# A Physical – Geometrical Model of an Early Universe

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***Abstract:*** *A physical-geometrical model for a possible early universe is proposed. One considers an initial singularity containing the energy of the whole universe. The singularity expands as a spherical wave at the speed of light generating space and time. The relations of the special theory of relativity, quantum mechanics and gas kinetics are considered applicable. A structuring of the primary wave is adopted on reasons of geometrical simplicity as well as on satisfying the conservation laws.*
*The evolution is able to lead to particles very close to neutrons as mass and radius. The actually admitted values for the radius and mass of the universe as well as the temperature of the ground radiation (3-5 K) can be obtained by using the proposed model.*

***Key Words:*** *singularity, spherical wave, ordered structure, primary wave, associated photon*

## 1. INTRODUCTION

"And God said: let there be light. And there was light.
And God saw the light, that it was good" (Genesis)

The standard model for the early universe considers an initial explosion: so-called BIG BANG [1; 2], though no sound could be heard through the vacuum, if there had been an outside observer; BIG FLASH is a better name, as the light can propagate through vacuum. The whole energy of our universe was implied but this fact has to be more taken into account.

In the following we present the ***basic assumptions*** of a somewhat different model:

a) a singularity occurred under the form of a spherical wave expanding at a limit speed c considered to be constant (the speed of the wave front) while its center is at rest. There was no time or space until this singularity appeared. With it the time has started to flow and the space has been created during the wave occurrence and expansion. Thus one can speak of a moment $t = 0$ and of a point O (the sphere center). In addition, it is assumed that the sphere has a spin; thus an axis of universe could be introduced;

b) the special theory of relativity, quantum mechanics and gas kinetics [3; 4; 5; 6] are applicable;

c) the spherical wave is made of pure energy and contains the whole energy, $E_U$, of a future universe. This energy is big, but finite, and at $t = 0$, the density of energy is infinite (of the type of a Dirac function [7]);

d) a photon-type particle, a sphere of radius $r_E$, and a temperature $T_E$ are associated to any amount of energy, $E$ ,under the form:

$$E = hc/\lambda_E; r_E = \lambda_E = hc/E; T_E = E/k_B \tag{1}$$

where $h$ is the Planck constant, $k_B$ - the Boltzmann constant and $\lambda_E$ the wave length of the *associated photon*. ***One starts the calculations from time $t_0$ when the explosion front has arrived at the radius $r_0$ given by:***

$$r_0 = hc/E_U\,;(t_0 = r_0/c;\ r_0 E_U = const.)\,. \tag{2}$$

The spherical wave of radius $r_0$ given by relation (2) will be called ***the primary wave (PW).*** It is not quite a light spherical wave except its front which propagates at the limit speed (which can be assimilated to the speed of light in vacuum). In a way ***PW*** is more similar to a ***photon gas*** at very high pressure and temperature. The inner photon-like particles are colliding elastically at different directions leading to resultant radial velocities smaller than the limit speed;

e) by using the special theory of relativity, one assigns to our model of universe a mass $M_{AU}$ given by:

$$M_{AU} = E_U/c^2\,;(M_{AU} r_0 = h/c = const.); \tag{3}$$

f) a kinetic momentum (spin) equal to the spin of the associated photon, $\hbar = h/2\pi$, is ascribed to the primary wave; this spin can be seen as a resultant spin of the inner photon-like particles in collision;

g) the ***PW*** evolution in the state of pure energy takes place according to an ***ordered scheme***, at least until substance is created. This ordered scheme will be selected on reasons of geometrical and physical simplicity, under the action of the general conservation laws and consists in principle in adopting convenient structures.

***Remark 1.*** By applying the (physical) uncertainty relation to a jump of energy equal to $E_U$ at singularity, one yields time and space intervals denoted by $(\Delta t)_{sing}, (\Delta r)_{sing}$:

$$(\Delta t)_{sing} \cdot E_U \ge h/2\pi;\ (\Delta t)_{sing} = h/2\pi;\ (\Delta r)_{sing} = c(\Delta t)_{sing} = r_0/2\pi\,. \tag{4}$$

One can see that the ***PW*** radius was taken equal to the circumference of a circle of radius $(\Delta r)_{sing}$. Then ***PW*** has a volume $(2\pi)^3 \approx 248$ times larger than the sphere at singularity and can include an enough large number of photon-like particles to collide.

These inside particles would be moving and ***colliding elastically*** according to the assigned temperature. One could speak of minimum time and space intervals $(\Delta t)_{sing}, (\Delta r)_{sing}$ in ***proper systems the reference***.

The assumption that the state of pure energy of ***PW*** is similar to photon gas is in agreement to the assigned temperature $E_U/k_B$ (rel. (1)) where from the average velocity between collisions there is just the limit speed *c*.

***Remark 2***. The existence of a constant limit speed of the expansion could be put in relation with the equilibrium between the existing high pressure forces and the gravity forces which are very large at these small distances. One does not know the gravity constant at these initial conditions but one could expect that a constant speed of the ***PW*** front ($c$) is somehow related to equilibrium and symmetry.

In Table 1, values for $r_0$, ***PW*** temperature $T_0$ and for $t_0$ are given, considering possible ratios between the energy of the actual universe, $E_U$, and the energy corresponding to the neutron mass at rest, $E_{ne0}$. One can see that the temperatures are much higher than the

Planck temperature ($10^{32}$ K), and the times $t_0$ are much smaller than the Planck time ($10^{-43}$ sec).

Table 1 (times, radii and temperatures at BIG FLASH)

| $E_U$ / $E_{ne0}$ | E 76 | E 78 | E 80 | E 82 | E 85 |
|---|---|---|---|---|---|
| $r_0$ (m) | 1.31866 E-91 | 1.31866 E-93 | 1.31866 E-95 | 1.31866 E-97 | 1.31866 E-100 |
| $T_0$ (K) | 7.27977 E 88 | 7.27977 E 90 | 7.27977 E 92 | 7.27977 E 94 | 7.27977 E 97 |
| $t_0$ (sec) | 4.39553 E-100 | 4.39553 E-102 | 4.39553 E-104 | 4.39553 E-106 | 4.39553 E-109 |

## 2. THE EVOLUTION OF THE PRIMARY SPHERE. STRUCTURING

The radius of the ***PW*** is increasing with time at speed *c*. According to the basic assumption g) one has to select a simple geometrical - physical scheme for the future transformation. One assumes that, in a step *S* at values of the radius denoted by $R_S$, the wave sphere is divided in smaller spheres of radius $r_S$ as follows:

$$R_S = n_A K_A^S r_0 ;\ r_S = K_A r_{S\text{-}1} ; S = 1;2;3\ldots, (n_A = 3), \tag{5}$$

$n_A$ and $K_A$ being integers.

Further on $n_A$ = 3 and $K_A$ = 11 will be selected as convenient values. The $K_A$ spheres are equal and have centers in two orthogonal planes passing through the Oz axis. One of these two orthogonal planes is represented in (Fig. 1) for $K_A$ = 11. A void fraction equal to 16/27 is obtained. However there is no room for another equal sphere.

Other combination of equal spheres could be possible, but we choose this one. The physical-geometrical scheme described below is associated to ***PW***:

- in the first step (*S=1*), a sphere of the ***PW*** radius increases up to the value $R_1 = n_A K_A r_0$, Then maintaining a sphere of radius $r_1 = K_A r_0$ in center, a division in $K_A$ parts of equal energy $E_U / K_A$ takes place, having the associated temperature $T_1 = T_0 / K_A$. If one conveniently selects $n_A = 3$, this makes it simple to consider for all parts equivalent spheres of the same radius $r_1 = K_A r_0$ as for the central part. Thus one obtains the configuration in Fig. 1. The sphere of radius $R_1$ continues the expansion with the speed *c;*
- in the next step (*S* = *2*) the sphere of radius $R_1 = n_A K_A r_0$, $n_A = 3$, however divided inside in parts as before, increases up to the value $R_2 = n_A K_A R_1 = (n_A K_A)^2 r_0$. Then maintaining a sphere of radius $r_2 = K_A r_1 = K_A^2 r_0$ in center, the division in $K_A$ parts of the same energy $E_U / K_A^2$ ***for all of the previous parts*** continues. The temperature is now $T_2 = T_0 / K_A^2$;
- the structuring continues similarly (see also rel. (5)) up to a final step which will be established later.

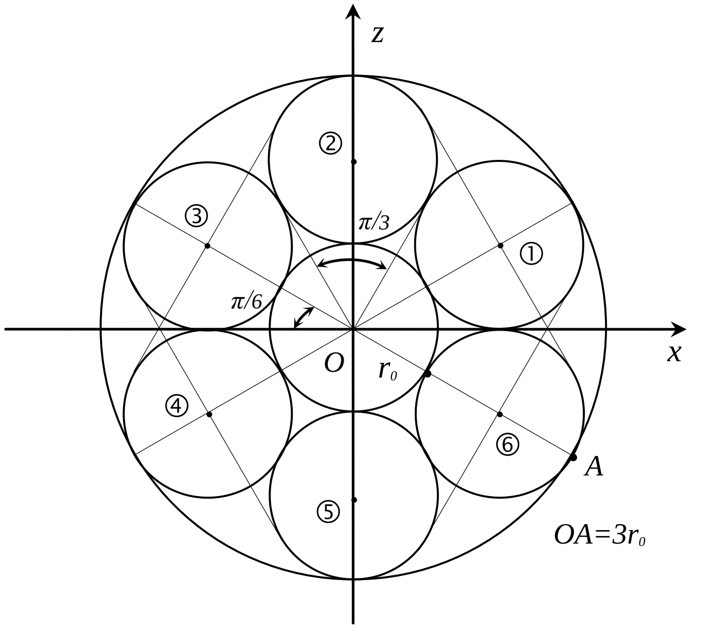


Fig. 1 The associated geometrical-physical scheme

The above presented division of a sphere of increasing radius at the limit speed *c*, is called ***associated geometrical- physical scheme (AGPhs)*** and it is applicable in describing a possible evolution of the ***PW***. Although generally the inside parts may not be all spheres as seen in the fixed coordinate system, this scheme has some important elements in common with the physical evolution, namely: a) the same radius at the front, expanding at the limit speed *c;* b) the same energy and appropriate average radii of parts; c) the conservation of energy, momentum and spin can be satisfied by choosing convenient values for $K_A$.

## 2.1 The conservation laws. Entropy

The conservation of energy, momentum and spin are satisfied by ***symmetrically arranging*** the $(K_A - 1)$ equal parts in pairs around the central one. Therefore $K_A$ ***should be an odd number.***

- The conservation of energy is obvious: $\left(E_U = K_A\left(E_U / K_A\right)\right)$.
- The conservation of momentum: as the $(K_A - 1)$ parts, $K_A$ odd, are ***symmetrically*** disposed in pairs, the central sphere is supporting momenta equilibrated two by two and the resultant momentum is null.
- The conservation of spin: the simplest way is to assign the initial spin of ***PW*** to the global sphere. In case the $(K_A - 1)$ parts are spherical waves, the inside photon-like particles are symmetrically disposed in order to have the resultant spin of the central one equal to ($\hbar$).

***The entropy***. By denoting the entropy with $S_E$, in an attempt of evaluation one considers the expansion analog to a photon gas in an adiabatic process (as no heat transfer can take place through a frontier moving with the limit speed). Then the total energy passes from a state 1 to a state 2 such as a relation between temperature and volume exists:

$$T\,R^{3\alpha}=const.;\ S_{E2}-S_{E1}\sim E_U\left(\frac{1}{T_2}-\frac{1}{T_1}\right)\sim E_U\left(R_2^{3\alpha}-R_1^{3\alpha}\right),\ (n_A=3;K_A>1),\qquad(6)$$

where $\alpha>0$, ($3\alpha=2$, for a monatomic gas). In *structured* and *unstructured* cases one obtains for state 2:

$$\left(S_{E2struct}-S_{E1}\right)\sim E_U\ R_1^{3\alpha}\left(K_A^{3\alpha}-1\right)>0;\ \left(S_{E2struct}-S_{E1}\right)\sim E_U\ R_1^{3\alpha}\left((3K_A)^{3\alpha}-1\right)>0\qquad(7)$$

Therefore the entropy increasing is smaller in case of structuring; ***the ordering is equivalent to a negative source of entropy.***

## 3. THE FORMATION OF NEUTRONS (SUBSTANCE)

As the temperature is diminished, at a given step $S=S_{ne}$ the threshold temperature of the neutron is approached.

On the other hand one notes that ***the association of a photon-type particle and of a sphere having a radius equal to an associated photon wave length (basic assumption d) to any amount of energy is well confirmed for neutron.***

Indeed denoting by $m_{neu0}$ the neutron mass at rest and taking a value close to a nucleon inside the Hydrogen nucleus [3] for the neutron radius at rest $r_{neu0}$ one yields:

$$\lambda_{assoc}=hc/(m_{neu0}\,c^2)=1.32E-15m;\ r_{neu0}=1.20E-15m.\qquad(8)$$

From this reason one considers that ***the transformation of pure energy in substance will take place when the associated mass of the parts resulted by structuring is close to*** $m_{neu0}$**.** One writes:

$$S=S_{ne},\ m_{Sne}=\gamma_m\,m_{ne0};\ r_{Sne}=\gamma_r\,r_{ne0};\ (E_{Sne}=\gamma_m\,E_{ne0});\ \gamma_m\in(1;3),\qquad(9)$$

where $\gamma_m,\gamma_r$ are numbers of the order of unity. Because the obtained neutron will be moving, one expects to have $\gamma_m>1$.

On the other hand because the moving neutron is seen contracted in the same ratio with the mass amplification by relativistic effects, it results:

$$\gamma_m\,\gamma_r=1;\ \gamma_m\in(1;3).\qquad(10)$$

Further one calculates:

$$E_{Sne}=E_U/K_A^{S_{ne}};\ S_{ne}=\ln\left(\frac{E_U}{\gamma_m\,E_{ne0}}\right)/\ln K_A;\ \gamma_m\in(1;3).\qquad(11)$$

The number $S_{ne}$ should be an integer. As regards $K_A$, one selects the value $K_A$ = 11, according to Fig. 1.

In this choice 11 spheres are arranged with centers in two planes orthogonal to each other: one plane is represented in Fig. 1; the other one is orthogonal to the first one.

For the radius of universe at neutron formation $R_{Une}$, one obtains the expression:

$$R_{Une} = (3K_A)^{S_{ne}} r_0 . \qquad (12)$$

***The Planck temperature*** $T_{Pl} = 10^{32} K$ is approached after $S_{Pl} = 56.5691$ steps, in $5.367 \cdot 10^{-16}$ sec. (for $E_U / E_{ne0} = 10^{78}$).

The transformations in step $S_{ne}$ take place within the whole universe at about the same time in the fixed system with center O.

They could be described as starting from the sphere centers given by ***AGPhs*** in terms of successive explosions taking place at radii: $R_{S_{ne}-k}$, $k = 1;2;3\ldots$, such that the speed at frontiers becomes equal to *c*. All explosions eject $(K_A - 1)$ spheres of energy equal to the energy of the remaining one.

Due to explosions the structure according to the ***associated geometrical- physical scheme (AGPhs) was installed,*** and the neutrons are formed from spheres with energy $E_{Sne} = \gamma_m E_{ne0}$; $\gamma_m \in (1;3)$.

***Diametral pairs*** of spheres are to be followed in order to see the conservation of momentum and spin as vectorial quantities, for the universe as a whole. The conservation laws are also followed for every neutron.

The sphere of energy $E_{Sne}$ was supposed to have a photon spin *ħ,* whereas the neutron spin is *ħ/2.* Then a neutron (*n*) and a *neutrino (ν )* are formed. Six kinds of neutrinos are known at this moment. As the amount of information is better the electronic neutrino related to $\beta^-$ decays is selected.

The energy and momentum conservation can be written under the form:

$$\gamma_m\, m_{ne0}\, c^2 = \frac{m_{ne0}\, c^2}{\sqrt{1-\beta_{ne}^2}} + E_{a\nu}\,;\ \beta_{ne} = V_{ne} / c\,;\ \gamma_m\, m_{ne0}\,(\alpha_S\, c) = \frac{m_{ne0}\, V_{ne}}{\sqrt{1-\beta_{ne}^2}} + m_{a\nu}\, c\,, \qquad (13)$$

where $E_{a\nu}$ and $V_{ne}$ are the energy attributed to neutrino and the velocity of neutron after ejection; $(\alpha_S\, c)$ is the velocity of a sphere of energy $E_{Sne}$ prepared for transformation: a precontraction of pure energy before becoming matter in combination with the 11 times temperature decreasing and a modification of the gravity field are to be taken into account.

Table 2 (emitting speeds of neutrons)

| $\gamma_m$ | $r_{e\nu}$ | $\alpha_S$ | $\beta_{ne}$ |
|---|---|---|---|
| 3 | $10^{-1}$ | 0.94071 | 0.93867 |
| 3 | $10^{-2}$ | 0.94261 | 0.94241 |
| 3 | $10^{-3}$ | 0.94279 | 0.94277 |
| 2 | $10^{-1}$ | 0.85777 | 0.85029 |
| 2 | $10^{-2}$ | 0.86525 | 0.86452 |
| 2 | $10^{-3}$ | 0.86595 | 0.86588 |
| 1.5 | $10^{-1}$ | 0.71986 | 0.69985 |
| 1.5 | $10^{-2}$ | 0.74305 | 0.74133 |
| 1.5 | $10^{-3}$ | 0.74513 | 0.74496 |

In $\beta^-$ decays the energy of neutrinos is of the order of 1 MeV [6], which represents about $10^{-3} E_{ne0}$ . For solar neutrinos one finds $E_{a\nu} \leq 15\text{MeV}$ [6]. At such big energies the velocity of neutrino is very close to the speed of light $c$ as considered in relation (13). By denoting with $r_{e\nu}$ a ratio defined bellow, from (13) the following is obtained for $\alpha_S$ and $\beta_{ne}$ functions of two parameters $\gamma_m$, $r_{e\nu}$ (see Table 2):

$$\alpha_S = \frac{\beta_{ne} + r_{e\nu}\sqrt{1-\beta_{ne}^2}}{1 + r_{e\nu}\sqrt{1-\beta_{ne}^2}}; \beta_{ne} = \left(1 - \left(\gamma_m - r_{e\nu}\right)^{-2}\right)^{0.5}; r_{e\nu} = E_\nu / m_{ne0}c^2 . \tag{14}$$

As one can see the speed of the ejected neutrons ($\beta_{ne}$) increases with $\gamma_m$ and decreases slightly with $r_{e\nu}$; it is close to the velocity of spheres prepared for transformation. The main role of the emitted neutrino is to equilibrate the spin. Collisions between emitted neutrons are possible although the void fraction is large (16/27).

Anyhow as one knows the life of free neutrons is short (about 1013 sec.) .They suffer $\beta^-$ decays according to reaction:

$$n \rightarrow p + e^- + \bar{\nu} . \tag{15}$$

where $p, e^-, \bar{\nu}$ represent a proton, an electron and an antineutrino, respectively.

Again a neutrino is needed to satisfy spin conservation. Thus protons and electrons are formed.

Possibly gravitons as particles responsible for gravity attraction could be present. However they will act more likely at large scale, not in reactions of the form (15).

***Remark 3***. Although the ratio $r_{e\nu}$ was seen to play a smaller role in energy conservation it is very important for the energy distribution in universe because the neutrino number is almost equal to formed neutrons number and represents about $r_{e\nu}$ of the total energy of universe that could become substance, once the neutrino rest mass is different from zero.

### 3.1 The conservation of baryon and lepton numbers

In the above model, the baryon and lepton numbers for neutrons and for neutrinos are not conserved at their formation. This could be done by taking equal numbers of particles and antiparticles. Then the standard explanation of a universe of matter rather than one of antiparticles consists in fluctuations at different times favoring the particle formation. However because we consider that no particle (substance) was created until the neutron and neutrino formation one can consider different alternatives as well:

a) the conservation of baryon and lepton numbers could act ***after*** such particles have appeared;

b) as the neutrons and neutrinos are produced in successive explosions (see chapt. 4**)** when layers of spheres with energy close to the neutron mass at rest in proportions equal to $\frac{K_A - 1}{K_A}\left(1 + \frac{1}{K_A} + \frac{1}{K_A^2} + \ldots + \frac{1}{K_A^{N_1 - 1}}\right)$ of the total energy $E_U$ are emitted ($N_1$ is given in Table 3), a possibility appears to have equal numbers of particles and antiparticles, for example, only in the last explosion. A reason for this would be that half of the spheres, those located “beneath” the equatorial plane of ***PW,*** have an inversely oriented spin. This could

make a difference for the orientation of spin and magnetic moments, which are different for neutron and antineutron. For $K_A = 11$, $N_1 = 4$, the proportion of the created antimatter would vary in the interval (0.684-3.42) $10^{-4} E_U$ . The conservation laws in case antiparticles are formed are the same and similar values as in Table 2 are obtained for speeds of ejection.
A “$\beta^+$ decay” similar to (15) can be suggested, as follows:

$$\bar{n} \rightarrow \bar{p} + e^+ + \nu , \tag{16}$$

where the antineutron ($\bar{n}$), the antiproton ($\bar{p}$) and the positron ($e^+$) appear. A transformation like (16) was not (experimentally) reported but it could have been possible at the neutron stage of ***PW*** evolution.

## 4. THE RADIUS OF A POSSIBLE FUTURE UNIVERS. THE BACKGROUND TEMPERATURE

We consider that not all energy $E_U$ of this BIG FLASH universe was transformed in neutrons and neutrinos at the second explosion. A small part located in a central sphere remains and it could be put in connection with the present ground temperature of 3 - 4 K (due to microwaves).

At the step $S_{ne}$ of transformation, one writes [4; 13]:

$$E_U = K_A^{S_{ne}} \gamma_m m_{ne} ; R_{U\,ne} = \frac{3^{S_{ne}} h}{\gamma_m m_{ne} c}, E_{RAD\,act} = 3.16775(E-15) T_G^4 R_{U\,act}^3 (J) , \tag{16}$$

where $R_{U\,ne}$ is the radius of the BIG FLASH universe at neutron formation. If $R_{U\,act}$ is the radius of the actual universe, by using the Planck formula for the density of radiation, one obtains for the energy of radiation the second expression (16).

Further one calculates the numbers of steps $N_1, N_2$, such that:

$$K_A^{N_1} = E_U / E_{RAD\,act} ; R_{U\,act} = R_{U\,ne} (3 K_A)^{N_2 - N_1} \tag{17}$$

Therefore $N_1, N_2$ represent: the number of steps back from $S_{ne}$ where the energy of the central sphere was equal to $E_{RAD\,act}$, and the number of steps necessary for this sphere to grow up to radius $R_{U\,act}$, respectively. All steps numbers should be integers. $T_G$ is the ground temperature.

The sphere with the energy $E_{RAD\,act}$ continues the evolution according to ***AGPhs*** expending at the speed *c*, being responsible for a background temperature. Some results are given in Table 3.

Table 3 - Radii of universe and background temperatures

| $\gamma_m$ | $N_1$ | $N_2$ | $R_{U\,ne}$ (*l. ys.*) | $R_{U\,act}$ (*l. ys.*) | $T_G$ (K) | $S_{ne}$ | $E_U / E_{ne0}$ |
|---|---|---|---|---|---|---|---|
| 3 | 5 | 8 | 7.636 E5 | 27.44 E9 | 3.042 | 78 | 3.386 E81 |
| 2 | 4 | 7 | 1.568 E6 | 41.16 E9 | 3.693 | 78 | 2.539 E81 |
| 1.75 | 4 | 7 | 4.364 E5 | 16.60 E9 | 4.045 | 77 | 2.693 E80 |
| 1.5 | 4 | 7 | 5.091 E5 | 18.30 E9 | 3.467 | 77 | 2.308 E80 |

As one can see in Table 3, the values of the background temperature of radiation can be approached at radii and energies of universe reported by various sources. The highest radius of universe given in the table (41.16 E 9 l.ys.) is closed to that reported [45.7 E9 l.ys., cf. Wikipedia, Observable universe].

The numbers of formed baryons and leptons is:

$$N_{bar} = N_{lept} = \frac{E_U \sqrt{1-\beta_{ne}^2}}{m_{ne0}(K_A - 1)}\left(1 - \frac{1}{K_A^{N_1}}\right). \tag{18}$$

It can be calculated by using data from Tables 2; 3 and varies in the interval $(10^{-2} - 10^{-1})E_U / E_{ne0}$. It changes mainly when antibaryons and antileptons are formed.

### 4.1 The Hubble constant

If one considers the point of the singularity at BIG FLASH as a central point and a linear velocity distribution in the interval [0; *c*], starting from this point, then several existing values of Hubble constant given in 1996, 1997 and 2010 lead to values of the age of universe in an accepted range as shown in Table 4. One notes that the radius of universe given in light years (l.ys.) indicates as well the age.

The Hubble constant is given in km /sec/ M parsec. We do not give more details now, but the present model could suggest some ideas for measuring the Hubble constants.

Table 4 - Hubble constant and age of universe

| Hubble const.(km/s/Mpc) | $R_{U\,act}$ $(l\ ys)$- model | Reference, year |
|---|---|---|
| 40 | 24.45 E9 | [8], 1997 |
| 50 | 19.56 E9 | [10], 1996 |
| 55 | 17.78 E9 | [11], 1996 |
| 63 | 15.52 E9 | [6], 2010 |

## 5. CONCLUSIONS

A model of a possible early universe starting from a singularity (BIG FLASH) was proposed. The evolution of a primary wave ***(PW)*** expanding at a limit speed *c* that can be interpreted as the speed of light in vacuum is followed. The energy of the whole universe, $E_U$, is implied. Time and space begin with this explosion. By using the relation of (physical) uncertainty at the singularity a time interval of the order of $10^{-100}$ sec. (much shorter than the Planck time, $10^{-43}$ sec) is obtained. A photon, a sphere with the radius equal to the associated photon wave length and a temperature on gas kinetics analogy are associated to any amount of energy. In this way one ascribes a radius to the primary wave ***(PW)***. The ***PW*** front is similar to a light spherical wave but its inside is pure energy that could be described as a "photon gas" at the associated temperature. The evolution of ***(PW)*** is considered to follow an ***associated geometrical- physical scheme (AGPhs)*** constructed on reasons of geometrical and physical simplicity. The ***AGPhs*** satisfies the conservation laws; a reasonable simple entropy study following the already adopted gas kinetics analogy seems to support the proposed structured evolution leading however to a slower temperature decreasing. The evolution in the state of pure energy stops when the temperature is close to the threshold temperature of neutrons, where the proposed scheme of associating a photon and a sphere to an energy amount is confirmed. The neutron formation is obtained by explosions at $N_1$ (see Table 3) different levels of the structured universe at energy close to the neutron energy at rest. The possibility to satisfy the conservation laws at reasonable values of some parameters making the scheme flexible is possible. Beside the neutrons, the formation of neutrinos can be introduced in connection to a local conservation of spin, although at large scale this conservation is satisfied due to symmetry As regards the conservation of baryon and lepton numbers, one could: a) consider it to act ***after*** such particles were formed; b) admit a small percentage of antimatter formed in the last step of explosions. Otherwise the existence of a universe of matter (not of antimatter) should be left to hazard or to other considerations. An expression of baryon and lepton numbers to be further conserved is also given in the alternative a). A "$\beta^+$ decay" for antineutron is suggested.

The proposed model is able to fit itself to some values given today for certain quantities like the background temperature (due to microwave radiation) and the radius of universe (today proposed values). The recent published values for the Hubble constant [8; 9; 10; 11] are in agreement with the existence of a "center of universe" and a linear velocity distribution in the interval (0; *c*), where *c* is the speed of light in vacuum.

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