

Gravitational waves and the black hole information paradox

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1. Abstract

The black hole information paradox is a contradiction between quantum mechanics and general relativity. Information which enters the black hole can never escape due to the extreme gravitational curvature of space-time, while at the same time the black hole slowly evaporates through the Hawking radiation due to virtual pairs generated at the surface of the event horizon. This collision of the uncertainty principle of quantum mechanics with the extreme gravitation predicted by general relativity can generate new ideas regarding the behavior of space-time. This paper suggests that information can escape from the black hole gravitational grip due to gravitational waves in the fabric of space time.

2. Introduction

The no hair theorem [1] states that all black holes have three characteristics: mass, electric charge and angular momentum. These three observable parameters are due to the singularity characteristics in the center of the black hole. This means that the black hole can communicate these three characteristics, through the fabric of space – time, from its singularity (where all the matter and energy are concentrated), to its event horizon where information can escape to the outer regions of space. This paper suggests that when information reaches the singularity region of the black hole, just before it is crushed to the singularity and gone forever, it is spaghettified into quantum bits of information in the form of a string (figure 1), generating turbulences in the fabric of space time near the singularity.

3. *Gravitational waves near the singularity at the center of the black hole*

As the information is crushed bit by bit into the singularity, these turbulences which are correlated to the information string, vibrate and influence the singularity region and by that also influence the three black hole characteristics (mass, charge and angular momentum). These influences from the singularity region on the three parameters, that are measurable by an outside observer that has not crossed the event horizon, generate gravitational waves which are correlated to the information that reached the singularity. These gravitational waves carry the information pattern back to outer space directly or by influencing the Hawking radiation. This is the way information is radiated back to the outer region of the event horizon and it is never lost even though it was crushed into the singularity of the black hole. This mechanism (figure 1) resolves the black hole information paradox [2]. In the future this mechanism can be simulated in a black hole bath [3] and computer simulations.

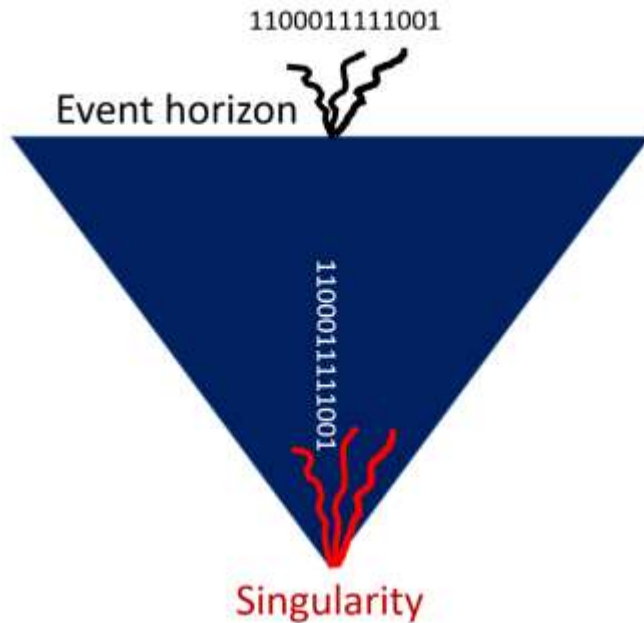


Figure 1: The black hole is illustrated as a triangle standing upside down on its vertex, while the vertex illustrates the singularity of the black hole. As the spaghettified information, illustrated by a white string of '0' and '1' bits, reaches the singularity region it generates turbulences in the fabric of space time correlated to the information pattern that is crushed into the singularity. These turbulences near the singularity of the black hole, are illustrated by the three curled red lines joining together in the singularity. These turbulences of space time influence (vibrate) the singularity and through the space – time fabric connection they influence (vibrate) the three major parameters of the black hole: mass, electric charge and spin. The vibrations in these three major parameters generate gravitational waves illustrated by the black curled lines at the edge of the event horizon. These gravitational waves carry back out (directly or through influencing the Hawking radiation), the information, illustrated by a black string of '0' and '1'bits ,that was originally crushed in the singularity of the black hole. This mechanism resolves the black hole information paradox.

References

- [1] https://en.wikipedia.org/wiki/No-hair_theorem
 - [2] https://en.wikipedia.org/wiki/Black_hole_information_paradox
 - [3] <https://astronomy.com/news/2017/06/black-hole-bath>
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