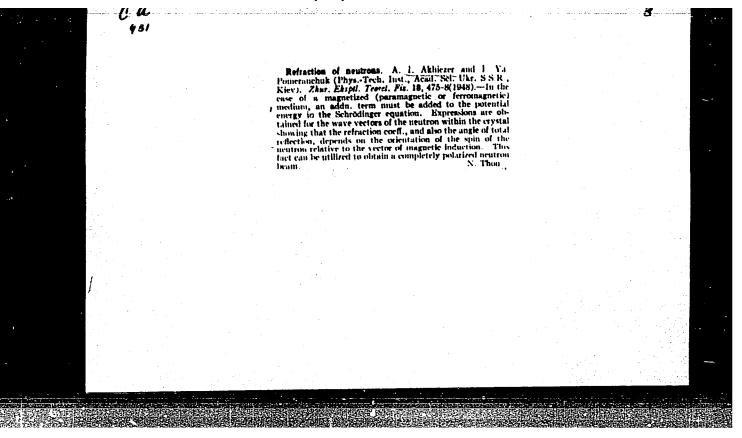
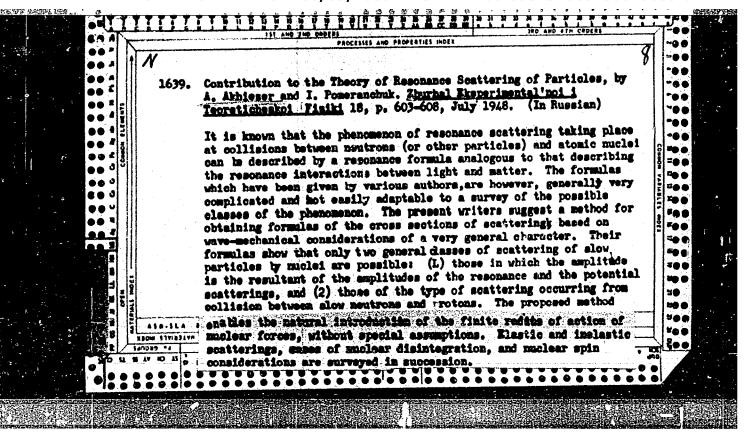
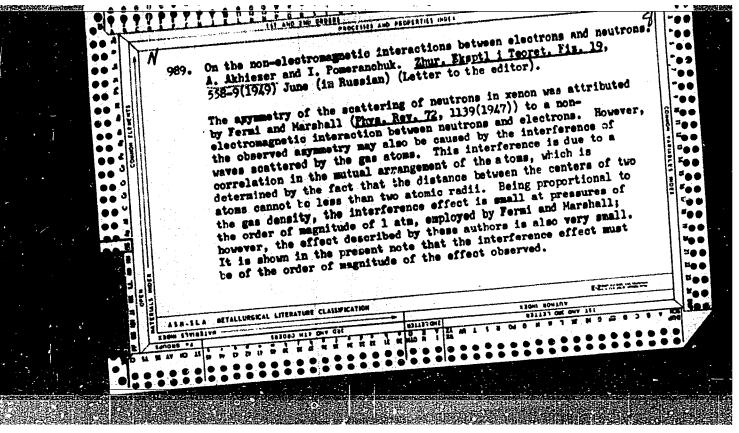
AKHIYEZER, A. I.

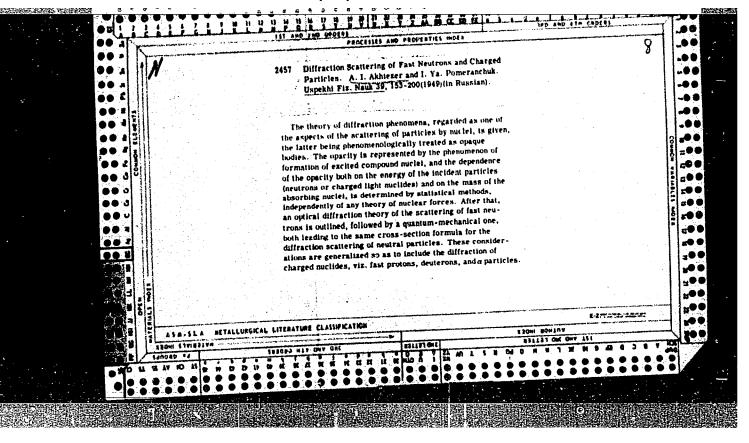
Akhivezer, A. I. and Pargamanik, L. E. - "Free oscillations of the electron AKRIVEZET, A. I. am rargamanik, L. E. - Free oscillations of one electron plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole", Uchen. zapiski Khar'k. gos. un-ta im. Gor'kogo, plasma in a magnetic pole. Uchen. zapiski kan in a magnetic pole. Uc

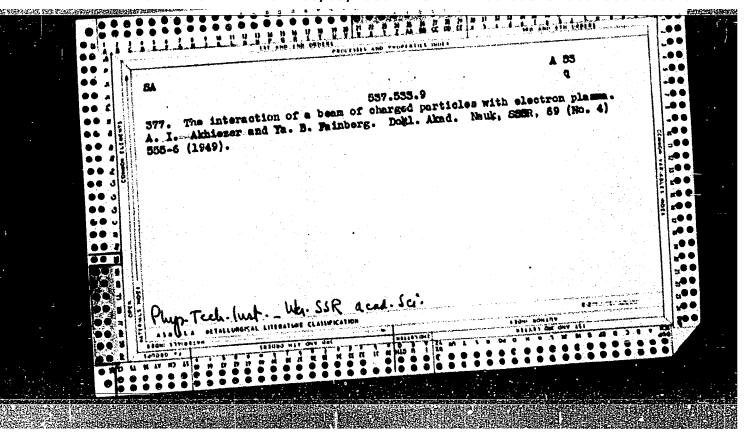
SO: U-3042, 11 March 53, (Letopis 'Zhurnal 'nykh Statey, No. 8, 1949),

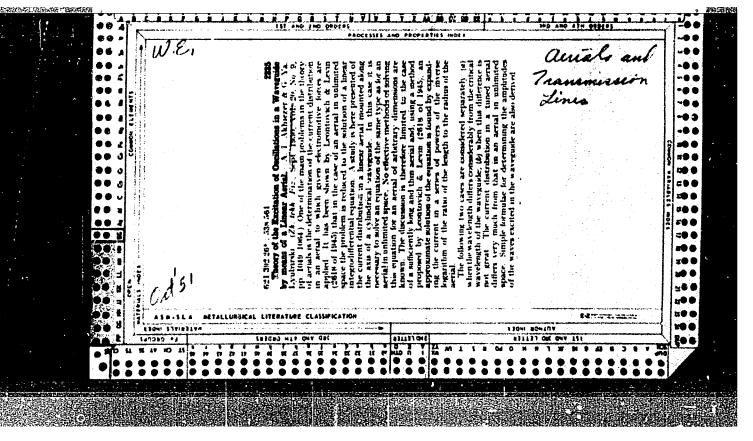


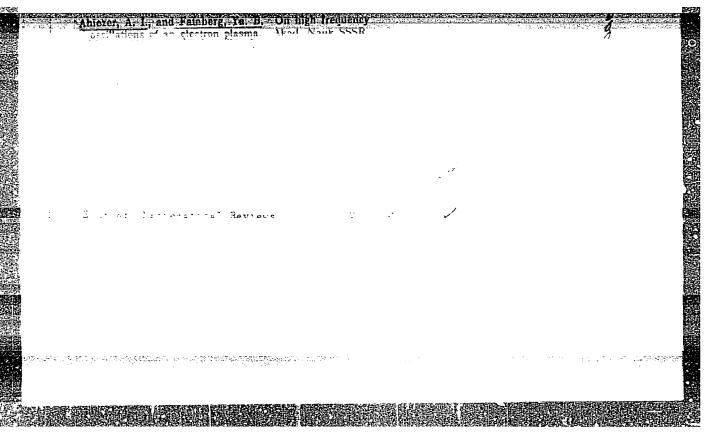












AKHIYEZER, A. I.

USSR/Physics - Nonlinear Plasma Oscillations

11 Sep 51

"Nonlinear Theory of Oscillations of Electron Plasma," A. I. Akhiyezer, G. Ya. Lyubarskiy

"Dok Ak Nauk SSSR" Vol LXXX, No 2, pp 193-195

Solves the simplest uniform nonlinear problem: Considers the longitudinal oscillations in unbounded plasma at abs zero, with the state of the plasma characterized by the ordinarily used distribution function of electron density n(r,t). Acknowledges the interest and valued discussion of Acad L. D. Landau. Submitted by L. D. Landau 18 Jul 51.

PA 236T101

AKHIYEZER, A. I.

USSR/Physics - Plasma Oscillations

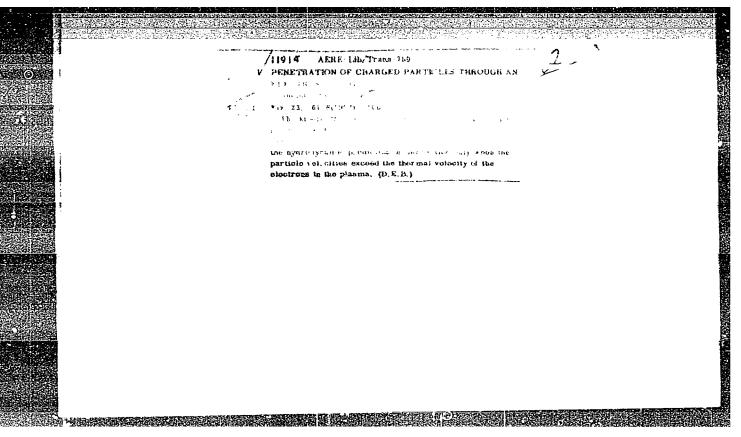
Nov 52

"Oscillation of Plasma in Crossed Electrical and Magnetic Fields," A. I. Akhiyezer and R. V. Polovin

"Zhur Tekh Fiz" Vol 22, No 11, pp 1794-1802

Authors consider the interaction of a compensated beam of electrons with slow waves in crossed-over electrical and magnetic fields. Clarify the conditions that govern the instability of the beam. Cite related works of V. M. Lopukhin and S. D. Gvozdover.

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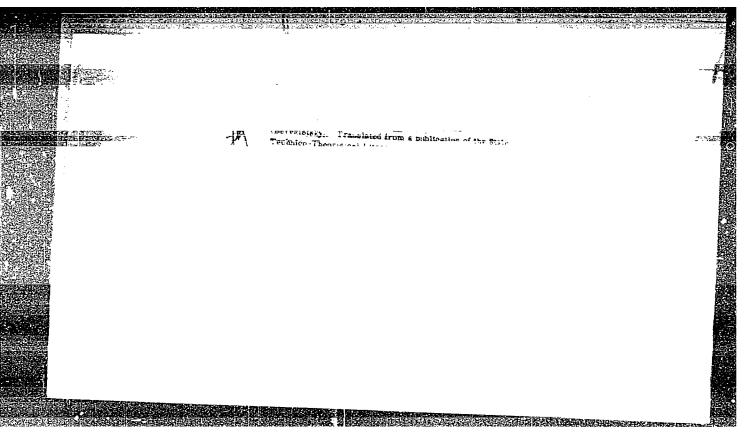


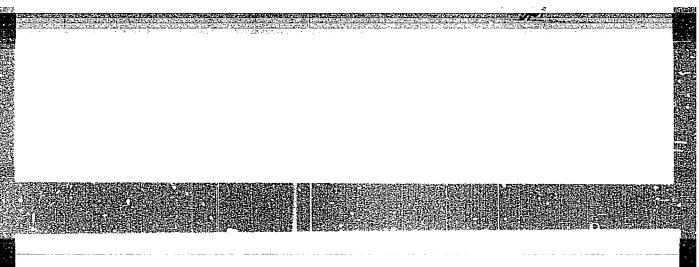
USSR/Physics - Paramagnetism 21 Dec 52

"Paramagnetic Dispersion," A. Akhiyezer and
I. Pomeranchuk

"DAN SSSR" Vol 87, No 6, pp 917, 918

Introduce definition of "magnons" (certain deviations from distribution of magnetic electron moments which are propagated in a crystal in form of a wave) and assume that they obey FermiDirac statistics. Attemp to explain why susceptibility of paramagnetic dielectrics becomes independent of temp at low temps. (cf. B. Cabrera, Rep Inst Phys Solvay, 6, 183, 1932). Presented by Acad L. A. Landau 11 Oct 52.



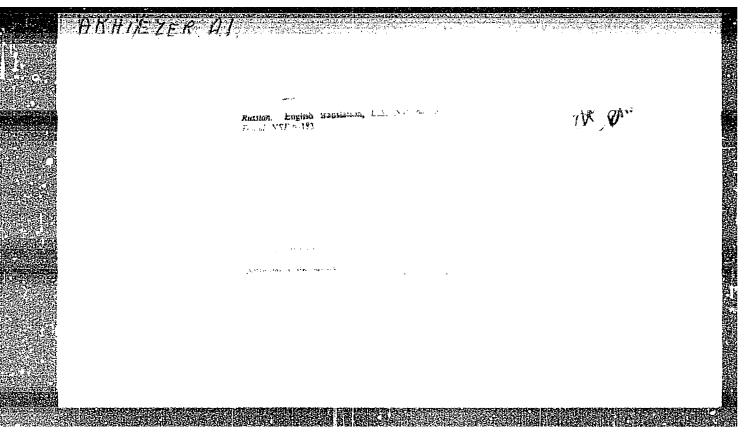


AKHIYEZER, A.

Radiative Corrections to the Scattering of an Electron by an Electron, A. Akhiyezer and R. Polovin. DAN SSSR Vol.90, no. 1, pp.55-57, 1953

Interaction of electron with zero oscillation of electromagnetic field and polarization of electron-positive vacuum lead to additional electron scattering in a specified external electromagnetic field. This should be considered in electron electron scattering. Corrections are computed and represented graphically.

Presented by Acad. L.D. Landau, 10 Mar 53.



USSR/Physics-Endovibrators FD-1234 Card 1/1 Pub. 153-18/22 Author Akhieser, A. I. and Lyubarskiy, G. Ya. Title : Theory of coupled endovibrators : Zhur. tekh. fiz., 24, 1697-1706, Sep 1954 Periodical : Proper frequencies of two endovibrators coupled through narrow and Abstract and long slits in metallic separators are computed. The necessary field equations are derived and integrated. Indebted to Prof. K. D. Sinelnikov, P. M. Zeydlits, O. Zavgorodnyy. Six references including 2 foreign. Institution:

Submitted April 3, 1954

CIA-RDP86-00513R000100610005-8" APPROVED FOR RELEASE: 06/05/2000

USSR/Physics - Quantum electrodynamics

Card 1/1 : Pub. 118 - 7/9

Authors Abrikosov, A. A.; Pomeranchuk, I. Ya.; and Shmushkevich, I. M.

Title : "Quantum Electrodynamics" by A. I. Akhizer and B. B. Berestetskiy.

Gosizdat, 1953, 428 p.

Periodical : Usp. fiz. nauk 53/3, 442-444, July 1954

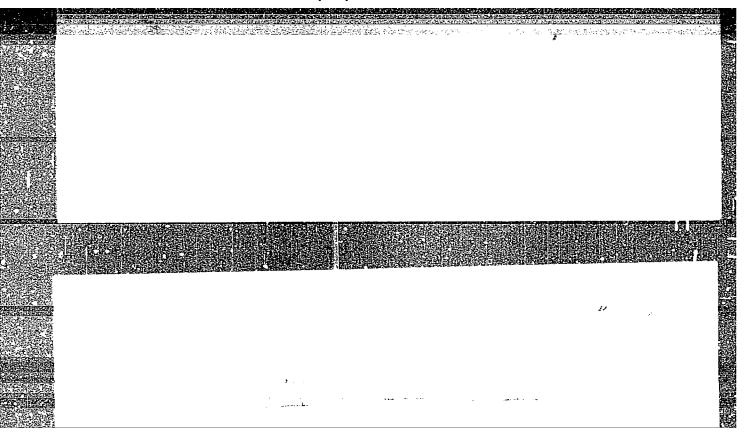
Abstract : A monographical work by two Soviet scientists is reviewed. The mono-

graph deals with quantum electrodynamics and is considered to be a

unique and very valuable work on theoretical physics.

Institution : ...

Submitted : ...



USSR/Physics - Endovibrators

FD-3134

Card 1/1

Pub. 153 - 9/19

Author

: Akhiyezer, A. I.; Lyubarskiy, G. Ya.

Title

: Theory of connected endovibrators. II

Periodical

: Zhur. tekh. fiz., 25, No 9 (September), 1955, 1597-1603

Abstract

: The authors consider the propagation of waves in a series of indentical endovibrators connected with one another by narrow and long slots for which the parameter a $= 1/(\ln[L/d])$ is considerably less than unity, where L is the length and d is the width of the slot. In the series it is possible then to have the propagation of both endovibratorial and also slot waves whose length is determined by the length of the slot. The pass band in both cases is proportional to the above parameter alpha, excluding the case of resonance between endovibrator and slot waves, when the band remains proportional to the square root of alpha. The displacement of frequency in the absence of resonance both for endovibrator waves and also for slot waves is proportional to parameter alpha and this frequency shift is a linear function of the cosine of psi, the shift in phases between the oscillations in two adjacent endovibrators. In the case of resonance the displacement in frequency is proportional to the square root of the linear function of cosine of psi multiplied by parameter alpha. The authors thank K. D. Sinel'nikov, Ya. B. Faynberg, and P. M. Zeydlits, and O. Zavgorodnyy. One reference: ibid., 24, 1697, 1954.

Submitted

: April 1, 1955

USSR / Radiophysics

I

Abs Jour

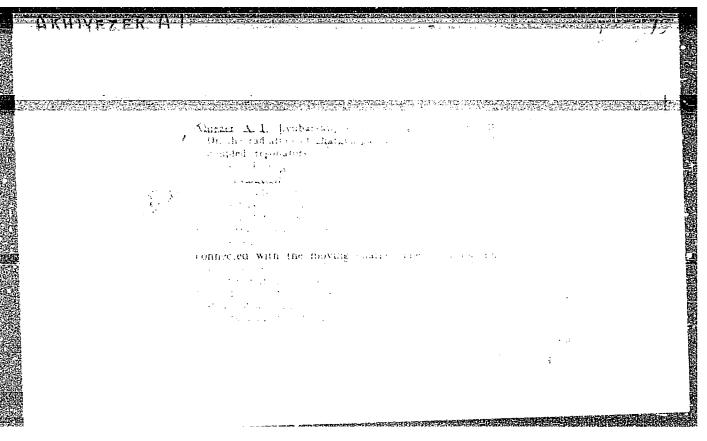
: Ref Zhur - Fizika, No 4, 1957, No 9918

Abstract

: in that case when the undisturbed beam velocity exceeds a certain critical value. The smaller the coupling between the resonators, the smaller this velocity. Thus, in a chain of resonators it is possible to propagate a space-charge wave and electromagnetic waves with increasing amplitudes. It is shown that as regards the character of the propagating waves, the resonator chain with a beam is analogous to a waveguide filled with dielectric, through which a beam of particle passes.

A connection is established between the increasing waves of the field and the space charge density and the Cherenkov radiation of each individual particle.

Card : 2/2



Charge-field interactions in cavity resonators. Uch.zap. KHGU
(MLRA 10:7)

64 no.6:5-7 '55.
(Electrons) (Electric fields)

1Khiyezer, 0..5 Ontegory : USSR/Nuclear Physics - Nuclear Reactions Abs Jour: Ref Zhur - Fizika, No 3, 1957, No 6057 Sotonko, A.G. ; Concerning the Theory of the Couteron Splitting Recction. Author Title Orig Pub : Uch. zap. Khar kovsk, u-nt, 1955, 64, 9-12 Abstract: If the change in the romontum of a douteron is sufficiently lerge, as a result of diffrection scattering of repid douterons by a nucleus, deuteron splitting is possible. The cross section of the diffraction splitting is approximately TRR, i.e, and of the same order as the cross section of the deuteron breakup, observed by Server (Serber, R., Physical Review, 1947, 72, 1008). Using the known expression for the emplitude of the nuclear reaction 17 had the first to the end replacing p', and $\frac{1}{2}$ are function describing the diffraction of protons, neutrons, and deuterons, respectively : 1/2

AKHIYEZER, A. I. Category : USSR/Electronics - Gas Hischarge and Gas-Discharge Instruments

H-7

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1709

: Akhiyezer, A.I., Lyubarskiy, G.Ya.

: On the Stability of the Distribution Function of Electron Plasma. Author Title

Orig Pub : Uch. zap. Khar Kovsk. un-ta, 1955, 64, 13-16

Abstract : An investigation was made of the stability of the stationary state in electron plasma in response to small disturbances. It was established that any monotonically decreasing energy-distribution function is stable with respect to small disturbances of the field and of the density. It is also shown that an electron beam of low density is unstable in the plasma for all electron velocities in the beam and for any dependence of the plasma electron distribution functions on the energy.

. 1/1

AKHIYEZER, A-1.

USSR/Nuclear Physics - Nuclear Reactions, C-5

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 34054

Author: Akhiezer, A. I., Sitenko, A. G.

Institution: Khar'kov University, Khar'kov, USSR

Title: On the Theory of the Nuclear Photoeffect

Original Periodical: Uch. zap. Khar'kovsk. un-ta, 1955, 64, 67-72

Abstract: It is shown that in addition to the process of evaperation of the nucleon from the nucleus and of the photoeffect by an individual nucleon, the photonucleons can also be produced by the following mechanism: the additional nucleon interacts with the surface oscillations of the nucleus, which interact in turn with the electromagnetic wave (interaction of the quadrupole moment of the nucleus with the electromagnetic field of the wave). Using perturbation theory, the authors obtain an approximate expression for the cross section of the quadrupole photonuclear effect. The ratio of the cross section of the quadrupole transition to the cross section of the dipole transition is $\frac{c^{Q}}{c^{Q}} = \frac{1}{5} \left(\frac{Z}{A-Z}\right)^{2} \left(\frac{w}{w+w_{2}}\right)^{2} \left(\frac{hw}{McZ}\right)^{2} A^{2}/3$, where hw is the

1 of 2

-1-

USSR/Nuclear Physics - Nuclear Reactions, C-5

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 34054

Author: Akhiezer, A. I., Sitenko, A. G.

Institution: Khar'kov University, Khar'kov, USSR

Title: On the Theory of the Nuclear Photoeffect

Original Periodical: Uch. zap. Khar'kovsk. un-ta, 1955, 64, 67-72

Abstract: energy of the incident photon and $\hbar w_2$ is the difference between the nearest levels of the residual nucleus. If A ~ 100 and $\hbar w_2 \sim 2-3$ MeV, then at $\hbar w = 17.5$ MeV this ratio will be on the order of 0.1-0.05.

2 of 2

ARHIYEZER, A.I.; LYUBARSKIY, G.Ya.; FAYNBERG, Ya.B.

Nonlinear theory of oscillations in plasma. Uch.zap. KHGU

(MIRA 10:7)

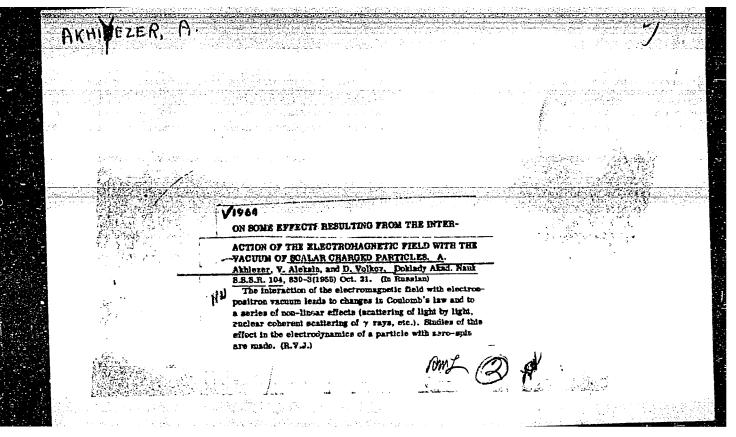
64 no.6:73-80 '55.

(Electric discharges through gases)

USSR Physics Card 1/1 Pub. 22 - 17/54 Akhiyezen, A., and Polovin, R. Authors About the reletivistic oscillations of plasma Title Periodical : Dok. AN SSSR 102/5, 919-920, June 11, 1955 Questions connected with the relativistic oscillations of plasma are Abstract analysed. The analysis is accomplished in view of the Harwell electromagnetic equations for the electric (E) and magnetic (H) fields. Only the longitudinal oscillations of the plasma are considered. One USSR reference (1951).

Institution :

Presented by : Academician L. D. Landau, February 26, 1955



AKHIYEZER, A. I. (Khar'kov)

"Theory of Relaxation and Kinetic Processes in Ferrodielectrics at Low Temperatures," paper presented at the International Conference on Physics of Magnetic Phenomena, Sverdlovsk, USSR, 23-31 May 1956.

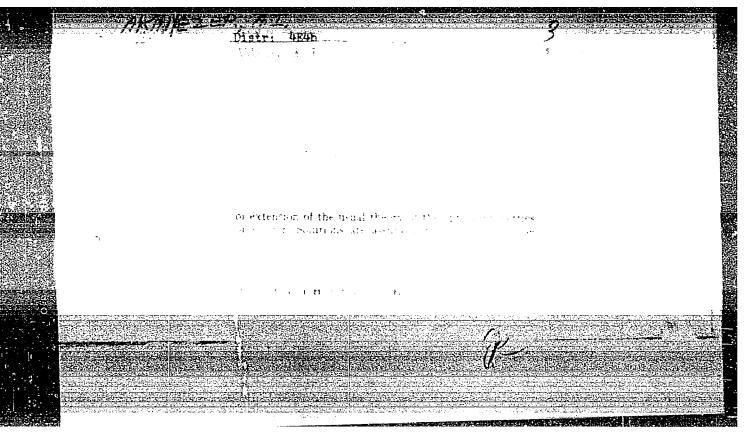
AKHIYEZER, A. I. and SITENKO, A. G.

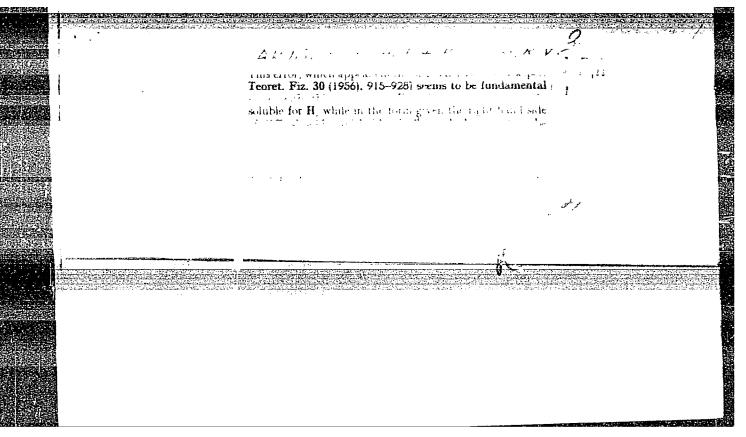
"On the Diffractional Disintegration and Scattering of Fast Neutrons by Nuclei"

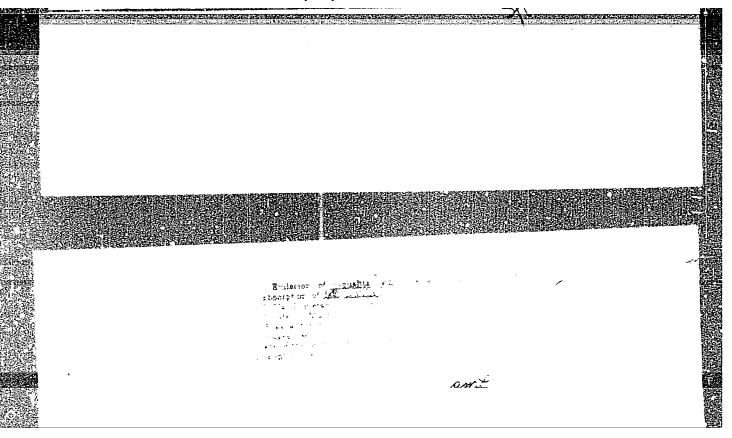
"Note on Nuclear Photo Effect" papers presented at the International Conference on Nuclear Reactions, Amsterdam, 2-7 July 1956.

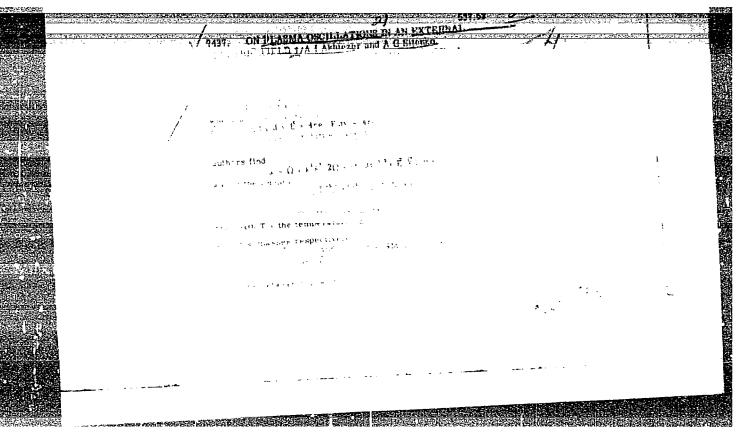
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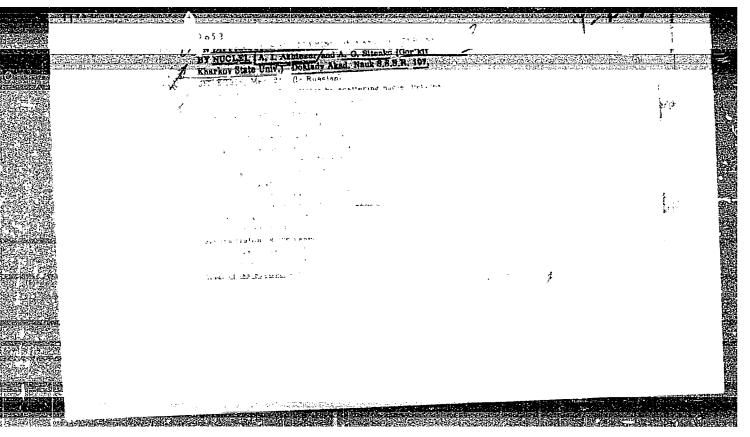
Н

USSR /Electronics

Abs Jour : Ref Zhur - Fizika, No h, 1957, No 9816

Abstract : plasma. For a plasma without external magnetic field, it is shown that the sollutions obtained are equivalent to the motion of an unrelativistic particle of unit mass in a field with a potential energy determined in this article. On the basis of the general equations, the authors consider in greater detail the following plasma motions: small oscillations of plasma (in the first and second approximation), longitudinal oscillations without limitation of the oscillation amplitudes, where the dependence of the period of such oscillations on the amplitude of the velocity is found; transverse oscillations, which have purely circular polarization, and particular cases of coupled longitudinal-transverse oscillations with types of polarizations that are unique to them. The frequencies of all the types of oscillations considered are determined.

1 2/2 Card



AKHYEZER, A. I., FAYNBERG, Ya. B., LYUBARSKIY, G. Ya.

"Cerenkov Radiation and the Stability of Beams in the Wave Guides of Slow Waves used in Linear Accelerators," paper presented at CERN Symposium, 1956, appearing in Nuclear Instruments, No. 1, pp. 21-30, 1957

56-4-20/52

AUTHOR TITLE

PERIODICAL.

ABSTRACT

AKHTYEZER, A.I., SITENKO, A.G.

On the Diffraction Scattering of Fast Deuterons By Nuclei

On the Diffraction Scattering of Fast Deuterons By Nuclei

(0) diffraktsiomom rassayanii bystrykh deytonov yadrami. Russian)

(0) diffraktsiomom rassayanii bystrykh deytonov yadrami. Russian)

Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol 32, Ar 4, pp 794 - 805

The paper under review determines the cross sections of the elastic scattering and of the diffraction spallation of fast deuterons by at)solutely black nuclei. It also determines the energy distribution of the spallation products. It is possible to determine the diffraction scattering of punctiform by absorbing nuclei with the aid of the optical method using the Huygens principle. In order to generalize this method for deuterons, the authors of the paper under review first of all investigate the problem of the diffraction scattering of punctiform particles by absorbing nuclei. This method of investigation permits to make the generalization for the case of the diffraction scattering of composed particles with weak coupling, e.g. of deuterons by absolutely black nuclei. In this context it is necessary to take into account the motion of the centers of mass of the deuterons as well as the relative motions of the neutron and of the proton in the deuteron. The paper under review proceeds to derive expressions for the differential and for the integral cross section of the elastic scattering and of the diffraction spallation, and also an expression for the inte-

Card 1/2

56-4-25/52

AUTHOR TITLE

PERIODICAL

ABSTRACT

AKHIYEZER, A.I., KAGANOV, M.I., LYUBARSKIY, G.Ya.
Un the Abserption of Ultrasonics in Metals
Un the Abserption of Ultrasonics in Metals

(O pogloshchenii ul'trarvula v metallakh. Russian) Zhuraal Eksperim. i Teeret. Fisiki, 1957, Vel 32, Nr 4, pp 837 - 841

When investigating the absorption of sound vibrations in solid bodies, we have to distinguish between two cases. — (a) the frequency of the sound vibrations ω is considerably higher than the reciprocal value of the relaxation time \mathcal{T}_{0} (b) $\omega \ll 1/\mathcal{T}_{0}$. In this first case ($\omega \mathcal{T} \gg 1$) it the relaxation time \mathcal{T}_{0} (b) $\omega \ll 1/\mathcal{T}_{0}$. In this first case ($\omega \mathcal{T} \gg 1$) it is possible to treat the absorption of sound as an absorption of sound quanta with the energy $\hbar \omega$ and with the impulse $\hbar k$ (k denotes the quanta with the collisions of the sound quanta with the quasi-particles characterising the energy spectrum of the solid body, i.e., in the usual distortion media with the phenons, and in the metals with electrons and phenons. In the second case ($\omega \mathcal{T} \ll 1$) the sound vibrations may be viewed as a certain external field in which the gas of the quasi-particles is situated and which medulates the energy of these particles.

The paper under review investigates the absorption of sound in the metals at lew temperatures. In this case the rôle played by the phonons is unimportant as their number tends towards zero in proportion to T is unimportant as their number tends towards zero in proportion to T is the temperature is reduced. The absorption of sound is caused by the

Card 1/2

56-4-25/52

On the Absorption of Ultrasonics in Netals

interaction of the sound wave with the conduction electrons. It is posesible that also the experimentally observable difference of coefficients of absorption of ultrasound in metals in their normal and in their sus pracenductive state is connected with this phenemenen, First of all the paper under review discusses the case with this centext, the changes of the distribution function of the electrons with respect to time and space are essential. The sound field alters the energy of the electrons, and thus also the chemical potential wand the temperatures are altered. In the metals, heat conductance has at lew temperatures no considerable influence on the dissipation of the energy. This discussion to metals are altered. sipation is mainly caused by a "friction" of the electron gas. It is pessible to neglect the appearing magnetic field and to consider the electrical field as lengitudinal. With the aid of the equation which is ebtained by linear appreximation it then is possible to determine the dissipation of the energy. Physical Technical Institute, Academy of Sciences of the Ukrainian SSSR

PRESENTED BY SUBMITTED

3 April 1956 Library of Congress

AKHIYEZER, A.I.

56-3-29/59 Akhiyezer, A.I., Prokhoda, I.G., Sitenko, A.G.

On the Scattering of Electromagnetic Waves in a Plasma AUTHORS:

(O rasseyanii elektronagnitnykh voln v plazme) TITLE:

Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol. 33, Nr 3,

PERIODICAL: pp: 753-757 (USSR)

For the propagation of electromagnetic waves in the plasma a ABSTRACT:

combined scattering of the waves by the density oscillations of the plasma is possible. The combined scattering is due to the fact that in the plasma a weakly damped electromagnetic oscillation may occur which is coupled with the wariation of density of the

plasma. The frequency of these oscillations is given by

 $Q = \sqrt{4\pi n_0 e^2/m}$.

These oscillations lead to a periodical variation of the dielectric constant of the plasma. The intensity of the combined scattering of the electromagnetic field waves in the plasma is theoretically derived with and without the exterior homogeneous magnetic field.

There are 4 Slavic references.

ASSOCIATION: Khar kov State University (Khar kovskiy gosudarstvennyy universitet)

Library of Congress AVAILABLE:

March 18, 1957 SUBMITTED: nota 1/1

AKHIYEZER, A.I

Akhiyezer, A.I., Rozentsveyg, L.N.,

56-3-31/59

AUTHORS:

Shmushkevich, I.M.

TITLE:

On the Scattering of Electrons by Protons (O rasseyanii elektronov

protonami)

PERIODICAL:

Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol. 33, Nr 3,

pp. 765-772 (USSR)

ABSTRACT:

It is demonstrated theoretically that also in the case of most general conditions prevailing the scattering of electrons by protons can be represented by two real functions $a(q^2)$ and $b(q^2)$ of the invariant $q^2 = (p_1 - p_2)^2$. p_1 and p_2 is the fourdimensional electron

momentum before and after the collision. Since the terms a and b do not depend on q2 an unlimited number of experiments independent of each other exist from which in the case of fixed q a and b can be computed. If the comparison of the results for the determination of a and b leads to contradictions in the case of high electron energies it is an important indication that the theory developed is not applicable for high energies. There are 5 figures.

SUBMITTED:

March 21, 1957.

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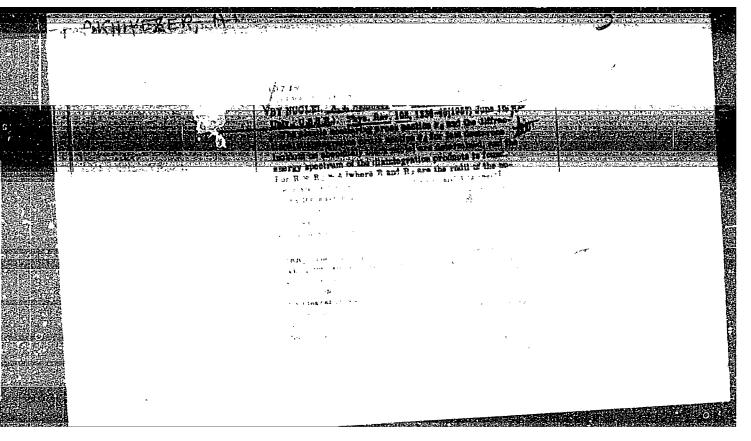
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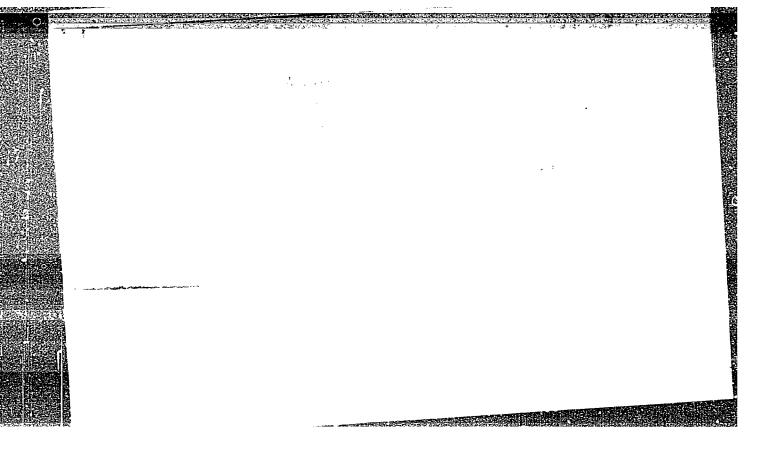
Card 1/1

"APPROVED FOR RELEASE: 06/05/2000

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KHIVEZER, A.L. 56-4-31/54 Sitenko, A.G., Akhiyezer, A.I., AUTHORS: On the Theory of Evaporation Reactions at High Energies (K teorii raaktsii sryva pri vysokikh energiyakh) , TITLE: Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol. 33, Nr 4, pp. 1040 - 1042 (USSE) (Letter to the Editor) PERIODICAL: The effective cross section of anevaporation is theoretically dervied, when the generally made assumption $R \gg R_d$ is not valid. (R = the radius of the nucleus to be split, R_d = the radius of the deuteron). The reaction is treated in which a ABSTRACT: neutron becomes free and a proton is absorbed. The total effective cross section for the evaporation reaction is determined to whereas the following was found for the absorption of a deuon: $\sigma_{a} = 2 \pi R^{2} \int_{0}^{\infty} \frac{p}{\xi} - arc \ tg \int_{p}^{\infty} . \frac{J^{2}_{1}(\xi)}{\xi} d\xi.$ Khar'kor State Unio, Physico-Jech Ind A5 UKr SSR



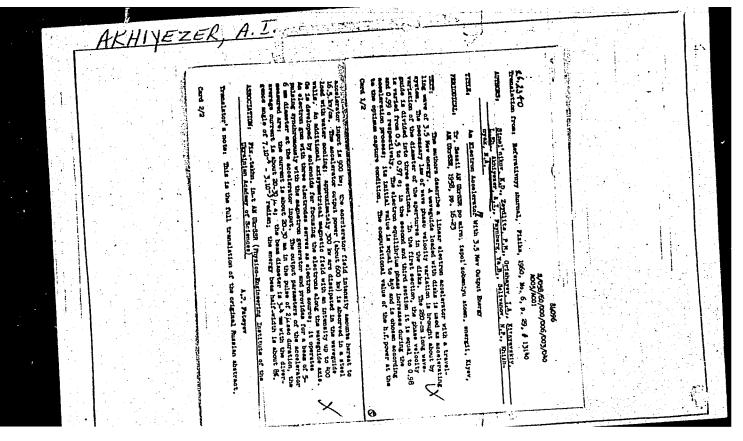


AKHIYEZER, A. I. and FEYNBERG, Ya. B.

"Theoretical Research on High-Frequency Properties of Plasma and Magnetohydro-Dynamic Shock Waves."

paper to be presented at the 2nd UN Intl. Conf. on the peaceful uses of Atomic Energy, Geneva, 1 - 13 Sept 58.

AKHIYEZER Card 2/2 Card 2/2	Application from Enterectivity thermal, Faith, 1960, No. 6, p. 20, \$130 \$2,212 \$1,000 \$	
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ARhiYEZER, A.I. والمتناسف ساداه الما

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Translation from: Referativnyy zhurnal, Fizika, 1960, No. 2, p. 73, # 3070

Akhiyezer, A. I., Akhiyezer, N. I., Lyubarskiy, G. Ya.

The Effective Boundary Condition on the Interface of a Multiplying AUTHORS:

TITLE:

Tr. Sessii AN UkrSSR po mirn. ispol'zovaniyu atomn. energii. Kiyev, PERIODICAL:

AN UKrSSR, 1958, pp. 107-115

TEXT: The distribution of thermal neutrons in a multiplying medium is described by the diffusion equation: $(\Delta N_1 + N_2)^2 = 0$, where $(\Delta N_2 + N_3)^2 = 0$, where $(\Delta N_3 + N_4)^2 = 0$, where $(\Delta N_4 + N_4)^2 = 0$, w region near the boundary of the multiplying medium with a reflector, Equation (1) is not applicable and yields an incorrect expression for N. If dimensions of the multiplying medium surpass the thickness of this layer considerably and if the distribution of the neutrons near the boundary is without interest, Equation (1) can be used for solving boundary problems by introducing the effective boundary condition which compensates the incorrectness of the shape of the curve N (x, y, z) near the boundary. In the general case of a boundary of arbitrary shape this condition can be expressed in he form

82138 8/058/60/000/02/13/023

The Effective Boundary Condition on the Interface of a Multiplying and Moderating Medium

 $\partial N_{1}/\partial \gamma = -(b_{\infty}/a_{\infty}) \times N_{1}/L_{1}$, where V is the direction of the inner normal to the boundary surface, a ∞ and b ∞ are coefficients which are chosen in such a way that the asymptotic bahavior of N_{1} should coincide with that obtained from the solution of the kinetic equation. An infinitely extended medium is considered which is divided by the plane x=0 into two parts: the left semi-infinite space filled with the moderator, and the right one filled with the multiplying medium. The moderating properties of both media are considered to be equal and K=1. The density n of the superthermal neutrons formed as a result of the moderation of fast neutrons is expressed by the authors in conformity with the age theory. H is assumed that neutrons with an initial energy (age $\gamma=0$) are distributed according to the law $n(x,0)=\epsilon N_{1}(x)$ at x>0, n(x,0)=0 at x<0 (ϵ is a certain coefficient). Then the densities of thermal neutrons in the left and right semi-infinite spaces N_{1} and N_{2} satisfy a system of integro-differential equations of the second order: $\frac{1}{2}N_{1}^{2}/dx=\beta N_{1}-\frac{1}{2}N_{2}^{2}\sqrt{\gamma}N_{1}^{2}$) I, $\frac{1}{2}N_{1}^{2}N_{2}^{2}$ exp $\frac{1}{2}N_{1}^{2}N_{2}^{2}N_{3}^{2}$ and $\frac{1}{2}N_{1}^{2}N_{2}^{2}N_{3}^{2}$ and $\frac{1}{2}N_{1}^{2}N_{2}^{2}N_{3}^{2}$ and $\frac{1}{2}N_{1}^{2}N_{2}^{2}N_{3}^{2}N_{3}^{2}$ in the form of quadratures; for small ϵ authors succeeded in finding the ratio ϵ among general integro-differential equation.

Card 2/2

A. Ya. Temkin

AKHIYEZER, O.I.; SITENKO, O.G. [Sytenko, O.H.]

Diffraction nuclear processes at high energies. Ukr.fiz.zhur.

(MIRA 11:4)

no.1:16-34 Ja-F '58.

1.Fiziko-tekhnichniy institut AN URSR.

(Collisions (Nuclear physics)

AKHIYEZER, A.I. [Akhiiezer, O.I.]; LYUBARSKIY, G.Ya. [Liubars'kyi, H.IA.];
POLOVIN, R.V.

Simple waves in magnetohydrodynamics [with summary in English].
Ukr.fiz.shur. 3 no.4:433-438 J1-Ag 158. (NIRA 11:12)

1. Fisiko-tekhnicheskiy institut AN USSR i Khar'kovskiy gosudarstvennyy institut. (Magnetohydrodynamics)

AKHIYEZER, A.I.; POMERANCHUK, I.Ya. Diffraction phenomena during collisions of fast particles with nuclei.

Usp. fiz. nauk 6 no.4:593-630 Ag 158.

(Collisions (Nuclear physics))

SOV/126-6-5-28/43

AUTHORS: Akhiyezer, A. I., Bar'yakhtar, V. G. and Kazanov, M.I.

On the Problem of the Ferromagnetic Resonance Line Width (K voprosu o shirine linii ferromagnitnogo TITLE:

PERIODICAL: Fizika Metallov i Metallovedeniye, 1958, Vol 6, Nr 5,

ABSTRACT: Kittel and Herring (Ref 5) and Ament and Rado (Ref 6) showed that the exchange interaction may broaden the ferromagnetic resonance lines if the magnetic moment is not uniform. Such a non-uniformity does in fact occur in ferromagnetic metals due to the skin effect. The present paper estimates the magnitude of broadening (γ_e) of the ferromagnetic resonance lines due to the exchange interaction. The value of γ_0 is given as a function of the parameters of the ferromagnetic and of the frequency ω in Eq (5). The symbols used in Eq (5) have the following meanings: Oc is the Curie temperature in ergs,

a is the lattice constant, c is the velocity of light

Card1/3 c

SOV/126-6-5-28/43

On the Problem of the Ferromagnetic Resonance Line Width

γ is the broadening due to relaxational processes, g is the gyromagnetic ratio, and is the magnetic moment at saturation and

 B_{o} is the magnetic flux density at saturation.

The total broadening γ is given by $\gamma = \gamma_e + \gamma_r$. The results obtained are generalised to the case of the The results obtained are generatives. The anomalous skin effect at low temperatures. The anomalous skin effect is the value of γ_e in the case expressions for γ_e (which is the value of γ_e then given of the anomalous skin effect) and γ_r are of the anomalous skill offect, and it is the mean free path of electrons. by Eq (6), where ℓ is the mean free path of electrons. Comparison of Eqs (6) and (5) shows that γ_e^a is much smaller than γ_e . Dependence of $\gamma = \gamma_e + \gamma_r$ on temperature is given in Fig.1. The total broadening Y is seen to have a minimum, but this can be observed only

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in very pure samples. Physics- Test And AS UKS SSR

AUTHORS:

Akhiyezer, A. I., Shishkin, L. A.

sov/56-34-5-31/61

TITLE:

On the Theory of Thermal Conductivity and Absorption of Sound in Ferromagnetic Dielectrics (K teorii teploprovodnosti i pogloshcheniya zvuka v ferromagnitnykh dielektrikakh)

PERIODICAL:

Zhurnal eksperimental noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 5, pp. 1267 - 1271 (USSR)

ABSTRACT:

In this paper the determination of the temperature dependence of the heat conductivity and of the absorption coefficient of sound in ferromagnetic dielectrics is investigated. In ferromagnetic dielectrics the elementary excitations are not only represented by phonons but also by spin waves. Therefore the investigation of the influence of the spin waves on heat conductivity and absorption of sound in these materials is of interest. The authors show that at low temperatures the heat conductivity of an unlimited ferromagnetic dielectric without admixtures is determined essentially by the interaction of the spin waves with each other and with the phonons. The dissipation function of the ferromagnetic dielectric will, if an external sonic field

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On the Theory of Thermal Conductivity and Absorption SOV/56-34-5-31/61 of Sound in Ferromagnetic Dielectrics

at low temperatures is present, also be determined by the interaction of the spin waves among each other; it will be independent of the temperature. (In the case of common dielectrics it is inversely proportional to the temperature). The elementary interaction processes in the system of the spin waves and phonons which are considered are the most important ones: Transformation of two phonons into one phonon, transformation of two spin waves into one spin wave, the scattering of a spin wave by a phonon, and the transformation of two spin waves into one phonon. Expressions for the probability of these processes are written down. Subsequently the authors write down and explain the kinetic equations for the distribution functions of the spin waves and phonons with regard to these interaction processes. These equations are specialized for low temperatures. Expressions for the heat currents, caused by the phonons and spin waves, are given. In the last section the absorption of sound in a ferromagnetic dielectric is investigated. On this occasion the deviations of the distribution functions of the phonons and spin waves from their equilibrium values must be found and the increase

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On the Theory of Thermal Conductivity and Absorption

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of Sound in Ferromagnetic Dielectrics

of the entropy of the crystal, which is connected with these deviations, must be determined. The influence of the sound field on the phonons and spin waves is reduced to a change in the energy of the phonon and of the spin wave. At $T \ll \Theta^2/\Theta_c$ the absorption of the sound is caused mainly by the spin waves. The authors express their gratitude to M.I. Kaganov for valuable discussions. There are 4 references, 3 of which are Soviet.

ASSOCIATION:

Khar'kovskiy gosudarstvennyy universitet (Khar'kov State

University)

SUBMITTED:

December 12, 1957

Card 3/4

Akhiyezer, A. I., Sitenko, A. G.

sov/56-35-1-16/59

AUTHORS:

TITLE:

On the Theory of the Excitation of Hydromagnetic Waves (K teorii vozbuzhdeniya gidromagnitnykh voln)

PERIODICAL:

Zhurnal eksperimental noy i teoreticheskoy fiziki, 1958,

Vol. 35, Nr 1, pp. 116 - 120 (USSR)

ABSTRACT:

In conductive liquids located in an external magnetic field hydromagnetic and magneto-acoustic waves are able to propagate (Ref 1). Lundquist (Lundkvist) (Ref 2) investigated the behavior of hydromagnetic waves in a liquid (Hg) during the mechanical excitation of waves by means of a revolving disk. It is, finally, possible to excite hydromagnetic waves by means of external variable

currents. In the present paper the latter possibility is

theoretically investigated, and the intensity of excitation is compared with that attained by mechanical means. First, a perfectly conductive compressible liquid is assumed to exist, which is located in an external magnetic field and is subjected to the action of external currents. The initial equations for the following deliberations are the hydrodynamic basic equations as well as Maxwell's (Maksvell) equations.

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On the Theory of the Excitation of Hydromagnetic Waves SOV/56-35-1-16/59

 $\overrightarrow{v}(\overrightarrow{r},t)$ is here set up as Fourier (Fur'ye) integral, and also for the current density j (k,ω) the Fourier components are written down; the wave equation in the perfect liquid and, further, an expression for the intensity are derived. Furthermore, an expression is also derived for the intensity of excitation as well as for the velocity of the propagation of the hydromagnetic waves in consideration of a damping, by basing on the assumption that the liquid possesses only finite conductivity and is viscous. There are 2 references, 1 of which is Soviet.

ASSOCIATION:

Fiziko-tekhnicheskiy institut Akademii nauk Ukrainskoy SSR

(Physico-Technical Institute, AS Ukrainskaya SSR)

SUBMITTED:

January 29, 1958

Card 2/2

sov/56-35-1-31/59 Akhiyezer, A. I., Bar'yakhtar, V. G., AUTHORS:

Peletminskiy, S. V.

Coupled Magnetoelastic Waves in Ferromagnetics and Ferro-TITLE:

acoustic Resonance (Svyazannyye magnitouprugiye volny v

ferromagnetikakh i ferroakusticheskiy rezonans)

Zhurnal eksperimental noy i teoreticheskoy fiziki, 1958, PERIODICAL:

Vol. 35, Nr 1, pp. 228-239 (USSR)

A deviation of the magnetic moment of ferromagnetics or ABSTRACT:

Seignette electrics from the equilibrium value (at a given temperature) propagates in form of waves, the dispersion characteristics of which do not differ from those of spin waves (Ref 1). In elastically deformable ferromagnetics an interaction between magnetic and elastic waves occurs as a result of magnetostriction and the ponderomotoric forces (caused

by spontaneous magnetization). In the present paper the authors develop a phenomenological theory of these phenomena and determine the velocities of sound in ferromagnetics in dependence on magnetization and the applied magnetic field

strength, the absorption coefficient in dependence on elec-

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Coupled Magnetoelastic Waves in Ferromagnetics and Ferroacoustic Resonance

SOV/56-35-1-31/59

tric conductivity and the relaxation of the magnetic moment, and finally they discuss the possibility of exciting magnetic waves with the aid of ultrasonics (as a result of resonance). The paper is divided into individual sections which deal with the following problems in the following order: Free energy of ferromagnetics; introduction of Maxwell's equations; the dispersion properties of magnetic waves; the absorption of magnetic waves as a result of limited conductivity and of relaxation processes; the case $\lambda \ll gM_0$; coupled and magneto-acoustic waves in ferromagnetics; coupled magneto-acoustic waves with $\lambda = 0$; coupled magneto-acoustic waves for the limiting case of high conductivity $\sigma \gg c^2/c_t^2$; determination of the phase velocity of sound vibrations at ψ_m 0; determination of the absorption coefficients of magneto-acoustic vibrations; disturbance of magnetic waves by external sound-fields. In conclusion, the authors thank L.D. Landau, Academician, and M.I. Kaganov for their advice and discussions. There are 8 references, 6 of which are Soviet.

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.24(3), 10(4)

SOV/56-35-3-25/61

AUTHORS:

Akhiyezer, A. I., Lyubarskiy, G. Ya., Polovin, R. V.

TITLE:

On the Stability of Shock Waves in Magnetohydrodynamics (Ob ustoychivosti udarnykh voln v magnitnoy gidrodinamike)

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 3, pp 731-737 (USSR)

ABSTRACT:

The present paper aims at investigating the stability of plane magnetohydrodynamic shock waves against minor disturbances in dependence on the distance to the explosion front and on time. It is shown that magnetohydrodynamic shock waves become instable and may be split up into several shock waves if the number of magnetohydrodynamic, magnetosound-, and entropy waves leaving the explosion front is different from six. The method of investigation is then described. By basing on the system of

equations (1) $\sum_{k=1}^{n} \left\{ X_{ik}(u) \frac{\partial u_k}{\partial x} + T_{ik}(u) \frac{\partial u_k}{\partial t} \right\} = 0; \quad i = 1, 2, ...n,$ where u_k is the total of hydrodynamic quantities (velocity v,

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magnetic field H, density ϱ , entropy s); $X_{ik}(u)$ and $T_{ik}(u)$ are

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On the Stability of Shock Waves in Magnetohydrodynamics

functions of u_1 , u_2 ,... u_n ; x is the distance to the explosion front, and t denotes the time. (1) is, in the following, linearized for u_{1k} and u_{2k} , and the system of equations (2) thus obtained is solved. Investigation of stability of shock waves is based on Syrovatskiy's (Ref 2) assumption that in magnetohydrodynamics there are seven types of onedimensional plane waves: 1) magnetohydrodynamic waves with the phase velocities $v_x - v_x$, $v_x + v_x$, where $v_x = \frac{1}{x}\sqrt{4\pi\varrho}$; 2) magnetic sound waves with the phase velocities $v_x - v_x$, $v_x + v_x$, where $v_x = \frac{1}{x}\sqrt{4\pi\varrho}$; 2) magnetic sound $v_x + v_x + v_x$, where $v_x + v_x + v_$

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On the Stability of Shock Waves in Magnetohydrodynamics

A)
$$u_{-1} < v_{1x} < v_{1x}$$
, $v_{2x} < u_{2-}$
B) $V_{1x} < v_{1x} < u_{1+}$, $u_{2-} < v_{2x} < v_{2x}$
C) $u_{1+} < v_{1x}$ $v_{2x} < v_{2x} < u_{2+}$ (9)

(cf. Fig 1).

The authors further investigate such cases in which the magnetic field develops parallel to the wave front and in which it is vertical to it; the respective conditions for stability are given (equations 10-13). In conclusion the case of anAl'fven rotary shock wave is investigated and the conditions of stability according to scheme (9) are discussed for various cases. The authors thank L. D. Landau, A. S. Kompaneyets, and G. I. Barenblatt for discussions and advice. There are 6 figures and 2 references, - which are Soviet.

ASSOCIATION: Fiziko-tekhnicheskiy institut Akademii nauk Ukrainskoy SSR (Physico-Technical Institute of the Academy of Sciences, Ukrainskaya SSR)

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CIA-RDP86-00513R000100610005-8 "APPROVED FOR RELEASE: 06/05/2000

AUTHORS:

Akhiyezer, A. I., Pomeranchuk, I. Ya.

SOV/53-65-4-3/13

TITLE:

Diffraction Phenomena in Collisions of Fast Particles With Nuclei (Difraktsionnyye yavleniya pri stolknoveniyakh bystrykh

chastits s yadrami)

PERIODICAL:

Uspekhi fizicheskikh nauk, 1958, Vol. 65, Nr 4,

pp. 593 - 630 (USSR)

ABSTRACT:

Absorption accompanied by nucleon-nuclei scattering causes an additional disturbance of the incident nucleon wave and independently of a production of compound nuclei leads to an additional elastic scattering of nucleons. Strong absorption of particles occurs when the wavelength & of the particles is short compared with the radius of the nuclei. In such cases for the incident particles the nucleus is a black or semitransparent body and the elastic scattering of these particles can, according to their absorption by the nuclei, be compared with the diffraction of light in black or semitransparent bodies. Diffraction scattering of fast particles by absorbing nuclei shows up in the purest form in the case of fast neutrons, but in a modificated form it also is possible with protons. In this case a diffraction emission

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Diffraction Phenomena in Collisons of Fast Particles SOV/53 With Nuclei

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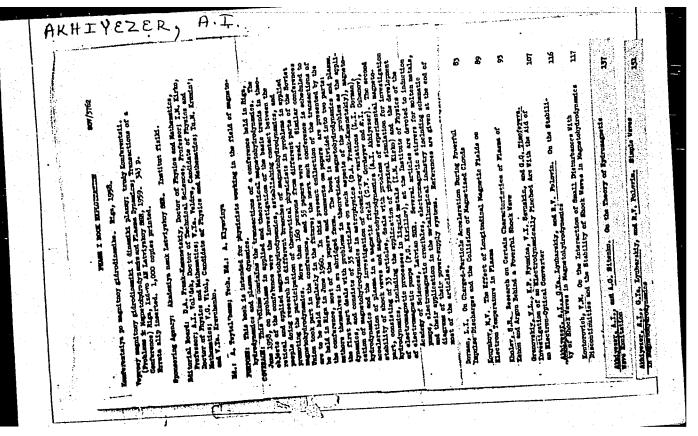
of photons takes place. Even more interesting are diffraction phenomena of charged pions scattered at nuclei or single nucleons. Pions of high energy come into intensive interaction with nucleons; pion and nucleon unite to form a short-lived system. The decay products of such systems are mesons and some pairs of nucleons. Diffraction production of mesons and nucleon pairs can also be a consequence of a collision of fast mesons or nucleons with nuclei. In the present paper such phenomena are investigated by wave mechanics. The wave functions of the particles (far away from the nucleus) are written down as superpositions of the incident plane waves with the waves diffracted by nuclei (black or semitransparent). The analogy with the optical phenomenon makes possible the application of the Huyghens (Gyuygens) principle. The authors try to construct a semi-phenomenological theory of the diffraction phenomena for high energies; this theory bases upon the application of a generalized Huyghens principle. The paper contains the following sections: 1) Introduction, 2) The elastic diffraction scattering, 3) Computation of the nuclear semitransparency, 4) The influence of the Coulomb

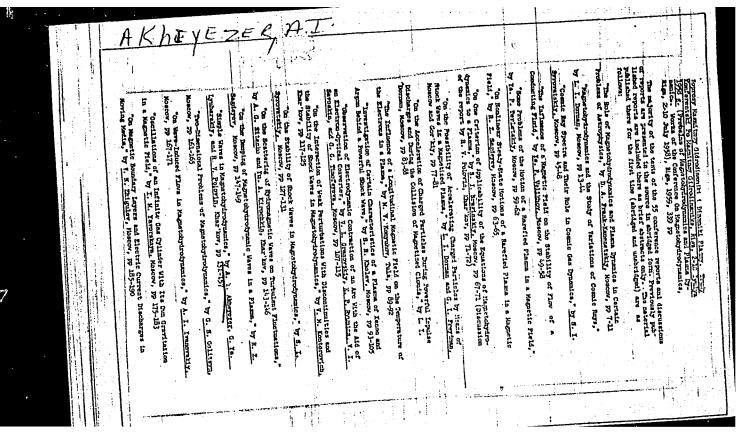
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Diffraction Phenomena in Collisions of Fast Particles SOV/53-65-4-3/13

(Kulon) nuclear field, 5) The Huyghens principle, 6) Diffraction emission of photons by pions (perturbation theory), 7) Emission of photons in dependence on the absorption of pions by nuclei or nucleons, 8) Diffraction production of pion pairs, 9) Diffraction emission of photons by particles with the spin = 1/2, formation of nucleon pairs, 10) Stopping emission of photons by particles with the spin = 1/2, 11)Diffraction phenomena in the scattering of fast neutrons at nuclei, 12) The elastic scattering cross section of the diffraction disintegration of deuterons. The stripping cross section at high energies. There are 5 figures and 28 references, 20 of which are Soviet.

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102000

28 369 s/124/61/000/008/008/042 A001/A101

26.1410 AUTHORS:

Akhiyezer, A.I., Lyubarskiy, G.Ya., Polovin, R.V.

TITLE:

, wellen

On the theory of plain and shock magnetohydrodynamical waves

PERIODICAL:

Referativnyy zhurnal.Mekhanika, no. 8, 1961, 3-4, abstract 8B17 ("Tr. 2-y Mezhdunar, konferentsii po mirn, ispol zovaniyu atomn. energii, 1958, T.1. Yadern. fiz.", Moscow, Atomizdat, 1959, 213-220)

The authors point at the existence of plane non-stationary plain magnetohydrodynamical waves, each of which propagates in an immovable gas with one of the velocities of small disturbance propagation. It is shown that phase velocity within the wave increases with increasing density, if the following relation is fulfilled:

where p is pressure, ρ is density, S is entropy. The interaction of magnetohydrodynamical shock waves with plane waves of small disturbances is considered. It is concluded that the necessary condition for the stability of a wave is as

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On the theory of plain and shock ...

follows: velocities of gas behind the wave and before it should be such that the number of small disturbances of various types diverging from the wave to both sides should be equal to six. By analyzing the shock adiabatic curve, it is established in magnetic hydrodynamics that in media in which relations

 $\left(\frac{\partial^2}{\partial p^2} \quad \frac{1}{\rho}\right)_s > 0, \left(\frac{\partial p}{\partial T}\right)_{\rho} > 0$

are fulfilled, shock waves accompanied by entropy growth are compression waves. It is concluded from the equation which relates the magnitude behind the shock wave to that before it, that magnetic field in the wave varies depending on the relation between densities and velocities.

A. Kulikovskiy

[Abstracter's note: Complete translation]

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PHASE I BOOK EXPLOITATION

SOV/2950

· 24(5); 21(7),(8) Akhiyezer, Aleksandr Il'ich, and Vladimir Borisovich Berestetskiy

Kvantovaya elektrodinamika (Quantum Electrodynamics) 2d ed., rev. Moscow, Fizmatgiz, 1959. 656 p. Errata slip inserted. 10,000 copies printed.

Ed.: Ye. Ye. Zhabotinskiy; Tech. Ed.: N. A. Tumarkina.

PURPOSE: This book is intended for students in advanced physics courses, Aspirants, and scientific researchers in this field.

COVERAGE: This is the second edition of a book which first appeared in 1953. Most of the chapters have been rewritten and much new material has been included. The book examines in detail the basic theories of quantum electrodynamics; i. e., the general theory of wave fields, the theory of Green's functions, and the theory of a scattering (S-) matrix. Radiation, internal conversion of gamma rays, the behavior of electrons in an external field, the Compton

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Quantum Electrodynamics (Cont.)

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effect, brehmsstrahlung, the creation and annihilation of electronposition pairs, the equivalent photon method, radiative corrections to atomic level and scattering, scattering of light by light and polarized particle processes are reviewed. The present intense interest in these subjects is attributed by the authors to the discovery of the nonconservation of parity. The various sections contain numerous computations, illustrated applications of general methods, and final results in the form of formulas and curves which may be used both in theoretical and experimental applications. As to the principal problems of quantum electrodynamics, the theory of renormalizations underwent the greatest revision. While the authors do not profess complete mathematical strictness, they attempt to set forth the concept of renormalizations from one simple physical point of view, avoiding prescribed methods for removing divergences and utilizing the general properties of quantum mechanics systems to the full. In relation to this, some changes have been made in the organization of the book: the investigation of the S matrix in light of the theory of radiative corrections is treated in a separate chapter

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Quantum Electrodynamics (Cont.)

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(Chapter VII); the study of dynamic processes in the first, not zero, approximation, not related to the removal of divergences and renormalizations, is given in Chapters V and VI; and higher approximations, in Chapter VIII. The number of electrodynamic approximations, in Chapter VIII. The number of electrodynamic phenomena covered has been increased, and in particular the phenomena covered has been increased, and in particular the theory of polarized particle processes, the method of "sighting" ("target", "aimed" or "definite-purpose") parameters, and other concepts have been introduced. The book aims on one hand to give a clear physical picture of principles and results of quantum electrodynamics and, on the other, to give, the reader an opportunity to master the method and technique of appropriate computunity to master the method and technique of appropriate computunity to master the method and technique of appropriate computurity. The authors thank V. Aleksin, V. Bar'yakhtar, V. Boldyshev, D. Volkov, S. Peletminskiy, R. Polovin, and P. Fomin for assistance in preparing the manuscript. References are included as footnotes.

TABLE OF CONTENTS:

Foreword to the Second Edition

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308L8 s/044/61/000/008/020/039 C111/C333

AUTHORS:

Akhiyezer, A. I., Lyubarskiy, G. Ya., Polovin, R. B.

TITLE:

Simple waves in magnetic hydrodynamics

PERIODICAL:

Referativnyy zhurnal, Matematika, no. 8, 1961, 56, abstract 8B244. ("Vopr. magnitn. gidrodinamiki i dinamiki plazmy" Riga, AN Latv SSR, 1959, 151-157)

TEXT: The authors describe a method for finding out simple plane waves with a finite amplitude of oscillation in magnetic hydrodynamics. The basic system of equations of magnetic hydrodynamics is schematically represented in the unidimensional case in the form

is schematically represented in the unitarity
$$\frac{\partial u_k}{\partial x} = 0; i = 1, 2, ..., n,$$
 (1)

where u_k is the totality of the hydrodynamic parameters, X_{ik} and T_{ik} -certain functions of u_k . The authors interprete all the functions u_k as functions of one of them: $u_k = u_k(u_1(x_j,t))$, substitute this into Card 1/2

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Simple waves in magnetic . . .

(1) and obtain a system of ordinary differential equations for the determination of $\mathbf{u}_{\mathbf{k}}$:

 $\frac{du_k}{du_1} = U_k(u_1, u_2, \ldots, u_n) .$

The form of the functions U_k is determined from the known solutions of the linearized system of equations (1). Simple plane waves with arbitrary amplitude of oscillation are investigated. In the domain adjecent to the constant flow the authors prove the uniqueness of the plane wave solution of (1).

[Abstracter's note: Conplete translation.]

card 2/2

Investigations of Low-tesperature Physics (lesisdovanige Po	Vestalk Akademii nauk 355R, 1959, Mr 2, pp 96-100 (U35R)	The 5th All-Union Conference on this problem took places in pyllist from October 71 to forward: 1990. Thillst, the pyllist from October 71 to forward: 1990. Thillst, the pyllist from October 71 to forward: 1990. Thillst, the present of forward or forward from the forward or forward or forward or forward from the forward or forwa	of charges on supraconductivity. V. Tolashish strands when the supraconductivity. V. Tolashish strands when the supraconductivity is a final supraconductor. In Interest the supraconductor and by the supraconductor and by the supraconductor and by the supraconductor in the supraconductor in the supraconductor in the supraconductor such an accretion of supraconductor such as a series of such as a series of such such such such such such such such	The controlled of the lestifut fatcheshild problem (Institute of Physical Froblem) investigated the properties (Last) and the controlled due to the second of the controlled due to the controlled due	consequence of soft conseq	erjanation of the notices with it Universalization of the notices will be desired to the notices of the notices will be desired to the properted on the initial principles of the second and the notices of the second and the notices of the second and the second of the second and the second of the
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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100610005-8

24(3) AUTEORS:

507/56-36-1-29/62 Akhiyezer, A. I., Bar'yakhtar, V. G.,

Peletminskiy, S. V.

TITLE:

On the Theory of Relaxation Processes in Ferroelectrics at Low Temperatures (K teorii relaksatsionnykh protsessov v ferrodielektrikakh pri nizkikh temperaturakh)

PERIODICAL:

Zhurnal eksperimental noy i teoreticheskoy fiziki, 1959,

Vol 36, Nr 1, pp 216-223 (USSR)

ABSTRACT:

The authors developed a theory of the relaxation of the magnetic moment of a ferrorelectric and showed that, because of the exchange interaction between the spin waves, above all the Bose distribution of the spin waves with the given nonequilibrium values of the square and the projection of the magnetic moment on to the axis of the slightest magnetization occurs. The Hamiltonian of interaction among spin waves and between spin waver and phonons can be represented in the form \mathcal{H}_{int} = \mathcal{H}_{e} + \mathcal{H}_{w} + \mathcal{H}_{a} + \mathcal{H}_{p} . Here \mathcal{H}_{e} and \mathcal{H}_{w} denote the Hamiltonians of exchange interaction and magnetic interaction respectively, $\mathcal{H}_{\mathbf{a}}$ - the energy of anisotropy, and $\mathcal{H}_{\mathbf{p}}$ - that Hamiltonian which describes the interaction between spin waves and phonons. When

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On the Theory of Relaxation Processes in Ferroelectrics at Low Temperatures

determining \mathcal{H}_{e} it is necessary to proceed from the expression for the exchange energy of the ferromagnetic:

 $\mathcal{H}_{e} = \frac{\alpha}{2} \int \frac{\partial M_{1}}{\partial x_{1}} \frac{\partial M_{1}}{\partial x_{1}} dv$, where M is the magnetic moment of the

volume unit and ∞ is the exchange integral. In the following, the expressions for \mathcal{H}_{w} , \mathcal{H}_{a} , and \mathcal{H}_{p} are written down. The authors then give the formulas for the variation of the number of spin waves with the momentum k in the unit of time, which are caused by the above-mentioned interactions. By using are caused by the collision operators, it is possible to expressions for the collision operators, it is possible to determine the mean probabilities of the various processes of determine the mean probabilities of the various processes of interaction between spin waves and phonons. Above all, the interaction between spin waves and phonons above scattering average probabilities for spin wave spin wave scattering (due to exchange interaction), of the splitting up of a spin (due to exchange interaction), of the splitting up of a spin (due to exchange interaction), of the splitting up of a spin (due to exchange interaction). The probabilities of the other processes are written down. The probabilities of the other processes are written down. The probabilities of the other processes are lower than those of the two last-mentioned. An equation,

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On the Theory of Relaxation Processes in Ferroelectrics at Low Temperatures

SOV/56-36-1-29/62

which is given, determines the quantity of heat transferred from the spin system to the lattice, and a further equation is the law for the conservation of energy. Also relaxation times are calculated. The authors finally thank Academician L. D. Landau and M. I. Kaganov for their valuable suggestions. There are 5 references, 4 of which are Soviet.

ASSOCIATION:

Fiziko-tekhnicheskiy institut Akademii nauk Ukrainskoy SSR (Physico-Technical Institute of the Academy of Sciences,

Ukrainskaya SSR)

SUBMITTED:

July 5, 1958

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24(3), 24(5)

SOV/56-36-3-32/71

AUTHORS:

Akhiyezer, A. I., Pomeranchuk, I. Ya.

TITLE:

On the Interaction Between Conductivity Electrons in Ferromagnetics (O vzaimodeystvii mezhdu elektronami pro-

vodimosti v ferromagnetikakh)

PERIODICAL:

Zhurnal eksperimental noy i teoreticheskoy fiziki, 1959,

Vol 36, Nr 3, pp 859-862 (USSR)

ABSTRACT:

Whereas in ordinary metals mutual attraction between electrons is a consequence of virtual phonon exchange and the matrix element describing interaction energy tends towards an infinite limiting value if the phonon momentum tends towards zero, ferromagnetics show an additional attraction between electrons, and this attraction forms the object of a theoretical investigation in this paper. Additional attraction is a consequence of a virtual emission and absorption of spin waves. As spin wave energy is proportional to the square of their momentum, and as the matrix elements of the emission and absorption of spin waves contain no additional factor that is proportional to the square root of spin wave energy, the matrix element describing the electron interaction energy which depends on the exchange spin waves, is inversely proportional

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SOV/56-36-3-32/71 On the Interaction Between Conductivity Electrons in Ferromagnetics

to the square of the spin wave momentum. In the present paper the character of this effective interaction between electrons in dependence on spin wave exchange is investigated, where the energy operator of interaction between s- and d-electrons is written down in the form $V(\vec{r}) = C \vec{sM}(\vec{r})$, where s denotes the spin of the s-electrons and $\vec{M}(\vec{r})$ - the magnetic moment caused by the d-electrons. C is given as $C = \Delta a^2/\mu$, where μ denotes the Bohr magneton, a - the lattice constant, and Δ - an energy $(\Delta \sim \sqrt{9A})$ depending on the Curie (Kyuri) temperature. For an energy of the conductivity electrons of the form $E(\vec{p},\sigma) = E(\vec{p}) + 2\sigma\Delta$ (p = electron momentum, $\sigma = +1/2$, the projection of the spin on to the z-axis, and $E(\vec{p}) = p^2/2m$) an explicit formula is derived for the matrix element U which describes the interaction energy. For its maximum $(U_{if})_{max} = -a^3U/\Omega$, is obtained with $U = \mu^2/6$, and for the total momentum of an electron pair it holds that $P_0 = \sqrt{p_-^2 - p_+^2} = p_0 \sqrt{2\Delta/\mu}$. There are 1 figure and 7 references, 3 of which are Soviet.

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AKHIYEZER, A.I.

[Introductory remarks to theoretical reports on magnetohydrodynamics] Vstupitel'nye zamechaniia k teoreticheskim dokladam po magnitnoi gidrodinamike. Khar'kov, Fizikotekhn. in-t AN USSR, 1960. 7 p. (MIRA 17:1)

(Magnetohydrodynamics) (Plasma (Ionized gases))

AKHIYEZER, A.I.; LYUBARSKIY, G.Ya.; POLOVIN, R.V.

[Evolutional discontinuities in magnetohydrodynamics] Evoliutsionnye razryvy v magnitnoi gidrodinamike. Khar'kov, Fiziko-tekhn. in-t AN USSR, 1960. 8-24 p. MIRA 17:3)

S/181/60/002/010/014/051 B019/B056

9,4300 (1143,1144,1138)

AUTHORS: Akhivezer. A

Akhiyezer, A. I. and Bar'yakhtar, V. G.

TITLE:

Theory of the Heat Conductivity of Ferrodielectrics at

Low Temperatures

PERIODICAL:

Fizika tverdogo tela, 1960, Vol. 2, No. 10, pp. 2446-2449

TEXT: As shown in an earlier paper (Ref. 1), the spin waves make a considerable contribution to the heat flow in ferrodielectrics at low temperatures. There, only one kind of interaction of spin waves was, however, taken into account, namely the merging of two spin waves into one, and the division of one spin wave into two. Simultaneously with this interaction, the "volume" scattering of spin waves by spin waves plays an essential part. In the present paper this kind of interaction is investigated and at the same time inaccuracies in previous papers are eliminated (Refs. 1,2). In this case, the authors proceed from the kinetic equations (1) for the determination of the change in the number of spin waves and phonons in the case of a small temperature gradient,

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Theory of the Heat Conductivity of Ferrodielectrics at Low Temperatures

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and obtain the solutions $n_{\vec{k}} = n_{\vec{k}}^{\circ} + n_{\vec{k}}^{\circ} (n_{\vec{k}}^{\circ} + 1) \quad \varphi_{\vec{k}}/T$ $N_{\vec{k}j} = N_{\vec{k}j}^{\circ} + N_{\vec{k}j}^{\circ} (N_{\vec{k}j}^{\circ} + 1) \Phi_{\vec{k}}/T$ (2)

 $n_{\vec{k}}^0$ and $N_{\vec{k}j}^0$ are equilibrium Bose functions. For the collision operators

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transferred by phonons. $c_1\gg c_s$. Here θ_D is the Debye temperature, θ_C -the Curie temperature. c_s and c_1 are the specific heats of the spin waves and the lattice respectively. There are 3 Soviet references.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN USSR Khar'kov (Institute

of Physics and Technology of the AS UkrSSR, Khar'kov)

SUBMITTED:

April 4, 1960

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Card 3/3

S/053/60/071/004/001/004 B004/B056

AUTHORS: Akhiyezer, A. I., Bar'yakhtar, V. G., Kaganov, M. I.

TITLE: Spin Waves in Ferromagnetics and Antiferromagnetics I

PERIODICAL: Uspekhi fizicheskikh nauk, 1960, Vol. 71, No. 4,

pp. 533 - 579

TEXT: The present paper deals with the essential properties of the energy spectrum of a ferromagnetic near magnetic saturation. The following properties depend on this spectrum at low temperatures: The interrelation between the magnetization of the ferromagnetic and temperature as well as with the external magnetic field; the thermal properties of the ferromagnetic, the relaxation of the magnetic moment, and the behavior of the ferromagnetic in electromagnetic alternating fields and in sound fields. In crystals, the deviation of the magnetic moment of an atom from the predominant direction does not remain localized on the atom, but it propagates as a wave, which is called spin wave. In the present paper, the ferromagnetic theory is dealt with as follows from the viewpoint of the spin waves: I. Energy spectra, thermal and magnetic

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Spin Waves in Ferromagnetics and Antiferromagnetics I

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properties of ferromagnetics and antiferromagnetics. 1) Spin waves in ferromagnetics. Definition of the microscopic theory of spin waves. 2) The phenomenological theory of spin waves. (The spin wave is defined as an oscillation of the magnetic moment of the ferromagnetic). 3) Derivation of the quantum theory of spin waves by proceeding from the phenomenological Hamiltanian of the ferromagnetic. 4) The high-frequency properties of ferromagnetics and ferromagnetic resonance. Here, the natural oscillations of the magnetic moment are investigated in finite samples, whose dimensions are considerably smaller than the damping length. This condition does not apply to massive ferromagnetic metals because of the skin effect, and therefore 5) deals with surface impedance. 6) Coupled magnetic and elastic waves and ferroacoustic resonance. In 7) the energy spectrum of antiferromagnetics is investigated by means of the phenomenological method. 8) Thermal and magnetic properties of ferromagnetics. From the spin-wave spectrum the magnetic moment of the ferromagnetic may be determined as a function of temperature and of the magnetic field, as well as the contribution made by the spin waves to the thermodynamic parameters of the ferromagnetic. In a similar manner, 9) deals with the thermal and magnetic properties of antiferro-

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Spin Waves in Ferromagnetics and Antiferromagnetics I

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magnetics. In the next issue of this periodical, the last part of this work will be published: II. Interaction among spin waves and between spin waves and lattice vibrations. Relaxation processes and kinetic processes. The authors mention papers by Ya. I. Frenkel' and Ya. G. Dorfman (Ref. 5), Ye. Lifshits (Ref. 8), L. Landau and Ye. Lifshits (Ref. 11), a paper by the authors in collaboration with S. Peletminskiy (Ref. 12), V. Gurevich (Ref. 30), A. Borovik-Romanov (Refs. 39,40), I. Dzyaloshinskiy (Ref. 41), Ye. Turov (Ref. 42), and N. N. Bogolyubov and S. V. Tyablikov (Ref. 15). There are 6 figures and 55 references: 36 Soviet, 13 US, 3 British, 2 Dutch, 3 French, and 3 German.

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9.43 00 (1035,1138,1143)

\$/053/60/072/001/001/005 B013/B060

AUTHORS:

Akhiyezer, A. I., Bar'yakhtar, V. G., Kaganov, M. I.

TITLE:

Spin Waves in Ferromagnetics and Antiferromagnetics. II

PERIODICAL:

Uspekhi fizicheskikh nauk, 1960, Vol. 72, No. 1, pp. 3-32

TEXT: This is the second part of an article published in "Uspekhi fizicheskikh nauk", 1960, Vol. 71, 533, and is devoted to the interaction of spin waves with one another and with lattice vibrations and, furthermore, to the relaxation—and kinetic processes. \$ 10 deals with the fusion and splitting of spin waves and their scattering on spin waves. The authors restrict themselves to considering electrets and, therefore, take into account, aside from the interaction of spin waves with one another, also their interaction with phonons (Ref. 1). The Hamiltonians of the interaction of spin waves are set up, the use of which is restricted to the temperature range below the Curie temperature. The probabilities of fusion and splitting, as well as the scattering of spin waves, are calculated. \$ 11 deals with the interaction of spin waves with one

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Spin Waves in Ferromagnetics and Antiferromagnetics. II 8/053/60/072/001/001/005 B013/B060

another was found to be stronger than their interaction with the lattice. This allows the conclusion that the equilibrium in the spin wave system is more quickly brought about than the one between spin waves and lattice. For this reason, the temperatures of spin waves and lattice may differ. The temperature balance is discussed in § 12 together with the relaxation of the magnetic moment in electrets. The course of relaxation of the magnetic moment in electrets can be explained on the basis of the probabilities the authors established for the interaction processes. In $\hat{\S}$ 13, the authors deal with the dispersion of magnetic permeability of a ferromagnetic dielectric. The complicated character of relaxation established in the preceding chapter influences the dependence of the electret susceptibility on frequency (Refs. 1,7). The case of a longitudinal magnetic alternating field polarized along the equilibrium magnetic moment is examined, i.e., the longitudinal component of magnetic permeability is calculated. When frequencies are sufficiently high it is more expedient not to speak of a calculation of susceptibility, but rather of an absorption coefficient of the photon. This coefficient is determined as the difference of the probabilities of all of the absorption and emission processes of the photon. A formula for determining the

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Spin Waves in Ferromagnetics and Antiferromagnetics. II S/053/60/072/001/001/005 B013/B060

dependence of the photon absorption coefficient on frequency is given (13,20); it can be applied to all limiting cases. The last chapter of the present article (§ 14) deals with the thermal conductivity of electrets. It can be calculated from the spin wave interaction Hamiltonian and the spin wave phonon Hamiltonian, as well as the phonon — phonon interaction Hamiltonian. There are 10 Soviet references.

Card 3/3

24,2120 (1049, 1502, 1482)

5/056/61/040/003/027/031

Akhiyezer, A. I., Lyubarskiy, G. Ya., Polovin, R. V.

TITLE:

Stability conditions of the electron distribution function in

the plasma

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 3, 1961, 963-969

TEXT: The authors deal with the problem of the stability of the electron distribution function toward plasma oscillations. The behavior of these functions at $t\rightarrow\infty$ (t-time) is determined by special points of their Laplace transforms ϕ_p and f_p with respect to time (p = $i\omega$, ω - complex oscillation frequency). In the free plasma ϕ_p and f_p are connected by $f_p(u) = (p+iku)^{-1} \{g(u)+ikem^{-1}\phi_p f_o'(u)\}$ (1) where u is the projection of the electron velocity on the wave vector \vec{k} , $f_o(u)$ the initial function of the distribution of u, and g the initial value of f(u,t). The necessary and sufficient condition for the stability of the distribution function $F_0(v)$ Card 1/%

Stability conditions of ...

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is given by the vanishing of the roots of

$$G(s) \equiv \int_{-\infty}^{\infty} \frac{f_0'(u)du}{u-s} = \frac{k^s}{\omega_0^s}, \quad s = \frac{ip}{k}$$
 (3)

 (ω_0) plasma frequency) in the upper semiplanes at an arbitrary value k(k>0). The criterion for the stability of the distribution function $f_0(u)$ has the form $\int_0^\infty \frac{f_0^2(u)\,du}{u-u} < 0, \quad f_0(u_l) = 0, \quad f_0(u_l) > 0.$ (6)

from which it follows that a distribution function having only one maximum is stable. This stability condition was observed by P. L. Auer (Ref.7: Phys.Rev.Lett.,1,411,1958). If the distribution function has two maxima, the function will not be stable. A further condition is that any spherically symmetrical distribution function $F_{o}(|v|)$ which is nowhere

vanishing is stable. Since $f_0(u) = \int F_0(v) dv_{\perp} = 2\pi \int_0^{\infty} F_0(\sqrt{u^2 + v_{\perp}^2}) v_{\perp} dv_{\perp}$,

holds, where v_{\perp} is the velocity component of the electron which is Card $2/7_2$

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form to	\vec{k} , $f_0'(u) = -2\pi u F_0(u)$ is o	btained. Hence (3) tal	ces on the	
	2n \	$\frac{u(1)}{u}du=\frac{k^2}{\omega_0^2}.$	(7)	
from which	$2\pi \int_{0}^{\infty} \frac{uF_{0}(u)}{ u ^{2}} du -$	$-2\pi^2 ls F_0(s) = \frac{k^3}{\omega_0^3}.$	(8)	
follows. The star	bility condition leads to the	ne fulfillment of the	4n_	
equality: $-\int \mathbf{F}_{0}$	$(u)du < 0$. If $g(\xi)$ is the	Fourier component of	the	
function f (u) =	$\int_{-\infty}^{\infty} g(f)e^{ifu} \cdot df \text{ it can be rep}$	resented in form		
		$g(\xi) = -\int_{0}^{\xi} \psi(\xi - \xi') \psi(\xi') d\xi'$	(10)	\
		$\psi(\xi) = \int_{-\infty}^{\infty} e^{-r\lambda} d\sigma(\lambda)$		
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if the distribution function is stable. Here $\sigma(\lambda)$ is an arbitrary continuous non-decreasing limited function. A certain stable distribution function corresponds to each of these functions. Representation (10) was obtained by A. I. Achizer, G. Ya. Lyubarskiy (Ref. 3: Tr.fiz.otd.fiz.-mat. f-ta KhGU, 6, 13). With a sufficient length of the plasma wave and a sufficiently strong magnetic field H the dispersion equation has the

sufficiently strong magnetic field in the dispersion equation has the following form: $1 - \frac{\omega_0^2 \cos^2 \theta}{\chi} \int_{-\infty}^{\infty} \frac{f_0'(u) du}{\chi u - \omega} + \frac{\omega_0^2 \sin^2 \theta}{2\omega_H} \int_{-\infty}^{\infty} \left(\frac{1}{\chi u - \omega + \omega_H} - \frac{1}{\chi u - \omega - \omega_H} \right) f_0(u) du = 0, \quad (12)$ where $\chi = |\cos \theta|$ and θ are the angles between K and H and $\omega_H = eH/mc$ the electronic gyrofrequency. In the following, $G_{H}(s) = \int_{-\infty}^{\infty} \left(\frac{\cos^{2}\theta}{u-s} + \frac{\sin^{2}\theta}{2s_{H}} \ln \frac{u-s+s_{H}}{u-s-s_{H}} \right) f_{0}'(u) du = \frac{\chi^{2}}{\omega_{0}^{2}}, \quad (13)$

$$G_{H}(s) = \int_{-\infty}^{\infty} \left(\frac{\cos^{2}\theta}{u - s} + \frac{\sin^{2}\theta}{2s_{H}} \ln \frac{u - s + s_{H}}{u - s - s_{H}} \right) f_{0}'(u) du = \frac{\chi^{2}}{\omega_{0}^{2}}, \quad (13)$$