SunQM-1: Quantum mechanics of the Solar system in a {N,n//6} QM structure

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The major part of this work started from Sep. 2015, finished in Aug. 2016.

Abstract

Finally, I find a way to extend Bohr's atom model (which was inspired by the Solar system structure) to our Solar system structure. In this paper, I present that how I decoded the quantum mechanics for our Solar system by introduce a {N,n//6} QM structure model. In the newly established Solar QM {N,n} structure, Sun core has a size of {0,1}, Sun surface has a size of {0,2}, Mercury, Venus, Earth, and Mars are at {1,n=3..6}o orbits. Jupiter, Saturn, Uranus, Neptune, and Kuiper belt are at {2,n=2..6}o orbits. Oort cloud is at {4,n=1..5}o orbits. There are four undiscovered planets/belts at orbits of {3,n=2..5}o. More interestingly, white dwarf, neutron star, and black hole are assigned to {-1,1}, {-3,2} and {-3,1} in the same model. From these results, I constructed a Solar QM {N,n} structure periodic table (similar as the chemical element's periodic table). A Solar QM {N,n} structure periodic plot is also presented here which shows some more detailed (and visualized) information.

Background

In memory of Niels Bohr who proposed QM formula $r_n = r_1 n^2$ in 1913.

About 100 years ago, with the great successes of classical physics for our daily-live-world (E-3 ~ E+6 meters)'s physics and the macro-world (E+6 ~ E+12 meters)'s physics, we human extended our exploration to the micro-world (<< E-6 meters)'s physics. In 1900, Max Planck started the first quantum theory and successfully quantized the energy for the black-body radiation [1]. In 1905, Albert Einstein successfully quantized the photon mechanics for the photoelectric effect [1]. In 1913, Niels Bohr successfully quantized the electron mechanics by proposing the famous Bohr model of atom with the inspiration of the known Solar system structure. It "*depicts the atom as a small, positively charged nucleus surrounded by electrons that travel in circular orbits around the nucleus—similar in structure to the Solar System, but with attraction provided by electrostatic forces rather than gravity*" [1]. Within only less than 15 years, Bohr model was replaced by a more accurate quantum mechanics mainly contributed by Schrodinger, Heisenberg, de Broglie, and Born, etc.[1]. Since then, Bohr model is only presented in the entry level QM text book, to bridge the classic physics to quantum physics for new students. Freshmen of QM always wonder that since structures of Solar system and Bohr model are so similar, why they cannot be described by a single mechanics? For over 100 years, many scientists, freshman students (like me in 34 years ago), and the citizen scientists (like me in today) must have tried to quantize Solar system, although none of them had a good luck. After leaning more QM, we all accepted the concept and "facts" that QM is only for micro-world, not for macro-world.

In 2015, 34 years after my first time of learning QM (at Fudan University), I re-picked this question (along with some other questions), and this time I made some astonishing discoveries: indeed, Solar system is able to be described by the same QM that has been developed for micro-world for past 100 years! In this paper, I am going to present how I depict Solar system in QM, with the intention to use Bohr model (due to it is such simple, elegant and so similar to Solar system) as the blueprint.

Introduction (of current paper)

My purpose is to quantize the Solar system by using Bohr model as blueprint, and then eventually to describe the whole Solar QM structure using Schrodinger equation and solution. To do this, we need first to compare the major results obtained from Bohr model and from Schrodinger equation solutions, then use those Bohr's formulas that are same as Schrodinger's result, and discard those formulas which different from Schrodinger's result. In Table 1, three major results, r_n, E_n, L_n, represents radius, energy, and angular momentum of orbital at quantum state n, obtained from either Bohr model, or Schrodinger equation solution are compared. It is obvious that for r_n and E_n, both Bohr model and Schrodinger equation solution produced the same results. But for L, the result is very different.

Table 1. Comparison of Bohr model with Schrodinger equation solutions for r_n, E_n, L_n.

	Bohr model	Schrodinger eq. solution
r_n	$r_n = r_1 * n^2 /Z$ [2]	$r_n = a_0 * n^2 /Z$ [5]
E_n	$E_n = -(13.6\ eV)\ Z^2 / n^2$ [3]	$E_n = -(13.6\ eV)\ Z^2 / n^2$ [6]
L_n	$L = n\ \hbar$ [4]	$L^2 = l(l+1)\ \hbar^2$ [7]

A series of papers [8] are used to present my discovery of Solar system quantum mechanics {N,n} structure:
Paper-1, how to quantize the orbits of Solar system solely based on the quantum orbit relationship of $r_n = r_1*n^2$, which was first obtained from Bohr model, and had also been proved to be correct in Schrodinger equation solution.
Paper-2, how to quantize the orbit energy of Solar system using E = hf, and how it led to the discovery of a new constant, a generalized Planck constant (named H-C unit).
Paper-3, how to seamlessly transform Schrodinger's equation/solution into Bohr-kind simple model for Solar system.
Paper-4, unfinished.
Paper-5, how to use a new QM method (based on interior {N,n} QM, multiplier n', $|R(n,l)|^2\ |Y(l,m)|^2$ guided mass occupancy, and RF) to analyze our world in scales from string to universe.

Each of these main papers has its own supplementary papers to present my additional results/thoughts that related to the main paper. Papers are abbreviated as: Main paper: SunQM-1, SunQM-2, SunQM-3, SunQM-5, etc. Supplementary paper: SunQM-1s1, SunQM-1s2, SunQM-1s3, SunQM-2s1, SunQM-3s1, SunQM-3s2, SunQM-3s3, SunQM-3s6, SunQM-5s1, etc.

The current paper is the paper-1 (SunQM-1), quantize Solar system for its orbits. Note: Microsoft Excel's number format is often used in this paper, for example: x^2 = x^2, 3.4E+12 = $3.4*10^{12}$, 5.6E-9 = $5.6*10^{-9}$.

I. Initial quantization of Solar planet orbits into a {N,n//6} QM structure.

Let me first explain what is {N,n//6}. {N,n} is a two digits number with n as ones and N as tens. {N,n//6} means n is a base-5 number for a given N, e.g, at N=0, n=1, 2, ,3 ,4, 5. When n=6, it equals to N=1, n=1. But between different N, n is a kind of base-6 number. So I defines this as a base-5*6^ number. Or "n//6" in {N,n//6} means n is base-5*6^ number. Here are some examples: if I define n=1 is {0,1}, then n=5 is {0,5}, n=6 is {0,6//6}={1,1//6}, or {1,1//6}'s n = n*6^N =1*6^1 =6, n=7 is {0,7}, {1,2//6}'s n = n*6^N =2*6^1 =12, {1,3//6}'s n =n*6^N =3*6^1 =18, {1,6//6}'s n =n*6^N =6*6^1 =36, or {1,6//6}={2,1//6}'s n =n*6^N =1*6^2 =36, {2,3//6}'s n =3*6^2 =108, etc. In other word, {N,n//6} is composed of {N-1,n=2..6}, {N,n=2..6}, {N+1,n=2..6}, each ΔN=1 has Δn=5.

Because Solar system is always a {N,n//6} QM structure, for simplicity, I usually write it as {N,n} only. For more explanation on {N,n} QM structure's nomenclature, please see section VII-a of this paper.

From Sep. 2015 to Aug. 2016, after countless matching and thinking of using $r_n = r_1 * n^2$, and $E_n = E_1 / n^2$ relationships for all planets in Solar system, and after many times reading of many QM text books, I gradually gained more understanding of the physical meaning of Schrodinger equation, its solution, the general QM equation E=hf, Planck constant *h*, space formation/transformation/orthogonality, uncertainty principle, rotation diffusion, etc. With the help of these new understandings (which I will explain them in next several papers), I was able to quantize the Solar system (in Aug. 2016) in the following way as shown in Table 2.

Table 2. Solar QM {N,n} system which has been optimized for Sun's core as r_1 (i.e., total n=1) and Sun's surface as n=2.

NASA's data of planets			Using NASA data to calc N & n			using {N,n} to generate N & n, then calc orbit-r				
	mass	planets' $r_{n\text{-orbit}}$	total n (at N=0) $=\text{sqrt}(r_n/r_1)$	N=1, $n=\text{sqrt}(r_n/r_1)$	N=2, $n=\text{sqrt}(r_n/r_1)$	N	n	period factor	total n from Sun core	calc. $r_{n\text{-orbit}}= n^2\, r_{1\text{-orbit}}$
unit	kg	m								m
		(or Sun's r)								
r1=			1.74E+08	6.26E+09	1.78E+11					1.74E+08
Sun core		1.74E+08	1.0			0	1	6	1	1.74E+08
SUN	1.99E+30	6.96E+08	2.0			0	2	6	2	6.96E+08
Mercury	3.30E+23	5.79E+10	18.2	3.04		1	3	6	18	5.64E+10
Venus	4.87E+24	1.08E+11	24.9	4.15		1	4	6	24	1.00E+11
Earth	5.97E+24	1.49E+11	29.3	4.88		1	5	6	30	1.57E+11
Mars	6.42E+23	2.28E+11	36.2	6.03	1.1	1	6	6	36	2.25E+11
Jupiter	1.90E+27	7.78E+11	66.9		2.1	2	2	5.33	64.0	7.12E+11
Saturn	5.68E+26	1.43E+12	90.6		2.8	2	3	5.33	95.9	1.60E+12
Uranus	8.68E+25	2.97E+12	130.8		4.1	2	4	5.33	127.9	2.85E+12
Neptune	1.02E+26	4.51E+12	161.0		5.0	2	5	5.33	159.9	4.45E+12
Pluto	1.46E+22	5.91E+12	184.4		5.8	2	6	5.33	191.9	6.40E+12

Now let me explain the (top-view) result in Table 2. Columns 1-3 are NASA's raw data (obtained from NASA's Planetary Fact Sheet at: http://nssdc.gsfc.nasa.gov/planetary/factsheet/). Sun's data is from https://en.wikipedia.org/wiki/Sun. Columns 7-11 are {N,n} QM model calculated result. What we want is to have the model calculated planet orbit r(s) (in column 11) matches the NASA's raw data (in column 3). Figure 1 showed that the two sets of r_n correlate with each other very well, with linear fitting line slop 0.9858 (very close to 1), and R^2 =0.9977. This clearly tells us that the Solar system completely follows {N,n} QM structure!

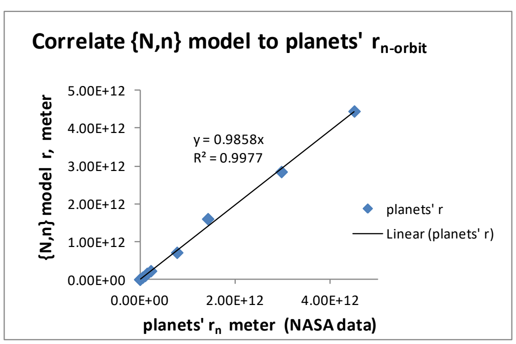


Figure 1. Correlation of {N,n} model's r_n to NASA's data with linear fitting (using Microsoft Excel's fitting function).

Before explaining the {N,n} QM model, let me first explain some new concepts of quantum number n for Solar system's QM. After many tries (not only for n number, but mostly on how to define a new QM unit which is equivalent to the Planck constant h, which I will explain in detail in paper SunQM-2), I realized that

1) a QM system should be able to be described by a series of small quantum number n=1, 2, 3, 4, … etc., If the system can only be described by a series of quantum number at n= hundreds, or even E+6, E+20, then the property of the system is either

not QM at all, or you are not in the right space for quantizing this property. This rule is not only valid for a central force field QM system (like the nuclear electrostatic central force field which QM originally developed for, or like the G-force field I am working on right now), but should also be valid for a non-central force field QM system. Note: these small integer n(s) are the base-frequency n (see my paper SunQM-2 for detailed explanation).

2) For a macro-world system like the solar system, the quantum numbers do not have to be a precise integer. A complete set of close to integer numbers is a valid QM description. Here a complete set of n ≈1, 2, 3, 4, … is most important! The small deviation from (base-frequency) n is caused by the modification of high-frequency multiplier n'. Note: for better understanding, see paper SunQM-2 for the new concept of base-frequency n vs. high-frequency multiplier-n' in QM.

3) A complete set of Δn =5 quantized FRACTION numbers is also valid as the quantum orbit number (see table 3)! Note: for detailed explanation see the interior {N,n} QM in my paper SunQM-2.

An over simplified version of how I discovered Solar QM {N,n} system is as follows: After played around planets' orbit quantum number many times, I found that the smallest close to integer number for four rocky planets, Mercury, Venus, Earth, Mars, were 3, 4, 5, 6. The next four ice-planets break the continuity of n number serial. I found that another set of smallest close to integer numbers for Jupiter, Saturn, Uranus, Neptune, and Pluto/Kuiper belt were 2, 3, 4, 5, 6, with Mars orbit QM number set to =1! From this I realized that the rocky-planets and the icy-planets belongs to two different QM periods, and this led me to propose the QM period number N (besides the orbit quantum number n), where rocky-planets have period number N, and icy-planets have period number N+1. It also led me to guess that within each period, the orbit quantum number n is a base-5*6^ system, where in N period, n=1, 2, 3, 4. 5, 6, and n=6 of N is equal to n=1 of N+1. So I named it as {N,n//6} QM system.

Then, I expanded the possible {N,n//6} QM system from rocky planets inward to Sun, and found to make the whole {N,n} system work, Sun's surface radius had to be r(n=2), and according to $r_n = r_1 * n^2$, there had to be a r(n=1) stable ball structure within Sun, and its r = 1/4 of Sun surface's radius. Checking Wikipedia for "Sun", there is a known solar core with 20% ~ 25% of solar radius, which fitted to my {N,n} model at n=1 perfectly! All this suddenly made sense after I gradually understood RF concept and developed the RF theory (between 2015 and 2016, see paper SunQM-2s1 for details).

Now let me explain the result in Table 2 in detail. The period number N is an arbitrary number, (after several times of optimizing) here I define N=0 at Sun surface for simplicity. So Sun core's edge is defined as {0,1}, Sun surface is defined as {0,2}. As shown in Table 2, the {N,n} for each planet is: Mercury {1,3}, Venus {1,4}, Earth {1,5}, Mars {1,6} = {2,1}. Jupiter {2,2}, Saturn {2,3}, Uranus {2,4}, Neptune {2,5}, and Pluto/Kuiper belt {2,6} = {3,1}.

A "total n" number is the total orbit n number which will be used in formula $r_n = r_1 * n^2$ to calculate r_n from r_1. (Note: the physics meaning of "total n" is the total effective n, which is the n related to the current QM effective r_1 {0,1}RF ball, and directly obey the relationship of $r_n = r_1 * n^2$). After you define which {N,1} to be r_1 , the rest orbits' total n can be calculated as (in general) total n = n * (period factor)^N.

The "period factor" is a factor to reflect whether the space of this period is squeezed in r-dimension or not. A regular "un-squeezed" period factor is =6 due to the base-5*6^ number system of Solar {N,n} QM. For a whole single period ΔN=1 and Δn=5, the r-dimension space from the most inner (r_1) to the most outer (r_6) fitted to formula $r_6 = 6\text{^}2 * r_1 = 36 * r_1$ naturally. But for period N=2, the r-dimension space from the most inner r_1 to the most outer r_6 (the whole super-shell space of ΔN=1) fits to formula $r_6 \approx 5.33\text{^}2 * r_1$ naturally. This means for 5 orbits in N=2 period, which was expected to occupy a Δ'n=6^ r-dimensional space, now squeezed into a Δ'n=5.33^ r-dimensional space! The history of why and how this happened will be explained in one of the supplementary papers (SunQM-1s1). To squeeze orbits of Jupiter, Saturn, Uranus, Neptune, and Pluto/Kuiper belt into a Δ'n=5.33^ r-dimensional space, a factor, named "period factor", is introduced (and originally calculated as sqrt(256/9) = 5.33). So the rule to calculate total n from {N,n} is: 1) for N< 2, total n= n*6^N, 2) for N≥ 2, total n= n*6^(N-1)*5.33 (start from {2,2} and up).

According to the total n calculation formula, some examples of how to calculate total n from {N,n} are given in below (some calculations are used in Table 2 and Table 3):

{0,6}, total n= 6*6^(0) =6

{1,6), total n= 6*6^1=36

{2,1}, total n= 1*6^2=36

{2,2}, total n= 2*6^(2-1)*5.33≈63.96

{2,6}, total n= 6*6^(2-1)*5.33≈191.88
{3,1}, total n= 1*6^(3-1)*5.33≈191.88
{3,2}, total n= 2*6^(3-1)*5.33≈383.76
{4,5}, total n= 5*6^(4-1)*5.33≈5756
{-1,1}, total n= 1*6^(-1) =1/6
{-3,1}, total n= 1*6^(-3) =1/216

So the total n is a quantum number relative to where you define n=1 orbit. If total n>1, it means orbit is located at outer space of r_1. If total n is not a strict integer, it means that somewhere there is r-dimension squeezing (or expansion). If total n<1, it must be a quantized fraction number, and it means orbit is located at inner space of r_1. Again, if total (fractional) n is not a strictly factor of 6, it means somewhere there is r-dimension squeezing (or expansion) inside r_1. So from {N,n} we can calculate total n, then using formula $r_n = r_1 *n^2$, with known total n, we can calculate r_n (if r_1 is known), or calculate r_1 (if r_n is known).

Now let me explain the true meaning of Table 2. Suppose we do not know anything about Solar system, what we only know is that there is a massive star with r_1= 1.74E+8 meters, and it follows {N,n//6} QM structure. Using formula $r_n=r_1 *n^2$, I am able to predict out the orbit r for quantum numbers {N=0,n=3..6} and {N=1,n=2..6} (columns 7 through 11 in Table 2), and amazingly they fit to all Solar system planets' and belts' r(s) (in column 3) extremely well.

II. Expanding the {N,n//6} QM structure outward and inward for Solar system

In Table 3, I expanded the {N,n//6} QM model both outward to Oort cloud, and inward into the Sun core. The result was also astonishing. Now let us try to correlate {N,n} QM orbits to the known Solar system objects outside (and inside) the Sun. (Note: see section VII-12 that the QM {N,n=2..6} size structure has QM orbits of {N,n=1..5}o).

Table 3. Expand QM {N,n//6} model outward to Oort cloud and inward to black hole.

NASA's data of planets			assigned N, n, period factor			Sun core total n=1, using {N,n} to calc total n & r			black hole total n=1, using {N,n} to calc total n & r		
	mass	Sun's radius or planets' $r_{n\text{-orbit}}$	N	n	period factor	total n from Sun core	calc. $r_{n\text{-orbit}}= n^2 r_{1\text{-orbit}}$	calc. $r_{n\text{-orbit}}= n^2 r_{1\text{-orbit}}$	total n from black hole	calc. $r_{n\text{-orbit}}= n^2 r_{1\text{-orbit}}$	calc. $r_{n\text{-orbit}}= n^2 r_{1\text{-orbit}}$
unit	kg	m					m	AU		m	AU
{-5,1}			-5	1	6	1*6^(-5)	2.88E+00		1*6^(-2)	2.88E+00	
			-5	2	6	2*6^(-5)	1.15E+01		2*6^(-2)	1.15E+01	
			-5	3	6	3*6^(-5)	2.59E+01		3*6^(-2)	2.59E+01	
			-5	4	6	4*6^(-5)	4.60E+01		4*6^(-2)	4.60E+01	
			-5	5	6	5*6^(-5)	7.19E+01		5*6^(-2)	7.19E+01	
{-4,1}			-5	6	6	6*6^(-5)	1.04E+02		6*6^(-2)	1.04E+02	
			-4	2	6	2*6^(-4)	4.14E+02		2*6^(-1)	4.14E+02	
			-4	3	6	3*6^(-4)	9.32E+02		3*6^(-1)	9.32E+02	
			-4	4	6	4*6^(-4)	1.66E+03		4*6^(-1)	1.66E+03	
			-4	5	6	5*6^(-4)	2.59E+03		5*6^(-1)	2.59E+03	
black hole {-3,1}			-4	6	6	6*6^(-4)	3.73E+03		1	3.73E+03	
neutron star {-3,2}			-3	2	6	2*6^(-3)	1.49E+04		2	1.49E+04	
			-3	3	6	3*6^(-3)	3.36E+04		3	3.36E+04	
			-3	4	6	4*6^(-3)	5.96E+04		4	5.96E+04	
			-3	5	6	5*6^(-3)	9.32E+04		5	9.32E+04	
{-2,1}			-3	6	6	6*6^(-3)	1.34E+05		6	1.34E+05	
			-2	2	6	2*6^(-2)	5.37E+05		12	5.37E+05	
			-2	3	6	3*6^(-2)	1.21E+06		18	1.21E+06	
			-2	4	6	4*6^(-2)	2.15E+06		24	2.15E+06	
			-2	5	6	5*6^(-2)	3.36E+06		30	3.36E+06	
White Dwarf {-1,1}			-2	6	6	6*6^(-2)	4.83E+06		36	4.83E+06	
			-1	2	6	2*6^(-1)	1.93E+07		72	1.93E+07	
			-1	3	6	3*6^(-1)	4.35E+07		108	4.35E+07	
			-1	4	6	4*6^(-1)	7.73E+07		144	7.73E+07	
			-1	5	6	5*6^(-1)	1.21E+08		180	1.21E+08	
Sun core		1.74E+08	0	1	6	1	1.74E+08		216	1.74E+08	
SUN	1.99E+30	6.96E+08	0	2	6	2	6.96E+08		432	6.96E+08	
{0,3} corona			0	3	6	3	1.57E+09		648	1.57E+09	
{0,4} corona			0	4	6	4	2.78E+09		864	2.78E+09	
{0,5} corona			0	5	6	5	4.35E+09		1080	4.35E+09	
{0,6} corona end, heliosphere start			0	6	6	6	6.26E+09	0.04	1296	6.26E+09	
{1,2}			1	2	6	12	2.50E+10	0.17	2592	2.50E+10	
Mercury	3.3E+23	5.79E+10	1	3	6	18	5.64E+10	0.38	3888	5.64E+10	
Venus	4.87E+24	1.08E+11	1	4	6	24	1.00E+11	0.67	5184	1.00E+11	
Earth	5.97E+24	1.49E+11	1	5	6	30	1.57E+11	1.05E+00	6480	1.57E+11	1.05E+00
Mars	6.42E+23	2.28E+11	1	6	6	36	2.25E+11	1.51E+00	7776	2.25E+11	1.51E+00
Jupiter	1.9E+27	7.78E+11	2	2	5.33	64.0	7.12E+11	4.78E+00	13815.36	7.12E+11	4.78E+00
Saturn	5.68E+26	1.43E+12	2	3	5.33	95.9	1.60E+12	1.07E+01	20723.04	1.60E+12	1.07E+01
Uranus	8.68E+25	2.97E+12	2	4	5.33	127.9	2.85E+12	1.91E+01	27630.72	2.85E+12	1.91E+01
Neptune	1.02E+26	4.51E+12	2	5	5.33	159.9	4.45E+12	2.98E+01	34538.4	4.45E+12	2.98E+01
Pluto	1.46E+22	5.91E+12	2	6	5.33	191.9	6.40E+12	4.30E+01	41446.08	6.40E+12	4.30E+01
{3,2}			3	2	6	383.8	2.56E+13	1.72E+02	82892.16	2.56E+13	1.72E+02
{3,3}			3	3	6	575.6	5.76E+13	3.87E+02	124338.24	5.76E+13	3.87E+02
{3,4}			3	4	6	767.5	1.02E+14	6.88E+02	165784.32	1.02E+14	6.88E+02
{3,5}			3	5	6	959.4	1.60E+14	1.07E+03	207230.4	1.60E+14	1.07E+03
Inner Oort, start 2000AU			3	6	6	1151.3	2.31E+14	1.55E+03	248676.48	2.31E+14	1.55E+03
Inner Oort			4	2	6	2302.6	9.22E+14	6.19E+03	497352.96	9.22E+14	6.19E+03
Inner Oort, end 20000AU			4	3	6	3453.8	2.07E+15	1.39E+04	746029.44	2.07E+15	1.39E+04
outer Oort, start 20000AU			4	4	6	4605.1	3.69E+15	2.48E+04	994705.92	3.69E+15	2.48E+04
outer Oort			4	5	6	5756.4	5.76E+15	3.87E+04	1243382.4	5.76E+15	3.87E+04
outer Oort,end 50000AU			4	6	6	6907.7	8.30E+15	5.57E+04	1492058.9	8.30E+15	5.57E+04
{5,2} Alpha Centauri			5	2	6	13815.4	3.32E+16	2.23E+05	2984117.8	3.32E+16	2.23E+05
{5,3}			5	3	6	20723.0	7.47E+16	5.01E+05	4476176.6	7.47E+16	5.01E+05
{5,4}			5	4	6	27630.7	1.33E+17	8.91E+05	5968235.5	1.33E+17	8.91E+05
{5,5}			5	5	6	34538.4	2.07E+17	1.39E+06	7460294.4	2.07E+17	1.39E+06
{5,6}			5	6	6	41446.1	2.99E+17	2.01E+06	8952353.3	2.99E+17	2.01E+06

II-a. Correlate {N,n} QM orbits to the known Solar system objects outside the Sun:

From "*Lecture 4 The Sun's Atmosphere, Astronomy 162: Professor Barbara Ryden*", http://www.astronomy.ohio-state.edu/~ryden/ast162_1/notes4.html. "*The corona stretches away for several million kilometers from the chromosphere,* *but it's so faint it can only be seen, like the chromosphere, during total solar eclipses"*. Since {0,6} has extended distance from Sun surface of (6.26E+9 - 6.96E+8)= 5.56E+9 m, accordingly I assign Sun's corona in orbits of {0,n=2..5}o.

From wiki "Sun", "*The heliosphere, the tenuous outermost atmosphere of the Sun, is filled with the solar wind plasma", "The termination shock is the point in the heliosphere where the solar wind slows down to subsonic speed (relative to the Sun) because of interactions with the local interstellar medium. …the termination shock is believed to be 75 to 90 astronomical units from the Sun"*. Since {3,1} has extended distance from Sun by ~43 AU, accordingly I assign Sun's heliosphere in this orbit.

From wiki "Oort cloud", "*Oort cloud is a theoretical cloud of predominantly icy planetesimals believed to surround the Sun. The region can be subdivided into a spherical outer Oort cloud of 20,000–50,000 AU, and a torus-shaped inner Oort cloud of 2,000–20,000 AU"*. Accordingly, I assign {4,1}o, {4,2}o, {4,3}o orbit spaces as inner Oort cloud, and {4,4}o, {4,5}o orbit spaces (up to {4,6}) as outer Oort cloud.

Alpha Centauri is the closest star system to the Solar System at a distance of 4.37 light-years (4.1E+16 m, or 2.77E+5 AU), a distance similar to radius of Solar QM {5,2}'s orbit. However, according to wiki "Alpha Centauri", our closest star Alpha Centauri does not orbit our Sun, it (or they, three of them) happened to just pass-by Sun, or our Sun just passing-by them.

II-b. Correlate {N,n} QM orbits to the known Sun-mass related objects inside the Sun

According to wiki "Black hole", "*The size of a black hole is roughly proportional to the mass M through Schwarzschild radius = 2.95 *M / Sun-mass"*, so a Sun-massed black hole has r = 2.95E+3 m. By purely using Solar QM {N,n} model, we find that at ΔN= -3 below Sun core {0,1}, there is a stable {-3,1}RF QM structure with r= 3.73E+3 m, and this is very close the Sun-mass black hole size 2.95E+3 m. Therefore, {-3,1} is assigned as the (theoretically calculated) black hole of Sun. (Note: in paper SunQM-1s1, it is shown that the Sun-massed black hole has two r(s), the heated-r =3.7E+3 m, and the gravity-r = 2.95E+3 m.)

According to wiki "White Dwarf", "*Sun's white dwarf r is between 0.008 and 0.01 of current Sun's r, which is between 5.6E+6 and 7E+6 meters"*. By purely using Solar QM {N,n} model, we find that at ΔN= -1 below Sun core {0,1}, there is a stable {-1,1}RF QM structure with r= 4.83E+6 m, and this is very close the Sun-mass white dwarf size 5.6E+6 ~ 7E+6 m. Therefore, {-1,1} is assigned as the (theoretically calculated) white dwarf of Sun.

According to wiki "Neutron star", "*a 1.5x of Sun-mass's neutron star could have r from 10.7 to 15.1 km"*. In Solar QM {N,n} model, we find that the {-3,2} state has r =14.9km. Therefore, {-3,2} is assigned as the (theoretically calculated) neutron star of Sun.

In {N,n} QM model, each integer n is a stable QM structure or orbit, e.g., {0,2} is a stable QM structure (of Sun surface), {1,5} is a stable orbit (of Earth). Each {N,1} QM structure is a super-stable QM structure because n=1 is the ground state of each N period, e.g., {0,1} is a super stable QM structure (of Sun core). I often write a {N,1} structure as {N,1}RF. The origination and development of RF concept will be explained in detail in papers SunQM-2 and SunQM-2s1.

Table 3 shows N from 0 to 5, a complete round of base-5*6^ numbers up from 0. It also presented N from 0 to -5, another complete round of base-5*6^ numbers down from 0. The base-5*6^ of n in {N,n} system may imply a base-5*6^ of N in a higher level QM structure, which means, at every ΔN=5, there should be a super-super stable QM structure. Assuming the current Sun core {0,1} is at a super-super stable QM state (which it should be because it formed 4.6E+9 years ago and will last another ~5E9 years), a previous super-super stable QM structure should be at {5,1} according to {N,n} model. This is exactly the out edge of Oort cloud. Then according to the same {N,n} model, the next super-super stable QM structure should be at {-5,1}, ΔN= -2 lower, or about 1000x smaller, than Sun's theoretical black hole {-3,1}. The finding of super fast spinning (close to light speed) black hole may support the idea of existence of {-5,1} super-super stable state (details will be discussed in a supplementary paper).

In this way, I have established a Solar QM {N,n} system! This model not only tells us what QM states our current Solar system is, but also tells us the history of Solar system, step-by-step, how it had evolved from the pre-Sun nebula to today's Solar system (see my paper SunQM-1s1). And it even tells us what the future of Sun will be!

II-c. New concept: {N,1} is the ground state of {N,n=1..5}o

Sun's {N,n} QM is actually a spherical shell based QM structure. We will see that there are three different levels of shells in Sun's {N,n} QM structure, N-level shell, n-level shell, and *l*-level shell. Here I call N-level shell as "super-shell", n-level shell as "shell", and *l*-level shell as "sub-shell". Each N super-shell contains 5 of n (orbital) shells, with orbit n=1..5. So n=1 is the ground state of {N,n=1..5}o (or the equivalent {N,n=2..6}) super-shell QM structure, and n=2 is the first excited state of {N,n=1..5}o super-shell QM structure. In paper SunQM-3, we will see that each n shell contains a set of *l* sub-shells, with *l*=0, 1, 2, … n-1.

The Sun core's {0,1} is not the only one that can be used as n=1 for the total n. Actually any {N,1} can be used as n=1 for total n. In Table 3, I showed one example that using black hole {-3,1} as the n=1 state for the total n calculation. When using {-3,1} as total n=1, Sun core {0,1} 's total n= 6^3=216. So the new r_1 of (black hole) = r (of sun core) /216^2 = 173925000/216^2 = 3727.8 meters. However, for convenience, I decided to use Sun core {0,1} as n=1 to be the standard, named "Sun{0,1}". So in all my papers, any {N,n} without specification is always under Sun{0,1}. In the (rare) situations where Sun{0,1} is not used, I will specify what {N,1} is used as total n=1.

II-d. New concept: the (new) interior {N,n} QM vs. the (traditional) exterior {N,n} QM

The traditional QM exerts its effect on the space outside of its physical body, as we learned from the micro-world QM where proton exerts its QM effect on electron (outside of the proton body). This part of QM is now named as "exterior {N,n} QM effect", and its quantum number is positive integer number, n ≥ 1. For Solar QM {N,n} system, it is like {0,1}, {0,2}, or {1,5}, …etc.

In study Solar QM {N,n} system, I realized that Sun's gravitation not only exert the exterior QM effect on the planets, but also exert QM effect inside of its own body ! Here I named this part of QM as "interior {N,n} QM effect", and its quantum number is a fraction of positive integer number, like 1/6, 2/6, or even 3/6^3, …etc. For Solar QM {N,n} system, it is like {0,1/6}={-1,1}, {0,2/6}={-1,2}, or {0,4/6^3}={-3,4}, …etc. This is a completely new concept. More detailed study will be presented in the series papers such as SunQM-2, SunQM-5, SunQM-1s1, and SunQM-3s3, etc.

For exterior {N,n} QM, the minimum n (of shell, orbit, ball size, structure, state …etc) is 1, and there is no limitation for the maximum n. The mass occupancy for (Solar system's) exterior {N,n} is generally < 1% of the available (orbital) space, so only the lowest energy state |nLL> is occupied by mass (where L=n-1, m=L, see paper SunQM-3s2 for "nLL effect"). So it turns out to be a disk (or a series of rings) shape.

For interior {N,n} QM, the maximum n (of shell, orbit, ball size, structure, state, …etc) is 1, and there is no limitation for the minimum n. The mass occupancy for (Solar system's) interior {N,n} is generally ≈ 100% of the available (orbital) space (also see paper SunQM-3s2 for details). So all |nlm> states are occupied by mass, and it turns out to be a (solid-like, or fully occupied) ball shape.

III. Solar system QM {N,n} structure periodic table

The Solar QM {N,n} structure in Table 3 can also be presented as a table form as shown in Table 4. Since this table shows the periodic properties of Solar QM {N,n} structure, which has some similarity to the periodic table of the chemical elements, it is reasonable to name this table as "Solar QM {N,n} structure Periodic Table". If the Solar QM {N,n} model turns out to be correct and accepted by other physicists, then I suggest to name the Chinese name of this model as "量子复旦模型" to honor Fudan University where I learned QM in 1981.

Table 4. Solar QM {N,n//6} structure Periodic Table.

		n= "n state" or "n shell"											
	{N,n//6}	**1**	**2**	**3**	**4**	**5**	**6**	7	8	9	10	11	12 = {N+1 ,2//6}
N=	-5	#####	#####	#####	#####	#####	####						
"N period" or "N super-	-4	####	####	####	####	black hole orbit	black hole surface						
	-3	neutron star orbit	neutron star surface	###	###	###	##						
	-2	##	##	##	##	white dwarf orbit	white dwarf surface						
	-1	dwarf ground state	#	#	#	#	Sun core surface						
	0	**Sun {0,1}o orbit**	**Sun surface**	*	*	*	*						
	1	*	*	**Mercury**	**Venus**	**Earth**	Mars	**	Ceres_ Asteroid belt	**	**	Jupiter$^+$	Jupiter$^+$
	2	**Mars/Asteroid belt**	**Jupiter**	**Saturn**	**Uranus**	**Neptune**	Pluto_ Kuiper belt	*** SDO	*** SDO/Eris	***	***	***	****
	3	**Pluto_ Kuiper belt**	****	****	****	****	inner Oort						
	4	**inner Oort**	**inner Oort**	**inner Oort**	**outer Oort**	**outer Oort**	Oort edge						
	5	*****	*****	*****	*****	*****	*****						

In Table 4, due to the rule of "all mass between r_n and r_{n+1} belong to orbit n (see paper SunQM-3s2)", Sun-mass black hole has size of {-3,1}, its mass' out most orbit is {-4,5}o. Neutron star has size of {-3,2}, its mass' out most orbit is {-3,1}o. White dwarf has size of {-1,1}, its mass' out most orbit is {-2,5}o. Sun has size of {0,2}, its mass' out most orbit is {0,1}o. Oort cloud has size of {5,1}, its mass 's out most orbit is {4,5}o.

In Table 4, {N,n=1..5}o are strong orbits, {N,n=7..11}o are weak orbits (see paper SunQM-1s1 section VII & VIII for details of weak orbit). In Table 4, in orbits n=1..5, gray colored cells have ~100% (or close to 100%) mass occupancy, so its mass fills all orbit space between r_n and r_{n+1}. Clear cells have <1% mass occupancy, so its mass stay only at r_n ! However, in N=4 super-shell, the relatively strong interstellar wind partially destroyed the weak (G-forced) nLL QM effect (see SunQM-3s2) so that the outer Oort cloud's n=4, 5 shells not only merged but also un-disk-lysed.

According to the result in paper SunQM-3s2, in {N,n//6} QM system, for each N super-shell, n=1..5 are real orbits,
1) For ~100% mass occupancy QM structure, n=6 is only the out boundary of n=5 orbit. So for each N super-shell, mass can fill in any one of n=1 to n=5 orbit shell, but it does not fill n=6 orbit shell (like Sun core). If it has to do so, the mass will fill n=1 shell of N+1 super shell instead (like Sun surface), because {N,6//6} = {N+1,1//6}.
2) For <1% mass occupancy QM structure, n=6 (even n=7, 8, … 11) is the available weak orbit (like Mars' orbit {1,6}o).

The signs in Table 4 are:
* Empty orbit, occupied by Sun corona matter.
** Empty orbit, part of the {1,6 } 's matter tails out to {1,n=7..10}, see paper SunQM-1s1 section VII for details.
*** SDO, scattered disc contains objects, part of Trans-Neptunian object (TNO), part of the Kuiper belt {2,6} which tails out to {2,n=7..11}, see wiki "Scattered disc".
**** Undiscovered {3,n=2..5} planet/belt (see SunQM-1s1 for estimated mass).
***** (Interstellar) fragment/dust/gas beyond the Oort cloud, not permanently (but temperately) bound to Solar system, or with its moving trajectory significantly affected by Solar QM.
# Excited states {N=-1, n=2..5}o of Sun white dwarf {-1,1}. The ground state {-1,1}o is made of the shrinked atoms (see SunQM-5 for details).
Excited states of {-2,1}. The ground state {-2,1} is made of the double-shrinked atoms (see SunQM-5 for details).

Excited states of Sun-mass black hole. Neutron star {-3,2} is the n=2 excited state of black hole. {-3,2} is made of the triple-shrinked atoms (see SunQM-5 for details).
Excited states of sub black hole structure {-4,1}. {-4,1} is made of the 5th-shrinked atoms (see SunQM-5 for details).
Excited states of a super-super stable state of black hole {-5,1}. It is made of the 6th-shrinked atoms (see SunQM-5 for details).
+ Usually {N+1,2//6}={N,12//6}, so Jupiter's {2,2}={1,12}. But due to the {N,n,Hot-G} to {N,n,Cold-G} transition, {1,12} is merged with {1,11}, so Jupiter now has {2,2}={1,12}={1,11}. (see SunQM-1s1 for details).

In a more completed Solar QM {N,n} periodic table, each cell can be designed as: middle center of the cell: name of this QM structure in this orbit, e.x., Earth; top left corner of the cell: total n using Sun core's total n=1; top right of the cell: r_n of this orbit in meter; bottom left corner: total mass in this orbit, e.x., mass of Earth; bottom right corner: orbit Δθ' range (see Fig 2 for details).

We can add the third digit to the left of {N,n} system, it become {K,N,n}, or {K,N//6, n//6} with the hypothesis that both N and n are base-5*6^ number. for simplicity, let us define {N,n}≡{0,N,n}, and define {0,0,1} has total n=1, so {0,1} = {0,0,1}, {2,5}={0,2,5}, {5,1}={1,0,1}, {-5,1}={-1,0,1}, … etc. Although under most situations, we still use {N,n} (rather than {K,N,n}) for convenience. For more discussion on {K,N,n}, see paper SunQM-5.

IV. Solar system QM {N,n} structure periodic plot

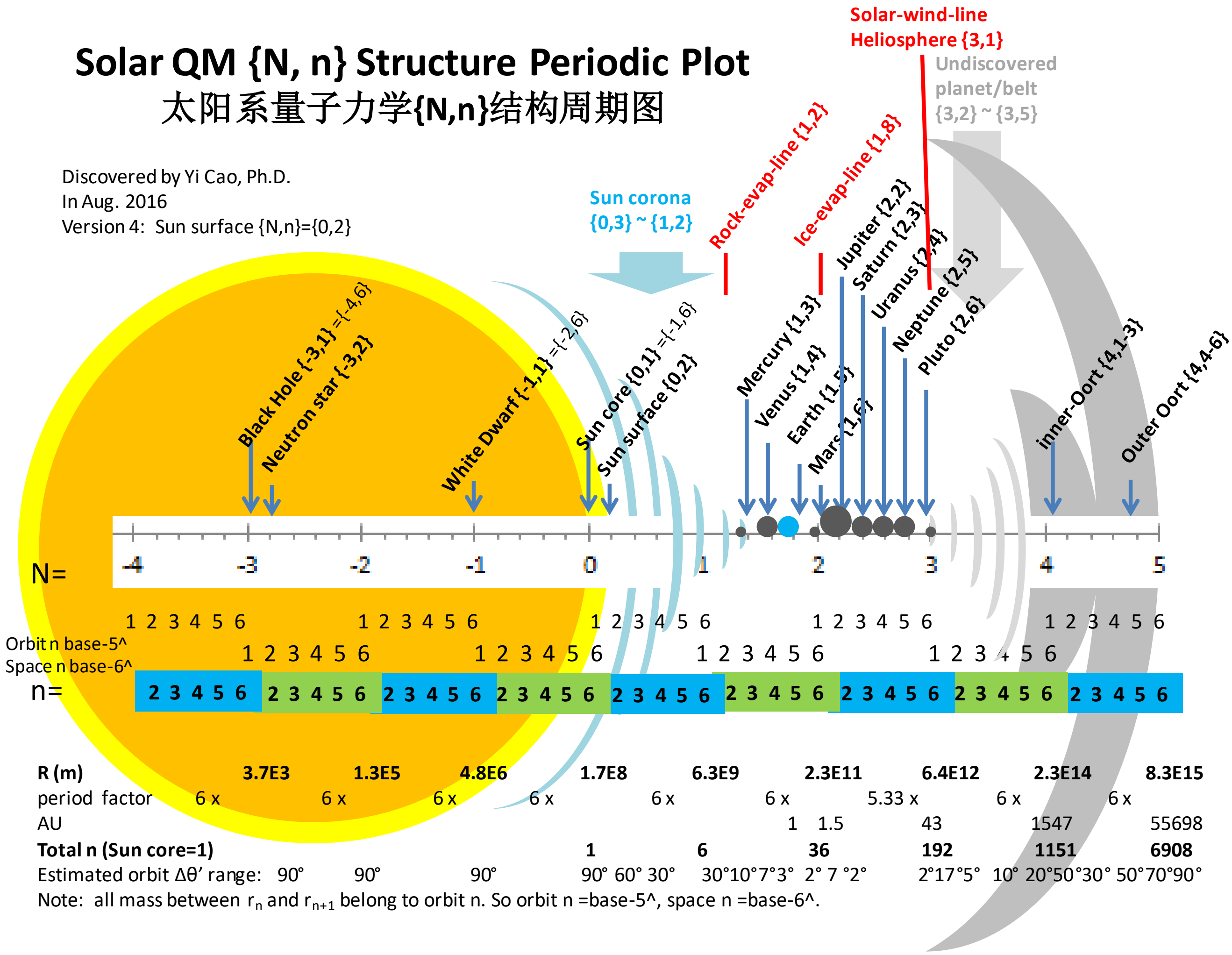
The information in the Solar quantum {N,n} structure Periodic Table (Table 4) can be depicted in a plot (named Solar QM {N,n} structure periodic plot) as see in Figure 2. All data in this figure has been explained in Tables 2, 3 and 4, except the last line: the estimated orbit Δθ' range (represented by Crescent-shaped shade in the figure). Let me use θ' to represent latitude degree of Solar system, and Δθ' represent its variation range. It shows what is the range (for a whole set of RF (or partially RF) orbits in a specific {N,n} spherical shell space) deviated from the Sun's equator plan. For Δθ'=0, all objects in this particular {N,n} orbit are in Sun's equator plan. For example, Jupiter is almost the only object in {2,2} orbit, its orbit inclination =1.3 , so its Δθ' ≈0. For Δθ'=90°, if all orbits are added together they will form a sphere. One example was the outer Oort cloud, its Δθ'=90° and formed spherical cloud.

From NASA published data, all orbits of major planets (from {1,4} to {2,5}) inclination <=3° , so the Δθ' is estimated to be < 3° for this range in Figure 2. From Sun's surface and inward, or {N,n} ≤ {0,2}, the Δθ' should =90°. So between {0,2} to {1,3}, Δθ' decreases from =90° to around 7°, estimated based on {1,3} Mercury's orbit inclination =7°. According to wiki "Oort cloud", the inner Oort has a torus shape, the outer Oort has a spherical shape. So from {4,4} and outward, Δθ' should =90°. From {4,4} inward to {3,1}, Δθ' decreases from =90° to around 5° based on the Pluto's orbit inclination = 17°.

In each {N,1} shell, it has n=1 QM effect (or RF effect). The n=1 QM ground state has |nlm> = |100> = R(1,0)*Y(0,0), and Y(0,0) causes Δθ' range increases to high (see paper SunQM-3). Remember {N,1} = {N-1,6//6} ? So at the outer most surface of each N super-shell, it has an n=1 QM effect! This n=1 QM effect causes the formation of Asteroid belt at {1,8} near {2,1}, and Kuiper belt at {3,1}={2,6}. In the Solar {N,n} structure periodic plot, I included this n=1 QM effect by increasing Δθ' values in the plot (7°at {2,1} and 17° at {3,1}). These degree values are purely from my guess.

Sun's nuclear fusion in the Sun core {0,1} not only generates radioactive zone, convective zone, photosphere between its core {0,1} and the surface {0,2}, and corona between {0,2} and {1,1}, but also generates a rock evaporation line (currently at around {1,2} orbit), and a ice evaporation line (currently at around {1,8} orbit) within which rock (or ice) is melted and evaporated. The Heliosphere (and solar wind) starts at {1,1}, ends at {3,1}.

Figure 2. A plot of Solar QM {N,n} structure.



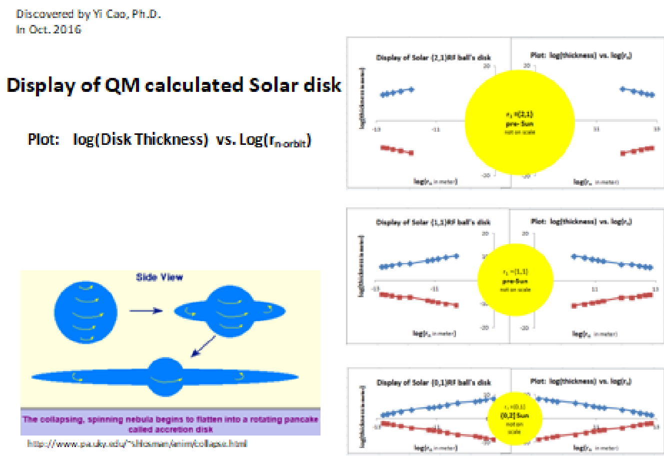
V. Some major discoveries that come out of the Solar {N,n} QM model

Here I listed some major discoveries that come out of the Solar {N,n} QM model in the rest (main & supplementary) papers [9]:

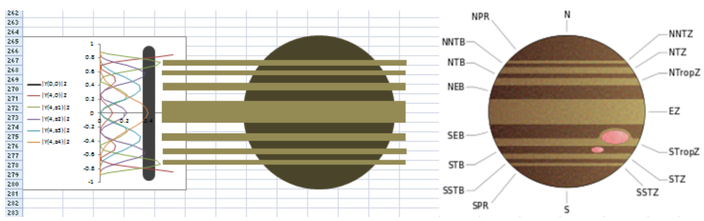
A complete Schrodinger equation and solution for Solar QM {N,n} structure (see SunQM-3).

A 1st-order spin-purterbation calculation for pre-Sun ball's disk-lyzation (see SunQM-3s1).

A (snap-shot) picture of pre-Sun ball disk-lyzation from {5,1} down to {0,1}, directly calculated from the probability density function |R(nl)Y(lm)|^2 (see SunQM-3s2).



A (snap-shot) picture of Jupiter atmosphere band pattern, directly calculate out from using probability density function |R(nl)Y(lm)|^2 (see SunQM-3s3).



A general Planck constant that is suitable for the QM not only for the micro world, but also for the macro world (see SunQM-2).

Some other questions that have been discussed and answered in my rest papers are:
1) Why and how pre-Sun ball collapse quantumly?
2) When the pre-Sun ball start to ignite the H-fusion?
3) Why Jupiter's mass is abnormally large?
4) Why Sun surface's temperature is abnormally low and corona's temperature is abnormally high?

VI. Major predictions

1) There should exist four planets (or belts) at orbit {3,2}, {3,3}, {3,4}, {3,5}.
2) If this model is correct, then the black body at size {-3,1} will further collapse to an even smaller but much stable {-5,1} structure with r = 1/36^2 of Schwarzschild radius (=2.88 m). There are two possible ways to check the existence of {-5,1} structure: a) The angular momentum conservation causes a {-5,1} structure spin much faster than that of {-3,1}. So NGC 1365 may support the existence of {-5,1} (see wiki "NGC 1365", "*the central supermassive black hole of NGC 1365, … is spinning at almost the speed of light*"). b) At r > black body's r={-3,1}, so in shells of {-3,n=2…6}, check the distribution range of orbits' inclination of stars moving around this black hole. If Δθ' range is high, then it is more likely a {-3,1} structure. If Δθ' range is low, then it is more likely a {-4,1} or {-5,1} structure (see paper SunQM-3s2 for details).
3) Some observed pulsars that we have assigned as neutron stars {-3,2} (with r ≈ 1.18E+4 m) may actually are {-2,1} QM structures (with r ≈ 1E+5 m).

VII. {N,n} QM nomenclature for Solar system (and planet-moon system, atom's nucleus-electron system, … etc.)

1) In {N,n} QM system, n is the (general) quantum number, it is the same as the n in |nlm> QM state, or in Schrodinger equation, or in Bohr model's QM. So n is the basic quantum number. In a central G-force (or EM-force) formed {N,n} QM structure, the n orbit defines a (spherical) space starts at r_n and ends at r_{n+1}, where $r_n=r_1 *n^2$. So when I say "n shell", it means the spherical space of n orbit starts at r_n and ends at r_{n+1}. N is the super-shell number (or period number). Several n shells forms one N super-shell, and N super-shells are repeated periodically. For example, in central G-force formed Solar {N,n} QM structure, five of n shells form one super-shell, and Earth (1,5} is at N=1 super-shell, Jupiter {2,2} is at N=2 super-shell.

2) Base-n, meaning the base number of n within each super-shell. For Solar system's {N,n}, base-n =5, and it is a true base-5 number. For Jupiter-moon system, base-n =4, and it is a true base-4 number.

3) Period factor (or pfactor), the factor for converting total n between super-shells. For Solar QM {N,n}, pfactor =6. Due to "all mass between r_n and r_{n+1} belong to orbit n", pfactor = (base-n) + 1.

4) Total n, is the n (usually at higher N period) relative to the r_1 at n=1 (usually at lower N period). Total n= n *(pfactor)^N. For example, Earth {1,5} has total n=5*6^1=30 relative to Sun{0,1}.

5) Base-pfactor-n (=(base-n)*(pfactor)^N), is the true complete number system for the {N,n} QM structure. For a true base-5 number, it has decimal = (base-5) as: 4=(4), 5=(10), 6=(11), 7=(12), …10=(20), 11=(21), etc. The relationship of orbit n (in Solar {N,n}o) with total n is: {0,1}o for total n=1, {0,5}o for total n=5, {0,6}o={1,1}o for total n=6, {1,2}o for total n=2*6^1=12, {1,3}o for total n=3*6^1=18, etc. So within each N super-shell, it is base-5 number, but between each N super-shell, it is kind of base-6^N number. For $r_n=r_1 *n^2$calculation, the space n is a shifted base-6 number (from 2 to 6, not from 1 to 6) within each N super-shell, but between each N super-shell, it is kind of base-6^N number. I do not know is there any existing number system fit to this. At this moment, I temporarily name it as "base-5*6^ number". So in general, this is a base-n*(pfactor)^ number system. For example, Solar system's base-pfactor-n = 5*6^, Jupiter system's base-pfactor-n = 4*5^, Earth system's base-pfactor- n=1*2^. So Earth (or Neptune, or Uranus)'s p{N,n}o is a true base-1 number (see wiki "Unary numeral system", base-1, 1,2,3,4, = 1, 11, 111, 1111).

6) {N,n} can also be written as {N,n//pfactor}. E.g., {1,5//6} means the convert-n is =6, so its total n = 5*6^1=30.

7) base-frequency n, is the n in {N,n} that has the smallest positive integer number. For example, Earth orbit {1,5} has base-frequency n =5.

8) multiplier n', is the high-frequency n' of the base-frequency n. It is calculated as n'=n*(pfactor)^N. For example, Earth orbit {1,5}'s base n=5 has multiplier n'=5*6^1=30, 5*6^2=180, 5*6^3=1080, … etc., for N=1, N=2, N=3, … etc.

9) {N,n,Hot}, or {N,n,Hot-G}, it has the "hot-G r-track" (or heated-r track), calculated by using the current Sun surface radius as {0,2}. Hot-G r-track is ~26% larger than the Cold-G r-track.

10) {N,n,Cold}, or {N,n,Cold-G}, its has the 'Cold-G r-track" (or gravity-r track), calculated by using Sun-mass black hole's r=2.95E+3 m as the reference point. It correlates to the radius of our Sun if there is no H-fusion. Cold-G r-track is ~80% of Hot-G r-track. So in transition from {N,n,Cold} to {N,n.Hot} (or vise versa), the pfactor no longer =6. In Solar {N,n} QM structure (with Sun core as {0,1}), super-shells of N= -1, 0, 1, 3, 4 have the pfactor =6, while the N =2 super-shell has pfactor =5.33 (instead of =6) due to this transition. After Sun died into white dwarf {-1,1} (or {-1,1,Hot}), its Hot-G r-track will (slowly) transit back to Cold-G r-track {-1,1,Cold} after the white dwarf cooled down.

11) {N,n=2..6} means a collection of {N,2}, {N,3}, ... up to {N,6}.

12) A suffix "o" to {N,n} means orbit, e.g, {N,n=1..5}o, means all orbits from n=1 to n=5 in N super-shell. {N,n} without suffix "o" means the space it take, e.g, {N,n=2..6}, means all spherical space from n=2 to n=6 in N super-shell (which correspond to the space of orbit n=1 to n=5). One important (may be over-simplified) rule is: all mass between r_n and r_{n+1} belong to orbit n (see paper SunQM-3s2 section IV). So {N,n}o is (almost) always has Δn= -1 than that of {N,n}. Sun's surface at {0,2}, but its true orbit is {0,1}o. The mass fills all space of orbit {0,1}o makes the mass distribution ends at {0,2} (which we call Sun surface). In the N= -1 super shell of Sun, previously I wrote {-1, n=2..6}, the mass actually fills orbit (with 100% occupancy) of {-1,n=1..5}o, although it has the surface at {-1,6} because the last shell (n=5) mass fills up to n=6. However, for the convenience of orbit calculation, I still use the old writing {-1, n=2..6}. Note: in this series papers, there may have some places that I forgot to change the old version of "{N,n} orbit" into the new version "{{N,n}o".

One exception: for Solar QM {N,n//6} structure, {N,6}={N+1,1}, but {N,6}o ≠ {N+1,1}o, because {N,6}o orbit covers shell space from {N,6} to {N,7}, while {N+1,1}o orbit covers shell space from {N+1,1}={N,6} to {N+1,2}={N,12}.

13) A suffix of "RF" to {N,n} means this is a spherical ball (with close to ~100% mass occupancy), it take space (not orbit) of {N,n}, and in RF mode. E.g., Sun is a {0,2}RF ball, means Sun take space up to {0,2}, and the mass is in RF.

14) A prefix to {N,n} means this {N,n} is for what object (Sun, planet, electron, …etc.)
e.g., p{N,n} means this {N,n} is for a planet (Earth, Jupiter, …, and even moon, instead of Sun).
e1{0,1} means this {0,1} is using electron n=1 shell as {0,1}, instead of using Sun{0,1}.
e6{0,1} means this {0,1} is using electron n=6 shell as {0,1}, instead of using Sun{0,1}.
prot{0,1} means this {0,1} is using proton's radius as {0,1}, instead of using Sun{0,1}.
qk{0,1} means this {0,1} is using quark's radius as {0,1}, instead of using Sun{0,1}.
bs{0,1} means this {0,1} is using (ball-like) body surface radius as {0,1}, instead of using Sun{0,1}.

If no prefix, then {N,n} always means using Sun core as {0,1} (or based on Sun{0,1}). E.g, Earth's orbit is {1,5}o, black hole size is {-3,1}, they are based on Sun{0,1}.

15) Sometimes, a prefix of "i" is used for i{N,n} to specify that it is the interior {N,n}. But most time the internal {N,n} is expressed by using the name of {0,1} as prefix, e.g., e1{0,1} means this {0,1} is using electron n=1 shell as {0,1}, bs{0,1} means this {0,1} is using (ball-like) body surface r as {0,1}, etc.

VIII. General notes for Solar {N,n} QM model

Note: in this series of papers, let us define "rotation" = orbital rotation, and define "spin" = self-spin. So Earth is rotating (not spinning) around Sun, and Sun is spinning (not rotating) around itself.

Note: In this series of paper, all calculations about planet movement in the Solar system are using the simplest model:
1) The N-body problem of Solar system is simplified into a 2-body movement, one Sun, one planet;
2) In calculation, only use planet's mass, do not use the reduced mass;
3) Assuming all planets moving around Sun in perfect circular orbits.
The purpose of this series of papers is to present a top-level view of some new concepts in QM, so a simple model will make the result more straight forward in discussion and easier to understand.

Note: {N,1}RF is a QM structure mass ball with RF character, so all orbit space is fully occupied by mass. On the other hand, {N,n} is a QM structure, it means size (of either a QM structure at that orbit, or just a size in the spherical shell space). {N,n}o means the orbit, or the orbit space.

Note: Microsoft Excel's number format is often used in this series of papers, for example: x^2 = x^2, 3.4E+12 = $3.4*10^{12}$, 5.6E-9 = $5.6*10^{-9}$.

Conclusion

1) Solar system has been quantized in a {N,n//6] QM structure, where n is a base-5*6^ number. Not only all planets and belts in Solar system, but also white dwarf, neutron star, black hole can be described by this {N,n} QM structure.

2) A {N,n} periodic table and plot has been established for the Solar system's {N,n} QM structure. It provides the guideline for the future study of Solar QM {N,n} structure.

References

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[4] Douglas C. Giancoli, Physics for Scientists & Engineers with Modern Physics, 4th ed. 2009, pp1004, eq-37-10

[5] John S. Townsed, A Modern Approch to Quantum Mechanics, 2nd ed., 2012, pp356, eq-10.50

[6] David J. Griffiths, Introduction to Quantum Mechanics, 2nd ed., 2015, pp151, eq-4.70 and pp152 eq-4.77.

[7] David J. Griffiths, Introduction to Quantum Mechanics, 2nd ed., 2015, pp167, eq-4.118

[8] A series of my papers that to be published (together with current paper):
SunQM-1: Quantum mechanics of the Solar system in a {N,n//6} QM structure.
SunQM-1s1: The dynamics of the quantum collapse (and quantum expansion) of Solar QM {N,n} structure.
SunQM-1s2: Comparing to other star-planet systems, our Solar system has a nearly perfect {N,n//6} QM structure.
SunQM-1s3: Applying {N,n} QM structure analysis to planets using exterior and interior {N,n} QM.
SunQM-2: Expanding QM from micro-world to macro-world: general Planck constant, H-C unit, H-quasi-constant, and the meaning of QM.
SunQM-3: Solving Schrodinger equation for Solar quantum mechanics {N,n} structure.
SunQM-3s1: Using 1st order spin-perturbation to solve Schrodinger equation for nLL effect and pre-Sun ball's disk-lyzation.
SunQM-3s2: Using {N,n} QM model to calculate out the snapshot pictures of a gradually disk-lyzing pre-Sun ball.
SunQM-3s3: Using QM calculation to explain the atmosphere band pattern on Jupiter (and Earth, Saturn, Sun)'s surface.
SunQM-3s6: Predict radial mass density distribution for Earth, planets, and Sun based on {N,n} QM probability distribution.
SunQM-5: A new version of QM based on interior {N,n}, multiplier n', |R(n,l)|^2 |Y(l,m)|^2 guided mass occupancy, and RF and its application from string to universe.
SunQM-5s1: White dwarf, neutron star, and black hole re-analyzed by using internal {N,n}QM.

[9] Major QM books, data sources, software I used for this study are:
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