Mathematical Reviews
Vol. 14 No. 10
Nov. 1953
Mathematical Physics

Šapiro, I. S. On transformation properties of wave functions of particles with spin 1/2. Akad. Nauk SSSR. Žurnal Eksper. Teoret. Fiz. 23, 412–416 (1952). (Russian)

Under a change of sign of the time coordinate, it is possible to transform the four components of the Dirac wave function in different ways so that the sign of either the energy or the charge changes. The author discusses the meaning of such a "time reflection". The transformation under which the sign of the charge changes is non-linear. However, L. Biedenharn [Physical Rev. (2) 82, 100 (1951); these Rev. 12, 658] has brought about linearity in the field-free case by introducing an eight-component wave function which satisfies a generalization of the Dirac equation. According to the author, this procedure fails if a field is present. He therefore proposes a generalization involving a six-dimensional space.

N. Rosen (Haifa).

SHAPIRO, I.S.

USSR/Nuclear Physics - Isotopic triplet FD-803

Card 1/1 Pub. 146-16/21

Author : Shapiro, I. S.

Title : The nature of τ-mesons and V_2^o - particles

Periodical : Zhur. eksp. i teor. fiz., 27, 257-258, Aug 1954

Abstract : Letter to the editor analyzes the question whether $\tau^{\pm}$ mesons and V_2^o particles form an isotopic triplet. Obtains affirmative answer in the case where both particles are of vector type. Three references including 2 foreign.

Institution : Moscow State University

Submitted : May 22, 1954

SHAPIRO I.S

Disintegration on particles with a null mass at rest. I. S. Shapiro (Moscow State Univ.). *Zhur. Eksptl. i Teoret. Fiz.* 27, 393–7(1954).—Selection rules were obtained for the disintegration of particles on 2 particles with arbitrary spin, if at least one of these possesses a null mass at rest. Werner Jacobson

62

USSR/ Physics - Quantum mechanics

Card : 1/1 Pub. 118 - 2/15

Authors : Shapiro, I. S.

Title : Properties of symmetry in the theory of elementary particles and nuclear processes

Periodical : Usp. fiz. nauk 53/1, 7 - 68, May 1954

Abstract : Properties of symmetry, used in the theory of elementary particles and nuclear processes, are described. Two types of symmetry are considered: an exact and real one; and, an inexact and problematical one. The symmetry of the normal space (spatial symmetry) and the symmetry of charges (charge symmetry) belong to the former and the symmetry in the space of an isotopic spin to the latter. Sixty two references. Tables; diagrams.

Institution : ...

Submitted : ...

SHAPIRO, I. S.

USSR

Radiative K-capture for forbidden transitions. V. V. Turovtsev and I. S. Shapiro (M. V. Lomonosov State Univ., Moscow). *Doklady Akad. Nauk S.S.S.R.* 95, 777–0 (1954).—Morrison and Schiff (*C.A.* 34, 5740[3]) have given a theory of radiative K-capture for permitted transitions. T. and S. developed an analogous theory for forbidden transitions of 1st order for the vector and tensor form of the theory of β-decay. Formulas are given for the energy distribution in the continuous γ-spectrum which results from radiative K-capture. Since the Born approximation is used, the formulas apply to light nuclei only. E. Gora

62

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SHAPIRO, I.S.

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539.166.835

6602. PARITY OF WAVE-FUNCTIONS OF PARA- AND ORTHO-STATES. I.S.Shapiro.
Dokl. Akad. Nauk SSSR, Vol. 95, No. 5, 975-7 (1954). In Russian.
A non-relativistic electron is described by a spinor, a positron by a pseudo-spinor. Having opposite parity an electron and positron may form para- or ortho-states (the $^1S_0$ or $^3S_1$ states of positronium). Using a previously introduced formulation (Abstr. 615/1953) for the conjugate spinors and pseudo-spinors the even wave-functions of positronium are constructed and their transformation properties demonstrated. J.W.Gardner

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SHAPIRO, I.S.

General correlations in the decay of heavy mesons. Izv.AN SSSR Ser.fiz.19 no.6:664 N-D '55. (MLRA 9:4)

1.Moskovskiy gosudarstvennyy universitet imeni M.V.Lomonosova. (Cosmic rays) (Nuclear physics)

SHAPIRO, I. S.

USSR / 5140

INTERNAL BREMSSTRAHLUNG IN 0–0 TRANSITIONS OF THE NUCLEUS. I. S. Shapiro and Yu. V. Orlov (Moscow State Univ.). Doklady Akad Nauk S.S.S.R. 101, 1047-9(1955) Apr. 21. (In Russian)

62

SHAPIRO, I. S.

"Photo Nuclear Reactions and the Scattering of Neutrons by Hight Nuclei" a paper presented at the International Conference on Nuclear Reactions, Amsterdam, 2-7 July 1956.

D551274

SHAPIRO, I. S.

4063
CHARACTERISTICS OF THE LEVELS OF NONSPHERICAL EVEN-EVEN NUCLEI. I. S. Shapiro (Moscow State Univ.). Soviet Phys. JETP 3, 779-81(1956) Dec.

Category : USSR/Nuclear Physics - Elementary Particles C-3

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 438

Author : Shapiro, I.S., and Estulin, I. V.
Inst : Moscow State University, USSR
Title : On the Electric Charge of a Neutron.

Orig Pub : Zh. eksperim. i teor. fiziki, 1956, 30, No 3, 579-580

Abstract : A narrow beam of thermal neutrons, filtered by graphite, with an average kinetic energy of 0.026 ev, was collimated by two foils of cadmium with slit apertures 2 mm wide, placed 50 cm apart. Two aluminum plates were placed in parallel with the planes of the slits. The plates were 50 cm long, and the distance between them was 7.5 mm. The difference of potential between the plates was 10 kv. If the neutron charge is qe, where e is the electron charge, then the electric field of the capacitor should deflect the beam by $\Delta x = qeEl^2/4w$, where E is the electric field intensity and W the kinetic energy of the neutrons. The experimentally observed displacement of the beam was less than 0.02 mm, corresponding to q less than 6×10^{-12}.

Card : 1/1

ŠAPIRO, I. S.

CARD 1 / 2 PA - 1373

SUBJECT USSR / PHYSICS
AUTHOR ŠAPIRO, I.S.
TITLE The Peculiarities of the Levels of Nonspherical Even-Even Nuclei.
PERIODICAL Žurn.eksp.i teor.fis, 30, fasc.5, 975-977 (1956)
Issued: 8 / 1956 reviewed: 10 / 1956

Here the properties of the levels with $\Omega = 0$ are investigated. (Ω - sum of the projections ω_i of the angular momenta of nucleons on the axis of the nucleus). Like in the case of the Σ-terms of a two-atom molecule a quantum number $\eta = \pm 1$ occurs in addition in the case $\Omega = 0$, which characterizes the behavior of the wave function on the occasion of a reflection of the space with respect to a plane passing through the symmetry axis of the nucleus. On the occasion of this transformation the wave function $\Psi_{\Omega P}$ is converted into $\hat{I}_{\phi\Psi\Omega P} = \Psi_{-\Omega P}$. Because of the invariance of the HAMILTONIAN of the system with respect to the transformation investigated, every term is twice degenerated with respect to Ω. Here $P = \pm 1$ denotes the parity of the state. in the case of $\Omega = 0$ it is true that $\hat{I}_{\phi\Psi oP\eta} = \eta\Psi_{oP\eta}$, $\eta = \pm 1$, and therefore it is possible that, instead of degeneration, two levels with different values of η exist. States with $\Omega = 0$ can occur in nuclei with even A and obviously especially in even-even nuclei. Among them are e.g. the ground state (J=0, P= +1) and the first excited state (J=2, P=+1). These two states of even-even nuclei have the same η. With η the following selection rule for the radiation transitions is connected: The transitions between levels with the same η (or with a change of sign for η) can be only of

SHAPIRO, I. S.

Sapiro, I. S. **Expansion of a wave function in irreducible representations of the Lorentz group.** Dokl. Akad. Nauk SSSR (N.S.) 106 (1956), 647–649. (Russian)

The author gives an explicit representation as a direct integral of irreducible representations of the homogeneous Lorentz group of the unitary representation associated with a relativistic particle of zero spin and unit mass. This representation assigns to the homogeneous Lorentz transformation g the operator $\phi(p)\to\phi(g^{-1}p)$ on the Hilbert space of functions ϕ on the manifold $p_0^2-p_1^2-p_2^2-p_3^2=1$ with the norm $\|\phi\|^2=\int|\phi(p)|^2p_0^{-1}d_3p$. The direct integration takes place over a variable that is essentially the (scalar) value of the operator $\varepsilon_{\mu\nu\lambda\sigma}M_{\mu\nu}M_{\lambda\sigma}$ in the particular irreducible representation, where $M_{\mu\nu}=-i(p_\mu\partial/\partial p_\nu-p_\nu\partial/\partial p_\mu)$; $\mu=1, 2, 3, 4$; $p_4=ip_0$.

I. E. Segal (Chicago, Ill.).

Moscow State Univ im M. V. Lomonosov

CHAIKIN, Y. P.

"β Decay and Nonconservation of Parity" (review lecture)

Moscow State Univ.

Paper submitted at the A-U Conf. on Nuclear Reactions in Medium and Low Energy Physics, Moscow, 19-27 Nov 57.

MENZEL, Donald H., red.; KAZARNOVSKIY, M.V. [translator]; TIKHOMIROV, F.A. [translator]; ARNOL'D, N.A. [translator]; PETRUKHIN, V.I. [translator]; MATSONASHVILI, B.N. [translator]; AKSENOV, S.I. [translator]; BAKANOV, S.P. [translator]; SHAPIRO, I.S., red.; ADIROVICH, E.I., red.; MEDVEDEV, Yu.T., red.; NAKHIMSON, I.G., red.; TELESNIN, N.L., red.; BELEVA, M.A., tekhn.red.

[Fundamental formulas of physics. Translated from the English] Osnovnye formuly fiziki. Moskva, Izd-vo inostr. lit-ry, 1957. 657 p. (MIRA 11:5)
(Mathematical physics)

SHAPIRO, I. S.

5465 A 19 3

ON THE SPIN AND PARITY OF THE τ-MESON. I. S. Shapiro and E. I. Dolinsky (Moscow State Univ.) and A. P. Mishakova (USSR Academy of Sciences, Moscow). Nuclear Phys. 3, 60-4(1957) March.

Energy distribution curves of π^--mesons produced in τ^+-decays have been obtained by assuming that the isobaric spin of the three π-meson system equals unity and the ratio of probabilities of τ and τ′ decays is 4. Comparison of the theoretical results with experimental data referring to 492 τ^+-decay events shows that the most probable values for τ-meson spin and parity is the 0^- combination. (auth)

SHAPIRO, I.S.

12163

ON THE INTERACTION BETWEEN μ-MESONS AND NUCLEONS. I. S. Shapiro, E. I. Dolinsky, and L. D. Blokhintsev (Moscow State Univ., U.S.S.R.). Nuclear Phys. 4, 273-6(1957) Aug.

The angular distribution and longitudinal polarization of neutrons produced in the capture of μ^- mesons by μ-mesohydrogen are computed. (auth)

Moscow State Univ.

I.S. Shapiro

Distr: 4E3d

3823

ON THE QUESTION OF THE SPIN AND PARITY OF THE τ-MESON. L. S. Shapiro, E. I. Dolinskii, and A. P. Mishakova (Moscow State Univ.). Soviet Phys. JETP 5, 129-30(1957) Aug.

A comparison of the experimental data on the energy spectrum and angular distribution of the π mesons formed in positive and negative τ decay with theoretical curves leads to the conclusion that the most probable spin and parity values for the meson are 0^-. (L.T.W.)

AUTHOR SHAPIRO, I.S., DOLINSKIJ, S.I., MISHAKOVA, A.P. PA - 2084

TITLE On the Spin and Parity of the τ-Meson (K voprosu o spine i chetnosti τ-mezona).

PERIODICAL Zhurnal Eksperimental'noi i Teoret. Fiziki, 1957, Vol 32, Nr 1, pp 173-175 (U.S.S.R.)

Received 3/1957 Reviewed 4/1957

ABSTRACT On the strength of consideration which formerly have not been taken into account, the present work shows that experimental data exclude the possibility investigated by MARSHAK. The authors hereby base on the following considerations. 1) The isotopic spin $I_{3\pi}$ of the system of 3 pions occurring on the occasion of τ-decay is equal to 1. This assumption made also by other authors results from the GELL-MANN scheme according to which the τ-meson has the isotopic spin $I_\tau = 1/2$. The slow decay $\tau^+ \to \pi^+ + \pi^+ + \pi^-$ can be explained by the non-conservation of isotopic spin. 2)K-mesons which decay according to the scheme $\tau'^{\pm} \to \pi^{\pm} + 2\pi^0$ are identified with τ'-mesons. 3) According to various experimental data $W_\tau/W_{\tau'} \sim 4$ is true for the ratio of probabilities of τ- and τ'-decay. Assuming validity of conditions 1) and 2), it holds that $W_\tau/W_{\tau'} = (4F + \Phi)/(F + \Phi)$. Here F denotes a quantity which can be obtained by integrating the squares of the moduli of the matrix-elements, which are symmetric with respect to the momenta of all pions, over the energies of the pions. Φ denotes an analogous quantity which can be obtained from the matrix-elements which are symmetric only with respect to the momenta of the identical pions. It is found that $\Phi \sim 0$, i.e. pions are produced only in states that are symmetric with respect to

Card 1/2

PA - 2084

On the Spin and Parity of the γ'-Meson.

the momenta of all 3 particles. If this assumption is correct the spectrum of positive pions in the case of γ'-decay must be identical with that of positive pions in the case of γ-decay. The lowest orbital momenta corresponding to these data are given in a scheme which contains also the orbital momenta and matrix-elements used by DALITZ. A diagram shows the curves for the energy spectrum of pions which have been computed from the matrix elements of the symmetric states. The curves corresponding to the spins and symmetries (parities) 1^+, 1^-, and 2^+ differ considerably from the experimental spectrum. Also the curve for the case 2^- agrees less well with the experimental value than the curve corresponding to case 0^-. Some conclusions. A) The combination 0^- is the most probable for spin and parity. B) Combinations 1^+, 1^-, and 2^+ are practically excluded. Thus the most probable values are especially those that lead to an occurrence of the so-called " $\gamma - \Theta$ " -problem. (1 illustration)

ASSOCIATION Moscow State University
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Card 2/2

PA - 3063

AUTHOR SHAPIRO I.S.

TITLE On the Non-Conservation of the Parity at the β-Decay.
(O nesokhranenii chetnosti pri β-raspade - Russian)

PERIODICAL Uspekhi Fizicheskikh Nauk, 1957, Vol 61, Nr 3, pp 313 - 330
(USSR)
Received: 5/1957 Reviewed: 7/1759

ABSTRACT After C.S. Wu et alii, and L.M. Lederman et alii, respectively (Phys Rev. 1957, in print) had succeeded in determining experimentally the anisotropy of the angular distribution of the electrons at the β-decay of polarized nuclei and at the decay of μ-mesons, respectively, this hypothesis must be considered to be verified. The following possible explanations are listed:
(a) Inner asymmetry of the particle, in analogy to the molecules of tartaric acid. Particular reference is made to the hypothesis by L.D. Landau (Zh. E.T.F., Vol 32, Nr 2), according to which a transition to the 'mirror particle' simultaneously means a transition to the antiparticle. Therefrom and from the longitudinal neutrino hypothesis' it is possible to derive conclusions which are not in contradiction with the experiments.

CARD 1/2

Shapiro, I. S.

AUTHORS: Shapiro, I. S., Dolinskiy, E. I., Blokhintsev, L.D., 20-6-14/42

TITLE: Problem of Interaction of Muon With Nucleons (K voprosu o vzaimodeystvii μ-mezonov s nuklonami).

PERIODICAL: Doklady AN SSSR, 1957, Vol. 116, Nr 6, pp. 946 - 948 (USSR)

ABSTRACT: The present report investigates the angular distribution of neutrons which were obtained at the capture of a negative muon by a proton in μ-mesohydrogen. The negative muon is assumed to be polarized. In this case the angular distribution of the neutrons in a general case will be generally anisotropic because of the nonconservation of the parity with weak interactions, in which case both the sign and the size of anisotropy depend on the form of interaction.The energy of interaction of a nuon with a nucleon taking account of the nonconservation of parity can be written down conjugated complex in the form $H=\sum_k(\overline{\Psi}_n O_k \Psi_p)(\overline{\Psi}_\nu[g_k-g'_k\gamma_5]O_k\Psi_\mu)$ +

In this case O_k means the operators known from the theory of the ß-decay which are composed of the Dirac matrices. It further holds k = s,p,v,a,t,in which case s,p,v,a,t signifies the scalar,pseudoscalar,vectorial,pseudovectorial,and tensorial variant of interaction.With $g_k = -g_k$ the variant proposed by L.D.Landau (reference 1) of the theory with a longitudinal polarized neutrino is obtained.The formula $W(\theta)=1+\alpha\cos\theta$,holds for the angular distribution of the neutrons,in which case θ denotes the angle between the

Card 1/2

Problem of Interaction of Muon With Nucleons. 20-6-14/42

direction of emission of the neutron and the negative direction of polarization of the negative muon. The terms valid in the case of the presence of all variants of interaction is given for α The values of α for the different variants of interaction (on the assumption of longitudinal neutrino)are summarized in a table.Such formulae can also be obtained for the capture of negative muons by protons which are bound to nuclei.In this case α depends on the matrix elements of the nuclei which renders the interpretation of the experimental data difficult.Besides the anisotropy of angular distribution of the neutrons, also the fact can be utilized for the determination of the form of interaction that the neutrons formed during the process $\mu^- + p \rightarrow n + \nu$ are generally polarized. This polarization takes place both transversally and longitudinally. A table contains the amounts of longitudinal polarization of the P-neutrons obtained at the capture of unpolarized negative muons by free protons in the case of a longitudinal neutrino.These data hold also approximately for the capture of muons by nuclei.There are 1 figure,1 table and 4 references,2 of which are Slavic. (vennyy universitet im.M.V.Lomonosova)

ASSOCIATION: Moscow State University im. M. V. Lomonosov (Moskovskiy gosudarst-
PRESENTED: May 27, 1957, by D. V. Skobel'tsyn,Academician
SUBMITTED: May 18,1957
AVAILABLE: Library of Congress
Card 2/2

LUKYANOV, A. V., ORLOV, Y. V., TIKHONOV, A. N., TUROVISEV, V. V. and SHAPIRO, I. S.

"Le Models Optique pour l'interaction avec les noyaux des neutrons d'energie moyenne."

report presented at the Intl. Congress for Nuclear Interactions (Low Energy) and Nuclear r Structure (Intl. Union Pure and Applied Physics.) Paris, 7-12 July 1958.

PHASE I BOOK EXPLOITATION SOV/1223

5(4)

Shapiro, Iosif Solomonovich, Doctor of Physical and Mathematical Sciences

Elementarnyye chastitsy (Elementary Particles) Moscow, Izd-vo "Znaniye," 1958. 31 p. (Series: Vsesoyuznoye obshchestvo po rasprostraneniyu politicheskikh i nauchnykh znaniy. Seriya VIII, 1958, vyp. II, no. 17) 35,000 cipies printed.

Sponsoring Agency: Vsesoyuznoye obshchestvo po rasprostraneniyu politicheskikh i nauchnykh znaniy.

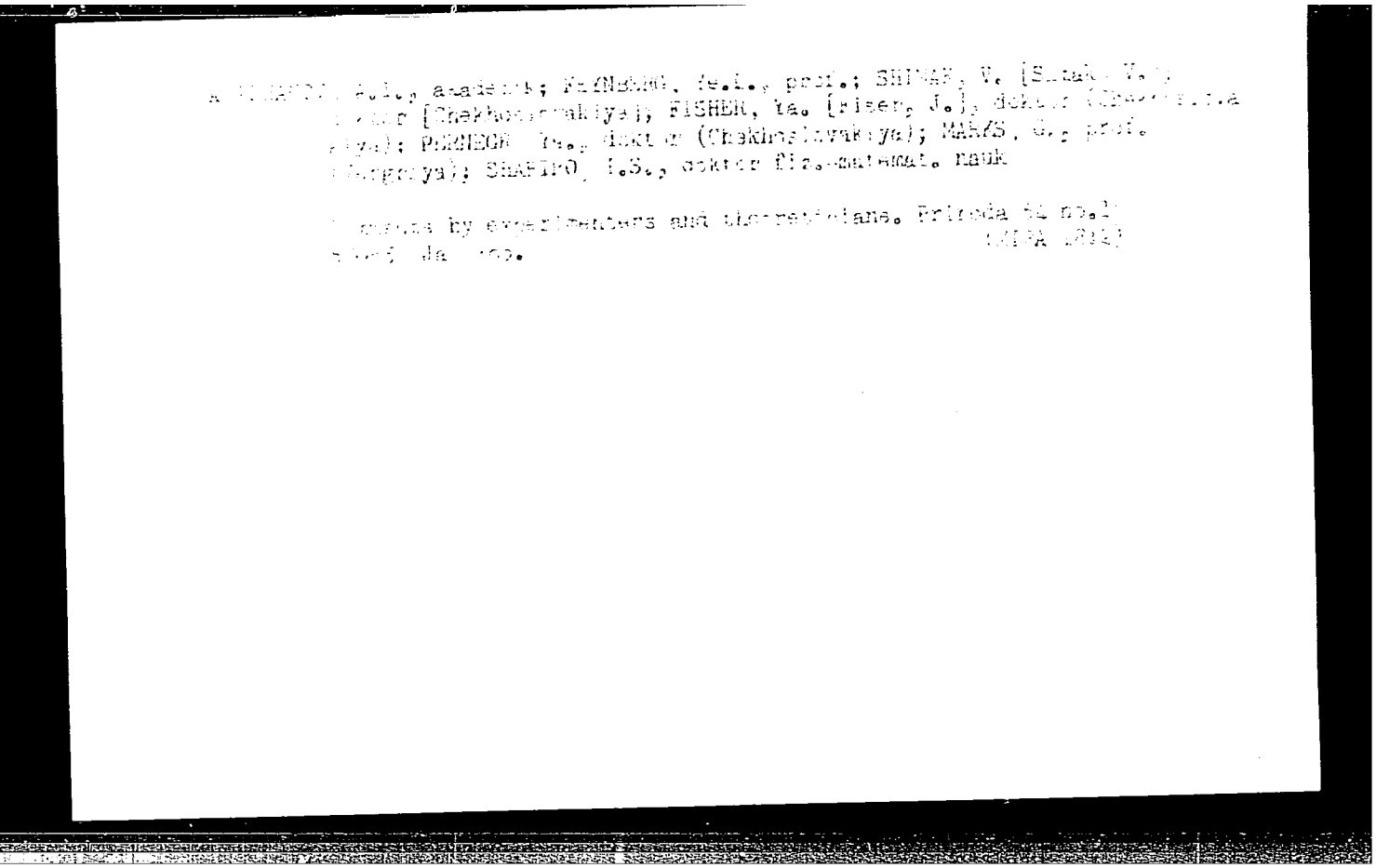
Ed.: Faynobym, I.B.; Tech. Ed.: Berlov, A.P.

PURPOSE: The book is intended for the general reader.

COVERAGE: The book is concerned with the present status of the physics of elementary particles. A description of the properties of elementary particles is given and their interaction, formation and decay are discussed. No personalities are mentioned. No references are given.

Card 1/3

21



DENISOV, F.P.,red.; LAZAREVA, L.Ye.,red.; LEYKIN, Ye.M.,red.; ROZHANSKIY, I.D.,red.; FRANK, I.M.,red.; SHAPIRO, I.S.,red.; SHAPIRO, F.L.,red.; POLENOVA, T.P.,tekhn. red.

[Low and intermediate energy nuclear reactions; transactions of the conference] Iadernye reaktsii pri malykh i srednikh energiiakh; trudy konferentsii. Moskva, Izd-vo Akad. nauk SSSR, 1958. 614 p. (MIRA 11:12)

1. Vsesoyuznaya konferentsiya po yadernym reaktsiyam pri malykh i srednikh energiyakh. Moscow, 1957.
(Nuclear reactions)

SOV/53-65-4-13/13

AUTHOR: Shapiro, I. S.

TITLE: Bibliography (Bibliografiya)

PERIODICAL: Uspekhi fizicheskikh nauk, 1958, Vol 65, Nr 4, pp 739 - 739 (USSR)

ABSTRACT: The author gives a detailed discussion of a handbook entitled: " New Symmetrical Properties of Elementary Particles". It is a selection of papers edited by I.M.Khalatnikov. The work was published 1957, it has 97 pages, and the price is 5,10 Roubles.

Card 1/1

SOV/25-59-7-5/53

AUTHOR: Shapiro, I.S., Doctor of Physical and Mathematical Sciences

TITLE: "Strange" Particles

PERIODICAL: Nauka i zhizn', 1959, Nr 7, pp 9-13 (USSR)

ABSTRACT: The article based on foreign research gives a survey of the latest findings in elementary particles research, up to the year 1958. It is divided into the following 7 sections: 1) Preface; 2) "Distinctive Marks" of Elementary Particles; 3) Classification of the Particles; 4) Particles and Anti-Particles; 5) Why K-Mesons and Hyperons are Called "Strange Particles"; 6) Disintegration of "Strange" Particles; 7) A "Double-Faced" Particle. There are 2 diagrams and 2 sets of diagrams.

Card 1/1

SOV/56-37-3-26/62

AUTHORS: Shapiro, I. S., Blokhintsev, L. D.

TITLE: Circular Polarization of the γ-Quanta Emitted by a Nucleus After a μ^--Capture

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 3(9), pp 760-764 (USSR)

ABSTRACT: In computing the circular polarization mentioned in the title the hyperfine splitting up of the level of the mesic atom was taken into account. The authors made their computations for the case that the nucleus passes to a discontinuously varying level in the μ^--capture (i.e. no neutron departs). The process to be investigated is the following: Nucleus A_Z with spin j_1 captures a polarized negative ion from the K-shell and passes to the excited level A_{Z-1} with spin j_2, which then passes from the multiplicity J to the ground state with spin j_3 under emission of a γ-quantum. The authors wrote down the Hamiltonian of the four-fermion interaction as a superposition of the vectorial (v), axially vectorial (a), and pseudoscalar (p) variant with the coupling constants g_v, g_a and g_p. The degree C_γ of circular

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polarization is defined as follows: $C_\gamma = (W_+ - W_-)/(W_+ - W_-)$. W_+ and W_- denote the probabilities of the emission of γ-quanta with their spin in parallel (right-hand polarization) and anti-parallel position respectively, to the momentum (left-hand polarization). For a longitudinal neutrino the computation furnishes the result: $C_\gamma = P_\mu \alpha \cos\theta$, $\alpha = B/A$. P_μ denotes the degree of polarization of the negative muon at the instant of its incidence on the K-orbit of the mesic atom, θ - the angle between the directions of the polarization vector of the negative muon and of the direction of departure of the γ-quantum. The above-mentioned formulas hold for the case that the neutrino departs with a certain angular momentum $\Lambda = \Lambda_{min}$. This is the least possible angular momentum admitted by selection rules. The correction shown by Gell-Mann (Ref 4) concerning the allowed transitions due to the "weak mechanism" has already been taken into consideration in the above expressions. In order to examine this, the authors investigate the transition $\Delta j \equiv j_2 - j_1 = \pm 1$ (no). A formula is written down for the

matrix element M_v of the μ transition. The structure of this matrix element M_v is similar to that of the matrix element of the operator for the energy of interaction of the magnetic moment with the magnetic field. Quantity μ (the total magnetic moment of the transition, computed in nuclear magneton units) takes into account the contribution of virtual pions according to Gell-Mann.(Ref 4). For the transitions of the type $\Delta j = \pm 1$ (no), however, neither corrections are made for a "weak mechanism" nor are other relativistic corrections of the same order of magnitude applied to the amount of polarization of the γ-rays although they contribute to the total probability of the process. The problem of such corrections in the μ^--capture was investigated more exactly by B. L. Ioffe (Ref 5). In computing the expression for C_γ the hyperfine splitting up of the mesic-atom level was taken into account, for it plays an important part. In the transitions satisfying Fermi's selection rules the circular polarization of γ-quanta is entirely due to hyperfine interaction. As an example of an allowed transition

Circular Polarization of the γ-Quanta Emitted by a Nucleus After a μ^--Capture SOV/56-37-3-26/62

with subsequent dipole radiation ($\Lambda = 0$, $J = 1$) at $j_1 = j_2 = j_3 = 1/2$ is investigated for the Gamov-Teller variant. In most cases, the μ^--capture leads to the departure of a neutron from the nucleus. There are 7 references, 3 of which are Soviet.

SUBMITTED: April 3, 1959

Card 4/4

SHAPIRO, I.S.

"Capture and Structure of Light Nuclei"

report submitted for the 2nd USSR Conference on Nuclear Reaction at Low and Intermediate Energies, Moscow, 21-28 July 1960.

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B006/B063

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AUTHOR: Shapiro, I. S.

TITLE: Radiationless Decay of a μ-Meson into an Electron

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 5, pp. 1646 - 1647

TEXT: The radiationless decay of a muon into an electron in the Coulomb field according to (1): $\mu^- + A_Z \rightarrow A^*_Z + e^-$ was investigated by Weinberg and Feinberg (Ref. 1) by the example of four-fermion interaction of the type $(\bar{e}\mu)(\bar{f}f)$ (f - charged particle). Steinberger and Wolfe determined the relative probability of this muon decay (with respect to the ordinary muon capture by protons of the Cu^{64} nucleus) to be $\leq 5 \cdot 10^{-4}$. They attempted to determine this decay by recording 100-Mev electrons. The present "Letter to the Editor" describes another possibility of determining reaction (1). The author studies a light μ-mesic atom having an even-even nucleus (C^{12}, O^{16} or Ne^{20}). For excitation energies of

Card 1/2

SHAPIRO, I.S.; GAPONOV, Yu.V.

Continuous representation of total Green's functions. Vest. Mosk. un. Ser. 3 Fiz., astron 16 no.2:73-81 Mr-Ap '61. (MIRA 14:6)

1. Nauchno-issledovatel'skiy institut yadernoy fiziki, Kafedra yadernoy spektroskopii.
(Boundary value problems)
(Functions, Continuous)

S/056/61/041/005/027/038
B102/B138

24,660

AUTHOR: Shapiro, I. S.

TITLE: Dispersion theory of direct nuclear reactions

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 5(11), 1961, 1616-1627

TEXT: The author uses the Feynman graph technique together with the dispersion relations to study direct nuclear interactions of the type $A + x \to \begin{cases} B + y \\ B + y + z \end{cases}$. First he formulates the kinematic relations and unitarity and analyticity conditions for the reaction $A + x \to B + y$. This can be expressed by two of the following independent variables: the kinetic energy E of the colliding particles, the square momentum transferred $q^2 = (p_y - p_x)^2$, or the square momentum sum $p^2 = (p_x + p_y)^2$. The unitarity condition $SS^+ = 1$ is defined for $S = 1 + i(2\pi)^4 T$, $T = B + iA$ with $A_{if} = \frac{(2\pi)^4}{2} \sum_n T_{in} T^+_{nf}$ and

Card 1/6

Dispersion theory of direct nuclear...

$$T_{kl}(q^2, E) = M_{kl}(q^2, E)\,\delta_{\lambda_k\lambda_l}\delta^4(l-m). \qquad (10)$$

$$A_{kl}(q^2, E) = A_{kl}(q^2, E)\,\delta_{\lambda_k\lambda_l}\delta^4(l-m). \qquad (11).$$

The arguments of the δ-function are the momenta and energies of the states k and l, the subscript λ indicates the totality of discrete quantum numbers. The amplitudes $M_{kl}(q^2, E)$ are analytic functions. Assuming that the main contribution to the amplitude of a direct nuclear process comes from Feynman graphs with singularities which are closest to the physical region of the variables, the contributions from the pole diagrams (Fig. 1) are investigated. At $p_b^2 = 2m_bE_b$ the amplitude M_{if} (transitions f→n, i→n) has a pole, near which

$$M_{if} = 2m_b \frac{\Sigma s_b M_{ib} M_{bf}^{+}}{p_b^2 - 2m_bE_b - i\eta}, \qquad \eta \to +0. \qquad (14).$$

The subscript b indicates the quantities of the compound particle b. A

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singular integral equation to allow for the interactions in the initial and final states is obtained from the energy dispersion relations for the graphs of Fig. 2.:

$$M_{xy}(E) = M^0_{xy}(E) + \frac{1}{\pi}\int_{E_0}^{\infty} \frac{A_{xy}(E')}{E' - E - i\eta}\, dE'. \qquad (31)$$

$M^0_{xy}(E)$ denotes the sum of all pole terms and $E_0 = \begin{cases} 0 & Q<0 \\ -Q & Q>0 \end{cases}$; Q is the total liberated energy. From this equation in zeroth iteration $M_{xy} = M^0_{xy}$ (Butler theory) is found, and in first iteration

$$M^{(1)}_{xy} = M^0_{xy} + \frac{1}{4\pi^2}\int_{E_0}^{\infty}\int \frac{dE'\, d\Omega_{x'}}{E' - E - i\eta}\, \rho_x(E')\, M^0_{x'y}(E')\, f_{xx'}(E') + \\ + \frac{1}{4\pi^2}\int_{E_0}^{\infty}\int \frac{dE'\, d\Omega_{y'}}{E' - E - i\eta}\, \rho_y(E')\, f^{(E')}_{y'y} M^0_{xy'}(E'). \qquad (34)$$

(method of distorted waves). The criteria of convergence of this iteration procedure are discussed. An investigation of triangular graph singularities shows that besides the pole graphs corresponding to the Butler mechanism and to exchange stripping and heavy pick-up reactions,

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more complex graphs can also make a significant contribution to the direct reaction mechanism. This is illustrated for the reactions $Be^9(\alpha,t)B^{10}$, $Be^9(d,n)B^{10}$ and $C^{12}(d,p)C^{13}$. Finally the mechanism of some reactions of the type A+x B+y+z is considered analogously. Peculiarities of reactions in which "clusters" of particles are nocked out of the nucleus are also discussed. The author thanks L. D. Landau and K. A. Ter-Martirosyan for comments. L. B. Okun', A. P. Rudik (Nucl. Phys. 15, 261, 1960) and N. A. Vlasov et al. (ZhETF, 39, 1468, 1960) are mentioned. There are 6 figures, 1 table, and 8 references: 3 Soviet and 5 non-Soviet. The four most recent references to English-language publications read as follows: R. D. Amado. Phys. Rev. Lett., 2, 399, 1959; L. D. Landau. Nucl. Phys. 13, 181, 1959; S. Ozaki et al. Phys. Rev. Lett. 4, 533, 1960; G. F. Chew, F. E. Low. Phys. Rev. 113, 1640, 1959.

ASSOCIATION: Institut teoreticheskoy i eksperimental'noy fiziki Akademii nauk SSSR (Institute of Theoretical and Experimental Physics of the Academy of Sciences, USSR)

SUBMITTED: June 3, 1961

Card 4/6

27484
S/053/61/075/001/002/003
B125/B108

24,3500 (1138, 1395, 1137)

AUTHOR: Shapiro, I. S.

TITLE: The optical model of nucleus in the light of modern data

PERIODICAL: Uspekhi fizicheskikh nauk, v. 75, no. 1, 1961, 61 - 100

TEXT: According to experimental and theoretical results of 1958 - 1960, nuclei are nearly as transparent for complex particles (deuterons, α-particles) as for nucleons. The optical model for the scattering of nucleons: Experiments do not confirm the theoretically derived monotonic increase of the scattering cross sections with increasing A and energy E. The Pauli principle is the principal cause of the unexpectedly sharp diminution of the scattering cross sections of coupled nucleons. The theoretical results hold also for nuclei of finite dimensions. The model with rectangular potentials such as $U(\vec{r}) = -V(\vec{r})(1+i\xi)$ (17) with

$V(r) = \begin{cases} V_0, & r < R \\ 0, & r > R \end{cases}$, $\xi = W/V_0$, $(U(\vec{r}) = -V(\vec{r}) - iW(\vec{r}))$ gives too high ratios

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The optical model of nucleus...

$\sigma_o = \sigma_s/\sigma_r$. The continuous decrease of $U(\vec{r})$ toward zero must cause an increase of $\sigma_r = \sigma_t - \sigma_s$. σ_t is the total cross section, $\sigma_s = 2\pi\int_0^\pi |f^2| \sin\vartheta d\vartheta$. The optical model with continuously decreasing nuclear potential was investigated by P. E. Nemirovskiy (DAN SSSR 101, 257 (1955)) for neutrons. An adequate choice of the model parameters gives a good agreement of experimental and theoretical values of σ_t and σ_o for medium and heavy nuclei. The theoretical value of σ_o for light nuclei is too high. The optical model describes also the distribution of scattered neutrons. The dependence of the potential on the nucleon spin orientation leaves σ_s and σ_r practically unchanged, but it may essentially diminish the intensity of the scattered nucleons for angles $\sim\pi$. Incident nucleons may be polarized in the direction $\vec{\vartheta}$ by spin-orientation-dependent scattering. The polarization $P_{\vec{\vartheta}} = (J_+ - J_-)/(J_+ + J_-)$ is zero for $\vartheta = 0, \pi$. J_+ and J_- are the numbers of nucleons scattered through the angle ϑ, whose spin projections s_z upon the direction $\vec{\vartheta}$ have the values $\pm\frac{1}{2}$, respectively. The above-

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mentioned facts require a spin-orientation-dependent potential matrix $\hat{U}(\vec{r}) = U(r).1 + V_s(r).\hat{\vec{l}}\hat{\vec{s}}$, $\vec{s} = \vec{\sigma}/2$, where U(r) is the usual central potential. The optical model leads to correct absolute values of $P(\vartheta)$ and to the dependence of polarization on the scattering angle ϑ. Scattering of α-particles: The optical model with diffuse periphery is in good agreement with the experimental data concerning the scattering of α-particles. It describes almost exactly the details of angular distribution. The best agreement with experiments and the best constancy of the parameters was attained with the model with surface absorption. Scattering of deuterons: Nuclei are transparent for deuterons with an energy of 10 - 15 Mev. Table 11 gives the parameters of the optical potential for deuterons. The scattering of heavy ions may also be described in a satisfactory manner by the optical model. A good agreement between theory and experiment is also given by an optical model with volume absorption and with the following values of the optical potential: V_o = 48 Mev, W_o = 5.75 Mev; $r_o = 1.275 \cdot 10^{-13}$ cm, $a = 0.575 \cdot 10^{-13}$ cm. The application of the optical model to direct processes also appears

The optical model of nucleus...

interesting and promising. There are 29 figures, 11 tables, and 23 references: 6 Soviet and 17 non-Soviet. The three most recent references to English-language publications read as follows: L. Rosen, Proc. of the Intern. Conference on Nucl. Structure, Kingston, Canada, 1960, p. 185; H. L. Reynolds, E. Goldberg, D. D. Kerlee, Phys. Rev. 119, 2009 (1960); R. H. Bassel, R. M. Drisko, Proc. of the Intern. Conference on Nucl. Structure, Kingston, Canada, 1960, p. 212.

Table 11. Parameters of the optical potential for deuterons.

Legend: (1) deuteron energy (Mev), (2) element, (3) Mev, (4) Fermi.

1 Энергия дейтрона (Мэв)	2 Элемент	3 V_0 (Мэв)	3 W_0 (Мэв)	4 r_0 (Ферми)	4 a (Ферми)
13,5	Ni	59	19	1,43	0,63
	Sn	60	10,5	1,60	0,62
	Au	50	9	1,50	0,66
	Al	55	25	1,50	0,60
	Ti	59	21	1,50	0,60
	Rh	52	12	1,62	0,60
15	Sn	55	11	1,60	0,58
	Pd	53	11	1,62	0,58
	Ta	48,5	9	1,55	0,53
	Au	50	9	1,55	0,66
	Pb	48,5	9	1,52	0,63

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LOKOV, G. A. and SHAPIRO, I. S.

"Radiative capture of π^- - Mesons in Hydrogen"

report presented at the Intl. Conference on High Energy Physics, Geneva, 4-11 July 1962

Institute of Theoretical and Experimental Physics, Moscow, USSR

SHAPIRO, I. S.

"Expansion of Scattering Amplitude in Relativistic Spherical Functions"

report presented at the Intl. Conference on High Energy Physics, Geneva, 4-11 July 1962

Inst. of Theoretical and Experimental Physics, Moscow, USSR

SAPIRO, I.S. [Shapiro, I.S.]

Nuclear optical model in the light of contemporary data. Analele mat 16 no.3:94-139 Jl-S '62.

S/056/62/043/003/050/063
B108/B102

AUTHOR: Shapiro, I. S.

TITLE: Vertex parts of the amplitudes of direct nuclear processes

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 3(9), 1962, 1068 - 1082

TEXT: The vertex parts previously introduced (ZhETF, 41, 1616, 1961; Nucl. Phys., 28, 244, 1961) are studied by using the optical model. The analytical properties of the vertex part as functions of the momentum transferred are investigated. The diffuseness of the edge of the potential well in the optical nuclear model leads to singularities in the vertex part. An essential singularity in the transferred momentum at infinity corresponds to the nuclear radius. The vertex parts are expressed in terms of the parameters of the optical model. The resulting formulas can be used for practical cases since the optical model is a good description of interaction between nuclei and nucleons or even more complex particles. There is 1 figure.

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Vertex parts of the...

S/056/62/043/003/050/063
B108/B102

ASSOCIATION: Institut teoreticheskoy i eksperimental'noy fiziki Akademii nauk SSSR (Institute of Theoretical and Experimental Physics of the Academy of Sciences USSR)

SUBMITTED: April 20, 1962

Card 2/2

S/056/62/043/005/026/058
B102/B104

AUTHOR: Shapiro, I. S.

TITLE: Expansion of scattering amplitude in relativistic spherical functions

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 5(11), 1962, 1727 - 1730

TEXT: The scattering of two spin-zero particles of equal mass $\varkappa$ is considered. From the dispersion relation with respect to the transfered momentum it follows that the invariant integral (1): $N = \int \left| \frac{U(t,s)}{(t-a)^n} \right|^2 \frac{d^3p}{\epsilon} < \infty$, ($a > 0$, $n \geq 0$) will converge. With $Z = p^o p/\varkappa^2$ it can be brought to the form

$$N = 4\pi\varkappa^2 \int_i^\infty |f(Z, s)|^2 \sqrt{Z^2 - 1}\, dZ, \qquad (1a)$$

$$f(Z, s) = U(t, s)/(t - a)^n. \qquad (3)$$

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Expansion of scattering...

where p^0 and p are the four-momenta of the incident and of the scattered particle, $\mathcal{E}$ is the energy of the latter. U(t,s) is the scattering amplitude in Mandelstam variables. Since $d^3p/\kappa^2\mathcal{E}$ is an element of the unit sphere, (1) can be considered as an integral over the surface of the four-dimensional sphere of a function of p. Thus the problem can be treated analogously to that of finding the expansion of the scattering amplitude in threedimensional spherical functions. In the present problem the operator $\hat{F} = \frac{1}{2} M_{\mu\nu} M_{\mu\nu}$ (angular four-momentum) will be the expansion quantity; $\mu,\nu=1,2,3,4$, $M_{\mu\nu} = -i(p_\mu \partial/\partial p_\nu - p_\nu \partial/\partial p_\mu)$. This expansion was already obtained in 1955 (I. S. Shapiro, DAN SSSR, 106, 647, 1956) by using the theory of Lorentz group representations. The pair j_1, j_2 of the usual irreducible Lorentz group representation is replaced by m,q where $m = 2(j_2-j_1)$ and $q=-2i(j_1+j_2+1)$. These numbers determine the eigenvalues of F and of the invariant pseudoscalar commutation operator $G = -i\varepsilon_{\mu\nu\lambda\sigma} M_{\mu\nu} M_{\lambda\sigma}$. $F = -\left[1 - (m^2-q^2)/4\right]$, $G = -mq$, where m is an integral

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and ϱ an arbitrary real number. For spin-zero particles $\hat{G} = 0$ and $m = 0$, so that

$$f(p, s) = \left(\frac{1}{4\pi}\right)^{1/2} \int_0^\infty C(\rho, s, n) \left(\frac{\varepsilon - pn}{\varkappa}\right)^{-1+i\rho/2} \rho^2 d\rho, \qquad (8a)$$

$$C(\rho, s; n) = \left(\frac{1}{4\pi}\right)^{1/2} \int f(p, s) \left(\frac{\varepsilon - pn}{\varkappa}\right)^{-1-i\rho/2} \frac{d^3p}{\varepsilon}. \qquad (8б)$$

$$\int |C|^2 \rho^2 d\rho \, d\omega_n = \int |f|^2 \frac{d^3p}{\varepsilon}. \qquad (9)$$

is obtained. After integration with respect to the solid-angle element $d\omega_n$, and considering the fact that $C(\varrho, s; \vec{n})$ does not depend on n, the functions $\phi(\chi, s)$ and $c(\varrho', s)$ are obtained. $\varrho' = \varrho/2$ are considered as relativistic invariants; so likewise are the particle amplitudes $c(\varrho', s)$. Eliminating s, these functions can be represented as

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$$\Phi(\chi, \varphi) = \frac{2}{\pi}\int_0^\infty\int_0^\infty c(\rho', \rho_1')\sin\chi\rho'\sin\varphi\rho_1' d\rho' d\rho_1', \tag{13a}$$

$$c(\rho', \rho_1') = \frac{2}{\pi}\int_0^\infty\int_0^\infty \Phi(\chi, \varphi)\sin\chi\rho'\sin\varphi\rho_1' d\chi d\varphi. \tag{13б}$$

$$\operatorname{ch}\varphi = Y = s/2\varkappa^2 - 1, \tag{14}$$

$$\Phi(\chi, \varphi) = \sqrt{Z^2-1}\ \sqrt{Y^2-1} f(Z, Y). \tag{15}$$

which solve the problem in this form. From

$$\int (Z_1 - \sqrt{Z_1^2-1}\,\mathbf{v}_1\mathbf{n})^{-1+i\rho/2}(Z_2 - \sqrt{Z_2^2-1}\,\mathbf{v}_2\mathbf{n})^{-1-i\rho/2} d\omega_n = \frac{8\pi}{\rho\sqrt{Z^2-1}}\sin\frac{1}{2}\rho\chi, \tag{16}$$

$$Z = Z_1Z_2 - \mathbf{v}_1\mathbf{v}_2\sqrt{Z_1^2-1}\sqrt{Z_2^2-1},\quad \mathbf{v}_1^2 = \mathbf{v}_2^2 = 1, \tag{16a}$$

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the unitarity condition

$$\mathrm{Im}\,C(\rho, s) = 32\varkappa^4 [\pi s (s - 4\varkappa^2)]^{-1/2} C(\rho, s) \frac{1}{\rho} \quad \frac{\eta\rho}{2} \times$$
$$\times \int_0^\infty C^*(\mu, s)\, \mu \sin \frac{\mu\eta}{2}\, d\mu. \qquad (17)$$

can be obtained for the two-particle intermediate state. $\eta = \ln\left\{\sqrt{\frac{s}{4\varkappa^2}} - \sqrt{\frac{s-4\varkappa^2}{4\varkappa^2}}\right\}$, $C(\rho,s)$ are particle amplitudes of the $U(s,t)$ matrix which is related with T_{ab} by $T_{ab} = (2\pi)^4 \frac{U_{ab}}{4\sqrt{\varepsilon_1\varepsilon_2\varepsilon_3\varepsilon_4}} \delta(p_a - p_b)$. From (17) $\mathrm{Im}C(\rho,s)/\mathrm{Re}C(\rho,s) = Q(s)$ follows.

ASSOCIATION: Institut teoreticheskoy i eksperimental'noy fiziki Akademii nauk SSSR (Institute of Theoretical and Experimental Physics of the Academy of Sciences USSR)

SUBMITTED: May 8, 1962
Card 5/5

S/056/62/043/005/035/058
B102/B104

AUTHORS: Lobov, G. A., Shapiro, I. S.

TITLE: Radiative capture of a μ^--meson by a proton

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 5(11), 1962, 1821 - 1825

TEXT: The contributions from induced pseudoscalar interaction to the radiative muon capture $\mu^- + p \rightarrow n + \nu + \gamma$ are investigated. In contradistinction to previous papers (Phys. Rev. 111, 354, 1958; 115, 694, 1959; Rev. Mod. Phys. 31, 797, 1959; 31, 802, 1959), all graphs (Figs. 1, 2) are taken into account. It can be shown that the contribution from the graphs of Fig. 2 is comparable with that from Fig. 1. The probability of radiative muon capture depends strongly on sign and magnitude of the pseudoscalar coupling constant g_p. Photonspectra due to the above graphs and photon circular polarization are calculated (Figs. 3, 4). The amount of circular polarization (β) is strongly affected by the presence of induced pseudoscalar interaction; change in sign of g_p changes β by a factor of 5. Taking account of the graphs 6 and 8 of Fig. 2 raises the probability of radiative

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Radiative capture of...

μ^--capture by almost 100%; change in sign of g_p reduces this probability from $\Lambda = 10.2 \cdot 10^{-2}$ sec^{-1} for $g_p = +8g_A$ to $\Lambda = 4.2 \cdot 10^{-2}$ sec^{-1} for $g_p = -8g_A$. The radiative μ^- capture due to induced pseudoscalar interaction and the processes $n + p \rightarrow \pi^- + p$ and $\pi^+ \rightarrow \mu^+ + \nu + \gamma$ are interrelated since the matrix element of the radiative capture in pole approximation can be expressed in terms of the form factors of the latter processes. There are 5 figures.

ASSOCIATION: Institut teoreticheskoy i eksperimental'noy fiziki Akademii nauk SSSR (Institute of Theoretical and Experimental Physics of the Academy of Sciences USSR)

SUBMITTED: June 1, 1962

Fig. 3. Spectra of the photons emitted in μ^- capture. A for graphs of Fig. 1 only, B - for all graphs with $g_p = +8g_A$, C - for all graphs with $g_p = -8g_A$.

Fig. 4. $\beta(x)$ for + (A) and - (B) sign of g_p; x is the photon energy in terms of its maximum energy.

S/056/62/043/005/035/058
B102/B104

Fig. 1

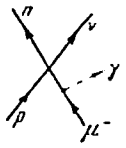


Fig. 2

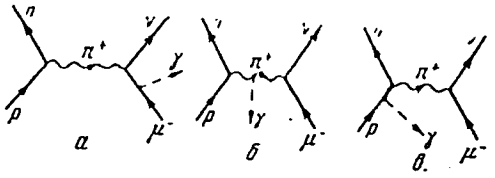


Fig. 3

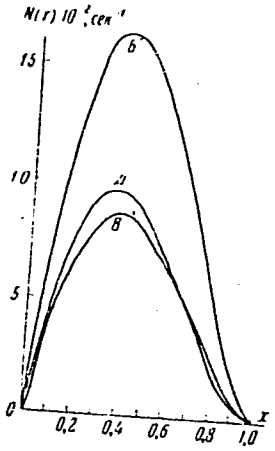
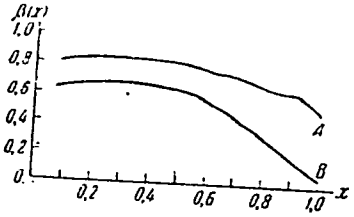


Fig. 4



Card 3/3

S/056/63/044/001/047/067
B102/B186

AUTHORS: Shapiro, I. S., Kolybasov, V. M.

TITLE: The mechanism of π^- capture by light nuclei

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 44, no. 1, 1963, 270-271

TEXT: N. V. Rabin et al. (Phys. Rev. Lett., in press) have shown that when π^- mesons are stopped and captured by light emulsion nuclei (C^{12} or O^{16}) a number of p, d, and t are emitted with E > 25 Mev. Since this energy is much greater than the nuclear temperature, such emissions must be due to direct processes, e.g. interaction of π^- with nucleon groups such as He^2, He^3 or α. On the basis of dispersion theory, using the pole graph formulas obtained by Shapiro (ZhETF, 41, 1616, 1961), the relative emission probabilities for p, d, and t on π^- capture are calculated for C^{12}. It is assumed that the above-mentioned nucleon groups are α-particles and that the reaction amplitude is constant. Besides the relative yields the energy spectrum of the particles emitted on π^- capture is calculated. The

The mechanism of π^- capture ...

results are in relatively good agreement with experimental data, i.e. π^- capture by nuclear α-particles can be considered the dominant mechanism. There are 2 figures.

SUBMITTED: July 26, 1962

Card 2/2

L 5043-66 EWT(d)/EWT(m)/T/EWA(m)-2 IJP(c)

ACCESSION NR: AT5022314 UR/3138/64/000/256/0001/0080

AUTHOR: Shapiro, I. S.; Mandel'tsveyg, V. B.

TITLE: Lie groups and the symmetry of elementary particles

SOURCE: USSR. Gosudarstvennyy komitet po ispol'zovaniyu atomnoy energii. Institut teoreticheskoy i eksperimental'noy fiziki. Doklady, no. 256, 1964. Gruppy Li i simmetriya elementarnykh chastits, 1-80

TOPIC TAGS: particle interaction, strong nuclear interaction

ABSTRACT: After a brief review of various parameters characterizing the strong interaction of elementary particles, the authors present an extensive mathematical analysis and formulate the possible symmetries on the basis of simple Lie groups. The first part of the article by I. S. Shapiro deals with the structural analysis of Lie groups while the second part by V. B. Mandel'tsveyg is devoted to the character of irreducible representations of a selected SU_3-group. In the first three chapters of Part I the basic designations and equations for a continuous matrix group are presented, the similarities, isomorphisms and homomorphisms are examined and the normal

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ACCESSION NR: AT5022314

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divisor or the invariant subgroup is defined. The elementary properties of Lie algebras are briefly summarized and three Lie theorems are derived in Chap. 4 and 5. In Chap. 6 and 7 the normal divisor and the structure constants for subgroups are discussed. Then an invarient semi-simple criterion is derived including the definition of the necessary and sufficient criterion conditions needed for a group semi-simplicity. The problem of commutation correlations is solved and a characteristic polynomial for the group with respect to X_0-matrice was presented in Chap. 8. The equation roots for a characteristic polynomial of semi-simple groups are analyzed in Chap. 9 while Chap. 10 is devoted to the derivation of equations for the semi-simple groups of the second class. It is stated that the simplest case of semi-simple group is the simple group. Namely, these simple groups are mainly used now for theoretical discussions of the strong interaction symmetries. The classification of simple groups is explained in Chap. II and the results are illustrated in

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two tables. Chap. 12 (the last of Part 1) deals with composing the root diagrams for the simple groups of the second class such as the SU_3, C_2, and G_2 groups. The first chapter of Part II determines the position of the SU_3 group among the simple groups of the second class. From the theoretical point of view this group seems to be the most attractive for a further discussion. In addition to strong interacting particles, this group also covers the weak and electromagnetic interaction symmetries. It survived experimental tests although it is yet too early to make definate conclusions in favor of the SU_3-group. In Chap. 2 the selection of tensors is discussed and the solutions of two theorems for various tensors are presented. Two versions are considered of which the first version considers only contravariant tensors while the second one deals with the tensors of a symmetrical type. These two versions are separately formulated in Chap. 3 and 4 including the irreducible representations of the SU_3-group, the isotopic concept of supermultiplets and the solution of three illustrative examples. The fifth chapter of Part II is devoted

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ACCESSION NR: AT5022314

to the deduction of the "mass formula" based on the article by S. Okubo (Prog. Theor. Phys. 28, 24 (1962)) and assisted by V. B. Berestetskiy, I. Yu. Kobzarev, L. B. Okun' and V. V. Sudakov. A gratitute is expressed by the author for their participation. Orig. art. has: 2 tables and 5 diagrams.

ASSOCIATION: none

SUBMITTED: 29May64 ENCL: 00 SUB CODE: NP, MA

NO REF SOV: 004 OTHER: 011

Card 4/4

SHAPIRO, I. S.; TIMASHEV, S. F., Moscow

"Direct reactions with two-nucleon transfer."

report submitted for Intl Conf on Low & Medium Energies Nuclear Physics, Paris, 2-8 Jul 64.

KUZNETSOV, B.G., prof.; [illegible], I.Ya., akademk; MOKODINSKIY, Ya.A., prof.; TAMM, I.Ye., akademik; SHIFRIN, I.S., prof.; CHERNOV, A.G.; FAYNBERG, I.B., red.

[Problems in the theory of elementary particles; fourth talk] Problemy teorii elementarnykh chastits, beseda chetvertaia. V besede uchastvuiut: B.G. Kuznetsov i dr. Moskva, Izd-vo "Znanie," 1964. 24 p. (Novoe v zhizni, nauke, tekhnike. IX Seriia: Fizika, matematika, astronomiia, no.20)

(MIRA 17:10)

L 15176-66 EWT(m)/T
ACC NR: AP6001151 SOURCE CODE: UR/0367/65/002/003/0445/0459

28
25
B

AUTHOR: Shapiro, I. S.; Timashev, S. F.

ORG: Institute of Theoretical and Experimental Physics, GKIAE (Institut teoreticheskoy i eksperimental'noy fiziki GKIAE)

TITLE: Direct reactions with two-nucleon transfers 19, 55

SOURCE: Yadernaya fizika, v. 2, no. 3, 1965, 445-459

TOPIC TAGS: nuclear reaction, nucleon, angular distribution, light nucleus

ABSTRACT: In direct reactions the number of amplitude characteristics which are close to each other increases with momentum transfers. In this connection it is interesting to determine whether such reactions can be described by a small number of Feynman plots. The test case selected is the angular distribution in reactions of the type (t, p) or (He^3, n) on light nuclei. The closest amplitude characteristics of these reactions are the branching points corresponding to the triangular diagram shown in Fig. 1. The calculation results and their comparison with some experimental data for the reactions (t, p) and (He^3, n) were recently

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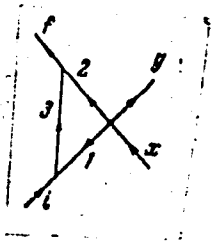

Fig. 1. Triangular diagram corresponding to the double stripping process.

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published by the present authors (Proc. of the Intern. Conf. on Nuclear Physics, Paris, 1964). This paper presents in detail a calculation method and examines experimental data not discussed in previous publications. The theory of the reactions (t, p) and (He^3, n) in this paper differs from the theory of H. C. Newns (Proc. Phys. Soc., 76, 489, 1960) in that it takes into account the non-zero relative orbital moments by the nucleons undergoing capture, and in the absence of free parameters. The results are in satisfactory agreement with the experimental data in the region of small momentum transfers. In conclusion authors express their gratitude to I. Ya. Baranova for great assistance in the numerical calculations, as well as to L. D. Blokhintsev and E. I. Dolinskiy for valuable comments. Orig. art. has: 10 figures and 72 formulas.

SUB CODE: 18/SUBM DATE: 23Mar65/ ORIG REF: 003/ OTH REF: 010

L 28864-66 EWP(k)/EWT(m)/T/EWP(v)/EWP(t)/ETI IJP(c) JD/HW

ACC NR: AP6011538 (N) SOURCE CODE: UR/0135/66/000/004/0031/0033

AUTHOR: Shapiro, I. S. (Candidate of technical sciences); Beyder, B. D. (Engineer); Lepp, V. R. (Engineer); Shubin, G. S. (Engineer); Samokhin, O. G. (Technician); Rozhnov, V. S. (Technician)

ORG: none

TITLE: Gas-electric arc cutting of aluminum alloys up to 250 mm thick

SOURCE: Svarochnoye proizvodstvo, no. 4, 1966, 31-33

TOPIC TAGS: metal cutting, metal cutting machine tool, gas cutting, cutting tool, rectilinear cutting machine, rectifier, metal plate cutting apparatus, flame cutting, aluminum alloy, electric arc, hydrogen / PPR-1 cutting tool, OPR-1 cutting tool

ABSTRACT: So far the maximum thickness of aluminum alloys cut industrially by the gas-electric arc method has been 70 mm. Further technical progress dictates the need to enlarge this maximum. In this connection, the authors investigated the possibility of cutting Al alloys up to 250 mm thick by the gas-electric arc method and developing efficient equipment and techniques for this purpose. AN IP-150/250M rectifier developed by the authors was used as the power source for the cutting arc and the cutting was performed with the aid of an PPR-1 semiautomatic rectilinear cutting machine.

Card 1/2 UDC: 621.791.945.55:669.715

L 28864-66

ACC NR: AP6011538

Slabs of the Al alloys AMg6 and D6 and avial-type alloys 70-250 mm thick were cut. A major factor in cutting metal plate is the so-called "piercing time" (time from the instant of ignition of the cutting arc until complete melting of the spot at which the arc is first applied): the shorter the piercing time is, the faster the cutting rate; this involves a certain (optimal) rate of hydrogen consumption for a specified thickness of metal. It was found that the optimal consumption of H_2 increases with increasing thickness of the metal being cut owing to the attendant increase in the length of the cutting arc and hence also in the amount of the hydrogen dissociated. Another factor to be considered is the optimal angle of approach of the electric arc to the line of planned cut and the subsequent rate of advance of the cutting head. Oscillographic studies of the change in cutting-arc voltage following contact with metal showed that then a linear increase in voltage takes place. This made it possible to develope a special servo system functionally -- through feedback -- relating the cutting rate to the arc voltage as based on the use of a cutting head powered by a DC motor whose armature is connected to a power system via an MU magnetic amplifier with self-magnetization and internal positive current feedback, which adjusts the motor RPM to an extent corresponding to the required rate of advance of the cutting head as function of the operation performed at the moment (no load, ignition, approach to planned line of cut, actual cutting). On this basis the OPR-1 plate-metal cutting apparatus for rectilinear as well as profile cutting has been developed; it is equipped with a special extensible panel for remote control of the operations if desired. Orig. art. has: 5 figures, 1 table.

SUB CODE: 11, 13/ SUBM DATE: none/ ORIG REF: 003

Card 2/2 UDC

135-12-11/17

AUTHOR: Vasil'yev, K.V., Candidate of Technical Sciences, and Shapiro, I.S., Engineer

TITLE: Oxygen-arc Cutting with the Use of Steel Bar Electrodes (Kislorodno-dugovaya rezka s ispol'zovaniyem stal'nykh sterzhnevykh elektrodov)

PERIODICAL: Svarochnoye Proizvodstvo, 1957, # 12, p 33-36 (USSR)

ABSTRACT: A new method and a device for manual cutting structural steel are described, which were investigated and devised by the authors at VNIIAvtogen in 1956. The oxygen-arc cutter "РГД-1-56" (Figure 4) is designed as a fixture attachable to any conventional electrode holder and requires nothing but the conventional steel electrode bars and welding equipment in addition to an oxygen container with hose. The entire device is diagrammed in Figure 5. Cutting operation parameters and electrode coating are recommended. The method eliminates the drawbacks of the known methods of manual cutting construction steel (Ref. 1 through 7 and work of K.P. Voshchanov and Ya.D. Rinskiy of the Moscow Welding Technicum in 1938). Calculation shows that mechanized oxygen-arc cutting would cost about half as much as

Card 1/2

Shapiro, I. S.

25(1) PHASE I BOOK EXPLOITATION SOV/2914

Vasil'yev, Kirill Vasil'yevich, and Il'ya Samoylovich Shapiro

Dugovaya elektricheskaya rezka metallov (Electric-arc Cutting of Metals) Moscow, Trudrezervizdat, 1958. 66 p. (Series: Novaya tekhnika i peredovyye metody truda) 10,000 copies printed.

Scientific Ed.: V.S. Chernyak; Ed.: L.P. Sitnikov; Tech. Ed.: Yu. N. Gorokhov.

PURPOSE: This booklet is intended for teachers and foremen of labor-reserve schools. It may also be useful for technical personnel and skilled workers in industry and construction.

COVERAGE: This booklet contains information on arc cutting of metals and the equipment used. Four methods of cutting metal are described: electric-arc, arc-air blast, shielded-arc, and oxygen-arc. No personalities are mentioned. There are no references.

Card 1/3

AVAILABLE: Library of Congress (TK4660.5.V3)

Card 3/3

GO/gmp
1-18-60

SOV/137-59-3-5876

Translation from: Referativnyy zhurnal. Metallurgiya, 1959, Nr 3, p 133 (USSR)

AUTHORS: Vasil'yev, K. V., Shapiro, I. S.

TITLE: A Mechanized Gas-arc Method of Cutting of Light Metals and Alloys (Mekhanizirovannaya gazodugovaya rezka legkikh metallov i splavov)

PERIODICAL: Opyt raboty prom. Sovnarkhoza (Sovnarkhoz Mosk. gor.-ekon. adm. r-na), 1958, Nr 2, pp 27-30

ABSTRACT: Technology and apparatus permitting mechanization of operations of gas-arc cutting of light metals and alloys were developed by the VNIIAvtogen: The procedure involves melting of the metal to a considerable depth with the aid of a concentrated arc discharge occurring between a tungsten electrode and the component being cut, followed by blowing out of the molten metal with a jet of gas ($Ar+H_2$) which does not react with either the electrode or the article. The stream of gas also protects the edges of the cut against oxidation and concentrates the arc discharge; at the same time the dissociation of the H_2 introduces an additional quantity of heat into the lower portion of the cut. Optimal results were obtained with a mixture consisting of 65% Ar and 35% H_2. The cutting arc is excited by an auxiliary arc produced with

APPROVED FOR RELEASE: 08/09/2001 CIA-RDP86-00513R001548320008-0"

A Mechanized Gas-arc Method of Cutting of Light Metals and Alloys

the aid of a HF stabilized electric-arc generator. The speed of cutting of Al at a current of 400 a varies from 8 m/min, at a thickness of 6 mm, to 0.5 m/min, at a thickness of 30 mm; the consumption of gas varies from 25 to 34 liters/min; the surface of the cut is covered with notches, which are inclined at an angle of 24-30° with respect to a line perpendicular to the upper edge of the cut, and exhibits a finish comparable to that obtained by mechanical means. The cut on the upper side of a 12 mm thick Al plate is 5 mm wide; in the case of a 20 mm thick plate it is 8 mm wide; the width of the cut on the lower side is in both instances equal to the diameter of the outlet opening of the nozzle (3 and 4 mm). The KDR-1-57 type device for mechanized cutting of light metals is composed of a blowpipe mounted on an adjustable holder, a control panel, and an automatic regulation unit. The adjustable holder permits cutting at various angles up to 40°. A PS-500 welding generator converted to supply 100 volts under open-circuit conditions may be employed The gas employed in cutting operations is stored in two cylinders from which it is supplied to the welding apparatus through two pressure regulator-metering units of the DZR-1-57 type.

V. S.

SOV-135-58-2-6/18

AUTHORS: Vasil'yev, K.V., Candidate of Technical Sciences, and Shapiro, I.S., Engineer

TITLE: Air-Arc Cutting of Metals (Vozdushno-dugovaya rezka metallov)

PERIODICAL: Svarochnoye proizvodstvo, 1958, Nr 2, pp 22 - 25 (USSR)

ABSTRACT: The article contains general information on the air-arc cutting method as well as technological recommendations. Information includes detailed description and operation proceedures for the "RVD-1-57" cutting torch, designed by VNIIAvtogen; the new torch design ensures stable cutting process without breakdowns and simplifies adjustment of the electrode work length. There are 5 graphs, 2 tables, 3 photos, 1 diagram and 5 references, 3 of which are Soviet, 1 English and 1 French.

ASSOCIATION: VNIIAVTogen

Card 1/1 1. Cutting torches--Design

APPROVED FOR RELEASE: 08/09/2001 CIA-RDP86-00513R001548320008-0"

SAPIRO, I.S., inzh.

Using combined guides for oxygen cutting. Svar. proizv. no. 7:38-39 '58. (MIRA 11:7)

1. Zavod imeni 15-letiya Leninskogo kommunisticheskogo soyuza molodezhi Ukrainy.
(Gas welding and cutting--Equipment and supplies)

135-58-8-19/20

AUTHOR: Strel'tsova, Ye. M., Head of the Technical Information Section

TITLE: The Sverdlovsk Regional Conference on Gas-Flame Metal Working and Electric-Gas Processes (Sverdlovskoye oblastnoye soveshchaniye po gazoplamennoy obrabotke metallov i elektrogazovym protsessam)

PERIODICAL: Svarochnoye proizvodstvo, 1958, Nr 8, pp 46 - 47 (USSR)

ABSTRACT: A regional Conference on work done in the field of gas-flame metal working and electric-gas processes was convened at Sverdlovsk from May 14 - 16 by VNIIAvtogen, together with the welding section of the Sverdlovsk NTO section of Mashprom, the Ural House of Engineering and the Technical Administration of the Sverdlovsk sovnarkhoz. About 200 representatives from Sverdlovsk enterprises and other Ural and Siberian sovnarkhozes were present. The Conference was opened by S. I. Likhaylov, Candidate of Technical Sciences, with an introductory report on problems relating to the improvement of gas-flame working of metals and new efficient processes connected with industrial reorganization. The Conference then heard the following reports: I.A. Antonov, Candidate of Technical Sciences, on the state of gas-flame working in the USSR and

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abroad; S. G. Guzov, Engineer, on new machines and equipment for oxygen cutting; I. V. Speshkov, engineer, on the application of gas-flame metal working at Uralmashzavod; I. S. Shapiro, engineer, on new methods of metal cutting; Yu. A. Maslov, engineer, on air-arc metal cutting; G. V. Chepushtanov, engineer, on work done in the field of gas-flame metal working at Uralkhimmashzavod; V. K. Deykun, engineer, on a "UGV" device for hardening small-module gears; G. V. Proskuryakov on manual and machine oxygen cutting; G. A. Asinovskaya, engineer, on automation of gas-flux welding; B. V. Konopka, engineer, on oxygen-flux and oxygen-sand cutting; Ye. V. Antoshin, engineer, on plastic, ceramic and metal coating; V. V. Bykov, chief

The Sverdlovsk Regional Conference on Gas-Flame Metal Working and Electric-Gas Processes SOV-135-58-8-19/20

technologist, on new equipment produced by the first Moscow Autogenous Plant; V. Ye. Kuryshev on new generator and kerosene-cutter designs. The Conference decided to take measures to develop gas-flame metal working.

ASSOCIATION: VNIIAvtogen

1. Welding--Conference

Card 3/3

SOV-117-58-9-11/22

AUTHORS: Shapiro, I.S., Engineer, Patsulo, R.V.

TITLE: Air-Arc Cutting of Metals (Vozdushno-dugovaya rezka metallov)

PERIODICAL: Mashinostroitel', 1958, Nr 9, pp 27-28 (USSR)

ABSTRACT: Air-arc method of cutting metals was developed in 1957 at the All-Union Scientific Research Institute of Autogenous Working of Metals and can be used for surface machining of almost all metals and alloys and for cutting hard-oxidable metals up to a thickness of 25 mm. The new method is a combination of heating and melting with the aid of carbon or graphite electrodes and simultaneous blowing of the molten metal by a jet of compressed air. General information is presented on experiences gained with air-arc cutting at various machinebuilding plants, such as: Moskovskiy zavod "Kompressor" (Moscow "Kompressor" Plant), Avtozavod imeni Likhacheva (Automobile Plant imeni Likhachev), Penzenskiy zavod khimicheskogo mashinostroyeniya (Penza Machinebuilding Plant of Chemical Equipment); Stalin-

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gradskiy zavod imeni Petrova (Stalingrad Plant imeni Petrov); Kanonerskiy sudoremontnyy zavod v Leningrade (Kanonerskiy Plant of Ship Repair in Leningrad).

1. Cutting tools--Operation 2. Air--Applications 3. Electric arcs--Applications

AUTHOR: Shapiro, I.S., Engineer SOV-125-58-11-12/21

TITLE: The Technical and Economic Efficiency of Air-Arc Cutting (Tekhniko-ekonomicheskaya effektivnost' vozdushno-dugovoy rezki)

PERIODICAL: Svarochnoye proizvodstvo, 1958, Nr 11, pp 33-34 (USSR)

ABSTRACT: Information is presented on the effect of the basic technological parameters of air-arc cutting on the technical and economic effects of air-arc and oxygen-flux cutting are compared. It is concluded that the efficiency of air-arc cutting depends on the intensity of current and that high economic effects can be obtained at the maximum current intensities. In cutting 20 mm thick stainless steel, air-arc cutting proved to be more economical than oxygen flux cutting, and a reduced metal thickness increases the relative efficiency of the process. The electrode diameter has no considerable influence in surface cutting but is an important

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The Technical and Economic Efficiency of Air-Arc Cutting

factor in separation cutting, where the efficiency increases with reduced electrode diameters. There are 4 tables and 3 graphs.

ASSOCIATION: VNIITAvtogen

1. Stainless steel—Processing 2. Cutting torches—Electrodes 3. Electrodes—Performance 4. Oxygen—Performance

SOV/130-58-11-14/16

AUTHOR: Shapiro, I.S.

TITLE: Ivan Pavlovich Bardin

PERIODICAL: Metallurg, 1958, Nr 11, pp 42-43 (USSR)

ABSTRACT: This is a biographical sketch, on the occasion of his 75th birthday, of academician I.P. Bardin, Vice President of the AN SSSR (AS USSR) and director of the Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii (Central scientific research institute for ferrous metallurgy) and the Institut metallurgii Akademii nauk SSSR (Institute of Metallurgy, Academy of Sciences of the USSR) and the President of the Ural'skiy filial (Ural Branch) of the Academy of Sciences of the USSR. He holds seven Orden Lenina (Order of Lenin), the title of Geroy Sotsialisticheskogo Truda (Hero of Socialist Labor) and was in April of this year awarded a Lenin prize with others

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Ivan Pavlovich Bardin SOV/130-58-11-14/16

for the creation of a full-scale continuous casting machine.

There is 1 illustration

Card 2/2

VASIL'YEV, Kirill Vasil'yevich, kand. tekhn. nauk; SHAPIRO, Il'ya Samuilovich, inzh.; NEKRASOV, Yuriy Ivanovich; RAGAZINA, M.F., inzh., ved. red.; SHTERLING, S.Z., dots., red.; SOROKINA, T.M., tekhn. red.

[Oxygen-arc cutting of metals. Backfire localizing device for gas and petroleum cutting torches] Elektrokislorodnaia rezka metallov. Lokalizator obratnykh udarov v benzo-i kerosinorezakh. [By] IU.I.Nekrasov. Moskva, Filial Vses. in-ta nauchn. i tekhn. informatsii, 1958. 12 p. (Peredovoi nauchno-tekhnicheskii i proizvodstvennyi opyt. Tema 12. No.M-58-102/8) (MIRA 16:2)

(Gas welding and cutting)

VASIL'YEV, Kirill Vasil'yevich; SHAPIRO, Il'ya Samuilovich; SHTEYNTSAYG, Kalman Khaymovich; RAGAZINA, M.F., inzh., red. red.; SOROKINA, T.M., tekhn. red.

[Air-arc cutting of metals. P.A.Vachkov's method for the gas planing of steel]Vozdushno-dugovaia rezka metallov. Gazovaia strozhka stali po metodu P.A.Vachkova. Moskva, Filial Vses. in-ta nauchn. i tekhn. informatsii, 1958. 13 p. (Peredovoi nauchno-tekhnicheskii i proizvodstvennyy opyt. Tema 12. No.M-58-70/7) (MIRA 16:3)
(Electric metal cutting) (Gas welding and cutting)

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A006/A001

18.5200 also 2208

Translation from: Referativnyy zhurnal, Metallurgiya, 1960, No. 7, p. 179, # 15407

AUTHOR: Shapiro, I. S.

TITLE: Using Air-Arc Cutting for Stainless Steel Processing

PERIODICAL: Opyt raboty prom-sti Sovnarkhoza (Mosk. gor. ekon. adm. r-na), 1958, No. 12, pp. 15-17

TEXT: Information is given on a method of separating air-arc cutting where the metal is melted by heating with a d-c reverse polarity electric arc (carbon electrode) and removed by a compressed air jet (4-6 kg/cm^2). The advantages of air arc cutting over other methods are shown. A formula is given expressing the dependence of air arc cutting speed on the current intensity and the electrode diameter and data are presented on the consumption of specific electric power and carbon electrodes per 1 running meter of cut. The ПС-500 (PS-500) or ПАС-400 (PAS-400) welding transformers are used as current feed sources. The maximum current intensity recommended for a carbon electrode of 6 mm in diameter is 400 amps, and 500 amps for 8 mm diameter. The РВД-1 (RVD-1)

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A006/A001

Using Air-Arc Cutting for Stainless Steel Processing

blowpipe designed by VNIIAvtogen is used for air arc cutting. It is expedient to use separating air arc cutting of stainless steels in a thickness range of 20 - 25 mm. In individual cases (e. g. in cutting-off castings lost heads) air arc cutting may be used for 30 - 35 mm thickness, although the quality of the cut surface is lower in this case.

V. Ch.

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

25(1) SOV/135-59-5-12/21

AUTHOR: Shapiro, I.S., Engineer

TITLE: The Nitrogen-Arc Cutting of Stainless Steel

PERIODICAL: Svarochnoye proizvodstvo, 1959, Nr 5, pp 30-32 (USSR)

ABSTRACT: The article describes research carried out by VNIIAVTOGEN which showed that the use of nitrogen in gas-arc cutting with properly selected technological parameters makes it possible to produce cut edges without the metal flowing. The nitrogen used was technical nitrogen of the highest quality with an oxygen content not exceeding 1%. Nitrogen-arc cutting can be used for cutting stainless steel up to 50 mm thick. The cheapness of nitrogen makes this method the most economical of all. The optimum consumption of the gas decreases with an increase in the thickness of the steel. At a thickness of 24 mm it is 1000 liters per hour, and remains the same up to a thickness of 50 mm. The cutting productivity is also bound up with the size of the current of the cutting arc (Figure 3), according to the formula:

$$v_p = k_{np} I,$$

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The Nitrogen-Arc Cutting of Stainless Steel

where v_p = the cutting speed in mm/min
I_p = the current in amps
k_{np} = the coefficient of cutting, representing the length of the cut in mm produced by 1 amp of the cutting arc in 1 minute; this coefficient is valid for all thicknesses.

The nitrogen-arc method can also be used for package cutting of stainless steel (Table 2, Fig. 6) provided that the gap between the sheets does not exceed 0.5 mm. The cutting efficiency can be increased for thicknesses not less than 16-20 mm by the addition of hydrogen to the nitrogen. Gas-arc cutting of stainless steel is carried out by VT-10 or VT-15 wolfram electrodes of 3 mm diameter. In nitrogen cutting their consumption does not exceed 0.025-0.030 grams per min. at a current of about 300 amps. Cutting in nitrogen at currents up to 400 amps is carried out with a nozzle having a diameter of 4 mm. Greater currents require nozzles with

The Nitrogen-Arc Cutting of Stainless Steel

larger diameters. There are 5 graphs, 2 tables, 2 photos, and 5 references, 3 of which are British and 2 Soviet.

ASSOCIATION: VNIIAVTOGEN

SHAPIRO, Il'ya Samuilovich; SHASHKOV, A.N., kand.tekhn.nauk, red.; SOBOLEVA, G.N., red.izd-va; SMIRNOVA, G.V., tekhn.red.

[Air-arc cutting of metals] Vozdushno-dugovaia rezka metallov. Pod red. A.N.Shashkova. Moskva, Gos.nauchno-tekhn.izd-vo mashinostroit.lit-ry, 1960. 42 p. (Bibliotechka avtogenshchika, no.3). (MIRA 13:7)

(Electric metal cutting)

S/125/60/000/03/014/018
D042/D001

25(1)

AUTHOR: Shapiro, I.S.

TITLE: On the Possibility of Welding Metals with a Penetrating Arc

PERIODICAL: Avtomaticheskaya svarka, 1960, Nr 3, pp 82-84

ABSTRACT: The cutting of metal with a "penetrating arc" in shielding gas is now used for cutting metals that cannot be cut by oxygen, e.g. aluminum and stainless steel 40 to 50 mm thick. This method has been described in literature /References 1, 2, 3/. In the department of gas-electrical processes of the VNIIAVTOGEN the possibility of welding metals with a "penetrating arc" has been experimentally checked and proved for the first time. The experiments were conducted with a "UDR-2-58" apparatus for manual metal cutting with a "penetrating arc", only the nozzle was somewhat changed. The principle is illustrated in a diagram (Figure 1). The tungsten electrode is placed inside a water-cooled copper nozzle, through which passes the shield gas. The filler

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D042/D001

On the Possibility of Welding Metals with a Penetrating Arc

metal is fed by hand, and this process should be mechanized. Metal up to 30 mm thick was welded. The possibility of using argon and argon - hydrogen mixtures in welding stainless steel was checked. The addition to argon of about 5% H_2 considerably increases the welding efficiency. Figure 2 shows a weld made with a "penetrating arc" using "1Kh18N9T" stainless steel 20 mm thick. The welding speed has not decreased when compared with welding in shielding gas with a melting electrode. There is 1 diagram, 2 photographs, and 3 Soviet references.

Card 2/2

SHAPIRO, I.S.

Chernaya, Metallurgiya Sibiri (by) V. E. Popov (1) I. S. Shapiro. Moskva, Izd-Vo Akademii Nauk SSSR, 1960.
117 (1) P. Tables.
At head of title: Akademiya Nauk SSSR.
Bibliography: P. 117-(118)

SHAPIRO, I.S.

Gas-shielded electric welding of 12 mm. thick coper. Avtom. svar. 13 no.6:74-78 Je '60. (MIRA 13:7)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut avtogennoy obrabotki metallov.
(Copper—Welding) (Protective atmospheres)

SHAPIRO, I.S., inzh.

Coefficient of melted metal removal in air-arc cutting. Trudy VNIIAvtogen no.6:134-135 '60. (MIRA 13:8)
(Gas welding and cutting)
(Underwater welding and cutting)

VASIL'YEV, K.V., kand.tekhn.nauk; SHAPIRO, I.S., inzh.

Despription and characteristics of air-arc cutting. Svar. proizv. no.8:1-4 Ag '60; (MIRA 13:7)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut avtogennoy obrabotki metallov.
(Electric metal cutting)

VASIL'YEV, K.V., kand.tekh.nauk; SHAPIRO, I.S., inzh.

Conditions of air-arc cutting of steel. Svar.proizv. no.9:7-10 S '60. (MIRA 13:8)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut avtogennoy obrabotki metallov.
(Electric metal cutting)