. We can therefore write the equation of motion as

$$F = -\mu\left(\frac{\partial y^2}{\partial t}\right) - \sigma y^2 \qquad (2.10)$$

$$\rho V \frac{\partial^2 y}{\partial t^2} + 2\mu y \left(\frac{\partial y}{\partial t}\right) + \sigma y^2 = 0 \qquad (2.11)$$

Where ρ is the density of the human blood (kgm^{-3}), V is the volume of the blood vessel which is considered to be cylindrical vascular geometry ($\pi r^2 l$) and the unit is (m^3), μ is the dynamic viscosity of blood (kgm^{-1}s^{-1}), σ is the elasticity of the blood medium. The influence of gravity on the flow of blood is assumed to be negligible. Hence for maximum value of the carrier wave we then rewrite (2.11) as

$$\rho V \frac{\partial^2 y_m}{\partial t^2} + 2\mu y_m \left(\frac{\partial y_m}{\partial t}\right) + \sigma y_m^2 = 0 \qquad (2.12)$$

Now with the following boundary conditions that at time $t = 0$, $\lambda = 0$ in (2.7), (2.8) and (2.9) we obtain

$$y_m = \left(a^2 - 2a^2 \cos(-\varepsilon)\right)^{\frac{1}{2}} \qquad (2.13)$$

$$y_m^2 = \left(a^2 - 2a^2 \cos(-\varepsilon)\right) \qquad (2.14)$$

$$\frac{\partial y_m}{\partial t} = n a^2 \sin(-\varepsilon) \left(a^2 - 2a^2 \cos(-\varepsilon)\right)^{-\frac{1}{2}} \qquad (2.15)$$

$$\frac{\partial^2 y_m}{\partial t^2} = n^2 a^2 \cos(-\varepsilon) \left(a^2 - 2a^2 \cos(-\varepsilon)\right)^{-\frac{1}{2}} - n^2 a^4 \sin^2(-\varepsilon) \left(a^2 - 2a^2 \cos(-\varepsilon)\right)^{-\frac{3}{2}} \qquad (2.16)$$

When we substitute (2.13) – (2.16) into (2.12) we get after simplification that

$$\rho V \left(\frac{n^2 a^2 \cos(-\varepsilon)}{(a^2 - 2a^2 \cos(-\varepsilon))^{1/2}} - \frac{n^2 a^4 \sin^2(-\varepsilon)}{(a^2 - 2a^2 \cos(-\varepsilon))^{3/2}} \right) +$$

$$2\mu \left((a^2 - 2a^2 \cos(-\varepsilon))^{1/2} \times \frac{n a^2 \sin(-\varepsilon)}{(a^2 - 2a^2 \cos(-\varepsilon))^{1/2}} \right) + \sigma\left(a^2 - 2a^2 \cos(-\varepsilon)\right) = 0 \qquad (2.17)$$

$$\rho V \left(\frac{n^2 a \cos(-\varepsilon)}{(1 - 2\cos(-\varepsilon))^{1/2}} - \frac{n^2 a \sin^2(-\varepsilon)}{(1 - 2\cos(-\varepsilon))^{3/2}} \right) + 2\mu \left(n a^2 \sin(-\varepsilon)\right) + \sigma \left(a^2 (1 - 2\cos(-\varepsilon))\right) = 0 \qquad (2.18)$$

To linearize (2.18) we multiply through it by $\left(1 - 2\cos(-\varepsilon)\right)^{\frac{3}{2}}$ in such a way that

$$\rho V \left(n^2 a \cos(-\varepsilon)(1 - 2\cos(-\varepsilon)) - n^2 a \sin^2(-\varepsilon)\right) + 2\mu \left(n a^2 \sin(-\varepsilon)(1 - 2\cos(-\varepsilon))^{3/2}\right) +$$
$$\sigma\left(a^2 (1 - 2\cos(-\varepsilon))^{5/2}\right) = 0 \qquad (2.19)$$

Note that $\cos(-\varepsilon) = \cos\varepsilon$ (even and symmetric function) and $\sin(-\varepsilon) = -\sin\varepsilon$ (odd and screw symmetric function), as a result (2.19) yields the following result.

$$\rho V\left(n^2 a \cos\varepsilon(1 - 2\cos\varepsilon) - n^2 a \sin^2\varepsilon\right) + 2\mu\left(-n a^2 \sin\varepsilon(1 - 2\cos\varepsilon)^{3/2}\right) + \sigma\left(a^2(1 - 2\cos\varepsilon)^{5/2}\right) = 0 \qquad (2.20)$$

Later we are going to utilize two types of approximation to reduce (2.20).

2.1.1 Calculation of the elasticity of the blood medium (σ)

The elasticity of the blood medium (σ) as it leaves the heart region which we are calculating here is different from the elasticity of the red blood cell. Now we know that the elasticity of the human aorta is about $\mu = 10\times10^5\, dyne/cm^2 = 1\times10^5\, N/m^2$ or more explicitly written as $\mu = 1\times10^5\; kgm^{-1}s^{-2}$ since we know that (1 N = 10^5 dyne, 10^4 cm^2 = 1 m^2). The dynamic viscosity of the human blood is about $\eta = 0.004$ kg/m s and also the approximate angular frequency of the human heart is $f = 1.2\, s^{-1}$. With the provision of these parameters we can estimate the mass impulse elasticity of the blood medium σ as it leaves the heart from the equation given,

$$\sigma = \frac{\eta^2 f^2}{\mu} = \frac{(0.004 kgm^{-1}s^{-1})^2 \times (1.2\, s^{-1})^2}{1\times10^5 kgm^{-1}s^{-2}} = 2.304\times10^{-10} kgm^{-1}s^{-2} \quad (2.21)$$

2.2 Calculation of the Phase Angle (ε), Angular Frequency (n) and the Amplitude (a) of the 'Host Wave'

We have indicated before now that two types of approximation shall be utilized in order to linearize (2.20). These are the 'third world approximation' and the 'fourth world approximation'. These approximations are the differential minimization of the resulting binomial expansion of a given variable function.

The new approximations which we introduced in this study have the advantage of converging results easily and also producing expected minimum value of results. Although, there are several approximation techniques whose application depends on the physical interest under investigation. The two new approximation techniques were actually developed for the purpose of this present research.

Now the 'third world approximation' states explicitly that

$$\left(1+\xi\, f(\phi)\right)^{\pm n} = \frac{d}{d\phi}\left(1 + n\,\xi\, f(\phi) + \frac{n(n-1)}{2!}\left(\xi\, f(\phi)\right)^2 + \frac{n(n-1)(n-2)}{3!}\left(\xi\, f(\phi)\right)^3 + \ldots\right) - n\frac{d}{d\phi}\left(\xi\, f(\phi)\right) \quad (2.22)$$

While the 'fourth world approximation' states explicitly that

$$\left(1+\xi\, f(\phi)\right)^{\pm n} = \frac{d}{d\phi}\left(1 + n\,\xi\, f(\phi) + \frac{n(n-1)}{2!}\left(\xi\, f(\phi)\right)^2 + \frac{n(n-1)(n-2)}{3!}\left(\xi\, f(\phi)\right)^3 + \ldots\right) - n\frac{d}{d\phi}\left(\xi\, f(\phi)\right) - \frac{n(n-1)}{2!}\frac{d}{d\phi}\left(\xi\, f(\phi)\right)^2 - \cdots \quad (2.23)$$

Here ϕ is any variable function and ξ is a scalar number. The 'fourth world approximation' enhances minimum functional value since the amplitude of the carrier wave would have to go through the smallest blood vessel – the capillaries. Hence using the 'third world approximation' in (2.20) we get

$$\left(1 - 2\cos\varepsilon\right)^{3/2} = \left(1 + (-2\cos\varepsilon)\right)^{3/2} = \left(0 + 3\sin\varepsilon - 3\cos\varepsilon\sin\varepsilon + \ldots\right) - 3\sin\varepsilon = -3\cos\varepsilon\sin\varepsilon \quad (2.24)$$

$$\left(1 - 2\cos\varepsilon\right)^{5/2} = \left(1 + (-2\cos\varepsilon)\right)^{5/2} = \left(0 + 5\sin\varepsilon - 15\cos\varepsilon\sin\varepsilon + \ldots\right) - 5\sin\varepsilon = -15\cos\varepsilon\sin\varepsilon \quad (2.25)$$

Also with a similar implementation of the 'fourth world approximation', in equation (2.20) we get

$$\left(1 - 2\cos\varepsilon\right)^{3/2} = \left(1 + (-2\cos\varepsilon)\right)^{3/2} = -\frac{3}{2}\cos^2\varepsilon\sin\varepsilon \quad (2.26)$$

$$\left(1 - 2\cos\varepsilon\right)^{5/2} = \left(1 + (-2\cos\varepsilon)\right)^{5/2} = \frac{15}{2}\cos^2\varepsilon\sin\varepsilon \quad (2.27)$$

When we substitute (2.24) and (2.25) into (2.20) we realize after some simplification and rearrangement that

$$\rho V n^2 a \left(\cos\varepsilon - 2\cos^2\varepsilon - \sin^2\varepsilon\right) + a^2\left(6\mu n \cos\varepsilon \sin^2\varepsilon - 15\sigma\cos\varepsilon\sin\varepsilon\right) = 0 \tag{2.28}$$

We can now equate the coefficient of the terms in the parentheses to zero so that we get two separate equations as shown in (2.29) and (2.30).

$$\left(\cos\varepsilon - 2\cos^2\varepsilon - \sin^2\varepsilon\right) = 0 \tag{2.29}$$

$$n = \frac{15\ \sigma\cos\varepsilon\sin\varepsilon}{6\mu\cos\varepsilon\sin^2\varepsilon} = \frac{15\ \sigma}{6\mu\sin\varepsilon} \tag{2.30}$$

Also by a similar substitution of (2.26) and (2.27) into (2.20) we get after some simplification that

$$2\rho V n^2 a \left(\cos\varepsilon - 2\cos^2\varepsilon - \sin^2\varepsilon\right) + a^2\left(6\mu n \cos^2\varepsilon\sin^2\varepsilon + 15\sigma\cos^2\varepsilon\sin\varepsilon\right) = 0 \tag{2.31}$$

$$a = \frac{-\left(\cos\varepsilon - 2\ \cos^2\varepsilon - \sin^2\varepsilon\right)2\rho V n^2}{6\mu n\ \sin^2\varepsilon\cos^2\varepsilon + 15\ \sigma\cos^2\varepsilon\sin\varepsilon} \tag{2.32}$$

Let us now solve for the critical value of the phase angle of the 'host wave' vibration by using the relation $\cos\varepsilon = 1 - \frac{\varepsilon^2}{2}$ and $\sin\varepsilon = \varepsilon$ in (2.29), so that

$$\varepsilon^4 - \varepsilon^2 + 2 = 0 \tag{2.33}$$

Upon solving for ε in (2.33) we get four roots as possible solutions to it; they are

$$\varepsilon_1 = -0.9783 + 0.6761i\,;\ \varepsilon_2 = -0.9783 - 0.6761i\,;\ \varepsilon_3 = 0.9783 + 0.6761i\,;\ \varepsilon_4 = 0.9783 - 0.6761i \tag{2.34}$$

Thus a more realistic complex value of the phase angle ε is $\varepsilon_3 = 0.9783 + 0.6761i$ and by converting the result from the complex value to a more realistic value in degree or radian we get

$$\tan\varepsilon = \frac{0.6761}{0.9783} = 0.6911 \ \Rightarrow\ \varepsilon = \tan^{-1}(0.6911) = 0.6109\ rad.\ (35^0) \tag{2.35}$$

$$n = \frac{15\times 2.304\times 10^{-10} kgm^{-1}s^{-2}}{6\times 0.004\times\sin(0.6109)\, kgm^{-1}s^{-1}} = 2.51\times 10^{-7}\ rad./s \tag{2.36}$$

$$a = \frac{-\left(\cos(0.6109) - 2\cos^2(0.6109) - \sin^2(0.6109)\right)2\rho V n^2}{6(2.51\times 10^{-7})(0.004)\cos^2(0.6109)\sin^2(0.6109) + 15(2.304\times 10^{-10})\cos^2(0.6109)\sin(0.6109)} \tag{2.37}$$

$$a = \left(320238983.1 kg^{-1} m s^2\right) 2\rho V n^2 \tag{2.38}$$

Now for the human ascending aorta whose radius $r = 0.015m$ and length $l = 0.07m$, then the volume V is

$$V = \pi r^2 l = 3.142 \times (0.015)^2 \times 0.07 = 4.94865 \times 10^{-5} m^3 \quad (2.39)$$

$$a = \left(3202389831\, kg^{-1} m\, s^2\right) \times 2 \times 1050 kgm^{-3} \times 4.94865 \times 10^{-5} m^3 \times (2.51 \times 10^{-7} rad.s^{-1})^2 = 2.1 \times 10^{-6} m \quad (2.40)$$

It should be made very clear that the amplitude a decreases in size as it leaves the source which is the heart and so it can assume the radius size of the capillary.

2.2.1 Calculation of the spatial frequency (k) of the 'host wave'

We have made the assumption that for the carrier wave CW to have a maximum value then the spatial oscillating phase must be equal to 1, as a result

$$\cos\left((\vec{k} - \vec{k}'\lambda).\vec{r} - (n - n'\lambda)t - E\right) = 1 \quad (2.41)$$

$$\left((\vec{k} - \vec{k}'\lambda).\vec{r} - (n - n'\lambda)t - E\right) = 0 \quad (2.42)$$

$$(\vec{k} - \vec{k}'\lambda) = (k - k'\lambda)_x i + (k - k'\lambda)_y j + (k - k'\lambda)_z k \quad (2.43)$$

$$\vec{r} = xi + yj + zk \quad (2.44)$$

If we assume that the motion is constant in the z-direction and the wave vector mode is also the same for both x and y plane in the cylindrical system then

$$(\vec{k} - \vec{k}'\lambda) = (k - k'\lambda)_x i + (k - k'\lambda)_y j \quad (2.45)$$

$$\vec{r} = r\cos\theta\, i + r\sin\theta\, j \quad (2.46)$$

where $\theta = \pi - (\varepsilon - \varepsilon'\lambda)$ is the variable angle between y_1 and y_2, please see Fig. 1 for details of the geometry.

$$(\vec{k} - \vec{k}'\lambda).\vec{r} = (k - k'\lambda)\, r\,(\cos\theta + \sin\theta) \quad (2.47)$$

$$\left((k - k'\lambda)\; r\,(\cos\theta + \sin\theta) - (n - n'\lambda)t - E\right) = 0 \quad (2.48)$$

We can now impose the same boundary conditions on (2.48). That is, from equation (2.6) at time $t = 0$, $\lambda = 0$,

$$E = \tan^{-1}(\tan\varepsilon) = \varepsilon = 0.6109\, rad.;$$
$$\theta = \pi - (\varepsilon - \varepsilon'\lambda) = \pi - \varepsilon = 3.142 - 0.6109 = 2.5311 rad. \quad (2.49)$$

$$k\, r\left(\cos(2.5311) + \sin(2.5311)\right) - 0.6109\, rad. = 0 \quad (2.50)$$

$$k = \frac{0.6109 rad.}{r\,(-0.2460945)} = \frac{0.6109 rad.}{0.015 m \times (-0.2460945)} = 166 rad./m \quad (2.51)$$

Note that the radius of the human aorta is r = 0.015m and we are also going to work with the absolute value of the wave number or the spatial frequency k in this study.

2.3 Calculation of the Phase Angle (ε'), Angular Frequency (n'), Wave Number (k') and Amplitude (b) of the HIV Vibration

The gradual deterioration in the intrinsic parameters of the biological system of HIV/ AIDS infected person would make us believe that after a sufficiently long period of time all the active constituents or characteristic features of the vibration of the resident host (Man) would have been completely eroded by the influence of the HIV. The gradual depletion of the wave form of the carrier wave CW and its several properties as a result of the multiplier, characterizes a predominance of the HIV 'parasitic wave' after a very long period of time. This time must correspond to when the HIV disease would have degenerated to AIDS and there is the presence of only the variables of the HIV parasitic wave. On the basis of this argument the relations below holds.

$$\left.\begin{aligned} a - b\lambda = 0 &\Rightarrow 2.1 \times 10^{-6} = b\lambda \\ n - n'\lambda = 0 &\Rightarrow 2.51 \times 10^{-7} = n'\lambda \\ \varepsilon - \varepsilon'\lambda = 0 &\Rightarrow 0.6109 = \varepsilon'\lambda \\ k - k'\lambda = 0 &\Rightarrow 166 = k'\lambda \end{aligned}\right\} \quad (2.52)$$

Upon dividing the above four relations in (52) with one another to eliminate λ , we get the following six relations.

$$\left.\begin{array}{l} \Rightarrow 8.3665\,n' = b \\ \Rightarrow 3.43755\times10^{-6}\,\varepsilon' = b \\ \Rightarrow 1.26506\times10^{-8}\,k' = b \\ \Rightarrow 4.10869\times10^{-7}\,\varepsilon' = n' \\ \Rightarrow 1.51204\times10^{-9}\,k' = n' \\ \Rightarrow 3.68012\times10^{-3}\,k' = \varepsilon' \end{array}\right\} \qquad (2.53)$$

Thus from all indications k' is related to ε' according to; $3.68\times10^{-3}\,k' = \varepsilon'$ or $3.68\,k' = 10^{3}\varepsilon'$. Suppose we want to re-establish another relationship between k' and ε' then we can simply multiply through the sets of the relations in (2.53) by a factor of 3.68012×10^{3} . Consequently, once this is done then a more realistic and applicable relation for both quantities can be found from the 2nd and 3rd relations in (2.53) after equating them to one another, that is, when $0.0126505985\,\varepsilon' = 0.000046555\,k'$. Hence from simple proportion or ratio we can generally establish that

$$\varepsilon' = 0.0000466\ rad.,\ k' = 0.0127\,rad./m,$$

$$n' = 1.91\times10^{-11}\,rad./s\ \ b = 1.60\times10^{-10}\,m \qquad (2.54)$$

Any of these estimated values of the HIV parameters shall produce a corresponding value of the multiplicative factor $\lambda = 13070$ upon substituting them into (2.52). Hence the range of the raising multiplier is $0 \le \lambda \le 13070$.

2.3.1 Determination of the attenuation constant (η) of CW

Attenuation is a decay process. It brings about a gradual reduction and weakening in the initial strength of the basic intrinsic parameters of a given physical system. In this study, the parameters are the amplitude (a), phase angle (ε), angular frequency (n) and the spatial frequency (k).

The dimension of the attenuation constant (η) is determined by the system under study. However, in this work, attenuation constant is the relative rate of fractional change σ (FC) in the basic parameters of the carrier wave function. There are 4 (four) attenuating parameters present in the carrier wave. Now, suppose a , n , ε , k represent the initial parameters of the 'host wave' that is present in the carrier wave and $a - b\lambda$, $n - n'\lambda$, $\varepsilon - \varepsilon'\lambda$, $k - k'\lambda$ represent the final parameters of the 'host wave' that survives after a given time. Then, the FC is

Fractional change,

$$\sigma = \frac{1}{4}\times\left(\left(\frac{a-b\lambda}{a}\right)+\left(\frac{\varepsilon-\varepsilon'\lambda}{\varepsilon}\right)+\left(\frac{n-n'\lambda}{n}\right)+\left(\frac{k-k'\lambda}{k}\right)\right) \qquad (2.55)$$

$$\eta = \frac{FC\big|_{\lambda=i} - FC\big|_{\lambda=i+1}}{unit\ time\ (s)} = \frac{\sigma_i - \sigma_{i+1}}{unit\ time\ (s)} \qquad (2.56)$$

The dimension is per second (s^{-1}). Thus (2.56) gives $\eta = 0.0000763\ s^{-1}$ for all values of $\lambda\ (i = 0,1,2,3,\ldots,13070\ )$.

2.3.2 Determination of the Attenuation or Decay Time (t) of the Carrier Wave CW

The decay time is also very crucial in the determination of the total time that would elapse before the resultant interference will attenuate to zero - provided the interference is destructive.

However, it is clear from the calculation that different attenuating fractional changes contained in the carrier wave function are approximately equal to one another. We can now apply the attenuation time equation given below.

$$\sigma = e^{-(\alpha\,\eta\,t)/\lambda} \qquad (2.57)$$

$$t = -\left(\frac{\lambda}{\alpha\eta}\right)\ln\sigma \qquad (2.58)$$

In this case, α is the HIV quality factor and in this study $\alpha = 3$. The reader should note that since the multiplier is quantized ($\lambda = 0,\ 1,\ 2,\ldots,13070$) the attenuation time of the decay time will also have varying values corresponding to each value of the multiplier.

However, the quality factor α is the same for any other human biological diseases that are not localized but different for other related human diseases that are localized. The equation is statistical and not a deterministic law, it gives the expected parameters of the 'host wave' that survives after time t .

2.3.3 Theory of the Interaction of Electromagnetic (EM) Waves with the Hiv Vibration

In order to simplify our discussion somewhat, we shall assume that our axes have been chosen so that the positive y axis is the direction of propagation of the EM wave; the transverse plane is then the xz plane and the motion is constant with respect to the y axis. Now suppose we assume specific orientation of the x and z axes with respect to the amplitude of the EM wave we get that

$$\vec{E}_x = E_x \sin(k y - \omega t - \theta_x) \tag{2.59}$$

$$\vec{E}_z = E_z \sin(ky - \omega t - \theta_z) \tag{2.60}$$

Usually the orientation may be assumed to be the same, hence $E_x = E_z = E_0$,

$$\theta_x = \theta_z = \theta \quad \text{and} \quad \vec{E}_x + \vec{E}_z = \vec{E} \tag{2.61}$$

Thus generally, the equation of the time - dependent Electromagnetic EM wave is given by

$$\vec{E} = 2E_0 \sin(kx - \omega t - \theta) \tag{2.62}$$

where E_0 (amplitude of the applied EM wave), ω (angular frequency), θ (phase angle) and t (time). Note that the magnetic field $\vec{B}$ is also implied in (2.62). This is true because, the magnetic $\vec{B}$ and the electric $\vec{E}$ fields cannot exist independently of one another. On interpretation; k is the spatial frequency of the EM wave and x is the distance covered by the EM wave. The factor two in (2.62) makes it a complete or full electromagnetic EM wave. Details of this shall be made clear in Fig. 7 and Fig. 8 as shown in section 3.

It should be mentioned here that all the symbols or parameters which may appear henceforth has nothing to do or does bear any similarity with the characteristics of the vibration of Man the 'Host wave'.

In natural systems, we can rarely find pure wave which propagates free from energy-loss mechanisms. But if these losses are not too serious we can describe the total propagation in time by a given force law $f(t)$. The propagation of the HIV 'parasitic wave' in the blood circulating system is affected by three major factors: (i) the effect of the mass m of the surrounding whole blood (ii) the damping effect of the permeability γ of blood and (iii) the damping effect of the elastic μ property of blood which rest in the red blood cells.

However, this assumption takes into account only the Human blood which is different from (2.10) in which the elasticity of the blood vessels was taken into consideration. The equation of motion governing the propagation of the HIV 'parasitic wave' in the human system therefore obeys the force law

$$f(t) = m y'' + \gamma y' + \mu y \tag{2.63}$$

The unit of mass m of the surrounding whole blood is kg, the unit of the permeability of blood γ is kg/s and the elastic μ property of red blood cell is N/m or kg/s^2 and this combination gives the dimension of force which is N or kgm/s^2. The force law governing the propagation of the HIV parasitic wave in the Human blood circulating system will now be intercepted by electromagnetic EM wave according to the equation below.

$$m y'' + \gamma y' + \mu y = 2E_0 \sin(k x - \omega t - \theta) \tag{2.64}$$

We that (2.64) is a second order non homogeneous differential equation, and the general solution shall comprise of the complementary function CF say $y_1(t)$ and the particular integral PI say $y_2(t)$. Now for the complementary function CF we equate the right hand side to zero and solve with operator D method, that is,

$$m y'' + \gamma y' + \mu y = 0 \tag{2.65}$$

$$D^2 y + \frac{\gamma}{m} D y + \frac{\mu}{y} y = 0 \tag{2.66}$$

$$\left(D^2 + \frac{\gamma}{m} D + \frac{\mu}{y} \right) y = 0 \qquad (2.67)$$

$$D = \frac{-\frac{\gamma}{m} \pm \sqrt{\left(\frac{\gamma}{m}\right)^2 - 4\left(\frac{\mu}{m}\right)}}{2} \qquad (2.68)$$

where we have used the fact that $(D = \frac{d}{dt})$ in (2.66) and ($y \neq 0$) in (2.67). Now with the standard values of; $\gamma = 0.015\, kg/s$, $\mu = 6.92 \times 10^{-7}\, kg/s^2$ and $m = 1050\, kg$.

$$D_1 = (-7.143 \times 10^{-6} + i\ 2.466 \times 10^{-5})\ rad/s\ ;$$
$$D_2 = (-7.143 \times 10^{-6} - i\ 2.466 \times 10^{-5})\ rad/s. \qquad (2.69)$$

$$D = -\omega_1 \pm \omega_2 i \qquad (2.70)$$

$$\omega_1 = \frac{\gamma}{2m} = 7.143 \times 10^{-6} \text{ rad/s};$$
$$\omega_2 = \frac{1}{2}\sqrt{\left(\frac{\gamma}{m}\right)^2 - 4\left(\frac{\mu}{m}\right)} = 2.466 \times 10^{-5} \text{rad/s} \qquad (2.71)$$

As a result, the complementary function CF which describes the motion of the human vibration in the absence of any given external field or driving force is therefore

$$y_1(t) = e^{-\omega_1 t}\left(A\cos(\omega_2)t + B\sin(\omega_2)t\right) \qquad (2.72)$$

The complementary function $y_1(t)$ represents the latent oscillating motion of the human whole blood in the micro vascular system. The equation (2.72) is similar to (2.2) just that k and ε are absent from it. This is good because we are not subjecting the parameters of the resident host vibration to EM wave. However, the vibration of the HIV coexists with the vibration of the Host (Man) which is conveyed by the Human blood. As a result, we can now recast the latent oscillating vibration of the Host (with respect to the whole blood) to include the vibration of the HIV. Thus, without loss of dimensionality (2.72) can be written as

$$y_1(t) = e^{-(\omega_1 + n'\lambda)t}\left\{b\lambda\cos\left(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda\right) + b\lambda\sin\left(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda\right)\right\} \qquad (2.73)$$

Consequently, we have taken the constants of integration $A = B = b\lambda$ as the amplitude of HIV vibration. This recast is possible because the HIV has its own independent existing vibration before it entered the human system. We can see that (2.73) is just a slight modification of (2.72). This is due to the fact that a second order differential equation must have two possible constants of integration which we already assumed to be ($b\lambda$). In order to obtain the general solution say $y(t)$, of (2.64), we have to determine the particular integral PI associated with the CF. In any case let us assume that the particular integral PI has a solution of the form

$$y_2(t) = e^{-\omega t}\left\{C\cos(kx - \omega t - \theta) + D\sin(kx - \omega t - \theta)\right\} \qquad (2.74)$$

Where C and D are also constants of integration to be determined from the initial boundary conditions.

$$y_2'(t) = -\omega e^{-\omega t}\left\{C\cos(kx - \omega t - \theta) + D\sin(kx - \omega t - \theta)\right\} + e^{-\omega t}\left\{C\omega\sin(kx - \omega t - \theta) - D\omega\cos(kx - \omega t - \theta)\right\} \qquad (2.75)$$

$$y''_2(t) = -\omega^2 e^{-\omega t}\left\{C\sin(kx - \omega t - \theta) - D\cos(kx - \omega t - \theta)\right\} \qquad (2.76)$$

We can now substitute (2.74), (2.75) and (2.76) in their appropriate positions in (2.64).

$$m\left(-\omega^2 e^{-\omega t}\left\{C\sin\left(kx-\omega t-\theta\right)-D\cos\left(kx-\omega t-\theta\right)\right\}\right)-$$

$$\gamma\omega e^{-\omega t}\left(\left\{C\cos\left(kx-\omega t-\theta\right)+D\sin\left(kx-\omega t-\theta\right)\right\}-\left\{C\sin\left(kx-\omega t-\theta\right)-D\cos\left(kx-\omega t-\theta\right)\right\}\right)$$

$$+\mu\left(e^{-\omega t}\left\{C\cos\left(kx-\omega t-\theta\right)+D\sin\left(kx-\omega t-\theta\right)\right\}\right)=2E_0\sin(kx-\omega t-\theta) \quad (2.77)$$

By equating the coefficients of cosine to zero and of sine to $2E_0$ we get after simplification that

$$-\left(m\,\omega^2-\gamma\omega\right)Ce^{-\omega t}-(\gamma\omega-\mu)De^{-\omega t}=2E_0 \quad (2.78)$$

$$\left(m\,\omega^2-\gamma\omega\right)D-(\gamma\omega-\mu)C=0 \quad (2.79)$$

By solving (2.79) and (2.80) simultaneously for the constants C and D we get after some simplification

$$C=\frac{-2\left(m\,\omega^2-\gamma\omega\right)E_0}{\left(\left(m\,\omega^2-\gamma\omega\right)^2+(\gamma\omega-\mu)^2\right)e^{-\omega t}} \quad (2.80)$$

$$D=\frac{-2(\gamma\omega-\mu)E_0}{\left(\left(m\,\omega^2-\gamma\omega\right)^2+(\gamma\omega-\mu)^2\right)e^{-\omega t}} \quad (2.81)$$

$$y_2(t)=e^{-\omega t}\left\{\frac{-2\left(m\,\omega^2-\gamma\omega\right)E_0}{\left(\left(m\,\omega^2-\gamma\omega\right)^2+(\gamma\omega-\mu)^2\right)e^{-\omega t}}\cos(kx-\omega t-\theta)-\right.$$

$$\left.\frac{-2(\gamma\omega-\mu)E_0}{\left(\left(m\,\omega^2-\gamma\omega\right)^2+(\gamma\omega-\mu)^2\right)e^{-\omega t}}\sin(kx-\omega t-\theta)\right\} \quad (2.82)$$

Hence the general solution $y(t)$ of equation (2.64) is given by the addition of CF and the PI, hence

$$y(t)=y_1(t)+y_2(t) \quad (2.83)$$

$$y(t) = e^{-(\omega_1 + n'\lambda)t}\left\{b\lambda \cos(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda) + b\lambda \sin(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda)\right\}$$

$$- \left\{\frac{2(m\omega^2 - \gamma\omega)E_0}{(m\omega^2 - \gamma\omega)^2 + (\gamma\omega - \mu)^2}\cos(kx - \omega t - \theta) + \frac{2(\gamma\omega - \mu)E_0}{(m\omega^2 - \gamma\omega)^2 + (\gamma\omega - \mu)^2}\sin(kx - \omega t - \theta)\right\} \quad (2.84)$$

Hence, the general equation given by (2.84) is the equation of motion of the interception of the EM wave with the HIV 'parasitic wave' in the human system. In other to get a more stable state of the displacement vector of the equation of motion (2.84) we then minimize it with respect to time. That is,

$$\frac{dy}{dt} = -(\omega_1 + n'\lambda)e^{-(\omega_1 + n'\lambda)t} b\lambda\{\cos(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda) +$$
$$\sin(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda)\} +$$
$$e^{-(\omega_1 + n'\lambda)t} b\lambda(\omega_2 + n'\lambda)\{\sin(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda) - \cos(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda)\}$$
$$- \left\{\frac{2(m\omega^2 - \gamma\omega)E_0\omega}{\left((m\omega^2 - \gamma\omega)^2 + (\gamma\omega - \mu)^2\right)}\sin(kx - \omega t - \theta) - \frac{2(\gamma\omega - \mu)E_0\omega}{\left((m\omega^2 - \gamma\omega)^2 + (\gamma\omega - \mu)^2\right)}\cos(kx - \omega t - \theta)\right\} \quad (2.85)$$

2.4 Steady – State flow Characteristics of the Equation of Motion of the Interception of the EM Wave and HIV Parasitic Wave:

The equation of motion of the whole blood in a HIV infected person is influenced by the superposition of two harmonic vibrations. This combination can either enhance or inhibit the steady - state flow characteristics of the blood medium. However, it is shown here that the combined effect of the two incoherent source vibrations strictly inhibits the flow of blood and its composition. At a steady-state the force giving rise to the equation of motion of the interception of the electromagnetic EM wave with the combined vibrations of the HIV and Man is zero, that is $dy/dt = 0$, as a result, (2.85) gives

$$-(\omega_1 + n'\lambda)e^{-(\omega_1 + n'\lambda)t} b\lambda\{\cos(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda) + \sin(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda)\}$$
$$- e^{-(\omega_1 + n'\lambda)t} b\lambda(\omega_2 + n'\lambda)\{\cos(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda) - \sin(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda)\}$$
$$+ \left\{\frac{2(\gamma\omega - \mu)E_0\omega}{(m\omega^2 - \gamma\omega)^2 + (\gamma\omega - \mu)^2}\cos(kx - \omega t - \theta) - \frac{2(m\omega^2 - \gamma\omega)E_0\omega}{(m\omega^2 - \gamma\omega)^2 + (\gamma\omega - \mu)^2}\sin(kx - \omega t - \theta)\right\} = 0 \quad (2.86)$$

Let us apply the addition formula for trigonometric identity to redefine (2.86) term by term. Hence with the implementation of

$$A\cos x + B\sin x = \sqrt{A^2 + B^2}\cos(x \pm \delta) \quad (2.87)$$

$$\tan\delta = \frac{\sin\delta}{\cos\delta} = \mp\frac{B}{A} \quad (2.88)$$

$$\sqrt{\left(-(\omega_1+n'\lambda)e^{-(\omega_1+n'\lambda)t}b\lambda\right)^2+\left(-(\omega_1+n'\lambda)e^{-(\omega_1+n'\lambda)t}b\lambda\right)^2}\times$$
$$\cos(k'\lambda x-(\omega_2+n'\lambda)t-\varepsilon'\lambda+\delta)$$
$$-\sqrt{\left(e^{-(\omega_1+n'\lambda)t}b\lambda(\omega_2+n'\lambda)\right)^2+\left(-e^{-(\omega_1+n'\lambda)t}b\lambda(\omega_2+n'\lambda)\right)^2}\times$$
$$\cos(k'\lambda x-(\omega_2+n'\lambda)t-\varepsilon'\lambda+\alpha)+$$
$$\sqrt{\left(\frac{2(\gamma\omega-\mu)E_0\,\omega}{\left((m\,\omega^2-\gamma\omega)^2+(\gamma\omega-\mu)^2\right)}\right)^2+\left(-\frac{2(m\,\omega^2-\gamma\omega)E_0\,\omega}{\left((m\,\omega^2-\gamma\omega)^2+(\gamma\omega-\mu)^2\right)}\right)^2}\times$$
$$\cos(k\,x-\omega t-\theta+\beta)=0 \qquad (2.89)$$

where δ , α and β are the epoch of the motion. It is clear that δ and α is the accelerating and velocity components of the epoch of the motion of the HIV in combination with the Human system, and β is the epoch of the motion associated with the applied EM wave. They represent a shift in the phase angles as a result of the motion. With the implementation of (2.88), we can calculate the various shifts in the respective phase angles of the general equation of motion as indicated by (2.89).

$$\delta=\tan^{-1}(-1)\left(\frac{-(\omega_1+n'\lambda)e^{-(\omega_1+n'\lambda)t}b\lambda}{-(\omega_1+n'\lambda)e^{-(\omega_1+n'\lambda)t}b\lambda}\right)=\tan^{-1}(-1)=-45^0\,(-\pi/4) \qquad (2.90)$$

$$\alpha=\tan^{-1}(-1)\left(\frac{-e^{-(\omega_1+n'\lambda)t}b\lambda(\omega_2+n'\lambda)}{e^{-(\omega_1+n'\lambda)t}b\lambda(\omega_2+n'\lambda)}\right)=\tan^{-1}(1)=45^0\,(\pi/4) \qquad (2.91)$$

$$\beta=\tan^{-1}(-1)\left(-\frac{2(m\,\omega^2-\gamma\omega)E_0\,\omega}{(m\,\omega^2-\gamma\omega)^2+(\gamma\omega-\mu)^2}\times\frac{(m\,\omega^2-\gamma\omega)^2+(\gamma\omega-\mu)^2}{2(\gamma\omega-\mu)E_0\,\omega}\right) \qquad (2.92)$$

$$\beta=\tan^{-1}\left(\frac{m\,\omega^2-\gamma\omega}{\gamma\omega-\mu}\right) \qquad (2.93)$$

We can (2.93) multiplicatively non-resistant by assuming the same value of β = 45^0 $(\pi/4)$. Then

$$45^0=\tan^{-1}\left(\frac{m\,\omega^2-\gamma\omega}{\gamma\omega-\mu}\right) \qquad (2.94)$$

$$1.6198=\left(\frac{m\,\omega^2-\gamma\omega}{\gamma\omega-\mu}\right) \qquad (2.95)$$

$$\omega=\frac{2.6198\,\gamma\pm\sqrt{(2.6198\,\gamma)^2-4m(1.6198\,\mu)}}{2m} \qquad (2.96)$$

The human blood has permeability γ or penetrability value of about 0.9 kg/min or 0.015 kg/s. The elasticity μ of red blood cells has a value that ranges between 0.108 – 2.146 dyn/cm x 10^{-3} with a median value of 0.692 x 10^{-3} dyn/cm or 6.92 x 10^{-7}N/m (6.92x10^{-7}kg/s^2). The density of blood plasma is approximately 1025 kg/m^3 and the density of blood cells circulating in the blood is approximately 1125 kg/m^3. The Blood plasma and its contents are known as whole blood and the average density of whole blood for a human is about 1050 kg/m^3 [18,19].

$$\omega = \frac{2.6198(0.015kg/s) \pm \sqrt{(2.6198 \times 0.015kg/s)^2 - 4(1050\ kg)(1.6198)(6.92 \times 10^{-7}\ kg/s^2)}}{2\ (1050kg)} \tag{2.97}$$

$$\omega = 0.000018714 \pm 0.000026786\ i \quad \text{(Radian/second)} \tag{2.98}$$

This gives the absolute value of the angular frequency of the applied oscillating electromagnetic EM wave as

$$\omega = 0.00003267\ radian/\sec ond \tag{2.99}$$

The angular frequency ω of the applied oscillating EM wave will also have its own inbuilt phase angle which is

$$\zeta = \tan^{-1}\left(\pm\frac{0.000026786}{0.000018714}\right) = \pm 55^0 = \pm\ 0.9611\ radian \tag{2.100}$$

The epoch of the equation of the electromagnetic EM wave and the combined HIV and the Host wave takes place either to the left direction ($+\pi/4$) or to the right direction ($-\pi/4$).

2.5 Evaluation of the Phase Angle and the total time of Exposure

There are three oscillating phases that are associated with the equation of motion. The oscillating phase associated with the applied EM wave, the oscillating phase associated with the interfering HIV parasitic wave and the oscillating phase associated with the Human blood system. For complete destructive interference to occur the phase difference between the applied oscillating electromagnetic EM wave and the combination of the vibrations of the HIV and that of the Human blood must be equal to 180^o (π). That is, the phase difference equation is given by

$$(kx - \omega t - \theta + \beta) - \left(\left(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda + \delta\right) + \left(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda + \alpha\right)\right) = \pi \tag{2.101}$$

$$\left(kx - \omega t - \theta + \beta\right) - \left(2k'\lambda x - 2(\omega_2 + n'\lambda)t - 2\varepsilon'\lambda + \delta + \alpha\right) = \pi \tag{2.102}$$

$$\left(kx - \omega t - \theta + \beta\right) - \left(2k'\lambda x - 2(\omega_2 + n'\lambda)t - 2\varepsilon'\lambda\right) = \pi \qquad (\delta = -\alpha) \tag{2.103}$$

$$\left(4kx - 4\omega t - 4\theta + \pi\right) - 8\left(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda\right) = 4\pi \tag{2.104}$$

There are two basic dependent variables which need to be determined from equation (2.104). The variables are the phase angle of the applied EM wave (θ) and the total time (t) – the total time of exposure of the HIV/AIDS infected person to the EM radiation. As it is, we want to assume any arbitrary value for the time and use the value to calculate the phase angle of the EM radiation. Hence, from the phase difference equation (2.104) we can redefine the phase angle of the applied oscillating EM wave as

$$\theta = \frac{\left(4kx - 4\omega t - 3\pi\right) - 8\left(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda\right)}{4} \tag{2.105}$$

We can now set $\lambda = 0, 1, 2, \ldots, 13070$. Let us not forget that the phase difference given by equation (2.105) states that irrespective of the values of λ and t, the value of the phase angle θ cancels out the effect of the HIV vibration. This will certainly force the vibration of the HIV in the resident host to attenuate to zero. The total time t of exposure can be fixed and we are taking it as t = 25 minutes (1500 seconds). As a result the corresponding value of the raising multiplier can be found from the relation

$$t = \frac{1500\ (\lambda - 1)}{\lambda} \text{ seconds} \qquad (2.106)$$

As part of the boundary conditions we can allow the spatial frequency k of the applied EM wave to assume any arbitrary value since what is responsible for destructive interference and attenuation in waves is mainly the phase angle difference of the interfering waves which must be equal to 180^0 (π). As a result, we have in this study set the value k = 150 rad/m.

The assumption made about the total time of exposure is based on the fact that it takes the human blood about 25 minutes (1500 seconds) to travel from the Heart to the tissues and back to the heart and this completes one cycle. 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 2.5 metres. Hence, in this work we are going to set or assume the value of x = 2.5 metres.

2.6 Evaluation of the Amplitude E_0 (maximum displacement) of the applied Oscillating EM Wave

In order to evaluate the maximum displacement or amplitude E_0 of the applied oscillating EM wave we need to recall and simplify (2.89) to get

$$\sqrt{2\left((\omega_1 + n'\lambda)e^{-(\omega_1 + n'\lambda)t}\, b\lambda\right)^2}\ \cos(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda + \delta)$$
$$- \sqrt{2\left((\omega_2 + n'\lambda)e^{-(\omega_1 + n'\lambda)t}\, b\lambda\right)^2}\ \cos(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda + \alpha) =$$
$$- \sqrt{\left(\frac{4E_0^2\ \omega^2\left((\gamma\omega - \mu)^2 + \left(m\,\omega^2 - \gamma\omega\right)^2\right)}{\left(\left(m\,\omega^2 - \gamma\omega\right)^2 + (\gamma\omega - \mu)^2\right)^2}\right)}\ \cos(k\,x - \omega t - \theta + \beta) \qquad (2.107)$$

Let us now square through equation (2.107) in an attempt to make E_0 (amplitude) the subject of the formula.

$$\sqrt{2\left((\omega_1 + n'\lambda)e^{-(\omega_1 + n'\lambda)t}\, b\lambda\right)^2} \times \cos^2(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda + \delta)$$
$$- 2\ \sqrt{2\left((\omega_2 + n'\lambda)e^{-(\omega_1 + n'\lambda)t}\, b\lambda\right)^2}\ \sqrt{2\left((\omega_1 + n'\lambda)e^{-(\omega_1 + n'\lambda)t}\, b\lambda\right)^2} \times$$
$$\cos(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda + \delta)\ \cos(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda + \alpha)$$
$$+ \sqrt{2\left((\omega_2 + n'\lambda)e^{-(\omega_1 + n'\lambda)t}\, b\lambda\right)^2} \times \cos^2(k'\lambda x - (\omega_2 + n'\lambda)t - \varepsilon'\lambda + \alpha)$$
$$= E_0^2 \left(\frac{4\ \omega^2\left((\gamma\omega - \mu)^2 + \left(m\,\omega^2 - \gamma\omega\right)^2\right)}{\left(\left(m\,\omega^2 - \gamma\omega\right)^2 + (\gamma\omega - \mu)^2\right)^2}\right) \times \cos^2(k\,x - \omega t - \theta + \beta) \qquad (2.108)$$

This can further be simplified with the use of trigonometric identity to realize

$$2\,(b\lambda)^2(\omega_1+n'\lambda)^2\,e^{-2(\omega_1+n'\lambda)t}\times\cos^2(k'\lambda x-(\omega_2+n'\lambda)t-\varepsilon'\lambda+\delta)$$
$$-\,4\,(b\lambda)^2\left((\omega_2+n'\lambda)\,(\omega_1+n'\lambda)\,e^{-2(\omega_1+n'\lambda)t}\right)\times$$
$$\cos(k'\lambda x-(\omega_2+n'\lambda)t-\varepsilon'\lambda+\delta)\cos(k'\lambda x-(\omega_2+n'\lambda)t-\varepsilon'\lambda+\alpha)$$
$$+\;2(b\lambda)^2(\omega_2+n'\lambda)^2 e^{-2(\omega_1+n'\lambda)t}\times\cos^2(k'\lambda x-(\omega_2+n'\lambda)t-\varepsilon'\lambda+\alpha)$$
$$=\;E_0^2\left(\frac{4\,\omega^2\left((\gamma\omega-\mu)^2+(m\,\omega^2-\gamma\omega)^2\right)}{\left((m\,\omega^2-\gamma\omega)^2+(\gamma\omega-\mu)^2\right)^2}\right)\times\cos^2(k\,x-\omega t-\theta+\beta) \tag{2.109}$$

The equation of motion of the intercepting EM wave with the HIV vibration in the Human system is a maximum provided the oscillating phases are equal to zero. That is

$$(k'\lambda x-(\omega_2+n'\lambda)t-\varepsilon'\lambda+\delta)=(k'\lambda x-(\omega_2+n'\lambda)t-\varepsilon'\lambda+\alpha)=(k\,x-\omega t-\theta+\beta)=0 \tag{2.110}$$

As a result, equation (2.109) after the accurate replacement of (2.106) basically yields the following equation.

$$2\,(b\lambda)^2(\omega_1+n'\lambda)^2\,e^{-2(\omega_1+n'\lambda)t}-4\,(b\lambda)^2\left((\omega_2+n'\lambda)\,(\omega_1+n'\lambda)\,e^{-2(\omega_1+n'\lambda)t}\right)+$$
$$2(b\lambda)^2(\omega_2+n'\lambda)^2 e^{-2(\omega_1+n'\lambda)t}\;=\;E_0^2\left(\frac{4\,\omega^2\left((\gamma\omega-\mu)^2+(m\,\omega^2-\gamma\omega)^2\right)}{\left((m\,\omega^2-\gamma\omega)^2+(\gamma\omega-\mu)^2\right)^2}\right) \tag{2.111}$$

$$2\,(b\lambda)^2\,e^{-2(\omega_1+n'\lambda)t}\left((\omega_1+n'\lambda)^2-2(\omega_2+n'\lambda)\,(\omega_1+n'\lambda)+(\omega_2+n'\lambda)^2\right)$$
$$=\;E_0^2\left(\frac{4\,\omega^2\left((\gamma\omega-\mu)^2+(m\,\omega^2-\gamma\omega)^2\right)}{\left((m\,\omega^2-\gamma\omega)^2+(\gamma\omega-\mu)^2\right)^2}\right) \tag{2.112}$$

$$E_0^2\;=\;(b\lambda)^2\,e^{-2(\omega_1+n'\lambda)t}\left(\frac{\left((\omega_1+n'\lambda)^2-2(\omega_2+n'\lambda)\,(\omega_1+n'\lambda)+(\omega_2+n'\lambda)^2\right)}{2\,\omega^2\left((\gamma\omega-\mu)^2+(m\omega^2-\gamma\omega)^2\right)}\right)\times$$
$$\left((m\,\omega^2-\gamma\omega)^2+(\gamma\omega-\mu)^2\right)^2 \tag{2.113}$$

$$E_0=\sqrt{\left(\frac{b^2\lambda^2\left((\omega_1+n'\lambda)^2-2(\omega_2+n'\lambda)\,(\omega_1+n'\lambda)+(\omega_2+n'\lambda)^2\right)}{2\,\omega^2\left((\gamma\omega-\mu)^2+(m\omega^2-\gamma\omega)^2\right)}\right)}\times$$
$$\left((m\,\omega^2-\gamma\omega)^2+(\gamma\omega-\mu)^2\right)\quad e^{-(\omega_1+n'\lambda)t} \tag{2.114}$$

Equation (2.114) therefore gives the amplitude (maximum displacement) of the applied oscillating EM wave $\vec{E}$ in relation with the HIV vibration in the Human micro-vascular system. It is a plane wave and the dimension is metres m. Now that we have determined the amplitude E_0 we can now substitute equation (2.114) into the EM field equation (2.62). As a result, the general displacement equation of the applied oscillating electromagnetic wave after the substitution is

$$\vec{E} = 2\sqrt{\left(\frac{b^2\lambda^2\left((\omega_1+n'\lambda)^2-2(\omega_2+n'\lambda)(\omega_1+n'\lambda)+(\omega_2+n'\lambda)^2\right)}{2\,\omega^2\left((\gamma\omega-\mu)^2+(m\omega^2-\gamma\omega)^2\right)}\right)} \times \left(\left(m\omega^2-\gamma\omega\right)^2+\left(\gamma\omega-\mu\right)^2\right) e^{-(\omega_1+n'\lambda)t}\sin(kx-\omega t-\theta) \quad (2.115)$$

Thus equation (2.115) is the required equation of the EM wave that could be applied for the selective annihilation of the dynamic characteristics of the vibration of the HIV from the Human system. The unit is metres m.

Fourier series has long provided one of the principal methods of analysis for mathematical physics, engineering, and signal processing. It has spurred generalizations and applications that continue to develop right up to the present. While the original theory of Fourier series applies to periodic functions occurring in wave motion, such as with light and sound, its generalizations often relate to wider settings, such as the time-frequency analysis underlying the recent theories of wavelet analysis and local trigonometric analysis. Periodic functions arise in the study of wave motion, when a basic waveform repeats itself periodically [20].

In other to make equation (2.114) and equation (2.115) periodic function we can further carryout a Fourier series expansion on the exponential term and the sinusoidal term which are the only variable functions it contains. The Fourier series expansion is very relevant as it helps to transform the equation into periodic functions. Thus

$$F\left(e^{-(\omega_1+n'\lambda)t}\sin(kx-\omega t-\theta)\right) = F\left(e^{-(\omega_1+n'\lambda)t}\right)\otimes F\left(\sin(kx-\omega t-\theta)\right) \quad (2.116)$$

That is, the functions can be separately expanded in Fourier series and thereafter we multiply the results term by term.

However we do not have to go about (2.116) laboriously when it can be shown that the direct substitution of the Fourier series expansion of only the exponential term into (2.114) and (2.115) shall produce the same periodic results. As a result, we are going to expand only the exponential function in Fourier series.

$$F\left[f\left(e^{-(\omega_1+n'\lambda)t}\right)\right] = F\left[f(E_0)\right] \quad (2.117)$$

Thus we can rewrite (2.114) and (2.115) based on (2.117) separately in the form

$$E_0 = \sqrt{\left(\frac{b^2\lambda^2\left((\omega_1+n'\lambda)^2-2(\omega_2+n'\lambda)(\omega_1+n'\lambda)+(\omega_2+n'\lambda)^2\right)}{2\,\omega^2\left((\gamma\omega-\mu)^2+(m\omega^2-\gamma\omega)^2\right)}\right)} \times \left(\left(m\omega^2-\gamma\omega\right)^2+\left(\gamma\omega-\mu\right)^2\right)\times F\left[f\left(e^{-(\omega_1+n'\lambda)t}\right)\right] \quad (2.118)$$

$$\vec{E} = 2\sqrt{\left(\frac{b^2\lambda^2\left((\omega_1+n'\lambda)^2-2(\omega_2+n'\lambda)(\omega_1+n'\lambda)+(\omega_2+n'\lambda)^2\right)}{2\,\omega^2\left((\gamma\omega-\mu)^2+(m\omega^2-\gamma\omega)^2\right)}\right)} \times \left(\left(m\omega^2-\gamma\omega\right)^2+\left(\gamma\omega-\mu\right)^2\right)\times F\left(f\left(e^{-(\omega_1+n'\lambda)t}\right)\right)\sin(kx-\omega t-\theta) \quad (2.119)$$

The Fourier series expansion of the exponential function gave two possible terms: the constant term without unit and is given by (A.27) and the frequency term with the unit of (s-1) which is given by (A.29). However, the implementation of the frequency term (s^{-1}) in (2.118) and (2.129) would result to velocity (m/s). Thus we can assume that it is the velocity with which the amplitude and the applied EM wave are moving.

The frequency term of the Fourier series expansion of the exponential function which is given by (A.29) can also be interpreted as the behaviour of the applied EM wave away from the origin. This term can be ignored from the series particularly if we are investigating the property of the EM wave around the origin and not away from the origin. Consequently, we are not going to implement the frequency term in our work. Now the constant term of the Fourier series expansion of the exponential function which is given by (A.27) is of the form:

$$F\left[f\,(e^{-(\omega_1+n'\lambda)t})\right] = \left(\frac{1-e^{-(\omega_1+n'\lambda)\tau}}{(\omega_1+n'\lambda)\tau}\right) + \sum_{\alpha=1}^{\infty}\left(\frac{e^{-(\omega_1+n'\lambda)\tau}\sin(\alpha n'\lambda)\tau}{\alpha(n'\lambda)\tau}\right)\cos\alpha(n'\lambda)t + \sum_{\alpha=1}^{\infty}\left(\frac{1-e^{-(\omega_1+n'\lambda)\tau}\cos(\alpha\, n'\lambda)\tau}{\alpha(n'\lambda)\tau}\right)\sin\alpha(n'\lambda)t \tag{2.120}$$

As it is, equation (2.120) has no unit upon evaluation. We can now substitute (2.120) into (2.118) and get

$$E_0 = \left\{\sqrt{\left(\frac{b^2\lambda^2\left((\omega_1+n'\lambda)^2-2(\omega_2+n'\lambda)(\omega_1+n'\lambda)+(\omega_2+n'\lambda)^2\right)}{2\,\omega^2\left((\gamma\omega-\mu)^2+(m\omega^2-\gamma\omega)^2\right)}\right)} \times \left(\left(m\omega^2-\gamma\omega\right)^2+\left(\gamma\omega-\mu\right)^2\right)\right\} \times \left\{\left(\frac{1-e^{-(\omega_1+n'\lambda)\tau}}{(\omega_1+n'\lambda)\tau}\right) + \sum_{\alpha=1}^{\infty}\left(\frac{e^{-(\omega_1+n'\lambda)\tau}\sin(\alpha n'\lambda)\tau}{\alpha(n'\lambda)\tau}\right) \times \cos\alpha(n'\lambda)t + \sum_{\alpha=1}^{\infty}\left(\frac{1-e^{-(\omega_1+n'\lambda)\tau}\cos(\alpha\, n'\lambda)\tau}{\alpha(n'\lambda)\tau}\right)\sin\alpha(n'\lambda)t\right\} \tag{2.121}$$

Hence the Fourier series expansion of the amplitude of the applied EM wave is given by equation (2.121). Thus the amplitude which is the maximum displacement of the applied oscillating EM wave has a unit of metres m. On the substitution of (2.121) into (2.119) we realize the displacement equation of the applied oscillating EM wave which is given by:

$$\vec{E} = 2\times\left(\frac{b^2\lambda^2\left((\omega_1+n'\lambda)^2-2(\omega_2+n'\lambda)(\omega_1+n'\lambda)+(\omega_2+n'\lambda)^2\right)}{2\,\omega^2\left((\gamma\omega-\mu)^2+(m\omega^2-\gamma\omega)^2\right)}\right)\times \left(\left(m\omega^2-\gamma\omega\right)^2+\left(\gamma\omega-\mu\right)^2\right)\times\left\{\left(\frac{1-e^{-(\omega_1+n'\lambda)\tau}}{(\omega_1+n'\lambda)\tau}\right) + \sum_{\alpha=1}^{\infty}\left(\frac{e^{-(\omega_1+n'\lambda)\tau}\sin(\alpha n'\lambda)\tau}{\alpha(n'\lambda)\tau}\right)\cos\alpha(n'\lambda)t + \sum_{\alpha=1}^{\infty}\left(\frac{1-e^{-(\omega_1+n'\lambda)\tau}\cos(\alpha\, n'\lambda)\tau}{\alpha(n'\lambda)\tau}\right)\sin\alpha(n'\lambda)t\right\}\sin(kx-\omega t-\theta) \tag{2.122}$$

Hence the unit of the displacement applied oscillating EM wave with Fourier series expansion which is given by (2.122) is also metres m.

3. RESULTS AND DISCUSSION

It is evident from Fig. 1 which is the graphical representation of equation (2.2) that in the absence of the HIV parasitic wave, the frequency of the Human vibration oscillates between $\pm$ 2.1 x 10^{-6}m. It has a regular equal band width and phase angle 0.6109 radian. However, based on the value of the raising multiplier λ = 13070 used in computing the time in (2.58) the wave-function of the Host goes to zero around 328479340 seconds (10 years). Note that this is not the age of Man, although, the expected age of Man can be calculated from it if the multiplier is suitably adjusted. Obviously, from Fig. 1 the vibration of the resident host wave has a regular frequency, constant amplitude and hence the displacement is consistently normal.

Table 1. Summary of the quantitative values of the vibration of the Resident 'Host wave' (Man) and the vibration of the HIV 'parasitic wave', the raising multiplier and the decay time

Physical Quantity	Symbol	Value
Amplitude of the Human host wave	a	2.1 x 10^{-6} m
Angular frequency of the Resident Host wave	n	2.51 x 10^{-7} rad/s
Spatial frequency of the Host wave	k	166 radian/m
Phase angle of the Host wave	ε	0.6109 radian
Amplitude of the HIV parasitic wave	b	1.6 x 10^{-10} m
Angular frequency of the HIV parasitic wave	n'	1.91 x 10^{-11} rad/s
Spatial frequency of the HIV parasitic wave	k'	0.0127 rad/m
Phase angle of the HIV parasitic wave	ε'	0.0000466 radian
The raising multiplier	λ	0, 1, 2, 3, . . . , 13070
Maximum decay time of the carrier wave CW	t	328479340 seconds (10 years)

Table 2. Shows how the generating EM wave device will be calibrated

Physical quantity	Symbol	Range / Unit
The phase angle of the Applied EM wave	θ	-457 $\leq \theta \leq$ 373 (radian)
The spatial frequency of the Applied EM wave	k	150 radian/m
Angular frequency of the applied EM wave	ω	0.00003267 radian/second
Angular frequency of the Human system with regard to the Permeability of blood medium	ω_1	0.000007143 radian/second
Angular frequency of the Human system with regard to the elasticity of Human red blood cell	ω_2	0.00002466 radian/second
The total time of exposure	t	0 $\leq t \leq$ 1500 s 1500seconds = (25 minutes)
Actual total time of exposure	τ	0.0208 seconds
Total distance to be covered by the EM wave	x	2.5 metres
Spatial oscillating phase of the Applied EM wave	$\sin(kx-\omega t-\theta)$	-1 $\leq \sin(kx-\omega t-\theta) \leq$ +1
The applied EM wave (without Fourier series expansion)	$\vec{E}$	-8 x $10^{-6} \leq \vec{E} \leq$ + 8 x 10^{-6} (metres)
The applied EM wave (with Fourier series expansion)	$\vec{E}$	-120 $\leq \vec{E} \leq$ +137 (metres)

The Fig. 2 is the graphical representation of equation (2.3). It is evident from the graph that the frequency of the HIV vibration first increases before it attains a regular frequency of oscillation between $\pm 1.6 \times 10^{-10}$ m. It has a regular equal band width and phase angle 0.0000466 radian. From the figures the phase angle of the Human vibration leads the phase angle of the vibration of HIV, that is, the HIV phase angle therefore lags the phase angle of Man. However, based on the same argument of the raising multiplier λ = 13070 the wave-function of the HIV vibration also goes to zero around 328479340 seconds (10 years).

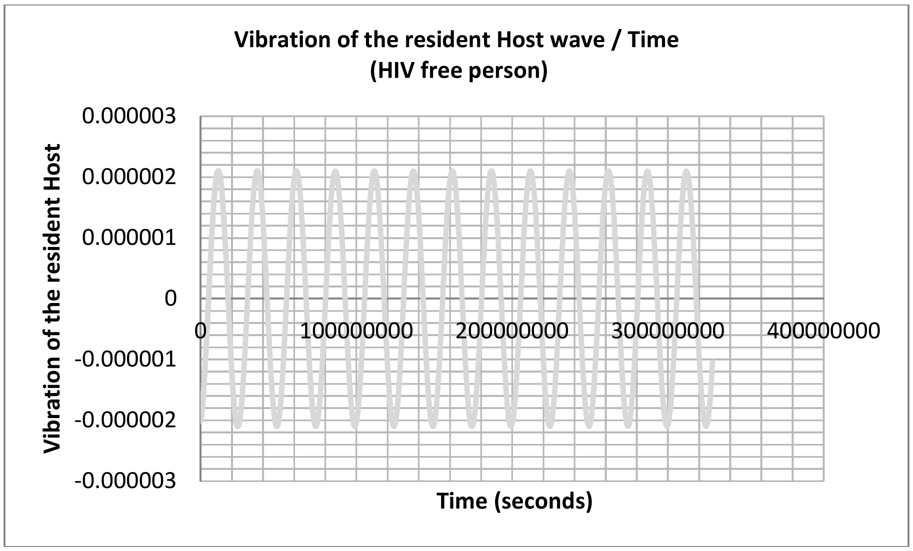

Fig. 1. Shows the graph of the displacement vector of the vibration of the resident Host wave (Man) as a function of time and multiplier. The graph represents equation (2.2) where $\vec{k}.\vec{r} = k\,r\,(\cos\varepsilon + \sin\varepsilon)$ **and** r **=0.015 m**

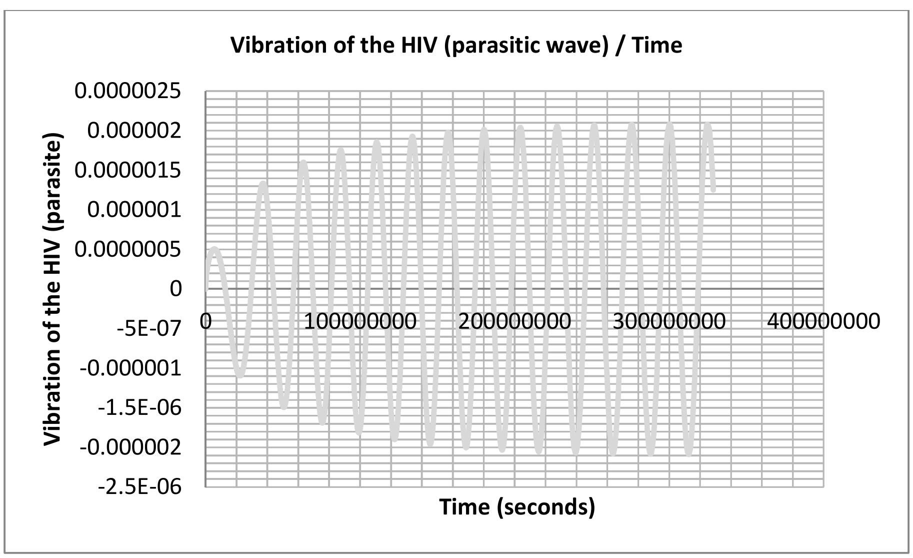

Fig. 2. Shows the graph of the displacement vector of the HIV vibration (parasitic wave) as a function of time and the multiplier. The graph represents equation (2.3) where $\vec{k}'\lambda.\vec{r} = k'\lambda\,r\,(\cos\varepsilon'\lambda + \sin\varepsilon'\lambda)$ **and** $r = b$ **m (where we take the space radius of the HIV as the same as the amplitude of the HIV vibration)**

It is also evident from fig. 1 and fig. 2 that the vibration of the HIV (parasite wave) and that of Man (Host wave) are oppositely directed and so they are out of phase. This factor satisfies the fact that both vibrations are actually incoherent. It is the incoherent nature of their source function that causes the carrier wave to attenuate to zero after a specified time when they are allowed to interfere with one another.

The spectrum of the displacement vector of the carrier wave CW as a function of time is shown in Fig. 3. From our calculation, the first peak below the equilibrium position (although not very distinct) has coordinates; λ =3000, t = 3405160 seconds (about 39 days or 1 month 9 days). This region indicates that the Human biological system is becoming aware and partially responding to the presence of a strange body (HIV).

This is followed by a marked and more prolonged elongated peak with coordinates; λ = 6000, t = 16035887 seconds (about 185 days or 6 months). The predominant nature of this peak shows that the Human system is now responding fully to the presence of the absolute manifestation of a strange body (HIV). It therefore takes about 6 months for the HIV parasite to incubate before its absolute manifestation is felt within the Human system.

Hence, according to the literature of clinical disease the 6 months of incubation is referred to as the window period. In other words, the HIV 'parasitic wave' does not take immediate absolute effect on the human system when it is contacted. Within this interval of time, there is a constant agitation by the intrinsic parameters of the 'host wave' to resist, thereby suppressing the destructive tendency of the interfering HIV 'parasitic wave'. During this period, although unnoticeable as it may, but so much imaginary harm would have been done to the constituent parameters of the biological system of the host (Man).

After now there are two other definite peaks in the CW curve; the third of the peaks is at time t = 52059148 seconds (603 days = 20 months = 1 year and 6 months) in which the CW displacement curve is almost zero. The fourth peak is at time t = 111087919 seconds (1285 days = 42 months = 3 year and 6 months) and the CW displacement curve increases negatively again.

These two inflection points, occurs about 20–42 months before the HIV disease translates into AIDS. In these region the vibrating features of the HIV is now becoming equal to the vibrating features of Man the resident host. Of course, in the literature of clinical disease this period of agitation for equal oscillating features is referred to as the change to more rapid increase in viral load (disease-causing).

From the graph the final discontinuity is in the positive region. The final discontinuity in the carrier wave CW curve is very sharp with very narrow band width. The CW curve in this region has coordinates; λ = 12859, t = 221866125 seconds (about 2567 days = 85 months or 7 years) and the corresponding carrier wave displacement $y(t)$ = -3.1632 x 10^{-7}m. It is at this point that the HIV disease degenerates into AIDS. Thus, the HIV translates into AIDS after 7 years counting from the day it is contacted, and this is also in agreement with the clinical literature of HIV/AIDS disease.

After this region the carrier wave is finally brought to rest. Our calculation shows that in the absence of specific treatment, the HIV infection degenerates to AIDS after 7 years and that is when the multiplicative factor $12859 \leq \lambda \leq 13070$. Consequently, the agitation for equal oscillating features between the HIV and the resident host (Man) would have been attained. This period involves a steady decay process which results to a complete reduction and weakening in the initial strength of the host latent vibrating features.

In this case the displacement of the carrier wave which describes the coexistence of the biological system of Man and the HIV ceases to exist – the phenomenon called death around 328479340 seconds (10 years) and the multiplicative factor λ would have attained the critical value of 13070.

The graph of the phase angle of the EM wave which represents equation (2.105) is shown in Fig. 4. The phase angle of the applied EM wave is directly proportional to the raising multiplier. It has a maximum value of 372.5800932 and a minimum value of -456.0576541. This shows that as the multiplier increases with time the phase angle also decrease and becomes more negatively large.

It should be observed that the amplitude E_0 and the displacement of the applied EM wave $\vec{E}$ given by (2.114) and (2.115) are not expanded in Fourier series; they are represented by Fig. 5 and Fig. 6 respectively. But the amplitude E_0

and the displacement of the applied EM wave $\vec{E}$ given by (2.121) and (2.122) are expanded in Fourier series; they are represented by Fig. 7 and Fig. 8 respectively. It is very clear that Fourier series expansion increases the band width of the applied electromagnetic EM wave.

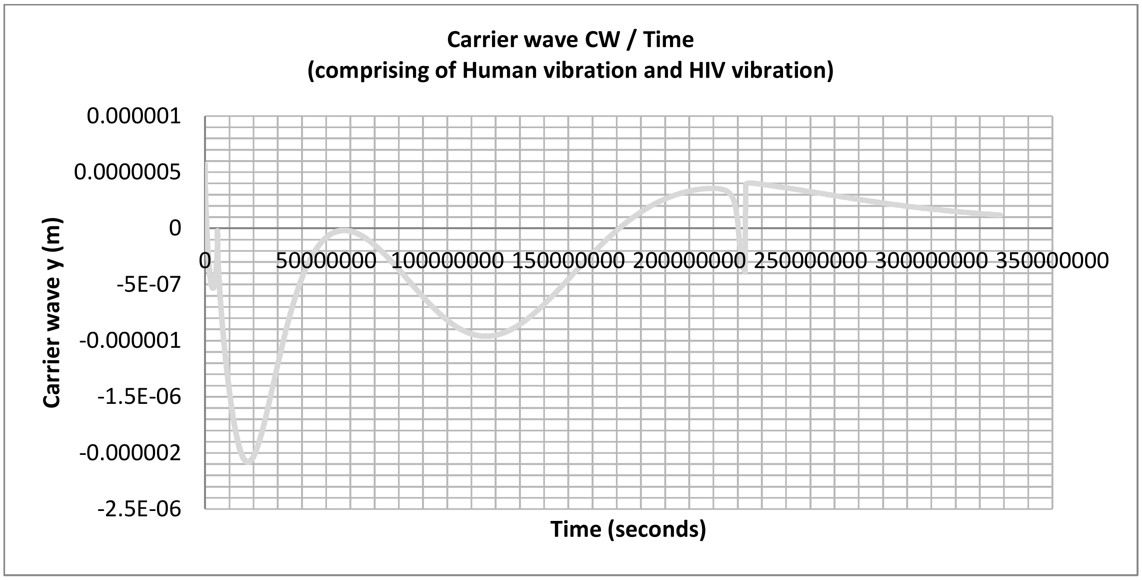

Fig. 3. Shows the graph of the displacement vector of the carrier wave CW against time as a function of the multiplier. The graph represents equation (2.5). The amplitude of the carrier wave is actually made up of the imaginary and real part, $A = A_1 + iA_2$. This shows that the motion is actually two-dimensional (2D). Thus A_1 and A_2 are the components of the amplitude in x and y - directions, and A is tangential to the phase of the moving amplitude in the carrier wave

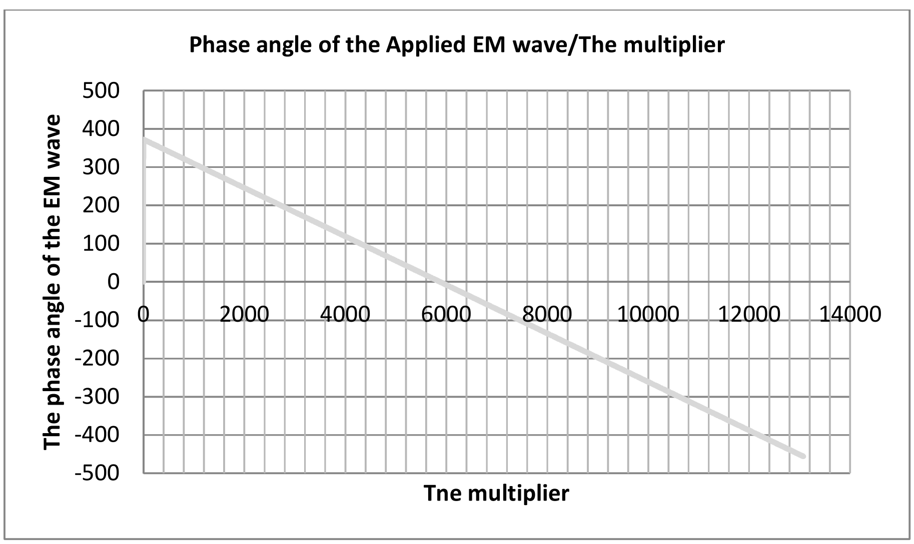

Fig. 4. Shows the graph of the phase angle θ of the applied oscillating electromagnetic EM wave as a function of the multiplier λ = 0, 1, 2, . . ., 13070. The phase angle decreases consistently as it leaves the source and it is directly proportional to the raising multiplier. The decrease in the phase angle of the applied oscillating EM wave is arithmetically linear and it ranges $-456 \leq \theta \leq 373$. The graph represents equation (2.105)

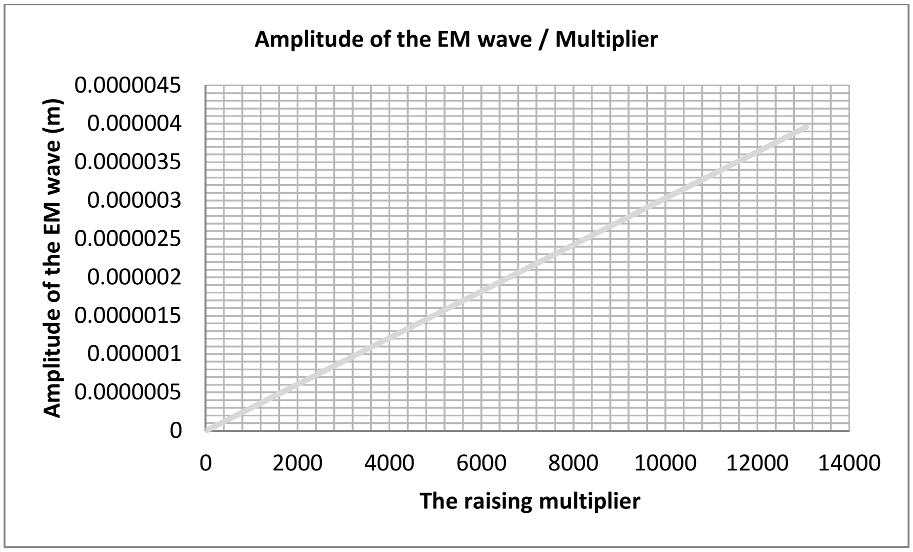

Fig. 5. shows the graph of the Amplitude E_0 of the applied electromagnetic EM wave as a function of time t = 0, 1, . . . , 1500 seconds and multiplier and λ = 0, 1, 2, . . ., 13070). The graph represents equation (2.114) without Fourier series expansion

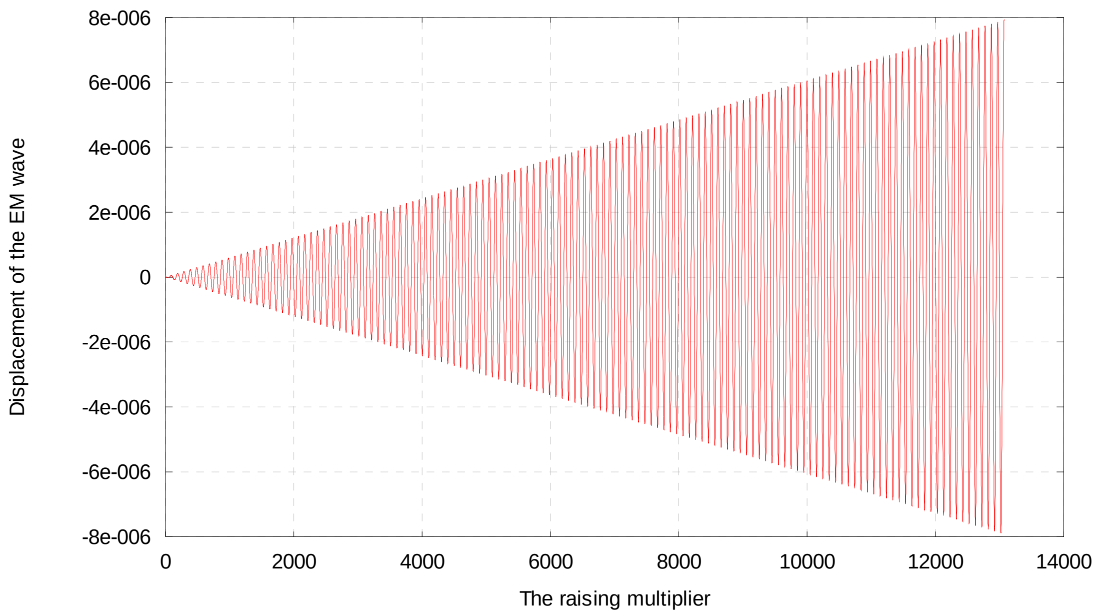

Fig. 6. Shows the graph of the Displacement of the applied oscillating electromagnetic EM wave $\vec{E}$ without Fourier series expansion. It is a function of time t = 0, 1, . . . , 1500 seconds and the multiplier λ = 0, 1, 2, . . . , 13070. The band spectrum of the applied electromagnetic EM wave increases consistently as it leaves the source. The graph represents equation (2.115) without Fourier series expansion. It is obvious that Fig. 6 is a full displacement of the EM wave that complements Fig. 5

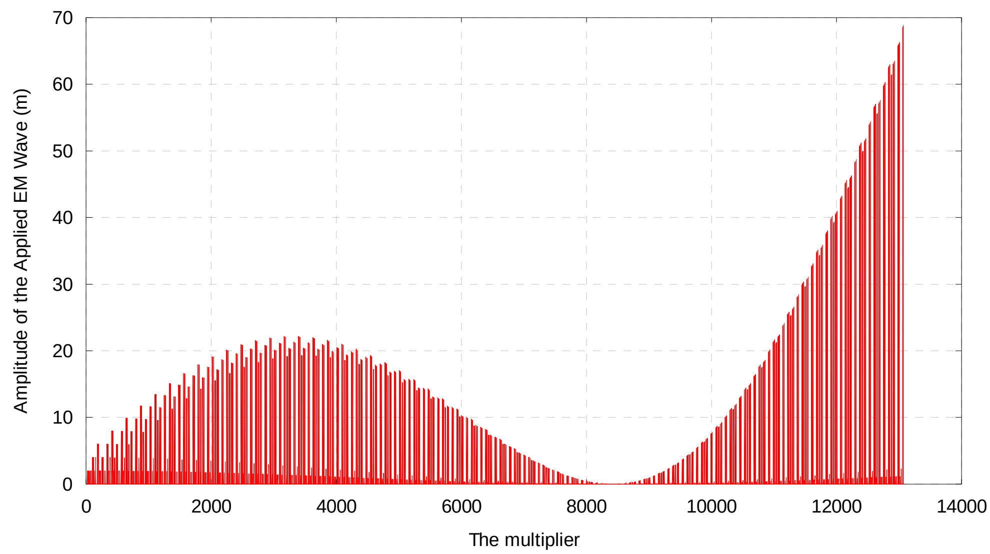

Fig. 7. Shows the graph of the amplitude E_0 of the applied oscillating electromagnetic EM wave as a function of time t = 0,. . . , 1500 seconds and the multiplier λ = 0, 1, 2, . . ., 13070. The graph represents equation (2.121) with Fourier series expansion

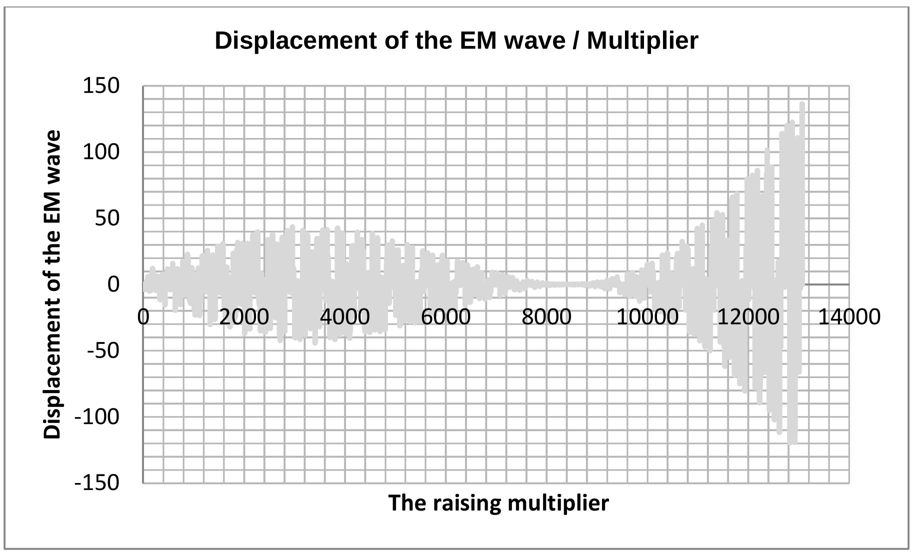

Fig. 8. Shows the graph of the applied electromagnetic EM wave $\vec{E}$ as a function of time t = 0, 1, . . . , 1500 seconds and multiplier and λ = 0, 1, 2, . . ., 13070). The graph represents equation (2.122) with Fourier series expansion

Clearly, from Fig. 5 the amplitude of the applied EM wave is directly proportional to the multiplier and it has a maximum value of 3.95896 x 10^{-6} metres and a linear arithmetic increment of 0.0003.

Also from Fig. 6 the displacement of the applied oscillating EM wave is represented by equation (2.115). It is evident from Fig. 6 that the displacement vector of the applied EM wave increases consistently during the interception with the HIV vibration resident in the Human system. The displacement of the applied EM wave $\vec{E}$ has a value of about $\pm$ 7.89765 x 10^{-6} metres. The band width of the applied EM wave increases as the multiplier is increased.

In consideration of Fig. 7 the amplitude E_0 of the applied EM wave only lie in the positive plane and it does not oscillating between any fixed origin and equilibrium position. Note that Fig. 7 is the graphical representation of (2.121). The amplitude of the applied EM wave first attains a value of 22.196773 metres as it moves from the origin. The amplitude of the applied EM wave goes to zero in the interval of the multiplier [8000, 9000] and then it rises again until it attains a maximum value of about +68.848055 metres.

In consideration of Fig. 8 which represents equation (2.122) the displacement of the EM wave has a maximum positive value of +136.483258 metres and a minimum negative value of about -119.6263106 metres. It is obvious that Fig. 8 is the complement of Fig. 7. That is, the displacement of the applied EM wave is twice the amplitude of the applied EM wave. Although, this is unusual as it is expected that the amplitude is the maximum displacement. This difference is as a result of the factor of two which was initially introduced in equation (2.62).

It is also evident from Fig. 8 that initially, when the EM wave interferes with the HIV parasitic wave as part of the carrier wave CW the displacement of the applied EM wave first reduces from a maximum value of +136.483258 m to a value of +41.112263 m when the multiplier λ is about 3560. After this time the applied EM wave decreases. The simple explanation for the initial decrease in the displacement of the applied EM wave is that the dynamic characteristics of the HIV vibration in the carrier wave are now putting up a very serious resistance to the applied EM wave.

The spectrum of the interception of the applied oscillating EM wave with the HIV parasitic wave in the carrier wave, as shown in Fig. 8 shows a constriction in the interval when the multiplier λ [8000, 9000] with a corresponding time interval t [1499.8125, 1499.8333] seconds. Therefore, the actual exposure time for the HIV/AIDS patient who is undergoing the radiation therapy is about 0.0208 seconds. The displacement of the applied oscillating EM wave tends to zero within this interval. The simple explanation for the constraint is that the applied EM wave has successfully eradicated the dynamic characteristics of the HIV vibration within this region or interval to a zero vibration thereby rendering the HIV parasitic wave in the Human system ineffective.

However, the displacement of the applied EM wave increases again when the multiplier λ is about 9000. The increase is consistently regular until the multiplier λ is about 13067 and the applied oscillating EM wave now revert to the maximum initial value of +136.483258 m before it finally goes to zero or a value of about 9.336 x 10^{-6} m when the multiplier is 13070. The simple explanation here is that the spectrum of the displacement of the applied oscillating EM wave becomes predominant after it has successfully eradicated the vibration of the HIV from the resident host (Man) and the applied EM wave will eventually attenuate to zero.

4. CONCLUSION

This study shows that the process of attenuation in most physically active system does not obviously begin immediately. The wave function that defines the activity and performance of most active system is guided by some internal factor which enables it to resist any external or internal influence that is destructive in nature. The anomalous behaviour exhibited by the applied EM wave at some point during the interception, is due to the resistance pose by the HIV parasitic wave in an attempt to annul the effects of the interfering EM wave. It is evident from this work that when the HIV parasitic wave is undergoing attenuation due to the influence of the applied EM wave, it does not steadily or consistently come to rest; rather it shows some resistance at some point in time during the damping process, before the HIV parasitic wave finally comes to rest or completely destroyed. It is clear from this study that the actual exposure time for the HIV/AIDS patient who is undergoing the radiation therapy is about 0.0208 seconds. Thus this study has to some extent provided the means of determining the basic activity and performance of HIV/AIDS disease in the human blood circulating system. As a consequence of knowing the vibrating parameters of the HIV, 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 condition which has been the global problem for about 34 years now.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Sepkowitz KA. AIDS-the first 20 years. N. Engl. J. Med. 2001;344(23):1764–72.
2. Alimonti JB, Ball TB, Fowke KR. Mechanics of CD4+T lymphocytes cell death in human immunodeficiency virus infection and AIDS. J. Gen. Virol. 2003;84(7):1649–1661.
3. Anderson RM, Medly GF, May RM, Johnson AM. A preliminary study of the transition dynamics of the human immunodeficiency virus (HIV), the causative agents of AIDS. M. A. Journal of Mathematics. Applied to medicine and Biology. 1986;3(4):229–263.
4. Mandel, Bennet, Dolan. HIV/AIDS – Wikipendia, Chapter 118; 2010.
5. UNAIDS, WHO (December 2007). '2007 AIDS Epidemic Update'.
6. Morgan D, Mahe C, Mayanja B, Okongo JM, Lubega R, Whitworth JA. HIV-1 infection in rural Africa. AIDS. 2002;16(4): 597–632.
7. [UNIADS. 2011;1–10]. AIDS.htm#cite_ref-UN2011 Ten_7-2
8. Enaibe A. Edison, Osafile E. Omosede, John OA. Idiodi. Quantitative treatment of HIV/AIDS in the human microvascular circulating blood system. International Journal of Computational Engineering Research. 2013;03(7):1–13.
9. Edison A. Enaibe, John O. A. Idiodi. The biomechanics of HIV/AIDS and the prediction of Lambda. The International Journal of Engineering and Science (IJES). 2013;2(7):43–57.
10. Edison A. Enaibe, Akpata Erhieyovwe, Osafile E. Omosede. The velocity profile of HIV/AIDS in the human blood system. Verlag/Publisher. LAP LAMBERT Academic Publishing; 2014. ISBN: 978-3-659-61912-0.
11. Canic S, Tambaca J, Guidoboni G, Mikelic A, Hartley C, Rosenstrauch D. Modeling viscoelastic behavior of arterial walls and their interaction with pulsatile blood flow. Journal of Applied Mathematics. 2006;67:164–193.
12. Tzu-Ching Shih, et al. Numerical analysis of Coupled effects of pulsatile blood flow and thermal relaxation time during thermal therapy. International Journal of Heat and Mass Transfer. 2012;55:3763–3773.
13. Roald K. Wangsness. Electromagnetic fields, 2nd Edition, John Wiley & Sons Inc., New York.
14. John David Jackson. Classical electrodynamics, 2nd Edition, John Wiley & Sons Inc., New York.
15. Lipson SG, Lipson H, Tannhauser. Optical physics. Cambridge University press third edition; 1996.
16. David Halliday, Robert Resnick and Jearl Walker: Fundamentals of Physics, 6th Edition, John Weley and Sons, Inc. New York.
17. Lain G. Main. Vibrations and waves in Physics. Cambridge University Press, third edition; 1995.
18. Thurston G. Plasma rheological parameters for the viscosity. Viscoelasticity, and thixotropy of Blood, Biorheology. 1979;16:149–162
19. Beris AN, Glacomin AJ. Everything flows. Applied Rheology. 2014;24. DOI: 10.3933/ApplRheol-24-52918.
20. Walker JS. Fourier analysis. Oxford Univ. Press, Oxford; 1988.

© 2017 Enaibe et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/18324