ACD Simulation Status

Heather Kelly
GSFC/SSAI
GSFC Cast of Characters

Dave Thompson (GSFC) Subsystem Manager
Tom Johnson (GSFC) Instrument Manager
Alex Moiseev (GSFC) Lead Scientist
Bob Hartman (GSFC) ACD Scientist
Analia Cillis (GSFC/NRC) Simulations
What has happened lately?

Upgrade digitization routines.
Major overhaul of digitization data output
  Data available within Gaudi TDS and in ROOT
Doxygen documentation for both AcdDigi
  and AcdRecon packages
  http://www-glast.slac.stanford.edu/software/ACD
Performance evaluation is in progress.
  Now Due October 30th
Current ACD Simulation Geometry

No side tile tilt or curved edges along the top
Base Electronics Assembly (BEA) is not included
Support structure and thermal blanket need to be updated.
Output Classes

AcdDigi

- Every AcdDigi corresponds to one detector associated with 2 PMTs.
- Each AcdDigi contains:
  2 PHAs
  2 Sets of Discriminators
    low
    veto
  CNO
  Energy deposited in MeV

AcdRecon

- One AcdRecon object per event.
- Each AcdRecon contains:
  Total energy deposited
  Count of ACDs above veto threshold
  DOCA
  List of DOCAs for top, sides
  Active Distance
  List of Act Distance for top, sides
  Collection of recon energies
Primary outputs (both originally designed by Bill Atwood):

1) Active Distance: measures distance from edge (done once for entire ACD, and by region)

2) Distance of Closest Approach (DOCA): measure distance from the center of a tile. Done also for different regions of the ACD, since tile size varies.

Recon also provides: energy deposition estimate and counts of tiles above threshold by region.

Note: As work to make the ACD digitization more realistic is nearly finished, will now update recon output.
Overview

Gaudi Algorithms

- AcddigiAlg
- AcdReconAlg

TDS

- McPositionHitCol
- AcddigiCol
- TkrFitTrackCol
- AcdRecon

GLAST
AO days before PDR

ACD response solely based on MC energy depositions

pdrApp

ACD response produces one PHA for every tile where conversion from MC energy deposition is based on constant conversion factor

X MeV => Y PHA

Now

2 PMTs per tile and discriminators – including edge effects, Poisson fluctuations and Gaussian noise.
AcdDigi Package

Two Gaudi algorithms
AcdDigiAlg – uses McPositionHitCol, optional edge effects
AcdDigiOrgAlg – original PDR alg

Gaudi Algorithms and AcdUtil class
accdigi.xml – input parameters
Locate ACD volumes

Edge Effects

Convert MeV To MIPs

Convert MIPs to PEs

Apply Poisson Fluctuations

Apply Gaussian Noise

Split signal between 2 PMTs

Calc. MIPs to Full Scale conversion

If MIPs > low threshold

Convert PEs to MIPs

TDS

Optional

MIPs to PHA Set Veto & CNO Discriminators

McPositionHitCol

AcdDigiCol
Edge Effects

Depending upon where a particle hits an ACD tile, the amount of energy “seen” will vary. This is modeled by a simple linear function, where positions further than 20 mm from an edge are unaffected.
AcdRecon Package

Currently based on original AcdRecon from glastsim and pdrApp with some updates.
AcdRecon output will be updated soon.

AcdRecon
- cmt
- doc
- src
- xml

AcdReconAlg and AcdDisplay

acdBFEM.xml – input parameters
Look! A Plot!!

300 MeV mu+ normal incidence - center
To Do List

  Side tile tilt, BEA, upgrade blanket & micrometeorite shield
Overhaul AcdRecon data output
Treat ribbons as detectors
Finish Performance tests
Calibration