used to increase the effectiveness of the action of the radiation on the water drop.

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INVESTIGATION OF INTERNAL ELECTROMAGNETIC FIELD IN WEAKLY ABSORBING PARTICLES UNDER RESONANCE CONDITIONS

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This paper deals with the structure of electromagnetic fields and with heat release inside a dielectric sphere under resonance conditions. The distributions of the electromagnetic energy inside the particles were calculated using the formulas and procedure described in [1, 2]. The energy density of the electromagnetic field and the heat release inside the particles are characterized by a quantity B, calculated in terms of the component of the electric field strength $\vec{E}$, viz. $B=\vec{E}\cdot\vec{E}^*/E_0^2$.

A typical picture of the energy distribution inside the particle under resonance conditions is shown Fig. 1, which presents two regions of equal-energy curves in the plane of the particle's great circle. The radiation flux is from left to right. The light incident on the particle is polarized. It can be seen from Fig. 1 that the largest inhomogeneity of the distribution of the electromagnetic energy is observed for this resonance in the direction $\theta=0^\circ$-180°, which coincides with the propagation direction of the incident radiation. With increasing distance from this direction, the values of B decrease rapidly (by three orders of magnitude). At $\theta>20^\circ$, the $B(\theta)$ dependence has an oscillating character with small oscillation amplitudes. It must be noted that the bulk of the electromagnetic energy is released in the regions adjacent to the particle surface.

The investigations have shown that for a particle with $\rho=44.409$ the predominant contribution to the resonance is made by a magnetic partial wave of the order of $\ell=53$. The maximum value of B is then on the diameter that coincides with the direction of the incident radiation. The character of the energy distribution inside the water droplets under conditions of resonances of the magnetic type of other orders does not differ from the energy distribution at the given value of ρ, and all that changes is the maximum value of B and its radial coordinate.

If the main contribution to the resonance is made by electric partial waves, the maximum value of B may turn out to be shifted by a certain angle $\pm\theta$ relative to the particle

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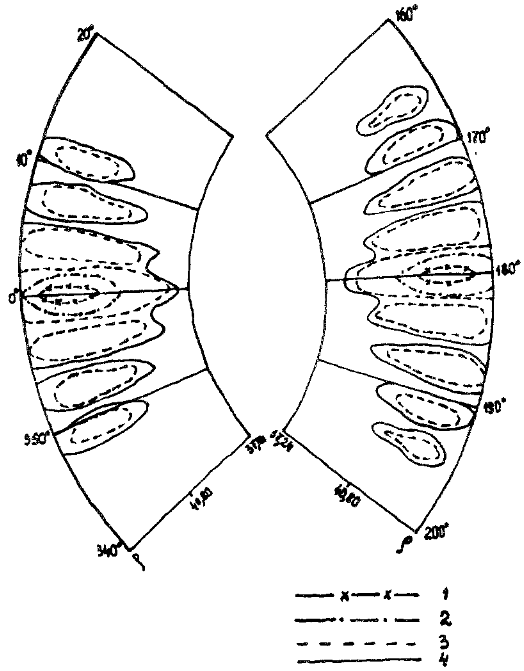

Fig. 1. Distribution electromagnetic energy inside a particle with $\rho = 44.409I$. The equal-energy curves correspond to the values $B = 40^4$(I); $5 \cdot IO^3$(2); IO^3(3); $5 \cdot IO^2$(4) .

diameter. The value of the shift angle θ depends on the size of the particle. In this case, two superheat regions each are produced in the illuminated and shadowed hemispheres; these regions are symmetric about the drop diameter that coincides with the direction of the incident radiation. Qualitatively, the pictures of the energy distribution inside water droplets produced by electric partial waves of different orders are approximately the same.

The investigation of the structure of electromagnetic fields inside weakly absorbing particles under resonance conditions have shown that narrow high peaks are observed in the energy-density distribution. The electromagnetic-energy distribution inside the particles under resonance conditions is considerably more inhomogeneous than in particles whose sizes differ from those of the resonant ones. The maximum values of B are higher by 2-3 orders of magnitude. The structure of the fields and the localization of the principal maxima of B inside the particles differ substantially, depending on the predominant contribution to the resonance by the electric or magnetic partial wave.

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