**MATHEMATICAL THEORY**

**ON**

**ENERGY,SPACE AND TIME**

BY

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**Fundamental universal field equation**

**Relating energy, Space and time**

**Part :1**

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

λ=h/mc

where h= Planck’s constant (6**.**625\*10-34JS).

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

c = λ /T

where T= time period.

By substitution of value of ‘c’ in the equation λ = h/mc

we get the expression m λ2 = hT.

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

Then the equation m λ2 = hT becomes f=h/mλ2

De Broglie wavelength associated with the photon is given by λ= h/p,

Thus the equation f=h/mλ2becomes f=p/mλ.

Angular frequency associated with the photon is given by ω= 2 πf.

By putting the value of f=p/mλ. in the above equation we get ω= 2 πp/mλ.

The above equation ω= 2 πp/mλ. can be applied to both photons and material particles like electron in motion.

Debroglie wavelength associated with the electron is given by λ=h/mv

Where v=velocity of electron in motion

Then the equation ω= 2 πp/mλ becomes ω= 2 πpmv/mh i.e ω= 2 πpv/h.

**Part : 2**

Consider a electron of mass “me” at rest, total energy associated with the electron is given by “me c2”.

Suppose radiation of energy hfis 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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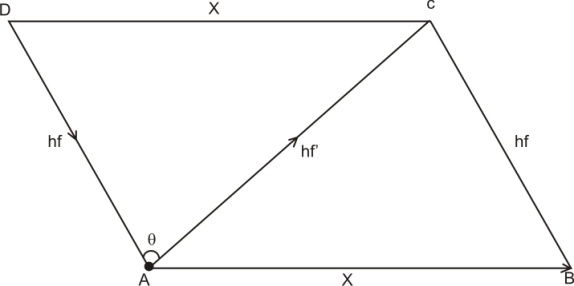


Figure :1 –Schematic diagram of scattering of energy of photon by electron

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 a2=b2+c2-2bc cos θ.

Let a =X, b=hf, c=hf’, cos A = cosθ.

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

X2=(hf)2+(hf’)2-2(hf)(hf’) cos θ ......................(1)

By law of conservation of momentum of photon.

We get where  be the momentum of incident, absorbed and scattered photon respectively.

Let us assume absorbed momentum of photon = momentum of electron

i.e. 

Thus  where  = momentum of electron

 Squaring on the both sides we get

p2= 2

Since (a-b)2=a2+b2-2ab Thus the above equation becomes p 2=py 2+py’ 2- 2 |y**.** y’|

According to dot product rule **| |=** |a||b|cosθ

Then we get p2= py 2+ py’ 2-2| py | | py’ | cos θ

Let us multiply the above equation by c 2we get

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

p2 c 2 = py 2c 2 + py’ c2-2| py | | py’ |c2cos θ

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 θ ...................( 2)

By comparison of (1) and( 2)

we getX 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 me c2to mc2.

Then total energy associated with the electron in motion is given by E= mc2.

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=mc2.

We get E= pc2/v

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

Then the above equation E= pc2/v becomesE=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

ω= 2 πpv/h, i.e ω= 2 πxv /hc

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

Rearranging this equation we get

h ω/ 2 πX =v/c........................( 4)

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

E= 2 πX 2**/** hω

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 πX  2**/** hω

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 ω = θ/t(θ = angular displacement with respect to time t)

The above equation E= 2 πX 2/hω becomes E= 2 πX 2t**/** hθ

Letθ = 2 πfor one complete revolution

Then the equation E= 2 πX 2t**/** hθ becomes E= 2 πX 2t**/** h2π

i.e E= X2t**/** 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 2t/ 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=X2t/ 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).

**DOES ENERGY AND IMPULSE ARE INTER CONVERTABLE**

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**Part : 1**

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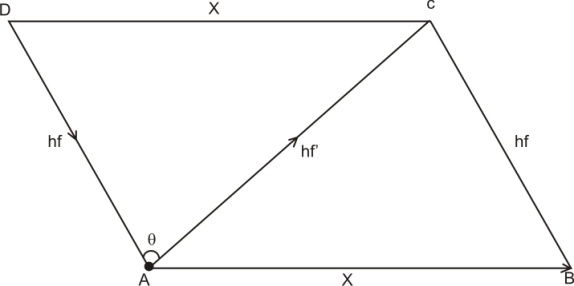


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Let us multiply the above equation by c 2we get

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

p2 c 2 = py 2c 2 + py’ c2-2| py | | py’ |c2cos θ

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 θ ...................( 2)

By comparison of (1) and( 2)

we getX 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

**PART:2**

At point A and B mass of electron is mei.e total energy associated with electron is mec2.

(Since electron is at rest at point A and B) But in between point A and B mass of electron is mc2

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

Hence total energy of electron in motion is mathematically given by E= mec2**+** 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

mec2=rest mass energy of electron As absorbed momentum of photon equals the momentum of electron i.e py’’= p As X=pc (position of electron is defined as the function of it’s momentum) then X= py’’c py’’c =hf “ then X=hf ’’ then the equation E= mec2+hf ’’becomes equation **E= mec2+X**........(3)

According to Einstein equation E= mec2+Ek......................(4 ) By camparison of (3)and( 4)

we get **Ek = 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 Ek = dX i.e I =dX/c

i.e I= d Ek/c i.e d Ek=Ic

According to workenergy theorm

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

i.e W= Ic

Work done on particle involves storage of energy in particle

i.e W=Ea where Ea= Energy stored in particle.

**Ea =Ic**

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

Thus impulse and energy are interconvertable.

**Part:-B**

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=mc2

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=X2t/ h(1+D)”.**

1. Energy stored in the particle defined as the function of impulse is given by **“Ea =Ic” .**

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