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HELVETICA PHYSICA ACTA
Zusammenfassungen der letzten eingegangenen Arbeiten
Résumés des derniers articles reçus

On the phase transition in XY - and Heisenberg models

by N. SZABO

Département de Physique Théorique, Université de Genève, CH-1211 Geneve 4, Switzerland

(2. V. 1977)

Abstract. For the free energy and susceptibility of the quantum XY - and Heisenberg models singular lower and upper bounds have been constructed in d dimensions. The bounds are given by the Ising model free energies and susceptibilities which prove the onset of continuous phase transition in d dimensions, $d \geq 2$.

On the phase transition in A^4 -phonon theory

by N. SZABO

Department of Theoretical Physics, University of Geneva, CH-1211 Geneva 4, Switzerland

(2. V. 1977)

Abstract. For a A^4 -quantum mechanical phonon Hamiltonian it is proven that the free energy is complex if the harmonic, dynamical matrix of the model has negative definite portion in the Brillouin zone. From this fact it follows that the free energy exhibits always an instability associated with the ground state.

Indefinite metric, quantum axiomatics, and the Markov property

by F. H. BROWNELL

Department of Mathematics, University of Washington, Seattle, Washington 98195, U.S.A.

(27. VI. 1977)

Abstract. In answer to a remark of Jauch, a set of axioms for an ‘indefinite metric’ formulation of quantum electro-dynamics is presented, and the connection with orthocomplementation noted. Here a strict version of the Markov property apparently fails, leading to a novel interpretation.

Anomalien der verbotenen Zone von Sb_2S_3 -Kristallen

A. GÄUMANN, A. ORLIUKAS und P. BOHAC

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(14. VI. 1977)

Summary. Synthetic Sb_2S_3 crystals with different contents of foreign elements and different divergences from stoichiometry were investigated with X-ray and thermoanalytical (DTA) methods, and investigations were made concerning the T -dependence of the energy gap in the range of 290–570 K.

The change of the lattice-constants in relation to the purity and the stoichiometry is $\Delta X \leq 0,02 \text{ \AA}$: the melting point in the different tests changed between 751,8–778,5 K.

From the change of the temperature coefficient of the energy gap $d/dT(\Delta E)$, we detected two phase transitions in the ranges 311–384 K and 393–494 K. With growing divergence of the stoichiometry and increasing content of foreign elements, $d/dT(\Delta E)$ decreases and the T -range of the transition phase is spreading and displaced to lower temperatures.

The regular external field problem in quantum electrodynamics

by M. KLAUS and G. SCHARF

Institut für Theoretische Physik der Universität Zürich, Schönberggasse 9,
CH-8001 Zürich, Switzerland

(2. VII. 1977)

Abstract. The quantized electron-positron field in interaction with an external classical static electromagnetic field is considered. The external potential is restricted in such a way that a dressed vacuum and dressed electron-positron states exist in Fock space. In this case the Furry picture has a mathematically well-defined meaning. A large class of such regular external fields is found which, however, contains no static magnetic field.

Vacuum polarization in Fock space

by M. KLAUS and G. SCHARF

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(2. VII. 1977)

Abstract. The regular external field problem in quantum electrodynamics which can be treated by ordinary Fock space methods is further investigated. The renormalized Hamiltonian is discussed and the charge density $\rho(x)$ is constructed as a local limit $x' \rightarrow x$ of a non-local quantity $\rho(x, x')$. This construction involves no formal manipulations for the class of regular external potentials. The expectation value of $\rho(x)$ in the dressed vacuum Ω' gives the usual vacuum polarization potential. In strong external fields, the vacuum Ω' may become charged. This phenomenon has recently attracted large interest in connection with heavy ion collisions.