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HELVETICA PHYSICA ACTA

Zusammenfassungen der letzten eingegangenen Arbeiten

Résumés des derniers articles reçus

Das Einschwingen eines zylindrischen Plasmas in magnetoakustischer Resonanz

VON K. APPERT, B. HOEGGER, H. SCHNEIDER UND E. WEISE
Institut für Physik der Universität Freiburg i. Ue.

(14. X. 71)

Abstract. The transient behaviour of an oscillating plasma cylinder is studied near magneto-acoustic resonance. Appropriate nonlinear magnetohydrodynamic equations are solved as an initial value problem and the results are compared with experiments. The energy absorbed in the plasma is found to be strongly dependent on transient effects.

A Coupled Channel Approach to the Isomer Fission State

by M. A. HOOSHYAR
The Institute of Molecular Physics
The University of Maryland, College Park, Maryland, USA

and

F. B. MALIK
Institut de Physique, Université Neuchâtel, Switzerland

(14. X. 71)

Abstract. It has been shown that the Isomer Fission States can originate from the simple channel coupling phenomenon. The set of coupled channel equations of the recently proposed theory of fission are treated in two approximations: (i) a simple two coupled channel case and (ii) a coupled system of N channels. In each case, under a certain physical assumption, it has been possible to find a transformation which uncouples the N channels. In the two channel case, the longer and the shorter half-lives can, respectively, be identified with the spontaneous and the isomer fission states. The N channel case reduces effectively to only 3 uncoupled equations. One of these corresponds to the scattering process for the parameters pertinent to the fission case. Thus, the N channel case reduces effectively to two independent decay channels. The half-lives associated with these two decay channels can again be identified with the decay of the spontaneous and isomer fission states. This treatment of the multichannel decay process is equally valid for the Bohr-Wheeler type of theory and can also be applied to uncouple the scattering problem, which fulfills the basic assumption of this model.

On a Covariant Expression of Energy-Momentum in the Relativistic Theory of Gravitation

by JEAN CHEVALIER
University of Geneva

and

E. C. G. STUECKELBERG DE BREIDENBACH
Universities of Geneva and Lausanne, CERN

(29. X. 72)

Abstract. The relativistic linear formalism developed by W. Scherrer leads to a covariant expression of gravitational energy-momentum. In the case of a mass distribution with spherical symmetry (Schwarzschild's *exterior* solution), this tensor gives a total gravitational energy equal

to $-Mc^2$. How can the minus sign be interpreted? A detailed analysis of Schwarzschild's *interior* solution shows that the gravitational energy has to be considered as a generalization of the classical potential energy, which is *negative* in our attractive case.

Cinétiques d'Adsorption d'Oxygène Formant des Centres Paramagnétiques sur du TiO_2 et SnO_2

par C. HAUSER
Laboratoire d'Optique Physique
Ecole Polytechnique Fédérale—Lausanne

(30. XI. 71)

Résumé. Nous avons mesuré les cinétiques d'adsorption par résonance de centres paramagnétiques provenant d'ions oxygène sur la surface de TiO_2 et SnO_2 . L'étude de ces cinétiques montre en début de réaction une forte perturbation. Un modèle est donné pour expliquer cette perturbation. Les énergies d'activation sont également calculées. Une discussion du modèle et des résultats est présentée.

Skineffekt und elektrische Leitfähigkeit in einem Argonplasma

VON HELMUT SCHNEIDER UND EDWIN HUGENTOBLER
Physikinstitut der Universität Freiburg, Schweiz

(2. XII. 71)

Abstract. Real and imaginary part of the electrical conductivity are measured in a decaying Argon plasma using skineffect of radiofrequency fields. The finite size of the probe is taken into account. The method is described and results are given.

Minimum Radius of Particles with Spin

by E. C. G. STUECKELBERG DE BREIDENBACH
Universities of Geneva and Lausanne, and CERN

(15. XII. 71)

On the Decay of an Unstable Particle

by KALYAN SINHA
Department of Theoretical Physics, University of Geneva

(22. XII. 71)

Abstract. It is shown that the absence of regeneration of the unstable particle from the decay products is inconsistent with a Hamiltonian bounded below. Consequences of some decay laws are also derived.

A Proposal for Corrections to Thermodynamic Scaling

by T. SCHNEIDER, G. SRINIVASAN and E. STOLL
IBM Zurich Research Laboratory, 8803 Rüschlikon, Switzerland

(23. XII. 71)

Abstract. Application of the scaling hypothesis has been highly successful in the immediate vicinity of the critical point. The determination of critical exponents from experiments usually incorporates a wide range of temperature so that the scaling theories would have to be generalized to a larger neighborhood around the critical point. We propose such an extension which is consistent

with available experimental data on the structural phase transformations in SrTiO_3 , LaAlO_3 and the order-disorder transitions in MnF_2 . It is shown through this scheme that *two* critical exponents can be deduced from given data on the temperature dependence of the order parameter.

Hyperfeinstruktur des Elektronenspinresonanzspektrums von molekularem Sauerstoff in der Gasphase

von P. GERBER und H. LABHART

Physikalisch-Chemisches Institut der Universität Zürich

(17. I. 72)

Summary. The hyperfine structure of the ESR-spectrum of gaseous $^{16}\text{O}^{17}\text{O}$ could be described using as a basis the eigenstates of the Hamiltonian for molecular rotation and electron spin in an external magnetic field. The following hyperfine coupling-operator was treated as the perturbation.

$$\mathcal{H}_{\text{HF}} = b(\hat{\mathbf{S}}, \hat{\mathbf{I}}) + c\hat{S}_z\hat{I}_z + \frac{e^2Qq}{4I(2I-1)}(3\hat{I}_z^2 - \hat{I}^2) + f(\hat{\mathbf{K}}, \hat{\mathbf{I}}).$$

The perturbation calculation was carried out to second and, in part, to third order. We obtain the following values for the hyperfine coupling constants.

$$b = (-101.441 \pm 0.010) \text{ MHz}$$

$$c = (140.123 \pm 0.036) \text{ MHz}$$

$$e^2Qq = (-8.42 \pm 0.18) \text{ MHz}$$

$$f = (-55 \pm 15) \text{ kHz}$$

The values of the magnetic hyperfine coupling constants b and c are compatible with the less accurate data determined from microwave spectra by Miller and Townes. The values of e^2Qq and f were previously unreported. The coupling constants were interpreted by simple MO-models, making use of approximations introduced by Miller, Townes, Dailey and Kotani. Some refinements to these approximations were made, based on the results of Kelly's calculations on the oxygen atom.

Analyse par ordinateur de la forme du signal de RPE d'ions O_2^- et Ti^{3+} sur le TiO_2 et O_2^- sur le SnO_2

von C. HAUSER

Ecole Polytechnique Fédérale, Lausanne, Laboratoire d'Optique Physique

(25. I. 72)

Résumé. L'analyse du signal de poudre en RPE d'ions O_2^- sur TiO_2 et SnO_2 et de Ti^{3+} dans TiO_2 a été effectuée à l'aide d'un programme de calcul permettant l'obtention des valeurs exactes des champs de résonance et des largeurs de raies selon les axes cristallins. Le programme tient compte d'une variation spatiale de la largeur de la raie de base en fonction de l'orientation des cristallites.

Statistical Description of Elementary Processes I. Single Particle Theory

by L. P. HORWITZ

University of Geneva

(28. I. 72)

Abstract. As a basis for the formulation of a statistical description of elementary processes, it is assumed that the measurements set up to characterize the quantum state of certain systems may not form (non-trivially) a complete set. The consequences of this assumption for the structure of quantum mechanical states and their evolution in time is investigated, and some aspects of scattering theory are discussed. A representation in terms of an overcomplete family of states is suggested by this structure, and its time evolution is studied. The phenomena of induced dispersion and broken symmetries are discussed.