

Zeitschrift: Helvetica Physica Acta
Band: 42 (1969)
Heft: 4

Rubrik: Zusammenfassungen der letzten eingegangenen Arbeiten = Résumés des derniers articles reçus

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HELVETICA PHYSICA ACTA

Zusammenfassungen der letzten eingegangenen Arbeiten

Résumés des derniers articles reçus

Linearisierte Enskog-Gleichung für Boltzonen mit abstossendem Potential endlicher Reichweite

von K. APPERT

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(16. XII. 68)

Zusammenfassung. Ausgehend von der Kuboformel für einen Transportkoeffizienten werden reduzierte Zeitkorrelationsoperatoren für ein quantenmechanisches Gas mit Boltzmannstatistik eingeführt, die die BBGKY-Hierarchie erfüllen. Mit einer Methode von ERNST wird ein Funktionalansatz $\psi_2\{\psi_1\}$ gefunden, der, in die erste Hierarchiegleichung eingesetzt, die linearisierte Enskoggleichung für Boltzonen ergibt.

N/D Equations in the Pole Approximation

by G. AUBERSON

Institut de Physique Théorique, Université de Lausanne (Switzerland)

(30. I. 69)

Summary. One-channel N/D equations are considered. We propose a method allowing the construction of a convergent sequence of pole approximations for the left-hand cut. Then, the convergence of the corresponding sequence of approximate amplitudes is proved under specific conditions. This convergence holds especially in the physical region. Finally, the physical meaning of some abnormal cases is discussed.

N/D Equations with Marginally Singular Kernels

by G. AUBERSON

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(30. I. 69)

Summary. The singular N/D equations which arise in the case of partial-wave dispersion relations with an asymptotically constant left-hand discontinuity $\phi(z)$ are investigated. It is proved that the resolvent (considered as an analytic function of the 'coupling constant' $\lambda = \lim_{z \rightarrow -\infty} \phi(z)$) has a non polar singularity in the λ -plane. The location of the singular point is controlled by the rate of inelasticity at infinite energy. This singularity gives rise to a multiplicity of solutions.

Polarisation der 4f-Schale von Eu durch Stösse mit optisch gepumptem Cs

von R. TILGNER, J. FRICKE und J. HAAS

Physikdepartment der Technischen Hochschule München

(29. I. 69)

Abstract. An experiment is described in which the $^8S_{7/2}$ ground state of Eu was polarized by collisions with optically pumped Cs. The rf induces transitions between the Zeeman sublevels of Eu were detected as a change in the Cs pumping light transmission.

Causality in *S*-Matrix Theory. II

by COLSTON CHANDLER

Seminar für Theoretische Physik der ETH Zürich

(3. II. 69)

Abstract. Two scattering processes are discussed for which there exist points in the physical region of the mass shell at which the analytic *S*-matrix cannot be represented as the boundary value of a single analytic function. At such points the *S*-matrix must instead be represented as a sum of at least two such boundary value terms.

Der zweifach verbotene Beta-Übergang von ^{137}Cs

VON H. SCHNEUWLY, L. SCHELLENBERG, O. HUBER und W. LINDT

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(5. II. 69)

Abstract. The spectrum of the twice parity-forbidden β -transition of ^{137}Cs was measured with two spectrometers of different types. The experimental shape factor was fitted with the one-parametric formula $S \propto q^2 + \lambda^2 p^2$ and the two-parametric ξ -approximation of the theoretical shape factor. With the hypothesis of CVC theory the ratio of nuclear matrix elements $\int i T_{ij} / \int R_{ij}$ is deduced.

On the Ratio of Wave Function Renormalization Constants of π and K Mesons

by R. ACHARYA

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(26. II. 69)

Abstract. The validity of Khuri's conjecture on the ratio of the wave function renormalization constants of π and K mesons is investigated within the framework of asymptotic $\text{SU}(3)$ symmetry. It is shown that the result holds only if certain strong asymptotic conditions are satisfied. These asymptotic requirements also lead to the degeneracy of A_1 and K_A masses under the pole dominance hypothesis for spin one spectral functions.

Investigation on Colour Centres in Alkaline Earth Fluorides

by H. BILL

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(20. III. 59)

Abstract. Two new colour centres in alkaline earth fluorides are investigated in this article. Both are due to the impurities oxygen and yttrium and they are only observed with EPR after the crystals have been X rayed. In fact the X rays change the valence state of the impurity complexes formed during growth or by hydrolysing the appropriately doped crystals thus creating the paramagnetic centres. One of them consists of a (YO_2) molecule substitutionally located in the crystal. The other centre involves one O^- ion in substitutional position nearby a Y^{3+} ion. Their model and the informations about their electronic structure have been deduced from EPR, ENDOR, optical measurements, annealing experiments and in the case of the (YO_2) also by investigating the centre produced with water enriched in ^{17}O . The results are described by the appropriate spin Hamiltonians. The centre (YO_2) is shown to form approximately a $(\text{Y}^{3+} + \text{O}_2^{3-})$ structure. The other centre has its magnetic electron located predominantly in a p_z orbital of the

O^- ion involved. The thermal annealing experiments performed on samples containing both centres and Y^{3+} ions exhibit after appropriate treatment of the samples charge transfert from the less stable centre involving one O^- ion to the $(YO_2)^-$ molecule ion (transfert of holes). The annealing experiments further show that the optical transition observed at $486\text{ m}\mu$ in CaF_2 and at $510\text{ m}\mu$ in SrF_2 arises from the (YO_2) centre.

Unitary Sum Rule and the Time Evolution of Neutral K -Mesons

by L. P. HORWITZ and J.-P. MARCHAND

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Denver, Colorado 80210

(3. IV. 69)

Abstract. The consequences of the unitary sum rule for the decay of neutral K -mesons are investigated without assuming the usual semigroup property (Wigner-Weisskopf equation with constant complex Hamiltonian). A much wider class of motions in the K -meson subspace then becomes possible. In particular, there may exist evolutions which do not admit any states with pure exponential decay laws. In a CP-invariant theory, however, the unitary sum rule alone implies exponential decay for the CP-eigenstates.

Singular Domains of Space

by PETR HÁJÍČEK

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(14. IV. 69)

Abstract. A generalization of a definition of cosmological singularity is proposed, which allows to formulate singularity theorems so that they refer only to a finite domain of space-time. In this way, two theorems due to Hawking are sharpened, by means of what it can be shown that our Universe cannot be singularity free, unless the causal loops violating the strong causality required by Hawking entirely lie in an explicitly indicated compact region of our past.

Elastische und inelastische Streuung von 14,1-MeV-Neutronen an ^{16}O und ^{18}O

von D. MEIER, M. BRÜLLMANN, H. JUNG und P. MARMIER

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(14. IV. 69)

Summary. Angular distributions for elastic and inelastic scattering of 14.1 MeV neutrons by ^{16}O and ^{18}O have been measured in the angular range $7.5^\circ \leq \theta \leq 155^\circ$ using a fast time-of-flight spectrometer and targets of $H_2^{16}O$, $D_2^{16}O$ and $D_2^{18}O$. Absolute differential cross sections were determined for the states or groups of states at 0, 6.1, 7 MeV in ^{16}O and at 0, 1.98, 3.7, 5.3 MeV in ^{18}O as well as the integrated cross sections for these levels and the levels at 6.3, 7.12, 7.62 MeV in ^{18}O . The results are compared with optical model predictions and direct interaction theories. In the case of ^{16}O , the experimental data are in good agreement with previous work. The angular distribution for neutrons inelastically scattered to the 6.1 MeV state differs from the corresponding proton data and is not well reproduced by theoretical curves. For ^{18}O appreciably larger scattering cross sections were observed for $Q = 0$ and -1.98 MeV than in comparable proton measurements. It may be concluded, that the averaging over the level structure in these light nuclei is not sufficient. In a supplementary measurement the total cross section for ^{18}O has been determined by a transmission experiment to 1610 ± 70 mb, which is considerably higher than the previously reported value.

On the Structure of Quantal Proposition Systems

by J. M. JAUCH and C. PIRON

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(23. IV. 69)

Abstract. It is shown that the axiom of atomicity and the covering law can be justified on the basis of a new and more satisfactory notion of state and the existence of ideal measurements of the first kind. These two axioms are thereby given a satisfactory justification in terms of empirical facts known about micro-systems. Furthermore the new notion of state introduced here does not involve any probability statements and there is therefore no difficulty attributing it to individual systems, which was not possible with the notion heretoforth used in quantum mechanics.

Le saut de diffusion lacunaire

par J.-J. PALTENGHI

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(30 IV 69)

Abstract. A phenomenological theory of the vacancy jump is presented. It is shown on one hand that diffusion of crystalline structure defects may be described only as evolution of statistical distributions. On the other hand, a strong conceptual relation is noted between the states of a diffusive particle and of a particle in a fluid.

The crystal energy is then taken as a sum of interactions between pairs of atoms. Jaynes' generalization of Gibbs' statistical method is used. A self consistent field approximation gives a simple analytical expression for the jump rate, the migration energy and the migration volume of a vacancy. Numerical results agree clearly well with experimental data.

This theory may be considered as a connection between fluid and solid diffusion.