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Knotted Hydrogen

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Abstract: *The knotted Hydrogen orbit can explain a slight discrepancy between the experimental inverse fine structure constant and the theoretical one satisfying demands of the double surface concept. As a consequence of just mentioned gap the vibrations of Hydrogen electron with a maximum of 0.01% shrinkage of Bohr radius are expected accompanied by the maximal energy release of 1.3 meV what is in THz frequency domain.*

Keywords: *Double surface concept, inverse fine structure constant, knotted Hydrogen orbit, energy and Bohr radius shrinkage*

1. INTRODUCTION

The subject of interest of this paper is - with the help of orbit knotting - to explain a slight discrepancy between the experimental[1] and the theoretical inverse fine structure constant arising from respecting the double surface concept[2] as follows:

$$\alpha^{-1}_{experimental} = 137.035\ 999\ 084 \neq \alpha^{-1}_{theoretical} = 137.036\ 006\ 254\ \ldots \qquad (1a)$$

Where

$$\alpha^{-1}_{theoretical} = s_{n\in\mathbb{N}} = n\left(2 - \frac{1}{\sqrt{1+\frac{\pi^2}{n^2}}}\right) for\ n = 137\ . \qquad (1b)$$

Here $\alpha^{-1}_{experimental}$ [1] and $\alpha^{-1}_{theoretical}$ [2] denotes the experimental and the theoretical average elliptic-hyperbolic orbit length of the electron in Hydrogen atom, respectively, expressed in Compton wavelengths of the electron, and n denotes the corresponding elliptic orbit length[2].

Figure1. *Hydrogen elliptic orbit length*

In fact, knotting can patch the gap $(1a)$ which separates an unstable experimental orbit length $\alpha^{-1}_{experimental}$ from the stable theoretical one $\alpha^{-1}_{theoretical}$.

Although only slightly difference between concerned inverse fine structure constants $(1a)$ being present it means that even in the case of Hydrogen atom we have deal with an orbit which should be changed to become stable.

2. The Stable Hydrogen Atom Orbit

The unstable orbit length of the electron in Hydrogen atom (recognized by the smaller inverse fine structure constant as expected respecting double surface concept) can become stable by the double improvement[3]:

a) the energy free knotting

b) as well as the energy dependent orbit length contraction.

To achieve a really stable Hydrogen atom following the double surface concept the energy change of the atom orbit formation ΔE_{orbit} should be negative [3]:

$$\Delta E_{orbit} = Ry.\alpha^{-1}_{experimental}\left(\frac{1}{(m \in \mathbb{N})\ x\ \alpha^{-1}_{experimental}} - \frac{1}{s_{n\in\mathbb{N}}}\right) < 0. \quad (3)$$

Here

$Ry = 13.605\ 693\ 122\ 994\ eV$ denotes Rydberg constant[1],

$\alpha^{-1}_{experimental} = 137.035\ 999\ 084$ denotes the experimental inverse fine structure constant[1],

m denotes the natural number of knots of Hydrogen orbit,

and $s_{n\in\mathbb{N}} = n\left(2 - \frac{1}{\sqrt{1+\frac{\pi^2}{n^2}}}\right)$ denotes the double surface stable orbit length of choice enabling the smallest absolute change of energy $|\Delta E|_n = minimal$ when only jumping to the nearest orbit is allowed. [3]

3. The Energy Benefit and Probability of Stable Hydrogen Orbit Formation

A stable Hydrogen atom occurs first in a twice multiplied-orbit and then in countless more times knotted orbit as can be seen in Table1.

Table1. *The stable m-times knotted Hydrogen. Here s = unstable Hydrogen orbit length; s(n) = respecting double surface stable orbit length; ΔE = energy of stable orbit length formation; p = probability of orbit knotting*

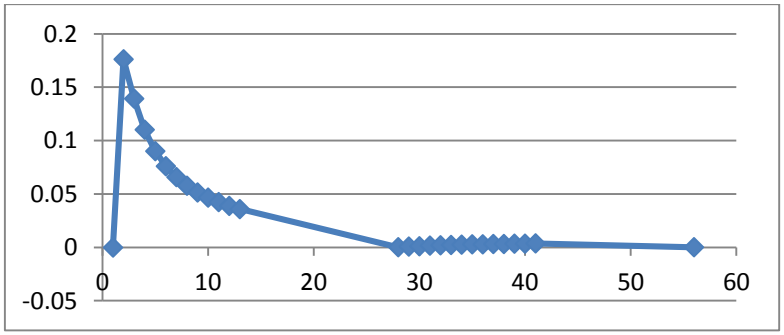
	m	m x s	s(n)	ds	ΔE	p
		(in λ_e)	(in λ_e)		(in eV)	
0th	 1	137,035999084	137,036006254	0,000	7,12E-07	-0,0001
1th	 2	274,071998168	274,018008451	0,054	-1,34E-03	0,1763
2nd	 3	411,107997252	411,012006292	0,096	-1,06E-03	0,1393
3rd	 4	548,143996336	548,009004892	0,135	-8,38E-04	0,1102
4th	 5	685,179995420	685,007203977	0,173	-6,86E-04	0,0903
5th	 6	822,215994504	822,006003343	0,210	-5,79E-04	0,0762
6th	 7	959,251993588	959,005145738	0,247	-5,00E-04	0,0658
7th	 8	1096,287992672	1096,004502529	0,283	-4,40E-04	0,0579
8th	 9	1233,323991756	1233,004002253	0,320	-3,92E-04	0,0516
9th	 10	1370,359990840	1370,003602031	0,356	-3,54E-04	0,0466
10th	 11	1507,395989924	1507,003274576	0,393	-3,22E-04	0,0424
11th	 12	1644,431989008	1644,003001696	0,429	-2,96E-04	0,0389
12th	 13	1781,467988092	1781,002770798	0,465	-2,73E-04	0,0360

13th	$_{28}$	3837,007974352	3837,001286109	0,007	-8,47E-07	0,0001
14th	$_{29}$	3974,043973436	3974,001241771	0,043	-5,04E-06	0,0007
15th	$_{30}$	4111,079972520	4111,001200389	0,079	-8,69E-06	0,0011
16th	$_{31}$	4248,115971604	4248,001161676	0,115	-1,19E-05	0,0016
17th	$_{32}$	4385,151970688	4385,001125382	0,151	-1,46E-05	0,0019
18th	$_{33}$	4522,187969772	4522,001091287	0,187	-1,70E-05	0,0022
19th	$_{34}$	4659,223968856	4659,001059197	0,223	-1,91E-05	0,0025
20th	$_{35}$	4796,259967940	4796,001028941	0,259	-2,10E-05	0,0028
21th	$_{36}$	4933,295967024	4933,001000365	0,295	-2,26E-05	0,0030
22nd	$_{37}$	5070,331966108	5070,000973333	0,331	-2,40E-05	0,0032
23rd	$_{38}$	5207,367965192	5207,000947724	0,367	-2,52E-05	0,0033
24th	$_{39}$	5344,403964276	5344,000923428	0,403	-2,63E-05	0,0035
25th	$_{40}$	5481,439963360	5481,000900347	0,439	-2,72E-05	0,0036
26th	$_{41}$	5618,475962444	5618,000878391	0,475	-2,81E-05	0,0037
27th	$_{56}$	7674,015948704	7674,000643055	0,015	-4,84E-07	0,0001
…	…	…	…	…	-2,70E-04	0,0355
∞th	$_{\infty}$	∞	∞	0	0	0
					∑ΔE= -0.0076	∑p = 1

The unknotted Hydrogen orbit with the energy cost of 7.12E-07 eV needed to be paid for a stable orbit formation is considered as unstable. It is included in Table1 for the comparison (see 0th solution). Knotting made of 14 to 27 knots is unstable, too, therefore it is omitted in Table1 (see 12th and 13th solution). Otherwise the number of solutions for the formation of Hydrogen stable orbit is infinite having a trend to become energetically less favourable (ΔE is becoming less negative) with the increasing number of knots although deviations exist. For instance, the most probable is the first solution with the energy benefit of 1.34E-03 eV given at a stable orbit formation. Right behind it is the second solution with the energy benefit of 1.06E-03 eV. At knotting made of 28 to 41 knots (see 13th and 26th solution) the trend is slightly reversed but at 27th solution with 56 knots the declining trend of given energy benifite continues again. Perturbations are found throughout solving the task but do not change the common declining trend. The energy benefit of an infinite knot is nil. The energy benefit of an infinite number of knots is finite, i.e. $\sum_{k=1}^{k=\infty} \Delta E_k = 0.0076\, eV$ rounded to four decimal places. Knowing this data the probability of each solution for the formation of Hydrogen knotted orbit is calculated as follows:

$$p_k = \frac{\Delta E_k}{\sum_{k=1}^{k\infty} \Delta E_k}. \qquad (4)$$

Where k means the orbit in question, ΔE_k means the energy of stable orbit formation in question, and p_k means its probability. For instance twice multiplied Hydrogen orbit length offers the most probable stable orbit. Its probability is 17.6% (see 1st solution). The probability of Hydrogen orbit formation with more than 56 knots is only 3.6% (see between 27th and ∞th solution). The probability of forming an infinite knot is nil. First 27 values of Hydrogen knotting are presented in Graph1.



Graph1. *Probability of Hydrogen knotting. X-axis = number of knots.*

4. The Vibrations Below Bohr Orbit

In a stable Hydrogen orbit formation the energy is released what puts the electron closer to the nucleus. More energy released allows a shorter distance between the electron and the nucleus of the atom. An Infinit number of different orbit formation energies causes an infinite number of different distances. The probability of finding the electron on Bohr radius $r_{Bohr} = 137.0360\frac{\lambda_e}{2\pi}$ (1a) is nil since it belongs to the infinit knotted Hydrogen orbit which with the zero orbit formation energy becomes imposible (3). The smallest possible electron radius, $r_{minimal} = 137.0225\frac{\lambda_e}{2\pi}$, belonging to the energy release of 1.34E-03 eV (Table1) respecting Bohr equation is at the same time the most probable one with the probability of 17.6% (Table1) to be occupied. All other available quantized radii lying between both extreme values posses lesser probability of being occupied by the electron as written below:

$$r_{minimal} = 137.0225\frac{\lambda_e}{2\pi}(p = 17.6\%) \leq r_{Hydrogen\ atom} < r_{Bohr} = 137.0360\frac{\lambda_e}{2\pi}(p = 0\%). \quad (5)$$

Representing a maximum of 0.01% shrinkage of Bohr radius.

5. Conclusion

It seems that governed by the present theory Hydrogen plays dice, too. Don't worry as long as the game is in a limited location.

Dedication

This fragment is dedicated to the first of September – the first day of school. As well as to the thirteenth anniversary of Lekarna Špringer (Springer Pharmacy). Let imagination enter and good luck

Figure1. *Imagination*

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