Çok - Kutuplu Karışım Oranları ve Açısal Korelasyon Katsayıları Arasındaki Bağıntıların Grafikle Gösterilmesi.

The Graphical Representation of The Relations Between The Multipole Mixing Ratios And The Angular Correlation Coefficients.

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ÖZET

Çok - kutuplu (δ - Multipol) karışım oranları deneysel olarak korelasyon katsayılarından elde edilmektedir. Bu çalışmada 2(1,2)2 , δ>0 ; 2(1,2)2 , δ<0 ; 3(1,2)2 , δ>0 ; 3(1,2)2 , δ<0 ; 3(1,2)3 , δ>0 ; 3(1,2)3 , δ<0 ; 2(1,2)3 , δ>0 ; 2(1,2)3 , δ<0 korelasyon katsayıları ve karışım oranları arasındaki bağıntıları grafiksel olarak gösterilmiş ve yapılan deneysel çalışmalara hesaplama kolaylığı getirmesi sağlanmıştır.

SUMMARY

Multipole mixing ratios (δ) are determined from the experimental correlation coefficients. In this work the relation between 2(1,2)2 , δ>0 ; 2(1,2)2 , δ<0 ; 3(1,2)2 , δ>0 ; 3(1,2)2 , δ<0 ; 3(1,2)3 , δ>0 ; 3(1,2)3 , δ<0 ; 2(1,2)3 , δ>0 ; 2(1,2)3 , δ<0 correlation coefficients and mixing ratios are represented graphically and a practical way is shown for the experimental calculations.

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INTRODUCTION

The importance of angular correlations and the multipole mixing ratios has been shown previously (1 - 3); the experimental application of these were also discussed in (1, 4 - 6). In order to prepare the results of these experimental work practically and check the data at once it is very useful to have the graphical relation between the angular correlation coefficients and the multipole mixing ratios.

THE RELATION BETWEEN THE CORRELATION COEFFICIENTS AND THE MULTIPOLE MIXING RATIOS

For the $\gamma_1 - \gamma_2(\theta)$ correlations (1) :

$$W(\theta) = \sum_{k\text{-even}} A_{kk} G_{kk} U_{kk} Q_{kk} P_{kk} (\cos\theta)$$

In this equation $A_{kk} = A_k(\gamma_1) A_k(\gamma_2)$ and

$$A_k(\delta_1) = [F_k(L_1 L_1 J_i J_{int}) - 2\delta_1 F_k(L_1 L_1' J_i J_{int}) + \delta_1^2 F_k(L_1' L_1' J_i J_{int})](1+\delta_1^2)^{-1} \quad (i)$$

$$A_k(\gamma_2) = [F_k(L_2 L_2 J_f J_{int}) + 2\delta_2 F_k(L_2 L_2' J_f J_{int}) + \delta_2^2 F_k(L_2' L_2' J_f J_{int})](1+\delta_1^2)^{-1} \quad (ii)$$

Here δ is the multipole mixing ratio, and it is defined as the intensity ratio of L′ multipole to the L multipole ; and are given by :

$$\delta_1 = \langle J_{int} \| \pi' L'_1 \| J_i \rangle / \langle J_{int} \| \pi L_1 \| J_i \rangle$$

$$\delta_2 = \langle J_{int} \| \pi' L_2' \| J_f \rangle / \langle J_{int} \| \pi L_2 \| J_f \rangle$$

SOME SPECIAL CASES AND THEIR GRAPHS

For $\delta < 0$ and $\delta > 0$, in the J(L, L′)J′ notation 2(1,2)2 , 2(1,2)3 , 3(1,2)2 and 3(1,2)3 states are of interest. Because in practice these are the most frequent ones and experimentaly it is very much appreciated to know these at once (4 - 6). The graphical representation of these cases have been determined from (i) and (ii) and are shown below.

When the coefficients are obtained experimentaly for $W(\theta)$ the results are divided by $G_{kk}U_{kk}Q_{kk}$ and A_{kk} will be found. The relation between $A_k(\gamma_1)$, $A_k(\gamma_2)$ and A_{kk} is :

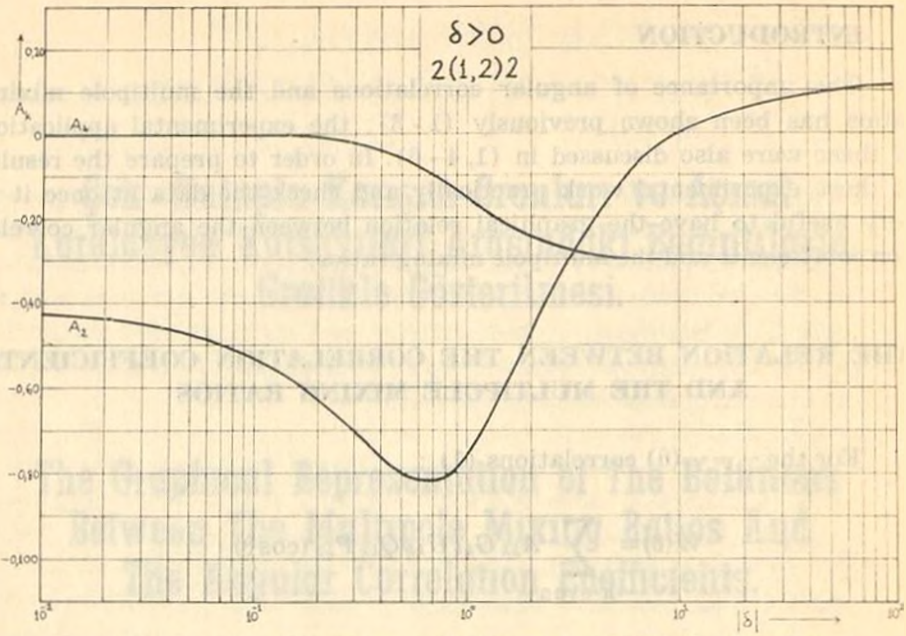

Fig. 1) The Angular Correlation coefficients $A_2(\gamma_2)$ and $A_4(\gamma_2)$ [for the $2 \rightarrow 2$ transitions and $\delta = \gamma(L'=2)/\gamma(L=1)$; $\delta > 0$] as a function of δ.

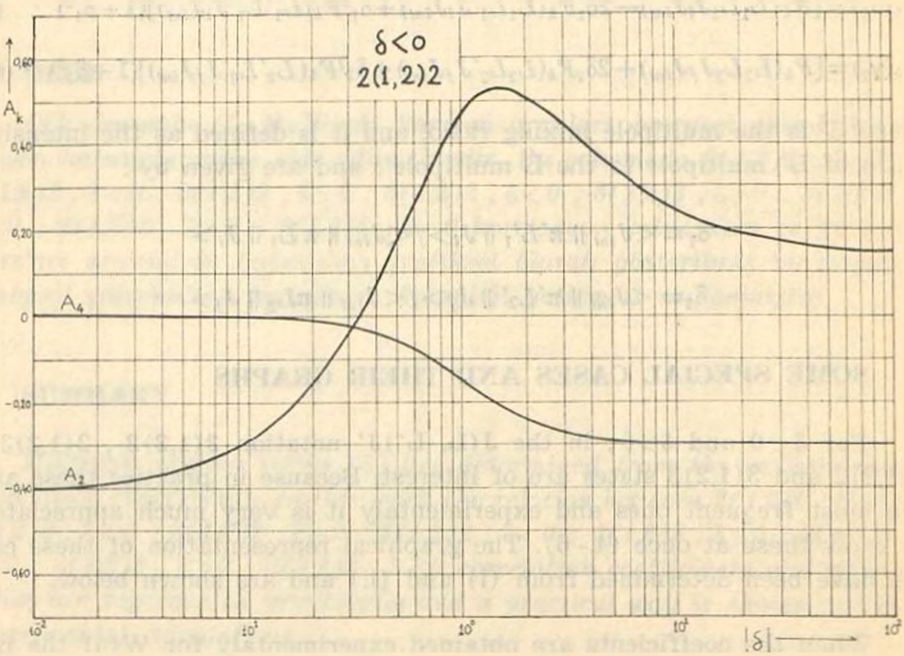

Fig. 2) The Angular Correlation coefficients $A_2(\gamma_2)$ and $A_4(\gamma_2)$ for the $2 \rightarrow 2$ transitions and $\delta = \gamma\ (L'=2)/\gamma(L=1)$; $\delta > 0$] as a function of δ.

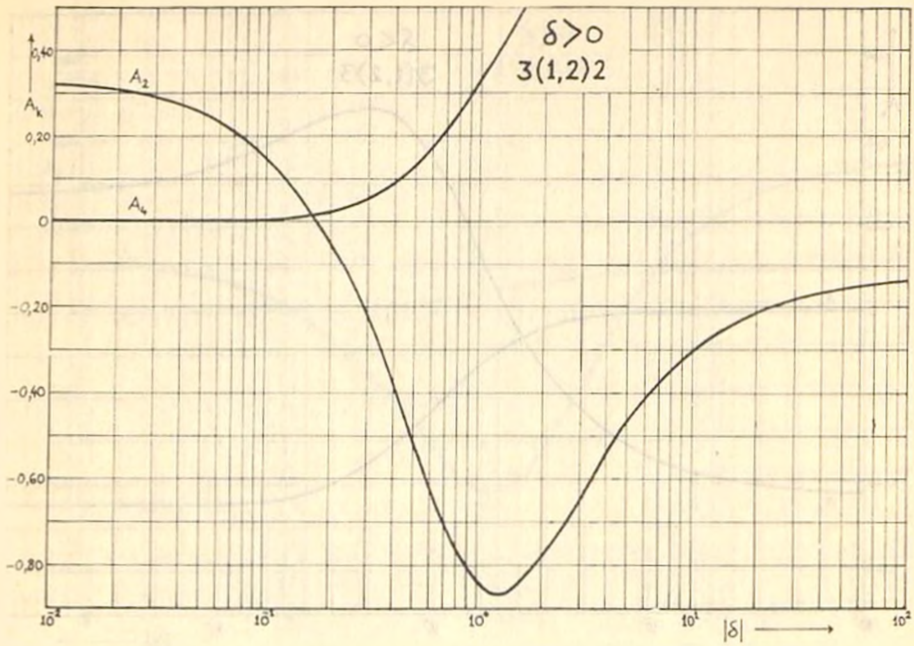

Fig. 3) The Angular Correlation coefficients $A_2(\gamma_2)$ and $A_4(\gamma_2)$ [for the $3 \rightarrow 2$ transitions and $\delta = \gamma(L'=2)/\gamma(L=1)$; $\delta > 0$] as a function of δ.

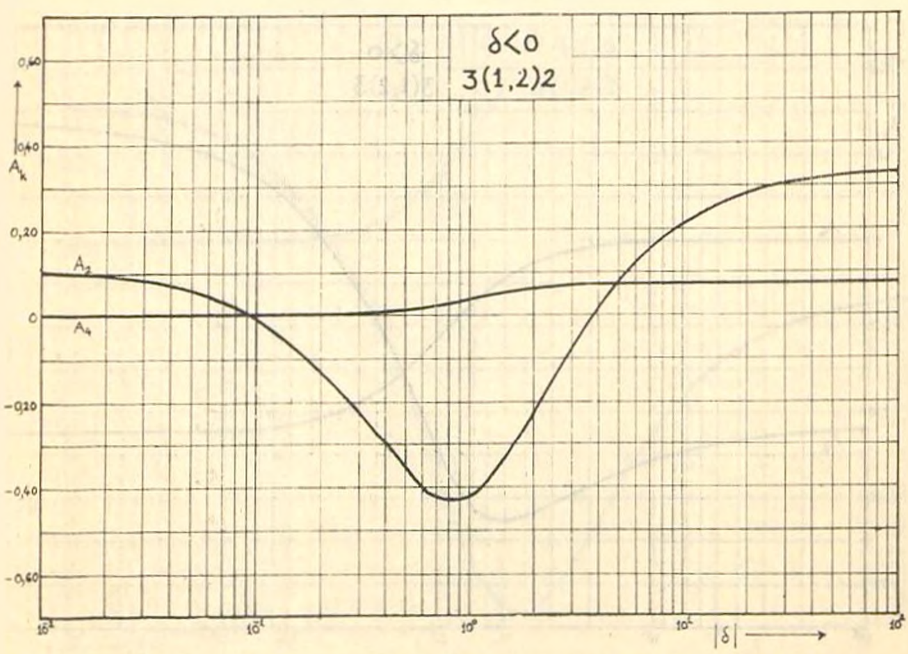

Fig. 4) The Angular Correlation coefficients $A_2(\gamma_1)$ and $A_4(\gamma_1)$ [for the $3 \rightarrow 2$ transitions and $\delta = \gamma(L'=2)/\gamma(L=1)$; $\delta < 0$] as a function of δ.

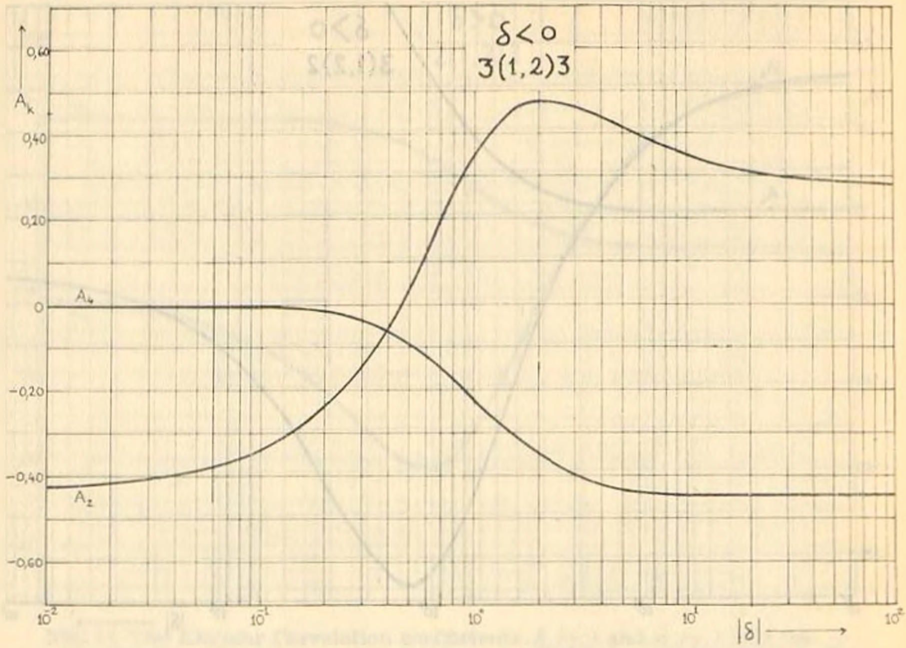

Fig. 5) The Angular Correlation coefficients $A_2(\gamma_2)$ and $A_4(\gamma_2)$ [for the $3 \rightarrow 3$ transitions and $\delta = \gamma(L' = 2)/\gamma(L = 1)$; $\delta > 0$] as a function of δ.

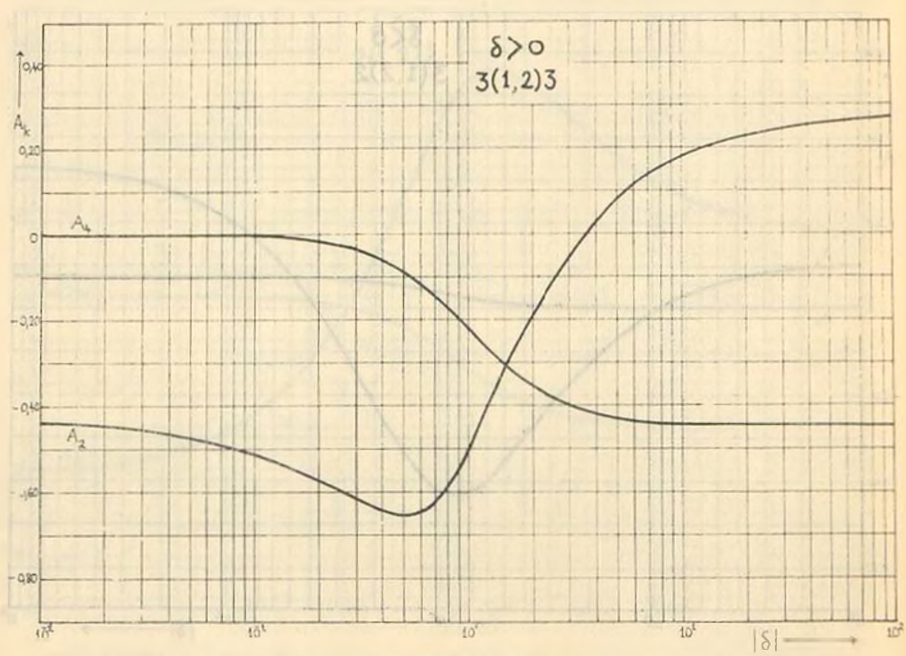

Fig. 6) The Angular Correlation coefficients $A_2(\gamma_1)$ and $A_4(\gamma_1)$ [for the $3 \rightarrow 3$ transitions and $\delta = \gamma(L' = 2)/\gamma(L = 1)$; $\delta < 0$] as a function of δ.

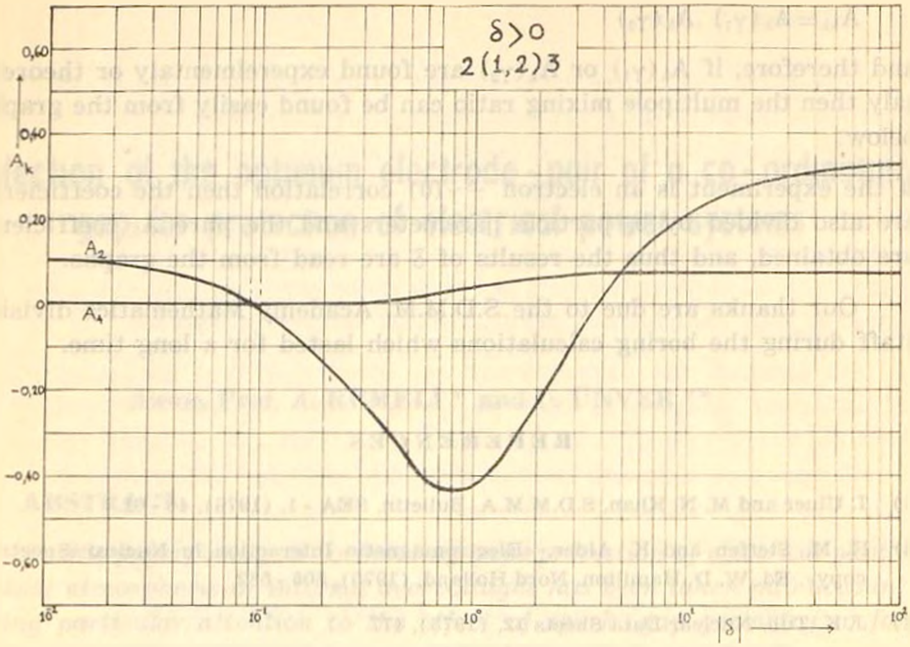

Fig. 7) The Angular Correlation coefficients $A_2(\gamma_2)$ and $A_4(\gamma_2)$ [for the $2 \to 3$ transitions and $\delta = \gamma(L'=2)/\gamma(L=1)$; $\delta > 0$] as a function of δ.

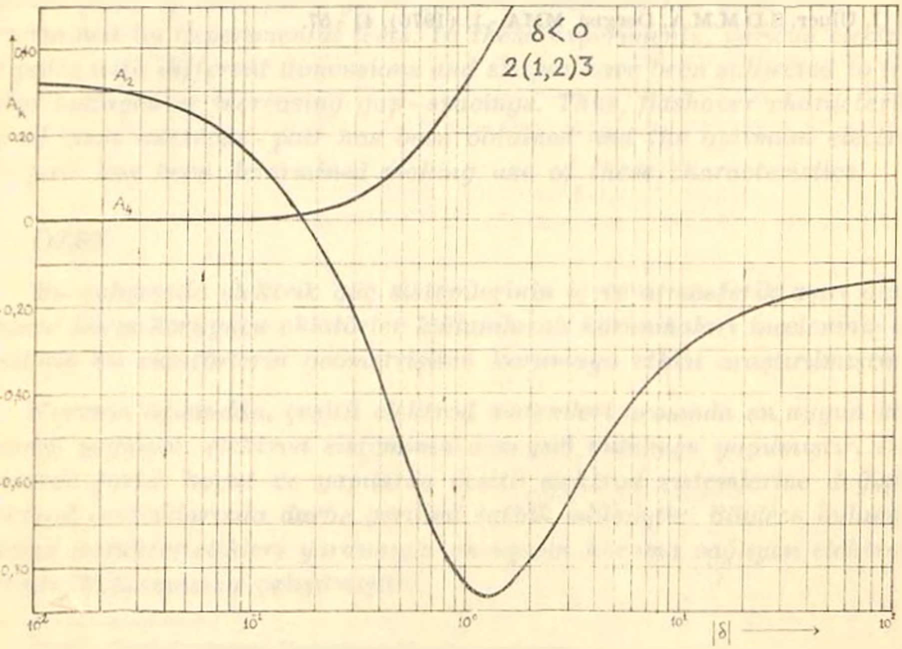

Fig. 8) The Angular Correlation coefficients $A_2(\gamma_2)$ and $A_4(\gamma_2)$ [for the $2 \to 3$ transitions and $\delta = \gamma(L'=2)/\gamma(L=1)$; $\delta < 0$] as a function of δ.

$$A_{kk} = A_k(\gamma_1) \; A_k(\gamma_2)$$

and therefore, if $A_k(\gamma_1)$ or $A_k(\gamma_2)$ are found expereimentaly or theoreticaly then the multipole mixing ratio can be found easily from the graphs below.

If the experiment is an electron $-\gamma(\theta)$ correlation then the coefficients are also divided by b_k particle paremeters and the pure A_k coefficients are obtained, and thus the results of δ are read from the graphs.

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REFERENCES

1) İ. Uluer and M. N. Khan, S.D.M.M.A. Bulletin, SEA - 1, (1976), 46 - 61.

2) R. M. Steffen and K. Alder, «Electromagnetic Interaction in Nuclear Spectroscopy», Ed. W. D. Hamilton, Nord Holland, (1975), 505 - 582.

3) J. K. Tuli, Nuclear Data Sheets 12, (1975), 477.

4) İ. Uluer et. al. Journal of Physics, G - 4, (1975), 476.

5) İ. Uluer, Technical Journal AEK. Vol. 2, No. 3, (1975), 105.

6) İ. Uluer, S.D.M.M.A. Dergisi, MMA - 1, (1976), 41 - 57.