

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

Comment on a Paper of Amrein, Martin and Misra

by W. W. ZACHARY

Naval Research Laboratory, Washington, D.C., USA

(12. II. 73)

Abstract. We point out a gap in the proof of a proposition in a paper of Amrein, Martin and Misra and give a proof of their result.

Relativistic Dynamics

by L. P. HORWITZ¹) and C. Piron

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(8. II. 73)

Abstract. A canonical formalism for the relativistic classical mechanics of many particles is constructed. The correct equations for the motion of a charged particle in an electromagnetic field are obtained in this formalism, and the relativistic two-body problem with an invariant interaction is solved by showing that there is a special frame in which the equations of motion are essentially the same as those for the non-relativistic theory. The classical canonical formalism is then used as a basis for the construction, by means of the correspondence principle, of a consistent relativistic quantum theory. A simple interpretation is provided for the Newton–Wigner position operator by showing that it is just the observable $q - \frac{1}{2}[(p/E)t + t(p/E)]$ in a representation, called the mass representation, which diagonalizes the momentum and the free particle ‘Schrödinger operator’.

Decay Formula and Fission Barrier

by F. BARY MALIK¹)

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and PIERRE C. SABATIER

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(16. II. 73)

Abstract. For any theory of fission, which construes the last step as a one-dimensional tunnelling process through a potential barrier, we show that the observed pre-neutron emission kinetic energies are inconsistent with the Bohr–Wheeler–Strutinski barrier used in computing the spontaneous fission half-lives. As regards these data, we establish that the significant feature of any model which attempts to describe the last stage of fission as a single channel tunnelling phenomenon is the presence of a potential hole whose minimum is lower than the observed kinetic energy. Only such a hole can contain a resonant state decaying through the last stage of the barrier with appropriate kinetic energies. Besides, the observed half-lives indicate that this last stage of the barrier is likely to be thinner than the one usually used. We also formulate an exact expression relating the half-life of a decay process through a barrier to the phase shift of the scattering by the associated potential.

EPR von Fe^{3+} in SrTiO_3 unter einachsigen $\langle 100 \rangle$ Druck

von TH. VON WALDKIRCH und K. A. MÜLLER
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(23. II. 73)

Abstract. The effect of uniaxial $\langle 100 \rangle$ stress on the EPR fine-structure lines of Fe^{3+} ions in SrTiO_3 has been investigated at 300 K, 78 K and 4.2 K. A linear shift of the lines up to stresses of 15 kg/mm^2 is observed for all three temperatures investigated. This, together with a negligible line broadening, proves that the stress was uniform and homogeneous throughout the sample. The spin-lattice strain coefficients G_{11} determined are 7.26, 7.21 and $7.66 \pm 0.2 \text{ cm}^{-1}$, respectively. From the experimental uncertainty to observe an eventual knee in the line splitting, an upper limit for a possible, stress-induced spontaneous ferroelectric bulk-polarization P_s of about $0.5 \mu\text{C/cm}^2$ at 15 kg/mm^2 and 4.2 K is deduced. This limit exceeds $P_s = 0.29 \mu\text{C/cm}^2$ derived recently from dielectric measurements under these conditions, but lies significantly below the values of P_s known from other ferroelectrics. Non-linear dielectric effects are discussed.

Analysis of a Non-Resonant Maser Model

by RENÉ WEISS

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(5. III. 73)

Abstract. A system of N two-level molecules interacting by dipole coupling with one non-resonant mode of the radiation field is treated quantum mechanically. First the eigenvalue spectrum of the Hamiltonian is discussed and asymptotic expressions (for large, but finite N) for the difference of successive eigenvalues are given. The time behaviour of the mean photon number and its mean square variance is then derived for various initial states. The time evolution of these quantities strongly depends on the ratio of the coupling constant and the difference of the field energy and the transition energy of the molecules.

Bestimmung einer oberen Grenze für die radiative Zerfallsbreite $\Gamma(\text{K}_{890}^{*+} \rightarrow \text{K}^+\gamma)$ in der kohärenten Produktion an Kernen

VON KLAUS FREUDENREICH

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(19. III. 73)

Abstract. The coherent production of K_{890} on nuclei has been investigated with a large magnet spark chamber at 10, 13 and 16 GeV/c. The K_{890} events found in the data exhibit the behavior expected for coherent production. A model is presented which describes the coherent production of K_{890} in terms of the strong and electromagnetic interactions including their interference. A comparison of the model with the data shows the strong production to be dominant and larger than expected. Via the interference with the Coulomb amplitude the phase of the strong production amplitude can be determined. Finally the upper limit for the radiative decay width is found to be smaller than 80 keV with 95% confidence.