

# The Unified Theory of Formation of Wormholes

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**Abstract** The term wormholes is quiet familiar to all theoretical physicist, but it's origin or the process of formation of the short-cut pathway through space & time is still a mystery. The short-cut pathway through space & time is called wormhole. This paper's emphasis is on only one question and ie. From where and how did the wormhole come? Or what is the procedure of formation of a wormhole.

**Keywords** Electrostatic potential, Charge, Black hole Mechanics, Space-time fabric, Event horizon

## 1. Introduction

A wormhole is a subject to mathematical formulation. That describes that there exist a pathway through space & time allows to reach from one point in a universe to another but by covering smaller distance ie. It provides a short-cut through space & time. In this paper my motif will be to bring forward the process of formation of wormholes. The process of formation of wormholes comes form that of two black holes or rather two oppositely charged black holes.

## 2. Symbols

- a.  $S_{bh}$  - Entropy
- b.  $\kappa_b$  - Boltzmann's Constant
- c.  $4lp^2$  - Planck's Length
- d.  $\kappa$  - Surface Gravity
- e.  $\Omega$  - Angular Velocity
- f.  $J$  - Angular Momentum
- g.  $\phi$  - Electrostatic Poential
1.  $\phi_{bh\alpha}$  – Electrostatic potential of +ve charge black hole
2.  $\phi_{bh\beta}$ –Electrostatic potential of -ve charge black hole
- h.  $Q$  - Charge
1.  $Q\alpha_{+}$  - Charge of +ve charge black hole
2.  $Q\beta_{-}$  - Charge of -ve charge black hole
- I.  $Rg_{\mu\nu}$  - Ricci Tensor

## 3. The Unified Theory of Formations of Wormholes

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Published online at <http://journal.sapub.org/ijtmp>  
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Although wormholes have not been observed but mathematical interpretation do suggest existence of wormholes. One reason for which wormholes haven't been detected, is that the conditions required for formation aren't achieved. Though the thought of formation a wormhole from two black holes is a radical thought but the mathematical interpretation does show chances for formation in that way.

Taking in consideration that a wormhole is created from two black hole. The procedure of formation might be merger of the two singularities of the respective black holes.

When the two singularities of the black hole merges to form a region of higher dimension, thereby forming a wormhole. The merger of the two singularities thereby forming a region of higher dimension is called singularity convergence. Singularity convergence occurs either when two black holes bearing opposite charges collide. As known that two black holes collide and merge to form a bigger black hole.

Now taking in consideration that the two black holes are having opposite charges hence as they come closer the two singularities get attracted and merges together even before the event horizon has merged. As the singularity has merged before the event horizon's merger. Hence the singularity merges to form higher dimension and the event horizon's work as a gateway from one point to another.

## 4. Equations

$$\delta M = \kappa \delta A / 8\pi G + \Omega \delta J + \phi \delta Q \quad (1)$$

For positively charged black hole:

$$\delta M_{\alpha} = \kappa \delta A_{\alpha} / 8\pi G + \Omega_{\alpha} \delta J_{\alpha} + \phi_{\alpha} \delta Q_{\alpha} \quad (2)$$

For negatively charged black hole:

$$\delta M_{\beta} = \kappa \delta A_{\beta} / 8\pi G + \Omega_{\beta} \delta J_{\beta} + \phi_{\beta} \delta Q_{\beta} \quad (3)$$

Charge on positively charged black hole:

$$\delta Q_{\alpha} = (\delta M_{\alpha} - \kappa \delta A_{\alpha} / 8\pi G - \Omega_{\alpha} \delta J_{\alpha}) / \phi_{\alpha} \quad (4)$$

Charge on negatively charged black hole:

$$\delta Q_\beta = (\delta M_\beta - \kappa \delta A_\beta / 8\pi G - \Omega_\beta \delta J_\beta) / \phi_\beta \quad (5)$$

Force of attraction:

$$\delta F = 1/4\pi\epsilon_0 * \delta Q_\beta * \delta Q_\alpha / r^2 \quad (6)$$

Again from black hole mechanics,

$$\delta E / c^2 = \kappa \delta A / 8\pi G + \Omega \delta J + \phi \delta Q \quad (7)$$

$$\delta E = c^2 \kappa \delta A / 8\pi G + c^2 \Omega \delta J + c^2 \phi \delta Q \quad (8)$$

$$-c^2 \kappa \delta A / 8\pi G = c^2 \Omega \delta J + c^2 \phi \delta Q - \delta E \quad (9)$$

$$-\kappa \delta A / 8\pi G = \Omega \delta J + \phi \delta Q - \delta E / c^2 \quad (10)$$

$$\kappa \delta A / 8\pi G = \delta M - \Omega \delta J - \phi \delta Q \quad (12)$$

$$\kappa \delta A = 8\pi G (\delta M - \Omega \delta J - \phi \delta Q) \quad (13)$$

$$\delta A = 8\pi G (\delta M - \Omega \delta J - \phi \delta Q) / \kappa \quad (14)$$

From the Hawking Radiation:

$$S_{bh} = \kappa_b A / 4lp^2 \quad (15)$$

$$\delta A = \delta S_{bh} * 4lp^2 / \kappa_b \quad (16)$$

$$\delta S_{bh} * 4lp^2 / \kappa_b = 8\pi G (\delta M - \Omega \delta J - \phi \delta Q) / \kappa \quad (17)$$

$$\delta S_{bh} * 4lp^2 = \kappa_b \{ 8\pi G (\delta M - \Omega \delta J - \phi \delta Q) / \kappa \} \quad (18)$$

$$\delta S_{bh} = \kappa_b \{ 8\pi G (\delta M - \Omega \delta J - \phi \delta Q) / \kappa \} / 4lp^2 \quad (19)$$

Entropy of positively charged black hole:

$$\delta S_{bh\alpha} = \kappa_b \{ 8\pi G (\delta M_\alpha - \Omega_\alpha \delta J_\alpha - \phi_\alpha \delta Q_\alpha) / \kappa \} / 4lp^2 \quad (20)$$

Entropy of negatively charged black hole:

$$\delta S_{bh\beta} = \kappa_b \{ 8\pi G (\delta M_\beta - \Omega_\beta \delta J_\beta - \phi_\beta \delta Q_\beta) / \kappa \} / 4lp^2 \quad (21)$$

Inserting General Relativity:

$$G_{\mu\nu} = R_{\mu\nu} - 1/2 R g_{\mu\nu} = 8\pi G / c^4 \cdot T_{\mu\nu} \quad (22)$$

$$R_{\mu\nu} - 1/2 R g_{\mu\nu} = 8\pi G / c^4 \cdot T_{\mu\nu} \quad (23)$$

$$c^4 (R_{\mu\nu} - 1/2 R g_{\mu\nu}) = 8\pi G \cdot T_{\mu\nu} \quad (24)$$

$$c^4 (R_{\mu\nu} - 1/2 R g_{\mu\nu}) / T_{\mu\nu} = 8\pi G \quad (25)$$

$$8\pi G = c^4 (R_{\mu\nu} - 1/2 R g_{\mu\nu}) / T_{\mu\nu} \quad (26)$$

Entropy of positively charged black hole:

$$\delta S_{bh\alpha} = \kappa_b \{ c^4 (R_{\mu\nu} - 1/2 R g_{\mu\nu}) / T_{\mu\nu} \cdot (\delta M_\alpha - \Omega_\alpha \delta J_\alpha - \phi_\alpha \delta Q_\alpha) / \kappa \} / 4lp^2 \quad (27)$$

Entropy of negatively charged black hole:

$$\delta S_{bh\beta} = \kappa_b \{ c^4 (R_{\mu\nu} - 1/2 R g_{\mu\nu}) / T_{\mu\nu} \cdot (\delta M_\beta - \Omega_\beta \delta J_\beta - \phi_\beta \delta Q_\beta) / \kappa \} / 4lp^2 \quad (28)$$

Curvature of Space and time in positively charged black hole:

$$R g_{\mu\nu\alpha} = 2 \{ -\delta S_{bh\alpha} * 4lp^2 / \kappa_b (-\kappa) \cdot (-\delta M_\alpha + \Omega_\alpha \delta J_\alpha + \phi_\alpha \delta Q_\alpha)^{-1} (-T_{\mu\nu\alpha}) (-c^4) + R_{\mu\nu\alpha} \} \quad (29)$$

Curvature of Space and time in negatively charged black hole:

$$R g_{\mu\nu\beta} = 2 \{ -\delta S_{bh\beta} * 4lp^2 / \kappa_b (-\kappa) \cdot (-\delta M_\beta + \Omega_\beta \delta J_\beta + \phi_\beta \delta Q_\beta)^{-1} (-T_{\mu\nu\beta}) (-c^4) + R_{\mu\nu\beta} \} \quad (30)$$

## 5. Result

As and when the singularities collide the ricci tensor or the curvature of the space and time changes from zero thereby proving change in the dimension and thereby forming a passage through space and time.

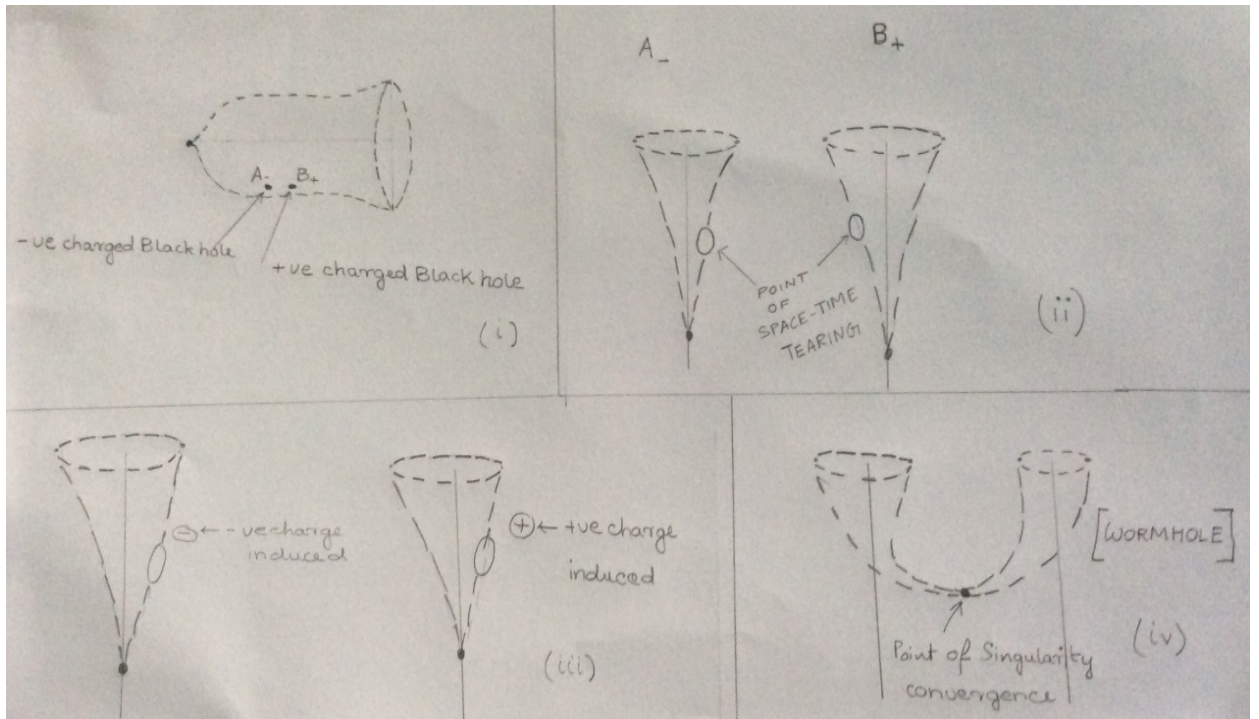


Figure 1.

## 6. Conclusions

The process of formation of wormhole is thus by singularity convergence between two black hole.

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## REFERENCES

- [1] Introductory Lectures on Black hole Thermodynamics By Ted Jacobson (page - 15).
- [2] A note: The Big Bang Theory by Prithwijit Sarkar (page - 2).