5.4. The complete interpretation of data from gamma-skip-gamma directional correlation measurements — ^{124}Te

A. H. KUKOČ, R. B. VUKANOVIĆ and I. V. ANIČIN, *Institute »Boris Kidrič«, Beograd*

5.5. Time coincidences in the reactions Er(n, γ) and Lu(n, γ)

J. SIMIĆ, S. KOIČKI and B. LALOVIĆ, *Institute »Boris Kidrič«, Beograd*

5.6. Linear polarization of 662 and 279 keV gamma rays elastically scattered in uranium

B. MOLAK, J. NOSIL and K. ILAKOVAC, *Institute »Ruđer Bošković«, Zagreb*

The measurements were performed in an arrangement described in Ref.[1] A planar Ge(Li) detector of $\phi 18 \times 3$ mm was used as a polarization analyzer. The scatterer was a disc of uranium metal of $\phi 32 \times 10$ mm. The gamma ray sources, ^{137}Cs of 5 Ci or ^{203}Hg of about 1 Ci, were placed inside a heavy lead shield. The shield and the scatterer were mounted inside a steel cylinder. The cylinder was pivoted in a fork to change the scattering angle, and the fork was mounted onto a shaft to rotate the scattering plane (sce Fig).

Small deviations of the detector from the axis of rotation cause considerable changes in the counting rate due to the strong dependence of the cross sections on the scattering angle. However, the change of the sum of counting rates at two

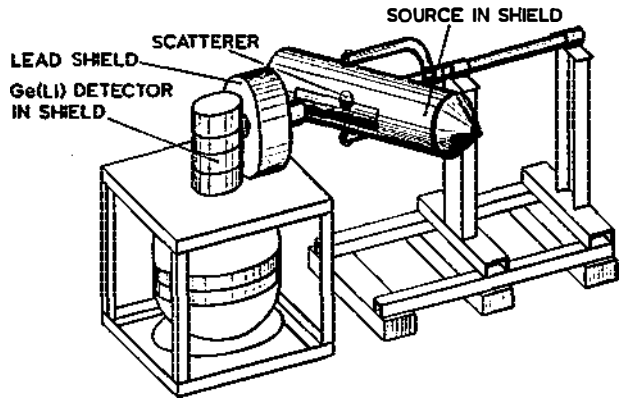

Fig.

opposite positions of the source cancels to first order, and in this way systematic errors can be practically eliminated. Therefore, the counting rates for both the »parallel« (N_1) and the »perpendicular« (N_2) orientation of the polarization plane with respect to the detector were determined for two opposite positions of the source (four positions altogether).

From the measured counting rates the asymmetry $A = (N_1 - N_2)/(N_1 + N_2)$ was determined. The polarimetric efficiency ε of the analyzer was calibrated by measuring the asymmetry in Compton scattering. From the relation $P = A/\varepsilon$ the degree of linear polarization was determined.

TABLE 1

Linear polarization in elastic scattering of 662 keV gamma rays
$Z = 92$ $\varepsilon = 6.54 \pm 0.95$

Θ	51°	60°	75°	90°	105°	120°	135°
$-A(\%)$	3.14±0.36	4.75±0.42	6.55±0.68	3.74±0.50	1.85±0.66	2.14±0.66	0.67±0.83
$-P(\%)$	48.8±9.0	72.5±12.4	100.2±15.0	57.1±11.3	28.3±11.0	32.7±10.9	10.2±12.6
$-P(\%)^*_{\text{theor}}$	60.0	82.8	99.0	78.5	48.0	25.3	12.0

* theoretical results of Ref.[2] for $Z = 82$ and $E_\gamma = 654$ keV.

TABLE 2

Linear polarization in elastic scattering of 279 keV gamma rays
$Z = 92$ $\varepsilon = 4.59 \pm 0.14$ ($E_\gamma = 288$ keV)

Θ	45°	60°	75°	90°	105°	120°	135°
$-A(\%)$	2.03±0.48	—	3.8±0.6	4.15±0.83	3.6±0.9	—	1.45±0.57
$-P(\%)$	44.3±10.6	—	82.7±13.4	90.5±18.3	78.4±19.7	—	31.7±12.4
$-P(\%)^*_{\text{theor}}$	43	75	85	94	68	38	20

* theoretical results of Ref. [2] for $Z = 82$ and $E_\gamma = 327$ keV.

The results of measurements with 662 keV and 279 keV gamma rays are shown in Table 1 and Table 2, respectively. The tables also show the theoretical results of Ref.[1] for scattering in mercury at energies of 654 keV and 327 keV, respectively.

References

1) B. Molak, K. Ilakovac and J. Nosil, this issue p. 15;
2) G. E. Brown and D. F. Mayers, Proc. Roy. Soc. A234 (1956) 387; A242 (1957) 89.