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A
Programa Fonte

```
      PROGRAM EQSTAXA
      PARAMETER(NmaxF=4)
      IMPLICIT DOUBLE PRECISION (A-H, O-Z)
      DOUBLE PRECISION N,NO1,NO2,NO1NO2,NO2NO1,JO1,JO2,L1,L2
      DIMENSION F(NmaxF),DFDT(NmaxF), Fant(NmaxF),
      DFDTant(NmaxF)
LOGICAL detalhe
COMMON ALFA1,ALFA2,GAMA_PAR,GAMA_1,GAMA_2,NO1NO2,NO2NO1
OPEN(6,FILE='EVOL-TO2.DAT')
C CONSTANTES BASICAS
      PI=ACOS(-1.DO)
      HBAR=1.05D-34
      EPSLONO=8.85D-12
      C=3.0D8
      N=1.5DO    !INDICE DE REFRACAO DO MEIO
C CONSTANTES DO ERBIO
      Tesp=10.D-3  !TAXA DE DECAIM ESPONT DO ESTADO EXCIT
      GAMA_PAR = 1.DO/Tesp
      GAMA_PERP= 1.29D13   !TAXA-1 DE DECAIM DA POLARIZ
      W= 2.DO*PI*C/(1535.D-9) !FREQ TRANS E DO LASER
  Wb= 2.DO*PI*C/(980.D-9) !FREQ DO FEIXE DE BOMB
      U= SQRT(3*PI*EPSLONO*HBAR*C**3/(W**3*Tesp))
C CONSTANTES DO SISTEMA
      L1=.3DO    !COMPRIMENTO DA CAVIDADE 1
      L2=.3DO    ! IDEM 2
      Rm=1.5D-6  !RAIO DO MEIO ATIVO NAS 2 CAVIDADES
      Vol1=PI*Rm**2*L1  !VOLUME DA CAVIDADE1
      Vol2=PI*Rm**2*L2  !VOLUME DA CAVIDADE2
      Rc=.8      !REFLET DO ESPELHO DO MEIO (CENTRO)
      Rd=.6      !REFLET DP ESPELHO DE SAIDA (A DIREITA)
      POTENCIA1=300D-3 !POTENCIA DE BOMB DA CAVIDADE1
      POTENCIA2=300D-3 !POTENCIA DE BOMB DA CAVIDADE2
      JO1= POTENCIA1/(Vol1*HBAR*Wb)  !BOMB DA CAVIDADE1
      JO2= POTENCIA2/(Vol2*HBAR*Wb)  !BOMB DA CAVIDADE2
```

```
      N01= J01/GAMA_PAR !INV DE POP/VOLUME SEM CAMPO 1535nm
      N02= J02/GAMA_PAR !INV DE POP/VOLUME SEM CAMPO 1535nm

      GAMA_1=L1/(C*ABS(DLOG(Rc))) !TAX DE DECAIM DA C1 (ESQ)
      GAMA_2=L2/(C*ABS(DLOG(Rd))) !IDEM CAVIDADE2 (DIR)
      ALFA=U**2*W/(HBAR*GAMA_PERP*EPSLON0)
C CONDICAO INICIAL
      F(1)=-1.0D20/Vol1  !F(1)=N1
      F(2)=-1.0D20/Vol2  !F(2)=N2
      F(3)=0.0D0 !F(3)=RHO1
      F(4)=0.0D0 !F(4)=RHO2
C NORMALIZAO/DEFINIO DAS VARIVEIS DINMICAS
C ENVOLVIDAS NO CLCULO COMPUTACIONAL
      F(1)=F(1)/N01
      F(2)=F(2)/N02
      F(3)=F(3)/N01
      F(4)=F(4)/N02
      ALFA1=ALFA*N01
      ALFA2=ALFA*N02
      N02N01=N02/N01
      N01N02=N01/N02
C EVOLUCAO TEMPORAL
      dt=0.1*Tesp
      t = 0.0
      write(6,100)N01,N02,Tesp
100  format('N01= ',E13.6,' N02= ',E13.6,' Tesp=',f7.5)
      write(6,110)t,F(1),F(2),F(3),F(4)
110   FORMAT('t=',f7.4,' F(1)=',E13.6,' F(2)=',
      E13.6,' F(3)=',E13.6, *' F(4)=',E13.6)
C pula o detalhamento do top do pulso na 1a vez
dtant = dt
      dfdtant(4) = -1.0d0
Fpara = F(4)
detalhe = .false.
31    call derivs(t,F,DFDT)
C (acima) calcula dfdt no mesmo tempo de f, em t
C DETALHAMENTO DO TOPO DO PULSO
      if((DFDT(4)<0).and.(dfdtant(4)>0)) then
   if(dt.eq.dtant) then
      BACKSPACE 6 !volta 01 regis pra tras no arq de saida
```

```
      t = t - dt
      dt = dt/5.
      F = Fant
      Fpara = Fant(4)
      DFDT = dfdtant
      detalhe = .true. !indica que o detalh estah rolando
   else
      if(F(4)<Fpara) then
    dt = dtant
        detalhe = .false.
        write(6,*)'***** em t=',t,' aconteceu esta situacao!'
      endif
   endif
else
   if((dt.ne.dtant).and.(F(4)<Fpara)) then
     dt = dtant
     detalhe = .false.
   endif
      endif
C "FIM" DO DETALHAMENTO

      dfdtant = DFDT
      Fant = F
      write(6,120)t,dt
      write(6,121)(F(i),i=1,4),icont
      write(6,122)DFDT(1),DFDT(2),DFDT(3),DFDT(4)
      write(6,*)' '
write(5,123)t,(F(i),i=1,4)
120   format(' t=',f13.11,' dt=',f13.11)
121   format(' F(1)=',E13.6,' F(2)=',E13.6,' F(3)=',
      E13.6,' F(4)=',     *       E13.6,' icont=',i3)
122   format(' DFDT(1)=',E13.6,' DFDT(2)=',E13.6,'
      DFDT(3)=',E13.6,
     *       ' DFDT(4)=',E13.6)
123   format(e18.11,4(1x,e13.6))

if((.not.detalhe).and.(icont.gt.0)) dt = dtant

icont=0
32    call RK4(F,DFDT,t,dt)
```

```
C Aqui calc e retorna f em t=t+dt.

C VERIFICAO DE INTENSIDADE NO NEGATIVA:
C preocupao apenas com a C intensidade da
C cavidade C dois (F(4)). No caso da cavidade
C 1, se a C intensidade der negativa, vou
C impor que  ZERO, de
C forma a simplificar o algoritmo.
if(F(4).lt.0) then
  dt = dt/2.
  F = Fant
  icont=icont+1
  goto 32
endif
      if(F(3).lt.0) F(3) = 0.0d0

C FIM DA VERIFICAO

      t = t + dt
      if(t.lt.31*Tesp) goto 31
C FIM DA EVOLUCAO TEMPORAL

C      DESSIN=DESSIN+DEL
C      GO TO 30
C FIM DO (POSSIVEL) LOOP DE FREQUENCIAS

 40   CLOSE(6)
      STOP
      END
*********************************************************
      SUBROUTINE rk4(y,dydx,x,h)
      PARAMETER(NmaxF=4)
      double precision h,x,dydx(NmaxF),y(NmaxF)
      double precision h6,hh,xh,dym(NMAXF),dyt(NMAXF),yt(NMAXF)

      hh=h*0.5
      h6=h/6.
      xh=x+hh
      do 11 i=1,NmaxF
        yt(i)=y(i)+hh*dydx(i)
```

```
11    continue
      call derivs(xh,yt,dyt)
      do 12 i=1,NmaxF
        yt(i)=y(i)+hh*dyt(i)
12    continue
      call derivs(xh,yt,dym)
      do 13 i=1,NmaxF
        yt(i)=y(i)+h*dym(i)
        dym(i)=dyt(i)+dym(i)
13    continue
      call derivs(x+h,yt,dyt)
      do 14 i=1,NmaxF
        y(i)=y(i)+h6*(dydx(i)+dyt(i)+2.*dym(i))
14    continue
      return
      END
C  (C) Copr. 1986-92 Numerical Recipes Software 13]2Y_213.
*************************************************
      SUBROUTINE derivs(t,F,DFDT)
      PARAMETER(NmaxF=4)
      IMPLICIT DOUBLE PRECISION (A-H, O-Z)
      DOUBLE PRECISION NO1NO2,NO2NO1
DIMENSION F(NmaxF),DFDT(NmaxF)

COMMON ALFA1,ALFA2,GAMA_PAR,GAMA_1,GAMA_2,NO1NO2,NO2NO1

      DFDT(1)=-GAMA_PAR*(F(1)-1.D0)-ALFA1*F(1)*F(3)
DFDT(2)=-GAMA_PAR*(F(2)-1.D0)-ALFA2*F(2)*F(4)
IF (F(1).LT.0) THEN !NAO TEM EMISSO EXPONTNEA
  DFDT(3)=-GAMA_1*F(3)+GAMA_1*NO2NO1*F(4)+ALFA1*F(1)*F(3)
ELSE
  DFDT(3)=-GAMA_1*F(3)+GAMA_1*NO2NO1*F(4)+ALFA1*F(1)*F(3)
     *          +GAMA_PAR*F(1)
ENDIF
IF(F(2).LT.0) THEN
  DFDT(4)=-GAMA_2*F(4)-GAMA_1*F(4)+GAMA_1*NO1NO2*F(3)
     *          +ALFA2*F(2)*F(4)     !NAO TEM EM.EXPONTNEA
ELSE
  DFDT(4)=-GAMA_2*F(4)-GAMA_1*F(4)+GAMA_1*NO1NO2*F(3)
     *          +ALFA2*F(2)*F(4)+GAMA_PAR*F(2)
```

```
ENDIF

      return
      end
```