KADOMSKAYA, K.P., Cand Tech Sci—(diss) "Limiting internal over-voltages in AC electric transmissions by the use of two-step switches." Len, 1958. 20 pp (Min of Higher Education USSR. Len Polytech Inst im M.I.Kalinin), 100 copies (KL,30-58,127)

8(2) SOV/105-59-8-2/28

AUTHORS: Levinshteyn, M. L., Docent, Candidate of Technical Sciences, Kadomskaya, K. P., Candidate of Technical Sciences

TITLE: Requirements Placed Upon Arresters Used as a Protection Against Internal Overvoltages

PERIODICAL: Elektrichestvo, 1959, Nr 8, pp 9 - 14 (USSR)

ABSTRACT: In connection with the conversion of the electrical transmission lines from 400 kv to 500 kv the requirements placed upon arresters used as a protection against internal overvoltages are investigated. A study of internal overvoltages in the transmission line Votkinskaya GES (Votkinskaya Hydroelectric Power Station) - Sverdlovsk lead to the following conclusions. An arrester with given characteristics is capable of interrupting an arc provided that the forced voltage component in the line does not exceed $(1.3-1.4)U_{ph}$. In order to arrive at a reliable overvoltage protection other measures must be taken which go beyond the installation of arresters. The circuit breakers must be installed in such a way as to secure a selective disconnection of the breaker located at

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Requirements Placed Upon Arresters Used as a Protection Against Internal Overvoltages

SOV/105/59-8-2/28

the buses with the smaller power and similarly a selective closing of the breaker at the buses with the higher power. The automation of the system must secure a reliable delay of the breakers of 1-2 periods. Measures must be taken to arrange for a discharge of the line capacity during the interval of automatic reclosure, and to place electromagnetic voltage transformers close to the line. It appears to be desirable that when the system is operative, all main connections are under load. The circuit breakers of modern transmission lines with 400 and 500 kv must be equipped with ohmic resistances shunting their main contacts. Recommendations are advanced concerning the improvement of the characteristics of the arrester developed in the Vsesoyuznyy elektrotekhnicheskiy institut im. Lenina (All-Union Institute of Electrical Engineering imeni Lenin). There are 9 figures, 1 table, and 2 Soviet references.

Card 2/3

Requirements Placed Upon Arresters Used as a Protection Against Internal Overvoltages

SOV/105-59-8-2/28

ASSOCIATION: Leningradskiy politekhnicheskiy institut im. Kalinina (Leningrad Polytechnic Institute imeni Kalinin)

SUBMITTED: March 12, 1959

Card 3/3

KADOMSKAYA, K.P., kand.tekhn.nauk; LEVINSHTEYN, M.L., kand.tekhn.nauk; CHERTOUSOVA, V. M., inzh.; SHAKHAYEVA, O. M., inzh.

Higher-order harmonics in electric power transmission lines without cutouts at the higher voltage end. Izv. vys. ucheb. zav.; energ. 5 no.1:15-23 Ja '62. (MIRA 15:2)

1. Leningradskiy politekhnicheskiy institut imeni M.I.Kalinina.
(Electric power distribution)

GRIBOV, A.N., kand.tekhn.nauk, dotsent; KADOMSKAYA, K.P., kand.tekhn.nauk;
CHERTOUSOVA, V.M., inzh.

Methods for calculating the voltages of an open-circuited power transmission line with consideration of the local load and saturation of transformers and reactors. Izv.vys.ucheb.zav.; energ. 5 no.4:33-40 Ap '62. (MIRA 15:5)

1. Leningradskiy politekhnicheskiy institut imeni M.I.Kalinina.
(Electric power distribution)

KADOMSKAYA, K.P., kand.tekhn.nauk; KAPLAN, V.V., kand.tekhn.nauk;
NASHATYR', V.M., kand.tekhn.nauk; SHCHERBACHEV, O.V., kand.tekhn.nauk

Problem concerning the use of two-way switches with shunting resistances. Elektrichestvo no.8:61-65 Ag '62. (MIRA 15:7)

1. Leningradskiy politekhnicheskiy institut imeni Kalinina.
(Electric switchgear)

KADOMSKAYA, K.P.(Leningrad); LEVINSHTEYN, M.L. (Leningrad); SHTERENBERG, G.P. (Leningrad)

Solution of the equations of a long electric power transmission line using numerical and digital computers. Izv. AN SSSR. Energ. i transp. no.4:508-513 Jl-Ag '63. (MIRA 16:11)

KADOMSKAYA, K.P. (Leningrad); SHTERENBERG, G.P. (Leningrad)

Study of internal overvoltages in electrical systems using electronic digital computers. Izv. AN SSSR. Energ. i transp. no.6:731-741 N-D '63. (MIRA 17:1)

KADOMSKAYA, K.P.; LEVINSHTEYN, M.L.; CHERTOUSOVA, V.M.; SHAKHAYEVA, O.M.

Comparison of the applicability of small parameter and harmonic balance techniques in calculating the periodic operating conditions of electric power transmission lines with nonlinear parameters. Izv.vys.ucheb.zav.;energ. 6 no.1:117-118 Ja '63. (MIRA 16:2)

1. Leningradskiy politekhnicheskiy institut imeni M.I. Kalinina.
(Electric power distribution)
(Electric lines—Overhead)

KADOMSKAYA, K.P., kand.tekhn.nauk; LEVINSHTEYN, M.L., dotsent, kand.tekhn.nauk; CHERTOUSOVA, V.M., inzh.

Methods for calculating higher harmonic voltages in systems with two nonlinear elements. Izv. vys. ucheb. zav.; energ. 6 no.10:27-35 O '63. (MIRA 16:12)

1. Leningradskiy politekhnicheskiy institut imeni M.I.Kalinina. Predstavlena kafedroy tekhniki vysokikh napryacheniy.

L 16385-65 RAEM(i)/ESD(dp)/SSD/BSD/AFWL/ASD(a)-5/AFM(dp)/...

ACCESSION NR: ...

AUTHOR: Kadomskaya, K. P. (Leningrad); Kontorovich, ... K. (Leningrad); Shterenberg, G. P. (Leningrad)

TITLE: Calculation of the internal overloads on long range power transmission lines using an electronic digital computer

SOURCE: AN SSSR. Izvestiya. Energetika i transport, no. 5, 1964, 587-592

TOPIC TAGS: digital computer, D'Alambert method, Runge Cutt method, power transmission, discharge device, power overload, magnetic circuit, Euler method, memorizing device, computer programming

ABSTRACT: The use of electronic digital computers to calculate the internal overloads on long-range power transmission lines calls for the solution of the ordinary differential equations describing the transient conditions at the terminal installations, and the equations of the line recorded in the D'Alambert form. Control calculations of the overloads on a 255-kV transmission line were made with a view to checking the accuracy of the various integration methods. The Runge-Cutt integration method, with a step interval of 0.17 milliseconds, was adopted and showed a margin of error of over 3%, while the error in the Euler method of integration was about 5%. The solution of these equations by a digital computer requires that it memorize not the variables involved but their derivatives, which should be

L 16385-65

ACCESSION NR: AP4049218

defined approximately. The approximate definition of the derivatives at the time of the current drop adds a certain amount of error to the solution. The approximate definition of the derivatives may lead to considerable unpredictable errors in the case of three-phase power-transmission systems containing [illegible] at several points. It should be pointed out that the method of solving the equation proposed by the authors reduces the necessary number of cells in the memorizing device required for storing the program (from 9 cells by the Runge-[illegible] method to 5 by the proposed method). In both cases it takes 60 full cells to memorize the delayed functions. The proposed method thus makes it possible to simplify the programming problem and reduce the time required to solve it with a tolerable degree of accuracy. Orig. art. has: 4 figures and 6 numbered formulas.

ASSOCIATION: none

SUBMITTED: 30Apr64 ENCL: 00 SUB CODE: DP, EE

NO REF SOV: 000 OTHER: 000

Card 2/2

L 19445-65 EWT(d)/EED-2/EWP(1) Po-4/Pq-4/Pg-4/Pk-4 IJP(c)/ASD(a)-5/AS(...)
AFWL(p)/AFTC(b)/ESD(dp)/ESD(t) GG/BB
ACCESSION NR: AP4049459 S/0143/64/000/010/0015/0024

AUTHOR: Gusev, Yu. M. (Engineer); Kadomskaya, K. P. (Candidate of technical sciences); Levinshteyn, M. L. (Candidate of technical sciences, Docent)

TITLE: Analog-computer simulation of corona on wires of a-c power transmission line

SOURCE: IVUZ. Energetika, no. 10, 1964, 15-24

TOPIC TAGS: analog system, corona, corona discharge, power transmission line

ABSTRACT: As analytical methods of calculating corona on power transmission lines are very complicated, the use of O. V. Shcherbachev's corona simulator (Trudy LPI, no. 1, 1954) combined with an analog computer is suggested. A single equivalent Γ-network, which reproduces the volt-coulomb characteristic of corona, is employed. The corona-equivalent capacitance is assumed to be independent of the line voltage; other parameters of the equivalent circuit are

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L 19445-65
ACCESSION NR: AP4049459

computed on the basis of corona loss in a real line. An example [illegible] single-phase line having a characteristic impedance of 250 ohms (base power 750 Mw) illustrates the method; corona loss is assumed to be 349 kw, [illegible]. The resulting reduction of overvoltage due to corona is 6.3% and 14% for the first [illegible] second maxima of the line voltage wave. An approach to solving 3-phase [illegible] loss problems is also outlined. Simplified diagrams and corona-parameter equations are given. An allowance for corona in calculating overvoltages on superhigh-voltage power transmission lines is considered important. Orig. art. has: 6 figures, 19 formulas, and 1 table.

ASSOCIATION: Leningradskiy politekhnicheskiy institut im. M. I. Kalinina (Leningrad Polytechnic Institute)

SUBMITTED: 10Mar64 ENCL: 00

SUB CODE: EE, DP NO REF SOV: 007 OTHER: 000

Card 2/2

GRUZDEV, Igor' Aleksandrovich; KADOMSKAYA, Kira Panteleymonovna; KUCHUMOV, Leonid Aleksandrovich; LUGINSKIY, Yakov Natanovich; PORTNOY, Marlen Gdalevich; SOKOLOV, Nikolay Ivanovich; NIKOLAYEVA, M.I., red.

[Use of analog computers in electric power systems; methods for studying transient processes] Primenenie analogovykh vychislitel'nykh mashin v energeticheskikh sistemakh; metody issledovanii perekhodnykh protsessov. [By] I.A.Gruzdev i dr. Moskva, Energiia, 1964. 407 p. (MIRA 18:2)

GUSEV, Yu.M., inzh.; KADOMSKAYA, K.P., kand. tekhn. nauk; LEVINSHETYN, M.L., kand. tekhn. nauk, dotsent

Simulation of corona on an a.c. power transmission line using an analog computer. Izv. vys. ucheb. zav.; energ. 7 no.10: 15-24 O '64. (MIRA 17:12)

1. Leningradskiy politekhnicheskiy institut imeni M.I. Kalinina.

KADOMSKAYA, K.P.; LEVINSHTEYN, M.L.; MIKHAYLOV, Yu.A.; OKOROKOV, V.R.; ORLOV, V.N.; POLOVOY, I.F.; KOSTENKO, M.V., prof. red.

[Internal overvoltages of high-voltage a.c. networks, 1961-1963] Vnutrennie perenapriazheniia v elektricheskikh setiakh vysokogo napriazheniia peremennogo toka, 1961- 1963. Moskva, 1964. 241 p. (MIRA 18:4)

1. Akademiya nauk SSSR. Institut nauchnoy informatsii.
2. Chlen-korrespondent AN SSSR (for Kostenko).

KADOMSKAYA, K.P. (Leningrad); KANTOROVICH, A.Kh. (Leningrad); SHTERENBERG, G.P. (Leningrad)

Calculation of internal overvoltages in long-distance power transmission lines using digital computers. Izv. AN SSSR. Energ. i transp. no.5:587-592 S-O '64. (MIRA 17:12)

KADOMSKAYA, K.P.

Equations of the transient processes of three-phase three-winding group transformers and autotransformers. Trudy LPI no.242:145-149 '65. (MIRA 18:8)

GUSEV, Yu.M.; KADOMSKAYA, K.P.; LEVINSHTEYN, M.L.; RODCHENKO, Ye.A.

Mathematical modeling of the characteristics of a discharger used in protection from internal overvoltages. Trudy LPI no.242:150-158 '65. (MIRA 18:8)

L 01081-67

ACC NR: AP6019200 (A) SOURCE CODE: UR/0143/66/000/002/0012/0018

AUTHOR: Gusev, Yu. M. (Engineer); Kadomskaya, K. P. (Candidate of technical sciences); Levinshteyn, M. L. (Candidate of technical sciences, Lecturer)

ORG: Leningrad Polytechnical Institute imeni M. I. Kalinin (Leningradskiy politekhnicheskiy institut)

TITLE: Effectiveness of spark connection for reactors designed for limiting internal surges

SOURCE: IVUZ. Energetika, no. 2, 1966, 12-18

TOPIC TAGS: reactor control, electric power transmission, spark gap, electric discharge, voltage stabilization

ABSTRACT: The number of reactors connected to a line under conditions of internal surge limitation is generally greater than the number necessary for compensating line capacity during low power transmission. For this reason, some of the reactors are connected to the line through spark gaps to limit internal surges in long-range electric power transmission. The authors consider the effectiveness of this type of reactor connection from the standpoint of its effect on maximum overvoltage. Maximum overvoltage in switching commutation is a function of the following random quantities: the emf switching phase Ψ and the breakdown voltage of the reactor spark gap $V_{br}$. In plot-

UDC: 621.316.435

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L 01081-67

ACC NR: AP6019200

ting the distribution functions for the maximum overvoltages it was assumed that the emf switching phase Ψ is distributed according to a uniform density law in the interval from -90° to +90° inclusive. Curves are given for the resultant distribution functions for surges which result from line connection over a wide range of spark gap breakdown voltages. A comparison of the mathematical expectations for maximum surges with pulse switching for conventional and spark connection of reactors shows that reactors connected to the line through spark gaps may be treated as straight connections for practical purposes in power transmissions of higher classes of voltage with relatively low natural frequencies. The operating conditions of dischargers in circuits containing reactors with spark connection are analyzed. The results of the study show that operation of the discharger spark gap has practically no effect on the service life of the discharger even under emergency conditions. The use of commutation dischargers behind the reactor spark gaps requires no special measures for preventing breakdown of the discharger spark gaps during operation of the reactor spark gap. Orig. art. has: 4 figures, 3 tables.

SUB CODE: 18,20/ SUBM DATE: 10Jul65/ ORIG REF: 004

Card 2/2 vlr

ACC NR: AM5011709

MONOGRAPH

UR

Gruzdev, Igor' Aleksandrovich; Kadomskaya, Kira Panteleymonovna; Kuchumov, Leonid Aleksandrovich; Luginskiy, Yakov Natanovich; Portnoy, Marlen Gdalevich; Sokolov, Nikolay Ivanovich

Using analog computers in power systems; methods for analyzing transient processes (Primeneniye analogovykh vychislitel'nykh mashin v energeticheskikh sistemakh; metody issledovaniy perekhodnykh protsessov) Moscow, Izd-vo "Energiya", 1964. 407 p. illus., biblio. 5,000 copies printed.

TOPIC TAGS: analog computer, electromagnetism, electric engineering, electric power engineering, mathematic model, computer circuit, computer application

PURPOSE AND COVERAGE: This book is concerned with the application of analog computers to the study of electromechanical and electromagnetic transient processes in power systems. It presents methods for mathematical modeling, circuits for special-purpose devices used in general-purpose computer studies, and examples of completed investigations. The book is intended for engineers at scientific research and planning institutes, workers at power systems, and students taking advanced courses in electric power and electromechanics.

TABLE OF CONTENTS [abridged]:



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UDC: 681.142.33/.34:620.9

ACC NR: AM5011709



SUB CODE: 09,13,20/ SUBM DATE: 31Oct64/ SOV REF: 083/ OTH REF: 001

Card 2/2

KADOMSKIY, D. Ye.

Kadomskiy, D. Ye.

"Internal excess voltage in transformer equipment for DC power-transmission systems." Min Higher Education USSR. Leningrad Polytechnic Inst imeni M. I. Kalinin. Leningrad, 1956. (Dissertation for the Degree of Candidate in Technical Science).

So: Knizhnaya letopis'
No. 25. 1956. Moscow

GROYS, Ye.S.; KADOMSKIY D.Ye.

Internal overvoltages in single-bridge converter substations for d.c. transmission. Izv. NIIPT no.5:101-126 '60. (MIRA 14:1)
(Electric substations)

KADOMSKIY, D.Ye.

Harmonic component of voltages acting on the insulation of the multibridge stages of converter networks. Izv. NIIPT no.7:111-119 '61. (MIRA 14:9)

(Electric current converters)
(Electric insulators and insulation)

KADOMSKIY, D.Ye.

Protection from overvoltages arising in the rectifier network of the power supply of a high-frequency generator. Izv. NIIPT no.7: 120-132 '61. (MIRA 14:9)

(Electric current rectifiers)
(Electric power supply to apparatus)

KADOMSKIY, D.Ye.; STUPEL', A.I.

Overvoltages in the Volgograd-Donets Basin d.c. power transmission line. Izv. NIIPT no.8:134-150 '61. (MIRA 15:7)
(Electric power distribution--Direct current)

KADOMTSEV, B.B.

AUTHOR: KADOMCEV, B.B. PA - 2008
TITLE: On the Hydrodynamic Description of Plasma Oscillations.
PERIODICAL: Zhurnal Eksperimental'noi i Teoret.Fiziki, 1956, Vol 31, Nr 6, pp 1083-1084 (U.S.S.R.)
Received: 1 / 1957 Reviewed: 3 / 1957

ABSTRACT: This paper investigates only electron oscillations, in which connection ions and molecules are considered to be infinitely heavy. Furthermore, the amplitude of the oscillations is assumed to be small and the distribution function of the electrons does not deviate much from MAXWELL's distribution $f_o(v)$. Under the effect of the electric field the velocity of the electrons is increased by $d\vec{v} = -(eE/m)dt$ and thus the distribution function changes at the first moment by $df' = (\partial f_o/\partial\vec{v})(e\vec{E}/m)dt$. In the following moments the distribution function change according to BOLTZMANN'S equation, in which case this modification is determined in the first stage by the free emission of electrons with gradual removal from the bundle (as a result of collisions). A formula is given for such electrons as have not suffered a single collision. - Also the electrons emerging from the primary bundle (which have suffered at least one collision) cause a certain change of the distribution function corresponding to equilibrium. By assuming that already one collision suffices for the establishment of MAXWELL'S equilibrium, this modification is represented as a modification of the parameters of MAXWELL'S distribution (i.e. of density, velocity, and temperature). This process can be described hydrodynamically and the corresponding hydrodynamic equations are:

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$\partial n/\partial t + n_o \mathrm{div}\vec{u} = (\alpha+\beta)n_o I_1$; $\partial\vec{u}/\partial t + \beta u + (\varkappa T_o/mn_o)\nabla n + (\varkappa/m)\nabla T = \alpha T_2$, $\partial T/\partial t + (2/3)T_o \mathrm{div}\,\vec{u} - \chi\Delta T = (\alpha\beta\beta)(m/3\varkappa)I_3$. Here n and T denote the deviations of density and temperature respectively from the values $n_o$ and $T_o$ respectively, which correspond to equilibrium, $\vec{u}$ - macroscopic velocity. The term $\beta\vec{u}$ takes account of the slowing down of electrons by heavy particles, and $\chi$ is the coefficient of temperature conductivity. The expressions on the right side of the equation are due to the emergence of electrons from the aforementioned distribution. In addition to the above given equation system there is another equation for the electric field: $\mathrm{div}\,\vec{E} = -4\pi e(n+n')$ with $n' = n_o I_1$. The latter equation and the aforementioned equation system represent the required transmission equations. In the case of $\alpha \to \infty$ they go over to ordinary hydrodynamic equations, and in the case of $\alpha = \beta = 0$ the equation $\mathrm{div}\,\vec{E} = -4\pi e(n+n')$ is identical with the dispersion equation to be obtained by the linearization of the equation by A.A.VLASOV (teorija mnogich castic (many-particle theory)(1950)). From the aforementioned equation a dispersion equation is deduced and its results are discussed.

ASSOCIATION: Not given
PRESENTED BY:
SUBMITTED:
AVAILABLE: Library of Congress

CARD 2 / 2

5992
ON THE HYDRODYNAMIC DESCRIPTION OF PLASMA OSCILLATIONS. B B Kadomtsev. Soviet Phys. JETP 4,

2R

KADOMTSEV, B.B.

AUTHOR: KADOMTSEV, B.B. 56-4-48/52

TITLE: On Fluctuations in a Gas. (O fluktuatsiyakh v gaze, Russian)

PERIODICAL: Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol 32, Nr 4, pp 943 - 944 (U.S.S.R.)

ABSTRACT: The state of a gas is fully described by the distribution function of the particles within the phase space $f(\vec{r},\vec{v},t)$, and therefore the problem of the fluctuations in a gas is reduced to the study of the correlation properties of the distribution function. By f, usually the statistical average density of the particles in the phase space is understood. This density, of course, cannot undergo fluctuations. If the fluctuations of the distribution functions are mentioned, the "real" density is actually meant: $F(\vec{r},\vec{v},t) = \sum_i \delta(\vec{r} - \vec{r}_i)\delta(\vec{v} - \vec{v}_i)$. Here summation extends to all particles. The density F is regarded here as a chance order of magnitude which is identical with f only in the average. The function F satisfies the equation

$$\frac{\partial F}{\partial t} + (\vec{v}\nabla)F = \frac{1}{m}\frac{\partial F(\vec{r},\vec{v},t)}{\partial \vec{v}}\int \frac{\partial U(\vec{r} - \vec{r}')}{\partial \vec{r}} F(\vec{r}',\vec{v}',t)d\vec{r}'d\vec{v}'$$

where m denotes the mass of the molecule and U - the potential energy of the interaction of the molecules among one another.

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On Fluctuations in a Gas. 56-4-48/52

In a perfect gas the interaction of the particles may be neglected, and in this case $F(\vec{r},\vec{v},t) = F(\vec{r} - \vec{v}(t - t_o),\vec{v},t_o)$ results from the formula just given, and herefrom furthermore:

$$\langle \varphi(\vec{r},\vec{v},t)\varphi(\vec{r}_o,\vec{v}_o,t_o)\rangle = f(\vec{r},\vec{v},t)\delta(\vec{r} - \vec{v}(t - t_o) - \vec{r}_o)\delta(\vec{v} - \vec{v}_o).$$

Here $\varphi = F - f$ applies, and the average is expressed by the pointed brackets.

The following work is destined to find the correlation by taking account of the collisions. In the case of not too dense gases only pair-like collisions need be regarded. In this case the right side in the first-mentioned equation can be given in form of a shock term S(F?F) (which is explicitely given here). The solution of the problem set here is derived step by step. When investigating the problem accurately and in the nonsteady case, the linearized kinetic equation has to be solved by means of a chance source. This equation also describes the further development of the chance disturbance of the distribution function. The kinetic method of investigation discussed here is very illustrative and, above all, applies also to the non-steady case.

Card 2/3

KADOMTSEV, B.B.

AUTHOR KADOMTSEV, B.B. 56-7-22/66

TITLE On the Effective Field in a Plasma.
(O deystvuyushchem pole v plazme.- Russian)

PERIODICAL Zhurnal Eksperim. i Teoret. Fiziki 1957, Vol 33, Nr 7, pp 151 - 157 (USSR)

ABSTRACT The present paper calculates the effective field acting on the charged particles in a plasma by means of the equations by BOGOLYUBOV for the "partial distribution functions". Here the trinary function is represented approximatively by a binary function, which corresponds to a development towards the small quantily $1/nD^3$. Here n denotes the density of the particles and D - Debye's radius. By this fact an analogous development is transferred also to the coupling of the effective field with the mean field. The author confines himself to the computation of a correction which is small only of second order. Apart from the electrons, the plasma is assumed to contain only simple ionised ions of one kind. The author here introduces the conceptions "microscopic density" of the particles in the phase space; the corresponding expressions have the following form for electrons and ions respectively:

$F_e = \sum_k \delta(\vec{r} - \vec{r}_k(t))\delta(\vec{v} - v_k(t))$ and

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APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R000519830009-6"

KADOMCEV, B.B.

AUTHOR KADOMCEV, B.B. PA - 2247

TITLE The Invariance Principle for a Homogeneous Medium of Arbitrary Shape (Pintsip invariantnosti dlya odnorodnoy sredy poizvol'noy geometricheskoy formoy).

PERIODICAL Doklady Akademii Nauk SSSR, 1957, Vol 112, Nr 5, pp 831-834 (U.S.S.R.)
Received 4/1957 Reviewed 5/1957

ABSTRACT The present paper applies the principle of invariance to media of arbitrary shape, a fact which is of interest for the theory of the dispersion of light and for some problems of neutron-physics. Dispersion is assumed not to change frequency (Generalization for the case with a modification of frequency does not offer particular difficulties). The investigated medium is assumed to be homogeneous and limited by a convex surface S. The corresponding transfer-equation is invariant with respect to a small motion in space. Therefore the effect of such a transformation can be fully taken into account by a modification of boundary conditions. This is just what is maintained by the invariance principle in the general case.
First the transfer equation for the influence-function is written down. The medium is shifted by the infinitely small quantity $\varepsilon$ in the direction of the unit vector $\vec{e}$, on which occasion the locations of the source and of the observer remain unchanged. On this occasion the influence function G goes over into a new function G' which is obviously equal to the old influence function but in which the points of observer and source have shifted. On the other hand, such a shift

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is equivalent to a certain variation of density, where matter is removed one side and added on the other. The variation $\delta G$ satisfies the transfer-equation and can therefore be represented by the influence-function. Next, an integral equation for G is derived, in which one integral vanishes because of the boundary conditions. Then space is turned round the infinitely small angle $\xi$ round a certain point $\vec{R}$. The resulting modification of G is given. The six scalar equations which correspond to two vector-equations form the mathematical formulation of the invariance principle. For the determination of these equations their homogeneity is very essential.
The author applies the here obtained equations to the problem of the diffuse reflection of light on a homogeneous medium. The solution of this problem is reduced to the determination of the influence-function $G(\vec{\omega},\vec{r};\vec{\omega}_0,\vec{r}_0)$ on the condition that the points $\vec{r}_0$ and $\vec{r}$ are on the surface S. Here $\vec{r}$ denotes the radius vector of radiation plotted pointand $\vec{\omega}$ the direction of the radiation in the plotted point. (The source is at point $\vec{r}_0$ and emits radiation in the direction $\vec{\omega}_0$. In the case of isotropic scattering the equations can be simplified.
(No illustrations)

ASSOCIATION Not given
PRESENTED BY M.A.LEONTOVICH, member of the Academy, on 27. 9. 1956.
SUBMITTED 26. 9. 1956
AVAILABLE Library of Congress

Card 2/2

On the Influence Function in the Theory of the Transport of Radiated Energy.

every solution of the above equation can be written down in the following form:

$$I(\nu,\vec{\omega},\vec{r},t)=\int G(\nu,\vec{\omega},\vec{r},t;\nu',\vec{\omega}',\vec{r}',t')j(\nu',\vec{\omega}',\vec{r}',t')d\nu'd\vec{\omega}'d\vec{r}'dt'$$

As an initial condition $I(\nu,\vec{\omega},\vec{r},t)=0$ at $t=-\infty$ is used here. Further, the here investigated medium is assumed to be surrounded by a convex surface S, which surrounds all radiation sources. The following reciprocal theorem applies: The influence function satisfies the influence function conjugated with respect to the point of the source with the conjugated boundary conditions. If on the surface S a source exists which transmits the radiation into the outer space, no radiation exists in the interior of S. The conjugated equation can be applied successfully in those problems, in which any characteristics of the radiation in dependence on the parameters of the punctiform source have to be determined. From the general relation of the reciprocity the optical reversibility results as a special case. Problems further exist in which the intensity of the radiation must be determined only in a part of the medium limited by the surface $S_1$. In conclusion, the boundary conditions valid for $S_1$ are derived. (Ni illustrations).

Card 2/3

B.B. KADOMTSEV, (S.I. Braginsky)

"PLASMA STABILIZATION BY MEANS OF NON-UNIFORM MAGNETIC FIELDS"

by B. B. Kadomtsev, S. I. Braginskiy

Report presented at 2nd UN Atoms-for-Peace Conference, Geneva, 9-13 Sept 1958

KADOMTSEV, B.B

KADOMTSEV B.B., (Sagdeyev R.Z.), (Rudakov L.I.), (Vedenov A.A.)

"DYNAMICS OF RARE PLASMA IN A MAGNETIC FIELD" by R. Z. Sagdeyev,

B. B. Kadomtsev, L. I. Rudakov, A. A. Vedenov

Report presented at 2nd UN Atoms-for-Peace Conference, Geneva, 9-13 Sept 1958

BRAGINSKIY, S. I. and KADOMTSEV, B. B.

"Stabilization of Plasma with the Help of Shielding Conductors." (Work carried out in 1957); pp. 300-326.

"The Physics of Plasmas; Problems of Controlled Thermonuclear Reactions." Vol. III, 1958, published by Inst. Atomic Energy, Acad. Sci. USSR, resp. ed. M. A. Leontovich, editorial work V. I. Kogan.

Available in Library.

KADOMTSEV, B. B.

"Magnetic Traps with "Gofrirovanoe" Field" (Work carried out in 1956); pp. 285-299.

"The Physics of Plasmas; PRoblems of Controlled Thermonuclear Reactions." Vol. III. 1958, published by Ins.t Atomic Energy, Acad. Sci. USSR.
resp. ed. M. A. Leontovich, editorial work V. I. Kogan.

Available in Library.

KADOMTSEV, B.B

21(7) p.2, 6, 7. PHASE I BOOK EXPLOITATION SOV/1244

Akademiya nauk SSR. Institut atomnoy energii

Fizika plazmy i problema upravlyayemykh termoyadernykh reaktsiy, t. IV. (Plasma Physics and the Problem of Controlled Thermonuclear Reactions, v. 4) [Moscow] Izd-vo AN SSSR, 1958. 439 p. 3,000 copies printed.

Resp. Ed.: Leontovich, M.A., Academician.

PURPOSE: This collection contains previously unpublished work of members of the Institut atomnoy energii (Institute of Atomic Energy) of the Academy of Sciences of the USSR. It is intended for scientist interested in this field.

COVERAGE: This book is the last of four volumes of previously unpublished work of members of the Institute of Atomic Energy during the period of 1951-58. The exploitation cards on the other volumes in this series have been released under the numbers 1241, 1242, and 1243.

Card 1/8







Card 2/8

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R000519830009-6"

Plasma Physics and the Problem (Cont.) SOV/1244

List of Previously Published Reports on Plasma Physics and Problems of Controlled Thermonuclear Reactions Made by Staff Members of the Institute of Atomic Energy of the Academy of Sciences of the USSR 436

AVAILABLE: Library of Congress (QC794.A38)

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Card 8/8

KADOMTSEV, B.B.; NEDOSPASOV, A.V.

[Instability of a positive column in a magnetic field, and "anomalous" diffusion] Neustoichivost' polozhitel'-nogo stolba v magnitnom pole i "anomal'naia" diffuziia. Moskva, In-t atomnoi energii, 1959. 14 p. (MIRA 17:2)

KADOMTSEV, B. B.

21(0) PHASE I BOOK EXPLOITATION SOV/2081

International Conference on the Peaceful Uses of Atomic Energy, 2d., Geneva, 1958

Doklady sovetskikh uchenykh; yadernaya fizika (Reports of Soviet Scientists; Nuclear Physics) Moscow, Atomizdat, 1959. 558 p. (Series: Its: Trudy, Vol. 1) 8,000 copies printed.

Eds. (Title page): A.I. Alikhanov, Academician; V.I. Veksler, Academician; and N.A. Vlasov, Candidate of Physical and Mathematical Sciences; Ed. of this volume: S.I. Drozdov and B.F. [illegible], Candidates of Physical and Mathematical Sciences; Ed. (Inside book): G.L. [illegible]; Tech. Ed.: Ye.I. Mazel'.

PURPOSE: This collection of articles is intended for scientific research workers and other persons interested in nuclear physics. The volume contains 43 papers presented by Soviet Scientists at the Second Conference on Peaceful Uses of Atomic Energy, held in Geneva in September 1958.

COVERAGE: It is divided into two parts. Part I contains 17 papers dealing with plasma physics and controlled thermonuclear reactions, and Part II contains 26 papers on nuclear physics, including problems of particle acceleration and of cosmic ray physics. The first paper by L.A. Artsimovich presents a review of Soviet work on controlled thermonuclear reactions. The remaining papers in Part I deal with particular problems in this field. Papers in Part II deal in detail with various problems in nuclear physics, such as the fission of heavy atoms and their isotopes, and with the study of cosmic radiation by means of artificial earth satellites and rockets, described in a paper by S.N. Vernov. The Russian-language edition of the proceedings of the conference is published in 16 volumes. The first 6 volumes contain all the papers presented by Soviet scientists as follows: Volume (1), Yadernaya fizika (Nuclear Physics); Volume (2), Yadernyye reaktory i yadernaya energetika (Nuclear Reactor and Nuclear Power); Volume (3), Yadernoye goryucheye i reaktornyye metally (Nuclear Fuel and Reactor Metals), Volume (4), Khimiya radioelementov i radiatsionnykh prevrashcheniy (Chemistry of Radioelements and of Radiation Transformations); Volume 5, Radiobiologiya i radiatsionnaya meditsina (Radiobiology and Radiation Medicine); Volume (6) Polucheniye i primeneniye izotopov (Production and Use of Isotopes). The other 10 volumes contain selected papers presented at the Conference by non-Soviet scientists. In the present volume discrepancies between the English and Russian language edition of the proceedings have been noted in three articles where the texts are not identical; viz; Andrianov, et al, "High Current Pulsed Discharge"; Akhiyezer, et al, "High Frequency Plasma Oscillation"; and Bogolyubov, "Investigations of the Many-body Problem". The serial numbers of reports 2302 and 2304 are reversed in the English edition. Report 2211, by Sinel'nikov, et al, is numbered 2536 in the English edition.

TABLE OF CONTENTS:

Reports of Soviet Scientists; Nuclear (Cont.) SOV/2081



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KADOMTSEV, B. B.

21(0) PHASE I BOOK EXPLOITATION SOV/[illegible]

International Conference on the Peaceful Uses of Atomic Energy, 2d., Geneva, 1958

Doklady sovetskikh uchenykh; yadernaya fizika (Reports of Soviet Scientists; Nuclear Physics) Moscow, Atomizdat, 1959. 5[illegible] p. (Series: Its: Trudy, Vol. 1) 8,000 copies printed.

Eds. (Title page): A.I. Alikhanov, Academician; V.I. Veksler, Academician; and N.A. Vlasov, Candidate of Physical and Mathematical Sciences; Ed. of this volume: [illegible] and [illegible], Candidates of Physical and Mathematical Sciences; Ed. (Inside book): [illegible]; Tech. Ed.: [illegible].

PURPOSE: This collection of articles is intended for scientific research workers and other persons interested in nuclear physics. The volume contains 43 papers presented by Soviet Scientists at the Second Conference on Peaceful Uses of Atomic Energy, held in Geneva in September 1958.

COVERAGE: It is divided into two parts. Part I contains 17 papers dealing with plasma physics and controlled thermonuclear reactions, and Part II contains 26 papers on nuclear physics, including problems of particle acceleration and of cosmic ray physics. The first paper by L.A. Artsimovich presents a review of Soviet work on controlled thermonuclear reactions. The remaining papers in Part I deal with particular problems in this field. [illegible] papers in Part II deal in detail with various problems in nuclear physics, such as the fission of heavy atoms and their isotopes, and with the study of cosmic radiation by means of artificial earth satellites and rockets, described in a paper by S.N. Vernov. The Russian-language edition of the proceedings of the conference is published in 16 volumes. The first 6 volumes contain all the papers presented by Soviet scientists as follows: Volume (1), Yadernaya fizika (Nuclear Physics); Volume (2), Yadernyye reaktory i yadernaya energetika (Nuclear Reactors and Nuclear Power); Volume (3), Yadernoye goryucheye i metally (Nuclear Fuel and Reactor Metals), Volume (4), Khimiya radioelementov i radiatsionnykh prevrashcheniy (Chemistry of Radioelements and of Radiation Transformations); Volume 5, Radiobiologiya i radiatsionnaya meditsina (Radiobiology and Radiation Medicine); Volume (6) Polucheniye i primeneniye izotopov (Production and Use of Isotopes). The other 10 volumes contain selected papers presented at the Conference by non-Soviet scientists. In the present volume discrepancies between the English and Russian language] edition of the proceedings have been noted in three articles where the texts are not identical; viz: [illegible], et al, "High Current Pulsed Discharges"; Akhiyezer, et al, "High Frequency Plasma Oscillations"; and [illegible], "Investigations of the Many-body Problem". The serial numbers of reports 2[illegible] and 2[illegible] are reversed in the English edition. Report 2[illegible], by [illegible], et al, is numbered 2[illegible] in the English edition.

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Reports of Soviet Scientists; Nuclear (Cont.) SOV/[illegible]



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KADOMTSEV, B.B.

66702

24.2120 SOV/109-4-8-22/35

AUTHORS: Granovskiy, V.L., Luk'yanov, S.Yu., Spivak, G.V. and Sirotenko, I.G.

TITLE: Report on the Second All-Union Conference on Gas Electronics

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 8, pp 1339 - 1358 (USSR)

I.M. Podgornyy and N.G. Koval'skiy - "New Data on X-ray Radiation During Pulse Discharges"

V.A. Khrabrov and M.M. Sulkovskaya dealt with the investigation of the neutron radiation in powerful gas discharges in chambers with conducting walls.

N.A. Borzunov et al. - "Investigation of the Gas Discharge in a Conical Chamber".

S.M. Osovets et al. - "A Turn of Plasma in Transverse Magnetic Field".

I.G. Kesayev "Data on the Division of a Cathode Spot on Mercury in a Low-pressure Arc" (see p 1289 of the journal).

A.E. Robson (England) - "A New Theory of the Cathode Spot" (see p 1295 of the journal).

L.N. Brusnova - "Positive Column in a Hydrogen Discharge With Stationary and Pulse Loads".

I.G. Nekrashevich and A.A. Labud - "Current Distribution on the Surface of Electrodes in Electric Pulse Discharges".

L.S. Ryg - "Some Properties of Gas Discharges in Low-voltage in Halogen Counters".

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G.I. Gletova and V.L. Granovskiy - "Comparison of the Initial De-ionisation in the Isotopes of Hydrogen (H and D)".

L.A. Akol'zina communicated some results on the pre-breakdown current pulses at low pressures.

M.Ya. Vasil'yeva and A.A. Zaytsev - "Charge-density oscillation Waves in Cylindrical Plasma".

L. Pekárek of Czechoslovakia communicated some information on the wave-like phenomena in gas-discharge plasma.

B.G. Brezhnev dealt with the problem of the determination of the energy of fast ions in pulse discharges.

B.B. Kadomtsev - "Convection Instability of a Plasma String".

S.I. Braginskiy and V.D. Shafranov - "Theory of a High-temperature Plasma String".

The fifth section was presided over by N.A. Kaptsov and dealt with high-frequency currents in gases. The following papers were read:

V.Ye. Golant - "Formation of Ultra-high Frequency Pulse Discharges in Inert Gases".

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G.I. Pateyuk - "Influence of the Boundary Conditions on the Formation and Maintenance of High-frequency Discharges".

P.S. Bulkin et al. - "Investigation of a Self-maintained Ultra-high Frequency Pulse Discharge and the Process of its Development".

G.M. Zastenker and G.S. Solntsev - "Some Results of the Investigation of the Formation of Low-pressure High-frequency Discharges".

H. Margenau (USA) - "Conductivity of Weakly Ionised Plasma".

A.A. Kuzovnikov - "The Conditions of Transition From High-frequency Corona Discharge at Atmospheric Pressures".

V.Ye. Golant - "The relationship Between the Characteristics of the Ultra-high Frequency Current and the Direct Current in Gas Discharges".

E.B. Lagov'yer analysed the conductivity of the disintegrating plasma in the window of a resonance discharge tube.

S.M. Levitskiy and I.P. Shashurin dealt with the applicability of the probe method to high-frequency discharges (see p 1238 of the journal).

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The paper by V. Ye. Mitsuk et al. was devoted to the investigation of the ultra-high frequency plasma by means of the Stark effect.

G.S. Solntsev et al. dealt with the problem of electric fields in a high-frequency discharge at low pressures.

Ye. Badareu of Rumania read a paper entitled "High-frequency Discharges in Methane".

The work of the sixth section was devoted to the problems of plasma and its radiation; the section was presided over by V.A. Fabrikant. The following papers were read:

Yu.M. Kagan - "New Techniques in the Probe Methods of Plasma Investigation".

V.I. Dro[illegible]ov - "Oscillographic Measurements in Plasma".

V.A. Simonov and A.G. Mileshkin - "Investigation of the Movement of Plasma by Means of a Mass Spectrometer of the Transit Time".

[illegible] the Oscillations in a

KADOMTSEV, B.B.

Convective instability of a plasma column. Zhur.eksp.i teor. fiz. 37 no.4:1096-1101 O '59. (MIRA 13:5)
(Plasma (Ionized gases))

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76980
SOV/56-37-6-20/55

AUTHOR: Kadomtsev, B. B.

TITLE: Stability of a Low Pressure Plasma

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 6, pp 1646-1651 (USSR)

ABSTRACT: Equations were derived describing a local stability condition for an arbitrary toroidal system. The problem of stability of a low pressure plasma in such systems was discussed. The surface of constant pressure, p = const, in such systems is a family of toroidal surfaces enclosed in one another. The surface is also a plane that encompasses the force lines of the magnetic field and the current. The following functions of p were introduced according to the method of M. Kruskal, R. Kulsrud (cf., Second United Nations Intern. Conf. on the Peaceful Uses of Atomic Energy, Geneva, 1958, p/1876):

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$$\psi = \int \mathbf{H} d\mathbf{S}_2, \quad \chi = \int \mathbf{H}\, d\mathbf{S}_1;$$

$$I = \int \mathbf{j}\, d\mathbf{S}_2, \quad J = \frac{c}{4\pi}\int \mathbf{H}\, d\mathbf{l}_1 = \frac{c}{4\pi}\int \mathbf{H}\, d\mathbf{l}_0 - \int \mathbf{j}\, d\mathbf{S}_1. \qquad (1a)$$

Here, $\psi$ - longitudinal magnetic flow through transverse cross section $S_2$ of the surface p = const; $\chi$ -azimuthal flow through surface $S_1$ passing through an arbitrary closed loop $\mathcal{L}_1$ parallel to the toroid p = const, and through magnetic axis $\mathcal{L}_0$ that is the limiting surface of equal pressure as the cross section of the surface approaches zero; I - longitudinal current; J - azimuthal current including the current in the outer circuit; $\Omega$ - volume of toroid p = const. The magnetic field in this geometry was represented in the form:

$$\mathbf{H} = [\nabla\psi, \nabla\vartheta], \qquad (1)$$

where,

$$\vartheta = \theta' - \mu\zeta' + \lambda, \quad \mu = \mu(\psi) = d\chi/d\psi, \qquad (1b)$$

Here, $\lambda$ is certain single-value function of the coordinate. As may be seen from this equation $\mathbf{H}\nabla\vartheta = 0$, i.e., the relation $\vartheta$ = const defines the position of the force lines on the surface $\psi$ = const, and therefore the term $\mu$ represents the number of turns of the force line along the small perimeter on one passage around the toroid. The total energy E of small oscillations according to the hydrodynamic approximation was shown to be:

$$E = T + V = \frac{\omega^2}{2}\int \rho\eta^2 dr + \frac{1}{2}\int \gamma p (\operatorname{div}\eta)^2 dr + \frac{1}{8\pi}\int (\operatorname{rot}[\eta\mathbf{H}])^2 dr - \\ - \frac{1}{8\pi}\int [\eta \operatorname{rot}\mathbf{H}] \operatorname{rot}[\eta\mathbf{H}]\, dr + \frac{1}{2}\int \eta\nabla p \operatorname{div}\eta\, dr, \qquad (4)$$

Stability of a Low Pressure Plasma

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Here, $\rho$ - density of plasma; $\omega$ - the increment, assuming that the shift of the plasma from the equilibrium position $\eta$ changes with time according to the rule $e^{\omega t}$. For the system with sufficiently deep modulating field, the condition of the stability

$$\frac{dp}{d\psi}\left\{\frac{d^2\Omega}{d\psi^2}-\frac{I\mu'}{\mu I+J}\frac{d\Omega}{d\psi}+\frac{1}{\mu I+J}\left(\mu\frac{dI}{d\psi}+\frac{dJ}{d\psi}\right)\frac{d\Omega}{d\psi}\right\}>-\frac{R}{16\pi}\left(\frac{d\mu}{d\psi}\right)^2 \qquad (16)$$

can be expressed as:

$$\nabla p \nabla U < (\pi a^2/4\,|U|)(\nabla\mu)^2. \qquad (17)$$

The last equation can be interpreted as the affinity of the plasma to occupy a space with a minimum "potential energy" U. Such a transition is hindered by the crossover effect of the force lines. There are 7 references, 1 Soviet, 2 German, 2 U.K., 2 U.S. The U.K. and U.S. references are:

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Stability cf a Low Pressure Plasma

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M. Kruskal, R. Kulsrud. Second United Nations Intern. Conf. On the Peaceful Uses of Atomic Energy, Geneva, p/1876; J. Bernstein, E. Frieman, M. Kruskal, K. Kulsrud, Proc. Roy. Soc. A224, 19, 1958; B. Suydam. Second United Nations Intern. Conf. On the Peaceful Uses of Atomic Energy, Geneva, 1958, p/354; J. Johnson, C. Oberman, R. Kulsrud, E. Frieman, Second United Nations Intern Conf. On the Peaceful Uses of Atomic Energy, Geneva, 1958, p/2170.

SUBMITTED: July 29, 1959

Card 5/5

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R000519830009-6"

S/020/60/133/01/18/070
B014/B011

AUTHORS: Kadomtsev, B. B., Rokotyan, V. Ye.

TITLE: The Stability of a Plasma in the Field of a Magnetic Dipole

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 1, pp. 68-70

TEXT: The surface of the Earth with its relatively near ionosphere is an ideal electric conductor, and therefore, the tangential component of the electric field is equal to zero. This leads to a forbiddenness of convective instability, i.e., to a stabilization of plasma. This effect is investigated with the aid of an energy principle according to which it is necessary and sufficient for the stability that the potential energy V of the small oscillations be positive. The general expression (2) for the potential energy is transformed into (5) by proceeding from the assumption of the Earth being an ideal conductor. (6) is obtained as a minimum of (5), and with the variation of (6) the authors arrive at the same problem as arises in quantum mechanics on the motion of particles in a potential well U. Thus, the condition desired for stability is derived from

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The Stability of a Plasma in the Field of a Magnetic Dipole S/020/60/133/01/18/070 B014/B011

inequality (7). By considering the longitudinal shift, condition (7) obtains the form of (8). Finally, a numerical integration leads to (9), which, compared to inequality (1) (which holds for an exact dipole), allows the study of the deviation of the geomagnetic field from that of a dipole. There are 7 references: 3 Soviet, 3 American, and 1 British.

PRESENTED: February 29, 1960, by M. A. Leontovich, Academician

SUBMITTED: January 4, 1960

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VC

28774 S/057/61/031/010/007/015
B104/B125

AUTHOR: Kadomtsev, B. B.

TITLE: Turbulent particle leakage from a discharge in a strong magnetic field

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 31, no. 10, 1961, 1209-1219

TEXT: Previous articles on the hydrodynamic instability of weakly ionized plasmas are discussed in the introduction. The intensified diffusion of charged particles from the positive column of a glow discharge through a longitudinal magnetic field, which has been established by B. Lehnert et al. (Report P/146 on the Second Intern. Conf. on the Peaceful Uses of Atomic Energy, Geneva, 1958; Phys. of Fluids, 3, 600, 1960), may explain instabilities of this kind. As is shown here, a similar instability may also occur in a completely ionized plasma. Only disturbances of temperature in a stabilized plasma filament produce instabilities. Such instabilities are called convection instabilities, because a turbulent convection, and thus, heat convection are caused thereby. It is shown that turbulent convection effects plasma cooling

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B104/B125



and particle leakage to the wall. A coefficient of turbulent diffusion is introduced to estimate the lifetime $\tau_o$ in plasma. An experimental value of $1.7 \cdot 10^{-4}$ sec is obtained for the lifetime of particles in a stellarator with a diaphragm (radius a = 1.4 cm, H = $3 \cdot 10^4$ oe). The theoretical value is about $3 \cdot 10^{-4}$ sec. The conclusion is attained that the convection studied and the intensified particle diffusion from the positive column in a magnetic field constitute two limiting cases of one and the same effect, i. e., convection instability. A weakly and a strongly ionized plasma differ merely in that in the latter $\sigma$ depends only on temperature, while in the former $\sigma$ is proportional to the density. There are 1 figure and 8 references: 2 Soviet and 6 non-Soviet. The five most important references to English-language publications read as follows: T. Coor et al., Report P/362 on the Second Intern. Conf. on the Peaceful Uses of Atomic Energy, Geneva, 1958; R. A. Ellis et al., Phys. of Fluids, 3, 468, 1960; J. B. Bernstein et al., Phys. of Fluids, 3, 136, 1960; L. Spitzer, Phys. of Fluids, 3, 659, 1960; B. B. Kadomtsev et al., J. of Nucl. Energy Part, C, 1, 230, 1960.

SUBMITTED: January 9, 1961

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30086
S/057/61/031/011/001/019
B104/B108

26.2310

AUTHOR: Kadomtsev, B. B.

TITLE: Plasma convection in the positive column in a magnetic field

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 31, no. 11, 1961, 1273 - 1283

TEXT: The author investigates the turbulent convection of slightly ionized plasma in a positive column, which is caused by current instabilities when a sufficiently strong longitudinal magnetic field is applied. In a study of the current-convection instabilities, the dispersion relation

$$\omega=(k_z v_0 - iD_e k_z^2)\frac{b_i k_z^2+\frac{b_i k_\perp^2}{1+(\Omega\tau)^2}-i\frac{k_y c}{H}\frac{(\Omega\tau)^2}{1+(\Omega\tau)^2}\frac{d\ln n}{dx}}{b_e k_z^2+\frac{b_i k_\perp^2}{1+(\Omega\tau)^2}+i\frac{k_y c}{H}\frac{1}{1+(\Omega\tau)^2}\frac{d\ln n}{dx}}. \quad (4)$$

is derived, where $b_e$ and $b_i$ are the electron and ion mobilities, respectively; $\Omega$ is the ion cyclotron frequency, and $D_e$ is the diffusion coeffi-



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cient. For strong magnetic fields, i. e. $(\Omega\tau)^2 \gg 1$, the imaginary part of the complex frequency $\omega$ is

$$\mathrm{Im}(\omega) = b_i E \sqrt{\frac{b_e}{b_i}} \frac{d \ln n}{dx} \cdot \frac{\varkappa}{1+\varkappa^2} \frac{k_y}{k_\perp} - D_e \frac{b_i k_\perp^2}{b_e (\Omega\tau)^2} \frac{\varkappa^2}{1+\varkappa^2}. \qquad (6).$$

This expression is discussed for different conditions, and it is shown that it can also be used for the case $\Omega\tau \sim 1$. The turbulent convection of plasma in a strong magnetic field is represented similarly to the flow of an inhomogeneous incompressible liquid through a porous medium (cylindrical coordinates):

$$-n\mathbf{u} - n\frac{b_e}{b_i} k^2 (\Omega\tau)^2 r^2 u_r \mathbf{r}_0 + k\Omega\tau v_0 n r \mathbf{r}_0 - \frac{1}{\Omega\tau} n [\mathbf{h}\mathbf{u}] = \nabla p, \qquad (11)$$

$$\frac{\partial n}{\partial t} + \mathbf{u}\nabla n + \mathrm{div}\left(\frac{n}{\Omega\tau}[\mathbf{h}\mathbf{u}]\right) = 0. \qquad (12)$$

$$\mathrm{div}\, u = 0, \qquad (13)$$

where $\vec{u} = \frac{c}{H}\left[\vec{h}\nabla\varphi\right]$ ; $\vec{r}_0$ is the radial unit vector; and p is an arbitrary



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B104/B108

Plasma convection in the positive ....

function of r and $\psi$; $\psi = \vartheta + kz$. In a study of the turbulent convection in a tube with a non-conducting wall, expressions are derived for the pulsations of the longitudinal and transverse components of the electric field. The method used to study the turbulent convection is checked by a comparison of theoretical and experimental results (F. C. Hoh, B. Lehnert, Phys. of Fluids, 3, 600, 1960; A. A. Zaytsev, M. Ya. Vasil'yeva, ZhETF, 38, 1639, 1960; A. Simon, Report P/366 on the Second Intern. Conf. on the Peaceful Uses of Atomic Energy, Geneva, 1958; E. M. Reykhrudel', G. V. Spivak, ZhETF, 10, 1408, 1940; I. A. Vasil'yeva, Radiotekhnika i elektronika, 5, 2015, 1960). The theoretical curve ($\Theta_s = E_s/E_0$) versus ap ( a is the tube radius) is in good agreement with experimental results. A study of turbulent diffusion in a very long tube with conducting walls adjusted to the lines of force has shown that in a smooth metallic tube the electron density is constant everywhere, except in the immediate neighborhood of the wall. If the walls are rough, the character of diffusion near the walls is entirely different. Considerable diffusion occurs in the laminar layer. A. Engel' (Ionizovannyye gazy, Fizmatgiz, 1959) is mentioned. The author thanks A. V. Nedospasov for discussions. X

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30086

Plasma convection in the positive ... S/057/61/031/011/001/019
B104/B108

There are 3 figures and 18 references: 8 Soviet and 8 non-Soviet. The four most recent references to English-language publications read as follows: T. K. Allen, G. A. Paulikas, R. V. Pyle. Phys. Rev. Lett., 5, 409, 1960; R. A. Ellis, L. P. Goldberg, J. G. Gorman. Phys. of Fluids, 3, 468, 1960; C. Ekman, F. C. Hoh, B. Lehnert. Phys. of Fluids, 3, 833, 1960; F. C. Hoh, B. Lehnert. Report III b, 25 on the Fourth Intern. Conf. on Ionization Phenomena in Gases, Uppsala, 1959.

SUBMITTED: March 4, 1961

Card 4/4

X

KADOMTSEV, B.B.

Stability of a low-pressure plasma. Zhur.eksp.i teor.fiz. 37 no.6:1646-1651 D '61. (MIRA 14:10)
(Plasma (Ionized gases))

89225

S/056/61/040/001/031/037
B102/B212

26.2321

AUTHOR: Kadomtsev, B. B.

TITLE: Turbulence of plasma in a magnetic mirror trap

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 1, 1961, 328-336

TEXT: The present paper brings a contribution to the problem of retaining high-temperature plasma in a magnetic mirror trap. This investigation was suggested by experiments of M. S. Ioffe et al., where the lifetime of plasma had been determined for such cases and also the escape effects had been studied. Here, the author considers a single plasma column ABCDE in a mirror trap which is shown schematically in Fig.1. If the electron energy is of the order of 10 ev at an ion energy of the order of 1 kev, then electrons are taken to be "cold", and $T_e = 0$ may be written. For the potential $\varphi$ along a plasma column the condition $0 < \varphi < (T/e)(H_m/H_s - 1)$ has to be fullfilled, T denoting the ion temperature, $H_s$ the field strength on the surface, and $H_m$ the field strength in the

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mirror. The electric contacts at the tube ends are discussed and the problem of convective instability is examined. The theoretical analysis is limited to such a diluted plasma that collisions between particles can be neglected, viz., the authors proceed from a kinetic equation without the collision term. Furthermore, a convection current is assumed with a frequency which is very small compared with the cyclotron frequency, and its characteristic length large compared with the Larmor frequency, so that for a zero approximation, the last term of the equation of motion can be dropped: $\frac{\partial f}{\partial t} + (\vec{v}\nabla)f + \frac{e}{M}\left\{\vec{E} + \frac{1}{c}\left[\vec{v}\vec{H}\right]\right\}\frac{\partial f}{\partial \vec{v}} = 0$. For a small $H_m/H_o$ ($H_o$ denotes the homogeneous magnetic field) and magnetic field lines with light curvature the transverse motion is described by:

$$Mn\left\{\frac{\partial \vec{v}_o}{\partial t} + (\vec{v}_o\nabla)\vec{v}_o\right\} + \nabla p + en\nabla\varphi - \frac{ne}{c}\left[\vec{v}_o\vec{H}\right] = Mn\vec{g},$$

where $n = \frac{H_o}{L}\iint f d\vec{v}\,\frac{dl}{H}$ denotes the mean density in the plasma column with a mean length L, $p = (H_o/L)\int(p_\perp/H)dl$ is the mean transverse pressure, $\vec{g}$ is radially oriented and amounts to

$g = \frac{1}{MnL}\int(p_{\perp} + p_{H})\frac{H_o^2 r_o}{H^2 Rr}dl \approx \frac{1}{MnL}\int(p_{\perp} + p_{H})\frac{H_o^{3/2}}{RH^{3/2}}dl$, $H_o$ is the field in the center of the trap, $r=r(s)$ the distance from the line of force to the axis of the system, $r_o=r(s=0)$, dl is an element along the line of force, R is the radius of curvature, $p_{\perp} = \int(Mw^2/2)fd\vec{v}$; $f = F(\vec{v}-\vec{v}_o)$, $\vec{v}_o = H^{-2}{}_o[\vec{E}\vec{H}]$, $\vec{w} = \vec{v} - \vec{u}\vec{H}/H$, $\vec{u}$ is the longitudinal, and $\vec{v}$ the total velocity. The electric field is given by $\Delta\varphi = -4\pi e(n-n_e)$; the equations of continuity for ions and electrons read: $\partial n/\partial t + \mathrm{div}(\vec{v}_o n) = 0$, $\partial n_e/\partial t + \vec{v}_e\nabla n_e = 0$. The degree of density at which the plasma will become unstable is determined next. The frequency is given by $\omega = -\frac{1}{2}m\omega_o \pm m\sqrt{\frac{1}{4}\omega_o^2 - 2\Omega_o^2\omega_o/\Omega_H\alpha_{mn}^2}$, with $\Omega_o^2 = 4\pi e^2N/M$. An instability will occur only at densities with $\Omega_o^2\ \frac{1}{8}\alpha_{mn}^2\omega_o\Omega_H$. Stability can be approximated on the condition that $r_d^2 > aR_o$, with $r_d^2 = T/M\Omega_o^2$ denoting the square of the Debye radius, a the radius of the

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89225

Turbulence of plasma in a...

S/056/61/040/001/031/037
B102/B212

chamber, $R_o$ the radius of curvature for the lines of force near the wall. The turbulent convection is studied next; and after extensive calculations the following expression is found with an electron distribution near the wall $n_o = N-3q/A(g^* q)^{1/3}x^{1/3}$ for the plasma lifetime:

$$\tau_o \approx \frac{\pi a^2 N}{2\pi a q} = Ca\left(\frac{\Omega_H^2+\Omega_o^2}{\Omega_o^2}\frac{R_o M}{\varrho T}\right)^{1/2}, \quad C = \frac{1}{2}\left(\frac{2+3\xi}{A\xi}\right)^{3/2}; \quad \xi \sim 1;$$

A is also a numerical coefficient of the order of one, $q = -Ddn_o/dx$, N = const, the density inside the chamber, i.e., at $x \to \infty$; D is the coefficient of turbulent diffusion. The results agree well with experimental data of Ioffe, R. I. Sobolev, V. G. Tel'kovskiy, Ye. Ye. Yushmanov (Refs. 6,7). The author thanks M. S. Ioffe and V. G. Tel'kovskiy for discussions. L.A.Artsimovich is mentioned. There are 2 figures and 7 references: 3 Soviet-bloc and 4 non-Soviet-bloc.

SUBMITTED: August 3, 1960

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89225

Turbulence of plasma in a...

S/056/61/040/001/031/037
B102/B212

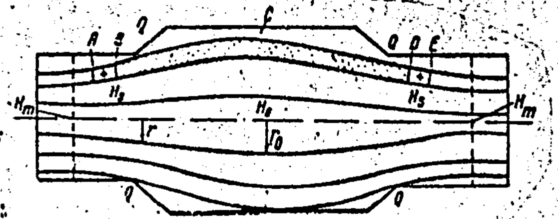


Fig. 1

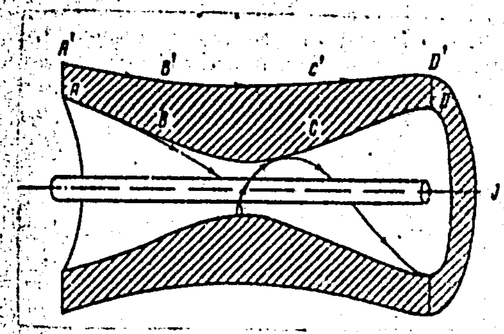


Fig. 2

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VOLKOV, T.F.; KADOMTSEV, B.B.

Stabilization of a low-pressure plasma by a high-frequency field. Atom. energ. 13 no.5:429-434 N '62. (MIRA 15:11)
(Magnetic fields)
(Plasma (Ionized gases))

KADOMTSEV, B.B.

"Anomalous" diffusion of a rarefied plasma with a current in a magnetic field. Zhur. eksp. i teor. fiz. 43 no.5:1688-1696 N '62. (MIRA 15:12)

(Plasma (Ionized gases))
(Magnetic fields)

KADOMTSEV, B.B.; PETVIASHVILI, V.I.

A weakly turbulent plasma in a magnetic field. Zhur.eksp.i teor.fiz. 43 no.6:2234-2244 D '62. (MIRA 16:1)
(Plasma (Ionized gases)) (Magnetic fields)

KADOMTSEV, B.B.; TIMOFEYEV, A.V.

Drift instability of an inhomogenous plasma in a magnetic field.
Dokl. AN SSSR 146 no.3:581-584 S '62. (MIRA 15:10)

1. Chlen-korrespondent AN SSSR (for Kadomtsev).
(Plasma (Ionized gases)) (Magnetic fields)

KADOMTSEV, B. B.

Dissertation defended for the degree of Doctor of Physicomathematical Sciences at the Technical Physics Institute imeni A. F. Ioffe in 1962:

"Convection of Plasma in the Magnetic Field."

Vest. Akad. Nauk SSSR, No. 4, Moscow, 1963, pages 119-145

KADOMTSEV, B.B

Hydromagnetic stability of a plasma. Vop. teor. plaz. no.2: 132-176 '63. (MIRA 17:2)

L 18883-63
AFWL/IJP(C)/SSD EPF(n)-2/EWG(k)/EWT(1)/BDS/ES(w)-2 Pu-4/Pz-4/Pi-4/Po-4/Pab-4 AT AFFTC/ASD/ESD-3/
ACCESSION NR: AP3003033

S/0025/63/000/006/0016/0018

AUTHOR: Kadomtsev, B. (Corresponding Member of the Academy of Sciences, SSSR)

TITLE: The taming of the shrew continues [plasma research]

SOURCE: Nauka i zhizn', no. 6, 1963, 16-18

TOPIC TAGS: plasma-producing unit, magnetic trap, plasma leak, PR-5 reactor, plasma temperature, plasma density, plasma life

ABSTRACT: The main draw back of all existing plasma-producing units (e.g. the doughnut-shaped ones such as the "Takemak" at the Institut atomnoy energii imeni I. V. Kurchatova (Atomic-Energy Institute), the British "Zeta", the US "Stellarator"; the magnetic traps such as the SSSR "Ogra", the US "D-C-X") is that the plasma lasts less than the time needed to create the magnetic field. This problem confronted M. S. Ioffe, V. G. Tel'kovskiy, R. I. Sobolev and Ye. Ye. Yushmanov of the Institute of Atomic Energy when they began to study plasma in the Ioffe trap with magnetic plugs. This separates the processes of creating and heating the plasma. First, plasma is created in the plasma source (in the end of the trap) by ionizing neutral gas entering the source around the electron-emitting cathode. The ionized substance moves along the magnetic lines of force into the trap with magnetic plugs. The

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ACCESSION NR: AP3003033

plasma obtained has high density and low temperature. Between the plasma "string" and the walls of the chamber is inserted an additional electric field of several tens of kilovolts, which heats the plasma. Then the electric field is turned off and the high-temperature plasma studied. The first tests showed that the plasma was unstable, lasting not more than a millisecond. A plasma leak was caused by convective instability: it was thrust out toward the weaker magnetic field, touched the walls and vanished. They built a new unit, the "PR-5" (shown in the photo), alongside which additional conductors with current were installed. The magnetic field created by these lines was to repel the plasma from the chamber walls. Ioffe, Sobolev, Yu. T. Bayborodov and V. M. Petrov obtained plasma with the "PR-5" with a life of more than 15-20 milliseconds, a temperature of 40 million degrees, density 10 sup 9 - 10 sup 10 particles per cu cm--a great triumph of Soviet physicists, inspiring the hope that a stable plasma in which a thermonuclear reaction can be brought about will be produced "after some time." Orig. has 1 photo.

ASSOCIATION: AN SSSR (Academy of Sciences of the SSSR)

SUBMITTED: 00 DATE ACQ: 23Jul63 ENCL: 00

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

Card 2/2

KADOMTSEV, B.B.

Symposium on the stability of plasma. Vest.AN SSSR 33 no.2:101-102 F '63. (MIRA 16:2)

1. Chlen-korrespondent AN SSSR.
(Plasma (Ionized gases))

APPROVED FOR RELEASE: 07/19/2001 CIA-RDP86-00513R000519830009-6"

KADOMTSEV, B.B.

Turbulent diffusion of a rarefied plasma in a high magnetic field. Zhur. eksp. i teor. fiz. 45 no.4:1230-1242 0 '63.
(MIRA 16:11)

KADOMTSEV, B.B.

Turbulence of a plasma. Vop. teor. plaz. no.4:188-339 '64.
(MIRA 17:11)

L 23083-65 EWT(1)/EWG(k)/EPA(sp)-2/EPA(w)-2/EEC(t)/T/EEC(b)-2/EWA(m)-2 Pz-6/ Po-4/Pab-10/Pi-4 IJP(c) AT

ACCESSION NR: AP5001850 S/0056/64/047/...

AUTHOR: Kadomtsev, B. B.; Mikhaylovskiy, A. B.; Timofeyev, A. V.

TITLE: Negative energy waves in dispersive media

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 47, no. 6, 1964, 2266-2268

TOPIC TAGS: negative energy wave, dispersive medium, plasma wave, ionized plasma, plasma conductivity

ABSTRACT: It is shown that nonequilibrium transparent media can exhibit anomalous dispersion, in which case the energy of a monochromatic electromagnetic wave can become negative, i.e., the energy of the medium is lower in the presence of the wave than in its absence. An example of such a medium is a plasma in a magnetic field with a configuration that is either anisotropic (with beams) or spatially inhomogeneous. Another example is an inhomogeneous plasma in a strong magnetic field with Maxwellian electron and ion distributions. A negative-energy wave can exhibit many unusual features when it interacts with matter or with other waves. For example, introduction of ordinary dissipation does not lead to time-attenuation

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L 23083-65
ACCESSION NR: AP5001850

of the wave, but to growth. A similar amplification effect arises when the wave is reflected from the boundary of a medium in which the dispersion is of the opposite sign. Related effects are the reflection of a sound wave from a [illegible] stream, and the production of pairs of waves with positive and negative [illegible] turbed surface with infinite reflection coefficient (Cerenkov emission [illegible] waves) or in an infinite plasma at rest when the dispersion equation has [illegible] roots. It is shown by an example that negative energy can be [illegible] the directed velocity of electrons in a weakly ionized plasma in a [illegible] electric field is much smaller than the thermal conductivity. Negative [illegible] effects can also be produced by nonlinear interactions between waves. Cases when the negative-energy effect is only apparent and can be removed by conversion to another coordinate system are discussed. Orig. art. has: 4 figures. [02]

ASSOCIATION: None

SUBMITTED: 23Jun64 ENCL: 00 SUB CODE: ME, GP

NO REF SOV: 005 OTHER: 000 ATD PRESS: 3173

Card 2/2

AUTHOR: Kadomtsev, B. B. (Corresponding member AN SSSR)

TITLE: Investigations of plasma instability

SOURCE: AN SSSR [illegible]

TOPIC TAGS: plasma instability, turbulence, linear differential equation, kinetic method, magnetic field, drift current, MHD flow

ABSTRACT: A summary review is given of various problems in plasma instab[illegible] At the present, most plasma instability analyses are restricted to linearized equations of motion. However, even small plasma oscillations require elaborate numerical calculations in order to correspond to experimental observations if plasma kinetic equations are used. To simplify the [illegible] [illegible] These are divided into two general groups: macroscopic instabilities and microscopic instabilities. [illegible]

L 35413-65
ACCESSION NR: AP5008086

whereas finite insta... are reduced by a field ...

SUBMITTED: 00 ENCL: 00

Card 2/2

L 3033-66 EWT(1)/ETC/EPF(n)-2/EWG(m)/EPA(w)-2 IJP(c) AT

ACCESSION NR: AT5021032 UR/3041/64/000/004/0188/0339

58
B+1

AUTHOR: Kadomtsev, B. B. 44,55

TITLE: Plasma turbulence 21,44,55

SOURCE: Voprosy teorii plazmy, no. 4, 1964, 188-339

TOPIC TAGS: turbulent plasma, plasma instability, plasma magnetic field, plasma diffusion, nonlinear plasma, plasma oscillation, mathematic physics

ABSTRACT: This 150 page review article with over 200 references is a small treatise on the theory of turbulent plasmas. Only those processes are discussed that might occur in the laboratory, however; astrophysical applications are ignored and, in particular, magnetohydrodynamic turbulence and turbulent shock waves are not discussed. Turbulence is defined as the simultaneous excitation of many collective degrees of freedom. Owing to its many possible varieties of collective motion, a turbulent plasma often bears little resemblance to a turbulent hydrodynamic flow, the turbulence frequently consisting in the disordered excitation of wave motions rather than of localized vortices. The turbulence of a plasma is called weak when the interactions between the different waves are small. In the first section a weakly turbulent plasma is treated in the quasilinear approximation, where one neglects the interactions between the waves but takes account of thermal

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ACCESSION NR: AT5021032

motions and the effect of the oscillations on the averaged velocity distribution function. Among the matters discussed in this approximation are laminar convection, excitation of Langmuir waves by a charged particle beam, and resonance interaction between a wave and particles whose thermal velocity is equal to the phase velocity of the wave. In the next approximation one considers the merging of two waves into a single one and the break up of a single wave into two others, with conservation of total frequency and wave number. The kinetic equation describing these processes is derived and is illustrated by a discussion of the interaction of Langmuir waves with ionic sound and of Alfven waves with magnetic sound. The wave kinetic equation is generalized to take account of thermal motions and the scattering of waves on particles. When the interaction terms in the wave kinetic equation are increased one obtains the weak coupling approximation to strong turbulence, in which the turbulent motion is described by two coupled nonlinear integral equations for the spectral density of the oscillations and the Green's function giving the reaction to an external force. When R.H.Kraichnan discussed hydrodynamic turbulence in this approximation (J.Fluid. Mech., 5, 497, 1959) he obtained a spectrum differing from that of Kolmogorov. It is shown that this was due to neglect of the adiabatic interaction between short and long wavelength oscillations; this defect of Kraichnan's theory is corrected. A phenomenological approach to the description of a turbulent plasma, employing the concept of mixing length

L 3033-66

ACCESSION NR: AT5021032

borrowed from hydrodynamic turbulence theory, is discussed briefly. The author has successfully employed this approach to treat turbulent diffusion in a magnetic mirror system and in a glow discharge positive column. It is illustrated here by a discussion of the turbulent jet and a derivation of the Kolmogorov-Obukhov-Heisberg 5/3-power law. In the final section there are discussed several specific questions involving strong turbulence. These questions include that of turbulent diffusion in a magnetic field. It is shown that drift-dissipative instability in a dense plasma can give rise to diffusion with a value of the diffusion constant of the order of Bohm's phenomenological value. The survey concludes with a brief discussion of experimental material on turbulent heating of plasmas, anomalous diffusion, and turbulence in toroidal discharges and magnetic mirror systems. The author concludes that at the present time there are no significant difficulties of principle that could hinder further development of the theory of turbulent plasmas. The survey article under review is to be published in England in "Progress in Plasma Physics". Orig. art. has: 513 formulas and 30 figures.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: ME

NO REF SOV: 114 OTHER: 102

Card 3/3

L 36248-66 EWT(1) IJP(c) AT

ACC NR: AP6023634 SOURCE CODE: UR/0386/66/004/001/0015/0019

AUTHOR: Kadomtsev, B. B.

ORG: none

TITLE: Instability of plasma on trapped particles

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 4, no. 1, 1966, 15-19

TOPIC TAGS: plasma instability, magnetic mirror machine, magnetic trapping/ Tokomak plasma machine

ABSTRACT: The author discusses a plasma instability which can arise in a plasma contained in a magnetic-mirror or a toroidal trap if the magnetic field configuration is such that there are present in the mirror particles that oscillate between the magnetic mirrors so that an instability called "trapped-particle instability" sets in the plasma. It differs from flute instability in that the charges due to the trapped particles are cancelled out to a considerable degree by the particles that can move freely along the force lines (transit particles). The growth increment of the instability is calculated in the quasiclassical approximation, and it is shown that in general trapped-particle instability is most likely to develop in a system with a moderately inhomogeneous magnetic field. This instability should cause ejection of the captured particles, and then collisions or instabilities induced by high-frequency longitudinal oscillations will cause plasma leakage out of the trap. Trapped-particle

L 36248-66

ACC NR: AP6023634

instability cannot occur in a dense plasma, and is also suppressed in a rarefied plasma under certain favorable directions of the particle drift, such as occur in apparatus of the Tokomak type. A detailed investigation of the trapped-particle instability in a Tokomak toroidal discharge was made by the author jointly with O. P. Pogutse. Orig. art. has: 4 formulas.

SUB CODE: 20/ SUBM DATE: 27Apr66/ ORIG REF: 004/ OTH REF: 003

Card 2/2

L 05704-67 EWT(1) IJP(c) AT

ACC NR: AP6013897 SOURCE CODE: UR/0020/66/167/006/1273/1275

AUTHOR: Kadomtsev, B. B. (Corresponding member AN SSSR); Shafranov, V. D.

ORG: none

TITLE: Diffusion in a toroidal discharge plasma

SOURCE: AN SSSR. Doklady, v. 167, no. 6, 1966, 1273-1275

TOPIC TAGS: plasma diffusion, plasma pinch, plasma discharge / Tokamak plasma device, stellarator plasma device

ABSTRACT: A formula is derived for the diffusion current of a plasma in a toroidal axiosymmetric discharge, assuming an external vortex electric field. The equations of V. D. Shafranov (*Voprosy teorii plazmy*, v. 1, M., 1963) are used to describe a system with this particular geometry. The average expansion rate of the plasma cord is given as the sum of terms representing the anomalous diffusion rate, the rate of pinch and two types of drift associated with the vortex field and the toroidal geometry. This expression is discussed in terms of experiments on Tokamak and stellarators. Orig. art. has: 15 formulas.

SUB CODE: 20/ SUBM DATE: 20Jan66/ ORIG REF: 004/ OTH REF: 002

UDC: 533.932

Card 1/1

ACC NR: AP6033267 SOURCE CODE: UR/0020/66/170/004/0811/0814

AUTHOR: Kadomtsev, B. B. (Corresponding member AN SSSR); Pogutse, O. P.

ORG: none

TITLE: Flute instability of a plasma in toroidal geometry

SOURCE: AN SSSR. Doklady, v. 170, no. 4, 1966, 811-814

TOPIC TAGS: plasma instability, magnetic trapping, plasma magnetic field, [illegible]

ABSTRACT: The authors consider flute instability of an ideally conducting plasma in toroidal discharge with strong longitudinal magnetic field, such as in the Tokamak system. The stability is defined by means of Suydam's condition (Second UN Conference on Peaceful Uses of Atomic Energy, Geneva, 1958, p. 354). It is shown that this condition is not applicable to Tokamak systems in strong magnetic fields, since the flute instability arises in final analysis as a result of the bending of the force lines. A different stability criterion is derived from the balance equation, which is linearized under certain simplifying assumptions. It is assumed that the flute instability arises under perturbations which are strongly stretched along the force lines. The maximum radius of the torus under which the straight-line approximation is still valid is estimated. The final criterion obtained for the stabilization of the flute instability is $\beta_\varphi = 8\pi p/H_\varphi^2 < 1$, where p is the plasma pressure and $H_\varphi$ the azimuthal magnetic field, under the assumption that p does not very too smoothly with the small

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ACC NR: AP6033267

radius of the torus. Orig. art. has: 17 formulas.

SUB CODE: 20/ SUBM DATE: 25Jun66/ ORIG REF: 003/ OTH REF: 005

Card 2/2

ACC NR: AP7003215 SOURCE CODE: UR/0056/66/051/006/1734/1746

AUTHOR: Kadomtsev, B. B.; Pogutse, O. P.

ORG: none

TITLE: Instability of a plasma due to particle trapping in a toroidal geometry

SOURCE: Zh eksper i teor fiz, v. 51, no. 6, 1966, 1734-1746

TOPIC TAGS: plasma instability, magnetic mirror machine, magnetic trapping, dispersion equation, particle collision

ABSTRACT: The article is devoted to a special type of flute instability occurring in a mirror device, first described in an earlier paper (ZhETF Pis'ma v. 4, 15, 1966) and called "trapped-particle" instability. In such an instability which a collisionless plasma can develop in a toroidal discharge with longitudinal magnetic field, the untrapped particles play the role of an environmental medium characterized by a high dielectric constant. These particles can only reduce the potential associated with the trapped particles but cannot eliminate it completely. The toroidal system considered is of the Tokomak type. The equilibrium state is analyzed and the drift trajectories of the particles are determined in a specially chosen coordinate frame. An integral equation playing the role of a dispersion relation for the determination of the characteristic oscillation frequency is derived and investigated. The case of particle collisions and instability by the trapped particles is then analyzed. The particles trapped between the effective magnetic mirrors in the toroidal configuration are

ACC NR: AP7003215

capable of giving rise to instability in a collisionless plasma. If the plasma density is sufficiently high, the instability becomes dependent on the sign of the magnetic drift. As the collision frequency increases, the growth rate for this instability falls off rapidly so that the trapped particle instability is insignificant in a sufficiently dense plasma. Orig. art. has: 2 figures, 46 formulas, and 1 table.

SUB CODE: 20/ SUBM DATE: 19Apr66/ ORIG REF: 008/ OTH REF: 003

Card 2/2

KADOMTSEV, I.F.

Methods for dressing chrome leather. Leg. prom. 18 no.3:51-52 Mr '58.
(Leather) (MIRA 11:4)

KADOMTSEV, I.F.

Method for processing pickled raw materials. Kozh.-obuv.prom. 5 no.3: 36-37 Mr '63. (MIRA 16:3)

(Leather)

24(3)

AUTHORS: Belov, K.P. and Kadomtseva, A.M. SOV/55-58-2-17/35

TITLE: On the Influence of One-Sided Elastic Deformations on the Curie Point of Ferromagnetics (O vliyanii odnostoronnikh uprugikh deformatsiy na tochku Kyuri ferromagnetikov)

PERIODICAL: Vestnik Moskovskogo Universiteta, Seriya matematiki, mekhaniki, astronomii, fiziki, khimii, 1958, Nr 2, pp 133-136 (USSR)

ABSTRACT: An experimental investigation of the influence of unidirectional elastic tensions on the Curie point led to the following results: The displacement of the Curie point under unidirectional tension is three times smaller than under universal tension and is essentially caused by the change in volume which follows the tension. A torsion does not displace the Curie point.
There are 3 figures, and 6 references, 4 of which are Soviet, and 2 American.

ASSOCIATION: Kafedra obshchey fiziki dlya biologo-pochvennogo i dr. f-tov (Chair of General Physics of the Faculty of Soil Biology and other Faculties) [Moscow Univ.]

SUBMITTED: June 26, 1957

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