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HELVETICA PHYSICA ACTA

Zusammenfassungen der letzten eingegangenen Arbeiten

Résumés des derniers articles reçus

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. LEEMANN, 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 π 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).

Eine Methode zur Messung des Dotierungsprofils von Halbleiter-Dioden

VON ERNST BALDINGER UND RUDOLF STOCKER

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(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

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(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

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(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.

Is a Quantum Logic a Logic?

by R. J. GREECHIE and S. P. GUDDER

Kansas State University, Dept. of Mathematics, Manhattan, Kansas, USA

(1. V. 70)

Calculation of the Multiplicity Yield Function of the Igy-Neutron Monitor

by H. DEBRUNNER and E. FLÜCKIGER

Physikalisches Institut, University of Berne
Berne, Switzerland

(11. IX. 70)

Abstract. Calculations to determine the multiplicity response function for IGY-neutron monitors are reported for vertically incident primary cosmic ray protons of the rigidity range $2.2 \text{ GV} < R_0 < 100 \text{ GV}$. A Monte Carlo method is used to calculate the secondary nucleon flux intensities in the atmosphere. Empirical and theoretical data on neutron monitor response are employed to relate the calculated flux data to the counting rates of the various multiplicities.

A direct comparison of our multiplicity response function and other related quantities with experimental data is at present not yet possible. But indirect comparisons show fairly good agreement.

Magnetische Wechselwirkung von O_2^- -Zentren in KCl, KBr und KJ

VON REGULA BAUMANN, H. U. BEYELER und W. KÄNZIG

Laboratorium für Festkörperphysik, Eidgenössische Technische Hochschule Zürich.

(6. X. 70)

Abstract. The alkali superoxides, particularly KO_2 , exhibit magnetic ordering through the p-electrons of the superoxide ion O_2^- . In order to arrive at a better understanding of this phenomenon we prepared magnetically dilute crystals, namely alkali halides in which one halide ion in a thousand is substituted by a paramagnetic O_2^- molecular ion. These samples contain enough pairs of neighbouring superoxide ions to permit a detailed study of their EPR spectrum. We have succeeded in determining the structure of nearest neighbour pairs in KCl, KBr and KI and of next nearest neighbour pairs in KCl. The geometry of the pairs is determined by elastic interactions and depends upon the host lattice. The exchange interaction is much weaker, and its magnitude and sign does not only depend upon the distance of the partner molecules but also upon their mutual orientation. The absolute value of J/k does not exceed 2°K for all the pairs studied. The structure of the pairs has a low symmetry, and the molecules are not parallel in some cases. For pairs with symmetry C_1 the skew Dzyaloshinsky-Moriya term $\mathbf{D} (\mathbf{S}_1 \times \mathbf{S}_2)$ could be determined. The interpretation of the EPR spectra illuminates therefore interesting features of the general pair-spin-hamiltonian.

Messung der Protonenpolarisation der d-d-Reaktion

VON A. STRICKER, E. BAUMGARTNER, D. ELLGEHAUSEN, R. GLEYVOD und P. HUBER

(16. X. 70)

Abstract. The polarization of protons from the $D(d,p)T$ reaction has been measured at four laboratory angles ($\theta_{Lab} = 27^\circ, 32^\circ, 45^\circ, 63^\circ$) for a mean deuteron energy of 650 keV. A thin D_2 -gas target was used, scattering from Helium served as the polarization analyzer. The maximum polarization is found to be -11% . The angular dependence was fitted to a sum over associated Legendre functions. It is shown that only the first term is significantly different from zero.