CG体系を用いた
EGS5入力ファイル作成入門

2022-8-1, 2024-7-24改 IWASE

元となるファイル

以下の三つが必要

- simple.f
- simple.inp
- simple.data

- （＋　egs5フォルダ 一式）

フォルダ構成

おさらい

- egs5/

VERSION auxcommons/ cgview-307/ docs/ egs5run*
extra_ucodes/ pegs/ run5again* slac730.pdf uccg-210721/
auxcode/ calc/ data/ egs/ include/
pegscommons/ samplecodes/ tutorcodes/

- egs5/calc/

egs5run* simple/

- egs5/calc/simple

simple.f simple.inp simple.data

simple.f

CG体系を用いた最小構成プログラム

- １つの主プログラムと２つの副プログラム（サブルーチン）
- program simple
- subroutine ausgab
- subroutine howfar

simple.fのダウンロード

simple.fの内容確認

- nmed = 1 　　　　　　　　　　! number of medium 物質数
- medarr(1) = ‘AL 　　　　　　‘ ! 物質名を任意で入力（24文字)

  物質番号1はALという名称の物質 (simple.inpで定義される)
- chard(1) = 7.62 　　　　　　! 物質1のcharacteristic dimension
- call pegs5 　　　　　　　　! simple.inpを元に物質毎のテーブルを作成
- iphter(i) = 0 ･･･ 　　　　　! EGSオプション
- iqin = 0 ･･･ 　　　　　　　! 線源入力

simple.fの内容確認その２

- ncases = 1000　　！計算回数（線源発生回数）
- maxpict = 50　　！CGVIEWプロット線源数
- call shower　　！EGSメインルーチンのcall

simple.inpの作成

物質情報と、物質ごとの粒子輸送のパラメータの設定

```
ELEM
 &INP IRAYL=1 /END
AL                            AL
AL
ENER
&INP
AE=0.521,AP=0.010,UE=2.511,UP=2.0
/END
PWLF
&INP  /END
DECK
&INP  /END
```

物質名（任意の名称：左詰24文字）

密度効果フラグ(31文字目から記入)

元素記号（左詰)

光子の
下限エネルギー

光子の
上限エネルギー

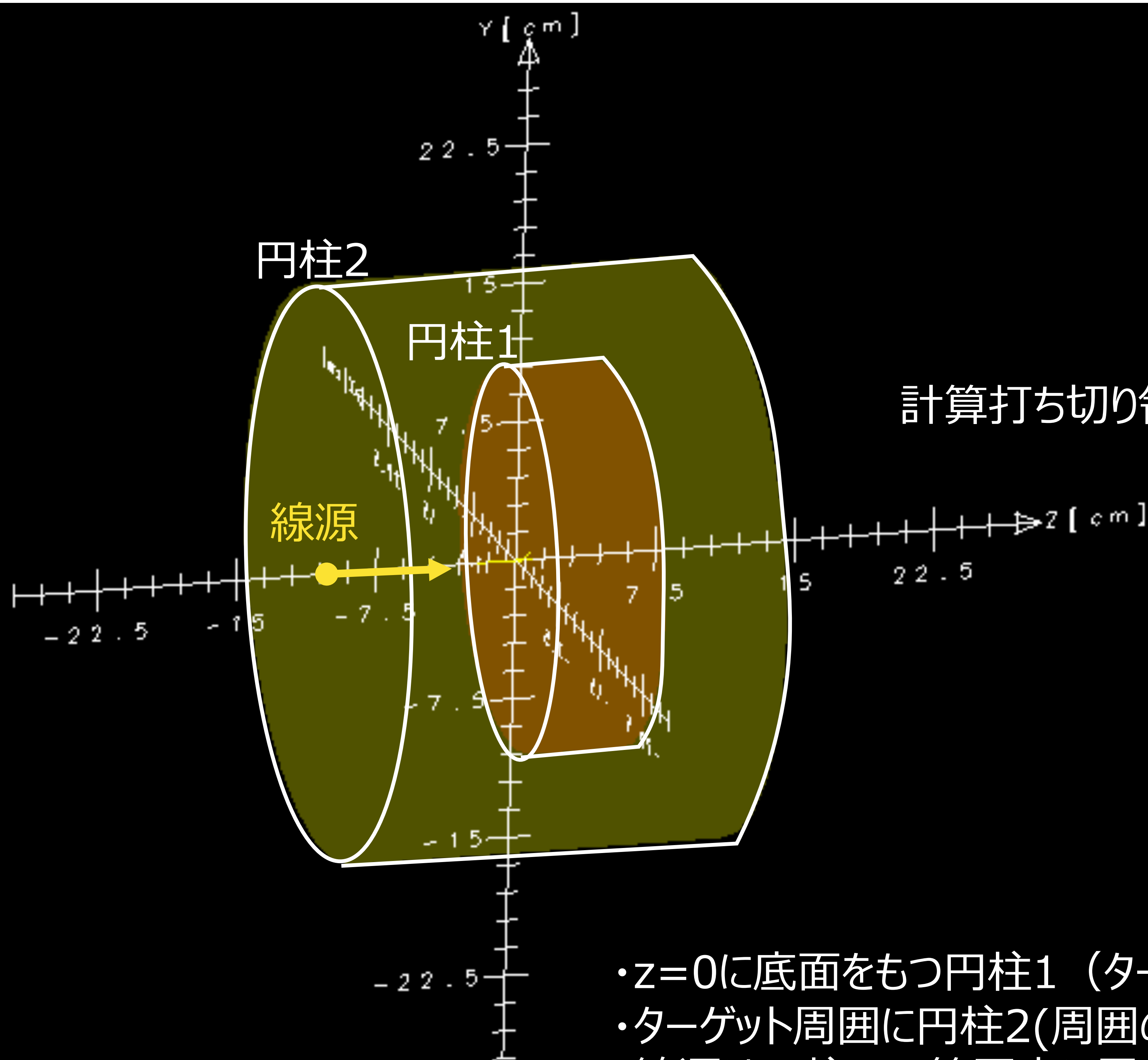
電子・陽電子の
下限エネルギー
に0.511 を足した値(MeV)

電子・陽電子の
上限エネルギー
に0.511 を足した値(MeV)

電子、光子とも 0.01 MeV - 2 MeV
までの範囲のデータテーブル作成を意味
する

CG体系の作成

（simple.dataの作成）



- z=0に底面をもつ円柱1（ターゲット）
- ターゲット周囲に円柱2(周囲の計算領域)
- 線源は円柱２の範囲内に置く（simple.f)
- 円柱2の外側は計算打ち切り領域

simple.dataの作成

RCC　1　0 0 0　0 0 5　10
円筒1　底面z=0　5cm高　10cm半径
RCC　2　0 0 -10　0 0 20　15
円筒2　底面z=-10　20cm高 15cm半径
END

Z1　+1

Z2　+2　-1

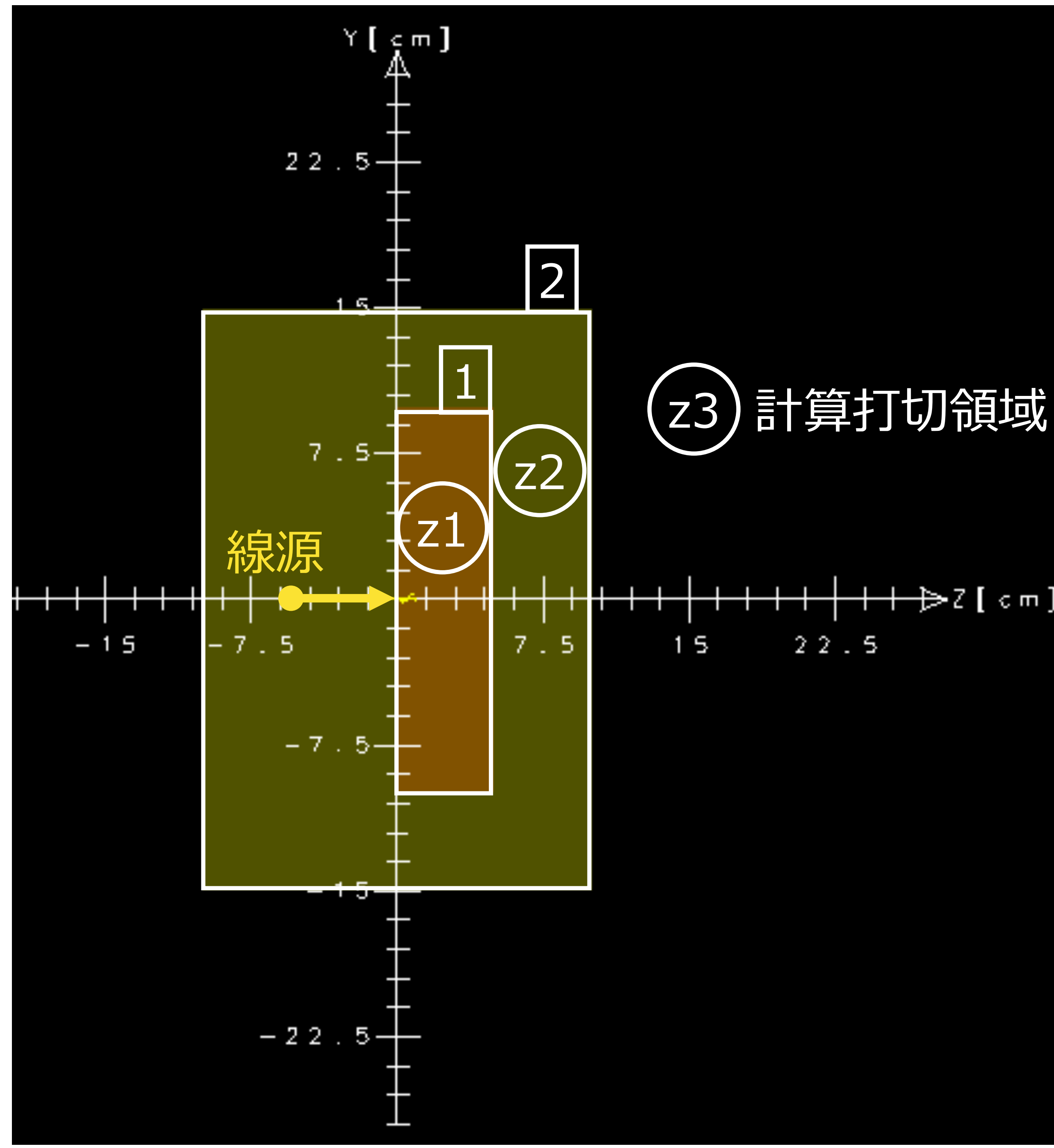
Z3　-2

END

1　0　0

z1, z2, z3の
物質番号
0は真空

一番最後の領域は
自動的に計算打ち切り領域に
設定される

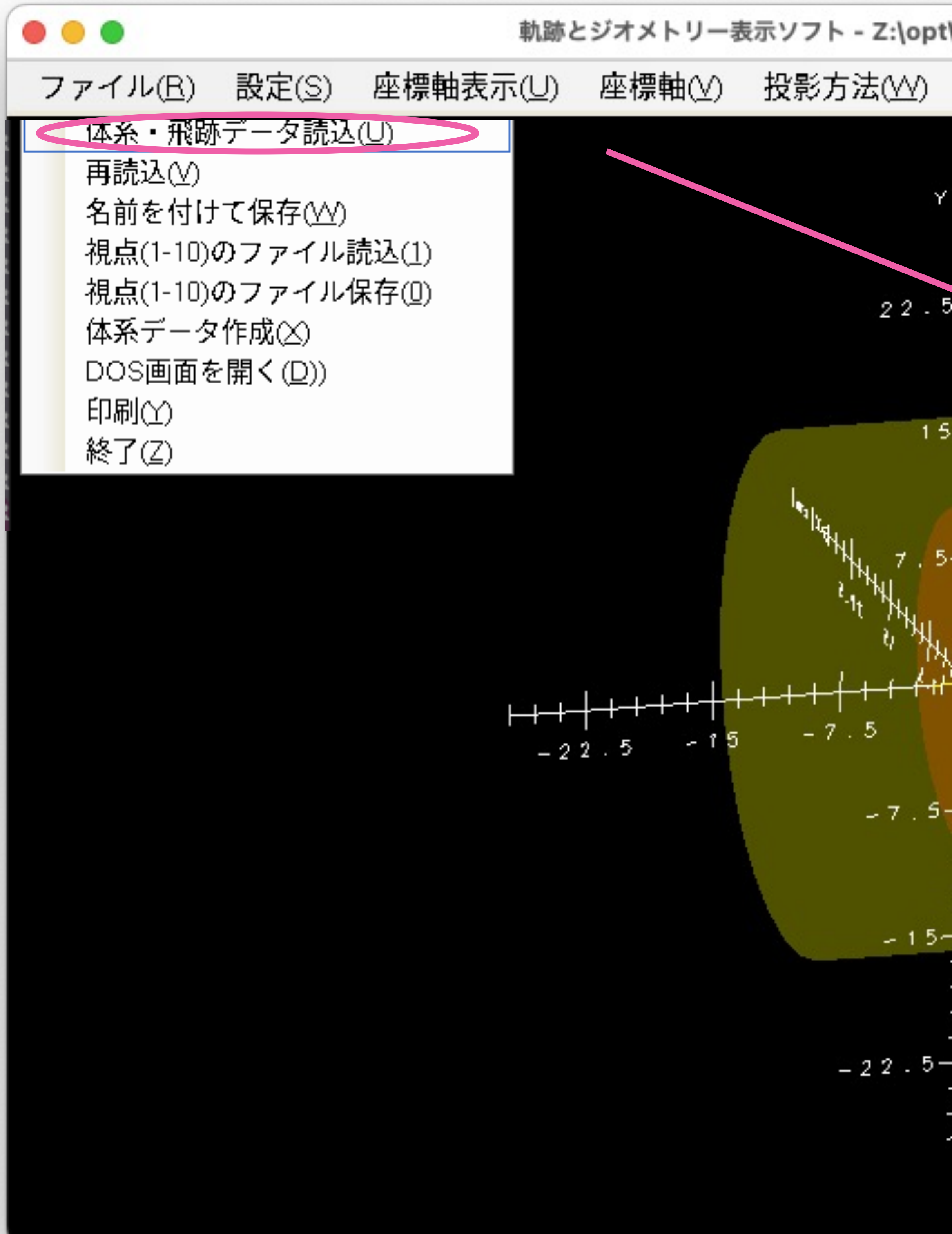


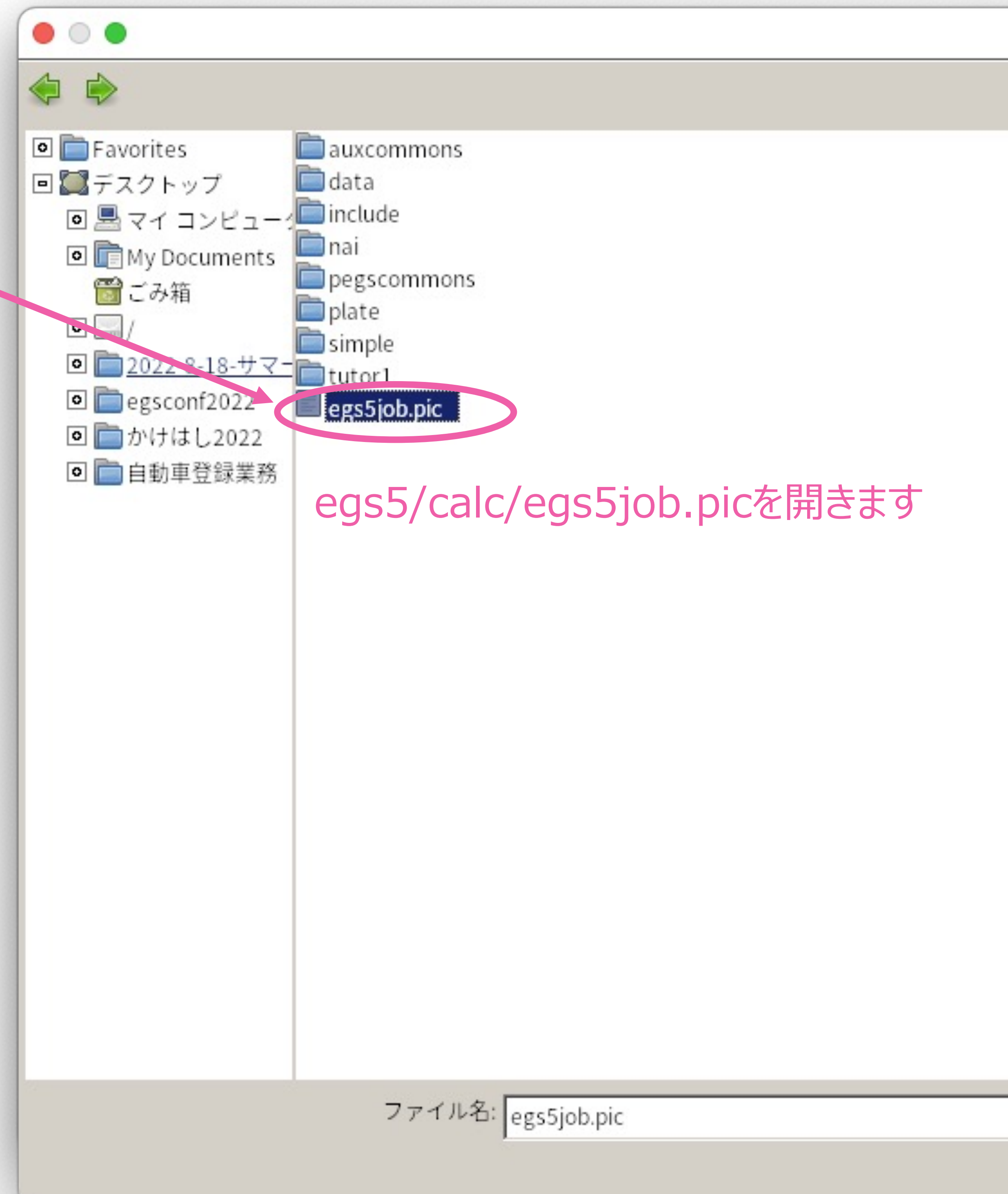
egs5runで実行

(ifortの場合)

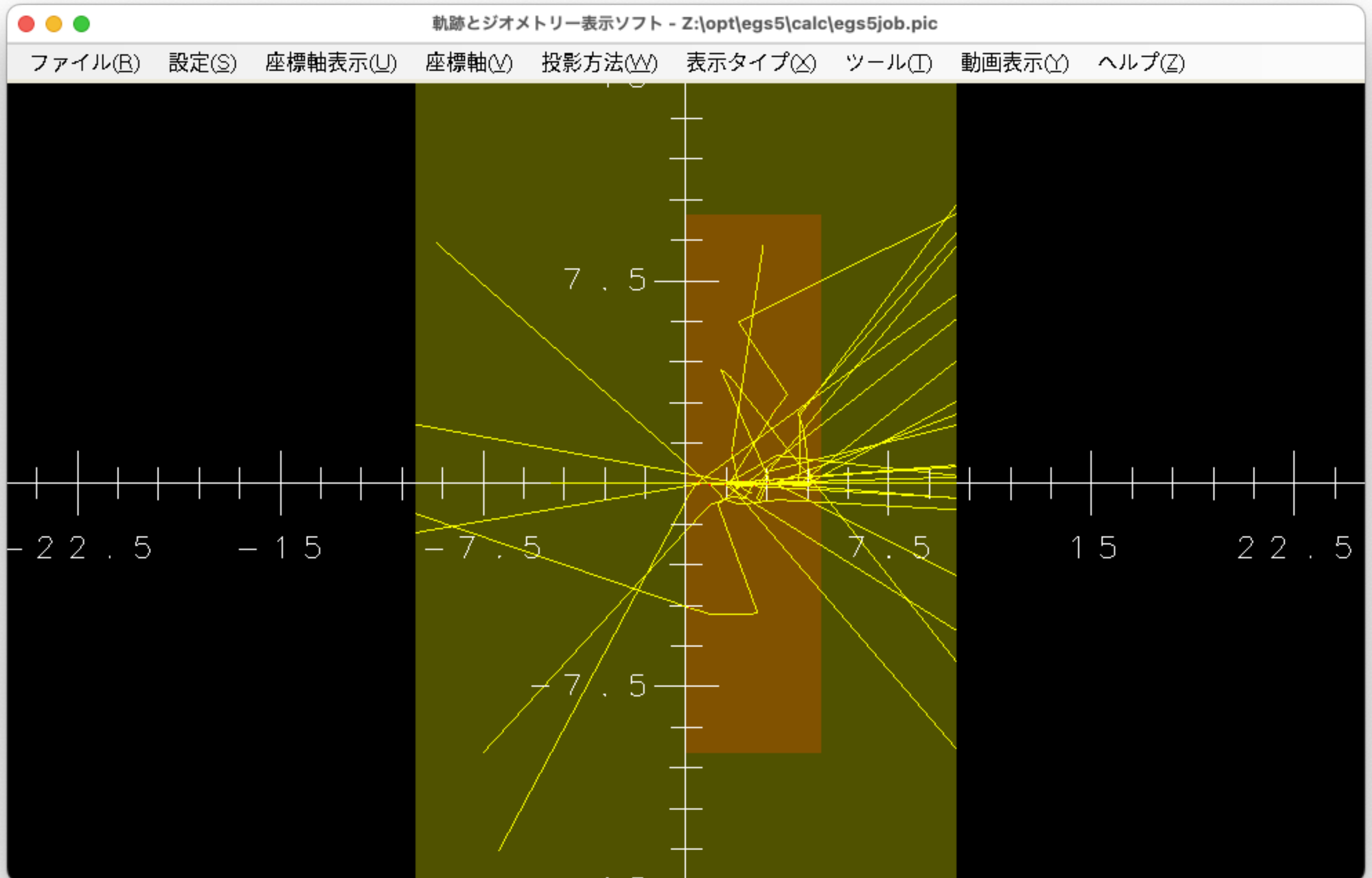
```
------------------------------------
Compiling (with -save -zero  -L/Library/Developer/CommandLineTools/SDKs/MacOSX.sdk/usr/lib and O)
------------------------------------
egs5job.f(6499): remark #8291: Recommended relationship between field width 'W' and the number of fractional digits 'D' in this edit descriptor is 'W>=D+7'.
 102  FORMAT(I6,' NEGATIVE USTEP=',E12.6,' IR,IRNEW,IROLD=',
------------------------------------^
egs5job.f(22363): remark #8291: Recommended relationship between field width 'W' and the number of fractional digits 'D' in this edit descriptor is 'W>=D+7'.
1510      format(2G10.5)
-------------------^
egs5job.f(22355): remark #8291: Recommended relationship between field width 'W' and the number of fractional digits 'D' in this edit descriptor is 'W>=D+7'.
1480      format(2G10.5)
-------------------^
egs5job.f(24575): remark #8291: Recommended relationship between field width 'W' and the number of fractional digits 'D' in this edit descriptor is 'W>=D+7'.
     write(31,'((1H ,7(1PE9.3,A)))') (ELECNI(I),',',I=1,MXRAW)
---------------------------^
egs5job.f(24580): remark #8291: Recommended relationship between field width 'W' and the number of fractional digits 'D' in this edit descriptor is 'W>=D+7'.
     write(31,'((1H ,5(1PE11.5,A)))') (CAPIN(I),',',I=1,MXRAW)
---------------------------^
egs5job.f(24583): remark #8291: Recommended relationship between field width 'W' and the number of fractional digits 'D' in this edit descriptor is 'W>=D+7'.
       write(31,'((1H ,7(1PE9.3,A)))') (SCPROF(j,i),',',j=1,31)
-----------------------------^

----------------------------------------------
  Does this user code read from the terminal?
  (Enter 1 for yes, anything else for no)
----------------------------------------------
1

     ********************************************************
     * User code simple/simple.f has been compiled and is starting *
     ********************************************************

 Ready for user input:


real                    0m1.288s
user                    0m0.737s
sys                     0m0.076s

========================
egs5run script has ended
========================
```

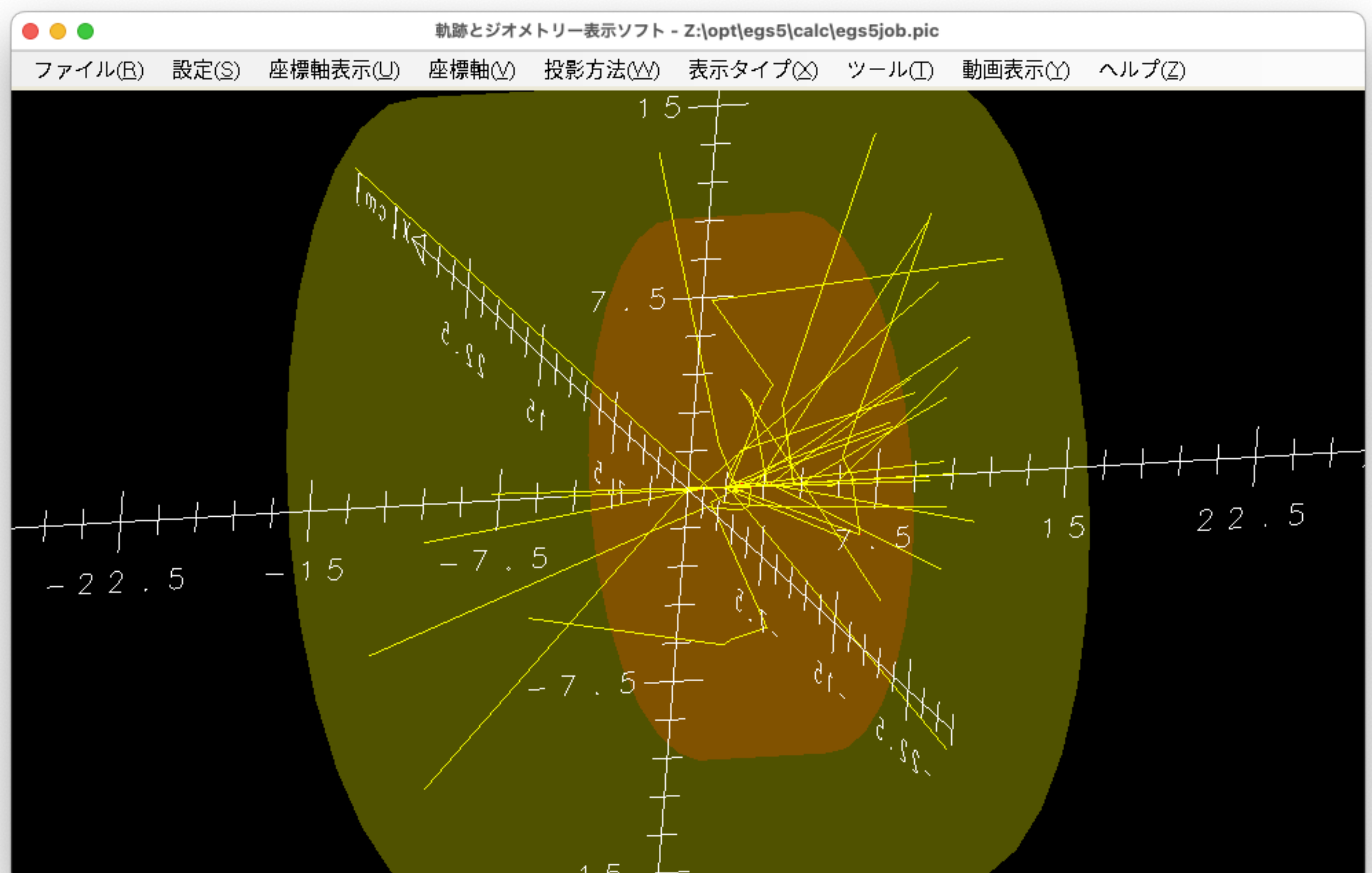
CGVIEWで飛跡の確認





egs5/calc/egs5job.picを開きます





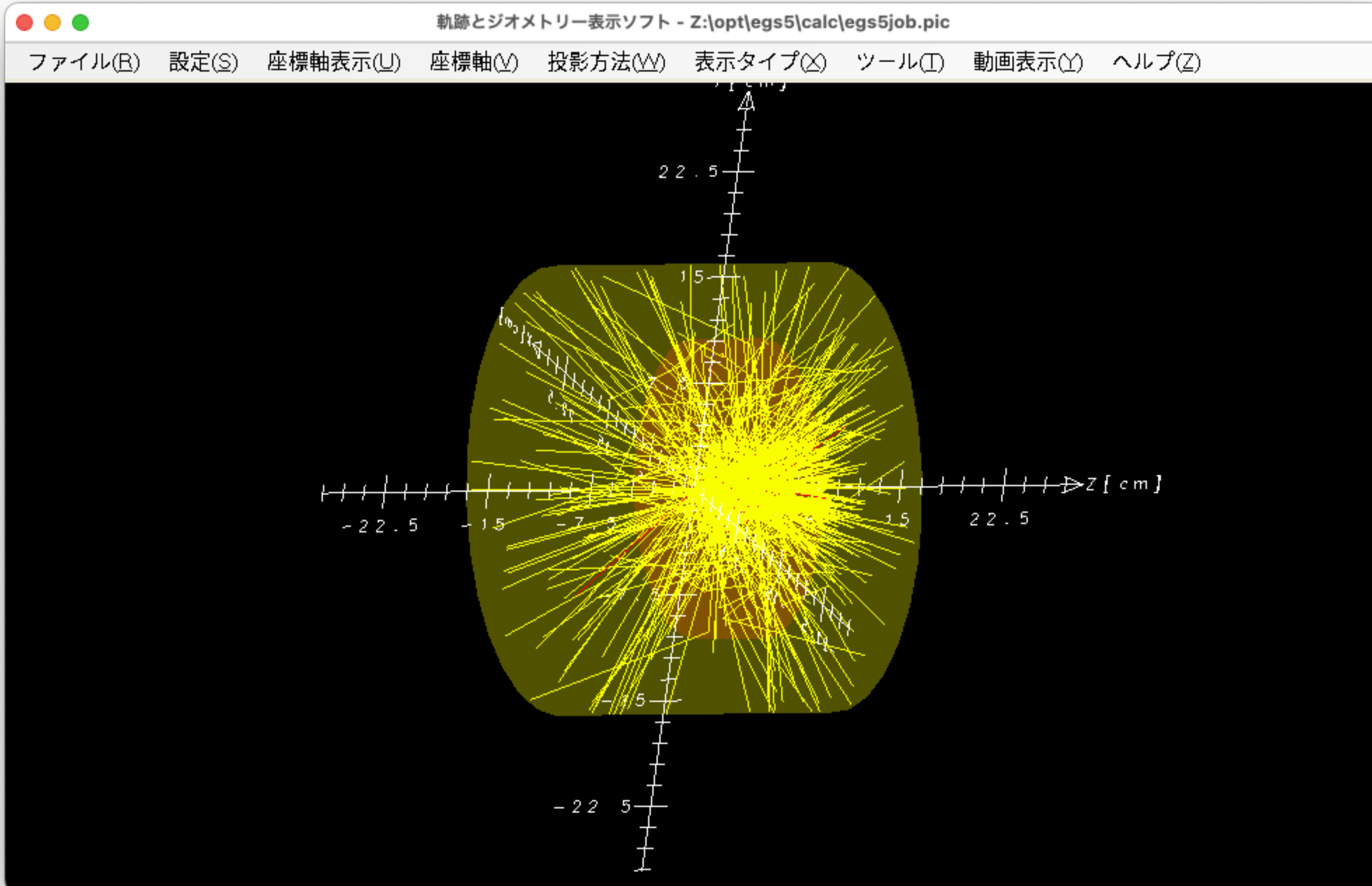
円柱1にz=-5から光子が50本真直に入射し
5cmのアルミ内で半数程度が散乱している
(散乱せず透過した光子は軸上を進むのみ)

エクセサイズ

simple.fにてmaxpict を50から大きめの数字にしてみる

```
!       ============================
        call ecnsv1(0,nreg,totke)
        call ntally(0,nreg)
!       ============================

        ncases=10000
        maxpict=1000

        write(39,fmt="('0    1')")
        if(iwatch.gt.0) call swatch(-99,iwatch)


        do i=1,ncases                              ! Start of shower call-loop

          wtin = 1.0
```

→ 実行してCGVIEWで飛跡を観察



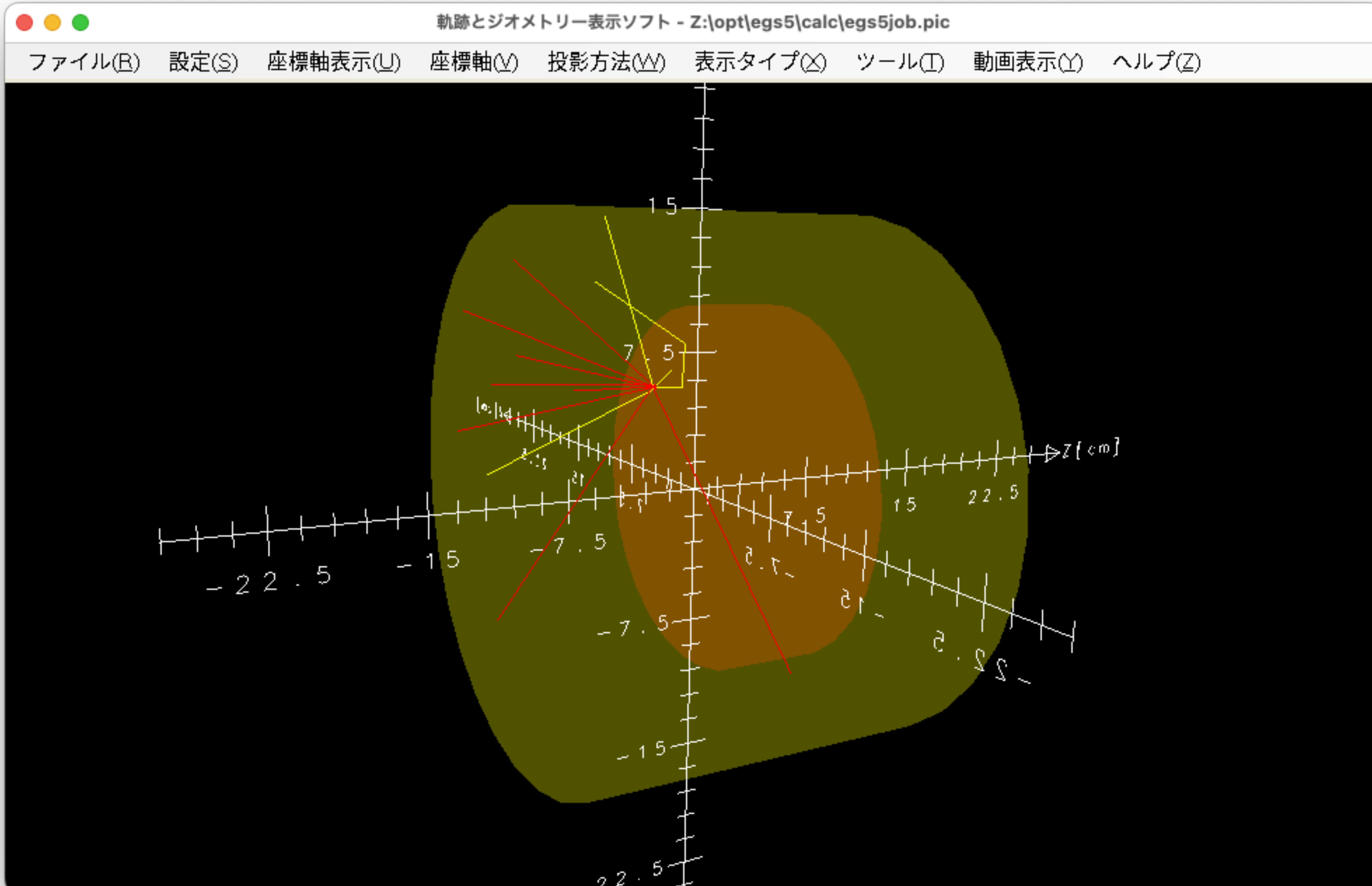
maxpictは多すぎるとCGVIEWの動作が重くなるので注意

エクセサイズ2

simple.fにて線源種類と位置を変更してみる

```
      call rluxinit           ! Initialize the Ranlux random-number generator

! source
      iqin  = -1              ! Incident particle charge - photons
      ekein = 1.253           ! Incident particle kinetic energy
      xin   =  5.0            ! Source position
      yin   =  5.0
      zin   = -5.0
      uin   =  0.0            ! Moving along z axis
      vin   =  0.0
      win   =  1.0
      irin  =  0              ! Starting region (0: Automatic search in CG)
      wtin  = 1.0             ! Weight = 1 since no variance reduction used
```

→ 実行してCGVIEWで飛跡を観察



- 電子の大半はアルミの表面で止まっている
- 一部は後方へ散乱している
- 制動放射線（ガンマ線）を若干放出している

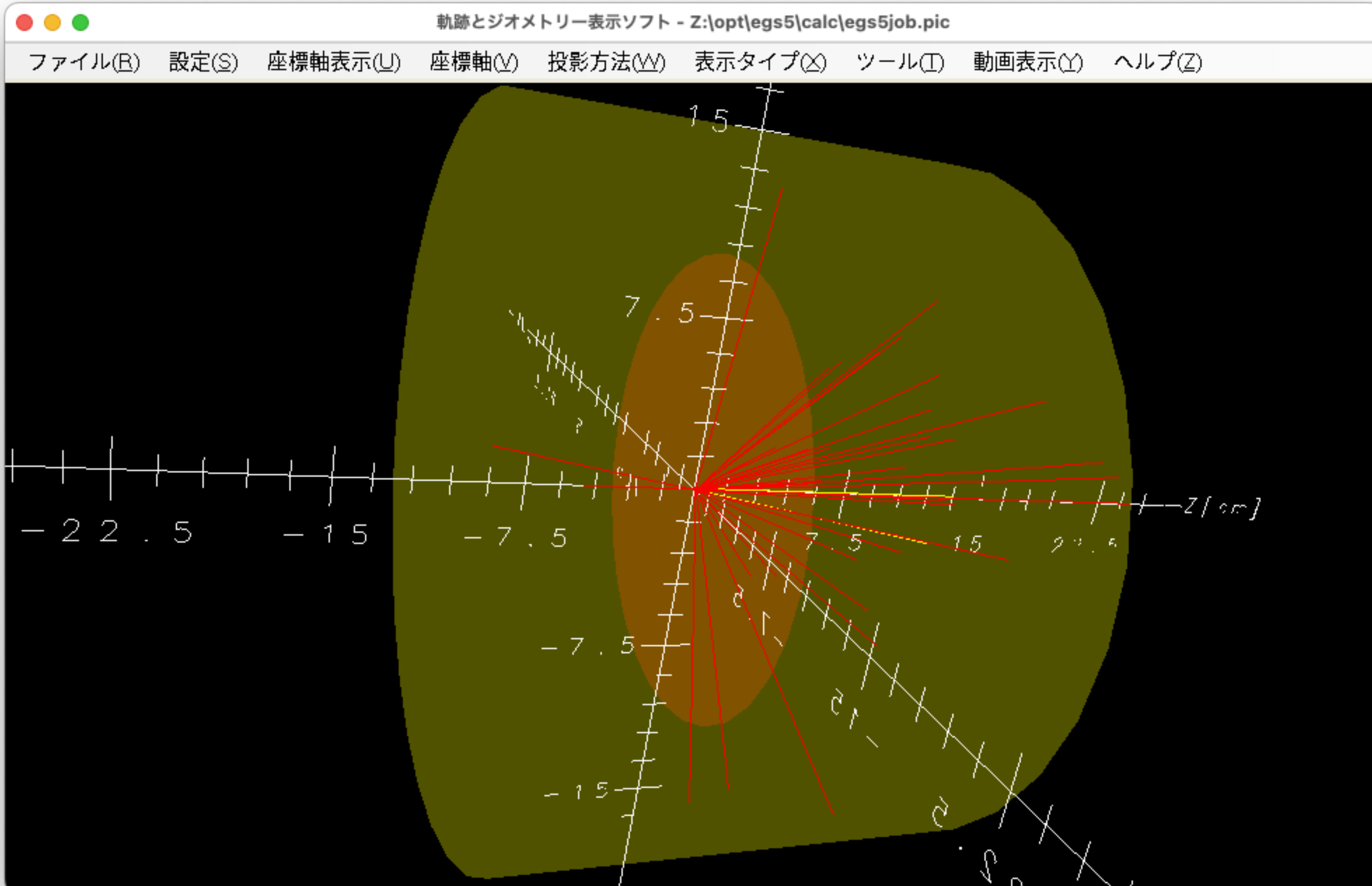
ベータ線をアルミで遮へい

アルミを薄く、線源位置を戻してみる

```
      call rluxinit           ! Initialize the Ranlux random-number generator

! source
      iqin  = -1              ! Incident particle charge - photons
      ekein = 1.253           ! Incident particle kinetic energy
      xin   =  0.0            ! Source position
      yin   =  0.0
      zin   = -5.0
      uin   =  0.0            ! Moving along z axis
      vin   =  0.0
      win   =  1.0
      irin  =  0              ! Starting region (0: Automatic search in CG)
      wtin  = 1.0             ! Weight = 1 since no variance reduction used

      if(irin.le.0.or.irin.gt.nreg) then
        call srzone(xin,yin,zin,iqin+2,0,irin)
        if(irin.le.0.or.irin.ge.nreg) then
          write(6,fmt="(' Stopped in MAIN. irin = ',i5)")irin
          stop
        end if
```

```
RCC    1      0 0 0      0 0 0.1  10
RCC    2      0 0 -10    0 0 20   15
END
 Z1       +1
 Z2       +2       -1
 Z3       -2
END
 1    0    0
```

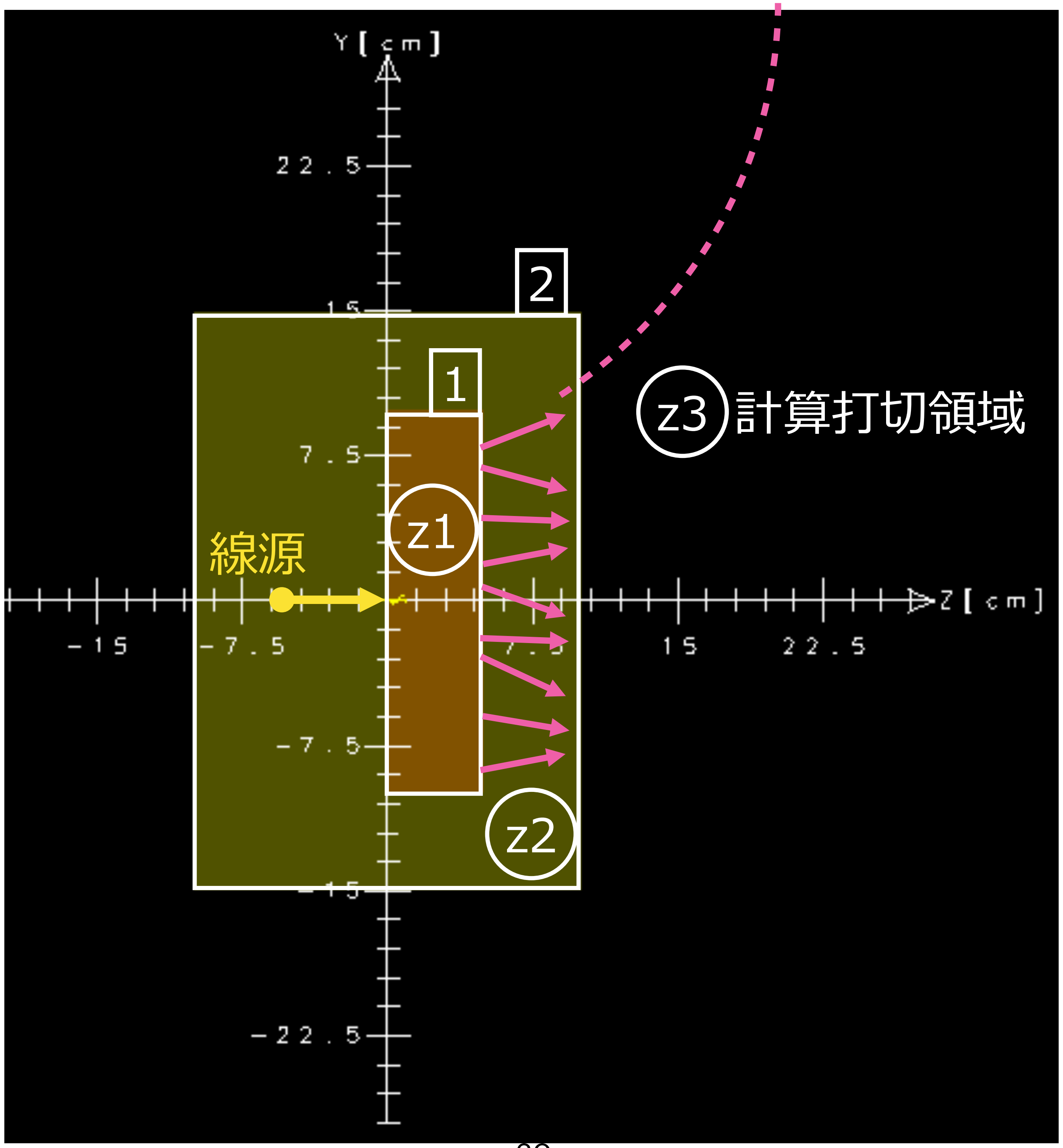
1ミリのアルミに1.253MeVのベータ線を入射



・電子の大半はアルミを透過している
・一部は後方へ散乱している
・制動放射線（ガンマ線）を若干放出している

ターゲット背後から放出される放射線を書き出す

CG版tutor1



CG版tutor1

tutor1/tutor1.fのausgabの一部をsimple/simple.fのausgabへ貼り付けて実行

```fortran
      integer                                               ! Arguments
     * iarg
      common/totals/depe,deltae,spec(3,50),maxpict ! Variables to score
      real*8 depe,deltae,spec
      integer maxpict
      real*8 angle,ekine                           ! tutor1:Local variables

!     Print out particle transport information (if switch is turned on)
      if (iwatch .gt. 0) call swatch(iarg,iwatch)

      if (iarg.eq.3.and.ir(np).eq.3) then                   ! tutor1
        angle=acos(w(np))*180./3.14159
        if (iq(np).eq.0) then
          ekine=e(np)
        else
          ekine=e(np)-RM
        end if
        write(6,100) ekine,iq(np),angle
 100    format(T21,F10.3,T33,I10,T49,F10.1)
      endif

      if(iarg .ge. 5) return

!     Output particle information for plot
      if (ncount.le.maxpict) then
        call plotxyz(iarg,np,iq(np),x(np),y(np),z(np),e(np),ir(np),
     *       wt(np),time(np))
      end if

      return
      end
```

追記（real*8 angle,ekine）

追記（if (iarg.eq.3.and.ir(np).eq.3) then … endif）

iarg=3かつir=3の条件については後で考察

```
ile Edit Options Buffers Tools Help
 RCC                1 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 1.0000E-01 1.0000E+01
 RCC                2 0.0000E+00 0.0000E+00 -1.0000E+01 0.0000E+00 0.0000E+00 2.0000E+01 1.5000E+01
 END
 Z1                       1
 Z2                       2          -1
 Z3                      -2
 END
ranlux luxury level set by rluxgo : 1     p=  48
ranlux initialized by rluxgo from seed          1
RAYLEIGH DATA AVAILABLE FOR MEDIUM  1 BUT OPTION NOT REQUESTED.

EMAXE set i
EGS SUCCESSI
                 0.747          -1      41.6
                 0.540          -1      69.1
                 0.695          -1      43.2
                 0.405          -1     156.2
                 0.895          -1      10.3
                 0.701          -1      31.3
                 0.830          -1      26.4
                 0.203          -1      31.1
                 0.877          -1      19.2
                 0.808          -1      26.0
                 0.579          -1      67.2
                 0.887          -1      48.9
                 0.916          -1      41.5
                 0.423          -1      43.6
                 0.830          -1      36.5
                 0.912          -1      32.2
                 0.616          -1      54.4
                 0.781          -1      73.9
                 0.890          -1      28.4
                 0.107           0      25.2
                 0.855          -1      18.3
                 0.847          -1      32.8
                 0.102           0      20.0
                 0.814          -1      30.0
                 0.367          -1     107.6
                 0.186          -1       7.8
                 0.691          -1      19.4
                 0.801          -1      61.3
                 0.681          -1      23.5
                 0.414          -1      58.2
                 0.751          -1      35.0
                 0.288          -1      49.4
```

運動エネルギー、粒子種、z軸からの角度（０のときz軸上）

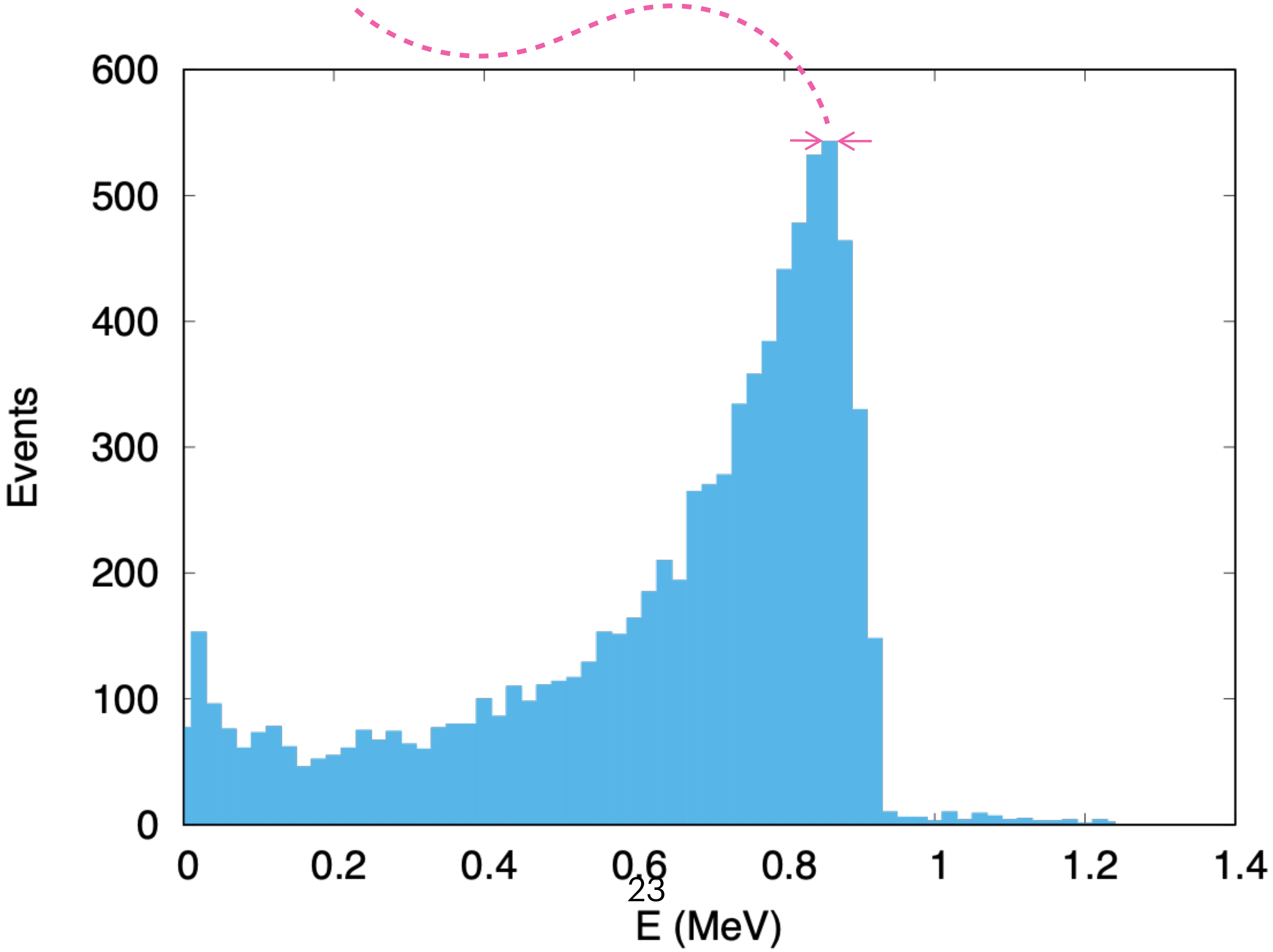
```
      write(6,100) ekine,iq(np),angle
100   format(T21,F10.3,T33,I10,T49,F10.1)
```

枠線内のデータでヒストグラムを作ってみる

gnuplotを用いたヒストグラム作成

```
set style fill solid
filter(x,y)=floor(x/y)*y
plot ‘out' u (filter($1,0.02)):(1) smooth frequency with boxes
```

ビン幅



IARGについて

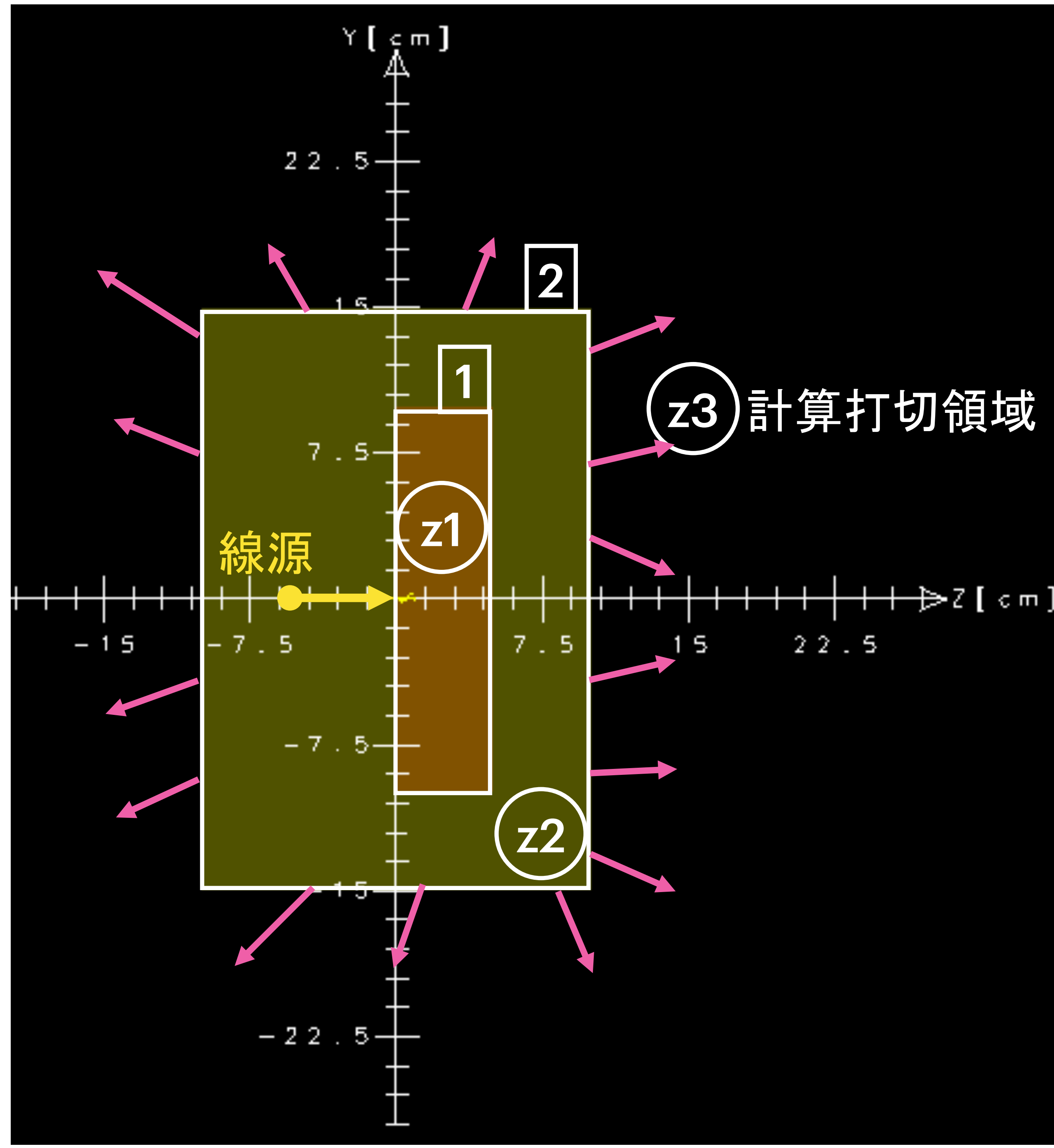
IARG	Situation
0	Particle is going to be transported by distance TVSTEP. 移動
1	Particle is going to be discarded because its energy is below the cutoff ECUT (for charged particles) or PCUT (for photons)—but its energy is larger than the corresponding PEGS cutoff AE or AP, respectively. エネルギーカット1
2	Particle is going to be discarded because its energy is below both ECUT and AE (or PCUT and AP). エネルギーカット2
3	Particle is going to be discarded because the user requested it (in HOWFAR usually). 体系外など
4	Part of particle energy is deposited due to the binding energy. This situation occurs in one of the following 3 cases: エネルギー付与 1. A photoelectric interaction has occurred and the difference in the electron binding energy and the secondary particle (X-ray or Auger electron) energy is deposited. 光電効果の後処理として 2. Compton interaction has occurred and the electron binding energy is deposited locally. This is enabled only when the Doppler-broadening option is turned on. コンプトン散乱の後処理として 3. The K-shell EII has occurred and the difference between the electron binding energy and the secondary particle (K-X ray) energy is deposited. This is enabled only when the EII option is turned on. K-shell EIIの後処理として

その他詳細

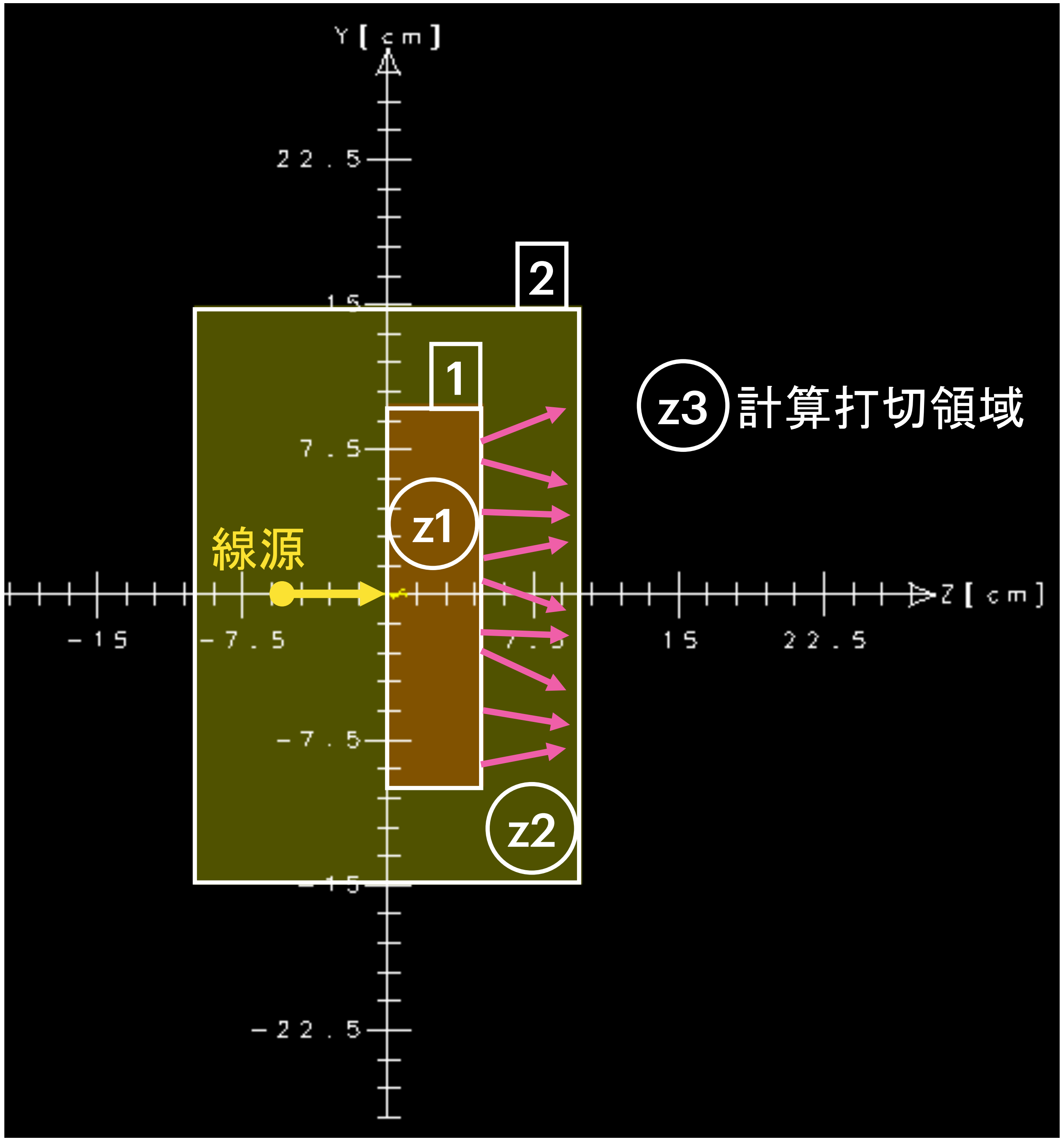
IARG	IAUSFL	Situation
5	6	Particle has been transported by distance TVSTEP.
6	7	A bremsstrahlung interaction is to occur and a call to BREMS is about to be made in ELECTR.
7	8	Returned to ELECTR after a call to BREMS was made.
8	9	A Møller interaction is to occur and a call to MOLLER is about to be made in ELECTR.
9	10	Returned to ELECTR after a call to MOLLER was made.
10	11	A Bhabha interaction is to occur and a call to BHABHA is about to be made in ELECTR.
11	12	Returned to ELECTR after a call to BHABHA was made.
12	13	An in-flight annihilation of the positron is to occur and a call to ANNIH is about to be made in ELECTR.
13	14	Returned to ELECTR after a call to ANNIH was made.
14	15	A positron has annihilated at rest.
15	16	A pair production interaction is to occur and a call to PAIR is about to be made in PHOTON.
16	17	Returned to PHOTON after a call to PAIR was made.
17	18	A Compton interaction is to occur and a call to COMPT is about to be made in PHOTON.
18	19	Returned to PHOTON after a call to COMPT was made.
19	20	A photoelectric interaction is to occur and a call to PHOTO is about to be made in PHOTON.
20	21	Returned to PHOTON after a call to PHOTO was made (assuming NP is non-zero).
21	22	Subroutine UPHI was just entered.
22	23	Subroutine UPHI was just exited.
23	24	A coherent (Rayleigh) interaction is about to occur.
24	25	A coherent (Rayleigh) interaction has just occurred.
25	26	An EII interaction is about to occur.
26	27	Returned to MOLLER after a call to EII was made.
27	28	An energy hinge is about to occur in ELECTR.
28	29	An energy hinge has just occurred in ELECTR.
29	30	A multiple-scattering hinge is about to occur in ELECTR.
30	31	A multiple-scattering hinge has just occurred in ELECTR.

iarg=3 かつ ir=3とは

```
      if (iarg.eq.3.and.ir(np).eq.3) then
        angle=acos(w(np))*180./3.14159
        if (iq(np).eq.0) then
          ekine=e(np)
        else
          ekine=e(np)-RM
        end if
        write(6,100) ekine,iq(np),angle
100     format(T21,F10.3,T33,I10,T49,F10.1)
      endif
```



ターゲット背後から放出される放射線を書き出すには



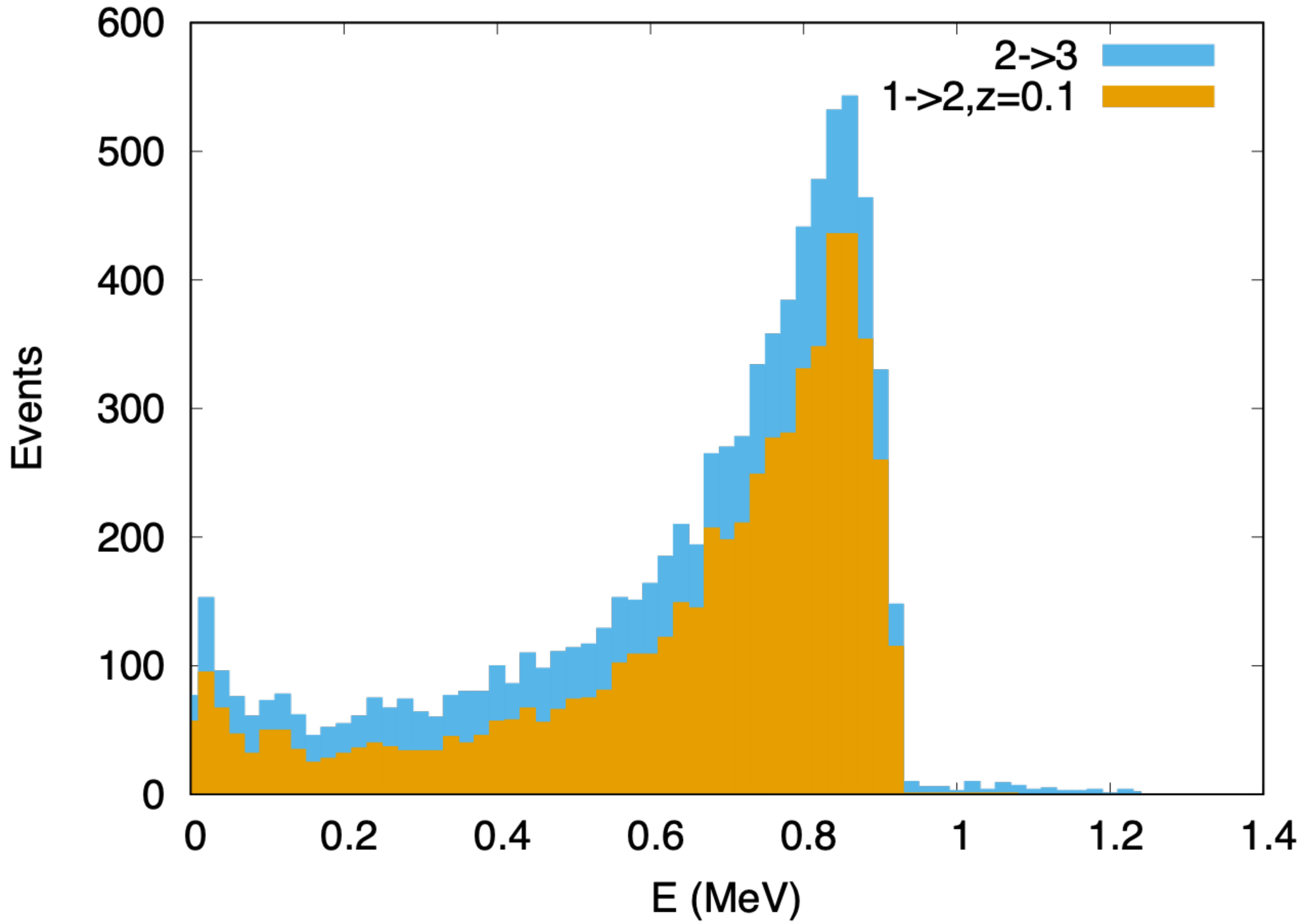
irold = 1 かつ ir = 2 かつ z = アルミ厚のとき

surface crossing設定例

領域1から領域2へ移動する粒子

```
!      Print out particle transport information (if switch is turned on)
       if (iwatch .gt. 0) call swatch(iarg,iwatch)

       if (irold.eq.1 .and. ir(np).eq.2 .and. z(np).eq.0.1d0 ) then
         angle=acos(w(np))*180./3.14159
         if (iq(np).eq.0) then
           ekine=e(np)
         else
           ekine=e(np)-RM
         end if
         write(6,100) ekine,iq(np),z(np)
 100     format(T21,F10.3,T33,I10,T49,F10.1)
       endif

       if(iarg .ge. 5) return
```

z=0.1d0と倍精度での指定がよい
z=0.1と単精度の指定は条件を満たさない恐れ



600
500
400
300
200
100
0
Events
0
0.2
0.4
0.6
0.8
1
1.2
1.4
E (MeV)
2->3
1->2,z=0.1

電子と光子を分けて出力する

```fortran

      ncases=100000
      maxpict=50

      write(39,fmt="('0    1')")
      if(iwatch.gt.0) call swatch(-99,iwatch)


      do i=1,ncases                        ! Start of shower call-loop
```

```fortran
!     Print out particle transport information (if switch is turned on)
      if (iwatch .gt. 0) call swatch(iarg,iwatch)

      if (irold.eq.1 .and. ir(np).eq.2 .and. z(np).eq.0.1d0 ) then
        if (iq(np).eq.0) then
          ekine=e(np)
          write(91,*) ekine
        else
          ekine=e(np)-RM
          write(92,*) ekine
        end if
      endif

      if(iarg .ge. 5) return
```

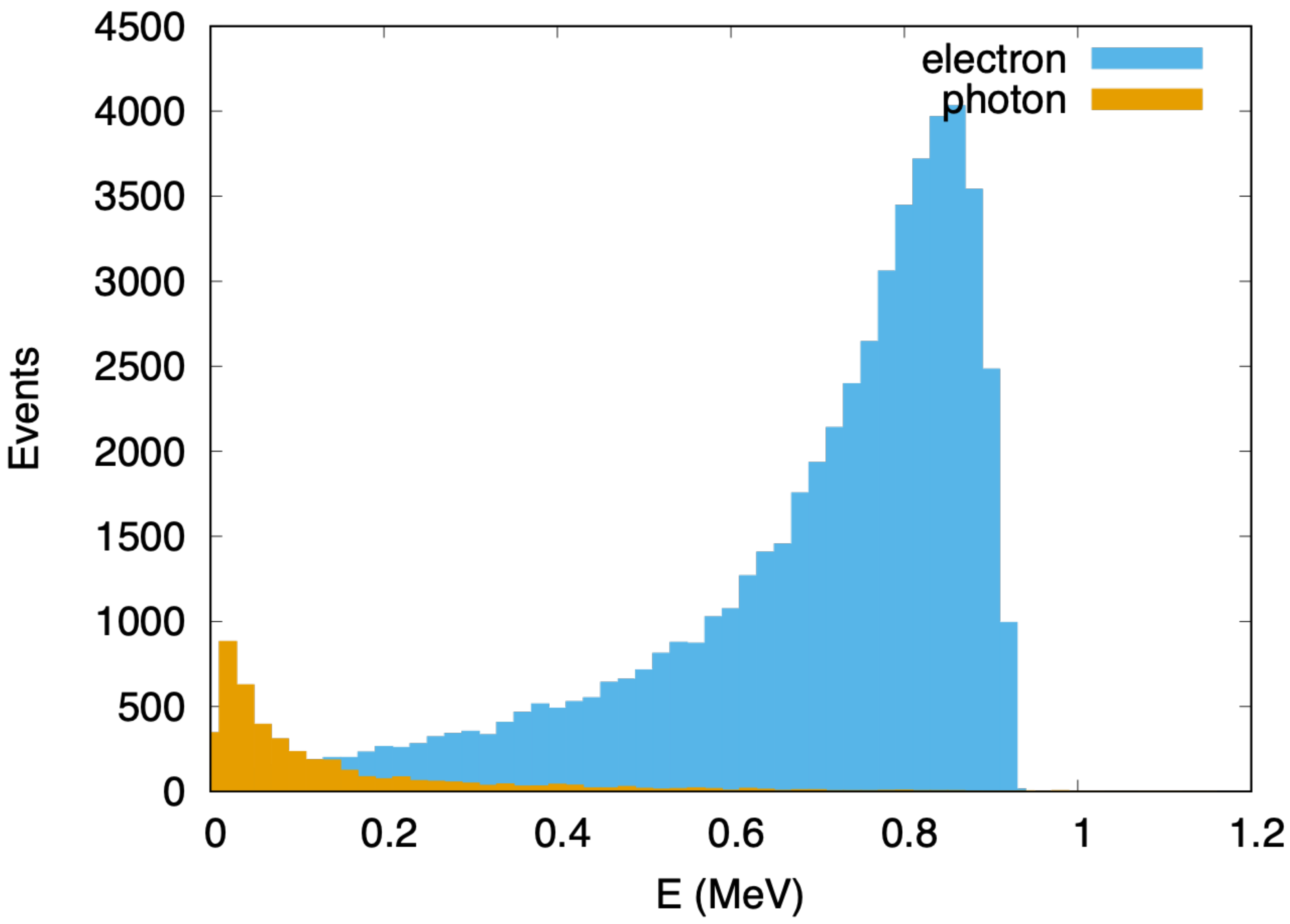
結果

fort.91 (photon)

```
  0.107140484629189
  0.102267272684809
  0.395397252626522
  0.639925780212798
  0.247087137482216
  0.267966328782001
  6.659264538373698E-002
  3.107949150083373E-002
  7.063016926108848E-002
  0.137363839686406
  0.120023201528415
  9.653519355772798E-002
  0.237160049495556
  4.857712306131567E-002
  4.395142113070239E-002
  0.134551177997255
  2.291256156484392E-002
:
```

fort.92 (electron)

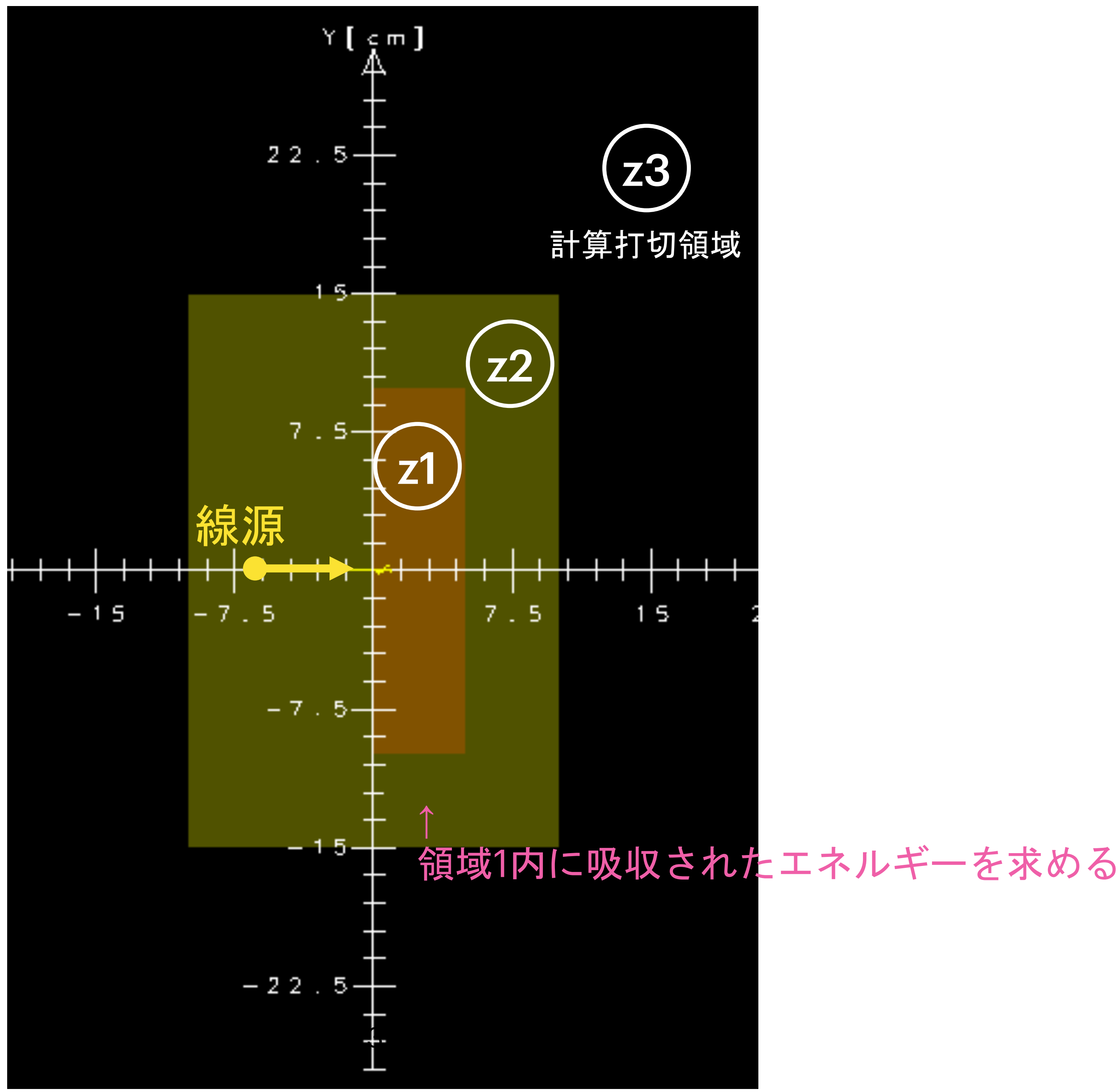
```
  0.540271512664514
  0.694575869707918
  0.701306645181710
  0.829987733342612
  0.203134256948940
  0.807720792774279
  0.579118950986061
  0.886655119575416
  0.423448134695322
  0.829891512015685
  0.615723358845304
  0.781277070179265
  0.855219289021240
  0.846917379926870
  0.813741911554502
  0.185829413707758
  0.691270549925618
:
```



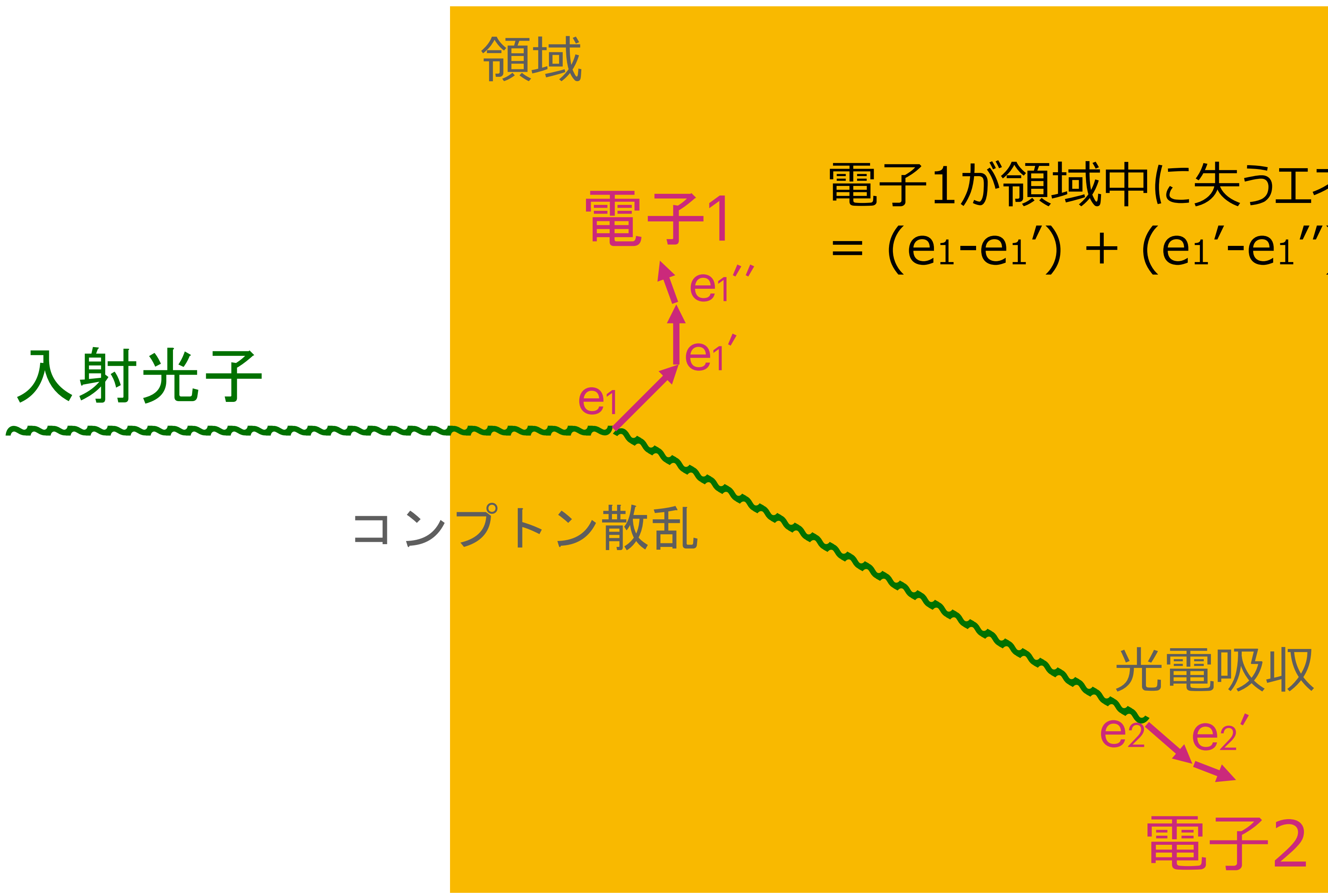
electron
photon
Events
E (MeV)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
0
0.2
0.4
0.6
0.8
1
1.2

シンチレータの応答、標的の熱計算

CG体系でtutor2
energy deposit量とその分布の計算



EGS5の吸収エネルギー

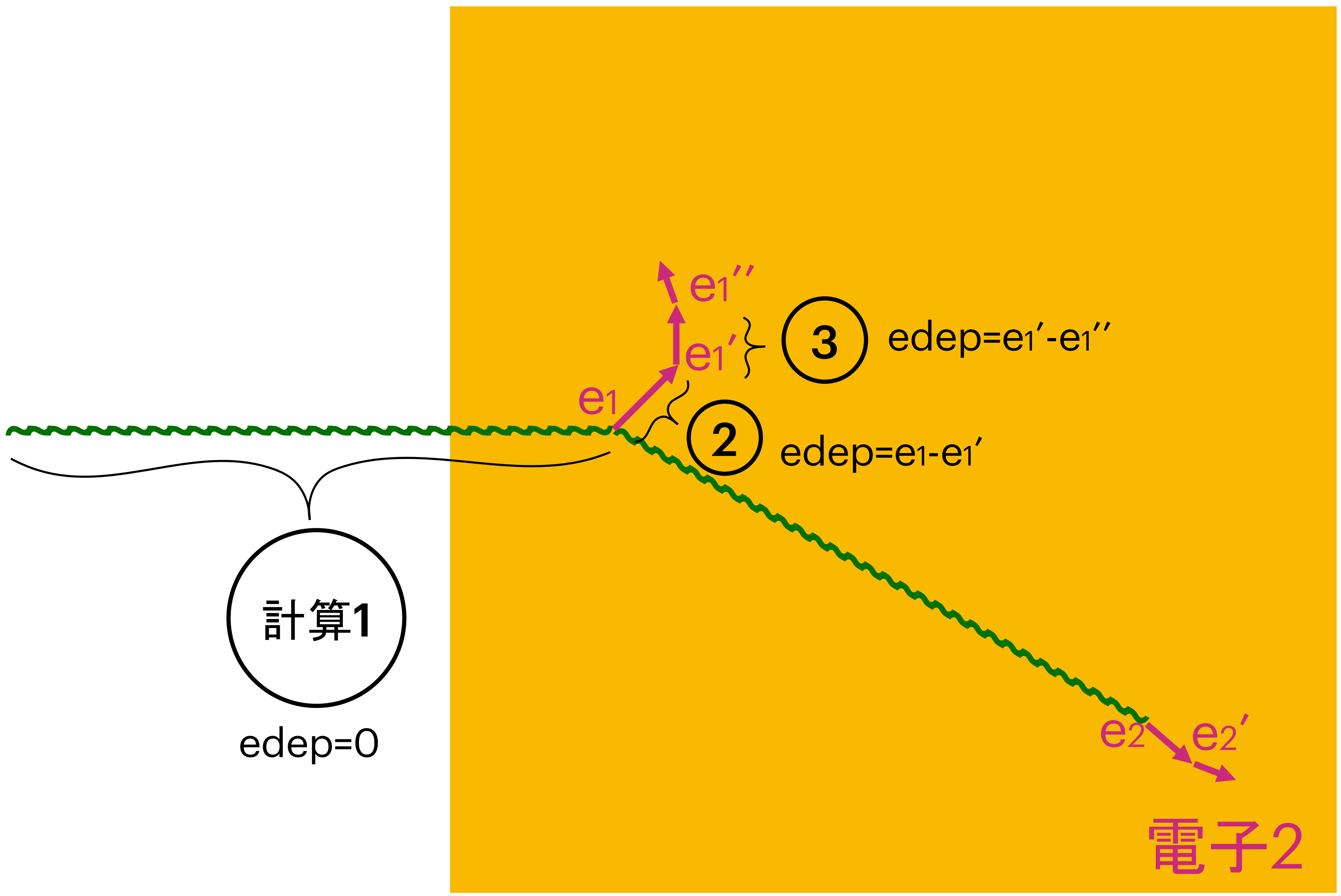


電子1が領域中に失うエネルギー
$= (e_1 - e_1') + (e_1' - e_1'') + \cdots$

電子2が領域中に失うエネルギー
$= (e_2 - e_2') + (e_2' - e_2'') + \cdots$

１ステップとdE

計算の段階ごとのedep



１入射放射線あたりの吸収エネルギー ＝ edep を足し合わせたもの

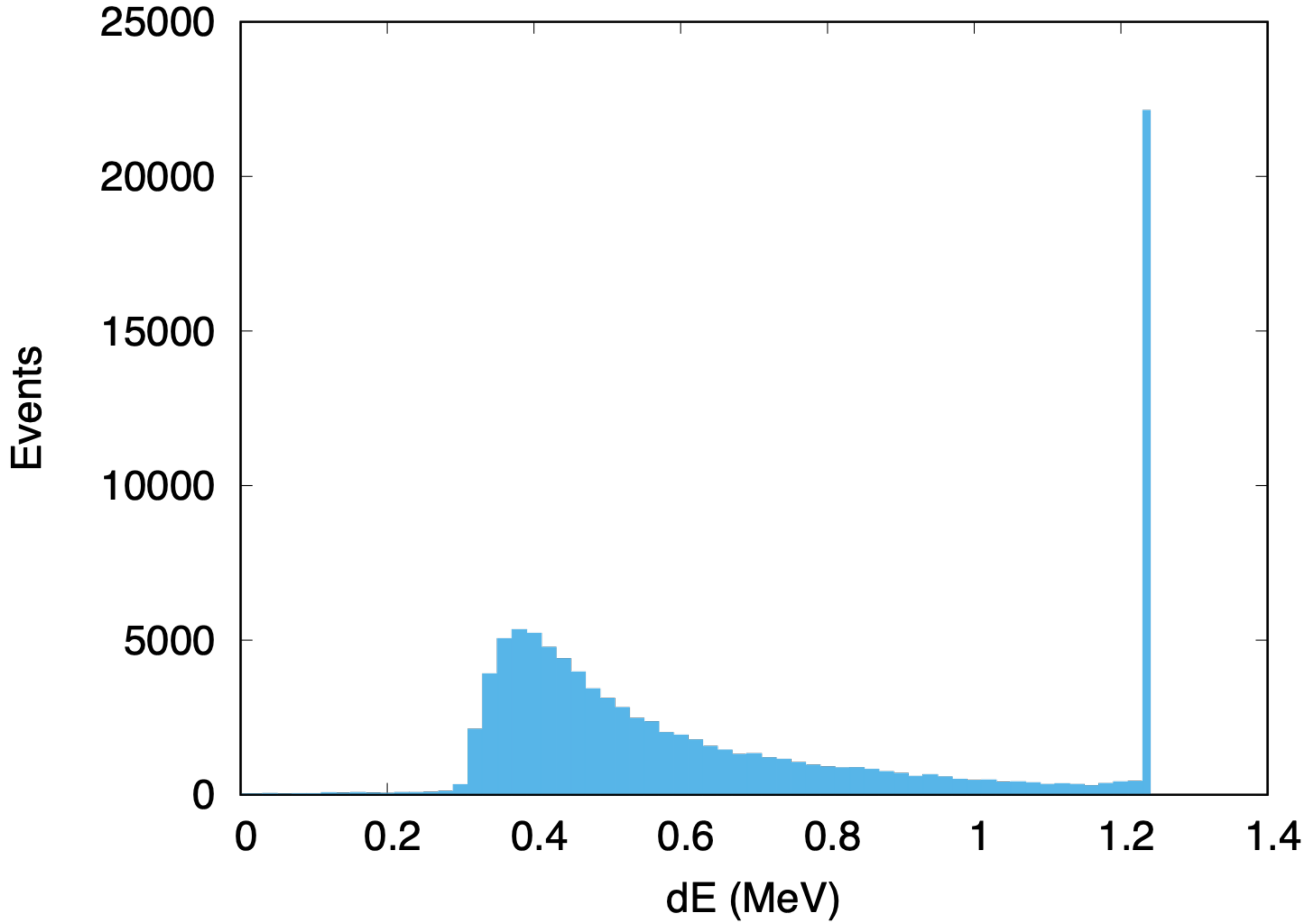
```
      common/cmn1/de
      real*8 de

      open(6,FILE='egs5job.out',STATUS='unknown')
      open(4,FILE='egs5job.inp',STATUS='old')
      open(39,FILE='egs5job.pic',STATUS='unknown')

      call counters_out(0)
```

```
          uf(1)=0.0
          vf(1)=0.0
          wf(1)=0.0  ! Needed if lpolar(i)=1

          de = 0d0

          call shower (iqin,etot,xin,yin,zin,uin,vin,win,irin,wtin)

          write(93,*)de

          ncount = ncount + 1          ! Count total number of actual cases

          if(iwatch.gt.0) call swatch(-1,iwatch)

        end do                                  ! End of CALL SHOWER loop

        if(iwatch.gt.0) call swatch(-88,iwatch)

        call plotxyz(99,0,0,0.D0,0.D0,0.D0,0.D0,0,0.D0,0.D0)

        write(39,fmt="('9')")          ! Set end of batch for CG View
```

```
      common/cmn1/de
      real*8 de

!     Print out particle transport information (if switch is turned on)
      if (iwatch .gt. 0) call swatch(iarg,iwatch)

      if (iarg.le.4 .and. ir(np).eq.1 ) then
         de = de + edep
      endif

      if(iarg .ge. 5) return
```

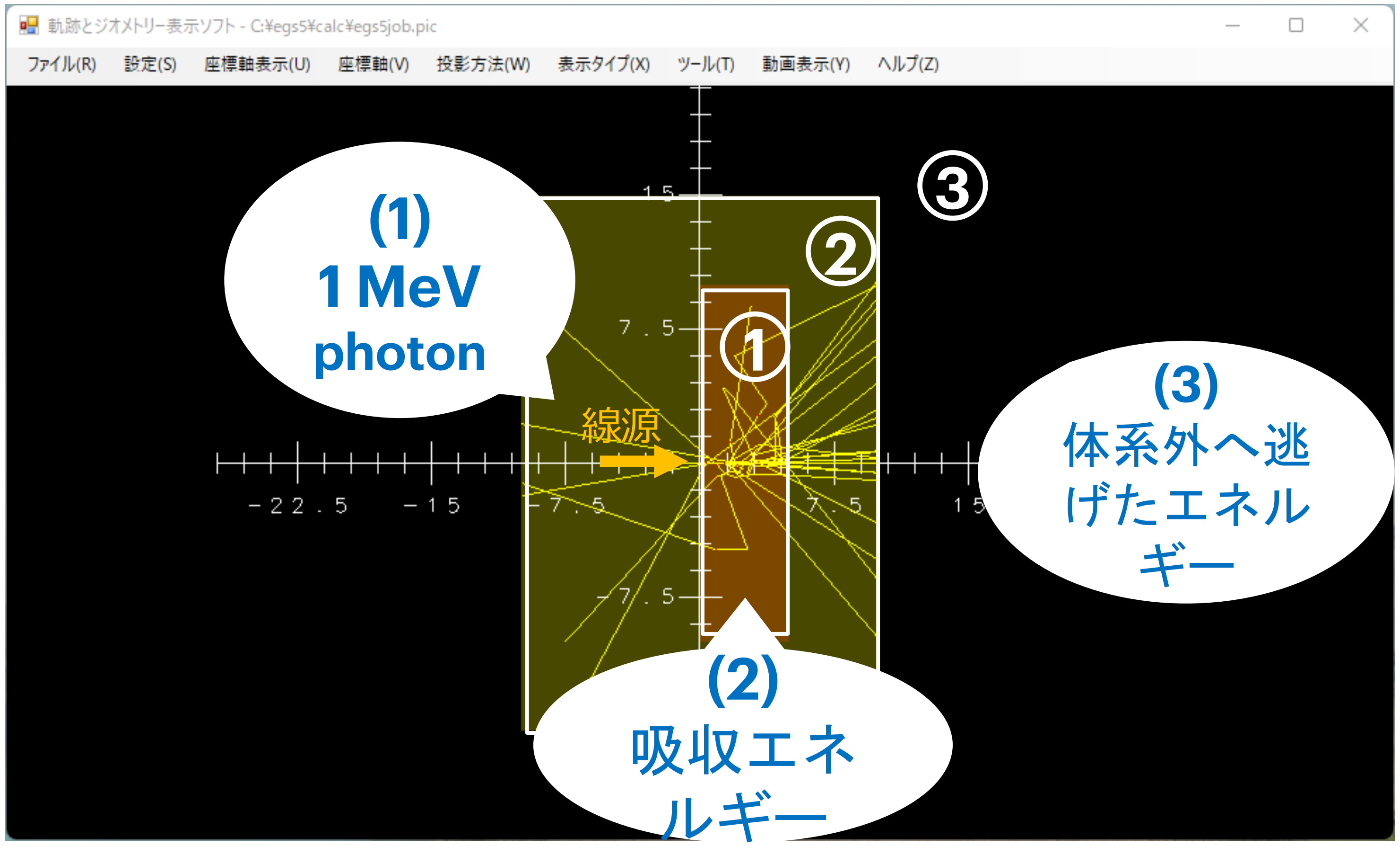
fort.93の中身

```
  1.25300002098084
  1.25300002098083
 0.506240130558479
 0.712728508316322
 0.558424151272919
 0.847693228025980
  1.25300002098083
  1.25300002098083
 0.357737686830670
 0.551693375799125
  1.25300002098084
 0.423012287638223
  1.25300002098083
  1.04986576403189
  1.25300002098083
 0.376270297827966
 0.445279228206556
 0.673881069994773
 0.366344901405419
 0.336851243980807
 0.829551886285513
 0.423108508965151
 0.340862623567150
 0.637276662135530
```



エネルギー収支を確認する (tutor2)

- 線源エネルギー (1) ＝ 吸収エネルギー (2) + 体系外へ逃げたエネルギー (3)



- エネルギー収支の取れていない計算はどこかにミスがある可能性

メインルーチンの変更点

```
  program simple
#####################################

  a frame of EGS5 CG calculation
  based on  ucnaicgv ver. 28Jul2012/
#####################################

  implicit none

  include 'include/egs5_h.f'
  include 'include/egs5_bounds.f'
  include 'include/egs5_brempr.f'
  include 'include/egs5_edge.f'
  include 'include/egs5_media.f'
  include 'include/egs5_misc.f'
  include 'include/egs5_stack.f'
  include 'include/egs5_thresh.f'
  include 'include/egs5_uphiot.f'
  include 'include/egs5_useful.f'
  include 'include/egs5_usersc.f'
  include 'include/egs5_userxt.f'
  include 'include/randomm.f'
  include 'auxcommons/aux_h.f'
  include 'auxcommons/edata.f'
  include 'auxcommons/etaly1.f'
  include 'auxcommons/instuf.f'
  include 'auxcommons/lines.f'
  include 'auxcommons/nfac.f'
  include 'auxcommons/watch.f'
  include 'auxcommons/geom_common.f

  common/cmn1/escore(3)
  integer maxpict
  real*8 escore
```

```
! source
      iqin   = 0
      ekein  = 1d0
      xin    =  0.0
      yin    =  0.0
      zin    = -5.0
      uin    =  0.0
      vin    =  0.0
      win    =  1.0
      irin   =  0
      wtin   = 1.0
```

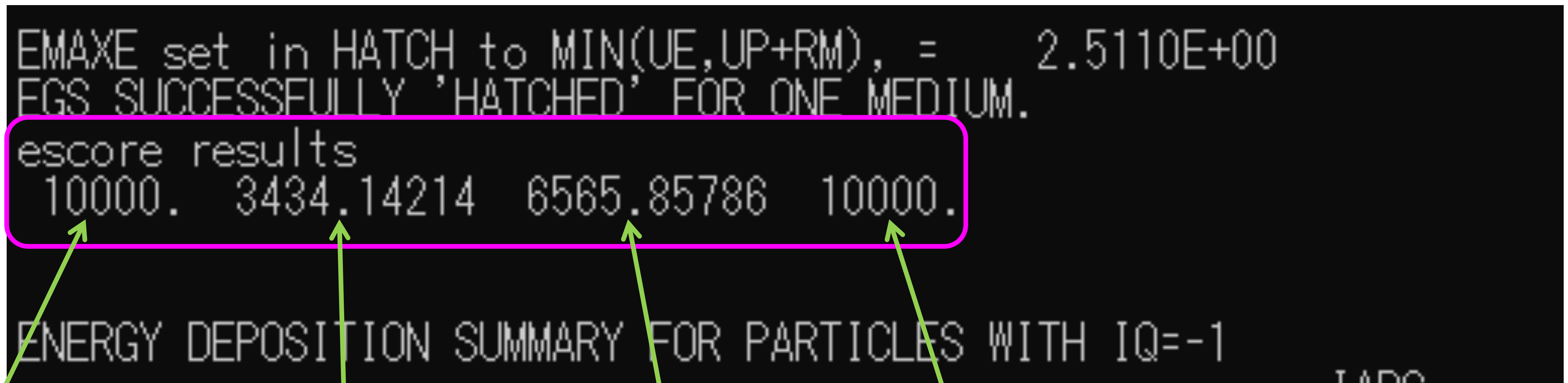
```
do i=1,ncases                                    ! Start of shower call

  escore(1)=escore(1)+ekein ! source kinetic energy

  wtin = 1.0

  wtsum = wtsum + wtin                          ! Keep running sum of we
  etot = ekein + iabs(iqin)*RM                   ! Incident total energy
```

```
    call shower (iqin,etot,xin,yin,zin,uin,vin,win,irin,wtin)

    ncount = ncount + 1             ! Count total number of actual cases

    if(iwatch.gt.0) call swatch(-1,iwatch)

  end do                                        ! End of CALL SHOWER loop

  write(6,*)"escore results"
  write(6,*)escore(1), escore(2), escore(3), escore(2)+ escore(3)
```

ausgabの変更点

```
 integer
* iarg
 common/cmn1/escore(3)
 integer maxpict
 real*8 escore

 Print out particle transport information (if switch i
 if (iwatch .gt. 0) call swatch(iarg,iwatch)

 if (iarg.le.4) then
    if(     ir(np).eq.1)then
       escore(2)=escore(2)+edep    ! deposit in z1

    elseif(ir(np).eq.3)then
       escore(3)=escore(3)+edep    ! escape to z3
    endif
 end if
```

結果



(1) 線源エネルギー
(1 MeV x 10,000回)

(2) 領域1の吸収エネルギー
(約34%, 厚みによる)

(3) 体系外へ逃げたエネルギー

(2) + (3) = (1) となった
⇒ エネルギー収支が確認できた

測定器の応答計算 (tutor3)

- 3インチのNaIの応答を計算する（簡易版）
- 結晶に直接光子を入射

simple.inp (PEGS入力:物質とデータテーブル作成)

```
COMP
&INP NE=2,RHO=3.67, PZ=1,1 IRAYL=1 /END
NAI                          NAI
NA I
ENER
&INP AE=0.521,AP=0.01,UE=2.511,UP=2.0 /END
PWLF
&INP  /END
DECK
&INP  /END
```

EGS研究会ホームページ
講習会資料 8-7 materials 参照
https://rcwww.kek.jp/egsconf/2015-nm/materials.html

simple.data (計算体系)

```
RCC   1    0 0 0     0 0 7.62    3.81
RCC   2    0 0 -10   0 0 20      15
END
Z1       +1
Z2       +2      -1
Z3       -2
END
1   0   0
```

メインルーチン

```
      nmed=1
       if(nmed.gt.MXMED) then
          write(*,*)'error:nmed exceeds MXMED'
         stop
       end if

       call block_set            ! Initialize some general variables
       medarr(1)='NAI                    '

```

```
! source
      iqin  = 0              ! Incident particle charge - photons
      ekein = 0.662d0        ! Incident particle kinetic energy
      xin   =  0.0           ! Source position
      yin   =  0.0
      zin   = -5.0
      uin   =  0.0           ! Moving along z axis
      vin   =  0.0
      win   =  1.0
      irin  =  0             ! Starting region (0: Automatic search in CG)
      wtin  = 1.0            ! Weight = 1 since no variance reduction used

```

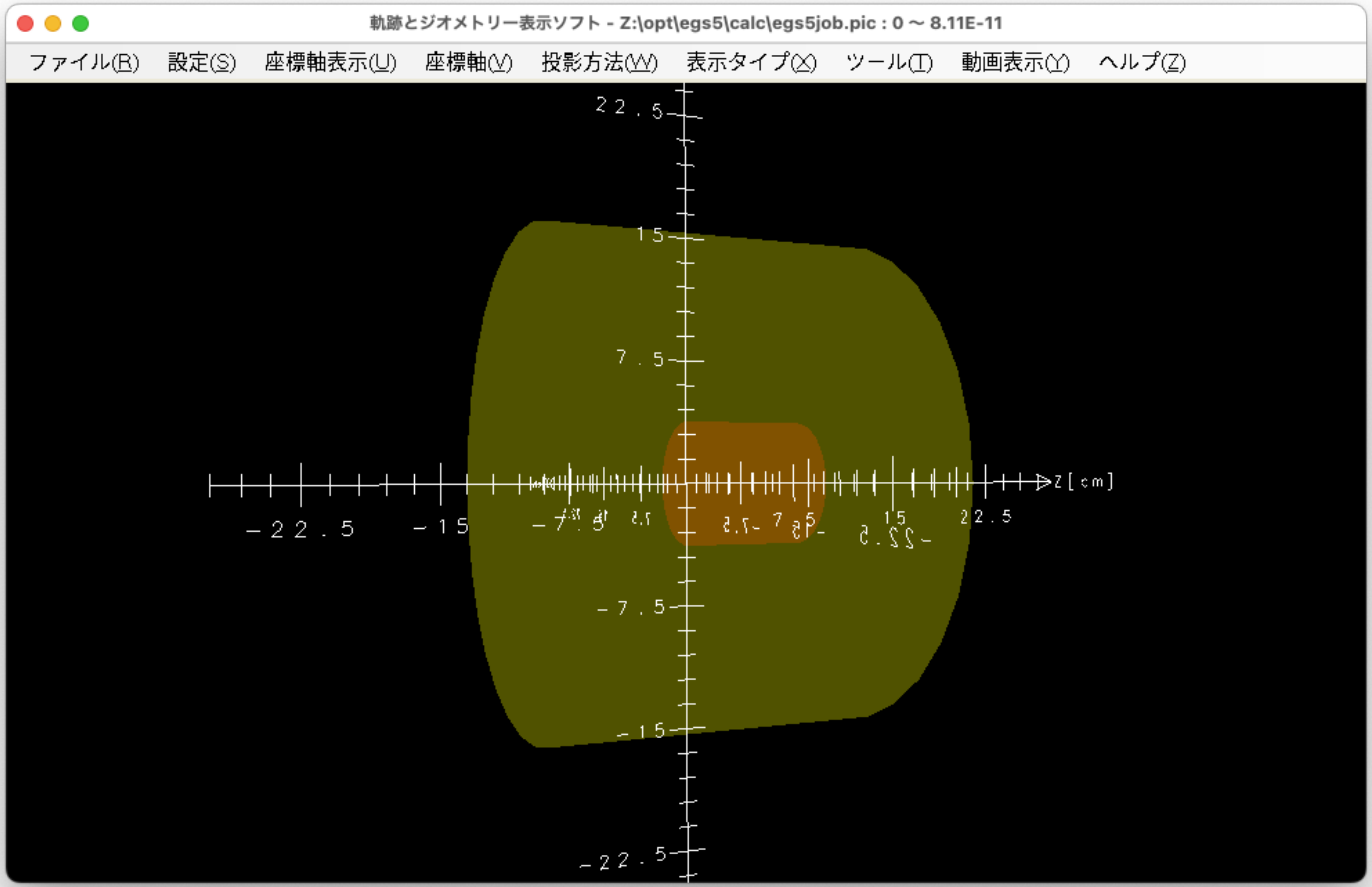
```
        uf(1)=0.0
        vf(1)=0.0
        wf(1)=0.0  ! Needed if lpolar(i)=1

        de = 0d0

        call shower (iqin,etot,xin,yin,zin,uin,vin,win,irin,wtin)

        if(de.ne.0) write(93,'(1pe13.5)') de

        ncount = ncount + 1          ! Count total number of actual cases

        if(iwatch.gt.0) call swatch(-1,iwatch)

      end do                              ! End of CALL SHOWER loop
```

ausgab

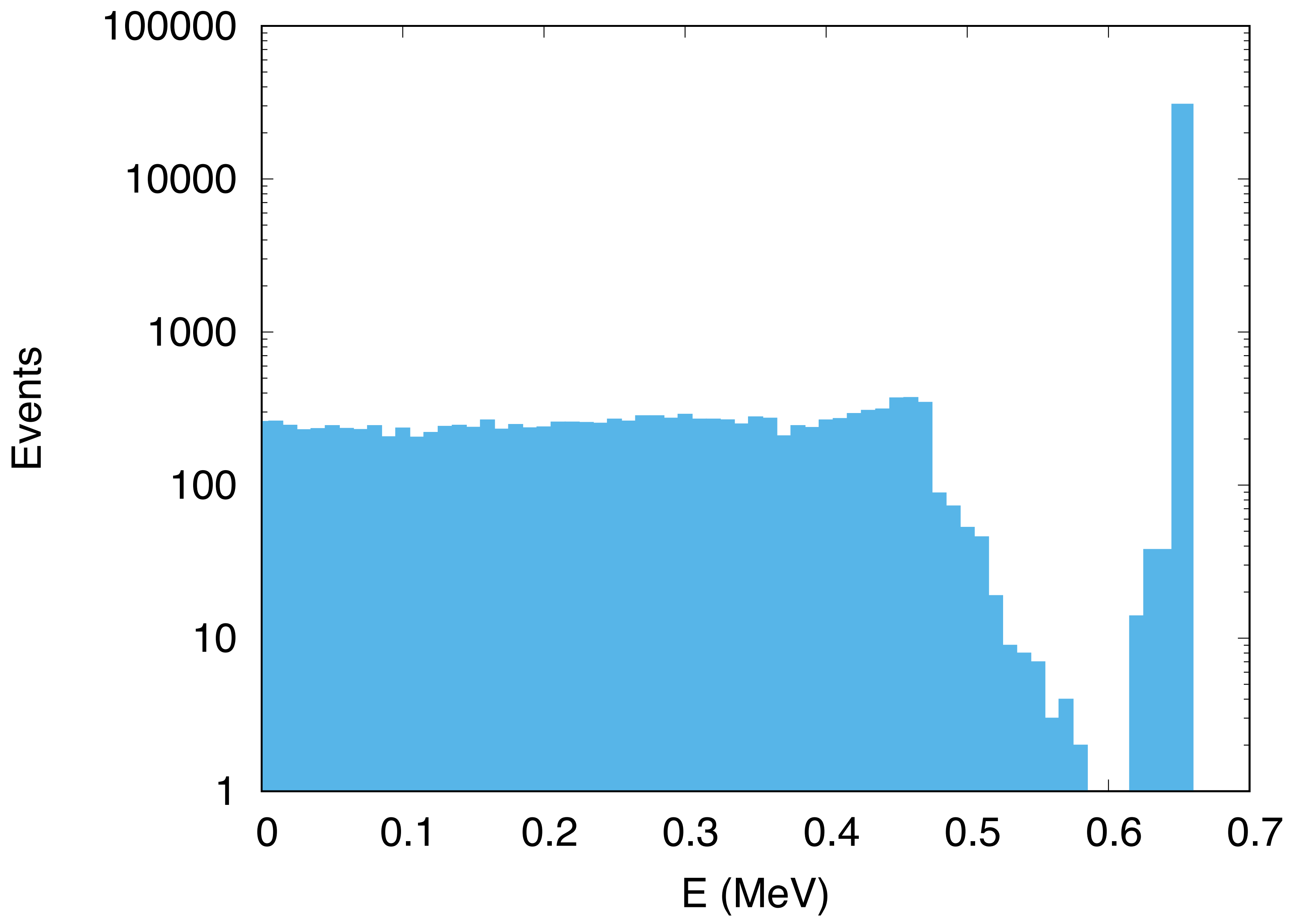
```
nmed=1
 if(nmed.gt.MXMED) then
    write(*,*)'error:nmed exceeds MXMED'
   stop
 end if

 call block_set           ! Initialize some general variables
 medarr(1)='NAI                    '

```

```
! source
iqin  = 0              ! Incident particle charge - photons
ekein = 0.662d0        ! Incident particle kinetic energy
xin   =  0.0           ! Source position
yin   =  0.0
zin   = -5.0
uin   =  0.0           ! Moving along z axis
vin   =  0.0
win   =  1.0
irin  =  0             ! Starting region (0: Automatic search in CG)
wtin  = 1.0            ! Weight = 1 since no variance reduction used

```

```
  uf(1)=0.0
  vf(1)=0.0
  wf(1)=0.0  ! Needed if lpolar(i)=1

  de = 0d0

  call shower (iqin,etot,xin,yin,zin,uin,vin,win,irin,wtin)

  if(de.ne.0) write(93,'(1pe13.5)') de

  ncount = ncount + 1          ! Count total number of actual cases

  if(iwatch.gt.0) call swatch(-1,iwatch)

end do                          ! End of CALL SHOWER loop
```


軌跡とジオメトリー表示ソフト - Z:\opt\egs5\calc\egs5job.pic : 0 〜 8.11E-11
ファイル(R) 設定(S) 座標軸表示(U) 座標軸(V) 投影方法(W) 表示タイプ(X) ツール(T) 動画表示(Y) ヘルプ(Z)
22.5
15
7.5
-7.5
-15
-22.5
-22.5
-15
-7.5
15
22.5
z[cm]

3 インチNaIの応答, Eγ=622keV



- 2024-7-24改　ページ数追加、p38と39のcmn1/からmaxpictを削除