IOFFE, B. G.

Why children get sick. Rabotnitsa 35 no.2:29 F '57. (MLRA 10:4)
(Children--Care and hygiene)

IOFFE, Blyuma Georgiyevna

[Care of the sick child] Ukhod za bol'nym rebenkom. Izd.2. Moskva, Medgiz, 1958. 21 p. (MIRA 13:5)
(CHILDREN--CARE AND HYGIENE) (PEDIATRIC NURSING)

IOFFE, B.G., inzh.

Welding in enterprises of the Stalino Economic Council.
Svar. proizv. no.10:41-42 O '61. (MIRA 14:9)
(Donetsk Province--Welding)

742. THE EFFECT OF RADIOTHERAPY OF THE DIENCEPHALO-HYPOPHYSEAL REGION ON THE EXCRETION OF 17-KETOSTEROIDS AND CORTICOSTEROIDS IN ITSENKO-CUSHING'S DISEASE (Russian text) - Ioffe B.I. and Zakharycheva A.A. All-Union Inst. of Exp. Endocrin., Moscow - PROBL.ENDOKR. 1956, 2/6 (12-19)

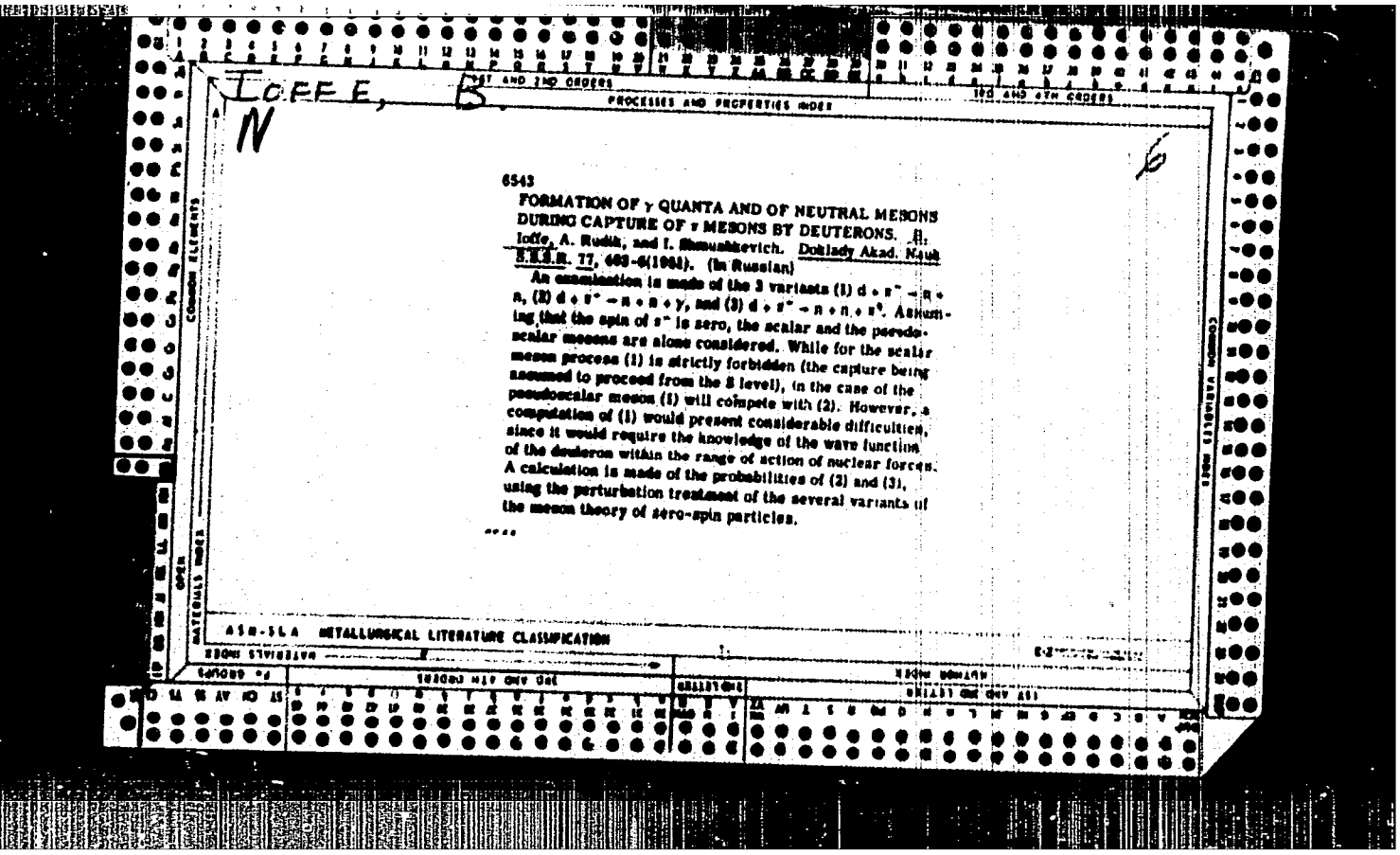
The effect of X-ray therapy of the diencephalo-hypophyseal region in Itsenko-Cushing's disease on the excretion of 17-ketosteroids and oxysteroids was investigated. In 8 out of 15 patients with a normal initial level of excretion of 17-ketosteroids, a dose of 800-2600 r. was followed by a reduction in the excretion of steroids. However, in patients with low excretion rates, the same dose led to an increase in the excretion of 17-ketosteroids. In 11 patients with an initially raised level of 17-ketosteroids, a reduction was observed after therapy, but subsequent investigation of this group 6-8 months later again revealed a high rate. The change in the excretion of oxysteroids was similar to that of the 17-ketosteroids. No connection could be demonstrated between the mechanism of excretion of the hormones and the therapeutic effect.

Dilman - Leningrad (5)

IOFFE, B.I.

Tables for determining the lag of drilling fluid in conducting gas logging in coal fields. Geofiz.razved. no.10:95-112 '62.
(MIRA 15:12)

(Drilling fluids)



IOFFE, B.

N

6543

FORMATION OF γ QUANTA AND OF NEUTRAL MESONS DURING CAPTURE OF π MESONS BY DEUTERONS. B. Ioffe, A. Rudik, and I. Shmushkevich. Doklady Akad. Nauk S.S.S.R. 77, 663-6(1951). (In Russian)

An examination is made of the 3 variants (1) $d + \pi^- \rightarrow n + n$, (2) $d + \pi^- \rightarrow n + n + \gamma$, and (3) $d + \pi^- \rightarrow n + n + \pi^0$. Assuming that the spin of π^- is zero, the scalar and the pseudoscalar mesons are alone considered. While for the scalar meson process (1) is strictly forbidden (the capture being assumed to proceed from the S level), in the case of the pseudoscalar meson (1) will compete with (2). However, a computation of (1) would present considerable difficulties, since it would require the knowledge of the wave function of the deuteron within the range of action of nuclear forces. A calculation is made of the probabilities of (2) and (3), using the perturbation treatment of the several variants of the meson theory of zero-spin particles.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

IOFFE, B. L.

USSR/Nuclear Physics - Mesons, Neutral Jan 52

"Formation of Gamma-Quanta and Neutral Mesons During Capture of "neg pi mesons" π^--Mesons by Deuterons. I," B. L. Ioffe, A. P. Rudik, I. M. Shmushkevich, Acad Sci USSR

"Zhur Eksper i Teoret Fiz" Vol XXII, No 1, pp 11-20

A brief exposition of results of present work was published in "Dok Akad Nauk SSSR" Vol LXXVII, 1951, 403. Calculates the probability of gamma-quanta formation during capture of π^--mesons by deuterons for various variations of the meson theory of particles with zero spin. Considers the capture of pseudoscalar mesons and the capture of scalar mesons. Submitted 22 Mar 51.

204T79

USSR/Nuclear Physics - Mesons, Neutral Jan 52

"Formation of Gamma-Quanta and Neutral Mesons During Capture of "neg pi-mesons" π^--Mesons by Deuterons. II," B. L. Ioffe, A. P. Rudik and I. M. Shmushkevich, Acad Sci USSR

"Zhur Eksper i Teoret Fiz" Vol XXII, No 1, pp 21-28

Calculate the probability of capture of π^--mesons by deuterons with the emission of neutral mesons. Computations are carried out for particles of different evenness with zero spin. Agreement with exptl data is obtained only in that case where π^-- and π^0 -mesons are pseudoscalar particles. Submitted 22 Mar 51.

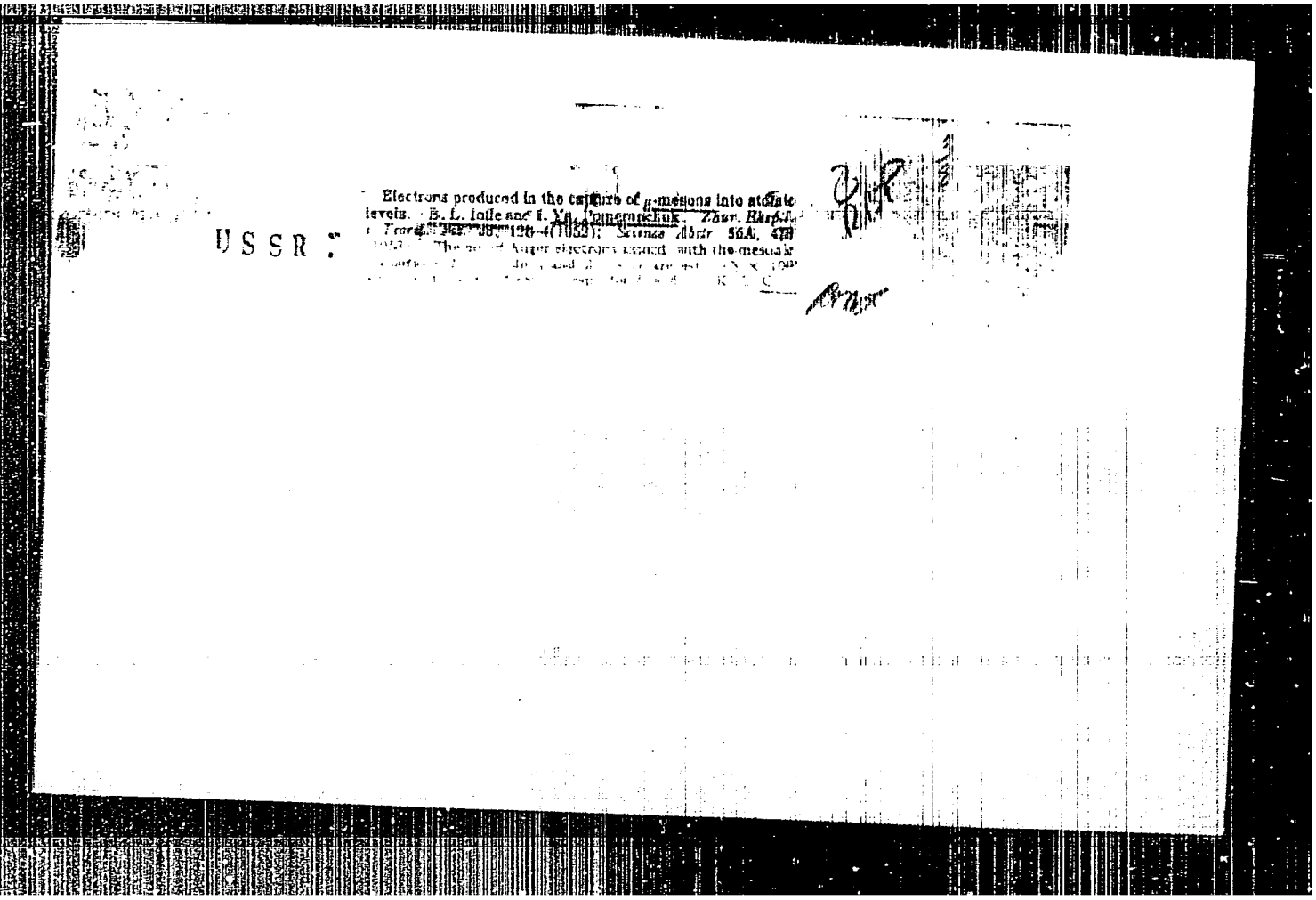
20WT60

USSR .

Interaction of π-mesons with nucleons. B. L. Ioffe and A. P. Rudik. *Zhur. Eksptl. i Teoret. Fiz.*, 22, 117-8(1952); *Science Abstr.* 56A, 333(1953).—Expll. orders of magnitude of cross sections for the photoproduction of charged π, capture of π⁻ by H, and scattering of 85-m.e.v. π⁻ by H (also the magnitude of the π⁰ lifetime ~10^{-16} sec.) could not be fitted in lowest order perturbation theory by using pseudoscalar mesons with only one kind of coupling, but suggest pseudoscalar coupling $g^2/\hbar c \sim 1$ and pseudovector $f^2/\hbar c \sim$ K. L. C.

(1)

62



USSR

Electrons produced in the capture of μ-mesons into atomic levels. B. L. Ioffe and I. Ya. Pomeranchuk. *Zhur. Eksp. i Teor. Fiz.* 28, 128-4(1953); *Science Abstr.* 56A, 478 (1953). The [illegible] Auger electrons accord with the measure

IOFFE, B.

USSR/Nuclear Physics - π -Mesons, Decay of — 21 Jan 52

"Decay of the π -Meson," B. Ioffe, A. Rudik

"Dok Ak Nauk SSSR" Vol LXXXII, No 3, pp 359, 360

Derives the ratio of complete probability of decay with emission of gamma-quantum and flight of π -meson less than given distance R to the probability of decay without expulsion of gamma-quantum as a function of the ratio of R to R_0, where R_0 is the flight distance of μ-meson during

211T85

the decay $\pi \to \mu + v$. From these one gets the following values for the consts: μ = 217 m_e, μ_π = 276 m_e and m = 0. Submitted by Acad L. D. Landau 29 Nov 51. Acknowledges the interest of Prof I. Ya. Pomeranchuk during discussion of subject problems.

(PA 56 no. 667: 5099 '53)

211T85

IOFFE, B. L.

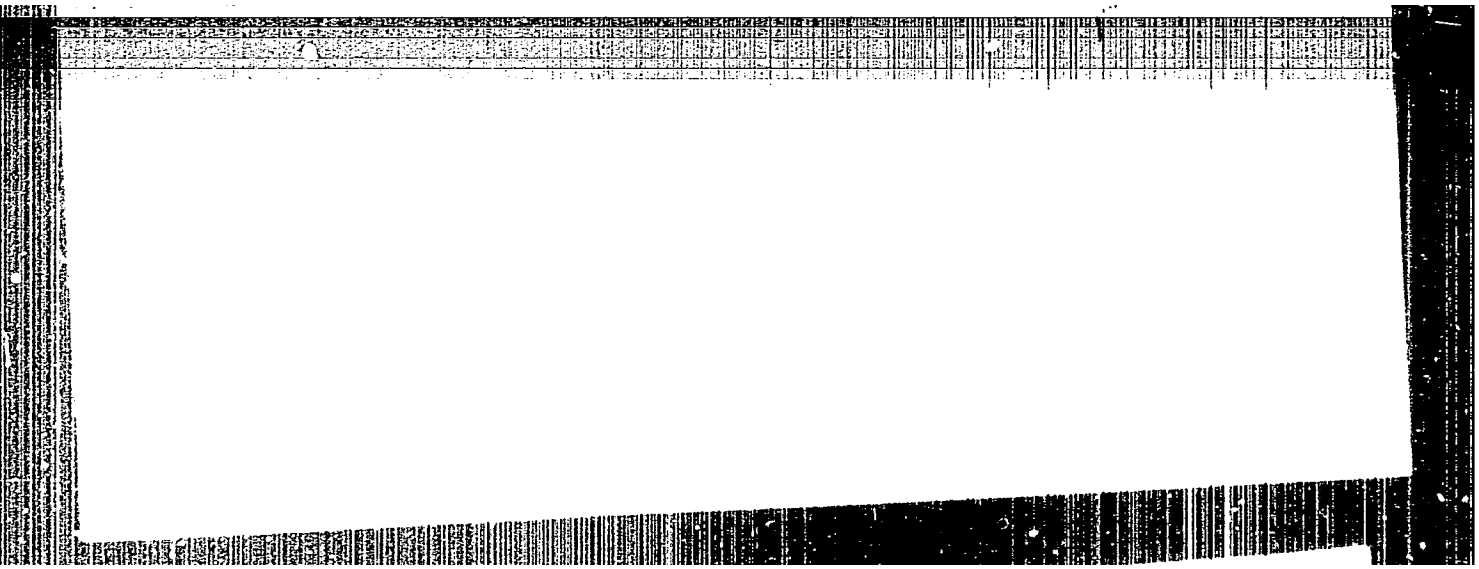
USSR/Nuclear Physics - Deuterium, Mesons 21 Feb 52

"The Formation of π-Mesons by Gamma-Rays on Deuteron," B. L. Ioffe, I. M. Shmushkevich

"Dok Ak Nauk SSSR" Vol LXXXII, No 6, pp 869-872

Acknowledges the interest and helpful discussion of Prof I. Ya. Pomeranchuk. Calculates the cross section of photo-production of charged mesons on deuteron by the 2 methods of perturbation and phenomenology. Submitted by Acad A. F. Ioffe 27 Dec 51.

(CA 47 no.15: 7341 '53)
(PA 56 no.667: 5100 '53)



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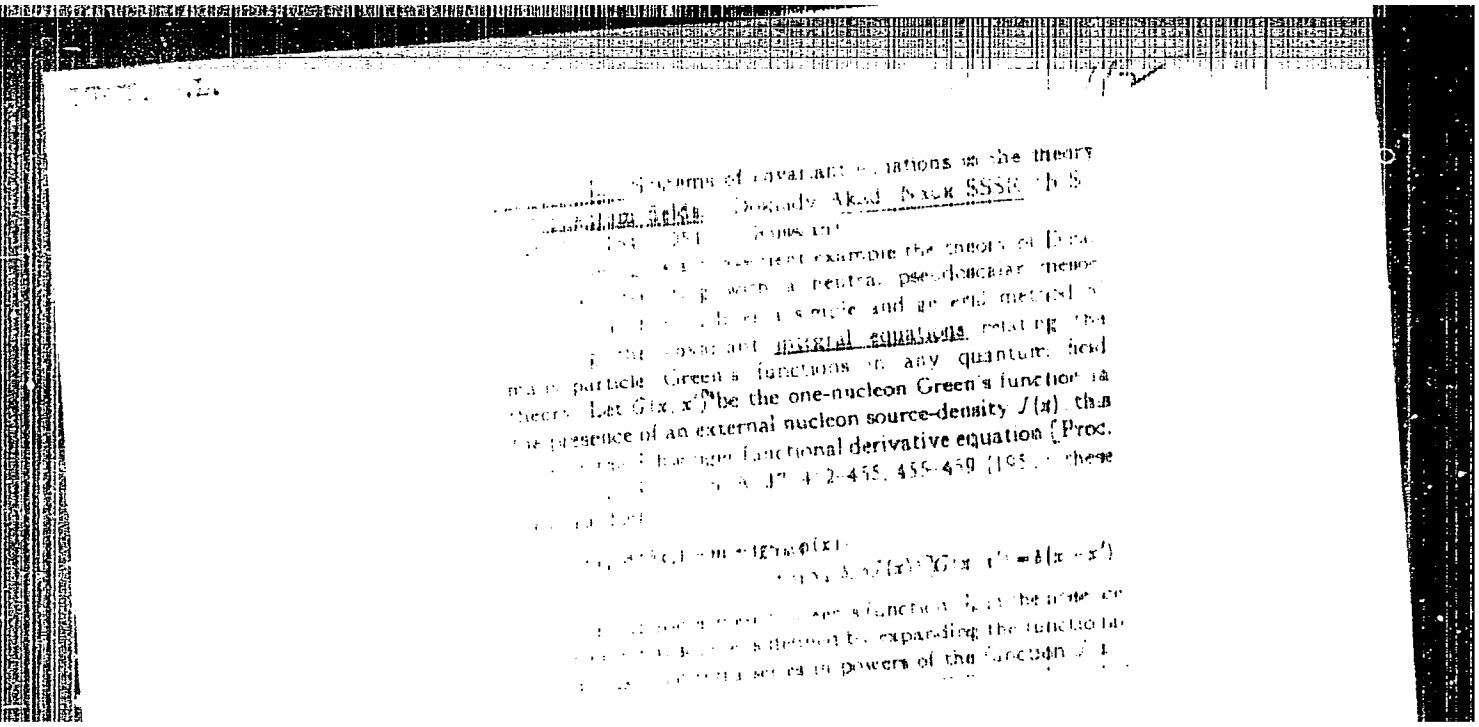
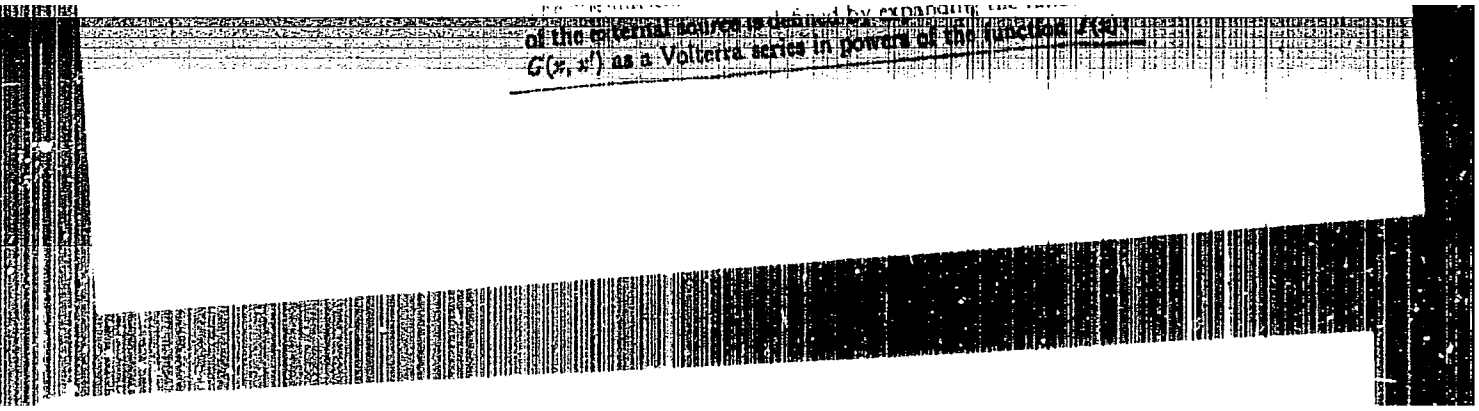
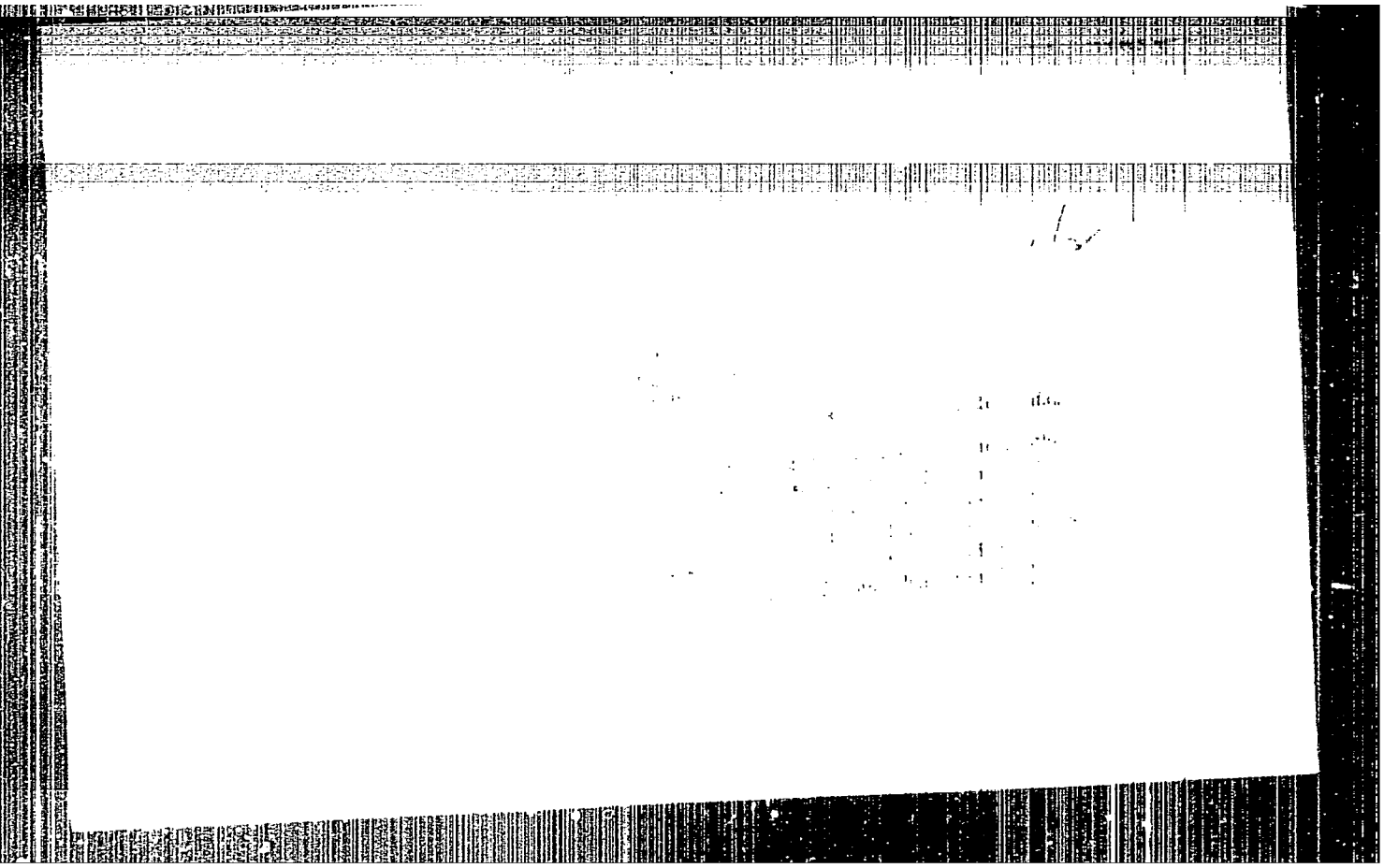






Ioffe, B. L.

USSR/Physics - Quantum theory

Card 1/1 Pub. 22 - 10/48

Authors : Galanin, A. D.; Ioffe, B. L.; and Pomeranchuk, I. Ya., Memb. Corresp. of AN.

Title : Re-standardization of mass and charge in covariant equations of quantum field theory

Periodical : Dok. AN SSSR 98/3, 361-364, Sep 21, 1954

Abstract : The purely physical arguments regarding the necessity of substituting fictitious mass and charge by experimental ones in the restandardization of mass and charge in covariant equations of quantum field theory, are analyzed. Such substitution was recommended regardless of the fact whether the mass and polarization operators are finite or infinite. An example of actual work on the restandardization of mass and charge in covariant equations is presented. Four references: 3-USA and 1-USSR (1949-1954).

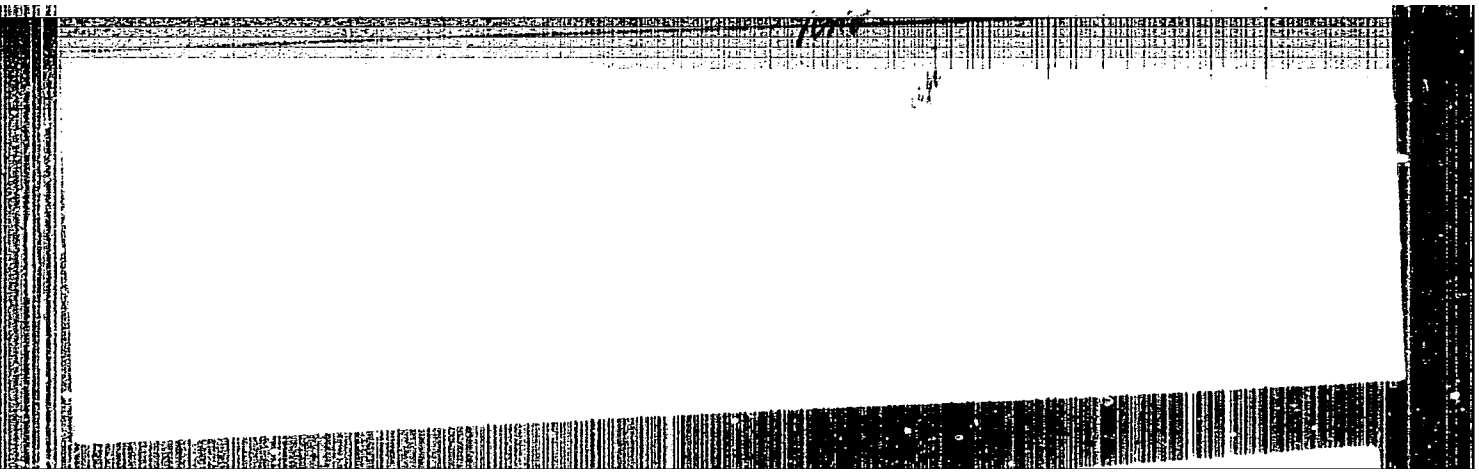
Institution : ...

Submitted : February 22, 1954

Ioffe, B.L.

✔ The asymptotics of the Green function of the nucleon and meson in the pseudoscalar theory at weak interaction.
62 A. D. Galanin, B. L. Ioffe, and I. Ya. Pomeranchuk. *Zhur. Eksptl. i Teoret. Fiz.* 28, 51-63(1955).—The asymptotics for $|p^2| \gg m^2$ is studied of the Green functions of nucleon and meson in the pseudoscalar (with scalar continuity) theory with small binding consts. The calculation starts out with the equation of Landau, *et al.* (*Doklady Akad. Nauk S.S.S.R.* 95, 497, 773, 1177; 96, 261(1954)). In contrast to the results by L., *et al.*, a renormalization of the mass is found, also of the charge, if one uses the method which was developed by G., *et al.* (*ibid.* 98, 301), and it is shown that this method removes all apparent infinity in the given problem. Werner Jacobson

(2)



APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618620014-3"

SUBJECT USSR / PHYSICS
AUTHOR IOFFE,B.L., OKUNJ,L.B.
TITLE On the Burning-Up of Fuel in Nuclear Reactors.
PERIODICAL Atomnaja Energija, 1, fasc. 4, 80-91 (1956)
Issued: 19.10.1956

The present work describes a method for the computation of this burning-up in consideration of the capture and the multiplication of neutrons in the course of the process of slowing down. In the course of computations the burning-up of U^{235} as well as the accumulation and the burning-up of Np^{239}, Pu^{239}, Pu^{240}, Pu^{241} and of the fission fragments (poisons) is taken into account. Here the change with respect to time of the reactivity of the reactor (dynamic of burning-up) in the case of the high burning-up of the fuel for systems of natural uranium with heavy water as a moderator is investigated. The work is arranged as follows: Multiplication during slowing down, the dynamic equations, changes of reactivity, computation of the burning-up of the fuel in reactors with natural uranium and heavy water as a moderator.

Summary: The numerical computation of the systems of natural uranium and heavy water as a moderator show that with a decrease of the reactivity of the reactor the accumulation of Pu^{240} as a result of the great resonance absorption by the level at 1,07 eV plays an important part. The duration of the operation increases considerably (compared with the case that the entire reactor is cleared out at one and the same time) if the reactor operates stead-

ily, i.e. if the channels are cleared out continuously and if at any time there are channels of any burn-up degree in the reactor. The channels must on this occasion be distributed evenly over the various burn-up degrees. By this the operation may be prolonged from 1,5 to double its length.
In the case of the here investigated reactors with uranium and heavy water burn-up degrees of from 3000 to 4000 megawatt per day/ton may be attained if operation is steady. If only the duration of the operation is intended to be increased, it is not allowed to use the lattice with the greatest probability of resonance capture corresponding to the given volume of the reactor. It is more advisable to leave a certain reserve in the multiplication coefficient. Hereby the performance of the reactor is, of course, reduced.
The parameters of the lattice (e.g. the cell spacing), which determine the amount of resonance absorption, must therefore be selected in consideration of two competing factors: prolongation of the duration of the operation (which, of course, entails a decrease of the quantity and a deterioration of the quality of the plutonium obtained on this occasion), and decrease of the performance of the reactor.
In an appendix the cross sections of the fissioned isotopes and the absorption in fission fragments is computed.

INSTITUTION:

IOFFE, B.L.

CARD 1 / 2 PA - 1888

SUBJECT USSR / PHYSICS
AUTHOR IOFFE, B.L.
TITLE The Dispersion Relations for Scattering and Photoproduction.
PERIODICAL Žurn.eksp.i teor.fis, 31, fasc.4, 583-595 (1956)
Issued: 1 / 1957

The present work investigates mathematically the dispersion relations for the scattering of pions by nucleons, the photoproduction of pions on nucleons, as well as the scattering of nucleons and antinucleons by nucleons and arrives at the following important conclusions: The here described method for the determination of dispersion relations is actually based upon the following assumption: signals cannot propagate with a velocity that is greater than that of light. All other points of view of the investigation were only of a secondary character and could, if desired, be replaced by other considerations which are not based upon the S-matrix in its present form. The following problem is therefore of considerable interest: Is it possible to demand that these conditions be satisfied for microscopic distances or is it possible to be content with macroscopic distances where such conditions without doubt hold good ? The present derivation furnishes several arguments in favor of the latter possibility. In this case it is actually assumed that the range of propagation of interaction is not limited by the cone of light, but that it reaches a little beyond it. The author assumes here (and this is important) that a condition that destroys causality is imposed upon an interval. Thus, the following expression would apply e.g. in the case of the scattering of pions by nucleons for the

Žurn.eksp.i teor.fis,31,fasc.4,582-595 (1956) CARD 2 / 2

amplitude of scattering in a forward direction:

$$f_{\pm}(\omega)/r = \int d\tau d \left\{ \int d\eta K_{\pm}(\tau,\varrho,\vec{r},t)\, e^{i\omega\tau - ik} \right\}$$

$$\varrho^2 - \tau^2 + l_0^2$$

In the model under investigation the disturbance of causality in a small domain does not disturb the entire course taken by the proof. However, a different choice can be made with respect to the condition that disturbs causality in that it is not imposed upon an interval. In this way it may generally be expected that then the dispersion relations no longer hold.
The following conclusion is thus arrived at: If the experimental data are in contradiction to the dispersion relations, this probably means that the signals propagate at short intervals with supersonic velocity. However, agreement with experimental data as regards dispersion relations therefore by no means excludes a disturbance of causality in the case of short distances. The extension of interaction is above all possible between two points which are located not within the cone of light but within a hyperboloid.

INSTITUTION:

IOFFE, B.L.

CARD 1 / 2 PA - 1695

SUBJECT USSR / PHYSICS
AUTHOR IOFFE,B.L., POMERANČUK,I.JA., RUDIK,A.P.
TITLE The Dispersion Relations for the Scattering of Pions by Deuterons.
PERIODICAL Žurn.eksp.i teor.fis,31,fasc.4,712-713 (1956)
Issued: 1 / 1957

The present work investigates the elastic scattering of pions by deuterons with the scattering angle 0. The dispersion relations which correspond to this process differ as follows from the dispersion relations for the scattering of pions by free nucleons: Firstly, the dispersion relations depend on the polarization of deuterons and secondly, only one single dispersion relation for the sum of the scattering amplitudes of positive and negative pions is obtained if COULOMB'S interaction is neglected.
Let the real- and imaginary parts of the amplitude of the scattering of pions with the energy ω by deuterons whose spin projection onto the direction of the motion of the pions is equal to m, be denoted by $D_m(\omega)$ and $A_m(\omega)$ respectively.

By using the connection between the real part of the amplitude of scattering into the angle 0 and the total cross section $A_m(\omega) = (k/4\pi)\sigma_m(\omega)$, (where $k^2=\omega^2-\mu^2$ applies and μ denotes the mass of the meson), the following equation is obtained by the ordinary method for the determination of dispersion relations:

$$D_m(\omega) - D_m(\mu) = (2k^2/\pi)\int_0^{\infty} \frac{\omega' A_m(\omega')\,d\omega'}{k'^2(\omega'^2-\omega^2)} + (k^2/2\pi^2)\int_0^{\infty} \frac{\omega'\sigma_m(\omega')\,d\omega'}{(\omega'^2-\omega^2)\,k'}$$

Žurn.eksp.i teor.fis,31,fasc.4,712-713 (1956) CARD 2 / 2 PA - 1895

For the determination of the contribution originating from the domain $0 \leq \omega' \leq \mu$ the following expression is used:

$$A_m(\omega') = \pi \sum_f |M_m(\omega', \vec{f})|^2 \delta\left[\omega' - \varepsilon_o - (k'^2/4M) - f^2/M\right].$$

Here $M_m(\omega', \vec{f})$ denotes that matrix element which corresponds to the capture of a pion by a deuteron in the state m with the production of two homogeneous nucleons and momentum f of the relative motion. This matrix element is explicitly written down; it differs essentially from zero only in the domain $f \sim k/2$. Also the HAMILTONIAN of the interaction between two nucleons, which is required here, is written down in a general form without taking tensor forces into account. The dispersion relations determined by means of this HAMILTONIAN for deuterons which are polarised parallel, antiparallel, and vertical to the inciding bundle are written down. They contain, apart from the constant g, certain effective values of the potential energy of the interaction between two nucleons in different states. It is from these effective values that the amount of the pole term for deuterons which are polarised vertical to the inciding bundle depends essentially.

INSTITUTION:

IOFFE B.L.

BERESTETSKIY, V.B., IOFFE, B.L., RUDICK, A.P., [illegible], K.A.
(Acad. Sci. USSR)

"Nonconservation of Parity in the -Decay."

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

Joffe B.L.

CZECHOSLOVAKIA/Nuclear Physics - Nuclear Power and Technology C-8

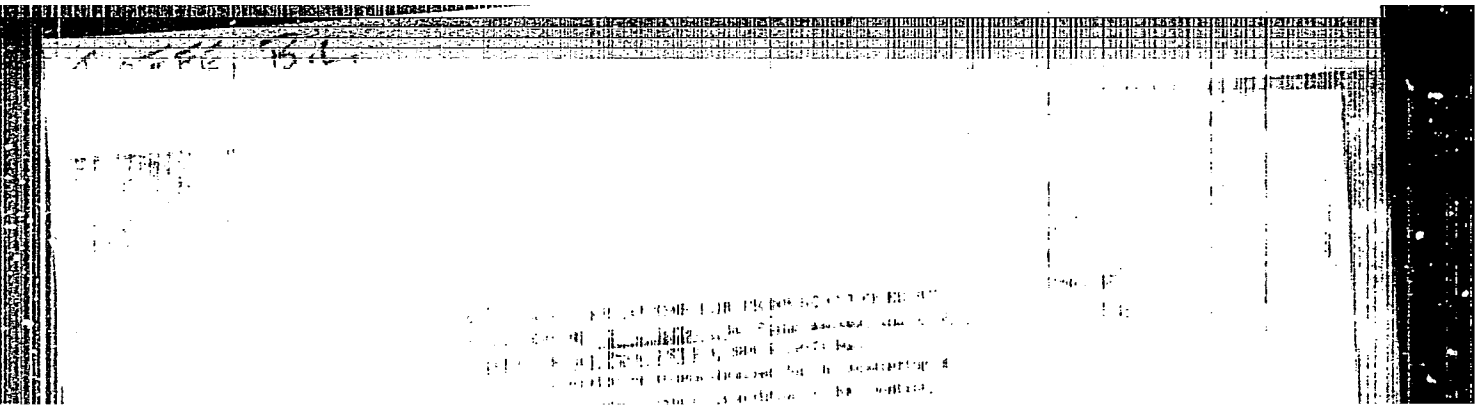
Abs Jour : Ref Zhur - Fizika, No 3, 1958, No 5589

Author : Joffe B.L., Okun, L.B.
Inst : Not Given
Title : On the Consumption of Fuel in Nuclear Reactors.

Orig Pub : Jaderna energie, 1957, 3, No 6, 168-177

Abstract : Translation from the Russian. See Referat Zhur Fizika, 1957, No 4, 16710.

Card : 1/1



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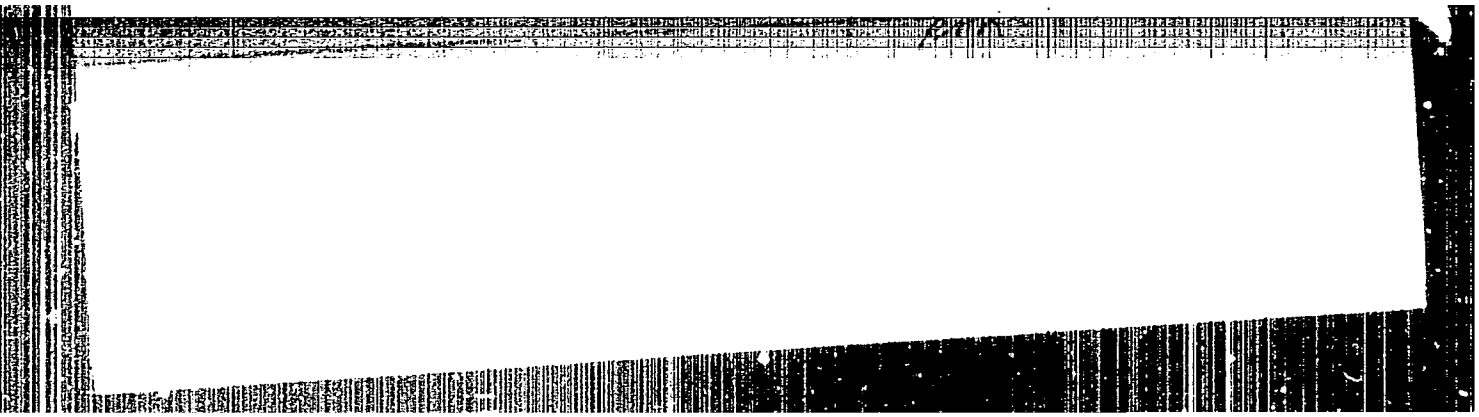

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618620014-3"

JOFFE, B.L. [Ioffe, B.L.]; OKUN, L.B. [Okun, L.B.]; BOHAL, L., inz. [translator]

Burning out of fuel in nuclear reactors. Jaderna energie 3 no.6:168-177 Je '57.

Ioffe, B.L

B-4

USSR/Theoretica Physics - Quantum Mechanics.

Abs Jour : Referat Zhur - Fizika, No 1, 1958, 182

Author : Ioffe, B.L., Okun', L.B., Rudih, A.P.
Inst :
Title : Concerning Nonconservation of Parity in Weak Interactions.

Orig Pub : Zh. eksperim. i teor. fiziki, 1957, 32, No 2, 396-397

Abstract : It is indicated that if invariance with respect to charge conjugation takes place in the case of weak interactions, then the effects noted by Lee and Yang (Referat Zhur Fizika, 1957, No 6, 16485), in which nonconservation of parity appears, vanish, since the corresponding pseudo-scalar terms vanish. By way of examples, the authors consider the decay of hyperons and the beta-decay of polarized nuclei and show that the invariant requirement with respect to the charged conjugation leads to a vanishing of all the effects connected with the nonconservation of parity. It is noted that experiments by Wu et al.

Card 1/2

B-4

USSR/Theoretical Physics - Quantum Mechanics.

Abs Jour : Ref Zhur - Fizika No 1, 1958, 182

(Referat Zhur Fizika, 1957, No 12, 29055) are evidence against the conservation of charge parity in weak interactions.

Card 2/2

Ioffe, B.L.

B-4

USSR/Theoretical Physics - Quantum Mechanics.

Abs Jour : Referat Zhur - Fizika, No 1, 1958, 181

IOFFE, B.L.

Capture of polaized μ^--mesons by nuclei. Zhur. eksp. i teor. fiz. 33 no.1:308-309 Jl '57. (MLRA 10:9)

(Mesons—Capture)

IOFFE, B. L.

56-7-64/66

AUTHOR IOFFE, B.L.

TITLE On the Capture of Polarized Negative Myons by Nuclei. (O zakhvate polyarizovannykh μ^--mezonov yadrami - Russian)

PERIODICAL Zhurnal Eksperim.i Teoret.Fiziki, 1957, Vol 33, Nr 7, pp 308-309 (USSR)

ABSTRACT The theoretical investigation of the capture of polarized negative myons is interesting because it is possible, when comparing theoretical with experimental results, to draw conclusions with respect to the character of the weak interaction of myons with the nucleons. The author here investigates the capture of a totally polarized myon by a nucleus. The Halmiltonian of interaction is here written down in form of a totality of all 5 varieties of the interaction: $H=(1/2)\sum_i g_i$ $(\overline{\Psi}_n O_i \Psi_p)$ $(\overline{\Psi}_\nu (1-\gamma_5) O_i \Psi_\mu)$ + herm.conj. (i= S,V,T,A,P) The neutrino is here considered to have two components. By taking the four varieties S,V,T and A into account it is possible to go over to nonrelativistic approximation with respect to the nucleons. The pseudoscalar variety vanishing in thenonrelativistical approximation furnishes a contribution only if the coupling constant g_p is much greater than the coupling constants of all other varieties. An expression for the matrix element, which is computed by using the above expression, is given. The share of this matrix element is then computed. The author here investigates the most frequent of all cases, i.e. that in which on the occasion of the capture of the negative

Card 1/2

On the Capture of Polarized Negative Myons by Nuclei. 56-7-64/66

myon one neutron and a recoil nucleus are created. The neutrons produced on the occasion of this capture (their momentum is inversely directioned to that of the neutrino) must mainly have the same (or opposite) direction to that of the spin of the myon. For the angular distribution the formulae $dW/d\Omega = 1 - \beta \cos\theta$, where θ denotes the angle between the direction of the emission of the neutron and the spin of the myon. In the case of the scalar, vectorial, and pseudovectorial varieties, $\beta=1$. In the case of the tensorial and axially vectorial variety the value of β can, in general, not be computed by means of the formulae given here. Experimental measuring of the angular distribution (with an energy in the upper part of the spectrum) On the occasion of the capture of polarized negative myons in light nuclei makes it possible to distinguish between the different variants of interaction between negative myons and nucleons.
(No illustrations)

ASSOCIATION Not Given.
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SUBMITTED 25.4.1957
AVAILABLE Library of Congress.
Card 2/2

60-6-18/59

AUTHOR IOFFE, B.L. and POMERANCHUK, I.Ya. Corresponding Member of the Academy of Sciences of the USSR

TITLE On the Possible Dipole Moment of the Transition at the Λ Particles. (O vozmoshnom dipolnom momente perekhoda u Λ -chastits - Russian)

PERIODICAL Doklady Akademii Nauk SSSR 1957, Vol 113, Nr 6, pp 1251-1254 (USSR)

ABSTRACT In order to clarify the existence of two different K-mesons with different parity and with almost identical masses, the following presupposition was made: There exist two kinds of K-mesons (θ and τ) and two kinds of hyperons (Λ_θ and Λ_τ, Σ_θ and Σ_τ), with all interactions (except the weak ones) being invariant with respect to the simultaneous exchange $\theta \to \tau$ and $\Lambda_\theta \to \Lambda_\tau$, $\Sigma_\theta \to \Sigma_\tau$. If this presupposition is valid, then the difference of the masses of Λ_θ and Λ_τ (which is caused only by the weak interactions) is extremely small (order of magnitude 10-6 eV). For exactly this reason, transitions $\Lambda_\theta \leftrightarrows \Lambda_\tau$ become possible under the influence of an

...change of

... a Λ-particle can lead to a

IOFFE,B.L.

"Homogenous Natural Uranium Reactor With Recycling of Plutonium Produced", (a paper to be presented at 1958 UN "Atoms-for-Peace" Conference, Geneva, Switzerland.).

BYAKOV, V. M. and IOFFE, B. L.

"Homogeneous Natural-Uranium Reactor with Recycling of Plutonium Produced."

paper to be presented at 2nd UN Intl.' Conf. on the peaceful uses of Atomic Energy, Geneva, 1 - 13 Sept 58.

Ioffe, B. L.

BERESTETSKIY, V. B., IOFFE, B. L., RUDIK, A. P. and TER-MARTIROSYAN, K. A.

(Acad. Sci. USSR)

" β-Decay and Non-Conservation of Parity," Nuclear Physics, Vol. 5, No. 3, Feb 1958 (No. Holland Publ. Co., Amsterdam)

Abst: Effects due to non-conservation of parity such as longitudinal and transverse polarization of β-electrons, angular distribution of β-electrons from an oriented nucleus (including the case when the direction of the recoil nucleus momentum is fixed) are examined in the present paper for the cases of allowed β-transitions and first order forbidden transitions. It is shown that owing to the influence of the Coulomb field the magnitude of these effects for forbidden transitions in heavy and intermediate nuclei is the same as for allowed transitions, perceptible deviations are observed in light nuclei ($Z \lesssim 20$). In the particular case of a 0-0 transition comparison with experiment may yield important data on the contribution of pseudoscalar coupling. Unique transitions ($\Delta j = 2$, yes) for which the electron angular distribution of oriented nuclei essentially differs from that for allowed transitions are considered separately.

AUTHORS: Ioffe, B. L., Lyubimov, V. A. SOV/56-34-5-10/61

TITLE: Conclusions From the Two-Component Electron Character in β-Interactions (O sledstviyakh iz dvukhkomponentnosti elektrona v β-vzaimodeystviyakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki 1958 Vol. 34, Nr 5, pp. 1321-1323 (USSR)

ABSTRACT: Most recent measurements (Refs 1 - 5) of the longitudinal polarization of electrons in the β-decay show that the amount of the longitudinal polarization $\langle \sigma_{\parallel} \rangle$ with good accuracy is equal to v/c in permitted transitions and of superforbidden transitions in heavy nuclei. As can be shown by a rigorous deduction from the formulae of a previous paper by F. B. Berestetskiy et al. (Ref 4) the necessary and sufficient condition for the equation $\langle \sigma_{\parallel} \rangle = v/c$ is the existence of the following relations between the interacting constants $C_S = -C'_S$, $C_T = -C'_T$, $C_A = C'_A$, $C_V = C'_V$. The Hamiltonian assumes the form $H = \sum_{\alpha} C_{\alpha} (\bar{\psi}_p O_{\alpha} \psi_n) (\psi_e (1 - \gamma_5) O_{\alpha} \psi_{\nu}) + \text{complex}$ conjugate and the ψ-function of the electrons is entered

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Conclusions From the Two-Component Electron Character in β-Interactions

into all variants of the β-interaction with only 2 components. The authors examine the deductions from the first given relationships, i.e. from the two-component character of the electron in the β-interactions. If the initially given relations are satisfied the terms for the various effects in the β-decay are considerably simplified. Thus only six independent combinations of the constants and of the matrix elements remain in the permitted processes. They are explicitly written down. The simplest experiment by which the amount of such a combination can be determined is the measurement of the angular distribution of the recoil nuclei which is found in experiments on the decay of oriented nuclei. In the latter case also the polarization of the recoil nucleus or the direction of the γ-quantum in the subsequent γ-transition is measured. The measurement of the polarization of the electrons (of the longitudinal and also of the transverse electron), in the case of oriented nuclei and in correlation with the neutrino, cannot furnish any new evidence compared to the experiments discussed above. For the determination of a complete information concerning the β-interaction in the permitted transitions it is sufficient to measure 4 of the

Conclusions From the Two-Component Electron Character in β-Interactions

6 expected quantities. There are 7 references, 2 of which are Soviet.

SUBMITTED: December 12, 1957

1. Electrons--Polarization 2. Beta decay 3. Electron transitions --Analysis

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SOV/56-34-5-53/61

AUTHOR: Ioffe, B. L.

TITLE: The Proof of the Absence of a Normalization of the Constant in the Vectorial Variant of the β-Interaction (O dokazatel'stve otsutstviya perenormirovki konstanty v vektornom variante β-vzaimodeystviya)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 5, pp. 1343 - 1345 (USSR)

ABSTRACT: Gell-Mann and Feynman (Ref 1) assume that the constant of the vectorial part of the β-decay-interaction is, because of the interaction of the mesons with the nucleons, not subjected to the normalization, if a direct interaction between the pions and the electron-neutrino field is introduced in such a way that the vectorial part of the Hamiltonian of the β-interaction between mesons and nucleons has the form

$$H = G_V \bar{\psi}\gamma_\mu \tau^+ \psi + 2i(\Phi^+ T^+ \nabla_\mu \Phi - (\nabla_\mu \Phi^+) T^+ \Phi) J_\mu + \text{hermite conjugate};$$

$J_\mu = (1/2)\psi_e \gamma_\mu (1 + \gamma_5)\psi_\nu$. The denotation is as follows:

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The Proof of the Absence of a Normalization of the Constant in the Vectorial Variant of the β-Interaction

$T^+ = (1/2)(T_x + iT_y)$ - the operators of the isotope spin;
$\vec{\varphi} = (\varphi, \varphi^0, \varphi^+)$ - the wave functions of the mesons. The relatio
$\tau^+ = (1/2)(\tau_x + i\tau_y)$ holds. This assertion by Gell-Mann and Feynman can be rigorously proved, if the following is assumed: If the aforementioned interaction holds, the total-Lagrangian of the nucleons and pions (with consideration of their interaction, but not considering the interaction with the electromagnetic field) permits the group of the infinitely small transformations

$\psi = [1 - i(\tau^+\chi + \tau\chi^*)]\psi'$; $\vec{\Xi} = [1 - 2i(T^+\chi + T\chi^*)]\vec{\Xi}'$;

$J_\mu = J'_\mu + \partial\gamma/\partial x_\mu$ by means of an infinitely small numerical function γ. Then a theorem can be proved which has its analog in the Ward (Uord) theories in quantum electrodynamics. The process of the proof is outlined. In the re-

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The Proof of the Absence of a Normalization of the Constant in the Vectorial Variant of the β-Interaction

presentation with respect to the momentum the relation $\Gamma^{+}_{\mu}(p, p; 0) = \tau^{+}\partial G^{-1}(p)/\partial p_{\mu}$ is obtained. If beside the pion-nucleon interactions also the interactions of the nucleons with the K-mesons and hyperons are considered then the above given group of transformations can also be extended to strange particles. There is 1 reference which is Soviet.

SUBMITTED: February 20, 1958

1. Beta decay--Mathematical analysis 2. Mesons--Properties 3. Neutrinos--Properties 4. Nuclei--Properties 5. Particles --Properties

AUTHORS: Vaks, V. G., Ioffe, B. L. SOV/56-35-1-30/59

TITLE: On the $\pi \to e + \nu + \gamma$ Decay ($O\pi \to e + \nu + \gamma$-raspade)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 35, Nr 1, pp. 221-227 (USSR)

ABSTRACT: Gell-Mann and Feynman (Ref 1) suggested a scheme of universal weak interaction in which the interaction of nucleons with the electron-neutrino field is described by means of vectorial and axially-vectorial variants. Proceeding from the Hamiltonian developed for this case by Gell-Mann and Feynman, the authors investigated $\pi^{\pm} \to e^{\pm} + \nu + \gamma$ decay. On the assumption that direct interaction exists between π-mesons and the electron-neutrino field in the vector theory, the ratio between the probability of decay of the process under investigation and the probability of $\pi^0 \to 2\gamma$-decay can be exactly defined. For the ratio between the total probability for the decay $\pi \to e + \nu + \gamma$ and that of $\pi \to \mu + \nu$ -decay 5.10^{-6} is obtained, for $W^{V}_{\mu+\nu+\gamma} \sim 5.10^{-10} W_{\mu+\nu}$, and $W^{V+A}_{\pi \to e+\nu+\gamma} / W_{\mu+\nu} \approx$

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On the $\overline{\mu} \rightarrow e + \nu + \gamma$ Decay

$\approx 6.10^{-8}$. Finally, expressions are derived for the angular- and energy distribution of electrons and quanta. In conclusion the authors thank I.Yu. Kobzarev and L.B. Okun' for their valuable discussions.
There are 2 figures, 1 table, and 8 references, 2 of which are Soviet.

SUBMITTED: February 20, 1958

Ioffe, B.L.

21(4) PHASE I BOOK EXPLOITATION SOV/2583

International Conference on the Peaceful Uses of Atomic Engergy. 2nd, Geneva, 1958.

Doklady sovetskikh uchenykh; yadernyye reaktory i yadernaya energetika. (Reports of Soviet Scientists; Nuclear Reactors and Nuclear Power) Moscow, Atomizdat, 1959. 707 p. (Series: Its: Trudy, vol. 2) Errata slip inserted. 8,000 copies printed.

General Eds.: N.A. Dollezhal, Corresponding Member, USSR Academy of Sciences, A.K. Krasin, Doctor of Physical and Mathematical Sciences, A.I. Leypunskiy, Member, Ukrainian SSR Academy of Sciences, I.I. Novikov, Corresponding Member, USSR Academy of Sciences, and V.S. Fursov, Doctor of Physical and Mathematical Sciences; Ed.: A.F. Alyab'yev; Tech. Ed.: Ye. I. Mazel'.

PURPOSE: This book is intended for scientists and engineers engaged in reactor designing, as well as for professors and students of higher technical schools where reactor design is taught.

COVERAGE: This is the second volume of a six-volume collection on the peaceful use of atomic energy. The six volumes contain the reports presented by Soviet scientists at the Second International Conference on Peaceful Uses of Atomic Energy, held from September 1 to 13, 1958 in Geneva. Volume 2 consists of three parts. The first is devoted to atomic power plants under construction in the Soviet Union; the second to experimental and research reactors, the experiments carried out on them, and the work to improve them; and the third, which is predominantly theoretical, to problems of nuclear reactor physics and construction engineering. Yu. I. Koryakin is the science editor of this volume. See SOV/2081 for titles of all volumes of the set. References appear at the end of the articles.

PART II. EXPERIMENTAL AND RESEARCH REACTORS

PART III. PHYSICS AND ENGINEERING OF REACTOR DESIGN

66546
SOV/30-59-7-3/50

~~21(0)~~ 24.6000

AUTHORS: Ioffe, B. L., Okun', L. B.

TITLE: Investigation of Elementary Particles (Issledovaniye elementarnykh chastits)

PERIODICAL: Vestnik Akademii nauk SSSR, 1959, Nr 7, pp 17-26 (USSR)

ABSTRACT: At present about 30 elementary particles are known (see Table) which can be divided into several classes. In the first class there is only one particle, the photon, the second group comprises the leptons: the neutrino, electron and μ-meson, the third group: the mesons (π and K), the fourth the baryons; nucleons (proton, neutron), and hyperons. The graviton may also be added to this list, although it has not been found experimentally, but its existence was predicted theoretically. All elementary particles show interactions which can be divided into three types: nuclear, electromagnetic, and weak interaction. At present there exists no logical theory describing all elementary particles and their interactions. Therefore only the general theorems of conservation of physics can be used for this purpose. This group of theorems is based upon the invariance theory of physical equations with respect to coordinate transformations. The other group of conservation

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theorems is connected with the coordinate reflection. One of the basic variations of the physics of elementary particles is the replacement of particles by antiparticles which not only differ in their charge signs from one another, but also in their nuclear properties. Elementary particles are classified on the basis of the following properties: mass, charge, spin, parity, parity with respect to time. A table shows a list of the elementary particles known at present as well as their properties. Among the three kinds of interaction, electromagnetic interaction is investigated best. Nuclear interaction is of decisive importance for mesons, baryons and antibaryons. A theory of nuclear interaction has not been developed up to now. The processes of weak interaction can be classified into three groups. To the first group those processes belong in which only leptons take part, to the second group processes in which leptons as well as baryons and mesons take part. The third group includes the slow processes in which leptons do not take part. This is the known decay of hyperons and K-mesons (see Table). At present the investigation of weak interactions is one of the essential problems of the physics of elementary particles. In recent time the investigation of

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Investigation of Elementary Particles SOV/30-59-7-3/50

elementary particles has been intensified. There is 1 table.

4

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SOV/56-37-1-25/64

21(7)

AUTHOR: Ioffe, B. L.

TITLE: On the Capture of μ^--Mesons by Light Nuclei (O zakhvate μ^--mezonov legkimi yadrami)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 1(7), pp 159-163 (USSR)

ABSTRACT: At present, there is every reason to assume that the interaction between muons and nucleons - similar to the β-decay - is described by the axial and vectorial variant. Under this assumption, the author investigates the capture of negative muons by light nuclei, in which the nuclei pass over to a certain excited level with no neutrons or protons escaping. If $\Delta j = 0 \pm 1$ (no) holds for the changes of the moment and of the parity of the nucleus, the theory of these processes will be in full analogy to the theory of the allowed transitions in the β-decay, the only difference being that the momentum of the escaping neutrino is in the order of magnitude m_μ (the mass of the muon) so that the corrections in the expansion into powers of R/λ (R = radius of the nucleus, λ = wavelength of the neutrino) and into v/c of the nucleons

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On the Capture of μ^--Mesons by Light Nuclei

will be very important. The author starts from the universal theory of weak interactions by Gell-Mann and Feynman (Ref 4), in which the β-current of the nucleons and pions is maintained, and the vectorial interaction is in full analogy to electrodynamics. According to Gell-Mann (Ref 3), this enables the corrections with respect to v/c of the nucleons, and with respect to $R/\lambda\!\!\!^{-}$ in the vectorial interaction, to be expressed by the characteristics of the nucleus in γ-transitions. For the matrix element of linear interaction, the following expressions hold with an accuracy up to the terms linear with respect to v/c:

$$G_v \int dV \psi_f^* \left\{ J_0 e^{-i\vec{q}\vec{r}} - \frac{\mu_v}{2M} \vec{\sigma} \left[\nabla \vec{J} e^{-i\vec{q}\vec{r}} \right] + \frac{i}{2M} \left(\nabla \vec{J} e^{-i\vec{q}\vec{r}} + \vec{J} e^{-i\vec{q}\vec{r}} \nabla \right) \right\} \tau \psi_i$$

$$J_0 = (1/2)\bar{\psi}_\nu \beta(1 + \gamma_5) \psi_\mu, \quad \vec{J} = (1/2)\bar{\psi}_\nu \beta\vec{\alpha}(1+\gamma_5) \psi_\mu.$$

ψ_i and ψ_f denote the initial and the final wave functions of the nucleus, $\vec{q}$ the neutrino moment, and M the nucleon mass. The first term in this expression is analogous to the electric

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On the Capture of μ^--Mesons by Light Nuclei

interaction with charge distribution in the nucleus, the second term to the interaction of the magnetic field with the spin $\mu\sigma\vec{H}$, the third term to the interaction of the electromagnetic field with the current. An expression for the matrix element of axial interaction is then derived. By means of the matrix elements mentioned hitherto, the total probability of μ^--capture, and the amount of longitudinal polarization of the nucleus in the capture of an unpolarized meson as well as the angular distribution and the polarization of the nucleus in the direction of the meson spin during the capture of a polarized meson can be calculated. Finally, the capture of negative muons in a C^{12}-nucleus is closely investigated. B^{12} is formed, which is then retransformed into C^{12} by β-decay. The author thanks A. I. Alikhanov and I. S. Shapiro for suggestions concerning the execution of the present paper, as well as V. B. Berestetskiy and L. B. Okun' for useful discussions. There are 12 references, 5 of which are Soviet.

ASSOCIATION: Institut teoreticheskoy i eksperimental'noy fiziki Akademii nauk SSSR

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SOV/56-37-1-25/64

On the Capture of μ^--Mesons by Light Nuclei

(Institute of Theoretical and Experimental Physics of the Academy of Sciences, USSR)

SUBMITTED: January 29, 1959

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24.6600, 16.8100, 16.7500

76982
SOV/56-37-6-22/55

AUTHORS: Galanin, A. D., Grashin, A. F., Ioffe, B. L., Pomeranchuk, I. Ya.

TITLE: Collision of Nucleons with Large Orbital Momenta

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 6, pp 1663-1679 (USSR)

ABSTRACT: A method of calculation was developed for that part of the nucleon-nucleon scattering amplitude for large orbital momenta $l \gg 1$ which is due to the exchange between two mesons. The connection between this amplitude and the scattering of real mesons by nucleons was established with the aid of the dispersion equations. The method is valid when, besides the condition $l \gg 1$, the inequality $l\mu/p \gg 1$ is also satisfied (here, μ is mass of π-meson; p is momentum of nucleon in the center mass system). The second assumption has a physical meaning: the quasi-classical parameter

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$r_0 = l\xi/\mu \gg 1/\mu$, i.e., it is the condition of the collision periphery. In words, the classification of interactions according to their "degree of periphery" with a small expansion parameter has meaning only when the above condition is satisfied. The main part of the asymptotic expansion parameter for the two-meson phases can be obtained by this method from the small parameter $1/L(l\xi)$, which at low energies ($\xi^2 \gg 1$) is $1/l$, and with an increase in the energy increases up to $1/l\xi$ (when $\xi^2 \ll 1$). The principle of the derivation was that under the above assumption of the virtual meson exchange between nucleons, the main role is played by mesons with physical relation between the energy and the momentum ($\omega^2 - k^2 = \mu^2$), but with nonphysical relation between energy $\omega = 0$ transferred by the momentum $q^2 = 4\mu^2$. Concrete examples of the calculation of two-meson phases and their comparision with the one-meson phases will be reported

Collision of Nucleons with Large Orbital Momenta

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SOV/56-37-6-22/55

by the authors in their forthcoming paper in this periodical. There are 4 graphs; and 23 references, 11 Soviet, 4 Italian, 1 British, 7 U.S. The 5 most recent U.S. and U.K. references are: S. Mandelstam, Phys. Rev., 112, 1344; 1958; R. Karplus, C. M. Sommerfield, E. H. Wichman, Phys. Rev., 114, 376, 1959; H. J. Bremermann, R. Oehme, J. G. Taylor, Phys. Rev., 109, 2178, 1958; K. Symanzik, Progr. Theor. Phys., 20; 690, 1958; M. L. Goldberger, Proc. of the Sixth. Ann. Rochester Conf., N. Y., 1956.

SUBMITTED: June 12, 1959

Card 3/3

16.8100, 24.6000, 16.8300

76993
SOV/56-37-6-33/55

AUTHOR: Ioffe, B. L.

TITLE: Analyticity and Unitarity in the Scattering of Scalar Mesons on a Static Nucleon

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 6, pp 1764-1769 (USSR)

ABSTRACT: Equations were derived for the determination of the scattering amplitude from the analyticity and unitarity conditions used in solving the problem of scattering of scalar neutral and charged mesons on a static nucleon in the one-meson approximation. The analysis was carried out by prescribing the analytic properties of the scattering amplitude over the complex Riemann multi-sheeted surface. Because of the statics of the nucleon, the contribution to the scattering amplitude of scalar mesons on nucleons is due only to S-wave. Therefore, the

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general expression for the amplitude of the scattering has the following form:

$$f(\omega) = (e^{2i\delta} - 1)/2ik,$$

where ω and k are energy and momentum of meson, respectively ($\hbar = c = 1$); $k = \sqrt{\omega^2 - \mu^2}$. In the one-meson approximation the scattering phase δ is real. The function $f(\omega)$ has two points of branching of the second order when $\omega = \mu$ and $\omega = -\mu$, so that the Riemann surface $f(\omega)$ consists of four sheets. Because of relativistic invariance (according to mesons), the expressions $\sqrt{\omega - \mu}$ and $\sqrt{\omega + \mu}$ cannot enter separately into $f(\omega)$, but only through the momentum k, i.e., in the combination

$\sqrt{\omega^2 - \mu^2}$. Therefore, the four sheets coincide in pairs, and the Riemann surface is reduced to two sheets. The first sheet was designated as the one in which the relation $\varphi = \arg\sqrt{\omega^2 - \mu^2}$ was within the limits $0 \leq \varphi \leq \pi$, and the second sheet, as the one in which $\pi \leq \varphi \leq 2\pi$. The unitarity condition occurs only for physical values of energy (i.e., ω is real, $\omega > \mu$, $\arg\sqrt{\omega^2 - \mu^2} = 0$). The condition can be described as follows:

$$\operatorname{Im} f_1(\omega) = k|f_1(\omega)|^2, \quad \omega = \omega + i0; \ \omega > \mu.$$

An analysis revealed that the nonuniqueness of the solution may be of the nature of virtual or the Breit-Wigner levels. K. A. Ter-Martirosyan, A. A. Logunov, and Yu. A. Gol'fand participated in the discussion of the subject. There are 6 references,

Analyticity and Unitarity in the Scattering of Scalar Mesons on a Static Nucleon

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SOV/56-37-6-33/55

2 Soviet, 4 U.S. The U.S. references are: M. Gell-Mann, Proc. of the Sixth Ann. Roch. Conf., 1956; S. Mandelstam, Phys. Rev., 112, 1344, 1958; L. Castillejro, R. Dalitz, F. Dyson, Phys. Rev., 101, 453, 1956; T. D. Lee, Phys. Rev., 95, 1329, 1954.

SUBMITTED: July 10, 1959

Card 4/4

IOFFE, B. L., Doc Phys-Math Sci (diss) -- "Problems in the theory of elementary particles". Moscow, 1960. 15 pp (Acad Sci USSR, Inst of Theoretical and Experimental Phys), 110 copies (KL, No 15, 1960, 131)

IOFFE, B. L.,

"Application Limit of Theory of Weak Interactions."

report submitted for the 10th Intl. Conf. on High Energy Physics, Rochester, N.Y., 25 Aug - 1 Sep 60

paper to be presented by A. P. Rudik

GALANIN, A.D.; GRASHIN, A.F.; IOFFE, B.L.; POMERANCHUK, I.Ya.

Nucleon-nucleon scattering in two-meson approximation with large orbital moments. Zhur.eksp.i teor.fiz. 38 no.2:475-488 F '60. (MIRA 14:5)

(Nucleons—Scattering)

83736

S/056/60/038/004/029/048
B006/B056

2445

AUTHOR: Ioffe, B. L.

TITLE: Renormalization in the Parity Non-conservation Theory

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 4, pp. 1263 - 1275

TEXT: Already several authors have dealt with questions relating to renormalization in connection with the non-conservation of parity, but, as the author of the present paper says in his introduction, this was done either with a lack of sufficient completeness or of correctness. Therefore, the present paper again deals with these problems, viz. in a form that is as general and as comprehensive as possible. In the case of non-conservation of parity, the free equations may have a form that deviates from the usual one. The author therefore (in part 1 of the paper) first investigates the properties of these free equations (the equations of motion of the free particles). In part 2 the renormalization technique (for the renormalization of mass, charge, and wave functions) is developed. As interaction with parity non-conservation, the interaction of a charged spin-zero boson with a fermion field is investigated. In the last part of the

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paper, the technique is applied to a concrete example, viz. for the purpose of calculating the asymptotic behavior of the Green function and the vertex parts with large p^2. The "three-Γ-approximation" equation is used for the vertex part. The results obtained are finally analyzed. A difficulty arises above all in putting the renormalized charge equal to zero: The renormalized Green function has a nonphysical singularity. In the following, the meaning of equation (3.12) is, above all, dealt with and several details are discussed. The author thanks I. Ya. Pomeranchuk, A. D. Galanin, and G. M. Gandel'man for discussions. L. D. Landau is mentioned. There are 15 references: 8 Soviet, 1 British, 3 Italian, and 3 US.

SUBMITTED: November 6, 1959

83604

S/056/60/038/005/037/050
B006/B063

24.6900

AUTHOR: Ioffe, B. L.

TITLE: The Range of Application of the Theory of Weak Interaction 19

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 5, pp. 1608-1614

TEXT: The question as to whether the type of four-fermion interaction in the theory of weak interaction is conserved at high energies and, if not, at which energies the type of interaction begins to deviate from that prevailing at weak energies, is to be answered primarily by way of experiment. An investigation of the energy dependence of the cross sections of weak processes must, if the type of interaction does not vary with growing energy, give $\sigma \sim g^2 E^2$ curves ($g \approx 10^{-5}/M^2$ is the weak interaction constant, M is the nucleon mass). Another possibility is an analysis of radiative losses for various effects observed at low energies. A consideration of the dimensions shows that the weak interaction at $E \sim 1/\sqrt{g} \sim 10^3$ Bev passes over into a strong interaction. When the radiative losses are calculated from the weak

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The Range of Application of the Theory of Weak Interaction

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B006/B063

interaction, integration after pulses can be carried out up to pulses $\Lambda \sim 1/\sqrt{g}$. Assuming that the weak interaction retains its form up to pulses Λ, the author estimates the upper limit of Λ by making use of experimental data. The following effects are particularly suitable for this purpose: the equality of the constants of the vectorial interaction in β- and μ-decays, the $\mu \to e + \gamma$ and $\mu \to 3e$ decay. The first effect is first analyzed and the correction of first order in $g\Lambda^2$ to the vertex part in the muon decay according to the graph of Fig. 1 is determined. No first-order correction to the vertex part results for a β-decay according to the graph of Fig. 2, and in the case of a muon decay there is only one if there exists one of type $(\bar{e}\nu)(\bar{\nu}e)$ and $(\bar{\mu}\nu)(\bar{\nu}\mu)$ interaction (Fig. 3) instead of a $(\bar{\mu}\nu)(\bar{\nu}e)$ interaction (Fig. 1). The upper limit of Λ was estimated to be $\Lambda \lesssim 120$ Bev. If the last-mentioned types of interaction do not exist, a contribution to the vertex part is only made by the graphs of Figs. 6 and 7. Besides, the charge renormalization in second approximation $(g^2\Lambda^4)$ is carried out by use of Ward's theorem. $\Lambda \lesssim 400$ Bev is obtained in this case. Next, the author studies the process $\mu \to e + \gamma$ which, according to experiments, probably does not exist. By use of the graphs of Figs. 8 and 9 the author obtains $\Lambda \lesssim 50$ Bev. The $\mu^{\pm} \to e^{\pm} + e^{+} + e^{-}$ decay of the lowest

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order with respect to $g\Lambda^2$ (graphs of Fig. 10) gives a value for the upper limit of Λ, which is close to 400 Bev. All of these analyses which are carried out in first perturbation-theoretical approximation, are not very accurate for the estimate of Λ; the error of Λ may be of the order of magnitude of this very Λ-value. I. Ya. Pomeranchuk and K. A. Ter-Martirosyan are thanked for discussions. L. B. Okun' is mentioned. There are 10 figures and 10 references: 2 Soviet, 6 US, 1 British, and 1 Italian.

SUBMITTED: December 21, 1959

Card 3/3

IOFFE, B.L.

Analyticity and unitarity in the scattering of scalar mesons on static nucleons. Zhur.eksp.i teor.fiz. 37 no.6:1764-1769 D '61. (MIRA 14:10)

(Mesons--Scattering) (Nucleons)

IOFFE, B. L.

"The Violation of $\Delta Q = \Delta S$ Rule in K-Mason Lepton Decays and Weak Interactions Behaviour at High Energies"

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

Institute of Theoretical and Experimental Physics, Moscow, USSR

GRIBOV, V. N., IOFFE, B. L., POMERANCHUK, I. Ya., AND RUDIK, A. P.

"Some consequences of the Moving Pole Hypothesis for High Energy Processes"

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

A. F. Ioffe Physico-Technical Institute, Leningrad, USSR (Gribov)
Institute of Theoretical and Experimental Physics, Moscow, USSR (Ioffe, Pomeranchuk, Rudik)

(1)

GESHKENBEYN, B. V. and IOFFE, B. L.

"The Restrictions on Coupling Constants Value in Field Quantum Theory"

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

Inst. of Theoretical and Experimental Physics, Moscow, USSR

37892
S/056/62/042/005/043/050
B108/B138

24.6610

AUTHOR: Ioffe, B. L.

TITLE: Violation of the principle $\Delta Q = \Delta S$ in lepton decay processes of K-mesons and the behavior of weak interactions at high energies

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 5, 1962, 1411-1413

TEXT: Experimental data led to the conclusion that the $K^0 \to \bar{K}^0$ transition can proceed in two ways, namely $K^0 \to \pi^- + e^+ + \nu \to \bar{K}^0$ and $K^0 \to \pi^+ + e^- + \bar{\nu} \to \bar{K}^0$. The theory of weak interactions can be applied to these processes. From the difference observed between the masses of the K_1^0 and K_2^0-mesons, it is concluded either, that weak interactions of the leptons cease at energies of the order of the nucleon mass, or, that the integral (along a closed path) over the leptons (Feynman graph) contains no quadratic divergence. There is 1 figure.

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37895
S/056/62/042/005/047/050
B108/B138

AUTHORS: Gribov, V. N., Ioffe, B. L., Pomeranchuk, I. Ya., Rudik, A.P.

TITLE: Some consequences of the pole shift hypothesis for high-energy processes

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 5, 1962, 1419-1421

TEXT: Some of the relations between the asymptotic values of the total cross sections of various processes are established using the theory of the reaction (R) matrices in the annihilation channel. It was found that in the spin-zero two-particle problem the ratio between any two partial amplitudes $T^l_{ik}(t)$ is uniform (t - square of total energy). Inelastic scattering of two particles yielding one unstable particle in the final state is considered. The behavior of the amplitude is determined by the last pole righthand in the l-plane. The system $\bar{N} + N^*$ may pass over into a "quasi-vacuum" state with isotopic spin T = 0, total momentum j = 0, 2, 4,..., and positive parity. The state where the pole shift

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Some consequences of the pole shift ...

$l_o(t)$ determines the total and elastic cross sections at high energies, lies between these states. At high energies the amplitude of the process considered is $f(s,t) = r(t)s^{l_o(t)}$, $l_o(0) = 1$. The cross section of this process is proportional to $\sim const/(c + \ln(s/4m^2))$; the constant c can be evaluated from experimental data. In accordance with this theory, NN-scattering shows $D_{3/2}$ and $F_{5/2}$ resonances in the energy range 10 - 27 Bev. No $P_{3/2}$ resonance with isotopic spin T = 3/2 was observed. Within the framework of this theory this must be due to the absence of "quasi-vacuum" states. The cross section of resonance state productions in processes passing a "quasi-vacuum" state does not decrease with increasing energy. This means that such resonances can also be detected at high energies. For nucleon-nucleus scattering processes the relation $\sigma_{NN}\sigma_{AA} = \sigma^2_{NA}$ is established. In general, $\sigma_{NA} \sim A^{2/3}$ (A - atomic number), but a dependence in proportion with A would not contradict the above relation either.

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S/056/62/042/005/047/050
B108/B138

Some consequences of the pole shift ...

ASSOCIATION: Leningradskiy fiziko-tekhnicheskiy institut Akademii nauk SSSR (Leningrad Physicotechnical Institute of the Academy of Sciences USSR) (V. N. Gribov); Institut teoreticheskoy i eksperimental'noy fiziki Akademii nauk SSSR (Institute of Theoretical and Experimental Physics of the Academy of Sciences USSR)

SUBMITTED: March 21, 1962

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S/056/62/043/001/050/056
B102/B104

AUTHOR: Ioffe, B. L.

TITLE: The $\Lambda\eta$-resonance

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 1(7), 1962, 341-342

TEXT: The resonance nature of the $\sigma_\eta(E)$-dependence of the η meson production in the reaction $K^- + p \to \Lambda + \eta$ (Bastien et al. Phys. Rev. Lett. 8, 114, 1962) is discussed. If the energy E (expressed in c. m. s.) surpasses the threshold energy ($m_\Lambda + m_\eta$ = 1660 Mev) of this reaction by 20 Mev the production cross section $\sigma_\eta = 0.63 \pm 0.11$ mb, and if $E-(m_\Lambda+m_\eta) = 60$ Mev, $\sigma_\eta < 0{,}04$ mb. This $\sigma_\eta(E)$-dependence indicates that the system $\Lambda\eta$ has a resonance with a mass of about 1680 Mev, with a half-width $\Gamma/2 < 10$ Mev, the isotopic spin of the resonance state Y being zero. The parity of Y is the same as that of the η meson, namely

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The $\Lambda\eta$-resonance

negative. Among the possible decay modes of Y the mode $Y \rightarrow \Sigma + \pi$ is the most probable. From an investigation of this mode it could be decided whether the η meson is pseudoscalar or vectorial (Rosenfeld et al. Phys. Rev. Lett., 8, 293, 1962).

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

SUBMITTED: May 11, 1962

Card 2/2

S/056/62/043/005/037/058
B102/B104

AUTHORS: Geshkenbeyn, B. V., Ioffe, B. L.

TITLE: An experimental possibility of verifying hypotheses on the nature of resonances

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 5(11), 1962, 1841 - 1842

TEXT: It is shown that there is no need to attribute all of the numerous recently discovered narrow mesonic or baryonic resonances to real particles. Since the mass of many resonances differs only little from the sum of masses of any particles C and D, the resonance Z can be assumed to correspond with a CD bound state, its width being determined by the transitions C+D→A+B, or it can be assumed that Z is a Breit-Wigner resonance level of the system A+B. In any case Z is assumed to have a non-zero isotopic spin. Here an experimental possibility is discussed which makes it possible to decide if the first mentioned hypothesis is tenable. This possibility is based on the fact that, if Z is a CD bound state with small binding energy ($e^2\varepsilon \ll \Delta M_{C_j}, \Delta M_{D_j}$, $\varepsilon = M_C + M_D + M_Z$), the mass difference ΔM_{Z_j}

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different isotopic components of the resonance have to equate the mass difference of the initial particles forming these components. This will not be valid if Z is a Breit-Wigner resonance level of A+B. This method is applied to the Y_1-resonance and the KΛ -resonance. Y_1: I=1, s=-1, M = 1385 Mev. Y_1 can be considered as an NK bound state; (Y_1^+ a pK^0, Y_1^- an nK^-, and Y_1^0 a 50:50 mixture of pK^- and nK^0 bound states). The mass differences will be

$$M_{Y_1^+} - M_{Y_1^-} = (M_p + M_{\bar{K}^0}) - (M_n + M_{K^-}) = 2{,}6 \text{ MeV},$$

$$M_{Y_1^+} - M_{Y_1^0} = (M_p + M_{\bar{K}^0}) - \tfrac{1}{2}(M_p + M_{K^-} + M_n + M_{K^0}) = 1{,}3 \text{ MeV}.$$

the latter is given without correction for pK^- Coulomb interaction. With it, 1.8 Mev result. ΛK : I = 1/2, M = 1650 Mev. This resonance can be considered as a ΛK bound state (+1/2 component: $\Sigma^+K^0 + \Sigma^0K^+$; -1/2 component: $\Sigma^-K^+ + \Sigma^0K^0$). The mass difference is

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$$M_{1/2} - M_{-1/2} = {}^{2}/_{3}(M_{\Sigma^+} + M_{K^0}) + {}^{1}/_{3}(M_{\Sigma^0} + M_{K^+}) - \\ - [{}^{2}/_{3}(M_{\Sigma^-} + M_{K^+}) + {}^{1}/_{3}(M_{\Sigma^0} + M_{K^0})] = -3{,}1 \text{ MeV},$$

if the first hypothesis is correct. With correction for Coulomb interaction, one obtains -2.5 Mev. Similar considerations of the Σ-hyperon resonance show that Σ cannot be a $\Lambda\pi$ bound state; the experimentally observed mass differencesdiffer too much from the calculated ones.

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

SUBMITTED: June 5, 1962

Card 3/3

IOFFE, B.L

S/056/63/044/004/017/044
B102/B186

AUTHORS: Geshkenbeyn, B. V., Ioffe, B. L.

TITLE: Restrictions as to the magnitude of the coupling constant in quantum field theory. I.

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 44, no. 4, 1963, 1211 - 1227

TEXT: It is shown that, based on the general principles of quantum field theory, without any additional assumptions or model representations, the necessity of an upper boundary for the coupling constant g^2 for given masses can be proved. For this purpose the Green function is represented by the Lehmann-Källen expansion, and the dispersion relation for the vertex part $\Gamma(\kappa^2)$ is used to obtain the limiting inequality

$$\frac{g^2}{2\pi}\int\limits_{(m_0+m_0)^2}^{\infty}\frac{|\Gamma(\kappa^2)|^2}{(\kappa^2-m_0^2)^2}\frac{q(\kappa^2)}{\kappa}d\kappa^2<1. \qquad (10)$$

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Restrictions as to the magnitude...

from

$$\int_{(m_b+m_c)^2}^{\infty} \frac{\rho(\kappa^2)}{|D(\kappa^2)|^2} \frac{1}{(\kappa^2-m_a^2)^2} d\kappa^2 \leqslant 1. \quad (5)$$

$$\rho(\kappa^2) = (2\pi)^3 \sum_n |a_{an}|^2 \delta, \quad (6)$$

$$a_{an} = \langle 0|A(0)|\Phi_n\rangle,$$

and

$$\rho_{\substack{\text{resonance}\\ \text{two-particle}}} = (1/2\pi)\, g^2 |D(\kappa^2)|^2 |\Gamma(\kappa^2)|^2 q(\kappa^2)/\kappa, \quad (9).$$

$$q(\kappa^2) = \sqrt{[\kappa^2-(m_b+m_c)^2][\kappa^2-(m_b-m_c)^2]}/2\kappa.$$

$\Gamma(\kappa^2) \equiv \Gamma(m_c^2, m_b^2, \kappa^2)$; m_a is the mass of the boson considered, m_b and m_c are the masses of the nearest (with respect to the sum of masses) particles b and c into which particle a may decay. The vertex part $\Gamma(\kappa^2)$ is assumed to be an analytic (holomorphic) function of κ^2 in the complex plane with a cut along the real axis beginning at $\kappa^2 = (m_b+m_c)^2$. At the real axis to the left of this point $\Gamma(\kappa^2)$ is real. At $\kappa^2 = m_a^2$, $\Gamma(m_a^2)=1$. $\Gamma(\kappa^2)$ has no poles in

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the complex plane. Under these assumptions the boundary for g^2 is obtained from the condition that the function

$$\Phi = 2(m_b + m_c)^2 \int_{(m_b+m_c)^2}^{\infty} \frac{|\Gamma(\kappa^2)|^2}{(\kappa^2 - m_q^2)^2} \frac{\varphi(\kappa^2)}{\kappa} d\kappa^2 \qquad (11)$$

has a minimum. For $1-\alpha \ll 1$,

$$\Phi_{min} = \frac{\pi}{4}\sqrt{\frac{1-\lambda}{1-\alpha}} = \frac{\pi}{4}\sqrt{\frac{2\mu}{\Delta}}, \qquad (21)$$

is obtained where

$$\beta = \sqrt{(1-\alpha)(\alpha-\lambda)}\left[\frac{\pi}{2} + \arcsin\frac{2\alpha - 1 - \lambda}{1-\lambda}\right],$$

$$L(x) = \sqrt{(x-1)(x-\lambda)}\ln\frac{(\sqrt{x-\lambda} + \sqrt{x-1})^2}{1-\lambda}.$$

and $\mu = m_b m_c/(m_b+m_c)$. This results in the relation $g^2 \ll 16\, m_q^2 \sqrt{\Delta/2\mu}$. This

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agrees with the previously obtained result that for small binding energies the coupling constant decreases in proportion to $\sqrt{\Delta}$. For neutron-proton scattering, for example, $g^2 = 12m_p^2\sqrt{\Delta/2\mu}$. Φ_{min} can also be determined analytically by means of a conformal transformation. In this case

$$\Phi_{min} = \frac{\pi}{4}\frac{\sqrt{1-\lambda}+\sqrt{1-\alpha}}{\sqrt{1-\alpha}(1+\sqrt{1-\alpha})^2}. \quad (58)$$

is obtained. Similar calculations are made for the case of a being a fermion. Only in the nonrelativistic case $(1-\alpha \ll 1)$ are simple relations obtained:

$$\Phi_{min} = \frac{\pi}{4}\sqrt{\frac{1-\lambda}{1-\alpha}}(1+\sqrt{\lambda}), \quad (59)$$

$$g^2 < 4\sqrt{\Delta/2\mu}\, m_a/m_b, \qquad \mu = m_b m_c/(m_b + m_c). \quad (60).$$

For πN interaction

$$g^2 < 2\pi/3\Phi_{min} = 85 \quad (74)$$

$$f^2 = (\mu/2m)^2 g^2 < 0{,}47. \quad (75).$$

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B102/B186

Finally it is discussed what will happen in the nonphysical region $g^2 > g^2_{max}$.

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

SUBMITTED: August 15, 1962

Card 5/5

[redacted], Ioffe, B. L.

TITLE: Trajectory of Regge vacuum poles

SOURCE: Zhur. eksper. i teoret. fiz., v. 45, no. 2, 1963, 346-348

TOPIC TAGS: Regge pole, trajectory, vacuum pole

ABSTRACT: Certain restrictions on the behavior of the vacuum pole trajectory $\ell_0(t)$ of the partial amplitude in the annihilation channel of high-energy scattering, as a function of the momentum transfer t, are established on the following properties of the vacuum-pole trajectory: 1) $\ell_0(0) = 1$; 2) $\ell_0(t)$ is an analytic function of t in the complex t-plane with a cut along the real axis from $4\mu_\pi^2$ to infinity (μ is the pion mass). A conformal-mapping technique is used. It is found that $\mathrm{Re}\,\ell_0(t) > 1.4$ and $|\ell_0(t/4\mu^2)|^2 \approx 0.75$. "The authors are grateful to I. Ya. Pomeranchuk for useful discussions." Orig. art. has 14 formulas.

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

SUBMITTED: 15Feb63 DATE ACQ: 06Sep63 ENCL: 00

SUB CODE: PH NO REF SOV: 006 OTHER: 006

Card 1/1

GESHKENBEYN, B.V.; IOFFE, B.L.

Restrictions on the coupling constants and vertex part of three particle interaction in quantum field theory. Zhur. eksp. i teor. fiz. 45 no.3:555-564 S '63. (MIRA 16:10)

1. Institut teoreticheskoy i eksperimental'noy fiziki.
(Quantum field theory)

ACCESSION NR: AP4025922 S/0056/64/046/003/0902/0904

AUTHORS: Geshkenbeyn, B. V.; Ioffe, B. L.

TITLE: Restrictions imposed by the analyticity conditions on the cross section for the conversion of an electron positron pair into a pion pair

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 46, no. 3, 1964, 902-904

TOPIC TAGS: S matrix theory, field theory, elementary particle interaction, S matrix analyticity, form factor, charged pion form factor, pair conversion, pair conversion cross section

ABSTRACT: The authors assume that the electromagnetic form factor $F(x)$ of the charged pion has the following properties as a function of complex x: it is analytic in the entire cut complex plane, it is real on the real axis to the left of $x = 1$, it grows no faster than

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ACCESSION NR: AP4025922

a finité power as x goes to infinity in complex directions, and it is normalized to 1 at x = 0. From these properties they derive restrictions on the cross section for $e^+ + e^- \rightarrow \pi^+ + \pi^-$ averaged over the energy. This work is related to previous work of the authors (Geshkenbeyn and Ioffe, ZhETF v. 44, 1211, 1963). "The authors express their gratitude to L. B. Okun' for useful remarks." Orig. art. has: 7 formulas.

ASSOCIATION: None

SUBMITTED: 12Jul63 DATE ACQ: 16Apr64 ENCL: 00

SUB CODE: PH NO REF SOV: 004 OTHER: 000

Card 2/2

ACCESSION NR: AP4043653 S/0056/64/047/002/0744/0749

AUTHORS: Ioffe, B. L.; Terent'yev, M. V.

TITLE: Region of applicability of perturbation theory in the electrodynamics of vector bosons

SOURCE: Zh. eksper. i teor. fiz., v. 47, no. 2, 1964, 744-749

TOPIC TAGS: electrodynamics, quantum field theory, perturbation theory, polarization, photon, scattering cross section, vector meson

ABSTRACT: In view of recent speculations on the possibility that weak interaction is produced by the exchange of a charged vector meson, the authors derive an exact energy limit above which the various quantities involved in the electrodynamics of the vector meson (vertex function, scattering amplitude) cannot be described by the first approximation of perturbation theory without contradicting the fundamental principles of quantum field theory. The

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ACCESSION NR: AP4043653

treatment is carried out both for the case in which the vector meson has an anomalous magnetic moment (of the order of unity), and for the case in which there is no such anomalous moment. The criterion is derived by considering two effects -- the polarization of vacuum due to vector mesons, and the scattering of a positive vector meson by a negative vector meson. The analysis of the polarization of vacuum yields a limit on the mass of a virtual photon, above which the vertex function for the decay of the virtual photon into two vector mesons must differ greatly from its unperturbed value, so that the electromagnetic interaction of the meson must begin to cut off. The scattering of positive vector mesons by negative vector mesons yields an energy limit above which the cross section for this scattering, calculated in the first approximation of perturbation theory, exceeds the unitarity limit. "The authors thank B. V. Geshkenbeyn, I. Yu. Kobzarev, Yu. P. Nikitin, L. B. Okun', I. Ya. Pomeranchuk, and A. P. Rudik for useful discussions." Orig. art. has: 2 figures and 16 formulas.

Card 2/3

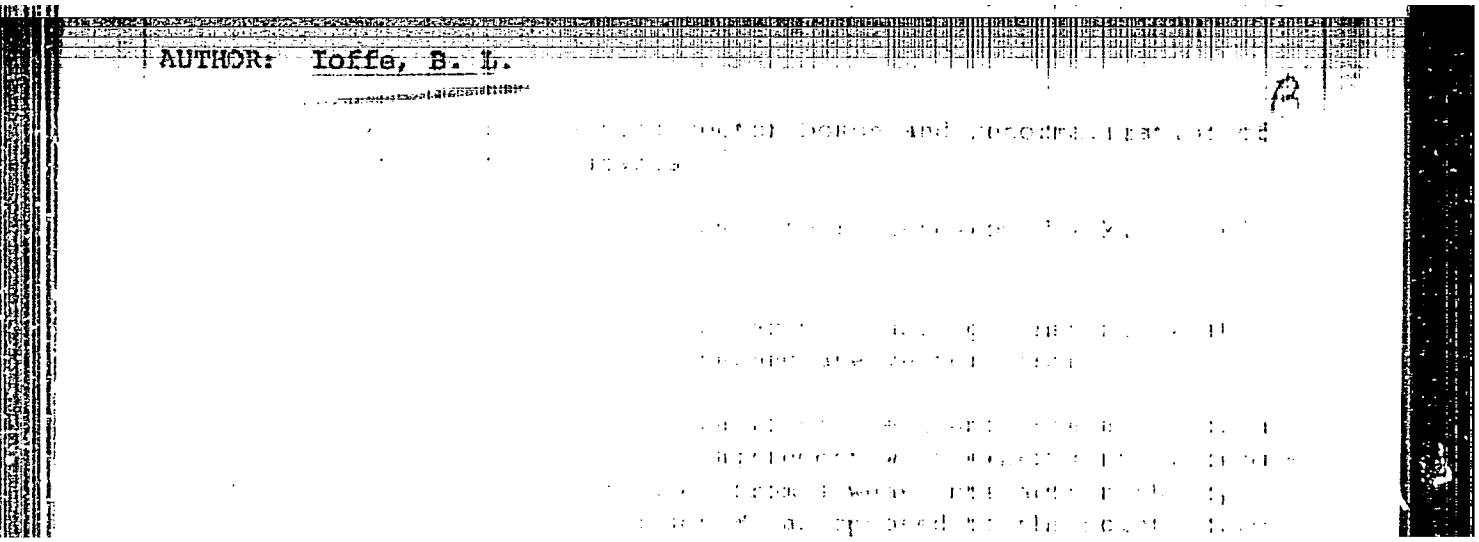
ACCESSION NR: AP4043653

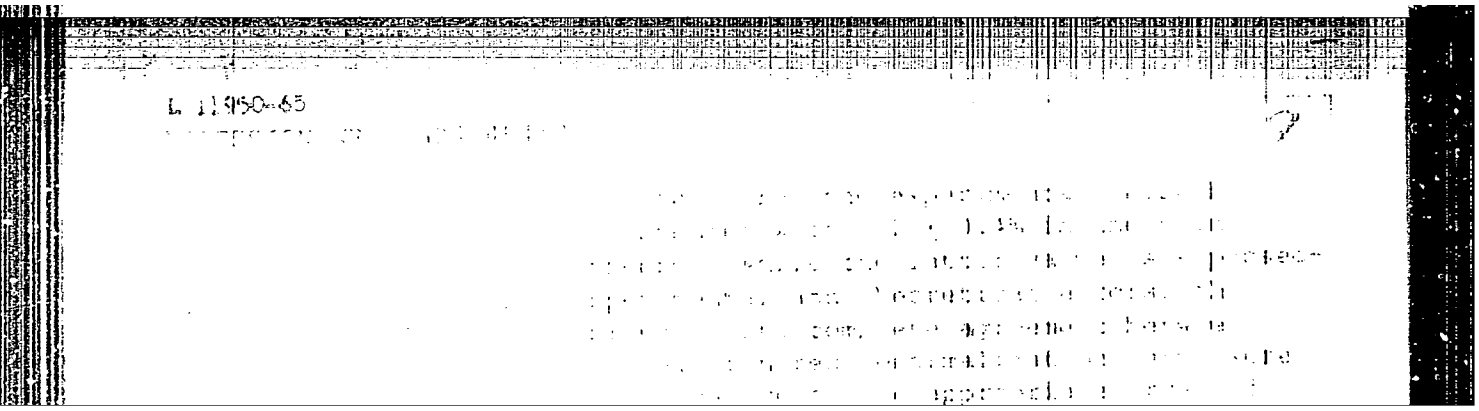
ASSOCIATION: None

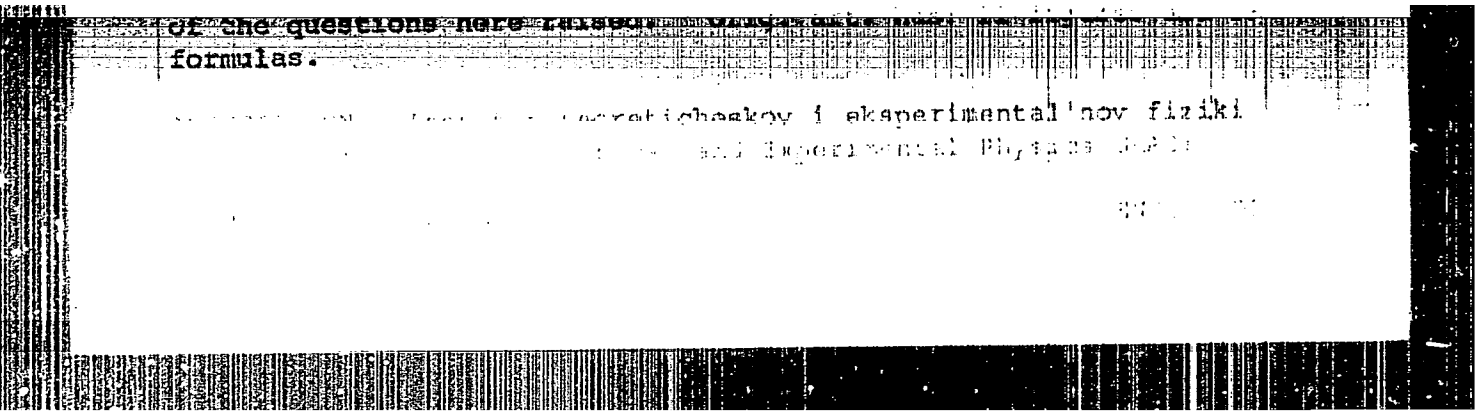
SUBMITTED: 06Mar64 ENCL: 00

SUB CODE: NP NR REF SOV: 002 OTHER: 004

Card 3/3







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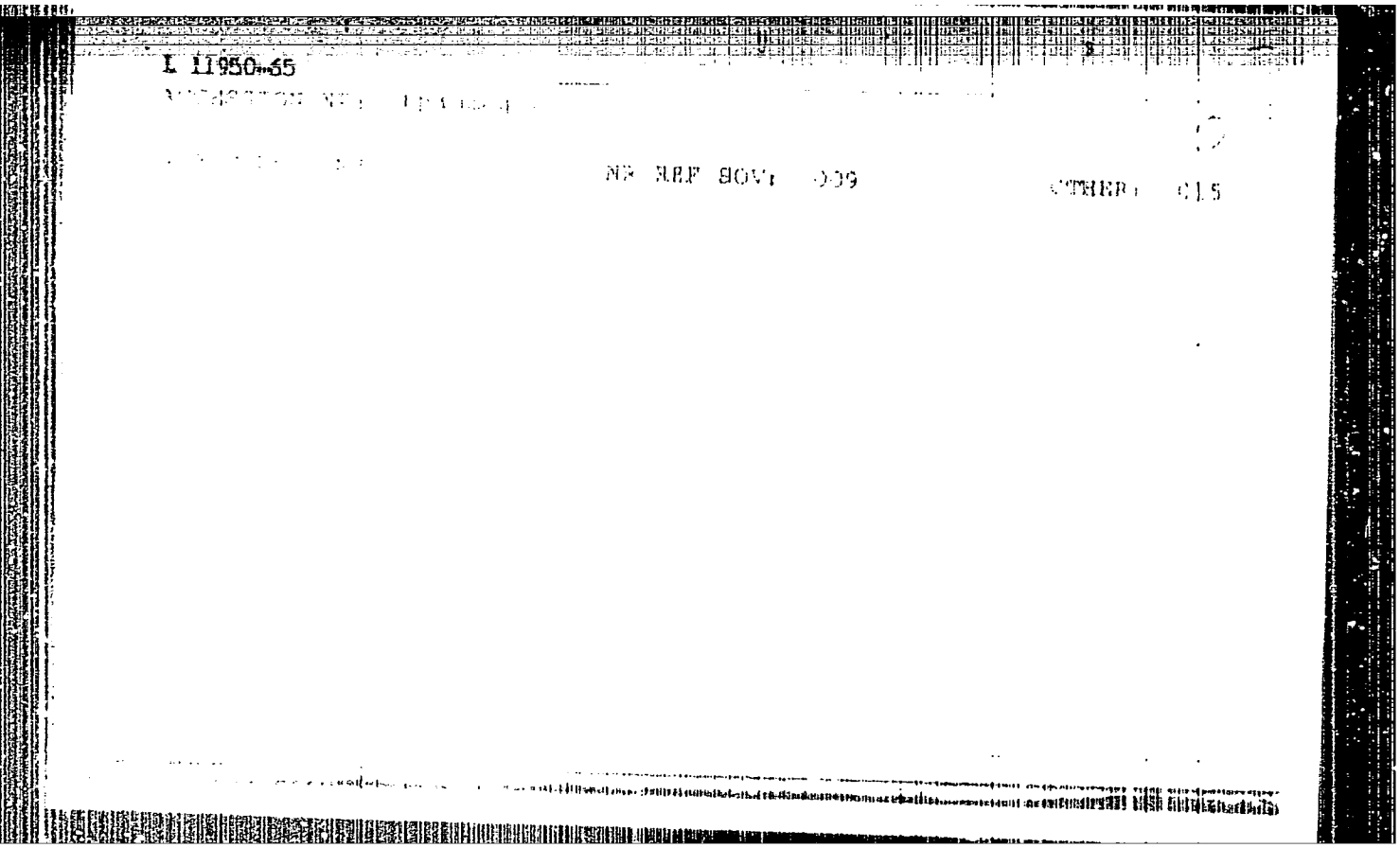

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ACCESSION NR: AP5000341 S/0056/64/047/005/1811/1815

B

[illegible] functions and orthogonalization of one-particle states

[illegible] Fizika i teoreticheskoy . teoreticheskoy Fiziki, v. 47, no. [illegible] 1964, [illegible]

TOPIC TAGS: field theory, analyticity, elementary particle, vertex function

ABSTRACT: The authors argue that criticism of their previous paper (ZhETF v. 44, 1211, 1963), dealing with bounds on scattering [illegible] and by Brodsky (ZhETF v. 46, 677, 1964), is not valid. The criticism was based on a certain model in which the vertex function has a pole. The authors consider a different model [illegible]

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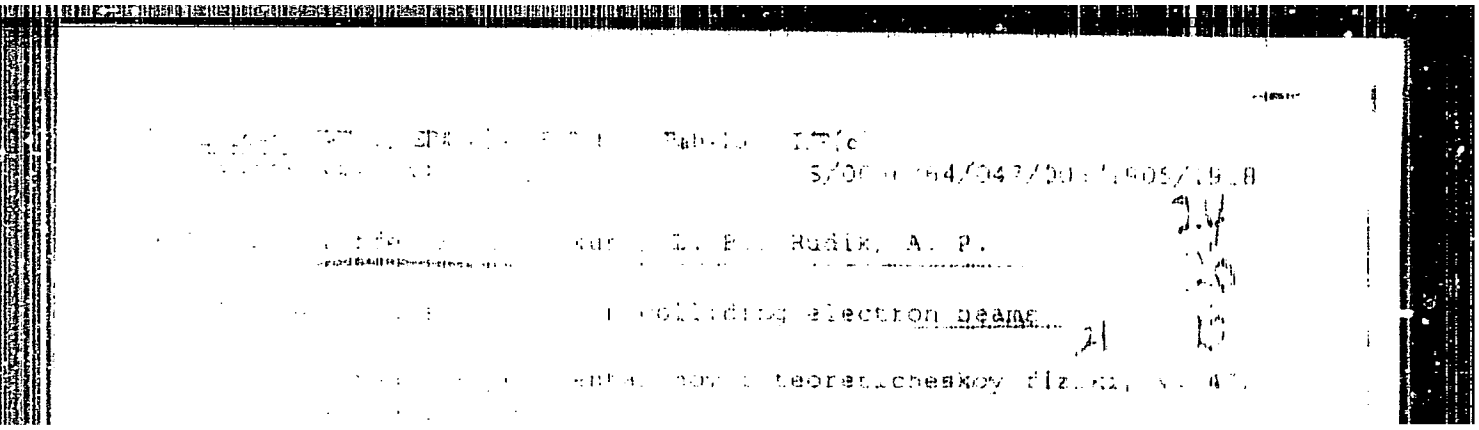
arising from transitions between two elementary particle states in [illegible] when the two states are made [illegible]



Rudik, A. P.

colliding electron beams

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