Origins of stellar mass neutron black holes, supermassive dark matter black holes and universe evolution

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Abstract;

The origins of the stellar mass neutron black holes and supermassive dark matter black holes without the singularities are reported based on the 4-D Euclidean space. The neutron black holes with the mass of $m_{BH} = 5 – 15\ m_{sun}$ are made by the 6-quark merged states (N_{6q}) of two neutrons with the mass ($m(N_{6q}) = 10\ m(n)$) of 9.4 GeV/c^2 that gives the black hole mass gap of $m_{BH} = 3 – 5\ m_{sun}$. Also, the supermassive black holes with the mass of $m_{SMBH} = 10^6 – 10^{11}\ m_{sun}$ are made by the merged 3-D states ($J(B1B2B3)_3$ particles) of the dark matters. The supermassive black hole at the center of the Milky way galaxy has the mass of $m_{SMBH} = 4.1\ 10^6\ m_{sun}$ that is consistent with $m_{SMBH} = 2.08 - 6.23\ 10^6\ m_{sun}$ calculated from the 3-D states ($J(B1B2B3)_3$ particles) of the dark matters with the mass of $m(J) = 1.95\ 10^{15}$ eV/c^2. In other words, this supports the existence of the B1, B2 and B3 dark matters with the proposed masses. The first dark matter black hole (primary black hole) was created at the big bang. This first dark matter black hole decayed to the supermassive dark matter black holes through the secondary dark matter black holes that are explained by the merged states of the $J(B1B2B3)_3$ particles. The universe evolution is closely connected to the decaying process of the dark matter black holes since the big bang. The dark matter cloud states are proposed at the intermediate mass black hole range of $m_{IMBH} = 10^2 – 10^5$ m_{sun}. This can explain why the dark matter black holes are not observed at the intermediate mass black hole range of $m_{IMBH} = 10^2 – 10^5\ m_{sun}$.

Key words: Neutron black holes; dark matter black holes; black hole mass gap; universe evolution

1. Introduction

The universe evolution has been the interesting research subject. The big bang theory including the inflation has been relatively well established. But how the big bang took place, what happened

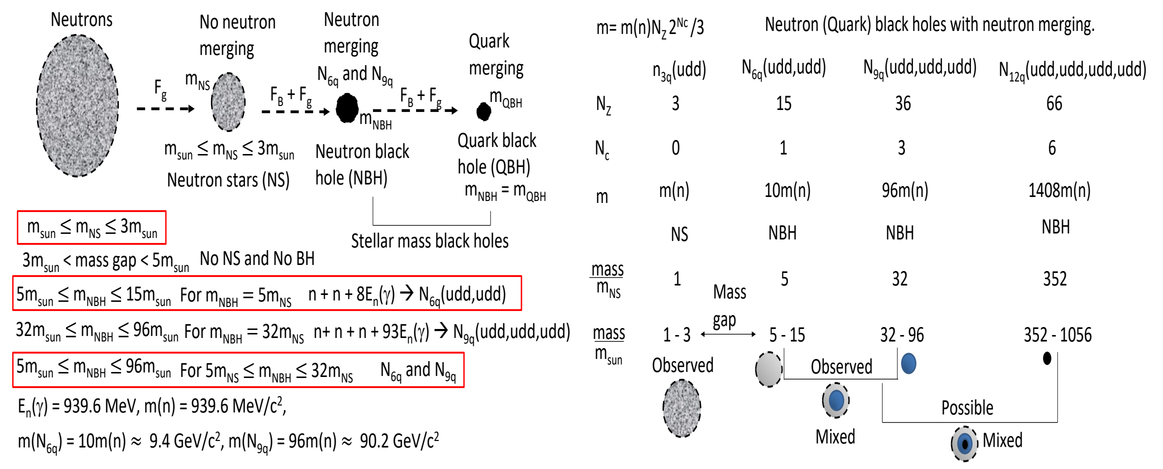

Fig. 1. Neutron stars and neutron (quark) black holes with the black hole (BH) mass gap.

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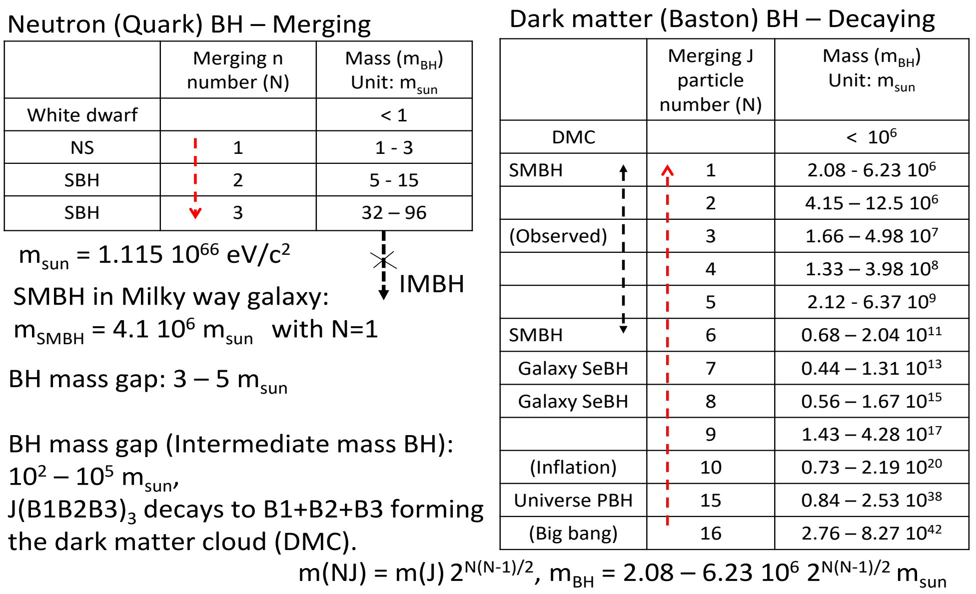
before the big bang and what force caused the inflation if the inflation happened really are three of the unsolved physical questions. Standard model does not give the solutions to these questions. Also, after the big bang how the supermassive black holes were formed, what caused the black hole mass gap, what is the relation between the dark matters and black holes, and how the galaxy with the supermassive black hole was formed need to be solved. To solve these questions, the revolutionary ideas beyond the standard model are required [1,2].



Neutron (Quark) BH – Merging

	Merging n number (N)	Mass (m_{BH}) Unit: m_{sun}
White dwarf		< 1
NS	1	1 - 3
SBH	2	5 - 15
SBH	3	32 – 96

$m_{sun} = 1.115\ 10^{66}$ eV/c^2

SMBH in Milky way galaxy:
$m_{SMBH} = 4.1\ 10^6\ m_{sun}$ with N=1

BH mass gap: $3 – 5\ m_{sun}$

BH mass gap (Intermediate mass BH):
$10^2 – 10^5\ m_{sun}$,
$J(B1B2B3)_3$ decays to B1+B2+B3 forming the dark matter cloud (DMC).

Dark matter (Baston) BH – Decaying

	Merging J particle number (N)	Mass (m_{BH}) Unit: m_{sun}
DMC		< 10^6
SMBH	1	2.08 - 6.23 10^6
	2	4.15 – 12.5 10^6
(Observed)	3	1.66 – 4.98 10^7
	4	1.33 – 3.98 10^8
	5	2.12 - 6.37 10^9
SMBH	6	0.68 – 2.04 10^{11}
Galaxy SeBH	7	0.44 – 1.31 10^{13}
Galaxy SeBH	8	0.56 – 1.67 10^{15}
	9	1.43 – 4.28 10^{17}
(Inflation)	10	0.73 – 2.19 10^{20}
Universe PBH	15	0.84 – 2.53 10^{38}
(Big bang)	16	2.76 – 8.27 10^{42}

$m(NJ) = m(J)\ 2^{N(N-1)/2}$, $m_{BH} = 2.08 – 6.23\ 10^6\ 2^{N(N-1)/2}\ m_{sun}$

Fig. 2. Dark matter black holes are closely connected to the universe evolution with the BH mass gap at mBH = 3 – 5 m_{sun}.

The neutron and J particle have the same properties to form the black holes.

$n_{3q} = n(udd) = n(0,0,-5) = n(0,0)\ A(CC=-5)_3$

$m(n) = 939.6$ MeV/c^2,

$m_{NS} = 1\text{-}3\ m_{sun}$ $m_{sun} = 1.115\ 10^{66}$ eV/c^2

$k_{qq}(CC) \approx 0$ $F_c \approx 0$ F_g : Very large

(CC)=(-5a) from the merging of neutrons. a: Integer

SBH: Stellar mass BH
IMBH: Intermediate mass BH
SMBH: Supermassive BH
SeBH: Secondary BH
PBH: Primary BH

$J_{3B} = J(B1B2B3)_3 = J(EC=-5)_3$

$m(J) = 1.95\ 10^{15}$ eV/c^2 = $2.075\ 10^6\ m(n)$,

$m_{SMBH} = 2.075 – 6.225\ 10^6\ m_{sun}$

$k_{dd}(EC) \approx 0$ $F_c \approx 0$ F_g : Very large

(EC)=(-5a) from the merging of J particles. a: Integer

Bastons (DM) mass: eV/c^2

	B1	B2	B3
m_{EC}	26.1	4.27 10^{10}	1.95 10^{15}
EC	-2/3	-5/3	-8/3

Calculation(TQSM) [2]: m_{EC}

$P(EC=-3,LC=-5)_3$ for leptons and $B(EC=-1,LC=-3,CC=-5)_3$ for quarks form the fast-decaying BHs because of the strong Coulomb forces since the big bang.

Fig. 3. The neutron and the J particle have the same properties [1,2].

There are two kinds of black holes such as the supermassive black holes ($m_{SMBH} \geq 10^6$ m_{sun}) and stellar mass black holes (m_{SBH} = 5-10^2 m_{sun}). The stellar mass black holes are created and are merged as the remnants of the exploding supernovae. The heavier black holes have been understood to be made from the merging of the smaller black holes and smaller matters by the huge gravitational collapse, too. The limit of the heaviest black hole is expected from the mass limit of the merging black holes. This bottom-to-top process of the black hole formation gives the smooth increase of the black hole mass from the lightest stellar mass black holes to the heaviest supermassive black holes. However, the intermediate mass black holes (m_{IMBH} = 10^2 - 10^5 m_{sun}) are missing in the observation even though the possible intermediate mass black hole with the mass of 142m_{sun} was, for the first time, discovered through the gravitational wave signal of GW190521 [3-7]. The observational missing of the intermediate mass black holes is the challenging topic which needs to be solved experimentally and theoretically. The dark stars with Planck core [8], BH-NS mergers[9], merging neutron stars [10,11], supermassive black hole at Milky way galaxy [12], binary BH mergers [13,14], BH mass gap [15] and supermassive black hole masses [16] are some of the interesting research subjects.

In the present work, the stellar mass black holes are created and are merged as the remnants of the exploding supernovae in Figs. 1 and 2. But the supermassive black holes are created by the decaying process of the first black hole to be formed at the big bang in Figs. 2 and 3. The first black hole (primary black hole) decays to the smaller black holes through the inflation after the big bang as shown in Figs. 2 and 3. Fig. 4 is shown for the simple explanation of the universe evolution from the first black hole through the galaxies to the elementary particles. In Fig. 3, the neutrons of n(udd) and J particles of $J(B1B2B3)_3$ are compared. In Fig. 3, "3" means the 3-D space shape. The Coulomb forces are zero for the neutrons and nearly zero for J particles in Figs. 5 and 6 [1]. And because of the huge gravitational forces, the neutron black holes and dark matter black holes are formed in Figs. 1-7. The merged 6-quark state (N_{6q}) of two neutrons with m(N_{6q}) = 10m(n) are obtained to explain the black hole mass gap at m_{BH} = 3 – 5 m_{sun}. And the mass of the supermassive black hole of the Milky way galaxy and the missing of the intermediate mass black holes are explained with the proposed masses of the dark matters (bastons) [2] in Fig. 3.

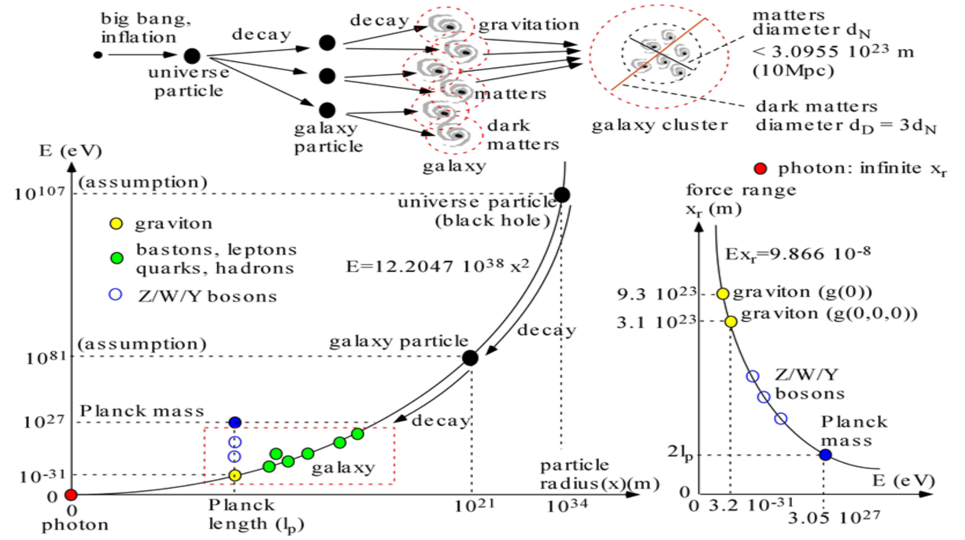


Fig. 4. Universe evolution and black holes are closely connected [1,2].

In the present work, the origins of the supermassive black holes and stellar mass black holes are reported in section 2 and section 3, respectively. Because the concepts of the present report are new, Figs. 1-7 to show the results are introduced in the introduction section for the reader.

2. Origins of the stellar mass black holes and neutron stars

First, the neutron star (NS) is explained. The neutron stars and neutron black holes are discovered as the remnants of the exploding supernovae. The neutron stars are composed of the neutrons densely populated by the huge inward pressure. The observed masses of the neutron stars are within the range of 1-3 m_{sun}. The white dwarfs are not included in the present report. And the neutron black holes (stellar mass black holes) have the masses of $m_{BH} = 5 - 100\ m_{sun}$ in Figs. 1 and 2. Then, the black hole mass gap has been discovered at $m_{BH} = 3 - 5\ m_{sun}$ in Figs. 1-2.

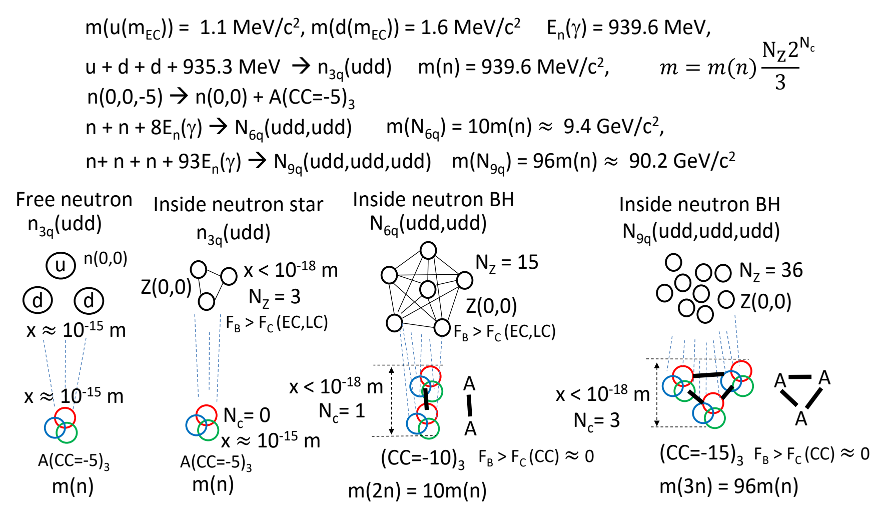


Fig. 5. The merged neutrons form the neutron black holes [1,2].

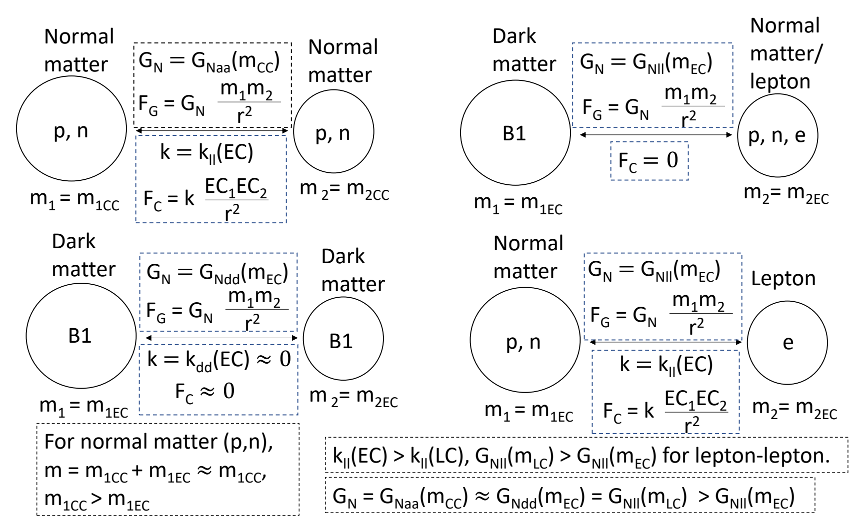


Fig. 6. Relative force strengths for the gravitational and Coulomb forces [Fig. 1 in Ref. 1].

The origins of the neutron black holes (Stellar mass black holes) are closely connected to the origins of the neutron stars. We know that the neutron stars are made of the densely populated neutrons. It is reasonably thought that the gravitational inward pressure in the neutron black holes should be much larger than the gravitational inward pressure in the neutron stars. If the origins of the neutron black holes are the same as the origins of the neutron stars, the neutrons in the neutron black holes exist as the merged neutron state of two neutrons by the larger inward pressure in Figs. 1 and 5. This is the starting point to look for the origin of the neutron black hole.

In Fig. 5, two neutrons are merged to be N_{6q}(udd,udd). Three neutrons are merged to be N_{9q}(udd,udd,udd). The minimum mass of the neutron black holes is $5m_{sun}$ that is 5 times bigger than the minimum mass ($1m_{sun}$) of the neutron stars. If the neutrons in the neutron star are replaced with the N_{6q}(udd,udd) particles and the N_{6q}(udd,udd) particle has the mass of 10m(n) in Fig. 5, the new state becomes the black holes with the $5m_{sun}$. This new state is called as the neutron black hole or stellar mass black hole. The neutron star has the mass range of m_{NS} = 1-3 m_{sun}. And the neutron black hole has the mass range of m_{NBH} = 5 – 15 m_{sun} in Figs. 1 and 2. The merged state of the neutrons has the mass following the mass equation of $m = m(n)\frac{N_Z 2^{N_c}}{3}$ in Figs. 1 and 5. The same arguments are applied to the N_{9q}(udd,udd,udd) and N_{12q}(udd,udd,udd,udd) particles in Figs. 1 and 5. As shown in Figs. 1, 2, 3, and 5, the stellar mass black holes can be explained by using the merged state of the neutrons by the merging process. This merging process of the neutron black holes (stellar mass black holes) are not extended to the intermediate mass black holes which have the mass range of $m_{IMBH} = 10^2$- 10^5 m_{sun}. The black hole mass gap at the intermediate mass black holes in Figs. 1 and 2 exists because only one possible intermediate mass black hole has been observed at m_{BH} = 144 m_{sun} [7].

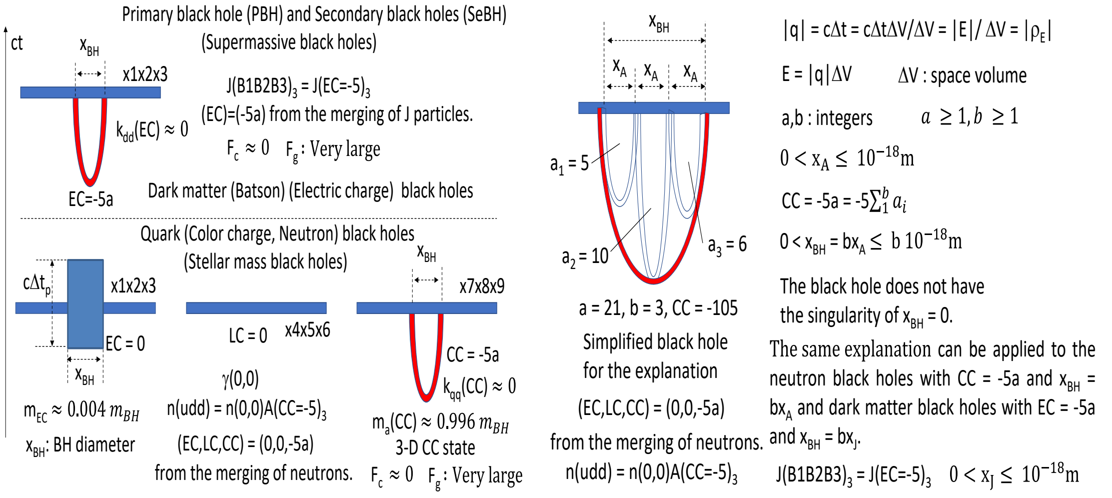
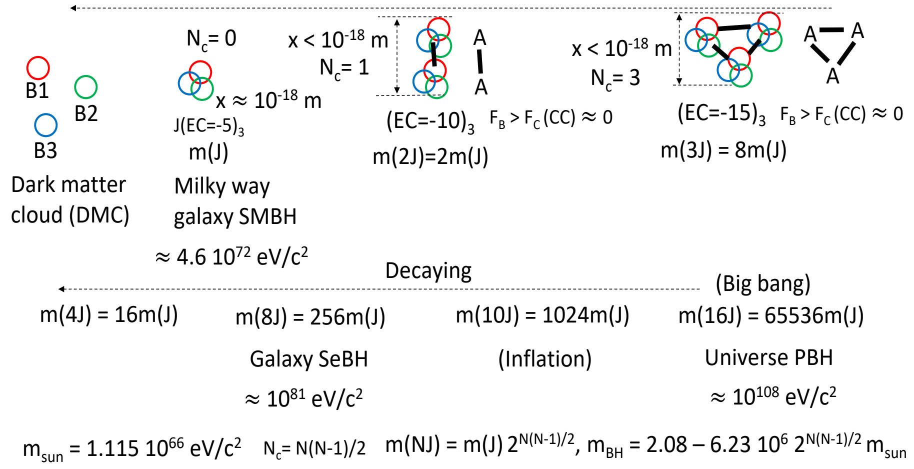


Fig. 7. Dark matter BH and quark BH are compared [18,1,2].

In Fig. 1, the neutron black holes and quark black holes have the same origins. The quark black hole is made by the quark merging of the neutron black hole. Then in Fig. 1, the neutron black hole has the same mass as the quark black hole. The present work is based on the 3-D quantized space model [2,17]. The neutron has the charge configuration of n(EC,LC,CC) = n(0,0,-5) [2,17]. The quark black hole has the charge configuration of (EC,LC,CC) = (0,0,-5a) in Fig. 7. The definition of the charge and energy can be seen in Ref. [18,1]. The quark black hole in Fig. 7 is the color charge (CC) black hole which means the warped x7x8x9 space. The quark black hole has the non-zero CC charge of CC = -5a. The case of a=21 is shown as one example in Fig. 7. Therefore, the quark black hole has the non-zero size. This indicates that the neutron and quark black holes do not have the singularities. The neutron black holes become the quark black holes by merging of the quarks. It is proposed in Fig. 6 [1] that the Coulomb forces of the color charges for quarks are nearly zero and the Coulomb forces of the electric charges for the dark matters are nearly zero. In Figs. 6 and 7, the neutron and quark black holes interact mostly by the gravitational forces but not by the Coulomb forces. The dark matter black holes, that is discussed in section 3, interact mostly by the gravitational forces but not by the Coulomb forces, too.

3. Origins of the supermassive black holes and universe evolution

Our matter universe was created from the nothing through the process of the big bang by the CTP symmetry [17]. Our matter universe was the black hole which experienced the inflation after the big bang. Through the inflation, the black hole decayed to many smaller black holes in Figs. 2 - 4. In Figs. 2 and 4, the primary black hole was formed at the big bang. This primary black hole is called as the universe particle in Figs. 2 and 4. This primary black hole decayed to the secondary black holes. These secondary black holes are called as the galaxy particles from which the galaxy clusters are originated in Figs. 2 and 4. The supermassive black holes are the light secondary black holes. The supermassive black hole located at the center of the Milky way galaxy [12] is one of the lightest secondary black holes. How the evolution of the universe evolution is controlled by the decaying of the dark matter black holes and why the intermediate mass black holes are not discovered at the center of the galaxies are the interesting and challenging research topics.



P(EC=-3,LC=-5)$_3$ for leptons and B(EC=-1,LC=-3,CC=-5)$_3$ for quarks forms the fast-decaying BHs because of the strong Coulomb forces unlike J(EC=-5) for bastons since the big bang.

Fig. 8. The relationship between the J particles and the dark matter black holes are shown since the big bang [1,2]. See Figs. 2 and 5.

First, remember that the EC Coulomb forces between the dark matters (bastons) are nearly zero and the EC and LC Coulomb forces between quarks are relatively strong in Figs. 6 and 7 [1]. But the CC Coulomb force between the quarks is nearly zero [1]. In Fig.7, the dark matter black hole is compared with the neutron black hole. From the charge conservation, the minimum value of the black hole sizes (x_{BH}) should be the size (x_A) of the A(CC=-5)$_3$ for the quark black holes and the size (x_J) of J(EC=-5)$_3$ for the dark matter black holes in Fig. 7. This indicates that the black holes do not have the singularities.

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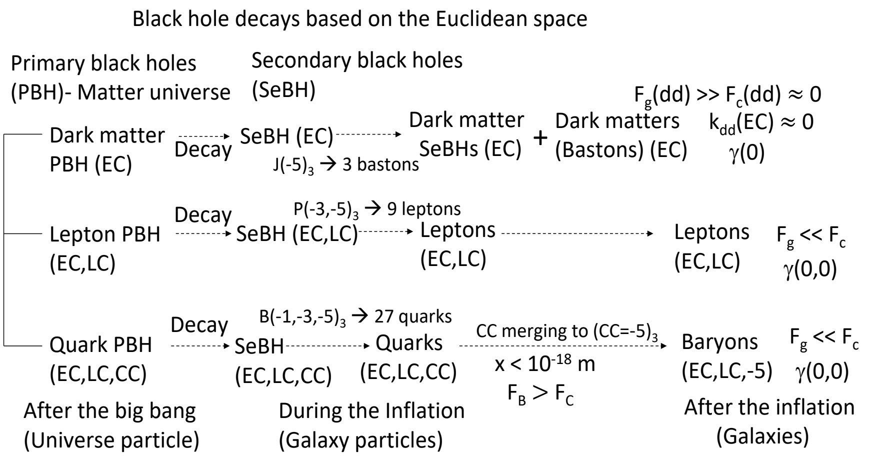
In Fig. 3, the neutron of n(udd) and J particle of $J(B1B2B3)_3$ are compared. The neutron and the J particle have the same properties for the Coulomb force and gravitational force. The neutrons form the neutron stars and neutron black holes under the strong gravitational forces. Therefore, the J particles can form the dark matter black holes under the strong gravitational forces. The neutron stars and neutron black holes are formed by the merging process in Figs. 1 and 2. The dark matter black holes are formed by the decaying process in Fig. 2. This indicates that there are two kinds of black holes. Because the stellar mass black holes are discussed in section 2, the dark matter black holes are discussed in this section 3.

In Fig. 8, the relationship between the J particles and the dark matter black holes are shown. The merged states of the J particles have the mass equation of $m(NJ) = m(J)2^{N(N-1)/2}$. The black hole masses corresponding to the merged states of the J particles are calculated in Figs. 2, 3 and 8. The P particles of $P(EC=-3,LC=-5)_3$ and B particles of $P(EC=-1,LC=-3,CC=-5)_3$ in Figs. 3 and 8 have the strong repulsive EC Coulomb forces. And the J particles of $J(EC=-5)_3$ have the nearly zero EC Coulomb forces. To form the P and B black holes are much harder than to form the J black holes. And the P and B particles are very unstable because of the strong internal repulsive EC Coulomb forces. The P and B particles decay fast to the 9 leptons and 27 quarks, respectively. But the J particles decay relatively slow to the 3 dark matters and the J dark matter black holes are stable enough to survive till now at the center of the galaxies. Because of these reasons, the dark matter black holes control the universe evolution since the big bang in Figs. 2, 4, 8 and 9.



Dark matter SeBHs are super-massive black holes with the masses of $10^6 - 10^{11}$ m_{sun} to be found at the center of the galaxies. x: average distance between quarks.

Fig. 9. The Black hole decays are shown since the big bang.

In Fig. 2, the supermassive black hole at the center of the Milky way galaxy [12] has the mas of $1.115\ 10^{66}$ eV/c^2 = $4.1\ 10^6$ m_{sun} which corresponds to N=1. This means that the supermassive black hole at the center of the Milky way is made of the J particles with the mass of $m(J) = 1.95\ 10^{15}$ eV/c^2 = $2.075\ 10^6$ m(n) in Fig. 3. It is assumed that the universe mass at the big bang is about $10^{107-108}$ eV/c^2 in Figs. 4 and 8. Then, the merged state of 16J particles can make the universe primary black hole of $m_{BH} = 10^{108}$ eV/c^2. Because the inward pressure of the primary black hole is huge at the big bang, the merged state of the 16J particles is possible. The merged state of 2n (6quark) or 3n (9 quark) is possible for the stellar mass black hole as discussed in section 1. The primary black hole and secondary black holes in Figs. 2, 4, 8 and 9 have the huge inward pressure when compared with the relatively weaker inward pressure of the stellar mass black holes (neutron black holes). It is assumed that the galaxy cluster mass is about 10^{45} m_{sun} in Figs. 4 and 8. Then, the merged state of 8J particles can make the secondary black hole corresponding to the galaxy cluster with the mass of $m_{BH} = 10^{45}$ m_{sun}.

The J particles make the dark matter black hole with the mass of m_{BH}= 2.08 – 6.23 10^6 m_{sun} in Fig. 3. This is the lower limit of the supermassive dark matter black hole. The proposed intermediate mass black hole has the mass of $m_{BH} = 10^2 – 10^5$ m_{sun}. The intermediate mass black holes have not been discovered. It indicates that the merging of the neutron black holes cannot be extended to the intermediate mass black holes even though the possible intermediate mass black hole with the mass of 142m_{sun} was, for the first time, discovered through the gravitational wave signal of GW190521 [3-7]. Also, the $J(B1B2B3)_3$ particles decay to the B1, B2 and B3 particles in the mass range of the intermediate mass dark matter black holes in Figs. 3 and 8. These free B1, B2 and B3 dark matter particles form the dark matter clouds (DMC) but not the intermediate mass dark matter black holes.

Therefore, the black hole mass gap exists at the mass range of the intermediate mass black holes. This indicates that the low BH mass gap and high BH mass gap exist at m_{BH} = 3- 5 m_{sun} and $m_{BH} = 10^2 – 10^5$ m_{sun}, respectively. The primary black holes and secondary black holes are compared for the dark matters, leptons, and quarks in Fig. 9. Dark matter black holes play the major role to make the galaxies. Dark matter black holes exist as the supermassive black holes at the center of the galaxies.

In Fig. 9, the dark matter secondary black holes decay to the smaller dark matter supermassive black holes and 3 dark matters (bastons). And the lepton secondary black holes decay to the 9 leptons [2]. The quark secondary black holes decay to the 27 quarks [2]. The created bastons (dark matters), leptons and quarks along with the dark matter supermassive black holes form the galaxy clusters and galaxies as shown in Fig. 4. The lepton primary black hole decays to the lepton secondary black holes. Because of the strong repulsive Coulomb forces between the electric charges (EC) of the lepton secondary black holes in Fig. 9, the lepton secondary black holes decay fast to the $P(EC=-3,LC=-5)_3$ particles. Then, the $P(EC=-3,LC=-5)_3$ particle decays to the 9 leptons. Also, Because of the strong repulsive Coulomb forces between the EC charges of the quark secondary black holes in Fig. 9, the quark secondary black holes decay fast to the $B(EC=-1,LC=-3,CC=-5)_3$ particles. Then, the $P(EC=-3,LC=-5)_3$ particle decays to the 27 quarks. However, because of the nearly zero Coulomb forces between the EC charges of the dark matter (baston) secondary black holes in Fig. 9, the dark matter (baston) secondary black holes decay slowly to the $J(EC=-5)_3$ particles and smaller dark matter (baston) secondary black holes. Then, the $J(EC=-5)_3$ particle decays to the 3 bastons of B1. B2 and B3 in Fig. 3. The remaining dark matter secondary black holes decay to the smaller secondary black holes which are called as the supermassive dark matter black holes. The supermassive black hole located at the center of the Milky way galaxy belongs to the supermassive dark matter black holes that are made by the $J(EC=-5)_3$ particles in Figs. 2 and 3. The calculated mass of the lightest supermassive black hole is 2.08 – 6.23 10^6 m_{sun} which is consistent with the observed mass (4.1 10^6 m_{sun}) of the supermassive black hole located at the center of the Milky way galaxy [12]. In other words, the proposed masses of the B1, B2 and B3 dark matters in Fig. 3 are reasonably right to reproduce the observed mass of the supermassive black hole located at the center of the Milky way galaxy.

Note in Fig. 9 that the 3 color charges of CC = -2/3, -5/3 and -8/3 were perfectly balanced to form the 3-D $A(CC=-5)_3$ states after the inflation. The particles with the $A(CC=-5)_3$ states are called as the baryons [1,2]. Therefore, all quarks were recombined to be the baryons which decayed to the protons and neutrons. After the inflation, the normal matters of neutrons and protons, leptons, dark matters (bastons) and supermassive dark matter black holes made the galaxies as shown in Figs. 4 and 9. In Figs. 2, 4 and 9, the galaxy clusters are originated from the secondary black holes called as the galaxy particles. This means that the universe evolution from the big bang to the galaxies can be explained by the black hole decays from the primary black hole to the supermassive black holes through the secondary black holes. In these decaying processes, the dark matter black holes play the major roles to form the galaxies with the supermassive dark matter black holes which are located at the center of the galaxies.

4. Summary

In summary, the stellar mass black holes (neutron BH, quark BH) in Fig. 1 and dark matter black holes in Fig. 9 are compared in terms of the 3-D quantized space model. The merged 6-quark state (N_{6q}) of two neutrons with $m(N_{6q}) = 10m(n)$ are obtained to explain the black hole mass gap at $m_{BH} = 3 – 5\ m_{sun}$. And the mass of the supermassive black hole of the Milky way galaxy and the missing of the intermediate mass black holes are explained with the proposed masses of the dark matters (bastons) in Fig. 3. The neutron black holes are originated from the merging states of the two neutrons (n_{6q}(udd,udd)) with the mass of 9.4 GeV/c^2 in Fig. 1. This explanation gives the stellar mass black holes at the BH mass at $m_{BH} = 5 – 15\ m_{sun}$ and the BH mass gap at $m_{BH} = 3 – 5\ m_{sun}$. And the merged states of three neutrons (n_{9q}(udd,udd,udd)) with the mass of 90.2 GeV/c^2 are introduced to explain the heavy stellar mass black holes with the mass of up to $m_{BH} = 96\ m_{sun}$ in Fig. 1.

It is concluded that the galaxies have been formed by the decaying processes from the primary black hole to the supermassive dark matter black holes through the secondary black holes. The stellar mass black holes are the 3-D quark merging states of the neutrons. And the dark matter black holes are the 3-D dark matter merging states of the $J(B1B2B3)_3$ particles. This indicates that the stellar mass black holes and dark matter black holes do not have the singularity. In other words, the black holes have the proper non-zero sizes and non-zero charges. The supermassive black hole at the center of the Milky way galaxy [12] has the mass of $m_{SMBH} = 4.1\ 10^6\ m_{sun}$ that is consistent with $m_{SMBH} = 2.08 - 6.23\ 10^6\ m_{sun}$ calculated from the 3-D states ($J(B1B2B3)_3$ particles) of the dark matters with the mass of $m(J) = 1.95\ 10^{15}$ eV/c^2. In other words, this supports the existence of the B1, B2 and B3 dark matters with the proposed masses [2].

The 3 color charges of CC = -2/3, -5/3 and -8/3 were perfectly balanced to reform the 3-D $A(CC=-5)_3$ states after the inflation. The particles with the $A(CC=-5)_3$ states are called as the baryons [1,2]. Therefore, all quarks were recombined to be the baryons which decayed to the protons and neutrons. After the inflation, the normal matters of neutrons and protons, leptons, dark matters (bastons) and supermassive dark matter black holes made the galaxies as shown in Figs. 4 and 9. In Figs. 2, 4 and 9, the galaxy clusters are originated from the secondary black holes called as the galaxy particles. This means that the universe evolution from the big bang to the galaxies can be explained by the black hole decays from the primary black hole to the supermassive black holes through the secondary black holes. In these decaying processes, the dark matter black holes play the major roles to form the galaxies with the supermassive dark matter black holes which are located at the center of the galaxies. The black holes and elementary particles will be discussed in the following paper.

This new paper is based on new ideas. The origins of the stellar mass black holes and supermassive black holes are discussed based on the 4-D Euclidean space. The black hole mass gap is automatically reproduced when the stellar mass black holes are originated from the merged states of the two neutron states (N_{6q}) with the mass of 9.4 GeV/c^2. Also, the supermassive black holes are proposed not to be originated from the merged states of the stellar mass black holes but to be originated from the merged states of the dark matters (so called J particles) with the mass of 1.95 10^{15} eV/c^2. The present work indicates that the supermassive black holes have the origins different from the origins of the stellar mass black holes. Finally, the universe evolution since the big bang is closely connected to the supermassive black holes. The questions about the galaxy formation could be answered based on the results of the present work.

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