the general science journal

Mathematical model of independent radiation field

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【Abstracts】: We can think that Michelson-Morley experiment negates ether medium, so, there is no medium for electromagnetic wave to transmit. So, the motion of electromagnetic wave is not transmission, but radiation, it radiates to the outside like ray flux. Now that it is radiation, time variable electric field is supposed to be the vector field with independent radiation, and it does not need time variable magnetic field to "bridge". In other words, in the vaccum, because electric wave or light wave does not have the medium of oscillation-transmission, and the mass of the field is zero, the motion of the field does not need the force, so the motion of the field is a kind of radiation, it does not need another field to be "bridge". According to this, time variable magnetic field can radiate independently, time variable electric field can also radiate independently. The more important thing is, we benefit from the great Hertz experimental logic. Initiating from LC oscillation circuit, and gradually extends into half-wave dipole antenna, the oscillation of the current on the half-wave dipole antenna generates time variable current and time variable charges. Its electric field wave is the radiation of the time variable charges on the oscillator, its magnetic field wave is the radiation of the time variable current on the oscillator. The exchange between electric field and magnetic field is through the flow of the time variable current on the half-wave dipole. In other words, time variable electric field and time variable magnetic field are generated by the time variable motion of the metal electrons on the transmitting antenna. Furthermore, this article proves the principle of radiation model and antenna receiving signal which satisfies the inverse distance square theorem.

【key words】: radiation of electric wave, reception principle, inverse distance square theorem

1 Introduction

It can check that, Maxwell's electromagnetic wave $\boldsymbol{E}\times\boldsymbol{H} = \dfrac{(Idl)^2 e^{j2\omega t - jkr}}{16\pi^2\varepsilon_0\omega r^3}(-k^3 r + 2jk^2 + \dfrac{2k}{r} - \dfrac{j}{r^2})\cdot \sin^2\theta\cdot\boldsymbol{e}_r$ is incompatible with the inverse distance square theorem. Take the radiation source as the spherical center, use the spherical integral to calculate, it is neither the conservation of transmitting wave energy, nor the conservation of radiation vector field. And analyzing through engineering application, the wave beam formation and reception field intensity of Maxwell theory both seriously disobey the inverse distance square theorem[1] in the engineering application. Article one also points out that there exists seven defects in Maxwell's mutual generation theory—uncorrectable defects.

Let's consider the time variable electric field when the sphere is distributed symmetrically, see figure one. The tube (charges' transmitting tube) is screened, it does not radiate any electric field outside, the charges gun emits charges to the metal sphere a. Suppose the charges' change rate in the sphere a is $Q(t)=\omega\cdot t$, the ω here is the emissivity, which is also, there is the time variable charges with spherical distribution in the sphere a, which makes that there exists time variable electric field around the sphere a. Because the time variable electric field is spherically symmetrically distributed, so $\frac{\partial B}{\partial t}=0$, thereby time variable electric field radiates independently to the free space. It is worthwhile to note that, there is no magnetic field around the sphere a, or $H=0$, time variable electric field radiates independently, the time variable electric field $\boldsymbol{E}(t)$ with independent radiation is filled in the entire free space. So according to Coulomb law, there is

$$\boldsymbol{E}(r,t)=\frac{Q(t-\frac{r}{c_0})}{4\pi\varepsilon_0 r^2}\boldsymbol{e}_r=\frac{\omega\cdot(t-\frac{r}{c_0})}{4\pi\varepsilon_0 r^2}\boldsymbol{e}_r \tag{1}$$

c_0 in the formula is the radiation speed of the electric field lines, $\frac{r}{c_0}$ is the time delay from the electric field radiation to point P in the free space(the distance between the center and point P is r). Please note particularly here: consider a as the center, take spherical surface S, the field that flows out of the spherical surface S is conservative. This is the important conclusion of inverse distance square theorem. The power lines that the spherical charges radiate in the figure one diverges externally. Very obviously, as for the time variable electric field in the figure one, it is an irrotational field, which is $E_t\propto\frac{1}{r^2}$.

Furthermore, now that ether does not exist, electromagnetic wave lacks transmitting medium, so electric wave is the vector field with independent radiation. According to it, this article is according to Coulomb law and Biot-Sarvart-Laplace theorem, to found electric wave radiation model and its principle of receiving electric wave, the purpose is to debunk the inverse distance square theorem in the engineering application. This article is based on the independent radiation of time variable electric field and time variable magnetic field, and gives out the radiation model of electric wave, debunks the physical action when antenna receives electric wave signal. Only such radiation can satisfy the relationship of inverse distance square theorem in radar, telecommunication.

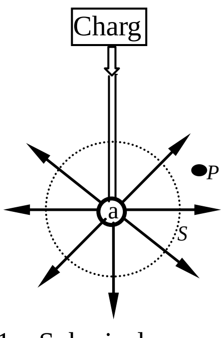


Figure 1　Spherical symmetrical distribution

In 1905, Einstein published relativity to emphasize, "according to Maxwell electrodynamics, when the magnet moves, there generate the inductive electric field in the space, so there is current in the coil, but when the coil moves, there does not generate inductive electric field in the space, but there is still current in the coil, it can see that the space should not have been symmetrical(so called relativity principle)". Now that there exists defect in Maxwell's unsymmetrical equation[3], and suppose the magnetic field wave radiates independently, then it needs to reconsider Einstein's relativity principle.

2 Independent radiation model of time variable electric field

2.1 The procedure that time variable electric field with sine and cosine radiates independently

Especially, after discovering the positrons or positive particles, it can promise that the charges of the sphere a in the figure one satisfies $Q(t) = Q_0 \sin \omega t$. Because it is spherical symmetrical distribution, the time variable electric field in the free space is $\boldsymbol{E}(r,t) = \dfrac{Q_0 \sin \omega(t - r/c_0)}{4\varepsilon\pi r^2}$, and $\boldsymbol{H}(r,t) = 0$, $\dfrac{r}{c_0}$ in the formula is the time delay when electric field is transmitted to space P point. Obviously, the electric field with sine function and cosine function radiates independently.

As for the radiation procedure of the time variable electric field with sine and cosine, we can use figure two to describe, all the transmitting wires are screened, and don't radiate any field externally. $U_s = U_m \sin \omega t$ in the figure is connected to the plate capacity, so: the time variable field at P point of the free space in figure (a) is generated by time variable charges, the same thing, the time variable electric field at P point of the free space in figure (b) is also generated by time variable charges.

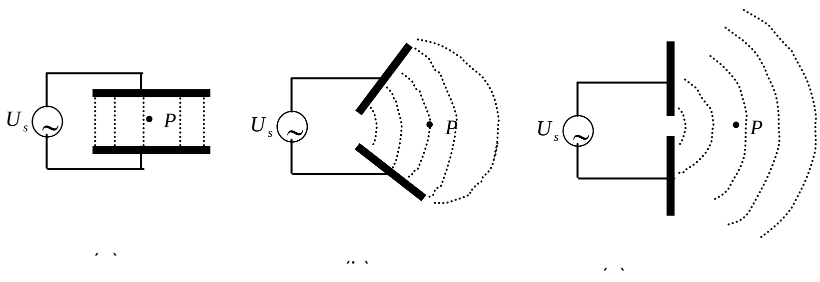


Figure 2 the radiation procedure of time variable electric field with sine and cosine

The same thing, in the figure (c), the time variable electric field at P point of the free space is still generated by time variable charges. In other words, in the free space, time variable electric field with sine and cosine is generated by the time variable charges with sine and cosine which is provided by the radiation source, and it radiates independently.

When studying the great Hertz's experiment carefully, it is not difficult to see, that the figure (c) is equivalent to Hertz's two discharging balls. In other words, we can think in this way: the electric wave that Hertz's experiment measured is just the time variable electric field that is generated by the time variable charges.

2.2 Description of the radiation electric field intensity

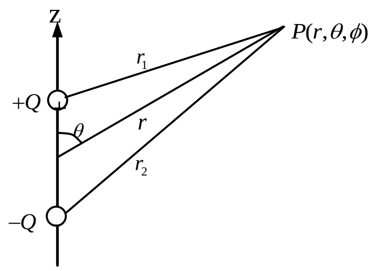


figure 3 time variable electric dipole

According to formula (1), we have already derived the radiation field intensity's formula of the time variable charges of time variable point charge and spherical distribution $\boldsymbol{E}(r,t)=\dfrac{Q_0\sin\omega(t-\frac{r}{c_0})}{4\pi\varepsilon_0 r^2}\cdot\boldsymbol{e}_r$.

But as for the dipole antenna, it is not a point charge, but a pair of electric dipoles, according to what figure three shows. In order to express more conveniently, it temporarily does not write the radiation delay time $\dfrac{r}{c_0}$. Let's first start from the time variable electric potential, which is the time variable electric potential at the point $P(r,\theta,\phi)$

$$\varPhi=\frac{Q(t)}{4\pi\varepsilon_0}\left(\frac{1}{r_1}-\frac{1}{r_2}\right)=\frac{Q(t)}{4\pi\varepsilon_0}\left(\frac{r_2-r_1}{r_2r_2}\right) \tag{2}$$

In the formula

$$r_1=\left[r^2+\left(\frac{l}{2}\right)^2-rl\cdot con\theta\right]^{\frac{1}{2}}$$

$$r_2=\left[r^2+\left(\frac{l}{2}\right)^2+rl\cdot con\theta\right]^{\frac{1}{2}}$$

Because in the actual project, $r \gg l$,so expand r_1, r_2 by binominal theorem, and neglect the high order minor terms, there is

$$r_1\approx r-\frac{l}{2}con\theta$$

$$r_2 \approx r + \frac{l}{2} con\theta$$

$$r_2 - r_1 \approx lcon\theta$$

$$r_1 r_2 \approx r^2$$

So

$$\Phi \approx \frac{Q(t)l \cdot con\theta}{4\pi\varepsilon_0 r^2} \tag{3}$$

Perform gradient operation to the above formula, there derives the time variable electric field

$$\boldsymbol{E} = -\nabla\Phi = \frac{Q(t)\cdot l \cdot con\theta}{2\pi\varepsilon_0 r^3}\boldsymbol{e}_r + \frac{Q(t)\cdot l\cdot sin\theta}{4\pi\varepsilon_0 r^3}\boldsymbol{e}_\theta \tag{4}$$

And then substitute the delay time $\frac{r}{c_0}$ into the above formula, which is the sine and cosine electric field that the electric dipole antenna radiates independently:

$$\boldsymbol{E}(r,t) = \frac{Q_m \sin(\omega t - \omega\, {}^{r}\!/_{c_0})l\cdot con\theta}{2\pi\varepsilon_0 r^3}\boldsymbol{e}_r + \frac{Q_m \sin(\omega t - \omega\, {}^{r}\!/_{c_0})l\cdot sin\theta}{4\pi\varepsilon_0 r^3}\boldsymbol{e}_\theta \tag{5}$$

This is the time variable electric field that is received at a certain point $P(r,\theta,\phi)$ in the free space. Please note, the radiation electric field here has not $\boldsymbol{e}_z$ component.

The prudential readers will ask back: “the above formula is inversely proportional to distance cube, the engineering practice has already verified that the current amplitude on the reception antenna is inversely proportional to distance square, how to explain formula (5)?”.It is a good question! As for this question, it will be answered at the below formula (24). The important thing is that formula (1) has already verified the relationship of inverse distance square theorem. Article[1] also proves: take the radiation source as the spherical center, and the field quantity that flows out of the spherical surface S_1 is equal to the field quantity that flows out of the spherical surface S_2, which is, radiation vector field is conservation.

2.3 Meridian with positive and negative time variable electric field

If it the negative charges that the spherical surface distributes, the power lines will be opposite. If it is the electric dipole composed of the positive and negative charges that two spherical surfaces distribute, the distribution of power lines will be meridian, according to what figure four shows. I think, the time variable electric field, which is measured in the classroom , by great Hertz’s experiment through using a pair of discharging balls, is just the meridian electric field in the figure

Please note here: power lines should have radiated vertically, but because of the vector superposition of the positive and negative power lines (electric field lines), it makes the power lines after being composited are curve. The farther distance is, the power lines after being composited quite resemble the horizontal power lines, which is so called transversal wave. But as for the electric field line itself, it radiates vertically, because after the positive and negative electric field generated by the positive and negative charges composites to become the meridian, it is the transversal wave seeing from the far area.

Although the electric field radiates independently, or the electric field in the free space can radiate independently, the electric field that human observe is not Maxwell's curl field, but independent radiation field

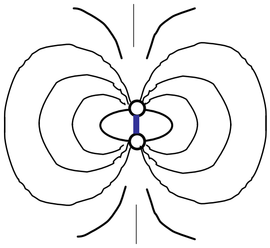


figure 4 meridian time variable electric field

3 Independent radiation model of time variable magnetic field

3.1 Generation of sine and cosine time variable magnetic field

Suppose the coil inductance is connected to sine and cosine current source $i_s = I_m \sin\omega t$, and under the condition that neglecting the voltage drop and phase lag of transmitting wire (only for calculating conveniently), so the current that flows through the coil is $i = I_m \sin\omega t$, under the condition that neglecting the edge effect, the magnetic field in the solenoid is $\boldsymbol{B} = \mu_0 n \cdot i(t)$, μ_0 here is the vacuum permeability, n is the turns of the straight solenoid, which is

$$\boldsymbol{B}(t) = \mu_0 n I_m \sin\omega t \tag{6}$$

It has supposed the stable case when $I_0 = 0$. In other words, the time variable magnetic field in the inductance is generated by the time variable current in the coil. Such conclusion is obviously correct.

3.2 Radiation of sine and cosine time variable magnetic field

In like manner, article[1] verifies to point out, time variable magnetic field is generated by time variable current, linear time variable magnetic field radiates independently. As for the radiation procedure of sine and cosine time variable magnetic field, we can use the four subfigures in the figure five to describe. All the transmitting wires (thin wires) are screened, and don't radiate any field externally. $i_s = i_m \sin\omega t$ in the figure is connected in series to the coil inductance. So, in the figure (a), the time variable magnetic field at point P is generated by time variable current, the same thing, in the figure (b), the time variable magnetic field at point P is generated by the time variable current, the same thing, in the figure (c), the time variable magnetic field at point P is generated by time variable current, the same thing, in the figure (d), the time variable magnetic field at point P is generated by the time variable current. In other words, sine and cosine time variable magnetic field in the free space is generated by the sine and cosine time variable current that is provide by the radiation source. Only admit point P in the figure (a) is a point in the free space, and time variable magnetic field is generated by time variable current, so, it necessarily admits that in the figure (d), sine and cosine time variable magnetic field at point P is also generated by time variable current.

Furthermore, we can also use the segmental linear time variable magnetic field generated by the segmental linear time variable current to describe its independent radiation. See figure six, apply zigzag wave current to current element Idl in the figure(a), zigzag wave current is shown in the figure (b), figure (c) is the zigzag wave magnetic field of free space P point, of which r/c_0 is the delay time in the radiation. When the current increases linearly, the magnetic field at point P in the space also increases linearly, when the current decreases linearly, the magnetic field at point P in the space also decreases linearly. We have already proved that linear time variable magnetic field radiates independently before, so the zigzag wave (triangular wave) time variable magnetic field also radiates independently. Under such circumstance, let's divide triangular wave into up and down two equal parts, and use curve to fit smoothly, which will be the sine and cosine wave. This is, the sine and cosine magnetic field generated by sine and cosine current is the same as linear magnetic field, triangular wave magnetic field, they all radiates independently to the free space.

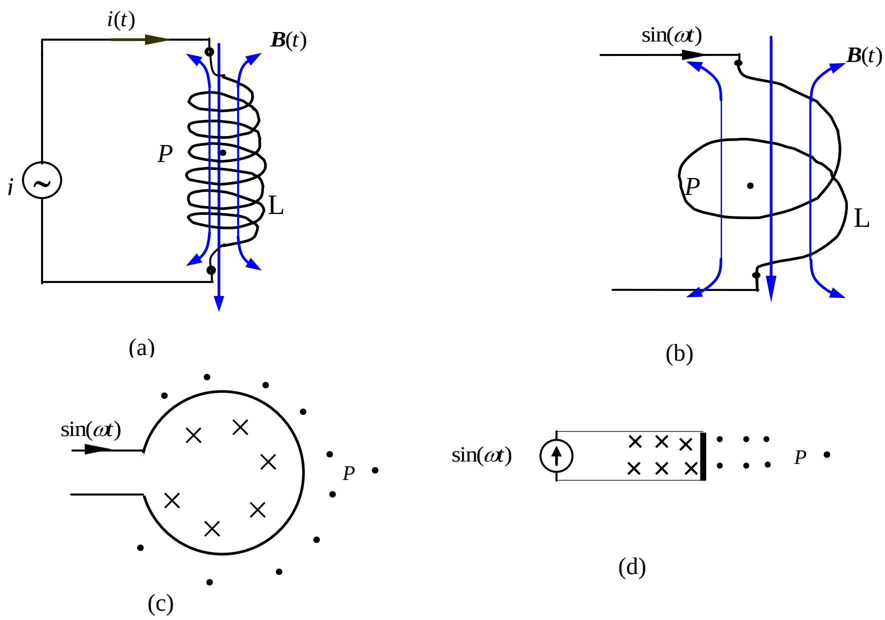
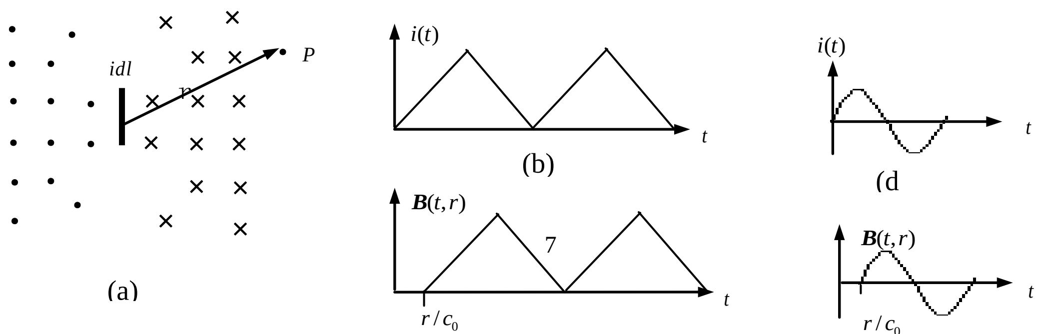


Figure 5　time variable current generates time variable magnetic field



3.3 Description of radiation magnetic field intensity

According to the formula (5), we have already derived the radiation field intensity formula of time variable current element $\boldsymbol{B}(r,t)=\dfrac{\mu_0 I_m dl \sin\omega(t-{r}/{c_0})}{4\pi r^2}\boldsymbol{e}_\varphi$. But as for the dipole antenna, it is not an ideal current element, but a segment of magnetic dipole, according to what figure seven shows. Use cylinder coordinate to calculate the magnetic field intensity $\boldsymbol{B}(r,t)$ of a certain point $P(r,\theta,\phi)$ in the free space. In order to write conveniently, it temporarily does not consider to write $\dfrac{r}{c_0}$ (radiation delay time). It can derive from the figure

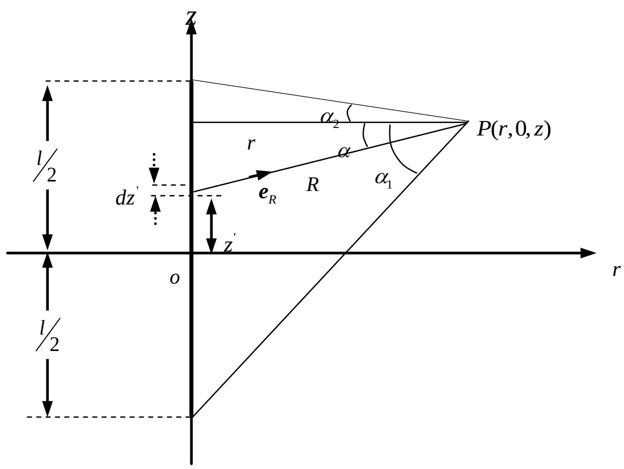


Figure 7 time variable magnetic dipole

$$z' = z - rtg\alpha$$

$$\mathrm{d}z' = r\sec^2\alpha\,\mathrm{d}\alpha$$

$$\mathrm{d}\boldsymbol{l} = r\sec^2\alpha\,\mathrm{d}\alpha\cdot\boldsymbol{e}_z$$

$$R = \sec\alpha$$

$$\boldsymbol{e}_R = \mathrm{con}\alpha\cdot\boldsymbol{e}_r + \sin\alpha\cdot\boldsymbol{e}_z$$

$$\mathrm{d}\boldsymbol{l}\times\boldsymbol{e}_R = -r\sec^2\alpha\,\mathrm{con}\alpha\,\mathrm{d}\alpha\cdot\boldsymbol{e}_\varphi$$

So, according to Biot-Sarvart-Laplace theorem, it can derive

$$
\begin{aligned}
\boldsymbol{B} &= \frac{\mu_0 I}{4\pi}\int_{\alpha 1}^{\alpha 2}\frac{-r\sec^2\alpha\mathrm{con}\alpha}{r^2\sec^2\alpha}\mathrm{d}\alpha\cdot\boldsymbol{e}_\varphi \\
&= \left(\frac{\mu_0 I}{4\pi r}\int_{\alpha 1}^{\alpha 2}-\mathrm{con}\alpha\mathrm{d}\alpha\right)\boldsymbol{e}_\varphi \\
&= \frac{\mu_0 I}{4\pi r}(\sin\alpha_1-\sin\alpha_2)\boldsymbol{e}_\varphi
\end{aligned}
\tag{7}
$$

In the formula

$$\sin\alpha_1 = \frac{z+{}^{l}\!/_{2}}{\sqrt{r^2+(z+{}^{l}\!/_{2})^2}}$$

$$\sin\alpha_2 = \frac{z-{}^{l}\!/_{2}}{\sqrt{r^2+(z-{}^{l}\!/_{2})^2}}$$

When z □ r , which is that when the point P is far away from the central line of magnetic dipole (or is at the two ends of the dipole), $\sin\alpha\to 0$,and $B\to 0$,which indicates that there is almost no magnetic field at the two ends of the magnetic dipole. It also indicates that magnetic dipole has very strong direction character.

In the real engineering application, because r □ z , which is $P(r,0,z)$ point is at the far place of the very front of the magnetic dipole, there is

$$\sin\alpha_1 \approx \frac{z+{}^{l}\!/_{2}}{r}$$

$$\sin\alpha_2 \approx \frac{z-{}^{l}\!/_{2}}{r}$$

So

$$\boldsymbol{B} \approx \frac{\mu_0 I}{4\pi r^2}\boldsymbol{e}_\varphi \tag{8}$$

And then substitute the delay time $\frac{r}{c_0}$ into the above formula, which is the sine and cosine magnetic field of magnetic dipole-antenna independent radiation

$$\boldsymbol{B}(r,t) = \frac{\mu_0 I_m l\sin\omega(t-{}^{r}\!/_{c_0})}{4\pi r^2}\boldsymbol{e}_\varphi \tag{9}$$

This is the magnetic field intensity that is received at a certain point $P(r,\theta,\phi)$ in the space at the very front of the magnetic dipole. Formula (8) indicates that the radiation vector field is inversely proportional to distance square.

Now that the magnetic wave radiates independently, or the magnetic wave in the free space can radiate independently, and what humans observe is magnetic wave, not Maxwell's mutual generation field, but the vector field with independent radiation.

4 Formation of complete radiation and dipole antenna

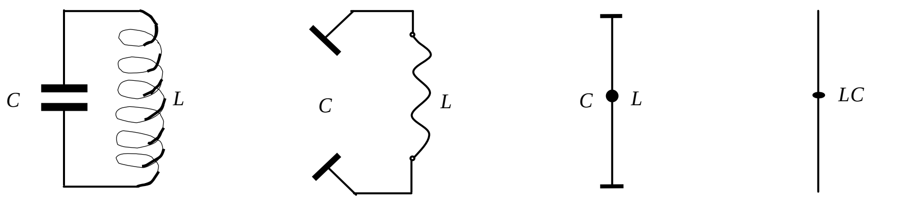
Great Hertz's experiment uses two discharging balls to prove "the whole classroom, also the whole space is filled with the electric wave". That's true, it is absolutely the case! Because the open capacity plate (or discharging balls) radiates electric field to the free space, open inductance wire radiates magnetic field to the free space. This section starts from the open capacity-inductance, according to the formation procedure of Hertz dipole antenna, further proves the independent radiation between electric field and magnetic field.

4.1 Time variable field is generated independently

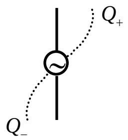
See the figure 8, as for the ordinary LC circuit [subfigure (a)], because the time variable electric field is stored in the capacity, time variable magnetic field is stored in the inductance, so the time variable electric field and time variable magnetic field at the peripheral free space are almost zero, which is, time variable electric field does not radiate, time variable magnetic field does not radiate. In order to solve this problem, we open the LC circuit gradually, see figure (b), (c) and (d), and it finally forms the circuit in the figure (e)----dipole antenna.

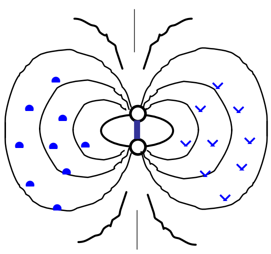
Because the capacity plate is open, time variable electric field is open in the whole free space, because the inductance wire is open, time variable magnetic field wave is open in the whole free space. This is the root of what Hertz has said "the whole classroom, and the whole space, is filled with the electric wave", this is the experimental logic from great Hertz's experiment, not the particular creation of this article, only the conclusion.

In the figure (a), time variable electric field is generated by the time variable charges, time variable magnetic field is generated by the time variable current in the coil, in the figure (b), time variable electric field is generated by the time variable charges, time variable magnetic field is generated by the time variable current in the coil, in the figure (c), time variable electric field is generated by the time variable charges, time variable magnetic field is generated by the time variable current in the coil, in the figure (d), time variable electric field is generated by the time variable charges, time variable magnetic field is generated by the time variable current in the coil. Comparing figure (d) with figure (a), the identical points are: time variable electric fields are all



(a) (b) (c) (d)





As for the half wave dipole, at the time when one end has the maximum positive charges, and the other end just has the maximum negative charges, the radiation efficiency is the greatest. So the electric field lines that are "photographed" at the certain time is meridian, magnetic field lines are the closed lines that surround the generated by the time variable charges, time variable magnetic fields are all generated by the time variable current, the difference is: in the figure (d), power lines are distributed in the whole free space, magnetic lines are distributed in the whole free space.

As for the half wave dipole, at the time when one end has the maximum positive charges, and the other end just has the maximum negative charges, the radiation efficiency is the greatest. So the electric field lines that are "photographed" at the certain time is meridian, magnetic field lines are the closed lines that surround the dipole antenna.

4.2 The exchange between electric field and magnetic field is realized through *LC*

We can also note, in the figure (a), the exchange between electric field and magnetic field is realized through the flow of the current in the circuit(on the half-wave dipole), and such exchange needs time. After the electric field reaches to maximum, the capacity starts to discharge, its discharging current will go through the coil L, and generates magnetic field, after the magnetic field reaches to maximum, it starts to charge the capacity again, and generates the electric field. Such circulation, which is so called the continuous exchange between electric energy and magnetic energy. But it has to note here, such exchange is exchanged through the motion of the charges in the circuit, not the direct exchange between electric field and magnetic field.

The same thing, in the figure (d), after the electric field reaches to maximum, distribution capacity C starts to discharge, its charging current will go through the inductance wire L, and generates magnetic field, after the magnetic field reaches to maximum, it starts to charge the capacity again. Such circulation, is the continuous exchange between electric field and magnetic field. The only difference is, time variable electric field and time variable magnetic field have already been open in the whole free space. Here, resonance is very important. And half-wave dipole is just the inductance and capacity in the resonance, this is the reason why half-wave dipole-antenna radiation is highly efficient. Please note especially, such exchange is exchanged through the motion of the charges in the circuit, not the direct exchange between electric field and magnetic field.

This is another important fact, in the subfigure (a), when the electric field reaches to the maximum, the magnetic field is zero, when the magnetic field reaches to the maximum, electric field is zero. There is phase difference 90^0 between these two. The same thing, in the subfigure (e), the radiation electric field and magnetic field also have 90^0 phase difference. Each field intensity is what formula (5) and formula (9) display.

4 Generation principle of the reception signal

How is the signal current on the reception antenna generated? Is it through wave hitting dipole antenna? Is it through energy density $\boldsymbol{E} \times \boldsymbol{H}$ entering dipole antenna? Neither. It is even less likely the action of Maxwell's curl theory! Engineering practice has already proved that the amplitude of reception signal and the distance of radiation source satisfy $\frac{1}{r^2}$ relationship, now let's describe the generation principle from radiation equation to signal reception.

4.1 Radiation equation

We still start from LC oscillation circuit, first study the subfigure (a) in the figure eight. Suppose the current in the LC circuit is $i(t) = I_m \sin(\omega t + \varphi_1)$, the voltages of the two ends of capacity are $U_C(t) = i(t) \cdot Z_C = I_m \frac{1}{\omega C} \sin(\omega t + \varphi_2)$, the charges in the capacity are $Q_C(t) = C \cdot U_C(t) = I_m \frac{1}{\omega} \sin(\omega t + \varphi_2)$. Then study the subfigures (b)~(e) in the figure eight, obviously, in the figure (e), the current and charge on the dipole transmitting antenna are respectively

$$i(t) = I_m \sin(\omega t + \varphi_2) \tag{10}$$

$$Q_C(t) = I_m \frac{1}{\omega} \sin(\omega t + \varphi_1) \tag{11}$$

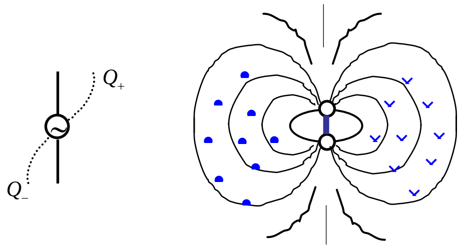
suppose

$$Q_m \equiv I_m \frac{1}{\omega} \tag{12}$$

so

$$Q_C(t) = Q_m \sin(\omega t + \varphi_1) \tag{13}$$

See figure nine, when the Q_+ end displays the maximum positive charge, and the bottom end displays the maximum negative charge, the metal electrons at this time start to drift to Q_+ end and generate the downward current (charge is negative), so there exists 90^0 phase difference between $i(t)$ and $Q_C(t)$. And it makes that there also exists 90^0 phase difference between magnetic field and electric field of each radiation.



Meridian time variable electric field

Figure 9 current, charges on the dipole and their radiation field distribution

As for the formula (5), and consider the radiation time delay factor and primary phase factor, it immediately derives the electric field that radiates on the dipole antenna

$$\boldsymbol{E}(r,t)=\frac{Q_m\sin(\omega t-\omega r/c_0+\varphi_1)l\cdot con\theta}{2\pi\varepsilon_0 r^3}\boldsymbol{e}_r+\frac{Q_m\sin(\omega t-\omega r/c_0+\varphi_1)l\cdot sin\theta}{4\pi\varepsilon_0 r^3}\boldsymbol{e}_\theta \quad (14)$$

Substitute formula (12) into (9), and consider the radiation time delay factor and primary phase factor, it immediately derives the magnetic field that radiates on the dipole antenna.

$$\boldsymbol{B}(r,t)=\frac{\mu_0\omega Q_m l\sin(\omega t-\omega r/c_0+\varphi_2)}{4\pi r^2}\boldsymbol{e}_\varphi \quad (15)$$

So, we call (13) and (14) the dipole antenna radiation equation. In the formula, $l=\frac{\lambda}{2}=\frac{f}{2c_0}$ is the length of half-wave dipole, C is the capacity of the half-wave dipole, $Q_\mathrm{m}=C\cdot V(t)$ is the time variable charge on the half-wave dipole.

4.2. The generation principle of the signal on reception antenna

According to the above radiation equation, it can know, reception antenna not only receives time variable electric field, but also receives time variable magnetic field. We used to point out[1], radiation field has very strong direction character, at the very front of the transmitting antenna, the reception is best. See figure ten, the metal electrons on the reception antenna are forced by Lorentz electric force $e\boldsymbol{E}$ and General Lorentz magnetic force $e(-\boldsymbol{c}_0)\times\boldsymbol{B}$ (magnetic field moves to the right at speed c_0, it is equivalent to metal electrons moving to the left), drift along the wire to generate current. Because $\boldsymbol{E}$ and $\boldsymbol{B}$ are time variable, the signal current is also time variable. It is linked with the action of two forces here, their resultant force is $F=eE_\theta+ec_0B$, please note, because eE_r is perpendicular to the reception antenna, can't generate signal current. Only $e\boldsymbol{E}_\theta$ and $e\boldsymbol{c}_0\times\boldsymbol{B}$ are parallel to the reception antenna, and can generate signal current, so the complete expression of resultant force is:

$$F_{合}=e\frac{Q_m\sin(\omega t-\omega r/c_0+\varphi_1)l\cdot sin\theta}{4\pi\varepsilon_0 r^3}+ec_0\frac{\mu_0\omega Q_m l\sin(\omega t-\omega r/c_0+\varphi_2)}{4\pi r^2} \quad (16)$$

According to the induced formulas of triangular function, it derives

$$F_{合}=\sqrt{F_E^2+F_B^2+2F_EF_Bcon(\phi_2-\phi_1)}\cdot\sin(\omega t+\phi) \quad (17)$$

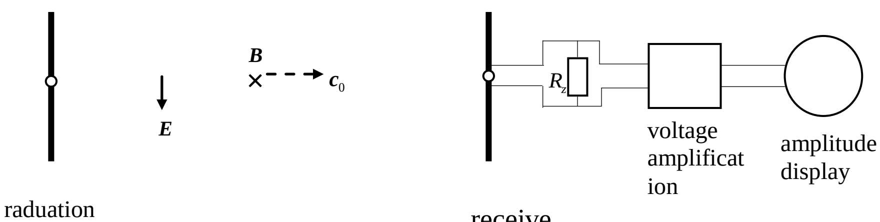


figure 10 reception mechanism

in the formula

$$\phi = arct\frac{k_E \sin\phi_1 + k_M \sin\phi_2}{k_E con\phi_1 + k_M con\phi_2} \quad (18)$$

$$F_E = e\frac{Q_m l \cdot sin\theta}{4\pi\varepsilon_0 r^3} \quad (19)$$

$$F_B = ec_0\frac{\mu_0\omega Q_m l}{4\pi r^2} \quad (20)$$

$$\phi_1 = -\omega r / c_0 + \varphi_1 \quad (21)$$

$$\phi_2 = -\omega r / c_0 + \varphi_2 \quad (22)$$

Formula (17) is the General Lorentz magnetic force acting on the reception antenna, metal electrons generate signal current under General Lorentz magnetic force. Please not, the first term in formula (16) is because two time variable charges sources are not at the center of the sphere (positive and negative electric field counteract a portion, so there comes out $1/r^3$ factor), see the explanation of formula (5).

Now let's research "inverse distance square theorem". See formula (16) and formula (17), F_E is the amplitude of Lorentz electric field force, F_B is the amplitude of Lorentz magnetic force, which is

$$F_E = e\frac{Q_m l \cdot sin\theta}{4\pi\varepsilon_0 r^3} \quad (23)$$

$$F_B = ec_0\frac{\mu_0\omega Q_m l}{4\pi r^2} \quad (24)$$

In the formula ε_0 and μ_0 are the dielectric rate and permeability in the vacuum, θ is the angle θ in the spherical coordination, as for the figure ten, because $\sin\theta \to 1$, so, suppose $\omega = 2\pi \times (10^8 Hz)$ (meter wave category), it derives

$$F_E = 9\times10^9 \cdot \frac{eQ_m l}{4\pi r^3} \quad \text{(Newton)} \quad (25)$$

$$F_B = 18.8\times10^9 \frac{eQ_m l}{4\pi r^2} \quad \text{(Newton)} \quad (26)$$

It can already see that F_B is twice as F_E. And then consider the communication receiving station of distance one kilometer (=1000 meters), so F_B is two thousand times as F_E. In other words, the reception antenna in radar and short wave communication is mainly forced by the General Lorentz magnetic force $\boldsymbol{F} = e(-\boldsymbol{V}_B) \times \boldsymbol{B} = e(-\boldsymbol{c}_0) \times \boldsymbol{B}$ to generate signal current, its signal intensity is inversely proportional to distance square. And F_B just satisfies the inverse distance square theorem, which coincides with the engineering practice. So speaking from this sense, the whole free space is mainly filled with magnetic wave, and magnetic wave radiates far distance, electric wave becomes weak fast (because the positive and negative time variable electric field generated by the positive and negative time variable charges counteracts s portion). So the whole free space is filled with magnetic wave. Please note, we can see from the formula (24), the effect when magnetic wave acts on the object is proportional to the frequency, which coincides with the frequency relationship of Planck's quantum hypothesis of the blackbody radiation experiment.

Of course, near the low frequent transmitting antenna, the electric field force also works, but it still obeys inverse distance square theorem, only supplementing the force of F_E, it approximately obeys inverse distance square theorem. So in a certain sense: the whole space is filled with time variable magnetic field. It needs to note "radiation vector field conservation is determined by formula (1) and formula (9), but formula (16) is the approximate result after the radiation positive electric field counteracts negative electric field.

Now that electric wave radiates independently, or the electric wave in the free space can radiate independently, the electric wave that humans observe is not Maxwell's "mutual generation field", but the force that formula (17) determines.

5 Epilogue

Article one and [three] point out that there exists serious defect in Maxwell mutual generation field theory, article [one] and [two] prove General Lorentz magnetic force. This article depends on the independent radiation conclusion in the reference, research the mathematical model of independent radiation field, its conclusion is: the signal intensity generated by the independent radiation field that the reception antenna receives, under General Lorentz magnetic force, obeys "inverse distance square theorem". Such conclusion is very coincident with the engineering practice in radar, communication. However, Maxwell theory can not satisfy such theorem.

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Expecting the references that you published

[1]Disputes Existing in the Physical Natural of Electromagnetic Induction

[2]Verification of General Lorentz Magnetic Force

[3]Experimental Method to Negate Maxwell Theory

[4].Mathematical Model of Independent Radiation Magnetic Field

[5]The Essence of Electric Wave Is not Energy

[6] About the Physical Essence of Michelson-Morley Experiment

[7] Light Velocity Obeys Galileo’s Relativity Principle

[8] Compton’s Scattering Experiment of Roentgen Rays Obeys Newton’s Law

[9] Clock Becoming Slower Is the Necessity of Newton’s Law

[10] Einstein’s Lorentz Transformation Is a Math Game.