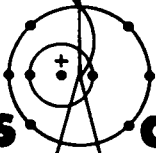


LA-4823

6.3

Numerical Solution of the Boltzmann Equation
for Energy Distributions of Electrons with
Inelastic Scattering on Molecules



los alamos
scientific laboratory

of the University of California

LOS ALAMOS, NEW MEXICO 87544



This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Atomic Energy Commission, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

Printed in the United States of America. Available from
National Technical Information Service
U. S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22151
Price: Printed Copy \$3.00; Microfiche \$0.95

LA-4823

UC-34

ISSUED: May 1972.



los alamos
scientific laboratory
of the University of California
LOS ALAMOS, NEW MEXICO 87544

Numerical Solution of the Boltzmann Equation for Energy Distributions of Electrons with Inelastic Scattering on Molecules

by

J. H. Hancock
R. C. Jones
C. B. Mills

LOS ALAMOS NATL. LAB. LIBS.



3 9338 00362 7980



NUMERICAL SOLUTION OF THE BOLTZMANN EQUATION FOR ENERGY
DISTRIBUTIONS OF ELECTRONS WITH INELASTIC SCATTERING ON MOLECULES

by

J. H. Hancock, R. C. Jones, and C. B. Mills

ABSTRACT

A new integration of the second-order Boltzmann equation for electron energy conservation in a gaseous electronic plasma, with large inelastic scattering cross sections, has been accomplished. The procedure was to solve a system of numerical equations approximating the differential equation by using the tridiagonal matrix form resulting from a first-order expansion of the terms of the equation in energy space. The results of the integration showed excellent self-consistency in energy balance, and gave significantly different excitation rate integrals from previous solutions. A FORTRAN computer code for the CDC 6600 is appended to the report.

I. INTRODUCTION

The solution of the Boltzmann equation for electron energy distribution in a gaseous medium, with electric gradient and high inelastic scattering cross section, has been a fundamental problem in the field of gaseous electronics. In recent years a first integral of the second-order linear differential equation has been solved numerically. Apparent errors in the energy conservation tests of this solution suggest that a numerical integration of the second-order equation should be attempted directly.

II. THE BOLTZMANN TRANSPORT EQUATION

We wish to find approximate solutions to the equation¹

$$\begin{aligned}
& \frac{E^2}{3} \frac{d}{du} \left(\frac{u}{NQ_m} \frac{df}{du} \right) + \frac{2m}{M} \frac{d}{du} \left(u^2 NQ_m f \right) + \frac{2mkT}{Me} \frac{d}{du} \left(u^2 NQ_m \frac{df}{du} \right) \\
& + \sum_j \left(u + u_j \right) f \left(u + u_j \right) NQ_j \left(u + u_j \right) - uf(u) N \sum_j Q_j(u) \\
& + \sum_j \left(u - u_j \right) f \left(u - u_j \right) NQ_{-j} \left(u - u_j \right) - uf(u) N \sum_j Q_{-j}(u) = 0. \quad (1)
\end{aligned}$$

Also, we have

$$\begin{cases}
\left(u - u_j \right) Q_{-j} \left(u - u_j \right) = \alpha_j u Q_j(u) \\
u Q_{-j}(u) = \alpha_j \left(u + u_j \right) Q_j \left(u + u_j \right),
\end{cases}$$

where

$$\alpha_j = \exp \left[- \frac{e}{kT} u_j \right]. \quad (2)$$

Substituting Eq. (2) into Eq. (1), replacing u by x , and letting

$$p_1(x) = \frac{E^2}{3} \frac{x}{NQ_m(x)} + \frac{2mkT}{Me} x^2 NQ_m(x)$$

and

$$p_2(x) = \frac{2m}{M} x^2 NQ_m(x),$$

we get

$$\begin{aligned}
& \frac{d}{dx} \left[p_1(x) f'(x) + p_2(x) f(x) \right] + N \sum_{j=1}^J \left\{ \left(x + u_j \right) Q_j \left(x + u_j \right) f \left(x + u_j \right) \right. \\
& \left. - \left[x Q_j(x) + \alpha_j \left(x + u_j \right) Q_j \left(x + u_j \right) \right] f(x) + \alpha_j x Q_j(x) f \left(x - u_j \right) \right\} = 0. \quad (3)
\end{aligned}$$

Now let $0 = x_1 < x_2 < \dots < x_I$ be a given partition and denote

$$\frac{x_{i-1} + x_i}{2} \text{ by } x_{i-\frac{1}{2}} \text{ and } \frac{x_i + x_{i+1}}{2} \text{ by } x_{i+\frac{1}{2}} .$$

Now we may integrate Eq. (3) from $x_{i-\frac{1}{2}}$ to $x_{i+\frac{1}{2}}$, $i = 2, \dots, I-1$, and obtain $I-2$ equations.

$$\begin{aligned} & \left[p_1(x) f'(x) + p_2(x) f(x) \right] \Bigg|_{x_{i-\frac{1}{2}}}^{x_{i+\frac{1}{2}}} + N \sum_{j=1}^J \int_{x_{i-\frac{1}{2}}}^{x_{i+\frac{1}{2}}} \left\{ (x + u_j) Q_j(x + u_j) f(x + u_j) \right. \\ & \left. - \left[x Q_j(x) + \alpha_j (x + u_j) Q_j(x + u_j) \right] f(x) + \alpha_j x Q_j(x) f(x - u_j) \right\} dx = 0 . \end{aligned} \quad (4)$$

Note that no approximations have been used in obtaining Eq. (4). To implement Eq. (4) numerically, we use the following approximations

$$(a) \quad f' \left(x_{i \pm \frac{1}{2}} \right) = \frac{f_{i \pm 1} - f_i}{x_{i \pm 1} - x_i} ,$$

$$(b) \quad f \left(x_{i \pm \frac{1}{2}} \right) = \frac{f_{i \pm 1} + f_i}{2} ,$$

$$(c) \quad \int_{x_{i-\frac{1}{2}}}^{x_{i+\frac{1}{2}}} \Phi(x) dx = \left(x_{i+\frac{1}{2}} - x_{i-\frac{1}{2}} \right) \Phi(x_i) ,$$

and

$$(d) \quad f \left(x_i \pm u_j \right) = \left(f_{x_{i_j \pm}} \right) , \quad (5)$$

where $x_{i_j \pm}$ is the smallest (largest) mesh point $\geq (\leq) x_i \pm u_j$. If no such mesh

point exists, the term is discarded.

Substituting Eq. (5) into Eq. (4), we obtain the I-2 approximate equations.

$$a_{i,i-1} f_{i-1} + a_{ii} f_i + a_{i,i+1} f_{i+1} + \sum_{j=1}^J \left(b_{i,j-} \right) \left(f_{i,j-} \right) + \sum_{j=1}^J \left(b_{i,j+} \right) \left(f_{i,j+} \right) = 0 ,$$

where

$$a_{i,i-1} = \frac{p_1 \left(x_{i-\frac{1}{2}} \right)}{x_i - x_{i-1}} - \frac{p_2 \left(x_{i-\frac{1}{2}} \right)}{2} ,$$

$$a_{ii} = \frac{p_1 \left(x_{i+\frac{1}{2}} \right)}{x_{i+1} - x_i} + \frac{p_1 \left(x_{i-\frac{1}{2}} \right)}{x_i - x_{i-1}} + \frac{1}{2} \left[p_2 \left(x_{i+\frac{1}{2}} \right) - p_2 \left(x_{i-\frac{1}{2}} \right) \right] - N \left(x_{i+\frac{1}{2}} - x_{i-\frac{1}{2}} \right) \sum_{j=1}^J \left[x_i Q_j \left(x_i \right) + \alpha_j \left(x_i + u_j \right) Q_j \left(x_i + u_j \right) \right] ,$$

$$a_{i,i+1} = \frac{p_1 \left(x_{i+\frac{1}{2}} \right)}{x_{i+1} - x_i} + \frac{p_2 \left(x_{i+\frac{1}{2}} \right)}{2} ,$$

$$b_{i,j-} = N \left(x_{i+\frac{1}{2}} - x_{i-\frac{1}{2}} \right) \alpha_j x_i Q_j \left(x_i \right) ,$$

and

$$b_{i,j+} = N \left(x_{i+\frac{1}{2}} - x_{i-\frac{1}{2}} \right) \left(x_i + u_j \right) Q_j \left(x_i + u_j \right) . \quad (6)$$

These I-2 equations may be augmented by two boundary conditions, therefore we use

$$f_1 = 1$$

and

$$f_I = 0.* \quad (7)$$

* This boundary condition is not strictly correct; however, the numerical process is insensitive to this value.

Now Eqs. (6) and (7) may be written in matrix form as

$$(A + B)f = C \quad , \quad (8)$$

where rows 2 through I-1 of A and B are defined by Eq. (6) and rows 1 and I are from Eq. (7).

Then

$$C = \begin{pmatrix} 1 \\ 0 \\ \vdots \\ \vdots \\ 0 \end{pmatrix} .$$

Because A and B are usually very large matrices, we do not attempt a direct solution of the linear system of Eq. (8), but use the following iteration

$$A f^{n+1} = C - Bf^n \quad , \quad (9)$$

where

$$f^0 = e^{-ax} \text{ for a suitable input constant } a.$$

III. REMARKS ON NUMERICAL PROCEDURE

The LU decomposition of A need be done only once, which is simple because A is tridiagonal. An iterative step consists of the calculation of C-Bf, back substitution, and the convergence test. Only the nonzero elements of A and B are stored and involved in the calculation. The convergence test is of the following form.

Let ϵ_1, ϵ_2 be given. Let i^* be the first index such that

$$\frac{|f_{i^*}^{n+1} - f_{i^*}^n|}{\text{MAX} \left\{ |f_{i^*}^{n+1}|, |f_{i^*}^n| \right\}} \geq \epsilon_1$$

if $i^* = I$ or $|f_{i^*}| < \epsilon_2$ convergence is assumed.

The iterative process is fast, requiring about 10% of the time necessary for the initial calculation of A and B. Therefore, the best hope for reducing calculation time is to reduce the size of the matrices by (1) increasing mesh size, or (2) by decreasing x_I .

Variable mesh is built into the program, but there is no evidence that a nonuniform mesh is valuable. It may be that effective use of a nonuniform mesh requires modification of the approximations in Eq. (5).

IV. FINAL CALCULATIONS

1. Replace x_1, \dots, x_I by z_1, \dots, z_I where $z_i = \frac{ex_1}{kT}$.
2. Replace f_1, \dots, f_I by ϕ_1, \dots, ϕ_I such that

$$\int_{z_1}^{z_I} z^{\frac{1}{2}} \phi(z) dz = 1 .$$

The quadrature, here and elsewhere, is done by Simpson's method for unequally spaced points.

3. Calculate

$$\mu = \frac{-e(2/kTm)^{\frac{1}{2}}}{3N} \int_{z_1}^{z_I} \frac{z\phi'(z)}{Q_m(z)} dz$$

and

$$D/\mu = \frac{(2kT/m)^{\frac{1}{2}}}{3N\mu} \int_{z_1}^{z_I} \frac{z\phi(z)}{Q_m(z)} dz .$$

Remarks

To approximate $\phi'(z)$, we use the identity $f' = f(\ln f)'$ and approximate $d \ln \phi_i$ by $\ln \left(\frac{\phi_{i+1}}{\phi_{i-1}} \right)$.

4. Replace z_1, \dots, z_I by $\epsilon_1, \dots, \epsilon_I$ where $\epsilon_i = kTz_i$.

Replace ϕ_1, \dots, ϕ_I by g_1, \dots, g_I where $g_i = \phi_i / (kT)^{3/2}$.

5. Calculate

$$\frac{v_{0j}}{N} = 10^{16} \left(\frac{2}{m}\right)^{\frac{1}{2}} \int_{\epsilon_1}^{\epsilon_I} g(\epsilon) \left[\epsilon Q_j(\epsilon) - \alpha_j(\epsilon + u_j) Q_j(\epsilon + u_j) \right] d\epsilon .$$

6. Calculate the left-hand side of energy balance equation = $eE^2\mu^2$.

7. Calculate the right-hand side of the energy balance equation

$$= e^{3/2} N \left(\frac{2}{m}\right)^{\frac{1}{2}} \left\{ \frac{2m}{M} \int_{\epsilon_1}^{\epsilon_I} \epsilon^2 Q_m(\epsilon) \left[g(\epsilon) + kT g'(\epsilon) \right] d\epsilon \right. \\ \left. + e \sum_{j=1}^J u_j \int_{\epsilon_1}^{\epsilon_I} g(\epsilon) \left[\epsilon Q_j(\epsilon) - \alpha_j(\epsilon + u_j) Q_j(\epsilon + u_j) \right] d\epsilon \right\} .$$

V. COMPUTER PROGRAM AND SAMPLE CALCULATION

The computer program is given in Appendix A. The application of electron energy distribution functions to molecular excitation rate integrals is illustrated in Appendix B.

ACKNOWLEDGMENTS

The numerical procedures evolved from discussions with R. S. Varga, a Visiting Staff Member at LASL, and B. Buzbee, J. R. Sopka, and B. K. Swartz.

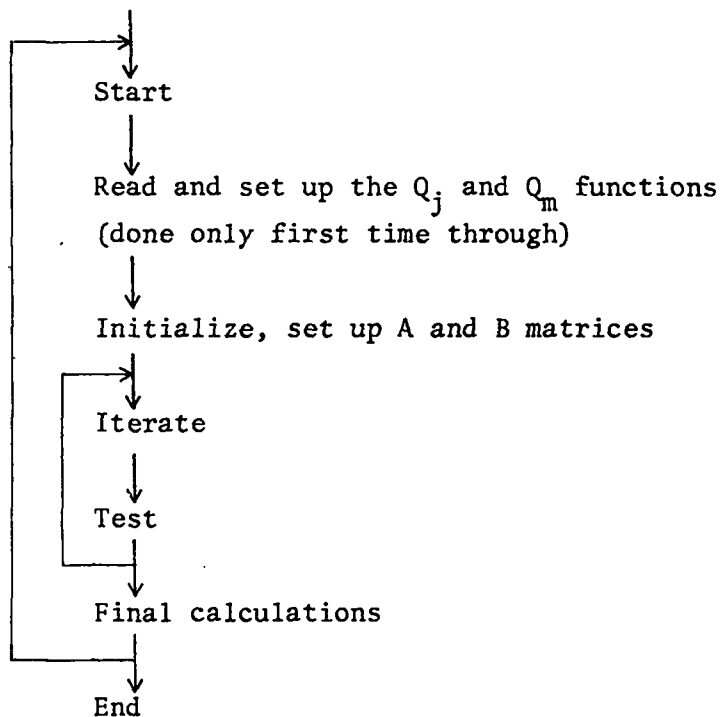
REFERENCES

1. L. S. Frost and A. V. Phelps, "Rotational Excitation and Momentum Transfer Cross Sections for Electrons in H_2 and N_2 from Transport Coefficients," Phys. Rev. 127, 1621(1962).
2. A. G. Engelhardt and A. V. Phelps, "Elastic and Inelastic Collision Cross Sections in Hydrogen and Deuterium from Transport Coefficients," Phys. Rev. 131, 2115 (1963).

APPENDIX A

CODE DESCRIPTION

The code is written primarily in FORTRAN for the LASL CDC 7600's and their attendant service routines. It requires 150,000 octal words of core and may use up to approximately 1,440,000 octal words of extended core storage. Input is in the form of cards (plus a magnetic tape if a previous run is being completed), and output is in the form of a listing, punched cards, 35-mm film, and a magnetic tape for an incomplete job to be restarted later. A simplified flow diagram is given here.



The options available as controlling parameters and physical constants for each run are defined by comment cards at the beginning of the code, as is the data deck structure. Up to 4000 mesh points may be specified. A typical run mixing H_2 , He, N_2 , and CO_2 in the ratio 0, 3, 1, 1 with 961 mesh points took 42 sec to set up, 6 sec to iterate and test 125 times, and 7 sec to do the final calculation.

	PROGRAM HANJON(INP,OUT,FILM,FSET3,FSET4,PUN,FSET1=INP)	HAJO	1
		HAJO	2
	COMMON A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB,	HAJO	3
1	XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,	HAJO	4
2	C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,	HAJO	5
3	ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,	HAJO	6
4	TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,	HAJO	7
5	FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND	HAJO	8
		HAJO	9
	NAMELIST/PARAM/ BE, BM, BN, BT, SE, SM, SK	HAJO	10
1	, FH2, FHE, FN2, FCO2	HAJO	11
		HAJO	12
	NAMELIST/CONTROL/ CII, EPS, II, IDEGRE, ITMAX, ITPLOT, ITPRNT,	HAJO	13
1	IXAXIS, IYAXIS, PICKUP, PWR, SPC, TMAX, X0, XII	HAJO	14
2	, SUPRES,THRU,FSTOP	HAJO	15
		HAJO	16
		HAJO	17
		HAJO	18
C	\$PARAM	HAJO	19
		HAJO	20
C	BE = ELECTRIC FIELD (DEFAULT = 2670.)	HAJO	21
C	BM = MOLECULAR MASS (DEFULAT = CALCULATED)	HAJO	22
C	BN = MOLECULES / CC (DEFAULT = 2.67 E+19)	HAJO	23
C	BT = GAS TEMPERATURE (DEFAULT = 293)	HAJO	24
C	SE = ELECTRONIC CHARGE (DEFAULT = 1.6 E- 12)	HAJO	25
C	SM = ELECTRONIC MASS (DEFAULT = 9.81 E- 28)	HAJO	26
C	SK = BOLTZMAN CONSTANT (DEFAULT = 1.38 E- 16)	HAJO	27
C		HAJO	28
C	FH2 = MIXING RATIOS, ANY ONE NOT ... THE 1ST \$PARAM CAR	HAJO	29
C	FHE = SPECIFIED DEFAULTS TO 0. SETS THESE FRACTI	HAJO	30
C	FN2 = IF NONE ARE SPECIFIED, FOR ALL SUBSEQUEN	HAJO	31
C	FCO2 = DEFAULT = 1/1/1/1. RUNS.	HAJO	32
		HAJO	33
		HAJO	34
C	\$CONTROL	HAJO	35
		HAJO	36
C	II = NO. OF POINTS	HAJO	37
C	DEFAULT = 481	HAJO	38
C	X0 = INITIAL X	HAJO	39
C	DEFAULT= 0.	HAJO	40
C	XII = FINAL X(II)	HAJO	41
C	DEFAULT= 10.	HAJO	42
C	EPS = CONVERGENCE DELTA	HAJO	43
C	DEFAULT = 1.E- 5	HAJO	44
C	ITMAX = MAX. NO. ITERATIONS	HAJO	45
C	DEFAULT = 300	HAJO	46
C	TMAX = TIME LIMIT, SEC.	HAJO	47
C	DEFAULT = 110.	HAJO	48
C	ITPRNT= ITERATION INTERVAL FOR PRINTING X(I), F(I)	HAJO	49
C	DEFAULT = - 1	HAJO	50
C	ITPLOT= ITERATION INTERVAL FOR PLOTING X(I), F(I)	HAJO	51
C	DEFAULT = - 1	HAJO	52

C	IXAXIS= +II = LINEAR X SCALE, = -II = LOG X SCALE	HAJO 53
C	DEFAULT = +II	HAJO 54
C	IYAXIS= +1 = LINEAR Y SCALE, = -1 = LOG Y SCALE	HAJO 55
C	DEFAULT = -1	HAJO 56
C	IDEGRE= ORDER OF INTERPOLATION	HAJO 57
C	DEFAULT = 1	HAJO 58
C	PWR= EXPONENT FACTOR, F=EXP(-PWR*X)	HAJO 59
C	DEFAULT= 40.	HAJO 60
C	SPC= VARIABLE MESH FACTOR, O.LT.SPC.LE.1.	HAJO 61
C	1. = UNIFORM DELTA X	HAJO 62
C	DEFAULT = 1.	HAJO 63
C	CII = FORCED F(II)	HAJO 64
C	DEFAULT= 0.	HAJO 65
C	SUPRES =+1., DO NOT PRINT A AND B MATRICES	HAJO 66
C	DEFAULT = +1.	HAJO 67
C	PICKUP = -1. NO RESTART AND NO DUMP	HAJO 68
C	0. DUMP ON TIME TO TAPE 3	HAJO 69
C	+1. RESTART FROM TAPE3	HAJO 70
C	DEFAULT = -1.	HAJO 71
C	THRU = +1. PRINT AND PUNCH RESULTS	HAJO 72
C	DEFAULT = 0.	HAJO 73
C	FSTOP = VALUE OF F FOR CONVERGENCE TEST	HAJO 74
C	DEFAULT = 0.	HAJO 75
		HAJO 76
C	MISCELLANEOUS PARAMETERS	HAJO 77
		HAJO 78
C	JJ= NO. OF QJ(X) DATA PAIRS = NO. OF U(X) VALUES	HAJO 79
C	KK= NO. OF QM(X) VALUES	HAJO 80
C	JQ(I)= NO. OF VALUES IN THE ITH QJ TABLE	HAJO 81
		HAJO 82
		HAJO 83
C	DATA DECK SETUP	HAJO 84
		HAJO 85
C	\$PARAM ... (CONSTANTS,MIX FRACTIONS) ... \$	HAJO 86
C	\$CONTROL ...(CONTROL PARAMETERS) ... \$	HAJO 87
C	NAME, FORMAT 8A10	HAJO 88
C	QJ DATA SETS	HAJO 89
C	BLANK CARD	HAJO 90
C	QM DATA SETS	HAJO 91
C	BLANK CARD	HAJO 92
C	\$PARAM ... PARAMETERS FOR 2ND RUN	HAJO 93
C	\$CONTROL	HAJO 94
C	\$PARAM ... PARAMETERS FOR 3RD RUN	HAJO 95
C	\$CONTROL	HAJO 96
C	.	HAJO 97
C	.	HAJO 98
C	.	HAJO 99
C	\$PARAM ... PARAMETERS FOR NTH RUN	HAJO 100
C	\$CONTROL	HAJO 101
		HAJO 102
		HAJO 103
C	ECS ARRANGEMENT	HAJO 104

C	LOCATION	NO. BLKS	LNTH	EA.	CONTENTS	HAJO
						105
						106
						107
C	IQM=0	I	400	QM		108
C	IQJ=400	JJ	400	QJ		109
C	IQB=(JJ+1)*400	II	2*IIB(I)	B MATRIX		110
						111
						112
						113
	NNNN=0					114
700	CONTINUE					115
	NNNN>NNNN+1					116
	IEND=1					117
	IF>NNNN.GT.1)GO TO 710					118
						119
	BE=2670.					120
	BM=4.649E- 23					121
	BN=2.67 E+19					122
						123
	BT=293.					124
	SE=1.6 E- 12					125
	SM=9.81 E- 28					126
	SK=1.38 E- 16					127
	FH2=FHE=FN2=FCO2=0.					128
710	CONTINUE					129
	READ(1,PARAM)					130
	IF>NNNN.GT.1)GO TO 702					131
						132
	IF(FH2.NE.0..O.FHE.NE.0.)GO TO 701					133
	IF(FN2.NE.0..O.FCO2.NE.0.)GO TO 701					134
	FH2=FHE=FN2=FCO2=0.25					135
	GO TO 703					136
						137
701	CONTINUE					138
	FTOT=FH2+FHE+FN2+FCO2					139
	FH2=FH2/FTOT					140
	FHE=FHE/FTOT					141
	FN2=FN2/FTOT					142
	FCO2=FCO2/FTOT					143
						144
703	CONTINUE					145
	BM=1.E- 24/(FH2/3.3461+FHE/6.6437+FN2/46.498+FCO2/73.049)					146
						147
	II=481					148
	EPS=1.E- 5					149
	ITMAX=300					150
	TMAX=110.					151
	ITPRNT=- 1					152
	ITPLOT=- 1					153
	IXAXIS=II					154
	IYAXIS=- 1					155
	IDEGRE=1					156

	PWR=40.	HAJO 157
	SPC=1.	HAJO 158
	X0=0.	HAJO 159
	XII=10.	HAJO 160
	CII=0.	HAJO 161
	PICKUP=- 1.	HAJO 162
	SUPRES=1.	HAJO 163
	THRU=0.	HAJO 164
	FSTOP=0.	HAJO 165
		HAJO 166
702	CONTINUE	HAJO 167
	READ(1,CONTROL)	HAJO 168
	TTMAX=TMAX	HAJO 169
	IISAV=II	HAJO 170
	IOM=0	HAJO 171
	IOJ=400	HAJO 172
		HAJO 173
	IF(PICKUP.GT.0.)GO TO 711	HAJO 174
		HAJO 175
	IF(NNNN.LE.1)READ 24,(NAME(I),I=1,8)	HAJO 176
24	FORMAT(8A10)	HAJO 177
	GO TO 712	HAJO 178
		HAJO 179
711	CALL RESTRT	HAJO 180
	TMAX=TTMAX	HAJO 181
		HAJO 182
712	CONTINUE	HAJO 183
	PRINT 6	HAJO 184
6	FORMAT(1H1)	HAJO 185
	PRINT 25,(NAME(I),I=1,8)	HAJO 186
25	FORMAT(10X,8A10)	HAJO 187
	PRINT 26, NNNN	HAJO 188
26	FORMAT(/,10X,*RUN NO.*,I3,/)	HAJO 189
		HAJO 190
	PRINT 7, BE,BM,BN,BT,SE,SM,SK,FH2,FHE,FN2,FCO2	HAJO 191
7	FORMAT(5X,*INITIAL DATA*//,10X,*BE = ELECTRIC FIELD =*,1PE12.4,	HAJO 192
1	/,10X,*BM = MOLECULAR MASS =*,E12.4/,10X,*BN = GAS MOLECULES PER	HAJO 193
2	CC =*,E12.4/,10X,*BT = GAS TEMPERATURE =*,E12.4/,10X,*SE = ELECT	HAJO 194
3	RONIC CHARGE =*,E12.4/,10X,*SM = ELECTRONIC MASS =*,E12.4/,10X,*	HAJO 195
4	SK = BOLTZMAN CONSTANT =*,E12.4/,12X,*F H2 =*,E12.4/,12X,*F HE =	HAJO 196
5	*,E12.4/,12X,*F N2 =*,E12.4/,12X,*F CO2 =*,E12.4,///)	HAJO 197
	PRINT 8, EPS,ITMAX,TMAX,ITPRNT,ITPLOT,II,X0,XII,CII,IDEGRE,PWR,SPC	HAJO 198
8	FORMAT(5X,*CONTROL PARAMETERS*//,10X,*EPS = CONVERGENCE DEL =*,1	HAJO 199
1	PE12.4/,10X,*ITMAX= MAX NO. OF ITERATIONS =*,I4/,10X,*TMAX = CP	HAJO 200
2	TIME LIMIT ON ITERATION =*,E12.4/,10X,*ITPRNT = PRINT INTERVAL =*	HAJO 201
3	,I4/,10X,*ITPLOT = PLOT INTERVAL =*,I4/,10X,*II = NO. OF POINTS	HAJO 202
4	=*,I5/,10X,*X0,XII = X RANGE =*,E12.4,* TO*,E12.4/,10X,*CII = FO	HAJO 203
5	RCED ENDPOINT =*,E12.4/,10X,*IDEGRE = INTERPOLATION ORDER =*,I3/	HAJO 204
	6 , 10X,*PWR, F(X)=EXP(- *,E12.4,* X)*/,10X,*SPC = SPACING FACTOR =*	HAJO 205
7	,E12.4)	HAJO 206
		HAJO 207

	GO TO (704,708,707)IEND	HAJO 208
708	IEND=- 1	HAJO 209
	GO TO 709	HAJO 210
704	CONTINUE	HAJO 211
	CALL XFSET	HAJO 212
	IF(NNNN.LE.1)CALL QXSET	HAJO 213
		HAJO 214
C	SET UP C MATRIX	HAJO 215
C	ONLY THE 1 ST AND II TH ELEMENTS OF C ARE NON-ZERO	HAJO 216
	CONE=1.	HAJO 217
		HAJO 218
C	SET UP TRI-DIAGONAL MATRIX A	HAJO 219
	CALL ASET	HAJO 220
		HAJO 221
		HAJO 222
C	SET UP B MATRIX	HAJO 223
C	ADD DIAGONAL ELEMENTS TO THE A MATRIX	HAJO 224
	CALL BSET	HAJO 225
		HAJO 226
		HAJO 227
C	DO INITIAL FACTOR OF A MATRIX	HAJO 228
	CALL FACTTD(II,A,4000)	HAJO 229
		HAJO 230
		HAJO 231
	IT=1	HAJO 232
	CALL SECOND(TIME)	HAJO 233
	PRINT 713, TIME	HAJO 234
713	FORMAT(/,10X,*SETUP COMPLETED*,F10.1,* SECONDS*,//)	HAJO 235
	TCMBF=TSOLTD1=TCNVRG=0.	HAJO 236
	CALL SECOND(TIMEL)	HAJO 237
		HAJO 238
1	CONTINUE	HAJO 239
		HAJO 240
C	SOLVE FOR COL VECTOR $R = C - B*FI$	HAJO 241
	CALL SECOND(TIME1)	HAJO 242
	CALL CMBF	HAJO 243
	CALL SECOND(TIME2)	HAJO 244
	TCMBF=TCMBF+TIME2- TIME1	HAJO 245
		HAJO 246
C	SOLVE FOR COL VECTOR $FIP1 = A(INVERSE)*R$	HAJO 247
	CALL SOLTD1(II,A,4000,FIP1,1)	HAJO 248
	CALL SECOND(TIME)	HAJO 249
	TIME1=TIME	HAJO 250
	TSOLTD1=TSOLTD1+TIME1- TIME2	HAJO 251
		HAJO 252
C	TEST FOR CONVERGENCE	HAJO 253
	CALL CNVRG	HAJO 254
	CALL SECOND(TIME2)	HAJO 255
	TCNVRG=TCNVRG+TIME2- TIME1	HAJO 256
		HAJO 257
709	IT=IT+1	HAJO 258
	IF(IEND.GE.0)GO TO 3	HAJO 259

		HAJO 260
	DO 2 I=1,II	HAJO 261
	FI(I)=FIP1(I)	HAJO 262
2	CONTINUE	HAJO 263
	GO TO 1	HAJO 264
		HAJO 265
		HAJO 266
		HAJO 267
3	CONTINUE	HAJO 268
	CALL SECOND(TIME1)	HAJO 269
	TLOOP1=TIME1- TIME1	HAJO 270
		HAJO 271
C	LIST AND PLOT RESULTS	HAJO 272
		HAJO 273
	LIT=IT- 1	HAJO 274
	IT=LIT	HAJO 275
	IF(PICKUP.GE.0..A.IEND.EQ.2)GO TO 705	HAJO 276
	IF(ITPRNT.GE.0)CALL FPRNT(1)	HAJO 277
		HAJO 278
	IF(ITPLOT.LE.0)GO TO 99	HAJO 279
	ENCODE(42,98,TITL)IT,FH2,FHE,FN2,FCO2	HAJO 280
98	FORMAT(* X, ITERATION*,I3,*, H2/HE/N2/CO2 *,3(2PF2.0,*/*),F2.0)	HAJO 281
	REWIND 4	HAJO 282
	BUFFER OUT(4,1)(FIP1(1),FIP1(4000))	HAJO 283
46	IF(UNIT,4)46,47,47,47	HAJO 284
47	CONTINUE	HAJO 285
	IIM1=II- 1	HAJO 286
		HAJO 287
	DO 48 I=1,IIM1	HAJO 288
	FIP1(I)=ALOG10(FIP1(I))	HAJO 289
48	CONTINUE	HAJO 290
	FIP1(II)=FIP1(II- 1)	HAJO 291
	CALL PLOJB(X,FIP1,II,1,0,0,0.,10.,10.,NAME,80,TITL,42,	HAJO 292
1	14HLOG 10 OF FIP1,14)	HAJO 293
	REWIND 4	HAJO 294
	BUFFER IN(4,1)(FIP1(1),FIP1(4000))	HAJO 295
52	IF(UNIT,4)52,53,53,53	HAJO 296
53	CONTINUE	HAJO 297
		HAJO 298
99	CONTINUE	HAJO 299
	IF(IEND.EQ.1)GO TO 700	HAJO 300
	CALL SECOND(TIME)	HAJO 301
	IF(TIME.GE.TMAX)GO TO 706	HAJO 302
707	CONTINUE	HAJO 303
	CALL SECOND(TIME1)	HAJO 304
	CALL INT	HAJO 305
	CALL SECOND(TIME2)	HAJO 306
	TINT=TIME2- TIME1	HAJO 307
	IF(THRU.GT.0)CALL SUMARY	HAJO 308
	CALL SECOND(TIME1)	HAJO 309
	TSUMARY=TIME1- TIME2	HAJO 310
	PRINT 7000, TCMBF,TSOLTD1,TCNVRG,TLOOP1,TINT,TSUMARY	HAJO 311
7000	FORMAT(/,/* TIME DISTRIBUTION*/*,* CMBF*,F10.1/*,* SOLTD1*,F10	

1	.1,/* CNVRG*,F10.1,/* LOOP 1*,F10.1,/* INT*,F10.1,/* S	HAJO 312
2	UMARY*,F10.1,)	HAJO 313
	GO TO 700	HAJO 314
		HAJO 315
		HAJO 316
706	IEND=3	HAJO 317
705	CALL CDUMP	HAJO 318
	CALL SUMARY	HAJO 319
	END	HAJO 320
	SUBROUTINE SETUP	HAJO 321
		HAJO 322
	COMMON A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB,	HAJO 323
1	XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,	HAJO 324
2	C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,	HAJO 325
3	ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,	HAJO 326
4	TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,	HAJO 327
5	FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND	HAJO 328
		HAJO 329
	DIMENSION HDR(20),QJSAV(3,200)	HAJO 330
	EQUIVALENCE (QJSAV,A)	HAJO 331
		HAJO 332
	EQUIVALENCE (IU,JJ)	HAJO 333
		HAJO 334
	ENTRY XFSET	HAJO 335
C	X VALUES AND INITIAL F GUESS	HAJO 336
		HAJO 337

X(1)=0.	HAJO 338
FI(1)=1.	HAJO 339
X(II)=XII	HAJO 340
FI(II)=EXP(- PWR*XII)	HAJO 341
DN=II- 1	HAJO 342
IIM2=II- 2	HAJO 343
IF(SPC.EQ.1.)GO TO 101	HAJO 344
	HAJO 345
DEL1=(1.- SPC)*XII/(1.- SPC**DN)	HAJO 346
X(II- 1)=XII- DEL1	HAJO 347
FI(II- 1)=EXP(- PWR*X(II- 1))	HAJO 348
DO 100 I=2,IIM2	HAJO 349
J=II- I.	HAJO 350
NM1=I- 1	HAJO 351
DX=DEL1*SPC**NM1	HAJO 352
X(J)=X(J+1)- DX	HAJO 353
FI(J)=EXP(- PWR*X(J))	HAJO 354
100 CONTINUE	HAJO 355
GO TO 103	HAJO 356
	HAJO 357
101 CONTINUE	HAJO 358
DX=XII/DN	HAJO 359
DO 102 I=2,II	HAJO 360
X(I)=X(I- 1)+DX	HAJO 361
FI(I)=EXP(- PWR*X(I))	HAJO 362
102 CONTINUE	HAJO 363
	HAJO 364
103 CONTINUE	HAJO 365
	HAJO 366
IF(ITPRNT.LE.0)GO TO 708	HAJO 367
PRINT 300,(NAME(I),I=1,8)	HAJO 368
300 FORMAT(1H1,10X,*X AND FI INPUT DATA*//,10X,8A10///, 4X,*I	HAJO 369
1 X(I) FI(I)*,/)	HAJO 370
CALL FPRNT(0)	HAJO 371
3 FORMAT(1X,14,2(1PE13.4))	HAJO 372
708 IF(ITPLOT.LE.0)RETURN	HAJO 373
	HAJO 374
DO 301 I=1,II	HAJO 375
A(I)=ALOG10(FI(I))	HAJO 376
301 CONTINUE	HAJO 377
CALL PLOJB(X,A,II,1,0,0,0.,10.,10.,NAME,80,16HX, INITIAL SETUP,16,	HAJO 378
1 12HLOG 10 OF FI,12)	HAJO 379
RETURN	HAJO 380
	HAJO 381
	HAJO 382
	HAJO 383
ENTRY QXSET	HAJO 384
	HAJO 385
LOC=IQJ	HAJO 386
PRINT 200	HAJO 387
200 FORMAT(1H1,10X,*QJ FUNCTIONS*)	HAJO 388
JJ=1	HAJO 389

	READ 106, N,MATL,(HDR(I),I=1,5),U(JJ),(HDR(I),I=7,15)	HAJO 390
106	FORMAT(2I2,5A5,F6.3,9A5)	HAJO 391
706	READ 6,(XX(I),I=1,N)	HAJO 392
	READ 6,(QX(I),I=1,N)	HAJO 393
	DO 710 I=1,3	HAJO 394
710	QJSAV(I,JJ)=HDR(I+12)	HAJO 395
	IF(MATL.EQ. 2)FRA=FH2	HAJO 396
	IF(MATL.EQ. 4)FRA=FHE	HAJO 397
	IF(MATL.EQ.28)FRA=FN2	HAJO 398
	IF(MATL.EQ.44)FRA=FCO2	HAJO 399
	QT=0.	HAJO 400
	DO 704 I=1,N	HAJO 401
	QX(I)=FRA*QX(I)	HAJO 402
704	QT=QT+QX(I)	HAJO 403
	IF(QT.LE.0.)GO TO 705	HAJO 404
	FLAG=- 1.	HAJO 405
	K=N- 1	HAJO 406
	L=1	HAJO 407
	M=N	HAJO 408
		HAJO 409
	DO 89 J=1,K	HAJO 410
	IF(QX(J).GT.0.)FLAG=1.	HAJO 411
	IF(FLAG.GT.0.)GO TO 88	HAJO 412
	IF((QX(J).EQ.0.).A.(QX(J+1).EQ.0.))L=L+1	HAJO 413
	GO TO 89	HAJO 414
88	CONTINUE	HAJO 415
	IF((QX(J).EQ.0.).A.(QX(J+1).EQ.0.))M=M- 1	HAJO 416
89	CONTINUE	HAJO 417
		HAJO 418
	N=M- L+1	HAJO 419
	JQ(JJ)=N	HAJO 420
		HAJO 421
	DO 107 NN=1,N	HAJO 422
	N1=NN+L- 1	HAJO 423
	XX(NN)=XX(N1)	HAJO 424
	QX(NN)=QX(N1)*1.E- 16	HAJO 425
107	CONTINUE	HAJO 426
		HAJO 427
	CALL ECWR(XX,LOC,400,IPAR)	HAJO 428
	LOC=LOC+400	HAJO 429
		HAJO 430
	PRINT 109,JJ,N,MATL,(HDR(I),I=1,5),U(JJ),(HDR(I),I=7,15)	HAJO 431
109	FORMAT(1X,*QJ(*,I2,*), *,2I2,5A5,F10.5,/,5X,9A5)	HAJO 432
	IF(ITPRNT.LE.0)GO TO 707	HAJO 433
	DO 1090 I=1,N	HAJO 434
1090	QX(I)=QX(I)*1.E+16	HAJO 435
	PRINT 110,(XX(I),QX(I),I=1,N)	HAJO 436
110	FORMAT(5X,1PE12.4,E18.4)	HAJO 437
	PRINT 703	HAJO 438
707	CONTINUE	HAJO 439
		HAJO 440
	JJ=JJ+1	HAJO 441

705	CONTINUE		HAJO 442
	READ 106, N,MATL,(HDR(I),I=1,5),U(JJ),(HDR(I),I=7,15)		HAJO 443
	IF(N.NE.0)GO TO 706		HAJO 444
	IQB=JJ*400		HAJO 445
	JJ=JJ- 1		HAJO 446
	PUNCH 711, JJ		HAJO 447
711	FORMAT(I5,* QJ NAMES FOLLOW*)		HAJO 448
	PUNCH 712,((QJSAV(I,J),I=1,3),J=1,JJ)		HAJO 449
712	FORMAT(16A5)		HAJO 450
			HAJO 451
	PRINT 400, IU		HAJO 452
400	FORMAT(1H1,10X,*U INPUT DATA,*I6,* VALUES* ,///,4X,*I	U(I)	HAJO 453
	1 *,/)		HAJO 454
	PRINT 108,(I,U(I),I=1,IU)		HAJO 455
108	FORMAT(1X,I4,1PE13.4)		HAJO 456
			HAJO 457
			HAJO 458
C	NO. OF QM VALUES		HAJO 459
	PRINT 104		HAJO 460
104	FORMAT(1H1,10X,*QM FUNCTION*,/)		HAJO 461
	DO 700 I=1,400		HAJO 462
700	XX(I)=0.		HAJO 463
	READ 5, KK,MATL,(HDR(I),I=1,19)		HAJO 464
5	FORMAT(2I2,19A4)		HAJO 465
			HAJO 466
			HAJO 467
C	X, QM VALUES		HAJO 468
701	READ 6,(XX(I),I=1,KK)		HAJO 469
	READ 6,(A(I),I=1,KK)		HAJO 470
6	FORMAT(10F8.4)		HAJO 471
	PRINT 8, KK,MATL,(HDR(I),I=1,19)		HAJO 472
8	FORMAT(1X,2I2,19A4)		HAJO 473
	IF(MATL.EQ. 2)FRA=FH2		HAJO 474
	IF(MATL.EQ. 4)FRA=FHE		HAJO 475
	IF(MATL.EQ.28)FRA=FN2		HAJO 476
	IF(MATL.EQ.44)FRA=FCO2		HAJO 477
	DO 60 I=1,KK		HAJO 478
60	QX(I)=QX(I)+FRA/(A(I))*1.E- 16)		HAJO 479
	KKK=KK		HAJO 480
	READ 5, KK,MATL,(HDR(I),I=1,19)		HAJO 481
	IF(KK.NE.0)GO TO 701		HAJO 482
	KK=KKK		HAJO 483
	DO 702 I=1,KK		HAJO 484
702	QX(I)=1./QX(I)		HAJO 485
	NO=400		HAJO 486
	CALL ECWR(XX,IQM,NO,IPAR)		HAJO 487
	IF(ITPRNT.LE.0)RETURN		HAJO 488
	DO 1040 I=1,KK		HAJO 489
1040	QX(I)=QX(I)*1.E+16		HAJO 490
	PRINT 703		HAJO 491
703	FORMAT(/)		HAJO 492
			HAJO 493
	PRINT 3,(I,XX(I),QX(I),I=1,KK)		HAJO 492
			HAJO 493

	PRINT 709	HAJO 494
709	FORMAT(1H1)	HAJO 495
	RETURN	HAJO 496
	END	HAJO 497
	SUBROUTINE ASET	HAJO 498
		HAJO 499
	COMMON A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB,	HAJO 500
1	XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,	HAJO 501
2	C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,	HAJO 502
3	ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,	HAJO 503
4	TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,	HAJO 504
5	FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND	HAJO 505
		HAJO 506
		HAJO 507
	C1=(BE*BE)/3.	HAJO 508
	C2=(SM+SM)/BM	HAJO 509
	C3=(2.*SM*SK*BT)/(BM*SE)	HAJO 510
		HAJO 511
	A(1,1)=0.	HAJO 512
	A(1,2)=1.	HAJO 513
	A(1,3)=0.	HAJO 514
		HAJO 515
	DX1=X(2)- X(1)	HAJO 516
	XM=0.5*(X(1)+X(2))	HAJO 517
	CALL CUEMX(XM,CUE)	HAJO 518
	P1XM=(C1*XM)/(BN*CUE*DX1)	HAJO 519
	P2XM=C2*XM*XM*BN*CUE	HAJO 520
	P3XM=C3*XM*XM*BN*CUE/DX1	HAJO 521
	K=II- 1	HAJO 522
		HAJO 523
	DO 1 I=2,K	HAJO 524
	DX2=X(I+1)- X(I)	HAJO 525
	XP=0.5*(X(I)+X(I+1))	HAJO 526
	CALL CUEMX(XP,CUE)	HAJO 527
	P1XP=(C1*XP)/(BN*CUE*DX2)	HAJO 528
	P2XP=C2*XP*XP*BN*CUE	HAJO 529
	P3XP=C3*XP*XP*BN*CUE/DX2	HAJO 530
		HAJO 531
	A(I,1)=P1XM- 0.5*P2XM+P3XM	HAJO 532
	A(I,2)=- P1XP- P1XM+0.5*(P2XP- P2XM)- P3XP- P3XM	HAJO 533
	A(I,3)=P1XP+0.5*P2XP+P3XP	HAJO 534
		HAJO 535
	P1XM=P1XP	HAJO 536
	P2XM=P2XP	HAJO 537
	P3XM=P3XP	HAJO 538
1	CONTINUE	HAJO 539
		HAJO 540
		HAJO 541
		HAJO 542
	A(II,1)=0.	HAJO 543

	A(I1,2)=1.	HAJO 544
	A(I1,3)=0.	HAJO 545
	IF(SUPRES.GT.0.)RETURN	HAJO 546
	PRINT 2	HAJO 547
2	FORMAT(1H1,5X,*A MATRIX, SETUP, W/O B DIAGONAL ELEMENTS*//)	HAJO 548
	PRINT 3,(I,A(I,1),A(I,2),A(I,3),I=1,I1)	HAJO 549
3	FORMAT(5X,I10,3(1PE13.4))	HAJO 550
		HAJO 551
	RETURN	HAJO 552
	END	HAJO 553
	SUBROUTINE BSET	HAJO 554
	COMMON A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB,	HAJO 555
1	XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,	HAJO 556
2	C3,CII,CONE,EPS,I1,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,	HAJO 557
3	ITPRNT,IXAXIS,IYAXIS,IJ,JK,NAME(8),SE,SK,SM,TIME,	HAJO 558
4	TMAX,TITL(8),PWR,SPC,X0,XI1,IIB(4000),SUPRES,FH2,FHE,	HAJO 559
5	FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND	HAJO 560
		HAJO 561
	IF(SUPRES.GT.0.)GO TO 110	HAJO 562
	PRINT 11	HAJO 563
11	FORMAT(1H1,10X,*B MATRIX*///,* NO.*,10(11X,*J *),/6X,10(HAJO 564
1	9X,*B(J)*))	HAJO 565
110	CONTINUE	HAJO 566
		HAJO 567
C	1ST ROW	HAJO 568
		HAJO 569
	DO 1 I=1,201	HAJO 570
	B(I)=0.	HAJO 571
1	IB(I)=0	HAJO 572
	IB(1)=1	HAJO 573
	IB(2)=1	HAJO 574
		HAJO 575
	LOC=IQB	HAJO 576
	NO=2	HAJO 577
	IIB(1)=NO	HAJO 578
	CALL ECWR(B,LOC,NO,IPAR)	HAJO 579
	LOC=LOC+NO	HAJO 580
	CALL ECWR(IIB,LOC,NO,IPAR)	HAJO 581
	LOC=LOC+NO	HAJO 582
	IIM1=I1- 1	HAJO 583
		HAJO 584
	CALL BPRNT(1)	HAJO 585
		HAJO 586
		HAJO 587
C	ROWS 2 THRU I1- 1	HAJO 588
	X1=X(1)	HAJO 589
	XI1=X(I1)	HAJO 590
	XM=0.5*(X(1)+X(2))	HAJO 591
		HAJO 592
		HAJO 593
		HAJO 594
		HAJO 595
	DO 10 K=2,IIM1	HAJO 596

	JB=0	HAJO 597
	JIB=1	HAJO 598
	IB(1)=0	HAJO 599
	B(1)=0.	HAJO 600
	XK=X(K)	HAJO 601
	XP=0.5*(X(K)+X(K+1))	HAJO 602
C	DIAGONAL ELEMENT	HAJO 603
	CALL DCUEJX(XK,CUE)	HAJO 604
	A(K,2)=A(K,2)+(XM-XP)*CUE	HAJO 605
		HAJO 606
		HAJO 607
		HAJO 608
C	QJ(+N)	HAJO 609
	DO 4 J=1, JJ	HAJO 610
	XKJ=XK+U(J)	HAJO 611
	IF(XKJ.GT.XII)GO TO 5	HAJO 612
		HAJO 613
	DO 2 L=K, II	HAJO 614
	KJ=L	HAJO 615
	IF(X(L).GE.XKJ)GO TO 3	HAJO 616
2	CONTINUE	HAJO 617
	GO TO 5	HAJO 618
		HAJO 619
3	CONTINUE	HAJO 620
	CALL CUEJX(XKJ,CUE,J)	HAJO 621
	IF(CUE.EQ.0.)GO TO 4	HAJO 622
	IF(IB(JIB).EQ.KJ)GO TO 40	HAJO 623
		HAJO 624
	JB=JB+1	HAJO 625
	JIB=JIB+1	HAJO 626
	B(JB)=CUE*(XP- XM)	HAJO 627
	IB(JIB)=KJ	HAJO 628
	GO TO 4	HAJO 629
		HAJO 630
40	CONTINUE	HAJO 631
	B(JB)=CUE*(XP- XM)+B(JB)	HAJO 632
		HAJO 633
4	CONTINUE	HAJO 634
		HAJO 635
5	CONTINUE	HAJO 636
		HAJO 637
		HAJO 638
C	QJ(- N)	HAJO 638
	DO 8 J=1, JJ	HAJO 639
	XKJ=XK- U(J)	HAJO 640
	IF(XKJ.LT.X1)GO TO 9	HAJO 641
		HAJO 642
		HAJO 643
	KM1=K- 1	HAJO 644
	DO 6 L=1, KM1	HAJO 645
	LL=K- L	HAJO 646
	KJ=LL	HAJO 647
	IF(X(LL).LE.XKJ)GO TO 7	HAJO 647
6	CONTINUE	HAJO 648

	GO TO 9	HAJO 649
		HAJO 650
7	CONTINUE	HAJO 651
	CALL CUEJX(XK ,CUE,- J)	HAJO 652
	IF(CUE.EQ.0.)GO TO 8	HAJO 653
	IF(IB(JIB).EQ.KJ)GO TO 80	HAJO 654
		HAJO 655
	JB=JB+1	HAJO 656
	JIB=JIB+1	HAJO 657
	B(JB)=CUE*(XP- XM)	HAJO 658
	IB(JIB)=KJ	HAJO 659
	GO TO 8	HAJO 660
		HAJO 661
80	CONTINUE	HAJO 662
	B(JB)=CUE*(XP- XM)+B(JB)	HAJO 663
		HAJO 664
8	CONTINUE	HAJO 665
		HAJO 666
9	CONTINUE	HAJO 667
	IB(1)=JB	HAJO 668
	NO=JB+1	HAJO 669
	IIB(K)=NO	HAJO 670
	CALL ECWR(B,LOC,NO,IPAR)	HAJO 671
	LOC=LOC+NO	HAJO 672
	CALL ECWR(IB,LOC,NO,IPAR)	HAJO 673
	LOC=LOC+NO	HAJO 674
		HAJO 675
	CALL BPRNT(K)	HAJO 676
		HAJO 677
	XM=XP	HAJO 678
10	CONTINUE	HAJO 679
		HAJO 680
C	I1th ROW	HAJO 681
	IB(1)=1	HAJO 682
	IB(2)=I1	HAJO 683
	B(1)=0.	HAJO 684
	NO=2	HAJO 685
	IIB(I1)=NO	HAJO 686
	CALL ECWR(B,LOC,NO,IPAR)	HAJO 687
	LOC=LOC+NO	HAJO 688
	CALL ECWR(IB,LOC,NO,IPAR)	HAJO 689
		HAJO 690
	CALL BPRNT(I1)	HAJO 691
		HAJO 692
	IF(SUPRES.GT.0.)RETURN	HAJO 693
	PRINT 20	HAJO 694
20	FORMAT(1H1,5X,*A MATRIX, SETUP, WITH B DIAGONAL ELEMENTS*,//)	HAJO 695
		HAJO 696
	PRINT23,(I,A(I,1),A(I,2),A(I,3),I=1,I1)	HAJO 696
23	FORMAT(5X,I10,3(1PE13.4))	HAJO 697
	PRINT 14	HAJO 698
14	FORMAT(1H1)	HAJO 699
		HAJO 700

	RETURN	HAJO 701
	END	HAJO 702
	SUBROUTINE CUEX(Z,CUE,N)	HAJO 703
		HAJO 704
	COMMON A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB,	HAJO 705
1	XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,	HAJO 706
2	C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,	HAJO 707
3	ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,	HAJO 708
4	TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,	HAJO 709
5	FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND	HAJO 710
		HAJO 711
	DIMENSION T(20)	HAJO 712
	EQUIVALENCE (T,FIP1)	HAJO 713
		HAJO 714
	ENTRY CUEMX	HAJO 715
	LOC=IQM	HAJO 716
	CALL ECRD(XX,LOC,400,IPAR)	HAJO 717
	CUE=AKNINT(Z,KK,IDEGRE,XX,QX,T)	HAJO 718
	RETURN	HAJO 719
		HAJO 720
		HAJO 721
	ENTRY DCUEJX	HAJO 722
	LOC=IQJ	HAJO 723
		HAJO 724
1	CUE=0.	HAJO 725
	DO 2 I=1,JJ	HAJO 726
	CALL ECRD(XX,LOC,400,IPAR)	HAJO 727
	LOC=LOC+400	HAJO 728
	JQI=JQ(I)	HAJO 729
	IF((Z.LT.XX(1)).O.(Z.GT.XX(JQI)))GO TO 5	HAJO 730
	ZQP=Z*AKNINT(Z,JQ(I),IDEGRE,XX,QX,T)	HAJO 731
	GO TO 6	HAJO 732
5	ZQP=0.	HAJO 733
6	CONTINUE	HAJO 734
	ZU=Z+U(I)	HAJO 735
	IF((ZU.LT.XX(1)).O.(ZU.GT.XX(JQI)))GO TO 7	HAJO 736
		HAJO 737
	EX=EXP(-(SE*U(I))/(SK*BT))	HAJO 738
	ZQM=ZU*EX*AKNINT(ZU,JQ(I),IDEGRE,XX,QX,T)	HAJO 739
	GO TO 8	HAJO 740
7	ZQM=0.	HAJO 741
8	CONTINUE	HAJO 742
	CUE=CUE+ZQP+ZQM	HAJO 743
2	CONTINUE	HAJO 743

	CUE=BN*CUE	HAJO 744
	RETURN	HAJO 745
	ENTRY CUEJX	HAJO 746
	K=N- 1	HAJO 747
	IF(N.LT.0)K=- N- 1	HAJO 748
	J=K+1	HAJO 749
	LOC=IQJ+K*400	HAJO 750
	CALL ECRD(XX,LOC,400,IPAR)	HAJO 751
	IF(Z.LT.XX(1))GO TO 4	HAJO 752
	JQJ=JQ(J)	HAJO 753
	IF(Z.GT.XX(JQJ))GO TO 4	HAJO 754
		HAJO 755
		HAJO 756
		HAJO 757
	IF(N.LT.0)GO TO 3	HAJO 758
	CUE=Z*BN*AKNINT(Z,JQ(J),IDEGRE,XX,OX,T)	HAJO 759
	RETURN	HAJO 760
3	EX=EXP(-(SE*U(J))/(SK*BT))	HAJO 761
	CUE=Z*BN*EX*AKNINT(Z,JQ(J),IDEGRE,XX,OX,T)	HAJO 762
	RETURN	HAJO 763
4	CUE=0.	HAJO 764
	RETURN	HAJO 765
		HAJO 766
		HAJO 767
	END	HAJO 768
	SUBROUTINE CMBF	HAJO 769
		HAJO 770
	COMMON A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB,	HAJO 771
1	XX(200),OX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,	HAJO 772
2	C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,	HAJO 773
3	ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,	HAJO 774
4	TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,	HAJO 775
5	FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND	HAJO 776
		HAJO 777
		HAJO 778
	DIMENSION D(201)	HAJO 779
		HAJO 780
	EQUIVALENCE (D,IB)	HAJO 781
		HAJO 782
	LOC=IQB	HAJO 783
		HAJO 784
	DO 3 I=1,II	HAJO 785
	NO=IIB(I)	HAJO 786
	CALL ECRD(B,LOC,NO,IPAR)	HAJO 787
	LOC=LOC+NO	HAJO 788
	CALL ECRD(IB,LOC,NO,IPAR)	HAJO 789
	LOC=LOC+NO	HAJO 790
	NONZRO=IB(1)	HAJO 791
	IF(NONZRO)5,2,4	HAJO 792
4	CONTINUE	HAJO 793
		HAJO 794
	DO 1 J=1,NONZRO	HAJO 795

	L=IB(J+1)	HAJO 796
1	D(J)=FI(L)	HAJO 797
		HAJO 798
2	CONTINUE	HAJO 799
	FIP1(I)=- DOTPRO(NONZRO,B,1,D,1)	HAJO 800
3	CONTINUE	HAJO 801
		HAJO 802
	FIP1(1)=CONE+FIP1(1)	HAJO 803
	FIP1(II)=CII+FIP1(II)	HAJO 804
	RETURN	HAJO 805
		HAJO 806
5	PRINT 6	HAJO 807
6	FORMAT(/,5X,*NEGATIVE IB INDEX*)	HAJO 808
	RETURN	HAJO 809
		HAJO 810
	END	HAJO 811
	SUBROUTINE CNVRG	HAJO 812
		HAJO 813
	COMMON A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IOB,	HAJO 814
1	XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,	HAJO 815
2	C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,	HAJO 816
3	ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,	HAJO 817
4	TMAX,TITL(8),PWR,SPC,X0,XII,IIB(4000),SUPRES,FH2,FHE,	HAJO 818
5	FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND	HAJO 819
		HAJO 820
	IEND=- 1	HAJO 821
		HAJO 822
	DO 1 I=1,II	HAJO 823
	III=I	HAJO 824
	FJ=FI(I)	HAJO 825
	FK=FIP1(I)	HAJO 826
	FD=ABS(FJ)	HAJO 827
	IF(ABS(FK).GT.FD)FD=ABS(FK)	HAJO 828
	IF(FD.LE.0.)GO TO 1	HAJO 829
	IK=I	HAJO 830
	FN=ABS(FK- FJ)	HAJO 831
	TEST=FN/FD	HAJO 832
	IF(TEST.GT.EPS)GO TO 3	HAJO 833
1	CONTINUE	HAJO 834
		HAJO 835
20	CONTINUE	HAJO 836
	CALL SECOND(TIME)	HAJO 837
	PRINT 2, EPS,IT,II,TIME	HAJO 838
2	FORMAT(/,2X,*CNVRGNCE CRITERIA OF EPS=*,E13.4,* MET ON ITERATION*	HAJO 839
1	,I4,*, II =*,I5,*,*,F10.1,* SECONDS*/)	HAJO 840
	IEND=0	HAJO 841
	RETURN	HAJO 842
		HAJO 843
21	CONTINUE	HAJO 844
	II=III	HAJO 845
	GO TO 20	HAJO 846
		HAJO 847
3	CONTINUE	HAJO 848

	IF(FIP1(III).LT.FSTOP)GO TO 21	HAJO 849
	IF(IT.GE.ITMAX)GO TO 5	HAJO 850
	IF(TIME.GE.TMAX)GO TO 7	HAJO 851
	IF(ITPRNT.LE.0)GO TO 44	HAJO 852
	PRINT 4,IT,IK	HAJO 853
4	FORMAT(5X,*FAILED TO CONVERGE ON ITERATION*,I4,* AT II=*,I4)	HAJO 854
		HAJO 855
	I1=1	HAJO 856
	I4=I1/4	HAJO 857
	I2=I4+I4	HAJO 858
	I3=I2+I4	HAJO 859
	PRINT 400,I1,I4,I2,I3,II	HAJO 860
400	FORMAT(55X,5(* I=*,I4,4X))	HAJO 861
	PRINT 401,FIP1(I),FIP1(I4),FIP1(I2),FIP1(I3),FIP1(II)	HAJO 862
401	FORMAT(47X,*FIP1(I)=*,5(1PE12.4),/)	HAJO 863
	IF(MOD(IT,ITPRNT).NE.0)GO TO 44	HAJO 864
	CALL FPRNT(1)	HAJO 865
	PRINT 43	HAJO 866
43	FORMAT(1H1)	HAJO 867
44	IF(MOD(IT,ITPLOT).NE.0)RETURN	HAJO 868
	IF(ITPLOT.LE.0)RETURN	HAJO 869
	ENCODE(42,45,TITL)IT,FH2,FHE,FN2,FCO2	HAJO 870
45	FORMAT(* X, ITERATION*,I3,* H2/HE/N2/CO2 *,3(2PF2.0,*/*),F2.0)	HAJO 871
	REWIND 4	HAJO 872
	BUFFER OUT(4,1)(FIP1(1),FIP1(4000))	HAJO 873
46	IF(UNIT,4)46,47,47,47	HAJO 874
47	CONTINUE	HAJO 875
	IIM1=II- 1	HAJO 876
	DO 48 I=1,IIM1	HAJO 877
	FIP1(I)=ALOG10(FIP1(I))	HAJO 878
48	CONTINUE	HAJO 879
	FIP1(II)=FIP1(II- 1)	HAJO 880
	CALL PLOJB(X,FIP1,II,1,0,0,0.,10.,10.,NAME,80,TITL,42,	HAJO 881
1	14HLOG 10 OF FIP1,14)	HAJO 882
	REWIND 4	HAJO 883
	BUFFER IN(4,1)(FIP1(1),FIP1(4000))	HAJO 884
49	IF(UNIT,4)49,50,50,50	HAJO 885
50	CONTINUE	HAJO 886
	RETURN	HAJO 887
		HAJO 888
5	PRINT 6, IT,IK	HAJO 889
6	FORMAT(//,2X,*FAILED TO CONVERGE IN*,I4,* ITERATIONS AT II=*,I4,/)	HAJO 890
	IEND=+1	HAJO 891
	RETURN	HAJO 892
		HAJO 893
7	PRINT 8, TIME,IT	HAJO 894
8	FORMAT(//,2X,*FAILED TO CNVRG IN*,F7.1,* SECONDS AFTER*,I4,* ITERA	HAJO 895
	TIONS*,/)	HAJO 896
	IEND=+2	HAJO 897
	RETURN	HAJO 898
		HAJO 899
		HAJO 900
	END	HAJO 901

	SUBROUTINE PRNT(IROW)		HAJO 902
			HAJO 903
	COMMON A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB,		HAJO 904
1	XX(200),QX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,		HAJO 905
2	C3,C11,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,		HAJO 906
3	ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,		HAJO 907
4	TMAX,TITL(8),PWR,SPC,X0,X11,IB(4000),SUPRES,FH2,FHE,		HAJO 908
5	FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND		HAJO 909
			HAJO 910
	ENTRY BPRNT		HAJO 911
	IF(SUPRES.GT.0.)RETURN		HAJO 912
	PRINT 120, IB(1)		HAJO 913
120	FORMAT(/,2H+ ,I4)		HAJO 914
	LIN=IB(1)/10+1		HAJO 915
	IF(MOD(IB(1),10).EQ.0)LIN=LIN- 1		HAJO 916
	MB=1		HAJO 917
	M=2		HAJO 918
	N=11		HAJO 919
	NN=IB(1)+1		HAJO 920
	DO 139 I=1,LIN		HAJO 921
	IF(N.GT.NN)N=NN		HAJO 922
	NB=N- 1		HAJO 923
	PRINT 12,(IB(L),L=M,N)		HAJO 924
12	FORMAT(6X,I6,9I13)		HAJO 925
	PRINT 121,IROW		HAJO 926
121	FORMAT(2H+ ,I4)		HAJO 927
	PRINT 13,(B(L),L=MB,NB)		HAJO 928
13	FORMAT(6X,10(1PE13.4),/)		HAJO 929
	M=M+10		HAJO 930
	MB=M- 1		HAJO 931
	N=N+10		HAJO 932
139	CONTINUE		HAJO 933
	RETURN		HAJO 934
	ENTRY FPRNT		HAJO 935
	NV=II/10+1		HAJO 936
	NL=Nv/4		HAJO 937
	IF(NV.GT.(NL*4))NL=NL+1		HAJO 938
	IF(IROW.LT.1)GO TO 10		HAJO 939
	PRINT 6		HAJO 940
6	FORMAT(1H1)		HAJO 941
	PRINT 1, IT		HAJO 942
1	FORMAT(* RESULTS AFTER ITERATION *,I4,/,4(* I X(I)		HAJO 943
1	F(I)*,/,)		HAJO 944
10	CONTINUE		HAJO 945
	NV=NL*10		HAJO 946
	DO 4 M=1,NL		HAJO 947
	I=(M- 1)*10		HAJO 948
	IF(I.LE.0)I=1		HAJO 949
	J=10*(M- 1+NL)		HAJO 950
	K=J+NV		HAJO 951
	L=K+NV		HAJO 952
	IF(IROW.LT.1)GO TO 14		HAJO 953
	IF(L.GT.II)GO TO 3		HAJO 954

	PRINT 2,I,X(I),FIP1(I),J,X(J),FIP1(J),K,X(K),FIP1(K),L,X(L),FIP1(L)	HAJO 955
1)	HAJO 956
2	FORMAT(4(1X,I8,1PE12.3,E12.3))	HAJO 957
	GO TO 4	HAJO 958
3	PRINT 2,I,X(I),FIP1(I),J,X(J),FIP1(J),K,X(K),FIP1(K)	HAJO 959
	GO TO 4	HAJO 960
14	IF(IROW.LT.0)GO TO 16	HAJO 961
	IF(L.GT.II)GO TO 15	HAJO 962
	PRINT 2,I,X(I),FI(I),J,X(J),FI(J),K,X(K),FI(K),L,X(L),FI(L)	HAJO 963
	GO TO 4	HAJO 964
15	PRINT 2,I,X(I),FI(I),J,X(J),FI(J),K,X(K),FI(K)	HAJO 965
	GO TO 4	HAJO 966
16	IF(L.GT.II)GO TO 17	HAJO 967
	PRINT 2,I,X(I),A(I),J,X(J),A(J),K,X(K),A(K),L,X(L),A(L)	HAJO 968
	GO TO 4	HAJO 969
17	PRINT 2,I,X(I),A(I),J,X(J),A(J),K,X(K),A(K)	HAJO 970
4	CONTINUE	HAJO 971
	RETURN	HAJO 972
	END	HAJO 973
	SUBROUTINE INT	HAJO 974
		HAJO 975
	COMMON P(4000),G(4000),D(4000),Z(4402),F(4000),U(200),IOB,	HAJO 976
1	XX(200),OX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,	HAJO 977
2	C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,	HAJO 978
3	ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,	HAJO 979
4	TMAX,TITL(8),PWR,SPC,X0,XI1,IIB(4000),SUPRES,FH2,FHE,	HAJO 980
5	FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND	HAJO 981
		HAJO 982
	DIMENSION R(4000),GP(1),GM(1)	HAJO 983
	EQUIVALENCE (GP,D),(GM,F)	HAJO 984
		HAJO 985
	REAL LHS	HAJO 986
		HAJO 987
	FA=SE/(SK*BT)	HAJO 988
	REWIND 4	HAJO 989
	BUFFER OUT(4,1)(X(1),X(4000))	HAJO 990
9000	IF(UNIT,4)9000,9001,9001,9001	HAJO 991
9001	CONTINUE	HAJO 992
	DO 9002 I=1,II	HAJO 993
	R(I)=FA*X(I)	HAJO 994
	X(I)=R(I)	HAJO 995
9002	CONTINUE	HAJO 996
	DO 1 I=1,II	HAJO 997
	G(I)=SQRT(R(I))*F(I)	HAJO 998
1	CONTINUE	HAJO 999
		HAJO1000
	CALL SIMPUN(R,G,II,1,Z)	HAJO1001
	C=Z(II)	HAJO1002
		HAJO1003
	DO 2 I=1,II	HAJO1004
	P(I)=F(I)/C	HAJO1005
	IF(P(I).LE.0.)P(I)=P(I- 1)	HAJO1006
	D(I)=ALOG10(P(I))	HAJO1007

2	CONTINUE	HAJO1008
	PRINT 3, XII,C	HAJO1009
3	FORMAT(1H1,5X,*P=F/C, C=INTEGRAL(0 TO*,F5.1,*) F SQRT(Z) =*,1PE12.	HAJO1010
1	4,/,5X,* Z P*,/)	HAJO1011
	CALL FPRNT(- 1)	HAJO1012
	ENCODE(42, 4,TITL)IT,FH2,FHE,FN2,FCO2	HAJO1013
4	FORMAT(* X, ITERATION*,I3,* H2/HE/N2/CO2 *,3(2PF2.0,*/*),F2.0)	HAJO1014
	CALL PLOJB(X,D,II,1,0,0,0.,10.,10.,NAME,80,TITL,42,1HP,1)	HAJO1015
	REWIND 4	HAJO1016
	BUFFER IN (4,1)(X(1),X(4000))	HAJO1017
9003	IF(UNIT,4)9003,9004,9004,9004	HAJO1018
9004	CONTINUE	HAJO1019
		HAJO1020
	IIM1=II- 1	HAJO1021
	DO 5 I=2,IIM1	HAJO1022
		HAJO1023
	CALL CUEMX(X(II),CUE)	HAJO1024
	G(I)=R(I)*P(I)*ALOG(P(I+1)/P(I- 1))/(CUE*(R(I+1)- R(I- 1)))	HAJO1025
5	CONTINUE	HAJO1026
		HAJO1027
	G(1)=0.	HAJO1028
	G(II)=0.	HAJO1029
		HAJO1030
	CALL SIMPUN(R,G,II,1,Z)	HAJO1031
	C=Z(II)	HAJO1032
	E=SE	HAJO1033
	AMU=E*SQRT(2./(SK*BT*SM))/(- 3.*BN) *C	HAJO1034
		HAJO1034
	DO 6 I=1,II	HAJO1036
	CALL CUEMX(X(I),CUE)	HAJO1037
	G(I)=(R(I)*P(I))/CUE	HAJO1038
6	CONTINUE	HAJO1039
		HAJO1040
	CALL SIMPUN(R,G,II,1,Z)	HAJO1041
	C=Z(II)	HAJO1042
	DMU=SQRT(2.*SK*BT/SM)/(3.*BN*AMU) *C	HAJO1043
		HAJO1044
	EBN=(BE/BN)*1.E+17	HAJO1045
	EMU=BE*AMU	HAJO1046
	OUT(1,NNNN)=EBN	HAJO1047
	OUT(2,NNNN)=EMU	HAJO1048
	OUT(3,NNNN)=DMU	HAJO1049
	OUT(7,NNNN)=DMU*AMU*AMU	HAJO1050
	OUT(8,NNNN)=BN*AMU*1.E- 16	HAJO1051
		HAJO1052
	FA=1./(SK*BT)**1.5	HAJO1053
	DO 100 I=1,II	HAJO1054
	R(I)=SE*X(I)	HAJO1055
100	P(I)=FA*P(I)	HAJO1056
	FF=SK*BT	HAJO1057
	DO 11 I=2,IIM1	HAJO1058
	CALL CUEMX(X(II),CUE)	HAJO1059
		HAJO1060

	G(I)=R(I)*R(I)*CUE*(P(I)+FF*ALOG(P(I+1)/P(I-1)))	HAJO1061
11	CONTINUE	HAJO1062
	G(1)=0.	HAJO1063
		HAJO1064
	G(II)=0.	HAJO1065
	CALL SIMPUN(R,G,II,1,Z)	HAJO1066
	C0=Z(II)	HAJO1067
		HAJO1068
	SUMA=0.	HAJO1069
	UJCJ=0.	HAJO1070
	REWIND 4	HAJO1071
	BUFFER OUT(4,1)(D(1),D(4000))	HAJO1072
9005	IF(UNIT,4)9005,9006,9006,9006	HAJO1073
9006	BUFFER OUT(4,1)(F(1),F(4000))	HAJO1074
9007	IF(UNIT,4)9007,9008,9008,9008	HAJO1075
9008	CONTINUE	HAJO1076
	DO 13 J=1,JJ	HAJO1077
	LOC=IQJ+(J-1)*400	HAJO1078
	CALL ECRD(XX,LOC,400,IPAR)	HAJO1079
	JQJ=JQ(J)	HAJO1080
	ALFAJ=EXP(-SE*U(J))/(SK*BT)	HAJO1081
		HAJO1082
	DO 12 I=1,II	HAJO1083
	XK=X(I)	HAJO1084
	XKUJ=XK+U(J)	HAJO1085
	CUE1=AKNINT(XK,JQJ,IDEGRE,XX,OX,Z)	HAJO1086
	CUE2=AKNINT(XKUJ,JQJ,IDEGRE,XX,OX,Z)	HAJO1087
	IF(XK.LT.XX(1).O.XK.GT.XX(JQJ))CUE1=0.	HAJO1088
	IF(XKUJ.LT.XX(1).O.XKUJ.GT.XX(JQJ))CUE2=0.	HAJO1089
	GP(I)=P(I)*R(I)*CUE1	HAJO1090
	GM(I)=-P(I)*R(I)*U(J)*ALFAJ*CUE2	HAJO1091
	G(I)=P(I)*R(I)*CUE1-ALFAJ*R(I)*U(J)*CUE2	HAJO1092
12	CONTINUE	HAJO1093
		HAJO1094
	CALL SIMPUN(R,GP,II,1,Z)	HAJO1095
	VP=SQRT(2./SM)*Z(II)*1.E+16	HAJO1096
	CALL SIMPUN(R,GM,II,1,Z)	HAJO1097
	VM=SQRT(2./SM)*Z(II)*1.E+16	HAJO1098
	CALL SIMPUN(R,G,II,1,Z)	HAJO1099
	VN=SQRT(2./SM)*Z(II)*1.E+16	HAJO1100
	OUT(J+8,NNNN+15)=VP	HAJO1101
	OUT(J+8,NNNN+30)=VM	HAJO1102
	OUT(J+8,NNNN)=VN	HAJO1103
	SUMA=SUMA+VN	HAJO1104
	UJCJ=UJCJ+U(J)*Z(II)	HAJO1105
13	CONTINUE	HAJO1106
	OUT(6,NNNN)=SUMA	HAJO1107
	REWIND 4	HAJO1108
	BUFFER IN(4,1)(D(1),D(4000))	HAJO1109
9009	IF(UNIT,4)9009,9010,9010,9010	HAJO1110
9010	BUFFER IN(4,1)(F(1),F(4000))	HAJO1111
9011	IF(UNIT,4)9011,9012,9012,9012	HAJO1112

9012 CONTINUE

UJCJ=SE*UJCJ
RHS=BN*SQRT(2./SM)*(2.*SM*C0/BM+UJCJ)
LHS=SE*BE*BE*AMU
OUT(4,NNNN)=LHS*1.E-7
OUT(5,NNNN)=RHS*1.E-7
II=IISAV
RETURN

ENTRY SUMMARY

PRINT 699
698 FORMAT(/)
699 FORMAT(1H1)
PRINT 700, FH2,FHE,FN2,FCO2,NNNN
PUNCH 700, FH2,FHE,FN2,FCO2,NNNN
700 FORMAT(1X,*HANCOCK- JONES CODE MIXING H2/HE/N2/CO2 *,3(2PF2.0,*/*)
1 ,F2.0,* ,* ,I3,* RUNS*)
PRINT 698
PRINT 702
702 FORMAT(* FRACTIONS H2/HE/N2/CO2*)
PRINT 703, FH2,FHE,FN2,FCO2
PUNCH 703, FH2,FHE,FN2,FCO2

HAJO1113
HAJO1114
HAJO1115
HAJO1116
HAJO1117
HAJO1118
HAJO1119
HAJO1120
HAJO1121
HAJO1122
HAJO1123
HAJO1124
HAJO1125
HAJO1126
HAJO1127
HAJO1128
HAJO1129
HAJO1130
HAJO1131
HAJO1132
HAJO1133
HAJO1134
HAJO1135
HAJO1136

703	FORMAT(1P6E13.4)	HAJO1137
	NN1=1 \$ NN2=NNNN	HAJO1138
	IF(NN2.GT.6)NN2=6	HAJO1139
704	CONTINUE	HAJO1140
	PRINT 701,(N,N=NN1,NN2)	HAJO1141
701	FORMAT(/, * RUN NO.*,6(I3,10X))	HAJO1142
	PRINT 698	HAJO1143
	PRINT 705	HAJO1144
705	FORMAT(* E/N VOLT-CM SQ., TOWNSENDS (X E- 17)*)	HAJO1145
	PRINT 703, (OUT(1,N),N=NN1,NN2)	HAJO1146
	PUNCH 703, (OUT(1,N),N=NN1,NN2)	HAJO1147
	PRINT 706	HAJO1148
706	FORMAT(* DRIFT VELOCITY CM/SEC, E MU*)	HAJO1149
	PRINT 703, (OUT(2,N),N=NN1,NN2)	HAJO1150
	PUNCH 703, (OUT(2,N),N=NN1,NN2)	HAJO1151
	PRINT 707	HAJO1152
707	FORMAT(* CHARACTERISTIC ENERGY VOLT, D/MU*)	HAJO1153
	PRINT 703, (OUT(3,N),N=NN1,NN2)	HAJO1154
	PUNCH 703, (OUT(3,N),N=NN1,NN2)	HAJO1155
	PRINT 708	HAJO1156
708	FORMAT(* POWER=IE=Q X W X E/N X N AT 1 ATM. WATTS/ELECTRON, LHS*)	HAJO1157
	PRINT 703, (OUT(4,N),N=NN1,NN2)	HAJO1158
	PUNCH 703, (OUT(4,N),N=NN1,NN2)	HAJO1159
	PRINT 709	HAJO1160
709	FORMAT(* POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS*)	HAJO1161
	PRINT 703, (OUT(5,N),N=NN1,NN2)	HAJO1162
	PUNCH 703, (OUT(5,N),N=NN1,NN2)	HAJO1163
	PRINT 710	HAJO1164
710	FORMAT(* TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL,SUMA*)	HAJO1165
	PRINT 703, (OUT(6,N),N=NN1,NN2)	HAJO1166
	PUNCH 703, (OUT(6,N),N=NN1,NN2)	HAJO1167
	PRINT 711	HAJO1168
711	FORMAT(* DN DIFF CONST X MOL/CC, UNITS 10E16 MOL*)	HAJO1169
	PRINT 703, (OUT(7,N),N=NN1,NN2)	HAJO1170
	PUNCH 703, (OUT(7,N),N=NN1,NN2)	HAJO1171
	PRINT 712	HAJO1172
712	FORMAT(* MUN MOBILITY X MOL/CC, UNITS 10E16 MOL*)	HAJO1173
	PRINT 703, (OUT(8,N),N=NN1,NN2)	HAJO1174
	PUNCH 703, (OUT(8,N),N=NN1,NN2)	HAJO1175
	PRINT 698	HAJO1176
	PRINT 713, JJ	HAJO1177
	PUNCH 713, JJ	HAJO1178
713	FORMAT(* COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL, J=*,I3)	HAJO1179
	PRINT 714, (N,N=NN1,NN2)	HAJO1180
714	FORMAT(/, * LEVEL RUN NO.*,I2,4X,5(7X,I2,4X))	HAJO1181
	DO 718 I=1,JJ	HAJO1182
	K=I+8	HAJO1183
	NN3=NN1+15 \$ NN4=NN2+15	HAJO1184
	NN5=NN1+30 \$ NN6=NN2+30	HAJO1185
	PRINT 715, I,(OUT(K,N),N=NN3,NN4)	HAJO1186
715	FORMAT(/,1X,I3,* 1ST KIND*,1PE13.4,5E13.4)	HAJO1187
	PRINT 716, (OUT(K,N),N=NN5,NN6)	HAJO1188

716	FORMAT(4X,* 2ND KIND*,1PE13.4,5E13.4)	HAJO 1189
	PUNCH 703, (OUT(K,N),N=NN3,NN4)	HAJO 1190
	PUNCH 703, (OUT(K,N),N=NN5,NN6)	HAJO 1191
718	CONTINUE	HAJO 1192
	PRINT 699	HAJO 1193
	IF(NN2.GE.NNNN)RETURN	HAJO 1194
	NN1=NN1+6	HAJO 1195
	NN2=NN2+6	HAJO 1196
	IF(NN2.GT.NNNN)NN2=NNNN	HAJO 1197
	GO TO 704	HAJO 1198
	END	HAJO 1199
	SUBROUTINE DUMPIC	HAJO 1200
	COMMON A(4000,3),B(201),IB(201),FI(4000),FIP1(4000),U(200),IQB,	HAJO 1201
1	XX(200),OX(200),JQ(200),X(4000),BE,BM,BN,BT,C1,C2,	HAJO 1202
2	C3,CII,CONE,EPS,II,IDEGRE,IQJ,IQM,IT,ITMAX,ITPLOT,	HAJO 1203
3	ITPRNT,IXAXIS,IYAXIS,JJ,KK,NAME(8),SE,SK,SM,TIME,	HAJO 1204
4	TMAX,TITL(8),PWR,SPC,XO,XII,IIB(4000),SUPRES,FH2,FHE,	HAJO 1205
5	FN2,FCO2,NNNN,THRU,OUT(60,50),PICKUP,FSTOP,IISAV,IEND	HAJO 1206
		HAJO 1207
		HAJO 1208
	DIMENSION NMLS(8)	HAJO 1209
	DIMENSION INARY(2)	HAJO 1210
		HAJO 1211
	ENTRY CDUMP	HAJO 1212
	INARY(1)=1	HAJO 1213
	INARY(2)=4LTAPE	HAJO 1214
	ITAPE=0	HAJO 1215
	CALL AFSREL(5LFSET3,INARY,ITAPE,0)	HAJO 1216
	REWIND 3	HAJO 1217
		HAJO 1218
	BUFFER OUT(3,1)(A(1),IEND)	HAJO 1219
1	IF(UNIT,3)1,2,2,2	HAJO 1220
		HAJO 1221
2	LOC=0 \$ JJP1=JJ+1	HAJO 1222
	DO 4 I=1,JJP1	HAJO 1223
	CALL ECRD(B,LOC,400,IPAR)	HAJO 1224
	BUFFER OUT(3,1)(B(1),B(400))	HAJO 1225
3	IF(UNIT,3)3,4,4,4	HAJO 1226
4	LOC=LOC+400	HAJO 1227
		HAJO 1228
		HAJO 1229
	DO 7 I=1,II	HAJO 1230
	LNTH=2*IIB(I)	HAJO 1231
	CALL ECRD(B,LOC,LNTH,IPAR)	HAJO 1232
	BUFFER OUT(3,1)(B(1),B(LNTH))	HAJO 1233
5	IF(UNIT,3)5,6,6,6	HAJO 1234
6	LOC=LOC+LNTH	HAJO 1235
7	CONTINUE	HAJO 1236
		HAJO 1237
8	READ 9, (NMLS(I),I=1,8)	HAJO 1238
9	FORMAT(8A10)	HAJO 1239
	IF(EOF,1)12,10	HAJO 1240
10	BUFFER OUT(3,1)(NMLS(1),NMLS(8))	HAJO 1241
11	IF(UNIT,3)11,8,8,8	HAJO 1242

		HAJO1242
12	END FILE 3	HAJO1243
	REWIND 3	HAJO1244
	CALL SECOND(TIME)	HAJO1245
	PRINT 13, NNNN,IT,IEND,TIME	HAJO1246
13	FORMAT(U///,* DUMP COMPLETED ON TAPE 3, RUN*,I4,*, AFTER ITER	HAJO1247
1	ATION*,I5,*, IEND =*,I2,*,*,F10.1,* SECONDS*)	HAJO1248
	RETURN	HAJO1249
		HAJO1250
		HAJO1251
	ENTRY RESTRT	HAJO1252
	REWIND 3	HAJO1253
		HAJO1254
	BUFFER IN(3,1)(A(1),IEND)	HAJO1255
101	IF(UNIT,3)101,102,102,102	HAJO1256
		HAJO1257
102	LOC=0 \$ JJP1=JJ+1	HAJO1258
	DO 105 I=1,JJP1	HAJO1259
	BUFFER IN(3,1)(B(1),B(400))	HAJO1260
103	IF(UNIT,3)103,104,104,104	HAJO1261
104	CALL ECWR(B,LOC,400,IPAR)	HAJO1262
105	LOC=LOC+400	HAJO1263
		HAJO1264
	DO 108 I=1,II	HAJO1265
	LNTH=2*IIB(I)	HAJO1266
	BUFFER IN(3,1)(B(1),B(LNTH))	HAJO1267
106	IF(UNIT,3)106,107,107,107	HAJO1268
107	CALL ECWR(B,LOC,LNTH,IPAR)	HAJO1269
108	LOC=LOC+LNTH	HAJO1270
		HAJO1271
	REWIND 1	HAJO1272
109	BUFFER IN(3,1)(NMLS(1),NMLS(8))	HAJO1273
110	IF(UNIT,3)110,111,112,111	HAJO1274
111	WRITE(1,9)(NMLS(I),I=1,8)	HAJO1275
	GO TO 109	HAJO1276
		HAJO1277
112	END FILE 1	HAJO1278
	REWIND 1	HAJO1279
	CALL SECOND(TIME)	HAJO1280
	PRINT 113, NNNN,IT,IEND,TIME	HAJO1281
113	FORMAT(1H1,* PICKUP COMPLETED FROM TAPE 3, RUN*,I4,*, AFTER IT	HAJO1282
1	ERATION*,I5,*, IEND =*,I2,*,*,F10.1,* SECONDS*)	HAJO1283
	PICKUP=0.	HAJO1284
	RETURN	HAJO1285
		HAJO1286
	END	HAJO1287
	SUBROUTINE SIMPUN(XX,FX,NX,I,AX)	HAJO1288
C	QUADRATIC INTEGRATION OVER UNEVENLY SPACED POINTS	HAJO1289
C		HAJO1290
C	XX IS STRICTLY INCREASING SINGLY DIMENSIONED ARRAY OF ABSCISSAS	HAJO1291
C	AT WHICH THE INTEGRAND WAS EVALUATED	HAJO1292
C	FX ARRAY OF INTEGRAND VALUES WHICH WERE EVALUATED AT XX(I),	HAJO1293
C	I=1,2,...,NX	HAJO1294

C	NX NUMBER OF POINTS AT WHICH THE INTEGRAND WAS EVALUATED	HAJO1295
C	L INTEGER WHICH DETERMINES THE DIRECTION OF INTEGRATION	HAJO1296
C	IF L IS NON-NEGATIVE INTEGRATION IS FORWARD	HAJO1297
C	IF L IS NEGATIVE, INTEGRATION IS BACKWARDS	HAJO1298
C	THIS IS SOMETIMES USEFUL FOR FUNCTIONS WHICH ARE SMALL WITH	HAJO1299
C	RESPECT TO THE INTEGRAL ON THE LEFT PORTION OF THE INTERVAL	HAJO1300
C	AX ARRAY WHICH CONTAINS VALUES OF INTEGRAL ON SUBINTERVALS	HAJO1301
C	L .GE. 0 AX(I) CONTAINS APPROX TO INTEGRAL WITH LOWER	HAJO1302
C	LIMIT XX(I) AND UPPER LIMIT XX(I)	HAJO1303
C	L .LT. 0 AX(I) CONTAINS APPROX TO INTEGRAL WITH LOWER	HAJO1304
C	LIMIT XX(I) AND UPPER LIMIT XX(NX)	HAJO1305
C		HAJO1306
	DIMENSION XX(2),FX(2),AX(2)	HAJO1307
	IF (L.LT.0) GO TO 30	HAJO1308
	AX(1)=0.0	HAJO1309
	DO 10 IX=2,NX,2	HAJO1310
	IXM1=IX- 1	HAJO1311
	IXP1=IX+1	HAJO1312
	D1=XX(IX)- XX(IXM1)	HAJO1313
	AX(IX)=AX(IXM1)+D1/2.0*(FX(IX)+FX(IXM1))	HAJO1314
	IF (NX.EQ.IX) GO TO 20	HAJO1315
	D2=XX(IXP1)- XX(IXM1)	HAJO1316
	D3=D2/D1	HAJO1317
	A2=D3/6.0*D2**2/(XX(IXP1)- XX(IX))	HAJO1318
	A3=D2/2.0- A2/D3	HAJO1319
10	AX(IXP1)=AX(IXM1)+(D2- A2- A3)*FX(IXM1)+A2*FX(IX)+A3* FX(IXP1)	HAJO1320
20	RETURN	HAJO1321
30	AX(NX)=0.0	HAJO1322
	DO 40 IX=2,NX,2	HAJO1323
	IC=NX+1- IX	HAJO1324
	ICM1=IC- 1	HAJO1325
	ICP1=IC+1	HAJO1326
	D1=XX(ICP1)- XX(IC)	HAJO1327
	AX(IC)=AX(ICP1)+D1/2.0*(FX(ICP1)+FX(IC))	HAJO1328
	IF (NX.EQ.IX) GO TO 20	HAJO1329
	D2=XX(ICP1)- XX(ICM1)	HAJO1330
	D3=D2/(XX(IC)- XX(ICM1))	HAJO1331
	A2=D3/6.0*D2**2/D1	HAJO1332
	A3=D2/2.0- A2/D3	HAJO1333
40	AX(ICM1)=AX(ICP1)+(D2- A2- A3)*FX(ICM1)+A2*FX(IC)+ A3*FX(ICP1)	HAJO1334
	RETURN	HAJO1335
	END	HAJO1336
	IDENT FACTTD	HAJO1337
	ENTRY FACTTD	HAJO1338
	ENTRY SOLTD1	HAJO1339
	ENTRY SOLTDM	HAJO1340
	VFD 42/0HFACTTD,18/3	HAJO1341
FACTTD	DATA 0 (N,A,IA)	HAJO1342
	SA2 B3 IA	HAJO1343
	SA5 ONE	HAJO1344
	SA1 B2+X2 B(1)	HAJO1345
	FX6 X5/X1 1./U(1)	HAJO1346
	SA4 B2+1 A(2)	HAJO1347

	SB6	X2	IA	HAJO1348
	SA2	B1	N	HAJO1349
	FX7	X6*X4	L(1)	HAJO1350
	SB7	1		HAJO1351
	SA3	A1+B6	C(1)	HAJO1352
	SB5	X2	N	HAJO1353
	SA6	A1	1./U(1)	HAJO1354
FACT	SA1	A1+B7	B(I)	HAJO1355
	FX0	X7*X3	L(I)*C(I- 1)	HAJO1356
	SA4	A4+B7	A(I+1)	HAJO1357
	FX2	X1- X0	B(I)- L(I)*C(I- 1)	HAJO1358
	SA3	A3+B7	C(I)	HAJO1359
	NX1	X2		HAJO1360
	FX6	X5/X1	1./U(I)	HAJO1361
	SB5	B5- B7		HAJO1362
	SA7	A4- B7	L(I)	HAJO1363
	EQ	B5,B7,SKIP		HAJO1364
	FX7	X6*X4	L(I+1)	HAJO1365
SKIP	SA6	A6+B7	1./U(I)	HAJO1366
	GT	B5,B7,FACT		HAJO1367
	EQ	FACTTD		HAJO1368
ONE	DATA	1.		HAJO1369
	VFD	42/0HSOLTD1,18/5		HAJO1370
SOLTD1	DATA	0	(N,A,IA,Y,LY)	HAJO1371
	SA4	B4	Y(1)	HAJO1372
	SA5	B5		HAJO1373
	BX7	X4	Z(1)	HAJO1374
	SA1	B1		HAJO1375
	SB7	1		HAJO1376
	SA2	B2+B7	L(2)	HAJO1377
	SB5	X5	LY	HAJO1378
	SB6	X1	N	HAJO1379
	SA4	A4+B5	Y(2)	HAJO1380
	SB4	2		HAJO1381
FWD1	FX0	X7*X2	L(I)*Z(I- 1)	HAJO1382
	SA2	A2+B7	L(I+1)	HAJO1383
	FX5	X4- X0	Y(I)- L(I)* Z(I- 1)	HAJO1384
	SA4	A4+B5	Y(I+1)	HAJO1385
	NX6	X5	Z(I)	HAJO1386
	FX1	X6*X2	L(I+1)*Z(I)	HAJO1387
	SA2	A2+B7	L(I+2)	HAJO1388
	FX3	X4- X1	Y(I+1)- L(I+1)*Z(I)	HAJO1389
	SX0	A4- B5		HAJO1390
	SA4	A4+B5	Y(I+2)	HAJO1391
	NX7	X3	Z(I+1)	HAJO1392
	SA6	X0	Z(I)	HAJO1393
	SB6	B6- B4		HAJO1394
	SA7	A4- B5	Z(I+1)	HAJO1395
	GT	B6,B4,FWD1		HAJO1396
	EQ	B6,B7,ODD		HAJO1397
	FX0	X7*X2		HAJO1398
	SA2	A2+B7	SET A2 TO L(N+1)	HAJO1399

	FX5	X4 X0		HAJO1400
	BX6	X7	Z(N- 1)	HAJO1401
	NX7	X5	Z(N)	HAJO1402
	SA7	A4	SET A7 TO ADDR(Y(N))	HAJO1403
ODD	SA3	B3	IA	HAJO1404
	SA1	B1	N	HAJO1405
	SB2	A2- B7	ADDR(L(N))	HAJO1406
	SA2	B2+X3	1./U(N)	HAJO1407
	FX7	X7*X2	X(N)	HAJO1408
	SB3	X3		HAJO1409
	SB6	X1		HAJO1410
	SA2	A2- B7	1./U(N- 1)	HAJO1411
	SA3	B3+A2	C(N- 1)	HAJO1412
	SA4	A7- B5	Z(N- 1)	HAJO1413
	SA7	A7		HAJO1414
BACK1	FX0	X3*X7	C(I)*X(I+1)	HAJO1415
	SA3	A3- B7	C(I- 1)	HAJO1416
	FX5	X4 X0	Z(I)- C(I)*X(I+1)	HAJO1417
	SA4	A4- B7	Z(I- 1)	HAJO1418
	NX1	X5		HAJO1419
	FX6	X1*X2	X(I)	HAJO1420
	SA2	A2- B7	U(I- 1)	HAJO1421
	FX0	X3*X6	C(I- 1)* X(I)	HAJO1422
	SA3	A3- B7	C(I- 2)	HAJO1423
	FX5	X4 X0		HAJO1424
	SA4	A4- B7		HAJO1425
	NX1	X5		HAJO1426
	FX7	X1*X2		HAJO1427
	SA2	A2- B7		HAJO1428
	SB6	B6- B4		HAJO1429
	SA6	A7- B5		HAJO1430
	SA7	A6- B5		HAJO1431
	GT	B6,B4,BACK1		HAJO1432
	EQ	B6,B7,SOLTD1		HAJO1433
	FX0	X3*X7		HAJO1434
	FX5	X4 X0		HAJO1435
	NX1	X5		HAJO1436
	FX6	X1*X2		HAJO1437
	SA6	A7- B5		HAJO1438
	EQ	SOLTD1		HAJO1439
N	DATA	0		HAJO1440
IA	DATA	0		HAJO1441
LY	DATA	0		HAJO1442
KY	DATA	0		HAJO1443
A	DATA	0		HAJO1444
Y	DATA	0		HAJO1445
LM	DATA	0		HAJO1446
M	DATA	0		HAJO1447
	VFD	42/0HSOLTD1,18/7		HAJO1448
SOLTD1	DATA	0	(N,A,IA,Y,LY,KY,M)	HAJO1449
	SA1	B1		HAJO1450
	SA2	B3		HAJO1451

	BX6	X1		HAJO1452
	SX7	X2		HAJO1453
	SA6	N		HAJO1454
	SB7	1		HAJO1455
	SA7	A6+B7		HAJO1456
	SX6	B2		HAJO1457
	SX7	B4		HAJO1458
	SA6	A		HAJO1459
	SA7	A6+B7	Y	HAJO1460
	SA1	B5		HAJO1461
	SA2	B6		HAJO1462
	BX6	X1		HAJO1463
	SX7	X2		HAJO1464
	SA6	LY		HAJO1465
	SA7	A6+B7	KY	HAJO1466
	SA1	M		HAJO1467
	SA2	X1		HAJO1468
	BX6	X2		HAJO1469
	SA6	A1-B7	M	HAJO1470
LOOP	RJ	SOLTDI		HAJO1471
	SA1	LM		HAJO1472
	SB7	-1		HAJO1473
	SA2	Y		HAJO1474
	SX6	X1+B7		HAJO1475
	SA3	KY		HAJO1476
	ZR	X6,SOLTDM		HAJO1477
	IX7	X3+X2		HAJO1478
	SA6	A1	M=M-1	HAJO1479
	SA7	A2	Y=Y+KY	HAJO1480
	SB4	A2		HAJO1481
	SB1	N		HAJO1482
	SB3	B1+B7		HAJO1483
	SB5	B3+B7		HAJO1484
	SA1	A		HAJO1485
	SA2	Y		HAJO1486
	SB2	X1		HAJO1487
	SB4	X2		HAJO1488
	EQ	LOOP		HAJO1489
	END			HAJO1490
	FUNCTION	AKNINT(XBAR,N,IM,X,Y,T)		HAJO1491
	DIMENSION	T(80),X(9),Y(9),MES1(6),MES3(6),MES4(6)		HAJO1492
	DATA	(MES1(I),I=1,6)/48HAKNINT WARNING ORDER OF INTERPOLATION TOO		HAJO1493
1	LARGE	/,(MES3(I),I=1,6)/48HAKNINT N LESS THAN 2, YBAR RETURNED AS		HAJO1494
2	Y(1)	/,(MES4(I),I=1,6)/48HAKNINT X(I) NOT SEQUENCED PROPERLY		HAJO1495
3	/			HAJO1496
	DOUBLE	PRECISION T		HAJO1497
	M =	IM		HAJO1498
	IF(M.GE.N)	GO TO 100		HAJO1499
9	K=N-1			HAJO1500
	IF(N.LT.2)	GO TO 300		HAJO1501
	DO 10	I=1,K		HAJO1502
10	IF(X(I).GE.X(I+1))	GO TO 200		HAJO1503
	DO 20	I=1,N		HAJO1504

	J=1	HAJO1505
20	IF(XBAR.LE.X(I)) GO TO 11	HAJO1506
11	K = M	HAJO1507
	M = M + 1	HAJO1508
	J = J - M/2	HAJO1509
	J=MAX0 (J,1)	HAJO1510
	J=MIN0 (J,N-K)	HAJO1511
	MEND=J+K	HAJO1512
	DO 12 I=J,MEND	HAJO1513
	KK=I-J+1	HAJO1514
	T(KK) = Y(I)	HAJO1515
12	T(KK+M)=DBLE(X(I)) - DBLE(XBAR)	HAJO1516
	DO 13 I=1,K	HAJO1517
	KK=I+1	HAJO1518
	DO 13 JJ=KK,M	HAJO1519
13	T(JJ)=(T(I)*T(JJ+M) - T(JJ)*T(I+M))/(DBLE(X(JJ+J-1))-DBLE(X(I+J-1)))	HAJO1520
	1)	HAJO1521
	AKNINT=T(M)	HAJO1522
	RETURN	HAJO1523
200	DO 210 I=1,K	HAJO1524
210	IF(X(I).LE.X(I+1)) GO TO 420	HAJO1525
	DO 120 I=1,N	HAJO1526
	J=I	HAJO1527
120	IF(XBAR.GE.X(I)) GO TO 11	HAJO1528
	GO TO 11	HAJO1529
420	CALL LABRT(4,MES4,4)	HAJO1530
	CALL LABRT(1,MES4,4)	HAJO1531
300	CALL LABRT(1,MES3,3)	HAJO1532
	AKNINT=Y(1)	HAJO1533
	RETURN	HAJO1534
100	CALL LABRT(1,MES1,1)	HAJO1535
	M=N-1	HAJO1536
	GO TO 9	HAJO1537
	END	HAJO1538

APPENDIX B
SAMPLE CALCULATIONS

The application of electron energy distribution functions to molecular excitation rate integrals is illustrated in this Appendix. The function $f(u)$ is normalized to

$$\int u^{\frac{1}{2}} f(u) du = 1 \quad ,$$

and this $f(u)$ is folded into excitation cross sections developed by Frost and Phelps.¹ The number of molecular excitations per electron per molecule per sec from level i to j is

$$v_{ij}/N = \sqrt{\frac{2e}{m}} \int Q_{ij} uf(u) du \quad ,$$

where terms were defined above. $Q_{ij}(u)$ values are tabulated below in Table B-I for $i = 0$ (ground state molecule) to the excited level j with electron energy loss and reaction threshold as shown. The energy balance equation² is

$$eEw = (2/m)^{\frac{1}{2}} 2m/M \int \epsilon^2 NQ_m(\epsilon) \left[f(\epsilon) + kT \frac{df(\epsilon)}{d\epsilon} \right] \\ + (2/m)^{\frac{1}{2}} \sum_j \epsilon_j \int \epsilon f(\epsilon) \left[NQ_j(\epsilon) - NQ_{-j}(\epsilon) \right] d\epsilon$$

where ϵ is electron energy.

Values for electron velocity w , characteristic energy D/μ , etc., and excitation rates for each of a number of excited levels are tabulated below in Table B-II as a function of E/N ($V\text{-cm}^2 \times 10^{-17}$) for several gas mixtures of He, N_2 , and CO_2 . Here the mole fractions of the component gases sum to unity ($N = 1$).

TABLE B-I

ELASTIC AND INELASTIC SCATTERING CROSS SECTIONS

QJ(1), 43 2 LEVEL 1, ENERGY LOSS = .04300
 9, THRESHOLD = 0.044, MW = H2 0-2

4.3000E-02	0.
4.7000E-02	1.8500E-20
5.0000E-02	2.7000E-20
5.5000E-02	3.5000E-20
6.0000E-02	4.2000E-20
6.5000E-02	4.8000E-20
7.0000E-02	5.3000E-20
8.0000E-02	6.0000E-20
9.0000E-02	6.8000E-20
1.0000E-01	7.4000E-20
1.1000E-01	7.9000E-20
1.3000E-01	8.9000E-20
1.5000E-01	9.9000E-20
2.0000E-01	1.2000E-19
2.5000E-01	1.3700E-19
3.0000E-01	1.6000E-19
3.5000E-01	1.8500E-19
4.0000E-01	2.1000E-19
4.5000E-01	2.3600E-19
5.0000E-01	2.6300E-19
6.0000E-01	3.2100E-19
7.0000E-01	3.8500E-19
8.0000E-01	4.5200E-19
9.0000E-01	5.2000E-19
1.0000E+00	5.9200E-19
1.2500E+00	7.8100E-19
1.5000E+00	9.6500E-19
2.0000E+00	1.3020E-18
2.4500E+00	1.5660E-18
2.7500E+00	1.6980E-18
3.0000E+00	1.7800E-18
3.2500E+00	1.8140E-18
3.5000E+00	1.8190E-18
3.7500E+00	1.7990E-18
4.0000E+00	1.7700E-18
4.4200E+00	1.6880E-18
5.0000E+00	1.5470E-18
5.5000E+00	1.4550E-18
6.0000E+00	1.3700E-18
6.5000E+00	1.2960E-18
7.0000E+00	1.2370E-18
8.0000E+00	1.1180E-18
1.0000E+01	9.0200E-19

6.0000E-01	1.8100E-19
6.5000E-01	2.0000E-19
7.0000E-01	2.2000E-19
8.0000E-01	2.7000E-19
9.0000E-01	3.1600E-19
1.0000E+00	3.6400E-19
1.5000E+00	5.9000E-19
2.0000E+00	8.1000E-19
2.2500E+00	9.0400E-19
2.4500E+00	9.6600E-19
2.7000E+00	1.0240E-18
2.9000E+00	1.0560E-18
3.1000E+00	1.0760E-18
3.3000E+00	1.0880E-18
3.4500E+00	1.0920E-18
3.7500E+00	1.0920E-18
4.0000E+00	1.0780E-18
4.4200E+00	1.0480E-18
5.0000E+00	9.9200E-19
5.5000E+00	9.3500E-19
6.0000E+00	8.8300E-20
7.0000E+00	7.7900E-20
8.0000E+00	6.9300E-20
9.0000E+00	6.2100E-20
1.0000E+01	5.5800E-20

QJ(3), 3544 LEVEL 1, ENERGY LOSS = .08300
 , THRESHOLD = 0.084, MW = 44 010

8.2700E-02	0.
8.4400E-02	8.5000E-01
8.6200E-02	1.1600E+00
9.3200E-02	1.8500E+00
1.0350E-01	2.3000E+00
1.2080E-01	2.6000E+00
1.3820E-01	2.6800E+00
1.7260E-01	2.6200E+00
2.0700E-01	2.4800E+00
2.7500E-01	2.1800E+00
3.4500E-01	1.9300E+00
5.0000E-01	1.4500E+00
7.0000E-01	1.1000E+00
9.0000E-01	8.0000E-01
1.1000E+00	6.2000E-01
1.4000E+00	4.6000E-01
1.6000E+00	4.2000E-01
1.8000E+00	4.4000E-01
2.3000E+00	7.0000E-01
2.6000E+00	9.3000E-01
3.0000E+00	1.3400E+00
3.2000E+00	1.5800E+00
3.4000E+00	1.7500E+00
3.6000E+00	1.8000E+00
3.8000E+00	1.7900E+00
4.0000E+00	1.7000E+00
4.2000E+00	1.5200E+00
4.6000E+00	1.0500E+00
5.1000E+00	5.7000E-01
5.5000E+00	5.1000E-01
6.0000E+00	5.0000E-01
7.0000E+00	4.8000E-01
8.0000E+00	4.5000E-01
1.0000E+01	2.0000E-01
2.0000E+01	0.

QJ(2), 44 2 LEVEL 2, ENERGY LOSS = .07200
 7, THRESHOLD = 0.073, MW = H2 1-3

7.2700E-02	0.
7.5000E-02	1.0000E-20
8.0000E-02	1.7000E-20
8.5000E-02	2.1500E-20
9.0000E-02	2.5000E-20
9.5000E-02	2.7500E-20
1.0000E-01	2.9500E-20
1.1000E-01	3.3500E-20
1.2000E-01	3.8000E-20
1.3000E-01	4.1000E-20
1.5000E-01	4.7000E-20
2.0000E-01	6.0000E-20
2.5000E-01	7.4000E-20
3.0000E-01	8.8000E-20
3.5000E-01	1.0250E-19
4.0000E-01	1.1750E-19
4.5000E-01	1.3300E-19
5.0000E-01	1.4900E-19
5.5000E-01	1.6500E-19

QJ(4), 2644 LEVEL 2 , ENERGY LOSS = .16700
 , THRESHHOLD = 0.168 , MW = 44 020+100

1.6700E-01	0.
2.0000E-01	6.0000E-01
2.2000E-01	7.6000E-01
2.5000E-01	8.0000E-01
3.0000E-01	7.8000E-01
5.0000E-01	6.4000E-01
7.0000E-01	5.3000E-01
1.0000E+00	4.4000E-01
1.2500E+00	4.4000E-01
1.5000E+00	4.4000E-01
2.0000E+00	5.3000E-01
2.5000E+00	8.4000E-01
3.0000E+00	1.2800E+00
3.2000E+00	1.5700E+00
3.4000E+00	1.7700E+00
3.5500E+00	1.7800E+00
3.7000E+00	1.7500E+00
3.9000E+00	1.6000E+00
4.1000E+00	1.2800E+00
4.5000E+00	8.8000E-01
4.9000E+00	3.9000E-01
5.2000E+00	3.3000E-01
6.0000E+00	2.7000E-01
8.0000E+00	2.5000E-01
1.0000E+01	2.1000E-01
2.0000E+01	0.

QJ(7), 1844 LEVEL 3 , ENERGY LOSS = .29100
 , THRESHHOLD = 0.286 , MW = 44 001

2.9100E-01	0.
2.9700E-01	4.0000E-01
3.0300E-01	5.0000E-01
3.2700E-01	6.2000E-01
3.6400E-01	7.1000E-01
4.2500E-01	7.7000E-01
4.8500E-01	8.4000E-01
6.0700E-01	9.2000E-01
7.2800E-01	9.7000E-01
9.6900E-01	9.9000E-01
1.2100E+00	9.5000E-01
2.4300E+00	6.6000E-01
4.8500E+00	4.4000E-01
9.6800E+00	2.6000E-01
1.8200E+01	1.5000E-01
3.6400E+01	9.2000E-02
5.8200E+01	5.8000E-02
1.0000E+02	0.

QJ(5), 744 LEVEL 4 , ENERGY LOSS = .25200
 , THRESHHOLD = 2.503 , MW = 44 0N0+N00

2.5000E+00	0.
3.0000E+00	9.2000E-01
3.5600E+00	5.4000E-01
4.1000E+00	3.4000E-01
4.5000E+00	1.6000E-01
5.0600E+00	4.4000E-02
6.0000E+00	0.

QJ(8), 844 LEVEL 5 , ENERGY LOSS = .33900
 , THRESHHOLD = 1.495 , MW = 44 0N0+N00

1.5000E+00	0.
1.9500E+00	7.0000E-02
2.5000E+00	2.0000E-01
3.0000E+00	4.1000E-01
3.5600E+00	6.6000E-01
4.1000E+00	3.4000E-01
4.5000E+00	1.5500E-01
5.0600E+00	0.

QJ(6), 332P LEVEL 1 , ENERGY LOSS = .29000
 , THRESHHOLD = 0.284 , MW = 28 01

3.0000E-01	0.
3.3000E-01	2.0000E-21
4.0000E-01	3.0000E-21
7.5000E-01	5.0000E-21
9.0000E-01	6.5000E-21
1.0000E+00	8.0000E-21
1.1000E+00	0.
1.1650E+00	1.2000E-20
1.2000E+00	1.3700E-20
1.2180E+00	1.5000E-20
1.4000E+00	6.7500E-20
1.5000E+00	9.5000E-20
1.6000E+00	1.2200E-19
1.6500E+00	1.3000E-19
1.7000E+00	1.6000E-19
1.8000E+00	3.3000E-19
1.9000E+00	1.5200E-18
2.0000E+00	1.3200E-18
2.1000E+00	4.6000E-19
2.2000E+00	1.6300E-18
2.3000E+00	1.2300E-18
2.4000E+00	4.6000E-19
2.5000E+00	8.6000E-19
2.6000E+00	1.0400E-18
2.7000E+00	2.7000E-19
2.8000E+00	4.2000E-19
2.9000E+00	4.2700E-19
3.0000E+00	4.3000E-19
3.1000E+00	5.8000E-19
3.2000E+00	3.8000E-19
3.3000E+00	2.9000E-19
3.6000E+00	2.9000E-19
5.0000E+00	0.

QJ(9), 544 LEVEL 6 , ENERGY LOSS = .42200
 , THRESHHOLD = 2.503 , MW = 44 0N0+N00

2.5000E+00	0.
3.0000E+00	1.0500E-01
3.5600E+00	2.2500E-01
4.1000E+00	1.0000E-01
4.5000E+00	0.

QJ(10), 544 LEVEL 7 , ENERGY LOSS = .50500
 , THRESHHOLD = 2.503 , MW = 44 0N0+N00

2.5000E+00	0.
3.0000E+00	1.5600E-01
3.5600E+00	3.3000E-01
4.1000E+00	1.5600E-01
4.5000E+00	0.

QJ(11), 27 2 LEVEL 3 , ENERGY LOSS = .51600
 , THRESHHOLD = 0.516 , MW = H2 01

5.1600E-01	0.
5.6000E-01	4.5000E-21
6.0000E-01	9.0000E-21
6.5000E-01	1.4500E-20
7.5000E-01	2.7000E-20
8.5000E-01	4.0000E-20
9.5000E-01	5.5000E-20
1.0000E+00	6.3500E-20
1.0500E+00	7.0500E-20
1.1000E+00	7.6000E-20
1.1500E+00	8.2000E-20
1.2000E+00	9.1000E-20
1.3000E+00	1.1200E-19
1.4000E+00	1.4000E-19
1.6000E+00	2.0300E-19
1.8000E+00	2.5800E-19
2.2000E+00	3.4300E-19
2.4000E+00	4.0000E-19
2.6000E+00	4.4000E-19
3.0000E+00	5.4000E-19
3.5000E+00	6.3000E-19
4.0000E+00	6.8000E-19
5.0000E+00	6.8000E-19
6.0000E+00	6.0000E-19
7.0000E+00	3.0000E-19
8.0000E+00	1.0000E-19
1.0000E+01	0.

QJ(12), 1828 LEVEL 2 , ENERGY LOSS = .59000
 , THRESHHOLD = 1.700 , MW = 28 02

1.7000E+00	0.
1.8000E+00	9.0000E-20
1.9000E+00	4.0000E-19
2.0000E+00	1.5200E-18
2.1000E+00	1.4800E-18
2.2000E+00	6.2000E-19
2.3000E+00	6.0000E-19
2.4000E+00	1.3900E-18
2.5000E+00	1.1400E-18
2.6000E+00	3.1000E-19
2.7000E+00	4.9000E-19
2.8000E+00	5.1000E-19
2.9000E+00	1.8000E-19
3.0000E+00	2.4000E-19
3.1000E+00	1.5000E-19
3.2000E+00	1.1000E-19
3.3000E+00	7.0000E-20
3.4000E+00	0.

QJ(13), 1728 LEVEL 3 , ENERGY LOSS = .88000
 , THRESHHOLD = 1.700 , MW = 28 03

1.8000E+00	0.
1.9000E+00	1.8000E-19
2.0000E+00	7.5000E-19
2.1000E+00	1.4100E-18
2.2000E+00	1.6900E-18
2.3000E+00	9.5000E-19
2.4000E+00	2.9000E-19
2.5000E+00	7.7000E-19
2.6000E+00	1.1700E-18
2.7000E+00	6.4000E-19
2.8000E+00	2.6000E-19
2.9000E+00	4.0000E-19
3.0000E+00	4.0000E-19
3.1000E+00	1.6000E-19
3.2000E+00	1.6000E-19
3.3000E+00	1.6000E-19
3.4000E+00	0.

QJ(14), 1628 LEVEL 4 , ENERGY LOSS = 1.17000
 , THRESHHOLD = 1.700 , MW = 28 04

1.9000E+00	0.
2.0000E+00	1.6000E-19
2.1000E+00	4.6000E-19
2.2000E+00	1.1000E-18
2.3000E+00	1.3000E-18
2.4000E+00	7.1000E-19
2.5000E+00	2.0000E-19
2.6000E+00	3.1000E-19
2.7000E+00	6.0000E-19
2.8000E+00	4.9000E-19
2.9000E+00	1.8000E-19
3.0000E+00	1.6000E-19
3.1000E+00	1.6000E-19
3.2000E+00	1.1000E-19
3.3000E+00	7.0000E-20
3.4000E+00	0.

QJ(15), 1528 LEVEL 5 , ENERGY LOSS = 1.47000
 , THRESHHOLD = 1.700 , MW = 28 05

2.0000E+00	0.
2.1000E+00	2.0000E-19
2.2000E+00	4.6000E-19
2.3000E+00	7.7000E-19
2.4000E+00	1.0400E-18
2.5000E+00	1.0100E-18
2.6000E+00	5.1000E-19
2.7000E+00	2.7000E-19
2.8000E+00	3.7000E-19
2.9000E+00	6.2000E-19
3.0000E+00	4.2000E-19
3.1000E+00	2.7000E-19
3.2000E+00	3.5000E-19
3.3000E+00	3.1000E-19
3.4000E+00	0.

QJ(16), 1328 LEVEL 6 , ENERGY LOSS = 1.76000
 , THRESHHOLD = 2.197 , MW = 28 06

2.2000E+00	0.
2.3000E+00	1.1000E-19
2.4000E+00	3.7000E-19
2.5000E+00	6.0000E-19
2.6000E+00	6.0000E-19
2.7000E+00	3.7000E-19
2.8000E+00	1.5000E-19
2.9000E+00	9.0000E-20
3.0000E+00	1.6000E-19
3.1000E+00	1.8000E-19
3.2000E+00	7.0000E-20
3.3000E+00	5.0000E-20
3.4000E+00	0.

QJ(17), 1228 LEVEL 7 , ENERGY LOSS = 2.06000
 , THRESHHOLD = 2.301 , MW = 28 07

2.3000E+00	0.
2.4000E+00	7.0000E-20
2.5000E+00	1.8000E-19
2.6000E+00	2.9000E-19
2.7000E+00	4.4000E-19
2.8000E+00	3.3000E-19
2.9000E+00	1.8000E-19
3.0000E+00	5.0000E-20
3.1000E+00	7.0000E-20
3.2000E+00	1.6000E-19
3.3000E+00	7.0000E-20
3.4000E+00	0.

QJ(18), 544 LEVEL 8 , ENERGY LOSS = 2.50000
 , THRESHHOLD = 2.503 , MW = 44 0N0+N00

2.5000E+00	0.
3.0000E+00	1.8000E-01
3.6000E+00	2.5000E-01
4.1000E+00	1.8000E-01
4.5000E+00	0.

QJ(19), 828 LEVEL 8 , ENERGY LOSS = 2.35000
 , THRESHHOLD = 2.507 , MW = 28 08

2.5000E+00	0.
2.6000E+00	7.0000E-20
2.7000E+00	1.1000E-19
2.8000E+00	1.8000E-19
2.9000E+00	2.4000E-19
3.0000E+00	1.5000E-19
3.1000E+00	7.0000E-20
3.2000E+00	0.

QJ(20), 944 LEVEL 9 , ENERGY LOSS = 3.85000
 , THRESHHOLD = 3.847 , MW = 44 C0+0-

3.8500E+00	0.
4.3000E+00	1.4000E-03
4.5000E+00	1.4000E-03
5.1000E+00	0.
6.6000E+00	0.
7.2000E+00	7.0000E-04
8.2000E+00	4.5000E-03
8.4000E+00	4.2000E-03
8.9000E+00	1.0000E-03

QJ(21), 728 LEVEL 9 , ENERGY LOSS = 5.00000
 , THRESHHOLD = 4.989 , MW = 28 09

5.0000E+00	0.
5.7000E+00	4.0000E-19
5.8000E+00	4.2000E-19
6.1000E+00	4.2000E-19
6.2000E+00	4.0000E-19
7.0000E+00	6.0000E-20
9.0000E+00	0.

QJ(22), 828 LEVEL 10 , ENERGY LOSS = 6.70000
 , THRESHHOLD = 6.695 , MW = 28 A3SUP
 6.7000E+00 0.
 7.1000E+00 5.0000E-19
 7.3000E+00 5.6000E-19
 8.0000E+00 5.6000E-19
 8.3000E+00 5.0000E-19
 8.7000E+00 2.4000E-19
 9.5000E+00 1.0000E-19
 2.0000E+01 0.

QJ(23), 444 LEVEL 10 , ENERGY LOSS = 7.00000
 , THRESHHOLD = 7.006 , MW = 44 E-EP
 7.0000E+00 0.
 8.0000E+00 6.0000E-01
 8.5000E+00 6.0000E-01
 1.1000E+01 0.

QJ(24), 528 LEVEL 11 , ENERGY LOSS = 8.40000
 , THRESHHOLD = 8.401 , MW = 28 A1pG
 8.4000E+00 0.
 8.7000E+00 4.2000E-19
 9.0000E+00 4.2000E-19
 1.0000E+01 3.0000E-19
 2.0000E+01 0.

QJ(25), 944 LEVEL 11 , ENERGY LOSS = 10.50000
 , THRESHHOLD = 10.500 , MW = 44 E-EP
 1.0500E+01 0.
 1.2000E+01 6.9000E-01
 1.2700E+01 7.3000E-01
 1.3500E+01 7.8000E-01
 1.5000E+01 8.8000E-01
 1.7000E+01 1.0400E+00
 2.0000E+01 1.2400E+00
 4.0000E+01 3.6000E+00
 1.0000E+02 6.3000E+00

QJ(26), 728 LEVEL 12 , ENERGY LOSS = 11.20000
 , THRESHHOLD = 11.193 , MW = 28 C3PU
 1.1200E+01 0.
 1.3500E+01 4.4000E-19
 1.4000E+01 1.0000E-18
 1.4500E+01 1.0000E-18
 1.5100E+01 2.4000E-19
 2.0500E+01 2.2000E-19
 1.0000E+02 5.0000E-20

QJ(27), 528 LEVEL 13 , ENERGY LOSS = 12.50000
 , THRESHHOLD = 12.511 , MW = 28 EXC.
 1.2500E+01 0.
 1.3000E+01 4.0000E-19
 1.3500E+01 4.0000E-19
 1.4000E+01 1.6000E-19
 2.0000E+01 0.

QJ(28), 1144 LEVEL 12 , ENERGY LOSS = 13.30000
 , THRESHHOLD = 13.306 , MW = 44 C02+
 1.3300E+01 0.
 1.4500E+01 6.0000E-02
 1.5000E+01 1.0400E-01
 1.6000E+01 1.8800E-01
 1.8000E+01 3.5900E-01
 2.0000E+01 5.3200E-01
 3.0000E+01 1.6300E+00
 4.0000E+01 2.2800E+00
 5.0000E+01 2.7900E+00
 7.0000E+01 3.4300E+00
 1.0000E+02 3.7900E+00

QJ(29), 828 LEVEL 14 , ENERGY LOSS = 14.00000
 , THRESHHOLD = 14.011 , MW = 28 EXC.
 1.4000E+01 0.
 1.4200E+01 1.3000E-18
 1.4400E+01 1.7000E-18
 1.4700E+01 1.7000E-18
 1.5600E+01 2.0000E-19
 2.0500E+01 2.0000E-19
 2.5500E+01 2.8000E-18
 1.5000E+02 2.8000E-18

QJ(30), 2728 LEVEL 15 , ENERGY LOSS = 15.50000
 , THRESHHOLD = 15.511 , MW = 28 ION
 1.5550E+01 0.
 1.6590E+01 3.4600E-20
 1.6760E+01 4.0800E-20
 1.7110E+01 5.1300E-20
 1.8680E+01 1.1610E-19
 2.0000E+01 2.0100E-19
 2.3000E+01 4.4000E-19
 2.5000E+01 6.1600E-19
 2.8000E+01 8.8000E-19
 3.0000E+01 1.0490E-18
 3.4000E+01 1.3600E-18
 3.7000E+01 1.5730E-18
 4.0000E+01 1.7720E-18
 4.3000E+01 1.9440E-18
 4.6000E+01 2.0880E-18
 4.8000E+01 2.1660E-18
 5.0000E+01 2.2270E-18
 5.4000E+01 2.3700E-18
 6.0000E+01 2.5300E-18
 6.5000E+01 2.6200E-18
 7.0000E+01 2.7000E-18
 7.5000E+01 2.7600E-18
 8.0000E+01 2.8100E-18
 8.5000E+01 2.8500E-18
 9.0000E+01 2.8700E-18
 9.5000E+01 2.8900E-18
 1.0000E+02 2.9000E-18

QJ(31), 7 2 LEVEL 4 , ENERGY LOSS = 13.60000
 , THRESHHOLD = 13.6 , MW = 2 H2+
 1.3600E+01 0.
 2.5000E+01 6.5000E-19
 3.0000E+01 8.0000E-19
 4.0000E+01 9.1000E-19
 5.0000E+01 9.7000E-19
 7.0000E+01 1.0300E-18
 1.0000E+02 9.7000E-19

QJ(32), 14 4 LEVEL 25 , ENERGY LOSS = 19.80000
 , THRESHHOLD = 19.801 , MW = 4 EEP
 1.9800E+01 0.
 2.0020E+01 4.1000E-20
 2.0240E+01 4.6000E-20
 2.1450E+01 4.2000E-20
 2.1800E+01 5.5000E-20
 2.2450E+01 5.5000E-20
 2.4220E+01 7.3000E-20
 2.5320E+01 9.2000E-20
 2.7530E+01 1.0800E-19
 2.9750E+01 1.1600E-19
 3.4180E+01 1.2100E-19
 4.6300E+01 1.2100E-19
 1.0000E+02 1.1500E-19
 2.0000E+02 1.0000E-19

QJ(33), 13 4 LEVEL 26 , ENERGY LOSS = 24.60000
 , THRESHHOLD = 24.609 , MW = 4 HE+
 2.4600E+01 0.
 3.0000E+01 7.1000E-20
 3.4000E+01 1.2100E-19
 4.0000E+01 1.7800E-19
 4.5000E+01 2.1200E-19
 5.0000E+01 2.4200E-19
 6.0000E+01 2.8900E-19
 7.0000E+01 3.1300E-19
 8.0000E+01 3.3200E-19
 9.0000E+01 3.4400E-19
 1.0000E+02 3.5100E-19
 1.5000E+02 3.4600E-19
 2.0000E+02 3.2400E-19

MOMENTUM TRANSFER CROSS SECTIONS FOR H2, HE, N2, AND CO2

52 2 H2 GIBSON (UNIV. AUSTR.) ROT AND VIB

0.0000	.0010	.0020	.0030	.0050	.0070	.0085	.0100	.0150	.0200
.0300	.0400	.0500	.0700	.1000	.1500	.2000	.2500	.3000	.3500
.4000	.5000	.7000	1.0000	1.2000	1.3000	1.5000	1.7000	1.9000	2.1000
2.2000	2.5000	2.8000	3.0000	3.3000	3.6000	4.0000	4.5000	5.0000	6.0000
7.0000	8.0000	10.0000	12.0000	15.0000	17.0000	20.0000	25.0000	30.0000	50.0000
75.0000	200.0000								
6.4	6.5	6.6	6.8	6.8	7.0	7.1	7.3	7.65	8.0
8.5	8.96	9.28	9.85	10.5	11.35	12.0	12.5	15.6	13.45
13.9	14.7	16.3	17.38	17.8	18.0	18.25	18.25	18.1	17.9
17.8	17.45	17.1	16.7	16.0	15.3	14.5	13.6	12.8	12.0
11.4	10.7	9.1	8.3	7.6	6.8	6.0	5.	4.	3.
2.	1.1								

52 4 HE PHELPS (NAT. BUR. STD.) VIB EXCIT. AND IONIZATION

0.0000	.0010	.0020	.0030	.0050	.0070	.0085	.0100	.0150	.0200
.0300	.0400	.0500	.0700	.1000	.1500	.2000	.2500	.3000	.3500
.4000	.5000	.7000	1.0000	1.2000	1.3000	1.5000	1.7000	1.9000	2.1000
2.2000	2.5000	2.8000	3.0000	3.3000	3.6000	4.0000	4.5000	5.0000	6.0000
7.0000	8.0000	10.0000	12.0000	15.0000	17.0000	20.0000	25.0000	30.0000	50.0000
75.0000	200.0000								
4.9600	4.9800	5.0200	5.0700	5.1200	5.1500	5.1800	5.2100	5.2800	5.3500
5.4600	5.5400	5.6200	5.7400	5.8600	6.0400	6.1600	6.2700	6.3500	6.4200
6.4900	6.5900	6.7300	6.8500	6.9100	6.9200	6.9600	6.9700	6.9800	6.9800
6.9800	6.9600	6.9200	6.8900	6.8200	6.7300	6.6000	6.4900	6.2600	6.0100
5.5300	5.2400	4.4500	4.0200	3.5800	3.3500	3.0500	2.7100	2.4500	2.8600
1.4000	1.1500								

5228 CO2 PHELPS (NAT. BUR. STD.) VIB EXCIT. AND IONIZATION

0.0000	.0010	.0020	.0030	.0050	.0070	.0085	.0100	.0150	.0200
.0300	.0400	.0500	.0700	.1000	.1500	.2000	.2500	.3000	.3500
.4000	.5000	.7000	1.0000	1.2000	1.3000	1.5000	1.7000	1.9000	2.1000
2.2000	2.5000	2.8000	3.0000	3.3000	3.6000	4.0000	4.5000	5.0000	6.0000
7.0000	8.0000	10.0000	12.0000	15.0000	17.0000	20.0000	25.0000	30.0000	50.0000
75.0000	200.0000								
1.0000	1.3400	1.4900	1.6200	1.8100	2.0000	2.1000	2.1900	2.5500	2.8500
3.4000	3.8600	4.3300	5.1300	6.0000	7.1200	7.4500	8.5000	8.8000	9.4400
9-7/0/	9-940/	9-970/	8-970/	00-500/	01-070/	01-950/	03-420/	09-820/	16-370/
28.7600	29.6000	28.0100	21.6300	17.1900	14.6600	12.6200	11.5200	11.1000	10.3000
10.2000	9.9000	9.5100	10.1400	11.1000	11.3000	12.0000	11.7000	11.1000	9.3000
7.7000	6.6000								

5244 CO2 PHELPS (NAT. BUR. STD.) VIB EXCIT. AND IONIZATION

0.0000	.0010	.0020	.0030	.0050	.0070	.0085	.0100	.0150	.0200
.0300	.0400	.0500	.0700	.1000	.1500	.2000	.2500	.3000	.3500
.4000	.5000	.7000	1.0000	1.2000	1.3000	1.5000	1.7000	1.9000	2.1000
2.2000	2.5000	2.8000	3.0000	3.3000	3.6000	4.0000	4.5000	5.0000	6.0000
7.0000	8.0000	10.0000	12.0000	15.0000	17.0000	20.0000	25.0000	30.0000	50.0000
75.0000	200.0000								
600.	540.	380.	325.	247.	200.	185.	170.	145.	120.
102.5	85.	79.	64.	52.	40.	31.5	25.	20.	16.5
13.	7.7	6.3	5.6	5.2	5.1	5.0	5.0	5.1	5.3
5.4	6.5	7.6	9.0	11.3	14.2	15.2	14.8	13.2	10.3
10.2	10.8	12.1	13.1	14.5	15.2	15.7	16.0	16.0	13.0
9.6	8.0								

TABLE B-II

EXCITATION RATES, ELECTRON DRIFT VELOCITIES,
AND CHARACTERISTIC ENERGIES

HANCOCK-JONES CODE MIXING H2/HE/N2/CO2 0/ 0/ 0/0.10 RUNS

FRACTIONS H2/HE/N2/CO2

1.0000E-18 1.0000E-18 1.0000E-18 1.0000E+00

RUN NO.	1	2	3	4	5	6
E/N VOLT-CM SQ., TOWNSEDS (X E-17)	5.0000E+00	7.5000E+00	1.0000E+01	1.2500E+01	1.5000E+01	1.7500E+01
DRIFT VELOCITY CM/SEC, E MU	8.6659E+05	1.3688E+06	1.9758E+06	2.8034E+06	3.8827E+06	5.1872E+06
CHARACTERISTIC ENERGY VOLT, D/MU	3.5688E-02	4.4922E-02	6.5612E-02	1.0292E-01	1.7408E-01	2.7908E-01
POWER=IE=Q X W X E/N X N AT 1 ATM. WATTS/ELECTRON, LMS	1.8510E-10	4.3855E-10	8.4405E-10	1.4970E-09	2.4881E-09	3.8780E-09
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RMS	3.0645E-10	5.5126E-10	9.5195E-10	1.5204E-09	2.3989E-09	3.7131E-09
TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL, SUMA	8.3225E+06	1.4288E+07	2.2555E+07	3.2074E+07	4.4073E+07	6.0543E+07
DN DIFF CONST X MOL/CC, UNITS 10E16 MOL	1.5038E+04	2.0988E+04	3.5928E+04	7.2610E+04	1.6361E+05	3.4396E+05
MUN MOBILITY X MOL/CC, UNITS 10E16 MOL	1.7332E+06	1.8250E+06	1.9758E+06	2.2427E+06	2.5885E+06	2.9641E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL, J= 33

LEVEL		RUN NO. 1	2	3	4	5	6
1	1ST KIND	5.0774E-13	7.4305E-13	1.2194E-12	2.2143E-12	4.7324E-12	9.7996E-12
	2ND KIND	-7.4345E-15	-9.3021E-15	-1.3150E-14	-2.1243E-14	-4.1612E-14	-8.2426E-14
2	1ST KIND	1.5340E-13	2.7162E-13	5.2854E-13	1.1286E-12	2.6556E-12	5.7533E-12
	2ND KIND	-2.2067E-15	-2.7873E-15	-4.0175E-15	-6.6811E-15	-1.3444E-14	-2.7032E-14
3	1ST KIND	8.1459E+06	1.3408E+07	1.9709E+07	2.5501E+07	3.0710E+07	3.6793E+07
	2ND KIND	-9.5584E+04	-1.0455E+05	-1.1556E+05	-1.2256E+05	-1.2940E+05	-1.3518E+05
4	1ST KIND	2.5507E+05	8.2512E+05	2.1139E+06	4.0292E+06	6.9651E+06	1.1036E+07
	2ND KIND	-1.8615E+03	-2.1251E+03	-2.4752E+03	-2.7665E+03	-3.2005E+03	-3.8278E+03
5	1ST KIND	1.8473E-07	3.1340E-02	2.5092E+01	1.2568E+03	1.7297E+04	1.0544E+05
	2ND KIND	-6.3487E-11	-3.6196E-06	-1.6454E-03	-5.8354E-02	-6.3382E-01	-3.2406E+00
6	1ST KIND	5.0107E-17	5.8867E-16	8.6008E-15	9.5990E-14	5.8148E-13	2.0293E-12
	2ND KIND	-7.9320E-20	-9.8862E-20	-1.7205E-19	-6.9241E-19	-3.0966E-18	-9.3922E-18
7	1ST KIND	1.8922E+04	1.6196E+05	8.4985E+05	2.6587E+06	6.4412E+06	1.2433E+07
	2ND KIND	-2.3915E+01	-2.7597E+01	-3.3329E+01	-4.0140E+01	-5.0853E+01	-6.5690E+01
8	1ST KIND	8.0774E-04	3.2939E+00	4.4360E+02	8.4109E+03	6.3721E+04	2.6120E+05
	2ND KIND	-8.2051E-09	-1.0153E-05	-7.9161E-04	-1.1435E-02	-7.4014E-02	-2.7420E-01
9	1ST KIND	2.1086E-08	3.5848E-03	2.8955E+00	1.4772E+02	2.0896E+03	1.3196E+04
	2ND KIND	-9.9570E-14	-2.9993E-09	-1.0148E-06	-3.0998E-05	-3.1086E-04	-1.5245E-03
10	1ST KIND	3.1327E-08	5.3257E-03	4.3011E+00	2.1936E+02	3.1016E+03	1.9576E+04

	2ND KIND	-1.5878E-14	-3.5304E-10	-1.0319E-07	-2.9006E-06	-2.7564E-05	-1.2980E-04
11	1ST KIND	7.6845E-18	5.6659E-16	1.1986E-14	9.2974E-14	4.2638E-13	1.2827E-12
	2ND KIND	-6.4653E-23	-9.4572E-23	-1.6780E-22	-3.5548E-22	-8.7447E-22	-1.9736E-21
12	1ST KIND	1.8960E-21	1.6374E-17	2.7480E-15	5.3375E-14	3.8501E-13	1.4553E-12
	2ND KIND	-1.5612E-29	-1.5935E-26	-9.2084E-25	-9.8533E-24	-4.8453E-23	-1.4149E-22
13	1ST KIND	1.0189E-21	1.1367E-17	2.1557E-15	4.4688E-14	3.3536E-13	1.3026E-12
	2ND KIND	-1.9035E-33	-8.1520E-31	-3.0379E-29	-2.5482E-28	-1.0728E-27	-2.8251E-27
14	1ST KIND	2.8449E-22	4.5752E-18	1.0396E-15	2.3718E-14	1.8864E-13	7.5895E-13
	2ND KIND	-1.2864E-37	-2.3893E-35	-5.8170E-34	-3.8268E-33	-1.3696E-32	-3.2267E-32
15	1ST KIND	1.0115E-22	2.2624E-18	6.2150E-16	1.5998E-14	1.3833E-13	5.9385E-13
	2ND KIND	-1.0158E-41	-6.8371E-40	-1.0399E-38	-5.3983E-38	-1.6800E-37	-3.6299E-37
16	1ST KIND	7.6082E-24	3.7022E-19	1.4687E-16	4.6182E-15	4.5118E-14	2.0996E-13
	2ND KIND	-2.4794E-46	-1.0072E-44	-1.1229E-43	-4.7415E-43	-1.2636E-42	-2.4325E-42
17	1ST KIND	1.2542E-24	9.2513E-20	4.6868E-17	1.7296E-15	1.8915E-14	9.5738E-14
	2ND KIND	-2.9496E-50	-2.7270E-49	-1.5267E-48	-4.5952E-48	-9.9556E-48	-1.6743E-47
18	1ST KIND	3.6145E-08	6.1385E-03	4.9365E+00	2.4957E+02	3.4835E+03	2.1635E+04
	2ND KIND	-8.4269E-38	-1.1999E-37	-1.9240E-37	-3.1387E-37	-5.2950E-37	-8.3445E-37
19	1ST KIND	6.5037E-26	1.0512E-20	7.9905E-18	3.7769E-16	4.8797E-15	2.7879E-14
	2ND KIND	-2.2285E-54	-8.1426E-54	-2.4521E-53	-5.1111E-53	-8.6656E-53	-1.2264E-52
20	1ST KIND	3.3938E-24	1.4491E-14	3.5288E-09	6.1568E-06	9.7324E-04	3.5717E-02
	2ND KIND	-7.0724E-63	-1.0030E-62	-1.5517E-62	-2.2797E-62	-3.2506E-62	-4.2662E-62
21	1ST KIND	0.	1.8571E-36	5.2643E-29	1.5734E-24	1.6486E-21	2.2552E-19
	2ND KIND	-2.9113E-98	-4.1528E-98	-6.7333E-98	-1.1209E-97	-1.9284E-97	-3.0840E-97
22	1ST KIND	0.	6.5121E-41	7.0008E-32	1.3631E-26	4.5267E-23	1.3196E-20
	2ND KIND	-5.1998-127	-7.3760-127	-1.1569-126	-1.8053-126	-2.9107-126	-4.4769-126
23	1ST KIND	0.	3.5358E-24	8.7760E-15	2.4645E-09	1.0630E-05	3.7795E-03
	2ND KIND	-1.8229-114	-2.6026-114	-4.2800-114	-7.5341-114	-1.4351-113	-2.5754-113
24	1ST KIND	0.	0.	4.3695E-36	7.1477E-30	9.7016E-26	7.6407E-23
	2ND KIND	-4.4436-156	-6.2337-156	-9.3779-156	-1.3586-155	-2.0128-155	-2.9046-155
25	1ST KIND	0.	0.	0.	1.2826E-15	9.7281E-11	2.5213E-07
	2ND KIND	-1.4889-174	-2.1261-174	-3.5207-174	-6.4341-174	-1.3238-173	-2.5961-173
26	1ST KIND	0.	0.	0.	2.6753E-35	3.3957E-30	1.2522E-26
	2ND KIND	-6.1677-205	-8.8077-205	-1.4603-204	-2.7027-204	-5.7850-204	-1.2053-203
27	1ST KIND	0.	0.	0.	0.	5.5655E-32	4.4057E-28
	2ND KIND	-1.3129-226	-1.8669-226	-2.9529-226	-4.6306-226	-7.3921-226	-1.1137-225
28	1ST KIND	0.	0.	0.	0.	1.1569E-16	1.6679E-12
	2ND KIND	-1.5590-223	-2.2264-223	-3.7013-223	-6.9612-223	-1.5931-222	-3.2621-222
29	1ST KIND	0.	0.	0.	0.	3.9652E-34	8.5362E-30
	2ND KIND	-1.9741-251	-2.7234-251	-3.9710-251	-5.4843-251	-7.5377-251	-9.8481-251
30	1ST KIND	0.	0.	0.	0.	0.	9.8797E-35
	2ND KIND	0.	0.	0.	0.	0.	0.
31	1ST KIND	0.	0.	0.	0.	3.3210E-35	5.9155E-31
	2ND KIND	-1.2705-246	-1.8143-246	-3.0077-246	-5.5521-246	-1.1745-245	-2.3919-245
32	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.
33	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.

RUN NO. 7 8 9 10

E/N VOLT-CM SQ., TOWNSENDS (X E-17)
 2.0000E+01 3.0000E+01 7.0000E+01 1.0000E+02
 DRIFT VELOCITY CM/SEC, E MU
 6.5379E+06 9.6986E+06 1.2894E+07 1.3588E+07
 CHARACTERISTIC ENERGY VOLT, D/MU
 4.0610E-01 7.9779E-01 1.9451E+00 2.7803E+00
 POWER=IE=Q X W X E/N X N AT 1 ATM. WATTS/ELECTRON, LHS
 5.5860E-09 1.2430E-08 3.8558E-08 5.8046E-08
 POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS
 5.3428E-09 1.0490E-08 3.0137E-08 5.1909E-08
 TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL.SUMA
 7.8411E+07 1.2606E+08 2.3550E+08 2.6241E+08
 DN DIFF CONST X MOL/CC, UNITS 10E16 MOL
 6.0874E+05 1.1696E+06 9.2579E+05 7.2002E+05
 MUN MOBILITY X MOL/CC, UNITS 10E16 MOL
 3.2690E+06 3.2329E+06 1.8420E+06 1.3588E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL. J= 33

LEVEL		RUN NO. 7	8	9	10
1	1ST KIND	1.7565E-11	4.4961E-11	1.0634E-10	1.2807E-10
	2ND KIND	-1.4482E-13	-3.6297E-13	-8.4202E-13	-1.0083E-12
2	1ST KIND	1.0536E-11	2.7407E-11	5.9321E-11	6.4262E-11
	2ND KIND	-4.7795E-14	-1.1988E-13	-2.5097E-13	-2.6890E-13
3	1ST KIND	4.1199E+07	4.9384E+07	7.6341E+07	8.4807E+07
	2ND KIND	-1.4015E+05	-1.5499E+05	-2.3985E+05	-2.6297E+05
4	1ST KIND	1.6049E+07	3.0603E+07	6.3808E+07	7.0081E+07
	2ND KIND	-4.6743E+03	-7.6969E+03	-1.4925E+04	-1.5986E+04
5	1ST KIND	3.7034E+05	3.1475E+06	1.5217E+07	1.6801E+07
	2ND KIND	-9.9444E+00	-6.1436E+01	-2.0295E+02	-2.0790E+02
6	1ST KIND	4.7576E-12	1.6197E-11	2.7211E-11	2.5318E-11
	2ND KIND	-2.0159E-17	-5.8251E-17	-8.2622E-17	-7.2361E-17
7	1ST KIND	2.0041E+07	3.7528E+07	5.2538E+07	5.4599E+07
	2ND KIND	-8.3082E+01	-1.1921E+02	-1.4942E+02	-1.5314E+02
8	1ST KIND	7.0045E+05	3.6297E+06	1.3769E+07	1.5027E+07
	2ND KIND	-6.8461E-01	-2.9758E+00	-8.1087E+00	-8.0963E+00
9	1ST KIND	4.8279E+04	4.8441E+05	3.0992E+06	3.5568E+06
	2ND KIND	-4.5884E-03	-2.8284E-02	-9.3756E-02	-9.3309E-02
10	1ST KIND	7.1584E+04	7.1739E+05	4.6040E+06	5.2925E+06
	2ND KIND	-3.7887E-04	-2.1636E-03	-6.4678E-03	-6.3150E-03
11	1ST KIND	2.7925E-12	9.4130E-12	3.0589E-11	3.8408E-11
	2ND KIND	-3.7094E-21	-1.0132E-20	-2.4934E-20	-2.8749E-20
12	1ST KIND	3.5570E-12	1.2674E-11	1.9964E-11	1.6592E-11
	2ND KIND	-2.8735E-22	-7.0773E-22	-7.8032E-22	-5.9884E-22
13	1ST KIND	3.2429E-12	1.2080E-11	1.9585E-11	1.6842E-11
	2ND KIND	-5.3492E-27	-1.1544E-26	-1.1195E-26	-8.5553E-27
14	1ST KIND	1.9361E-12	7.5279E-12	1.2759E-11	1.0878E-11
	2ND KIND	-5.6594E-32	-1.0535E-31	-9.0562E-32	-6.6193E-32
15	1ST KIND	1.5908E-12	6.9798E-12	1.3644E-11	1.1987E-11
	2ND KIND	-6.0161E-37	-1.0177E-36	-8.1253E-37	-5.8645E-37

16	1ST KIND	5.9295E-13	2.8496E-12	5.7874E-12	5.1235E-12
	2ND KIND	-3.6966E-42	-5.2854E-42	-3.6135E-42	-2.5271E-42
17	1ST KIND	2.8793E-13	1.5992E-12	3.8037E-12	3.3973E-12
	2ND KIND	-2.3237E-47	-2.8364E-47	-1.6983E-47	-1.1468E-47
18	1ST KIND	7.7707E+04	7.3042E+05	4.3550E+06	4.9811E+06
	2ND KIND	-1.1714E-36	-1.6460E-36	-1.2096E-36	-8.6277E-37
19	1ST KIND	9.1665E-14	6.1292E-13	1.6520E-12	1.5298E-12
	2ND KIND	-1.5017E-52	-1.4720E-52	-7.2443E-53	-4.6806E-53
20	1ST KIND	5.0854E-01	1.0187E+02	1.5301E+04	3.4766E+04
	2ND KIND	-5.1026E-62	-5.5975E-62	-1.3882E-61	-1.8060E-61
21	1ST KIND	8.2804E-18	8.4721E-15	2.2638E-12	4.6487E-12
	2ND KIND	-4.3785E-97	-6.3629E-97	-5.0784E-97	-3.7465E-97
22	1ST KIND	8.2766E-19	2.3523E-15	2.0268E-12	5.7257E-12
	2ND KIND	-6.2664E-126	-9.3628E-126	-9.0411E-126	-7.8276E-126
23	1ST KIND	2.7823E-01	1.1737E+03	1.6916E+06	5.2448E+06
	2ND KIND	-4.0578E-113	-7.5284E-113	-8.0995E-113	-6.4809E-113
24	1ST KIND	1.0113E-20	1.4764E-16	7.4944E-13	3.0935E-12
	2ND KIND	-3.9357E-155	-6.0579E-155	-7.9609E-155	-8.0692E-155
25	1ST KIND	8.0046E-05	7.5745E+00	3.0805E+05	2.1878E+06
	2ND KIND	-4.4290E-173	-1.0089E-172	-2.3163E-172	-3.2308E-172
26	1ST KIND	5.2040E-24	9.5015E-19	9.7056E-14	8.2877E-13
	2ND KIND	-2.1953E-203	-6.0774E-203	-1.3450E-202	-1.4732E-202
27	1ST KIND	3.1653E-25	1.7240E-19	3.4720E-14	3.0608E-13
	2ND KIND	-1.5267E-225	-2.2214E-225	-2.2988E-225	-2.0139E-225
28	1ST KIND	1.9015E-09	3.3252E-03	4.3796E+03	7.4932E+04
	2ND KIND	-5.9869E-222	-1.6438E-221	-6.8861E-221	-1.2589E-220
29	1ST KIND	1.2611E-26	3.4108E-20	3.6757E-14	4.5432E-13
	2ND KIND	-1.1980E-250	-1.3720E-250	-1.3747E-250	-1.9707E-250
30	1ST KIND	3.7308E-31	9.5684E-24	2.3050E-16	7.5557E-15
	2ND KIND	0.	0.	0.	0.
31	1ST KIND	7.8019E-28	1.8532E-21	3.0624E-15	5.3145E-14
	2ND KIND	-4.2363E-245	-1.0776E-244	-3.7990E-244	-6.4700E-244
32	1ST KIND	2.2058E-39	1.2341E-28	1.5890E-18	1.7533E-16
	2ND KIND	0.	0.	0.	0.
33	1ST KIND	0.	4.1264E-37	1.8309E-22	2.3525E-19
	2ND KIND	0.	0.	0.	0.

HANCOCK-JONES CODE MIXING H2/HE/N2/CO2 0/50/ 0/50. 10 RUNS

FRACTIONS H2/HE/N2/CO2

5.0000E-19 5.0000E-01 5.0000E-19 5.0000E-01

RUN NO.	1	2	3	4	5	6
E/N VOLT-CM SQ., TOWNSENDS (X E-17)	5.0000E+00	7.5000E+00	1.0000E+01	1.2500E+01	1.5000E+01	1.7500E+01
DRIFT VELOCITY CM/SEC, E MU	3.5746E+06	4.7071E+06	5.5597E+06	6.2708E+06	6.7203E+06	7.0448E+06
CHARACTERISTIC ENERGY VOLT, D/MU	8.6158E+02	1.3749E-01	2.2970E-01	3.4624E-01	4.8805E-01	6.3335E-01
POWER=IE=0 X W X E/N X N AT 1 ATM, WATTS/ELECTRON, LHS	7.6354E+10	1.5082E-09	2.3751E-09	3.3486E-09	4.3064E-09	5.2667E-09
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS	8.1102E+10	1.5025E-09	2.3701E-09	3.1928E-09	4.0426E-09	4.9018E-09
TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL, SUMA	1.8590E+07	2.8971E+07	3.8963E+07	4.6818E+07	5.4193E+07	6.1382E+07
DN DIFF CONST X MOL/CC, UNITS 10E16 MOL	6.1772E+05	7.5970E+05	9.9597E+05	1.2223E+06	1.3742E+06	1.4397E+06
MUN MOBILITY X MOL/CC, UNITS 10E16 MOL	7.1492E+06	6.2762E+06	5.5597E+06	5.0166E+06	4.4802E+06	4.0256E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL. J= 33

LEVEL	RUN NO.	1	2	3	4	5	6
1	1ST KIND	9.0865E-13	1.9914E-12	4.7047E-12	8.9868E-12	1.4338E-11	1.9664E-11
	2ND KIND	-8.9529E-15	-1.7819E-14	-3.9877E-14	-7.4350E-14	-1.1714E-13	-1.5949E-13
2	1ST KIND	4.2840E-13	1.0712E-12	2.7253E-12	5.3690E-12	8.6784E-12	1.1965E-11
	2ND KIND	-2.7600E-15	-5.6740E-15	-1.3023E-14	-2.4537E-14	-3.8781E-14	-5.2794E-14
3	1ST KIND	1.5648E+07	2.0899E+07	2.3580E+07	2.4238E+07	2.4417E+07	2.4967E+07
	2ND KIND	-6.6351E+04	-7.2241E+04	-7.4071E+04	-7.3300E+04	-7.3157E+04	-7.4755E+04
4	1ST KIND	2.2202E+06	4.7684E+06	7.4715E+06	9.7731E+06	1.2136E+07	1.4481E+07
	2ND KIND	-1.5072E+03	-1.7943E+03	-2.1100E+03	-2.4723E+03	-2.9475E+03	-3.4850E+03
5	1ST KIND	2.4781E-02	1.3805E+02	9.9173E+03	9.3113E+04	3.6208E+05	8.6646E+05
	2ND KIND	-3.4048E-06	-8.2641E-03	-3.8379E-01	-2.7567E+00	-8.9261E+00	-1.8653E+01
6	1ST KIND	2.8747E-15	4.0485E-14	4.6873E-13	1.8103E-12	3.9924E-12	6.3620E-12
	2ND KIND	-8.9584E-20	-3.5847E-19	-2.7203E-18	-8.6338E-18	-1.6916E-17	-2.4901E-17
7	1ST KIND	7.8995E+05	3.3754E+06	7.9262E+06	1.2512E+07	1.6532E+07	1.9444E+07
	2ND KIND	-2.1085E+01	-2.9015E+01	-3.9196E+01	-4.8270E+01	-5.5987E+01	-6.1600E+01
8	1ST KIND	6.0113E+00	2.1901E+03	4.5982E+04	2.2912E+05	6.1927E+05	1.1848E+06
	2ND KIND	-2.6004E-05	-4.0044E-03	-5.8609E-02	-2.4485E-01	-5.9244E-01	-1.0427E+00
9	1ST KIND	2.8339E-03	1.6057E+01	1.2031E+03	1.2014E+04	5.0143E+04	1.2886E+05
	2ND KIND	-3.2270E-09	-5.0038E-06	-1.9481E-04	-1.3072E-03	-4.1344E-03	-8.5975E-03
10	1ST KIND	4.2102E-03	2.3849E+01	1.7857E+03	1.7817E+04	7.4313E+04	1.9091E+05
	2ND KIND	-4.0843E-10	-5.0527E-07	-1.7648E-05	-1.1106E-04	-3.3622E-04	-6.7591E-04
11	1ST KIND	2.7805E-15	6.2066E-14	4.1320E-13	1.2079E-12	2.3884E-12	3.7127E-12
	2ND KIND	-1.2453E-22	-3.2362E-22	-8.8966E-22	-1.8441E-21	-3.0771E-21	-4.3357E-21
12	1ST KIND	2.4682E-17	1.3356E-14	2.8279E-13	1.2657E-12	2.9668E-12	4.8628E-12
	2ND KIND	-4.4799E-26	-4.7538E-24	-4.5909E-23	-1.3465E-22	-2.4209E-22	-3.3245E-22

13	1ST K̄IND	1.5954E-17	1.0429E-14	2.4034E-13	1.1255E-12	2.7138E-12	4.5402E-12
	2ND K̄IND	-2.9080E-30	-1.6036E-28	-1.1263E-27	-2.7956E-27	-4.5403E-27	-5.8331E-27
14	1ST K̄IND	5.8069E-18	5.0039E-15	1.3052E-13	6.4952E-13	1.6226E-12	2.7696E-12
	2ND K̄IND	-1.0401E-34	-3.0908E-33	-1.5865E-32	-3.3166E-32	-4.8226E-32	-5.7567E-32
15	1ST K̄IND	2.6277E-18	3.0019E-15	9.1658E-14	5.0321E-13	1.3457E-12	2.4245E-12
	2ND K̄IND	-3.5675E-39	-5.4125E-38	-2.0777E-37	-3.7907E-37	-5.1049E-37	-5.8176E-37
16	1ST K̄IND	3.6067E-19	7.2020E-16	2.8216E-14	1.7581E-13	5.0485E-13	9.4981E-13
	2ND K̄IND	-5.6766E-44	-5.6774E-43	-1.6776E-42	-2.5952E-42	-3.1124E-42	-3.2732E-42
17	1ST K̄IND	8.3040E-20	2.3657E-16	1.1365E-14	8.0445E-14	2.5176E-13	5.0374E-13
	2ND K̄IND	-1.3608E-48	-6.3729E-48	-1.3377E-47	-1.7434E-47	-1.8807E-47	-1.8454E-47
18	1ST K̄IND	4.8532E-03	2.7268E+01	2.0019E+03	1.9436E+04	7.8755E+04	1.9702E+05
	2ND K̄IND	-1.4826E-37	-3.0495E-37	-5.4742E-37	-7.5528E-37	-8.9367E-37	-9.5456E-37
19	1ST K̄IND	8.3674E-21	4.3027E-17	2.8037E-15	2.3734E-14	8.3165E-14	1.7994E-13
	2ND K̄IND	-2.5738E-53	-6.8395E-53	-1.0536E-52	-1.1478E-52	-1.0939E-52	-9.8472E-53
20	1ST K̄IND	6.9014E-14	6.1059E-07	2.1452E-03	2.0894E-01	3.8643E+00	2.8134E+01
	2ND K̄IND	-1.2224E-62	-2.2335E-62	-3.1873E-62	-3.5313E-62	-3.5027E-62	-3.3496E-62
21	1ST K̄IND	0.	2.7671E-25	1.3968E-20	5.4017E-18	2.2183E-16	2.5766E-15
	2ND K̄IND	-5.1648E-98	-1.0975E-97	-2.0209E-97	-2.8191E-97	-3.3667E-97	-3.6333E-97
22	1ST K̄IND	0.	1.4428E-27	6.0483E-22	5.6389E-19	3.9771E-17	6.6634E-16
	2ND K̄IND	-8.9838E-127	-1.7305E-126	-2.9073E-126	-3.9318E-126	-4.7011E-126	-5.1495E-126
23	1ST K̄IND	0.	1.3540E-10	1.6414E-04	1.9965E-01	1.7080E+01	3.3136E+02
	2ND K̄IND	-3.2439E-114	-7.2077E-114	-1.4938E-113	-2.3835E-113	-3.2208E-113	-3.8457E-113
24	1ST K̄IND	0.	0.	2.9548E-24	9.7714E-21	1.5218E-18	4.4323E-17
	2ND K̄IND	-7.2697E-156	-1.2498E-155	-1.8794E-155	-2.4060E-155	-2.8418E-155	-3.1583E-155
25	1ST K̄IND	0.	0.	0.	1.5886E-04	6.2390E-02	3.2292E+00
	2ND K̄IND	-2.6509E-174	-6.0163E-174	-1.3546E-173	-2.4016E-173	-3.5845E-173	-4.6659E-173
26	1ST K̄IND	0.	0.	0.	1.1176E-23	7.8619E-21	5.0994E-19
	2ND K̄IND	-1.0982E-204	-2.5014E-204	-5.8217E-204	-1.1077E-203	-1.8022E-203	-2.5444E-203
27	1ST K̄IND	0.	0.	0.	0.	1.4808E-21	1.2199E-19
	2ND K̄IND	-2.2966E-226	-4.5184E-226	-7.4948E-226	-9.8062E-226	-1.1391E-225	-1.2273E-225
28	1ST K̄IND	0.	0.	0.	0.	2.5385E-05	4.0365E-03
	2ND K̄IND	-2.7761E-223	-6.3740E-223	-1.5337E-222	-2.9994E-222	-4.9219E-222	-6.9561E-222
29	1ST K̄IND	0.	0.	0.	0.	2.7286E-22	4.3878E-20
	2ND K̄IND	-3.0226E-251	-4.9219E-251	-6.8099E-251	-7.7816E-251	-8.0995E-251	-8.0109E-251
30	1ST K̄IND	0.	0.	0.	0.	0.	3.2125E-23
	2ND K̄IND	0.	0.	0.	0.	0.	0.
31	1ST K̄IND	0.	0.	0.	0.	1.3228E-23	2.4958E-21
	2ND K̄IND	-2.2621E-246	-5.1506E-246	-1.1890E-245	-2.2044E-245	-3.4572E-245	-4.7186E-245
32	1ST K̄IND	0.	0.	0.	0.	0.	0.
	2ND K̄IND	0.	0.	0.	0.	0.	0.
33	1ST K̄IND	0.	0.	0.	0.	0.	0.
	2ND K̄IND	0.	0.	0.	0.	0.	0.

RUN NO. 7 8 9 10

E/N VOLT-CM SQ., TOWNSENDS (X E-17)
 2.0000E+01 3.0000E+01 7.0000E+01 1.0000E+02
 DRIFT VELOCITY CM/SEC, E MU
 7.3403E+06 8.5089E+06 1.2583E+07 1.5A72E+07
 CHARACTERISTIC ENERGY VOLT, D/MU
 7.6733E-01 1.1994E+00 2.6891E+00 3.5920E+00
 POWER=IE=Q X W X E/N X N AT 1 ATM. WATTS/ELECTRON, LHS
 6.2716E-09 1.0905E-08 3.7629E-08 6.7806E-08
 POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS
 5.7598E-09 9.4060E-09 3.4322E-08 6.5673E-08
 TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL,SUMA
 6.8213E+07 9.3221E+07 1.2885E+08 1.3216E+08
 DN DIFF CONST X MOL/CC, UNITS 10E16 MOL
 1.4499E+06 1.3535E+06 1.2189E+06 1.2694E+06
 MUN MOBILITY X MOL/CC, UNITS 10E16 MOL
 3.6702E+06 2.8363E+06 1.7976E+06 1.5872E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL, J= 33

LEVEL		RUN NO. 7	8	9	10
1	1ST KIND	2.4381E-11	3.8942E-11	6.3934E-11	6.5530E-11
	2ND KIND	-1.9685E-13	-3.1094E-13	-5.0240E-13	-5.1341E-13
2	1ST KIND	1.4854E-11	2.3140E-11	3.0779E-11	2.8452E-11
	2ND KIND	-6.5010E-14	-9.9333E-14	-1.2855E-13	-1.1802E-13
3	1ST KIND	2.5769E+07	3.1287E+07	4.1279E+07	4.0440E+07
	2ND KIND	-7.7851E+04	-9.6619E+04	-1.2784E+05	-1.2466E+05
4	1ST KIND	1.6724E+07	2.4562E+07	3.3766E+07	3.2602E+07
	2ND KIND	-4.0235E+03	-5.8593E+03	-7.6363E+03	-7.2884E+03
5	1ST KIND	1.5421E+06	4.5739E+06	7.6631E+06	6.9317E+06
	2ND KIND	-2.9944E+01	-6.9986E+01	-9.3647E+01	-8.1574E+01
6	1ST KIND	8.4177E-12	1.2705E-11	1.1098E-11	9.2869E-12
	2ND KIND	-3.1190E-17	-4.2022E-17	-3.2492E-17	-2.5985E-17
7	1ST KIND	2.1445E+07	2.4952E+07	2.7150E+07	2.6946E+07
	2ND KIND	-6.5393E+01	-7.2109E+01	-7.6272E+01	-7.5503E+01
8	1ST KIND	1.8388E+06	4.4318E+06	6.8946E+06	6.1928E+06
	2ND KIND	-1.5111E+00	-2.9930E+00	-3.6453E+00	-3.1262E+00
9	1ST KIND	2.4485E+05	8.5736E+05	1.6281E+06	1.4876E+06
	2ND KIND	-1.3827E-02	-3.2416E-02	-4.1625E-02	-3.5420E-02
10	1ST KIND	3.6276E+05	1.2720E+06	2.4241E+06	2.2168E+06
	2ND KIND	-1.0592E-03	-2.3319E-03	-2.8029E-03	-2.3655E-03
11	1ST KIND	5.0093E-12	9.8701E-12	1.9075E-11	1.9264E-11
	2ND KIND	-5.4763E-21	-9.0970E-21	-1.4010E-20	-1.3492E-20
12	1ST KIND	6.4917E-12	9.5368E-12	7.5326E-12	5.7616E-12
	2ND KIND	-3.9239E-22	-4.5001E-22	-2.8213E-22	-2.0404E-22
13	1ST KIND	6.1443E-12	9.3391E-12	7.4560E-12	5.8738E-12
	2ND KIND	-6.595AE-27	-6.9620E-27	-3.9953E-27	-2.8985E-27
14	1ST KIND	3.8005E-12	5.9132E-12	4.8675E-12	3.7958E-12
	2ND KIND	-6.2079E-32	-5.9673E-32	-3.1775E-32	-2.2247E-32
15	1ST KIND	3.4612E-12	5.9312E-12	5.3444E-12	4.2396E-12
	2ND KIND	-6.0895E-37	-5.5462E-37	-2.8192E-37	-1.9598E-37

16	1ST \bar{K} IND	1.3914E-12	2.4773E-12	2.2599E-12	1.8063E-12
	2ND \bar{K} IND	-3.2401E-42	-2.6516E-42	-1.2191E-42	-8.3211E-43
17	1ST \bar{K} IND	7.7120E-13	1.5131E-12	1.5186E-12	1.2122E-12
	2ND \bar{K} IND	-1.7456E-47	-1.3116E-47	-5.5662E-48	-3.7181E-48
18	1ST \bar{K} IND	3.6620E+05	1.2265E+06	2.2809E+06	2.0851E+06
	2ND \bar{K} IND	-9.6482E-37	-8.3681E-37	-4.1287E-37	-2.8604E-37
19	1ST \bar{K} IND	2.9061E-13	6.3232E-13	6.6893E-13	5.4828E-13
	2ND \bar{K} IND	-8.7686E-53	-5.8912E-53	-2.2424E-53	-1.4697E-53
20	1ST \bar{K} IND	1.1552E+02	2.0373E+03	2.0052E+04	2.7210E+04
	2ND \bar{K} IND	-3.2693E-62	-4.3934E-62	-9.0014E-62	-8.8078E-62
21	1ST \bar{K} IND	1.3907E-14	3.2402E-13	2.6269E-12	3.2078E-12
	2ND \bar{K} IND	-3.7117E-97	-3.3460E-97	-1.7725E-97	-1.2588E-97
22	1ST \bar{K} IND	4.7140E-15	1.9913E-13	3.5313E-12	5.4184E-12
	2ND \bar{K} IND	-5.3588E-126	-5.2324E-126	-3.7886E-126	-3.1837E-126
23	1ST \bar{K} IND	2.6306E+03	1.4482E+05	3.2675E+06	5.1257E+06
	2ND \bar{K} IND	-4.2478E-113	-4.5931E-113	-2.9910E-113	-2.2424E-113
24	1ST \bar{K} IND	4.7173E-16	4.8411E-14	2.2350E-12	4.3314E-12
	2ND \bar{K} IND	-3.3761E-155	-3.7954E-155	-3.9393E-155	-3.6606E-155
25	1ST \bar{K} IND	5.2499E+01	1.4210E+04	2.4211E+06	7.2512E+06
	2ND \bar{K} IND	-5.5647E-173	-8.3060E-173	-1.7957E-172	-2.4016E-172
26	1ST \bar{K} IND	9.8728E-18	4.0563E-15	9.6619E-13	2.8090E-12
	2ND \bar{K} IND	-3.2345E-203	-5.2229E-203	-7.2128E-203	-7.4285E-203
27	1ST \bar{K} IND	2.7335E-18	1.4028E-15	3.5011E-13	9.7871E-13
	2ND \bar{K} IND	-1.2697E-225	-1.2678E-225	-9.5630E-226	-7.8178E-226
28	1ST \bar{K} IND	1.2537E-01	1.5477E+02	1.8659E+05	9.6287E+05
	2ND \bar{K} IND	-8.9310E-222	-1.8111E-221	-7.6780E-221	-1.2209E-220
29	1ST \bar{K} IND	1.3332E-18	1.3326E-15	6.8772E-13	2.5184E-12
	2ND \bar{K} IND	-7.7684E-251	-6.9187E-251	-1.2362E-250	-2.0156E-250
30	1ST \bar{K} IND	1.9684E-21	7.6829E-18	3.5682E-14	2.6065E-13
	2ND \bar{K} IND	0.	0.	0.	0.
31	1ST \bar{K} IND	8.1025E-20	1.0748E-16	1.3071E-13	6.5809E-13
	2ND \bar{K} IND	-5.8905E-245	-1.0844E-244	-3.8139E-244	-5.6712E-244
32	1ST \bar{K} IND	5.8490E-08	5.7996E-02	2.2270E+03	2.2864E+04
	2ND \bar{K} IND	0.	0.	0.	0.
33	1ST \bar{K} IND	0.	1.1896E-05	4.1515E+01	1.2792E+03
	2ND \bar{K} IND	0.	0.	0.	0.

HANCOCK-JONES CODE MIXING H2/HE/N2/CO2 0/67/ 0/33. 10 RUNS

FRACTIONS H2/HE/N2/CO2
 3.3333E-19 6.6667E-01 3.3333E-19 3.3333E-01

RUN NO.	1	2	3	4	5	6
E/N VOLT-CM SQ., TOWNSENDS (X E-17)	5.0000E+00	7.5000E+00	1.0000E+01	1.2500E+01	1.5000E+01	1.7500E+01
DRIFT VELOCITY CM/SEC. E MU	3.8339E+06	4.7346E+06	5.2039E+06	5.5906E+06	5.8676E+06	6.1278E+06
CHARACTERISTIC ENERGY VOLT. D/MU	1.1866E-01	2.0664E-01	3.5244E-01	5.1077E-01	6.7638E-01	8.3364E-01
POWER IE=0 X W X E/N X N AT 1 ATM. WATTS/ELECTRON. LHS	8.1892E-10	1.5170E-09	2.2231E-09	2.9854E-09	3.7600E-09	4.5812E-09
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP. RHS	8.4496E-10	1.4928E-09	2.1947E-09	2.8279E-09	3.5043E-09	4.2368E-09
TOTAL COLL. RATE / ELECTRON / MOL. UNITS 10E16 MOL.SUMA	1.7312E+07	2.5249E+07	3.1964E+07	3.7283E+07	4.2693E+07	4.8356E+07
DN DIFF CONST X MOL/CC. UNITS 10E16 MOL	9.7869E+05	1.1552E+06	1.3388E+06	1.4331E+06	1.4518E+06	1.4338E+06
MUN MORILITY X MOL/CC. UNITS 10E16 MOL	7.6678E+06	6.3128E+06	5.2039E+06	4.4724E+06	3.9117E+06	3.5016E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL, J= 33

LEVEL		RUN NO. 1	2	3	4	5	6
1	1ST KIND	9.8579E-13	2.5753E-12	6.0028E-12	1.0095E-11	1.4211E-11	1.7974E-11
	2ND KIND	-9.0781E-15	-2.2061E-14	-4.9705E-14	-8.2407E-14	-1.1510E-13	-1.4480E-13
2	1ST KIND	5.0826E-13	1.4705E-12	3.5825E-12	6.1150E-12	8.6511E-12	1.0931E-11
	2ND KIND	-2.8541E-15	-7.1663E-15	-1.6403E-14	-2.7288E-14	-3.8070E-14	-4.7663E-14
3	1ST KIND	1.3214E+07	1.5839E+07	1.6419E+07	1.6451E+07	1.6806E+07	1.7670E+07
	2ND KIND	-4.7586E+04	-4.9743E+04	-4.9045E+04	-4.8797E+04	-5.0334E+04	-5.3462E+04
4	1ST KIND	2.6586E+06	4.7567E+06	6.7080E+06	8.4164E+06	1.0214E+07	1.2054E+07
	2ND KIND	-1.1437E+03	-1.3677E+03	-1.6581E+03	-2.0161E+03	-2.4419E+03	-2.8891E+03
5	1ST KIND	1.8575E+00	1.9774E+03	5.2116E+04	2.6836E+05	7.0939E+05	1.3250E+06
	2ND KIND	-1.6489E-04	-8.6415E-02	-1.5680E+00	-6.4239E+00	-1.4530E+01	-2.4212E+01
6	1ST KIND	7.4534E-15	1.5821E-13	1.1151E-12	2.8076E-12	4.6520E-12	6.2078E-12
	2ND KIND	-1.0003E-19	-1.0405E-18	-5.4977E-18	-1.1899E-17	-1.8001E-17	-2.2581E-17
7	1ST KIND	1.4880E+06	4.6875E+06	8.6710E+06	1.1600E+07	1.3660E+07	1.4991E+07
	2ND KIND	-1.7532E+01	-2.5023E+01	-3.2977E+01	-3.8505E+01	-4.2367E+01	-4.4914E+01
8	1ST KIND	1.1143E+02	1.3260E+04	1.3639E+05	4.4415E+05	9.1866E+05	1.4922E+06
	2ND KIND	-3.1564E-04	-1.9093E-02	-1.4941E-01	-4.2135E-01	-7.8694E-01	-1.1755E+00
9	1ST KIND	2.1355E-01	2.3669E+02	6.7346E+03	3.8001E+04	1.0964E+05	2.2064E+05
	2ND KIND	-1.2344E-07	-4.6105E-05	-7.4953E-04	-2.9805E-03	-6.7122E-03	-1.1203E-02
10	1ST KIND	3.1723E-01	3.5137E+02	9.9874E+03	5.6314E+04	1.6244E+05	3.2698E+05
	2ND KIND	-1.3944E-08	-4.3214E-06	-6.4091E-05	-2.4094E-04	-5.2190E-04	-8.4558E-04
11	1ST KIND	1.2514E-14	1.7428E-13	7.7670E-13	1.6943E-12	2.7545E-12	3.8480E-12
	2ND KIND	-1.4876E-22	-4.6806E-22	-1.2247E-21	-2.1716E-21	-3.1523E-21	-4.0723E-21
12	1ST KIND	5.7491E-16	8.2604E-14	7.6408E-13	2.0805E-12	3.5482E-12	4.7688E-12
	2ND KIND	-4.8051E-25	-1.7841E-23	-8.7593E-23	-1.7089E-22	-2.3703E-22	-2.7769E-22
13	1ST KIND	4.0759E-16	6.8153E-14	6.7420E-13	1.9046E-12	3.3252E-12	4.5472E-12
	2ND KIND	-2.2733E-29	-4.9113E-28	-1.8723E-27	-3.2151E-27	-4.1344E-27	-4.6085E-27

14	1ST KIND	1.6981E-16	3.5474E-14	3.8541E-13	1.1379E-12	2.0374E-12	2.8239E-12
	2ND KIND	-5.9875E-34	-7.7273E-33	-2.2816E-32	-3.4251E-32	-4.0482E-32	-4.2684E-32
15	1ST KIND	8.7761E-17	2.3601E-14	2.9447E-13	9.4786E-13	1.8018E-12	2.6189E-12
	2ND KIND	-1.4313E-38	-1.1069E-37	-2.6488E-37	-3.6178E-37	-4.0588E-37	-4.1462E-37
16	1ST KIND	1.6025E-17	6.7199E-15	1.0123E-13	3.5641E-13	7.1025E-13	1.0605E-12
	2ND KIND	-1.8467E-43	-9.7565E-43	-1.8493E-42	-2.2009E-42	-2.2521E-42	-2.1628E-42
17	1ST KIND	4.4040E-19	2.5421E-15	4.5724E-14	1.7924E-13	3.8334E-13	6.0120E-13
	2ND KIND	-2.7872E-48	-8.4656E-48	-1.2489E-47	-1.3141E-47	-1.2482E-47	-1.1416E-47
18	1ST KIND	3.6475E-01	3.9638E+02	1.0889E+04	5.9185E+04	1.6550E+05	3.2543E+05
	2ND KIND	-1.6107E-37	-3.3632E-37	-5.2625E-37	-6.2284E-37	-6.5432E-37	-6.4633E-37
19	1ST KIND	6.0603E-19	5.7588E-16	1.3300E-14	5.9997E-14	1.3966E-13	2.3190E-13
	2ND KIND	-3.6373E-53	-7.0852E-53	-8.1703E-53	-7.4782E-53	-6.4696E-53	-5.5538E-53
20	1ST KIND	5.2129E-10	2.4071E-04	1.4562E-01	4.7080E+00	4.1502E+01	1.8057E+02
	2ND KIND	-1.2688E-62	-2.1097E-62	-2.4809E-62	-2.4000E-62	-2.2619E-62	-2.2524E-62
21	1ST KIND	0.	1.0791E-21	4.3444E-18	3.3696E-16	4.6341E-15	2.5121E-14
	2ND KIND	-5.7072E-98	-1.2372E-97	-1.9654E-97	-2.3488E-97	-2.4972E-97	-2.4996E-97
22	1ST KIND	0.	1.9206E-23	4.6763E-19	6.8265E-17	1.4023E-15	1.0067E-14
	2ND KIND	-9.4472-127	-1.8072-126	-2.7233-126	-3.2666-126	-3.5445-126	-3.6387-126
23	1ST KIND	0.	2.0334E-06	1.6785E-01	3.1061E+01	7.5303E+02	6.1064E+03
	2ND KIND	-3.6313-114	-8.7263-114	-1.6353-113	-2.2566-113	-2.6940-113	-2.9490-113
24	1ST KIND	0.	0.	7.6906E-21	3.2960E-18	1.2424E-16	1.3535E-15
	2ND KIND	-7.1653-156	-1.1927-155	-1.6557-155	-1.9641-155	-2.1808-155	-2.3287-155
25	1ST KIND	0.	0.	0.	1.4422E-01	1.2566E+01	2.1352E+02
	2ND KIND	-2.9798-174	-7.6256-174	-1.6229-173	-2.5199-173	-3.3383-173	-4.0393-173
26	1ST KIND	0.	0.	0.	1.2459E-20	2.2712E-18	4.7305E-17
	2ND KIND	-1.2349-204	-3.2174-204	-7.3875-204	-1.2706-203	-1.8496-203	-2.3994-203
27	1ST KIND	0.	0.	0.	0.	6.1828E-19	1.4589E-17
	2ND KIND	-2.4540-226	-4.7146-226	-6.8245-226	-7.9070-226	-8.4297-226	-8.6251-226
28	1ST KIND	0.	0.	0.	0.	1.6050E-02	8.9688E-01
	2ND KIND	-3.1255-223	-8.3545-223	-1.9950-222	-3.4716-222	-5.0882-222	-6.7973-222
29	1ST KIND	0.	0.	0.	0.	1.9879E-19	9.3882E-18
	2ND KIND	-2.8811-251	-4.4513-251	-5.4075-251	-5.5440-251	-5.3777-251	-5.1276-251
30	1ST KIND	0.	0.	0.	0.	0.	1.5815E-20
	2ND KIND	0.	0.	0.	0.	0.	0.
31	1ST KIND	0.	0.	0.	0.	9.0511E-21	5.9910E-19
	2ND KIND	-2.5436-246	-6.6049-246	-1.4780-245	-2.4351-245	-3.4225-245	-4.4103-245
32	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.
33	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.

16	1ST K̄IND	1.3329E-12	1.7615E-12	1.2878E-12	9.9870E-13
	2ND K̄IND	-2.0286E-42	-1.4955E-42	-6.4863E-43	-4.4121E-43
17	1ST K̄IND	7.8203E-13	1.1113E-12	8.7265E-13	6.7398E-13
	2ND K̄IND	-1.0376E-47	-7.1808E-48	-2.9306E-48	-1.9602E-48
18	1ST K̄IND	5.1062E+05	1.1497E+06	1.4247E+06	1.2218E+06
	2ND K̄IND	-6.2047E-37	-4.8197E-37	-2.2155E-37	-1.5248E-37
19	1ST K̄IND	3.1324E-13	4.7754E-13	3.8647E-13	3.0559E-13
	2ND K̄IND	-4.8338E-53	-3.0789E-53	-1.1602E-53	-7.6720E-54
20	1ST K̄IND	5.0555E+02	3.7730E+03	1.6591E+04	1.9698E+04
	2ND K̄IND	-2.4289E-62	-4.0200E-62	-5.9654E-62	-5.3834E-62
21	1ST K̄IND	7.7946E-14	5.9570E-13	2.0291E-12	2.1885E-12
	2ND K̄IND	-2.4300E-97	-1.9648E-97	-9.6120E-98	-6.7604E-98
22	1ST K̄IND	3.8631E-14	4.8154E-13	3.1876E-12	4.2133E-12
	2ND K̄IND	-3.6299-126	-3.2781-126	-2.2672-126	-1.8797-126
23	1ST K̄IND	2.5693E+04	3.9018E+05	2.9960E+06	3.9739E+06
	2ND K̄IND	-3.0630-113	-2.8827-113	-1.6621-113	-1.2230-113
24	1ST K̄IND	7.0481E-15	1.7092E-13	2.3955E-12	3.8592E-12
	2ND K̄IND	-2.4304-155	-2.6335-155	-2.5061-155	-2.2439-155
25	1ST K̄IND	1.5441E+03	8.1909E+04	3.6472E+06	9.0687E+06
	2ND K̄IND	-4.6529-173	-6.9639-173	-1.4580-172	-1.9516-172
26	1ST K̄IND	3.9333E-16	2.8154E-14	1.4271E-12	3.2437E-12
	2ND K̄IND	-2.8668-203	-4.0362-203	-4.8795-203	-4.9952-203
27	1ST K̄IND	1.3009E-16	1.0215E-14	5.0164E-13	1.0714E-12
	2ND K̄IND	-8.6472-226	-8.1042-226	-5.6155-226	-4.4727-226
28	1ST K̄IND	1.1125E+01	1.9826E+03	4.3989E+05	1.7376E+06
	2ND K̄IND	-8.6805-222	-1.9108-221	-7.0687-221	-1.0879-220
29	1ST K̄IND	1.0430E-16	1.3204E-14	1.2167E-12	3.7122E-12
	2ND K̄IND	-4.9029-251	-4.7071-251	-1.1583-250	-1.8402-250
30	1ST K̄IND	4.0289E-19	1.7555E-16	1.1242E-13	5.8972E-13
	2ND K̄IND	0.	0.	0.	0.
31	1ST K̄IND	7.6177E-18	1.4001E-15	3.0234E-13	1.1510E-12
	2ND K̄IND	-5.4449-245	-1.0744-244	-3.3454-244	-4.7946-244
32	1ST K̄IND	7.8205E-05	7.3480E+00	1.8806E+04	1.2043E+05
	2ND K̄IND	0.	0.	0.	0.
33	1ST K̄IND	0.	1.0356E-02	8.7568E+02	1.3398E+04
	2ND K̄IND	0.	0.	0.	0.

HANCOCK-JONES CODE MIXING H2/HE/N2/CO2 0/75/ 0/25, 10 RUNS

FRACTIONS H2/HE/N2/CO2
 2.5000E-19 7.5000E-01 2.5000E-19 2.5000E-01

RUN NO.	1	2	3	4	5	6
E/N VOLT-CM SQ., TOWNSENDS (X E-17)	5.0000E+00	7.5000E+00	1.0000E+01	1.2500E+01	1.5000E+01	1.7500E+01
DRIFT VELOCITY CM/SEC. E MU	3.7626E+06	4.4354E+06	4.7163E+06	5.0224E+06	5.2921E+06	5.5626E+06
CHARACTERISTIC ENERGY VOLT. D/MU	1.4796E-01	2.7153E-01	4.5860E-01	6.3991E-01	8.1757E-01	9.8755E-01
POWER=IE=Q X W X E/N X N AT 1 ATM. WATTS/ELECTRON, LHS	8.0368E-10	1.4211E-09	2.0148E-09	2.6820E-09	3.3912E-09	4.1586E-09
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS	8.2006E-10	1.3916E-09	1.9753E-09	2.5298E-09	3.1521E-09	3.8505E-09
TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL,SUMA	1.5529E+07	2.1685E+07	2.6744E+07	3.1164E+07	3.5914E+07	4.0860E+07
DN DIFF CONST X MOL/CC, UNITS 10E16 MOL	1.1753E+06	1.3321E+06	1.4309E+06	1.4491E+06	1.4275E+06	1.3996E+06
MUN MOBILITY X MOL/CC, UNITS 10E16 MOL	7.5251E+06	5.9139E+06	4.7163E+06	4.0179E+06	3.5280E+06	3.1786E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL, J= 33

LEVEL		RUN NO. 1	2	3	4	5	6
1	1ST KIND	1.0511E-12	2.9844E-12	6.4688E-12	9.9629E-12	1.3226E-11	1.6223E-11
	2ND KIND	-9.3687E-15	-2.5079E-14	-5.3032E-14	-8.0821E-14	-1.0660E-13	-1.3012E-13
2	1ST KIND	5.6707E-13	1.7489E-12	3.9032E-12	6.0603E-12	8.0422E-12	9.7858E-12
	2ND KIND	-2.9838E-15	-8.2247E-15	-1.7554E-14	-2.6747E-14	-3.5093E-14	-4.2345E-14
3	1ST KIND	1.1010E+07	1.2309E+07	1.2352E+07	1.2538E+07	1.3174E+07	1.4197E+07
	2ND KIND	-3.6859E+04	-3.7256E+04	-3.6493E+04	-3.7328E+04	-3.9818E+04	-4.3372E+04
4	1ST KIND	2.6534E+06	4.3338E+06	5.8992E+06	7.3626E+06	8.9209E+06	1.0492E+07
	2ND KIND	-9.2587E+02	-1.1228E+03	-1.4106E+03	-1.7539E+03	-2.1334E+03	-2.5083E+03
5	1ST KIND	2.1890E+01	8.2424E+03	1.1856E+05	4.3789E+05	9.4430E+05	1.5395E+06
	2ND KIND	-1.4831E-03	-2.9636E-01	-3.0545E+00	-9.2033E+00	-1.7294E+01	-2.5544E+01
6	1ST KIND	1.5312E-14	3.3249E-13	1.5851E-12	3.1485E-12	4.5233E-12	5.5228E-12
	2ND KIND	-1.4705E-19	-1.8994E-18	-7.1118E-18	-1.2455E-17	-1.6591E-17	-1.9230E-17
7	1ST KIND	1.9020E+06	5.0349E+06	8.1180E+06	1.0004E+07	1.1215E+07	1.1979E+07
	2ND KIND	-1.5248E+01	-2.1897E+01	-2.7827E+01	-3.1342E+01	-3.3610E+01	-3.5083E+01
8	1ST KIND	5.6450E+02	3.3652E+04	2.2728E+05	5.9267E+05	1.0733E+06	1.5936E+06
	2ND KIND	-1.2377E-03	-4.2232E-02	-2.2703E-01	-5.1838E-01	-8.4864E-01	-1.1601E+00
9	1ST KIND	2.5377E+00	1.0207E+03	1.6288E+04	6.6876E+04	1.5750E+05	2.7448E+05
	2ND KIND	-9.6800E-07	-1.4855E-04	-1.4291E-03	-4.2565E-03	-8.0045E-03	-1.1829E-02
10	1ST KIND	3.7693E+00	1.5145E+03	2.4142E+04	9.9087E+04	2.3342E+05	4.0703E+05
	2ND KIND	-1.0196E-07	-1.3293E-05	-1.1777E-04	-3.3326E-04	-6.0495E-04	-8.7072E-04
11	1ST KIND	2.7548E-14	2.8892E-13	9.9875E-13	1.8717E-12	2.8083E-12	3.7800E-12
	2ND KIND	-1.6981E-22	-5.7709E-22	-1.3683E-21	-2.1955E-21	-2.9912E-21	-3.7363E-21
12	1ST KIND	3.2412E-15	2.0318E-13	1.1451E-12	2.3841E-12	3.4618E-12	4.2033E-12
	2ND KIND	-1.6651E-24	-3.2350E-23	-1.0666E-22	-1.6812E-22	-2.0568E-22	-2.2297E-22
13	1ST KIND	2.4311E-15	1.7322E-13	1.0337E-12	2.2221E-12	3.2934E-12	4.0603E-12
	2ND KIND	-6.4663E-29	-7.8778E-28	-2.1044E-27	-2.9904E-27	-3.4436E-27	-3.5862E-27

14	1ST KIND	1.1004E-15	9.4484E-14	6.0792E-13	1.3526E-12	2.0443E-12	2.5453E-12
	2ND KIND	-1.4090E-33	-1.0948E-32	-2.3536E-32	-2.9934E-32	-3.2188E-32	-3.2040E-32
15	1ST KIND	6.2115E-16	6.7221E-14	4.9051E-13	1.1807E-12	1.8836E-12	2.4469E-12
	2ND KIND	-2.7385E-38	-1.4049E-37	-2.5640E-37	-3.0347E-37	-3.1371E-37	-3.0479E-37
16	1ST KIND	1.3449E-16	2.1101E-14	1.7889E-13	4.6064E-13	7.6002E-13	1.0055E-12
	2ND KIND	-3.0800E-43	-1.1057E-42	-1.6358E-42	-1.7212E-42	-1.6487E-42	-1.5227E-42
17	1ST KIND	4.1504E-17	8.7308E-15	8.6698E-14	2.4513E-13	4.2962E-13	5.9215E-13
	2ND KIND	-3.6573E-48	-8.3720E-48	-1.0119E-47	-9.6615E-48	-8.7344E-48	-7.7635E-48
18	1ST KIND	4.3166E+00	1.6823E+03	2.5675E+04	1.0138E+05	2.3225E+05	3.9758E+05
	2ND KIND	-1.6543E-37	-3.3004E-37	-4.5655E-37	-4.9376E-37	-4.8946E-37	-4.6518E-37
19	1ST KIND	6.9152E-18	2.2565E-15	2.7720E-14	8.7960E-14	1.6489E-13	2.3766E-13
	2ND KIND	-3.9307E-53	-6.1181E-53	-5.9785E-53	-5.0822E-53	-4.2578E-53	-3.5963E-53
20	1ST KIND	8.4176E-08	6.3242E-03	1.3215E+00	2.2846E+01	1.3403E+02	4.3689E+02
	2ND KIND	-1.2281E-62	-1.8108E-62	-1.8715E-62	-1.7361E-62	-1.7072E-62	-1.8659E-62
21	1ST KIND	0.	8.4903E-20	7.7169E-17	2.4429E-15	1.8749E-14	6.8192E-14
	2ND KIND	-5.9546E-98	-1.2257E-97	-1.7154E-97	-1.8780E-97	-1.8893E-97	-1.8229E-97
22	1ST KIND	0.	2.5682E-21	1.2936E-17	6.9328E-16	7.4786E-15	3.4660E-14
	2ND KIND	-9.3997-127	-1.7247-126	-2.3672-126	-2.6452-126	-2.7384-126	-2.7268-126
23	1ST KIND	0.	2.8653E-04	5.4344E+00	3.6430E+02	4.5495E+03	2.3406E+04
	2ND KIND	-3.8714-114	-9.2707-114	-1.5612-113	-1.9681-113	-2.2027-113	-2.3028-113
24	1ST KIND	0.	0.	3.8395E-19	5.6460E-17	1.0183E-15	6.6727E-15
	2ND KIND	-6.7618-156	-1.0818-155	-1.4160-155	-1.6115-155	-1.7421-155	-1.8321-155
25	1ST KIND	0.	0.	0.	3.8366E+00	1.6134E+02	1.5684E+03
	2ND KIND	-3.2079-174	-8.5271-174	-1.6648-173	-2.3752-173	-2.9879-173	-3.5428-173
26	1ST KIND	0.	0.	0.	3.6036E-19	3.5110E-17	4.1422E-16
	2ND KIND	-1.3312-204	-3.6878-204	-8.0400-204	-1.2850-203	-1.7578-203	-2.1773-203
27	1ST KIND	0.	0.	0.	0.	1.0942E-17	1.3915E-16
	2ND KIND	-2.4651-226	-4.4360-226	-5.7965-226	-6.3103-226	-6.4910-226	-6.5003-226
28	1ST KIND	0.	0.	0.	0.	3.4069E-01	1.1915E+01
	2ND KIND	-3.3811-223	-9.7590-223	-2.1921-222	-3.5311-222	-4.9903-222	-6.7067-222
29	1ST KIND	0.	0.	0.	0.	4.4560E-18	1.1767E-16
	2ND KIND	-2.6601-251	-3.8273-251	-4.2247-251	-4.1062-251	-3.8850-251	-3.6782-251
30	1ST KIND	0.	0.	0.	0.	0.	2.9098E-19
	2ND KIND	0.	0.	0.	0.	0.	0.
31	1ST KIND	0.	0.	0.	0.	1.9811E-19	8.1866E-18
	2ND KIND	-2.7418-246	-7.5164-246	-1.5697-245	-2.3988-245	-3.2468-245	-4.1880-245
32	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.
33	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.

RUN NO. 7 8 9 10

E/N VOLT-CM SQ., TOWNSENDS (X E-17)
 2.0000E+01 3.0000E+01 7.0000E+01 1.0000E+02
 DRIFT VELOCITY CM/SEC, E MU
 5.8558E+06 7.1073E+06 1.3022E+07 1.7701E+07
 CHARACTERISTIC ENERGY VOLT, D/MU
 1.1481E+00 1.7617E+00 3.6038E+00 4.6854E+00
 POWER=IE=Q X W X E/N X N AT 1 ATM. WATTS/ELECTRON, LMS
 5.0032E-09 9.1087E-09 3.8942E-08 7.5621E-08
 POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RMS
 4.6051E-09 8.3648E-09 3.7490E-08 7.4655E-08
 TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL,SUMA
 4.5419E+07 5.7634E+07 6.5842E+07 6.8620E+07
 DN DIFF CONST X MOL/CC, UNITS 10E16 MOL
 1.3807E+06 1.3870E+06 1.7496E+06 2.0594E+06
 MUN MORILITY X MOL/CC, UNITS 10E16 MOL
 2.9279E+06 2.3691E+06 1.8604E+06 1.7701E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL. J= 33

LEVEL		RUN NO. 7	8	9	10
1	1ST KIND	1.8891E-11	2.6670E-11	3.2206E-11	2.9991E-11
	2ND KIND	-1.5095E-13	-2.1111E-13	-2.5197E-13	-2.3429E-13
2	1ST KIND	1.1223E-11	1.4525E-11	1.3847E-11	1.1764E-11
	2ND KIND	-4.8242E-14	-6.1391E-14	-5.7449E-14	-4.8564E-14
3	1ST KIND	1.5313E+07	1.8832E+07	1.9831E+07	1.8131E+07
	2ND KIND	-4.7143E+04	-5.8336E+04	-6.1157E+04	-5.5745E+04
4	1ST KIND	1.1904E+07	1.5447E+07	1.5970E+07	1.4495E+07
	2ND KIND	-2.8319E+03	-3.5788E+03	-3.5631E+03	-3.2135E+03
5	1ST KIND	2.0970E+06	3.4340E+06	3.3278E+06	2.7468E+06
	2ND KIND	-3.2382E+01	-4.5763E+01	-3.9083E+01	-3.1517E+01
6	1ST KIND	6.1305E-12	6.5652E-12	4.3350E-12	3.4397E-12
	2ND KIND	-2.0577E-17	-2.0392E-17	-1.2392E-17	-9.4769E-18
7	1ST KIND	1.2475E+07	1.3336E+07	1.3390E+07	1.3044E+07
	2ND KIND	-3.6039E+01	-3.7724E+01	-3.7582E+01	-3.6627E+01
8	1ST KIND	2.0642E+06	3.1628E+06	2.9805E+06	2.4467E+06
	2ND KIND	-1.4065E+00	-1.8468E+00	-1.4982E+00	-1.1953E+00
9	1ST KIND	3.9229E+05	7.0179E+05	7.1555E+05	5.9182E+05
	2ND KIND	-1.4968E-02	-2.0762E-02	-1.6994E-02	-1.3451E-02
10	1ST KIND	5.8211E+05	1.0434E+06	1.0664E+06	8.8249E+05
	2ND KIND	-1.0806E-03	-1.4377E-03	-1.1308E-03	-8.9180E-04
11	1ST KIND	4.7267E-12	7.6727E-12	9.4266E-12	8.5218E-12
	2ND KIND	-4.3981E-21	-6.1773E-21	-6.5851E-21	-5.7621E-21
12	1ST KIND	4.8478E-12	4.6070E-12	2.8071E-12	2.0641E-12
	2ND KIND	-2.2562E-22	-1.9398E-22	-1.0180E-22	-7.1443E-23
13	1ST KIND	4.4835E-12	4.5972E-12	2.7956E-12	2.1126E-12
	2ND KIND	-3.5397E-27	-2.8948E-27	-1.4210E-27	-1.0076E-27
14	1ST KIND	2.8313E-12	2.9362E-12	1.8285E-12	1.3667E-12
	2ND KIND	-3.0762E-32	-2.3761E-32	-1.1141E-32	-7.6644E-33
15	1ST KIND	2.8031E-12	3.1063E-12	2.0414E-12	1.5430E-12
	2ND KIND	-2.8804E-37	-2.1555E-37	-9.8081E-38	-6.7206E-38

16	1ST KIND	1.1637E-12	1.3059E-12	8.6236E-13	6.5677E-13
	2ND KIND	-1.3912E-42	-9.7400E-43	-4.1573E-43	-2.8197E-43
17	1ST KIND	7.0485E-13	8.3813E-13	5.8722E-13	4.4475E-13
	2ND KIND	-6.9209E-48	-4.6017E-48	-1.8675E-48	-1.2488E-48
18	1ST KIND	5.6186E+05	9.8884E+05	1.0021E+06	8.2987E+05
	2ND KIND	-4.3424E-37	-3.1822E-37	-1.4279E-37	-9.7804E-38
19	1ST KIND	2.9118E-13	3.6505E-13	2.6087E-13	2.0198E-13
	2ND KIND	-3.0968E-53	-1.9241E-53	-7.3262E-54	-4.8626E-54
20	1ST KIND	9.8408E+02	4.5705E+03	1.3640E+04	1.5079E+04
	2ND KIND	-2.1743E-62	-3.5690E-62	-4.3256E-62	-3.7378E-62
21	1ST KIND	1.5907E-13	6.9518E-13	1.5977E-12	1.6156E-12
	2ND KIND	-1.7245E-97	-1.3140E-97	-6.2381E-98	-4.3583E-98
22	1ST KIND	9.7292E-14	6.5666E-13	2.7563E-12	3.3685E-12
	2ND KIND	-2.6641-126	-2.3174-126	-1.5729-126	-1.2898-126
23	1ST KIND	7.0930E+04	5.5985E+05	2.5989E+06	3.1574E+06
	2ND KIND	-2.3086-113	-2.0051-113	-1.0953-113	-7.9650-114
24	1ST KIND	2.4111E-14	2.8350E-13	2.2829E-12	3.3343E-12
	2ND KIND	-1.8944-155	-2.0026-155	-1.7981-155	-1.5711-155
25	1ST KIND	7.5485E+03	1.7826E+05	4.2933E+06	9.7465E+06
	2ND KIND	-4.0686-173	-6.0996-173	-1.2466-172	-1.6747-172
26	1ST KIND	2.2352E-15	6.6096E-14	1.6207E-12	3.2516E-12
	2ND KIND	-2.5098-203	-3.2382-203	-3.6910-203	-3.7776-203
27	1ST KIND	7.8204E-16	2.4202E-14	5.5427E-13	1.0288E-12
	2ND KIND	-6.4181-226	-5.7917-226	-3.8307-226	-2.9996-226
28	1ST KIND	9.5705E+01	6.5680E+03	6.5863E+05	2.2705E+06
	2ND KIND	-8.7512-222	-1.9343-221	-6.4794-221	-9.8026-221
29	1ST KIND	7.9314E-16	3.6344E-14	1.5764E-12	4.4640E-12
	2ND KIND	-3.5435-251	-3.8442-251	-1.0800-250	-1.6674-250
30	1ST KIND	5.0735E-18	7.7592E-16	1.9516E-13	8.6490E-13
	2ND KIND	0.	0.	0.	0.
31	1ST KIND	6.6820E-17	4.6476E-15	4.4549E-13	1.4686E-12
	2ND KIND	-5.2598-245	-1.0466-244	-2.9673-244	-4.1683-244
32	1ST KIND	2.3803E-03	7.6230E+01	5.5000E+04	2.7879E+05
	2ND KIND	0.	0.	0.	0.
33	1ST KIND	0.	2.6748E+01	4.0006E+03	4.3604E+04
	2ND KIND	0.	0.	0.	0.

HANCOCK-JONES CODE MIXING H2/HE/N2/CO2 0/60/20/20, 10 RUNS

FRACTIONS H2/HF/N2/CO2

2.0000E-19 6.0000E-01 2.0000E-01 2.0000E-01

RUN NO.	1	2	3	4	5	6
E/N VOLT-CM SQ., TOWNSEND (X E-17)	5.0000E+00	7.5000E+00	1.0000E+01	1.2500E+01	1.5000E+01	1.7500E+01
DRIFT VELOCITY CM/SEC, E MU	3.4856E+06	4.0218E+06	4.3735E+06	4.8637E+06	5.3263E+06	5.8037E+06
CHARACTERISTIC ENERGY VOLT, D/MU	1.7092E-01	3.0271E-01	4.5707E-01	5.7107E-01	6.7250E-01	7.5739E-01
POWER=IE*Q X W X E/N X N AT 1 ATM, WATTS/ELECTRON, LHS	7.4453E-10	1.2886E-09	1.8684E-09	2.5972E-09	3.4131E-09	4.3388E-09
POWER ABS. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS	7.5590E-10	1.2578E-09	1.8372E-09	2.4695E-09	3.2525E-09	4.1333E-09
TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL, SUMA	1.3688E+07	1.8455E+07	2.2078E+07	2.4949E+07	2.8049E+07	3.1356E+07
DN DIFF CONST X MOL/CC, UNITS 10E16 MOL	1.1652E+06	1.2210E+06	1.2264E+06	1.2128E+06	1.1894E+06	1.1685E+06
MUN MOBILITY X MOL/CC, UNITS 10E16 MOL	6.9713E+06	5.3623E+06	4.3735E+06	3.8910E+06	3.5509E+06	3.3164E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL, J= 33

LEVEL		RUN NO. 1	2	3	4	5	6
1	1ST KIND	1.0269E-12	2.5772E-12	4.4394E-12	5.8444E-12	7.1108E-12	8.2641E-12
	2ND KIND	-9.0213E-15	-2.1644E-14	-3.6672E-14	-4.7939E-14	-5.8037E-14	-6.7175E-14
2	1ST KIND	5.6507E-13	1.5134E-12	2.6644E-12	3.5364E-12	4.3209E-12	5.0279E-12
	2ND KIND	-2.8917E-15	-7.1105E-15	-1.2150E-14	-1.5922E-14	-1.9282E-14	-2.2277E-14
3	1ST KIND	9.2820E+06	9.9599E+06	9.7285E+06	9.4824E+06	9.3664E+06	9.4637E+06
	2ND KIND	-2.9948E+04	-2.9624E+04	-2.8274E+04	-2.7492E+04	-2.7302E+04	-2.7749E+04
4	1ST KIND	2.4477E+06	3.6711E+06	4.4580E+06	4.9233E+06	5.3638E+06	5.8308E+06
	2ND KIND	-7.7402E+02	-9.1314E+02	-1.0368E+03	-1.1330E+03	-1.2362E+03	-1.3509E+03
5	1ST KIND	2.6958E-01	1.8856E+02	4.4798E+03	2.6444E+04	8.7628E+04	2.0345E+05
	2ND KIND	-5.0560E-05	-1.2418E-02	-1.7228E-01	-7.3577E-01	-1.9681E+00	-3.9389E+00
6	1ST KIND	1.5347E+04	1.6344E+05	5.7205E+05	1.0728E+06	1.6291E+06	2.1620E+06
	2ND KIND	-1.6131E-01	-1.4252E+00	-4.0960E+00	-6.5992E+00	-8.9032E+00	-1.0729E+01
7	1ST KIND	1.9705E+06	4.5600E+06	6.6237E+06	7.7354E+06	8.4841E+06	8.9570E+06
	2ND KIND	-1.3307E+01	-1.8609E+01	-2.2531E+01	-2.4577E+01	-2.5950E+01	-2.6845E+01
8	1ST KIND	4.4044E+02	1.0888E+04	4.7376E+04	1.0725E+05	2.0180E+05	3.3509E+05
	2ND KIND	-1.4568E-03	-2.2467E-02	-7.5191E-02	-1.4060E-01	-2.2429E-01	-3.2309E-01
9	1ST KIND	3.0958E-02	2.2628E+01	5.8905E+02	3.8681E+03	1.4083E+04	3.5182E+04
	2ND KIND	-7.5044E-08	-9.6350E-06	-1.0146E-04	-3.8444E-04	-9.7393E-04	-1.8982E-03
10	1ST KIND	4.5990E-02	3.3592E+01	8.7358E+02	5.7335E+03	2.0877E+04	5.2177E+04
	2ND KIND	-1.2282E-08	-1.1380E-06	-1.0086E-05	-3.4355E-05	-8.1090E-05	-1.5028E-04
11	1ST KIND	3.4711E-14	2.3104E-13	5.5100E-13	8.4010E-13	1.1383E-12	1.4508E-12
	2ND KIND	-1.7140E-22	-4.9724E-22	-9.1030E-22	-1.2314E-21	-1.5277E-21	-1.8053E-21
12	1ST KIND	1.5158E+03	5.7889E+04	2.8513E+05	6.2415E+05	1.0365E+06	1.4503E+06
	2ND KIND	-2.3554E-06	-2.9057E-05	-7.8430E-05	-1.1793E-04	-1.4885E-04	-1.6953E-04
13	1ST KIND	8.2382E+02	3.8837E+04	2.1414E+05	5.0208E+05	8.7314E+05	1.2637E+06
	2ND KIND	-9.2200E-11	-7.8379E-10	-1.7894E-09	-2.4651E-09	-2.9275E-09	-3.1882E-09

14	1ST KIND	2.2362E+02	1.4687E+04	9.6446E+04	2.5024E+05	4.6483E+05	7.0195E+05
	2ND KIND	-1.8999E-15	-1.1156E-14	-2.1568E-14	-2.7348E-14	-3.0648E-14	-3.2049E-14
15	1ST KIND	7.7298E+01	7.0115E+03	5.5767E+04	1.6486E+05	3.3707E+05	5.4913E+05
	2ND KIND	-3.3804E-20	-1.3904E-19	-2.3478E-19	-2.8107E-19	-3.0461E-19	-3.1213E-19
16	1ST KIND	5.7882E+00	1.1459E+03	1.3094E+04	4.7083E+04	1.0823E+05	1.8995E+05
	2ND KIND	-3.5630E-25	-1.0601E-24	-1.4995E-24	-1.6351E-24	-1.6622E-24	-1.6333E-24
17	1ST KIND	1.0819E+00	3.2928E+02	4.7985E+03	2.0102E+04	5.1245E+04	9.6729E+04
	2ND KIND	-3.8040E-30	-7.5849E-30	-8.9823E-30	-9.0188E-30	-8.7146E-30	-8.2908E-30
18	1ST KIND	5.2908E-02	3.7858E+01	9.4658E+02	5.9662E+03	2.1055E+04	5.1499E+04
	2ND KIND	-1.5757E-37	-2.9899E-37	-4.0479E-37	-4.5089E-37	-4.7139E-37	-4.7408E-37
19	1ST KIND	8.9992E-02	5.6004E+01	1.1514E+03	5.8455E+03	1.6765E+04	3.4232E+04
	2ND KIND	-3.7349E-35	-5.2088E-35	-5.0708E-35	-4.5894E-35	-4.1350E-35	-3.7628E-35
20	1ST KIND	5.0195E-10	1.0467E-04	4.0555E-02	1.1118E+00	9.5054E+00	4.1731E+01
	2ND KIND	-1.1223E-62	-1.5498E-62	-1.6022E-62	-1.5240E-62	-1.4404E-62	-1.3972E-62
21	1ST KIND	0.	1.0262E-03	1.4785E+00	7.8188E+01	9.7089E+02	5.2846E+03
	2ND KIND	-5.7200E-80	-1.1106E-79	-1.5025E-79	-1.6711E-79	-1.7489E-79	-1.7650E-79
22	1ST KIND	0.	1.4857E-05	1.0834E-01	1.1208E+01	2.1585E+02	1.6062E+03
	2ND KIND	-8.7799-109	-1.5255-108	-2.0045-108	-2.2339-108	-2.3618-108	-2.4155-108
23	1ST KIND	0.	1.5507E-06	3.6828E-02	4.8291E+00	1.0979E+02	9.2369E+02
	2ND KIND	-3.7710-114	-8.3502-114	-1.2674-113	-1.5215-113	-1.6960-113	-1.8026-113
24	1ST KIND	0.	0.	1.5974E-03	4.5433E-01	1.5902E+01	1.7988E+02
	2ND KIND	-6.1284-138	-9.2985-138	-1.1456-137	-1.2539-137	-1.3269-137	-1.3761-137
25	1ST KIND	0.	0.	0.	1.5733E-02	1.2749E+00	2.2719E+01
	2ND KIND	-3.1416-174	-7.5303-174	-1.2342-173	-1.5657-173	-1.8393-173	-2.0670-173
26	1ST KIND	0.	0.	0.	1.3664E-03	2.1217E-01	4.4896E+00
	2ND KIND	-1.3032-186	-3.1632-186	-5.3108-186	-6.9584-186	-8.5308-186	-1.0053-185
27	1ST KIND	0.	0.	0.	0.	5.2922E-02	1.2989E+00
	2ND KIND	-2.3111-208	-3.9082-208	-4.8867-208	-5.2718-208	-5.4583-208	-5.5268-208
28	1ST KIND	0.	0.	0.	0.	9.9484E-04	4.7353E-02
	2ND KIND	-3.3142-223	-8.3059-223	-1.4393-222	-1.9196-222	-2.3852-222	-2.8693-222
29	1ST KIND	0.	0.	0.	0.	1.0352E-02	4.7252E-01
	2ND KIND	-2.3816-233	-3.2770-233	-3.6043-233	-3.6176-233	-3.5488-233	-3.4518-233
30	1ST KIND	0.	0.	0.	0.	0.	6.2226E-04
	2ND KIND	-3.3306-261	-8.8688-261	-1.5239-260	-2.0021-260	-2.4556-260	-2.9284-260
31	1ST KIND	0.	0.	0.	0.	5.1376E-22	2.9289E-20
	2ND KIND	-2.6844-246	-6.5130-246	-1.0895-245	-1.4141-245	-1.7107-245	-1.9995-245
32	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.
33	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.

16	1ST KIND	2.8249E+05	6.0893E+05	7.7077E+05	6.5353E+05
	2ND KIND	-1.5768E-24	-1.2685E-24	-5.4673E-25	-3.6783E-25
17	1ST KIND	1.5159E+05	3.6522E+05	5.1368E+05	4.3563E+05
	2ND KIND	-7.8364E-30	-6.0456E-30	-2.4905E-30	-1.6527E-30
18	1ST KIND	9.8911E+04	3.7784E+05	8.1497E+05	7.6289E+05
	2ND KIND	-4.6653E-37	-3.9272E-37	-1.8121E-37	-1.2387E-37
19	1ST KIND	5.6590E+04	1.5096E+05	2.2475E+05	1.9596E+05
	2ND KIND	-3.4496E-35	-2.5247E-35	-9.8961E-36	-6.5458E-36
20	1ST KIND	1.2193E+02	1.1775E+03	8.2006E+03	1.0632E+04
	2ND KIND	-1.4113E-62	-1.9588E-62	-3.4949E-62	-3.3543E-62
21	1ST KIND	1.7439E+04	1.8657E+05	1.0453E+06	1.2293E+06
	2ND KIND	-1.7456E-79	-1.5091E-79	-7.5340E-80	-5.3050E-80
22	1ST KIND	6.7213E+03	1.2607E+05	1.4829E+06	2.1640E+06
	2ND KIND	-2.4256-108	-2.2599-108	-1.5480-108	-1.2816-108
23	1ST KIND	4.2456E+03	9.8403E+04	1.3853E+06	2.0439E+06
	2ND KIND	-1.8650-113	-1.8509-113	-1.1821-113	-8.9197-114
24	1ST KIND	1.0277E+03	3.8899E+04	1.0195E+06	1.8394E+06
	2ND KIND	-1.4140-137	-1.5155-137	-1.5428-137	-1.4221-137
25	1ST KIND	1.8181E+02	1.5257E+04	1.3410E+06	3.8256E+06
	2ND KIND	-2.2845-173	-3.2575-173	-7.4062-173	-1.0100-172
26	1ST KIND	4.0973E+01	4.7149E+03	5.1371E+05	1.3734E+06
	2ND KIND	-1.1613-185	-1.7638-185	-2.7392-185	-2.8965-185
27	1ST KIND	1.2971E+01	1.7048E+03	1.8224E+05	4.5882E+05
	2ND KIND	-5.5336-208	-5.2752-208	-3.8093-208	-3.0933-208
28	1ST KIND	6.8129E-01	2.4195E+02	1.4750E+05	6.8257E+05
	2ND KIND	-3.4511-222	-7.3172-222	-3.2987-221	-5.3140-221
29	1ST KIND	6.3289E+00	1.6328E+03	4.0582E+05	1.4617E+06
	2ND KIND	-3.3471-233	-3.0502-233	-5.5509-233	-8.9591-233
30	1ST KIND	2.0919E-02	2.1237E+01	3.7110E+04	2.2266E+05
	2ND KIND	-3.5121-260	-7.8061-260	-4.0881-259	-6.8670-259
31	1ST KIND	4.4261E-19	1.6827E-16	1.0158E-13	4.5604E-13
	2ND KIND	-2.3279-245	-4.3424-245	-1.6067-244	-2.4045-244
32	1ST KIND	7.1816E-06	1.4919E+00	9.1460E+03	6.6859E+04
	2ND KIND	0.	0.	0.	0.
33	1ST KIND	0.	1.1619E-03	2.9989E+02	5.6994E+03
	2ND KIND	0.	0.	0.	0.

HANCOCK-JONES CODE MIXING H2/HE/N2/CO2 0/50/33/17, 10 RUNS

FRACTIONS H2/HE/N2/CO2

1.6667E-19 5.0000E-01 3.3333E-01 1.6667E-01

RUN NO.	1	2	3	4	5	6
E/N VOLT-CM SQ., TOWNSENDS (X F-17)	5.0000E+00	7.5000E+00	1.0000E+01	1.2500E+01	1.5000E+01	1.7500E+01
DRIFT VELOCITY CM/SEC, E MU	3.2486E+06	3.6877E+06	4.0114E+06	4.4999E+06	4.9587E+06	5.4504E+06
CHARACTERISTIC ENERGY VOLT, D/MU	1.9175E-01	3.4500E-01	4.8872E-01	5.9109E-01	6.8060E-01	7.4909E-01
POWER=IE=Q X W X E/N X N AT 1 ATM. WATTS/ELECTRON, LHS	6.9791E-10	1.1815E-09	1.7137E-09	2.4029E-09	3.1775E-09	4.0748E-09
POWER ARS. BY INELASTIC COLL. WATTS/ELECTRON STP. RHS	7.0211E-10	1.1487E-09	1.6792E-09	2.2550E-09	3.0138E-09	3.8643E-09
TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL, SUMA	1.2247E+07	1.6179E+07	1.9275E+07	2.1805E+07	2.4610E+07	2.7537E+07
DN DIFF CONST X MOL/CC, UNITS 10E16 MOL	1.1355E+06	1.1361E+06	1.1031E+06	1.0745E+06	1.0433E+06	1.0193E+06
MUN MOBILITY X MOL/CC, UNITS 10E16 MOL	6.4973E+06	4.9170E+06	4.0114E+06	3.5999E+06	3.3058E+06	3.1145E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL, J= 33

LEVEL		RUN NO. 1	2	3	4	5	6
1	1ST KIND	1.0099E-12	2.4098E-12	3.8678E-12	4.8329E-12	5.6619E-12	6.3478E-12
	2ND KIND	-8.7825E-15	-2.0169E-14	-3.1936E-14	-3.9684E-14	-4.6310E-14	-5.1763E-14
2	1ST KIND	5.6395E-13	1.4220E-12	2.3237E-12	2.9231E-12	3.4381E-12	3.8623E-12
	2ND KIND	-2.8246E-15	-6.6398E-15	-1.0588E-14	-1.3186E-14	-1.5401E-14	-1.7210E-14
3	1ST KIND	7.9881E+06	8.3252E+06	8.0526E+06	7.8279E+06	7.6772E+06	7.6576E+06
	2ND KIND	-2.5153E+04	-2.4505E+04	-2.3284E+04	-2.2592E+04	-2.2240E+04	-2.2261E+04
4	1ST KIND	2.2564E+06	3.2208E+06	3.7878E+06	4.0816E+06	4.3357E+06	4.5735E+06
	2ND KIND	-6.6689E+02	-7.8031E+02	-8.7137E+02	-9.3164E+02	-9.9037E+02	-1.0492E+03
5	1ST KIND	3.0929E-02	2.9925E+01	8.8505E+02	6.2195E+03	2.4090E+04	6.3693E+04
	2ND KIND	-1.2039E-05	-3.1399E-03	-4.7074E-02	-2.1894E-01	-6.4436E-01	-1.4085E+00
6	1ST KIND	3.4402E+04	2.8781E+05	8.6449E+05	1.5000E+06	2.2039E+06	2.8775E+06
	2ND KIND	-3.7005E-01	-2.7820E+00	-7.0501E+00	-1.0624E+01	-1.3920E+01	-1.6483E+01
7	1ST KIND	1.9891E+06	4.2078E+06	5.7950E+06	6.5831E+06	7.1212E+06	7.4452E+06
	2ND KIND	-1.1880E+01	-1.6311E+01	-1.9297E+01	-2.0738E+01	-2.1720E+01	-2.2390E+01
8	1ST KIND	5.3251E+02	9.1378E+03	3.2349E+04	6.3242E+04	1.0769E+05	1.6775E+05
	2ND KIND	-1.9030E-03	-2.1286E-02	-5.9575E-02	-9.8419E-02	-1.4390E-01	-1.9429E-01
9	1ST KIND	3.5402E-03	3.5308E+00	1.1297E+02	8.8040E+02	3.7587E+03	1.0743E+04
	2ND KIND	-3.0702E-08	-3.4238E-06	-3.4350E-05	-1.3040E-04	-3.4502E-04	-7.1286E-04
10	1ST KIND	5.2595E-03	5.2430E+00	1.6760E+02	1.3054E+03	5.5733E+03	1.5935E+04
	2ND KIND	-6.4926E-09	-4.8489E-07	-3.9206E-06	-1.2967E-05	-3.1222E-05	-6.0206E-05
11	1ST KIND	4.1781E-14	2.2638E-13	4.7608E-13	6.6861E-13	8.5270E-13	1.0251E-12
	2ND KIND	-1.7319E-22	-4.7027E-22	-7.9434E-22	-1.0140E-21	-1.2059E-21	-1.3682E-21
12	1ST KIND	2.8459E+03	8.2114E+04	3.0274E+05	7.5931E+05	1.2545E+06	1.7680E+06
	2ND KIND	-6.3108E-06	-5.9180E-05	-1.4166E-04	-2.0129E-04	-2.4922E-04	-2.8179E-04
13	1ST KIND	1.3480E+03	4.9168E+04	2.4812E+05	5.6485E+05	9.8813E+05	1.4526E+06
	2ND KIND	-2.4038E-10	-1.6038E-09	-3.2913E-09	-4.3243E-09	-5.0601E-09	-5.4881E-09

14	1ST KIND	2.8924E+02	1.5435E+04	9.6330E+04	2.4971E+05	4.7696E+05	7.4403E+05
	2ND KIND	-4.6950E-15	-2.2394E-14	-3.9554E-14	-4.8364E-14	-5.3723E-14	-5.6215E-14
15	1ST KIND	7.9297E+01	6.1167E+03	4.7260E+04	1.4190E+05	3.0244E+05	5.1515E+05
	2ND KIND	-7.7884E-20	-2.7055E-19	-4.2393E-19	-4.9350E-19	-5.3220E-19	-5.4727E-19
16	1ST KIND	3.0767E+00	6.5391E+02	8.2113E+03	3.2370E+04	8.1737E+04	1.5570E+05
	2ND KIND	-7.7762E-25	-1.9921E-24	-2.6500E-24	-2.8402E-24	-2.8890E-24	-2.8625E-24
17	1ST KIND	4.2675E-01	1.5016E+02	2.5113E+03	1.1907E+04	3.4166E+04	7.1358E+04
	2ND KIND	-7.6463E-30	-1.3628E-29	-1.5435E-29	-1.5389E-29	-1.4953E-29	-1.4400E-29
18	1ST KIND	6.0602E-03	5.9557E+00	1.8396E+02	1.3763E+03	5.6824E+03	1.5864E+04
	2ND KIND	-1.5048E-37	-2.7256E-37	-3.5581E-37	-3.9067E-37	-4.0859E-37	-4.1362E-37
19	1ST KIND	2.1251E-02	1.8631E+01	4.8374E+02	2.9399E+03	9.8497E+03	2.2828E+04
	2ND KIND	-6.9919E-35	-8.9065E-35	-8.4002E-35	-7.6302E-35	-6.9506E-35	-6.4345E-35
20	1ST KIND	3.2108E-11	1.2626E-05	6.8527E-03	2.3304E-01	2.3419E+00	1.1578E+01
	2ND KIND	-1.0290E-62	-1.3372E-62	-1.3464E-62	-1.2903E-62	-1.2109E-62	-1.1632E-62
21	1ST KIND	0.	2.2911E-04	4.2220E-01	2.7370E+01	4.0695E+02	2.5733E+03
	2ND KIND	-1.0999E-79	-2.0266E-79	-2.6356E-79	-2.8848E-79	-3.0140E-79	-3.0547E-79
22	1ST KIND	0.	2.1015E-06	1.9562E-02	2.6783E+00	6.5123E+01	5.8508E+02
	2ND KIND	-1.6489-108	-2.7457-108	-3.4870-108	-3.8230-108	-4.0251-108	-4.1199-108
23	1ST KIND	0.	1.0443E-07	2.9231E-03	5.1399E-01	1.4923E+01	1.5306E+02
	2ND KIND	-3.6793-114	-7.7339-114	-1.1144-113	-1.2985-113	-1.4291-113	-1.5075-113
24	1ST KIND	0.	0.	1.8327E-04	7.1654E-02	3.3392E+00	4.7557E+01
	2ND KIND	-1.1221-137	-1.6419-137	-1.9652-137	-2.1153-137	-2.2173-137	-2.2821-137
25	1ST KIND	0.	0.	0.	7.8680E-04	8.7331E-02	2.0734E+00
	2ND KIND	-3.0860-174	-7.0219-174	-1.0814-173	-1.3146-173	-1.5016-173	-1.6435-173
26	1ST KIND	0.	0.	0.	1.2862E-04	2.5267E-02	7.1241E-01
	2ND KIND	-2.5611-186	-5.8907-186	-9.2205-186	-1.1417-185	-1.3364-185	-1.5070-185
27	1ST KIND	0.	0.	0.	0.	5.3124E-03	1.8149E-01
	2ND KIND	-4.3468-208	-6.9868-208	-8.4393-208	-8.9729-208	-9.2469-208	-9.3538-208
28	1ST KIND	0.	0.	0.	0.	3.6872E-05	2.1410E-03
	2ND KIND	-3.2633-223	-7.7448-223	-1.2471-222	-1.5706-222	-1.8617-222	-2.1255-222
29	1ST KIND	0.	0.	0.	0.	6.4598E-04	4.0404E-02
	2ND KIND	-4.3123-233	-5.6945-233	-6.1266-233	-6.1291-233	-6.0347-233	-5.9100-233
30	1ST KIND	0.	0.	0.	0.	0.	3.3155E-05
	2ND KIND	-6.7605-261	-1.6635-260	-2.6564-260	-3.3077-260	-3.8787-260	-4.3889-260
31	1ST KIND	0.	0.	0.	0.	1.7484E-23	1.2117E-21
	2ND KIND	-2.6378-246	-6.0664-246	-9.4853-246	-1.1704-245	-1.3611-245	-1.5241-245
32	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.
33	1ST KIND	0.	0.	0.	0.	0.	0.
	2ND KIND	0.	0.	0.	0.	0.	0.

RUN NO. 7 8 9 10

E/N VOLT-CM SQ., TOWNSENDS (X E-17)
 2.0000E+01 3.0000E+01 7.0000E+01 1.0000E+02
 DRIFT VELOCITY CM/SEC, E MU
 5.9426E+06 7.7833E+06 1.2901E+07 1.6560E+07
 CHARACTERISTIC ENERGY VOLT, 0/MU
 8.0777E-01 1.0246E+00 2.2420E+00 3.0934E+00
 POWER=IE=Q X W X F/N X N AT 1 ATM. WATTS/ELECTRON, LHS
 5.0774E-09 9.9751E-09 3.8579E-08 7.0746E-08
 POWER ARG. BY INELASTIC COLL. WATTS/ELECTRON STP, RHS
 4.8099E-09 9.2640E-09 3.7112E-08 6.9542E-08
 TOTAL COLL. RATE / ELECTRON / MOL, UNITS 10E16 MOL, SUMA
 3.0436E+07 4.3621E+07 6.9783E+07 7.5250E+07
 DN DIFF CONST X MOL/CC, UNITS 10E16 MOL
 1.0004E+06 9.6741E+05 1.0682E+06 1.1900E+06
 MUN MOBILITY X MOL/CC, UNITS 10E16 MOL
 2.9713E+06 2.5944E+06 1.8430E+06 1.6560E+06

COLL RATE EACH LEVEL FOR Q(J), UNITS 10E16 MOL, J= 33

LEVEL		RUN NO. 7	8	9	10
1	1ST KIND	7.0032E-12	9.9339E-12	1.9213E-11	2.0695E-11
	2ND KIND	-5.6947E-14	-7.9880E-14	-1.5134E-13	-1.6241E-13
2	1ST KIND	4.2628E-12	5.9267E-12	9.5036E-12	9.3023E-12
	2ND KIND	-1.8900E-14	-2.5770E-14	-3.9880E-14	-3.8729E-14
3	1ST KIND	7.7183E+06	8.7719E+06	1.2762E+07	1.3059E+07
	2ND KIND	-2.2590E+04	-2.6271E+04	-3.9315E+04	-4.0163E+04
4	1ST KIND	4.8387E+06	6.2917E+06	1.0269E+07	1.0470E+07
	2ND KIND	-1.1155E+03	-1.4614E+03	-2.3195E+03	-2.3447E+03
5	1ST KIND	1.3167E+05	6.5047E+05	2.1322E+06	2.1596E+06
	2ND KIND	-2.5463E+00	-9.6949E+00	-2.6099E+01	-2.5622E+01
6	1ST KIND	3.5265E+06	5.6110E+06	6.9962E+06	6.3302E+06
	2ND KIND	-1.8595E+01	-2.3697E+01	-2.2092E+01	-1.8604E+01
7	1ST KIND	7.6808E+06	8.2207E+06	8.9465E+06	8.9514E+06
	2ND KIND	-2.2765E+01	-2.3796E+01	-2.5214E+01	-2.5117E+01
8	1ST KIND	2.4796E+05	7.3780E+05	1.9696E+06	1.9580E+06
	2ND KIND	-2.5216E-01	-5.3343E-01	-1.0565E+00	-1.0042E+00
9	1ST KIND	2.3523E+04	1.2975E+05	4.5536E+05	4.6349E+05
	2ND KIND	-1.2472E-03	-4.4979E-03	-1.1537E-02	-1.1120E-02
10	1ST KIND	3.4908E+04	1.9286E+05	6.7825E+05	6.9075E+05
	2ND KIND	-1.0029E-04	-3.2799E-04	-7.8017E-04	-7.4591E-04
11	1ST KIND	1.2104E-12	2.2156E-12	5.6189E-12	6.0518E-12
	2ND KIND	-1.5272E-21	-2.2589E-21	-4.2443E-21	-4.3328E-21
12	1ST KIND	3.2734E+06	7.8777E+06	4.7513E+06	3.9860E+06
	2ND KIND	-3.0311E-04	-3.2899E-04	-2.2259E-04	-1.6349E-04
13	1ST KIND	1.9263E+06	3.5423E+06	4.6028E+06	4.0006E+06
	2ND KIND	-5.7244E-09	-5.7282E-09	-3.3557E-09	-2.4307E-09
14	1ST KIND	1.0309E+06	2.0753E+06	2.9441E+06	2.5571E+06
	2ND KIND	-5.7184E-14	-5.3523E-14	-2.8336E-14	-1.9555E-14
15	1ST KIND	7.6519E+05	1.8306E+06	3.0997E+06	2.7715E+06
	2ND KIND	-5.4975E-19	-5.0074E-19	-2.5513E-19	-1.7480E-19

16	1ST KIND	2.4962E+05	6.8868E+05	1.2808E+06	1.1659E+06
	2ND KIND	-2.8008E-24	-2.4149E-24	-1.1398E-24	-7.6710E-25
17	1ST KIND	1.2242E+05	3.9192E+05	8.4031E+05	7.6892E+05
	2ND KIND	-1.3833E-29	-1.1502E-29	-5.2124E-30	-3.4620E-30
18	1ST KIND	3.4203E+04	1.8404E+05	6.3836E+05	6.5012E+05
	2ND KIND	-4.1173E-37	-3.6952E-37	-1.8639E-37	-1.2767E-37
19	1ST KIND	4.2102E+04	1.5520E+05	3.6345E+05	3.4353E+05
	2ND KIND	-6.0172E-35	-4.7836E-35	-2.0769E-35	-1.3771E-35
20	1ST KIND	3.7224E+01	4.8340E+02	5.5289E+03	7.9494E+03
	2ND KIND	-1.1432E-62	-1.3708E-62	-2.7762E-62	-2.8461E-62
21	1ST KIND	9.6646E+03	1.5250E+05	1.4704E+06	1.9113E+06
	2ND KIND	-3.0488E-79	-2.7865E-79	-1.5139E-79	-1.0719E-79
22	1ST KIND	2.8685E+03	8.5210E+04	1.8804E+06	3.0824E+06
	2ND KIND	-4.1562-108	-4.0011-108	-2.8472-108	-2.3626-108
23	1ST KIND	8.3142E+02	3.1389E+04	8.6838E+05	1.4550E+06
	2ND KIND	-1.5585-113	-1.5955-113	-1.1200-113	-8.6159-114
24	1ST KIND	3.2917E+02	2.1543E+04	1.1685E+06	2.4088E+06
	2ND KIND	-2.3306-137	-2.4647-137	-2.6104-137	-2.4721-137
25	1ST KIND	2.0953E+01	3.2981E+03	6.3046E+05	2.0790E+06
	2ND KIND	-1.7699-173	-2.3180-173	-5.2786-173	-7.2761-173
26	1ST KIND	8.2440E+00	1.8284E+03	4.7948E+05	1.5312E+06
	2ND KIND	-1.6773-185	-2.4180-185	-4.2903-185	-4.6751-185
27	1ST KIND	2.3747E+00	6.4350E+02	1.7310E+05	5.2473E+05
	2ND KIND	-9.3813-208	-9.1167-208	-6.9523-208	-5.7443-208
28	1ST KIND	3.9766E-02	3.0511E+01	5.5226E+04	3.1438E+05
	2ND KIND	-2.4139-222	-4.3360-222	-2.1365-221	-3.5744-221
29	1ST KIND	7.4912E-01	4.6061E+02	3.3532E+05	1.4355E+06
	2ND KIND	-5.7763-233	-5.2931-233	-7.5637-233	-1.2064-232
30	1ST KIND	1.5262E-03	4.2031E+00	2.5230E+04	1.8800E+05
	2ND KIND	-4.9537-260	-9.0593-260	-5.1840-259	-9.0452-259
31	1ST KIND	2.4134E-20	2.0777E-17	3.8288E-14	2.1283E-13
	2ND KIND	-1.6927-245	-2.7187-245	-1.0741-244	-1.6700-244
32	1ST KIND	2.0189E-07	1.1561E-01	2.8307E+03	2.6642E+04
	2ND KIND	0.	0.	0.	0.
33	1ST KIND	0.	3.3150E-05	5.4783E+01	1.5168E+03
	2ND KIND	0.	0.	0.	0.