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Unification of gravitation and electromagnetic force (First Portion)

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The contents of this article fall within Fields, Wave and Electromagnetics; Photonics and Electrooptics area of scope of [TechRxiv](#), part of it are published in my book (ISBN: 9789881767592) but is not published in journal. For convenience readers, I revise and submit it to here

Abstract: Since electron has been discovered, people have been thinking it possess one electric charge, the nuclear possess contrary charge. Based on the provided new discovery that moving photons do create force, I have calculated the number Z of elements, discovered that the number Z of elements can be calculated by frequency of x-ray, and the atomic weight can also be calculated by frequency of x-ray. This method of calculated way shows the essence of electric charge, and shows the essence of gravitational mass, from this way; here in first time provide one fact show the unification of gravitation and electromagnetic force.

Keywords: frequency of x-ray, force, gravitation, electromagnetic force, unification.

INTRODUCTION

Since Newton discovered universal gravitation^[1], people have been thinking that the origin of gravitation only relate to the gravitational mass, and define gravitational mass in the expression of the gravitation without investigating other origin theories. While during the process of investigating the origin of gravitation, my experiments showed that moving photons produce gravitation. This discovery reveals the origin of gravitation. Meanwhile I found that the atomic weight can be calculated by frequency of x-ray^[2]. On the other hand, I have also found that the number Z of elements can also be calculated by frequency of x-ray. By these experiments and calculations, to show that the electromagnetic force and gravitation are generated from the same origin. Their essence is the same. So we can comprehend the meaning of the gravitational mass which defined by Newton and Einstein and the meaning of charge which defined by Coulomb and Franklin. This shows the unification of gravitation and electromagnetic force.

Chapter.1. Moving photon generate force

The experimental devices are indication in picture **a, b, c** of Figure1. The process of experiment is below: first the light beam **L** is separated into 2

parts by a ring as position in picture **c, d** of Figure1. Light beam **L** then become two new light beams **P** and **O**, as shown in picture **d** of Figure1. Along with light moving forward, the five light beams possessing highest intensity in the light beam **P** with biggest attractive force have been obviously attracting light beam **O** to become a pentagon (see picture 1-12 of Figure1). Only the five spots of light beams **O** that corresponding five points of light beams which possessing highest intensity in light beam **P**, have been moving to contact, and become gradually link to together. Note: at first light beam **P** and light beam **O** do not contact at all. It is impossible that this contact action can occurs in the light wave theory. This action is not an effect of wave interaction. On the contrary, it is indicating an effect of moving photons create gravitation. (See picture 1-12 of Figure1)

Figure1. Picture **b** shows the device of the experiment. Picture **c, d** shows the site of ring in light beam **O**, and pictures 1-12 showing that the form of light beam **O** has been changed from a circular shape to a pentagon by moving photon creates gravitation.

In order to verify this phenomenon is brought on by gravitation, the second experiment is performed. The experiment device is shown in picture **a** of Figure2. Picture **b, c** in Figure2 show

that other light beams do not move forward and that only light beam O is allowed to move forward; under this status, light beam O has been keeping its circular shape. This phenomenon is shown in pictures 1-12 of Figure2. This result demonstrates 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 is appearing that the light beam O keeps its circular shape in unchanged form when there are no other light beams moving forward. From this experiment, the light beam O does not appear before phenomenon of gravitation acted upon it become, it is confirm that this is only appeared with interaction force indicating gravitation brought about it, thus we find that moving photons create gravitation.

Chapter.2. The quantitative experiment

In before article: [Gravitation origin](#)^[2], we get below formula: $\vec{F}_a = \frac{m_1 m_2 \times \vec{v}_1 \times (\vec{v}_2 \times \vec{r}_{12})}{4\pi\theta\vec{r}_{12}^3} G_a$

About describing of this effect, see [Gravitation origin](#)^[2], here do not repeat it.

Chapter.3. The essence of electric charge

According to above discoveries and formula:

$$\vec{F}_a = \frac{m_1 m_2 \times \vec{v}_1 \times (\vec{v}_2 \times \vec{r}_{12})}{4\pi\theta\vec{r}_{12}^3} G_a \quad [2]$$

we can get a formula that can calculate the nuclear charge of element, see formula: $Q_Z = \sqrt{\frac{c}{\lambda}} \times Zb \times (1 - (A_m - Z)k_1)k_2$ Where, Q_Z is the nuclear charge of element, A_m is the atomic weight of element, Z is the atomic number, $\lambda_{k1}, \lambda_{k2}$ are the first and second wavelength of X-Ray Emission 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 result of test about this formula see below table 1, Table2^{[3],[4]}.

$$K_1 = KL3 = 1s1/2 - 2p3/2,$$

$$K_2 = KL2 = 1s1/2 - 2p1/2^{[3],[4]}.$$

$$\bar{\lambda} = \frac{\lambda_{k1} + \lambda_{k2}}{2} \times 10^{-10}$$

$$\text{For example about Li: } Q_Z = \sqrt{\frac{c}{\lambda}} \times Zb \times (1 - (A_m - Z)k_1) \times k_2$$

$$= \sqrt{\frac{3 \times 10^8}{234192 \times 10^{-10}}} + 3 \times 2.72641 \times 10^{15} \times (1 - (6.941 - 3) \times 5 \times 10^{-4}) \times 2.075 \times 10^{-8}$$

=3. Other element number or nuclear charge of element can also be calculated by this formula. See above table1. This formula testifies that the nuclear charge of element can be calculated by wavelength of X-Ray of element, thus this formula indicate the essence of nuclear charge of element, namely reveal the essence of electric charge.

Table1^{[3],[4],[5],[6]}:

Z	symbol	atomic weight(A_m)	$A_m - Z$	$\lambda_{k1} \times 10^{-10}$	$\lambda_{k2} \times 10^{-10}$	δ	$\bar{\lambda} = \frac{\lambda_{k1} + \lambda_{k2}}{2} \times 10^{-10}$	b	k_1	k_2	$Q_Z = \sqrt{\frac{c}{\lambda}} \times Zb \times (1 - (A_m - Z)k_1) \times k_2$
3	Li	6.941	3.941	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	5.012	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	5.881	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	6.011	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	7.006	31.5966	30.9899	1.006	31.3880	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	7.000
8	O	15.999	7.999	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	9.998	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}	30.02
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	95.9420	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	97.9070	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	101.070	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	0.56276	2.72641×10^{15}	5×10^{-4}	2.075×10^{-8}	47.00
48	Cd	112.411	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

Table2^{[3],[4],[5],[6]}:

Z	symbol	atomic weight(A _m)	A _m -Z	λ _{k1} ×10 ⁻¹⁰	λ _{k2} ×10 ⁻¹⁰	δ	$\bar{\lambda} = \frac{\lambda_{k1} + \lambda_{k2}}{2} \times 10^{-10}$	b	k ₁	k ₂	$m_a = \sqrt{\frac{b}{\bar{\lambda}^2 \times (1 + (\frac{k_1}{Z})^2 + (\frac{k_2}{Z})^2)}}$
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	0.32481	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	103.97	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	111.21	0.20762	0.20762	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	115.22	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	117.08	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	117.97	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	0.11837	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
##	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.4. The essence of gravitational mass

According to above discovery, can get a formula that calculate the atomic mass of element by moving photons, see below formula $m_a = \sqrt{\frac{b}{\bar{\lambda}^2 \times (1 + (\frac{k_1}{Z})^2 + (\frac{k_2}{Z})^2)}}$ Where,

m_a is the atomic mass of element, A_m is the atomic weight of element, Z is the atomic number or element number, λ_{k1} is the wavelength of X-Ray Emission in lower energy level, λ_{k2} is the wavelength of X-Ray Emission in higher energy level, $\bar{\lambda}$ is the mean wavelength of these two wavelength of X-Ray Emission. b, k_1, k_2 are all constant. For example about Li:

$$m_a = \sqrt{\frac{b}{\bar{\lambda}^2 \times (1 + (\frac{k_1}{Z})^2 + (\frac{k_2}{Z})^2)}} = \sqrt{\frac{2 \times 10^{16}}{226.456 \times 10^{-10} \times 3 \times 2.72641 \times 10^{15} \times (1 + 1.314 \times \frac{5.942}{3})}} \times 1.115 \times 10^{-8} = 6.5941$$

Other atomic mass can also be calculated by this formula. Test about this formula see below Table3, Table4^{[3],[4],[5],[6]}.

Z	symbol	atomic weight(<i>A_m</i>)	<i>A_m</i> -Z	$\lambda_{k1} \times 10^{-10}$	$\lambda_{k2} \times 10^{-10}$	$\bar{\lambda} = \frac{\lambda_{k1} + \lambda_{k2}}{2} \times 10^{-10}$	<i>b</i>	<i>k₁</i>	<i>k₂</i>	$m_a = \sqrt{\frac{b}{\bar{\lambda}^2 \times (1 + (\frac{k_1}{Z})^2 + (\frac{k_2}{Z})^2)}}$	
3	Li	6.941	3.941	226.456	226.456	2.72641 × 10 ¹⁵	1.314	1.115 × 10 ⁻⁸	6.5941		
4	Be	9.012	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	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	4.40391	4.40391	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	1.83989	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	74.414	
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	112.414	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	168.589	
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	
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	

Z	symbol	atomic weight(A_m)	A_m-Z	$\lambda_{k1} \times 10^{-10}$	$\lambda_{k2} \times 10^{-10}$	$\bar{\lambda} = \frac{\lambda_{k1} + \lambda_{k2}}{2} \times 10^{-10}$	b	k_1	k_2	$m_a = \sqrt{\frac{c^2 + Zb}{\lambda_{k1} + \lambda_{k2}}}$
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

In these tables: Some data got by formula:

$$= \frac{12398.418}{E[\text{eV}]}$$
. This calculated show that the essence of gravitational mass is due to the photons moving. Because the atomic mass in the periodic table of elements is the weighted aggregates, for accurately test the meaning of $M_a = \sqrt{\frac{c^2 + nb}{\lambda}} (1 + 1.314 \times \frac{A_m}{Z}) k$, see below test: Table5 [3],[4],[5],[6]

Z	symbol	atomic weight(A_m)	natural abundance	$\lambda_{k1} \times 10^{-10}$	$\lambda_{k2} \times 10^{-10}$	$\bar{\lambda} = \frac{\lambda_{k1} + \lambda_{k2}}{2} \times 10^{-10}$	b	k_1	k_2	$k = \sqrt{\frac{c^2 + Zb}{\lambda_{k1} + \lambda_{k2}}}$
3	Li	7.012	92.414		226.456	226.456	2.72641×10 ⁻¹⁵	1.314	1.17661×10 ⁻⁸	
4	Be	9.012	100		111.698	111.698	2.72641×10 ⁻¹⁵	1.314	1.17095×10 ⁻⁸	
5	B	11.01	80.17	65.9496		65.9496	2.72641×10 ⁻¹⁵	1.314	1.16525×10 ⁻⁸	
6	C	12.00	98.93		43.6813	43.6813	2.72641×10 ⁻¹⁵	1.314	1.13425×10 ⁻⁸	
7	N	14.00	99.636		30.9899	30.9899	2.72641×10 ⁻¹⁵	1.314	1.13353×10 ⁻⁸	
8	O	16.00	99.757		23.3186	23.3186	2.72641×10 ⁻¹⁵	1.314	1.13686×10 ⁻⁸	
9	F	19.00	100		18.0894	18.0894	2.72641×10 ⁻¹⁵	1.314	1.15379×10 ⁻⁸	
10	Ne	19.99	90.48		14.3023	14.3023	2.72641×10 ⁻¹⁵	1.314	1.13220×10 ⁻⁸	
11	Na	22.99	100		11.5755	11.5755	2.72641×10 ⁻¹⁵	1.314	1.14121×10 ⁻⁸	
12	Mg	25.99	10.029	9.8903		9.89030	2.72641×10 ⁻¹⁵	1.314	1.16570×10 ⁻⁸	
13	Al	26.98	100	8.3420		8.34200	2.72641×10 ⁻¹⁵	1.314	1.15171×10 ⁻⁸	
14	Si	27.98	92.223		7.0665	7.06650	2.72641×10 ⁻¹⁵	1.314	1.13433×10 ⁻⁸	
15	P	30.97	100	6.1661	6.1088	6.13345	2.72641×10 ⁻¹⁵	1.314	1.14575×10 ⁻⁸	
16	S	31.97	94.99	5.3719	5.0187	5.19530	2.72641×10 ⁻¹⁵	1.314	1.11894×10 ⁻⁸	
17	Cl	34.97	75.76	4.8889	4.3982	4.64350	2.72641×10 ⁻¹⁵	1.314	1.13490×10 ⁻⁸	
18	Ar	39.96	99.603	4.1948	3.8710	4.03290	2.72641×10 ⁻¹⁵	1.314	1.14563×10 ⁻⁸	
19	K	38.96	93.258	3.7445	3.4365	3.59050	2.72641×10 ⁻¹⁵	1.314	1.11955×10 ⁻⁸	
20	Ca	39.96	96.941	3.3617		3.36170	2.72641×10 ⁻¹⁵	1.314	1.13272×10 ⁻⁸	
21	Sc	44.96	100	3.0343	2.7620	2.8982	2.72641×10 ⁻¹⁵	1.314	1.12808×10 ⁻⁸	
22	Ti	47.95	73.72	2.7523	2.4974	2.6249	2.72641×10 ⁻¹⁵	1.314	1.13147×10 ⁻⁸	
23	V	50.94	99.75	2.5074	2.2692	2.3883	2.72641×10 ⁻¹⁵	1.314	1.13441×10 ⁻⁸	
24	Cr	51.94	83.789	2.2936	2.0703	2.1820	2.72641×10 ⁻¹⁵	1.314	1.12596×10 ⁻⁸	
25	Mn	54.94	100	2.1058	1.8965	2.0012	2.72641×10 ⁻¹⁵	1.314	1.12883×10 ⁻⁸	
26	Fe	55.93	91.754	1.9401	1.7435	1.8418	2.72641×10 ⁻¹⁵	1.314	1.12098×10 ⁻⁸	
27	Co	58.93	100	1.7929	1.6082	1.70055	2.72641×10 ⁻¹⁵	1.314	1.12388×10 ⁻⁸	
28	Ni	57.94	68.077	1.6618		1.66180	2.72641×10 ⁻¹⁵	1.314	1.13572×10 ⁻⁸	
29	Cu	62.93	69.15	1.5444	1.3806	1.46256	2.72641×10 ⁻¹⁵	1.314	1.11949×10 ⁻⁸	
30	Zn	65.93	27.73	1.4390	1.28339	1.36120	2.72641×10 ⁻¹⁵	1.314	1.12167×10 ⁻⁸	
31	Ga	68.93	60.108	1.3440	1.19582	1.26991	2.72641×10 ⁻¹⁵	1.314	1.12360×10 ⁻⁸	
32	Ge	73.92	36.521	1.2580	1.11662	1.18731	2.72641×10 ⁻¹⁵	1.314	1.13301×10 ⁻⁸	
33	As	74.92	100	1.1799	1.04496	1.11243	2.72641×10 ⁻¹⁵	1.314	1.12673×10 ⁻⁸	
34	Se	79.92	49.803	1.1088	0.97977	1.04430	2.72641×10 ⁻¹⁵	1.314	1.13722×10 ⁻⁸	
35	Br	80.92	49.31	1.0438	0.92045	0.98213	2.72641×10 ⁻¹⁵	1.314	1.12909×10 ⁻⁸	
36	Kr	83.91	56.987	0.9841	0.86555	0.92483	2.72641×10 ⁻¹⁵	1.314	1.12978×10 ⁻⁸	
37	Rb	84.91	72.172	0.9297	0.81556	0.87263	2.72641×10 ⁻¹⁵	1.314	1.12408×10 ⁻⁸	
38	Sr	87.91	82.581	0.8795	0.76976	0.82463	2.72641×10 ⁻¹⁵	1.314	1.12497×10 ⁻⁸	
39	Y	88.91	100	0.8330	0.72769	0.78035	2.72641×10 ⁻¹⁵	1.314	1.11950×10 ⁻⁸	
40	Zr	89.90	51.45	0.7901	0.68885	0.73948	2.72641×10 ⁻¹⁵	1.314	1.11418×10 ⁻⁸	
41	Nb	92.91	100	0.7504	0.65300	0.70170	2.72641×10 ⁻¹⁵	1.314	1.11517×10 ⁻⁸	
42	Mo	97.91	24.292	0.7136	0.61994	0.66677	2.72641×10 ⁻¹⁵	1.314	1.12182×10 ⁻⁸	
43	Tc	99.91	15.85	0.6793	0.58908	0.63419	2.72641×10 ⁻¹⁵	1.314	1.11958×10 ⁻⁸	
44	Ru	101.90	31.550	0.6474	0.56053	0.60397	2.72641×10 ⁻¹⁵	1.314	1.11745×10 ⁻⁸	
45	Rh	102.91	100	0.6176	0.53396	0.57578	2.72641×10 ⁻¹⁵	1.314	1.11267×10 ⁻⁸	
46	Pd	107.90	26.46	0.5898	0.50922	0.54951	2.72641×10 ⁻¹⁵	1.314	1.11848×10 ⁻⁸	
47	Ag	108.91	48.162	0.5638	0.48590	0.52485	2.72641×10 ⁻¹⁵	1.314	1.11405×10 ⁻⁸	
48	Cd	113.90	28.754	0.5394	0.46409	0.50175	2.72641×10 ⁻¹⁵	1.314	1.11897×10 ⁻⁸	
49	In	114.90	95.715	0.5165	0.44372	0.48011	2.72641×10 ⁻¹⁵	1.314	1.11443×10 ⁻⁸	
50	Sn	119.90	32.589	0.4950	0.42468	0.45984	2.72641×10 ⁻¹⁵	1.314	1.11924×10 ⁻⁸	

Table6 [3],[4],[5],[6].

Z	symbol	atomic weight(A_m)	natural abundance	$\lambda_{k1} \times 10^{-10}$	$\lambda_{k2} \times 10^{-10}$	$\bar{\lambda} = \frac{\lambda_{k1} + \lambda_{k2}}{2} \times 10^{-10}$	b	k_1	k_2	$k = \sqrt{\frac{c^2 + Zb}{\lambda_{k1} + \lambda_{k2}}}$
51	Sb	122.904	42.79	0.4748	0.40669	0.44075	2.72641×10 ⁻¹⁵	1.31	1.11925×10 ⁻⁸	
52	Te	125.903	18.84	0.4558	0.38975	0.42278	2.72641×10 ⁻¹⁵	1.31	1.11920×10 ⁻⁸	
53	I	126.904	100	0.4378	0.37383	0.40582	2.72641×10 ⁻¹⁵	1.31	1.11486×10 ⁻⁸	
54	Xe	128.904	26.908	0.4208	0.35844	0.38962	2.72641×10 ⁻¹⁵	1.31	1.11239×10 ⁻⁸	
55	Cs	132.905	100	0.4048	0.34453	0.37467	2.72641×10 ⁻¹⁵	1.31	1.11454×10 ⁻⁸	
56	Ba	137.905	71.698	0.3896	0.33105	0.36033	2.72641×10 ⁻¹⁵	1.31	1.11811×10 ⁻⁸	
57	La	138.905	99.911	0.3753	0.31845	0.34688	2.72641×10 ⁻¹⁵	1.31	1.11406×10 ⁻⁸	
58	Ce	141.909	11.114	0.3617	0.30649	0.33410	2.72641×10 ⁻¹⁵	1.31	1.11378×10 ⁻⁸	
59	Pr	140.907	100	0.3487	0.30498	0.32684	2.72641×10 ⁻¹⁵	1.31	1.11419×10 ⁻⁸	
60	Nd	145.913	17.189	0.3365	0.29404	0.31527	2.72641×10 ⁻¹⁵	1.31	1.11786×10 ⁻⁸	
61	Pm	147.917	5.37d	0.3248	0.28361	0.30421	2.72641×10 ⁻¹⁵	1.31	1.11579×10 ⁻⁸	
62	Sm	151.919	26.75	0.3137	0.27376	0.29373	2.72641×10 ⁻¹⁵	1.31	1.11732×10 ⁻⁸	
63	Eu	152.921	55.196	0.3031	0.26434	0.28372	2.72641×10 ⁻¹⁵	1.31	1.11350×10 ⁻⁸	
64	Gd	157.924	24.84	0.2930	0.25535	0.27418	2.72641×10 ⁻¹⁵	1.31	1.11650×10 ⁻⁸	
65	Tb	158.925	100	0.2834	0.24684	0.26512	2.72641×10 ⁻¹⁵	1.31	1.11279×10 ⁻⁸	
66	Dy	163.929	28.260	0.2743	0.23863	0.25647	2.72641×10 ⁻¹⁵	1.31	1.11561×10 ⁻⁸	
67	Ho	164.930	100.000	0.2655	0.23084	0.24817	2.72641×10 ⁻¹⁵	1.31	1.11185×10 ⁻⁸	
68	Er	167.932	2.978	0.2572	0.22342	0.24031	2.72641×10 ⁻¹⁵	1.31	1.11419×10 ⁻⁸	
69	Tm	168.934	100	0.2491		0.24910	2.72641×10 ⁻¹⁵	1.31	1.14542×10 ⁻⁸	
70	Yb	173.938	32.026	0.2438	0.21037	0.22708	2.72641×10 ⁻¹⁵	1.31	1.11399×10 ⁻⁸	
71	Lu	174.967	97.40	0.2364	0.20384	0.22012	2.72641×10 ⁻¹⁵	1.31	1.11038×10 ⁻⁸	
72	Hf	179.946	35.08	0.2293	0.19759	0.21345	2.72641×10 ⁻¹⁵	1.31	1.11267×10 ⁻⁸	
73	Ta	180.948	99.99	0.2225		0.22245	2.72641×10 ⁻¹⁵	1.31	1.14899×10 ⁻⁸	
74	W	183.950	30.64	0.2159		0.21592	2.72641×10 ⁻¹⁵	1.31	1.14836×10 ⁻⁸	
75	Re	186.955	62.60	0.2096		0.20960	2.72641×10 ⁻¹⁵	1.31	1.14765×10 ⁻⁸	
76	Os	191.961	40.78	0.2036		0.20360	2.72641×10 ⁻¹⁵	1.31	1.14983×10 ⁻⁸	

gravitational force in atom are all produced by the moving photons in atom, so their origins are same:

$\frac{(\frac{c}{\lambda} + Zb)}{r^2}$. the difference size of value between them is only due to the Coulomb force is the first interactional force by this produced force, it do not include gravitational force, the gravitational force include the effect of Coulomb force interacted: $(1 - (A_m - Z)k_1) \times k_2, (1 + k_1 \times \frac{A_m}{Z}) \times k_2$.

Now we have preliminary known the unification of the electromagnetic force and gravitational force^[5-6] first time .

Chapter.6. Conclusion

We have known the essence of electric charge and the essence of gravitational mass in atom; meanwhile we have also known the unification of gravitation and electromagnetic force by the way of applying new discoveries, about the more contents and the more evidences of unification of the electromagnetic force and gravitational force, please waiting to see will be coming next article.

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References

- [1] Isaac Newton philosophiae naturalis principia mathematica praeses julii ,5,1687 londini
- [2] Zheng shengming, Physicist (2021): Gravitation origin. TechRxiv. Preprint. <https://doi.org/10.36227/techrxiv.16677298.v1>
- [3] Günter Zschomarch Handbook of X-Ray Data, springer 2007
- [4] E.W.White.G.G.Johnson, Jr X-Ray emission and absorption edge wavelengths. The Pennsylvania state university.
- [5] Zheng sheng ming. Mechanism of interaction in moving matter-the origin of gravitation. ISBN 9783847326588.
- [6] Zheng sheng ming. Nature mechanism-force origin. ISBN 9789881986863 2012.