

Simulation of Timing and Collected Energy from Spatially-Distributed Source (Shower)

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On each step of the simulation:

1. Attenuate each chunk of deposited energy to the both photodetectors of the correspondent readout cell.

- 2a. For each of energy chunk, calculate times of propagation to both photodetectors of the correspondent readout cell.

- 2b. Smear the calculated times according to the “rise” and “decay” time constants of photodetector signals (optionally can be done in the end of each event)

- 3c. Store calculated time (or smeared time signal) in the histogram of the correspondent readout cell photodetector with the “attenuated-energy” weight.

In the end of each event:

- 3d. For each photodetector, the time histogram represents the time distribution of collected energy (viz., simulated output signal). First channel that contains energy above the threshold gives us the time from leading-edge discriminator.

gustep.F

Collected Energies

```
if(Energy .gt. 0.) then
```

```
  ad_l1(ICell)=ad_l1(ICell)+  
+      1000.*Energy*exp(-Z/AttLn)  
  ad_r1(ICell)=ad_r1(ICell)+  
+      1000.*Energy*exp( Z/AttLn)
```

C

“Left” Time

“Left” Time Bin

```
  td_l_new=TOFG+(0.5*SciLengGL + Z)*0.05e-09*sqrt(2.)  
  kd_l=(td_l_new-25.e-09)/Time_bin_Width
```

```
  energ_l=1000.*Energy*exp(-Z/AttLn)
```

“Left” Smearred Histogram

```
  do k=kd_l,MSTIME  
    tv_l1(ICell,k)=tv_l1(ICell,k)+  
+      energ_l*exp((kd_l-k)/tau5ns)*  
+      (1.-exp((kd_l-k)/tau1ns))  
  enddo
```

“Right” Time

```
  td_r_new=TOFG+(0.5*SciLengGL - Z)*0.05e-09*sqrt(2.)  
  kd_r=(td_r_new-25.e-09)/Time_bin_Width
```

```
  energ_r=1000.*Energy*exp( Z/AttLn)
```

“Right” Smearred Histogram

```
  do k=kd_r,MSTIME  
    tv_r1(ICell,k)=tv_r1(ICell,k)+  
+      energ_r*exp((kd_r-k)/tau5ns)*  
+      (1.-exp((kd_r-k)/tau1ns))  
  enddo  
endif
```

End of Each Event

Leading-Edge Timing

```
do i=1,Num_of_Cells

  do j=1,MSTIME
    if (tv_l1(i,j) .le. Thrsh) then
      td_l1(i)=j*Time_bin_Width+25.e-09
    else
      goto 201
    endif
  enddo
201 continue

  do j=1,MSTIME
    if (tv_r1(i,j) .le. Thrsh) then
      td_r1(i)=j*Time_bin_Width+25.e-09
    else
      goto 301
    endif
  enddo
301 continue

enddo
```