SOV/56-36-3-48/71

On the Problem of the Covariant Determination of the Spin-pseudovector

It further holds that

$\xi_1 = k_0 \sqrt{1-s^2} \cos\delta$, $\xi_2 = k_0 \sqrt{1-s^2} \sin\delta$,

$\xi_3 = ks$, $\xi_4 = iks$; several special cases are investigated.

There are 7 references, 6 of which are Soviet.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University)

SUBMITTED: October 27, 1958

Card 2/2

TERNOV, I.M.; TUMANOV, V.S.

Effect of vacuum fluctuations on the polarization of electrons moving in a magnetic field. Zhur.eksp.i teor.fiz. 37 no.4: 1137-1139 O '59. (MIRA 13:5)

1. Moskovskiy gosudarstvennyy universitet.
(Electrons) (Magnetic fields)

9(3),24(4)

AUTHORS: Ternov, I. M., Tumanov, V. S. SOV/20-124-5-21/62

TITLE: On the Radiation of a Polarized Electron (Ob izluchenii polyarizovannogo svetyashchegosya elektrona)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 5, pp 1038-1041 (USSR)

ABSTRACT: The authors investigated the radiation of a polarized relativistic electron in a constant and homogeneous magnetic field. In this connection it is useful to demand that the wave function of the electron moving in the magnetic field $A_x = -(1/2)yH$, $A_y = (1/2)xH$, $A_z = 0$ be a solution of the Dirac equation and, besides, an eigenfunction of the operator of the spin projection on the kinetic momentum: $(\vec{\sigma}\vec{P})\psi = \vec{\sigma}(-i\hbar\nabla + \frac{e}{c}\vec{A})\psi = \hbar\mu\zeta\psi$. It is useful to make such a selection of the wave function because the orientation of the spin of the electron with respect to the direction of its motion in a magnetic field remains conserved. The steady solution of the Dirac equation in the system of coordinates r, φ, z is explicitly written down. An expression for the

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polarized radiation of the electron at its spontaneous transition from the initial to another state is written down. The matrix elements of the Dirac matrices are proportional to certain Laguerre-functions. The authors above all estimate the intensity of radiation at transitions with approximation of the polarization of spin. The intensity of the radiation which is connected with depolarization is much lower than the corresponding value for transitions with conservation of polarization. For the investigation of the angular distribution of radiation intensity the usual approximation of matrix elements must be carried out, and the above-mentioned expression for the intensity of the polarized radiation of the electron must be summated with respect to all harmonics and radial transitions. Next, rather long expressions are derived also for the integral intensity of radiation. The polarization of the electron manifests itself already in the terms of the order of magnitude $\hbar$, although the radiation with the re-orientation of spin is of the order $\hbar^2$. The authors thank Professor A. A. Sokolov and Professor D. D. Ivanenko for discussing the problem and its results. There are 7 Soviet references.

On the Radiation of a Polarized Electron SOV/20-124-5-21/62

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

PRESENTED: October 31, 1958, by N. N. Bogolyubov, Academician

SUBMITTED: October 24, 1958

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69453
S/139/60/000/01/027/041
E032/E414

9.3130

AUTHORS: Ternov, I.M. and Tumanov, V.S.

TITLE: On the Motion of Polarized Electrons in a Magnetic Field

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1960, Nr 1, pp 155-163 (USSR)

ABSTRACT: It is well known that the effect of electromagnetic fields on the motion of a polarized electron beam can, in the general case, be reduced to a change in the momentum and the direction of the spin vector. In the case of a purely magnetic field, this change takes place in such a way that the component of the spin vector in the direction of motion is conserved. The situation is however complicated by the interaction of the electron with the electromagnetic vacuum. This leads to an additional energy which should be included in the generalized Dirac equation. A consideration of the effect of the vacuum interaction energy shows that in the non-relativistic approximation, the electron has a vacuum magnetic moment (in addition to the Bohr magneton) so that the Hamiltonian in the generalized Dirac

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E032/E414

On the Motion of Polarized Electrons in a Magnetic Field

equation for an electron in the magnetic field is of the form given by Eq (3). The presence of the additional vacuum moment leads to the fact that the change in the momentum vector and in the spin direction, when the electron moves in a magnetic field, is such that the spin component in the direction of motion is no longer an integral of motion, since the operator (σP) no longer commutes with the Hamiltonian of the generalized Dirac equation. In this way, the original polarization of the electron beam gradually changes with time. The vacuum interaction plays the major part in the change in the polarization since the kinematic (non-vacuum) part of the magnetic moment is automatically taken into account by the Hamiltonian given by Eq (2) and has no effect on the polarization. The vacuum correction to the Dirac equation (Eq (3)) in the form of an additional field moment is only significant in the non-relativistic approximation. The relativistic problem must be

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On the Motion of Polarized Electrons in a Magnetic Field

the present paper. The treatment given holds up to ultra-relativistic electron velocities. The derivation is given of radiational corrections to the Dirac equation, and the effective energy of interaction of an electron with vacuum is computed. An estimate is also given of the change in the orientation of the electron spin vector which is due to the vacuum interaction. The discussion is concluded with an example in which the electron moves in a direction perpendicular to the magnetic field. Acknowledgement is made to Professor A.A.Sokolov for discussion of the results obtained. There are 10 references, 6 of which are Soviet and 4 English.

ASSOCIATION: Moskovskiy gosuniversitet imeni M.V.Lomonosova
(Moscow State University imeni M.V.Lomonosov)

SUBMITTED: July 23, 1959

Card 3/3

S/139/60/000/01/040/041
E201/E391

AUTHORS: Vorob'yev, A.A. and Ternov, I.M.

TITLE: International Conference on High-energy Particle Accelerators and on Nuclear-physics Instrumentation

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika. 1960, Nr 1, pp 236 - 241 (USSR)

ABSTRACT: The conference was opened by the Chairman of CERN, Dr. Baker.
At the first session four papers were read on the necessity of building new high-energy accelerators. One of these papers was read by Professor Panovskiy, who argued that large accelerators give no information which could not be obtained from cosmic rays. The evening session on September 14 and two sessions on September 15 were occupied by twenty-one papers on extension of the accelerator energies towards higher values. During these sessions papers were presented by Kolomenskiy, V.P. Dmitriyevskiy (description of a 12 MeV cyclotron in Dubno, which uses spatial variation of the magnetic field) and

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International Conference on High-energy Particle Accelerators and on Nuclear-physics Instrumentation

V.I. Zamolodchikov (description of a 1.5 m cyclotron with azimuthal variation of the magnetic field). The morning session on September 15 included 7 papers on acceleration of charges in plasmas; among these were papers by Rodionov, Academician I.F. Kvartskhava (experimental investigations of production and acceleration of plasmas), Academician V.I. Veksler (coherent shock acceleration of ring plasmas), A.N. Lebedev and A.A. Kolomenskiy (theory of stochastic acceleration and accumulation); A.A. Vorob'yev drew the attention of the conference to the absence of papers on injection.

The morning session on September 16 was devoted to fundamental limitations of accelerators. Among the papers presented at this session there were communications from D.G. Koshkarev (theory of non-linear problems of betatron oscillations and particles losses in resonances); V.V. Vladimirskiy (space-charge limitations), Lebedev, Finkel'shteyn and Veksler.

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S/139/60/000/01/040/041
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International Conference on High-energy Particle Accelerators and on Nuclear-physics Instrumentation

Another group of papers dealt with departure from cyclic acceleration of electrons due to radiation and quantum effects (A.N. Lebedev and D.G. Koshkarev participated in this group).

At the evening session on September 16, twelve papers were presented which described technical details of high-energy accelerators.

The 7 BeV proton synchrotron in Moscow and a planned 50 BeV synchrophasotron in Serpukhov were described by V.V. Vladimirskiy.

Engineer Zinov'yev described 30, 90 and 200 MeV linear electron accelerators, constructed at UFTI.

A.A. Vorob'yev read a paper on "The Theory of Cyclic Waveguide Electron Accelerators", based on his own work and that of A.N. Didenko, Ye.S. Kovalenko and B.N.Morozov.

At the morning session on September 17, devoted to

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International Conference on High-energy Particle Accelerators and on Nuclear-physics Instrumentation

production, extraction and separation of particles in high-energy machines, papers were read by S.V. Chuvilo (formation of a meson beam of 7 BeV/c momentum in the Dubno synchrophasotron) and by Professor Panovskiy (microwave separation of particles).

ASSOCIATIONS: Moskovskiy gosuniversitet imeni M.V. Lomonosova (Moscow State University imeni M. V. Lomonosov)
Tomskiy politekhnicheskiy institut imeni S.M. Kirova (Tomsk Polytechnical Institute imeni S.M. Kirov)

SUBMITTED: December 11, 1959

Card 4/4

ACCESSION NR: AP4041444 S/0188/64/000/003/0101/0103

AUTHOR: Sokolov, A. A.; Ternov, I. M.; Loskutov, Yu. M.

TITLE: The problem of radiation damping of betatronic oscillations

SOURCE: Moscow. Universitet. Vestnik. Seriya 3. Fizika, astronomiya, no. 3, 1964, 101-103

TOPIC TAGS: betatron, betatronic oscillation, cyclic accelerator, radiation damping, quantum theory, cyclic electron accelerator, electron accelerator, electron radiation, electron oscillation, electron motion, parabolization

ABSTRACT: After the demonstration of the influence of quantum fluctuations of radiation on the movement of electrons in a cyclic accelerator, the development of the quantum theory of electron movement acquired theoretical and practical significance. Recently, in a paper by S. A. Kheyfets and Yu. F. Orlov (ZhETF, 45, 1225, 1963), an attempt was made to obtain not only fluctuation activation of betatronic oscillations, but also classical damping using a nonrelativistic approximation in addition to the quantum method. These authors feel that one cannot obtain radiation damping in either the classical case or the quantum case because quadratic terms in r and $\frac{dr}{dt}$ are neglected in the equations of movement, i.e. "paraboliza-

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ACCESSION NR: AP4041444

tion" of the potential energy describing the betatronic oscillations is carried out. The present authors then point out that "parabolization" of the potential energy actually takes place in both the classical and quantum calculations. Nevertheless, in spite of the assertions of S. A. Kheyfets and Yu. F. Orlov, with the help of the classical theory the authors at once found an expression for radiation damping:

$$\ddot{x} + \gamma\dot{x} + \omega_r^2 x = -\frac{q}{1-q}\frac{\bar{W}^{kl}}{E}\dot{x} \qquad (1)$$

They then review their previous work on the application of quantum theory to the excitation of betatronic oscillations, and show that the criticism of Kheyfets and Orlov concerning the origin of classical damping cannot be applied to the ultrarelativistic case of "free" betatronic oscillations. Attention is drawn, in this connection, to the work of Gutbrod (Zs. f. Phys., 168, 177, 1962). Taking into account all the terms of the analysis, one can obtain the following expression for the change in the quantum number s:

$$\frac{ds}{dt} = \frac{55}{48\sqrt{3}}\frac{e^2c}{R^2 m_0c^2 (1-q)^{2/3}}\left(\frac{E}{m_0c^2}\right)^6 - \frac{q}{1-q}s\frac{\bar{W}^{kl}}{E} \qquad (2)$$

where W^{kl} is the classical expression for the energy being radiated in a unit of

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ACCESSION NR: AP4041444

time. In conclusion, the authors remark that the quantum fluctuations of the radius have great practical significance. In this regard, if the first quantum term in the right hand side of equation (2), corresponding to the quantum fluctuations, is neglected, then the square of the amplitude of the radial fluctuations rapidly vanishes in the presence of relatively large energies. Acutally, however, the amplitude of the vertical or axial oscillations tends toward a small positive limit. It also follows that the effect of classical damping begins to decrease at energies on the order of 400-600 Mev. The article is followed by a brief rebuttal by S. A. Kheyfets. Orig. art. has: 9 formulas.

ASSOCIATION: Kafedra teoreticheskoy fiziki Moskovskogo universiteta (Department of Theoretical Physics, Moscow University)

SUBMITTED: 07Dec63 ENCL: 00

SUB CODE: NP NO REF SOV: 007 OTHER: 003

Card 3/3

ACCESSION NR: AP4043800 S/0188/64/000/004/0062/0070

AUTHOR: Ternov, I. M., Bagrov, V. G., Rzayev, R. A.

TITLE: Influence of synchrotron radiation of electrons on their spin orientation

SOURCE: Moscow. Universitet. Vestnik. Seriya 3. Fizika, astronomiya, no. 4, 1964, 62-70

TOPIC TAGS: electron, magnetic field, synchrotron radiation, electron spin, electron spin polarization, electron spin orientation

ABSTRACT: The influence of an electromagnetic field on the movement of a polarized beam of electrons generally leads to a change in both the momentum vector of the particles and their spin orientation. In the case of a magnetic field which is uniform in space and constant in time this change occurs in such a way that the state of polarization of the electron spin, determined relative to the direction of motion of the electron and relative to the direction of the external magnetic field, does not change with time. During motion in a magnetic field an electron becomes a source of extremely strong electromagnetic radiation which can lead to a change in the orientation of electron spin. In this article the author considers the problem of the behavior of electron spin during synchrotron radiation. Two states of polarization are investigated: relative to the direction of

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motion (longitudinal) and relative to the direction of the magnetic field (for practical purposes transverse). Expressions are derived for the wave functions, followed by an analysis of the probability of spontaneous transitions. In his exposition of the formulas characterizing spectral distribution, the author cites

$$w = \frac{\sqrt{3}}{4\pi}\frac{e^2}{\hbar c}\frac{c}{R}\frac{1}{\sqrt{\varepsilon_0}}\int_0^\infty \frac{dy}{(1+\xi y)^3}F, \qquad (1)$$

where F is dependent on the state of polarization of the electron spin. The state of longitudinal polarization is

$$F^{\rightarrow} = [2(1+\xi y)+\xi^2 y^2]\int_0^\infty K_{5/3}(x)\,dx, \qquad (2)$$

$$F^{\rightleftarrows} = \xi^2 y^2\left(2K_{5/3}(y) - \int_y^\infty K_{5/3}(x)\,dx\right). \qquad (3)$$

where arrows indicate transitions corresponding to spin flipping ($\rightleftarrows$) and without change in spin orientation ($\rightarrow$). These formulas show that transition probability is generally independent of the initial state of polarization. In the case $E \leqslant E1/2$ (that is, when $\xi \ll 1$),

ACCESSION NR: AP4043800

spin flipping is expressed in terms proportional to the square of the Planck constant $\hbar^2$. The state of polarization along a magnetic field is

(4)

$$F^{\uparrow\uparrow} = 2(1+\xi y)\int_{y}^{\infty}(K_{1/3}(x))\,dx + \xi^2 y^2 K_{1/3}(y) - \zeta(2+\xi y)\,\xi y K_{1/3}(y),$$

(5)

$$F^{\uparrow\downarrow} = \xi^2 y^2 (K_{1/3}(y) \mp \zeta K_{1/3}(y)).$$

where the arrows indicate retention of polarization ($\uparrow\uparrow$) and change of polarization ($\uparrow\downarrow$) (spin flipping). The results differ appreciably from the preceding case: dependence on initial spin state enters into both expressions. Limiting the problem to the region of energies E << E 1/2, when it can be assumed that $\zeta << 1$, the authors find the integral value for transition probability. It is shown that the integral transition probability without spin flipping is identical for both longitudinal polarization and polarization along the field

(6)

$$\omega^{\uparrow\uparrow} \simeq \omega^{\rightrightarrows} = \frac{5\sqrt{3}}{6}\,\frac{e^2}{\hbar c}\,\frac{c}{R}\,\frac{E}{m_0 c^2}.$$

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ACCESSION NR: AP4043800

The probability of transitions with spin flipping in the case of longitudinal polarization is not dependent on initial spin orientation

$$w^{\uparrow\downarrow} = \frac{5\sqrt{3}\pi e^2}{36 \cdot 9\hbar c} \frac{c}{R} \frac{E}{m_0 c^2} \xi^2. \quad (7)$$

A different situation prevails for states of polarization of electron spin relative to magnetic field direction.

$$w^{\uparrow\uparrow} = \frac{5\sqrt{3}}{36} \frac{e^2}{\hbar c} \frac{c}{R} \frac{E}{m_0 c^2} \xi^2 \left(1 + \zeta \frac{8\sqrt{3}}{15}\right). \quad (8)$$

Thus, as a result of radiation it is possible for there to be predominant orientation of electron spin against the field $\zeta = -1$. This effect also will occur for electrons which are nonpolarized at the initial time. "The authors thank Professor A. A. Sokolov for discussion of the results." Orig. art. has: 47 formulas.

ASSOCIATION: Kafedra teoreticheskoy fiziki Moskovskogo Universiteta. (Department of Theoretical Physics, Moscow University)

ACCESSION NR: AP4043800

SUBMITTED: 15Oct63 ENCL: 00

SUB CODE: NP NO REF SOV: 007 OTHER: 004

Card 5/5

S/139/60/000/005/017/031
E032/E114

AUTHORS: Vorob'yev, A.A., and Ternov, I.M.

TITLE: Physical Problems in the Development of Cyclic Electron Accelerators/9

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1960, No. 5, pp 100-107

TEXT: The present paper is a summary of the Proceedings of the International Conference on High Energy Accelerators and Instruments which took place in Geneva in September 1959.

There are 7 figures and 3 Soviet references.

ASSOCIATION: Tomskiy politekhnicheskiy institut imeni S.M.Kirova, (Tomsk Polytechnical Institute imeni S.M. Kirov),

Moskovskiy gosuniversitet imeni M.V. Lomonosova (Moscow State University imeni M.V. Lomonosov)

SUBMITTED: December 22, 1959

Card 1/1

TERNOV, I. M.

Doc Phys-Math Sci - (diss) "Studies in the quantum theory of luminous electrons." Moscow, 1961. 20 pp; (Ministry of Higher and Secondary Specialist Education RSFSR, Moscow State Univ imeni M. V. Lomonosov); 200 copies; price not given; bibliography on pp 19-20 (32 entries); (KL, 6-61 sup, 191)

S/058/63/000/001/014/120
A062/A101

AUTHOR: Ternov, I. M.

TITLE: On the stability of movement of polarized spin electron beams

PERIODICAL: Referativnyy zhurnal, Fizika, no. 1, 1963, 37- 38, abstract 1A354 (In collection: "Elektron. uskoritel'. Tomsk, Tomskiy un-t, 1961, 388 - 392)

TEXT: Results are reported of a quantum mechanical calculation of the movement of electrons in the magnetic field of a circular accelerator. It is shown that in accelerated polarized beams the precession effect of the spin projection (periodical change of the sign of the spin projection onto the direction of movement) should be observed. In the case of nonrelativistic electrons the sign of polarization changes to the opposite in a time equal to~450 periods of its revolution. Increase of energy brings about a reduction of the time in which the polarization changes; for an energy of 200 MeV this change occurs during one revolution.

A. Fateyev

[Abstracter's note: Complete translation]

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21506
S/139/61/000/002/001/018
E032/E414

21.2000

AUTHORS: Sokolov, A.A. and Ternov, I.M.

TITLE: On the Theory of Synchrotron Radiation

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1961, No.2, pp.3-12

TEXT: This paper was presented at the 3rd Conference of Schools of Higher Education on Accelerators, in Tomsk, September 1959.

It is well known that at high energies (a few tens of Mev or higher) an electron moving in a cyclic accelerator becomes a source of strong synchrotron radiation, as predicted by Ivanenko and Pomeranchuk. This radiation has a number of special properties. The first of these is the characteristic intensity distribution: the intensity maximum is not found in the region of the fundamental (as in the nonrelativistic case) but in the region of higher harmonics whose order of magnitude is related to the electron energy E by the formula

$$\nu_{max} \sim (E/m_0c^2)^3 \qquad (1)$$

The second property consists in that the emission is very directional since the photons are largely emitted in the direction of motion of the electrons. Moreover, the radiation is strongly polarized, i.e. the electric field vector has a preferred direction (parallel to the radius of the circular electron trajectory). Theoretical formulae describing the polarization (Ref.2: A.A.Sokolov and I.M.Ternov, ZhETF, 25, 698, 1953) were confirmed experimentally by F.A.Korolev et al (Ref.7). The third property of synchrotron radiation is its quantum character which becomes important as relatively low energies given by

$$E \sim E_{1/5} = m_o c^2 (m_o c\, R/h)^{1/5} \qquad (2)$$

where R is the radius of the instantaneous equilibrium orbit. The quantum character of the radiation leads to the fact that the radiation is emitted discretely and the number of photons emitted per revolution is given by

$$N \simeq \frac{1}{137} E/m_o c^2 \qquad (3)$$

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When $E > E_{1/5}$ (for example, at a few hundreds of Mev) the quantum character of the radiation should lead to the excitation of radial oscillations by quantum fluctuations. It was generally admitted at the Geneva Conferences on the Physics of Accelerators (1956 and 1959) that the quantum character of the radiation is of great practical importance. However, calculations based on the quasi-classical theory (Robinson, Kolomenskiy, Lebedev, Livingston and others) led to a large damping coefficient not only for classical oscillations but for quantum fluctuations also. In the present paper, rigorous quantum theory is used to investigate the motion of a radiating electron in two limiting cases, namely (a) free motion in the direction of the magnetic field (continuous spectrum) and (b) limited motion in the direction of the field (potential well with infinite walls; discrete spectrum). The second case is looked upon as an approximation to the real conditions of motion of an electron in an accelerator with magnetic focusing along the field. It is shown that in case (a) the time derivative of the momentum along the field is given by

$$\frac{dk}{dt} = -k\frac{W}{E} \qquad (27)$$

where

$$W = \frac{2}{3}\frac{e^2c}{R^2}(E/m_0c^2)^4 \qquad (28)$$

Thus the electron experiences radiational friction which leads to damping, in complete agreement with classical theory (Ref.3: A.A.Sokolov and I.M.Ternov, DAN SSSR, 117,967,1957). In case (b) it is found that

$$\frac{d\kappa^2}{dt} = \frac{13}{24}\frac{1}{\sqrt{3}}\frac{e^2}{h}\frac{1}{R^2}(E/m_0c^2)^5, \qquad (38)$$

i.e. in distinction to the previous case, radiational damping is absent in the case of discrete spectra (quantized motion). The paper is concluded with a quasi-classical interpretation of the quantum effects. In the "real" case of an electron moving in a

cyclic accelerator the emission of synchrotron radiation should lead to the damping of axial betatron oscillations (classical region). An undamped spread of axial oscillations due to quantum fluctuations is then gradually superimposed on its damped part. Finally, the classical damped part should gradually vanish, but owing to the quantum fluctuations the amplitude of the oscillations should tend to some constant limit. These final oscillations will be undamped since they are entirely due to quantum fluctuations. These results are in qualitative agreement with the experiments of F.A.Korolev et al (Ref.7) who have shown that the axial oscillations do, in fact, tend to a finite limit. There are 7 Soviet references.

ASSOCIATION: Moskovskiy gosuniversitet imeni M.V.Lomonosova
(Moscow State University imeni M.V.Lomonosov)

SUBMITTED: November 10, 1960

S/188/61/000/005/006/006
B102/B109

AUTHORS: Ternov, I. M., Stepanov, A. S.

TITLE: Radiation from a relativistic electron which travels helically in a magnetic field

PERIODICAL: Moskovskiy Universitet. Vestnik. Seriya III. Fizika, astronomiya, no. 5, 1961, 83-89

TEXT: The radiation emitted by an electron traveling in a constant and homogeneous magnetic field is investigated quantum-theoretically. When the field is described by $A_x = -Hy/2$, $A_y = Hx/2$, $A_z = 0$, it is only necessary to assume that the wave function of the electron is a solution of Dirac's problem $i\hbar\frac{\partial\psi}{\partial t} = \left\{c(\vec{\alpha}\vec{P}) + \rho_3 mc^2\right\}\psi$ and also an eigenfunction of the operator of the spin projection upon the kinetic momentum

$$(\vec{\sigma}\vec{P})\psi = \vec{\sigma}\left\{-i\hbar\vec{\nabla} + \frac{e}{c}\vec{A}\right\}\psi = \hbar k\zeta\psi; \quad \zeta\hbar k = \zeta\hbar\sqrt{K^2 - k_0^2};$$

$\zeta = \pm 1$ gives the two possible orientations of the electron spin with

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Radiation from a relativistic...

respect to the direction of motion. These relations are sufficient to solve the problem. On the assumption that the momentum components are nonvanishing, formulas are derived for the intensities $W^{(i)}_{nn'ss'}$ of the polarized radiation emitted by the electron during its spontaneous transition from the state n, s, k_z, ζ into the state n', s', k'_z, ζ'.

$W^{(i)}_{nn'ss'} = \frac{e^2c}{2\pi}\oint d\Omega_\kappa \kappa^2 S_i \delta(K-K'-\kappa)d\vec{\kappa}$ is valid where S_i are functions of the Dirac matrix elements. As shown by A. A. Sokolov and I. M. Ternov, $S_2 = |\bar{\vec{a}}_1|^2$ characterizes the emission of photons, the polarization vector of which lies in the orbital plane. $S_3 = |\bar{a}_2|^2\cos^2\theta + |\bar{a}_3|^2\sin^2\theta - 2\bar{a}_2^+\bar{a}_3\sin\theta\cos\theta$ holds for the emission of photons with a polarization vector perpendicular to the orbital plane. The circularly polarized radiation is characterized by

$$S_\lambda = \frac{1}{2}\{S_2 + S_3 + i\lambda[\cos\theta(\bar{a}_1^+\bar{a}_3 - \bar{a}_3^+\bar{a}_1) - \sin\theta(\bar{a}_1^+\bar{a}_3 - \bar{a}_3^+\bar{a}_1)]\} \quad (7)$$

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($\lambda = 1$ corresponds to right-hand, and $\lambda = -1$ to left-hand, polarization of the phonons). The final expressions for the spectral and angular distributions of the radiation intensities are then derived, $\sin\Theta$ and $\cos\Theta$ being expressed by functions of the momentum component k_z in the field direction. The following is obtained:

$$W_2 = W^{KA}\left\{\frac{7}{8} - \frac{50\sqrt{3}}{16}\frac{1}{\beta'}\xi + \frac{1}{4}\zeta\frac{k_z}{K}\frac{1}{\beta'}\eta\right\}, \quad (13),$$

$$W_3 = W^{KA}\left\{\frac{1}{8} - \frac{5\sqrt{3}}{16}\frac{1}{\beta'}\xi + \frac{1}{4}\zeta\frac{k_z}{K}\frac{1}{\beta'}\eta\right\}, \quad (14),$$

$$W_\lambda = \frac{1}{2}W^{KA}\left\{1 - \frac{55\sqrt{3}}{16}\frac{1}{\beta'}\xi + \frac{1}{2}\zeta\frac{k_z}{K}\frac{1}{\beta'}\eta - \right.$$
$$\left. - \lambda\left[\frac{\sqrt{3}}{4}\frac{k_z}{K}\frac{k_0}{K} + \frac{55\sqrt{3}}{48}\frac{1}{\beta'}\zeta\xi\right]\right\}, \quad (15)$$

with

$$W^{KA} = \frac{2}{3}\frac{ce^2}{R^2}\left(\frac{E}{mc^2}\right)^4, \quad \xi = \frac{\hbar}{mcR}\left(\frac{E}{mc^2}\right)^3,$$

$$\eta = \frac{\hbar}{mcR}\frac{E}{mc^2}.$$

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This indicates that the spin corrections in the linearly polarized intensity components are nonvanishing but by one order of E/mc^2 smaller than the main quantum correction. The relative polarization, given by

$$\delta = \frac{W_{-1} - W_{+1}}{W_{-1} + W_{+1}} = \frac{\sqrt{3}}{4} \frac{k_z}{K} \frac{mc^2}{E} + \frac{55\sqrt{3}}{48} \frac{1}{\beta'} \zeta \frac{\lambda}{mcR} \left(\frac{E}{mc^2}\right)^2,$$

does not vanish when $\lambda \to 0$ and depends on the orientation of k_z relative to H. Thus, the helical motion of an electron is accompanied by emission of circularly polarized photons. The time τ for which the polarization of the electron spin remains constant, is estimated for an orbital radius $R \sim 100$ cm and an energy of ~ 500 Mev: $\tau = 1/w \sim 10^3$ sec (w is the transition probability). Finally, the damping law is derived. With $p_z = \hbar k_z$ it reads as follows:

$$dp_z/dt = - p_z \frac{W}{E} - \frac{1}{2} \zeta \frac{\lambda}{R} \frac{W^{K\Lambda}}{E} \left(\frac{E}{mc^2}\right)^2$$

The authors express their gratitude to Professor A. A. Sokolov for discussions. There are 6 Soviet references.

Radiation from a relativistic...

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

SUBMITTED: January 23, 1961

Card 5/5

TERNOV, I.M.; LOSKUTOV, Yu.M.; KOROVINA, L.I.

Possibility of polarization of an electron beam due to reativistic radiation in a magnetic field. Zhur.eksp.i teor.fiz. 41 no.4:1294-1295 O '61. (MIRA 14:10)

1. Moskovskiy gosudarstvennyy universitet.
(Electron beams) (Magnetic fields)

SOKOLOV, Arseniy Aleksandrovich, prof.; LOSKUTOV, Yuriy Mikhaylovich; TERNOV, Igor' Mikhaylovich; LARIN, S.I., red.; SMIRNOVA, M.I., tekhn. red.

[Quantum mechanics] Kvantovaia mekhanika. Pod obshchei red. A.A. Sokolova. Moskva, Gos. uchebno-pedagog. izd-vo M-va prosv. RSFSR, 1962. 591 p. (MIRA 15:3)

(Quantum theory)

ACCESSION NR: AP4002278 S/0139/63/000/005/0127/0139

AUTHORS: Ternov, I. M.; Bagrov, V. G.; Rzayev, R. A.

TITLE: Polarization properties of emission of spin oriented fast electrons in a magnetic field

SOURCE: IVUZ. Fizika, no. 5, 1963, 127-139

TOPIC TAGS: relativistic electron emission, extreme ultrarelativistic region, linear emission, circular emission, spin oriented fast electron, fast electron polarization, fast electron emission, polarization property

ABSTRACT: The polarization properties of relativistic electron emission in a homogeneous magnetic field including electron and photon spin correlation have been investigated. The relativistic motion of the electron is obtained by solving the Dirac equation

$$i\hbar\frac{\partial\psi}{\partial t} = (c(\alpha P) + \rho_3 mc^2)\psi,$$

Card 1/2

ACCESSION NR: AP4002278

where $(\sigma P)\psi = \sigma\left(-i\hbar\nabla + \frac{e}{c}A\right)\psi = \hbar k\zeta\psi$

Expressions are obtained describing linear and angular polarization emissions valid for electron energies $E \ll E_{1/2}$, as well as for $E \gg E_{1/2}$ thus including in the analysis extreme ultrarelativistic region. "The author is grateful to Professor A. A. Sokolov and to his colleague B. K. Kerimov." Orig. art. has: 80 equations.

ASSOCIATION: Moskovskiy gosuniversitet imeni, M. V. Lomonosova (Moscow State University)

SUBMITTED: 14Jul62 DATE ACQ: 02Dec63 ENCL: 00

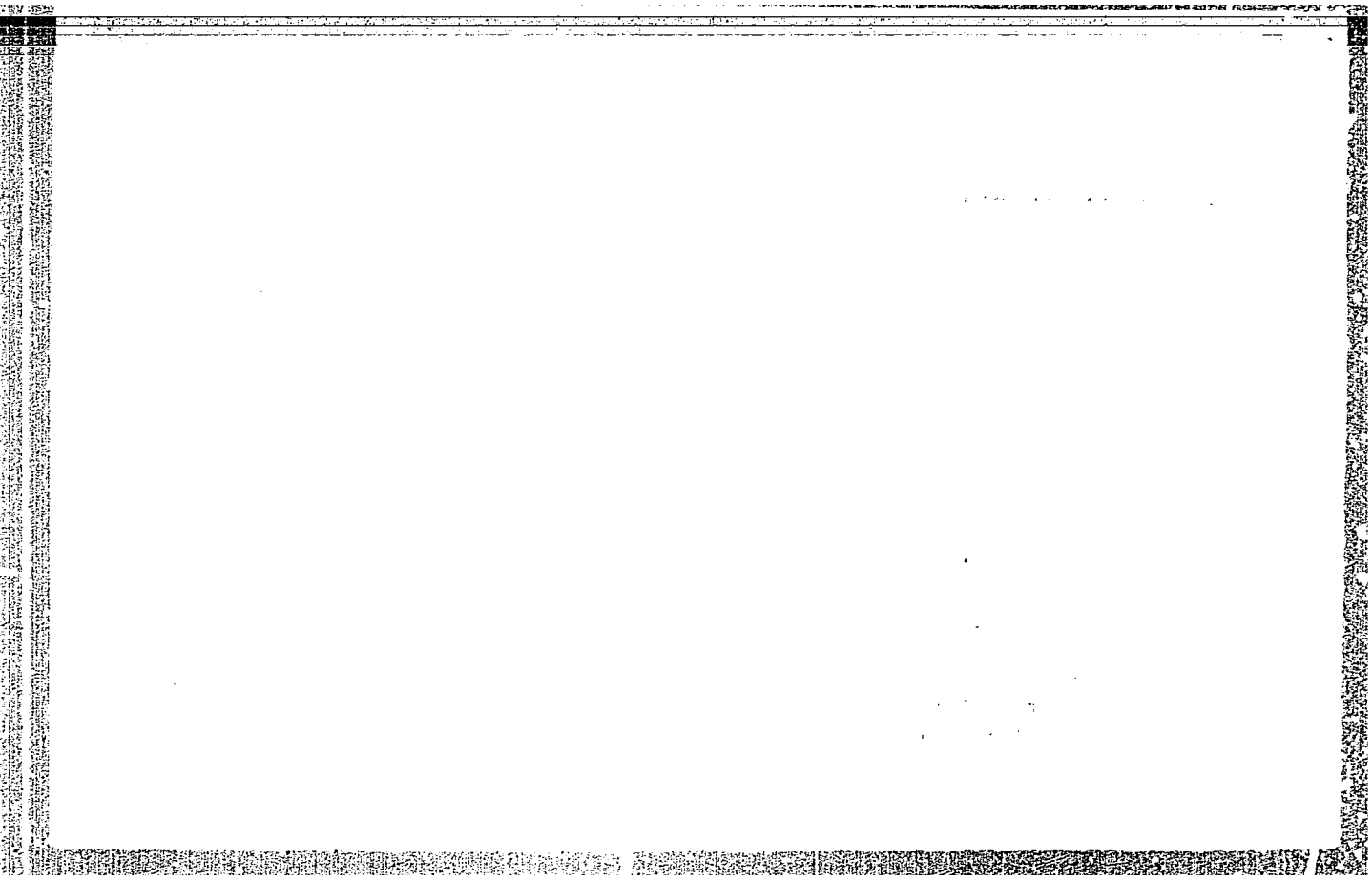
SUB CODE: PH NO REF SOV: 012 OTHER: 000

Card 2/2

SOKOLOV, A.A.; TERNOV, I.M.

Polarization and spin effects in the synchrotron radiation theory. Dokl. AN SSSR 153 no.5:1052-1054 D '63.
(MIRA 17:1)

1. Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova. Predstavleno akademikom N.N. Bogolyubovym.



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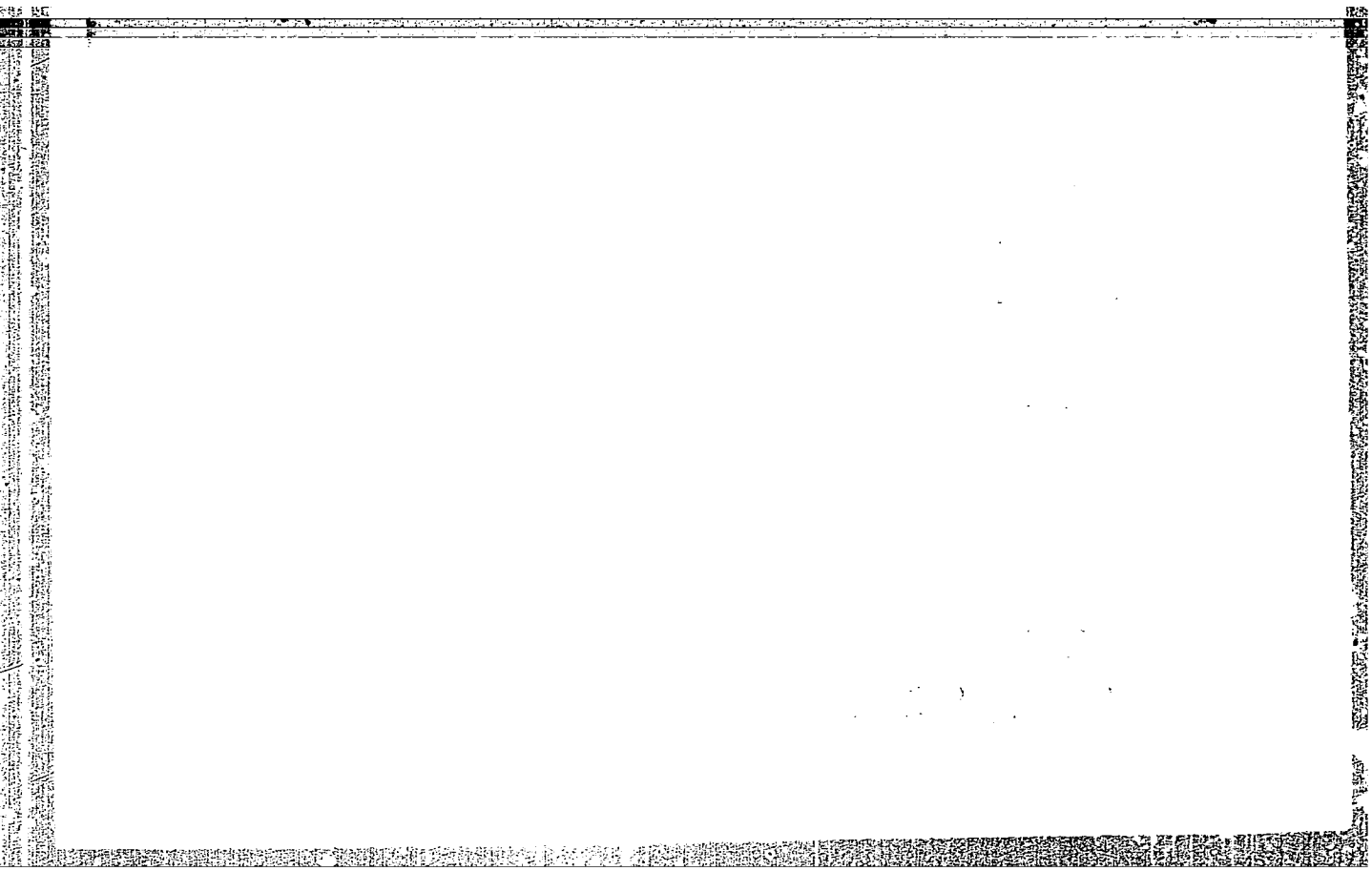

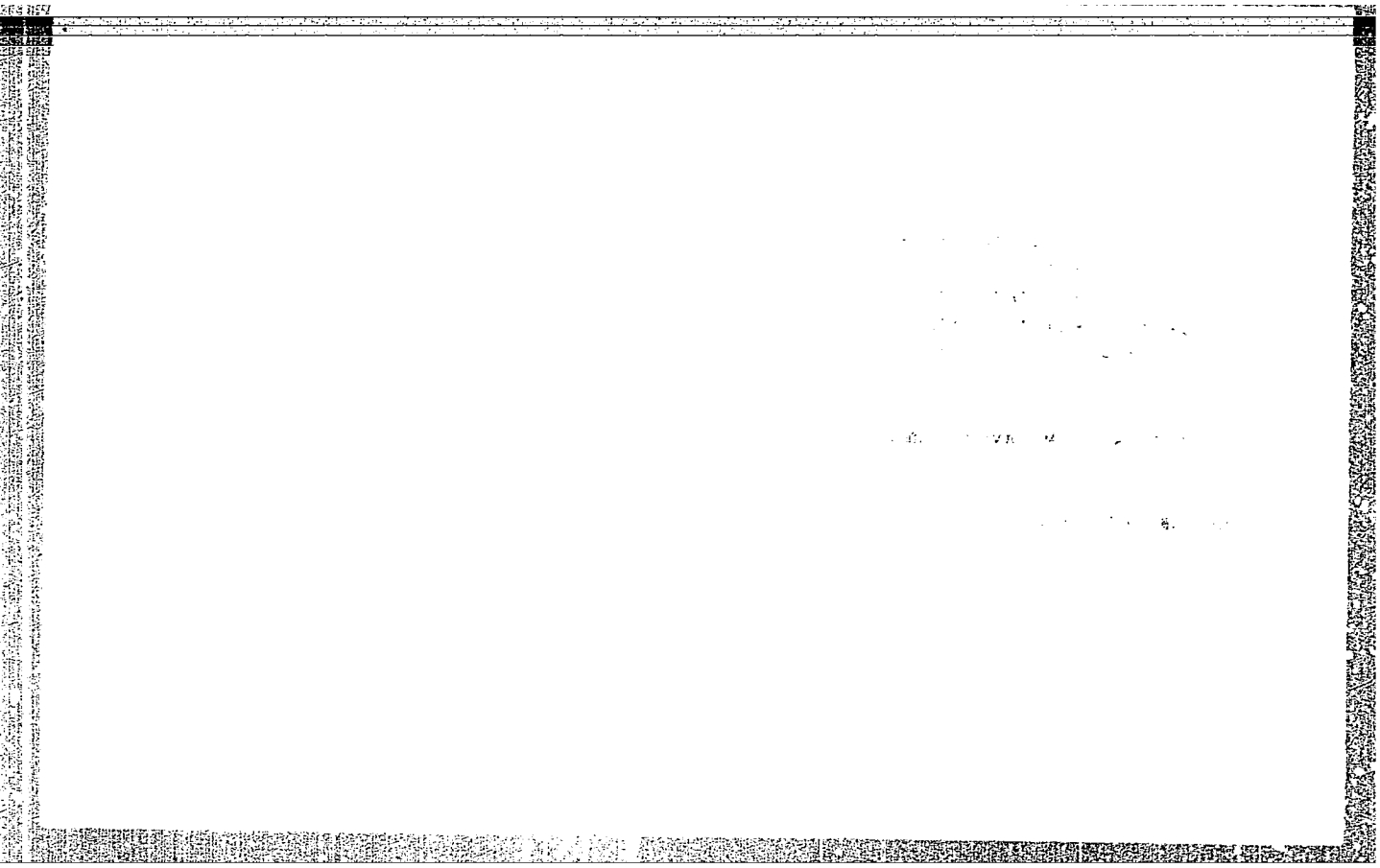

SOKOLOV, A.A.; TERNOV, I.M.; LOSKUTOV, Yu.M.

Radiation damping of betatron oscillations. Vest. Mosk. un. Ser. 3:Fiz., astron. 19 no.3:101-103 My-Je '64.
(MIRA 17:11)

1. Kafedra teoreticheskoy fiziki Moskovskogo universiteta.

TERNOV, I.M.; BAGROV, V.G.; RZAYEV, R.A.

Effect of synchrotron electron emission on the orientation of their spin. Vest. Mosk. un. Ser. 3: Fiz., astron. 19 no.4: 62-70 Jl-Ag '64. (MIRA 17:10)

1. Kafedra teoreticheskoy fiziki Moskovskogo universiteta.

L 4229-66 ENT(m)/EPA(w)-2/EWA(m)-2 IJP(c) GS

ACCESSION NR: AT5007964 S/0000/64/000/000/0921/0923

AUTHOR: Sokolov, A. A.; Ternov, I. M.

TITLE: Polarization and spin effects in the theory of synchrotron radiation

SOURCE: International Conference on High Energy Accelerators. Dubna, 1963. Trudy. Moscow, Atomizdat, 1964, 921-923

TOPIC TAGS: high energy accelerator, electric polarization, electron spin, synchrotron

ABSTRACT: Synchrotron radiation is strongly polarized, with 7/8 of the total radiation intensity being referable to the σ-component (the electric radiation field vector directed along the radius to trajector center) and 1/8 to the π-component (electric radiation field vector almost perpendicular to the orbit plane). (Sokolov, A. A.; Ternov, I. M., *ZhETF* 31, 473 (1956)). This conclusion was experimentally verified by experiments of F. A. Korolev and associates (DAN 110, 542 (1956)). In the present report the authors investigate the influence of electron spin orientation upon polarization and intensity of radiation if the electron moves in a constant and homogeneous magnetic field. In the investigation of spin ef-

Card 1/2

L 1229-66
ACCESSION NR: AT5007964

fects, the solutions of the Dirac equation are conveniently resolved into two states which characterize the spin orientation either (a) with or against the motion (longitudinal polarization) or (b) with or against the field (that is, almost perpendicular polarization, as in the authors' problem). The authors examine the solution of the Dirac equation which describes the motion of an electron in a magnetic field under certain physical conditions. Orig. art. has: 22 formulas.

ASSOCIATION: MGU imeni M. V. Lomonosova, SSSR

SUBMITTED: 26May64 ENCL: 00 SUB CODE: NP

NO REF SOV: 008 OTHER: 001

Card 2/2

ACCESSION NR: AP4012565 S/0056/64/046/001/0374/0382

AUTHORS: Ternov, I. M.; Bagrov, V. G.; Rzayev, R. A.

TITLE: Radiation of fast electrons with oriented spins in a magnetic field

SOURCE: Zhurnal eksper. i teoret. fiz., v. 46, no. 1, 1964, 374-382

TOPIC TAGS: electron radiation, fast electron radiation, relativistic electron radiation, electron with oriented spin, electron in magnetic field, electron polarized radiation, electron radiation polarization, electron spontaneous emission, spin dependence of polarization

ABSTRACT: In view of the high degree of polarization of the radiation of fast electrons moving in a magnetic field, the authors investigate the radiation properties of relativistic electrons in a magnetic field, using quantum theory methods and allowing for the

Card 1/2

ACCESSION NR: AP4012565

polarization of the electron spin. Wave functions are derived for an electron moving in a homogeneous and constant magnetic field. The spontaneous emission and the intensity of the polarized radiation are evaluated for polarization along the direction of motion and polarization along the magnetic field vector. In the former case the change in electron spin polarization is independent on the direction of the spin at the initial instant of time. In the latter case the radiation component does depend on the initial spin orientation, and the dependence is included in terms proportional to the first power of Planck's constant. "The authors are grateful to Prof. A. A. Sokolov and Yu. M. Loskutov for participating in a discussion of the results." Orig. art. has: 60 formulas.

ASSOCIATION: Moskovskiy gosudarstvenny*y universitet (Moscow State University)

SUBMITTED: 04Jul63 DATE ACQ: 26Feb64 ENCL: 00

SUB CODE: PH NO REF SOV: 008 OTHER: 003

Card 2/2

SOKOLOV, Arseniy Aleksandrovich; LOSKUTOV, Yuriy Mikhaylovich; TERNOV, Igor' Mikhaylovich; MIKHAILKEVICH, T.V., red.;

[Quantum mechanics] Kvantovaia mekhanika. Izd.2., ispr. i dop. Moskva, Prosveshchenie, 1965. 638 p.
(MIRA 18:5)

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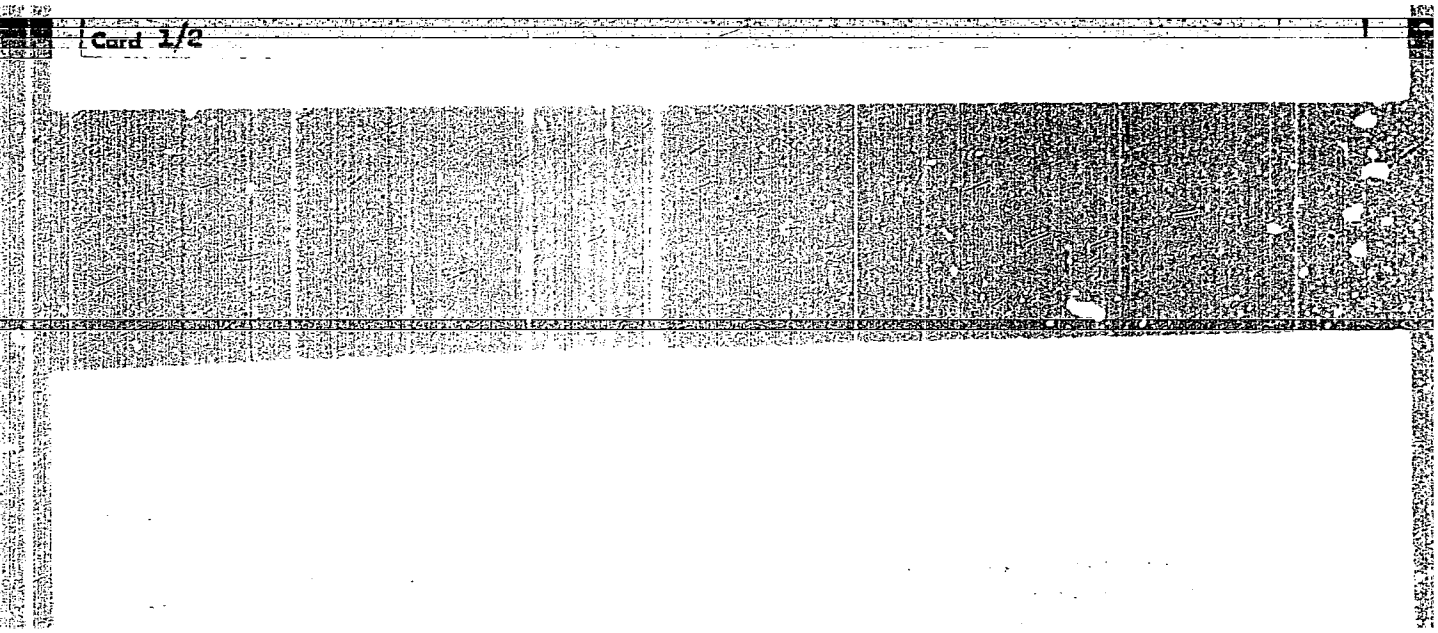
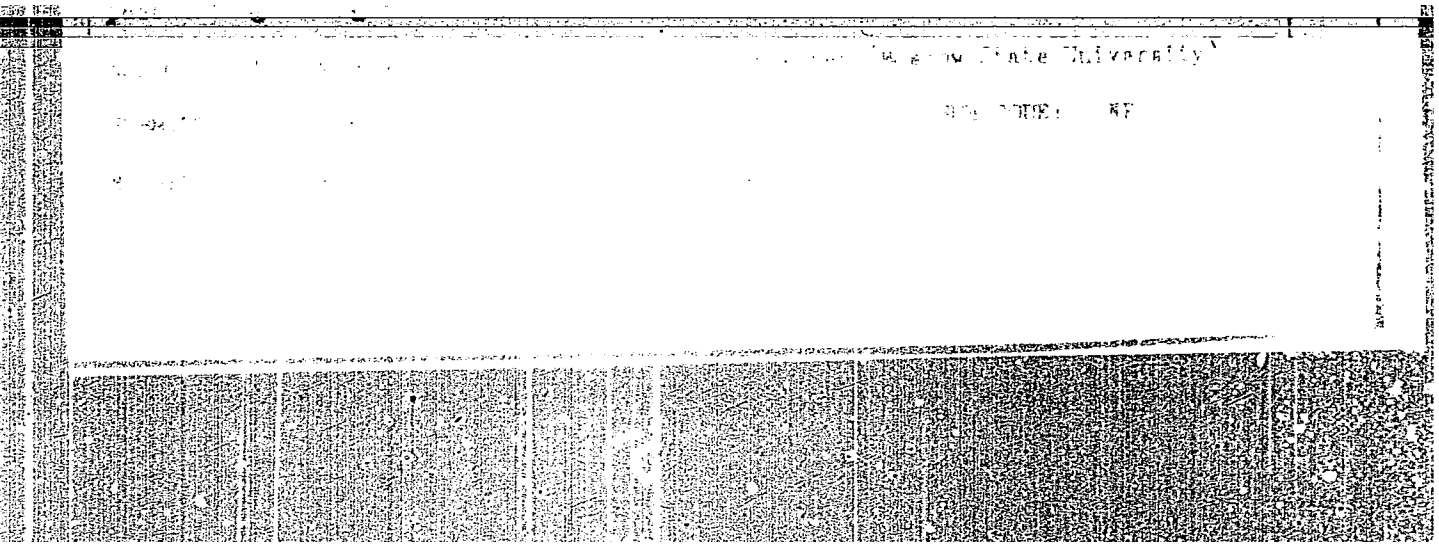


APPROVED FOR RELEASE: 07/16/2001 CIA-RDP86-00513R001755420005-2"



TERNOV, I.M.; LYSOV, B.A.; KOROVINA, L.I.

Theory of the β-decay of a neutron in an external magnetic field. Vest. Mosk. un. Ser. 3: Fiz., astron. 20 no.5:58-63 S-O '65. (MIRA 18:11)

1. Kafedra teoreticheskoy fiziki Moskovskogo universiteta. Submitted May 26, 1964.

TERNOV, I.M.; RZAYEV, R.A.

Characteristics of the relativistic positron radiation in a magnetic field. Vest. Mosk. un. Ser. 3: Fiz., astron. 20 no.6: 87-89 N-D '65. (MIRA 19:1)

1. Kafedra teoreticheskoy fiziki Moskovskogo universiteta. Submitted April 20, 1965.

L 22527-66 EWT(1) IJP(c) AT
ACC NR: AP6009421 SOURCE CODE: UR/0020/66/166/006/1332/1334

AUTHORS: Sokolov, A. A.; Ternov, I. M.

ORG: Moscow State University im. M. V. Lomonosov (Moskovskiy gosudarstvennyy universitet)

TITLE: Contribution to the theory of induced transitions in the emission from a radiating electron

SOURCE: AN SSSR. Doklady, v. 166, no. 6, 1966, 1332-1334

TOPIC TAGS: electron radiation, electron interaction, electromagnetic wave phenomenon, wave function, electron transition, relativistic electron

ABSTRACT: The authors consider the radiation of an electron moving in a constant and homogeneous magnetic field, induced by an incident external electromagnetic wave. The damping brought about by the finite time that the electron stays at the initial level is taken into account. Use is made of the electron wave functions calculated by the authors earlier (ZhETF v. 25, 698, 1953). The case when the incident

Card 1/2 UDC: 535

L 22527-66
ACC NR: AP6009421

electromagnetic wave is linearly polarized is also considered. An expression is derived for the energy absorbed per unit time by an electron during resonant transitions, in terms of the electric field intensity in the incident wave. The formula obtained is applicable for any number of harmonics of all order and has no limitation connected with the velocity of the electron. In the case of a nonrelativistic electron the expression agrees with that obtained by J. Schneider (Phys. Rev. Letters, no. 2, 504, 1959). This report was presented by Academician N. N. Bogolyubov. Orig. art. has: 20 formulas.

SUB CODE: 20/ SUBM DATE: 25Jun65/ ORIG REF: 003/ OTH REF: 001

Card 2/2 BLG

L 25733-66 EWT(m)/T
ACC NR: AP6002291 SOURCE CODE: UR/0188/65/000/006/0087/0089

AUTHOR: Ternov, I. M.; Rzayev, R. A.

ORG: Department of Theoretical Physics, Moscow State University (Kafedra teoreticheskoy fiziki Moskovskogo universiteta)

TITLE: Characteristics of relativistic radiation of positrons in a magnetic field

SOURCE: Moscow. Universitet. Vestnik. Seriya III. Fizika, astronomiya, no. 6, 1965, 87-89

TOPIC TAGS: radiation, magnetic field, positron, homogeneous magnetic field, wave function, electron spin

ABSTRACT: In order to solve the problem of the properties of radiation emitted by positrons which have an oriented spin during their motion in a homogeneous magnetic field, the authors used the wave functions of a positron which satisfy the Dirac equation

$$\left\{i\hbar\frac{\partial}{\partial t} - c\vec{\alpha}\left(\hat{\vec{p}} - \frac{e_0}{c}\vec{A}\right) - p_3 m_0 c^2\right\}\psi^{pos} = 0 \qquad (1)$$

In order to divide the solution to the Dirac equation according to the states of spin, the wave function was used in the capacity of an eigen function of the operator of the polarization tensor. The Dirac function was solved in a cylindrical system of

UDC: 539.124.6

Card 1/2

L 5713-66

ACC NR: AP6002291

co-ordinates. The authors concluded that during a simultaneous motion in a magnetic field of spin polarized electrons and positrons with an identical energy over a sufficiently long time period, $t > \tau = (2\omega^0)^{-1}$, the spins of the particles should become oriented opposite each other. The authors thank A. A. Sokolov for his discussion. Orig. art. has: 9 equations.

SUB CODE: 20 / SUBM DATE: 20Apr65/ ORIG REF: 004/ OTH REF: 000

Card 2/2 BK

L 45160-66 EWT(1)/EEC(k)-2/T/EWP(k) IJP(c) WG

ACC NR: AP6031334 SOURCE CODE: UR/0386/66/004/003/0090/0092

46
B

AUTHOR: Sokolov, A. A.; Ternov, I. M.

ORG: Physics Department, Moscow State University im. M. V. Lomonosov (Fizicheskiy fakul'tet Moskovskogo gosudarstvennogo universiteta)

TITLE: Use of an electron synchrotron as a maser 25

SOURCE: Zh. eksper. i teoret. fiz. Pis'ma v redaktsiyu. Prilozheniye v. 4, no. 3, 1966, 90-92

TOPIC TAGS: synchrotron, stimulated emission, electron accelerator, maser theory

ABSTRACT: The authors show that stimulated emission from electrons moving in a magnetic field is possible in the relativistic case in a definite band of high harmonics corresponding to a certain resonance. The formula for the total power of the stimulated emission and absorption of a given harmonic ν is obtained for an incident electromagnetic wave which is linearly polarized and propagates perpendicular to a constant magnetic field causing cyclic motion of the electron. The values of ν at which stimulated emission will prevail over absorption and which gives a maximum intensity of spontaneous emission are determined. The calculations show that for an accelerator with E ~ 50 Mev the intensification of the emission is possible up to harmonics $\nu < \sqrt{\nu_{max}} \sim 1000$. When $\nu > \sqrt{\nu_{max}}$, to the contrary, the absorption energy begins to exceed the emission energy. This method (in the case of absorption) can also be used to accelerate relativistic electrons in cyclic accelerators. Orig. ar. has: 6 formulas. [02]

SUB CODE: 20/ SUBM DATE: 23May66/ ORIG REF: 003/ OTH REF: 002/ ATD PRESS: 5081

Card 1/1 awm

L 29284-66 EWT(m)/T

ACC NR: AP6019334 SOURCE CODE: UR/0367/66/003/003/0499/0502

AUTHOR: Ternov, I. M.; Korovina, L. I.; Pavlova, O. S.

ORG: Moscow State University (Moskovskiy gosudarstvennyy universitet)

TITLE: Single-photon annihilation of polarized electron-positron pairs in a magnetic field

SOURCE: Yadernaya fizika, v. 3, no. 3, 1966, 499-502

TOPIC TAGS: magnetic field, photon, electron positron pair, electron spin

ABSTRACT: The influence of the electron and positron spin orientation on the probability of their annihilation in a magnetic field is investigated. It is shown the annihilation probability decreases if the electron spin is opposite to the positron spin and to the direction of the magnetic field. Orig. art. has: 18 formulas. [Based on authors' Eng. abst.] [JPRS]

SUB CODE: 20 / SUBM DATE: 29Jun65 / ORIG REF: 005

Card 1/1

L 36509-66 EWT(1) IJP(c) AT

ACC NR: AP6013463 SOURCE CODE: UR/0139/66/000/002/0111/0118

AUTHOR: Ternov, I. M.; Bagrov, V. G.; Rzayev, R. A.

ORG: Moscow State University im. M. V. Lomonosov (Moskovskiy gosudarstvennyy universitet)

TITLE: Scattering of electrons by a short-range force center in a constant and homogeneous magnetic field

SOURCE: IVUZ. Fizika, no. 2, 1966, 111-118

TOPIC TAGS: electron scattering, potential scattering, electron spin, wave function, constant magnetic field, homogeneous magnetic field

ABSTRACT: The purpose of the investigation was to examine the spin flip of an electron moving in a magnetic field and scattered by short-range centers such as a Yukawa potential. The authors write out the wave function of such an electron with account taken of the fact that this wave function must also satisfy the equation of the eigenvalues of one of the electron-spin polarization operators. The resultant equation is used to obtain the change in the electron spin orientation in the Born approximation. An expression is obtained for the total scattering probability, summed and integrated over all the quantities except the eigenvalues of the spin operators. Only the scattering probability of transversely polarized electrons is of practical interest, since the probability of longitudinal electrons does not differ from that of free electrons. Particular attention is therefore paid to the behavior of the spin projection on the direction of the magnetic field. Approximate expressions are ob-

Card 1/2

L 36509-66

ACC NR: AP6013463 O

tained for this probability in several limiting cases. The results show that there is no preferred directivity in the spin flip process. Orig. art. has: 46 formulas.

SUB CODE: 20/ SUBM DATE: 22Jul64/ ORIG REF: 005/

Card 2/2 mlp

L 29003-66 EWT(1)/EWT(m)/T JK

ACC NR: AP6018074 SOURCE CODE: UR/0240/65/000/004/0047/0052

AUTHOR: Ternov, V I.

ORG: Institute of Labor Hygiene and Occupational Diseases, AMN SSSR, Moscow (Institut gigiyeny truda i profzabolevaniy AMN SSSR)

TITLE: Effect of prolonged absorption of small doses of calcium 45 on certain indices of natural immunity

SOURCE: Gigiyena i sanitariya, no. 4, 1965, 47-52

TOPIC TAGS: rat, blood serum, immunity, radioisotope, calcium, radiation biologic effect, bacteria, bacteriology

ABSTRACT: The article describes an experiment made on six groups of white rats. Group I received by mouth daily doses of 0.0009 microcurie per kg of Ca^{45} (in the chloride); Group II received 0.009, and Group III 0.09 microcurie per kg. These doses, which are respectively 10, 100, and 1,000 times the maximum permissible dose, were given for a period of 9-10½ months. Group IV received the same dosage as Group III for this period, but in the form of stable calcium. The other two groups served as controls. Before treatment and every 1½ months during the experiment the animals were tested for immunity ot E. coli and a micrococcus isolated from the mouth of a healthy rat. Tests of the phagocytic activity of blood neutrophils, the digestive ability of plasma, serum activity in the complement fixation re-

Card 1/2 UDC: 612.017.11-06:613.648+613.648-07:612.017.1

L 29003-66

ACC NR: AP6016874

action, and bacterial invasion revealed the most pronounced changes in immunity in Groups III and IV: persistent depression of the digestive ability of phagocytes and blood plasma, decline of blood serum activity in complement fixation, and development of bacterial invasion. Group II showed less pronounced changes, and Group I revealed no changes in immunity. On the basis of these results and hematological and pathologicomorphological examinations, the author concludes that the USSR's maximum permissible concentration of Ca^{45} in open water basins and the water supply complies with present hygienic requirements. Orig. art. has: 2 figures. [JPRS]

SUB CODE: 06, 18 / SUBM DATE: 23Mar64 / ORIG REF: 007

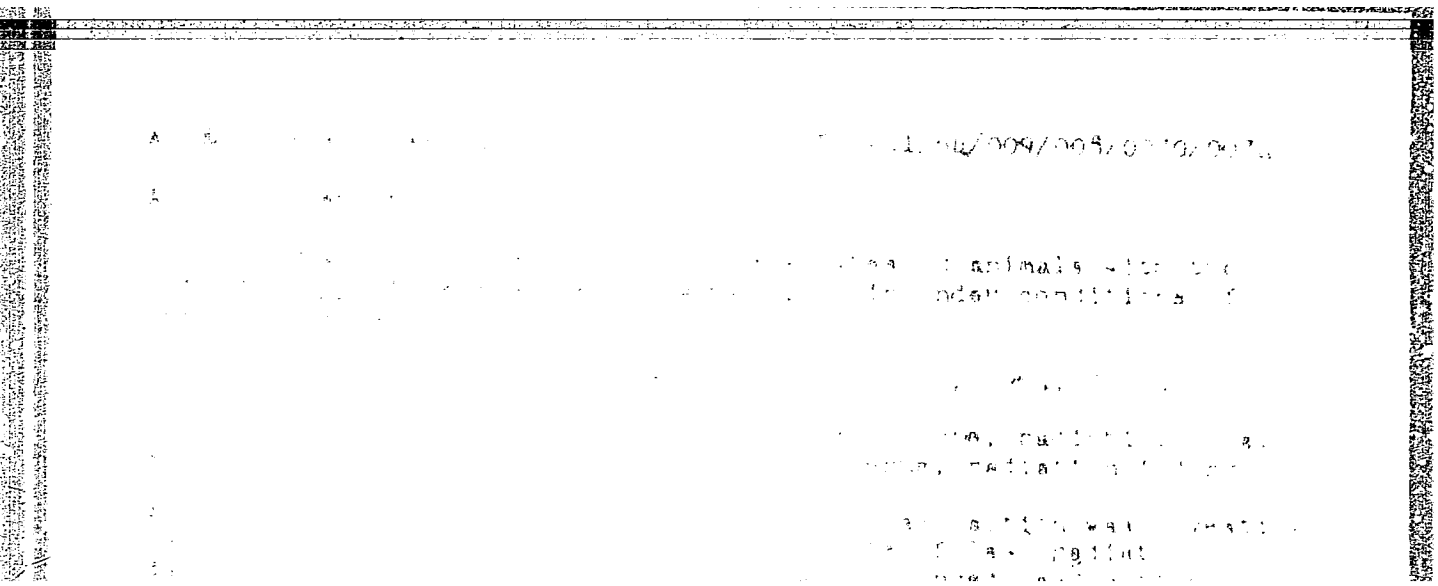
Card 2/2 BLG

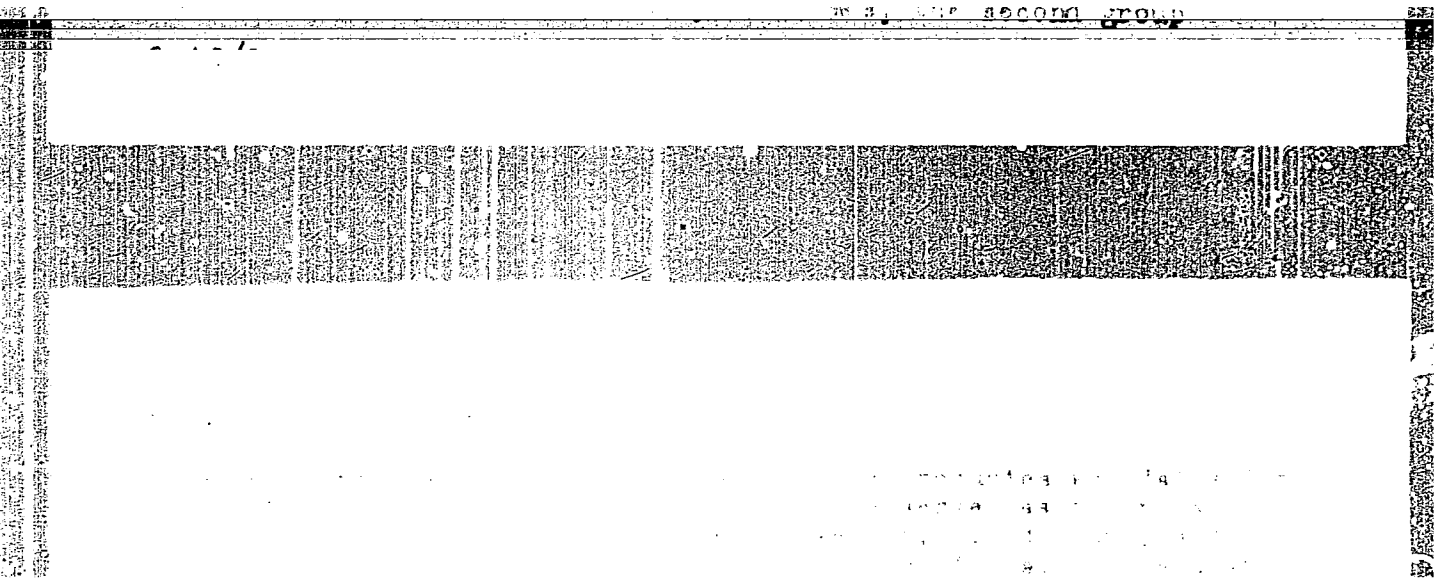
IZBAVITELEV, P.V.; MOGILEVCHIK, Z.K.; PASHKOVSKAYA, G.I.; TERNOV, V.I.; TSELYUKO, I.G.

Street noise in Minsk. Zdrav. Bel. 7 no.8:46-49 Ag '61. (MIRA 15:2)

1. Iz kafedry obshchey gigiyeny Minskogo meditsinskogo instituta (zav.kafedroy - prof. Z.K.Mogilevchik) i Belorusskogo sanitarno-giginicheskogo instituta (direktor - doktor meditsinskikh nauk P.V.Ostapenya).

(MINSK--NOISE CONTROL)





ROIZ, I.A., inzh.; TERNOVSKOY, I.K., inzh.

Operation of low-power asynchronous motors. Energetik. 13 no.4:21-22 Ap '65. (MIRA 18:6)

Ternova, F. V. Lieutenant Colonel of the Medical Service--Pneurnoarthrography in Injuries of the Knee Joint. PALAMARCHUK, A.K. and SOROKA, V.G.

Voyenno-Meditsinskiy Zhurnal, No. 11, 1941, pp. 70-79.

TERNOVA, T. I.

Some cardiac rhythm and conduction disorders in children with rheumatism. Pediatriia no.11:48-54 '61. (MIRA 14:12)

1. Iz Instituta pediatrii AMN SSSR (dir. - prof. O. D. Sokolova-Ponomareva).

(RHEUMATIC HEART DISEASE) (HEART BLOCK)
(ARRHYTHMIA)

OSKOLKOVA, M.K., kand.med.nauk; TERNOVA, T.I.

Characteristics of heart sounds during extrasystoles in children according to phonocardiographic data. Vop. okh. mat. i det. 6 no.8:29-35 Ag '61. (MIRA 15:1)

1. Iz kliniki starshego detskogo vozrasta (zav. - deystvitel'nyy chlen AMN SSSR prof. O.D. Sokolova-Ponomareva) Instituta pediatrii AMN SSSR (dir. - kandidat meditsinskikh nauk M.Ya.Studenikin).
(HEART SOUNDS) (ARRHYTHMIA)

TERNOVA, T.I.; MIRIMOVA, T.D.

Clinical X-ray kymographic study of some disorders of cardiac rhythm in children. Vop. okh. mat. i det. 7 no.5: 78-84 My '62. (MIRA 15:6)

1. Iz otdeleniya starshego detskogo vozrasta (zav. - deystvitel'nyy chlen AMN SSSR prof. O.D. Sokolova-Ponomareva) i rentgenovskogo otdeleniya (zav. - doktor meditsinskikh nauk K.A. Moskacheva) Instituta pediatrii AMN SSSR (dir. - dotsent M.Ya. Studenikin).

(ARRHYTHMIA) (KYMOGRAPH)
(HEART--RADIOGRAPHY)

OSKOLKOVA, M. K.; TERNOVA, T. I.

Clinical phonocardiographic observations in disorders of the heart rhythm and its conductivity. Pediatriia 41 no.3:26-33 '62. (MIRA 15:2)

1. Iz kliniki starshego detskogo vozrasta (zav. - deystvitel'nyy chlen AMN SSSR prof. O. D. Sokolova-Ponomareva) Instituta pediatrii AMN SSSR (dir. - dotsent M. Ya. Studenikin)

(ARRHYTHMIA) (HEART--SOUNDS) (HEART--DISEASES)

OSKOLKOVA, M.K.; TERNOVA, T.I.

Clinical phonocardiographic observations of extrasystoles in children. Trudy Inst. klin. i eksper. kard. AN Gruz. SSR 8: 475-476 '63. (MIRA 17:7)

1. Iz kliniki starshego detskogo vozrasta Instituta pediatrii AMN SSSR, Moskva.

TERNOVA, T.I.

Clinical electrocardiographic observations of children with rheumatic fever and disorders of the cardiac rhythm. Trudy Inst. klin. i eksper. kard. AN Gruz. SSR 3:477-479 '63.
(MIRA 17:7)

1. Iz kliniki starshego detskogo vozrasta Instituta pediatrii AMN SSSR, Moskva.

YATSIMIRSKIY, K.B.; DAVIDENKO, N.K.; KOSTROMINA, N.A.; TERNOVAYA, T.V.

Determination of the chemical structure of lanthanide coordination compounds based on their absorption spectra. Teoret. i eksper. khim. 1 no.1:100-105 Ja-F '65. (MIRA 18:7)

1. Institut obshchey i neorganicheskoy khimii AN UkrSSR, Kiyev.

L 10458-66 EWT(m)/EWP(1)/T/EWP(t)/EWP(b) IJP(c) JD/JG/RM

ACC NR: AP6000284 SOURCE CODE: UR/0078/65/010/009/2023/2029

AUTHOR: Ternovaya, T.V.; Kostromina, N.A.

ORG: none

TITLE: Band splitting in absorption spectra of neodymium and europium in the field of ligands during complex formation

SOURCE: Zhurnal neorganicheskoy khimii, v. 10, no. 9, 1965, 2023-2029

TOPIC TAGS: neodymium, europium, band spectrum, absorption spectrum, complex molecule, line splitting, RARE EARTH METAL

ABSTRACT: The splitting of the ground level of neodymium $^4I_{9/2}$ and of the excited level of europium $^5D_2$ was studied in chlorides and in solutions of nitrilotriacetate (NTA), ethylenediaminetetraacetate (EDTA), and diethylenetriaminepentaacetate (DTPA) complexes. A KSA-1 spectrograph with glass optics was used. Identification of the splitting pattern of the ground level of Nd^{3+} (obtained at 430 nm), analysis of the spectrum, and consideration of the intensities of the components of the splitting made it possible to determine the absorption spectra of neodymium for all the complexes studied. From the number of splitting sublevels it was found that aquo ions and complexes with EDTA have a tetragonal symmetry, and complexes with NTA and DTPA have a trigonal symmetry. Probable structural formulas of the complexes are proposed. Orig. art. has: 9 figures and 3 tables.

SUB CODE: 07,21 SUBM DATE: 13Apr64 / ORIG REF: 003 / OTH REF: 011

Card 1/1 UDC: 546.657.3:535.343+546.661.3:535.343

TERNOVOY, M.P., inzh.; BONESKO, V.A.

Repair of damaged shafts of radial-flow turbines. Energetik 12 no.5:36-37 My '64. (MIRA 17:6)

S/054/62/000/004/014/017
B101/B186

AUTHORS: Myuller, R. L., Orlova, G. M., Timofeyeva, V. N., Ternovaya, G. I.

TITLE: The range of vitrification in the system arsenic - sulfur - germanium

PERIODICAL: Leningrad. Universitet. Vestnik. Seriya fiziki i khimii, no. 4, 1962, 146-150 — VOL 17 - No 22

TEXT: The physicochemical properties of glasses in the system As - S - Ge were studied. Attempts to obtain binary GeS_x melts (x = 1.0-4.0) in the glassy state failed. Optimum conditions for producing glassy melts: heating of the charge in ampoules for 1.5-2 hrs at 250°C, for 6-7 hrs at 450°C, for 2 hrs at 850°C (at somewhat lower temperature with high S content), cooling to room temperature of the ampoule remaining in the furnace. 60 samples were melted (Fig.). The glasses of the system AsS_xGe_y can be classified in four groups: (I) $x - 2y \geq 1.5$; (II) $1.0 \leq x - 2y < 1.5$; (III) $0 \leq x - 2y < 1.0$; (IV) $x - 2y < 0$. Composition, density, glass group, molecular weight, content of structural units $[GeS_{4/2}]$, $[AsS_{3/2}]$, $[AsS_{2/2}]$,

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The range of vitrification in... $[SS_{2/2}]$, $[AsAs_{3/3}]$, and $[GeGe_{4/4}]$, and the microhardness of the glassy melts are tabulated. The microhardness values calculated from the structural formula agree well with the experimental data (mean deviation 8%). There are 1 figure and 2 tables.

SUBMITTED: April 1962

Fig. Boundary of vitrification in the system As - S - Ge. --- boundary of vitrification; —— boundary of crystallization; .... boundary of vitrification according to B. T. Kolomiyets, N. A. Goryunova, V. P. Shilo (Collection "Stekloobraznoye sostoyaniye" [Glassy State], M.-L., Izd. AN SSSR, 456, 1960)

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The range of vitrification in...

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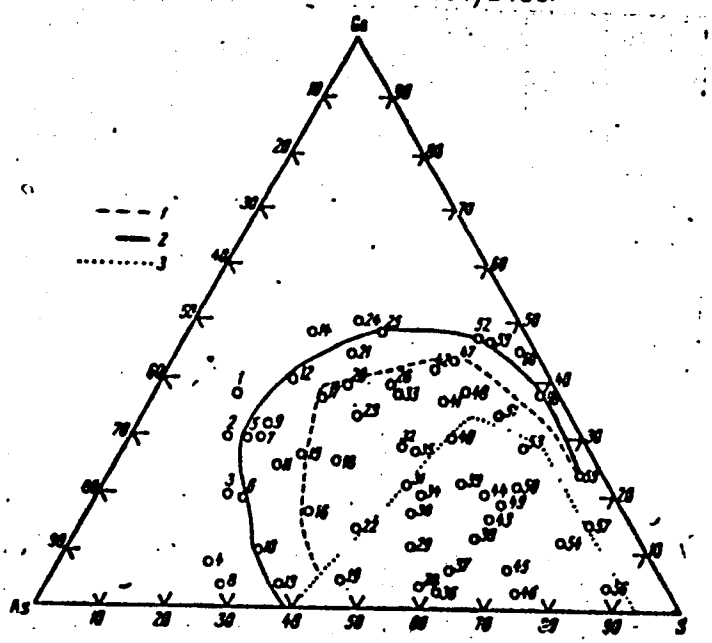

Card 3/3

TIMOFEYEVA, V.N.; ORLOVA, G.M.; TERNOVAYA, G.I.; TSAYUN, G.P.

Kinetics of dissolution of vitreous $AsSe_{1.5}Ge_x$, $AsS_{1.5}Ge_x$, $AsS_{2.5}Ge_x$ in sodium hydroxide solutions. Vest. LGU 18 no.10: 108-115 '63. (MIRA 16:8)

(Glass manufacture--Chemistry)
(Solution (Chemistry))

TERNOVAYA, K.G.

Sulfur baths and intracutaneous vaccination for treating brucellosis at the "Goriachii kliuch" health resort. Sov.med. 21 Supplement:27 '57. (MIRA 11:2)

1. Iz brutsellesnogo otdeleniya sanatoriya kurorta "Goryachiy klyuch".
(MINERAL WATERS, SULFUROUS)
(VACCINES) (BRUCELLOSIS)

KHILINSKIY, F.A.; LOTYSHEV, I.P.; LEBEDENKO, G.B.; SHAVKUNOVA, N.D.; DORIZO, A.P.; TERNOVAYA, K.G.; ANTIPOV, A.S., obshchestv. red.; BABAK, Yu.M., tekhn. red.

[Goryachiy Klyuch] Goriachii kliuch. Izd.2., ispr. i dop. [By] F.A.Khilinskii i dr. Krasnodarsk, Krasnodarskoe knizhnoe izd-vo, 1963. 84 p. (MIRA 17:2)

1. Glavnyy vrach sanatoriya No.2 Kurorta Goryachiy Klyuch, Kavkaz (for Lebedenko). 2. Sanatoriy No.1 Kurorta Goryachiy Klyuch, Kavkaz (for Shavkunova,Ternovaya).3,Zamestitel' glavnogo vracha po meditsinskoy chasti sanatoriya No.2 kurorta Goryachiy Klyuch, Kavkaz (for Dorizo).

KUDRA, O.K.; TERNOVAYA, N.I.

Investigating physicochemical propertier of aluminum chloride solutions in ethyl n-butyl ether. Ukr.khim.zhur. 27 no.5:612-615 '61. (MIRA 14:9)

1. Kiyevskiy politekhnicheskiy institut.
(Aluminum chloride) (Ether)

TERNOVAYA, N.I.; KUDRA, O.K.

Physicochemical properties of aluminum chloride solutions in dibutyl ether. Ukr.khim.zhur. 27 no.5:615-618 '61. (MIRA 14:9)

1. Kiyevskiy politekhnicheskiy institut.
(Aluminum chloride) (Ether)

KOTOMKIN, A; BIRGER, I., TERNOVAYA, R.P., redaktor; KRASHENINNIKOVA, V.F., tekhnicheskiy redaktor.

[Builders of hydroelectric power plants] Gidrostroevtsy; rasskazy peredovykh liudei Stalingradgidrostroia. Stalingrad, obl. kn-vo, 1952. 73 p. (MLRA 8:8)
(Hydroelectric power stations)

TERNOVAYA, R.P., redaktor; KRASHENINNIKOVA, V.F., tekhnicheskiy redaktor.

[Historic sites in the defense of TSaritsyn-Stalingrad; guidebook] Istoricheskie mesta oborony TSaritsyna - Stalingrada; putevoditel'. [Stalingrad] Stalingradskoe knizhnoe izd-vo, 1953. 111 p
(Stalingrad--Description) (MLRA 7:10)

S/073/63/029/002/004/006
A057/A126

AUTHOR: Ternovaya, T. V.

TITLE: On the X-ray spectrum analysis of rare earth elements

PERIODICAL: Ukrainskiy khimicheskiy zhurnal, v. 29, no. 2, 1963, 205 - 208

TEXT: A method for the preparation of samples and an efficient procedure of analysis is described. An accuracy of 3 - 10% relative to a 2 - 4 hr duration of the analysis can be attained with only four standards. The experiments were carried out with a universal long-wave M. A. Blokhin X-ray spectrometer and a Geiger counter (type МСТР -3 (MSTR-3)) used as detector in combination with a Б -2 (B-2) apparatus. The anodic current was stabilized by a stabilizer developed by A. I. Froyman. The method of external standards was used and the analysis carried out by the secondary X-ray spectra with the most intensive lines L_{α_1} and L_{β_1} of the L-series of rare earths. If elements were present in which L_{α_1} was superposed by other rare earths the method of subtraction was used. The samples were prepared in the following manner: 20 - 25 mg of the powdered sample are placed on an aluminum disk (20 mm diam., 4 mm thick), 6 drops of glue (type БФ-2 (BF-2))

with some alcohol added, mixed with a spatula and dried in a desiccator for 15 - - 20 min, or at room temperature for 10 - 15 hrs. It is important to obtain a uniform coating with plane surface. The samples and standards were prepared in exactly the same way. Four compositions of standards are sufficient, i.e., for samples containing 0 - 3% of rare earths there were used the standard with 91.7% Pr_2O_3 and 1.1 - 1.3% of the oxides of Ce, Ho, Sm, Tb, Dy, Er, and La or the standard with 92.9% La_2O_3 and 1.14 - 1.2% of the oxides of Nd, Yb, Pr, Lu, Gd, and Tu, while for samples containing 3 - 20% rare earths there were used the standards containing about 10 - 17% of the oxides of Ce, Ho, Sm, Tb, Dy, Er, La, and Pr containing about 11 - 30% oxides of Nd, Yb, Pr, Lu, Gd, Tu, and La. For samples containing more than 20% rare earths the standards were prepared from oxides of rare earths. Analyses carried out by the present method with various mixtures of rare earths, minerals and concentrates gave results which were in good agreement with results obtained by other methods. There are 2 tables.

ASSOCIATION: Institut obshchey i neorganicheskoy khimii AN USSR (Institute of General and Inorganic Chemistry of the AS UkrSSSR)

SUBMITTED: November 11, 1961

YATSIMIRSKIY, K. B.; DAVIDENKO, N. K.; KOSTROMINA, N. A.; TERNOVAYA, T. V.

"Chemical structure determination of lantanides' coordination compounds on the basis of their absorption spectra."

report presented at the 8th Intl Conf on Coordination Chemistry, Vienna, 7-11 Sep 64.

GUTYUK, V.G.; TERNOVENKO, A.G.

Three observations on traumatic diaphragmatic hernia. Zdrav. Kazakh. 21 no. 3:20-23 '61. (MIRA 14:4)
(HERNIA)

GUTYUK, V.G. (Karagandinskaya oblast', pochtovoye otdeleniye Dolinka, Sangorodok, d.12, kv.6); SICHINAVA, V.V.; TERNOVENKO, A.G.

Foreign body in the pleural cavity for 15 years. The formation of an external bronchpleural fistula. Klin.khir. no.11:79-80 N '62. (MIRA 16:2)
(PLEURA--FOREIGN BODIES) (FISTULA, BRONCHIAL)

TERNOVENKO, K. M.

37691 porazheniye kozhi pri brutselleze. vestnik venerologii i dermatologii, 1949, No. 6, s. 25-28- bibliogr: s. 27-28

So. Letopis' Zhurnal'nykh Statey, Vol. 47, 1949

USSR / Human and Animal Morphology, Normal and Pathological. S-6
Cutaneous Integument.

Abs Jour : Ref Zhur - Biol., No 18, 1958, No 83777

Author : Ternovenko, K. M.
Institution: Uzbekistan Scientific Research Dermato-venereological Institute.
Title : Materials for the Study of the Histopathology of the Skin in Brucellosis.

Orig Pub : Sb. tr. Uzbekist. n.-i kozhno-venerol. in-ta, 1957, 6, 189-196.

Abstract : Degenerative-inflammatory changes of both the epidermis and the dermis were ascertained on the basis of material consisting of 14 biopsies of pathologically altered skin, 7 biopsies of clinically healthy skin of patients suffering from various forms of brucellosis, and two autopsies. The epidermis was thinned out to the point of atrophy. What took

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USSR / Human and Animal Morphology, Normal and Pathological. S-6
Cutaneous Integument.

Abs Jour : Ref Zhur - Biol., No 18, 1958, No 83777

: place was its parenchymatous degeneration, less often spongioid inflammation, and sometimes - parakeratosis. In the dermis there occurred vascular changes such as hemorrhages in the deep layers, while in the larger blood vessels there occurred endo- and mesoperi-arterites and hyalinosis of the muri. In the collagenous fibers - an increase occurred in the number of fibroblasts and histiocytes. Pathological changes were likewise revealed in clinically healthy skin.

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KAMZOLOVA, K.P.; TERNOVENKO, K.M.

Armais Aristogesovich Akovbian. Med. zhur. Uzb. no.6:76-77 Je '60.
(MIRA 15:2)

(AKOVBIAN, ARMAIS ARISTOGESOVICH, 1900-)

TERNOVENKO, N.M. Cand Agr Sci (diss) "The Caucasian breed of sheep in the 'Bolshevik' sheep-breeding sovkhoz and means to improve it." Mos , 1957 20pp 21 cm. (All-Union Sci Res Inst of Anim Husbandry)

110 copies

(KL, 11-57, 99)