

Harmonic Oscillator of Rotational Electro-magnetic wave

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Abstract: Cosmic frequency makes Harmonic Oscillator and zero point energy. Harmonic Oscillator is anchored by zero point energy. Harmonic Oscillator has duality between potential energy and kinetic one.

The spherical coordinate energy $h\nu\left(\frac{r_0}{r}\right)$ also comes from the cosmic frequency. Positron, electron, neutrino and anti-neutrino are from the zero point energy $\left(\frac{1}{2}h\nu\right)$, the cosmic frequency and the spherical coordinate energy $h\nu\left(\frac{r_0}{r}\right)$. These are realized by implosivity and explosivity of the rotational electro-magnetic waves. The rotational electro-magnetic waves are related to western physics and oriental ones.

1. Conventional Harmonic Oscillator

$$E_n = \left(n + \frac{1}{2}\right)h\nu, n = 0, 1, 2, 3 \quad \dots\dots(5)$$

$$E_o = \frac{1}{2}h\nu \quad \dots\dots(6)$$

1-1. Harmonic Oscillator of mass system (ref.1)

$$\frac{d^2x}{dt^2} + \frac{k}{m}x = 0 \quad \dots\dots(1)$$

$$x = A \cos(2\pi\nu t + \varnothing) \quad \dots\dots(2)$$

$$v = \frac{1}{2\pi} \sqrt{\frac{k}{m}} \quad \dots\dots(3)$$

Where x = displacement, t = time, k = spring constant, m = mass, A = amplitude, \varnothing = phase angle, ν = frequency

1-2. Energy Levels

$$\frac{d^2\Psi}{dy^2} + (\alpha - y^2)\Psi = 0 \quad \dots\dots(4)$$

Where $y = \left(\frac{1}{h} \sqrt{km}\right)^{\frac{1}{2}} x = \sqrt{\frac{2\pi m \nu}{h}} x$,

$$\alpha = \frac{2E}{h} \sqrt{\frac{m}{k}} = \frac{2E}{h\nu}$$

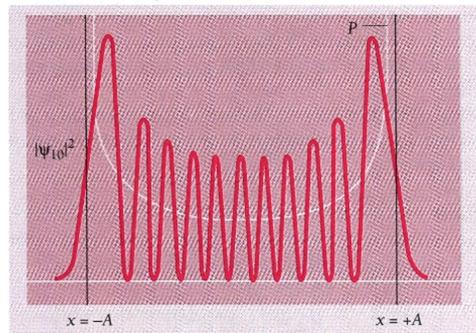
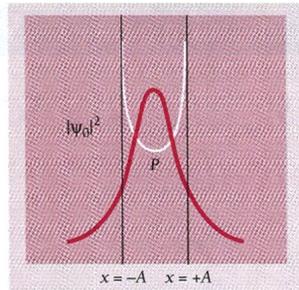


Fig. 1 Probability densities for the $n=0$ and $n=10$ states of a quantum-mechanical harmonic oscillator. The probability densities for classical harmonic oscillators with the same energies are shown in white. In the $n=10$ state, the wavelength is shortest at $x=0$ and longest at $x=-A$.

Equation (5) suggests the cosmic frequency.

2. Zero Point Energy and Anchoring

It is the lowest value the energy of the oscillator can have. It is called zero point energy(ref.1). It is not $E=0$ as the temperature approaches to $0^{\circ}K$.

Any oscillating movement is anchored by the zero point energy.

3. Harmonic Oscillator of Rotational Electro-magnetic wave

3-1. Poincaré Conjecture(ref.2)

$$\vec{E} = h\nu\left(\frac{r_0}{r}\right)ii + h\nu\left(1 - \frac{r_0}{r}\right)jj \quad \dots\dots(7)$$

$$\underline{P} = h\nu\left(\frac{r_0}{r}\right) + ih\nu\left(\frac{-r_0}{r}\right) \quad \dots\dots(8)$$

Where \underline{P} : potential energy

i : imaginary

ii, ij : unit vector

3-2. Rieman Hypothesis(ref.3)

$$\Psi = \frac{1}{1^s} + \frac{1}{2^s} + \frac{1}{3^s} + \frac{1}{4^s} + \dots = 0 \quad \dots\dots(9)$$

Where Ψ : probability density function

$$s = \frac{1}{2} + i\frac{1}{e^{h\nu/k_b t - 1}} \quad \dots\dots(10)$$

3-3. Duality Between Potential Energy and Kinetic Energy

The $h\nu\left(\frac{r_0}{r}\right)$ is potential energy in Poincaré conjecture while it has kinetic energy also in Rieman Hypothesis(ref.2).

4. Conclusion

① Cosmic frequency makes Harmonic Oscillator. Vice Versa.

② Harmonic Oscillator is anchored by zero point energy.

③ Harmonic Oscillator has duality between potential energy and kinetic one.

References

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2. Hungkuk Oh, Yohan Oh, Jeunghyun Oh, Solution for the Millennium Seven Problems, journal of applied subtle energy, 2013, vol.11, no.1, pp.15-22