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Effect of an undisturbed aether on the detectors of radiation.

This paper defends that the Cosmic Microwave Background Radiation (CMBR) can plausibly be caused by the random collisions suffered by the electrons of a detector due to the aetherinos of an undisturbed (canonical) local aether instead of by the remnant radiation of an hypothetical Big Bang.
The description invokes the features of the “EVE model of the aether” but the main lines of the explanation are probably valid for other models of the aether of statistical nature.

Consider a detector of radiation bathed by an aether that has a *standard* (canonical) distribution of aetherino speeds (i.e. a local aether that is not significantly disturbed by neighbor material bodies). It will be supposed that the ultimate, elementary detectors composing the macro-detector are "quasi-free" electrons.

Recall.
The aether of the model is a statistical ensemble of freely moving aetherinos with a wide range of speeds. A statistical analysis can therefore be made of the random aetherinical impulses suffered by a detector-electron (due to the collisions by aetherinos of its local aether) and of how those impulses affect the *intrinsic* rotations of the electrons. As shown in other sections of this work, such intrinsic rotations are what causes and explains the radiation emitted by an electron.

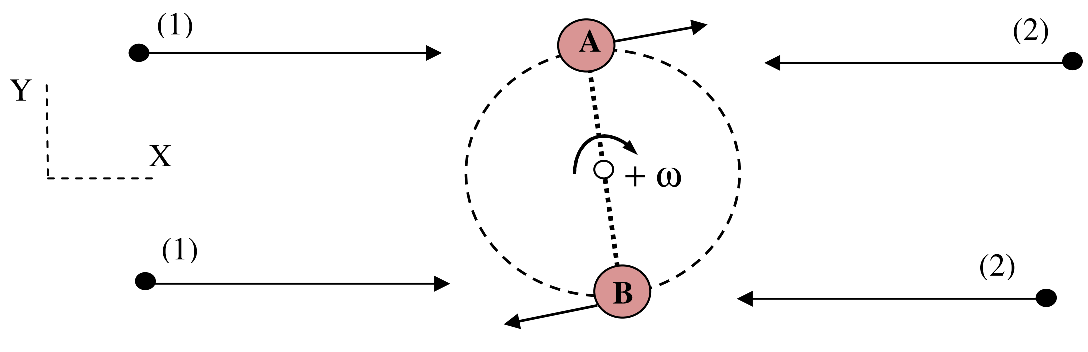
The model defines the *elementary aetherinical impulse* suffered by a particle of matter when collided by a *single* aetherino as $\mathbf{i}_1 = h_1 \mathbf{v_R}$ where h_1 is a universal constant and $\mathbf{v_R}$ is the velocity of the aetherino *relative* to the particle.
An hypothesis of the model is that when an aetherino collides with a particle of matter it changes the velocity of the particle by an amount $\Delta\mathbf{v} = q\, \mathbf{i_1} = q\, h_1\mathbf{v_R}$ where q is a constant that depends on the nature of the particle and more specifically on the property of the particle that mainstream physics calls its "inertial mass". Note: the relation between the inertial mass m of a particle and the constant q would be given by m =1/q .
Let $\mathbf{i}_\Sigma$ be the total (net) impulse suffered by the electron during a small time interval Δt. This impulse $\mathbf{i}_\Sigma$ is just the vector sum of all the individual impulses given to the electron during Δt by all the aetherinos that collide with it from all directions of space. The *net aetherinical impulse suffered in unit time by a material particle* is called in this work an *aetherinical force*. The force suffered by a particle is evaluated as $\mathbf{F} = \mathbf{i}_\Sigma / \Delta t$ where the time interval Δt must be *big* enough to allow for a big number (with statistical significance) of aetherino' collisions and at the same time Δt must be *small* enough to describe the force and the acceleration suffered by the particle with a good precision from the point of view of classical physics.
It can be shown (see for example Eve_3-4.pdf) that an aetherinical force **F** acting on a free particle (or more generally, on a free material "body") causes an acceleration of the particle given by $\mathbf{a} = \mathbf{F}/m$ (i.e. Newton's 2nd law is also a law predicted by the hypothesis of the model).

Note: The electron is described by the model as having an *intrinsic axial symmetry* that affects both its cross section to aetherino collisions and the way in which the colliding aetherinos are affected (redistributed) after a collision with an electron. Such intrinsic symmetry is by hypothesis characterized by a symmetry axis called the Preferred Redistribution Axis (PRA) of the electron.

When the electron suffers an aetherinical *force* (that, being a vector, will have a specific direction) it aligns its PRA perpendicularly to the force and the PRA rotates at a rate related with the strength of the force. More precisely, the vector that defines the intrinsic rotation of the electron remains aligned with the force and perpendicular to the electron's PRA. (That behavior is analogous to that of a spinning gyroscope suffering a force and it is supposed that due to this rotation there is a conservation of the intrinsic angular momentum of the electron). The rotation of the redistribution axis of the electron is what implements the radiation (called *electromagnetic* in mainstream physics) emerging from the electron. The rotation of such PRA is perceived by a distant observer as an oscillating flux of aetherinos of angular frequency ω that mainstream Physics calls electromagnetic “radiation”.

At the microscopic level (e.g. when considering the effect of the collision of a *single* aetherino) the simulations described below have been done supposing that, when a colliding aetherino gives an impulse $\mathbf{i}_1$ to the electron, the electron suffers a small change $\Delta\omega$ of its intrinsic rotation velocity where such $\Delta\omega$ is aligned with the elementary impulse $\mathbf{i}_1$ suffered by the electron.
Computer simulations have *first* been made assuming the simple hypothesis $\Delta\omega = k\,\mathbf{i}_1$ (k being a numerical constant) and computing the evolution of the angular speeds ω of a big sample of electrons subject to a high rate of random aetherinical impulses $\mathbf{i}_1$ It was found that the resultant *distribution* of angular speeds ω, acquired by the sample of electrons, gets indefinitely wider and wider (i.e. the average angular *speed* of the electrons of the distribution continues to increase when the observation time and hence the number of collisions suffered by the electrons increases). I.e. the distribution of angular speeds does not stabilize when it is based on the hypothesis $\Delta\omega = k\,\mathbf{i}_1$ (k being a numerical constant).
Computer simulations have *next* been made assuming that the Δω (increase or decrease of its angular speed) acquired by an electron in an aetherino collision *depends on* the angular speed ω of the electron (before such collision). The postulated dependence makes the following suppositions considered "reasonable":
- when the aetherino collision tends to increase the angular speed ω of the electron then such increase Δω is smaller the bigger is the electron's angular speed ω.
- when the aetherino collision tends to decrease the angular speed ω of the electron then such decrease Δω is bigger the bigger is the electron's angular speed ω.

An example of such behavior is shown in Fig[1] where a body made of two linked sections A and B is rotating with an angular speed ω . The center of rotation is a point O half way between A and B. Suppose for simplicity that the body is located at {x=0, y=0} and rotates in the plane XY (i.e. with a rotation "vector" orthogonal to such plane). Suppose that the sections A and B of the body suffer random collisions of small particles coming either from +X or from -X. Finally make the reasonable assumption that the impulse communicated by a colliding particle to the collided section (A or B) is proportional to the speed of the colliding particle *relative to* the collided section.
Consider then the possible cases:
A particle (1) collides with the section A that at the moment of the collision is receding from it and therefore the collision gives to section A a small impulse and hence a small increase Δω of the angular speed of the body as a whole.
The particle (1) collides with the section B that at the moment of the collision is approaching the incoming particle and therefore the collision gives to section B a big impulse and hence produces a big decrease Δω of the angular speed of the body as a whole.
Similarly with the collisions with particle (2) reaching the body from the other side: a collision of the particle with a section of the body *receding from it* (section B in this case) tends always to increase the angular speed of the body but since in those cases the *relative* speed of the colliding entities will (in general) be "small" so will be the impulse and also small will be the increase Δω of the angular speed of the body as a whole. And vice versa for the case in which the incoming particle (2) hits a section of the body (e.g. section A in the figure) that at the moment of the collision is *approaching* the particle.



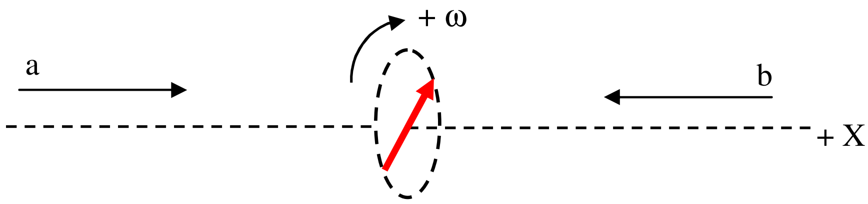
Fig[1]

Computer evaluations have been done making some simplifications (about the detecting electrons and about the local aether). Those simplifications consist mainly in treating the problem in 1-Dimension (1D). It is considered that these simplifications don't alter significantly the conclusions of this paper in what concerns the real 3D world.

- It has been supposed that the "detecting electrons" rotate with a rotation vector always aligned in a given direction that will be called direction X. The plane in which the PRA of the electron rotates can then be imagined to be at all epochs orthogonal to the direction X. (See Fig[2]). The red arrow in Fig[2] represents the PRA (axis) of the electron.
- For calculation purposes, it will be considered that the intrinsic rotation of the electron has a value $\omega>0$ (i.e. a positive sign) when it is seen to rotate *clockwise* from positions of higher X than that of the location of the electron. The electron of Fig-2 has therefore an angular speed ω of positive sign.

Conversely, if the electron is seen to rotate anti-clockwise from positions of higher X then the angular speed ω of the electron will be assigned a negative sign.

- For simplification the evaluations assumed that the aetherinos colliding with the electron proceed only along the direction X, either with a velocity along the semidirection +x (like aetherino "a" of Fig-2) or with a velocity along the semidirection -x (like aetherino "b" of Fig-2).
- It is assumed that when an aetherino collides with the electron it gives to the electron a small increment $\Delta\omega$ of angular speed in the clockwise direction as seen from the position of the incoming aetherino. Therefore, in the scenario of Fig-2, the aetherino "b", when colliding with the electron, will add a small positive angular speed $+|\Delta\omega|$ to the speed $+\omega$ of the electron while the aetherino "a" will add a small negative angular speed $-|\Delta\omega|$ to the earlier speed $+\omega$ of the electron (therefore reducing its modulus). (The opposite would be true if the electron happened to have a negative angular speed (i.e. if it was rotating anticlockwise as seen from positions of higher X).



Fig[2]

The computer simulation (that has been done):

(1) assigns to the electron being observed an initial angular speed $\omega=\omega_0$ for example equal to zero (i.e. $\omega_0 = 0$)

(2) draws out a random real number R between -1 and +1.

If R > 0 the simulation considers that an aetherino coming from the *right* has collided with the electron.

If R < 0 the simulation considers that an aetherino coming from the *left* has collided with the electron.

The velocity of the aetherino (with its sign) relative to the electron can be considered to be proportional to the random number R.

The following <u>algorithm</u>/rule is then applied to deduce the random *increment* $\Delta\omega$ *of angular speed given to the electron by the aetherino collision*:

[1] $\Delta\omega = k_1 R \,\mathrm{Exp}[- k_2 R \omega]$ with $k_1 > 0$, $k_2 > 0$

where R is a random real number, and

where k_1 and k_2 are positive constants (k_1 having the dimension of *time*$^{-1}$ and k_2 the dimension of *time*).

After the collision with the pertinent aetherino, the angular speed ω of the electron takes the new value $\omega + \Delta\omega$ (where as explained above, ω and $\Delta\omega$ can be positive or negative).

The simulation then:

- repeats step (2) and draws another random real number R between -1 and +1

- deduces (applying the algorithm [1]) the new value ω of the angular speed of the electron (based on its preceding value ω and on the R just obtained).

And repeats those steps a big number n of times (i.e. for a big number of aetherino collisions).
The program saves (in an array) for further analysis the ω acquired by the sampled electron after those n collisions

The program then samples another electron applying to it the same number n of random aetherino collisions and saves in the array the final ω acquired by this new sampled electron.
The program repeats the sampling (with the same initial ω_0 and the same number n of random collisions) for a big number S of electrons.

Finally, using the information of the S samples (saved in the array), the program builds the distribution function Dist[ω] that gives the number of electrons that have acquired (after the n collisions) a final angular speed ω (by unit interval of angular speed).

Notice that the algorithm of Eq[1] satisfies qualitatively the "damping" requests expressed above. For example:
- If R > 0 then Δω>0 and in this case:

if ω was positive (i.e. ω>0), the collision *increases* the modulus of the angular speed of the electron but such increase will not be "too big" since the argument [- k_2 R ω] of the exponential function is a negative number and therefore Exp[- k_2 R ω] < 1. But

if it was ω<0 then the collision *decreases* the modulus of the angular speed of the electron (since it adds a positive number Δω to a negative number ω). And now such decrease Δω can be considered comparatively big since the argument [- k_2 R ω] of the exponential function is now a positive number and therefore Exp[- k_2 R ω] > 1.

- If R < 0 then Δω<0 and similar reasonings can be applied depending on whether ω was negative or positive.

It happens therefore that (no matter whether R is positive or negative) if R and ω have opposite sign then |Δω| takes higher values than when R and ω have the same sign. This contributes to some sort of *damping* that forbids the average angular speed of the pertinent electron to increase indefinitely when more and more aetherinos collisions are applied to it and it hence causes the *stabilization* of the distribution Dist[ω] of angular speeds when the number "n" of collisions applied to each electron is sufficiently big (i.e. when an increase in the number n does not change the distribution of angular speeds obtained).

Notice that the constant k_1 is "a measure" (of the same order of magnitude) of the *average modulus* of the increment of angular speed given to the electron by an aetherino collision.
Notice also that, to allow the factor Exp[- k_2 R ω] to accomplish properly its damping purpose, the constant k_2 should be assigned a smaller enough value that guarantees that, even for the higher values of ω attained in the simulations, the product of k_2 and |ω| is, say, smaller than 1 (i.e. k_2 |ω| < 1), because otherwise, in those cases in which R and ω have opposite sign the factor Exp[- k_2 R ω] could take values much bigger than 1 producing an increase | Δω | much bigger than k_1 which seems unphysical.

The computer simulations show that the distribution Dist[ω] of angular speeds acquired by a big sample of electrons, once such distribution has stabilized, is given by a Gaussian distribution centered at ω=0. The RMS (root mean square) σ of the distribution depends on the constants k_1 and k_2 assumed in the algorithm Eq[1]. More precisely since a *normalized* (unit area) Gaussian distribution centered at ω=0 is given by

$$P[\omega] = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{\omega^2}{2\sigma^2}}$$

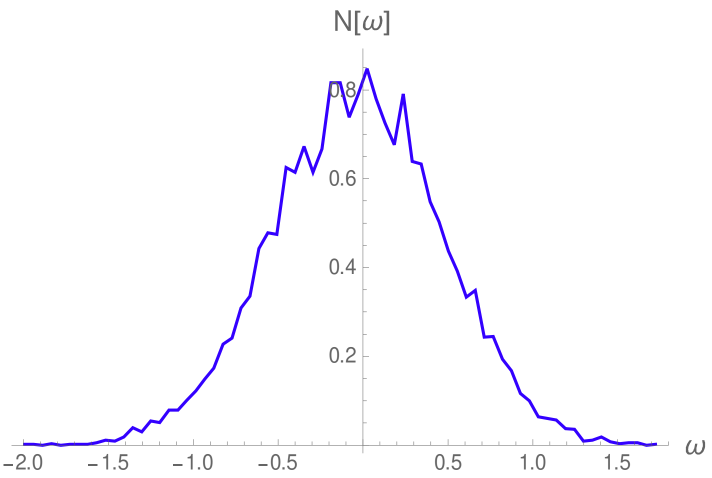
[2]

then, when normalizing the distribution Dist[ω] obtained in the simulations, it is found that this distribution is very well fitted by the Eq[2] (the Gaussian normalized distribution) replacing in it the σ by:

[3] $$\sigma = \frac{2}{3}\sqrt{\frac{k_1}{k_2}}$$

Another fact observed in the simulations is that, independently of the initial angular speed ω_0 assigned to the sampled electrons, the distribution always stabilizes to the same Gaussian function (dependent only on k_1 and k_2) although for some initial angular speeds the simulation needs a bigger "n" (number of aetherino collisions suffered by each electron) to stabilize.

As an example of distribution obtained with the computer simulations see Fig[3]



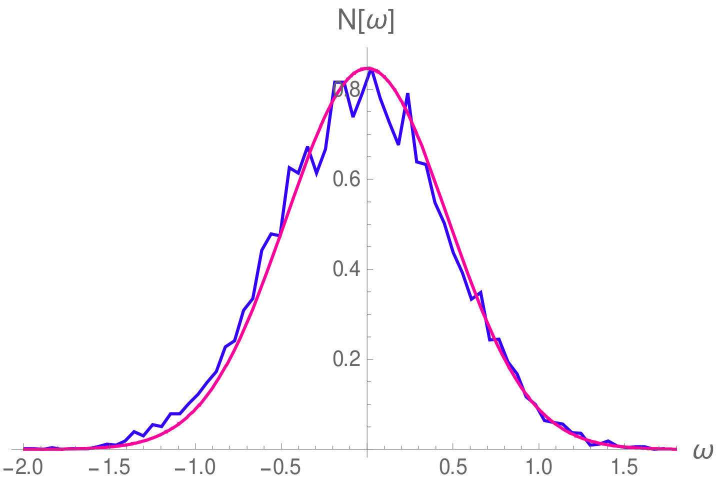
Fig[3]

Normalized distribution of angular speeds ω acquired by a big sample of electrons subject to the random collisions of the aetherinos of its local aether.

In this computer simulation it was supposed:

k_1=0.05; k_2=0.1; n=10000;

Notice also in Fig[4] the good fit of the distribution by a Gaussian function (that of Eq[2], taking $\sigma=2/3\,(k_1/k_2)^{1/2}=0.471$) (in red):



Fig[4]

From the detection of radiation point of view, the electrons that, induced by the aether, are rotating at the angular speed $+\omega$ and those that, induced by the aether, are rotating at the angular speed $-\omega$ are indistinguishable in so far it can be asserted that they are both detecting a radiation of angular frequency ω. The distribution of electrons detecting a radiation of angular frequency ω (understanding that a *frequency* is always a positive quantity), per unit frequency interval, will then rather be given by the expression of Eq[2] multiplied by 2 but adding the restriction that the equation is only valid for $\omega>0$:

[4] $$D[\omega] = \frac{2}{\sigma\sqrt{2\pi}} e^{-\frac{\omega^2}{2\sigma^2}}$$ valid for $\omega > 0$

Assuming now that when an electron of a macro-detector behaves (e.g. rotates) as if it is receiving a continuous radiation of frequency ω then *the power absorbed by such electron is proportional to the frequency* ω, i.e.

[5] $W_1 = k_3\,\omega$ where k_3 is a positive constant

ιt can then be asserted that a macro-detector, implemented by a big number of electrons, will absorb a *spectral power* (i.e. the specific power dependent on the frequency ω) given by the product of (a) the number n_e of active electrons in the detector, (b) the probability that an electron is rotating at the frequency ω and (c) the mentioned contribution ($k_3\,\omega$) to the absorbed power of an electron rotating at the frequency ω.

Therefore the *spectral power* S_W , per unit interval of angular frequency ω, received by a detector of radiation made of n_e elementary detectors (actively detecting electrons) when the detector is bathed only by the aether but otherwise does not receive any identifiable directional radiation from any source, would be:

[7] $S_W = n_e\, D[\omega]\;\; k_3\, |\omega|$

that according to equations [3] and [4] takes the more detailed form:

[7b] $$S_W = \frac{3\sqrt{k_2}\ k_3\, n_e\ e^{-\frac{9\omega^2 k_2}{8 k_1}}\ \omega}{\sqrt{2\pi}\sqrt{k_1}}$$

The Planck's spectral emittance of a black body is given by

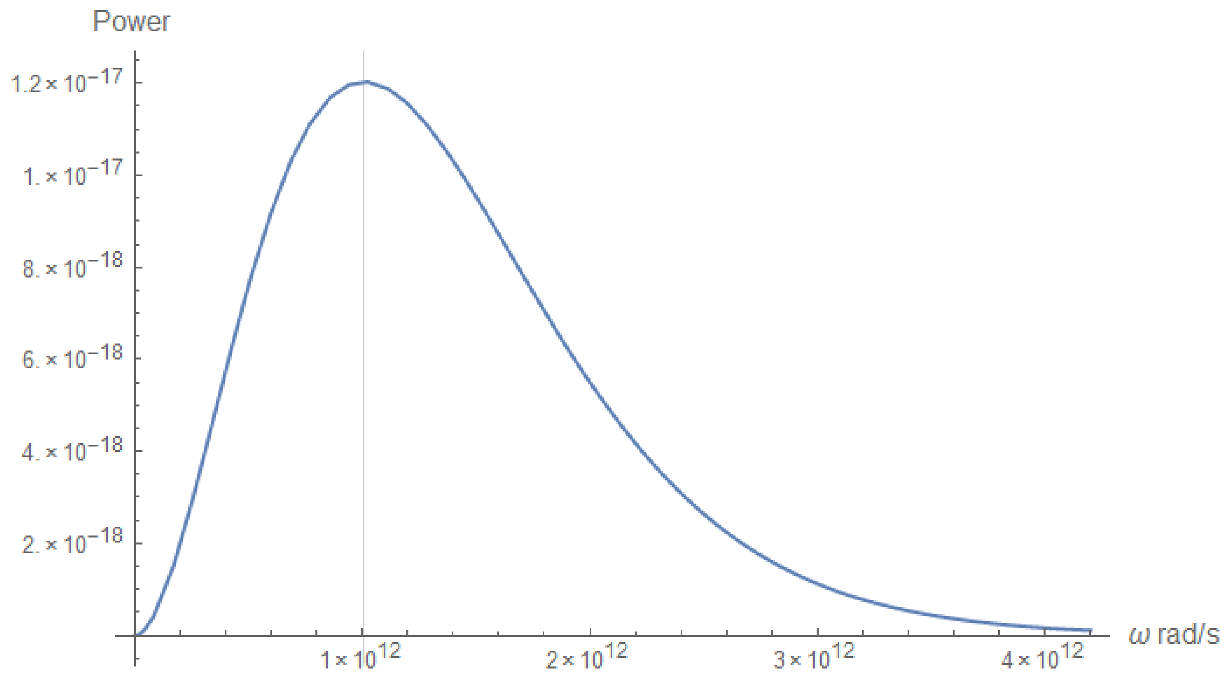
[8] $$S_\nu = \frac{2\pi h \nu^3}{c^2(e^{h\nu/(kT)}-1)}$$

which expressed as a function of the angular frequency ω (instead of the standard frequency ν) and since ν=ω/(2 π) then:

[8b] $$S_\omega = \frac{2\boldsymbol{\pi} h\omega^3/(2\pi)^3}{c^2(e^{h\omega/(2\pi kT)}-1)}$$

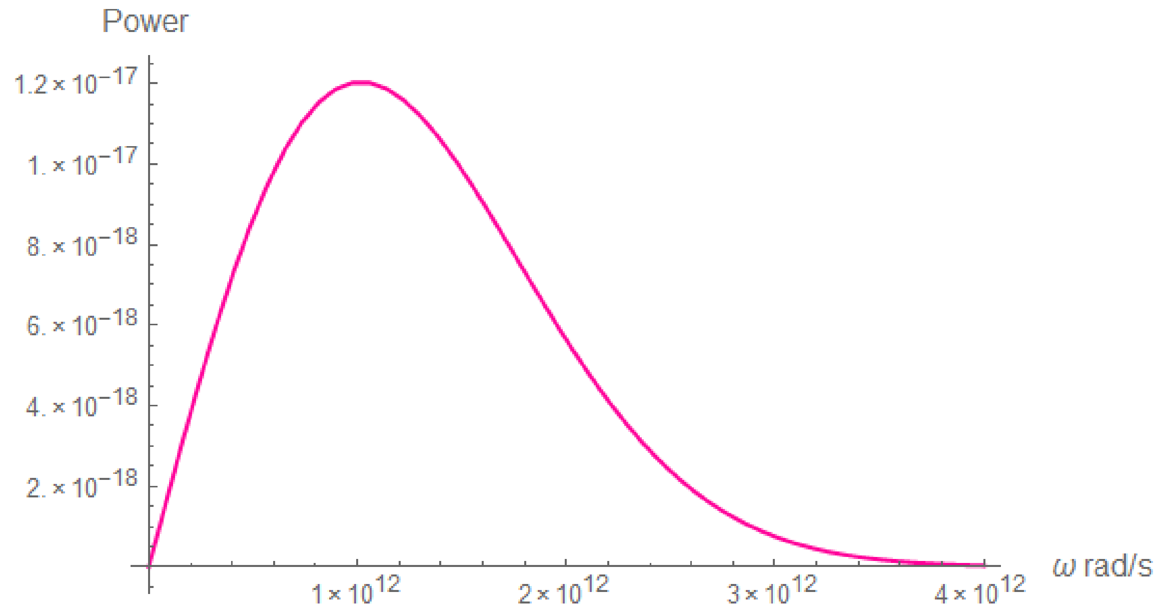
where
h is Planck's constant
k is Boltzmann's constant
c is the speed of light in vacuum
T is the absolute temperature of the body

The cosmic background radiation (CBR) is known (experimentally) to have the same spectral distribution to that of the radiation emitted by a black body at a temperature T= 2.725 K which gives the following plot of Eq[8b]



Fig[5]

But when plotting the spectral power Eq[7b] absorbed, according to the model, by a detector of radiation, then giving ad hoc values to the constants (k_1, k_2, k_3, n_e) entering such equation the following graphic is obtained:

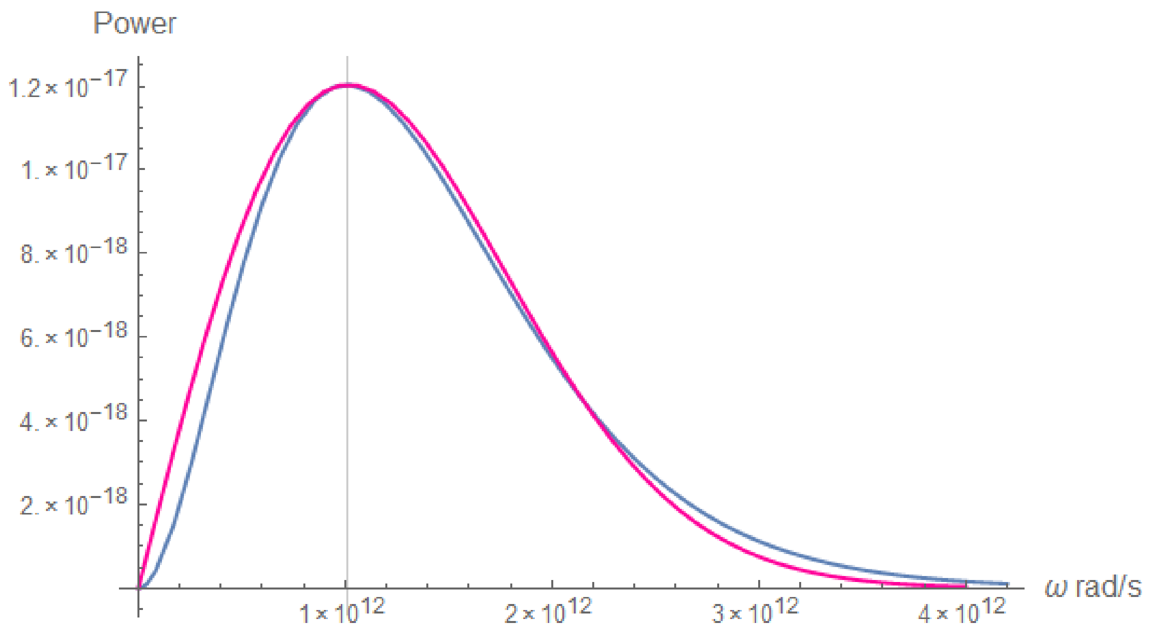


Fig[6]

Plot of Eq[7b] with k_1=1, k_2=4.3*10^{-25} , k_3=6.6*10^{-34} , n_e=3.77*10^{16}

Note: Notice that the expression Eq[7b] proposed by the model (to describe the CMBR) needs to assign a huge value to the quotient k_1/k_2 to account for the (relatively) "high" frequencies (160.2 GHz at its maximum) of the cosmic background radiation. This can be achieved either supposing a very big k_1 or a very small k_2 or a combination of both. Since the constant k_1 (see the algorithm Eq[1]) somehow represents the average modulus $|\Delta\omega|$ of the angular speed increment given to the target electron by a single aetherino collision then it seems reasonable to suppose that k_1 will not be much bigger than one (1 rad/s). But taking k_1=1 implies the need to take k_2 as small as 4.3*10^{-25} . But since k_2 is the constant that moderates/damps the increase of the angular frequencies acquired by the electrons due to the aetherino collisions, a very small value of k_2 implies that the electrons have to suffer a huge number *n* of aetherino collisions before the distribution of angular speeds (of a big sample of electrons) stabilizes. (Computing each output of such big number *n* of collisions, a computer simulation would need a huge computing time to reach a stabilized distribution. For that reason the approximation proposed in Eqs[2] and [3] has been obtained doing simulations with relatively big values of k_2 and assuming that the approximation is also valid for very small values of k_2).

And when plotting both functions (Fig-5 and Fig-6) together for comparison:



Fig[7]

Reinterpretation of the CMBR. **Proposed experiment**:

Since the EVE model of the aether invoked in this article predicts that the detectors of electromagnetic radiation should detect a radiation with a spectral distribution very similar to that of a "black body" even in those places where mainstream physics does not recognize the existence of any radiation source that could cause it, then it seems reasonable to ask for the possibility that the CMBR is caused by the random aetherino collisions suffered by the electrons of a detector bathed by an undisturbed (free of radiation sources) local aether instead of by the remnant radiation of an hypothetical Big Bang.

An experiment can plausibly be performed to decide if the detected microwave radiation (CMBR) is, or is not, coming from outer space.
The experiment proposed is to setup a microwave detector shielded (by the adequate screens or filters) from all external radiation (including the thermal radiation emerging from the shielding screens and from the detector itself). That would probably need to cool the detecting apparatus and the walls of the shielding chamber to temperatures significantly smaller than 2.72 ºK so that the heat radiation of its surroundings does not masks the signal, if any, observed at the detector.
If the detector of the experiment, in spite of its shielding, keeps detecting a signal similar to that of a 2.72 ºK blackbody radiation then it should be discarded that such signal is due to a radiation coming from the outer space of the Earth and hence from an alleged Big Bang.

It must be recalled that the aetherinos of the model are omnipresent in all spaces, including vacuum of course, and that (similarly to neutrinos) they are able to penetrate through big and dense amounts of matter (like for example through planets and of course through the shielding screens of the proposed experiment). In those cases in which a set of aetherinos are "organized" as waves (radiation) then, if when the wave arrives to a specific material screen it does not penetrate it because it is reflected or absorbed (e.g. by the emission of secondary cancelling waves), the aetherinos that were implementing such wave do still penetrate the screen (all screens, as said above) although now having lost their spatial organization as "wave".

Study not yet completed

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