New Solutions of Lorentz Transformation IV

TomášKafoněk

Studied Technical University in Brno, Faculty of Electrical Engineering (FE VUT Brno), Czech Republic
E-mail: Kafonek.T@seznam.cz

Abstract:

This paper is the fourth part of a hypothesis originally based on the basic assumptions of Lorentz transformation and has various implications.

In the first part of the hypothesis [1], I calculated the wave function from the general assumptions of the Lorentz transformation. This wave function describes spacetime deformations and entirely replaces the original Lorentz solution used in special relativity. Importantly, each new solution, for both time and space deformation, has two possible solutions that are equally probable. Therefore, I have used these equations for further calculations, which already have a quantum nature.

In the second part of my hypothesis [2], I converted this equation into an electromagnetic one and used it to calculate interference and diffraction. Thus, the resulting equation is not based on complex functions, as in standard calculations. We can further investigate this equation, for example, in the context of electron levels in an atom, as interference and diffraction are phenomena related to Young's experiment, and the wave properties of electrons have been demonstrated.

In the third part of my hypothesis [3], I applied the calculations to atomic relations and outlined possible solutions for atomic orbitals. This outline of the potential arrangement of energies in the atomic model arose from the fact that some molecules, such as CH4, have the shape of a Platonic solid tetrahedron, which I consider pivotal within the framework of the VSEPR theory.

Keywords: Lorentz transformation, STR, interference, diffraction, atomic orbitals

1. Spatial arrangement of the atomic model, assessment of the electric and magnetic components

In my previous work, I utilized a function to depict orbitals in an atom, illustrating the energy dependence on angle. This function is represented by equation [10.3] from the mentioned work [3].

$$E_h = -hcR_h A_n \qquad\qquad [1.1]$$

And equation [10.13] from the mentioned work [3].

$$A_n = \frac{\sin^2\left(\left(n-\frac{1}{2}\right)\pi sin\alpha\right)}{n^2} \qquad\qquad [1.2]$$

This is an equation that solves the model of the hydrogen atom. However, let's assume that the shape of individual electron layers in hydrogen is at least similar to the electron layers of more complex atoms.

It is important to note that this function is derived from the previous work [2], where the expression focused on representing the probability distribution of electron occurrence. In the expression for A_n, it is clearly observed that the energy in this case is inversely proportional to the square of the principal quantum number.

Simultaneously, if we utilize the assumption that the areal energy density decreases with the square of the distance, we can attempt to depict energy layers as a function of distance by considering that the distance of the electron layer from the nucleus is proportional to the principal quantum number.

If A_n fundamentally determines the shape of the function I used to express the energy, then a certain A_{n0} would determine the shape of the function that would express the spatial distribution.

$$A_{n0} = n_0 \sin^2 \left(\left(n_0 - \frac{1}{2} \right) \pi \sin\alpha \right) \qquad\qquad [1.3]$$

Here, n_0 would be related to both the principal quantum number and the distance of the electron from the nucleus. It is interesting that both the n_0 and $(n_0\text{-}1/2)$ components occur simultaneously in this equation. If we consider that this shift of ½ may be caused by the presence of the electromagnetic field of the electron, which is coupled to the electromagnetic field of the nucleus, then we could use an equation as a complete foundation for calculations, one that could be labeled as a fundamental function.

$$A_{n00} = n_{00} \sin^2 \left(n_{00} \pi \sin\alpha \right) \qquad\qquad [1.4]$$

This consideration is crucial because it leads to the unification of the electric and magnetic components. The electric component undoubtedly has a significant impact on the shape of molecules formed in accordance with the electron levels of atoms. Simultaneously, this equation [1.4] conforms to the vector model of the atom for an odd number of electrons in the shell, precisely what we consider when studying the hydrogen atom.

The shape of the basic function [1.4] can be observed in the following figure. The maxima of the A_{n00} function, in contrast to the A_{n0} function, strictly follow the levels ±0.5; ±1.5; ±2.5; ±3.5; ±4.5, etc.
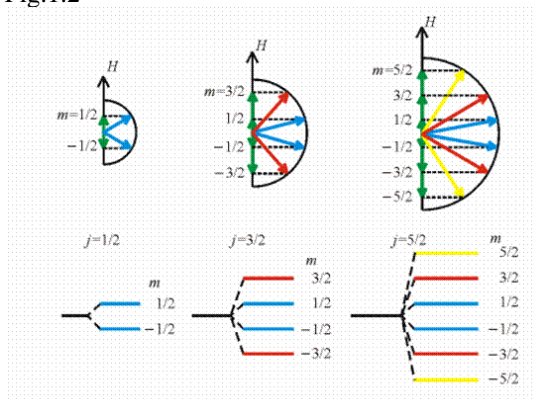
The graph of the function A_{n00} for n_{00}, which is a natural multiple of 0.5:
Fig.1.1
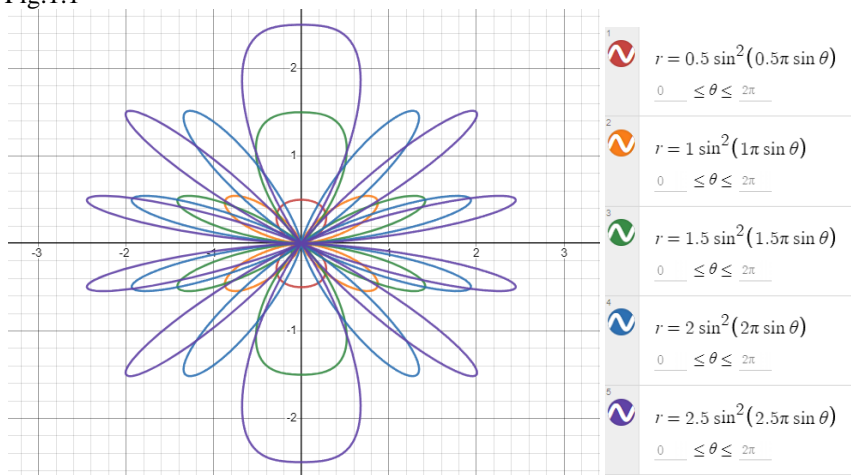
Related to this spatial distribution is the vector model of the atom, which for the hydrogen atom looks like this:
Fig.1.2

With the radii of these circles from left to right are:

For s: $\sqrt{0,5 * 1,5}$ h

For p: $\sqrt{1,5 * 2,5}$ h

For d: $\sqrt{2,5 * 3,5}$ h
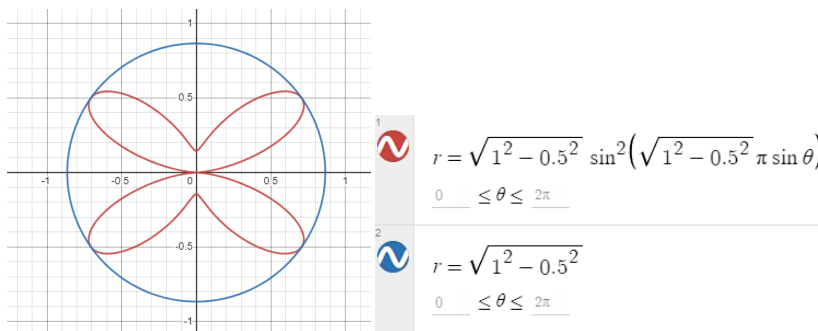
Or:

For s: $\sqrt{1^2 - 0,5^2}$ h

For p: $\sqrt{2^2 - 0,5^2}$ h

For d: $\sqrt{3^2 - 0,5^2}$ h

Which is, of course, the same thing, but we will use this form of the equations in the following expression.

This arrangement can also be expressed using the previously mentioned function [1.4]. However, the parameter n_{00} can be any real number determining the radius of the mentioned circles, as follows for s (l=0):

Fig.1.3

$$r = \sqrt{1^2 - 0.5^2} \ \sin^2\left(\sqrt{1^2 - 0.5^2} \ \pi \sin\theta\right)$$
$$0 \le \theta \le 2\pi$$

$$r = \sqrt{1^2 - 0.5^2}$$
$$0 \le \theta \le 2\pi$$

For p (l=1):

Fig.1.4

$$r = \sqrt{2^2 - 0.5^2} \ \sin^2\left(\sqrt{2^2 - 0.5^2} \ \pi \sin\theta\right)$$
$$0 \le \theta \le 2\pi$$

$$r = \sqrt{2^2 - 0.5^2}$$
$$0 \le \theta \le 2\pi$$

For d (l=2):

Fig.1.5

$$r = \sqrt{3^2 - 0.5^2} \ \sin^2\left(\sqrt{3^2 - 0.5^2} \ \pi \sin\theta\right)$$
$$0 \le \theta \le 2\pi$$

$$r = \sqrt{3^2 - 0.5^2}$$
$$0 \le \theta \le 2\pi$$
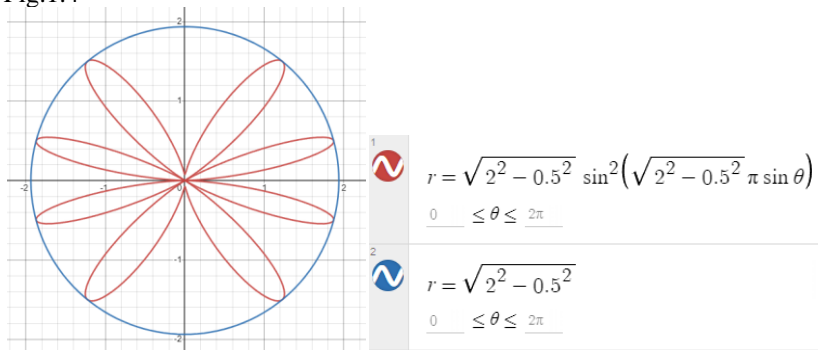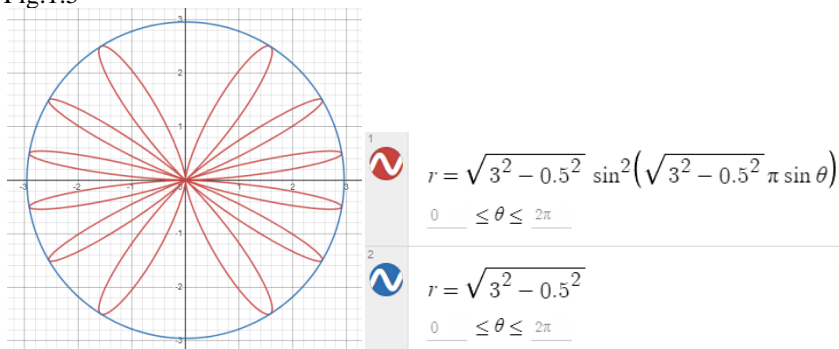
2. Naturally, the simplest way of unifying the electric and magnetic components of an atom

Naturally, the simplest explanation and the same time the unification of the mentioned rules for the electric and magnetic components after the following modification of the orbital angular momentum quantum number l:

$$l_1 = l + 1 \tag{2.1}$$

are the following equations, where n is the principal quantum number.
For the electrical component:

$$A_e = \frac{n}{l_1}\left(l_1 - \frac{1}{2}\right)\sin^2\left(\left(l_1 - \frac{1}{2}\right)\pi \sin\alpha\right) \tag{2.2}$$

For the magnetic component:

$$A_m = \frac{n}{l_1}\sqrt{l_1^2 - \left(\frac{1}{2}\right)^2}\sin^2\left(\sqrt{l_1^2 - \left(\frac{1}{2}\right)^2}\pi \sin\alpha\right) \tag{2.3}$$

A graphical representation can be created, for example, for n=1 (i.e., l=0), assuming fluctuations between the electric and magnetic components. The level at a distance of 1 is marked in green:
Fig.2.1
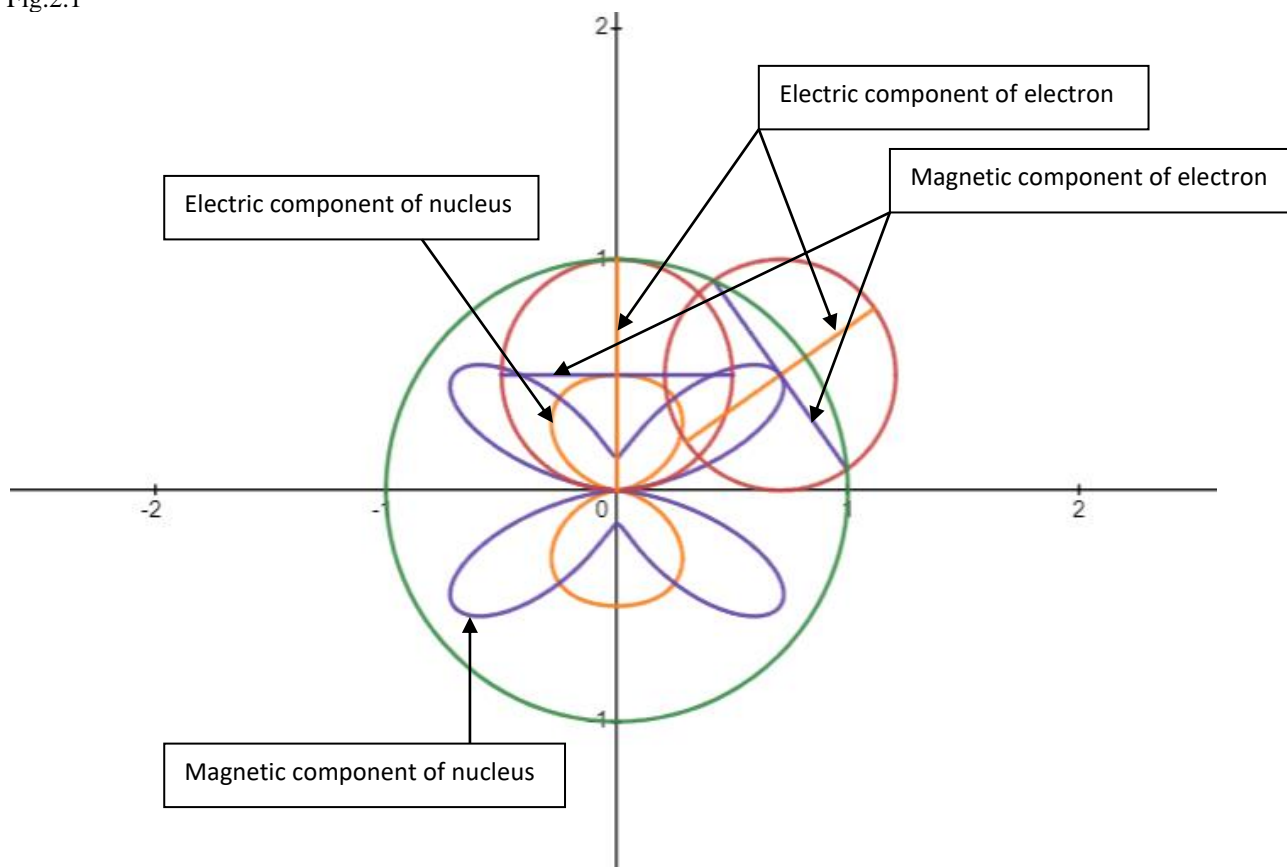
You can also create a graphical representation, for example, for n=2, $l_1=2$ (i.e., l=1), where the fluctuations between the electric and magnetic components are determined by the green-marked level at a distance of 2:

Fig2.2

Electric component of electron 2p3/2

Magnetic component of electron 2p3/2

Magnetic component of nukleus 2p3/2

Magnetic component of nukleus 2p1/2
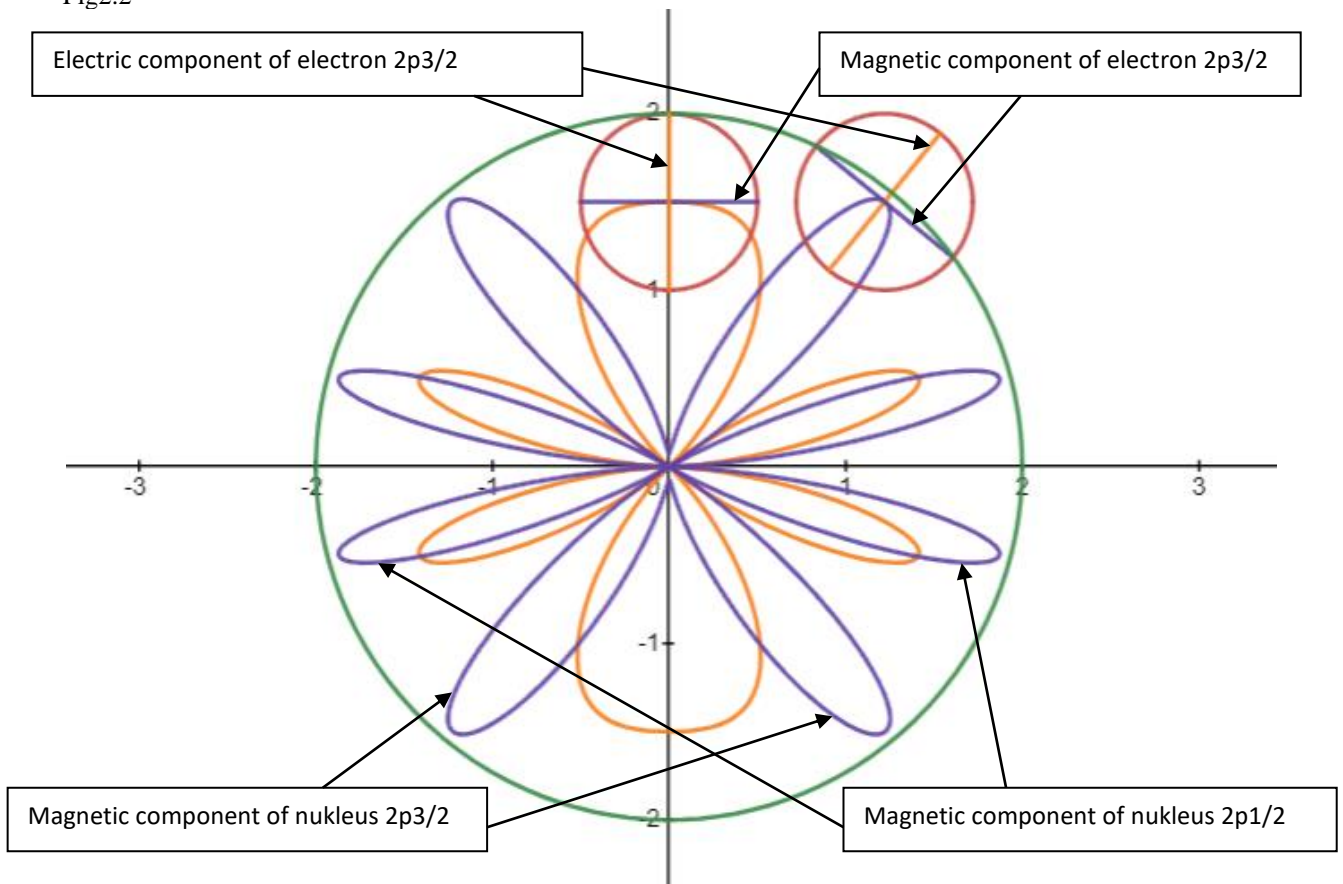
Graphical spatial representation of the layer s:

Fig2.3
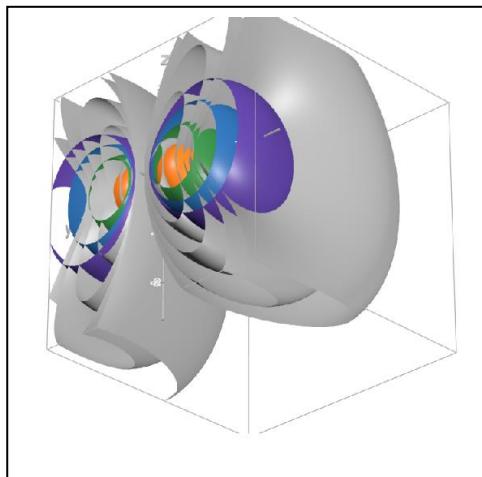
Graphical spatial representation of the layer p:

Fig.2.4
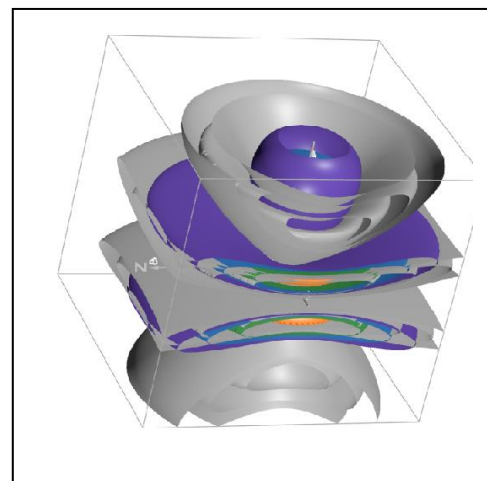
Graphical spatial representation of the layer d:

Fig.2.5
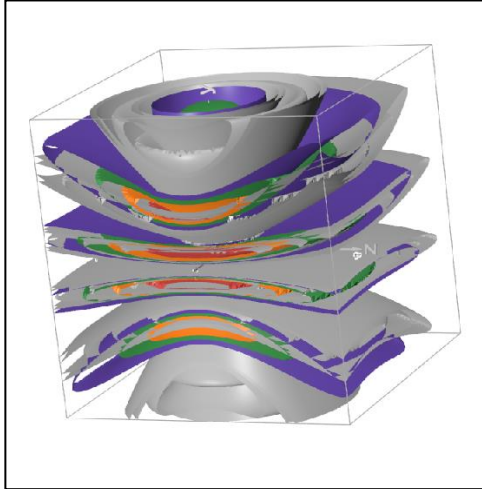
Graphical spatial representation of the layer f:

Fig.2.6
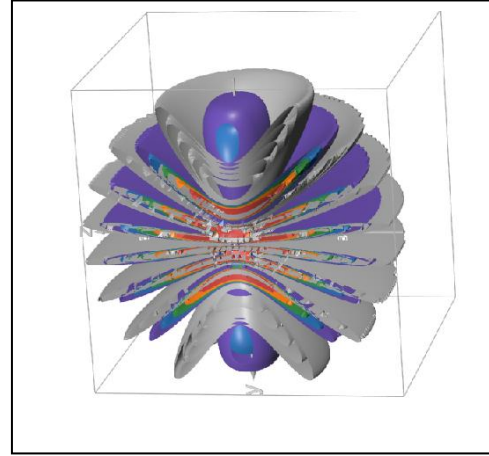
It is always a depiction of the corresponding function for five consecutive principal quantum numbers, with colors representing the lowest to highest n - red, orange, green, blue, violet. The electric component is shown in color, and the magnetic component is shown in grey.

3. Comparison of energy level values

So, if we assume that the electron and proton have the same charge magnitude but opposite signs, it rather induces a planar character of the probability distribution of the electron in a specific layer. In contrast, the difference of several orders of magnitude between the magnetic moment of the electron and the nucleus of the atom is likely to cause a spatial character of the probability distribution.

This leads us to the point that the predominant electric effect on the total energy of the electron in the atomic shells is determined by equations with a square term in the denominator (e.g., [1.2]), while the fine effect in this consideration would be expressed by equations with a cubic term in the denominator.

Some approximation could be achieved through a calculation utilizing energy differences in related levels. This would be expressed by the relation for the p level (of the hydrogen atom):

$$\frac{E_{np\frac{1}{2}} - E_{np\frac{3}{2}}}{(n+1)^3} = \frac{E_{(n+1)p\frac{1}{2}} - E_{(n+1)p\frac{3}{2}}}{n^3} \qquad [3.1]$$

From this, we can then derive further calculations in which we calculate the specific energy of the electron from three other known (i.e., measured) specific energies of the electron.

$$E_{np\frac{1}{2}} = \frac{(n+1)^3}{n^3}\left(E_{(n+1)p\frac{1}{2}} - E_{(n+1)p\frac{3}{2}}\right) + E_{np\frac{3}{2}} \qquad [3.1.1]$$

$$E_{(n+1)p\frac{1}{2}} = \frac{n^3}{(n+1)^3}\left(E_{np\frac{1}{2}} - E_{np\frac{3}{2}}\right) + E_{(n+1)p\frac{3}{2}} \qquad [3.1.2]$$

$$E_{np\frac{3}{2}} = E_{np\frac{1}{2}} - \frac{(n+1)^3}{n^3}\left(E_{(n+1)p\frac{1}{2}} - E_{(n+1)p\frac{3}{2}}\right) \qquad [3.1.3]$$

$$E_{(n+1)p\frac{3}{2}} = E_{(n+1)p\frac{1}{2}} - \frac{n^3}{(n+1)^3}\left(E_{np\frac{1}{2}} - E_{np\frac{3}{2}}\right) \qquad [3.1.4]$$

Where n is the principal quantum number, p is the atomic orbital (l=1). Of course, the rule holds that if l=1, then n>=2.

The situation may look similar for the orbital d:

$$\frac{E_{nd\frac{3}{2}}-E_{nd\frac{5}{2}}}{(n+1)^3} = \frac{E_{(n+1)d\frac{3}{2}}-E_{(n+1)d\frac{5}{2}}}{n^3} \qquad [3.2]$$

And the derived equations then take the form:

$$E_{nd\frac{3}{2}} = \frac{(n+1)^3}{n^3}\left(E_{(n+1)d\frac{3}{2}} - E_{(n+1)d\frac{5}{2}}\right) + E_{nd\frac{5}{2}} \qquad [3.2.1]$$

$$E_{(n+1)d\frac{3}{2}} = \frac{n^3}{(n+1)^3}\left(E_{nd\frac{3}{2}} - E_{nd\frac{5}{2}}\right) + E_{(n+1)d\frac{5}{2}} \qquad [3.2.2]$$

$$E_{nd\frac{5}{2}} = E_{nd\frac{3}{2}} - \frac{(n+1)^3}{n^3}\left(E_{(n+1)d\frac{3}{2}} - E_{(n+1)d\frac{5}{2}}\right) \qquad [3.2.3]$$

$$E_{(n+1)d\frac{5}{2}} = E_{(n+1)d\frac{3}{2}} - \frac{n^3}{(n+1)^3}\left(E_{nd\frac{3}{2}} - E_{nd\frac{5}{2}}\right) \qquad [3.2.4]$$

For equation [3.2], n>=3.

Similarly, we can formulate an equation for the f orbital:

$$\frac{E_{nf\frac{5}{2}}-E_{nf\frac{7}{2}}}{(n+1)^3} = \frac{E_{(n+1)f\frac{5}{2}}-E_{(n+1)f\frac{7}{2}}}{n^3} \qquad [3.3]$$

Etc. These equations still hold only for an odd number of electrons in the shell, i.e., J is an odd multiple of ½.

We can now verify our prediction against the NIST tables [4]. For a hydrogen atom with one electron (H I), the calculation is as follows. The gray boxes represent values obtained from NIST, and the colored boxes indicate the difference between the measured energy and the calculation based on the provided equations. In the colored boxes, a value written in black indicates that the difference between the calculation and the measured energy is less than the stated measurement error, while a red value indicates that the difference between the calculation and the measured energy is greater than the measurement error.

Tab.3.1

	J	Energy	Meas.error	Calc.2p	Calc.3p, 3d	Calc.4p, 4d, 4f	Calc.5p, 5d, 5f, 5g
2p	¹/₂	10,198806150240000	4,00E-11	-	3,74989E-11	-9,89999E-10	1,065E-08
	³/₂	10,198851514590000	5,00E-11	-	-3,74989E-11	9,89999E-10	-1,065E-08
3p	¹/₂	12,087493659100000	9,00E-10	-1,11111E-11	-	-3,04444E-10	3,14445E-09
	³/₂	12,087507100400000	9,00E-10	1,11111E-11	-	3,04444E-10	-3,14445E-09
3d	³/₂	12,087507078300000	2,50E-09		-	-1,96222E-09	1,58148E-09
	⁵/₂	12,087511558200000	9,00E-10		-	1,96222E-09	-1,58148E-09
4p	¹/₂	12,748532446320000	6,00E-11	1,2375E-10	1,28438E-10	-	1,46E-09
	³/₂	12,748538116740000	4,00E-11	-1,2375E-10	-1,28438E-10	-	-1,46E-09
4d	³/₂	12,748538108400000	1,00E-09		8,27812E-10	-	1,495E-09
	⁵/₂	12,748539997530000	1,00E-10		-8,27812E-10	-	-1,495E-09
4f	⁵/₂	12,748539998000000	6,00E-09			-	-5,45625E-09
	⁷/₂	12,748540940300000	1,60E-09			-	5,45625E-09
5p	¹/₂	13,054498182000000	5,00E-09	-6,81601E-10	-6,79201E-10	-7,4496E-10	-

	$^3/_2$	13,054501086000000	5,00E-09	6,81601E-10	6,79201E-10	7,4496E-10	-
5d	$^3/_2$	13,054501074000000	3,00E-09		-3,41601E-10	-7,65E-10	-
	$^5/_2$	13,054502042000000	3,00E-09		3,41601E-10	7,65E-10	-
5f	$^5/_2$	13,054502046336000	1,00E-11			2,7936E-09	-
	$^7/_2$	13,054502526000000	6,00E-09			-2,7936E-09	-
5g	$^7/_2$	13,054502529303000	1,00E-10				-
	$^9/_2$	13,054502819633000	1,00E-10				-
6p	$^1/_2$	13,220701461980000	1,20E-10	1,11022E-12	2,49933E-12	-3,55556E-11	3,95556E-10
	$^3/_2$	13,220703142140000	1,20E-10	-1,11022E-12	-2,49933E-12	3,55556E-11	-3,95556E-10
6d	$^3/_2$	13,220703139410000	1,60E-10		5,75007E-11	-1,87777E-10	2,55186E-10
	$^5/_2$	13,220703699340000	5,00E-11		-5,75007E-11	1,87777E-10	-2,55186E-10
6f	$^5/_2$	13,220703699081000	1,00E-11			-8,22E-10	-2,43867E-09
	$^7/_2$	13,220703979103000	1,00E-11			8,22E-10	2,43867E-09
6g	$^7/_2$	13,220703978574000	1,00E-11				4,61853E-14
	$^9/_2$	13,220704146589000	1,00E-11				-4,61853E-14
7p	$^1/_2$	13,320916647000000	5,00E-09	1,06064E-09	1,06152E-09	1,03755E-09	1,31E-09
	$^3/_2$	13,320917704000000	5,00E-09	-1,06064E-09	-1,06152E-09	-1,03755E-09	-1,31E-09
7d	$^3/_2$	13,320917703000000	3,00E-09		-3,54811E-10	-5,09E-10	-2,30321E-10
	$^5/_2$	13,320918056000000	3,00E-09		3,54811E-10	5,09E-10	2,30321E-10
8p	$^1/_2$	13,385960078690000	7,00E-11	-2,03038E-12	-1,44595E-12	-1,75007E-11	1,64375E-10
	$^3/_2$	13,385960787510000	7,00E-11	2,03038E-12	1,44595E-12	1,75007E-11	-1,64375E-10
8d	$^3/_2$	13,385960786360000	4,00E-11		-3,4273E-11	-1,37749E-10	4,91251E-11
	$^5/_2$	13,385961022639000	2,50E-11		3,4273E-11	1,37749E-10	-4,91251E-11
9p	$^1/_2$	13,430553600000000	5,00E-09	-1,74486E-10	-1,74074E-10	-1,8535E-10	-5,76126E-11
	$^3/_2$	13,430554098000000	5,00E-09	1,74486E-10	1,74074E-10	1,8535E-10	5,76126E-11
9d	$^3/_2$	13,430554096000000	3,00E-09		-7,77778E-11	-1,50452E-10	-1,92042E-11
	$^5/_2$	13,430554262000000	3,00E-09		7,77778E-11	1,50E-10	1,92042E-11
10p	$^1/_2$	13,462451058000000	5,00E-09	-8,52012E-11	-8,4901E-11	-9,3122E-11	0,00E+00
	$^3/_2$	13,462451421000000	5,00E-09	8,52012E-11	8,4901E-11	9,3122E-11	0,00E+00
10d	$^3/_2$	13,462451419080000	1,60E-10		-3,26992E-11	-8,5679E-11	1,00009E-11
	$^5/_2$	13,462451540070000	1,60E-10		3,26992E-11	8,5679E-11	-1,00009E-11
11p	$^1/_2$	13,486051554000000	5,00E-09	-3,3674E-10	-3,36515E-10	-3,42691E-10	-2,73E-10
	$^3/_2$	13,486051827000000	5,00E-09	3,3674E-10	3,36515E-10	3,42691E-10	2,73E-10
11d	$^3/_2$	13,486051825000000	3,00E-09		-1,2299E-10	-1,63E-10	-9,09068E-11
	$^5/_2$	13,486051916000000	3,00E-09		1,2299E-10	1,63E-10	9,09068E-11

	J		Meas.error	Calc. 2p	Calc. 3p, 3d	Calc. 4p, 4d, 4f	Calc. 5p, 5d, 5f, 5g
12p	¹/₂	13,504001658000000	5,00E-09	1,02014E-09	1,02031E-09	1,01556E-09	1,07E-09
	³/₂	13,504001867000000	5,00E-09	-1,02014E-09	-1,02031E-09	-1,01556E-09	-1,07E-09
12d	³/₂	13,504001865810000	4,00E-11		-1,15623E-11	-4,22222E-11	1,31486E-11
	⁵/₂	13,504001935820000	3,00E-11		1,15623E-11	4,22222E-11	-1,31486E-11

From this sample of different electron energies, 111 calculated results were below the level of measurability, and for 33 calculated results, the calculated difference was greater than the reported measurement accuracy. The worst result came from the calculation of 2p from 5p; however, the 5p measurement is made with a measurement error that is two orders of magnitude larger than the 2p measurement. The mere speculative assumption that the results of the 5p measurement may differ from the measured value below the measurability limit may lead us to believe that the calculated results for 2p may then be well below the 2p measurability limit. Conversely, the best result is the calculation of 10p from 5p; the difference between the calculated and measured value is zero. Here, of course, there is no unmeasurable accuracy of the calculation, but a random interplay of multiplied and divided numbers.

For He II, i.e., helium with one electron, the calculation is as follows:
Tab.3.2

	J		Meas.error	Calc. 2p	Calc. 3p, 3d	Calc. 4p, 4d, 4f	Calc. 5p, 5d, 5f, 5g
2p	¹/₂	40,813030900000000	1,10E-09	-	1,48251E-09	-2,23E-09	-5,59306E-09
	³/₂	40,813757096390000	1,10E-09	-	-1,48251E-09	2,23E-09	5,59306E-09
3p	¹/₂	48,371297459920000	2,50E-10	-4,39265E-10	-	-1,10001E-09	-2,09646E-09
	³/₂	48,371512629660000	1,20E-10	4,39265E-10	-	1,10001E-09	2,09646E-09
3d	³/₂	48,371512275660000	1,00E-11		-	3,42744E-10	2,68685E-10
	⁵/₂	48,371583992058000	7,00E-12		-	-3,42744E-10	-2,68685E-10
4p	¹/₂	51,016661238380000	1,00E-10	2,78753E-10	4,64063E-10	-	-4,20378E-10
	³/₂	51,016752012650000	5,00E-11	-2,78753E-10	-4,64063E-10	-	4,20378E-10
4d	³/₂	51,016751861500000	1,10E-09		-1,44595E-10	-	-3,12426E-11
	⁵/₂	51,016782117000000	1,10E-09		1,44595E-10	-	3,12426E-11
4f	⁵/₂	51,016782062500000	5,00E-10			-	4,37481E-11
	⁷/₂	51,016797189800000	5,00E-10			-	-4,37481E-11
5p	¹/₂	52,241074154950000	5,00E-11	3,57957E-10	4,52836E-10	2,15238E-10	-
	³/₂	52,241120631161000	2,50E-11	-3,57957E-10	-4,52836E-10	-2,15238E-10	-
5d	³/₂	52,241120553300000	7,00E-10		-5,80371E-11	1,60E-11	-
	⁵/₂	52,241136044100000	7,00E-10		5,80371E-11	-1,60E-11	-
5f	⁵/₂	52,241136016000000	5,00E-10			-2,24034E-11	-
	⁷/₂	52,241143761200000	5,00E-10			2,24034E-11	-
5g	⁷/₂	52,241143746480000	9,00E-11				-
	⁹/₂	52,241148393570000	9,00E-11				-
6p	¹/₂	52,906182083940000	2,50E-10	2,726E-10	3,27503E-10	1,90006E-10	6,54481E-11
	³/₂	52,906208979830000	2,50E-10	-2,726E-10	-3,27503E-10	-1,90006E-10	-6,54481E-11

	J		Meas.error	Calc. 2p	Calc. 3p, 3d	Calc. 4p, 4d, 4f	Calc. 5p, 5d, 5f, 5g
6d	$^3/_2$	52,906208934200000	5,00E-10		-5,02496E-11	-7,40386E-12	-1,66622E-11
	$^5/_2$	52,906217898800000	5,00E-10		5,02496E-11	7,40386E-12	1,66622E-11
6f	$^5/_2$	52,906217882500000	4,00E-10			6,29683E-11	7,59286E-11
	$^7/_2$	52,906222364600000	4,00E-10			-6,29683E-11	-7,59286E-11
6g	$^7/_2$	52,906222356140000	1,10E-10				-1,18092E-11
	$^9/_2$	52,906225045440000	1,10E-10				1,18092E-11
7p	$^1/_2$	53,307218753880000	2,50E-10	2,95131E-10	3,29706E-10	2,43119E-10	1,65E-10
	$^3/_2$	53,307235691110000	2,50E-10	-2,95131E-10	-3,29706E-10	-2,43119E-10	-1,65E-10
7d	$^3/_2$	53,307235662200000	4,00E-10		-8,58762E-11	-5,89E-11	-6,47233E-11
	$^5/_2$	53,307241307600000	4,00E-10		8,58762E-11	5,89E-11	6,47233E-11
8p	$^1/_2$	53,567505739780000	1,20E-10	1,586E-10	1,81764E-10	1,23755E-10	7,12035E-11
	$^3/_2$	53,567517086440000	1,20E-10	-1,586E-10	-1,81764E-10	-1,23755E-10	-7,12035E-11
8d	$^3/_2$	53,567517066950000	2,50E-10		2,94307E-11	4,75069E-11	4,35989E-11
	$^5/_2$	53,567520848840000	2,50E-10		-2,94307E-11	-4,75069E-11	-4,35989E-11
9p	$^1/_2$	53,745956961280000	1,20E-10	2,7336E-10	2,89631E-10	2,48889E-10	2,11983E-10
	$^3/_2$	53,745964930240000	1,20E-10	-2,7336E-10	-2,89631E-10	-2,48889E-10	-2,11983E-10
9d	$^3/_2$	53,745964916600000	1,20E-10		4,28955E-11	5,55858E-11	5,28431E-11
	$^5/_2$	53,745967572720000	1,20E-10		-4,28955E-11	-5,56E-11	-5,28431E-11
10p	$^1/_2$	53,873601673210000	1,10E-10	1,31116E-10	1,42975E-10	1,13275E-10	8,64E-11
	$^3/_2$	53,873607482650000	1,10E-10	-1,31116E-10	-1,42975E-10	-1,13275E-10	-8,64E-11
10d	$^3/_2$	53,873607472650000	1,20E-10		-4,72511E-11	-3,79998E-11	-3,99965E-11
	$^5/_2$	53,873609409040000	1,20E-10		4,72511E-11	3,79998E-11	3,99965E-11
11p	$^1/_2$	53,968044080240000	1,00E-10	9,67688E-11	1,05679E-10	8,3368E-11	6,32E-11
	$^3/_2$	53,968048444960000	1,00E-10	-9,67688E-11	-1,05679E-10	-8,3368E-11	-6,32E-11
11d	$^3/_2$	53,968048437430000	1,00E-10		2,96296E-12	9,92E-12	8,41283E-12
	$^5/_2$	53,968049892230000	1,00E-10		-2,96296E-12	-9,92E-12	-8,41283E-12

Of this sample of different electron energies, 72 calculated results were below the level of measurability, and 58 calculated differences were greater than the reported measurement precision.

For Li III, lithium with one electron, the calculation is as follows:
Tab3.3

	J		Meas.error	Calc. 2p	Calc. 3p, 3d	Calc. 4p, 4d, 4f	Calc. 5p, 5d, 5f, 5g
2p	$^1/_2$	91,839353610000000	1,10E-07	-	2,2725E-08	-1,74E-08	-5,72002E-08
	$^3/_2$	91,843030792200000	1,10E-07	-	-2,2725E-08	1,74E-08	5,72002E-08
3p	$^1/_2$	108,848098465400000	2,50E-09	-6,73334E-09	-	-1,18889E-08	-2,36815E-08
	$^3/_2$	108,849188007600000	1,20E-09	6,73334E-09	-	1,18889E-08	2,36815E-08

	j	Energy	Uncertainty				
3*d*	³/₂	108,849186211170000	9,00E-11		-	5,12557E-09	-5,7814E-10
	⁵/₂	108,849549313600000	7,00E-11		-	-5,12557E-09	5,7814E-10
4*p*	¹/₂	114,801009684100000	1,10E-09	2,175E-09	5,01562E-09	-	-4,97502E-09
	³/₂	114,801469329700000	6,00E-10	-2,175E-09	-5,01562E-09	-	4,97502E-09
4*d*	³/₂	114,801468562000000	6,00E-09		-2,16235E-09	-	-2,40625E-09
	⁵/₂	114,801621748000000	6,00E-09		2,16235E-09	-	2,40625E-09
4*f*	⁵/₂	114,801621471800000	2,50E-09			-	-1,88594E-09
	⁷/₂	114,801698060600000	2,50E-09			-	1,88594E-09
5*p*	¹/₂	117,556293341300000	6,00E-10	3,66082E-09	5,11521E-09	2,54721E-09	-
	³/₂	117,556528677300000	4,00E-10	-3,66082E-09	-5,11521E-09	-2,54721E-09	-
5*d*	³/₂	117,556528282000000	4,00E-09		1,24885E-10	1,23E-09	-
	⁵/₂	117,556606712000000	4,00E-09		-1,24885E-10	-1,23E-09	-
5*f*	⁵/₂	117,556606570500000	2,50E-09			9,65599E-10	-
	⁷/₂	117,556645783000000	2,50E-09			-9,65599E-10	-
5*g*	⁷/₂	117,556645709300000	5,00E-10				-
	⁹/₂	117,556669236900000	5,00E-10				-
6*p*	¹/₂	119,052964000800000	1,10E-09	3,33334E-09	4,17501E-09	2,68889E-09	1,21481E-09
	³/₂	119,053100189400000	1,00E-09	-3,33334E-09	-4,17501E-09	-2,68889E-09	-1,21481E-09
6*d*	³/₂	119,053099958100000	2,50E-09		-3,96241E-10	2,44455E-10	-4,68503E-10
	⁵/₂	119,053145346300000	2,50E-09		3,96241E-10	-2,44455E-10	4,68503E-10
6*f*	⁵/₂	119,053145263200000	1,20E-09			-1,12223E-09	-1,68103E-09
	⁷/₂	119,053167957300000	1,20E-09			1,12223E-09	1,68103E-09
6*g*	⁷/₂	119,053167913500000	5,00E-10				9,26548E-12
	⁹/₂	119,053181529000000	5,00E-10				-9,26548E-12
7*p*	¹/₂	119,955396879800000	1,10E-09	2,68251E-09	3,21255E-09	2,27668E-09	1,3484E-09
	³/₂	119,955482642300000	1,10E-09	-2,68251E-09	-3,21255E-09	-2,27668E-09	-1,3484E-09
7*d*	³/₂	119,955482495100000	1,20E-09		3,07026E-10	7,11E-10	2,61522E-10
	⁵/₂	119,955511077200000	1,20E-09		-3,07026E-10	-7,11E-10	-2,61522E-10
8*p*	¹/₂	120,541104262400000	9,00E-10	2,17187E-09	2,52696E-09	1,90001E-09	1,27812E-09
	³/₂	120,541161716200000	9,00E-10	-2,17187E-09	-2,52696E-09	-1,90001E-09	-1,27812E-09
8*d*	³/₂	120,541161617600000	1,10E-09		-1,20295E-10	1,49996E-10	-1,50791E-10
	⁵/₂	120,541180765700000	1,10E-09		1,20295E-10	-1,49996E-10	1,50791E-10
9*p*	¹/₂	120,942659876200000	7,00E-10	1,76543E-09	2,01481E-09	1,57448E-09	1,13772E-09
	³/₂	120,942700227600000	7,00E-10	-1,76543E-09	-2,01481E-09	-1,57448E-09	-1,13772E-09

9*d*	³/₂	120,942700158100000	9,00E-10			-6,18599E-11	1,27969E-10	-8,32756E-11
	⁵/₂	120,942713606400000	9,00E-10			6,18599E-11	-1,28E-10	8,32756E-11
10*p*	¹/₂	121,229888234600000	6,00E-10	1,45759E-09	1,63939E-09	1,3184E-09	9,99989E-10
	³/₂	121,229917650600000	6,00E-10	-1,45759E-09	-1,63939E-09	-1,3184E-09	-9,99989E-10
10*d*	³/₂	121,229917599900000	6,00E-10			-3,43903E-11	1,04009E-10	-4,99938E-11
	⁵/₂	121,229927403700000	6,00E-10			3,43903E-11	-1,04009E-10	4,99938E-11
11*p*	¹/₂	121,442403500200000	5,00E-10	1,27129E-09	1,40788E-09	1,16671E-09	9,275E-10
	³/₂	121,442425600700000	5,00E-10	-1,27129E-09	-1,40788E-09	-1,16671E-09	-9,275E-10
11*d*	³/₂	121,442425562500000	5,00E-10			-8,57767E-11	1,82E-11	-9,75149E-11
	⁵/₂	121,442432928300000	5,00E-10			8,57767E-11	-1,82E-11	9,75149E-11

Of this sample of different electron energies, 58 calculated results were below the level of measurability, and 72 calculated differences were greater than the reported measurement accuracy.
Original calculations are given on the website [5].

4. Conclusion

Given that the result of the Lorentz transformation yields wave equations, calculations allow us to bridge this relativistic aspect with quantum phenomena. This article delves into the topic in a manner that can elucidate a wide array of phenomena related to the structure of the atom. It not only explains potential groupings of atoms into molecules but also aligns with the vector model of the atom. However, it avoids using vectors directly, instead working directly with the probability of occurrence.

Exploration in this direction has led to the discovery of presumed dependencies between various energy levels within the atom. While this observation applies to specialized cases, it has unveiled previously unknown relationships based on certain predictions.

From a scientific perspective, the paramount significance lies in the agreement between predictions derived from calculations and experimental results.

Resources:

[1] https://www.sjpub.org/sjp/sjp-220.pdf

[2] https://eijms.com/index.php/ms/article/view/51/75

[3] https://www.arpgweb.com/journal/10/archive/04-2021/2/7

[4] https://physics.nist.gov/PhysRefData/ASD/levels_form.html

[5] https://www.newgentheory.com/tab313233/