The Cosmic Microwave Background Radiation as Viewed in the Planck Vacuum Theory

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Abstract—The invisible Planck vacuum (PV) state is a degenerate collection of Planck particle (PP) cores that fills a seven-dimensional spacetime. The degenerate nature of this PV state assures that the only motion available to the separate PP cores is a spin angular momentum and a local random PP motion. This spherical confinement of each PP core in the vacuum state leads to the cosmic-microwave-background-radiation (CMBR) spectrum seen in the free-space night sky.

The CMBR is the experimental proof for the PV theory.

Index Terms—PV State, PP Core, Planck Oscillator, CMBR.

I. INTRODUCTION

THE theoretical foundation [1] [2] [3] [4] of the PV theory rests upon the unification of the Einstein, Newton, and Coulomb superforces:

$$\frac{c^4}{G} \left(= \frac{m_* c^2}{r_*} \right) = \frac{m_*^2 G}{r_*^2} = \frac{e_*^2}{r_*^2} \rightarrow r_* m_* c = \frac{e_*^2}{c} \quad (= \hbar) \quad (1)$$

where the ratio c^4/G is the curvature superforce that appears in the Einstein field equations. G is Newton's gravitational constant, c is the speed of light, m_* and r_* are the Planck mass and length respectively [5, p.1234], and e_* is the massless bare (or coupling) charge. The fine structure constant is given by the ratio $\alpha \equiv e^2/e_*^2$, where e is the observed electronic charge magnitude. The ratio e_*^2/c to the right of the arrow is the spin coefficient for the PP, the proton, and the electron cores, where $\hbar$ is the reduced Planck constant. The e_*^2 in (1) is the squared coupling charge, where one of the e_* s belongs to one of the PP cores ($\pm e_*, m_*$) in the PV state and the other e_* s belong to the remaining cores in that state, leading to the quantum oscillations of the PP cores [6].

The degenerate nature of the PP cores in the vacuum state insure that each of the cores ($\pm e_*, m_*$) is confined to a spherical volume of roughly $3\pi r_*^3/4$, implying that the particle motion consists of the spin and a random motion of the cores.

After the Introduction in Section I, Section II presents an important result from a previous paper [6] concerning the single PP core, and Section III calculates equations for the CMBR. Section IV presents conclusions.

II. PLANCK PARTICLE OSCILLATOR

The oscillator energy [6] of a single PP core within the PV state is ($n = 0, 1, 2, \dots$)

$$u_n = A_n \nu = \left(\frac{1}{2} + n \right) h\nu \quad (2)$$

where h is the Planck constant and $h\nu$ is a photon energy. This energy u_n is due to the quantization of the single PP energy and is derived from first principles in the reference.

III. THERMODYNAMIC OSCILLATOR

From the second term ($nh\nu$) on the right side of equation (2): $u_i = ih\nu$ ($i = 0, 1, 2, \dots$), where the thermodynamic occupation numbers for the u_i are given by the Boltzmann equations [7, p.209]

$$N_i = N_0 e^{-ih\nu/kT} \quad (3)$$

and

$$N = N_0 \sum e^{-ih\nu/kT} = \frac{N_0}{1 - e^{-h\nu/kT}} \quad (4)$$

where k is the Boltzmann constant and T is the absolute temperature.

Differentiating both sides of equation (4) with respect to ($1/kT$) and canceling negative signs leads to the identity

$$N_0 \sum (ih\nu) e^{-ih\nu/kT} = \frac{N_0 h\nu e^{-h\nu/kT}}{(1 - e^{-h\nu/kT})^2} \quad (5)$$

where the left hand side of (5) is just the thermodynamic energy $U - U_0$. Then substituting for N_0 from (4) on the right of (5) leads to

$$U - \frac{Nh\nu}{2} = \frac{Nh\nu}{e^{h\nu/kT} - 1}. \quad (6)$$

For the single Planck particle oscillator, (6) leads to the equation

$$u(\nu, T) - \frac{h\nu}{2} = \frac{h\nu}{e^{h\nu/kT} - 1} \quad (7)$$

where the expression on the right refers to a blackbody process. *So the PP oscillators in the PV state are effectively black-body emitters responsible for the CMBR.*

In a different setting, applying the previous calculations to an astrophysical system leads to the brightness (intensity) expression [5, p.73] for the blackbody spectrum

$$B_\nu(T) = \frac{2\nu^2}{c^2} \frac{h\nu}{e^{h\nu/kT} - 1} \quad (8)$$

with the units 'energy per unit time per unit surface area per unit solid angle' in the frequency range between ν and $\nu + d\nu$. For $T = 2.725$ kelvin, (8) yields the experimental CMBR curve [5, p.1167]. In conclusion then, *the calculations in Sections II and III imply that the omnipresent nature of the PV state is the source of this brightness energy density.*

IV. COMMENTS AND CONCLUSIONS

The invisible PV state is a degenerate collection of PP cores that fills a seven-dimensional spacetime. The degenerate nature of this PV state assures that the only motion available to the separate PP cores is a spin angular momentum and a local random PP motion, leading to the thermodynamic energy equation

$$u(\nu, T) = \frac{h\nu}{2} + \frac{h\nu}{e^{h\nu/kT} - 1} \quad (9)$$

for each PP core in the vacuum state. This yields the CMBR spectrum [6] seen in the free-space night sky. In effect, the CMBR is the experimental proof for the PV theory.

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