HELVETICA PHYSICA ACTA

Zusammenfassungen der letzten eingegangenen Arbeiten

Résumés des derniers articles reçus

Nuclear Magnetic Resonance in $Be_{22}Re$ and $Be_{22}Tc$

by M. Bernasson, P. Descouts and G. A. Styles

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(31. I. 70)

Abstract. The N. M. R. Knight shifts, K, and line-widths, ΔH, of the ^{9}Be, ^{185}Re, ^{187}Re and ^{99}Tc resonances have been measured in the intermetallic compounds $Be_{22}Re$ and $Be_{22}Tc$ at three different magnetic field strengths. Both K and ΔH were determined at 300 °K, 77 °K and 4.2 °K and were found to be independent of temperature. The line-widths of the ^{9}Be resonance in both compounds and of the ^{185}Re and ^{187}Re resonances in $Be_{22}Re$ exhibit a field-dependence which is shown to be due to second-order quadrupole effects. The values of the Knight shift of ^{9}Be (K = − 0.0027%), close to that measured in pure Be, together with those of ^{185}Re (K = −0.880%) and of ^{99}Tc (K = −0.536%) appear to indicate localisation of the d-electron wavefunctions near to the transition metal ions.

On the Asymptotic Condition of Scattering Theory

by W. O. Amrein, Ph. A. Martin and B. Misra

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(6. II. 70)

Abstract. We propose a new formulation of the asymptotic condition of scattering theory which applies to Coulomb interactions and other long range potentials and which generalizes the usual asymptotic condition. It consists of the requirement that the constants of the free motion be asymptotically stationary also under the real evolution. From this and two supplementary conditions we prove the existence of wave operators and of a scattering operator. It is then shown that the wave operators are strong operator limits as in standard scattering theory except that the free evolution may have to be replaced by a modified propagator. Finally, Dollard's method of proving the asymptotic convergence for the Coulomb interaction is extended to a more general class of potentials.

The Decay of ^{51}Cr

by Cl. Ribordy and O. Huber

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(16. II. 70)

Abstract. The decay of ^{51}Cr is studied with a Ge(Li) detector of 3.2 cm^3 and a double focusing beta spectrometer. Hypothetical transitions (150 keV, 325 keV, 470 keV and 645 keV) in ^{51}V are excluded. The energy and K-internal conversion coefficient of the signle γ-transition in ^{51}V are measured: E_γ = (320.032 ± 0.040) keV and α_K = (1.46 ± 0.13) 10^{-3}. The Q value of the decay $^{51}Cr \to {}^{51}V$ is obtained from the end point energy of the internal bremsstrahlung (IB) spectrum: Q = (748 ± 14) keV. This IB spectrum is measured with a Ge(Li) detector and unfolded with a described procedure. Although a pile up rejector was used, this Ge(Li) measurement suffers still from a distortion due to the pile up effect. The IB spectrum taken with the magnetic spectrometer (Pile up free) reveals a doubtful structure which remains unclear. The proportion of the electron captures populating the first excited state of ^{51}V is measured: β = (10.2 ± 1 %). A decay scheme is proposed.

Nucleon Transfer Reactions below the Coulombbarrier

by D. Trautmann and K. Alder
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(23. II. 70)

Abstract. A DWBA treatment for nucleon transfer reactions is given which is applicable for energies below and in the neighbourhood of the Coulomb barrier. At energies well below the Coulomb barrier the theory is essentially exact and the radial integrals describing the reaction may be evaluated analytically by means of generalized hypergeometric series. Methods for their numerical calculation are given. Semiquantal and semiclassical approximations are considered. From those it is possible to recognize a close similarity between transfer processes and Coulomb excitation. The effects of nuclear interaction, which become important at energies close to the Coulomb barrier, are treated in an approximate manner. Expressions are given for the differential and total cross-section. The deuteron stripping reaction is treated as a special case and the polarisation of the outgoing proton in (d, p)-reactions is calculated. The connection between this treatment and the diffraction model developed by Dar and Frahn and Sharaf is discussed. An improvement of the model is given. A method similar to the one used in scattering and Coulomb excitation calculations is used to improve the slow convergence of the sum over the orbital angular momenta. Comparisons with actual experiments are discussed.

Four-Particle-Two-Hole Core-Excitation in Heavy Nuclei

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(23. II. 70)

Abstract. Four-particle-two-hole core-excitation in heavy nuclei with two nucleons outside the closed shells is investigated by including the highest core orbits into the configurations space of a shell-model calculation. The core-excitation is supposed to be effected by an interaction between core nucleons and valence nucleons which is essentially the same as the well-known residual interaction between the valence nucleons. The nucleons in the core are assumed to be excited only in pairs coming from the same core orbit. Therefore, the angular momentum of the core is always even.

For the description of core-excited configurations in second quantization formalism an orthogonal system of four-fermion operators is constructed. Using a phenomenological interaction potential with appropriate spin-spin and tensor parts and restricting to excitations with core-spin 0 energy levels and transition probabilities of the nuclei Pb^{206}, Po^{210} and Hg^{206} are calculated.