# EUR 2104.e

EUROPEAN ATOMIC ENERGY COMMUNITY - EURATOM

# THE CODE COSTANZA

by

A. AGAZZI (C. Gavazzi S.p.A. - Milan),
E. VINCENTI and R. MONTEROSSO
(Euratom)

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## LEGAL NOTICE

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# CONTENTS

# 1. Identification

Dynamic code for the study of reactor TESI.

a. 60.5414. CØST

b. Vincenti - Monterosso - Agazzi - February 1964

c. EURATOM, C.E.T.I.S., Ispra

d. IBM 7090 Standard Fortran Monitor System, CALCOMP.

e. Fortran II vers. 3.

# 2. Purpose

The code studies the spatial dynamic of Reactor TESI, in
the two groups approximation and one space dimension. Only
one group of delayed neutron is considered. The reactor is
an infinite horizontal slab and consists, along the height
of three regions :
$R_1$ = lower reflector, $R_2$ = core, $R_3$ = upper reflector. The
lower and upper reflectors are of the same material.
The code simulates the movement of the control rods along
the height, according to any given law of movement. The
rods are substituted by an equivalent poison uniformly
distributed in the rodded region. If some rods remain in
the reactor they can be simulated by an equivalent poison
$\Sigma_{pr}$ uniformly distributed all over the reactor.
The core is not cooled and the temperature increases as the
integral of the flux.
The reflectors remain at the initial temperature.
The code calculates the evolution of the fluxes and temperature
and precursor concentration in space and time during the
power excursion.

## 3. Method (*)

The quasi linear system of the two-groups diffusion equations is :

$$D_f^k \frac{\partial^2 \psi}{\partial z^2} - A^k \psi + B^k \varphi + C^k = \frac{1}{w^k} \frac{\partial \psi}{\partial t}$$

$$D_t^k \frac{\partial^2 \varphi}{\partial z^2} - E^k \varphi + F^k \psi = \frac{1}{v^k} \frac{\partial \varphi}{\partial t}$$

Supposing that the coefficients are constant during a time step $\Delta t$, this is transformed, by the finite difference method, into a system of linear equations.
This system can be solved optionally, either by the blok Gauss-Seidel iterative method, or by a direct method.
The cross sections and the neutron velocities are calculated according to :

$$\Sigma_a^c (z,t) = \Sigma_{ao}^c \sqrt{\frac{T_o}{T(z,t)}}$$

$$\Sigma_p (z,t) = \Sigma_{po} \sqrt{\frac{T_o}{T(z,t)}}$$

$$w(z,t) = w_o \sqrt{\frac{T(z,t)}{T_o}}$$

$$v(z,t) = v_o \sqrt{\frac{T(z,t)}{T_o}}$$

where $T_o$ is the uniform temperature of the cold reactors at the initial state and $\Sigma_{ao}^c$, $\Sigma_{po}$, $w_o$, $v_o$, are values corresponding to the temperature $T_o$.
The quantities $k$, $\tau$, $c$ are obtained by linear interpolation on tables given as input data.

_____

(*) See report EUR 596.e.

## 4. Input Data

Card 1          Comment - maximum 72 characters (Format 12A6)

Card 2          Contains the 7 following quantities (Format 7E10.6)

Column    1-10    $\Delta Z_1$ (DZ1) mesh increment in the region $R_1$

          11-20   $\Delta Z_2$ (DZ2)   "       "       "       "    $R_2$

          21-30   $\Delta Z_3$ (DZ3)   "       "       "       "    $R_3$

          31-40   $D_f^R$ (DRF) Fast diffusion coefficient in the reflectors

          41-50   $D_f^c$ (DCF)   "       "         "         "    "  core

          51-60   $D_t^R$ (DRT) Thermal "         "         "    "  reflectors

          61-70   $D_t^c$ (DCT)   "       "         "         "    "  core

Card 3          Contains the following 7 quantities (Format 7E10.6)

Column    1-10    $\Delta t$ (DT) Time Step

          11-20   $\Sigma_{ao}^R$ (SARZ) Absorption cross section in the reflectors

          21-30   $\Sigma_{ao}^c$ (SACZ)   "       "       "       "    "  core

          31-40   $w_o$ (WZ) Neutron velocity of the fast group

          41-50   $v_o$ (VZ)   "         "       "   "  thermal  "

          51-60   $\Sigma_{po}$ (SPZ) Control rod equivalent poison

          61-70   $T_o$ (TZ) Temperature of the cold reactor (in Kelvin)

Card 4          Contains the 7 following quantities (Format 7E10.6)

Column    1-10    $B^2$ (BU) Radial buckling

          11-20   $\beta$ (B) Fraction of fission neutrons which is delayed

          21-30   $\lambda$ (DL) Decay constant of the delayed neutrons precursors

          31-40   $\Sigma_{pr}$ (SPR) Poison equivalent to the control rods which remain in the reactor.

          41-50   $\varepsilon$ (PREC) Precision of the iterative method in the inner iterations for every time step ($\varepsilon = 0$ for the direct method)

          51-60   $v$ (VNU) Number of fast neutrons released per fission

          61-70   FC (FC) Energy released per fission in calories

<u>Card 5</u>    Contains the 7 following quantities (Format 7E10.6)

Column 1-10   $x_z$ (XZ) Position of the control rods

11-20  $t_0$ (TØ) Initial time ($t_0$=0 in a new calculation; $t_l \neq 0$ when an interrupted calculation is reinitiated at the same instant)

21-30  $t_f$ (TF) Maximum physical time corresponding to the calculation

31-40  $K_p$ (VKP)

41-50  $\tau_c^R$ (TRP)   Slope of the curves $K_{ao}(T)$, $\tau^R(T)$,

51-60  $\tau_o^c$ (TCP)   $\tau^c(T)$, cs(T) at the highest temperature

61-70  csp (CSP)   of the table. See card, group A.

<u>Card 6</u>    Contains the two following quantities (Format 2E10.6)

Column 1-10   $T_M^R$ (TMR) Initial reflector temperature at the lower interface core-reflector

11-20  $T_N^R$ (TNR) Initial reflector temperature at the upper interface core- reflector

<u>Card 7</u>    Contains the 7 following quantities (Format 7I10)

Column 1-10 M   Index of the point at the interface between the lower interface and the core.

11-20 N   Index of the point at the interface between core and upper reflector

21-30 L   Index of the point at the external boundary of the upper reflector

31-40 INT   Number of inner iterations for the Gauss- Seidel method (INT = 0 for the direct method)

41-50 KL   Number of entries in the tables of $K_\infty(T)$, $\tau^R(T)$, $T^c(T)$, cs(T) for ΔT constant. (See next group of cards)

51-60 KI   These are utilized only when Sense Switch 3 is Down for the Gauss- Seidel method -

61-70 KS   ( KI KS = 0 for Sense Switch 3 ON)

<u>Group A</u>  -  KL Cards (KL - card 7 -(41 ÷ 50)) containing the
the tables of $K\infty$, $\tau^R$, $\tau^c$, cs. Each card contains
with Format 5E10.6 :
Column 1-10  TK  (TT) Temperature in $^oK$
      11-20  $K\infty(T_k)$ (VK) Infinite
      21-30  $\tau^R(T_k)$ (TAUR) Fermi age in reflectors
      31-40  $\tau^c(T_k)$ (TAUC)  "    "   "  core
      41-50  $cs(T_k)$ (CST) Specific heat $\dfrac{calories}{cm^3\ {}^oK}$


<u>Group B</u>  -  L Cards (L - Card 7 -(21 ÷ 30)) containing the
initial distributions of T, C, $\psi$, $\varphi$ of the time
$t_o$ ($t_o$ - Card 5 -(11 - 20)) with format 4E10.6 :
Column 1-10  $T(z_i, t_o)$ (T1) Temperature in $^oK$
      11-20  $C(z_i, t_o)$ (C1) Density of the delayed
                              neutrons precursors
      21-30  $\psi(z_i, t_o)$ (PS1) Fast flux
      31-40  $\varphi(z_i, t_o)$ (PS2) Thermal flux


<u>Group C</u>  -  These cards control the rods movement and the
print . Each card contains :
Column 1-10  JI    Format I10
      11-20  JS     "      "
      21-30  IP     "      "
      31-40  VB    Format E10.6

This specifies that, from the time step JI to the
time step JS, the control rods move with the
constant velocity $VB\dfrac{cm}{sec}$ (VB positive = extraction;
VB negative = introduction) and the program prints
at every IP time steps.


<u>Example</u>

$\Delta t = 10^{-3}sec$ ; $t_f - t_o = 1$ sec.

Height of the reactor = $(M-1) \cdot \Delta Z1 + (N-M) \cdot \Delta Z2 + (L-N) \cdot \Delta Z3$
                      $= 300$ cm.

|        | JI  | JS   | IP  | VB $(\frac{cm}{sec})$ |
|--------|-----|------|-----|------------------------|
| Card C1 | 1   | 100  | 10  | 10 |
| Card C2 | 101 | 150  | 25  | 20 |
| Card C3 | 151 | 250  | 50  | 10 |
| Card C4 | 251 | 750  | 850 | 0  |
| Card C5 | 751 | 1001 | 251 | 0  |

In each card it must be $1 \leqslant IP \leqslant (JS - JI + 1)$ and $\frac{JS-JI+1}{IP}$ = integer.

In the last card

$$JS = \frac{t_f - t_o}{\Delta t} + 1$$

The program can process successively several cases.

## 5. Output

In the first page of the output the code prints all the data
contained in the cards 1 to 7, and the table given in the
cards of Group A.

At every IP time step (card of the C-group) the program prints
a page with :

- the time $T\emptyset$
- the number of time step ITER
- the position of the control rods XZ
- $1/T$ = the reciprocal of the reactor period (REP)
- $d\varphi(t)/\lambda t$ = the thermal flux time derivative (DP)
- the thermal group neutron velocity VM.

In correspondence of every point $z_l$ of the lattice, the
program prints :

TR = temperature of the reflector (Kelvin)
TC =    "     "   " core    (  "  )
C  = density of the atoms precursor of delayed neutrons($\frac{C}{cm^3}$)
PH1 = $\psi(z)$ fast flux (n/cm². sec)
PH2 = $\varphi(z)$ thermal flux (n/cm². sec)
N = Density of the thermal neutrons (n/cm³)

The number appearing below each column is the average value
in the core.
In addition to the print made at every IP time steps, the
code makes automatically a print at the beginning "Condizioni
Iniziali", at all the maxima and minima of the function $\overline{\varphi}(t)$
"Massimo o Minimo" and at the end of the calculation.

## 6. Sense Switches

Switch 1 - Normally is UP

> If DOWN the program prints the coefficients of the
> linear system (see 3) Method)

Switch 2 - Normally UP

> If DOWN the program makes a print to check the
> poisoning due to the control rod.

Switch 3 - Normally UP

> If DOWN : print of check of the convergence of the
> inner iterations in the Gauss-Seidel Method.
> At every time step between KI and KS (see Card 7 -
> (51 ÷ 70)) it will be printed :
> ITER = Index of the time step
> INT1 = Index of the inner iteration
> J4 = The fluxes $\psi(z)$ and $\varphi(z)$ have their maximum
> relative error at the point $Z_{J4}$.
> PH1(J4) = Fast flux
> PH2(J4) = Thermal flux
> SM = Maximum relative error

Switch 4 - Normally UP

> If DOWN the program prepares the tape for the
> Calcomp Data Plotter.
> This tape contains the curves $\overline{\psi}(t)$, $\overline{\varphi}(t)$, $\overline{T}(t)$ :
> average fluxes and average temperature as function
> of time. These curves are plotted in a semi- loga-
> rithmic scale, except the third one.

Switch , - Normally UP

> If DOWN the program prepares the tape for the
> Calcomp Data Plotter. This tape contains the
> spatial distribution of fast and thermal fluxes
> and of the temperature.
> The curves will be plotted in correspondence of
> every print.

Switch 6 - Must be UP

If DOWN the calculation will be interrupted at the
end of the time step and a print will be made.
The average flux will not be plotted even if requested
(Switch 4 DOWN)

## 7. Program Composition

The code consists of the Main Program, 10 Subroutines and one Function Subprogram.

1) - Main Program - Reads the input data up to group B included. Calculates the constant parts of the coefficients. Choices, according to the datum INT, the method of calculation (Iterative INT$\neq$ 0; Direct INT = 0). Storage used 938 words.

2) - Sub. SOLU - Reads. data cards of group C. Coordinates the subprograms.
161 words.

3) - Sub. BARRE - Determines the control rods position and calculates the parameters influenced by the rod's position.
250 words.

4) - Sub. COEFF - Calculates the coefficients at every time step.
338 words.

5) - Sub. FLUX 1 - Solution by the direct method of the diffusion equations system.
846 words.

6) - Sub. FLUX 2 - Solution of the diffusion equations system by the iterative Gauss-Seidel method. If SWITCH 3 is DOWN prints informations on the convergency of the inner iterations.
454 words.

7) - Sub. TEMPER - Calculates the evolution of temperature in the core.
45 words.

8) - Sub. INTEGR. - Calculates $\bar{\psi}$, $\bar{\varphi}$ fast and thermal fluxes averaged in the core. Call the subroutine STAMPA at the maxima and minima of $\bar{\varphi}(t)$.
94 words.

9) - Sub. STAMPA - This subroutine is called at the time
steps indicated in the data (Group C),
at the initial instant and at the
maxima and minima of $\bar{\varphi}(t)$. It effectuates
the prints according to the switches 1
and 2 (see OUTPUT).
881 words.

10) - Sub. STPLOT - Plots the curves $\bar{\psi}(t)$, $\bar{\varphi}(t)$ and $\bar{T}(t)$.
119 words.

11) - Sub. SPAZPL - Plots the spatial distributions $\psi(z)$,
$\varphi(z)$ and $T(z)$.
186 words.

12) - Function FUNC - Makes the linear interpolations on
the tables of $K_\infty$, $\tau$ and specific heat.

The code uses 2900 words of the COMMON. In addition there are
the memory cells occupied by the input-output sub-programs
and by the subroutines for the use of the Calcomp Data Plotter.
The listing is in annex 1.

Limitation of the code
The maximum number of lattice-points is 100.
Stops are not expected.

Accuracy and computer time
To reach a good accuracy a $\Delta t \leqslant 10^{-3}$ sec is suggested.
The computer time is of about 0.15 sec per time step.
The use of Calcomp (Switches 4 and 5) increases considerably
the computer time.

Example

Annex 2    Input data
  "      3    Output
  "      4    Plot of $\bar{\psi}(t)$, $\bar{\varphi}(t)$, $\bar{T}(t)$
  "      5    Plot of $\psi(z)$, $\varphi(z)$, $T(z)$ at the instant when $\bar{\varphi}(t)$
is maximum.

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of Neutron Fluxes";

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                   for nuclear reactor dynamics."
                   Euratom report to be published

**A n n e x    1**

Listing of the program

```
      DIMENSION ST(100),STO(100),ST1(100),Z(100),T(100),SQT(100),C(100),COSTC002
     1T1(100),C1(100),PS1(100),PH1(100),PS2(100),PH2(100),PS(100,2),PH(1COST0003
     200,2)                                                               COST0004
      DIMENSION P(100,2),R(100,2),S(100,2),TN(100,2),VKV(100)             COST0005
      DIMENSION TT(30),TAUR(30),TAUC(30),CST(30),VK(30)                   COST0006
      EQUIVALENCE(PS,PS1),(PS(101),PS2),(PH,PH1),(PH(101),PH2)            COST0007
                                                                          COST0008
      COMMON M,N,L,MM1,NM1,MP1,NP1,LM1,IF1,ITER ,INT,KL                   COST0009
      COMMON KI,KS                                                        COST0010
      COMMON ST,STO,ST1,Z,T,SQT,C,T1,C1,PS1,PS2,PH1,PH2,P,R,S,TN,VKV      COST0011
      COMMON TT,TAUR,TAUC,CST,VK,TRP,TCP,CSP,VKP                          COST0012
      COMMON DZ1DRF,DZ3DRF,DZ2DCF,DZ1DRT,DZ22DCT,DZ3DRT,DTL               COST0013
      COMMON DZ1FM,DZ2FM,DZ3FM,DZ2L,DZ2LM,P11,P121,P122,P12,P21,P22,P231COST0014
     1,P232,P31,P32,S21,S21M,STRM,SQTRM,STRN,SQTRN,TOVO1M,TOVO2M,TOVO3M,COST0015
     2TOWO1M,TOWO2M,TOWO3M,A3,B3,AR,ZN,ZM,AZ,PREC,DTAB                    COST0016
      COMMON A1B1,A2B2,AC,BU,COEC,COET,DL,FC,R11,R12,R21,R22,R31,R32,SACCOST0017
     1Z,SARZ,SPR,SPZ,SQZ,TOSA1,TOSA2,TOSA3,TOSAC,TOSAR,TOVO,TOWO,TF,TZ,VCOST0018
     2NU,VZ,WZ                                                            COST0019
      COMMON PS1M,PS2M,C1M,T1M,V1M,P1N,PSI,DP1,REP1                       COST0020
      COMMON PH1M,PH2M,CM,TM,VM,PN,PHI,DP,REP                             COST0021
      COMMON A1,B1,A2,B2,A3B3,A1B1M,A2B2M,A3B3M,A1M,B1M,A2M,B2M,A3M,B3M,COST0022
     1VB,B,XZ,XZ1,DT,DZ1,DZ2,DZ3,DRF,DRT,DCF,DCT,TOWO1,TOWO2,TOWO3,TOVO1COST0023
     2,TOVO2,TOVO3,TRM,TRM1,TRN,TRN1,VZSTO,TO                            COST0024
      DIMENSION XX(100),YY(100,3)                                         COST0025
      COMMON XX,YY,IPLOT                                                  COST0026
      DIMENSION ALFA(12)                                                  COST0027
C     LETTURA DATI                                                        COST0028
    1 READ INPUT TAPE 5,1001,ALFA                                         COST0029
 1001 FORMAT (12A6)                                                       COST0030
      WRITE OUTPUT TAPE 6,2001,ALFA                                       COST0031
 2001 FORMAT (1H1,30X,12A6//////)                                         COST0032
      READ INPUT TAPE 5,1002,DZ1,DZ2,DZ3,DRF,DCF,DRT,DCT,DT,SARZ,SACZ,WZCOST0033
     1,VZ,SPZ,TZ,BU,B,DL,SPR,PREC,VNU,FC,XZ,TO,TF,VKP,TRP,TCP,CSP,TRM,TRCOST0034
     2N                                                                   COST0035
      READ INPUT TAPE 5,1003,M,N,L,INT,KL,KI,KS                          COST0036
      READ INPUT TAPE 5,1004,(TT(K),VK(K),TAUR(K),TAUC(K),CST(K),K=1,KL)COST0037
      READ INPUT TAPE 5,1005,(T1(I),C1(I),PS1(I),PS2(I),I=1,L)           COST0038
      DTAB=TT(2)-TT(1)                                                    COST0039
 1005 FORMAT (4E10.6)                                                     COST0040
 1004 FORMAT (5E10.6)                                                     COST0041
 1002 FORMAT (7E10.6)                                                     COST0042
 1003 FORMAT (7I10)                                                       COST0043
      WRITE OUTPUT TAPE 6,2002,DZ1,DZ2,DZ3,DRF,DCF,DRT,DCT,CT,SARZ,SACZ,COST0044
     1WZ,VZ,SPZ,TZ,BU,B,DL,SPR,PREC,VNU,FC,XZ,TF,VKP,TRP,TCP,CSP         COST0045
      WRITE OUTPUT TAPE 6,2003,M,N,L,INT,KL,KI,KS                        COST0046
      WRITE OUTPUT TAPE 6,2004,(TT(K),VK(K),TAUR(K),TAUC(K),CST(K),K=1,KCOST0047
     1L)                                                                  COST0048
 2004 FORMAT (1H0/1H0,27X,1HT,18X,2HVK,17X,4HTAUR,17X,4HTAUC,18X,2HCS// COST0049
     1(1H ,12X,5E20.5))                                                   COST0050
 2002 FORMAT (1H0,9X,3HDZ1,13X,3HDZ2,13X,3HDZ3,13X,3HDRF,13X,3HDCF,13X, COST0051
     13HDRT,13X,3HDCT/1H0,7E16.5/1H0,9X,3HDT ,12X,4HSARZ,12X,4HSACZ,13X,COST0052
     22HWZ,14X,2HVZ,14X,3HSPZ,13X,2HTZ/1H0,7E16.5/                       COST0053
     31H0,9X,2HBU,15X,1HB,14X,2HDL,14X,3HSPR,12X,4HPREC,13X,3HVNU,13X,   COST0054
     42HFC/1H0,7E16.5/1H0,9X,2HXZ,14X,2HTF,14X,3HVKP,13X,3HTRP,13X,3HTCPCOST0055
     5,13X,3HCSP/1H0,6E16.5///)                                          COST0056
```

```
2003 FORMAT (1H0,10X,3HM =,I3,10X,3HN =,I3,10X,3HL =,I3,8X,5HINT =,I3,9   COST0057
    1X,4HKL =,I3,9X,4HKI =,I3,9X,4HKS =,I3///)                           COST0058
     MM1=M-1                                                             COST0059
     MP1=M+1                                                             COST0060
     NM1=N-1                                                             COST0061
     NP1=N+1                                                             COST0062
     LM1=L-1                                                             COST0063
     Z(1)=0.                                                             COST0064
     DO 30 I=2,M                                                         COST0065
  30 Z(I)=Z(I-1)+DZ1                                                     COST0066
     DO 31 I=MP1,N                                                       COST0067
  31 Z(I)=Z(I-1)+DZ2                                                     COST0068
     DO 32 I=NP1,L                                                       COST0069
  32 Z(I)=Z(I-1)+DZ3                                                     COST0070
     ZM=Z(M)                                                            COST0071
     ZN=Z(N)                                                            COST0072
     AR=Z(L)                                                            COST0073
     AC=ZN-ZM                                                           COST0074
     AZ=N-M                                                             COST0075
     DO 33 I=1,L                                                         COST0076
     T(I)=T1(I)                                                         COST0077
     PH1(I)=PS1(I)                                                      COST0078
  33 PH2(I)=PS2(I)                                                      COST0079
     SQZ=SQRTF(TZ)                                                      COST0080
     VZSTO=VZ/SQZ                                                       COST0081
     TOW0=SQZ/(DT*WZ)                                                   COST0082
     TOW01=DZ1*TOW0                                                     COST0083
     TOW02=DZ2*TOW0                                                     COST0084
     TOW03=DZ3*TOW0                                                     COST0085
     TOV0=SQZ/(DT*VZ)                                                   COST0086
     COET=(DT*FC*SACZ*SQZ)/VNU                                          COST0087
     COEC=(DT*B*SACZ*SQZ)                                               COST0088
     TOV01=DZ1*TOV0                                                     COST0089
     TOV02=DZ2*TOV0                                                     COST0090
     TOV03=DZ3*TOV0                                                     COST0091
     TOSAR=(SARZ+SPR)*SQZ                                               COST0092
     TOSAC=(SACZ+SPR)*SQZ                                               COST0093
     TOSA1=TOSAR*DZ1                                                    COST0094
     TOSA2=TOSAC*DZ2                                                    COST0095
     TOSA3=TOSAR*DZ3                                                    COST0096
     P11=DRF*(2./DZ1+DZ1*BU)                                            COST0097
     P21=DCF*(2./DZ2+DZ2*BU)                                            COST0098
     P31=DRF*(2./DZ3+DZ3*BU)                                            COST0099
     P121=0.5*(P11+P21)                                                 COST0100
     P231=0.5*(P21+P31)                                                 COST0101
     P12=DRT*(2./DZ1+DZ1*BU)                                            COST0102
     P22=DCT*(2./DZ2+DZ2*BU)                                            COST0103
     P32=DRT*(2./DZ3+DZ3*BU)                                            COST0104
     P122=0.5*(P12+P22)                                                 COST0105
     P232=0.5*(P22+P32)                                                 COST0106
     DZ1DRF=DZ1*DRF                                                     COST0107
     DZ3DRF=DZ3*DRF                                                     COST0108
     UMB=1.-B                                                           COST0109
     S21=SACZ*SQZ*DZ2*UMB                                               COST0110
     S21M=S21*0.5                                                       COST0111
     DZ2L=DZ2*DL                                                        COST0112
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      DZ2LM=DZ2L*0.5                          COST0113
      DZ2DCF=DZ2*DCF                          COST0114
      DTL=DL*DT                               COST0115
      A1=TOSA1+TOVO1                          COST0116
      B1=DZ1*SPZ*SQZ                          COST0117
      A2=TOSA2+TOVO2                          COST0118
      B2=DZ2*SPZ*SQZ                          COST0119
      A3=TOSA3+TOVO3                          COST0120
      B3=DZ3*SPZ*SQZ                          COST0121
      A1B1=A1+B1                              COST0122
      A3B3=A3+B3                              COST0123
      A2B2=A2+B2                              COST0124
      A1B1M=A1B1*0.5                          COST0125
      A2B2M=A2B2*0.5                          COST0126
      A3B3M=A3B3*0.5                          COST0127
      A1M=A1*0.5                              COST0128
      A2M=A2*0.5                              COST0129
      A3M=A3*0.5                              COST0130
      B1M=B1*0.5                              COST0131
      B2M=B2*0.5                              COST0132
      B3M=B3*0.5                              COST0133
      DO 10 I=2,MM1                           COST0134
      STO(I)=A1                               COST0135
      ST1(I)=A1B1                             COST0136
   10 CONTINUE                                COST0137
      STO(M)=A2M                              COST0138
      ST1(M)=A2B2M                            COST0139
      DO 11 I=MP1,NM1                         COST0140
      STO(I)=A2                               COST0141
      ST1(I)=A2B2                             COST0142
   11 CONTINUE                                COST0143
      STO(N)=A2M                              COST0144
      ST1(N)=A2B2M                            COST0145
      DO 12 I=NP1,LM1                         COST0146
      STO(I)=A3                               COST0147
      ST1(I)=A3B3                             COST0148
   12 CONTINUE                                COST0149
      DZ1FM=DZ1DRF*0.5                        COST0150
      DZ2FM=DZ2DCF*0.5                        COST0151
      DZ3FM=DZ3DRF*0.5                        COST0152
      TOWO1M=TOWO1*0.5                        COST0153
      TOWO2M=TOWO2*0.5                        COST0154
      TOWO3M=TOWO3*0.5                        COST0155
      TOVO1M=TOVO1*0.5                        COST0156
      TOVO2M=TOVO2*0.5                        COST0157
      TOVO3M=TOVO3*0.5                        COST0158
      R11=DRF/DZ1                             COST0159
      R12=DRT/DZ1                             COST0160
      R21=DCF/DZ2                             COST0161
      R22=DCT/DZ2                             COST0162
      R31=DRF/DZ3                             COST0163
      R32=DRT/DZ3                             COST0164
      DO 20 I=3,M                             COST0165
      R(I,1)=R11                              COST0166
      R(I,2)=R12                              COST0167
   20 S(I,1)=0.                               COST0168
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      DO 21 I=MP1,N                                          COST0169
      R(I,1)=R21                                             COST0170
      R(I,2)=R22                                             COST0171
   21 CONTINUE                                               COST0172
      DO 22 I=NP1,LM1                                        COST0173
      R(I,1)=R31                                             COST0174
      R(I,2)=R32                                             COST0175
   22 S(I,1)=0.                                              COST0176
      R(2,1)=0.                                              COST0177
      R(2,2)=0.                                              COST0178
      R(L,1)=0.                                              COST0179
      R(L,2)=0.                                              COST0180
      TRM1=TRM                                               COST0181
      TRN1=TRN                                               COST0182
      ITER=0                                                 COST0183
      SENSE LIGHT 2                                          COST0184
      IF1=1                                                  COST0185
      PHI=0.                                                 COST0186
      IPLOT=0                                                COST0187
   34 SPH2=0.5*(PS2(M)+PS2(N))                               COST0188
      DO 35 I=MP1,NM1                                        COST0189
   35 SPH2=SPH2+PS2(I)                                       COST0190
      PS2M=SPH2/AZ                                           COST0191
F     FLUX1                                                  COST0192
F     FLUX2                                                  COST0193
      IF(INT)100,100,102                                     COST0194
  100 WRITE OUTPUT TAPE 6,2006                               COST0195
 2006 FORMAT (1H1,35X,31HRISOLUZIONE CON METODO DIRETTO ///) COST0196
      CALL SOLU(FLUX1)                                       COST0197
      GO TO 9                                                COST0198
  102 WRITE OUTPUT TAPE 6,2007,INT                           COST0199
 2007 FORMAT (1H1,30X,33HRISOLUZIONE CON METODO ITERATIVO ,5X,5HINT =,I3COST0200
     1///)                                                   COST0201
      CALL SOLU(FLUX2)                                       COST0202
    9 CALL STAMPA(1)                                         COST0203
      IF(SENSE SWITCH 4)36,2                                 COST0204
   36 CALL STPLOT                                            COST0205
    3 CALL FINTRA                                            COST0206
      GO TO 1                                                COST0207
    2 IF(SENSE SWITCH 5)3,1                                  COST0208
      END(1,0,0,0,0,0,1,0,0,0,0,0,0,0,0)
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C                                                                 COST0212
      SUBROUTINE SOLU(FLUSSI)                                     COST0213
C     CODICE COSTANZA                                             COST0214
      DIMENSION ST(100),STO(100),ST1(100),Z(100),T(100),SQT(100),C(100),COST0215
     1T1(100),C1(100),PSI(100),PHI(100),PS2(100),PH2(100),PS(100,2),PH(1COST0216
     200,2)                                                       COST0217
      DIMENSION P(100,2),R(100,2),S(100,2),TN(100,2),VKV(100)     COST0218
      DIMENSION TT(30),TAUR(30),TAUC(30),CST(30),VK(30)           COST0219
      EQUIVALENCE(PS,PS1),(PS(101),PS2),(PH,PHI),(PH(101),PH2)    COST0220
                                                                  COST0221
      COMMON M,N,L,MM1,NM1,MP1,NP1,LM1,IF1,ITER ,INT,KL           COST0222
      COMMON KI,KS                                                COST0223
      COMMON ST,STO,ST1,Z,T,SQT,C,T1,C1,PS1,PS2,PH1,PH2,P,R,S,TN,VKV  COST0224
      COMMON TT,TAUR,TAUC,CST,VK,TRP,TCP,CSP,VKP                  COST0225
      COMMON DZ1DRF,DZ3DRF,DZ2DCF,DZ1DRT,DZ2DCT,DZ3DRT,DTL        COST0226
      COMMON DZ1FM,DZ2FM,DZ3FM,DZ2L,DZ2LM,P11,P121,P122,P12,P21,P22,P231COST0227
     1,P232,P31,P32,S21,S21M,STRM,SQTRM,STRN,SQTRN,TOVC1M,TCVO2M,TOVO3M,COST0228
     2TOWO1M,TOWO2M,TOWO3M,A3,B3,AR,ZN,ZM,AZ,PREC,DTAB            COST0229
      COMMON A1B1,A2B2,AC,BU,COEC,COET,DL,FC,R11,R12,R21,R22,R31,R32,SACCOST0230
     1Z,SARZ,SPR,SPZ,SQZ,TOSA1,TOSA2,TOSA3,TOSAC,TOSAR,TOVO,TOWO,TF,TZ,VCOST0231
     2NU,VZ,WZ                                                    COST0232
      COMMON PS1M,PS2M,C1M,T1M,V1M,P1N,PSI,DP1,REP1               COST0233
      COMMON PH1M,PH2M,CM,TM,VM,PN,PHI,DP,REP                     COST0234
      COMMON A1,B1,A2,B2,A3B3,A1B1M,A2B2M,A3B3M,A1M,B1M,A2M,B2M,A3M,B3M,COST0235
     1VB,B,XZ,XZ1,DT,DZ1,DZ2,DZ3,DRF,DRT,DCF,DCT,TOWO1,TOWO2,TOWO3,TOVO1COST0236
     2,TOVO2,TOVO3,TRM,TRM1,TRN,TRN1,VZSTO,TO                     COST0237
      DIMENSION XX(100),YY(100,3)                                 COST0238
      COMMON XX,YY,IPLOT                                          COST0239
      WRITE OUTPUT TAPE 6,2005,TO,XZ                              COST0240
 2005 FORMAT (1H0,40X,19HCONDIZIONI INIZIALI//4X,4HTO =,F10.5,10X,4HXZ =COST0241
     1,F10.5///)                                                  COST0242
      CALL STAMPA(3)                                              COST0243
  100 READ INPUT TAPE 5,1006,JI,JS,IP,VB                          COST0244
 1006 FORMAT ( 3I10,E10.6)                                        COST0245
      DO 102 ITE=JI,JS,IP                                         COST0246
      DO 103 ITER1=1,IP                                           COST0247
      CALL BARRE                                                  COST0248
      CALL COEFF                                                  COST0249
      CALL FLUSSI                                                 COST0250
      CALL TEMPER                                                 COST0251
      CALL INTEGR                                                 COST0252
      PS2M=PH2M                                                   COST0253
      DO 40 I=2,LM1                                               COST0254
      PS1(I)=PH1(I)                                               COST0255
      PS2(I)=PH2(I)                                               COST0256
      C1(I)=C(I)                                                  COST0257
      T1(I)=T(I)                                                  COST0258
   40 CONTINUE                                                    COST0259
      ITER=ITER+1                                                 COST0260
      TO=TO+DT                                                    COST0261
      IF(TO-TF)108,9,9                                            COST0262
  108 IF(SENSE SWITCH6)8,103                                      COST0263
  103 CONTINUE                                                    COST0264
      CALL STAMPA(1)                                              COST0265
  102 CONTINUE                                                    COST0266
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       GO TO 100                                              COST0267
    8 CALL STAMPA(1)                                          COST0268
      IF(SENSE SWITCH 4)10,11                                 COST0269
   10 CALL STPLOT                                             COST0270
   12 CALL FINTRA                                             COST0271
   13 CALL EXIT                                               COST0272
   11 IF(SENSE SWITCH 5)12,13                                 COST0273
    9 CONTINUE                                                COST0274
      RETURN                                                  COST0275
      END(1,0,0,0,0,0,1,0,0,0,0,0,0,0,0)
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C      CODICE COSTANZA                                             COST0279
       SUBROUTINE BARRE                                            COST0280
       DIMENSION ST(100),STO(100),ST1(100),Z(100),T(100),SQT(100),C(100),COST0281
      1T1(100),C1(100),PS1(100),PHI(100),PS2(100),PH2(100),PS(100,2),PH(1COST0282
      200,2)                                                       COST0283
       DIMENSION P(100,2),R(100,2),S(100,2),TN(100,2),VKV(100)     COST0284
       DIMENSION TT(30),TAUR(30),TAUC(30),CST(30),VK(30)           COST0285
       EQUIVALENCE(PS,PS1),(PS(101),PS2),(PH,PH1),(PH(101),PH2)    COST0286
                                                                   COST0287
       COMMON M,N,L,MM1,NM1,MP1,NP1,LM1,IF1,ITER ,INT,KL           COST0288
       COMMON KI,KS                                                COST0289
       COMMON ST,STO,ST1,Z,T,SQT,C,T1,C1,PS1,PS2,PHI,PH2,P,R,S,TN,VKV COST0290
       COMMON TT,TAUR,TAUC,CST,VK,TRP,TCP,CSP,VKP                  COST0291
       COMMON DZ1DRF,DZ3DRF,DZ2DCF,DZ1DRT,DZ2DCT,DZ3DRT,DTL        COST0292
       COMMON DZ1FM,DZ2FM,DZ3FM,DZ2L,DZ2LM,P11,P121,P122,P12,P21,P22,P231COST0293
      1,P232,P31,P32,S21,S21M,STRM,SQTRM,STRN,SQTRN,TOVO1M,TOVO2M,TOVO3M,COST0294
      2TOWO1M,TOWO2M,TOWO3M,A3,B3,AR,ZN,ZM,AZ,PREC,DTAB            COST0295
       COMMON A1B1,A2B2,AC,BU,COEC,COET,DL,FC,R11,R12,R21,R22,R31,R32,SACCOST0296
      1Z,SARZ,SPR,SPZ,SQZ,TOSA1,TOSA2,TOSA3,TOSAC,TOSAR,TOVO,TOWO,TF,TZ,VCOST0297
      2NU,VZ,WZ                                                    COST0298
       COMMON PS1M,PS2M,C1M,T1M,V1M,P1N,PSI,DP1,REP1               COST0299
       COMMON PH1M,PH2M,CM,TM,VM,PN,PHI,DP,REP                     COST0300
       COMMON A1,B1,A2,B2,A3B3,A1B1M,A2B2M,A3B3M,A1M,B1M,A2M,B2M,A3M,B3M,COST0301
      1VB,B,XZ,XZ1,DT,DZ1,DZ2,DZ3,DRF,DRT,DCF,DCT,TOWO1,TOWO2,TOWO3,TOVO1COST0302
      2,TOVO2,TOVO3,TRM,TRM1,TRN,TRN1,VZSTO,TO                     COST0303
       DIMENSION XX(100),YY(100,3)                                 COST0304
       COMMON XX,YY,IPLOT                                          COST0305
C      SENSE LIGHT 2 ON PRIMA VOLTA                                COST0306
       IF(SENSE LIGHT 2)10,11                                      COST0307
   11  CONTINUE                                                    COST0308
       IF(VB)10,100,10                                             COST0309
   10  XZ=XZ+VB*DT                                                 COST0310
       IF(XZ)1,3,20                                                COST0311
   20  IF(XZ-AR)30,4,2                                             COST0312
   30  IF(XZ-ZM)31,32,34                                           COST0313
   32  IZ=M                                                        COST0314
       ST(M)=A2B2M                                                 COST0315
       GO TO 33                                                    COST0316
   31  IZ=XZ/DZ1+1.0000001                                        COST0317
       A=(Z(IZ+1)-XZ)/DZ1                                          COST0318
       ST(IZ)=A1+A*B1                                              COST0319
       ST(M)=A2B2M                                                 COST0320
   33  STRM=A1B1M                                                  COST0321
       STRN=A3B3M                                                  COST0322
       GO TO 50                                                    COST0323
   34  IF(XZ-ZN)35,36,39                                           COST0324
   36  IZ=N                                                        COST0325
       ST(N)=A2B2M                                                 COST0326
       GO TO 37                                                    COST0327
   35  IZ=(XZ-ZM)/DZ2+0.00000001                                  COST0328
       IZ=IZ+M                                                     COST0329
       A=(Z(IZ+1)-XZ)/DZ2                                          COST0330
       ST(IZ)=A2+A*B2                                              COST0331
       ST(N)=A2B2M                                                 COST0332
       IF(IZ-M)56,56,37                                           COST0333
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 56 STRM=A1M+A*B1M                                      COST0334
    ST(M)=A2M+A*B2M                                     COST0335
    GO TO 38                                            COST0336
 37 STRM=A1M                                            COST0337
 38 STRN=A3B3M                                          COST0338
    GO TO 50                                            COST0339
 39 IZ=(XZ-ZN)/DZ3+0.00000001                          COST0340
    IZ=N+IZ                                             COST0341
    A=(Z(IZ+1)-XZ)/DZ3                                  COST0342
    IF(IZ-N)40,40,41                                    COST0343
 40 ST(N)=A2M+A*B2M                                     COST0344
    STRN=A3M+A*B3M                                      COST0345
    STRM=A1M                                            COST0346
    GO TO 50                                            COST0347
 41 STRN=A3M                                            COST0348
    ST(IZ)=A3+A*B3                                      COST0349
    STRM=A1M                                            COST0350
    GO TO 50                                            COST0351
  1 XZ=0.                                               COST0352
  3 DO 80 I=1,L                                         COST0353
 80 ST(I)=ST1(I)                                        COST0354
    STRM=A1B1M                                          COST0355
    STRN=A3B3M                                          COST0356
    GO TO 100                                           COST0357
  2 XZ=AR                                               COST0358
  4 DO 90 I=1,L                                         COST0359
 90 ST(I)=ST0(I)                                        COST0360
    STRM=A1M                                            COST0361
    STRN=A3M                                            COST0362
    GO TO 100                                           COST0363
 50 IS=IZ-1                                             COST0364
    ID=IZ+1                                             COST0365
    DO 60 I=1,IS                                        COST0366
 60 ST(I)=ST0(I)                                        COST0367
    DO 70 I=ID,L                                        COST0368
 70 ST(I)=ST1(I)                                        COST0369
100 RETURN                                              COST0370
    END(1,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0)
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C      CODICE COSTANZA                                              COST0374
       SUBROUTINE COEFF                                             COST0375
       DIMENSION ST(100),STO(100),ST1(100),Z(100),T(100),SQT(100),C(100),COST0376
      1T1(100),C1(100),PS1(100),PH1(100),PS2(100),PH2(100),PS(100,2),PH(1COST0377
      200,2)                                                        COST0378
       DIMENSION P(100,2),R(100,2),S(100,2),TN(100,2),VKV(100)      COST0379
       DIMENSION TT(30),TAUR(30),TAUC(30),CST(30),VK(30)            COST0380
       EQUIVALENCE(PS,PS1),(PS(101),PS2),(PH,PH1),(PH(101),PH2)     COST0381
                                                                    COST0382
       COMMON M,N,L,MM1,NM1,MP1,NP1,LM1,IF1,ITER ,INT,KL            COST0383
       COMMON KI,KS                                                 COST0384
       COMMON ST,STO,ST1,Z,T,SQT,C,T1,C1,PS1,PS2,PH1,PH2,P,R,S,TN,VKV COST0385
       COMMON TT,TAUR,TAUC,CST,VK,TRP,TCP,CSP,VKP                   COST0386
       COMMON DZ1DRF,DZ3DRF,DZ2DCF,DZ1DRT,DZ2DCT,DZ3DRT,DTL         COST0387
       COMMON DZ1FM,DZ2FM,DZ3FM,DZ2L,DZ2LM,P11,P121,P122,P12,P21,P22,P231COST0388
      1,P232,P31,P32,S21,S21M,STRM,SQTRM,STRN,SQTRN,TOVO1M,TCVO2M,TOVO3M,COST0389
      2TOWO1M,TOWO2M,TOWO3M,A3,B3,AR,ZN,ZM,AZ,PREC,DTAB             COST0390
       COMMON A1B1,A2B2,AC,BU,COEC,COET,DL,FC,R11,R12,R21,R22,R31,R32,SACCOST0391
      1Z,SARZ,SPR,SPZ,SQZ,TOSA1,TOSA2,TOSA3,TOSAC,TOSAR,TOVO,TOWO,TF,TZ,VCOST0392
      2NU,VZ,WZ                                                     COST0393
       COMMON PS1M,PS2M,C1M,T1M,V1M,P1N,PSI,DP1,REP1                COST0394
       COMMON PH1M,PH2M,CM,TM,VM,PN,PHI,DP,REP                      COST0395
       COMMON A1,B1,A2,B2,A3B3,A1B1M,A2B2M,A3B3M,A1M,B1M,A2M,B2M,A3M,B3M,COST0396
      1VB,B,XZ,XZ1,DT,DZ1,DZ2,DZ3,DRF,DRT,DCF,DCT,TOWO1,TOWO2,TOWO3,TOVO1COST0397
      2,TOVO2,TOVO3,TRM,TRM1,TRN,TRN1,VZSTO,TO                      COST0398
       DO 1 I=1,MM1                                                 COST0399
     1 SQT(I)=SQRTF(T(I))                                           COST0400
       SQTRM=SQRTF(TRM)                                             COST0401
       DO 2 I=M,N                                                   COST0402
       SQT(I)=SQRTF(T(I))                                           COST0403
       VKV(I)=FUNC(VK,VKP,T(I))                                     COST0404
       C(I)=C1(I)-DTL*C1(I)+COEC*PH2(I)*VKV(I)/SQT(I)              COST0405
     2 CONTINUE                                                     COST0406
       SQTRN=SQRTF(TRN)                                             COST0407
       DO 3 I=NP1,L                                                 COST0408
       SQT(I)=SQRTF(T(I))                                           COST0409
     3 CONTINUE                                                     COST0410
       DO 10 I=2,MM1                                                COST0411
       PP=TOWO1/SQT(I)                                              COST0412
       S(I,2)=DZ1DRF/FUNC(TAUR,TRP,T(I))                           COST0413
       P(I,2)=P12+ST(I)/SQT(I)                                      COST0414
       TN(I,2)=TOVO1*PS2(I)/SQT(I)                                  COST0415
       P(I,1)=P11+S(I,2)+PP                                         COST0416
       TN(I,1)=PP*PS1(I)                                            COST0417
    10 CONTINUE                                                     COST0418
       PP=TOWO1M/SQTRM+TOWO2M/SQT(M)                                COST0419
       S(M,2)=DZ1FM/FUNC(TAUR,TRP,TRM)+DZ2FM/FUNC(TAUC,TCP,T(M))   COST0420
       P(M,2)=P122+STRM/SQTRM+ST(M)/SQT(M)                          COST0421
       TN(M,2)=(TOVO1M/SQTRM+TOVO2M/SQT(M))*PS2(M)                 COST0422
       P(M,1)=P121+S(M,2)+PP                                        COST0423
       TN(M,1)=PP*PS1(M)+DZ2LM*C(M)                                 COST0424
       S(M,1)=S21M*VKV(M)/SQT(M)                                    COST0425
       DO 20 I=MP1,NM1                                              COST0426
       PP=TOWO2/SQT(I)                                              COST0427
       S(I,2)=DZ2DCF/FUNC(TAUC,TCP,T(I))                           COST0428
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      P(I,2)=P22+ST(I)/SQT(I)                                    COST0429
      TN(I,2)=TOV02*PS2(I)/SQT(I)                                COST0430
      P(I,1)=P21+S(I,2)+PP                                       COST0431
      TN(I,1)=PP*PS1(I)+DZ2L*C(I)                                COST0432
      S(I,1)=S21*VKV(I)/SQT(I)                                   COST0433
   20 CONTINUE                                                   COST0434
      S(N,2)=DZ2FM/FUNC(TAUC,TCP,T(N))+DZ3FM/FUNC(TAUR,TRP,TRN)  COST0435
      PP=TOW02M/SQT(N)+TOW03M/SQTRN                              COST0436
      TN(N,1)=PP*PS1(N)+DZ2LM*C(N)                               COST0437
      P(N,1)=P231+PP+S(N,2)                                      COST0438
      S(N,1)=S21M*VKV(N)/SQT(N)                                  COST0439
      P(N,2)=P232+ST(N)/SQT(N)+STRN/SQTRN                        COST0440
      TN(N,2)=(TOV02M/SQT(N)+TOV03M/SQTRN)*PS2(N)                COST0441
      DO 30 I=NP1,LM1                                            COST0442
      S(I,2)=DZ3DRF/FUNC(TAUR,TRP,T(I))                          COST0443
      PP=TOW03/SQT(I)                                            COST0444
      TN(I,1)=PP*PS1(I)                                          COST0445
      P(I,1)=P31+PP+S(I,2)                                       COST0446
      P(I,2)=P32+ST(I)/SQT(I)                                    COST0447
      TN(I,2)=TOV03*PS2(I)/SQT(I)                                COST0448
   30 CONTINUE                                                   COST0449
      RETURN                                                     COST0450
      END(1,0,0,0,0,0,1,0,0,0,0,0,0,0,0)
```

```
      SUBROUTINE FLUX1                                              COST0454
C     CODICE COSTANZA                                              COST0455
      DIMENSION ST(100),STO(100),ST1(100),Z(100),T(100),SQT(100),C(100),COST0456
     1T1(100),C1(100),PS1(100),PH1(100),PS2(100),PH2(100),PS(100,2),PH(1COST0457
     200,2)                                                        COST0458
      DIMENSION P(100,2),R(100,2),S(100,2),TN(100,2),VKV(100)      COST0459
      DIMENSION TT(30),TAUR(30),TAUC(30),CST(30),VK(30)           COST0460
      EQUIVALENCE(PS,PS1),(PS(101),PS2),(PH,PH1),(PH(101),PH2)     COST0461
                                                                   COST0462
      COMMON M,N,L,MM1,NM1,MP1,NP1,LM1,IF1,ITER ,INT,KL           COST0463
      COMMON KI,KS                                                 COST0464
      COMMON ST,STO,ST1,Z,T,SQT,C,T1,C1,PS1,PS2,PH1,PH2,P,R,S,TN,VKV COST0465
      COMMON TT,TAUR,TAUC,CST,VK,TRP,TCP,CSP,VKP                   COST0466
      COMMON DZ1DRF,DZ3DRF,DZ2DCF,DZ1DRT,DZ2DCT,DZ3DRT,DTL         COST0467
      COMMON DZ1FM,DZ2FM,DZ3FM,DZ2L,DZ2LM,P11,P121,P122,P12,P21,P22,P231COST0468
     1,P232,P31,P32,S21,S21M,STRM,SQTRM,STRN,SQTRN,TOVO1M,TOVO2M,TOVO3M,COST0469
     2TOWO1M,TOWO2M,TOWO3M,A3,B3,AR,ZN,ZM,AZ,PREC,DTAB             COST0470
      COMMON A1B1,A2B2,AC,BU,COEC,COET,DL,FC,R11,R12,R21,R22,R31,R32,SACCOST0471
     1Z,SARZ,SPR,SPZ,SQZ,TOSA1,TOSA2,TOSA3,TOSAC,TOSAR,TOVO,TOWO,TF,TZ,VCOST0472
     2NU,VZ,WZ                                                     COST0473
      COMMON PS1M,PS2M,C1M,T1M,V1M,P1N,PSI,CP1,REP1                COST0474
      COMMON PH1M,PH2M,CM,TM,VM,PN,PHI,DP,REP                      COST0475
      COMMON A1,B1,A2,B2,A3B3,A1B1M,A2B2M,A3B3M,A1M,B1M,A2M,B2M,A3M,B3M,COST0476
     1VB,B,XZ,XZ1,DT,DZ1,DZ2,DZ3,DRF,DRT,DCF,DCT,TOWO1,TOWO2,TOWO3,TOVO1COST0477
     2,TOVO2,TOVO3,TRM,TRM1,TRN,TRN1,VZSTO,TC                      COST0478
      DIMENSION AA(2,2,100),BB(2,100),WL(2,2),WM(2,2)             COST0479
      AA(1,1,2)=R(3,1)/P(2,1)                                      COST0480
      AA(2,2,2)=R(3,2)/P(2,2)                                      COST0481
      AA(1,2,2)=0.                                                 COST0482
      WM(2,1)=+S(2,2)/(P(2,1)*P(2,2))                             COST0483
      AA(2,1,2)=WM(2,1)*R(3,1)                                     COST0484
      BB(1,2)=TN(2,1)/P(2,1)                                       COST0485
      BB(2,2)=TN(2,2)/P(2,2)+WM(2,1)*TN(2,1)                       COST0486
      DO 10 I=3,LM1                                                COST0487
      WL(1,1)=P(I,1)-R(I,1)*AA(1,1,I-1)                           COST0488
      WL(1,2)=                                                     COST0489
     1          -S(I,1)-R(I,1)*AA(1,2,I-1)                        COST0490
      WL(2,1)=                                                     COST0491
     1          -S(I,2)-R(I,2)*AA(2,1,I-1)                        COST0492
      WL(2,2)=P(I,2)-R(I,2)*AA(2,2,I-1)                           COST0493
      WW=WL(1,1)*WL(2,2)-WL(1,2)*WL(2,1)                          COST0494
      WM(1,1)=WL(2,2)/WW                                          COST0495
      WM(1,2)=-WL(1,2)/WW                                         COST0496
      WM(2,1)=-WL(2,1)/WW                                         COST0497
      WM(2,2)=WL(1,1)/WW                                          COST0498
      AA(1,1,I)=WM(1,1)*R(I+1,1)                                  COST0499
      AA(1,2,I)=WM(1,2)*R(I+1,2)                                  COST0500
      AA(2,1,I)=WM(2,1)*R(I+1,1)                                  COST0501
      AA(2,2,I)=WM(2,2)*R(I+1,2)                                  COST0502
      WL(1,1)=TN(I,1)+R(I,1)*BB(1,I-1)                            COST0503
      WL(2,1)=TN(I,2)+R(I,2)*BB(2,I-1)                            COST0504
B                                                                  COST0505
     1B(1,I)=WM(1,1)*WL(1,1)+WM(1,2)*WL(2,1)                      COST0506
B                                                                  COST0507
     1B(2,I)=WM(2,1)*WL(1,1)+WM(2,2)*WL(2,1)                      COST0508
```

```
10 CONTINUE                                                          COST0509
   PH(LM1,1)=BB(1,LM1)                                               COST0510
   PH(LM1,2)=BB(2,LM1)                                               COST0511
   K=LM1                                                             COST0512
   DO 20 I=3,LM1                                                     COST0513
   K=K-1                                                             COST0514
   PH(K,1)=AA(1,1,K)*PH(K+1,1)+AA(1,2,K)*PH(K+1,2)+BB(1,K)           COST0515
   PH(K,2)=AA(2,1,K)*PH(K+1,1)+AA(2,2,K)*PH(K+1,2)+BB(2,K)           COST0516
20 CONTINUE                                                          COST0517
   RETURN                                                            COST0518
   END(1,0,0,0,0,0,1,0,0,0,0,0,0,0,0)
```

```
C       CODICE COSTANZA                                                    COST0522
C       SENSE SWITCH 3 DOWN STAMPA CONVERGENZA KI=ITER=KS                  COST0523
        SUBROUTINE FLUX2                                                   COST0524
        DIMENSION ST(100),STO(100),ST1(100),Z(100),T(100),SQT(100),C(100),COST0525
       1T1(100),C1(100),PS1(100),PHI(100),PS2(100),PH2(100),PS(100,2),PH(1COST0526
        200,2)                                                             COST0527
        DIMENSION P(100,2),R(100,2),S(100,2),TN(100,2),VKV(100)            COST0528
        DIMENSION TT(30),TAUR(30),TAUC(30),CST(30),VK(30)                  COST0529
        EQUIVALENCE(PS,PS1),(PS(101),PS2),(PH,PHI),(PH(101),PH2)           COST0530
                                                                           COST0531
        COMMON M,N,L,MM1,NM1,MP1,NP1,LM1,IF1,ITER ,INT,KL                  COST0532
        COMMON KI,KS                                                       COST0533
        COMMON ST,STO,ST1,Z,T,SQT,C,T1,C1,PS1,PS2,PHI,PH2,P,R,S,TN,VKV     COST0534
        COMMON TT,TAUR,TAUC,CST,VK,TRP,TCP,CSP,VKP                         COST0535
        COMMON DZ1DRF,DZ3DRF,DZ2DCF,DZ1DRT,DZ2DCT,DZ3DRT,DTL               COST0536
        COMMON DZ1FM,DZ2FM,DZ3FM,DZ2L,DZ2LM,P11,P121,P122,P12,P21,P22,P231COST0537
       1,P232,P31,P32,S21,S21M,STRM,SQTRM,STRN,SQTRN,TOVO1M,TOVO2M,TOVO3M,COST0538
       2TOWO1M,TOWO2M,TOWO3M,A3,B3,AR,ZN,ZM,AZ,PREC,DTAB                   COST0539
        COMMON A1B1,A2B2,AC,BU,COEC,COET,DL,FC,R11,R12,R21,R22,R31,R32,SACCOST0540
       1Z,SARZ,SPR,SPZ,SQZ,TOSA1,TOSA2,TOSA3,TOSAC,TOSAR,TOVO,TOWO,TF,TZ,VCOST0541
       2NU,VZ,WZ                                                           COST0542
        COMMON PS1M,PS2M,C1M,T1M,V1M,P1N,PSI,DP1,REP1                      COST0543
        COMMON PH1M,PH2M,CM,TM,VM,PN,PHI,DP,REP                            COST0544
        COMMON A1,B1,A2,B2,A3B3,A1B1M,A2B2M,A3B3M,A1M,B1M,A2M,B2M,A3M,B3M,COST0545
       1VB,B,XZ,XZ1,DT,DZ1,DZ2,DZ3,DRF,DRT,DCF,DCT,TOWO1,TOWO2,TOWO3,TOVO1COST0546
       2,TOVO2,TOVO3,TRM,TRM1,TRN,TRN1,VZSTO,TO                           COST0547
        DIMENSION AL(100),BE(100)                                          COST0548
C       CALCOLO PHI                                                        COST0549
        DO 1000 INT1=1,INT                                                 COST0550
        SM=0.                                                              COST0551
        K1=2                                                               COST0552
        DO 30 K=1,2                                                        COST0553
        AL(2)=R(3,K)/P(2,K)                                                COST0554
        BE(2)=(TN(2,K)+S(2,K)*PH(2,K1))/P(2,K)                             COST0555
        DO 10 I=3,LM1                                                      COST0556
        AL(I)=R(I+1,K)/(P(I,K)-R(I,K)*AL(I-1))                             COST0557
        BE(I)=(TN(I,K)+S(I,K)*PH(I,K1)+R(I,K)*BE(I-1))/(P(I,K)-R(I,K)*AL(ICOST0558
       1-1))                                                              COST0559
     10 CONTINUE                                                           COST0560
        DO 20 I=2,LM1                                                      COST0561
        J=L-I+1                                                            COST0562
        X=PH(J,K)                                                          COST0563
        PH(J,K)=AL(J)*PH(J+1,K)+BE(J)                                      COST0564
        X=ABSF(X-PH(J,K))/ PH(J,K)                                         COST0565
        IF(SM-X)19,20,20                                                   COST0566
     19 SM=X                                                               COST0567
        J4=J                                                               COST0568
     20 CONTINUE                                                           COST0569
     30 K1=1                                                               COST0570
        IF(SENSE SWITCH 3)1010,2000                                        COST0571
   1010 IF(ITER-KI)1000,1003,1002                                         COST0572
   1002 IF(ITER-KS)1003,1003,1000                                         COST0573
   1003 WRITE OUTPUT TAPE 6,1006,ITER,INT1,J4,PH1(J4),PH2(J4),SM           COST0574
   1006 FORMAT (1H0,3I10,3E20.8)                                          COST0575
   2000 IF(SM-PREC)1001,1001,1020                                         COST0576
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FLUX2                                    1/14/63

1020 CONTINUE                                    COSTC577
1000 CONTINUE                                    COSTO578
1001 CONTINUE                                    COSTO579
     RETURN                                      COSTO580
     END(1,0,0,0,0,1,0,0,0,0,0,0,0)

```
C       CODICE COSTANZA                                                 COST0584
        SUBROUTINE TEMPER                                               COST0585
        DIMENSION ST(100),STO(100),ST1(100),Z(100),T(100),SQT(100),C(100),COST0586
       1T1(100),C1(100),PS1(100),PHI(100),PS2(100),PH2(100),PS(100,2),PH(1COST0587
       200,2)                                                           COST0588
        DIMENSION P(100,2),R(100,2),S(100,2),TN(100,2),VKV(100)         COST0589
        DIMENSION TT(30),TAUR(30),TAUC(30),CST(30),VK(30)              COST0590
        EQUIVALENCE(PS,PS1),(PS(101),PS2),(PH,PHI),(PH(101),PH2)        COST0591
                                                                        COST0592
        COMMON M,N,L,MM1,NM1,MP1,NP1,LM1,IF1,ITER ,INT,KL               COST0593
        COMMON KI,KS                                                    COST0594
        COMMON ST,STO,ST1,Z,T,SQT,C,T1,C1,PS1,PS2,PH1,PH2,P,R,S,TN,VKV  COST0595
        COMMON TT,TAUR,TAUC,CST,VK,TRP,TCP,CSP,VKP                      COST0596
        COMMON DZ1DRF,DZ3DRF,DZ2DCF,DZ1DRT,DZ2DCT,DZ3DRT,DTL            COST0597
        COMMON DZ1FM,DZ2FM,DZ3FM,DZ2L,DZ2LM,P11,P121,P122,P12,P21,P22,P231COST0598
       1,P232,P31,P32,S21,S21M,STRM,SQTRM,STRN,SQTRN,TOVO1M,TCVO2M,TOVO3M,COST0599
       2TOWO1M,TOWO2M,TOWO3M,A3,B3,AR,ZN,ZM,AZ,PREC,DTAB                COST0600
        COMMON A1B1,A2B2,AC,BU,COEC,COET,DL,FC,R11,R12,R21,R22,R31,R32,SACCOST0601
       1Z,SARZ,SPR,SPZ,SQZ,TOSA1,TOSA2,TOSA3,TOSAC,TOSAR,TOVO,TOWO,TF,TZ,VCOST0602
       2NU,VZ,WZ                                                        COST0603
        COMMON PS1M,PS2M,C1M,T1M,V1M,P1N,PSI,DP1,REP1                    COST0604
        COMMON PH1M,PH2M,CM,TM,VM,PN,PHI,DP,REP                         COST0605
        COMMON A1,B1,A2,B2,A3B3,A1B1M,A2B2M,A3B3M,A1M,B1M,A2M,B2M,A3M,B3M,COST0606
       1VB,B,XZ,XZ1,DT,DZ1,DZ2,DZ3,DRF,DRT,DCF,DCT,TOWO1,TOWO2,TOWO3,TOVO1COST0607
       2,TOVO2,TOVO3,TRM,TRM1,TRN,TRN1,VZST0,TO                         COST0608
        DO 10 I=M,N                                                     COST0609
     10 T(I)=T1(I)+COET*VKV(I)*PH2(I)/(SQT(I)*FUNC(CST,CSP,T(I)))        COST0610
        RETURN                                                          COST0611
        END(1,0,0,0,0,0,1,0,0,0,0,0,0,0,0)
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C       CODICE COSTANZA                                           COST0615
        SUBROUTINE INTEGR                                         COST0616
        DIMENSION ST(100),ST0(100),ST1(100),Z(100),T(100),SQT(100),C(100),COST0617
       1T1(100),C1(100),PS1(100),PHI(100),PS2(100),PH2(100),PS(100,2),PH(1COST0618
       200,2)                                                     COST0619
        DIMENSION P(100,2),R(100,2),S(100,2),TN(100,2),VKV(100)   COST0620
        DIMENSION TT(30),TAUR(30),TAUC(30),CST(30),VK(30)         COST0621
        EQUIVALENCE(PS,PS1),(PS(101),PS2),(PH,PHI),(PH(101),PH2)  COST0622
        COMMON M,N,L,MM1,NM1,MP1,NP1,LM1,IF1,ITER ,INT,KL         COST0623
        COMMON KI,KS                                              COST0624
        COMMON ST,ST0,ST1,Z,T,SQT,C,T1,C1,PS1,PS2,PHI,PH2,P,R,S,TN,VKV  COST0625
        COMMON TT,TAUR,TAUC,CST,VK,TRP,TCP,CSP,VKP                COST0626
        COMMON DZ1DRF,DZ3DRF,DZ2DCF,DZ1DRT,DZ2DCT,DZ3DRT,DTL      COST0627
        COMMON DZ1FM,DZ2FM,DZ3FM,DZ2L,DZ2LM,P11,P121,P122,P12,P21,P22,P231COST0628
       1,P232,P31,P32,S21,S21M,STRM,SQTRM,STRN,SQTRN,TOVO1M,TOVO2M,TOVO3M,COST0629
       2TOWO1M,TOWO2M,TOWO3M,A3,B3,AR,ZN,ZM,AZ,PREC,CTAB          COST0630
        COMMON A1B1,A2B2,AC,BU,COEC,COET,DL,FC,R11,R12,R21,R22,R31,R32,SACCOST0631
       1Z,SARZ,SPR,SPZ,SQZ,TOSA1,TOSA2,TOSA3,TOSAC,TOSAR,TOVO,TOWO,TF,TZ,VCOST0632
       2NU,VZ,WZ                                                  COST0633
        COMMON PS1M,PS2M,CIM,TIM,VIM,P1N,PSI,DP1,REP1             COST0634
        COMMON PH1M,PH2M,CM,TM,VM,PN,PHI,DP,REP                   COST0635
        COMMON A1,B1,A2,B2,A3B3,A1B1M,A2B2M,A3B3M,A1M,B1M,A2M,B2M,A3M,B3M,COST0636
       1VB,B,XZ,XZ1,DT,DZ1,DZ2,DZ3,DRF,DRT,DCF,DCT,TOWO1,TOWO2,TOWO3,TOVO1COST0637
       2,TOVO2,TOVO3,TRM,TRM1,TRN,TRN1,VZST0,T0                   COST0638
        SPH2=(PH2(M)+PH2(N))*0.5                                  COST0639
        DO 10 I=MP1,NM1                                           COST0640
        SPH2=SPH2+PH2(I)                                          COST0641
   10   CONTINUE                                                  COST0642
        PH2M=SPH2/AZ                                              COST0643
        GO TO (100,200),IF1                                       COST0644
  100   IF(PH2M-PS2M)101,102,102                                  COST0645
  200   IF(PS2M-PH2M)104,102,102                                  COST0646
  104   IF1=1                                                     COST0647
        GO TO 105                                                 COST0648
  101   IF1=2                                                     COST0649
  105   CONTINUE                                                  COST0650
        CALL STAMPA(2)                                            COST0651
  102   CONTINUE                                                  COST0652
        DP=(PH2M-PS2M)/DT                                         COST0653
        REP=DP*2./(PH2M+PS2M)                                     COST0654
        PHI=PHI+DT*PH2M                                           COST0655
        XZ1=XZ                                                    COST0656
        RETURN                                                    COST0657
        END(1,0,0,0,0,0,1,0,0,0,0,0,0,0,0)
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C      SWITCH 5 DOWN  PLOTTER SPAZIALE                                   COST0661
C      SWITCH 4 DOWN PLOTTER VALORI MEDI                                 COST0662
C      SENSE SWITCH 2 DOWN STAMPA I VETTORI  STC,STI,ST                  COST0663
C      SENSE SWITCH 1 DOWN STAMPA I COEFFICIENTI                         COST0664
C      CODICE COSTANZA                                                   COST0665
       SUBROUTINE STAMPA(ISA)                                            COST0666
C      CODICE COSTANZA                                                   COST0667
       DIMENSION ST(100),STO(100),ST1(100),Z(100),T(100),SQT(100),C(100),COST0668
      1T1(100),C1(100),PS1(100),PHI(100),PS2(100),PH2(100),PS(100,2),PH(1COST0669
      200,2)                                                            COST0670
       DIMENSION P(100,2),R(100,2),S(100,2),TN(100,2),VKV(100)          COST0671
       DIMENSION TT(30),TAUR(30),TAUC(30),CST(30),VK(30)               COST0672
       EQUIVALENCE(PS,PS1),(PS(101),PS2),(PH,PHI),(PH(101),PH2)        COST0673
                                                                        COST0674
       COMMON M,N,L,MM1,NM1,MP1,NP1,LM1,IF1,ITER ,INT,KL               COST0675
       COMMON KI,KS                                                    COST0676
       COMMON ST,STO,ST1,Z,T,SQT,C,T1,C1,PS1,PS2,PH1,PH2,P,R,S,TN,VKV  COST0677
       COMMON TT,TAUR,TAUC,CST,VK,TRP,TCP,CSP,VKP                      COST0678
       COMMON DZ1DRF,DZ3DRF,DZ2DCF,DZ1DRT,DZ2DCT,DZ3DRT,DTL            COST0679
       COMMON DZ1FM,DZ2FM,DZ3FM,DZ2L,DZ2LM,P11,P121,P122,P12,P21,P22,P231COST0680
      1,P232,P31,P32,S21,S21M,STRM,SQTRM,STRN,SQTRN,TOVO1M,TOVO2M,TOVO3M,COST0681
      2TOW01M,TOW02M,TOW03M,A3,B3,AR,ZN,ZM,AZ,PREC,DTAB                 COST0682
       COMMON A1B1,A2B2,AC,BU,COEC,COET,DL,FC,R11,R12,R21,R22,R31,R32,SACCOST0683
      1Z,SARZ,SPR,SPZ,SQZ,TOSA1,TOSA2,TOSA3,TOSAC,TOSAR,TOVO,TOWO,TF,TZ,VCOST0684
      2NU,VZ,WZ                                                         COST0685
       COMMON PS1M,PS2M,C1M,T1M,V1M,P1N,PSI,DP1,REP1                    COST0686
       COMMON PH1M,PH2M,CM,TM,VM,PN,PHI,DP,REP                          COST0687
       COMMON A1,B1,A2,B2,A3B3,A1B1M,A2B2M,A3B3M,A1M,B1M,A2M,B2M,A3M,B3M,COST0688
      1VB,B,XZ,XZ1,DT,DZ1,DZ2,DZ3,DRF,DRT,DCF,DCT,TOW01,TOW02,TOW03,TOVO1COST0689
      2,TOVO2,TOVO3,TRM,TRM1,TRN,TRN1,VZSTO,TO                          COST0690
       DIMENSION XX(100),YY(100,3)                                      COST0691
       COMMON XX,YY,IPLOT                                               COST0692
       DIMENSION PN2(100)                                               COST0693
       GO TO(10,20,30),ISA                                              COST0694
   10  WRITE OUTPUT TAPE 6,1                                            COST0695
       DO 12 I=2,LM1                                                    COST0696
       PN2(I)=PH2(I)/(VZSTO*SQRTF(T(I)))                               COST0697
   12  CONTINUE                                                         COST0698
       PN2(M)=PH2(M)/(VZSTO*SQRTF(0.5*(T(M)+TRM)))                     COST0699
       PN2(N)=PH2(N)/(VZSTO*SQRTF(0.5*(T(N)+TRN)))                     COST0700
       SPH1=(PH1(M)+PH2(N))*0.5                                         COST0701
       SC=(C(M)+C(N))*0.5                                               COST0702
       WT=(T(M)+T(N))*0.5                                               COST0703
       PN=(PN2(M)+PN2(N))*0.5                                           COST0704
       DO 11 I=MP1,NM1                                                  COST0705
       SPH1=SPH1+PH1(I)                                                 COST0706
       SC=SC+C(I)                                                       COST0707
       WT=WT+T(I)                                                       COST0708
       PN=PN+PN2(I)                                                     COST0709
   11  CONTINUE                                                         COST0710
       PH1M=SPH1/AZ                                                     COST0711
       CM=SC/AZ                                                         COST0712
       TM=WT/AZ                                                         COST0713
       VM=VZSTO*SQRTF(TM)                                               COST0714
       PN=PN/AZ                                                         COST0715
```

```
  1 FORMAT (1H1)                                                    COST0716
    WRITE OUTPUT TAPE 6,3,TO,ITER,XZ,VB,REP,DP,PHI,VM               COST0717
  3 FORMAT ( 4X,4HTO =,F10.5,3X,6HITER =,I6//,4X,4HXZ =F10.5,5X,4HVB =COST0718
   1E14.6,4X,5HREP =,E14.6,4X,4HDP =E14.6,4X,5HPHI =,E14.6,4X,4HVM =, COST0719
   2E14.6////)                                                      COST0720
    WRITE OUTPUT TAPE 6,4                                           COST0721
  4 FORMAT (1H0,8X,1HZ,15X,2HTR,14X,2HTC,15X,1HC,14X,3HPH1,15X,3HPH2,1COST0722
   12X,1HN ///)                                                     COST0723
    WRITE OUTPUT TAPE 6,5,(Z(I),T(I),PH1(I),PH2(I),PN2(I),I=1,MM1)   COST0724
    WRITE OUTPUT TAPE 6,6,ZM,TRM,T(M),C(M),PH1(M),PH2(M),PN2(M)      COST0725
    WRITE OUTPUT TAPE 6,7,(Z(I),T(I),C(I),PH1(I),PH2(I),PN2(I),I=MP1,NCOST0726
   1M1)                                                             COST0727
    WRITE OUTPUT TAPE 6,6,ZN,TRN,T(N),C(N),PH1(N),PH2(N),PN2(N)      COST0728
    WRITE OUTPUT TAPE 6,5,(Z(I),T(I),PH1(I),PH2(I),PN2(I),I=NP1,L)   COST0729
  5 FORMAT (1H ,2E16.5,32X,3E16.5)                                  COST0730
  6 FORMAT (1H ,7E16.5)                                             COST0731
  7 FORMAT (1H ,E16.5,16X,5E16.5)                                   COST0732
    WRITE OUTPUT TAPE 6,8,TM,CM,PH1M,PH2M,PN                        COST0733
    IF(SENSE SWITCH 2)1010,2000                                     COST0734
1010 WRITE OUTPUT TAPE 6,9,(ST0(I),ST1(I),ST(I),(PH(I,K),K=1,2),I=1,L) COST0735
2000 CONTINUE                                                       COST0736
    IF(SENSE SWITCH 5)1033,1034                                     COST0737
1033 CALL SPAZPL(Z  ,PH     ,T   ,TO,LM1-1)                         COST0738
1034 CONTINUE                                                       COST0739
    IF(SENSE SWITCH 4)1031,1030                                     COST0740
1031 IPLOT=IPLOT+1                                                  COST0741
    XX(IPLOT)=TO                                                    COST0742
    YY(IPLOT,1)=PH1M                                                COST0743
    YY(IPLOT,2)=PH2M                                                COST0744
    YY(IPLOT,3)=TM                                                  COST0745
    GO TO 1030                                                      COST0746
 20 WRITE OUTPUT TAPE 6,2                                           COST0747
  2 FORMAT (1H1,55X,16HMASSIMO O MINIMO ///)                        COST0748
 30 DO 22 I=2,LM1                                                   COST0749
    PN2(I)=PS2(I)/(VZSTO*SQRTF(T1(I)))                             COST0750
 22 CONTINUE                                                        COST0751
    PN2(M)=PS2(M)/(VZSTO*SQRTF(0.5*(T1(M)+TRM1)))                  COST0752
    PN2(N)=PS2(N)/(VZSTO*SQRTF(0.5*(T1(N)+TRN1)))                  COST0753
    SPH1=(PS1(M)+PS1(N))*0.5                                       COST0754
    SC=(C1(M)+C1(N))*0.5                                           COST0755
    WT=(T1(M)+T1(N))*0.5                                           COST0756
    PN=(PN2(M)+PN2(N))*0.5                                         COST0757
    DO 21 I=MP1,NM1                                                 COST0758
    SPH1=SPH1+PS1(I)                                               COST0759
    SC=SC+C1(I)                                                    COST0760
    WT=WT+T1(I)                                                    COST0761
    PN=PN+PN2(I)                                                   COST0762
 21 CONTINUE                                                        COST0763
    PS1M=SPH1/AZ                                                    COST0764
    C1M=SC/AZ                                                      COST0765
    T1M=WT/AZ                                                      COST0766
    V1M=VZSTO*SQRTF(T1M)                                          COST0767
    P1N=PN/AZ                                                     COST0768
    IF(ISA-2)31,31,33                                             COST0769
 31 WRITE OUTPUT TAPE 6,3,TO,ITER,XZ1,VB,REP ,DP ,PHI,V1M          COST0770
 33 WRITE OUTPUT TAPE 6,4                                          COST0771
```

```
        WRITE OUTPUT TAPE 6,5,(Z(I),T1(I),PS1(I),PS2(I),PN2(I),I=1,MM1)    COST0772
        WRITE OUTPUT TAPE 6,6,ZM,TRM1,T1(M),C1(M),PS1(M),PS2(M),PN2(M)      COST0773
        WRITE OUTPUT TAPE 6,7,(Z(I),T1(I),C1(I),PS1(I),PS2(I),PN2(I),I=MP1  COST0774
      1,NM1)                                                                COST0775
        WRITE OUTPUT TAPE 6,6,ZN,TRN1,T1(N),C1(N),PS1(N),PS2(N),PN2(N)      COST0776
        WRITE OUTPUT TAPE 6,5,(Z(I),T1(I),PS1(I),PS2(I),PN2(I),I=NP1,L)     COST0777
        WRITE OUTPUT TAPE 6,8,TIM,C1M,PS1M,PS2M,P1N                         COST0778
      8 FORMAT (1H0,5X,11HVALORI MEDI ,16X,5E16.5)                          COST0779
      9 FORMAT (1H0//(5E20.8))                                             COST0780
        IF(SENSE SWITCH 5)1035,1036                                        COST0781
   1035 CALL SPAZPL(Z    ,PS      ,T1    ,TO,LM1-1)                         COST0782
   1036 CONTINUE                                                           COST0783
        IF(SENSE SWITCH 4)1032,1030                                        COST0784
   1032 IPLOT=IPLOT+1                                                      COST0785
        XX(IPLOT)=TO                                                       COST0786
        YY(IPLOT,1)=PS1M                                                   COST0787
        YY(IPLOT,2)=PS2M                                                   COST0788
        YY(IPLOT,3)=TIM                                                    COST0789
   1030 CONTINUE                                                           COST0790
        IF(SENSE SWITCH 1)1020,100                                         COST0791
   1020 WRITE OUTPUT TAPE 6,200,((P(I,K),R(I,K),S(I,K),TN(I,K),K=1,2),I=1, COST0792
      1L)                                                                  COST0793
    200 FORMAT (1H1/(1H ,8E16.5))                                          COST0794
    100 RETURN                                                             COST0795
        END(1,0,0,0,0,0,1,0,0,0,0,0,0,0,0)
```

```
      SUBROUTINE STPLOT                                              COST0799
C     CODICE COSTANZA                                                COST0800
      DIMENSION ST(100),STO(100),ST1(100),Z(100),T(100),SQT(100),C(100),COST0801
     1T1(100),C1(100),PS1(100),PH1(100),PS2(100),PH2(100),PS(100,2),PH(1COST0802
      200,2)                                                         COST0803
      DIMENSION P(100,2),R(100,2),S(100,2),TN(100,2),VKV(100)        COST0804
      DIMENSION TT(30),TAUR(30),TAUC(30),CST(30),VK(30)              COST0805
      EQUIVALENCE(PS,PS1),(PS(101),PS2),(PH,PH1),(PH(101),PH2)       COST0806
                                                                     COST0807
      COMMON M,N,L,MM1,NM1,MP1,NP1,LM1,IF1,ITER ,INT,KL             COST0808
      COMMON KI,KS                                                   COST0809
      COMMON ST,STO,ST1,Z,T,SQT,C,T1,C1,PS1,PS2,PH1,PH2,P,R,S,TN,VKV COST0810
      COMMON TT,TAUR,TAUC,CST,VK,TRP,TCP,CSP,VKP                     COST0811
      COMMON DZ1DRF,DZ3DRF,DZ2DCF,DZ1DRT,DZ2DCT,DZ3DRT,DTL           COST0812
      COMMON DZ1FM,DZ2FM,DZ3FM,DZ2L,DZ2LM,P11,P121,P122,P12,P21,P22,P231COST0813
     1,P232,P31,P32,S21,S21M,STRM,SQTRM,STRN,SQTRN,TOVO1M,TOVO2M,TOVO3M,COST0814
     2TOWO1M,TOWO2M,TOWO3M,A3,B3,AR,ZN,ZM,AZ,PREC,DTAB              COST0815
      COMMON A1B1,A2B2,AC,BU,COEC,COET,DL,FC,R11,R12,R21,R22,R31,R32,SACCOST0816
     1Z,SARZ,SPR,SPZ,SQZ,TOSA1,TOSA2,TOSA3,TOSAC,TOSAR,TOVO,TOWO,TF,TZ,VCOST0817
     2NU,VZ,WZ                                                       COST0818
      COMMON PS1M,PS2M,C1M,T1M,V1M,P1N,PSI,DP1,REP1                  COST0819
      COMMON PH1M,PH2M,CM,TM,VM,PN,PHI,DP,REP                        COST0820
      COMMON A1,B1,A2,B2,A3B3,A1B1M,A2B2M,A3B3M,A1M,B1M,A2M,B2M,A3M,B3M,COST0821
     1VB,B,XZ,XZ1,DT,DZ1,DZ2,DZ3,DRF,DRT,DCF,DCT,TOWO1,TOWO2,TOWO3,TOVO1COST0822
     2,TOVO2,TOVO3,TRM,TRM1,TRN,TRN1,VZSTO,TO                        COST0823
      DIMENSION XX(100),YY(100,3)                                    COST0824
      COMMON XX,YY,IPLOT                                             COST0825
      CALL FINIM(3.,3.)                                              COST0826
      CALL SYMBL4 (5.,-2.5,0.2,0.,23HCODE COSTANZA I 60.5414 ,23)    COST0827
      CALL DESSIN(XX,YY,IPLOT,1,1,2,0,100,15.,21.,0,1,4HTIME,-4,12HAVERACOST0828
     1GE FLUX,12,0)                                                  COST0829
      CALL FINIM(0.,30.)                                             COST0830
      CALL DESSIN(XX,YY(1,3),IPLOT,1,1,1,0,0,15.,21.,0,0,4HTIME,-4,19HAVCOST0831
     1ERAGE TEMPERATURE,19,0)                                        COST0832
      CALL FINIM (20.,-33.)                                          COST0833
      RETURN                                                         COST0834
      END(1,0,0,0,0,0,1,0,0,0,0,0,0,0,0)
```

```
      SUBROUTINE SPAZPL(XX,YY,ZZ,TO,N)                              COST0838
      DIMENSION XX(100),YY(100,2),ZZ(100)                          COST0839
      CALL FINIM(3.,5.)                                            COST0840
      CALL SYMBL4 (2.,-3.5,0.21,0.,23HCODE COSTANZA I 60.5414 ,23) COST0841
      CALL SYMBL4 (2.,-1.5,0.21,0.,28HSPATIAL DISTRIBUTION  TIME =,28) COST0842
      CALL NUMBER (7.10,-1.5,0.21,0.,TO,5)                         COST0843
      CALL DESSIN (XX(2),YY(2,1),                                  COST0844
     1            N,1,1,2,0,100,15.,21.,0,0,6HZ AXIS,-6,4HFLUX,4,  COST0845
     10)                                                           COST0846
      CALL FINIM(0.,30.)                                           COST0847
      CALL SYMBL4(2.,-2.5,0.2,0.,6HTIME = ,6)                      COST0848
      CALL NUMBER (3.15,-2.5,0.21,0.,TO,5)                         COST0849
      CALL DESSIN (XX(2),ZZ(2),                                    COST0850
     1            N,1,1,1,0,0,15.,21.,0,0,6HZ AXIS,-6,11HTEMPERAT  COST0851
     1URE,11,0)                                                    COST0852
      CALL FINIM(20.,-35.)                                         COST0853
      RETURN                                                       COST0854
      END(1,0,0,0,0,0,1,0,0,0,0,0,0,0,0)
```

```
C       CODICE COSTANZA                                                    COSTC858
        FUNCTION FUNC(AAA,BB,CC)                                           COSTC859
        DIMENSION ST(100),STO(100),ST1(100),Z(100),T(100),SQT(100),C(100),COST0860
       1T1(100),C1(100),PS1(100),PH1(100),PS2(100),PH2(100),PS(100,2),PH(1COSTC861
        200,2)                                                             COSTC862
        DIMENSION P(100,2),R(100,2),S(100,2),TN(100,2),VKV(100)            COST0863
        DIMENSION TT(30),TAUR(30),TAUC(30),CST(30),VK(30)                  COSTC864
        EQUIVALENCE(PS,PS1),(PS(101),PS2),(PH,PHI),(PH(101),PH2)           COSTC865
                                                                           COSTC866
        COMMON M,N,L,MM1,NM1,MP1,NP1,LM1,IF1,ITER ,INT,KL                  COSTC867
        COMMON KI,KS                                                       COSTC868
        COMMON ST,STO,ST1,Z,T,SQT,C,T1,C1,PS1,PS2,PH1,PH2,P,R,S,TN,VKV     COSTC869
        COMMON TT,TAUR,TAUC,CST,VK,TRP,TCP,CSP,VKP                         COST0870
        COMMON DZ1DRF,DZ3DRF,DZ2DCF,DZ1DRT,DZ2DCT,DZ3DRT,CTL               COST0871
        COMMON DZ1FM,DZ2FM,DZ3FM,DZ2L,DZ2LM,P11,P121,P122,P12,P21,P22,P231COST0872
       1,P232,P31,P32,S21,S21M,STRM,SQTRM,STRN,SQTRN,TOVO1M,TCVO2M,TOVO3M,COST0873
        2TOWO1M,TOWO2M,TOWO3M,A3,B3,AR,ZN,ZM,AZ,PREC,DTAB                  COSTC874
        COMMON A1B1,A2B2,AC,BU,COEC,COET,DL,FC,R11,R12,R21,R22,R31,R32,SACCOST0875
       1Z,SARZ,SPR,SPZ,SQZ,TOSA1,TOSA2,TOSA3,TOSAC,TOSAR,TOVO,TOWO,TF,TZ,VCOST0876
        2NU,VZ,WZ                                                          COSTC877
        COMMON PS1M,PS2M,C1M,T1M,V1M,P1N,PSI,DP1,REP1                      COSTC878
        COMMON PH1M,PH2M,CM,TM,VM,PN,PHI,DP,REP                            COSTC879
        COMMON A1,B1,A2,B2,A3B3,A1B1M,A2B2M,A3B3M,A1M,B1M,A2M,B2M,A3M,B3M,COSTC880
       1VB,B,XZ,XZ1,DT,DZ1,DZ2,DZ3,DRF,DRT,DCF,DCT,TOWO1,TCWO2,TOWO3,TOVO1COSTC881
        2,TOVO2,TOVO3,TRM,TRM1,TRN,TRN1,VZSTO,TO                          COSTC882
        DIMENSION AAA(30)                                                  COSTC883
        KP=(CC-TT(1))/DTAB+1.0001                                          COSTC884
        IF(KP-KL)1,2,2                                                     COSTC885
      1 DD=TT(KP+1)-CC                                                     COSTC886
        DS=DTAB-DD                                                         COSTC887
        FUNC=(AAA(KP)*DD+AAA(KP+1)*DS) /DTAB                               COSTC888
        GO TO 3                                                            COSTC889
      2 FUNC=AAA(KL)+(CC-TT(KL))*BB                                        COSTC890
      3 RETURN                                                             COSTC891
        END(1,0,0,0,0,1,0,0,0,0,0,0,0,0)
```

A n n e x  2

Input data of the test case

| PROBLEM | CASO TEST COSTANZA | | DATE | 1964 | PAGE | 1 | OF | 1 |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COSTANZA – CONTROL RODS STEP EXPULSION – SPR= 0.00007 | | | | | | | | | | | | | | 01 |
| 145 | +02 | 145 | +02 | 145 | +02 | 110 | +01 | 1066 | +01 | 986 | +00 | 955 | +00 | 02 |
| 100 | -02 | 2635 | -03 | 2477 | -02 | 308 | +07 | 2486 | +06 | 58338 | -03 | 293 | +03 | 03 |
| 344 | -03 | 676 | -02 | 7679 | -01 | 700 | -04 | 1 | -03 | 247 | +01 | 766 | -11 | 04 |
| 0 | +00 | 0 | +00 | 5 | +00 | -555 | +00 | 0 | +00 | 502 | -04 | 535 | -02 | 05 |
| 293 | +03 | 293 | +03 | | | | | | | | | | | 06 |
| | 5 | | 15 | | 19 | | 6 | | 20 | | 0 | | 0 | 07 |
| 293 | +03 | 18315 | +01 | 426 | +03 | 402 | +03 | 252 | +00 | | | | | A-01 |
| 393 | +03 | 18255 | +01 | 426 | +03 | 392 | +03 | 350 | +00 | | | | | A-02 |
| 493 | +03 | 18195 | +01 | 426 | +03 | 3935 | +03 | 44 | +00 | | | | | A-03 |
| 593 | +03 | 18145 | +01 | 426 | +03 | 3908 | +03 | 51 | +00 | | | | | A-04 |
| 693 | +03 | 18100 | +01 | 426 | +03 | 3885 | +03 | 555 | +00 | | | | | A-05 |
| 793 | +03 | 18055 | +01 | 426 | +03 | 3868 | +03 | 6 | +00 | | | | | A-06 |
| 893 | +03 | 18022 | +01 | 426 | +03 | 385 | +03 | 63 | +00 | | | | | A-07 |
| 993 | +03 | 17995 | +01 | 426 | +03 | 383 | +03 | 66 | +00 | | | | | A-08 |
| 1093 | +04 | 17970 | +01 | 426 | +03 | 3818 | +03 | 68 | +00 | | | | | A-09 |
| 1193 | +04 | 17950 | +01 | 426 | +03 | 3805 | +03 | 70 | +00 | | | | | A-10 |
| 1293 | +04 | 17933 | +01 | 426 | +03 | 379 | +03 | 72 | +00 | | | | | A-11 |
| 1393 | +04 | 17915 | +01 | 426 | +03 | 378 | +03 | 735 | +00 | | | | | A-12 |
| 1493 | +04 | 17900 | +01 | 426 | +03 | 377 | +03 | 75 | +00 | | | | | A-13 |
| 1593 | +04 | 17890 | +01 | 426 | +03 | 3764 | +03 | 76 | +00 | | | | | A-14 |
| 1693 | +04 | 17880 | +01 | 426 | +03 | 3755 | +03 | 77 | +00 | | | | | A-15 |
| 1793 | +04 | 17870 | +01 | 426 | +03 | 3745 | +03 | 78 | +00 | | | | | A-16 |
| 1893 | +04 | 17865 | +01 | 426 | +03 | 3740 | +03 | 286 | +00 | | | | | A-17 |
| 1993 | +04 | 17855 | +01 | 426 | +03 | 3735 | +03 | 792 | +00 | | | | | A-18 |

| PROBLEM | CASO TEST COSTANZA | | | | | | DATE | 1964 | PAGE | 2 | OF | 1 |

| 1-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51-80 | Ref |
|---|---|---|---|---|---|---|
| 2093 +04 | 17850 +01 | 426 +03 | 3730 +03 | 798 +00 | | A-19 |
| 2193 +04 | 17845 +01 | 426 +03 | 3725 +03 | 800 +00 | | A-20 |
| 293 +03 | 0 +00 | 0 +00 | 0 +00 | | | B-01 |
| 293 +03 | 0 +00 | 54178 +09 | 15561 +10 | | | B-02 |
| 293 +03 | 0 +00 | 13901 +10 | 32396 +10 | | | B-03 |
| 293 +03 | 0 +00 | 30251 +10 | 50483 +10 | | | B-04 |
| 293 +03 | 26334 +07 | 63719 +10 | 65938 +10 | | | B-05 |
| 293 +03 | 32161 +07 | 10538 +11 | 80529 +10 | | | B-06 |
| 293 +03 | 38662 +07 | 13544 +11 | 76809 +10 | | | B-07 |
| 293 +03 | 43997 +07 | 15676 +11 | 11016 +11 | | | B-08 |
| 293 +03 | 47409 +07 | 16968 +11 | 11871 +11 | | | B-09 |
| 293 +03 | 48577 +07 | 17403 +11 | 12164 +11 | | | B-10 |
| 293 +03 | 47409 +07 | 16968 +11 | 11871 +11 | | | B-11 |
| 293 +03 | 43997 +07 | 15676 +11 | 11016 +11 | | | B-12 |
| 293 +03 | 38662 +07 | 13544 +11 | 96809 +10 | | | B-13 |
| 293 +03 | 32161 +07 | 10538 +11 | 80529 +10 | | | B-14 |
| 293 +03 | 26334 +07 | 63719 +10 | 65938 +10 | | | B-15 |
| 293 +03 | 0 +00 | 30251 +10 | 50483 +10 | | | B-16 |
| 293 +03 | 0 +00 | 13901 +10 | 32396 +10 | | | B-17 |
| 293 +03 | 0 +00 | 54178 +09 | 15561 +10 | | | B-18 |
| 293 +03 | 0 +00 | 0 +00 | 0 +00 | | | B-19 |
| 1 | 50 | 50 | 3 +07 | | | C-01 |
| 51 | 350 | 50 | 0 +00 | | | C-02 |
| 351 | 501 | 151 | 0 +00 | | | C-03 |

# A n n e x  3

Output of the test case

COSTANZA - CONTROL RODS STEP EXPULSION  -  SPR= 0.00007

| DZ1 | DZ2 | DZ3 | DRF | DCF | DRT | DCT |
|---|---|---|---|---|---|---|
| 0.14500E 02 | 0.14500E 02 | 0.14500E 02 | 0.11000E 01 | 0.10660E 01 | 0.98600E 00 | 0.95500E 00 |
| DT | SARZ | SACZ | WZ | VZ | SPZ | TZ |
| 1.00000E-03 | 0.26350E-03 | 0.24770E-02 | 0.30800E 07 | 0.24860E 06 | 0.58338E-03 | 0.29300E 03 |
| BU | B | DL | SPR | PREC | VNU | FC |
| 0.34400E-03 | 0.67600E-02 | 0.76790E-01 | 0.70000E-04 | 1.00000E-04 | 0.24700E 01 | 0.76600E-11 |
| XZ | TF | VKP | TRP | TOP | CSP | |
| 0. | 0.50000E 00 | -0.55500E 00 | 0. | 0.50200E-04 | 0.57500E-02 | |

| M = 5 | N = 15 | L = 19 | INT = 6 | KL = 20 | KI = 0 | KS = 0 |
|---|---|---|---|---|---|---|

| T | VK | TAUR | TAUC | CS |
|---|---|---|---|---|
| 0.29300E 03 | 0.18315E 01 | 0.42600E 03 | 0.40200E 03 | 0.25200E-00 |
| 0.39300E 03 | 0.18255E 01 | 0.42600E 03 | 0.39700E 03 | 0.35000E-00 |
| 0.49300E 03 | 0.18195E 01 | 0.42600E 03 | 0.39350E 03 | 0.44000E-00 |
| 0.59300E 03 | 0.18145E 01 | 0.42600E 03 | 0.39080E 03 | 0.51000E 00 |
| 0.69300E 03 | 0.18100E 01 | 0.42600E 03 | 0.38850E 03 | 0.55500E 00 |
| 0.79300E 03 | 0.18055E 01 | 0.42600E 03 | 0.38680E 03 | 0.60000E 00 |
| 0.89300E 03 | 0.18022E 01 | 0.42600E 03 | 0.38500E 03 | 0.63000E 00 |
| 0.99300E 03 | 0.17995E 01 | 0.42600E 03 | 0.38300E 03 | 0.66000E 00 |
| 0.10930E 04 | 0.17970E 01 | 0.42600E 03 | 0.38180E 03 | 0.68000E 00 |
| 0.11930E 04 | 0.17950E 01 | 0.42600E 03 | 0.38050E 03 | 0.70000E 00 |
| 0.12930E 04 | 0.17933E 01 | 0.42600E 03 | 0.37900E 03 | 0.72000E 00 |
| 0.13930E 04 | 0.17915E 01 | 0.42600E 03 | 0.37800E 03 | 0.73500E 00 |
| 0.14930E 04 | 0.17900E 01 | 0.42600E 03 | 0.37700E 03 | 0.75000E 00 |
| 0.15930E 04 | 0.17890E 01 | 0.42600E 03 | 0.37640E 03 | 0.76000E 00 |
| 0.16930E 04 | 0.17880E 01 | 0.42600E 03 | 0.37550E 03 | 0.77000E 00 |
| 0.17930E 04 | 0.17870E 01 | 0.42600E 03 | 0.37450E 03 | 0.78000E 00 |
| 0.18930E 04 | 0.17865E 01 | 0.42600E 03 | 0.37400E 03 | 0.78600E 00 |
| 0.19930E 04 | 0.17855E 01 | 0.42600E 03 | 0.37350E 03 | 0.79200E 00 |
| 0.20930E 04 | 0.17850E 01 | 0.42600E 03 | 0.37300E 03 | 0.79800E 00 |
| 0.21930E 04 | 0.17845E 01 | 0.42600E 03 | 0.37250E 03 | 0.80000E 00 |

## CONDIZIONI INIZIALI

TO =   0.                 XZ =   0.

| Z | TR | TC | C | PH1 | PH2 | N |
|---|---|---|---|---|---|---|
| 0. | | | | 0. | 0. | 0. |
| 0.14500E 02 | 0.29300E 03 | | | 0.54178E 09 | 0.15561E 10 | 0.62595E 04 |
| 0.29000E 02 | 0.29300E 03 | | | 0.13901E 10 | 0.32396E 10 | 0.13031E 05 |
| 0.43500E 02 | 0.29300E 03 | | | 0.30251E 10 | 0.50483E 10 | 0.20307E 05 |
| 0.58000E 02 | 0.29300E 03 | 0.29300E 03 | 0.26334E 07 | 0.63719E 10 | 0.65938E 10 | 0.26524E 05 |
| 0.72500E 02 | | 0.29300E 03 | 0.32161E 07 | 0.10538E 11 | 0.80529E 10 | 0.32393E 05 |
| 0.87000E 02 | | 0.29300E 03 | 0.38662E 07 | 0.13544E 11 | 0.96809E 10 | 0.38942E 05 |
| 0.10150E 03 | | 0.29300E 03 | 0.43997E 07 | 0.15676E 11 | 0.11016E 11 | 0.44312E 05 |
| 0.11600E 03 | | 0.29300E 03 | 0.47409E 07 | 0.16968E 11 | 0.11871E 11 | 0.47751E 05 |
| 0.13050E 03 | | 0.29300E 03 | 0.48577E 07 | 0.17403E 11 | 0.12164E 11 | 0.48930E 05 |
| 0.14500E 03 | | 0.29300E 03 | 0.47409E 07 | 0.16968E 11 | 0.11871E 11 | 0.47751E 05 |
| 0.15950E 03 | | 0.29300E 03 | 0.43997E 07 | 0.15676E 11 | 0.11016E 11 | 0.44312E 05 |
| 0.17400E 03 | | 0.29300E 03 | 0.38662E 07 | 0.13544E 11 | 0.96809E 10 | 0.38942E 05 |
| 0.18850E 03 | | 0.29300E 03 | 0.32161E 07 | 0.10538E 11 | 0.80529E 10 | 0.32393E 05 |
| 0.20300E 03 | 0.29300E 03 | 0.29300E 03 | 0.26334E 07 | 0.63719E 10 | 0.65938E 10 | 0.26524E 05 |
| 0.21750E 03 | 0.29300E 03 | | | 0.30251E 10 | 0.50483E 10 | 0.20307E 05 |
| 0.23200E 03 | 0.29300E 03 | | | 0.13901E 10 | 0.32396E 10 | 0.13031E 05 |
| 0.24650E 03 | 0.29300E 03 | | | 0.54178E 09 | 0.15561E 10 | 0.62595E 04 |
| 0.26100E 03 | 0.29300E 03 | | | 0. | 0. | 0. |
| VALORI MEDI | | 0.29300E 03 | 0.39937E 07 | 0.13723E 11 | 0.99999E 10 | 0.40225E 05 |

TO = 0.05000    ITER = 50

XZ = 261.00000    VB = 0.300000E 07    REP = 0.135757E 03    DP = 0.119042E 16    PHI = 0.735617E 11    VM = 0.248602E 06

| Z | TR | TC | C | PH1 | PH2 | N |
|---|---|---|---|---|---|---|
| 0. | 0.29300E 03 | | | 0. | 0. | 0. |
| 0.14500E 02 | 0.29300E 03 | | | 0.47620E 12 | 0.14849E 13 | 0.59730E 07 |
| 0.29000E 02 | 0.29300E 03 | | | 0.12256E 13 | 0.30825E 13 | 0.12399E 08 |
| 0.43500E 02 | 0.29300E 03 | | | 0.26783E 13 | 0.47835E 13 | 0.19242E 08 |
| 0.58000E 02 | 0.29300E 03 | 0.29300E 03 | 0.39301E 07 | 0.56676E 13 | 0.62176E 13 | 0.25010E 08 |
| 0.72500E 02 | | 0.29300E 03 | 0.47930E 07 | 0.93802E 13 | 0.75614E 13 | 0.30416E 08 |
| 0.87000E 02 | | 0.29300E 03 | 0.57571E 07 | 0.12042E 14 | 0.90673E 13 | 0.36473E 08 |
| 0.10150E 03 | | 0.29300E 03 | 0.65485E 07 | 0.13923E 14 | 0.10304E 14 | 0.41448E 08 |
| 0.11600E 03 | | 0.29300E 03 | 0.70547E 07 | 0.15063E 14 | 0.11095E 14 | 0.44631E 08 |
| 0.13050E 03 | | 0.29300E 03 | 0.72280E 07 | 0.15446E 14 | 0.11366E 14 | 0.45721E 08 |
| 0.14500E 03 | | 0.29300E 03 | 0.70547E 07 | 0.15063E 14 | 0.11095E 14 | 0.44631E 08 |
| 0.15950E 03 | | 0.29300E 03 | 0.65485E 07 | 0.13923E 14 | 0.10304E 14 | 0.41448E 08 |
| 0.17400E 03 | | 0.29300E 03 | 0.57571E 07 | 0.12042E 14 | 0.90673E 13 | 0.36473E 08 |
| 0.18850E 03 | | 0.29300E 03 | 0.47930E 07 | 0.93802E 13 | 0.75614E 13 | 0.30416E 08 |
| 0.20300E 03 | 0.29300E 03 | 0.29300E 03 | 0.39301E 07 | 0.56676E 13 | 0.62176E 13 | 0.25010E 08 |
| 0.21750E 03 | 0.29300E 03 | | | 0.26783E 13 | 0.47835E 13 | 0.19242E 08 |
| 0.23200E 03 | 0.29300E 03 | | | 0.12256E 13 | 0.30825E 13 | 0.12399E 08 |
| 0.24650E 03 | 0.29300E 03 | | | 0.47620E 12 | 0.14849E 13 | 0.59730E 07 |
| 0.26100E 03 | 0.29300E 03 | | | 0. | 0. | 0. |
| VALORI MEDI | | 0.29300E 03 | 0.59464E 07 | 0.12220E 14 | 0.93640E 13 | 0.37667E 08 |

TO = 0.10000    ITER =   100

XZ = 261.00000    VB = 0.              REP = 0.135046E 03    DP = 0.105559E 19    PHI = 0.658110E 14    VM = 0.250139E 06


| Z | TR | TC | C | PH1 | PH2 | N |
|---|---|---|---|---|---|---|
| 0. | 0.29300E 03 | | | 0. | 0. | 0. |
| 0.14500E 02 | 0.29300E 03 | | | 0.42223E 15 | 0.13214E 16 | 0.53153E 10 |
| 0.29000E 02 | 0.29300E 03 | | | 0.10867E 16 | 0.27430E 16 | 0.11034E 11 |
| 0.43500E 02 | 0.29300E 03 | | | 0.23746E 16 | 0.42571E 16 | 0.17124E 11 |
| 0.58000E 02 | 0.29300E 03 | 0.29542E 03 | 0.11694E 10 | 0.50247E 16 | 0.55358E 16 | 0.22222E 11 |
| 0.72500E 02 | | 0.29594E 03 | 0.14220E 10 | 0.83145E 16 | 0.67359E 16 | 0.26960E 11 |
| 0.87000E 02 | | 0.29652E 03 | 0.17045E 10 | 0.10670E 17 | 0.80795E 16 | 0.32306E 11 |
| 0.10150E 03 | | 0.29700E 03 | 0.19365E 10 | 0.12333E 17 | 0.91831E 16 | 0.36690E 11 |
| 0.11600E 03 | | 0.29731E 03 | 0.20848E 10 | 0.13339E 17 | 0.98895E 16 | 0.39492E 11 |
| 0.13050E 03 | | 0.29741E 03 | 0.21356E 10 | 0.13677E 17 | 0.10131E 17 | 0.40450E 11 |
| 0.14500E 03 | | 0.29731E 03 | 0.20848E 10 | 0.13339E 17 | 0.98895E 16 | 0.39492E 11 |
| 0.15950E 03 | | 0.29700E 03 | 0.19365E 10 | 0.12333E 17 | 0.91831E 16 | 0.36690E 11 |
| 0.17400E 03 | | 0.29652E 03 | 0.17045E 10 | 0.10670E 17 | 0.80795E 16 | 0.32306E 11 |
| 0.18850E 03 | | 0.29594E 03 | 0.14220E 10 | 0.83145E 16 | 0.67359E 16 | 0.26960E 11 |
| 0.20300E 03 | | 0.29542E 03 | 0.11694E 10 | 0.50247E 16 | 0.55358E 16 | 0.22222E 11 |
| 0.21750E 03 | 0.29300E 03 | | | 0.23746E 16 | 0.42571E 16 | 0.17124E 11 |
| 0.23200E 03 | 0.29300E 03 | | | 0.10867E 16 | 0.27430E 16 | 0.11034E 11 |
| 0.24650E 03 | 0.29300E 03 | | | 0.42223E 15 | 0.13214E 16 | 0.53153E 10 |
| 0.26100E 03 | 0.29300E 03 | | | 0. | 0. | 0. |
| VALORI MEDI | | 0.29664E 03 | 0.17600E 10 | 0.10827E 17 | 0.83443E 16 | 0.33357E 11 |

TO =   0.15000    ITER =    150

XZ = 261.00000    VB =  0.              REP =  0.452386E 02    DP =  0.809946E 20    PHI =  0.247841E 17    VM =  0.417215E 06

| Z | TR | TC | C | PH1 | PH2 | N |
|---|---|---|---|---|---|---|
| 0. | 0.29300E 03 | | | 0. | 0. | 0. |
| 0.14500E 02 | 0.29300E 03 | | | 0.56836E 17 | 0.27290E 18 | 0.10978E 13 |
| 0.29000E 02 | 0.29300E 03 | | | 0.14594E 18 | 0.56423E 18 | 0.22696E 13 |
| 0.43500E 02 | 0.29300E 03 | | | 0.31788E 18 | 0.87781E 18 | 0.35310E 13 |
| 0.58000E 02 | 0.29300E 03 | 0.69542E 03 | 0.34173E 12 | 0.67027E 18 | 0.11757E 19 | 0.36416E 13 |
| 0.72500E 02 | | 0.75792E 03 | 0.41229E 12 | 0.10960E 19 | 0.14757E 19 | 0.36909E 13 |
| 0.87000E 02 | | 0.81744E 03 | 0.48286E 12 | 0.13795E 19 | 0.17784E 19 | 0.42829E 13 |
| 0.10150E 03 | | 0.86273E 03 | 0.53823E 12 | 0.15671E 19 | 0.20216E 19 | 0.47390E 13 |
| 0.11600E 03 | | 0.89053E 03 | 0.57281E 12 | 0.16757E 19 | 0.21763E 19 | 0.50214E 13 |
| 0.13050E 03 | | 0.89984E 03 | 0.58452E 12 | 0.17114E 19 | 0.22291E 19 | 0.51167E 13 |
| 0.14500E 03 | | 0.89053E 03 | 0.57281E 12 | 0.16757E 19 | 0.21763E 19 | 0.50214E 13 |
| 0.15950E 03 | | 0.86273E 03 | 0.53823E 12 | 0.15671E 19 | 0.20216E 19 | 0.47390E 13 |
| 0.17400E 03 | | 0.81744E 03 | 0.48286E 12 | 0.13795E 19 | 0.17784E 19 | 0.42829E 13 |
| 0.18850E 03 | | 0.75792E 03 | 0.41229E 12 | 0.10960E 19 | 0.14757E 19 | 0.36909E 13 |
| 0.20300E 03 | 0.29300E 03 | 0.69542E 03 | 0.34173E 12 | 0.67027E 18 | 0.11757E 19 | 0.36416E 13 |
| 0.21750E 03 | 0.29300E 03 | | | 0.31788E 18 | 0.87781E 18 | 0.35310E 13 |
| 0.23200E 03 | 0.29300E 03 | | | 0.14594E 18 | 0.56423E 18 | 0.22696E 13 |
| 0.24650E 03 | 0.29300E 03 | | | 0.56836E 17 | 0.27290E 18 | 0.10978E 13 |
| 0.26100E 03 | 0.29300E 03 | | | 0. | 0. | 0. |

VALORI MEDI

|  |  | 0.82525E 03 | 0.49387E 12 | 0.14071E 19 | 0.18309E 19 | 0.44226E 13 |

# MASSIMO O MINIMO

TO = 0.16500    ITER = 165

XZ = 261.00000    VB = 0.    REP = 0.485171E-01    DP = 0.119572E 18    PHI = 0.589254E 17    VM = 0.505087E 06

| Z | TR | TC | C | PH1 | PH2 | N |
|---|---|---|---|---|---|---|
| 0. | 0.29300E 03 | | | 0. | 0. | 0. |
| 0.14500E 02 | 0.29300E 03 | | | 0.63024E 17 | 0.37833E 18 | 0.15219E 13 |
| 0.29000E 02 | 0.29300E 03 | | | 0.16167E 18 | 0.77705E 18 | 0.31257E 13 |
| 0.43500E 02 | 0.29300E 03 | | | 0.35170E 18 | 0.11996E 19 | 0.48254E 13 |
| 0.58000E 02 | | 0.99237E 03 | 0.72769E 12 | 0.74052E 18 | 0.16021E 19 | 0.43514E 13 |
| 0.72500E 02 | | 0.10981E 04 | 0.87341E 12 | 0.12036E 19 | 0.20047E 19 | 0.41653E 13 |
| 0.87000E 02 | | 0.11971E 04 | 0.10141E 13 | 0.15037E 19 | 0.23997E 19 | 0.47755E 13 |
| 0.10150E 03 | | 0.12719E 04 | 0.11231E 13 | 0.16977E 19 | 0.27140E 19 | 0.52398E 13 |
| 0.11600E 03 | | 0.13176E 04 | 0.11908E 13 | 0.18083E 19 | 0.29131E 19 | 0.55258E 13 |
| 0.13050E 03 | | 0.13329E 04 | 0.12136E 13 | 0.18444E 19 | 0.29809E 19 | 0.56219E 13 |
| 0.14500E 03 | | 0.13176E 04 | 0.11908E 13 | 0.18083E 19 | 0.29131E 19 | 0.55258E 13 |
| 0.15950E 03 | | 0.12719E 04 | 0.11231E 13 | 0.16977E 19 | 0.27140E 19 | 0.52398E 13 |
| 0.17400E 03 | | 0.11971E 04 | 0.10141E 13 | 0.15037E 19 | 0.23997E 19 | 0.47755E 13 |
| 0.18850E 03 | | 0.10981E 04 | 0.87341E 12 | 0.12036E 19 | 0.20047E 19 | 0.41653E 13 |
| 0.20300E 03 | | 0.99237E 03 | 0.72769E 12 | 0.74052E 18 | 0.16021E 19 | 0.43514E 13 |
| 0.21750E 03 | 0.29300E 03 | | | 0.35170E 18 | 0.11996E 19 | 0.48254E 13 |
| 0.23200E 03 | 0.29300E 03 | | | 0.16167E 18 | 0.77705E 18 | 0.31257E 13 |
| 0.24650E 03 | 0.29300E 03 | | | 0.63024E 17 | 0.37833E 18 | 0.15219E 13 |
| 0.26100E 03 | 0.29300E 03 | | | 0. | 0. | 0. |

VALORI MEDI    0.12095E 04    0.10344E 13    0.15012E 19    0.24646E 19    0.49386E 13

TO = 0.20000   ITER = 200

XZ = 261.00000   VB = 0.       REP = -0.446987E 02     DP = -0.412731E 20     PHI = 0.119898E 18     VM = 0.601364E 06

| Z | TR | TC | C | PH1 | PH2 | N |
|---|---|---|---|---|---|---|
| 0. | 0.29300E 03 | | | 0. | 0. | 0. |
| 0.14500E 02 | 0.29300E 03 | | | 0.19386E 17 | 0.14789E 18 | 0.59488E 12 |
| 0.29000E 02 | 0.29300E 03 | | | 0.49684E 17 | 0.30064E 18 | 0.12093E 13 |
| 0.43500E 02 | 0.29300E 03 | | | 0.10795E 18 | 0.45758E 18 | 0.18406E 13 |
| 0.58000E 02 | | 0.13876E 04 | 0.13403E 13 | 0.22698E 18 | 0.60303E 18 | 0.14324E 13 |
| 0.72500E 02 | | 0.15485E 04 | 0.15950E 13 | 0.36617E 18 | 0.74486E 18 | 0.13034E 13 |
| 0.87000E 02 | | 0.16964E 04 | 0.18348E 13 | 0.45372E 18 | 0.88140E 18 | 0.14735E 13 |
| 0.10150E 03 | | 0.18080E 04 | 0.20186E 13 | 0.50896E 18 | 0.98908E 18 | 0.16016E 13 |
| 0.11600E 03 | | 0.18763E 04 | 0.21322E 13 | 0.54008E 18 | 0.10568E 19 | 0.16799E 13 |
| 0.13050E 03 | | 0.18992E 04 | 0.21704E 13 | 0.55017E 18 | 0.10799E 19 | 0.17062E 13 |
| 0.14500E 03 | | 0.18763E 04 | 0.21322E 13 | 0.54008E 18 | 0.10568E 19 | 0.16799E 13 |
| 0.15950E 03 | | 0.18080E 04 | 0.20186E 13 | 0.50896E 18 | 0.98908E 18 | 0.16016E 13 |
| 0.17400E 03 | | 0.16964E 04 | 0.18348E 13 | 0.45372E 18 | 0.88140E 18 | 0.14735E 13 |
| 0.18850E 03 | | 0.15485E 04 | 0.15950E 13 | 0.36617E 18 | 0.74486E 18 | 0.13034E 13 |
| 0.20300E 03 | 0.29300E 03 | 0.13876E 04 | 0.13403E 13 | 0.22698E 18 | 0.60303E 18 | 0.14324E 13 |
| 0.21750E 03 | 0.29300E 03 | | | 0.10795E 18 | 0.45758E 18 | 0.18406E 13 |
| 0.23200E 03 | 0.29300E 03 | | | 0.49684E 17 | 0.30064E 18 | 0.12093E 13 |
| 0.24650E 03 | 0.29300E 03 | | | 0.19386E 17 | 0.14789E 18 | 0.59488E 12 |
| 0.26100E 03 | 0.29300E 03 | | | 0. | 0. | 0. |
| VALORI MEDI | | 0.17145E 04 | 0.18672E 13 | 0.47030E 18 | 0.90273E 18 | 0.15255E 13 |

TO = 0.25000    ITER = 250

XZ = 261.00000    VB = 0.          REP = -0.526954E 02      DP = -0.387455E 19      PHI = 0.136381E 18      VM = 0.621698E 06

| Z | TR | TC | C | PH1 | PH2 | N |
|---|---|---|---|---|---|---|
| 0. | 0.29300E 03 | | | 0. | 0. | 0. |
| 0.14500E 02 | 0.29300E 03 | | | 0.14893E 16 | 0.11915E 17 | 0.47926E 11 |
| 0.29000E 02 | 0.29300E 03 | | | 0.38163E 16 | 0.24165E 17 | 0.97203E 11 |
| 0.43500E 02 | 0.29300E 03 | | | 0.82899E 16 | 0.36657E 17 | 0.14746E 12 |
| 0.58000E 02 | 0.29300E 03 | 0.14804E 04 | 0.14922E 13 | 0.17427E 17 | 0.48141E 17 | 0.11132E 12 |
| 0.72500E 02 | | 0.16538E 04 | 0.17719E 13 | 0.28070E 17 | 0.59266E 17 | 0.10035E 12 |
| 0.87000E 02 | | 0.18129E 04 | 0.20341E 13 | 0.34719E 17 | 0.69944E 17 | 0.11311E 12 |
| 0.10150E 03 | | 0.19330E 04 | 0.22349E 13 | 0.38903E 17 | 0.78340E 17 | 0.12269E 12 |
| 0.11600E 03 | | 0.20066E 04 | 0.23587E 13 | 0.41246E 17 | 0.83621E 17 | 0.12853E 12 |
| 0.13050E 03 | | 0.20312E 04 | 0.24004E 13 | 0.42004E 17 | 0.85416E 17 | 0.13049E 12 |
| 0.14500E 03 | | 0.20066E 04 | 0.23587E 13 | 0.41246E 17 | 0.83621E 17 | 0.12853E 12 |
| 0.15950E 03 | | 0.19330E 04 | 0.22349E 13 | 0.38903E 17 | 0.78340E 17 | 0.12269E 12 |
| 0.17400E 03 | | 0.18129E 04 | 0.20341E 13 | 0.34719E 17 | 0.69944E 17 | 0.11311E 12 |
| 0.18850E 03 | | 0.16538E 04 | 0.17719E 13 | 0.28070E 17 | 0.59266E 17 | 0.10035E 12 |
| 0.20300E 03 | 0.29300E 03 | 0.14804E 04 | 0.14922E 13 | 0.17427E 17 | 0.48141E 17 | 0.11132E 12 |
| 0.21750E 03 | 0.29300E 03 | | | 0.82899E 16 | 0.36657E 17 | 0.14746E 12 |
| 0.23200E 03 | 0.29300E 03 | | | 0.38163E 16 | 0.24165E 17 | 0.97203E 11 |
| 0.24650E 03 | 0.29300E 03 | | | 0.14893E 16 | 0.11915E 17 | 0.47926E 11 |
| 0.26100E 03 | 0.29300E 03 | | | 0. | 0. | 0. |

VALORI MEDI

| | | TC | C | PH1 | PH2 | N |
|---|---|---|---|---|---|---|
| | | 0.18324E 04 | 0.20692E 13 | 0.36066E 17 | 0.71590E 17 | 0.11712E 12 |

TO = 0.30000   ITER = 300

XZ = 261.00000   VB = 0.        REP = -0.436819E 02    DP = -0.263578E 18    PHI = 0.137626E 18    VM = 0.62317TE 06

| Z | TR | TC | C | PH1 | PH2 | N |
|---|---|---|---|---|---|---|
| 0. | 0.29300E 03 | | | 0. | 0. | 0. |
| 0.14500E 02 | 0.29300E 03 | | | 0.12352E 15 | 0.96161E 15 | 0.38681E 10 |
| 0.29000E 02 | 0.29300E 03 | | | 0.31660E 15 | 0.19554E 16 | 0.78656E 10 |
| 0.43500E 02 | 0.29300E 03 | | | 0.68797E 15 | 0.29788E 16 | 0.11982E 11 |
| 0.58000E 02 | | 0.14872E 04 | 0.14981E 13 | 0.14467E 16 | 0.39347E 16 | 0.90808E 10 |
| 0.72500E 02 | | 0.16616E 04 | 0.17787E 13 | 0.23348E 16 | 0.48700E 16 | 0.82263E 10 |
| 0.87000E 02 | | 0.18215E 04 | 0.20417E 13 | 0.28932E 16 | 0.57650E 16 | 0.93007E 10 |
| 0.10150E 03 | | 0.19422E 04 | 0.22429E 13 | 0.32461E 16 | 0.64681E 16 | 0.10106E 11 |
| 0.11600E 03 | | 0.20162E 04 | 0.23671E 13 | 0.34444E 16 | 0.69104E 16 | 0.10597E 11 |
| 0.13050E 03 | | 0.20410E 04 | 0.24089E 13 | 0.35087E 16 | 0.70607E 16 | 0.10761E 11 |
| 0.14500E 03 | | 0.20162E 04 | 0.23671E 13 | 0.34444E 16 | 0.69104E 16 | 0.10597E 11 |
| 0.15950E 03 | | 0.19422E 04 | 0.22429E 13 | 0.32461E 16 | 0.64681E 16 | 0.10106E 11 |
| 0.17400E 03 | | 0.18215E 04 | 0.20417E 13 | 0.28932E 16 | 0.57650E 16 | 0.93007E 10 |
| 0.18850E 03 | | 0.16616E 04 | 0.17787E 13 | 0.23348E 16 | 0.48700E 16 | 0.82263E 10 |
| 0.20300E 03 | 0.29300E 03 | 0.14872E 04 | 0.14981E 13 | 0.14467E 16 | 0.39347E 16 | 0.90808E 10 |
| 0.21750E 03 | 0.29300E 03 | | | 0.68797E 15 | 0.29788E 16 | 0.11982E 11 |
| 0.23200E 03 | 0.29300E 03 | | | 0.31660E 15 | 0.19554E 16 | 0.78656E 10 |
| 0.24650E 03 | 0.29300E 03 | | | 0.12352E 15 | 0.96161E 15 | 0.38681E 10 |
| 0.26100E 03 | 0.29300E 03 | | | 0. | 0. | 0. |

| VALORI MEDI | | 0.18411E 04 | 0.20768E 13 | 0.30037E 16 | 0.59022E 16 | 0.96301E 10 |

TO =   0.35000    ITER =    350

XZ = 261.00000    VB = 0.          REP = -0.118352E 02    DP = -0.176205E 17    PHI = 0.137763E 18    VM = 0.623333E 06

| Z | TR | TC | C | PH1 | PH2 | N |
|---|---|---|---|---|---|---|
| 0. | 0.29300E 03 | | | 0. | 0. | 0. |
| 0.14500E 02 | 0.29300E 03 | | | 0.31795E 14 | 0.22329E 15 | 0.89821E 09 |
| 0.29000E 02 | 0.29300E 03 | | | 0.81559E 14 | 0.45859E 15 | 0.18447E 10 |
| 0.43500E 02 | 0.29300E 03 | | | 0.17742E 15 | 0.70964E 15 | 0.28546E 10 |
| 0.58000E 02 | 0.29300E 03 | 0.14880E 04 | 0.14936E 13 | 0.37355E 15 | 0.95704E 15 | 0.22083E 10 |
| 0.72500E 02 | | 0.16624E 04 | 0.17734E 13 | 0.60668E 15 | 0.12070E 16 | 0.20383E 10 |
| 0.87000E 02 | | 0.18224E 04 | 0.20355E 13 | 0.75633E 15 | 0.14441E 16 | 0.23292E 10 |
| 0.10150E 03 | | 0.19433E 04 | 0.22362E 13 | 0.85233E 15 | 0.16301E 16 | 0.25461E 10 |
| 0.11600E 03 | | 0.20172E 04 | 0.23599E 13 | 0.90673E 15 | 0.17470E 16 | 0.26782E 10 |
| 0.13050E 03 | | 0.20421E 04 | 0.24016E 13 | 0.92444E 15 | 0.17868E 16 | 0.27225E 10 |
| 0.14500E 03 | | 0.20172E 04 | 0.23599E 13 | 0.90673E 15 | 0.17470E 16 | 0.26782E 10 |
| 0.15950E 03 | | 0.19433E 04 | 0.22362E 13 | 0.85233E 15 | 0.16301E 16 | 0.25461E 10 |
| 0.17400E 03 | | 0.18224E 04 | 0.20355E 13 | 0.75633E 15 | 0.14441E 16 | 0.23292E 10 |
| 0.18850E 03 | | 0.16624E 04 | 0.17734E 13 | 0.60668E 15 | 0.12070E 16 | 0.20383E 10 |
| 0.20300E 03 | 0.29300E 03 | 0.14880E 04 | 0.14936E 13 | 0.37355E 15 | 0.95704E 15 | 0.22083E 10 |
| 0.21750E 03 | 0.29300E 03 | | | 0.17742E 15 | 0.70964E 15 | 0.28546E 10 |
| 0.23200E 03 | 0.29300E 03 | | | 0.81559E 14 | 0.45859E 15 | 0.18447E 10 |
| 0.24650E 03 | 0.29300E 03 | | | 0.31795E 14 | 0.22329E 15 | 0.89821E 09 |
| 0.26100E 03 | 0.29300E 03 | | | 0. | 0. | 0. |
| VALORI MEDI | | 0.18421E 04 | 0.20705E 13 | 0.78339E 15 | 0.14800E 16 | 0.24114E 10 |

TO =   0.50100    ITER =    501

XZ = 261.00000    VB = 0.            REP = -0.777468E-01     DP = -0.896407E 14     PHI = 0.137944E 18     VM = 0.623545E 06

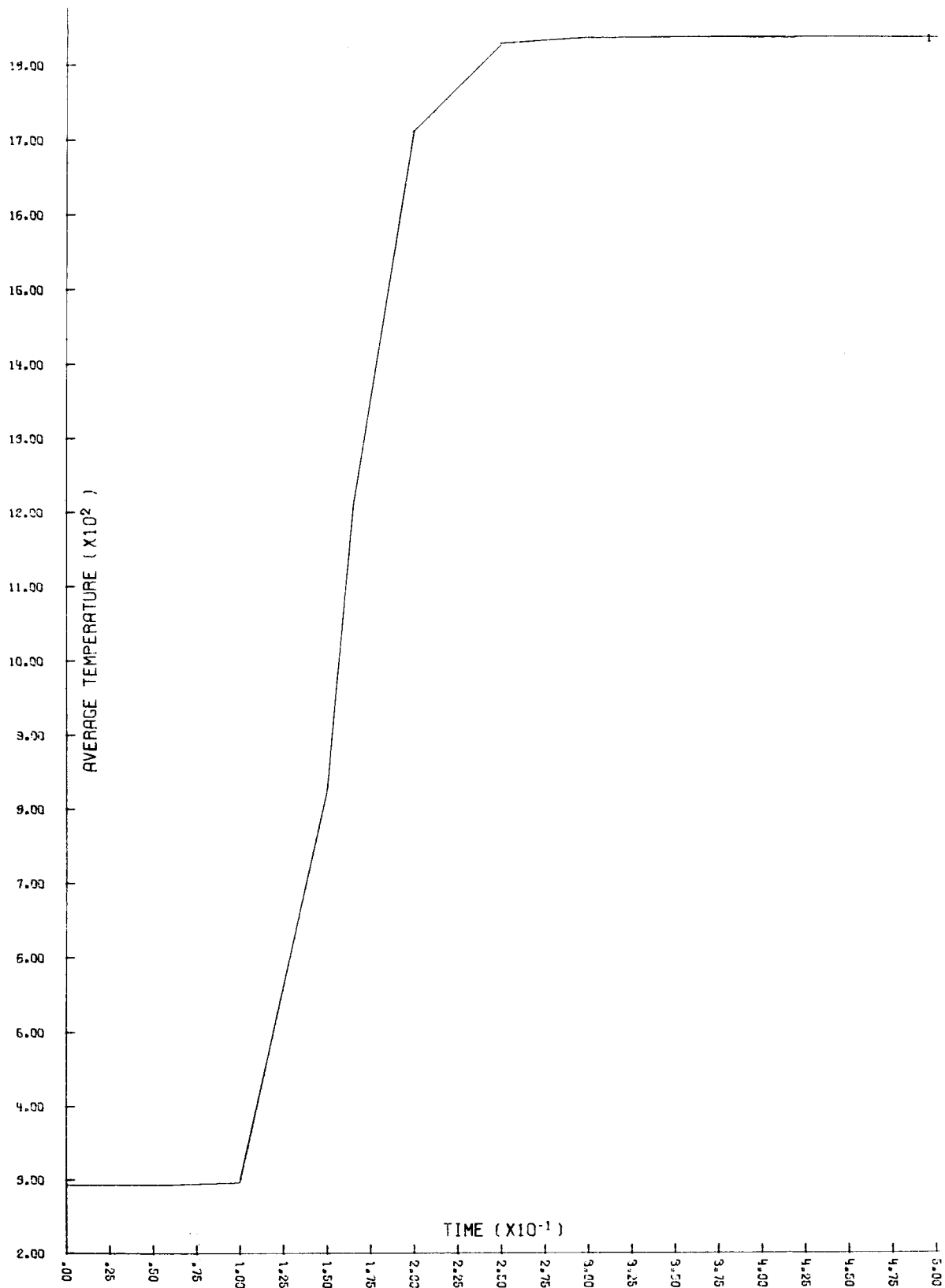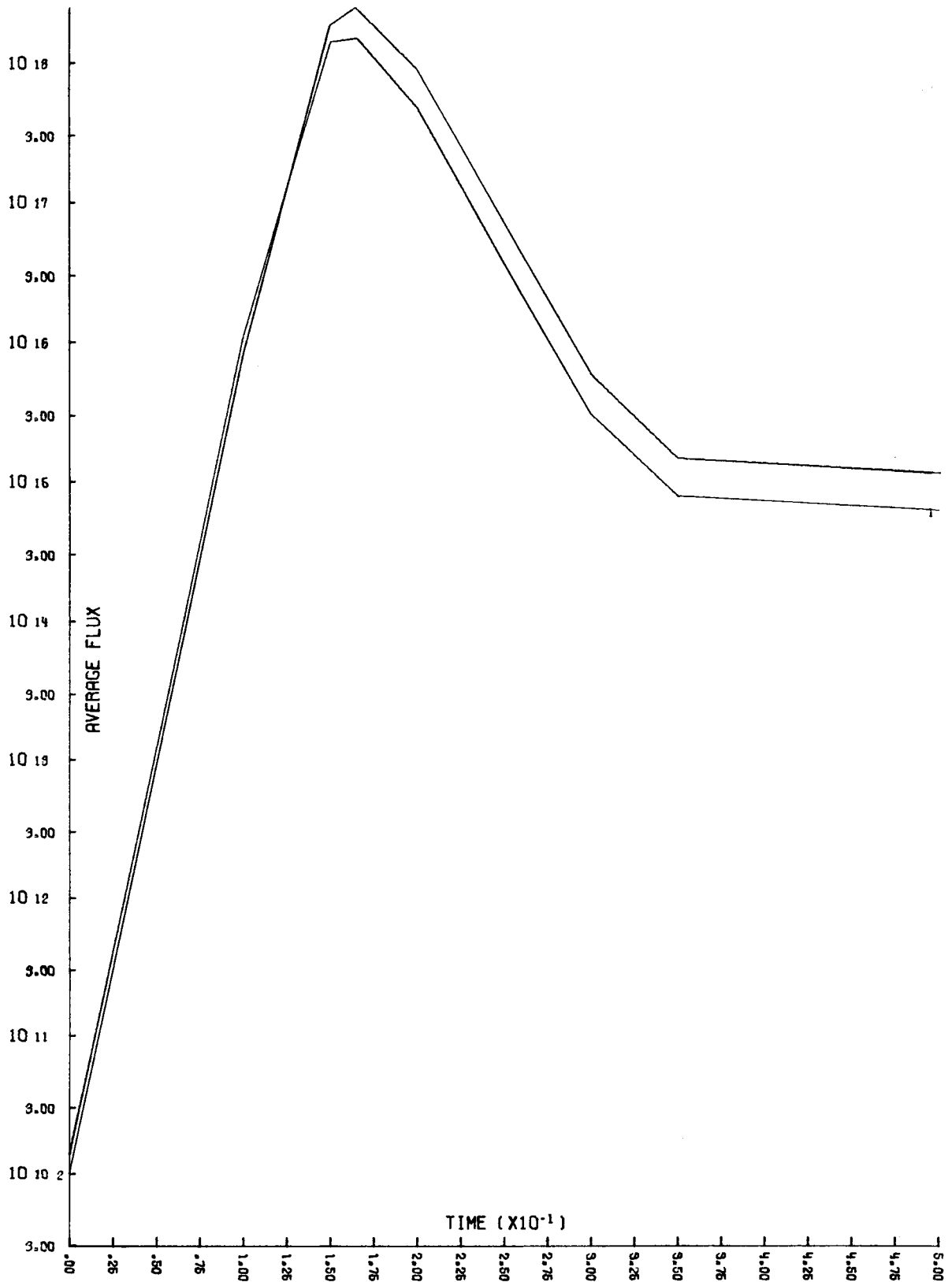| Z | TR | TC | C | PHI | PH2 | N |
|---|---|---|---|---|---|---|
| 0. | 0.29300E 03 | | | 0. | 0. | 0. |
| 0.14500E 02 | 0.29300E 03 | | | 0.24995E 14 | 0.16892E 15 | 0.67948E 09 |
| 0.29000E 02 | 0.29300E 03 | | | 0.64134E 14 | 0.34829E 15 | 0.14010E 10 |
| 0.43500E 02 | 0.29300E 03 | | | 0.13957E 15 | 0.54229E 15 | 0.21814E 10 |
| 0.58000E 02 | | 0.14889E 04 | 0.14780E 13 | 0.29397E 15 | 0.73720E 15 | 0.17006E 10 |
| 0.72500E 02 | | 0.16635E 04 | 0.17547E 13 | 0.47849E 15 | 0.93628E 15 | 0.15806E 10 |
| 0.87000E 02 | | 0.18237E 04 | 0.20141E 13 | 0.59776E 15 | 0.11245E 16 | 0.18132E 10 |
| 0.10150E 03 | | 0.19446E 04 | 0.22127E 13 | 0.67463E 15 | 0.12721E 16 | 0.19863E 10 |
| 0.11600E 03 | | 0.20187E 04 | 0.23351E 13 | 0.71832E 15 | 0.13649E 16 | 0.20917E 10 |
| 0.13050E 03 | | 0.20435E 04 | 0.23764E 13 | 0.73256E 15 | 0.13965E 16 | 0.21271E 10 |
| 0.14500E 03 | | 0.20187E 04 | 0.23351E 13 | 0.71832E 15 | 0.13649E 16 | 0.20917E 10 |
| 0.15950E 03 | | 0.19446E 04 | 0.22127E 13 | 0.67463E 15 | 0.12721E 16 | 0.19863E 10 |
| 0.17400E 03 | | 0.18237E 04 | 0.20141E 13 | 0.59776E 15 | 0.11245E 16 | 0.18132E 10 |
| 0.18850E 03 | | 0.16635E 04 | 0.17547E 13 | 0.47849E 15 | 0.93628E 15 | 0.15806E 10 |
| 0.20300E 03 | 0.29300E 03 | 0.14889E 04 | 0.14780E 13 | 0.29397E 15 | 0.73720E 15 | 0.17006E 10 |
| 0.21750E 03 | 0.29300E 03 | | | 0.13957E 15 | 0.54229E 15 | 0.21814E 10 |
| 0.23200E 03 | 0.29300E 03 | | | 0.64134E 14 | 0.34830E 15 | 0.14010E 10 |
| 0.24650E 03 | 0.29300E 03 | | | 0.24995E 14 | 0.16892E 15 | 0.67948E 09 |
| 0.26100E 03 | 0.29300E 03 | | | 0. | 0. | 0. |
| VALORI MEDI | | 0.18433E 04 | 0.20488E 13 | 0.61866E 15 | 0.11529E 16 | 0.18771E 10 |

# A n n e x   4
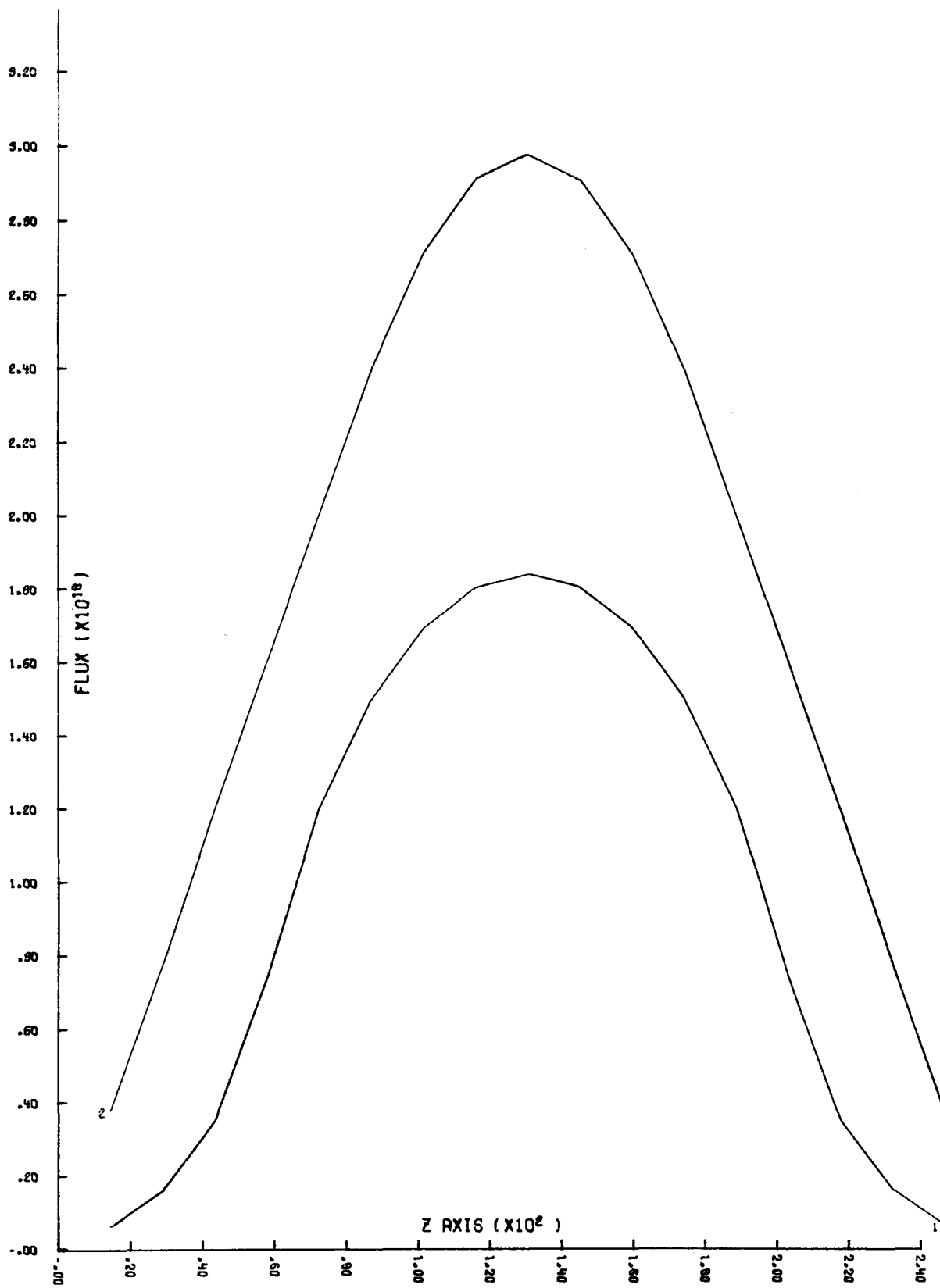
Plot of the average fluxes and
average temperature curves
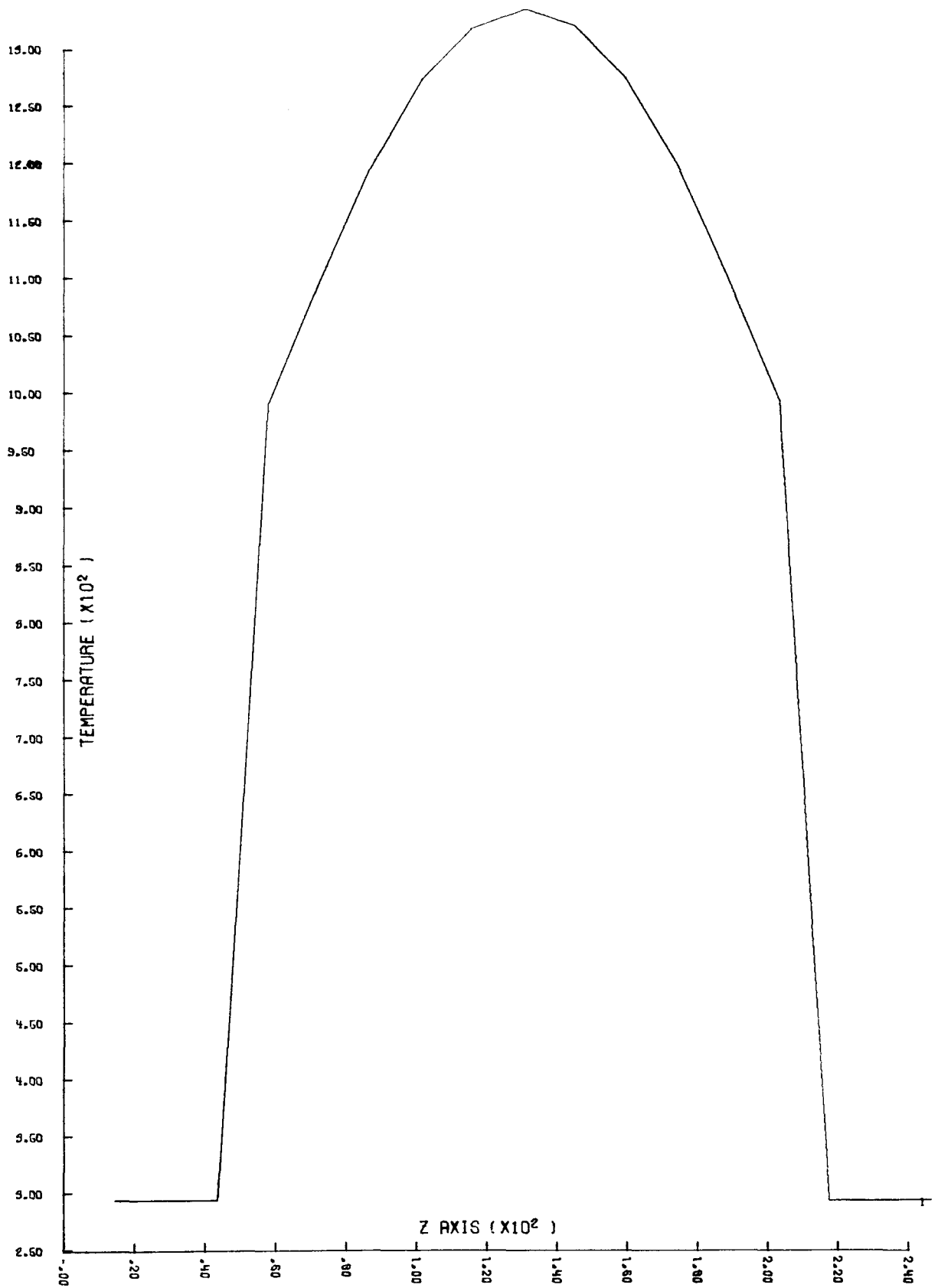
CODE COSTANZA I 60.5414

# A n n e x 5

Plot of the spatial distribution
of fast and thermal fluxes and
of the temperature at the instant
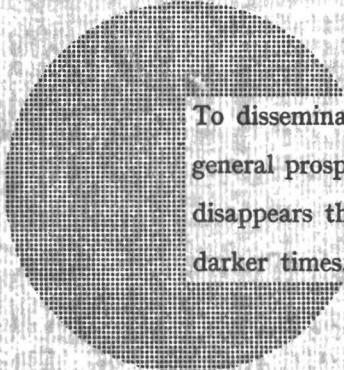when $\overline{\varphi}(t)$ is maximum.

SPATIAL DISTRIBUTION  TIME - .16499

CODE COSTANZA I 60.5414

TIME - .16499

To disseminate knowledge is to disseminate prosperity — I mean general prosperity and not individual riches — and with prosperity disappears the greater part of the evil which is our heritage from darker times.

Alfred Nobel