S/781/62/000/000/025/036

AUTHORS: Zolototrubov I. M., Ryzhov N. M., Skoblik I. P., Tolok, V. T.

TITLE: Investigation of the properties of a plasma in a magnetic field

SOURCE: Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza; doklady I konferentsii po fizike plazmy i probleme upravlyayemykh termoyadernykh reaktsiy. Fiz.-tech. inst. AN Ukr. SSR. Kiev, Izd-vo AN Ukr. SSR, 1962, 123-127

TEXT: A highly-ionized plasma was investigated, produced by an electrodeless discharge in a molybdenum glass tube (100 mm dia and 1 m long) in a vacuum of 10^{-6} mm Hg by an alternating magnetic field resulting from the discharge of a capacitor and producing plasma confinement through trap geometry. The apparatus and the measuring equipment (magnetic probe) are described. The behavior of the magnetic field inside and outside the tube was monitored, along with recording the change in plasma luminosity by means of a photomultiplier. The tests show that noticeable ionization does not set in until the fourth quarter of the oscillation cycle, when a magnetic pressure is produced to detach the plasma from the walls and constrict it toward the center in a radial direction. The plasma density was es-

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Investigation of the properties of a plasma... S/781/62/000/000/025/036

timated by probing it with a signal of 8 mm wavelength. It has been found that a plasma of density not less than 10^{13} per cc is confined in the discharge tube for a time corresponding to 10 periods of oscillation of the magnetic field, during which the amplitude of the magnetic field drops to 1/40 of its initial value. Doubling the magnetic field intensity gave rise to radial oscillations in the plasma, the nature of which is not yet clear. There are four figures. The two references pertain to Russian translations of papers by Colgate and Wright and by Tuck.

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S/781/62/000/000/033/036

AUTHORS: Dushin, L. A., Kononenko, V. I., Privezentsev, V. I., Skibenko, A. I., Tolok, V. T.

TITLE: Microwave plasma diagnostics

SOURCE: Fizika plazmy i problemy upravlyayemogo termoyadernogo sinteza; doklady I konferentsii po fizike plazmy i probleme upravlyayemykh termoyadernykh reaktsiy. Fiz.-tekh. inst. AN Ukr. SSR. Kiev, Izd-vo AN Ukr. SSR, 1962, 156-164

TEXT: Several methods of plasma diagnostics are described, based on the interaction between the electromagnetic field and the plasma, with the electric field of the wave parallel to the external magnetic field, so that the external magnetic field does not influence the character of propagation of the microwaves used for the measurements. The real and imaginary parts of the coefficient of propagation of a microwave signal thorugh a plasma determine the attenuation and the phase constant of the wave. The plasma density is determined by the frequency at which the microwave signal ceases to pass through the plasma. The character of variation ofthe microwave signal as a function of the pressure was also

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Microwave plasma diagnostics

S/781/62/000/000/033/036

determined. Measurements of the variation of the phase and attenuation of the signal make it possible to follow the variation of the density and the electron collision frequency during the decay of the plasma. Phase measurements yielded also data on the distribution of electron density along the radius. At the present time the use of microwave diagnostics is limited by the capabilities of the microwave radiation sources. Present microwave generators have sufficient power to diagnose plasmas with electron densities near 10^{15} per cu. cm. Once submillimeter equipment is available, the densities can probably raised to 10^{16}-10^{18} el/cm^3. There are 11 figures. Reference is made to work by Wharton (ref. 4, Microwave diagnostics for controlled fusion research, UCRL, 1957) and by Wharton and Slager (J. Appl. Phys. 31, 428 - 430, 1960).

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TOLOK, V. T.

AID Nr. 981-5 3 June

COHERENT EM RADIATION FROM A HIGH CURRENT DENSITY PLASMA (USSR)

Suprunenko, V. A., Ya. B. Faynberg, V. T. Tolok, Ye. A. Sukhomlin, N. I. Reva, P. Ya. Burchenko, N. I. Rudnev, and Ye. D. Volkov. Atomnaya energiya, v. 14, no. 4, Apr 1963, 349-352. S/089/63/014/004/001/019

Results are given of experiments with plasma discharges at high current densities. Intense radial EM radiation was detected which was coherent and close to Langmuir frequency. Test apparatus included an alundum discharge tube, 10 cm in diameter and 25 cm in length, charged with H_2; aluminum electrodes, connected by a 15-μf capacitor bank charged to 30-40 kv and yielding a discharge current of about 100 kamp; an axial magnetic field variable from 0 to 10 kgs. Efforts to insure repeatability included the use of metal vacuum seals and a titanium pump, the baking of the apparatus at 300°C, and preionization of the gas mixtune prior to discharging. Electric field gradients of 300-500 v/cm gave a high "runaway" electron condition in the discharge beam.

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AID Nr. 981-5 3 June

COHERENT EM RADIATION [Cont'd] S/089/63/014/004/001/019

This current was measured by means of a Faraday cell and a Rogovsky belt, both located at one electrode. A typical test result at a 6-kgs field strength and a 3-4- μsec plasma life showed that coherent EM radiation received by a horn antenna through the tube wall and detected over the 8-14. 4-mm wavelength region was as much as 10^7 times more intense than thermal radiation from a plasma of 10-ev electron temperature, and was constant along the column. Coherence was detected by two probe antennas placed 11 mm apart in the column and connected to an 8-mm interferometer. Variation of the magnetic field from 0 to 8 kgs had no effect on observed radiation. Variation of other parameters revealed a sharply critical value of runaway electron current, below which radiation is absent and above which it rises rapidly in intensity accompanied by a dip in runaway current. This verified a casual relationship between the two. The relation of radiation intensity to initial gas pressures and to radial distance from the plasma column are also discussed. [SH]

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ACCESSION NR: AP3003967 S/0089/63/015/001/0003/0006

AUTHORS: Bakayev, I. I.; Zalesskiy, Yu. G.; Nazarov, N. I.; Ukrainskiy, A. M.; Tolok, V. T.

TITLE: Ion cyclotron resonance in a moving plasma 21

84
83

SOURCE: Atomnaya energiya, v. 15, no. 1, 1963, 3-6

TOPIC TAGS: ion cyclotron resonance, moving plasma, pinch, plasma density, Doppler effect

ABSTRACT: In the heating of a stationary plasma by means of an ion cyclotron resonance, the time required for a considerable acceleration of plasma ions is not more than 10^{-5} sec. Therefore for the pinches moving with a velocity of 10^7 cm/sec, the length of the heating section is not unreasonable (about 1m.). In the present work, the generation and absorption of ion cyclotron waves in a moving plasma pinch has been observed. The absorption of high frequency energy occured at two frequencies shifted to both sides from a certain average frequency, because of Dappler effect. "Magnetic shores" are important for the damping of ion cyclotron waves. By measuring the Dappler effect and the resonance frequencies, the average velocity of the pinch was found (6.7×10^6 cm/sec), and the plasma density (7×10^{12} cm^3).

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L 14939-63

ACCESSION NR: AP3003967

"The authors express their deep gratitude to K. D. Sinel'nikov for discussion of the results". Orig. art. has: 5 figures and 3 equations.

ASSOCIATION: none

SUBMITTED: 22Sep62 DATE ACQ: 08Aug63 ENCL: 00

SUB CODE: PH NO REF SOV: 002 OTHER: 002

Card 2/2

ZYKOV, V.G.; SINITSA, N.G.; STEPANENKO, I.A.; TOLOK, V.T.; STEKL'NIKOV, K.V.

Interaction of plasma streams in a transverse magnetic field.
Zhur. tekh. fiz. 34 no.8:1417-1423 Ag '64. (MIRA 17:9)

L 12862-66 EWT(1)/ETC(F)/EPF(n)-2/EWG(m) IJP(c) AT

ACC NR: AT5022298 SOURCE CODE: UR/3137/64/000/048/0001/0015

AUTHOR: Il'yenko, B. P.; Lats'ko, Ye. M.; Zalkind, V. M.; Zykov, V. G.; Tolok, V. T.

ORG: Physicotechnical Institute, Academy of Sciences UkrSSR (Fiziko-tekhnicheskiy institut Akademiya nauk UkrSSR)

TITLE: Investigation of a plasmoid moving in a toroidal magnetic field

SOURCE: AN UkrSSR. Fiziko-tekhnicheskiy institut. Doklady, no. 048/P--007, 1964. Issledovaniye plazmennogo sgustka, dvizhushchegosya v toroidal'nom magnitom pole, 1-15

TOPIC TAGS: plasmoid, plasma magnetic field, plasma density, plasma injection

ABSTRACT: The present paper is a continuation of an investigation of electrical fields in plasmoids moving in curved magnetic fields. Fig. 1 shows the general view of the experimental apparatus used in the investigation. The maximum magnetic field was 200 ka/m, length of vacuum tube was 252 cm, effective radius of spiral windings was 5.4 cm. The plasma was injected from conical plasma sources. Battery capacity was

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L 12862-66

ACC NR: AT5022298

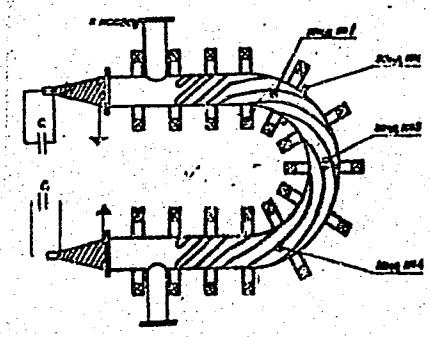

Fig. 1.

3 μf and discharge time 6.5 μsec. Plasma density injected by the source was not less than 10^{13} cm^{-3}. To measure the difference of potentials between two points in the plasma, two electrostatic probes were used: one grounded and located close to the wall of the chamber and the second moving along the cross section of the vacuum chamber. Measurements of the V_z component of the field was taken in the middle of toroidal portion. The Z-direction is parallel to the axis through the origin of the large radius of curvature. It is confirmed that component V_z is formed due to the separation of charges resulting from the drift forces. It was noticed that in the curved section, the components of the plasmoid's radial polarization were equal to the V_z component. Later, the V_z component dominated the other two components. Measurements confirm the fact that the magnetic field of spiral type improves the passing of plasmoids by about one order of magnitude. Orig. art. has: 13 figures.

SUB CODE: 20/ SUBM DATE: 00/ ORIG REF: 005/ OTH REF: 001

Card 2/2 HW

L 13449-66 EWT(l)/EWT(m)/ETC(F)/EPF(n)-2/EWG(m)/EWP(t)/EWP(b) IJP(c) JD/AT

ACC NR: AP6002441 SOURCE CODE: UR/0057/65/035/012/2185/2188

AUTHOR: Shvets, O.M.; Ovchinnikov, B.S.; Tarasenko, V.F.; Pavlichenko, O.S.; Tolok, V.T.

ORG: none

TITLE: Production of a dense plasma in a metallic chamber by a high frequency technique 21,44,55

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 35, no. 12, 1965, 2185-2188

TOPIC TAGS: plasma generator, plasma electron temperature, plasma density, plasma heating, high frequency discharge, magnetic field

ABSTRACT: Dense (up to 2 x 10^{14} cm^{-3}) plasmas were produced in a 12.5 cm diameter, 2 m long cylindrical copper chamber of 2.5 mm wall thickness with glass ends by exciting two 5 cm diameter, 7 cm long aluminum electrodes located 1 m apart on the axis of the chamber at 1.82 MHz with a 100kW oscillator. A longitudinal magnetic field up to 2.5 kOe was provided by a suitable winding. The experiments are preliminary to a projected investigation of plasma heating by ion cyclotron waves. The plasma densities were determined from the Stark broadening of H β, observed with a 1.3 m focal length spectrometer, and from reflection of 3 cm and 0.8 cm wavelength microwaves. Electron temperatures were determined from the intensity ratio of triplet to singlet helium lines. Plasma densities were also determined from the intensity of H β on the assumption that excitation is entirely by electron impact; the densities

Card 1/2 UDC: 533.9.07

L 13449-66

ACC NR: AP6002441

so determined were in agreement with the values obtained from microwave reflection. Owing to the rectifying action of the plasma, the electrodes became negatively charged to a potential of several kilovolts; this gave rise to an oscillatory motion of the electrons near the axis of the chamber between the electrodes, as a result of which the dense plasmas were produced. The dense plasma was confined to a 2 cm diameter region about the axis; at 3 cm from the axis the plasma density was less by an order of magnitude. The plasma density did not depend strongly on the magnetic field strength. The maximum observed plasma density was 2×10^{14} cm^{-3} at a gas pressure of 3×10^{-3} mm Hg. The plasma density remained above 10^{13} cm^{-3} for 3.6 millisec, and above 10^{12} cm^{-3} for 17 millisec. Electron temperatures of 40 to 50 eV were observed. Advantages of the described technique are the low input impedance, which eliminated difficulties associated with high voltage rf systems, and the good coupling between the electrodes and the plasma. Orig. art. has: 2 formulas and 5 figures.

SUB CODE: 20 SUBM DATE: 18Feb65 ORIG. REF: 001 OTH REF: 002

Card 2/2

L 24318-66 EWT(1)/EPF(n)-2/EWG(m) IJP(c) AT

ACC NR: AT6006750 SOURCE CODE: UR/3137/64/000/080/0001/0008

AUTHORS: Zolototrubov, I. M.; Kiselev, V. A.; Novikov, Yu. M.; Tolok, V. T.

ORG: none

TITLE: Operation of a coaxial plasma source in a longitudinal magnetic field

SOURCE: AN UkrSSR. Fiziko-tekhnicheskiy institut. Doklady, no. 080/P-032, 1964. Rabota koaksial'nogo plasmennogo istochnika v prodol'nom magnitnom pole, 1-8

TOPIC TAGS: plasma gun, plasma injection, plasmoid, hydrogen plasma, plasma structure, plasmoid acceleration, longitudinal magnetic field

ABSTRACT: To produce a plasmoid with a relatively small number of impurities and neutral particles, the authors developed a new construction, in which the coaxial plasma gun is placed in a longitudinal magnetic field, with an aim of having the rotation of the plasma in the crossed electric and magnetic fields symmetrize the discharge in

Card 1/3

L 24318-66

ACC NR: AT6006750

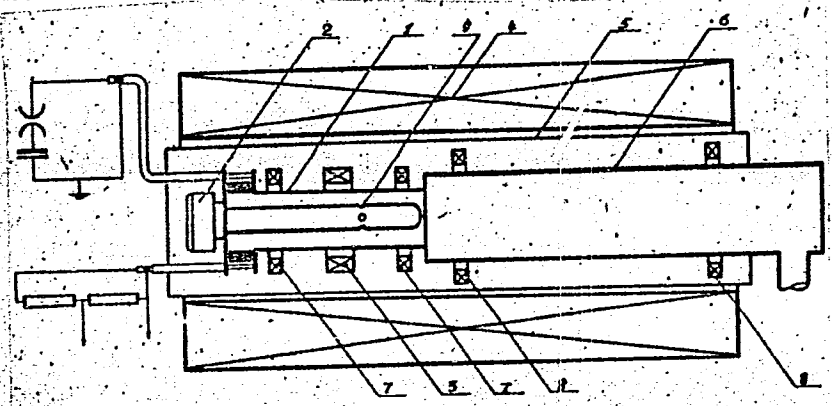

Fig. 1. Diagram of setup. 1 -- Gun, 2 -- vacuum valve, 3 -- field coil, 4 -- solenoid, 5 -- screen, 6 -- vacuum system, 7, 8 -- magnetic probes, 9 -- gas-inlet openings.

azimuth and increase the degree of ionization and the magnitude of the transverse component of the particle energy (Fig. 1). A field up to 8000 G was produced by discharging a capacitor bank. The working gas was hydrogen. The gun-current oscillogram shows the typical plateau characterizing rotation of the plasma in the crossed

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L 24318-66

ACC NR: AT6006750

fields. The rotation of the plasma was measured with external probes and the propagation of the plasma in the azimuthal direction was investigated by high-speed photography. The experiment has shown that when the coaxial source is placed in a longitudinal magnetic field the plasma rotates in azimuthal direction, the discharge occurs over the entire length of the gun and is symmetrical with respect to the periphery of the electrodes. This contributes to a cleaner plasma. Spectrograms of the discharge have shown that the magnetic field does decrease the intensity of the iron and chromium lines in the plasma spectrum. A shortcoming of the source is the small longitudinal plasmoid velocity (10^7 cm/sec) and insufficient ionization. These shortcomings are expected to be eliminated in the future. Orig. art. has: 6 figures.

SUB CODE: 20/ 1 ORIG REF: 002/ OTH REF: 003

SUBM DATE: none

Card 3/3 fv

L 40920-66 EWT(1) IJP(c) AT (N)
ACC NR: AT6020562 SOURCE CODE: UR/0000/65/000/000/0010/0014

AUTHOR: Nazarov, N. I.; Yermakov, A. I.; Tolok, V. T.

ORG: none

TITLE: Measurement of the perpendicular component of energy and the time of plasma breakup in high frequency heating

SOURCE: AN UkrSSR. Vysokochastotnyye svoystva plazmy (High frequency properties of plasma). Kiev, Naukovo dumka, 1965, 10-14

TOPIC TAGS: plasma decay, plasma heating, diamagnetism, plasma magnetic field, external magnetic field, electron density, plasma charged particle, pulsed magnetic field

ABSTRACT: The heating by high frequency generators and the breakup of plasma is studied by making use of the dependence of the plasma diamagnetism on the perpendicular component of particle energy. The method of measuring the diamagnetism consists of determining the magnetic field in the plasma and comparing it with the external field. The measurements were made on an experimental apparatus which used either a strong ion cyclotron wave or fast magnetosonic wave for plasma heating. The results showing the ion temperature as a function of a ratio of the external magnetic field to the plasma field (at which the gyrofrequency is 10 MHz) indicate the maximum temperature of 10 kev during the resonant excitation of the ion cyclotron wave. The density was 10^{13}

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L 40920-66
ACC NR: AT6020562

electrons/cm^3. The expected cooling time of the ions was observed to be reduced by a factor of ten down to 10 μsec owing to energy transfer to colder electrons and to charge-transfer collisions in the region of the cold plasma boundary found near the plasma vessel walls. It is suggested that removal of the walls would permit considerably higher heating of the plasma. Orig. art. has: 5 figures.

SUB CODE: 20/ SUBM DATE: 19Nov65/ ORIG REF: 003/ OTH REF: 001

Card 2/2 vmb

L 41067-66 EWT(1) IJP(C) GD/AT

ACC NR: AT6020410 (N) SOURCE CODE: UR/0000/65/000/000/0129/0136

AUTHOR: Il'yenko, B. P.; Lats'ko, Ye. M.; Zalkind, V. M.; Zykov, V. G.; Tolok, V. T.

ORG: none

TITLE: Investigation of plasmoids moving in a toroidal magnetic field

SOURCE: AN UkrSSR. Issledovaniye plazmennykh sgustkov (Study of plasma clusters). Kiev, Naukovo dumka, 1965, 129-136

TOPIC TAGS: plasmoid, plasma magnetic field, plasma injection, plasma gun, plasma pinch, helical magnetic field

ABSTRACT: This work reports on three experimental studies of electric fields in plasma. Electric fields arising due to polarization in plasma in 1) curved magnetic fields with varying radii of curvature, 2) in a toroidal field where two plasmoids collide and 3) in a case where a plasmoid moves along the toroidal field, are studied. The measurements were performed with two probes, one near the vessel wall and the other located at a given point in the plasma. The plasma was generated in a conical pinch gun and injected into the working region. The experiments show that polarization fields consist of the components along the toroid's major and minor radii and along the toroidal axis. Initially, the latter two components dominate in the main part of the plasmoid; subsequently, only the axial component is dominant. Plasma density was

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L 41067-66

ACC NR: AT6020410

also found to increase by an order of magnitude at the exit from the helical magnetic field of a curved toroidal section. Data for the various cases showing both space and time dependence of the various quantities measured are graphed. Orig. art. has: 9 figures.

SUB CODE: 20/ SUBM DATE: 11Nov65/ ORIG REF: 003/ OTH REF: 001

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L 43800-66 EWT(1) IJP(c) AT/GD
ACC NR: AT6020414 (N) SOURCE CODE: UR/0000/65/000/000/0165/0171

AUTHOR: Zolototrubov, I. M.; Kiselev, V. A.; Novikov, Yu. M.; Tolok, V. T. 64 B+1

ORG: none

TITLE: Operation of the coaxial plasma source in a longitudinal magnetic field

SOURCE: AN UkrSSR. Issledovaniye plazmennykh sgustkov (Study of plasma clusters). Kiev, Naukovo dumka, 1965, 165-171

TOPIC TAGS: plasma gun, plasma source, plasma magnetic field, plasma dynamics, LONGITUDINAL MAGNETIC FIELD

ABSTRACT: An attempt to develop a plasma source free of impurities by the use of a coaxial gun in a longitudinal magnetic field is discussed. The plasma gun and its operation is described, its energy source is a battery of condensers (1000 μf) working at 5 kv, the working gas is hydrogen injected by a fast-acting valve. When the gun is operated in the magnetic field, the discharge current plate appears. This, together with the observation of the plasma ejection velocity, indicates plasma drift typical of crossed electric and magnetic fields. High speed photography reveals that the plasma generated when the magnetic field is applied is much more uniform than in the absence of the field. Spectroscopic analysis shows that the magnetic field inhibits very strongly the appearance of electrode material impurities found in discharges without the external field. It is planned to overcome the insufficient ionization and

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ACC NR: AT6020414

low plasma velocity by increasing the electric power input and the modified magnetic field. Orig. art. has: 6 figures, 1 formula.

SUB CODE: 20/ SUBM DATE: 11Nov65/ ORIG REF: 002/ OTH REF: 003

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L 25505-66 EPF(n)-2/EWT(l)/EWT(m)/ETC(f)/EWG(m) IJP(c) AT/JD

ACC NR: AP6011387 SOURCE CODE: UR/0057/66/036/003/0443/0446

AUTHOR: Shvets, O.M.; Tarasenko, V.F.; Ovchinnikov, S.S.; Brzhechko, L.V.; Pavlichenko, O.S.; Tolok, V.T.

ORG: none

TITLE: Investigation of high frequency heating of a dense plasma in a metallic chamber

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 3, 1966, 443-446

TOPIC TAGS: plasma heating, ion temperature, cyclotron resonance, magnetic mirror machine, high frequency, hydrogen, helium, argon, helium plasma, hydrogen plasma charged particle, plasma density

ABSTRACT: This paper appears to be a sequel to an earlier paper by five of the present authors (ZhTF, 35, 1285, 1965). Hydrogen-helium and hydrogen-argon mixtures at pressures in the (1-3) x 10^{-3} mm Hg range with charged particle density of 10^{14} cm^{-3} were produced in the "Vikhr'" magnetic [illegible] heated by ion cyclotron waves which were produced in the v[illegible] magnetic mirror and propagated to the center of the discharge chamber [illegible] magnetic field was weaker and corresponded to the proton cyclotron resonance. The 150 kW oscillator operated at a frequency of 1.82 Mhz. The following advantages are claimed for the employed technique (which is not described in any detail in the present paper): the momentum initially imparted to the ion is perpendicular to the external magnetic field

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UDC: 533.9

L 25505-66

ACC NR: AP6011387

and thus does not tend to drive the ion away from the region of the magnetic mirror; the conditions for producing the waves do not deteriorate with increasing plasma size or density; the input impedance is low; and energy can be introduced at two different frequencies if it is desired to heat both the ion and the electron components of the plasma. Regular oscillations at frequencies of the order of 20 kHz of the intensities of spectrum lines were observed at magnetic field strengths close to the proton cyclotron resonance. These oscillations appeared when waves were being excited in the plasma and were due to eccentric rotation of the plasma filament as a whole with respect to the axis of the chamber, as was confirmed by longitudinal observation with two photomultipliers mounted 3 cm from the axis. The ion temperatures were determined from the Doppler broadening of spectrum lines. The temperature of the additional gas (helium or argon) increased sharply as the strength of the magnetic field approached the proton cyclotron resonance value. Argon temperatures as high as 250 eV were observed. Temperatures of various impurity ions were also measured; these temperatures were independent of the mass of the impurity ion. The width of H_β interpreted as Doppler broadening, indicated a much lower temperature for hydrogen atoms than for the various ions. This is ascribed to the short life of a hydrogen atom in the plasma. The temperature of the plasma decreased rapidly with increasing distance from the axis, being down by a factor of 5 at 4 cm from the axis. The ion temperature increased rapidly with increasing high-frequency power, and much higher temperatures could apparently be achieved by increasing the high-frequency power and the magnetic field strength. It is concluded that a dense plasma containing two kinds of ions can be

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L 25505-66
ACC NR: AP6011387

heated by resonance production of ion cyclotron waves in ions of one kind, but that the mechanism of energy transfer between the two different kinds of ions is not understood. Orig. art. has: 3 formulas and 4 figures.

SUB CODE: 20 SUBM DATE: 18Feb65 ORIG. REF: 002

Card 3/3

L 21566-66 EWT(1)/EPF(n)-2/EWG(m) IJP(c) AT

ACC NR: AP6008748

SOURCE CODE: UR/0386/66/003/006/0243/0247

AUTHOR: Burchenko, P. YA.; Vasilenko, B. T.; Volkov, YE. D.; Nikolayev, R. M.; Potapenko, V. A.; Tolok, V. T.

ORG: Physicotechnical Institute, Academy of Sciences, UkrSSR (Fiziko-tekhnicheskiy institute Akademii nauk UkrSSR)

TITLE: Excitation and thermalization of plasma oscillations in a stellarator

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 3, no. 6, 1966, 243-247

TOPIC TAGS: controlled thermonuclear reaction, plasma confinement, plasma electron oscillation, plasma electron temperature, ~~Sirius~~ magnetic trap, electric field

ABSTRACT: The authors studied the influence of collective processes on the behavior of a plasma in a closed stellarator-type magnetic trap (Sirius), comprising a race-track with two trifilar helical windings placed on the toroidal sections. The stellarator had a vacuum chamber with axial length 600 cm and minor diameter 10 cm, a maximum retaining field $H_0 = 2 \times 10^4$ oe, and $\beta_c = 8\pi nkT/H_0^2 = 7.5 \times 10^{-4}$. To excite intense collective oscillations, a longitudinal electric field of large amplitude ($E \geq E_K = 1.58 \times 10^{-8}\ n/T_e$), was applied to a plasma produced in the stellarator chamber by a pre-ionization generator. All the experiments were made at initial neutral-helium pressures 5×10^{-5} -- 8×10^{-4} mm Hg. The experiments consisted of measuring the plasma current and the loop voltage in the chamber, the plasma density, the x-radiation from the diaphragm limiting the plasma pinch and from the chamber walls, the

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microwave radiation from the plasma, and the integral amount of light. With increase in field, the initially sinusoidal current signal became distorted, and after build-up of the oscillations, the current decreased to a value I = 100--200 A, at which level it remained for 10--20 μsec, although a rather large electric field was applied to the plasma. In all the intervals of the investigated neutral gas pressure and electric and magnetic field intensities the discharge was accompanied by microwave emission from the plasma at wavelengths λ = 2--4 cm. In stronger electric fields a broad spectrum of oscillations was excited in the plasma at wavelengths 4.6--200 cm, with the maximum radiated power in the 12--15 cm interval. In electric fields stronger than critical, the plasma emits also intense x-rays, from which it is deduced that the plasma contains a group of electrons with almost-Maxwellian velocity distribution and with a temperature that ranges from 4 to 9 kev. Measurements of the integral amount of light have shown that at the instant of excitation of the collective processes and appearance of x-radiation from the chamber walls the intensity of plasma glow decreases abruptly, thus confirming indirectly the fact that the electrons become heated.
Authors thank K. D. Sinel'nikov for interest in the work and valuable discussions.
Orig. art. has: 2 figures.

SUB CODE: 20/ SUBM DATE: 31Jan66/ ORIG REF: 003/ OTH REF: 002

L 46296-66 EWT(1) IJP(c) AT/GD (N)
ACC NR: AT6020561 SOURCE CODE: UR/0000/65/000/000/0005/0009

AUTHOR: Nazarov, N. I.; Yermakov, A. I.; Tolok, V. T.

ORG: none

TITLE: Investigation of the energy of charged particles leaving magnetic traps after high frequency heating

SOURCE: AN UkrSSR. Vysokochastotnyye svoystva plazmy (High frequency properties of plasma). Kiev, Naukovo dumka, 1965, 5-9

TOPIC TAGS: plasma heating, HF, ~~plasma heating~~, plasma magnetic field, plasma temperature

ABSTRACT: This work describes the results of measurements of the energy of ions and electrons which are moving along the magnetic field. The heating mechanisms used in the experiments were collective excitations by ion cyclotron and fast magnetosonic waves. The characteristic waves in the plasma were excited by the spatially periodic electromagnetic fields with 10 MHz frequency. The generator power used was at the 300 kw level. The particle energy and composition was measured by the electrostatic analyzer and multigrid probes. The plasma temperature was determined by spectroscopic methods. Plasma density was determined by a microwave interferometer. It was found that three types of ions flowed out, namely, H_1^+, H_2^+, H_3^+, all of which had the same

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ACC NR: AT6020561

energy even though the resonant acceleration condition is satisfied for H_I^+ only. The ion temperature of 2 kev was reached, while the electron energy was only 30 ev. This also indicates the presence of three types of ions. In magnetosonic wave heating, both ions and electrons were found to reach a temperature of 150 ev. The various measuring methods gave consistent results. Orig. art. has: 5 figures.

SUB CODE: 20/ SUBM DATE: 19Nov65/ ORIG REF: 004

Card 2/2 afs

L 41007-66 EWT(1),T IJP(c) AT/DS

ACC NR: AP6018729 SOURCE CODE: UR/0057/66/036/006/1040/1048

AUTHOR: Zolototrubov,I.M.; Kiselev,V.A.; Novikov, Yu.M.; Ryzhov, N.M. ; Tolok, V. T.

ORG: none

60
58
B

TITLE: A coaxial plasma gun in a longitudinal magnetic field

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 6, 1966, 1040-1048

TOPIC TAGS: plasma gun, hydrogen plasma, contamination, longitudinal magnetic field,

ABSTRACT: In an effort to improve the purity and the uniformity with regard to velocity, density, and total number of particles of the plasma bursts from a coaxial plasma gun, the authors investigated the influence of a longitudinal magnetic field on the performance of the gun. It was anticipated that the rotation of the plasma within the gun, due to the Lorentz force on the radial current in the longitudinal magnetic field, would improve the azimuthal uniformity of the current sheet. The diameters of the inner and outer stainless steel electrodes of the 70 cm long coaxial gun were 3 and 7 cm, respectively. The gas (0.1 cm^3 of hydrogen) was admitted through six openings in the inner electrode near its center, and the gun was fired by the 20 kV discharge of a 12 microfarad capacitor. The plasma gun was located in the uniform portion of the field of a 1.4 m long solenoid. The magnetic field rose to its maximum strength of up to 8 kOe in 28 millisec and subsequently decayed exponentially with a time constant of 72 millisec. The processes taking place within the plasma gun

Card 1/2 UDC: 533.9

ACC NR: AP6018729 2

were investigated with the aid of a magnetic probe and by recording the discharge current, and the plasmas ejected from the gun were investigated with an external magnetic probe, a spectrograph, a photomultiplier, a monochrometer with the aid of which the intensities of different spectrum lines were displayed on an oscillograph, and a thermal probe. The rather involved processes that took place within the gun are discussed at some length. The rotation of the plasma gave rise to a magnetic trap within which a considerable portion of the gas was confined. Two plasma bursts were usually produced, but under some conditions it was possible to obtain only one burst containing some 2×10^{16} particles at a density of 2.4×10^{13} cm^{-3} and moving with a velocity of 3×10^{7} cm/sec. The purity of the plasma bursts increased with increasing longitudinal magnetic field strength; at a magnetic field strength of 6.4 kOe there were no lines due to electrode materials in the spectrum, and the lines due to carbon, oxygen, and nitrogen were considerably weaker than in the spectra of plasmas produced without the magnetic field. It is concluded that with the aid of a longitudinal magnetic field one can obtain from a coaxial plasma gun pure high energy plasmas free of slow and contaminated tails, but at the cost of inefficient use of the energy stored in the capacitor bank. The authors thank O.M.Shvets, and Ya.F.Volkov for discussions and criticism. Orig. art. has: 3 formulas and 7 figures.

SUB CODE: 20/ SUBM DATE: 26Apr65/ ORIG. REF: 004/ OTH REF: 002

Card 2/2 hs

EWT(1) IJP(z) GD/AT

ACC NR: AT6020564 SOURCE CODE: UR/0000/65/000/000/0026/0038

AUTHOR: Shvets, O. M.; Ovchinnikov, S. S.; Tarasenko, V. F.; Brzhechko, L. V.; Pavlichenko, O. S.; Tolok, V. T.

58
57
B+1

ORG: none

TITLE: Study of the conditions for generating a dense plasma in a metal chamber and the high frequency heating of plasma

SOURCE: AN UkrSSR. Vysokochastotnyye svoystva plazmy (High frequency properties of plasma). Kiev, Naukovo dumka, 1965, 26-38

TOPIC TAGS: heated plasma, plasma density, plasma generator, argon plasma

ABSTRACT: The generation of plasma in a metal container and the properties of such a plasma were investigated. A diagram of the experimental apparatus is shown. Up to 100 kw can be generated at frequencies of $1.82 \cdot 10^6$ Hg. The magnetic field which can be produced in several configurations, has a maximum value of $2 \cdot 10^5$ A/m. The plasma diagnostics consist of: 1) voltage monitoring across the plasma column, which determines the coupling between the generator and the plasma load; 2) spectral measurements of plasma ions and impurity lines, giving the density and temperature of the ions; and 3) magnetic probe to determine the field distributions. A plasma density of $2 \cdot 10^{14}$ cm^{-3} and a temperature of $4 \cdot 10^5$°K were attained. Another set of experiments

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L 40922-66

ACC NR: AT6020564

was performed to observe the launching of high frequency waves into the plasma to produce ion heating. The results of these experiments show that when argon plasma was used, an ion temperature of $2 \cdot 10^6$°K was reached. Since the ion temperature depends strongly on the applied voltage, it is concluded that higher voltage would result in hotter plasma. It was also shown that a mixture of two different ionic species can be effectively heated; the energy transfer mechanism, however, must be further investigated. Orig. art. has: 5 figures.

SUB CODE: 20/ SUBM DATE: 19Nov65/ ORIG REF: 002/ OTH REF: 001

Card 2/2 vmb

L 07408-67 EWT(1) IJP(c) GD/AT

ACC NR: AT6020574 (N) SOURCE CODE: UR/0000/65/000/000/0126/0133

62

B+1

AUTHOR: Sukhomlin, Ye. A.; Supruchenko, V. A.; Reva, N. I.; Tolok, V. T.

ORG: none

TITLE: Dissipation of plasma oscillations excited in a current-carrying plasma

SOURCE: AN UkrSSR. Vysokochastotnyye svoystva plazmy (High frequency properties of plasma). Kiev, Naukovo dumka, 1965, 126-133

TOPIC TAGS: plasma heating, plasma oscillation, plasma conductivity, plasma containment

ABSTRACT: The heating and containment of plasma in a strong magnetic field in the presence of instabilities caused by "run-away" electrons is investigated. The experiment consists of a 100 ka linear discharge in hydrogen, characterized by the absence of gross hydrodynamic instabilities. The "run-away" current was monitored to study the onset of two-stream instability and the resultant thermalization of the plasma. In the absence of collisions the anomalous diffusion observed is attributed to an increase in the kinetic pressure of electrons in the center of the discharge. This effect was used to estimate the electron temperature from the time of arrival of the expanding plasma at the tube wall. The heating time, measured by observation of the emitted x-radiation and intense microwave bursts, is much shorter than that which can

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L 07408-67

ACC NR: AT6020574

be explained by collisional heating. The very high final temperature of the electrons (2 kev) and short heating time correspond to the postulated collective process of heating by a two-stream instability. Orig. art. has: 4 figures.

SUB CODE: 20/ SUBM DATE: 19Nov65/ ORIG REF: 008/ OTH REF: 005

Card 2/2

ACC NR: AP6036030 SOURCE CODE: UR/0057/66/036/011/1971/1975

AUTHOR: Zykov,V.G.; Stepanenko,I.A.; Tolok,V.T.

ORG: none

TITLE: Volume polarization interaction of plasmas in a multipole magnetic field

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 11, 1966, 1971-1975

TOPIC TAGS: plasma injection, dense plasma, plasma gun, plasma interaction, non-homogeneous magnetic field, combined magnetic field, magnetic trap

ABSTRACT: The authors have investigated the behavior of plasma bursts with velocities of 2×10^6 cm sec and densities of 10^{12} to 10^{13} cm^{-3} produced by conical plasma guns and transversely injected singly or simultaneously in opposite directions into the magnetic field produced by the inductively loaded 3 kV discharge of a 2.7 millifarad capacitor bank through four parallel 1 cm diameter 150 cm long brass rods, which formed the edges of a rectangular parallelepipedon with a cross section diagonal of 10.5 cm. The period of the loaded discharge was 4 millisec and the maximum strength of the magnetic field produced on the injection axis by the currents in the rods, all four of whichl were in the same direction, was 1.2 kOe. The injected plasmas were photographed and their behavior was investigated with electric and magnetic probes. It was found that a plasma burst of considerable density would pass through both magnetic barriers. From this it is concluded that simultaneous injection from

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ACC NR: AP6036030

opposite directions is necessary for efficient entrapment of plasma. The magnetic field configuration recorded with simultaneous injection of plasmas from opposite directions differed considerably from the algebraic sum of the fields recorded with single injection of plasmas from the two directions; this shows that the colliding plasmas interacted with each other. The moving plasmas were electrically polarized. The polarization of a singly injected plasma changed sign, but the polarization passed through zero not on the axis of the system, but some 0.5 cm beyond the axis in the direction of motion of the plasma. When two plasmas were simultaneously injected in opposite directions their polarizations decreased smoothly and vanished on the axis of the system. Plasma was entrapped in the field when; two plasmas were simultaneously injected; the entrapped plasma moved both along the magnetic lines of force and parallel to the axis of the system. It is planned to investigate injection of plasmas parallel to the axis of the system and entrapment of interacting plasmas in magnetic traps. The authors thank graduate student A.V.Pashchenko of the MIFI for participating in the measurements. Orig. art. has: 7 figures.

SUB CODE: 20 SUBM DATE: 22Jul65 ORIG. REF: 001 OTH REF: 002

Card 2/2

L 05917-67 EWT(1) IJP(c) AT

ACC NR: AR6032293 SOURCE CODE: UR/0275/66/000/007/A023/A023

AUTHOR: Shvets, O. M.; Ovchinnikov, S. S.; Tarasenko, V. F.; Brzhechko, L. V.; Pavlichenko, O. S.; Tolok, V. T.

TITLE: Investigation of conditions for the production of a dense plasma in a metal chamber and for its h-f heating

SOURCE: Ref. zh. Elektronika i yeye primeneniye, Abs. 7A167

REF SOURCE: none

TOPIC TAGS: dense plasma, particle density, charged particle density, cyclotron ion wave

ABSTRACT: Conditions for producing a dense plasma on a "VIKHR'" system by means of high-powered frequency oscillators were investigated. Charged particle density was determined on the basis of the Stark widening of the line H_β and by SHF methods. Electron temperature was determined by the intensity ratios of the He lines. It was found that the density of the plasma produced in a metal chamber reached $\sim 10^{13}$ cm^{-3} at an electron temperature of 40 ev. Further action of

UDC: 537.575

Card 1/2

L 05917-67

ACC NR: AR6032293

0

cyclotron ion waves on the plasma resulted in an insignificant increase in the ion temperature of the basic gas (H_3) and a noticeable heating up of the ions of other gases which were present in the system (up to $\sim$200 ev). The mechanism of energy transmission by protons to other ions is not clear. Bibliography of 3 titles. [Translation of abstract]

SUB CODE: 09, 20/

kh

Card 2/2

SOURCE CODE: UR/0000/65/000/000/0018/0025

ACC NR: AT7008875

AUTHOR: Tolok, V. T. (Candidate of physico-mathematical sciences)

ORG: none

TITLE: Plasma jet interactions

SOURCE: Problemy termoyadernykh issledovaniy, 1965, 18-25

TOPIC TAGS: plasma interaction, plasma jet, plasma beam

SUB CODE: 20

ABSTRACT: The modern, controlled thermonuclear reaction research works basically in the direction of 1) studies of the turbulent heating of plasma (Academician Ye. K. ZAVOYSKIY and his group) and 2) fundamental investigation concerning hot plasma trapping within large-scale magnetic traps (the group led by Doctor of Physico-Mathematical Sciences I.N. GOLOVIN). The author of the article proposes still another, third approach: injecting an already prepared plasma into the magnetic traps. This would result in a fast filling of the trap and possibilities for the cleaning and additional heating of the plasma. The problem splits into three parts: a) how to prepare a plasma of required characteristics; b) how to inject it into the trap; and c) how to keep it within the trap. The paper presents the results of the study of plasma beam interactions at the Khar'kov Physico-Technological Insitute.

UDC: none

0929 1674

Card 1/2

ACC NR: AT7008875

One of the possible methods for plasma braking is the utilization of a collective interaction of colliding plasma jets under specified conditions of temperature and velocity relationships of the plasma components. This so-called two-jet ionic instability was proposed by the Cor. member of the AS USSR B.B. KADOMTSEV and was experimentally verified by Ye. K. ZAVOYSKIY. Another method, the so-called polarization approach for colliding jet braking, does not impose auxiliary conditions on the plasma, and experiments proved this method also very effective, except that the resulting plasma was highly erratic. Subsequent research could attempt either to 1) stabilize the plasma following the collision of the jets, or 2) to search for conditions leading to a more quiet interaction. This second method, volume polarization interaction, was tested successfully in two real magnetic systems: a magnetic trap with colliding magnetic fields, and in conjunction with conductors carrying the current in a single direction. The continuing success of these and similar investigations will depend on the purification of plasma jets from harmful foreign admixtures. Orig. art. has: 6 figures and 4 formulas. [JPRS]

Card 2/2

SUKHOMLIN, Ya.A.; REVA, N.I.; SUPRUNENKO, V.A.; TOIOK, V.T.

Excitation and thermalization of electron plasma waves in a high-current gas discharge. Pis'. v red. Zhur. eksper. i teoret. fiz. 1 no.2:45-49 Ap '65. (MIRA 18:10)

1. Fiziko-tekhnicheskiy institut AN Ukrainskoy SSR.

ZYKOV, V.C.; STEPANENKO, I.A.; TOLOK, V.T.

Polarization interaction of opposing plasma streams in a trap with combined magnetic fields. Zhur. tekh. fiz. 35 no.9:1585-1589 S '65.
(MIRA 18:10)

IL'YENKO, B.P.; LATS'KO, Ye.M.; ZALKIND, V.M.; ZYKOV, V.G.; TOLOK, V.T.

Polarization of a plasma moving in a helical magnetic field. Zhur. tekh. fiz. 35 no.9:1594-1597 S '65.

Polarization of a plasma moving in a toroidal magnetic field. Ibid.:1598-1601

Polarization of a plasmoid moving in magnetic fields with different signs of the curvature of the lines of force. Ibid.:1602-1605

(MIRA 18:10)

ZYKOV, V.G.; STEPANENKO, I.A.; TOLOK, V.T.; SINEL'NIKOV, K D.

Study of plasma capture in a magnetic trap with opposing fields.
Zhur. tekh. fiz. 35 no.1:62-71 Ja '65.
(MIRA 18:3)

1. Fiziko-tekhnicheskiy institut AN UkrSSR, Khar'kov.

L 2491-66 EWT(1)/ETC/EPF(n)-2/EWG(m)/EPA(w)-2 IJP(c) AT
ACCESSION NR: AP5020723 UR/0057/65/035/008/1390/1393

68
65
B

AUTHOR: Zykov, V.G.; Stepanenko, I.A.; Tolok, V. T. 44,55

TITLE: Interaction of polarized plasma streams in a magnetic field that increases toward the periphery 21,44,55

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 35, no. 8, 1965, 1390-1393

TOPIC TAGS: turbulent plasma, plasma confinement, plasma injection, plasma interaction, magnetic trap, magnetic mirror, cusped magnetic field

ABSTRACT: The authors and collaborators have previously investigated the interaction of oppositely directed plasma streams in a uniform transverse magnetic field (ZhTF, 32, 1050, 1962). The oppositely polarized plasmas interacted strongly and deceleration occured; turbulence arose, however, which led to loss of plasma. In the present paper the authors report experiments with oppositely directed plasmas in a biconical cusped field, which were undertaken with the expectation that the more smoothly varying field would not give rise to turbulence. The biconical cusp was produced in a 30 cm diameter stainless steel chamber by the discharge with a 19 μsec period of a 2700 μfd capacitor through appropriate windings. The maximum

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field strength in the mirror region was 8800 Oe, and in the cusp at the chamber wall, 2250 Oe. Plasmas were injected from one, two, or four conical guns symmetrically disposed with respect to the plane of the cusp in a meridian plane of the biconical field. The injection directions were at 45° to the axis of the field. Each plasma gun was fired by the 12-15 kV discharge of a 1.2 μfd capacitor, the discharge period being 3.5 μsec. The behavior of the plasmas was observed by photographing their luminescence from different directions, and the plasma polarization at different points was measured with a double floating probe. The plasma polarization did not vanish when the plasma crossed the central point of zero magnetic field; it disappeared only after the plasma had penetrated several centimeters beyond this point into the region of oppositely directed field. The oppositely directed plasmas did strongly interact without observable turbulence, but part of the plasma escaped through the cusp, and part escaped through the mirrors. "In conclusion, we express our deep gratitude to Academician K.D.Sinel'nikov for his valuable advice and interest in the work." Orig. art. has: 4 figures. 44,55

ASSOCIATION: none

SUBMITTED: 16Nov64 ENCL: 00 SUB CODE: ME

NR REF SOV: 003 OTHER: 000

Card 2/2 lch

L 3614-66 EWT(1)/ETC/EPF(n)-2/EWG(m)/EPA(w)-2 IJP(c) AT
ACCESSION NR: AP5024033 UR/0057/65/035/009/1585/1589 59 56
533.9 B

AUTHOR: Zykov, V. G.; Stepanenko, I. A.; Tolok, V. T. 44,55

TITLE: Polarization interaction of opposed plasma streams in a composite magnetic field trap 21, 44,55

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 35, no. 9, 1965, 1585-1589

TOPIC TAGS: magnetic mirror, combined magnetic field, plasma injection, plasma jet, plasma confinement, plasma interaction

ABSTRACT: The authors have investigated the behavior of plasma bursts colliding within a magnetic mirror system provided with an auxiliary quadrupole or octupole magnetic field. The magnetic mirror system was produced in a 30 cm diameter stainless steel chamber by discharge of a 2700 microfarad capacitor through suitable windings. The maximum magnetic field at the center of the system was 2800 Oe and the mirror ratio was 2.16. The auxiliary field was provided by currents in eight copper rods parallel to the main field and disposed at equal intervals on the surface of a 10.6 cm diameter cylinder. The rods could be connected variously in series or series-parallel, but the rod system was always connected in series with the main windings so that the ratio of the auxiliary to the main field remained constant during the discharge. At the surface of the 1 cm diameter rods this ratio

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L 3614-66

ACCESSION NR: AP5024033

3.

was 0.87. Plasma bursts from four conical plasma guns disposed symmetrically in the equatorial plane of the mirror system were injected transversely to the main magnetic field. The velocity of the leading edge of a plasma jet was 2×10^6 cm/sec and the ion density was of the order of 10^{13} cm^{-3}. In the presence of the auxiliary magnetic field the turbulent plasma "protuberances" observed earlier by the authors and collaborators (ZhTF, 34, 1417, 1964) did not occur, and there was no difficulty in assuring head on collision between oppositely directed jets. It was established with the aid of probes that the oppositely polarized colliding jets interacted strongly. The maximum plasma density in the center of the system was much greater when the auxiliary field was present than when it was not, but the confinement time was the same in both cases. "The authors express their sincere gratitude to Academician K.D.Sinel'nikov for his valuable advice and support of the work." Orig. art has: 4 figures. 44,55

ASSOCIATION: none

SUBMITTED: 16Nov64 ENCL: 00 SUB CODE: ME

NO REF SOV: 004 OTHER: 000

Card 2/2

L 3611-66 EWT(1)/ETC/EPF(n)-2/EWG(m)/EPA(w)-2 IJP(c) AT

ACCESSION NR: AP5024036 UR/0057/65/035/009/1598/1601

AUTHOR: Il'yenko, B.P.; Lats'ko, Ye.M.; Zalkind, V.M.; Zykov, V.G.; Tolok, V.T.

TITLE: Investigation of the polarization of a plasma moving in a toroidal magnetic field

SOURCE: Zurnal tekhnicheskoy fiziki, v. 35, no. 9, 1965, 1598-1601

TOPIC TAGS: inhomogeneous plasma, electric field, toroidal geometry, longitudinal magnetic field

ABSTRACT: The authors measured the polarization of plasmas moving in a toroidal magnetic field. The magnetic field (up to 200 kA/m) was produced in a U-shaped copper drift tube (diameter not given). The large radius of the toroidal section of the drift tube was 42 cm and the straight legs were 60 cm long. Plasmas with ion densities exceeding 10^{13} cm^{-3} were injected at one end of the drift tube with a conical plasma gun powered by the 8-12 kV 0.5 μ sec discharge of a 3 μfd capacitor. The charged particle density of the injected plasmas was not less than 10^{13} cm^{-3}. The electric field polarization in the plasma was measured with probes at the exit from the toroidal section. The polarization field had components in the direction

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ACCESSION NR: AP5024036

of the large radius of the torus and in the direction of the axis of the torus. The axial component changed sign when the direction of the longitudinal field was reversed, and the component did not. The distribution of the polarization field across the section of the drift tube and the variation of the polarization field with the longitudinal magnetic field strength were measured and are presented graphically. By comparing the time of maximum polarization with that at which a 3 cm wave crossing the drift tube was cut off by the plasma , it was established that the polarization was confined almost entirely to the more rapid, less dense leading portion of the plasma burst. Orig. art. has: 9 figures.

ASSOCIATION: none

SUBMITTED: 18Dec64 ENCL: 00 SUB CODE: ME

NR REF SOV: 002 OTHER: 002

Card 2/2

L 3610-66 ETC/EPF(n)-2/EWG(m)/EPA(w)-2 IJP(c) AT
ACCESSION NR: AP5024037 UR/0057/65/035/009/1601/1605 51
533.9 44,55 49,55
AUTHOR: Il'yenko, B. P.; Lats'ko, Ye. M.; Zalkind, V. M.; Zykov, V. G.; Tolok, V. T. B

TITLE: Investigation of the polarization of plasmas moving in magnetic fields of opposite curvatures

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 35, no. 9, 1965, 1601-1605

TOPIC TAGS: inhomogeneous plasma, electric field, toroidal geometry, longitudinal magnetic field,

ABSTRACT: The authors measured the polarization of plasmas moving in a toroidal magnetic field, using the apparatus described in the two accompanying papers (ZhTF 35, 1598, 1601, 1965 [see abstracts AP5024035 and AP5024036]) and, in addition, a 7.4 cm diameter S-shaped copper drift tube consisting of two half-tori of 35 cm large radius joined by a 20 cm long straight section. A longitudinal magnetic field of 200 kA/m was maintained in both drift tubes. Plasmas could be injected at either or both ends of both drift tubes by means of conical plasma guns. The polarization of the plasmas was measured with probes located at the center of the toroidal section of the U-shaped drift tube and in the straight section joining the

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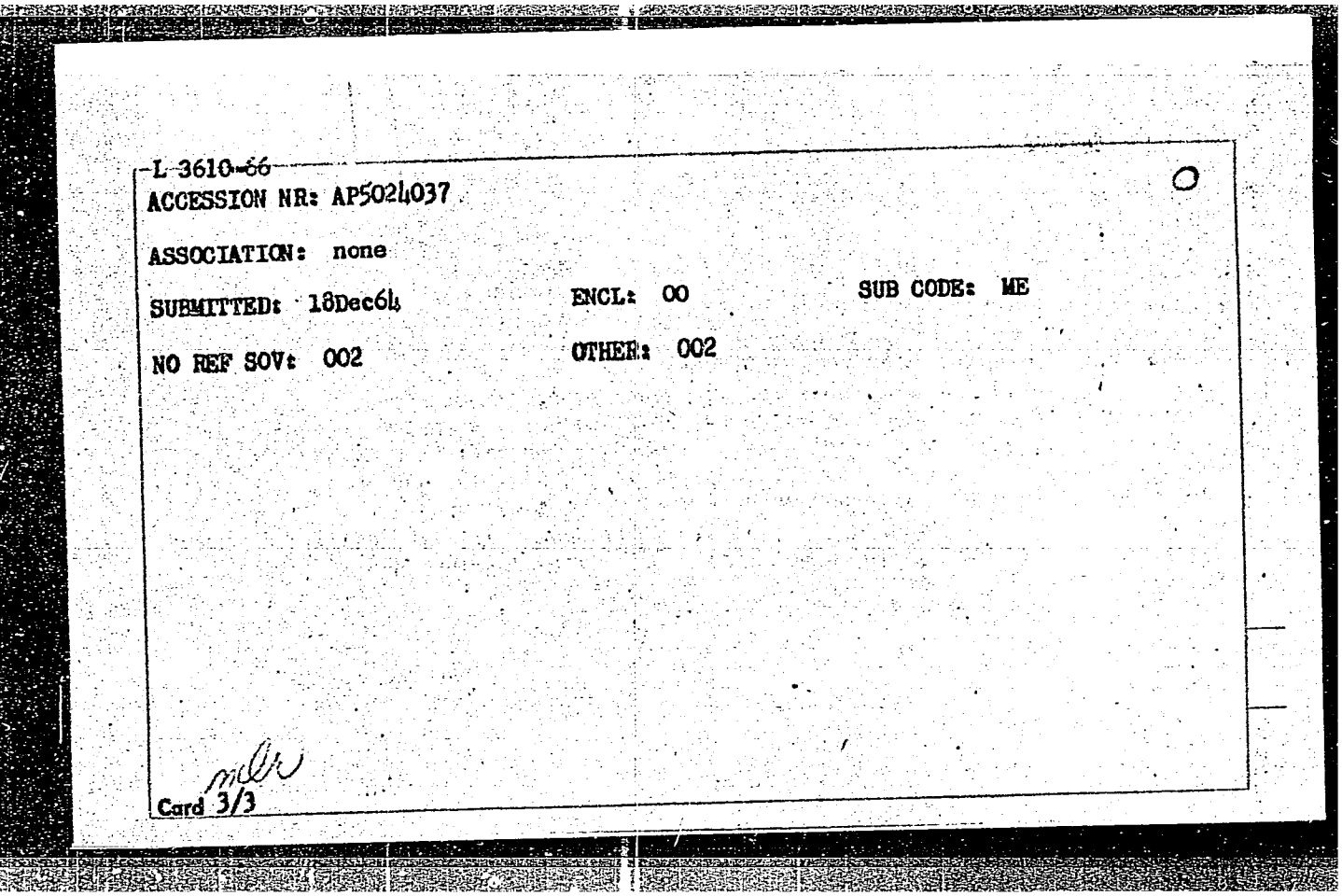
L 3610-66

ACCESSION NR: AP5024037

two half-tori of the S-shaped drift tube. The polarization is analyzed in terms of three components V_z, V_R, and V_r: V_z is parallel to the axis of the torus, V_R is in the direction of the large radius of the torus, and V_r is in the plane of V_z and V_R and is directed away from the axis of the drift tube (along the small radius of the torus). It was found that V_z changes sign when the direction of the magnetic field is reversed but not when the direction of motion of the plasma through the U-shaped drift tube is reversed without reversing the field. When the direction of motion of the plasma through the S-shaped drift tube was reversed, however, the V_z component of the polarization measured in the straight section joining the two half-tori changes sign. When two oppositely moving plasmas collided in the center of the U-shaped drift tube the value of V_z was approximately the same as when only one plasma was present. When two oppositely moving plasmas collided in the straight section joining the two half-tori of the S-shaped drift tube, the V_z polarization components of the two plasmas canceled each other and only V_r was measured. The distributions of V_z and V_r across the drift tube are presented graphically. It was found that V_z and V_r are of comparable magnitude in the fast leading edge of the plasma burst, but that V_z predominates in the tail. Orig. art. has: 8 figures.

Card 2/3



L 3610-66

ACCESSION NR: AP5024037

ASSOCIATION: none

SUBMITTED: 18Dec64 ENCL: 00 SUB CODE: ME

NO REF SOV: 002 OTHER: 002

Card 3/3

ZYKOV, V.G.; STEPANENKO, I.A.; DUSHIN, L.A.; NIKOI SKIY, I.K.;
PAVLICHENKO, O.S.; TOLOK, V.T.

Spectroscopic study of plasma clots in collision. Zhur. tekh.
fiz. 35 no.1:56-61 Ja '65. (MIRA 18:3)

SHVETS, O.M.; OVCHINNIKOV, S.S.; TARASENKO, V.F.; TOLOK, V.T.

Study on the properties of a plasma in mutually opposed electric and magnetic fields. Zhur. tekh. fiz. 35 no.4:717-722 Ap '65. (MIRA 18:5)

[redacted]

[redacted]

[redacted]

topic TAGS: plasma heating, high frequency heating, ion cyclotron wave, magneto-

[redacted]

Card 1/2

ACCESSION NR: AT5006096

...theory and the experimental data on resonant excitation, propa-... a plasma.

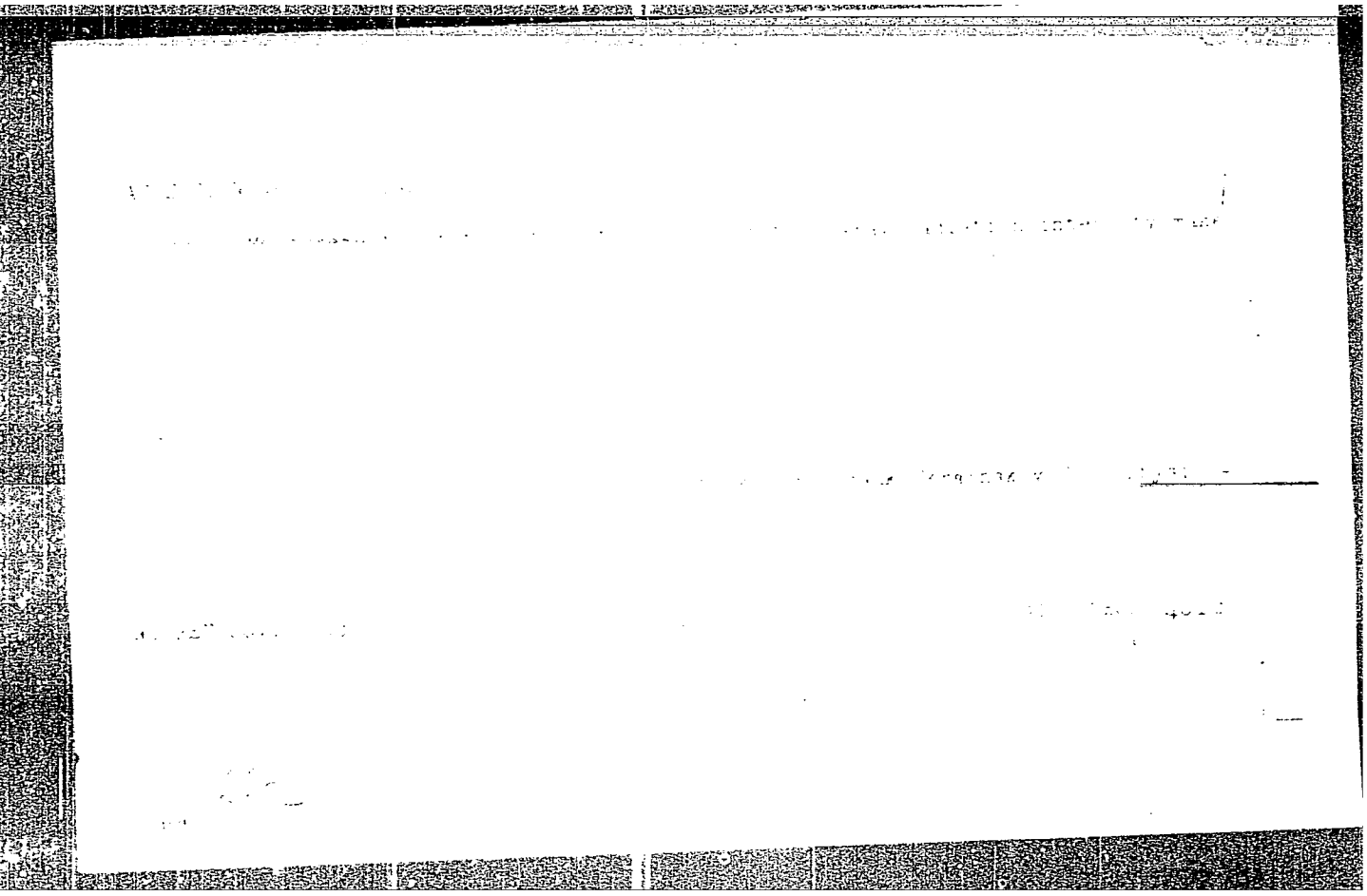
...Institute, AN UzbSSR)

SUB CODE: ME, NP

AUTHOR: Sukhomlin, Ye. A.; Reva, V.

plasma

electric fields a considerable part of the energy supplied by an outside source is



APPROVED FOR RELEASE: 07/16/2001 CIA-RDP86-00513R001756110018-1"

.722

ACCESSION NR:

[illegible] Tarasenko, V.F.; Tolok, V.T.

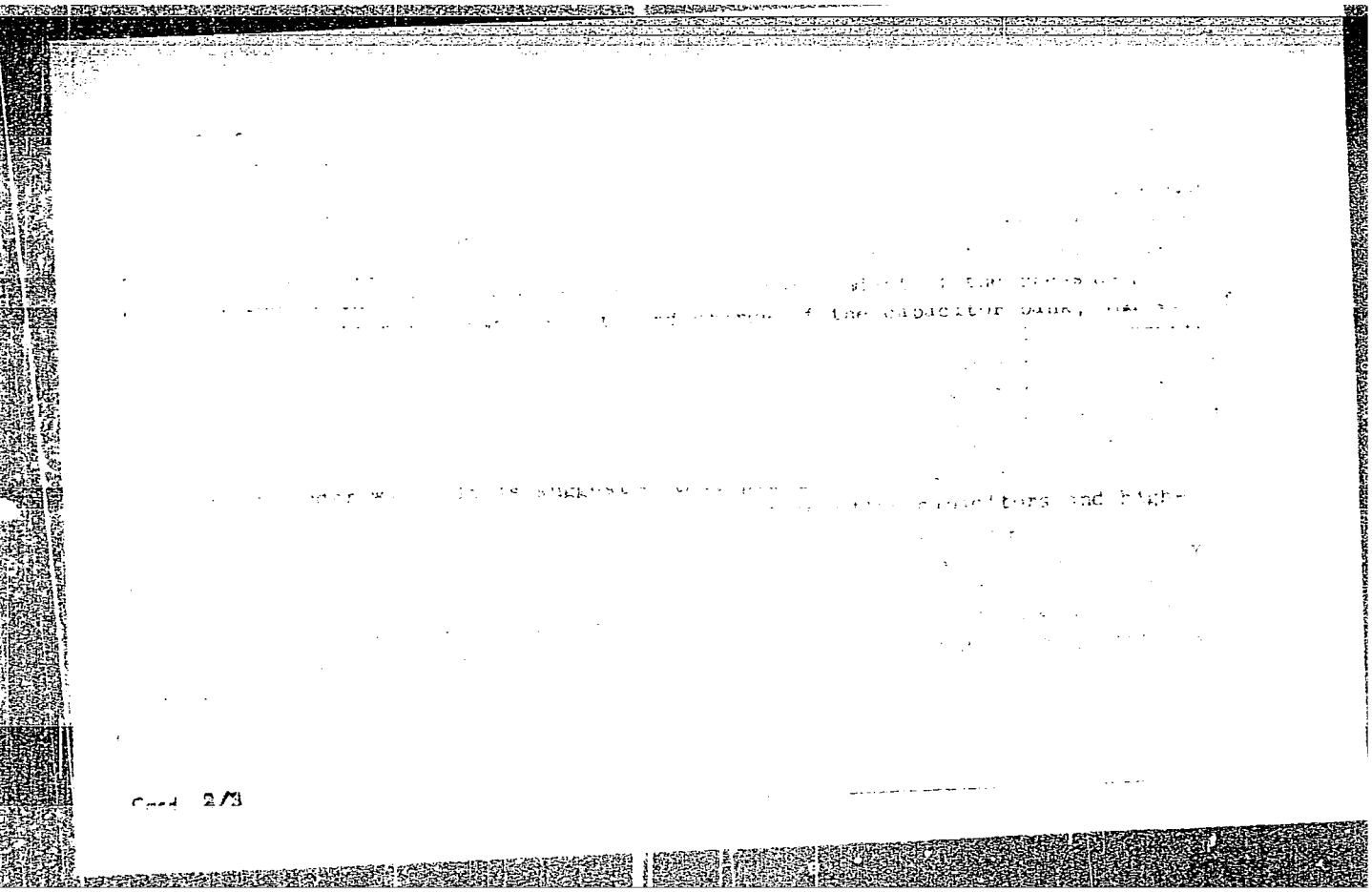
[illegible] in crossed electric and

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 35, no. 4, 1965, 717-722

[illegible] plasma rotation, plasma stability, plasma confinement, hydrogen

[illegible] The radial electric field was produced [illegible] magnetic field up to 2500 Oe [illegible] was admitted and the system [illegible] through the plasma [illegible] with a spark gap. The [illegible] and the [illegible]

Card 1/3



ASSOCIATION: None

SUB CODE: MM

Copy 3/3

L 27597-65 EWT(1)/EPA(sp)-2/EPA(w)-2/EEC(t)/T/EWA(m)-2 Pz-6/Po-4/Pab-10/Pi-4
IJP(c) AT

ACCESSION NR: AP5003237 S/0057/65/035/001/0056/0061

AUTHOR: Zykov,V.G./ Stepanenko,I.A./ Dushin,L.A./ Nikol'skiy,I.K./ Pavlichenko, O.S./ Tolok, V.T.

TITLE: Spectroscopic investigation of the plasma in colliding bursts

SOURCE: Zhurnal tekhnicheskoy fiziki, v.35, no.1, 1965, 56-61

TOPIC TAGS: plasma interaction, plasma spectral line, charge exchange

ABSTRACT: This paper reports a continuation of work by some of the present authors and others (ZhTF 35,62,1965 /see Abstract AP5003238/) concerning the confinement of plasma injected into a cusp magnetic field. The present work was performed without the magnetic field, and was undertaken to investigate the processes taking place in colliding plasma bursts. Plasma bursts were injected from one or more of four conical plasma guns equally disposed about the periphery of a 20 cm diameter stainless steel tube, and the spectra were observed in both the longitudinal and transverse directions. The time-integrated spectrum was recorded photographically in the range from 2000 to 6000 Å, and the time dependence of the intensity of certain lines was determined with a photoelectric instrument. The plasma bursts had a maximum density

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L 27597-65

ACCESSION NR: AP5003237

3

of 2 x 10^{14} cm^{-3} and the electron temperature was 4 to 4.5 eV. The velocity of the fast component of a bursts was 1.4 x 10^{7} cm/sec; this was followed by a slower "tail". The collision of two plasma bursts led to an increase in the intensity of all spectrum lines and the appearance of lines that were not observed in single bursts. Velocity measurements performed with the photoelectric instrument using the H_β 4861, C I 4371 and C II 4267 lines showed that both the carbon ions and the hydrogen atoms moved more rapidly than the carbon atoms. The presence of excited ions in the plasma burst at a considerable distance from the source is discussed, and it is suggested that these are continually formed by a charge exchange mechanism. The ion temperature was determined from the Doppler broadening of the C II 4267 line. Collision of the plasma bursts was found to be accompanied by an increase of the ion temperature. After brief discussion it is concluded that the strong interaction between plasma bursts observed in this and the previous work can be accounted for by Coulomb interaction. "In conclusion, the authors express their gratitude to L. V.Brzhechko, A.P.Dolgom and A.A.Kutsyn for technical assistance in performing the work." Orig.art.has: 6 figures.

Card 2/3

ACCESSION NR: AT4036054 S/2781/63/000/003/0164/0168

AUTHORS: Nazarov, N. I.; Yermakov, A. I.; Tolok, V. T.; Sinel'nikov, K. D.

TITLE: Investigation of instability in the cyclotron method of plasma heating

SOURCE: Konferentsiya po fizike plasmy* i problemam upravlyayemogo termoyadernogo sinteza. 3d, Kharkov, 1962. Fizika plazmy* i problemy* upravlyayemogo termoyadernogo sinteza (Plasma physics and problems of controlled thermonuclear synthesis); doklady* konferentsii, no. 3, Kiev, Izd-vo AN UkrSSR, 1963, 164-168

TOPIC TAGS: cyclotron resonance phenomena, plasma instability, plasma heating, plasma ion oscillation, plasma decay, microwave plasma, gyromagnetic resonance

ABSTRACT: To clarify the question of the effectiveness of plasma heating by ion cyclotron waves and to study the influence of the

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ACCESSION NR: AT4036054

level of the high-frequency power on the plasma heating in the ion gyroresonance region, an experiment was performed with a setup described in detail elsewhere (ZhTF v. 32, No. 5, 1962). The results of the tests indicate that there exist two distinctly different modes of plasma behavior, one in which the plasma exists for a relatively long time, and one in which the plasma begins to decay even before the termination of the high-frequency power pulse. A radical decrease in the lifetime of the plasma occurs at a definite critical power level supplied to the plasma, and the smaller the pressure the smaller the critical power. The critical power depends on the cleanliness of the system and increases for a poorly preconditioned system. This dependence on the pressure and on the purity of the system suggests that the observed instability is due to the appearance of ion currents with large directional velocities. At the present time the nature of the observed instability cannot be reconciled with the existing theory. "In conclusion the authors thank Ya. B. Faynberg and V. I. Kurilko for interest in the work and for a

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ACCESSION NR: AT4036054

discussion of the results, and also A. L. Lobko, V. A. Bondarev, and Ye. S. Khokhlov for help with the experiment. Orig. art. has: 5 figures.

ASSOCIATION: None

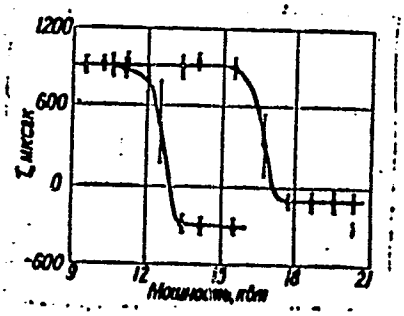
SUBMITTED: 00 DATE ACQ: 21May64 ENCL: 02

SUB CODE: ME NR REF SOV: 003 OTHER: 002

Card 3/5

ACCESSION NR: AT4036054

ENCLOSURE: 01



Dependence of the lifetime τ of a plasma with n ~ 1.2 x 10^{12} cm^{-3} after termination of the high-frequency pulse, on the power, for two pressures: o - 0.997 and Δ - 0.585 n/m^2

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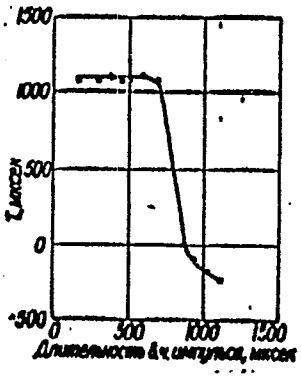
ACCESSION NR: AT4036054

ENCLOSURE: 02



Duration of hf pulse, μsec

Dependence of τ on the duration of the high-frequency pulse

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ACCESSION NR: AT4036070 S/2781/63/000/003/0273/0282

AUTHORS: Zy*kov, V. G.; Stepanenko, I. A.; Tolok, V. T.; Sinel'nikov, K. D.

TITLE: Injection of plasma through an annular gap of a trap with opposing magnetic fields

SOURCE: Konferentsiya po fizike plazmy* i problemam upravlyayemogo termoyadernogo sinteza. 3d, Kharkov, 1962. Fizika plazmy* i problemy* upravlyayemogo termoyadernogo sinteza (Plasma physics and problems of controlled thermonuclear synthesis); doklady* konferentsii, no. 3. Kiev, Izd-vo AN UkrSSR, 1963, 273-282

TOPIC TAGS: plasmoid, plasma source, plasmoid plasma interaction, magnetic trap, plasma confinement, plasma injection

ABSTRACT: With an aim at reducing the particles lost when a plasma is injected into the trap through one of the axial magnetic mirrors,

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ACCESSION NR: AT4036070

the authors investigated the injection of plasma through the annular gap in the magnetic field from sources distributed around the gap periphery. The report describes the first experiments in which injection was investigated both in a stationary gap in the magnetic field, as well as in the gap existing during a certain time ("magnetic valve"). To simplify the initial experiments, the injection gap was produced by a constant field, with the coils connected to buck each other. A 20-cm diameter and 180-cm long cylindrical stainless steel vacuum chamber was used. Eight conical plasma guns were distributed uniformly around the periphery of the chamber in the magnetic gap plane. The synchronization circuit permitted simultaneous switching of all eight guns or a fraction of them. The plasmoids injected by each gun had a density 2×10^{14} cm^{-3} and a velocity of 3×10^{4} m/sec. The working vacuum was 6.6×10^{-4} n/m^{2}. The maximum magnetic field intensity, equal to 2×10^{5} A/m, was located 40 cm away from the magnetic gap. The experiments have shown that a plasma injected into a gap between opposing magnetic fields moves subse-

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ACCESSION NR: AT4036070

quently along the system axis. A strong interaction was observed between the opposing plasma streams, even in the absence of external magnetic fields. The nature of this interaction, and the time of confinement of the plasma in the trap when such an injection method is used, will be investigated in the future. Orig. art. has: 9 figures.

ASSOCIATION: None

SUBMITTED: 00	DATE ACQ: 21May64	ENCL: 01
SUB CODE: ME	NR REF SOV: 002	OTHER: 002

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ACCESSION NR: AT4036070

ENCLOSURE: 01

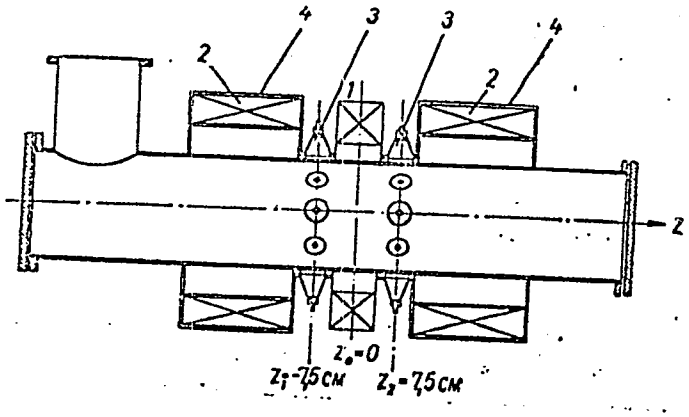

Diagram of set-up: 1 - coil of opposing magnetic field, 2 - coil of main magnetic field, 3 - plasma guns, 4 - protective shield

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ACCESSION NR: AT4036048 S/2781/63/000/003/0117/0124

AUTHORS: Shvets, O. M.; Tarasenko, V. F.; Ovchinnikov, S. S.; Tolok, V. T.

TITLE: Supply of high-frequency power to a plasma situated in a metal chamber

SOURCE: Konferentsiya po fizike plazmy* i problemam upravlyayemogo termoyadernogo sinteza. 3d, Kharkov, 1962. Fizika plazmy* i problemy* upravlyayemogo termoyadernogo sinteza (Plasma physics and problems of controlled thermonuclear synthesis); doklady* konferentsii, no. 3, Kiev, Izd-vo AN UkrSSR, 1963, 117-124

TOPIC TAGS: plasma heating, microwave plasma, plasma magnetic field interaction, plasma rotation, plasma confinement, ionized plasma, plasma density

ABSTRACT: The purpose of the investigation was to study the possi-

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ACCESSION NR: AT4036048

bility of feeding high-frequency power to a plasma contained in a metal chamber, and the behavior of the plasma under the influence of this power. It is possible to obtain in such a chamber a rotating plasma in crossed electric and magnetic fields, with high density, high degree of ionization, sufficiently long confinement time, but low ion temperature. The article describes the first stage of the experiments, which carried out without reconditioning the plasma in the working volume. A coaxial geometry was used and 3.3-Mc power was applied either through a blocking capacitor or without one. It was found that much more power can be fed to the plasma without a capacitor. The experiments have shown that high-power high-frequency generators can be used to produce a dense plasma in a metal chamber at relatively low voltages. The densities attained were 1.2×10^8 cm^{-3} at a generator voltage of 205 V, and 1.7×10^8 cm^{-3} at 220 V (approximate magnetic field 10^5 A/m). A low load impedance can be attained by preconditioning the plasma. The high-frequency power can be readily used for effective generation of waves to heat the

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ACCESSION NR: AT4036048

plasma. If the generator frequency is lower than the ion cyclotron frequency, the high-frequency generator can be used to produce a rotating plasma more effectively than in crossed electric and magnetic fields (using a radial capacitor discharge), since no arc is produced to contaminate the plasma with wall-chamber material. Plots showing the relations between the different plasma parameters are included. Orig. art. has: 8 figures and 2 formulas.

ASSOCIATION: None

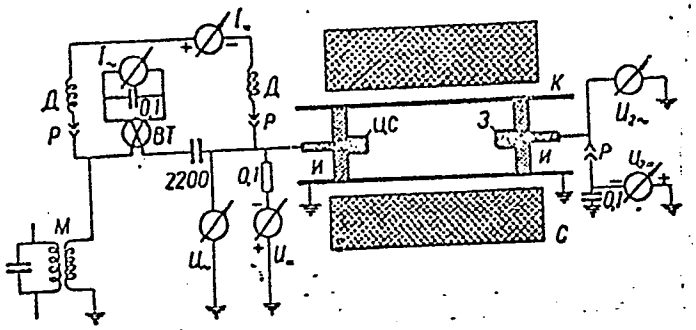
SUBMITTED: 00 DATE ACQ: 21May64 ENCL: 01

SUB CODE: ME NR REF SOV: 000 OTHER: 003

Card 3/4

ENCLOSURE: 01

ACCESSION NR: AT4036048



Schematic diagram of set-up

К - copper vacuum chamber, И - insulator, ЦС - central rod, З - probe, ВТ - high-frequency thermocouple, Д - high-frequency choke, Р - disconnect, М - coil for coupling to high-frequency generator, С - solenoid producing a homogeneous magnetic field

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ACCESSION NR: AT4036069 S/2781/63/000/003/0262/0273

AUTHORS: Zy*kov, V. G.; Stepanenko, I. A.; Tolok, V. T.; Sinel'nikov, K. D.

TITLE: Investigation of plasma capture in a magnetic trap

SOURCE: Konferentsiya po fizike plazmy* i problemam upravlyayemogo termoyadernogo sinteza. 3d, Kharkov, 1962. Fizika plazmy* i problemy* upravlyayemogo termoyadernogo sinteza (Plasma physics and problems of controlled thermonuclear synthesis); doklady* konferentsii, no. 3. Kiev, Izd-vo AN UkrSSR, 1963, 262-273

TOPIC TAGS: plasmoid, plasma source, plasmoid plasma interaction, magnetic trap, plasma confinement, Coulomb repulsion force, plasma injection

ABSTRACT: The first reports are presented of experiments on the confinement of a plasma in a trap with bucking fields, with simultaneous

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ACCESSION NR: AT4036069

injection of plasma in the opposite direction. The apparatus consists of a cylindrical vacuum chamber 20 cm in diameter made of stainless steel and placed inside the field-producing coils. Each coil is connected to buck the neighboring one, so that three traps with sharp-angle magnetic field geometry are produced, with a 15.6 cm distance between magnetic gaps. Conical plasma guns were used. The plasma was injected into the apparatus pumped out to 6.6×10^{-4} n/m^2. The central trap was the principal one and the outer ones served for injection of the plasma into the central trap. Double electrostatic probes were used to measure the ion density, the electron temperature, and the time dependence of the density. The plasma propagation in the trap was investigated by using targets of photographic paper, the surface of which burned out after several impacts by the plasma. The apparatus and the probes are described in detail. The interaction of the opposing plasma streams is confirmed by several of the results of the investigations. Estimates also show that Coulomb interaction exists between the plasmoid particles. It is

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pointed out that both the apparatus and the method are preliminary and this affects the accuracy of the final results. Orig. art. has: 12 figures.

ASSOCIATION: None

SUBMITTED: 00	DATE ACQ: 21May64	ENCL: 01
SUB CODE: ME	NR REF SOV: 003	OTHER: 003

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ACCESSION NR: AT4036069

ENCLOSURE: 01

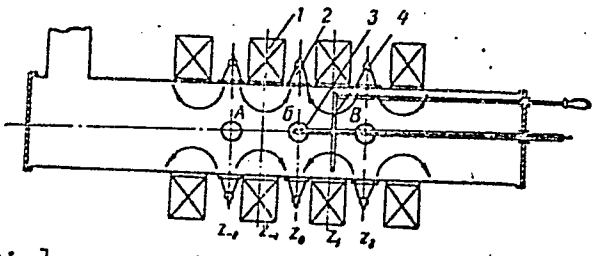

Diagram of setup: 1 - magnetizing coils, 2 - plasma gun, 3 - double electric probe, 4 - diamagnetic probe.

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ACCESSION NR: AT4036051 S/2781/63/000/003/0144/0150

AUTHORS: Suprunenko, V. A.; Faynberg, Ya. B.; Tolok, V. T.; Sukhomlin, Ye. A.; Reva, N. I.; Burchenko, P. Ya.; Rudnev, N. I.; Volkov, Ye. D.

TITLE: Coherent interaction of runaway electrons in a pinch

SOURCE: Konferentsiya po fizike plazmy* i problemam upravlyayemogo termoyadernogo sinteza. 3d, Kharkov, 1962. Fizika plazmy* i problemy* upravlyayemogo termoyadernogo sinteza (Plasma physics and problems of controlled thermonuclear synthesis); doklady* konferentsii, no. 3. Kiev, Izd-vo AN UkrSSR, 1963, 144-150

TOPIC TAGS: plasma pinch, plasma radiation, plasma ion oscillation, plasma electron oscillation, plasma compression, discharge plasma

ABSTRACT: The coherent radiation of transverse electromagnetic waves with frequency close to $\omega_0 (m_e/m_i)^{1/3}$ (ω_0 -- frequency of longi-

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ACCESSION NR: AT4036051

tudinal oscillations, m_e -- electron mass, M_i -- ion mass) excited in a plasma by a beam of "runaway electrons," was investigated. The experiments were carried out in a straight tube (alundum, 10 cm dia, 25 cm long) usually filled with hydrogen at 1.3 n/m^2, through which a 15 F capacitor bank was discharged from 30--40 kV. Preliminary experiments with the setup were reported elsewhere (ZhTF, v. 30, 1057, 1961). In the present experiment the formation of the current of runaway electrons was investigated along with its correlation with the electromagnetic radiation of the plasma; some characteristics of this radiation were also investigated. The measurements have shown that an electron current, with energy equal to the maximum energy, constituted a small fraction of the total runaway electron current, the bulk of the current being due to electrons with energy somewhat higher than thermal but much lower than maximal. Part of the runaway electron beam goes to the development of electrostatic instabilities in the discharge, which give rise to the occurrence of the electromagnetic radiation. The radiation was found to

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ACCESSION NR: AT4036051

be coherent in the entire range of investigated initial gas pressures, with an intensity which is constant practically along the entire discharge length. The frequency of the electromagnetic radiation was found to be close to the plasma frequency and the power to exceed appreciably the power of thermal radiation from the plasma. The transformation of the longitudinal electrostatic oscillations into transverse electromagnetic waves can be attributed to the nonlinearity of the oscillations in the plasma due to the large amplitude, and also to boundary effects on the surface of the plasma pinch. Orig. art. has: 5 figures and 3 formulas.

ASSOCIATION: None

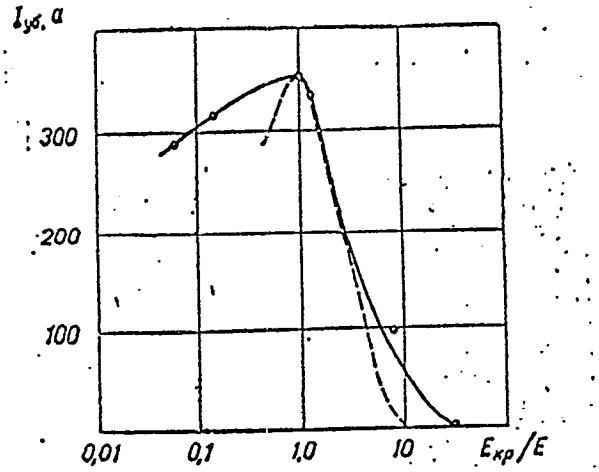
SUBMITTED: 00 DATE ACQ: 21May64 ENCL: 03

SUB CODE: ME NR REF SOV: 006 OTHER: 003

Card 3/6

ACCESSION NR: AT4036051

ENCLOSURE: 01



Dependence of runaway electron current on the critical field at constant electric field in a plasma, E = 400 V/m

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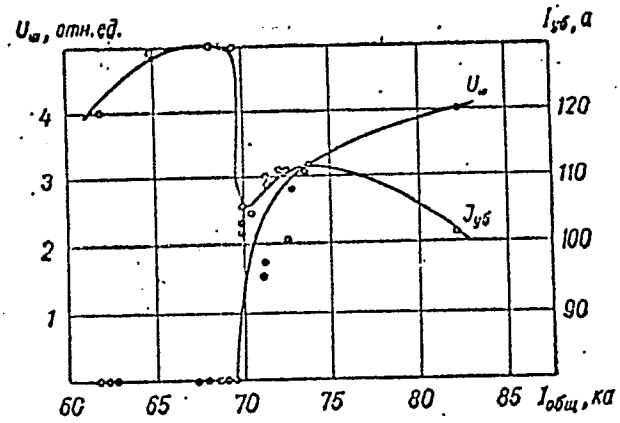
ACCESSION NR: AT4036051

ENCLOSURE: 02

Plasma rad. rel. un.



Runaway elect.

Tot. cur.

Dependence of plasma radiation and of runaway electron current on the total current in the discharge, at hydrogen pressure $p = 2.6$ n/m^2 and magnetic field $H_i = 0.6$ Tesla

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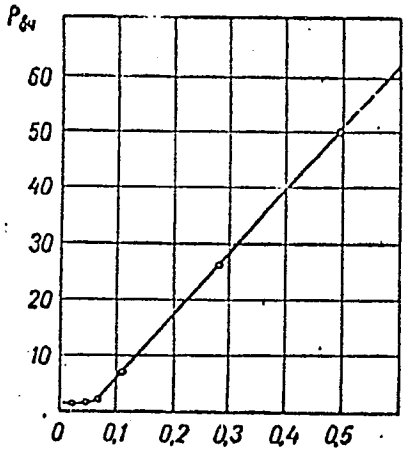
ACCESSION NR: AT4036051

ENCLOSURE: 03



Dependence of hf oscillation power at the receiver on the frequency

Card 6/6

ZOLOTOTRUBOV, I.M.; RYZHOV, N.M.; SKOBLIK, I.P.; TOLOK, V.T.

Plasma injection into a magnetic trap with opposing fields.
Zhur. tekh.fiz. 34 no. 2:382-384 F '64. (MIRA 17:6)

1. Fiziko-tekhnicheskiy institut AN UkrSSSR, Khar'kov.

ACCESSION NR: AP4042928 S/0057/64/034/008/1417/1423

AUTHOR: Zy*kov, V. G.; Sinitsa, N. G.; Stepanenko, I. A.; Tolok, V. T.; Sinel'nikov, K. D.

TITLE: Investigation of interaction of plasma fluxes in a transverse magnetic field

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 34, no. 8, 1964, 1417-1423

TOPIC TAGS: plasma thermalization, plasma interaction, plasma flux collision

ABSTRACT: This article is a continuation of experimental investigations of the possibility of complete slow-down and thermalization of fast opposed plasma fluxes in order to convert the kinetic energy of their directed motion into thermal energy. The investigation was carried out with apparatus consisting of a plasma source, a plasma guide, a magnetic screen, 8 magnetic coils, a vacuum chamber, a double electric probe, and a collector probe. The chamber, which was 20 cm in diameter, was placed in a longitudinal magnetic field produced by coils driven by a d-c current generator. The field could be

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ACCESSION NR: AP4042928

varied from 0 to 0.5 T. Eight plasma guns were distributed along the inner circumference of the central part of the chamber. The discharge period was 6 μsec. The plasma consisted of fast and slow components with velocities of 8×10^4 and 3×10^4 m/sec respectively at 4 kv potential in the gun and contained hydrogen, carbon, oxygen, and nitrogen ions. High-speed photography was used for recording. The experiments show that during head-on collisions of the opposed plasma flows in a transverse magnetic field, a strong slow-down to a complete stop of their motion in the initial direction occurs. Contrary to Coulomb interactions, this interaction does not occur in the volume of plasma streams but in their forward fronts and is of a turbulent character. It is important to note that such an interaction should take place even when there is no Coulomb interaction. Orig. art. has: 12 figures and 1 formula.

ASSOCIATION: none

SUBMITTED: 27Nov63 ATD PRESS: 3074 ENCL: 00

SUB CODE: NP, EM NO REF SOV: 004 OTHER: 004

Card 2/2

VOLKOV, Ya.F.; PAVLOV, Yu.S.; TOLOK, V.T.; SKIBENKO, A.I.

[A plasma in a variable magnetic field] Plazma v peremennom magnitnom pole. Khar'kov, Fiziko-tekhn. in-t AN USSR, 1960. 255-266 p. (MIRA 17:3)

VOLKOV, Ya.F.; TOLOK, V.T.; KRIVORUCHKO, S.M.

θ-pinch plasma in a magnetic net. Zhur. tekh. fiz. 33 no.9:1093-1097 S '63. (MIRA 16:11)

S/0057/64/034/002/0382/0384

ACCESSION NR: AP4013436

AUTHOR: Zolototrubov, I.M.; Ry*zhov, N.M.; Skoblik, I.P.; Tolok, V.T.

TITLE: Plasma injection into an opposed field magnetic trap (Letter to the editor)

SOURCE: Zhurnal tekhn. fiz., v.34, no.2, 1964, 382-384

TOPIC TAGS: plasma, magnetic trap, opposed field magnetic trap, magnetic trap injection, magnetic trap escape, x-ray, x-ray burst

ABSTRACT: The injection of plasma into an opposed field magnetic trap of the type discussed by John E. Osher (Phys.Rev.Letters,8,305,1962) and others was investigated experimentally. The trap was formed in a 70 cm long 30 cm diameter vacuum chamber by the discharge of a bank of capacitors through two windings, each about one half of the chamber. The rise time of the magnetic field was 4.4 millisec and the subsequent decay time was 16 millisec. This behavior was achieved with the aid of a shunt circuit. The maximum magnetic field was 5 kOe in the mirror regions and 4.2 kOe in the gap. The plasma was injected axially through the magnetic mirror at the time of maximum field strength by an ordinary coaxial plasma gun. The gun was operated in two different modes. In one mode ("short delay") the plasma was emitted in

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ACCESSION NR: AP4013436

several bursts having different velocities. The velocity of the most rapid of these bursts was 8.8 x 10^7 cm/sec, corresponding to a hydrogen ion energy of 3.9 keV. The x-rays produced in the apparatus were recorded with a cesium iodide crystal, shielded from light by aluminum foil and located in the magnetic gap. A short burst of x-rays was always observed at the moment of injection. When the plasma gun was operated in the "short delay" mode there was observed, in addition to this, an intense emission of x-rays beginning 840 microsec after injection, reaching its peak at about 1500 microsec, and decaying with a 3 millisec time constant. The spatial and energy distributions of these x-rays were investigated with a photographic film and a step absorber. The x-rays were found to originate within the magnetic gap. The mean energy of the x-rays was 3.8 keV, corresponding to the energy of the injected hydrogen ions. It is concluded that the x-rays were produced by impact with the wall of the chamber of charged particles that were imprisoned for a time and then escaped through the magnetic gap. Orig.art.has: 3 figures.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN UkrSSR,Khar'kov (Physical Technical Institute, AN UkrSSR)

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

SUB CODE: PH, SD NR REF SOV: 000 OTHER: 003

Card 2/2

DUSHIN, L.A. [Dushyn, L.O.]; KONONENKO, V.I.; KOVTUN, R.I.; SKIBENKO, A.I. [Skybenko, A.I.]; SINEL'NIKOV, K.D. [Synel'nykov, K.D.]; TOLOK, V.T.

Study of a plasma using a microwave interferometer. Ukr. fiz. zhur. 8 no.7:740-746 Jl '63. (MIRA 16:8)

1. Fiziko-tekhnicheskiy institut AN UkrSSR, Khar'kov.
(Plasma (Ionized gases))
(Interferometry)

ZOLOTOTRUBOV, I.M.; RYZHOV, N.M.; SKOBLIK, I.P.; TOLOK, V.T.

[Properties of a plasma in a magnetic field] Issledovanie svoistv plazmy v magnitnom pole. Khar'kov, Fiziko-tekhn. in-t AN USSR, 1960. 269-279 p. (MIRA 17:1)
(Plasma (Ionized gases)) (Magnetic fields)

DOLGOPOLOV, V.V.; YERMAKOV, A.I.; NAZAROV, N.I.; STEPANOV, K.N.; TOLOK, V.T.

Experimental observation of Landau damping in a plasma. Zhur. eksp. i teor. fiz. 45 no.4:1260-1261 O '63. (MIRA 16:11)

1. Fiziko-tekhnicheskiy institut AN UkrSSR.

REIZOV, N.; TITS, Yu.; TOLOK, V.V.; MAMAYEV, I.M.; MALEYEV, L.I., dotsent; RYBOCHKIN, G.

Eliminate unnecessary load testing of bridge cranes. Metallurg 10 no.8:33-35 Ag '65. (MIRA 18:8)

1. Glavnyy mekhanik Magnitogorskogo metallurgicheskogo kombinata (for Reizov). 2. Glavnyy mekhanik Zhdanovskogo metallurgicheskogo zavoda im. Il'icha (for Tits). 3. Inspektora po kranovomu khozyaystvu Metallurgicheskogo zavoda im. Dzerzhinskogo (for Tolok, Mamayev). 4. Glavnyy mekhanik Kuznetskogo metallurgicheskogo kombinata (for Rybochkin).

ACCESSION NR: AT4036057 S/2781/63/000/003/0184/0192

AUTHORS: Shvets, O. M.; Ovchinnikov, S. S.; Tarasenko, V. F.; Tolok, V. T.

TITLE: Investigation of the properties of a plasma in crossed electric and magnetic fields

SOURCE: Konferentsiya po fizike plazmy* i problemam upravlyayemogo termoyadernogo sinteza. 3d, Kharkov, 1962. Fizika plazmy* i problemy* upravlyayemogo termoyadernogo sinteza (Plasma physics and problems of controlled thermonuclear synthesis); doklady* konferentsii, no. 3. Kiev, Izd-vo AN UkrSSR, 1963, 184-192

TOPIC TAGS: plasma research, plasma rotation, plasma magnetic field interaction, plasma electric field interaction, magnetic mirror, ionized plasma

ABSTRACT: Tests were made on a rotating plasma in crossed fields, confined by a system of magnetic mirrors. The installation consti-

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