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Notes for Section 4 of Paper 49

In section 4 the equation relating the mass of an object to its intensity is derived, a derivation based on the fact that the intensity absorbed by an object of mass M and radius R (surface area $4\pi R^2$) is the same as the intensity the object absorbs from the universe around it

$$I_{absorbed} = I_{emitted}. \qquad -(1)$$

The absorbed intensity in watts per square meter is:

$$\langle I_{absorbed} \rangle = n L_0 \int_0^r e^{-\alpha r} dr . \frac{1}{4\pi} \int_0^\theta d\theta \int_0^\phi \sin\phi \, d\phi \qquad -(2)$$

where L_0 is the intrinsic luminosity of a surface area $4\pi r^2$ of the whole universe, and n is the number of objects in the equivalent volume $\frac{4}{3}\pi r^3$.

Assis considered the limit:

$$r \rightarrow \infty, \quad \theta \rightarrow 2\pi, \quad \phi \rightarrow \pi. \qquad -(3)$$

In this limit:

$$\boxed{\langle I_{absorbed} \rangle = \frac{n L_0}{\alpha}}. \qquad -(4)$$

This is described by Assis as "the total flux received from the whole universe". By "flux" Assis means power density or intensity in watts per square meter of black body radiation.

Then Assis defines n as:

$$n = \frac{\rho}{M} \quad -(5)$$

where ρ is the "mean density of matter in the universe" and M is the "average mass of the bodies in the Universe".
This means that the units of n must be m^{-3}, ρ must be $kg\,m^{-3}$ and M must be kg.

Therefore:

$$\langle I_{absorbed} \rangle = \frac{\rho L_0}{M d} \quad -(6)$$

and so L_0 must be the average intrinsic luminosity of an astronomical object. Assis considers n such objects in an infinite, spherical universe.

Assis then considers the Universe to be in a steady state, so that an astronomical object emits the same intensity of radiation as it absorbs (eq. (1)). The radius of the object is then defined as R, so the emitted intensity or power density is:

$$I_{emitted} = \frac{L_0}{4\pi R^2}. \quad -(7)$$

Assis then assumes that:

$$\boxed{\langle I_{absorbed} \rangle = I_{emitted}} \quad -(8)$$

This means that the emitted intensity is the

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same as the average $\langle I_{absorbed} \rangle$. The latter is the amount of intensity of black body radiation absorbed from the whole of the universe by an object of radius R, such as a star or galaxy. The meaning of m is that if one considers the universe to be made up of n objects in a sphere, m is the average mass of an object.

From eqs. (6) and (7):

$$\frac{\rho L_0}{m \alpha} = \frac{L_0}{4\pi R^2} \quad -(9)$$

Assis finally uses the Stefan-Boltzmann law in the form:

$$I = \frac{L_0}{4\pi R^2} = 4\sigma T^4 \quad -(10)$$

and assumes:

$$T = 2.7\,K. \quad -(11)$$

Therefore:

$$\boxed{\alpha = \frac{\rho L_0}{4 m \sigma T^4}} \quad -(12)$$

is the average power absorption coefficient of the steady state universe. If R can be measured by parallax L_0 can be found from eq. (10). Given the mean density ρ of the

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$$\alpha = \left(\frac{\rho L_o}{4\sigma T^4}\right)\frac{1}{m} \quad -(13)$$

This means that the average α is inversely proportional to the average mass m of an object.

Finally Assis uses:

$$\alpha = \frac{H}{c} \quad -(14)$$

where H is the Hubble constant. Therefore:

$$H = \left(\frac{\rho L_o c}{4\sigma T^4}\right)\frac{1}{m} \quad -(15)$$

From this model Assis finds that:

$$\frac{L_o}{m} \sim 10^{-5} \text{ watts per kilogram} \quad -(16)$$

$$\frac{L_o}{R^2} \sim 4 \times 10^{-5} \text{ watts per sq. m} \quad -(17)$$

This is in good agreement with experimental data for the Milky Way and most galaxies.

For the Milky Way:

$$\frac{L_o}{m} \sim 2.5 \times 10^{-5} \text{ watts per kilogram} \quad -(18)$$

$$\frac{L_o}{R^2} \sim 15 \times 10^{-5} \text{ watts per sq. m.} \quad -(19)$$

We can obtain an independent comparison of these figures from Atkins, page 8, for the

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intensity of black body radiation at 2.7 K from the Stefan – Boltzmann law:

$$I = cU = 2.998 \times 10^{8} \times 4.02 \times 10^{-14} \quad -(20)$$
$$= 1.205 \times 10^{-5} \text{ watts per sq. m.}$$

This value is, according to Assis, the mean intensity of radiation from the mean temperature, 2.7 K, of a steady state universe containing n radiators per cubic metre.

As can be seen from a comparison of eqs. (19) and (20) the mean background intensity is an order of magnitude less than the mean intensity of our own galaxy, the Milky Way.

The extra input given by ECE theory is that α originates in:

$$\nabla \times (\epsilon_r \mathbf{E}) + \frac{\partial}{\partial t}\left(\frac{\mathbf{B}}{\mu_r}\right) = \mathbf{0} \quad -(21)$$

where

$$n^2 = \epsilon_r \mu_r . \quad -(22)$$

So

$$\epsilon_r = n^2 / \mu_r$$

and

$$\alpha = \frac{\omega \epsilon_r''}{c n'(\omega)} \quad -(23)$$

where

$$\epsilon_r = \epsilon_r' + i \epsilon_r'' . \quad -(24)$$

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Therefore eq. (14) is true if:

$$\frac{\omega \epsilon_r''}{c n'} = \frac{H}{c} \quad -(25)$$

i.e.

$$\epsilon_r'' = \frac{n' H}{\omega} \quad -(26)$$

This gives the mean or background dielectric loss of the steady state universe considered by Assis. This dielectric loss is due to the mean ρ of the universe heating up after absorbing light or electromagnetic radiation via the homogeneous current j^a of ECE theory.

Although eqn (26) is adequate as a rough guide, it assumes that α is H/c. In general it is known that this is a considerable over simplification. Also eqn. (26) is defined for a given frequency ω of the black body radiation. Eq. (23) is the standard relation between α and dielectric loss at a given ω.

So "missing mass" and "dark matter" is speculation based on an assumed equation (15).