Table of Contents

Introduction

We are trying to determine what type of energy a black hole is generating. Then we will attempt to gather the energy some how, and us it as new source to better understand everyday lives. Black holes have extreme amounts of energy. Enough some believe, to transport you through time. You can find the volume of a black hole by using the equation: volume = 4 / 3 * pi * r^3, found in the internet site, "Commonly asked questions about black holes." Thus, figuring out about how much energy a black hole has.

One way of extracting energy from a black hole is reducing the size of it, therefore allowing it to give off its own energy. This is known as the Penrose Process. Secondly, black holes give off its own energy when they emit particles, because their gravitational pull is so intense, this process is known as the Hawking Radiation. These so called particles are known as 'virtual pairs' which are particle, antiparticle pairs, which pop into existence, separate for a very short amount of time, come back together, then disappear just as fast. For that very short time period there is extra mass-energy in the universe. The vertical pairs usually pop into existence around a black hole. As it falls through the black hole it produces enough energy for another particle to exist. This is such a huge amount of energy, that if you could harness it, the energy would be unthinkable. The last way a black hole gives off energy is that it evaporates or disappears. The simple task of disappearing into the black hole produces energy. The reason is Newton's First Law of Motion in that an object in motion stays in motion, which can be converted into energy.

A black hole is created when a star runs out of fuel and collapses into itself. It’s a region of space that has so much mass concentrated in it that there is no way for a nearby object to escape its gravitational pull. When a star explodes, or runs out of fuel, one of two things can happen. It could either explode into a super nova destroying everything in the range of the explosion, or it could implode into itself and great a black hole. Even light cannot escape from the gravitational pull of a black hole.

Problem Definition

What is a Black hole?
And can we use any energy from it.

Hypothesis

Is it possible to be able to extract X-rays from a black hole and use them to accomplish tasks here on Earth?

X-ray Energy

However, if a black hole passes through a cloud of interstellar , matter or is close to another "normal" star, the black hole can accrete matter into itself. As the matter falls or is pulled towards the black hole, it gains kinetic energy, heats up and is squeezed by tidal forces. The heating ionizes the atoms, and when the atoms reach a few million degrees Kelvin, they emit X-rays. The X-rays are sent off into space before the matter crosses the Schwarzschild radius and crashes into the singularity. Thus we can see this X-ray emission.

Description

As we were doing research for this project, we came across many dead ends, and pit traps so to speak. We would find something useful and then lose the website, or forget where we found the information at. But all in all, we were able to still plan out and research enough to come to the conclusion that with our current knowledge it is not possible to extract X-rays from a black hole. We came to this conclusion after many trial and error tests involving searching, and trying to figure it out on our own. All of the tests failed terribly.

Results

The results that we accomplished were kind of short, and very simple. With our current knowledge of black holes and the origin of them and what they are made of, we have no solid amount of evidence that you can successfully collect X-rays from a black hole. Now there has been X-rays coming from black holes that have hit the hubble space station and we have been able to read those, but I don't think or believe that you can successfully extract X-rays directly from the black hole itself. Our program in itself is very small, and even simpler then the results that we were able to gather from it. The program and all it's variables will be posted in the appendixes along with some good examples of the event horizon and the hawking radiation I was mentioning before.

Conclusion

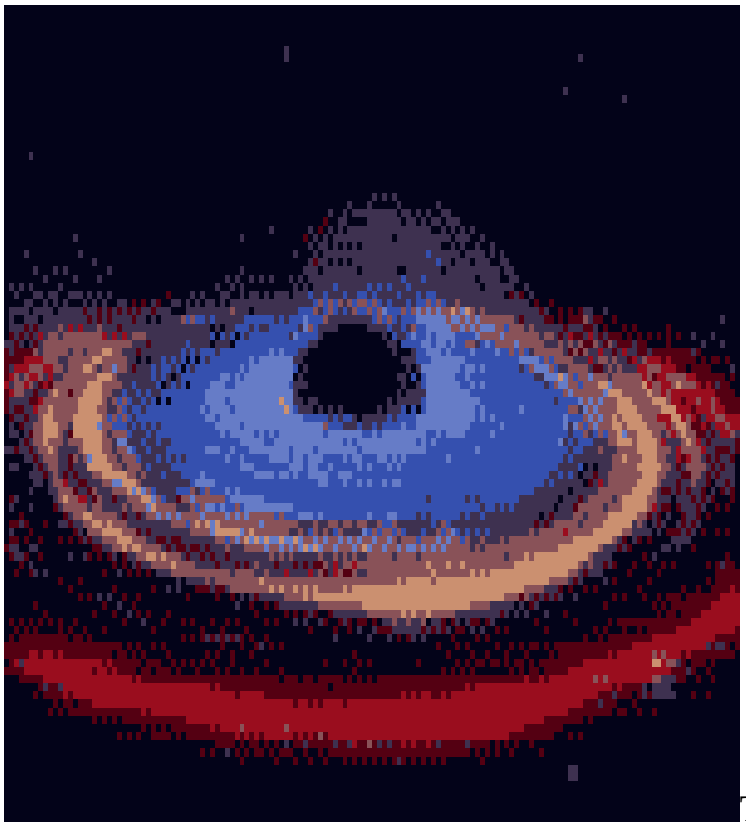
We conclude that it is impossible for us, with our current knowledge, to honestly say right now if you can extract X-rays from a black hole. There are in fact times when X-ray energy is squeezed by tidal forces. They heat up to such an enormous temperature that the black hole emits X-rays. Maybe with more research, more time, and more knowledge we might be able to say otherwise, but right now that is all we can conclude.

Appendixes

Appendix A: Program

```
    #include <iostream.h>
int main()
{
  const float PI = 3.14
  float volume, radius;
  cout << “Please enter the radius, in kilometers, of the Black Hole; “;
  cin >> radius;
  volume = 4.0/3.0 * PI * (radius * radius * radius);
  cout << “The volume of the Black Hole is ” <<volume << “kilometers” << endl;
return 0;
}
```

Appendix B: Pictures

 This is a picture of a black hole that best shows the event horizon. The gray color is the event horizon.

 This black hole best shows the fact that a black hole’s gravitational pull forces object towards it.

 This picture best shows the Hawking Radiation that I was explaining earlier.