**Dirac Large Numbers--** **Fe/Fg = Ln = 2.27×1039 Can Be Verified With The New**

Formulas of BH-theory Proposed By Author

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**[Preface].** By a comparison of hydrogen atom as a model, a proper ratio Fe/Fg betweenthe electromagnetic force Feand the gravitational force Fg could be accurately established as a famous Dirac large numbers Ln = Fe/Fg=2.27×1039, this is because in a hydrogen atom, the electrical force Fe and the gravitational force Fg can act on the same electron and the same proton with the same acting distance R. The electromagnetic force Feand the gravitational force Fg are two fundamental forces in the Universe. Since Fe/Fg = Ln = 2.27×1039 is a constant for a hydrogen atom, it should not be an isolated case, and it should be universal. In the book < **Blackhole(BH)-Cosmology** > [1] written by author, on the basis of Hawking's the black hole (BH) theory, author deduced many new formulas and improved the black hole theory. This article will take advantage of several new formulas to test and verify the correctness and accurateness of Dirac large numbers-- Fe/Fg = Ln = 2.27×1039, it can also verify the correctness of the new BH-theory and new formulas. **The question is what kind of a BH can be used as a suitable model of Fe/Fg= Ln.**

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**Key Words:** The electromagnetic force Feand the gravitational force Fg；Dirac large numbers Fe/Fg = Ln = 2.27×1039；to test and verify the correctness of Dirac large numbers with some new formulas of BHs；ideal BH--Mbo formed by pure protons；the physical meaning of Dirac large numbers;

**§1；Fe/Fg = Ln= 2.27×1039 = Dirac large numbers could be calculated out with the model of a hydrogen atom.**

**First，**let us look back how to get the Dirac large number—Ln. Taking a hydrogen atom as a model, in which an electron on its surface can possess a e— (= e+ = 4.80325×10—10 esu.), and mass em= 9.1096×10--28g, a proton in the center can possess a e+ and a proton mass pm =1.6727×10--24g, the atomic radius is R, G = the gravitational constant = 6.6726×10--8 cm3 /s2\*g, Electronic power = 4.80325×10—10 esu. Then, the electromagnetic force Fe and the gravitational forceFg are as below,

**Fg**＝Gpmem/R2=6.6726×10--8×1.6727× 10—24×9.1096×10--28/R2 =**101.67×10--60/R2** [3] (1a)

**Fe**=(4.80325×10—10)2/R2=**23.10×10--20/R2**[3] (1b)

**Fe/Fg = Ln** = 23.10×10--20/101.67×10--60

= **2.27×1039** [3] (1c)

Formula (1c) shows that, in hydrogen atom, the distance R is the same for Fe and Fg, Then, the no dimension constant Ln = e2/Gpmem = 2.27×1039=Fe/Fg.

**§2；Hawking formula of entropy ratio before and after the collapse of a stellar BH**

According to the Hawking’s famous formula of entropy ratio of a stellar black holes, in the collapse process of a qualified star, it could increase in its entropy and decrease in its information amount. Suppose Sb—the entropy before its collapse; Sa—the entropy after its collapse; Mθ—sun mass = 2×10 33g, then,

**Sa/Sb ≈** **1018Mb/Mθ [1][2]  (2a)**

**Jacob Bekinstein** pointed out, **under the ideal condition,** while in the collapse process of a qualified star from its beginning to its end, if Sa = Sb, from (2a), a mini black hole of **Mbs ≈ 2×1015g** could be got, it was so-called original mini black hole in the Universe. The density **ρbs** of **Mbs --ρbs ≈ 1.8×1052g/cm3.**

From Bekinstein’s interpretation to the equal entropy process of stellar collapse can draw a very significant conclusions.

Bekinstein for Hawking formula (2a) only made a simple mathematical explanation, and let it be established in harmony. But author believes, (2a) should be used to explain the importantly physical meaning in the stellar collapse.

**First, formula (2a) shows that, entropy could not keep a constant in the** stellar **collapse process to form BHs of >**  Mbs≈ 2×1015g. **Second, the physical significance of entropy conservation shows that, only after quarks decomposed from protons could have no heat movement and no friction, they would enter in the ideal condition. Thus, quarks either in a contractive or in an expansive process between densities 1.8× 1052g/cm3 and 1093g/cm3 as the density of the Planck particles, they should be in the ideal process of no heat movement 、no friction and no energy exchanges. It is said, in case of protons not decomposed into quarks, i.e., in BHs of density--ρbs<1.8×1052g/cm3. it will be non-ideal state.**

In modern physics,[5] quark model and its structures inside have not be completely recognized yet, only some properties of quarks relevant to verify **Dirac Large Numbers-- Fe/Fg = Ln** can be simply described below: 1\*; According to the theories of modern particle physics and quantum chromodynamics (QCD), quarks are all imprisoned in protons, no quark could exist singly and freely. 2\*, A proton is formed by 3 quarks of ‘uud’ with 3 different colors—green, blue and red, every quark has its special color. Only 3 quarks bundled together with above 3 different colors can form a stable proton. Color may be the source of nuclear strong forces and be the expression of Pauli exclusion principle. 3\*, There are 2 ‘u’ quarks and a ‘d’ quark in a decomposed proton, every ‘u’ quark has 2e+/3 electrical charge, and a ‘d’ quark has e--/3 electrical charge. Therefore, a proton can hold a completely positive charge e+. All protons composed from 3 quarks can closely paste together in the whole space of Mbo= 0.71×1014g**.**  4\*, Every electron as a free one can be gathered in the vicinity of the inner horizon radius Rb of Mbs due to their exclusive forces each others. 5\*, It can be seen, every proton and electron can be acted simultaneously the electromagnetic forces Feand the gravitational forces Fg, and has **a same distance R. Thus, it will be simple and easy for us to find out Fe/Fg.**

**The important conclusion: It can be seen from above statements and analyses,** any BH of Mbo < Mbs(2×1015g) and its density--ρbs >1.8×1052 g/cm3 **are formed from pure protons incomposed from quarks, and must be in the ideal state.** That is to say, in a mini BH Mbo, except all protons close to each other, there are no impurities or other high radiations between protons. Thus, in the ideal process, when the temperature increases or decreases, their entropy will inverse decrease or increase with no additional entropy produced.

**§3；How to find some ideal mini BH--Mbo composed from pure protons as a suitable model**

Suppose mss be a Hawking quantum radiations of a ideal mini BH—Mbo, **i**t can be seen from [Referebce 1], on the horizon radius Rb of any BH, there are some generally suitable formulas as below,

**MbTb = (C 3/4G) × (h /2πκ) (3a)**

**E = mss C2 = κTb (3b)**

**GMb/Rb = C 2/2 (3c)**

**mssMb = hC/8πG = 1.187×10--10g2 (3d)**

Formula (3d) was newly derived from (3a) and (3b) by author, it improved the Hawking BH- theory. In above formulas, Mb—amonnt of tatol energy-matters of any BH, Rb—the horizon radius of BH, **Tb**–- temperature on Rb of a BH**, mss –-** mass of a Hawking quantum radiation, **h**—Planck constant=6.63×10--27gcm2/s, **C**– light speed=3×1010cm/s, **G–-**gravitational constant = 6.67×10—8cm3/s2\*g, **κ—**Bolzmann constant **=** 1.38×10—16g\*cm2/s2\*k, **mp–-**Planck participle =1.09×10—5g**,**

If using some ideal mini BH--Mbo as a model, it must be formed from pure protons. Then, **its mss must also be equal to a proton--pm**，so，

**mss= pm =1.6727×10—24**g, **（3e）**

From **(3d)**，

**mssMbo = hC/8πG = 1.187×10--10g2**

**So，Mbo =** 1.187×10—10/mp =1.187×10—10/ 1.6727×10—24= **0.71×1014g**, **（3f）**

According to **(3c)，finding Rbo of Mbo,**

**Rbo =** 2GMbo/C2=2×6.67×10—8×0.71×1014 g/9×1020 **= 1.05×10—14cm,**

According to sphere formula, finding density **bo** of **Mbo，**

**bo = 3Mbo/4πRbo3 = 1.5×1055g/cm3**

Tbo = 1.09 ×1013k;;

Numbers **np** of protons in mini **Mbo**，

**np** = Mbo/pm = 0.71×1014/1.67×10—24 = **0.424×1038 （3g）**

**Conclusions：**It can be known from above calculations, Mbs(2×1015g) > Mbo (0.71 ×1014g), and ρbs(1.8×1052g/cm3) < bo (1.5× 1055 g/cm3). Thus, **Mbo has already been in the ideal state of pure protons as a qualified model。**See also [Reference 1]，any Hawking radiations of equivalent mass < mss of Mbo can be impossible to exist in Mbo, but must naturally flee out to external Mbo. Thus, **there are only pure protons (**pm= mss**) in Mbo.**

**Therefore, it will be suitable to do a qualified model for a special mini Mbo = 0.71×1014g。**

**§4；Using Mbo = 0.71×1014g composed by pure protons as a qualified model to find out the Dirac large number Fe/Fg= Ln。**

From above paragraphs, since special Mbo is formed from pure protons which paste closely each others, every proton has a e+ and the gravitational force of a proton mass pm. All e— are pushed to the inside surface of Mbo due to their repulsions, and every free electron has a e-- and the gravitational force of an electronic mass em. The distributions of gravitational forces and electromagnetic forces on protons and on electronns are very similar to the hydrogen atom. No matter whether all protons as a concentrative mass or the distributed mass, **the total effects of both forces of all protons to a electron is exactly the same.** That is why Mbo can do a better model as the same with hydrogen atom to find out **Fe/Fg = Ln.**

Owing to **Mbo = np**pm**，mss=** pm **= em×** pm **/ em = 1836 em。From (3d)，**

**mssMbo=hC/8πG =1.187×10--10g2 can be changed to (4a),**

G**Mbomss/R2=hC/8πR2 (4a)**

Owing to Mbo= nppm, everypm has thesamegravitational force Fg and the same electromagnetic force Fe of a e+**. Then, the distance R between a proton and a electron for Fg and Fe is the same. So,(4a) can be changed to (4b) below,**

G **np** pm **em /R2=hC/(1836×8πR2) (4b)**

Similarly, **npe+e--/R2=npFe/R2 (4c)**

**From (4b),** G pm **em =hC/(1836×8πnp) =Fg**

**Fg = hC/(1836×8πnp)=** 6.63×10--2×3×1010 /(8π1836×0.424×1038) =**101.7×10—60(4d)**

So, **(4d) ≡ (1a)(4e)**

**Since Fe remains.**

**Fe = 23.07×10—20 (1b)**

** Fe/Fg = 23.07×10—20/101.7×10—60 = 2.27×1039。** (1c)

**§5；Some analyses and conclusions：**

**（1）; Dirac large number Fe/Fg = Ln= 2.27×1039 is a precise ratio of 2 fundamemtal forces with long distance in the Universe, it has nothing to do with some numbers 1038~40 got from other occasions in nature. Some numerical coincidences have no physical meaning.**

**（2）；Why could mini Mbs ≈ 2×1015g not**

**become a qualified model to find Fe/Fg = Ln ？**

Since Mbs from formula（2a）is an approximate formula; from **(3d)，mssMbs = hC/8πG = 1.187×10--10g2，**so, Hawking radiation mss = 1.187×10—10/2×1015=6×10—26g. Thus, **mss < pm(1.67×10—24),** it indicates, there may be many participles mss of high energy in Mbs, **i.e. pm > mss > 6×10—26g, they may let many electrons have no fixed locations and walk freely in Mbs.** This of course can not make Mbs as a suitable model for seeking Fe/Fg = Ln.

There is speculation that the number ns of protons in Mbs has some relationship with the Dirac large numbers,

**ns = Mbs/mp = 1.2×1039 (5a)**

From above analyses, ns = 1.2×1039 looks like a Dirac large numbers, but its practical significance is a ratio of the total mass of Mbs with the mass of a proton. In fact, ns and **np**  are all coincidences with the Dirac large number **Fe/Fg = Ln**, they have no physical meaning.

**（3）；**In this paper, the Dirac large number **Fe/Fg = Ln= 2.27×1039** re-confirmed precisely with the model of a special BH-- **Mbo of pure protons**, it indicates clearly the correctness of many new formulas in BH-theory proposed by author are also verified.

====The End====

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