Mathematical Theory On Evolution Of Universe

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Abstract:-Most of the theories like Big bang ,Steady state theory..... were proposed to explain the evolution of universe. The inherent goal of proposal of this theory is to explain the early evolution of universe to some extent through mathematical derived equations. The fundamental concepts like energy,time,temperature ,mass ..are incorparated to frame this mathematical theory to explain the formation of universe . The new mathematical model allows to calculate Poynting–Robertson force. It is shown that the equation for the calculation of Poynting–Robertson force accounts for the force exerted by incoming solar radiation,gravitational radius of sun and dust grain's orbital radius. The new mathematical model is putforward to calculate momentum of emitted hawking radiation. [Academia Arena, 2010;2(6):23-36] (ISSN 1553-992X).

Key words : Energy ,time , mass speed of light in vacuum.

The empty space was dominant in the early universe. To fill the emptiness energy occupied the empty space leading to the emergence of energy dominated universe .We know that energy in turn implies motion .The concept of time came into existence followed by the concept of motion(energy).

According to the equation **E=tc**

Here E=Energy, t = Time, c = Speed of light in vacuum($3*10^8$m/s)

E ***a*** t.

The huge temperature and huge pressure prevailed in the universe.Moreover high energy content leaded to unstability of universe.

Energy ***a*** 1/stability

According to the mathematical equation $\mathbf{E=X^2t/h}$

Here E=Energy content of universe ,X=Space ,t=time ,h=Planck's constant($6.625*10^{-34}$JS)

Let us assume E = constant [since total energy of universe is constant]

$$\mathbf{X^2 \; a 1/t}$$

Space varies inversely with time in the absence of mass. Rate of expansion of universe occurs in short time or contraction of universe occurs in long time.

NOTE :- In the absence of concept of mass, [space and time] behaved as separate factors.

As the time passed ,huge fluctuations in temperature occurred .These fluctuations caused the conversion of some part of energy to mass [matter+antimatter]. Although space and time behaved as two different concepts before but now they both unified togather to form spacetime.The presence of mass caused curvature of spacetime.

According to the equation $\mathbf{E=MC^2}$

Conversion of energy into mass and its vice versa is beautifully explained by Einstein's famous equation **$E=MC^2$**,here **C** is not just the velocity of a certain phenomenon—namely the propagation of electromagnetic radiation (light)—but rather a fundamental feature of the way space and time are unified as space time. The equation implies conversion of energy into mass and its vice versa accounts the unification of space and time. In other words in presence of mass there is unification of space and time .In absence of mass ,space and time behave as two separate factors. The space, time, mass are different concepts in physics and these concepts are brought to gather in one equation. Moreover the question arises in human mind the need of unification of space and time in conversion of energy into mass and its vice versa.

Equation **m=X^2t/h(1+D)** (where m=total mass content of universe, x=space, t=time, D=spacial distance, h=planck's constant) describes how space, time, mass, spacial distance are related to each other. Created mass [matter+antimatter] varied directly with the value of' X'withrespect to time 't'such that the value of spacial distance'D'is reduced to some extent. As more mass prevailed in the universe, more gravity began to come into existence. Gravity has control on rate of expansion or rate of contraction of universe with respect to time 't'. More over pressure become negligible compared to mass density of universe: $P= wpc^2$

Here $w = 0$ for matter dominated universe

Consider elementary particles like electron ,proton,neutron,positron ,neutrino were created in the early in the early universe .thus electro magneticforces came into existence.The antiparticle [antielectron]and particle [electron] were brought togather by{electrostatic force of attraction+gravity}.Hence they exerted impulse on each other resulting in the release of energy in the form of photons[radiation]

E=Ic

Here E= Energy released ,I=Impulse ,c = Speed of light in vacuum

Thus the electromagnetic radiation filled the early universe.

The protons were attracted towards the electronby the force of attraction to form the neutrons.These neutrons ,protons were clubed togather by [gravity] to form nucleus and this nucleus clubed with electrons by [electrostatic force+gravity] to form atom .Thus nuclear force came into existence .

Similarly sun , solarsystem ,galaxy..... were formed .

Energy which was unaffected by fluctuations in temperature remained as [dark energy+darkmatter] that filled the universe homogeneously.

Proof for the above equations:-

Derivation of the equation $E=X^2t/h$

Part :1

Consider a photon of relativistic mass 'm' moving with speed 'c' is associated with the wavelength 'λ' is given by the relation

$\lambda=h/mc$

where h= Planck's constant ($6.625*10^{-34}$JS).

According to wave theory, speed of the photon wave is given by

$c = \lambda / T$

where T= time period.

By substitution of value of 'c' in the equation $\lambda = h/mc$

we get the expression $m \lambda^2 = hT$.

According to wave theory, frequency of photon wave is given by f=1/T.

Then the equation $m \lambda^2 = hT$ becomes $f=h/m\lambda^2$

De Broglie wavelength associated with the photon is given by $\lambda= h/p$,

Thus the equation $f=h/m\lambda^2$becomes $f=p/m\lambda$.

Angular frequency associated with the photon is given by $\omega= 2 \pi f$.

By putting the value of $f=p/m\lambda$. in the above equation we get $\omega= 2 \pi p/m\lambda$.

The above equation $\omega= 2 \pi p/m\lambda$. can be applied to both photons and material particles like electron in motion.

Debroglie wavelength associated with the electron is given by $\lambda=h/mv$

Where v=velocity of electron in motion

Then the equation $\omega= 2 \pi p/m\lambda$ becomes $\omega= 2 \pi pmv/mh$ i.e $\omega= 2 \pi pv/h$.

Part: 2

Consider a electron of mass "m_e" at rest, total energy associated with the electron is given by "$m_e c^2$".

Suppose radiation of energy hf is incident on this electron at rest. Part of energy hf " is absorbed by electron and part of energy hf' is scattered by electron . Absorbed energy hf " is converted to motion of electron, hence electron travels a distance 'X' in time 't'. let θ is the scattering angle

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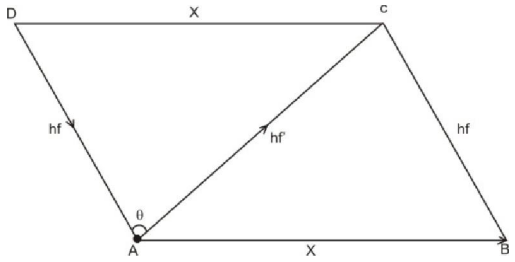

Figure :1 –Schematic diagram of scattering of energy of photon by electron

X= Linear displacement of electron

hf = Energy of incident radiation

hf' = Energy of scattered radiation

θ = scattering angle

Consider a parallelogram ABCD constructed as shown in the figure 1.

Let AB=CD=X, AD=BC=hf, AC=hf'(opposite sides in parallelogram are equal)

Law of cosine is given by $a^2=b^2+c^2-2bc\cos\theta$.

Let a =X, b=hf, c=hf', cos A = cosθ.

By applying the law of cosine to the triangle ADC, we get

$X^2=(hf)^2+(hf')^2-2(hf)(hf')\cos\theta$ .....(1)

By law of conservation of momentum of photon.

We get $\vec{p}_y = \vec{p}_{y''} + \vec{p}_{y'}$ where $\vec{p}_y, \vec{p}_{y''}, \vec{p}_{y'}$ be the momentum of incident, absorbed and scattered photon respectively.

Let us assume absorbed momentum of photon = momentum of electron

i.e. $\vec{p}_{y''} = \vec{p}$

Thus $\vec{p}_y = \vec{p} + \vec{p}_{y'}$ where $\vec{p}$ = momentum of electron

$\vec{p} = \vec{p}_y - \vec{p}_{y'}$ Squaring on the both sides we get

$p^2 = \left(\vec{p}_y - \vec{p}_{y'}\right)^2$

Since $(a-b)^2=a^2+b^2-2ab$

Thus the above equation becomes $p^2=p_y{}^2+p_{y'}{}^2- 2\ |\vec{p}_y . \vec{p}_{y'}|$

According to dot product rule $|\vec{a}\bullet\vec{b}| = |a||b|\cos\theta$

Then we get $p^2= p_y{}^2+ p_{y'}{}^2-2|p_y||p_{y'}|\cos\theta$

Let us multiply the above equation by c^2 we get

where c = speed of light in vaccum ($3* 10^8$ m/s)

$p^2 c^2 = p_y{}^2c^2 + p_{y'} c^2-2|p_y||p_{y'}|c^2\cos\theta$

As we know frequency of photon is directly proportional to it's momentum

i.e hf = pc

Thus the below equation is obtained

$p^2 c^2 = (hf)^2 + (hf')^2 - 2(hf)(hf')\cos\theta$ .....(2)

By comparison of (1) and(2)

we get $X^2 = p^2 c^2$

i.e X= pc

(position of electron is defined as the function of it's momentum)

After absorption of energy hf" from the photon, total energy of electron increases from $m_e c^2$ to mc^2.

Then total energy associated with the electron in motion is given by $E= mc^2$.

Amount of motion associated with the electron is given by p =mv, thus we can write m=p/v.

By substitution of value of 'm' in the equation $E=mc^2$.

We get $E= pc^2/v$

As position of electron is defined as the function of it's momentum.i.e. X=pc

Then the above equation $E= pc^2/v$ becomes E=xc/v

By rearranging the above equation

we get

v/c = X / E.....(3)

Angular frequency associated with the electron during it's motion can be given by

$\omega= 2\pi pv/h$, i.e $\omega= 2\pi xv /hc$

Since X= pc (position of electron is defined as the function of it's momentum)

Rearranging this equation we get

$h\omega/ 2\pi X = v/c$ .....(4)

By comparison of(3) and (4) we get the equation

$E= 2\pi X^2/ h\omega$

where E=Total Energy of electron

X = Position of electron

ω = Angular frequency of electron

h =Planck's constant ($6.625*10^{-34}$ JS).

Part : 3

Consider a material particle like electron moving in a circular orbit with constant angular velocity "ω".

Then total energy associated with the particle can be given by the equation $E= 2 \pi X^{2}/ h\omega$

where E=Total Energy of electron in circular orbit

X = Position of electron in circular orbit

ω = Angular velocity of electron in circular orbit

h =Planck's constant ($6.625*10^{-34}$ JS).

Note : Angular frequency of electron can be defined as angular velocity when it moves in a circular orbit.

As orbit is circular $\omega = \theta/t$ (θ = angular displacement with respect to time t)

The above equation $E= 2 \pi X^{2}/h\omega$ becomes $E= 2 \pi X^{2}t/ h\theta$

Let $\theta = 2 \pi$ for one complete revolution

Then the equation $E= 2 \pi X^{2}t/ h\theta$ becomes $E= 2 \pi X^{2}t/ h2\pi$

i.e $E= X^{2}t/ h$ is obtained

Let "E" be total energy of particle at position "X" with respect to time "t"

We can also tell that total energy of particle "E" is distributed at position "X" with respect to time "t".

As we know that total energy of universe "E" is distributed along its space "X" with respect to time "t".

This energy is given by the equation **$E=X^{2}t/ h$** .....(5)

Fundamental equation of unified field theory is given by the equation

E=total m(1+D) .....(6)

By comparison of (5) and (6)

we get the expression

Total $m=X^{2}t/ h(1+D)$ where m = mass content of universe

X= space of universe

t = time

D = spacial distance

h = Planck's constant ($6.625*10^{-34}$ JS).

Derivation of E=Ic

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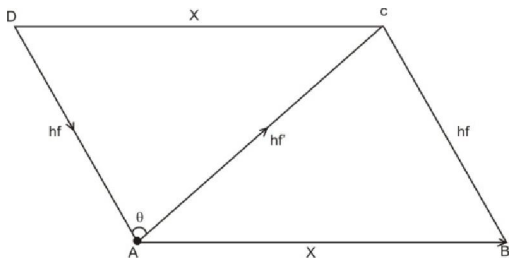

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Let us multiply the above equation by c^2 we get

where c = speed of light in vaccum ($3* 10^8$ m/s)

$p^2 c^2 = p_y^2 c^2 + p_y' c^2-2| p_y | | p_{y'} |c^2\cos \theta$

As we know frequency of photon is directly proportional to it's momentum

i.e hf = pc

Thus the below equation is obtained

$p^2 c^2= (hf)^2+(hf')^2-2(hf)(hf')\cos \theta$ .....(2)

By comparison of (1) and(2)

we get $X^2 = p^2 c^2$

i.e X= pc

(position of electron is defined as the function of it's momentum)

Small change in momentum of electron causes small change in it's position

i.e. dX= dpc

Hence dp = dX/c

Newton second law of motion is mathematically represented by equation F=dp/dt

Where F = force exerted by photon

dp = Small change in momentum of electron with respect to time

As dp = dX/c then the above equation becomes F= dX/dtc.

velocity of electron is defined as v = dX/dt.

Then **F =v/c** is obtained

Force exerted by photon is defined as function of velocity of electron

As impulse exerted by photon is mathematically given by I = F dt.

then the equation F= dX/dtc becomes Fdt = dX/c

i.e **I =dX/c**

Impulse exerted by photon is defined as function of change in position of electron

At point A and B mass of electron is m_ei.e total energy associated with electron is m_ec^2.

(Since electron is at rest at point A and B)
But in between point A and B mass of electron is mc^2

(Since electron is in motion in between point A and B)

Hence total energy of electron in motion is mathematically given by $E= m_ec^2+ hf$ ''
(Since absorbed energy adds up to rest mass energy of electron)

where E= total energy of electron in motion

hf'=absorbed energy of photon

m_ec^2=rest mass energy of electron

As absorbed momentum of photon equals the momentum of electron i.e $p_{y''}= p$
As X=pc (position of electron is defined as the function of it's momentum) then $X= p_{y''}c$
$p_{y''}c =hf$ " then X=hf '' then the equation $E= m_ec^2+hf$ ''becomes **$E= m_ec^2+X$**.....(3)

According to Einstein equation $E= m_ec^2+E_k$.....(4)
By camparison of (3)and(4)

we get **$E_k = X$**

i.e Kinetic energy of electron = Position of electron

Small change in kinetic energy of electron causes small change in it's position

$d E_k = dX$ i.e $I =dX/c$

i.e $I= d E_k/c$ i.e $d E_k=Ic$

According to workenergy theorm

Work done on particle equals change in kinetic energyof particle i.e $W= d E_k$

i.e $W= Ic$

Work done on particle involves storage of energy in particle

i.e $W=E_a$ where E_a= Energy stored in particle.

$E_a =Ic$

Energy stored in particle is defined as a function of impulse applied
Thus E_a ***a*** I (As c is constant)

Thus impulse and energy are interconvertable.

Derivation of E=tc

Since X= pc (position of electron is defined as the function of it's momentum)

Momentum of electron can be given by p=mv

then the equation X= pc becomes X= (mv) c i.e X/v=mc

According to Newton's law of mechanics

velocity of moving particle is given by

v=X /t

Equation X/v = mc becomes t=mc
According to Einstein 's equation $E=mc^2$

Hence E=(mc)c becomes **E= tc**

Energy of particle is defined as the function of time

Result : -

1) Total energy of universe "E" is distributed along its space "X" with respect to time "t". This energy is given by the equation **"$E=X^2t / h$".**
2) Space, time, mass content and spacial distance are related to each other by the expression "**Total $m=X^2t/ h(1+D)$".**

3) Energy stored in the particle defined as the function of impulse is given by **"$E_a = Ic$" .**

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Additional information:-

Power of emitted hawking radiation

Power of the emitted hawking radiation from the evaporating black hole of mass 'M ' is given by

$$P= \hbar C^6/15360 \pi G^2M^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Let us divide the above equation by M and then multiply by 3 we get

$$3\,P/M= \hbar C^6/5120 \pi G^2M^3 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Evaporation time of black hole is given by

$$\mathbf{T_{ev} = 5120\ \pi\ G^2M^3/\ \hbar C^4}\text{……..(3)}$$

Thus (2) becomes

$$\mathbf{3\ P/M= C^2/\ T_{ev}}\text{……(4)}$$

The power of emitted hawking radiation is also given by

$$\mathbf{P=h}\boldsymbol{f}^{\mathbf{2}}\text{……..(5)}$$

Thus (4)becomes

$$\mathbf{3(\ h}\boldsymbol{f}\mathbf{)}\ \boldsymbol{f}\ \mathbf{/\ M= C^2/\ T_{ev}}\text{……(6)}$$

By the equivalence of Einstein ‘s mass energy law and planck ‘s law we get

$$\mathbf{h}\boldsymbol{f}\mathbf{=mC^2}$$

Thus (6) becomes

$$\mathbf{3(mC^2)}\ \boldsymbol{f}\mathbf{=M\ C^2/\ T_{ev}}\text{……..(7)}$$

$$\boldsymbol{f}\mathbf{=M\ /\ 3m\ T_{ev}}\text{……..……(8)}$$

As frequency of emitted Hawking radiation is given by

$$\boldsymbol{f}=C/\lambda$$

Thus (8) becomes

$$\mathbf{m}\ C/\lambda\ \mathbf{=M\ /\ 3\ T_{ev}}\text{……..……(9)}$$

Momentum of emitted Hawking radiation is given by

$$\boldsymbol{p}\mathbf{=mC}$$

Thus (9) becomes

$$\boldsymbol{p}\ /\lambda\ \mathbf{=M\ /\ 3\ T_{ev}}\ \text{……..(10)}$$

Wavelength of emitted Hawking radiation is given by

$$\lambda\mathbf{=h/}\boldsymbol{p}$$

Let us divide the above equation by $\boldsymbol{p}$ we get

$$\boldsymbol{p}\ /\lambda\ \mathbf{= h/}\boldsymbol{p}^2$$

Thus (10) becomes

$$\boldsymbol{p}^2\ \mathbf{=\ hM\ /\ 3\ T_{ev}}\text{……..…….(11)}$$

$$\boldsymbol{p}\ \mathbf{= [hM\ /\ 3\ T_{ev}]^{1/2}}$$

Poynting–Robertson force -:

Power of radiation can be given by **P=hf^2 i.e P= (hf)c/ λ** (1)

Force exerted by radiation can be given by **F=hf/ λ**

Proof for **F=hf/ λ** :

Determination of the Photon Force and Pressure

Reissig, Sergej

The 35th Meeting of the Division of Atomic, Molecular and Optical Physics, May 25-29, 2004, Tuscon, AZ. MEETING ID: DAMOP04, abstract #D1.102

In [1] the formula for the practical determination of the power of a light particle was derived: P = hf^2 (W) (1). For the praxis it is very usefully to define the forces and pressure of the electromagnetic or high temperature heat radiation. The use of the impulse equation F = fracdPdt = fracd(mc)dt (2) together with the Einstein formula for E = mc^2 leads to the following relationship: F = frac1cfracd(mc^2)dt = frac1cfracdEdt (3) In [1] was shown: - fracdEdt = P (4). With the use the eq. (1), (3), (4) the force value could be finally determinated: | F | = frachf^2 c or | F | = frachcλ ^2 = fracEλ [N]. The pressure of the photon could be calculated with using of the force value and effective area: p = fracFA [Pa]. References 1. About the calculation of the photon power. S. Reissig, APS four corners meeting, Arizona, 2003 -www.eps.org/aps/meet/4CF03/baps/abs/S150020.html

E=F λ

According to Planck's theory of radiation

Energy associated with radiation can be given by

E=hf

Thus the equation **E=F λ** becomes **F=hf/ λ**

Then the equation (1) becomes **P=FC** (2)

Here **P=** Power of radiation, **F**= Force exerted by radiation ,**C**= speed of light in vacuum , **h** = Planck's constant ,

f **=** Frequency of radiation , **λ =** wavelength of radiation .

Consider a dust grain orbiting the sun in the solar system . Newton's law of universal gravitation states that "Every massive particle in the universe attracts every other massive particle with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between them ".

Gravitational force of sun experienced by the dust grains orbiting the sun can be given by

$$F= GM\ m\ /r^2 \quad (3)$$

Here F = Gravitational force between the sun and dust grain, G = Universal gravitational constant , M = Mass of the sun, m = Mass of the dust grain, r = Distance between the Sun and dust grain(orbital radius of dust grain).

Centrifugal force is an outward force associated with curved motion, that is, rotation about some (possibly not stationary) center. Centrifugal force is one of several so-called pseudo-forces (also known as inertial forces). Centrifugal force acts on dust grain to prevent the collapse of dust grain towards the sun can be given by

$$F = mv^2 / r \qquad (4)$$

Here F = centrifugal force , m = Mass of the dustgrain , r= Distance between the Sun and dust grain(orbital radius of dust grain) , v= velocity of dust grain .

By the comparison of (3) and (4) we get

$$r = GM / v^2 \qquad (5)$$

Here M_s= Mass of the sun, r = Distance between the Sun and dust grain(orbital radius of dust grain), v= velocity of dust grain, G = Universal gravitational constant .

Solar radiation causes a dust grain in the solar system to slowly spiral inward. The drag is essentially a component of radiation pressure tangential to the grain's motion. The first description of this effect, given by Poynting in 1903. The grain of dust circling the Sun (panel (a) of the figure), the Sun's radiation appears to be coming from a slightly forward direction (aberration of light). Therefore the absorption of this radiation leads to a force with a component against the direction of movement. (The angle of aberration is extremely small since the radiation is moving at the speed of light while the dust grain is moving many orders of magnitude slower than that.)

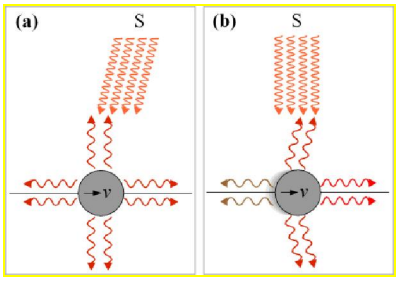

Figure:1

The Poynting–Robertson drag can be understood as an effective force opposite the direction of the dust grain's orbital motion, leading to a drop in the grain's angular momentum. It should be mentioned that while the dust grain thus spirals slowly into the Sun, its orbital speed increases continuously.

Poynting–Robertson force can be given by

$$F_{PR} = Pv/C^2 \qquad (6)$$

Here **P** is the power of the incoming solar radiation, **v** is the grain's velocity**, C** is the speed of light in vaccum, and **R** isthe dust grain's orbital radius , F_{PR} = Poynting–Robertson force .

From (1) we know that power of incoming solar radiation can be denoted by **P=FC**

Then the equation (6) becomes $F_{PR} = (FC)v/C^2$

$$F_{PR} = (Fv) / C \qquad (7)$$

Here F_{PR} = Poynting–Robertson force , **F**= Force exerted by solar radiation , **v** is the grain's velocity , **C** is the speed of light in vaccum **.**

Squaring the equation (7) we get

$$F_{PR}{}^2 = F^2 * (v/C)^2 \qquad (8)$$

From (5) we have $r = GM/v^2$ i.e $v^2 = GM/r$

Thus the equation (8) becomes $F_{PR}{}^2 = F^2 * (v^2/C^2)$

$$F_{PR}{}^2 = F^2 * (GM/rC^2) \ .$$

The Schwarzschild radius (sometimes historically referred to as the gravitational radius) is a characteristic radius associated with every quantity of mass. Gravitational radius of the sun can be given by

$$R_g = 2GM/C^2 \quad (9)$$

From (9) the equation $F_{PR}^2 = F^2 * (GM/rC^2)$ can be written as

$$F_{PR}^2 = (F^2 * R_g)/2R \quad (10)$$

$$F_{PR} = F * (R_g/2r)^{1/2} \quad (11)$$

Here F_{PR} = Poynting–Robertson force , F= Force exerted by solar radiation , R_g= gravitational radius of sun, C is the speed of light in vaccum , r is the dust grain's orbital radius .

Result:-

1) Poynting–Robertson force can also be given by $F_{PR} = F * (Rg/2R)^{1/2}$
[F_{PR} = Poynting–Robertson force , F= Force exerted by solar radiation , Rg = gravitational radius of sun, C is the speed of light in vaccum , R is the dust grain's orbital radius]

2) Momentum of emitted hawking radiation is given by the relation $p = [hM / 3\,T_{ev}]^{1/2}$
[p = momentum of emitted hawking radiation,M=Mass of evaporating blackhole, Tev= evaporation time of blackhole] .

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