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# HELVETICA PHYSICA ACTA

Zusammenfassungen der letzten eingegangenen Arbeiten

Résumés des derniers articles reçus

## The Scattering Matrix is Non-Trivial for Weakly Coupled $P(\varphi)_2$ Models

by KONRAD OSTERWALDER

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Centre de Physique Théorique, Ecole Polytechnique, Palaiseau, France

(21. I. 1976)

*Abstract.* We show that for sufficiently small coupling constant  $\lambda$ , the  $\lambda P(\varphi)_2$  quantum field theory models have a scattering matrix which is different from  $\mathbb{1}$ . Our method is to write the scattering matrix elements as polynomials in  $\lambda$ , whose coefficients, though themselves functions of  $\lambda$ , are uniformly bounded for  $\lambda$  sufficiently small. The first order term in that expansion is the one given by perturbation theory.

## Energy Loss of Charged Particles in a Medium of Resonant Atoms in the Presence of an Electromagnetic Field

by S. P. ANDREIEV

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

(3. II. 1976)

*Abstract.* The process of the energy loss of a massive charged particle in a medium of independent atoms in the presence of a resonant electromagnetic field is investigated. It is shown that the field changes radically the character of the movement of the particle, from elastic to inelastic. The sign of the energetic losses depends on the sign of the difference between the frequency of the field and transition frequency of atoms.

## Propagation of Ion Acoustic Solitons in a Warm Ion Plasma

By CH. HOLLENSTEIN and M. Q. TRAN

Centre de Recherches en Physique des Plasmas,  
Ecole Polytechnique Fédérale de Lausanne, Switzerland

(3. II. 1976)

*Abstract.* We study the propagation of ion acoustic solitons in a large collisionless plasma with hot ion ( $T_e/T_i = 9$ ). Mach number and soliton widths were measured and the experimental results are well described by Sakanaka's theory. The number of solitons is in good agreement with the theoretical predictions of Gardner et al. when ion pressure is considered in the Korteweg de Vries equation.

# **The Effect of Radiative Capture on Threshold $\pi^-p$ Scattering and the Theory of the Panofsky Ratio**

by G. RASCHE

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

and W. S. WOOLCOCK

Research School of Physical Sciences, The Australian National University, Canberra, Australia

(6. II. 1976)

*Abstract.* The effect of the  $(\gamma n)$  channel on threshold  $\pi^-p$  scattering is considered. The symmetric  $3 \times 3$  matrix of  $s$ -wave scattering amplitudes is written in terms of the components of a real symmetric  $3 \times 3$  matrix, which can be expanded in a power series in  $q^2$ . The behaviour near the  $\pi^-p$  threshold of the cross-sections for the processes  $\pi^-p \rightarrow \pi^0 n$  and  $\pi^-p \rightarrow \gamma n$  is obtained and the Panofsky ratio in flight is calculated. The  $2 \times 2$  matrix of  $s$ -wave scattering amplitudes for the open channels  $(\pi^0 n)$ ,  $(\gamma n)$  below the  $\pi^-p$  threshold is also obtained and shown to be unitary. The theory of the Panofsky ratio for the decay of the  $\pi^-p$   $1s$  state is developed.

## **Der Deuteronenaufbruch an Mittelschweren Kernen**

by P. VIATTE, S. MICEK, R. MÜLLER, J. LANG, J. UNTERNÄHRER, C. M. TEODORESCU und  
L. JARCZYK

Laboratorium für Kernphysik ETH Zürich, Schweiz

(6. II. 1976)

*Abstract.* Spins, parities and partial widths of proton unbound states in  $^{41}\text{Sc}$  and  $^{59}\text{Cu}$  have been determined by proton-neutron angular correlation measurements on the reactions  $^{40}\text{Ca}(d, n)^{41}\text{Sc}(p)^{40}\text{Ca}$  and  $^{58}\text{Ni}(d, n)^{59}\text{Cu}(p)^{58}\text{Ni}$  at deuteron energies of 11 and 10 MeV respectively, for a fixed neutron angle ( $25^\circ$ ) and various proton angles. The data were analyzed in the framework of the DWBA theory using a resonance form factor. The calculations were performed following the approach of Vincent and Fortune.

Seven levels in  $^{41}\text{Sc}$  were studied in the excitation energy range of 3 to 7 MeV. Compared with values given in the literature, the consistence of the spins and parities assigned proves the applicability of the particle-particle correlation method as an alternative tool for the investigation of stripping reactions to resonant states. The agreement of the extracted resonance widths with those known from elastic proton scattering is an important test for the reliability of DWBA calculations. In the case of  $^{59}\text{Cu}$  new spectroscopic information was obtained in the excitation energy range of 5.4 to 8.4 MeV. Thirty resonances could be identified as levels in  $^{59}\text{Cu}$ , 17 of which could be interpreted.

The stripping reaction turns out to be a complementary technique to elastic proton scattering for the study of higher angular momentum states which, considering the different barrier transmission factor, are easier to observe in transfer reactions.

## **Local and Substantial Fluxes for Energy, Linear Momentum and Quasi Momentum in Systems with a Non-local Internal Interaction**

by J. A. KOBUSSEN

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Schönberggasse 9, Switzerland

(16. II. 1976)

*Abstract.* The dynamics of a continuous inhomogeneous system with a non-linear non-local internal interaction is described. This is done in terms of a Lagrangian density by means of local as well as substantial coordinates. In both coordinate systems the conservation laws for energy and linear momentum are derived. Additionally, a balance equation for a quantity, which may be termed quasi momentum, has been constructed. The expressions in both coordinate systems are mutually related.