MILLER, M. A.

USSR/ Physics Radio wave propagation

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

Authors : Getmantsev, G. G., Zhevakin, S. A., Kobrin, M. M., and Miller, M. A.

Title : Propagation of radio waves

Periodical : Usp. fiz. nauk 53/2, 298 - 303, June 1954

Abstract : The book "Propagation of Radio Waves", written by V. N. Kessenikh, is criticized. Many fundamental errors in interpretation of the subject covered by the book were found. Also, the unmethodical arrangement of many experimental data, included in the book, render it useless even for reference. In short, the publication of the book by the "Gostekhizdat" (State Publ. House for Tech. Literature) is considered to be erroneous.

Institution : ....

Submitted : ....

MILLER, M.A.

Surface electromagnetic waves in rectangular channels. Zhur.tekh.fiz. 25 no.11:1972-1982 O '55. (MIRA 9:1)
(Wave guides) (Electric waves)

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R001134310(

Miller, M A

USSR/Radiophysics - Superhigh Frequencies, I-11

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 35453

Author: Bespalov, V. I., Miller, M. A.

Institution:

Title: Electromagnetic Waves in Rectangular Slots in Which the Bottom Is Covered by Dielectric

Original Periodical: Uch. zap. Gor'kovsk. un-t., 1956, 30, 61-75

Abstract: A discussion of the propagation of electromagnetic waves in a rectangular U-shaped slot, the bottom of which is covered with a layer of isotropic dielectric. A new method is proposed for finding the natural waves, propagating along the slot; the fields are found in the form of a superposition of TE and TM waves relative to the direction of the aperture of the slot. From the dispersion equation obtained it follows that the attenuation factor of the field of the surface wave is independent of the width of the slot and consequently, this dispersion equation is valid also for a slot that varies in

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USSR/Radiophysics - Superhigh Frequencies, I-11

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 35453

Abstract: width along the direction of propagation. Usual methods are used to obtain the attenuation due to the losses in the metal and in the dielectric, and to find the directivity pattern of the radiation of the first propagating wave from the aperture of the slot. The directivity pattern for this wave has a trough-like form. Bibliography, 9 titles.

Card 2/2

Mihher, M. A

AVERKOV, S. I., ANIKIN, V. I., BRAVO-ZHIVOTOVSKIY, D. M., G[illegible]KOV, [illegible] V., GREKHOVA, M. T., YERGAKOV, V. S., LOPYREV, V. A., MILLER, M. A., and PLYAZIN, V. A.

"A Diode Noise Generator in the Three-Centimeter Range," by S. I. Averkov, V. I. Anikin, D. M. Bravo-Zhivotovskiy, A. V. [illegible], M. T. Grekhova, V. S. Yergakov, V. A. Lopyrev, M. A. [illegible] Elektronika, No 6,

MiLLER, M. A.

SUBJECT USSR / PHYSICS CARD 1 / 2 PA - 1832
AUTHOR MILLER, M.A., TALANOV, V.I.
TITLE Electromagnetic Surface Waves directioned by a Boundary with a Slight Curvature.
PERIODICAL Žurn.techn.fis, 26, fasc.12, 2755-2765 (1956)
Issued: 1 / 1957

In the paper by the same authors, Zurn.techn.fis.25, fasc.11, 1810 (1955) the properties of electromagnetic surface waves directioned by flat boundaries were investigated. This problem may be looked upon as a limiting case of the problem concerning waves directioned by a cylinder (in the case of an infinite value of the ratio between the cylinder radius r_1 and the wave length λ). The present work aims at investigating this boundary transition more closely than had been the case in the previous work. It was furthermore important to evaluate the distortions which were carried into the surface field (in the case of high but finite values of the curvature radius of the directioning boundary). Apart from the practical point of view, this is of interest also as a matter of principle, because there exists a certain class of waves which in the vicinity of a directioning boundary lose their surface character even if the curvature be ever so small. At first the equation for the wave numbers is set up. For this purpose a cylinder with any radius $r=r_1$, on the surface of which homogeneous boundary conditions prevail, is investigated. The problem consists in finding the radicals of the equations which were set up. With any value of the parameter $p=kr_1$ these equations can be solved only numerically; if $p_1 = kr_1 \gg 1$ ($r_1 \gg \lambda$) is

Žurn.techn.fis,26, fasc.12, 2755-2765 (1956) CARD 2 / 2 PA - 1832

sufficiently great, the asymptotic value of the radicals can be found analytically. ($k = \frac{2\pi}{\lambda}$). The condition $p_1 \gg 1$ corresponds to the case of slight curvatures of the directioning boundary, which interests us here. Only those boundaries are investigated here which are curved only in the direction of the propagated waves. For this reason the azimuthal waves were dealt with. Azimuthal waves can be divided into two groups: stable waves, which remain on the surface in the case of any curvature of the boundary, which are threedimensional, and may e.g. be realized in the grooves of a rectangular profile with ideally conductive lateral walls, and unstable waves in the case of which, even if the curvatures of the boundary are slight, a radiation field occurs, and which are in the main line two-dimensional. On the basis of the solution of the problem of the rotation of azimuthal waves, corrections to the propagation constants of the waves, which are characterized by a finite but sufficiently small curvature of the directioning surface, are found. For nonstable waves the propagation constant becomes complex. Radiation losses diminish considerably in the case of a curvature of the boundary in the direction of the field.

INSTITUTION:

MILLER, M.A.

621.396.67

1764. ON THE INTEGRAL EQUATION FOR CURRENTS IN THE THEORY OF METALLIC AERIALS. A.V. Gaponov and M.A. Miller. Zh. tekh. Fiz., Vol. 26, No. 12, 2766-70 (1956). In Russian.

5

2 {1-4E4c, 1-4E1d}

Discussion of an error in the use of integral equations in the theory of aerials when the field due to the magnetic currents is ignored. Since an arbitrary field can be represented as a field of purely electric currents distributed over a closed surface Σ, the introduction of fictitious magnetic currents does not appear necessary. It is, however, a convenient expedient when calculating the impedance characteristics of these aerials. For the case of an aerial under load or for a finite conductivity of the metal, the tangential components of the electric and magnetic fields over Σ are related by the relation $E_T = f(H_T)$. Z.F.Voyner

NS conf

Miller, M. A.

Distr: 4E1d

"Integral Equation for Currents in the Theory of Metal-Antennas," A. V. Gaponov and M. A. Miller. Zh. Tekh. Fiz., Oct. 1957, pp. 2377-2378. 11 refs. Discussion concerning the error in the use of the integral equation method in antenna theories when the field created by magnetic currents is neglected.

4

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Gmw

BaW

MILLER, M.A.

TRANSLATION 3

Distr: 4E4c/4E3d

*Miller, M. A.; and Talanov, V. I. Surface electromagnetic waves guided by boundaries of slight curvature. Translated by Morris D. Friedman, 572 California St., Newtonville 60, Mass., 1957. 15 pp. Translated from Z. Tehn. Fiz. 26 (1956) 2755-2765.

MILLER, M.

Tensiometry, a modern measuring method. p.185.
(Elektrotechnik, Vol. 12, No. 6, June 1957, Praha, Czechoslovakia)

SO: Monthly List of East European Accessions (EEAL) LC. Vol. 6, No. 9, Sept. 1957. Uncl

06507
SOV/141-58-4-24/26

AUTHOR: Miller, M.A.

TITLE: A Principle of Generation of High-Frequency Oscillations (Ob odnom printsipe generatsii vysokochastotnykh kolebaniy)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1958, Nr 4, pp 166-167 (USSR)

ABSTRACT: It was shown earlier by the author (Ref 1) that the motion of a charged particle in a slightly non-homogeneous electromagnetic field can be represented in the form of the super-position of an oscillatory motion with a frequency ω and an average motion (averaged over a period $2\pi/\omega$) which can be represented $R = -\nabla \Phi$; R describes the motion as a function of time while Φ represents the high-frequency potential. The sum of the kinetic energy of the averaged motion and the mean kinetic energy of the oscillatory motion is constant in such a system. Consequently, if a beam of particles is directed towards an increasing potential Φ, at the point of reflection corresponding to I = 0, a

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SOV/141-58-4-24/26

A Principle of Generation of High-Frequency Oscillations

total transformation of the energy of linear motion in the oscillatory energy takes place. Thus, assuming that during the instant when the total velocity is zero and the particles recede from the interaction space, the kinetic energy of the particles becomes transferred into the field. Consequently, the principle can be used to devise a high-frequency oscillator. An example of this type of oscillatory system is considered. The oscillator contains a parallel tank with a capacitance C and an inductance L, the quality factor of the system being Q. It is shown that the system can be described by Eq (3), where C_1 is a certain additional capacitance due to the presence of the space charge. The author expresses his gratitude to A.V.Gaponov, Ye.V.Zagryadskiy and M.I.Kuznetsov for

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06508
SOV/141-58-4-24/26

A Principle of Generation of High-Frequency Oscillations

a number of valuable remarks. There is 1 Soviet reference.

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

SUBMITTED: 14th June 1958

Card 3/3

MILLER M.A

56-1-44/56

AUTHORS: Gaponov, A. V., Miller, M. A.

TITLE: On the Potential Wells for Charged Particles in a High-Frequency Electromagnetic Field (O potentsial'nykh yamakh dlya zaryazhennykh chastits v vysokochastotnom elektromagnitnom pole)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 1, pp. 242-243 (USSR)

ABSTRACT: As is well-known there exist no absolute maxima and minima of the potential in an electromagnetic field in solenoidal domains, which excludes the possibility that a charged particle remains in the state of stable equilibrium. This fact also prevents the possibility of the localization of a particle, provided that under localization a state is understood in which a particle with an energy staying below a certain limit can leave a limited domain under no initial conditions whatever. This statement, however, does not apply to the case of a high-frequency electromagnetic field where the particle (as shown here) can be localized. The authors investigate a particle with the charge e and with the mass m which moves in the outer electromagnetic field

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On the Potential Wells for Charged Particles in a High-Frequency Electromagnetic Field

56-1-44/56

$\vec{E}(\vec{r},t) = E(\vec{r})e^{i\omega t}$, $H(\vec{r},t) = H(\vec{r})e^{i\omega t}$. In nonrelativistic approximation the equation of motion reads $\ddot{\vec{r}} = \eta\vec{E}(\vec{r},t) + (\eta/c)[\dot{\vec{r}}\,\vec{H}(\vec{r},t)]$, where $\eta = e/m$ applies. At a sufficiently high frequency ω of the outer field the solutions of the just-mentioned equation can be represented in the form of a sum of a function $\vec{r}_0(t)$ slowly varying (with regard to the period of the oscillations of the outer field) and of a function $\vec{r}_1(t)$ oscillating with the frequency ω. After averaging the above-mentioned equation over the period of the high-frequency field the following equation is obtained for $\vec{r}_0(t)$: $\ddot{\vec{r}}_0(t) = -\nabla\Phi$, $\Phi = (\eta/2\omega)^2|E|^2$. By averaging over the time the force acting upon the particle becomes a potential force, where the potential of the force is proportional to the square of the modulus of the electric field strength and is not dependent on the sign of the charge. There exists an infinite number of possibilities for the construction of the potential wells for $\Phi(\vec{r})$. The simplest of them is realized in the quasielectrostatic multipole fields. In order to determine the nature of the motion of the particle within the potential well, the authors investigate the first integral of the last-mentioned

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On the Potential Wells for Charged Particles in a High-Frequency 56-1-44/56
Electromagnetic Field

equations. When $\vec{E} = 0$ applies in the center of the potential well, the particles with an energy of $\approx V_o$ are localized within a certain domain on whose boundaries the conditions $L\omega^2 / |\eta| \gg |E| > 2\omega(V_o/|\eta|)^{1/2}$ are valid. It is also possible to build up threedimensional potential wells of unidimensional and two-dimensional potential wells. There are 3 references, 2 of which are Slavic.

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

SUBMITTED: October 15, 1957

AVAILABLE: Library of Congress

Card 3/3

SOV/56-34-3-36/55

AUTHORS: Gaponov, A. V., Miller, M. A.

TITLE: On the Use of Moving High-Frequency Potential Wells for the Acceleration of Charged Particles (Ob ibpol'zovanii dvizhushchikhsya vysokochastotnykh potentsial'nykh yam dlya uskoreniya zaryazhennykh chastits)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 3, pp. 751-752 (USSR)

ABSTRACT: When using oscillations of different frequencies generally a potential relief $\Phi(\vec{r}_0,t)$ changing with increasing time is obtained. This way especially an accelerated motion of potential wells can be realized and consequently charged particles localized in such wells can be accelerated. The authors investigate 2 wave running in opposite directions ($\pm z$). With equal frequencies and amplitudes they form a standing wave $\vec{E}_0(x,y,z)e^{i\omega t}$, where $\vec{E}_0(x,y,z)$ is a real function. The potential corresponding to this field may give absolute minima. For the reason of a displacement of the potential wells on the z-axis the phase of one of the oppositely running waves must be changed. The authors restrict themselves to a non-relativistic motion $|\Delta\omega| \ll \omega_0$ and ne-

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On the Use of Moving High-Frequency Potential Wells for the Acceleration of Charged Particles SOV/56-34-3-36/55

glect the difference in the structure of the fields of oppositely running waves. Then the expression $\vec{F} = \vec{E}_0(x,y,z - v_0 t)e^{i(\omega t - z\Delta h)}$ is obtained for the whole field, where $2\Delta h = h(\omega_1) - h(\omega_2)$ holds, and where $h(\omega)$ denotes the propagation constant. The potential corresponding to this field has the form $\Phi = \Phi_0(x,y,z - v_0 t)$. The velocity $v_0 = 2\Delta\omega/[h(\omega_1)-h(\omega_2)]$ of the displacement of the potential wells is proportional to the difference of the frequencies of the oppositely running waves so that the capture and the subsequent acceleration of the particle can be realized by a change of the frequency of the generator exciting one of these waves. When the velocity v_0 is relativistic the potential wells in the corresponding supply system are a little deformed. However, the velocity of their displacement also then satisfies the last mentioned relation. As the particle to be accelerated in the corresponding supply system constantly oscillates with the frequency of the external field the degree of efficiency of such an accelerator is smaller than that of a normal linear accelerator. The here discussed accelerators with high-frequency potential wells have, however, also their advantages. First of all in the use of transverse magnetic waves there is no necessity of an

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On the Use of Moving High-Frequency Potential Wells for the Acceleration of Charged Particles

additional focusing of the particles in the transverse cross section. As the capture and the acceleration of the particles do not depend on the sign of their charge this principle can also be used for the acceleration of quasineutral plasma concentrations. After all, waves with random phase velocities (greater and smaller than light velocity) can be used. Therefore also the usual smooth-walled waveguides can be used in place of periodic structures. When an additional focusing magnetic field H_z = const is present in the accelerator also waves of the transverse-electric type can be used. There are 2 references, 2 of which are Soviet.

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

SUBMITTED: November 25, 1957

Card 3/3

SOV/56-35-1-52/59

AUTHOR: Miller, M. A.

TITLE: The Reflection of Electrons on a High-Frequency Potential Barrier (Otrazheniye elektronov ot vysokochastotnogo potentsial'-nogo bar'yera)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 35, Nr 1, pp. 299 - 300 (USSR)

ABSTRACT: According to the papers by Gaponov and the author the non-relativistic motion of a charged particle in a high-frequency electromagnetic field is determined by the contour of the high-frequency potential. The simplest way of experimentally verifying these assumptions is to investigate the reflection of particles on high-frequency potential barriers. This barrier is given by the function $\tilde{\Phi}(z)$ which has a maximum in the point $z = z_1$. The experiment was carried out with a ceaselessly evacuated electron tube which consisted of a rectangular resonator (2,9. 1,3.10 cm) The resonator was excited by high frequency pulses of 10^{-6} sec. The height of the barrier was determined by measuring the positive compensating tension pulse which was transmitted

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SOV/56-35-1-52/59

The Reflection of Electrons on a High-Frequency Potential Barrier

to the anode of the electron gun. The results of the experiments are demonstrated in a diagram in which the barrier height (in volts) is plotted against the power Π (in kilowatts). The same diagram demonstrates also the analogous dependence in consideration of the configuration of the fields in the resonator and its Q-factor. The difference of these results is not higher than the experimental errors. The experiment was carried out at relatively low wattages although it is theoretically possible to introduce pulse wattages of 10^6 W into such systems. The author thanks B.G.Yeremin, Ye.V.Zagryadskiy, V.A.Lopyrev, S.B. Mochenev, and V.A.Flyagin for helping to prepare the electron tubes and for their aid in carrying out the experiment. There are 1 figure and 3 references, 2 of which are Soviet.

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

SUBMITTED: April 9, 1958

Card 2/3

21(7)

SOV/56-35-3-50/61

AUTHOR: Miller, M. A.

TITLE: On Some Possibilities in Connection With the Selection of Charged Particles Which Are in Interaction With a Slightly Inhomogeneous High-Frequency Electromagnetic Field (O nekotorykh vozmozhnostyakh, svyazannykh s otborom zaryazhennykh chastits, vzaimodeystvuyushchikh so slabo neodnorodnym vysokochastotnym elektromagnitnym polem)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 3, pp 809 - 810 (USSR)

ABSTRACT: A rectilinear bundle of particles is assumed to move with the velocity $-\dot{z} = v_0$ towards a potential-relief $\Phi(z)$ monotonously increasing from zero, which is produced by a cophasal inhomogeneous high-frequency field. Here, the possibility is offered of a suitable selection of the parti cles for the maintenance of a certain level of high-frequen power in the system. If, for instance, there is a condensa tion of plasma in a high-frequency potential well inside th resonance cavity, and if the temperature of the plasma is kept constant (i.e. if the plasma is heated by any foreign

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On Some Possibilities in Connection With the Selection of Charged Particles Which Are in Interaction With a Slightly Inhomogeneous High-Frequency Electromagnetic Field SOV/56-35-3-50/61

sources), selection of the fast particles on the walls may warrant the intensity of the high-frequency field which is necessary for the retention of the slow particles. For this purpose it is possible also to introduce a special additional bundle of fast particles. Naturally, the selection of particles interacting with the slightly inhomogeneou field is also of quite independent significance as one of the possible principles of producing and amplifying microradiowaves. There are 7 references, 5 of which are Soviet.

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

SUBMITTED: June 17, 1958

Card 2/2

20-119-3-21/65

AUTHOR: Miller, M. A.

TITLE: On the Focussing of Beams of Charged Particles by High Frequency Fields (O fokusirovke puchkov zaryazhennykh chastits vysokochastotnymi polyami)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol. 119, Nr 3, pp. 478-480 (USSR)

ABSTRACT: For the focussing of rectilinear beams of charged particles periodical electro- and magnetostatic fields can be used. A focussing also is possible under the influence of a quickly variable electromagnetic field of certain structure. Beside these focussing systems also specifically high frequency fields exist, which have no static analogs and which cannot be reduced to static systems by any transformations of the reference system. Here the author by the focussing of rectilinear beams of charged particles in the most general meaning of the word denotes the restriction of their trajectories to a certain cylindrical domain with the radius R_M. The beam of the particles, which propagate along the z-axis with the mean velocity v_z, may be subjected to the influence of the electromagnetic field $\vec{E}(\vec{r},t) = \vec{E}(\vec{r})e^{i\omega t}$, $\vec{H}(\vec{r},t) = \vec{H}(\vec{r})e^{i\omega t}$.

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On the Focussing of Beams of Charged Particles by High Frequency Fields

20-119-3-21/65

On this occasion $v_z^2 = 2|\eta|v_z$, $\eta = e/m$ holds and the notation is: e - charge and m - mass of the particle. In non--relativistic approximation the equation of motion of a single particle within the beam is $\ddot{\vec{r}} = \eta\vec{E}(\vec{r},t) + (\eta/c)[\dot{\vec{r}}\vec{H}] + \eta\vec{E}^{(q)}(\vec{r},t)$. Here $\vec{r}$ denotes the radius vector and $\vec{E}^{(q)}(\vec{r},t)$ the field strength of the spatial charge. The beam is assumed to maintain the quasicylindrical shape and the density of the particles in this beam is supposed to be sufficiently small. Then the distortions, caused by the beam in the high frequency field, can be neglected and for the estimation of $\vec{E}^{(q)}$ the two-dimensional static equation $\vec{E}^{(q)} = -\Delta\varphi^{(q)}$, $\varphi^{(q)} = -(Q/R_M^2)R^2$ is sufficient. Here Q denotes the charge per unit length, which is"blurred" over the cross section of the beam with constant density. The first written equation can be simplified considerably, if one is interested only in the mean motion of the particle during one period of the high frequency field. For the focussing of the beam in the scalar field a "potential channel" (a two-dimensional "potential pot") must be produced, which stretches along the z-axis. Also a condition is given preventing the particles

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On the Focussing of Beams of Charged Particles by High Frequency Fields 20-119-3-21/65

from surpassing the boundary of the beam. As an example the author investigates the focussing of a rectilinear paraxial beam in the field of a symmetrical wave of the transverse-electric type, which propagates in a circular wave guide with perfectly conductive walls. The relief of the potential Φ is illustrated by a diagram. A further diagram illustrates the dependences of the limiting values of the field strengths as functions of κR_M. A focussing is possible in the case of almost all waves of the transverse-electric type. Also wave guides with inhomogeneous dielectric filling and also with periodically repeated boundary shape can be used. Not only the application of travelling, but also that of standing waves is possible. Finally also fields with several different frequencies can be used. The author thanks A. V. Gaponov and M. L. Levin for the discussion of the here found results. There are 2 figures and 3 references, 2 of which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom gosudarstvennom universitete im. N. I.

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APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R001134310(

On the Focussing of Beams of Charged Particles by High Frequency Fields 20-119-3-21/65

Lobachevskogo (Radiophysics Scientific Research Institute at the Gor'kiy State University imeni N. I. Lobachevskiy)

PRESENTED: November 23, 1957, by M. A. Leontovich, Member, Academy of Sciences, USSR

SUBMITTED: November 23, 1957

AVAILABLE: Library of Congress

Card 4/4

MILLER, M. A.

М. А. Миллер

Ускорение плазменных сгустков высокочастотными электромагнитными полями.

10 июня.

(с 10 до 22 часов)

Л. Н. Воскресенский,
Р. А. Грановская

Замедляющая система в виде спиральной [illegible] для ЛБВ

С. Г. Константинов

Отклоняющая система с бегущей волной.

[illegible],
[illegible],
[illegible],
[illegible]

Исследование электронных потоков в пространстве взаимодействия приборов СВЧ с помощью автомата для построения траекторий заряженных частиц.

Г. А. [illegible],
Е. Д. [illegible]

Замедляющая цепь типа фильтра для мощных ламп с бегущей волной дециметрового диапазона.

26

11 июня

(с 10 до 16 часов)

Совместное заседание с секцией ферритовых устройств СВЧ

В. Н. Зубков, Н. С. [illegible]

Некоторые вопросы теории параметрических усилителей.

В. Я. [illegible]

К теории ферритового усилителя.

В. Я. [illegible],
Ю. Т. [illegible],
В. В. [illegible]

Экспериментальное исследование ферритового усилителя

А. Л. [illegible],
Я. З. [illegible]

Некоторые результаты исследования ферритовых усилителей.

А. С. Тагер

К теории параметрического усиления в волноводных системах.

[illegible]

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

06339
SOV/141-2-1-11/19

AUTHORS: Bravo-Zhivotovskiy, D.M., Yeremin, B.G., Zagryadskiy, Ye.V., Miller, M.A. and Mochenev, S.B.

TITLE: Experimental Study of the Motion of Electron Beams in Weakly Non-uniform High-frequency Fields

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1959, Vol 2, Nr 1, pp 94 - 100 (USSR)

ABSTRACT: It has been shown in previous papers (A.V. Gaponov, M.A. Miller - Refs 1-3) that non-relativistic motion of a changed particle in a weakly non-uniform field can be represented as the superposition of an oscillation with the frequency of the external field $\underline{r}^{(1)}(t)$ and a motion averaged over the period of that field, $\underline{r}^{(0)}(t)$. These components obey Eqs (2) and (3) and since the r.h.s. of Eq (2) contains the electric potential vector the averaged motion of a particle is completely defined by the initial conditions and the form of the high-frequency potential $\Phi(\underline{r})$. The equations are best proved by studying the passage of an electron beam through a high-frequency potential barrier.

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APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R001134310(

06339
SOV/141-2-1-11/19

Experimental Study of the Motion of Electron Beams in Weakly Non-uniform High-frequency Fields

The experiments demonstrate: deflection of charged particles along the slope of the barrier; reflection from the barrier; high-frequency focusing. It should be possible to study the first effect in an ordinary multi-cavity magnetron working in the π-mode. Such measurements are hindered by a discharge which arises even in a cold magnetron when a high enough power is introduced. In a cold magnetron without magnetic field, the electrons appearing as a result of ionisation must slide down the slope of the potential barrier to the cathode and faster ions will arise there, the height of whose potential barrier is, from Eq (2), $(m_i/m_e)^2$ times less. Thus, a high-frequency impulse, introduced into a cold magnetron, will produce in the anode-cathode circuit a current pulse of reverse sign with an extended near flank. Measurements have been made by applying a positive voltage to the anode to compensate for the discharge current, with a typical result as in

Card2/4

06339

SOV/141-2-1-11/19

Experimental Study of the Motion of Electron Beams in Weakly Non-uniform High-frequency Fields

Figure 1. This demonstration is only qualitative since the curve of Figure 1 should be linear. Reasons suggested for the non-linearity are: tunnel-effect, distortion of potential barrier, interaction between electrodes and particle-source in the interaction space. The reflection of electrons from a potential barrier has been studied using the special arrangement of Figure 2 in which a beam of electrons traverses the centre of a waveguide resonator. The resonator is excited with 1 µsec pulses of power at 60 Gc/s. The height of the potential barrier is measured by the negative compensating pulse applied to the cathode of the electron gun. The graphs of Figure 3 are experimental results which agree with the theoretical expectations of Eqs (5) and (6) to better than the experimental error of 7%. The possibility of focusing a rectilinear electron beam has been demonstrated using a form of travelling-wave tube with a helical delay line of mean diameter 5.9 mm, wire diameter 0.3 mm, pitch 0.63 mm. The wavelength was 10 cm. The focusing of the

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electron beam was indicated by the appearance of collector current with high-frequency power sent along the helix. The transverse velocity within the beam could be changed by applying a constant transverse magnetic field over a short length of the flight path. The relation between the limiting transverse velocity of electrons and the power necessary to confine them within the limits of the helix is Eq (8) and the experimental result of Figure 4 shows excellent agreement. V.A. Flyagin and V.A. Lopyrev assisted in preparation of the apparatus.
There are 4 figures and 7 references, 6 of which are Soviet and 1 English.

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

SUBMITTED: October 31, 1958

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24.2500

67538

SOV/141-2-3-15/26

AUTHOR: Miller, M.A.

TITLE: Averaged Equations of Motion of Charged Particles in Weakly Non-uniform Static and in High-frequency Fields

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1959, Vol 2, Nr 3, pp 438 - 442 (USSR)

ABSTRACT: In a previous paper the author has dealt with the case where the static field was uniform. The high-frequency field is given by Eq (1). The electrostatic case, Eq (2), is first considered. The relation between the "scales" of the non-uniformities is given by Eq (3) and on this assumption the dispersion equations used in Ref 1 can be simplified to Eq (4). If the assumption is not valid then the general expression, Eq (7), is involved. The average equation becomes that of Eq (9), whose right-hand side cannot be represented as a vector potential. Nevertheless, interesting conclusions may be drawn, such as the simplification which ensures when the variable and static fields have the same structure. When the static field is magnetic, the "fast motion" described

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SOV/141-2-3-15/26

Averaged Equations of Motion of Charged Particles in Weakly Non-uniform Static and in High-frequency Fields

by Eq (11) includes oscillations at field frequency ω and at cyclotron frequency ω_H. The averaging process must take account of the relative values of the frequencies. When the averaging is taken over the field period, the equation of motion is Eq (15) and again, the right-hand side is not, generally speaking, a vector potential. The third term may be interpreted physically as caused by a force due to the static magnetic field acting on a dipole moment. When the averaging is taken over the cyclotron period, the result is Eq (25), used in the so-called drift approximation. Ye.I. Yakubovich is thanked for his comments.

There are 3 Soviet references.

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

SUBMITTED: February 4, 1959

Card 2/2

9.1000

75341
SOV/57-29-10-18/18

AUTHORS: Gaponov, A. V., Miller, M. A.

TITLE: Letter to the Editor. A Reply to the Letter Written by B. V. Braude on the Subject of a Paper by the Authors, Entitled "On Integration of an Equation for Currents in the Theory of Metallic Antennae"

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1959, Vol 29, Nr 10, p 1291 (USSR)

ABSTRACT: In their reply to the letter by Braude, B. V., the authors of the paper state that apparently Braude, B. V., somewhat modified his original views with which the authors did not agree and which were erroneous. There are 2 Soviet references.

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21 (7) SOV/56-36-6-40/66

AUTHOR: Miller, M. A.

TITLE: Acceleration of Plasma Clusters by Electromagnetic High-Frequency Fields (Uskoreniye plazmennykh sgustkov vysokochastotnymi elektromagnitnymi polyami)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 6, pp 1909 - 1917 (USSR)

ABSTRACT: In connection with the problems of controlled thermonuclear reactions the methods for the conservation of the plasma are of considerable interest. One of the possible means consists in using weakly inhomogeneous electromagnetic high-frequency fields; V. I. Veksler was the first to point out this possibility of localizing plasma. Several special cases permitting an electrodynamically selfconsistent solution have already been dealt with: Plasma sphere in a spherical resonator, plasma cylinder in a round waveguide, two-dimensional plasma layer between ideal planes (diploma paper by Ye. I. Yakubovich, Gor'kiy State University) etc. A general solution is possible only for a plasma of low concentration. In continuation of several earlier papers (Refs 5-7), the author, partly in collaboration with A. V. Gaponov, investigates special cases of accelerations

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of quasineutral plasma clusters by an electromagnetic high--frequency field, and shows it to be possible to accelerate clusters of a completely ionized quasineutral plasma located in a high-frequency potential well if, besides the condition of total ionization, the following conditions are satisfied: Maxwell distribution of particles according to the average velocity, dielectric constant of the plasma to be nearly equal to unity, i.e. that particle concentration be $N \ll m_e\omega^2/4\pi e^2 = 3.1.10^{-8}\omega^2$ (m_e and e denote the mass and charge respectively of the electron, ω - cyclic frequency of the external field). It is thus possible to solve the kinematic part of the problem, i.e. the problem of the spatial displacement of the localized fields. It is shown that, if the potential well is formed by the fields of two waves of different frequency, the plasma can be accelerated only by changing the frequency of one of the waves or by using waveguides of variable cross section. Finally, the author investigates possibilities for cyclic plasma acceleration. Application of the formulas is, like in the preceding chapter dealing with the selection of accelerator parameters, discussed on the basis of numerical examples. In conclusion, the author thanks A. V. Gaponov, V. B. Gil'denburg, and S. B. Mochenev for discussing the results obtained. There are 2 figures and 8 references, 6 of which are Soviet.

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

SUBMITTED: January 23, 1959

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R001134310(

MILLER, M. A., Doc Phys-Math Sci -- (diss) "Motion of charged particles in weakly heterogeneous high-frequency electromagnetic fields." Gor'kiy, 1960. 17 pp; (Ministry of Higher and Secondary Specialist Education RSFSR, Gor'kiy State Univ im N. I. Lobachevskiy, Scientific Research Radiophysical Inst -- NIRFI); 300 copies; price not given; bibliography on page 15 (25 entries); (KL, 27-60, 147)

69418

S/141/60/003/01/010/020
E032/E514

24,2120

AUTHORS: Gil'denburg, V.B. and Miller, M.A.

TITLE: On the Acceleration of a Plasma Bunch During its Passage Through a Nonuniform Electromagnetic Field

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1960, Vol 3, Nr 1, pp 97-101 (USSR)

ABSTRACT: In studying the motion of a plasma bunch in a nonuniform alternating electromagnetic field, the perturbation introduced by the plasma into the external field must be taken into account. Although these perturbations cannot be calculated in a general form the main features of the motion of a plasma bunch can be deduced from an analysis of a simple example. The example considered in the present paper is that of a plasma sphere. It is assumed that during its interaction with the field its characteristics remain unaltered, i.e. it behaves as an absolutely stable object. It is further assumed that the plasma is fully ionized and quasi-neutral and its effect on the field is equivalent to that of a medium with purely real (collisions are neglected) dielectric

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constant which is given by

$$\varepsilon = 1 - (\omega_{\Pi\Pi}^2/\omega^2) = 1 - 4\pi\ Ne^2/m_e\omega^2$$

where e is the charge and m_e the mass of an electron, N is the electron concentration and ω is the angular frequency of the external field. Furthermore, the radius of the sphere a is considered to be small compared with a characteristic linear dimension L of the region of the nonuniform field. It is also considered to be small compared with the wavelength in free space ($\lambda = 2\pi/k = 2\pi c/\omega$) and in plasma ($\lambda_\varepsilon = \lambda/\sqrt{|\varepsilon|}$). These conditions are summarized in Eq (1). The perturbation of the field is then estimated on the dipole approximation and the nonrelativistic equation of motion for the bunch in an external field $\underline{E}(\underline{r})\,e^{i\omega t}$, $\underline{H}(\underline{r})\,e^{i\omega t}$ is written down in the form given by Eq (2), where b is given by the expression just below Eq (2), m_i is the

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mass and Ze is the charge of an ion and p is the polarization vector (dipole moment per unit volume) which satisfies the condition given by Eq (3) and is given by Eq (4). The other parameters employed in Eq (4) are defined by Eq (5) and it is assumed that $\gamma \ll \omega, \omega_o$. The motion is assumed to take place in the weakly nonuniform field and the sphere passes through a distance L during a time interval containing a large number of the periods $2\pi/\omega$ and $2\pi/|\omega - \tilde{\omega}|$, where $\tilde{\omega} = \omega_o + i\gamma_o/2$. Substituting Eq (4) into Eq (2) the solution of Eq (2) is written down in the form of a superposition of a rapidly oscillating and averaged motion. This is expressed by Eqs (6) to (8). Thus, the total average force per unit mass $\underline{F}_{\Sigma}$ is made up of two terms, namely, the potential force $\underline{F}_{\nabla}$, which is due to the nonuniformity of the modulus of the amplitude of the field and the force $\underline{F}_p$ which is due to the electro-

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magnetic pressure. In order to estimate the relationship between F_{∇} and F_p, the example is considered whether the amplitudes of the standing and travelling waves are the same and $E \simeq H$ and $\nabla \sim 1/L \simeq k$. Hence $F_p/F_{\nabla} \simeq \omega\gamma/|\omega^2 - \omega_o^2|$. This ratio is small except for frequencies close to ω_o. When $\omega = \omega_o$ the force F_{∇} becomes zero but at a small distance away from resonance, e.g. for $\Delta\omega \simeq \gamma$ the quantity F_{∇} reaches a maximum value of the order of F_p. When $\omega \gg \omega_o$, the force F_p becomes proportional to the total number of particles in the bunch and the acceleration of particles in the field of the standing wave is ω/γ times more effective than in the case of a travelling wave. The theory is then applied to a number of other cases:

1) When F_p is negligible compared with F_{∇};

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2) to estimate the velocity reached by a plasma bunch when it is ejected from a nonuniform field;
3) the effect of the alternating field on the polarization and
4) the passage of a fast bunch through a quasi-electrostatic field.
There are 8 Soviet references.

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

SUBMITTED: October 20, 1959

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R001134310(

86858

9,2585
9,4200

S/141/60/003/005/013/026
E192/E382

AUTHOR: Miller, M.A.

TITLE: Some Properties of Electron Gaps with Large Transit Angles

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1960, Vol. 3, No. 5, pp. 837 - 847

TEXT: The gaps considered meet the condition:

$$\dot{L}_E \gg \dot{r}_{cp} T \qquad (1.1)$$

where $\dot{L}_E$ is the length of the gap,

T is the period of oscillation of the control field and

$\dot{r}_{cp}$ is the average velocity of the particle (electron).

For the purpose of analysis it is assumed that the electromagnetic field inside the gap is in the form of $\underline{E}(\underline{r})e^{i\omega t}$ and $\underline{H}(\underline{r})e^{i\omega t}$. The motion of an electron can therefore be represented as the super-position of an

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oscillatory motion:

$$\underline{r}^{(1)}(t) = -\eta/\omega^2 \underline{E}(\underline{r})e^{i\omega t},$$
$$\dot{\underline{r}}^{(1)}(t) = -i\eta/\omega \underline{E}(\underline{r})e^{i\omega t} \qquad (2.1)$$

and a continuous motion obeying:

$$\ddot{r}^{(0)} = \nabla\Phi(\underline{r}^{(0)}) \qquad (2.2)$$

where η is the ratio of the electron charge, e , to its mass, Φ is the high-frequency potential expressed by:

$$\Phi = \left|\eta\underline{E}/2\omega\right|^2 \qquad (2.3).$$

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This averaging description of the motion is valid if the conditions defined by Eqs. (2.4), (2.5) and (2.6) are met. On the basis of Eq. (2.2), the integral of the averaged energy is given by:

$$\dot{\underline{r}}^{(0)2}/2 + \Phi(\underline{r}^{(0)}) = \text{const} \qquad (2.7).$$

First, the ideal case is considered which corresponds to the maximum value of the electron conductivity $G_{эл}$ (Refs. 7, 8). A rectilinear beam of particles with input velocity v_{BX} enters a gap whose high-frequency potential increases monotonically. It is now possible to choose the "output surface" of the gap so that the overall velocity of the particles on it is zero (see Eq. 3.1). In this case, the kinetic energy of the electrons will be fully transferred to the electromagnetic field. This corresponds to the maximum possible value of the electron conductance. However,

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in actual conditions the value of the electron conductance will be lower. The optimum value of the conductance is given by Eq. (4.4), where $V_e = mc^2/e$, I is the current in the beam and f(r) is the field distribution in the gap. In the case of a non-optimum bunching or sorting of particles it is necessary to derive special formulae. The beam is assumed to be rectilinear and it is oriented at an angle α_n with respect to the output boundary x = 0 of the gap. It is assumed that the tangential component of the vector $\underline{E}$ at this boundary is equal to zero so that $\underline{E}$ is expressed by Eq. (5.1), where $V_\sim f(z_n)/L_E$ is the amplitude of the uniform field in the bunching space. On the basis of Eqs. (4.1) and (4.2), the trajectories of the electrons can be written as Eqs. (5.2) and (5.3), where $\tau = \omega t$ and μ is the phase bunching parameter which is defined by

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Eq. (5.4); here, $t_b = \tau_b/\omega$ is the instant of the particles entering the sorting space and x_b and z_b are the coordinates determining the boundary of the sorting space. Now, the electron conductance can be expressed as $G = G_{опт} F(\mu)$, where μ is defined by Eq. (5.12). The function $F(\mu)$ can be referred to as the phase debunching factor. At $\mu > 1$, it is impossible to obtain real values for τ_1 and τ_3. In the limiting case, when $\mu \to 0$ and $\tau_2 \to \tau_3$, the function $F(\mu) \to k + 1$. On the other hand, for small μ the function $F(\mu)$ is approximately expressed by Eq. (5.14). For the case when the field E in the sorting or bunching space is in the form of Eq. (5.1) but the output plane of the gap is at an angle γ with the plane $x = 0$, the phase debunching factor is expressed by Eq. (6.4), where $\tilde{\mu}$ is defined by Eq. (6.2). For small $\tilde{\mu}$

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Eq. (6.4) is written as Eq. (6.5). A graph of the debunching factor (given by Eq. 6.4) is shown in Fig. 1. It is of some interest to determine the change in the velocity of the electron beam while passing through a gap. The velocity of the electrons in the direction of the field can be found directly from Eqs. (5.3) and it is expressed by Eqs. (7.1). The above analysis can easily be applied to the systems whose gaps are subjected to the interaction of static fields. There are 2 figures and 8 references: 5 Soviet and 3 English.

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

SUBMITTED: May 14, 1960

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S/141/60/003/005/014/026
E192/E382

9,2585
9,4200

AUTHOR: Miller, M.A.

TITLE: Electron Gaps with Large Transit Angles in Oscillator Systems

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, 1960, Vol. 3, No. 5, pp. 848 - 859

TEXT: The article is a direct continuation of the preceding work (see pp. 837 - 847 of this journal) and it is devoted to the investigation of the interaction of thin electron beams with electromagnetic fields in resonators. It is assumed that an electron gap is in the form of a high-quality resonator with a predetermined structure of the electromagnetic field which corresponds to one of the natural frequencies of the system. The field excited in the resonator by the electron beam oscillating at a frequency ω is written as Eq. (2.1), which is analogous to Eq. (5.2) of the preceding article. Here, $V_{\sim}(t)$ is a slowly varying voltage function which is described by Eq. (2.2) and L_E is the characteristic linear

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dimension of the resonator; $\underline{f}(\underline{r})$ in Eq. (2.1) represents the distribution of the electric field inside the resonator. For the amplitude function $V_{\sim}(t)$, it is possible to obtain the following equation:

$$\frac{d^2V_{\sim}}{dt^2} + 2i\omega\frac{dV_{\sim}}{dt} + (\omega^2_{co6} - \omega^2)\,V_{\sim} = -\frac{da}{dt} - i\omega a \qquad (2.4)$$

where ω_{co6} is the natural frequency of the resonator.

The simplified equations for the system are in the form of Eqs. (2.6) and (2.7), where Q is the quality factor of the resonator, while the parameters a_s and a_c are defined by Eqs. (2.8) and (2.9). The current vector in Eq. (2.9) is expressed by Eq. (2.10) so that a of Eq. (2.8) is given by Eq. (2.11). It is now necessary to combine Eqs. (3.1) and (3.2) of the preceding article with Eqs. (2.5) and (2.7).

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For this purpose, the current of Eq. (2.10) can be represented by Eq. (3.1). Now, the parameter a is expressed by Eq. (3.2) where various constants are defined by Eqs. (3.3), (3.4) and (3.5). The final system of simplified averaged equations is in the form of Eqs. (3.6). Here, the quantity $\widetilde{M}$ determines the frequency displacement due to the electron beam. It is seen that for $\widetilde{M}$ = const., the frequency shift is given by Eq. (3.7). Since the quantity $\widetilde{M}$ is comparatively small, Eqs. (3.6) can be approximately written as Eqs. (3.9), where $G_{рез}$ is the effective conductance of the resonator and $G_{эл}$ is the real component of the electron conductance. The formulae are used to analyse the system with a two-dimensional electron beam of finite thickness $(D_1 \leq x \leq D_2)$ which is parallel to the plane $x = 0$. In this case, the electron conductance is given either by Eq. (4.7) or Eq. (4.8). In particular, when $D_1 = 0$, i.e. when there is no gap between

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the beam and the collector, the electron conductance is defined by Eqs. (4.9), where $G_I = I/V_e$. The dependence of the electron conductance for $kD_2 = 1$ on $V_\sim/V_e$ is illustrated in Fig. 1a. If it is assumed that an ideally narrow electron beam enters the electron gap at an angle α_b (with respect to the collector plane), the electron conductance is defined by Eq. (5.7). This formula is identical with Eq. (4.9), if it is assumed that $D_1 = D_2 = D$. A graph of the electron conductance expressed by Eq. (5.7) is shown in Fig. 16. For the case of a system with longitudinal bunching (an inverted coaxial diode, where the electrons with the initial velocity v_b are injected through an external sheath having a radius b) the electron conductance is expressed by Eq. (6.2). A graph of this function is given in Fig. 1B.

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It is of interest to estimate the principal parameters necessary for obtaining the oscillation conditions in the above systems. These parameters are the current I and the voltage V_I, corresponding to the steady-state oscillations in the system. It is shown that the current is expressed by Eq. (7.2), where $L_{эф}$ is the effective dimension of the resonator which is defined by Eq. (7.3). The voltage V_I is expressed as follows:

$$V_I = \frac{V_e}{2\pi^2} \frac{(kL_E)^2}{n} = 2.6 \cdot 10^4 \frac{(kL_E)^2}{n} \text{ (volt)} \qquad (7.6)$$

where $n = \Delta t/T$; Δ is the transit time through the gap having a length L_E and T is the period of oscillations;

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n thus represents the number of waves or oscillations along the gap.
There are 2 figures and 9 Soviet references; one of the references is translated from English.

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

SUBMITTED: May 15, 1960

Card 6/6

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9,3700

33199
S/141/61/004/005/001/021
E039/E135

AUTHORS: Miller, M.A., and Talanov, V.I.

TITLE: The use of the surface impedance concept in surface electromagnetic wave theory. (Review)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, v.4, no.5, 1961, 795-830

TEXT: This is a comprehensive review paper which deals with some general questions on the way in which the theory of surface electromagnetic waves is related to impedance and on the guiding properties of boundaries. It is assumed that in the general case surface impedance may possess spatial dispersion. The value of this in the study of free waves, as well as for the solution of the problem of surface field excitation by means of various sources, is shown. The work is discussed under four main headings, as follows.

1. Free surface waves. This section is divided into ten parts and starts with a discussion on surface impedance. In the case of a closed boundary surface the tangential form of the vector field is given as:

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$$\underline{E}_i = \sum_{k=1}^{2} Z_{ik} \left[\underline{nH}\right]_k \qquad (1.1)$$

where $\underline{n}$ is normal to the surface, ik is the characteristic index of orthogonal coordinates in the direction of the surface. The tensor $Z_{ik} = R_{ik} + jX_{ik}$ in a practical rationalised system of units (used in this survey) has the dimensions of impedance and is called the surface impedance tensor. It is shown that surface waves guided by a plane boundary become plane heterogeneous waves and, for cylindrical surfaces, cylindrical heterogeneous waves. A large part of the work on surface waves is devoted to the guiding properties of surfaces. The basic properties of surface waves are discussed in detail. Briefly, the condition for the existence of surface waves near a plane z = 0 leads to the relation:

$$\operatorname{Re}\tilde{\gamma} = -\operatorname{Im}\gamma > 0 \qquad (1.13)$$

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The phase velocity of such waves is always less than the velocity of propagation (for a two dimensional plane the velocity of light $c = 1/\sqrt{\varepsilon\mu}$). Discarding non-essentials the solution of the equation for local fields for $\tilde{\gamma}^2 = -1$ gives:

$$\tilde{\gamma}_\pm = \tilde{M} \pm \sqrt{\tilde{M}^2 + N} \quad (1.15)$$

If $\tilde{M}$ and N are considered real it is comparatively simple to classify all possible forms of surface waves. Fig.1 shows five different regions for the parameters $\tilde{M}$ and N. In the first three the condition (1.13) is satisfied. In region I ($N > 0$) there is only one positive root ($\tilde{\gamma}_+ > 0$, $\tilde{\gamma}_- < 0$) and only one type of surface wave is possible. In region II, ($\tilde{M}^2 > -N$, $N < 0$, $\tilde{M} > 0$) the simultaneous existence of two propagated waves is permitted. In region III ($\tilde{M}^2 < -N$, $N < 0$, $\tilde{M} > 0$) there are two complex roots with positive real parts. The regions IV and V correspond to the propagation of non-localised fields. In IV ($\tilde{M} < -N$, $N < 0$, $\tilde{M} < 0$)

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both roots of Eq.(1.15) are complex, and in V ($\tilde{M} > -N$, $N < 0$, $\tilde{M} < 0$) real and negative. This illustrates the possible forms of surface waves and shows the critical values of parameters appropriate to transitions from one region to another. The review continues with a discussion on surface impedance at a plane boundary and on systems with cylindrical boundaries. The latter condition is qualitatively analogous to the plane boundary case. The case of surface waves on a heterogeneous boundary is considered and it is shown that for the general case one must resort to an approximate method. This section is concluded by a consideration of the effect of a boundary with a sinusoidal change of impedance.

2. The excitation of surface waves by an external source.
The question of excitation by an external source situated near a dividing boundary is the subject of a whole series of papers. Surface fields are in principle analogous to comparatively simple problems such as the determination of fields inside a screened transmission line; hence one is able to use well developed wave theory methods. In practice a real source will excite a whole

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complex of other fields apart from the surface fields, forming the so-called spatial waves weakly coupled to the guiding boundary.

3. The diffraction of surface waves. This question is discussed in detail under a number of headings. It is shown that, as with the study of free surface waves, the use of the impedance approach is extremely effective. This permits the use of a series of simple models for the elucidation of the basic characteristics of practical systems.

4. Antenna systems. It is shown that one of the most useful applications of the impedance approach is in the design of antenna systems.

M.C. Neyman, G.D. Malyuzhinets, M.D. Khaskind, B.Ya. Moyzhes, L.A. Vaynshteyn, Kuan-Ting-Hua, P.S. Mukazan and V.I. Bespalov are mentioned in the article in connection with their contributions in this field.

There are 5 figures and 227 references: 89 Soviet-bloc, 2 Russian translations from non-Soviet-bloc publications, and 138 non-Soviet-bloc. The four most recent English language references read as follows:

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Ref. 18: A. F. Harvey, IRE Trans., v. MTT-8, 30 (1960).
Ref. 20: F. J. Zucker, Handbook of Antenna Engineering, H. Jasi:. McGraw-Hill Book Co., 1960.
Ref. 21: F. J. Zucker, J. Res. NBS, v. 64D, 6 (1960).
Ref. 72: A. D. Bresler, IRE Trans., v. MTT-8, 81 (1960).

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

SUBMITTED: June 27, 1961

Card 6/16

43399

24920

S/141/62/005/005/005/016
E032/E514

AUTHOR: Miller, M.A.

TITLE: On the parametric interaction of charged or quasi-neutral objects with nonuniform high-frequency fields

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, v.5, no.5, 1962, 929-932

TEXT: It is assumed that the charged or quasi-neutral objects are small and that the perturbation which they introduce into the external field may be neglected. The latter is taken to be

$$\underline{E}(\underline{r},t) = \underline{E}_a(\underline{r})f(t)e^{i\omega t}; \quad \underline{H}(\underline{r},t) = \underline{H}_a(\underline{r})f(t)e^{i\omega t} \qquad (1)$$

where the amplitude is a slowly varying function of the coordinates and of time so that on the nonrelativistic approximation $|\dot{\underline{r}}|c \ll 1$; $\Omega/\omega \sim |\dot{\underline{r}}|/\omega L \ll 1$, where L and $1/\Omega$ are the characteristic distances within which the amplitude undergoes an appreciable change. Using a method similar to that employed in the case of constant amplitudes, it can be shown that the equation of motion averaged over the period $2\pi/\omega$ is on this approximation $\ddot{\underline{r}} = -\nabla\Phi(\underline{r})f^2(t)$, (Eq.3) where $\Phi(\underline{r})$ is a stationary high-frequency

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potential whose properties have been discussed in detail by the author in previous papers (Dissertation, NIRFI, Gor'kiy, 1960; Proc. Intern.Conf. High Energy Acc. and Instr., CERN, 1959, p.662; Izv.vyssh.uch.zav. Radiofizika, v.1, no.3, 110, 1958; v.2,439,1959). The latter equation is formally identical with the equation of motion for a mass point in a quasi-static force field so that there is a high-frequency analog to any quasi-static system. On the other hand, Eq.(3) involves a time dependent parameter and, therefore, a definite class of "mechanisms" of parametric interaction between the object and the quasi-static field should also occur in the high frequency case. It is noted that there are many examples of this in electronics and mechanics. In the present note the particular examples considered are the acceleration and deceleration of plasma bunches in amplitude modulated fields and also their interaction with travelling fields of averaged forces.

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

SUBMITTED: December 19, 1961

45627

S/141/62/005/006/012/023
E192/E382

24,6730

AUTHORS: Yeremin, B.G. and Miller, M.A.

TITLE: Interaction of electrons at large transit angles with the field of a standing wave

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, v. 5, no. 6, 1962, 1151 - 1159

TEXT: The interaction space (electron gap) is in the form of a two-dimensional rectangular cavity:

$$0 \leq x \leq b, \quad 0 \leq z \leq L = \lambda/2, \quad -\infty \leq y \leq +\infty .$$

The field inside the cavity is produced by external means and does not change as a result of its interaction with the electrons; the field is given by:

$$E_x = x_o E_o \sin(kz) \sin(\omega t); \qquad (1)$$

$$H_y = y_o E_o \cos(kz) \cos(\omega t)$$

which characterize a standing wave (with respect to the coordinate

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S/141/62/005/006/012/023
E192/E382

Interaction of electrons ....

z) of the TEM type. By introducing the following normalized symbols:

$$x' = kx, \quad z' = kz, \quad \tau = \omega t, \quad \Psi = eE_o/m_o\omega C \qquad (2)$$

where e is the charge of a particle and m_o is its rest mass, the relativistic equations of motion can be written as:

$$\ddot{x}' = (1 - \dot{x}'^2 - \dot{z}'^2)^{1/2}\Psi\left[(1 - \dot{x}'^2)\sin z' \sin \tau - \dot{z}' \cos z' \cos \tau\right]$$
$$\ddot{z}' = (1 - \dot{x}'^2 - \dot{z}'^2)^{1/2}\dot{x}'\Psi\left[\cos z' \cos \tau - \dot{z}' \sin z' \sin \tau\right] \qquad (3).$$

Since the relativistic effect is significant only at comparatively small transit angles, in this case it was sufficient to take into account only the terms of the second-order in the expansion of Eqs. (3) with respect to $\dot{x}'$ and $\dot{z}'$. In the case of the asymptotic approximation for:

$$\Psi \ll 1, \quad \dot{z}' \sim \dot{x}' \ll 1 \qquad (5)$$

the motion of the particles can be described by an oscillatory component:

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$$x'^{(1)} = -\Psi \sin z' \sin \tau \qquad (6)$$

and an averaged component:

$$\ddot{z}'^{(0)} = - \frac{d}{dz'} (\tilde{\Phi}) \qquad (7)$$

where the potential $\tilde{\Phi}$ is given by:

$$\tilde{\Phi} = \frac{\Psi^2 \sin^2 z'}{4} = \frac{\dot{x}'^{(1)2}}{4} \qquad (9).$$

It is seen from these equations that a gradual increase in the amplitude of the particles in the direction of x' is produced inside the interaction space due to deceleration of the particles along z'. Three types of trajectory are possible: 1) a particle passes through the interaction space at small Ψ and intersects $z' = \pi$ with the same velocity which it had at the input; 2) at larger Ψ the particle is fully reflected from a

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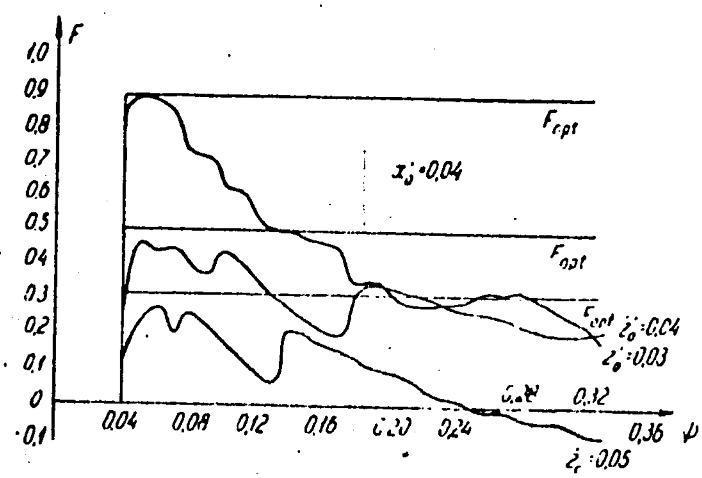
plane whose coordinate is given by $z = \arcsin(\sqrt{2}\, z'_0/\Psi)$;
3) the electrons intersect the plane $x' = 0$ and leave the interaction space. The electron efficiency of the gap for the case of the optimum energy transfer represented by Eq. (5) was evaluated and the efficiency is plotted as a function of Ψ in Fig. 5. The above calculations are valid for the systems with ideally thin electron beams which enter the interaction space in parallel to the plane $x' = 0$. However, the finite width of the beam can be taken into account by integrating the equations with respect to the parameter x'. There are 6 figures.

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

SUBMITTED: April 23, 1962

Interaction of electrons S/141/62/005/006/012/023
E192/E382

Fig. 5:



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APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R00113431

45628

24,2500

S/141/62/005/006/013/023
E192/E382

AUTHORS: Litvak, A.G., Miller, M.A. and Sholokhov, N.V.

TITLE: A more exact form of the averaged equation of motion for charged particles in the field of a standing electromagnetic wave

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiofizika, v. 5, no. 6, 1962, 1160 - 1170

TEXT: The Van der Pol method can be used in describing the motion of a particle in the following manner:

$$\underline{r} = \underline{r}^{(1)} + \underline{r}^{(0)} \tag{1}$$

where $\underline{r}^{(1)}$ is an oscillatory component and $\underline{r}^{(o)}$ is a slowly changing component. This description is valid when the motion is nonrelativistic:

$$\beta = v_o/c \sim \dot{r}^{(0)}/c \sim \dot{r}^{(1)}/c \ll 1 \tag{2}$$

and when the oscillations of the particle are small in comparison with the characteristic dimension L_E of the field irregularity, i.e.

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E192/E382

A more exact form ....

$$\alpha \sim r^{(1)}/L_E \ll 1 \qquad (3)$$

Further, the transit time of the particle through a non-homogeneous region should be much greater than the period of the field, i.e:

$$\gamma = v_o/\omega L_E \sim \dot{r}^{(0)}/\omega L_E \sim \dot{r}^{(1)}/\omega L_E \ll 1 \qquad (4)$$

In the case of a monochromatic sinusoidal field the oscillatory component is described by:

$$\underline{r}^{(1)} = -(\eta/\omega^2)\underline{E}(\underline{r}^{(0)})e^{i\omega t} \qquad (5)$$

$$\underline{r}^{(1)} = -(i\eta/\omega)\underline{E}(\underline{r}^{(0)})e^{i\omega t}$$

and the slowly changing component is given by:

$$\frac{d^2\underline{r}^{(0)}}{dt^2} = -\nabla\Phi_o(\underline{r}^{(0)}) \qquad (6)$$

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E192/E382

A more exact form ....

where: $\Phi_o(\underline{r}^{(0)}) = |\eta \underline{E}/2\omega|^2$.

Analysis of this equation is based on the assumption that there exists an integral:

$$(\underline{r}^{(0)})^2/2 + \Phi_o(\underline{r}^{(0)}) = \text{const} \qquad (7)$$

for the averaged energy of the system. An attempt is made to evaluate the validity of this method by introducing a more exact equation containing expansion terms of the third order. It is assumed that the particles move in linearly polarized standing waves, described by:

$$\underline{E}(\underline{r}, t) = E_o \underline{e}(\underline{r})\cos(\omega t); \quad \underline{H}(\underline{r}, t) = H_o \underline{h}(\underline{r}) \sin(\omega t) \qquad (8)$$

where E_o and H_o are the amplitudes and $\underline{e}$ and $\underline{h}$ are normalized field-distribution functions. First, it is found that Eq. (6) can be made more exact by introducing expansion terms with regard

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APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R001134310(

A more exact form ....

S/141/62/005/006/013/023
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to parameters β and α, while the parameter $\chi = \beta/\gamma$ is an arbitrary quantity. The field components e and h are therefore expanded with respect to α and averaged equations of motion are derived on the basis of the relativistic equation. The averaged equations are employed to investigate the motion of a particle in a transverse electromagnetic standing wave and it is found that the exact formulae lead to an increase $\delta\Phi$ in the potential. This increment is a function of α, χ and β. Similar conclusions regarding the potential increment are arrived at in the case of a particle moving in the standing wave of the TM type. The exact formula can be primarily used for determining the accuracy of the first approximation (as calculated from Eq. 6).

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

SUBMITTED: April 23, 1962

Card 4/4

ACCESSION NR: AP4024473 S/0141/64/007/001/0124/0134

AUTHOR: Kondrat'yev, I. G.; Miller, M. A.

TITLE: Two-dimensional electromagnetic fields guided by plasma layers, I

SOURCE: IVUZ. Radiofizika, V. 7, no. 1, 1964, 124-134

TOPIC TAGS: plasma waveguide, plasma homogeneous layer, plasma isotropic layer, zero dielectric constant layer, plasma wall waveguide, radiation loss, role of collision, spatial dispersion, focusing magnetic field

ABSTRACT: This is the first of a series of articles and is devoted to plasma waveguides made up of piecewise-homogeneous isotropic layers, which guide two-dimensional electromagnetic waves. It is shown that the reflection coefficient of the electromagnetic wave from a single plasma layer is close to unity in three cases: (a) when the electron concentration inside the layer is sufficiently high. (b) in the case of glancing incidence for arbitrary concentration, and (c) in the case of TM waves incident on a layer with zero dielectric constant. A related case is that of complex angles of incidence, corresponding to surface waves. All these possibilities can be utilized to construct waveguide systems with plasma

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ACCESSION NR: AP4024473

walls. Among the considered characteristics of such systems are the radiation losses, the role of the collisions and of spatial dispersion, and the role of the focusing magnetic fields. Orig. art. has: 9 formulas and 4 figures.

ASSOCIATION: Nauchno issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete (Scientific Research Radiophysics Institute at the Gor'kiy University)

SUBMITTED: 15Apr63 DATE ACQ: 15Apr64 ENCL: 00

SUB CODE: PH NR REF SOV: 004 OTHER: 010

Card 2/2

ACCESSION NR: AP4024479 S/0141/64/007/001/0176/0179

AUTHORS: Kondrat'yev, I. G.; Miller, M. A.

TITLE: On the field structure inside a plasma layer with zero dielectric constant

SOURCE: IVUZ. Radiofizika, v. 7, no. 1, 1964, 176-179

TOPIC TAGS: plasma, plasma layer, zero dielectric constant layer, zero permittivity layer, spatial dispersion, reflection by plasma layer, plasma layer waveguide, spatially nondispersive layer

ABSTRACT: This is a supplement to a more extensive investigation of reflecting properties of certain plasma layers (IVUZ. Radiofizika v. 7, 124, 1964). Although the layer with zero dielectric constant acts as a perfect reflector for electromagnetic waves, part of the energy does penetrate through such a layer in the presence of spatial dispersion due to the thermal motion of the particles. The character

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ACCESSION NR: AP4024479

of the variation of the field in the presence of spatial dispersion is treated for a TM wave incident on the plasma layer. It is shown that allowance for the spatial dispersion does not eliminate the total screening by the zero-permittivity layer, but merely shifts the resonant value of the dielectric constant away from zero, making this layer slightly transparent to TM waves. In the limit of a spatially-nondispersive layer the correct results are again obtained, but the parameters must be allowed to approach zero in a definite sequence. All the uncertainties can be eliminated by introducing a small amount of damping. In this case there is a magnetic field in the plasma layer, corresponding to an infinite electric field, but the plasma field component compensates for the infinite electric component, making the total field finite. Orig. art has: 1 figure and 6 formulas.

ASSOCIATION: Nauchno issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete (Scientific Research Radiophysics

ACCESSION NR: AP4024479

Institute at the Gor'kiy University)

SUBMITTED: 19Sep63 DATE ACQ: 15Apr64 ENCL: 00

SUB CODE: PH NR REF SOV: 001 OTHER: 002

Card 3/3

L 53023-65 EWT(d)/EWT(l)/EEC(k)-2/EPF(n)-2/EWG(m)/EEC-4/EPA(w)-2/EEC(t) Pn-4/Ps-6/ Po-4/Pab-10/Pg-4/Pt-7/Pi-4/Pl-4 IJP(c) WW/AT/WS-4

ACCESSION NR: AP5010674 UR/0141/65/008/001/0034/0041

AUTHOR: Kondrat'yev, I. G.; Miller, M. A.

TITLE: Two-dimensional electromagnetic fields guided by plasma layers. II.

SOURCE: IVUZ. Radiofizika, v. 8, no. 1, 1965, 34-41

TOPIC TAGS: waveguide propagation, plasma waveguide, plasma layer, gyrotropic plasma

ABSTRACT: The first part of the paper (Izv. vyssh. uch. zav. - Radiofizika v. 7, 124, 1964) dealt with the possibility of existence of localized electromagnetic waves guided by layers of a homogeneous isotropic plasma. This problem is now generalized to include the case of anisotropic layers (principally gyrotropic) and to take into account the possibility of a continuous density distribution, rather than a piecewise homogeneous distribution. Several variants of two-dimensional waveguide systems with gyrotropic plasma walls are considered. The coefficients of reflection and surface impedances are determined for a simple ... layer, inside of which the field is constant and oriented either

coefficients of reflection and surface impedances are determined for a gyrotropic plasma layer inside of which the field is constant and oriented either along the wave propagation or perpendicular to it. By analyzing the behavior of

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ACCESSION NR: AP5010674

the reflection coefficients at various modes from a single isolated layer conditions are deduced under which such layers can serve as screens for high-frequency electromagnetic field and form waveguide walls. It is shown that ideal screening is possible only in the case of plasma resonance of a layer with constant magnetic field oriented perpendicular to the TM propagation direction; in round-cylinder waveguides this should be an azimuthal magnetic field. The effect of spatial dispersion and absorption inside the layer are briefly discussed. Orig. art. has: 1 figure and 10 formulas.

ASSOCIATION: Nauchno-issledovatel'skiy radiofizicheskiy institute pri Gor'kovskom universitete (Radiophysics Scientific Research Institute at the Gor'kiy University)

SUBMITTED: 27Mar64 ENCL: 00 SUB CODE: ME, EM

NR REF SOV: 005 OTHER: 000

Card 2/2

ACC NR: AP6033284 SOURCE CODE: UR/0141/66/009/005/0910/0918

AUTHOR: Kondrat'yev, I. G.; Miller, M. A.

ORG: Scientific Research Radiophysics Institute at the Gor'kiy University (Nauchno-issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete)

TITLE: Use of the solutions of certain nonlinear equations for the study of waves in linear inhomogeneous media

SOURCE: IVUZ. Radiofizika, v. 9, no. 5, 1966, 910-918

TOPIC TAGS: wave propagation, nonlinear equation, dielectric constant, magnetic permeability

ABSTRACT: In view of the limited number of solutions obtained for problems dealing with the propagation of waves in linear inhomogeneous media, the authors propose a method based on known solutions of the corresponding nonlinear equations, wherein the solution of the nonlinear problem is transformed into a solution of a linear problem with a corresponding inhomogeneous distribution of some parameter. In particular, the authors consider the solution of linear second-order equations for electromagnetic fields with variable dielectric constant ϵ and variable permeability μ. The artificial nonlinearization is effected by introducing a dependence of the coefficients on the unknown functions $\epsilon(E, H)$ and $\mu(E, H)$. This makes possible integration of the equation in general form, and then a return to the solution of the initial linear system with fixed distributions ($\epsilon(E(r), H(r))$ and $\mu(E(r), H(r))$). The method is uni-

Card 1/2 UDC: 621.371.123: 538.56

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R001134310(

ACC NR: AP6033284

versal and is illustrated in this paper by using as examples the propagation of a two-dimensional electromagnetic field along transversely inhomogeneous dielectric layers. Inasmuch as the solution of the nonlinear equation contains as a rule arbitrary parameters, it is possible, by varying the parameters, to realize a sufficiently broad class of distributions of the parameters in the linear system. Orig. art. has: 4 figures and 28 formulas.

SUB CODE: 09, 20/ SUBM DATE: 20Dec65/ ORIG REF: 004/ OTH REF: 002

Card 2/2

L 33757-66 EWT(m)
ACC NR: AP6025838 SOURCE CODE: UR/0089/66/020/003/0230/0232

AUTHOR: Zager, B. A.; Miller, M. B.; Mikheyev, V. L.; Polikanov, S. M.; Sukhov, A. M; Flerov, G. N.; Chelnokov, L. P.

ORG: none

50
B

TITLE: Properties of the 102 sup 254 isotope 19

SOURCE: Atomnaya energiya, v. 20, no. 3, 1966, 230-232

TOPIC TAGS: isotope, cyclotron, half life, particle physics

ABSTRACT: Isotope 102^{254} has been produced on the external beam of the 150 centimeter OIYaI cyclotron following the $Am^{245}(N^{15}, 4n)102^{254}$ reaction. It was established by recording the α-decay of the primary and daughter nuclei that the half-life of this isotope is within the 20-50 sec interval, while the energy of the emitted α particles is equal to 8.10±0.05 MeV. The new results are in disagreement with the data found in literature ($T_{1/2}$ = 3 sec, and E_α = 8.3 MeV). The authors thank the collective that worked on the accelerator; A. F. Linev, I. A. Shelayev, and V. S. Alfeyev for checking the efficiency of the cyclotron; K. A. Gavrilov for preparing the target, which was stable under very intense beams; and V. A. Chugreyev for carrying out the construction work. They also thank Doctor of Physicomathematical Sciences I. G. Gverdtsiteli, who provided the isotope N^{15}; V. I. Kuznetsov, A. G. Smirnov-Averin, and A. G. Kozlov, who guaranteed the receipt of Am^{243} for the target. Finally, they thank A. G. Belov, V. I. Ilyushchenko and V. I. Nikolayev for help in conducting the experiments. Orig. art. has: 2 figures. [JPRS: 36,139]

SUB CODE: 18, 20 / SUBM DATE: 15Dec65 / ORIG REF: 006 / OTH REF: 005
Card 1/1 BLG UDC: 546.799.92
0916 0948

BICHUL', T. V., BERDICHEVSKAYA, K. M. and MILLER, M. I. (State Inst of Applied Chem)

"Synthesis of Phenol, With Its Nucleus Tagged by Carbon Isotope C^{14}"

Isotopes and Radiation in Chemistry, Collection of papers of 2nd All-Union Sci. Tech. Conf. on Use of Radioactive and Stable Isotopes and Radiation in National Economy and Science, Moscow, Izd-vo AN SSSR, 1958, 380pp.

This volume published the reports of the Chemistry Section of the 2nd AU Sci Tech Conf on Use of Radioactive and Stable Isotopes and Radiation in Science and the National Economy, sponsored by Acad Sci USSR and Main Admin for Utilization of Atomic Energy under Council of Ministers USSR Moscow 4-12 Apr 1957.

MiLLER, V. R.

137-1957-12-23412

Translation from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 12, p 82 (USSR)

AUTHORS: Madyanov, A. M., Permitin, Ye. S., Miller, M. R., Lyutov, A. I., Vishevnik, V. K., Kaznevskaya, V. A.

TITLE: An Experiment in Casting an Eight-ton Ingot With Small Height-diameter Ratio (H/D = 0.5) [Opyt otlivki vos'mitonnogo slitka s malym otnosheniyem vysoty k diametru (H/D = 0.5)]

PERIODICAL: V sb.: Novoye v liteyn. proiz-ve. Nr 2. Gor'kiy, Knigoizdat, 1957, pp 222-232

ABSTRACT: An experimental ingot of the 40-A type was cast. The small ratio H/D = 0.5 was dictated by the conditions of forging. In order to achieve horizontal orientation of the crystallization plane, the following steps were taken: the exterior of the mold (M) was covered with heat-insulating slag-wool, the bottom of the M was cooled by air-water jets, and the shrinkage head was heated by an electric arc of a capacity of 1500 A. The pouring of the body of the ingot required 300 seconds, and the pouring of the shrinkage head (12 percent of the weight of the ingot) 210 seconds. The solidification time was 7 hrs. The horizontal orientation of the principal crystallization plane was not achieved. A study of the

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137-1957-12-23412

An Experiment in Casting an Eight-ton Ingot (cont.)

longitudinal templets showed a lack of axial sponginess, and a satisfactory macrostructure, with the shrinkage cavity open on top. Liquation beyond the axial zone was observed. In the cross-sectional templets the zone of small crystals occupied 20-30 mm, that of acicular crystals 50-60 mm, the remainder being non-oriented crystals of medium magnitude. On the cross-sectional templets taken from the center area and from the area below the sinkhead, large liquation-spots were discovered. The heat-insulating layer around the walls of the M proved to be detrimental, since it placed the liquation zones further away from the area of the arc's action. The employment of electrical heating improved the quality of the axial portion of the ingot. Plans for the cooling of the lower section of the ingot and for the design of a mold are presented.

G. S.

1. Castings-Development 2. Castings-Test methods 3. Castings-Test results

Card 2/2

CAMPBELL, C., Douglas and [illegible], . . [illegible].

Railway transportation in Soviet Russia. (Journal of the Institute of transport, Dec. 1933, v. 15, p. 9[illegible]- DLC: [illegible]. 1[illegible]

SO: Soviet Transportation and Communications, A Bibliography, Library of Congress, Reference Department, Washington, 1952, Unclassified.

1. OSIPENKO, I. O.; MILLER, M. S.

2. USSR (600)

4. Hoisting Machinery

7. TL-1 winch for unloading full-length logs. Les.prom. 13 no. 2 1953.

9. Monthly List of Russian Accessions, Library of Congress, April 1953, Uncl.

[illegible], M. S.

36307 Vliyaniye kushcheniya na formirovaniye kolosa yarovoy pshenitsy. Zapiski Leningr. S-Kh. IN-TA, Vyp. 5, 1948, S. 81-95-Bibliogr: 2? Nazv

SO: Letopis' Zhurnal'nykh Statey, No. 49, 1949

MILLER, M. S.

24100 MILLER, M. S. Potochnyy metod lesozagotovok v Timiryazevskom opytno-pokazatel'nc lespromkhoze (S primech. Red) Les. prom-st', 1949, No. 7, S. 4-6.

SO: Letopis, No. 32, 1949.

MILLER, M. S.

"The Influence of Lateral Runners upon Spike Formation in Spring Wheat,"

Dok.AN, 67, No. 6, 1949. Mor. Leningrad Agricultural Inst. -c1949-.

CA MILLER M. S.

Distribution of assimilated nitrogen between shoots in the summer wheat plant. M. S. Miller. *Botan. Zhur. S.S.S.R.* 35, 469-74 (1950).—Presence of side shoots in the plant lowers the hydration level in the main ear shoot and decreases its rate of development. Hydroponic study in aq. soln. contg. 0.5 g. $Ca(NO_3)_2$, 0.125 g. KH_2PO_4, 0.125 g. $MgSO_4$, and 0.012 g. $FeCl_3$ (per l. ?) with either full nutrition of roots of the main shoot and the side shoots, or with decrease of N in either set of roots, showed that in the 15-day expt. if N is excluded from the main-shoot roots, it is supplied to this shoot through the side-shoot roots, but over-all N level in both shoots suffered a drop. If the side roots are deprived of direct N supply, this is taken over by the main roots, leading to an even more severe decline of N content in the main shoot, but not in the side shoots. Hence, side shoots have a definite utility to the plant only after they develop their own root systems, but until this occurs they serve to undermine the productivity of the total plant.

G. M. Kosolapoff

MILLER, M. S.

F. D. Skazkin, Ye. I. Lovchinovskaya, M. S. Miller, et al, Praktikum po fiziologii rasteniy (Plant Physiology Practice). Fourth Edition, revised and supplemented. "Sovetskaya nauka" Press.

The manual presents simple and easy methods for the study of vital processes of plants. Much of the work has the character of research, and its fulfillment trains the student to work independently. The manual also contains a chapter on methods of conducting practical studies, and laboratory work on plant physiology.

The manual is intended for pedagogical institute biology students.

SO: Sovetskiye knigi (Soviet Books), No. 186, 1953, Moscow, (U-6472)

MILLER, M. S.

7670. MILLER, M. S. I --Organizatsiyz lesozagotovok s Vy-Vozkoy lesa V khlystakh v Kazachins Kom lespromkhoze trestra "Eniseyskles". Page 35 Po materialam Sib. Nauch.--issled. in-ta lesnoro khozyaystva i lesoekspluatatsii Sib NIILKHE. Novosibirsk, 1954, 56 S. S. ill. 20 ss. (Vsesoyuz. Nauch. INZH - tekhn. O-VO lesnoy prom-sti I lesnogo khozyzystva VNITOKes. Zap. - Sibotd-niye) . 1.000 ekz. bespl. -- (55-3429)P
634.98:658.5(57.21) & 634.982.5:656.13

SO: Knizhnaya Letopsis', Vol. 7, 1955

SKAZKIN, F.D., prof.; LOVCHINOVSKAYA, Ye.I.; MILLER, M.S.; ANIKIYEV, V.V.; YATSKOVSKAYA, K.N., red.; SIDOROVA, V.I., red.izd-va; PAVLOVA, V.A., tekhn.red.

[Laboratory manual of plant physiology] Praktikum po fiziologii rastenii. Izd.5., ispr. i dop. Pod red. F.D.Skazkina. Moskva, Gos.izd-vo "Sovetskaia nauka," 1958. 338 p. (MIRA 12:5)

1. Deystvitel'nyy chlen Akademii pedagogicheskikh nauk RSFSR (for Skazkin).
(Botany--Physiology)

MILLER, M.S.

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