

OUTPUT FORMAT

Output of SPACAL simulations is stored in a ROOT file. This file contains several TTree, and a Configuration folder and 2 optional TH1F histograms.

The relevant info on the energy deposition and optical photons is contained in the TTrees **shower**, **primaries**, **photons**, and **photonsAbsPoint**. The simulation structure is in TTrees **modules**, **absorbers**, **cells**, **holes**, and **fibres**. The configuration data is the **Configuration** folder. Optionally, if a simulation is performed with optical photons as primaries, the energy and time spectrum of the scintillator (used to produce the primaries) are saved in the **enHisto** and **tHisto** histograms.

Shower

A list of all the energy deposition events occurred during the simulation. For an example on how to read this info from the simulation output, see the energyResolution.cpp program.

run	Run number
event	Event number
isInCrystal	= 1 if energy deposited in a crystal volume, = 0 otherwise
crystalID	Number of the crystal where deposition occurred
x	X position of energy deposition [mm]
y	Y position of energy deposition [mm]
z	Z position of energy deposition [mm]
t	Time of energy deposition [ns]
totalEnDep	Total energy deposited [MeV] (ionizing + non ionizing)
ionizingEnDep	Ionizing energy deposited [MeV]
nonIonizingEnDep	Non ionizing energy deposited [MeV]

Primaries

A list with info on primary particles shot to the calorimeter.

run	Run number
event	Event number
PositionAtVertexX	X position of particle at vertex [mm]
PositionAtVertexY	Y position of particle at vertex [mm]
PositionAtVertexZ	Z position of particle at vertex [mm]
MomentumAtVertexX	X component of particle momentum at vertex

MomentumAtVertexY	Y component of particle momentum at vertex
MomentumAtVertexZ	Z component of particle momentum at vertex
EnergyAtVertex	Particle energy at vertex [MeV]
PositionOnAbsorberX	X position of particle when it first enters the absorber [mm]
PositionOnAbsorberY	Y position of particle when it first enters the absorber [mm]
PositionOnAbsorberZ	Z position of particle when it first enters the absorber [mm]
MomentumOnAbsorberX	X component of particle momentum when it first enters the absorber
MomentumOnAbsorberY	Y component of particle momentum when it first enters the absorber
MomentumOnAbsorberZ	Z component of particle momentum when it first enters the absorber
EnergyOnAbsorber	Particle energy when it first enters the absorber [MeV]

Photons

A list of all optical photons that enter a photo-detector. Whenever a optical photon enters a volume defined as a photo-detector in the simulation, it is killed and recorded.

run	Run number
event	Event number
front_back	= 0 if PMT is on the front (negative z), = 1 if it is on the back
pmt_number	Number of PMT where the photon is detected
module_number	Number of module where the photon is detected
PhPerPMT	Not used
vertX	X position of optical photon creation [mm]
vertY	Y position of optical photon creation [mm]
vertZ	Z position of optical photon creation [mm]
PositionX	X position of optical photon detection [mm]
PositionY	Y position of optical photon detection [mm]
PositionZ	Z position of optical photon detection [mm]
PreMomentumX	X component of momentum at interface before entering detector
PreMomentumY	Y component of momentum at interface before entering detector
PreMomentumZ	Z component of momentum at interface before entering detector
PostMomentumX	X component of momentum at interface after entering detector
PostMomentumY	Y component of momentum at interface after entering detector
PostMomentumZ	Z component of momentum at interface after entering detector
globalTime	Time of detection [ns]
PhotonEnergy	Energy of the optical photon [eV]

PhotonsAbsPoint

A list of the point of absorption for all the optical photons produced.

run	Run number
event	Event number
x	X position of optical photon absorption [mm]
y	Y position of optical photon absorption [mm]
z	Z position of optical photon absorption [mm]
globalTime	Time of absorption [ns]
PhotonEnergy	Energy of the optical photon [eV]

modules, absorbers, cells, holes, fibres

These lists carry information on the structure of the simulation. For info on the simulation structure logic, see the template.cfg file. For an example on how to read this info from the simulation output, see the energyResolution.cpp program.

ID	Element ID
material	Element material
x	Element x center position [mm]
y	Element y center position [mm]
z	Element z center position [mm]
dx	Element x length [mm]
dy	Element y length [mm]
dz	Element z length [mm]

Configuration

Folder with configuration files and more. To read it from an output file, use the program extractConfiguration.cpp (run it without arguments to get usage help).

Seed	Random seed of simulation
Hostname	Name of computer where the simulation was run
PWD	Full path of folder where simulation was run
ConfigFile	Full configuration file
GpsFile	Full GPS file

Tree

Old TTree, inherited from previous versions, not relevant.