Internal conversion measurements

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SUMMARY

In this thesis accurate internal conversion ratios are presented for the isomeric transitions in ^{58m}Co, ^{60m}Co, ^{83m}Kr and ^{134m}Cs. These measurements were undertaken to determine possible multipole mixtures. We further measured the electron spectrum associated with the decay of ^{116m}In in order to find evidence for an electric monopole transition. The isomers were produced by neutron induced reaction in the High Flux Reactor at the Reactor Centrum Nederland at Petten. In the last part we present the combined results of conversion electron and Mössbauer measurements on the well known 14.4 keV transition in ^{57}Fe, performed to determine the nuclear radius change during this transition.

In chapter II we consider theoretical conversion coefficient calculations and discuss the relation between conversion coefficients and electron contact densities.

In chapter III the double focusing spectrometer and the associated equipment are described.

In chapter IV the experimental results obtained for the short-lived isomers are presented. For the 9.4 keV transition in ^{83m}Kr a mixing ratio $\delta^2(E2/M1) = (2.2\pm0.5)\times10^{-4}$ was obtained. No evidence was found for L=4 components in the investigated octupole transitions. We estimated a strength parameter $0.03 < \rho < 0.1$ for the 1757.0 keV $0^+ \rightarrow 0^+$ transition in ^{116}Sn following the decay of ^{116m}In.

From the results of the conversion measurements given in chapter V the contact density of Fe in different metallic hosts was calculated. Together with the results of the Mössbauer experiments, this yields a relative difference $\Delta R/R = -(5.4\pm1.7)\times10^{-4}$ of the mean charge radius of the ^{57}Fe nucleus in the 14.4 keV and the ground state. The importance of the influence of the unknown inner-shell behaviour on this result is discussed and the influence of line-shape differences due to shake-off was investigated.