SLP-995-72
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TO: Distribution

FROM: D. W. Hewett

SUBJECT: Program to Evaluate Electron Counting Efficiencies

I. Introduction

This program is designed to compute silicon electron detector efficiencies for various electron incident energies. The program essentially performs a numerical integration of the energy deposition function which has been tabulated for various incident energies at several detector thicknesses.[1] Absolute efficiencies may be calculated for arbitrary detector thresholds Eth; and, any tabulated detector thickness t may be considered by choosing the appropriate data set.

The detector relative efficiency may be defined as

$$\epsilon(T_o, E_{th}, t) \equiv \frac{\int_{E_{th}}^{\infty} dh\ R(T_o, h, t)}{\int_{E_m}^{\infty} dh\ R(T_o, h, t)} \qquad (1)$$

where T_o is the incident energy, $R(T_o, h, t)$ is the response function of the detector, and E_m is the threshold of the beam monitoring detector. The response function may be further broken down as follows:

$$R(T_o, h, t) = \int_o^{\infty} D(T_o, T, t)\ G(T, h) dT \qquad (2)$$

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[1] M.J. Berger, S.M. Seltzer, S.E. Chappell, J.C. Humphreys, and J.W. Motz; Tables of Response Functions for Silicon Electron Detectors, NBS Technical Note 489 (August 1969).

$D(T_o,T,t)dT$ is the probability that an incident electron at T_o incident will deposit an energy between T and T + dT; and, $G(T,h)dh$ is the probability that an energy loss T will produce a pulse height between h and h + dh. G(T,h) has been taken to have the following form:

$$G(T,h) = \frac{1}{\sqrt{2\pi}\ \sigma}\ e^{-\frac{(h-T)^2}{2\sigma^2}} \qquad (3)$$

σ depends upon detector and electronic noise (σ = full width at half maximum /2.348). $D(T_o,T,t)$ may conveniently be broken down one further step.

$$D(T_o,T,t) = D_E(T_o,T,t) + P_A(T_o,t)\ \delta(T - T_o) \qquad (4)$$

The second term on the right represents a total absorption peak while the first term represents the energy deposition contribution from electrons before they have been completely stopped. It is these two functions, $D_E(T_o,T,t)$ and $P_A(T_o,t)$, that are tabulated in reference (1).

This is the expression which results from these substituting (3) and (4) into (2) and integrating

$$\int_E^\infty dh\ R(T_o,h,t) = \frac{1}{\sqrt{2\pi}\ \sigma}\int_E^\infty \left[\int_o^{T_o} dT\ D_E(T_o,T,t)\ e^{-\frac{(h-T)^2}{2\sigma^2}} + P_A(T_o,t)\ e^{-\frac{(h-T_o)^2}{2\sigma^2}}\right] dh \qquad (5)$$

The second term on the right may be expressed in terms of the error function.

$$\int_E^\infty P_A(T_o,t)\, e^{-\frac{(h-T_o)^2}{2\sigma^2}}\, dh = P_A(T_o,t) \int_{\frac{E-T_o}{\sqrt{2}\,\sigma}}^\infty \sqrt{2}\,\sigma\, e^{-\frac{x^2}{2}}\, dx \qquad (6)$$

$$= \sqrt{\frac{\pi}{2}}\,\sigma\, P_A(T_o,t)\ \mathrm{erfc}\ \frac{E-T_o}{\sqrt{2}\,\sigma}$$

$$= \sqrt{\frac{\pi}{2}}\,\sigma\, P_A(T_o,t)\left[1 + \mathrm{erf}\left(\frac{T_o-E}{\sqrt{2}\,\sigma}\right)\right]$$

Therefore the final equation to be solved numerically is

$$\epsilon(T_o,E_{th},t) = \frac{ENT(E_{th},T_o)}{ENT(E_m,T_o)} \qquad (7)$$

where

$$ENT(E,T_o) = \int_E^\infty dh \int_o^{T_o} dT\, D_E(T_o,T,t)\, e^{-\frac{(h-T)^2}{2\sigma^2}} \qquad (8)$$

$$+ \sqrt{\frac{\pi}{2}}\,\sigma\, P_A(T_o,t)\left[1 + \mathrm{erf}\left(\frac{T_o-E}{\sqrt{2}\,\sigma}\right)\right]$$

II. Numerical Procedure

The numerical procedure involved in calculating a detector efficiency may be broken down into several general sections. First, run parameters and data tables are read in; a specific incident energy and detector threshold is chosen; and, an efficiency value is calculated.

This last step, of course, involves the evaluation of ENT in a function subroutine ENT(E,TTOP,TZERO). This routine first employs a 16 point trapezoidal rule technique to perform the integration over h from E to "infinity" (TTOP). The integrand of this integration is itself the integral of $D_E(T_o,T,t)$ $\exp(-(h-T)^2/2\sigma^2)$ dT. This "second" integration is done with a 32 point trapezoidal quadrature in another function subroutine RESP(TZERO,H). The integrand of this integral is, aside from the exponential factor, an interpolated value from the selected input data table. This interpolated value and the exponential multiplier are generated in still another function subroutine called DAVW(H,T). These routines and their functions are denoted in this diagram.

$$\text{ENT}(E,\text{TTOP},\text{TZERO}) \equiv \underbrace{\int_E^{\text{TTOP}} dh \underbrace{\int_o^{T_o} dT\, D_E(T_o,T,t)\, e^{-\frac{(h-T)^2}{2\sigma^2}}}_{\text{DAVW}(T,H)}}_{\text{RESP}(\text{TZERO},H)} + \sqrt{\frac{\pi}{2}}\,\sigma\, P_A(T_o,t)\left[1+\text{erf}\left(\frac{T_o-E}{\sqrt{2}\,\sigma}\right)\right] \tag{9}$$

One other difficulty is that the original data is presented by giving an average value of D_E for each small energy band DELTE from 0 to TZERO. The obvious way to interpret this data is to assign each average D_E value to the

argument of the midpoint of the corresponding energy interval. This arrangement causes the endpoints of the integration to be slightly outside this data table. Since the interpolation routine is required to produce values for all integration arguments, the original table was extended on both ends. At the lower end of the argument range, the D_E function was extended to the negative side of T = 0 by treating D_E as an odd function, i.e. $D_E(T_o,T,t) = -D_E(T_o,-T,t)$. This extension insures that the interpolated values of D_E will go through zero when the argument is zero. On the top end of the argument range, extra zero data points are added to energy arguments greater than TZERO — insuring that interpolated values of D_E will go smoothly to zero as the argument approaches TZERO.

Additional problems were encountered for incident energies where $T_o \gg \sigma$ for which the main contribution to

$$\int_o^{T_o} dT\, D_E(T_o,T,t)\, e^{-\frac{(h-T)^2}{2\sigma^2}}$$

comes from the relatively narrow spike at h = T. The difficulty is that, as T_o increases, the width of quadrature intervals ($T_o/32$ in this code) also increases. Typical run parameters (FWHM = .064, .2 Mev $\leq T_o \leq$ 5.0 Mev) produce quadrature intervals from $\sim$ 0.1 to 2.5 times the full width at half maximum. This difficulty resulted in the construction of a section in the main routine to compare the D_E quadrature interval to the full width at half maximum and quarantee that there will be at least 4 integration points within a FWHM interval about h = T.

In summary, the sequential order of operations described above goes like this. First the noise factor FWHM and the detector thresholds ETH are

read in. Next, absorption peak constants P_A, energy intervals DELTE, and incident electron energies TZERO are read in for each incident energy we wish to evaluate. Finally, the D_E tables for all energies are assimilated, thus completing the input.

With all the data required for each TZERO value now stored in core, the next task is to select a TZERO and calculate the efficiencies for each threshold. In the version of the code given in appendix A, efficiencies are calculated for each incident energy starting with the smallest. After a TZERO has been selected, extended D_E and argument arrays are generated and the integration interval in the D_E integration is compared to the width of the noise function. The upper limit TTOP used in the evaluation of ENT

$$\text{TTOP} = \text{TZERO} + 3.0(\text{DELTE})$$

is effectively infinite for this integration. Now the denominator of the efficiency relation is calculated by using the function subroutines previously discussed. All that remains is to very the threshold energies and calculate the numerator of the efficiency relation, divide, and print the results. When this procedure is completed, a new TZERO is selected; and, this entire process is repeated.

III. Discussion of Results

The computer methods described above have been applied to a typical detector system (Explorer 47 prototype unit, APP 1-11, March calibration at GSFC). The results are shown in Figure 1, wherein the relative efficiencies of the three electron channels have been plotted versus incident energy. The attached listing also applies to this case. One can see from Figure 1 that the agreement is very satisfactory except at energies above the nominal electron energy required to penetrate the 900 micron detector. The experimental efficiencies are 10 to 20% higher than the calculated efficiencies. The major source of this discrepancy probably lies in the fact that the experimental system had a 40 micron detector in the path of the electron beam ahead of the 900 micron detector. The electron energy loss in the 40 micron detector was not more than 10 to 20 keV and was probably not as important at the scattering of the electrons in the 40 micron detector causing the beam to be incident on the 900 micron detector with a spread of angles. The projected depth in the experimental situation is therefore somewhat greater than the theoretical model. The electrons would leave more energy in the 900 micron detector than expected and cause the higher energy portion of the pulse height spectrum to be enhanced.

IV. Program and Typical Data Deck Set-Up

The data deck for the following listing consists of these cards. The first card contains the noise factor FWHM and four detector thresholds, the first threshold being that of the monitor. The format for this card is (5X,F10.5,5X,4(E15.7)). The quantities on this first card are constant for all incident energies considered in the run.

The next set of data contains the data set number ITZ, the total absorption factor P, the corresponding incident kinetic energy, TZERO, and the data table energy interval DELTE. There is one card for each incident energy to be read into storage. From this point on, reference to a particular incident kinetic energy and all parameters uniquely associated with it will be made by reference to the corresponding data set number. The format for each of these cards is (6X,I2,2X,3D10.3).

The final set of data consists of the D_E tables. The D_E tables are stored in core with two subscripts. The first subscript denotes the corresponding energy argument value within each D_E table; the second, denotes the particular incident energy to which that D_E table applies. Notice that the second subscript is just the data set number. These two subscripts are read in on the same card with each D_E value to help prevent errors occurring due to misordering in this section of the data deck. However, with this version of the code, there must be 50 D_E values read in for each incident energy read in.

The program presently reads in data for 13 incident energy values impinging upon a detector one millimeter thick with three detector thresholds. Data sets could be produced in this same format for other values of detector

thickness or other values of incident energies. Care must be taken with the size of common blocks in the event that greater numbers of incident energies are used or if data tables with more than 50 entries are used.

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DWH/mjo

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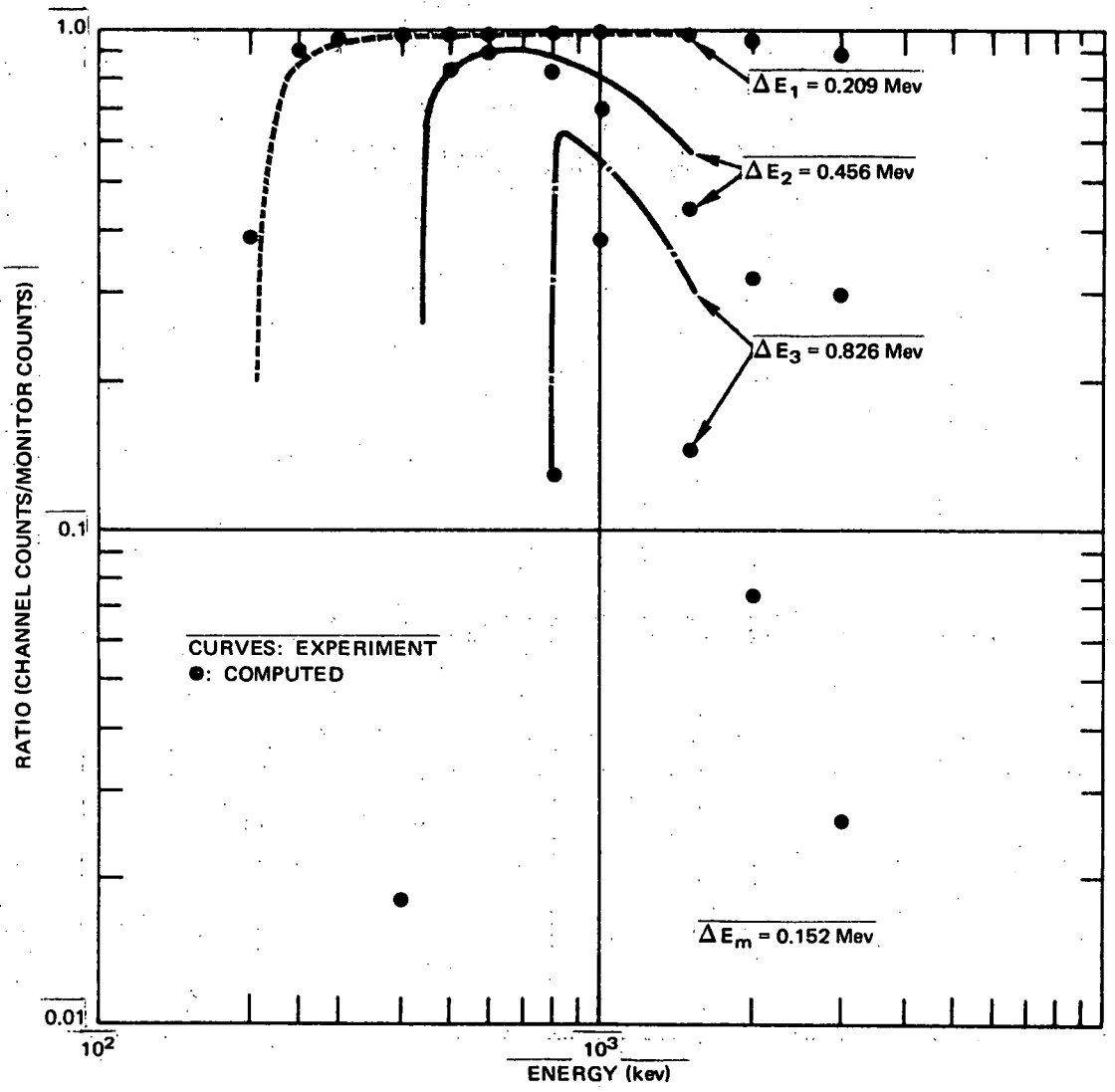

Fig. 1 COMPARISON OF COMPUTED AND EXPERIMENTAL RELATIVE ELECTRON EFFICIENCIES

```
      DIMENSION DTZT( 50,13), ETH(4), PAB(13), TZ(13), DEL(13)
C
C           THIS IS THE MAIN ROUTINE AND AS SUCH IT CONTROLS
C           THE THRESHOLDS AND INCIDENT ENERGIES FOR WHICH
C           EFFICIENCIES ARE COMPUTED ALONG WITH READING
C           IN THE DATA TABLES AND WRITING THE RESULTS
C
      COMMON DE( 58), EARG( 58), P, VSIG, SIG, EPS, X, ITOUT2, IXO
      DATA ITZT / 13 /,  III / 650 /,  ITOUT  /  50  /
      ITOUT2=58
      EPS=1.0D-05                                                    2
C
C           BEGIN INPUT
C
      READ (5,105) FWHM, (ETH(I),I=1,4)                              3
  105 FORMAT (5X,F10.5,5X,4(E15.7))                                  9
      SIG=FWHM/2.348                                                 9
      EM=ETH(1)                                                     10
      WRITE (6,110) SIG, EM                                         11
  110 FORMAT (1H1//5X,19HTHIS RUN USES SIG =,F10.5,                 14
     1   3X,27HAND A MONITOR THRESHOLD OF ,F10.5//)
      DO 180 I=1,ITZT                                               14
      READ (5,170) N, A1, A2, A3                                    15
  170 FORMAT (6X,I2,2X,3D10.3)                                      19
      PAB(N)=A1                                                     19
      TZ(N)=A2                                                      20
  180 DEL(N)=A3                                                     21
      DO 195 II=1,III                                               23
      READ (5,190) IC1, IC2, A                                      24
  190 FORMAT (2I5,D15.4)                                            29
  195 DTZT(IC2,IC1)=A                                               29
C
C           INPUT COMPLETE
C
      VSIG=1.0/(SIG*SIG)                                            31
      DO 400 ITZ=1,ITZT                                             32
      P=PAB(ITZ)                                                    33
      TZERO=TZ(ITZ)                                                 34
      WRITE (6,930) TZERO, ITZ                                      35
      DELTE=DEL(ITZ)                                                38
      TTOP=TZERO+3.0*DELTE                                          39
C
C           THIS SECTION SETS A SWITCHING PARAMETER IF THE
C           EXPONENTIAL NOISE FACTOR IS STEEP ENOUGH TO LIMIT
C           INTEGRATION ONLY TO THIS NOISE PEAK IN THE RESP FUNCTION
C           INTEGRATION OF DE
C
      X=.5*FWHM                                                     40
      XO=.125*TZERO-FWHM                                            41
      IF (XO) 210,205,205                                           42
  205 IXO=1                                                         43
```

```
      GO TO 215                                                          44
  210 IX0=2                                                              45
  215 CONTINUE                                                           46
C
C             THIS SECTION SETS UP AN EXTENDED ARGUMENT RANGE
C             FOR BETTER INTERPOLATION
C
      EARG(1)=-3.500*DELTE                                               47
      DO 220 I=2,ITOUT2                                                  48
  220 EARG(I)=EARG(I-1)+DELTE                                            49
      DO 250 I=1,ITOUT                                                   51
  250 DE(I+4)=DT4T(I,ITZ)                                                52
      DO 300 I=1,4                                                       54
      I2=5-I                                                             55
      DE(I2)=-DE(I+4)                                                    56
  300 DE(I+54)=0.0                                                       57
C
C             SMOOTH RETURNS WITH THE SELECTED INCIDENT
C             ENERGY TABLE SMOOTHED BY LEAST SQUARE SMOOTHING TWICE
C             AND STORED IN THE DE ARRAY
C
      CALL SMOOTH                                                        59
      EMON =ENT(EM,TTOP,TZERO)                                           60
      EMONN=EMON/(SIG*2.506628275D0)                                     61
      WRITE (6,920) TZERO, EMONN, EM                                     62
      DO 340 IETH=2,4                                                    65
      E=ETH(IETH)                                                        66
      IF (E-TZERO) 330,320,320                                           67
  320 WRITE (6,960)  E                                                   68
  330 EPSIL=ENT(E,TTOP,TZERO)/EMON                                       71
      WRITE (6,940) EPSIL, E                                             72
  340 CONTINUE                                                           75
  400 CONTINUE                                                           77
C
C
  920 FORMAT (1H1//20X,7HTZERO =,F10.5/                                  79
     1   13X,22HDENOMINATOR VALUE IS =,F10.5,
     2   3X,27HFOR A MONITOR THRESHOLD OF ,F10.5//)
  930 FORMAT (1H1////20X,33HDETECTOR EFFICIENCIES FOR TZERO =,F10.5///   79
     1   25X,5HITZ =,I5///)
  940 FORMAT (//9X,25HA DETECTOR EFFICIENCY OF ,F10.5,                   79
     1 42H WAS COMPUTED FOR A DETECTOR THRESHOLD OF ,F10.5//)
  960 FORMAT (/5X,50HTHE INCIDENT ENERGY IS BELOW THIS THRESHOLD ENERGY, 79
     1   F10.5/3X,32HSO THIS EFFICIENCY IS THE RESULT,
     2   1X,25HOF THE NOISE CONTRIBUTION)
      STOP                                                               79
      END                                                                80
```

23734 WORDS OF MEMORY USED BY THIS COMPILATION

```
      FUNCTION ENT(E,TTOP,TZERO)
      COMMON DE( 58), EARG( 58), P, VSIG, SIG, EPS, X, ITOUT2, IXO
C
C           THIS SECTION INTEGRATES THE DE PART OF THE RESP FUNCTION
C           BY A 16 PT TRAPEZOIDAL RULE
C
      ENT=0.0
      DEX=(TTOP-E)/16.0                                                  2
      IF (DEX) 300,300,5                                                 3
    5 H=E                                                                4
      TAB=.5                                                             5
      INTEG=0                                                            6
      GO TO 20                                                           7
   10 IF (INTEG-16) 20,15,25                                             8
   15 TAB=.5                                                             9
   20 ENT=ENT+RESP(TZERO,H)*TAB                                         10
      INTEG=INTEG+1                                                     11
      H=H+DEX                                                           12
      TAB=1.0                                                           13
      GO TO 10                                                          14
   25 ENT=ENT*DEX                                                       15
C     WRITE (6,251) ENT, IXO
C 251 FORMAT (/10X,11HENT EQUALS ,D17.7,3X,6HIXO = ,I5/)
C
C           THIS SECTION PERFORMS THE ABSORPTION PEAK INTEGRATION
C
  300 ZP=(TZERO-E)/(1.4142135624D0*SIG)                                 16
      IF (ZP-9.3) 330,320,320                                           17
  320 ERF=1.0                                                           18
      TAB=1.0                                                           19
      GO TO 340                                                         20
  330 IF (ZP) 332,334,336                                               21
  332 ZP=-ZP                                                            22
      TAB=-1.0                                                          23
      GO TO 336                                                         24
  334 ERF=0.0                                                           25
      GO TO 340                                                         26
  336 TAB=1.0                                                           27
  338 ZPP=1.0/(1.0+.3275911D0*ZP)                                       28
      EZP2=EXP(-ZP*ZP)                                                  29
      ERF=1.0-ZPP*(.254829592D0+ZPP*(-.284496736D0+ZPP*                 30
     1   (1.421413741D0+ZPP*(-1.453152027D0+1.061405429D0*ZPP))))*EZP2
  340 ENT=ENT+1.253314137D0*SIG*P*(1.0+ERF*TAB)                         31
C     WRITE (6,251) ENT
      RETURN                                                            32
      END                                                               33
```

23759 WORDS OF MEMORY USED BY THIS COMPILATION

```
      FUNCTION RESP(TZERO,H)
      COMMON DE( 58), EARG( 58), P, VSIG, SIG, EPS, X, ITOUT2, IXO
C
C           THIS ROUTINE INTEGRATES THE DE ARRAY BY A
C           32 PT TRAPEZOIDAL RULE
C
C           THE LIMITS OF THIS INTEGRATION DEPENDS UPON THE RELATIVE
C           WIDTH OF THE NOISE FACTOR COMPARED TO THE WHOLE INTERVAL
C           WHICH IS FROM ZERO TO TZERO
C
      JK=1
      GO TO (100,150), IXO                                              2
  100 T=H-4.0*X                                                         3
      IF (T) 120,130,130                                                4
  120 T=0.0                                                             5
  130 TCH=T+8.0*X-TZERO                                                 6
      IF (TCH) 145,145,140                                              7
  140 T=TZERO-8.0*X                                                     8
  145 DEX=X*.25                                                         9
      GO TO 160                                                         10
  150 DEX=TZERO/32.0                                                    11
      T=0.0                                                             12
  160 RESP=0.0                                                          13
      TAB=.5                                                            14
      INTEG=0                                                           15
      GO TO 20                                                          16
   10 IF (INTEG-32) 20,15,25                                            17
   15 TAB=.5                                                            18
   20 RESP=RESP+DAVW(H,T,JK)*TAB                                        19
      INTEG=INTEG+1                                                     20
      T=T+DEX                                                           21
      TAB=1.0                                                           22
      GO TO 10                                                          23
   25 RESP=RESP*DEX                                                     24
C
C     WRITE (6,500) RESP, H
C 500 FORMAT (5X,7HRESP = ,D17.7,3X,7HFOR H= ,D17.7)
      RETURN                                                            25
      END                                                               26
```

23812 WORDS OF MEMORY USED BY THIS COMPILATION

```
      FUNCTION DAVW(H,T,JK)
      COMMON DE( 56), EARG( 58), P, VSIG, SIG, EPS, X, ITOUT2, IXQ
C
C           THIS ROUTINE INTERPOLATES A VALUE FROM THE DE ARRAY
C           GIVEN AN ARGUMENT T.  THIS INTERPOLATED VALUE
C           IS MULTIPLIED BY THE EXPONENTIAL NOISE FACTOR
C           BEFORE RETURNING.
C
C           FIRST CHECK TO SEE IF THE EXPONENTIAL FACTOR WILL
C           UNDERFLOW
C
      JK=JK+4
      HMT=-((H-T)**2)*.5D0*VSIG                                          2
      TPONK=ABS(HMT)-85.0                                                3
      IF (TPONK) 3,2,2                                                   4
    2 DAVW=0.0D0                                                         5
      JK=JK-4                                                            6
C     WRITE (6,42) T, DAVW, HMT
      RETURN                                                             7
C
C           THIS SECTION DOES A LINEAR INTERPOLATION OF THE DE ARRAY
C           GIVEN AN ARGUMENT T
C
    3 CH=T-EARG(JK)                                                      8
      IF (CH) 5,7,10                                                     9
    5 DAVW=CH*(DE(JK)-DE(JK-1))/(EARG(JK)-EARG(JK-1))+DE(JK)            10
      GO TO 40                                                          11
    7 DAVW=DE(JK)                                                       12
      GO TO 40                                                          13
   10 JK=JK+1                                                           14
      IF (JK-58) 12,12,11                                               15
   11 STOP                                                              16
   12 GO TO 3                                                           17
C
C
   40 CONTINUE                                                          18
      JK=JK-4                                                           19
C     WRITE (6,42) T, DAVW, HMT
C  42 FORMAT (5X,3HT =,D17.7,5X,6HDAVW =,D17.7,5X,5HHMT =,D17.7)
      DAVW=DAVW*EXP(HMT)                                                20
      RETURN                                                            21
      END                                                               22
```

23810 WORDS OF MEMORY USED BY THIS COMPILATION

```
      SUBROUTINE SMOOTH
      COMMON DE( 56), EARG( 58), P, VSIG, SIG, EPS, X, ITOUT2, IXO
      DIMENSION   DEORD( 56), WORK(58)
C
C             LOCAL LEAST SQUARES SMOOTHING
C             (REF. IBM SSP PAGE 255)
C
      WRITE (6,190)
  190 FORMAT (1H1,7X,46HORIGINAL AND SMOOTH VERSIONS OF THE INPUT DATA/
     1   12X,8HORIGINAL,9X,6HSMOOTH,11X,7HSMOOTH2,10X,8HARGUMENT)
      JIFF=0                                                              3
  200 JIFF=JIFF+1                                                         4
      B=.16666666666666667D0*(5.D0*DE(1)+2.D0*DE(2)-DE(3))                5
      DO 400 I=3,ITOUT2                                                   6
      A=B                                                                 7
      B=.33333333333333333D0*(DE(I-2)+DE(I-1)+DE(I))                      8
  400 WORK(I-2)=A                                                         9
      WORK(ITOUT2-1)=B                                                   11
      WORK(ITOUT2)=.16666666666666667D0*(5.D0*DE(ITOUT2)                 12
     1   +2.D0*DE(ITOUT2-1)-DE(ITOUT2-2))
C
C             IF ONLY ONE LEVEL OF LEAST SQUARE SMOOTHING IS
C             DESIRED, USE THE FOLLOWING CARD.
C     JIFF=2
C
      GO TO (500,700), JIFF                                              13
  500 DO 600 I=1,ITOUT2                                                  14
      DEORD(I)=DE(I)                                                     15
  600 DE(I)=WORK(I)                                                      16
      GO TO 200                                                          18
C
C             THIS SECTION LISTS THE ORIGINAL DATA, LEAST SQUARE ONE,
C             LEAST SQUARE TWO, AND THE ARGUMENT.
C
  700 DO 800 I=1,ITOUT2                                                  19
      WRITE (6,750) DEORD(I), DE(I), WORK(I), EARG(I)                    20
  750 FORMAT (5X,4D17.7)                                                 23
  800 DE(I)=WORK(I)                                                      23
      RETURN                                                             25
      END                                                                26
```

23684 WORDS OF MEMORY USED BY THIS COMPILATION

THIS RUN USES SIG = 0.02741 AND A MONITOR THRESHOLD OF 0.15200

DETECTOR EFFICIENCIES FOR TZERO = 0.20000

ITZ = 1

ORIGINAL AND SMOOTH VERSIONS OF THE INPUT DATA

ORIGINAL	SMOOTH	SMOOTH2	ARGUMENT
-0.37500000D 00	-0.3583333D 00	-0.3527778D 00	-0.1400000D-01
-0.17500000D 00	-0.2083333D 00	-0.2194444D 00	-0.1000000D-01
-0.75000000D-01	-0.9166667D-01	-0.1083333D 00	-0.6000000D-02
-0.25000000D-01	-0.2500000D-01	-0.3055556D-01	-0.2000000D-02
0.25000000D-01	0.2500000D-01	0.3055556D-01	0.2000000D-02
0.75000000D-01	0.9166667D-01	0.1083333D 00	0.6000000D-02
0.17500000D 00	0.2083333D 00	0.2138889D 00	0.1000000D-01
0.37500000D 00	0.3416667D 00	0.3138889D 00	0.1400000D-01
0.47500000D 00	0.3916667D 00	0.3916667D 00	0.1800000D-01
0.32500000D 00	0.4416667D 00	0.4611111D 00	0.2200000D-01
0.52500000D 00	0.5500000D 00	0.5666667D 00	0.2600000D-01
0.80000000D 00	0.7083333D 00	0.6777778D 00	0.3000000D-01
0.80000000D 00	0.7750000D 00	0.7388889D 00	0.3400000D-01
0.72500000D 00	0.7333333D 00	0.7361111D 00	0.3800000D-01
0.67500000D 00	0.7000000D 00	0.7605556D 00	0.4200000D-01
0.70000000D 00	0.8483333D 00	0.8772222D 00	0.4600000D-01
0.11700000D 01	0.1083333D 01	0.1068333D 01	0.5000000D-01
0.13800000D 01	0.1273333D 01	0.1180000D 01	0.5400000D-01
0.12700000D 01	0.1183333D 01	0.1182222D 01	0.5800000D-01
0.90000000D 00	0.1090000D 01	0.1126667D 01	0.6200000D-01
0.11000000D 01	0.1106667D 01	0.1126667D 01	0.6600000D-01
0.13200000D 01	0.1183333D 01	0.1171111D 01	0.7000000D-01
0.11300000D 01	0.1223333D 01	0.1196667D 01	0.7400000D-01
0.12200000D 01	0.1183333D 01	0.1193333D 01	0.7800000D-01
0.12000000D 01	0.1173333D 01	0.1174444D 01	0.8200000D-01
0.11000000D 01	0.1166667D 01	0.1171111D 01	0.8600000D-01
0.12000000D 01	0.1173333D 01	0.1198889D 01	0.9000000D-01
0.12200000D 01	0.1256667D 01	0.1242222D 01	0.9400000D-01
0.13300000D 01	0.1296667D 01	0.1281111D 01	0.9800000D-01
0.13200000D 01	0.1290000D 01	0.1247778D 01	0.1020000D 00
0.12000000D 01	0.1156667D 01	0.1129444D 01	0.1060000D 00
0.95000000D 00	0.9416667D 00	0.9800000D 00	0.1100000D 00
0.67500000D 00	0.8416667D 00	0.8555555D 00	0.1140000D 00
0.90000000D 00	0.7833333D 00	0.8111111D 00	0.1180000D 00
0.77500000D 00	0.8083333D 00	0.7805556D 00	0.1220000D 00
0.75000000D 00	0.7500000D 00	0.7638889D 00	0.1260000D 00
0.72500000D 00	0.7333333D 00	0.7250000D 00	0.1300000D 00
0.72500000D 00	0.6916667D 00	0.7055556D 00	0.1340000D 00
0.62500000D 00	0.6916667D 00	0.6722222D 00	0.1380000D 00
0.72500000D 00	0.6333333D 00	0.6500000D 00	0.1420000D 00
0.55000000D 00	0.6250000D 00	0.6250000D 00	0.1460000D 00
0.60000000D 00	0.6166667D 00	0.5888889D 00	0.1500000D 00
0.70000000D 00	0.5250000D 00	0.5194444D 00	0.1540000D 00
0.27500000D 00	0.4166667D 00	0.4083333D 00	0.1580000D 00
0.27500000D 00	0.2833333D 00	0.3277778D 00	0.1620000D 00
0.30000000D 00	0.2833333D 00	0.3027778D 00	0.1660000D 00
0.27500000D 00	0.3416667D 00	0.3194444D 00	0.1700000D 00
0.45000000D 00	0.3333333D 00	0.3277778D 00	0.1740000D 00
0.27500000D 00	0.3083333D 00	0.2861111D 00	0.1780000D 00
0.20000000D 00	0.2166667D 00	0.2361111D 00	0.1820000D 00
0.17500000D 00	0.1833333D 00	0.1759222D 00	0.1860000D 00
0.17500000D 00	0.1277667D 00	0.1268444D 00	0.1900000D 00
0.33300000D-01	0.6943333D-01	0.6943333D-01	0.1940000D 00
0.	0.1110000D-01	0.2684444D-01	0.1980000D 00
0.	0.	0.3700000D-02	0.2020000D 00
0.	0.	0.	0.2060000D 00
0.	0.	0.	0.2100000D 00
0.	0.	0.	0.2140000D 00

TZERO = 0.20000
DENOMINATOR VALUE IS = 0.94134 FOR A MONITOR THRESHOLD OF 0.15200

THE INCIDENT ENERGY IS BELOW THIS THRESHOLD ENERGY 0.20900
SO THIS EFFICIENCY IS THE RESULT OF THE NOISE CONTRIBUTION

A DETECTOR EFFICIENCY OF 0.37984 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.20900

THE INCIDENT ENERGY IS BELOW THIS THRESHOLD ENERGY 0.45600
SO THIS EFFICIENCY IS THE RESULT OF THE NOISE CONTRIBUTION

A DETECTOR EFFICIENCY OF 0. WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.45600

THE INCIDENT ENERGY IS BELOW THIS THRESHOLD ENERGY 0.82600
SO THIS EFFICIENCY IS THE RESULT OF THE NOISE CONTRIBUTION

A DETECTOR EFFICIENCY OF 0. WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.82600

DETECTOR EFFICIENCIES FOR TZERO = 0.25000

ITZ = 2

ORIGINAL AND SMOOTH VERSIONS OF THE INPUT DATA

ORIGINAL	SMOOTH	SMOOTH2	ARGUMENT
-0.2400000D 00	-0.2333333D 00	-0.2288889D 00	-0.1750000D-01
-0.1200000D 00	-0.1333333D 00	-0.1422222D 00	-0.1250000D-01
-0.4000000D-01	-0.6000000D-01	-0.6888889D-01	-0.7500000D-02
-0.2000000D-01	-0.1333333D-01	-0.2000000D-01	-0.2500000D-02
0.2000000D-01	0.1333333D-01	0.2000000D-01	0.2500000D-02
0.4000000D-01	0.6000000D-01	0.6888889D-01	0.7500000D-02
0.1200000D 00	0.1333333D 00	0.1200000D 00	0.1250000D-01
0.2400000D 00	0.1666667D 00	0.1666667D 00	0.1750000D-01
0.1400000D 00	0.2000000D 00	0.1977778D 00	0.2250000D-01
0.2200000D 00	0.2266667D 00	0.2511111D 00	0.2750000D-01
0.3200000D 00	0.3266667D 00	0.3400000D 00	0.3250000D-01
0.4400000D 00	0.4666667D 00	0.4444444D 00	0.3750000D-01
0.6400000D 00	0.5400000D 00	0.5355555D 00	0.4250000D-01
0.5400000D 00	0.6000000D 00	0.5577778D 00	0.4750000D-01
0.6200000D 00	0.5333333D 00	0.5622222D 00	0.5250000D-01
0.4400000D 00	0.5533333D 00	0.5044444D 00	0.5750000D-01
0.6000000D 00	0.6666667D 00	0.6755555D 00	0.6250000D-01
0.9600000D 00	0.8066667D 00	0.7955556D 00	0.6750000D-01
0.8600000D 00	0.9133333D 00	0.8688889D 00	0.7250000D-01
0.9200000D 00	0.8866667D 00	0.9044444D 00	0.7750000D-01
0.8800000D 00	0.9133333D 00	0.9111111D 00	0.8250000D-01
0.9400000D 00	0.9333333D 00	0.9377778D 00	0.8750000D-01
0.9800000D 00	0.9666667D 00	0.9577778D 00	0.9250000D-01
0.9900000D 00	0.9733333D 00	0.9755556D 00	0.9750000D-01
0.9600000D 00	0.9866667D 00	0.9911111D 00	0.1025000D 00
0.1020000D 01	0.1013333D 01	0.1000000D 01	0.1075000D 00
0.1050000D 01	0.1000000D 01	0.9666667D 00	0.1125000D 00
0.9200000D 00	0.8866667D 00	0.9111111D 00	0.1175000D 00
0.6800000D 00	0.8466667D 00	0.8177778D 00	0.1225000D 00
0.9400000D 00	0.7200000D 00	0.7844444D 00	0.1275000D 00
0.5400000D 00	0.7866667D 00	0.7600000D 00	0.1325000D 00
0.8800000D 00	0.7733333D 00	0.7822222D 00	0.1375000D 00
0.9000000D 00	0.7866667D 00	0.7644444D 00	0.1425000D 00
0.5800000D 00	0.7333333D 00	0.7466667D 00	0.1475000D 00
0.7200000D 00	0.7200000D 00	0.7488889D 00	0.1525000D 00
0.8600000D 00	0.7933333D 00	0.7466667D 00	0.1575000D 00
0.8000000D 00	0.7266667D 00	0.7400000D 00	0.1625000D 00
0.5200000D 00	0.7000000D 00	0.6755555D 00	0.1675000D 00
0.7800000D 00	0.6000000D 00	0.6333333D 00	0.1725000D 00
0.5000000D 00	0.6000000D 00	0.5644444D 00	0.1775000D 00
0.5200000D 00	0.4933333D 00	0.5111111D 00	0.1825000D 00
0.4600000D 00	0.4400000D 00	0.4355556D 00	0.1875000D 00
0.3400000D 00	0.3733333D 00	0.3688889D 00	0.1925000D 00
0.3200000D 00	0.2933333D 00	0.3288889D 00	0.1975000D 00
0.2200000D 00	0.3200000D 00	0.3044444D 00	0.2025000D 00
0.4200000D 00	0.3000000D 00	0.3266667D 00	0.2075000D 00
0.2600000D 00	0.3600000D 00	0.3355556D 00	0.2125000D 00
0.4000000D 00	0.3466667D 00	0.3466667D 00	0.2175000D 00
0.3800000D 00	0.3333333D 00	0.3266667D 00	0.2225000D 00
0.2200000D 00	0.3000000D 00	0.2933333D 00	0.2275000D 00
0.3000000D 00	0.2466667D 00	0.2466667D 00	0.2325000D 00
0.2200000D 00	0.1933333D 00	0.1777778D 00	0.2375000D 00
0.6000000D-01	0.9333333D-01	0.1022222D 00	0.2425000D 00
0.	0.2000000D-01	0.3777778D-01	0.2475000D 00
0.	0.	0.6666667D-02	0.2525000D 00
0.	0.	0.	0.2575000D 00
0.	0.	0.	0.2625000D 00
0.	0.	0.	0.2675000D 00

YZERO = 0.25000
DENOMINATOR VALUE IS = 0.90136 FOR A MONITOR THRESHOLD OF 0.15200

A DETECTOR EFFICIENCY OF 0.90240 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.20900

THE INCIDENT ENERGY IS BELOW THIS THRESHOLD ENERGY 0.45600
SO THIS EFFICIENCY IS THE RESULT OF THE NOISE CONTRIBUTION

A DETECTOR EFFICIENCY OF 0. WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.45600

THE INCIDENT ENERGY IS BELOW THIS THRESHOLD ENERGY 0.82600
SO THIS EFFICIENCY IS THE RESULT OF THE NOISE CONTRIBUTION

A DETECTOR EFFICIENCY OF 0. WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.82600

DETECTOR EFFICIENCIES FOR TZERO = 0.30000

ITZ = 3

ORIGINAL AND SMOOTH VERSIONS OF THE INPUT DATA

ORIGINAL	SMOOTH	SMOOTH2	ARGUMENT
-0.13300000D 00	-0.13305000D 00	-0.13213060 00	-0.21000000D-01
-0.93300000D-01	-0.98320000D-01	-0.85038890-01	-0.15000000D-01
-0.33300000D-01	-0.53886667D-01	-0.44388890-01	-0.90000000D-02
0.	-0.11100000D-01	-0.12955560-01	-0.30000000D-02
0.	0.11100000D-01	0.1295556D-01	0.30000000D-02
0.33300000D-01	0.53886670-01	0.4438809D-01	0.90000000D-02
0.83300000D-01	0.98320000D-01	0.79500000D-01	0.15000000D-01
0.13300000D 00	0.11643330 00	0.11465560 00	0.21000000D-01
0.13300000D 00	0.14433330 00	0.15170000 00	0.27000000D-01
0.16700000D 00	0.19433330 00	0.20177780 00	0.33000000D-01
0.28300000D 00	0.26666670 00	0.2776667D 00	0.39000000D-01
0.35000000D 00	0.33720000D 00	0.34800000 00	0.45000000D-01
0.48300000D 00	0.40533330 00	0.40722220 00	0.51000000D-01
0.38300000D 00	0.44433330 00	0.42577780 00	0.57000000D-01
0.46700000D 00	0.42766670 00	0.4740000D 00	0.63000000D-01
0.43300000D 00	0.45500000D 00	0.52766670 00	0.69000000D-01
0.75000000D 00	0.46053330 00	0.61288890 00	0.75000000D-01
0.63300000D 00	0.46833330 00	0.6573333D 00	0.81000000D-01
0.66700000D 00	0.46833330 00	0.7000000D 00	0.87000000D-01
0.75000000D 00	0.47333330 00	0.70555560 00	0.93000000D-01
0.78300000D 00	0.47000000D 00	0.7074444D 00	0.99000000D-01
0.56700000D 00	0.46890000D 00	0.6853333D 00	0.10500000D 00
0.71700000D 00	0.46670000D 00	0.6872222D 00	0.11100000D 00
0.71700000D 00	0.47056670D 00	0.7375555D 00	0.11700000D 00
0.68300000D 00	0.48400000D 00	0.8192222D 00	0.12300000D 00
0.11200000D 01	0.49120000D 00	0.8917778D 00	0.12900000D 00
0.93300000D 00	0.49233330 00	0.8821111D 00	0.13500000D 00
0.71700000D 00	0.48110000D 00	0.8392222D 00	0.14100000D 00
0.78300000D 00	0.47833330 00	0.8054444D 00	0.14700000D 00
0.85000000D 00	0.48220000D 00	0.7998889D 00	0.15300000D 00
0.83300000D 00	0.47943330 00	0.7665556D 00	0.15900000D 00
0.70000000D 00	0.46833330 00	0.6777778D 00	0.16500000D 00
0.51700000D 00	0.45556670 00	0.6056667D 00	0.17100000D 00
0.45000000D 00	0.45780000D 00	0.5778889D 00	0.17700000D 00
0.76700000D 00	0.46000000D 00	0.6056667D 00	0.18300000D 00
0.58300000D 00	0.46390000D 00	0.5982222D 00	0.18900000D 00
0.56700000D 00	0.45556670 00	0.5650000D 00	0.19500000D 00
0.51700000D 00	0.45033330 00	0.5038889D 00	0.20100000D 00
0.41700000D 00	0.45566670 00	0.4742222D 00	0.20700000D 00
0.43300000D 00	0.46666670 00	0.4703333D 00	0.21300000D 00
0.55000000D 00	0.48866670 00	0.4757778D 00	0.21900000D 00
0.48300000D 00	0.47200000D 00	0.4497778D 00	0.22500000D 00
0.38300000D 00	0.38866670 00	0.3980000D 00	0.23100000D 00
0.30000000D 00	0.33333330 00	0.3500000D 00	0.23700000D 00
0.31700000D 00	0.32800000D 00	0.3278889D 00	0.24300000D 00
0.36700000D 00	0.32233330 00	0.3334444D 00	0.24900000D 00
0.28300000D 00	0.35000000D 00	0.3258889D 00	0.25500000D 00
0.40000000D 00	0.30533330 00	0.3146667D 00	0.26100000D 00
0.23300000D 00	0.28866670 00	0.2775556D 00	0.26700000D 00
0.23300000D 00	0.23866670 00	0.2424444D 00	0.27300000D 00
0.25000000D 00	0.20000000D 00	0.2036667D 00	0.27900000D 00
0.11700000D 00	0.17233330 00	0.1537778D 00	0.28500000D 00
0.15000000D 00	0.89000000D-01	0.1037778D 00	0.29100000D 00
0.	0.50000000D-01	0.4633333D-01	0.29700000D 00
0.	0.	0.1666667D-01	0.30300000D 00
0.	0.	0.	0.30900000D 00
0.	0.	0.	0.31500000D 00
0.	0.	0.	0.32100000D 00

TZERO = 0,30000
DENOMINATOR VALUE IS = 0.92225 FOR A MONITOR THRESHOLD OF 0.15200

A DETECTOR EFFICIENCY OF 0.96154 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.20900

THE INCIDENT ENERGY IS BELOW THIS THRESHOLD ENERGY 0.45600
SO THIS EFFICIENCY IS THE RESULT OF THE NOISE CONTRIBUTION

A DETECTOR EFFICIENCY OF 0.00000 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.45600

THE INCIDENT ENERGY IS BELOW THIS THRESHOLD ENERGY 0.82600
SO THIS EFFICIENCY IS THE RESULT OF THE NOISE CONTRIBUTION

A DETECTOR EFFICIENCY OF 0. WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.82600

DETECTOR EFFICIENCIES FOR TZERO = 0.40000

ITZ = 4

ORIGINAL AND SMOOTH VERSIONS OF THE INPUT DATA

ORIGINAL	SMOOTH	SMOOTH2	ARGUMENT
-0.8230000D-01	-0.8750000D-01	-0.8625000D-01	-0.2800000D-01
-0.6250000D-01	-0.5250000D-01	-0.5500000D-01	-0.2000000D-01
-0.1250000D-01	-0.2500000D-01	-0.2722222D-01	-0.1200000D-01
0.	-0.4166667D-02	-0.8333333D-02	-0.4000000D-02
0.	0.4166667D-02	0.8333333D-02	0.4000000D-02
0.1250000D-01	0.2500000D-01	0.2722222D-01	0.1200000D-01
0.6250000D-01	0.5250000D-01	0.5727778D-01	0.2000000D-01
0.8250000D-01	0.9433333D-01	0.8177778D-01	0.2800000D-01
0.1330000D 00	0.9850000D-01	0.1073889D 00	0.3600000D-01
0.7500000D-01	0.1293333D 00	0.1246111D 00	0.4400000D-01
0.1750000D 00	0.1460000D 00	0.1387778D 00	0.5200000D-01
0.1880000D 00	0.1410000D 00	0.1593333D 00	0.6000000D-01
0.6000000D-01	0.1910000D 00	0.1936667D 00	0.6800000D-01
0.3250000D 00	0.2490000D 00	0.2563333D 00	0.7600000D-01
0.3620000D 00	0.3290000D 00	0.3001111D 00	0.8400000D-01
0.3000000D 00	0.3223333D 00	0.3330000D 00	0.9200000D-01
0.3050000D 00	0.3476667D 00	0.3586667D 00	0.1000000D 00
0.4380000D 00	0.4060000D 00	0.3927778D 00	0.1080000D 00
0.4750000D 00	0.4246667D 00	0.4294444D 00	0.1160000D 00
0.3610000D 00	0.4576667D 00	0.4646667D 00	0.1240000D 00
0.5370000D 00	0.5116667D 00	0.5132222D 00	0.1320000D 00
0.6370000D 00	0.5703333D 00	0.5536667D 00	0.1400000D 00
0.5370000D 00	0.5790000D 00	0.5678889D 00	0.1480000D 00
0.5630000D 00	0.5543333D 00	0.5570000D 00	0.1560000D 00
0.5630000D 00	0.5376667D 00	0.5486667D 00	0.1640000D 00
0.4870000D 00	0.5540000D 00	0.5595556D 00	0.1720000D 00
0.6120000D 00	0.5870000D 00	0.5885556D 00	0.1800000D 00
0.6620000D 00	0.6246667D 00	0.6037778D 00	0.1880000D 00
0.6000000D 00	0.5996667D 00	0.5872222D 00	0.1960000D 00
0.5370000D 00	0.5373333D 00	0.5581111D 00	0.2040000D 00
0.4750000D 00	0.5373333D 00	0.5387778D 00	0.2120000D 00
0.6000000D 00	0.5416667D 00	0.5430000D 00	0.2200000D 00
0.5500000D 00	0.5500000D 00	0.5207778D 00	0.2280000D 00
0.5000000D 00	0.4706667D 00	0.4901111D 00	0.2360000D 00
0.3620000D 00	0.4496667D 00	0.4455556D 00	0.2440000D 00
0.4870000D 00	0.4163333D 00	0.4261111D 00	0.2520000D 00
0.4000000D 00	0.4123333D 00	0.4040000D 00	0.2600000D 00
0.3500000D 00	0.3833333D 00	0.4068889D 00	0.2680000D 00
0.4000000D 00	0.4250000D 00	0.3985556D 00	0.2760000D 00
0.5250000D 00	0.3873333D 00	0.3971111D 00	0.2840000D 00
0.2370000D 00	0.3790000D 00	0.3636667D 00	0.2920000D 00
0.3750000D 00	0.3246667D 00	0.3503333D 00	0.3000000D 00
0.3620000D 00	0.3473333D 00	0.3355556D 00	0.3080000D 00
0.3050000D 00	0.3346667D 00	0.3264444D 00	0.3160000D 00
0.3370000D 00	0.2973333D 00	0.2981111D 00	0.3240000D 00
0.2500000D 00	0.2623333D 00	0.2754444D 00	0.3320000D 00
0.2000000D 00	0.2666667D 00	0.2722222D 00	0.3400000D 00
0.3500000D 00	0.2876667D 00	0.2681667D 00	0.3480000D 00
0.3130000D 00	0.2501667D 00	0.2710000D 00	0.3560000D 00
0.8750000D-01	0.2751667D 00	0.2695000D 00	0.3640000D 00
0.4250000D 00	0.2831667D 00	0.2861111D 00	0.3720000D 00
0.3370000D 00	0.3000000D 00	0.2508667D 00	0.3800000D 00
0.1330000D 00	0.1694333D 00	0.1755111D 00	0.3880000D 00
0.3330000D-01	0.5710000D-01	0.7921111D-01	0.3960000D 00
0.	0.1110000D-01	0.2273333D-01	0.4040000D 00
0.	0.	0.3700000D-02	0.4120000D 00
0.	0.	0.	0.4200000D 00
0.	0.	0.	0.4280000D 00

TZERO = 0.40000
DENOMINATOR VALUE IS = 0.95396 FOR A MONITOR THRESHOLD OF 0.15200

A DETECTOR EFFICIENCY OF 0.96720 WAS COMPUTED FOR A DETECTOR THRESHOLD OF: 0.20900

THE INCIDENT ENERGY IS BELOW THIS THRESHOLD ENERGY 0.45600
SO THIS EFFICIENCY IS THE RESULT OF THE NOISE CONTRIBUTION

A DETECTOR EFFICIENCY OF 0.01843 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.45600

THE INCIDENT ENERGY IS BELOW THIS THRESHOLD ENERGY 0.82600
SO THIS EFFICIENCY IS THE RESULT OF THE NOISE CONTRIBUTION

A DETECTOR EFFICIENCY OF 0. WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.82600

DETECTOR EFFICIENCIES FOR TZERO = 0.50000

ITZ = 5

ORIGINAL AND SMOOTH VERSIONS OF THE INPUT DATA

ORIGINAL	SMOOTH	SMOOTH2	ARGUMENT
-0.20000000D-01	-0.3333333D-01	-0.3277778D-01	-0.3500000D-01
-0.50000000D-01	-0.2333333D-01	-0.2444444D-01	-0.2500000D-01
0.	-0.1666667D-01	-0.1333333D-01	-0.1500000D-01
0.	0.	-0.5555556D-02	-0.5000000D-02
0.	0.	0.5555556D-02	0.5000000D-02
0.	0.1666667D-01	0.1333333D-01	0.1500000D-01
0.50000000D-01	0.2333333D-01	0.2888889D-01	0.2500000D-01
0.20000000D-01	0.4666667D-01	0.3777778D-01	0.3500000D-01
0.70000000D-01	0.4333333D-01	0.5000000D-01	0.4500000D-01
0.40000000D-01	0.6000000D-01	0.5777778D-01	0.5500000D-01
0.70000000D-01	0.7000000D-01	0.7777778D-01	0.6500000D-01
0.10000000D 00	0.1033333D 00	0.1100000D 00	0.7500000D-01
0.14000000D 00	0.1566667D 00	0.1711111D 00	0.8500000D-01
0.23000000D 00	0.2533333D 00	0.2366667D 00	0.9500000D-01
0.39000000D 00	0.3000000D 00	0.2833333D 00	0.1050000D 00
0.28000000D 00	0.2966667D 00	0.2944444D 00	0.1150000D 00
0.22000000D 00	0.2866667D 00	0.2933333D 00	0.1250000D 00
0.36000000D 00	0.2966667D 00	0.3144444D 00	0.1350000D 00
0.31000000D 00	0.3600000D 00	0.3366667D 00	0.1450000D 00
0.41000000D 00	0.3533333D 00	0.3611111D 00	0.1550000D 00
0.34000000D 00	0.3700000D 00	0.3655556D 00	0.1650000D 00
0.36000000D 00	0.3733333D 00	0.3800000D 00	0.1750000D 00
0.42000000D 00	0.3966667D 00	0.3988889D 00	0.1850000D 00
0.41000000D 00	0.4266667D 00	0.4177778D 00	0.1950000D 00
0.45000000D 00	0.4300000D 00	0.4411111D 00	0.2050000D 00
0.43000000D 00	0.4666667D 00	0.4566667D 00	0.2150000D 00
0.52000000D 00	0.4733333D 00	0.4755556D 00	0.2250000D 00
0.47000000D 00	0.4866667D 00	0.4766667D 00	0.2350000D 00
0.47000000D 00	0.4700000D 00	0.4766667D 00	0.2450000D 00
0.47000000D 00	0.4733333D 00	0.4688889D 00	0.2550000D 00
0.48000000D 00	0.4633333D 00	0.4633333D 00	0.2650000D 00
0.44000000D 00	0.4533333D 00	0.4600000D 00	0.2750000D 00
0.44000000D 00	0.4633333D 00	0.4522222D 00	0.2850000D 00
0.51000000D 00	0.4400000D 00	0.4311111D 00	0.2950000D 00
0.37000000D 00	0.3900000D 00	0.3788889D 00	0.3050000D 00
0.29000000D 00	0.3066667D 00	0.3344444D 00	0.3150000D 00
0.26000000D 00	0.3066667D 00	0.3022222D 00	0.3250000D 00
0.37000000D 00	0.2933333D 00	0.3133333D 00	0.3350000D 00
0.25000000D 00	0.3400000D 00	0.3222222D 00	0.3450000D 00
0.40000000D 00	0.3333333D 00	0.3466667D 00	0.3550000D 00
0.35000000D 00	0.3666667D 00	0.3388889D 00	0.3650000D 00
0.35000000D 00	0.3166667D 00	0.3266667D 00	0.3750000D 00
0.25000000D 00	0.2966667D 00	0.2944444D 00	0.3850000D 00
0.29000000D 00	0.2700000D 00	0.2711111D 00	0.3950000D 00
0.27000000D 00	0.2466667D 00	0.2455556D 00	0.4050000D 00
0.18000000D 00	0.2200000D 00	0.2322222D 00	0.4150000D 00
0.21000000D 00	0.2300000D 00	0.2366667D 00	0.4250000D 00
0.30000000D 00	0.2600000D 00	0.2800000D 00	0.4350000D 00
0.27000000D 00	0.3500000D 00	0.3444444D 00	0.4450000D 00
0.48000000D 00	0.4233333D 00	0.4100000D 00	0.4550000D 00
0.52000000D 00	0.4566667D 00	0.4177778D 00	0.4650000D 00
0.37000000D 00	0.3733333D 00	0.3522222D 00	0.4750000D 00
0.23000000D 00	0.2266667D 00	0.2344444D 00	0.4850000D 00
0.80000000D-01	0.1033333D 00	0.1188889D 00	0.4950000D 00
0.	0.2666667D-01	0.4333333D-01	0.5050000D 00
0.	0.	0.8888889D-02	0.5150000D 00
0.	0.	0.	0.5250000D 00
0.	0.	0.	0.5350000D 00

EXP UNDERFLO AT LOCATION 021167
EXP UNDERFLO AT LOCATION 021167

TZERO = 0.50000
DENOMINATOR VALUE IS = 0.97414 FOR A MONITOR THRESHOLD OF 0.15200

EXP UNDERFLO AT LOCATION 021167
EXP UNDERFLO AT LOCATION 021167

A DETECTOR EFFICIENCY OF 0.97705 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.20900

A DETECTOR EFFICIENCY OF 0.93775 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.45600

THE INCIDENT ENERGY IS BELOW THIS THRESHOLD ENERGY 0.82600
SO THIS EFFICIENCY IS THE RESULT OF THE NOISE CONTRIBUTION

A DETECTOR EFFICIENCY OF 0. WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.82600

DETECTOR EFFICIENCIES FOR TZERO = 0,60000

ITZ = 6

ORIGINAL AND SMOOTH VERSIONS OF THE INPUT DATA

ORIGINAL	SMOOTH	SMOOTH2	ARGUMENT
-0.16700000D-01	-0.2362833D-01	-0.2385861D-01	-0.4200000D-01
-0.33300000D-01	-0.1944333D-01	-0.1898278D-01	-0.3000000D-01
-0.83300000D-02	-0.1387667D-01	-0.1203222D-01	-0.1800000D-01
0.	-0.2776667D-02	-0.4625556D-02	-0.6000000D-02
0.	0.2776667D-02	0.4625556D-02	0.6000000D-02
0.83300000D-02	0.1387667D-01	0.1203222D-01	0.1800000D-01
0.33300000D-01	0.1944333D-01	0.2221778D-01	0.3000000D-01
0.16700000D-01	0.3333333D-01	0.2778111D-01	0.4200000D-01
0.50000000D-01	0.3056667D-01	0.3074444D-01	0.5400000D-01
0.25000000D-01	0.2833333D-01	0.3277778D-01	0.6600000D-01
0.10000000D-01	0.3943333D-01	0.5151111D-01	0.7800000D-01
0.83300000D-01	0.8676667D-01	0.8843333D-01	0.9000000D-01
0.16700000D 00	0.1391000D 00	0.1318444D 00	0.1020000D 00
0.16700000D 00	0.1696667D 00	0.1584778D 00	0.1140000D 00
0.17500000D 00	0.1666667D 00	0.1657778D 00	0.1260000D 00
0.15300000D 00	0.1610000D 00	0.1656667D 00	0.1380000D 00
0.15000000D 00	0.1693333D 00	0.1721111D 00	0.1500000D 00
0.20000000D 00	0.1860000D 00	0.1934444D 00	0.1620000D 00
0.20800000D 00	0.2250000D 00	0.2277778D 00	0.1740000D 00
0.26700000D 00	0.2723333D 00	0.2686667D 00	0.1860000D 00
0.34200000D 00	0.3086667D 00	0.2974444D 00	0.1980000D 00
0.31700000D 00	0.3113333D 00	0.3076667D 00	0.2100000D 00
0.27500000D 00	0.3030000D 00	0.3057778D 00	0.2220000D 00
0.31700000D 00	0.3030000D 00	0.3177778D 00	0.2340000D 00
0.31700000D 00	0.3473333D 00	0.3417778D 00	0.2460000D 00
0.40300000D 00	0.3750000D 00	0.3703333D 00	0.2580000D 00
0.40000000D 00	0.3886667D 00	0.3860000D 00	0.2700000D 00
0.35900000D 00	0.3943333D 00	0.3943333D 00	0.2820000D 00
0.42300000D 00	0.4000000D 00	0.4055556D 00	0.2940000D 00
0.41700000D 00	0.4223333D 00	0.3926667D 00	0.3060000D 00
0.42500000D 00	0.3556667D 00	0.3760000D 00	0.3180000D 00
0.22500000D 00	0.3500000D 00	0.3426667D 00	0.3300000D 00
0.40000000D 00	0.3223333D 00	0.3556667D 00	0.3420000D 00
0.34200000D 00	0.3946667D 00	0.3622222D 00	0.3540000D 00
0.44200000D 00	0.3696667D 00	0.3761111D 00	0.3660000D 00
0.32500000D 00	0.3640000D 00	0.3510000D 00	0.3780000D 00
0.32500000D 00	0.3193333D 00	0.3490000D 00	0.3900000D 00
0.30800000D 00	0.3636667D 00	0.3497778D 00	0.4020000D 00
0.45800000D 00	0.3663333D 00	0.3645556D 00	0.4140000D 00
0.33300000D 00	0.3636667D 00	0.3562222D 00	0.4260000D 00
0.30000000D 00	0.3386667D 00	0.3405556D 00	0.4380000D 00
0.38300000D 00	0.3193333D 00	0.3285556D 00	0.4500000D 00
0.27500000D 00	0.3276667D 00	0.3101111D 00	0.4620000D 00
0.32500000D 00	0.2833333D 00	0.3000000D 00	0.4740000D 00
0.25000000D 00	0.2890000D 00	0.2917778D 00	0.4860000D 00
0.29200000D 00	0.3030000D 00	0.3066667D 00	0.4980000D 00
0.36700000D 00	0.3280000D 00	0.3297778D 00	0.5100000D 00
0.32500000D 00	0.3583333D 00	0.3416667D 00	0.5220000D 00
0.38300000D 00	0.3386667D 00	0.3655556D 00	0.5340000D 00
0.30900000D 00	0.3996667D 00	0.4015556D 00	0.5460000D 00
0.50800000D 00	0.4663333D 00	0.4385556D 00	0.5580000D 00
0.58300000D 00	0.4496667D 00	0.4035444D 00	0.5700000D 00
0.25300000D 00	0.2946333D 00	0.2815333D 00	0.5820000D 00
0.42900000D-01	0.1003000D 00	0.1364111D 00	0.5940000D 00
0.	0.1430000D-01	0.3820000D-01	0.6060000D 00
0.	0.	0.4766667D-02	0.6180000D 00
0.	0.	0.	0.6300000D 00
0.	0.	0.	0.6420000D 00

TZERO = 0.60000
DENOMINATOR VALUE IS = 0.98489 FOR A MONITOR THRESHOLD OF 0.15200

A DETECTOR EFFICIENCY OF 0.98590 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.20900

A DETECTOR EFFICIENCY OF 0.89739 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.45600

THE INCIDENT ENERGY IS BELOW THIS THRESHOLD ENERGY 0.82600
SO THIS EFFICIENCY IS THE RESULT OF THE NOISE CONTRIBUTION

A DETECTOR EFFICIENCY OF 0. WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.82600

DETECTOR EFFICIENCIES FOR TZERO = 0.80000

ITZ = 7

ORIGINAL AND SMOOTH VERSIONS OF THE INPUT DATA

ORIGINAL	SMOOTH	SMOOTH2	ARGUMENT
-0.1880000D-01	-0.1879167D-01	-0.1879028D-01	-0.5600000D-01
-0.1250000D-01	-0.1251667D-01	-0.1251944D-01	-0.4000000D-01
-0.62500000D-02	-0.6250000D-02	-0.6950000D-02	-0.2400000D-01
0.	-0.2083333D-02	-0.2083333D-02	-0.8000000D-02
0.	0.2083333D-02	0.2083333D-02	0.8000000D-02
0.62500000D-02	0.6250000D-02	0.6950000D-02	0.2400000D-01
0.1250000D-01	0.1251667D-01	0.1112222D-01	0.4000000D-01
0.1830000D-01	0.1460000D-01	0.1599444D-01	0.5600000D-01
0.1250000D-01	0.2086667D-01	0.2293333D-01	0.7200000D-01
0.3130000D-01	0.3333333D-01	0.3612222D-01	0.6800000D-01
0.5620000D-01	0.5416667D-01	0.4930000D-01	0.1040000D 00
0.7500000D-01	0.6040000D-01	0.5902222D-01	0.1200000D 00
0.5000000D-01	0.6250000D-01	0.6180000D-01	0.1360000D 00
0.6250000D-01	0.6250000D-01	0.6805556D-01	0.1520000D 00
0.7500000D-01	0.7916667D-01	0.8055556D-01	0.1680000D 00
0.1000000D 00	0.1000000D 00	0.9861111D-01	0.1840000D 00
0.1250000D 00	0.1166667D 00	0.1194444D 00	0.2000000D 00
0.1250000D 00	0.1416667D 00	0.1410000D 00	0.2160000D 00
0.1750000D 00	0.1646667D 00	0.1612222D 00	0.2320000D 00
0.1940000D 00	0.1773333D 00	0.1696667D 00	0.2480000D 00
0.1630000D 00	0.1670000D 00	0.1905556D 00	0.2640000D 00
0.1440000D 00	0.2273333D 00	0.2224444D 00	0.2800000D 00
0.3750000D 00	0.2730000D 00	0.2980000D 00	0.2960000D 00
0.3000000D 00	0.3936667D 00	0.3923333D 00	0.3120000D 00
0.5050000D 00	0.5103333D 00	0.5346667D 00	0.3280000D 00
0.7250000D 00	0.7000000D 00	0.7127778D 00	0.3440000D 00
0.8690000D 00	0.9280000D 00	0.8970000D 00	0.3600000D 00
0.1190000D 01	0.1063000D 01	0.1055889D 01	0.3760000D 00
0.1130000D 01	0.1176667D 01	0.1144333D 01	0.3920000D 00
0.1210000D 01	0.1193333D 01	0.1192222D 01	0.4080000D 00
0.1240000D 01	0.1206667D 01	0.1190000D 01	0.4240000D 00
0.1170000D 01	0.1170000D 01	0.1173333D 01	0.4400000D 00
0.1190000D 01	0.1143333D 01	0.1141111D 01	0.4560000D 00
0.1150000D 01	0.1110000D 01	0.1105778D 01	0.4720000D 00
0.1070000D 01	0.1064000D 01	0.1067111D 01	0.4880000D 00
0.9620000D 00	0.1027333D 01	0.1018556D 01	0.5040000D 00
0.1050000D 01	0.9643333D 00	0.9770000D 00	0.5200000D 00
0.8810000D 00	0.9393333D 00	0.9192222D 00	0.5360000D 00
0.8870000D 00	0.8540000D 00	0.8657778D 00	0.5520000D 00
0.7940000D 00	0.8040000D 00	0.7860000D 00	0.5680000D 00
0.7310000D 00	0.7000000D 00	0.7263333D 00	0.5840000D 00
0.5750000D 00	0.6750000D 00	0.6736667D 00	0.6000000D 00
0.7190000D 00	0.6460000D 00	0.6577778D 00	0.6160000D 00
0.6440000D 00	0.6523333D 00	0.6258889D 00	0.6320000D 00
0.5940000D 00	0.5793333D 00	0.5710000D 00	0.6480000D 00
0.5000000D 00	0.4813333D 00	0.5014444D 00	0.6640000D 00
0.3500000D 00	0.4436667D 00	0.4416667D 00	0.6800000D 00
0.4810000D 00	0.4000000D 00	0.4215556D 00	0.6960000D 00
0.3690000D 00	0.4210000D 00	0.4140000D 00	0.7120000D 00
0.4130000D 00	0.4210000D 00	0.4111111D 00	0.7280000D 00
0.4810000D 00	0.4813333D 00	0.4708889D 00	0.7440000D 00
0.5500000D 00	0.5103333D 00	0.4583333D 00	0.7600000D 00
0.5000000D 00	0.3833333D 00	0.3645556D 00	0.7760000D 00
0.1000000D 00	0.2000000D 00	0.2055556D 00	0.7920000D 00
0.	0.3333333D-01	0.7777778D-01	0.8080000D 00
0.	0.	0.1111111D-01	0.8240000D 00
0.	0.	0.	0.8400000D 00
0.	0.	0.	0.8560001D 00

TZERO = 0.80000
DENOMINATOR VALUE IS = 0.99277 FOR A MONITOR THRESHOLD OF 0.15200

A DETECTOR EFFICIENCY OF 0.99422 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.20900

A DETECTOR EFFICIENCY OF 0.83397 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.45600

THE INCIDENT ENERGY IS BELOW THIS THRESHOLD ENERGY 0.82600
SO THIS EFFICIENCY IS THE RESULT OF THE NOISE CONTRIBUTION

A DETECTOR EFFICIENCY OF 0.10398 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.82600

DETECTOR EFFICIENCIES FOR TZERO = 1.00000

ITZ = 8

ORIGINAL AND SMOOTH VERSIONS OF THE INPUT DATA

ORIGINAL	SMOOTH	SMOOTH2	ARGUMENT
-0.15000000D-01	-0.11666667D-01	-0.11666667D-01	-0.70000000D-01
0.	-0.66666667D-02	-0.66666667D-02	-0.50000000D-01
-0.50000000D-02	-0.16666667D-02	-0.33333330D-02	-0.30000000D-01
0.	-0.16666667D-02	-0.55555550D-03	-0.10000000D-01
0.	0.16666667D-02	0.55555550D-03	0.10000000D-01
0.50000000D-02	0.16666667D-02	0.33333330D-02	0.30000000D-01
0.	0.66666670D-02	0.66666670D-02	0.50000000D-01
0.15000000D-01	0.11666667D-01	0.12222220D-01	0.70000000D-01
0.20000000D-01	0.18333330D-01	0.16666670D-01	0.90000000D-01
0.20000000D-01	0.20000000D-01	0.21666670D-01	0.11000000D 00
0.20000000D-01	0.26666670D-01	0.29444440D-01	0.13000000D 00
0.40000000D-01	0.41666670D-01	0.40000000D-01	0.15000000D 00
0.65000000D-01	0.51666670D-01	0.50555560D-01	0.17000000D 00
0.50000000D-01	0.50333330D-01	0.61111110D-01	0.19000000D 00
0.60000000D-01	0.73333330D-01	0.72222220D-01	0.21000000D 00
0.11000000D 00	0.85000000D-01	0.96111110D-01	0.23000000D 00
0.85000000D-01	0.13000000D 00	0.15722220 00	0.25000000D 00
0.19500000D 00	0.25666670D 00	0.31388890D 00	0.27000000D 00
0.49000000D 00	0.35500000D 00	0.40611110D 00	0.29000000D 00
0.98000000D 00	0.10066670D 01	0.10016670D 01	0.31000000D 00
0.15500000D 01	0.14433330D 01	0.14311110D 01	0.33000000D 00
0.18000000D 01	0.18433330D 01	0.17855560D 01	0.35000000D 00
0.21300000D 01	0.20700000D 01	0.20211110D 01	0.37000000D 00
0.22300000D 01	0.21500000D 01	0.20844440D 01	0.39000000D 00
0.20400000D 01	0.20333330D 01	0.20400000D 01	0.41000000D 00
0.18300000D 01	0.19366670D 01	0.19377780D 01	0.43000000D 00
0.19400000D 01	0.18433330D 01	0.18277780D 01	0.45000000D 00
0.17500000D 01	0.17033330D 01	0.16911110D 01	0.47000000D 00
0.14100000D 01	0.15266670D 01	0.15355560D 01	0.49000000D 00
0.14100000D 01	0.13766670D 01	0.13933330D 01	0.51000000D 00
0.13100000D 01	0.12766670D 01	0.12744440D 01	0.53000000D 00
0.11100000D 01	0.11700000D 01	0.11472220D 01	0.55000000D 00
0.10900000D 01	0.99500000D 00	0.10288890D 01	0.57000000D 00
0.78500000D 00	0.92166670D 00	0.90666670D 00	0.59000000D 00
0.89000000D 00	0.80333330D 00	0.83777780D 00	0.61000000D 00
0.73500000D 00	0.78833330D 00	0.77000000D 00	0.63000000D 00
0.74000000D 00	0.71833330D 00	0.72944440D 00	0.65000000D 00
0.68000000D 00	0.68166670D 00	0.67333330D 00	0.67000000D 00
0.62500000D 00	0.62000000D 00	0.62111110D 00	0.69000000D 00
0.55500000D 00	0.56166670D 00	0.56833330 00	0.71000000D 00
0.50500000D 00	0.52333330D 00	0.52722220D 00	0.73000000D 00
0.51000000D 00	0.49666670D 00	0.49222220D 00	0.75000000D 00
0.47500000D 00	0.45666670D 00	0.45111110D 00	0.77000000D 00
0.38500000D 00	0.40000000D 00	0.40777780D 00	0.79000000D 00
0.34000000D 00	0.36666670D 00	0.37444440D 00	0.81000000D 00
0.37500000D 00	0.35666670D 00	0.35222220D 00	0.83000000D 00
0.35500000D 00	0.33333330D 00	0.33277780D 00	0.85000000D 00
0.27000000D 00	0.30833330D 00	0.30555560D 00	0.87000000D 00
0.30000000D 00	0.27500000D 00	0.28444440D 00	0.89000010D 00
0.25500000D 00	0.27000000D 00	0.27222220D 00	0.91000010D 00
0.25500000D 00	0.27166670D 00	0.27888890D 00	0.93000010D 00
0.30500000D 00	0.29500000D 00	0.27588890D 00	0.95000010D 00
0.32500000D 00	0.26100000D 00	0.23844440D 00	0.97000010D 00
0.15300000D 00	0.15933330D 00	0.15711110D 00	0.99000010D 00
0.	0.51000000D-01	0.70111110D-01	0.10100000D 01
0.	0.	0.17000000D-01	0.10300000D 01
0.	0.	0.	0.10500000D 01
0.	0.	0.	0.10700000D 01

TZERO = 1.00000
DENOMINATOR VALUE IS = 0.99493 FOR A MONITOR THRESHOLD OF 0.15200

A DETECTOR EFFICIENCY OF 0.99629 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.20900

A DETECTOR EFFICIENCY OF 0.69941 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.45600

A DETECTOR EFFICIENCY OF 0.37696 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.82600

DETECTOR EFFICIENCIES FOR TZERO = 1.50000

ITZ = 9

ORIGINAL AND SMOOTH VERSIONS OF THE INPUT DATA

ORIGINAL	SMOOTH	SMOOTH2	ARGUMENT
-0.45300000D-01	-0.43533330D-01	-0.36277780D-01	-0.13125000D 00
-0.26700000D-01	-0.30233330D-01	-0.44744440D-01	-0.93750000D-01
-0.18700000D-01	-0.60466670D-01	-0.32311110D-01	-0.56250000D-01
-0.13500000D 00	-0.62333330D-02	-0.20155560D-01	-0.18750000D-01
0.13500000D 00	0.62333330D-02	0.20155560D-01	0.18750000D-01
0.18700000D-01	0.60466670D-01	0.32311110D-01	0.56250000D-01
0.26700000D-01	0.30233330D-01	0.42977780D-01	0.93750000D-01
0.45300000D-01	0.38233330D-01	0.39122220D-01	0.13125000D 00
0.42700000D-01	0.48900000D-01	0.65755560D-01	0.16875000D 00
0.58700000D-01	0.11013330D 00	0.92755560D 00	0.20625000D 00
0.22900000D 00	0.97192330D 00	0.95634440D 00	0.24375000D 00
0.18700000D 01	0.20396670D 01	0.20029670D 01	0.28125000D 00
0.40200000D 01	0.32500000D 01	0.29865560D 01	0.31875000D 00
0.38500000D 01	0.36700000D 01	0.33266670D 01	0.35625000D 00
0.31300000D 01	0.30600000D 01	0.30055560D 01	0.39375000D 00
0.21700000D 01	0.22866670D 01	0.23466670D 01	0.43125000D 00
0.15400000D 01	0.16933330D 01	0.17588890D 01	0.46875000D 00
0.13200000D 01	0.12966670D 01	0.13351110D 01	0.50625000D 00
0.10000000D 01	0.10153330D 01	0.10261110D 01	0.54375000D 00
0.69500000D 00	0.76633330D 00	0.79833330D 00	0.58125000D 00
0.60300000D 00	0.61333330D 00	0.64000000D 00	0.61875000D 00
0.54100000D 00	0.54033330D 00	0.54155560D 00	0.65625000D 00
0.47700000D 00	0.47100000D 00	0.46866670D 00	0.69375000D 00
0.39900000D 00	0.39466670D 00	0.40266670D 00	0.73125000D 00
0.31200000D 00	0.34233330D 00	0.34377780D 00	0.76875000D 00
0.32000000D 00	0.29433330D 00	0.30588890D 00	0.80625000D 00
0.25100000D 00	0.28100000D 00	0.27711110D 00	0.84375000D 00
0.27200000D 00	0.25600000D 00	0.25511110D 00	0.88125000D 00
0.24500000D 00	0.22833330D 00	0.22422220D 00	0.91875000D 00
0.16900000D 00	0.18833330D 00	0.19455560D 00	0.95625000D 00
0.15200000D 00	0.16700000D 00	0.16933330D 00	0.99375000D 00
0.18100000D 00	0.15266670D 00	0.15622220D 00	0.10312500D 01
0.12500000D 00	0.14900000D 00	0.14466670D 00	0.10687500D 01
0.14100000D 00	0.13233330D 00	0.13407780D 00	0.11062500D 01
0.13100000D 00	0.12090000D 00	0.11912220D 00	0.11437500D 01
0.90700000D-01	0.11041330D 00	0.10405560D 00	0.11812500D 01
0.90700000D-01	0.98713330D-01	0.92500000D-01	0.12187500D 01
0.80000000D-01	0.98623330D-01	0.81200000D-01	0.12562500D 01
0.88000000D-01	0.97023330D-01	0.74377780D-01	0.12937500D 01
0.42700000D-01	0.96666670D-01	0.68155560D-01	0.13312500D 01
0.69300000D-01	0.86756670D-01	0.70522220D-01	0.13687500D 01
0.90700000D-01	0.87733330D-01	0.75266670D-01	0.14062500D 01
0.72000000D-01	0.80900000D-01	0.78522220D-01	0.14437500D 01
0.80000000D-01	0.87733330D-01	0.82411110D-01	0.14812500D 01
0.90000000D-01	0.89000000D-01	0.79188890D-01	0.15187500D 01
0.10700000D 00	0.97123330D-01	0.77155560D-01	0.15562500D 01
0.26700000D-01	0.97123330D-01	0.62311110D-01	0.15937500D 01
0.80000000D-01	0.94446670D-01	0.56344440D-01	0.16312500D 01
0.26700000D-01	0.95333330D-01	0.41488890D-01	0.16687500D 01
0.53300000D-01	0.92666670D-01	0.32588890D-01	0.17062500D 01
0.	0.91776670D-01	0.14811110D-01	0.17437500D 01
0.	0.	0.59222220D-02	0.17812500D 01
0.	0.	0.	0.18187500D 01
0.	0.	0.	0.18562500D 01
0.	0.	0.	0.18937500D 01
0.	0.	0.	0.19312500D 01
0.	0.	0.	0.19687500D 01
0.	0.	0.	0.20062500D 01

TZERO = 1.50000
DENOMINATOR VALUE IS = 0.99046 FOR A MONITOR THRESHOLD OF 0.15200

A DETECTOR EFFICIENCY OF 0.98000 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.20900

A DETECTOR EFFICIENCY OF 0.43787 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.45600

A DETECTOR EFFICIENCY OF 0.14693 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.82600

DETECTOR EFFICIENCIES FOR TZERO = 2.00000

ITZ = 10

-0.48000000D-01	-0.47000000D 01	-0.3872222D-01	-0.17500000D 00
-0.42000000D-01	-0.44000000D-01	-0.60555556D-01	-0.12500000D 00
-0.42000000D-01	-0.9066667D-01	-0.4955556D-01	-0.75000000D-01
-0.18300000D 00	-0.11400000D-01	-0.3022222D-01	-0.25000000D-01
0.18300000D 00	0.11400000D-01	0.3022222D-01	0.25000000D-01
0.42000000D-01	0.9066667D-01	0.4955556D-01	0.75000000D-01
0.42000000D-01	0.44000000D-01	0.71111111D-01	0.12500000D 00
0.48000000D-01	0.7866667D-01	0.37800000D 00	0.17500000D 00
0.14500000D 00	0.11011333D 01	0.13062222D 01	0.22500000D 00
0.28600000D 01	0.2828667D 01	0.2634444D 01	0.27500000D 00
0.55000000D 01	0.40633333D 01	0.35740000D 01	0.32500000D 00
0.38500000D 01	0.33830000D 01	0.3438889D 01	0.37500000D 00
0.21400000D 01	0.12423333D 01	0.2549556D 01	0.42500000D 00
0.12900000D 01	0.11395333D 01	0.1565778D 01	0.47500000D 00
0.76500000D 00	0.78786667D 00	0.95711111D 00	0.52500000D 00
0.59000000D 00	0.55973333D 00	0.63666667D 00	0.57500000D 00
0.43600000D 00	0.44340000D 00	0.4495555D 00	0.62500000D 00
0.27500000D 00	0.33173333D 00	0.3291111D 00	0.67500000D 00
0.24000000D 00	0.23600000D 00	0.25000000D 00	0.72500000D 00
0.19200000D 00	0.19666667D 00	0.19955556D 00	0.77500000D 00
0.15800000D 00	0.16600000D 00	0.16533333D 00	0.82500000D 00
0.14500000D 00	0.13333336D 00	0.1406667D 00	0.87500000D 00
0.94000000D-01	0.11226667D 00	0.1186667D 00	0.92500000D 00
0.12500000D 00	0.10000000D 00	0.1048889D 00	0.97500000D 00
0.80000000D-01	0.92000000D-01	0.88222222D-01	0.10250000D 01
0.70000000D-01	0.7266667D-01	0.7666667D-01	0.10750000D 01
0.68000000D-01	0.76333333D-01	0.6533333D-01	0.11250000D 01
0.58000000D-01	0.58000000D-01	0.59111111D-01	0.11750000D 01
0.48000000D-01	0.54000000D-01	0.5444444D-01	0.12250000D 01
0.56000000D-01	0.51333333D-01	0.51111111D-01	0.12750000D 01
0.50000000D-01	0.48000000D-01	0.47333333D-01	0.13250000D 01
0.38000000D-01	0.44266667D-01	0.41333333D-01	0.13750000D 01
0.40000000D-01	0.43333333D-01	0.3644444D-01	0.14250000D 01
0.22000000D-01	0.33333333D-01	0.3244444D-01	0.14750000D 01
0.38000000D-01	0.33066667D-01	0.3066667D-01	0.15250000D 01
0.32000000D-01	0.32800000D-01	0.2733333D-01	0.15750000D 01
0.14000000D-01	0.32333333D-01	0.2288889D-01	0.16250000D 01
0.24000000D-01	0.31733333D-01	0.2022222D-01	0.16750000D 01
0.14000000D-01	0.32000000D-01	0.2088889D-01	0.17250000D 01
0.22000000D-01	0.32533333D-01	0.2466667D-01	0.17750000D 01
0.40000000D-01	0.32866667D-01	0.2666667D-01	0.18250000D 01
0.24000000D-01	0.32600000D-01	0.2911111D-01	0.18750000D 01
0.14000000D-01	0.33266667D-01	0.3000000D-01	0.19250000D 01
0.60000000D-01	0.33133333D-01	0.3244444D-01	0.19750000D 01
0.20000000D-01	0.33333333D-01	0.2822222D-01	0.20250000D 01
0.20000000D-01	0.32000000D-01	0.2666667D-01	0.20750000D 01
0.20000000D-01	0.32666667D-01	0.2444444D-01	0.21250000D 01
0.40000000D-01	0.32666667D-01	0.2444444D-01	0.21750000D 01
0.20000000D-01	0.32000000D-01	0.1777778D-01	0.22250000D 01
0.	0.26666667D-02	0.8888889D-02	0.22750000D 01
0.	0.	0.2222222D-02	0.23250000D 01
0.	0.	0.	0.23750000D 01
0.	0.	0.	0.24250000D 01
0.	0.	0.	0.24750000D 01
0.	0.	0.	0.25250000D 01
0.	0.	0.	0.25750000D 01
0.	0.	0.	0.26250000D 01
0.	0.	0.	0.26750000D 01

TZERO = 2.00000
DENOMINATOR VALUE IS = 0.97406 FOR A MONITOR THRESHOLD OF 0.15200

A DETECTOR EFFICIENCY OF 0.94844 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.20900

A DETECTOR EFFICIENCY OF 0.32106 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.45600

A DETECTOR EFFICIENCY OF 0.07367 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.82600

DETECTOR EFFICIENCIES FOR TZERO = 3.00000

ITZ = 11

ORIGINAL AND SMOOTH VERSIONS OF THE INPUT DATA

ORIGINAL	SMOOTH	SMOOTH2	ARGUMENT
-0.33400000D 01	-0.28009000D 01	-0.2698844D 01	-0.2625000D 00
-0.70700000D-01	-0.1148900D 01	-0.1353011D 01	-0.1875000D 00
-0.36000000D-01	-0.1092333D 00	-0.4233778D 00	-0.1125000D 00
-0.22100000D 00	-0.1200000D-01	-0.3641111D-01	-0.3750000D-01
0.22100000D 00	0.1200000D-01	0.3641111D-01	0.3750000D-01
0.36000000D-01	0.1092333D 00	0.4233778D 00	0.1125000D 00
0.70700000D-01	0.1148900D 01	0.1420567D 01	0.1875000D 00
0.33400000D 01	0.3003567D 01	0.2603044D 01	0.2625000D 00
0.56000000D 01	0.3656667D 01	0.3154967D 01	0.3375000D 00
0.20300000D 01	0.2804667D 01	0.2513444D 01	0.4125000D 00
0.78400000D 00	0.1079000D 01	0.1458444D 01	0.4875000D 00
0.42300000D 00	0.4916667D 00	0.6204444D 00	0.5625000D 00
0.26900000D 00	0.2906667D 00	0.3221111D 00	0.6375000D 00
0.18100000D 00	0.1840000D 00	0.1971889D 00	0.7125000D 00
0.10300000D 00	0.1169000D 00	0.1240444D 00	0.7875000D 00
0.66700000D-01	0.7123333D-01	0.7826667D-01	0.8625000D 00
0.44000000D-01	0.4666667D-01	0.4936667D-01	0.9375000D 00
0.29300000D-01	0.3020000D-01	0.3272222D-01	0.1012500D 01
0.17300000D-01	0.2130000D-01	0.2234444D-01	0.1087500D 01
0.17300000D-01	0.1553333D-01	0.1745556D-01	0.1162500D 01
0.12000000D-01	0.1553333D-01	0.1420333D-01	0.1237500D 01
0.17300000D-01	0.1154333D-01	0.1272889D-01	0.1312500D 01
0.53300000D-02	0.1111000D-01	0.9776667D-02	0.1387500D 01
0.10700000D-01	0.6676667D-02	0.8751111D-02	0.1462500D 01
0.40000000D-02	0.8466667D-02	0.7125556D-02	0.1537500D 01
0.10700000D-01	0.6233333D-02	0.7274444D-02	0.1612500D 01
0.40000000D-02	0.7123333D-02	0.5934444D-02	0.1687500D 01
0.66700000D-02	0.4446667D-02	0.5338889D-02	0.1762500D 01
0.26700000D-02	0.4446667D-02	0.4150000D-02	0.1837500D 01
0.40000000D-02	0.3556667D-02	0.3704444D-02	0.1912500D 01
0.40000000D-02	0.3110000D-02	0.2814444D-02	0.1987500D 01
0.13300000D-02	0.1776667D-02	0.1924444D-02	0.2062500D 01
0.	0.8866667D-03	0.1035556D-02	0.2137500D 01
0.13300000D-02	0.4433333D-03	0.7388889D-03	0.2212500D 01
0.	0.8866667D-03	0.7388889D-03	0.2287500D 01
0.13300000D-02	0.8866667D-03	0.1034444D-02	0.2362500D 01
0.13300000D-02	0.1330000D-02	0.1182222D-02	0.2437500D 01
0.13300000D-02	0.1330000D-02	0.1182222D-02	0.2512500D 01
0.13300000D-02	0.8866667D-03	0.1183333D-02	0.2587500D 01
0.	0.1333333D-02	0.1036667D-02	0.2662500D 01
0.26700000D-02	0.8900000D-03	0.1037778D-02	0.2737500D 01
0.	0.8900000D-03	0.5933333D-03	0.2812500D 01
0.	0.	0.2966667D-03	0.2887500D 01
0.	0.	0.	0.2962500D 01
0.	0.	0.	0.3037500D 01
0.	0.	0.	0.3112500D 01
0.	0.	0.	0.3187500D 01
0.	0.	0.	0.3262500D 01
0.	0.	0.	0.3337500D 01
0.	0.	0.	0.3412500D 01
0.	0.	0.	0.3487500D 01
0.	0.	0.	0.3562500D 01
0.	0.	0.	0.3637500D 01
0.	0.	0.	0.3712500D 01
0.	0.	0.	0.3787500D 01
0.	0.	0.	0.3862500D 01
0.	0.	0.	0.3937500D 01
0.	0.	0.	0.4012500D 01

EXP UNDERFLO AT LOCATION 021167

TZERO = 3.00000
DENOMINATOR VALUE IS = 0.89997 FOR A MONITOR THRESHOLD OF 0.15200

EXP UNDERFLO AT LOCATION 021167

A DETECTOR EFFICIENCY OF 0.89648 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.20900

EXP UNDERFLO AT LOCATION 021167

A DETECTOR EFFICIENCY OF 0.29623 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.45600

EXP UNDERFLO AT LOCATION 021167

A DETECTOR EFFICIENCY OF 0.02674 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.82600

DETECTOR EFFICIENCIES FOR TZERO = 4.00000

ITZ = 12

ORIGINAL AND SMOOTH VERSIONS OF THE INPUT DATA

ORIGINAL	SMOOTH	SMOOTH2	ARGUMENT
-0.4750000D 01	-0.4932500D 01	-0.4791194D 01	-0.3500000D 00
-0.2920000D 01	-0.2575000D 01	-0.2857614D 01	-0.2500000D 00
-0.4500000D-01	-0.1065333D 01	-0.1218444D 01	-0.1500000D 00
-0.2310000D 00	-0.1500000D-01	-0.3551114D 00	-0.5000000D-01
0.2310000D 00	0.1500000D-01	0.3551114D 00	0.5000000D-01
0.4500000D-01	0.1065333D 01	0.1218444D 01	0.1500000D 00
0.2920000D 01	0.2575000D 01	0.2195667D 01	0.2500000D 00
0.4750000D 01	0.2946667D 01	0.2541556D 01	0.3500000D 00
0.1160000D 01	0.2103000D 01	0.1875556D 01	0.4500000D 00
0.3820000D 00	0.5770000D 00	0.9674444D 00	0.5500000D 00
0.1820000D 00	0.2223333D 00	0.3057778D 00	0.6500000D 00
0.9600000D-01	0.1180000D 00	0.1367778D 00	0.7500000D 00
0.7600000D-01	0.7000000D-01	0.7844444D-01	0.8500000D 00
0.3800000D-01	0.4733333D-01	0.4755556D-01	0.9500000D 00
0.2800000D-01	0.2533333D-01	0.2988889D-01	0.1050000D 01
0.1000000D-01	0.1700000D-01	0.1711111D-01	0.1150000D 01
0.1300000D-01	0.9000000D-02	0.1166667D-01	0.1250000D 01
0.4000000D-02	0.9000000D-02	0.8333333D-02	0.1350000D 01
0.1000000D-01	0.7000000D-02	0.8111111D-02	0.1450000D 01
0.7000000D-02	0.8333333D-02	0.7222222D-02	0.1550000D 01
0.8000000D-02	0.6333333D-02	0.6888889D-02	0.1650000D 01
0.4000000D-02	0.6000000D-02	0.5666667D-02	0.1750000D 01
0.6000000D-02	0.4666667D-02	0.4666667D-02	0.1850000D 01
0.4000000D-02	0.3333333D-02	0.3222222D-02	0.1950000D 01
0.	0.1666667D-02	0.1777778D-02	0.2050000D 01
0.1000000D-02	0.3333333D-03	0.7777778D-03	0.2150000D 01
0.	0.3333333D-03	0.2222222D-03	0.2250000D 01
0.	0.	0.1111111D-03	0.2350000D 01
0.	0.	0.	0.2450000D 01
0.	0.	0.1111111D-03	0.2550000D 01
0.	0.3333333D-03	0.2222222D-03	0.2650000D 01
0.1000000D-02	0.3333333D-03	0.3333333D-03	0.2750000D 01
0.	0.3333333D-03	0.2222222D-03	0.2850000D 01
0.	0.	0.1111111D-03	0.2950000D 01
0.	0.	0.	0.3050000D 01
0.	0.	0.	0.3150000D 01
0.	0.	0.	0.3250000D 01
0.	0.	0.	0.3350000D 01
0.	0.	0.	0.3450000D 01
0.	0.	0.	0.3550000D 01
0.	0.	0.	0.3650000D 01
0.	0.	0.	0.3750000D 01
0.	0.	0.	0.3850000D 01
0.	0.	0.	0.3950000D 01
0.	0.	0.	0.4050000D 01
0.	0.	0.	0.4150000D 01
0.	0.	0.	0.4250000D 01
0.	0.	0.	0.4350000D 01
0.	0.	0.	0.4450000D 01
0.	0.	0.	0.4550000D 01
0.	0.	0.	0.4650000D 01
0.	0.	0.	0.4750000D 01
0.	0.	0.	0.4850000D 01
0.	0.	0.	0.4950000D 01
0.	0.	0.	0.5050000D 01
0.	0.	0.	0.5150000D 01
0.	0.	0.	0.5250000D 01
0.	0.	0.	0.5350000D 01

TZERO = 4.00000
DENOMINATOR VALUE IS = 0.81174 FOR A MONITOR THRESHOLD OF 0.15200

A DETECTOR EFFICIENCY OF 0.90933 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.20900

A DETECTOR EFFICIENCY OF 0.36093 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.45600

A DETECTOR EFFICIENCY OF 0.02919 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.82600

DETECTOR EFFICIENCIES FOR TZERO = 5.00000

ITZ = 13

ORIGINAL AND SMOOTH VERSIONS OF THE INPUT DATA

ORIGINAL	SMOOTH	SMOOTH2	ARGUMENT
-0.12500000D 01	-0.2924333D 01	-0.2890833D 01	-0.4375000D 00
-0.56900000D 01	-0.2361333D 01	-0.2428333D 01	-0.3125000D 00
-0.13400000D 00	-0.1999333D 01	-0.1468444D 01	-0.1875000D 00
-0.17400000D 00	-0.4466667D-01	-0.6664444D 00	-0.6250000D-01
0.17400000D 00	0.4466667D-01	0.6664444D 00	0.6250000D-01
0.13400000D 00	0.1999333D 01	0.1468444D 01	0.1875000D 00
0.56900000D 01	0.2361333D 01	0.2264556D 01	0.3125000D 00
0.12500000D 01	0.2433000D 01	0.1794444D 01	0.4375000D 00
0.34900000D 00	0.5890000D 00	0.1073089D 01	0.5625000D 00
0.15800000D 00	0.1972667D 00	0.2952889D 00	0.6875000D 00
0.84300000D-01	0.9960000D-01	0.1187778D 00	0.8125000D 00
0.56000000D-01	0.5946667D-01	0.6564444D-01	0.9375000D 00
0.37500000D-01	0.3786667D-01	0.3973333D-01	0.1062500D 01
0.20000000D-01	0.2186667D-01	0.2382222D-01	0.1187500D 01
0.80000000D-02	0.1173333D-01	0.1386667D-01	0.1312500D 01
0.72000000D-02	0.80000000D-02	0.8711111D-02	0.1437500D 01
0.88000000D-02	0.6400000D-02	0.6400000D-02	0.1562500D 01
0.32000000D-02	0.4800000D-02	0.4444444D-02	0.1687500D 01
0.24000000D-02	0.2133333D-02	0.2844444D-02	0.1812500D 01
0.80000000D-03	0.1600000D-02	0.1600000D-02	0.1937500D 01
0.16000000D-02	0.1066667D-02	0.1155556D-02	0.2062500D 01
0.80000000D-03	0.8000000D-03	0.7111111D-03	0.2187500D 01
0.	0.2666667D-03	0.3555556D-03	0.2312500D 01
0.	0.	0.1777778D-03	0.2437500D 01
0.	0.2666667D-03	0.1777778D-03	0.2562500D 01
0.80000000D-03	0.2666667D-03	0.2666667D-03	0.2687500D 01
0.	0.2666667D-03	0.1777778D-03	0.2812500D 01
0.	0.	0.1777778D-03	0.2937500D 01
0.	0.2666667D-03	0.1777778D-03	0.3062500D 01
0.80000000D-03	0.2666667D-03	0.2666667D-03	0.3187500D 01
0.	0.2666667D-03	0.1777778D-03	0.3312500D 01
0.	0.	0.8888899D-04	0.3437500D 01
0.	0.	0.	0.3562500D 01
0.	0.	0.	0.3687500D 01
0.	0.	0.	0.3812500D 01
0.	0.	0.	0.3937500D 01
0.	0.	0.	0.4062500D 01
0.	0.	0.	0.4187500D 01
0.	0.	0.	0.4312500D 01
0.	0.	0.	0.4437500D 01
0.	0.	0.	0.4562500D 01
0.	0.	0.	0.4687500D 01
0.	0.	0.	0.4812500D 01
0.	0.	0.	0.4937500D 01
0.	0.	0.	0.5062500D 01
0.	0.	0.	0.5187500D 01
0.	0.	0.	0.5312500D 01
0.	0.	0.	0.5437500D 01
0.	0.	0.	0.5562500D 01
0.	0.	0.	0.5687500D 01
0.	0.	0.	0.5812500D 01
0.	0.	0.	0.5937500D 01
0.	0.	0.	0.6062500D 01
0.	0.	0.	0.6187500D 01
0.	0.	0.	0.6312500D 01
0.	0.	0.	0.6437500D 01
0.	0.	0.	0.6562500D 01
0.	0.	0.	0.6687500D 01

TZERO = 5.00000
DENOMINATOR VALUE IS = 0.76979 FOR A MONITOR THRESHOLD OF 0.15200

A DETECTOR EFFICIENCY OF 0.91872 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.20900

A DETECTOR EFFICIENCY OF 0.43358 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.45600

A DETECTOR EFFICIENCY OF 0.04091 WAS COMPUTED FOR A DETECTOR THRESHOLD OF 0.82600