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BLACK HOLE ENERGY DEFICIENCY EQUAL, PARTICLE ENERGY WHO ESCAPED FROM THE BLACK HOLE EVENT HORIZON

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According to quantum entanglement theory, particle and antiparticle entangle in black hole event horizon, so assume that when the particle escaped from the black hole as a radiation which called hawking radiation this time some energy deficiency is held and entangle particle gain some energy. This process we calculate the how much energy is deficient in Black hole also we measured gaining energy of particle who can escape from the black hole.

Keywords: BLACK HOLES, DEFICIENCY OF ENARGY IN BLACK HOLES, ENERGY OPERATOR.

INTRODUCTION

Paper is depends on calculation and theory base, so many important symbols are used. Then first time introduce this all symbols they are used the calculation.

1. Black holes using symbol:

$\varepsilon -$ Black holes energy operator.

$E -$Black holes total energy.

$< e > -$Real values of energy which is loss in the black hole.

2. Particle using symbol:

$\varepsilon' -$ Particle's energy operator.

$E_1 -$Particle own energy store

$< e' > -$ Real value of gaining energy of particle who escaped from the black hole.

CASE-1

First time, calculated this two phenomena (the amount of energy is release in the black hole through hawking radiation and the same amount energy gain the entangle particle who escaped from the black hole according to hawking radiation) are happen in the same time. We first prove that two energy operator commute each and other.

Black hole energy operator $(\varepsilon) depand\ on\ (E-< e >)$..................1

All particle's energy operator who escaped from the black

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hole(ε') $depend\ on\ (E_1 + < e' >$ $)$...............2

First time multiplying equation 1and 2,

$$\varepsilon \cdot \varepsilon' = (E - < e >)(E_1 + < e' >)$$

$$= EE_1 - < e > E_1 + E < e' > - < e >< e' >$$ 3

Second time multiplying equation 2and 1,

$$\varepsilon' \cdot \varepsilon = (E_1 + < e' >)(E - < e >)$$

$$= E_1 E + < e' > E - E_1 < e > - < e >< e' >$$ 4

Then subtraction equation 3and 4m,

$$\varepsilon\varepsilon' - \varepsilon'\varepsilon = EE_1 - < e > E_1 + E < e' > - < e >< e' > - E_1 E - < e' > E + E_1 < e > + < e >< e' >$$

$\varepsilon\varepsilon' - \varepsilon'\varepsilon = 0$ (This all are cancelled out because all are not operator they simply ordinary number and the energy operator in general formula they are commute each other)

$$\varepsilon\varepsilon' - \varepsilon'\varepsilon = 0 \ldots\ldots\ldots\ldots\ldots..5$$

$$[\varepsilon, \varepsilon'] = 0 \ldots\ldots\ldots\ldots\ldots 6$$

Such that, the equation 5 and 6 clear that the black hole energy operator and the particle's energy operator are commute that means the deficiency of black hole energy and particle gaining energy we calculate the same time, so assume equation 1 and 2 is happen in the same time and the real value is not equal in two equation, the equation 6 proof that this two equation is right in a fix time.

CASE: 2

We use to an expectation value of a black hole energy operator ε in the state ς and the dual form ς^*can be written in there,

$$\langle\varepsilon\rangle = \frac{\int_{-\infty}^{+\infty} \varsigma^* \varepsilon \varsigma \, dx}{\int_{-\infty}^{+\infty} \varsigma^* \varsigma \, dx} \quad (\varsigma \text{ depends on })$$

$$\langle\varepsilon\rangle = \int_{-\infty}^{+\infty} \varsigma^* \varepsilon \varsigma \, dx \ \ldots\ldots\ldots\ldots\ldots.....7$$

$[\int_{-\infty}^{+\infty} \varsigma^* \varsigma \, dx$ =1 that the normalisation function]

$$\langle\varepsilon\rangle = \langle\varsigma|\varepsilon|\varsigma\rangle \ldots\ldots\ldots\ldots\ldots\ldots\ldots..8$$

Similarly act on same format the particle's energy operator,

$$\langle\varepsilon'\rangle = \frac{\int_{-\infty}^{+\infty} \varsigma^* \varepsilon' \varsigma dx}{\int_{-\infty}^{+\infty} \varsigma^* \varsigma dx}$$

$$\langle\varepsilon'\rangle = \int_{-\infty}^{+\infty} \varsigma^* \varepsilon' \varsigma dx \ldots\ldots\ldots 9$$

[Same kind of expression for normalisation, $\int_{-\infty}^{+\infty} \varsigma^* \varsigma dx$ =1 that the normalisation function] .

$$\langle\varepsilon'\rangle = \langle\varsigma|\varepsilon'|\varsigma\rangle \ldots\ldots\ldots\ldots\ldots10$$

Assuming the different Eigen value in different state of ς

$$\varepsilon|\varsigma\rangle = \lambda|\varsigma\rangle \ldots\ldots\ldots\ldots\ldots 11$$

[λ is a Eigen value of black hole system]

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Another things for particle system different Eigen value λ',

$$\varepsilon'|\varsigma\rangle = \lambda'|\varsigma\rangle \ldots\ldots\ldots\ldots\ldots 12$$

If the $\varepsilon, \varepsilon'$ operating on ς returns the same function ς and the real constant λ, λ'

Then show that the black hole energy operator and particle energy operator both are Hermitian operators.

First time show that the arbitrary function is a normalisation function that is proof equation no 8 ...10.and secondly show that this normalisation function is mutually orthogonal.

$$\int_{-\infty}^{+\infty} \varsigma^* \varepsilon\varsigma \, dx = \langle\varsigma|\varepsilon\varsigma\rangle \ldots\ldots\ldots\ldots\ldots 13$$

$$\langle\varsigma|\varepsilon\varsigma\rangle = \int_{-\infty}^{+\infty} \varsigma^* \, \varepsilon\varsigma dx$$

$$= \left(\int_{-\infty}^{+\infty} \varsigma^* \, \varepsilon\varsigma dx\right)^*$$

$$= \int_{-\infty}^{+\infty} (\varepsilon\varsigma)^* \, \varsigma dx$$

$$= \langle\varepsilon\varsigma|\varsigma\rangle$$

$$\langle\varsigma|\varepsilon\varsigma\rangle = \langle\varepsilon\varsigma|\varsigma\rangle \ldots\ldots\ldots\ldots\ldots\ldots 14$$

Similarly as the particle energy operator,

$$\langle\varsigma|\varepsilon'\varsigma\rangle = \langle\varepsilon'\varsigma|\varsigma\rangle \ldots\ldots\ldots\ldots\ldots 15$$

Then,

$$(\lambda - \lambda')(\varsigma, \varsigma) = 0$$

When $\lambda \neq \lambda'$ then the equation,

$$\int_{-\infty}^{+\infty} \varsigma^* \varsigma dx = 0$$

$$\int_{-\infty}^{+\infty} |\varsigma|^2 dx = 0 \ldots\ldots\ldots\ldots\ldots\ldots 16$$

$|\varsigma|^2 -$ Square term is never negative in this condition, All 13 to 16 all equation tells the black hole energy operator and the particle energy operator is a Hermitian operator. So the hermition operator's Eigen value is the real. Also Eigen functions are orthogonal. Then suppose choose two different or the same Eigen function of the energy operator then get the same Eigen value so rewrite ,

$$\varepsilon|\varsigma\rangle = \lambda|\varsigma\rangle \ldots\ldots\ldots\ldots\ldots\ldots 17$$

Use the same arbitrary function in this case,

$$\varepsilon'|\varsigma\rangle = \lambda|\varsigma\rangle \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 18$$

[According to this theory equation 18 is given]

Then equation 17 and 18 equivalent each other,

$$\varepsilon'|\varsigma\rangle = \varepsilon|\varsigma\rangle \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 19$$

ς is a Eigen function on ε and ε' then the equivalent theory,

$$\boxed{\varepsilon = \varepsilon'} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 20$$

FINAL CALCULATION:

According to equation 1 and 2 then apply the equation 20

$$< e' >= \varepsilon' - E_1 \ldots\ldots\ldots\ldots 21$$

$$< e >= E - \varepsilon \text{..................22}$$

$$\varepsilon = E - < e > \cdots \text{... ... ... .23}$$

Then,

$$\langle e' \rangle = \varepsilon' - E_1$$

$$< e' > = \varepsilon - E_1 \quad \text{(According to } \varepsilon = \varepsilon' \text{ equation)........24}$$

$$\varepsilon =< e' > + E_1 \text{ ....25}$$

Put the value of ε in equation 23,

$$E - \langle e \rangle = \langle e' \rangle + E_1$$

$$E - E_1 = \langle e' \rangle + < e > \text{................26}$$

According two equation 26 energy different of black hole and his entangle particle is zero

$$\langle e' \rangle + < e > = 0$$

$$\langle e' \rangle = -\langle e \rangle \text{........................27}$$

The equation 27 proof that the gaining energy of the particle is equal to deficiency energy of the black hole is negative sine.

CONCLUSION

According to the hawking radiation, huge luminous ray escaped from the black hole and huge temperature belonging this time. This luminous ray is nothing but entangle particle escaped from the black hole. Assuming that the huge energy store the black hole and then it release through the entangle particle that means black hole energy deficiency real value is same as the particles gaining energy value in a same time. At the last time tells the opposite way black hole store the huge energy and then it is release, held some energy deficiency then the black hole fulfil this energy and create huge attraction held on this place, called it Gravity. Black hole energy carryout through the entangle particle.

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REFERENCES

1. Harvey Reall , BLACK HOLE (page- 13th March 2015)
2. Stephen hawking , A BRIEF HISTORY OF TIME (89-125) ,1988

3. David J. Griffiths , QUANTUM MECHANICS (142) 2002
4. Carl Sagan , Cosmos (241) 1981
5. A.S. Hicks, Hermition operators and their applications (1-3) 24th October 2008.