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Model of the Mysterious Black Hole

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Abstract

The purpose of this project is to create an accurate and world standard scientifically strong model of the black hole which will be relied upon for explanations of the phenomena going on in the black hole in the area of Physics. The research problem that motivates this project includes attempts to provide answers to questions asked about it such as: Why do black holes grow? Can a black hole collapse? Why does the black hole emit electromagnetic radiation? Why it that light or even matter can't escape the black hole? And a host of other questions. The method used to develop this model include scientific analysis and inquiries together with Quasi-experimental as a 3-D representation of the black hole was practicalized. Also, a lot of experimental data were gathered from astronomers and documents analyzed. A host of Physics literature such as advanced level Physics were consulted before a model was formulated. Conclusions reached include a diagrammatic representation of the model of the black hole showing the presence of energy levels in the black hole and a core which exerts a strong attractive force on any body in its orbital. The aim of formulating this model hopes to removes the 'mysterious' from the name-'the mysterious black hole' which people have given it and hopes to provide groundbreaking explanations to every phenomenon that goes on in the black hole based on already laid down principles of Physics.

Keywords: Black holes; orbital; energy levels; force; quanta; spontaneous emission; stimulated emission; radioactive decay; quantum entanglement.

1. Introduction

"The most beautiful experience we have is the mysterious. It is the fundamental emotion that stands at the cradle of true art and science whoever does not know it and can no longer wonder, no longer marvel, is as good as dead, and his eyes are dimmed"[1].

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This is a citation from Albert Einstein's book 'The world as I see it' and is in fact the inspiration behind this project. The black hole as it stands now is the most beautiful experience we scientists have and if we must be ready to tackle it's mysteriousity if we are ready to uphold the integrity of true science. The black hole as we know it today is a region of space time, first predicted by Albert Einstein in his theory of general relativity. It is a region where light nor even matter can't escape and it is believed that strong gravitational forces are present in it. Another interesting fact of the black hole is that if a person falls into it, he would die before being completely straightened up into a spaghetti-like form. Also, black holes don't suck since it has been established that it is not a vacuum. Instead, objects fall into it. Not long ago, scientists discovered radiation on the event horizon, that is the outer part of the black hole and there's no explanation. Questions like: why do some black holes increase in size? Are still hanging. Can a black hole collapse and why? All these questions and many more is what my model seeks to provide explanations to. My approach in solving the problem of the black hole is simply by designing 3-D model of the black hole, experimentally and studying it. Then, going back to the principles and foundations which our Physics theories rely upon and checking their correspondence.

2. Materials and Methods

- The effect of gravitation in a hole was studied in the night time so that it could represent the black hole.
- A field study was actually conducted at latitude 4.77742 and longitude 7.0134. A flat bare ground was also picked to prevent any variations from occurring. Although the wind and temperature couldn't be controlled.
- Firstly, light rays were passed from the top of the hole and a mirror placed at the bottom in order to again verify if the hypothetical core would be added to the set up and no light coming out from the hole was observed.
- A cylinder open at both ends was used and placed on a tall platform, like a table. A hole was then made in the middle of the table and the cylinder filled with sand. Then, a long rod was passed through the middle of the sand-filled cylinder and through the hole made in the table. Therefore, we have a hole. The center of the hole was then filled with sand using a straw to represent the core of the black hole. Black hole

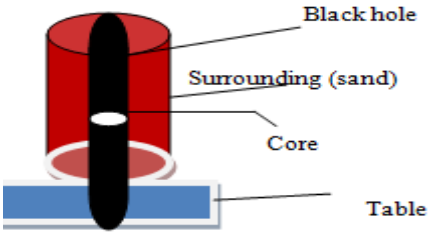

Figure 1: Diagram of experimental design

The figure 1 above should help explain the experimental design.

- An observer, John, was positioned at the bottom of the table to observe the hole and I watched from the top of the hole by climbing a ladder. A beam of light was passed through the top. We then tried from

the bottom but when we observed the top, something happened. Then, a stalk of plant was thrown inside from the top but to our shock, the results were astonishing. Several matter such as leaves and some insects were thrown into it. We then decided to leave the set up like that for one week and we came back in the night after one week to see if we could observe anything at all.

3. Results

Note that the table in the experiment was kept high so that the effect of gravity on the set up would be increased.

When the beam of light was passed through the top, the light wasn't seen at the bottom and when the beam of light was passed through the bottom, we didn't observe any light coming out from the top. Shocking! When small materials such as leaves, insects, and stalks were thrown, nothing came out of our hole! Then, when we came back exactly one week later at that same time, we observed radiation coming out of the hole in the form of heat. Biology might explain that as decomposition but as a Physicist, that is electromagnetic radiation; the hole was radiating it. Also, we noticed the hole had become darker than before.

4. 1 Discussion

Before I start the discussion, I would like to first introduce the model:

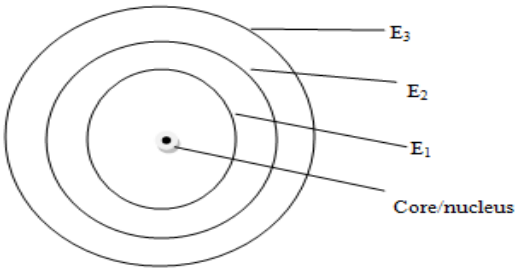

Figure 2: Diagrammatic representation of black hole model

The black hole according to this model shown above in figure 2, is composed of several energy levels or orbital which rotate at different speeds, generating a field. The core/nucleus of the black hole exerts a strong attractive electrostatic force on its orbital. Therefore if a body of mass m falls into the black hole:

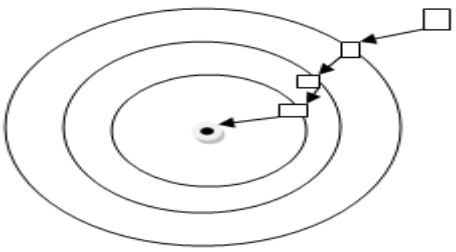

Figure 3: Body being pulled into the core of the black hole

The force at the core pulls the body, maybe a charge, photon or any other body with mass m to itself at the speed of light. The force can be determined according to Bohr by this formula 1 below:

$$F=mv^2/r \quad (1.)$$

But the exact position of the body in the black hole cannot be determined in accordance with the Heisenberg's uncertainty principle because position and velocity are complementary variables. The momentum of the body is also complementary to its position. Also, the time taken for the black hole to completely absorb the particle cannot be determined because energy and time are also complementary variables. And that explains why we didn't know where the light was in the hole or even the materials thrown. In the larger picture, the black hole, we cannot determine the position of the galaxies or bodies which the black hole absorbs. And then a brilliant question: Can a black hole collapse? Yes, it can. But according to Bohr, the energy in the orbital of the black hole is constant, therefore the black hole doesn't collapse but if by any way, the energy in an orbital increases to a certain point, which should not happen anyway, the black hole collapses. Bohr explained this using a formula 2 below:

$$Mvr=nh/2\pi \quad (2.)$$----that is, momentum×radius is proportional to $h/2\pi$.

Now, another question is: where does the black hole get its energy from? As Einstein proved, that matter is equivalent to energy through the formula 3 below:

$$E=mc^2 \quad (3.)$$

The black hole absorbs all sorts of energy in the form of matter-galaxies, materials and other energy forms, even photons and other bodies from space and within, there is a large infusion of energy and then the atom becomes excited and according to Bohr, once an atom has been excited, it will try to reduce its energy. Therefore, the energy is lost in the form of electromagnetic radiation. Then, a wonderful question one can ask is how do we know a black hole is growing or if it is constant in size and at what rate? Also, how can we measure the energy a black hole possesses? All these questions will be treated. The size of a black hole is proportional to the amount of materials it absorbs. Therefore, if amount of energy absorbed=amount of energy radiated/amount of matter given out, then, the size remains constant. Combing some equations together, I was able to come up with the black hole equation in formula 4 below:

$$(m_ac^2-hf_r)+E_0=E \quad (4.)$$ ---black hole equation

Where m_a=total mass absorbed; c=speed of light (3×10^8m/s); h=planck's constant; f_r=frequency of radiation released; E_0=initial energy of black hole at time of creation; E=energy of black hole at time t.

Therefore, the net energy plus the initial energy would give you the energy of a black hole. Therefore, from the formula given, one can find out if a given black hole is decreasing in size, or growing or is constant and at what rate .

4.2 The reason the black hole doesn't allow light or matter escape

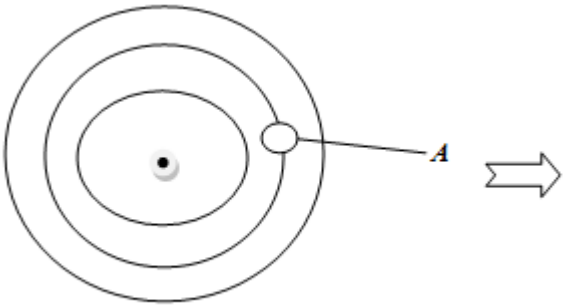

Figure 4: Atom in the E_2 orbital

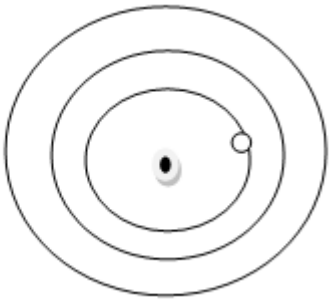

Figure 5: Atom in the E_1 orbital

Applying the principle of ruby laser to this case, the excited atoms in the black hole decay spontaneously to the lower energy level E_1, as shown in figures 4 and 5 above. As they decay, they emit energy in the form of radiation but the E_1 has a special property of having a large stimulated emission probability so the atoms don't decay spontaneously in E_1 and therefore the E_1 which I would call the fundamental energy level is trapped with the atoms of the materials the black hole absorbs and then we have a phenomenon described as 'population inversion'. And this explains why light is trapped in a black hole and even other particles can't escape.

The idea is further reinforced by Einstein's proof that the probability per second that the atoms would decay to the fundamental energy level and keep on radiating energy is a function of two terms: stimulated emission and spontaneous emission. The stimulated emission is a function of the amount of energy present in the environment of the atoms and this energy is high. Stimulated emission is represented by formula 5 below:

$\Psi = \alpha hf$ (5.) where ψ=stimulated emission (energy emitted in one second per unit area caused by stimulating photon); α=photon flux;h=planck's constant; f=frequency of a photon.

And the spontaneous emission, we know, is also high because the atoms in the higher energy levels like E_2 and E_3, decay spontaneously to the fundamental energy level, and therefore radiating energy and releasing quarks. Therefore, the count rate of the black hole in figures 4 and 5 above can hence be represented by formula 6 below:

$4\pi r^2 \times dN \div dt = dN^1 \div dt$ (6.) where dN^1/dt=count rate of the black hole; $4\pi r^2$=Area of a sphere; dN/dt=count rate of an atom in the black hole.

Also, since light is a wave, the energy of the light which enters the black hole is confined to it in its core, therefore light cannot escape by any means, if we obey Bohr's theory. The properties of a star could tell you the properties of its corresponding black hole, even its rotational properties.

Our experimental hole became darker and we couldn't see anything in it due to the following reason: How do we see objects? Light from the object comes to our eye and strikes the retina and then we can see the object. But

in this case, light, unfortunately, cannot come from the black hole as it is trapped in its core. The hole becomes darker because: force exerted is directly proportional to amount of mass in the body, therefore as the hole kept on absorbing various materials, its mass concentrated in the core increases, therefore it is able to pull materials in it more and even able to trap more light.

4.3 A crazy exception

Yes, the black hole absorbs materials within its reach into it but not all bodies enter the black hole. If the trajectory or movement of a body does not coincide or agree with the spinning orbital of the black hole, then it doesn't gain access into the black hole. And the movement of the body depends on the quantum numbers. For example, if a body of mass m accelerates towards the black hole with its orbital and the direction of acceleration coincides with the direction of rotation of an orbital which depends on its angular distributions and the orbital angular momentum, the body is successfully absorbed in. Recall that in 1925, Goudsmit and Uhlenbeck showed that the magnetic field generated by the spin of a charged body of mass m around an axis could reinforce or oppose the field generated by the orbital motion of the charged body around the core/nucleus and recall that the body would be opposed if the natural state of the body has an overall spin down because it would be anti-parallel to the external field which in this case is the field of the black hole. But if the overall body is a spin up, it would in fact reinforce the field of the black hole and the body is pulled. If such a body approaches a black hole, coupled with the fact that it's other quantum numbers do not agree with such black hole, it would oppose the attractive field generated by the orbital in the black hole and therefore, such body still with its spin (angular momentum) doesn't just die off and wouldn't also be absorbed by the black hole but instead keeps moving round it, though radiating energy around itself which could also be absorbed by the black hole, therefore its momentum decreases gradually and it becomes slower. So, it's like a tussle between the two.

4.4 Relativity in black holes

There is a common misconception that time doesn't exist in black holes but it's not actually true, although technically otherwise. The fact that I fly close to the region of a black hole and my watch begins to work slower than its normal rate as I know it: that's relativity. Some scientists' say that time exists in a black hole, although far slower; is wrong. If it was right then we would be able to observe light as it is being absorbed into the black hole gradually or in fact, any other body and there be no such concept as 'singularity'. Black holes absorb objects at a great speed which should be greater or equal to the speed of light and that's what causes what we know as 'singularity'. From the point of view of the astronomers and the scientists, it appears slow or not moving at all, in fact.

5. Conclusions

Please endeavor to study the discussion above before going to the conclusion because some information which could be likened to the conclusion are present in the conclusion. Also, I may refer you back to the discussion to explain matters dealt with in the conclusion.

This implies that the black hole could actually produce the brightest bodies in the universe, even though it is

referred to as 'black'. Due to the fact that we know the black hole emits energy in the form of electromagnetic radiation and the black hole absorbs energy too through photons and other bodies which falls into it, then it can actually produce very bright bodies. Because, Einstein proved that the photon produced by stimulated emission is always in phase with the stimulating photon. Therefore, if the two photons from opposite directions meet, as shown in figure 6 below, and they are in phase, as has been proved, then according to the principle of superposition, they would interfere constructively and produce a far greater amplitude of light than their individual amplitudes/energies. This, I believe also explains the mystery of quantum entanglement-photons from space and photons from black hole. It also explains why high-energy light is made when a black hole and a star are together.

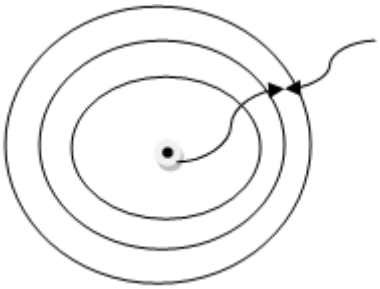

Figure 6: Two waves in phase meeting (one from the black hole and the other entering the black hole)

Surely, black holes interact with and when black holes interact, photons are released according to the Compton Effect because we would obviously have some recoiling photons, which could be in the form of electromagnetic radiation or light and when the black holes merge, their mass increases, they emit more radiation and matter and in fact, during the collision, there is a huge burst out of energy, obeying the law of conservation of energy and momentum. This also means that we can determine what kind of materials are in the black hole by studying the spectral lines produced by the radiation emitted, according to Einstein's spectral theory. Also, the only reason why a black hole would stop emitting radiation is if it is not excited in any way, that is, if it doesn't absorb materials/photons. Also, from what was proved in the discussion above and in this conclusion above, basic information cannot be lost in a black hole but it cannot be retrieved unless the black hole collapses/evaporates. Furthermore, the core of black holes exhibits nuclei properties such as magnetic spin, moment, momentum, etc. Lastly, the dark matter that holds the elements of the universe together are likely to be emissions from the black hole; they have been observed to be related and my prediction is that in the next few years to come, the ratio of dark energy to dark matter would have increased. In fact, it is pretty hard to say but the core of a black hole might actually be radioactive leading to the release of neutrinos, energy, radiation and other particles. I hope I've been able to clear the 'mysterious' nature of the black hole and I hope this model would take us a step further in understanding our universe.

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