Report on the Evaluation
of Chapter 1
in
"The Grand Unified Theory of Classical Physics"
(September 2016 version)
by Dr. Randell L. Mills

Prepared by

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August 7, 2017

Executive Summary

In my analysis, I conducted calculations on the Lande g-factor of the electron. I also replicated calculations leading to the values found in Tables 1.1, 1.2, 1.3, 1.4, and 1.5 in the book "The Grand Unified Theory of Classical Physics" by Dr. Randell L. Mills (September 2106 version). In the course of these calculations, I replicated all of his results in these tables, to a very high degree of accuracy. I also verified many of the equations he used in Chapter 1. And I verified that the equations he used to describe the generation of the electron atomic orbital, using the OCVF and BECVF methods, are correct and reasonable. (These methods stand for the Atomic Orbital Current Vector Field (OCVF) and the Basis Element Current Vector Field (BECVF).)

Purpose

The physics being modeled here are four-fold. First, the Lande g-factor for the electron is calculated. Then the Lande g-factor for the muon is calculated. These are important numbers that are fundamental to the make-up of these particles. They also play an important role in calculating spin-flip transitions going from a spin-up state to a spin-down state. The spin-flip transition can be considered to involve a magnetic moment g times that of a Bohr magneton, $\Delta E = g\mu_B B$.

Secondly, quantities associated with one-electron atoms and ions are calculated. This is a very important class of atoms and ions to understand. Any correct theory of quantum mechanics must start here and show that it can calculate these results. The Bohr model of the atom excelled at describing one-electron systems (atoms and ions).

Thirdly, the generation of the electron atomic orbital is an important section of Chapter 1. I find this section to be now clearer and easier to follow than the discussion in earlier editions of the book. The use of more diagrams and Table 1.1 helped me to more easily conceptualize the geometries involved in generating the atomic orbital.

Fourthly, relativistic corrections to the Ionization Potential make up the last section of Chapter 1. These corrections are important when the velocity of the electron in the electron atomic orbital exceeds 0.1c. Then special relativity has a bearing on these energies and must be taken into account to get the desired accuracy needed in comparing the theoretical value of the Ionization Potential to the experimentally measured value of the Ionization Potential.

Calculation

From CP, the g/2 factor for the electron is given by Equation 1.228:

$$g/2 = 1 + \alpha/2\pi + (2\alpha^2/3)(\alpha/2\pi) – (4/3)(\alpha/2\pi)^2$$

I used the value for α^{-1} found after Equation 1.228, namely 137.0360411. When I used this value in Equation 1.228, I found g/2 to be

g/2 = 1.001 159 652.

This compares very well with the CP value of 1.001 159 652 120 shown in Equation 1.229. This is also in excellent agreement with the experimental value of 1.001 159 652 188(4) quoted in Equation 1.230.

I also used Equation 1.204 to calculate α (using the values given in Equations 1.231-1.234 for μ_e, e, c, and h) and found α^{-1} to be 137. 0360382, which is exactly the value quoted in Equation 1.235. Using this value of α^{-1} in Equation 1.228, I found g/2 equal to 1.001 159 652, which is in agreement with the value shown in Equation 1.236, namely 1.001 159 652 137. Again this is in excellent agreement with the experimental value of g/2 given in Equation 1.237 of 1.001 159 652 188(4).

I have verified that all the entries in Table 1.1 are correct.

Next I wanted to replicate the values given in Table 1.2, calculated parameters for the hydrogen atom (n = 1). Here are my results:

Parameter	Mill's Value	My Value
Radius	5.2947×10^{-11} m	5.2948×10^{-11} m
Potential Energy	-27.196 eV	-27.197 eV
Kinetic Energy	13.598 eV	Same as Mills
Angular velocity	4.1296×10^{16} rad/s	4.1293×10^{16} rad/s
Linear velocity	2.1865×10^{6} m/s	2.186499×10^{6} m/s
Wavelength	3.325×10^{-10} m	3.3267×10^{-10} m
Spin quantum number	½	Same as Mills
Moment of inertia	1.277×10^{-51} kgm^2	Same as Mills
Angular kinetic energy	6.795 eV	6.796 eV
Angular momentum mag.	1.0545×10^{-34} Js	1.0546×10^{-34} Js
Projection of the ang. Mom.	2.636×10^{-35} Js	Same as Mills
z-axis proj. of ang. Mom.	5.273×10^{-35} Js	Same as Mills
Mass density	2.589×10^{-11} kg/m^2	2.586×10^{-11} kg/m^2
Charge density	4.553 C/m^2	4.548 C/m^2

The agreement here is very close indeed, except for the last entry.

I also verified the values given in Table 1.3, for one-electron atoms. All of my r_1 values exactly agreed with those in Table 1.3. Here's my other results (all units are in eV):

KE (Mills)	KE (my value)	PE (Mills)	PE (my value)	Ionization E. (Mills)	Ionization E. (my value)
13.61	Same	-27.21	Same	13.61	Same
54.42	Same	-108.85	Same	54.42	Same
122.45	Same	-244.90	-244.91	122.45	Same
217.69	217.70	-435.39	Same	217.69	217.7
340.15	Same	-680.29	-680.30	340.15	Same
489.81	489.82	-979.62	-979.63	489.81	489.82
666.68	666.69	-1333.37	-1333.39	666.68	666.69
870.77	870.78	-1741.54	-1741.57	870.77	870.78

Again, the agreement is extremely good.

Next, I replicated the values given in Table 1.4, for one-electron atoms.

R_1(Mills) (a_o)	R_1 (me) (a_o)	Ang. Vel. (Mills)	Ang. Vel. (me)	Linear Vel. (Mills)	Linear Vel. (me)	Wave length (Mills)	Wave Length (me)
1.000	Same	0.413	Same	2.19	Same	3.325	3.321
0.500	Same	1.65	Same	4.38	4.37	1.663	1.661
0.333	Same	3.72	Same	6.56	Same	1.108	1.109
0.250	Same	6.61	Same	8.75	Same	0.831	Same
0.200	Same	10.3	Same	10.9	Same	0.665	0.667
0.167	Same	14.9	Same	13.1	Same	0.554	0.555
0.143	Same	20.3	20.2	15.3	Same	0.475	Same
0.125	Same	26.5	26.4	17.5	Same	0.416	Same

Here, again, the agreement is excellent.

I verified all of the entries in Table 1.5. I got the exact values for all the entries in the column of β values. I also got the exact values for all the entries in the last column, namely, the Relative Difference between Experimental and Calculated. My values for the Theoretical Ionization Energies were remarkably close to the values reported in the CP book. They were all close enough for me to be convinced they were right, usually differing only in the last one or two decimal places – a very small difference, actually. There were only two values that were the farthest off. For Z=21, the Mills' book gets 6035.681 and I got 6035.520, and for Z=25, the Mills' book gets 8575.426 and I got 8575.229. All the rest of the values for the Theoretical Ionization Energies agreed very closely.

I have verified that equations 1.32-1.36, 1.38, and 1.40-1.55 are valid equations.

I have also verified that equations 1.62-1.64, 1.66-1.67, and 1.71-1.74 are valid.

Also I have verified that equations 1.80-1.82 are valid equations.

I have also verified that equations 1.125, 1.126 and 1.129-1.131 are correct. I have also verified that the value that equation 1.131 yields is correct.

I have also shown that equations 1.142, 1.143, 1.154, and 1.160-1.162 are correct as well.

In Box 1.1, I have verified that equations 1-5, 22, 23, 29, 31, and 33 are valid and true.

Also in Box 1.1, I have verified that the values produced by equations 7-13, 24, and 25 are true and correctly presented by Dr. Mills.

I have also shown that equations 1.168, 1.169, and 1.172-1.181 are correct as written.

Equations 1.183-1.184 and 1.188-1.200 are also correctly written, as are equations 1.202-1.209.

I have shown that equations 1.215, 1.218, and 1.220-1.223 are correct.

Also, equations 1.226 and 1.228 are correct as stated in the book.

I have also verified that equations 1.229, 1.235, 1.261, and 1.262 are also valid equations, and yield the results listed from their calculations.

I have also shown that equations 1.245-1.249 are correct, as are equations 1.251, 1.254, 1.256, 1.257, 1.259, 1.260, and 1.263.

Equations 1.269-1.272 are correct as well, as is equation 1.277.

Equations 1.283-1.287 are valid as well, as are 1.291-1.292.

Conclusion

I successfully verified the values of the one-electron quantities in Tables 1,1, 1.2, 1.3, 1.4, and 1.5. Furthermore, I was able to verify the CP value for the Lande g factor for the electron. I successfully verified many of the equations and calculated quantities listed in Chapter 1, as well. I consider this to be validation of the CP theory in Chapter 1.