

Black Holes Having Density Greater Than Planck Density Are Source of Tachyon Particles

¹ S. Sahoo, ² M. Kumar

^{1,2} Department of Physics, National Institute of Technology,
Durgapur – 713209, West Bengal, India.

¹ sukadevsahoo@yahoo.com

ABSTRACT

Black holes having density greater than Planck density possesses negative gravitational force or repulsive gravitational force around itself. Tachyon particles have imaginary rest mass but real moving mass. The product of rest masses of two tachyon particles is negative. Hence gravitational interaction between two tachyon particles will be negative i.e. there will be strong repulsive gravitational force between two tachyon particles at rest. So we can say that black holes having density greater than Planck density are source of tachyon particles.

Keywords: Black hole; Tachyon particle; Special theory of relativity; Planck density

1. INTRODUCTION

Gravity is “strongly interacting” at a fundamental, non-perturbative level. This statement may come as a surprise, given that gravity is much weaker than the other fundamental forces and can safely be ignored in particle interactions. Black holes are an important test area of quantum gravity. In general relativity it is impossible, under very general assumptions on the equation of state, to stop the gravitational collapse of a very heavy star. Gravity is always attractive, and thus becomes the dominant force when matter is sufficiently dense. In quantum gravity, the space-time dynamics changes, and as in the solvable cosmological model we have repulsive gravity at extremely high densities. Also for black holes, a non-singular collapse results, but one that still leads to a horizon trapping light. However, the horizon disappears once the collapsing matter has traversed the high density phase. Horizons, and thus by definition black holes, exist only for finite times. The horizon shrinks by Hawking evaporation, and eventually disappears, at which time one expects some kind of stellar explosion. Also here, specific models for collapse depend on the matter behavior, opening ways for tests. Planck density is given by

$$\rho_{Pl} = \frac{M_{Pl}}{\frac{4}{3}\pi r_{Pl}^3} = 10^{96} \text{ gm/cm}^3. \quad (1)$$

We know from quantum theory of gravity, if ρ is density of a black hole then for

$$\rho > 10^{-10} \rho_{Pl}, \quad (2)$$

negative or repulsive gravitational force is produced around the black hole. Hence we can say that product of two masses will be negative inside black holes having density greater than Planck density.

2. STRONG GRAVITATIONAL INTERACTION BETWEEN TWO IMAGINARY MASSES AND CREATION OF TACHYON PARTICLES

Let im_{01} and im_{02} be rest masses of two tachyon particles. Then the strong gravitational force between two tachyon particles is given by

$$F_{Sg} = \frac{\Gamma(im_{01})(im_{02})}{d^2} \quad (3)$$

$$F_{Sg} = -\frac{\Gamma m_{01}m_{02}}{d^2} \quad (4)$$

The above equation shows that negative gravitational force is acting between two tachyon particles. Hence the strong gravitational force will be repulsive and two tachyon particles will be created from this negative product of the two masses which will move away from each other with velocity greater than the velocity of light, where $\Gamma = 2.77 \times 10^{32} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2}$ is strong gravitational constant. Now

$$m_1 = \frac{m_{01}}{\sqrt{\frac{v^2}{c^2} - 1}} \quad (5)$$

$$m_2 = \frac{m_{02}}{\sqrt{\frac{v^2}{c^2} - 1}} \quad (6)$$

From equations (2) and (4) we conclude that tachyon particles can be created from black holes having density greater than Planck density. Equations (5) and (6)

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represent the moving masses of tachyon particles moving with the velocity greater than the velocity of light. Hence we can say that black holes having density greater than Planck density are source of tachyon particles.

3. CONCLUSION

From above discussions we conclude that there is existence of imaginary mass inside black holes having density greater than Planck density because at these high density mass losses its properties and we can only imagine the existence of mass at this high density. Due to imaginary mass each and every part of the black hole will apply repulsive force to one another. Due to this repulsion between imaginary masses of the black hole tachyon particles will be created having imaginary rest mass but real moving mass and will move away from each other with velocity greater than the velocity of light.

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