Formula for the total energy in the lok.

Abstract. A theoretical calculation is made of the total energy of the wave vortex in a vacuum, for the general case.

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The formula is derived in accordance with the laws of mechanics for a solid. It is more convenient to deploy the lok so that all the oscillations occur parallel to the vertical axis Z, and the rotation of waves around this axis. Such a choice is denoted as W_0.

$$\left.\begin{array}{c} W_x = W_y = 0\,; \\ W_z = W_0 = \dfrac{C_{j,m}}{\sqrt{r}} \bullet J_{j+\frac{1}{2}}(kr) \bullet Y_{j,m}(\theta,\varphi) \bullet \cos(\omega t + \delta) \end{array}\right\}$$

i=1,2,3 (Cartesian); j=0,1,2,...; m=0,1,...,j; c - Speed of light;

$C^i_{j,m}$ - constants; ω - frequency; λ - wavelength; $\lambda \bullet \omega = c$;

$k = 1/\lambda$ - Wave number.

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(1-11)

Further, for simplicity, the constant C_j, m and the time dependence are not considered, because in the process of voltage oscillations in the fixed-locus element the sum of the kinetic and potential energy does not change and is determined by the point at which $\cos(\omega t + \delta) = 1$.

Action plan is standard.

A) The strain tensor is first expressed through the solution (1-11).

B) Then the energy density of one coil (!) of a localized wave is also via the solution (1-11).

C) Then the layering factor is taken into account and the real energy density in the lok is obtained.

D) The energy density is integrated over the space with allowance for the layering law and the total energy of the lok is found.

Transformations between cartesian and spherical coordinates are used.

Standard conversions between Cartesian and spherical coordinates:

$$\left.\begin{array}{c} W_r = W_x \sin\theta \cos\varphi + W_y \sin\theta \sin\varphi + W_z \cos\theta\,; \\ W_\theta = W_x \cos\theta \cos\varphi + W_y \cos\theta \sin\varphi - W_z \sin\theta\,; \\ W_\varphi = - W_x \sin\varphi + W_y \cos\varphi\,; \end{array}\right\}$$

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(1-12)

Where W_x , W_y , W_z are three components of the solution (1-2). Or with the choice of (1-11):

The expression for the displacement in the lok located vertically in spherical coordinates:	
$W_r = W_0 \cos\theta$;	}
$W_\theta = - W_0 \sin\theta$;	
$W_\varphi = 0$;	
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(1-13)

Next, we need the strain tensor in the lok.

The tensor of deformations in the lock:
$W_{ik} = \frac{1}{2}\left(\frac{\partial W_i}{\partial x_k} + \frac{\partial W_k}{\partial x_i}\right)$
i,k = 1,2,3;
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(1-14)

The strain tensor in spherical coordinates. We draw attention to the fact that on the left-hand side of the equations there are double indices, and not double derivatives.

The tensor of deformations in a lok in spherical coordinates:	
$2W_{\varphi\theta} = \frac{1}{r\sin\theta}\frac{\partial W_\theta}{\partial\varphi} + \frac{1}{r}\frac{\partial W_\varphi}{\partial\theta} - \frac{1}{r}W_\varphi ctg\theta$	$W_{rr} = \frac{\partial W_r}{\partial r}$
$2W_{r\theta} = \frac{1}{r}\frac{\partial W_r}{\partial\theta} + \frac{\partial W_\theta}{\partial r} - \frac{W_\theta}{r}$	$W_{\varphi\varphi} = \frac{1}{r\sin\theta}\frac{\partial W_\varphi}{\partial\varphi} + \frac{W_\theta}{r}ctg\theta + \frac{W_r}{r}$
$2W_{r\varphi} = \frac{\partial W_\varphi}{\partial r} - \frac{W_\varphi}{r} + \frac{1}{r\sin\theta}\frac{\partial W_r}{\partial\varphi}$	$W_{\theta\theta} = \frac{1}{r}\frac{\partial W_\theta}{\partial\theta} + \frac{W_r}{r}$
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(1-15)

Definitions and definitions are introduced:

1) ρ^1_E - the energy density of one turn of a localized wave.

2) ρ_E - The real energy density of a localized wave, taking into account "winding".

3) E - the total energy of the lok obtained by integrating the energy density over space with allowance for "winding".

For the energy density in the lok, the following relation (from Hooke's law) holds:

Density of energy in Lok:
$$\rho_E^1 = \frac{L_1}{2}\sum W_{ii}^{\ 2} + L_2 \sum W_{ik}^{\ 2}$$
i,k = 1,2,3;
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(1-16)

Where L_1 and L_2 - Lame Gukuum coefficients (elasticity characteristics); i,k = 1,2,3 - indices of variables.

Volume element in spherical coordinates:

$$dv = r^2 \cdot sin\theta \cdot dr \cdot d\theta \cdot d\varphi \ ; \qquad (1\text{-}17)$$

The total energy is the integral over the entire space:

The total energy of the lok:
$$E = \iiint \rho_E dv = \iiint \Phi \bullet \{\frac{L_1}{2}\sum W_{ii}^{\ 2} + L_2 \sum W_{ik}^{\ 2}\} r^2 \sin\theta dr d\theta d\varphi$$
i,k = 1,2,3;
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(1-18)

Where Φ - The functional factor, which takes into account the "stratification" of the solution. It is taken equal $(1/r)^2$. It is more convenient to proceed to a dimensionless variable.

Please note that this is where the dimensionless coordinate appears q ! :

$$q = k \bullet r \ ; \qquad (1\text{-}19)$$

The total energy of the lok after the transformations:

The total energy of a lok with a dimensionless radial coordinate $q=k\bullet r$:
$$E = \frac{1}{k}\iiint \{\frac{L_1}{2}\sum W_{ii}^{\ 2}(\frac{q}{k},\theta,\varphi) + L_2 \sum W_{ik}^{\ 2}(\frac{q}{k},\theta,\varphi)\} \sin\theta dq d\theta d\varphi$$
i,k = 1,2,3 (Cartesian); j=0,1,2,...; m=0,1,...,j; c - Speed of light; ω - frequency; λ - wavelength; $\lambda \bullet \omega = c$; k = $1/\lambda$; - Wave number.
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(1-20)

Calculation of this formula is the most laborious place, if you work manually. The results are achieved using computer programs. A huge thanks to their developers.

We expand the expression for the integral of the total energy (1-20):

The integral of the total energy in the expanded form:

$$E^{полная} = \iiint \Phi \bullet \{\frac{L_1}{2}\sum W_{ii}^{\ 2} + L_2 \sum W_{ik}^{\ 2}\} r^2 \sin\theta d\varphi d\theta dr =$$

$$= \int_0^\infty \int_0^\pi \int_0^{2\pi} \frac{L_1}{2r^2}\{\frac{\partial W_r}{\partial r}\}^2 r^2 \sin\theta d\varphi d\theta dr +$$

$$+ \int_0^\infty \int_0^\pi \int_0^{2\pi} \frac{L_1}{2r^2}\{\frac{1}{r}\frac{\partial W_\theta}{\partial \theta} + \frac{W_r}{r}\}^2 r^2 \sin\theta d\varphi d\theta dr +$$

$$+ \int_0^\infty \int_0^\pi \int_0^{2\pi} \frac{L_1}{2r^2}\{\frac{1}{r\sin\theta}\frac{\partial W_\varphi}{\partial \varphi} + \frac{W_\theta}{r} ctg\theta + \frac{W_r}{r}\}^2 r^2 \sin\theta d\varphi d\theta dr +$$

$$+ \int_0^\infty \int_0^\pi \int_0^{2\pi} \frac{L_2}{4r^2}\{\frac{1}{r}\frac{\partial W_r}{\partial \theta} + \frac{\partial W_\theta}{\partial r} - \frac{W_\theta}{r}\}^2 r^2 \sin\theta d\varphi d\theta dr +$$

$$+ \int_0^\infty \int_0^\pi \int_0^{2\pi} \frac{L_2}{4r^2}\{\frac{\partial W_\varphi}{\partial r} - \frac{W_\varphi}{r} + \frac{1}{r\sin\theta}\frac{\partial W_r}{\partial \varphi}\} r^2 \sin\theta d\varphi d\theta dr +$$

$$+ \int_0^\infty \int_0^\pi \int_0^{2\pi} \frac{L_2}{4r^2}\{\frac{1}{r\sin\theta}\frac{\partial W_\varphi}{\partial \varphi} + \frac{W_\theta}{r} ctg\theta + \frac{W_r}{r}\}^2 r^2 \sin\theta d\varphi d\theta dr$$

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(1-21*)

The sign * is entered here so that there are no coincidences with subsequent chapters.

Next we sequentially set the values j = 1,2,3,… m = 0,1,…,j . Then, according to equation (1-11), we choose W_0 . After this, using the formula (1-13), we find the values of the quantities W_r , W_θ , W_φ . After that, we substitute these values into the integral expression (1-21 *) and calculate these integrals.

For such formulas it is possible to compile a computer algorithm. For each pair (j,m) their numerical coefficients in (1-21 *) will be obtained. Within a few days, we managed to calculate a certain array of integrals on the computer. And these results deserve attention. It turned out that in all tested combinations of integer parameters the total energy of the lok depends only on the sum of the Lamé elasticity characteristics for Gukuum L_1 и L_2 . Change only ahead of the standing coefficients.

Table of energy levels.

There is a serious assumption that this is the table of all particles of the universe. In each cell it is necessary to set the values of the analogous coefficient for the angular momentum, the wave number k, and also the effective particle size D.

It turned out that in all locks - combinations of integer parameters (j, m) the total energy of the lok depends only on five parameters: the numbers themselves (j, m), the Lame elasticity characteristics for Gukumi L_1, L_2 and the wave number k. in the formulas the value of k is repeatedly found, in the figures the decoding $k = 1/\lambda$ is given. It is connected only with the actual mass (energy) of the particle, and it is determined by it. There is no theoretical meaning in it. This is nothing more than a link between ω in the vibrational part of the solution and the radial coordinate in the Bessel function: $\omega = k \bullet c$, c is the speed of light. The physics is such that in each particle (in each solution), due to physical reasons, the frequency of the wave traveling along the circle and its particle size are set. Physical causes are determined by the form of the solution, and the way the solution is wound up on itself, and how the whole system stabilizes to a stable state. Also, particles have excited states. It is not yet possible to investigate this. This can only be observed. Thus, all further solutions and formulas are only an illustration of the state in which all the wave vortices are located = loks = elementary particles. It turned out that the moment of the lok impulse is also expressed only through these parameters. These are the formulas:

The energy of lok (j,m).

The energy of the lok (j, m) in the general case:

$$E_{j,m} = K^{E}_{j,m} \bullet \pi k^2 \bullet (L_1 + L_2)$$

$K^{E}_{j,m}$ - **Coefficient obtained After solving the equations.**

k - **Wave number.** j**=0,1,2,3,...;** m**=0,1,2,...,**j;

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(1-36*)

Spin of lok (j,m). (The derivation of this formula is given in the following chapters).

Spin of the lok (j, m) in the general case:

$$M_{j,m} = K^{M}_{j,m} \bullet \frac{k(L_1 + L_2)}{c}$$

$K^{M}_{j,m}$ - **Coefficient obtained after solving the equations.**

k - **Wave number.** j**=0,1,2,3,...;** m**=0,1,2,...,**j;

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(1-37*)

j =0,1,2,…; m =0,1,2,… . $K_{j,m}$ - Some numerical coefficients that are obtained in the process of integrating formulas (1-33 *).

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