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MASTER

PHYSICS DEPARTMENT

Informal Report

TABLE OF ATTENUATION COEFFICIENTS FOR ANGULAR DISTRIBUTION OF GAMMA RAYS FROM PARTIALLY ALIGNED NUCLEI

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NOTICE

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ABSTRACT

A set of attenuation coefficients have been calculated to be used in the interpretation of angular distributions of gamma radiations from partially aligned nuclei.

Excited staces produced in heavy ion (HI) reactions of the type (HI,Xn) are well aligned relative to the beam direction.[1] As a consequence, gamma rays depopulating these states exhibit characteristic angular distributions depending upon the multipolarities of the radiations and spins of the involved nuclear states. This fortunate circumstance provides the researcher with the opportunity to study high and moderate spin states in a wide range of nuclei. Indeed, tables of coefficients needed to interpret measured gamma ray angular distributions have appeared in the literature, a particularly useful example of which is the tables published by T. Yamazaki[2] in Nuclear Data. This paper[2] provides tables of angular distribution coefficients for the case of total alignment and formulas for calculating attenuation coefficients $\alpha_K(J)$ when alignment is incomplete.

The angular distribution function for a transition $J_i \rightarrow J_f$, where J represents the spin of the nuclear state is usually expressed as

$$W(\theta) = 1 + A_2 P_2(\cos\theta) + A_4 P_4(\cos\theta) \qquad (1)$$

In Yamazaki's notation, the angular distribution coefficients A_K which appear in this function are labelled A_K^{max} for the case of complete alignment. Thus, in this case

$$W(\theta) = 1 + A_2^{max} P_2(\cos\theta) + A_4^{max} P_4(\cos\theta) \qquad (2)$$

If the alignment is partial, this function may be replaced[2] by

$$W(\theta) = 1 + \alpha_2 A_2^{max} P_2(\cos\theta) + \alpha_4 A_4^{max} P_4(\cos\theta) \qquad (3)$$

where α_2 and α_4 are attenuation coefficients which depend on J and the distribution of the nuclear state over its m substates. Yamazaki gives explicit expressions

for the calculation of coefficients $\alpha_K(J)$ and discusses the experimentally justifiable assumption that partial alignment may be represented by a Gaussian distribution in m states.

In the following table $\alpha_K(J)$ has been calculated for K = 2,4 and J ranging from 1 to 26. The distribution in m states is characterized by a parameter σ which is the half width of the assumed Gaussian distribution; in particular, the m-state population parameter is given by

$$P_m(J) = \frac{e^{-m^2/2\sigma^2}}{\sum_{m'=-J}^{J} e^{-\frac{m'^2}{2\sigma^2}}} \qquad (4)$$

For convenience, the attenuation coefficients $\alpha_K(J)$ are tabulated against σ/J for values ranging from 0.1 to 2.0.

To illustrate the use of these tables consider the following example: Assume that a $J_i = 10$ state has been prepared by some means so that its m-state distribution is represented by a gaussian centered on the m = 0 state. Assume also that this state decays by an L = 2 transition to a final state $J_f = 5$. With the help of Yamazaki's tables one obtains values for the angular distribution coefficients for maximum alignment which, in this case, would be

$$A_2^{max} = 0.41353, \qquad A_4^{max} = -0.17514$$

Since the nuclei are only partially aligned after their formation, an experimental determination of A_2 and A_4 will yield values which are equal to $\alpha_2 A_2^{max}$ and $\alpha_4 A_4^{max}$, where α_2 and α_4 depend on the width of the Gaussian distribution.

If σ/J were 0.3 for the $J_i = 10$ state, one obtains from the following table the attenuation coefficients

$$\alpha_2(10) = 0.7560, \qquad \alpha_4(10) = 0.4093$$

The expected angular distribution coefficients would then be

$$A_2 = \alpha_2(10)A_2^{max} = (0.7560)x(0.41353) = 0.3126$$

$$A_4 = \alpha_4(10)A_4^{max} = (0.4093)x(-0.17514) = -0.0717$$

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REFERENCES

1) R. M. Diamond, E. Matthias, J. O. Newton, and F. S. Stephens, Phys. Rev. Letters 16, 1205 (1966).

2) T. Yamazaki, Nuclear Data A 3, 1 (1967).

RUN	J	σ/J	α_2	α_4
	1	.1000	.10000E 01	.00000E 00
	1	.2000	.99999E 00	.00000E 00
	1	.3000	.98849E 00	.00000E 00
	1	.4000	.97884E 00	.00000E 00
	1	.5000	.96048E 00	.00000E 00
	1	.6000	.95086E 00	.00000E 00
	1	.7000	.93164E 00	.00000E 00
	1	.8000	.92302E 00	.00000E 00
	1	.9000	.92157E 00	.00000E 00
	1	1.0000	.91779E 00	.00000E 00
	1	1.1000	.91571E 00	.00000E 00
	1	1.2000	.91156E 00	.00000E 00
	1	1.3000	.90295E 00	.00000E 00
	1	1.4000	.88311E-01	.00000E 00
	1	1.5000	.76596E-01	.00000E 00
	1	1.6000	.67075E-01	.00000E 00
	1	1.7000	.59230E-01	.00000E 00
	1	1.8000	.52691E-01	.00000E 00
	1	1.9000	.47182E-01	.00000E 00
	1	2.0000	.42497E-01	.00000E 00
	2	.1000	.10000E 01	.99999E 00
	2	.2000	.95960E 00	.86537E 00
	2	.3000	.82421E 00	.44397E 00
	2	.4000	.68377E 00	.20174E 00
	2	.5000	.53784E 00	.95181E-01
	2	.6000	.41482E 00	.48393E-01
	2	.7000	.32225E 00	.26611E-01
	2	.8000	.25469E 00	.15682E-01
	2	.9000	.20517E 00	.97921E-02
	2	1.0000	.16828E 00	.64136E-02
	2	1.1000	.14026E 00	.43705E-02
	2	1.2000	.11857E 00	.30785E-02
	2	1.3000	.10147E 00	.22303E-02
	2	1.4000	.87784E-01	.16548E-02
	2	1.5000	.76665E-01	.12536E-02
	2	1.6000	.67517E-01	.96687E-03
	2	1.7000	.59903E-01	.75763E-03
	2	1.8000	.53503E-01	.60208E-03
	2	1.9000	.48071E-01	.48434E-03
	2	2.0000	.43423E-01	.39425E-03
	3	.1000	.99808E 00	.99361E 00
	3	.2000	.91210E 00	.71301E 00
	3	.3000	.79768E 00	.43714E 00
	3	.4000	.65007E 00	.23256E 00
	3	.5000	.50422E 00	.11991E 00
	3	.6000	.38730E 00	.64406E-01
	3	.7000	.30103E 00	.36730E-01
	3	.8000	.23838E 00	.22198E-01
	3	.9000	.19246E 00	.14114E-01
	3	1.0000	.15817E 00	.93683E-02
	3	1.1000	.13207E 00	.64486E-02
	3	1.2000	.11181E 00	.45778E-02
	3	1.3000	.95806E-01	.33364E-02
	3	1.4000	.82968E-01	.24877E-02
	3	1.5000	.72523E-01	.18918E-02
	3	1.6000	.63916E-01	.14639E-02
	3	1.7000	.56745E-01	.11502E-02
	3	1.8000	.50709E-01	.91600E-03

J	σ/J	α_2	α_4
3	1.9000	.45582E-01	.73850E-03
3	2.0000	.41191E-01	.60183E-03
4	.1000	.98788E 00	.95960E 00
4	.2000	.90401E 00	.69918E 00
4	.3000	.78441E 00	.43403E 00
4	.4000	.63125E 00	.23263E 00
4	.5000	.48576E 00	.12131E 00
4	.6000	.37187E 00	.65845E-01
4	.7000	.28872E 00	.37868E-01
4	.8000	.22860E 00	.23034E-01
4	.9000	.18460E 00	.14718E-01
4	1.0000	.15176E 00	.98062E-02
4	1.1000	.12676E 00	.67698E-02
4	1.2000	.10734E 00	.48169E-02
4	1.3000	.92008E-01	.35173E-02
4	1.4000	.79698E-01	.26265E-02
4	1.5000	.69679E-01	.19999E-02
4	1.6000	.61421E-01	.15490E-02
4	1.7000	.54538E-01	.12181E-02
4	1.8000	.48744E-01	.97080E-03
4	1.9000	.43821E-01	.78315E-03
4	2.0000	.39604E-01	.63865E-03
5	.1000	.97850E 00	.92842E 00
5	.2000	.90000E 00	.69444E 00
5	.3000	.77565E 00	.42842E 00
5	.4000	.61916E 00	.22912E 00
5	.5000	.47398E 00	.11967E 00
5	.6000	.36195E 00	.65142E-01
5	.7000	.28071E 00	.37567E-01
5	.8000	.22216E 00	.22904E-01
5	.9000	.17937E 00	.14661E-01
5	1.0000	.14746E 00	.97829E-02
5	1.1000	.12317E 00	.67615E-02
5	1.2000	.10431E 00	.48156E-02
5	1.3000	.89414E-01	.35189E-02
5	1.4000	.77456E-01	.26292E-02
5	1.5000	.67722E-01	.20029E-02
5	1.6000	.59699E-01	.15519E-02
5	1.7000	.53012E-01	.12207E-02
5	1.8000	.47381E-01	.97312E-03
5	1.9000	.42597E-01	.78509E-03
5	2.0000	.38500E-01	.64036E-03
6	.1000	.97489E 00	.91671E 00
6	.2000	.89714E 00	.69034E 00
6	.3000	.76943E 00	.42321E 00
6	.4000	.61070E 00	.22547E 00
6	.5000	.46578E 00	.11768E 00
6	.6000	.35502E 00	.64098E-01
6	.7000	.27509E 00	.37001E-01
6	.8000	.21762E 00	.22581E-01
6	.9000	.17567E 00	.14466E-01
6	1.0000	.14440E 00	.96587E-02
6	1.1000	.12061E 00	.66792E-02
6	1.2000	.10214E 00	.47589E-02
6	1.3000	.87551E-01	.34784E-02
6	1.4000	.75842E-01	.25997E-02
6	1.5000	.66312E-01	.19807E-02
6	1.6000	.58457E-01	.15348E-02
6	1.7000	.51909E-01	.12076E-02
6	1.8000	.46396E-01	.96269E-03

J	σ/J	α_2	α_4
6	1.9000	.41712E-01	.77673E-03
6	2.0000	.37700E-01	.63357E-03
7	.1000	.97382E 00	.91364E 00
7	.2000	.89500E 00	.68690E 00
7	.3000	.76479E 00	.41877E 00
7	.4000	.60446E 00	.22225E 00
7	.5000	.45974E 00	.11584E 00
7	.6000	.34991E 00	.63090E-01
7	.7000	.27092E 00	.36430E-01
7	.8000	.21425E 00	.22240E-01
7	.9000	.17291E 00	.14253E-01
7	1.0000	.14212E 00	.95195E-02
7	1.1000	.11869E 00	.65847E-02
7	1.2000	.10051E 00	.46922E-02
7	1.3000	.86155E-01	.34303E-02
7	1.4000	.74632E-01	.25640E-02
7	1.5000	.65253E-01	.19536E-02
7	1.6000	.57523E-01	.15142E-02
7	1.7000	.51079E-01	.11912E-02
7	1.8000	.45655E-01	.94971E-03
7	1.9000	.41045E-01	.76620E-03
7	2.0000	.37097E-01	.62469E-03
8	.1000	.97334E 00	.91249E 00
8	.2000	.89333E 00	.68403E 00
8	.3000	.76119E 00	.41505E 00
8	.4000	.59965E 00	.21951E 00
8	.5000	.45510E 00	.11425E 00
8	.6000	.34598E 00	.62197E-01
8	.7000	.26772E 00	.35915E-01
8	.8000	.21164E 00	.21929E-01
8	.9000	.17078E 00	.14056E-01
8	1.0000	.14035E 00	.93890E-02
8	1.1000	.11721E 00	.64951E-02
8	1.2000	.99252E-01	.46289E-02
8	1.3000	.85071E-01	.33843E-02
8	1.4000	.73691E-01	.25296E-02
8	1.5000	.64430E-01	.19276E-02
8	1.6000	.56797E-01	.14938E-02
8	1.7000	.50434E-01	.11752E-02
8	1.8000	.45078E-01	.93692E-03
8	1.9000	.40527E-01	.75581E-03
8	2.0000	.36628E-01	.61628E-03
9	.1000	.97300E 00	.91170E 00
9	.2000	.89200E 00	.68161E 00
9	.3000	.75833E 00	.41192E 00
9	.4000	.59584E 00	.21720E 00
9	.5000	.45143E 00	.11288E 00
9	.6000	.34286E 00	.61424E-01
9	.7000	.26518E 00	.35465E-01
9	.8000	.20958E 00	.21654E-01
9	.9000	.16908E 00	.13881E-01
9	1.0000	.13894E 00	.92729E-02
9	1.1000	.11602E 00	.64154E-02
9	1.2000	.98247E-01	.45725E-02
9	1.3000	.84207E-01	.33432E-02
9	1.4000	.72941E-01	.24991E-02
9	1.5000	.63773E-01	.19044E-02
9	1.6000	.56217E-01	.14760E-02
9	1.7000	.49919E-01	.11612E-02
9	1.8000	.44617E-01	.92574E-03

J	σ/J	α_2	α_4
9	1.9000	.40112E-01	.74692E-03
9	2.0000	.36253E-01	.60903E-03
10	.1000	.97273E 00	.91106E 00
10	.2000	.89091E 00	.67957E 00
10	.3000	.75598E 00	.40926E 00
10	.4000	.59274E 00	.21523E 00
10	.5000	.44845E 00	.11172E 00
10	.6000	.34034E 00	.60758E-01
10	.7000	.26311E 00	.35074E-01
10	.8000	.20789E 00	.21415E-01
10	.9000	.16770E 00	.13728E-01
10	1.0000	.13780E 00	.91709E-02
10	1.1000	.11506E 00	.63449E-02
10	1.2000	.97426E-01	.45225E-02
10	1.3000	.83501E-01	.33068E-02
10	1.4000	.72329E-01	.24719E-02
10	1.5000	.63236E-01	.18837E-02
10	1.6000	.55743E-01	.14600E-02
10	1.7000	.49498E-01	.11486E-02
10	1.8000	.44240E-01	.91575E-03
10	1.9000	.39773E-01	.73873E-03
10	2.0000	.35947E-01	.60250E-03
11	.1000	.97250E 00	.91050E 00
11	.2000	.89000E 00	.67782E 00
11	.3000	.75403E 00	.40699E 00
11	.4000	.59017E 00	.21353E 00
11	.5000	.44598E 00	.11071E 00
11	.6000	.33824E 00	.60182E-01
11	.7000	.26140E 00	.34735E-01
11	.8000	.20650E 00	.21206E-01
11	.9000	.16656E 00	.13593E-01
11	1.0000	.13684E 00	.90812E-02
11	1.1000	.11426E 00	.62829E-02
11	1.2000	.96745E-01	.44781E-02
11	1.3000	.82915E-01	.32744E-02
11	1.4000	.71820E-01	.24476E-02
11	1.5000	.62791E-01	.18652E-02
11	1.6000	.55350E-01	.14456E-02
11	1.7000	.49148E-01	.11372E-02
11	1.8000	.43927E-01	.90655E-03
11	1.9000	.39491E-01	.73129E-03
11	2.0000	.35692E-01	.59628E-03
12	.1000	.97231E 00	.91001E 00
12	.2000	.88923E 00	.67631E 00
12	.3000	.75239E 00	.40503E 00
12	.4000	.58800E 00	.21207E 00
12	.5000	.44390E 00	.10984E 00
12	.6000	.33648E 00	.59680E-01
12	.7000	.25996E 00	.34439E-01
12	.8000	.20533E 00	.21024E-01
12	.9000	.16559E 00	.13476E-01
12	1.0000	.13604E 00	.90026E-02
12	1.1000	.11358E 00	.62284E-02
12	1.2000	.96170E-01	.44393E-02
12	1.3000	.82421E-01	.32459E-02
12	1.4000	.71390E-01	.24264E-02
12	1.5000	.62414E-01	.18490E-02
12	1.6000	.55017E-01	.14330E-02
12	1.7000	.48852E-01	.11273E-02
12	1.8000	.43662E-01	.89856E-03

J	σ/J	α_2	α_4
12	1.9000	.39253E-01	.72487E-03
12	2.0000	.35477E-01	.59101E-03
13	.1000	.97214E 00	.90959E 00
13	.2000	.88857E 00	.67499E 00
13	.3000	.75098E 00	.40332E 00
13	.4000	.58615E 00	.21080E 00
13	.5000	.44213E 00	.10908E 00
13	.6000	.33498E 00	.59242E-01
13	.7000	.25873E 00	.34179E-01
13	.8000	.20432E 00	.20863E-01
13	.9000	.16477E 00	.13373E-01
13	1.0000	.13536E 00	.89334E-02
13	1.1000	.11301E 00	.61806E-02
13	1.2000	.95678E-01	.44053E-02
13	1.3000	.81998E-01	.32211E-02
13	1.4000	.71022E-01	.24079E-02
13	1.5000	.62092E-01	.18348E-02
13	1.6000	.54733E-01	.14220E-02
13	1.7000	.48599E-01	.11188E-02
13	1.8000	.43436E-01	.89185E-03
13	1.9000	.39050E-01	.71942E-03
13	2.0000	.35293E-01	.58659E-03
14	.1000	.97200E 00	.90922E 00
14	.2000	.88800E 00	.67382E 00
14	.3000	.74976E 00	.40181E 00
14	.4000	.58455E 00	.20968E 00
14	.5000	.44060E 00	.10841E 00
14	.6000	.33368E 00	.56855E-01
14	.7000	.25767E 00	.33949E-01
14	.8000	.20346E 00	.20722E-01
14	.9000	.16405E 00	.13281E-01
14	1.0000	.13476E 00	.88721E-02
14	1.1000	.11251E 00	.61382E-02
14	1.2000	.95254E-01	.43749E-02
14	1.3000	.81632E-01	.31989E-02
14	1.4000	.70705E-01	.23911E-02
14	1.5000	.61813E-01	.18222E-02
14	1.6000	.54487E-01	.14122E-02
14	1.7000	.48381E-01	.11109E-02
14	1.8000	.43240E-01	.88563E-03
14	1.9000	.38874E-01	.71446E-03
14	2.0000	.35133E-01	.58246E-03
15	.1000	.97188E 00	.90890E 00
15	.2000	.88750E 00	.67280E 00
15	.3000	.74869E 00	.40048E 00
15	.4000	.58316E 00	.20869E 00
15	.5000	.43927E 00	.10781E 00
15	.6000	.33255E 00	.58512E-01
15	.7000	.25675E 00	.33746E-01
15	.8000	.20270E 00	.20596E-01
15	.9000	.16343E 00	.13200E-01
15	1.0000	.13425E 00	.88177E-02
15	1.1000	.11207E 00	.61004E-02
15	1.2000	.94882E-01	.43480E-02
15	1.3000	.81312E-01	.31792E-02
15	1.4000	.70427E-01	.23766E-02
15	1.5000	.61570E-01	.18110E-02
15	1.6000	.54271E-01	.14037E-02
15	1.7000	.48189E-01	.11043E-02
15	1.8000	.43069E-01	.88032E-03

J	σ/J	α_2	α_4
15	1.9000	.38719E-01	.71009E-03
15	2.0000	.34994E-01	.57905E-03
16	.1000	.97176E 00	.90860E 00
16	.2000	.88706E 00	.67187E 00
16	.3000	.74775E 00	.39930E 00
16	.4000	.58193E 00	.20780E 00
16	.5000	.43809E 00	.10728E 00
16	.6000	.33155E 00	.58206E-01
16	.7000	.25593E 00	.33564E-01
16	.8000	.20203E 00	.20483E-01
16	.9000	.16288E 00	.13127E-01
16	1.0000	.13379E 00	.87690E-02
16	1.1000	.11169E 00	.60668E-02
16	1.2000	.94554E-01	.43241E-02
16	1.3000	.81030E-01	.31618E-02
16	1.4000	.70182E-01	.23636E-02
16	1.5000	.61355E-01	.18012E-02
16	1.6000	.54082E-01	.13961E-02
16	1.7000	.48020E-01	.10984E-02
16	1.8000	.42918E-01	.87571E-03
16	1.9000	.38583E-01	.70650E-03
16	2.0000	.34871E-01	.57615E-03
17	.1000	.97167E 00	.90833E 00
17	.2000	.88667E 00	.67105E 00
17	.3000	.74691E 00	.39823E 00
17	.4000	.58084E 00	.20701E 00
17	.5000	.43705E 00	.10681E 00
17	.6000	.33067E 00	.57930E-01
17	.7000	.25521E 00	.33400E-01
17	.8000	.20144E 00	.20382E-01
17	.9000	.16240E 00	.13061E-01
17	1.0000	.13339E 00	.87250E-02
17	1.1000	.11135E 00	.60363E-02
17	1.2000	.94264E-01	.43023E-02
17	1.3000	.80781E-01	.31459E-02
17	1.4000	.69965E-01	.23517E-02
17	1.5000	.61164E-01	.17922E-02
17	1.6000	.53913E-01	.13891E-02
17	1.7000	.47871E-01	.10929E-02
17	1.8000	.42784E-01	.87135E-03
17	1.9000	.38463E-01	.70307E-03
17	2.0000	.34762E-01	.57328E-03
18	.1000	.97158E 00	.90810E 00
18	.2000	.88632E 00	.67031E 00
18	.3000	.74616E 00	.39728E 00
18	.4000	.57987E 00	.20630E 00
18	.5000	.43612E 00	.10638E 00
18	.6000	.32988E 00	.57683E-01
18	.7000	.25456E 00	.33253E-01
18	.8000	.20092E 00	.20290E-01
18	.9000	.16196E 00	.13002E-01
18	1.0000	.13302E 00	.86852E-02
18	1.1000	.11104E 00	.60086E-02
18	1.2000	.94005E-01	.42825E-02
18	1.3000	.80557E-01	.31314E-02
18	1.4000	.69770E-01	.23409E-02
18	1.5000	.60994E-01	.17839E-02
18	1.6000	.53763E-01	.13826E-02
18	1.7000	.47737E-01	.10877E-02
18	1.8000	.42664E-01	.86722E-03

J	σ/J	α_2	α_4
18	1•9000	•38355E-01	•69957E-03
18	2•0000	•34664E-01	•57047E-03
19	•1000	•97150E 00	•90788E 00
19	•2000	•88600E 00	•66963E 00
19	•3000	•74549E 00	•39641E 00
19	•4000	•57899E 00	•20566E 00
19	•5000	•43528E 00	•10599E 00
19	•6000	•32917E 00	•57458E-01
19	•7000	•25398E 00	•33119E-01
19	•8000	•20044E 00	•20207E-01
19	•9000	•16157E 00	•12949E-01
19	1•0000	•13270E 00	•86491E-02
19	1•1000	•11077E 00	•59835E-02
19	1•2000	•93772E-01	•42645E-02
19	1•3000	•80356E-01	•31181E-02
19	1•4000	•69596E-01	•23310E-02
19	1•5000	•60841E-01	•17764E-02
19	1•6000	•53628E-01	•13768E-02
19	1•7000	•47617E-01	•10832E-02
19	1•8000	•42557E-01	•86348E-03
19	1•9000	•38258E-01	•69659E-03
19	2•0000	•34577E-01	•56808E-03
20	•1000	•97143E 00	•90768E 00
20	•2000	•88572E 00	•66902E 00
20	•3000	•74488E 00	•39562E 00
20	•4000	•57820E 00	•20507E 00
20	•5000	•43453E 00	•10564E 00
20	•6000	•32853E 00	•57253E-01
20	•7000	•25346E 00	•32997E-01
20	•8000	•20002E 00	•20131E-01
20	•9000	•16122E 00	•12899E-01
20	1•0000	•13241E 00	•86160E-02
20	1•1000	•11052E 00	•59604E-02
20	1•2000	•93561E-01	•42482E-02
20	1•3000	•80175E-01	•31061E-02
20	1•4000	•69438E-01	•23219E-02
20	1•5000	•60703E-01	•17693E-02
20	1•6000	•53506E-01	•13714E-02
20	1•7000	•47508E-01	•10788E-02
20	1•8000	•42459E-01	•86008E-03
20	1•9000	•38171E-01	•69390E-03
20	2•0000	•34497E-01	•56577E-03
21	•1000	•97136E 00	•90751E 00
21	•2000	•88546E 00	•66846E 00
21	•3000	•74433E 00	•39490E 00
21	•4000	•57748E 00	•20454E 00
21	•5000	•43385E 00	•10532E 00
21	•6000	•32795E 00	•57067E-01
21	•7000	•25298E 00	•32886E-01
21	•8000	•19963E 00	•20062E-01
21	•9000	•16090E 00	•12855E-01
21	1•0000	•13214E 00	•85858E-02
21	1•1000	•11030E 00	•59396E-02
21	1•2000	•93370E-01	•42331E-02
21	1•3000	•80010E-01	•30951E-02
21	1•4000	•69295E-01	•23136E-02
21	1•5000	•60577E-01	•17631E-02
21	1•6000	•53395E-01	•13666E-02
21	1•7000	•47409E-01	•10751E-02
21	1•8000	•42371E-01	•85703E-03

J	σ/J	α_2	α_4
21	1•9000	•38091E-01	•69138E-03
21	2•0000	•34425E-01	•56374E-03
22	•1000	•97130E 00	•90734E 00
22	•2000	•88522E 00	•66794E 00
22	•3000	•74383E 00	•39424E 00
22	•4000	•57683E 00	•20404E 00
22	•5000	•43322E 00	•10503E 00
22	•6000	•32742E 00	•56895E-01
22	•7000	•25255E 00	•32783E-01
22	•8000	•19927E 00	•19998E-01
22	•9000	•16061E 00	•12813E-01
22	1•0000	•13190E 00	•85581E-02
22	1•1000	•11009E 00	•59202E-02
22	1•2000	•93195E-01	•42194E-02
22	1•3000	•79860E-01	•30851E-02
22	1•4000	•69164E-01	•23062E-02
22	1•5000	•60463E-01	•17574E-02
22	1•6000	•53293E-01	•13620E-02
22	1•7000	•47319E-01	•10715E-02
22	1•8000	•42290E-01	•85417E-03
22	1•9000	•38018E-01	•68905E-03
22	2•0000	•34359E-01	•56191E-03
23	•1000	•97125E 00	•90719E 00
23	•2000	•88500E 00	•66747E 00
23	•3000	•74337E 00	•39363E 00
23	•4000	•57623E 00	•20359E 00
23	•5000	•43265E 00	•10475E 00
23	•6000	•32694E 00	•56737E-01
23	•7000	•25215E 00	•32689E-01
23	•8000	•19895E 00	•19940E-01
23	•9000	•16034E 00	•12775E-01
23	1•0000	•13167E 00	•85324E-02
23	1•1000	•10991E 00	•59025E-02
23	1•2000	•93036E-01	•42065E-02
23	1•3000	•79722E-01	•30755E-02
23	1•4000	•69044E-01	•22990E-02
23	1•5000	•60358E-01	•17519E-02
23	1•6000	•53201E-01	•13578E-02
23	1•7000	•47237E-01	•10681E-02
23	1•8000	•42216E-01	•85146E-03
23	1•9000	•37952E-01	•68682E-03
23	2•0000	•34299E-01	•56010E-03
24	•1000	•97120E 00	•90705E 00
24	•2000	•88480E 00	•66703E 00
24	•3000	•74295E 00	•39307E 00
24	•4000	•57568E 00	•20317E 00
24	•5000	•43212E 00	•10450E 00
24	•6000	•32649E 00	•56591E-01
24	•7000	•25179E 00	•32602E-01
24	•8000	•19865E 00	•19885E-01
24	•9000	•16010E 00	•12740E-01
24	1•0000	•13147E 00	•85087E-02
24	1•1000	•10973E 00	•58858E-02
24	1•2000	•92889E-01	•41946E-02
24	1•3000	•79596E-01	•30668E-02
24	1•4000	•68935E-01	•22924E-02
24	1•5000	•60261E-01	•17468E-02
24	1•6000	•53116E-01	•13537E-02
24	1•7000	•47161E-01	•10648E-02
24	1•8000	•42148E-01	•84886E-03

J	σ/J	α_2	α_4
24	1•9000	•37891E-01	•68462E-03
24	2•0000	•34244E-01	•55818E-03
25	•1000	•97115E 00	•90692E 00
25	•2000	•88462E 00	•66663E 00
25	•3000	•74255E 00	•39255E 00
25	•4000	•57517E 00	•20279E 00
25	•5000	•43164E 00	•10427E 00
25	•6000	•32608E 00	•56456E-01
25	•7000	•25145E 00	•32521E-01
25	•8000	•19838E 00	•19835E-01
25	•9000	•15987E 00	•12708E-01
25	1•0000	•13128E 00	•84867E-02
25	1•1000	•10957E 00	•58704E-02
25	1•2000	•92753E-01	•41836E-02
25	1•3000	•79479E-01	•30587E-02
25	1•4000	•68833E-01	•22862E-02
25	1•5000	•60172E-01	•17422E-02
25	1•6000	•53037E-01	•13500E-02
25	1•7000	•47091E-01	•10620E-02
25	1•8000	•42086E-01	•84652E-03
25	1•9000	•37834E-01	•68279E-03
25	2•0000	•34193E-01	•55665E-03
26	•1000	•97111E 00	•90680E 00
26	•2000	•88445E 00	•66625E 00
26	•3000	•74219E 00	•39207E 00
26	•4000	•57470E 00	•20243E 00
26	•5000	•43119E 00	•10406E 00
26	•6000	•32570E 00	•56331E-01
26	•7000	•25114E 00	•32446E-01
26	•8000	•19812E 00	•19789E-01
26	•9000	•15966E 00	•12677E-01
26	1•0000	•13111E 00	•84665E-02
26	1•1000	•10943E 00	•58563E-02
26	1•2000	•92628E-01	•41734E-02
26	1•3000	•79371E-01	•30513E-02
26	1•4000	•68739E-01	•22807E-02
26	1•5000	•60090E-01	•17378E-02
26	1•6000	•52964E-01	•13468E-02
26	1•7000	•47026E-01	•10594E-02
26	1•8000	•42028E-01	•84439E-03
26	1•9000	•37782E-01	•68107E-03
26	2•0000	•34146E-01	•55531E-03

EXIT