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FAST NEUTRON PROCESSES IN NIOBIUM----MEASUREMENTS AND EVALUATION

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Preface

With recent advances in the understanding of basic fusion mechanisms, the conceptual design of a practical fusion-reactor is now a matter of concern. Such devices are formidable engineering ventures with severe material, cryogenic and neutronic problems. A prominently suggested structural material for these reactors is niobium, particularly where employed for plasma containment. However, the fast neutron properties of niobium are uncertain and the validity of evaluated data files employed in conceptual neutronics calculations is in doubt. It was the objective of the present studies to improve the experimental knowledge of niobium fast neutron cross sections and to present the new results in the format of the ENDF system for direct use in fusion-reactor and other calculations.

The measurements were undertaken at the ANL Fast Neutron Generator. This facility has a unique capability for fast neutron studies extending to incident energies of 20.0 MeV. However, the present measurements were confined to energies of $\lesssim 5.0$ MeV since the work was essentially a bi-product of other endeavors concentrated at lower energies. Even with this restricted energy range, the experimental results and associated theoretical models made possible an appreciable improvement in the evaluated niobium data files. The derivation of the file was an integral part of this work.

It is hoped that this is only an initial contribution to the far more comprehensive nuclear data effort that the CTR technology programs will ultimately require.

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January 1973

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Fast Neutron Processes in Niobium--Measurements and Evaluation*

by

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Neutron total and elastic and inelastic scattering cross sections of niobium are measured in the incident energy interval 0.3 to 5.0 MeV. Differential elastic neutron scattering cross sections are determined at ~ 20 scattering angles distributed between 20 and 160 degrees. The cross sections for the inelastic neutron excitation of 11 states with Q-values of ≤ 2520 keV are quantitatively measured and the excitation of an additional 8 states qualitatively observed. The experimental results are compared with previously reported values and provide a foundation from which is deduced an optical potential suitable for the interpolation and extrapolation of the measured values. The experimental results and the associated theoretical model are used to construct an evaluated data file in the ENDF format with particular attention to fast neutron cross sections applicable to the neutronic study of fusion reactor systems.

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I. Introductory Remarks

Consideration of practical fusion-reactor concepts has stimulated interest in the fast neutron properties of niobium to energies of 14.0 MeV and above (1,2). This metal is a promising structural material in such devices particularly where used for plasma containment. The neutronic design of the practical system is sensitive to neutron removal, production and energy transfer processes. The cross sections for these processes in niobium are not well known particularly over the wide energy range of importance in fusion applications. The niobium nucleus itself is physically interesting; lying, as it does, just beyond the closed neutron shell at $N=50$. Its ground state has been attributed to a mixture of p^2g (76%) and $g_{9/2}^3$ (24%) proton configurations and a $d_{5/2}^2$ neutron configuration. A $pg_{7/2}$ proton configuration has been suggested for the first excited state ($E_x \sim 29$ keV) and other excited states have been related to the shell model (3). Niobium is in a region of very low $\lambda=0$ strength functions and their experimental determination may be influenced by the presence of intermediate resonance phenomena (4). Few, if any, nuclear models have successfully and comprehensively described the neutron interaction with niobium over the wide energy range, thermal to 20.0 MeV, important in the fusion application.

It was the objective of this study to: a) provide an improved experimental understanding of neutron total and scattering cross sections of niobium to energies of ~ 5.0 MeV, b) correlate this new experimental information with previously measured values, c) develop from the experimental basis a physically rational model descriptive of the neutron interaction with niobium to 20.0 MeV and d) generate from the experimental and calculational foundation an improved evaluated data file in the ENDF format. Subsequent portions of this paper outline the experimental method, describe the measured results, define a model based upon the available experimental information and establish an evaluated data file suitable for fusion and other applied neutronic computations.

II. Experimental Methods

All of the experimental measurements employed cylindrical samples of high-purity natural niobium metal. Several sizes were used in the total cross section measurements, adjusted to assure neutron transmissions in the axial direction of 50% or greater. The scattering measurements employed a sample 2 cm in length and 2 cm in diameter with neutrons incident on the lateral surface.

Total neutron cross sections were deduced from the observed transmissions of monoenergetic neutrons through the samples. The experimental apparatus employed a "good" geometry and fast time-of-flight techniques to reduce "in-scattering" and background effects. Incident neutron energy resolutions were 5 to 10 keV and the absolute energy scale was determined to ± 5 keV relative to the threshold of the $^7\text{Li}(p,n)$ reaction (5). All of the total cross section measurements employed the $^7\text{Li}(p,n)$ source reaction and the system performance was verified by simultaneous measurement of the known total neutron cross sections of carbon (6). Details of the total cross section apparatus and method are given in Ref. 7.

The fast neutron scattering measurements were made with the unique 10-channel fast neutron time-of-flight apparatus shown in Fig. 1. Ten detectors spanned the angular range 20 to 160 degrees. Generally, measurements were made in two sets at different angles providing a total of twenty differential cross sections at each incident energy. The $^7\text{Li}(p,n)$ reaction was employed as a neutron source throughout the scattering measurements with the lithium film of the target adjusted to provide an incident neutron resolution of ~ 50 keV. Scattered-neutron flight paths were in the range 5 to 7 meters giving scattered neutron resolutions of ~ 0.5 nsec/m. Most of the differential scattering cross sections were determined relative to the known $\text{H}(n,n)$ differential scattering cross section (8) and the remainder made relative to the $\text{C}(n,n)$ differential elastic scattering cross section (9). Results obtained with the two standards at identical incident neutron energies were consistent. All of the scattering results were corrected for experimental angular resolution, incident beam attenuation and for the effects of multiple processes within the samples. The details

of the experimental apparatus and procedures can be found in Ref. 10.

III. Experimental Results

A. Total Neutron Cross Sections

Approximately 300 total cross section measurements were made over the incident neutron energy range of approximately 0.25 to 5.0 MeV. The statistical uncertainty of the individual measurements was $\sim 1\%$. In addition, there were possible systematic errors primarily associated with backgrounds. These were negligible above ~ 1.0 MeV but increased with decreasing energy to as much as 2% to 5% at approximately 0.25 MeV. Many of the measured values were essentially redundant in energy and generally the results were consistent to within the above error estimates.

The experimental results were averaged over 10 keV energy intervals, approximately equivalent to the energy resolution of the experimental measurements. The uncertainties in the average quantities were expressed as the root-mean-square of the statistical uncertainties in the individual points. The average experimental values and their associated uncertainties are shown in Fig. 2 together with some of the previously reported values. Below 1.0 MeV the present results are in good agreement with those reported by Uttley (11) but somewhat smaller than the values given by Miller et al. (12). Seth (13) has reported considerable structure in the niobium total neutron cross section in the few hundred keV region. There is some indication of such structure in the variation of the low energy values of the present work and there tends to be an energy correlation with the Seth results. Above 2.0 MeV the present results are essentially indistinguishable from the values reported by Foster and Glasgow (14) and by Carlson and Barschall (15) though they continue to remain somewhat lower than the Miller et al. values. Langsdorf et al. have reported total scattering cross sections to ~ 2.0 MeV (9). Above 1.0 MeV the Langsdorf results are consistent with the present work while at lower energies they tend to be somewhat larger.

B. Differential Elastic Neutron Scattering Cross Section

Differential elastic scattering cross sections were measured at 16 to 20 scattering angles distributed between 20 and 160 deg. and at in-

cident neutron energy intervals of ~ 100 keV from 1.8 to 3.8 MeV. All of the measured "elastic" scattering cross sections were inclusive of a small inelastic-scattering component due to the excitation of the first (29 keV) state. The statistical accuracies of the individual measurements ranged from 1% to 10% depending on scattering angle and the conditions of the particular experiment. In addition there were systematic uncertainties associated with the experimental determination of relative and absolute detector efficiencies, the Monte-Carlo procedures used for multiple-event corrections and the experimental geometry (particularly the precision of the scattering-angle setting). Some of these systematic effects tended to cancel in the measurement program which employed somewhat varied experimental arrangements over a period of more than a year. The collective effect of the systematic uncertainties was estimated to be in the range 5% to 10% with the larger value associated with the minima of the angular distributions. Thus the overall absolute uncertainty in the individual measurements was 5% to 14%. The consistency of the measurements was generally better than these estimates.

The experimental results were least-square fitted with a legendre expansion of the form

$$\frac{d\sigma}{d\Omega} = \frac{\sigma}{4\pi} \left[1 + \sum_{i=1}^n W_i P_i \right] \quad (1)$$

where σ (the angle-integrated elastic scattering cross section) and W_i are coefficients deduced from the fitting procedure. At energies of ≤ 3.0 MeV the expansion was terminated at $n=6$. At higher energies "n" was set equal to 8. The selection of "n" was determined from an inspection of the fits and the corresponding data. In most instances the fitting procedures utilized only the experimental values. However, in a few distributions, the exact placement of the several largest-angle cross sections tended to give an unsatisfactory extrapolation of the fit to 180 deg. In these cases the model, described below, was used to introduce a 180 deg. cross section value and thus assure a good extrapolation of the fit to 180 deg. The zero degree extrapolation of the fits exceeded Wick's Limit (16) in $\sim 85\%$ of the cases. In the remaining instances the fit was $< 10\%$ lower than the Limit and perturbed by uncertainties in the very forward-angle

measured values. The estimated uncertainties in the angle-integrated values were 5% to 8% and the internal consistency of the measurements was in accord with these estimates. The experimental elastic scattering results and the corresponding fits of Eq. 1 are shown in Fig. 3 together with the lower-energy results of Reitmann et al. (17) obtained at this Laboratory nearly a decade ago.

The results of the present elastic scattering measurements can be compared with those reported by Coles (18) and by Gorlov et al. (19), as illustrated in Fig. 4. The results of the present work are in good agreement with those of Coles at energies of ≤ 3.0 MeV while there appears to be some systematic difference at 3.5 MeV. The present 3.8 MeV values compare well with the 4.0 MeV values of Gorlov et al. possibly excepting values at very large scattering angles. The agreement with the Coles 4.0 MeV values is less satisfactory. With the exception of a few isolated points, the agreement between measurements at energies of ≤ 3.5 MeV is generally within the respective uncertainty estimates. Furthermore, the largest discrepancies tend to be near the distribution minima where all the results are sensitive to the exact placement of the scattering angle and to multiple-event corrections. Isolated-energy comparisons do not reflect the systematic consistency of the present measurements as illustrated, for example, in Fig. 3.

C. Inelastic Neutron Scattering Cross Sections

The scattered-neutron resolutions of the present experiments were not sufficient to resolve all of the known structure of niobium (20) and some of the observed "states" consisted of several components. The energies of the observed states were determined from the measured neutron time-of-flight with the time-scale of the apparatus calibrated using well established inelastic neutron scattering processes (e.g. the excitation of the 845 keV state in ^{56}Fe). The uncertainties attributed to the observed excitation energies were subjective judgements based upon the consistency of values measured over a one year period and an estimate of systematic errors in the energy scales. These uncertainties were relative to the mean excitation energies and not necessarily representative of the

energy spreads of the various components that may have contributed to the observed "state". The sensitivity of the apparatus varied with the experimental conditions with "best" cross sectional sensitivities of ~ 1 mb/sr and lowest detector cut-off energies of a few hundred keV. The measurements employed the ${}^7\text{Li}(p,n){}^7\text{Be}$ source reaction which produces a secondary neutron group whose intensity varies with incident energy (5). The experimental results were corrected for contributions due to this second source group. However, in the context of the complex scattered-neutron distributions, the corrections were not always unambiguous and as a consequence some distortions of cross sections and/or energy values may have resulted.

The excitation energies observed in the present experiments are summarized in Table 1 and qualitatively compared with some of the previously reported values in Fig. 5. The present work, and all other reported neutron scattering studies, did not resolve the first excited state at ~ 29 keV though it has been observed in both $(n;n',\gamma)$ and charged particle studies (20). Inelastic contributions due to the excitation of this level were included in the "elastic" component as discussed above. Calculations indicated that such contributions were small (see below). The states at 738, 810, 959, 1070, 1315, 1488, 1674, 1947, 2159 and 2335 keV observed in the present work are consistent with those reported by Coles (18) and by Almén et al. (21), though it is not clear that the latter work represents an independent energy determination. The 2519 keV state observed in the present work is at a lower energy than that given by Coles however it may correspond to the 2520 keV state reported from ${}^{92}\text{Zr}({}^3\text{He},d)$ measurements (22) rather than to a composite of 2520 and 2590 keV excitations as presumed by Coles. It is evident from Fig. 5 that the present, and previously reported, neutron determinations of excitation energies are in reasonable agreement with the structure deduced from $(n;n',\gamma)$ measurements (23-26). The latter method provides far superior resolution indicating that the "states" observed in the neutron work are frequently unresolved multiplets. The exact details of these multiple structures are not entirely clear and the $(n;n',\gamma)$ results are not unambiguous. However, the present tentative identification of additional states at 1442, 1539, 1620, 1709, 1759, 1920

and 2270 keV is compatible with the reported existence of a more complex excited structure in niobium (20). The weak excitation observed at 1883 keV may be associated with the uncertain complex of states near 1900 keV (20).

The inelastic excitation cross sections of the well established states were measured at up to 20 scattering angles distributed between 20 and 160 deg. The corresponding angle-integrated cross sections were deduced from the angular distributions by least-square fitting a legendre expansion of the form of Eq. 1 to the measured data. In most instances the observed angle-differential distributions were essentially isotropic and the fitting procedure degenerated into a simple average of experimental values. In a few cases P_1 or P_2 fits were employed (i.e. $n=1$ or 2 in Eq. 1) but it was not clear that the deviation from isotropy was more than a statistical artifact. The least-square fitting procedures employed equal weighting and the uncertainty assigned to the respective angle-integrated values was subjectively based upon the estimated quality of the individual measurements, reproducibility and an estimate of systematic errors. Generally, detector-efficiency calibration was judged reliable only at energies ≥ 0.5 MeV and measured cross sections were not accepted nearer than 0.5 MeV of the respective thresholds. The resulting angle-integrated inelastic excitation cross sections are given in Fig. 6 together with values previously reported from $(n;n')$ and $(n;n',\gamma)$ measurements. With a few minor exceptions the cross sections determined in the present work compare favorably with those deduced from the neutron measurements of Coles (18) and of Almén et al. (21). Furthermore, the present results nicely extrapolate to the lower energy neutron values of Reitmann et al. (17). The agreement with cross sections deduced from $(n;n',\gamma)$ measurements is less satisfactory. The latter can be difficult to interpret due to uncertainties in excited structure, branching ratios and internal conversion and, in some instances, are reported only as gamma-ray production cross sections (e.g. Nath et al. (26)). The $(n;n',\gamma)$ results are most unambiguous near the respective thresholds but even in these limited energy regions there are discrepancies with the neutron measurements and between the gamma-ray measurements themselves.

IV. Model Calculations

An optical-statistical model (27,28) was employed for the interpretation and extrapolation of the measured values. The selection of model parameters was based upon the following premises approximately in order of emphasis:

1. Calculated total cross sections should represent the measured values throughout the continuum region to ~ 20 MeV. The total cross section is the only unambiguously calculable quantity in this region.
2. Calculated elastic-scattering-angular distributions should describe the measured quantities at low energies where the excited structure is reasonably known and at high energies where the elastic process is essentially due to "shape-scattering".
3. At low energies the calculated $\ell=0$ strength function should agree with that determined from resonance experiments.
4. The choice of model should not be influenced by considerations of inelastic scattering processes as the excited structure of niobium is complex and relatively uncertain.

The calculations were based upon a spherical optical potential which should be appropriate as ^{93}Nb is near the closed shell at $N=50$. The non-locality of the potential was approximated by energy dependent parameters in the manner of Engelbrecht and Fiedeldey(29). Compound-nucleus contributions were calculated using the Hauser-Feshbach formula (28). All the computations were carried out with an improved version of the computer program ABACUS-NEARREX (30). This program accepted up to 19 excited states. This was a restriction for more than 19 states have been reported in niobium at excitation energies of ≤ 2.0 MeV (20). Therefore the general calculations (excluding the detailed examination of spin and parity, described below) compromised the excited structure in such a way as to give good representation of the structure to excitation energies of ~ 1.3 MeV and a qualitative approximation of structure at higher energies. The exact nature of the structure did not appreciably influence the computation of total cross sections, elastic-angular distributions or strength

functions; the quantities upon which the model selection was based.

Initial computational attempts employed a number of potentials reported in the literature including those of Holmqvist et al.(31). Perey and Buck (32), Moldauer (33) and Lambropoulos et al.(34). The latter, developed from an analysis of neutron interactions with the isotopes of molybdenum, proved very successful in the present niobium application. The Lambropoulos potential consists of a Woods-Saxon real term, a derivative surface-imaginary term and a Thomas spin-orbit term (27) with the following parameters:

$$\begin{aligned} V_{\text{real}}^0 &= 50.0 \text{ MeV}, & R_{\text{real}} &= 5.527 \text{ F.}, & A_{\text{real width}} &= 0.69 \text{ F.} \\ W_{\text{imag}}^0 &= 6.0 \text{ MeV}, & R_{\text{imag}} &= 5.798 \text{ F.}, & A_{\text{imag width}} &= 0.55 \text{ F.} \\ V_{\text{s-o}} &= 7.0 \text{ MeV} \end{aligned} \quad (2)$$

with the energy dependence

$$V = V^0 - 0.25 E(\text{MeV}) \text{ and } W = W^0 - 0.2 E(\text{MeV}).$$

Total neutron cross sections calculated with the above potential are in very good agreement with experimental values measured from 0.1 to 20.0 MeV as illustrated in Figs. 2 and 7. The calculated values and the experimental evaluation (see below) differ by no more than 5% and the difference is largest at low energies where structure in the total cross section has been reported (13) and therefore the model may not be rigorously applicable. Generally, the differences between measured and calculated total cross sections are equivalent to or less than those between different measurements.

Calculated elastic scattering angular distributions were inclusive of compound-elastic and inelastic ($Q = -29 \text{ keV}$) contributions to energies of $\sim 2.5 \text{ MeV}$. At energies of $\sim 4.0 \text{ MeV}$ the elastic distributions were assumed to be essentially due to "shape-scattering". Between 2.5 and 4.0 MeV the contribution of compound elastic scattering was linearly extrapolated from the calculated value at 2.5 MeV to zero at 4.0 MeV. Generally, calculations based upon the above potential are in very good agreement with observed measured elastic angular distributions from incident energies of a few hundred keV to 5.0 MeV as illustrated by the examples of Fig. 4. The agree-

ment with the results of Holmqvist et al.(31) at 8.05 MeV is reasonably good (See Fig. 4). The calculated results generally follow the latter measurements at forward angles and reproduce the location of the observed diffraction minima. They are somewhat larger than experiment at back-scattering angles. Similar small discrepancies between calculation and experiment at 8.05 MeV have been noted in Ref. 31. The agreement between the present-calculated and the measured values of Western et al.(35) at 14.0 MeV is not as satisfactory as similar comparisons at lower energies. At forward angles the calculated 14.0 MeV values are appreciably larger than the experimental results. However, the latter extrapolate to zero-deg. cross sections which are as much as a factor of two smaller than "Wick's Limit" (16). The calculations more clearly define a diffraction pattern of the distribution than do the experimental results and the calculated pattern is a reasonable extrapolation of the above 8.05 MeV distributions. Attempts to fit the measured 14.0 MeV data with Eq. 1 using a reasonable number of terms were not particularly successful. Reported comparisons of calculated results with this particular 14.0 MeV data were less successful than that obtained here (35).

The above potential centers the surface absorption slightly outside the real-potential radius in a manner similar to that suggested by Moldauer (33) from study of the systematics of $\ell=0$ strength functions. As a consequence, the calculated $\ell=0$ strength function is a reasonable 0.75×10^{-4} as compared to the experimental value of $0.4 \pm 0.1 \times 10^{-4}$ tabulated by Seth (36). The calculated result is somewhat larger than that deduced from experiment but it is in a mass region of rapidly changing strength functions, its experimental value could be influenced by energy-local fluctuations, and the calculated result is not inconsistent with systematics in the mass region (4).

The starting point of the inelastic scattering calculations was the above optical model, the Hauser-Feshbach formula (28) and the excited structure of niobium as reported by Gobel et al.(23), Rogers et al.(24) and van Heerden et al.(25) from $(n;n',\gamma)$ measurements and as generally summarized by Kocher (20). This information indicates a very complex structure with an average level spacing of ~ 50 keV to excitations of 2.0 MeV. The reported excited energies are relatively consistent to energies

of ~ 1.2 MeV with the exception of the state at ~ 686 keV. Above ~ 1.2 keV discrepancies and uncertainties increase with energy.

Rogers et al. compared measured and calculated inelastic neutron scattering cross sections to deduce the spin and parity of a number of states. This approach was also used by Göbel et al. but in addition these authors further restricted the options by correlating the multipolarity of the emitted radiation with observed life-times. The latter approach leads to values that are not always consistent with those of Rogers et al. or reported elsewhere (20,25). Direct neutron detection including the present work, that of Reitmann et al. (17), Almén et al. (21) and Coles (18) does not have the resolution of the $(n;n',\gamma)$ studies and thus does not as well define the details of the excited energies. However, neutron detection provides a better knowledge of the corresponding inelastic neutron excitation cross sections. Here these directly measured neutron cross sections are compared with the results of statistical calculations for an improved assay of possible spin and parity assignments. The comparisons primarily test the spins and parities postulated by Göbel et al. and by Rogers et al. The calculations did not employ the fluctuation correction to the Hauser-Feshbach formula (37) as it was felt that such corrections were not warranted in view of the complexity of the problem. As a consequence, the calculated values were expected to be somewhat larger than the experimental results, particularly near thresholds. Primary attention was given to excitation energies of ~ 1.2 MeV. Above ~ 1.2 MeV the excited structure becomes increasingly uncertain with correspondingly dubious calculational results. In particular, the number of excited states employed in the calculations (≤ 19) was insufficient at energies > 1.2 MeV. Therefore, channel-competition was deficient and the calculated results became progressively larger than experimental values as the energy increased beyond ~ 1.2 MeV.

The structure observed in the present measurements are correlated with the corresponding structure reported by Göbel et al. and Rogers et al from $(n;n',\gamma)$ measurements as defined in Table 2. At energies below ~ 1.2 MeV this correlation is relatively free of uncertainty. An exception is the additional 686 keV ($\frac{3}{2}^-$) state reported by van Heerden et al. (25)

and from some charged particle work (20). If the spin and parity assignment is correct such a state would not have been strongly excited. It was not observed in the present experiment and for the present interpretation it is ignored. Approximately a hundred calculations were made using the structure correlations of Table 2 starting with sub-threshold energies and extending upward across the thresholds of the first eight observed excited "states". All combinations of spin and parity suggested by Göbel et al. were examined. From comparisons of calculated and measured cross sections some of the alternative assignments of Göbel et al. were qualitatively unacceptable and were rejected. The remaining acceptable alternatives are given in the "Calculational Model" of Table 2. Some further choice between remaining alternatives is guided by the shell-model estimates of Engelbrecht (3). A second set of calculations employed the spin and parity suggestions of Rogers et al. (See Table 2). The two sets of calculated results (the "Calculational Model" = Model #1 selected from Göbel et al. and that based upon the assignments of Rogers et al. = Model #2) are compared with the available cross section data in Fig. 6.

The ground ($\frac{9}{2}^+$) and first excited 29 keV ($\frac{1}{2}^-$) states are well established (20) and the latter has not been observed by neutron detection. The 686 keV reported in some work (20,25) was ignored as noted above. If present in the neutron experiments it would likely have made a minor contribution to the observed 738 keV excitation cross sections. Comparison of measured and calculated results indicates that the 738 keV state is $\frac{7}{2}^+$. This is consistent with essentially all available evidence (20). The observed 810 keV "state" was attributed to 808 and 810 keV components. Comparison of measurement and calculation indicates $\frac{7}{2}^+$ and $\frac{3}{2}^-$ (alternatively $\frac{5}{2}^-$) assignments, respectively. These differ from those of Rogers et al. and Ref. 20. The respective cross sections reported by Rogers et al. are much smaller than those obtained by neutron detection and this is reflected in different spins and parities. The choice made here is consistent with the work of Göbel et al. The calculated excitation of 738 and 810 keV "states" increased more rapidly from threshold than indicated by experiment. This was attributed to a lack of a fluctuation correction to the calculation as noted above. The observed 959 keV "state" was attributed to 950 and 979

keV components. Comparison indicates $\frac{5}{2} +$ and $\frac{11}{2} +$ (or alternatively $\frac{7}{2} -$ and $\frac{13}{2} +$, $\frac{9}{2} +$) assignments, respectively. These estimates are reasonably consistent with those of Rogers et al. or Ref. 20 but the difference between the various calculations is small. The present selection was strongly influenced by the conclusions of Göbel et al. The observed 1070 keV "state" was attributed to contributions from 1080 and 1127 keV states. The latter was apparently observed only in the work of Göbel et al. Reasonable agreement between calculation and experiment was achieved with $\frac{11}{2} +$ and $\frac{5}{2} +$ (or alternatively $\frac{9}{2} +$ and $\frac{5}{2} +$) assignments, respectively. These are consistent with those of Ref. 20 but not with those of Rogers et al., though such comparisons may not be significant due to the possibly uncertain nature of the 1127 keV state. Results obtained with the "Calculational Model" were descriptive of the observed excitation of the 1315 keV "state" but the contributing structure is complex and uncertain. Detailed comparison of measured and calculated excitations of higher energy states were not rewarding due to the uncertainty in contributing exit channels. Generally, the "Calculational Model" of Table 2, employing spin and parity assignments consistent with those suggested by Göbel et al, was descriptive of inelastic excitation cross sections determined by neutron-detection to energies of ~ 1350 keV.

V. Evaluation

The objective of this evaluation was the provision of a good contemporary evaluated file for neutronic calculations to 20.0 MeV. Primary emphasis was given to fast neutron interactions including those emitting charged particles. No attention was given to gamma-ray induced processes nor to gamma-ray emission spectra. Experimental information in both of these latter areas is sparse and it is suggested that requirements for such information be met by theoretical calculation. At incident neutron energies of ≤ 100 keV this evaluation is explicitly identical to that of Allen and Drake given in ENDF/B MAT-1164 (38). From 100 keV to 8.0 MeV this evaluation is primarily based on recent experimental results. Above 8.0 MeV it is founded on experimental results where available. However, the experimental information is limited, particularly as energies approach

20.0 MeV, and a large number of reaction channels open. Thus in the difficult high-energy region a major reliance was placed upon physical understanding and associated calculational models and on available systematic experimental knowledge. The latter is not without some question particularly in this region near the $N=50$ shell. The result should be an improved evaluated file for neutronic calculations particularly where high-energy processes are important (e.g. in CTR applications). The use of the file in specialized calculations emphasizing minority charged-particle-emitting reactions should be circumspect as the latter are not well known and this uncertainty is reflected in the evaluation.

The present evaluation considers the reactions defined in Table 3. The respective Q -values were calculated from the mass tabulations of Wapstra et al. (39) or from observed experimental values as was judged most suitable. The particle emission in all reactions other than elastic neutron scattering was assumed to be isotropic. In the case of discrete inelastic neutron excitation cross sections this assumption was justified by experimental evidence. However, other reactions, particularly at the higher energies, may result in anisotropic particle emission as direct-reaction mechanisms undoubtedly are a contributing factor. Evidence of such anisotropy is very limited and uncertainties inherent in the deduction of the angle-integrated cross sections transcend those that can be expected from any reasonable anisotropy.

Subsequent portions of this Section outline the basis of and procedures employed in this evaluation. This outline should be considered the support documentation for the numerical file given in Appendix A.

A. Total Neutron Cross Sections

The evaluated total neutron cross sections were deduced from the weighted averages of experimental values available from 0.1 to 15.0 MeV and extended to 20.0 MeV using the model described above. The available experimental information is summarized in Fig. 7. The experimental weighting factors were estimates based upon: the stated experimental errors (when available), the estimated validity of the technique in the respective energy regions, evidence of systematic errors in sets of measurements and

collaborating evidence such as concurrent measurement of a standard cross section. The experimental information was obtained from the open literature and the files of the National Neutron Cross Section Center (40).

From 0.1 to 0.5 MeV the evaluation was based upon the experimental results of Miller et al.(12), Uttley (11), Langsdorf et al.(9) and of the present work. The latter two sources were not given large weight as the Langsdorf measurements were not direct total cross section determinations (total scattering cross sections were measured) and the techniques employed in the present work were least reliable at these lower neutron energies. The evaluation assumed a smooth energy dependence of the total cross section. This may be an over simplification as Seth (13) has reported considerable structure in the total cross section and the elastic scattering cross sections reported by Reitmann et al.(17) show a tendency toward such structure.

The evaluation from 0.5 to 1.0 MeV was based primarily upon the results of Uttley (11) and those of the present work. Though the measurements were made using different techniques the agreement is excellent. The results of Miller et al.(12) and of Langsdorf et al.(9) were utilized with reduced weighting. The Miller values appear consistently higher than the others in this region and, again, the Langsdorf measurements were not a direct determination of the total cross sections. The resulting evaluated total neutron cross section is 5% to 8% lower than the total elastic scattering cross section reported by Reitmann et al.(17). However, this comparison is influenced by possible structure, as noted above, and the Reitmann measurements are indirectly related to the results of Langsdorf et al.(9) which also tend to be higher than the present evaluation in this energy range.

From 1.0 to 5.0 MeV the agreement between the experimental results of: Miller et al.(12), Langsdorf et al.(9), Carlson and Barschall (15), Foster and Glasgow (14) and the present work is excellent. A simple average yields an evaluated total neutron cross section with an estimated uncertainty of a few per cent. From 5.0 to 15.0 MeV the evaluation relies upon the experimental results of Foster and Glasgow and of Carlson and Barschall. These measurements are parts of comprehensive experimental programs which

have been shown to provide energy-averaged total neutron cross sections consistent with a number of other values. Above 15.0 MeV the evaluation relies entirely upon results calculated with the model outlined above, slightly renormalized to smoothly join the experimental values near 15 MeV. This model was descriptive of measurements at energies below 15.0 MeV and Engelbrecht and Fiedeldey(29) have shown this particular potential energy dependence to be valid to 100.0 MeV and above.

The resulting evaluated total neutron cross sections are compared with the experimental quantities and with the evaluation of ENDF/B MAT-1164 in Fig. 11. The primary differences between the present evaluation and that of ENDF are below energies of 2.0 MeV. The differences are both positive and negative and amount to as much as 10% in some energy ranges. Comparisons at energies of ≤ 100 keV are, of course, meaningless as the present evaluation explicitly employs the ENDF MAT-1164 values in this lower energy range.

B. Elastic Scattering Cross Sections

It is evident from the discussion of Section IV and Fig. 4 that the relative elastic angular distributions calculated from the above Model are in excellent agreement with a number of experimental results at energies of ~ 5.0 MeV and in reasonable agreement with the observed distribution at 8.05 MeV. At 14.0 MeV the Model-calculated result is less descriptive of the single measured distribution (35). Calculations based upon other models were little, if any, more suitable. The difference between calculation and measurement at 14.0 MeV is in the character of the diffraction pattern where the cross sections are relatively small. The difference is not so appreciable in the important regions of large cross sections. The above considerations justify the use of the Model for the determination of the relative shape of elastic-scattering angular distributions for the present evaluation. Furthermore, this procedure assures a reasonably systematic and physically licit behavior. The distributions calculated from the Model and used in this evaluation are summarized in Fig. 8. They are numerically expressed in the file (see Appendix A) as f_{ℓ} coefficients defined by:

$$\frac{d\sigma}{d\Omega} = \frac{\sigma}{2\pi} \left[\sum_{\ell=0}^n \frac{2\ell+1}{2} f_{\ell} P_{\ell} \right] \quad (4)$$

where σ is the elastic scattering cross section and P_{ℓ} the legendre polynomials. The expansion was terminated by judgements based on the magnitudes of the contributions from various angular momenta in the calculations.

At neutron energies of ~ 5.0 MeV the evaluated angle-integrated elastic scattering cross sections were based upon the firm experimental foundation described and referenced in Sec. III, above. At energies of ~ 2.5 MeV, the non-elastic cross section can be reasonably deduced from experimental information. At these energies, the consistency between measured total, elastic and non-elastic cross sections was good. However, in the evaluation process small adjustments of the elastic cross section were made to assure the exact consistency required of the numerical file. The adjustments were well within the uncertainties of the measured elastic cross sections. At 8.05 MeV, the angle-integrated elastic cross section calculated from the Model is in good agreement with the measured value of Holmqvist et al.(31) thus the Model was used to interpolate the elastic cross section from ~ 5.0 to 8.05 MeV. The non-elastic cross sections at energies of 2.5 to 8.0 MeV, deduced from the evaluated total and elastic scattering cross sections, tend to be smaller than those reported by Thomson from measurements (41) though not generally outside the errors in the latter measured values.

There apparently is only one experimental measurement of elastic scattering at energies above ~ 8.0 MeV; the 14.0 MeV distribution reported by Western et al.(35). Using a "black core formula" these authors set an upper limit to the 14.0 MeV elastic scattering cross section of 1.77 b. This value appeared small. An attempt was made to numerically deduce the 14.0 MeV angle-integrated elastic scattering cross section from the differential measurements of Western et al. "Wick's Limit" was used as a zero-degree point. The measured distribution was smoothly interpolated between measured values and extrapolated from the last measured point at ~ 140 deg. to 180 deg. Numerical integration of this extrapolated distribution resulted in an angle-integrated cross section of 2.05 b. Furthermore, it

was noted that 85% of the cross section was obtained from the angular interval 0 to 30 deg. and explicitly involved only three of the Western et al. differential measurements. The above Model lead to a calculated 14.0 MeV elastic cross section of 2.9 b. The two potentials proposed by Holmqvist et al. (31) and based upon the analysis of high energy elastic scattering gave 2.30 and 2.34 b. All three calculations gave total cross sections in good agreement with the experimental 14.0 MeV value. Several other potentials gave 14.0 MeV elastic scattering cross sections in the range 2.3-3.0 b but an inferior description of the measured total cross section. From these considerations a 14.0 MeV elastic scattering cross section of 2.3 b was chosen for the present evaluation. It is consistent with: a) the lower values predicted by calculations giving reasonable agreement with the measured total cross section, b) the measured elastic scattering at 8.05 MeV and c) the present re-interpretation of the Western et al. measurements with a reasonable uncertainty estimate. The evaluation implies a 14.0 MeV non-elastic cross section of ~ 1.65 b. The latter is a critical value as it sets an upper limit on the sum of partial non-elastic cross sections. The present evaluation employs the potential of Holmqvist et al. to interpolate the elastic cross section between 8.05 and 14.0 MeV and extrapolate it to 20.0 MeV. The resulting evaluated elastic scattering cross section over the energy range 0.1 to 20.0 MeV is shown in Fig.11. Generally, the present evaluation differs from that of ENDF-III MAT-1164 by 10% or more over much of the energy range. There are some small fluctuations in the present evaluated results near 2.0 MeV. These are reflections of similar artifacts in the total inelastic cross section arising from detailed channel competition in the discrete inelastic processes. The present evaluated discrete inelastic cross sections are smooth curves not reflecting these detailed effects. These discrete inelastic cross sections combined with the linear-linear interpolation scheme employed in the file lead to the above small fluctuations. "Cosmetic" treatment could have removed these artifacts with no significant physical change in an applied context. Such manipulations were felt unwarranted and would have appreciably increased the numerical volume of the file.

C. Inelastic Scattering Cross Sections

The evaluation of discrete inelastic neutron excitation cross sections was largely based upon the neutron detection measurements described and referenced in Sec. III, above. The corresponding reaction Q-values are given in Table 3. The Q-value selection was such as to group the individual excitations in a manner comparable to the experimental resolutions of the neutron measurements and did not fully represent the detailed structure observed in $(n;n',\gamma)$ studies. However, the latter detail is not usually critical to neutronic calculation (e.g. the distinction between the excitation of 809 and 810 keV states is relatively unimportant) and, at present, the energetics and cross sections for the excitation of the detailed structure are not unambiguous. Model calculations were of little assistance in the inelastic evaluation due to uncertainties in excited structure and therefore the procedure was essentially empirical. Exceptions were the deduction of the cross sections for the excitation of the 29 keV state, which were based entirely upon calculation, and the behavior of some of the cross sections near threshold where model-determined shapes offer guidance. The resulting evaluated discrete inelastic excitation cross sections are shown in Fig. 6 and given numerically in Appendix A. As noted above, the evaluated discrete inelastic excitation cross sections were smooth curves not reflecting the detailed inset of competing channels and, as a consequence, their summation showed small fluctuations.

The inset of the continuum inelastic excitation cross section is at ~ 2.5 MeV (i.e. the energy of the last discretely observed excited state) and becomes the entire inelastic cross section at 6.0 MeV. Throughout this evaluation the continuum inelastic scattering cross section was treated as a free parameter adjusted to assure consistency with the evaluated non-elastic and other partial cross sections. The result, shown in Fig. 9, was physically reasonable.

The neutron emission spectrum from continuum inelastic neutron scattering was assumed to be a simple Weisskopf "temperature" distribution of the form

$$N(E) \sim E \exp (-E/T) \quad (4)$$

where

$$T = \left[\frac{E}{a} \right]^{1/2}$$

and "a" is a level-density parameter.

It was realized that this was an over-simplification at high incident energies where direct-reaction processes can be a contributing factor. The possible contribution from direct processes is not well defined from experiment and Coles (18) suggests that deviations from a "temperature" distribution are, in part, due to partially resolved discrete-state excitations. Moreover, deviations from a "temperature" distribution were masked by other uncertainties in neutron-emitting partial cross sections. Thus the simple assumption of Eq. 4 was believed justified for the present evaluation.

The level density parameter, a, of Eq. 4 was deduced from the measured results of Thomson and Coles (18,41). There are appreciable errors associated with these experimental results particularly at their lowest incident energies (4.0 and 3.5 MeV respectively). The evaluated density parameter $a=21.5 \text{ MeV}^{-1}$ was obtained from the simple average of values deduced from the measurements neglecting the lowest energy point in each set. The resulting evaluated temperatures are reasonably descriptive of measurements as illustrated in Fig. 10.

The inelastic scattering cross sections of the present evaluation are appreciably different from those given in ENDF-III MAT-1164 as illustrated in Fig. 9. The discrete inelastic cross sections of ENDF-III bear little resemblance to those of the present evaluation and are truncated at 1.4 MeV. The continuum inelastic cross section of the present evaluation is based largely upon the measured total and elastic scattering cross sections to 8.05 MeV as discussed above. It differs from that of ENDF-III by 20% or more over much of the energy range including the region below 8.0 MeV where experimental results give good guidance. Above ~ 9.0 MeV both evaluations become more speculative but a very large difference remains. Interestingly, the present continuum inelastic cross sections tend to rise with increasing energy above 15.0 MeV possibly due to the contributions from $(n;p,n')$ and $(n;\alpha,n')$ processes.

D. Neutron Radiative Capture; $^{93}\text{Nb}(n;\gamma)^{94}\text{Nb}$ Cross Sections

The present $(n;\gamma)$ evaluated cross sections at energies of ≤ 0.1 MeV were taken directly from ENDF-III MAT-1164. Values at energies ≥ 0.1 MeV

were deduced from the references of BNL-325 (42) and from the results of later work by Kompe (43), Macklin and Gibbons (44) and Rigaud et al. (45). The resulting cross sections are relatively small as illustrated in Fig. 9 and do not differ appreciably from the values given in ENDF-III below several MeV. Near 14.0 MeV the present evaluation is approximately a factor of two higher than ENDF-III due to the new measurements of Rigaud et al. The $(n;\gamma,n')$ process was not considered as theoretical estimates indicated a small value (46) and the present file system makes no explicit provision of this quantity.

E. The $^{93}\text{Nb}(n;2n')^{92}\text{Nb}$ Cross Section

A number of measurements have determined the cross section for the activation of the ~ 10 day isomer of ^{92}Nb by means of the $(n;2n')$ process (47-57). These results are relatively consistent and are summarized in Fig. 12. For this evaluation we emphasize the values of Paulsen and Widera (47) as they are precise, detailed, extend over a wide energy range and are reasonably representative of a number of other measurements. The only appreciable discrepancies appear toward the threshold energy and are not large.

There have been three recent measurements of the total $(n;2n')$ cross section. Mather et al., using coincidence techniques, report 0.977 ± 0.079 b at 12.4 MeV and 1.312 ± 0.083 b at 14.3 MeV (58). Paulsen and Widera obtain a value of $1.38 \text{ b} \pm 13\%$ at 16.8 MeV relative to the $^{59}\text{Co}(n;2n')$ cross section of 0.78 b (47). They used time-of-flight techniques that may not have been entirely free of perturbations from $(n;n')$, $(n;p,n')$ and $(n;\alpha,n')$ processes. The total $(n;2n')$ cross section results of Mather et al. and of Paulsen and Widera are shown in Fig. 12.

Paulsen and Widera discuss the interpretation of the isomer activation cross sections in terms of the statistical model of Büttner et al. (59) and of the isomer-ratio formalism of Huizenga and Vandenbosch (60). The present evaluation utilizes the latter interpretation. The isomer-ratio calculations depend on the ^{92}Nb spin and parity assignments involved and the spin cutoff factor. The spin and parity of the 135 keV isomeric state of ^{92}Nb is apparently 2^+ (20). The ground state is probably 7^+ with an alternative of 5^+ . Results calculated by Paulsen and Widera using both ground state

assumptions are shown in Fig. 12. A comparison of measured and calculated values suggests that the ground state is $5+$. In either case the isomer ratio calculations lead to total $(n;2n')$ cross sections that are essentially an energy independent multiple of the observed isomer-activation cross sections. Thus it was assumed in this evaluation that the total $(n;2n')$ cross section could be obtained by suitably renormalizing the measured isomer-activation values. Over the relatively narrow energy range involved this assumption is physically reasonable. A normalization factor of 2.88 was chosen by comparing the measured isomer-activation values with the three total $(n;2n')$ measurements. The comparison gave greater weight to the values of Mather et al. as they were felt to be less subject to perturbation from other processes. The resulting evaluated total $(n;2n')$ cross section is shown in Fig. 12. It differs from any of the three measured total $(n;2n')$ cross sections by no more than one standard deviation and has the energy dependent shape of the Paulsen and Widera isomer-activation results. The shape is not particularly similar to that given in ENDF-III and there is a difference in the magnitudes of the two evaluations over large portions of the comparable energy range.

The 14.0 MeV evaluated cross section of 1.24 b is reasonably consistent with a number of estimates based upon systematics and theory; e.g. Adam and Jéki ~ 1.08 b (61), Pearlstein 1.29 b (62), Blow 1.1-1.2 b (63), and Carter $(n;2n') + (n;p,n') \sim 1.5$ b (64). Furthermore, the evaluation is consistent with the non-elastic cross section deduced above throughout the energy range threshold to 20.0 MeV.

The evaluation uses the simple energy independent "temperature" emission spectrum of Eq. 4 normalized to the temperature value of 0.70 ± 0.05 MeV deduced by Paulsen and Widera from measurements of the $(n;2n')$ cross section at an incident energy of 16.8 MeV.

F. The $^{93}\text{Nb}(n;3n')^{91}\text{Nb}$ Cross Section

The systematics of this cross section, based upon a statistical model, are discussed by Liskien (65). He concludes that the total reaction cross section is ~ 180 mb at an incident neutron energy of ~ 19 MeV. Liskien also

attempted to observe the activation of the ^{91}Nb metastable state by the $(n;3n')$ process and concluded that the respective cross section was ~ 60 mb. This evaluation accepts the systematic value of Liskien as consistent with the experimental upper limit of the cross section for the activation of the metastable state and a reasonable isomer activation ratio. The cross section is smoothly interpolated from threshold at 16.89 MeV to 20.0 MeV as shown in Fig. 11 and a relatively "soft" energy independent "temperature" of 0.4 MeV is selected for the evaluation. Due to the high-energy threshold and relatively small cross section this reaction will not be a factor in most neutronic calculations. There is no ENDF-III value for comparison.

G. The $^{93}\text{Nb}(n;p)^{93}\text{Zr}$ Cross Section

^{93}Zr is essentially a stable nucleus (i.e. $t_{1/2} = 9.5 \times 10^5$ y) and as a consequence conventional activation techniques have not been productive of $(n;p)$ cross sections. Verbinski et al. have measured the emitted proton spectrum at emission energies of ~ 6.0 MeV and an incident neutron energy of 14.0 MeV (66). They deduce a cross section for the emission of the observed protons of 22 ± 8 mb which must be considered a lower limit of the total $(n;p)$ reaction cross section. Further, they note the importance of direct reaction mechanisms. Chatterjee has reviewed the systematics of the $(n;p)$ processes and correlated them with predictions based upon statistical theory (67). His conclusions indicate that the $(n;p)$ cross section of ^{93}Nb at an incident energy of 14.0 MeV is ~ 40 mb. This value is 30% larger than that given in ENDF-III MAT-1164. The present evaluation uses the energy dependence of the reaction as given in MAT-1164, renormalized to the 40 mb value at 14.0 MeV suggested by Chatterjee. This procedure is consistent with the body of experimental knowledge of the $(n;p)$ processes and with the reported direct observation of the proton product.

H. The $^{93}\text{Nb}(n;d)^{92}\text{Zr}$ and $^{93}\text{Nb}(n;p,n')^{92}\text{Zr}$ Cross Sections

Both of these processes result in a stable nucleus. Consequently they are difficult to experimentally study and apparently no measured values have been reported. The $^{93}\text{Nb}(n;d)^{92}\text{Zr}$ cross sections will probably be small and

are not considered in the present evaluation. The $^{93}\text{Nb}(n;p,n')^{92}\text{Zr}$ reaction is energetically less favorable than the $(n;\alpha,n')$ process and the latter is not large. However, from statistical arguments Carter has concluded that the $(n;p,n')$ cross section at an incident energy of 14.0 MeV is 336 mb (64). This large value is not particularly consistent with fragmentary knowledge of the $(n;p)$ cross section deduced from direct observation of the omitted protons (66) or with the partial cross sections and the non-elastic cross sections of the present evaluation. The $(n;p,n')$ reaction in the present evaluation is included with the $(n;n')$ cross section and, in this sense, the latter may be considered a "neutron production" cross section. As noted above, this inclusion could have contributed to the slight rise in the $(n;n')$ cross section above 15.0 MeV. The combining of the two cross sections will not appreciably effect the use of the file in neutronic calculations as the emitted neutron spectra from the two reactions will probably not grossly differ.

I. The $^{93}\text{Nb}(n;2p)^{92}\text{Y}$ Cross Section

Bramlitt and Fink set an upper experimental limit of 0.5 mb at 14.7 MeV on the cross section for this reaction (68). Due to this small value and the experimental uncertainty this reaction was not considered in the present evaluation.

J. The $^{93}\text{Nb}(n;^3\text{He})^{91}\text{Y}$ Cross Section

The cross section for the process $^{93}\text{Nb}(n;^3\text{He})^{91m}\text{Y}$ at an incident energy of 14.7 MeV has been measured by Bramlitt and Fink (68) to be ~ 0.06 mb. Even allowing for substantial enhancement due to corrections for the isomer ratio the resulting total reaction cross section will likely be only a few tenths of a milli-barn. Therefore, this cross section was ignored in the present evaluation.

K. The $^{93}\text{Nb}(n;T)^{91}\text{Zr}$ Cross Section

This process should be similar to the $^{93}\text{Nb}(n;^3\text{He})^{91}\text{Y}$ reaction which is small. Therefore, this reaction is not considered in the present evaluation.

L. The $^{93}\text{Nb}(n;\alpha)^{90}\text{Y}$ Cross Section

A number of experimental values of the cross section for the activation of both the ground and metastable state of ^{90}Y by ~ 14.0 MeV neutrons have been reported (69-72). The experimental values are generally consistent with a total reaction cross section of 9-10 mb. This value is in agreement with that given in the existing ENDF-III MAT-1164 file and the latter was accepted and extrapolated to 20.0 MeV for this re-evaluation.

M. The $^{93}\text{Nb}(n;\alpha,n')^{89}\text{Y}$ Cross Section

This reaction is energetically much less favorable than the $^{93}\text{Nb}(n;\alpha)^{90}\text{Y}$ process. The cross section for the excitation of the 16 sec. isomer of ^{90}Y with 14.7 MeV neutrons is reported by Bramlitt and Fink (68) to be 2.5 ± 1.1 mb. Even assuming a large $\times 3-4$ factor for the isomer correction the total reaction cross section will be ~ 10 mb. In view of the relatively large error associated with the above measured quantity and the relatively small upper limit to the cross section the evaluation smoothly interpolates the total reaction cross section from zero at threshold to 5 mb at 20.0 MeV and assumes an energy independent neutron "temperature" of 0.5 MeV. These are rather gross approximations but they will have little effect on most neutronic calculations.

VI. Conclusion

The present study appreciably improves the experimental knowledge of neutron total and elastic and inelastic scattering cross sections of niobium to incident energies of 5.0 MeV. Calculations based upon a spherical optical potential, widely applicable in this mass region, and statistical theory give a good description of; measured total cross sections to 15.0 MeV, differential elastic scattering cross sections to 8.0 MeV and of $l=0$ strength functions reported from low energy resonance measurements. Comparison of measured and calculated inelastic neutron scattering excitation cross sections suggest the spin and parity assignments of states to excitations of ~ 1.3 MeV. These assignments are not always unique. However, the present comparisons preclude some of the assignments suggested in previously reported work.

The available experimental information and the Computational Model developed in the present work were utilized to deduce an evaluated data file in the ENDF format. This new file is believed to be an appreciable improvement over comparable previous files particularly where the application is to neutronic calculations at relatively high energies such as involved in the design of a fusion-reactor system. A major problem in the construction of the file was uncertain and contradictory knowledge of high energy elastic neutron scattering (e.g. at 14.0 MeV). Some charged-particle emitting processes of importance in radiation-damage studies are essentially unknown and reliance must be placed upon systematics. In addition, gamma-ray production cross sections and associated emission spectra are largely unknown. Thus, while the present evaluation is believed to be a considerable advance, many facets of the fast neutron interaction with niobium are in doubt to an extent that may severely limit some specialized calculations at high incident energies.

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Table 1. Excitation Energies Observed the Present Inelastic Neutron Scattering Measurements

E_x (keV)	dE_x (keV) ^a	Comments
738	± 10	
810	± 10	
959	± 10	
1070	± 10	
1315	± 15	
1488	± 20	Inclusive of tentatively identified states at 1442 and 1539 keV.
1674	± 50	Inclusive of tentatively identified states at 1620, 1709 and 1759 keV.
1843	--	Questionable state with very small cross section.
1947	± 50	A multiplet including a tentatively identified state at 1920 keV.
2159	± 30	
2270	--	Questionable state with very small cross section.
2335	± 30	
2519	± 40	

a. These uncertainties are pertinent to the observed average excitation energies and do not necessarily reflect the energies of various contributing components.

Table 2. Energies, Spins and Parities of Excited States of ^{93}Nb .

This Exp.	Calculation Model		Göbel et al. Ref. 22		Rogers et al. Ref. 23	
$E_X^a \pm \Delta E_X$	E_X	J^π	E_X	J^π	E_X	J^π
--b		9/2+	--		--	
--c	29	1/2-	30	1/2-	28	1/2-
738 10	740	7/2+	744	7/2, 9/2+	742	7/2+
810 10	808	7/2+	808	7/2, 9/2,	808	3/2-
	810	3/2-(5/2-)	810	11/2-	809	5/2+
959 10	950	5/2+(7/2-)	950	5/2+, 7/2,	952	13/2+
	979	11/2+	979	9/2-	980	9/2+
1070 10		(13/2, 9/2+)		11/2+, 13/2+		
	1080	11/2+(9/2+)	1082	9/2, 11/2+	1080	7/2+
1315 15	1127	5/2+	1127	5/2+, 7/2		
	1298	7/2-	1298	7/2	1295	7/2±, 9/2-
	1316	3/2-	1316	3/2, 5/2-	1337	17/2+
1488 20 (1442) (1539)	1335	7/2-	1335	7/2, 9/2-		
	1395	5/2-	1395	5/2	1465	5/2-, 3/2+
	1485	5/2-	1485	5/2	1492	9/2, 11/2+,
	1491	5/2+	1491	7/2, 5/2+	1507	13/2
	1500	7/2-	1500	7/2	1528	
			1567	1/2		

a. All energies in keV.

b. Ground State.

c. 29 keV state not observed in the present experiments.

Table 2. (Cont'd.)

This Exp.	Calculation Model	Göbel et al. Ref. 22	Rogers et al. Ref. 23
$E_x \pm \Delta E_x$	$E_x \quad J^\pi$	$E_x \quad J^\pi$	$E_x \quad J^\pi$
(1620)		1605 $7/2^+, 9/2$	
1674 50	1683 $9/2^+$	1683 $11/2^-$	
(1709)		1683 $9/2, 11/2,$	
(1759)		1771 $5/2$	
(1883)	-- --		
(1920)		1911 $7/2, 9/2^-$	
1947 50	1930 $5/2^+$	1951 $5/2, 7/2^-$	
		1970 $9/2, 11/2$	
		2003 $7/2$	
2159 30	2155 $5/2^+$	2155 $1/2, 3/2$	
		2203 $5/2, 7/2$	
(2270)	-- --		
2335 30	-- --		
2519 40	-- --		

Table 3. Reactions and Processes Contributing to this Evaluation

<u>Reaction-Process</u>	<u>Q(MeV)</u>	<u>Threshold (MeV)</u>
$^{93}\text{Nb}(\text{Total Cross Section})$	--	--
$^{93}\text{Nb}(n;\gamma)^{94}\text{Nb}$	--	--
$^{93}\text{Nb}(n;n')^{93}\text{Nb}$		
a	0.0 (elastic)	0.0
b	-0.029	0.02931
c	-0.740	0.74792
d	-0.810	0.81867
e	-0.959	0.96926
f	-1.070	1.08145
g	-1.315	1.32917
h	-1.488	1.50392
i	-1.674	1.69191
j	-1.947	1.96783
k	-2.159	2.18210
l	-2.335	2.35998
m	-2.519	2.54595
n	--	2.54595
		(inset of temperature distribution)
$^{93}\text{Nb}(n;2n')^{92}\text{Nb}$	-8.826	8.9204
$^{93}\text{Nb}(n;3n')^{91}\text{Nb}$	-16.718	16.8968
$^{93}\text{Nb}(n;p)^{93}\text{Zr}$	+0.719	0.0
$^{93}\text{Nb}(n;p,n')^{92}\text{Zr}$	-6.039	6.1036
$^{93}\text{Nb}(n;d)^{92}\text{Zr}$	-3.815	3.8558
$^{93}\text{Nb}(n;t)^{91}\text{Zr}$	-6.192	6.25825
$^{93}\text{Nb}(n;2p)^{92}\text{Y}$	-8.880	8.969
$^{93}\text{Nb}(n;^3\text{He})^{91}\text{Y}$	-7.718	7.8005
$^{93}\text{Nb}(n;\alpha)^{90}\text{Y}$	+4.914	0.0
$^{93}\text{Nb}(n;\alpha,n')^{89}\text{Y}$	-1.946	1.9668

Figure Captions

1. View of the 10-channel time-of-flight system. Flight paths are variable from 1.5 to 7.0 meters. The angular range is from -110 to +170 degrees. Samples are placed at the focus of the collimator system approximately 15 cm from the neutron source. The neutron source is pulsed at a repetition rate of 0.5 to 2.0 Mhz and with a pulse width of ~ 1.0 nsec.
2. Comparison of measured, calculated and evaluated total neutron cross sections of niobium. References are as follows: X = 15, | = 14, Δ = 11, $\Diamond$ = 12 and $\square$ = 9.
3. Measured differential elastic scattering cross sections of niobium. Values at energies ≤ 1.5 MeV are taken from Ref. 17. Values at energies > 1.5 MeV are from the present work. Curves indicate the result of a least-square fit of the legendre expansion of Eq. 1 to the measured data.
4. Comparison of measured (data points) and calculated (curves) niobium differential elastic scattering distributions. Data references are as follows: $O(E \leq 1.5 \text{ MeV}) = 17$, $O(E > 1.5 \text{ MeV}) = \text{present work}$, $\triangleleft = 18$, $+ = 19$, X = 73, $\Diamond = 41$, $\leftarrow = 31$ and $\mathbb{K} = 35$.
5. Qualitative comparison of the reported excited structures of ^{93}Nb with those observed in the present experiments. The references are: NDS = 20, A = 26, B = 24, C = 25, D = 23, E = 17, F = 21 and G = 18.
6. Comparison of measured, calculated and evaluated discrete inelastic excitation cross sections of niobium. Curves indicate calculation and evaluation as described in the text. Data points indicate measured values referenced as follows: O = this work, $\Delta = 17$, $+ = 21$, X = 18, $\Diamond = 74$, $\bar{X} = 26$, $\dagger = 24$ and Y = 23. Vertical bars on data points give an indication of experimental uncertainty.
7. Comparison of measured, calculated and evaluated total neutron cross sections of niobium from 0.1 to 20.0 MeV. Experimental data points are referenced as follows: O = this work, X = 15, | = 14, Δ = 11, $\Diamond$ = 12, $\square$ = 9 and $\star = 75$.
8. Angle-energy dependence of evaluated neutron differential elastic scattering cross sections.

Figure Captions (Cont'd)

9. Evaluated inelastic neutron scattering and reaction cross sections of niobium. Solid curves indicate the present evaluation and dotted curves that of ENDF-III, MAT-1164 (38,40).
10. Comparison of measured and evaluated inelastic neutron scattering "temperatures". Data indicated by boxes is from Ref. 18, that shown by circles is from Ref. 41. The curve indicates the evaluation. The format of the figure is essentially that used in Ref. 18.
11. Summary comparison of the results of the present evaluation with those of ENDF-III, MAT-1164 (40).
12. Comparison of measured, calculated and evaluated (n;2n') cross sections of niobium. Data points indicate measured values referenced as follows:
 $\square$ and $\circ$ = 47, $*$ = 58, Δ = 48, $+$ = 49, $\times$ = 50, $\diamond$ = 51, $\dagger$ = 52, $\bar{x}$ = 53, Z = 54, Y = 55, $\boxtimes$ = 56 and $\bar{X}$ = 57. Interpretation of the curves is discussed in the text.

Fig. 2.

Fig. 3

Fig. 2

Fig. 6

Fig. 2

Nb Evaluation

Fig. 8

Fig. 9

Fig. 10

Fig. 11

Fig. 12

APPENDIX--Evaluated Data File in ENDF Format..

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4.10930+ 4 9.21051+ 1      1      0      0      481164 1451      1
0.00000+ 0 0.00000+ 0      0      0      8      01164 1451      2
NISSIIUM-93      EVALUATION BY A. B. SMITH, 1973-FEB.      1164 1451      3
*****      1164 1451      4
ALL VALUES FOR NEUTRON ENERGIES OF LESS THAN 100 KEV TAKEN      1164 1451      5
DIRECTLY FROM EVALUATION OF ALLEN + DRAKE GIVEN IN MAT-1164.      1164 1451      6
VALUES AT ENERGIES ABOVE 100 KEV ARE ESSENTIALLY BASED UPON      1164 1451      7
EXPERIMENT AND THEORETICAL CALCULATION AS DESCRIBED IN DETAIL      1164 1451      8
BY A. B. SMITH, PRIVATE COMMUNICATION (1973).      1164 1451      9
*****      1164 1451     10
      1      451      58      1164 1451     11
      2      151      241      1164 1451     12
      3      1      51      1164 1451     13
      3      2      39      1164 1451     14
      3      4      29      1164 1451     15
      3      16      9      1164 1451     16
      3      17      5      1164 1451     17
      3      22      6      1164 1451     18
      3      51      12      1164 1451     19
      3      52      12      1164 1451     20
      3      53      12      1164 1451     21
      3      54      11      1164 1451     22
      3      55      11      1164 1451     23
      3      56      9      1164 1451     24
      3      57      9      1164 1451     25
      3      58      10      1164 1451     26
      3      59      10      1164 1451     27
      3      60      9      1164 1451     28
      3      61      8      1164 1451     29
      3      62      6      1164 1451     30
      3      91      11      1164 1451     31
      3      102      28      1164 1451     32
      3      103      13      1164 1451     33
      3      107      12      1164 1451     34
      3      251      14      1164 1451     35
      3      252      14      1164 1451     36
      3      253      14      1164 1451     37
      4      2      161      1164 1451     38
      4      16      10      1164 1451     39
      4      17      10      1164 1451     40
      4      22      10      1164 1451     41
      4      51      10      1164 1451     42
      4      52      10      1164 1451     43
      4      53      10      1164 1451     44
      4      54      10      1164 1451     45
      4      55      10      1164 1451     46
      4      56      10      1164 1451     47
      4      57      10      1164 1451     48
      4      58      10      1164 1451     49
      4      59      10      1164 1451     50
      4      60      10      1164 1451     51
      4      61      10      1164 1451     52
      4      62      10      1164 1451     53
      4      91      10      1164 1451     54
      5      16      9      1164 1451     55
      5      17      7      1164 1451     56
      5      22      7      1164 1451     57
      5      91      10      1164 1451     58
      1164 1 0      59

```


4.10930+	4	9.21051+	1	0	0	1	1164	0	0	60			
4.10930+	4	1.00000+	0	0	0	2	01164	2151		61			
1.00000-	5	7.50000+	3	1	1	0	01164	2151		62			
4.50000+	0	7.02400-	1	0	0	2	01164	2151		63			
9.21051+	1	0.00000+	0	0	0	570	951164	2151		64			
1.05800+	2	4.50000+	0	1.45450-	1	4.50000-	4	1.45000-	1	0.00000+	01164	2151	65
1.19200+	2	4.50000+	0	1.49000-	1	4.00000-	3	1.45000-	1	0.00000+	01164	2151	66
1.93800+	2	4.50000+	0	1.86000-	1	3.60000-	2	1.50000-	1	0.00000+	01164	2151	67
3.35500+	2	4.50000+	0	1.95600-	1	1.56000-	2	1.80000-	1	0.00000+	01164	2151	68
3.78400+	2	4.50000+	0	3.00000-	1	1.05000-	1	1.95000-	1	0.00000+	01164	2151	69
4.60300+	2	4.50000+	0	1.87700-	1	7.70000-	3	1.80000-	1	0.00000+	01164	2151	70
6.04400+	2	4.50000+	0	1.74650-	1	3.40000-	3	1.71250-	1	0.00000+	01164	2151	71
6.40800+	2	4.50000+	0	1.76550-	1	5.30000-	3	1.71250-	1	0.00000+	01164	2151	72
7.41400+	2	4.50000+	0	3.65250-	1	1.94000-	1	1.71250-	1	0.00000+	01164	2151	73
9.12300+	2	4.50000+	0	1.74750-	1	3.50000-	3	1.71250-	1	0.00000+	01164	2151	74
9.34700+	2	4.50000+	0	6.60000-	1	4.30000-	1	2.30000-	1	0.00000+	01164	2151	75
1.00900+	3	4.50000+	0	6.91250-	1	5.20000-	1	1.71250-	1	0.00000+	01164	2151	76
1.10770+	3	4.50000+	0	2.13300-	1	9.30000-	3	2.04000-	1	0.00000+	01164	2151	77
1.12720+	3	4.50000+	0	2.19000-	1	1.50000-	2	2.04000-	1	0.00000+	01164	2151	78
1.14770+	3	4.50000+	0	3.27000-	1	1.82000-	1	1.45000-	1	0.00000+	01164	2151	79
1.17530+	3	4.50000+	0	4.44250-	1	2.73000-	1	1.71250-	1	0.00000+	01164	2151	80
1.19390+	3	4.50000+	0	2.16250-	1	4.50000-	2	1.71250-	1	0.00000+	01164	2151	81
1.22890+	3	4.50000+	0	2.13250-	1	4.20000-	2	1.71250-	1	0.00000+	01164	2151	82
1.39310+	3	4.50000+	0	3.52250-	1	1.81000-	1	1.71250-	1	0.00000+	01164	2151	83
1.45200+	3	4.50000+	0	1.02925+	0	8.58000-	1	1.71250-	1	0.00000+	01164	2151	84
1.52930+	3	4.50000+	0	2.17900-	1	1.39000-	2	2.04000-	1	0.00000+	01164	2151	85
1.53990+	3	4.50000+	0	2.31000-	1	2.70000-	2	2.04000-	1	0.00000+	01164	2151	86
1.57620+	3	4.50000+	0	3.70250-	1	1.99000-	1	1.71250-	1	0.00000+	01164	2151	87
1.65380+	3	4.50000+	0	2.49000-	1	4.50000-	2	2.04000-	1	0.00000+	01164	2151	88
1.81000+	3	4.50000+	0	2.60250-	1	8.90000-	2	1.71250-	1	0.00000+	01164	2151	89
1.83200+	3	4.50000+	0	8.86250-	1	7.15000-	1	1.71250-	1	0.00000+	01164	2151	90
1.99000+	3	4.50000+	0	2.25000-	1	2.10000-	2	2.04000-	1	0.00000+	01164	2151	91
2.02100+	3												

3.83900+	3	4.50000+	0	3.34000-	1	1.30000-	1	2.04000-	1	0.00000+	01164	2151	120
3.92500+	3	4.50000+	0	3.04000-	1	1.00000-	1	2.04000-	1	0.00000+	01164	2151	121
3.94000+	3	4.50000+	0	2.84000-	1	8.00000-	2	2.04000-	1	0.00000+	01164	2151	122
3.97400+	3	4.50000+	0	7.84000-	1	5.80000-	1	2.04000-	1	0.00000+	01164	2151	123
4.03600+	3	4.50000+	0	2.74000-	1	7.00000-	2	2.04000-	1	0.00000+	01164	2151	124
4.06600+	3	4.50000+	0	1.06125+	0	8.90000-	1	1.71250-	1	0.00000+	01164	2151	125
4.55300+	3	4.50000+	0	5.14390-	1	3.10390-	1	2.04000-	1	0.00000+	01164	2151	126
4.59500+	3	4.50000+	0	2.37315+	0	2.16915+	0	2.04000-	1	0.00000+	01164	2151	127
4.80700+	3	4.50000+	0	2.78880-	1	7.48800-	2	2.04000-	1	0.00000+	01164	2151	128
4.82500+	3	4.50000+	0	2.79019-	1	7.50190-	2	2.04000-	1	0.00000+	01164	2151	129
5.04300+	3	4.50000+	0	3.74434-	1	1.70434-	1	2.04000-	1	0.00000+	01164	2151	130
5.06300+	3	4.50000+	0	3.17848-	1	1.13848-	1	2.04000-	1	0.00000+	01164	2151	131
5.15000+	3	4.50000+	0	3.50514+	0	3.30114+	0	2.04000-	1	0.00000+	01164	2151	132
5.46500+	3	4.50000+	0	3.14890-	1	1.10890-	1	2.04000-	1	0.00000+	01164	2151	133
5.50900+	3	4.50000+	0	2.78223-	1	7.42230-	2	2.04000-	1	0.00000+	01164	2151	134
5.54300+	3	4.50000+	0	4.86910-	1	2.82910-	1	2.04000-	1	0.00000+	01164	2151	135
5.57100+	3	4.50000+	0	7.26473-	1	5.22473-	1	2.04000-	1	0.00000+	01164	2151	136
5.65200+	3	4.50000+	0	5.04720-	1	3.00720-	1	2.04000-	1	0.00000+	01164	2151	137
5.68700+	3	4.50000+	0	2.01389+	0	1.80989+	0	2.04000-	1	0.00000+	01164	2151	138
5.78800+	3	4.50000+	0	5.53960+	1	3.49960+	1	2.04000-	1	0.00000+	01164	2151	139
5.85500+	3	4.50000+	0	9.69180-	1	7.65180-	1	2.04000-	1	0.00000+	01164	2151	140
5.89800+	3	4.50000+	0	1.12558+	0	9.21576-	1	2.04000-	1	0.00000+	01164	2151	141
5.99900+	3	4.50000+	0	3.61193+	0	3.40793+	0	2.04000-	1	0.00000+	01164	2151	142
6.04400+	3	4.50000+	0	8.25940-	1	6.21940-	1	2.04000-	1	0.00000+	01164	2151	143
6.10800+	3	4.50000+	0	9.85540-	1	7.81540-	1	2.04000-	1	0.00000+	01164	2151	144
6.16800+	3	4.50000+	0	2.25990-	1	2.19900-	2	2.04000-	1	0.00000+	01164	2151	145
6.20800+	3	4.50000+	0	3.30066-	1	1.26066-	1	2.04000-	1	0.00000+	01164	2151	146
6.22100+	3	4.50000+	0	3.45971-	1	1.41971-	1	2.04000-	1	0.00000+	01164	2151	147
6.40600+	3	4.50000+	0	2.60511+	0	2.40111+	0	2.04000-	1	0.00000+	01164	2151	148
6.49800+	3	4.50000+	0	3.08793-	1	1.04793-	1	2.04000-	1	0.00000+	01164	2151	149
6.53500+	3	4.50000+	0	1.09323+	0	8.89230-	1	2.04000-	1	0.00000+	01164	2151	150
6.56500+	3	4.50000+	0	4.47080-	1	2.43080-	1	2.04000-	1	0.00000+	01164	2151	151
6.63000+	3	4.50000+	0	1.18110+	0	9.77100-	1	2.04000-	1	0.00000+	01164	2151	152
6.71100+	3	4.50000+	0	4.49763-	1	2.45763-	1	2.04000-	1	0.00000+	01164	2151	153
6.73400+	3	4.50000+	0	4.33770-	1	2.29770-	1	2.04000-	1	0.00000+	01164	2151	154
6.79500+	3	4.50000+	0	9.45890-	1	7.41890-	1	2.04000-	1	0.00000+	01164	2151	155
6.90400+	3	4.50000+	0	7.85630-	1	5.81630-	1	2.04000-	1	0.00000+	01164	2151	156
6.92700+	3	4.50000+	0	4.53687-	1	2.49687-	1	2.04000-	1	0.00000+	01164	2151	157
7.03900+	3	4.50000+	0	8.75190-	1	6.71190-	1	2.04000-	1	0.00000+	01164	2151	158
7.23700+	3	4.50000+	0	2.24570+	0	2.04170+	0	2.04000-	1	0.00000+	01164	2151	159
7.32200+	3	4.50000+	0	3.92250-	1	1.68250-	1	2.04000-	1	0.00000+	01164	2151	160
9.21051+	1	0.00000+	0		1		0	738		1231164	2151	161	
3.58000+	1	4.50000+	0	2.10110-	1	1.10000-	4	2.10000-	1	0.00000+	01164	2151	162
4.23000+	1	4.50000+	0	2.00088-	1	8.80000-	5	2.00000-	1	0.00000+	01164	2151	163
9.43000+	1	4.50000+	0	2.05350-	1	3.50000-	4	2.05000-	1	0.00000+	01164	2151	164
1.84300+	2	4.50000+	0	2.50200-	1	2.00000-	4	2.50000-	1	0.00000+	01164	2151	165
2.43700+	2	4.50000+	0	2.52200-	1	2.20000-	3	2.50000-	1	0.00000+	01164	2151	166
3.19000+	2	4.50000+	0	2.22000-	1	2.00000-	3	2.20000-	1	0.00000+	01164	2151	167
3.62600+	2	4.50000+	0	2.04270-	1	2.70000-	4	2.04000-	1	0.00000+	01164	2151	168
3.65000+	2	4.50000+	0	2.04500-	1	5.00000-	4	2.04000-	1	0.00000+	01164	2151	169
3.92500+	2	4.50000+	0	2.02600-	1	2.60000-	3	2.00000-	1	0.00000+	01164	2151	170
5.00600+	2	4.50000+	0	2.30100-	1	5.10000-	3	2.25000-	1	0.00000+	01164	2151	171
5.99300+	2	4.50000+	0	2.05200-	1	1.20000-	3	2.04000-	1	0.00000+	01164	2151	172
6.17700+	2	4.50000+	0	2.05400-	1	1.40000-	3	2.04000-	1	0.00000+	01164	2151	173
6.72000+	2	4.50000+	0	2.28800-	1	8.80000-	3	2.20000-	1	0.00000+	01164	2151	174
6.78200+	2	4.50000+	0	2.22200-	1	2.20000-	3	2.20000-	1	0.00000+	01164	2151	175
7.21300+	2	4.50000+	0	2.34700-	1	1.47000-	2	2.20000-	1	0.00000+	01164	2151	176
7.57300+	2	4.50000+	0	2.22000-	1	2.00000-	3	2.20000-	1	0.00000+	01164	2151	177
9.52700+	2	4.50000+	0	2.33300-	1	1.33000-	2	2.20000-	1	0.00000+	01164	2151	178
1.01640+	3	4.50000+	0	2.29200-	1	9.20000-	3	2.20000-	1	0.00000+	01164	2151	179

1,23300+	3	4.50000+	0	2.07511-	1	3.51140-	3	2.04000-	1	0.00000+	01164	2151	180
1,24300+	3	4.50000+	0	2.34200-	1	1.42000-	2	2.20000-	1	0.00000+	01164	2151	181
1,28360+	3	4.50000+	0	2.31000-	1	1.10000-	2	2.20000-	1	0.00000+	01164	2151	182
1,35040+	3	4.50000+	0	2.52800-	1	3.28000-	2	2.20000-	1	0.00000+	01164	2151	183
1,35390+	3	4.50000+	0	2.31000-	1	1.10000-	2	2.20000-	1	0.00000+	01164	2151	184
1,46680+	3	4.50000+	0	2.58000-	1	3.80000-	2	2.20000-	1	0.00000+	01164	2151	185
1,55600+	3	4.50000+	0	2.19000-	1	1.50000-	2	2.04000-	1	0.00000+	01164	2151	186
1,61600+	3	4.50000+	0	2.50000-	1	3.00000-	2	2.20000-	1	0.00000+	01164	2151	187
1,67850+	3	4.50000+	0	2.24600-	1	4.60000-	3	2.20000-	1	0.00000+	01164	2151	188
1,71200+	3	4.50000+	0	2.73600-	1	5.30000-	2	2.20000-	1	0.00000+	01164	2151	189
1,76700+	3	4.50000+	0	2.20000-	1	1.60000-	2	2.04000-	1	0.00000+	01164	2151	190
1,85700+	3	4.50000+	0	2.06586-	1	2.58600-	3	2.04000-	1	0.00000+	01164	2151	191
1,94600+	3	4.50000+	0	2.25400-	1	5.40000-	3	2.20000-	1	0.00000+	01164	2151	192
1,98100+	3	4.50000+	0	2.12000-	1	8.00000-	3	2.04000-	1	0.00000+	01164	2151	193
2,09900+	3	4.50000+	0	2.05633-	1	1.83300-	3	2.04000-	1	0.00000+	01164	2151	194
2,11700+	3	4.50000+	0	2.61000-	1	4.10000-	2	2.20000-	1	0.00000+	01164	2151	195
2,18640+	3	4.50000+	0	2.42000-	1	2.20000-	2	2.20000-	1	0.00000+	01164	2151	196
2,23700+	3	4.50000+	0	2.04060-	1	6.00000-	5	2.04000-	1	0.00000+	01164	2151	197
2,31000+	3	4.50000+	0	2.06900-	1	2.90000-	3	2.04000-	1	0.00000+	01164	2151	198
2,36100+	3	4.50000+	0	2.43000-	1	3.90000-	2	2.04000-	1	0.00000+	01164	2151	199
2,39200+	3	4.50000+	0	2.09900-	1	5.90000-	3	2.04000-	1	0.00000+	01164	2151	200
2,50900+	3	4.50000+	0	2.38000-	1	3.40000-	2	2.04000-	1	0.00000+	01164	2151	201
2,54500+	3	4.50000+	0	2.54000-	1	5.00000-	2	2.04000-	1	0.00000+	01164	2151	202
2,57600+	3	4.50000+	0	2.39000-	1	3.50000-	2	2.04000-	1	0.00000+	01164	2151	203
2,66100+	3	4.50000+	0	2.72000-	1	5.20000-	2	2.20000-	1	0.00000+	01164	2151	204
2,69600+	3	4.50000+	0	2.19577-	1	1.55770-	2	2.04000-	1	0.00000+	01164	2151	205
2,83200+	3	4.50000+	0	2.22000-	1	1.80000-	2	2.04000-	1	0.00000+	01164	2151	206
2,85400+	3	4.50000+	0	2.28000-	1	2.40000-	2	2.04000-	1	0.00000+	01164	2151	207
2,88400+	3	4.50000+	0	2.14000-	1	1.00000-	2	2.04000-	1	0.00000+	01164	2151	208
2,96750+	3	4.50000+	0	2.10537-	1	6.53700-	3	2.04000-	1	0.00000+	01164	2151	209
2,98400+	3	4.50000+	0	2.17000-	1	1.30000-	2	2.04000-	1	0.00000+	01164	2151	210
3,02000+	3	4.50000+	0	2.10595-	1	6.59500-	3	2.04000-	1	0.00000+	01164	2151	211
3,07500+	3	4.50000+	0	2.08436-	1	4.43600-	3	2.04000-	1	0.00000+	01164	2151	212
3,18700+	3	4.50000+	0	2.07387-	1	3.38700-	3	2.04000-	1	0.00000+	01164	2151	213
3,25400+	3	4.50000+	0	2.25000-	1	2.10000-	2	2.04000-	1	0.00000+	01164	2151	214
3,28100+	3	4.50000+	0	2.26000-	1	2.20000-	2	2.04000-	1	0.00000+	01164	2151	215
3,30500+	3	4.50000+	0	2.09749-	1	5.74900-	3	2.04000-	1	0.00000+	01164	2151	216
3,40600+	3	4.50000+	0	2.14000-	1	1.00000-	2	2.04000-	1	0.00000+	01164	2151	217
3,42500+	3	4.50000+	0	2.12000-	1	8.00000-	3	2.04000-	1	0.00000+	01164	2151	218
3,44200+	3	4.50000+	0	2.08694-	1	4.69400-	3	2.04000-	1	0.00000+	01164	2151	219
3,45900+	3	4.50000+	0	2.08705-	1	4.70500-	3	2.04000-	1	0.00000+	01164	2151	220
3,50000+	3	4.50000+	0	2.07550-	1	3.55000-	3	2.04000-	1	0.00000+	01164	2151	221
3,56400+	3	4.50000+	0	2.09970-	1	5.97000-	3	2.04000-	1	0.00000+	01164	2151	222
3,57500+	3	4.50000+	0	2.09979-	1	5.97900-	3	2.04000-	1	0.00000+	01164	2151	223
3,62800+	3	4.50000+	0	2.11228-	1	7.22800-	3	2.04000-	1	0.00000+	01164	2151	224
3,65000+	3	4.50000+	0	2.07625-	1	3.62500-	3	2.04000-	1	0.00000+	01164	2151	225
3,71600+	3	4.50000+	0	2.10096-	1	6.09600-	3	2.04000-	1	0.00000+	01164	2151	226
3,73200+	3	4.50000+	0	2.10109-	1	6.10900-	3	2.04000-	1	0.00000+	01164	2151	227
3,91800+	3	4.50000+	0	2.16519-	1	1.25190-	2	2.04000-	1	0.00000+	01164	2151	228
3,95800+	3	4.50000+	0	2.06517-	1	2.51700-	3	2.04000-	1	0.00000+	01164	2151	229
3,98500+	3	4.50000+	0	2.24000-	1	2.00000-	2	2.04000-	1	0.00000+	01164	2151	230
4,00000+	3	4.50000+	0	2.29298-	1	2.52980-	2	2.04000-	1	0.00000+	01164	2151	231
4,02100+	3	4.50000+	0	2.64000-	1	6.00000-	2	2.04000-	1	0.00000+	01164	2151	232
4,12000+	3	4.50000+	0	2.20669-	1	1.66660-	2	2.04000-	1	0.00000+	01164	2151	233
4,13800+	3	4.50000+	0	2.29731-	1	2.57310-	2	2.04000-	1	0.00000+	01164	2151	234
4,19000+	3	4.50000+	0	2.10473-	1	6.47300-	3	2.04000-	1	0.00000+	01164	2151	235
4,22800+	3	4.50000+	0	2.17005-	1	1.30050-	2	2.04000-	1	0.00000+	01164	2151	236
4,25200+	3	4.50000+	0	2.17041-	1	1.30410-	2	2.04000-	1	0.00000+	01164	2151	237
4,29100+	3	4.50000+	0	2.43304-	1	3.93040-	2	2.04000-	1	0.00000+	01164	2151	238
4,32000+	3	4.50000+	0	2.14516-	1	1.05160-	2	2.04000-	1	0.00000+	01164	2151	239

4.34600+	3	4.50000+	0	2.30370-	1	2.63700-	2	2.04000-	1	0.00000+	01164	2151	240
4.36500+	3	4.50000+	0	2.10603-	1	6.60300-	3	2.04000-	1	0.00000+	01164	2151	241
4.38000+	3	4.50000+	0	2.10607-	1	6.60700-	3	2.04000-	1	0.00000+	01164	2151	242
4.40100+	3	4.50000+	0	2.17268-	1	1.32680-	2	2.04000-	1	0.00000+	01164	2151	243
4.44900+	3	4.50000+	0	2.24010-	1	2.00100-	2	2.04000-	1	0.00000+	01164	2151	244
4.48000+	3	4.50000+	0	2.06677-	1	2.67700-	3	2.04000-	1	0.00000+	01164	2151	245
4.53900+	3	4.50000+	0	2.17474-	1	1.34740-	2	2.04000-	1	0.00000+	01164	2151	246
4.60600+	3	4.50000+	0	2.17574-	1	1.35740-	2	2.04000-	1	0.00000+	01164	2151	247
4.64700+	3	4.50000+	0	2.17634-	1	1.36340-	2	2.04000-	1	0.00000+	01164	2151	248
4.72600+	3	4.50000+	0	2.17752-	1	1.35720-	2	2.04000-	1	0.00000+	01164	2151	249
4.74000+	3	4.50000+	0	2.24654-	1	2.06540-	2	2.04000-	1	0.00000+	01164	2151	250
4.78000+	3	4.50000+	0	2.10914-	1	6.91400-	3	2.04000-	1	0.00000+	01164	2151	251
4.84000+	3	4.50000+	0	2.10957-	1	6.95700-	3	2.04000-	1	0.00000+	01164	2151	252
4.86800+	3	4.50000+	0	2.10977-	1	6.97700-	3	2.04000-	1	0.00000+	01164	2151	253
4.88500+	3	4.50000+	0	2.08194-	1	4.19400-	3	2.04000-	1	0.00000+	01164	2151	254
4.91000+	3	4.50000+	0	2.11007-	1	7.00700-	3	2.04000-	1	0.00000+	01164	2151	255
4.93200+	3	4.50000+	0	2.25068-	1	2.10680-	2	2.04000-	1	0.00000+	01164	2151	256
4.95500+	3	4.50000+	0	2.11039-	1	7.03900-	3	2.04000-	1	0.00000+	01164	2151	257
5.08500+	3	4.50000+	0	2.25393-	1	2.13930-	2	2.04000-	1	0.00000+	01164	2151	258
5.10500+	3	4.50000+	0	2.18290-	1	1.42900-	2	2.04000-	1	0.00000+	01164	2151	259
5.16500+	3	4.50000+	0	2.32747-	1	2.67470-	2	2.04000-	1	0.00000+	01164	2151	260
5.17600+	3	4.50000+	0	2.18392-	1	1.43920-	2	2.04000-	1	0.00000+	01164	2151	261
5.22900+	3	4.50000+	0	2.32925-	1	2.89250-	2	2.04000-	1	0.00000+	01164	2151	262
5.26500+	3	4.50000+	0	2.11256-	1	7.25600-	3	2.04000-	1	0.00000+	01164	2151	263
5.29200+	3	4.50000+	0	3.05844-	1	1.01844-	1	2.04000-	1	0.00000+	01164	2151	264
5.33500+	3	4.50000+	0	2.18608-	1	1.46080-	2	2.04000-	1	0.00000+	01164	2151	265
5.38700+	3	4.50000+	0	2.18679-	1	1.46790-	2	2.04000-	1	0.00000+	01164	2151	266
5.48000+	3	4.50000+	0	2.18805-	1	1.48050-	2	2.04000-	1	0.00000+	01164	2151	267
5.60000+	3	4.50000+	0	2.18967-	1	1.49670-	2	2.04000-	1	0.00000+	01164	2151	268
5.71600+	3	4.50000+	0	2.19121-	1	1.51210-	2	2.04000-	1	0.00000+	01164	2151	269
5.73500+	3	4.50000+	0	2.34292-	1	3.02920-	2	2.04000-	1	0.00000+	01164	2151	270
5.83000+	3	4.50000+	0	2.80354-	1	7.63540-	2	2.04000-	1	0.00000+	01164	2151	271
5.87400+	3	4.50000+	0	2.22394-	1	1.83940-	2	2.04000-	1	0.00000+	01164	2151	272
5.93600+	3	4.50000+	0	2.11705-	1	7.70500-	3	2.04000-	1	0.00000+	01164	2151	273
6.06900+	3	4.50000+	0	2.50742-	1	4.67420-	2	2.04000-	1	0.00000+	01164	2151	274
6.14500+	3	4.50000+	0	2.19678-	1	1.56780-	2	2.04000-	1	0.00000+	01164	2151	275
6.27500+	3	4.50000+	0	2.59451-	1	5.54510-	2	2.04000-	1	0.00000+	01164	2151	276
6.35000+	3	4.50000+	0	2.27906-	1	2.39060-	2	2.04000-	1	0.00000+	01164	2151	277
6.44500+	3	4.50000+	0	2.52169-	1	4.81690-	2	2.04000-	1	0.00000+	01164	2151	278
6.78000+	3	4.50000+	0	2.76107-	1	7.41070-	2	2.04000-	1	0.00000+	01164	2151	279
6.84100+	3	4.50000+	0	2.53626-	1	4.96260-	2	2.04000-	1	0.00000+	01164	2151	280
6.86000+	3	4.50000+	0	2.20565-	1	1.65650-	2	2.04000-	1	0.00000+	01164	2151	281
6.88000+	3	4.50000+	0	2.37178-	1	3.31780-	2	2.04000-	1	0.00000+	01164	2151	282
7.07100+	3	4.50000+	0	2.46045-	1	4.20450-	2	2.04000-	1	0.00000+	01164	2151	283
7.12900+	3	4.50000+	0	2.63103-	1	5.91030-	2	2.04000-	1	0.00000+	01164	2151	284
7.50000+	3	1.00000+	5		2		1		0		01164	2151	285
4.50000+	0	7.02400-	1		0		0		3		01164	2151	286
9.21051+	1	0.00000+	0		0		0		12		01164	2151	287
1.55100+	2	4.00000+	0	1.00000+	0	1.93400-	3	2.00000-	1	0.00000+	01164	2151	288
1.26900+	2	5.00000+	0	1.00000+	0	2.36400-	3	2.00000-	1	0.00000+	01164	2151	289
9.21051+	1	0.00000+	0		1		0		24		01164	2151	290
3.49600+	2	3.00000+	0	1.00000+	0	1.14400-	2	2.40000-	1	0.00000+	01164	2151	291
2.71900+	2	4.00000+	0	2.00000+	0	1.47100-	2	2.40000-	1	0.00000+	01164	2151	292
2.22500+	2	5.00000+	0	2.00000+	0	1.79300-	2	2.40000-	1	0.00000+	01164	2151	293
1.88300+	2	6.00000+	0	1.00000+	0	2.12400-	2	2.40000-	1	0.00000+	01164	2151	294
9.21051+	1	0.00000+	0		2		0		36		01164	2151	295
4.89500+	2	2.00000+	0	1.00000+	0	1.43000-	3	2.20000-	1	0.00000+	01164	2151	296
3.49600+	2	3.00000+	0	2.00000+	0	2.00200-	3	2.20000-	1	0.00000+	01164	2151	297
2.71900+	2	4.00000+	0	2.00000+	0	2.57400-	3	2.20000-	1	0.00000+	01164	2151	298
2.22500+	2	5.00000+	0	2.00000+	0	3.14600-	3	2.20000-	1	0.00000+	01164	2151	299

1.88300+	2	6.00000+	0	2.00000+	0	3.71700-	3	2.20000-	1	0.00000+	01164	2151	300
1.63200+	2	7.00000+	0	1.00000+	0	4.28900-	3	2.20000-	1	0.00000+	01164	2151	301
											1164	2	0
											1164	0	0
4.10930+	4	9.21051+	1		0		99		0		01164	3	1
0.00000+	0	0.00000+	0		0		0		2		1421164	3	1
	7		5		142		2				1164	3	1
.10000E-04		.53025E	02	.10000E-02		.53025E	01	.10000E-01		.16768E	011164	3	1
.25300E-01		.10542E	01	.10000E	00	.53025E	00	.10000E	01	.16768E	001164	3	1
.96000E	03	.54120E-02		.96000E	03	.10000E	00	.12000E	04	.10800E	001164	3	1
.15000E	04	.12100E	00	.20000E	04	.13800E	00	.25000E	04	.15200E	001164	3	1
.30000E	04	.16500E	00	.40000E	04	.18800E	00	.50000E	04	.20800E	001164	3	1
.60000E	04	.22800E	00	.70000E	04	.24200E	00	.75000E	04	.24900E	001164	3	1
.75000E	04	.12900E	00	.80000E	04	.12500E	00	.90000E	04	.11500E	001164	3	1
.10000E	05	.10500E	00	.12000E	05	.92000E-01		.14000E	05	.84000E-01	011164	3	1
.16000E	05	.79000E-01		.18000E	05	.65000E-01		.20000E	05	.58000E-01	011164	3	1
.25000E	05	.43000E-01		.28000E	05	.35000E-01		.30000E	05	.30000E-01	011164	3	1
.35000E	05	.23100E-01		.40000E	05	.14200E-01		.50000E	05	.84000E-02	01164	3	1
.60000E	05	.11600E-01		.70000E	05	.24700E-01		.80000E	05	.31800E-01	01164	3	1
.90000E	05	.35000E-01		.95000E	05	.35100E-01		.10000E	06	.35200E-01	01164	3	1
.10000E	06	.93300E	01	.12000E	06	.93260E	01	.13000E	06	.93390E	011164	3	1
.14000E	06	.93520E	01	.16000E	06	.93780E	01	.18000E	06	.94040E	011164	3	1
.20000E	06	.94300E	01	.25000E	06	.93950E	01	.30000E	06	.93600E	011164	3	1
.35000E	06	.91550E	01	.40000E	06	.89500E	01	.45000E	06	.86500E	011164	3	1
.50000E	06	.83500E	01	.60000E	06	.79200E	01	.70000E	06	.75000E	011164	3	1
.74790E	06	.73323E	01	.75000E	06	.73250E	01	.80000E	06	.71500E	011164	3	1
.81670E	06	.70845E	01	.85000E	06	.69750E	01	.90000E	06	.68000E	011164	3	1
.96930E	06	.65921E	01	.10000E	07	.65000E	01	.10810E	07	.62651E	011164	3	1
.11000E	07	.62100E	01	.12000E	07	.60000E	01	.13000E	07	.58000E	011164	3	1
.13240E	07	.57275E	01	.14000E	07	.55500E	01	.15000E	07	.53500E	011164	3	1
.15040E	07	.53440E	01	.16000E	07	.52000E	01	.16920E	07	.50696E	011164	3	1
.17000E	07	.50800E	01	.18000E	07	.50000E	01	.19000E	07	.49000E	011164	3	1
.19470E	07	.46765E	01	.19688E	07	.48666E	01	.19680E	07	.48660E	011164	3	1
.20000E	07	.48500E	01	.21000E	07	.47700E	01	.21590E	07	.47287E	011164	3	1
.21820E	07	.47126E	01	.22000E	07	.47000E	01	.22500E	07	.46625E	011164	3	1
.23000E	07	.46250E	01	.23350E	07	.45987E	01	.23600E	07	.45800E	011164	3	1
.24000E	07	.45500E	01	.25000E	07	.44550E	01	.25490E	07	.44084E	011164	3	1
.26000E	07	.43600E	01	.27000E	07	.42650E	01	.27500E	07	.42175E	011164	3	1
.28000E	07	.41700E	01	.29000E	07	.41000E	01	.30000E	07	.40500E	011164	3	1
.30500E	07	.40150E	01	.31000E	07	.39800E	01	.32000E	07	.39200E	011164	3	1
.32500E	07	.39050E	01	.33000E	07	.38900E	01	.34000E	07	.36500E	011164	3	1
.35000E	07	.37900E	01	.36000E	07	.37200E	01	.37500E	07	.37050E	011164	3	1
.38000E	07	.37000E	01	.40000E	07	.37000E	01	.42000E	07	.37100E	011164	3	1
.44000E	07	.37300E	01	.45000E	07	.37450E	01	.46000E	07	.37600E	011164	3	1
.48000E	07	.37700E	01	.50000E	07	.37800E	01	.55000E	07	.38200E	011164	3	1
.60000E	07	.39100E	01	.65000E	07	.40200E	01	.70000E	07	.41200E	011164	3	1
.75000E	07	.42100E	01	.80000E	07	.42500E	01	.85000E	07	.42750E	011164	3	1
.89000E	07	.42950E	01	.89200E	07	.42960E	01	.90000E	07	.43000E	011164	3	1
.95000E	07	.42900E	01	.10000E	08	.42800E	01	.10500E	08	.42550E	011164	3	1
.11000E	08	.42300E	01	.11500E	08	.41950E	01	.12000E	08	.41600E	011164	3	1
.12500E	08	.41200E	01	.13000E	08	.40800E	01	.13500E	08	.40300E	011164	3	1
.14000E	08	.39500E	01	.14500E	08	.39350E	01	.15000E	08	.38900E	011164	3	1
.15000E	08	.38140E	01	.16896E	08	.37459E	01	.17000E	08	.37380E	011164	3	1
.17500E	08	.37000E	01	.18000E	08	.36684E	01	.19000E	08	.36052E	011164	3	1
.20000E	08	.35420E	01	.00000E	00	.00000E	00	.00000E	00	.00000E	001164	3	1
											1164	3	0
4.10930+	4	9.21051+	1		0		99		0		01164	3	2
0.00000+	0	0.00000+	0		0		0		1		1061164	3	2
	106		2								1164	3	2
.10000E-04		.00000E	00	.75000E	04	.00000E	00	.10000E	06	.00000E	001164	3	2

.10000E	06	.91871E	01	.12000E	06	.92243E	01	.13000E	06	.92393E	011164	3	2	360
.14000E	06	.92553E	01	.16000E	06	.92853E	01	.18000E	06	.93135E	011164	3	2	361
.20000E	06	.93417E	01	.25000E	06	.93106E	01	.30000E	06	.92795E	011164	3	2	362
.35000E	06	.90754E	01	.40000E	06	.88713E	01	.45000E	06	.85685E	011164	3	2	363
.50000E	06	.82661E	01	.60000E	06	.78239E	01	.70000E	06	.74057E	011164	3	2	364
.74790E	06	.72365E	01	.75000E	06	.72090E	01	.80000E	06	.69524E	011164	3	2	365
.81870E	06	.68599E	01	.65000E	06	.66550E	01	.90000E	06	.63576E	011164	3	2	366
.96930E	06	.60584E	01	.10000E	07	.58258E	01	.10810E	07	.53458E	011164	3	2	367
.11000E	07	.52251E	01	.12000E	07	.47098E	01	.13000E	07	.43688E	011164	3	2	368
.13290E	07	.42718E	01	.14000E	07	.39738E	01	.15000E	07	.36418E	011164	3	2	369
.15040E	07	.36299E	01	.16000E	07	.33487E	01	.16920E	07	.32102E	011164	3	2	370
.17000E	07	.31586E	01	.18000E	07	.29235E	01	.19000E	07	.27884E	011164	3	2	371
.19470E	07	.27824E	01	.19668E	07	.27896E	01	.19680E	07	.27901E	011164	3	2	372
.20000E	07	.26813E	01	.21000E	07	.25490E	01	.21590E	07	.25232E	011164	3	2	373
.21820E	07	.25222E	01	.22000E	07	.24317E	01	.22500E	07	.24076E	011164	3	2	374
.23000E	07	.23575E	01	.23350E	07	.23354E	01	.23600E	07	.23239E	011164	3	2	375
.24000E	07	.22302E	01	.25000E	07	.21809E	01	.25490E	07	.21644E	011164	3	2	376
.26000E	07	.21270E	01	.27000E	07	.20962E	01	.27500E	07	.20748E	011164	3	2	377
.28000E	07	.20474E	01	.29000E	07	.19956E	01	.30000E	07	.19578E	011164	3	2	378
.30000E	07	.19249E	01	.31000E	07	.18930E	01	.32000E	07	.18392E	011164	3	2	379
.32000E	07	.18323E	01	.33000E	07	.18250E	01	.34000E	07	.18005E	011164	3	2	380
.35000E	07	.17559E	01	.36000E	07	.17014E	01	.37500E	07	.17096E	011164	3	2	381
.38000E	07	.17148E	01	.40000E	07	.17554E	01	.42000E	07	.17681E	011164	3	2	382
.44000E	07	.17908E	01	.45000E	07	.18072E	01	.46000E	07	.18353E	011164	3	2	383
.48000E	07	.18715E	01	.50000E	07	.19078E	01	.55000E	07	.20247E	011164	3	2	384
.60000E	07	.21917E	01	.65000E	07	.23121E	01	.70000E	07	.24271E	011164	3	2	385
.75000E	07	.25441E	01	.80000E	07	.26098E	01	.85000E	07	.26627E	011164	3	2	386
.89000E	07	.27062E	01	.89200E	07	.27084E	01	.90000E	07	.26971E	011164	3	2	387
.95000E	07	.27222E	01	.10000E	08	.26974E	01	.10500E	08	.26824E	011164	3	2	388
.11000E	08	.26374E	01	.11500E	08	.25934E	01	.12000E	08	.26093E	011164	3	2	389
.12500E	08	.25130E	01	.13000E	08	.24370E	01	.13500E	08	.23586E	011164	3	2	390
.14000E	08	.22965E	01	.14500E	08	.22595E	01	.15000E	08	.22274E	011164	3	2	391
.16000E	08	.21371E	01	.16376E	08	.21189E	01	.17000E	08	.20927E	011164	3	2	392
.17500E	08	.20421E	01	.18000E	08	.19976E	01	.19000E	08	.19648E	011164	3	2	393
.20000E	08	.19669E	01	.00000E	00	.00000E	00	.00000E	00	.00000E	001164	3	2	394
											1164	3	0	395
4.10930+	4	9.21051+	1		0		99		0		01164	3	4	396
0.00000+	0	2.90000+	4		0		0		1		771164	3	4	397
	77		2								1164	3	4	398
.29310E	05	.00000E	00	.35000E	05	.10000E-03		.40000E	05	.20000E-03	1164	3	4	399
.50000E	05	.40000E-03		.60000E	05	.60000E-03		.70000E	05	.70000E-03	1164	3	4	400
.80000E	05	.80000E-03		.90000E	05	.10000E-02		.10000E	06	.29000E-02	1164	3	4	401
.13000E	06	.55200E-02		.16000E	06	.85400E-02		.20000E	06	.12100E-01	1164	3	4	402
.40000E	06	.20500E-01		.60000E	06	.39900E-01		.74790E	06	.49140E-01	1164	3	4	403
.75000E	06	.69270E-01		.80000E	06	.15240E	00	.81870E	06	.18000E	001164	3	4	404
.85000E	06	.27630E	00	.90000E	06	.40020E	00	.96930E	06	.49570E	001164	3	4	405
.10000E	07	.63800E	00	.10810E	07	.68800E	00	.11000E	07	.95470E	001164	3	4	406
.12000E	07	.12650E	01	.13000E	07	.14100E	01	.13290E	07	.14360E	011164	3	4	407
.14000E	07	.15600E	01	.15000E	07	.16940E	01	.15040E	07	.17000E	011164	3	4	408
.16000E	07	.18380E	01	.16920E	07	.18670E	01	.17000E	07	.19090E	011164	3	4	409
.18000E	07	.20450E	01	.19000E	07	.21010E	01	.19470E	07	.20840E	011164	3	4	410
.19680E	07	.20560E	01	.20300E	07	.21590E	01	.21000E	07	.22120E	011164	3	4	411
.21590E	07	.21970E	01	.21820E	07	.21820E	01	.22000E	07	.22600E	011164	3	4	412
.22500E	07	.22470E	01	.23000E	07	.22650E	01	.23350E	07	.22560E	011164	3	4	413
.23600E	07	.22490E	01	.24000E	07	.23130E	01	.25000E	07	.22680E	011164	3	4	414
.25490E	07	.22390E	01	.26000E	07	.22270E	01	.27000E	07	.21630E	011164	3	4	415
.27500E	07	.21370E	01	.28000E	07	.21170E	01	.29000E	07	.20990E	011164	3	4	416
.30000E	07	.20870E	01	.30500E	07	.20850E	01	.32000E	07	.20760E	011164	3	4	417
.32500E	07	.20680E	01	.35000E	07	.20300E	01	.37500E	07	.19910E	011164	3	4	418
.40000E	07	.19400E	01	.45000E	07	.19330E	01	.50000E	07	.18670E	011164	3	4	419

.60000E	07	.17100E	01	.70000E	07	.16800E	01	.60000E	07	.16200E	011164	3	4	420
.90000E	07	.15550E	01	.10000E	08	.12580E	01	.11000E	08	.85100E	001164	3	4	421
.12000E	03	.45500E	00	.13000E	08	.38300E	00	.14000E	08	.41600E	001164	3	4	422
.15000E	03	.43000E	00	.16000E	08	.50000E	00	.17000E	08	.52000E	001164	3	4	423
.18000E	08	.54000E	00	.20000E	08	.56000E	00	.00000E	00	.00000E	001164	3	4	424
											1164	3	0	425
4.10930+	4	9.21051+	1		0		99		0		01164	3	16	426
0.00000+	0	-8.82600+	6		0		0		1		181164	3	16	427
	18		2								1164	3	16	428
.89200E	07	.00000E	00	.90000E	07	.02000E	00	.95000E	07	.13000E	001164	3	16	429
.10000E	03	.29000E	00	.10500E	08	.48000E	00	.11000E	08	.70000E	001164	3	16	430
.11500E	03	.90000E	00	.12000E	08	.10500E	01	.12500E	08	.11400E	011164	3	16	431
.13000E	03	.12100E	01	.13500E	08	.12200E	01	.14000E	08	.12150E	011164	3	16	432
.14500E	08	.12000E	01	.15000E	08	.11800E	01	.16000E	08	.11250E	011164	3	16	433
.17000E	08	.10500E	01	.18000E	08	.98000E	00	.20000E	08	.80000E	001164	3	16	434
											1164	3	0	435
4.10930+	4	9.21051+	1		0		99		0		01164	3	17	436
0.0		+ 0-1.67180+	7		0		0		1		51164	3	17	437
	5		2								1164	3	17	438
.16696E	08	.00000E	00	.17000E	08	.02400E	00	.18000E	08	.10000E	001164	3	17	439
.19000E	08	.15000E	00	.20000E	08	.16500E	00	.00000E	00	.00000E	001164	3	17	440
											1164	3	0	441
4.10930+	4	9.21051+	1		0		99		0		01164	3	22	442
0.0		+ 0-1.94600+	6		0		0		1		91164	3	22	443
	9		2								1164	3	22	444
.19668E	07	.00000E	00	.50000E	07	.10000E-05		.60000E	07	.20000E-03	1164	3	22	445
.80000E	07	.60000E-03		.10000E	08	.12500E-02		.12000E	08	.19000E-02	1164	3	22	446
.14000E	03	.25000E-02		.17500E	08	.28000E-02		.20000E	08	.30000E-02	1164	3	22	447
											1164	3	0	448
4.10930+	4	9.21051+	1		0		1		0		01164	3	51	449
0.00000+	0	-2.90000+	4		0		0		1		271164	3	51	450
	27		2								1164	3	51	451
.29310E	05	.00000E	00	.35000E	05	.10000E-03		.40000E	05	.20000E-03	1164	3	51	452
.50000E	05	.40000E-03		.60000E	05	.60000E-03		.70000E	05	.70000E-03	1164	3	51	453
.80000E	05	.80000E-03		.90000E	05	.10000E-02		.10000E	06	.29000E-02	1164	3	51	454
.13000E	06	.55200E-02		.16000E	06	.85400E-02		.20000E	06	.12100E-01	1164	3	51	455
.40000E	06	.20500E-01		.60000E	06	.39900E-01		.80000E	06	.52400E-01	1164	3	51	456
.10000E	07	.38000E-01		.12000E	07	.35400E-01		.14000E	07	.35000E-01	1164	3	51	457
.15000E	07	.34500E-01		.20000E	07	.27000E-01		.25000E	07	.25000E-01	1164	3	51	458
.30000E	07	.23000E-01		.35000E	07	.22000E-01		.40000E	07	.21000E-01	1164	3	51	459
.45000E	07	.15000E-01		.50000E	07	.10000E-01		.60000E	07	.00000E	006116	3	51	460
											1164	3	0	461
4.10930+	4	9.21051+	1		0		2		0		01164	3	52	462
0.00000+	0	-7.40000+	5		0		0		1		271164	3	52	463
	27		2								1164	3	52	464
.74792E	06	.00000E	00	.75000E	06	.20000E-01		.80000E	06	.10000E	001164	3	52	465
.90000E	06	.25500E	00	.10000E	07	.31000E	00	.11000E	07	.32000E	001164	3	52	466
.12000E	07	.32000E	00	.13000E	07	.30000E	00	.14000E	07	.28000E	001164	3	52	467
.15000E	07	.26000E	00	.16000E	07	.23000E	00	.17000E	07	.20800E	001164	3	52	468
.18000E	07	.13500E	00	.19470E	07	.16030E	00	.20000E	07	.15000E	001164	3	52	469
.21590E	07	.13400E	00	.22500E	07	.12000E	00	.23350E	07	.11000E	001164	3	52	470
.25000E	07	.93000E-01		.27500E	07	.75000E-01		.30500E	07	.60000E-01	1164	3	52	471
.32500E	07	.50000E-01		.35000E	07	.40000E-01		.40000E	07	.22500E-01	1164	3	52	472
.45000E	07	.16300E-01		.50000E	07	.10000E-01		.60000E	07	.00000E	001164	3	52	473
											1164	3	0	474
4.10930+	4	9.21051+	1		0		3		0		01164	3	53	475
0.00000+	0	-8.10000+	5		0		0		1		261164	3	53	476
	26		2								1164	3	53	477
.81867E	06	.00000E	00	.85000E	06	.50000E-01		.90000E	06	.10000E	001164	3	53	478
.10000E	07	.19000E	00	.11000E	07	.25000E	00	.12000E	07	.23000E	001164	3	53	479

.13000E	07	.30000E	00	.14000E	07	.29500E	00	.15000E	07	.27500E	001164	3	53	480
.16000E	07	.26000E	00	.17000E	07	.23000E	00	.18000E	07	.20000E	001164	3	53	481
.19470E	07	.16300E	00	.20000E	07	.15200E	00	.21590E	07	.13200E	001164	3	53	482
.22500E	07	.11500E	00	.23350E	07	.10800E	00	.25000E	07	.95000E	-011164	3	53	483
.27500E	07	.70000E	-01	.30000E	07	.55000E	-01	.32500E	07	.40000E	-011164	3	53	484
.35000E	07	.30000E	-01	.40000E	07	.10000E	-01	.45000E	07	.50000E	-021164	3	53	485
.50000E	07	.30000E	-02	.60000E	07	.00000E	00	.00000E	00	.00000E	001164	3	53	486
											1164	3	0	487
4.10930+	4	9.21051+	1	0	4	0	0	0	0	0	01164	3	54	488
0.00000+	0	-9.59000+	5	0	0	1	1	1	1	1	241164	3	54	489
											1164	3	54	490
.96926E	06	.00000E	00	.10000E	07	.10000E	00	.11000E	07	.34000E	001164	3	54	491
.12000E	07	.50000E	00	.13000E	07	.56000E	00	.14000E	07	.60000E	001164	3	54	492
.15000E	07	.60000E	00	.16000E	07	.59500E	00	.17000E	07	.56000E	001164	3	54	493
.18000E	07	.53000E	00	.19470E	07	.47300E	00	.20000E	07	.45000E	001164	3	54	494
.21590E	07	.38300E	00	.22500E	07	.33800E	00	.23350E	07	.31300E	001164	3	54	495
.25000E	07	.25000E	00	.27500E	07	.20500E	00	.30000E	07	.16000E	001164	3	54	496
.32500E	07	.13200E	00	.35000E	07	.10000E	00	.40000E	07	.60000E	-011164	3	54	497
.45000E	07	.40000E	-01	.50000E	07	.20000E	-01	.60000E	07	.00000E	001164	3	54	498
											1164	3	0	499
4.10930+	4	9.21051+	1	0	5	0	0	0	0	0	01164	3	55	500
0.00000+	0	-1.07000+	6	0	0	1	1	1	1	1	231164	3	55	501
											1164	3	55	502
.10615E	07	.00000E	00	.11000E	07	.80000E	-02	.12000E	07	.13000E	001164	3	55	503
.13000E	07	.21500E	00	.14000E	07	.29000E	00	.15000E	07	.33000E	001164	3	55	504
.16000E	07	.36000E	00	.17000E	07	.35000E	00	.18000E	07	.32000E	001164	3	55	505
.19470E	07	.25000E	00	.20000E	07	.23000E	00	.21590E	07	.19000E	001164	3	55	506
.22500E	07	.17000E	00	.23350E	07	.16200E	00	.25000E	07	.12500E	001164	3	55	507
.27500E	07	.10500E	00	.30000E	07	.90000E	-01	.32500E	07	.75000E	-011164	3	55	508
.35000E	07	.60000E	-01	.40000E	07	.40000E	-01	.45000E	07	.30000E	-011164	3	55	509
.50000E	07	.18000E	-01	.60000E	07	.00000E	00	.00000E	00	.00000E	001164	3	55	510
											1164	3	0	511
4.10930+	4	9.21051+	1	0	6	0	0	0	0	0	01164	3	56	512
0.00000+	0	-1.31500+	6	0	0	1	1	1	1	1	181164	3	56	513
											1164	3	56	514
.13292E	07	.00000E	00	.14000E	07	.60000E	-01	.15000E	07	.14000E	001164	3	56	515
.16000E	07	.20000E	00	.17000E	07	.25000E	00	.18000E	07	.28000E	001164	3	56	516
.19000E	07	.30000E	00	.20000E	07	.30500E	00	.21000E	07	.30000E	001164	3	56	517
.21590E	07	.29500E	00	.22000E	07	.29000E	00	.25000E	07	.24000E	001164	3	56	518
.30000E	07	.15000E	00	.35000E	07	.90000E	-01	.40000E	07	.45000E	-011164	3	56	519
.45000E	07	.22000E	-01	.50000E	07	.15000E	-01	.60000E	07	.00000E	001164	3	56	520
											1164	3	0	521
4.10930+	4	9.21051+	1	0	7	0	0	0	0	0	01164	3	57	522
0.00000+	0	-1.48840+	6	0	0	1	1	1	1	1	171164	3	57	523
											1164	3	57	524
.15039E	07	.00000E	00	.16000E	07	.16000E	00	.17000E	07	.24000E	001164	3	57	525
.18000E	07	.28000E	00	.19000E	07	.32000E	00	.19470E	07	.33000E	001164	3	57	526
.20000E	07	.33500E	00	.21000E	07	.33000E	00	.22000E	07	.32500E	001164	3	57	527
.23350E	07	.28700E	00	.25000E	07	.25000E	00	.30000E	07	.15000E	001164	3	57	528
.35000E	07	.95000E	-01	.40000E	07	.60000E	-01	.45000E	07	.30000E	-011164	3	57	529
.50000E	07	.15000E	-01	.60000E	07	.00000E	00	.00000E	00	.00000E	001164	3	57	530
											1164	3	0	531
4.10930+	4	9.21051+	1	0	8	0	0	0	0	0	01164	3	58	532
0.00000+	0	-1.67400+	6	0	0	1	1	1	1	1	191164	3	58	533
											1164	3	58	534
.16919E	07	.00000E	00	.17000E	07	.40000E	-01	.18000E	07	.24000E	001164	3	58	535
.19000E	07	.34000E	00	.19470E	07	.37000E	00	.20000E	07	.39000E	001164	3	58	536
.21000E	07	.42000E	00	.21590E	07	.42500E	00	.22000E	07	.43000E	001164	3	58	537
.23000E	07	.42000E	00	.24000E	07	.40000E	00	.25000E	07	.38000E	001164	3	58	538
.27500E	07	.31000E	00	.30000E	07	.24000E	00	.35000E	07	.13000E	001164	3	58	539

.40000E 07	.80000E-01	.45000E 07	.35000E-01	.50000E 07	.20000E-01	1164	3	58	540
.60000E 07	.00000E 00	.00000E 00	.00000E 00	.00000E 00	.00000E 00	01164	3	58	541
4.10930+ 4	9.21051+ 1	0	9	0		1164	3	0	542
0.00000+ 0	-1.94700+ 6	0	0	1		01164	3	59	543
19	2					191164	3	59	544
.19678E 07	.00000E 00	.20000E 07	.12000E 00	.21000E 07	.24000E 00	1164	3	59	545
.21590E 07	.24000E 00	.22000E 07	.30000E 00	.23000E 07	.33000E 00	001164	3	59	546
.23350E 07	.34000E 00	.24000E 07	.36000E 00	.25000E 07	.37000E 00	001164	3	59	547
.26000E 07	.37000E 00	.27000E 07	.36000E 00	.28000E 07	.34000E 00	001164	3	59	548
.29000E 07	.32000E 00	.30000E 07	.29500E 00	.35000E 07	.13000E 00	001164	3	59	549
.40000E 07	.10000E 00	.45000E 07	.55000E-01	.50000E 07	.30000E-01	001164	3	59	550
.60000E 07	.00000E 00	.00000E 00	.00000E 00	.00000E 00	.00000E 00	001164	3	59	551
4.10930+ 4	9.21051+ 1	0	10	0		1164	3	0	552
0.00000+ 0	-2.15900+ 6	0	0	1		01164	3	60	553
17	2					171164	3	60	554
.21821E 07	.00000E 00	.22000E 07	.90000E-01	.23000E 07	.20000E 00	1164	3	60	555
.23350E 07	.23000E 00	.24000E 07	.28000E 00	.25000E 07	.30500E 00	001164	3	60	556
.24000E 07	.31500E 00	.27000E 07	.31000E 00	.28000E 07	.29500E 00	001164	3	60	557
.24000E 07	.27000E 00	.30000E 07	.25000E 00	.32000E 07	.21000E 00	001164	3	60	558
.35000E 07	.15000E 00	.40000E 07	.90000E-01	.45000E 07	.60000E-01	001164	3	60	559
.50000E 07	.35000E-01	.60000E 07	.06000E 00	.00000E 00	.00000E 00	001164	3	60	560
4.10930+ 4	9.21051+ 1	0	11	0		1164	3	0	561
0.00000+ 0	-2.33500+ 6	0	0	1		01164	3	61	562
14	2					141164	3	61	563
.23599E 07	.00000E 00	.24000E 07	.75000E-01	.25000E 07	.13000E 00	1164	3	61	564
.24000E 07	.17000E 00	.27000E 07	.18500E 00	.28000E 07	.19000E 00	001164	3	61	565
.29000E 07	.18700E 00	.30000E 07	.18200E 00	.32000E 07	.17000E 00	001164	3	61	566
.35000E 07	.13000E 00	.40000E 07	.90000E-01	.45000E 07	.50000E-01	001164	3	61	567
.50000E 07	.35000E-01	.60000E 07	.00000E 00	.00000E 00	.00000E 00	001164	3	61	568
4.10930+ 4	9.21051+ 1	0	12	0		1164	3	0	569
0.00000+ 0	-2.51900+ 6	0	0	1		01164	3	62	570
9	2					91164	3	62	571
.25495E 07	.00000E 00	.30000E 07	.50000E-01	.32000E 07	.70000E-01	1164	3	62	572
.35000E 07	.90300E-01	.37500E 07	.82000E-01	.40000E 07	.62000E-01	001164	3	62	573
.45000E 07	.41000E-01	.50000E 07	.22000E-01	.60000E 07	.00000E 00	001164	3	62	574
4.10930+ 4	9.21051+ 1	0	99	0		1164	3	0	575
0.00000+ 0	2.54950+ 6	0	0	1		01164	3	91	576
24	2					241164	3	91	577
.25495E 07	.00000E 00	.26000E 07	.15000E-01	.27000E 07	.51000E-01	1164	3	91	578
.28000E 07	.13100E 00	.29000E 07	.25100E 00	.30000E 07	.38000E 00	001164	3	91	579
.35000E 07	.90300E 00	.40000E 07	.12600E 01	.45000E 07	.15340E 00	011164	3	91	580
.50000E 07	.16340E 01	.60000E 07	.17100E 01	.70000E 07	.16800E 00	011164	3	91	581
.80000E 07	.16200E 01	.90000E 07	.15550E 01	.10000E 08	.12580E 00	011164	3	91	582
.11000E 08	.85100E 00	.12000E 08	.45500E 00	.13000E 08	.39300E 00	001164	3	91	583
.14000E 08	.41600E 00	.15000E 08	.43000E 00	.16000E 08	.50000E 00	001164	3	91	584
.17000E 08	.52000E 00	.18000E 08	.54000E 00	.20000E 08	.56000E 00	001164	3	91	585
4.10930+ 4	9.21051+ 1	0	99	0		1164	3	0	586
0.00000+ 0	7.21390+ 6	0	0	2		01164	3	102	587
7	5	73	2			731164	3	102	588
.10000E-04	.53025E 02	.10000E-02	.53025E 01	.10000E-01	.16768E 00	011164	3	102	589
.25300E-01	.10542E 01	.10000E 00	.53025E 00	.10000E 01	.16768E 00	001164	3	102	590
.96000E 03	.54120E-02	.96000E 03	.10000E 00	.12000E 04	.10600E 00	001164	3	102	591
.15000E 04	.12100E 00	.20000E 04	.13800E 00	.25000E 04	.15200E 00	001164	3	102	592
.30000E 04	.16500E 00	.40000E 04	.18800E 00	.50000E 04	.20000E 00	001164	3	102	593

.60000E 04	.22300E 00	.70000E 04	.24200E 00	.75000E 04	.24200E 00	001164	3102	600
.75000E 04	.12900E 00	.80000E 04	.12500E 00	.90000E 04	.11500E 00	001164	3102	601
.10000E 05	.10500E 00	.12000E 05	.92000E-01	.14000E 05	.84000E-01	001164	3102	602
.16000E 05	.79000E-01	.18000E 05	.65000E-01	.20000E 05	.58000E-01	001164	3102	603
.25000E 05	.43800E-01	.28000E 05	.35000E-01	.30000E 05	.30000E-01	001164	3102	604
.35000E 05	.23000E-01	.40000E 05	.14000E-01	.50000E 05	.80000E-02	001164	3102	605
.60000E 05	.11000E-01	.70000E 05	.24000E-01	.10000E 06	.34000E-01	001164	3102	606
.10000E 06	.11000E 00	.12000E 06	.09800E 00	.14000E 06	.09000E 00	001164	3102	607
.16000E 06	.06400E 00	.18000E 06	.08000E 00	.20000E 06	.07600E 00	001164	3102	608
.25000E 06	.07000E 00	.30000E 06	.06400E 00	.35000E 06	.06100E 00	001164	3102	609
.40000E 06	.05300E 00	.45000E 06	.05600E 00	.50000E 06	.05350E 00	001164	3102	610
.60000E 06	.05100E 00	.70000E 06	.04800E 00	.80000E 06	.04500E 00	001164	3102	611
.90000E 06	.04200E 00	.10000E 07	.03600E 00	.11000E 07	.03000E 00	001164	3102	612
.12000E 07	.02500E 00	.13000E 07	.02100E 00	.14000E 07	.01600E 00	001164	3102	613
.15000E 07	.01400E 00	.20000E 07	.00950E 00	.25000E 07	.00600E 00	001164	3102	614
.30000E 07	.00510E 00	.35000E 07	.00400E 00	.40000E 07	.00320E 00	001164	3102	615
.50000E 07	.00230E 00	.60000E 07	.00200E 00	.70000E 07	.00180E 00	001164	3102	616
.80000E 07	.00160E 00	.90000E 07	.00140E 00	.10000E 08	.00120E 00	001164	3102	617
.12000E 08	.00100E 00	.14000E 08	.00080E 00	.16000E 08	.00075E 00	001164	3102	618
.20000E 08	.00070E 00					1164	3102	619
						1164	3	0
4.10930+ 4	9.21051+ 1	0	99	0		01164	3103	620
0.0 + 0	7.190 + 5	0	0	1		291164	3103	621
	25	2				1164	3103	622
.10000E-04	.00000E 00	.30000E 07	.00000E 00	.35000E 07	.00000E 00	001164	3103	623
.40000E 07	.13300E-02	.45000E 07	.20000E-02	.50000E 07	.25600E-02	001164	3103	624
.50000E 07	.40000E-02	.60000E 07	.53200E-02	.65000E 07	.65000E-02	001164	3103	625
.70000E 07	.93100E-02	.75000E 07	.11970E-01	.80000E 07	.15960E-01	001164	3103	626
.85000E-07	.20000E-01	.89000E 07	.22080E-01	.90000E 07	.22610E-01	001164	3103	627
.95000E 07	.20300E-01	.10000E 08	.27930E-01	.10500E 08	.30590E-01	001164	3103	628
.11000E 08	.33300E-01	.11500E 08	.34500E-01	.12000E 08	.35910E-01	001164	3103	629
.12000E 08	.37400E-01	.13000E 08	.38570E-01	.13500E 08	.40000E-01	001164	3103	630
.14000E 08	.43000E-01	.14500E 08	.40000E-01	.15000E 08	.40000E-01	001164	3103	631
.17500E 08	.38000E-01	.20000E 08	.37000E-01	.00000E 00	.00000E 00	001164	3103	632
						1164	3	0
4.10930+ 4	9.21051+ 1	0	99	0		01164	3107	633
0.00000+ 0	4.91400+ 6	0	0	1		251164	3107	634
	25	2				1164	3107	635
.10000E-04	.00000E 00	.40000E 07	.00000E 00	.45000E 07	.06000E 00	001164	3107	636
.50000E 07	.20000E-03	.55000E 07	.50000E-03	.60000E 07	.70000E-03	001164	3107	637
.65000E 07	.10000E-02	.70000E 07	.13000E-02	.75000E 07	.17000E-02	001164	3107	638
.80000E 07	.20000E-02	.85000E 07	.25000E-02	.89000E 07	.29000E-02	001164	3107	639
.90000E 07	.30000E-02	.95000E 07	.36000E-02	.10000E 08	.42000E-02	001164	3107	640
.10500E 08	.40000E-02	.11000E 08	.56000E-02	.11500E 08	.62000E-02	001164	3107	641
.12000E 08	.69000E-02	.12500E 08	.76000E-02	.13000E 08	.83000E-02	001164	3107	642
.14000E 08	.92000E-02	.15000E 08	.92000E-02	.17500E 08	.94000E-02	001164	3107	643
.20000E 08	.94000E-02	.00000E 00	.00000E 00	.00000E 00	.00000E 00	001164	3107	644
						1164	3	0
4.10930+ 4	9.21051+ 1	0	0	0		01164	3251	645
0.0 + 0	0.0 + 0	0	0	1		331164	3251	646
	33	2				1164	3251	647
.100 E-04	.72328E-02	.1 E 05	.72328E-02	.1 E 06	.73036E-01	001164	3251	648
.2 E 06	.11911E 00	.3 E 06	.21021E 00	.4 E 06	.25771E 00	001164	3251	649
.5 E 06	.27309E 00	.6 E 06	.31955E 00	.7 E 06	.33241E 00	001164	3251	650
.8 E 06	.35159E 00	.9 E 06	.39379E 00	.1 E 07	.42097E 00	001164	3251	651
.12 E 07	.42197E 00	.14 E 07	.50839E 00	.16 E 07	.51984E 00	001164	3251	652
.18 E 07	.51071E 00	.2 E 07	.50822E 00	.25 E 07	.53480E 00	001164	3251	653
.3 E 07	.53627E 00	.35 E 07	.55351E 00	.4 E 07	.54892E 00	001164	3251	654
.45 E 07	.56158E 00	.5 E 07	.57851E 00	.6 E 07	.62716E 00	001164	3251	655
.7 E 07	.68303E 00	.8 E 07	.72929E 00	.9 E 07	.76266E 00	001164	3251	656

.1	E 08	.78744E 00	.12	E 08	.80357E 00	.14	E 08	.79614E 00	001164	3251	660
.16	E 08	.75557E 00	.18	E 08	.69833E 00	.2	E 08	.65553E 00	001164	3251	661
									1164	3	0
4.10930+	4	9.21051+	1	0	0	0			01164	3252	663
0.0	+ 0	0.0	+ 0	0	0	1			331164	3252	664
	33	2							1164	3252	665
.1	E-04	.21542E-01	.1	E 05	.21542E-01	.1	E 06	.20114E-01	011164	3252	666
.2	E 06	.13463E-01	.3	E 06	.17137E-01	.4	E 06	.16107E-01	011164	3252	667
.5	E 06	.15339E-01	.6	E 06	.14765E-01	.7	E 06	.14356E-01	011164	3252	668
.8	E 06	.13352E-01	.9	E 06	.13154E-01	.1	E 07	.12564E-01	011164	3252	669
.12	E 07	.11240E-01	.14	E 07	.10667E-01	.16	E 07	.10419E-01	011164	3252	670
.15	E 07	.10617E-01	.20	E 07	.10671E-01	.25	E 07	.10094E-01	011164	3252	671
.3	E 07	.10062E-01	.35	E 07	.96835E-02	.40	E 07	.97879E-02	021164	3252	672
.45	E 07	.95132E-02	.5	E 07	.91459E-02	.60	E 07	.80903E-02	021164	3252	673
.7	E 07	.68779E-02	.8	E 07	.58742E-02	.9	E 07	.51500E-02	021164	3252	674
.1	E 08	.46123E-02	.12	E 08	.42623E-02	.14	E 08	.44324E-02	021164	3252	675
.16	E 08	.53038E-02	.18	E 08	.65460E-02	.20	E 08	.74747E-02	021164	3252	676
									1164	3	0
4.10930+	4	9.21051+	1	0	0	0			01164	3253	677
0.0	+ 0	0.0	+ 0	0	0	1			331164	3253	679
	33	2							1164	3253	680
.1	E-04	.14414E-01	.1	E 05	.14414E-01	.1	E 06	.14038E-01	011164	3253	681
.2	E 06	.13504E-01	.3	E 06	.13038E-01	.4	E 06	.12659E-01	011164	3253	682
.5	E 06	.12377E-01	.6	E 06	.12179E-01	.7	E 06	.12063E-01	011164	3253	683
.8	E 06	.11695E-01	.9	E 06	.11621E-01	.1	E 07	.11397E-01	011164	3253	684
.12	E 07	.10618E-01	.14	E 07	.10752E-01	.16	E 07	.10650E-01	011164	3253	685
.15	E 07	.10419E-01	.20	E 07	.11774E-01	.25	E 07	.12104E-01	011164	3253	686
.3	E 07	.12487E-01	.35	E 07	.12355E-01	.40	E 07	.12275E-01	011164	3253	687
.45	E 07	.12204E-01	.5	E 07	.11792E-01	.6	E 07	.11440E-01	011164	3253	688
.7	E 07	.11106E-01	.8	E 07	.10754E-01	.9	E 07	.10509E-01	011164	3253	689
.1	E 08	.10251E-01	.12	E 08	.10316E-01	.14	E 08	.11196E-01	011164	3253	690
.16	E 08	.12528E-01	.18	E 08	.12850E-01	.2	E 08	.12425E-01	011164	3253	691
									1164	3	0
									1164	0	0
4.10930+	4	9.21051+	1	1	1	0			01164	4	2
0.00000+	0	9.21051+	1	0	2	441			201164	4	2
1.00000+	0	7.23811-	3	2.35641-	5-2.03616-	10	0.00000+	0	0.00000+	01164	4
0.00000+	0	0.00000+	0	0.00000+	0	0.00000+	0	0.00000+	01164	4	2
0.00000+	0	0.00000+	0								

0.00000+ 0 0.00000+ 0 0.00000+ 0 0.00000+ 0	8.81865-13-2.70027-10	1164	4	2	720
5.10005- 8-6.68003- 6 6.05553- 4-3.50479- 2	9.98343- 1 4.59452-	21164	4	2	721
1.05019- 3 1.56773- 5-1.19813- 8-4.40058- 9	0.00000+ 0 0.00000+ 0	1164	4	2	722
0.00000+ 0 0.00000+ 0 0.00000+ 0 0.00000+ 0	0.00000+ 0 0.00000+ 0	1164	4	2	723
0.00000+ 0-9.48336-15 3.12718-12-6.49702-10	9.67030- 8-1.05198-	51164	4	2	724
8.11890- 4-4.04902- 2 9.97572- 1 5.13740- 2	1.31498- 3 2.20743-	51164	4	2	725
6.26413- 8-6.32615- 9 0.00000+ 0 0.00000+ 0	0.00000+ 0 0.00000+ 0	1164	4	2	726
0.00000+ 0 0.00000+ 0 0.00000+ 0 0.00000+ 0	1.02205-16-3.59479-14	1164	4	2	727
8.09129-12-1.33403- 9 1.66288- 7-1.55566- 5	1.04751- 3-4.59221-	21164	4	2	728
9.97342- 1 5.67953- 2 1.60907- 3 2.99834- 5	2.05617- 7-5.04969-	91164	4	2	729
0.00000+ 0 0.00000+ 0 0.00000+ 0 0.00000+ 0	0.00000+ 0 0.00000+ 0	1164	4	2	730
0.00000+ 3-1.10317-18 4.10853-16-9.90718-14	1.77872-11-2.47062-	91164	4	2	731
2.66897- 7-2.19501- 5 1.31241- 3-5.13451- 2	9.96753- 1 6.22095-	21164	4	2	732
1.93250- 3 3.95711- 5 3.76290- 7-8.91059- 9	0.00000+ 0 0.00000+ 0	1164	4	2	733
0.00000+ 0 0.00000+ 0 0.00000+ 0 0.00000+ 0	1.19203-20-2.93963-18	1164	4	2	734
1.19735-15-2.31202-13 3.51270-11-4.24696- 9	4.05728- 7-2.98592-	51164	4	2	735
1.60658- 3-5.67601- 2 9.96106- 1 6.76168- 2	5.05218- 3 5.09872-	51164	4	2	736
6.92780- 7 4.21640- 9 0.00000+ 0 0.00000+ 0	0.00000+ 0 0.00000+ 0	1164	4	2	737
0.00000+ 0 0.00000+ 0 2.44663-20-9.50171-18	2.94696-15-4.83200-13	1164	4	2	738
6.41542-11-6.49513- 9 5.92039- 7-3.94429- 5	1.92998- 3-6.21673-	21164	4	2	739
9.95400- 1 7.30170- 2 2.66718- 3 6.44122- 5	9.66552- 7-5.94949-	91164	4	2	740
0.00000+ 0 0.00000+ 0 0.00000+ 0 0.00000+ 0	0.00000+ 0 0.00000+ 0	1164	4	2	741
8.43478-20-2.32578-17 6.47960-15-9.31271-13	1.10299-10-1.06965-	81164	4	2	742
8.35150- 7-5.78596- 5 2.28258- 3-6.75869- 2	9.94636- 1 7.84099-	21164	4	2	743
3.07825- 3 7.99627- 5 1.48836- 6 2.03411- 8	0.00000+ 0 0.00000+ 0	1164	4	2	744
0.00000+ 0 0.00000+ 0 0.00000+ 0 0.00000+ 0	2.11616-19-4.92696-17	1164	4	2	745
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1.91465- 6 2.22029-18 1.14675- 8 0.00000+ 0	0.00000+ 0 0.00000+ 0	1164	4	2	748
0.00000+ 0 0.00000+ 0 4.58091-19-9.86296-17	2.48453-14-2.09847-12	1164	4	2	749
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4.48630- 3 1.41149- 4 3.27019- 6 0.00000+ 0	0.00000+ 0 0.00000+ 0	1164	4	2	755
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0.00000+ 0 0.00000+ 0 0.00000+ 0-6.96428-20	1.35847-17-3.25817-15	1164	4	2	767
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0.00000+ 0 0.00000+ 0 0 0	1	331164	4	2	770
33		1164	4	2	771
0.00000E 00 .100000E-04	0	0	1	01164	4
0.00000+ 0				1164	4
0.00000E 00 .100000E-05	0	0	1	01164	4
0.00000E 00				1164	4
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.65933E-01 .17304E-01 .00000E 00 .00000E 00	.00000E 00 .00000E 00	01164	4	2	777
.00000E 00 .20000E 06	0	0	2	01164	4
.14213E 00 .34020E-01 .00000E 00 .00000E 00	.00000E 00 .00000E 00	01164	4	2	779

.00000E 00	.30000E 06	0	0	4	01164	4	2	780	
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.00000E 00	.80000E 06	0	0	4	01164	4	2	790	
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.00000E 00	.90000E 06	0	0	4	01164	4	2	792	
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.41500E 00	.17034E 00	.32800E-01	.10617E-01	.00000E 00	.00000E 00	01164	4	2	795
.00000E 00	.12000E 07	0	0	4	01164	4	2	796	
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.00000E 00	.14000E 07	0	0	6	01164	4	2	798	
.50500E 00	.25040E 00	.73671E-01	.34469E-01	.39491E-02	.10600E-02	01164	4	2	799
.00000E 00	.16000E 07	0	0	6	01164	4	2	800	
.51467E 00	.28100E 00	.95271E-01	.50989E-01	.74400E-02	.21523E-02	01164	4	2	801
.00000E 00	.18000E 07	0	0	6	01164	4	2	802	
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.00000E 00	.20000E 07	0	0	6	01164	4	2	804	
.50533E 00	.32640E 00	.13343E 00	.95033E-01	.21664E-01	.72915E-02	01164	4	2	805
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.00000E 00	.30000E 07	0	0	6	01164	4	2	808	
.53200E 00	.40840E 00	.22114E 00	.22244E 00	.10182E 00	.36877E-01	01164	4	2	809
.00000E 00	.30000E 07	0	0	8	01164	4	2	810	
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.60453E-02	.15018E-02	.00000E 00	.00000E 00	.00000E 00	.00000E 00	01164	4	2	812
.00000E 00	.40000E 07	0	0	8	01164	4	2	813	
.54467E 00	.40380E 00	.27514E 00	.29144E 00	.19600E 00	.87846E-01	01164	4	2	814
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.00000E 00	.45000E 07	0	0	8	01164	4	2	816	
.55733E 00	.40900E 00	.29829E 00	.30456E 00	.22645E 00	.10692E 00	01164	4	2	817
.19507E-01	.63529E-02	.00000E 00	.00000E 00	.00000E 00	.00000E 00	01164	4	2	818
.00000E 00	.50000E 07	0	0	8	01164	4	2	819	
.57433E 00	.41940E 00	.31986E 00	.31178E 00	.24791E 00	.12600E 00	01164	4	2	820
.31267E-01	.10900E-01	.00000E 00	.00000E 00	.00000E 00	.00000E 00	01164	4	2	821
.00000E 00	.60000E 07	0	0	10	01164	4	2	822	
.62333E 00	.46780E 00	.36357E 00	.32578E 00	.27073E 00	.16162E 00	01164	4	2	823
.58673E-01	.24459E-01	.75842E-02	.13446E-02	.00000E 00	.00000E 00	01164	4	2	824
.00000E 00	.70000E 07	0	0	10	01164	4	2	825	
.67967E 00	.53240E 00	.41114E 00	.34978E 00	.28764E 00	.19262E 00	01164	4	2	826
.90800E-01	.42171E-01	.14511E-01	.32133E-02	.00000E 00	.00000E 00	01164	4	2	827
.00000E 00	.60000E 07	0	0	10	01164	4	2	828	
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.11780E 00	.58886E-01	.22753E-01	.58762E-02	.00000E 00	.00000E 00	01164	4	2	830
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.13727E 00	.71529E-01	.29084E-01	.84857E-02	.36600E-02	.47440E-03	01164	4	2	833
.00000E 00	.10000E 07	0	0	12	01164	4	2	834	
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.00000E 00	.12000E 08	0	0	12	01164	4	2	837	
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.18753E 00	.10959E 00	.62053E -01	.36090E -01	.25274E -01	.23568E -02	01164 4 2 842
.00000E 00	.15000E 08	0	0	14	01164 4 2	843
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.45556E -01	.77103E -02	.00000E 00	.00000E 00	.00000E 00	.00000E 00	01164 4 2 854
					1164 4 0	855
4.10930+ 4	9.21051+ 1	0	2	0	01164 4 16	856
0.00000+ 0	9.21051+ 1	0	1	0	01164 4 16	857
0.00000+ 0	0.00000+ 0	0	0	1	21164 4 16	858
	2	2			1164 4 16	859
0.00000+ 0	8.92000+ 6	0	0	1	21164 4 16	860
	2				1164 4 16	861
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		1164 4 16	862
0.00000+ 0	2.00000+ 7	0	0	1	21164 4 16	863
	2				1164 4 16	864
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		1164 4 16	865
					1164 4 0	866
4.10930+ 4	9.21051+ 1	0	2	0	01164 4 17	867
0.0 + 0	9.21051+ 1	0	1	0	01164 4 17	868
0.0 + 0	0.0 + 0	0	0	1	21164 4 17	869
	2				1164 4 17	870
0.0 + 0	1.58950+ 7			1	21164 4 17	871
	2				1164 4 17	872
-1.0 + 0	5.0 - 1	1.0 + 0	5.0 - 1		1164 4 17	873
0.0 + 0	2.0 + 7			1	21164 4 17	874
	2				1164 4 17	875
-1.0 + 0	5.0 - 1	1.0 + 0	5.0 - 1		1164 4 17	876
					1164 4 0	877
4.10930+ 4	9.21051+ 1	0	2	0	01164 4 22	878
0.0 + 0	9.21051+ 1	0	1	0	01164 4 22	879
0.0 + 0	0.0 + 0	0	0	1	21164 4 22	880
	2				1164 4 22	881
0.0 + 0	1.966860+ 7			1	21164 4 22	882
	2				1164 4 22	883
-1.0 + 0	5.0 - 1	1.0 + 0	5.0 - 1		1164 4 22	884
0.0 + 0	2.0 + 7			1	21164 4 22	885
	2				1164 4 22	886
-1.0 + 0	5.0 - 1	1.0 + 0	5.0 - 1		1164 4 22	887
					1164 4 0	888
4.10930+ 4	9.21051+ 1	0	2	0	01164 4 51	889
0.0 + 0	9.21051+ 1	0	2	0	01164 4 51	890
0.00000+ 0	0.00000+ 0	0	0	1	21164 4 51	891
	2				1164 4 51	892
0.00000+ 0	2.93100+ 4	0	0	1	21164 4 51	893
	2				1164 4 51	894
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		1164 4 51	895
0.00000+ 0	2.00000+ 7	0	0	1	21164 4 51	896
	2				1164 4 51	897
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		1164 4 51	898
					1164 4 0	899

4.10930+	4	9.21051+	1	0	2	0	01164	4	52	900	
0.00000+	0	9.21051+	1	0	2	0	01164	4	52	901	
0.00000+	0	0.00000+	0	0	0	1	21164	4	52	902	
	2		2				1164	4	52	903	
0.00000+	0	7.47920+	5	0	0	1	21164	4	52	904	
	2		2				1164	4	52	905	
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1	1164	4	52	906
0.00000+	0	2.00000+	7	0	0	1	21164	4	52	907	
	2		2				1164	4	52	908	
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1	1164	4	52	909
							1164	4	0	910	
4.10930+	4	9.21051+	1	0	2	0	01164	4	53	911	
0.00000+	0	9.21051+	1	0	2	0	01164	4	53	912	
0.00000+	0	0.00000+	0	0	0	1	21164	4	53	913	
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0.00000+	0	8.18670+	5	0	0	1	21164	4	53	915	
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0.00000+	0	2.00000+	7	0	0	1	21164	4	53	918	
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-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1	1164	4	53	920
							1164	4	0	921	
4.10930+	4	9.21051+	1	0	2	0	01164	4	54	922	
0.00000+	0	9.21051+	1	0	2	0	01164	4	54	923	
0.00000+	0	0.00000+	0	0	0	1	21164	4	54	924	
	2		2				1164	4	54	925	
0.00000+	0	9.64260+	5	0	0	1	21164	4	54	926	
	2		2				1164	4	54	927	
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1	1164	4	54	928
0.00000+	0	2.00000+	7	0	0	1	21164	4	54	929	
	2		2				1164	4	54	930	
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1	1164	4	54	931
							1164	4	0	932	
4.10930+	4	9.21051+	1	0	2	0	01164	4	55	933	
0.00000+	0	9.21051+	1	0	2	0	01164	4	55	934	
0.00000+	0	0.00000+	0	0	0	1	21164	4	55	935	
	2		2				1164	4	55	936	
0.00000+	0	1.08150+	6	0	0	1	21164	4	55	937	
	2		2				1164	4	55	938	
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1	1164	4	55	939
0.00000+	0	2.00000+	7	0	0	1	21164	4	55	940	
	2		2				1164	4	55	941	
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1	1164	4	55	942
							1164	4	0	943	
4.10930+	4	9.21051+	1	0	2	0	01164	4	56	944	
0.00000+	0	9.21051+	1	0	2	0	01164	4	56	945	
0.00000+	0	0.00000+	0	0	0	1	21164	4	56	946	
	2		2				1164	4	56	947	
0.00000+	0	1.32920+	6	0	0	1	21164	4	56	948	
	2		2				1164	4	56	949	
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1	1164	4	56	950
0.00000+	0	2.00000+	7	0	0	1	21164	4	56	951	
	2		2				1164	4	56	952	
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1	1164	4	56	953
							1164	4	0	954	
4.10930+	4	9.21051+	1	0	2	0	01164	4	57	955	
0.00000+	0	9.21051+	1	0	2	0	01164	4	57	956	
0.00000+	0	0.00000+	0	0	0	1	21164	4	57	957	
	2		2				1164	4	57	958	
0.00000+	0	1.50390+	6	0	0	1	21164	4	57	959	

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0.00000+ 0	2.00000+ 7	0	0	1	1164 4 57 961
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		21164 4 57 962
4.10930+ 4	9.21051+ 1	0	2	0	1164 4 57 963
0.00000+ 0	9.21051+ 1	0	2	0	1164 4 0 965
0.00000+ 0	0.00000+ 0	0	0	1	01164 4 58 966
0.00000+ 0	1.69190+ 6	0	0	1	01164 4 58 967
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		21164 4 58 968
0.00000+ 0	2.00000+ 7	0	0	1	1164 4 58 969
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		21164 4 58 970
4.10930+ 4	9.21051+ 1	0	2	0	1164 4 58 971
0.00000+ 0	9.21051+ 1	0	2	0	1164 4 58 972
0.00000+ 0	0.00000+ 0	0	0	1	21164 4 58 973
0.00000+ 0	1.96780+ 6	0	0	1	1164 4 58 974
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		1164 4 58 975
0.00000+ 0	2.00000+ 7	0	0	1	1164 4 0 976
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		01164 4 59 977
4.10930+ 4	9.21051+ 1	0	2	0	01164 4 59 978
0.00000+ 0	9.21051+ 1	0	2	0	21164 4 59 979
0.00000+ 0	0.00000+ 0	0	0	1	1164 4 59 980
0.00000+ 0	2.16210+ 6	0	0	1	21164 4 59 981
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		1164 4 59 982
0.00000+ 0	2.00000+ 7	0	0	1	1164 4 59 983
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		21164 4 59 984
4.10930+ 4	9.21051+ 1	0	2	0	1164 4 59 985
0.00000+ 0	9.21051+ 1	0	2	0	1164 4 0 987
0.00000+ 0	0.00000+ 0	0	0	1	01164 4 60 988
0.00000+ 0	2.16210+ 6	0	0	1	01164 4 60 989
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		21164 4 60 990
0.00000+ 0	2.00000+ 7	0	0	1	1164 4 60 991
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		21164 4 60 992
4.10930+ 4	9.21051+ 1	0	2	0	1164 4 60 993
0.00000+ 0	9.21051+ 1	0	2	0	1164 4 60 994
0.00000+ 0	0.00000+ 0	0	0	1	21164 4 60 995
0.00000+ 0	2.35990+ 6	0	0	1	1164 4 60 996
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		1164 4 60 997
0.00000+ 0	2.00000+ 7	0	0	1	1164 4 0 998
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		01164 4 61 999
4.10930+ 4	9.21051+ 1	0	2	0	01164 4 61 1000
0.00000+ 0	9.21051+ 1	0	2	0	21164 4 61 1001
0.00000+ 0	0.00000+ 0	0	0	1	1164 4 61 1002
0.00000+ 0	2.35990+ 6	0	0	1	21164 4 61 1003
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		1164 4 61 1004
0.00000+ 0	2.00000+ 7	0	0	1	1164 4 61 1005
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		21164 4 61 1006
4.10930+ 4	9.21051+ 1	0	2	0	1164 4 61 1007
0.00000+ 0	9.21051+ 1	0	2	0	1164 4 61 1008
0.00000+ 0	0.00000+ 0	0	0	1	1164 4 0 1009
0.00000+ 0	2.54950+ 6	0	0	1	01164 4 62 1010
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		01164 4 62 1011
0.00000+ 0	2.00000+ 7	0	0	1	21164 4 62 1012
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		1164 4 62 1013
4.10930+ 4	9.21051+ 1	0	2	0	21164 4 62 1014
0.00000+ 0	9.21051+ 1	0	2	0	1164 4 62 1015
0.00000+ 0	0.00000+ 0	0	0	1	1164 4 62 1016
0.00000+ 0	2.54950+ 6	0	0	1	21164 4 62 1017
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		1164 4 62 1018
0.00000+ 0	2.00000+ 7	0	0	1	1164 4 62 1019
-1.00000+ 0	5.00000- 1	1.00000+ 0	5.00000- 1		

4.10930+	4	9.21051+	1	0	2	0	1164	4	0	1020										
0.00000+	0	9.21051+	1	0	2	0	01164	4	91	1021										
0.00000+	0	0.00000+	0	0	0	1	01164	4	91	1022										
	2		2				21164	4	91	1023										
0.00000+	0	2.54950+	6	0	0	1	1164	4	91	1024										
	2		2				21164	4	91	1025										
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1	1164	4	91	1026									
0.00000+	0	2.00000+	7	0	0	1	1164	4	91	1027										
	2		2				21164	4	91	1028										
-1.00000+	0	5.00000-	1	1.00000+	0	5.00000-	1	1164	4	91	1029									
							1164	4	91	1030										
							1164	4	0	1031										
							1164	0	0	1032										
4.10930+	4	9.21051+	1	0	0	1	01164	5	16	1033										
8.92000+	6	0.00000+	0	0	9	1	21164	5	16	1034										
	2		2				1164	5	16	1035										
8.92000+	6	1.00000+	0	2.00000+	7	1.00000+	0	1164	5	16	1036									
0.00000+	0	0.00000+	0	0	0	1	1164	5	16	1037										
	7		2				71164	5	16	1037										
8.92	+	6	5.09	+	5	1.0	+	7	5.37	+	5	1.2	+	7	5.89	+	51164	5	16	1039
1.4	+	7	6.35	+	5	1.6	+	7	6.85	+	5	1.6	+	7	7.21	+	51164	5	16	1040
2.0	+	7	7.60	+	5												1164	5	16	1041
																	1164	5	0	1042
4.10930+	4	9.21051+	1	0	0	1	01164	5	17	1043										
1.6896	+	7	0.0	+	0	0	9	1	21164	5	17	1044								
	2		2						1164	5	17	1045								
1.6876	+	7	1.0	+	0	2.0	+	7	1.0	+	0						1164	5	17	1046
0.0	+	0	0.0	+	0	0	0	1	21164	5	17	1047								
	2		2						1164	5	17	1048								
1.6896	+	7	4.0	+	5	2.0	+	7	4.0	+	5						1164	5	17	1049
									1164	5	0	1050								
4.10930+	4	9.21051+	1	0	0	1	01164	5	22	1051										
1.6880	+	0	0.0	+	0	0	9	1	21164	5	22	1052								
	2		2						1164	5	22	1053								
1.6880	+	6	1.0	+	0	2.0	+	7	1.0	+	0						1164	5	22	1054
0.0	+	0	0.0	+	0	0	0	1	21164	5	22	1055								
	2		2						1164	5	22	1056								
1.6880	+	6	5.0	+	5	2.0	+	7	5.0	+	5						1164	5	22	1057
									1164	5	0	1058								
4.10930+	4	9.21051+	1	0	0	1	01164	5	91	1059										
2.54952+	6	0.00000+	0	0	9	1	21164	5	91	1060										
	2		2						1164	5	91	1061								
2.54952+	6	1.00000+	0	2.00000+	7	1.00000+	0		1164	5	91	1062								
0.00000+	0	0.00000+	0	0	0	1	11164	5	91	1063										
	11		5						1164	5	91	1064								
2.54952+	6	3.43	+	5	3.0	+	6	3.73	+	5	4.0	+	6	4.31	+	51164	5	91	1065	
6.0	+	6	5.23	+	5	8.0	+	6	6.10	+	5	1.0	+	7	6.82	+	51164	5	91	1066
1.2	+	7	7.47	+	5	1.40	+	7	8.07	+	5	1.60	+	7	8.63	+	51164	5	91	1067
1.00	+	7	9.15	+	5	2.00	+	7	9.64	+	5						1164	5	91	1068
																	1164	5	0	1069
																	1164	0	0	1070
																	0	0	0	1071