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Distortion and Heating Galaxy Clusters by Supergiant Black Holes

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ABSTRACT: In the present work, the orbital speed and temperature of energetic particles and excited atoms at distances many times beyond the Schwarzschild radius have been determined precisely. The mass, radius, density, colour and thickness of an accretion disc of black holes, as well as the rotational speed, temperature, kinetic energy, and potential energy of particles in the accretion disc, may change rapidly due to the turbulent fabric of a black hole and the rapid change in the spinning speed of a singularity ball. The gravitational force and centripetal force are equalized to calculate the orbital speed of energetic particles. The orbital kinetic energy of particles at a distant point of a black hole is thermalized to measure the temperature of black hole particles. Wien's law is involved in the crucial calculation of the wavelength of cosmic radiation and the energetic particles of a black hole, typically accelerated proton particles at the external edge of a black hole. The mass, radius, and accretion disc colour of black holes are changeable. The planetary mass black hole has a tiny radius, huge density, and the hottest accretion disc of energetic particles orbiting it. Indeed, stellar mass black holes, supermassive black holes, and supergiant black holes have yellow, red, and whiter accretion discs with lower temperatures as compared to the blue and hottest accretion disc of tiny mass black holes, typically the Jupiter mass black holes, since collecting enough amount of mass from the surface of planets and stars during direct interaction or collision with them. The planetary mass black holes could be formed from a collapsed amount of mass in the heart of a black hole to a superparticle, and as superparticles escaped to space to give birth to newborn lower mass black holes. The massive black holes are formed from the collapse of a sufficient amount of mass and the death of stars, or grow rapidly by collecting additional mass from their surroundings or companion stars. The hydrostatic balance of a black hole and its singularity sphere enhanced the evolution and dynamics of the entire shapes of black holes.

KEYWORDS: Orbital speed of particles; Equivalent temperature of particles; Birth of Black holes; Supergiant Black Holes; Superparticles degeneracy pressure; Tidal Disruption of Stars; Galaxy Clusters.

1. INTRODUCTION

The black hole could be formed from the dead heart of collapsed stars or born from escaped superparticles. A supernova is an explosion of a star initiated when the nuclear fuel of this massive star is exhausted, or the hydrostatic balance is suspended at its core entirely. The birth of a star originates from the collapse of gas particles in the stellar nebula, and the death of a star occurs rapidly as its core collapses due to the exhaustion of its fuel, and its balance is disrupted [1, 2, 3, 4, 5, 6, 7]. The collapsed heart of stars may become a white dwarf, neutron star, or black hole, depending on the mass of the dead star. A black hole is a place where atoms, molecules, subatomic particles, and photons in its accretion disk are distorted, accelerated, and heat up rapidly. The black hole can be classified into low mass black holes and high mass black holes according to its mass and event horizon radius. Low-mass black holes have masses comparable to those of stars, planets, mountains, and rocks. Yellow and blue accretion discs of energetic particles orbit the stellar mass black holes and planetary mass black holes. The mass of a high mass black hole may exceed the mass of a galaxy or galaxy clusters. Red and white colour accretion discs of matter and energy are orbiting supermassive black holes and supergiant black holes. The density and temperature of low-mass black holes are higher than those of massive black holes. The gas and atoms may be torn apart urgently when entered directly into the accretion disc of a low-mass black hole, because the density of a tiny mass black hole is incredibly high. The matter in an accretion disc of a tiny mass black hole orbits the dense ball of a singularity at the nearest point. The distance between the singularity in the heart of a tiny mass black hole and its accretion disc of matter and energy is closer as compared to high mass black holes. The black hole singularity in the heart of a tiny mass black hole has a huge impact on the acceleration, disruption, distortion, and heating up of particles in the accretion disc. The singularity tunnel waves' effects are annihilated and reduced on the accretion disc of a supermassive black hole. The distance between the singularity in the heart of a high mass black hole and its accretion disc incredibly high; as a result, the accretion disc of a supermassive black hole glows with particles at a lower temperature.

Black holes are categorized by their mass into two main types: stellar-mass (low-mass) black holes and supermassive (high-mass) black holes. While they share basic structural features like a singularity and event horizon, they differ vastly in their formation, size, and tidal effects. Low-mass (stellar-mass) black holes form from the dead heart of massive stars (3-200 solar masses). They have a tiny size, huge density, and strong tidal forces [8, 9, 10, 11, 12, 13 , 14, 15, 16, 17]. A low-mass black hole has a denser singularity ball at its heart, and the hottest accretion disc orbits it at a few meters and centimetres. Indeed, high-mass (supermassive) black holes (millions to billions of solar masses) sit at galaxy center, possess much weaker tidal forces at their event horizon, and grow by merging or consuming gas. Despite the supermassive black hole containing a dense singularity ball, a maximum number of superparticles, and condensed dark fabric matter at its core, but far away from an accretion disc. Due to the largest event horizon radius, gas particles are orbiting the supermassive black holes at a lower speed and minimum temperature. The supergiant black hole is another type of black hole with masses millions to billions of times the mass of the Milky Way Galaxy, and a radius of 20 to billions of light-years. The supergiant black hole formed from a collapsed enough amount of matter inside a parent supergiant black hole before a big bang event. The parent supergiant black hole existed before initiating the formation of our visible universe. An accretion disc orbits the parent supergiant black hole, which has a mass trillions of times the mass of the visible universe, and dragged a portion of matter from this huge accretion disc to form a big bang singularity. The Big Bang singularity was formed inside a parent supergiant black hole and escaped into space to form our visible universe after evaporation. The supergiant black holes with a mass of our visible universe could be formed inside a parent supergiant black hole before and after the Big Bang event, even forever. The supergiant black holes, with masses comparable to those of several galaxies and galaxy clusters, are still widely available inside the visible universe; they could have formed from the evaporation of a cosmic mass black hole after the Big Bang event. The second probability of the formation of a supergiant black hole is that it could be formed from collapsing the whole accretion disc of quasars into the heart of a supermassive black hole to feed it and accelerate its growth. Both probabilities are right and possible to form a supergiant black hole. The supergiant black hole can distort a maximum number of galaxies in its external edge or devour them at once. A large and whiter accretion disc about 20 to thousands of light-years orbits a supergiant black hole. The accretion disc and galaxy cluster had been warped steeply and accelerated rapidly around this cosmic monster.

The main objectives of this study are to calculate the orbital speed **v** and Temperature **T** of accelerated Particles at a distance **r** from a black hole.

2. ORBITAL SPEED AND TEMPERATURE OF PARTICLES

The orbital speed of a particle at a distance **r** from a black hole can be described by a relativistic formula, which approximates the Newtonian formula at large distances, and Keplerian orbits [18, 19]. The kinetic energy of particles can be used to measure their temperature and thermal energy, and determine photon wavelengths that are radiated from these energetic particles. The temperature of accelerated particles near a black hole depends on the observer's frame of reference and is distinct from the black hole's intrinsic Hawking temperature. An equation of the Gravitational acceleration $\boldsymbol{g(r)}$ and Potential energy $\boldsymbol{\phi(r)}$ of the stars, galaxies, and gas bubbles at a distance $\boldsymbol{r}$ from the external surface of a black hole:

$$\boldsymbol{g(r)} = \frac{GM_{BH}}{r^2} \quad (1)$$

$$\boldsymbol{\phi(r)} = \frac{GM_{BH}}{r} \quad (2)$$

$$\boldsymbol{R_s} = \frac{2GM_{BH}}{c^2} \quad (3)$$

$$\boldsymbol{v} = \sqrt{\frac{G\,M_{BH}}{r}} \quad (4)$$

Where ($\boldsymbol{M = M_{BH}}$) is the Mass of a Black Hole, $\boldsymbol{R_s}$ is the radius of a black hole, which is called the Schwarzschild radius, and (**c=300,000 km/s**) is the escape velocity of any object from the external surface of a black hole at the speed of light in space. Thusly, a gravitational constant is ($G = 6.674\,x\,10^{-11}\,\frac{N.m^2}{kg^2}$), and $\boldsymbol{v}$ is the tangential velocity which is called the orbital velocity of any objects or particles with mass **m** orbit a black hole at a distance **r**. If orbital kinetic energy of particles ($KE = \frac{1}{2}\boldsymbol{mv^2}$) were thermalized ($E = \frac{3}{2}\boldsymbol{k}$**T**):

$$\frac{1}{2}\boldsymbol{mv^2} = \frac{3}{2}\boldsymbol{k}\mathbf{T} \quad (5)$$

$$\boldsymbol{T} = \frac{mv^2}{3K_B} \quad (6)$$

Where $\boldsymbol{T}$ is the temperature of accelerated particles and the hottest objects due to the gravity of a black hole. The Boltzmann constant is ($\boldsymbol{K_B = 1.38\,x\,10^{-23}\,J/K}$). Wien's Displacement Law plays a crucial role in measuring the surface temperature of stars and hot celestial objects [20]. Following is **Wien's Law**, which is necessary in measuring the surface temperature of the hot objects:

$$\boldsymbol{\lambda_{Max}} = \frac{0.0029\,m.K}{T} \quad (7)$$

$$\boldsymbol{t} = \frac{2\pi\,r}{v} \quad (8)$$

Where **E** is a thermal energy of particles and celestial objects, and $\boldsymbol{\lambda_{Max}}$ is the maximum wavelength of a photon particle, it is inversely proportional with a temperature **T**. The orbital period or orbital time **t** is the time it takes an astronomical object to complete one orbit around another object at a distance r, such as a planet around a star or a moon around a planet. The internal planets of the Solar System orbit it at the shortest time periods and at the highest speeds as compared to the external planets of the Solar System. This time varies depending on the object's distance from the central body and the gravitational pull exerted by it. Earth's orbital period around the Sun is approximately 365.25 days, which we refer to as a year, since Earth orbits the Sun at a distance of 150 million kilometers at orbital speed 30 km/s. In astronomy, the Luminosity term is utilized to measure the radiated electromagnetic energy per unit time. It is the radiant power emitted by a light-emitting object or the total amount of electromagnetic energy emitted per unit of time by a star, Quasars, planet, galaxy, or other celestial objects [21, 22, 23, 24, 25]. The luminosity of stars is changeable due to their mass, radius, density, nuclear fusion processes, central pressure, and surface temperature. The surface area and effective temperature of stars may participate directly in an increment and decrement of stellar luminosity and its brightness.

$$L = \sigma 4\pi r^2 T^4 \quad (9)$$

If an Eddington luminosity (L_{Edd}) in units of watts (W):

$$L_{Edd} = 1.26\ x\ 10^{31} \left(\frac{M}{M\odot}\right) W \quad (10)$$

$$P = L = \frac{(KE = E)}{t} \quad (11)$$

Where **(L=P)** is the luminosity of Stars and hot celestial objects equalized to power, **M** mass of Star, **L** is the luminosity of stars as compared to the luminosity of a Sun L⊙. **M** is the mass of stars, and mass of Sun is ($M\odot = 2\ x 10^{30}\ kg$). If a star has twice the mass of the Sun, then: $L_{Edd} = 1.26\ x\ 10^{31} \left(\frac{M}{M\odot}\right) = 1.26\ x\ 10^{31}\ x\ 2.$ $L_{Edd} = 2.52\ x\ 10^{31}\ W$. Then, ***A*** is the surface of Stars and hot objects, the radius of stars **r** that determined in meters, ***T*** is the effective surface temperature of Stars and black body radiations that measured in kelvins, and σ is the Stefan–Boltzmann constant with a value 5.670374419×10^{-8} W·m^{-2}·K^{-4}. In astronomy, luminosity is defined as the total amount of energy it radiates per unit of time across all wavelengths of the electromagnetic spectrum. The luminosity is in units of watts or Joules per second. The Andromeda Galaxy has an estimated luminosity **L** of approximately $2.5\ x\ 10^{10}$ times the Sun's **L⊙**. $L = 2.5\ x\ 10^{10} x$ L⊙ $= 2.5$ x $10^{10}\ x\ 3.828\ x\ 10^{26} W$. Then the luminosity of the Andromeda galaxy, as compared to the luminosity of Solar mass stars, was determined to be: $L = 9.57\ x\ 10^{36}\ W$. The Andromeda galaxy contains billions of stars, and its luminosity is high enough to be seen with the naked eyes.

3. STARS AND GALAXY LUMINOSITY EVIDENCE

The surface temperature of stars and particles increased rapidly while orbiting a black hole, increasing the luminosity of the entire galaxy. The luminosity, surface temperature, and nuclear fusion processes of stars are changeable in an accretion disc of a galaxy; typically, the stars orbit the black hole in turbulent orbits. The surface temperature and luminosity of stars have increased and decreased rapidly since passing to the closest point or farthest point from a black hole. Wien's Law describes the inverse relationship between the temperature of a blackbody and its peak wavelength of emitted radiation, meaning that hotter celestial objects, such as stars, galaxies, Quasars, blue stars, and galaxy clusters, emit at shorter, bluer wavelengths. In comparison, cooler objects peak at longer, redder wavelengths, such as red giant stars and the Moon [26, 27, 28, 29, 30]. Luminosity, the total photon energy emitted per unit time, is a crucial piece of evidence for understanding stars and galaxies—the hottest celestial objects emit photons with high frequency. Blue massive stars can emit photons with high energy and frequency as compared to yellow and red giant stars. The blue massive stars have the hottest surface temperature and are incredibly luminous. The mass, gravity, central pressure, and central temperature of massive stars are high enough to burn most of their fuel within a few billion or millions of years; as a result, the lifetime of a blue star is shorter than that of the yellow stars. The lifetime of a solar mass star is very long. The Sun is an average star that has been burning its fuel gradually for 5 billion years, and it will continue for another 5 billion years. The Sun may become a white dwarf after its fuel is exhausted entirely for the next five billion years. The external surface temperature, luminosity, central pressure, and central temperature of stars may increase rapidly when they enter the zone of a black hole or orbit it closely due to tidal forces and the powerful gravitational field of a black hole. The black hole can tear apart the companion stars or cause them to burn their nuclear fuel violently, causing them to glow rapidly. The companion stars, celestial objects, and galaxy clusters may be affected by the powerful tidal force of a black hole, specifically supermassive black holes and supergiant black holes. The supermassive black hole is hosted in the core of a galaxy, and Quasars. It plays a crucial role in the growth, death, heating, and acceleration of stars, galaxies, and particles.

Problem 1: Calculate the orbital speed v and **T** temperature of particles on the surface of a blue star while orbiting a supermassive black hole with a Mass 2 billion times greater than the Sun at distances **10**, **20**, **30**, **40**, **50**, **60**, **70**, **80**, **90**, **100** Schwarzschild radius **Rs** of this supermassive black hole?.

The mass of a supermassive black hole is approximately 2 billion solar masses ($M_{BH} = 2x10^9\ x\ 2x\ 10^{30} kg$) , and its radius is the Schwarzschild radius ($R_s = \frac{2GM_{BH}}{c^2} = 5.93\ x\ 10^{12}\ m$). The Blue star orbits the supermassive black hole at variable distances **r** from the external surface of the supermassive black hole, where ($r = n\, x\, R_s$). Thus ($n = 10, 20, 30, 40, 50, 60, 70, 80, 90, 100$). Then, the orbital speed of Blue star at distance 10 Schwarzschild radius ($r = n\, x\, R_s = 10\, R_s$) is ($v = \sqrt{\frac{G\, M_{BH}}{r}} = 67036\ \frac{Km}{s}$). I need to compute the orbital speed of Star, the fraction of light speed (**v/c=0.2236)**, Time period of star ($t = \frac{2\pi\, r}{v}$=**64.1 days**) and the kinetic energy **KE** of a proton particle equivalent to thermal energy **E** of a proton particle on the surface of a blue star at a distance 10 **Rs** of the supermassive black hole, it is approximately (**KE=E=23497 KeV)**. Where the mass of a proton particle is ($m = m_P = 1.6726\, x\, 10^{-27}$ **kg**), the temperature of a hydrogen atom or proton particles on the surface of a blue star at distance (**10Rs**) is very high, it is approximately $\left(T = \frac{mv^2}{3K_B} = 1.81\, x\, 10^{11}\, K \right)$. The protons temperature in the edge of a black hole may exceed billions of kelvins due to the powerful gravitational acceleration of a black hole. The blue star orbits the supermassive black hole at a distance of 10 to 100 times the Schwarzschild radius (r=n Rs). At a distance (**r**=10 Rs), the orbital speed of stars and the Hydrogen temperature are enormously high. At a distance (**r**= 100 Rs), the orbital speed of stars and the Hydrogen temperature are enormously low.

Table 1: Orbital Speed and Equivalent Temperature of Proton Particles Vs. Radius of n Multiple Schwarzschild Radius.

r=n Rs	v (km/s)	v / c	Period (days)	Kinetic-equiv. T (K)
10	67,036	0.2236	64.1 days	1.82×10^{11} K
20	47,401	0.1581	181.2 days	9.08×10^{10} K
30	38,703	0.1291	333.0 days	6.05×10^{10} K
40	33,518	0.1118	512.6 days	4.54×10^{10} K
50	29,979	0.1000	716.4 days	3.63×10^{10} K
60	27,367	0.0913	941.7 days	3.03×10^{10} K
70	25,337	0.0845	1187.0 days	2.59×10^{10} K
80	23,701	0.0791	1450.2 days	2.27×10^{10} K
90	22,345	0.0745	1730.2 days	2.02×10^{10} K
100	21,199	0.0707	2026.0 days	1.82×10^{10} K

The orbital speed of the blue star at a distance r from a Supermassive Black Hole changes due to a gravitation and tidal forces. The stars orbit a black hole quickly at the lowest distance from the black hole. It is moving slowly in distant points. The stars have a turbulent elliptical orbit due to the powerful gravitational field of a black hole. The stars are speeding up at the minimum distance from a black hole, and their velocity slows down at the largest radius from a black hole. The Tidal Forces increased as a star in a close orbit approaches the pericenter (closest point) of its orbit, the black hole's immense tidal forces can stretch and compress the star. This compression can generate strong shocks, rapidly heating the star's outer layers or even its core to temperatures comparable to the star's initial core temperature (millions of Kelvin). If the black hole is actively feeding by additional mass from its surrounding, it is surrounded by an accretion disk of infalling gas and dust particles. This material gets incredibly hot due to friction and gravitational energy release as it spirals inward.

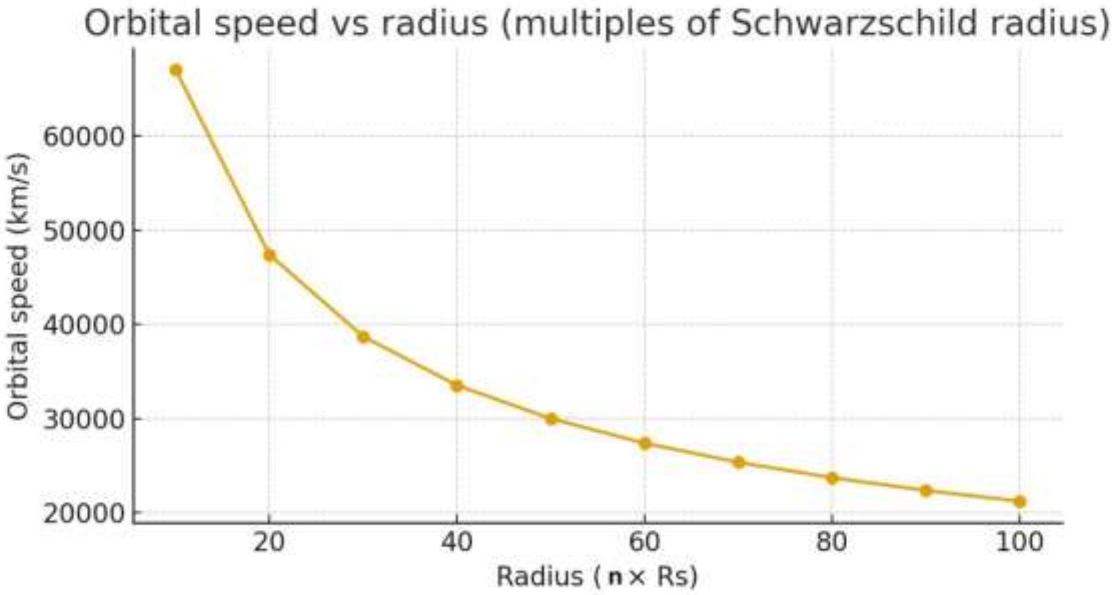

Fig. 1. Orbital Speed of a Blue Star at distance r from a Supermassive Black Hole.

The proton and Hydrogen atoms have a variable Temperature since the blue star is at a variable distance r from a Supermassive Black Hole due to the powerful and weakest gravitational field of a black hole. The stars orbit a black hole in an elliptical orbit. The surface temperature of stars has increased rapidly due to the powerful gravitational field of a black hole in the narrower orbits of stars. The orbital speed of stars and proton temperature could be dropped quickly since orbiting a black hole at distant points. The temperature of a proton particle on the surface of a blue star is typically millions to billions. The thermal energy of proton particles is converted to powerful kinetic energy and released as thinner plasma jets on the surface of an excited star. The blue star has powerful plasma jets and coronal mass ejections due to the acceleration of proton particles on its surface. The orbital speed of a blue star and its surface temperature dynamically increased while the star was orbiting a supermassive black hole at closest point to the black hole. The surface temperature of a blue star is vastly lower than the temperatures found in the inner regions of a supermassive black hole's accretion disk, which can reach millions to hundreds of millions of Kelvin. Particles in an accretion disc of a black hole are accelerated to thousands of kilometers per second, and their equivalent temperature changes randomly. The orbital radius of a star generally does not directly determine its inherent surface temperature, but its proximity to a black hole can induce extreme heating events. The nuclear fusion processes in the heart of stars accelerate to burn a huge amount of fuel and glow enormously. The lifetime of stars perturbed by a black hole is much shorter than the lifetime of stars surviving in a distant location from it. The effective surface temperature of stars and their luminosity are enhanced due to the turbulent force of a black hole.

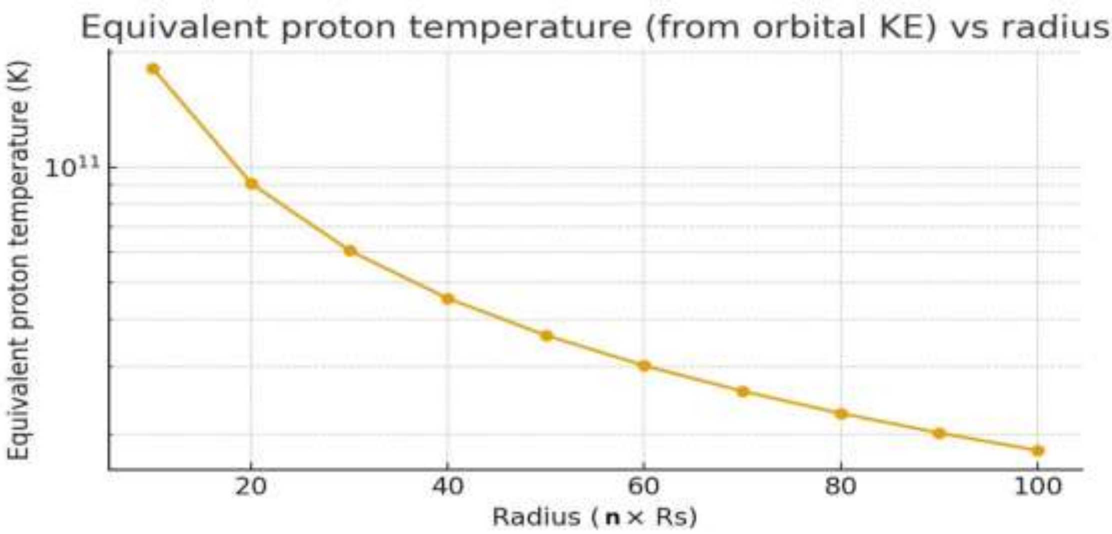

Fig. 2. Proton Temperature at distance r from a Supermassive Black Hole.

4. TIDAL DISRUPTIONS OF STARS AND GALAXY CLUSTERS BY BLACK HOLES

The supermassive black hole and a supergiant black hole are among the largest and violent types of black holes that act and are directly involved in the formation, evolution of galaxies and galaxy clusters. The Stars and galaxy clusters are formed and accelerated due to turbulent forces and gravitational waves from low-mass black holes and high-mass black holes. The galaxy contained multiple types of black holes, such as planetary mass black holes, black dwarfs, stellar mass black holes, and supermassive black holes that are hosted in the heart of a galaxy. The star may die since its fuel is exhausted and its core collapses inward under the gravitational effect. The black dwarf was formed from the dead heart of a solar mass star. The stellar mass black hole is born from the collapsed heart of a massive star during an explosion event of stars, which is called a supernova event. The stars in a distant place from the black hole may burn their fuel uniformly and survive for a longer time. The stars at the nearest point to a black hole are faced toward the turbulent force of a black hole, and their speed is accelerated randomly. The black hole may change the mechanism of a fuel’s burning in the core of companion stars. The companion stars are influenced by powerful gravitational tunnel waves and tidal force of a black hole, specifically, the stars were located at the nearest point to the edge of a black hole. The nuclear fusion processes increased, and multiple fusion processes were initiated by burning several types of atoms in the core of a star. The fuel of a star could be exhausted in a short time; as a result, the companion stars may die at the minimum possible time. The lifetime of companion stars could be very narrow, and their fuel can vanish in thousands or millions of years. The black hole and neighbouring stars are in a turbulent and violent position. The black holes are involved in the formation of stars from stellar nebulae, participating in the mechanism of accelerating the fuel burning in the core of stars. The supermassive black hole hosted in the core of a galaxy may collect enough gas and dust particles from the interior shell of a galaxy and act directly in the mechanism of star formation and galaxy evolution. The supermassive black hole is the largest and violent type of black hole in the galaxy structure. The low-mass stars and high-mass stars could be distorted and accelerated by a tidal force, turbulence, and the gravitational field of a supermassive black hole. The stars are speeding up in their velocity since passing by the supermassive black hole. Typically, such stars are found in the core of a galaxy.

The AGN could be hosted by a supermassive black hole and filled with accumulated gas and dust particles. The gas and dust particles in the heart of AGN had been distorted and heated violently to millions or billions of kelvins due to the tidal force of the supermassive black hole. A Tidal Disruption Event (TDE) occurs when an object, typically a star or planet, gets too close to a black hole and is shredded by its immense tidal forces. The stars are being dragged and disrupted by the powerful tidal force of a supermassive black hole (SMBH) in galactic nuclei [30, 31, 32, 33, 34, 35]. Powerful disruptions occurring within galaxy clusters by supergiant black holes. The stars are spiralling into the supermassive black hole and feeding it with additional mass and energy. The mass from the external surface of stars and molecules in an accretion disc of a black hole could be dropped rapidly into the heart of a black hole, and release high-energy radiation, such as Gamma rays, X-rays, and UV radiation. Quasars and AGN host supermassive black holes and an excited state of gas and dust particles accumulated there. A black hole strips a significant amount of gas and dust particles from the external surface of stars, and jets of energetic plasma appear at the poles of a black hole. Black hole birth would rely on the death of stars or the collapse heart of a nuclear fusion ball in the core of the black hole itself. The nuclear fusion ball is a sufficient amount of gas and dust particles that could be dragged inwardly into a black hole or collapse steeply to form a superparticle. The surviving superparticle gives birth to a newborn black hole. The black hole plays a crucial role in the formation and evolution of stellar nebulae, stellar bubbles, stars, planets, galaxies, superparticles, accelerating lifetime of stars, and galaxy clusters. The gas and dust particles are influenced and accumulated by tidal forces and gravitational waves of compact objects, including white dwarfs, neutron stars, and black holes. The speed and luminosity of gas and dust particles increased rapidly by the tidal force of dense and massive celestial objects.

5. BIRTH OF BLACK HOLES

The birth, death, evolution, and evaporation of black holes are among the longest mysteries and deepest debates in the history of science and the scientific community. Most scientists believe that the black hole could be formed from the collapsed heart of massive stars after its fuel was exhausted and its nuclear fusion had ceased. The hydrostatic balance of the star may face a critical moment, and its probability of an explosion is closest anyway. Black holes are born from the catastrophic explosion and ultimate death of low-mass stars and massive stars when their cores collapse under immense gravity after fuel runs out, eventually forming stellar-mass black holes and black dwarfs. Other types, supermassive black holes, form at galactic nuclei and Quasars, typically from earlier black holes that were growing over time or from the collapse of massive primordial gas clouds, or create and grow since they tear a significant amount of mass from companion stars. The process for stellar mass black holes involves a supernova explosion, leaving behind an incredibly dense core called a neutron star or stellar mass black hole, according to the mass of a dead star [36, 37, 38, 39, 40]. A black hole is a collapsed ordinary matter and energy, and the distorted dark matter and energy in the region where the electromagnetic spectrum is stretched, dispersed, travelling, and passing through it after redshifted. Indeed, the black hole could be formed during the collapse of a star's core and the survival of superparticles. The black dwarf and stellar mass black hole formed from the collapsed core of stars. The cosmic mass black hole formed from the collapse of a high enough amount of matter and energy inside a parent supergiant black hole. The cosmic mass black hole is a superparticle that could be formed inside a common supergiant black hole and escaped into space to evaporate and produce the visible universe. Black holes with variable masses and different sizes are born amazingly due to their formation and evolution in different ways and through multiple mechanisms. Black holes can be classified into three main categories: low-mass black holes, Supermassive black holes, and Supergiant black holes.

5.1 Low Mass Black Holes

A Low mass black hole is a popular kind of black hole that could be formed from the dead heart of stars or from surviving superparticles. The mass of a low-mass black hole could be similar to the mass of stars, planets, mountains, rocks, the human body, and agricultural seeds. In fact, the formation and evolution of black holes have different mechanisms. The stellar mass black hole could be formed directly from the collapsed heart of massive stars, but the black hole with a tiny mass, as the mass of planets and rocks, could be formed from collapsed matter inside a black hole as superparticles. A black hole is formed from the gravitational collapse of a high-mass star at the end of its lifetime is called a stellar mass black hole. The minimum mass for a black hole formed by this process is estimated to be around 3 to 200 solar masses. The range below this is a black dwarf that could be formed from the dead heart of a solar mass star, or is not expected to be formed directly from such standard stellar processes. The planetary mass black hole or micro black hole could be formed from surviving superparticles. The superparticles, likely the mass of any rocks and planets, could be formed from collapsed matter inside a black hole and escape directly into space to become a singularity for a newborn black hole. The galaxies and the universe are still filled with superparticles and planetary mass black holes. The radius of a planetary mass black hole could be a few centimetres or meters. Micro black holes have a lower radius and a minimum collapsed mass inside them. The planetary mass black hole or micro black hole could not have been formed through the processes where the core of a massive star collapses inward under the gravitational effect to produce a black hole. The tiny mass black hole could be formed directly from collapsed matter and energy inside the black hole itself. The matter and energy may be dragged inward from an accretion disc of a black hole. The matter could be drawn into the event horizon of a black hole to form a nuclear fusion ball. The nuclear fusion ball in the center will face additional pressure and the powerful tidal force of a black hole to collapse and contract inward. Indeed, the collapsed heart of a nuclear fusion ball under the gravitational effect may produce an ultra-massive particle called the superparticle. Superparticles can grow by collecting mass from their surroundings to travel into the depths of a black hole and collide with a singularity at its heart. Most of the superparticles may collide with a heart of singularity and hang there for a longer time before a black hole evaporates.

5.2 Supermassive Black Holes

A supermassive black hole (SMBH) is a spacious in size and massive black hole with millions to billions of times the mass of the stars and Sun, typically found at the heart of active galactic nuclei, including our own Milky Way Galaxy and the neighbouring galaxy the Andromeda or it can be founded in heart of Quasars widely. These black holes are invisible to the naked eye or normal telescopes because light cannot escape from their gravitational pull easily, but their existence can be confirmed due to the release of radiation in their accretion disc or by observing the behaviour of excited nearby stars, dust particles and gas molecules. An active galactic nucleus (AGN) is a region at the center of a galaxy where gas and dust particles have condensed and accumulated. The gas and dust particles have enough chance of friction, vibration, and collision that they emit a significant amount of energy across the electromagnetic spectrum. Most active galaxies host an AGN. A supermassive black hole can collect enough amount of matter in its accretion disc to release the non-stellar radiation from an AGN [41, 42, 43, 44]. Active galactic nuclei are the most luminous sources of electromagnetic radiation in the universe and are necessary to discover distant objects. The AGN has a massive central black hole, a high enough amount of gas and dust condensed in its accretion onto the black hole, and the presence or absence of powerful plasma jets. Supermassive black holes are found at the heart of luminous galactic cores, that called Quasars, acting as the powerful source for these hottest and luminous giant cosmic objects. Indeed, if enough amount of matter like gas, dust particles, and stars falls into the supermassive black hole, it forms a hot, energetic, glowing accretion disk that emits a powerful radiation spectrum, making the quasar visible across millions or billions of light-years away from Earth. The powerful jets of particles and gas that travel at nearly the speed of light can be released from a supermassive black hole due to its powerful gravity, density, and intense singularity tunnel waves effect. An accretion disc of a black hole and accretion disc of a galaxy are twisted steeply around the supermassive black hole, especially AGN. The black hole is a large sphere of an event horizon resident in the core of a galaxy to enhance its stability and keep it more homogeneous. An accretion disc is a bright and hottest state of matter and energy warped and accelerated in the edge of a black hole. Gas and dust particles are abundantly at the depth core of galaxy are crucial to feed a supermassive black hole and enhance the mechanism of a galaxy evolution.

Indeed, newborn stars could be formed from an accretion disc of a supermassive black hole, despite the formation of stars in the stellar nebulae. An accretion disc of a supermassive black hole has a large thickness, and it contains an adequate amount of gas and dust particles to enhance the probability of creating stars and celestial objects. The gas and dust particles in the stellar nebula are not high enough to form such large numbers of stars in the galaxy disc. It is possible that an accretion disc of a black hole participated in the creation and evolution of stars, celestial objects, and planets of a galaxy. The supermassive black hole is surrounded by a huge accretion of matter and energy in its outer shell beyond the event horizon. The gas and dust particles in the accretion disc could be accelerated, accumulated, and collide abundantly to form newborn stars, and push them violently to survive in the galaxy disc. Different types of Materials and stars are resident in the core of galaxy. The supermassive black hole contains a dense ball of singularity, and a warped sphere or flatted disc of an event horizon from outside. The singularity could be formed from the collapsed core of a star and steeply fused nuclear fusion balls in the depths of a black hole. The event horizon is filled with fabriton particles that are warped around the black hole singularity. The vacuum and intermediate distances among fabriton particles are very low, and even photon particles are struggling to penetrate through the interior shells of a black hole. The electromagnetic radiation emitted from the external surface of a nuclear fusion ball is redshifted as it passes a black hole. The atomic fusion ball is formed by spiralling and dragging matter from the accretion disc, and it could be compressed steeply in the depths of a black hole to form superparticles. The superparticles are born from the collapsed heart of a nuclear fusion ball in the depths of a black hole due to singularity tunnel waves. The matter and black hole particles are highly concentrated and compressed in the structure of a singularity and at the interior shell of a black hole. A supermassive black hole is a powerful celestial object and essential for the formation, evolution, and protection of a galaxy arms. The supergiant black holes may strip gas and dust particles from a galaxy at a distant point or tear stars from neighbouring galaxies. Galaxy clusters could be twisted and accumulated by gravitational tunnel waves emanating from a supergiant black hole. It is the main reason for the formation and evolution of galaxy clusters in the visible universe.

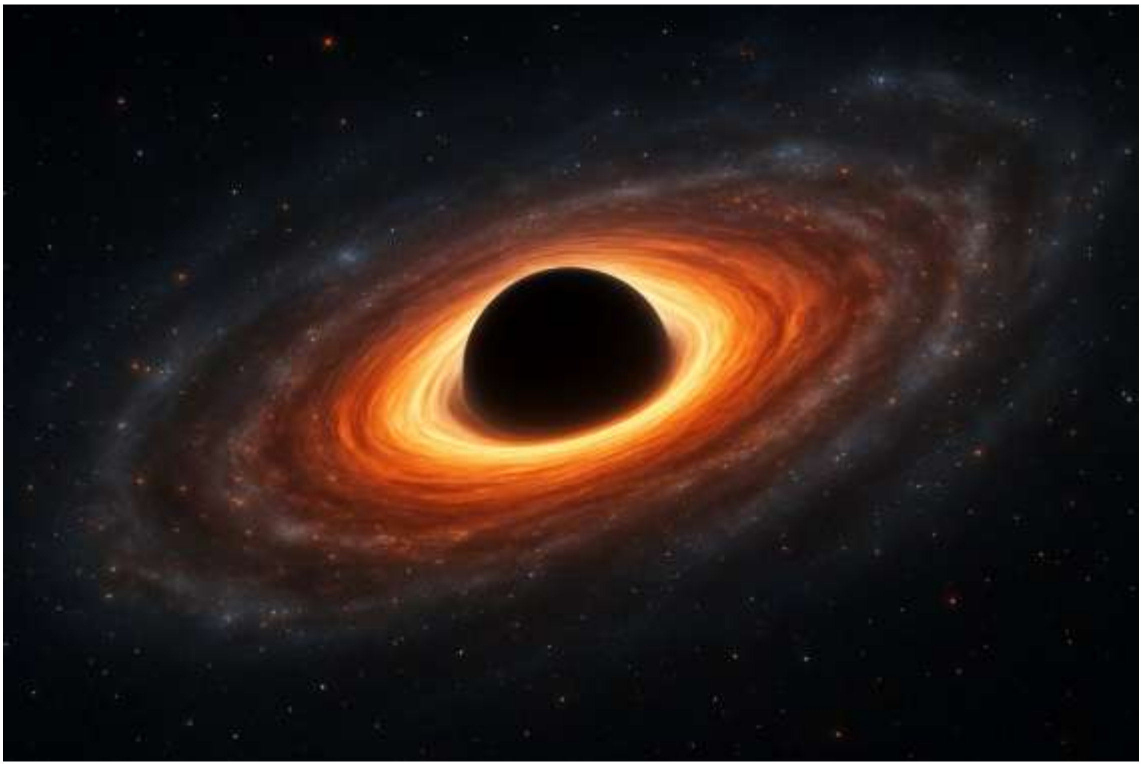

Fig. 3. Galaxy Disc and An Accretion Disc Warped Steeply by Supermassive Black Hole

5.3 Supergiant Black Holes

A Supergiant Black Hole (SGBH) is the largest type of black hole available in the visible Universe and can cause turbulence and distortions in galaxy clusters and the cosmic web. It is formed from a high enough amount of matter and energy. The low-mass black holes could be formed immediately from dead stars or surviving superparticles. The supermassive black holes and supergiant black holes required a much violent environment to give birth to them, and the maximum amount of mass and energy can be accumulated to feed them to grow gradually into such a large size. The supermassive black hole or supergiant black hole could be formed from a high enough amount of mass and energy inside one of the largest kinds of supergiant black holes before a big bang event or during a big bang event few moments after the cosmic seed was evaporated and expanded rapidly. The visible universe may have been formed from a high enough amount of mass and energy inside a common and parent type of a supergiant black hole before a big bang event. The parent supergiant black hole has enough mass, density, gravity, pressure, turbulence, and tidal force to accumulate enough matter and compress it to a tiny point called the cosmic mass superparticle. The superparticle with a cosmic mass can succeed and escape from any possible collision with the super singularity at the bottom of a primary supergiant black hole. The cosmic mass superparticle escaped into space to evaporate rapidly and give birth to whole celestial objects, gases, dust particles, stars, primordial black holes, supermassive black holes, galaxies, supergiant black holes, and galaxy clusters in the visible universe. The supermassive black hole at the heart of an active galactic nucleus or quasar is surrounded from outside by enough amount of matter and energy. Indeed, a sufficient fraction of these gas and dust particles could be swirling inwardly into the core of a galaxy or quasar to feed a black hole and make it grow quickly. The stars near a supermassive black hole or supergiant black hole could be distorted, face powerful tidal forces, be heated up to burn their fuel quickly, and could explode in the shortest possible lifetime. The collapsed stars at the edge of a supermassive black hole or supergiant black holes may accelerate the collision, friction, and accumulation mechanism in matter at the accretion disc of a supergiant black hole. An accelerated amount of matter in the accretion disc can be spiralling inward towards the core of a supermassive black hole to produce a nuclear fusion ball and superparticles. The collapsed heart of a nuclear fusion ball can give birth to a new compacted object which is called the superparticle. The superparticles can travel against the singularity tunnel waves to collide with a singularity that is hosted in the core of a supermassive black hole to feed it with additional mass, to grow and become the largest type of black hole is a supergiant black hole. The supergiant black hole has the largest mass and size compared to low-mass black holes or supermassive black holes. The mass of a supergiant black hole exceeded the mass of supermassive black holes and the mass of galaxies.

The radius of a supergiant black hole exceeded light-years. The mass of a singularity in the heart of a supergiant black hole may exceed the mass of multiple galaxies [45]. The supergiant black hole can grow urgently when enough amounts of gas and dust particles are dragged into its heart. The supergiant black hole has the largest dark event horizon, and the maximum ring of the accretion disc is in white colour. The black hole singularity and interior zone of an event horizon are steeply distorted and condensed regions at the bottom of a supergiant black hole. The fabriton particles are dark matter particles that could be highly concentrated and accumulated at the edge of a singularity, even light and superparticles are struggling to penetrate the depth of a black hole or leave there easily. The fabriton particles are highly concentrated and compressed, so even light can't pass through them easily. The superparticles are only highly concentrated balls of collapsed matter and energy that can break the gravitational wall of the compacted fabriton particles to collide directly with a singularity or come out into space directly from the depth of a black hole. Superparticles are spiralling and swimming inward and outward around the black hole singularity, even escaping into space to become a singularity for a newborn black hole or evaporating into space as energetic particles or photons. Eventually, the supergiant black hole can be formed directly from the collapse of a huge amount of mass and energy inside the largest supergiant black hole as a surviving superparticle, or it may be born from the collapsed heart of stars, grown step by step by collecting mass and particles from its surroundings over a longer time. The quasars and AGN are a suitable environment for feeding and growing low-mass black holes quickly to become a supermassive black hole or a supergiant black hole. In the heart of quasars and AGN, a high enough amount of gas and dust particles are spiralling into the black holes, and superparticles could be formed abundantly and collide with the center of a black hole to grow as soon as possible. A supergiant black hole is acting directly on the formation, evolution, distortion, and heating up of the galaxy clusters. The supergiant black hole has enough mass, density, and a gravitational tunnel effect to combine galaxy clusters in a narrow zone on a cosmic scale. The dark fabric matter and energy could be distorted widely around the supergiant black hole, and the largest gravitational tunnel was formed during its transition through the cosmic fabric. The galaxy clusters are distorted and dragged to fill up that temporary tunnel continuously. Indeed, the stars, planets, and galaxies in the zone of a supergiant black hole may face a powerful tidal force and turbulence; as a result, they heat up and radiate powerful electromagnetic radiations. The supergiant black hole could be formed or grown from colliding binary black holes, neighbouring black holes, or merging sufficient numbers of low-mass and supermassive black holes, or tearing mass from their accretion discs. The stars, planets, stellar nebulae, an accretion disc, galaxy disc, and even a supermassive black hole in AGN could be twisted due to a supergiant black hole. The supergiant black hole can warp and accumulate the maximum number of galaxies, galaxy clusters, and even enhanced the stability of the visible universe.

The visible universe contains a maximum number of supergiant black holes, galaxy clusters, and twisted cosmic fabric. Indeed, the formation and evolution of stars, planets, stellar systems, galaxies, and galaxy clusters rely on the formation and evolution of black holes. The supermassive black hole increased the stability and evolution of a galaxy disc. The supergiant black hole plays a crucial role in the formation, protection, and evolution of galaxy clusters, and it is involved in enhancing their stability for billions of years.

The galaxy clusters are bound strictly to a supergiant black hole through a bridge of gravity. Gravity is a cosmic dark fabric that is warped steeply around the black hole or any celestial object. The supergiant black hole can attract, bind galaxies and merge number of them to build up galaxy clusters. The mass of a supergiant black hole exceeded the mass of thousands or billions of Milky Way galaxies. Its event horizon and its total radius exceeded light-years. Its gravitational field and tidal force are high enough to accumulate galaxies or tear them apart at once. There is a supergiant black hole surrounded by a large accretion disc and several distorted galaxies at a distance r from its center. The supergiant black hole can tear apart mass from stars and galaxies at distances billions of light-years away from its center. The supergiant black hole has the largest event horizon radius, a thick accretion disc of energetic particles, and is capable of accreting and heating galaxy clusters at distances of millions of years away. The galaxy clusters are accumulated, distorted, heat up, and are stabilized by the powerful gravitational waves of a supergiant black hole.

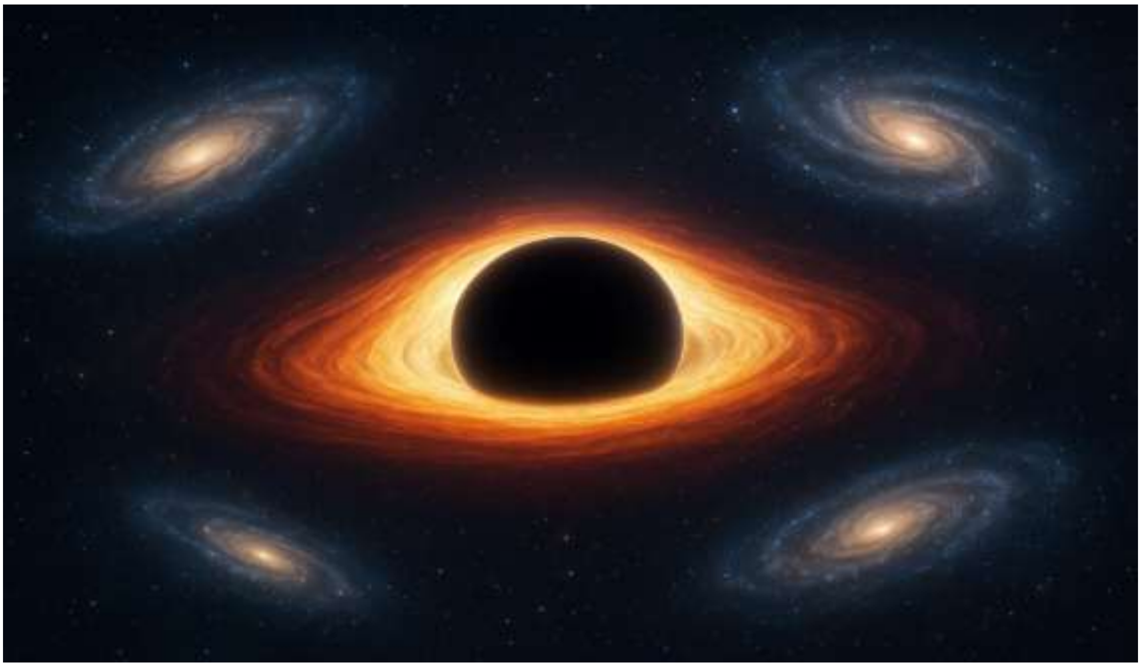

Fig. 4. Galaxy Clusters Distortion by a Supergiant Black Hole

6. NEIGHBOURING BLACK HOLES

Neighbouring Black Holes (NBH) are astronomical objects consisting of two or more black holes in close orbit around each other. Neighbouring black holes can orbit one another to a point where they tear apart mass from each other or collide. The visible universe is filled with such a binary system of black holes since two black holes orbit each other at the closest point to each other. Scientists have been struggling for many years to prove the existence of binary black holes because they do not allow the electromagnetic spectrum easily to escape and not easy to be detected by our own technology at this moment. However, if two or more black holes were to merge violently, powerful electromagnetic radiation and gravitational tunnel waves would be spread out as a result of their violent collision. The merging of two or more neighbouring black holes is a new mechanism for growing black holes in mass, density, energy, and size [46, 47, 48, 49, 50, 51]. If two or more black holes collided and combined may give birth to a newer, larger, and stronger type of black hole. The companion stars could collapse and feed their neighbouring black hole with additional mass and energy immediately. The lifetime of a companion star is shorter than other free stars. The companion stars of a black hole face powerful gravitational waves and tidal forces to burn their fuel and collapse in the shortest time. In fact, the gas and dust particles could be stripped from the external surface of a companion star by Black holes. Eventually, if multiple companion stars collapse and evaporate in the final moments, they definitely become the newborn black hole. If two or more companion stars collapsed beside one another may give birth to new Neighbouring black holes. The Neighbouring black hole can be formed from the collapse of two or more massive stars. The singularity and superparticles inside the structure of a black hole have huge mass, density, energy, and maximum angular momentum. The superparticles in the structure of a black hole may collide with a singularity ball or leave their parent black hole forever. The superparticle has enough density, power, and angular momentum to collide with a singularity of its companion black hole. The mass, density, event horizon radius, and accretion disc of a black hole could be increased or decreased at any moment. The black hole can evaporate immediately when its superparticles escape into space or are dragged by its companion black holes. The companion black hole can strip gas and dust particles from one another or attract superparticles from its neighbouring black holes. The lifetime of black holes can be extended or decreased according to their external effects. The neighbouring black holes are the most turbulent systems of celestial objects in the dynamic universe.

7. SURFACE TEMPERATURE OF A COMPANION STAR

The surface temperature of a companion star could be increased rapidly due to the turbulent and tidal forces of a neighbouring black hole. The companion star is the nearest star to a black hole and is influenced by its tidal force every moments. The gravitational waves emanate from the depth of a black hole and penetrate throughout the entire structure of a companion star every time. The companion stars are influenced by the neighbouring black holes, because a portion of their mass could be stripped by the black holes. The compact objects of the Universe, Such as black holes, white dwarfs, and neutron stars, can tear mass from companion stars to grow rapidly [52, 53, 54, 55]. The gas and dust particles in the structure of a companion stars are absorbing enough gravitational waves from their neighbouring black hole and acting directly on burning its fuel. The lifetime of a companion star is shorter and violent than that of other stars in the visible universe. Indeed, the maximum ratio of a fuel in a companion star may burn out every second of living beside cosmic monsters. The central pressure and thermal energy of any companion star had been increasing every moment. The nuclear fusion processes in the core of a companion star are accelerated to burn most of fuel; as a result, their surface temperature changes rapidly. Then its surface temperature and stellar colour had been changed according to the nuclear fusion processes in the core of a star and maximum temperature come out from core to the surface. The companion star has a violent nuclear fusion mechanism and the highest surface temperature due to the turbulent effects and tidal force of a black hole. The stars near a black hole may evaporate or burn their fuel to feed a black hole. The black hole can grow and glow when gas and dust particles are spiralling into an accretion disc of a black hole.

8. UNIVERSE DENSITY

The mystery and illusion of a universe’s total mass, size, radius, age and density have astonished the entire scientific community for decades. The density of the Universe changes according to the amount of matter and energy distributed on the large scale of the Universe. The universe's average density is extremely low, approximately a few hydrogen atoms per cubic meter after its expansion. For a compact object such as a black hole, its density is incredibly high. However, for a supermassive black hole or supergiant black holes with the same mass as the universe, its "average density" can be as low as that of water and air molecules, because its size and its event horizon are so enormous. Indeed, the matter is highly concentrated in the depth of a black hole, normally around a singularity sphere, and the density of a black hole increases, typically at the singularity edge, where fabriton particles are compressed one another. Cosmic fabric matter and energy could be distorted and compressed extremely around the black hole singularity; as a result, the density of a black hole changed from its center to the accretion disc. The fabriton particles are concentrated in the depth of a black hole, and ordinary matter could be accumulated and fused violently there to form black hole's superparticles due to the singularity tunnel waves. The average density of a black hole decreases as its mass increases; typically, supermassive black holes have the largest event horizon and an average density less than that of water or air, according to utilizing the Schwarzschild radius and density equation. In contrast, the average density of the observable universe and celestial objects is extremely low, and density decreases continuously due to cosmic expansion. Most of the mass and energy of the visible universe is concentrated and combined inside the compact objects of the universe. Compact objects, such as Black holes, white dwarfs, neutron stars, singularities, and black hole's superparticles, have a high density as compared to the average density of the Universe and normal celestial objects. Most mass of the visible universe is accumulated inside the compact objects, which prevents the rapid evaporation and expansion of the universe, and is necessary for extending the universe's lifetime. The lifetime of compact objects exceeded trillions of years. The neutron stars, white dwarfs, and black holes can accumulate and collect high enough mass and energy to enhance their core density and extend their lifetime. The black hole’s evaporation time required trillions of years to die and annihilate, especially the supermassive black holes. The black holes can be merged to become a new massive and powerful type of black hole; its core density increases, and its lifetime is extended. The black holes with the largest event horizon and mass can survive in the visible universe for a longer time and accumulate enough mass of the universe. The black holes are necessary celestial objects to save and store enough mass and energy, and enhance the stability of the visible universe. Black holes are directly involved in the formation and evolution of stars, galaxies, galaxy clusters, the cosmic web, and the whole universe.

We see light from celestial objects, and galaxies on the edge of the visible universe that were once close but are now incredibly far away due to cosmic inflation and its continuous expansion, making the observable sphere much larger and dim than its age, as proposed by scientists. The size, mass, radius, and density of the Visible Universe are among the longest debates [56, 57, 58]. What is the radius of a visible universe before a Big Bang event if we take the estimated mass in the observable universe?, The resulting size and radius are approximately those of a proton, and the density same as a Planck density before inflation. The length of the visible universe is now about 93 billion light-years after inflation and its rapid expansion. The radius of the observable universe is about 46.5 billion light-years, even though the age of the universe is only 13.8 billion years. The visible Universe, like another multiverses is formed inside a parent supergiant black hole. The Parent supergiant black hole is surrounded by the greatest and largest accretion disc of matter and energetic particles. The gas and dust particles from the accretion disc had been dragged and compressed into the depths of a parent supergiant black hole to form a cosmic mass superparticle. The cosmic mass superparticle can escape from a common supergiant black hole into space to evaporate as inflation and Big Bang Event and form all stars and galaxies of the Visible Universe. The story of the multiverse and visible universe started as collapsed matter into the core of a common supergiant black hole and survived from the parent black hole into infinite space to form a new universe. The superparticle that collided with the singularity of a parent black hole may become part of it, survive there for a longer time, and help it to grow during the superparticle's degeneracy pressure. The superparticles' degeneracy pressure worked against the contraction and annihilation of a black hole singularity due to gravity. The visible universe is a denser type of cosmic singularity, similar in size to the size of an atom and mass of the visible universe that was formed from collapsed matter and energy in the heart of a parent black hole before a Big Bang Event. The parent black hole is the largest known black hole, which existed before the Big Bang event to form cosmic seeds for the multiverse and our visible universe. It is the main origin of the visible universe and many other cosmos. The creation steps and final journey of the whole Universe bubbles are initiated in the parent black hole. The parent black hole is a cosmic superparticle creator, known as the compactor, due to compression and creation of the superparticles from collapsed matter and energy.

9. SUPERPARTICLES DEGENERACY PRESSURE IN THE HEART OF A SINGULARITY SPHERE

However, the concept of "superparticles degeneracy pressure in the heart of a singularity sphere" is based on speculative, non-standard theoretical models that are not part of the widely accepted Standard Model of particle physics or the current understanding of general relativity. In established astrophysics, degeneracy pressure is a real, quantum-mechanical effect that prevents the gravitational collapse of dense stellar remnants. It arises from the Pauli exclusion principle, which prohibits identical fermions (particles like electrons, protons, and neutrons) from occupying the same quantum state simultaneously. An Electron degeneracy pressure supports the existence of white dwarf stars, and their contraction is suspended in this way. The white dwarf star remains at the size of the Moon and planets. Neutron degeneracy pressure supports neutron stars to reach the size of a city. Black hole superparticles are remnant cores of collapsed hearts of stars and the compressed nuclear fusion balls inside a black hole. The superparticle is a highly dense state of matter and energy, comparable in size to atoms or subatomic particles, and its mass compared to the mass of stars and galaxies. Superparticles could be formed in a violent world, typically due to a supernova event, or they could be formed when an amount of matter is trapped and compressed steeply in the depths of a black hole. The concept of "superparticles degeneracy pressure" was recently proposed in some non-standard, speculative research papers, which suggest it as a potential mechanism to halt the contraction of a singularity, preventing a point of infinite density from forming. These models indicate that a sphere of these hypothetical particles could exist in hydrostatic balance within a black hole's core, counteracting the immense gravity. In summary, the idea combines two distinct theoretical concepts: the established physical principle of degeneracy pressure and the unproven hypothetical particles from supersymmetry theory, applying them to explain the speculative internal structure of a black hole singularity. This is not yet fully understood, and it's not yet an accepted part of mainstream physics. The concept of a superparticle degeneracy pressure is new and fundamental in explaining the most fantastic phenomena of the black hole singularity. The superparticles' degeneracy pressure sustained the existence of a black hole singularity and prohibited its contraction and annihilation to the zero point and infinite density. The singularity is a white and smooth ball of steeply contracted state of matter and energy in the size of atoms and mass of stars and the visible universe. Indeed, the heart of most black hole singularity could be bombarded by superparticles with great violence. The rapid spinning moment of a singularity sphere in the heart of dark fabric matter may build up a tiny tunnel to capture additional mass from its surroundings or make powerful gravitational waves that propagate throughout the entire structure of a black hole and the whole visible universe. The singularity tunnel waves may pass through the whole visible universe as electromagnetic waves propagate. The singularity tunnel waves may bring out enough information in the depths of a black hole.

The singularity has a powerful attraction and repulsion force. Fortunately, superparticles are powerful types of energetic particles that can collide with a singularity heart and become trapped there. The black hole's singularity can be bombarded by superparticles to feed it and make it grow urgently because the superparticles' degeneracy pressure and their binding energy can afford the extreme temperature of a singularity ball and keep it from evaporation. The Powerful binding energy, electromagnetic field, and gravity can capture most of the superparticles during direct collisions with the core of a singularity [59, 60]. The formation, evolution, and evaporation of a black hole and its singularity are only the Quantum effects, thermodynamic conversions, and dynamical phenomena of nature as a whole. In fact, the nuclei of a singularity sphere are bombarded by superparticles with a mass of planets, stars, and galaxies, and these superparticles may stick there for a longer time to build up the new violent singularity and the largest type of black hole, which is called a supermassive black hole or supergiant black hole. Indeed, the heart of a singularity ball is occupied by maximum numbers of the compacted superparticles. The singularity looks like an atomic structure according to the singularity atomic model. An atomic nucleus is completed by protons and neutrons, and electrons orbit it. In fact, the heart of a singularity sphere is filled with bombardment superparticles, and other energetic superparticles orbit its nuclei. The singularity core could be collided with by powerful superparticles, and turbulent superparticles may orbit it in the inner or outer shells of a black hole. The black hole singularity has powerful gravitational tunnel waves. It is highly rotating on its axis in the dark fabric. The singularity can build up a tiny tunnel in the dark fabric and produce powerful gravitational waves. The singularity can distort and vibrate the fabric of matter-energy in its outer edge. An atomic-sized tunnel around a spinning singularity can collect the mass of stars and galaxies to there. It is a main reason that the singularity contained ultra-massive particles. An ultra-massive particles have the size of atoms or particles, but the mass of stars and galaxies. Most of the mass of a singularity ball is occupied in its heart, at a region is only 4% of its total radius, in the form of combined superparticles. The singularity has a thin shell of energetic photon particles and dropped condensed state of matter. The white and smooth shell of compacted matter and trapped photon particles may surround the superparticles of a singularity from outside. It is much difficult to see the superparticles in the singularity nuclei through the thin shell of the trapped state of matter and energy. The superparticles are combined and held together by a powerful kind of binding energy that has never been found in nature. Even trillions of kelvins of temperature in the heart of a singularity ball failed to break this extreme bond. The superparticles degeneracy pressure has sustained the formation and evolution of a singularity ball. The heart of a singularity is filled by a compacted state of matter and energy that is called superparticles degeneracy pressure. Eventually, the degeneracy pressure mechanism of a singularity ball is the reason for the creation and evolution of a black hole, and an enhancement of its structure and its dynamics. The superparticles degeneracy pressure suspended the singularity contraction and stored the maximum ratio of matter and energy for the growth of a singularity ball, and was involved in the distortion and expansion of the event horizon of the entire black hole, and its accretion disc. Superparticles in the heart of a singularity sphere are covered by a white and smooth shell of the condensed state of matter and energy, precisely. The central temperature and central pressure of a black hole singularity prevail over those in neutron stars and white dwarfs. The density, gravity, electromagnetic field, and temperature of a singularity exceeded the natural forces and the nature of ordinary matter and energy. The super particle degeneracy pressure in the heart of a black hole is the realistic mechanism of a black hole and extends the lifetime of a black hole. The planetary mass black hole has an energetic singularity ball in its core, and it is collecting gas and dust particles from celestial objects during its penetration through planets, stars, nebulae, and the accretion disc of another black hole to grow rapidly. The black hole has a dense spinning singularity in its heart, and a fantastic event horizon surrounds it to capture mass of celestial objects continuously to grow. The black hole can grow since collection mass from its surroundings and evaporates after losing mass as radiation and escaping energetic particles from its accretion disc or escaping other superparticles from its deep heart.

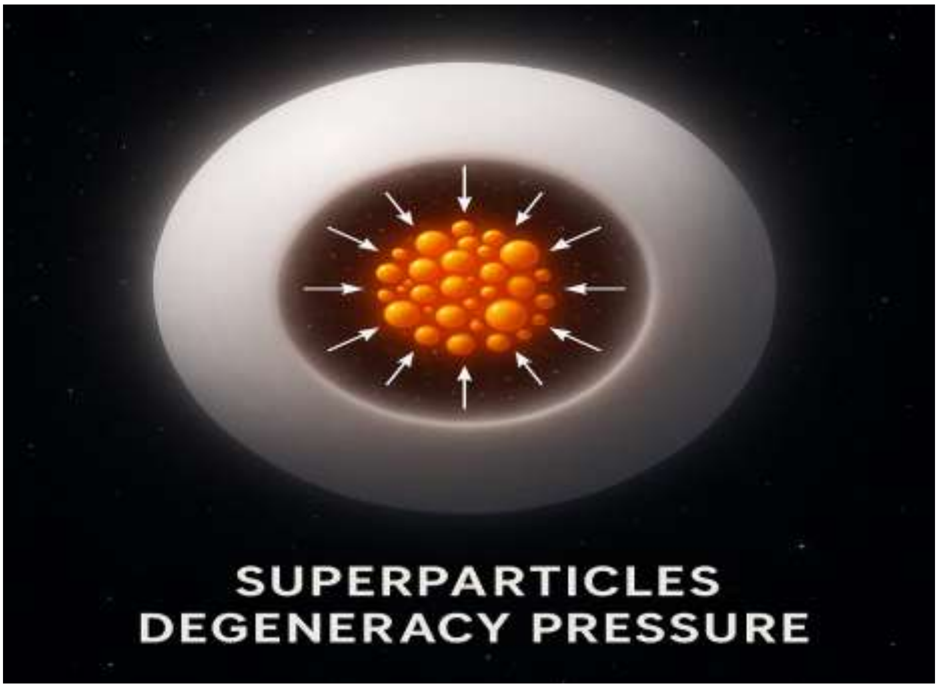

Fig. 5. Superparticles Degeneracy Pressure in the Heart of White and Smooth Ball of a Black Hole's Singularity.

10. RESULTS AND DISCUSSION

The mass, radius, and density of a black hole changed due to accreting mass from its surroundings or losing some of its mass as radiation. The mass, radius, event horizon radius, and density of black holes, an orbital velocity, time period, temperature, number of revolutions, and the black hole particles and superparticles degeneracy pressure in the heart of a singularity sphere could be discussed and determined mathematically. Hydrogen atoms and proton particles orbit the black hole at maximum speed and radiate with the hottest subatomic particles and photons. An orbital speed of molecules and subatomic particles may reach the speed of light, and their surface temperature is extremely high enough to emit gamma rays and X-rays. The black hole can grow due to bombardment of its surface by molecules from a companion star or due to bombardment of its core by ultra-massive particles. The superparticles are capable of the most powerful kinds of particles, they have enough energy and momentum to reach the heart of a black hole. The black hole singularity can spin rapidly and distort the dark fabric matter; as a result, it acts directly on the acceleration and deceleration of superparticles at its external edge. However, a singularity has powerful gravitational waves and an electromagnetic field; superparticles can reach the heart of a black hole and collide with a singularity. The superparticles can break the dark fabric, an intense electromagnetic field, and penetrate through the thin shell of condensed matter and energy that surrounds the singularity ball, collide with its core directly, and stick there forever. The superparticles with lower energy may orbit a singularity sphere. The powerful and denser kinds of superparticles gain enough energy and momentum to collide with a black hole singularity or leave it forever. The black hole singularity becomes denser and hotter as it gathers mass from its surroundings. An accretion disc and event horizon radius of a black hole could be increased due to accreting and collecting additional mass, fabriton particles, and photon particles from nature. The fabriton particles, photon particles, atoms, and molecules are involved in the formation and evolution of a black hole. The fabriton particles of the dark matter, molecules, and photon particles, ordinary matter and energy, could be trapped and compressed steeply to a tiny point and condensed state of matter and energy since they entered the edge of a singularity ball.

The black hole with the mass of Planets, moons, mountains, rocks, human bodies, and baseballs could have formed as it was being dragged into the event horizon of a black hole and compressed there under the higher pressure and acceleration effects. A black hole and a singularity may grow by collecting mass from their surroundings or be annihilated by losing mass or energy. Ordinary matter and energy are not high enough to build up the size of a black hole. Photon particles and fabriton particles strongly participated in the formation, growth, and evolution of a black hole and its heart, even feeding the singularity sphere. Superparticles' degeneracy pressure suspended the contraction of a singularity ball and protect it from evaporation. The black hole with the mass of Earth's Planet ($M = 5.97\ x\ 10^{24}\ kg$) has an event horizon radius of (R_s =0.00885 meter). An orbital speed of proton particles at a distance (r=1Rs) from an external surface of a black hole is ($v = 2.12\ x\ 10^{8}\ \frac{m}{s}$). The proton particle has tremendous surface temperatures about ($1.81\ x\ 10^{12}\ K$). An external surface of this energetic proton particle may be released with a narrower or wider electromagnetic wavelength ($\boldsymbol{\lambda_{Max}} = \frac{\mathbf{0.0029\ m.K}}{\boldsymbol{T}} = 1.6\ x\ 10^{-15}\ m$). The planetary mass black hole has a tiny event horizon radius. It is the densest and violent kind of black hole ever discussed in nature. The particles quickly orbit it, and their temperature may reach 100 billion kelvins. The planetary mass black hole with the mass of a Jupiter planet has the hottest blue accretion disc since entering the Earth's atmosphere. The black hole singularity has a lower mass and a tiny radius. Still, its density and temperature in the accretion disc are extremely high, causing it to glow a blue colour. The planetary mass black hole has been collecting gas and dust particles from its surroundings since passing through Earth's atmosphere. The particles and molecules orbit the planetary mass black hole violently, and radiate the hottest blue radiation and high-energy photon particles.

The black hole with the mass of Jupiter's Planet ($M = 1.898\ x\ 10^{27}\ kg$). Jupiter is a gas giant Planet; it has not become a black hole. The concept of its "black hole radius" refers to its Schwarzschild radius, a hypothetical size it would need to be compressed to form a black hole inside an event horizon of a supermassive black hole, which is about ($R_s = 2.8\ meters$), (about the size of an oversized beach ball). An orbital speed of hydrogen and proton particles at a distance two times the Schwarzschild radius (r=2Rs) of a Jupiter mass black hole is ($v = 1.5\ x\ 10^{8}\ \frac{m}{s}$). The surface temperature of a proton particle about ($9.1\ x\ 10^{11}\ K$). Its radiation with maximum wavelength ($\boldsymbol{\lambda_{Max}} = \frac{\mathbf{0.0029\ m.K}}{\boldsymbol{T}} = 3.186\ x\ 10^{-15}\ m$). These photon particles have the shortest wavelength, maximum frequency, and higher photonic energy as compared to the photon particles that come out directly from the surface of the Sun and Stars. Indeed, a blue accretion disc of highly concentrated and accelerated energetic particles orbits the planetary mass black holes due to the superdensity of the tiny mass black holes.

The black hole with the mass of a Sun ($M = 2\ x\ 10^{30}\ kg$) is called a black dwarf. The Sun is an average mass star; its fuel may run out after five billion years, and its core may collapse to form a white dwarf and black dwarf. The white dwarf would need to be compressed to form a black dwarf, which is about ($R_s = 2966\ meters = 3\ km$), (it is about the Hight of a mountain). An orbital speed of hydrogen atoms and proton particles at a distance (r=3Rs) from an external surface of a Solar mass black hole is ($v = 1.22\ x\ 10^{8}\ \frac{m}{s}$). The surface temperature of a proton particle and hydrogen atoms approximately ($6.01\,x\,10^{11}\,K$). It radiates photon particle with maximum wavelength ($\boldsymbol{\lambda_{Max}} = \frac{\mathbf{0.0029\,m.K}}{\boldsymbol{T}} = 4.82\,x\,10^{-15}\,m$). These photon particles have higher photonic energy and narrower wavelength.

Betelgeuse is a massive red supergiant with a mass estimated to be around 19 times the mass of our Sun. The black hole with the mass of a Betelgeuse star ($M = 3.8\,x\,10^{31}\,kg$) is called a stellar mass black hole. Betelgeuse is massive enough to go supernova, and its remnant core will most likely be a neutron star or a black hole. Its Schwarzschild radius is ($R_s = 56358.2\,meters$), (it is about the length of a province). An orbital speed of the molecules, hydrogen atoms and proton particles at a distance four times the Schwarzschild radius (r=4Rs) of a Stellar mass black hole is about ($v = 1.06\,x\,10^{8}\,\frac{m}{s}$). Then, the surface temperature of a proton particle and hydrogen atoms approximately ($4.5\,x\,10^{11}\,K$). It radiates stream of photon particle with maximum wavelength ($\boldsymbol{\lambda_{Max}} = \frac{\mathbf{0.0029\,m.K}}{\boldsymbol{T}} = 6.4\,x\,10^{-15}\,m$). Material in an accretion disc of a stellar mass black hole can radiate particles with higher photonic energy. In fact, the concentrated and yellowish accretion disc of particles orbits the stellar mass black holes, typically, the solar mass black holes.

The black hole with the mass of four million solar masses ($M = 8.2\,x\,10^{36}\,kg$) is called a supermassive black hole (SMBH). The Sagittarius A* (abbreviated Sgr A*) is the supermassive black hole located at the center of our galaxy the Milky Way, approximately 26,000 to 27,000 light-years from Earth and solar system. It has a mass of roughly 4.1 million times that of our Sun. Its radius is about four million times the radius of black dwarfs with the mass of a Sun ($R_s = 4000000\,x\,3\,km = 12000000\,km$). An orbital speed of hydrogen atoms and proton particles at a distance (r=5Rs) from an external surface of a Supermassive black hole is ($v = 9.55\,x\,10^{7}\,\frac{m}{s}$). The surface temperature of a proton particle and hydrogen atoms approximately ($3.68\,x\,10^{11}\,K$). Energetic particles in an accretion disc of a supermassive black hole radiate a photon particle with maximum wavelength is about ($\boldsymbol{\lambda_{Max}} = \frac{\mathbf{0.0029\,m.K}}{\boldsymbol{T}} = 7.86\,x\,10^{-15}\,m$). This photon particle has a narrower wavelength and higher photonic energy as compared to another photon particles that come out from an external surface of a Sun and stars. The temperature of energetic Particles in the accretion disc of a black hole may reach millions or billions of degrees Celsius, and their speeds may reach the speed of light or exceed it. The particles in this violent condition may become superheated and accelerated, for these particles can be called superparticles.

TON 618 is a Hyper luminous quasar powered by one of the most massive black holes ever discovered. This massive black hole containing around 66 billion times the mass of our Sun, making it an "ultra-massive black hole". It is located near the border of the constellations Canes Venatici and Coma Berenices, about 10.8 billion light-years away from Earth. This celestial object is so bright, it outshines the galaxy, shining 140 trillion times brighter than the Sun, and its event horizon is vast enough to swallow our entire solar system many times over. The black hole with the mass of 66 billion solar masses ($M = 1.32\,x\,10^{41}\,kg$) is called a supermassive black hole (SMBH), and its radius is about ($R_s = 196\,trillion\,meters$). An orbital speed of atoms, molecules, particles, and proton particles at a distance (r=6Rs) from an external surface of a TON 618 is ($v = 8.65\,x\,10^{7}\,\frac{m}{s}$). The surface temperature of a proton particle and hydrogen atoms approximately ($3.02\,x\,10^{11}\,K$). Atoms and energetic Particles in an accretion disc of this mass black hole radiate photon particles with intense wavelength is about ($\boldsymbol{\lambda_{Max}} = \frac{\mathbf{0.0029\,m.K}}{\boldsymbol{T}} = 9.59\,x\,10^{-15}\,m$). Red and yellowish accretion disc orbits a supermassive black hole that is located in the heart of a galaxy or quasar. The inner shell of an accretion disc orbits the supermassive black hole at a higher speed, and its temperature is higher than that of the outer shells. The gravitational waves of a black hole act directly on the distortion, heating, turbulences and acceleration of gas and dust particles in both shells of the accretion disc. The hottest particles are rising from the inner shell of an accretion disc that is located at the closest point to the event horizon surface to enhance the temperature of particles in the outer shell of an accretion disc and glow with different colours and with variable temperature. The hottest and fastest particles orbit the black hole at the nearest point to the singularity, or these energetic particles are rising rapidly to escape from a black hole and are involved in heating the gas and dust particles in the outer shell of an accretion disc. Phoenix A (or Phoenix A*) is an ultra-massive black hole at the center of the Phoenix Cluster, with a mass of around 100 billion times that of the Sun. It was discovered in 2010 by using the South Pole Telescope, which confirmed that the hot gas and galaxies are influenced by its huge gravity. Galaxies and galaxy clusters are distorted and accelerated by ultra-massive black holes [61, 62, 63, 64]. The black hole can grow beyond the supermassive black hole to become a mass trillions of times the mass of the Sun or thousands of times the mass of galaxies. These types of black holes are called supergiant black holes.

The Supergiant black hole (SGBH) is the largest type of black holes in the visible universe and multiverse. Its mass could be trillions of times the mass of milky way galaxy, and its radius or its event horizon exceeded 10 light years or billions of light years according to its mass, Schwarzschild radius and escape velocity of light in the edge of a black hole. The black hole with the mass ($M = 3.5\,x\,10^{44}\,kg$) is called a supergiant black hole. This supergiant black hole has an event horizon radius or Schwarzschild radius is ($R_s = 5.19\,x\,10^{17}\,meters$), (it is about 54.857 light years, same as the distance between stars in stellar clusters). An orbital speed of the molecules, atoms, particles, hydrogen atoms and proton particles at a distance seven times the Schwarzschild radius (r=7Rs) of a Supergiant black hole is about ($v = 8.02\ x\ 10^7\ \frac{m}{s}$). Then, the surface temperature of a proton particle and hydrogen atoms approximately ($2.59\ x\ 10^{11}\ K$). It radiates stream of concentrated photon particles with maximum wavelength ($\lambda_{Max} = \frac{0.0029\ m.K}{T} = 1.1\ x\ 10^{-14}\ m$). Eventually, the condensed and white colour accretion disc of the energetic particles orbits the supergiant black holes. An orbital speed and surface temperature of the particles at a distance n times the Schwarzschild radius of the black holes could be determined mathematically by using eqn. (4) and eqn. (6). The orbital speed and surface temperature of particles are reduced since they orbit the black hole at a distant location. The accretion disc of tiny mass black holes is hotter than the accretion disc of high mass black holes. Indeed, the energetic particles that orbit the black hole singularity at the nearest point, and denser types of black holes may have a higher speed and maximum surface temperature.

The core concepts of black hole jets and singularities discussed by researcher Sabir Sadiq present an unconventional model of astrophysics. Unlike standard general relativity, which defines a singularity as an infinitely dense point with zero volume. Sadiq proposes that a singularity is a finite, highly energetic physical object whose extreme conditions generate unique relativistic behaviour and powerful plasma jets with temperatures of billions of kelvins.

Black holes with different masses could be formed from dragged matter in the accretion disc of a black hole and collapse this matter in the inner shells of a black hole to form superparticles or collide with a singularity at the center. The surviving superparticles may form a new black hole outside of a parent black hole [65, 66, 67, 68]. As matter falls toward and crosses the event horizon of a black hole, extreme gravitational force, tidal effects, and compressive forces accelerate it and cause particles to collide violently, driving local temperatures and energy densities past their limits to rise up into trillions of kelvins and form a quark- gluon plasma fluid. At this threshold, nucleons melt and undergo a phase transition into a deconfined quark–gluon plasma (QGP) Fluid [69, 70, 71]. Experiments at CERN's Large Hadron Collider (LHC) indicate that quark-gluon plasma (QGP) forms at a critical transition temperature of roughly 155 to 175 MeV (about 1.8 to 2 trillion degrees Celsius), with peak initial temperatures in higher-energy lead-lead collisions exceeding 5.5 trillion degrees Celsius. Quark–Gluon Plasma temperature in the inner shells of a black hole could be increased steeply due to singularity tunnel waves in the center of a black hole and turbulent superparticles at the edge of a singularity sphere. The cloud of QGP Fluid could be trapped and concentrated in the outer shells of a superparticle. The superparticles are ultra-massive particles formed from falling and spiralling matter in the heart of a black hole due to the immense gravity and density of a black hole.

Table 1: An Orbital Speed and Temperature of Particles at a Distance n From Black Holes

Black Hole Mass (M_{BH})	**Distance of Proton Particles** (r =n Rs)	**Orbital Speed of Particles** $v = \sqrt{\frac{G\,M_{BH}}{r}}$	**Particles Temperature** $T = \frac{mv^2}{3K_B}$
$\mathbf{5.97\ x\ 10^{24}\ kg}$	1 x 0.00885 m	$2.12\ x\ 10^8\ m/s$	$1.81\ x\ 10^{12}\ K$
$\mathbf{1.898\ x\ 10^{27}\ kg}$	2 x 2.8 m	$1.5\ x\ 10^8\ m/s$	$9.1\ x\ 10^{11}\ K$
$\mathbf{2\ x\ 10^{30}\ kg}$	3 x 2966 m	$1.22\ x\ 10^8\ m/s$	$6.01\ x\ 10^{11}\ K$
$\mathbf{3.8\ x\ 10^{31}\ kg}$	4 x 56358.2 m	$1.06\ x\ 10^8\ m/s$	$4.5\ x\ 10^{11}\ K$
$\mathbf{8.2\ x\ 10^{36}\ kg}$	5 x 1.2 x 10^{10} m	$9.55\ x\ 10^7\ m/s$	$3.68\ x\ 10^{11}\ K$
$\mathbf{1.32\ x\ 10^{41}\ kg}$	6 x 1.96 x 10^{14} m	$8.65\ x\ 10^7\ m/s$	$3.02\ x\ 10^{11}\ K$
$\mathbf{3.5\ x\ 10^{44}\ kg}$	7 x 5.19 x 10^{17} m	$8.02\ x\ 10^7\ m/s$	$2.59\ x\ 10^{11}\ K$

11. CONCLUSION

The black hole is a dense, violent, and variable celestial object in mass, size, and temperature. The mass of black holes, the event horizon radius, the orbital speed, colour, and temperature of particles in an accretion disc of the black holes are changeable dynamically. A black hole can grow by collecting mass from companion stars or by being bombarded at its heart by superparticles. The black hole has a powerful electromagnetic field and gravitational field to tear mass from its companion star. The planetary mass black hole has a tiny mass, a small size, and an energetic singularity sphere at its core. A low mass black hole can grow rapidly since collecting mass from its surroundings, and the hottest particles in its accretion disc are orbiting its center violently. An accretion disc of a low mass black hole is hotter than the accretion disc of high mass black holes. A high mass black hole can reach the mass of a galaxy and galaxy cluster, which is called a Supergiant black hole. The Supergiant black hole can distort and heat distant stars, the largest accretion disc, and galaxy clusters. The orbital speed and temperature of particles could be increased rapidly as they move closer to the surface of a black hole; the speed and temperature of particles had been reduced at the furthest points from a black hole.

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CONFLICT OF INTEREST

I declare that I have no conflict of interests.

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