Excitation of Negative Mass

N. Murata , YojaPanchan

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Abstract

In this paper, a circuit was conceptually designed which can excite either a positive or a negative mass, using the mass equation derived from the g_equation on the assumption of certain conditions. This study examined the construction of an element from positive mass in order to establish the above excitation, and how to apply the element.

本論文では、ある条件下の g_equation から導き出された質量式に基づき、正の質量及び負の質量を励起する回路をデザインする。

電荷及び誘電率は、回路に供給する電圧・電流・電磁場に対する等価回路として構築する。等価回路が複素数の値となるように電圧・電流・電磁場を供給するならば、回路には複素質量が励起する。

複数の回路がそれぞれ励起した複素質量を一つの合成質量と見なすため、複数の回路を相互に近接配置する。複数の回路がそれぞれ励起した複素質量の絶対値及び偏角を個別に制御することにより、合成質量の実部が正もしくは負の値となる。

複数の回路を極めて小型に構築するとともに多数を設置するほか、回路を極めて短い周期で励起することにより、正の質量及び負の質量の増加を図る。

1 質量式

ある条件下の g_equation は、相互作用項を含む非線形微分方程式となる。相互作項が零になる時空を選ぶことにより距離の逆二乗の相互作用式とソリトン解が得られたほか、次の質量式が導き出された。ここで、τ は m が存在した時間、q は ϵ での電荷である。

$$m = \frac{1}{2c}\sqrt{\frac{2\pi\hbar}{\sqrt{4\pi G}}\frac{1}{\sqrt{\tau}}\left[\frac{q^2}{\epsilon}\right]^{\frac{1}{4}}}$$

c : velocity of light
G : gravitation constant
τ : excitation time
$\hbar$: Planck's constant
q : electric charge
ϵ : permittivity

また、

$$m_I = |m|$$

m : gravitational mass
m_I : inertial mass

"素粒子質量の計算"[1] から、質量式及び重力質量と慣性質量の関係が妥当であると仮定し、以後の考察を進める。

2 負の質量の励起

2.1 ipmMass

ϵ 及び q が複素数である m を ipmMass (imaginary number phase meta Mass) と呼ぶ。

$$\epsilon = \epsilon_R + i\,\epsilon_I \qquad q = q_R + i\,q_I \qquad m = \kappa\zeta e^{i\delta}$$

$$\kappa = \frac{1}{2c}\sqrt{\frac{2\pi\hbar}{\sqrt{4\pi G}}} \qquad \zeta = \frac{1}{\sqrt{\tau}}\left[\frac{{q_R}^2 + {q_I}^2}{\sqrt{{\epsilon_R}^2 + {\epsilon_I}^2}}\right]^{\frac{1}{4}} \qquad \delta = \frac{1}{2}\arg q - \frac{1}{4}\arg\epsilon$$

複素平面上の象限毎の $\arg\epsilon$ 及び $\arg q$ を考える。

$$\arg q = n_q\pi + s_q\tan^{-1}\frac{|q_I|}{|q_R|}$$

q quadrant $(n_q,\ s_q)$: 1st $(0,\ +1)$, 2nd $(1,\ -1)$, 3rd $(1,\ +1)$, 4th $(2,\ -1)$

$$\arg\epsilon = n_\epsilon\pi + s_\epsilon\tan^{-1}\frac{|\epsilon_I|}{|\epsilon_R|}$$

ϵ quadrant $(n_\epsilon,\ s_\epsilon)$: 1st $(0,\ +1)$, 2nd $(1,\ -1)$, 3rd $(1,\ +1)$, 4th $(2,\ -1)$

$$\delta = \frac{1}{2}\left(n_q\pi + s_q\tan^{-1}\frac{|q_I|}{|q_R|}\right) - \frac{1}{4}\left(n_\epsilon\pi + s_\epsilon\tan^{-1}\frac{|\epsilon_I|}{|\epsilon_R|}\right)$$

ϵ 及び q に、次の"偏角条件"を与える。

ϵ' : $(\,\epsilon'_R < 0\,,\ \epsilon'_I > 0\,)$ 2nd quadrant , $\qquad q'$: $(\,q'_R > 0\,,\ q'_I < 0\,)$ 4th quadrant

$$m' = \kappa\zeta'_{(\tau',\,\epsilon',\,q')}\exp\left[i\frac{1}{2}\left(2\pi - \tan^{-1}\frac{|q'_I|}{|q'_R|}\right)\right]\exp\left[-i\frac{1}{4}\left(\pi - \tan^{-1}\frac{|\epsilon'_I|}{|\epsilon'_R|}\right)\right]$$

ϵ'' : $(\,\epsilon''_R < 0\,,\ \epsilon''_I < 0\,)$ 3rd quadrant , $\qquad q''$: $(\,q''_R > 0\,,\ q''_I < 0\,)$ 4th quadrant

$$m'' = \kappa\zeta''_{(\tau'',\,\epsilon'',\,q'')}\exp\left[i\frac{1}{2}\left(2\pi - \tan^{-1}\frac{|q''_I|}{|q''_R|}\right)\right]\exp\left[-i\frac{1}{4}\left(\pi + \tan^{-1}\frac{|\epsilon''_I|}{|\epsilon''_R|}\right)\right]$$

m' 及び m'' は近接しているとして、次の"同化条件"を与える。

$$|\epsilon'_R| = |\epsilon''_R| \equiv |\epsilon_R|\,,\quad |\epsilon'_I| = |\epsilon''_I| \equiv |\epsilon_I|\,,\quad q'_R = q''_R \equiv q_R\,,\quad q'_I = q''_I \equiv q_I\,,\quad \tau' = \tau'' \equiv \tau$$

一つの ipmMass とみなすため m' と m'' の和 M をとる。

$$M = -2\kappa Z e^{-i\theta} \qquad Z = \frac{1}{\sqrt{\tau}}\left[\frac{{q_R}^2 + {q_I}^2}{\sqrt{{\epsilon_R}^2 + {\epsilon_I}^2}}\right]^{\frac{1}{4}}\cos\left(\frac{1}{4}\tan^{-1}\frac{|\epsilon_I|}{|\epsilon_R|}\right) \qquad \theta = \frac{1}{2}\tan^{-1}\frac{|q_I|}{|q_R|} + \frac{\pi}{4}$$

実部のみが物理的意味を持つとするならば、ipmMass は負の質量 $\Re[M] < 0$ となる。

2.2 励起素子

近接する m' と m'' が"偏角条件"及び"同化条件"を満たすならば、"粗視化"によって一個の ipmMass が励起される。これまでの考察から、ipmMass は正の質量を持つ材料で構築できる回路に置き換えることができる。これを励起素子と呼ぶ。励起素子が τ の間隔で繰り返し励起されるならば、$\frac{1}{\tau}$ は励起の周期となる。

n 組の異なる励起素子に角周波数 ω の場を供給する。一組の ipmMass とみなすために和 M_N をとる。

$$\epsilon_n \to \epsilon_{nR(\omega_\epsilon)} + i\,\epsilon_{nI(\omega_\epsilon)} \qquad \omega_\epsilon : \text{frequency}$$

$$q_n \to q_{nR(\omega_q)} + i\,q_{nI(\omega_q)} \qquad \omega_q : \text{frequency}$$

$$M_N = -2\kappa \sum_n Z_n e^{-i\,\theta_n} \qquad Z_n = \frac{1}{\sqrt{\tau_n}} \left[\frac{q_{nR}^{\,2} + q_{nI}^{\,2}}{\sqrt{\epsilon_{nR}^{\,2} + \epsilon_{nI}^{\,2}}} \right]^{\frac{1}{4}} \cos\left(\frac{1}{4} \tan^{-1} \frac{|\epsilon_{nI}|}{|\epsilon_{nR}|} \right)$$

$$\theta_n = \frac{1}{2} \tan^{-1} \frac{|q_{nI}|}{|q_{nR}|} + \frac{\pi}{4}$$

2.3 場の供給

外部の場として電圧 $v_{(\omega)}$ 及び電流 $j_{(\omega)}$ を励起素子に供給する。

$$v_{n(\omega)} = v_{nR(\omega)} + i\,v_{nI(\omega)} \qquad v : \text{voltage}$$

$$C_{n(\epsilon_n)} = C_{nR(\epsilon_n)} + i\,C_{nI(\epsilon_n)} \qquad C : \text{capacitance}$$

$$q_{n(\omega)} \to C_n v_n = (C_{nR} v_{nR} - C_{nI} v_{nI}) + i\,(C_{nR} v_{nI} + C_{nI} v_{nR})$$

$$M_N = -2\kappa \sum_n Z_n e^{-i\,\theta_n}$$

$$Z_n = \frac{1}{\sqrt{\tau_n}} \left[\frac{(C_{nR} v_{nR} - C_{nI} v_{nI})^{\,2} + (C_{nR} v_{nI} + C_{nI} v_{nR})^{\,2}}{\sqrt{\epsilon_{nR}^{\,2} + \epsilon_{nI}^{\,2}}} \right]^{\frac{1}{4}} \cos\left(\frac{1}{4} \tan^{-1} \frac{|\epsilon_{nI}|}{|\epsilon_{nR}|} \right)$$

$$\theta_n = \frac{1}{2} \tan^{-1} \frac{|\,C_{nR} v_{nI} + C_{nI} v_{nR}\,|}{|\,C_{nR} v_{nR} - C_{nI} v_{nI}\,|} + \frac{\pi}{4}$$

q の"同化条件"は次のとおりであるが、C は ϵ の関数であることから、"同化条件"を満たすためには励起素子個々の制御が必要になる。

$$C'_{nR} v'_{nR} - C'_{nI} v'_{nI} = C''_{nR} v''_{nR} - C''_{nI} v''_{nI}\ , \qquad C'_{nR} v'_{nI} + C'_{nI} v'_{nR} = C''_{nR} v''_{nI} + C''_{nI} v''_{nR}$$

3 課題

3.1 実現への課題

MKSC 単位系を用いる。

$[\ \ ]_{us}$: MKSC unit system

$$[\kappa]_{us} = [J^{-1/4}\, m^{-1/4}\, s^{+1/2}\, kg] \qquad (\kappa = 7.977624 * 10^{-24}\ {}_{[\kappa]_{us}})$$

$$[\zeta]_{us} = [J^{+1/4}\, m^{+1/4}\, s^{-1/2}]$$

現在の技術で実現可能と思われる数値を用いて $\Re[M_{N}]$ のオーダー計算を行う。ここで、$1_{[\mu m]} \times 1_{[\mu m]}$ の面積を有する励起素子を、$1_{[m]} \times 1_{[m]}$ の面上に集積する。

$$\epsilon \;\simeq\; 10^{-12}{}_{[J^{-1}\,m^{-1}\,C^{2}]} \qquad Cv \;\simeq\; 10^{-12}{}_{[F]} \times 10^{-3}{}_{[V]} =\; 10^{-15}{}_{[C]}$$

$$\frac{1}{\tau} \;\simeq\; 1_{[GHz]} = 10^{+9}{}_{[s^{-1}]} \qquad n = \frac{1}{1_{[\mu m]}}\frac{1}{1_{[\mu m]}} =\; 10^{+12}{}_{[m]}$$

$$\Re[M_{N}] \;\simeq\; -10^{-24}10^{+9/2+(-15\times 2+12)/4}10^{+12}{}_{[kg]} = -10^{-12}{}_{[kg]}$$

実用に向けては、励起素子の回路設計や材料開発が課題となる。

3.2 理論への課題

集積した励起素子、励起制御装置、電力供給装置などで構成されたシステム全体の質量を M_{S} とする。この時、正の質量 M を持つ半径 R の天体の地表近傍において、自由落下する M_{S} の加速度 a は次のとおりとなる。

$$m_{I}a = -mg \quad (g \simeq GM/R^2)$$

$$M_{S} > 0 \;\;:\;\; |M_{S}|a = -(+|M_{S}|)g \;\;\rightarrow\;\; a = -g$$

$$M_{S} < 0 \;\;:\;\; |M_{S}|a = -(-|M_{S}|)g \;\;\rightarrow\;\; a = +g$$

参考文献

[1] viXra:1201.0003 ”Calculation of the Elementary Particle Mass”, N.Murata , YojaPanchan , 2011.01.01

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In this paper, a circuit was conceptually designed which can excite either a positive or a negative mass, using the mass equation derived from the g_equation on the assumption of certain conditions. This study examined the construction of an element from positive mass in order to establish the above excitation, and how to apply the element.

1 Mass Equation

Under certain conditions, the g_equation becomes a non-linear differential equation that contains interactive terms. Selecting a time domain in which the interactive terms take the value of zero, we obtained an inverse square-term interaction equation and a soliton solution of distance, and derived the following mass equation: where τ is the time when m exists and q is the electric charge at ϵ.

$$m = \frac{1}{2c}\sqrt{\frac{2\pi\hbar}{\sqrt{4\pi G}}}\frac{1}{\sqrt{\tau}}\left[\frac{q^2}{\epsilon}\right]^{\frac{1}{4}}$$

c : velocity of light $\hbar$: Planck's constant
G : gravitation constant q : electric charge
τ : excitation time ϵ : permittivity

and

$$m_I = |m|$$

m : gravitational mass m_I : inertial mass

We assume that the relations among the mass equation, the gravitational mass and the inertial mass in Source "Calculation of the Elementary Particle Mass"[1] are valid, and proceed to the following observations.

2 Excitation of negative mass

2.1 ipmMass

ϵ and q are assumed to be complex numbers. Complex mass is referred to as "ipmMass (imaginary number phase meta Mass)".

$$\epsilon = \epsilon_R + i\,\epsilon_I \qquad q = q_R + i\,q_I \qquad m = \kappa\zeta e^{i\delta}$$

$$\kappa = \frac{1}{2c}\sqrt{\frac{2\pi\hbar}{\sqrt{4\pi G}}} \qquad \zeta = \frac{1}{\sqrt{\tau}}\left[\frac{q_R^{\,2}+q_I^{\,2}}{\sqrt{\epsilon_R^{\,2}+\epsilon_I^{\,2}}}\right]^{\frac{1}{4}} \qquad \delta = \frac{1}{2}\arg q - \frac{1}{4}\arg\epsilon$$

Let us consider $\arg\epsilon$ and $\arg q$ in each quadrant of the complex plane.

$$\arg q = n_q\pi + s_q \tan^{-1}\frac{|q_I|}{|q_R|}$$

q quadrant $(n_q,\ s_q)$: 1st $(0,\ +1)$, 2nd $(1,\ -1)$, 3rd $(1,\ +1)$, 4th $(2,\ -1)$

$$\arg\epsilon = n_\epsilon\pi + s_\epsilon \tan^{-1}\frac{|\epsilon_I|}{|\epsilon_R|}$$

ϵ quadrant $(n_\epsilon,\ s_\epsilon)$: 1st $(0,\ +1)$, 2nd $(1,\ -1)$, 3rd $(1,\ +1)$, 4th $(2,\ -1)$

$$\delta = \frac{1}{2}\left(n_q\pi + s_q \tan^{-1}\frac{|q_I|}{|q_R|}\right) - \frac{1}{4}\left(n_\epsilon\pi + s_\epsilon \tan^{-1}\frac{|\epsilon_I|}{|\epsilon_R|}\right)$$

The following conditions are applied to the arguments of ϵ and q:

$\epsilon' \,:\, (\,\epsilon'_R < 0\,,\; \epsilon'_I > 0\,)$ 2nd quadrant , $\quad q' \,:\, (\,q'_R > 0\,,\; q'_I < 0\,)$ 4th quadrant

$$m' = \kappa\zeta'_{(\tau',\,\epsilon',\,q')} \exp\left[i\frac{1}{2}\left(2\pi - \tan^{-1}\frac{|q'_I|}{|q'_R|}\right)\right]\exp\left[-i\frac{1}{4}\left(\pi - \tan^{-1}\frac{|\epsilon'_I|}{|\epsilon'_R|}\right)\right]$$

$\epsilon'' \,:\, (\,\epsilon''_R < 0\,,\; \epsilon''_I < 0\,)$ 3rd quadrant , $\quad q'' \,:\, (\,q''_R > 0\,,\; q''_I < 0\,)$ 4th quadrant

$$m'' = \kappa\zeta''_{(\tau'',\,\epsilon'',\,q'')} \exp\left[i\frac{1}{2}\left(2\pi - \tan^{-1}\frac{|q''_I|}{|q''_R|}\right)\right]\exp\left[-i\frac{1}{4}\left(\pi + \tan^{-1}\frac{|\epsilon''_I|}{|\epsilon''_R|}\right)\right]$$

m' and m'' are assumed to be close in value to each other, and to be identical under the following conditions (conformation conditions):

$$|\epsilon'_R| = |\epsilon''_R| \equiv |\epsilon_R|\,,\quad |\epsilon'_I| = |\epsilon''_I| \equiv |\epsilon_I|\,,\quad q'_R = q''_R \equiv q_R\,,\quad q'_I = q''_I \equiv q_I\,,\quad \tau' = \tau'' \equiv \tau$$

The sum $m' + m'' = M$ is calculated to determine the value of a synthetic mass.

$$M = -2\kappa Z e^{-i\theta} \qquad Z = \frac{1}{\sqrt{\tau}}\left[\frac{q_R^2 + q_I^2}{\sqrt{\epsilon_R^2 + \epsilon_I^2}}\right]^{\frac{1}{4}} \cos\left(\frac{1}{4}\tan^{-1}\frac{|\epsilon_I|}{|\epsilon_R|}\right) \qquad \theta = \frac{1}{2}\tan^{-1}\frac{|q_I|}{|q_R|} + \frac{\pi}{4}$$

If we assume that only the real portion has any physical meaning, a synthetic mass then has the value of negative mass $\Re[M] < 0$.

2.2 Excitation element

If adjacent m' and m'' satisfy the argument conditions and the conformation conditions, single ipmMass is excited with coarse graining. In view of the observations given above, ipmMass can be replaced with a circuit constructed of material with a positive mass. This is called the "excitation element". If this element is excited at intervals of τ, then $\frac{1}{\tau}$ is the frequency of excitation.

A field is then supplied at an angular frequency of ω to n pairs of excitation elements. Each pair is considered to be ipmMass, so the sum is M_N.

$$\epsilon_n \to \epsilon_{nR(\omega_\epsilon)} + i\,\epsilon_{nI(\omega_\epsilon)} \qquad \omega_\epsilon \,:\, \text{frequency}$$
$$q_n \to q_{nR(\omega_q)} + i\,q_{nI(\omega_q)} \qquad \omega_q \,:\, \text{frequency}$$

$$M_N = -2\kappa\sum_n Z_n e^{-i\theta_n} \qquad Z_n = \frac{1}{\sqrt{\tau_n}}\left[\frac{q_{nR}^2 + q_{nI}^2}{\sqrt{\epsilon_{nR}^2 + \epsilon_{nI}^2}}\right]^{\frac{1}{4}} \cos\left(\frac{1}{4}\tan^{-1}\frac{|\epsilon_{nI}|}{|\epsilon_{nR}|}\right)$$

$$\theta_n = \frac{1}{2}\tan^{-1}\frac{|q_{nI}|}{|q_{nR}|} + \frac{\pi}{4}$$

2.3 Supply of fields

The voltage $v_{(\omega)}$ and current $j_{(\omega)}$ are applied to the excitation elements as external fields.

$$v_{n(\omega)} = v_{nR(\omega)} + i\,v_{nI(\omega)} \qquad v: \text{voltage}$$

$$C_{n(\epsilon_n)} = C_{nR(\epsilon_n)} + i\,C_{nI(\epsilon_n)} \qquad C: \text{capacitance}$$

$$q_{n(\omega)} \rightarrow C_n v_n = (C_{nR}v_{nR} - C_{nI}v_{nI}) + i\,(C_{nR}v_{nI} + C_{nI}v_{nR})$$

$$M_N = -2\kappa \sum_n Z_n e^{-i\,\theta_n}$$

$$Z_n = \frac{1}{\sqrt{\tau_n}} \left[\frac{(C_{nR}v_{nR} - C_{nI}v_{nI})^{\,2} + (C_{nR}v_{nI} + C_{nI}v_{nR})^{\,2}}{\sqrt{\epsilon_{nR}^{\,2} + \epsilon_{nI}^{\,2}}} \right]^{\frac{1}{4}} \cos\left(\frac{1}{4}\tan^{-1}\frac{|\epsilon_{nI}|}{|\epsilon_{nR}|}\right)$$

$$\theta_n = \frac{1}{2}\tan^{-1}\frac{|\,C_{nR}v_{nI} + C_{nI}v_{nR}\,|}{|\,C_{nR}v_{nR} - C_{nI}v_{nI}\,|} + \frac{\pi}{4}$$

The conformation conditions for q are as follows. Since C is a function of ϵ, all of the excitation elements must be controlled in order to fulfill the conformation conditions.

$$C'_{nR}v'_{nR} - C'_{nI}v'_{nI} = C''_{nR}v''_{nR} - C''_{nI}v''_{nI}\,, \qquad C'_{nR}v'_{nI} + C'_{nI}v'_{nR} = C''_{nR}v''_{nI} + C''_{nI}v''_{nR}$$

3 Summary

Electric charge and the dielectric constant are established using the voltage, current and electric field applied to an equivalent circuit. If the voltage, current and electric field are set such that the parameters of the equivalent circuit take on complex values, a complex mass is also excited in the circuit. Each complex mass excited in any one of the multiple circuits can be viewed as a synthetic mass, so multiple circuits can be placed close together. Controlling each of the absolute values and the argument of the complex masses excited in the multiple circuits individually results in the total real portion of the synthetic masses being either positive or negative in value. In addition to constructing miniaturized versions of multiple circuits and placing large numbers of them together, these circuits can be excited at extremely high frequencies, increasing the magnitude of the positive or negative mass. This system is thought to come true by the applied technology of the Meta-Material.

4 Issues with practical realization

The MKSC system of units is used.

$[\ \ ]_{us}$: MKSC unit system

$$[\,\kappa\,]_{us} = [J^{-1/4}\,m^{-1/4}\,s^{+1/2}\,kg] \qquad (\kappa = 7.977624 * 10^{-24}\,{}_{[\kappa]_{us}})$$

$$[\,\zeta\,]_{us} = [J^{+1/4}\,m^{+1/4}\,s^{-1/2}]$$

With current technology, calculations of the order of $\Re[M_N]$ are carried out using values that seem practicable. Here, excitation elements of the area $1_{[\mu m]} \times 1_{[\mu m]}$ are placed on an area $1_{[m]} \times 1_{[m]}$ in size.

$$\epsilon \;\simeq\; 10^{-12}\,{}_{[J^{-1}\,m^{-1}\,C^2]} \qquad Cv \;\simeq\; 10^{-12}\,{}_{[F]} \times 10^{-3}\,{}_{[V]} = \; 10^{-15}\,{}_{[C]}$$

$$\frac{1}{\tau} \;\simeq\; 1\,{}_{[GHz]} = 10^{+9}\,{}_{[s^{-1}]} \qquad n = \frac{1}{1_{[\mu m]}}\frac{1}{1_{[\mu m]}} = \; 10^{+12}\,{}_{[m]}$$

$$\Re[M_N] \;\simeq\; -10^{-24}10^{+9/2+(-15\times 2+12)/4}10^{+12}\,{}_{[kg]} = -10^{-12}\,{}_{[kg]}$$

Two issues with the practical realization of this concept are the design of the circuit of the excitation elements and the development of materials.

References

[1] viXra:1201.0003 "Calculation of the Elementary Particle Mass", N.Murata , YojaPanchan , 2011.01.01