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The Generation of a Computer Library for Discrete Ordinates Quadrature Sets

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THE GENERATION OF A COMPUTER LIBRARY FOR DISCRETE ORDINATES QUADRATURE SETS

PART I: FULLY SYMMETRIC QUADRATURES AND THE DOQDP COMPUTER CODE

PART II: COMMON QUADRATURES AND THE QUADRATURE LIBRARY

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ABSTRACT

Although various discrete ordinates quadrature sets are in general use, there exists a need for a standard collection supported by documentation of their origin and derivation. This report attempts to provide this documentation for most of the commonly used sets. Instructions for using DOQDP — the computer code used to generate these quadratures — is provided. A library (in standard interface format) containing many of the quadratures has been generated and is documented in this report. Finally, a listing of the fully symmetric, half-symmetric, and several biased sets is provided for XY, RZ, and Rθ geometries.

Part I of the report describes the DOQDP code and the generation of S2-S16 fully symmetric quadratures. Part II describes the generation of S4-S10 half-symmetric and several biased sets, as well as a discussion of the quadrature library.

PART I. FULLY SYMMETRIC QUADRATURES AND THE DOQDP COMPUTER CODE

J. P. Jenal, D. B. Simpson, and W. A. Rhoades

The purpose of this part of the study was to produce and document a standard collection of two-dimensional level symmetric (R-Z, X-Y) quadrature sets for use with DOT-III and later codes. This was expedited by the modification of the DOQ[1] code, subsequently renamed DOQDP.

Although two-dimensional quadratures are in common use both here at ORNL and elsewhere, there exists a need for a standard collection supported by documentation of their origins and derivation. This part will, therefore, be comprised of two major sections. The first will be a brief discussion of quadrature sets in general while the second will deal with the DOQDP code in particular. A short section of comments and general observations follows.

Fully Symmetric Quadrature Sets

The method of discrete ordinates, introduced by Carlson, Lathrop, Lee and others in the late fifties for obtaining numerical solutions to the Boltzmann transport equation, incorporated the development of sets of "discrete directions to which is attached a set of weights,"[2] that is, quadrature sets. Over the years, the "How-To" of quadrature set generation has changed repeatedly. It is not the goal of this paper to present a survey of prior methods (the truly enthusiastic reader is invited to pursue the bibliography for a more or less complete list of pertinent documents concerning quadrature sets), but rather it seeks to present the background material needed for one type of quadrature set currently in use, namely LQ_n.[3] LQ_n stands for level symmetric quadrature and is a type of quadrature currently used with the DOT two-dimensional transport codes developed at ORNL. "Level symmetric" means that the angles subtended by the latitudinal level lines are constant. Or, in English, the eta levels (latitude lines) are constant as the mu's vary.

Some rules help to define the quadrature set. They are:

(1) The quadrature set is defined as a set of pairs $(P_m, \hat{\Omega}_m)$ of weights and directions -- the number of which depends on the order of the quadrature set, and $m = 1, 2, 3, \ldots M(n)$.

(2) The order, n, is even: $n = 2, 4, 6 \ldots\ldots$

(3) The weights, P_m, are generally positive with the normalization

$$\sum_m P_m = 1 \qquad (1)$$

(4) The components μ_m, η_m, and ξ_m of the vectors Ω_m satisfy

$$\mu_m^2 + \eta_m^2 + \xi_m^2 = 1 \qquad (2)$$

$$\sum_m P_m \mu_m = 0$$

$$\sum_m P_m \eta_m = 0 \qquad (3)$$

$$\sum_m P_m \xi_m = 0$$

and

$$\sum_m P_m \mu_m^2 = 1/3 \ . \qquad (4)$$

Equation 3 is known as the flow condition while equation 4 is the diffusion theorem condition.[4]

(5) The common quadrature set is defined on one octant (known as the principle octant) and is reflected into other octants by making appropriate sign changes. The following statements apply within any octant:

(a) the number of points per octant is given by

$$M(n) = n(n+2)/8 \qquad (5)$$

(b) the points are arranged in a triangular pattern with n/2 different levels and n/2 - i + 1 points on the ith level.

(c) if a point Ω_m (μ_m, η_m, ξ_m) is contained in the basic quadrature set, so are all points that can be constructed by permutating its components. Such permutation groups fall into classes of 1, 3, or 6 points each and within a given class, all points have the same weight. This condition is known as rotational symmetry.

This describes a completely symmetric quadrature set, one that exhibits no bias toward any particular direction. Calling to mind the triangular pattern mentioned in 5b above, note that the levels may be numbered from one of the three sides of the octant to the opposite corner or pole. These levels may be regarded as lines on the surface of the unit sphere, in this case, latitudinal lines that subtend (from

the center of the sphere) a constant angle with the companion pole. A point in the set, Ω_m, can be given three level indices, call them i, j, and k, one with respect to each of the three poles. It can be shown (by induction)[4] that

$$i + j + k = n/2 + 2 \tag{6}$$

In the level symmetric case (LQ_n), the components μ_m, η_m, ξ_m are chosen from the same set of n/2 cosines, θ_i, i = 1, 2, ... n/2. Hence, if i, j, and k are the level indicies for Ω_m, Equation 2 becomes

$$\theta_i^2 + \theta_j^2 + \theta_k^2 = 1 \ . \tag{7}$$

Making use of rotation-reflection invariance, Lee has shown[4] that Equations 6 and 7 will yield the relation

$$\theta_i^2 = \theta_1^2 + (i-1)\Delta \tag{8}$$

where

$$\Delta = 2(1-3\theta_1^2)/(n-2) \tag{9}$$

This result is very important and can be verified by substitution into Equation 7 as follows:

$$1 = \theta_i^2 + (i-1)\Delta + \theta_i^2 + (j-1)\Delta + \theta_i^2$$

$$+ (k-1)\Delta = 3\theta_i^2 + (i+j+k-3)\Delta \tag{10}$$

Using Equation 6,

$$1 = 3\theta_1^2 + (n/2+2-3)\Delta = 3\theta_1^2 + (n/2-1)\Delta \ . \tag{11}$$

No SYM	Half SYM	Complete SYM
	S_6	
6	1	1
5 3	2 4	2 2
4 2 1	3 2 1	1 2 1
	S_8	
10	1	1
9 6	2 5	2 2
8 5 3	3 6 5	2 3 2
7 4 2 1	4 3 2 1	1 2 2 1
	S_{10}	
15	1	1
14 10	2 6	2 2
13 9 6	3 7 9	3 4 3
12 8 5 3	4 8 7 6	2 4 4 2
11 7 4 2 1	5 4 3 2 1	1 2 3 2 1

Fig. 1. Point Numbering Schemes for Different SYM Options. Points in the principal octant.

Solving for Δ gives,

$$\Delta = (1-3\theta_1^2)/(n/2-1) = 2(1-3\theta_1^2)/(n-2) \tag{12}$$

which is Equation 9.
Thus, the condition of complete symmetry fixes all θ's except θ_1 and the freedom of Gaussian quadrature is not present.

Given θ_1, the remaining direction cosines are determined from Equations 8 and 9. Although the value of θ_1 determines how the points are clustered, its magnitude is somewhat arbitrary ($0 \leq \theta_1^2 \leq \frac{1}{3}$). The points will possess the required symmetry regardless of the value of θ_1. Lee derived a prescription for θ_1 to be $\theta_1^2 = \frac{1}{3(n-1)}$.

With the μ's and η's determined, all that remains is to solve for the point weights. Carlson, writing in 1971,[5] makes use of "even angular moments" to solve for the needed point weights. This amounts to double moments involving the weights, μ's and η's, and is an expansion of a technique developed by Carlson for one-dimensional quadrature sets. Thus,

$$b_{k,\ell} = \sum_{\eta}^{\#\ wts.} P_m \mu_i^k \eta_j^\ell \tag{13}$$

for some set of pairs (k,ℓ) (k and ℓ even), where

$$b_{k,\ell} = \frac{2}{\pi} \int_0^1 \int_0^{\pi/2} \mu^k \eta^\ell d\phi d\mu \tag{14}$$

with

$$\eta = \sqrt{1-\mu^2} \cos\phi$$
$$\xi = \sqrt{1-\mu^2} \cos\phi \tag{15}$$

which relate ϕ to η and ξ. Because μ and η come from the same set of numbers, they are interchangeable and thus we need only include (k,ℓ) combinations for which $k \geq \ell$. No even moments involving all three components need to be considered because any even power of a third component can be expressed in terms of even powers of the two.

Integrating Equation 15 with arbitrary k and ℓ gives,

$$b_{k,\ell} = 1/2\ \Gamma\left(\frac{k+1}{2}\right)\ \Gamma\left(\frac{\ell+1}{2}\right) \Big/ \Gamma(1/2)\ \Gamma\left(\frac{k+\ell+3}{2}\right) \qquad (18)$$

where $\Gamma(1/2) = \sqrt{\pi}$ and $\Gamma(x) = (x-1)\ \Gamma(x-1)$. For k and ℓ even, Equation 18 becomes

$$b_{k,\ell} = \frac{1}{k+1}\left(\frac{1}{k+3}\ \frac{1}{k+5}\ \frac{1}{k+7}\ \cdots\ \frac{\ell-1}{k+\ell+1}\right) \qquad (19)$$

where the bracket is set to unity if $\ell = 0$. Equation 14 is linear with respect to the point weights and by choosing various appropriate combinations of (k,ℓ), a system of simultaneous linear equations are produced; the system can then (theoretically) be solved. This brings us to the discussion of the DOQDP code itself.

DOQDP

Theoretical Considerations

DOQDP is an acronym for discrete ordinates quadratures double precision. It is basically a modification of the DOQ code which was itself adapted by Westinghouse Astronuclear from the SNAFU code originally developed by J. Penland and F. R. Mynatt[6] at ORNL.

Completely symmetric quadrature sets are those in which μ, η, and ξ are chosen from the set of cosines determined by Equations 8 and 9. Half-symmetric quadratures are those in which μ and η are chosen from the same set of cosines with values for ξ determined by Equations 2 and 6. A common procedure is to choose the values for μ and η to be the

roots of the Legendre polynomial of order n. Non-symmetric quadratures are those in which values for μ, η, and ξ are each chosen from a different set of cosines.

DOQDP is used to generate a weight for each direction determined by the appropriate μ, η, and ξ. For other than completely symmetric quadratures, values for μ and η must be supplied as input. Given a set of μ's and η's, the point weights are determined using Equations 13 and 19.

Depending on the symmetry option, some directions may be constrained to have equal weights. Figure 1 shows the direction arrays with prints of equal weights assigned a common number; e.g., all directions having the number 3 have a common weight.

The number of unknowns for a given n and symmetry condition is given by

$$\text{No-symmetry} = n(n+2)/8, \tag{20}$$

$$\text{Half-symmetry} = n(n+4)/16^{*}, \text{ and} \tag{21}$$

$$\text{Complete-symmetry} = n(n+8)/48^{*} \tag{22}$$

where the asterisk denotes rounding to the next higher integer if the result is not integral.

Equations 14 and 19 may be written in matrix form as

$$\underline{A}P = B,$$

where

$\underline{A}$ is the matrix of elements formed from Equation 13,

P is the column vector of unknown point weights, and

B is the column vector of elements formed from Equation 19.

The particular values of k and ℓ inherent in Equation 23 are arbitrary except that k and ℓ must both be even and $k + \ell < n$. DOQDP will determine which (k,ℓ) pairs are used to generate Equation 23 unless the user chooses to supply these values as input.

Code Structure and Improvements

DOQDP represents a major modification of the DOQ code that it replaces and, it is believed, a major improvement. DOQDP is faster and more versatile than its predecessor while at the same time it is more accurate. A word about how this was accomplished is in order.

With regard to speed, DOQ used Equation 18 to store values for $b_{k,\ell}$ that required four calls to the Gamma functions for each moment desired. Since it is known that ℓ and m will always be even, Equation 19 can be substituted for Equation 18 and the subsequent code is both shorter and faster. Also, the interative routine for solving the system of simultaneous equations stored a matrix on tape and then renewed the matrix after each iteration. The tape was replaced by a fixed-dimension array which can be enlarged if needed and on one run, the number of I/O requests dropped from 383 to 15. Similarly, the cpu time was better than cut in half.

As for flexibility, FIDO output option was added to the code. Thus, the user can choose from four possible output combinations: (1) just print, no punch; (2) print plus ANISN-W type punch; (3) print plus ADOQ or DOT-II with punch; and (4) print plus FIDO punch. FIDO, of course, is used as input to DOT-III and several other codes.

Further improvement could be realized in the area of solving the system of simultaneous equations. The current routines (ISUDS and DSIMEQ) fail for high n. So far, an alternative routine which performs better has not been found.

Input Data Description

All data are input from cards and are read using either a right-justified I 12 integer format or an E12.7 real format.

Appendix A describes the input data required to run DOQDP.

Description of Printed Output

The output of DOQDP is as follows:

(1) The amount of storage used in the calculation (i.e., the total number of locations used from the common block)

(2) A list of the Mu's (μ's)

(3) A list of the L and M combinations used for moment equations

(4) The point diagram used

(5) The maximum elementwise error by iteration in solving the simultaneous system

(6) The order of the quadrature

(7) A tabulation of the initial directions (the Mu's that correspond to zero weights)

(8) A tabulation of the point weights derived from solving the system of simultaneous equations

(9) A comparison of results from equations 16 and 20 (labeled "Gamma Expression")

(10) Finally, a listing of the quadrature set itself.

A sample of the output is shown in Fig. 2.

Description of Punched Output

Cards are punched by DOQDP if IDEM = 1, 2, or 3. No cards are punched if IDEM = -1, -2, or -3. (-2 and -3 are equivalent). If IDEM = 1, the output is as follows: (1) a 6U card (6 in col. 2, U in Col. 3); (2) quadrature weights, 6F12.9 format; (3) A 7U card (as above); and (4) quadrature direction cosines, 6F12.9 format.

```
DATA STORAGE REQUIREMENT =      257

MU( 1) = 8.81917128890-01
MU( 2) = 3.3333330000-01

EQUATIONS USED            L          M
                          0          0
                          2          0

POINT DIAGRAM

    1
    2    1


ITERATION CONVERGENCE
 ERROR = 9.66667D-01
 ERROR = 1.24900D-16

 S  4 CONSTANTS

 INITIAL DIRECTIONS
 9.42809053D-01
 4.71404474D-01

POINT          POINT WEIGHT          POINT WEIGHT/2          POINT WEIGHT/4
    1           3.33333333D-01          1.66666667D-01          8.33333333D-02
    2           3.33333333D-01          1.66666667D-01          8.33333330-02

   L     M          SUM              GAMMA EXPR
   0     0    1.00000000D 00     1.00000000D 00
   2     0    3.33333333D-01     3.33333330-01
```

M	MU	ETA	WEIGHT
1	-4.71404474D-01	-8.81917129D-01	0.0
2	-3.33333300D-01	-8.81917129D-01	8.33333333D-02
3	3.33333300D-01	-8.81917129D-01	8.33333333D-02
4	-9.42809053D-01	-3.33333300D-01	0.0
5	-8.81917129D-01	-3.33333300D-01	8.33333333D-02
6	-3.33333300D-01	-3.33333300D-01	8.33333333D-02
7	3.33333300D-01	-3.33333300D-01	8.33333333D-02
8	8.81917129D-01	-3.33333300D-01	8.33333333D-02
9	-4.71404474D-01	8.81917129D-01	0.0
10	-3.33333300D-01	8.81917129D-01	8.33333333D-02
11	3.33333300D-01	8.81917129D-01	8.33333333D-02
12	-9.42809053D-01	3.33333300D-01	0.0
13	-8.81917129D-01	3.33333300D-01	8.33333333D-02
14	-3.33333300D-01	3.33333300D-01	8.33333333D-02
15	3.33333300D-01	3.33333300D-01	8.33333333D-02
16	8.81917129D-01	3.33333300D-01	8.33333333D-02

Fig. 2. Sample Output of DOQDP.

For IDEM = 2, the output is as follows:

(1) a 7U card
(2) Mu's, 6F12.9 format
(3) Eta's, 6F12.9 format
(4) A T card
(5) A 6U card
(6) Weights, 6F12.9 format
(7) A T card.

For IDEM = 3, the output is as follows:

(1) A title card (FIDO comment)
(2) A 7* card
(3) Mu's
(4) Eta's
(5) A T card
(6) A 6* card
(7) Weights
(8) A T card.

PART II. COMMON QUADRATURES AND THE QUADRATURE LIBRARY

P. J. Erickson, M. L. Williams, and W. A. Rhoades

The purpose of this part of the study was to generate a quadrature library containing the discrete ordinates quadrature sets (R-Z, X-Y, R-θ) commonly used by radiation transport computer codes at ORNL. This required the generation of half-symmetric and biased sets to be combined with previously produced fully symmetric sets (see Part I), as well as the development of a control program to create and access the library.

The first section of this part is a description of the various types of quadrature sets found in the library. The second section describes the contents of the library and tells how to access it.

Quadrature Sets

The direction variable $\vec{\Omega}$ in a radiation transport calculation is defined by its direction cosines in an orthagonal coordinate frame which is locally aligned with respect to the unit vectors of the geometrical coordinate system. The possible orientations of the angular direction vector $\vec{\Omega}$ define a unit sphere in (μ,η,ξ) space. In a discrete ordinates calculation, this continuous direction space is represented by a discrete set of vectors known as the "discrete ordinates directional quadrature set:"

$$\hat{\Omega}_m = (\mu_m, \eta_m, \xi_m) ,$$

with the constraint

$$\mu_m^2 + \eta_m^2 + \xi_m^2 = 1.0$$

The "weights" of the quadrature set, Pm, are proportional to the areas subtended by the solid angles associated with the specified directions. They correspond to fractions of the total surface area of the unit sphere and are generally positive with the normalization

$$\sum_m P_m = 1.0$$

Proper ordering of the directions is essential. For the DOT code and certain other codes, all directions with common η must be grouped together in order of increasing μ. Each such group must have, as its first member, an arbitrary boundary direction for which $\xi = 0$. Thus, for a given η:

$$\mu_0 = \sqrt{1 - \eta^2}$$

These directions are assigned weight = 0. All negative η's must preceed all positive η's. In a two-dimensional code, only 4 octants are considered, the others being redundant.

Full Symmetry

Fully symmetric quadrature sets are those exhibiting complete rotational symmetry; i.e., the discrete (μ_i, η_i, ξ_i) coordinates chosen to represent the direction vectors are required to be invariant under all 90 degree rotations about the μ, η, or ξ axis. Hence, each set of μ, η, ξ, coordinates must be symmetric with respect to the origin; and, further, the set of projected points Θ_i on each axis must be the same. These conditions dictate that quadratures weights also be chosen in a symmetric fashion.

All Θ_i except Θ_1 are determined by the complete symmetry requirement and the fact that $\mu^2 + \eta^2 + \xi^2 = 1$. The selection of familiar Gaussian quadrature is not allowed, since choosing μ_i and η_i to be Legendre zeros, automatically sets

$$\xi_i = \sqrt{1 - \mu_i^2 - \eta_i^2}$$

which is not a Gaussian set; and therefore, the Gaussian directions are not fully symmetric.

The fully symmetric sets contained in the generated quadrature library are the S2, S4, S6, S8, S10, S12, S14, S16 sets and are taken from Part I of this report. For more information on fully symmetric quadrature sets, see Part I.

No Symmetry and Half Symmetry

Complete symmetry is required only in three-dimensional geometries. In lower dimensional geometries, a relaxation of symmetry requirements allows additional degrees of freedom.

A simple such relaxation is to keep the point and level arrangement of complete symmetry while allowing the points on each axis to be chosen

from an independent set; the only requirement being that the points lie on the unit sphere; i.e.,

$$\mu^2 + \eta^2 + \xi^2 = 1$$

This corresponds to a "no symmetry" condition.

The "half symmetry" condition requires rotational symmetry about one axis only, so that $\mu_i^2 = \eta_i^2$, and $\xi_i = \sqrt{1 - \mu_i^2 - \eta_i^2}$. Thus half symmetric quadrature sets are those which are invariant for 90° rotations only about the ξ axis. (Note the contrast to fully symmetric sets that exhibit rotational invariance about all three axes).

Unlikely fully symmetric sets, the Θ's of a half symmetric set can be arbitrarily chosen. For a S_n half symmetric set, they are usually chosen to be the zeros of a N^{th} degree Legendre polynomial, and such was the case for the present work.

Half symmetric quadrature sets contained in the quadrature library are the S4, S6, S8, and S10 sets and were generated by using the DOQDP code as described in Reference 1. The N/2 positive roots of the N^{th} order Legendre polynomial (input in descending order) were input as the values for Θ.

Biased Quadrature Sets

Biased quadrature sets are those quadrature sets which do not have an equal number of directions in the positive and negative domain of one of the variables; i.e., they are "biased" by having a larger number of directions in some portion of the unit sphere.

These sets are used when the neutron flow is highly anistropic in some preferred direction. The biased quadrature sets contained in the quadrature library are the 100, 166, and 210 direction downward biased sets and the 100, 166, and 210 direction upward biased sets.

100-Direction Biased Sets. The 100 direction sets contain 65 directions in the biased hemisphere and 35 directions in the unbiased hemisphere. The directions in the unbiased hemisphere were taken from the S10 half symmetric set. The directions in the biased hemisphere are also from the S10 half symmetric set; however, the first eta level, containing three points, has been replaced by 11 new levels, each containing three points. These 11 replacement levels were taken from a high order one-dimensional quadrature set.

166-Direction Biased Sets. The 166 direction sets contain 131 directions in the biased hemisphere and 35 directions in the unbiased hemisphere. The directions in the unbiased hemisphere were again taken from the S10 half symmetric set. The directions in the biased hemisphere are from a S10 half symmetric set, in which the first eta level, containing three points, has been replaced by 11 new levels, each containing nine points. These 11 new levels are again taken from a high order one-dimensional quadrature set.

210-Direction Biased Sets. The 210 direction sets contain 153 directions in the biased hemisphere and 57 directions in the unbiased hemisphere. They are found exactly like the 166 direction sets with one addition: the last eta level of both the biased and unbiased hemisphere, containing 11 points, is replaced by three new levels, each containing 11 points.

R-Theta Quadrature Sets

The quadrature library described in this report also contains the S2, S4, S6, S8, S10, S12, S14, and S16 R-θ quadrature sets.

An R-θ quadrature set is a set where the μ and ξ angles are specified instead of the μ and η angles; i.e., it corresponds to a slice through an infinite cylinder.

Since $\mu^2 + \eta^2 + \xi^2 = 1$, given any two of the angles, the third one can be found. Thus a R-Θ quadrature set is actually the same as its counterpart R-Z quadrature set except that μ and ξ are used to specify the direction vector instead of μ and η. The direction ordering is not changed. The value of ξ is stored in the position normally occupied by η in data files and listings.

The R-Θ sets in this report were generated from the S2, S4, S6, S8, S10, S12, S14, and S16 fully symmetric R-Z quadrature sets. Note that the ξ's for the zero-weight points are equal to ± 0.00001.

Theoretically, the ξ's should be zero at these points but certain computer code restrictions (e.g., in DOT) require them to be non-zero.

Quadrature Library

The quadrature library which has been generated contains twenty six different quadrature sets of types described in previous sections of this report. This section will describe the exact contents of this library and the necessary information to access each of the quadrature sets. Appendix B describes the computer program which generated the quadrature library.

The table below gives a list of all quadrature sets in the library and information necessary to access them.

Quadrature Set	Data Set Name (DSN)	Logical Unit Number	Data Set Sequence Number
S2 Symmetric	S2SYM	8	1
S4 Symmetric	S4SYM	9	2
S6 Symmetric	S6SYM	10	3
S8 Symmetric	S8SYM	11	4
S10 Symmetric	S10SYM	12	5
S12 Symmetric	S12SYM	13	6
S14 Symmetric	S14SYM	14	7
S16 Symmetric	S16SYM	15	8
S4 Half Symmetric	S4HSYM	16	9
S6 Half Symmetric	S6HSYM	17	10
S8 Half Symmetric	S8HSYM	18	11
S10 Half Symmetric	S10HSYM	19	12
100 Angle Biased Down	BDN100	20	13
100 Angle Biased Up	BUP100	21	14
166 Angle Biased Down	DDN166	22	15
166 Angle Biased Up	BUP210	23	16
210 Angle Biased Down	BDN210	24	17
210 Angle Biased Up	BUP210	25	18
S2 R-θ	S2RTH	26	19
S4 R-θ	S4RTH	27	20
S6 R-θ	S6RTH	28	21
S8 R-θ	S8RTH	29	22
S10 R-θ	S10RTH	30	23
S12 R-θ	S12RTH	31	24
S14 R-θ	S14RTH	32	25
S16 R-θ	S16RTH	33	26

The quadrature library is presently available on tape with each quadrature set existing as a separate data set with a different logical unit number. The data sets are written in standard interface file format for S_n constants as set forth on Pages 39-40 of Reference 3.

A separate DD card must be included to access each of the quadrature sets. A sample DD card for the S2 symmetric set follows:

```
//GO.FT[08]F002  DD DSN=[S2SYM],VOL=SER=X12163,DISP=OLD,UNIT=TAPE9,
                                                LABEL=[1]
```

LOGICAL UNIT NUMBER

DATA SET NAME

DATA SET SEQUENCE NUMBER

To access any of the other sets, simply include a similar DD card and substitute the appropriate logical unit number, data set name, and data set sequence number. The set can then be read by using the logical unit number in a FORTRAN READ statement.

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7. Standard Interface Files and Procedures for Reactor Physics Codes, Version III LA-5486-MS, compiled by B. M. Carmichael.

APPENDIX A. DOQDP INPUT DATA DESCRIPTION

Card #	Format	Column	Variable Name	Description
1	(20A4)	1-80	Title	
2	(6I12)	1-12	NQD	Order of quadrature desired (even integer - 2/4/6/ etc; $S_2/S_4/S_6$ etc).
		13-24	ISYM	Symmetry condition option (see earlier comments): ISYM = 1 no symmetry, ISYM = 2 half symmetry (suggested option), ISYM = 3 complete symmetry.
		25-26	LMRD	Moment equation option: LMRD = 0 Use internally determined moment equations, LMRD = 1 User will input own moments,
		37-48	IET	Eta option: IET = 0 Set $\eta_j = \mu_j$ for all i's (suggested option), IET = 1 read in values for η.
		49-60	NMU	Mu option: NMU = 0 read in all μ_i's, NMU = 1 read in only μ_1 (usually $\mu_1 = 1/\sqrt{3(n-1)}$, and calculate all other μ_i's from eqns 2 and 3.
		61-72	IDEM	Punch and geometry option: IDEM = 1 1-D calculation (ANISN-W), IDEM = 2 2-D calculation (ADOQ or DOT II-W), IDEM = 3 2-D calculation (FIDO) If IDEM is negative (ie -1, -2, -3) no cards will be punched.
3	(6G12.7)	1-12,13-24 etc.	MU(I)	Enter values for μ_i as follows: If NMU = 0, enter values; If NMU = 1, enter μ_1 only.
4	(6E12.7)	1-12,13-24 etc.	ETA(J)	Enter values for η_i as follows: If IET = 0, omit this card; If IET = 1, enter NQD/2 values.
5	(2I12)	1-12, 13-24	LR(I),MR(I)	Power of μ and η to be used in the ith moment eqn. Omit if LMRD = 0 else, one card per equation.

Typically,

NQD - varies
ISYM = 2
LMRD = 0
IET = 0
NMU = 1
IDEM = +3
Mu(1) = $1/\sqrt{3(n-1)}$

cards 4 and 5 are omitted

APPENDIX B. PROGRAM TO GENERATE QUADRATURE LIBRARY

This appendix describes the program which generated the quadrature library. The program reads the quadrature sets in FIDO format and outputs them as separate data sets (with different logical unit numbers) on tape. Each data set is written according to the standard interface file format for S_n constants listed on Pages 39-40 of Reference 7. The program input description follows below.

	VARIABLE	FORMAT
CARD #1	HNAME	A6
CARD #2	HUSE(1),HUSE(2),IVERS,NDIM,FILE	2A6,3I4
	NDIR	5$ FIDO ARRAY
	DIRMU(I),I=1,NDIR	7* FIDO ARRAY
	*DIRETA(I),I=1,NDIR	
	DIRWGT(I),I=1,NDIR	6* FIDO ARRAY

*Omit if quadrature set is 1D

Repeat this sequence (except first card) for each quadrature set. The program is set up to handle 26 different sets with logical unit numbers 8-33.

A description of the input variable names is listed below.

VARIABLE NAME	DESCRIPTION
HNAME	File name
HUSE	User Identification
IVERS	File Version Number
NDIM	Number of Dimensions
NDIR	Number of Directions
DIRWGT	Direction Weights
DIRMU	Direction Mu's
DIRETA	Direction Eta's
FILE	Logical Unit Number

The program is designed to write either a one-dimensional or two-dimensional quadrature set depending on the value of NDIM. A list of the program follows. Note that when running the program, the FIDO subroutine must also be included.

```
      COMMON D(1000)
C
C  CALL SUBROUTINE WHICH READS QUADRATURE SETS
      CALL INPUT
C
      STOP
      END
```

```
      SUBROUTINE INPUT
      COMMON L1,L2,L3,L4,L5,L6,L7,L8,NDIR
      COMMON/COM2/ HNAME,HUSE,IVERS,NDIM
      REAL*8 HUSE(2),HNAME
      INTEGER*4 FILE
      DIMENSION D(1)
      EQUIVALENCE (D(1), L1)
      READ(5,500) HNAME
C
C  SET 5$ AND 6* POINTERS
      L5 =9
      L6 = 10
5     READ(5,505,END=50) HUSE,IVERS,NDIM,FILE
      WRITE(6,510) HUSE,IVERS,NDIM,FILE
C
C  READ 5$ ARRAY INTO NDIR
      CALL FIDO (1, NER, 5, 6)
C
C  DETERMINE IF QUADRATURE SET IS 1-D OR 2-D
      IF (NDIM .EQ. 2) GOTO 10
      IF (NDIM .NE. 1) GOTO 15
C
C  SET POINTERS FOR 1-D SET
      L7 = L6 + NDIR
      L8 = L7 + NDIR
C
C  READ 6* AND 7# ARRAYS CONTAINING WEIGHT'S AND MU'S OF 1-D SET
      CALL FIDO(1,NER,5,6)
      CALL FIDO(1,NER,5,6)
C
C  CALL TAPE OUTPUT SUBROUTINE FOR 1-D SETS
      CALL TAPE1D(D(L6),D(L7),NDIR,FILE)
      GOTO 5
C
C  SET POINTERS FOR 2-D SET
10    L7 = L6 + NDIR
      L8 = L7 + 2*NDIR
C
C  READ 6* AND 7* ARRAYS CONTAINING WEIGHT'S, MU'S AND ETA'S OF 2-D SET
      CALL FIDO (1, NER, 5, 6)
      CALL FIDO (1, NER, 5, 6)
C
C  CALL TAPE OUTPUT SUBROUTINE FOR 2-D SETS
      CALL TAPE2D(D(L6),D(L7),NDIR,FILE)
      GOTO 5
C
C  WRITE ERROR MESSAGE IF NDIM DOT EQUAL TO 1 OR 2
15    WRITE(6,515) NDIM
      STOP
```

```
C
50      RETURN
500     FORMAT(A6)
505     FORMAT(2A6,3I4)
510     FORMAT('0',2A6,3I4)
515     FORMAT('***ERROR*** NDIM = ',I3)
        END
```

```
        SUBROUTINE TAPE1D(DIRWGT,DIRMU,NDIR,FILE)
        REAL*4 DIRWGT(1),DIRMU(1)
        REAL*8 HUSE(2),HNAME
        INTEGER*4 FILE
        COMMON/COM2/HNAME,HUSE,IVERS,NDIM
C
C   WRITE 1-D QUADRATURE SET ON TAPE
        WRITE(FILE) HNAME,HUSE,IVERS
        WRITE(FILE) NDIM,NDIR,IDUM,IDUM
        WRITE(FILE)(DIRWGT(I),I=1,NDIR),(DIRMU(I),I=1,NDIR)
        ENDFILE FILE
        REWIND FILE
        RETURN
        END
```

```
        SUBROUTINE TAPE2D(DIRWGT,DIRME,NDIR,FILE)
        REAL*4 DIRWGT(1),DIRME(1)
        REAL*8 HUSE(2),HNAME
        INTEGER*4 FILE
        COMMON/COM2/ HNAME,HUSE,IVERS,NDIM
C
C   WRITE 2-D QUADRATURE SET ON TAPE
        WRITE(FILE) HNAME,HUSE,IVERS
        WRITE(FILE) NDIM,NDIR,IDUM,IDUM
        WRITE(FILE)(DIRWGT(I),I=1,NDIR),(DIRME(I),I=1,NDIR),
       +(DIRME(NDIR+I),I=1,NDIR)
        ENDFILE FILE
        REWIND FILE
        RETURN
        END
```

APPENDIX C. LISTING OF QUADRATURE SETS

This appendix consists of a list of all quadrature sets contained in the library.

S2 Symmetric

	MU	ETA	WEIGHT
1	-0.81650E 00	-0.57735E 00	0.0
2	-0.57735E 00	-0.57735E 00	0.25000E 00
3	0.57735E 00	-0.57735E 00	0.25000E 00
4	-0.81650E 00	0.57735E 00	0.0
5	-0.57735E 00	0.57735E 00	0.25000E 00
6	0.57735E 00	0.57735E 00	0.25000E 00

S4 Symmetric

	MU	ETA	WEIGHT
1	-0.47140E 00	-0.88192E 00	0.0
2	-0.33333E 00	-0.88192E 00	0.83333E-01
3	0.33333E 00	-0.88192E 00	0.83333E-01
4	-0.94281E 00	-0.33333E 00	0.0
5	-0.88192E 00	-0.33333E 00	0.83333E-01
6	-0.33333E 00	-0.33333E 00	0.83333E-01
7	0.33333E 00	-0.33333E 00	0.83333E-01
8	0.88192E 00	-0.33333E 00	0.83333E-01
9	-0.47140E 00	0.88192E 00	0.0
10	-0.33333E 00	0.88192E 00	0.83333E-01
11	0.33333E 00	0.88192E 00	0.83333E-01
12	-0.94281E 00	0.33333E 00	0.0
13	-0.88192E 00	0.33333E 00	0.83333E-01
14	-0.33333E 00	0.33333E 00	0.83333E-01
15	0.33333E 00	0.33333E 00	0.83333E-01
16	0.88192E 00	0.33333E 00	0.83333E-01

S6 Symmetric

	MU	ETA	WEIGHT
1	-0.36515E 00	-0.93095E 00	0.0
2	-0.25820E 00	-0.93095E 00	0.41667E-01
3	0.25820E 00	-0.93095E 00	0.41667E-01
4	-0.73030E 00	-0.68313E 00	0.0
5	-0.68313E 00	-0.68313E 00	0.41667E-01
6	-0.25820E 00	-0.68313E 00	0.41667E-01
7	0.25820E 00	-0.68313E 00	0.41667E-01
8	0.68313E 00	-0.68313E 00	0.41667E-01
9	-0.96609E 00	-0.25820E 00	0.0
10	-0.93095E 00	-0.25820E 00	0.41667E-01
11	-0.68313E 00	-0.25820E 00	0.41667E-01
12	-0.25820E 00	-0.25820E 00	0.41667E-01
13	0.25820E 00	-0.25820E 00	0.41667E-01
14	0.68313E 00	-0.25820E 00	0.41667E-01
15	0.93095E 00	-0.25820E 00	0.41667E-01
16	-0.36515E 00	0.93095E 00	0.0
17	-0.25820E 00	0.93095E 00	0.41667E-01
18	0.25820E 00	0.93095E 00	0.41667E-01

S6 Symmetric (Cont.)

19	-0.73030E 00	0.68313E 00	0.0
20	-0.68313E 00	0.68313E 00	0.41667E-01
21	-0.25820E 00	0.68313E 00	0.41667E-01
22	0.25820E 00	0.68313E 00	0.41667E-01
23	0.68313E 00	0.68313E 00	0.41667E-01
24	-0.96609E 00	0.25820E 00	0.0
25	-0.93095E 00	0.25820E 00	0.41667E-01
26	-0.68313E 00	0.25820E 00	0.41667E-01
27	-0.25820E 00	0.25820E 00	0.41667E-01
28	0.25820E 00	0.25820E 00	0.41667E-01
29	0.68313E 00	0.25820E 00	0.41667E-01
30	0.93095E 00	0.25820E 00	0.41667E-01

S8 Symmetric

	MU	ETA	WEIGHT
1	-0.30861E 00	-0.95119E 00	0.0
2	-0.21822E 00	-0.95119E 00	0.30247E-01
3	0.21822E 00	-0.95119E 00	0.30247E-01
4	-0.61721E 00	-0.78680E 00	0.0
5	-0.57735E 00	-0.78680E 00	0.22685E-01
6	-0.21822E 00	-0.78680E 00	0.22685E-01
7	0.21822E 00	-0.78680E 00	0.22685E-01
8	0.57735E 00	-0.78680E 00	0.22685E-01
9	-0.81650E 00	-0.57735E 00	0.0
10	-0.78680E 00	-0.57735E 00	0.22685E-01
11	-0.57735E 00	-0.57735E 00	0.23148E-01
12	-0.21822E 00	-0.57735E 00	0.22685E-01
13	0.21822E 00	-0.57735E 00	0.22685E-01
14	0.57735E 00	-0.57735E 00	0.23148E-01
15	0.78680E 00	-0.57735E 00	0.22685E-01
16	-0.97590E 00	-0.21822E 00	0.0
17	-0.95119E 00	-0.21822E 00	0.30247E-01
18	-0.78680E 00	-0.21822E 00	0.22685E-01
19	-0.57735E 00	-0.21822E 00	0.22685E-01
20	-0.21822E 00	-0.21822E 00	0.30247E-01
21	0.21822E 00	-0.21822E 00	0.30247E-01
22	0.57735E 00	-0.21822E 00	0.22685E-01
23	0.78680E 00	-0.21822E 00	0.22685E-01
24	0.95119E 00	-0.21822E 00	0.30247E-01
25	-0.30861E 00	0.95119E 00	0.0
26	-0.21822E 00	0.95119E 00	0.30247E-01
27	0.21822E 00	0.95119E 00	0.30247E-01
28	-0.61721E 00	0.78680E 00	0.0
29	-0.57735E 00	0.78680E 00	0.22685E-01
30	-0.21822E 00	0.78680E 00	0.22685E-01
31	0.21822E 00	0.78680E 00	0.22685E-01
32	0.57735E 00	0.78680E 00	0.22685E-01
33	-0.81650E 00	0.57735E 00	0.0
34	-0.78680E 00	0.57735E 00	0.22685E-01
35	-0.57735E 00	0.57735E 00	0.23148E-01
36	-0.21822E 00	0.57735E 00	0.22685E-01
37	0.21822E 00	0.57735E 00	0.22685E-01
38	0.57735E 00	0.57735E 00	0.23148E-01
39	0.78680E 00	0.57735E 00	0.22685E-01
40	-0.97590E 00	0.21822E 00	0.0
41	-0.95119E 00	0.21822E 00	0.30247E-01
42	-0.78680E 00	0.21822E 00	0.22685E-01
43	-0.57735E 00	0.21822E 00	0.22685E-01
44	-0.21822E 00	0.21822E 00	0.30247E-01
45	0.21822E 00	0.21822E 00	0.30247E-01
46	0.57735E 00	0.21822E 00	0.22685E-01
47	0.78680E 00	0.21822E 00	0.22685E-01
48	0.95119E 00	0.21822E 00	0.30247E-01

S10 Symmetric

	MU	ETA	WEIGHT
1	-0.272176 00	-0.962256 00	0.0
2	-0.192456 00	-0.962256 00	0.230016-01
3	0.192456 00	-0.962256 00	0.230016-01
4	-0.544336 00	-0.838876 00	0.0
5	-0.509186 00	-0.838876 00	0.174686-01
6	-0.192456 00	-0.838876 00	0.174686-01
7	0.192456 00	-0.838876 00	0.174686-01
8	0.509186 00	-0.838876 00	0.174686-01
9	-0.720086 00	-0.693896 00	0.0
10	-0.693896 00	-0.693896 00	0.123466-01
11	-0.509186 00	-0.693896 00	0.130516-01
12	-0.192456 00	-0.693896 00	0.123466-01
13	0.192456 00	-0.693896 00	0.123466-01
14	0.509186 00	-0.693896 00	0.130516-01
15	0.693896 00	-0.693896 00	0.123466-01
16	-0.860666 00	-0.509186 00	0.0
17	-0.838876 00	-0.509186 00	0.174686-01
18	-0.693896 00	-0.509186 00	0.130516-01
19	-0.509186 00	-0.509186 00	0.130516-01
20	-0.192456 00	-0.509186 00	0.174686-01
21	0.192456 00	-0.509186 00	0.174686-01
22	0.509186 00	-0.509186 00	0.130516-01
23	0.693896 00	-0.509186 00	0.130516-01
24	0.838876 00	-0.509186 00	0.174686-01
25	-0.981316 00	-0.192456 00	0.0
26	-0.962256 00	-0.192456 00	0.230016-01
27	-0.838876 00	-0.192456 00	0.174686-01
28	-0.693896 00	-0.192456 00	0.123466-01
29	-0.509186 00	-0.192456 00	0.174686-01
30	-0.192456 00	-0.192456 00	0.230016-01
31	0.192456 00	-0.192456 00	0.230016-01
32	0.509186 00	-0.192456 00	0.174686-01
33	0.693896 00	-0.192456 00	0.123466-01
34	0.838876 00	-0.192456 00	0.174686-01
35	0.962256 00	-0.192456 00	0.230016-01
36	-0.272176 00	0.962256 00	0.0
37	-0.192456 00	0.962256 00	0.230016-01
38	0.192456 00	0.962256 00	0.230016-01
39	-0.544336 00	0.838876 00	0.0
40	-0.509186 00	0.838876 00	0.174686-01
41	-0.192456 00	0.838876 00	0.174686-01
42	0.192456 00	0.838876 00	0.174686-01
43	0.509186 00	0.838876 00	0.174686-01
44	-0.720086 00	0.693896 00	0.0
45	-0.693896 00	0.693896 00	0.123466-01
46	-0.509186 00	0.693896 00	0.130516-01
47	-0.192456 00	0.693896 00	0.123466-01
48	0.192456 00	0.693896 00	0.123466-01
49	0.509186 00	0.693896 00	0.130516-01
50	0.693896 00	0.693896 00	0.123466-01
51	-0.860666 00	0.509186 00	0.0
52	-0.838876 00	0.509186 00	0.174686-01
53	-0.693896 00	0.509186 00	0.130516-01
54	-0.509186 00	0.509186 00	0.130516-01
55	-0.192456 00	0.509186 00	0.174686-01
56	0.192456 00	0.509186 00	0.174686-01
57	0.509186 00	0.509186 00	0.130516-01
58	0.693896 00	0.509186 00	0.130516-01
59	0.838876 00	0.509186 00	0.174686-01
60	-0.981316 00	0.192456 00	0.0
61	-0.962256 00	0.192456 00	0.230016-01
62	-0.838876 00	0.192456 00	0.174686-01
63	-0.693896 00	0.192456 00	0.123466-01
64	-0.509186 00	0.192456 00	0.174686-01
65	-0.192456 00	0.192456 00	0.230016-01
66	0.192456 00	0.192456 00	0.230016-01
67	0.509186 00	0.192456 00	0.174686-01
68	0.693896 00	0.192456 00	0.123466-01
69	0.838876 00	0.192456 00	0.174686-01
70	0.962256 00	0.192456 00	0.230016-01

S12 Symmetric

	MU	ETA	WEIGHT
1	-0.24618E 00	-0.96922E 00	0.0
2	-0.17408E 00	-0.96922E 00	0.18643E-01
3	0.17408E 00	-0.96922E 00	0.18643E-01
4	-0.49237E 00	-0.87039E 00	0.0
5	-0.46057E 00	-0.87039E 00	0.13760E-01
6	-0.17408E 00	-0.87039E 00	0.13760E-01
7	0.17408E 00	-0.87039E 00	0.13760E-01
8	0.46057E 00	-0.87039E 00	0.13760E-01
9	-0.65134E 00	-0.75879E 00	0.0
10	-0.62765E 00	-0.75879E 00	0.98031E-02
11	-0.46057E 00	-0.75879E 00	0.98912E-02
12	-0.17408E 00	-0.75879E 00	0.98031E-02
13	0.17408E 00	-0.75879E 00	0.98031E-02
14	0.46057E 00	-0.75879E 00	0.98912E-02
15	0.62765E 00	-0.75879E 00	0.98031E-02
16	-0.77850E 00	-0.62765E 00	0.0
17	-0.75879E 00	-0.62765E 00	0.98031E-02
18	-0.62765E 00	-0.62765E 00	0.76720E-02
19	-0.46057E 00	-0.62765E 00	0.76720E-02
20	-0.17408E 00	-0.62765E 00	0.98031E-02
21	0.17408E 00	-0.62765E 00	0.98031E-02
22	0.46057E 00	-0.62765E 00	0.76720E-02
23	0.62765E 00	-0.62765E 00	0.76720E-02
24	0.75879E 00	-0.62765E 00	0.98031E-02
25	-0.88763E 00	-0.46057E 00	0.0
26	-0.87039E 00	-0.46057E 00	0.13760E-01
27	-0.75879E 00	-0.46057E 00	0.98912E-02
28	-0.62765E 00	-0.46057E 00	0.76720E-02
29	-0.46057E 00	-0.46057E 00	0.98912E-02
30	-0.17408E 00	-0.46057E 00	0.13760E-01
31	0.17408E 00	-0.46057E 00	0.13760E-01
32	0.46057E 00	-0.46057E 00	0.98912E-02
33	0.62765E 00	-0.46057E 00	0.76720E-02
34	0.75879E 00	-0.46057E 00	0.98912E-02
35	0.87039E 00	-0.46057E 00	0.13760E-01
36	-0.98473E 00	-0.17408E 00	0.0
37	-0.96922E 00	-0.17408E 00	0.18643E-01
38	-0.87039E 00	-0.17408E 00	0.13760E-01
39	-0.75879E 00	-0.17408E 00	0.98031E-02
40	-0.62765E 00	-0.17408E 00	0.98031E-02
41	-0.46057E 00	-0.17408E 00	0.13760E-01
42	-0.17408E 00	-0.17408E 00	0.18643E-01
43	0.17408E 00	-0.17408E 00	0.18643E-01
44	0.46057E 00	-0.17408E 00	0.13760E-01
45	0.62765E 00	-0.17408E 00	0.98031E-02
46	0.75879E 00	-0.17408E 00	0.98031E-02
47	0.87039E 00	-0.17408E 00	0.13760E-01
48	0.96922E 00	-0.17408E 00	0.18643E-01
49	-0.24618E 00	0.96922E 00	0.0
50	-0.17408E 00	0.96922E 00	0.18643E-01
51	0.17408E 00	0.96922E 00	0.18643E-01
52	-0.49237E 00	0.87039E 00	0.0
53	-0.46057E 00	0.87039E 00	0.13760E-01
54	-0.17408E 00	0.87039E 00	0.13760E-01
55	0.17408E 00	0.87039E 00	0.13760E-01
56	0.46057E 00	0.87039E 00	0.13760E-01
57	-0.65134E 00	0.75879E 00	0.0
58	-0.62765E 00	0.75879E 00	0.98031E-02
59	-0.46057E 00	0.75879E 00	0.98912E-02
60	-0.17408E 00	0.75879E 00	0.98031E-02
61	0.17408E 00	0.75879E 00	0.98031E-02
62	0.46057E 00	0.75879E 00	0.98912E-02
63	0.62765E 00	0.75879E 00	0.98031E-02
64	-0.77850E 00	0.62765E 00	0.0
65	-0.75879E 00	0.62765E 00	0.98031E-02
66	-0.62765E 00	0.62765E 00	0.76720E-02

S12 Symmetric (Cont.)

67	-0.46057E 00	0.62765E 00	0.76720E-02
68	-0.17408E 00	0.62765E 00	0.98031E-02
69	0.17408E 00	0.62765E 00	0.98031E-02
70	0.46057E 00	0.62765E 00	0.76720E-02
71	0.62765E 00	0.62765E 00	0.76720E-02
72	0.75879E 00	0.62765E 00	0.98031E-02
73	-0.88763E 00	0.46057E 00	0.0
74	-0.87039E 00	0.46057E 00	0.13760E-01
75	-0.75879E 00	0.46057E 00	0.98912E-02
76	-0.62765E 00	0.46057E 00	0.76720E-02
77	-0.46057E 00	0.46057E 00	0.98912E-02
78	-0.17408E 00	0.46057E 00	0.13760E-01
79	0.17408E 00	0.46057E 00	0.13760E-01
80	0.46057E 00	0.46057E 00	0.98912E-02
81	0.62765E 00	0.46057E 00	0.76720E-02
82	0.75879E 00	0.46057E 00	0.98912E-02
83	0.87039E 00	0.46057E 00	0.13760E-01
84	-0.98473E 00	0.17408E 00	0.0
85	-0.96922E 00	0.17408E 00	0.18643E-01
86	-0.87039E 00	0.17408E 00	0.13760E-01
87	-0.75879E 00	0.17408E 00	0.98031E-02
88	-0.62765E 00	0.17408E 00	0.98031E-02
89	-0.46057E 00	0.17408E 00	0.13760E-01
90	-0.17408E 00	0.17408E 00	0.18643E-01
91	0.17408E 00	0.17408E 00	0.18643E-01
92	0.46057E 00	0.17408E 00	0.13760E-01
93	0.62765E 00	0.17408E 00	0.98031E-02
94	0.75879E 00	0.17408E 00	0.98031E-02
95	0.87039E 00	0.17408E 00	0.13760E-01
96	0.96922E 00	0.17408E 00	0.18643E-01

S14 Symmetric

	MU	ETA	WEIGHT
1	-0.22646E 00	-0.97402E 00	0.0
2	-0.16013E 00	-0.97402E 00	0.16007E-01
3	0.16013E 00	-0.97402E 00	0.16007E-01
4	-0.45291E 00	-0.89156E 00	0.0
5	-0.42366E 00	-0.89156E 00	0.10445E-01
6	-0.16013E 00	-0.89156E 00	0.10445E-01
7	0.16013E 00	-0.89156E 00	0.10445E-01
8	0.42366E 00	-0.89156E 00	0.10445E-01
9	-0.59914E 00	-0.80064E 00	0.0
10	-0.57735E 00	-0.80064E 00	0.97550E-02
11	-0.42366E 00	-0.80064E 00	0.85209E-02
12	-0.16013E 00	-0.80064E 00	0.97550E-02
13	0.16013E 00	-0.80064E 00	0.97550E-02
14	0.42366E 00	-0.80064E 00	0.85209E-02
15	0.57735E 00	-0.80064E 00	0.97550E-02
16	-0.71611E 00	-0.69798E 00	0.0
17	-0.69798E 00	-0.69798E 00	0.55018E-02
18	-0.57735E 00	-0.69798E 00	0.55165E-02
19	-0.42366E 00	-0.69798E 00	0.55165E-02
20	-0.16013E 00	-0.69798E 00	0.55018E-02
21	0.16013E 00	-0.69798E 00	0.55018E-02
22	0.42366E 00	-0.69798E 00	0.55165E-02
23	0.57735E 00	-0.69798E 00	0.55165E-02
24	0.69798E 00	-0.69798E 00	0.55018E-02
25	-0.81650E 00	-0.57735E 00	0.0
26	-0.80064E 00	-0.57735E 00	0.97550E-02
27	-0.69798E 00	-0.57735E 00	0.55165E-02
28	-0.57735E 00	-0.57735E 00	0.56153E-02
29	-0.42366E 00	-0.57735E 00	0.55165E-02
30	-0.16013E 00	-0.57735E 00	0.97550E-02

S14 Symmetric (Cont.)

31	0.16013E 00	-0.57735E 00	0.97550E-02
32	0.42366E 00	-0.57735E 00	0.55165E-02
33	0.57735E 00	-0.57735E 00	0.56153E-02
34	0.69798E 00	-0.57735E 00	0.55165E-02
35	0.80064E 00	-0.57735E 00	0.97550E-02
36	-0.90582E 00	-0.42366E 00	0.0
37	-0.89156E 00	-0.42366E 00	0.10445E-01
38	-0.80064E 00	-0.42366E 00	0.85209E-02
39	-0.69798E 00	-0.42366E 00	0.55165E-02
40	-0.57735E 00	-0.42366E 00	0.55165E-02
41	-0.42366E 00	-0.42366E 00	0.85209E-02
42	-0.16013E 00	-0.42366E 00	0.10445E-01
43	0.16013E 00	-0.42366E 00	0.10445E-01
44	0.42366E 00	-0.42366E 00	0.85209E-02
45	0.57735E 00	-0.42366E 00	0.55165E-02
46	0.69798E 00	-0.42366E 00	0.55165E-02
47	0.80064E 00	-0.42366E 00	0.85209E-02
48	0.89156E 00	-0.42366E 00	0.10445E-01
49	-0.98710E 00	-0.16013E 00	0.0
50	-0.97402E 00	-0.16013E 00	0.16007E-01
51	-0.89156E 00	-0.16013E 00	0.10445E-01
52	-0.80064E 00	-0.16013E 00	0.97550E-02
53	-0.69798E 00	-0.16013E 00	0.55018E-02
54	-0.57735E 00	-0.16013E 00	0.97550E-02
55	-0.42366E 00	-0.16013E 00	0.10445E-01
56	-0.16013E 00	-0.16013E 00	0.16007E-01
57	0.16013E 00	-0.16013E 00	0.16007E-01
58	0.42366E 00	-0.16013E 00	0.10445E-01
59	0.57735E 00	-0.16013E 00	0.97550E-02
60	0.69798E 00	-0.16013E 00	0.55018E-02
61	0.80064E 00	-0.16013E 00	0.97550E-02
62	0.89156E 00	-0.16013E 00	0.10445E-01
63	0.97402E 00	-0.16013E 00	0.16007E-01
64	-0.22646E 00	0.97402E 00	0.0
65	-0.16013E 00	0.97402E 00	0.16007E-01
66	0.16013E 00	0.97402E 00	0.16007E-01
67	-0.45291E 00	0.89156E 00	0.0
68	-0.42366E 00	0.89156E 00	0.10445E-01
69	-0.16013E 00	0.89156E 00	0.10445E-01
70	0.16013E 00	0.89156E 00	0.10445E-01
71	0.42366E 00	0.89156E 00	0.10445E-01
72	-0.59914E 00	0.80064E 00	0.0
73	-0.57735E 00	0.80064E 00	0.97550E-02
74	-0.42366E 00	0.80064E 00	0.85209E-02
75	-0.16013E 00	0.80064E 00	0.97550E-02
76	0.16013E 00	0.80064E 00	0.97550E-02
77	0.42366E 00	0.80064E 00	0.85209E-02
78	0.57735E 00	0.80064E 00	0.97550E-02
79	-0.71611E 00	0.69798E 00	0.0
80	-0.69798E 00	0.69798E 00	0.55018E-02
81	-0.57735E 00	0.69798E 00	0.55165E-02
82	-0.42366E 00	0.69798E 00	0.55165E-02
83	-0.16013E 00	0.69798E 00	0.55018E-02
84	0.16013E 00	0.69798E 00	0.55018E-02
85	0.42366E 00	0.69798E 00	0.55165E-02
86	0.57735E 00	0.69798E 00	0.55165E-02
87	0.69798E 00	0.69798E 00	0.55018E-02
88	-0.81650E 00	0.57735E 00	0.0
89	-0.80064E 00	0.57735E 00	0.97550E-02
90	-0.69798E 00	0.57735E 00	0.55165E-02
91	-0.57735E 00	0.57735E 00	0.56153E-02
92	-0.42366E 00	0.57735E 00	0.55165E-02
93	-0.16013E 00	0.57735E 00	0.97550E-02
94	0.16013E 00	0.57735E 00	0.97550E-02
95	0.42366E 00	0.57735E 00	0.55165E-02
96	0.57735E 00	0.57735E 00	0.56153E-02
97	0.69798E 00	0.57735E 00	0.55165E-02

S14 Symmetric (Cont.)

98	0.80064E 00	0.57735E 00	0.97550E-02
99	-0.90582E 00	0.42366E 00	0.0
100	-0.89156E 00	0.42366E 00	0.10445E-01
101	-0.80064E 00	0.42366E 00	0.85209E-02
102	-0.69798E 00	0.42366E 00	0.55165E-02
103	-0.57735E 00	0.42366E 00	0.55165E-02
104	-0.42366E 00	0.42366E 00	0.85209E-02
105	-0.16013E 00	0.42366E 00	0.10445E-01
106	0.16013E 00	0.42366E 00	0.10445E-01
107	0.42366E 00	0.42366E 00	0.85209E-02
108	0.57735E 00	0.42366E 00	0.55165E-02
109	0.69798E 00	0.42366E 00	0.55165E-02
110	0.80064E 00	0.42366E 00	0.85209E-02
111	0.89156E 00	0.42366E 00	0.10445E-01
112	-0.98710E 00	0.16013E 00	0.0
113	-0.97402E 00	0.16013E 00	0.16007E-01
114	-0.89156E 00	0.16013E 00	0.10445E-01
115	-0.80064E 00	0.16013E 00	0.97550E-02
116	-0.69798E 00	0.16013E 00	0.55018E-02
117	-0.57735E 00	0.16013E 00	0.97550E-02
118	-0.42366E 00	0.16013E 00	0.10445E-01
119	-0.16013E 00	0.16013E 00	0.16007E-01
120	0.16013E 00	0.16013E 00	0.16007E-01
121	0.42366E 00	0.16013E 00	0.10445E-01
122	0.57735E 00	0.16013E 00	0.97550E-02
123	0.69798E 00	0.16013E 00	0.55018E-02
124	0.80064E 00	0.16013E 00	0.97550E-02
125	0.89156E 00	0.16013E 00	0.10445E-01
126	0.97402E 00	0.16013E 00	0.16007E-01

S16 Symmetric

	MU	ETA	WEIGHT
1	-0.21082E 00	-0.97753E 00	0.0
2	-0.14907E 00	-0.97753E 00	0.13586E-01
3	0.14907E 00	-0.97753E 00	0.13586E-01
4	-0.42164E 00	-0.90576E 00	0.0
5	-0.39441E 00	-0.90576E 00	0.97681E-02
6	-0.14907E 00	-0.90576E 00	0.97681E-02
7	0.14907E 00	-0.90576E 00	0.97681E-02
8	0.39441E 00	-0.90576E 00	0.97681E-02
9	-0.55777E 00	-0.82999E 00	0.0
10	-0.53748E 00	-0.82999E 00	0.64738E-02
11	-0.39441E 00	-0.82999E 00	0.50390E-02
12	-0.14907E 00	-0.82999E 00	0.64738E-02
13	0.14907E 00	-0.82999E 00	0.64738E-02
14	0.39441E 00	-0.82999E 00	0.50390E-02
15	0.53748E 00	-0.82999E 00	0.64738E-02
16	-0.66667E 00	-0.74536E 00	0.0
17	-0.64979E 00	-0.74536E 00	0.64634E-02
18	-0.53748E 00	-0.74536E 00	0.71124E-02
19	-0.39441E 00	-0.74536E 00	0.71124E-02
20	-0.14907E 00	-0.74536E 00	0.64634E-02
21	0.14907E 00	-0.74536E 00	0.64634E-02
22	0.39441E 00	-0.74536E 00	0.71124E-02
23	0.53748E 00	-0.74536E 00	0.71124E-02
24	0.64979E 00	-0.74536E 00	0.64634E-02
25	-0.76012E 00	-0.64979E 00	0.0
26	-0.74536E 00	-0.64979E 00	0.64634E-02
27	-0.64979E 00	-0.64979E 00	0.14381E-02
28	-0.53748E 00	-0.64979E 00	0.36342E-02
29	-0.39441E 00	-0.64979E 00	0.14381E-02
30	-0.14907E 00	-0.64979E 00	0.64634E-02
31	0.14907E 00	-0.64979E 00	0.64634E-02

S16 Symmetric (Cont.)

32	0.39441E 00	-0.64979E 00	0.14381E-02
33	0.53748E 00	-0.64979E 00	0.36342E-02
34	0.64979E 00	-0.64979E 00	0.14381E-02
35	0.74536E 00	-0.64979E 00	0.64634E-02
36	-0.84327E 00	-0.53748E 00	0.0
37	-0.82999E 00	-0.53748E 00	0.64738E-02
38	-0.74536E 00	-0.53748E 00	0.71124E-02
39	-0.64979E 00	-0.53748E 00	0.36342E-02
40	-0.53748E 00	-0.53748E 00	0.36342E-02
41	-0.39441E 00	-0.53748E 00	0.71124E-02
42	-0.14907E 00	-0.53748E 00	0.64738E-02
43	0.14907E 00	-0.53748E 00	0.64738E-02
44	0.39441E 00	-0.53748E 00	0.71124E-02
45	0.53748E 00	-0.53748E 00	0.36342E-02
46	0.64979E 00	-0.53748E 00	0.36342E-02
47	0.74536E 00	-0.53748E 00	0.71124E-02
48	0.82999E 00	-0.53748E 00	0.64738E-02
49	-0.91894E 00	-0.39441E 00	0.0
50	-0.90676E 00	-0.39441E 00	0.97681E-02
51	-0.82999E 00	-0.39441E 00	0.50390E-02
52	-0.74536E 00	-0.39441E 00	0.71124E-02
53	-0.64979E 00	-0.39441E 00	0.14381E-02
54	-0.53748E 00	-0.39441E 00	0.71124E-02
55	-0.39441E 00	-0.39441E 00	0.50390E-02
56	-0.14907E 00	-0.39441E 00	0.97681E-02
57	0.14907E 00	-0.39441E 00	0.97681E-02
58	0.39441E 00	-0.39441E 00	0.50390E-02
59	0.53748E 00	-0.39441E 00	0.71124E-02
60	0.64979E 00	-0.39441E 00	0.14381E-02
61	0.74536E 00	-0.39441E 00	0.71124E-02
62	0.82999E 00	-0.39441E 00	0.50390E-02
63	0.90676E 00	-0.39441E 00	0.97681E-02
64	-0.98883E 00	-0.14907E 00	0.0
65	-0.97753E 00	-0.14907E 00	0.13586E-01
66	-0.90676E 00	-0.14907E 00	0.97681E-02
67	-0.82999E 00	-0.14907E 00	0.64738E-02
68	-0.74536E 00	-0.14907E 00	0.64634E-02
69	-0.64979E 00	-0.14907E 00	0.64634E-02
70	-0.53748E 00	-0.14907E 00	0.64738E-02
71	-0.39441E 00	-0.14907E 00	0.97681E-02
72	-0.14907E 00	-0.14907E 00	0.13586E-01
73	0.14907E 00	-0.14907E 00	0.13586E-01
74	0.39441E 00	-0.14907E 00	0.97681E-02
75	0.53748E 00	-0.14907E 00	0.64738E-02
76	0.64979E 00	-0.14907E 00	0.64634E-02
77	0.74536E 00	-0.14907E 00	0.64634E-02
78	0.82999E 00	-0.14907E 00	0.64738E-02
79	0.90676E 00	-0.14907E 00	0.97681E-02
80	0.97753E 00	-0.14907E 00	0.13586E-01
81	-0.21082E 00	0.97753E 00	0.0
82	-0.14907E 00	0.97753E 00	0.13586E-01
83	0.14907E 00	0.97753E 00	0.13586E-01
84	-0.42164E 00	0.90676E 00	0.0
85	-0.39441E 00	0.90676E 00	0.97681E-02
86	-0.14907E 00	0.90676E 00	0.97681E-02
87	0.14907E 00	0.90676E 00	0.97681E-02
88	0.39441E 00	0.90676E 00	0.97681E-02
89	-0.55777E 00	0.82999E 00	0.0
90	-0.53748E 00	0.82999E 00	0.64738E-02
91	-0.39441E 00	0.82999E 00	0.50390E-02
92	-0.14907E 00	0.82999E 00	0.64738E-02
93	0.14907E 00	0.82999E 00	0.64738E-02
94	0.39441E 00	0.82999E 00	0.50390E-02
95	0.53748E 00	0.82999E 00	0.64738E-02
96	-0.66657E 00	0.74536E 00	0.0
97	-0.64979E 00	0.74536E 00	0.64634E-02
98	-0.53748E 00	0.74536E 00	0.71124E-02

S16 Symmetric (Cont.)

99	-0.39441E 00	0.74536E 00	0.71124E-02
100	-0.14907E 00	0.74536E 00	0.64634E-02
101	0.14907E 00	0.74536E 00	0.64634E-02
102	0.39441E 00	0.74536E 00	0.71124E-02
103	0.53748E 00	0.74536E 00	0.71124E-02
104	0.64979E 00	0.74536E 00	0.64634E-02
105	-0.76012E 00	0.64979E 00	0.0
106	-0.74536E 00	0.64979E 00	0.64634E-02
107	-0.64979E 00	0.64979E 00	0.14381E-02
108	-0.53748E 00	0.64979E 00	0.36342E-02
109	-0.39441E 00	0.64979E 00	0.14381E-02
110	-0.14907E 00	0.64979E 00	0.64634E-02
111	0.14907E 00	0.64979E 00	0.64634E-02
112	0.39441E 00	0.64979E 00	0.14381E-02
113	0.53748E 00	0.64979E 00	0.36342E-02
114	0.64979E 00	0.64979E 00	0.14381E-02
115	0.74536E 00	0.64979E 00	0.64634E-02
116	-0.88327E 00	0.53748E 00	0.0
117	-0.82999E 00	0.53748E 00	0.64738E-02
118	-0.74536E 00	0.53748E 00	0.71124E-02
119	-0.64979E 00	0.53748E 00	0.36342E-02
120	-0.53748E 00	0.53748E 00	0.36342E-02
121	-0.39441E 00	0.53748E 00	0.71124E-02
122	-0.14907E 00	0.53748E 00	0.64738E-02
123	0.14907E 00	0.53748E 00	0.64738E-02
124	0.39441E 00	0.53748E 00	0.71124E-02
125	0.53748E 00	0.53748E 00	0.36342E-02
126	0.64979E 00	0.53748E 00	0.36342E-02
127	0.74536E 00	0.53748E 00	0.71124E-02
128	0.82999E 00	0.53748E 00	0.64738E-02
129	-0.91894E 00	0.39441E 00	0.0
130	-0.90676E 00	0.39441E 00	0.97681E-02
131	-0.82999E 00	0.39441E 00	0.50390E-02
132	-0.74536E 00	0.39441E 00	0.71124E-02
133	-0.64979E 00	0.39441E 00	0.14381E-02
134	-0.53748E 00	0.39441E 00	0.71124E-02
135	-0.39441E 00	0.39441E 00	0.50390E-02
136	-0.14907E 00	0.39441E 00	0.97681E-02
137	0.14907E 00	0.39441E 00	0.97681E-02
138	0.39441E 00	0.39441E 00	0.50390E-02
139	0.53748E 00	0.39441E 00	0.71124E-02
140	0.64979E 00	0.39441E 00	0.14381E-02
141	0.74536E 00	0.39441E 00	0.71124E-02
142	0.82999E 00	0.39441E 00	0.50390E-02
143	0.90676E 00	0.39441E 00	0.97681E-02
144	-0.98883E 00	0.14907E 00	0.0
145	-0.97753E 00	0.14907E 00	0.13586E-01
146	-0.90676E 00	0.14907E 00	0.97681E-02
147	-0.82999E 00	0.14907E 00	0.64738E-02
148	-0.74536E 00	0.14907E 00	0.64634E-02
149	-0.64979E 00	0.14907E 00	0.64634E-02
150	-0.53748E 00	0.14907E 00	0.64738E-02
151	-0.39441E 00	0.14907E 00	0.97681E-02
152	-0.14907E 00	0.14907E 00	0.13586E-01
153	0.14907E 00	0.14907E 00	0.13586E-01
154	0.39441E 00	0.14907E 00	0.97681E-02
155	0.53748E 00	0.14907E 00	0.64738E-02
156	0.64979E 00	0.14907E 00	0.64634E-02
157	0.74536E 00	0.14907E 00	0.64634E-02
158	0.82999E 00	0.14907E 00	0.64738E-02
159	0.90676E 00	0.14907E 00	0.97681E-02
160	0.97753E 00	0.14907E 00	0.13586E-01

S4 Half Symmetric

	MU	ETA	WEIGHT
1	-0.50837E 00	-0.86114E 00	0.0
2	-0.33998E 00	-0.86114E 00	0.86964E-01
3	0.33998E 00	-0.86114E 00	0.86964E-01
4	-0.94043E 00	-0.33998E 00	0.0
5	-0.86114E 00	-0.33998E 00	0.86964E-01
6	-0.33998E 00	-0.33998E 00	0.76073E-01
7	0.33998E 00	-0.33998E 00	0.76073E-01
8	0.86114E 00	-0.33998E 00	0.86964E-01
9	-0.50837E 00	0.86114E 00	0.0
10	-0.33998E 00	0.86114E 00	0.86964E-01
11	0.33998E 00	0.86114E 00	0.86964E-01
12	-0.94043E 00	0.33998E 00	0.0
13	-0.86114E 00	0.33998E 00	0.86964E-01
14	-0.33998E 00	0.33998E 00	0.76073E-01
15	0.33998E 00	0.33998E 00	0.76073E-01
16	0.86114E 00	0.33998E 00	0.86964E-01

S6 Half Symmetric

	MU	ETA	WEIGHT
1	-0.36125E 00	-0.93247E 00	0.0
2	-0.23862E 00	-0.93247E 00	0.42831E-01
3	0.23862E 00	-0.93247E 00	0.42831E-01
4	-0.75020E 00	-0.66121E 00	0.0
5	-0.66121E 00	-0.66121E 00	0.55239E-01
6	-0.23862E 00	-0.66121E 00	0.34952E-01
7	0.23862E 00	-0.66121E 00	0.34952E-01
8	0.66121E 00	-0.66121E 00	0.55239E-01
9	-0.97111E 00	-0.23862E 00	0.0
10	-0.93247E 00	-0.23862E 00	0.42831E-01
11	-0.66121E 00	-0.23862E 00	0.34952E-01
12	-0.23862E 00	-0.23862E 00	0.39196E-01
13	0.23862E 00	-0.23862E 00	0.39196E-01
14	0.66121E 00	-0.23862E 00	0.34952E-01
15	0.93247E 00	-0.23862E 00	0.42831E-01
16	-0.36125E 00	0.93247E 00	0.0
17	-0.23862E 00	0.93247E 00	0.42831E-01
18	0.23862E 00	0.93247E 00	0.42831E-01
19	-0.75020E 00	0.66121E 00	0.0
20	-0.66121E 00	0.66121E 00	0.55239E-01
21	-0.23862E 00	0.66121E 00	0.34952E-01
22	0.23862E 00	0.66121E 00	0.34952E-01
23	0.66121E 00	0.66121E 00	0.55239E-01
24	-0.97111E 00	0.23862E 00	0.0
25	-0.93247E 00	0.23862E 00	0.42831E-01
26	-0.66121E 00	0.23862E 00	0.34952E-01
27	-0.23862E 00	0.23862E 00	0.39196E-01
28	0.23862E 00	0.23862E 00	0.39196E-01
29	0.66121E 00	0.23862E 00	0.34952E-01
30	0.93247E 00	0.23862E 00	0.42831E-01

S8 Half Symmetric

	MU	ETA	WEIGHT
1	-0.27900E 00	-0.96029E 00	0.0
2	-0.18343E 00	-0.96029E 00	0.25307E-01
3	0.18343E 00	-0.96029E 00	0.25307E-01
4	-0.60442E 00	-0.79667E 00	0.0
5	-0.52553E 00	-0.79667E 00	0.35623E-01
6	-0.18343E 00	-0.79667E 00	0.19972E-01
7	0.18343E 00	-0.79667E 00	0.19972E-01

S8 Half Symmetric (Cont.)

8	0.52553E 00	-0.79667E 00	0.35623E-01
9	-0.85077E 00	-0.52553E 00	0.0
10	-0.79667E 00	-0.52553E 00	0.35623E-01
11	-0.52553E 00	-0.52553E 00	0.16252E-01
12	-0.18343E 00	-0.52553E 00	0.26552E-01
13	0.18343E 00	-0.52553E 00	0.26552E-01
14	0.52553E 00	-0.52553E 00	0.16252E-01
15	0.79667E 00	-0.52553E 00	0.35623E-01
16	-0.98303E 00	-0.18343E 00	0.0
17	-0.96029E 00	-0.18343E 00	0.25307E-01
18	-0.79667E 00	-0.18343E 00	0.19972E-01
19	-0.52553E 00	-0.18343E 00	0.26552E-01
20	-0.18343E 00	-0.18343E 00	0.18840E-01
21	0.18343E 00	-0.18343E 00	0.18840E-01
22	0.52553E 00	-0.18343E 00	0.26552E-01
23	0.79667E 00	-0.18343E 00	0.19972E-01
24	0.96029E 00	-0.18343E 00	0.25307E-01
25	-0.27900E 00	0.96029E 00	0.0
26	-0.18343E 00	0.96029E 00	0.25307E-01
27	0.18343E 00	0.96029E 00	0.25307E-01
28	-0.60442E 00	0.79667E 00	0.0
29	-0.52553E 00	0.79667E 00	0.35623E-01
30	-0.18343E 00	0.79667E 00	0.19972E-01
31	0.18343E 00	0.79667E 00	0.19972E-01
32	0.52553E 00	0.79667E 00	0.35623E-01
33	-0.85077E 00	0.52553E 00	0.0
34	-0.79667E 00	0.52553E 00	0.35623E-01
35	-0.52553E 00	0.52553E 00	0.16252E-01
36	-0.18343E 00	0.52553E 00	0.26552E-01
37	0.18343E 00	0.52553E 00	0.26552E-01
38	0.52553E 00	0.52553E 00	0.16252E-01
39	0.79667E 00	0.52553E 00	0.35623E-01
40	-0.98303E 00	0.18343E 00	0.0
41	-0.96029E 00	0.18343E 00	0.25307E-01
42	-0.79667E 00	0.18343E 00	0.19972E-01
43	-0.52553E 00	0.18343E 00	0.26552E-01
44	-0.18343E 00	0.18343E 00	0.18840E-01
45	0.18343E 00	0.18343E 00	0.18840E-01
46	0.52553E 00	0.18343E 00	0.26552E-01
47	0.79667E 00	0.18343E 00	0.19972E-01
48	0.96029E 00	0.18343E 00	0.25307E-01

S10 Half Symmetric

	MU	ETA	WEIGHT
1	-0.22695E 00	-0.97391E 00	0.0
2	-0.14887E 00	-0.97391E 00	0.16668E-01
3	0.14887E 00	-0.97391E 00	0.16668E-01
4	-0.50166E 00	-0.86506E 00	0.0
5	-0.43340E 00	-0.86506E 00	0.24442E-01
6	-0.14887E 00	-0.86506E 00	0.12921E-01
7	0.14887E 00	-0.86506E 00	0.12921E-01
8	0.43340E 00	-0.86506E 00	0.24442E-01
9	-0.73375E 00	-0.67941E 00	0.0
10	-0.67941E 00	-0.67941E 00	0.27011E-01
11	-0.43340E 00	-0.67941E 00	0.85498E-02
12	-0.14887E 00	-0.67941E 00	0.19211E-01
13	0.14887E 00	-0.67941E 00	0.19211E-01
14	0.43340E 00	-0.67941E 00	0.85498E-02
15	0.67941E 00	-0.67941E 00	0.27011E-01
16	-0.90120E 00	-0.43340E 00	0.0
17	-0.86506E 00	-0.43340E 00	0.24442E-01
18	-0.67941E 00	-0.43340E 00	0.85498E-02
19	-0.43340E 00	-0.43340E 00	0.27468E-01
20	-0.14887E 00	-0.43340E 00	0.68566E-02

S10 Half Symmetric (Cont.)

21	0.14887E 00	-0.43340E 00	0.68566E-02
22	0.43340E 00	-0.43340E 00	0.27468E-01
23	0.67941E 00	-0.43340E 00	0.85498E-02
24	0.86506E 00	-0.43340E 00	0.24442E-01
25	-0.98886E 00	-0.14887E 00	0.0
26	-0.97391E 00	-0.14887E 00	0.16668E-01
27	-0.86506E 00	-0.14887E 00	0.12921E-01
28	-0.67941E 00	-0.14887E 00	0.19211E-01
29	-0.43340E 00	-0.14887E 00	0.68566E-02
30	-0.14887E 00	-0.14887E 00	0.18225E-01
31	0.14887E 00	-0.14887E 00	0.18225E-01
32	0.43340E 00	-0.14887E 00	0.68566E-02
33	0.67941E 00	-0.14887E 00	0.19211E-01
34	0.86506E 00	-0.14887E 00	0.12921E-01
35	0.97391E 00	-0.14887E 00	0.16668E-01
36	-0.22695E 00	0.97391E 00	0.0
37	-0.14887E 00	0.97391E 00	0.16668E-01
38	0.14887E 00	0.97391E 00	0.16668E-01
39	-0.50166E 00	0.86506E 00	0.0
40	-0.43340E 00	0.86506E 00	0.24442E-01
41	-0.14887E 00	0.86506E 00	0.12921E-01
42	0.14887E 00	0.86506E 00	0.12921E-01
43	0.43340E 00	0.86506E 00	0.24442E-01
44	-0.73376E 00	0.67941E 00	0.0
45	-0.67941E 00	0.67941E 00	0.27011E-01
46	-0.43340E 00	0.67941E 00	0.85498E-02
47	-0.14887E 00	0.67941E 00	0.19211E-01
48	0.14887E 00	0.67941E 00	0.19211E-01
49	0.43340E 00	0.67941E 00	0.85498E-02
50	0.67941E 00	0.67941E 00	0.27011E-01
51	-0.90120E 00	0.43340E 00	0.0
52	-0.86506E 00	0.43340E 00	0.24442E-01
53	-0.67941E 00	0.43340E 00	0.85498E-02
54	-0.43340E 00	0.43340E 00	0.27468E-01
55	-0.14887E 00	0.43340E 00	0.68566E-02
56	0.14887E 00	0.43340E 00	0.68566E-02
57	0.43340E 00	0.43340E 00	0.27468E-01
58	0.67941E 00	0.43340E 00	0.85498E-02
59	0.86506E 00	0.43340E 00	0.24442E-01
60	-0.98886E 00	0.14887E 00	0.0
61	-0.97391E 00	0.14887E 00	0.16668E-01
62	-0.86506E 00	0.14887E 00	0.12921E-01
63	-0.67941E 00	0.14887E 00	0.19211E-01
64	-0.43340E 00	0.14887E 00	0.68566E-02
65	-0.14887E 00	0.14887E 00	0.18225E-01
66	0.14887E 00	0.14887E 00	0.18225E-01
67	0.43340E 00	0.14887E 00	0.68566E-02
68	0.67941E 00	0.14887E 00	0.19211E-01
69	0.86506E 00	0.14887E 00	0.12921E-01
70	0.97391E 00	0.14887E 00	0.16668E-01

100 Angle Biased Down

	MU	ETA	WEIGHT
1	-0.25298E-01	-0.99968E 00	0.0
2	-0.16595E-01	-0.99968E 00	0.19755E-03
3	0.16595E-01	-0.99968E 00	0.19755E-03
4	-0.57248E-01	-0.99836E 00	0.0
5	-0.37554E-01	-0.99836E 00	0.46261E-03
6	0.37554E-01	-0.99836E 00	0.46261E-03
7	-0.89576E-01	-0.99598E 00	0.0
8	-0.58760E-01	-0.99598E 00	0.72768E-03
9	0.58760E-01	-0.99598E 00	0.72768E-03
10	-0.12192E 00	-0.99254E 00	0.0
11	-0.79977E-01	-0.99254E 00	0.99024E-03

100 Angle Biased Down (Cont.)

12	0.79977E-01	-0.99254E 00	0.99024E-03
13	-0.15413E 00	-0.98805E 00	0.0
14	-0.10111E 00	-0.98805E 00	0.12528E-02
15	0.10111E 00	-0.98805E 00	0.12528E-02
16	-0.18621E 00	-0.98251E 00	0.0
17	-0.12215E 00	-0.98251E 00	0.15129E-02
18	0.12215E 00	-0.98251E 00	0.15129E-02
19	-0.21808E 00	-0.97593E 00	0.0
20	-0.14306E 00	-0.97593E 00	0.17729E-02
21	0.14306E 00	-0.97593E 00	0.17729E-02
22	-0.24971E 00	-0.96832E 00	0.0
23	-0.16381E 00	-0.96832E 00	0.20305E-02
24	0.16381E 00	-0.96832E 00	0.20305E-02
25	-0.28110E 00	-0.95968E 00	0.0
26	-0.18439E 00	-0.95968E 00	0.22856E-02
27	0.18439E 00	-0.95968E 00	0.22856E-02
28	-0.31216E 00	-0.95003E 00	0.0
29	-0.20477E 00	-0.95003E 00	0.25406E-02
30	0.20477E 00	-0.95003E 00	0.25406E-02
31	-0.34291E 00	-0.93937E 00	0.0
32	-0.22494E 00	-0.93937E 00	0.27907E-02
33	0.22494E 00	-0.93937E 00	0.27907E-02
34	-0.50167E 00	-0.86506E 00	0.0
35	-0.43340E 00	-0.86506E 00	0.24447E-01
36	-0.14888E 00	-0.86506E 00	0.12924E-01
37	0.14888E 00	-0.86506E 00	0.12924E-01
38	0.43340E 00	-0.86506E 00	0.24447E-01
39	-0.73377E 00	-0.67940E 00	0.0
40	-0.67942E 00	-0.67940E 00	0.27017E-01
41	-0.43340E 00	-0.67940E 00	0.85519E-02
42	-0.14888E 00	-0.67940E 00	0.19214E-01
43	0.14888E 00	-0.67940E 00	0.19214E-01
44	0.43340E 00	-0.67940E 00	0.85519E-02
45	0.67942E 00	-0.67940E 00	0.27017E-01
46	-0.90121E 00	-0.43339E 00	0.0
47	-0.86507E 00	-0.43339E 00	0.24447E-01
48	-0.67941E 00	-0.43339E 00	0.85519E-02
49	-0.43340E 00	-0.43339E 00	0.27474E-01
50	-0.14887E 00	-0.43339E 00	0.68585E-02
51	0.14887E 00	-0.43339E 00	0.68585E-02
52	0.43340E 00	-0.43339E 00	0.27474E-01
53	0.67941E 00	-0.43339E 00	0.85519E-02
54	0.86507E 00	-0.43339E 00	0.24447E-01
55	-0.98886E 00	-0.14887E 00	0.0
56	-0.97391E 00	-0.14887E 00	0.16672E-01
57	-0.86506E 00	-0.14887E 00	0.12924E-01
58	-0.67941E 00	-0.14887E 00	0.19215E-01
59	-0.43340E 00	-0.14887E 00	0.68586E-02
60	-0.14887E 00	-0.14887E 00	0.18229E-01
61	0.14887E 00	-0.14887E 00	0.18229E-01
62	0.43340E 00	-0.14887E 00	0.68586E-02
63	0.67941E 00	-0.14887E 00	0.19215E-01
64	0.86506E 00	-0.14887E 00	0.12924E-01
65	0.97391E 00	-0.14887E 00	0.16672E-01
66	-0.22698E 00	0.97390E 00	0.0
67	-0.14889E 00	0.97390E 00	0.16672E-01
68	0.14889E 00	0.97390E 00	0.16672E-01
69	-0.50167E 00	0.86506E 00	0.0
70	-0.43340E 00	0.86506E 00	0.24447E-01
71	-0.14888E 00	0.86506E 00	0.12924E-01
72	0.14888E 00	0.86506E 00	0.12924E-01
73	0.43340E 00	0.86506E 00	0.24447E-01
74	-0.73377E 00	0.67940E 00	0.0
75	-0.67942E 00	0.67940E 00	0.27017E-01
76	-0.43340E 00	0.67940E 00	0.85519E-02
77	-0.14888E 00	0.67940E 00	0.19214E-01
78	0.14888E 00	0.67940E 00	0.19214E-01

100 Angle Biased Down (Cont.)

79	0.43340E 00	0.67940E 00	0.85519E-02
80	0.67942E 00	0.67940E 00	0.27017E-01
81	-0.90121E 00	0.43339E 00	0.0
82	-0.86507E 00	0.43339E 00	0.24447E-01
83	-0.67941E 00	0.43339E 00	0.85519E-02
84	-0.43340E 00	0.43339E 00	0.27474E-01
85	-0.14887E 00	0.43339E 00	0.68585E-02
86	0.14887E 00	0.43339E 00	0.68585E-02
87	0.43340E 00	0.43339E 00	0.27474E-01
88	0.67941E 00	0.43339E 00	0.85519E-02
89	0.86507E 00	0.43339E 00	0.24447E-01
90	-0.98886E 00	0.14887E 00	0.0
91	-0.97391E 00	0.14887E 00	0.16672E-01
92	-0.86506E 00	0.14887E 00	0.12924E-01
93	-0.67941E 00	0.14887E 00	0.19215E-01
94	-0.43340E 00	0.14887E 00	0.68586E-02
95	-0.14887E 00	0.14887E 00	0.18229E-01
96	0.14887E 00	0.14887E 00	0.18229E-01
97	0.43340E 00	0.14887E 00	0.68586E-02
98	0.67941E 00	0.14887E 00	0.19215E-01
99	0.86506E 00	0.14887E 00	0.12924E-01
100	0.97391E 00	0.14887E 00	0.16672E-01

100 Angle Biased Up

	MU	ETA	WEIGHT
1	-0.22698E 00	-0.97390E 00	0.0
2	-0.14889E 00	-0.97390E 00	0.16672E-01
3	0.14889E 00	-0.97390E 00	0.16672E-01
4	-0.50167E 00	-0.86506E 00	0.0
5	-0.43340E 00	-0.86506E 00	0.24447E-01
6	-0.14888E 00	-0.86506E 00	0.12924E-01
7	0.14888E 00	-0.86506E 00	0.12924E-01
8	0.43340E 00	-0.86506E 00	0.24447E-01
9	-0.73377E 00	-0.67940E 00	0.0
10	-0.67942E 00	-0.67940E 00	0.27017E-01
11	-0.43340E 00	-0.67940E 00	0.85519E-02
12	-0.14888E 00	-0.67940E 00	0.19214E-01
13	0.14888E 00	-0.67940E 00	0.19214E-01
14	0.43340E 00	-0.67940E 00	0.85519E-02
15	0.67942E 00	-0.67940E 00	0.27017E-01
16	-0.90121E 00	-0.43339E 00	0.0
17	-0.86507E 00	-0.43339E 00	0.24447E-01
18	-0.67941E 00	-0.43339E 00	0.85519E-02
19	-0.43340E 00	-0.43339E 00	0.27474E-01
20	-0.14887E 00	-0.43339E 00	0.68585E-02
21	0.14887E 00	-0.43339E 00	0.68585E-02
22	0.43340E 00	-0.43339E 00	0.27474E-01
23	0.67941E 00	-0.43339E 00	0.85519E-02
24	0.86507E 00	-0.43339E 00	0.24447E-01
25	-0.98886E 00	-0.14887E 00	0.0
26	-0.97391E 00	-0.14887E 00	0.16672E-01
27	-0.86506E 00	-0.14887E 00	0.12924E-01
28	-0.67941E 00	-0.14887E 00	0.19215E-01
29	-0.43340E 00	-0.14887E 00	0.68586E-02
30	-0.14887E 00	-0.14887E 00	0.18229E-01
31	0.14887E 00	-0.14887E 00	0.18229E-01
32	0.43340E 00	-0.14887E 00	0.68586E-02
33	0.67941E 00	-0.14887E 00	0.19215E-01
34	0.86506E 00	-0.14887E 00	0.12924E-01
35	0.97391E 00	-0.14887E 00	0.16672E-01
36	-0.25298E-01	0.99968E 00	0.0
37	-0.16595E-01	0.99968E 00	0.19755E-03

100 Angle Biased Up (Cont.)

38	0.16595E-01	0.99968E 00	0.19755E-03
39	-0.57248E-01	0.99836E 00	0.0
40	-0.37554E-01	0.99836E 00	0.46261E-03
41	0.37554E-01	0.99836E 00	0.46261E-03
42	-0.89576E-01	0.99598E 00	0.0
43	-0.58760E-01	0.99598E 00	0.72768E-03
44	0.58760E-01	0.99598E 00	0.72768E-03
45	-0.12192E 00	0.99254E 00	0.0
46	-0.79977E-01	0.99254E 00	0.99024E-03
47	0.79977E-01	0.99254E 00	0.99024E-03
48	-0.15413E 00	0.98805E 00	0.0
49	-0.10111E 00	0.98805E 00	0.12528E-02
50	0.10111E 00	0.98805E 00	0.12528E-02
51	-0.18621E 00	0.98251E 00	0.0
52	-0.12215E 00	0.98251E 00	0.15129E-02
53	0.12215E 00	0.98251E 00	0.15129E-02
54	-0.21808E 00	0.97593E 00	0.0
55	-0.14306E 00	0.97593E 00	0.17729E-02
56	0.14306E 00	0.97593E 00	0.17729E-02
57	-0.24971E 00	0.96832E 00	0.0
58	-0.16381E 00	0.96832E 00	0.20305E-02
59	0.16381E 00	0.96832E 00	0.20305E-02
60	-0.28110E 00	0.95968E 00	0.0
61	-0.18439E 00	0.95968E 00	0.22856E-02
62	0.18439E 00	0.95968E 00	0.22856E-02
63	-0.31216E 00	0.95003E 00	0.0
64	-0.20477E 00	0.95003E 00	0.25406E-02
65	0.20477E 00	0.95003E 00	0.25406E-02
66	-0.34291E 00	0.93937E 00	0.0
67	-0.22494E 00	0.93937E 00	0.27907E-02
68	0.22494E 00	0.93937E 00	0.27907E-02
69	-0.50167E 00	0.86506E 00	0.0
70	-0.43340E 00	0.86506E 00	0.24447E-01
71	-0.14888E 00	0.86506E 00	0.12924E-01
72	0.14888E 00	0.86506E 00	0.12924E-01
73	0.43340E 00	0.86506E 00	0.24447E-01
74	-0.73377E 00	0.67940E 00	0.0
75	-0.67942E 00	0.67940E 00	0.27017E-01
76	-0.43340E 00	0.67940E 00	0.85519E-02
77	-0.14888E 00	0.67940E 00	0.19214E-01
78	0.14888E 00	0.67940E 00	0.19214E-01
79	0.43340E 00	0.67940E 00	0.85519E-02
80	0.67942E 00	0.67940E 00	0.27017E-01
81	-0.90121E 00	0.43339E 00	0.0
82	-0.86507E 00	0.43339E 00	0.24447E-01
83	-0.67941E 00	0.43339E 00	0.85519E-02
84	-0.43340E 00	0.43339E 00	0.27474E-01
85	-0.14887E 00	0.43339E 00	0.68585E-02
86	0.14887E 00	0.43339E 00	0.68585E-02
87	0.43340E 00	0.43339E 00	0.27474E-01
88	0.67941E 00	0.43339E 00	0.85519E-02
89	0.86507E 00	0.43339E 00	0.24447E-01
90	-0.98886E 00	0.14887E 00	0.0
91	-0.97391E 00	0.14887E 00	0.16672E-01
92	-0.86506E 00	0.14887E 00	0.12924E-01
93	-0.67941E 00	0.14887E 00	0.19215E-01
94	-0.43340E 00	0.14887E 00	0.68586E-02
95	-0.14887E 00	0.14887E 00	0.18229E-01
96	0.14887E 00	0.14887E 00	0.18229E-01
97	0.43340E 00	0.14887E 00	0.68586E-02
98	0.67941E 00	0.14887E 00	0.19215E-01
99	0.86506E 00	0.14887E 00	0.12924E-01
100	0.97391E 00	0.14887E 00	0.16672E-01

166 Angle Biased Down

	MU	ETA	WEIGHT
1	-0.25298E-01	-0.99968E 00	0.0
2	-0.19937E-01	-0.99968E 00	0.16682E-03
3	-0.46106E-02	-0.99968E 00	0.15365E-04
4	-0.22051E-02	-0.99968E 00	0.87799E-05
5	-0.66232E-03	-0.99968E 00	0.65851E-05
6	0.66232E-03	-0.99968E 00	0.65851E-05
7	0.22051E-02	-0.99968E 00	0.87799E-05
8	0.46106E-02	-0.99968E 00	0.15365E-04
9	0.19937E-01	-0.99968E 00	0.16682E-03
10	-0.57248E-01	-0.99836E 00	0.0
11	-0.45113E-01	-0.99836E 00	0.39065E-03
12	-0.10433E-01	-0.99836E 00	0.35981E-04
13	-0.49897E-02	-0.99836E 00	0.20560E-04
14	-0.14987E-02	-0.99836E 00	0.15421E-04
15	0.14987E-02	-0.99836E 00	0.15421E-04
16	0.49897E-02	-0.99836E 00	0.20560E-04
17	0.10433E-01	-0.99836E 00	0.35981E-04
18	0.45113E-01	-0.99836E 00	0.39065E-03
19	-0.89576E-01	-0.99598E 00	0.0
20	-0.70587E-01	-0.99598E 00	0.61448E-03
21	-0.16324E-01	-0.99598E 00	0.56597E-04
22	-0.78072E-02	-0.99598E 00	0.32341E-04
23	-0.23450E-02	-0.99598E 00	0.24256E-04
24	0.23450E-02	-0.99598E 00	0.24256E-04
25	0.78072E-02	-0.99598E 00	0.32341E-04
26	0.16324E-01	-0.99598E 00	0.56597E-04
27	0.70587E-01	-0.99598E 00	0.61448E-03
28	-0.12192E 00	-0.99254E 00	0.0
29	-0.96074E-01	-0.99254E 00	0.83620E-03
30	-0.22218E-01	-0.99254E 00	0.77018E-04
31	-0.10626E-01	-0.99254E 00	0.44010E-04
32	-0.31917E-02	-0.99254E 00	0.33008E-04
33	0.31917E-02	-0.99254E 00	0.33008E-04
34	0.10626E-01	-0.99254E 00	0.44010E-04
35	0.22218E-01	-0.99254E 00	0.77018E-04
36	0.96074E-01	-0.99254E 00	0.83620E-03
37	-0.15413E 00	-0.98805E 00	0.0
38	-0.12146E 00	-0.98805E 00	0.10579E-02
39	-0.28089E-01	-0.98805E 00	0.97439E-04
40	-0.13434E-01	-0.98805E 00	0.55680E-04
41	-0.40350E-02	-0.98805E 00	0.41761E-04
42	0.40350E-02	-0.98805E 00	0.41761E-04
43	0.13434E-01	-0.98805E 00	0.55680E-04
44	0.28089E-01	-0.98805E 00	0.97439E-04
45	0.12146E 00	-0.98805E 00	0.10579E-02
46	-0.18621E 00	-0.98251E 00	0.0
47	-0.14674E 00	-0.98251E 00	0.12776E-02
48	-0.33934E-01	-0.98251E 00	0.11767E-03
49	-0.16230E-01	-0.98251E 00	0.67240E-04
50	-0.48747E-02	-0.98251E 00	0.50431E-04
51	0.48747E-02	-0.98251E 00	0.50431E-04
52	0.16230E-01	-0.98251E 00	0.67240E-04
53	0.33934E-01	-0.98251E 00	0.11767E-03
54	0.14674E 00	-0.98251E 00	0.12776E-02
55	-0.21808E 00	-0.97593E 00	0.0
56	-0.17185E 00	-0.97593E 00	0.14971E-02
57	-0.39743E-01	-0.97593E 00	0.13789E-03
58	-0.19008E-01	-0.97593E 00	0.78795E-04
59	-0.57091E-02	-0.97593E 00	0.59097E-04
60	0.57091E-02	-0.97593E 00	0.59097E-04
61	0.19008E-01	-0.97593E 00	0.78795E-04
62	0.39743E-01	-0.97593E 00	0.13789E-03
63	0.17185E 00	-0.97593E 00	0.14971E-02
64	-0.24971E 00	-0.96832E 00	0.0
65	-0.19678E 00	-0.96832E 00	0.17146E-02
66	-0.45507E-01	-0.96832E 00	0.15793E-03

166 Angle Biased Down (Cont.)

67	-0.21764E-01	-0.96832E 00	0.902445-04
68	-0.65371E-02	-0.96832E 00	0.67684E-04
69	0.65371E-02	-0.96832E 00	0.67684E-04
70	0.21764E-01	-0.96832E 00	0.90244E-04
71	0.45507E-01	-0.96832E 00	0.15793E-03
72	0.19678E 00	-0.96832E 00	0.17146E-02
73	-0.28110E 00	-0.95968E 00	0.0
74	-0.22151E 00	-0.95968E 00	0.19301E-02
75	-0.51226E-01	-0.95968E 00	0.17777E-03
76	-0.24500E-01	-0.95968E 00	0.10158E-03
77	-0.73587E-02	-0.95968E 00	0.76187E-04
78	0.73587E-02	-0.95968E 00	0.76187E-04
79	0.24500E-01	-0.95968E 00	0.10158E-03
80	0.51226E-01	-0.95968E 00	0.17777E-03
81	0.22151E 00	-0.95968E 00	0.19301E-02
82	-0.31216E 00	-0.95003E 00	0.0
83	-0.24598E 00	-0.95003E 00	0.21454E-02
84	-0.56887E-01	-0.95003E 00	0.19760E-03
85	-0.27207E-01	-0.95003E 00	0.11291E-03
86	-0.81719E-02	-0.95003E 00	0.84688E-04
87	0.81719E-02	-0.95003E 00	0.84688E-04
88	0.27207E-01	-0.95003E 00	0.11291E-03
89	0.56887E-01	-0.95003E 00	0.19760E-03
90	0.24598E 00	-0.95003E 00	0.21454E-02
91	-0.34291E 00	-0.93937E 00	0.0
92	-0.27021E 00	-0.93937E 00	0.23566E-02
93	-0.62490E-01	-0.93937E 00	0.21705E-03
94	-0.29887E-01	-0.93937E 00	0.12403E-03
95	-0.89768E-02	-0.93937E 00	0.93024E-04
96	0.89768E-02	-0.93937E 00	0.93024E-04
97	0.29887E-01	-0.93937E 00	0.12403E-03
98	0.62490E-01	-0.93937E 00	0.21705E-03
99	0.27021E 00	-0.93937E 00	0.23566E-02
100	-0.50167E 00	-0.86506E 00	0.0
101	-0.43340E 00	-0.86506E 00	0.24447E-01
102	-0.14888E 00	-0.86506E 00	0.12924E-01
103	0.14888E 00	-0.86506E 00	0.12924E-01
104	0.43340E 00	-0.86506E 00	0.24447E-01
105	-0.73377E 00	-0.67940E 00	0.0
106	-0.67942E 00	-0.67940E 00	0.27017E-01
107	-0.43340E 00	-0.67940E 00	0.85519E-02
108	-0.14888E 00	-0.67940E 00	0.19214E-01
109	0.14888E 00	-0.67940E 00	0.19214E-01
110	0.43340E 00	-0.67940E 00	0.85519E-02
111	0.67942E 00	-0.67940E 00	0.27017E-01
112	-0.90121E 00	-0.43339E 00	0.0
113	-0.86507E 00	-0.43339E 00	0.24447E-01
114	-0.67941E 00	-0.43339E 00	0.85519E-02
115	-0.43340E 00	-0.43339E 00	0.27474E-01
116	-0.14887E 00	-0.43339E 00	0.68585E-02
117	0.14887E 00	-0.43339E 00	0.68585E-02
118	0.43340E 00	-0.43339E 00	0.27474E-01
119	0.67941E 00	-0.43339E 00	0.85519E-02
120	0.86507E 00	-0.43339E 00	0.24447E-01
121	-0.98886E 00	-0.14887E 00	0.0
122	-0.97391E 00	-0.14887E 00	0.16672E-01
123	-0.86506E 00	-0.14887E 00	0.12924E-01
124	-0.67941E 00	-0.14887E 00	0.19215E-01
125	-0.43340E 00	-0.14887E 00	0.68586E-02
126	-0.14887E 00	-0.14887E 00	0.18229E-01
127	0.14887E 00	-0.14887E 00	0.18229E-01
128	0.43340E 00	-0.14887E 00	0.68586E-02
129	0.67941E 00	-0.14887E 00	0.19215E-01
130	0.86506E 00	-0.14887E 00	0.12924E-01
131	0.97391E 00	-0.14887E 00	0.16672E-01
132	-0.22698E 00	0.97390E 00	0.0
133	-0.14889E 00	0.97390E 00	0.16672E-01

166 Angle Biased Down (Cont.)

134	0.14889E 00	0.97390E 00	0.16672E-01
135	-0.50167E 00	0.86506E 00	0.0
136	-0.43340E 00	0.86506E 00	0.24447E-01
137	-0.14888E 00	0.86506E 00	0.12924E-01
138	0.14888E 00	0.86506E 00	0.12924E-01
139	0.43340E 00	0.86506E 00	0.24447E-01
140	-0.73377E 00	0.67940E 00	0.0
141	-0.67942E 00	0.67940E 00	0.27017E-01
142	-0.43340E 00	0.67940E 00	0.85519E-02
143	-0.14888E 00	0.67940E 00	0.19214E-01
144	0.14888E 00	0.67940E 00	0.19214E-01
145	0.43340E 00	0.67940E 00	0.85519E-02
146	0.67942E 00	0.67940E 00	0.27017E-01
147	-0.90121E 00	0.43339E 00	0.0
148	-0.86507E 00	0.43339E 00	0.24447E-01
149	-0.67941E 00	0.43339E 00	0.85519E-02
150	-0.43340E 00	0.43339E 00	0.27474E-01
151	-0.14887E 00	0.43339E 00	0.68585E-02
152	0.14887E 00	0.43339E 00	0.68585E-02
153	0.43340E 00	0.43339E 00	0.27474E-01
154	0.67941E 00	0.43339E 00	0.85519E-02
155	0.86507E 00	0.43339E 00	0.24447E-01
156	-0.98886E 00	0.14887E 00	0.0
157	-0.97391E 00	0.14887E 00	0.16672E-01
158	-0.86506E 00	0.14887E 00	0.12924E-01
159	-0.67941E 00	0.14887E 00	0.19215E-01
160	-0.43340E 00	0.14887E 00	0.68586E-02
161	-0.14887E 00	0.14887E 00	0.18229E-01
162	0.14887E 00	0.14887E 00	0.18229E-01
163	0.43340E 00	0.14887E 00	0.68586E-02
164	0.67941E 00	0.14887E 00	0.19215E-01
165	0.86506E 00	0.14887E 00	0.12924E-01
166	0.97391E 00	0.14887E 00	0.16672E-01

166 Angle Biased Up

	MU	ETA	WEIGHT
1	-0.22698E 00	-0.97390E 00	0.0
2	-0.14889E 00	-0.97390E 00	0.16672E-01
3	0.14889E 00	-0.97390E 00	0.16672E-01
4	-0.50167E 00	-0.86506E 00	0.0
5	-0.43340E 00	-0.86506E 00	0.24447E-01
6	-0.14888E 00	-0.86506E 00	0.12924E-01
7	0.14888E 00	-0.86506E 00	0.12924E-01
8	0.43340E 00	-0.86506E 00	0.24447E-01
9	-0.73377E 00	-0.67940E 00	0.0
10	-0.67942E 00	-0.67940E 00	0.27017E-01
11	-0.43340E 00	-0.67940E 00	0.85519E-02
12	-0.14888E 00	-0.67940E 00	0.19214E-01
13	0.14888E 00	-0.67940E 00	0.19214E-01
14	0.43340E 00	-0.67940E 00	0.85519E-02
15	0.67942E 00	-0.67940E 00	0.27017E-01
16	-0.90121E 00	-0.43339E 00	0.0
17	-0.86507E 00	-0.43339E 00	0.24447E-01
18	-0.67941E 00	-0.43339E 00	0.85519E-02
19	-0.43340E 00	-0.43339E 00	0.27474E-01
20	-0.14887E 00	-0.43339E 00	0.68585E-02
21	0.14887E 00	-0.43339E 00	0.68585E-02
22	0.43340E 00	-0.43339E 00	0.27474E-01
23	0.67941E 00	-0.43339E 00	0.85519E-02
24	0.86507E 00	-0.43339E 00	0.24447E-01
25	-0.98886E 00	-0.14887E 00	0.0
26	-0.97391E 00	-0.14887E 00	0.16672E-01
27	-0.86506E 00	-0.14887E 00	0.12924E-01
28	-0.67941E 00	-0.14887E 00	0.19215E-01

166 Angle Biased Up (Cont.)

29	-0.43340E 00	-0.14887E 00	0.68586E-02
30	-0.14887E 00	-0.14887E 00	0.18229E-01
31	0.14887E 00	-0.14887E 00	0.18229E-01
32	0.43340E 00	-0.14887E 00	0.68586E-02
33	0.67941E 00	-0.14887E 00	0.19215E-01
34	0.85506E 00	-0.14887E 00	0.12924E-01
35	0.97391E 00	-0.14887E 00	0.16672E-01
36	-0.25298E-01	0.99968E 00	0.0
37	-0.19937E-01	0.99968E 00	0.16682E-03
38	-0.46106E-02	0.99968E 00	0.15365E-04
39	-0.22051E-02	0.99968E 00	0.87799E-05
40	-0.66232E-03	0.99968E 00	0.65851E-05
41	0.66232E-03	0.99968E 00	0.65851E-05
42	0.22051E-02	0.99968E 00	0.87799E-05
43	0.46106E-02	0.99968E 00	0.15365E-04
44	0.19937E-01	0.99968E 00	0.16682E-03
45	-0.57248E-01	0.99836E 00	0.0
46	-0.45113E-01	0.99836E 00	0.39065E-03
47	-0.10433E-01	0.99836E 00	0.35981E-04
48	-0.49897E-02	0.99836E 00	0.20560E-04
49	-0.14987E-02	0.99836E 00	0.15421E-04
50	0.14987E-02	0.99836E 00	0.15421E-04
51	0.49897E-02	0.99836E 00	0.20560E-04
52	0.10433E-01	0.99836E 00	0.35981E-04
53	0.45113E-01	0.99836E 00	0.39065E-03
54	-0.89576E-01	0.99598E 00	0.0
55	-0.70587E-01	0.99598E 00	0.61448E-03
56	-0.16324E-01	0.99598E 00	0.56597E-04
57	-0.78072E-02	0.99598E 00	0.32341E-04
58	-0.23450E-02	0.99598E 00	0.24256E-04
59	0.23450E-02	0.99598E 00	0.24256E-04
60	0.78072E-02	0.99598E 00	0.32341E-04
61	0.16324E-01	0.99598E 00	0.56597E-04
62	0.70587E-01	0.99598E 00	0.61448E-03
63	-0.12192E 00	0.99254E 00	0.0
64	-0.96074E-01	0.99254E 00	0.83620E-03
65	-0.22218E-01	0.99254E 00	0.77018E-04
66	-0.10626E-01	0.99254E 00	0.44010E-04
67	-0.31917E-02	0.99254E 00	0.33008E-04
68	0.31917E-02	0.99254E 00	0.33008E-04
69	0.10626E-01	0.99254E 00	0.44010E-04
70	0.22218E-01	0.99254E 00	0.77018E-04
71	0.96074E-01	0.99254E 00	0.83620E-03
72	-0.15413E 00	0.98805E 00	0.0
73	-0.12146E 00	0.98805E 00	0.10579E-02
74	-0.28089E-01	0.98805E 00	0.97439E-04
75	-0.13434E-01	0.98805E 00	0.55680E-04
76	-0.40350E-02	0.98805E 00	0.41761E-04
77	0.40350E-02	0.98805E 00	0.41761E-04
78	0.13434E-01	0.98805E 00	0.55680E-04
79	0.28089E-01	0.98805E 00	0.97439E-04
80	0.12146E 00	0.98805E 00	0.10579E-02
81	-0.18621E 00	0.98251E 00	0.0
82	-0.14674E 00	0.98251E 00	0.12776E-02
83	-0.33934E-01	0.98251E 00	0.11767E-03
84	-0.16230E-01	0.98251E 00	0.67240E-04
85	-0.48747E-02	0.98251E 00	0.50431E-04
86	0.48747E-02	0.98251E 00	0.50431E-04
87	0.16230E-01	0.98251E 00	0.67240E-04
88	0.33934E-01	0.98251E 00	0.11767E-03
89	0.14674E 00	0.98251E 00	0.12776E-02
90	-0.21808E 00	0.97593E 00	0.0
91	-0.17185E 00	0.97593E 00	0.14971E-02
92	-0.39743E-01	0.97593E 00	0.13789E-03
93	-0.19008E-01	0.97593E 00	0.78795E-04
94	-0.57091E-02	0.97593E 00	0.59097E-04
95	0.57091E-02	0.97593E 00	0.59097E-04
96	0.19008E-01	0.97593E 00	0.78795E-04
97	0.39743E-01	0.97593E 00	0.13789E-03

166 Angle Biased Up (Cont.)

98	0.17185E 00	0.97593E 00	0.14971E-02
99	-0.24971E 00	0.96832E 00	0.0
100	-0.19678E 00	0.96832E 00	0.17146E-02
101	-0.45507E-01	0.96832E 00	0.15793E-03
102	-0.21764E-01	0.96832E 00	0.90244E-04
103	-0.65371E-02	0.96832E 00	0.67684E-04
104	0.65371E-02	0.96832E 00	0.67684E-04
105	0.21764E-01	0.96832E 00	0.90244E-04
106	0.45507E-01	0.96832E 00	0.15793E-03
107	0.19678E 00	0.96832E 00	0.17146E-02
108	-0.28110E 00	0.95968E 00	0.0
109	-0.22151E 00	0.95968E 00	0.19301E-02
110	-0.51226E-01	0.95968E 00	0.17777E-03
111	-0.24500E-01	0.95968E 00	0.10158E-03
112	-0.73587E-02	0.95968E 00	0.76187E-04
113	0.73587E-02	0.95968E 00	0.76187E-04
114	0.24500E-01	0.95968E 00	0.10158E-03
115	0.51226E-01	0.95968E 00	0.17777E-03
116	0.22151E 00	0.95968E 00	0.19301E-02
117	-0.31216E 00	0.95003E 00	0.0
118	-0.24598E 00	0.95003E 00	0.21454E-02
119	-0.56887E-01	0.95003E 00	0.19760E-03
120	-0.27207E-01	0.95003E 00	0.11291E-03
121	-0.81719E-02	0.95003E 00	0.84688E-04
122	0.81719E-02	0.95003E 00	0.84688E-04
123	0.27207E-01	0.95003E 00	0.11291E-03
124	0.56887E-01	0.95003E 00	0.19760E-03
125	0.24598E 00	0.95003E 00	0.21454E-02
126	-0.34291E 00	0.93937E 00	0.0
127	-0.27021E 00	0.93937E 00	0.23566E-02
128	-0.62490E-01	0.93937E 00	0.21705E-03
129	-0.29887E-01	0.93937E 00	0.12403E-03
130	-0.89768E-02	0.93937E 00	0.93024E-04
131	0.89768E-02	0.93937E 00	0.93024E-04
132	0.29887E-01	0.93937E 00	0.12403E-03
133	0.62490E-01	0.93937E 00	0.21705E-03
134	0.27021E 00	0.93937E 00	0.23566E-02
135	-0.50167E 00	0.86506E 00	0.0
136	-0.43340E 00	0.86506E 00	0.24447E-01
137	-0.14888E 00	0.86506E 00	0.12924E-01
138	0.14888E 00	0.86506E 00	0.12924E-01
139	0.43340E 00	0.86506E 00	0.24447E-01
140	-0.73377E 00	0.67940E 00	0.0
141	-0.67942E 00	0.67940E 00	0.27017E-01
142	-0.43340E 00	0.67940E 00	0.85519E-02
143	-0.14888E 00	0.67940E 00	0.19214E-01
144	0.14888E 00	0.67940E 00	0.19214E-01
145	0.43340E 00	0.67940E 00	0.85519E-02
146	0.67942E 00	0.67940E 00	0.27017E-01
147	-0.90121E 00	0.43339E 00	0.0
148	-0.86507E 00	0.43339E 00	0.24447E-01
149	-0.67941E 00	0.43339E 00	0.85519E-02
150	-0.43340E 00	0.43339E 00	0.27474E-01
151	-0.14887E 00	0.43339E 00	0.68585E-02
152	0.14887E 00	0.43339E 00	0.68585E-02
153	0.43340E 00	0.43339E 00	0.27474E-01
154	0.67941E 00	0.43339E 00	0.85519E-02
155	0.86507E 00	0.43339E 00	0.24447E-01
156	-0.98886E 00	0.14887E 00	0.0
157	-0.97391E 00	0.14887E 00	0.16672E-01
158	-0.86506E 00	0.14887E 00	0.12924E-01
159	-0.67941E 00	0.14887E 00	0.19215E-01
160	-0.43340E 00	0.14887E 00	0.68586E-02
161	-0.14887E 00	0.14887E 00	0.18229E-01
162	0.14887E 00	0.14887E 00	0.18229E-01
163	0.43340E 00	0.14887E 00	0.68586E-02
164	0.67941E 00	0.14887E 00	0.19215E-01
165	0.86506E 00	0.14887E 00	0.12924E-01
166	0.97391E 00	0.14887E 00	0.16672E-01

210 Angle Biased Down

	MU	ETA	WEIGHT
1	-0.25298E-01	-0.99968E 00	0.0
2	-0.19937E-01	-0.99968E 00	0.16682E-03
3	-0.46106E-02	-0.99968E 00	0.15365E-04
4	-0.22051E-02	-0.99968E 00	0.87799E-05
5	-0.66232E-03	-0.99968E 00	0.65851E-05
6	0.66232E-03	-0.99968E 00	0.65851E-05
7	0.22051E-02	-0.99968E 00	0.87799E-05
8	0.46106E-02	-0.99968E 00	0.15365E-04
9	0.19937E-01	-0.99968E 00	0.16682E-03
10	-0.57248E-01	-0.99836E 00	0.0
11	-0.45113E-01	-0.99836E 00	0.39065E-03
12	-0.10433E-01	-0.99836E 00	0.35981E-04
13	-0.49897E-02	-0.99836E 00	0.20560E-04
14	-0.14987E-02	-0.99836E 00	0.15421E-04
15	0.14987E-02	-0.99836E 00	0.15421E-04
16	0.49897E-02	-0.99836E 00	0.20560E-04
17	0.10433E-01	-0.99836E 00	0.35981E-04
18	0.45113E-01	-0.99836E 00	0.39065E-03
19	-0.89576E-01	-0.99598E 00	0.0
20	-0.70587E-01	-0.99598E 00	0.61448E-03
21	-0.16324E-01	-0.99598E 00	0.56597E-04
22	-0.78072E-02	-0.99598E 00	0.32341E-04
23	-0.23450E-02	-0.99598E 00	0.24256E-04
24	0.23450E-02	-0.99598E 00	0.24256E-04
25	0.78072E-02	-0.99598E 00	0.32341E-04
26	0.16324E-01	-0.99598E 00	0.56597E-04
27	0.70587E-01	-0.99598E 00	0.61448E-03
28	-0.12192E 00	-0.99254E 00	0.0
29	-0.96074E-01	-0.99254E 00	0.83620E-03
30	-0.22218E-01	-0.99254E 00	0.77018E-04
31	-0.10626E-01	-0.99254E 00	0.44010E-04
32	-0.31917E-02	-0.99254E 00	0.33008E-04
33	0.31917E-02	-0.99254E 00	0.33008E-04
34	0.10626E-01	-0.99254E 00	0.44010E-04
35	0.22218E-01	-0.99254E 00	0.77018E-04
36	0.96074E-01	-0.99254E 00	0.83620E-03
37	-0.15413E 00	-0.98805E 00	0.0
38	-0.12146E 00	-0.98805E 00	0.10579E-02
39	-0.28089E-01	-0.98805E 00	0.97439E-04
40	-0.13434E-01	-0.98805E 00	0.55680E-04
41	-0.40350E-02	-0.98805E 00	0.41761E-04
42	0.40350E-02	-0.98805E 00	0.41761E-04
43	0.13434E-01	-0.98805E 00	0.55680E-04
44	0.28089E-01	-0.98805E 00	0.97439E-04
45	0.12146E 00	-0.98805E 00	0.10579E-02
46	-0.18621E 00	-0.98251E 00	0.0
47	-0.14674E 00	-0.98251E 00	0.12776E-02
48	-0.33934E-01	-0.98251E 00	0.11767E-03
49	-0.16230E-01	-0.98251E 00	0.67240E-04
50	-0.48747E-02	-0.98251E 00	0.50431E-04
51	0.48747E-02	-0.98251E 00	0.50431E-04
52	0.16230E-01	-0.98251E 00	0.67240E-04
53	0.33934E-01	-0.98251E 00	0.11767E-03
54	0.14674E 00	-0.98251E 00	0.12776E-02
55	-0.21808E 00	-0.97593E 00	0.0
56	-0.17185E 00	-0.97593E 00	0.14971E-02
57	-0.39743E-01	-0.97593E 00	0.13789E-03
58	-0.19008E-01	-0.97593E 00	0.78795E-04
59	-0.57091E-02	-0.97593E 00	0.59097E-04
60	0.57091E-02	-0.97593E 00	0.59097E-04
61	0.19008E-01	-0.97593E 00	0.78795E-04
62	0.39743E-01	-0.97593E 00	0.13789E-03
63	0.17185E 00	-0.97593E 00	0.14971E-02
64	-0.24971E 00	-0.96832E 00	0.0
65	-0.19678E 00	-0.96832E 00	0.17146E-02
66	-0.45507E-01	-0.96832E 00	0.15793E-03

210 Angle Biased Down (Cont.)

67	-0.21764E-01	-0.96832E 00	0.90244E-04
68	-0.65371E-02	-0.96832E 00	0.67684E-04
69	0.65371E-02	-0.96832E 00	0.67684E-04
70	0.21764E-01	-0.96832E 00	0.90244E-04
71	0.45507E-01	-0.96832E 00	0.15793E-03
72	0.19678E 00	-0.96832E 00	0.17146E-02
73	-0.28110E 00	-0.95968E 00	0.0
74	-0.22151E 00	-0.95968E 00	0.19301E-02
75	-0.51226E-01	-0.95968E 00	0.17777E-03
76	-0.24500E-01	-0.95968E 00	0.10158E-03
77	-0.73587E-02	-0.95968E 00	0.76187E-04
78	0.73587E-02	-0.95968E 00	0.76187E-04
79	0.24500E-01	-0.95968E 00	0.10158E-03
80	0.51226E-01	-0.95968E 00	0.17777E-03
81	0.22151E 00	-0.95968E 00	0.19301E-02
82	-0.31216E 00	-0.95003E 00	0.0
83	-0.24598E 00	-0.95003E 00	0.21454E-02
84	-0.56887E-01	-0.95003E 00	0.19760E-03
85	-0.27207E-01	-0.95003E 00	0.11291E-03
86	-0.81719E-02	-0.95003E 00	0.84688E-04
87	0.81719E-02	-0.95003E 00	0.84688E-04
88	0.27207E-01	-0.95003E 00	0.11291E-03
89	0.56887E-01	-0.95003E 00	0.19760E-03
90	0.24598E 00	-0.95003E 00	0.21454E-02
91	-0.34291E 00	-0.93937E 00	0.0
92	-0.27021E 00	-0.93937E 00	0.23566E-02
93	-0.62490E-01	-0.93937E 00	0.21705E-03
94	-0.29887E-01	-0.93937E 00	0.12403E-03
95	-0.89768E-02	-0.93937E 00	0.93024E-04
96	0.89768E-02	-0.93937E 00	0.93024E-04
97	0.29887E-01	-0.93937E 00	0.12403E-03
98	0.62490E-01	-0.93937E 00	0.21705E-03
99	0.27021E 00	-0.93937E 00	0.23566E-02
100	-0.50167E 00	-0.86506E 00	0.0
101	-0.43340E 00	-0.86506E 00	0.24447E-01
102	-0.14888E 00	-0.86506E 00	0.12924E-01
103	0.14888E 00	-0.86506E 00	0.12924E-01
104	0.43340E 00	-0.86506E 00	0.24447E-01
105	-0.73377E 00	-0.67940E 00	0.0
106	-0.67942E 00	-0.67940E 00	0.27017E-01
107	-0.43340E 00	-0.67940E 00	0.85519E-02
108	-0.14888E 00	-0.67940E 00	0.19214E-01
109	0.14888E 00	-0.67940E 00	0.19214E-01
110	0.43340E 00	-0.67940E 00	0.85519E-02
111	0.67942E 00	-0.67940E 00	0.27017E-01
112	-0.90121E 00	-0.43339E 00	0.0
113	-0.86507E 00	-0.43339E 00	0.24447E-01
114	-0.67941E 00	-0.43339E 00	0.85519E-02
115	-0.43340E 00	-0.43339E 00	0.27474E-01
116	-0.14887E 00	-0.43339E 00	0.68585E-02
117	0.14887E 00	-0.43339E 00	0.68585E-02
118	0.43340E 00	-0.43339E 00	0.27474E-01
119	0.67941E 00	-0.43339E 00	0.85519E-02
120	0.86507E 00	-0.43339E 00	0.24447E-01
121	-0.98129E 00	-0.19252E 00	0.0
122	-0.96646E 00	-0.19252E 00	0.11756E-01
123	-0.85844E 00	-0.19252E 00	0.91134E-02
124	-0.67421E 00	-0.19252E 00	0.13549E-01
125	-0.43008E 00	-0.19252E 00	0.48364E-02
126	-0.14773E 00	-0.19252E 00	0.12854E-01
127	0.14773E 00	-0.19252E 00	0.12854E-01
128	0.43008E 00	-0.19252E 00	0.48364E-02
129	0.67421E 00	-0.19252E 00	0.13549E-01
130	0.85844E 00	-0.19252E 00	0.91134E-02
131	0.96646E 00	-0.19252E 00	0.11756E-01
132	-0.99863E 00	-0.52340E-01	0.0
133	-0.98353E 00	-0.52340E-01	0.39314E-02

210 Angle Biased Down (Cont.)

134	-0.87361E 00	-0.52340E-01	0.30476E-02
135	-0.68612E 00	-0.52340E-01	0.45310E-02
136	-0.43768E 00	-0.52340E-01	0.16173E-02
137	-0.15034E 00	-0.52340E-01	0.42985E-02
138	0.15034E 00	-0.52340E-01	0.42985E-02
139	0.43768E 00	-0.52340E-01	0.16173E-02
140	0.68612E 00	-0.52340E-01	0.45310E-02
141	0.87361E 00	-0.52340E-01	0.30476E-02
142	0.98353E 00	-0.52340E-01	0.39314E-02
143	-0.99996E 00	-0.87300E-02	0.0
144	-0.98485E 00	-0.87300E-02	0.98432E-03
145	-0.87477E 00	-0.87300E-02	0.76304E-03
146	-0.68704E 00	-0.87300E-02	0.11345E-02
147	-0.43827E 00	-0.87300E-02	0.40493E-03
148	-0.15054E 00	-0.87300E-02	0.10762E-02
149	0.15054E 00	-0.87300E-02	0.10762E-02
150	0.43827E 00	-0.87300E-02	0.40493E-03
151	0.68704E 00	-0.87300E-02	0.11345E-02
152	0.87477E 00	-0.87300E-02	0.76304E-03
153	0.98485E 00	-0.87300E-02	0.98432E-03
154	-0.22698E 00	0.97390E 00	0.0
155	-0.14889E 00	0.97390E 00	0.16672E-01
156	0.14889E 00	0.97390E 00	0.16672E-01
157	-0.50167E 00	0.86506E 00	0.0
158	-0.43340E 00	0.86506E 00	0.24447E-01
159	-0.14888E 00	0.86506E 00	0.12924E-01
160	0.14888E 00	0.86506E 00	0.12924E-01
161	0.43340E 00	0.86506E 00	0.24447E-01
162	-0.73377E 00	0.67940E 00	0.0
163	-0.67942E 00	0.67940E 00	0.27017E-01
164	-0.43340E 00	0.67940E 00	0.85519E-02
165	-0.14888E 00	0.67940E 00	0.19214E-01
166	0.14888E 00	0.67940E 00	0.19214E-01
167	0.43340E 00	0.67940E 00	0.85519E-02
168	0.67942E 00	0.67940E 00	0.27017E-01
169	-0.90121E 00	0.43339E 00	0.0
170	-0.86507E 00	0.43339E 00	0.24447E-01
171	-0.67941E 00	0.43339E 00	0.85519E-02
172	-0.43340E 00	0.43339E 00	0.27474E-01
173	-0.14887E 00	0.43339E 00	0.68585E-02
174	0.14887E 00	0.43339E 00	0.68585E-02
175	0.43340E 00	0.43339E 00	0.27474E-01
176	0.67941E 00	0.43339E 00	0.85519E-02
177	0.86507E 00	0.43339E 00	0.24447E-01
178	-0.98129E 00	0.19252E 00	0.0
179	-0.96646E 00	0.19252E 00	0.11756E-01
180	-0.85844E 00	0.19252E 00	0.91134E-02
181	-0.67421E 00	0.19252E 00	0.13549E-01
182	-0.43008E 00	0.19252E 00	0.48364E-02
183	-0.14773E 00	0.19252E 00	0.12854E-01
184	0.14773E 00	0.19252E 00	0.12854E-01
185	0.43008E 00	0.19252E 00	0.48364E-02
186	0.67421E 00	0.19252E 00	0.13549E-01
187	0.85844E 00	0.19252E 00	0.91134E-02
188	0.96646E 00	0.19252E 00	0.11756E-01
189	-0.99863E 00	0.52340E-01	0.0
190	-0.98353E 00	0.52340E-01	0.39314E-02
191	-0.87361E 00	0.52340E-01	0.30476E-02
192	-0.68612E 00	0.52340E-01	0.45310E-02
193	-0.43768E 00	0.52340E-01	0.16173E-02
194	-0.15034E 00	0.52340E-01	0.42985E-02
195	0.15034E 00	0.52340E-01	0.42985E-02
196	0.43768E 00	0.52340E-01	0.16173E-02
197	0.68612E 00	0.52340E-01	0.45310E-02
198	0.87361E 00	0.52340E-01	0.30476E-02
199	0.98353E 00	0.52340E-01	0.39314E-02
200	-0.99996E 00	0.87300E-02	0.0

210 Angle Biased Down (Cont.)

201	-0.98485E 00	0.87300E-02	0.98432E-03
202	-0.87477E 00	0.87300E-02	0.76304E-03
203	-0.68704E 00	0.87300E-02	0.11345E-02
204	-0.43827E 00	0.87300E-02	0.40493E-03
205	-0.15054E 00	0.87300E-02	0.10762E-02
206	0.15054E 00	0.87300E-02	0.10762E-02
207	0.43827E 00	0.87300E-02	0.40493E-03
208	0.68704E 00	0.87300E-02	0.11345E-02
209	0.87477E 00	0.87300E-02	0.76304E-03
210	0.98485E 00	0.87300E-02	0.98432E-03

210 Angle Biased Up

	MU	ETA	WEIGHT
1	-0.22698E 00	-0.97390E 00	0.0
2	-0.14889E 00	-0.97390E 00	0.16672E-01
3	0.14889E 00	-0.97390E 00	0.16672E-01
4	-0.50167E 00	-0.86506E 00	0.0
5	-0.43340E 00	-0.86506E 00	0.24447E-01
6	-0.14888E 00	-0.86506E 00	0.12924E-01
7	0.14888E 00	-0.86506E 00	0.12924E-01
8	0.43340E 00	-0.86506E 00	0.24447E-01
9	-0.73377E 00	-0.67940E 00	0.0
10	-0.67942E 00	-0.67940E 00	0.27017E-01
11	-0.43340E 00	-0.67940E 00	0.85519E-02
12	-0.14888E 00	-0.67940E 00	0.19214E-01
13	0.14888E 00	-0.67940E 00	0.19214E-01
14	0.43340E 00	-0.67940E 00	0.85519E-02
15	0.67942E 00	-0.67940E 00	0.27017E-01
16	-0.90121E 00	-0.43339E 00	0.0
17	-0.86507E 00	-0.43339E 00	0.24447E-01
18	-0.67941E 00	-0.43339E 00	0.85519E-02
19	-0.43340E 00	-0.43339E 00	0.27474E-01
20	-0.14887E 00	-0.43339E 00	0.68585E-02
21	0.14887E 00	-0.43339E 00	0.68585E-02
22	0.43340E 00	-0.43339E 00	0.27474E-01
23	0.67941E 00	-0.43339E 00	0.85519E-02
24	0.86507E 00	-0.43339E 00	0.24447E-01
25	-0.98129E 00	-0.19252E 00	0.0
26	-0.96646E 00	-0.19252E 00	0.11756E-01
27	-0.85844E 00	-0.19252E 00	0.91134E-02
28	-0.67421E 00	-0.19252E 00	0.13549E-01
29	-0.43008E 00	-0.19252E 00	0.48364E-02
30	-0.14773E 00	-0.19252E 00	0.12854E-01
31	0.14773E 00	-0.19252E 00	0.12854E-01
32	0.43008E 00	-0.19252E 00	0.48364E-02
33	0.67421E 00	-0.19252E 00	0.13549E-01
34	0.85844E 00	-0.19252E 00	0.91134E-02
35	0.96646E 00	-0.19252E 00	0.11756E-01
36	-0.99863E 00	-0.52340E-01	0.0
37	-0.98353E 00	-0.52340E-01	0.39314E-02
38	-0.87361E 00	-0.52340E-01	0.30476E-02
39	-0.68612E 00	-0.52340E-01	0.45310E-02
40	-0.43768E 00	-0.52340E-01	0.16173E-02
41	-0.15034E 00	-0.52340E-01	0.42985E-02
42	0.15034E 00	-0.52340E-01	0.42985E-02
43	0.43768E 00	-0.52340E-01	0.16173E-02
44	0.68612E 00	-0.52340E-01	0.45310E-02
45	0.87361E 00	-0.52340E-01	0.30476E-02
46	0.98353E 00	-0.52340E-01	0.39314E-02
47	-0.99996E 00	-0.87300E-02	0.0
48	-0.98485E 00	-0.87300E-02	0.98432E-03
49	-0.87477E 00	-0.87300E-02	0.76304E-03
50	-0.68704E 00	-0.87300E-02	0.11345E-02

210 Angle Biased Up (Cont.)

51	-0.43827E 00	-0.87300E-02	0.40493E-03
52	-0.15054E 00	-0.87300E-02	0.10762E-02
53	0.15054E 00	-0.87300E-02	0.10762E-02
54	0.43827E 00	-0.87300E-02	0.40493E-03
55	0.68704E 00	-0.87300E-02	0.11345E-02
56	0.87477E 00	-0.87300E-02	0.76304E-03
57	0.98485E 00	-0.87300E-02	0.98432E-03
58	-0.25298E-01	0.99968E 00	0.0
59	-0.19937E-01	0.99968E 00	0.16682E-03
60	-0.46106E-02	0.99968E 00	0.15365E-04
61	-0.22051E-02	0.99968E 00	0.87799E-05
62	-0.66232E-03	0.99968E 00	0.65851E-05
63	0.66232E-03	0.99968E 00	0.65851E-05
64	0.22051E-02	0.99968E 00	0.87799E-05
65	0.46106E-02	0.99968E 00	0.15365E-04
66	0.19937E-01	0.99968E 00	0.16682E-03
67	-0.57248E-01	0.99836E 00	0.0
68	-0.45113E-01	0.99836E 00	0.39065E-03
69	-0.10433E-01	0.99836E 00	0.35981E-04
70	-0.49897E-02	0.99836E 00	0.20560E-04
71	-0.14987E-02	0.99836E 00	0.15421E-04
72	0.14987E-02	0.99836E 00	0.15421E-04
73	0.49897E-02	0.99836E 00	0.20560E-04
74	0.10433E-01	0.99836E 00	0.35981E-04
75	0.45113E-01	0.99836E 00	0.39065E-03
76	-0.89576E-01	0.99598E 00	0.0
77	-0.70587E-01	0.99598E 00	0.61448E-03
78	-0.16324E-01	0.99598E 00	0.56597E-04
79	-0.78072E-02	0.99598E 00	0.32341E-04
80	-0.23450E-02	0.99598E 00	0.24256E-04
81	0.23450E-02	0.99598E 00	0.24256E-04
82	0.78072E-02	0.99598E 00	0.32341E-04
83	0.16324E-01	0.99598E 00	0.56597E-04
84	0.70587E-01	0.99598E 00	0.61448E-03
85	-0.12192E 00	0.99254E 00	0.0
86	-0.96074E-01	0.99254E 00	0.83620E-03
87	-0.22218E-01	0.99254E 00	0.77018E-04
88	-0.10625E-01	0.99254E 00	0.44010E-04
89	-0.31917E-02	0.99254E 00	0.33008E-04
90	0.31917E-02	0.99254E 00	0.33008E-04
91	0.10625E-01	0.99254E 00	0.44010E-04
92	0.22218E-01	0.99254E 00	0.77018E-04
93	0.96074E-01	0.99254E 00	0.83620E-03
94	-0.15413E 00	0.98805E 00	0.0
95	-0.12146E 00	0.98805E 00	0.10579E-02
96	-0.28089E-01	0.98805E 00	0.97439E-04
97	-0.13434E-01	0.98805E 00	0.55680E-04
98	-0.40350E-02	0.98805E 00	0.41761E-04
99	0.40350E-02	0.98805E 00	0.41761E-04
100	0.13434E-01	0.98805E 00	0.55680E-04
101	0.28089E-01	0.98805E 00	0.97439E-04
102	0.12146E 00	0.98805E 00	0.10579E-02
103	-0.18621E 00	0.98251E 00	0.0
104	-0.14674E 00	0.98251E 00	0.12776E-02
105	-0.33934E-01	0.98251E 00	0.11767E-03
106	-0.16230E-01	0.98251E 00	0.67240E-04
107	-0.48747E-02	0.98251E 00	0.50431E-04
108	0.48747E-02	0.98251E 00	0.50431E-04
109	0.16230E-01	0.98251E 00	0.67240E-04
110	0.33934E-01	0.98251E 00	0.11767E-03
111	0.14674E 00	0.98251E 00	0.12776E-02
112	-0.21808E 00	0.97593E 00	0.0
113	-0.17185E 00	0.97593E 00	0.14971E-02
114	-0.39743E-01	0.97593E 00	0.13789E-03
115	-0.19008E-01	0.97593E 00	0.78795E-04
116	-0.57091E-02	0.97593E 00	0.59097E-04
117	0.57091E-02	0.97593E 00	0.59097E-04

210 Angle Biased Up (Cont.)

118	0.19008E-01	0.97593E 00	0.78795E-04
119	0.39743E-01	0.97593E 00	0.13789E-03
120	0.17185E 00	0.97593E 00	0.14971E-02
121	-0.24971E 00	0.96832E 00	0.0
122	-0.19678E 00	0.96832E 00	0.17146E-02
123	-0.45507E-01	0.96832E 00	0.15793E-03
124	-0.21764E-01	0.96832E 00	0.90244E-04
125	-0.65371E-02	0.96832E 00	0.67684E-04
126	0.65371E-02	0.96832E 00	0.67684E-04
127	0.21764E-01	0.96832E 00	0.90244E-04
128	0.45507E-01	0.96832E 00	0.15793E-03
129	0.19678E 00	0.96832E 00	0.17146E-02
130	-0.28110E 00	0.95968E 00	0.0
131	-0.22151E 00	0.95968E 00	0.19301E-02
132	-0.51226E-01	0.95968E 00	0.17777E-03
133	-0.24500E-01	0.95968E 00	0.10158E-03
134	-0.73587E-02	0.95968E 00	0.76187E-04
135	0.73587E-02	0.95968E 00	0.76187E-04
136	0.24500E-01	0.95968E 00	0.10158E-03
137	0.51226E-01	0.95968E 00	0.17777E-03
138	0.22151E 00	0.95968E 00	0.19301E-02
139	-0.31216E 00	0.95003E 00	0.0
140	-0.24598E 00	0.95003E 00	0.21454E-02
141	-0.56887E-01	0.95003E 00	0.19760E-03
142	-0.27207E-01	0.95003E 00	0.11291E-03
143	-0.81719E-02	0.95003E 00	0.84688E-04
144	0.81719E-02	0.95003E 00	0.84688E-04
145	0.27207E-01	0.95003E 00	0.11291E-03
146	0.56887E-01	0.95003E 00	0.19760E-03
147	0.24598E 00	0.95003E 00	0.21454E-02
148	-0.34291E 00	0.93937E 00	0.0
149	-0.27021E 00	0.93937E 00	0.23566E-02
150	-0.62490E-01	0.93937E 00	0.21705E-03
151	-0.29887E-01	0.93937E 00	0.12403E-03
152	-0.89768E-02	0.93937E 00	0.93024E-04
153	0.89768E-02	0.93937E 00	0.93024E-04
154	0.29887E-01	0.93937E 00	0.12403E-03
155	0.62490E-01	0.93937E 00	0.21705E-03
156	0.27021E 00	0.93937E 00	0.23566E-02
157	-0.50167E 00	0.86506E 00	0.0
158	-0.43340E 00	0.86506E 00	0.24447E-01
159	-0.14888E 00	0.86506E 00	0.12924E-01
160	0.14888E 00	0.86506E 00	0.12924E-01
161	0.43340E 00	0.86506E 00	0.24447E-01
162	-0.73377E 00	0.67940E 00	0.0
163	-0.67942E 00	0.67940E 00	0.27017E-01
164	-0.43340E 00	0.67940E 00	0.85519E-02
165	-0.14888E 00	0.67940E 00	0.19214E-01
166	0.14888E 00	0.67940E 00	0.19214E-01
167	0.43340E 00	0.67940E 00	0.85519E-02
168	0.67942E 00	0.67940E 00	0.27017E-01
169	-0.90121E 00	0.43339E 00	0.0
170	-0.86507E 00	0.43339E 00	0.24447E-01
171	-0.67941E 00	0.43339E 00	0.85519E-02
172	-0.43340E 00	0.43339E 00	0.27474E-01
173	-0.14887E 00	0.43339E 00	0.68585E-02
174	0.14887E 00	0.43339E 00	0.68585E-02
175	0.43340E 00	0.43339E 00	0.27474E-01
176	0.67941E 00	0.43339E 00	0.85519E-02
177	0.86507E 00	0.43339E 00	0.24447E-01
178	-0.98129E 00	0.19252E 00	0.0
179	-0.96646E 00	0.19252E 00	0.11756E-01
180	-0.85844E 00	0.19252E 00	0.91134E-02
181	-0.67421E 00	0.19252E 00	0.13549E-01
182	-0.43008E 00	0.19252E 00	0.48364E-02
183	-0.14773E 00	0.19252E 00	0.12854E-01
184	0.14773E 00	0.19252E 00	0.12854E-01

210 Angle Biased Up (Cont.)

185	0.43008E 00	0.19252E 00	0.48364E-02
186	0.67421E 00	0.19252E 00	0.13549E-01
187	0.85844E 00	0.19252E 00	0.91134E-02
188	0.96646E 00	0.19252E 00	0.11756E-01
189	-0.99863E 00	0.52340E-01	0.0
190	-0.98353E 00	0.52340E-01	0.39314E-02
191	-0.87361E 00	0.52340E-01	0.30476E-02
192	-0.68612E 00	0.52340E-01	0.45310E-02
193	-0.43768E 00	0.52340E-01	0.16173E-02
194	-0.15034E 00	0.52340E-01	0.42985E-02
195	0.15034E 00	0.52340E-01	0.42985E-02
196	0.43768E 00	0.52340E-01	0.16173E-02
197	0.68612E 00	0.52340E-01	0.45310E-02
198	0.87361E 00	0.52340E-01	0.30476E-02
199	0.98353E 00	0.52340E-01	0.39314E-02
200	-0.99996E 00	0.87300E-02	0.0
201	-0.98485E 00	0.87300E-02	0.98432E-03
202	-0.87477E 00	0.87300E-02	0.76304E-03
203	-0.68704E 00	0.87300E-02	0.11345E-02
204	-0.43827E 00	0.87300E-02	0.40493E-03
205	-0.15054E 00	0.87300E-02	0.10762E-02
206	0.15054E 00	0.87300E-02	0.10762E-02
207	0.43827E 00	0.87300E-02	0.40493E-03
208	0.68704E 00	0.87300E-02	0.11345E-02
209	0.87477E 00	0.87300E-02	0.76304E-03
210	0.98485E 00	0.87300E-02	0.98432E-03

S2 R-0

	MU	ETA	WEIGHT
1	-0.81650E 00	-0.10000E-04	0.0
2	-0.57735E 00	-0.57735E 00	0.25000E 00
3	0.57735E 00	-0.57735E 00	0.25000E 00
4	-0.81650E 00	0.10000E-04	0.0
5	-0.57735E 00	0.57735E 00	0.25000E 00
6	0.57735E 00	0.57735E 00	0.25000E 00

S4 R-0

	MU	ETA	WEIGHT
1	-0.47140E 00	-0.10000E-04	0.0
2	-0.33333E 00	-0.33333E 00	0.83333E-01
3	0.33333E 00	-0.33333E 00	0.83333E-01
4	-0.94281E 00	-0.10000E-04	0.0
5	-0.88192E 00	-0.33333E 00	0.83333E-01
6	-0.33333E 00	-0.88192E 00	0.83333E-01
7	0.33333E 00	-0.88192E 00	0.83333E-01
8	0.88192E 00	-0.33333E 00	0.83333E-01
9	-0.47140E 00	0.10000E-04	0.0
10	-0.33333E 00	0.33333E 00	0.83333E-01
11	0.33333E 00	0.33333E 00	0.83333E-01
12	-0.94281E 00	0.10000E-04	0.0
13	-0.88192E 00	0.33333E 00	0.83333E-01
14	-0.33333E 00	0.88192E 00	0.83333E-01
15	0.33333E 00	0.88192E 00	0.83333E-01
16	0.88192E 00	0.33333E 00	0.83333E-01

S6 R-θ

	MU	ETA	WEIGHT
1	-0.36515E 00	-0.10000E-04	0.0
2	-0.25820E 00	-0.25820E 00	0.41667E-01
3	0.25820E 00	-0.25820E 00	0.41667E-01
4	-0.73030E 00	-0.10000E-04	0.0
5	-0.68313E 00	-0.25820E 00	0.41667E-01
6	-0.25820E 00	-0.68313E 00	0.41667E-01
7	0.25820E 00	-0.68313E 00	0.41667E-01
8	0.68313E 00	-0.25820E 00	0.41667E-01
9	-0.96609E 00	-0.10000E-04	0.0
10	-0.93095E 00	-0.25820E 00	0.41667E-01
11	-0.68313E 00	-0.68313E 00	0.41667E-01
12	-0.25820E 00	-0.93095E 00	0.41667E-01
13	0.25820E 00	-0.93095E 00	0.41667E-01
14	0.68313E 00	-0.68313E 00	0.41667E-01
15	0.93095E 00	-0.25820E 00	0.41667E-01
16	-0.36515E 00	0.10000E-04	0.0
17	-0.25820E 00	0.25820E 00	0.41667E-01
18	0.25820E 00	0.25820E 00	0.41667E-01
19	-0.73030E 00	0.10000E-04	0.0
20	-0.68313E 00	0.25820E 00	0.41667E-01
21	-0.25820E 00	0.68313E 00	0.41667E-01
22	0.25820E 00	0.68313E 00	0.41667E-01
23	0.68313E 00	0.25820E 00	0.41667E-01
24	-0.96609E 00	0.10000E-04	0.0
25	-0.93095E 00	0.25820E 00	0.41667E-01
26	-0.68313E 00	0.68313E 00	0.41667E-01
27	-0.25820E 00	0.93095E 00	0.41667E-01
28	0.25820E 00	0.93095E 00	0.41667E-01
29	0.68313E 00	0.68313E 00	0.41667E-01
30	0.93095E 00	0.25820E 00	0.41667E-01

S8 R-θ

	MU	ETA	WEIGHT
1	-0.30861E 00	-0.10000E-04	0.0
2	-0.21822E 00	-0.21821E 00	0.30247E-01
3	0.21822E 00	-0.21821E 00	0.30247E-01
4	-0.61721E 00	-0.10000E-04	0.0
5	-0.57735E 00	-0.21820E 00	0.22685E-01
6	-0.21822E 00	-0.57734E 00	0.22685E-01
7	0.21822E 00	-0.57734E 00	0.22685E-01
8	0.57735E 00	-0.21820E 00	0.22685E-01
9	-0.81650E 00	-0.10000E-04	0.0
10	-0.78680E 00	-0.21820E 00	0.22685E-01
11	-0.57735E 00	-0.57735E 00	0.23148E-01
12	-0.21822E 00	-0.78680E 00	0.22685E-01
13	0.21822E 00	-0.78680E 00	0.22685E-01
14	0.57735E 00	-0.57735E 00	0.23148E-01
15	0.78680E 00	-0.21820E 00	0.22685E-01
16	-0.97590E 00	-0.10000E-04	0.0
17	-0.95119E 00	-0.21821E 00	0.30247E-01
18	-0.78680E 00	-0.57734E 00	0.22685E-01
19	-0.57735E 00	-0.78680E 00	0.22685E-01
20	-0.21822E 00	-0.95119E 00	0.30247E-01
21	0.21822E 00	-0.95119E 00	0.30247E-01
22	0.57735E 00	-0.78680E 00	0.22685E-01
23	0.78680E 00	-0.57734E 00	0.22685E-01
24	0.95119E 00	-0.21821E 00	0.30247E-01
25	-0.30861E 00	0.10000E-04	0.0
26	-0.21822E 00	0.21821E 00	0.30247E-01
27	0.21822E 00	0.21821E 00	0.30247E-01
28	-0.61721E 00	0.10000E-04	0.0
29	-0.57735E 00	0.21820E 00	0.22685E-01
30	-0.21822E 00	0.57734E 00	0.22685E-01

S8 R-θ (Cont.)

31	0.21822E 00	0.57734E 00	0.22685E-01
32	0.57735E 00	0.21820E 00	0.22685E-01
33	-0.81650E 00	0.10000E-04	0.0
34	-0.78680E 00	0.21820E 00	0.22685E-01
35	-0.57735E 00	0.57735E 00	0.23148E-01
36	-0.21822E 00	0.78680E 00	0.22685E-01
37	0.21822E 00	0.78680E 00	0.22685E-01
38	0.57735E 00	0.57735E 00	0.23148E-01
39	0.78680E 00	0.21820E 00	0.22685E-01
40	-0.97590E 00	0.10000E-04	0.0
41	-0.95119E 00	0.21821E 00	0.30247E-01
42	-0.78680E 00	0.57734E 00	0.22685E-01
43	-0.57735E 00	0.78680E 00	0.22685E-01
44	-0.21822E 00	0.95119E 00	0.30247E-01
45	0.21822E 00	0.95119E 00	0.30247E-01
46	0.57735E 00	0.78680E 00	0.22685E-01
47	0.78680E 00	0.57734E 00	0.22685E-01
48	0.95119E 00	0.21821E 00	0.30247E-01

S10 R-θ

	MU	ETA	WEIGHT
1	-0.27217E 00	-0.10000E-04	0.0
2	-0.19245E 00	-0.19245E 00	0.23001E-01
3	0.19245E 00	-0.19245E 00	0.23001E-01
4	-0.54433E 00	-0.10000E-04	0.0
5	-0.50918E 00	-0.19244E 00	0.17468E-01
6	-0.19245E 00	-0.50918E 00	0.17468E-01
7	0.19245E 00	-0.50918E 00	0.17468E-01
8	0.50918E 00	-0.19244E 00	0.17468E-01
9	-0.72008E 00	-0.10000E-04	0.0
10	-0.69389E 00	-0.19244E 00	0.12346E-01
11	-0.50918E 00	-0.50917E 00	0.13051E-01
12	-0.19245E 00	-0.69389E 00	0.12346E-01
13	0.19245E 00	-0.69389E 00	0.12346E-01
14	0.50918E 00	-0.50917E 00	0.13051E-01
15	0.69389E 00	-0.19244E 00	0.12346E-01
16	-0.86066E 00	-0.10000E-04	0.0
17	-0.83887E 00	-0.19244E 00	0.17468E-01
18	-0.69389E 00	-0.50917E 00	0.13051E-01
19	-0.50918E 00	-0.69388E 00	0.13051E-01
20	-0.19245E 00	-0.83887E 00	0.17468E-01
21	0.19245E 00	-0.83887E 00	0.17468E-01
22	0.50918E 00	-0.69388E 00	0.13051E-01
23	0.69389E 00	-0.50917E 00	0.13051E-01
24	0.83887E 00	-0.19244E 00	0.17468E-01
25	-0.98131E 00	-0.10000E-04	0.0
26	-0.96225E 00	-0.19245E 00	0.23001E-01
27	-0.83887E 00	-0.50918E 00	0.17468E-01
28	-0.69389E 00	-0.69389E 00	0.12346E-01
29	-0.50918E 00	-0.83887E 00	0.17468E-01
30	-0.19245E 00	-0.96225E 00	0.23001E-01
31	0.19245E 00	-0.96225E 00	0.23001E-01
32	0.50918E 00	-0.83887E 00	0.17468E-01
33	0.69389E 00	-0.69389E 00	0.12346E-01
34	0.83887E 00	-0.50918E 00	0.17468E-01
35	0.96225E 00	-0.19245E 00	0.23001E-01
36	-0.27217E 00	0.10000E-04	0.0
37	-0.19245E 00	0.19245E 00	0.23001E-01
38	0.19245E 00	0.19245E 00	0.23001E-01
39	-0.54433E 00	0.10000E-04	0.0
40	-0.50918E 00	0.19244E 00	0.17468E-01
41	-0.19245E 00	0.50918E 00	0.17468E-01
42	0.19245E 00	0.50918E 00	0.17468E-01
43	0.50918E 00	0.19244E 00	0.17468E-01

S10 R-0 (Cont.)

44	-0.72008E 00	0.10000E-04	0.0
45	-0.69389E 00	0.19244E 00	0.12346E-01
46	-0.50918E 00	0.50917E 00	0.13051E-01
47	-0.19245E 00	0.69389E 00	0.12346E-01
48	0.19245E 00	0.69389E 00	0.12346E-01
49	0.50918E 00	0.50917E 00	0.13051E-01
50	0.69389E 00	0.19244E 00	0.12346E-01
51	-0.86066E 00	0.10000E-04	0.0
52	-0.83887E 00	0.19244E 00	0.17468E-01
53	-0.69389E 00	0.50917E 00	0.13051E-01
54	-0.50918E 00	0.69388E 00	0.13051E-01
55	-0.19245E 00	0.83887E 00	0.17468E-01
56	0.19245E 00	0.83887E 00	0.17468E-01
57	0.50918E 00	0.69388E 00	0.13051E-01
58	0.69389E 00	0.50917E 00	0.13051E-01
59	0.83887E 00	0.19244E 00	0.17468E-01
60	-0.98131E 00	0.10000E-04	0.0
61	-0.96225E 00	0.19245E 00	0.23001E-01
62	-0.83887E 00	0.50918E 00	0.17468E-01
63	-0.69389E 00	0.69389E 00	0.12346E-01
64	-0.50918E 00	0.83887E 00	0.17468E-01
65	-0.19245E 00	0.96225E 00	0.23001E-01
66	0.19245E 00	0.96225E 00	0.23001E-01
67	0.50918E 00	0.83887E 00	0.17468E-01
68	0.69389E 00	0.69389E 00	0.12346E-01
69	0.83887E 00	0.50918E 00	0.17468E-01
70	0.96225E 00	0.19245E 00	0.23001E-01

S12 R-0

	MU	ETA	WEIGHT
1	-0.24618E 00	-0.10000E-04	0.0
2	-0.17408E 00	-0.17409E 00	0.18643E-01
3	0.17408E 00	-0.17409E 00	0.18643E-01
4	-0.49237E 00	-0.10000E-04	0.0
5	-0.46057E 00	-0.17406E 00	0.13760E-01
6	-0.17408E 00	-0.46056E 00	0.13760E-01
7	0.17408E 00	-0.46056E 00	0.13760E-01
8	0.46057E 00	-0.17406E 00	0.13760E-01
9	-0.65134E 00	-0.10000E-04	0.0
10	-0.62765E 00	-0.17405E 00	0.98031E-02
11	-0.46057E 00	-0.46056E 00	0.98912E-02
12	-0.17408E 00	-0.62764E 00	0.98031E-02
13	0.17408E 00	-0.62764E 00	0.98031E-02
14	0.46057E 00	-0.46056E 00	0.98912E-02
15	0.62765E 00	-0.17405E 00	0.98031E-02
16	-0.77850E 00	-0.10000E-04	0.0
17	-0.75879E 00	-0.17405E 00	0.98031E-02
18	-0.62765E 00	-0.46056E 00	0.76720E-02
19	-0.46057E 00	-0.62764E 00	0.76720E-02
20	-0.17408E 00	-0.75878E 00	0.98031E-02
21	0.17408E 00	-0.75878E 00	0.98031E-02
22	0.46057E 00	-0.62764E 00	0.76720E-02
23	0.62765E 00	-0.46056E 00	0.76720E-02
24	0.75879E 00	-0.17405E 00	0.98031E-02
25	-0.88763E 00	-0.10000E-04	0.0
26	-0.87039E 00	-0.17406E 00	0.13760E-01
27	-0.75879E 00	-0.46056E 00	0.98912E-02
28	-0.62765E 00	-0.62764E 00	0.76720E-02
29	-0.46057E 00	-0.75878E 00	0.98912E-02
30	-0.17408E 00	-0.87039E 00	0.13760E-01
31	0.17408E 00	-0.87039E 00	0.13760E-01
32	0.46057E 00	-0.75878E 00	0.98912E-02
33	0.62765E 00	-0.62764E 00	0.76720E-02

S12 R-0 (Cont.)

34	0.75879E 00	-0.46056E 00	0.98912E-02
35	0.87039E 00	-0.17406E 00	0.13760E-01
36	-0.98473E 00	-0.10000E-04	0.0
37	-0.96922E 00	-0.17409E 00	0.18643E-01
38	-0.87039E 00	-0.46056E 00	0.13760E-01
39	-0.75879E 00	-0.62764E 00	0.98031E-02
40	-0.62765E 00	-0.75878E 00	0.98031E-02
41	-0.46057E 00	-0.87039E 00	0.13760E-01
42	-0.17408E 00	-0.96922E 00	0.18643E-01
43	0.17408E 00	-0.96922E 00	0.18643E-01
44	0.46057E 00	-0.87039E 00	0.13760E-01
45	0.62765E 00	-0.75878E 00	0.98031E-02
46	0.75879E 00	-0.62764E 00	0.98031E-02
47	0.87039E 00	-0.46056E 00	0.13760E-01
48	0.96922E 00	-0.17409E 00	0.18643E-01
49	-0.24618E 00	0.10000E-04	0.0
50	-0.17408E 00	0.17409E 00	0.18643E-01
51	0.17408E 00	0.17409E 00	0.18643E-01
52	-0.49237E 00	0.10000E-04	0.0
53	-0.46057E 00	0.17406E 00	0.13760E-01
54	-0.17408E 00	0.46056E 00	0.13760E-01
55	0.17408E 00	0.46056E 00	0.13760E-01
56	0.46057E 00	0.17406E 00	0.13760E-01
57	-0.65134E 00	0.10000E-04	0.0
58	-0.62765E 00	0.17405E 00	0.98031E-02
59	-0.46057E 00	0.46056E 00	0.98912E-02
60	-0.17408E 00	0.62764E 00	0.98031E-02
61	0.17408E 00	0.62764E 00	0.98031E-02
62	0.46057E 00	0.46056E 00	0.98912E-02
63	0.62765E 00	0.17405E 00	0.98031E-02
64	-0.77850E 00	0.10000E-04	0.0
65	-0.75879E 00	0.17405E 00	0.98031E-02
66	-0.62765E 00	0.46056E 00	0.76720E-02
67	-0.46057E 00	0.62764E 00	0.76720E-02
68	-0.17408E 00	0.75878E 00	0.98031E-02
69	0.17408E 00	0.75878E 00	0.98031E-02
70	0.46057E 00	0.62764E 00	0.76720E-02
71	0.62765E 00	0.46056E 00	0.76720E-02
72	0.75879E 00	0.17405E 00	0.98031E-02
73	-0.88763E 00	0.10000E-04	0.0
74	-0.87039E 00	0.17406E 00	0.13760E-01
75	-0.75879E 00	0.46056E 00	0.98912E-02
76	-0.62765E 00	0.62764E 00	0.76720E-02
77	-0.46057E 00	0.75878E 00	0.98912E-02
78	-0.17408E 00	0.87039E 00	0.13760E-01
79	0.17408E 00	0.87039E 00	0.13760E-01
80	0.46057E 00	0.75878E 00	0.98912E-02
81	0.62765E 00	0.62764E 00	0.76720E-02
82	0.75879E 00	0.46056E 00	0.98912E-02
83	0.87039E 00	0.17406E 00	0.13760E-01
84	-0.98473E 00	0.10000E-04	0.0
85	-0.96922E 00	0.17409E 00	0.18643E-01
86	-0.87039E 00	0.46056E 00	0.13760E-01
87	-0.75879E 00	0.62764E 00	0.98031E-02
88	-0.62765E 00	0.75878E 00	0.98031E-02
89	-0.46057E 00	0.87039E 00	0.13760E-01
90	-0.17408E 00	0.96922E 00	0.18643E-01
91	0.17408E 00	0.96922E 00	0.18643E-01
92	0.46057E 00	0.87039E 00	0.13760E-01
93	0.62765E 00	0.75878E 00	0.98031E-02
94	0.75879E 00	0.62764E 00	0.98031E-02
95	0.87039E 00	0.46056E 00	0.13760E-01
96	0.96922E 00	0.17409E 00	0.18643E-01

S14 R-0

	MU	ETA	WEIGHT
1	-0.226456E 00	-0.10000E-04	0.0
2	-0.16013E 00	-0.16014E 00	0.16007E-01
3	0.16013E 00	-0.16014E 00	0.16007E-01
4	-0.45291E 00	-0.10000E-04	0.0
5	-0.42366E 00	-0.16010E 00	0.10445E-01
6	-0.16013E 00	-0.42365E 00	0.10445E-01
7	0.16013E 00	-0.42365E 00	0.10445E-01
8	0.42366E 00	-0.16010E 00	0.10445E-01
9	-0.59914E 00	-0.10000E-04	0.0
10	-0.57735E 00	-0.16013E 00	0.97550E-02
11	-0.42366E 00	-0.42366E 00	0.85209E-02
12	-0.16013E 00	-0.57735E 00	0.97550E-02
13	0.16013E 00	-0.57735E 00	0.97550E-02
14	0.42366E 00	-0.42366E 00	0.85209E-02
15	0.57735E 00	-0.16013E 00	0.97550E-02
16	-0.71611E 00	-0.10000E-04	0.0
17	-0.69798E 00	-0.16015E 00	0.55018E-02
18	-0.57735E 00	-0.42366E 00	0.55165E-02
19	-0.42366E 00	-0.57735E 00	0.55165E-02
20	-0.16013E 00	-0.69798E 00	0.55018E-02
21	0.16013E 00	-0.69798E 00	0.55018E-02
22	0.42366E 00	-0.57735E 00	0.55165E-02
23	0.57735E 00	-0.42366E 00	0.55165E-02
24	0.69798E 00	-0.16015E 00	0.55018E-02
25	-0.81650E 00	-0.10000E-04	0.0
26	-0.80064E 00	-0.16013E 00	0.97550E-02
27	-0.69798E 00	-0.42366E 00	0.55165E-02
28	-0.57735E 00	-0.57735E 00	0.56153E-02
29	-0.42366E 00	-0.69798E 00	0.55165E-02
30	-0.16013E 00	-0.80064E 00	0.97550E-02
31	0.16013E 00	-0.80064E 00	0.97550E-02
32	0.42366E 00	-0.69798E 00	0.55165E-02
33	0.57735E 00	-0.57735E 00	0.56153E-02
34	0.69798E 00	-0.42366E 00	0.55165E-02
35	0.80064E 00	-0.16013E 00	0.97550E-02
36	-0.90582E 00	-0.10000E-04	0.0
37	-0.89156E 00	-0.16010E 00	0.10445E-01
38	-0.80064E 00	-0.42366E 00	0.85209E-02
39	-0.69798E 00	-0.57735E 00	0.55165E-02
40	-0.57735E 00	-0.69798E 00	0.55165E-02
41	-0.42365E 00	-0.80064E 00	0.85209E-02
42	-0.16013E 00	-0.89156E 00	0.10445E-01
43	0.16013E 00	-0.89156E 00	0.10445E-01
44	0.42366E 00	-0.80064E 00	0.85209E-02
45	0.57735E 00	-0.69798E 00	0.55165E-02
46	0.69798E 00	-0.57735E 00	0.55165E-02
47	0.80064E 00	-0.42366E 00	0.85209E-02
48	0.89156E 00	-0.16010E 00	0.10445E-01
49	-0.98710E 00	-0.10000E-04	0.0
50	-0.97402E 00	-0.16014E 00	0.16007E-01
51	-0.89156E 00	-0.42365E 00	0.10445E-01
52	-0.80064E 00	-0.57735E 00	0.97550E-02
53	-0.69798E 00	-0.69798E 00	0.55018E-02
54	-0.57735E 00	-0.80064E 00	0.97550E-02
55	-0.42366E 00	-0.89156E 00	0.10445E-01
56	-0.16013E 00	-0.97402E 00	0.16007E-01
57	0.16013E 00	-0.97402E 00	0.16007E-01
58	0.42366E 00	-0.89156E 00	0.10445E-01
59	0.57735E 00	-0.80064E 00	0.97550E-02
60	0.69798E 00	-0.69798E 00	0.55018E-02
61	0.80064E 00	-0.57735E 00	0.97550E-02
62	0.89156E 00	-0.42365E 00	0.10445E-01
63	0.97402E 00	-0.16014E 00	0.16007E-01

S14 R-θ (Cont.)

64	-0.22645E 00	0.10000E-04	0.0
65	-0.16013E 00	0.16014E 00	0.16007E-01
66	0.16013E 00	0.16014E 00	0.16007E-01
67	-0.45291E 00	0.10000E-04	0.0
68	-0.42366E 00	0.16010E 00	0.10445E-01
69	-0.16013E 00	0.42365E 00	0.10445E-01
70	0.16013E 00	0.42365E 00	0.10445E-01
71	0.42366E 00	0.16010E 00	0.10445E-01
72	-0.59914E 00	0.10000E-04	0.0
73	-0.57735E 00	0.16013E 00	0.97550E-02
74	-0.42366E 00	0.42366E 00	0.85209E-02
75	-0.16013E 00	0.57735E 00	0.97550E-02
76	0.16013E 00	0.57735E 00	0.97550E-02
77	0.42366E 00	0.42366E 00	0.85209E-02
78	0.57735E 00	0.16013E 00	0.97550E-02
79	-0.71611E 00	0.10000E-04	0.0
80	-0.69798E 00	0.16015E 00	0.55018E-02
81	-0.57735E 00	0.42366E 00	0.55165E-02
82	-0.42366E 00	0.57735E 00	0.55165E-02
83	-0.16013E 00	0.69798E 00	0.55018E-02
84	0.16013E 00	0.69798E 00	0.55018E-02
85	0.42366E 00	0.57735E 00	0.55165E-02
86	0.57735E 00	0.42366E 00	0.55165E-02
87	0.69798E 00	0.16015E 00	0.55018E-02
88	-0.81650E 00	0.10000E-04	0.0
89	-0.80064E 00	0.16013E 00	0.97550E-02
90	-0.69798E 00	0.42366E 00	0.55165E-02
91	-0.57735E 00	0.57735E 00	0.56153E-02
92	-0.42366E 00	0.69798E 00	0.55165E-02
93	-0.16013E 00	0.80064E 00	0.97550E-02
94	0.16013E 00	0.80064E 00	0.97550E-02
95	0.42366E 00	0.69798E 00	0.55165E-02
96	0.57735E 00	0.57735E 00	0.56153E-02
97	0.69798E 00	0.42366E 00	0.55165E-02
98	0.80064E 00	0.16013E 00	0.97550E-02
99	-0.90582E 00	0.10000E-04	0.0
100	-0.89156E 00	0.16010E 00	0.10445E-01
101	-0.80064E 00	0.42366E 00	0.85209E-02
102	-0.69798E 00	0.57735E 00	0.55165E-02
103	-0.57735E 00	0.69798E 00	0.55165E-02
104	-0.42366E 00	0.80064E 00	0.85209E-02
105	-0.16013E 00	0.89156E 00	0.10445E-01
106	0.16013E 00	0.89156E 00	0.10445E-01
107	0.42366E 00	0.80064E 00	0.85209E-02
108	0.57735E 00	0.69798E 00	0.55165E-02
109	0.69798E 00	0.57735E 00	0.55165E-02
110	0.80064E 00	0.42366E 00	0.85209E-02
111	0.89156E 00	0.16010E 00	0.10445E-01
112	-0.98710E 00	0.10000E-04	0.0
113	-0.97402E 00	0.16014E 00	0.16007E-01
114	-0.89156E 00	0.42365E 00	0.10445E-01
115	-0.80064E 00	0.57735E 00	0.97550E-02
116	-0.69798E 00	0.69798E 00	0.55018E-02
117	-0.57735E 00	0.80064E 00	0.97550E-02
118	-0.42366E 00	0.89156E 00	0.10445E-01
119	-0.16013E 00	0.97402E 00	0.16007E-01
120	0.16013E 00	0.97402E 00	0.16007E-01
121	0.42366E 00	0.89156E 00	0.10445E-01
122	0.57735E 00	0.80064E 00	0.97550E-02
123	0.69798E 00	0.69798E 00	0.55018E-02
124	0.80064E 00	0.57735E 00	0.97550E-02
125	0.89156E 00	0.42365E 00	0.10445E-01
126	0.97402E 00	0.16014E 00	0.16007E-01

S16 R-0

	MU	ETA	WEIGHT
1	-0.21082E 00	-0.10000E-04	0.0
2	-0.14907E 00	-0.14904E 00	0.13586E-01
3	0.14907E 00	-0.14904E 00	0.13586E-01
4	-0.42164E 00	-0.10000E-04	0.0
5	-0.39441E 00	-0.14909E 00	0.97681E-02
6	-0.14907E 00	-0.39442E 00	0.97681E-02
7	0.14907E 00	-0.39442E 00	0.97681E-02
8	0.39441E 00	-0.14909E 00	0.97681E-02
9	-0.55777E 00	-0.10000E-04	0.0
10	-0.53748E 00	-0.14910E 00	0.64738E-02
11	-0.39441E 00	-0.39441E 00	0.50390E-02
12	-0.14907E 00	-0.53749E 00	0.64738E-02
13	0.14907E 00	-0.53749E 00	0.64738E-02
14	0.39441E 00	-0.39441E 00	0.50390E-02
15	0.53748E 00	-0.14910E 00	0.64738E-02
16	-0.66667E 00	-0.10000E-04	0.0
17	-0.64979E 00	-0.14904E 00	0.64634E-02
18	-0.53748E 00	-0.39440E 00	0.71124E-02
19	-0.39441E 00	-0.53747E 00	0.71124E-02
20	-0.14907E 00	-0.64978E 00	0.64634E-02
21	0.14907E 00	-0.64978E 00	0.64634E-02
22	0.39441E 00	-0.53747E 00	0.71124E-02
23	0.53748E 00	-0.39440E 00	0.71124E-02
24	0.64979E 00	-0.14904E 00	0.64634E-02
25	-0.76012E 00	-0.10000E-04	0.0
26	-0.74536E 00	-0.14904E 00	0.64634E-02
27	-0.64979E 00	-0.39439E 00	0.14381E-02
28	-0.53748E 00	-0.53748E 00	0.36342E-02
29	-0.39441E 00	-0.64978E 00	0.14381E-02
30	-0.14907E 00	-0.74535E 00	0.64634E-02
31	0.14907E 00	-0.74535E 00	0.64634E-02
32	0.39441E 00	-0.64978E 00	0.14381E-02
33	0.53748E 00	-0.53748E 00	0.36342E-02
34	0.64979E 00	-0.39439E 00	0.14381E-02
35	0.74536E 00	-0.14904E 00	0.64634E-02
36	-0.84327E 00	-0.10000E-04	0.0
37	-0.82999E 00	-0.14910E 00	0.64738E-02
38	-0.74536E 00	-0.39440E 00	0.71124E-02
39	-0.64979E 00	-0.53748E 00	0.36342E-02
40	-0.53748E 00	-0.64979E 00	0.36342E-02
41	-0.39441E 00	-0.74536E 00	0.71124E-02
42	-0.14907E 00	-0.83000E 00	0.64738E-02
43	0.14907E 00	-0.83000E 00	0.64738E-02
44	0.39441E 00	-0.74536E 00	0.71124E-02
45	0.53748E 00	-0.64979E 00	0.36342E-02
46	0.64979E 00	-0.53748E 00	0.36342E-02
47	0.74536E 00	-0.39440E 00	0.71124E-02
48	0.82999E 00	-0.14910E 00	0.64738E-02
49	-0.91894E 00	-0.10000E-04	0.0
50	-0.90676E 00	-0.14909E 00	0.97681E-02
51	-0.82999E 00	-0.39441E 00	0.50390E-02
52	-0.74536E 00	-0.53747E 00	0.71124E-02
53	-0.64979E 00	-0.64978E 00	0.14381E-02
54	-0.53748E 00	-0.74536E 00	0.71124E-02
55	-0.39441E 00	-0.82999E 00	0.50390E-02
56	-0.14907E 00	-0.90676E 00	0.97681E-02
57	0.14907E 00	-0.90676E 00	0.97681E-02
58	0.39441E 00	-0.82999E 00	0.50390E-02
59	0.53748E 00	-0.74536E 00	0.71124E-02
60	0.64979E 00	-0.64978E 00	0.14381E-02
61	0.74536E 00	-0.53747E 00	0.71124E-02
62	0.82999E 00	-0.39441E 00	0.50390E-02
63	0.90676E 00	-0.14909E 00	0.97681E-02
64	-0.98883E 00	-0.10000E-04	0.0
65	-0.97753E 00	-0.14904E 00	0.13586E-01
66	-0.90676E 00	-0.39442E 00	0.97681E-02

S16 R-θ (Cont.)

67	-0.82999E 00	-0.53749E 00	0.64738E-02
68	-0.74536E 00	-0.64978E 00	0.64634E-02
69	-0.64979E 00	-0.74535E 00	0.64634E-02
70	-0.53748E 00	-0.83000E 00	0.64738E-02
71	-0.39441E 00	-0.90676E 00	0.97681E-02
72	-0.14907E 00	-0.97753E 00	0.13586E-01
73	0.14907E 00	-0.97753E 00	0.13586E-01
74	0.39441E 00	-0.90676E 00	0.97681E-02
75	0.53748E 00	-0.83000E 00	0.64738E-02
76	0.64979E 00	-0.74535E 00	0.64634E-02
77	0.74536E 00	-0.64978E 00	0.64634E-02
78	0.82999E 00	-0.53749E 00	0.64738E-02
79	0.90676E 00	-0.39442E 00	0.97681E-02
80	0.97753E 00	-0.14904E 00	0.13586E-01
81	-0.21082E 00	0.10000E-04	0.0
82	-0.14907E 00	0.14904E 00	0.13586E-01
83	0.14907E 00	0.14904E 00	0.13586E-01
84	-0.42164E 00	0.10000E-04	0.0
85	-0.39441E 00	0.14909E 00	0.97681E-02
86	-0.14907E 00	0.39442E 00	0.97681E-02
87	0.14907E 00	0.39442E 00	0.97681E-02
88	0.39441E 00	0.14909E 00	0.97681E-02
89	-0.55777E 00	0.10000E-04	0.0
90	-0.53748E 00	0.14910E 00	0.64738E-02
91	-0.39441E 00	0.39441E 00	0.50390E-02
92	-0.14907E 00	0.53749E 00	0.64738E-02
93	0.14907E 00	0.53749E 00	0.64738E-02
94	0.39441E 00	0.39441E 00	0.50390E-02
95	0.53748E 00	0.14910E 00	0.64738E-02
96	-0.56667E 00	0.10000E-04	0.0
97	-0.64979E 00	0.14904E 00	0.64634E-02
98	-0.53748E 00	0.39440E 00	0.71124E-02
99	-0.39441E 00	0.53747E 00	0.71124E-02
100	-0.14907E 00	0.64978E 00	0.64634E-02
101	0.14907E 00	0.64978E 00	0.64634E-02
102	0.39441E 00	0.53747E 00	0.71124E-02
103	0.53748E 00	0.39440E 00	0.71124E-02
104	0.64979E 00	0.14904E 00	0.64634E-02
105	-0.76012E 00	0.10000E-04	0.0
106	-0.74536E 00	0.14904E 00	0.64634E-02
107	-0.64979E 00	0.39439E 00	0.14381E-02
108	-0.53748E 00	0.53748E 00	0.36342E-02
109	-0.39441E 00	0.64978E 00	0.14381E-02
110	-0.14907E 00	0.74535E 00	0.64634E-02
111	0.14907E 00	0.74535E 00	0.64634E-02
112	0.39441E 00	0.64978E 00	0.14381E-02
113	0.53748E 00	0.53748E 00	0.36342E-02
114	0.64979E 00	0.39439E 00	0.14381E-02
115	0.74536E 00	0.14904E 00	0.64634E-02
116	-0.84327E 00	0.10000E-04	0.0
117	-0.82999E 00	0.14910E 00	0.64738E-02
118	-0.74536E 00	0.39440E 00	0.71124E-02
119	-0.64979E 00	0.53748E 00	0.36342E-02
120	-0.53748E 00	0.64979E 00	0.36342E-02
121	-0.39441E 00	0.74536E 00	0.71124E-02
122	-0.14907E 00	0.83000E 00	0.64738E-02
123	0.14907E 00	0.83000E 00	0.64738E-02
124	0.39441E 00	0.74536E 00	0.71124E-02
125	0.53748E 00	0.64979E 00	0.36342E-02
126	0.64979E 00	0.53748E 00	0.36342E-02
127	0.74536E 00	0.39440E 00	0.71124E-02
128	0.82999E 00	0.14910E 00	0.64738E-02
129	-0.91894E 00	0.10000E-04	0.0
130	-0.90676E 00	0.14909E 00	0.97681E-02
131	-0.82999E 00	0.39441E 00	0.50390E-02
132	-0.74536E 00	0.53747E 00	0.71124E-02
133	-0.64979E 00	0.64978E 00	0.14381E-02

S16 R-θ (Cont.)

134	-0.53748E 00	0.74536E 00	0.71124E-02
135	-0.39441E 00	0.82999E 00	0.50390E-02
136	-0.14907E 00	0.90676E 00	0.97681E-02
137	0.14907E 00	0.90676E 00	0.97681E-02
138	0.39441E 00	0.82999E 00	0.50390E-02
139	0.53748E 00	0.74536E 00	0.71124E-02
140	0.64979E 00	0.64978E 00	0.14381E-02
141	0.74536E 00	0.53747E 00	0.71124E-02
142	0.82999E 00	0.39441E 00	0.50390E-02
143	0.90676E 00	0.14909E 00	0.97681E-02
144	-0.98883E 00	0.10000E-04	0.0
145	-0.97753E 00	0.14904E 00	0.13586E-01
146	-0.90676E 00	0.39442E 00	0.97681E-02
147	-0.82999E 00	0.53749E 00	0.64738E-02
148	-0.74536E 00	0.64978E 00	0.64634E-02
149	-0.64979E 00	0.74535E 00	0.64634E-02
150	-0.53748E 00	0.83000E 00	0.64738E-02
151	-0.39441E 00	0.90676E 00	0.97681E-02
152	-0.14907E 00	0.97753E 00	0.13586E-01
153	0.14907E 00	0.97753E 00	0.13586E-01
154	0.39441E 00	0.90676E 00	0.97681E-02
155	0.53748E 00	0.83000E 00	0.64738E-02
156	0.64979E 00	0.74535E 00	0.64634E-02
157	0.74536E 00	0.64978E 00	0.64634E-02
158	0.82999E 00	0.53749E 00	0.64738E-02
159	0.90676E 00	0.39442E 00	0.97681E-02
160	0.97753E 00	0.14904E 00	0.13586E-01

APPENDIX D. BIBLIOGRAPHY

The following are in chronological order only by date written (all were obtained at the Central Research Library).

(1) B. G. Carlson, "Solution of the Transport Equation by Sn Approxima- LA-1891, February 1955 - early work provides background data on basis for Sn method, one-dimensional only.

(2) B. G. Carlson and G. I. Bell, "Solution of the Transport Equation by the Sn Method," P/2386, 1958 - same as above, contains a mathematical development of the method.

(3) Bengt G. Carlson and Clarence E. Lee, "Mechanical Quadrature and the Transport Equation," LAMS-2573, June 1961 - first discussion of the development of one-dimensional quadrature sets (Sn, Pn-1, DPn/2-1) - solving point weights by Lee's method of areas - hexagonals, houses, and squares, tables to S16 (one-dimensional).

(4) C. E. Lee, "The Discrete Sn Approximation to Transport Theory," March 1962 (Chapter 3 and Appendices A-3), LA-2595 - an exhaustive treatise on Lee's early method for using area's (as mentioned above) to calculate point weights, pages of formulas and diagrams.

(5) K. D. Lathrop and B. G. Carlson, "Discrete Ordinates Angular Quadrature of the Nuetron Transport Equation," LA-3186, September 1964 - this report starts to hit home. Discusses symmetry requirements, when they are and why they are desirable. First reference to two-dimensional sets and also biased quadrature sets. It is all here, just hard to recognize unless you known what you are looking for.

(6) P. N. Stevens, "Use of the Discrete Ordinates Sn Method in Radiation Shielding Calculations," *Nucl. Eng. and Design*, March 1970 - basically mentions codes used with the Sn method - no direct relation to the quadrature problem.

(7) Bengt G. Carlson, "Transport Theory: Discrete Ordinates Quadrature Over the Unit Sphere," LA-4554) - first paper to discuss "level symmetric" quadrature sets in one or two dimensions (LPn or LQn).

Shows the moment equation simplification used in DOQDP. Also discusses SQn quadrature sets.

(8) Bengt G. Carlson, "On a More Precise Definition of the Discrete Ordinates Method," January 1971 - discusses three types of quadrature sets (SQn, LQn, and EQn) and ways of producing them - primarily LQn, first definition of EQn (equal weight) quadrature sets.

(9) Bengt G. Carlson, "Tables of Equal Weight Quadrature EQn Over the Unit Sphere," LA-4734, July 1971 - contains a sparse explanation of how to produce EQn quadrature sets along with several pages of tables and formulas up to S16.

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