L 24218-65

ACCESSION NR: AP5001268

tion for several years, and is still working without failure. Orig. art. has: 6 figures

ASSOCIATION: None

SUBMITTED: 00 ENCL: 00 SUB CODE: NP

NR REF SOV: 002 OTHER: 001

Card 2/2

L 29668-66 EWT(m)/ETC(f)
ACC NR: AT6012690 SOURCE CODE: UR/3136/65/000/986/0001/0046

AUTHOR: Feynberg, S. M.

ORG: State Committee on the Use of Atomic Energy SSSR, Institute of Atomic Energy im. I. V. Kurchatov, Moscow (Gosudarstvennyy komitet po ispol'zovaniyu atomnoy energii SSSR, Institut atomnoy energii)

TITLE: Prospects of developemnt of research reactors

SOURCE: Moscow. Institut atomnoy energii. Doklady, no. 986, 1965. Perspektivy rzvitiya issledovatel'skikh reaktorov, 1-46

TOPIC TAGS: nuclear reactor, research reactor

ABSTRACT: This is a review article showing the most recent trend in the development of research reactors in the USSR, with special attention to comparison with the counterpart reactors in the US. The loop-type Soviet 50 MW SM reactor, reported by the author earlier (Atomnaya energiya, v. 8, no. 6, p. 493, 1960 and elsewhere) is described in some detail and it is pointed out that claims made by American researchers (T. Auerbach et al., Paper 424, Second Geneva Conference, 1958) that reactors of this type offer no advantages over thermal-neutron reactors have not been borne out, and some American reactors (HFBR, HFIR, and AARR) were later developed as a result of the success of the SM-2 reactor. The beam-type

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L 29668-66
ACC NR: AT6012690

4

reactor discussed is the MIF-type, developed at the Kurchatov Atomic Energy Institute. This reactor, with maximum thermal-neutron flux 5.5 x 10^{14} neut/cm^2sec is compared with the HFBR reactor with respect to a large number of parameters. Although the HFBR is rated 40 MW and the MIF only 20 MW, the maximum thermal-neutron fluxes in the reflector are practically the same. The thermal fluxes of the neutrons at the beam output are five times larger in the MIF than in the HFBR, because of the shorter length and the larger beam diameter. The author also describes the design of a projected neutrino source based on a special reactor and discussed in another paper by the author (Third Geneva Conference, Paper 322, 1964). The projected output is 1.5 x 10^{15} neutrino/cm^2 in a pulse of 1 sec duration with a repetition rate of ~10 pulses daily. A 10-fold increase in the output is planned for the future. The author thanks Ya. V. Shevelev, A. S. Kochenov, V. A. Chebotarev, and N. I. Laletin, who contributed much to the progress of the discussed projects. Orig. art. has: 17 figures, 2 tables, and 6 formulas.

SUB CODE: 18/ SUBM DATE: 00/ ORIG REF: 003/ OTH REF: 008

Card 2/2 CC

L 22559-66 EWT(1) LIP(c)
ACC NR: AT6001616 SOURCE CODE: UR/3136/65/000/933/0001/0080

AUTHOR: Feynberg, S. M.

ORG: none

39
B+1

TITLE: Mathematical foundations of mechanics with discontinuous momentum

SOURCE: Moscow. Institut atomnoy energii. Doklady, IAE-933, 1965. Matematicheskiye osnovaniya mekhaniki razryvnogo impul'sa, 1-80

TOPIC TAGS: quantum mechanics, statistic mechanics, particle physics, theoretic physics

ABSTRACT: This monograph considers the mathematical foundations of the hypothetical nonclassical mechanics of a point. The underlying assumption of the mechanics is the following property of the momentum of the particle: the momentum is a continuous function of time and has a first derivative but the second derivative does not exist. The first derivative is everywhere discontinuous and therefore Newtonian forces do not exist. The consequences are discussed by considering infinitesimal time intervals and in terms of a coordinate variable formed by Lebesque integration of the momentum. The momentum function is constructed by considering N measurable sets of momenta,

Card 1/2

ACC NR: AT6001616

which are everywhere dense and everywhere discontinuous. Characteristics of these sets are discussed with emphasis placed on Cantor sets. The study of these sets leads to discontinuous functions, properties of which are studied in some detail also. It is shown that derivatives of momentum (proportional to force in other mechanics) are single-valued from the mathematical point of view, but when used to describe physical phenomena, the momenta are indeterminate for any finite-time measurement. Many other aspects, such as similarity with statistical interpretation and their connection with Wigner's and Plank's approach to quantum mechanics are analyzed. Orig. art. has: 350 formulas, 1 figure.

SUB CODE: 20/ SUBM DATE: 00/ ORIG REF: 001/ OTH REF: 000

Card 2/2

FEYNBERG, S. M.

Hypothesis on the trajectory of a quantum particle. Dokl. AN SSSR 153 no. 5:1058-1061 D '63. (MIRA 17:1)

1. Predstavleno akademikom M. A. Leontovichem.

FEYNBERG, M.V.

Photo-allergy; a case of local facial photo-allergy, following photodermatitis. Vest. vener. No.3:36-37 May-June 50. (CLML 19:4)

1. Of the Department of Skin and Venereal Diseases, Leningrad State Syphilological Insitute.

FEYNBERG, TS. M., DOCENT

USSR/Medicine - Encephalitis
Brain Diseases

Jan/Feb 49

"The Question of Forensic Psychiatric Evaluation in Cases of Tick-Borne Encephalitis," O. Ye. Freyerov, Sr Sci Collaborator, Cen Sci Res Inst of Forensic Psychiatry imeni Prof Serbskiy, 3 ½ pp

"Nevropatol i Psikhiat" Vol XVIII, No 1

Cites two examples of solutions of the problem of personal responsibility in cases of tick-borne encephalitis by Inst of Forensic Psychiatry. They are in conformity with Art II of Penal Code RSFSR establishing criteria based on diagnosis of destructive tendencies of the disease, degree of mental disturbance, presence of psychotic symptoms, loss of will power, etc. Dir, Cen Sci Res Inst of Forensic Psychiatry: Docent Ts. M. Feynberg; Sci Dir: Prof M. O. Gurevitz, Active Mem, Acad Med Sci.

PA149T57

LISKOVETS, V.A.; FEYNBERG, V.Z.

Permutability of mappings. Dokl. AN BSSR 7 no.6:366-369 Je '63.
(MIRA 16:10)

1. Belorusskiy gosudarstvennyy universitet imeni Lenina.
Predstavleno akademikom AN BSSR V.I. Krylovym.

[redacted] Vol.

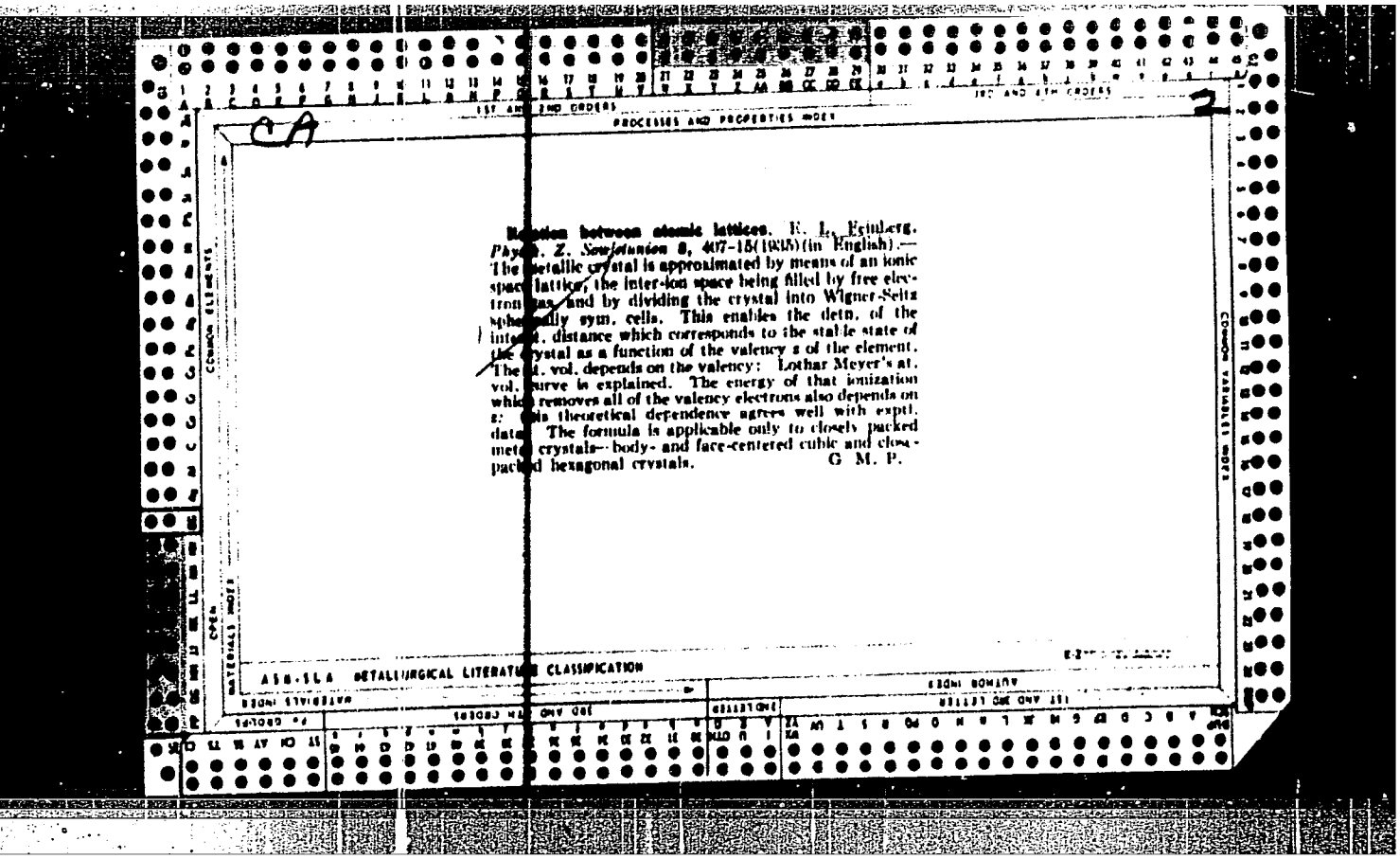
Zhur. Eksp. i Teore. Fiz. Vol. 5, No. 10 pp 919-925, 1935, "On the Possibility of Applying the Thomas-Fermi Method to the Problem of Metallic Cohesion" (Moscow State University, Department of Physics).

"The present work shows in a purely analytical way the energy of the crystal calculated on the basis of the Thomas-Fermi method, when expressed as a function of the interatomic distance, has no minima. This confirms the results of the numerical calculation of the energy curve, carried out independently of this work by Slater and Krutter, who, in spite of careful plotting of the curve, failed to reveal any minima. It means that the Thomas-Fermi method cannot explain the stability of the crystal lattices."

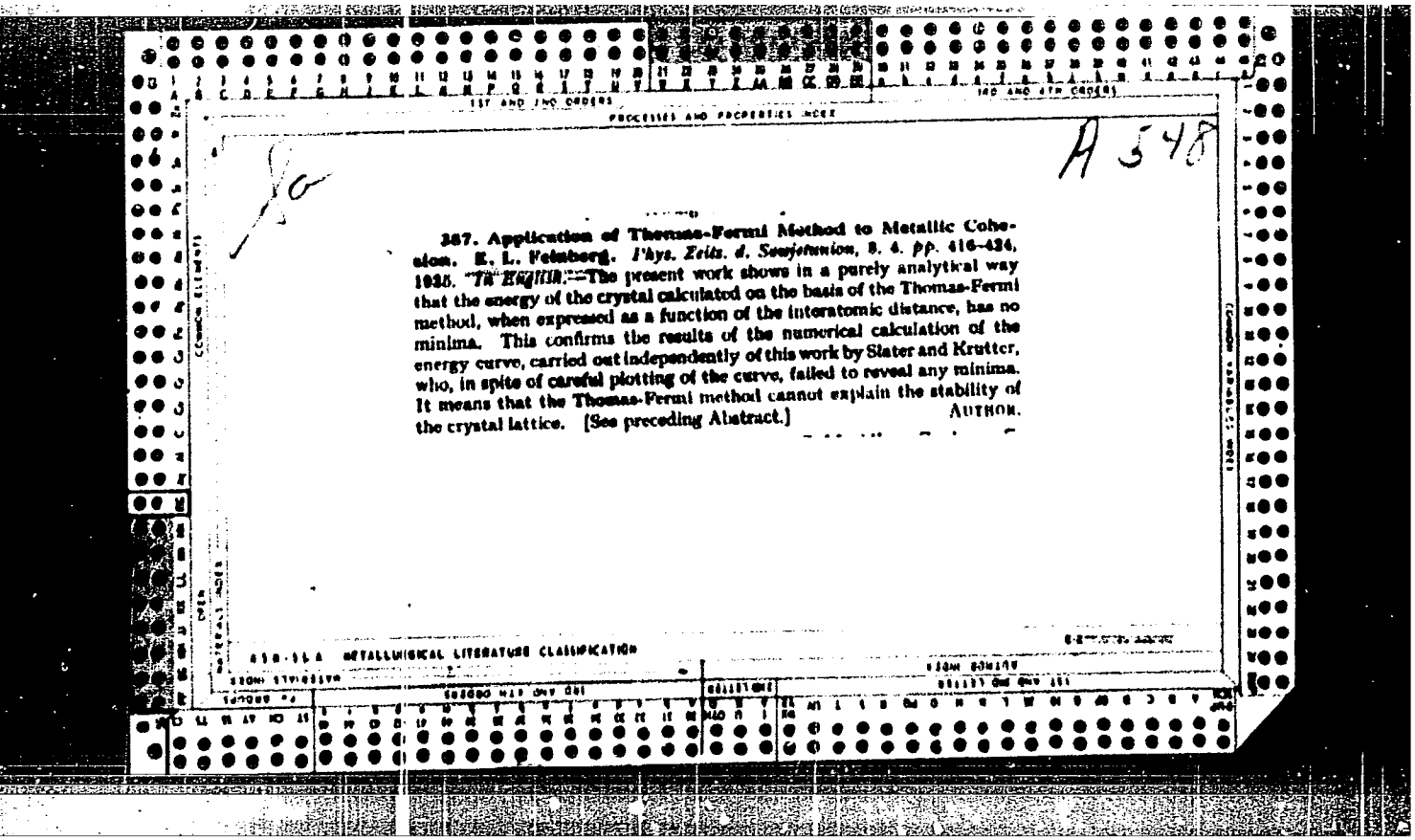
FEYNBERG, YE. L.

Zhur. Eksp. i Teoret. Fiz. Vol. 5, No. 10 pp 926-931, 1935, "Some Relations Concerning Atomic Crystal Lattices" (Moscow State University, Department of Physics)

"A conception of the metallic crystal as a space lattice formed by the ions with the interionic space filled with free electron gas, and division of the crystal into the Wigner and Seitz spherical symmetrical cells, permits a determination of the value of the interatomic space corresponding to the stabel state of the crystal, and affords a means of expressing it as a function of the valency of the element. In this way determinations are made of the dependence on the valency of (a) atomic volume and Lother Meyer's atomic volume curve, and (b) the energy of ionization required to deprive the atom of all its valeny electrons. The results are in good agreement with experimental data."

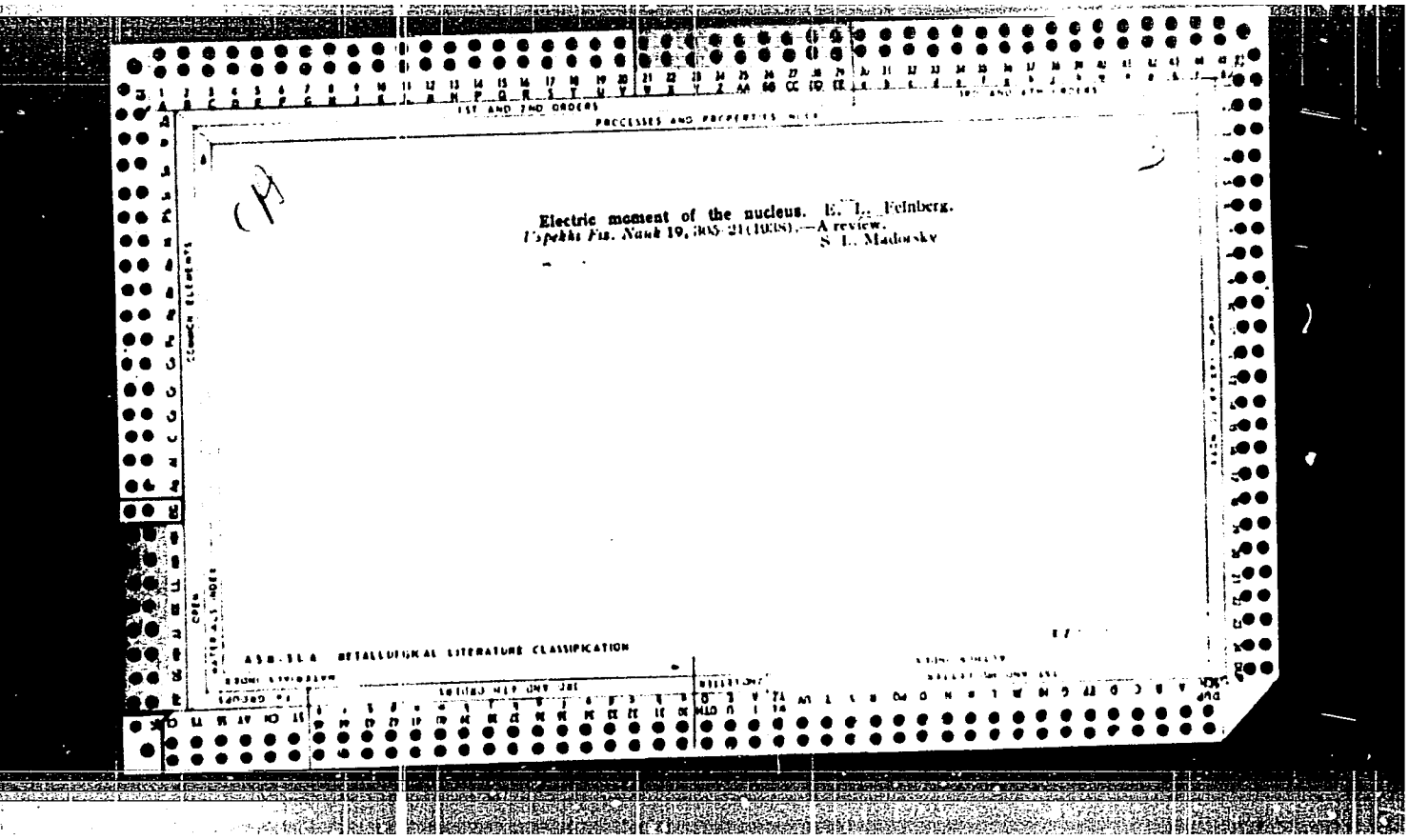


Relation between atomic lattices. E. L. Egiuleraş. *Phys. Z. Sowjetunion* **8**, 407–15(1935)(in English).—The metallic crystal is approximated by means of an ionic space lattice, the inter-ion space being filled by free electron gas, and by dividing the crystal into Wigner-Seitz spherically sym. cells. This enables the detn. of the interat. distance which corresponds to the stable state of the crystal as a function of the valency z of the element. The at. vol. depends on the valency: Lothar Meyer's at. vol. curve is explained. The energy of that ionization which removes all of the valency electrons also depends on z: this theoretical dependence agrees well with exptl. data. The formula is applicable only to closely packed metal crystals—body- and face-centered cubic and close-packed hexagonal crystals. G. M. P.



A 548

387. Application of Thomas-Fermi Method to Metallic Cohesion. E. L. Feinberg. *Phys. Zeits. d. Sowjetunion*, 8. 4. pp. 416–434, 1935. *In English.*—The present work shows in a purely analytical way that the energy of the crystal calculated on the basis of the Thomas-Fermi method, when expressed as a function of the interatomic distance, has no minima. This confirms the results of the numerical calculation of the energy curve, carried out independently of this work by Slater and Krutter, who, in spite of careful plotting of the curve, failed to reveal any minima. It means that the Thomas-Fermi method cannot explain the stability of the crystal lattice. [See preceding Abstract.] AUTHOR.



Electric moment of the nucleus. E. L. Feinberg.
Uspekhi Fiz. Nauk 19, 305-21(1938).—A review.
S. L. Madorsky

FAYNBERG, Ya. L.

Dokl. AN USSR Vol. 23, No8, pp 778-782, 1939, "Ionization of the Atom Due to -Decay" (P. N. Lebedev Physical Institute, Academy of Sciences of the USSR Moscow).

"An interpretation is made of β-decay in the case where the energy is given to the core electron. The effect is an ejection of slow electrons and emmission of the radiation after the transition of the core to the normal state. The probability is $W \sim Z^2$. The Hamiltonian operator for a neg. electron β-decay, using the Fermi method, may be split for evaluation of the perturbation in 3 ways. The first and second approximations of the matrix elements contain terms attributable to "direct collision'and to a change in state of the core revealed as 'adabatic'shrikage and 'shaking' of the core. Excitations leading to ionization of the k-shell calcd. by the method of spherical waves, and then more precisely, show that the excitation due to direct collision may be neglected by comparison with 'shaking' of the core for both slow and fast β-particles, and that the nonrelativistic approximation may be utilized."

FEINBERG, YE. L.

Journal of Physics USSR, Vol. 4, pp 423-438, 1941, "Ionization of the Atom Due to β-decay."

"Perturbation of the state of the atomic core due to β-decay is investigated; special attention is paid to the ionization of the K level. Non-relativistic treatment of the problem for comparatively fast β-praticles yields a formula which is confirmed by a more general relativistic treatment. The at. core suffers the direct action of the emitted β-particles, being of the nature of a simple collision and after the change of the nuclear charge, the at. electrons are in a nonstationary state. They go over into a stationary state either by 'adiabatic' shrinkage (or expansion for 'nonadiabatic' jump into the free state. The distrubance of the Core appears to be the main cause of ionization."

FEYNBERG, Ye. L.

Journal of Physics USSR Vol. 5, Nos. 2-3 pp 177-183, 1941, "Angular Distribution for the Interaction of Mesons with Nuclei.

"Influence of nuclear dimensions on the angular distribution is considered for the processes which include the interaction of mesons with nuclear particles, this interaction being either of the Coulomb or of the nuclear type."

FEYNBERG, Ye. L.

"Perturbation of Radio-Wave Fronts Due to Coastal Effect and Propogation Over Inhomogeneous Ground," pp 167-176, Iz Ak Nauk SSSR, 1942

ATIC 126038
F-TS-6141-V

FEINBERG, Ye. L.

Ia. Ak. Nauk SSSR, SEr. Fiz. Vol. 7- No. 5, pp 167-176, 1943, "Perturbance (Disturbance) of the Radio-Wave Front in Propagation Along a Heterogeneous Surface and Shore Refraction" (Fizicheskii Institut imeni P. N. Lebedeva, Akademii Nauk SSSR)

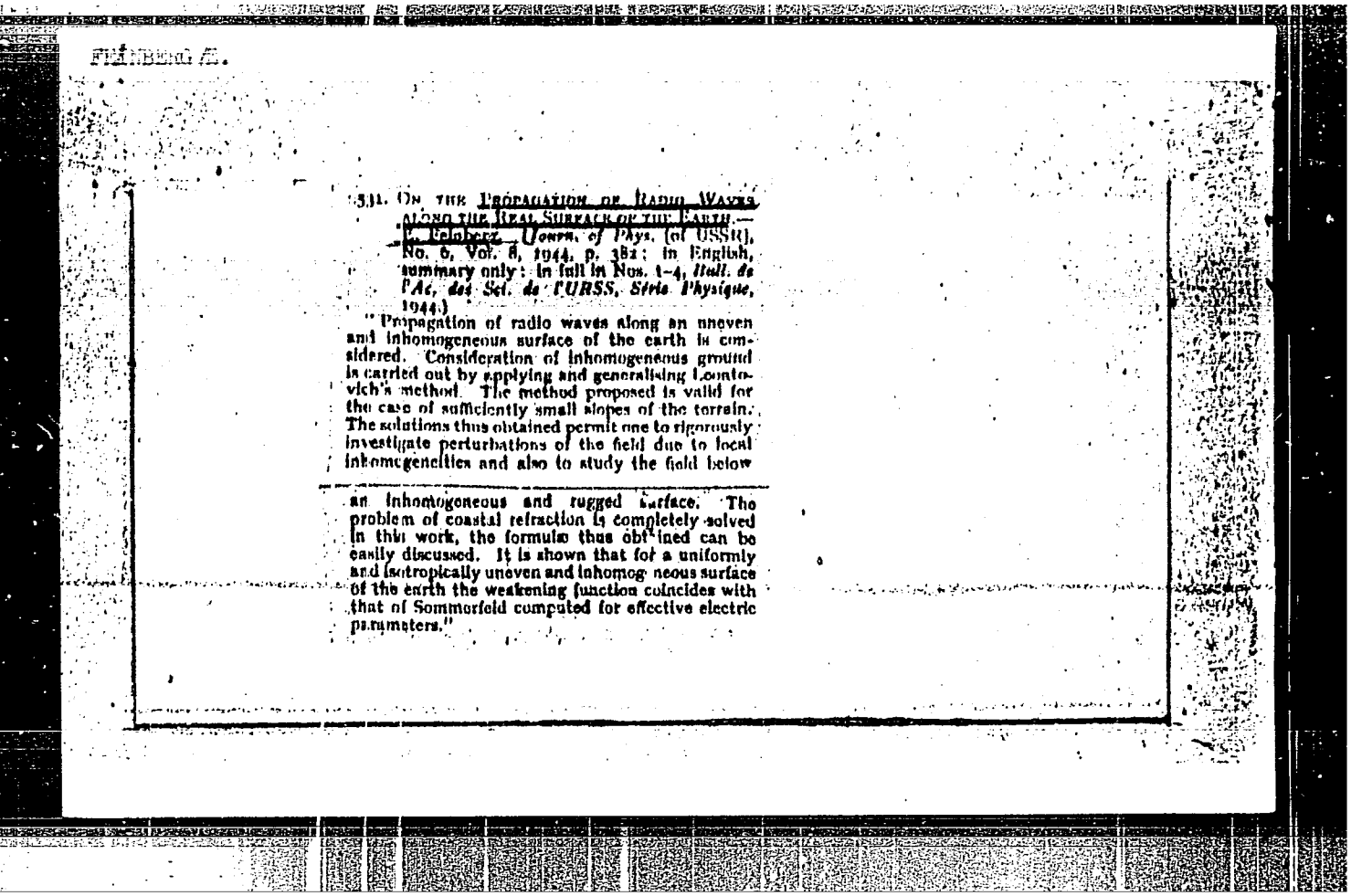
FEYNBERG, V. L.

Journal of Physics (U. S. S. R.), Vol. 8, No. 6, pp 317-330, 1944, "On the Propagation of Radio Waves Along an Imperfect Surface" (Lebedev Physical Institute, AS USSR

"A method for investigating ground wave propagation along an uneven homogeneous surface is developed for the case of small gradients and deflections of the surface from an averaging plane, assuming the complex dielectric constant to be large. Inhomogeneity of the latter quantity must be small within an interval of the order of the depth of penetration of the field into the ground. Thus the theory generalizes that of Sommerfeld for a plane homogeneous conducting earth, and deals primarily with the case of a vertical dipole placed on the surface of the earth."

"The method may be used for investigating local perturbations, as well as for evaluating the function describing the average attenuation of the field. The conclusion is reached that in certain cases the surface may be characterized by an effective conductivity, which is complex and dependent on wavelength. Formulae for various limiting cases are given."

"It is shown that for a 'uniformly and isotropically corrugated inhomogeneous surface' the attenuation function is the same as that of Sommerfeld, substituting effective electrical parameters. Propagation along a surface withvariable electrical parameters, (true for a plane surface, effective for a corrugated surface) is reduced to an integral equation in one dimension."



311. On the Propagation of Radio Waves along the Real Surface of the Earth.—M. Feinberg. (*Journ. of Phys.* [of USSR], No. 6, Vol. 8, 1944, p. 382; in English, summary only: in full in Nos. 1–4, *Bull. de l'Ac. des Sci. de l'URSS, Série Physique*, 1944.)

"Propagation of radio waves along an uneven and inhomogeneous surface of the earth is considered. Consideration of inhomogeneous ground is carried out by applying and generalising Leontovich's method. The method proposed is valid for the case of sufficiently small slopes of the terrain. The solutions thus obtained permit one to rigorously investigate perturbations of the field due to local inhomogeneities and also to study the field below an inhomogeneous and rugged surface. The problem of coastal refraction is completely solved in this work, the formulæ thus obtained can be easily discussed. It is shown that for a uniformly and isotropically uneven and inhomogeneous surface of the earth the weakening function coincides with that of Sommerfeld computed for effective electric parameters."

FEYNBERG, Ye. L.

Iz. Ak. Nauk. SSSR, Ser. Fiz. Vol. 8, No. 3, pp 132-318, 1944, " On the Effective Path of Radio Waves Along the Ground" (Fizicheskii Institut imeni P. N. Lebedeva, Akademii Nauk SSSR).

621.396.11 2012

On the Theory of the Propagation of Radio Waves along a Real Surface.—E. L. Feinberg.—(*Bull. Acad. Sci. U.R.S.S., sér. phys.*, 1944, Vol. 8, No. 1, pp. 200–209. In Russian.) Complete paper, of which an English summary was abstracted in 253 of 1945.

FEYNBERG, E. L.

Journal of Physics USSR, Vol. 9, No. 1, pp 1-6, 1945, "On the Propagation of Radio Waves Along an Imperfect Surface. Part III. On the "Effective Path" of Ground Ray of Radio Waves (Lebedev Physical Institute, AS USSR).

FEYNBERG, Ya. L.

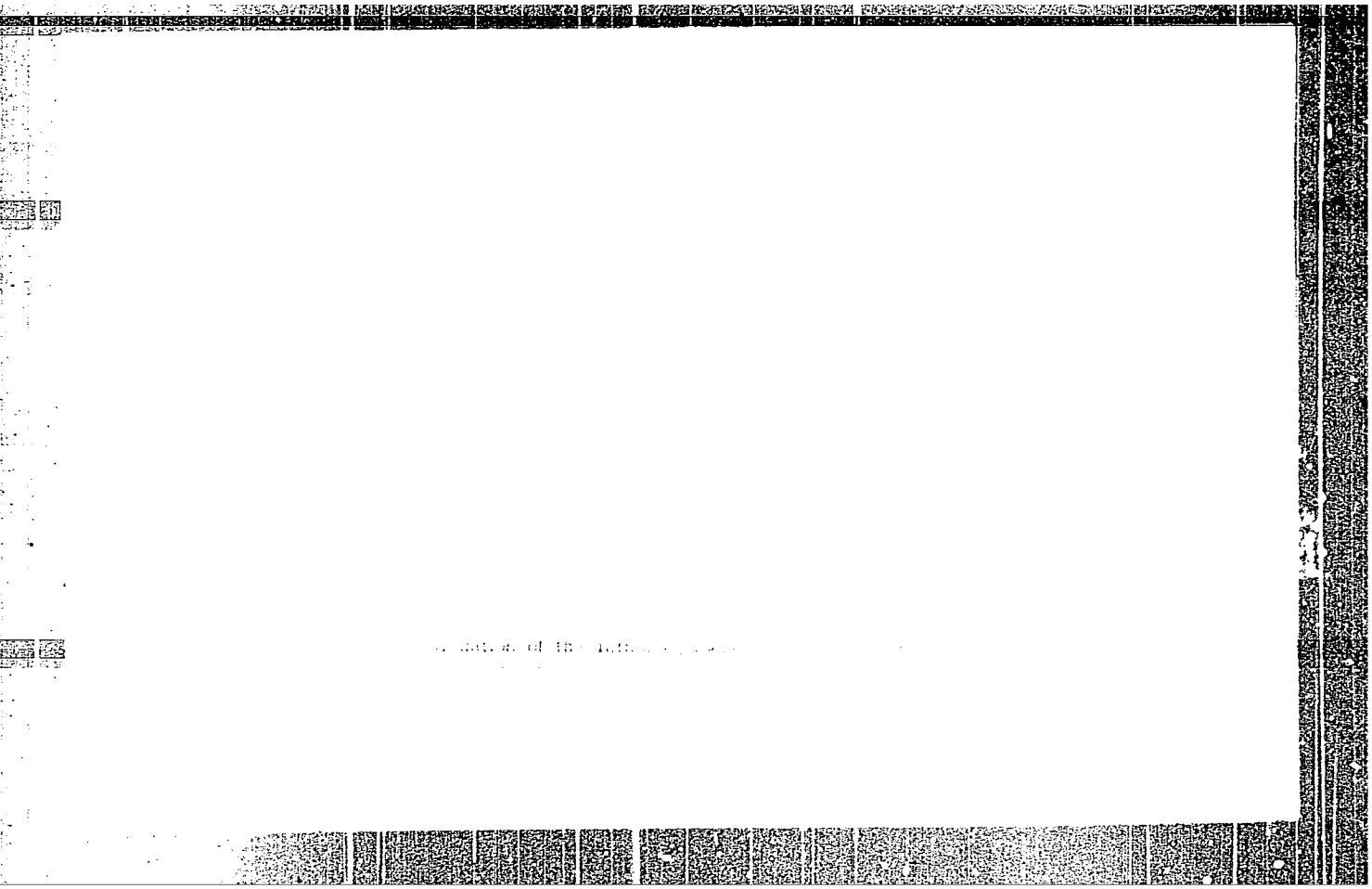
Iz. Ak. Nauk SSSR, Ser. Fiz. Vol. 10, No. 2, pp 196-216, 1946, "On the Coastal Effect in Radio Direction Finding (Akademii Nauk SSSR, Fizicheskii Institut Imeni P. N. Lebedeva)

"Previous investigations of the phenomenon are briefly reviewed; it is usual to ascribe the effect to the difference in the electrical properties of land and sea and to call it 'coastal refraction'. The author suggests that the actual vertical configuration of the coast also affects the propagation of electromagnetic waves, since it is known, for example, that the difference in the electrical constant s of land and sea is greater in the case of a high coast. Accordingly a more general theory is developed in which the effect of the boundary line is taken into account and formulae are derived for different relative positions of the observer and transmitter. The considerable effect of the transitional zone is also demonstrated.

"The theory is derived from a general theory of the propagation of radio waves along a non-uniform and uneven surface developed by the author elsewhere (1962 of 1946 and back references). That theory was based on an integral equation first solved by Grunberg (3386 of 1944) and more fully investigated by Fock in Matkematicheski Sbornik, 1-2 (1944). In the present paper a method is proposed which makes the solution of the integral equation unnecessary and the problem is reduced to the evaluation of integrals of known functions. This results in a considerable simplification of the necessary calculations.

Iz. Ak. Nauk SSSR, Ser. Fiz. Vol. 10, No. 2, pp 196-216, 1946," On the Coastal Effect in Radio Direction Finding"

"In Conclusion a brief analysis is made of available experimental data, which are in comformity with the theory."



APPROVED FOR RELEASE: 06/13/2000 CIA-RDP86-00513R000413010004-8"

FEYNBERG, Ye. L.

"Propagation of Radio Waves along an Irregular Surface: IV. Coastal Refraction and Allied Phenomena," Journal Phys., 10, No. 5, 1946.

Physics Inst. im. P. N. Lebedev, Dept. Physico-Math. Sci., AS.

FEYNBERG, Ye. L.

"On the Nature of Barometric and Temperature Effects of Cosmic Rays," DOk. AN, 53, No. 5, 1946.

Physics Inst. im. P. N. Lebedev, Dept. Physico-Math. Sci., AS.

FEYNBERG, Ye. L., GROSHEV, L. V., RYTOV, S. M., LOVSHIN, V. L.,

Physics Course, Vol. II (Electricity, Optics, Nuclear Physics), Ministry of Higher Education of USSR, Moscow, 1947 (PAPALEKSI, N. D., Editor).

W.E.

Propagation of Waves

1721

621.396.11

Russian Radiophysics and the Theory of Radio Wave Propagation over the Surface of the Earth. — E. L. Feinberg. (*Radiotekhnika*, Moscow, April 1947. Vol. 2, No 4, pp. 3-14. In Russian, with English summary.) The researches of Russian investigators are outlined

Physics Inst. im. P. N. Lebedev, Dept. Physico-Math. Sci., AS.

1948

FEYNBERG, YE. L.

PA 152T77

USSR/Nuclear Physics - Cosmic Rays
Photons

Dec 49

"Generation of Photons by Primary Protons of Cosmic Rays," Ye. L. Feynberg, Phys Inst imeni Lebedev, Acad Sci USSR, 6 pp

"Zhur Eksper i Teoret Fiz" Vol XIX, No 12 pp. 1098-1103

Shows the classical formula for electromagnetic radiation emitted during birth (or destruction) of a charged particle can be applied in quantum field down to frequencies w such that quantum hw is much less than energy E of the particle. Therefore, such disappearance process (or abrupt variation in energy) of fast cosmic particle or flight process of newly created particles must be connected with the emission of electromagnetic radiation whose energy is of the order $(e^2/hc)E$. In particular, this method is used to determine radiation emitted during scattering of fast nucleons in "intercharge." Indicated mechanism is evidently insufficient to explain formation of fundamental mass of soft component of cosmic rays which are created from nucleons with energy E equal to 10^{10} eV. However, radiation increases logarithmically with energy, and for energy E greater than 10^{14} eV a small fraction of the energy must be radiated during each act of the basic process. Discussion of data on large atmospheric showers shows this to be essential in any explanation of formation of showers. Submitted 19 Jul 49.

152T77

FEINBERG, YE. AND FAINBERG, V. YA.

Doki. Akad. Nauk SSSR, Vol. 68, No. 1, pp 45-47, 1949, "Electromagnetic Radiation Due to Proton-

"Experiments with fast protons and neutrons (E 10^2ev) [Hadley et al, Phys. Rev., 75, 351 (1949(showed the important part exchange forces must play in the interaction neutron-proton. Pomeranchuk and Shmushkevich (Doklady Akad. Nauk SSSR 64, 499 (1949)] pointed out that a specific electromagnetic radiation, corresponding to the considerable change in electric dipole moment of the system, must result from the exchange of charges. The present authors show that this specific radiation is not the only possible outcome of the interaction. In general, a charge exchange between a proton and aneutron may modify not only the electric moment of the system, but its magnetic moment as well. Since the orientation of a proton's magnetic moment coincides with the spin, and that of a neutron is opposed to it, it will depend on the initial mutual orientation of the two spins whether or not; in the former case, a supplementary radiation must take place. It is shown that this radiation consists predominantly of high frequency quanta and is isotropic. It is seen that the analysis of the emitted quanta can furnish information on the character of the nuclear forces present, viz. whether they are forces of the usual type (Wigner) , or forces involving charge exchanges only (Heisenberg), or charge and spin exchanges (Majorana), or spin exchanges alone (Bartlett)."

FEYNBERG, Ye. L., SOKOLOV, A. A., MARKOV, M. A., DRABKINA, S. I., SUVOROV, S. G.(Editor), AKHLAMOV, S. N. (Tech. Editor).

D. I. Blokhintsev, "Fundamentals of Quantum Mechanics", Osnovy Kvantovoy Mekhaniki, State Press for Technical-Theoretical Literature.

Table of Contents W-17671, 5 Apr 1951

FEINBERG, YE. L.

Dok. Akad. Nauk SSSR, Vol. 80, No. 6, pp 871-874, 1951, "Angle Distribution of the Energy of Secondsay Radiation Created by Primary Cosmic Particles" (Fizicheskii Institut imeni P. N. Lebedeva, Akademii Nauk SSSR).

"Previous measurements have shown that the secondary radiation which is created by the primary particles basically retains the angular distribution of the primary particle. Colcns. are described which make it possible to evaluate the angular distribution for the energy of the secondary radiation with respect to the direction of the primary particles. The following conclusion is drawn about the character of the angular distribution: the energy transmitted to the secondary radiation decreases sharply for an increase of over 29-30° in the angle between the secondary and the primary radiation."

Physics Inst im Lebedev

FEYNBERG, YE. L.

USSR/Nuclear Physics - Generation of Particles — 11 Dec 51

"Concerning the Generation of Particles During Collision of Fast Nucleons," Ye. L. Feynberg, D. S. Chernavskiy, Phys Inst imeni Lebedev, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol LXXXI, No 5, pp 795-798

The interaction of fast nucleons and mesons was considered in a number of works which employed, because of the absence of a theory of elementary particles, various semiquant considerations. Special interest is shown in Fermi's work (Progress

210T78

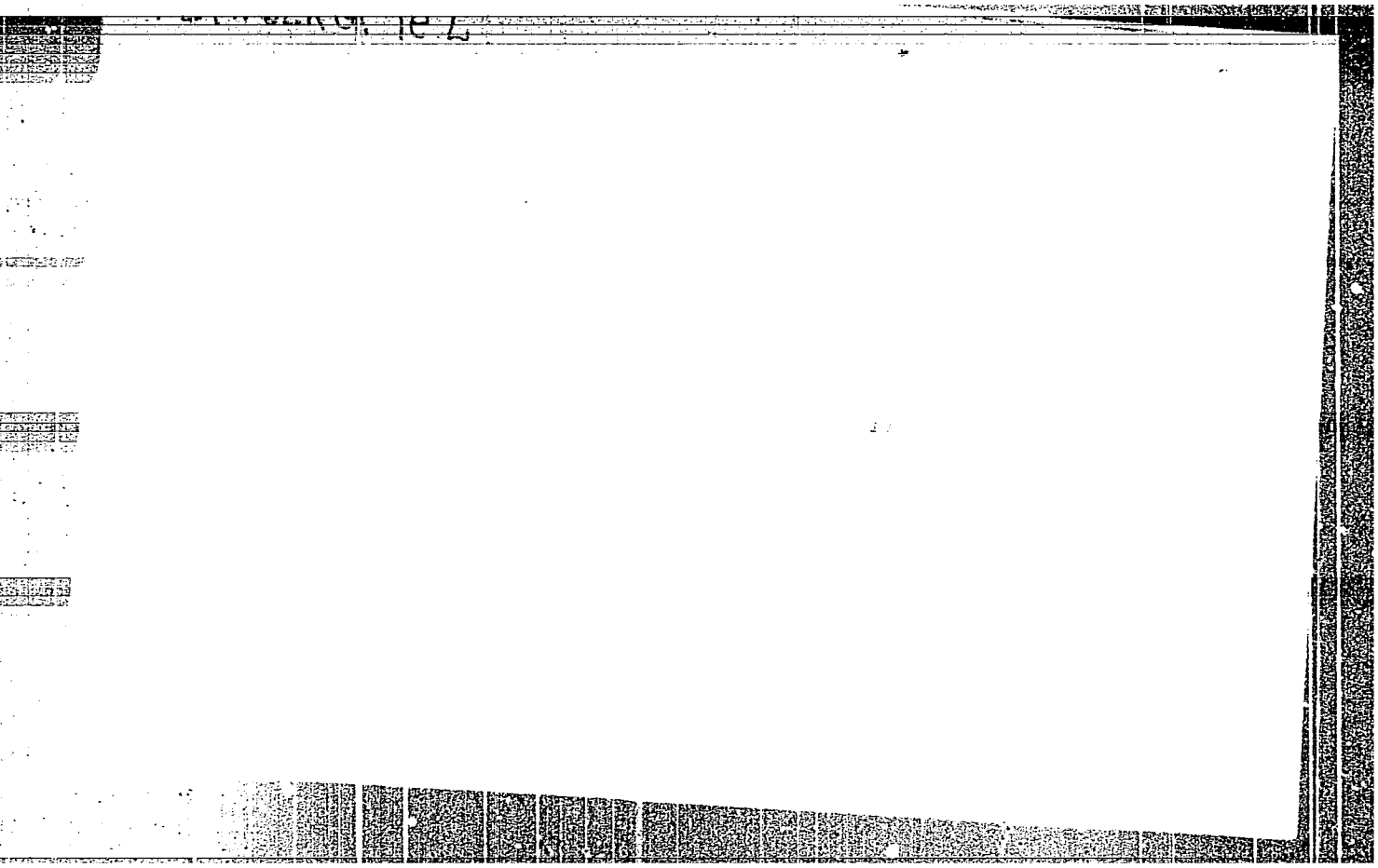
USSR/Nuclear Physics - Generation of Particles (Contd) — 11 Dec 51

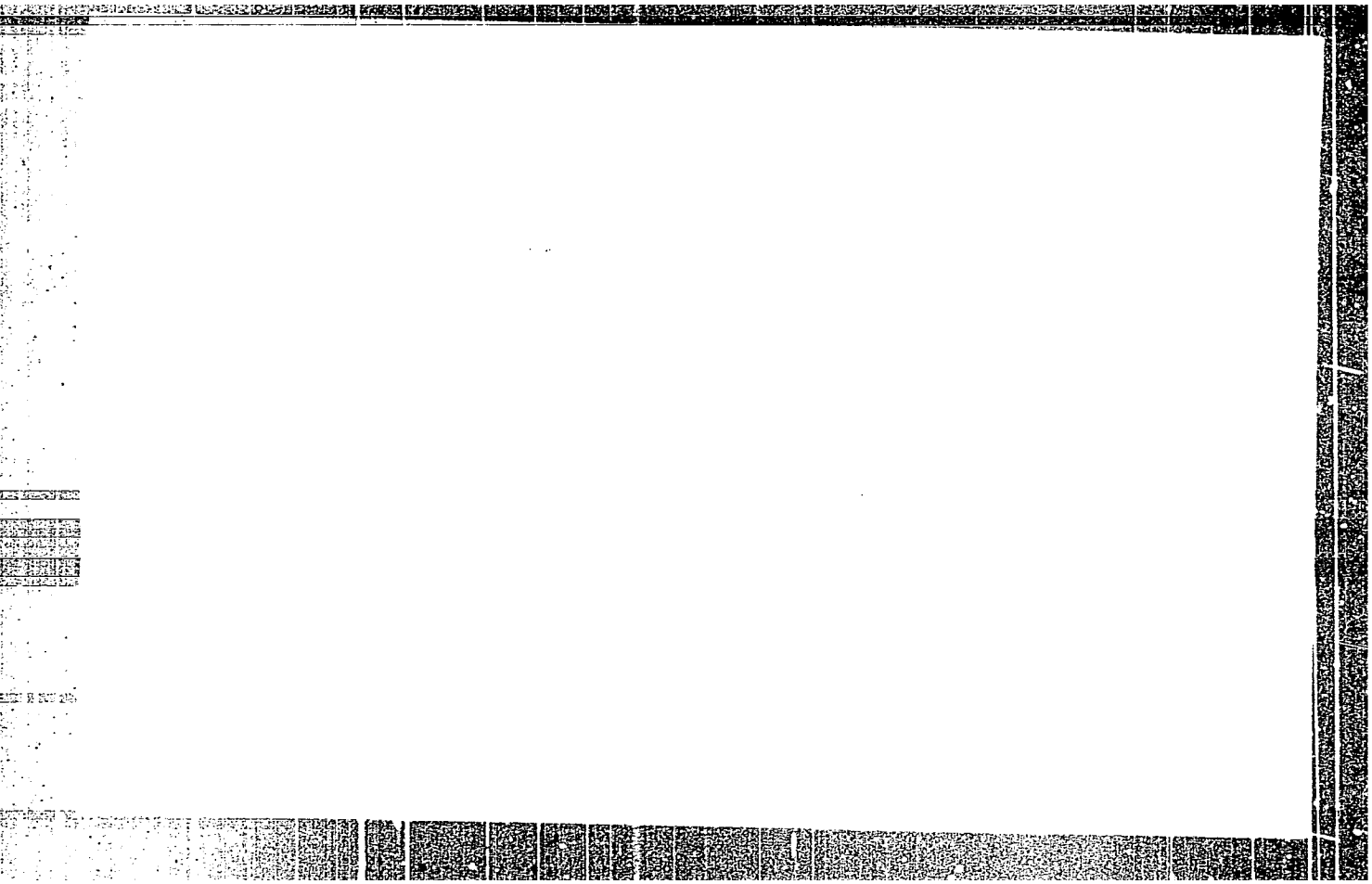
of Theoretical Physics, 5, No 4, p 570, 1950), certain points of which however seem to be questionable. The authors attempt to modify Fermi's scheme so that these points may be eliminated. Submitted by Acad D. V. Skobel'tsyn 22 Oct 51.

210T78

AL'PERT, Ya.L.; GINZBURG, V.L.; FEYNBERG, Ye.L.

[Radio wave propagation] Rasprostranenie radiovoln. Moskva, Gos. izd-vo tekhniko-teoret. lit-ry, 1953. 883 p. (MLRA 7:1)
(Radio waves)





USSR/Nuclear Physics - Cosmic rays in meteorology FD 417

Card 1/1 Pub. 147-3/16

Author : Dorman, L. I.; Kuz'min, A. I.; Tyanutova, G. V.; Feynberg, Ye. L.; Shafer, Ya. G.

Title : Variations in the intensity of cosmic rays and the role of meteorological factor

Periodical : Zhur. eksp. i teor. fiz. 26, 537-544, May 1954

Abstract : Briefly expound the results of an experimental and theoretical study of the influence of meteorological factors on the observed (at sea level) intensity of the hard component of cosmic rays. Show that knowing the distribution of temperature in the atmosphere above the observation point one can allow for the meteorological factors with an accuracy up to 0.1 to 0.2% in the intensity of cosmic rays. Here the remaining divergence lies within the limits of error of the given meteorological sounding. It turns out that the seasonal variations in the intensity of the hard component are due to meteorological factors. The daily variations are essentially masked by these factors.

Submitted : October 27, 1953

FAYNBERG, Ye.I. and PERSHAN, S. N.

"A Device for Measuring the Coefficient of Correlation of Stationary Noises".

Acoustic Institute, and Physics Institute imeni P. N. Lebedev; both of the Academy of Sciences USSR

A report delivered at a conference on Electro-acoustics held by the Acoustic Commission, the Acoustic Institute of the Academy of Sciences, USSR, and the Kiev Order of Lenin Polytechnic Inst., from 1-5 July 1955 in Kiev.

SO: Sum 728, 28 Nov 1955.

FEYNBERG, Ya. L., GROSHEV, L. V., and FRANK, I. M.

Ses. Akad. Nauk SSSR, po Mirnomu Ispol'zovaniiu Atomnoi Energii (Zasedaniia Otdeleniia Fiziko-Mathematicheskikh) pp 3-20, 1955, "Multiplication of Neutrons in Uranium-Graphite Systems."

"The present paper is a general introduction to a group of the three subsequent papers on experimental and, to some degree, theoretical investigations. The purpose of these investigations was to study the physical aspect of neutron multiplication in a heterogeneous uranium-graphite system. The experiments led to the necessity of further development of the theory of the method as well as of the experimental procedure. The reports contain a discription of numerous experiments performed with various concentrations of uranium in graphite under various temperature condtions. The values of the thermal neutron utilization constant φ and of the multiplication constant k were determined by measurements, and the effect of the air gap and waterjacket around the slug was studied. The temperature dependence of Θ, of the slowing-down probability $\bar{m}$, of the averagenumber of neutrons emitted by a slug per captured thermal neutron (with the multiplication coefficient of fast neutrons taken into account) $\nu_1 - \nu u$, as well as that of the multiplication constant $k=\nu_1 \varphi \Theta$, were determined experimentally. These data, together with a detailed analysis, are given in subsequent reports. The diffusion of slow neutrons within a multiplicative system cell was considered in great detail, particularly with respect to the difference between the properties of heterogeneous and homogeneous systems. This difference is clarified on the basis of the conception of the 'path of the first arrival' (i. e., the path covered by a neutron after

entering the cadmium energy region before it strikes the slug for the first time). The path plays a different part than that between subsequent arrivals. The possibility of a 'gap effect' is pointed out. This effect was subsequently found by effect and the predictions of simple theoretical calculations demonstrates the insufficiency of a theory neglecting the difference between the energies of the first arrival neutrons and the average neutron energy within the lattice. Various effects due to the water jacket which surrounds the slugs, are considered. In this case the part played by the path of the first arrival must also be particularly considered."

SOV/109-3-9-2/20

AUTHORS: Kalinin, Yu. K. and Feynberg, Ye. L.

TITLE: Propagation of the Ground Wave over a Non-Uniform Spherical Earth Surface (Rasprostraneniye zemnoy volny nad neodnorodnoy sfericheskoy poverkhnost'yu zemli)

PERIODICAL: Radiotekhnika i elektronika, 1958, Vol 3, Nr 9, pp 1122-1132 (USSR)

ABSTRACT: For the purpose of analysis it is assumed that the field is produced by a vertical dipole situated on the surface of the Earth. The vertical component of the electrical field E_n satisfies:

$$E_n = E_n^{(0)} + \frac{1}{4\pi}\int\left\{\frac{\partial v}{\partial n}E_n - \frac{\partial E_n}{\partial n}v\right\}dS \qquad (1)$$

where $E_n^{(0)}$ is the volume integral of the source function multiplied by v, n is the normal to the surface (directed towards the centre of the Earth) and v is the Green function which can be expressed by Eq.(2) where θ is the arc angle of a great circle connecting two points, k is the wave number, a is the radius of the Earth and z is

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the vertical co-ordinate; the coefficient $q_o = iA/\sqrt{\varepsilon'_o}$, where $A = (1/2\ ka)^{1/3}$; on the other hand, $V(\vartheta, z; q_o)$ denotes the attenuation function. For the case of $z = 0$, the function V can be expressed by Eq.(3), where $w(t)$ is the Airy function of a complex argument. For this case, the boundary conditions are expressed by Eqs.(4), so that E_n is in the form of Eq.(5). The solution for E_n is in the form of Eq.(6) where W is a slowly changing attenuation function. This can be written in the form of Eq.(5a) or in the form of Eq.(7). The integral in Eq.(7) is taken along the great circle connecting the points of transmission and reception. If the transmission route consists of N segments which are uniform, Eq.(7) can be written as Eq.(8), where ϑ_j is the angular length of the j^{th} segment and q_j is a parameter describing its characteristics. For a route

Propagation of the Ground Wave over a Non-Uniform Spherical Earth Surface

consisting of two segments, the attenuation function is expressed by Eq.(9) or Eq.(10). This can also be written as Eq.(12). For a route consisting of 3 segments, the attenuation function W_3 can be written as Eq.(15). It is of interest to define the attenuation of various segments of a transmission route; this can be done by employing Eq.(18). This was used to determine the attenuation of a number of systems. The results are shown in Figs.1 and 2; the attenuation functions W are plotted for sea-land-sea and land-sea-land systems as a function of their relative angular width, ξ . Similar results are shown in Figs.3 and 4; Fig.3 shows the field as a function of distance D over a land-sea system, while Fig.4 gives the field for a sea-land system; the crosses and circles in the figures denote the experimental points (taken from Ref.7). For systems in which $q = q_1$ and $q = q_2$, the so-called boundary refraction phenomenon is observed (see Fig.5). The attenuation function for this case can be written as Eq.(21) or Eq.(22), from which the differential attenuation can be expressed by

Propagation of the Ground Wave over a Non-Uniform Spherical Earth Surface

SOV/109-3-9-2/20

Eq.(23). The paper contains 5 figures and 8 references; 5 of the references are English and 3 Soviet.

ASSOCIATION: NII zemnogo magnetizma, ionosfery i rasprostraneniya radiovoln i Fizicheskiy institut im. P. N. Lebedeva, AN SSSR) The Scientific Research Institute for Earth Magnetism, Ionosphere and Radio Wave Propagation and the Physics Institute im. P. N. Lebedev of the Soviet Academy of Sciences)

SUBMITTED: June 26, 1957.

Card 4/4

AUTHORS: Sobel'man, I. I., Feynberg, Ye. L. SOV/48-22-6-3/28

TITLE: The Optical Effects of the Collective Oscillations of Electrons in Metals (Opticheskiye effekty kollektivnykh kolebaniy elektronov v metallakh)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 6, pp. 654-658 (USSR)

ABSTRACT: It may be concluded from results obtained by theoretical research that in a homogeneous plasma with atrophic electron gas, besides the Fermi excitation spectrum of the individual electrons also a Bose excitation spectrum may be observed. In this case the "plasmons" are concerned, the frequency ω and wave number k of which depend on the conditions of dispersion:

$$\omega^2 = \omega_p^2 + \langle v^2 \rangle k^2, \quad \omega_p^2 = \frac{4\pi ne^2}{m}$$

where e, m, n denote the charge, the mass, and the electron number respectively; $\langle v^2 \rangle$ - mean square of the velocity of the electrons in the non-excited Fermi gas. By entering into interaction with individual electrons, the plasmons quickly pass

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over to single electron excitations, which makes a constancy of plasmons possible only in the case of very long waves. On this basis the theory concerning electron losses of plasmons and the system of plasmon equations are developed. The following subjects are further dealt with by separate chapters: 1.) Excitation of the plasmon during the absorption of X-ray quanta and its influence upon the fine structure of the limit of X-ray absorption. 2.) The combined scattering of X-ray quanta with plasmon yield. 3.) Light absorption on the plasmon frequency. There are 13 references, 7 of which are Soviet.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P. N. Lebedev AS USSR)

1. Metals--Properties 2. Electron gas--Spectra 3. Electron gas--Optical effects 4. Radiation--Absorption 5. Mathematics --Applications 6. Perturbation theory

AUTHOR: Feynberg, Ye. L., Doctor of Physical and Mathematical Sciences. 30-1-15/39

TITLE: Conference on Cosmic Radiation at Varenna (Konferentsiya po kosmicheskim luchum v Varenne).

PERIODICAL: Vestnik AN SSSR, 1958, Vol. 28, Nr 1, pp. 86-90 (USSR)

ABSTRACT: The International Union for Physics at the UNESCO convenes a conference on cosmic radiation every second year. The conference, which took place from June 21, - June 26, 1957, was attended by a Soviet delegation with S. N. Vernov as the head, and by N. A. Dobrotin, G. T. Zatsepin, N. L. Grigorov, A. Ye. Chudakov and Ye. L. Feynberg. At present the following are the main problem to be dealt with in this field: The investigation of the interactions of particles in the domain of highest energies (10^{11}-10^{18} eV), which are inaccessible for the acceleration of elementary particles, and the investigation of the problem of the creation of cosmic radiation and its behavior in cosmic electromagnetic fields, which is closely connected with astrophysics. An important part was played in this connection by the investigation of the variation of intensities and of the composition of cosmic radiation, which was also examined by this conference. The investigation of interaction

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Conference on Cosmic Radiation at Varenna. 30-1-15/39

in the domain of highest energies is at present carried out by two methods: The first consists in the observation of separate acts and whole cascades of interactions of ionizing particles in thick photoemulsion layers; the second method is based upon the investigation of broad atmospheric heavy rains of cosmic rays by complicated systems consisting of several thousand counters, which, among other things, also contain ionization- and Wilson chambers. In the report delivered by Soviet scientists the results obtained in this field in the USSR have been collected. N. L. Grigorov mentioned the first results achieved by him on a device produced by himself, in which ionization chambers and counters are used in combination with the technique of emulsions. The Soviet delegation also submitted works by G. B. Zhdanov (experimental) and G. A. Milekhin, I. L. Rozental', D. S. Chernavskiy (theoretical), as well as such by V. L. Ginzburg and I. S. Shklovskiy.

AVAILABLE: Library of Congress

1. Cosmic rays-Conference 2. Ionization

Card 2/2

Feynberg Ye. L.

AUTHORS: Sobel'man, I. I., Feynberg, Ye. L. 56-2-29/51

TITLE: Some Optical Effects of Plasma Vibrations in a Solid Body (Nekotoryye opticheskiye effekty plazmennykh kolebaniy v tverdom tele)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol 34, Nr 2, pp 494-500 (USSR)

ABSTRACT: In the plasma of free electrons in a solid body collective vibrations of two different kinds are possible: optically active (which absorb light and are fluorescent) and optically inactive vibrations. With both kinds of vibrations, however an indirect interaction with light is possible. The authors investigate the following processes: 1) The excitation of a plasma by the absorption of a γ-quantum. This process is of importance for the structure of the absorption edge. 2) The excitation of a plasmon in the inelastic scattering of a photon (combination scattering). 3) The absorption of light at the frequency of optically inactive plasma vibrations by the virtual excitation of one of the inner electrons. All these processes are caused by the Coulomb interaction of a

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plasma with the inner electrons; the corresponding probabilities are quite considerable. For the sake of safety it is assumed here that the inner electron is situated on the K-shell. The separate chapters of this work deal with the edge of the band of γ-absorption, the combination scattering and the absorption at the frequency of plasma vibrations. The results found in these investigations are discussed afterwards. The mechanism investigated for the excitation of the plasmons in the absorption of γ-quanta is very effective. The authors also determine in which way this process can influence the structure of the absorption limit. The combination scattering is also sufficiently effective. Therefore the appearance of long-wave satellites can be ovserved in the reflected (dispersed) light. The division of plasma vibrations into optically active and optically inactive ones is rather done at random and only separates the mechanisms of the processes from each other. Besides these investigated optical effects which are connected with the excitation of the plasmon also other processes can occur, e. g. the radiation of a γ-quantum at the transition n's $\rightarrow$ n"s. All processes investigated are, in principle, also possible when a second electron takes

Some Optical Effects of Plasma Vibrations in a Solid Body 57-2-2[illegible]/31

part in them in stead of the plasmon. There are 8 references, 3 of which are Slavic.

ASSOCIATION: **Institute of Physics** imeni P. N. **Lebedev, AS** USSR (Fizicheskiy institut imeni P. N. Lebedeva Akademii nauk SSSR)

SUBMITTED: August 27, 1957

AVAILABLE: Library of Congress

1. Plasma oscillations-Optical effects 2. Photons-Scattering

Card 3/3

AUTHOR: Feynberg, Ye. L.

TITLE: The Collective Vibrations of Electrons in a Crystal (Kollektivnyye kolebaniya elektronov v kristalle)

SOV/ 56-34-5-11/61

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958 Vol. 34, Nr 5, pp. 1125-1137 (USSR)

ABSTRACT: The problem consists in the investigation of all the electrons of the crystal (including the ion surplus) from a uniform point of view. The theory itself must make it possible to calculate the share of the electrons participating in the plasmon. This paper investigates this problem (though in a very crude manner) corresponding to the crudeness of the approximation of the collective vibrations. In the case of an inhomogeneous density it is possible to give the kinetic equation for the distribution function $f(\vec{r}, \vec{p}, t)$ of the electrons. It is possible to use a previously given quantum kinetic equation. In the case of a slowly changing field of nuclei it is possible to use the classical approximation. The author also gives a transition from the distribution in a multidimensional space to a one-particle approximation that is equivalent to the Hartree-approximation. It is possible to pass from the kinetic equation

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for $f_1(\vec{r}_1, \vec{p}_1, t)$ to the "quasihydrodynamic approximation". A system of equations is obtained for the first moments $\int f_1 d\vec{p} \equiv \varrho_1(\vec{r}, t)$, $\int f_1 p_i d\vec{p}$, $\int f_1 p_i p_k d\vec{p}$ ..... of the unknown distribution and the following moments (of higher orders) are neglected. In the case of electrons in a crystal a linear homogeneous system of equations is obtained, with coefficients which correspond to a periodical lattice. The next part of this paper deals with the hydrodynamic approximation. By solving the hydrodynamic equations for an electron gas with Coulomb forces (giving a collective interaction) it is possible to take into account the collisions and the thermal motion in the member $\int dp/\varrho$, where p denotes the pressure. If the system of the solutions for the crystal is known, the variation of the state that is caused by the influence of the external field may be calculated with the usual method. In the next part of the paper the interaction with the light is calculated. Already for lengths that are by far smaller than $137d \sim c/\omega_0 \sim 1/k_0$ the absorption will be a total one. Therefore the light wave is transformed very fast, already on the surface of the crystal, into a transverse plasmon wave. The prin-

The Collective Vibrations of Electrons in a Crystal SOV/56-34-5-11/61

cipal component of this wave is a dipole vibration parallel to the electrical field. The author calculates and gives formulae for the excitation of a fast charged particle. At last quantitative evaluations are given. The author thanks V. L. Ginzburg and V. P. Silin for their interesting and useful discussions and D. G. Sannikov for the results of his calculations. There are 1 figure and 16 references, 9 of which are Soviet.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P. N. Lebedev, AS USSR)

SUBMITTED: August 27, 1957(initially), and February 12, 1958 (after revision)

1. Crystals---Analysis 2. Electrons---Vibration 3. Crystals ---Lattices 4. Mathematics---Applications

Card 3/3

FEINBERG, YE. L.

Г. М. Бартенев

Внезапное затухание коротких радиоволн в ионосфере. Статистика наблюдений за время с 1938 по 1957 гг.

В. Е. Кашпровский

Методы безимпульсного зондирования неоднородностей слоев ионосферы.

Г. В. Васильев,
Ю. В. Кушнеревский

Ионосферная станция ручного управления с механическим сопряжением настроек передатчика и приемника.

11 июня
(с 10 до 16 часов)

Е. Л. Фейнберг,
А. Д. Петрашкий

О приближенных граничных условиях в теории распространения радиоволн вдоль земли.

С. М. Дадьков (Чехословакия)

Измерение эффекта Допплера третьего советского искусственного спутника Земли.

В. А. Загуменко

Исследование лунных приливных движений в ионосфере

Н. Н. Потапова

Спорадический слой E по наблюдениям на станциях Советского Союза за период Международного геофизического года.

М. С. Зинченко,
А. Я. Усиков

Отражение радиоволн миллиметрового диапазона от слоя снега.

11 июня
(с 18 до 22 часов)

В. С. Халстед (США)

Применение тропосферного распространения УКВ для целей многоканальной радиосвязи и телевидения.

Н. М. Трифонов

Исследование дальнего приема телевизионных и других сигналов на УКВ.

К. Ф. Греков

Дальний и сверхдальний прием телевизионных сигналов.

report submitted for the Centennial Meeting of the Scientific Technological Society of Radio Engineering and Electrical Communications im. A. S. Popov (VNORiE), Moscow, 8-12 June. 1959

23712
S/035/61/000/004/047/058
A001/A101

3.2410

AUTHORS: Dorman, L. I., and Feynberg, Ye. L.

TITLE: Some problems in the theory of cosmic ray variations

PERIODICAL: Referativnyy zhurnal. Astronomiya i Geodeziya, no. 4, 1961, 68 abstract 4A508 (V sb. "Variatsii kosmich. luchey pod zemley, no urovne morya i v stratosfere". no. 1, Moscow, AN SSSR, 1959, 49-57)

TEXT: The authors discuss various mechanisms for temporary modulation of cosmic ray intensity of galactic origin during magnetic storms. In particular they show, that Parker's geocentrical model which assumes gravitational capture of the magnetized plasma cloud by the Earth meets serious difficulties, since according to observational data plasma fluxes move with speeds of 1,000 km/sec and therefore they cannot be captured by the Earth's gravitational field. The model is further developed in which intensity drops of cosmic rays during magnetic storms is associated with scattering of cosmic rays by regular magnetic fields frozen-in in corpuscular flows. Three types of the observed profiles of this reduction can be explained. These differences are caused by the type of Earth capture by the magnetized corpuscular flow: 1) capture by the forward front

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S/035/61/000/004/047/058
A001/A101

Some problems in the theory ...

between the flow axis and the lagging side edge (sharp drop during several hours followed by the smooth slow recovery during several days; 2) capture by the forward front, but between its axis and the advancing side edge (very rapid drop passing over into a smoother reduction of intensity followed by the gradual slow recovery of intensi y up to initial level; 3) capture by the side edge of the flow (smooth drop o. intensity and almost just as smooth recovery). Profiles of the first and second type must be induced by storms with sudden commencement, the third type by storms with gradual commencement. The authors also discuss the question on the possible "aftereffect" of magnetic storms on cosmic rays. It is supposed that it can be associated with an escape of magnetic field force lines from the flow and their closure in the interplanetary medium. Therefore, even after leaving the flow by the Earth (with termination of a magnetic storm), it will still stay for some time within the magnetic field. There are 15 references.

L. Dorman

[Abstractor's note: Complete translation]

Card 2/2

24(7)

AUTHOR: Feynberg, Ye.L., Doctor of Physico-Mathematical Sciences, Professor

SOV/25-59-2-3/48

TITLE: The Vavilov-Cherenkov Effect (Effekt Vavilova-Cherenkova)

PERIODICAL: Nauka i zhizn', 1959, Nr 2, p 7-11 (USSR)

ABSTRACT: The article deals in popular form with the intrinsic nature of the Vavilov-Cherenkov effect, the history of the discovery and the scientific elaboration of this phenomenon. The phenomenon was discovered and elaborated in the Fizicheskiy institut imeni P.N. Lebedeva Akademii nauk SSSR (Institute of Physics imeni P.N. Lebedev of the AS USSR). In the early thirties, S.I. Vavilov and the young aspirant P.A. Cherenkov began the study of luminescence in liquids subjected to the action of radium gamma rays. The theory of this phenomenon was elaborated in 1937 by two

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The Vavilov-Cherenkov Effect

collaborators of Vavilov, I.Ye. Tamm and I.M. Frank, who supplied a reliable mathematical foundation, to make the various observations fit for practical use. The essence of the explanation given by I. Ye. Tamm and I.M. Frank can be reduced to the simple fact that the speed of the electrons in the Cherenkov experiments was so high that it exceeded the speed of light in the medium selected for the experiments. The theory of these scientists has shown that the Vavilov-Cherenkov effect is not due to electron acceleration itself, but depends on an electron speed lying between the reciprocal value of the refraction index of the medium and the light speed in the vacuum. In this way the phenomenon can be also produced by a uniformly moving electron. - The discovery of the phenomenon and its theoretical elaboration have proved useful for a

The Vavilov-Cherenkov Effect

number of practical applications, of which the "Cherenkov counters" deserve mentioning. They are intended for the recording of swift charged particles capable of penetrating through thick layers of materials such as glass or plexiglass. The radiation caused by these particles in the medium is picked up by photomultipliers and recorded by the counter. These counters are better in some respects than the usual gas-discharge counters. The discovery also proved useful for the determination of the speed of a particle. The determination of the speed is based on the measuring of the angle of the light radiation. This method proved particularly useful in the measuring of the speed of protons accelerated by powerful accelerators. It helped to discover the antiproton. If the brightness of the Vavilov-Cherenkov radiation is proportionate

to the square of the charge of a moving particle, it is possible, if the light beams are "sorted" according to their intensity, to determine the amount of the charge of the moving particles in the matter. The search for multicharged atom nuclei in the substance of cosmic rays in the upper strata of the atmosphere is based on this principle. An installation to accomplish this task was installed on the third Soviet earth satellite. There is another utilization of the Vavilov-Cherenkov phenomenon. It is known that the speed of superfast particles of cosmic rays - electrons, positrons, mesons and protons - approximates the speed of light in a vacuum. Sometimes cosmic rays form superpower "showers" and hundreds of thousands or millions of particles simultaneously fall on an area of thousands of square meters. They are usually

The Vavilov-Cherenkov Effect

recorded by a system of many gas-discharge counters. Now it is known that in the air all these particles must emit the Cherenkov radiation. When a system of many photomultipliers equipped with light-gathering reflectors was used for the recording, it was revealed that the phenomenon of the "shower" is accompanied by a weak yet noticeable light "burst". This observation was useful for the further investigation of cosmic rays. - The 1958 Nobel prize in physics was awarded to the Doctor of Physico-Mathematical Sciences, Professor Pavel Alekseyevich Cherenkov, the Academician Igor' Yevgen'yevich Tamm, and the associate member of the AS USSR, Il'ya Mikhaylovich Frank, for "the discovery and theoretical explanation of the Cherenkov effect". In 1946, the now deceased S.I. Vavilov, P.A. Cherenkov, I.Ye.Tamm and I.M. Frank

SOV/25-59-2-3/48

The Vavilov-Cherenkov Effect

were awarded the First Class Stalin Prize. -
There are 4 sketches and 3 sets of diagrams.

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9.9000

77951
SOV/109-5-3-5/26

AUTHORS: Petrovskiy, A. D., Feynberg, Ye. L.

TITLE: Approximate Boundary Conditions in the Theory of Radio-Wave Propagation Along the Surface of the Earth

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol 5, Nr 3, pp 385-388 (USSR)

ABSTRACT: M. A. Leontovich developed approximate boundary conditions for the case of bulk complex dielectric permeability of the earth

$$|\varepsilon'| = \left|\varepsilon + 4\pi i \frac{\sigma}{\omega}\right| \gg 1 \qquad (1)$$

This equation is transformed ignoring the wave passing through the earth, but taking into consideration waves gliding along the boundary, and those falling under an angle of incidence

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$$\frac{\partial E_r}{\partial z} = -\frac{ik}{\sqrt{\varepsilon' + \cos^2\psi}} E_r. \qquad (3)$$

It is further assumed that $\cos^2\psi$ is a slowly varying term which, within limits of the main zone, can be considered constant. For the field of a source located on the boundary plane $\psi = 0$. The problem at hand is an investigation of the possibility of formulating for any value of ε' a homogeneous boundary condition, which would not contain the field in the earth and would, therefore, permit studying wave propagation in space above the earth and, from these results, determining the field in the ground. This condition differs from Eq. (2) by the substitution of

$$\varepsilon^0 = \frac{\varepsilon'^2}{\varepsilon' - \cos^2\psi}. \qquad (4)$$

Instead of ϵ^{-1}. The primary criterion for establishing homogeneous conditions is a sufficient distance of the investigated area of the earth surface from inhomogeneities of the ground or from places where the geometrical uniformity of the boundary surface is disturbed. The boundary surface may be spherical (with a satisfactory great radius) or plane, but the field components must satisfy the condition

$$E \sim w e^{i(k_x x + k_y y)} \cdot e^{\alpha z} = 0, \qquad (5)$$

where α is slowly varying function of attenuation.

$$\left| \frac{1}{k_x w} \frac{\partial w}{\partial x} \right| \ll 1, \quad \left| \frac{1}{k_y w} \frac{\partial w}{\partial y} \right| \ll 1. \qquad (6)$$

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Therefore, the sidewave propagated through the ground, must be attenuated in due time. Further, Eq. (8) is developed.

$$\frac{\partial E_z}{\partial z} = -\frac{ik}{\sqrt{\epsilon''}} E_z \qquad (8)$$

This equation is a generalized expression of Eq. (3). The boundary conditions Eqs. (1) and (2) permit determination of the function of Sommerfeld-Weil-Van der Pol of field attenuation above the earth which takes into account diffraction over non-uniform ground. All attenuation functions remain valid if ϵ^0 is substituted for ϵ^1, even for $|\epsilon^1|$ of the order of unity, as long as the wave in the ground is extinguished in the zone where waves are absent. Sommerfeld used the following equation to determine required distance for a wave gliding on the boundary plane:

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$$p = s^0 x = \frac{ik\varepsilon}{2\varepsilon^0} = \frac{i}{2}\frac{\varepsilon' k - k}{\varepsilon'^2} x.$$

For propagation along the x-axis on the boundary surface the following relation between the horizontal and vertical field components is established.

$$\frac{\partial E_x}{\partial x} \simeq ik_x E_x = -\frac{\partial E_z}{\partial z} = \frac{ik}{\sqrt{\varepsilon^0}} E_z$$

For the general case of propagation under angle φ to the x-axis

$$E_x = \frac{1}{\cos\psi}\frac{\cos\varphi}{\sqrt{\varepsilon^0}} E_z,$$

$$(z = 0). \qquad (9)$$

$$E_y' = \frac{1}{\cos\psi}\frac{\sin\varphi}{\sqrt{\varepsilon^0}} E_z.$$

Card 5/7 As an example of application of Eq. (8) curves for

angle α from the vertical of the major axis of the polarization ellipse of the electric field vector above the uniform earth.

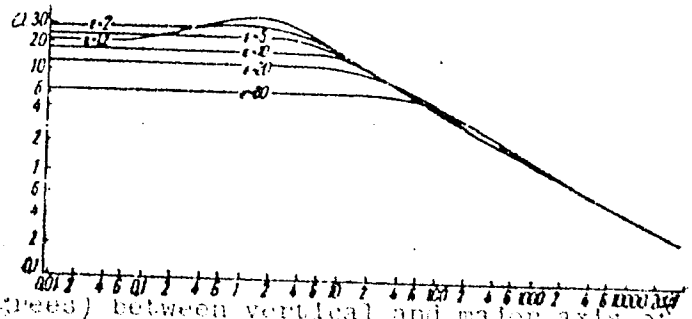

Figure 8
Angle α (in degrees) between vertical and major axis of the polarization ellipse of the electrical field vector on the surface for arbitrary dielectric permeabilities of the ground ($\psi = 0$).

Approximate Boundary Conditions in the Theory of Radio-Wave Propagation Along the Surface of the Earth

77951
SOV/109-5-3-5/26

There are one figure; and 6 references, 4 Soviet, 1 U.S. and 1 German. The U.S. reference is A. Hufford, Quart. J. Appl. Math, 9, 4, 391 (1952).

SUBMITTED: August 17, 1959

Card 7/7

AUTHOR: Feynberg, Ye. L.

S/053/60/070/02/007/016
B006/B007

TITLE: Multiple Production in Collisions of Particles With Ultrahigh Energies

PERIODICAL: Uspekhi fizicheskikh nauk, 1960, Vol 70, Nr 2, pp 333-350 (USSR)

ABSTRACT: The present article is a revised reproduction of a lecture delivered at the Moscow Conference on Cosmic Radiation and at the Kiyev Conference on High Energy Physics (July 1959). In the introduction the author describes the problems arising in the theoretical description of processes developing in spatial regions whose diameter is essentially smaller than 10^{-13} cm, as well as the possibilities open to the theory. Particular account is taken in this connection of the hydrodynamic theory of Heisenberg - Landau, which also forms the subject of the present article. This theory is based on the following assumptions: Our conceptions of the space - time continuum are valid also in the case of an arbitrarily small scale; 2) In the production of a large number of particles, the system may be considered to be quasi-classical; and 3) interaction is so strong that in particle collisions the entire or nearly the entire momentum is transferred. It was the aim of the present article to a certain degree to supplement the comprehensive theoretical survey

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given by Koba and Takagi, which, however, takes only such literature as was published up to 1958 into account. Apart from some fundamental work, the present article deals with the more recent papers in this field. First, the fundamentals of the hydrodynamic theory of frontal collisions are dealt with. This is done on the basis of the example of the collision between two high-energy nucleons if the energy of the incident nucleon in the laboratory system is $E_L > 10^{12}$ ev. For this case the third postulate is equivalent to the second; it may be required further that not only the system as a whole, but each of its elements be treated as quasi-classical, a demand which, as Blokhintsev has shown, is hardly satisfied in the initial stage. This may be avoided if, according to a suggestion made by Landau, the primary volume is considered to be a parameter which enters into the mathematical formulation. However, in a collision between two π-mesons, not even the system as a whole may be considered to be quasi-classical. In the following, the author describes the hydrodynamic representation of the quantum field theory carried out by Japanese theoretical physicists, and he deals with the description of interacting fields by means of

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PHASE I BOOK EXPLOITATION SOV/5892

Feynberg, Yevgeniy L'vovich

Rasprostraneniye radiovoln vdol' zemnoy poverkhnosti (Propagation of Radio Waves Over the Surface of the Earth) Moscow, Izd-vo AN SSSR, 1961. 546 p. 3700 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Fizicheskiy institut im. P.N. Lebedeva.

Eds. of Publishing House: N.N. Butomo and L.K. Nikolayeva; Tech. Ed.: S.G. Tikhomirova.

PURPOSE: This book is intended for scientific workers, engineers, aspirants, and degree students specializing in radiophysics and radio engineering.

COVERAGE: The book presents the fundamentals of the theory of the propagation of surface waves; i.e., waves which are not affected

Card 1/[illegible]

FAYNBERG, YE. L.

BOOK INFORMATION SOV/5902

International Conference on High-Energy Physics. 9th, Kiyev, 1959.

Devyataya [illegible] po fizike vysokikh energiy, Kiyev 15-25 iyulya 1959 g. (Ninth International Conference on High-Energy Physics. Kiyev, July 15-25, 1959), Moscow, 1961. 739 p. 2,500 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Ordenonosnyy Soyuz chistoy i prikladnoy fiziki.

Contributors not mentioned.

PURPOSE: This book is intended for nuclear physicists.

CONTENTS: The collection contains 30 [illegible] reports presented at the [illegible] July 1959. [illegible] High Energy Physics [illegible]

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(F7)

Ninth International Conference (Cont.) SOV/5982

nucleons, their structure, weak and strong interactions, scattering, and their decay. No personalities are mentioned. References accompany individual articles.

TABLE OF CONTENTS:

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AVAILABLE: Library of Congress

SUBJECT: Physics

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11/8/62

BELEN'KIY, S.Z.[deceased]; VUL, B.M.; ZHARKOV, G.F.; ZHDANOV, G.B.; SILIN, V.P.; FAYNBERG, V.Ya.; FEYNBERG, Ye.L.; LARIN, S.I., red.; UL'YANOVA, O.G., tekhn. red.

[From classical to quantum physics; fundamental representations in the theory of the constitution of matter]Ot klassicheskoi fiziki k kvantovoi; osnovnye predstavleniia ucheniia o stroenii materii. Moskva, Izd-vo Akad. nauk SSSR, 1962. 69 p. (MIRA 16:3)

(Physics) (Quantum theory) (Matter--Constitution)

24.6711
24.6700

37547
S/048/62/026/005/011/022
B108/B104

AUTHOR: Feynberg, Ye. L.

TITLE: Electromagnetic processes accompanying multiple production of particles

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 26, no. 5, 1962, 622-634

TEXT: Multiple production of particles during collision can be interpreted by the formation of an excited region in the interacting fields, which then extends to a certain size. The resultant cluster of particles is described from the viewpoint of hydrodynamics. It is shown that the electromagnetic processes accompanying multiple production may furnish experimental evidence on some fundamental characteristics of strong interaction. If the charged pions produced emitted merely electromagnetic radiation of the "bremsstrahlung" type (at the moment of their departure), the photon energy would not exceed $e^2/4\pi$. This quantity, however, has to be supplemented by an accumulation factor Q so that $E_\gamma/E_\pi \sim e^2Q/4\pi$. Experimental data indicate

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FEYNBERG, Ye.L.

"Special role" of electromagnetic potentials in quantum mechanics.
Usp. fiz. nauk 78 no.1:52-64 S '62. (MIRA 15:9)
(Quantum theory) (Electrodynamics)

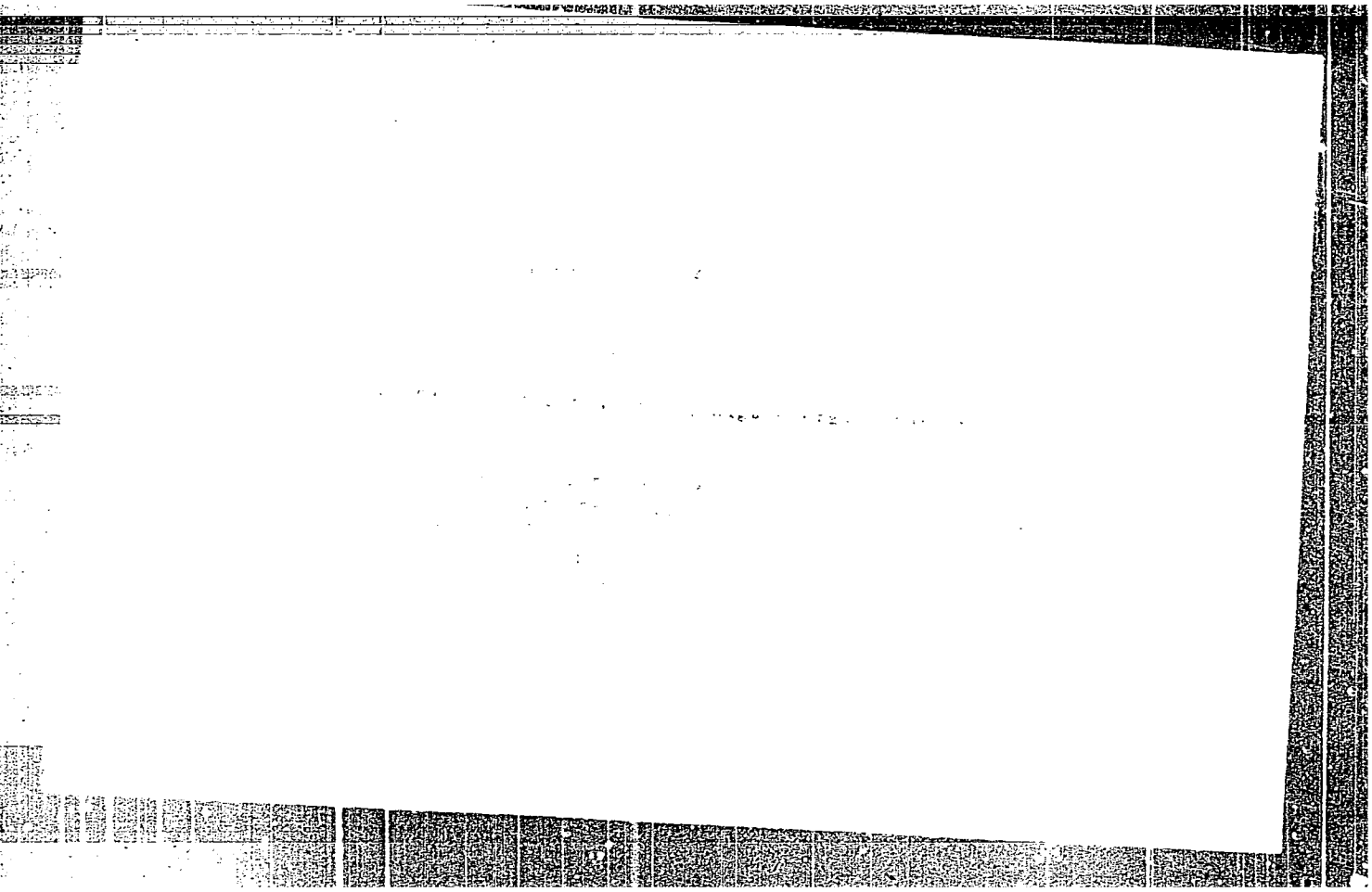
FEYNBERG, Ye.L; CHERNAVSKIY, D.S.

Regge narrowing of the diffraction cone and the role of multiple-meson interactions. Zhur. eksp. i teor. fiz. 45 no.4:1252-1259 O '63. (MIRA 16:11)

1. Fizicheskiy institut imeni P.N.Lebedeva AN SSSR.

FEYNBERG, Ye.L.

The life and work of Niels Bohr. Usp. fiz. nauk 80 no.2: 197-205 Je '63. (MIRA 16:9)
(Bohr, Niels Henrick David, 1885-1962)



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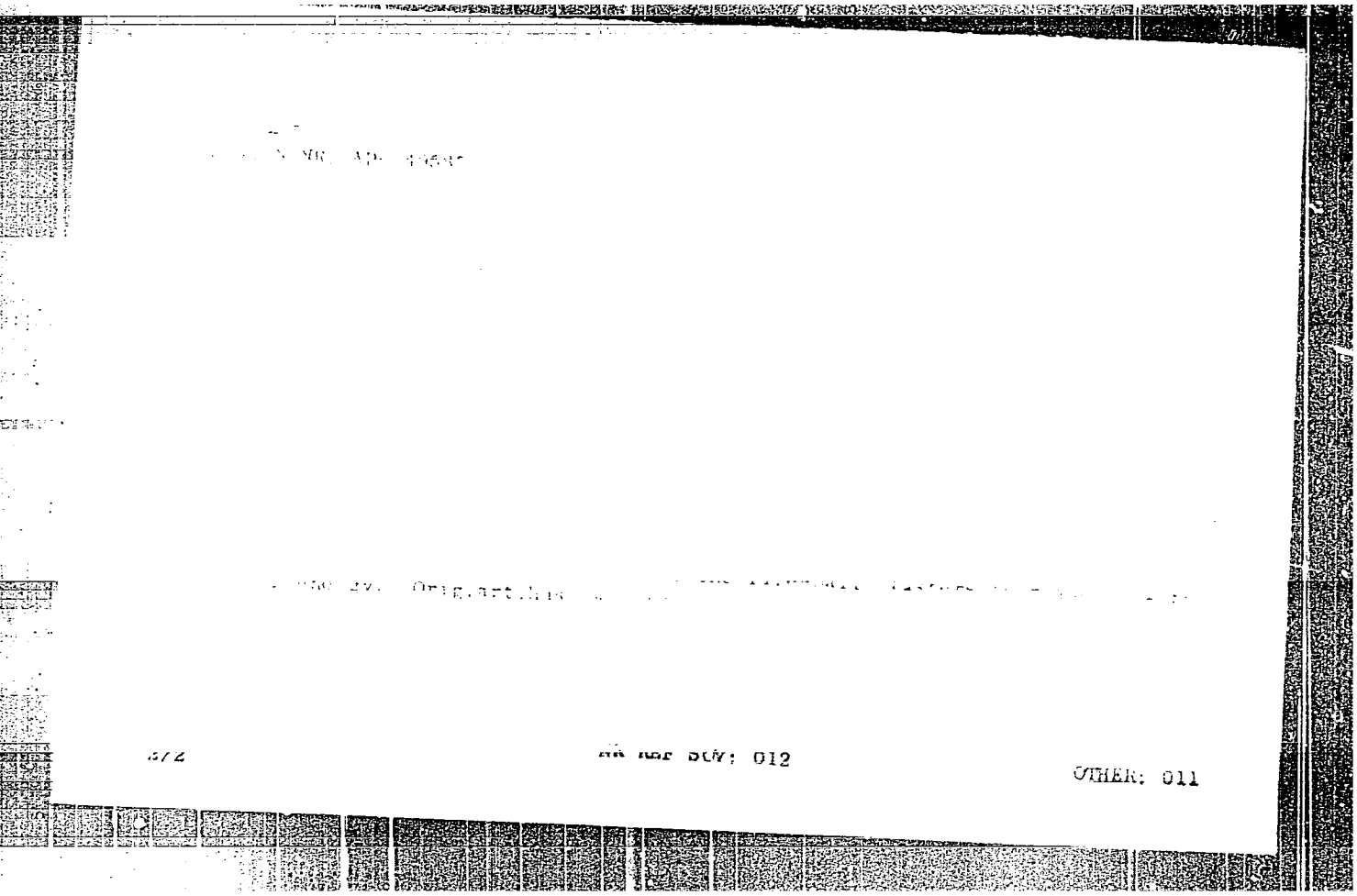

OTHER: 011

ACCESSION NR: AP4014906 S/0053/64/082/001/0003/0081

AUTHORS: Feynberg, Ye. L.; Chernavskiy, D. S.

TITLE: Strong interactions at very high energies

SOURCE: Uspekhi fizicheskikh nauk, v. 82, no. 1, 1964, 3-81

TOPIC TAGS: strong interaction, moving pole method, one pion exchange method, two center model, fire ball model, multiperipheral model, fully peripheral model, Regge pole, peripheral interaction, elastic interaction, inelastic interaction, pion proton scattering, cosmic ray energy, diagram technique, mixed model

ABSTRACT: This review article deals with the two principal methods presently under development in the theory of strong interactions -- the Regge poles or moving pole method (MPM) and the one pion exchange approximation (OPE). The main premises of both methods are treated at some length in view of the lack of a published treatment suitable

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ACCESSION NR: AP4014906

for the non-specialist, particularly on the MPM. An effort is made to reconcile some terminological differences that have crept into the literature and to specify the various theoretical assumptions. Some experimental results obtained at the highest energies afforded by accelerators and at cosmic-ray energies are used to analyze the two methods, with an aim at establishing the connection between them. A tentative conclusion is drawn that the asymptotic properties of elastic scattering, derived from the MPM in its most prevalent modification (allowance for only one pole on the extreme right),, agree with the result of the OPE approximation for inelastic interactions of the same particles. Both experimental and theoretical arguments are advanced in favor of this conclusion, although no rigorous proof is claimed. The table of contents reads: I. Introduction. II. Moving pole method. 1. Introduction. 2. Derivation of main asymptotic formula. 3. Properties of elastic-scattering amplitude at high energies. 4. Extension to other processes. 5. Elastic π^-p scattering and discrepancy between theory and experiment. III. The-

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ACCESSION NR: AP4014906

ory of peripheral interactions. 1. Initial premises and formula for total cross section. 2. Classification of methods. 3. Two center (fireball) model. 4. Fully peripheral (multiperipheral) model. 5. Additional remarks. IV. Experimental data at $E_{lab} \gtrsim 10^{11}$ eV. Comparison with theory. 1. Summary of earlier results. 2. Methods of analysis of experiments. 3. Principal recent experimental results and their significance to the theory. 4. Conclusion. V. Connection between the MPM and the diagram approach in the OPE approximation. 1. Formulation of problem. 2. Diagram interpretation of MPM. 3. Mixed model. 4. Inelastic processes in OPE and MPM. Appendix. Literature. Orig. art. has: 30 figures and 98 formulas.

ASSOCIATION: None

SUBMITTED: 00 DATE ACQ: 14Feb64 ENCL: 00

SUB CODE: PH NO REF SOV: 0056 OTHER: 0071

Card 3/3

VVEDENSKIY, B.A., glav. red.; VUL, B.M., glav. red.; SHTEYNMAN, R.Ya., zam. glav. red.; BALDIN, A.M., red.; VONSOVSKIY, S.V., red.; GALANIN, M.D., red.; ZERNOV, D.V., red.; ISHLINSKIY, A.Yu., red.; KAPITSA, P.L., red.; KAPTSOV, N.A., red.; KOZODAYEV, M.S., red.; LEVICH, V.G., red.; LOYTSYANSKIY, L.G., red.; LUK'YANOV, S.Yu., red.; MALYSHEV, V.I., red.; MIGULIN, V.V., red.; REBINDER, P.A., red.; SYRKIN, Ya.K., red.; TARG, S.M., red.; TYABLIKOV, S.V., red.; FEYNBERG, Ye.L., red.; KHAYKIN, S.E., red.; SHUBNIKOV, A.V., red.

[Encyclopedic physics dictionary] Fizicheskii entsiklopedicheskii slovar'. Moskva, Sovetskaia Entsiklopediia. Vol.4. 1965. 592 p. (MIRA 18:1)

FEYNBERG, Ye.L.

Ionization of atoms in beta decay. IAd. fiz. 1 no.4:612-620 Ap '65. (MIRA 18:5)

1. Fizicheskiy institut im. P.N.Lebedeva AN SSSR.

FEYNBERG, Ye.L.

Present state of the hydrodynamic theory of multiple particle generation. Trudy Fiz. inst. 29:155-168 '65. (MIRA 18:8)

ALIKHANOV, A.I., akademik; FEYNBERG, Ye.L., prof.; SHIMAK, V. [Šimak, V.]; doktor [Chekhoslovakiya]; FISHER, Ya. [Fišer, J.], doktor (Chekhoslovakiya); PERNEGR, Ya., doktor (Chekhoslovakiya); MARKS, G., prof. (Vengriya); SHAPIRO, I.S., doktor fiz.-matemat. nauk

Comments by experimenters and theoreticians. Priroda 54 no.1: 57-65 Ja '65. (MIRA 18:2)

L 1344-66 EWT(m)/FCC/T/EWA(m)-2 IJP(c)

ACCESSION NR: AP5021242 UR/0053/65/086/004/0733/0746
537.591+539.12

AUTHOR: Feynberg, Ye. L. 44,55

TITLE: Cosmic rays and the physics of elementary particles 19,44,55 19,44,55

30
B

SOURCE: Uspekhi fizicheskikh nauk, v. 86, no. 4, 1965, 733-746

TOPIC TAGS: elementary particle, electron, neutrino, particle interaction

ABSTRACT: The problems of cosmic rays and of the formation of particles composing atmospheric showers are still in a hypothetical state. The generation of new particles having short lifetimes depends upon the energy and the mass of the particles. The use of accelerators made it possible to discover the existence of mesons and positrons by overcoming the threshold energies in laboratory experiments. The mass and the lifetime of the μ-meson were determined, and also its instability. π-Mesons were detected in atmospheric showers, and their bulk generation was achieved in particle interactions with energies of 10^{10} ev.

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ACCESSION NR: AP5021242

The symmetry of elementary particles consists of combinations in which new primary particles appear. There are assumed particles with fractional charges of + 2/3e, + 1/3e, and - 1/3e, where e is the elementary charge. However, these particles are not found in accelerator experiments. The interactions of elementary particles may be divided into three types: 1) strong or meson interactions which are characteristic of nucleons, π-mesons, hyperons, et cetera; 2) electromagnetic interactions, which play an important role in the behavior of electrons, positrons, μ-mesons, and photons; 3) weak interactions characteristic of neutrinos and other particles. The electromagnetic interaction of μ-mesons makes it possible to check quantum electrodynamics by experiments with these particles whose magnetic moments are precisely measured. The energy of μ-mesons is very high; they penetrate deep into the earth and generate π-mesons. Weak interactions of the neutrino type studied with low energies of 1 Mev are characterized by conversion of two Fermi particles into two other similar particles. An interaction between a photon and electron yields a Fermi particle.

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If two colliding particles characterized by strong interaction have high energies, the result is the generation of many new particles as π-mesons, nucleons, et cetera. This is the principal peculiarity of strong interactions. In the case of electromagnetic interactions, the probability of emission of two photons due to collision of an electron with a nucleus is one-half that of emission of one photon. The emission of soft photons is called the "infrared catastrophe" because the law of probability is wrong in this case. An infrared catastrophe takes place in any case of strong interactions. The process of elastic scattering during interactions does not have simple properties even at energies of 30 Gev, and asymptotic development is not attained by energies greater than the rest energy. This indicates that another threshold exists in addition to the Mc^2 energy threshold.

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ACCESSION NR: AP5021242

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Studies of cosmic rays showed that collisions of two nucleons in which π-mesons are created are not the source of meson emission, but meson fluxes originate in accumulations of mesonic matter surrounding the collision. Mesonic matter is generated by superhigh energies. Mesons composed of this matter have masses greater than the mass of a nucleon.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: NP, AA

NR REF SOV: 000 OTHER: 000 ATD Press: 4083-F

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L 21808-66 EWT(m)/T
ACC NR: AP6012192

SOURCE CODE: UR/0386/66/003/008/0340/0344

AUTHOR: Maksimenko, V. M.; Sisakyan, I. N.; Feynberg, Ye. L.; Chernavskiy, D. S.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences, SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: The cross section of quark generation

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 3, no. 8, 1966, 340-344

TOPIC TAGS: quantum electrodynamics, strong nuclear interaction, nuclear cross section, collision cross section, quark

ABSTRACT: The authors show that both independent experiment and the theory yield for the quark generation cross section a value some 5 orders of magnitude larger than would follow from estimates based on the absence of quarks from pN collisions in accelerators or cosmic rays. The basic assumption is that at the particular interaction distances the qN or $q\pi$ (q = quark) interaction is essentially the usual one for NN and πN. The dependence of the cross section for the generation of pairs of heavy strongly-interacting particles on their mass can be deduced from accelerator experiments on the generation of $\tilde{p}$ (antiprotons) and $\tilde{d}$ (antideuterons), and also Σ^- and Y_1^*. From an estimate of the ratio of their numbers $n_{\tilde{p}}$ and $n_{\tilde{d}}$

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to the number of pions n_{π^-} in the p-Be collison act (which is practically the same as for the pN collision) it is possible to estimate the generation cross sections $\sigma_{\tilde{q}}$ and σ_q in pN collision, and from them the cross sections and the number of the quarks. A theoretical justification for the estimate is given. As an example it is indicated that even for very large $n_\pi \sim 500$, for example in collisions of a Ca nucleus with energy $E_{lab} > 10^{12}$ ev/nucleon in emulsion, the estimate yields $n_q \approx$ 12, 0.6×10^{-3}, and 1×10^{-9} for $m_q/m_N = 1$, 2, and 3, respectively. The relation derived theoretically is general and shows that the decay of any excited center into pions is always more convenient than other processes. The same holds also for electric generation, and in general for any diagram vertex in which a $q\tilde{q}$ pair is produced. Orig. art. has: 1 figure and 2 formulas.

SUB CODE: 20/ SUBM DATE: 11Mar66/ ORIG REF: 001/ OTH REF: 005

L 32205-66 EWT(l)/EWT(m)/FCC/T IJP(c) GW

ACC NR: AP6020799 SOURCE CODE: UR/0386/66/003/012/0497/0501

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39
9

AUTHOR: Feynberg, Ye. L.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Possible presence of relic quarks in cosmic rays

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 3, no. 12, 1966, 497-501

TOPIC TAGS: strong nuclear interaction, elementary nuclear particle, cosmic ray particle, cosmology

ABSTRACT: The author suggests that if quarks are present in cosmic rays they may be "cold" relic quarks (with temperature 3 - 4K) remaining from the first stages of the expansion of the universe in the interstellar medium and in other cold media. Their number is assumed to be $Q \sim 10^{-11}$ per baryon. Estimates are presented of the possible number and energy of such quarks under several assumptions regarding the origin, propagation, and acceleration mechanisms of the cosmic rays. The analysis shows that it is reasonable to expect the primary flux of cosmic rays to contain quarks, especially in the low energy region. If the cosmic rays come from non-convective shells of the sun or stationary stars, or are accelerated in

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