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M/L AND (N + O + ...)/M CONVERSION RATIOS FOR M1 + E2 TRANSITIONS

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For the $M1 + E2$ transitions we continued sistematical investigation of internal conversion process in L, M and $(N + O + \ldots)$ atomic shells.

The aim of this investigation was to estimate the possibility of higher multipolarity admixture determination from precise experimental measurement or the ratio M/L, as well as to check the newest theoretical conversion calculations of Hager and Seltzer[1] for this type of transitions.

The conversion in $(N + O + \ldots)$ shells was investigated to estimate its contribution to the total conversion coefficient.

On the high resolution ironfree $\pi\sqrt{2}$ β-spectrometer we measured the internal conversion M/L and $(N + O + \ldots)/M$ ratios for four $M1 + E2$ transitions and one pure $M1$ transition for the atomic numbers 63 to 83, and in the energy interval from 77 to 239 keV. The results of this measurements are listed in the Table. Each measurement is repeated 3—4 times. Statistical error of each particular measurement was comparable with the mean deviation of the final result.

Experimental values of M/L ratios are compared with theoretical values of Hager and Seltzer[1]. The interpolation has been done according to the programme given in[1]. For the higher multipole admixture the newest experimental results given in the Table were used.

Our results show, within the experimental error, good agreement with the conversion M/L ratios obtained with the Hager and Seltzer values and $E2/M1$ mixing ratios from other experiments.

Experimental $(N + O + \ldots)/M$ ratios differ slightly from the values for pure $M1$ and $E2$ transistions obtained in earlier measurements.

If the mixing ratios are to be determined from this type results the errors should be of order of 0.5 % provided the transitions contain from 30 to

Table

Nucleus	E_γ keV	Trans.	$\delta^2 = \frac{E2}{M1}$	Ref.	$\left[\frac{M}{L}\right]_{exp}$	$\left[\frac{(N+O+..)}{M}\right]_{exp}$	$\left[\frac{M}{L}\right]_{th}$	$\frac{\left[\frac{M}{L}\right]_{exp}}{\left[\frac{M}{L}\right]_{th}}$
$^{153}_{63}Eu$	103.2	$\frac{7+}{2} \to \frac{5+}{2}$	1.74×10^{-2}	2	0.206 ± 0.006	0.272 ± 0.015	0.217	0.949 ± 0.027
$^{165}_{63}Ho$	94.7	$\frac{9-}{2} \to \frac{7-}{2}$	2.35×10^{-2}	3	$0\ 244 \pm 0.007$	0.279 ± 0.016	0.220	1.111 ± 0.031
$^{169}_{69}Tm$	198.0	$\frac{7+}{2} \to \frac{5+}{2}$	9.29×10^{-2}	4	0.235 ± 0.007	0.281 ± 0.017	0.225	1.044 ± 0.026
$^{191}_{77}Ir$	129.5	$\frac{5+}{2} \to \frac{3+}{2}$	2.35×10^{-1}	5	0.241 ± 0.007	0.309 ± 0.018	0.235	1.026 ± 0.030
$^{212}_{83}Bi$	238.6	$0- \to 1-$	0	6	0.227 ± 0.003	$0\ 300 \pm 0.020$	0.234	0.970 ± 0.013

70 % of the higher multipole. With the present experimental techniques such small error is difficult to reach, especially for weak transitions. But, even if such error is once reached, errors in theoretical values are larger than this limit. For this reason, all experiments of this type, given with an error of the order of 3 %, cannot be used to determine the mixing ratios.

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