

UNCLASSIFIED

AD NUMBER
AD400764
NEW LIMITATION CHANGE
TO Approved for public release, distribution unlimited
FROM Distribution authorized to U.S. Gov't. agencies and their contractors; Foreign Government Information; 16 MAR 1961. Other requests shall be referred to US Library of Congress, Attn: Aerospace Technology Division, Washington, DC.
AUTHORITY
ATD ltr, 2 Dec 1965

THIS PAGE IS UNCLASSIFIED

UNCLASSIFIED

AD **400 764**

DEFENSE DOCUMENTATION CENTER

FOR

SCIENTIFIC AND TECHNICAL INFORMATION

CAMERON STATION, ALEXANDRIA, VIRGINIA



UNCLASSIFIED

NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

400764

43924

S/188/62/000/006/016
B187/B102

STEP
AUTHOR:

Gor'kov, V. P.

TITLE:

The dispersion relation for the ordinary wave with consideration of the wave magnetic field

PERIODICAL:

Moscow. Universitet. Vestnik. Seriya III. Fizika, astronomiya, no. 6, 1962, 28-31

TEXT:

When waves are propagated in a uniform unbounded plasma placed in a field \vec{H}_0 , the frequency ω and the propagation constant k are interrelated by a dispersion relation resulting from the Maxwell equations and from the kinetic equation. In general, the electron distribution is assumed to be Maxwellian. This paper starts with an arbitrary electron distribution $f_0(v, u)$ where v is the transverse component, u is the longitudinal component of the electron velocity with reference to \vec{H}_0 . In the general dispersion relation for the ordinary wave propagating transversely to \vec{H}_0 , the term accounting for the effect of the magnetic field vanishes when the

Card 1/3

The dispersion relation for the...

S/188/62/000/006/016
B187/B102

velocity distribution is isotropic: $f_0(v, u) = f_0(v^2 + u^2)$. In this case, the dispersion relation is

$$G(k, \omega) = k^2 - \frac{\omega^2}{c^2} - \frac{\omega \omega_0^2}{\omega_H c^2} 2\pi \int_0^{+\infty} \int_{-\infty}^{+\infty} f_0 \times$$

$$\times \sum_{n=-\infty}^{+\infty} \frac{I_n^2\left(\frac{kv}{\omega_H}\right)}{n - \frac{\omega}{\omega_H}} v dv du = 0. \quad (2)$$

$\omega_H = \frac{eH_0}{mc}$ is the Larmor frequency, $\omega_0 = \sqrt{\frac{4\pi Ne^2}{m}}$ is the plasma frequency of the electrons, ϑ is the polar angle in velocity space ($z \parallel \vec{H}_0$, ϑ counted from the x-axis), $I_n(kv/\omega_H)$ are Bessel functions. By means of the principle of the argument (Cauchy integral theorem in the theory of

Card 2/3

functions) it is shown that $G(k, \omega)$ for any given real k has no complex solutions $\omega(k)$ and that a real solution exists in every interval $(n\omega_H, (n+1)\omega_H)$, where n is a natural number. This holds true also for a non-isotropic distribution if $f_0(v, u)$ is a monotonically decreasing function with respect to the variable v . If this restriction upon f_0 is not fulfilled, then it is not possible to make any general statements as to the kind of solutions, owing to the method used here.

ASSOCIATION: Kafedra statisticheskoy fiziki i mekhaniki (Department of Statistical Physics and Mechanics)

SUBMITTED: March 16, 1961

ASTIA FILE COPY