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Com Quantum Laws of LIGO Signal *

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The signal waveform with monotonic frequency change detected by LIGO is implying the discrete law of macroscopic quantization. Here, observation data of gw150914 signal are analyzed accurately, and it is proved that Livingston waveform of positive and negative strain reversal is 7.324218ms ahead of Hanford waveform. Then, the time of the positive and negative strain peaks of the main vibration part is corrected by using the superposition waveform, and the numerical results of the discrete frequency of GW150914 signal are calculated. Finally, the numerical analysis method of the minimum solution of characteristic Diophantine equations is introduced to fit the Lagrange frequency change rate and frequency jump change rate of GW150914 signal with quantization significance, which provides a quantitative basis for inferring the accurate information of the wave source.

Keywords: LIGO Signal; Lagrange change rate; Jump change rate; Com quantum law.

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1 Introduction

Can macro quantum theory and micro quantum theory be unified in the same logical framework? The answer to this question is yes. There is an important basic fact that any discrete physical quantity defined to describe a quantum process presents the law of quantization. In the micro field, the establishment and development of quantum mechanics[1-5] based on the Rydberg formula[6] of the hydrogen spectrum is successful, although quantum mechanics also hides some logical paradoxes[22] that need to be solved urgently. In the macro field, quantum gravity has not achieved satisfactory results, which may be due to the lack of experimental basis, so the theory deviates far from reality. LIGO's so-called detection of the gravitational wave of the merger of ancient spiral binaries[8-13] seems to fill the experimental gap in the study of macro quantization law. Here, the GW150914 signal wave[14] with accurate data report is re analyzed. Firstly, the exact relationship between Hanford waveform and Livingston waveform is clarified, and then the correct superposition waveform is obtained. Then, the time of wide peak or uncertain peak is corrected by using the superposition waveform within the error range, and the frequency distribution of positive and negative strain peak of GW150914 signal wave is calculated. Referring

*The academic circles over publicize the difficult process of LIGO exploring the signal and extracting the signal according to the predetermined target, which not only exposes the essence that such so-called scientific experiments are more like secret children's play, but also makes readers' attention far deviate from the important theme of how to use scientific methods to test whether LIGO signal is the gravitational wave generated in the process of spiral binary star merger, so as to blindly believe in science fiction news. What exact law should gravitational waves obey? Since LIGO gives the so-called observation data of gw150914 signal, as long as the accurate law obeyed by gw150914 signal is analyzed and compared with the accurate law of gravitational wave, an irrefutable scientific conclusion can be obtained. In fact, the gw150914 signal does not follow the relativistic Blanchet frequency equation of gravitational waves that LIGO likes to talk about (please refer to the paper: relativistic equation failure for LIGO signals). It has a unique law and seems to be a signal on the earth. However, further analysis shows that it has some specific differences from such signals on the earth. The comprehensive conclusion from multiple perspectives shows that the key operators of LIGO secretly extract data of the motion process of the simulation device to confuse the public and thus forge gw150914 gravitational wave, which is very likely. This paper accurately fits the com quantum law obeyed by gw150914 signal frequency. However, almost all famous mainstream academic journals unanimously refuse to publish such papers on the accurate analysis of the precise law of LIGO signal, and continue to publish more science fiction stories without experimental data analysis to further maintain lies. The author now offers a reward of 1 million yuan to reward scholars who strictly deduce the accurate co quantization law of gw150914 signal in theory rather than guessing through hypothesis. People who pursue truth all over the world unite to prevent the further spread of mainstream academic corruption that ignores academic morality, only seeks fame and wealth, cooperates in fraud and stifles truth. This reward is valid before the author publishes the core principles of COM quantum theory and is limited to the author's lifetime.

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to the Blanchet frequency equation[15] of gravitational wave in general relativity[16-20], the Lagrange frequency change rate[22] and frequency jump change rate with quantization meaning are defined. We introduce the numerical analysis method of the minimum solution of the characteristic Diophantine equations, and use the numerical results of frequency distribution to fit two kinds of quantized frequency change rates of GW150914 signal with high accuracy.

2 Superposition waveform of GW150914 signal

Making a high-precision scale or screen ruler to measure the vibration peak time interval of the vibration curve, and calculate the high-precision period and frequency distribution of the signal wave, so that the Hanford waveform and Livingston waveform of GW150914 signal can be accurately superimposed. The periods and frequencies mentioned here refer to the intrinsic periods and frequencies with observational effects. The time of measuring Hanford strain peak of GW150914 signal with screen ruler can reach the accuracy of 10^{-6}s. This method is especially suitable for analyzing vibration curves of unknown original function and unpublished detailed observation data. However, time accuracy of recording GW150914 signal wave by LIGO is 10^{-9}s, which is three orders of magnitude higher than that of a screen ruler. Therefore, we extracted the waveform data of LIGO Open Science Center database[21], and redrawn Hanford waveform and Livingston waveform by computer science drawing software.

As shown in Figures 1 and Figures 2. By reading the time of positive and negative strain peaks and comparing the total time or frequency distribution of the equal number of positive and negative main strain peaks, the rough relationship between the two waveform phases can be found. Then the exact time of several positive and negative strain peaks is extracted from LIGO raw data, and the main vibration peaks of the two waveforms are overlapped to the maximum extent by moving one waveform point by point, thus the exact relationship between the two waveforms is determined.

The Hanford waveform is shown in Figure 1. Seven Hanford main positive strain peaks appear in turn at the time 0.3398s, 0.3624s, 0.3842s, 0.4021s, 0.4122s, 0.4146s and 0.4282s respectively. From this, one can obtain the intrinsic frequency distribution of the positive strain peaks of Hanford waveform as follows, $F_{\rm H}^{+}=\{$44.2478Hz, 45.8716Hz, 55.8659Hz, 80.0Hz, 116.2791Hz, 200.0Hz$\}$, and the time interval between the first and seventh Hanford positive peaks is

$$\Delta t_{\rm H}^{+} = 0.4282{\rm s} - 0.3398{\rm s} = 0.0884{\rm s}$$

On the other hand, time readings of seven Hanford main negative strain peaks are 0.3496s, 0.3743s, 0.3932s, 0.4078s, 0.4194s, 0.4259s and 0.4301s respectively. From this, the intrinsic frequency distribution of the negative strain peaks of the Hanford waveform is calculated as follows, $F_{\rm H}^{-}=\{$40.4858Hz, 52.9101Hz, 80.2069Hz, 153.8462Hz, 238.0952Hz$\}$, and the time interval between the first and seventh Hanford negative strains is

$$\Delta t_{\rm H}^{-} = 0.4301{\rm s} - 0.3496{\rm s} = 0.0805{\rm s}$$

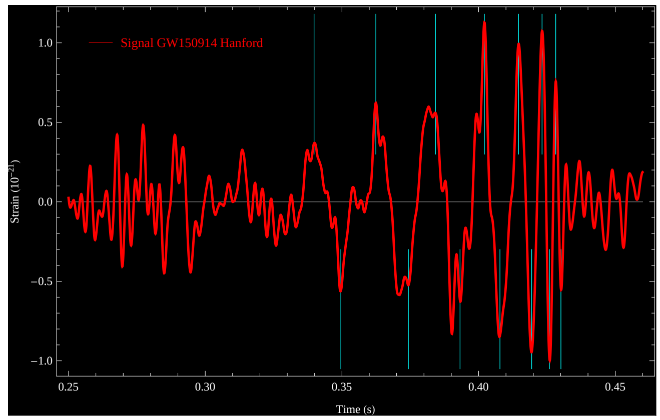

Figure 1 Hanford vibration curve of the GW150914 signal wave

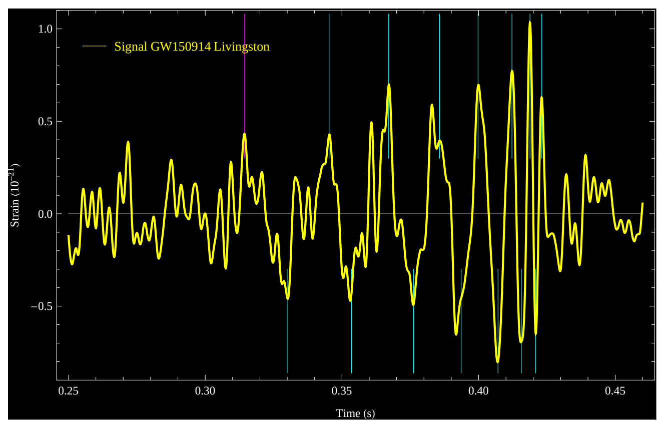

Figure 2 Livingston vibration curve of the GW150914 signal wave

The Livingston waveform is shown in Figure 2. Seven Livingston main positive strain peaks appear in turn at the time 0.3453s, 0.3671s, 0.3857s, 0.3998s, 0.4122s, 0.4188s and 0.4231s respectively. From this, the intrinsic frequency distribution of the positive strain peaks of Livingston waveform is calculated to be, $F_{\rm L}^{+}=\{$45.8716Hz, 53.7634Hz, 70.9220Hz, 80.6452Hz, 151.5152Hz, 232.5581Hz$\}$, and the time interval between the first and seventh Livingston positive peaks is

$$\Delta t_{\rm L}^{+} = 0.4231{\rm s} - 0.3453{\rm s} = 0.0778{\rm s}$$

For another, time readings of seven Livingston negative strain peaks are 0.3302s, 0.3535s, 0.3762s, 0.3936s, 0.4071s, 0.4156s and 0.4208s respectively. From this, one can obtain the intrinsic frequency distribution of the Livingston negative strain peaks, $F_{\rm L}^{-}=\{$42.9185Hz, 44.0529Hz, 57.4713Hz, 74.0741Hz, 117.6471Hz, 192.3077Hz}, and the time interval between the first and seventh Livingston negative strain peaks is

$$\Delta t_{\mathrm{L}}^{-} = 0.4208\mathrm{s} - 0.3302\mathrm{s} = 0.0906\mathrm{s}$$

By comparing the total time of seven positive and negative strain peaks of the Hanford waveform and the Livingston waveform, and comparing the frequency distribution of the positive and negative strain of the two waveforms, it is not difficult to find the following approximate relationships,

$$\Delta t_{\mathrm{H}}^{+} \approx \Delta t_{\mathrm{L}}^{-},\ \Delta t_{\mathrm{H}}^{-} \approx \Delta t_{\mathrm{L}}^{+},\ F_{\mathrm{H}}^{+} \approx F_{\mathrm{L}}^{-},\ F_{\mathrm{H}}^{-} \approx F_{\mathrm{L}}^{+}$$

Considering the experimental error, it can be deduced that the Livingston waveform is opposite to the Hanford waveform. In fact, the same number of positive and negative strain peaks seen in Figures 1 and 2 is also sufficient to detect the relationship between the two waveforms. In view of the above, the Livingston waveform is flipped up and down in the same coordinate system, and then gradually shifted, so that its main vibration curve can overlap with the main vibration curve of the Hanford waveform. The final confirmation result is that the main vibration curves of Livingston waveform with inversion of positive strains and negative strains as well as delay of 7.324218ms are coincident with the main vibration curves of Hanford waveform.

It is well known that the signals in Hanford and Livingston observatories are phase-shifted by π can be interpreted as that is due to the fact that the Michelson interferometers have a relative rotation of nearly $\pi/2$ and then the signals will have the π phase difference.

3 Frequency distribution of GW150914 signal

The superposition waveform of the Livingston waveform and the Hanford waveform is shown in Figure 3, and the frequency of the main vibration part increases monotonously. There are several strain peaks that deviate from the monotonic variation law, and the reason may be caused by noise or the screening templates of the extracted signals. In fact, each strain can be distorted to varying degrees, because the record data or the filtered data are not continuous. According to the characteristics of frequency monotonic increase, the time of the distortion strain peak is corrected within the error range, and the corrected values are obtained by the characteristic equation approximation with the highest credibility, which will be introduced in detail later. Here we only focus on the numerical analysis of the frequency distribution of GW150914 signal wave. The time of several strain peaks in the high frequency region is LIGO original record time, and the original accuracy of 10^{-9}s and 10^{-9}Hz are naturally retained in the correction process. In the Figure 3, the positive and negative strain peaks are numbered in reverse time order, and the right-most vertical line corresponds to the number 1. The t_n values in Table 1 is the modified time of the main positive and negative strain peaks of the GW150914 superposition waveform. Here n is positive integer of the inverse time series distribution, that is, quantum number.

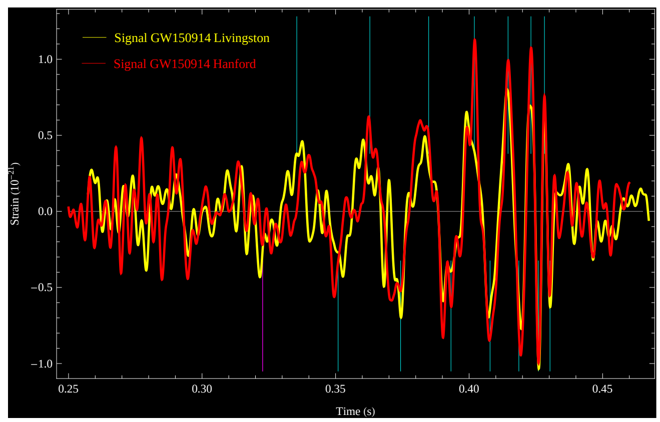

Figure 3 Synchronous superposition of Livingston and Hanford vibration curves of the GW150914 signal wave: the main vibration part of the Livingston waveform of positive and negative strain inversion and delay of 7.324218ms coincides with the main vibration part of the Hanford waveform

Table 1 Positive and negative strain peak times of the GW150914 signal wave and its frequency distribution

n	Positive strain			Negative strain		
	t_n	T_n	f_n	t_n	T_n	f_n
1	0.428222656	0.005065918	197.3975904	0.430297903	0.004333505	230.7600891
2	0.423156738	0.008573092	116.6440307	0.425964398	0.007333624	136.3582345
3	0.414583646	0.012607488	79.31794085	0.418630774	0.010784741	92.72359945
4	0.401976158	0.017110162	58.44479852	0.407846033	0.014636434	68.32265222
5	0.384865996	0.022037889	45.37639637	0.393209599	0.018851727	53.04553744
6	0.362828106	0.027357380	36.55320819	0.374357872	0.023402144	42.73112738
7	0.335470727			0.350955728	0.028264927	35.37953557
8				0.322690801		

The formulas for calculating the periods and frequencies of positive and negative strain peaks are $T_n = t_n - t_{n+1}$ and $f_n = T_n^{-1}$ respectively. The results of the calculations are listed in Table 1. It is known that the period and frequency of the strain peaks represent the period and frequency of the signal wave. There are

6 frequencies for the positive strain from 36.55320819Hz to 197.3975904Hz, and the negative strain has seven frequencies from 35.37953557Hz to 230.7600891Hz. Compared with the spectral law of atomic hydrogen[23, 24], in theory, the frequency of the GW150914 signal wave is a decreasing function of quantum numbers. The maximum frequency of the positive and negative strains of the GW150914 signal wave corresponds to the minimum quantum number of 1, so the values in the table are inverse timing numbers.

4 Lagrange frequency change rate

The vibration curve of gw15091414 signal wave accords with the characteristics of standard gravity waveform[25-27] of general relativity. The equation describing the frequency distribution and the variation of gravitational waves in general relativity is Blanchet frequency equation[15]. However, the definition of frequency and frequency change rate in Blanchet frequency equation comes from the derivative of the phase of the vibration function to time, which belongs to the formal frequency that cannot be observed directly. It needs the intrinsic definition of observational effect to describe the frequency and frequency change rate of the signal wave with frequency change. In various intrinsic definitions of frequency change rate, Lagrange frequency change rate and jump change rate are relatively simple in numerical processing. Now we discuss the Lagrange frequency change rate of GW150914 signal wave. Because of the inverse temporal arrangement of quantum numbers, the Lagrange frequency change rate is defined as $[\dot{f}_n = (f_{n-1} - f_{n+1})(T_n + T_{n-1})^{-1}$, that is

$$\dot{f}_n = \frac{(f_{n-1} - f_{n+1}) f_n f_{n-1}}{f_n + f_{n-1}} \tag{1}$$

Table 2 Observed and theoretical values of Lagrange frequency change rate of the GW150914 signal wave and the ratio of Lagrange frequency change rate to frequency square.

n	Positive strain			Negative strain			Theory values
	f_n	$\dot{f}_n$	$\dot{f}_n f_n^{-2}$	f_n	$\dot{f}_n$	$\dot{f}_n f_n^{-2}$	$\dot{f}_n f_n^{-2}$
1	197.3975904			230.7600891			1.219696970
2	116.6440307	8657.494220	0.636307692	136.3582345	11831.23042	0.636307692	0.636307692
3	79.31794085	2747.763841	0.436753649	92.72359945	3755.061951	0.436753649	0.436753649
4	58.44479852	1142.134177	0.334368530	68.32265222	1560.827218	0.334368530	0.334368530
5	45.37639637	559.1999942	0.271585859	53.04553744	764.1961764	0.271585859	0.271585859
6	36.55320819			42.73112738	418.0919129	0.228972362	0.228972362
7				35.37953557			0.198077922

Table 2 lists the numerical results of the Lagrange frequency variation rate of the GW150914 signal wave, and gives the numerical results of the frequency characteristic relation $\dot{f}_n f_n^{-2}$ of the positive and negative strain peaks corresponding to the quantum number n, which is convenient for fitting the law of signal wave frequency change. The frequency distribution of the positive and negative strains of the GW150914 signal wave is different, but their Lagrange frequency change rates have the same regularity for the same quantum values,

$$\begin{aligned} \dot{f}_2^{\pm} &= 0.636307692\left(f_2^{\pm}\right)^2 \\ \dot{f}_3^{\pm} &= 0.436753649\left(f_3^{\pm}\right)^2 \\ \dot{f}_4^{\pm} &= 0.334368530\left(f_4^{\pm}\right)^2 \\ \dot{f}_5^{\pm} &= 0.271585859\left(f_5^{\pm}\right)^2 \\ \dot{f}_6^{-} &= 0.228972362\left(f_6^{-}\right)^2 \end{aligned} \tag{2}$$

From this, we can infer that the Lagrange frequency change rate of the GW150914 signal wave obeys a com quantum law which needs to be accurately described by quantum numbers, which means that there are com quantization formulas for the frequency of GW150914 signal wave and other forms of frequency change rate.

Approximate equation of high precision corresponding to relation (2) can be fitted by numerical calculation. According to the relation (2), it is further deduced that the frequency f_n of the GW150914 signal wave is a decreasing function of the quantum number n. Therefore, the square of frequency f_n^2 and the Lagrange change rate of frequency f_n^2 are all functions of the quantum number n. According to the relation between frequency change rate of oscillation function and frequency square[28], it is assumed that $\dot{f}_n f_n^{-2} = \lambda(n)[\eta(n)]^{-1}$, where $\lambda(n)$ and $\eta(n)$ are undetermined functions. The Laurent series expansion of two undetermined functions is as follows, $\lambda(n) = n^p \sum_{i=0}^{\infty} a_i n^{-i}$, $\eta(n) = n^s \sum_{i=0}^{\infty} b_i n^{-i}$, where a_i and b_i are both undetermined coefficient, p and s are rational numbers. If the above two series are truncated into polynomials, $\dot{f}_n f_n^{-2} = \lambda(n)[\eta(n)]^{-1}$ is reduced to an approximate rational formula. Taking advantage of the $\dot{f}_n f_n^{-2}$ values of 5 negative strains on the right of the relation (2), we can only fit a lower power rational formula with only 5 irreducible coefficients. But like the fitting of a curve function, if the quantity is known to be too small, the resulting function often can only represent a small range of an implicated curve. In order to obtain a high-precision approximate quantization equation for the domain of quantum numbers, the rational method is first to use the solution of the system of Diophantine Equations to fit the lower power rational formula with fewer parameters, then use the lower power rational formula to calculate the $\dot{f}_n f_n^{-2}$ values of several larger quantum numbers, and then combine 5 known $\dot{f}_n f_n^{-2}$ values to fit the higher power rational formula with more undetermined parameters. If the numerical results of the lower power rational formula and the higher power rational formula are consistent in the error range, then the result of the fitting is reliable.

From Table 2, it can be found that the frequency of GW150914 signal wave is a monotone decreasing function of the quantum number. The first five terms of the Laurent series are preserved, and the approximate characteristic relation of frequency is obtained.

$$\frac{\dot{f}_n}{f_n^2} = \frac{\left(a_0 + a_1 n^{-1} + a_2 n^{-2} + a_3 n^{-3} + a_4 n^{-4}\right)}{n^{s-p}\left(b_0 + b_1 n^{-1} + b_2 n^{-2} + b_3 n^{-3} + b_4 n^{-4}\right)}$$

which contains a total of 9 discrete undetermined coefficients from a to i. Its rationality can be explained by fitting com quantum equation at last. Euler considered that nature pursues its diverse ends by the most efficient and economical means, and that hidden simplicities underlie apparent chaos of phenomena[29]. Based on this philosophy, we use the observation data of the GW150914 signal wave to fit the approximate equation, and take $s-p=1$ to find the most concise form. The reduced form is as follows

$$\frac{\lambda(n)}{\eta(n)} = \frac{a + bn + cn^2 + dn^3 + en^4}{n\left(f + gn + hn^2 + in^3 + n^4\right)} = \frac{\dot{f}_n}{f_n^2}$$

where the quantum number $n \geqslant 1$. For the GW150914 signal wave, the $\dot{f}_n f_n^{-2}$ values of the negative strain on the right side of (2) are represented by the fractions. Substituting them into above formula reads the following linear Diophantine Equations,

$$\frac{a + 2b + 2^2c + 2^3d + 2^4e}{2\left(f + 2g + 2^2h + 2^3i + 2^4\right)} = 0.636307692 = \frac{1034}{1625}$$
$$\frac{a + 3b + 3^2c + 3^3d + 3^4e}{3\left(f + 3g + 3^2h + 3^3i + 3^4\right)} = 0.436753649 = \frac{1975}{4522}$$
$$\frac{a + 4b + 4^2c + 4^3d + 4^4e}{4\left(f + 4g + 4^2h + 4^3i + 4^4\right)} = 0.334368530 = \frac{323}{966}$$
$$\frac{a + 5b + 5^2c + 5^3d + 5^4e}{5\left(f + 5g + 5^2h + 5^3i + 5^4\right)} = 0.271585859 = \frac{26887}{99000}$$
$$\frac{a + 6b + 6^2c + 6^3d + 6^4e}{6\left(f + 6g + 6^2h + 6^3i + 6^4\right)} = 0.228972362 = \frac{2676}{11687}$$

We need to find the minimum rational solution set of the above Diophantine equations. But solving such Diophantine equations[30-37] seems to lead to a pure mathematical problem. Here, we can give the result that the test is true: $a = 63/16$, $b = 447/32$, $c = 69/4$, $d = 69/8$, $e = 3/2$, $f = 105/32$, $g = 389/32$, $h = 227/16$ and $i = 13/2$. Thus, a simplified approximate com quantization equation for the Lagrange frequency change rate of the GW150914 signal wave is obtained,

$$\dot{f}_n = \frac{3(n+2)(4n+3)\left(4n^2+12n+7\right)}{n(n+3)(2n+1)(4n+5)(4n+7)} f_n^2 \qquad (3)$$

where $n \geqslant 1$. The theoretical values of the last column in Table 2 are calculated on the basis of this equation.

It is very difficult to find the reduced rational formula of $\dot{f}_n f_n^{-2}$ with high precision. Because the power of the rational formula is increased, not only is it difficult to find the approximate rational number with high precision, but also the difficulty of finding the minimal solution of indeterminate equations is increased. By further modifying the strain time of the GW150914 signal wave, we obtain the following high power simple com quantized equation of $\dot{f}_n f_n^{-2}$,

$$\dot{f}_n = \frac{(n+2)(4n+3)\left(6n^3+24n^2+28n+9\right)}{n(n+1)(n+3)(2n+3)\left(8n^2+16n+5\right)} f_n^2 \qquad (4)$$

where $n \geqslant 1$. Formally, there are differences between high power equation (3) and high power equation (4), but their calculation results are consistent in the error range. This means that there is no need to further fit other higher power approximation rational functions. On the other hand, from a mathematical point of view, comparing the low-power approximation obtained by numerical analysis with the first-order expansion of the exact theoretical equation, it is also sufficient to prove whether the theory conforms to the experimental observation results.

5 Jump change rate of frequency

Lagrange frequency change rate has the meaning of an average change rate, which is easy to accept to describe the change rate of discrete frequency. However, the calculation of Lagrange frequency change rate is rather troublesome, and the com quantization equation obtained is also complicated. The definition of jump change rate of discrete quantity is concise, and the results of describing the frequency variation of signal waves should also be concise. Now we discuss the jump change rate of discrete frequency of the GW150914 signal wave, its definition is $\hat{f}_n = (f_n - f_{n+1})T_n^{-1}$, expressed in frequency as follows

$$\hat{f}_n = \left(1 - \frac{f_{n+1}}{f_n}\right) f_n^2 \qquad (5)$$

According to the frequency distribution of positive and negative strain peaks of the GW150914 signal wave given in Table 1, the corresponding frequency's jump change rate can be calculated. The results are listed in Table 3.

Table 3 Observed and theoretical values of the jump change rate and the ratio of the jump change rate to the square of the frequency of the GW150914 signal wave.

n	Positive strain			Negative strain			Theory values
	f_n	$\hat{f}_n$	$\hat{f}_n f_n^{-2}$	f_n	$\hat{f}_n$	$\hat{f}_n f_n^{-2}$	$\hat{f}_n f_n^{-2}$
1	197.3975904	15940.5581	0.409090909	230.7600891	21784.18038	0.409090909	0.409090909
2	116.6440307	4353.86557	0.32	136.3582345	5949.941798	0.32	0.32
3	79.31794085	1655.614669	0.263157895	92.72359945	2262.543657	0.263157895	0.263157895
4	58.44479852	763.7801306	0.223602484	68.32265222	1043.773	0.223602484	0.223602484
5	45.37639637	400.3644841	0.194444444	53.04553744	547.133425	0.194444444	0.194444444
6	36.55320819			42.73112738	314.1418061	0.172043011	0.172043011
7				35.37953557			0.154285714

The definition formula of frequency's jump change rate (5) shows that $\hat{f}_n f_n^{-2} = 1 - f_{n+1} f_n^{-1}$ is a function of quantum number n, so the result of its approximate expansion is also a characteristic rational formula of n. Similar to the steps of fitting equation (3), we try to use the simplest rational formula about n, and substitute the numerical results of $\hat{f}_n f_n^{-2}$ of positive and negative strains in the above table into rational formula in turn to get a system of characteristic Diophantine Equation. Then, the coefficients are determined by the minimum solution of the system of the characteristic Diophantine Equation, and the frequency's jump change rate equation of com quantization of the GW150914 signal wave is found,

$$\hat{f}_n = \frac{6\,(n+2)}{(n+3)\,(4n+7)} f_n^2 \tag{6}$$

The theoretical values of $\hat{f}_n f_n^{-2}$ in Table 3 are written out by the equation (6). The time distribution of positive and negative strain peaks of the GW150914 signal wave is corrected by this equation, which is within the allowable error range. This is also the most reliable correction method at present.

The modified values of the time of the positive and negative strain peaks are different, and the fitting form of the frequency's jump change rate equation is different. The com quantization frequency's jump change rate corresponding to equation (4) is as follows.

$$\hat{f}_n = \frac{2\left(24n^2 + 96n + 95\right)}{(n+3)\left(32n^2 + 120n + 111\right)} f_n^2 \tag{7}$$

The frequency's jump change rate equation (6) or (7) of GW150914 signal wave is very concise, because the definition of the jump change rate is concise. It is most convenient to describe the law of frequency variation of signal wave with concise definition of jump change rate in mathematical form. Equation (6) or (7) is also quantized. The approximate expansion of the exact equation for the frequency jump change rate of signal wave derived theoretically should be consistent with (6) or (7).

6 Conclusions and comments

In 1888, Johannes Rydberg modified the Balmer formula to propose a universal empirical formula for the spectral lines of hydrogen atoms which led to the birth of Bohr's quantum theory. On this basis, quantum mechanics, quantum electrodynamics and quantum field theory have developed successively. The Rydberg formula is the result of numerical analysis. Similar to the Rydberg formula of hydrogen atomic spectrum, whether the gw150914 signal published by LIGO belongs to natural signal or the signal of artificial simulation device, the fitted com quantum equation (3) or (4) of the Lagrange frequency change rate of gw150914 signal wave and the jump change rate equation (6) or (7) of gw150914 signal wave frequency, it will be an important beginning to reveal the law of com quantum theory contained in macro motion. They are not only the quantitative basis for testing the accuracy of the gravitational wave theory of spiral binary stars, but also the experimental basis for establishing and developing a com quantum theory that uniformly describes the macro and micro quantization law.

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