PeneloPET

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PENELOPE

Nuclear Energy Agency, NEA-OECD

www.nea.fr

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PeneloPET Versión 1.0

- Descargar:
  http://nuclear.fis.ucm.es/penelopet/files
- Instalar
- Leer Manual de Usuario
- Recopilar isótopos y materiales
- Crear Ficheros Input:
  - Escáner, Fuente, Objetos, Principal (alineamientos)
- Simulación de prueba (points.dat, gview)
- Correr simulación
- Analizar resultados

Descargar

- Descargar:

  http://nuclear.fis.ucm.es/penelopet/files/version_1

- Weblog:

  http://nuclear.fis.ucm.es/penelopet/fantoma.php

Instalar

- Crear directorio
- Meter fichero zip en directorio
- Descomprimir fichero zip (unzip)
- Compilar *penelopet.f*

  (G77, absoft) (Windows,Linux)
- Poner ejecutable en directorio *work*

Manual de Usuario

- Se encuentra en el directorio *doc*

1. ***INSTALLING PeneloPET***
2. ***LIST OF FILES***
3. ***LIST OF UNITS***
4. ***SOURCE CODE FILES***
5. ***INPUT FILES***
6. ***OUTPUT FILES***
7. ***EXECUTING PeneloPET***

APPENDIX 1: How to Read Hits List File Using FORTRAN 77
APPENDIX 2: CRYSTAL PIXEL NUMERATION
APPENDIX 3: LOR System Response Simulation
APPENDIX 4: Sinograms
APPENDIX 5: LOR histogram

Isótopos y Materiales

- isotope.inp

```
---------- ISOTOPES ----------
1     6586.2          9          F18        !Numeration  Half_Life[sec] Z Isotope_name
B+    249.8E3         1.                    !Type        Energy Fraction
------------------------------------------------------
2     1223.4          6          C11        !Numeration  Half_Life[sec] Z Isotope_name
B+    385.6E3         1.                    !Type        Energy Fraction
------------------------------------------------------
3     597.9           7          N13        !Numeration  Half_Life[sec] Z Isotope_name
B+    491.82E3        1.                    !Type        Energy Fraction
------------------------------------------------------
4     122.24          8          O15        !Numeration  Half_Life[sec] Z Isotope_name
B+    735.28E3        1.                    !Type        Energy Fraction
------------------------------------------------------
5     8.210972E+07    11         Na22       !Numeration  Half_Life[sec] Z Isotope_name
B+    215.54E3        1.                    !Type        Energy Fraction
G     1274.54E3       1.
------------------------------------------------------
```

Isótopos y Materiales

- mat_names.inp

```
water.mat
bgo.mat
czt06.mat
czt07.mat
czt08.mat
gso.mat
labr.mat
lso.mat
nai.mat
nylon11.mat
pb.mat
al.mat
lyso_0.9.mat
```

Crear Ficheros INPUT- scanner.inp

```
---------------------------------- SCANNER PARAMETERS --------------------------
4                    !Number of Detectors by Ring
1                    !Number of Detectors in Coincidence in the same Ring
90.0                 !Angle Between adyacent Detectors [DEG]
1                    !Number of Rings
0.                   !Gap Between Rings [cm]
15                   !Number of transaxial crystals by Detector [COLUMNS]
15                   !Number of axial crystals by Detector [ROWS]
1                    !Number of crystal layers by Detector
1.5 8 .15 1 40 1.5   !Length; Material; Energy Resol; Rise T; Fall T, T Resol
0.2 0.2              !Pitch (Transaxial; Axial): Pitch
7.0                  !Radio: Center FOV - Center Front of Detector [cm]
-------------------------------------------------------------------------------
```

Crear Ficheros INPUT- main.inp

```
12345 54321          [Random number generator seeds]
0.1 0.1              [Acquisition Real Time[sec]; Frame Time[sec]]
T                    [read alignments.inp file]
1000                 [Limit for the number of interactions in each particle]
T                    [Positron Range]
T                    [Non-Collinearity]
0 270 5 1            [Start&Stop Angles [DEG]; Number of Steps per cycle; time per cycle SEC
F                    [Secundary Particles Simulation]
100000.              [Lower Energy Window (eV)]
700000.              [Upper Energy Window (eV)]
5.                   [Coincidence Time Window (ns)]
20.                  [Triggers Dead Time (ns)]
220.                 [Integration Time (ns)]
1600.                [Singles Dead Time (ns)]
F F                  [Hits LIST; Coincidence LIST]
F                    [Write Lor Histogram]
F 35 90 2.16         [Write Sinogram; radial bins; angular bins; maximum radio]
T                    [Hits checking]
T                    [Verbose]
F                    [Get Rid more than 2 single en coincidencia]
F                    [System Renponse Simulation:  LOR-RESPONSE]
F                    [System Renponse Simulation:  SINOGRAM-RESPONSE]
1   1     13         [Chord points - Transaxial Axial Longitudinal]
0.5 0.5   8.55       [Chord size: Tranaxial; Axial; Longitudinal(cm)]
2   5000000          [Chord Aperture, Decays/Point]
```

Crear Ficheros INPUT- object.inp

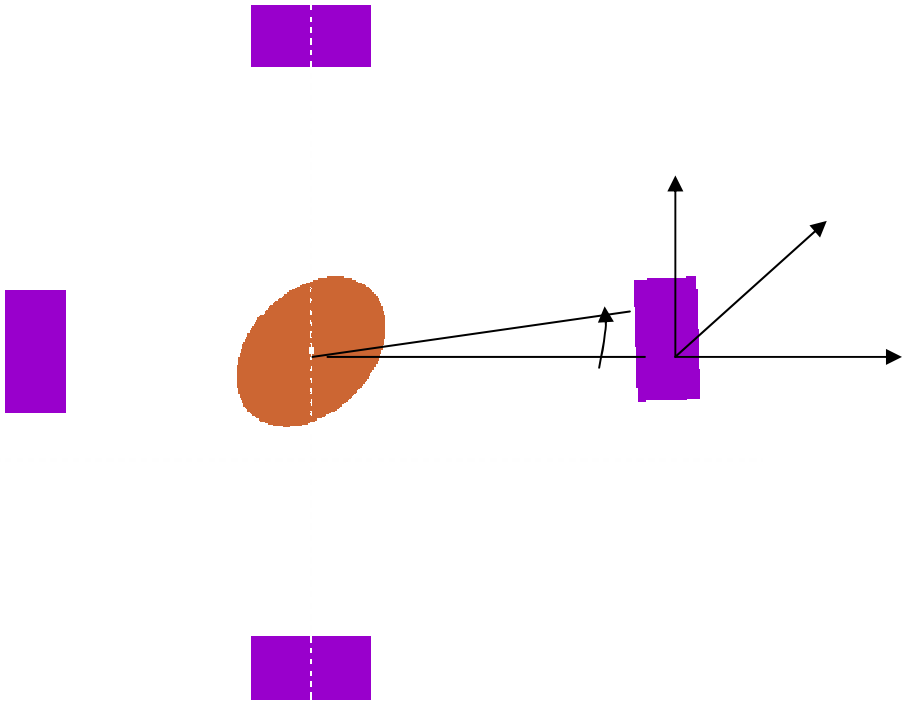
```
!TYPE MATERIAL X_CENTER Y_CENTER Z_CENTER R1 R2 HEIGHT[cm] PH_INC TH_INC[DEG]
C 1 0 0 0 0 1.5 5.0 45 45
!WRITE ONE OBJECT PER LINE. FILE END WITH A STARTING CHARATER NOT VALID FOR TYPE
--------------------------------------------------------------------------------
```

Crear Ficheros INPUT- source.inp

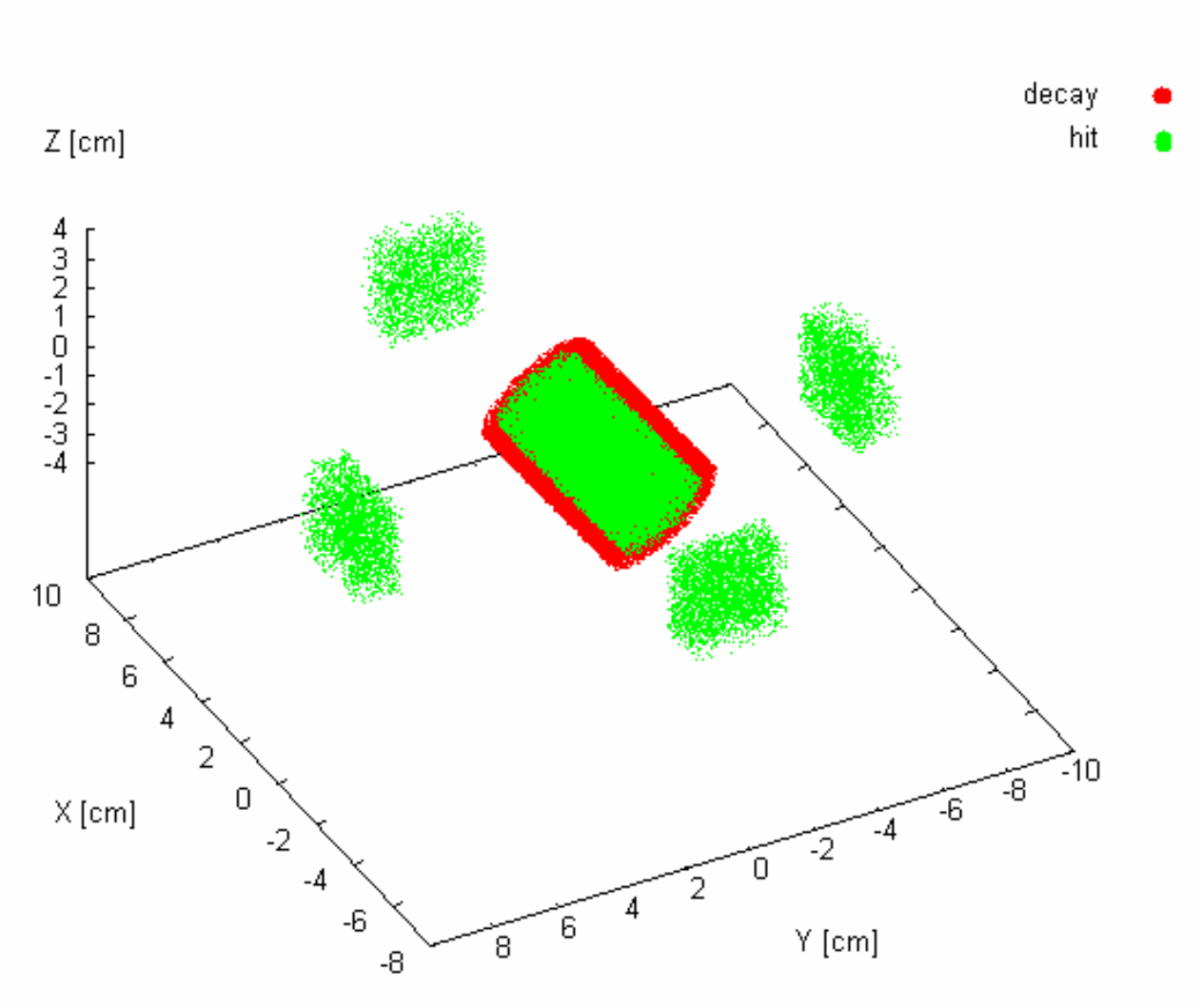
```
!TYPE ACTIVITY[Bq] UNITS ISOTOPE X Y Z R1 R2 H[cm] PH_INC TH_INC PH TH TH1 TH2[DEG]
C 1E6 F 1 0 0 0 0 2 5 45 45 0 0 0 180
!WRITE ONE SOURCE PER LINE. FILE END WITH A STARTING CHARATER NOT VALID FOR TYPE
--------------------------------------------------------------------------------
```

Crear Ficheros INPUT-
alignments.inp (opcional)

```
0 0 1 0 0 2 !RING BLOCK X Y Z[CM] ANGLE[DEG]
0 2 -1 0 0 0
```



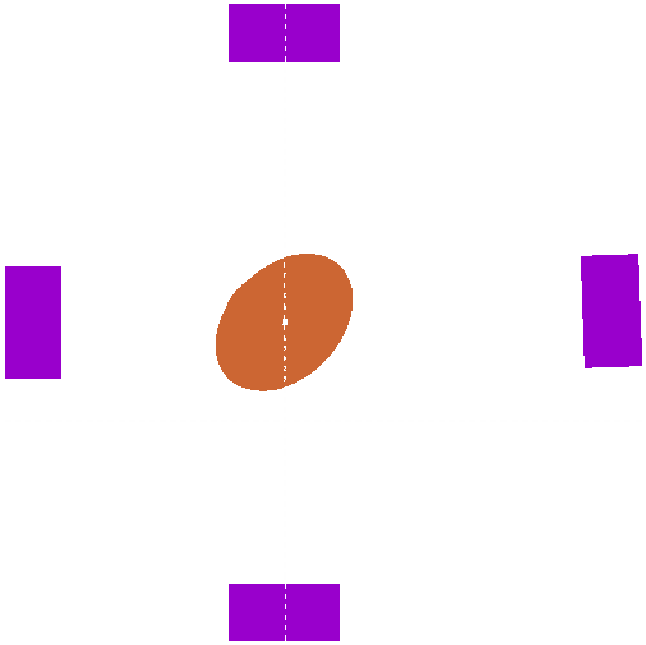
Simulación de prueba: points.dat



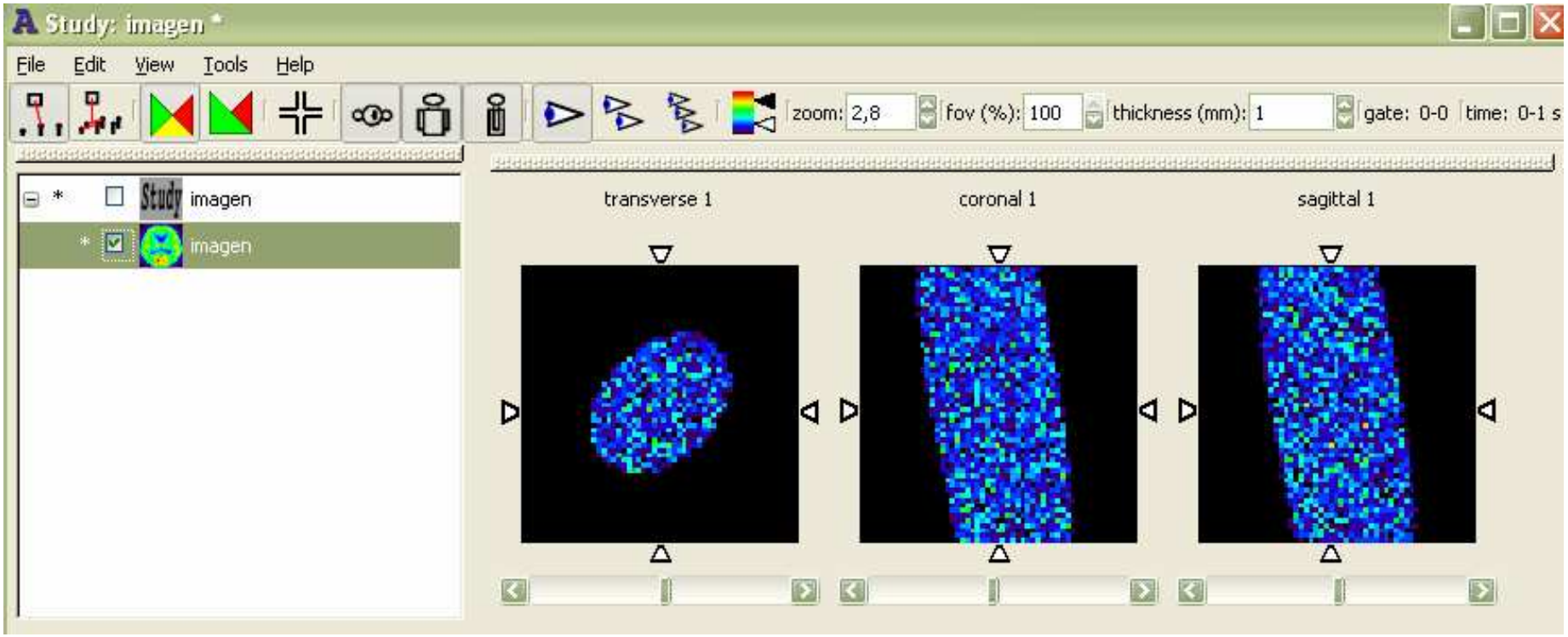
Simulación de prueba: scanner.geo

gview3d.exe

gview2d.exe



Simulación de prueba: imagen.bin



Correr Simulación

./penelopet.exe working_dir

```
-------------------------------------------------------------
  PPPPP   EEEEEE  N    N  EEEEEE L      OOOOOO PPPPP  EEEEEE TTTTTTT
  P    P  E       NN   N  E      L      0    0 P    P E         T
  P    P  E       N N  N  E      L      0    0 P    P E         T
  PPPPP   EEEE    N  N N  EEEEE  L      0    0 PPPPP  EEEEE     T
  P       E       N   NN  E      L      0    0 P      E         T
  P       EEEEEE  N    N  EEEEEE LLLLLL 000000 P      EEEEEE    T
-------------------------------------------------------------

                  WORKING DIRECTORY: working_dir

   --> GENERAL SIMULATION PARAMETERS. READING main.inp FILE...

                                  RANDOM SEEDS:     12345      54321
                         REAL TIME TO SIMULATE: 10000.00 SEC
                                TIME PER FRAME: 10000.00 SEC
                               READ ALIGNMENTS:F
                     MUM NUMBER OF INTERACTIONS: 1000
                                POSITRON RANGE: T
                            NON-COLLINERARITY: T
                        START ANGULAR POSITION:     0.00
                          END ANGULAR POSITION:   180.00
              NUMBER OF SCANNER ANGULAR POSITIONS:    500
                                TIME PER CYCLE:  7000.00
                    SECONDARY PARTICLE SIMULATION: F
```

Correr Simulación - Paralelizar

python parallelyzer.py working_dir Ncpus semilla

```
 -------------------------------
 | Python paralyzer for PeneloPET |
  -------------------------------

Total & Frame time [sec]: 14400.0 1.0
Initial Activity [Bq]: 40000000.0
Number of CPUs to paralyze: 30


PROCESS:  0  TIME [sec]:  250.0  ACTIVITY [Bq]:  40000000.0
      directory  rpet/smallcyl//run0  already exist
   RUNNING PROCCES  0 : qsub_sam run rpet/smallcyl//run0
Your job 16615 ("run rpet/smallcyl//run0") has been submitted

PROCESS:  1  TIME [sec]:  257.0  ACTIVITY [Bq]:  38960833.6513
          creating directory  rpet/smallcyl//run1
   RUNNING PROCCES  1 : qsub_sam run rpet/smallcyl//run1
Your job 16616 ("run rpet/smallcyl//run1") has been submitted

PROCESS:  2  TIME [sec]:  264.0  ACTIVITY [Bq]:  37920704.8882
          creating directory  rpet/smallcyl//run2
   RUNNING PROCCES  2 : qsub_sam run rpet/smallcyl//run2
Your job 16617 ("run rpet/smallcyl//run2") has been submitted
```

Analizar Resultados

- Sinogramas
- Histogramas de LOR
- Ficheros LIST de coincidencias
- Histogramas varios

- *simu2rpet_sino.f*
- *simu2rpet_list.f*