RECEIVING ANTENNA IN A MAGNETOPLASMA IN THE RESONANCE FREQUENCY BAND

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ABSTRACT

We find the rms voltage on a receiving dipole antenna in the electromagnetic field of a quasi-potential-wavepacket in a magnetoplasma in the resonance frequency band. It is shown that this voltage can be determined as a product of the electromagnetic-field amplitude of the incident wave by the effective length L_{eff} of the receiving antenna. For a short dipole whose length is much smaller than the electromagnetic-mode wavelength, the antenna effective length is proportional to the product of the dipole effective length in free space by the excitation coefficient of quasielectrostatic waves (non-normalized electric-field pattern of a dipole).

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We find the rms voltage on a receiving dipole antenna in the electromagnetic field of a quasi-potential-wavepacket in a magnetoplasma in the resonance frequency band. It is shown that this voltage can be determined as a product of the electromagnetic-field amplitude of the incident wave by the effective length L_{eff} of the receiving antenna. For a short dipole whose length is much smaller than the electromagnetic-mode wavelength, the antenna effective length is proportional to the product of the dipole effective length in free space by the excitation coefficient of quasielectrostatic waves (non-normalized electric-field pattern of a dipole). In the case where the receiving antenna is located in proximity to the resonance cone on the lighted side, this excitation coefficient is much greater than unity. Therefore, the determined voltage differs significantly from the conventional estimate, which is based on formulas valid for antennas in free space. We perform our derivations using the reciprocity theorem and the fluctuation-dissipation theorem applied to a regular electromagnetic field and a receiving antenna, which constitute the special case of a system which is not in equilibrium but allows an equilibrium (stationary state) to be reached between the incident radiation field and the electromagnetic field reemitted by the antenna. The emphasis is placed on the universal nature of the applied calculation procedure which is valid for arbitrary antennas and matters [1].

REFERENCES

[1] Yu. V. Chugunov, “Receiving antenna in a magnetoplasma in the resonance frequency band”, *Radiophysics and Quantum Electronics*, vol.44, Nos. 1-2, pp.151-160. 2001.