A Spiral Structure of Universe

Suraj Kumar

Abstract — In this paper it has been tried to establish as analogous image of spiral structure of Universe to that of spiral structure of elementary particles [1]. It describes the distribution of potential along the axis of evil of Cosmic Microwave Background Radiation. The roots of the zeta function are derived from the multipoles of the Cosmic Microwave Background Radiation which is in turn used to establish the eigenvector for the spiral structure of elementary particles which creates a unified view at both the scales. The geometric pattern in the partial sums of Riemann's zeta function provides the mirror symmetry between the partial sums and the centre of spiral structures at different scales across the axis of evil of Cosmic Microwave Background Radiation which is tried to be quantized with the Approximate Functional Equation.

Index Terms— Spiral, Particles, Universe, Axis of Evil, Large Number Hypothesis, Golden Ratio

1 Introduction

1.1 What is Axis of Evil?

A non-random distribution of cold and hot spots in the canvas imprinted with the radiation left behind by the Big Bang unlike as predicted by the standard cosmology which believes the Universe to be isotropic. It was observed by Kate Land and Joao M. of Imperial College of London in 2005 while analyzing the map of Cosmic Microwave Background created b NASA's WMAP Satellite. It was later observed by Damier H. of University of Liege in Belgium who analyzed the polarization of various quasars and found the polarization to be ordered more than expected for the quasars nearer to the axis of evil. Michael Longe of University of Michigan analyzed the spiral galaxies from Sloan Digital Sky Survey and discovered the linear pattern between the sizes of rotation of most galaxies and axis of evil, with probability of 0.4%.

1.2 Interpretation of Axis of Evil

The axis of evil of Cosmic Microwave Background Radiation can be considered to be the generating curve of the spiral structure of Universe $\mathrm{C}(s)$ which is determined by its curvature $\kappa(s)$ and its torsion $\mathrm{T}(s)$ which twists the canvas of the Universe to distribute the potential along the axis of evil. To quantize the generating curve, let's consider $\overrightarrow{\mathrm{T}(s)} = \frac{d\mathrm{C}(s)}{ds}$ is the unit tangent vector. $\overrightarrow{\mathrm{N}(s)}$ is the unit normal vector and $\overrightarrow{\mathrm{B}(s)} = \overrightarrow{\mathrm{T}(s)} \times \overrightarrow{\mathrm{N}(s)}$ is the binormal vector.

Using the arc-length parameterization for the axis of evil of Cosmic Microwave Background Radiation, given $\kappa(s) > 0$ and existing $\tau(s)$ by Fernet-Serret equation (which describes the geometric properties of the curve). We have:

$$\frac{d\overrightarrow{\mathrm{T}(s)}}{ds} = \kappa(s)\overrightarrow{\mathrm{N}(s)}$$

$$\frac{d\overrightarrow{\mathrm{N}(s)}}{ds} = -\kappa(s)\overrightarrow{\mathrm{T}(s)} + \kappa(s)\overrightarrow{\mathrm{B}(s)}$$

$$\frac{d\overrightarrow{\mathrm{B}(s)}}{ds} = -\tau(s)\overrightarrow{\mathrm{N}(s)}$$

The Curve C is defined by:

$$\mathrm{C}(s) = \int_0^s \left[\int_0^t \frac{d\overrightarrow{\mathrm{T}(u)}}{du}\, du + \overrightarrow{\mathrm{T}_0}\right] dt + \mathrm{X}_0$$

Where $\overrightarrow{\mathrm{T}(u)}$ runs over $[0, t]$, which is the variation of tangent vector through the age of the Universe at each point of reference. $\overrightarrow{\mathrm{T}_0}$ represents the unit tangent vector at the formation stage of Universe. The integral ranging from $[0, s]$ represents the variation of tangent vector combined for all the point of reference. X_0 represents the curvature induced from the initial formation of Universe during the Big Bang from the information preserved in the symmetry of SU (1) [2].

It is expected that the curve should minimize the sum of the square variation of the curvature and the torsion:

$$\mathrm{S}[(\kappa, \tau)] = \int_0^{\mathrm{L}} c^2[\kappa_s^2(s) + \tau_s^2(s)]\, ds$$

Where L is the length of axis of evil of Cosmic Microwave Background Radiation, $\kappa_s = \frac{\partial \kappa}{\partial s}$ and $\tau_s = \frac{\partial \tau}{\partial s}$ and c^2 is the rate of autocatalysis.

The solution to the equation gives a curve whose curvature and torsion changes linearly along the curve. Thus for some

- *Suraj Kumar, India, PH-+91-9619617484. E-mail: surajkumar600s@gmail.com*

constants κ_0, τ_0, γ, $\delta \in R$ and for $0 < s < L$ we get parameters at the initial formation of Universe.

$$\kappa(s) = \kappa_0 + \gamma s \text{ and } \tau(s) = \tau_0 + \delta s$$

Since, the curvature and torsion for the spiral structure of elementary particles vary by a fixed scale of $\varphi = 1.53158$ which is reflected along the spiral structure of Universe. In similar term the dynamics of spiral structure provides the electromagnetic potential to the Universe as a whole, which can also be interpreted from the observation of Modified Inflation Model which allows the Universe to expand more in one direction where inflation stops at a relatively early point leaving traces of early unevenness in the form of the axis of evil along which the Universe wrapped itself around. Further proposed by Leonardo Compenalli of the University Of Ferrara, Italy who suggested the magnetic field of the Universe for the orientation of the spiral galaxies, since formally the quadruple and octupole moments of the fluctuation aligns. Also at the small scale, the fluctuation reflects a particular random pattern.

2 Geometric Pattern in the Partial Sums of the Riemann Zeta Function

2.1 What is Riemann Zeta Function?

It is the simplest Drichlet Series form as $\zeta(s) = \sum_{n+1}^{\infty} n^{-s}$ where$\{ s \in \mathbb{C} : 0 < R(s) < 1\}$. The conjugate of s is denoted by $\bar{s}$ and the conjugate changes the imaginary part and flips over the real axis.

$$f(\bar{s}) = \overline{f(s)}$$

Let $s = R(s) + iI(t) \approx s = \sigma + it$. To avoid loss of generality, we take t to be positive. A Partial Sum is the sum of two components of each summand individually. Let $P_s(n)$ represents the nth partial sum of the series with argument s.

$$P_s(n) = \sum_{k=1}^{n} k^{-s}$$
$$= \sum_{k=1}^{n} \left(R(k^{-s}), I(k^{-s})\right)$$
$$= \left(\sum_{k=1}^{n} (R(k^{-s})), \sum_{k=1}^{n} (I(k^{-s})),\right)$$

The partial sums differ in step of n^{-s} or by the vector $\left(R(n^{-s}), I(n^{-s})\right)$ which forms the nth branch. It represents the stable spiral structures which can induce the behavior of particles. The constraint for a spiral to be stable structure for elementary particles requires the geometric pattern in the partial sums to have analytic continuation where $\zeta(s)$ has a unique value for all values of s by continuation.

Riemann in 1859 stated a fundamental equation that implies symmetry across the line $s = \frac{1}{2}$: $\zeta(1 - s) = \gamma(s)\zeta(s)$. Since we know that the stable elementary particles with long decay period have spin parameters as $\frac{1}{2}$ i.e. fermions being described by the values of s through the functional equation as $\zeta(1 - s)$ refers to the residual structure potential i.e. $\zeta(1/2)$, $\gamma(1/2)$ refers to the action of autocatalysis for spin potential while $\zeta(1/2)$ represents the spin potential for the spiral structure for elementary particles. Thus the functional equation for fermions can be given as:

$$\zeta(1/2) = \gamma(1/2)\zeta(1/2)$$

where $\gamma\left(\frac{1}{2}\right) = 1 = c^2$. Thus for fermions the rate of autocatalysis is equal to unity i.e. the residual structure potential is equal to the spin potential which prohibits the decay of potential and returns the structure.

2.2 Geometric Pattern in the Partial Sums of the Spiral Structure for Elementary Particles

Let $\zeta(s)$ have partial sums with $s \approx \frac{1}{2} + 1.53158i$. The swirling shape of the partial sums provides the potential branches for the formation of spiral structure of elementary particles.

The final spiral diverges in regular outward spiraling pattern around $\zeta(s)$. The spiral structure for the whole of the Universe is given by C_0 which spiral around centre with $\zeta\left(\frac{1}{2} + 1.53158i\right) = 0$. As the Drichlet series at this point is divergent. Here $\zeta(s)$ is estimated by analytical continuation unlike the series represents.

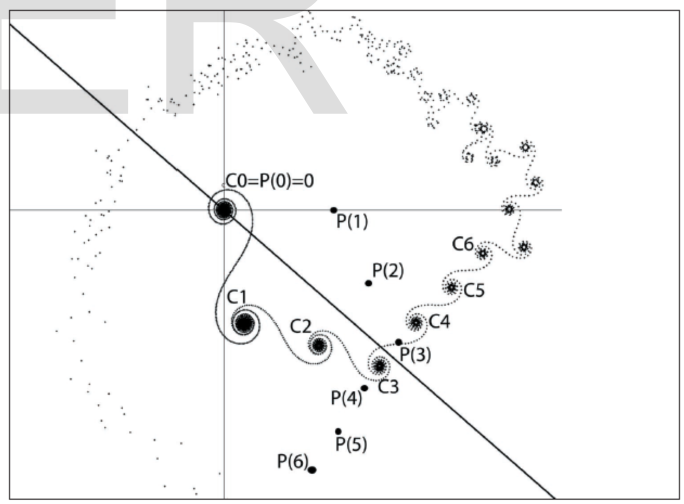

Figure 1: The partial sums. This is a zero of the zeta function, evidenced by C0, which is the same as ζ(s), being at the origin. Note the mirror symmetry between partial sums and the centers of the spirals across the line of symmetry.

We can observe the fall in variation rate as we move away from the centre; this provides increased mass for the particles formed through the spiral potential away from the centre.

The figure 1 can be compared with analogous pattern in the figure 2 as:

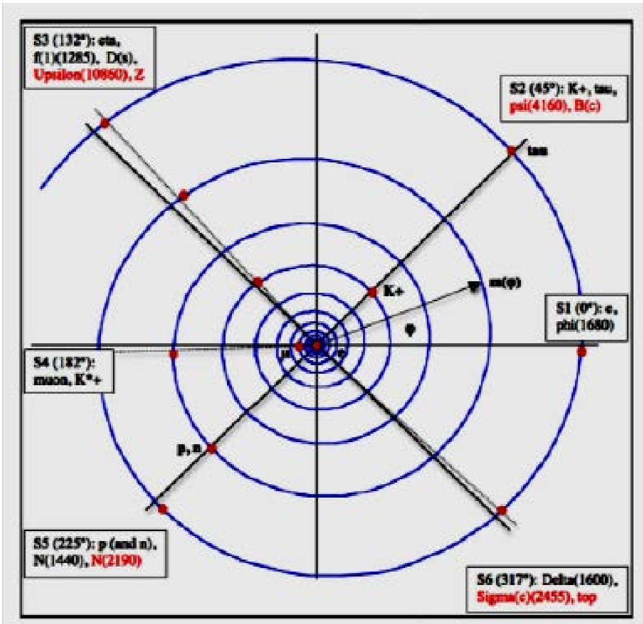

Figure 2: The masses of elementary particles placed on the spiral and listed for each resulting sequence starting from the centre. The solid lines are separated by 45 degree. The red dot in the centre is the electron at 0 degree. The outer limit of the spiral at 135 degree is about 2 GeV in first figure and at 80 degree is about 6.5 GeV in second figure. Particles allocated on a sequence, but with masses too large for this scale are marked red in the attached listings of sequence particles. The top for example is far outside on S6 at 317.

3 Finding the Centre of Spiral

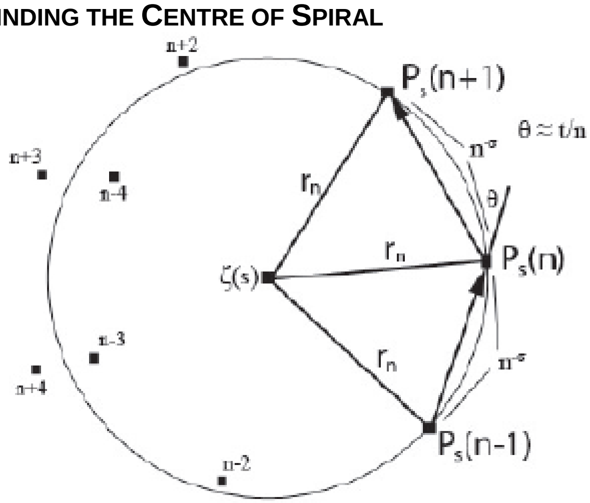

Figure 3: Demonstration of deducing C_0 with length and angles known. The curvature and centre of spiral can be deduced as the partial sums of spirals away from C_0.

Estimating a function to 'correct' the outward spiraling back to centre through smooth function over three consecutive partial sums in the critical strip analogous to approximating the behavior of spiral structure of elementary particles (stable composite particles) to the scale of spiral structure of Universe by eliminating the effect of inflation. It vanishes distance between the partial sums as their index increases i.e. their scale gets smaller reflecting particular localized random behavior of the fluctuations in the Cosmic Microwave Background Radiation.

$$\lim_{n\to\infty} |\, n^{-s}| = 0$$

The variation in angle between vector $P_s(n-1)$ to $P_s(n)$ and vector $P_s(n)$ to $P_s(n+1)$ is approximately [t/n] and the length is $n^{-\sigma}$. Then the radius is r_n

$$r_n = \frac{n^{1-\sigma}}{2t} \text{ [radius of approximation to the axis of evil]}$$

where n represents the number of possible centre of spirals raised to power of $1-\sigma$ where σ is the variation factor of the potential away from the axis of evil of Cosmic Microwave Background Radiation. t is the total available potential (dark potential).

The total length δ is: $\delta = \frac{n^{1-\sigma}}{1-\sigma}$. Thus the curvature is given by $\kappa = \frac{1}{\sigma_n} = \frac{t}{\delta(1-\sigma)}$. The centre of the final spiral i.e. the spiral for the Universe, in the progression of the partial sums is given by $C_0 = \lim_{n\to\infty}\left(\sum_{k=1}^{n} k^{-s} - \frac{n^{-s}}{1-s}\right)$. This gives $\zeta(s) = C_0$.

4 Approximate Function Equation (AFE)

Given $s \in C$ in the critical strip $(0 < R(s) < 1)$ and real parameter $X, Y \geq 1$ s.t. $2\pi XY = I(s)$, then

$$\zeta(s) = \sum_{k\leq X} k^{-s} + \varphi(1-s)\sum_{k\leq Y} k^{s-1} + \theta\left(X^{\frac{1}{2}-R(s)}\left(X^{-\frac{1}{2}} + Y^{-\frac{1}{2}}\right)\log XY\right)$$

where $\varphi(s) = \pi^{\frac{1}{2}-s}\frac{\Gamma(\frac{s}{2})}{\Gamma[\frac{1-s}{2}]}$, approximates the rate of autocatalysis and $\sum_{k\leq X} k^{-s}$ represents the partial sums.

According to AFE, all the partial sums should approximate to $\zeta(s) - \varphi(1-s)$. The centre of the spirals occurs at the partial sums with:

$$\frac{t}{n} \equiv \pi \bmod 2\pi \text{ or } n = \frac{t}{\pi(2x-1)} \;\forall\, x > 0$$

Now for $C_0 : n = \frac{t}{\pi}$; $C_1 : n = \frac{t}{3\pi}$ and the change in the angle is of π and the change in the potential is of 1.53158.

ISSN 2229-5518

Estimating the relation among X and Y and AFE can be expressed as : $\zeta(s) = C_0 \approx C_1 + \varphi(1-s)$. Thus the difference between the location C_0 and C_1 is $\varphi(1-s)$! i.e. the rate of autocatalysis. Moving further, $(s) = C_0 \approx C_2 + \varphi(1 - s(1s{-}1{+}2s{-}1)$.

In generalized form: $C_0 = \zeta(s) - \varphi(1-s)P_{1-s}(n)$
Since, the absolute value of $\varphi(1-s)$ is one for which s is on critical line i.e.

$$|\varphi(1-s)| = 1 \rightarrow 1 - \sigma = \frac{1}{2} \rightarrow \sigma = \frac{1}{2}$$

and when $\sigma = \frac{1}{2}$ then s and $1-s$ are conjugate i.e.

$$\bar{s} = \overline{\sigma + it} = \frac{1}{2} - it = 1 - \left(\frac{1}{2} + it\right) = 1 - s$$

Thus for complex analytical function, $P_{1-s}(n) = \overline{P_s(n)}$ when $\sigma = \frac{1}{2}$. On other hand, if $|\varphi(s)| \neq 1$ for $R(s) \neq \frac{1}{2}$. So the geometric relation among C_n and $P_s(n)$ is destroyed. This provides us with the symmetry breaking required for acquiring potential for gravity and initiation of big bang.

The factors in the above equation can be resolved as:

1) The $\varphi(1-s) \approx \varphi(\frac{1}{2})$ for stable fundamental particles such as fermions. The φ factor represents the rate of autocatalysis which extracts the potential to form the spiral structure scaling the potential to be unity.
2) The relation between $P_s(n)$ and $P_{1-s}(n)$ reflects the symmetry with charge conjugate. For example $P_s(n)$ for electron is $P_{1/2}(n)$ and for that of positron is $P_{1-1/2}(n) \approx P_{1/2}(n)$

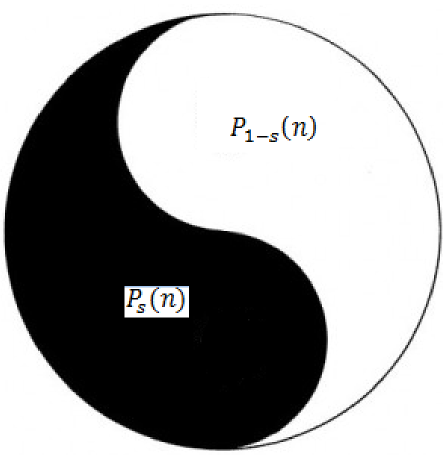

Figure 4: The similar analogy can be expressed for spiral structure for Universe in terms of symmetry of generating curve.

For $C_0 = P_s(0)$ with $\zeta(s) = 0$ has mirror symmetry with ½. This represents the state of singularity before big bang where there was no generating curves to initiate formation & expansion.

5 Relation between Spiral Structure for Elementary Particles and Roots of Riemann Zeta Function

The primes represented by the roots of Riemann Zeta Function can be considered to be analogous to the elementary particle. Non-primes can be considered geometrically to be equivalent to the composite particles which is separable symmetric connection following the constant of energy conservation. As observed, the growth of prime numbers and that of masses of elementary particles follow the same trend model. Also a possible connection between atomic structure and the zeroes of Riemann Zeta Function is found, where it matches the spacing of energy levels in nucleus.

Growth of primes is defined by logarithmic law in the theory of prime. Assuming a close packaging of circles on a plane, so as to make a bigger circle with ratio of bigger to smaller circle as:

$$\frac{R}{r} = 1 + \frac{1}{\sin t}$$

The structure to be stable requires $(1/\sin t)$ to be integer and consecutively t to be either $\frac{\pi}{6}$ or $\frac{\pi}{2}$ which gives $\frac{R}{r}$ to be 2 or 3. Since only the number is non-trivial, it gives a view of "discretization numbers of the continuous 3D space" and provides 6 circles connected to each other tangent to 7th circle at centre. Looking at the pattern predicted, every prime can be written as $6n \pm 1$ where n is an integer. Thus, 6 can be considered to be the generator of prime and correspondingly the stable atomic structure as it scales the combined length of the spirals of 2 and 3 quarks constituents corresponding to $SU(2) \times SU(3)$ and energy of each structure is proportional to n^2 (the number density squares the correlation between particle mass and primes to 0.999992). We can consider the same to be related to Large Number Hypothesis for the length of the spiral structure for the Universe as if one estimates the total number of nucleons in the Universe. Let the total number of the galaxies with a speed of recession be less than $\frac{1}{2}c$ considering the Universe to be infinite, one gets a number somewhere around $10^{78} \cong t^2 \approx n^2$.

It is to be noted that the potential energy and forces are determined by radial distances i.e. radii of large nuclei.

6 Multipoles of Cosmic Microwave Background and Riemann Zeta Function

Cosmic Microwave Background dipole is analogous to half spin particle with generating curve equal to $\zeta(1/2)$. The distribution of the potential is measured by the temperature and polarization.

ISSN 2229-5518

According to Friedmann's equation, the expansion rate of early Universe was determined by radiation density: $\frac{\dot{a}}{a} \propto a^{-2}$. This requires the volume of spiral structure of the Universe to grow according to inflation in same proportion: $\dot{V}/V \propto V^{-2}$.

Components of cosmic fluid can be approximated to behave as primon gas of Riemann Gas, this requires particle to interact with short range forces which allows the partition sums to be written as power of one-particle partition sums and the internal energy in independent of volume occupied. The Maxwell-Boltzmann Distribution of Primon Gas in the Cosmic Fluid is given by:

$$Z(\beta) = \sum_{n\geq 1} e^{-\beta E_n} = \sum_{n\geq 1} e^{-\beta \log(n)} = \sum_{n\geq 1} e^{(\log(n))^{-\beta}} = \sum_{n\geq 1} n^{-\beta} = \zeta(\beta)$$

Note: Particle will drop out of equilibrium when their interaction rate falls below the expression rate of Universe.

7 Decoupling of Cosmic Microwave Background Radiation and Association to Riemann Zeta Function

We know the recombination reaction: $p + e^- \rightarrow H + \gamma$ described by minimizing the free energy.

$$F = -kT\ln Z: \; -kT\ln\left[\frac{Z_p{}^{N_p}}{N_p!}\frac{Z_e{}^{N_e}}{N_e!}\frac{Z_H{}^{N_H}}{N_H!}\right]$$

where Z is canonical partition sums of mixture of protons, electrons and Hydrogen. The equilibrium state is extreming the free energy. $\frac{\partial F}{\partial N_e} = 0$. This gives the ionization fraction $x = \frac{N_e}{N_B}$. The result is: $\frac{x^2}{1-x} = \frac{\sqrt{\pi}}{4\sqrt{2}\,\zeta(3)n}\left(\frac{m_e c^2}{kT}\right)^{3/2} e^{-\chi/kT}$ where χ is ionization energy of H=13.6eV and $\zeta(3)$ is Riemann Zeta Function.

Associating the decoupling of Cosmic Microwave Background to the roots of Riemann Zeta Function, we require finding the partial partition sums for components of recombination reaction. This can be done by taking the spiral structure for the components in recombination reaction giving the partial partitions sum to be as Canonical Partition Sum:

$$Z_p = \sum \zeta(S_p) = \sum P_{S_p}(n_p) = \left(\sum_{k\geq 1}^{n_p}\left(R(k^{-S_p})\right), \sum_{k\geq 1}^{n_p}(I(k^{-S_p}))\right)$$

Since the spin of proton is ½ equivalent to that of electron, thus the initial component of recombination reaction provides a half-spin constituent with rate of autocatalysis equal to $c^2 = 1$.

Similarly for the product part, we have Hydrogen with approx spin of ½+ which provide a uniform rate of autocatalysis and sustainable existence of Cosmic Microwave background as $c^2 = 1$ provides a structural stability and moderates the autocatalysis reaction, giving the initial abundance of Hydrogen in the Universe.

8 Application of Multipole Method to Find the Roots of Riemann Zeta Function Describing the Spiral Structure of Universe

Computing the eigenvalues of arrowhead matrices with a form of modified Stress-Energy Tensor as:

$$A = \begin{bmatrix} D & z \\ z^t & p \end{bmatrix} \approx \begin{matrix} T^{11} & T^{12} & T^{13} & T^{10} \\ T^{21} & T^{22} & T^{23} & T^{20} \\ T^{31} & T^{32} & T^{33} & T^{30} \\ T^{01} & T^{02} & T^{03} & T^{00} \end{matrix}$$

where $D = \begin{matrix} T^{11} & T^{12} & T^{13} \\ T^{21} & T^{22} & T^{23} \\ T^{31} & T^{32} & T^{33} \end{matrix}$ represents the momentum flux with its constituents as pressure in diagonal element and shear stress in upper and lower triangle; $z = \begin{matrix} T^{10} \\ T^{20} \\ T^{30} \end{matrix}$ is the vector representing momentum density; $z^t = T^{01} \quad T^{02} \quad T^{03}$ is the transpose of vector representing momentum density and T^{00} is the energy density distributed with instance of autocatalysis reaction.

The Arrowhead matrix above can be calculated randomly at any point in the Universe to analyze the flow of potential along the spiral structure of Universe. The eigenvalues of the matrix are the roots of secular function:

$\emptyset(\lambda) = p - \lambda - \sum_{i=1}^{3} \frac{z_i{}^2}{d_i - \lambda}$ where λ is the cosmological constant which is the eigenvalues of the Arrowhead matrix for the spiral structure of complex Universe. The Arrowhead matrix can also be written as: $A = D + \rho z z^t$ with root rewritten as: $\emptyset(\lambda) = 1 + \rho \sum_{i=1}^{3} \frac{z_i{}^2}{d_i - \lambda}$.

8.1 Multipole Algorithm

On the principle of different level of potential for formation of spiral structure at different scales by spiral hashed information vessel. We define subinterval by dividing the considered parent level into equal parts at sublevel. With refinement, the multipole functions are constructed by summing the contribution of spiral structure of elementary particles formed by the potential in the subinterval.

ISSN 2229-5518

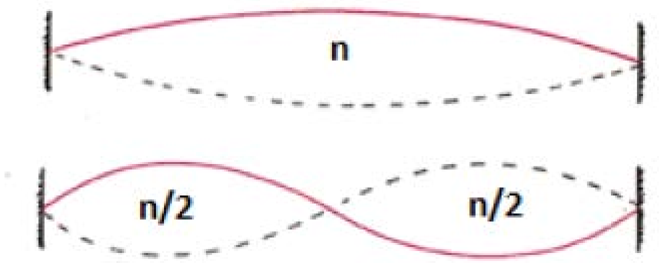

Figure 5: Illustration of division for sublevels.

Thus, if there are l particles in the interval i.e. p_l. At coarser level, the function coefficients are derived by fusing together the multipoles of children in subinterval.
If a_{k_1}, a_{k_2}, b_k are child and parent multipole coefficient and c_1, c_2, c_p are centre of respective intervals. Then, $b_l = \sum_{i=1}^{2}\sum_{k=0}^{l} a_{k_i}(c_i - c_p)^{l-k}\binom{l}{k}$ where i is potential subinterval and k is number of spiral structure for elementary particles.

The contribution of all particles can be approximated by sum of different multipole function of different levels of potential hierarchy. The choice of selection of multipoles to perform summing is on the basis of interaction list which for an interval I is all intervals of same size which are the children of the neighbors of I's parents. But are not neighbors of I. In summation, the multipoles of intervals of the I's interaction list is summed first, then those in the interaction list of I's parent potential and goes on up to the top of potential tree.

To determine the multipole function we have, approximated coordinates (q_i, x_i) for a particle where q_i is its momentum obtained from the dynamics of its spiral structure and x_i is its position obtained by the eigenvector of the spiral derived through the roots of the Riemann Zeta Function. Suppose that all the spiral structure for elementary particles is in interval [0,1]. It can be divided into hierarchy of sub intervals as in spiral hashed information vessel. The constituent of the particles in each subinterval I is approximated by multipole function of the form: $m(x) = \sum_{x=0}^{p}\frac{q_k}{(x-c)^{k+1}}$ where c is the centre of subinterval potential of I and the coefficient are determined by interpolating $x = \infty$ i.e. approximating for complete of Universe gives: $a_k = \sum_{z_i \in I} q_i\,(z_i - c)^k$.

The basic algorithm generalizes the process to two or more dimensions with complex algorithm; the particles are located on complex plane with complex potential. Thus, we have squares instead of intervals but this degrades the convergence of multipole expansion as dimension increases. This can be visualized through the action of eigenvectors on vectors of Random Matrices. To calculate the vector $w = Q^t v$, where Q is the matrix whose columns are the eigenvectors of $A = D + \rho zz^t$ and v is pre-specified vector which contains the properties induced by the particle whose spiral structure is in consideration. By divide-and-conquer parallel eigenvalues algorithm, v is either e_1 or e_n (extremes). For rank-one perturbation matrix using multipole methods, let q and λ be eigenpair of A for spiral structure of Universe as a whole. Then, $(D + \rho zz^t)q = \lambda q; (D - \lambda I)q = -p(z^t q)z$. Eigenvector of ith level for q is $q_i = \theta_i q_{0i}$ with $(q_{0i}^t q_{0i})^{-1/2}$ as normalizing constant $q_{0i} = (D - \lambda I)^{-1} z$.

The divide-and-conquer algorithm requires that we calculate the first and last element of each eigenvector. The lth element of q_{0i} is: $q_{0il} = \frac{z_l}{d_{l-\lambda_i}}$. Calculation of all elements of q_{0i} is to be calculated to determine θ_i. Solving through multipole method, we have:

$$\theta_i^{-2} = q_{0i}^t q_{0i} = z^t (D - \lambda_i I)^{-1}(D - \lambda_i I)^{-1}\, z$$
$$= \sum_{i=1}^{n}\frac{z_i^2}{(d_i - \lambda_i)^2} \approx \theta_i^{-2} = \frac{1}{p}\frac{d}{d\lambda'}\emptyset(\lambda_i)$$

Here λ' is the process of autocatalysis. We can also calculate the same by linear combination of eigenvectors i.e. $wQv = \sum_{i=1}^{n} v_i\theta_i(D - \lambda_i I)^{-1}z$. The lth element would be, $w_l = \sum_{i=1}^{n} v_i\theta_i\frac{1}{d_l - \lambda_i}z_l = -z_l\sum_{i=1}^{n}\frac{v_i\theta_i}{\lambda_i - d_l} \to w = \{-z_l\zeta(d_l)\}_{l=1}^{n}$ where $\zeta(d) = \sum_{i=1}^{n} v_i\theta_i\frac{1}{\lambda_i - d}$. The particles in last expression are located at λ_i rather than at the d_i. λ_i is the autocatalytic centre of spiral structure for elementary particles. In practical situation, the eigenvalues of matrix will not be uniformly distributed over an interval but are clustered together in same places and spreaded.

9 Spherical Multipole Moments

The initial Cosmic Microwave Background Radiation has a dipole spiral structure which can be visualized through the longer wavelengths observations. This dipole spiral structure represents the Universe as a whole equivalent to the Spiral Structure for Elementary Particle with one-half spin. Decreasing the wavelength of the observations provide us a more granular structure of the cosmic microwave background radiation which includes the constituent spiral structures of the universe providing the multipoles.

ISSN 2229-5518

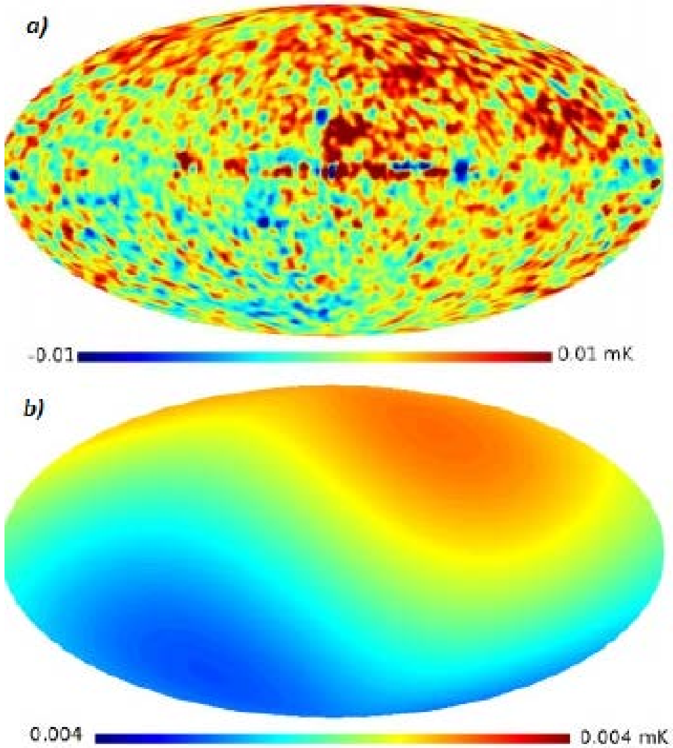

Figure 6: a) Represents the multipoles observed at the temperature of 0.01 mK with smaller wavelengths.
b) Represents the multipoles observed at the temperature of 0.004 mK with longer wavelengths.

We can define the constituent spiral structures for the universe by the spherical harmonic multipole number (l).

9.1 What are the spherical harmonic multipole moments?

This can be mathematically represented as

$\frac{\Delta T(\theta,\emptyset)}{T} = \sum_{l_m} a_{l_m} Y_{l_m}(\theta,\emptyset)$

The density perturbation describes the multipole moments to have zero mean i.e. $< a_{l_m} >= 0$ and are described by Gaussian random process. The angular power spectrum, $C_l =< |a_{l_m}|^2 >$ contains all possible information about the observed universe as provided by the inflation. With non-Gaussian density perturbation, the higher order correlation coefficient functions contain additional information about the orientation.

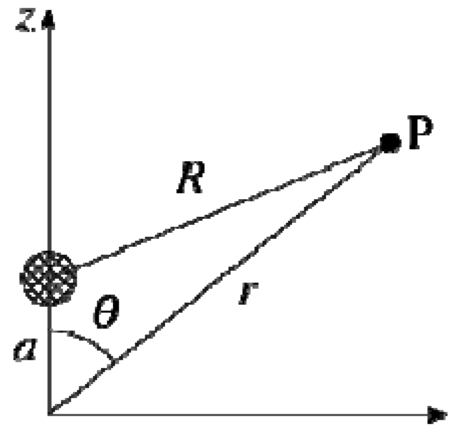

Figure 7: Illustration of Spherical Multipole Moments.

$\rho(\bar{x})$ is potential field distribution and all potential is contained within a spherical region of radius R. No potential in $r > R$. Then the potential for $\emptyset \to 0$ as $r \to \infty$: $\emptyset(r,\theta,\omega) = \frac{1}{4\pi\epsilon_0}\sum_{l=0}^{\infty}\sum_{m=-l}^{l}\frac{4\pi}{2l+1}\frac{q_{lm}}{r^{l+1}}Y_{lm}(\theta,\omega)$

Calculating for $q_{lm} = \int \rho(\bar{x}')(r')^l Y_{lm}^*(\theta',\omega')d^3x'$

Deriving spherical dipole moment for spherical cavity of Universe (approximation):
$\emptyset(r,\theta,\omega) = \frac{1}{4\pi\epsilon_0}\sum_m \frac{4\pi}{3} Y_m(\theta,\omega)\int \rho(\bar{x}')\left(\frac{r'}{r^2}\right) Y_m^*(\theta',\omega')d^3x'$.
Approximating the spiral to be a ring of potential of radius 'a' carries linear potential density as per the direction of spin orientation that varies with angle ω measured around ring $\lambda' = \lambda'_0 \cos\omega$. The dipole moments and the potential for $r > a$ can be derived as:

$$\emptyset = \frac{\lambda'_0 \sin\theta\cos\omega}{Y\epsilon_0}\frac{a^2}{r^2}\left[1 + \frac{3}{8}\frac{a^2}{r^2}(1 - 5\cos^2\theta) + \cdots\right]$$

Taking the dominating term of dipole, as the ring representing spiral structure has zero potential within. The dipole moment then: $\bar{p} = \pi\lambda_0 a^2 x$ as

$$\bar{p} = \int_0^{\infty}\int_0^{2\pi}\int_{-1}^{+1}\frac{\lambda_0\cos\omega\,\delta(\mu)\delta(r-a)}{r} r[\hat{\mu}_2 + \sqrt{1-\mu^2}(\cos\omega\,\hat{x} + \sin\omega\,\hat{y})]\, r^2 dr d\mu d\omega$$

This dipole moment helps in computing the radiations from time dependent potential distribution.

10 An Insight into the Spectrums of Random Matrix Theory

The spectrums of Random Matrices can be classified as: Bulk – with eigenvalues of given matrix. Extremes – largest and smallest of all eigenvalues.

These spectrums help in determining the stability and invertibility of the spiral structure corresponding to the matrix. The main feature of random matrix ensemble is repulsion i.e. any two correlated eigenvalues obtained from ensemble matrix unlikely to be close together. The probability goes to zero as a power of distance between them. Thus, the spacings distribution precludes non-zero spacings. The two features of Random Matrix ensemble is time reversal invariance and spin geometry symmetry.

11 Conclusion

From the analysis presented in this paper we can explain the possible generating curve for the axis of evil in Cosmic Microwave Background Radiation and its structural description can be quantized in terms of Large Number Hypothesis. We can also further look at the inflating factor for the golden ration of 1.618 from the factor $\emptyset = 1.53158$ found across nature in plants, hurricanes, etc. Its-ever present in the Universe. The multipole approach provides the trigger potential for forming the generating curves at different scale.

12 Bibliography

1. Suraj Kumar, "A Spiral Structure for Elementary Particles". Int. J. Res. Vol. 1, Issue 6, July 2014 [ISSN 2348-6848].
2. Suraj Kumar, "Journey of the Universe from Birth to Rebirth with insight into the Unified Interaction of Elementary Particles with Spiral Structure". Int. J. Res. Vol. 1, Issue 9, October 2014 [ISSN 2348-6848].
3. Suraj Kumar, "Quantum Spiral Theory". Int. J. Res. Vol. 2, Issue 1, January 2015 [ISSN 2348-6848].
4. Suraj Kumar, "Spiral Hashed Information Vessel". International Journal of Scientific & Engineering Research Vol. 6, Issue 4, April 2015 [ISSN 2229-5518].
5. Suraj Kumar, "Spiral Structure of Elementary Particles analogous to Sea Shells: A Mathematical Description". International Journal of Current Research, Vol. 7, Issue 02, Feb. 2015 [ISSN 0975-833x] p. 12814.
6. Clifford A. Pickover, Leonardo, "Mathematics and Beauty: A Sampling of Spirals and 'Strange' Spirals in Science", Nature & Art, Vol. 21, No. 22 (1988), pp 173-181, [Published by MIT Press]
7. Nicholas M. Katz and Peter Sarnak, "Zeroes of Zeta Functions and Symmetry", Bulletin of the American Mathematical Society, vol. 36 Number 1 (1999), pp. 1-20.
8. E. C. Titchmarsh, The Theory of the Riemann Zeta-function, Oxford University Press, 1951.
9. Harry I. Ringermacher and Lawrence R. Mead, "A New Formula Describing the Scaffold Structure of Spiral Galaxies", https://arxiv.org/ftp/arxiv/papers/0908/0908.0892.pdf
10. Akio SUGAMOTO, "Factorization of number into prime numbers viewed as decay of particle into elementary particles conserving energy", https://arxiv.org/abs/0810.4434v1
11. Carl Erickson , "A Geometric Perspective on the Riemann Zeta Function's Partial Sums", SURJ Mathematics 22–31.