The creation of electron

Based on the gap space theory

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[1] Unit system of the expressions

(a) Electromagnetic field and the light velocity

I could not give a lot of expressions that were gotten in the <<Pair production of light velocity **c** with Planck's constant ħ>> the unit dimension. Here, I will reconsider them. Incidentally, the unit dimension system is **[VAMS]**.

<<"The electromagnetic unit is not difficult" Imai Isao, January 2002, KAGAKU, Iwanami co.>>

The expression of light velocity is

$$v_j = \frac{c\omega_j^2 \exp(+\rho_j)\cos\delta_j}{(\sigma_j^2+\omega_j^2)} \quad [m^1 s^{-1}] \qquad \rho_j = \sigma_j \tau \quad \delta_j = \omega_j \tau \qquad [1\text{-}1]$$

The relation between electric field **E** and magnetic field **B** are

$$\frac{\varepsilon_0 E^2}{2} = \frac{B^2}{2\mu_0} \qquad E\ [V^1 m^{-1}] \quad B\ [A^1 m^{-1}] \qquad [1\text{-}2]$$

and

$$\frac{E}{B} = \frac{1}{(\varepsilon_0 \mu_0)^{1/2}} \qquad [V^1 A^{-1}]$$

$$= c \qquad [m^1 s^{-1}] \qquad [1\text{-}3]$$

Here, ε_0 has the dielectric constant and μ_0 has the magnetic permeability.

You should pay attention here that the unit dimension has in the relation

$$[V^1 A^{-1}] \equiv [m^1 s^{-1}] \qquad [1\text{-}4]$$

from **[1-3]**. In the above, find that the ratio of light velocity **c** and Planck's constant ħ is represented as follows

$$\frac{ħ}{c} = 3.51767 \times 10^{-43} \qquad [V^1 A^1 m^{-1} s^3] \equiv [A^2 s^2] \qquad [1\text{-}5]$$

It has the unit dimension of the electric charge squared.

I have any other important things. Get

Case **A**	Condition	$w_j \tau = 48.87668$ $\theta_j = 4.21671 \times 10^{-7}$ $\delta_j = 0.00001312066853 \frac{\pi}{2}$
	Solution	$Q_R = 3.21814 \times 10^{-14}$ $Q_I = 1.7487 \times 10^{-13}$

set same condition with **Case④** on the **<<**Pair production of light velocity **c** with Planck's constant **ħ>>** in the complex function

$$Q_j = \frac{Q\omega_j^2 \exp(-i\rho_j)\cos\delta_j}{(\sigma_j^2+\omega_j^2)} \qquad [1\text{-}6]$$

that is find from [1-1]. Q_R is a solution in the real space and Q_I is in the imaginary space **(CaseA)**.

Absolute value $|Q_j|$ of Q_j is

$$|Q_j| = 1.77807 \times 10^{-13} \qquad [1\text{-}7]$$

Here, I consider product **c** by **ħ**.

$$c\hbar = 3.16153 \times 10^{-26} \qquad [V^1A^1m^1s^1] \equiv [V^2s^2] \qquad [1\text{-}8]$$

has the unit dimension of the magnetic charge (the magnetic flux) squared. The square root of **cħ** is

$$(c\hbar)^{1/2} = 1.77807 \times 10^{-13} \qquad [V^1s^1] \qquad [1\text{-}9]$$

You pay attention to **[1-7]** and **[1-9]** are the same value. Now, Q_j may have the unit dimension of the magnetic charge. If accept here, I can give all expressions the unit dimension. I will collect expressions that are true. This is valuable work for us.

(b) Expressions

I gave many expressions of the <<Pair production of light velocity **c** with Planck's constant ħ>> the symbol in expedient. Here, correct them to the general symbol on the physical, as follows.

$f(\theta_j) = \pm R\omega_j \exp(\pm\rho_j)\cos\delta_j$	Elementary-function	[1-10]

$a_j = c\omega_j \exp(+\rho_j)\cos\delta_j$	$[m^1s^{-2}]$	Acceleration
$1/C_j = \lvert a_j \rvert$	$[V^1A^{-1}s^{-1}]$	C_j ; Capacity
$M_j = ħ\omega_j \exp(-\rho_j)\cos\delta_j$	$[A^2m^1]$	Moment of force
$\ddot{E}_j = \lvert M_j \rvert$	$[V^1A^1s^1]$	Energy
$V_{-j} = V\omega_j \exp(-i\rho_j)\cos\delta_j$	$[V^1]$	Electric potential
$V_{+j} = V\omega_j \exp(+i\rho_j)\cos\delta_j$		[1-11]

$v_j = \dfrac{c\omega_j^2 \exp(+\rho_j)\cos\delta_j}{(\sigma_j^2+\omega_j^2)}$	$[m^1s^{-1}]$	(Light)Velocity
$\Omega_j = \lvert v_j \rvert$	$[V^1A^{-1}]$	Resistance
$H_j = \dfrac{ħ\omega_j^2 \exp(-\rho_j)\cos\delta_j}{(\sigma_j^2+\omega_j^2)}$	$[V^1A^1s^2]$	Angular momentum Planck's constant
$\lvert H_j \rvert$	$[A^2m^1s^1]$	
$Q_{-j} = \dfrac{Q\omega_j^2 \exp(-i\rho_j)\cos\delta_j}{(\sigma_j^2+\omega_j^2)}$	$[V^1s^1] = [A^1m^1]$	Magnetic chage(flux)
$Q_{+j} = \dfrac{Q\omega_j^2 \exp(+i\rho_j)\cos\delta_j}{(\sigma_j^2-\omega_j^2)}$		(Magnetic radius ratio) [1-12]

$r_j = \frac{c\omega_j^3 \exp(+\rho_j)\cos\delta_j}{(\sigma_j^2+\omega_j^2)^2}$	$[m^1]$	Length
$L_j = \lvert r_j \rvert$	$[V^1A^{-1}s^1]$	Inductance
$I_j = \frac{\hbar\,\omega_j^3 \exp(-\rho_j)\cos\delta_j}{(\sigma_j^2+\omega_j^2)^2}$	$[V^1A^1s^3]$	Moment of inertia
$\lvert I_j \rvert$	$[A^2m^1s^2]$	
$U_{-j} = \frac{U\omega_j^3 \exp(-i\rho_j)\cos\delta_j}{(\sigma_j^2+\omega_j^2)^2}$	$[V^1s^2] = [A^1m^1s^1]$	Electric moment
$U_{+j} = \frac{U\omega_j^3 \exp(+i\rho_j)\cos\delta_j}{(\sigma_j^2-\omega_j^2)^2}$		[1-13]

I am careful in the existence of singularity (in case of $\theta_j = \pi/4$) in Q_{+j} and U_{+j}.

Also, the < magnetic radius ratio > means ratio with magnetic moment μ_e and radius of electron r_e. I explain this detail to you later.

Moreover, I can get the high-order integration. I write them down according to need.

[2] Electric charge

(a) Theoretical expression of the electronic charge

Now, I got that find the expression of the electric charge theoretically. However, there are the many forms. $(\hbar/c)^{1/2}$ is one of form that already I got it in chapter **[1]**. But, my goal is to get the experiment value of the electric charge. Here, I will make it

$$e = 1.60217 \times 10^{-19} \qquad [A^1 s^1] \qquad [2\text{-}1]$$

The expression of electric charge q_j is represented as

$$q_j = A_j t_j \qquad [2\text{-}2]$$

in electric current A_j and time t_j.

I make electric current A_j

$$A_j = \frac{M_j}{Q_{-j}} \qquad [A^1] \qquad [2\text{-}3]$$

M_j ; Moment of force

Q_{-j} ; Magnetic charge

By the way, A_j is useless in this form. Because I understand what "w_j" that has the infinity mathematically and does not determine physically comes out on M_j. The detail of this expression is

$$\begin{aligned} M_j &= \hbar\, \omega_j \exp(-\rho_j) \cos\delta_j \\ &= \hbar\, w_j \sin\theta_j \exp(-w_j \tau \cos\theta_j) \cos(w_j \tau \sin\theta_j \end{aligned} \qquad [2\text{-}4]$$

$$\rho_j = \sigma_j \tau = w_j \tau \cos\theta_j \qquad \delta_j = \omega_j \tau = w_j \tau \sin\theta_j$$

However, the expression that I need is q_j. As **[2-2]**, I get q_j by product A_j by t_j. Therefore, I will make

$$t_j = \tau \sin\theta_j \qquad [2\text{-}5]$$

By this expression, both of w_j and t_j that unsettled independently and have the time dimension are woven.

$$48.87668 \leqq w_j \tau \leqq 48.901915 \qquad [2\text{-}6]$$

I had already gotten this value.

Next, I reassemble expression q_j of the electric charge. Now, can get

$$q_j = \frac{M_j \tau \sin \theta_j}{Q_j}$$

$$= \frac{[e]\, w_j \tau \exp(-\rho_j)}{\cos \rho_j - i \sin \rho_j} \quad [e]\ ; \begin{matrix}\text{Symbol of the} \\ \text{electric charge}\end{matrix} \qquad [2\text{-}7]$$

by expressions [2-2], [2-3]. Get [e] by the combination of ħ with Q that is mere symbol.

By the way, we already discussed that the imaginary part does not occur in the real space, you can see [Sheet1] and [Graph2]. I consider it, the expression of the electric charge is

$$q_j = \frac{[e]\, w_j \tau \exp(-w_j \tau \cos \theta_j)}{\cos(w_j \tau \cos \theta_j)} \qquad [2\text{-}8]$$

Then,

$$q_k = \frac{ħ_k \tau \sin \theta_k}{U_k} \qquad [2\text{-}9]$$

is the form of the electric charge to similar [2-8]. You must pay attention that do not lose sight of the essence of electron, however

$$q_j = \frac{w_j \tau M_j}{V_j} \qquad [2\text{-}10]$$

$$= \frac{w_j \tau ħ_j}{Q_j} \qquad [2\text{-}11]$$

$$= \frac{w_j \tau l_j}{U_j} \qquad [2\text{-}12]$$

are same forms.

(b) Value of the electric charge

I need microcomputer and calculation software at least to find the value of the electric charge. I have results of many computations on another problem.

I should do now is to find the value of "$w_j \tau$" in each condition.

For example, the value of "$w_j \tau$" depends on the each case that "$\omega_j \tau$" is $\pi/4$ or $\pi/3$. The method that we search "$w_j \tau$" for

$$\frac{\hbar_j}{v_j} \equiv \frac{\hbar}{c} \qquad [2\text{-}13]$$

is formed. After that, I should substitute the value for [2-8]. In four cases, the results are as follows ([CaseA], [CaseB], [CaseC], [CaseD]).

CaseA	ConditionA	$\omega_1 \tau = 0.00001321066853\,\pi/2$	$[rad^1]$
		$w_1 \tau = 48.87668$	$[rad^1]$
		$\theta_1 = 4.21671 \times 10^{-7}$	$[rad^1]$
	SolutionA	$q_1 = 1.60167 \times 10^{-19}$	$[A^1 s^1]$
CaseB	ConditionB	$\omega_2 \tau = \Theta(0.955316618)$	$[rad^1]$
		$w_2 \tau = 48.886015$	$[rad^1]$
		$\theta_2 = 0.01954296$	$[rad^1]$
	SolutionB	$q_2 = 1.60198 \times 10^{-19}$	$[A^1 s^1]$
CaseC	ConditionC	$\omega_3 \tau = 1.23788593$	$[rad^1]$
		$w_3 \tau = 48.892354$	$[rad^1]$
		$\theta_3 = 0.02532135$	$[rad^1]$
	SolutionC	$q_3 = 1.60217 \times 10^{-19}$	$[A^1 s^1]$
CaseD	ConditionD	$\omega_4 \tau = 0.999999999890292\,\pi/2$	$[rad^1]$
		$w_4 \tau = 48.901915$	$[rad^1]$
		$\theta_4 = 0.032126893$	$[rad^1]$
	SolutionD	$q_4 = 1.60249 \times 10^{-19}$	$[A^1 s^1]$

Also, I list their details in [Sheet2].

(c) Fractional charge

I should catch real electric charge q_j that is the scalar of vector **P** in three-dimensional space **[Fig.3]**. Below, I replace **P** in **[Fig.3]** with **q**.

q is

$$\mathbf{q} = (q_x , q_y , q_z) \qquad [2\text{-}14]$$

$$| \mathbf{q} | = q_j$$

$$= (q_x^2 + q_y^2 + q_z^2)^{1/2} \qquad [2\text{-}15]$$

because it is composed by three dimensional axes of **x**, **y** and **z**.

I can calculate only one element of **[2-14]**. However, this method does not get to have resolved it into each element. Actually, I can understand that the value of each element exists mathematically but it is impossible for me to take it out in mathematically and physically then consider about scalar **|q|** in expression **[2-15]**.

It is the reason why the fractional charge does not exist in nature.

I discuss below the purpose of the comparison between existent theory and this theory.

The fractional charge of the quark is given in case of angle δ_k that has

$$\delta_k = \Theta \qquad \Theta = 0.955316618 \ [\mathrm{rad}] \qquad k = x , y , z \qquad [2\text{-}16]$$

between vector **q** and each dimension. The baryon has the electric charge and each

$$q_k^2 = q \cos^2 \delta_k$$

$$= \frac{1}{3} \qquad [2\text{-}17]$$

is distributed three quarks respectively. In case of the expression that electric charge q_j is

$$q_j = (q_x^2 + q^{*}{}_x^2)^{1/2} \qquad [2\text{-}18]$$

$$q^*_x = q \sin \delta_x$$
$$= (q \cos \delta_y , q \cos \delta_z)$$
$$q^{*2}_x = \frac{2}{3}$$

it is equivalent to the electric charge distribution as the meson that is composed by two quarks. In other words, one quark has **1/3** electric charge and another one has **2/3** electric charges.

The cube is one representative that angle Θ is stable. Vector **P** has a diagonal line which on a vertex **(0,0,0)** and **(1,1,1)** as the scalar. Therefore, **t**his vector **P** is not possible to move when the cube sides are stable. If vector **P** is the same as vector **q**, it is guaranteed that the electric charge is stable **(**The proof omission**)**.

I can describe the "quark confinement" in the reason that is the same as the process that the fractional electric charge does not exist in nature.

You refer to the **<<**Pair production of light velocity **c** with Planck's constant $\hbar$**>>**.

(d) Fine-structure constant

I get

$$\beta = \frac{(\hbar / c)}{q_j^2}$$

$$= 1.37036 \times 10^{-5} \qquad [\text{dimensionless}] \qquad [2\text{-}19]$$

from **[1-5].** This mean is fine-structure constant α, and get

$$\frac{1}{\alpha} = 4\pi \varepsilon_0 c^2 \beta$$

$$= 137.036 \qquad [\text{dimensionless}] \qquad [2\text{-}20]$$

if I accept

$$4\pi \varepsilon_0 c^2 = 1 \times 10^7 \qquad [\text{dimensionless}]$$

[3] Electronic mass

(a) Consider of existent mass expression

I know that a lot of pioneers got a lot of expressions include electronic mass m_e. I take some expressions out from them.

① The relation between m_e and the radius of electron

The expression that classical radius of electron r_e is as follows.

$$r_q = \frac{e^2}{m_e}$$

$$= 2.81794092 \times 10^{-8} \quad [m^1] \qquad [3\text{-}1]$$

$$r_e = \frac{r_q}{4\pi \varepsilon_0 c^2}$$

$$= 2.81794092 \times 10^{-15} \quad [m^1] \qquad [3\text{-}2]$$

② The relation between m_e and the magnetic moment

Bohr magneton μ_b is as follows.

$$\mu_b = \frac{\hbar e}{2m_e}$$

$$= 9.2740154 \times 10^{-24} \quad [A^1m^2] \ (= [V^1m^1s^1]) \qquad [3\text{-}3]$$

Experiment value μ_e of the magnetic moment is as follows.

$$\mu_e = \frac{g'\hbar e}{2m_e}$$

$$= 9.2847701 \times 10^{-24} \quad [A^1m^2] \qquad [3\text{-}4]$$

Here, g' is gotten from the g-factor, as follows.

$$g' = \frac{g}{2}$$

$$= 1.00115965226 \qquad [3\text{-}5]$$

③ The relation between m_e and the electric current

I get

$$m_e = \frac{A_j q_j}{v_j} \qquad [3\text{-}6]$$

from [2-3]. This [3-6] is composed by velocity v_j, electric current A_j and electron q_j.

By the way, I cannot get the value of m_e use these expressions. So, they have a big problem. It is that I do not decide the value one set of $\omega\tau$, must decide the value of isolated ω or τ that are in these expressions. However, I cannot find the logical limitation which decides the value of isolated ω or τ.

The ratio of electron radius r_q and Bohr magneton μ_b is as follows.

$$\frac{\mu_b}{r_q} = \frac{\Phi_e}{2}$$

$$= 3.29106 \times 10^{-16} \quad [V^1 s^1] \qquad [3\text{-}7]$$

$$\Phi_e = \frac{\hbar}{q_j}$$

$$= 6.58212 \times 10^{-16} \quad [V^1 s^1] \qquad [3\text{-}8]$$

Φ_e is the physical quantity which is called the magnetic charge or the magnetic flux. Also, the < magnetic radius ratio > that was found before is this Φ_e. This one has the unit dimension which is the same as Q_j. Unfortunately, this discussion does not develop any more. However, we have the harvest that magnetic charge Φ_e has the possibility to exist as the physical substance.

Now, I replace symbol m_e with electronic mass to m_q, so electric charge q_j

has width was gotten in chapter **[2].**

By the way, does some hint go out of electric current A_j? Actually,

$$\frac{A_j}{c} = 5.68566 \times 10^{-12} \qquad [A^1 m^1 s^{-1}] = [V^1] \qquad [3\text{-}9]$$

$$(v_j = c)$$

is gotten as the expectation value, but it is not a logical answer because the value of ω or τ does not decided. I state that this expectation value is gotten as the ratio of the expression to enumerate by the following to the end of this section.

$$\frac{A_j}{c} = \frac{m_q}{q_j} = \frac{q_j}{r_q} = \frac{\hbar}{2\mu_b} \qquad [V^1] \qquad [3\text{-}10]$$

(b) Electronic mass

I understood that electronic mass could not be gotten from existent theory. Will seek electronic mass while search for the answer of "why does it so".

Now, I reconsider about all value solutions that were gotten.

I am convinced that all value in addition to light velocity c, Planck's constant $\hbar$ and electric charge q_j that finds them out has contents. Also I believe what a lot of singularities that are expressed in the place around q_j have a meaning. For example, the expression

$$Q_{+j} = \frac{Q\omega_j^2 \exp(+i\rho_j)\cos\delta_j}{(\sigma_j^2 - \omega_j^2)} \qquad [V^1 s^1] \qquad [1\text{-}12]$$

has a solution of smooth vibration but I know that it has a singularity to the point of $\theta = \pi/4$. In the near future, you can make the physical meaning of it clear.

I state that the value in this paper is all of them in the physics. Actually, I can find electronic mass m_q out under the firm conviction.

I state repeatedly that the electric charge on this theory has the width of

$$1.60167\times10^{-19} \leqq q_j \leqq 1.60249\times10^{-19} \qquad [3\text{-}11]$$

$$\Delta q = 8.2\times10^{-23} \qquad [3\text{-}12]$$

It has cause to two kinds that

$$48.87668 \leqq w_j \tau \leqq 48.901915 \qquad [3\text{-}13]$$

$$\Delta w\tau = 0.025235 \qquad [3\text{-}14]$$

also

$$0 \leqq \theta_j \leqq 0.032126893 \qquad [3\text{-}15]$$

$$\Delta\theta = 0.032126893 \qquad [3\text{-}16]$$

in the fluctuation width of micro angle. The direct cause that electric charge q_j has width is in

$$\Delta\omega\tau = \Delta w\tau \cdot \sin\Delta\theta \qquad [3\text{-}17]$$

$$\simeq \Delta w\tau \cdot \Delta\theta \qquad [3\text{-}18]$$

which is composed by $\Delta w\tau$ and $\Delta\theta$. This $\Delta\omega\tau$ is the curvature angle in the space accompanies electric charge q_j which I pictured in **[Fig.6]** or the motion of precession angle ϕ. Yes, I should say that electric charge q_j is born by the effect that the motion of precession angle

$$\phi = \Delta\omega\tau \qquad \textbf{[Fig.11]} \qquad [3\text{-}19]$$

appears by the space has the curvature.

In this way, I can not find electric mass m_q out by ignore the motion of precession angle ϕ. As I considered in **[3]-(a)**, this is the biggest reason that cannot get electron mass m_e from all existent expressions.

By the way, I define Δq from another point before make a mass function. It will be

$$\Delta q = \int_{j=1}^{n} A_j \, d\tau$$

$$= \max{:}q - \min{:}q \qquad [3\text{-}20]$$

from the relation between electric charge q_j and electric current A_j.

A_j is impossible to calculation in case of [j=0] that has $\theta = 0$ (reference to **[Sheet2]**). So, I delete the case of j=0. Case [j=1] has condition [$a \simeq 0$, $\theta < a$, $\theta \neq 0$]. So, I do not need to make fix

$$\theta = 1.77807 \times 10^{-13} \qquad [3\text{-}21]$$

on it. Case [j=n] is last one.

Let's see **[Fig.10]**. Expression [3-18] is a base under the existence area of electric charge q_j. Then, I understand that Δq is fluctuation range of the electric charge in the micro fluctuation angle, i.e. the motion of precession angle ϕ.

Then, I bring in fine-structure constant β to here that the condition to get electronic mass m_q assembles.

Therefore, I get

$$m^*_q = \Delta q \cdot \beta \cdot \Delta w\tau \cdot \Delta\theta \qquad [3\text{-}22]$$

$$= 9.1100458\times10^{-31} \qquad [3\text{-}23]$$

from the interesting mass function.

The mass function that I can be logically satisfied is as follows.

$$m_q = \Delta q \cdot \beta \cdot \sin\Delta\omega\tau \qquad [3\text{-}24]$$

$$= 9.1084777\times10^{-31} \qquad [3\text{-}25]$$

Incidentally, I must make

$$\sin\Delta\omega\tau \cdot \cdot \cdot > [V^1m^{-2}s^2]$$

to adjust the unit dimension.

The electronic mass that was gotten from the experiment is

$$m_e = 9.1093897\times10^{-31} \qquad [V^1A^1m^{-2}s^3] \qquad [3\text{-}26]$$

$$m_e \simeq m_q \simeq m^*_q$$

What is the cause of the difference of these solutions? I think that the curvature of the space has this cause, too.

Therefore, I want to pursue the curvature of the space to confirm right with mass function m_q that was gotten here.

(c) g-factor

I already describe that the image of the motion of precession has been pictured in **[Fig.11]** ⓐ, ⓑ and ⓒ. Let's discuss while we look this sometimes.

Moment of force M is composed by moment of inertia I with angular acceleration α, as follows.

$$M = I\alpha \qquad (I = mr^2) \qquad [3\text{-}27]$$

Magnetic moment μ is composed as follows by magnetic field H with M.

$$\mu = \frac{M}{H} \qquad [3\text{-}28]$$

By the way, we discussed that the motion of precession and mass do not exist if the space does not have curvature Φ. This mean is that the "arm" does not exist which produces M. In other words, the space does not have measurement of the length, as the result it connects with that the space itself does not exist.

As you know, get the magnetic moment of electron μ_b from the point that electronic mass is known. As for this, curvature Φ in the space does not considered. In this case, the theoretical value should

$$\mu_b = 0 \qquad (\therefore\ \Phi = 0) \qquad [3\text{-}29]$$

However, I dare try for the contradiction that cannot ignore the existence of the value. Then, I can understand that α in **[3-27]** is

$$\alpha = g'a$$

$$= a \qquad (\therefore\ g' = 1) \qquad [3\text{-}30]$$

After all, I need the operation that finds the g-factor

$$g' = 1.00115965226 \qquad [3\text{-}5]$$

to make μ_b coincide with μ_e.

How do I get the value that is equivalent to the g-factor from the gap

space theory **?**

I make vector **P** that has the angle is the inclination axis of electron Θ on **[Fig.11]**ⓐ**.**

$$\omega_j \tau = \Theta$$

$$= 0.955316618 \quad [\text{rad}] \qquad [3\text{-}31]$$

Then, I must make the inclination angle of **P**

$$ⓑ \quad \delta_a = \Theta + \phi$$

$$ⓒ \quad \delta_b = \Theta - \phi \qquad [3\text{-}32]$$

on **[Fig.11]** ⓑ**,** ⓒ that I consider the motion of precession angle ϕ**.** Incidentally, I get

$$\phi = 8.1058268 \times 10^{-4} \qquad [3\text{-}33]$$

from **[3-19].**

Here, I take the cosine ratio of **P'** in ⓑ**,** ⓒ to vector **P** in space ⓐ, get the ratio of ⓑ in the "opened space" and ⓒ in the "closed space"**.**

Opend space	$g'_a = \dfrac{\cos\Theta}{\cos(\Theta+\phi)}$	
	$= 1.001148$	[3-34]
Closed space	$g'_b = \dfrac{\cos(\Theta-\phi)}{\cos\Theta}$	
	$= 1.001146$	[3-35]

By the way, the value of ratios g'_a, g'_b does not concord **g'.** I can estimate them**.** As I got solutions **[3-34]** and **[3-35]**, I can understand what only compare cosine ingredient **o-a**, **o-b** of **P** and **P'** that has a curvature is insufficient**.** Therefore, I make **o-c** as the cosine ingredient of **P'** on dimension r_j that is dimension x_j have a curvature and work in the comparison with **o-a**, pictured them in **[Fig.12].** However, cannot pursue only

$$\overset{\frown}{PP'} = \phi$$

$$\frac{\phi}{\sin\phi} = 1.000000232 \qquad [3\text{-}36]$$

in my current. In this reason, I do not find the logical limitation that determines space curvature Φ.

However, I can expect that error **k** has

$$k = \frac{\overset{\frown}{oc}}{\overline{ob}}$$

$$= 1.000011657 \quad (= 1.00001363\ ) \qquad [3\text{-}37]$$

from the existence of solution **[3-36].**

Directionality in the future

In the above, light velocity **c**, Planck's constant $\hbar$, electric charge **q**, electronic mass m_q and all physical quantity to have gotten from the gap space theory are found by the space which has curvature Φ.

After all, space curvature Φ is the principle of the force and invents gravitation. Yes, space curvature Φ is gravitation itself.

I do not find how much value the cosmological term of the general relativity. However, I look forward to the gap space theory do not contradict to it.

If the gap space theory is right, we have the following propositions.

① The "generalization of mass" and the "theoretical evidence with experiment value".

② "Unification of the interaction" and " Theoretical prove the force exists"

③ "Find the gravitational constant"

Already, we got the way that we should advance on discussed ①, ② in the << Pair production of light velocity **c** with Planck's constant $\hbar$ >>. We will be able to solve ③ in the near future.

[VAMS] unit system

Physical quantity	Unit	Power of Dimention							
		[VAMS] unit system				[SI] unit system			
		V	A	m	s	A	Kg	m	s
Length	m	0	0	1	0	0	0	1	0
Time	s	0	0	0	1	0	0	0	1
Mass	Kg	1	1	-2	3	0	1	0	0
Momentum	N・s	1	1	-1	2	0	1	1	-1
Force	N	1	1	-1	1	0	1	1	-2
Energy	J	1	1	0	1	0	1	2	-2
Angular momentum	J・s	1	1	0	2	0	1	2	-1
Power	P	1	1	0	0	0	1	2	-3
Electric charge, Electric flux	C	0	1	0	1	1	0	0	1
Magnetic flux, Magnetic charge	wb	1	0	0	1	-1	1	2	-2
Electric potential, Magnetic current	V	1	0	0	0	-1	1	2	-3
Electric current, Magnetic potential	A	0	1	0	0	1	0	0	0
Electric current density	A/Am^2	0	1	-2	0	1	0	-2	0
Density of electric charge	C/m^3	0	1	-3	1	1	0	-3	1
Electric displacement	C/m^2	0	1	-2	1	1	0	-2	1
Flux density	T	1	0	-2	1	-1	1	0	-2
Electric field	V/m	1	0	-1	0	-1	1	1	-3
Magnetic field	A/m	0	1	-1	0	1	0	-1	0
Dielectric constant	F/m	-1	1	-1	1	2	-1	-3	4
Magnetic permeability	H/m	1	-1	-1	1	-2	1	1	-2
Electric resistance	Ω	1	-1	0	0	-2	1	2	-3
Conductance	S	-1	1	0	0	2	-1	-2	3
Electric conductivity	1/(Ω・m)	-1	1	-1	0	2	-1	-3	3
Electric capacity	F	-1	1	0	1	2	-1	-2	4
Inductance	H	1	-1	0	1	-2	1	2	-2
Electric moment	C・m	0	1	1	1	1	0	1	1
Magnetic moment	Wb・m	1	0	1	1	-1	1	3	-2
Electric polarization	C/m^2	0	1	-2	1	1	0	-2	1
Magnetic polarization	Wb/m^2	1	0	-2	1	-1	1	0	-2

[VAMS] 単位系

物理量	単位	基本単位ベキ							
		[VAMS]単位系				[SI]単位系			
		V	A	m	s	A	Kg	m	s
長さ	m	0	0	1	0	0	0	1	0
時間	s	0	0	0	1	0	0	0	1
質量	Kg	1	1	-2	3	0	1	0	0
運動量	N・s	1	1	-1	2	0	1	1	-1
力	N	1	1	-1	1	0	1	1	-2
エネルギー	J	1	1	0	1	0	1	2	-2
角運動量	J・s	1	1	0	2	0	1	2	-1
仕事率	P	1	1	0	0	0	1	2	-3
電荷、電束	C	0	1	0	1	1	0	0	1
磁束、磁荷	wb	1	0	0	1	-1	1	2	-2
電位、磁流	V	1	0	0	0	-1	1	2	-3
電流、磁位	A	0	1	0	0	1	0	0	0
電流密度	A/Am^2	0	1	-2	0	1	0	-2	0
電荷密度	C/m^3	0	1	-3	1	1	0	-3	1
電束密度	C/m^2	0	1	-2	1	1	0	-2	1
磁束密度	T	1	0	-2	1	-1	1	0	-2
電場	V/m	1	0	-1	0	-1	1	1	-3
磁場	A/m	0	1	-1	0	1	0	-1	0
誘電率	F/m	-1	1	-1	1	2	-1	-3	4
透磁率	H/m	1	-1	-1	1	-2	1	1	-2
電気抵抗	Ω	1	-1	0	0	-2	1	2	-3
コンダクタンス	S	-1	1	0	0	2	-1	-2	3
電気伝導度	1/(Ω・m)	-1	1	-1	0	2	-1	-3	3
電気容量	F	-1	1	0	1	2	-1	-2	4
インダクタンス	H	1	-1	0	1	-2	1	2	-2
電気モーメント	C・m	0	1	1	1	1	0	1	1
磁気モーメント	Wb・m	1	0	1	1	-1	1	3	-2
電気分極	C/m^2	0	1	-2	1	1	0	-2	1
磁気分極	Wb/m^2	1	0	-2	1	-1	1	0	-2

GAPS T. Sheet 1 (ω τ = Θ e)		θ	[real part] $R\,\omega\exp(\pm i\rho)\cos\delta =$	[imaginary part] $R\,\omega\exp(\pm i\rho)\cos\delta =$	$c\,\omega\exp(+\rho)\cos\delta =$	$\hbar\,\omega\exp(-\rho)\cos\delta =$	$\hbar / c$
w τ = ω τ / sin θ	value of [w τ]	θ = asin(ω τ / w τ)	R wsin θ cos(w τ cos θ)cos(w τ sin θ)	i R wsin θ sin(w τ cos θ)cos(w τ sin θ)	cwsin θ exp(w τ cos θ)cos(w τ sin θ)	ħ wsin θ exp(-w τ cos θ)cos(w τ sin θ)	
0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
0.001	0.001	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0.001001	0.001001	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0.001005	0.001005	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0.00101	0.00101	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0.00102	0.00102	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0.00105	0.00105	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0.0011	0.0011	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0.0012	0.0012	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0.0015	0.0015	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0.002	0.002	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0.003	0.003	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0.004	0.004	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0.005	0.005	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0.01	0.01	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0.05	0.05	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
π /32	0.09817477	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
π /16	0.196349541	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
π /8	0.392699082	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
π /4	0.785398163	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
Θ	0.955316618	1.570796327	0.577350269	3.37867E-17	0.577350269	0.577350269	1
Θ '	0.955316618	1.570796285	0.577350269	2.32462E-08	0.577350292	0.577350246	0.999999919
	0.96	1.471978367	0.571958749	0.054333298	0.63160841	0.522616408	0.82743738
	0.97	1.396578918	0.560592186	0.095154844	0.672722699	0.480611169	0.714426865
	0.98	1.345880466	0.549419179	0.122032563	0.700296097	0.452313503	0.645888938
	0.99	1.305314832	0.538434371	0.143091124	0.722369803	0.429678317	0.594817661
1	1	1.270729093	0.527632619	0.16066663	0.741237521	0.410408187	0.553679725
π /3	1.047197551	1.148768441	0.478978107	0.219057481	0.808809151	0.342981044	0.424056829
	1.07	1.103566123	0.456755146	0.238921505	0.834658096	0.318344422	0.381406978
	1.1	1.052106942	0.42868808	0.260076352	0.865011729	0.290647133	0.33600369
	1.12	1.021632472	0.41067342	0.271774998	0.883612936	0.274457624	0.310608427
	1.15	0.980382018	0.384633258	0.286502499	0.909764489	0.252841727	0.277919978
B	1.170019129	0.955316618	0.36787825	0.294767392	0.926327125	0.239896054	0.258975526
	1.27	0.851421497	0.290900989	0.3224704	1.002789845	0.188085814	0.187562544
	1.351	0.785414239	0.235716287	0.333331452	1.061223242	0.157056516	0.147995737
	1.37	0.771639616	0.223593362	0.334794073	1.074809295	0.150799834	0.140303805
	1.47	0.70742029	0.164395223	0.337273614	1.146804193	0.122757905	0.107043474
	1.52	0.679620352	0.1374606	0.335819001	1.183580736	0.11124701	0.093991906
π /2	1.570796327	0.653757546	0.11174974	0.332871812	1.221773346	0.100912046	0.082594735
	1.6	0.639847215	0.097680322	0.330591236	1.244180345	0.095510278	0.076765622
	1.67	0.608997992	0.065946825	0.323619909	1.29943283	0.083943415	0.064600042
	1.77	0.570112671	0.025131944	0.310596354	1.38272882	0.070224695	0.050787034
	1.87	0.536190121	-0.010842846	0.294748388	1.471981573	0.059100047	0.040149991
	1.97	0.506285747	-0.042412154	0.276744742	1.568021604	0.049990665	0.031881363
2 π /3	2.094395102	0.473641685	-0.076069727	0.2521209	1.698161648	0.040839193	0.024049061
3 π /4	2.35619449	0.417469923	-0.128879952	0.195413014	2.017325515	0.027162839	0.013464777
	2.3859	0.411954356	-0.133470697	0.188748189	2.057930171	0.025967988	0.012618498
	2.4	0.409388671	-0.135556398	0.185576642	2.077545318	0.025421456	0.012236294
	2.5	0.392096497	-0.148677051	0.16299916	2.223239969	0.021893089	0.00984738
	2.6	0.376243647	-0.158999886	0.140429725	2.381197626	0.018898671	0.007936624
	2.7	0.361653193	-0.166702249	0.118068284	2.55250487	0.016348552	0.006404905
7 π /8	2.748893572	0.354933152	-0.169565878	0.107265607	2.641474223	0.01524092	0.005769854
15 π /16	2.945243113	0.330334194	-0.175553741	0.065195922	3.036773569	0.011548317	0.003802825
31 π /32	3.043417883	0.319293633	-0.175504095	0.045187092	3.259571628	0.010076036	0.003091215
π	3.141592654	0.308979608	-0.173625234	0.026022873	3.501081834	0.008803825	0.002514601
33 π /32	3.239767424	0.299321533	-0.170065299	0.007807352	3.762925654	0.007702294	0.00204689
17 π /16	3.337942194	0.29025782	-0.164971464	-0.009367861	4.046868465	0.006746782	0.001667161
9 π /8	3.534291735	0.2737039	-0.150766461	-0.040291189	4.688913737	0.005193933	0.001107705
	3.6	0.268583229	-0.144974936	-0.049550558	4.928229168	0.004762966	0.000966466
	3.7	0.261152019	-0.13531384	-0.062541908	5.318510742	0.00417811	0.000785579
	3.8	0.25412552	-0.124762882	-0.074171384	5.742747004	0.003668483	0.000638803
5 π /4	3.926990817	0.245735071	-0.11031313	-0.0869349	6.335236416	0.003113801	0.000491505
4 π /3	4.188790205	0.230089887	-0.077998663	-0.106085326	7.775422869	0.002229832	0.00028678
	4.2068	0.229087204	-0.075697911	-0.107049432	7.886659347	0.002179599	0.000276365
3 π /2	4.71238898	0.204139377	-0.011434267	-0.116483173	11.81448683	0.001159515	9.81435E-05
5 π /3	5.235987756	0.183479772	0.044458789	-0.095496934	18.12924374	0.000612063	3.37611E-05
	5.41281	0.177421162	0.05882824	-0.083200706	20.9901511	0.000494666	2.35666E-05
7 π /4	5.497787144	0.174650375	0.064764713	-0.076616945	22.52863045	0.000446748	1.98302E-05
	5.59	0.171740424	0.070461207	-0.069069013	24.33137442	0.000400113	1.64443E-05
	5.69	0.168692911	0.07574004	-0.060494407	26.45650201	0.000355154	1.34241E-05
	5.79	0.165752166	0.080068211	-0.051608598	28.77464002	0.00031536	1.09596E-05
15 π /8	5.890486225	0.162899082	0.083452559	-0.042462648	31.31654202	0.000279961	8.93971E-06
31 π /16	6.086835766	0.157599577	0.08728783	-0.024325395	36.97543785	0.000222063	6.0057E-06
63 π /32	6.185010537	0.15507758	0.087853732	-0.015297634	40.19088881	0.000197863	4.92308E-06
2 π	6.283185307	0.152635344	0.087548167	-0.006406743	43.69528591	0.000176351	4.03594E-06
2.05 π	6.44026494	0.148884421	0.085325973	0.007341745	49.97031462	0.000146776	2.93726E-06
2.1 π	6.597344573	0.145314075	0.081113154	0.020247931	57.17552186	0.000122243	2.13803E-06
2.15 π	6.754424205	0.141911529	0.075105317	0.032050103	65.45145129	0.000101877	1.55653E-06
2.2 π	6.911503838	0.138665188	0.067528748	0.042523387	74.96018288	8.49567E-05	1.13336E-06
2.25 π	7.068583471	0.135564502	0.058634351	0.051482903	85.88866858	7.0888E-05	8.25348E-07
	7.3013	0.131218223	0.043612115	0.061680836	105.157731	5.42665E-05	5.16049E-07
2.35 π	7.382742736	0.129762463	0.037980578	0.064333574	112.9008143	4.94357E-05	4.37869E-07
2.4 π	7.539822369	0.12704428	0.02678841	0.068070413	129.5205604	4.13154E-05	3.18988E-07
2.45 π	7.696902001	0.124437931	0.015399927	0.069984674	148.643357	3.45459E-05	2.32408E-07
2.5 π	7.853981634	0.121936635	0.004092991	0.070106443	170.6519487	2.8899E-05	1.69345E-07

2.55 π	8.011061267	0.119534151	-0.006867597	0.06850547	195.9882794	2.4186E-05	1.23405E-07
2.6 π	8.168140899	0.117224724	-0.017235414	0.065288152	225.1627324	2.02503E-05	8.99361E-08
2.65 π	8.325220532	0.115003039	-0.026787173	0.060593832	258.7648218	1.6962E-05	6.55498E-08
	8.5232	0.112320287	-0.037363085	0.052835854	308.4878162	1.35747E-05	4.4004E-08
2.75 π	8.639379797	0.110803582	-0.042688954	0.047470097	342.0818142	1.19146E-05	3.48296E-08
2.8 π	8.79645943	0.108817027	-0.04874138	0.039443272	393.4928192	9.99127E-06	2.53912E-08
2.85 π	8.953539063	0.106900585	-0.053386984	0.030734129	452.75944	8.3814E-06	1.85118E-08
2.9 π	9.110618695	0.105050601	-0.056564692	0.021574678	521.0963633	7.03331E-06	1.34971E-08
2.95 π	9.267698328	0.103263671	-0.058249649	0.012199349	599.90784	5.90398E-06	9.84148E-09
3 π	9.424777961	0.10153662	-0.058452584	0.002839608	690.81749	4.95756E-06	7.17636E-09
3.05 π	9.581857593	0.099866482	-0.05721842	-0.006281191	795.7028214	4.16412E-06	5.23326E-09
3.1 π	9.738937226	0.098250487	-0.05462415	-0.014952632	916.7352144	3.4987E-06	3.81648E-09
3.15 π	9.896016859	0.096686037	-0.050776082	-0.022981623	1056.42624	2.94045E-06	2.78339E-09
3.2 π	10.05309649	0.095170704	-0.045806497	-0.030196272	1217.681323	2.47195E-06	2.03005E-09
3.25 π	10.21017612	0.093702205	-0.039869825	-0.036449178	1403.861914	2.07866E-06	1.48067E-09
	10.42394	0.091775182	-0.030549776	-0.04320184	1704.365778	1.64266E-06	9.63794E-10
3.35 π	10.52433539	0.090897275	-0.025798143	-0.045617803	1867.169263	1.47096E-06	7.87801E-10
3.4 π	10.68141502	0.089556938	-0.018043525	-0.048381537	2154.006498	1.23785E-06	5.74674E-10
3.45 π	10.83849465	0.088255606	-0.010073182	-0.049881336	2485.399101	1.04193E-06	4.19221E-10
3.5 π	10.99557429	0.086991598	-0.00208503	-0.050117948	2868.327393	8.77221E-07	3.0583E-10
3.55 π	11.15265392	0.08576333	0.005728269	-0.049121935	3310.872852	7.38711E-07	2.23117E-10
3.6 π	11.30973355	0.084569305	0.01318363	-0.046952135	3822.392817	6.22205E-07	1.62779E-10
3.65 π	11.46681319	0.083408108	0.020111541	-0.043693525	4413.723055	5.24183E-07	1.18762E-10
	11.6503	0.082091486	0.02733358	-0.038654512	5222.417795	4.29168E-07	8.21781E-11
	11.7541	0.081364928	0.030928415	-0.035289067	5744.471506	3.83305E-07	6.67259E-11
3.75 π	11.78097245	0.081178925	0.031795811	-0.034363904	5887.996276	3.72258E-07	6.32231E-11
3.8 π	11.93805208	0.080108476	0.036310738	-0.028567132	6802.310245	3.13798E-07	4.61311E-11
3.85 π	12.09513172	0.079065918	0.039819866	-0.022222649	7859.858653	2.64568E-07	3.36607E-11
3.9 π	12.25221135	0.078050175	0.042264746	-0.01549778	9083.238375	2.23102E-07	2.4562E-11
3.95 π	12.40929098	0.077060226	0.043613746	-0.008564593	10498.63191	1.88168E-07	1.79231E-11
4 π	12.56637061	0.076095097	0.04386212	-0.00159575	12136.37915	1.58732E-07	1.3079E-11
4.05 π	12.72345025	0.075153868	0.043031458	0.005239566	14031.64064	1.33923E-07	9.54436E-12
4.1 π	12.88052988	0.074235659	0.041168533	0.011779541	16225.1672	1.1301E-07	6.9651E-12
4.15 π	13.03760951	0.073339637	0.038343599	0.01787336	18764.1928	9.53779E-08	5.08297E-12
4.2 π	13.19468915	0.072465005	0.034648171	0.0233845	21703.4707	8.05093E-08	3.70951E-12
4.25 π	13.35176878	0.071611007	0.03019237	0.028193609	25106.47578	6.79689E-08	2.70722E-12
	13.55537	0.070533611	0.02349245	0.033221779	30329.12287	5.45872E-08	1.79983E-12
4.35 π	13.66592804	0.069962054	0.019514667	0.035328183	33609.77136	4.84652E-08	1.442E-12
4.4 π	13.82300768	0.069165753	0.013577351	0.037519969	38894.33445	4.09338E-08	1.05244E-12
4.45 π	13.98008731	0.068387389	0.007441626	0.038744527	45015.23128	3.45775E-08	7.6813E-13
4.5 π	14.13716694	0.067626362	0.001260514	0.038993977	52105.53437	2.92122E-08	5.60636E-13
4.55 π	14.29424657	0.066882099	-0.004815281	0.038283976	60319.58666	2.46827E-08	4.09199E-13
4.6 π	14.45132621	0.066154051	-0.010640899	0.036652839	69836.41484	2.08582E-08	2.98672E-13
4.65 π	14.60840584	0.065441695	-0.016080633	0.034160138	80863.69218	1.76285E-08	2.18002E-13
	14.78352	0.064665434	-0.021539352	0.030462884	95233.74315	1.46159E-08	1.53474E-13
4.75 π	14.9225651	0.064062067	-0.025323217	0.026922985	108451.8693	1.25965E-08	1.16148E-13
4.8 π	15.07964474	0.063393853	-0.028925875	0.022385124	125616.5871	1.06499E-08	8.47807E-14
4.85 π	15.23672437	0.062739445	-0.031746363	0.017393306	145512.799	9.00511E-09	6.18853E-14
4.9 π	15.393804	0.062098418	-0.03373241	0.01207798	168577.1774	7.61522E-09	4.51735E-14
4.95 π	15.55088364	0.061470366	-0.034852875	0.006574708	195316.4792	6.44057E-09	3.29751E-14
5 π	15.70796327	0.060854899	-0.035098068	0.001020828	226318.8325	5.4477E-09	2.40709E-14
5.05 π	15.8650429	0.060251641	-0.034479556	-0.004447853	262266.847	4.60837E-09	1.75713E-14
5.1 π	16.02212253	0.059660233	-0.033029465	-0.009700273	303952.8426	3.89877E-09	1.28269E-14
5.15 π	16.17920217	0.05908033	-0.030799316	-0.01461315	352296.54	3.29876E-09	9.36359E-15
5.2 π	16.3362818	0.058511597	-0.02785842	-0.019073779	408365.6119	2.79137E-09	6.83547E-15
5.25 π	16.49336143	0.057953716	-0.024291877	-0.022982522	473399.5587	2.36226E-09	4.98999E-15
	16.69062	0.057268034	-0.019079504	-0.026981238	570000.481	1.91581E-09	3.36107E-15
5.35 π	16.8075207	0.056869289	-0.015686934	-0.028823551	636350.1479	1.69227E-09	2.65934E-15
5.4 π	16.96460033	0.056342161	-0.010875373	-0.030639083	737877.7701	1.43252E-09	1.94141E-15
5.45 π	17.12167996	0.05582472	-0.005886064	-0.031671365	855673.1932	1.21275E-09	1.41731E-15
5.5 π	17.27875959	0.055316702	-0.000843544	-0.03190968	992352.6274	1.02679E-09	1.0347E-15
5.55 π	17.43583923	0.054817851	0.004128629	-0.03136267	1150954.381	8.6942E-10	7.5539E-16
5.6 π	17.59291886	0.054327922	0.008910826	-0.030057788	1335007.153	7.36231E-10	5.51481E-16
5.65 π	17.74999849	0.053846676	0.013390147	-0.0280403	1548609.412	6.23498E-10	4.02618E-16
	17.9197	0.053336256	0.017769775	-0.025131421	1818092.052	5.2107E-10	2.86603E-16
5.75 π	18.06415776	0.05290933	0.021037463	-0.022128875	2084273.557	4.47284E-10	2.14599E-16
5.8 π	18.22123739	0.052452794	0.024035225	-0.018400156	2418288.769	3.78887E-10	1.56676E-16
5.85 π	18.37831702	0.052004074	0.026393292	-0.014284828	2806029.628	3.20974E-10	1.14387E-16
5.9 π	18.53539666	0.051562968	0.028065217	-0.009889643	3256165.65	2.71934E-10	8.35135E-17
5.95 π	18.69247629	0.051129287	0.029021934	-0.005326313	3778769.3	2.30404E-10	6.09732E-17
6 π	18.84955592	0.050702842	0.029252174	-0.000708738	4385543.592	1.95231E-10	4.45168E-17
6.05 π	19.00663555	0.050283455	0.028762438	0.003849768	5090086.709	1.65439E-10	3.25022E-17
6.1 π	19.16371519	0.049870952	0.027576545	0.008239197	5908199.655	1.40203E-10	2.37303E-17
6.15 π	19.32079482	0.049465165	0.025734782	0.012355439	6858243.967	1.18826E-10	1.7326E-17
6.2 π	19.47787445	0.049065931	0.023292659	0.016102695	7961557.633	1.00715E-10	1.26501E-17
6.25 π	19.63495408	0.048673092	0.020319335	0.019395648	9242938.727	8.53697E-11	9.2362E-18
	19.82787	0.048199157	0.016060841	0.022712026	11103108.7	6.9691E-11	6.27671E-18
6.35 π	19.94911335	0.047905995	0.013112387	0.02434081	12459861.77	6.13498E-11	4.92379E-18
6.4 π	20.10619298	0.047531446	0.009067144	0.025890141	14467834.61	5.20128E-11	3.59506E-18
6.45 π	20.26327262	0.047162711	0.004862657	0.026781438	16800381.65	4.40996E-11	2.62492E-18
6.5 π	20.42035225	0.046799655	0.000603846	0.02700318	19510108.24	3.73927E-11	1.91658E-18
6.55 π	20.57743188	0.046442147	-0.003604661	0.026560259	22658166.11	3.17078E-11	1.3994E-18
6.6 π	20.73451151	0.046090062	-0.007661059	0.025473611	26315644.78	2.68888E-11	1.02178E-18
6.65 π	20.89159115	0.045743278	-0.011468776	0.023779473	30565190.01	2.28036E-11	7.46064E-19
	21.05754	0.045382539	-0.015122898	0.021385783	35804410.45	1.91612E-11	5.35162E-19
6.75 π	21.20575041	0.045065137	-0.017991348	0.018783204	41240446.32	1.64037E-11	3.97758E-19
6.8 π	21.36283004	0.044733554	-0.020558395	0.01561851	47907758.8	1.39139E-11	2.90432E-19
6.85 π	21.51990968	0.044406816	-0.022584405	0.012117527	55655850.9	1.18027E-11	2.12066E-19

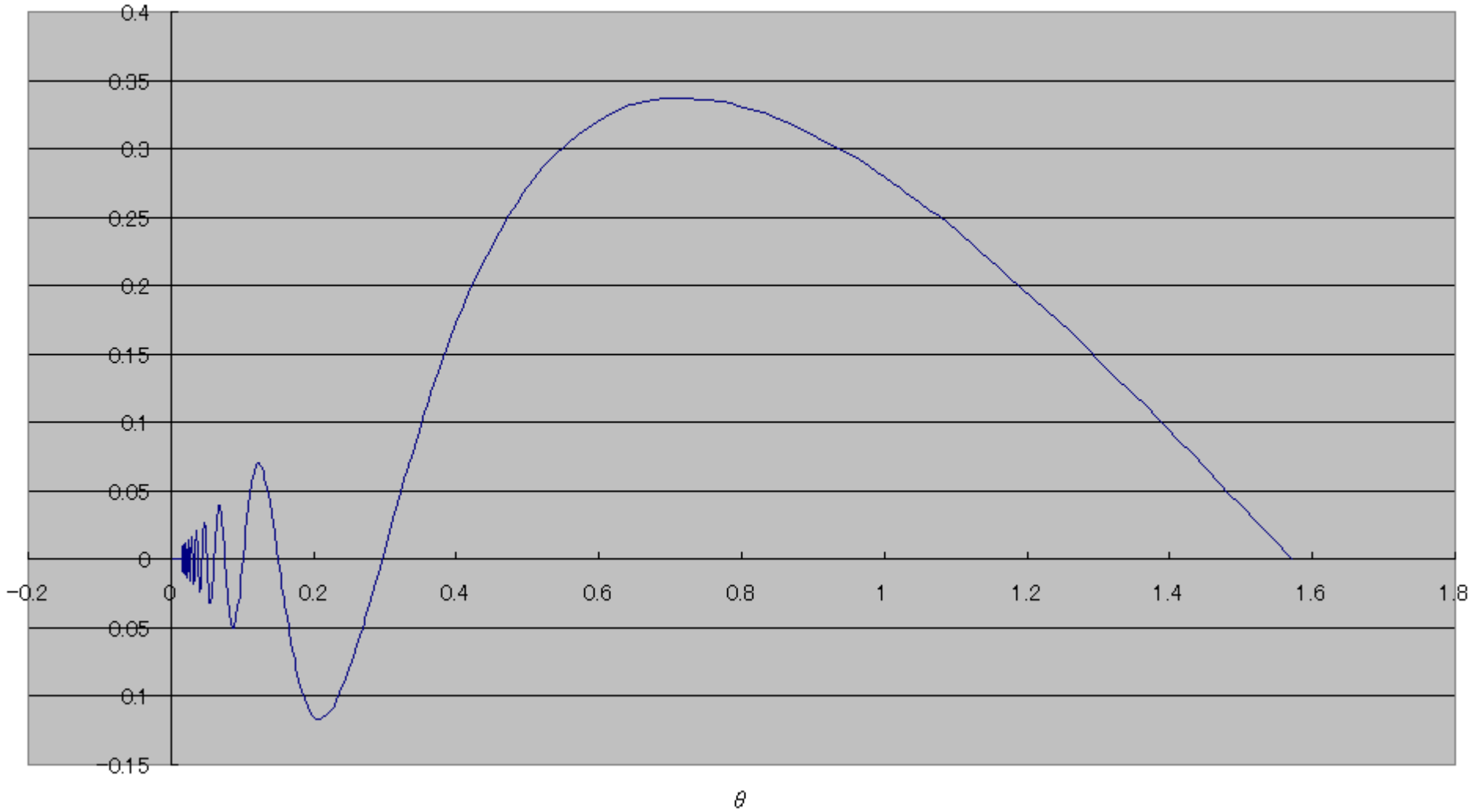
6.9 π	21.67698931	0.044084818	-0.024027864	0.008370538	64660335.65	1.00124E-11	1.54846E-19
6.95 π	21.83406894	0.043767458	-0.024862006	0.00447249	75125422.06	8.4941E-12	1.13066E-19
7 π	21.99114858	0.043454635	-0.025075246	0.00052063	87288580.56	7.20643E-12	8.25587E-20
7.05 π	22.14822821	0.043146254	-0.024671247	-0.003387875	101425970.9	6.11429E-12	6.02833E-20
7.1 π	22.30530784	0.042842221	-0.023668613	-0.007158293	117858757.7	5.18794E-12	4.40183E-20
7.15 π	22.46238747	0.042542443	-0.02210023	-0.010700582	136960457.8	4.40217E-12	3.21419E-20
7.2 π	22.61946711	0.042246833	-0.020012272	-0.013931501	159165490.7	3.73559E-12	2.34699E-20
7.25 π	22.77654674	0.041955304	-0.017462898	-0.016776537	184979125.9	3.17011E-12	1.71377E-20
	22.96632	0.041608422	-0.013865917	-0.019608425	221824065.6	2.60005E-12	1.17212E-20
7.35 π	23.090706	0.041384155	-0.011262791	-0.021064341	249878884.7	2.28333E-12	9.13776E-21
7.4 π	23.24778564	0.041104374	-0.007773043	-0.022415453	290443766.1	1.93797E-12	6.67246E-21
7.45 π	23.40486527	0.040828352	-0.004139743	-0.023199252	337608682.7	1.64493E-12	4.8723E-21
7.5 π	23.5619449	0.040556013	-0.000453503	-0.023404214	392449656.3	1.39626E-12	3.55781E-21
7.55 π	23.71902453	0.040287285	0.003194983	-0.023033046	456218457.2	1.18524E-12	2.59797E-21
7.6 π	23.87610417	0.040022095	0.006717145	-0.022102435	530371358.5	1.00616E-12	1.89708E-21
7.65 π	24.0331838	0.039760374	0.010028649	-0.020642456	616602600.2	8.54172E-13	1.38529E-21
	24.19632	0.039492162	0.013161175	-0.018611561	721061242.5	7.20614E-13	9.9938E-22
7.75 π	24.34734307	0.039247071	0.015715308	-0.016315935	833506983.9	6.15688E-13	7.38672E-22
7.8 π	24.5044227	0.03899536	0.017959973	-0.01356694	969141959.1	5.22754E-13	5.39398E-22
7.85 π	24.66150233	0.038746857	0.019735937	-0.010520552	1126893128	4.43866E-13	3.93884E-22
7.9 π	24.81858196	0.038501502	0.021005794	-0.007254958	1310373284	3.76899E-13	2.87627E-22
7.95 π	24.9756616	0.038259235	0.021744926	-0.00385269	1523786374	3.20048E-13	2.10035E-22
8 π	25.13274123	0.03802	0.021941949	-0.00039857	1772024374	2.71784E-13	1.53375E-22
8.1 π	25.44690049	0.037550395	0.020730629	0.006326995	2396678315	1.96017E-13	8.1787E-23
8.2 π	25.76105976	0.037092252	0.017541568	0.012275782	3242004554	1.41394E-13	4.36133E-23
8.3 π	26.10557	0.036602532	0.012197659	0.017251072	4516111813	9.88422E-14	2.18866E-23
8.4 π	26.38937829	0.036208712	0.006801468	0.019762912	5934809792	7.36052E-14	1.24023E-23
8.5 π	26.70353756	0.035782544	0.000353046	0.020651636	8031436594	5.31181E-14	6.61377E-24
8.6 π	27.01769682	0.035366293	-0.00597952	0.01951913	10870204665	3.83388E-14	3.52697E-24
	27.33569	0.034954713	-0.01164878	0.01647475	14768762068	2.75657E-14	1.86649E-24
8.8 π	27.64601535	0.03456219	-0.015944503	0.011991495	19920288718	1.99808E-14	1.00304E-24
8.9 π	27.96017462	0.034173699	-0.018658869	0.006401223	26971589654	1.44274E-14	5.3491E-25
9 π	28.27433388	0.033793846	-0.019504631	0.000314899	36523340945	1.04188E-14	2.85264E-25
9.1 π	28.58849315	0.033422346	-0.018441394	-0.005668106	49463670139	7.52497E-15	1.52131E-25
9.2 π	28.90265241	0.033058926	-0.015613761	-0.010971568	66996628462	5.43557E-15	8.1132E-26
	29.24528	0.03267148	-0.010888213	-0.015398987	93286012501	3.81281E-15	4.08723E-26
9.4 π	29.53097094	0.032355296	-0.006045381	-0.017671635	1.22952E+11	2.83716E-15	2.30754E-26
9.5 π	29.84513021	0.032014597	-0.000282617	-0.018478318	1.66589E+11	2.05012E-15	1.23065E-26
9.6 π	30.15928947	0.031681	0.005387434	-0.017476428	2.25739E+11	1.48158E-15	6.56325E-27
	30.47561	0.03135206	0.010449319	-0.014776838	3.06563E+11	1.06844E-15	3.48522E-27
9.8 π	30.78760801	0.031034239	0.014335643	-0.010743724	4.1463E+11	7.74036E-16	1.86681E-27
9.9 π	31.10176727	0.030720663	0.016783606	-0.005726953	5.62023E+11	5.59563E-16	9.95623E-28
10 π	31.41592654	0.030413361	0.017554602	-0.000255057	7.61887E+11	4.0456E-16	5.30997E-28
10.3 π	32.38531	0.029502735	0.009833186	0.013905446	1.9493E+12	1.48798E-16	7.63341E-29
10.5 π	32.98672286	0.02896469	0.00023134	0.016718833	3.49293E+12	8.00396E-17	2.29147E-29
10.7 π	33.6158	0.028422505	-0.009473164	0.013396502	6.43137E+12	4.18585E-17	6.50849E-30
11 π	34.55751919	0.02764777	-0.015959022	0.000210784	1.6049E+13	1.58723E-17	9.8899E-31
11.3 π	35.52566	0.026894132	-0.008963919	-0.012676283	4.1121E+13	5.86173E-18	1.42548E-31
11.5 π	36.12831552	0.026445406	-0.00019285	-0.015265265	7.38892E+13	3.15426E-18	4.2689E-32
11.7 π	36.75624	0.025993524	0.008663876	-0.012251842	1.36112E+14	1.65431E-18	1.2154E-32
12 π	37.69911184	0.025343273	0.014629307	-0.000177112	3.40811E+14	6.28054E-19	1.84282E-33
12.3 π	38.66621	0.02470927	0.008235838	0.011646698	8.7428E+14	2.32734E-19	2.662E-34
12.5 π	39.26990817	0.024329338	0.000163225	0.014044216	1.57465E+15	1.25277E-19	7.95583E-35
12.7 π	39.8968	0.023946981	-0.007981261	0.011287851	2.90162E+15	6.58653E-20	2.26995E-35
13 π	40.8407045	0.02339342	-0.013504122	0.000150909	7.28674E+15	2.50296E-20	3.43495E-36
13.3 π	41.80691	0.022852676	-0.00761719	-0.010771709	1.87115E+16	9.30185E-21	4.9712E-37
13.5 π	42.41150082	0.022526848	-0.000139936	-0.013004029	3.37684E+16	5.00836E-21	1.48315E-37
13.7 π	43.0376	0.022199079	0.007399247	-0.010463772	6.2248E+16	2.63847E-21	4.23864E-38
	43.288296	0.022070496	0.009707743	-0.008252412	7.95254E+16	2.04139E-21	2.56697E-38
14 π	43.98229715	0.021722189	0.01253965	-0.000130118	1.56701E+17	1.00357E-21	6.40435E-39
14.3 π	44.94779	0.021255518	0.007084409	0.010019356	4.0276E+17	3.73861E-22	9.28249E-40
14.5 π	45.55309348	0.020973036	0.000121299	0.012107293	7.28073E+17	2.01355E-22	2.76559E-40
14.7 π	46.17848	0.020688961	-0.006896064	0.009752007	1.3425E+18	1.06262E-22	7.91527E-41
15 π	47.1238898	0.020273837	-0.011703755	0.000113346	3.38676E+18	4.04488E-23	1.19432E-41
15.3 π	48.08867	0.019867039	-0.006622158	-0.009364621	8.71097E+18	1.51015E-23	1.73362E-42
15.5 π	48.69468613	0.019619757	-0.000106151	-0.011326248	1.57713E+19	8.1347E-24	5.1579E-43
ħ /c ; Planck's c./light v	48.886015	0.01954296	0.002042012	-0.011096084	1.90228E+19	6.6916E-24	3.51767E-43
15.7 π	49.31939	0.019371212	0.006456403	-0.009131293	2.90864E+19	4.2998E-24	1.47829E-43
16 π	50.26548246	0.019006565	0.010972332	-9.96196E-05	7.35183E+19	1.63771E-24	2.22763E-44
16.3 π	51.22968	0.018648799	0.006216144	0.00879045	1.89219E+20	6.12585E-25	3.23745E-45
16.5 π	51.83627878	0.018430542	9.36731E-05	0.010639864	3.43036E+20	3.3004E-25	9.62115E-46
16.7 π	52.460448	0.018211233	-0.006069994	0.00858444	6.3279E+20	1.74683E-25	2.76051E-46
17 π	53.40707511	0.017888408	-0.01032695	8.82436E-05	1.60205E+21	6.65734E-26	4.15552E-47
17.3 π	54.37081	0.017571299	-0.005856592	-0.00828291	4.1259E+21	2.49415E-26	6.04512E-48
17.5 π	54.97787144	0.017377259	-8.32728E-05	-0.010031915	7.48825E+21	1.34406E-26	1.79489E-48
17.7 π	55.60159	0.017182308	0.005727408	-0.008099239	1.38165E+22	7.12197E-27	5.15468E-49
18 π	56.54866776	0.016894511	0.009753269	-7.87105E-05	3.50295E+22	2.71578E-27	7.75284E-50
18.3 π	57.51189	0.016611531	0.005537151	0.007830229	9.02567E+22	1.01901E-27	1.12901E-50
18.5 π	58.11946409	0.01643786	7.45132E-05	0.009489683	1.6399E+23	5.49177E-28	3.34884E-51
18.7 π	58.74269	0.016263449	-0.005420739	0.007666446	3.02611E+23	2.91327E-28	9.6271E-52
19 π	59.69026042	0.016005248	-0.00923997	7.06428E-05	7.6827E+23	1.11135E-28	1.44657E-52
19.3 π	60.65307	0.015751159	-0.005250398	-0.007424698	1.98043E+24	4.17549E-29	2.10838E-53
19.5 π	61.26105675	0.015594823	-6.70664E-05	-0.009003061	3.60169E+24	2.2506E-29	6.24874E-54
19.7 π	61.88388	0.015437858	0.005145525	-0.007277345	6.64713E+24	1.19504E-29	1.79784E-54
20 π	62.83185307	0.015204922	0.008777996	-6.37548E-05	1.68958E+25	4.56073E-30	2.69932E-55
	628.3185307	0.001520434	0.000877823	-6.37517E-07	6.5821E+269	1.1707E-276	0
0.961835 π E+25	3.02169E+25	3.16153E-26	#NUM!	#NUM!	#NUM!	0	#NUM!
			Graph.1	Graph.2	Graph.3	Graph.4	

Sheet2

ω τ		w τ	θ	[M τ sin θ] ħ ω τ sin θ exp(- ρ)cos δ =	[v] c ω^{2}exp(+ ρ)cos δ /(σ ^{2}+ω^2)=	[ħ] ħ ω^{2}exp(- ρ)cos δ /(σ ^{2}+ω^2)=	ratio ħ /c=3.51767E-43	[Q_R] Q ω^{2}exp(- i ρ)cos δ /(σ ^{2}+ω^2)=	[Q $_i$]	eiectron
ω τ = w τ sin θ	value of [ω τ]		θ =asin(ω τ /w τ)	ħ w τ sin^2 θ exp(-w τ cos θ)cos(w τ sin θ)	csin^2 θ exp(w τ cos θ)cos(w τ sin θ)	ħ sin^2 θ exp(-w τ cos θ)cos(w τ sin θ)		Qsin^2 θ cos(w τ cos θ)cos(w τ sin θ) -	i Qsin^2 θ sin(w τ cos θ)cos(w τ sin θ)	q = *M* τ sin θ /Q_R
0	0	48.8766796	0	0	0	0	#DIV/0!	0	0	#DIV/0!
π /2×0.000000000005532610 63	8.6906E-12	48.8766796	1.77807E-13	9.16486E-46	5.33051E-05	1.8751E-47	3.51767E-43	5.72206E-27	3.10931E-26	1.60167E-19
π /2×0.0000000292757	4.59862E-08	48.8766796	9.40861E-10	2.56614E-38	1492.530397	5.25023E-40	3.51767E-43	1.60216E-19	8.706E-19	1.60167E-19
π /2×0.00001312066853	2.06099E-05	48.87668	4.21671E-07	5.15439E-33	299792458	1.05457E-34	3.51767E-43	3.21814E-14	1.7487E-13	1.60167E-19
0.001	0.001	48.8766801	2.04597E-05	1.21346E-29	7.05779E+11	2.4827E-31	3.51767E-43	7.57623E-11	4.11684E-10	1.60167E-19
0.001001	0.001001	48.8766801	2.04801E-05	1.21589E-29	7.07191E+11	2.48767E-31	3.51767E-43	7.59139E-11	4.12508E-10	1.60167E-19
0.001005	0.001005	48.8766801	2.0562E-05	1.22563E-29	7.12855E+11	2.50759E-31	3.51767E-43	7.65218E-11	4.15811E-10	1.60167E-19
0.00101	0.00101	48.8766801	2.06643E-05	1.23785E-29	7.19965E+11	2.5326E-31	3.51767E-43	7.72851E-11	4.19959E-10	1.60167E-19
0.00102	0.00102	48.8766801	2.08688E-05	1.26248E-29	7.34293E+11	2.583E-31	3.51767E-43	7.88231E-11	4.28316E-10	1.60167E-19
0.00105	0.00105	48.87668011	2.14826E-05	1.33784E-29	7.78122E+11	2.73717E-31	3.51767E-43	8.3528E-11	4.53882E-10	1.60167E-19
0.0011	0.0011	48.87668011	2.25056E-05	1.46829E-29	8.53993E+11	3.00406E-31	3.51767E-43	9.16724E-11	4.98138E-10	1.60167E-19
0.0012	0.0012	48.87668012	2.45516E-05	1.74738E-29	1.01632E+12	3.57508E-31	3.51767E-43	1.09098E-10	5.92825E-10	1.60167E-19
0.0015	0.0015	48.87668015	3.06895E-05	2.73028E-29	1.588E+12	5.58607E-31	3.51767E-43	1.70465E-10	9.26288E-10	1.60167E-19
0.002	0.002	48.8766802	4.09193E-05	4.85383E-29	2.82311E+12	9.93078E-31	3.51767E-43	3.03049E-10	1.64673E-09	1.60167E-19
0.003	0.003	48.8766803	6.1379E-05	1.09211E-28	6.35199E+12	2.23442E-30	3.51767E-43	6.81859E-10	3.70514E-09	1.60167E-19
0.004	0.004	48.8766804	8.18386E-05	1.94152E-28	1.12924E+13	3.97229E-30	3.51767E-43	1.21219E-09	6.58689E-09	1.60167E-19
0.005	0.005	48.8766805	0.000102298	3.03361E-28	1.76443E+13	6.20667E-30	3.51767E-43	1.89404E-09	1.0292E-08	1.60167E-19
0.01	0.01	48.876681	0.000204597	1.2134E-27	7.05744E+13	2.48258E-29	3.51767E-43	7.57585E-09	4.11664E-08	1.60167E-19
0.05	0.05	48.8767059	0.001022982	3.02986E-26	1.76224E+15	6.19898E-28	3.51767E-43	1.89169E-07	1.02792E-06	1.60167E-19
π /32	0.09817477	48.876779	0.002008619	1.16393E-25	6.76972E+15	2.38136E-27	3.51767E-43	7.26701E-07	3.94881E-06	1.60167E-19
	0.12	48.876828	0.002455154	1.73481E-25	1.00901E+16	3.54935E-27	3.51767E-43	1.08313E-06	5.88558E-06	1.60167E-19
	0.15	48.8769105	0.003068939	2.69962E-25	1.57016E+16	5.52329E-27	3.51767E-43	1.6855E-06	9.1588E-06	1.60167E-19
	0.17	48.8769763	0.003478127	3.45633E-25	2.01028E+16	7.07148E-27	3.51767E-43	2.15795E-06	1.1726E-05	1.60167E-19
π /16	0.196349541	48.877075	0.004017222	4.58834E-25	2.66868E+16	9.38751E-27	3.51767E-43	2.86471E-06	1.55665E-05	1.60168E-19
	0.25	48.877319	0.005114869	7.34827E-25	4.27388E+16	1.50341E-26	3.51767E-43	4.58781E-06	2.49297E-05	1.60169E-19
	0.3	48.877601	0.006137819	1.04332E-24	6.06809E+16	2.13455E-26	3.51767E-43	6.51383E-06	3.53954E-05	1.6017E-19
	0.35	48.877933	0.007160757	1.39633E-24	8.12121E+16	2.85677E-26	3.51767E-43	8.71776E-06	4.73714E-05	1.60171E-19
π /8	0.392699082	48.878258	0.008034315	1.72881E-24	1.00549E+17	3.53697E-26	3.51767E-43	1.07935E-05	5.86504E-05	1.60172E-19
	0.47	48.87894	0.009615741	2.38977E-24	1.38989E+17	4.88916E-26	3.51767E-43	1.49198E-05	8.10727E-05	1.60174E-19
	0.55	48.879775	0.011252335	3.12918E-24	1.8199E+17	6.40179E-26	3.51767E-43	1.95358E-05	0.000106155	1.60176E-19
	0.63	48.88074	0.012888869	3.89132E-24	2.2631E+17	7.96085E-26	3.51767E-43	2.42934E-05	0.000132008	1.6018E-19
	0.71	48.881837	0.014525333	4.63845E-24	2.69756E+17	9.48911E-26	3.51767E-43	2.89571E-05	0.00015735	1.60183E-19
π /4	0.785398163	48.88299	0.016067592	5.29218E-24	3.07767E+17	1.08262E-25	3.51767E-43	3.30374E-05	0.000179522	1.60187E-19
	0.81	48.883391	0.016570804	5.4887E-24	3.19193E+17	1.12282E-25	3.51767E-43	3.42639E-05	0.000186187	1.60189E-19
	0.84	48.883898	0.017184418	5.71409E-24	3.32297E+17	1.16891E-25	3.51767E-43	3.56707E-05	0.00019383	1.6019E-19
	0.87	48.884422	0.01779802	5.92159E-24	3.4436E+17	1.21135E-25	3.51767E-43	3.69655E-05	0.000200867	1.60193E-19
	0.9	48.884965	0.018411609	6.10879E-24	3.55242E+17	1.24963E-25	3.51767E-43	3.81336E-05	0.000207214	1.60194E-19
	0.93	48.885527	0.019025183	6.27327E-24	3.64803E+17	1.28326E-25	3.51767E-43	3.916E-05	0.000212791	1.60196E-19
	0.935	48.885622	0.019127444	6.2983E-24	3.66258E+17	1.28838E-25	3.51767E-43	3.93161E-05	0.00021364	1.60197E-19
	0.94	48.885718	0.019229705	6.32262E-24	3.67672E+17	1.29335E-25	3.51767E-43	3.94679E-05	0.000214464	1.60197E-19
	0.945	48.8858145	0.019331965	6.34622E-24	3.69043E+17	1.29817E-25	3.51767E-43	3.96151E-05	0.000215265	1.60197E-19
	0.95	48.885911	0.019434225	6.3691E-24	3.70372E+17	1.30285E-25	3.51767E-43	3.97577E-05	0.00021604	1.60198E-19
	0.955	48.8860085	0.019536485	6.39122E-24	3.71658E+17	1.30737E-25	3.51767E-43	3.98958E-05	0.00021679	1.60198E-19
	0.9551	48.8860108	0.01953853	6.39165E-24	3.71683E+17	1.30746E-25	3.51767E-43	3.98986E-05	0.000216805	1.60198E-19
	0.9552	48.8860128	0.019540575	6.39209E-24	3.71709E+17	1.30755E-25	3.51767E-43	3.99013E-05	0.000216819	1.60198E-19
Θe	0.955316618	48.886015	0.01954296	6.39259E-24	3.71738E+17	1.30765E-25	3.51767E-43	3.99044E-05	0.000216837	1.60198E-19
Θe×1.00000000000001	0.955316618	48.886015	0.01954296	6.39259E-24	3.71738E+17	1.30765E-25	3.51767E-43	3.99044E-05	0.000216837	1.60198E-19
	0.96	48.886107	0.019638743	6.41258E-24	3.729E+17	1.31174E-25	3.51767E-43	4.00292E-05	0.000217514	1.60198E-19
	0.97	48.886305	0.01984326	6.45301E-24	3.7525E+17	1.32E-25	3.51767E-43	4.02815E-05	0.000218885	1.60198E-19
	0.98	48.886504	0.020047775	6.49028E-24	3.77415E+17	1.32762E-25	3.51767E-43	4.05139E-05	0.000220148	1.60199E-19
	0.99	48.886706	0.020252289	6.5243E-24	3.79392E+17	1.33458E-25	3.51767E-43	4.07262E-05	0.000221301	1.60199E-19
1	1	48.886909	0.020456801	6.55499E-24	3.81175E+17	1.34085E-25	3.51767E-43	4.09175E-05	0.000222341	1.602E-19
π /3	1.047197551	48.887897	0.021422023	6.65202E-24	3.86809E+17	1.36067E-25	3.51767E-43	4.15223E-05	0.000225628	1.60204E-19
	1.07	48.888391	0.021888334	6.66873E-24	3.87777E+17	1.36407E-25	3.51767E-43	4.16262E-05	0.000226192	1.60205E-19
	1.1	48.889057	0.022501821	6.65841E-24	3.87172E+17	1.36194E-25	3.51767E-43	4.15613E-05	0.000225839	1.60207E-19
	1.12	48.88951	0.022910804	6.63007E-24	3.8552E+17	1.35613E-25	3.51767E-43	4.13838E-05	0.000224876	1.6021E-19
	1.15	48.890207	0.023524263	6.5536E-24	3.81068E+17	1.34047E-25	3.51767E-43	4.0906E-05	0.000222279	1.60211E-19
B	1.170019129	48.890682	0.023933617	6.4789E-24	3.76721E+17	1.32518E-25	3.51767E-43	4.04393E-05	0.000219743	1.60213E-19
	1.23	48.892155	0.025160065	6.13414E-24	3.56665E+17	1.25463E-25	3.51767E-43	3.82865E-05	0.000208044	1.60217E-19
	1.23788593	48.892354	0.025321305	6.07467E-24	3.53206E+17	1.24246E-25	3.51767E-43	3.79152E-05	0.000206026	1.60217E-19
	1.27	48.893177	0.025977916	5.79683E-24	3.37044E+17	1.18561E-25	3.51767E-43	3.61802E-05	0.000196599	1.60221E-19
	1.351	48.895348	0.027633957	4.82713E-24	2.80651E+17	9.87236E-26	3.51767E-43	3.01266E-05	0.000163705	1.60228E-19
	1.37	48.895877	0.02802239	4.54077E-24	2.63999E+17	9.28662E-26	3.51767E-43	2.83392E-05	0.000153992	1.60229E-19
	1.47	48.898781	0.030066629	2.63738E-24	1.53328E+17	5.39355E-26	3.51767E-43	1.64591E-05	8.94366E-05	1.60239E-19
	1.48	48.899082	0.03027104	2.40892E-24	1.40044E+17	4.9263E-26	3.51767E-43	1.50331E-05	8.16885E-05	1.60241E-19
	1.49	48.8993855	0.030475448	2.17328E-24	1.26345E+17	4.44439E-26	3.51767E-43	1.35625E-05	7.36974E-05	1.60242E-19
	1.5	48.8996913	0.030679853	1.93042E-24	1.12225E+17	3.94772E-26	3.51767E-43	1.20469E-05	6.54615E-05	1.60243E-19
	1.51	48.899999	0.030884256	1.68028E-24	9.76828E+16	3.43616E-26	3.51767E-43	1.04858E-05	5.69788E-05	1.60244E-19
	1.52	48.900309	0.031088656	1.42282E-24	8.27145E+16	2.90963E-26	3.51767E-43	8.87903E-06	4.82478E-05	1.60245E-19
	1.53	48.9006208	0.031293053	1.15797E-24	6.73173E+16	2.368E-26	3.51767E-43	7.22621E-06	3.92665E-05	1.60246E-19
	1.54	48.9009345	0.031497448	8.85691E-25	5.14884E+16	1.81119E-26	3.51767E-43	5.52704E-06	3.00334E-05	1.60247E-19
	1.55	48.9012505	0.031701841	6.05936E-25	3.5225E+16	1.2391E-26	3.51767E-43	3.78124E-06	2.05469E-05	1.60248E-19
	1.56	48.901569	0.03190623	3.18656E-25	1.85244E+16	6.51627E-27	3.51767E-43	1.98851E-06	1.08053E-05	1.60248E-19
π /2×0.999999999890292	1.570796327	48.901915	0.032126893	5.15704E-33	299791839.4	1.05457E-34	3.51767E-43	3.21814E-14	1.7487E-13	1.60249E-19
π /2×0.999999999996476	1.570796327	48.9019152	0.032126892	1.65657E-34	9630038.373	3.38753E-36	3.51767E-43	1.03375E-15	5.61724E-15	1.60249E-19
π /2×0.999999999999999	1.570796327	48.9019152	0.032126892	4.17019E-38	2424.239306	8.52766E-40	3.51767E-43	2.60232E-19	1.41407E-18	1.60249E-19
π /2	1.570796327	48.9019152	0.032126892	1.83316E-39	106.5661875	3.74864E-41	3.51767E-43	1.14394E-20	6.21605E-20	1.60249E-19

Graph2

[imaginary part] $\Re\omega \exp(\pm i\rho)\cos\delta = i\,\Re w \sin\theta \sin(w\tau\cos\theta)\cos(w\tau\sin\theta)$



case ④		(w τ =48.87668)	[c] $\omega^2\exp(+\rho)\cos\delta/(\sigma^2+\omega^2)$=	[ħ] $\omega^2\exp(-\rho)\cos\delta/(\sigma^2+\omega^2)$=	ratio ħ /c=3.51767E-43
ω τ = w τ sin θ	value of [ω τ]	θ =asin(ω τ /w τ)	$\sin^2\theta\exp(w\tau\cos\theta)\cos(w\tau\sin\theta)$	$\sin^2\theta\exp(-w\tau\cos\theta)\cos(w\tau\sin\theta)$	
0	0	0	0	0	#DIV/0!
π /2×0.000000000000553261063	8.6906E-12	1.77807E-13	5.33051E-05	1.8751E-47	3.51767E-43
π /2×0.0000000029257	4.59862E-08	9.40861E-10	1492.53097	5.25023E-40	3.51767E-43
π /2×0.00001312066853	2.06099E-05	4.21671E-07	299792458	1.05457E-34	3.51767E-43
0.001	0.001	2.04597E-05	7.05779E+11	2.4827E-31	3.51767E-43
0.001001	0.001001	2.04801E-05	7.07191E+11	2.48767E-31	3.51767E-43
0.001005	0.001005	2.0562E-05	7.12855E+11	2.50759E-31	3.51767E-43
0.00101	0.00101	2.06643E-05	7.19965E+11	2.5326E-31	3.51767E-43
0.00102	0.00102	2.08688E-05	7.34293E+11	2.583E-31	3.51767E-43
0.00105	0.00105	2.14826E-05	7.78121E+11	2.73717E-31	3.51767E-43
0.0011	0.0011	2.25056E-05	8.53993E+11	3.00406E-31	3.51767E-43
0.0012	0.0012	2.45516E-05	1.01632E+12	3.57508E-31	3.51767E-43
0.0015	0.0015	3.06895E-05	1.588E+12	5.58607E-31	3.51767E-43
0.002	0.002	4.09193E-05	2.82311E+12	9.93078E-31	3.51767E-43
0.003	0.003	6.1379E-05	6.35199E+12	2.23442E-30	3.51767E-43
0.004	0.004	8.18386E-05	1.12924E+13	3.97229E-30	3.51767E-43
0.005	0.005	0.000102298	1.76443E+13	6.20667E-30	3.51767E-43
0.01	0.01	0.000204597	7.05743E+13	2.48258E-29	3.51768E-43
0.05	0.05	0.001022983	1.7622E+15	6.19915E-28	3.51785E-43
π /32	0.09817477	0.002008623	6.76908E+15	2.38161E-27	3.51836E-43
	0.12	0.002455161	1.00887E+16	3.5499E-27	3.51871E-43
	0.15	0.003068953	1.56981E+16	5.52462E-27	3.51929E-43
	0.17	0.003478148	2.00971E+16	7.07366E-27	3.51975E-43
π /16	0.196349541	0.004017255	2.66767E+16	9.39138E-27	3.52045E-43
	0.25	0.005114936	4.27126E+16	1.50441E-26	3.52217E-43
	0.3	0.006137935	6.06273E+16	2.1366E-26	3.52415E-43
	0.35	0.00716094	8.11146E+16	2.8605E-26	3.5265E-43
π /8	0.392699082	0.008034574	1.00397E+17	3.54278E-26	3.52879E-43
	0.47	0.009616186	1.38688E+17	4.90068E-26	3.53361E-43
	0.55	0.011253048	1.8145E+17	6.42245E-26	3.53951E-43
	0.63	0.012889939	2.25431E+17	7.99456E-26	3.54635E-43
	0.71	0.014526866	2.68425E+17	9.54019E-26	3.55414E-43
π /4	0.785398163	0.016069667	3.0591E+17	1.08976E-25	3.56235E-43
	0.81	0.016573079	3.17145E+17	1.13069E-25	3.56521E-43
	0.84	0.017186956	3.30004E+17	1.17773E-25	3.56882E-43
	0.87	0.01780084	3.41812E+17	1.22115E-25	3.57257E-43
	0.9	0.01841473	3.5243E+17	1.26045E-25	3.57646E-43
	0.93	0.019028627	3.6172E+17	1.29513E-25	3.58048E-43
	0.935	0.019130944	3.6313E+17	1.30043E-25	3.58116E-43
	0.94	0.019233261	3.64498E+17	1.30558E-25	3.58185E-43
	0.945	0.019335579	3.65824E+17	1.31058E-25	3.58254E-43
	0.95	0.019437896	3.67107E+17	1.31543E-25	3.58323E-43
	0.955	0.019540214	3.68347E+17	1.32013E-25	3.58393E-43
	0.9551	0.01954226	3.68371E+17	1.32022E-25	3.58395E-43
	0.9552	0.019544306	3.68396E+17	1.32032E-25	3.58396E-43
Θe	0.955316618	0.019546693	3.68424E+17	1.32042E-25	3.58398E-43
Θe×1.00000000000001	0.955316618	0.019546693	3.68424E+17	1.32042E-25	3.58398E-43
	0.96	0.019642532	3.69543E+17	1.32468E-25	3.58463E-43
	0.97	0.019847168	3.71801E+17	1.3333E-25	3.58605E-43
	0.98	0.020051805	3.73875E+17	1.34127E-25	3.58748E-43
	0.99	0.020256443	3.75761E+17	1.34858E-25	3.58893E-43
1	1	0.020461082	3.77453E+17	1.3552E-25	3.59039E-43
π /3	1.047197551	0.02142694	3.82669E+17	1.37665E-25	3.5975E-43
	1.07	0.02189358	3.83445E+17	1.38081E-25	3.60105E-43
	1.1	0.022507521	3.82602E+17	1.37961E-25	3.60585E-43
	1.12	0.022916819	3.80804E+17	1.37437E-25	3.60913E-43
	1.15	0.023530774	3.76155E+17	1.35949E-25	3.61416E-43
B	1.170019129	0.023940474	3.71694E+17	1.34464E-25	3.6176E-43
	1.27	0.025986686	3.31752E+17	1.20615E-25	3.63571E-43
	1.351	0.027644515	2.75669E+17	1.00661E-25	3.65154E-43
	1.37	0.028033399	2.59181E+17	9.47412E-26	3.65541E-43
	1.47	0.030080229	1.5011E+17	5.51913E-26	3.67672E-43
	1.48	0.030284918	1.37066E+17	5.04258E-26	3.67894E-43
	1.49	0.030489609	1.23622E+17	4.55073E-26	3.68118E-43
	1.5	0.030694302	1.09774E+17	4.04346E-26	3.68343E-43
	1.51	0.030898995	9.55213E+16	3.52063E-26	3.6857E-43
	1.52	0.03110369	8.08602E+16	2.98211E-26	3.68799E-43
	1.53	0.031308386	6.57885E+16	2.42779E-26	3.69029E-43
	1.54	0.031513084	5.03039E+16	1.85753E-26	3.69261E-43
	1.55	0.031717783	3.44042E+16	1.27122E-26	3.69495E-43
	1.56	0.031922483	1.80872E+16	6.68737E-27	3.6973E-43
π /2×0.999999999890292	1.570796327	0.032143485	292618608.9	1.08265E-34	3.69986E-43
π /2×0.999999999996476	1.570796327	0.032143485	9399639.294	3.47773E-36	3.69986E-43
π /2	1.570796327	0.032143485	104.0165869	3.84847E-41	3.69986E-43

Case A

(w τ =48.87668)

ω τ		θ	$[M \tau \sin\theta]$ ħ ω τ sin θ exp(- ρ)cos δ=	$[v]$ $c\omega^3\exp(+\rho)\cos\delta/(\sigma^2+\omega^2)$=	$[\hbar]$ ħ $\omega^2\exp(-\rho)\cos\delta/(\sigma^2+\omega^2)$=	ratio ħ /c=3.51767E-43	$[Q_R]$ $Q\omega^2\exp(-i\rho)\cos\delta/(\sigma^2+\omega^2)$=	$[Q_I]$	electron
ω τ = w τ sin θ	value of [ω τ]	θ =asin(ω τ /w τ)	ħ w τ $\sin^2\theta\exp(-w\tau\cos\theta)\cos(w\tau\sin\theta)$	$c\sin^2\theta\exp(w\tau\cos\theta)\cos(w\tau\sin\theta)$	ħ $\sin^2\theta\exp(-w\tau\cos\theta)\cos(w\tau\sin\theta)$		$Q\sin^2\theta\cos(w\tau\cos\theta)\cos(w\tau\sin\theta)$ -	i $Q\sin^2\theta\sin(w\tau\cos\theta)\cos(w\tau\sin\theta)$	$q = M \tau \sin\theta / Q_R$
0	0	0	0	0	0	#DIV/0!	0	0	#DIV/0!
π /2×0.00000000000553261063	8.6906E-12	1.77807E-13	9.16486E-46	5.33051E-05	1.8751E-47	3.51767E-43	5.72207E-27	3.10931E-26	1.60167E-19
π /2×0.0000000029275 7	4.59862E-08	9.40861E-10	2.56614E-38	1492.53097	5.25023E-40	3.51767E-43	1.60217E-19	8.706E-19	1.60167E-19
π /2×0.00001312066853	2.06099E-05	4.21671E-07	5.15439E-33	299792458	1.05457E-34	3.51767E-43	3.21814E-14	1.7487E-13	1.60167E-19
0.001	0.001	2.04597E-05	1.21346E-29	7.05779E+11	2.4827E-31	3.51767E-43	7.57623E-11	4.11684E-10	1.60167E-19
0.001001	0.001001	2.04801E-05	1.21589E-29	7.07191E+11	2.48767E-31	3.51767E-43	7.59139E-11	4.12508E-10	1.60167E-19
0.001005	0.001005	2.0562E-05	1.22563E-29	7.12855E+11	2.50759E-31	3.51767E-43	7.65218E-11	4.15811E-10	1.60167E-19
0.00101	0.00101	2.06643E-05	1.23785E-29	7.19965E+11	2.5326E-31	3.51767E-43	7.72851E-11	4.19959E-10	1.60167E-19
0.00102	0.00102	2.08688E-05	1.26248E-29	7.34293E+11	2.583E-31	3.51767E-43	7.88231E-11	4.28316E-10	1.60167E-19
0.00105	0.00105	2.14826E-05	1.33784E-29	7.78121E+11	2.73717E-31	3.51767E-43	8.35279E-11	4.53882E-10	1.60167E-19
0.0011	0.0011	2.25056E-05	1.46829E-29	8.53993E+11	3.00406E-31	3.51767E-43	9.16723E-11	4.98138E-10	1.60167E-19
0.0012	0.0012	2.45516E-05	1.74738E-29	1.01632E+12	3.57508E-31	3.51767E-43	1.09098E-10	5.92825E-10	1.60167E-19
0.0015	0.0015	3.06895E-05	2.73028E-29	1.588E+12	5.58607E-31	3.51767E-43	1.70465E-10	9.26289E-10	1.60167E-19
0.002	0.002	4.09193E-05	4.85384E-29	2.82311E+12	9.93078E-31	3.51767E-43	3.03049E-10	1.64673E-09	1.60167E-19
0.003	0.003	6.1379E-05	1.09211E-28	6.35199E+12	2.23442E-30	3.51767E-43	6.81857E-10	3.70514E-09	1.60167E-19
0.004	0.004	8.18386E-05	1.94152E-28	1.12924E+13	3.97229E-30	3.51767E-43	1.21219E-09	6.5869E-09	1.60167E-19
0.005	0.005	0.000102298	3.03362E-28	1.76443E+13	6.20667E-30	3.51767E-43	1.89403E-09	1.0292E-08	1.60167E-19
0.01	0.01	0.000204597	1.2134E-27	7.05743E+13	2.48258E-29	3.51768E-43	7.57581E-09	4.11664E-08	1.60168E-19
0.05	0.05	0.001022983	3.02994E-26	1.7622E+15	6.19915E-28	3.51785E-43	1.89143E-07	1.02793E-06	1.60193E-19
π /32	0.09817477	0.002008623	1.16405E-25	6.76908E+15	2.38161E-27	3.51836E-43	7.26313E-07	3.9489E-06	1.60269E-19
	0.12	0.002455161	1.73507E-25	1.00887E+16	3.5499E-27	3.51871E-43	1.08226E-06	5.88578E-06	1.60319E-19
	0.15	0.003068953	2.70025E-25	1.56981E+16	5.52462E-27	3.51929E-43	1.6834E-06	9.15927E-06	1.60404E-19
	0.17	0.003478148	3.45737E-25	2.00971E+16	7.07366E-27	3.51975E-43	2.1545E-06	1.17268E-05	1.60472E-19
π /16	0.196349541	0.004017255	4.59019E-25	2.66767E+16	9.39138E-27	3.52045E-43	2.85861E-06	1.55679E-05	1.60574E-19
	0.25	0.005114936	7.35306E-25	4.27126E+16	1.50441E-26	3.52217E-43	4.572E-06	2.49333E-05	1.60828E-19
	0.3	0.006137935	1.0443E-24	6.06273E+16	2.1366E-26	3.52415E-43	6.48147E-06	3.54027E-05	1.61121E-19
	0.35	0.00716094	1.39812E-24	8.11146E+16	2.8605E-26	3.5265E-43	8.65884E-06	4.73847E-05	1.61467E-19
π /8	0.392699082	0.008034574	1.73159E-24	1.00397E+17	3.54278E-26	3.52879E-43	1.07016E-05	5.86712E-05	1.61807E-19
	0.47	0.009616186	2.39529E-24	1.38688E+17	4.90068E-26	3.53361E-43	1.47379E-05	8.11137E-05	1.62525E-19
	0.55	0.011253048	3.13908E-24	1.8145E+17	6.42245E-26	3.53951E-43	1.92096E-05	0.000106229	1.63412E-19
	0.63	0.012889939	3.90748E-24	2.25431E+17	7.99456E-26	3.54635E-43	2.37611E-05	0.000132127	1.64448E-19
	0.71	0.014526866	4.66293E-24	2.68425E+17	9.54019E-26	3.55414E-43	2.81512E-05	0.00015753	1.65639E-19
π /4	0.785398163	0.016069667	5.32637E-24	3.0591E+17	1.08976E-25	3.56235E-43	3.19121E-05	0.000179773	1.66908E-19
	0.81	0.016573079	5.52643E-24	3.17145E+17	1.13069E-25	3.56521E-43	3.30225E-05	0.000186464	1.67353E-19
	0.84	0.017186956	5.75634E-24	3.30004E+17	1.17773E-25	3.56882E-43	3.42806E-05	0.00019414	1.67918E-19
	0.87	0.01780084	5.96857E-24	3.41812E+17	1.22115E-25	3.57257E-43	3.54202E-05	0.000201211	1.68507E-19
	0.9	0.01841473	6.16067E-24	3.5243E+17	1.26045E-25	3.57646E-43	3.64276E-05	0.000207594	1.69121E-19
	0.93	0.019028627	6.33017E-24	3.6172E+17	1.29513E-25	3.58048E-43	3.72891E-05	0.000213206	1.69759E-19
	0.935	0.019130944	6.35605E-24	3.6313E+17	1.30043E-25	3.58116E-43	3.74175E-05	0.000214061	1.69868E-19
	0.94	0.019233261	6.38122E-24	3.64498E+17	1.30558E-25	3.58185E-43	3.75415E-05	0.000214892	1.69978E-19
	0.945	0.019335579	6.40567E-24	3.65824E+17	1.31058E-25	3.58254E-43	3.76609E-05	0.000215698	1.70088E-19
	0.95	0.019437896	6.42939E-24	3.67107E+17	1.31543E-25	3.58323E-43	3.77757E-05	0.000216479	1.70199E-19
	0.955	0.019540214	6.45236E-24	3.68347E+17	1.32013E-25	3.58393E-43	3.78858E-05	0.000217236	1.70311E-19
	0.9551	0.01954226	6.45281E-24	3.68371E+17	1.32022E-25	3.58395E-43	3.7888E-05	0.00021725	1.70313E-19
	0.9552	0.019544306	6.45326E-24	3.68396E+17	1.32032E-25	3.58396E-43	3.78901E-05	0.000217265	1.70315E-19
Θe	0.955316618	0.019546693	6.45379E-24	3.68424E+17	1.32042E-25	3.58398E-43	3.78926E-05	0.000217283	1.70318E-19
Θe×1.000000000000001	0.955316618	0.019546693	6.45379E-24	3.68424E+17	1.32042E-25	3.58398E-43	3.78926E-05	0.000217283	1.70318E-19
	0.96	0.019642532	6.47458E-24	3.69543E+17	1.32468E-25	3.58463E-43	3.79912E-05	0.000217966	1.70423E-19
	0.97	0.019847168	6.51671E-24	3.71801E+17	1.3333E-25	3.58605E-43	3.81876E-05	0.000219349	1.7065E-19
	0.98	0.020051805	6.55568E-24	3.73875E+17	1.34127E-25	3.58748E-43	3.83642E-05	0.000220624	1.7088E-19
	0.99	0.020256443	6.59141E-24	3.75761E+17	1.34858E-25	3.58893E-43	3.85208E-05	0.000221789	1.71113E-19
1	1	0.020461082	6.62378E-24	3.77453E+17	1.3552E-25	3.59039E-43	3.86568E-05	0.000222841	1.71349E-19
π /3	1.047197551	0.02142694	6.72862E-24	3.82669E+17	1.37665E-25	3.5975E-43	3.90062E-05	0.000226183	1.72501E-19
	1.07	0.02189358	6.74892E-24	3.83445E+17	1.38081E-25	3.60105E-43	3.89925E-05	0.000226773	1.73082E-19
	1.1	0.022507521	6.74306E-24	3.82602E+17	1.37961E-25	3.60585E-43	3.87819E-05	0.000226451	1.73871E-19
	1.12	0.022916819	6.71747E-24	3.80804E+17	1.37437E-25	3.60913E-43	3.85147E-05	0.000225507	1.74413E-19
	1.15	0.023530774	6.64472E-24	3.76155E+17	1.35949E-25	3.61416E-43	3.79157E-05	0.000222935	1.7525E-19
B	1.170019129	0.023940474	6.57216E-24	3.71694E+17	1.34464E-25	3.6176E-43	3.73792E-05	0.000220414	1.75824E-19
	1.23	0.025168032	6.23181E-24	3.51408E+17	1.27501E-25	3.62827E-43	3.50838E-05	0.000208744	1.77627E-19
	1.23788593	0.025329427	6.17265E-24	3.47934E+17	1.2629E-25	3.62972E-43	3.47026E-05	0.000206728	1.77873E-19
	1.27	0.025986686	5.89527E-24	3.31752E+17	1.20615E-25	3.63571E-43	3.29533E-05	0.000197303	1.78898E-19
	1.351	0.027644515	4.92E-24	2.75669E+17	1.00661E-25	3.65154E-43	2.7085E-05	0.000164364	1.8165E-19
	1.37	0.028033399	4.63064E-24	2.59181E+17	9.47412E-26	3.65541E-43	2.53968E-05	0.000154629	1.82332E-19
	1.47	0.030080229	2.69757E-24	1.5011E+17	5.51913E-26	3.67672E-43	1.44908E-05	8.98598E-05	1.86158E-19
	1.48	0.030284918	2.46464E-24	1.37066E+17	5.04258E-26	3.67894E-43	1.32108E-05	8.20801E-05	1.86563E-19
	1.49	0.030489609	2.22425E-24	1.23622E+17	4.55073E-26	3.68118E-43	1.18961E-05	7.40552E-05	1.86973E-19
	1.5	0.030694302	1.97631E-24	1.09774E+17	4.04346E-26	3.68343E-43	1.05467E-05	6.57834E-05	1.87387E-19
	1.51	0.030898995	1.72077E-24	9.55213E+16	3.52063E-26	3.6857E-43	9.16248E-06	5.72626E-05	1.87806E-19
	1.52	0.03110369	1.45756E-24	8.08602E+16	2.98211E-26	3.68799E-43	7.74354E-06	4.8491E-05	1.88229E-19
	1.53	0.031308386	1.18662E-24	6.57885E+16	2.42779E-26	3.69029E-43	6.28985E-06	3.9467E-05	1.88656E-19
	1.54	0.031513084	9.07897E-25	5.03039E+16	1.85753E-26	3.69261E-43	4.80144E-06	3.01886E-05	1.89088E-19
	1.55	0.031717783	6.21328E-25	3.44042E+16	1.27122E-26	3.69495E-43	3.27834E-06	2.06544E-05	1.89525E-19
	1.56	0.031922483	3.26857E-25	1.80872E+16	6.68737E-27	3.6973E-43	1.7206E-06	1.08626E-05	1.89966E-19
π /2×0.999999999890292	1.570796327	0.032143485	5.29162E-33	292618608.9	1.08265E-34	3.69986E-43	2.77851E-14	1.75807E-13	1.90448E-19
π /2×0.999999999996476	1.570796327	0.032143485	1.6998E-34	9399639.294	3.47773E-36	3.69986E-43	8.92526E-16	5.64737E-15	1.90448E-19
π /2×0.999999999999999	1.570796327	0.032143485	4.96085E-38	2743.276392	1.01497E-39	3.69986E-43	2.60483E-19	1.64818E-18	1.90448E-19
π /2	1.570796327	0.032143485	1.881E-39	104.0165869	3.84847E-41	3.69986E-43	9.87671E-21	6.24939E-20	1.90448E-19

Case B

(w τ =48.886015)

ω τ		θ	[M τ sin θ] ħ ω τ sin θ exp(- ρ)cos δ =	[v] c ω^{2}exp(+ ρ)cos δ /(σ ^{2}+ω^2)=	[ħ̄] ħ ω^{2}exp(- ρ)cos δ /(σ ^{2}+ω^2)=	ratio ħ /c=3.51767E-43	[Q_R] Q ω^{2}exp(-i ρ)cos δ /(σ ^{2}+ω^2)=	[Q_I]	electron
ω τ = w τ sin θ	value of [ω τ]	θ =asin(ω τ /w τ)	ħ w τ sin^2 θ exp(-w τ cos θ)cos(w τ sin θ)	csin^2 θ exp(w τ cos θ)cos(w τ sin θ)	ħ sin^2 θ exp(-w τ cos θ)cos(w τ sin θ)		Qsin^2 θ cos(w τ cos θ)cos(w τ sin θ) -	i Qsin^2 θ sin(w τ cos θ)cos(w τ sin θ)	q = M τ sin θ /Q_R
0	0	0	0	0	0	#DIV/0!	0	0	#DIV/0!
π /2×0.000000000000553261063	8.6906E-12	1.77773E-13	9.07797E-46	5.37845E-05	1.85697E-47	3.4526E-43	6.00978E-27	3.10265E-26	1.51053E-19
π /2×0.000000002927 57	4.59862E-08	9.40681E-10	2.54181E-38	1505.953679	5.19946E-40	3.4526E-43	1.68272E-19	8.68734E-19	1.51053E-19
π /2×0.00001312066853	2.06099E-05	4.21591E-07	5.10553E-33	302488567.5	1.04437E-34	3.4526E-43	3.37995E-14	1.74496E-13	1.51053E-19
0.001	0.001	2.04557E-05	1.20196E-29	7.12126E+11	2.45869E-31	3.45261E-43	7.95716E-11	4.10802E-10	1.51053E-19
0.001001	0.001001	2.04762E-05	1.20436E-29	7.13551E+11	2.46361E-31	3.45261E-43	7.97308E-11	4.11624E-10	1.51053E-19
0.001005	0.001005	2.0558E-05	1.21401E-29	7.19265E+11	2.48334E-31	3.45261E-43	8.03693E-11	4.1492E-10	1.51053E-19
0.00101	0.00101	2.06603E-05	1.22612E-29	7.2644E+11	2.50811E-31	3.45261E-43	8.1171E-11	4.19059E-10	1.51053E-19
0.00102	0.00102	2.08649E-05	1.25052E-29	7.40896E+11	2.55802E-31	3.45261E-43	8.27863E-11	4.27398E-10	1.51053E-19
0.00105	0.00105	2.14785E-05	1.32516E-29	7.85119E+11	2.71071E-31	3.45261E-43	8.77277E-11	4.52909E-10	1.51053E-19
0.0011	0.0011	2.25013E-05	1.45437E-29	8.61673E+11	2.97502E-31	3.45261E-43	9.62816E-11	4.9707E-10	1.51053E-19
0.0012	0.0012	2.45469E-05	1.73082E-29	1.02546E+12	3.54051E-31	3.45261E-43	1.14583E-10	5.91555E-10	1.51053E-19
0.0015	0.0015	3.06836E-05	2.7044E-29	1.60228E+12	5.53205E-31	3.45261E-43	1.79036E-10	9.24304E-10	1.51053E-19
0.002	0.002	4.09115E-05	4.80782E-29	2.8485E+12	9.83475E-31	3.45261E-43	3.18286E-10	1.64321E-09	1.51053E-19
0.003	0.003	6.13672E-05	1.08176E-28	6.40911E+12	2.21281E-30	3.45261E-43	7.16141E-10	3.6972E-09	1.51053E-19
0.004	0.004	8.1823E-05	1.92312E-28	1.13939E+13	3.93388E-30	3.45261E-43	1.27313E-09	6.57278E-09	1.51054E-19
0.005	0.005	0.000102279	3.00485E-28	1.78029E+13	6.14666E-30	3.45261E-43	1.98926E-09	1.02699E-08	1.51054E-19
0.01	0.01	0.000204557	1.2019E-27	7.1209E+13	2.45857E-29	3.45261E-43	7.95672E-09	4.10782E-08	1.51054E-19
0.05	0.05	0.001022788	3.00121E-26	1.77805E+15	6.13921E-28	3.45278E-43	1.98654E-07	1.02573E-06	1.51077E-19
π /32	0.09817477	0.00200824	1.15302E-25	6.82996E+15	2.35858E-27	3.45329E-43	7.62853E-07	3.94044E-06	1.51145E-19
	0.12	0.002454692	1.71862E-25	1.01794E+16	3.51557E-27	3.45362E-43	1.13673E-06	5.87318E-06	1.51191E-19
	0.15	0.003068367	2.67465E-25	1.58393E+16	5.4712E-27	3.45419E-43	1.76815E-06	9.13967E-06	1.51268E-19
	0.17	0.003477484	3.42459E-25	2.02778E+16	7.00526E-27	3.45465E-43	2.26301E-06	1.17017E-05	1.51329E-19
π /16	0.196349541	0.004016488	4.54667E-25	2.69166E+16	9.30056E-27	3.45533E-43	3.00267E-06	1.55346E-05	1.51421E-19
	0.25	0.005113959	7.28335E-25	4.30967E+16	1.48986E-26	3.45702E-43	4.80272E-06	2.488E-05	1.5165E-19
	0.3	0.006136763	1.0344E-24	6.11725E+16	2.11594E-26	3.45897E-43	6.80908E-06	3.53272E-05	1.51915E-19
	0.35	0.007159573	1.38486E-24	8.18441E+16	2.83284E-26	3.46127E-43	9.09732E-06	4.72837E-05	1.52228E-19
π /8	0.392699082	0.00803304	1.71518E-24	1.013E+17	3.50852E-26	3.46351E-43	1.12445E-05	5.85464E-05	1.52534E-19
	0.47	0.00961435	2.37258E-24	1.39935E+17	4.85328E-26	3.46824E-43	1.54886E-05	8.09416E-05	1.53182E-19
	0.55	0.011250899	3.10932E-24	1.83082E+17	6.36034E-26	3.47404E-43	2.01927E-05	0.000106004	1.53982E-19
	0.63	0.012887478	3.87043E-24	2.27458E+17	7.91725E-26	3.48075E-43	2.49841E-05	0.000131849	1.54916E-19
	0.71	0.014524092	4.61872E-24	2.70839E+17	9.44793E-26	3.48839E-43	2.96093E-05	0.0001572	1.55989E-19
π /4	0.785398163	0.016066598	5.27587E-24	3.08661E+17	1.07922E-25	3.49645E-43	3.35762E-05	0.000179399	1.57131E-19
	0.81	0.016569914	5.47402E-24	3.19997E+17	1.11975E-25	3.49926E-43	3.47487E-05	0.000186076	1.57532E-19
	0.84	0.017183674	5.70176E-24	3.32973E+17	1.16634E-25	3.5028E-43	3.60779E-05	0.000193738	1.5804E-19
	0.87	0.01779744	5.91197E-24	3.44887E+17	1.20934E-25	3.50648E-43	3.7283E-05	0.000200795	1.5857E-19
	0.9	0.018411213	6.10225E-24	3.556E+17	1.24826E-25	3.51029E-43	3.83496E-05	0.000207165	1.59122E-19
	0.93	0.019024993	6.27014E-24	3.64974E+17	1.2826E-25	3.51424E-43	3.92631E-05	0.000212768	1.59696E-19
	0.935	0.019127291	6.29578E-24	3.66396E+17	1.28785E-25	3.51491E-43	3.93994E-05	0.000213621	1.59794E-19
	0.94	0.019229588	6.32071E-24	3.67776E+17	1.29295E-25	3.51558E-43	3.95311E-05	0.00021445	1.59892E-19
	0.945	0.019331886	6.34493E-24	3.69114E+17	1.2979E-25	3.51626E-43	3.9658E-05	0.000215255	1.59991E-19
	0.95	0.019434184	6.36842E-24	3.70409E+17	1.30271E-25	3.51694E-43	3.978E-05	0.000216035	1.60091E-19
	0.955	0.019536482	6.39118E-24	3.7166E+17	1.30736E-25	3.51763E-43	3.98972E-05	0.00021679	1.60191E-19
	0.9551	0.019538528	6.39162E-24	3.71685E+17	1.30745E-25	3.51764E-43	3.98995E-05	0.000216804	1.60193E-19
	0.9552	0.019540574	6.39207E-24	3.7171E+17	1.30755E-25	3.51766E-43	3.99018E-05	0.000216819	1.60195E-19
Θe	0.955316618	0.01954296	6.39259E-24	3.71738E+17	1.30765E-25	3.51767E-43	3.99044E-05	0.000216837	1.60198E-19
Θe×1.00000000000001	0.955316618	0.01954296	6.39259E-24	3.71738E+17	1.30765E-25	3.51767E-43	3.99044E-05	0.000216837	1.60198E-19
	0.96	0.01963878	6.41319E-24	3.72867E+17	1.31187E-25	3.51832E-43	4.00093E-05	0.000217519	1.60292E-19
	0.97	0.019843378	6.45492E-24	3.75145E+17	1.3204E-25	3.51971E-43	4.02185E-05	0.000218899	1.60496E-19
	0.98	0.020047976	6.49352E-24	3.77238E+17	1.3283E-25	3.52111E-43	4.0407E-05	0.000220172	1.60703E-19
	0.99	0.020252575	6.5289E-24	3.79141E+17	1.33554E-25	3.52253E-43	4.05744E-05	0.000221335	1.60912E-19
1	1	0.020457175	6.56097E-24	3.80848E+17	1.3421E-25	3.52397E-43	4.07201E-05	0.000222385	1.61123E-19
π /3	1.047197551	0.021422848	6.66481E-24	3.86112E+17	1.36334E-25	3.53094E-43	4.11006E-05	0.000225723	1.62158E-19
	1.07	0.021889398	6.68492E-24	3.86894E+17	1.36745E-25	3.53443E-43	4.10925E-05	0.000226312	1.6268E-19
	1.1	0.022503222	6.67911E-24	3.86044E+17	1.36626E-25	3.53914E-43	4.0879E-05	0.000225993	1.63387E-19
	1.12	0.022912442	6.65377E-24	3.8423E+17	1.36108E-25	3.54236E-43	4.06032E-05	0.000225051	1.63873E-19
	1.15	0.02352628	6.58171E-24	3.79539E+17	1.34634E-25	3.5473E-43	3.99805E-05	0.000222487	1.64623E-19
B	1.170019129	0.023935902	6.50984E-24	3.75038E+17	1.33164E-25	3.55067E-43	3.94206E-05	0.000219971	1.65138E-19
	1.23	0.025163225	6.17271E-24	3.5457E+17	1.26267E-25	3.56114E-43	3.70173E-05	0.000208327	1.66752E-19
	1.23788593	0.025324589	6.11411E-24	3.51064E+17	1.25069E-25	3.56256E-43	3.66175E-05	0.000206316	1.66972E-19
	1.27	0.025981723	5.83936E-24	3.34736E+17	1.19449E-25	3.56844E-43	3.4781E-05	0.000196911	1.67889E-19
	1.351	0.027639234	4.87334E-24	2.78149E+17	9.96877E-26	3.58397E-43	2.86078E-05	0.000164041	1.7035E-19
	1.37	0.028028044	4.58672E-24	2.61513E+17	9.38247E-26	3.58777E-43	2.68294E-05	0.000154326	1.70959E-19
	1.47	0.030074483	2.67198E-24	1.51461E+17	5.46574E-26	3.60868E-43	1.53235E-05	8.96863E-05	1.74372E-19
	1.48	0.030279134	2.44127E-24	1.38299E+17	4.9938E-26	3.61086E-43	1.39714E-05	8.19218E-05	1.74733E-19
	1.49	0.030483785	2.20315E-24	1.24734E+17	4.50671E-26	3.61305E-43	1.25824E-05	7.39127E-05	1.75098E-19
	1.5	0.030688439	1.95756E-24	1.10762E+17	4.00434E-26	3.61527E-43	1.11563E-05	6.56569E-05	1.75467E-19
	1.51	0.030893093	1.70444E-24	9.63808E+16	3.48657E-26	3.61749E-43	9.69317E-06	5.71527E-05	1.7584E-19
	1.52	0.031097749	1.44373E-24	8.15877E+16	2.95326E-26	3.61974E-43	8.19295E-06	4.83981E-05	1.76216E-19
	1.53	0.031302406	1.17537E-24	6.63804E+16	2.4043E-26	3.622E-43	6.65563E-06	3.93914E-05	1.76597E-19
	1.54	0.031507064	8.99285E-25	5.07565E+16	1.83956E-26	3.62427E-43	5.08124E-06	3.0131E-05	1.76982E-19
	1.55	0.031711724	6.15435E-25	3.47138E+16	1.25892E-26	3.62657E-43	3.46978E-06	2.0615E-05	1.7737E-19
	1.56	0.031916385	3.23756E-25	1.82499E+16	6.62268E-27	3.62888E-43	1.82128E-06	1.08419E-05	1.77763E-19
π /2×0.9999999999890292	1.570796327	0.032137345	5.24143E-33	295252006.8	1.07217E-34	3.63139E-43	2.94147E-14	1.75473E-13	1.78191E-19
π /2×0.9999999999996476	1.570796327	0.032137345	1.68354E-34	9483457.519	3.44381E-36	3.63139E-43	9.44795E-16	5.63619E-15	1.78191E-19
π /2×0.999999999999999	1.570796327	0.032137345	4.9138E-38	2767.960723	1.00515E-39	3.63139E-43	2.7576E-19	1.64505E-18	1.78191E-19
π /2	1.570796327	0.032137345	8.6167E-39	485.382281	1.76261E-40	3.63139E-43	4.83565E-20	2.88471E-19	1.78191E-19

Case C

(w τ =48.892354)

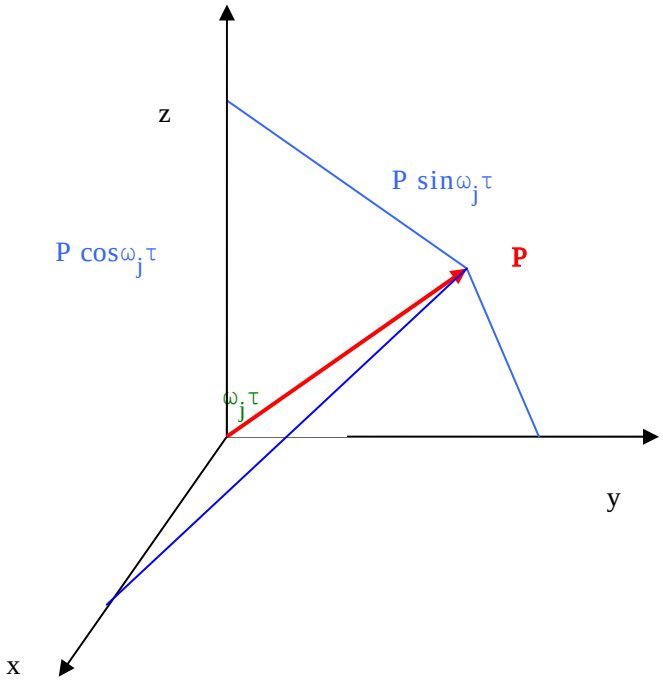
ω τ		θ	[M τ sin θ] ħ ω τ sin θ exp(- ρ)cos δ =	[v] c ω^{2}exp(+ ρ)cos δ /(σ ^{2}+ω^2)=	[ħ] ħ ω^{2}exp(- ρ)cos δ /(σ ^{2}+ω^2)=	ratio ħ /c=3.51767E-43	[Q_R] Q ω^{2}exp(-i ρ)cos δ /(σ ^{2}+ω^2)=	[Q_I]	electron
ω τ = w τ sin θ	value of [ω τ]	θ =asin(ω τ /w τ)	ħ w τ sin^2 θ exp(-w τ cos θ)cos(w τ sin θ)	c sin^2 θ exp(w τ cos θ)cos(w τ sin θ)	ħ sin^2 θ exp(-w τ cos θ)cos(w τ sin θ)		Q sin^2 θ cos(w τ cos θ)cos(w τ sin θ) -	i Q sin^2 θ sin(w τ cos θ)cos(w τ sin θ)	q = M τ sin θ /Q_R
0	0	0	0	0	0	#DIV/0!	0	0	#DIV/0!
π /2×0.000000000000553261063	8.6906E-12	1.7775E-13	9.01944E-46	5.41125E-05	1.84475E-47	3.40911E-43	6.20472E-27	3.09797E-26	1.45364E-19
π /2×0.000000029277	4.59862E-08	9.40559E-10	2.52542E-38	1515.137282	5.16527E-40	3.40911E-43	1.73731E-19	8.67425E-19	1.45364E-19
π /2×0.00001312066853	2.06099E-05	4.21536E-07	5.07261E-33	304333202.6	1.03751E-34	3.40911E-43	3.48959E-14	1.74233E-13	1.45364E-19
0.001	0.001	2.04531E-05	1.19421E-29	7.16469E+11	2.44252E-31	3.40911E-43	8.21527E-11	4.10183E-10	1.45364E-19
0.001001	0.001001	2.04735E-05	1.1966E-29	7.17903E+11	2.44741E-31	3.40911E-43	8.23171E-11	4.11004E-10	1.45364E-19
0.001005	0.001005	2.05554E-05	1.20618E-29	7.23652E+11	2.46701E-31	3.40911E-43	8.29763E-11	4.14295E-10	1.45364E-19
0.00101	0.00101	2.06576E-05	1.21821E-29	7.3087E+11	2.49162E-31	3.40911E-43	8.3804E-11	4.18428E-10	1.45364E-19
0.00102	0.00102	2.08622E-05	1.24245E-29	7.45414E+11	2.5412E-31	3.40911E-43	8.54717E-11	4.26754E-10	1.45364E-19
0.00105	0.00105	2.14758E-05	1.31661E-29	7.89907E+11	2.69288E-31	3.40911E-43	9.05734E-11	4.52227E-10	1.45364E-19
0.0011	0.0011	2.24984E-05	1.44499E-29	8.66927E+11	2.95545E-31	3.40911E-43	9.94048E-11	4.96321E-10	1.45364E-19
0.0012	0.0012	2.45437E-05	1.71966E-29	1.03172E+12	3.51723E-31	3.40911E-43	1.183E-10	5.90663E-10	1.45364E-19
0.0015	0.0015	3.06796E-05	2.68696E-29	1.61205E+12	5.49567E-31	3.40911E-43	1.84844E-10	9.22911E-10	1.45364E-19
0.002	0.002	4.09062E-05	4.77682E-29	2.86587E+12	9.77007E-31	3.40911E-43	3.2861E-10	1.64073E-09	1.45364E-19
0.003	0.003	6.13593E-05	1.07478E-28	6.4482E+12	2.19826E-30	3.40911E-43	7.39371E-10	3.69163E-09	1.45364E-19
0.004	0.004	8.18124E-05	1.91072E-28	1.14634E+13	3.90801E-30	3.40911E-43	1.31443E-09	6.56288E-09	1.45364E-19
0.005	0.005	0.000102265	2.98548E-28	1.79115E+13	6.10623E-30	3.40911E-43	2.05379E-09	1.02544E-08	1.45364E-19
0.01	0.01	0.000204531	1.19415E-27	7.16433E+13	2.4424E-29	3.40912E-43	8.21483E-09	4.10163E-08	1.45365E-19
0.05	0.05	0.001022655	2.98186E-26	1.78889E+15	6.09883E-28	3.40928E-43	2.05099E-07	1.02418E-06	1.45386E-19
π /32	0.09817477	0.002007979	1.14558E-25	6.87161E+15	2.34307E-27	3.40978E-43	7.87611E-07	3.9345E-06	1.4545E-19
	0.12	0.002454374	1.70754E-25	1.02415E+16	3.49245E-27	3.41011E-43	1.17363E-06	5.86433E-06	1.45492E-19
	0.15	0.003067969	2.6574E-25	1.59359E+16	5.43522E-27	3.41068E-43	1.82558E-06	9.12591E-06	1.45565E-19
	0.17	0.003477033	3.40251E-25	2.04015E+16	6.95919E-27	3.41112E-43	2.33654E-06	1.16841E-05	1.45622E-19
π /16	0.196349541	0.004015967	4.51736E-25	2.70807E+16	9.23939E-27	3.4118E-43	3.10028E-06	1.55112E-05	1.45708E-19
	0.25	0.005113296	7.23638E-25	4.33595E+16	1.48006E-26	3.41347E-43	4.95905E-06	2.48426E-05	1.45923E-19
	0.3	0.006135967	1.02773E-24	6.15456E+16	2.10202E-26	3.41539E-43	7.03106E-06	3.52741E-05	1.4617E-19
	0.35	0.007158645	1.37593E-24	8.23432E+16	2.81421E-26	3.41766E-43	9.39444E-06	4.72129E-05	1.46463E-19
π /8	0.392699082	0.008031998	1.70412E-24	1.01917E+17	3.48545E-26	3.41988E-43	1.16124E-05	5.84587E-05	1.46749E-19
	0.47	0.009613103	2.35728E-24	1.40788E+17	4.82136E-26	3.42455E-43	1.59972E-05	8.08209E-05	1.47355E-19
	0.55	0.01124944	3.08927E-24	1.84199E+17	6.31851E-26	3.43027E-43	2.08589E-05	0.000105847	1.48103E-19
	0.63	0.012885807	3.84547E-24	2.28845E+17	7.86518E-26	3.4369E-43	2.58127E-05	0.000131654	1.48976E-19
	0.71	0.014522208	4.58893E-24	2.72491E+17	9.38579E-26	3.44444E-43	3.05974E-05	0.000156969	1.49978E-19
π /4	0.785398163	0.016064515	5.24184E-24	3.10544E+17	1.07212E-25	3.4524E-43	3.47039E-05	0.000179136	1.51045E-19
	0.81	0.016567766	5.43872E-24	3.21949E+17	1.11239E-25	3.45517E-43	3.59183E-05	0.000185804	1.51419E-19
	0.84	0.017181446	5.66499E-24	3.35003E+17	1.15867E-25	3.45867E-43	3.72958E-05	0.000193455	1.51894E-19
	0.87	0.017795133	5.87385E-24	3.4699E+17	1.20138E-25	3.4623E-43	3.85453E-05	0.000200502	1.52388E-19
	0.9	0.018408826	6.0629E-24	3.57769E+17	1.24005E-25	3.46606E-43	3.96519E-05	0.000206864	1.52903E-19
	0.93	0.019022526	6.22971E-24	3.672E+17	1.27417E-25	3.46996E-43	4.06007E-05	0.000212459	1.53438E-19
	0.935	0.01912481	6.25518E-24	3.68631E+17	1.27938E-25	3.47062E-43	4.07425E-05	0.000213312	1.5353E-19
	0.94	0.019227095	6.27995E-24	3.70019E+17	1.28444E-25	3.47129E-43	4.08793E-05	0.00021414	1.53621E-19
	0.945	0.019329379	6.30401E-24	3.71366E+17	1.28936E-25	3.47195E-43	4.10113E-05	0.000214943	1.53714E-19
	0.95	0.019431664	6.32735E-24	3.72668E+17	1.29414E-25	3.47263E-43	4.11383E-05	0.000215722	1.53807E-19
	0.955	0.019533949	6.34996E-24	3.73927E+17	1.29876E-25	3.4733E-43	4.12602E-05	0.000216476	1.53901E-19
	0.9551	0.019535994	6.3504E-24	3.73952E+17	1.29885E-25	3.47332E-43	4.12625E-05	0.000216491	1.53902E-19
	0.9552	0.01953804	6.35085E-24	3.73977E+17	1.29895E-25	3.47333E-43	4.12649E-05	0.000216506	1.53904E-19
Θe	0.955316618	0.019540426	6.35137E-24	3.74006E+17	1.29905E-25	3.47335E-43	4.12677E-05	0.000216523	1.53906E-19
Θe×1.00000000000001	0.955316618	0.019540426	6.35137E-24	3.74006E+17	1.29905E-25	3.47335E-43	4.12677E-05	0.000216523	1.53906E-19
	0.96	0.019636234	6.37183E-24	3.75142E+17	1.30324E-25	3.47399E-43	4.13769E-05	0.000217204	1.53995E-19
	0.97	0.019840805	6.41329E-24	3.77434E+17	1.31172E-25	3.47536E-43	4.15948E-05	0.000218583	1.54185E-19
	0.98	0.020045376	6.45164E-24	3.79539E+17	1.31956E-25	3.47674E-43	4.17913E-05	0.000219854	1.54378E-19
	0.99	0.020249949	6.4868E-24	3.81453E+17	1.32675E-25	3.47815E-43	4.1966E-05	0.000221016	1.54572E-19
1	1	0.020454522	6.51866E-24	3.83171E+17	1.33327E-25	3.47956E-43	4.21184E-05	0.000222065	1.5477E-19
π /3	1.047197551	0.02142007	6.62183E-24	3.88467E+17	1.35437E-25	3.48645E-43	4.252E-05	0.000225399	1.55734E-19
	1.07	0.02188656	6.64181E-24	3.89254E+17	1.35845E-25	3.48989E-43	4.25156E-05	0.000225989	1.5622E-19
	1.1	0.022500304	6.63604E-24	3.88399E+17	1.35728E-25	3.49454E-43	4.23002E-05	0.00022567	1.5688E-19
	1.12	0.022909471	6.61085E-24	3.86573E+17	1.35212E-25	3.49772E-43	4.20184E-05	0.000224731	1.57332E-19
	1.15	0.02352323	6.53926E-24	3.81854E+17	1.33748E-25	3.50259E-43	4.13796E-05	0.000222171	1.58031E-19
B	1.170019129	0.023932798	6.46785E-24	3.77326E+17	1.32288E-25	3.50592E-43	4.0804E-05	0.00021966	1.5851E-19
	1.23	0.025159962	6.1329E-24	3.56733E+17	1.25437E-25	3.51627E-43	3.83276E-05	0.000208035	1.60012E-19
	1.23788593	0.025321305	6.07467E-24	3.53206E+17	1.24246E-25	3.51767E-43	3.79152E-05	0.000206026	1.60217E-19
	1.27	0.025978354	5.8017E-24	3.36778E+17	1.18663E-25	3.52347E-43	3.60196E-05	0.000196636	1.61071E-19
	1.351	0.02763565	4.8419E-24	2.79846E+17	9.90319E-26	3.53881E-43	2.96398E-05	0.000163814	1.63358E-19
	1.37	0.028024409	4.55713E-24	2.63108E+17	9.32075E-26	3.54255E-43	2.78003E-05	0.000154113	1.63924E-19
	1.47	0.030070582	2.65474E-24	1.52385E+17	5.42977E-26	3.5632E-43	1.58878E-05	8.95641E-05	1.67093E-19
	1.48	0.030275207	2.42552E-24	1.39143E+17	4.96094E-26	3.56535E-43	1.44869E-05	8.18104E-05	1.67428E-19
	1.49	0.030479832	2.18894E-24	1.25495E+17	4.47706E-26	3.56752E-43	1.30475E-05	7.38123E-05	1.67767E-19
	1.5	0.030684459	1.94494E-24	1.11438E+17	3.978E-26	3.5697E-43	1.15695E-05	6.55678E-05	1.68109E-19
	1.51	0.030889086	1.69345E-24	9.69688E+16	3.46363E-26	3.5719E-43	1.00528E-05	5.70752E-05	1.68455E-19
	1.52	0.031093716	1.43442E-24	8.20855E+16	2.93383E-26	3.57411E-43	8.49752E-06	4.83326E-05	1.68804E-19
	1.53	0.031298346	1.16778E-24	6.67854E+16	2.38848E-26	3.57635E-43	6.90353E-06	3.93382E-05	1.69157E-19
	1.54	0.031502978	8.93484E-25	5.10662E+16	1.82745E-26	3.57859E-43	5.27086E-06	3.00903E-05	1.69514E-19
	1.55	0.031707611	6.11464E-25	3.49256E+16	1.25063E-26	3.58086E-43	3.59952E-06	2.05872E-05	1.69874E-19
	1.56	0.031912246	3.21668E-25	1.83613E+16	6.5791E-27	3.58314E-43	1.88952E-06	1.08273E-05	1.70238E-19
π /2×0.999999999890292	1.570796327	0.032133177	5.20762E-33	297053484.5	1.06512E-34	3.58562E-43	3.0519E-14	1.75238E-13	1.70635E-19
π /2×0.999999999996476	1.570796327	0.032133177	1.67268E-34	9541320.76	3.42115E-36	3.58562E-43	9.80268E-16	5.62862E-15	1.70635E-19
π /2×0.999999999999999	1.570796327	0.032133177	4.2111E-38	2402.098484	8.613E-40	3.58562E-43	2.46791E-19	1.41705E-18	1.70635E-19
π /2	1.570796327	0.032133177	1.85114E-39	105.5929078	3.78616E-41	3.58562E-43	1.08485E-20	6.22914E-20	1.70635E-19

Case D

(w τ =48.901915)

ω τ		θ	[M τ sin θ] ħ ω τ sin θ exp(- ρ)cos δ =	[v] c ω^{2}exp(+ ρ)cos δ /(σ ^{2}+ω^2)=	[ħ] ħ ω^{2}exp(- ρ)cos δ /(σ ^{2}+ω^2)=	ratio ħ /c=3.51767E-43	[Q_R] Q ω^{2}exp(-i ρ)cos δ /(σ ^{2}+ω^2)=	[Q_I]	electron
ω τ = w τ sin θ	value of [ω τ]	θ =asin(ω τ /w τ)	ħ w τ sin^2 θ exp(-w τ cos θ)cos(w τ sin θ)	csin^2 θ exp(w τ cos θ)cos(w τ sin θ)	ħ sin^2 θ exp(-w τ cos θ)cos(w τ sin θ)		Qsin^2 θ cos(w τ cos θ)cos(w τ sin θ) -	i Qsin^2 θ sin(w τ cos θ)cos(w τ sin θ)	q = M τ sin θ /Q_R
0	0	0	0	0	0	#DIV/0!	0	0	#DIV/0!
π /2×0.000000000000553261063	8.6906E-12	1.77715E-13	8.93187E-46	5.4611E-05	1.82649E-47	3.34454E-43	6.49809E-27	3.09069E-26	1.37454E-19
π /2×0.000000029275	4.59862E-08	9.40375E-10	2.5009E-38	1529.094888	5.11412E-40	3.34454E-43	1.81945E-19	8.65386E-19	1.37454E-19
π /2×0.00001312066853	2.06099E-05	4.21454E-07	5.02336E-33	307136752.5	1.02723E-34	3.34454E-43	3.65458E-14	1.73823E-13	1.37454E-19
0.001	0.001	2.04491E-05	1.18261E-29	7.23069E+11	2.41833E-31	3.34454E-43	8.6037E-11	4.09219E-10	1.37454E-19
0.001001	0.001001	2.04695E-05	1.18498E-29	7.24516E+11	2.42317E-31	3.34454E-43	8.62092E-11	4.10037E-10	1.37454E-19
0.001005	0.001005	2.05513E-05	1.19447E-29	7.30318E+11	2.44258E-31	3.34454E-43	8.68996E-11	4.13321E-10	1.37454E-19
0.00101	0.00101	2.06536E-05	1.20638E-29	7.37603E+11	2.46694E-31	3.34454E-43	8.77664E-11	4.17444E-10	1.37454E-19
0.00102	0.00102	2.08581E-05	1.23039E-29	7.52281E+11	2.51603E-31	3.34454E-43	8.95129E-11	4.25751E-10	1.37454E-19
0.00105	0.00105	2.14716E-05	1.30383E-29	7.97184E+11	2.66621E-31	3.34454E-43	9.48558E-11	4.51164E-10	1.37454E-19
0.0011	0.0011	2.2494E-05	1.43096E-29	8.74914E+11	2.92618E-31	3.34454E-43	1.04105E-10	4.95154E-10	1.37454E-19
0.0012	0.0012	2.45389E-05	1.70296E-29	1.04122E+12	3.4824E-31	3.34454E-43	1.23893E-10	5.89275E-10	1.37454E-19
0.0015	0.0015	3.06736E-05	2.66087E-29	1.6269E+12	5.44125E-31	3.34454E-43	1.93583E-10	9.20741E-10	1.37454E-19
0.002	0.002	4.08982E-05	4.73044E-29	2.89227E+12	9.67332E-31	3.34454E-43	3.44148E-10	1.63687E-09	1.37454E-19
0.003	0.003	6.13473E-05	1.06435E-28	6.5076E+12	2.17649E-30	3.34454E-43	7.7433E-10	3.68295E-09	1.37454E-19
0.004	0.004	8.17964E-05	1.89216E-28	1.1569E+13	3.86931E-30	3.34454E-43	1.37658E-09	6.54745E-09	1.37454E-19
0.005	0.005	0.000102245	2.95649E-28	1.80765E+13	6.04576E-30	3.34454E-43	2.1509E-09	1.02303E-08	1.37454E-19
0.01	0.01	0.000204491	1.18255E-27	7.23033E+13	2.41822E-29	3.34455E-43	8.60324E-09	4.09198E-08	1.37455E-19
0.05	0.05	0.001022455	2.95291E-26	1.80537E+15	6.03844E-28	3.34471E-43	2.14798E-07	1.02177E-06	1.37474E-19
π /32	0.09817477	0.002007587	1.13446E-25	6.93491E+15	2.31987E-27	3.3452E-43	8.2487E-07	3.92526E-06	1.37532E-19
	0.12	0.002453894	1.69096E-25	1.03358E+16	3.45787E-27	3.34552E-43	1.22916E-06	5.85056E-06	1.3757E-19
	0.15	0.003067369	2.6316E-25	1.60827E+16	5.38139E-27	3.34608E-43	1.912E-06	9.10447E-06	1.37636E-19
	0.17	0.003476353	3.36948E-25	2.05894E+16	6.89028E-27	3.34652E-43	2.44718E-06	1.16567E-05	1.37688E-19
π /16	0.196349541	0.004015182	4.4735E-25	2.73302E+16	9.1479E-27	3.34718E-43	3.24716E-06	1.54748E-05	1.37766E-19
	0.25	0.005112297	7.16612E-25	4.3759E+16	1.46541E-26	3.34882E-43	5.19431E-06	2.47844E-05	1.37961E-19
	0.3	0.006134768	1.01775E-24	6.21125E+16	2.08121E-26	3.3507E-43	7.36511E-06	3.51915E-05	1.38185E-19
	0.35	0.007157245	1.36257E-24	8.31018E+16	2.78634E-26	3.35293E-43	9.84157E-06	4.71025E-05	1.38451E-19
π /8	0.392699082	0.008030428	1.68757E-24	1.02856E+17	3.45093E-26	3.3551E-43	1.21661E-05	5.83222E-05	1.38711E-19
	0.47	0.009611224	2.33439E-24	1.42085E+17	4.77362E-26	3.35968E-43	1.67627E-05	8.06327E-05	1.39261E-19
	0.55	0.01124724	3.05927E-24	1.85896E+17	6.25593E-26	3.36529E-43	2.18615E-05	0.000105601	1.39939E-19
	0.63	0.012883287	3.80813E-24	2.30954E+17	7.78729E-26	3.3718E-43	2.70598E-05	0.00013135	1.4073E-19
	0.71	0.014519369	4.54437E-24	2.75001E+17	9.29283E-26	3.3792E-43	3.20843E-05	0.000156608	1.41638E-19
π /4	0.785398163	0.016061374	5.19094E-24	3.13405E+17	1.0615E-25	3.387E-43	3.6401E-05	0.000178726	1.42604E-19
	0.81	0.016564526	5.38591E-24	3.24915E+17	1.10137E-25	3.38972E-43	3.76786E-05	0.000185379	1.42943E-19
	0.84	0.017178086	5.60998E-24	3.3809E+17	1.14719E-25	3.39315E-43	3.91286E-05	0.000193014	1.43373E-19
	0.87	0.017791653	5.81681E-24	3.50187E+17	1.18949E-25	3.39671E-43	4.0445E-05	0.000200046	1.4382E-19
	0.9	0.018405226	6.00402E-24	3.61066E+17	1.22777E-25	3.4004E-43	4.1612E-05	0.000206395	1.44286E-19
	0.93	0.019018807	6.16921E-24	3.70583E+17	1.26155E-25	3.40422E-43	4.26139E-05	0.000211979	1.4477E-19
	0.935	0.019121071	6.19443E-24	3.72027E+17	1.26671E-25	3.40487E-43	4.27637E-05	0.000212829	1.44853E-19
	0.94	0.019223335	6.21896E-24	3.73429E+17	1.27172E-25	3.40553E-43	4.29084E-05	0.000213655	1.44936E-19
	0.945	0.0193256	6.24279E-24	3.74787E+17	1.27659E-25	3.40618E-43	4.3048E-05	0.000214457	1.45019E-19
	0.95	0.019427864	6.26591E-24	3.76102E+17	1.28132E-25	3.40684E-43	4.31824E-05	0.000215235	1.45103E-19
	0.955	0.019530129	6.2883E-24	3.77373E+17	1.2859E-25	3.40751E-43	4.33114E-05	0.000215987	1.45188E-19
	0.9551	0.019532174	6.28874E-24	3.77398E+17	1.28599E-25	3.40752E-43	4.33139E-05	0.000216002	1.4519E-19
	0.9552	0.01953422	6.28918E-24	3.77423E+17	1.28608E-25	3.40753E-43	4.33165E-05	0.000216017	1.45191E-19
Θe	0.955316618	0.019536605	6.28969E-24	3.77452E+17	1.28618E-25	3.40755E-43	4.33194E-05	0.000216034	1.45193E-19
Θe×1.00000000000001	0.955316618	0.019536605	6.28969E-24	3.77452E+17	1.28618E-25	3.40755E-43	4.33194E-05	0.000216034	1.45193E-19
	0.96	0.019632394	6.30995E-24	3.78598E+17	1.29033E-25	3.40817E-43	4.34351E-05	0.000216714	1.45273E-19
	0.97	0.019836925	6.35101E-24	3.80911E+17	1.29872E-25	3.40952E-43	4.36661E-05	0.00021809	1.45445E-19
	0.98	0.020041457	6.38899E-24	3.83036E+17	1.30649E-25	3.41088E-43	4.38747E-05	0.000219359	1.45619E-19
	0.99	0.020245989	6.4238E-24	3.84968E+17	1.31361E-25	3.41225E-43	4.40604E-05	0.000220519	1.45795E-19
1	1	0.020450522	6.45535E-24	3.86702E+17	1.32006E-25	3.41364E-43	4.42227E-05	0.000221566	1.45974E-19
π /3	1.047197551	0.021415881	6.55752E-24	3.92046E+17	1.34095E-25	3.4204E-43	4.46561E-05	0.000224894	1.46845E-19
	1.07	0.02188228	6.5773E-24	3.92841E+17	1.345E-25	3.42378E-43	4.46574E-05	0.000225484	1.47284E-19
	1.1	0.022495904	6.57159E-24	3.91978E+17	1.34383E-25	3.42834E-43	4.4439E-05	0.000225167	1.47879E-19
	1.12	0.022904991	6.54665E-24	3.90135E+17	1.33873E-25	3.43145E-43	4.41484E-05	0.000224231	1.48287E-19
	1.15	0.02351863	6.47575E-24	3.85373E+17	1.32423E-25	3.43624E-43	4.34855E-05	0.000221678	1.48918E-19
B	1.170019129	0.023928118	6.40504E-24	3.80803E+17	1.30977E-25	3.4395E-43	4.28861E-05	0.000219174	1.4935E-19
	1.23	0.025155042	6.07333E-24	3.6002E+17	1.24194E-25	3.44965E-43	4.02997E-05	0.000207577	1.50704E-19
	1.23788593	0.025316354	6.01568E-24	3.5646E+17	1.23015E-25	3.45102E-43	3.98683E-05	0.000205574	1.50889E-19
	1.27	0.025973273	5.74535E-24	3.39882E+17	1.17487E-25	3.45671E-43	3.78838E-05	0.000196206	1.51657E-19
	1.351	0.027630245	4.79487E-24	2.82425E+17	9.80509E-26	3.47175E-43	3.1193E-05	0.000163459	1.53716E-19
	1.37	0.028018929	4.51287E-24	2.65533E+17	9.22841E-26	3.47543E-43	2.92616E-05	0.00015378	1.54225E-19
	1.47	0.030064701	2.62896E-24	1.53789E+17	5.37598E-26	3.49568E-43	1.67373E-05	8.93731E-05	1.57072E-19
	1.48	0.030269286	2.40196E-24	1.40426E+17	4.91179E-26	3.49779E-43	1.52628E-05	8.16361E-05	1.57373E-19
	1.49	0.030473871	2.16768E-24	1.26652E+17	4.4327E-26	3.49991E-43	1.37476E-05	7.36553E-05	1.57677E-19
	1.5	0.030678457	1.92604E-24	1.12465E+17	3.93858E-26	3.50206E-43	1.21914E-05	6.54286E-05	1.57984E-19
	1.51	0.030883045	1.677E-24	9.78626E+16	3.42931E-26	3.50421E-43	1.05942E-05	5.69542E-05	1.58295E-19
	1.52	0.031087634	1.42049E-24	8.28421E+16	2.90476E-26	3.50639E-43	8.95595E-06	4.82303E-05	1.58608E-19
	1.53	0.031292225	1.15644E-24	6.7401E+16	2.36481E-26	3.50858E-43	7.27666E-06	3.9255E-05	1.58924E-19
	1.54	0.031496817	8.84805E-25	5.15369E+16	1.80935E-26	3.51078E-43	5.55628E-06	3.00268E-05	1.59244E-19
	1.55	0.03170141	6.05525E-25	3.52475E+16	1.23824E-26	3.513E-43	3.7948E-06	2.05438E-05	1.59567E-19
	1.56	0.031906004	3.18543E-25	1.85305E+16	6.51392E-27	3.51524E-43	1.99222E-06	1.08045E-05	1.59893E-19
π /2×0.999999999890292	1.570796327	0.032126893	5.1570E-33	299791839.4	1.05457E-34	3.51767E-43	3.21814E-14	1.7487E-13	1.60249E-19
π /2×0.999999999996476	1.570796327	0.032126893	1.65657E-34	9630036.525	3.38753E-36	3.51767E-43	1.03374E-15	5.61724E-15	1.60249E-19
π /2×0.999999999999999	1.570796327	0.032126893	4.83467E-38	2810.517619	9.88647E-40	3.51767E-43	3.01697E-19	1.63939E-18	1.60249E-19
π /2	1.570796327	0.032126893	8.47795E-39	492.844946	1.73366E-40	3.51767E-43	5.29048E-20	2.87478E-19	1.60249E-19

Fig.3



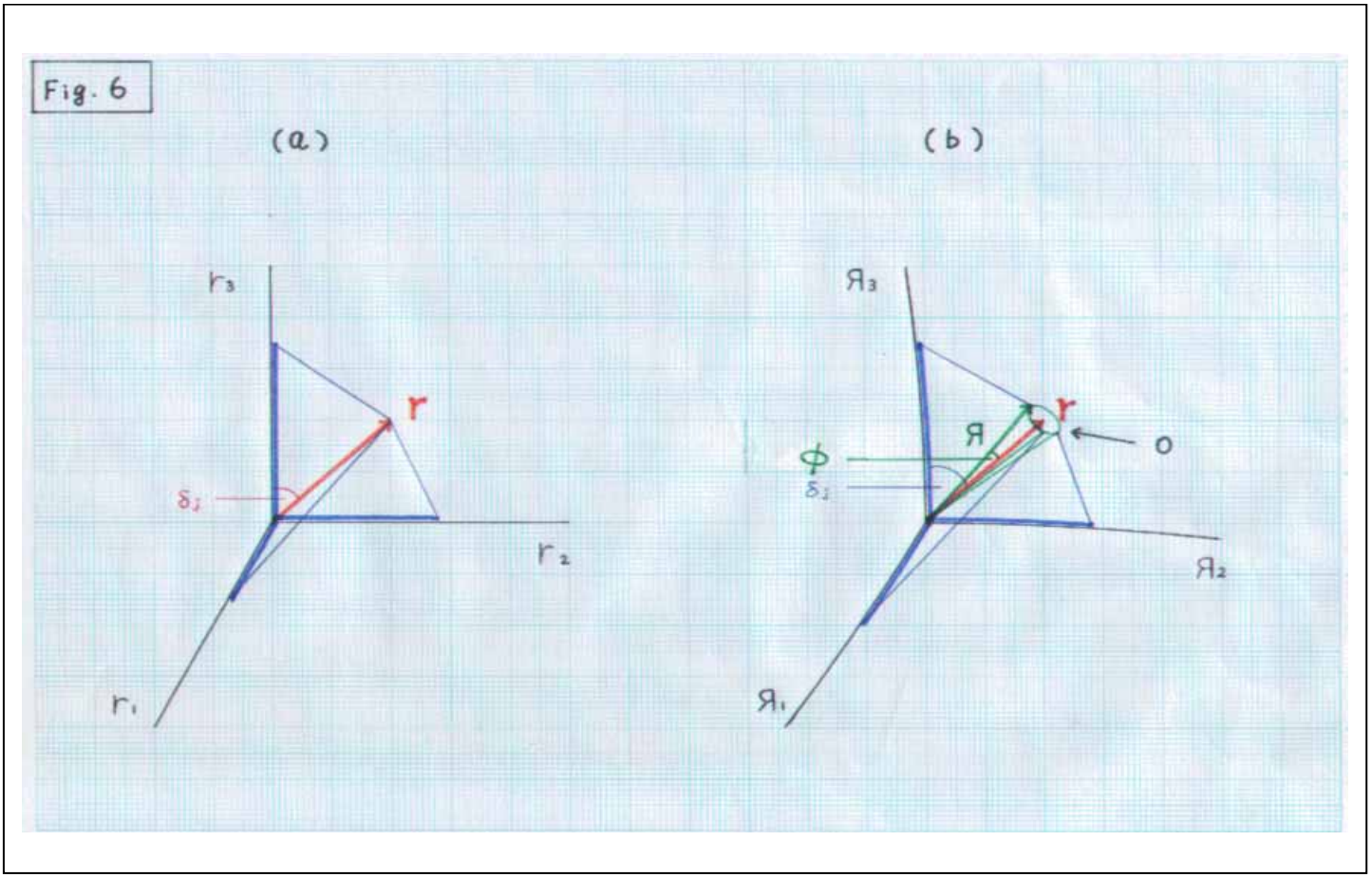


Fig. 6
(a)
(b)
r
r₃
r₂
r₁
δ_j
Я
Я₃
Я₂
Я₁
φ
o

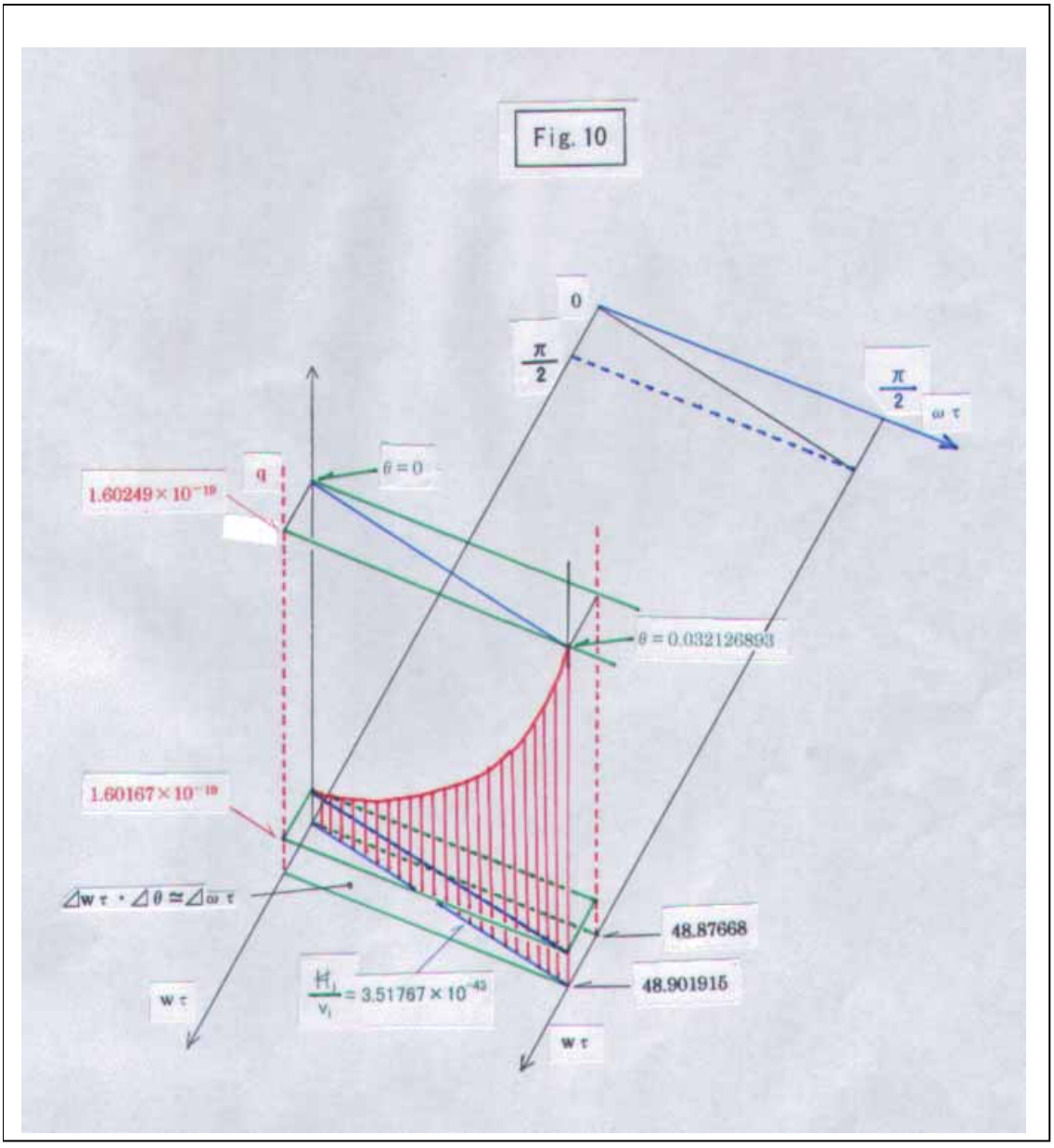
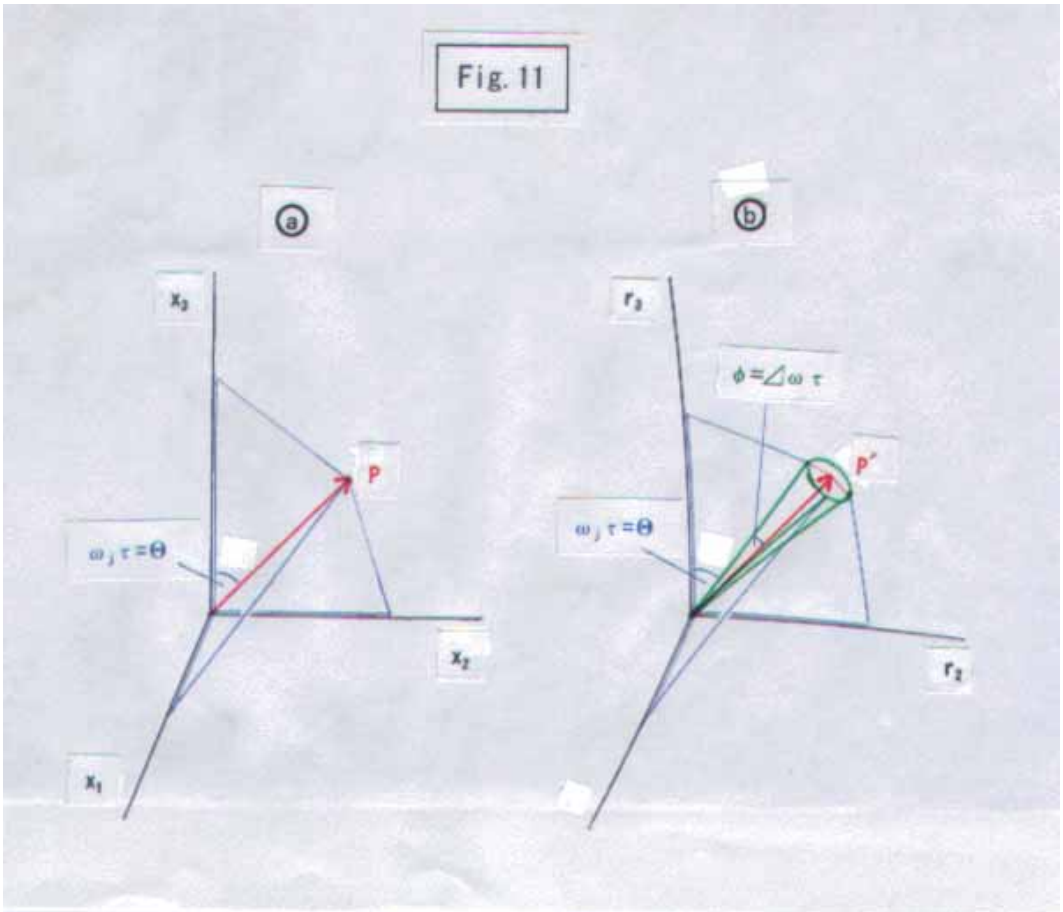
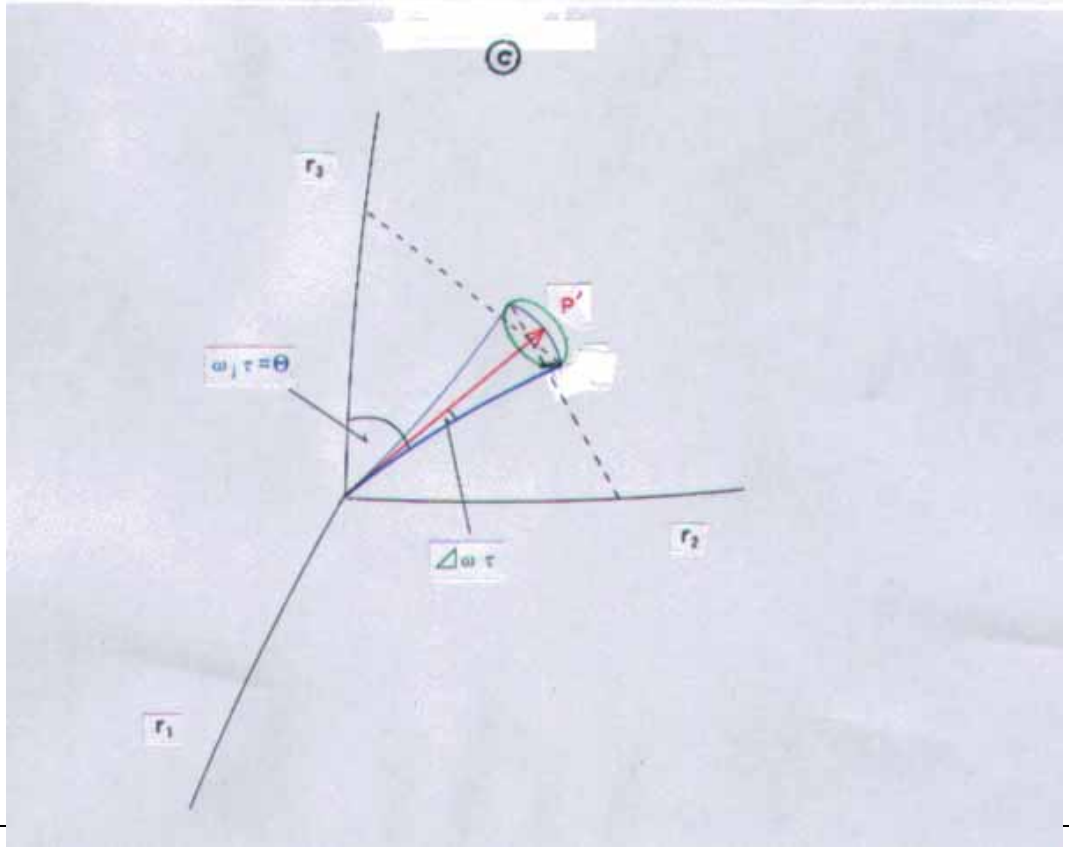


Fig. 10
0
π/2
π/2
ω τ
q
θ = 0
1.60249 × 10⁻¹⁹
θ = 0.032126893
1.60167 × 10⁻¹⁹
⊿w τ ・⊿θ ≃ ⊿ω τ
48.87668
48.901915
H_1/v_1 = 3.51767 × 10⁻⁴³
w τ
w τ

Fig. 11


ⓐ
x_3
P
$\omega_j \tau = \theta$
x_2
x_1
ⓑ
r_3
$\phi = \Delta\omega\tau$
P'
$\omega_j \tau = \theta$
r_2


ⓒ
r_3
P'
$\omega_j \tau = \theta$
$\Delta\omega\tau$
r_2
r_1

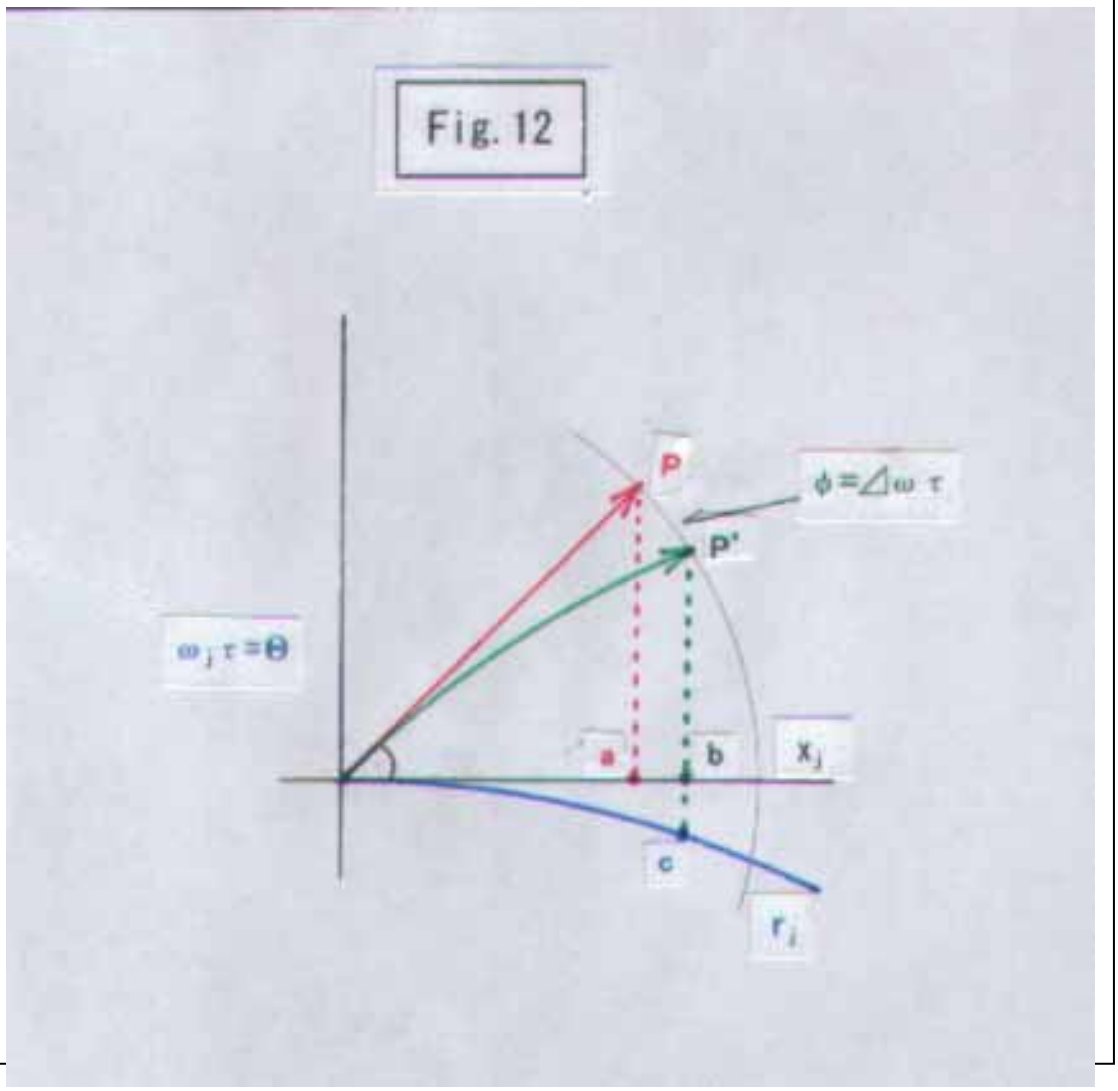


Fig. 12
P
P'
$\phi = \Delta\omega\tau$
$\omega_j\tau = \theta$
a
b
x_j
c
r_j