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RESEARCH ARTICLE OPEN ACCESS

COMPUTER METHODS SOLVING CLASSICAL QUANTUM ELECTRODYNAMICS EQUATIONS

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ABSTRACT

Atoms are known to be the very basis of physical and chemical elements, as finally established by the periodic table. Atomic compositions, i,e, molecules, are the founding basis of matters. For many years now, scientific research has been focusing on capturing images from the microworld. Actually, real pictures ofgranules, molecules, atoms and subatonic particles are displayed on the worldwide intenet. These astonishing images reveal complex elementary structures not only of such an amazing diversity, but also to recall and inspiredetailed studies. Considering atomic and subatomic electrc charges, theoretical studies and good explanations are offered by quantum mechanics and electrodynamics.

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INTRODUCTION

Partons, by theories and experimental observations, have empowered physics with new insights, concerning elemnentary particles and their subatomic properties. As stated, electric charges are specific objects confined inside particles, figure 1, and moving freely within. Therefore, any electrical approach to charged particles should result with inner displacements of particles' charge (1) (2). Partons (hadrons, quarks and else suggest a similar behaviour occuring to elementary charges, as well. For instance, two negative and positive particles approaching each – other will cause both charges to gather at inner point – zonesofrespective surfaces and, thus, facing. *Due, a light negative particle may not be abble to move a heavy positive particle, but the positive charge inside the specific heavy particle can be displaced pretty well.* From this persperctive, when the electron moves around the proton, the positive charge inside the proton moves too.Instantly standing, or facing, the revolving electron, the positive charge rotates alongside at the same angular velocity ωp = ωe. As a consequence to such electrical motions, electrodynamic fields are produced. The most significant one is the magnetic field, or better defined as electromagnetic (3). Applying classical electrodynamics to these two particles, theoretically, a new elementary structure reveals. Real images from the microworld show that complex elementary structures do exist. Intriguing pictures of such structures are downloaded from the internet, figure 2, figure 3. They clearly demonstrate regional structures, confined within innermost and outermost orbitals. In 2013, physicists used a "quantum microscope" to peer inside a hydrogen atom. Credit: A. S. Stodolna et al., 2013 https://arstechnica.com/science/2023/05/this-is-the-first-x-ray-taken-of-a-single-atom/

MATERIALS AND METHODS

Experimental Observations and Theoretical Physics:Naturally, these images seek detailed explanations and science has a strong tendency for using mathematics to study experiments and practice. As recommended, simple geometry and math should be used to understandsuch elementary structures, wellknown as atoms. To this aim, Bohr's quantum condition is the first conception formulae to summon and the physical equation becomes quite familiar and ready for solution, (4).

mevere = n(h/2π): However famous, Bohr's quantum condition introducesonly a mechanical aspectof the atomic world and further physical approaches are needed. Consequently, Newton's second law and Coulomb's law of electrostatic are also applied with Rutherford – Bohr's model (5) (6):

meveve/re = (kee/rere)

me is the mass of the electron
ve is the linear velocity of the revolving electron
re is the distance of the electron from the proton – nucleus

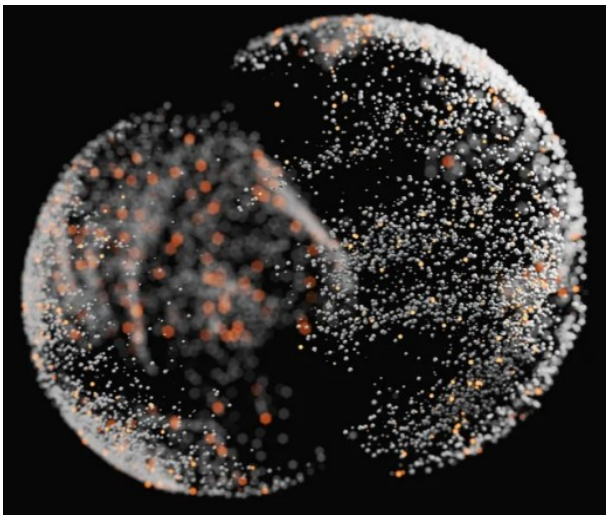


Figure 1. Saved from the public internet https://www.scientificamerican.com/article/physicists-see-strange-matter-form-inside-atomic-nuclei/

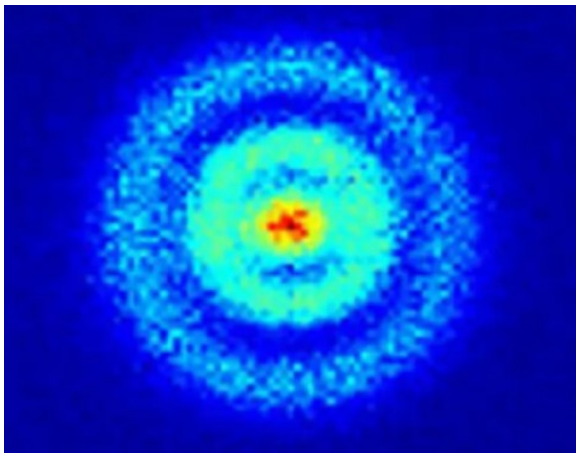


Figure 2. Saved from public Internet

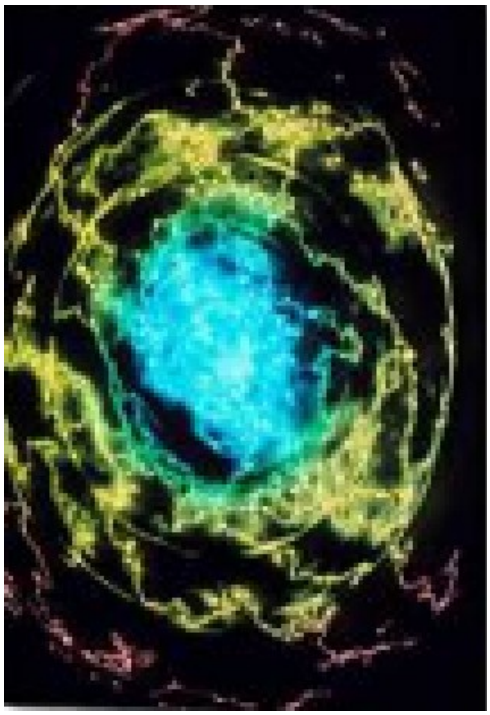


Figure 3. Saved from public internet ar.inspiredpencil.com Helium Atomic Structure

It looks like that these two equations combined satisfy the need for understanding key features of the electron – proton dipole, but actually, situations emerge.For instance, anyone may venture to calculate the velocity of the electron at any givem, or taken, point inside the atomic image. Calculations show that both formulaes do not come to the same conclusions. To fix this disaccordance, the quantum condition may be reintroduced as:

mevere = (n/m)(h/2π)

n is the quantum integerfeaturing the energy levels of excitement: n = 1, 2,3, 4, 5, etc. m is a magnetic integer representing the quantum magnetic state and varying within a range of two consecutive quantumintegers (m, Int(m)+1).Comsequently, the magnetic state should be assumed unstable, resulting to tiny oschillations, or vibrations. Regard to the cause and effect relationship, a better physical explanationcan be stressed by introducing a full ***electrodynamic*** formulae.

meveve/re = (kee/rere) ±(kee/rere)(vevp/cc)

meveve/re = (kee/rere) (1 ± veverp/recc)

The newterm represents the magnetic force acting on the revolving electron, and a supporting reason to the magnetic number m.

vp is the linear velocity of the charge – rotating proton due to electron revolution:

$$vp = (ve/re)\, rp$$
$$vp = \omega e\, rp$$

rp is the radius of the proton – nucleus. Rutherford's suggests a proton's radius of approximate size: rp = 1.25 10(–15).*This physical quantity should be kept untouched while studing excitements, however difficult this may sound.* By now, to the negative particle's revolution, three physical forces are mainly introduced, 1) Centrifugal - mechanical, 2) Coulomb – electrical, 3) Lorentz – electromagnetic, (4)(5)(6).

RESULTS AND DISSCUSSION

Computer methods provide fast and multiple solutions, giving good mathematical explanations to the challenging images of theelementary structure, (7). Visual Basic is the outstanding authoring language to calculate these visionary fundamentals of physics. Exel – Developer – Visual Basic, an American and worldwide licence, canbe used to solve these cases of classical quantum electrodynamics, (8).

Displayed values show extremities of quantum regions, a place where negativity longs to be, table 1 and table 2. It should be noticed that relevant and more accurate calculations should be tried for different values of re, rp, or n, due to experimental images, or further occuring data. Therefore, atomic Larmor's radiations are predictely expeted to vary from infrared to gamma, oreven delta frequencies. For calculations' sake, it is of minor importance whether such elementary matterforms exist or not. On the other hand, it is extremely importatnt to point out that, actually, we are better prepared to work with

Table 1. Classic dipole – Proton far aside charge opposing the electron Attractive magnetic term applied

re (m)	ve (m/s)	meveve/re	rp (m)	(kee/rere)(1+veverp/recc)	R	
5.3e-11	2200000	8.21887e-08	1.25e-15	8.19309e-08	1.00315	
5.3e-12	6950000	8.20231e-06	1.25e-15	8.19309e-06	1.00112	
5.3e-13	22000000	0.000821887	1.25e-15	0.00081932	1.00313	
5.3e-14	69600000	0.082259321	1.25e-15	0.082034942	1.00274	
5.3e-15	235500000	9.417778302	1.25e-15	9.383845779	1.00362	
2.0e-15	1.1e+09	544.5	1.25e-15	540.9982222	1.00647	
re (m)	**ve (m)**	**mevere**	**h/2pi**	**R**	**n**	**m**
5.3e-11	2200000	1.0494e-34	1.055e-34	0.995091281	1	1.00493
5.3e-12	6950000	3.31515e-35	1.055e-34	0.314358382	1	3.18108
5.3e-13	22000000	1.0494e-35	1.055e-34	0.099509128	1	10.0493
5.3e-14	69600000	3.31992e-36	1.055e-34	0.03148107	1	31.7651
5.3e-15	235500000	1.12334e-36	1.055e-34	0.010652	1	93.8791
2.0e-15	1.1e+09	1.98e-36	1.055e-34	0.018775307	1	53.2614

Table 2. Short dipole – Proton charge facing alongside the electron Repulsive magnetic term applied

re (m)	ve (m/s)	meveve/re	rp (m)	(kee/rere)(1-veverp/recc)	R	
5.3e-11	2200000	8.21887e-08	1.25e-15	8.19309e-08	1.00315	
5.3e-12	6950000	8.20231e-06	1.25e-15	8.19309e-06	1.00113	
5.3e-13	22000000	0.000821887	1.25e-15	0.000819299	1.00316	
5.3e-14	69600000	0.082259321	1.25e-15	0.08182693	1.00528	
5.3e-15	207000000	7.276245283	1.25e-15	7.273109695	1.00043	
2e-15	260500000	30.5371125	1.25e-15	30.42206011	1.00378	
re (m)	**ve (m)**	**mevere**	**h/2pi**	**R**	**n**	**m**
5.3e-11	2200000	1.0494e-34	1.055e-34	0.995091281	1	1.00493
5.3e-12	6950000	3.31515e-35	1.055e-34	0.314358382	1	3.18108
5.3e-13	22000000	1.0494e-35	1.055e-34	0.099509128	1	10.0493
5.3e-14	69600000	3.31992e-36	1.055e-34	0.03148107	1	31.7651
5.3e-15	207000000	9.8739e-37	1.055e-34	0.009362904	1	106.804
2e-15	260500000	4.689e-37	1.055e-34	0.004446334	1	224.904

any atomic/subatomic structure produced and possed in challenge (9). And that's the true power of scientific research assembled with STEM.

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