L 2340-66 EWT(1)

ACCESSION NR: AT5022104 UR/3136/64/000/750/0001/0011

AUTHORS: Kagan, Yu.; Zhernov, A. P.

TITLE: Effect of anharmonism on the phonon spectrum near a degeneracy point

SOURCE: Moscow. Institut atomnoy energii. [Doklady], IAE-750, 1964. Vliyaniye angarmonizma na spektr fononov vblizi tochki vyrozhdeniya, 1-11

TOPIC TAGS: nuclear physics, phonon, spectrum, scattering cross section, slow neutron, Green function

ABSTRACT: Green's function $G_{\lambda\lambda'}(\omega)$ is used to analyze the effect of anharmonism on phonon spectrum near a degeneracy point. To take into account the effect of independent phonon branches on each other in the proposed harmonic oscillation, it becomes necessary to solve the Dyson equation

$$G_{\lambda\lambda'}(\omega) = G^{(0)}_{\lambda\lambda}(\omega)\delta_{\lambda\lambda'} + G^{(0)}_{\lambda\lambda}(\omega)P_{\lambda\lambda''}(\omega)G_{\lambda''\lambda'}(\omega),$$

$$G^{(0)}_{\lambda\lambda}(\omega) = \frac{2\omega_\lambda}{\omega^2 - \omega_\lambda^2}.$$

For the case of a simple single-atom lattice, the solution of the Dyson equation

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leads to

$$Z = \frac{1}{2}(\Pi_{11}(\omega) + \Pi_{22}(\omega) + \delta) \pm$$
$$\pm \sqrt{\frac{1}{4}(\Pi_{11}(\omega) + \Pi_{22}(\omega) + \delta)^2 - (\Pi_{11}(\omega)\Pi_{22}(\omega) - \Pi_{12}(\omega)\Pi_{21}(\omega) - \delta)}$$

where

$$Z = \omega^2 - \omega_1^2, \quad \delta = \omega_2^2 - \omega_1^2, \quad \Pi_{\alpha\alpha'}(\omega) = 2\sqrt{\omega_\alpha \omega_{\alpha'}}\, P_{\alpha\alpha'}(\omega).$$

The cases of essential and accidental degeneracy are considered in some detail. It is shown that during accidental degeneracy the excitations that occur can have strongly differing lifetimes and frequency renormalizations, both in their magnitudes and temperature dependences. Next, the cross section of single-phonon, coherent, slow-neutron scattering near the degeneracy point is considered. Near the point of essential degeneracy $G_{12} = 0$, the cross section of coherent scattering has a peak similar to the case of an isolated phonon branch. Near the point of accidental degeneracy this cross section has an anomalous form. Orig. art has: 12 equations.

ASSOCIATION: Institut atomnoy energii im. I. V. Kurchatova, AN SSSR (Institute of Atomic Energy, AN SSSR) 44,55

Card 2/3

L 2340-66

ACCESSION NR: AT5022104

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SUBMITTED: 00 ENCL: 00 SUB CODE: NP

NO REF SOV: 001 OTHER: 003

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Card 3/3

KAGAN, Yu.; ZHERNOV, A.P.

Nature of the "tail" in the cross section of inelastic incoherent scattering of slow neutrons in crystals. Zhur. eksp. i teor. fiz. 47 no.5:1997-1999 N '64. (MIRA 18:2)

APPROVED FOR RELEASE: 03/15/2001 CIA-RDP86-00513R002064720008-2"

PA 27T87

ZHERNOV, I. YE.

USSR/Petroleum - Well Drilling Jun 1946
Filters, Industrial

"Calculations for Screenless Filters for Drilling Wells," I. Ye. Zhernov, 7 pp

"Razvedka Nedr" No 3

Experimental and practical data have shown that perforated filters can be used in the water level of any mechanical setup. The article discusses the calculations for making perforated filters for lowering the level of surface water in wells.

27T87

ID

ZHERNOV, I. YE

21740 ZHERNOV, I. YE. O neobkhodimosti i masshtabakh drenazha vnutrennikh otvalov ugol'nykh razrezov. Ugol', 1949, No.7 S. 21-25.

SO: Letopis'Zhurnal'nykh Statey, No. 29, Moskva, 1949

ZHERNOV, I.Ye.; SEMENENKO, M.P., diysnyy chlen.

Problem of classifying water-bearing coal deposits. Dop.AN URSR no.4:310-314 '52. (MLRA 6:10)

1. Akademiya nauk Ukrayins'koyi RSR (for Semenenko). 2. Instytut geologichnykh nauk Akademiyi nauk Ukrayins'koyi RSR (for Zhernov). (Coal)

4

ZHERNOV, I. YE.

Mine Drainage

Rational method of preliminary coal mine drainage., Ugol', 27, no. 3 (312), 1952

9. Monthly List of Russian Accessions, Library of Congress, May 1952 1952, Uncl.

ZHERNOV, I.Ye., doktor geolog-mineralog. nauk; ALEKHINA, T.P., inzh.

Practice and possible plans for the drainage of soft overburden materials at the Rozdol sulphur strip mine. Nauch. zap. Ukrniiproekta no.10:96-107 '63. (MIRA 17:6)

ZHERNOV, I.Ye., doktor geologo-mineralog. nauk; KALUGIN, V.N., inzh.; SPIVAK, O.A., inzh.

Modeling the operations of linear strip mine drainage systems by means of a Luk'ianov hydraulic integrator. Nauch. zap. Ukrniiproekta no.10:82-95 '63. (MIRA 17:6)

ZHERNOV, I.Ye., kand.geolog-mineralogicheskikh nauk

Efficient system for draining pits in deposits with a steep drop of layers. Nauch.zap.Ukrniiproekta no.5:56-69 '61. (MIRA 15:7)
(Mine drainage)

ZHERNOV, I.Ye., kand.geol.-min.nauk

Hydrogeological calculations for draining deposits mined by the open-pit method. Nauch. zap. Ukrniiproekta no.2:39-64 '60. (MIRA 15:1)

(Mine drainage)

ZHERNOV, I. Ye., Doc Geol-Min Sci -- (diss) "Hydro-geological bases for the drainage of lignite deposits and a method of calculating drainage for irregular movements of underground water." Kiev, 1960. 33 pp; (Ministry of Higher and Secondary Specialist Education UkSSR, Kievskiy Order of Lenin State Univ im T. G. Shevchenko); 150 copies; price not given; list of authors' works at end of text (11 entries); (KL, 18-60, 148)

ZHERNOV, I.Ye., Doc Geol-Min Sci — (diss) "Hydrogeological principles of the drainage and reclamation of coal deposits of the platform type." Mos, 1958. 30 pp (Min of Higher Education USSR. Mos State U im M.V.Lomonosov), 100 copies (KL,43-58, 114) Bibliography: pp 29-30 (13 titles)

-11-

PHASE I BOOK EXPLOITATION SOV/5507

Zhernov, V.S., and S.V. Mamikonyan

Novyye radiometricheskiye i spektrometricheskiye pribory (New Radiometric and Spectrometric Instruments) Moscow, Atomizdat, 1960. 20 p. 3,000 copies printed.

Ed.: G.M. Pchelintseva; Tech. Ed.: N.A. Vlasova.

PURPOSE: This booklet is intended for technical personnel concerned with radioactive isotopes and radiation.

COVERAGE: The booklet presents six measuring instruments described as new developments which make it possible to solve a number of problems of radiometry and spectrometry. No personalities are mentioned. There are no references.

~~TABLE OF CONTENTS~~:

Card 1/2

ZHERNOV, V.S.; MURASHOV, Ye.F.; RYZHOV, N.V.; SERZHANTOV, A.P.

The electronic commutator. IAd.-prib. no.1:139-150 '64. (MIRA 18:5)

L 5073-66 EWT(m) DM
ACC NR: AP5022633
UR/0089/65/019/002/0157/0161
614.8:539.12.08

AUTHORS: Zhernov, V. S.; Ryzhov, N. V.; Skatkin, V. M.; Starovoytov, V. S.

TITLE: Continuous centralized monitoring of personal radiation doses

SOURCE: Atomnaya energiya, v. 19, no. 2, 1965, 157-161

TOPIC TAGS: radiation dosimetry, radiation monitor

ABSTRACT: The present article is an abbreviated version of the report presented in September 1964 to the international conference in Budapest. This conference was attended by the countries belonging to the Council for Mutual Economic Aid. Various possible developments of a centralized system for personal monitoring were discussed and some alternative control methods were reviewed. The use of individual and stationary dosimeters was considered. Possibilities for an automatic processing of personal doses were examined and the use of computers and analyzers were recommended. The use of computing equipment was recommended also for collecting information on personal doses and for calculating cumulative doses. A general electronic computing arrangement

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L 5073-66

ACC NR: AP5022633

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was described and schematically presented. The use of stationary dosimeters for area and room monitoring by means of a remote control equipment is discussed and a formula for the determination of pulse reading errors is given. The fundamental aspects of determining personal doses by means of telemetering devices were reviewed and one of the possible arrangements was illustrated. In conclusion, it is stated that the proposed devices and arrangements can be realized by using existing standard instruments and equipment. Orig. art. has: 1 table and 3 diagrams.

ASSOCIATION: None

SUBMITTED: 25Nov65 ENCL: 00 SUB CODE: NP

NO REF SOV: 003 OTHER: 002

Card 2/2 *Md*

YEGOROV, I.M.; ZHERNOV, V.S.; LAZAREV, A.F.; PEROV, N.L.; TIMOFEYEV, A.A.; MATVEYEV, V.V., doktor tekhn. nauk, red.; KHAZANOV, B.I., kand. tekhn. nauk, red.; MELESHKO, V.K., red.

[Apparatus for recording and studying ionizing radiations; reference book] Apparatura dlia registratsii i issledovaniia ioniziruiushchikh izluchenii; spravochnik. Moskva, Atomizdat, 1965. 429 p. (MIRA 18:7)

SOURCE CODE: UR/0413/66/000/021/0056/0056

ACC NR: AP7001386 (A,N)

INVENTORS: Denisov, N. I.; Zhernov, V. S.; Nabatnikov, A. A.; Murashov, Ye. P.; Ryzhov, N. V.; Serzhantov, V. P.; Skatkin, V. M.

ORG: none

TITLE: Multichannel pulse counting rate meter. Class 21, No. 187843 [announced by Union Scientific Research Institute for Instrument Manufacture (Soyuznyy nauchno-issledovatel'skiy institut priborostroyeniya)]

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 21, 1966, 56

TOPIC TAGS: pulse counter, pulse rate, count rate meter

ABSTRACT: This Author Certificate presents a multichannel pulse counting rate meter containing a cathode ray tube, pulse registers, a high-speed electronic switch, and a vertical and horizontal deflection amplifier for the cathode ray tube. To measure counting rate differences varying over a wide range simultaneously in all channels without switching subranges, electronic commutator switches are connected to the outputs of wide-band linear differential counting rate meters, one for each channel (see Fig. 1). The switch outputs are connected through current-setting resistors and isolating capacitors to the input of a collecting stage consisting of a grounded base transistor. The output of the collecting stage is connected to the input of a linear-logarithmic CRT vertical deflection amplifier.

UDC: 621.374

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ACC NR: AP7001386

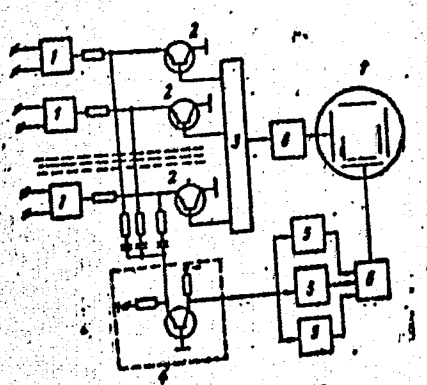

Fig. 1. 1 - counting rate meters; 2 - switches; 3 - decoder; 4 - electronic commutator; 5 - clipper amplifiers; 6 - summing stage; 7 - cathode ray tube; 8 - horizontal deflection amplifier

Orig. art. has: 1 diagram.

SUB CODE: 09/ SUBM DATE: 22Nov63

Card 2/2

ZHERNOV, V.S.; MURASHOV, Ye.P.; NABATNIKOV, A.A.

Pulsed linear logarithmic amplifier. IAd. prib. no.1:151-159 '64.

Linear intensimeter of counting speed varying by three orders of magnitude. Ibid.:160-165. (MIRA 18:5)

ZHERNOV, V.S., red.; SHIRSHOV, D.P., red.; PCHELINTSEVA, G.M., red.; BORTSOVA, A.F., red.; VLASOVA, N.A., tekhn. red.

[Units of new apparatus for the investigation of nuclear radiation] Uzly novoi apparatury dlia issledovaniia iadernykh izluchenii; nauchno-tekhnicheskii sbornik. Moskva, Gos. izd-vo lit-ry v oblasti atomnoi nauki i tekhn., 1961. 149 p. (MIRA 14:11)
(Radioactivity)

KUROCHKIN, S.S., kand. tekhn. nauk, red.; MATVEYEV, V.V., kand. fiz.-mat. nauk, red.; ZHERNOV, V.S., red.; KUZNETSOV, K.F., red.; LAZAREV, A.F., red.; MAMIKONYAN, S.V., glav. red.; NEMIROVSKIY, B.V., red.; POLIKARPOV, V.I., red.; KHAZANOV, B.I., red.; ERGLIS, K.E., zam. glav. red.; SHIRSHOV, D.P., red.; ANDREYENKO, Z.D., red.; VLASOVA, N.A., tekhn. red.

[Apparatus for nuclear spectrometry; collection of scientific and technical articles] Apparatura dlia iadernoi spektrometrii; nauchno-tekhnicheskii sbornik. Moskva, Gos. izd-vo lit-ry v oblasti atomnoi nauki i tekhniki. No.1. 1960. 131 p. (MIRA 14:7)
(Spectrometry) (Nuclear research)

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PHASE I BOOK EXPLOITATION SOV/5486

Vsesoyuznoye soveshchaniye po vnedreniyu radioaktivnykh izotopov i yadernykh izlucheniy v narodnoye khozyaystvo SSSR. Riga, 1960.

Radioaktivnyye izotopy i yadernyye izlucheniya v narodnom khozyaystve SSSR; trudy soveshchaniya v 4 tomakh. t. 1: Obshchiye voprosy primeneniya izotopov, pribory s istochnikami radioaktivnykh izlucheniy, radiatsionnaya khimiya, khimicheskaya i neftepererabatyvayushchaya promyshlennost' (Radioactive Isotopes and Nuclear Radiations in the National Economy of the USSR; Transactions of the Symposium in 4 Volumes. v. 1: General Problems in the Utilization of Isotopes; Instruments With Sources of Radioactive Radiation; Radiation Chemistry; the Chemical and Petroleum-Refining Industry) Moscow, Gostoptekhizdat, 1961. 340 p. 4,140 copies printed.

Sponsoring Agency: Gosudarstvennyy nauchno-tekhnicheskiy komitet Soveta Ministrov SSSR, and Gosudarstvennyy komitet Soveta Ministrov SSSR po ispol'zovaniyu atomnoy energii.

Ed. (Title page): N.A. Petrov, L.I. Petrenko and P.S. Savitskiy; Eds. of this Vol.: L.I. Petrenko, P.S. Savitskiy, V.I. Sinitsin, Ya. M. Kolotyrkin, N.P. Syrkus and R.F. Romm; Executive Eds.: Ye. S. Levina and B. V. Titskaya; Tech. Ed.: E.A. Mukhina.

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Radioactive Isotopes (Cont.) SOV/5486

PURPOSE: The book is intended for technical personnel concerned with problems of application of radioactive isotopes and nuclear radiation in all branches of the Soviet economy.

COVERAGE: An All-Union Conference on problems in the introduction of radioactive isotopes and nuclear radiation into the national economy of the Soviet Union took place in Riga on 12-16 April 1960. The Conference was sponsored by: the Gosudarstvennyy nauchno-tekhnicheskiy komitet Soveta Ministrov SSSR (State Scientific and Technical Committee of the Council of Ministers, USSR); Glavnoye upravleniye po ispol'zovaniyu atomnoy energii pri Sovete Ministrov SSSR (Main Administration for the Utilization of Atomic Energy of the Council of Ministers, USSR); Academy of Sciences, USSR; Gosplan USSR; Gosudarstvennyy komitet Soveta Ministrov SSSR po avtomatizatsii i mashinostroyeniyu (State Committee of the Council of Ministers, USSR, for Automation and Machine Building) and the Council of Ministers of the Latvian SSR. The transactions of this Conference are published in four volumes. Volume I contains articles on the following subjects: the general problems of the Conference topics; the state and prospects of development of radiation chemistry; and results and prospects of applying radioactive isotopes and nuclear radiation in the petroleum refining and chemical industries. Problems of designing and manufacturing instruments which contain sources of radioactive radiation and are used for checking and automation of technological processes are examined, along with problems of accident prevention in their use. No personalities are mentioned. References accompany some of the articles.

Card 2/12

INSTRUMENTS WITH RADIOACTIVE RADIATION SOURCES

ZHERNOV, V.S.; MAMIKONYAN, S.V.; PCHELINTSEVA, G.M., red.; VLASOVA, N.A., tekhn.red.

[New radiometric and spectrometric instruments] Novye radiometricheskie i spektrometricheskie pribory. Moskva, Izd-vo Gos.kom-ta Soveta Ministrov SSSR po ispol'zovaniiu atomnoi energii, 1960. 20 p. (MIRA 14:4)
(Spectrometer) (Radiometer)

L 38898-66 EWT(m)

ACC NR: AP6029716 SOURCE CODE: UR/0089/66/020/001/0082/0084

AUTHOR: Zhernov, V. S.; Murashov, Ye. P.; Ryzhov, N. V.; Skatkin, V. M.

ORG: none

60 B

TITLE: Multipoint control of radiation levels

SOURCE: Atomnaya energiya, v. 20, no. 1, 1966, 82-84

TOPIC TAGS: radiation measurement, nuclear safety, automatic control system

ABSTRACT: The tendency toward centralization and automation of control systems extends to the continuous collection of radiation dose data from operating personnel while working. Cathode-ray tubes were found suitable for such centralized collection of radiation safety information. Continuous and simultaneous indication of the radiation levels from several locations, e.g., in the form of vertical lines, the lengths of which are proportional to the dose level, allows a rapid and convenient survey of the situation at any given moment. The system requires suitably placed individual senders, connection systems, and a central control room provided with amplifiers and scanners. A multichannel count-rate device is used, with a linear, rather than logarithmic measuring system. Care was taken to eliminate interaction between channels. The authors thank B. V. Nemirovskiy for useful advice and A. P. Serzhantov for assisting the authors in the working of the multichannel count-rate device. Orig. art. has: 1 figure and 1 formula. [NA]

SUB CODE: 18 / SUBM DATE: 01Oct65 / ORIG REF: 005

Card 1/1 MLP

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L 26391-66 EWA(h)/EWT(m) UR/ B+1

ACC NR: AM5025517 Monograph

YEgorov, I. M.; Zhernov, V. S.; Lazarev, A. F.; Perov, N. L.; Timofeyev, A. A., comps.

Apparaturs for recording and investigating ionizing radiation; a handbook (Apparatura dlya registratsii i issledovaniya ioniziruyushchikh izlucheniy; spravochnik) Moscow, Atomizdat, 1965. 429 p. illus., biblio. 4500 copies printed.

TOPIC TAGS: radiation dosimetry, ionizing radiation, nuclear physics apparatus, scintillator photomultiplier, gas discharge counter, ionization chamber, radiation dosimeter, radiometer, spectrometer

PURPOSE AND COVERAGE: This handbook is intended for research physicists in the field of dosimetrics and engineers and scienticists dealing with radioactive sources of radiation. It may also be useful to persons concerned with the development, operation, and maintenance of dosimetric, spectrometric, and radiometric equipment. The book deals with Soviet experimental nuclear physics instruments, equipment, photomultipliers, scintillatofs, Geiger-Mueller counters, ionization chambers, etc. Characteristics of instruments for individual dosimetric control, mearurements of doses and dose power, determination of the contamination of working areas and water by radioactive substances, aerosol devices, single and multichannel pulse analyzers, and others are described.

TABLE OF CONTENTS [abridged]:

UDC: 539.107.5

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L 26391-66

ACC NR: AM5025517

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L 26391-66

ACC NR: AM5025517

SUB CODE: 09, 20/ SUBM DATE: 29Apr65/ ORIG REF: 068/ OTH REF: 002

Card 3/3

ZHERNOVKOV, A.

UUKKIVI, V.; VIRYULEV, V.; ZHERNOVKOV, A.

Stands used for checking ignition system devices. Avt.transp. 35 no.6:17-18 Je '57. (MIRA 10:7)

(Automobiles--Ignition)

ZHERNOVKOV, A.

BEREZKIN, V.; ZHERNOVKOV, A.

Modernization of the ignition control instruments. Avt. transp. 34 no.12:12-13 D '56. (MLRA 10:2)

(Automobiles--Ignition)

BEREZKIN, V., inzhener; ZHERKHOVKOV, A., inzhener.

Compressometer. Za rul. 14 no.5:18 Ag '56. (MIRA 10:1)
(Automobiles--Engines--Testing)

ZHERNOVKOV, A.

Testing device for generator and starter armatures. Avt. transp. 34 no.8:17-18 Ag '56. (MLRA 9:10)

(Automobiles--Electric equipment)

ZHERNOVKOV, A.

New sets of nut wrenches. Avt. transp. 36 no. 6:16-17 Je '58. (MIRA 11:7)

(Wrenches)

ZHERNOVKOV, A.S.; NIKONENKO, I.N.; KOLYCHEV, A.L., red.; SHMLUKHIN, A.S., red.; KOGAN, F.L., tekhn.red.

[Garage and automobile repairing equipment; a reference catalog] Garazhnoe i avtoremontnoe oborudovanie; katalog-spravochnik. Sostaviteli A.S.Zhernovkov i I.N.Nikonenko. Pod. obshchei red. A.L. Klycheva. Moskva, Nauchno-tekhn.izd-vo avtotransp. lit-ry, 1957. 191 p. (MIRA 11:3)

1.Russia (1917- R.S.F.S.R.) Ministerstvo avtomobil'nogo transporta i shosseynykh dorog. 2.Glavnyy inzhener Tresta po rukovodstvu zavodami po proizvodstvu garazhnogo oborudovaniya (for Kolychev)

(Automobiles--Service stations)

KOLYCHEV, Aleksandr Leonidovich; ZHERNOVKOV, Anatoliy Sergeyevich; YABLOKOV, V.I., red.; MAL'KOVA, N.V., tekhn. red.

[Garage equipment; manual] Garazhnoe oborudovanie; spravochnik. Izd.2., ispr. i dop. Moskva, Avtotransizdat, 1962. 239 p. (MIRA 15:5)

(Service stations--Equipment and supplies)

ZHERNOVNIKOV, N.M.

Tachymetric tables of I.F.Gont and E.A.Ploticher. Geod. i kart. no.7: 70-72 Jl '64. (MIRA 17:12)

MILOVANOV, A.F.; ZHERNOVOV, I.V.; NIKITIN, V.P.

New jerboa species in Turkmenia (Allactaga bobrinskii Kolesn.).
Izv. AN Turk. SSR no.5:97 '58. (MIRA 11:12)

1. Turkmenskaya protivochumnaya stantsiya.
(Turkmenistan--Jerboas)

KAMNEV, P.I.; ZHERNOVOV, I.V.; SKVORTSOV, G.N.

New findings of dormouse Myomimus personatus Ogn. in West Kopet Dag. Zool. zhur. 41 no.2:297 F '62. (MIRA 15:4)

1. All-Union Research Institute "Microbe", Sarator and Turkmenian Anti-Plague Station, Ashkhabad.
(Kopet Dag--Dormice, Fossil)

120-2-17/37

AUTHOR: Zhernovoy, A. I., Latyshev, G. D., and Sergeyev, A.G.

TITLE: Magnetic Field Measurement by the Proton magnetic Resonance Method. (Izmereniye Magnitnogo Polya Metodom Magnitnogo Rezonansa Protonov.)

PERIODICAL: Pribory i Tekhnika Eksperimenta, 1957, No.2, pp. 60 - 63 (USSR).

ABSTRACT: In the present article the authors describe an instrument which measures magnetic field intensities within the range necessary for β-spectroscopy. The accuracy of relative measurements of the field, evaluated from the resonant absorption curve width is 10^{-4} in the range 35-100 oersted, 2×10^{-5} in the range 100-400 oersted and increases with the field intensity. The accuracy of control measurements is determined from the reproducibility of maxima of conversion lines. The construction of the source elements, of the high frequency coil element (litz wire ЛЭШО 10 x .07 for each layer) and of the radio frequency generator are given. The latter is based on the standard circuitry as used for investigations of nuclear resonance (Ref. 2). The oscillator consists of RF coil of the source element, connected through a co-axial cable PK-150, length 2 meters, to the variable condenser C = 1000PF. The oscillator uses

Card 1/2

AUTHOR ZHERNOVOY, A.I., KRISYUK, E.M., LATYSHEV, G.D., REMENNYY, A.S., 56-4-7/52
SERGEYEV, A.G., FADEYEV, V.I.

TITLE Spectra of the Internal Conversion Electrons of the Active Precipitation of Radiathorium II.
(Spektr elektronov vnutrenney konversii aktivnogo osadka radiotoriyaII - Russian)

PERIODICAL Zhurnal Eksperim.i Teoret.Fiziki, 1957, Vol 32, Nr 4, pp 682-689 (U.S.S.R.)
Received 7/1957 Reviewed 8/1957

ABSTRACT Investigation of the active precipitation was carried out within the domain H 500-1380 cm magnetic spectrometer (width of lines 0,25°/o, angle of the spectrometer in the horizontal plane 40°, height of diaphragm 16 mm). The magnetic field was measured by the method of proton magnetic resonance. Registration of electrons was carried out by means of 2 self-extinguishing GM counters. The position andthe intensities of K and L conversion electron energies of the electrons are computed according to the formula
$EKL_pL_q = E_K^z - E_{L_p}^z - E_{Lq}^{z+\Delta z}$ where E_K^z and E_{Lp}^z denote the binding energies of K and Lp electrons in the normal atom, and $E_{Lq}^{z+\Delta z}$ is the binding energy of Lq electrons in the atom in which no Lp electrons are present. The decrease of the quality of the shielding effect can be explained by the increase of the charge: $\Delta Z = (E_{Lq}^{z+\Delta z} - E_{Lq}^z)/(E_{Lq}^{z+1} - E_{Lq}^z)$. Theoretical computation of the quantity ΔZ is complicated and at present not yet possible. The spectra of the internal conversion of the active precipitation of radia-

Card 1/2

ZHERNOVOY, A.I.; YEGOROV, Yu.S.; LATYSHEV, G.D.

Using proton resonance in measuring and stabilizing weak uniform magnetic fields [with summary in English]. Inzh.-fiz. zhur. 1 no.8:95-97 Ag '58. (MIRA 11:8)

1. Institut inzhenerov zheleznodorozhnogo transporta, Leningrad.
(Magnetic fields--Measurement) (Nuclear magnetic resonance)

SOV/120-58-2-36/37

AUTHORS: Zhernovoy, A. I., Yegorov, Yu. S. and Latyshev, G. D.

TITLE: Measurement and Stabilisation of Weak Magnetic Fields Using Proton Magnetic Resonance (Izmereniye i stabilizatsiya slabykh magnitnykh poley na osnove magnitnogo rezonansa protonov)

PERIODICAL: Pribory i Tekhnika Eksperimenta, 1958, Nr 2, p 115 (upper half) (USSR)

ABSTRACT: Up to the present time the method of nuclear resonance has only been used in the measurement and stabilisation of strong and intermediate magnetic fields. In the case of weak fields the application of the method was difficult because of a small signal to noise ratio. The authors have considerably reduced the dependence of the amplitude of the signal on the magnitude of the measured field by the use of a preliminary magnetisation of the current of water in a subsidiary magnet giving rise to a strong field. In this way it was found to be possible to measure and stabilise magnetic fields of a few oersted with small volume specimens. The accuracy of measurement is limited only by the accuracy with which the frequency can be measured. The

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SOV/120-58-2-36/37

Measurement and Stabilisation of Weak Magnetic Fields Using Proton Magnetic Resonance.

coefficient of stabilisation for the scheme described in Ref.1 is 300. A full description of the work will be published in the future issue of this journal. There is 1 Soviet reference.

ASSOCIATION: Leningradskiy institut inzhenerov zheleznodorozhnogo transporta (Leningrad RR Transport Engineering Institute)

SUBMITTED: October 31, 1957.

1. Magnetic fields--Stabilization 2. Magnetic fields--Measurement 3. Nuclear magnetic resonance--Applications 4. Frequency--Measurement

Card 2/2

SOV/120-58-2-37/37

AUTHORS: Zhernovoy, A. I., Yegorov, Yu. S. and Latyshev, G. D.

TITLE: ~~A New Method of~~ Measuring Uniform and Non-Uniform Magnetic Fields Using Proton Magnetic Resonance (Novyy metod izmereniya odnorodnykh i neodnorodnykh magnitnykh poley na osnove magnitnogo rezonansa protonov)

PERIODICAL: Pribory i Tekhnika Eksperimenta, 1958, Nr 2, p 115 (lower half) (USSR)

ABSTRACT: A method has been developed for the measurement of magnetic fields using the phenomenon of nutation of the total magnetic moment of nuclei. The measurement was carried out using a continuous current of water which in turn passes through a magnetising region in an auxiliary strong field, the region where the field is to be measured (with a superimposed high frequency transverse field which produces the nutation), and then enters the usual set up for the observation of nuclear resonance. If the frequency of the high frequency field is equal to the frequency of precession of the nuclei, the phenomenon of nutation takes place in the measured field and the nuclear resonance signal disappears or changes polarity. In practice fields between 0.17 and 500 oersted with non-uniformities of up

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APPROVED FOR RELEASE: 03/15/2001 CIA-RDP86-00513R002064720008-2"

SOV/120-58-5-17/32

AUTHORS: Zhernovoy, A. I., Yegorov, Yu. S., Latyshev, G. D.

TITLE: A New Method of Measuring Uniform and Non-Uniform Magnetic Fields, Using Proton Magnetic Resonance (Novyy metod izmereniya odnorodnykh i neodnorodnykh magnitnykh poley na osnove magnitnogo rezonansa protonov)

PERIODICAL: Pribory i tekhnika eksperimenta, 1958, Nr 5, pp 71-72 (USSR)

ABSTRACT: A method is suggested for measuring magnetic fields between 0.17 and 500 oersted with non-uniformities up to 200 oersted/cm. The method is based on the phenomenon of nutation, which consists in the change in the precession cone of the total magnetic moment of nuclei under the action of a transverse field oscillating with a frequency $\omega = \gamma H$, where H is the magnetic field in which the nuclei are placed, and γ is the gyromagnetic ratio. The apparatus is illustrated diagramatically in Fig.1. The flowing water from a magnetising field enters into a nutation element which is placed in the measured field and then passes into an

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SOV/120-58-5-17/32

A New Method of Measuring Uniform and Non-Uniform Magnetic Fields, Using Proton Magnetic Resonance

absorption element placed in a uniform field and which serves as the detector of nutation. The nutation element is in the form of a coil of a few turns placed on a glass tube. If the frequency of the generator $\omega \neq \omega_o$, where $\omega_o = \gamma_p H_o$, γ_p is the gyromagnetic ratio and H_o is the measured field, then the absorption signal is given by:

$$A \sim M_o \exp(- V_T/QT_1) , \qquad (1)$$

where V_T is the volume of the connecting tube between the absorption and nutation elements, Q is the water flow, T_1 is the longitudinal relaxation time, and M_o is the total magnetic moment of protons per unit volume of water passing through the nutation element. If the frequency of the generator is $\omega = \omega_o$, then, due to the nutation of the vector M_o from the direction of H_o, transverse components M_x and M_y appear in the nutation element volume V_N. In that case the signal will be given by:

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A New Method of Measuring Uniform and Non-Uniform Magnetic Fields, Using Proton Magnetic Resonance

$$A \sim \left[M_z^2 \exp(-2V_T/QT_1) + (M_x^2 + M_y^2)\exp(-2V_T/QT_2^*)\right]^{1/2} , \quad (2)$$

where T_2^* is the transverse relaxation time. Since $T_1 \gg T_2^*$, it follows that $A \sim M_z$. When $V_N/Q \ll T_1$, $\Delta H_o < H_1$, $\omega = \omega_o$ and ΔH_o is the non-uniformity of the field in the volume of the nutation element while H_1 is equal to half the amplitude of the oscillating field, then it follows from the solution of Bloch's equation, that:

$$M_z = M_o\left(\cos K\gamma H_1 \frac{V_H}{Q} + \frac{1}{2T_2 K\gamma H_1}\sin K\gamma H_1 \frac{V_H}{Q}\right)$$

$$\exp\left(-\frac{V_H}{2T_2 Q}\right) , \quad (3)$$

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A New Method of Measuring Uniform and Non-Uniform Magnetic Fields, Using Proton Magnetic Resonance

where $K = (1 - 1/4T_2^2\gamma^2H_1^2)^{1/2}$. It follows from Eq.(3) that the nutation angle $\theta = K\gamma H_1 V_N/Q$ governs the form of the absorption signal. If $\theta = n\pi$, then for even n the signal is positive and for odd n it is negative. If $\theta = (2n - 1)\pi/2$, then the signal is equal to 0 . This is in good agreement with experiment. The dependence of the amplitude of the first negative signal on Q is shown in Fig.2. It is clear from this plot that the first multiplier in Eq.(3) agrees with experiment. For $V_N = 0.2\ cm^3$ it was found that $T_2 = 3.6 \times 10^{-3}$ sec. The legend of Fig.1 is as follows: H_o is the measured magnetic field, 6 nutation element, 1 frequency generator, 2 frequency meter, 5 nuclear absorption element, 3 and

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SOV/120-58-5-17/32

A New Method of Measuring Uniform and Non-Uniform Magnetic Fields, Using Proton Magnetic Resonance

4 detectors of nuclear absorption signal. There are 2 figures and 2 references, 1 of which is English and 1 Soviet.

ASSOCIATION: Leningradskiy institut inzhenerov Zh.-D. transporta (Leningrad Institute for Railway Transport Engineering)

SUBMITTED: October 31, 1957.

Card 5/5

SOV/120-58-5-18/32

AUTHORS: Zhernovoy, A. I., Yegorov, Yu. S., Latyshev, G. D.

TITLE: Measurement and Stabilization of Weak Magnetic Fields Using Proton Magnetic Resonance (Izmereniye i stabilizatsiya slabykh magnitnykh poley na osnove magnitnogo rezonansa protonov)

PERIODICAL: Pribory i tekhnika eksperimenta, 1958, Nr 5, pp 73-75 (USSR)

ABSTRACT: Proton magnetic resonance is used to measure and stabilise weak, uniform magnetic fields. The apparatus constructed for this purpose may be used to measure magnetic fields beginning with 5 oersted. The magnetic fields may be measured with an accuracy whose lower limit is 10^{-4} and which increases as the field increases. The stabilization of magnetic fields is obtained beginning with 12 oersted. The stabilization coefficient at its lower limit is equal to 300. The working substance is pure water (Refs.6 and 7). The element through which the water is flowing is in the form of a glass tube. The length of the high frequency coil wound directly on the tube is 5 cm. The frequency of

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Measurement and Stabilization of Weak Magnetic Fields Using Proton Magnetic Resonance

the modulation of the field is 15 c/s. There are 5 figures and 7 references, of which 1 is Swiss, 3 English and 3 Soviet.

ASSOCIATION: Leningradskiy institut inzhenerov zh.-d. transporta (Leningrad Institute for Railway Transport Engineering)

SUBMITTED: October 31, 1957.

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ZHERNOVOY, A.I.; YEGOROV, Yu.S.; LATYSHEV, G.D.

Using proton resonance in measuring nonuniform magnetic fields[with summary in English]. Inzh.-fiz. zhur. no. 9:123-127 S '58. (MIRA 11:10)

1. Institut inzhenerov zheleznodorozhnogo transporta, g. Leningrad. (Magnetic fields--Measurement) (Nuclear magnetic resonance)

SOV/48-22-8-14/20

AUTHORS: Zhernovoy, A. I., Yegorov, Yu. S., Latyshev, G. D.

TITLE: Estimation of Magnetic Field Strength Measurement Accuracy by Means of the Nutation Method (Otsenka tochnosti izmereniya magnitnogo polya metodom nutatsii)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 8, pp. 988 - 992 (USSR)

ABSTRACT: This principle was already described in reference 7. The amplitude of the nuclear resonance signal is proportional to the projection of the vector of the total magnetic nuclear moment upon the direction of the external field. In a homogeneous field the first negative absorption signal occurs at an accurate resonance, if

$$\gamma H_1 \frac{V_n}{Q} = \pi \qquad (2)$$

As can be seen from figure 2 the absorption signal can have a negative polarity only, if the field is displaced from the resonance value to $\Delta H < 0,8H_1$. Outside the $\Delta H = 3H_1$ zone the nutation effect is practically missing. In an inhomogeneous

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SOV/48-22-8-14/20

Estimation of Magnetic Field Strength Measurement Accuracy by Means of the Nutation Method

field formula (2) does not hold any longer for two reasons: 1) The occurrence of a transverse inhomogeneity of the field ΔH reduces the relaxation period T_2^+ to $T_2^+ \sim \frac{1}{\gamma \Delta H}$.
2) The conditions of an accurate resonance cannot be satisfied in all points of the nutation pick-up (datchik). From the formula

$$M_z = M_o \left[1 - \frac{H_1^2}{H_1^2 + \Delta H^2}\left(\cos \sqrt{H_1^2 + \Delta H^2}\ \frac{\gamma h}{Q} - 1\right)\right] \quad (1),$$

however, it proceeds that the nutation frequency will be equal to

$$\Omega = \gamma \sqrt{H_1^2 + \Delta H^2} \quad (10),$$

if the field differs from the resonance value by ΔH. A consideration of optimum conditions and taking into account the demand (6) $dK_d \leqslant 1,5\ H_1$ for a cylindrical pick-up furnishes the formulae for such dimensions as ensure a minimum error:

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Estimation of Magnetic Field Strength Measurement Accuracy by Means of the Nutation Method

$$d_{opt} = \sqrt{\frac{6\,Q}{\gamma lmK_d}}\,;\quad l_{opt} = \sqrt{\frac{12\,Q}{\gamma mK_l}}.$$

It is apparently better do direct the water flow in the direction of the gradient of the external field. If the pick-up (datchik) is shaped like a parallelepipedon with the lateral lengths a, b, l, and the gradients of the field are taken to be directed along the sides K_a, K_b, K_l and if the water flows along l, the optimum parameters can be found from the subsequent conditions:

$$Q_{opt} = \frac{1,5\,H_1}{K_a},\quad b_{opt} = \frac{1,5\,H_1}{K_b},\quad l_{opt} = \frac{3\,H_1}{K_l};$$

$$H_1 = \sqrt[4]{\frac{\pi Q}{\gamma 6,7}K_aK_bK_l} = 0,07\,\left[Oe^{1/4}\ sec^{1/4}\right]\sqrt[4]{QK_aK_bK_l};$$

$$\sigma_{min} = 0,75\,H_1$$

The results permit to draw the conclusion that this method will yield good results in measurements of absolute field strength

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Estimation of Magnetic Field Strength Measurement Accuracy by Means of the Nutation Method

with pronounced gradients. As the nutation effect is independent from the field strength of the external field it may be useful in measurements of very weak fields. In practical work the accuracy can still be increased. The preliminary experimental results do not contradict the given data.
There are 2 figures, 2 tables, and 2 references, 2 of which are Soviet.

ASSOCIATION: Leningradskiy institut inzhenerov zheleznodorozhnogo transporta im. V. N. Obraztsova (Leningrad Institute of Railroad Transport Engineers iméni V. N. Obraztsov)

Card 4/4

AUTHORS: Zhernovoy, A. I., Latyshev, G. D. SOV/48-22-8-15/20

TITLE: New Measuring Method of Spin-Lattice Relaxation Time in Liquids (Novyy metod izmereniya spin-reshetochnogo vremeni relaksatsii zhidkostey)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 8, pp. 993 - 993 (USSR)

ABSTRACT: If a pick-up (datchik) is used in the investigation of a flowing resonance medium (Ref 1), the possibility arises of measuring the longitudinal relaxation time in a simple manner. If the condition

$$H_2 \ll H_1 e^{-V_2/QT_1}, \quad (1 - e^{-V_3/QT_1}) \quad H_3 \ll H_1 e^{-V_2/QT_1}$$

is satisfied, the amplitude of the signal of nuclear magnetic resonance is given by:

$$A_c \sim H_1 e^{-V_2/QT_1} (1 - e^{-V_1/QT_1}).$$

This formula was confirmed experimentally. If the dependence of the amplitude of the signal on the volume V_2 or V_1 is studied at constant Q, the absolute values of the longitudinal

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SOV/48-22-8-15/20

New Measuring Method of Spin-Lattice Relaxation Time in Liquids

relaxation time > 0,05 sec can be determined with an accuracy up to a few per cent. The advantages of this method are as follows: Good accessibility to measurement by any nuclear magnetic resonance measuring unit (skhema YaMR), the absence of errors because of the action of a high-frequency field on the nuclear relaxation, the possibility of measuring T_1 of nuclei in an arbitrary magnetic field practically from zero values. The relaxation times measured as a control do not contradict those measured by other methods. The method is convenient in the investigation of solvation processes and of the complex formation in chemical reactions, in catalytic processes etc. There is 1 reference, 1 of which is Soviet.

ASSOCIATION: Leningradskiy institut inzhenerov zheleznodorozhnogo transporta im. V. N. Obraztsova (Leningrad Institute of Railroad Transport Engineers imeni V. N. Obraztsov)

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SOV/48-22-8-15/20

New Measuring Method of Spin-Lattice Relaxation Time in Liquids

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AUTHORS: Zhernovoy, A. I., Latyshev, G. D. SOV/48-22-8-16/20

TITLE: A New Method of Measuring the Spin-Spin Relaxation Time of Liquids (Novyy metod izmereniya spin-spinovogo vremeni relaksatsii zhidkostey)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 8, pp. 994 - 994 (USSR)

ABSTRACT: In contrast to all other methods (Refs 1-4), this method, which was proposed by the authors, permits to determine the spin-spin relaxation time of nuclei in very weak magnetic fields (near zero). It is accessible to measurement with any recording equipment for nuclear resonance, the method, however, being applicable only to liquid samples with $T_1 > 0,05$ sec (T_1 - spin-lattice relaxation time). The substance under investigation passes through a strong magnetic field for a period which is sufficient for a complete polarization of the nuclei. Then it flows through a connecting tube into the volume V_1 which is kept in a very weak homogenuous field shielded from external fields. The inhomogeneity of this field which is directed

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A New Method of Measuring the Spin-Spin Relaxation Time of Liquids

transversely to the flow of the liquid should not exceed $1/T_2$. If the field strength is reduced, this condition can more easily be satisfied. When the liquid enters the volume V the total nuclear magnetic moment is turned into a direction at right angles to the external magnetic field by the action of the oscillating resonance field. When it leaves the volume it is turned into a parallel direction in the same manner. If Q denotes the water consumption, the total nuclear magnetic moment is reduced by the factor

$$e^{-V/QT_2}$$

during its stay in the volume V. If the volume V, which is equal to V_1 and V_2, amplitudes of the nuclear magnetic resonance corresponding to A_1 and A_2 are observed, the following equation holds:

$$T_2 = \frac{V_2 - V_1}{Q \ln \frac{A_1}{A_2}}$$

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SOV/48-22-8-16/20

A New Method of Measuring the Spin-Spin Relaxation Time of Liquids

If $T_2 < 0,01$ sec and if too small a volume V is required, T_2 can be determined from the dependence of the amplitude of the nutation signal on the consumption of liquid (as in Ref 5). In this case only one of the oscillating fields is used. There are 5 references, 1 of which is Soviet.

ASSOCIATION: Leningradskiy institut inzhenerov zheleznodorozhnogo transporta im. V. N. Obraztsova (Leningrad Institute of Railroad Transport Engineers imeni V. N. Obraztsov)

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66195

(10.2000 SOV/31-59-5-10/16

AUTHORS: Zhernovoy, A.I. and Latyshev, G.D.

TITLE: The Application of Nuclear Magnetic Resonance for the Determination of the Actual Liquid Jet Volume in the Part of a Piping System With Variable Section

PERIODICAL: Vestnik Akademii nauk Kazakhskoy SSR, 1959, Nr 5, pp 74 - 76 (USSR)

ABSTRACT: The article deals with the determination of the volume of a polarized liquid by means of nuclear magnetic resonance. If a liquid passes through a tube with a small section into another tube with a large section at great velocity, the jet volume only occupies a part of the volume of the wider tube. Let the length of the wider tube be ℓ, and the section and average velocity of the jet at a distance x be congruent from its basis, the liquid is polarized and the magnetic moment of the volume unit at a distance x from the jet bases is M(x). The specific magnetic moment in the liquid flowing out of

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SOV/31-59-5-10/16

The Application of Nuclear Magnetic Resonance for the Determination of the Actual Liquid Jet Volume in the Part of a Piping System With Variable Section

the wider tube is M(e). It results from nuclear magnetic relaxation that disregarding the variation of velocity at the jet section, the variation of the polarization of nuclei is

$$\frac{dM(x)}{dx} = -\frac{M(x)}{T_1 v(x)},$$

where T_1 is the relaxation period of the liquid, whence it follows that

$$M(\ell) = M(0)e^{-\frac{\ell}{T_1}\int_0^{\ell}\frac{dx}{v(x)}}$$

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The Application of Nuclear Magnetic Resonance for the Determination of the Actual Liquid Jet Volume in the Part of a Piping System With Variable Section

where M(O) is the specific magnetic moment of the liquid flowing into the wider tube. Obviously,

$$v(x).S(x) = Q,$$

where Q is the discharge of liquid in the system. Hence it follows that

$$M(\ell) = M(0)e^{-\frac{\ell}{T_1 Q}\int_0^{\ell} S(x)\,dx} = M(0)e^{-\frac{v_c}{T_1 Q}}$$

where v_c is the volume of the liquid jet. The ratio $\frac{M(e)}{M(0)}$ is equal to the ratio of amplitudes of the nuclear resonance signals $\frac{A}{A_0}$ given by the liquid

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The Application of Nuclear Magnetic Resonance for the Determination of the Actual Liquid Jet Volume in thePart of a Piping System With Variable Section

entering the nuclear resonance transmitter. Thus,

$$v_c = QT_1 \cdot ln \frac{A_0}{A}$$

The method is applied to guarantee an equal distribution of the liquid velocity in a section of any volume. The scheme of the apparatus is given in the diagram. There are 1 diagram and 12 references, 8 of which are Soviet and 4 unidentified. 4

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21(3) SOV/48-23-2-16/20

AUTHORS: Yegorov, Yu. S., Seliverstov, D. M., Latyshev, G. D., Zhernovoy, A. I.

TITLE: Instrument for Measurement and Stabilization of the Magnetic Field in Spectrometers (Ustanovka dlya izmereniya i stabilizatsii magnitnogo polya v spektrometrakh)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959, Vol 23, Nr 2, pp 244-250 (USSR)

ABSTRACT: In this paper a universal measuring instrument and a stabilizer of the magnetic field for spectrometers is designed. The instrument is based on the principle of measurement and stabilization of the magnetic field by magnetic nuclear resonance. It permits the measurement of magnetic fields within the range 3 - 2500 Oe and stabilization within the range 10-2500 Oe. For good resolution of the lower limit the authors applied the method of previous magnetization of water. (Fig 2, block scheme of the instrument in figure 1), whereby the lower limit of the field strength to be measured can be reduced to 3 Oe. Due to the ratio of signal noise obtained by this method it is possible to use the signal of nuclear resonance for stabiliz-

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Instrument for Measurement and Stabilization of the Magnetic Field in Spectrometers SOV/48-23-2-16/20

ing the field of the spectrometer also at a field strength of 10 Oe. For the purpose of obtaining the signals of nuclear resonance the scheme of the Franklin generator was applied, as suggested by Pound (Ref 8). Reactive tubes of the type 6Zh5P were used for frequency stabilization, whereby a frequency stability of the generator of $8 \cdot 10^{-6}$ was obtained within a wide range of frequency. There are 6 figures and 10 references, 7 of which are Soviet.

ASSOCIATION: Leningradskiy institut inzhenerov zheleznodorozhnogo transporta im. V. N. Obraztsova
(Leningrad Institute for Railroad Engineers imeni V. N. Obraztsov)

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ZHERNOVOY, A. I., Cand Phys-Math Sci -- (diss) "Research into and the application of some characteristics of the nuclear magnetic resonance effect in a circulating fluid." Moscow, 1960. 11 pp; (Inst of Theoretical and Experimental Physics of the Academy of Sciences USSR); 150 copies; free; bibliography on pp 10-11 (18 entries); (KL, 50-60, 131)

ZAGRIYEVA, A. I.

PHASE I BOOK EXPLOITATION SOV/5410

Tashkentskaya konferentsiya po mirnomu ispol'zovaniyu atomnoy energii, Tashkent, 1959.

Trudy (Transactions of the Tashkent Conference on the Peaceful Uses of Atomic Energy) v. 2. Tashkent, Izd-vo AN UzSSR, 1960. 449 p. Errata slip inserted. 1,500 copies printed.

Sponsoring Agency: Akademiya nauk Uzbekskoy SSR.

Responsible Ed.: S. V. Starodubtsev, Academician, Academy of Sciences Uzbek SSR. Editorial Board: A. A. Abdullayev, Candidate of Physics and Mathematics; D. M. Abdurasulov, Doctor of Medical Sciences; U. A. Arifov, Academician, Academy of Sciences Uzbek SSR; A. A. Borodulina, Candidate of Biological Sciences; V. N. Ivashev; G. S. Ikramova; A. Ye. Kiv; Ye. M. Lobanov, Candidate of Physics and Mathematics; A. I. Nikolayev, Candidate of Medical Sciences; D. Nishanov, Candidate of Chemical Sciences; A. S. Sadykov, Corresponding Member, Academy of Sciences USSR, Academician, Academy of Sciences Uzbek SSR; Yu. N. Talanin,

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SOV/5410

Candidate of Physics and Mathematics; Ya. Kh. Turakulov, Doctor of Biological Sciences. Ed.: R. I. Khamidov; Tech. Ed.: A. G. Babakhanova.

PURPOSE : The publication is intended for scientific workers and specialists employed in enterprises where radioactive isotopes and nuclear radiation are used for research in chemical, geological, and technological fields.

COVERAGE: This collection of 133 articles represents the second volume of the Transactions of the Tashkent Conference on the Peaceful Uses of Atomic Energy. The individual articles deal with a wide range of problems in the field of nuclear radiation, including: production and chemical analysis of radioactive isotopes; investigation of the kinetics of chemical reactions by means of isotopes; application of spectral analysis for the manufacturing of radioactive preparations; radioactive methods for determining the content of elements in the rocks; and an analysis of methods for obtaining pure substances. Certain instruments used, such as automatic regulators, flowmeters, level gauges, and high-sensitivity gamma-relays, are described. No personalities are mentioned. References follow individual articles.

TABLE OF CONTENTS:

Transactions of the Tashkent (Cont.) SOV/5410

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S/263/62/000/002/004/009
I004/I204

AUTHOR: Zhernovoy, A. I. and Latyshev, G. D.

TITLE: Magnetic rate-of-flow meter for liquids

PERIODICAL: Referativnyy zhurnal, otdel'nyy vypusk. Izmeritel'naya tekhnika, no. 2, 1962, 39-40, abstract 32.2.273. "Tr. Tashkentsk. konferentsii po mirn. ispol'zovaniyu atomn. energii. v. 2". Tashkent, AS UzSSR, 1960, 17-19

TEXT: A flow-meter was developed in the Institute of Nuclear Physics of the AS of KazSSR based on nuclear magnetic resonance (NMR). This device is intended for measuring the rate of flow of liquids containing hydrogen, fluorine, lithium and other substances with a high gyromagnetic ratio (water, alcohol, gasoline, petroleum and others). The device possesses the advantages of low inertia and absence of any elements within the pipe line. The flow meter is in the form of a branch-pipe made of nonmagnetic and non-conducting material. The branch pipe is located in a strong magnetic field. At the outlet of the branch pipe a coil is wound which is connected by means of a cable with the NMR detector circuit. The liquid which passes through the branch pipe after polarization is under action of a resonance H. F. field. An analytic expression of the dependence of the NMR signal upon the rate-of-flow of the liquid is given together with a formula for the determination of the theoretical upper measurement limit at which the characteristic is still linear.

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Magnetic rate-of-flow...

S/263/62/000/002/004/009
I004/I204

A graph of an experimentally obtained dependence of the amplitude of the NMR signal upon the rate of flow of water in a 15 cm^3 branch tube is given; this dependence being linear for the rate-of-flow range between 0 and 70 cm^3/sec. The measurement range in these experiments was 20 to 1. The sensitivity of the device may be increased at the price of reduced measurement range by moving away the NMR transducer from the magnetizing field and placing it between poles of an additional magnet. The device has the capacity to record jumps in the rate of flow of 0.1 sec. duration. There are 3 figures and 10 references.

[Abstracter's note: Complete translation.]

Card 2/2

ZHERNOVOY, A.I.; LATYSHEV, G.D.

Use of nuclear resonance for measurements in science and technology. Vest.AN Kazakh.SSR 16 no.5:33-41 My '60. (MIRA 13:7)
(Nuclear magnetic resonance)

9,6130

S/058/62/000/003/073/092
A061/A101

AUTHORS: Zhernovoy, A. I., Latyshev, G. D.

TITLE: The use of nuclear resonance for the measurement and stabilization of weak and highly inhomogeneous magnetic fields

PERIODICAL: Referativnyy zhurnal, Fizika, no. 3, 1962, 68, abstract 3E511 ("Tr. Tashkentsk. konferentsii po mirn. ispol'zovaniyu atomn. energii, 1959 g. T. 1, Tashkent, AN UzSSR", 1961, 236 - 240)

TEXT: An earlier described (RZhFiz, 1959, no. 5, 10742) pickup with the polarized substance flowing through is recommended for use in the measurement and stabilization of weak inhomogeneous magnetic fields (up to 200 oe with a gradient up to 35 oe/cm). The calculation of the NMR signal, based on Bloch's equations, and experimental results are given. A signal-to-noise ratio $>$ 10 could be obtained even in fields of the order of 4 oe when using a pickup of 0.03 cm^3.

A. Kessenikh

[Abstracter's note: Complete translation]
Card 1/1

33110

S/638/61/001/000/036/056
B108/B138

24.2300 (1144, 1158, 1160)

AUTHORS: Zhernovoy, A. I., Latyshev, G. D.

TITLE: Nutation method of measuring direct current by nuclear magnetic resonance

SOURCE: Tashkentskaya konferentsiya po mirnomy ispol'zovaniyu atomnoy energii. Tashkent, 1959. Trudy. v. 1. Tashkent, 1961, 240 - 242

TEXT: A new method of measuring magnetic fields by nuclear magnetic resonance has been developed, using a single-channel converter. It is free from the common errors since it provides for direct measurement of the dependence of field on current, and exact measurement of parasitic magnetic fields, which figure can then be subtracted from the total field. With this method, which uses only one pickup currents can be measured 1000 times weaker than was hitherto possible. They do not have to be modulated. Passing through the measuring channel of the converter is a thin tube through which flows the water polarized by a strong magnetic field (10,000 oe). The nutation pickup is at one end. Farther on, the water

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33110

Nutation method of measuring... S/638/61/001/000/036/056
B108/B138

passes into the nuclear resonance pickup (single frequency) which is in a permanent uniform magnetic field of 20 - 30 oe. When the r.f. magnetic field generated in the nutation pickup coil equals the proton precession frequency, polarization of the flowing water will vanish or change its sign, and so will the nuclear resonance signal in the detector. The current in the converter is determined by $I = K(f - f_0)$, $I = Kf \cdot f_0$ is the nutation frequency at which the resonance signal vanishes when no current flows through the converter, f the signal when a current flows. The converter constant K usually causes the principal error in the measurements. This can be reduced by exact current measurement at a current of about 10 a. The result of this measurement can be used to determine the K value which may then be employed in the entire range of measurements. Details about the optimum parameters of the arrangement can be found in earlier papers by the authors (Inzh. fiz. zhurnal, 1958, 9, 123). There are 1 figure and 6 references: 5 Soviet and 1 non-Soviet.

ASSOCIATION: Institut yadernoy fiziki AN KazSSR (Institute of Nuclear Physics AS Kazakhskaya SSR)

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33111
S/638/61/001/000/037/056
B108/B138

9.2574 (1055, 1158, 1163)

AUTHORS: Zhernovoy, A. I., Latyshev, G. D.

TITLE: Dependence of the frequency of a nuclear resonance maser on the parameters of the arrangement

SOURCE: Tashkentskaya konferentsiya po mirnomy ispol'zovaniyu atomnoy energii. Tashkent, 1959. Trudy. v. 1. Tashkent, 1961, 242-248

TEXT: The authors calculated the effect of the parameters of an r.f. oscillatory circuit and of non-unifirmities of the magnetic field on oscillations under radiative relaxation. The latter is due to magnetic interaction between polarized nuclei and the resonance circuit oscillating at a frequency which is near the Larmor precession of the nuclei. The radiative relaxation signal can be used in measuring and stabilizing a magnetic field. K. V. Vladimirskiy (ZhETF, 33, 532, 1957) established the condition $-2\pi M_0 |\gamma| \eta Q > 1/T_2$ for radiative relaxation for the longitudinal component of magnetization. M_0 is the longitudinal component of the overall nuclear magnetic moment of the specimen, η the space factor of the

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Dependence of the frequency ...

pickup coil, Q - quality factor, γ - nuclear g-factor, T_2 - transverse relaxation time. The oscillation frequency in this kind of circuit is

$$\omega = \frac{\omega_0}{\sqrt{1 - 2\pi|\gamma|\eta M_0 T_2^2 \frac{\Delta\omega_n}{1 + \Delta\omega_n T_2^2}}}, \qquad (12)$$

where $\Delta\omega_n$ is the difference between frequency of the oscillating field and ω_n the resonance frequency of the nuclei, ω_0 is the resonance frequency of the circuit. Where $\Delta\omega_r \ll \omega_0$ the shift from resonance frequency ω_0, of the circuit oscillations,

$$\Delta\omega_r = -\frac{\omega_0 T_2}{2Q}\Delta\omega_n.$$

The magnetic field strength in the pickup of a Larmor frequency circuit is $H = \frac{\omega}{\gamma} \cdot T_2$ depends on field non-uniformity δH as $T_2^* \simeq \frac{2}{\gamma\delta H}$. Experimental checking yielded good agreement between theory and experiment. The calculations can be used to estimate the systematic error in measuring a magnetic field through the oscillation frequency of a maser. The error

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AUTHOR: Zhernovoy, A.I.

TITLE: Measurement of liquid flow by means of nuclear resonance

PERIODICAL: Priborostroyeniye, no. 7, 1961, 6 - 7

TEXT: The paper describes several methods of contactless flow measurement of liquid dielectrics. This type of flowmeter can be used for liquids containing large amounts of hydrogen, fluorine or other elements having high gyromagnetic ratio to water, alcohol, gasolin, kerosene, oil etc. The part of pipe associated with the flow transmitter is made of non-magnetic and non-electric material, e.g. plastic. The principle of measurement is based on the fact that the signal amplitude of the nuclear magnetic resonance is a function of flow. The transmitter includes a strong permanent magnet of an interpolar space $V > 3q_{max}T_1$ where T_1 - longitudinal relaxation time; q_{max} - maximum value of flow. On passing through the field of the magnet liquid be-

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comes polarized. At the end of the plastic section of the pipe, in a uniform field, is a winding of several turns wound round the pipe. It is connected via a radio frequency cable to a nuclear resonance detector. The liquid, acted upon by a resonant radio frequency field produced a signal of nuclear absorption at the output of the system. The uniform field is modulated with a frequency of 10 - 1000 cycles. The signal amplitude of the nuclear resonance is proportional to magnetization vector A,

$$\frac{qT_1Z}{V_\delta}\left(1-e^{-\frac{V_\delta}{qT_1Z}}\right),$$

where Z - saturation factor; V_δ - volume of transmitter. B,

$$T_1Z = \frac{T_1}{1+\gamma^2H_1^2\,T_1T_2};$$

where H_1 - intensity of oscillating field in the transmitter winding; γ - gyromagnetic ratio; T_2 - transverse relaxation time.

For $Z \ll 1$ C

$$T_1 Z = \frac{1}{\gamma^2 H_1^2 T_2^*},$$

and the signal amplitude is D

$$A = KNq\left(1 - e^{-\frac{V_\partial}{qT_1Z}}\right),$$

where K - coefficient which depends on shape, detector setting and non-uniformity of internal field; N - concentration of resonating nuclei. The above analysis is approximate and therefore this method requires calibration by means of an absolute method. For $\frac{V\partial}{q} > 3T_1Z$ the signal amplitude is proportional to flow. The upper limit of linearity is determined by $q_{max} \approx \frac{V\partial}{3T_1Z}$.

The bottom limit is determined by the noise to signal ratio.