Possible implications of the 3 K background radiation

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Letters to the Editor

Possible implications of the 3 K background radiation

Abstract. This letter proposes a novel explanation for the anomalies that have been observed in the approximately 3 K microwave background radiation. A possible observational test, for the theoretical model on which the explanation is based, is indicated.

Since the approximately 3 K microwave background radiation was first observed (Penzias and Wilson 1965) it has been accepted that this radiation may correspond to the equilibrium radiation predicted by hot, big-bang cosmological theory. If this correspondence is to be convincingly established it is essential that the radiation should be shown to be isotropic and that it should exhibit a thermal spectrum. Although the latest isotropy considerations and observations continue to support the view that 3 K radiation is cosmic equilibrium radiation, the vast majority of observations of the spectrum of 3 K radiation show deviations from the expected thermal spectrum for wavelengths less than 10 mm. The first reported deviation was published by Schwandan *et al.* (1968) and this type of result is continuing to be confirmed by the latest observations. These deviations are so great that, for wavelengths between 10 mm and 1 mm, the experimental points lie close to the extrapolation of a low-frequency, Rayleigh–Jeans spectrum; whereas for a theoretical 3 K thermal spectrum the *maximum* of the energy–frequency curve should occur at a wavelength of about 2 mm.

The purpose of this letter is to direct attention to a possible novel and simple explanation of the apparent discrepancy between the observed results and the predicted thermal spectrum.

The energy maximum of a thermal spectrum occurs for $\nu_{\max} = kTh^{-1}C^{-1}$. If, during the lifetime of the universe, the value of Planck's constant (h) has been gradually increasing with time then one would expect the maximum of a 3 K thermal spectrum, associated with energy having its origins in an earlier epoch, to occur at a wavelength that is much less than 2 mm. The Rayleigh–Jeans law would then continue to apply at millimetre wavelengths for this energy.

This proposal has an exact parallel with the well-known suggestion made by Dirac that the gravitational constant might vary during the evolution of the universe. The proposal is also consistent with, and could be considered to be implied by, a

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gravitational model proposed by the author (Stephenson 1969). Of perhaps greater significance is the fact that the dynamical nature of this gravitational model indicates a gravitational red-shift explanation of the varying red shifts that are observed to exist between individual members of related galaxies. Arp (1970) has shown that the different red shifts of the members of these galactic groups cannot arise solely from Doppler velocities and yet existing gravitational models do not predict sufficiently large gravitational red shifts to account for these observations.

An extremely simple way of testing this proposal is to check whether the observed red shifts of the individual members of a related galactic group are inverseley proportional to the squares of the radii of the individual galaxies; such a variation would be expected from a first-order approximation of the suggested gravitational model, if constant angular momentum is assumed for each galaxy.

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On the equations governing the second-order correlation functions for the velocity and the magnetic field of isotropic hydromagnetic turbulence in an incompressible fluid

Abstract. By applying the Smirnov method one derives the equations describing the correlation functions of the velocity and the magnetic field for an isotropic non-homogeneous hydromagnetic turbulence in an incompressible conducting fluid.

The statistical treatment of the theory of hydromagnetic turbulence involves an incomplete set of equations, whose number is less than the number of unknown functions (i.e. of all sorts of correlations). Supplementary arguments are to be imposed in order to obtain a complete set of equations.

Chandrasekhar (1955) formulated a deductive theory of isotropic homogeneous stationary hydromagnetic turbulence and obtained the equations for the second-order correlation functions of the velocity and the magnetic field respectively.

Lee (1965) developed a new formulation of the theory of stationary hydromagnetic turbulence as a generalization of Wyld (1961) theory of ordinary turbulence. This formulation involves terms describing the external force.