

# Zusammenfassungen der letzten eingegangenen Arbeiten = Résumés des derniers articles reçus

Objektyp: **Group**

Zeitschrift: **Helvetica Physica Acta**

Band (Jahr): **43 (1970)**

Heft 8

PDF erstellt am: **13.09.2024**

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# HELVETICA PHYSICA ACTA

Zusammenfassungen der letzten eingegangenen Arbeiten  
Résumés des derniers articles reçus

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## Coulomb Corrections to Low Energy Elastic and Charge Exchange $\pi N$ Scattering

by G. C. OADES and G. RASCHE

Institut für Theoretische Physik der Universität Zürich

(24. VI. 70)

*Summary.* We consider the problem of  $\pi N$  scattering in the simultaneous presence of the short range nuclear potential and the long range Coulomb potential. The existing treatment of  $\pi^+ p$  scattering is outlined and similar methods are then used to derive the corresponding results for the coupled channel processes  $\pi^- p \rightarrow \pi^- p$  and  $\pi^- p \rightarrow \pi^0 n$ . Finally we show how the Coulomb corrections so obtained can be calculated to first order in the Coulomb parameter.

## Spectromètre pour l'Étude des Réactions $(n, \alpha)$ à 14 MeV

par J. F. LOUDE, J. P. PERROUD et CH. SELLEM

Institut de physique nucléaire de l'Université de Lausanne

(16 VII 70)

*Abstract.* A spectrometer has been constructed for the study of  $(n, \alpha)$  reactions at 14 MeV. By detecting the  ${}^4\text{He}$  particle associated with neutron production, it is possible to measure the  $\alpha$  time-of-flight in addition to the residual energy and energy loss, as measured by a telescope comprising a semiconductor detector and two proportional counters. The differential cross-section for the reaction  ${}^{12}\text{C}(n, \alpha_0){}^9\text{Be}^{g.s.}$  has been measured for several angles.

## Coupled Channel Equations and the Giant Dipole Resonance

by G. BAUR and K. ALDER

Institute for Theoretical Physics, University of Basel

(20. VII. 70)

*Abstract.* The cross section for the  $(\gamma, \text{nucleon})$  reaction on nuclei in the giant resonance region is calculated in a coupled-channel model. 1 particle-1 hole excitations and collective surface vibrations, which are coupled to the particle degrees of freedom, are considered. It is shown that the coupled channel equations may be simplified by using the 'external mixing' approximation. Furthermore, the interference of E1- and E2-radiation and its influence on the angular distribution are calculated. Numerical calculations are done for the giant dipole resonance in  $\text{C}^{12}$  and  $\text{O}^{16}$  and compared with the experimental data. Contrary to the usual bound state calculations this model makes explicit predictions for the various observable quantities, such as total cross sections for photodisintegration and their angular distributions.

## Quasi-Elastic Electron Scattering and Nuclear Shell Structure

by RAOUL D. VIOLLIER and KURT ALDER

Institute for Theoretical Physics, University of Basel

(20. VII. 70)

*Abstract.* Quasi-elastic electron scattering, knocking out a proton from the target nucleus, is treated in a distorted wave Born approximation. The coincidence cross section for the  $N(e, e' p)N'$  reaction is calculated in the impulse approximation. Since the energy of the emitted proton depends upon the shell and its binding energy, the nuclear shell structure can be studied directly if the angular correlation of the emerging particles is measured. The angular distribution of the outgoing proton is calculated and compared with plane wave Born approximation values for  $^{40}\text{Ca}$ ,  $^{32}\text{S}$  and  $^{28}\text{Si}$ .

## Bemerkungen über quantenmechanische Entropie-Ungleichungen

VON FRITZ BAUMANN

Seminar für theoretische Physik, ETH Zürich

(24. VII. 70)

*Abstract.* In a first part we check the validity of a conjecture of D. Robinson and D. Ruelle, concerning the quantum mechanical entropy. The partial results obtained tend to confirm it.

The second part deals with a generalization of an expression for the skew information defined by E. Wigner and M. Yanase; it is shown, that for Quaternions an important convexity property holds.

## On Nonrelativistic Positive- $\alpha$ Landau Surfaces

by COLSTON CHANDLER

Seminar für theoretische Physik der Eidgenössischen Technischen Hochschule, Zürich

(30. VII. 70)

*Abstract.* Results previously proved for relativistic positive- $\alpha$  Landau surfaces are extended to the nonrelativistic case. It is proved that in the physical region, at points where no two initial and no two final particle momenta are parallel, leading surfaces are real analytic submanifolds of codimension 1. The normal to a leading surface at a manifold point is proved to determine, in an essentially unique way, the Coleman-Norton space-time picture of the corresponding multiple scattering process.

## On the Logarithmic Power of Kernel Integrals

by J.-P. ECKMANN

Institut de Physique Théorique, Université de Genève

(30. VII. 70)

*Abstract.* Sufficient conditions are given under which the asymptotic behaviour of integrals is described by pure power counting, excluding therefore logarithmic powers.

## Explicit Solutions for Quadratic Interactions

by PH. CH. ZABEY and M. DUCOMMUN

Institute for Theoretical Physics, Geneva, Switzerland

(31. VII. 70)

*Abstract.* Explicit operator solutions are given for quadratic interactions, both for scalar and spinor fields. Their existence is rigorously established.

### **Das Verhältnis von Neutralen zu geladenen Hadronen der kosmischen Strahlung in einer atmosphärischen Tiefe von $976 \text{ g cm}^{-2}$**

VON PIERRE LE COULTRE

Physikalisches Institut der Universität Bern

(15. VIII. 70)

*Abstract.* The ratio of neutral to charged hadrons in the cosmic rays at an atmospheric depth of  $976 \text{ g cm}^{-2}$  is measured with a spark chamber set-up. A value of  $0.73 \pm 0.03$  has been found for incoming particles with a weighted average energy larger than or equal to 12 GeV. At a minimum value of 15 GeV approximately the ratio is  $0.64 \pm 0.04$ . Provided that the neutron to proton ratio equals unity at the atmospheric depth of  $976 \text{ g cm}^{-2}$ , the  $\pi$ -meson to nucleon ratios for energies larger or equal to 12 GeV and 15 GeV are  $0.18 \pm 0.03$  and  $0.28 \pm 0.05$  respectively.

### **Eine Methode zur Messung des Dotierungsprofils von Halbleiter-Dioden**

VON ERNST BALDINGER UND RUDOLF STOCKER

Institut für angewandte Physik, Universität Basel

(28. VIII. 70)

*Summary.* In this paper a simple method for measuring doping profiles in semiconductor diodes as well as its comparatively inexpensive realization is described. It is based on a continuous capacitance measurement over the region of reverse bias and its simultaneous processing with analog electronics. The diode, initially strongly reverse biased, is discharged by a constant current. The course of the voltage across the diode depends upon the depletion layer capacitance and contains therefore information about the doping profile: Whereas the first time derivative of this voltage is proportional to the width of the space-charge region, the second derivative gives the reciprocal doping concentration. These two signals display the inverse doping profile on a  $xy$ -oscilloscope within milliseconds.

The resolution is theoretically limited by the Debye length, practically by the noise and the high frequency cutoff of the electronics. Undesired circuit capacitances can be separated from the depletion layer capacitance.

### **Mesures de températures ioniques dans un plasma de brève durée à l'aide d'un interféromètre de Fabry-Perot multicanal**

par A. BERNEY

Centre de Recherches en Physique des Plasmas, Avenue des Bains 21, Lausanne

(22 VIII 70)

*Abstract.* This work describes ion temperature measurements made by means of Doppler line broadening in a rotating magnetic field pinch experiment. A 12-channel Fabry-Perot interferometer has been constructed and profiles of various helium and impurity lines were measured as functions of time and position in the discharge tube.

The theoretical standard deviation of the results was computed by a statistical analysis using a Monte-Carlo simulation programme. This allowed us to separate the real variations of the plasma from the fluctuations of the measurements.

The main limitations of the accuracy of the results were due to lack of light intensity and parasitic broadening mechanisms (Stark and reabsorption effects). Nevertheless, reasonable values of the temperatures of ionised nitrogen, oxygen and helium were obtained for three different filling pressures (20, 60 and 180 mTorr He).

### Some Criticisms of Quantum Logic

by M. INGLEBY

School of Mathematical and Physical Sciences, University of Sussex,  
Brighton BN1 9QH, England  
(11. VII. 70)

*Abstract.* We argue that the division ring (sfield) obtained by C. Piron after embedding a coherent lattice of propositions (questions) in a projective geometry is a lower bound on the division ring of coefficients over which a quantum-mechanical Hilbert Space must be constructed. Using the first four of G. W. Mackey's six axioms preceding his adoption of von Neumann's quantum mechanics in his seventh axiom, a Hilbert Space over any valued sfield is constructed. Then observables are represented as projection-valued measures and certain states are represented as rays.

### Die $^3\text{He}(d, p)^4\text{He}$ -Reaktion mit polarisiertem und unpolarisiertem Target und polarisiertem Deuteronenstrahl bei $E_d = 430$ keV

VON CH. LEE MANN, H. BÜRGISSER, P. HUBER, U. ROHRER, H. SCHIECK und F. SEILER

Physikalisches Institut der Universität Basel  
(17. VIII. 70)

*Abstract.* The sensitivities of the  $^3\text{He}(d, p)^4\text{He}$ -reaction to deuteron polarization and some selected combinations of  $^3\text{He}$ - and deuteron polarization have been measured at  $E_D = 430$  keV. In addition to the reaction matrix element  $R_1 = (2\ 1/2\ 3/2^+ | R | 0\ 3/2\ 3/2^+)$  giving the main contribution to cross section and polarization sensitivities  $p$ - and  $d$ -wave admixtures of the order of a few percent relative to  $R$  are found. Real parts of the matrix elements which were calculated from the experimental results and the influence of  $p$ - and  $d$ -waves on the analyzing power of the reaction are discussed.

### Mass Differences as Additional Electromagnetic Corrections in Low Energy Elastic and Charge Exchange $\pi$ N Scattering

by G. C. OADES and G. RASCHE

Institut für Theoretische Physik der Universität Zürich  
(17. VIII. 70)

*Summary.* We present a treatment of low energy  $\pi^- p \rightarrow \pi^- p$  and  $\pi^- p \rightarrow \pi^0 n$  scattering which includes non-relativistically both mass difference effects and the effect of the long range Coulomb potential. Using this formalism we then show how the corrections to the usual charge independent expressions can be calculated in a first order perturbation treatment.

### L'hamiltonien de spin de Koster et Statz: cas de Fe(III) en symétrie cubique

par R. LACROIX et J. WEBER

Laboratoire de physico-chimie du solide, Institut de chimie physique, Université de Genève  
(19 VIII 70)

*Abstract.* It is shown that the additional constants of the spin-Hamiltonian due to Koster and Statz appear only from the fourth order of the perturbation calculation in the case of the Fe(III) ion. Hence they are experimentally negligible.

### Evaluation théorique du facteur $g$ pour les ions du groupe du Fer dans l'état S

par J. WEBER et R. LACROIX

Laboratoire de physico-chimie du solide, Institut de chimie physique, Université de Genève  
(19 VIII 70)

*Abstract.* A theoretical evaluation of the  $g$  factor for Fe(III), Mn(II) and Cr(I) ions in MgO is done, taking into account localized states of the conduction band in the perturbation calculation. It is shown that the influence of the conduction band can be as important as that of the valence band. It is the competition of the influences of the two bands which explains the sign inversion of  $(g - 2)$  between Fe(III) and Cr(I).