81653

The Interaction of Acoustic Oscillations in Ion- and Electron-ion Plasmas

S/181/60/002/06/43/050
B006/B056

phononic thermal conductivity, which must be known in order to be able to establish the validity of Bloch's assumption concerning the equilibrium distribution of phonons when solving the equation of motion in the conductivity problem. The effect produced by screening the electric field of ions is treated as a result of the zero plasma oscillations of the electron gas (which are analogous to the optical oscillations in ion crystals). The screening constant k_o of the Coulomb field is at first estimated, and an approximate expression for the velocity of sound in ion crystals is found. Formula (3) gives the Hamiltonian $\hat{H}$ of the system of interacting ions; in the latter the chaotic ion motion and its influence upon collective vibrations may be neglected. The operators for the production and annihilation of phonons (4) are defined and introduced into $\hat{H}$. The non-equilibrium distribution function $N_{\vec{k}}$ ($\vec{k}$ - wave number) of the phonons during the occurrence of a temperature gradient in the x-direction is investigated for the case of a slight deviation from equilibrium. For the mean path length of the phonons one obtains $l_{ph} \sim 2\frac{e^2}{k_o^3}\frac{n_o}{\varkappa T}$; $n_o e^2/k_c^2$

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S/126/63/015/002/001/033
E032/E314

AUTHOR: Skrotskaya, Ye.G.

TITLE: Temperature dependence of the electrical conductivity of metals in a magnetic field

PERIODICAL: Fizika metallov i metallovedeniye, v. 15, no. 2, 1963, 166 - 169

TEXT: Lifshits et al (ZhETF, 1956, 31, no. 1, 7) have reported an expression for the resistance of a metal in a magnetic field which includes the parameter t_o which is a measure of the mean time interval between collisions. For low-temperatures and static fields the mean free time cannot be rigorously introduced and it is therefore not clear whether the temperature dependence of t_o is the same as in the absence of the field. To elucidate this problem the author determined the dependence of the conductivity tensor on the temperature for a dispersion relation of the form $\varepsilon(p) = p^2/2m$. It is shown that the form of this tensor is such that t_o is of the same order and has the same temperature dependence as in the absence of the magnetic field. Calculations have

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S/126/63/015/002/001/033
E032/E314

Temperature dependence ....

shown that this conclusion remains in force even for a general dispersion relation.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy institut fiziko-tekhnicheskikh izmereniy (All-Union Scientific Research Institute of Physicotechnical Measurement)

SUBMITTED: July 10, 1962

Card 2/2

L 16515-65 EWT(1)/EPF(c)/EPA(w)-2 Pab-10/Pr-4 IJP(c)/ESD(t)/SSD/AFWL/
AS(mp)-2 WW S/0056/64/047/005/1958/1965
ACCESSION NR: AP5000356

B

AUTHORS: Azbel', M. Ya.; Skrotskaya, Ye. G.

TITLE: Magnetic susceptibility in strong magnetic fields

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 47, no. 5, 1964, 1958-1965

TOPIC TAGS: magnetic susceptibility, conduction electron, temperature dependence, dispersion law, magnetic moment

ABSTRACT: In connection with the difficulties encountered in the past in separating the monotonic susceptibility of the conduction electrons from the lattice susceptibility, the authors calculate the dependence of the susceptibility on the temperature and on the magnetic field by first determining the magnetic moment of the conduction electrons in strong fields. An expression is then obtained for the susceptibility in explicit form and a criterion is derived

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ACCESSION NR: AP5000356

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for magnetic fields which can be regarded as strong for this calculation. Calculations are made for both quadratic (but anisotropic) and arbitrary dispersion laws, and it is shown that for the latter case an experimental investigation of the magnetic susceptibility will yield the field dependence of the energy and of the state denwity at the ground state; in the case of a quadratic dispersion law in strong magnetic fields, the total magnetic moment (diamagnetic and paramagnetic) tends to saturation. The monotonic part of the susceptibility is obtained by subtracting the oscillating part (the deHaas--VanAlphen effect). It is concluded that in strong magnetic fields the magnetic moment in the main approximation does not depend on the temperature and is determined only by the magnetic-field-dependence of the ground state energy. In extremely strong magnetic fields, the magnetic moment is subject to a small increment that depends linearly on the temperature; the proportionality coefficient is determined by the density of states at the ground state. Orig. art. has: 22 formulas.

Card 2/3

L 16515-65
ACCESSION NR: AP5000356

ASSOCIATION: Institut Fiziko-tekhnicheskikh i radiotekhnicheskikh izmereniy (Institute of Physicotechnical and Radio Measurements)

SUBMITTED: 26May64

ENCL: 00

SUB CODE: EM

NR REF SOV: 010

OTHER: 000

Card 3/3

AZBEL', M.Ya.; SKROTSKAYA, Ye.G.

Magnetic susceptibility in strong magnetic fields. Zhur. eksp. i teor. fiz. 47 no.5:1958-1965 N '64. (MIRA 18:2)

1. Institut fiziko-tekhnicheskikh i radiotekhnicheskikh izmereniy.

SHROTSKIY, A. [illegible] i CHERNYUK, I.I.

22072 Shrotskiy, A... i Chernyuk, I.I. Rannyaya diagnostika i terapiya tuberkuleznogo meningita. Uchen. Zapiski Nauch-issled In-ta tuberkuleza v Odesse, Ch. 2, 1948, s. 65-70.

SO: Letopis' Zhurnal'nykh Statey, No. 25, Moskva, 1949.

APPROVED FOR RELEASE: 07/13/2001 CIA-RDP86-00513R001651130006-8"

PUSHCHEVOY, Ya.I.; SKROTSKIY, A. I.

Significance of spontaneous pneumothorax in pediatrics. Pediatriia no.4:78-79 Jl-Ag '55. (MLRA 8:12)

1. Iz rentgenovskogo otdeleniya(zav. Ya.I.Pushchevoy) Detskoy klinicheskoy dorozhnoy bol'nitsy Odessko-Kishinevskoy zheleznoy dorogi (nachal'nik V.I.Gus'kova)
(PNEUMOTHORAX, in infant and child)

EXCERPTA MEDICA Sec.8 Vol.10/10 Neurology, etc. Oct57

Skratskiy, A.I.

4497. SKROTSKIY A.I. and MILLER T.L. Clin. for Child. Dis. of the Med. Inst., ~~Odessa.~~ Application of mud packs to children in the early stage of recovery from poliomyelitis (Russian text) VRAČ. DELO 1956, 7 (709-714)

After using the method for periods up to 1 year, good results were obtained in 64% of cases, but in patients whose illness was of 5 or more years' duration, only 13% of successes was obtained. Concurrently the patients received massage, exercises, vitamin B, haemotherapy, dibazol etc. In all 385 children were under observation. In 38 children the mud therapy was given in the subacute phase. Usually after the first 2 or 3 treatments the pain in the limbs diminished or even disappeared and recovery of movement took place in paralysed muscles. This recovery of function was irregular. Recovery was delayed longest in m.m. quadriceps, peroneus brevis, peroneus longus and deltoid. It took up to 1 or 2 yr. The course of mud therapy comprised from 15 to 30 treatments. All the children tolerated them well. The children were kept under observation after discharge from the unit and long-term domiciliary treatment was arranged - massage, exercises and orthopaedic measures. One month after discharge diathermy was given; sun baths were also provided; after 3 months a course of dibazol; after 5 months a course of galvanism and ultra-violet irradiation. The mud treatment was repeated after one year or sometimes after 6 months. The full course of treatment extended over 3-4 yr. One year after the commencement of mud therapy, 10 children had recovered, 24 had regained full movement, in 1 movement was stronger and 1 child showed no change. Improvement was particularly marked in those children having repeated mud therapy. Each further treatment gave benefit.

Belova - Leningrad (XX,8,7)

20-1-9/64

On the Influence of Gravity on the Propagation of Light.

MASS M_0. The approximate solutions for the gravitational field outside of the body are given in their explicit form. The above-listed MAXWELL-like equations are specialized also for periodical processes $\omega = ck$, and are then solved. In zeroth approximation we obtain a generalized iconal equation. Also the equations of first approximation are given in the paper under review. As a matter of fact, no rotation dispersion exists in the gravitational field. At the propagation of the wave in the direction parallel to the exis of rotation of the body the ray of light suffers not only an EINSTEIN's curvature but it also winds in the direction of rotation of the body. Additional details are listed in the paper under review.
(No reproduction).

ASSOCIATION Ural Polytechnic Institute "S.M.KIROV".
PRESENTED BY FOK V.A., Member of the Academy
SUBMITTED 26.7.1956
AVAILABLE Library of Congress.
Card 2/2

48-6-11/23

SUBJECT: USSR/Physics of Magnetic Phenomena

AUTHORS: Skrotskiy, G.V. and Kurbatov, L.V.

TITLE: Thermodynamical Theory of Relaxation and Resonance Phenomena in Two-Spin Systems (Termodinamicheskaya teoriya relaksatsionnykh i rezonansnykh yavleniy v dvukhspinovykh sistemakh)

PERIODICAL: Izvestiya Akademii Nauk SSR, Seriya Fizhicheskaya, 1957, Vol 21, #6, pp 833-843 (USSR)

ABSTRACT: Substances with pure spin magnetism are considered. They can be represented as a combination of two spin-systems with different partial magnetizations and different gyromagnetic factors.

It is assumed that the spin-systems giving rise to magnetic properties of the substance and the lattice are quasi-independent. In this case, the state of a magnetic substance can be characterized by 3 temperatures: lattice temperature, T_0, which is assumed to be constant, and temperatures of spin-systems, T_1 and T_2. The kinetics of the processes proceeding in a magnetic material is determined by the relaxation times within each of the spin-systems, τ_{11} and τ_{22}, the relaxation times between each of the systems and the lattice, τ_{10} and τ_{20}, and the relaxation

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In the article, "On the Influence of Gravit. on the Propagation of light G. V. Skrotskiy of the Ural Polytechnical Institute imeni S. M. Kirov obtains an expression for the angle of rotation of the plane of polarization of an electromagnetic wave which passes through the gravitational field of a rotating spherical body. The electromagnetic field equations are written in the form of Maxwell's equations for a moving anisotropic medium. The properties of the metrical tensor determine the anisotropy. (Doklady Akademii Nauk SSSR Vol 114, No 1, May 57, pp 73-76) (U)

SKROTSKIY, G.V.; SHMATOV, V.T.

Thermodynamic derivation of an equation of motion in the theory of ferromagnetic resonance. Nauch. dokl. vys. skoly; fiz.-mat. nauki no.1:136-137 '58. (MIRA 12:3)

1. Ural'skiy politekhnicheskiy institut i Ural'skiy filial AN SSSR. (Ferromagnetism)

SKROTSKIY, G.V.; SHMATOV, V.T.

Thermodynamic theory of relaxations. Izv. vys. ucheb. zav.; fiz. no.2:138-143 '58. (MIRA 11:6)

1. Ural'skiy politekhnicheskiy institut i Ural'skiy filial Akademii nauk SSSR.
(Thermodynamics) (Statistical mechanics)

equilibrium, using the linear approximation and according to (2)

$$\tau_T \dot{a} + (a - a_o) = \left(\frac{\partial a}{\partial T}\right)_A (T - T_o) + \left(\frac{\partial a}{\partial A}\right)_T (A - A_o) \qquad (3)$$

where the equilibrium values of the derivatives are found from the equation of state for the subsystem and

$$\tau_T = \left\{ L\left(\frac{\partial A}{\partial a}\right)_T \right\}^{-1}$$

is the time of isothermic internal relaxation. In this approximation

$$\dot{Q} = \alpha(T - T_o) \qquad (4)$$

where α is the coefficient of thermal conductivity between the subsystem and the thermostat, and Q is the heat given by the subsystem to the thermostat. Using well known thermodynamic relations and the linear approximation we find that

SOV/126-6-2-26/34

Thermodynamical Derivation of Dynamic Susceptibility

using (3) and (5) that the dynamic "susceptibility" is given by:

$$\left(\frac{\partial a}{\partial A}\right)_{\omega} = \left(\frac{\partial A}{\delta A}\right) \frac{1 + i\omega\tau_a}{1 + i\omega(\tau_T+\gamma\tau_a)-\omega^2\tau_a\tau_T}$$

There are 3 Soviet references.

(NOTE: This is a complete translation)

ASSOCIATION: Ural'skiy politekhnicheskiy institut;Ural'skiy filial AN SSSR (Ural Polytechnical Institute;Ural Branch of the Ac.Sc. USSR)

SUBMITTED: April 16, 1956

Card 5/5 1. Thermodynamics--Mathematical analysis

SOV/56-34-3-32/55

AUTHORS: Skrotskiy, G. V., Shmatov, V. T.

TITLE: On the Thermodynamical Theory of Resonance and Relaxation Phenomena in Ferromagnetics (K termodinamicheskoy teorii rezonansnykh i relaksatsionnykh yavleniy v ferromagnetikakh)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 3, pp. 740-745 (USSR)

ABSTRACT: The present work shows the following: Using the thermodynamical method of irreversible processes equations for the time change of the magnetization taking into account the spin-spin relaxation and the spin-lattice relaxation can be obtained on very general and simple conditions. Furthermore the influence of the spin-lattice relaxation on the phenomena of ferromagnetic resonance are discussed. The system of spin-moments responsible for the magnetic properties of the ferromagnetic substances can, from the thermodynamical point of view of be separated into on own sub-system with the temperature T(spin-system). The residual degrees of freedom of the complete system are

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On the Thermodynamical Theory of Resonance and Relaxation SOV/56-34-3-32/55
Phenomena in Ferromagnetics

the amount of the vector of spontaneous magnetization $\vec{M} = \vec{M}_s$, but only its direction. The ferromagnetic resonance is in weak fields very insensitive to the detailed form of the equations used for its description. The one or other form of the equations must only then be preferred when non-linear effects are observed.
There are 11 references, 7 of which are Slavic.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnical Institute)

SUBMITTED: October 18, 1957

Card 4/4

SOV/56-35-1-29/59

On the Theory of the Anisotropy of the Width of the Lines of Ferromagnetic Resonance Absorption

This is the equation by Landau and Lifshits, with the aid of which the dependence of the width of the absorption lines on the field is derived. For $\alpha = \lambda/\gamma M$ one obtains for the connection of spin-spin relaxation time τ with α: $\frac{1}{\tau} = \gamma M^{-2}(\vec{M}\vec{H})\alpha$; $((\vec{M}\vec{H}) = MH)$ and for $\lambda : \lambda = M^2/\tau(\vec{M}\vec{H})$. For manganese ferrite with slight zinc impurities (investigated in paper (Ref 1)) at 9100 megacycles and an anisotropy K/M at room temperature of (-71 ± 1) Oe) as well as for manganese ferrite $Mn_{0,98}\,Fe_{1,86}\,O_4$ (Ref 7, 9300 megacycles (-79 ± 3) Oe) the values of H_{res}, ΔH, $|\alpha|$ and $1/\tau$ are in the following compiled in a table in accordance with the derived formulae. $|\alpha|$ is of the order 10^{-3} and $1/\tau \approx 10^8\,sec^{-1}$. There are 1 table and 7 references, 2 of which are Soviet.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute)

Card 2/2

SOV/56-35-3-40/61

The Equations of Motion for a System Which Consists of 2 Sorts of Interacting Spins

$$\dot{M}_k^{(2)} = L_{ik}^{21}\,(H_i - H_i^{(1)}) + L_{ik}^{22}\,(H_i - H_i^{(2)})$$

where $\vec{H}^{(1)}$ and $\vec{H}^{(2)}$ are connected with the magnetizations of the subsystems of the spins $\vec{M}^{(1)}$ and $\vec{M}^{(2)}$ by the relations $\vec{M}^{(1)} = \chi_{o1}\,\vec{H}^{(1)}$, $\vec{M}^{(2)} = \chi_{o2}\,\vec{H}^{(2)}$. The coefficients L_{ik} satisfy the relations of Onsager (Onzager). The initially given equations are specialized for the case in which the medium is isotropic in the absence of a field. These equations can be reduced to $\vec{M}^{(1)} = \chi_{o1}\,\vec{H}^{(1)}$, $\vec{M}^{(2)} = \chi_{o2}\,\vec{H}^{(2)}$ if there is no transverse radiofrequency field in the steady state. For parallel fields $\left[\vec{H}_o, \vec{h}(t)\right] = 0$ this system of equations agrees with the equations deduced by Solomon. If there is no second subsystem, the equations may be reduced to an equation of the form $\dot{\vec{M}} + \vec{M}/\tau = (\chi_o/\tau)\vec{H} + \gamma\left[\vec{M}\,\vec{H}\right]$. Equations are deduced also for constant $\vec{M}^{(1)}$ and $\vec{M}^{(2)}$. The equations deduced in this paper may be applied to relaxation and resonance processes in anti-

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SOV/56-35-6-22/44

24(3)

AUTHORS: Skrotskiy, G. V., Zyryanov, P. S., Izyumov, T. G.

TITLE: The Influence of Paramagnetic Electron Resonance on the Optical Effect of Faraday at Low Temperatures (Vliyaniye elektronnogo paramagnitnogo rezonansa na opticheskiy effekt Faradeya pri nizkikh temperaturakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 6, pp 1471-1474 (USSR)

ABSTRACT: Daniels and Wesemeyer (Daniyels, Vezemeyer)(Ref 1) experimentally investigated the influence exercised by magnetic resonance on the optical Faraday (Faradey) effect. They worked with neodymium ethylene sulfate single crystals at 1.5 °K, 9060 megacycles, and 5461 Å. Kastler (Ref 2) was the first to investigate the connection between Faraday effect and paramagnetic resonance, and Opechowski (Opekhovskiy) (Ref 3) carried out the respective quantum-mechanical calculations. The results obtained are discussed in the introduction. The authors of the present paper investigated these phenomena on the basis of the usual macroscopical theory; an explicit expression is derived for the angle of rotation of the polarization plane of a light wave near paramagnetic resonance in a

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SOV/56-35-6-22/44

The Influence of Paramagnetic Electron Resonance on the Optical Effect of Faraday at Low Temperatures

radio-frequency field which is weak in comparison to the constant magnetic field H_o. The influence of paramagnetic resonance on the optical effect is based upon spin-orbit interactions. The dielectric constant characterizes the optical properties, and as the state of the spin system varies considerably within range of paramagnetic resonance, a change of the state of the spin system (in consideration of spin-orbit coupling) leads to a variation of the dielectric constant, which fact explains the influence exercised upon optical properties. Theoretically, the problem was dealt with according to the method outlined in reference 4. The ansatz for the specific angle of rotation of the polarization plane is, according to Vol'kenshteyn (Ref 5) the following:

$\Theta = (\omega/4c)\ (n_-^2 - n_+^2)/n$, where the refraction index $n_{\pm}$ is ck/ω for right-handed and left-handed circularly polarized waves respectively. The following approximated solution is obtained: $\Theta = (2\pi\gamma/c)nM_{oz}$ (see figure). For strong radio-frequency fields there is only qualitative agreement between this formula and the experiments. There are 1 figure and 5 references, 2 Soviet

Card 2/3

2 URAL Polytechnic Inst.

SOV/56-35-6-24/44

24(3)

AUTHORS: Skrotskiy, G. V., Alimov, Yu. I.

TITLE: Ferromagnetic Resonance in a Circularly Polarized Electromagnetic Field of Arbitrary Amplitude (Ferromagnitnyy rezonans v polyarizovannom po krugu elektromagnitnom pole proizvol'noy amplitudy)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 6, pp 1481-1484 (USSR)

ABSTRACT: It is the aim of the present paper to analyze the exact solutions of the equations of motion of magnetization, viz. of the equation of the Bloch (Blokh)-type $\dot{\vec{M}} = \gamma\left[\vec{M}\vec{H}\right] + (\chi_0\vec{H} - \vec{M})/\tau$ as well as of the Landau-Lifshits equations (Ref 1) $\dot{\vec{m}} = \gamma\left[\vec{m}\vec{H}\right] + \alpha\left[\vec{m}\dot{\vec{m}}\right]$, $\alpha < 0$, where $\vec{m} = \vec{M}/M_s$ and $\vec{H} = \vec{H}_0 + \vec{h}$. In the introduction, the respective experimental investigations carried out by Damon (Demon) (Ref 2), Bloembergen and Wang (Blumbergen and Vang) (Ref 3), as well as the theoretical investigation by Suhl (Sul) (Ref 1) are discussed in short. The present paper investigates the solutions of the aforementioned equations in a circularly polarized

Card 1/2

SKROTSKIY, G.V.; KOKIN, A.A.

Space and time, forms in which matter exists. Filos. vop. fiz. i khim. no. 1:33-39 '59. (MIRA 14:2)
(Space and time) (Matter)

SKROTSKIY, G.V. [Skrots'kyi, H.V.]; TALUTS, G.G. [Taluts, H.H.]

Extending Frenel's formulae to the case of absorbing uniaxial crystals. Ukr.fiz.zhur. 4 no.6:724-728 N-D '59. (MIRA 14:10)

1. Ural'skiy politekhnicheskiy institut im. Kirova.
(Crystals--Optical properties)

24,2200
24.7900

67655
SOV/126-8-6-1/24

AUTHORS: Zyryanov, P.S., Izyumova, T.G. and Skrotskiy, G.V.

TITLE: Electrical Conductivity of Ferromagnetic Metals in a Radio-Frequency Field

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 6, pp 801-806 (USSR)

ABSTRACT: It is well known that ferromagnetic metals have an additional resistivity due to the interaction of conduction electrons with thermal fluctuations in the magnetization. In the case of ferromagnetic resonance, the character of the magnetization fluctuations may be altered quite considerably. The resistivity of a metallic ferromagnetic may be looked upon as consisting of three components, namely those due to the interaction of the conduction electrons with phonons and ferromagnons, and a further component due to the change in the magnetization in a radio frequency field. The temperature dependence and the order of magnitude of the first of the above three components is well known. The second component has been calculated by Turov (Ref 1) for the low temperature region, using the spin wave model; the temperature dependence of this component is in a

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67655
SOV/126-8-6-1/24

Electrical Conductivity of Ferromagnetic Metals in a Radio-Frequency Field

qualitative agreement with experiment. The present authors attempt to set up a quantitative theory of the increase in the resistivity of ferromagnetics in a radio-frequency field. Near the ferromagnetic resonance, the energy of the radio-frequency field is transferred to spin waves having a wave number close to zero and this corresponds to an increase in the precession angle of the magnetization vector. Since in this case the magnetization remains uniform, there is no additional contribution to resistivity. However, in the case of a ferromagnetic metal in a radio-frequency field, the magnetization in the skin-layer will no longer be uniform and the radio-frequency field will tend to increase this nonuniformity and excite a spin wave with a wave number $k \sim 1/\delta$, where δ is the depth of the skin-layer. This increase in the nonuniformity of the magnetization in the skin-layer near resonance will give rise to an additional interaction of conduction electrons with the metal and hence the resistance of the skin-layer has a resonance character. The effect can be observed in thin films

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SOV/56-36-1-23/62

24(3)

AUTHORS: Skrotskiy, G. V., Kokin, A. A.

TITLE: A System of Magnetic Moments in a Weak Variable Magnetic Field (Sistema magnitnykh momentov v slabom peremennom magnitnom pole)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 1, pp 169-175 (USSR)

ABSTRACT: The authors investigate a system of magnetic moments with electric exchange interactions and with magnetic dipole-dipole interactions, which is located in the external magnetic field $\vec{H}_0 + \vec{h}(t)$. By employing the method of Kubo and Tomita (Ref 5), they deduce the equation of motion of the magnetization vector for a system of magnetic moments which are connected with electric exchange interactions and also with weak magnetic dipole-dipole interactions. The coefficients figuring in these equations can be calculated for concrete cases. First, an expression is defined for the component of the magnetization vector. The calculations are given step by step. For calculating the components $M_\alpha(t)$ of the magnetization it is sufficient to determine the components of the tensor

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SOV/56-36-1-23/62

A System of Magnetic Moments in a Weak Variable Magnetic Field

function $G_{\alpha\beta}(\tau)$ of relaxation. For calculating the components of $G_{\alpha\beta}$, the expression for the operator $\hat{M}_{\alpha}(t)$ is expanded into a series. The expression found for the magnetization $\hat{M}_{\alpha}$ determines its time dependence in weak variable fields. Finally, the authors deduce the differential equation for the components of the magnetization vector. There are 8 references, 1 of which is Soviet.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute)

SUBMITTED: June 23, 1958

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SOV/56-36-2-20/63

24(3),12(0)

AUTHORS: Skrotskiy, G. V., Kokin, A. A.

TITLE: On the Theory of Nuclear Paramagnetic Resonance in Liquids (K teorii yadernogo paramagnitnogo rezonansa v zhidkostyakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 2, pp 481-487 (USSR)

ABSTRACT: The quantum theory of magnetic resonance absorption in radio-frequency fields developed by Kubo and Tomita (Ref 1) is used by the authors of this paper for the purpose of describing nuclear paramagnetic resonance in liquids; the thermal motion of the molecules, which leads to narrowing of the absorption line is taken into account on the basis of the diffusion theory. Already in reference 2 the influence exercised by the anisotropy of the g-factor upon line shape was investigated by means of this method, and in reference 3 this was done with respect to the influence of exchange interaction on hyperfine structure in electronic paramagnetic resonance. A. K. Chirkov and A. A. Kokin by this method determined the line shape of electronic resonance absorption in powders of free radicals (Ref 4). G. V. Skrotskiy and Kokin (Ref 5) introduced an equation of

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SOV/56-36-2-20/63

On the Theory of Nuclear Paramagnetic Resonance in Liquids

motion for the magnetization vector. Thermal motion was taken into account by reference 6 (as intranslatory-reference 1) by $f(t) = \exp(-|t|/\tau_c)$, which describes the Braun and rotational motion. The correlation time τ_c is for rotational motion a function of temperature, motion, and dimensions of molecules, for translatory motion it depends on the mutual position of the paramagnetic molecules or ions. Basing upon these assumptions and by using the results of the previous paper (Ref 5), the authors in the following investigate the transversal and longitudinal relaxation time in liquids on the basis of the diffusion theory, assuming that the sample is located in a constant magnetic field $H_0 = H_z$ and in a weak radio-frequency field $\vec{h}(t)$. For the relaxation times $T_{\parallel}$ and $T_{\perp}$, e.g. for water at 20°C with $a = 1.45.10^{8}$ cm, $b = 1.54.10^{-8}$ cm, $\tau_0 = 0.32.10^{-11}$ sec and $V/N = 30.10^{-24}$ cm^3 (Ref 8), one obtains with (36) $\frac{1}{T} = \frac{1}{T_{\perp}} = \frac{1}{T_{\parallel}} = \frac{3}{2} g^4 \mu_0^4 \hbar^{-2} \tau_c \left(\frac{6\pi}{S} \frac{N}{V} a^{-3} + b^{-6}\right)$; $\tau_0 \omega_0 \ll 1$,

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On the Theory of Nuclear
Paramagnetic Resonance in Liquids

which differs from the formula obtained in reference 6 only by numerical coefficients, $T = T_{\parallel} = T_{\perp} = 3$ sec, which is in agreement with the experimentally determined times $T_{\parallel} = T_{\perp} = (3.6 \pm 0.4)$ sec. There are 2 figures and 9 references, 3 of which are Soviet.

SUBMITTED: June 23, 1958 (initially) and October 28, 1958 (after revision)

SOV/56-36-3-49/71

24(3)

AUTHORS: Skrotskiy, G. V., Kokin, A. A.

TITLE: On the Disordered Free Precession of the Magnetic Moments of Atomic Nuclei (O neuporyadochennoy svobodnoy pretsessii magnitnykh momentov atomnykh yader)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 3, pp 932 - 933 (USSR)

ABSTRACT: The authors of the present paper ("Letter to the Editor") theoretically investigated the precession motion of magnetic nuclear moments in a sample that was subjected to the action of a magnetic field H_o. The sample was assumed to be in a pick-up coil and to be magnetized vertical to H_o. In the case of a sufficient homogeneity of the H_o-field signal damping (increase of noise in the circuit) causes fluctuations of the voltage at the end of the pick-up coil; these fluctuations are determined, on the one hand, by the thermal noise and, on the other, by magnetization fluctuations of the sample. Whereas a formula was already derived (Ref 1) for the spectral density of the mean voltage square V_T^2, caused by the thermal

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On the Disordered Free Precession of the Magnetic Moments of Atomic Nuclei SOV/56-36-3-49/71

noise in the pick-up circuit, the authors in the present paper derive analogous formulae describing voltage fluctuations caused by magnetization fluctuations (V_M^2). It was found possible, in the case of conditions being favorable, to separate the signal of disordered free precession of magnetic nuclear moments from the thermal noise spectrum. The ratio

$\eta = (V_M^2)_\gamma/(V_T^2)_\gamma$ is found to be proportional to $(\gamma H_o)^2$.

There are 2 Soviet references.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Urals Polytechnic Institute)

SUBMITTED: October 28, 1958

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24(3) SOV/56-36-4-44/70

AUTHORS: Skrotskiy, G. V., Alimov, Yu. I.

TITLE: The Influence of the Shape of the Specimen on Ferromagnetic Resonance in a Strong Radio-Frequency Field (Vliyaniye formy obraztsa na ferromagnitnyy rezonans v sil'nom radiochastotnom pole)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 4, pp 1267-1271 (USSR)

ABSTRACT: Experimentally (Refs 1, 2) it was shown that the magnetization component M_z decreases slowly in the direction of the constant field H_0 with growing microwave power. This effect was theoretically investigated by Suhl (Refs 3, 4) and derived by using the Landau-Lifshits equation (1): $\dot{\vec{m}} + \gamma\left[\vec{m}\vec{H}^{ef}\right] + \alpha\left[\dot{\vec{m}}\,\vec{m}\right] = 0$, $\vec{m} = \vec{M}/M_s$, $\alpha > 0$, $\gamma > 0$, for an r.f. field h_σ, the amplitudes of which are great compared to the threshold field h_c: $h_c = \Delta H(3.08\,\Delta H/4\pi M_s)^{1/2}$. The authors of the present paper analyze the exact solutions

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SOV/56-36-4-44/70

The Influence of the Shape of the Specimen on Ferromagnetic Resonance in a Strong Radio-Frequency Field

of (1) for nonspherical ferromagnetic specimens in an r.f. field of arbitrary amplitude (they had already derived the solutions in a previous paper (Ref 5). It is found that above a certain value of h_c the motion of the magnetization vector becomes unstable. The slow decrease of the magnetization component and the shift of the resonance field for field strengths $h_o > h_c$ are explained. At $h_o > h_c$ the height of the absorption peak decreases and its width increases. The results agree essentially with those obtained by Suhl. The dependence of m_z on ξ at $\xi_N = 10$ for different values of a is shown by figure 1; figure 2 shows the influence exercised by the nonsphericity of the specimen upon m_z in dependence on a^2 with $\xi_N = 100$; the diagram for comparison contains the curve $m_z(a^2)$ for a homogeneously magnetized spherical specimen. The denotations apply to a system of coordinates rotating round $H_o = H_z$ with the frequency ω, where (1) has the form

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The Influence of the Shape of the Specimen on Ferromagnetic Resonance in a Strong Radio-Frequency Field

$$\left[\vec{m}\vec{\xi}\right] + \left[\vec{m}\left[\vec{m}\vec{\Omega}\right]\right] = 0, \text{ with } \vec{\xi} = (\gamma \vec{H}^{ef} - \vec{\omega})/\alpha\omega,$$

$$\vec{\Omega} = \vec{\omega}/\omega \; ; \; a = \frac{\gamma h_o}{\alpha\omega} \; , \quad \xi_N = \gamma \frac{N_{\parallel} - N_{\perp}}{\alpha\omega} M_s$$

There are 2 figures and 6 references, 1 of which is Soviet.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute)

SUBMITTED: October 28, 1958

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SOV/56-37-2-23/56

24(3)

AUTHORS: Kokin, A. A., Skrotskiy, G. V.

TITLE: The Theory of Paramagnetic Resonance in Systems Containing Two Kinds of Magnetic Moments

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 2(8), pp 482-489 (USSR)

ABSTRACT: The authors develop a better and more complete (as compared to that of G. V. Skrotskiy, Ref 4) thermodynamical and microscopical theory of systems containing two kinds of magnetic moments. This theory is developed for weak alternating fields, including the deduction of equations for the partial magnetizations $\vec{M}_1$ and $\vec{M}_2$. The thermodynamical theory of the systems under consideration can be developed on the basis of the thermodynamics of irreversible processes. The paramagnetic sample is considered to be in a constant magnetic field $H=H_z$ and in an alternating magnetic field $\vec{h}(t)$, which is a slight disturbance to the thermodynamical equilibrium. In this case the partial magnetizations $M_j=M_j(t)$ $(j=1,2)$ of the subsystems satisfy the equations $\dot{M}_{lj} = \sum_{m,k} L_{lm,jk}(h_m(t) - h_m^k)$, $l,m = x,y,z;\ j,k = 1,2$, which are linear with respect to the variable field. In these equations,

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The Theory of Paramagnetic Resonance in Systems Containing Two Kinds of Magnetic Moments

$\vec{h}^k = \chi_k^{-1}(\vec{M}_k(t)-\vec{M}_k^o)$, $\vec{M}_k^o = \chi_k\vec{H}$ denoting the partial magnetizations of the magnetic subsystems. After several steps the system of the linear equations of motion for the partial magnetizations are found. The static susceptibilities entering these equations depend upon the thermodynamic temperatures of the subsystems which in the general case will be different from the temperature of the remaining degrees of freedom of the magnetic substance - the equilibrium temperature of the lattice. The variation of the temperature of the subsystems is ignored, and is arbitrarily assumed to be equal to the temperature of the sample. The free precession of the magnetization $\vec{h}(t)=0$ in the constant magnetic field H_o is investigated. In the sequel the solutions of the above linear equations of motion for the partial magnetizations are determined and written down. The microscopical theory of the relaxation and resonance phenomena in systems with two kinds of magnetic moments can be developed on the basis of the method due to R. Kubo and K. Tomita (Ref 8) in a manner similar to that employed by the authors for the case of one kind of spin (Ref 7). The g-factors of the particles are assumed to be isotropic. By a suitable

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The Theory of Paramagnetic Resonance in Systems Containing Two Kinds of Magnetic Moments

choice of the Hamiltonian it is possible to account for the quadrupole moments of the nuclei, atoms and ions and their interaction with the local inhomogeneous and generally fluctuating electric field. Moreover, it is possible by these means to account for the weak direct and indirect exchange interactions (which lead to a hyperfine structure). The relaxation functions are determined for a homogeneous and isotropic medium. The relaxation time and the displacement of the resonance frequency of one subsystem are interrelated with the relaxation time and the resonance frequency of the other subsystem. This means that a general relationship exists analogous to that of Kramers-Kronig. The real and imaginary part of the susceptibility are interrelated through these relations. There are 9 references, 5 of which are Soviet.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute)

SUBMITTED: March 5, 1959

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SOV/56-37-3-32/62

24(3)

AUTHORS: Skrotskiy, G. V., Kokin, A.A.
[redacted]

TITLE: On the Influence of the Coherent Magnetic Dipole Radiation on Magnetic Resonance

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 3(9), pp 802-804 (USSR)

ABSTRACT: L. I. Mandel'shtam (Ref 3) was the first to find out that coherence phenomena occur during the emission of electromagnetic quanta caused by a spin system, if the wavelength is greater than the dimensions of the system; these phenomena lead to a considerable increase of the radiation width of the line (cf. also Refs 1,2,4). V. M. Fayn (Ref 5) found that taking spin interaction into account by means of a general radiation field in the radio frequency range leads to a shift of resonance frequency. In the present paper the authors calculate the corrections to the relaxation time and calculate the additional resonance frequency shift caused by the coherent radiation field. As expected, the quantum theory, within the approximation investigated, leads to the same results as the classical one. The classical equation of motion for a magnetic

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SOV/56-37-3-32/62

On the Influence of the Coherent Magnetic Dipole Radiation on Magnetic Resonance

moment $\vec{\mu}$ of a homogeneously magnetized sample that is small compared to the wave length of the radiation, is set up according to Ginzburg (Ref 6) as follows: $\dot{\vec{\mu}} = \gamma\left[\vec{\mu}\vec{H}\right] - \frac{4\gamma\omega_m}{3\pi v^3}\left[\mu\ddot{\mu}\right] + \frac{2}{3v^3}\left[\mu\dddot{\mu}\right]$; $v = c/\sqrt{\varepsilon\mu}$ is the phase velocity of light in sample matter, and $\omega_m \approx cV^{-1/3}$. Classical equations describing the magnetization $M = \mu/V$ are derived. The quantum-theoretical treatment of this phenomenon is carried out (for weak radio-frequency fields) by means of the method developed by Kubo and Tomita (Ref 7). The time-independent part of the Hamiltonian is written down in the form $\hat{\mathcal{H}} = \hat{\mathcal{H}}_1 + \hat{\mathcal{H}}_2 + \hat{\mathcal{H}}' = \hat{\mathcal{H}}_o + \hat{\mathcal{H}}'$, where $\hat{\mathcal{H}}_1 = -\hbar\omega_o\sum_j^N \hat{I}_{j_o}$ and $\hat{\mathcal{H}}_2 = \sum_{k\lambda}(\hat{a}^+_{k\lambda}\hat{a}_{k\lambda} + \frac{1}{2})\hbar vk$; $\hat{\mathcal{H}}_1$ describes the interaction of the magnetic moments with the external constant magnetic field, $\hat{\mathcal{H}}_2$ - the Hamiltonian of the radiation field,

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$\lambda = \pm 1$ corresponds to the two possible values of the polarization. The Hamiltonian of the interaction of the magnetic moments with the radiation field is, if the dimensions of the system are considerably smaller than the wave lengths, obtained as $\hat{\mathcal{H}}' = -i\gamma\hbar \sum_{k,\lambda} \sqrt{2\pi\hbar v k/V} \sum_{j\alpha}^{N} (-1)^{\alpha} \hat{I}_{j\alpha} \varepsilon_{k-\lambda-\alpha} (\hat{a}_{k\lambda} - \hat{a}^{+}_{k\lambda})$. Relaxation time and resonance frequency shift may be found in an analogous manner as shown by one of the authors' previous papers (Ref 8). In conclusion, the case is briefly discussed in which the sample is assumed not to be in free space but in a resonator, and the hereby caused change of signal characteristic is investigated. If $Q'(\omega_0)$ is the quality of an ideal resonator with magnetic field, and $Q_0(\omega_0)$ that of a real resonator without a magnetic field, and $Q(\omega_0)$ that of a real resonator with magnetic field, $Q'(\omega_0) = \dfrac{Q_0(\omega_0)}{Q_0(\omega_0)/Q(\omega_0) - 1}$ holds;

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On the Influence of the Coherent Magnetic Dipole Radiation on Magnetic Resonance

Q_o/Q and Q_o could be measured directly, and thus the frequency dependence of the relaxation time could be determined. There are 8 references, 5 of which are Soviet.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute)

SUBMITTED: April 17, 1959

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S/058/61/000/010/034/100
A001/A101

24,7900

AUTHORS: Skrotskiy, G.V., Kokin, A.A.

TITLE: On radiation effects in magnetic resonance

PERIODICAL: Referativnyy zhurnal. Fizika, no. 10, 1961, 159, abstract 10V326 (V sb. "Paramagnitn. rezonans", Kazan', Kazansk. un-t, 1960, 46-50)

TEXT: The authors calculate corrections to the times of longitudinal $T_{\parallel}$ and transversal $T_{\perp}$ relaxation, due to radiation effects, for the case when a paramagnetic specimen is placed into a resonator of arbitrary shape, possessing a high Q-factor. The role of radiation phenomena is discussed for the case when the specimen is in the resonator and resonance frequency $\omega_0 = \gamma H_0$ is considerably greater than inverse relaxation times caused by intramolecular mechanisms.

V. Avvakumov

[Abstracter's note: Complete translation]

Card 1/1

S/058/61/000/010/027/100
A001/A101

24.7700

AUTHORS: Kokin, A.A., Skrotskiy, G.V.

TITLE: On the role of self-diffusion process in the theory of magnetic resonance

PERIODICAL: Referativnyy zhurnal.Fizika, no.10, 1961, 153, abstract 10V269 (V sb. "Paramagnitn. rezonans", Kazan', Kazansk. un-t, 1960, 171-176)

TEXT: The authors discuss the role of translational Brown motion in the magnetic resonance theory. This type of motion is essential at determination of the shape of absorption line in the case of electronic or nuclear magnetic resonance in liquids, solutions, gases and some solids. The correlation function for scalar and dipole-dipole magnetic interactions is calculated for the case of proton resonance in a paramagnetic solution.

V. Avvakumov

[Abstracter's note: Complete translation]

Card 1/1

S/139/60/000/03/005/045
E032/E314

AUTHORS: Zyryanov, P.S., Izyumova, T.G. and Skrotskiy, G.V.

TITLE: Effect of Electron Magnetic Resonance on the Optical Properties of Ferromagnetic and Paramagnetic Bodies

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1960, Nr 3, pp 32 - 38 (USSR)

ABSTRACT: Using a system of macroscopic equations, taking into account spin orbit interactions, a calculation is made of the refractive index of a gyrotropic medium under the conditions of magnetic resonance. An expression is obtained for the rotation of the plane of polarisation of a light wave as a function of amplitude and frequency of the rf field for transparent paramagnetic and ferromagnetic bodies. A study is made of the effect of ferromagnetic resonance on the optical Kerr effect and the results obtained are compared with experiment. The macroscopic equations are taken in the form given by Eqs (1)-(3), which must be supplemented by the equation of motion for the magnetisation M. In paramagnetic media, the latter is chosen in the Bloch form (Eq 4). For ferromagnetic materials the Landău Livshits form given

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E032/E314

Effect of Electron Magnetic Resonance on the Optical Properties of Ferromagnetic and Paramagnetic Bodies

by Eq (5) is employed. It was shown in a previous paper (Ref 3) that Eqs (1)-(3) together with Eq (4) or Eq (5) take into account spin orbit interactions. In fact, the self-consistent field H_i is due to spin-spin and spin-orbit interactions. Eq (1) does not include the damping term but this has no fundamental effect on the final results. The change in the optical properties of solids in magnetic resonance, and in particular the resonance Faraday effect, may in the case of paramagnetic media be used to determine the longitudinal and transverse relaxation times $\tau_{\parallel}$ and $\tau_{\perp}$. It is shown that the relative change in the rotation of the plane of polarisation is given by Eq (25), while the width of the absorption line can be determined from Eq (26). Eq (25) is the same as the expression obtained by Daniels and Wesemeyer (Ref 6) by another method. Using experimental values for $\Delta\theta/\theta$ at resonance $(\Delta\omega = 0)$ and H_0, one can calculate $\tau_{\parallel}$ and $\tau_{\perp}$ (H_0 is the constant magnetic

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S/139/60/000/03/005/045
E032/E314

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field). The effect of paramagnetic and ferromagnetic resonance on the optical Faraday effect can be used in fast modulation of beams of light by varying the amplitude of the rf field.
There are 2 figures and 11 references, of which 1 is French, 1 German, 5 English and 4 Soviet.

ASSOCIATION: Ural'skiy politekhnicheskiy institut imeni S.M. Kirova (Ural Polytechnical Institute imeni S.M. Kirov)

SUBMITTED: March 16, 1959

Card 3/3

83349

S/139/60/000/004/005/033
E032/E514

24.6900

AUTHORS: Korshunov, V.A. and Skrotskiy, G.V.

TITLE: On the Doppler Effect in the Theory of Vavilov-Cherenkov Radiation

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1960, No.4, pp.56-59

TEXT: It is well known that an electric charge moving through a medium with a velocity which is greater than the phase velocity of light in the medium loses energy by radiation even when the velocity is constant. The classical theory of this phenomenon (Vavilov-Cherenkov effect) admits of a simple geometrical interpretation. The electromagnetic field due to a charge moving along the z-axis with a constant velocity $v = \beta c$ in an infinite medium having a refractive index n can be derived from a scalar potential φ, since x and y components of the vector potential are zero and the z-component is given by

$$A_z = \beta n^2 \varphi \quad \text{and} \quad v\frac{\partial\varphi}{\partial z} + \frac{\partial\varphi}{\partial t} = 0.$$

This result is used to obtain an explicit expression for the

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S/139/60/000/004/005/033
E032/E514

On the Doppler Effect in the Theory of Vavilov-Cherenkov Radiation

potential φ in a non-dispersive medium. The results obtained are then used to investigate the Doppler effect in the above case. The final formulas are well known and the present paper presents a different way of deriving them. There are 1 figure and 6 Soviet references.

ASSOCIATION: Ural'skiy politekhnicheskiy institut imeni S.M.Kirova (Ural Polytechnical Institute imeni S.M.Kirov)

SUBMITTED: August 24, 1959

24,7900

82990
S/181/60/002/008/009/045
B006/B070

AUTHORS: Skrotskiy, G. V., Izyumova, T. G.

TITLE: The Magneto-optical Kerr Effect in Ferromagnetic Substances Placed in a Radio-frequency Field

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 8, pp. 1739-1740

TEXT: In an earlier work (Ref. 1) the authors have developed a macroscopic theory to explain the observed effect of electron paramagnetic resonance on the optical Faraday effect. The method developed in Ref. 1 for the determination of the refractive index of non-conducting paramagnetic media in the presence of a radio-frequency field is, in the present work, extended to conducting ferromagnetic substances. This enables one to make an estimate of the effect of ferromagnetic resonance on the magnitude of the magneto-optical Kerr effect. This happens for the special case when the direction of propagation of the linearly polarized light wave, hitting perpendicularly the ferromagnetic mirror magnetized to saturation, coincides with the direction of the magnetizing field.

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The Magneto-optical Kerr Effect in Ferromagnetic Substances Placed in a Radio-frequency Field

S/181/60/002/008/009/045
B006/B070

Starting from the system of equations (1) - (4), a dispersion equation is obtained and from this an expression (in the first approximation) for the refractive index of the polarized light wave is derived. Further, an expression for the angle of rotation of the phase of polarization of light on reflection at a ferromagnetic is given. It is shown that in the region of ferromagnetic resonance this angle is diminished. Also an expression is obtained for the depth of penetration of the radio frequency waves in the dielectric, which is essentially greater than that for light waves. There are 5 references: 3 Soviet, 1 Canadian, and 1 US.

ASSOCIATION: Ural'skiy politekhnicheskiy institut Sverdlovsk (Ural Polytechnic Institute, Sverdlovsk)

SUBMITTED: December 30, 1958 (initially) and August 30, 1959 (after revision)

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82993

S/181/60/002/008/012/045
B006/B070

24.7900

AUTHORS: Izyumov, Yu. A., Skrotskiy, G. V.

TITLE: Spin Resonance on Conduction Electrons in Ferromagnetic Metals

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 8, pp. 1766-1772

TEXT: The spin resonance of conduction electrons in alkali metals has been already investigated both theoretically and experimentally. It is found that the diffusion of conduction electrons in the skin layer leads to a strong asymmetry of the absorption lines. For very fine metallic particles, which are smaller in size than the thickness of the skin, the symmetry of the absorption lines is retained. In this case the line-width amounts to some ten oersteds and depends linearly on temperature, and tends to a definite value for $T \to 0^{\circ}K$. It was shown that for alkali metals the resonance takes place at the Larmor frequency. Now, the problem the authors posed for themselves was to investigate the conditions for the resonance absorption on conduction electrons in ferromagnetic metals. Since in this case there exists a spontaneous

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Spin Resonance on Conduction Electrons in Ferromagnetic Metals

S/181/60/002/008/012/045
B006/B070

magnetic moment, the energy of the conduction electrons must depend on the orientation of the spin relative to the magnetization vector, and for the simplest case it may be assumed that the energy of an electron $\varepsilon_{\vec{k}}^{\sigma}$ is a function of both the quantum numbers $\vec{k}$ and σ (quasimomentum and spin). The form of the magnetic resonance absorption lines is calculated on the assumption that the effective mass of conduction electrons depends on the orientation of the spin relative to the spontaneous magnetic moment. The interaction of the electrons with one another and with the lattice is described by the operator $\hat{\mathcal{H}}_{int}$, in terms of which the energy of the system of conduction electrons in the second quantization representation is represented by the Hamiltonian

$\hat{\mathcal{H}} = \sum_{\vec{k}\sigma} \varepsilon_{\vec{k}}^{\sigma} a_{\vec{k}\sigma}^{+} a_{\vec{k}\sigma} + \hat{\mathcal{H}}_{int}$. If $\hat{S}_{\alpha}$ is the spin operator of the electron system, the operator of the magnetic moment may be put as $\hat{M}_{\alpha} = 2\mu_0 S$ (μ_0-Bohr magneton). The $\hat{S}_i$ ($i = x,y,z$) are given by formula (13), the

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Spin Resonance on Conduction Electrons in Ferromagnetic Metals

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B006/B070

commutators $[\hat{S}_i, \hat{\mathcal{H}}_o]$ (regardless of $\hat{\mathcal{H}}_{int}$) by (14). Finally the special case is investigated, where $\varepsilon_{\vec{k}}^{-} - \varepsilon_{\vec{k}}^{+} = L$ is independent of $\vec{k}$. The calculations are carried out in the zeroth approximation in relation to $\hat{\mathcal{H}}_{int}$, i.e., the interaction among the elementary excitations is not taken into account. There are 13 references: 5 Soviet, 7 US, and 1 Japanese.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet (Ural State University). Ural'skiy politekhnicheskiy institut Sverdlovsk (Ural Polytechnic Institute, Sverdlovsk)

SUBMITTED: May 7, 1959 (initially) and February 27, 1960 (after revision)

Card 3/3

84595

6, 3000 (1024, 1106)
6, 4780

S/181/60/002/010/017/051
B019/B056

AUTHORS: Skrotskiy, G. V. and Izyumova, T. G.

TITLE: The Theory of the Optical Faraday-Effect in Ferrimagnetic Garnet Single Crystals in a Radiofrequency Field

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 10, pp. 2458-2460

TEXT: The authors first show that by increasing the amplitude of the highfrequency field up to values that correspond to the line width αH_0 of the ferrimagnetic resonance absorption, the angle of rotation θ of the plane of polarization of the light waves may be made zero. This would make possible a quick modulation of light intensity by changing the amplitude of the radiofrequency field. The paper by Dillon (Ref. 1) is then discussed, in which the rotation of the plane of polarization of light in thin plates made of rare earth ferrites was investigated. It is shown that here demagnetization must be taken into account, that is to say, in the equation for the magnetization of ferrimagnetics H_0 must be replaced by $H_0 - 4\pi M_z$. There are 1 figure and 6 references: 2 Soviet, 2 US, 1 Canadian, and 1 Australian.

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ASSN: Ural Polytechnic Inst.

85984

9.4300 (3203,1043,1143)

S/141/60/003/004/009/019
E032/E314

AUTHORS: Skrotskiy, G.V. and Kokin, A.A.

TITLE: On the Possible Role of Coherent Effects in Magnetic Resonance

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1960, Vol. 3, No. 4, pp. 650 - 655

TEXT: In magnetic-resonance experiments the specimen is placed in a coil included in a resonance circuit or in a resonator, and this has an important effect on radiative corrections. Consider a specimen placed in a resonator of volume V_p of arbitrary form, placed in an external magnetic field $H_o = H_z$. If the Q-factor of the resonator is very much greater than unity, the natural frequencies ω_n of the resonator and the proper functions $\chi_{\lambda n}(r)$ are not very different from the natural frequencies and the proper functions of the resonator when there are no losses. The latter are determined by Eq. (1) and the boundary conditions for an ideal resonator. The parameter $\underline{n}(n_1, n_2, n_3)$ in Eq. (1) assumes discrete values

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S/141/60/003/004/009/019
E032/E314

On the Possible Rôle of Coherent Effects in Magnetic Resonance

and the two values of the subscript λ, i.e. ± 1, correspond to the two possible states of polarisation. The proper functions $\underline{v}_{\lambda n}$ are looked upon as orthogonal, i.e. they satisfy Eq. (2), where α represents the components of the vector $\underline{v}_{\lambda n}$ in circular variables, i.e.

$$v_{\pm 1} = \pm \frac{1}{\sqrt{2}} (v_x \pm i v_y), \quad v_o = v_z .$$

The damping in the resonator can be taken into account by introducing complex frequencies, as indicated by Eq. (3). The radiation field in the resonator containing a small specimen volume V can be found from Eq. (4), whose solution is given by Eqs. (5) and (6). Beginning with a certain value of $n = n_m$, when the change in $\underline{v}_{\lambda n}(\underline{r})$ takes place over distances which are small in comparison with the dimensions of the specimen, i.e.

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On the Possible Rôle of Coherent Effects in Magnetic Resonance

$$c/\omega_n < V^{1/3} = c/\omega_m$$

zones with $n > n_m$ can be neglected so that

$$\underline{v}_{\lambda n}(\underline{r}) \simeq \underline{v}_{\lambda n}(0) \quad (n < n_m), \ \underline{M}(r,t) = \underline{M}(0,t) \ .$$

Bearing in mind Eq. (7), the radiation field is given by Eqs. (8) and (9). In steady state (frequency ω) the magnetisation is given by Eq. (10), which for small deviations from the equilibrium state, $M_\alpha(t) \approx \approx \chi_0 H_0 \delta_{\alpha 0}$, may be replaced by Eq. (11). If the external magnetic field $\underline{h}(t)$ has a "left" polarisation in the plane perpendicular to the constant magnetic field H_o (Eq.12), then neglecting radiative reaction, the magnetisation is given by Eq. (13). Substituting this expression into Eq. (8), it is found that the magnetic field is given by Eq. (14).

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On the Possible Rôle of Coherent Effects in Magnetic Resonance

The latter equation represents the main result of the present work. Using Eq. (11), the analysis can be extended to a system of equations which can be used to determine $M_{\alpha}(t)$, taking into account the reaction due to the radiation. This system of equations assumes a very simple form in two special cases, which are considered at the end of the present paper, where expressions are derived for the relaxation time and the shift in the resonance frequency due to radiative corrections.

Acknowledgments are expressed to V.L. Ginzburg for valuable advice. There are 11 references: 4 Soviet, 1 French and 6 English.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnical Institute)

SUBMITTED: August 28, 1959, originally; March 10, 1960, after revision.

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67895

S/126/60/010/003/001/009/XX
E201/E391

9.6130

AUTHORS: Skrotskiy, G.V. and Kurbatov, L.V.

TITLE: The Effect of Magnetic Long-range Order Fluctuations on the Temperature Dependence of the Width of a Ferromagnetic Resonance Absorption Line

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol. 10, No. 3, pp. 335 - 340

TEXT: A simple statistical-mechanics calculation is given which leads to an explicit expression for broadening of a ferromagnetic resonance absorption line due to magnetisation fluctuations, without any necessity for knowledge of the sample microstructure. It is shown that for any one sample:

$$\Delta H_f \left(G'(a_s) \cdot \frac{\Theta}{T} \right)^{1/2} = \text{const.} \qquad (14)$$

where $G'(a_s) = 1/(1 - a_s^2)$,

a_s is the spontaneous magnetisation in relative units,

Θ is the Curie temperature,

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S/126/60/010/003/001/009/XX
E201/E391

The Effect of Magnetic Long-range Order Fluctuations on the Temperature Dependence of the Width of a Ferromagnetic Resonance Absorption Line

X

T is the absolute temperature of the sample,

ΔH_f is the line broadening.

A table on p. 339 gives the values of the quantities occurring in Eq. (14) for a monocrystal of yttrium ferrite garnet (Curie temperature of 560 °K); Eq. (14) can be seen to be obeyed within the temperature range 494-556.5 °K. The authors discuss also ferromagnetic resonance line broadening in polycrystalline samples, when anisotropy broadening and broadening due to air pores occur in addition to broadening due to magnetisation fluctuations. The paper ends with a brief discussion of ferrite garnets with a compensation point; this point is a temperature at which spontaneous magnetisation of sublattices cancel out each other and the

87895

S/126/60/010/003/001/009/XX
E201/E391

The Effect of Magnetic Long-range Order Fluctuations on the Temperature Dependence of the Width of a Ferromagnetic Resonance Absorption Line

resonance line broadens quite strongly. Acknowledgments are made to A.G. Gurevich and I.Ye. Gubler for communicating their results before publication.
There are 1 table and 22 references: 5 Soviet and 17 non-Soviet.

ASSOCIATION: Ural'skiy politekhnicheskiy institute imeni S.M. Kirova (Ural Polytechnical Institute imeni S.M. Kirov)

SUBMITTED: May 10, 1960

S/058/62/000/002/005/053
A058/A101

AUTHORS: Ryzhkov, V. M., Skrotskiy, G. V.

TITLE: Some special features of the free precession of atomic nuclei

PERIODICAL: Referativnyy zhurnal, Fizika, no. 2, 1962, 37, abstract 2V284 ("Tr. Ural'skogo politekhn. in-ta", 1961, v. III, 45-62)

TEXT: The cutoff process of polarizing magnetic fields in experiments on the free precession of nuclear magnetic moments is examined. It is shown that if the time in which the magnetic field changes direction is shorter than half the period of the Larmer precession of the nuclear magnetic moments, the nuclear magnetization vector does not manage to keep up with the field (anadiabatic case). In the case of slower rotations of the field, the nuclear magnetization vector does keep up with the field and free precession is not observed(adiabatic case). The effect of magnetic-field inhomogeneities on the amplitude of free precession is examined. It is shown that in the case of a constant gradient and a cylindrical specimen, the envelope of the oscillations of the free-precession signal can be expressed by a Bessel function of the first order, which corresponds to the appearance of well pronounced beats. Calculation results were substantiated experimentally.

Card 1/2

RYZHKOV, V.M.; SKROTSKIY, G.V.

Uses of free precession methods. Trudy Ural. politekh. inst. no.111:63-70 '61. (MIRA 16:6)

(Nuclei, Atomic)

S/058/62/000/006/029/136
A061/A101

AUTHORS: Skrotskiy, G. V., Izyumova, T. G.

TITLE: Optical orientation of atoms

PERIODICAL: Referativnyy zhurnal, Fizika, no. 6, 1962, 16, abstract 6V101 ("Tr. Ural'skogo politekhn. in-ta," 1961, sb. III, 71 - 84)

TEXT: Review. Some details of the process of the optical orientation of atoms in alkali metal vapors are described. The following problems are considered: the energy spectrum of alkali metalatoms, the principle of the optical orientation of atoms, the optical detection of atomic polarization, the calculation of the effect of relaxation processes on the degree of optical pumping of atoms, and the role of buffer gases.

[Abstracter's note: Complete translation]

Card 1/1

L 19573-63 EWT(1)/BDS AFFTC/ASD/IJP(C)
ACCESSION NR: AR3006959 S/0058/63/000/008/B014/B014

SOURCE: RZh. Fizika, Abs. 8B131

AUTHOR: Skrotskiy, G. V.

TITLE: Gravitational field of a homogeneous uniformly moving sphere

CITED SOURCE: Tr. Ural'skogo politekhn. in-ta, sb. 123, 1962, 85-88

TOPIC TAGS: gravitational field, spherical symmetry, Schwarzschild solution, special relativity theory

TRANSLATION: The spherically-symmetrical gravitational field determined by the Schwarzschild solution has been calculated in a coordinate system that moves uniformly relative to the source. The Lorentz transformations are applied to the components of the metric tensor in the calculations. The momentum of the field in the new coordinates, calculated in accordance with the known formulas, co-

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L 19373-63
ACCESSION NR: AR3006959

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incides with the usual expression for the momentum of a particle within the framework of special relativity. Ya. Pugachev.

DATE ACQ: 06Sep63 SUB CODE: PH ENCL: 00

Card 2/2

SKROTSKIY, G. V.; IZYUMOVA, T. G.

Use of the phenomenon of optical orientation of atoms in the measurement of weak magnetic fields. Trudy Ural. politekh. inst. no.111:85-88 '61. (MIRA 16:6)

(Atoms) (Magnetic fields--Measurement)

44263

S/785/61/000/008/001/005
E194/E155

AUTHORS: Rotshteyn, A.Ya., and Skrotskiy, G.V.

TITLE: Radio-spectroscopic methods of measuring weak magnetic fields

SOURCE: USSR. Ministerstvo geologii i okhrany nedr. Osoboye konstruktorskoye byuro. Geofizicheskoye priborostroyeniye. no.8. 1961. 36-65

TEXT: The special features of magnetometers based on free nucmear precession are discussed. The frequency of free precession is strictly proportional to the total vector magnetic field strength, and so field strength can be assessed absolutely and not as an increment over an unknown level as in permalloy magnetometers. Given adequate signal-to-noise ratio, the accuracy depends on the accuracy with which the proton magneto/mechanical ratio γ_p is known for water or other fluid, and the measurement of this is discussed. Accuracy can be improved by increasing the magneto/mechanical ratio, the duration of measurements, the signal-to-noise ratio, or the strength of the magnetic field being measured. Similar considerations also apply to resonance methods

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Radio-spectroscopic methods of ... S/785/61/000/008/001/005
E194/E155

of measurement. Ways of reducing inaccuracies due to atmospheric and industrial noise are briefly explained. Frequency is usually measured by counting the cycles of free precession in a fixed time interval. With one-second interval, the accuracy required is 0.04 c/s. After describing methods of frequency measurement, existing precession magnetometers are reviewed in three groups according to method of frequency measurement. In some magnetometers the beat signal and standard frequency are recorded together with time markers; others use vibration frequency meters. However, the most widely used is the third group employing electron counter frequency meters. A novel Soviet portable instrument is described and so are the instruments used in the Vanguard satellites. The foregoing relates to measurement of the modulus of the magnetic field vector. By combining the magnetometer and Helmholz rings the direction of the vector in three-dimensional space can also be measured; various methods are explained. The free-precession method can also be used to measure magnetic field gradients. Despite their considerable advantages, free-precession magnetometers have certain disadvantages, particularly the small

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amplitude of the output signals. This necessitates the use of large pick-ups and powerful polarising sources. The sample must be remagnetised from time to time, which interrupts operation and prevents the use of simple methods of frequency measurement and limits the speed of the measurement. Because of the low frequency of precession in the terrestrial magnetic fields, measurement times are unduly long. Accordingly, possible developments in radio spectroscopic magnetometers for weak field measurements are discussed. Magnetometers using the Oberhauser effect have been suggested, but would require a suitable paramagnetic salt which, when dissolved in a liquid containing protons, would give greater signal strength without appreciably altering the relaxation time. Oberhauser-effect magnetometers are more intricate than free-precession magnetometers because they use complicated high-frequency generators. Nuclear-precession generators (with Maser-type feed-back and flowing liquid) can provide a continuous undamped precessional signal, whose frequency follows the magnetic field intensity, but they cannot make continuous measurements. Magnetometers may be characterised by their ability to record actual magnetic anomalies. Precession aeromagnetometer type АЭМ-49 (AEM-49) can record at a rate of 80 γ/sec and anomalies which vary as fast as 200 γ/sec are recorded with considerable error. The speed of measurement of nuclear generators may be increased by using several frequency-meters operating at successive time shifts. Nuclear-precession magnetometers determine the total field strength at each measurement and the field change between measurements does not exceed 0.1%. They thus give excess information which could in principle be used to ensure greater speed and accuracy. Their frequency meters may be more simple and interference-free than the electron-counter type, but are less stable than those used in the free precession method. Electron resonance and free precession might be used in magnetometers, and work in this field is briefly reviewed. Magnetometers based on the optical orientation of atoms are briefly described; they can determine both the magnitude and direction of the magnetic field. By using helium rather than rubidium these magnetometers need no thermostatic control of the absorption chamber and the helium need not be absolutely pure. The helium magnetometer can detect changes of field of hundredths of γ and can measure fields of a few γ. There are 17 figures.

89208
S/056/61/040/001/014/037
B102/B204

24.7900 (1144,1147,1158,1160)

AUTHORS: Izyumova, T. G., Skrotskiy, G. V.

TITLE: Theory of double electron and nuclear resonance in systems with hyperfine interaction

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40 no. 1, 1961, 133-142

TEXT: The method of double magnetic resonance is applied to systems containing two kinds of magnetic moments; here the specimen is exposed to a constant magnetic field and two variable magnetic fields, whose frequencies are near the Larmor frequencies of the precession of the two types of magnetic moment. In interactions of the latter (e.g., hyperfine interaction) a correspondence of resonances of two systems occurs. In the presence of nuclear and electronic paramagnetism, the hyperfine interaction leads to a number of effects, which may be subdivided into two groups. The first group comprises effects due to the action of electron paramagnetic resonance upon nuclear resonance (e.g., Overhauser effect). The second comprises effects that are due to the action of nuclear resonance upon electron resonance.

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89208

S/056/61/040/001/014/037
B102/B204

Theory of double electron ...

Such an effect was observed for the first time by Feher and was qualitatively explained. (The saturation of the nuclear system leads to no noticeable polarization of the electron spins, whereby the conditions for the saturation of the electron system are changed and a change in the absorption of the energy of an r.f. field is caused by the electron system). The present paper gives a quantum-mechanical analysis of the effect produced by nuclear magnetic resonance upon paramagnetic resonance. Such an analysis cannot be carried out within the framework of the linear theory of magnetic resonance. The authors operate by means of the method of the statistical perturbation theory developed by Tomita. A system is studied which consists of non-compensated electron spins $\vec{S}^k$, which are near several nuclei with different moments $\vec{I}^l$. Between electrons and nuclei a scalar interaction is assumed, and also an interaction between electrons and lattice. The magnetic field in which the specimen is located, is assumed to be characterized by $\vec{H} = \vec{H}_o + \vec{h}_s(t) + \vec{h}_I(t)$, where $\vec{h}_s$ and $\vec{h}_I$ are the strengths of the microwave and the r.f. fields. These fields are assumed to be circularly polarized in a plane that is perpendicular to $\vec{H}_o$. The Hamiltonian of the system consisting of electrons and nuclei is set up as:

X

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$\hat{\mathcal{H}} = -g_s\mu_s \sum\limits_k \hat{\vec{s}}^k\vec{H} - \sum\limits_l g_I^l \mu_I^l \hat{\vec{I}}^l \vec{H} + \sum\limits_{l,k} A_l \hat{\vec{s}}^k \hat{\vec{I}}^l + \hat{\vec{s}}\hat{\vec{F}} + \hat{\mathcal{H}}_F$, where μ_s and μ_I denote electron and nuclear magnetons respectively, A_l denoting the hyperfine interaction constant; the term $\hat{\vec{s}}\hat{\vec{F}}$ takes electron-lattice interaction $(\vec{s} = \sum \hat{\vec{s}}^k)$ into account, and $\hat{\mathcal{H}}_F$ is the operator of lattice energy. By the introduction of variables adapted to the problem, $\hat{\mathcal{H}}$ is transformed to scalar representation. It is further assumed that the energy of hyperfine interaction is low compared to the Zeeman energy of the electrons, in which case electron and nuclear spins precess independently around the strong constant field H_0, and the hyperfine interaction may be considered as a perturbation. In this case, the hyperfine interaction leads to an irregular broadening of the epr lines (Ref. 6), which, as the spin system is not in equilibrium, is also a function of time. On these assumptions, the equation of motion for the magnetization vector of the electron system is determined which, in first approximation (taking account of the terms linear in $\hbar\Omega_F/kT$) reads as follows:

$$\frac{d}{dt}\langle \hat{M}^T\rangle = \frac{i}{\hbar}\langle [\hat{M}^T, \mathcal{H}_0^T]\rangle - i\sum a_{0\nu}(\theta)(\Phi_0 \mp \Psi_0)\langle [\hat{M}^T, \hat{s}_\nu]\rangle -$$
$$- \sum_{\mu\nu\nu'} a_{\mu\nu}(\theta)\, a_{-\mu\nu'}(\theta)\{(\Phi_{-\mu\nu'} \mp \Psi_{-\mu\nu'})\langle[[\hat{M}^T \hat{s}_\nu]\hat{s}_{\nu'}]\} +$$
$$+ \sum_{\mu\nu\nu'} a_{\mu\nu}(\theta)\, a_{-\mu\nu'}(\theta)\frac{\hbar\Omega_F}{kT}\Phi_{-\mu\nu'}\langle \hat{s}_{\nu'}[\hat{M}^T, \hat{s}_\nu]\rangle. \quad (40)$$

This equation for vanishing hyperfine interaction goes over into the equation given by Tomita. By means of (40), the complex susceptibility and the saturation factor of the electron system are calculated:

In the steady state $M_x^T = \chi_s' h^s$, $M_y^T = \chi_s'' h^s$, $M_z^T = \chi_0 H_0 Z_s^{\mp}$ holds,

S/053/61/073/003/002/004
B125/B201

AUTHORS: Skrotskiy, G. V., and Izyumova, T. G.

TITLE: Optical orientation of atoms and its applications

PERIODICAL: Uspekhi fizicheskikh nauk, v. 73, no. 3, 1961, 423-470

TEXT: The optical orientation of ions and atoms, which have magnetic moments in the ground state, may arise with selective absorption and the subsequent emission of light by these atoms and ions. This optical orientation may arise not only in beams, but also in vapors at reduced pressure. This opens a new way for the study of the structure of energy levels in the ground state and also in the excited states. Studies conducted later led on the one hand to the development of the method of optical orientation and to the elaboration of a theory of the phenomena accompanying the "optical pumping" (pompage optique). By this term one understands the following phenomenon: Irradiation of an assembly of atoms by light with the resonant frequency changes the type of filling of energy sublevels of the ground state of atoms: J. Brossel and A. Kastler

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B125/B201

Optical orientation of atoms...

of the ground state sublevels. Table V shows the resonant frequency as a function of the buffer gas pressure. Theoretical studies by R. H. Dicke are pointed out. IV. Phenomenological theory of the optical orientation of atoms. Equations for magnetization, effect of the radar frequency field upon the process of the orientation of atoms. The case of the "slow passage" according to Bloch is mentioned. V. Determination of the radar frequency resonance with the optical method. Determination of the constants of superfine structure, as well as of the g factors of nuclei and electrons. The energy spectrum of the atoms of alkali metals in a magnetic field, experiments on the study of radar frequency resonance with optical methods, multiquantum transitions, determination of the constants of hyperfine splitting. J. Brossel and F. Bitter were the first to study the 6^3P_1 state of mercury atoms by the optical method. VI. Practical applications of the method of optical orientation of atoms: Measurement of weak magnetic fields, determination of orientation in the space, standard of frequency determined by atoms. H. G. Dehmelt was the first to point to the possible use of the optical orientation of atoms

Card 3/5

and 75 non-Soviet-bloc. The three most recent references to English-language publications read as follows: T. L. Skillman, Intern. Hydrograph. Rev. 37, 107 (1960), F. D. Colegrove, P. A. Franken, Phys. Rev. Lett. 4, 548 (1960), T. H. Maiman, Phys. Rev. Lett. 4, 564 (1960).

L 40695-65 EPF(c)/EWT(l)/EWT(m)/EWP(b)/EWP(t) Pr-4 IJP(c) JD S/0141/64/007/006/1106/1110

ACCESSION NR: AP5006022

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B

AUTHOR: Skrotskiy, G. V; Pokazan'yev, V. G.

TITLE: Energy spectrum of the 2^3S_1 state of He^3 in an arbitrary magnetic field

21

SOURCE: IVUZ. Radiofizika, v. 7, no. 6, 1964, 1106-1110

TOPIC TAGS: helium, 4 energy spectrum, metastable state, transition frequency, Zeeman splitting

ABSTRACT: To facilitate the study of the atomic structure and spectrum of He^3 and He^4 atoms by the method of optical orientation, the authors investigate the energy spectrum of the metastable ground state of He^3. The energy of the magnetic sublevels of the 2^3S_1 state of the He^3 atom in an arbitrary magnetic field are first calculated by determining the roots of the secular equation of the corresponding Hamiltonian. The results are shown to agree with the expressions obtained by N. F. Ramsey (Molecular Beams, [Russ. Transl.] IL, M. 1960). The frequencies of the allowed transitions between neighboring Zeeman sublevels are determined and it is shown that the frequencies of the transitions between the sublevels of the

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ACCESSION NR: AP5006022

2^3S_1 ground state with magnetic moment F = 3/2 and 1/2 in a magnetic field on the order of 1 Oe lie approximately in the regions 1.9 and 3.8 Mcs, respectively. The same equations can be used to determine the intensity of a weak magnetic field from the measured transition frequency. It is shown that four resonant lines should be observed in a weak magnetic field, and the expressions for their frequencies are given. A simple expression convenient for an experimental determination of the hyperfine splitting constant, is also derived. Orig. art. has: 24 formulas.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute)

SUBMITTED: 03Feb64 ENCL: 00 SUB CODE: NP, OP

NR REF SOV: 001 OTHER: 002

Card 2/2 mp

L 38116-65 EWT(1)/EWT(m)/EPF(c)/T/EWP(t)/EEC(b)-2/EWP(b) Pq-4/Pr-4/Pi-4
IJP(c) JD

S/0141/64/007/006/1111/1121

ACCESSION NR: AP5006023

30
29
B

AUTHOR: Skrotskiy, G. V.; Pokazan'yev, V. G.

21

TITLE: Contribution to the theory of optical orientation in He^3

SOURCE: IVUZ. Radiofizika, v. 7, no. 6, 1964, 1111-1121

TOPIC TAGS: helium, 21 optical orientation, level transition, resonant frequency, magnetization intensity, oriented atom

ABSTRACT: This is a companion to a paper by the same authors in the same source (Izv. vyssh. uch. zav. - Radiofizika v. 7, 1106, 1964; Accession AP5006022), and is devoted to a discussion of some features of optical orientation of metastable atoms of He^3 in the 2^3S_1 state. The helium is situated in an arbitrary magnetic field. The relative probabilities of transitions induced by light of resonant frequency between the 2^3S_1 and $2^3P_{0,1,2}$ levels of orthohelium are determined by calculating the signal and magnetization of the optically oriented helium atoms for both polarized and unpolarized light propagating along the direction of the magnetizing field. It is shown that in the case of the 2^3S_1--2^3P_0

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ACCESSION NR: AP5006023

transitions the magnetization and the signal are larger than the values obtained for the other two transitions. Although the analysis is limited to light propagating along the field, the effect of light perpendicular to the field can be analyzed similarly and in some cases such light can produce more effective orientation of the atoms than the longitudinal light. The feasibility of a sensitive helium magnetometer based on the results of the article is briefly discussed. Orig. art. has: 28 formulas and 4 tables.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute)

SUBMITTED: 03Feb64 ENCL: 00 SUB CODE: GP

NR REF SOV: 002 OTHER: 005

me

Card 2/2

L 63104-65 EWT(l) IJP(c)

ACCESSION NR: AP5019229 UR/0056/65/049/001/0163/0169

AUTHOR: Pokazan'yev, V. G.; Skrotskiy, G. V.

21 / B

TITLE: Radiooptic resonance of atoms in strong magnetic fields 21

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 1, 1965, 163-169

TOPIC TAGS: radiooptic resonance, fluorescence intensity, double resonance, cadmium atom, hyperfine structure, magnetic field, rf field

ABSTRACT: An expression is derived for the intensity of the fluorescence produced when microwave and radio-frequency fields are applied to a system of excited atoms in a state of radiooptic resonance in a strong magnetic field. The time evolution of the system is analyzed with the interaction between the atom and the radiation field taken into account in the Hamiltonian of the system with first-order perturbation-theory accuracy. The analysis shows that the fluorescence intensity changes appreciably when the nuclear resonance frequency is approached. The results are compared with experimental data on gaseous cadmium and it is shown that radiooptic resonance can be used to investigate experimentally the hyperfine structure of atoms. Orig. art. has: 1 figure and 32 formulas. [02]

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute)

Card 1/2

L 63104-65

ACCESSION NR: AP5019229

SUBMITTED: 11Nov64

NO REF SOV: 000

ENCL: 00

OTHER: 008

SUB CODE: OP

ATD PRESS: 4074

Card 2/2

SKROTSKIY, S.

Improve work organization in the construction of derricks.
Sots.trud 4 no.5:145-146 My '59. (MIRA 12:8)
(Cranes, derricks, etc.)

SKROTSKIY, S.

Work of the norm research station of the administration of "Stalingradneftegaz." Biul.nauch. inform.: trud i zar. plata 4 no.8:37-40 '61. (MIRA 14:10)

(Volgograd Province--Petroleum industry--Production standards)

(Volgograd Province--Gas industry--Production standards)

SKROTSKIY, S.S.

Volgograd drillers' practice of introducing mechanisms which speed up hoisting and lowering operations. Neft. khoz. 39 no.12: 60-63 D '61. (MIRA 14:12)

(Volgograd Province--Oil well drilling--Equipment and supplies)

SKROTSKIY, Sigizmund Stanislavovich; LOSEV, M.T., red.; KAYESHKOVA, S.M., ved. red.; STAROSTINA, L.D., tekhn. red.

[Planning labor and wages in petroleum and gas producing enterprises] Planirovanie truda i zarabotnoi platy na predpriiatiiakh neftegazodobyvaiushchei promyshlennosti. Moskva, Izd-vo "Nedra," 1964. 150 p. (MIRA 17:3)

SKROTSKIY, S.S.

Evaluating the work of an publicizing progressive drilling and derrick building crews. Neft. khoz. 42 no.1:8-12 Ja'64. (MIRA 17:5)

VOROB'YEV, G.G.; SHKROV, G. [Skrov, G.]

Recent data characterizing the fall of tektites (vltavines) in Czechoslovakia. Dokl. AN SSSR 161 no.1:63-65 Mr '65. (MIRA 18:3)

1. Komitet po meteoritam AN SSSR i Ceske-Budeyovitskaya astronomicheskaya observatoriya, Chekhoslovatskaya Sotsialisticheskaya Respublika. Submitted October 9, 1964.

S[illegible]VANEK, A.

Antenna with an iron core. p. 119. TECHNICKA PRACA. (Statne nakladatelstov technickej literatury) Vol. 6, no. 2, Feb. 1954.

SOURCE: East European Accessions List, Vol. 5, no. 9, September 1956

CZECH/14-60-3-8/56

6(4,6)

AUTHOR: Skrovánek, Ambróz, Engineer

TITLE: Reception of FM Broadcasting With a TV Receiver

PERIODICAL: Sdělovací technika, 1960, Nr 3, pp 87-88

ABSTRACT: The author describes various methods to receive fm
radio programs with a TV receiver and gives a de-
tailed description of the method employed in the
Soviet TV sets "Rubin" (diagram 1) and "Rekord"
(diagram 2). The Soviet receivers have superhet
functions, are equipped with an additional oscil-
lator for fm reception and use 2 frequency-mixing
stages. Upon the first mixing, an intermediate
frequency arises which is conform to the interme-
diate video frequency, and upon the second mixing,
a frequency of 6.5 mc is resulting, conform to the
original intermediate audio frequency. This stage
is tuned with the same elements as used for TV

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CZECH/14-60-3-8/56

Reception of FM Broadcasting With a TV Receiver

tuning. The receivers are fed from 2 transformers and the one, supplying the video circuits is disconnected during fm radio reception. The oscillator frequency is fed to the demodulating diode either directly or thru the last stage of the intermediate video-frequency amplifier. Mixing takes place due to the non-linear characteristics of the diode and a frequency of 6.5 mc results, same as in TV reception. The audio stage, tuned to this frequency, processes the fm signals the conventional way up to the loudspeaker. The author gives then a wiring diagram of the Czechoslovak TV receiver 4b "Athos", modified for fm radio reception (graph 3). There are 3 diagrams.

Card 2/2

SKROVANEK, Ambroz, inz.

Universal transistorized low-frequency ampli ier. Sdel tech 13 no.2:51-52 F '65.

SKROVANEK, Ambroz, inz.

Preamplifier for electron tube toltmeters. Sdel tech 11 no.8: 309-310 Ag '63.

SKROVANEK, Ambroz, Inz.

Transistors in low-frequency engineering. Sdel tech 11 no.5: 172-175 My '63.