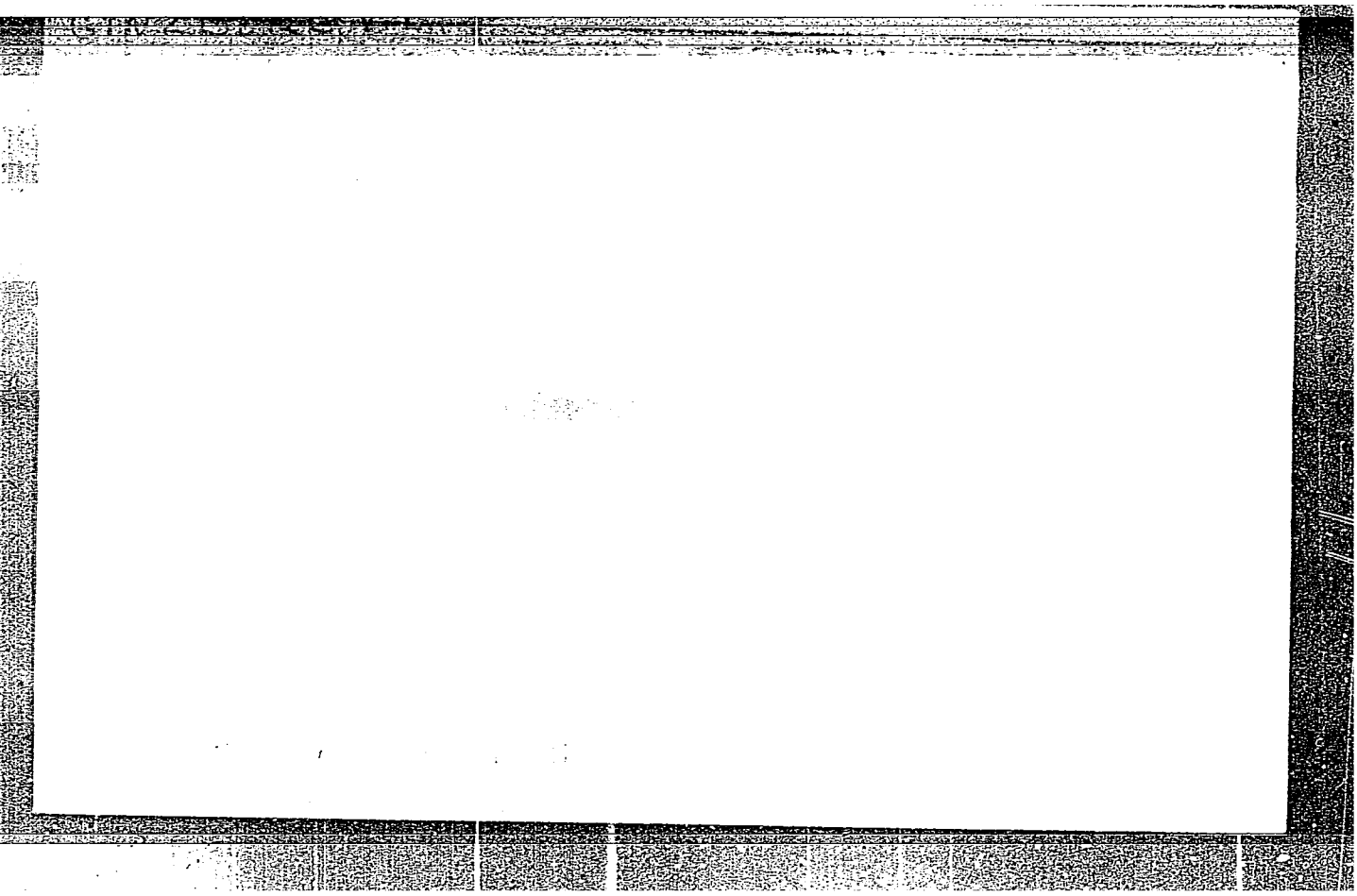

APPROVED FOR RELEASE: Thursday, July 27, 2000 CIA-RDP86-00513R00051673(

AUTHOR GINZBURG, V.L., FAYN, V.M. PA - 2080

TITLE On the Quantum Effects occurring on Interactions of Electrons with High Frequency Fields in Resonant Cavities (O kvantovykh effektakh pri vzaimodeystvii elektronov c vysokochastochnymi polyami v polykh rezonatorakh).

PERIODICAL Zhurnal Eksperimental'noi i Teoret. Fiziki, 1957, Vol 32, Nr 1, pp 162-164 (U.S.S.R.)

Received 3/1957 Reviewed 4/1957

ABSTRACT The authors investigated the following problem in classical manner: At the moment A = 0 with the kinetic energy $K_0 = mv_0^2/2$ a non-relativistical electron enters the resonator and leaves it at the moment $t = \tau$ with the energy $K_\tau = mv_\tau^2/2$. For reasons of simplicity the electric field E in the resonator on the path of the electron is assumed to be homogeneous and parallel to the velocity of the electron (such a case is absolutely real). If $E = E_1 \cos\omega t + (E_2 + E_0) \sin\omega t$ applies, $m(dv/dt) = eE$ and $v_\tau = v_0 + (e/m\omega)\left[E_1 \sin\omega t + (E_2 + E_0)(1 - \cos\omega\tau)\right]$ is obtained. Here E_1 and E_2 denote chance quantities and $\overline{E_1} = \overline{E_2} = 0$ and $\overline{E_1^2} = \overline{E_2^2} = \overline{V^2}/d^2$ are assumed to apply. d denotes the path to be covered by the electron (thickness of the resonator) and $\overline{V^2}$ denotes the mean square of the fluctuation-voltage. The averaging is carried out over the corresponding assemblies of the identical systems. The field in the resonator is assumed to influence the movement of the electrons only to a small extent so that the terms of the order of magnitude e^2 may be taken to be sufficient. Under these circumstances $\overline{(\Delta K_\tau)^2} = e^2\overline{V^2}\left[(\sin(\omega\tau/2)/(\omega\tau/2)\right]^2$ applies. For

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On the Quantum Effects occurring on Interactions of Electrons with High Frequency Fields in Resonant Cavities.

the dispersion of velocity then $\overline{(\Delta v_\tau)^2} = \overline{(\Delta K_\tau)^2} m^{-2} v_0^{-2}$ applies. If $\omega\tau \ll 1$, then $\overline{(\Delta K_\tau)^2} = e^2\overline{V^2}$ applies. If oscillations of different frequencies exist in the resonator, $(\Delta K_\tau)^2 = e^2 \int_0^\infty \overline{|V_\omega|^2}\left[\sin(\omega\tau/2)/(\omega\tau/2)\right]^2 d\omega$, $\overline{V^2} = \int_0^\infty \overline{|V_\omega|^2} d\omega$ applies. For a slightly damping resonator with the frequency $\omega_0 = (LC)^{1/2}$ the following expression is found (proceeding from the general expression for $\overline{(\Delta K_\tau)^2}$): $\overline{(\Delta K_\tau)^2} = \frac{\pi e^2}{C\Gamma(\omega_0)}\left(\frac{\hbar\omega_0}{2} + \frac{\hbar\omega_0}{e^{\hbar\omega_0/kT} - 1}\right)\left(\frac{2}{\omega\tau}\sin\frac{\omega\tau}{2}\right)^2$ Other authors found the same results by the application of the quantum-mechanical perturbation theory, their calculations, however, are more complicated and are suited only for the range of small damping. The entire quantum-like effect in the problem of the passage of an electron through a resonator is based on the consideration of the quantum-like fluctuations of radiation in the resonator and especially of the zero oscillations with the energy $\hbar\omega/2$. (Without images)

ASSOCIATION Physical Institute "P.N.LEBEDEV" of the Academy of Sciences of the USSR and the State University GOR'KIY.

PRESENTED BY

SUBMITTED 21. 9. 1956

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Card 2/2

PA - 2053

AUTHOR: GEJLIKMAN,B.T., GINZBURG,V.L.

TITLE: In Memory of S.Z.BELEN'KIJ.

PERIODICAL: Uspekhi Fizicheskikj Nauk, 1957, Vol 61, Nr 1, pp 129-132(U.S.S.R.)
Received: 3 / 1957 Reviewed: 3 / 1957

ABSTRACT: On September 21st 1956 SEMEN ZACHAROVIC BELEN'KIJ, a well-known theoretical physicist whose reputation is mainly based on his works on cosmic rays, died at the age of 41. S.Z.BELEN'KIJ was born in Moscow on the 14.June, 1916; after his leaving examination (1931) he worked two years in an electric plant. From 1933 to 1938 he studied with great success at the physical faculty of Moscow university and worked from 1941 to 1943 at the Central Aero-Hydrodynamic Institute. He then undertook a dissertation at the Physical Institute of the Academy of Science of the USSR and became the head of one of the theoretical sectors of this institute in 1948. BELEN'KIJ wrote his first scientific work (on the scattering of X-rays) during his last university term. These works showed the author's aptitude for theoretical physical work. In 1938, as an aspirant at Moscow university, he was able to concentrate his whole attention on the problem I.E.TAMM had asked him to solve (theory of cascade showers in cosmic rays). BELEN'KIJ was able to determine the spectrum of cascade electrons and this work served as a basis for his candidates' dissertation written in 1941. (Reviewer's comment: In the USSR there are candidates'- and doctors' disserta-

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tions). In connection with the problems solved by experiments BELEN'KIJ undertook quite a series of further investigations, in which the development of the theory of cascade showers was practically completed. In 1948 his monography "Cascade processes in cosmic rays" was published. BELEN'KIJ's works on the cascade theory are of fundamental importance. Though it is true that the investigations of the cascade showers form the main part of BELEN'KIJ's entire activity, they were not his only domain of research; he also dealt with hydrodynamic problems as well as with the hydrodynamic and statistical theory of the multiple production of particles at high and superhigh energies. Recently BELEN'KIJ dealt with the nuclear cascade processes and with the phenomenological theory of the scattering of nucleons by nucleons at high energies. For his merits in solving applied problems he was awarded the Lenin order and the Stalin prize.

ASSOCIATION: Not given.
PRESENTED BY:
SUBMITTED:
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Card 2/2

AUTHOR GERSHMAN, B.N., GINZBURG, V.L., DENISOV, N.G. 53-4-4/7

TITLE The Propagation of Electromagnetic Waves in a Plasma (in the Ionosphere). (Rasprostraneniye elektromagnitnykh voln v plasme (ionosfere) -Russian).

PERIODICAL Uspekhi Fiz. Nauk, 1957, Vol 61, Nr 4, pp 561-612 (U.S.S.R.)

Received 6/1957 Reviewed 7/1957

ABSTRACT Starting out from the monograph by Ya.L.Al'pert, V.L.Ginsburg, El.Feynberg "The Propagation of Radio Waves" (Raspostraneniye rediovoln - Gostekhizdat, 1953, the paper under review deals with some problems of this field which have been clarified to a certain extent since the publication of the monograph. The consideration of the heat motion of electrons in a homogeneous medium in the magnetic field leads to the ocurrence of plasma waves, the consideration of the heat motion of ions, on the other hand, results in low-frequency magnetohydrodynamic and quasi-acoustic waves, both with dispersion. In inhomogeneous media it is possible that we have cases where the approximation of geometrical optics is no more permissible and where an interaction of waves takes place which would be independent in the homogeneous or quasi-homogeneous case. This is the case in the absence of a magnetic field at vertical incidence in the proximity of the reflection point and at oblique incidence in the proximity of the point $(\omega) = 0$, at the existence of a magnetic field at a small angle between the wave normal and the magnetic field (multiplication of the reflected radio signals), and at the beginning of the layer where the concentration of the electrons still is small. For the latter case the paper under review computes the boundary polarization of the short waves which leave the ionosphere for a certain model of the ionosphere, but it is unable to offer any new information about the ionosphere.

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GINZBURG, V.L.

53-2-2/9

AUTHOR: GINZBURG, V.L.

TITLE: The Origin of Cosmic Radiation. (Proiskhozhdeniye kosmicheskikh luchey, Russian)

PERIODICAL: Uspekhi Fiz.Nauk, 1957, Vol 62, Nr 2, pp 37-98 (U.S.S.R.)

ABSTRACT: The theory of the origin of cosmic radiation as expounded in the present paper is based upon radioastronomic and, of course, also on other experimental data. However, the present paper by no means claims to be complete either in a historical respect or with respect to experimental data. The paper is arranged as follows:

1.) The primary cosmic rays near the earth.
2.) The nature of the bremsstrahlung of cosmic radiation and the distribution of cosmic radiation in the galaxy.
3.) The motion of cosmic particles in the interstellar medium.
4.) The supernovae and the novae as sources of cosmic radiation.

Summarizing it may be said that the assumption concerning the acceleration of cosmic particles by explosions of supernovae is permitted within the framework of existing knowledge and sufficient in order to explain all known facts. It stands to reason, however, that there is as yet no guarantee that the supernovae and novae furnish the entire energy. There is further no proof against the existence of any other sources of energy or against an additional acceleration of particles in the inter-

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AUTHOR GINZBURG, V.L. 53-1a-7/18

TITLE ~~The Use of Artificial~~ Satellites for the Purpose of the Verification of the General Relativity
(Ispol'zovaniye iskusstvennykh sputnikov zemli dlya proverki obshchey teorii otnositel'nosti. Russian)

PERIODICAL Uspekhi Fiz. Nauk, 1957, Vol 63, Nr 1a, pp 119 - 122 (U.S.S.R.)

ABSTRACT The author at first gives a short survey of the present stage of the problem of the experimental verification of the general relativity. The perihelion displacement, the gravitational displacement of the spectral lines, and the deflection of light rays by a field of gravitation are discussed in short. The effects predicted by the theory were observed, but in spite of this additional confirmations of the theory would be desirable. The astronomical methods used up to now have not yet been fully exploited. New ways, however, have to be found which permit a more rapid and more exact verification. Some possibilities in this direction are offered by making use of artificial satellites.

The perigee of an artificial satellite will be displaced just like the perihelion of the planets. The displacement of the perigee is, however, considerably greater than even is the case of the planet Mercury, and attains values of about 1500 " per century for satellites near the earth. This effect increases the nearer the satellite is to the earth.

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The Use of Artificial Satellites for the Purpose of the Verification of the General Relativity

The orbit of such earth-near satellites can be determined far more accurately than the orbit elements of the planet Mercury and the relativistic effect can apparently be observed without difficulties. On the other hand, however, the orbit of the satellite, even if the relativistic effects are neglected entirely, is not exactly elliptical because the air resistance in the ionosphere, the nonspherical distribution of the masses on the earth, and perturbation by other celestial bodies, especially the moon, act upon the motion of the satellite. Perturbation by the moon can easily be taken into account, but not the other influences mentioned here. It is not yet possible to say whether the orbit of an artificial satellite may, for the purpose of verifying the relativistic effects, be predetermined with sufficient exactitude. V.L. GINZBURG, however, has no doubt as to the existence of such a possibility and also points out an effect of the general relativity which, in principle, may be observed by studying the orbit of the satellite. An additional perihelion displacement of the satellite and the motion of the node of the satellite's orbit is concerned, which may be caused by the revolution of the earth. This very interesting effect of the general relativity attains 50 " during a century for artificial satellites and

The Use of Artificial Satellite for the Purpose of the Verfication of the General Relativity

is therefore of the same order of magnitude as the entire relativistic effect in the case of the planet Mercury. This revolution effect, with a sufficiently high accuracy of measurement, could be separated from the total effect. The artificial satellite may also be used for measuring the shifting of the frequencies within the radar domain, which are due to gravitation. Within the domain of visible frequencies such observations are not yet possible, and in the case of satellites near the earth ($h \sim 800$ km) not even in the radar domain. For satellites near the earth even the quadratic Doppler effect is greater than the shifting of frequency due to gravitation, and this, of course, applies to a higher extent to the linear Doppler effect. Therefore satellites are necessary for the purpose of the verification of frequency shifts due to gravitation, which must be sufficiently far from the earth ($h \gtrsim r_E$). Perhaps, however, this will also be possible for satellites which are nearer to the earth.

Thus, the use of artificial satellites offer very attractive possibilities for a further examination of the general relativity. (No illustrations).

GINZBURG, V.L.

53-1a-9/18

AUTHOR VERNOV, S.N., GINZBURG, V.L., KURNOSOVA, L.V., RAZORENOV, L.A., FRADKIN, M.I.

TITLE The Investigation of the Composition of Primary Cosmic Radiation (Issledovaniye sostava pervichnogo kosmicheskogo izlucheniya. Russian)

PERIODICAL Uspekhi Fiz. Nauk, 1957, Vol 63, Nr 1a, pp 131 - Nr 1b, pp 148 (U.S.S.R.)

ABSTRACT According to the data available at present, cosmic radiation consists of protons, α-particles and, to a far less extent, of heavy nuclei. The distribution of the nuclei with $Z > 2$ has as yet not been investigated sufficiently well and also other problems are still to be solved. Rockets are not suited for such measurements because their time of flight outside the atmosphere is too short. By means of artificial earth satellites, however, the necessary statistical material for the investigation of rarely occurring heavy nuclei can be obtained. One of the most important problems concerns the numerical ratio between the currents of the light nuclei Li, Be, B and the nuclei C, N, O, F. By experimental determination of this ratio the various theories concerning the creation of cosmic radiation can be confirmed or rejected, If the particles of the cosmic radiation in the clouds of the supernovae are accelerated, a value $\geq 0{,}1$ is obtained for the ratio (Li, Be, B) / (C, N, O, F). In the case of this theory the ratio can also be somewhat higher, but never lower than 0,1. The data at present obtained for this ratio contradict each other. The problem whether or not nuclei with $Z > 30$ exist in cos-

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The Investigation of the Composition of Primary Cosmic Radiation

mic radiation can also be solved by means of artificial earth satellites. The existence of such nuclei in cosmic radiation would, on account of its large interaction cross section and the short range in the interstellar space, indicate an exceptionally large amount of heavy elements existing in the sources of cosmic radiation.

The experimental data on the composition of primary radiation: The results of the experiments carried out in 1952 - 1953 have already been published in form of a collection of articles. The respective results obtained within the last years have been compiled in two tables. The importance of the geographical location of the place of observation in the case of equal geomagnetic latitude is pointed out. From the point of view of determining the energy spectrum of the various nuclear groups in primary cosmic radiation, with the help of artificial earth satellites afford great possibilities, because in this way the intensity of the fluxes of the particles with various energies (even at different widths) can be determined by means of the same devices. This, naturally, will considerably increase the reliability of the data obtained concerning the energy spectrum of the primary nuclei. One of the most interesting problems of primary cosmic radiation is the determination of

The Investigation of the Composition of Primary Cosmic Radiation

the amount of the nuclei of the group Li, Be, B. 53-1a-9/18

The experimental method for the study of the charge spectrum of nuclei in primary cosmic radiation. Such methods are of advantage as do not discriminate the particles with respect to their charge and mass. The use of particle counters in the case of which, on the occasion of the passage of a particle, the produced pulse depends upon the charge of the particle, forms part of this method. The application of such devices to an artificial earth satellite is, besides, of advantage in-so-far as the measured data can be telegraphed to the earth. The disadvantages of methods which are based upon the ionization of a medium by rapidly charged particles, are enumerated. The CHEREKOV counter is free from such disadvantages. The conditions to be fulfilled when measuring by this method, are enumerated. The apparatus is disdussed on the basis of a drawing. During the time of observation of one week about 1000 nuclei with $Z \geqslant 6$ cm, 7000 α-particles and a corresponding number of Li-, Be- and B-nuclei can be registered. For the experiments it is intended to register the differential spectrum of the nuclei with respect to Z in the interval from the α-particle up to oxygen. Such a method is realizeable only if the device is able to solve every peak belonging to the various values of Z. The use of artificial satellites offers new possi-

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The Investigation of the Composition of Primary Cosmic Radiation

bilities for the investigation of the primary cosmic radiation, viz. measuring of the primary proton flux, explaining of the part played by the "albedo" of the atmosphere of the earth, the determination of the lower limit of the electron-positron components, the study of the interaction of the primary particles with matter and the variations with respect to time of intensity. (With 7 illustrations and 4 tables).

ASSOCIATION Not given
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SUBMITTED
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Card 4/4

GINZBURG, V.L., VERNOV, S.N., KURNOSOVA, L.V., RAZORENOV, L.A., FRADKIN, M.I.

"Investigation of the Composition in Primary Cosmic Rays," Uspekhi Fizicheskikh Nauk, Vol. 63, No. 1-2, p. 190, September 1957.

SO: JPRS Report No. 187

GINZBURG, V.L.

"The Use of Artificial Earth Satellites for the Purpose of Proving General Relativity Theory," Uspekhi Fizicheskikh Nauk, Vol. 63, No. 1-2, p. 175, September 1957.

SO: JPRS Report No. 187

GINZBURG, V.L.

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PHASE I BOOK EXPLOITATION SOV/5494

Vasil'yev, Mikhail Vasil'yevich, and Sergey Zakharovich Gushchev

Reportazh iz XXI veka; my zapisali rasskazy dvadtsati devyati sovetskikh uchenykh o nauke i tekhnike budushchego (Reports From the Twenty-First Century; Stories of Twenty-Nine Soviet Scientists on Science and Engineering of the Future) [Moscow] Izd-vo Sovetskaya Rossiya, 1958. 243 p. 50,000 copies printed.

Ed.: V. A. Golubkova; Tech. Ed.: G. I. Kleyeva.

PURPOSE : This book is intended for the general reader.

COVERAGE: The book contains 27 articles (told reporters by Soviet scientists) dealing with probable future progress in physics, chemistry, electricity, metallurgy, engineering, mining, medicine, biology, agriculture, zoology, transportation, exploration of space, and photography. Attention is given to automation, automatic underground gasification of coal, use of new metals, modernization of oil fields, atomic electric stations, production of metal parts by the process of explosion, explosions

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Reports From the Twenty-First (Cont.) SOV/5494

in dam construction, cancer, internal longevity reserves, machine diagnoses of illnesses, surgery vs. treatment by ultrasonic vibrations, mechanical heart substitutes, human body banks, "medical engineering," enriched fodder, "superfertilizers", artificial snowfalls, agriculture vs. "mariculture", radiochemistry, power beam vs. wire, machines doing intellectual work, "HF automobiles" (with "radio motors"), "artificial sun" (electromagnetic rays focused above a city which cause heated molecules to shine), future ocean ships, "railway dreadnoughts", Moscow of the future, moving pavements, wheelless and driverless automobiles, electric cameras, the industrialization of Siberia, use of underground heat, climate control, living on the moon, antimatter, and photon jet. Names of the interviewed scientists are given. There are no references.

TABLE OF CONTENTS:

INTRODUCTION

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Reports From the Twenty-First (Cont.) SOV/5494

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THE AGE OF RADIO

GINZBURG, V.L.

24(7) PHASE I BOOK EXPLOITATION SOV/1700

L'vov. Universitet

Materialy X Vsesoyuznogo soveshchaniya po spektroskopii, 1956. t. II: Atomnaya spektroskopiya (Materials of the 10th All-Union Conference on Spectroscopy, 1956. Vol 2: Atomic Spectroscopy) [L'vov] Izd-vo L'vovskogo univ., 1958. 568 p. (Series: Its: Fizicheskiy sbornik, vyp.4(9)) 3,000 copies printed.

Additional Sponsoring Agency: Akademiya nauk SSSR. Komissiya po spektroskopii.

Editorial Board: G.S. Landsberg, Academician, (Resp. Ed.); B.S. Neporent, Doctor of Physical and Mathematical Sciences; I.L. Fabelinskiy, Doctor of Physical and Mathematical Sciences; V.A. Fabrikant, Doctor of Physical and Mathematical Sciences; V.G. Koritskiy, Candidate of Technical Sciences; S.M. Rayskiy, Candidate of Physical and Technical Sciences; L.K. Klimovskaya, Candidate of Physical and Mathematical Sciences; V.S. Miliyanchuk (Deceased), Doctor of Physical and Mathematical Sciences; A.Ye. Glauberman, Doctor of Physical and Mathematical Sciences; Ed.: S.L. Gazer; Tech. Ed.: T.V. Saranyuk.

PURPOSE: This book is intended for scientists and researchers in the field of spectroscopy, as well as for technical personnel using spectrum analysis in various industries.

COVERAGE: This volume contains 177 scientific and technical studies of atomic spectrography presented at the 10th All-Union Conference on Spectroscopy in 1956. The studies were carried out by members of scientific and technical institutes and include extensive bibliographies of Soviet and other sources. The studies cover many phases of spectroscopy: spectra of rare earths, electromagnetic radiation, physicochemical methods for controlling uranium production, physics and technology of gas discharge, optics and spectroscopy, abnormal dispersion in metal vapors, spectroscopy and the combustion theory, spectrum analysis of ores and minerals, photographic methods for quantitative spectrum analysis of metals and alloys, spectral determination of the hydrogen content of metals by means of isotopes, tables, and atlases of spectral lines, spark spectrographic analysis, statistical study of variation in the parameters of calibration curves, determination of traces of metals, spectrum analysis in metallurgy, thermochemistry in metallurgy, and principles and practice of spectrochemical analysis.

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Materials of the 10th All-Union Conference (Cont.) SOV/1700

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GINZBURG, V. L.

"The Role of Surface Energies in Superconductivity,"

"The Theory of Superfluidity," with L. P. Pitayevskiy

reports submitted but not presented at the Kamerlingh Onnes Conference, Leiden, Conf. on Low Temperature Physics, Leiden, 23-28 Jun 58.

Lebedev Physical Inst, AS USSR

GINZBURG, V.L.

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 16, p 136 (USSR) 30V/81-59-16-56920

AUTHORS: Belokrinitskaya, Ye.Ye., Borisenko, V.V., Vitushkina, I.N., Gerasimova, M.G., Ginsburg, V.L., Gramenitskiy, I.N., Livshits, D.M., Kryzhnaya, V.F.

TITLE: The Spectral Analysis of Cobalt for Metallic Impurities With the Use of Cast Electrodes

PERIODICAL: V sb.: Materialy 1-go Ural'skogo soveshchaniya po spektroskopii. 1956. Sverdlovsk, Metallurgizdat, 1958. pp 59-61

ABSTRACT: The samples are cast into chill molds in the forms of rods of 7 mm in diameter and 40 mm long. The butts of the rods are filed to a plane and treated by a HCl solution (1 : 1) for cleaning from Fe. The spectra are excited in an a-c arc with an upper carbon electrode and photographed with an average quartz spectrograph. The standards are prepared on the basis of pure cobalt, in which the concentration of admixtures is determined chemically. Ni, Fe, Si, Mn, Al, Cu, As and Sb can be determined with a mean error of 5 - 15%.

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G. Kibisov.

GINZBURG, V.L.; ZHELEZNYAKOV, V.V.

Absorption and radiation of electromagnetic waves by a magnetically active plasma. Izv.vys.ucheb.zav.; radiofiz. 1 no.2:59-65 '58. (MIRA 11:11)

1. Issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete.

(Radio waves)

06457
SOV/141-1-5-6-1/28

AUTHOR: Ginzburg, V.L.

TITLE: Radio-astronomy and the Origin of Cosmic Rays

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1958 Vol 1, Nr 5-6, pp 3 - 8 (USSR)

ABSTRACT: This is a review paper which was first read during the symposium on radio-astronomy at the conference of the International Astronomical Union, which took place in Paris, France, in August, 1958.
It is suggested that the main part of non-thermal cosmic radio emission has a synchrotron nature and is not generated in stellar atmospheres. The second problem considered is that of the mechanism of acceleration in the envelopes of supernovae and novae and certain other regions of interstellar space. There seems to be no doubt of the effectiveness of the statistical mechanism in envelopes. However, a number of important details must still be filled in. Korchak et al (Ref 15) have suggested that the statistical acceleration of nuclei with $Z > 2$ may become very effective compared with the acceleration of protons (as far as conditions of injection are concerned). This is important

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Radio-astronomy and the Origin of Cosmic Rays

in connection with the problem of the chemical composition of cosmic rays (Ref 7). The third problem discussed is that of the origin of electrons giving the general galactic radio emission. It is suggested that the material available at present cannot lead to a definite conclusion as to whether the electrons are primary or secondary. There are 20 references, of which 10 are Soviet, 8 English and 2 German.

ASSOCIATION: Fizicheskiy institut im. P.N. Lebedeva AN SSSR (Physics Institute imeni P.N. Lebedev of the Ac.Sc., USSR) and Gor'kovskiy gosudarstvennyy universitet (Gor'kiy State University)

SUBMITTED: June 26, 1958

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06458
SOV/141-1-5-6-2/28

AUTHORS: Ginzburg, V.L. and Zheleznyakov, V.V.

TITLE: On the Mechanisms of Sporadic Solar Radio Emission

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1958, Vol 1, Nr 5-6, pp 9 - 16 (USSR)

ABSTRACT: This paper was read at the symposium on radio-astronomy during the conference of the International Astronomical Union, which took place in August, 1958 in Moscow. Possible coherent and incoherent mechanisms of sporadic solar radio emission in an isotropic and magneto-active coronal plasma are considered. The problem has been considered by the present authors in Refs 1-3 and the present paper is a summary of the results obtained. types II and III bursts, which are an important part of sporadic solar radio emission, are unpolarized or only weakly polarized. It is suggested that the magnetic field in the region where these bursts are produced is very low (possibly less than 1 Oe). Under these conditions, the plasma may be considered as isotropic in the first approximation. The presence of frequency drift and other properties of types II and III bursts suggests that they are due to particle streams. In an

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On the Mechanisms of Sporadic Solar Radio Emission

isotropic plasma these streams excite only longitudinal waves. The existence in the plasma wave of a longitudinal electric field leads to an instability of the particle stream in the plasma and, as a result, coherent emission of plasma waves takes place. Incoherent and coherent emission of plasma waves takes place simultaneously but they have different frequency and angular spectra and depend on the parameters of the problem in a different way. It is argued that noncoherent emission of plasma waves by particle streams can, in principle, explain the appearance of type III bursts. It is, however, possible that when reabsorption is taken into account in detail, this mechanism may turn out to be unsuitable. Moreover, type II bursts cannot be connected with incoherent emission by particle streams since the particle velocity is not suitable. Coherent emission of plasma waves by particle streams can explain the properties of type III bursts and very probably also type II bursts. Since type I bursts are polarized, the analysis can only be

On the Mechanisms of Sporadic Solar Radio Emission

carried out by taking the magnetic field into account. In this case, the incoherent emission by particle streams may be divided into Cherenkov radiation and synchrotron radiation. If reabsorption is taken into account it turns out that types I, II and III bursts cannot be associated with synchrotron radiation of electrons. Cherenkov effect cannot explain these bursts either. A charged particle stream moving in a magneto-active plasma is in general unstable and this leads to the coherent emission of ordinary and extraordinary waves. If the magnetic field is weak this coherent emission is practically identical with the coherent emission of plasma waves. In a stronger field (greater than 1 Oe), the coherent radiation leaves the corona predominantly in the form of ordinary waves and hence it can be associated with type I bursts. In order to produce the observed type I bursts, the oscillations in the corona must have an amplitude of about 10 V/cm. How such oscillations are excited is not clear.

06458

SOV/141-1-5-6-2/28

On the Mechanisms of Sporadic Solar Radio Emission

There are 2 figures and 18 references, of which 4 are English and 14 Soviet.

ASSOCIATIONS: Fizicheskiy institut im. P.N. Lebedeva AN SSSR (Physics Institute im. P.N. Lebedev of the Ac.Sc., Gor'kovskiy gosudarstvennyy universitet (Gor'kiy State University)

SUBMITTED: June 7, 1958

Card 4/4

GINZBURG, V. L.

25-2-2/43

AUTHOR: Ginzburg, V.L., Corresponding Member, Academy of Sciences, USSR

TITLE: Artificial Satellites and the Theory of Relativity (Iskusstvennyye sputniki i teoriya otnositel'nosti)

PERIODICAL: Nauka i Zhizn', 1958, # 2, p 7-12 (USSR)

ABSTRACT: Vitaliy Lazarevich Ginzburg, Corresponding Member of the USSR Academy of Sciences, gave a lecture recently on the use of artificial satellites for the checking of Einstein's general theory of relativity. This, along with other problems concerning cosmic space, the atmosphere of the earth, etc., will be solved with the help of artificial satellites.

The author deals with three effects of the general theory of relativity which can be observed in our solar system:

1. Deviations in the movements of planets;
2. the deflection of rays of light, and
3. gravitational change in the frequency of spectral lines.

In general, the above aspects of the theory of relativity are borne out by the usual methods of astronomical observation, however, there are still inaccuracies in measurement.

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Artificial Satellites and the Theory of Relativity 25-2-2/43

There are five sketches.

ASSOCIATION: Akademiya nauk SSSR (Academy of Sciences of the USSR)

AVAILABLE: Library of Congress

Card 2/2

AUTHOR: Ginzburg, V. L. SOV/126-6-6-4/25

TITLE: Role of Surface Energy in Superconductivity (Rol' poverkhnostnoy energii v yavlenii sverkhprovodimosti)

PERIODICAL: Fizika metallov i metallovedeniye, 1958, Vol 6, Nr 6, pp 994-998 (USSR)

ABSTRACT: The author deals with properties of massive samples. At $H = 0$ and $H \ll H_{кр}$, $\psi^2 = \psi_\infty^2 = \text{const.}$, and Londons' equation is obeyed. Here, H is the magnetic field, $H_{кр}$ is the critical field for a massive sample, ψ's are electron wave-functions. At higher fields spatial non-uniformity of ψ becomes important and this leads to the appearance of additional energy with density:

$$\frac{h^2}{2m}(\nabla\psi)^2 = \frac{H_{кр}^2}{4\pi\varkappa^2}(\nabla\psi_0)^2$$

where $\psi_0 = \psi/\psi_\infty$, h is Planck's constant, m is the

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Role of Surface Energy in Superconductivity

electron mass, δ_o is the depth of penetration of a weak magnetic field and $\kappa = \sqrt{2}\, eH_{km}\, \delta_o^2/hc$, e is the electron charge, c is the velocity of light. This energy is called surface energy in superconductivity. Its appearance is always connected with a boundary of a superconducting phase with either vacuum or normal phase. No other surface energy need be considered in the theory of superconductivity. For a massive metal, this surface energy density is necessary to find the value of σ_{nS}, which is the surface energy of a boundary between superconducting and normal phases. The value of σ_{nS} is required in determination of the limits of supercooling and superheating (i.e. fields $H_{\kappa 1}$ and $H_{\kappa 2}$) and in determination of the dependence of the depth of penetration δ_H on the magnetic field intensity. The author discusses in detail calculation of $H_{\kappa 1}$ and $H_{\kappa 2}$ as well as δ_H. He compares the calculated values with experimental data and concludes that the theory does not contradict the experiment. Further studies of the effect of surface energy in superconductivity require fuller empirical data, The

Role of Surface Energy in Superconductivity SOV/126-6-6-4/25

paper is entirely theoretical. There are 2 tables and 18 references, 9 of which are Soviet, 8 English and 1 German.

ASSOCIATION: Fizicheskiy institut imeni P.N. Lebedeva AN SSSR (Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR)

SUBMITTED: June 28, 1958.

Card 3/3

SOV-25-58-7-53/56

AUTHOR: Ginzburg, V.L., Corresponding Member of the USSR Academy of Sciences

TITLE: Answers to Questions (Otvety na voprosy). Is "Time Travel" Possible (Vozmozhno li puteshestviye vo vremeni)

PERIODICAL: Nauka i zhizn', 1958, Nr 7, pp 77 - 78 (USSR)

ABSTRACT: Referring to a preceding article by the author on the Einstein theory of relativity, one reader asks whether "time travels" are possible. The author admits the theoretical possibility, but positively denies its practical realization.

1. Time--Theory

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SOV-26-58-8-1/51

AUTHORS: Ginzburg, V.L., Associate Member of the USSR Academy of Sciences; Fradkin, M.I., Candidate of Physico-Mathematical Sciences

TITLE: The Origin of Cosmic Rays (Proiskhozhdeniye kosmicheskikh luchey)

PERIODICAL: Priroda, 1958, Nr 8, pp 3-12 (USSR)

ABSTRACT: Cosmic rays were discovered more than 40 years ago, but radio-astronomical data permitted conclusions on their origin only in 1950-1953. Primary cosmic rays have an energy of 10^9-10^{10} ev with a small percentage reaching 10^{15}-10^{18} ev. The primary rays collide with the molecules of the atmosphere and form the secondary rays which consist of mesons, electrons, and photons. The primary rays can be observed at altitudes of 20 - 30 km by means of balloons, at 100 km by rockets, and at higher altitudes by artificial satellites. The intensity of the rays depends on the geomagnetic latitude. This latitude effect indicates that the cosmic rays consist of charged particles. The distribution of the particles according to energies (the energy spectrum) shows that the higher the energy, the lower the number of particles (Figure 1). The principal part of the primary rays is made up of protons.

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Their intensity for particles with an energy higher than $1.4 \cdot 10^9$ ev is equal to 1 proton per cm^2/sec. In the primary cosmic rays are also heavier particles, like the nuclei of helium, carbon, oxygen, silicon, iron, etc. The relative composition of the primary rays is given in Table 1. Electrons, positrons, and photons, could not yet be detected in the primary rays. The place of origin of the cosmic radiation is investigated by means of radioastronomy. The radiation of the Galaxy in the radio wavelengths is a general radiation and radiation of single sources. These cosmic radic waves are due to the radiation of relativistic electrons which move in interstellar magnetic fields. In interstellar space, magnetic fields are present with 10^{-15}-10^{-6} oersted. Electrons which move with an energy of 10^8-10^9 ev in this field emit a radiation in the radio wave length. The power of the magnetic field changes with the activity of the sun spots. The emitted radiation decreases the energy of the electrons. The energy of the particles with high energy changes to a greater degree than that of particles with low energy. The Galaxy is surrounded by a "corona" which emits radio waves. This may be observed in the nebula M31 in the Andromeda constellation which is in many respects similar to our own Ga-

laxy. The radio waves are emitted by an area which is considerably greater than the visible area (Figure 3) and has the form of a spheroid, whereas the nebula is optically a flat disc. In our Galaxy, the area covered by cosmic rays has a radius of 50,000 light years. The space is filled by interstellar gas with a concentration of 0.01 - 0.03 particles per cm^3. In some "clouds" it reaches a concentration of 10 particles per cm^3. In collisions with the gas, the protons lose energy and form mesons. The fission of heavy nuclei leads to the formation of Li, Be, and B nuclei, the concentration of which near the earth's surface supplies information on the number of collisions at higher altitudes. The high energy of the cosmic particles is explained by the statistic mechanism. If heavy particles with high speed collide with light particles, the latter are accelerated by a transition of the energy from the heavy particles to the light ones. The single radio sources in the universe could be identified by galaxies or accumulations of galaxies. The radiations of these sources are caused by relativistic charged particles moving in the magnetic fields of the nebulae. The nebulae are the residues of super-novae. The energy of the electrons in their magnetic fields is 10^{45}-10^{48} erg. Every 30 years, a

super-nova arises in the Galaxy. The power of the electrons generated then reaches 10^{36}-10^{39} erg/sec. The energy lost by the electrons for the emission of radiowaves is 10^{38} erg/sec. It can be seen that the energy for radio emission is supplied by the super-nova. It is shown that the super-nova is also the source of protons and nuclei in the cosmic rays. The novae, one hundred of which arise every year, must also be considered as a source for cosmic rays. The novae and super-novae are accumulated principally near the center of the Galaxy. The cosmic rays are scattered by the chaotically distributed magnetic fields, so that they reach the earth from all sides. It is possible that a part of the cosmic rays, especially with an energy of more than 10^{15} ev, is of metagalactic origin.
There are 2 graphs, 2 tables, 1 photo and 1 Soviet reference.

1. Cosmic rays--Sources 2. Cosmic rays--Analysis 3. Cosmic rays --Properties 4. Radio astronomy--Applications

Card 4/4

GINSBURG, V. L. (Acad. Sci. USSR)

"Is Flight into Time Practicable?" Journal of Scientific and Industrial Research, Vol. 17 A, P. 352, 1958 Council of Scientific and Industrial Research, India.

GINZBURG, V.L.

Artificial satellites and the theory of relativity. Nauka i zhizn' 25 no.2:7-12,16 F '58. (MIRA 11:3)

1. Chlen-korrespondent AN SSSR.
(Artificial satellites) (Relativity (Physics))

GINZBURG, V. L.

56-1-18/56

AUTHOR: Ginzburg, V. L.

TITLE: On the Annihilation and the Occurrence of Superconductivity in a Magnetic Field (O razruzhenii i vozniknovenii sverkhprovodimosti v magnitnom pole).

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1956, Vol. 34, Nr 1, pp. 113-125 (USSR).

ABSTRACT: The present paper investigates the transitions from the state of superconductivity into the normally conducting state and vice versa in the presence of an external magnetic field. At the outset the author deals with the general thermodynamic relations of superconductors. Among other formulae are given for the density of the free energy of the superconductor and a condition is given for the minimum of free energy. In a few pure metals the relation $\kappa \ll 1$ (for aluminum for example $\kappa = 0{,}05$ at $T \to 0$). If such conditions prevail, it is possible to let $\kappa = 0$ for the sake of simplicity, which is just the case in the investigation of the annihilation of the superconductivity of samples with small dimensions. The author here investigates this case at full length, tracing the computations step by step. The general investigation of the problem of

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On the Annihilation and the Occurrence of Superconductivity in a Magnetic Field. 56-1-18/56

original ... strength in the range of $\kappa L/\delta_0 \sim 1$ proves to be very complicated and for this reason the author limits himself to the boundary case of $\kappa L/\delta_0 \gg 1$. In actual experiment the overheating of the superconducting phase can be observed only with difficulty in massive samples, whereas with samples of medium dimensions this may be different. The assumption of an overheating does not contradict theory. On the strength of the results of this paper a further investigation of the problem of the boundaries of the domains of overheating and undercooling should be of interest, in particular in samples of medium dimensions. There are 6 figures and 16 references, 9 of which are Slavic.

ASSOCIATION: Physical Institute imeni P. N. Lebedev AN USSR (Fizicheskiy institut imeni P. N. Lebedeva Akademii nauk SSSR).

SUBMITTED: July 11, 1957

AVAILABLE: Library of Congress

Card 2/2

GINZBURG V L

56-1-46/56

On the Theory of the Rayleigh Dispersion of Light in Liquids 56-1-46/56

models for the range of radiofrequencies. As example the author investigates solid hollow, nonmetallic spherules having dispersing dipoles in their centers. The totality of these spherules will at any density of them disperse the radiowaves due to the fluctuations of the orientation of the dipoles. This dispersion even takes place in the complete absence or under neglect of the dispersion connected with the inhomogeneous spatial distribution of the spherules and with other factors. Under real conditions the anti - symmetrical part of the dispersion in the case of weak absorption is very small. In Rytov's papers (references 1, 4) factually only part of the dispersion is investigated and this still more restricts the applicability of the formulae obtained by Rytov. There are 5 references, all of which are Slavic.

ASSOCIATION: Physical Institute imeni P. N. Lebedev AN USSR (Fizicheskiy institut imeni P. N. Lebedeva Akademii nauk SSSR)

SUBMITTED: October 19, 1957

AVAILABLE: Library of Congress

Card 2/2

AUTHORS: Ginzburg, V. L., Pitayevskiy, L. P. SOV/56-34-5-26/61

TITLE: On the Theory of Superfluidity (K teorii sverkhtekucheati)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 5, pp. 1240-1245 (USSR)

ABSTRACT: This paper deals with the properties of helium near the λ-point. In the problem investigated in this paper the expansion parameter must be correlated to the density of the superfluent part ρ_s of the liquid. ρ_s is different from zero in He II and equal to zero in He I. Taking into account the quantum character of the phenomena in liquid helium, it is natural to choose as such a parameter the complex function $\psi(x,y,z) = \eta e^{i\varphi}$ which plays the rôle of an "effective wave function" of the superfluent part of the liquid. This paper deals only with those stable problems the normal part of which is assumed to be at rest. The velocity $\vec{v}_s$ of the superfluent part is zero: $v_s = 0$. For this case the thermodynamic potential F is given explicitly. The total thermodynamic potential is given as

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On the Theory of Superfluidity SOV/56-34-5-26/61

$\int F dV$ with $F = (h^2/2m^*)|\nabla\psi|^2 + F_o(p,T|\psi|^2)$. By variation with respect to ψ^* and ψ (considering the boundary condition $\psi = 0$) an equation that is an analogon of the equation used in the phenomenological theory of superconduction is obtained. Finally the equation $-(h^2/2m)\Delta\psi + (\partial F_o/\partial|\psi|^2)\psi = 0$ is obtained. To this equation belongs also the boundary condition $\psi = 0$ which is to be used also for the free surface of helium. The thermodynamic potential F_o is expanded (as in the ordinary theory of phase transitions) into powers of $|\psi|^2$: $F_o = F_I(p,T) - \alpha|\psi|^2 + (\beta/2)|\psi|^4$.

The theory used in this paper can be used only in the immediate neighborhood of the λ-point. The second section of this paper deals with some special problems. First the authors investigate the properties of helium near a solid wall. In this case an additional surface energy appears. Then a helium film, i.e. a helium layer with the density d, is investigated. The temperature of the λ-transition in a helium film is lower than in great masses of helium. Finally a vortex in He II is investigated. There are 1 figure and [illegible] references, 7 of which are Soviet.

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On the Theory of Superfluidity SOV/ 56-34-5-26/61

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR
(Physics Institute imeni P. N. Lebedev, AS USSR)
Institut Fizicheskikh problem Akademii nauk SSSR
(Institute for Problems on Physics, AS USSR)

SUBMITTED: December 10, 1957

1. Helium (Liquid)--Properties 2. Helium (Liquid)--Mathematical analysis 3. Low temperature research

Card 3/3

AUTHOR: Ginzburg, V. L. SOV/56-34-6-28/51

TITLE: On the Electromagnetic Waves in Isotropic and Crystalline Medin With Respect to the Spatial Dispersion of the Dielectric Permeability (Ob elektromagnitnykh volnakh v izotropnykh i kristallicheskikh sredakh pri uchete prostranstvennoy dispersii dielektricheskoy pronitsayemosti)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 6, pp. 1593-1604 (USSR)

ABSTRACT: The influence of the spatial dispersion may be taken into account by the following expression for the relation between $\vec{D}$ and $\vec{E}$:

$$D_i = \varepsilon_{ik}(\omega)\, E_k + \gamma_{ik\ell}(\omega)\, \frac{\partial E_k}{\partial x_\ell} + \delta_{ik\ell m}(\omega)\, \frac{\partial^2 E_k}{\partial x_\ell \partial x_m}$$

The term with $\gamma_{ik\ell}$, which corresponds to the optical activity, is neglected. The author investigates plane waves and writes the above given equation in the form $D_i = \hat{\varepsilon}_{ik} E_k$, $\hat{\varepsilon}_{ik} = \varepsilon_{ik} - \alpha_{ik\ell m} s_\ell s_m \hat{n}^2$, $\alpha_{ik\ell m} = (\omega/c)^2 \delta_{ik\ell m}$. s denotes the unit

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On the Electromagnetic Waves in Isotropic and Crystalline Media With Respect to the Spatial Dispersion of the Dielectric Permeability

vector of the normal to the wave, $\hat{n} = n - i\varkappa$ - the complex refraction index. The above given expansions not always are sufficient, sometimes a different expression has to be used. In an isotropic medium the tensors $\hat{\varepsilon}_{ik}$, ε_{ik}, $\alpha_{ik\ell m}$, and $\beta_{ik\ell m}$ can be regarded as scalars and the above mentioned equation is written down in the form $\vec{D} = \hat{\varepsilon}\vec{E}$, $\hat{\varepsilon} = \varepsilon - \alpha\hat{n}^2$. This equation and its solution is discussed for transverse and for longitudinal waves. The possibility of the observation of the new wave (which corresponds to a new radical for $\hat{n}^2$ caused by the account of the spatial dispersion) depends in a remarkable degree on the intensity of the absorption. In the following part of this paper the tensor a is specialized for media of various crystalline types. The phenomena in the media with various crystal symmetry are discussed in detail. The last part of this paper gives some remarks on the collective energy losses and on the Vavilov-Cherenkov effect. The new waves caused by the account of the spatial dispersion can be excited easily if the Vavilov-Cherenkov effect is used.

SOV/56-34-6-28/51

On the Electromagnetic Waves in Isotropic and Crystalline Media With Respect to the Spatial Dispersion of the Dielectric Permeability

There are 3 figures and 10 references, 8 of which are Soviet.

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

SUBMITTED: January 16, 1958

Card 3/3

21(8)
AUTHOR: Ginzburg, V. L., Fayn, V. M. SOV/56-35-3-54/61

TITLE: On the Radiation of Systems With Many Levels Which Move in a Medium With Super-Light-Velocity (Ob izluchenii sistem s mnogimi urovnyami, dvizhushchikhsya v srede so sverkhsvetovoy skorost'yu)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 3, pp 817 - 818 (USSR)

ABSTRACT: The present paper deals with interesting possibilities offered in connection with systems of many levels moving with a velocity greater than that of light. If, initially, the system was on a single level (e.g. the lowest energy level) it will be possible, in the course of time, to observe it in all those states into which it may pass over by direct or cascade-like radiation transition. Formulae are given for the degree of occupation of the levels and for the energy emitted into the unit solid angle in the unit of time. To the systems which have many levels there also belong the bunches of atoms or molecules with two suitable levels. The radiation of such bunches (which have dimensions smaller than the wave length)

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On the Radiation of Systems With Many Levels Which Move in a Medium With Super-Light-Velocity SOV/56-35-3-54/61

is coherent with and similar to the radiation of a system in a magnetic field. However, the radiation (with a velocity greater than that of light) of such bunches as well as of single atoms and molecules or of para- and ferromagnetic particles is of hardly any practical importance. However, the radiation (with a velocity greater than that of light) of electrons moving along a magnetic field is perfectly real. In this connection, a metallic slowing-down system but also a dielectric or a plasma located near the bundle can play the part of this medium. Next, some details connected with this phenomena are given. A more detailed report on this Doppler-radiation of electrons moving with a velocity greater than that of light is intended to be given at a later date. There are 9 references, 8 of which are Soviet.

ASSOCIATION: Gor'kovskiy gosudarstvennyy universitet (Gor'kiy State University)

SUBMITTED: June 30, 1958

Card 2/3

3(1)

AUTHORS: Ginzburg,V.L., and Zheleznyakov,V.V. SOV/33-35-5-3/20

TITLE: On the Possible Mechanisms of Sporadic Solar Radio Emission (Radiation in Isotropic Plasma) (O vozmozhnykh mekhanizmakh sporadicheskogo radioizlucheniya solntsa (izlucheniye v izotropnoy plazme))

PERIODICAL: Astronomicheskiy zhurnal, 1958, Vol 35, Nr 5, pp 694-712 (USSR)

ABSTRACT: The authors discuss the coherent and incoherent mechanisms of sporadic solar radio emission in isotropic coronal plasma. They show that it is impossible or improbable to combine type II bursts and type III bursts with an incoherent plasma mechanism of radio emission, while the description by coherent plasma mechanisms leads to no contradiction. Because of polarization the consideration of type I bursts related to sunspots by isotropic plasma only is senseless. In a following note the case of magnetoactive plasma shall be considered. About the contents of both notes it was partly reported on November 27, 1957 at the Radioastronomical Committee of the Astronomical Assembly of the Academy of Sciences of the USSR. It is mentioned in a footnote that, according to a remark of D.A.Frank-Kamentskiy, the question

On the Possible Mechanisms of Sporadic Solar Radio Emission (Radiation in Isotropic Plasma) SOV/33-35-5-3/20

whether the transition of plasma waves into electromagnetic waves is essential for the dispersion of plasma waves at coronal electrons is investigated by A.A.Vedenov and R.Z.Sagdeyev. There is 1 figure, and 17 references, 13 of which are Soviet, 2 American, 1 Australian, and 1 German.

ASSOCIATION: Fizicheskiy institut imeni P.N.Lebedeva Akademii nauk SSSR (Physical Institute imeni P.N.Lebedev of the AS USSR) Radiofizicheskiy institut pri Gor'kovskom universitete imeni N.I.Lobachevskogo (Radiophysical Institute at the Gor'kiy University imeni N.I.Lobachevskiy)

SUBMITTED: April 23, 1958

Card 2/2

24(5) SOV/56-35-6-28/44

AUTHORS: Ginzburg, V. L., Eydman, V. Ya.

TITLE: On the Cherenkov Radiation of Dipole Moments (O Cherenkovskom izluchenii dipol'nykh momentov)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 6, pp 1508-1512 (USSR)

ABSTRACT: Bunches of particles with dimensions sufficiently small with respect to the wave length in the medium give the same Cherenkov radiation as point particles with a corresponding charge and multipole moments. Therefore, the investigation of the Cherenkov radiation of magnetic and electric dipoles is of interest irrespective of the fact that it is only very weak for separated particles (electrons, neutrons). With respect to the question of the Cherenkov radiation of the magnetic moment, contradictory opinions are, however, found to be expressed in publications (Refs 1-6). In this connection the authors developed a calculation method, which differs somewhat from that used in earlier papers (Refs 2-4). It is first developed for the Cherenkov radiation of electric and magnetic dipoles moving in a continuous medium, and further for that of dipoles moving in channels or gaps ($\varepsilon = \mu = 1$).

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On the Cherenkov Radiation of Dipole Moments SOV/56-35-6-28/44

The case in which ϵ and μ are different from 1 is finally discussed. The authors thank L. S. Bogdankevich, A. V. Gaponov, M. A. Miller and I. M. Frank for discussions. There are 12 references, 11 of which are Soviet.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P. N. Lebedev of the Academy of Sciences, USSR) Gor'kovskiy gosudarstvennyy universitet (Gor'kiy State University)

SUBMITTED: June 27, 1958

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24(3) SOV/56-35-6-37/44

AUTHOR: Ginzburg, V. L.

TITLE: On the Nonlinear Interaction of Radiowaves Propagated in a Plasma (O nelineynom vzaimodeystvii radiovoln, rasprostranyayushchikhsya v plazme)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 6, pp 1573-1575 (USSR)

ABSTRACT: With the propagation of sufficiently strong radio waves in a plasma, especially in the terrestrial ionosphere, nonlinear phenomena (cross modulation, interaction, and also "self-action" of non-modulated radio waves) occur (Refs 1-3). As far as the author knows, only nonlinearity in dependence on the effective number ν_{eff} of collisions having a field strength $\vec{E}_1$ of a strong radio wave 1 has hitherto been investigated. In the most simple case of a non-modulated wave 1 (when it holds that $\vec{E}_1 = \vec{E}_o \cos(\omega t - \vec{k}\vec{r}) = \vec{E}_o \cos\varphi$), the condition $\omega^2 \gg \nu^2_{eff}$ is satisfied and the influence exercised by the constant magnetic field is neglected. The nonlinear effect is in that case connected in the most simple manner with the modification of

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On the Nonlinear Interaction of Radiowaves Propagated in a Plasma

electron velocity, and an expression is also written down for the corresponding variation of electric conductivity. These phenomena become a little more complicated if electron velocity distribution, modulation, etc. are taken into account, which is, however, not of essential importance for the linear effect under investigation. In an inhomogeneous isotropic plasma (and also in a homogeneous magnetically active plasma) electron concentration (unlike what is the case with an isotropic and homogeneous plasma) depends on radio wave field strength. An expression for the thereby caused variation of the radio wave 1 and of a plane wave in a magnetically active medium is written down. Variation of the electron concentration ΔN leads to a proportional variation of the dielectric constant ε'_{ik} of the magnetically active plasma. The nonlinear effect investigated is linear with respect to field 1, and the combination frequencies occurring are equal to $\omega' \pm \omega$. The effect investigated here is of the same kind as in the case of the scattering of transversal radio waves on plasma waves in an isotropic medium. The concrete influence exercised by this effect

On the Nonlinear Interaction of Radiowaves Propagated in a Plasma

upon the propagation of radio waves in the terrestrial atmosphere and in the solar corona remains to be investigated. There are 5 Soviet references.

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

SUBMITTED: August 23, 1958

SOV/53-66-2-1/9

AUTHORS: Getmantsev, G. G., Ginzburg, V. L., Shklovskiy, I. S.

TITLE: Radioastronomical Investigations With the Aid of Artificial Earth Satellites (Radioastronomicheskiye issledovaniya s pomoshch'yu iskusstvennykh sputnikov Zemli)

PERIODICAL: Uspekhi fizicheskikh nauk, 1958, Vol 66, Nr 2, pp 157-161 (USSR)

ABSTRACT: Artificial satellites are of great importance for optical- as well as for radio-astronomy; they may serve as receiving stations for near- and far ultraviolet-, X-ray- and far infrared radiation which, because of absorption in the atmosphere, does not reach the surface of the earth, as well as for the r.f.-range where absorption in the troposphere and refraction and absorption in the ionosphere act upon radiation. The authors first discuss absorption in the troposphere (especially in the $\lambda < 2$ cm range), connection with the effective temperature of the radiation source, solar and lunar radiation, the influence exercised by the ionosphere, and several problems of a general nature; discussion is based upon scientific publications mentioned

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(Refs 1-8). The conditions for a receiving apparatus for the range 10 cm $< \lambda <$ 10 m are then discussed ($T_{eff} = a\lambda^{2.8}$, intensity $I_\nu = \frac{2kT_{eff}}{2} \sim \lambda^{0.8}$; with $\lambda \sim 3$ m, T_{eff} is of the order of 10^3 degrees, at 30 cm $< \lambda <$ 100 m $T_{eff} \sim 10^6$ to 10^7 degrees, $I_\nu \cong$ const; $\lambda >$ 100 m: $T_{eff} \gtrsim 10^7$ degrees). The authors further discuss radio-receiving apparatus. For $\lambda >$ 100 m very low limiting values of the noise factor($F_n \sim 2$) are obtained for coincidence superheterodyne receiving sets. For large λ wire antennae of several 10 m length would be necessary; as this is impossible in a Sputnik, frame antennae with ferrite core are used, which can be of very small dimensions ($\ell \sim 10$ cm, weight 300 g). The axis of the frame is parallel to the metal surface of the Sputnik. Because of a Sputnik's own rotary motion also the position of the frame is modified which causes fluctuations of the intensity of reception. It is therefore necessary to know the orientation of the frame at every instant. The antenna will not receive a radiation for which it holds that $\mathcal{E}(f,H) = 0$ at the place of reception. If the magnetic terrestrial field is

neglected, it holds that

$$\varepsilon(f) = 1 - \frac{4\pi e^2 N}{m(2\pi f)^2} = 1 - 8.10^7 \frac{N}{f^2}$$

Here N is the electron concentration, f - the frequency of the radiation received. In interplanetary space $N \sim 1$ to 5.10^2, $\varepsilon(f) > 0$, $f > f_o = 9.10^4 - 2.10^5$ or $\lambda = c/f < \lambda_o = 1.5$ to 3 km. When measuring f_o it is possible to calculate N according to the aforementioned formula. The influence exercised by the terrestrial field complicates investigation, but this influence is not very considerable for relatively fast Sputniks. There are 11 references, 4 of which are Soviet.

Card 3/3

GINZBURG V. L.

20-3-13/59

AUTHOR: Ginzburg, V. L., Corresponding Member AN USSR

TITLE: The Critical Current for Superconducting Films (Kriticheskiy tok dlya sverkhprovodyashchikh plenok)

PERIODICAL: Doklady AN SSSR, 1958, Vol. 118, Nr 3, pp. 464 - 467 (USSR)

ABSTRACT: If films are used which are laid upon a cylindrical surface, the determination of the critical current obviously is more reliable than the determination of the critical field strength. Therefore the author here discusses the computation of the critical current somewhat more exactly than in one of his previous works (reference 1). The most interest deserve thin films with a thickness of $1 \sim 10^{-5}$ to 10^{-6} cm. In case of application of cylindrical supports with ~1 mm diameter such films can be supposed to be plane and the cylindrical configuration of the film must be considered only in case of the boundary conditions for the field. First the equations for the determination of the function Ψ and of the vector potential $\vec{A}$ are written down. Then a condition for the boundaries of the field is given. The complete current flows in

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The Critical Current for Superconducting Films

the direction of the cylinder axis and in the same direction an outside field can be applied as well. In the inside surface of the cylindrical film the field strength of the field, which is caused by the current, is equal to zero. For the field strength $\vec{h}$ in the film and for the corresponding potential $\vec{a}$ terms are written down. The critical field strength of the field induced by the current can be ascertained from an equation given here. The transition into the normal state has under certain conditions the character of a second order transition. There are 2 figures, and 4 references, all of which are Slavic.

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

SUBMITTED: October 31, 1957

AVAILABLE: Library of Congress

AFRIKYAN, Levon Melkonovich; GINZBURG, V.L., red.; GARIBYAN, G.M., kand.fiz.-mat.nauk, red.; AZIZBEKYAN, L.A., tekhn.red.

[Works on theoretical physics] Raboty po teoreticheskoi fizike. Pod red. V.L.Ginzburga i G.M.Garibiana. Erevan, Izd-vo Akad. nauk Armianskoi SSR, 1959. 74 p. (MIRA 12:12)

1. Chlen-korrespondent AN SSSR (for Ginzburg).
(Physics)

GINSBURG, V.L.

"CERTAIN ASPECTS OF COSMIC RAY ORIGIN THEORY"

V.L. Ginsburg

Certain aspects of the theory of cosmic ray origin are discussed in the light of the works which appeared since the Varenna conference.

report presented at the International Cosmic Ray Conference, Moscow 6-11 July 1959

GINZBURG, V.L.

PHASE I BOOK EXPLOITATION SOV/3405

Soveshchaniye po voprosam kosmogonii. 6th, Moscow, 1957

Vnegalakticheskaya astronomiya i kosmologiya; trudy soveshchaniya (Extragalactic Astronomy and Cosmology; Transactions of the 6th Conference on Problems of Cosmogony, June 5-7, 1957) Moscow, AN SSSR, 1959. 273 p. Errata slip inserted. 1,500 copies printed.

Sponsoring Agency: Akademiya nauk SSSR.

Ed. of Publishing House: L.V. Samsonenko; Tech. Ed.: G.N. Shevchenko; Editorial Board: D.A. Frank-Kamenetskiy (Resp. Ed.) Professor; B.A. Vorontsov-Vel'yaminov, Corresponding-Member.

PURPOSE: The book is intended for astronomers and physicists studying problems of general cosmology.

COVERAGE: The book is a collection of papers on cosmogony read by scientists participating in a conference held in Moscow on June 5-7, 1957. The papers review recent observational and theoretical work in extragalactic astronomy, gravitational theory, theory of relativity, red shift, radio astronomy, formation of chemical elements, thermodynamics of the universe, entropy, etc. No personalities are mentioned. There are references following most of the reports.

Ginzburg, V.L.

21(0),24(0) PHASE I BOOK EXPLOITATION SOV/...

Akademiya nauk SSSR. Fizicheskiy institut

Issledovaniya po eksperimental'noy i teoreticheskoy fizike; [sbornik] (Studies on Experimental and Theoretical Physics; Collection of Articles) Moscow, Izd-vo AN SSSR, 1959. 304 p. Errata slip inserted. 2,300 copies printed.

Ed.: I. L. Fabelinskiy, Doctor of Physical and Mathematical Sciences; Eds. of Publishing House: A. L. Chernyak and V. G. Berkgaut, Tech. Ed.: Yu. V. Rylina; Commission for Publishing the Collection in Memory of Grigoriya Samuilovich Landsberg: I. Ye. Tamm (Chairman), Academician; M. A. Leontovich, Academician; P. A. Bazhulin, Doctor of Physical and Mathematical Sciences; S. L. Mandel'shtam, Doctor of Physical and Mathematical Sciences; I. L. Fabelinskiy, Doctor of Physical and Mathematical Sciences; F. S. Landsberg-Baryshanskaya, Candidate of Physical and Mathematical Sciences; and G. P. Motulevich (Secretary), Candidate of Physical and Mathematical Sciences.

PURPOSE: This book is intended for physicists and researchers engaged in the study of electromagnetic radiations and their role in investigating the structure and composition of materials.

COVERAGE: The collection contains 30 articles which review investigations in spectroscopy, sonics, molecular optics, semiconductor physics, nuclear physics, and other branches of physics. The introductory chapter gives a biographical profile of G. S. Landsberg, Professor and Head of the Department of Optics of the Division of Physical Technology at Moscow University, and reviews his work in Rayleigh scattering, combat gases, spectral analysis of metals, etc. No personalities are mentioned. References accompany each article.

GINZBURG, V. L.

PHASE I BOOK EXPLOITATION SOV/3609

Soveshchaniye po voprosam kosmogonii, 6th, 1957.

Trudy soveshchaniya...; vnegalakticheskaya astronomiya i kosmologiya (Transactions of the 6th Conference on Problems of Cosmogony; Extragalactic Astronomy and Cosmology) Moscow, Izd-vo AN SSSR, 1959. 273 p. Errata slip inserted. 1,500 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Astronomicheskiy Sovet.

Editorial Board: D.A. Frank-Kamenetskiy, Professor (Resp. Ed.); B.A. Vorontsov-Vel'yaminov, Corresponding Member, Academy of Pedagogical Sciences USSR; Ya. A. Smorodinskiy, Professor; A.L. Zel'manov, Senior Scientific Contributor; and R.Z. Sagdeyev (Scientific Secretary) Junior Scientific Contributor; Ed. of Publishing House: L.V. Samsonenko; Tech. Ed.: G.N. Shevchenko.

PURPOSE: The publication is intended for astronomers, geophysicists and theoretical physicists interested in general problems of cosmology.

COVERAGE: This is a collection of reports given at the 6th Conference on the Problems of Cosmogony, June 5-7, 1957. In the publication observational data in the field of extragalactic astronomy are summarized, the data are analyzed from a theoretical point of view, and the accuracy and reliability of the observations are evaluated. The relativistic cosmological theories are discussed in detail for the first time in Soviet literature and correlated with observational data, primarily with the red-shift measurements. The relationship of cosmology to the theory of the formation of chemical elements and general thermodynamic and philosophical problems of cosmology are also investigated. No personalities are mentioned. References accompany some of the articles.

TABLE OF CONTENTS:

06330
SOV/141-21-1-2/19

AUTHORS: Gershman, B. N. and Ginzburg, V. L.

TITLE: On the Formation of Ionospheric Irregularities

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1959, Vol 2 , Nr 1, pp 8-13 (USSR)

ABSTRACT: In the case of the lower layers of the ionosphere (in particular, the E-layer), there is no doubt that the formation of irregularities is due to the turbulization of gas currents and both the turbulization and the irregularities are produced by ionospheric winds (Ref 1). Therefore, the only controversial problem is the mechanism of the formation of irregularities in the F-layer and one is mainly concerned with irregularities responsible for the twinkling of radio stars and the spread of the F-echo. The present paper is mainly concerned with the discussion of the motion of the ionized component of the gas in the ionosphere. The quasi-hydrodynamic equations, given by Eqs (1)-(3), are employed. In these equations the subscripts e , i and m refer

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On the Formation of Ionospheric Irregularities

to electrons, ions and molecules, respectively. $\underline{u}$ are the velocities, $\rho_e = mN_e$, $\rho_i = MN_i$ and $\rho_m = MN_m$ are the densities, N_e , N_i , N_m are the concentrations of electrons, ions and molecules, $-e$, m are the charge and the mass of an electron, M is the mass of the ions and molecules (assumed equal, the charge of the ions is taken as equal to e), $\underline{H}_0$ is the intensity of the terrestrial magnetic field (the difference between the magnetic field and H_0 is neglected), $\underline{E}$ is the intensity of the electric field, η_e , η_i and η_m are the viscosity coefficients, ν_{ei} , ν_{em} and ν_{im} are the numbers of collisions of electrons with ions and molecules, and ions with molecules, $\underline{g}$ is the acceleration due to gravity and p is the pressure. If the mean density $\rho_p = \rho_e + \rho_i$ is introduced and $\underline{u}_p = (\rho_e \underline{u}_e + \rho_i \underline{u}_i)/(\rho_e + \rho_i)$ then Eqs (1) and (2) give Eq (4), where $N = N_e = N_i$ and $N \ll N_m$. In this equation terms involving pressure, viscosity and the force of gravity are

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On the Formation of Ionospheric Irregularities

included and

$$j = eN(\underline{u}_i = \underline{u}_e) \ , \ \underline{u} = (\rho_m \underline{u}_m + \rho_p \underline{u}_p)/(\rho_p + \rho_m) \ ,$$

$\nu_{em} \gg \nu_{im}$, $M\nu_{im} \gg m\nu_{em}$ and $M\nu_{im} \gg m\nu_{ei}$. The system of equations (1)-(2) also leads to Eq (5), in which the unimportant terms have been neglected and $\nu_e = \nu_{ei} + \nu_{em}$. It is clear from Eq (4) that in the absence of the field $\underline{H}_o$ and the current $\underline{j}$, the velocities $\underline{u}_p$ and $\underline{u}$ become equal during a time of the order of $1/\nu_{im}$. The current $\underline{j}$ for $\underline{H}_o = 0$ is damped out during a time of the order of $1/\nu_{em}$. If one confines one's attention to quasi-static processes then the time derivative in Eqs (4) and (5) may be neglected and one obtains Eqs (6), where $\sigma_{\parallel}$, $\sigma_{\perp}$ and σ_H are the conductivities parallel to H_o , perpendicular

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On the Formation of Ionospheric Irregularities

to H_o and the Hall conductivity respectively. $\underline{E}'_{\parallel}$ and $\underline{E}'_{\perp}$ are the parallel and perpendicular to $\underline{H}_o$ components of $\underline{E}'$. Also, $\omega_H = eH_o/mc$ and $\Omega_H = eH_o/Mc$. If the z-axis is chosen along the $\underline{H}_o$ and condition (7) is satisfied, then one obtains Eq (8), where the y-axis is chosen to be perpendicular to $\underline{u}$. Condition (7) is satisfied for altitudes $>$ 90-100 km. If condition (9) is satisfied, then Eqs (8) assume the form given by the first three equations at the top of p 11. If condition (10) is satisfied then one obtains Eq (11). It is shown that an ionospheric wind can be set up in the F-layer only in the presence of an electric field $\underline{E}$ which, in the first approximation, is independent of the velocity $\underline{u}$ and is given by Eq (12). An analysis of the above theory leads to the conclusion that the formation and motion of ionization irregularities in the F-layer is not a hydrodynamic problem and should be considered with the inclusion of the terrestrial magnetic field $\underline{H}_o$, the electric field $\underline{E}$ and the difference between the velocity of the gas as a whole, $\underline{u}$, and the velocity of the ionized

On the Formation of Ionospheric Irregularities

component $\underline{u}_p$. If one neglects the velocity gradients, the quantity $\underline{u}_p$ is determined by the two quantities $\underline{u}$ and $\underline{E}$ and usually to a good approximation by $\underline{E}$ only (cf Eq (12)). In order to solve the ionospheric wind and the ionospheric irregularity problems, the character of distribution of the field $\underline{E}$ and the velocity $\underline{u}$ must be known on a scale comparable with the dimensions of the terrestrial globe. There are 12 references, of which 4 are Soviet and 8 are English.

ASSOCIATION: Issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete (Research Radio-Physical Institute of Gor'kiy University)

SUBMITTED: August 25, 1958.

24(5)
AUTHORS: Ginzburg, V. L., Eydman, V. Ya. SOV/56-36-6-28/66

TITLE: The Radiative Force For a Charge Moving in a Medium (O sile reaktsii izlucheniya pri dvizhenii zaryada v srede)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 6, pp 1823-1833 (USSR)

ABSTRACT: In the present paper the radiative force for a non-punctiform charge moving in a generally anisotropic and gyrotropic medium is investigated. The radiative force in a medium may play a considerable role when the particle moves in a magnetoactive plasma, in channels and slits in dielectrics and also in wave guides. At velocities larger than the phase velocity of light in the medium the radiative force, which changes the amplitude of the oscillations and which is related to the emission of anomalous Doppler frequencies, possesses a different sign than that of radiative friction due to the emission of normal Doppler frequencies. The total radiative force which is responsible for the change in the amplitude of the oscillations of a particle in an isotropic medium

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corresponds to friction also in the case of super-light motion. However, this friction may be appreciably smaller than the radiative friction encountered at sublight velocities. In an anisotropic medium amplification of the oscillations may occur instead of friction. The decrease of radiative friction or the appearance of the amplification may be related to the peculiarities of the anomalous Doppler effect as revealed by a quantum mechanics analysis and also to the instability of the super-light particle beams. The theoretical considerations are based upon the results obtained by a large number of previous papers (Ginzburg et al), and, in the course of the final discussion, the resulting conclusions are discussed. There are 15 Soviet references.

ASSOCIATION: Radiofizicheskiy institut Gor'kovskogo gosudarstvennogo universiteta (Radiophysics Institute of Gor'kiy State University)

SUBMITTED: December 20, 1958

24.6820

67524
SOV/141-2-3-1/26

AUTHORS: Ginzburg, V.L. and Eydman, V.Ya.

TITLE: On Some Peculiarities of Electromagnetic Waves Radiated by Particles Moving Faster Than Light

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1959, Vol 2, Nr 3, pp 331 - 343 (USSR)

ABSTRACT: The paper was presented at the Ministry of Higher Education Conference on Radio-electronics, Kiyev, 1959. The classical treatment of this problem yields the Vavilov-Cherenkov radiation condition in:

$$\cos \Theta_0 = c/n(\omega)v \qquad (1)$$

where Θ_0 is the angle between the particle velocity $\bar{v}$ and the wave-vector $\bar{k}$ of the Cherenkov wave, $n(\omega)$ is the refractive index at the frequency ω, the medium being isotropic. In this paper quantum representations are used because they are so fruitful of interesting results. The fundamental conclusion is that for particles moving faster than light the reaction force of the radiation, changing the amplitude of particle vibration.

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On Some Peculiarities of Electromagnetic Waves Radiated by Particles Moving Faster Than Light

is less compared with that for velocities less than light and, in an anisotropic medium, can even change sign. The force corresponds, therefore, not to "friction" but to an excitation of the vibrations. This effect is obviously directly connected to the instability of faster-than-light particle beams. A point charge moving uniformly in an isotropic medium radiates energy, as a result of the Vavilov-Cherenkov effect, at a rate given by Eq (2). If the radiated frequency is ω_0, then as a result of the Doppler effect, the apparent frequency at an angle Θ is given by Eq (3). Within the so-called Cherenkov cone the Doppler effect is anomalous since ω increases with Θ and, if n is constant, $\omega \to \infty$ when $\Theta \to \Theta_0$. In practice, the effect is of interest for particle beams passing through narrow slots or close to delaying systems or for beams in magneto-active plasma where the losses are low. From a quantum point of view, the kinematics of radiation are determined by the laws of conservation of

On Some Peculiarities of Electromagnetic Waves Radiated by Particles Moving Faster Than Light

energy and momentum. The changes in energy and momentum as a result of radiation are given in Eqs (4) and (5), respectively. A system which moves uniformly in vacuo can only radiate as a result of a change in its interval state (thus, for example, an electron cannot radiate in vacuo if moving uniformly). In the general case, when $n \neq 1$, the radiation condition, in quantum terms, is that given by Eq (6). The advantage of the latter representation is that it shows the normal Doppler effect to involve an energy transition from an upper to a lower level, while the anomalous effect requires the reverse transition. A system which has only two discrete energy levels can exhibit both kinds of Doppler effect. In systems with many energy levels the anomalous effect leads to the possibility of exciting transverse radiation. Two cases exist, corresponding to an increase and decrease, respectively, of the system energy. The calculation of the transition probabilities which determine how a system will behave may be carried out by classical means; quantum methods

SOV/141-2-5-1/25

On Some Peculiarities of Electromagnetic Waves Radiated by Particles Moving Faster Than Light

offer no advantage. The absorption coefficient, in the "normal" process, is that given by Eq (9) while the anomalous value is Eq (10). The latter expression is useful where the production of microwaves is considered. In particular, the case of a magneto-active plasma medium is applicable to sporadic solar radiation. In an anisotropic medium the phase and group velocities of a wave need not have the same direction. Figure 2 shows the effect of the sign of $d\omega/dk_r$ on the generation of the Cherenkov radiation.

As a rule, the radiation forces are small compared with the retarding forces but may become significant when motion occurs in narrow channels or in plasma.

There are 2 figures and 26 references, 25 of which are Soviet and 1 Hungarian.

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On Some Peculiarities of Electromagnetic Waves Radiated by Particles Moving Faster than Light

SOV/141-2-3-1/26

ASSOCIATION: Issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete (Radiophysics Research Institute of Gor'kiy University)

SUBMITTED: February 25, 1959

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3(1)

AUTHORS: Ginzburg, V.L., Zheleznyakov, V.V. SOV/33-36-2-5/27

TITLE: On the Propagation of Electromagnetic Waves in the Solar Corona Taking Into Account the Influence of the Magnetic Field

PERIODICAL: Astronomicheskiy zhurnal,1959,Vol 36,Nr 2,pp 233-246 (USSR)

ABSTRACT: The present note has preparatory character. In a following article the authors intend to investigate the influence of the magnetic field of the corona on the sporadic solar radiation. In this connection the influence of the magnetic field on the propagation and emission of the electromagnetic waves of the corona is considered as a preparation. The authors compile well-known results of western and Soviet scientists and complete them in a form necessary for the following article. In particular they consider the emission from the corona caused by the interaction of normal waves and caused by their dispersion on the fluctuations of the electron density ; conditions of emission are given. Furthermore the authors describe the propagation of the electromagnetic waves in the corona under the influence of a strong sunspot magnetic field. N. A. Mityakov is mentioned in the paper.

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ASSOCIATION: Sci. Res. Inst. of Radiophysics, Gor'kiy Univ.

24 (5), 24 (8)

AUTHOR: Ginzburg, V. L.

SOV/56-36-6-46/66

TITLE: Comparison of the Macroscopic Theory of Superconductivity With Experimental Data (O sravnenii makroskopicheskoy teorii sverkhprovodimosti s eksperimental'nymi dannymi)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, , Nr 6, pp 1930 - 1932 (USSR)

ABSTRACT: L. P. Gor'kov (Ref 1) (see this periodical p 1918) showed that the macroscopic equations for superconductors set up by Landau and Ginzburg (Ref 2) can be deduced from the modern microscopic theory of superconductivity. In the equations deduced by Gor'kov the charge e_{eff} was put equal to the double electron charge corresponding to the Cooper pairs (e_{eff} is identical with the quantity denoted by Gor'kov as e^*). The phenomenological constant $\varkappa$ obeys the equation (1):
$\varkappa = \frac{\sqrt{2}\,|e_{eff}|}{\hbar c} H_{cm}\,\delta_L^2 = 4.32.10^7 H_{cm}\,\delta_L^2$ (H_{cm} denotes the critical magnetic field, δ_L - the (London) penetration depth of the field into the massive metal at the given temperature T). The measured

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penetration depth δ is equal to δ_L if T is equal to the critical temperature T_c. Within the range of critical temperature, accuracy differs, for Sn $\delta \approx \delta_L$ at $\Delta T = T_c - T \leq 0.1^\circ$, at Al $\delta \approx \delta_L$ if $\Delta T \leq (10^{-3})^\circ$. Further, a number of empirical relations is set up, viz. for δ, H_{cm}, $\varkappa$, T_c and Δ and for Sn, Sn+In (2.3% In). The experimentally obtained values are compared with theoretical values. Thus, for Sn $T_c = 3.73^\circ$ and $\varkappa = 0.158$ is obtained, according to Faber 0.15 and for the isotropic model according to reference 5, 10 : $\varkappa = 0.149$, so that the value $\varkappa = 0.15 - 0.16$ may be considered to be correct (both in the macro- and in the microscopical theory). If, for the surface energy, it holds that $\sigma_{ns} = H_{cm}\Delta/8\pi$, one obtains with $\varkappa = 0.158$: $\Delta = 6.5\delta_L \approx 1.66 \cdot 10^{-5} \sqrt{T_c/(T_c - T)}$; experimentally, however, the values 2.5 (according to Sharvin, reference 8) and 1.38 (Faber, reference 9) are obtained instead of 1.66. All data hitherto

Comparison of the Macroscopic Theory of Superconductivity With Experimental Data

SOV/56-36-6-46/66

mentioned refer to Sn. Analogous comparisons are drawn for Al. There are 14 references, 7 of which are Soviet.

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

SUBMITTED: February 19, 1959

Card 3/3

L. Ginzburg

24(0)

AUTHOR: Chentsov, R. SOV/53-67-4-7/7

TITLE: The Fifth All-Union Conference on the Physics of Low Temperatures (5-ye Vsesoyuznoye soveshchaniye po fizike nizkikh temperatur)

PERIODICAL: Uspekhi fizicheskikh nauk, 1959, Vol 67, Nr 4, pp 743-750 (USSR)

ABSTRACT: This Conference took place from October 27 to November 1 at Tbilisi; it was organized by the Otdeleniye fiziko-matematicheskikh nauk Akademii nauk SSSR (Department of Physico-mathematical Sciences of the Academy of Sciences, USSR), the Akademiya nauk Gruzinskoy SSR (Academy of Sciences, Gruzinskaya SSR), and the Tbilisskiy gosudarstvennyy universitet im. Stalina (Tbilisi State University imeni Stalin). The Conference was attended by about 300 specialists from Tbilisi, Moscow, Khar'kov, Kiyev, Leningrad, Sverdlovsk, and other cities as well as by a number of young Chinese scientists at present working in the USSR. About 50 lectures were delivered which were divided according to research fields. - I. Liquid Helium. Reports were delivered by the researchers of the Laboratoriya nizkikh temperatur TGU (Laboratory for Low Temperatures of Tbilisi State University) under the supervision of E. L. Andronikashvili: D. S. Tsakadze, Yu. G. Mamaladze and S. G. Matinyan spoke about the investigation of the damping of rotational oscillations of a single disk in He II in dependence on the rotation rate. G. A. Gamtsemlidze spoke about the influence exercised by the state of the disk surface on critical rate and on the damping of its oscillations in the transcritical range. V. P. Peshkov (IFP AN SSSR - Institute for Physical Problems AS USSR) spoke about further investigations of the boundary between superfluid and non-superfluid helium (discovered by himself) in a heat flow. This boundary characterizes the density- and temperature jump. Kuang, Wei-yen, V. N. Zinov'yeva and V. P. Peshkov spoke about investigations at extremely low temperatures (down to 0.5°K) which were attained by the method of the evacuation of He^3-vapors. Kuang, Wei-yen investigated in the interval 0.57 - 2.07°K the phenomenon of the temperature jump (discovered by P. L. Kapitsa in 1941) on the boundary of a solid (in this case Cu) by means of He II; for the thermal resistance not the T^3-law but a T^n-law holds, where $n=2.6\pm0.1$. Zinov'yeva and Peshkov investigated, among other things, also the phase diagram of He^3 dissolved in He^4 (20 - 89%). V. L. Ginzburg (FIAN) gave a report on the phenomenological theory of He II in the region of the λ-point in consideration of quantum effects (the theory was developed by himself and by L. P. Pitayevskiy). B. T. Geylikman (IAE AN SSSR - Institute for Atomic Energy, AS USSR) delivered a short report on the theory of phase transition in liquid He^4. I. M. Lifshits and D. G. Sanikidze (KhPTI AN USSR - Khar'kov Physico-technical Institute AS UkrSSR) investigated the melting of solid He^3 on the basis of Landau's theory of the Fermi-fluid and found that melting pressure as a function of temperature has a minimum at 0.5°K (Pomeranchuk-effect). The comprehensive discussion was held under the supervision of P. L. Kapitsa.-

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GINZBURG, V. L.

"Artificial Satellites and Relativity," Scientific American, vol. 200, No. 5, May 1959. (US Publication.)

N.L. Ginzberg

24(0) SOV/53-67-4-7/7

AUTHOR: Chentsov, R.

TITLE: The Fifth All-Union Conference on the Physics of Low Temperatures (5-ye Vsesoyuznoye soveshchaniye po fizike nizkikh temperatur)

PERIODICAL: Uspekhi fizicheskikh nauk, 1957, Vol 67, Nr 4, pp 743-750 (USSR)

ABSTRACT: This Conference took place from October 27 to November 1 at Tbilisi; it was organized by the Otdeleniye fiziko-matematicheskikh nauk Akademii nauk SSSR (Department of Physico-mathematical Sciences of the Academy of Sciences, USSR), the Akademiya nauk Gruzinskoy SSR (Academy of Sciences, Gruzinskaya SSR), and the Tbilisskiy gosudarstvennyy universitet im. Stalina (Tbilisi State University imeni Stalin). The Conference was attended by about 300 specialists from Tbilisi, Moscow, Khar'kov, Kiyev, Leningrad, Sverdlovsk, and other cities as well as by a number of young Chinese scientists at present working in the USSR. About 50 lectures were delivered which were divided according to research fields.

II. Supraconductivity. 13 lectures were delivered on this field of which two were experimental and the others theoretical. Reports on experimental investigations of supraconductivity were delivered by Yu. V. Sharvin and V. P. Gantmakher (IFP) and N. V. Zavaritskiy (IFP). The former investigated the structure of the intermediate state in monocrystals of pure tin, the latter measured the thermal conductivity of different-

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ly shaped orientated cylindrical gallium samples at 0.1 - 4.2°K. A. A. Abrikosov, L. P. Gor'kov and I. M. Khalatnikov (IFP) theoretically investigated the behavior of a superconductor in the high-frequency field. V. L. Ginzburg and G. F. Zharkov (FIAN) dealt with the microscopical theory, and Ginzburg discussed among other things the part played by fluctuations in phase transitions of the second kind. I. M. Lifshits (KhFTI) showed that it follows from the modern theory of supraconductivity in consideration of the anisotropy of metals that, in principle, the existence of supraconductors is possible which are supra-conductive only within a limited range of temperature (and not at all temperatures below the critical ones). B. T. Geylikman and V. E. Kresin (IAE) investigated the electron- and phonon thermal conductivity of supraconductors by means of the microscopical theory at temperatures that are not very near absolute zero. M. V. Buykov and L. E. Gurevich (FTI AN SSSR) spoke about the surface energy on the boundary between the supraconductive and normal phases. D. N. Zubarev and Yu. A Tserkovnikov (Matematicheskiy institut AN SSSR = Mathematics Institute AS USSR) dealt with the thermodynamics of the supraconductive state (Froehlich-model), V. V. Tolmachev (MIAN) investigated the problem of collective excitations in a supraconductor. D. V. Shirkov (Ob"yedinennyy institut yadernykh issledovaniy - Joint Institute of Nuclear Research) spoke about consideration of Coulomb-interaction of electrons in semiconductors. The problem of consideration of the Coulomb interaction was discussed by Chen' Ch'un-hsien and Chou, Hsi-hsin (MGU).

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Ginzburg, V.L.

PHASE I BOOK EXPLOITATION SOV/4946

Mikhaylov, A. A., ed.

Stantsii v kosmose; sbornik statey (Space Stations; Collection of Articles) Moscow, Izd-vo AN SSSR, 1960. 344 p. 25,000 copies printed. (Series: Akademiya nauk SSSR. Nauchno-populyarnaya Seriya)

Resp. Ed.: A. A. Mikhaylov; Compiler: V. V. Fedorov; Ed. of Publishing House: Ye. M. Klyaus; Tech. Ed.: I. D. Novichkova.

PURPOSE: This book is intended both for the space specialist and the average reader interested in space problems.

COVERAGE: The book contains 73 short articles by various Soviet authors on problems connected with space travel and the launching of artificial earth satellites and space rockets. Some possibilities of future developments are also discussed. The articles were published in the period of 1957-1960. No personalities are mentioned. There are no references.

SOV/5449

PHASE I BOOK EXPLOITATION

Ginzburg, Vitaliy Lazarevich

Rasprostraneniye elektromagnitnykh voln v plazme (Propagation of Electromagnetic Waves in Plasma) Moscow, Fizmatgiz, 1960. 552 p. Errata slip inserted. 8,000 copies printed.

Ed.: V.D.Kozlov; Tech. Ed.: K.F.Brudno.

PURPOSE: This book is intended for scientific workers, aspirants, and university students enrolled in advanced courses in physics and radiophysics.

COVERAGE: The book discusses the propagation of electromagnetic waves of various frequencies in an isotropic as well as in a magnetically active plasma, the propagation of electromagnetic waves of various types, radio waves, plasma waves, magnetohydrodynamic waves in plasma, and the behavior of a plasma in an electric field varying in time, but uniform in space. The author

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SOV/5449

Propagation of Electromagnetic (Cont.)

also treats the case of a homogeneous and inhomogeneous medium, and gives special attention to the propagation of radio waves in the ionosphere and in cosmic space. The author reports a number of basic results and conclusions from research in plasma physics, placing emphasis on investigations and research in which he took part. Where possible, he has borrowed material for the present work from his Teoriya rasprostraneniya radiovoln v ionosfere (Theory of the Propagation of Radio Waves in the Ionosphere) (Gostekhizdat, 1949), and from the second part of the book, Rasprostraneniye radiovoln (Propagation of Radio Waves) (Gostekhizdat, 1953), written in collaboration with Ya. L. Al'pert and Ye. L. Feynberg. To facilitate its use as reference book, certain formulas have been repeated in various sections of the book. The bibliography includes references to works on problems not discussed in this work, for example, the propagation of radio waves in the presence of statistical irregularities. The author thanks Ye.A.Benediktov, B.N.Gershman, A.V.Gurevich, N.G.Denisov, V.V.Zheleznyakov, N.A.Mityakov,

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S/035/61/000/012/013/043
A001/A101

AUTHOR: Ginzburg, V.L.

TITLE: Some questions in the theory of cosmic ray origin

PERIODICAL: Referativnyy zhurnal. Astronomiya i Geodeziya, no. 12, 1961, 39, abstract 12A329 ("Tr. Mezhdunar. konferentsii po kosmich. lucham, 1959, v. 3", Moscow, AN SSSR, 1960, 200 - 208)

TEXT: The mean life time of cosmic ray nuclei in the Galaxy is estimated. For protons it amounts to 3.8×10^9 years, for nuclei of the M group (C, N, O) - 3.6×10^8 and for Fe - 1.4×10^8 years. Since the existence time of the Galaxy is about 10^{10} years, the flux of Fe nuclei, for instance, should have been attenuated during this time by a factor of 10^{25}. Therefore, the hypothesis that cosmic rays were generated in the early stage of galactic evolution should be rejected. The necessary summary power of cosmic ray sources ($\sim 10^{39}$ - 10^{40} erg/sec) can be furnished only by explosions of Supernovae. Energy liberation in the explosion of a Supernova amounts to over 10^{50} and conversion of 0.1-0.01 fraction of its energy into energy of cosmic rays is quite plausible. If a preferential accele-ration of heavy nuclei of the N group ($Z \geqslant 10$) takes place in this process, then

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Some questions in the theory of cosmic ray origin

the observed proton flux is a secondary one, due to disintegration of heavy nuclei. The magnitude of the ratio of proton flux to the flux of heavy nuclei, which is equal to 15 - 20, agrees with this assumption. Diffusion of cosmic rays generated near the galactic plane to the halo boundaries restricts their life time in the Galaxy. Therefore it is presumed that magnetic fields in the Galaxy are in such a disordered state ("knot" of force lines) that ~ 1% of cosmic rays, i.e., 10^{41} - 10^{42} particles/sec can go our of the halo. In this case the life time of protons relative to nuclear absorption is comparable to their life time relative to the leakage from the Galaxy. If there are galactic fields of ~ 10^{-5} gauss, heavy nuclei possessing energies up to 10^{19} ev will also leave the Galaxy considerably slower than vanish in nuclear collisions. Taking into account their leaving the system due to drifting in a non-homogeneous magnetic field does not alter the conclusions drawn. The problem of anisotropy degree of cosmic rays is discussed, which is due to ordering of the magnetic field in the galactic spiral. Radio astronomical data, as well as data on anisotropy degree of cosmic rays near the Earth, show that effect of spiral arms on the motion of cosmic rays is insignificant. The problem of the origin of cosmic ray electron component is briefly discussed. If the adiabatic invariant $\sin^2\theta/H$ is preserved in the field the motion of cosmic rays will proceed with low values of [illegible], i.e. the field

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ACCESSION NR: AT3012749 S/2831/60/000/002/0013/0018

AUTHORS: Gershman, B. N.; Ginzburg, V. L.

TITLE: Formation of ionospheric inhomogeneities

SOURCE: AN SSSR. Mezhduvedomst. komit. po prov. mezhdunarodn. geofizich. goda. 5 razdel program. MGG: Ionosfera. Sb. statey, no. 2, 1960, 13-18

TOPIC TAGS: ionosphere, ionospheric inhomogeneities, F layer, E layer, ionization wind, plasma velocity, ionization wind velocity, altitude variation of ionosphere

ABSTRACT: Some of the hypotheses recently advanced to explain the mechanism whereby inhomogeneities are produced in the F layer are discussed, with emphasis on the inhomogeneities that cause flicker of radio stars and diffuse reflection from the F layer. The authors analyze the conditions which determine the motion of an ionized gas

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component in the ionosphere, since a clarification of this question can serve as a premise for the construction of a theory of "ionization winds" and formation of inhomogeneities in the F layer. It is concluded from various estimates of the possible plasma and wind velocities and the resultant variations of the electric and magnetic fields in the ionosphere that the formation and motion of inhomogeneities of ionization in the F layer is not a hydrodynamic problem but must be solved with allowance for the earth's magnetic field, the electric field, and the fact that the gas as a whole does not move with the same speed as its ionized component. The nature of the ionospheric winds and ionospheric inhomogeneities must be ascertained by clarifying the character of the distribution of the electric field and the velocity on scales that are comparable with the dimensions of the earth's sphere. The particular partial problems still to be considered are: the transport of the electric field in the F layer from the diurnal region and the related circulation in the F layer, the passage of different types of low fre-

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quency waves from the E layer into the F layer (capable of becoming propagated in a weakly ionized gas), the influence of the earth's magnetic field, and the inhomogeneity of the atmosphere with altitude. Orig. art. has: 12 formulas.

ASSOCIATION: None

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S/181/60/002/009/003/036
B004/B056

9.2180

AUTHOR: Ginzburg, V. L.

TITLE: Some Remarks on Phase Transitions of Second Kind and the Microscopic Theory of Seignettoelectrics

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 9, pp. 2031-2043

TEXT: The author discusses the problem as to whether transitions of second kind have the same character in superconductors, liquid helium, ferromagnetics, and seignettoelectrics, and differ from one another only by the value of one parameter. Corresponding to the theory of phase transitions developed by L. D. Landau (Ref. 2), the author writes down the series: $\Phi = \Phi_0 + \alpha\eta^2 + (\beta/2)\eta^4 + (\gamma/6)\eta^6 + \delta(\text{grad }\eta)^2$ (1) for the thermodynamic potential Φ, where Φ_0, α, β, γ, δ, are functions of temperature and pressure, and $\delta(\text{grad }\eta)^2$ is described as correlation energy. Because of thermal motion, η fluctuates round a mean value η_0. The series (1) in first approximation gives correct results as long as $(\overline{\Delta\eta})^2 \sim (\overline{\Delta\eta})^2_0$ and $(\overline{\Delta\eta})^2_T$, respectively, are small as compared to $\eta_0^2 \equiv (\overline{\eta})^2$. The condition

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$\Delta T/\theta \gg \varkappa^2/(\delta/\alpha'_\theta\theta)^3 (\Delta c)^2 = \zeta_T$ (5b) is written down ($\varkappa$ = Boltzmann constant, θ = temperature of the transition point). $\Delta T = \theta - T$, $T \simeq \theta$, $\Delta c = (\alpha'_\theta)^2 \theta \beta_\theta^{-1}$. The character of transition thus depends only on ζ_T. For superconductors it is found that $\zeta_T \sim 3 \cdot 10^{-16}$, for liquid helium, $\zeta_T \sim 0.3$, and for solids, $\zeta_T \sim 0.03$. Therefore, no anomalies of specific heat are observed in superconductors. Likewise, ζ_T is anomalously low for ferromagnetics. For seignettoelectrics, above all $BaTiO_3$, it is found that the parameter $l^2 = \delta/\alpha'_\theta\theta$ is anomalously great, whereas the fluctuation is relatively low. This qualitative statement is quantitatively investigated by means of a model of anharmonic oscillators, and for the frequencies of $BaTiO_3$ it is found that $\omega_t(\theta) = \sqrt{\alpha(\theta)/\mu} \sim 6.3 \cdot 10^{-11}$; $\omega'_{z,t}(\theta) = 2\sqrt{\alpha(\theta)/\mu}$, and for wavelengths $\lambda_t = 2\pi c/\omega_t(\theta) \sim 3$ mm; $\omega_{z,t} \sim 1.5$ mm. ($\mu = m/2e^2_{eff}N$, N = concentration of the dipoles). The author considers detailed experimental investigations of the behavior of substances near the transition point to be necessary. There are 35 references: 22 Soviet, 9 US, 3 British, 2 Dutch, and 1 German.

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Some Remarks on Phase Transitions of Second Kind and the Microscopic Theory of Seignetto-electrics

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva, Moskva (Institute of Physics imeni P. N. Lebedev, Moscow)

SUBMITTED: February 10, 1960

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80876

S/141/60/003/02/023/025
E032/E314

3,1700

AUTHOR: Ginzburg, V.L.

TITLE: On the Possibility of a Determination of the Magnetic Field in the Outer Solar Corona by Examining the Polarized Radiation due to Discrete Sources Transmitted Through it

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1960, Vol 3, Nr 2, pp 341 - 342 (USSR)

ABSTRACT: The presence of an ordered magnetic field in the solar corona can lead to a rotation of the plane of radio emission passing through the corona. The radio emission of the Crab nebula is the radiation in question. It passes through the corona during June and has a polarization of approximately 7% at 3 cm. The polarization is characterised by a position angle of $\Psi = 148\text{-}149^{\circ}$. For 10 cm waves the polarization is $3 \pm 0.5\%$ and $\Psi = 142 \pm 5^{\circ}$. There is evidence that at long wavelengths the polarization is smaller. In the corona (in the plane of the solar equator) the electron concentration is (Ref 7) $N \sim 7 \times 10^4$ cm^{-3} at $\eta = 5$, $N \sim 10^4$ cm^{-3} at $\eta = 10$ and $N \sim 2.5 \times 10^3$ cm^{-3} at $\eta = 20$. It

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follows that for $\eta = 5$ to 20 , $\omega_0^2 = 4\pi e^2 N/m = 3.18 \times 10^9$, $N \sim 2 \times 10^{14} - 8 \times 10^{12}$ and $\omega_H = eH/mc = 1.76 \times 10^7 H \sim 10^5 - 10^5$ sec^{-1} . Moreover, the frequency of the radio emission $\omega = 2\pi c/\lambda \sim 2 \times 10^{10}$ sec^{-1} at $\lambda \simeq 10$ cm . Under these conditions the propagation of radio waves may be looked upon as quasi-longitudinal for practically all angles α between the magnetic field $\underline{H}$ and the direction of the wave normal. The difference between the refractive indices $n_{\pm}$ for normal circularly polarized waves is $\Delta n = \omega_H \omega_0^2 \cos \alpha/\omega^3 = 5.6 \times 10^{16} HN \cos \alpha/\omega^3$. The rotation of the plane of polarization after passage through the plasma layer is given by Eq (1), where the integration is carried out along the ray which in the present case can be considered to be rectilinear. In order to estimate this

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effect it is assumed that:

$$\Delta\Psi \sim \frac{10^6 \text{ HNL cos } \alpha}{\omega^2}$$

where L is a certain effective path length. With $\eta \cong 5$, $H \sim 10^{-2}$ Oe, $N \sim 10^5$ cm^{-3}, cos $\alpha \sim 1$ and $L \sim \eta R_0 \sim 3 \times 10^{11}$ cm the rotation of the plane of polarization is $\Delta\Psi = 60^\circ$. When $\eta \cong 10$, $H \sim 10^{-3}$, $N \sim$ cm^{-3}, cos $\alpha \sim 1$ and $L \sim 10R_\odot$, the rotation is $\Delta\Psi \sim 1^\circ$. The relatively strong dependence of the rotation on ω should serve as a useful additional effect. There are 9 references, 5 of which are Soviet and 4 English.

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On the Possibility of a Determination of the Magnetic Field in the Outer Solar Corona by Examining the Polarized Radiation due to Discrete Sources Transmitted Through it

ASSOCIATION: Nauchno-issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete (Scientific-research Radiophysics Institute of Gor'kiy University)

SUBMITTED: March 25, 1960

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GABIKHER, O.; GINZBURG, V.L. [translator]

Achievements and objectives of the industry of rubber products for engineering uses in the German Democratic Republic. Kauch. i rez. 19 no. 11:29-32 N '60. (MIRA 13:11)

1. TSentral'naya nauchno-issledovatel'skaya laboratoriya rezinovogo zavoda "El'be", Germanskaya Demokraticheskaya Respublika.

(Germany, East--Rubber goods)