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First Portion: The Essence of Gravitational Mass and Electric Charge

Zheng Shengming
Department of Management Science

***Corresponding author:** Zheng shengming, Department of Management Science, Beijing, China.

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Abstract

Since the discovery of an electron, people have thought that it possesses one electric charge and that the nucleus possesses a contrary charge. Based on the new discovery that moving photons do create force, I have calculated the number Z of elements and discovered that the number Z of elements can be calculated by the frequency of X-rays, and the atomic weight can also be calculated by the frequency of X-rays. This method of calculation shows the essence of the electric charge and the essence of the gravitational mass; here, for the first time, this study provides the unification of gravitation and electromagnetic force. Further based on the new discovery that moving photons create force and a formula for describing this new discovery, applying this discovery from the micro world to the macro world shows that from the atomic world to the galaxy world, nature has been working to obey this law, and its actions can all be described by this formula. Coulomb's law and the Newtonian University's law of gravitation are only approximate calculation formulas for specific conditions.

Keywords: Frequency of X-ray, force, gravitation Electromagnetic force Unification

Introduction

Since Newton discovered universal gravitation [1], people have thought that the origin of gravitation only relates to the gravitational mass and have defined gravitational mass in the expression of gravitation without investigating other origin theories. During the process of investigating the origin of gravitation, my experiments showed that moving photons produce gravitation. This discovery reveals the origin of gravitation. Moreover, I found that the atomic weight can be calculated by the frequency of the X-ray [2]. On the other hand, I have also found that the number Z of elements can also be calculated by the frequency of the X-ray. These experiments and calculations show that the electromagnetic force and gravitation are generated from the same origin. Their essence is the same. Therefore, we can comprehend the meaning of the gravitational mass, which was defined by Newton and Einstein, and the meaning of charge, which was defined by Coulomb and Franklin. This shows the unification of gravitation and electromagnetic force.

Chapter.1. Force generated by moving photons

The experimental devices are indicated in pictures **a, b, and c** of Figure 1. The process of the experiment is as follows: first, the light beam **L** is separated into 2 parts by a ring, as shown in pictures c and d of Figure 1. Light beam **L** then becomes two new light beams **P** and **O**, as shown in picture **d** of Figure 1. Along with light moving forward, the five light beams possessing the highest intensity in light beam **P** with the greatest attractive force obviously attracted light beam **O** to become a pentagon (see pictures 1-12 of Figure 1). Only the five points of light beam **O**, which correspond to the five points of light beams that possess the highest intensity in light beam **P**, are in contact with each other and gradually link to each other. Note: at first, light beam **P** and light beam **O** do not contact at all. It is impossible for this contact to occur in the light wave theory. This action is not an effect of wave interaction. In contrast, this indicates that moving photons create gravitation. (See pictures 1-12 of Figure 1.)

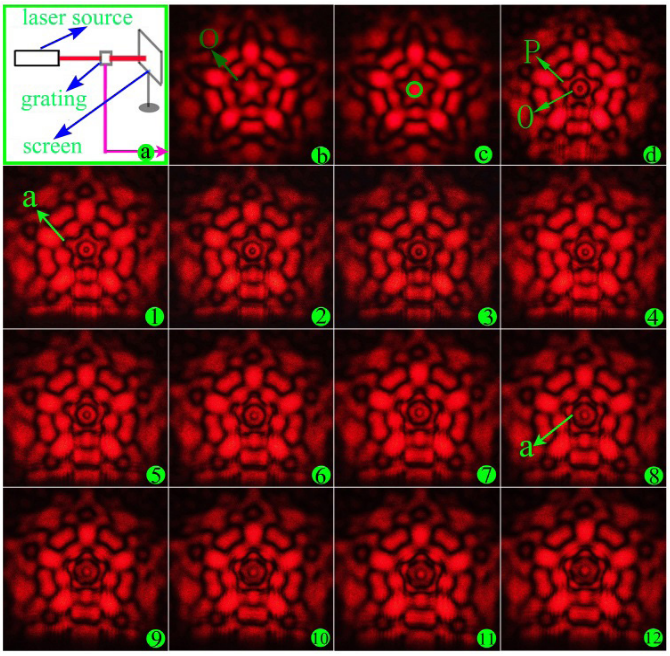


Figure 1. Picture **b** shows the device used in the experiment. Images **c and d** show the site of the ring in light beam O, and images 1-12 show that the form of light beam O changes from a circular shape to a pentagon because moving photons cause gravitation.

To verify that this phenomenon is caused by gravitation, a second experiment was performed. The experimental device is shown in picture **a** of Figure 2. Images b and c in Figure 2 show that the other light beams do not move forward and that only light beam O is allowed to move forward; under these conditions, light beam O maintains its circular shape. This phenomenon is shown in Figures 1-12 of Figure 2. This result demonstrated that if there was no other light beam, the light beam O would not accept the foregone gravitation.

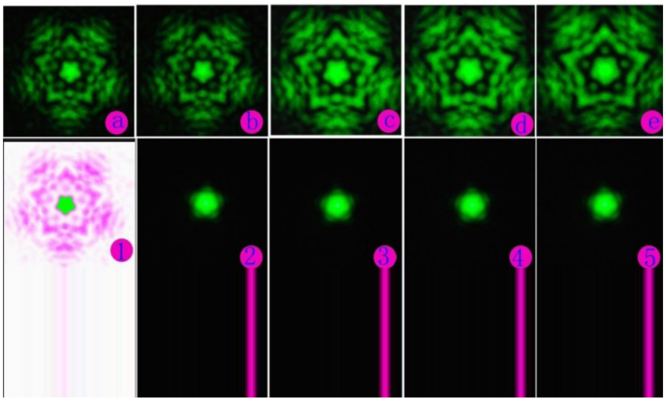


Figure2. This experiment shows that light beam O does not change its circular shape when there are no other light beams moving forward.

In comparison with experiment 1, it appears that light beam O maintains its circular shape in unchanged form when there are no other light beams moving forward. According to the results of this experiment, light beam O does not appear before the phenomenon of gravitation. This phenomenon is confirmed only by the interaction force, indicating that gravitation occurs; thus, we find that moving photons cause gravitation.

Chapter.2. Validation of the force generated by moving photons

According to previous studies Gravitation origin [1] , Unification of gravitation and electromagnetic force[2], moving photons generate force. According to this validated discovery, there is an interaction force between two light beams. Specifically, the distribution of light beams in space gives rise to a force field; thus, a change in the force field will change the distribution of light beams in space; on the other hand, a change in the distribution of light beams will change the force field in space. This inference can be further tested to validate the new discovery; for this purpose, I perform the following experiment. Figure 3(a) shows a light source. When all the light beams move forward, the form of the central light beam changes with the difference form when only the central light beam moves forward. When only the center light beam moves forward, the intensity of the center light beam increases more than that when it moves with the other light beams, which occurs when the other light beams do not move forward; thus, more light beams are attracted to the center. See pictures **a, b, c, d, e, 1, 2, 3, 4, and 5**. This experiment validated the above findings.

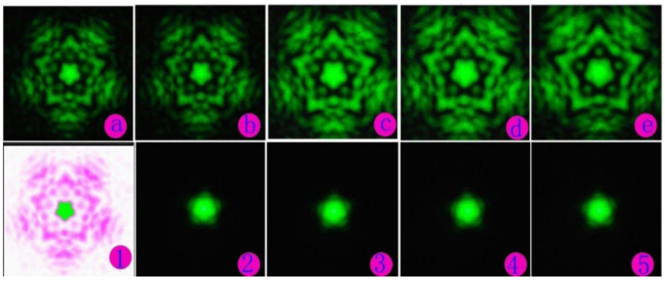


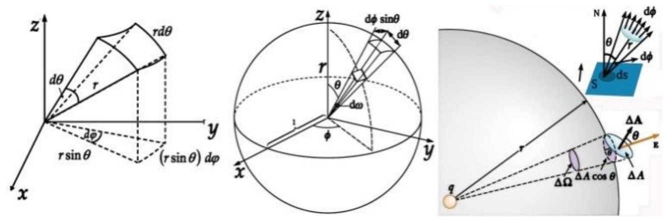
Figure 3. Image **a** is a light source. The form of the central light beam changes with the form. When only the central light beam moves forward, If so, the center light beam increases intensely, which indicates that when other light beams do not move forward, more light rays are attracted to the center. The form of center light beam will be difference, when all light beams move forward. **See pictures a, b, c, d, e, 1, 2, 3, 4, and 5 of figure 3.**

This experiment tests the validity of the above discovery that moving photons generate force. From the above experiments, we can obtain a law of nature in which a moving photon creates force.

Chapter 3.The quantitative experiment

3.1. Quantitative experiments. Below, we present the results of a quantitative experiment: first, we think that photons possess mass. The above two experiments indicate that there is a force between the light beams. Therefore, it is true that light possesses mass.

The process of the quantitative experiment is described below. First, I think that motion photons produce this gravitation proportional to their mass, and their velocity of motion, which is denoted as M_a, can be calculated via the following formula: $M_a = mv\,k_m$The change in the distributed intensity of this force field in a specific space in a unit area is its value divided by $4\pi r^2$, which indicates that the change in the intensity of the force field in space is inversely proportional to the square of the increase in distance.



The results are shown below.

Figure 4. The figure shows the change in the distributed intensity of the force field in space with increasing distance.

The intensity of this force field decreases with increasing distance r. Then, I write the following formula: $E_a = M_a/4\pi r^2$, namely, $E_a = mv\,k_m/4\pi r^2$. When the distance between two photons is r and m_1, m_2, v_1, v_2 are their mass and velocity, respectively, from the preceding analysis, at photon m_2, the intensity of the force field produced by m_1 is $E_a = m_1 v_1\,k_m/4\pi r^2$. The greater the mass of photon m_2 is, the greater the amount of force received from photon m_1 in space; the faster the velocity of motion of photon m_2 is, the greater the amount of force received from photon m_1 in unit time. In other words, photon m_2 accepting force is proportional to the intensity of the force field in which photon m_1 is produced: E_a, and its mass is m_2, and its velocity is v_2.

Write a formula below: $F_a = \frac{m_1 m_2 v_1 v_2}{4\pi r^2} G_a$; this is a scalar form. On the other hand, from the abovementioned experiments, the two light beams are parallel, but the direction of the generated gravitation is perpendicular to the direction of the traveling path.

Considering the characteristics of the medium, Θ is used to determine $\vec{F}_a = \frac{m_1 m_2 \times \vec{v}_1 \times (\vec{v}_2 \times \vec{r}_{12})}{4\pi\Theta \vec{r}_{12}^{3}} G_a$, which is a vector form. This formula implies that the two particles attracting or repelling only have to do with their motion direction.

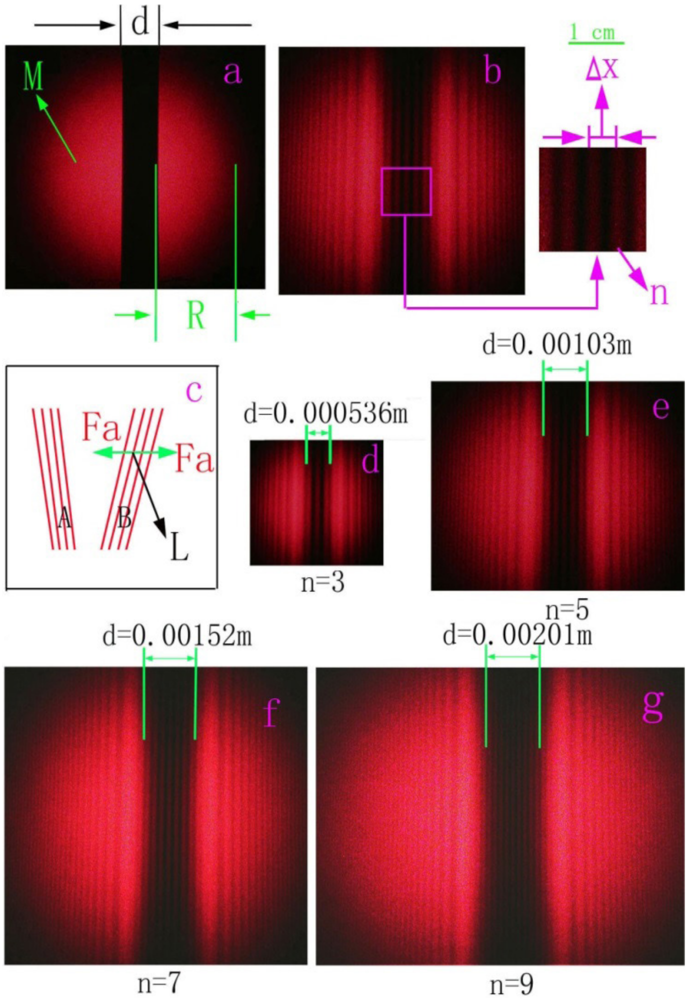


Figure 5. Pictures **a, b, and c** show the status of the two dispersing light beams A and B. Pictures **d, e, f, and g** are photographs of the experimental results.

Because there is an interaction force between two light beams, they can yield new light beams between them under special conditions. The changing distance between two light beams will change the number of light beams created between them. This phenomenon cannot be elucidated by wave theory but can be elucidated by the above discovery, as shown in Figure 5In light beam B of picture **c**, the first light ray of the inside light beam accepts force from the outside light beam; on the other hand, the first light ray also accepts force from light beam A because the light disperses while moving forward. The distance between the first light ray and the outside light beam increases faster than that between the first light ray and light beam A; thus, the first light ray accepting force from light beam A will undergo a smaller change than that from its outside light beam. In other words, the first light ray, which accepts force from the outside light beam in light beam B, decreases as the light beam moves forward. Thus, part of the internal light beam B will move to light beam A. The motion status of light beam A is similar to that of light beam B; in the end, new light rays will appear between light beams A and B (see Figure 5).

When the status of the new light beam is balanced by the accepted force from its two sides, the magnitude of the force, which every new light beam receives from its two sides, is equal; the directions of the two forces received from the two sides are opposite. At the site of the light beam **n** in picture **b** of Figure 4, according to the formula $F_a = \frac{m_1 m_2 v_1 v_2}{4\pi\Theta r^2} G_a$, we can obtain:

$$\frac{m^2v^2(n+1)^2}{4\pi d^2}G_a + \frac{m^2v^2(n+1)^2}{4\pi(2d)^2}G_a + \cdots + \frac{m^2v^2(n+1)^2}{(n+3)^2 4\pi d^2}G_a + \int_{\frac{n+3}{2(n+1)}d}^{\frac{n+3}{2(n+1)}d+R} \frac{mMv^2}{4\pi r^2} G_a\, dr$$

$$=\frac{m^2v^2(n+1)^2}{4\pi d^2}G_a + \frac{m^2v^2(n+1)^2}{4\pi(2d)^2}G_a + \cdots + \frac{m^2v^2(n+1)^2}{(n-1)^2 4\pi d^2}G_a + \int_{\frac{n-1}{2(n+1)}d}^{\frac{n-1}{2(n+1)}d+R} \frac{mMv^2}{4\pi r^2} G_a\, dr$$

$$d = \frac{n-1}{2p}\left(\frac{n+1}{n+3} + \frac{n+3}{n+1}\right)$$

where m is the mass of the new light beam created between two light beams and M is the mass in unit distance of two light beams A and B. The experiments3 and their results are shown in Figure 5and Table 1. Note that the calculation units are metric. Figure 5and Table 1 show that **n** changes as **d** changes. The changes in their values in this experiment are in extremely good agreement with the calculated outcome according to

$d = \frac{n-1}{2p}\left(\frac{n+1}{n+3} + \frac{n+3}{n+1}\right)$,

which is deduced from $\vec{F}_a = \frac{m_1 m_2 \times \vec{v}_1 \times (\vec{v}_2 \times \vec{r}_{12})}{4\pi\Theta\vec{r}_{12}^3} G_a$.

If the photon possesses mass and the above analysis is correct, ***p*** will approach a constant value in the experiment. The third experiment confirms this prediction, as shown in Table 1. As a result of this experiment, the validity of the following formulas is confirmed:

$$\vec{F}_a = \frac{m_1 m_2 \times \vec{v}_1 \times (\vec{v}_2 \times \vec{r}_{12})}{4\pi\Theta\vec{r}_{12}^3} G_a$$

Table 1: Results of experiment 3

Table the result of experiment				
the experimental d	d=0.00053mm	d=0.00103mm	d=0.00152mm	d=0.00201mm
the experimental n	n=3	n=5	n=7	n=9
the calculating p	p=4088.5	p=4045.307	p=4046.052	p=4046.434

From the above experiments, we discover the origin of gravitation: motion photons generate gravitation, and several formulas can be used to describe this phenomenon. See below:

$$\vec{M}_a = \frac{m\vec{v}\times\vec{r}}{\vec{r}} k_m,\quad \vec{E}_a = \frac{m_1\times\vec{v}_1\times\vec{r}_{12}}{4\pi\vec{r}_{12}^3},\quad \vec{F}_a = \frac{m_1 m_2\times\vec{v}_1\times(\vec{v}_2\times\vec{r}_{12})}{4\pi\Theta\vec{r}_{12}^3} G_a .$$

3.4. The mechanism of the chemical reaction

The chemical reactions described in article Gravitation origin [1] need not be repeated here.

3.5. Application in thermoelectricity

For applications in thermoelectricity, see article Gravitation origin [1], here, it does not need to be repeated.

$\vec{F}_a = \frac{m_1 m_2\times\vec{v}_1\times(\vec{v}_2\times\vec{r}_{12})}{4\pi\Theta r_{12}^3} G_a$ xamples, we know that the formula is the universal law in the micro world.

Chapter.4. The essence of electric charge

According to the above discoveries and formula:

$$\vec{F}_a = \frac{m_1 m_2\times\vec{v}_1\times(\vec{v}_2\times\vec{r}_{12})}{4\pi\Theta r_{12}^3} G_a$$

We can obtain a formula that can calculate the nuclear charge of an element; see the following formula: $Q_z = \sqrt{\frac{c}{\lambda} + Zb} \times (1 - (A_m - Z)k_1)k_2$ where Q_z is the nuclear charge of the element, A_m is the atomic weight of the element, Z is the atomic number, and $\lambda_{k1}, \lambda_{k2}$ are the first and second wavelengths of X-ray emission, respectively, in $k, \bar{\lambda}$ is the mean wavelength of these two wavelengths of X-ray emission. b, k_1, k_2 are all constant. The test results for this formula are shown in Table 1 and Table 2 [3,4].

K1 = KL3 = 1 s1/2 − 2p3/2,

K2 = KL2 = 1 s1/2 − 2p1/2[3],[4] $\bar{\lambda} = \frac{\delta\lambda_1+\lambda_2}{2} \times 10^{-10}$

For example,

for Li: $Q_Z = \sqrt{\frac{c}{\bar{\lambda}} + Zb} \times (1-(A_m - Z)k_1)k_2 =$

$\sqrt{\frac{3\times10^{8}}{234.192\times10^{-10}} + 3\times2.72641\times10^{15}} \times ((6.941-3)\times5\times10^{-4})\times2.075\times10^{-8} = 3.$

Table 2

Z	symbol	atomic weight(A_m)	A_m-Z	$\lambda_{k1}\times10^{-10}$	$\lambda_{k2}\times10^{-10}$	δ	$\bar{\lambda} = \frac{\delta\lambda_1+\lambda_2}{2}\times10^{-10}$	b	k_1	k_2	$Q_z = \sqrt{\frac{c}{\bar{\lambda}}+Zb} \times(1-(A_m-Z)k_1)k_2$
3	Li	6.941	3.9410	241.686	226.456	1.001	234.192	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	3.000
4	Be	9.012	5.0120	114.272	111.698	1.007	113.379	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	4.000
5	B	10.811	5.8810	67.6400	65.9495	1.005	66.9638	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	5.000
6	C	12.011	6.0110	44.7600	43.6813	1.002	44.2654	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	6.000
7	N	14.006	7.0060	31.5966	31.5966	1.006	31.3880	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	7.000
8	O	15.999	7.9990	23.6207	23.3186	0.996	23.4224	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	8.000
9	F	18.998	9.9980	18.2000	18.0499	1.000	18.1250	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	9.000
10	Ne	20.179	10.179	14.6105	14.3023	1.001	14.4637	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	10.00
11	Na	22.989	11.989	11.9102	11.6174	1.004	11.7876	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	11.00
12	Mg	24.305	12.305	9.80700	9.80700	1.000	9.80700	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	12.00
13	Al	26.981	13.981	8.27067	8.27067	1.000	8.27067	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	13.00
14	Si	28.085	14.085	7.07677	7.07677	1.001	7.08030	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	14.00
15	P	30.973	15.973	6.11663	6.11663	1.001	6.11968	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	15.00
16	S	32.065	16.065	5.35329	5.34077	1.002	5.35038	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	16.00
17	Cl	35.453	18.453	4.71100	4.69567	1.001	4.70569	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	17.00
18	Ar	39.948	21.948	4.19180	4.19180	0.993	4.16245	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	18.00
19	K	39.098	20.098	3.74140	3.72060	1.000	3.73100	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	19.00
20	Ca	40.078	20.078	3.36166	3.34013	1.003	3.35593	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	20.00
21	Sc	44.956	23.955	3.03090	3.03090	0.997	3.02181	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	21.00
22	Ti	47.867	25.876	2.74851	2.74851	0.997	2.74026	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	22.00
23	V	50.941	27.941	2.50356	2.50356	0.997	2.49605	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	23.00
24	Cr	51.996	27.996	2.28970	2.28970	0.999	2.28741	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	24.00
25	Mn	54.938	29.938	2.10180	2.10180	0.999	2.09969	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	25.00
26	Fe	55.845	29.845	1.93998	1.93735	1.000	1.93866	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	26.00
27	Co	58.933	31.933	1.79285	1.78896	1.000	1.79091	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	27.00
28	Ni	58.693	30.693	1.66179	1.66179	1.001	1.66345	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	28.00
29	Cu	63.546	34.546	1.54440	1.54056	1.001	1.54325	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	29.00
30	Zn	65.409	35.409	1.43900	1.43515	1.002	1.43851	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	30.00
31	Ga	69.723	38.723	1.34138	1.34138	1.000	1.34138	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	31.00
32	Ge	72.641	40.640	1.25405	1.25405	1.000	1.25405	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	32.00
33	As	74.921	41.921	1.17588	1.17588	1.001	1.17705	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	33.00
34	Se	78.963	44.960	1.10477	1.10477	0.999	1.10366	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	34.00
35	Br	79.904	44.904	1.03974	1.03974	1.001	1.04077	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	35.00
36	Kr	83.798	47.798	0.98010	0.98010	0.999	0.98000	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	36.00
37	Rb	85.467	48.467	0.92550	0.92550	1.000	0.92550	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	37.00
38	Sr	87.621	49.620	0.87529	0.87529	1.001	0.87616	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	38.00
39	Y	88.905	49.905	0.83071	0.83071	1.000	0.83070	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	39.00
40	Zr	91.224	51.224	0.79012	0.78595	1.000	0.78803	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	40.00
41	Nb	92.906	51.906	0.75040	0.74622	1.001	0.74868	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	41.00
42	Mo	95.942	53.940	0.71360	0.70932	1.001	0.71181	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	42.00
43	Tc	97.907	54.907	0.67934	0.67509	1.003	0.67823	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	43.00
44	Ru	101.07	57.070	0.64743	0.64310	1.002	0.64591	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	44.00
45	Rh	102.905	57.905	0.61765	0.61329	1.003	0.61639	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	45.00
46	Pd	106.421	60.420	0.58984	0.58547	1.002	0.58810	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	46.00
47	Ag	107.868	60.868	0.56382	0.55943	1.004	0.56277	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	47.00
48	Cd	112.441	64.411	0.53944	0.53503	1.000	0.53723	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	48.00
49	In	114.818	65.818	0.51656	0.51213	1.001	0.51460	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	49.00
50	Sn	118.711	68.711	0.49062	0.49062	1.003	0.49209	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	50.00

Table 3 [3,4]

The number or nuclear charge of other elements can also be calculated by this formula. This formula indicates that the nuclear charge of an element can be calculated by the wavelength of the X-ray of the element; thus, this formula indicates the essence of the nuclear charge of the element, namely, it reveals the essence of the electric charge.

Z	symbol	atomic weight(A_m)	A_m-Z	$\lambda_{k1}\times10^{-10}$	$\lambda_{k2}\times10^{-10}$	δ	$\bar{\lambda} = \frac{\delta\lambda_1+\lambda_2}{2}\times10^{-10}$	b	k_1	k_2	$Q_z = \sqrt{\frac{c}{\bar{\lambda}}+Zb} \times(1-(A_m-Z)k_1)k_2$
51	Sb	121.761	70.761	0.47037	0.47037	1.004	0.47210	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	51.0
52	Te	127.603	75.603	0.45129	0.45129	1.001	0.45170	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	52.0
53	I	126.904	73.904	0.43784	0.43333	0.999	0.43536	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	53.0
54	Xe	131.293	77.293	0.41635	0.41635	1.003	0.41759	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	54.0
55	Cs	132.905	77.905	0.40180	0.40180	1.001	0.40220	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	55.0
56	Ba	137.327	81.327	0.38512	0.38512	1.005	0.38666	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	56.0
57	La	138.905	81.905	0.37532	0.37075	0.998	0.37266	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	57.0
58	Ce	140.116	82.116	0.36169	0.35710	1.001	0.35958	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	58.0
59	Pr	140.907	81.907	0.34876	0.34415	1.006	0.34750	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	59.0
60	Nd	144.243	84.240	0.33185	0.33185	1.010	0.33517	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	60.0
61	Pm	144.910	83.910	0.32481	0.31481	0.998	0.32416	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	61.0
62	Sm	150.363	88.363	0.31371	0.30905	1.006	0.31232	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	62.0
63	Eu	151.964	88.964	0.30313	0.30313	0.997	0.30222	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	63.0
64	Gd	157.253	93.253	0.29305	0.28836	1.005	0.29143	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	64.0
65	Tb	158.925	93.925	0.28343	0.27873	1.008	0.28221	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	65.0
66	Dy	162.500	96.500	0.27427	0.26954	1.007	0.27186	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	66.0
67	Ho	164.930	97.930	0.26549	0.26077	1.009	0.26432	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	67.0
68	Er	167.259	99.259	0.25712	0.25237	1.011	0.25616	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	68.0
69	Tm	168.934	99.934	0.25163	0.24435	1.005	0.24862	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	69.0
70	Yb	173.043	103.04	0.24150	0.23666	1.013	0.24065	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	70.0
71	Lu	174.967	103.967	0.23409	0.23409	0.998	0.23362	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	71.0
72	Hf	178.490	106.49	0.22926	0.22223	1.007	0.22655	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	72.0
73	Ta	180.948	107.95	0.22030	0.22030	0.999	0.22007	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	73.0
74	W	183.840	109.84	0.21383	0.21383	0.999	0.21362	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	74.0
75	Re	186.205	111.205	0.26762	0.26762	1.000	0.20762	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	75.0
76	Os	190.230	114.23	0.20165	0.20165	0.999	0.20145	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	76.0
77	Ir	192.217	115.217	0.19591	0.19591	1.001	0.19611	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	77.0
78	Pt	195.078	117.078	0.19038	0.19038	1.001	0.19057	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	78.0
79	Au	196.967	117.967	0.18508	0.18508	1.002	0.18545	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	79.0
80	Hg	200.590	120.59	0.17996	0.17996	1.002	0.18032	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	80.0
81	Tl	204.383	123.38	0.17504	0.17504	1.003	0.17556	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	81.0
82	Pb	207.200	125.20	0.17030	0.17030	1.003	0.17081	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	82.0
83	Bi	208.980	125.98	0.16572	0.16572	1.005	0.16655	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	83.0
84	Po	208.980	124.98	0.16248	0.16248	1.002	0.16280	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	84.0
85	At	209.990	124.99	0.15846	0.15846	1.003	0.15893	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	85.0
86	Rn	222.020	136.02	0.15293	0.15293	1.003	0.15338	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	86.0
87	Fr	223.020	136.02	0.15028	0.15028	0.998	0.14998	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	87.0
88	Ra	226.030	138.03	0.14640	0.14640	0.998	0.14611	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	88.0
89	Ac	227.030	138.03	0.14265	0.14265	1.001	0.14279	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	89.0
90	Th	232.038	142.04	0.13903	0.13903	1.000	0.13903	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	90.0
91	Pa	231.035	140.04	0.13552	0.13552	1.005	0.13620	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	91.0
92	U	238.028	146.03	0.13212	0.13212	1.002	0.13238	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	92.0
93	Np	237.050	144.05	0.12883	0.12883	1.008	0.12986	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	93.0
94	Pu	244.060	150.06	0.12564	0.12564	1.005	0.12626	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	94.0
95	Am	243.060	148.05	0.12255	0.12255	1.008	0.12365	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	95.0
96	Cm	247.070	151.07	0.11955	0.11955	1.010	0.12075	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	96.0
97	Bk	247.070	150.07	0.11662	0.11662	1.015	0.11887	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	97.0
98	Cf	251.080	153.08	0.11383	0.11383	1.017	0.11577	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	98.0
99	Es	252.080	153.08	0.11109	0.11109	1.020	0.11331	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	99.0
100	Fm	257.010	157.01	0.10838	0.10838	1.021	0.11066	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	100.0

Chapter 5. The essence of gravitational mass

According to the above findings, the following formula can be used to calculate the atomic mass of an element by moving photons:

$$m_a = \sqrt{\frac{c}{\bar{e}} + Zb} \times (1 + (k_1 \times \frac{A_m}{Z})k_2$$

where m_a is the atomic mass of the element, A_m is the atomic weight of the element, Z is the atomic number or element number, λ_{k1} is the wavelength of X-ray emission at a lower energy level , λ_{k2} is the wavelength of X-ray emission at a higher energy level, and $\bar{e}$ is the mean wavelength of these two wavelengths of X-ray emission. b, k_1, k_2 are all constant. For example, Li:

$$m_a = \sqrt{\frac{c}{\ddot{e}} + B} \times (1+(k_1 \times \frac{A_m}{Z})k_2 =$$

$$\sqrt{\frac{3\times10^{8}}{226.456\times10^{-10}}+3\times2.72641\times10^{15}}\times\left(1+1.314\times\frac{6.941}{3}\right)\times1.115\times10^{-8}=6.5941$$

Other atomic masses can also be calculated by this formula. The test results for this formula are shown in Table 4, Table 5 [3,4,5,6].

Z	symbol	atomic weight(A_m)	Am-Z	$\lambda_{k1}\times10^{-10}$	$\lambda_{k2}\times10^{-10}$	$\bar{\lambda}=\frac{\lambda_1+\lambda_2}{2}\times10^{-10}$	b	k_1	k_2	$m_a=\sqrt{\frac{c}{\bar{\lambda}}+Zb}\times(1+(\frac{A_m}{Z})k_1)k_2$
3	Li	6.9410	3.941		226.456	226.456	2.72641×10^{15}	1.314	1.115×10^{-8}	6.5941
4	Be	9.0120	5.012		111.698	111.698	2.72641×10^{15}	1.314	1.115×10^{-8}	8.5812
5	B	10.811	5.881		65.9495	65.9495	2.72641×10^{15}	1.314	1.115×10^{-8}	10.413
6	C	12.011	6.011		43.6813	43.6813	2.72641×10^{15}	1.314	1.135×10^{-8}	12.015
7	N	14.006	7.006		30.9899	30.9899	2.72641×10^{15}	1.314	1.135×10^{-8}	14.018
8	O	15.999	7.999		23.3186	23.3186	2.72641×10^{15}	1.314	1.115×10^{-8}	15.691
9	F	18.998	9.998		18.0894	18.0894	2.72641×10^{15}	1.314	1.115×10^{-8}	18.359
10	Ne	20.179	10.179		14.3023	14.3023	2.72641×10^{15}	1.314	1.135×10^{-8}	20.177
11	Na	22.989	11.989		11.5693	11.5693	2.72641×10^{15}	1.314	1.135×10^{-8}	22.917
12	Mg	24.305	12.305	9.51257		9.51257	2.72641×10^{15}	1.314	1.115×10^{-8}	24.086
13	Al	26.981	13.981	7.9484		7.94838	2.72641×10^{15}	1.314	1.115×10^{-8}	26.703
14	Si	28.085	14.085		6.73833	6.73833	2.72641×10^{15}	1.314	1.115×10^{-8}	28.186
15	P	30.973	15.973	5.78424	5.78424	5.78424	2.72641×10^{15}	1.314	1.115×10^{-8}	30.970
16	S	32.065	16.065		5.03166	5.03166	2.72641×10^{15}	1.314	1.115×10^{-8}	32.405
17	Cl	35.453	18.453			4.403905	2.72641×10^{15}	1.314	1.115×10^{-8}	35.572
18	Ar	39.948	21.948		3.8861	3.8861	2.72641×10^{15}	1.314	1.115×10^{-8}	39.567
19	K	39.098	20.098	3.7445	3.4365	3.5905	2.72641×10^{15}	1.314	1.118×10^{-8}	39.078
20	Ca	40.078	20.078	3.3617	3.0704	3.2161	2.72641×10^{15}	1.314	1.115×10^{-8}	40.252
21	Sc	44.955	23.955	3.0343	2.7620	2.8982	2.72641×10^{15}	1.314	1.115×10^{-8}	44.434
22	Ti	47.876	25.876	2.7486	2.4974	2.6230	2.72641×10^{15}	1.314	1.115×10^{-8}	47.216
23	V	50.941	27.941	2.5074	2.2692	2.3883	2.72641×10^{15}	1.314	1.115×10^{-8}	50.069
24	Cr	51.996	27.996	2.2897	2.0703	2.1800	2.72641×10^{15}	1.314	1.115×10^{-8}	51.498
25	Mn	54.938	29.938	2.1018	1.8965	1.99915	2.72641×10^{15}	1.314	1.115×10^{-8}	54.291
26	Fe	55.845	29.845	1.9361	1.7435	1.83980	2.72641×10^{15}	1.314	1.115×10^{-8}	55.593
27	Co	58.933	31.933	1.78903	1.6082	1.69862	2.72641×10^{15}	1.314	1.115×10^{-8}	58.499
28	Ni	58.693	30.693	1.6618	1.4881	1.57495	2.72641×10^{15}	1.314	1.115×10^{-8}	58.921
29	Cu	63.546	34.546	1.5444	1.3806	1.46256	2.72641×10^{15}	1.314	1.115×10^{-8}	63.131
30	Zn	65.409	35.409	1.4390	1.28339	1.36120	2.72641×10^{15}	1.314	1.115×10^{-8}	65.152
31	Ga	69.723	38.723	1.3401	1.19582	1.26796	2.72641×10^{15}	1.314	1.115×10^{-8}	69.038
32	Ge	72.641	40.640	1.2541	1.11662	1.18536	2.72641×10^{15}	1.314	1.118×10^{-8}	72.048
33	As	74.921	41.921	1.1799	1.04496	1.11243	2.72641×10^{15}	1.314	1.115×10^{-8}	74.141
34	Se	78.963	44.960	1.1048	0.97977	1.04229	2.72641×10^{15}	1.314	1.118×10^{-8}	78.078
35	Br	79.904	44.904	1.0438	0.92045	0.98213	2.72641×10^{15}	1.314	1.118×10^{-8}	79.366
36	Kr	83.798	47.798	0.9801	0.86555	0.92283	2.72641×10^{15}	1.314	1.118×10^{-8}	83.038
37	Rb	85.467	48.467	0.92558	0.81556	0.87057	2.72641×10^{15}	1.314	1.120×10^{-8}	85.115
38	Sr	87.621	49.620	0.8795	0.76976	0.82463	2.72641×10^{15}	1.314	1.118×10^{-8}	87.148
39	Y	88.905	49.905	0.8330	0.72769	0.78035	2.72641×10^{15}	1.314	1.118×10^{-8}	88.786
40	Zr	91.224	51.224	0.7901	0.68885	0.73948	2.72641×10^{15}	1.314	1.118×10^{-8}	91.201
41	Nb	92.906	51.906	0.7504	0.65300	0.70170	2.72641×10^{15}	1.314	1.115×10^{-8}	92.891
42	Mo	95.942	53.940	0.7136	0.61994	0.66677	2.72641×10^{15}	1.314	1.115×10^{-8}	95.838
43	Tc	97.907	54.907	0.6793	0.58908	0.63419	2.72641×10^{15}	1.314	1.115×10^{-8}	97.997
44	Ru	101.07	57.070	0.6474	0.56053	0.60397	2.72641×10^{15}	1.314	1.115×10^{-8}	101.027
45	Rh	102.905	57.905	0.6176	0.54121	0.57941	2.72641×10^{15}	1.314	1.115×10^{-8}	102.804
46	Pd	106.421	60.421	0.5898	0.50922	0.54951	2.72641×10^{15}	1.314	1.115×10^{-8}	106.452
47	Ag	107.868	60.868	0.5638	0.49771	0.53076	2.72641×10^{15}	1.314	1.115×10^{-8}	107.650
48	Cd	112.441	64.411	0.5394	0.46409	0.50175	2.72641×10^{15}	1.314	1.115×10^{-8}	112.372
49	In	114.818	65.818	0.5165	0.44372	0.48011	2.72641×10^{15}	1.314	1.115×10^{-8}	114.897
50	Sn	118.711	68.711	0.4950	0.42468	0.45984	2.72641×10^{15}	1.314	1.115×10^{-8}	118.547
51	Sb	121.761	70.761	0.4748	0.40669	0.44075	2.72641×10^{15}	1.314	1.115×10^{-8}	121.572
52	Te	127.603	75.603	0.4513	0.38975	0.42053	2.72641×10^{15}	1.314	1.115×10^{-8}	127.051
53	I	126.904	73.904	0.4378	0.37383	0.40582	2.72641×10^{15}	1.314	1.115×10^{-8}	126.919
54	Xe	131.293	77.293	0.4208	0.35844	0.38962	2.72641×10^{15}	1.314	1.115×10^{-8}	131.020
55	Cs	132.905	77.905	0.4048	0.34453	0.37467	2.72641×10^{15}	1.314	1.115×10^{-8}	132.959
56	Ba	137.327	81.327	0.3896	0.33105	0.36033	2.72641×10^{15}	1.314	1.115×10^{-8}	137.082
57	La	138.905	81.905	0.3753	0.31937	0.34734	2.72641×10^{15}	1.314	1.115×10^{-8}	138.931
58	Ce	140.116	82.116	0.3617	0.30649	0.33410	2.72641×10^{15}	1.314	1.115×10^{-8}	140.695
59	Pr	140.907	81.907	0.3487	0.30498	0.32684	2.72641×10^{15}	1.314	1.114×10^{-8}	140.890
60	Nd	144.243	84.240	0.3365	0.29404	0.31527	2.72641×10^{15}	1.314	1.115×10^{-8}	144.270
61	Pm	144.910	83.910	0.3248	0.28361	0.30421	2.72641×10^{15}	1.314	1.115×10^{-8}	145.524
62	Sm	150.363	88.363	0.3137	0.27376	0.29373	2.72641×10^{15}	1.314	1.115×10^{-8}	150.418
63	Eu	151.964	88.964	0.3031	0.26434	0.28372	2.72641×10^{15}	1.314	1.112×10^{-8}	151.987
64	Gd	157.253	93.253	0.2930	0.25535	0.27418	2.72641×10^{15}	1.314	1.115×10^{-8}	157.200
65	Tb	158.925	93.925	0.2834	0.24684	0.26512	2.72641×10^{15}	1.314	1.113×10^{-8}	158.954
66	Dy	162.500	96.500	0.2743	0.23863	0.25647	2.72641×10^{15}	1.314	1.115×10^{-8}	162.745
67	Ho	164.930	97.930	0.2655	0.23084	0.24817	2.72641×10^{15}	1.314	1.112×10^{-8}	164.952
68	Er	167.259	99.259	0.2572	0.22342	0.24031	2.72641×10^{15}	1.314	1.115×10^{-8}	167.957
69	Tm	168.934	99.934	0.2491	0.21636	0.23273	2.72641×10^{15}	1.314	1.112×10^{-8}	169.589
70	Yb	173.043	103.04	0.2438	0.21037	0.22708	2.72641×10^{15}	1.314	1.115×10^{-8}	173.409
71	Lu	174.967	103.97	0.2364	0.20384	0.22012	2.72641×10^{15}	1.314	1.115×10^{-8}	175.689
72	Hf	178.490	106.49	0.2293	0.19759	0.21345	2.72641×10^{15}	1.314	1.115×10^{-8}	179.204
73	Ta	180.948	107.95	0.2225	0.19161	0.20705	2.72641×10^{15}	1.314	1.115×10^{-8}	181.916
74	W	183.850	109.85	0.2159	0.18586	0.20088	2.72641×10^{15}	1.314	1.115×10^{-8}	184.993
75	Re	186.207	111.21	0.2096	0.18035	0.19498	2.72641×10^{15}	1.314	1.115×10^{-8}	187.653
76	Os	190.200	114.20	0.2036	0.17506	0.18933	2.72641×10^{15}	1.314	1.115×10^{-8}	191.579
77	Ir	192.220	115.22	0.1978	0.16998	0.18388	2.72641×10^{15}	1.314	1.112×10^{-8}	193.482
78	Pt	195.080	117.08	0.1921	0.16509	0.17865	2.72641×10^{15}	1.314	1.112×10^{-8}	196.555
79	Au	196.967	117.97		0.18020	0.18020	2.72641×10^{15}	1.314	1.115×10^{-8}	195.795
80	Hg	200.590	120.59		0.17507	0.17507	2.72641×10^{15}	1.314	1.118×10^{-8}	200.020
80	Hg	200.590	120.59		0.17507	0.17507	2.72641×10^{15}	1.314	1.118×10^{-8}	200.020
81	Tl	204.383	121.38		0.17013	0.17013	2.72641×10^{15}	1.314	1.115×10^{-8}	203.322
82	Pb	207.200	125.20		0.16538	0.16538	2.72641×10^{15}	1.314	1.115×10^{-8}	206.425
83	Bi	208.980	`125.98		0.16079	0.16079	2.72641×10^{15}	1.314	1.115×10^{-8}	208.757
84	Po	208.982	124.98		0.15633	0.15633	2.72641×10^{15}	1.314	1.115×10^{-8}	209.760
85	At	209.987	124.99		0.15209	0.15209	2.72641×10^{15}	1.314	1.115×10^{-8}	211.503
86	Rn	222.017	136.02		0.14797	0.14797	2.72641×10^{15}	1.314	1.115×10^{-8}	221.783
87	Fr	223.019	136.02		0.14399	0.14399	2.72641×10^{15}	1.314	1.115×10^{-8}	223.586
88	Ra	226.025	138.03		0.14014	0.14014	2.72641×10^{15}	1.314	1.115×10^{-8}	226.959
89	Ac	227.028	138.03	0.1414	0.13640	0.13890	2.72641×10^{15}	1.314	1.118×10^{-8}	227.379
90	Th	232.038	142.04	0.1378	0.13282	0.13532	2.72641×10^{15}	1.314	1.115×10^{-8}	231.625
91	Pa	232.038	141.04	0.1344	0.12933	0.13184	2.72641×10^{15}	1.314	1.115×10^{-8}	232.652
92	U	238.028	146.03	0.1310	0.12595	0.12848	2.72641×10^{15}	1.314	1.115×10^{-8}	238.318
93	Np	237.048	144.05	0.1288	0.12268	0.12575	2.72641×10^{15}	1.314	1.112×10^{-8}	237.447
94	Pu	244.064	150.06	0.1246	0.11951	0.12204	2.72641×10^{15}	1.314	1.115×10^{-8}	245.156
95	Am	243.061	149.06	0.1215		0.12150	2.72641×10^{15}	1.314	1.115×10^{-8}	242.935
96	Cm	247.071	151.07	0.1185		0.11854	2.72641×10^{15}	1.314	1.115×10^{-8}	247.051
97	Bk	247.071	150.07		0.11566	0.11566	2.72641×10^{15}	1.314	1.115×10^{-8}	248.101
98	Cf	251.079	153.08		0.11288	0.11288	2.72641×10^{15}	1.314	1.112×10^{-8}	251.572
99	Es	252.083	153.08	0.1111		0.11107	2.72641×10^{15}	1.314	1.112×10^{-8}	252.387
100	Fm	257.095	157.09	0.1084		0.10838	2.72641×10^{15}	1.314	1.112×10^{-8}	257.331

Table 5[3-9]

In these tables, from Cl to La, the X-ray wavelengths include the Kl2 and K_{abs} edges at the K level. Some data were obtained via the following formula: $\lambda = \frac{12398.418}{E[eV]}$. From Li to S, the constant k_3 is $1.135e^{-8}$, which is more accurate than the value of $1.115e^{-8}$. From Cl to Fm, the constant K_3 is $1.115e^{-8}$. This calculation shows that the essence of gravitational mass is due to the movement of photons. Because the atomic mass in the periodic table of elements is a weighted aggregate, every atomic mass with its X-ray wavelength is used to accurately test the meaning of $M_a = \sqrt{\frac{c}{\bar{\lambda}} + nb}\left(1+1.314\times\frac{A_m}{Z}\right)k$;

see the following test: Table 6,7 [3,9].

Z	symbol	atomic weight(A_m)	natural abundance	$\lambda_{k1}\times10^{-10}$	$\lambda_{k2}\times10^{-10}$	$\bar{\lambda}=\frac{\lambda_1+\lambda_2}{2}\times10^{-10}$	b	k_1	$k=M_a/(\sqrt{\frac{c}{\bar{\lambda}}+Zb}\times(1+(\frac{A_m}{Z})k_1))$
3	Li	7.0120	92.414		226.456	226.456	2.72641×10^{15}	1.314	1.17661×10^{-8}
4	Be	9.0120	100		111.698	111.698	2.72641×10^{15}	1.314	1.17095×10^{-8}
5	B	11.0093	80.17	65.9496		65.9496	2.72641×10^{15}	1.314	1.16525×10^{-8}
6	C	12.0000	98.93		43.6813	43.6813	2.72641×10^{15}	1.314	1.13425×10^{-8}
7	N	14.0031	99.636		30.9899	30.9899	2.72641×10^{15}	1.314	1.13353×10^{-8}
8	O	15.9990	99.757		23.3186	23.3186	2.72641×10^{15}	1.314	1.13686×10^{-8}
9	F	18.9980	100		18.0894	18.0894	2.72641×10^{15}	1.314	1.15379×10^{-8}
10	Ne	19.9924	90.48		14.3023	14.3023	2.72641×10^{15}	1.314	1.13220×10^{-8}
11	Na	22.9890	100		11.5755	11.5755	2.72641×10^{15}	1.314	1.14121×10^{-8}
12	Mg	25.9850	10.029	9.8903		9.89030	2.72641×10^{15}	1.314	1.16570×10^{-8}
13	Al	26.9810	100	8.3420		8.34200	2.72641×10^{15}	1.314	1.15171×10^{-8}
14	Si	27.9769	92.223		7.0665	7.06650	2.72641×10^{15}	1.314	1.13433×10^{-8}
15	P	30.9737	100	6.1661	6.1088	6.13345	2.72641×10^{15}	1.314	1.14575×10^{-8}
16	S	31.9720	94.99	5.3719	5.0187	5.19530	2.72641×10^{15}	1.314	1.11894×10^{-8}
17	Cl	34.9688	75.76	4.8889	4.3982	4.64350	2.72641×10^{15}	1.314	1.13490×10^{-8}
18	Ar	39.9622	99.603	4.1948	3.8710	4.03290	2.72641×10^{15}	1.314	1.14563×10^{-8}
19	K	38.9637	93.258	3.7445	3.4365	3.59050	2.72641×10^{15}	1.314	1.11955×10^{-8}
20	Ca	39.9625	96.941	3.3617		3.36170	2.72641×10^{15}	1.314	1.13272×10^{-8}
21	Sc	44.9559	100	3.0343	2.7620	2.8982	2.72641×10^{15}	1.314	1.12808×10^{-8}
22	Ti	47.9479	73.72	2.7523	2.4974	2.6249	2.72641×10^{15}	1.314	1.13147×10^{-8}
23	V	50.9439	99.75	2.5074	2.2692	2.3883	2.72641×10^{15}	1.314	1.13441×10^{-8}
24	Cr	51.9406	83.789	2.2936	2.0703	2.1820	2.72641×10^{15}	1.314	1.12596×10^{-8}
25	Mn	54.9380	100	2.1058	1.8965	2.0012	2.72641×10^{15}	1.314	1.12883×10^{-8}
26	Fe	55.9349	91.754	1.9401	1.7435	1.8418	2.72641×10^{15}	1.314	1.12098×10^{-8}
27	Co	58.9330	100	1.7929	1.6082	1.70055	2.72641×10^{15}	1.314	1.12388×10^{-8}
28	Ni	57.9353	68.077	1.6618		1.66180	2.72641×10^{15}	1.314	1.13572×10^{-8}
29	Cu	62.9295	69.15	1.5444	1.3806	1.46256	2.72641×10^{15}	1.314	1.11949×10^{-8}
30	Zn	65.9260	27.73	1.4390	1.28339	1.36120	2.72641×10^{15}	1.314	1.12167×10^{-8}
31	Ga	68.9255	60.108	1.3440	1.19582	1.26991	2.72641×10^{15}	1.314	1.12360×10^{-8}
32	Ge	73.9211	36.521	1.2580	1.11662	1.18731	2.72641×10^{15}	1.314	1.13301×10^{-8}
33	As	74.9215	100	1.1799	1.04496	1.11243	2.72641×10^{15}	1.314	1.12673×10^{-8}
34	Se	79.9165	49.803	1.1088	0.97977	1.04430	2.72641×10^{15}	1.314	1.13722×10^{-8}
35	Br	80.9162	49.31	1.0438	0.92045	0.98213	2.72641×10^{15}	1.314	1.12909×10^{-8}
36	Kr	83.9114	56.987	0.9841	0.86555	0.92483	2.72641×10^{15}	1.314	1.12978×10^{-8}
37	Rb	84.9117	72.172	0.9297	0.81556	0.87263	2.72641×10^{15}	1.314	1.12408×10^{-8}
38	Sr	87.9056	82.581	0.8795	0.76976	0.82463	2.72641×10^{15}	1.314	1.12497×10^{-8}
39	Y	88.9058	100	0.8330	0.72769	0.78035	2.72641×10^{15}	1.314	1.11950×10^{-8}
40	Zr	89.9045	51.45	0.7901	0.68885	0.73948	2.72641×10^{15}	1.314	1.11418×10^{-8}
41	Nb	92.9063	100	0.7504	0.65300	0.70170	2.72641×10^{15}	1.314	1.11517×10^{-8}
42	Mo	97.9054	24.292	0.7136	0.61994	0.66677	2.72641×10^{15}	1.314	1.12182×10^{-8}
43	Tc	99.9076	15.8s	0.6793	0.58908	0.63419	2.72641×10^{15}	1.314	1.11958×10^{-8}
44	Ru	101.904	31.550	0.6474	0.56053	0.60397	2.72641×10^{15}	1.314	1.11745×10^{-8}
45	Rh	102.905	100	0.6176	0.53396	0.57578	2.72641×10^{15}	1.314	1.11267×10^{-8}
46	Pd	107.903	26.46	0.5898	0.50922	0.54951	2.72641×10^{15}	1.314	1.11848×10^{-8}
47	Ag	108.905	48.162	0.5638	0.48590	0.52485	2.72641×10^{15}	1.314	1.11405×10^{-8}
48	Cd	113.903	28.754	0.5394	0.46409	0.50175	2.72641×10^{15}	1.314	1.11897×10^{-8}

Z	symbol	atomic weight(A_m)	natural abundance	$\lambda_{k1}\times10^{-10}$	$\lambda_{k2}\times10^{-10}$	$\bar{\lambda}=\frac{\lambda_1+\lambda_2}{2}\times10^{-10}$	b	k_1	$k=M_a/\left(\sqrt{\frac{c}{\bar{\lambda}}+Zb}\times(1+(\frac{A_m}{Z})k_1)\right)$
49	In	114.904	95.715	0.5165	0.44372	0.48011	2.72641×10^{15}	1.314	1.11443×10^{-8}
50	Sn	119.902	32.589	0.4950	0.42468	0.45984	2.72641×10^{15}	1.314	1.11924×10^{-8}
51	Sb	122.904	42.79	0.4748	0.40669	0.44075	2.72641×10^{15}	1.314	1.11925×10^{-8}
52	Te	125.903	18.84	0.4558	0.38975	0.42278	2.72641×10^{15}	1.314	1.11920×10^{-8}
53	I	126.904	100	0.4378	0.37383	0.40582	2.72641×10^{15}	1.314	1.11486×10^{-8}
54	Xe	128.904	26.908	0.4208	0.35844	0.38962	2.72641×10^{15}	1.314	1.11239×10^{-8}
55	Cs	132.905	100	0.4048	0.34453	0.37467	2.72641×10^{15}	1.314	1.11454×10^{-8}
56	Ba	137.905	71.698	0.3896	0.33105	0.36033	2.72641×10^{15}	1.314	1.11811×10^{-8}
57	La	138.905	99.911	0.3753	0.31845	0.34688	2.72641×10^{15}	1.314	1.11406×10^{-8}
58	Ce	141.909	11.114	0.3617	0.30649	0.33410	2.72641×10^{15}	1.314	1.11378×10^{-8}
59	Pr	140.907	100	0.3487	0.30498	0.32684	2.72641×10^{15}	1.314	1.11419×10^{-8}
60	Nd	145.913	17.189	0.3365	0.29404	0.31527	2.72641×10^{15}	1.314	1.11786×10^{-8}
61	Pm	147.917	5.37d	0.3248	0.28361	0.30421	2.72641×10^{15}	1.314	1.11579×10^{-8}
62	Sm	151.919	26.75	0.3137	0.27376	0.29373	2.72641×10^{15}	1.314	1.11732×10^{-8}
63	Eu	152.921	55.196	0.3031	0.26434	0.28372	2.72641×10^{15}	1.314	1.11350×10^{-8}
64	Gd	157.924	24.84	0.2930	0.25535	0.27418	2.72641×10^{15}	1.314	1.11650×10^{-8}
65	Tb	158.925	100	0.2834	0.24684	0.26512	2.72641×10^{15}	1.314	1.11279×10^{-8}
66	Dy	163.929	28.260	0.2743	0.23863	0.25647	2.72641×10^{15}	1.314	1.11561×10^{-8}
67	Ho	164.930	100.000	0.2655	0.23084	0.24817	2.72641×10^{15}	1.314	1.11185×10^{-8}
68	Er	167.932	2.978	0.2572	0.22342	0.24031	2.72641×10^{15}	1.314	1.11141×10^{-8}
69	Tm	168.934	100	0.2491		0.24910	2.72641×10^{15}	1.314	1.14542×10^{-8}
70	Yb	173.938	32.026	0.2438	0.21037	0.22708	2.72641×10^{15}	1.314	1.11399×10^{-8}
71	Lu	174.967	97.40	0.2364	0.20384	0.22012	2.72641×10^{15}	1.314	1.11038×10^{-8}
72	Hf	179.946	35.08	0.2293	0.19759	0.21345	2.72641×10^{15}	1.314	1.11267×10^{-8}
73	Ta	180.948	99.99	0.2225		0.22245	2.72641×10^{15}	1.314	1.14899×10^{-8}
74	W	183.950	30.64	0.2159		0.21592	2.72641×10^{15}	1.314	1.14836×10^{-8}
75	Re	186.955	62.60	0.2096		0.20960	2.72641×10^{15}	1.314	1.14765×10^{-8}
76	Os	191.961	40.78	0.2036		0.20360	2.72641×10^{15}	1.314	1.14983×10^{-8}
77	Ir	192.962	62.71	0.1978		0.19780	2.72641×10^{15}	1.314	1.14628×10^{-8}
78	Pt	195.964	25.21	0.1921		0.19214	2.72641×10^{15}	1.314	1.14511×10^{-8}
79	Au	196.967	100.00		0.18020	0.18020	2.72641×10^{15}	1.314	1.12167×10^{-8}
80	Hg	201.971	29.74		0.17507	0.17507	2.72641×10^{15}	1.314	1.12298×10^{-8}
81	Tl	204.974	70.48		0.17013	0.17013	2.72641×10^{15}	1.314	1.12157×10^{-8}
82	Pb	207.976	52.41		0.16538	0.16538	2.72641×10^{15}	1.314	1.12015×10^{-8}
83	Bi	208.980	100.00		0.16079	0.16079	2.72641×10^{15}	1.314	1.11412×10^{-8}
84	Po	209.982	138.4d		0.15633	0.15633	2.72641×10^{15}	1.314	1.11210×10^{-8}
85	At	216.002	0.3ms		0.15209	0.15209	2.72641×10^{15}	1.314	1.11431×10^{-8}
86	Rn	222.017	3.823d		0.14797	0.14797	2.72641×10^{15}	1.314	1.11615×10^{-8}
87	Fr	225.025	3.9m		0.14399	0.14399	2.72641×10^{15}	1.314	1.11442×10^{-8}
88	Ra	228.031	5.76a		0.14014	0.14014	2.72641×10^{15}	1.314	1.11264×10^{-8}
89	Ac	229.033	1.04h	0.1414	0.13640	0.13890	2.72641×10^{15}	1.314	1.11852×10^{-8}
90	Th	232.038	99.98	0.1378	0.13282	0.13532	2.72641×10^{15}	1.314	1.11698×10^{-8}
91	Pa	231.035	100	0.1344		0.13435	2.72641×10^{15}	1.314	1.12156×10^{-8}
92	U	238.028	99.274	0.1310		0.13097	2.72641×10^{15}	1.314	1.12439×10^{-8}
93	Np	239.052	2.355d	0.1288		0.12880	2.72641×10^{15}	1.314	1.12539×10^{-8}
94	Pu	246.070	10.85d	0.1246		0.12457	2.72641×10^{15}	1.314	1.12343×10^{-8}
95	Am	247.071	22.m	0.1215		0.12150	2.72641×10^{15}	1.314	1.11974×10^{-8}
96	Cm	247.071		0.1185		0.11854	2.72641×10^{15}	1.314	1.11508×10^{-8}
97	Bk	249.074	320d		0.11566	0.11566	2.72641×10^{15}	1.314	1.11243×10^{-8}
98	Cf	254.087	60.5d		0.11288	0.11288	2.72641×10^{15}	1.314	1.11283×10^{-8}
99	Es	255.090	40.d	0.1111		0.11107	2.72641×10^{15}	1.314	1.11359×10^{-8}
100	Fm	259.101	1.5s	0.1084		0.10838	2.72641×10^{15}	1.314	1.11263×10^{-8}

Chapter6. Unification of gravitation and electromagnetic force

From the following two formulas and the above discoveries,

$$Q_Z=\sqrt{\tfrac{c}{\lambda}+Zb}\times(1-(A_m-Z)k_1)\times k_2;$$

$$m_a=\sqrt{\tfrac{c}{\lambda}+Zb}\times(1+k_1\times\tfrac{A_m}{Z})\times k_2$$

the interactions between two units of lithium are shown below; between them, the value of their Coulomb force is

$$F_c=\frac{Q_1\times Q_2}{r^2}k=\frac{[\sqrt{\frac{c}{\lambda}+Zb}\times(1-(A_m-Z)k_1)\times k_2]^2}{r^2}k=\frac{(\frac{c}{\lambda}+Zb)}{r^2}k\times[(1-(A_m-Z)k_1)\times k_2]^2$$

Among them, the value of their gravitational force is

$$F_g=\frac{m_1\times m_2}{r^2}G=\frac{[\sqrt{\frac{c}{\lambda}+Zb}\times(1+k_1\times\frac{A_m}{Z})\times k_2]^2}{r^2}G=\frac{(\frac{c}{\lambda}+Zb)}{r^2}G\times[(1+k_1\times\frac{A_m}{Z})\times k_2]^2$$

From the preceding validation, we can determine that the electromagnetic force and gravitational force are generated by the moving photons in the atom, and their origins are the same: $\frac{(\frac{c}{\lambda}+Zb)}{r^2}$.

The difference in the values between them is only because the Coulomb force is the first interaction force generated by this force; it does not include the gravitational force, and the gravitational force includes the effect of the Coulomb force interaction: $(1-(A_m-Z)k_1)\times k_2$, $(1+k_1\times\frac{A_m}{Z})\times k_2$.

Now, we have known the unification of the electromagnetic force and gravitational force [5,6]. There are only two different effects of one force.

Second portion: The Universal formula in the nature

Chapter 7. It application in the micro world

7.1. Applied in the interaction between atoms and molecules

We now know that motion particles produce attraction or repulsion forces; from this, two motion atoms also produce attraction or repulsion forces between them; thus, the force of attraction or repulsion between two atoms or molecules will lead to chemical reactions, namely, the mechanism of chemical reactions is the mechanism of their attraction and repulsion forces, which are created by their motion. Below is a result of this interaction to prove the Maxwell distribution formula.

In particular, for a gas, is set up such that an atom moves from v_0 to v_t by attraction or repulsion, and the displacement is $r-r_0$ in this process;

therefore, $fs=\frac{1}{2}mv_t^2-\frac{1}{2}mv_0^2$

according to the following formula: $f_a=\frac{m_1m_2v_1v_2}{r^2}G_a$

Thus, $\int_r^{\infty}\frac{m_1m_2v_1v_2}{r^2}G_a dr\,s=\int_{r_0}^{r}dr\int_r^{\infty}\frac{m_1m_2v_1v_2}{r^2}G_a dr$

$$\int_r^{\infty}\frac{m_1m_2v_1v_2}{r^2}G_a dr\,s=\int_{r_0}^{r}dr\int_r^{\infty}\frac{m_1m_2v_1v_2}{r^2}G_a dr=\frac{1}{2}mv_t^2-\frac{1}{2}mv_0^2;$$

because

$$k_s=\frac{2k_BG_a}{k_\lambda^2};\ k_B=\frac{R}{N_A},$$

$$G_a=\frac{k_\lambda^2K_s}{2R}\cdot N_A$$

can be obtained. Considering $v_1=v_2=v$ under specific conditions, the following equations can be obtained:

$$\int_{r_0}^{r}dr\int_r^{\infty}\frac{m_2\sqrt{m_1v^2}\cdot\sqrt{m_1v^2}}{r^2}G_a dr=\int_{r_0}^{r}dr\int_r^{\infty}\frac{m_2\sqrt{m_1v^2}\cdot\sqrt{m_1v^2}}{r^2}\frac{k_\lambda^2k_s}{2R}N_A dr;$$

$$\int_{r_0}^{r} dr \int_{r}^{\infty} \frac{m_2\sqrt{N_\lambda m_1 v^2}\cdot\sqrt{N_\lambda m_1 v^2}}{r^2}\frac{K_\lambda^2 k_s}{2R}dr = \int_{r_0}^{r} dr \int_{r}^{\infty} \frac{\sqrt{3K_BT}\cdot\sqrt{3K_BT}}{r^2}\frac{K_\lambda^2 k_s m_2}{2R}dr;$$

$$\int_{r_0}^{r} dr \int_{r}^{\infty} \frac{\sqrt{3k_BT}\cdot\sqrt{3K_BT}\, m_2 k_\lambda^2 k_s}{r^2 2R}dr = \frac{1}{2}mv_t^2 - \frac{1}{2}mv_0^2\ ;$$

$$3K_BT\ln\left(\frac{r}{r_0}\right)\cdot\frac{m_2 k_s k_\lambda^2}{2R} = \frac{1}{2}mv_t^2 - \frac{1}{2}mv_0^2;$$

$$\frac{r}{r_0} = e^{\frac{\frac{1}{2}mv_t^2-\frac{1}{2}mv_0^2}{3K_BT}\frac{2R}{K_\lambda^2 k_s m_2}} = \left(e^{\frac{\frac{1}{2}mv_t^2-\frac{1}{2}mv_0^2}{3K_BT}}\right)^{\frac{2R}{K_\lambda^2 k_s m_2}}$$

Because m_2; K_s; R; K_λ are all constant values,

$$\sqrt[\frac{2R}{K_\lambda^2 k_s m_2}]{\frac{r}{r_0}} = e^{\frac{\frac{1}{2}mv_t^2-\frac{1}{2}mv_0^2}{3K_BT}}$$ can obtain

$$\frac{r'}{r_0'} = e^{\frac{\frac{1}{2}mv_t^2-\frac{1}{2}mv_0^2}{3K_BT}};$$

Namely:

$$r = r_0 e^{\frac{\frac{1}{2}mv_t^2-\frac{1}{2}mv_0^2}{3K_BT}};$$

$$r^3 = r_0^3 e^{\frac{\frac{1}{2}mv_t^2-\frac{1}{2}mv_0^2}{3K_BT}};$$

$$\frac{4}{3}\pi r^3 = \frac{4}{3}\pi r_0^3 e^{\frac{\frac{1}{2}mv_t^2-\frac{1}{2}mv_0^2}{3K_BT}}.$$

This formula can be written as follows:

$$\left(\frac{2m}{3}\right)^{\frac{3}{2}}\pi^{\frac{3}{2}}r^3 = \left(\frac{2m}{3}\right)^{\frac{3}{2}}\pi^{\frac{3}{2}}r_0^3 e^{\frac{mv_t^2-mv_0^2}{2K_BT}};$$

$r = v_0 t = v_0$(in unit time:$t = 1$) is defined as follows:

$$m_d = \frac{m}{\left(\frac{2m}{3}\right)^{\frac{3}{2}}\pi^{\frac{3}{2}}r^3} = \frac{m}{\left(\frac{2m}{3}\right)^{\frac{3}{2}}\pi^{\frac{3}{2}}r_0^3}e^{-\frac{mv_t^2-mv_0^2}{2K_BT}} = m\left(\frac{1}{\left(\frac{2m}{3}\right)^{\frac{3}{2}}\pi^{\frac{3}{2}}r_0^3}\right)e^{-\frac{mv_t^2-mv_0^2}{2K_BT}} = m\left(\frac{3m}{2\pi mv^2}\right)^{\frac{3}{2}}e^{-\frac{mv_t^2-mv_0^2}{2K_BT}} = m\left(\frac{m}{2\pi K_BT}\right)^{\frac{3}{2}}e^{-\frac{mv_t^2-mv_0^2}{2K_BT}};$$

Namely $m_d = m\left(\frac{m}{2\pi K_BT}\right)^{\frac{3}{2}}e^{-\frac{mv_t^2-mv_0^2}{2K_BT}}$

Since $m_d = m\cdot p$ eventually: $p = f(v) = \left(\frac{m}{2\pi K_BT}\right)^{\frac{3}{2}}e^{-\frac{mv_t^2-mv_0^2}{2K_BT}}$

Namely,

$$f(v) = \left(\frac{m}{2\pi K_BT}\right)^{\frac{3}{2}}e^{-\frac{mv_t^2-mv_0^2}{2K_BT}}.$$

This is the probability of one atom in one direction with velocity v. Therefore, in the whole space, the probability with velocity v is

$$f(v) = 4\pi v^2\left(\frac{m}{2\pi K_BT}\right)^{\frac{3}{2}}e^{-\frac{mv_t^2-mv_0^2}{2K_BT}},$$

which is the **Maxwell distribution law of velocity**.

When $v_0 = 0$, $f(v) = 4\pi v^2\left(\frac{m}{2\pi K_BT}\right)^{\frac{3}{2}}e^{-\frac{mv^2}{2K_BT}}$.

7.2. The electric charge of the particle

We now know that moving photons do generate force, and knowledge of the unification of electromagnetic force and gravitation suggests that if a particle holds photons that are more or less than the threshold of its internal balance of force, it will attract or repel other particles; hence, the phenomenon of attracting or repelling other particles appears, showing electric characteristics, which is the essence of the electric charge of a particle. From this, we can determine the origin of the electrical charge of the particle.

7.3. Revealing the Bohr hydrogen spectrum formula

In the hydrogen atom, one electron revolves around the nucleus, between them, when the electron moves from velocity v_1 to v_2, and the distance between them changes from r_1 to r_2. In this changing process, the change in the energy of the electron is as follows:

$$\Delta E = \int_{r_1}^{r_2} dr \int_{v_1}^{v_2} \frac{MVmv}{4\pi\theta r^2}G_a dv = \int_{r_1}^{r_2} \frac{Qe}{r^2}kdr$$

$$\frac{MVmG_a}{4\pi\theta}\times\frac{r_1-r_2}{r_1r_2}\times(v_2^2-v_1^2) = \frac{Qek}{r_1r_2}(r_1-r_2)$$

$$v_2^2 - v_1^2 = \frac{4\pi\theta Qek}{MVmG_a}$$

can be obtained via the following formula:

$$m \times (v_2^2 - v_1^2) = m \times \frac{4\pi\theta Qek}{MVmG_a};$$

$$E_2 - E_1 = m \times \frac{4\pi\theta Qek}{MVmG_a} \qquad (1)$$

Moreover, according to $\frac{MVmv}{4\pi\theta r^2} G_a = \frac{Qe}{r^2} k$, $v = \frac{k_\lambda}{\lambda}$ can be calculated via the following formula:

$$v = \frac{4\pi\theta Qek}{MVmG_a} = \frac{k_\lambda}{\lambda}$$

Compare (1) yields the following formula:

$$\frac{k_\lambda}{\lambda} = \frac{1}{m} \times (E_2 - E_1),$$

namely, $\frac{1}{\lambda} = \frac{1}{mk_\lambda} \times (E_2 - E_1)$ and m and k_λ are all constants, and $\frac{1}{\lambda} = k \times (E_2 - E_1)$ is obtained. This formula explains why the Bohr formula can describe the hydrogen spectrum. From this, in generalization, the two-body system can be described by this formula. The spectrum of hydrogen and the spectrum of hydrogen-like systems include the ions He^{+}, Li^{2+}, Be^{3+}, and $U91^{+}$ and the spectrum of alkali metal can all be described by this formula. The hydrogen is only a specific case.

7.4. The decay of the particle

According to the above discovery that moving photons generate force, there is a force between photons and other particles. Namely, photons can interact with any other particles. One photon can be attracted or repelled by other photons or other particles. On the other hand, the magnitude of the force that moving photons create is specific. The two photons that produce the electron position pair need sufficient energy, and the appearance of the particle is determined by its moving state. If one particle absorbs one photon, its internal original balance of force will change, which will lead to fusion or fission for a new balance of force. In this process, the parent particle displays a decay process. For example, neutron decay, meson decay, nuclear decay, etc… involve many photons in space, and any particle can absorb photons at any time; thus, almost all the particles exhibit decay characteristics. The reason why the particles decay is the force between the photons and the particles.

Chapter 8. Applying in the macro world

8.1. The essence of the bending of light

From the above, we know the origin of gravitation. Here, this finding is used to calculate the bending of light. Figure 6 shows the state of the light of the star passing near the Sun, where r is the distance between the center of the Sun and the passing light. A is the actual site of the star, B is the site of the Earth, and R is the radius of the Sun. Figure 6: According to the formula $\vec{F_a} = \frac{m_1 m_2 \times \vec{v}_1 \times (\vec{v}_2 \times \vec{r}_{12})}{4\pi\theta r_{12}^3} G_a$, $F_a = \frac{m_s m_p v_s c}{4\pi\theta r^2} G_a$,

where m_s is the mass of the Sun, v_s is the average speed of the moving particle in the Sun, m_p is the mass of the photon, c is the speed of light, and r is the distance between the center of the Sun and the passing light. The gravitation of the star light accepted from the Sun changes with distance, and the accepted gravitation is greatest when the star light passes through the nearest sun. Therefore, in this special area nearest to the Sun, the distance at which light moves S plays a key role in the bending of light; at this distance, light acceptance of gravity may represent the gross gravitation that occurs along its whole travel path. Then, after light has passed through the Sun, the velocity can increase via this gravitation:

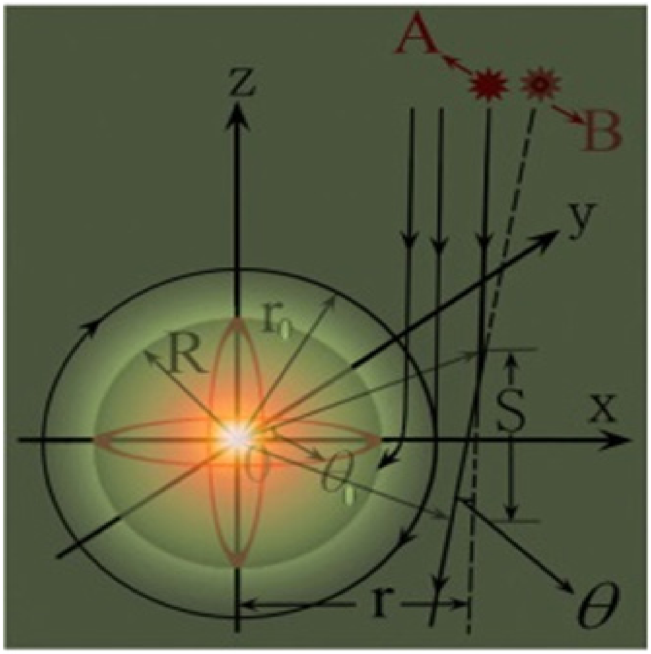


Figure 6 This is the state of light from a star passing through the Sun, which is the distance between the center of the Sun and the passing light. A is the actual site of the star, B is the site of the Earth, and R is the radius

of the Sun.

$$v = at = \frac{m_s v_s m_p c}{r^2 m_p} G \cdot \frac{s}{c} = \frac{m_s v_s}{r^2} G_a S = \frac{m_s v_s}{r^2} G_a 2rtg\theta_0 = \frac{m_s v_s}{r} G_a 2tg\theta_0$$

Namely, $v=\frac{m_s V_s}{r}G_a 2g\dot{e}_0$. When light arrives at the Earth, it experiences a displacement:

$$h = vt = \frac{m_s V_s}{r} G_a 2g\dot{e}_0 \frac{L_1}{c} = \frac{m_s v\, 2g\dot{e}_0 G_a}{rc} L_1 ;$$

Namely, $h=\frac{2m_s v_s G_a g\dot{e}_0}{rc}L_1$ thus: $g\dot{e}=\frac{h}{L_2}=\frac{2m_s v_s G_a g\dot{e}_0}{rcL_2}L_1$ Namely, $g\dot{e}=\frac{2m_s v_s G_a g\dot{e}_0}{rcL_2}L_1$. where L_1 is the distance between the Earth and the Sun and L_2 is the distance between the Earth and the star. Because m_s, v_s, G_a, c, L_1 are all constant, only L_2 and θ_0 undergo little change, so $g\dot{e}=\frac{h}{L_2}=\frac{2g\dot{e}_0}{L_2}k$; here, if L_2 and θ_0 are all constant, then $g\dot{e}=\frac{2tg\dot{e}_0}{L_2}k=\frac{k_0}{r}$. Namely, $rtg\dot{e}=k$=constant. The test results are shown in Table8.

Table8 7:

table 5.12

r	θ	$tg\theta$	$rtg\theta$
1.85	0.95″	4.61E-06	8.52E-06
4.82	0.37″	1.79E-06	8.65E-06
7.05	0.26″	1.26E-06	8.88E-06
8.35	0.21″	1.01E-06	8.50E-06
8.5	0.215″	1.04E-06	8.85E-06

Table8. shows the results of the deduced conclusions. From this test, we can find that formula $g\dot{e}=\frac{2m_s v_s G_a g\dot{e}_0}{rcL_2}L_1$ is compatible with the bending of light when it passes near the Sun.

According to the formula $\vec{F}_a = \frac{m_1 m_2 \times \vec{v}_1 \times (\vec{v}_2 \times \vec{r}_{12})}{4\pi\varepsilon r_{12}^3} G_a = m_p \frac{c^2}{r}$, three statuses of the bending of light when it passes through the Sun can be obtained. First, when $\frac{m_s V_s}{4\delta r} > c$, the light beam will be absorbed by the Sun. On Earth, the light beam cannot be observed. In the second status: when $\frac{m_s V_s}{4\delta r} = c$, the light beam will revolve around the Sun. On Earth, the light beam cannot be observed. The above two conditions indicate that in the special scope nearest to the Sun, we cannot see the star in the sky. Third, when $\frac{m_s V_s}{4\delta r} < c$, the light beam will move forward, and the earth can see this bending of light. These three statuses are in good agreement with the phenomena that occur on Earth. Moreover, from these three statuses, we can clearly determine the extent to which the star light passes through the scope nearest to the Sun where the star light cannot reach the Earth, the reason why we cannot see a star when its light passes through the nearest Sun, and the orbit of light moving in space. With all this information, the term "general relativity" cannot be used.

8.2. The dark matter does not exist

8.2.1. The gravitation of the spiral galaxy rotation

The spiral galaxy is similar to the rotation of the disk. It includes two features: one is the spiral arm. The second center spherical component includes a large halo and a nuclear bulge, where the main mass of the galaxy is concentrated.

According to the formula, $\vec{F}_a = \frac{m_1 m_2 \times \vec{v}_1 \times (\vec{v}_2 \times \vec{r}_{12})}{4\pi\varepsilon r_{12}^3} G_a$.

For a spiral galaxy, there is a central bulge where most of the mass is concentrated and the spiral arms are spread over a disk. For a star in such a galaxy at a distance *r* from the galactic center moving with a circular velocity: v.

When $M_{body<r}$: where $M_{<r}$ is the mass enclosed within radius *r*. If the star is within the dense central region (or central hub) of the galaxy, then $M_{<r} = \frac{4}{3}\pi r^3 \rho$,

where ρ is the average density of the central hub. Therefore, within the central hub, one expects from

$$\frac{mMvV}{4\pi r^2} G_a = \frac{m\frac{4}{3}\pi r^3 \rho \cdot 2\pi r V}{4\pi r^2 T} G_a = \frac{mv^2}{r}.$$

(consider: $v = \frac{2\pi r}{T}$)

can obtain: $v = \sqrt{\frac{2\rho\pi G_a V}{3T} r^3} = \sqrt{r^3}\sqrt{\frac{2\rho\pi G_a V}{3T}}$

When $M_{body>r}, M > r$: $\frac{mMvV}{4\pi r^2} G_a = \frac{mv^2}{r}$

consider: $v = \frac{2\pi r}{T}$

The following conclusions can be drawn:

$$\frac{mMV2\pi r}{4\pi r^2 T} G_a = \frac{mv^2}{r} \quad v = \sqrt{\frac{MVG_a}{2T}}.$$

In this result, the rotation velocity of the spiral galaxy is constant when $\sqrt{\frac{MVG_a}{2T}}$ is constant, which is in extremely good agreement with the fact that the observational measurements of rotation curves for several spiral galaxies show *v* to be equally constant for large *r*.

. These results indicate that Newton's law of universal gravitation is not a natural law and that dark matter does not exist in nature. According to the following formula,

$$\vec{F}_a = \frac{m_1 m_2 \times \vec{v}_1 \times (\vec{v}_2 \times \vec{r}_{12})}{4\pi e r_{12}^3} G_a$$

yields two results: When $M_{<r}$: $v = \sqrt{r^3}\sqrt{\frac{2\rho\pi G_a V}{3T}}$;

When $M_{>r}$: $v = \sqrt{\frac{MVG_a}{2T}}$.

According to formula $F = \frac{m_1 m_2}{r^2} G$,

the following two results can be obtained:

when $M_{<r}$: $v = \sqrt{\frac{4\pi\rho G}{3}} r$;

when $M_{>r}$: $v = \frac{\sqrt{MG}}{\sqrt{r}}$.

It is unequivocal that the two results from formula

$$\vec{F}_a = \frac{m_1 m_2 \times \vec{v}_1 \times (\vec{v}_2 \times \vec{r}_{12})}{4\pi e r_{12}^3} G_a$$

are in extremely good agreement with the observational facts, but the two results from

$$F = \frac{m_1 m_2}{r^2} G$$

are not in agreement with the observational facts.

8.2.2. These observations confirmed the discoveries

According to $v = \sqrt{\frac{MVG_a}{2T}}$, in one galaxy, if $\frac{MVG_a}{2T}$ is constant and the main mass of the galaxy is concentrated in the center of the galaxy, the rotation curve of the spiral galaxy will be flat; if the period changes more greatly than the mass changes, the rotation curve of the spiral galaxy will also change. Therefore, because N4565, N4594, M31, and N891 are around the center of the galaxy rotation, similar to the standard of disk rotation, from their center to large r, $\frac{MVG_a}{2T}$ is nearly constant, and we can infer that the velocity of rotation will be constant with increasing radius. The curve rotation is flat. Among these spiral galaxies, N4565 is the most standard rotation disk; thus, its rotation curve appears to be a straight line. N5033 has a main mass in its center, begins with a standard rotation disk, and then changes this status, so its rotation curve is flat first and then decreases. The M83, N7217, M51, M81, and our galaxy are not standard rotation disks, and their rotation curves are not flat. These observations are in good agreement with these conclusions [10-20].

8. 3. Newton's law of gravitation is not a natural law

Compared with the calculated result from Newton's law of universal gravitation, Newton's law is not in agreement with some observations, so the hypothesis of dark matter appears. We now know that there is no dark matter in nature; in fact, Newton's law of universal gravitation laws is based on the Kepler law. Namely, Newton's law of universal gravitation is not the law of nature; it is only an approximation formula that is deduced by Kepler's third law to calculate some mathematical problems. According to several observational facts [10]-[17], these observational rotation curves show that Newton's law of universal gravitation does not agree with the observational facts. However, the above conclusions are in extremely good agreement with the observational data. The dark matter does not exist.

The above observations also show that the highest site (the O point in the rotation curve) of the rotation curve from the observation is greater than the highest site (the N point in the rotation curve) from the Newtonian law calculated result, which is in good agreement with the fact that the calculated speed value

$$v = \sqrt{r^3}\sqrt{\frac{2\rho\pi G_a V}{3T}}$$

from

$$\vec{F}_a = \frac{m_1 m_2 \times \vec{v}_1 \times (\vec{v}_2 \times \vec{r}_{12})}{4\pi e r_{12}^3} G_a$$

is greater than the calculated speed value

$$v = \sqrt{\frac{4\pi\rho G}{3}} r$$

from

$$F = \frac{m_1 m_2}{r^2} G;$$

thus, Newton's law of universal gravitation is incorrect for describing the galaxy.

On the other hand, other observations, such as *gravitational lensing*—the bending of light from distant sources by the cluster's gravity—also confirm that moving photons generate gravitation but are not due to dark matter.

8.4. Demonstrate Kepler third laws

When the Sun and Planet are all moving forward, they are all revolving around the center of mass movement. In this condition, the Sun and all Planets are all around their center of mass moving forward in the infinity universe, which is the same as when they are all moving in one space, so here, the characteristics of the medium $\boldsymbol{\Theta}$ are not considered; thus:

$$F_a = \frac{MV^2 m_p v_p}{4\pi r_c^2} G_a = M_p \frac{v^2}{r_c},$$

Consider:

$$M_p = m_p v_p k$$

$$v^2 r_c = \frac{MV^2 G_a k}{4\pi}$$

in the Sun system can be obtained because the M V k G_a are all constant, so $v^2 a = constant,$ this is the Kepler third law. Here, the value of M is not equal to the known mass of the Sun.

8.5. Newtonian law of universal gravitation

To demonstrate the Newtonian law of universal gravitation, see article Gravitation origin [1]; here, we do not need to repeat it.

8.6. The Universe does not inflation!

8.6.1. The Doppler Effect in light.

In light, according to the above discovery, we now know that light is not a wave–particle duality; rather, it is a particle. According to the following formula, $\lambda v = k_\lambda$ we can obtain the following formula: $\lambda = \frac{k_\lambda}{v}$, where the wavelength is the reciprocal of the speed. For an observer, some photons move toward left observer A, while some photons move toward right observer B; therefore, in observer A's eye, the wavelength of the photon is $\frac{k_\lambda}{v-v_0}$, where is the speed of light and v_0 is the speed of the atom. In this case, the wavelength is increased, which is a redshift. The wavelength of the photon toward observer B is $\frac{k_\lambda}{v+v_0}$; in this case, the wavelength is decreased, and this is a blue shift. Namely, the frequency of photons decreases when moving toward left observer A, and the frequency of photons increases when moving toward observer B. This is the reason for the redshift and blue shift. However, the status of atomic movement, which emits light, did not change.

8.6.2. The Universe does not inflation

Doppler Effect in the Astronomy: See following Figure 7

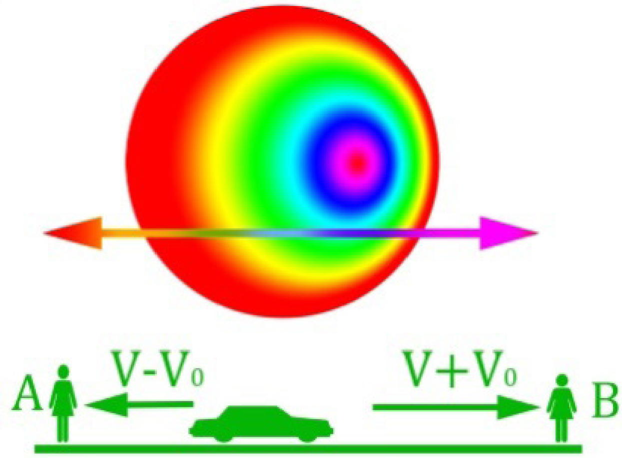


Figure 7 This figure shows the essence of the Doppler Effect.

According to the above analysis, because some stars depart from the Earth, the wavelength that the Earth receives is $\frac{k_\lambda}{v-v_0}$, where v is the speed of light, v_0 is the speed of the star, and for some stars arriving at the Earth, the wavelength at which the Earth receives is $\frac{k_\lambda}{v+v_0}$; thus, we can observe the redshift of the light of some stars and the blue shift of some stars. Why we observe the light from a farther star, its more redshift than near a star sent, I think this is similar to the movement of a bullet, because in the moving process, the greater the distance moved is, the more energy is lost, so the lower the speed of the movement is. This is the reason why the greater the distance between the earth and the star is, the greater the redshift. The greater the distance between the earth and the star is the greater the distance needed to move for light, so the speed will decrease more than when the earth stars are nearer. In fact, in this state, only the wavelength of light will change as the distance between the earth and the star changes, but the state of the moving star does not change as it does for observers A and B (see the state of the moving car), and the space also does not change. Thus, the Universe is not inflation.

In Figure 7, if the speed of the car is v_0, the speed of sound of the car is v; when the car is moving toward right observer B, for observer A, the speed of the message is $v - v_0$, where v_0 is the speed of the car and v is the speed of sound. For observer B, the speed of the message is $v + v_0$, so observer A receives less sound than does the car. Observer B receives more sound than does the car. In fact, the frequency of sound sent by the car does not change, and only the frequency at which the observer receives sound changes. This is the essence of the Doppler effect.

Conclusion

We know the essence of electric charge and the essence of gravitational mass in atoms; moreover, we have known the unification of gravitation and electromagnetic force by applying this new discovery from the micro world to the macro world and about the greater content and the greater evidence of unification of the electromagnetic force and gravitational force; please see the next article [19].

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References

1. Isaac Newton philosophiae naturalis principia mathematuca praeses julii,5,1687 londini
2. Professor Zheng Shengming (2021) The Origin of Grativation. TechRxiv. Preprint. https://doi.org/10.36227/techrxiv.16677298.v2
3. Günter Zschomarch (2007) Handbook of X-ray Data, springer.
4. White EW, Johnson Jr GG (1970) X-ray emission and absorption edge wavelengths and interchange settings for LiF geared curved crystal spectrometer.
5. Zheng Sheng Ming. Mechanism of interaction in moving matter-the origin of gravitation. ISBN 9783847326588.2011.
6. Zheng Sheng Ming (2012) Nature mechanism-force origin. ISBN 9789881986863.
7. Zheng, shengming (2023) The Origin of Grativation TechRxiv. Preprint. https://doi.org/10.36227/techrxiv.16677298.v3
8. Zheng, shengming (2021): Unification of gravitation and electromagnetic force (First Portion). TechRxiv. Preprint. https://doi.org/10.36227/techrxiv.16817275.v3
9. Haynes WM (2016) CRC handbook of chemistry and physics. CRC press.
10. Mike Seeds, Dana Backman. Astronomy: The Solar System and Beyond, 349.
11. Malcolm S. Longair. Galaxy Formation 68.
12. Kutner ML (2003) Astronomy: A physical perspective. cambridge university press.
13. Karttunen H, Kröger P, Oja H, Poutanen M, Donner K J (Eds) (2007). Fundamental astronomy. Berlin, Heidelberg: Springer Berlin Heidelberg.
14. Livio M (Ed) (2001) The Dark Universe: Matter, Energy, and Gravity: Poster Papers from the Space Telescope Science Institute Symposium, Baltimore, Maryland, Space Telescope Science Institute.
15. Livio M (Ed) (2004) The dark universe: matter, energy and gravity 15. Cambridge University Press.
16. Scarpa R (2006) Modified newtonian dynamics, an introductory review. In AIP Conference Proceedings 822: 253-265. American Institute of Physics.
17. Livio M(Ed) (2004) The dark universe: matter, energy and gravity 15. Cambridge University Press.
18. Zheng sheng ming. Mechanism of interaction in moving matter-the origin of gravitation. ISBN 9783847326588.2011.
19. Zheng sheng ming (2012) Nature mechanism-force origin. ISBN 9789881986863.
20. Kittel C (2005) Introduction To Solid State Physics; Wiley India Pvt.