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Quantitative Analysis of the Velocity Profile of Hiv/Aids in the Human Blood Circulating System: using Exact Oscillating total Phase Angle$_{|\partial E|}$.

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ABSTRACT

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. If the participating particles are sufficiently close together, they will be driven coherently, with quite different results. In this case the scattered waves can be superposed with the direct wave, giving rise to a new disturbance which will be the wave in the material. We have in this present study applied the Fourier transform technique in determining the velocity profile of HIV/AIDS in the Human blood circulating system. We also established in this work the adequacy and effectiveness of the carrier wave equation CCW with exact oscillating total phase angle in explaining the coexistence of HIV/AIDS and Man. In this study, we used the known characteristics of the vibration of the HIV and those of Man obtained from a previous study to determine the velocity profile of HIV/AIDS in the Human system. It is also shown in this work, that the possible time taken for the HIV infection to degenerate to AIDS due to the distortion in the velocity process is about 84 months (7 years)

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INTRODUCTION

In spite of the enormous theoretical and experimental approach based on the cure to HIV/AIDS, the understanding of the dynamical properties and the formation of the disease is still lacking. 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 (UNAIDS, WHO, 2007; Anderson, R.M., G.F. Medly,1986). 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 and existence. It is not the Human system that gives the HIV its life and existence, since the HIV itself is a living organism and with its own peculiar characteristics even before it entered the system of Man.

The role of Human-Immunodeficiency Virus (HIV) in the normal blood circulating system of Man (host) has in general been poorly understood. However, its role in clinical disease has attracted increasing interest. Human immunodeficiency virus (HIV) infection / acquired immunodeficiency syndrome (AIDS) is a disease of the human immune system caused by HIV (Sepkowitz, K.A., 2001; Morgan, D., 2002).

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. As the illness progresses it interferes more and more with the immune system, making people much more likely to get infections, including opportunistic infections, which do not usually affect people with immune systems (Mandel, Bennet and Dolan, 2010). In the absence of specific treatment, around half of the people infected with HIV develop AIDS within ten years and average survival time after infection with HIV is estimated to be 9 to 11 years ([UNIADS, 2011; Alimonti, J.B., 2003).

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It is the vibration of the unknown force that causes life and existence. Therefore, for any active matter to exist it must possess vibration. The human heart stands as a transducer of this vibration while the blood stands as a means of conveying this vibration to all units of the human system. The cyclic heart contraction 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 blood vessels and in the process it orients the active particles of the blood and sets them into oscillating motion with a unified frequency as it passes.

The activity of the HIV is everywhere the same within the human blood circulating system, mutation if at all does not affect its activity. That the HIV kills slowly with time shows that wave characteristics such as the amplitude, angular frequency, wave number and the phase angle of the host wave were initially greater than those of the HIV. Also the basic characteristics of the vibration of Man and those of the HIV were initially incoherent.

Man and the Human-Immunodeficiency Virus (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 blood circulating system after infection. The resultant interference of the vibration 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 function have been altered (Edison, A., 2013).

Some waves in nature behave parasitically when they interfere with another one. Such waves as the name implies has the ability of transforming the initial characteristics and behaviour of the interfered wave to its own form and quality after a given period of time. Under this circumstance, all the active constituents of the interfered 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 independent parameters for sustaining a continuous existence (Edison, A., 2013).

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 (Walker, J.S., 1988).

We used a new method of approximation, otherwise, called the ‘third world approximation’ to derive the velocity of the CCW. The approximation has the advantage of easy convergence of results by direct analysis of the region of space of our interest. In qualitative analysis, unlike numerical work, the number one is a fundamental number, an indiscriminate constant value which can only describe the neutral behaviour of a system of varying series.

In consequence, the exact behaviour of a non-stationary system may not be studied in the indiscriminate region of a constant value. Thus the constant value term which is a non-zero-order approximation may therefore be neglected from the varying series solution by the ‘third world approximation’. Thus the approximation has the advantage of fast convergence of result and high degree of minimization. It also helps to control the complex anomalous behaviour of any square root displacement function which may produce unnecessary imaginary result.

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 are shown in section 3. While in section 4, we present the analytical discussion of the results obtained. The conclusion of this work is shown in section 5. This is immediately followed by appendix of some useful identities and 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 the ’third world approximation’ to derive the velocity of the CCW, which is the combined effect of the superposition of the two waves. Finally, we applied Fourier transform technique to study the behaviour of the CCW as it propagates with time away from the source.

2.0 Mathematical Theory:

2.1 Dynamical theory of superposition of two incoherent waves:

The interference of one wave y_2 say ‘parasitic wave’ on another one y_1 say ‘host wave’ could cause the ‘host wave’ to decay to zero if they are out of phase. The decay process of y_1 can be gradual, over-damped or critically damped depending on the rate in which the amplitude of the host wave is brought to zero. However, the general concept is that the combination of y_1 and y_2 would first yield a third stage called the resultant wave say y, before the process of decay sets in. In this work, we refer to the resultant wave as the carrier wave equation CCW. Now let us consider two incoherent waves defined by the displacement vectors

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

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

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

where all the symbols have their usual wave related meaning. In this study, (2.1) is regarded as the 'host wave' generated by the latent vibration from the human heart whose propagation depends on the inbuilt multiplier β (= 0, 1, 2, . . . $\beta_{\max}$). While (2.2) represents a 'parasitic wave' emanating from the vibration of the HIV. The propagation also depend on the inbuilt multiplier λ (= 0, 1, 2, . . . $\lambda_{\max}$). The inbuilt multipliers are both dimensionless and as the name implies, they have the ability of gradually raising the basic characteristics of both waves respectively with time.

Consequently, we have established in a previous study [9] that when (2.2) interferes with (2.1) according to (2.3) and let the 'host wave' multiplier β to be of negligible effect, in which case $\beta = 1$, we get after some simplifications and assumption that

$$y = \left\{(a^2 - b^2\lambda^2) - 2\left(a - b\lambda\right)^2 \cos\left((n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda\right)\right\}^{\frac{1}{2}} \cos\left(\vec{k}_c.\hat{r} - (n - n'\lambda)t - \left|\partial E\right|\right) \tag{2.4}$$

Equation (2.4) is regarded as the carrier wave equation (CCW) and it is the equation that governs the dynamical behaviour of the coexistence of the HIV parasite in the human blood circulating system. It is obvious from the equation that once the constituent parameters of the vibration of HIV become equal to those of Man as a result of the multiplier λ, then the CCW goes to zero and the host wave ceases to exist. However, we shall redefine some of the parameters appearing in (2.4) in this work. The total differentiation of the total phase angle gives the exact phase angle. There is need for us to make the total phase angle of the spatial oscillating phase not to depend explicitly on time, as this would enhance the quality of the results in such a way that the subsequent wave form does not produce irregular complex behaviour.

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

$$\frac{\partial E}{\partial \varepsilon} = \frac{a^2 + ab\lambda\cos\left((\varepsilon - \varepsilon'\lambda) + (n - n'\lambda)t\right)}{a^2 + b^2\lambda^2 + 2ab\lambda\cos\left((\varepsilon - \varepsilon'\lambda) + (n - n'\lambda)t\right)} \;;\; \frac{\partial E}{\partial \varepsilon'} = \frac{b^2\lambda^3 + ab\lambda^2\cos\left((\varepsilon - \varepsilon'\lambda) + (n - n'\lambda)t\right)}{a^2 + b^2\lambda^2 + 2ab\lambda\cos\left((\varepsilon - \varepsilon'\lambda) + (n - n'\lambda)t\right)} \tag{2.6}$$

$$\partial E = \frac{\partial E}{\partial \varepsilon}d\varepsilon + \frac{\partial E}{\partial \varepsilon'}d\varepsilon' \quad \Rightarrow \quad \left|\partial E\right| = \sqrt{\left(\frac{\partial E}{\partial \varepsilon}\right)^2 + \left(\frac{\partial E}{\partial \varepsilon'}\right)^2} \tag{2.7}$$

Where E represents total phase angle of the carrier wave equation CCW and $\vec{k}.\vec{r} = (k - k'\lambda)\,r\,(\cos\varphi + \sin\varphi)$ or $\vec{k}_c.\hat{r} = (k - k'\lambda)(\cos\varphi + \sin\varphi)$ is a two dimensional (2D) space vector and $\hat{r} = \vec{r}/r = \cos\varphi + \sin\varphi$ is a unit vector. From the geometry of the two interfering waves $\varphi = \pi - (\varepsilon - \varepsilon'\lambda)$. By definition: $(n - n'\lambda)$ the modulation angular frequency, the modulation propagation constant $(k - k'\lambda)$, the phase difference δ between the two interfering waves is $(\varepsilon - \varepsilon'\lambda)$ while $2\left(a - b\lambda\right)^2 \cos\left((n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda\right)$ is the interference term.

Equation (2.4) can be made to reproduce the properties of wave and to satisfy boundary conditions. Therefore y_1 and y_2 vary harmonically with the angular frequency $(n - n'\lambda)$ in the CCW. However, we can decompose the CCW into two functions; function of the oscillating amplitude $f(A)$ and the function of the spatial oscillating phase $f(\theta)$.

$$f(A) = \left\{(a^2 - b^2\lambda^2) - 2\left(a - b\lambda\right)^2 \cos\left((n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda\right)\right\}^{\frac{1}{2}} \tag{2.8}$$

$$f(\theta) = \cos\left(\vec{k}_c.\vec{r} - (n - n'\lambda)t - \left|\partial E\right|\right) \tag{2.9}$$

2.2 Application of the "third world approximation" on the oscillating amplitude of the CCW:

Equation (2.8) is comprehensively valid in the macroscopic scale. However, if we implement the "third world approximation" which we developed in a previous paper [9], then the function can be made valid for both macroscopic and microscopic scale. The "third world approximation" states that

$$\left(1 + \xi\, f(\phi)\right)^{\pm n} = \frac{d}{d\phi}\left(1 + n\,\xi\, f(\phi) + \frac{n(n-1)}{2!}\left(\xi\, f(\phi)\right)^2 + \frac{n(n-1)(n-2)}{3!}\left(\xi\, f(\phi)\right)^3 + \ldots\right) - n\frac{d}{d\phi}\left(\xi\, f(\phi)\right) \tag{2.10}$$

We should emphasize here that ϕ is a function of any variable which depends upon the dimension of the physical quantity we are investigating. However, in this study ϕ is taken as the time. The first term in the series or 'first world' is usually a constant while the unit of the rest member of the series is based on the choice of the parameter under evaluation. For instance, the dimension of (2.8) is meters and if we apply (2.10) on it, then the first two terms, otherwise, the 'first world' and the 'second world' terms are both switched off leaving the third term or the 'third world' in radian/s which is the dimension of angular velocity. This approximation has the advantage of converging results easily by taking us directly to the region of space of our interest. Now let us rearrange (2.8) for the purpose of implementing (2.10).

$$f(A) = \left(a^2 - b^2\lambda^2\right)^{\frac{1}{2}} \left\{ 1 - \frac{2\left(a - b\lambda\right)^2}{(a^2 - b^2\lambda^2)} \cos\left((n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda\right) \right\}^{\frac{1}{2}} \quad (2.11)$$

Now after a careful implementation of (2.10) to the expression in the parenthesis of (2.11), we find that

$$\left\{ 1 - \frac{2\left(a - b\lambda\right)^2}{(a^2 - b^2\lambda^2)} \cos\left((n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda\right) \right\}^{\frac{1}{2}} = \frac{\left(a - b\lambda\right)^4 (n - n'\lambda)}{2(a^2 - b^2\lambda^2)^{3/2}} \sin 2\left((n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda\right) \quad (2.12)$$

That is, we have used the fact that $\sin 2\theta = 2\sin\theta\cos\theta$ in the simplification process to get the result. Hence

$$f(A) = \frac{(a - b\lambda)^4 (n - n'\lambda)}{2(a^2 - b^2\lambda^2)^{3/2}} \sin 2\left((n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda)\right) = Q(n - n'\lambda) \sin 2\left((n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda)\right) \quad (2.13)$$

Where for the purpose of linearity we have decided to set

$$Q = \frac{(a - b\lambda)^4}{2(a^2 - b^2\lambda^2)^{3/2}} \quad (2.14)$$

2.3 Fourier series expansion of the oscillating amplitude $f(A)$ of the CCW:

The cornerstone of Fourier theory is a theorem which states that almost any periodic function can be analysed into a series of harmonic functions with periods τ, $\tau/2$, $\tau/3$, ... , where τ is the period of the function under analysis (Lain, G., Main, 1995). Expansion of an oscillating function by Fourier series gives all modes of oscillation (fundamental and all overtones) which is extremely useful in physics. In particular, astronomical phenomena are usually periodic, as are animal heartbeats, tides and vibrating strings, so it makes sense to express them in terms of periodic functions [10]. Now, by expanding the oscillating term of (2.12) in terms of Fourier series we get

$$F\left[f(A)\right] = C_0 + C_1\left(\sin 2\left(1(n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda)\right)\right) + C_2\left(\sin 2\left(2(n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda)\right)\right) +$$
$$C_3\left(\sin 2\left(3(n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda)\right)\right) + \ldots + C_\alpha\left(\sin 2\left(\alpha(n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda)\right)\right) \quad (2.15)$$

$$F\left[f(A)\right] = C_0 + \sum_{\alpha=1}^{\infty} C_\alpha\left(\sin 2\left(\alpha(n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda)\right)\right) \quad (2.16)$$

The constant term C_0 may be thought of as a harmonic with zero frequency. Each term in the series has amplitude and a phase constant; by adjusting these we can expand the various harmonics vertically, or shift them horizontally, to make the superposition fit the function $F\left[f(A)\right]$. Harmonic analysis consists essentially of finding C_α and $(\varepsilon - \varepsilon'\lambda)_\alpha$ for each value of α. It is however not always convenient to specify amplitude and phase together [12], therefore, we can decompose the last term appearing in (2.16) as

$$C_\alpha\left(\sin 2\left(\alpha(n - n'\lambda)t - (\varepsilon - \varepsilon'\lambda)\right)\right) = A_\alpha \cos 2\alpha(n - n'\lambda)t + B_\alpha \sin 2\alpha(n - n'\lambda)t \quad (2.17)$$

We can specify the modulation amplitudes A_α and B_α as components of the variable phase angle as

$$\left.\begin{aligned} A_\alpha &= C_\alpha \cos 2(\varepsilon - \varepsilon'\lambda) \\ B_\alpha &= -C_\alpha \sin 2(\varepsilon - \varepsilon'\lambda) \end{aligned}\right\} \Rightarrow C_\alpha = \sqrt{A_\alpha^2 + B_\alpha^2} \quad (2.18)$$

The negative sign indicates complex conjugate of the real part and the inclusions will make the dynamic components of the phase angle real. Thus (2.18) represents the amplitude of the nth harmonic. Where α =1, 2, 3, … , ∞ is the Fourier index. From (2.17), if $\alpha = 0$

$$C_0 = -\frac{1}{\sin 2(\varepsilon - \varepsilon'\lambda)} A_0 \qquad \because (\sin(-x) = -\sin x) \quad (2.19)$$

Equation (2.17) can be substituted into (2.16) to get both the cosine (even) and sine (odd) sinusoidal functions. But the subsequent results generated will be the same as when we applied (2.16) as it stands.

2.4 Determination of the Fourier coefficients of the oscillating amplitude $f(A)$ of the CCW:

The Fourier components C_α in (2.16) which is specified in (2.18) and (2.19) are given by the Euler formulas

$$A_0 = \frac{1}{\tau}\int_0^\tau f(A)\,dt = \frac{1}{\tau}\int_0^\tau Q(n-n'\lambda)\sin 2\big((n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\big)dt \tag{2.20}$$

$$A_\alpha = \frac{1}{\tau}\int_0^\tau f(A)\cos 2\big(\alpha(n-n'\lambda)t\big)dt = \frac{1}{\tau}\int_0^\tau Q(n-n'\lambda)\sin 2\big((n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\big)\cos 2\big(\alpha(n-n'\lambda)t\big)dt \tag{2.21}$$

$$B_\alpha = \frac{1}{\tau}\int_0^\tau f(A)\sin 2\big(\alpha(n-n'\lambda)t\big)dt = \frac{1}{\tau}\int_0^\tau Q(n-n'\lambda)\sin 2\big((n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\big)\sin 2\big(\alpha(n-n'\lambda)t\big)dt \tag{2.22}$$

where τ is the period of the function under analysis, here it is the period of the latent vibration of the CCW generated by the beating of the human heart. In this work, we define $\tau(n-n'\lambda)=2\pi$. Let us now evaluate (2.20) for A_0. Direct integration and rearrangement gives

$$A_0 = \frac{Q}{2\tau}\left\{\cos 2(\varepsilon-\varepsilon'\lambda)-\cos 2\big((n-n'\lambda)\tau-(\varepsilon-\varepsilon'\lambda)\big)\right\} \tag{2.23}$$

$$A_0 = \frac{(a-b\lambda)^4(n-n'\lambda)}{8\pi(a^2-b^2\lambda^2)^{3/2}}\left\{\cos 2(\varepsilon-\varepsilon'\lambda)-\cos 2\big(2\pi-(\varepsilon-\varepsilon'\lambda)\big)\right\} \tag{2.24}$$

Where we have used the fact that $\cos(-\theta)=\cos\theta$ (even and symmetric function), thereby leaving the dimension of A_0 in m/s. Hence, when we substitute (2.24) into (2.19), we get

$$C_0 = -\frac{(a-b\lambda)^4(n-n'\lambda)}{8\pi(a^2-b^2\lambda^2)^{3/2}\sin 2(\varepsilon-\varepsilon'\lambda)}\left\{\cos 2(\varepsilon-\varepsilon'\lambda)-\cos 2\big(2\pi-(\varepsilon-\varepsilon'\lambda)\big)\right\} \tag{2.25}$$

By invoking the rule of compound angles in trigonometry, see appendix, we can further simplify (2.25) to yield

$$C_0 = \left(\frac{(a-b\lambda)^4(n-n'\lambda)}{4\pi(a^2-b^2\lambda^2)^{3/2}\sin 2(\varepsilon-\varepsilon'\lambda)}\right)\left\{\sin 2(\pi)\sin 2\big((\varepsilon-\varepsilon'\lambda)-\pi\big)\right\} \tag{2.26}$$

Hence, C_0 has the dimension of velocity. Also from (2.20) we can solve for A_α as follows. Let us first use trigonometric identity see appendix to further reduce (2.21) so that

$$A_\alpha = \frac{Q(n-n'\lambda)}{2\tau}\int_0^\tau\left\{\sin 2\big((1+\alpha)(n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\big)+\sin 2\big((1-\alpha)(n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\big)\right\}dt \tag{2.27}$$

$$A_\alpha = \frac{Q(n-n'\lambda)}{2\tau}\left\{-\left(\frac{1}{2(1+\alpha)(n-n'\lambda)}\Big(\cos 2\big((1+\alpha)(n-n'\lambda)\tau-(\varepsilon-\varepsilon'\lambda)\big)-\cos 2(-(\varepsilon-\varepsilon'\lambda))\Big)\right)\right\} -$$
$$\frac{Q(n-n'\lambda)}{2\tau}\left\{-\left(\frac{1}{2(1-\alpha)(n-n'\lambda)}\Big(\cos 2\big((1-\alpha)(n-n'\lambda)\tau-(\varepsilon-\varepsilon'\lambda)\big)-\cos 2(-(\varepsilon-\varepsilon'\lambda))\Big)\right)\right\} \tag{2.28}$$

The second term on the right side of (2.28) is ignored since if $\alpha=1$ according to the summation rule the expression in the parenthesis will otherwise be infinite and will not be useful in this work. So that

$$A_\alpha = \frac{(a-b\lambda)^4(n-n'\lambda)}{16\pi(a^2-b^2\lambda^2)^{3/2}(1+\alpha)}\left\{\cos 2(\varepsilon-\varepsilon'\lambda)-\cos 2\big((1+\alpha)2\pi-(\varepsilon-\varepsilon'\lambda)\big)\right\} \tag{2.29}$$

$$A_\alpha = -\frac{(a-b\lambda)^4(n-n'\lambda)}{8\pi(a^2-b^2\lambda^2)^{3/2}(1+\alpha)}\left\{\sin 2\big((1+\alpha)\pi\big)\sin 2\big((\varepsilon-\varepsilon'\lambda)-(1+\alpha)\pi\big)\right\} \tag{2.30}$$

where $\alpha = 1, 2, 3, \ldots, \infty$, and therefore leaving the dimension of A_α in m/s. Finally by following the same step and procedure that led to (2.29) we can solve for B_α as follows.

$$B_\alpha = \frac{Q(n-n'\lambda)}{2\tau}\int_0^\tau\left\{\cos 2\big((1-\alpha)(n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\big)-\cos 2\big((1+\alpha)(n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\big)\right\}dt \tag{2.31}$$

$$B_\alpha = \frac{Q(n-n'\lambda)}{2\tau}\left\{\frac{1}{2(1-\alpha)(n-n'\lambda)}\Big(\sin 2\big((1-\alpha)(n-n'\lambda)\tau-(\varepsilon-\varepsilon'\lambda)\big)-\sin 2(-(\varepsilon-\varepsilon'\lambda))\Big)\right\} -$$

$$\frac{Q(n-n'\lambda)}{2\tau}\left\{\frac{1}{2(1+\alpha)(n-n'\lambda)}\left(\sin 2\left((1+\alpha)(n-n'\lambda)\tau-(\varepsilon-\varepsilon'\lambda)\right)-\sin 2(-(\varepsilon-\varepsilon'\lambda))\right)\right\} \tag{2.32}$$

The first term in (2.32) is also ignored since if $\alpha = 1$ according to the summation rule the expression in the parenthesis will be.

$$B_\alpha = -\frac{(a-b\lambda)^4(n-n'\lambda)}{16\pi(a^2-b^2\lambda^2)^{3/2}(1+\alpha)}\left\{\sin 2(\varepsilon-\varepsilon'\lambda)+\sin 2\left((1+\alpha)2\pi-(\varepsilon-\varepsilon'\lambda)\right)\right\} \tag{2.33}$$

$$B_\alpha = -\frac{(a-b\lambda)^4(n-n'\lambda)}{8\pi(a^2-b^2\lambda^2)^{3/2}(1+\alpha)}\left\{\sin 2\left((1+\alpha)\pi\right)\cos 2\left((\varepsilon-\varepsilon'\lambda)-(1+\alpha)\pi\right)\right\} \tag{2.34}$$

$\alpha = 1, 2, 3, \ldots, \infty$. Where we have used the fact that $\sin(-\theta) = -\sin\theta$ (odd and antisymmetric function), thereby leaving the dimension of B_α the same as m/s. Upon adding the squares of (2.30) and (2.34) then the Fourier coefficients C_α in (2.18) becomes

$$C_\alpha = \left(\frac{(a-b\lambda)^4(n-n'\lambda)}{8\pi(a^2-b^2\lambda^2)^{3/2}(1+\alpha)}\right)\sin 2\left((1+\alpha)\,\pi\right) \tag{2.35}$$

Then finally, we can now substitute (2.26) and (2.35) into (2.16) so that the Fourier transform of the oscillating amplitude of the CCW becomes after much simplification

$$F\left[f(A)\right] = \left(\frac{(a-b\lambda)^4(n-n'\lambda)\sin 2(\pi)\sin 2\left((\varepsilon-\varepsilon'\lambda)-\pi\right)}{4\pi(a^2-b^2\lambda^2)^{3/2}\sin 2(\varepsilon-\varepsilon'\lambda)}\right) + \frac{(a-b\lambda)^4(n-n'\lambda)}{8\pi(a^2-b^2\lambda^2)^{3/2}}\sum_{\alpha=1}^{\infty}\left(\frac{1}{(1+\alpha)}\right)\times$$
$$\left\{\sin 2\left((1+\alpha)\,\pi\right)\times\sin 2\left(\alpha(n-n'\lambda)t-(\varepsilon-\varepsilon'\lambda)\right)\right\} \tag{2.36}$$

Equation (2.36) is the Fourier transform of the oscillating amplitude of the CCW, while the first term represents the fundamental oscillating amplitude.

2.5 Fourier series expansion of the spatial oscillating phase $f(\theta)$ of the CCW:

Also if we now expand the spatial oscillating phase of the CCW using Fourier analysis technique, the same way we did for the oscillating amplitude then we can write (2.9) as

$$F\left[f(\theta)\right] = C_0 + C_1\cos\left(\vec{k}_c.\hat{r}-1(n-n'\lambda)t-\left|\partial E\right|\right)+C_2\cos\left(\vec{k}_c.\hat{r}-2(n-n'\lambda)t-\left|\partial E\right|\right)+$$
$$C_3\cos\left(\vec{k}_c.\hat{r}-3(n-n'\lambda)t-\left|\partial E\right|\right)+\ldots+C_\beta\cos\left(\vec{k}_c.\hat{r}-\beta(n-n'\lambda)t-\left|\partial E\right|\right) \tag{2.37}$$

$$F\left[f(\theta)\right] = C_0 + \sum_{\beta=1}^{\infty} C_\beta\cos\left(\vec{k}_c.\hat{r}-\beta(n-n'\lambda)t-\left|\partial E\right|\right) \tag{2.38}$$

However, there is need to separate or decompose the function in the summation sign into two realistic components in such a way that the resulting equation carries the information of the decomposed one. On the basis of this argument we can write formatively that

$$C_\beta\cos\left(\vec{k}_c.\hat{r}-\beta(n-n'\lambda)t-\left|\partial E\right|\right) = A_\beta\cos\left(\beta(n-n'\lambda)t\right)+B_\beta\sin\left(\beta(n-n'\lambda)t\right) \tag{2.39}$$

with the assumption that

$$\left.\begin{array}{l}A_\beta = C_\beta\cos\left(\vec{k}_c.\hat{r}-\left|\partial E\right|\right)\\ B_\beta = -C_\beta\sin\left(\vec{k}_c.\hat{r}-\left|\partial E\right|\right)\end{array}\right\} \Rightarrow C_\beta = \sqrt{A_\beta^2+B_\beta^2} \tag{2.40}$$

In equation (2.39), if we set $\beta = 0 \Rightarrow$

$$C_0 = \frac{1}{\cos\left(\vec{k}_c.\hat{r}-\left|\partial E\right|\right)}A_0 \tag{2.41}$$

Consequently the series given by (2.38) can be rewritten on account of (2.39) and (2.41) as

$$F\left[f(\theta)\right] = \frac{1}{\cos\left(\vec{k}_c.\hat{r}-\left|\partial E\right|\right)}A_0 + \sum_{\beta=1}^{\infty}\left\{A_\beta\cos\left(\beta(n-n'\lambda)t\right)+B_\beta\sin\left(\beta(n-n'\lambda)t\right)\right\} \tag{2.42}$$

The Fourier components A_0, A_β and B_β in (2.40) or (2.42) are given by the Euler formulas

$$A_0 = \frac{1}{\tau}\int_0^\tau f(\theta)\,dt = \frac{1}{\tau}\int_0^\tau \cos\left(\vec{k}_c.\hat{r}-(n-n'\lambda)t-\left|\partial E\right|\right)dt \tag{2.43}$$

$$A_\beta = \frac{1}{\tau}\int_0^\tau f(\theta)\cos\left(\beta(n-n'\lambda)t\right)dt = \frac{1}{\tau}\int_0^\tau \cos\left(\vec{k}_c.\hat{r}-(n-n'\lambda)t-\left|\partial E\right|\right)\cos\left(\beta(n-n'\lambda)t\right)dt \tag{2.44}$$

$$B_\beta = \frac{1}{\tau}\int_0^\tau f(\theta)\sin\left(\beta(n-n'\lambda)t\right)dt \;=\frac{1}{\tau}\int_0^\tau \cos\left(\vec{k}_c.\hat{r}-(n-n'\lambda)-|\partial E|\right)\sin\left(\beta(n-n'\lambda)t\right)dt \tag{2.45}$$

Let us now evaluate (2.43) by using known simple integral technique. With careful operation we get

$$A_0 = -\frac{1}{\tau}\frac{1}{(n-n'\lambda)}\left\{\sin\left(\vec{k}_c.\hat{r}-(n-n'\lambda)\tau-|\partial E|\right)-\sin\left(\vec{k}_c.\hat{r}-|\partial E|\right)\right\} \tag{2.46}$$

$$A_0 = \frac{1}{2\pi}\left\{\sin\left(\vec{k}_c.\hat{r}-|\partial E|\right)-\sin\left(\vec{k}_c.\hat{r}-2\pi-|\partial E|\right)\right\} = \frac{1}{\pi}\left\{\sin(\pi)\cos\left(\vec{k}_c.\hat{r}-\pi-|\partial E|\right)\right\} \tag{2.47}$$

$$C_0 = \frac{1}{\pi}\left(\frac{\sin(\pi)\cos\left(\vec{k}_c.\hat{r}-\pi-|\partial E|\right)}{\cos\left(\vec{k}_c.\hat{r}-|\partial E|\right)}\right) \tag{2.48}$$

Also with use of identity we can simplify (2.44) as

$$A_\beta = \frac{1}{2\tau}\left\{\int_0^\tau \cos\left(\vec{k}_c.\hat{r}-(1-\beta)(n-n'\lambda)t-|\partial E|\right)dt+\int_0^\tau \cos\left(\vec{k}_c.\hat{r}-(1+\beta)(n-n'\lambda)t-|\partial E|\right)dt\right\} \tag{2.49}$$

$$A_\beta = \frac{1}{2\tau}\left\{-\left(\frac{\sin\left(\vec{k}_c.\hat{r}-(1-\beta)(n-n'\lambda)\tau-|\partial E|\right)-\sin\left(\vec{k}_c.\hat{r}-|\partial E|\right)}{(1-\beta)(n-n'\lambda)}\right)-\left(\frac{\sin\left(\vec{k}_c.\hat{r}-(1+\beta)(n-n'\lambda)\tau-|\partial E|\right)-\sin\left(\vec{k}_c.\hat{r}-|\partial E|\right)}{(1+\beta)(n-n'\lambda)}\right)\right\} \tag{2.50}$$

The first term on the right side of (2.50) is ignored since it becomes infinite if $\beta = 1$. As a result,

$$A_\beta = -\left(\frac{\sin\left(\vec{k}_c.\hat{r}-(1+\beta)(n-n'\lambda)\tau-|\partial E|\right)-\sin\left(\vec{k}_c.\hat{r}-|\partial E|\right)}{2\tau(1+\beta)(n-n'\lambda)}\right) \tag{2.51}$$

$$A_\beta = \frac{\sin\left((1+\beta)\pi\right)\cos\left(\vec{k}_c.\hat{r}-(1+\beta)\pi-|\partial E|\right)}{2\pi(1+\beta)} \tag{2.52}$$

Now finally, we can solve for B_β from (2.45) by following the same procedure that led to A_β result.

$$B_\beta = \frac{1}{2\tau}\left\{\int_0^\tau \sin\left(\vec{k}_c.\hat{r}-(1-\beta)(n-n'\lambda)t-|\partial E|\right)dt-\int_0^\tau \sin\left(\vec{k}_c.\hat{r}-(1+\beta)(n-n'\lambda)t-|\partial E|\right)dt\right\} \tag{2.53}$$

$$B_\beta = \frac{1}{2\tau}\left\{\left(\frac{\cos\left(\vec{k}_c.\hat{r}-(1-\beta)(n-n'\lambda)\tau-|\partial E|\right)-\cos\left(\vec{k}_c.\hat{r}-|\partial E|\right)}{(1-\beta)(n-n'\lambda)}\right)-\left(\frac{\cos\left(\vec{k}_c.\hat{r}-(1+\beta)(n-n'\lambda)\tau-|\partial E|\right)-\cos\left(\vec{k}_c.\hat{r}-|\partial E|\right)}{(1+\beta)(n-n'\lambda)}\right)\right\} \tag{2.54}$$

$$B_\beta = -\frac{\sin\left((1+\beta)\pi\right)\sin\left(\vec{k}_c.\hat{r}-(1+\beta)\pi-|\partial E|\right)}{2\pi(1+\beta)} \tag{255}$$

Eventually upon adding the squares of (2.52) and (2.55) according to (2.40), we obtain

$$C_\beta = \left(\frac{\sin\left((1+\beta)\pi\right)}{2\pi(1+\beta)}\right) \tag{2.56}$$

We can now substitute (2.48) and (2.56) into (2.38) and get the following result.

$$F\left[f(\theta)\right] = \frac{1}{\pi}\left(\frac{\sin(\pi)\cos\left(\vec{k}_c.\hat{r}-\pi-|\partial E|\right)}{\cos\left(\vec{k}_c.\hat{r}-|\partial E|\right)}\right)+\frac{1}{2\pi}\sum_{\beta=1}^{\infty}\left(\frac{\sin\left((1+\beta)\pi\right)}{(1+\beta)}\right)\cos\left(\vec{k}_c.\hat{r}-\beta(n-n'\lambda)t-|\partial E|\right) \tag{2.57}$$

Equation (2.57) is the Fourier transform of the oscillating phase angle of the CCW.

2.6 Convolution theory of the Fourier transform of the amplitude $F\left[f(A)\right]$ and the spatial oscillating phase $F\left[f(\theta)\right]$ of the CCW:

Now that we have separately determined the Fourier transform of the oscillating amplitude $F\left[f(A)\right]$ and the spatial oscillating phase $F\left[f(\theta)\right]$ respectively, the necessary requirement now is to convolute them in order to obtain a concise equation of the CCW. Convolution here means multiplying $F\left[f(A)\right]$ and $F\left[f(\theta)\right]$ term by term.

Australian Journal of Basic and Applied Sciences, 8(16) October 2014, Pages: 190-203

Let us represent the result of the convolution of these functions by H and also let v be the velocity displacement vector of the CCW after the convolution. Hence, from (2.36) and (2.57) we get that

$$v = H\left\{ F\left[f(A)\right]; F\left[f(\theta)\right]\right\} = F\left[f(A)\right] \otimes F\left[f(\theta)\right] \tag{2.58}$$

$$\begin{aligned} v = H\left\{ F\left[f(A)\right]; F\left[f(\theta)\right]\right\} = &\left(\frac{(a - b\lambda)^4 (n - n'\lambda) \sin 2(\pi) \sin 2\left((\varepsilon - \varepsilon'\lambda) - \pi\right)}{4\pi^2 \sqrt{(a^2 - b^2\lambda^2)^3}\, \sin 2(\varepsilon - \varepsilon'\lambda)} \right) \times \\ &\left(\frac{\sin(\pi)\cos\left(\vec{k}_c . \hat{r} - \pi - \left|\partial E\right|\right)}{\cos(\vec{k}_c . \hat{r} - \left|\partial E\right|)} \right) + \left(\frac{(a - b\lambda)^4 (n - n'\lambda) \sin 2(\pi) \sin 2\left((\varepsilon - \varepsilon'\lambda) - \pi\right)}{8\pi^2 \sqrt{(a^2 - b^2\lambda^2)^3}\, \sin 2(\varepsilon - \varepsilon'\lambda)} \right) \sum_{\beta = 1}^{\infty} \left(\frac{1}{1+\beta} \right) \times \\ &\left(\frac{\sin\left((1+\beta)\pi\right)}{(1+\beta)} \right) \cos\left(\vec{k}_c . \hat{r} - \beta (n - n'\lambda) t - \left|\partial E\right|\right) + \left(\frac{(a - b\lambda)^4 (n - n'\lambda) \sin(\pi) \cos\left(\vec{k}_c . \hat{r} - \pi - \left|\partial E\right|\right)}{8\pi^2 \sqrt{(a^2 - b^2\lambda^2)^3}\, \cos\left(\vec{k}_c . \hat{r} - \left|\partial E\right|\right)} \right) \times \\ &\sum_{\beta = 1}^{\infty} \left(\frac{1}{1+\beta} \right) \left\{ \sin 2\left((1+\beta)\ \pi\right) \times \sin 2\left(\beta (n - n'\lambda) t - (\varepsilon - \varepsilon'\lambda)\right) \right\} + \left(\frac{(a - b\lambda)^4 (n - n'\lambda)}{16\pi^2 \sqrt{(a^2 - b^2\lambda^2)^3}} \right) \sum_{\beta = 1}^{\infty} \left(\frac{1}{1+\beta} \right)^2 \times \\ &\left\{ \sin 2\left((1+\beta)\ \pi\right) \sin 2\left(\beta (n - n'\lambda) t - (\varepsilon - \varepsilon'\lambda)\right) \right\} \sin\left((1+\beta)\pi\right) \cos\left(\vec{k}_c . \hat{r} - \beta (n - n'\lambda) t - \left|\partial E\right|\right) \end{aligned} \tag{2.59}$$

Note that we assumed the same constraint for the product of the two convoluting functions. That is the constraints are of equal weights $\alpha = \beta$. However, if we apply the double summation rule as it stands, that means, we shall first allow α take the value of one and let β run from one to infinity, again we allow α take the value of two and let β run from one to infinity and the process is repeated. However, since both constraints are of the same source function we can equate them so as to save us computation time and unnecessary difficult task.

We used table scientific calculator and Microsoft excel to compute our results. Also the GNUPLOT 3.7 version was used to plot the corresponding graphs.

2.7 Calculated values of the dynamic characteristics of the latent vibration of Man represented by the 'host wave' and that of the HIV represented by the 'parasitic wave':

We have in a previous study presented a model for determining the dynamic characteristics of HIV/AIDS in the human blood circulating system. Our work assumes that the dynamic components of the HIV responsible for their destructive tendency are $b\lambda$, $n'\lambda$, $\varepsilon'\lambda$ and $k'\lambda$ been influenced by the multiplicative factor λ whose physical range of interest is $0 \le \lambda \le 13070$. In this study, we calculated the values of the amplitude $b = 1.60 \times 10^{-10} m$, angular frequency $n' = 1.91 \times 10^{-11} rad./s$, phase angle $\varepsilon' = 0.0000466\, rad$ and the wave number $k' = 0.0127\, rad./m$ of the HIV parameters and with a slow varying interval of the multiplier $\lambda = 0, 1, 2, 3, \ldots, 13070$. While the dynamic characteristics of the latent vibration of the human blood circulating system caused by the beating of the human heart we also calculated are; amplitude $a = 2.1 \times 10^{-6} m$, angular frequency $n = 2.51 \times 10^{-7} rad./s$, phase angle $\varepsilon = 0.6109\, rad$, wave number $k = 166\, rad./m$. We also established in the study that the average survival time for HIV/AIDS patient is about 11 years (126 months) counting from the moment the HIV is contacted. However we classified the time interval in seconds as $0 \le t \le 328479340\ s$, with a slow varying time interval $t = 0, 1, 2, 3, \ldots, 328479340\ s$.

3.0 Presentation of Results.

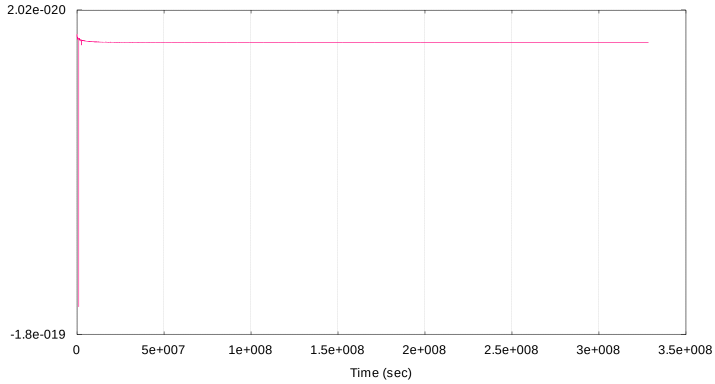


Fig. 3.1: Represents the multiplier λ [0, 13070] and time [0, 126 months], β =0.

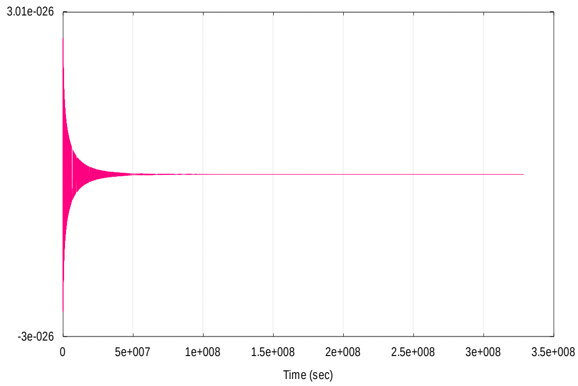


Fig. 3.2: Represents the multiplier λ [0, 13070] and time [0, 126 months], β =13070.

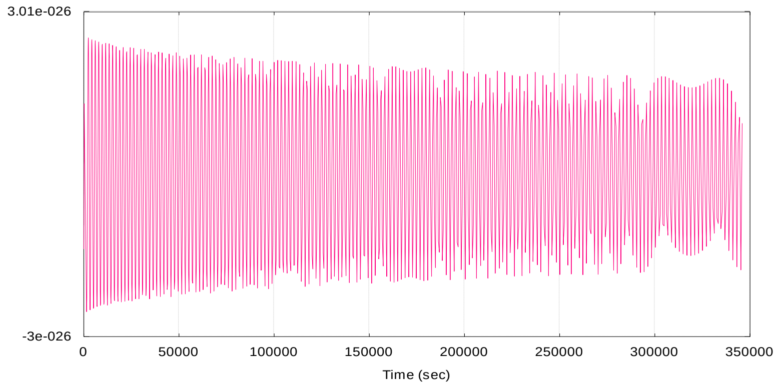


Fig. 3.3: Represents the multiplier λ [0, 1000] and time [0, 4 days], β =13070.

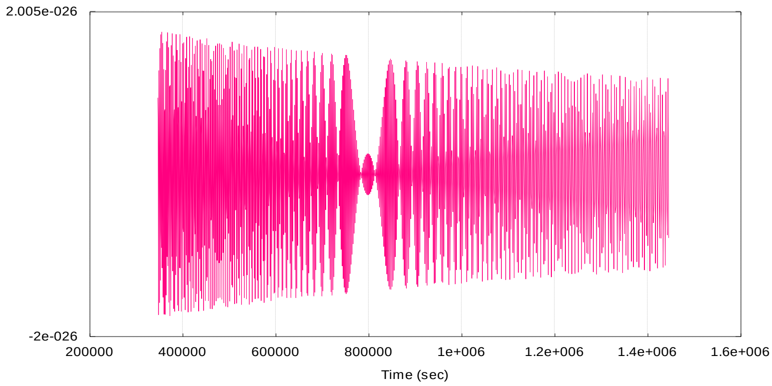


Fig. 3.4: Represents the multiplier λ [1000, 2000] and time [4 days, 16 days], β =13070.

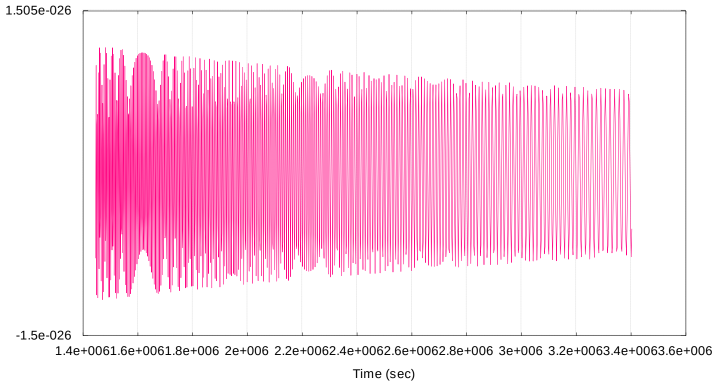


Fig. 3.5: Represents the multiplier λ [2000, 3000] and time [16 days, 1month], β =13070.

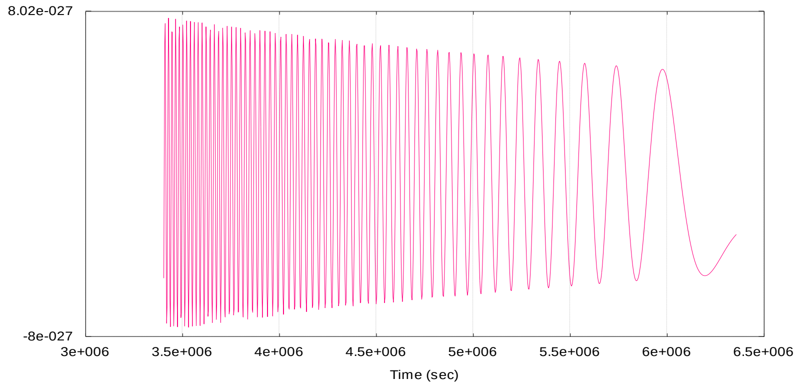


Fig. 3.6: Represents the multiplier λ [3000, 4000] and time [1 month, 2 months], β =13070.

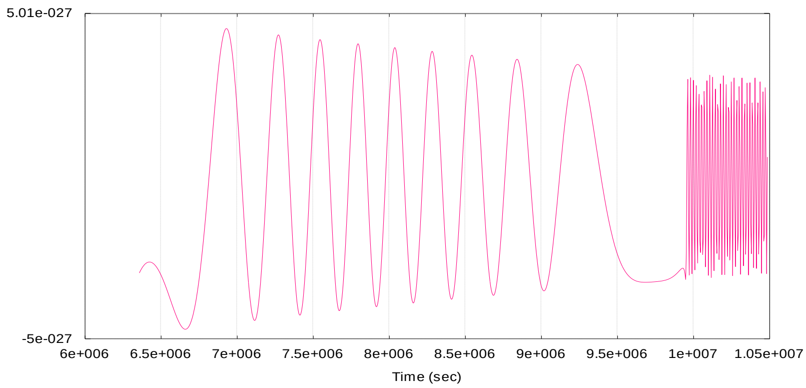
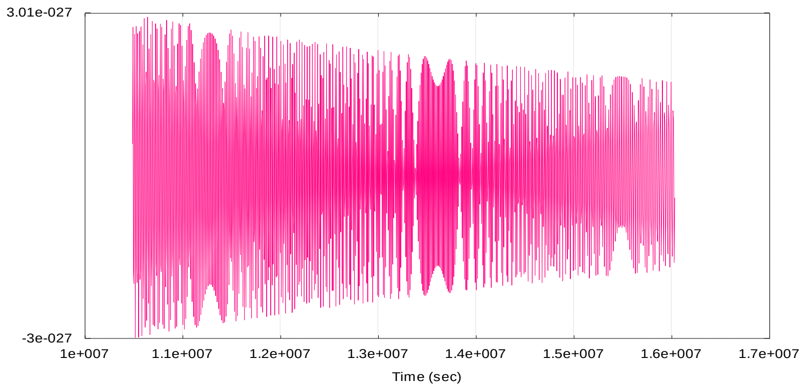


Fig. 3.7: Represents the multiplier λ [4000, 5000] and time [2 months, 4 months], β =13070.



Australian Journal of Basic and Applied Sciences, 8(16) October 2014, Pages: 190-203

Fig. 3.8: Represents the multiplier λ [5000, 6000] and time [4 months, 6 months], β =13070.

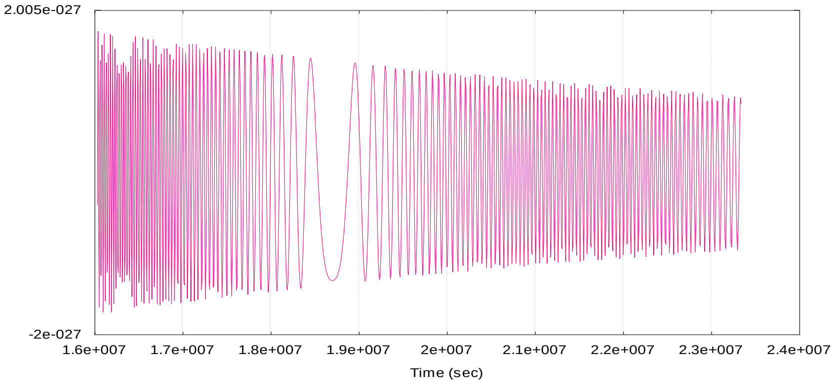


Fig. 3.9: Represents the multiplier λ [6000, 7000] and time [6 months, 9 months], β =13070.

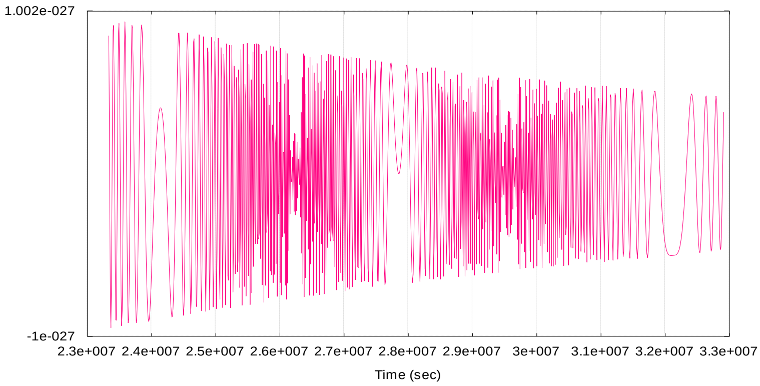


Fig. 3.10: Represents the multiplier λ [7000, 8000] and time [9 months, 12 months], β =13070.

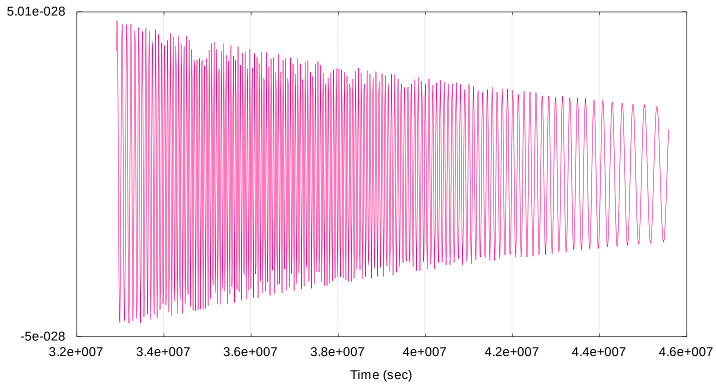
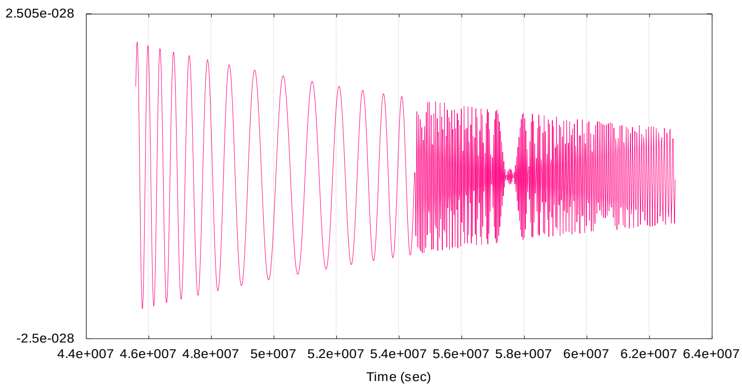


Fig. 3.11: Represents the multiplier λ [8000, 9000] and time [12 months, 17 months], β =13070.



Australian Journal of Basic and Applied Sciences, 8(16) October 2014, Pages: 190-203

Fig. 3.12: Represents the multiplier λ [9000, 10000] and time [17 months, 24 months], β =13070.

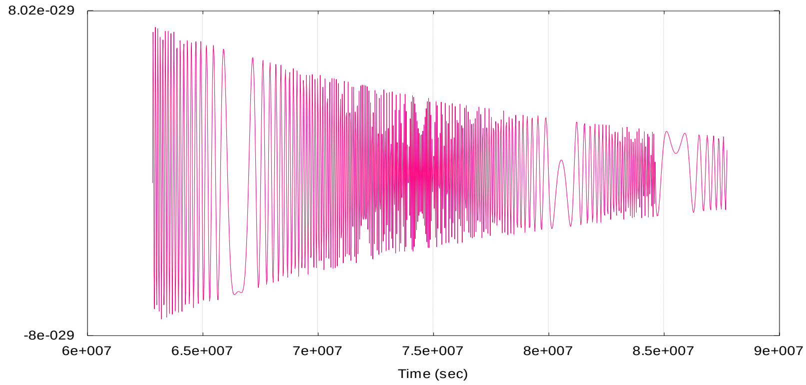


Fig. 3.13: Represents the multiplier λ [10000, 11000] and time [24 months, 33 months], β =13070.

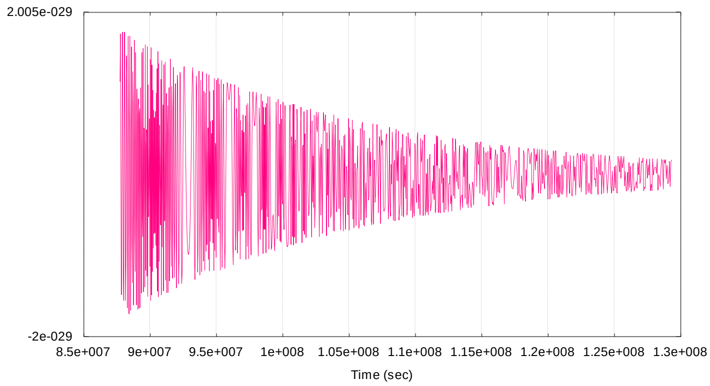


Fig. 3.14: Represents the multiplier λ [11000, 12000] and time [33 months, 49 months], β =13070.

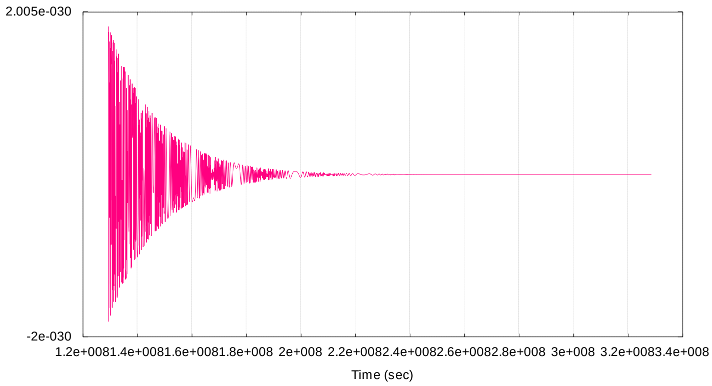


Fig. 3.15: Represents the multiplier λ [12000, 13070] and time [49 months, 126 months], β =13070.

4.0 Discussion of Results.

The graph of the velocity gradient of the carrier wave equation CCW is represented by figs 3.1 – 3.15. It is clear from fig. 3.2 that because of the numerous waveforms involved when the Fourier index β =13070 for every value of the multiplier λ, the figure could not really reflect all the possible waveforms available for the given period of time 0 – 126 months that the CCW lasted, as a result, the figure almost displayed a straight line. Consequently, we classified our work based on the interval of the multiplier [0 – 1000] so that this interval would help to delineate the parameter space accessible to our model. Although, our work was confined to only when the Fourier index was 13070, since we believe that this is the relevant region of interest to our work. Note that fig. 3.1 which is the first term of equation (2.59) is the fundamental velocity or the harmonic velocity of the CCW which does not contain the Fourier index β . As we can see the CCW is constant with time.

Generally, all the figures show sinusoidal waves which reveal the radial velocity fluctuations of the CCW resulting from a spread in the component frequencies. At time t = 0 the CCW has initial maximum positive angular velocity of about 3.01 x 10^{-26} rad/s and a final minimum positive angular velocity of about 8.02 x 10^{-34} rad/s at time t = 126 months, while an initial maximum negative angular velocity of about -3.0 x 10^{-26} rad/s at time t = 0 and a final minimum negative angular velocity of about -8.0 x 10^{-34} rad/s at time t = 126 months. This information is shown in figs. 3.2 and 3.15. Positive angular velocity means attraction and hence constructive interference between the 'host wave' and the 'parasitic wave', while negative angular velocity means repulsion and hence destructive interference between them. It is the reduction in the radial velocity of the CCW that causes a delay or a slow down process in the energy transfer mechanism which eventually leads to energy attenuation in a HIV/AIDS patient.

It is obvious from fig. 3.4, that immediately when one contacts HIV, about 800000 s (9 days) after the infection, the velocity profile of the CCW show something different from usual which indicates the presence of strange manifestations of a velocity-like body. However, this situation is renormalized to a continuous group velocity with high component frequencies after this time. This is synonymous with the fact that the process of constant degeneracy in the host system after the HIV infection is not immediate, and that the host system would by itself tends to annul the destructive effect of the interfering HIV.

It is observed in figs. 3.6 and 3.7 that there are certain region which show reduced frequency in the velocity profile of the CCW as it propagates. It is shown in the figures that the time for this remarkable distortion in the frequency to occur is between 5.5 x 10^{6} s (2 months) and 1 x 10^{7} s (3 months). This formation is characterised by a reduced frequency of the components of the CCW and this indicates that the destructive influence of the HIV in the human system has reached a noticeable advanced stage.

As the time progresses, the intrinsic characteristics of the HIV grow due to the inbuilt multiplier and this causes several alterations in the velocity profile and depletion of the active constituents of the CCW. This information is provided in figs, 3.9, 3.10, 3.12, and 3.13. The time for these remarkable alterations is between 7 and 22 months. This frequent alteration causes severe instability in the system of the host. To be consistent with the literature of clinical diseases this period of time is regarded as the window period. The window period signifies the time when the human biological system is now reacting fully to the presence of the HIV parasite due to the noticeable damage it may have done to the velocity of the CCW. Consequently, the window period differs from one individual to another due to different immune system. However, while it may appear in some individual after 2, 3, 7, 9, 10 months or so, others may take up to 22 months.

The frequency of the velocity of the CCW decreases from figs. 3.15 to 3.16. The spectrum of the velocity profile becomes parasitically monochromatic beyond 2.2 x 10^{8} s or about 84 months (7 years) as shown in fig. 3.15 this however, indicates the prominence of the HIV parasite which is now taking active control in the CCW. Thus within this region all the active components of the 'host wave' would have been completely eroded by the interfering HIV 'parasitic wave' thereby rendering the immune system of the host ineffective and non restorable. This situation depicts the possible period of time when the HIV infection degenerates to AIDS. Finally, the velocity of the CCW is brought to zero or rest after 126 months (10 years) as shown in fig. 3.15 and once this stage is reached the phenomenon called death of the host occurs.

5.0 Conclusion:

The decay process of the velocity of the CCW is not instantaneous but gradual. Initially, the Human system tends to annul the destructive influence of the invading HIV starting from the moment an individual contacted it. In the absence of specific treatment, the HIV infection degenerates to AIDS after about 77 months (6 years). This period involves a steady decay process in the velocity spectrum of the CCW and this result to a rapid weakening in the initial strength of the intrinsic parameters of the host system. The velocity of the CCW finally goes to zero - a phenomenon called death, when the multiplier approaches the critical value of 13070 and the time it takes to attain this value is about 126 months (10 years). It is the reduction in the angular velocity of the CCW that causes a delay or a slow down process in the energy transfer mechanism which eventually leads to energy attenuation in a HIV/AIDS patient. Thus this study has to some extent provided the means of determining the basic activity and performance of HIV in the human blood circulating system. As a result, the HIV can be selectively and discriminately destroyed from the human biological system by anti-vibrating component without causing the slightest harm to the mechanism of the Human system. This work thus identifies the matrix of scientific priorities that should bring us measurably closer to our vision of developing a cure for HIV/AIDS infection.

Australian Journal of Basic and Applied Sciences, 8(16) October 2014, Pages: 190-203

5.1 Suggestions for further work:

This study in theory and practice can be extended to investigate wave interference and propagation in two- and three- dimensional systems. The carrier wave equation CCW that we have developed can be utilized in the deductive and predictive study of wave attenuation in exploration geophysics and telecommunication engineering. This work can also be extended to investigate energy attenuation in a HIV/AIDS patient.

Appendix:

The following is the list of some useful identities which we implemented in the study.

(1) $\sin x + \sin y = 2\sin\frac{x+y}{2}\cos\frac{x-y}{2}$; (2) $\sin x - \sin y = 2\cos\frac{x+y}{2}\sin\frac{x-y}{2}$

(3) $\cos x + \cos y = 2\cos\frac{x+y}{2}\cos\frac{x-y}{2}$; (4) $\cos x - \cos y = -2\sin\frac{x+y}{2}\sin\frac{x-y}{2}$

(5) $2\sin x\cos y = \sin(x+y) + \sin(x-y)$; (6) $2\cos x\sin y = \sin(x+y) - \sin(x-y)$

(7) $2\cos x\cos y = \cos(x+y) + \cos(x-y)$; (8) $2\sin x\sin y = \cos(x-y) - \cos(x+y)$

(9) $\sin(x \pm y) = \sin x\cos y \pm \cos x\sin y$; (10) $\cos(x \pm y) = \cos x\cos y \mp \sin x\sin y$

(11) $\sin 2x = 2\sin x\cos x$; (12) $\sin(-x) = -\sin x$ (odd and antisymmetric function)

(13) $\cos(-x) = \cos x$ (even and symmetric function)

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