SuperGLAST configuration

Preliminary Results

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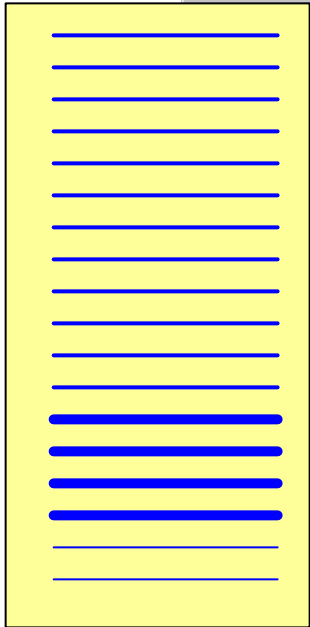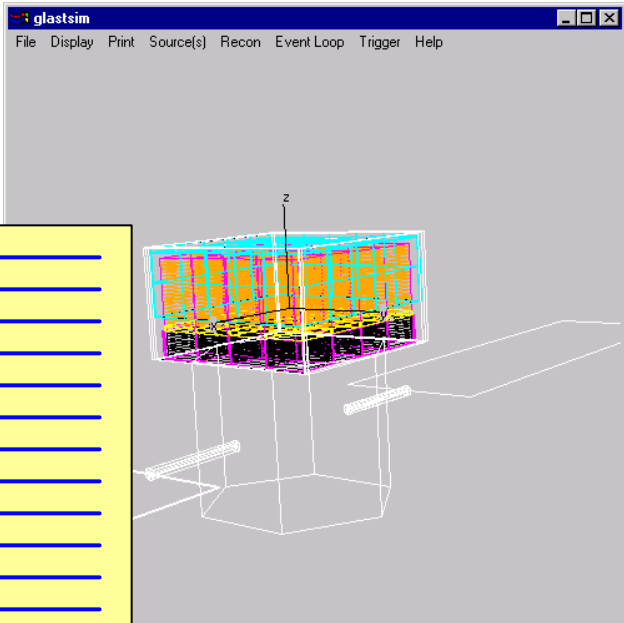
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Outlook

Premises: $PSF \sim \sqrt{X_0|_{plane}}$ $Aeff \sim X_0$ $Total \sim 2 X_0$

Idea:

Thick converter material for the bottom planes

Effects: $PSF|_{thick} \approx 2 \times PSF|_{thin}$ $Aeff|_{thick} \approx 5 \times Aeff|_{thin}$

thin converter layers

- similar PSF to GLAST baseline
- less acceptance for low energy photons
- worse energy resolution

thick converter layers

- Large effective area
- relatively good PSF for high energy photons
- good energy resolution

Configuration:

12 planes with 3.4% X0 Pb converter

4 planes with 25% X0 Pb converter

Expectations:

FoM (source sensitivity) $FoM = \dfrac{\sqrt{Aeff}}{PSF} \approx const$

Large Aeff - better determination of energy spectrum

possible advantages for Two sources identification

Deterioration of energy resolution for the "thin" conversions at low energy

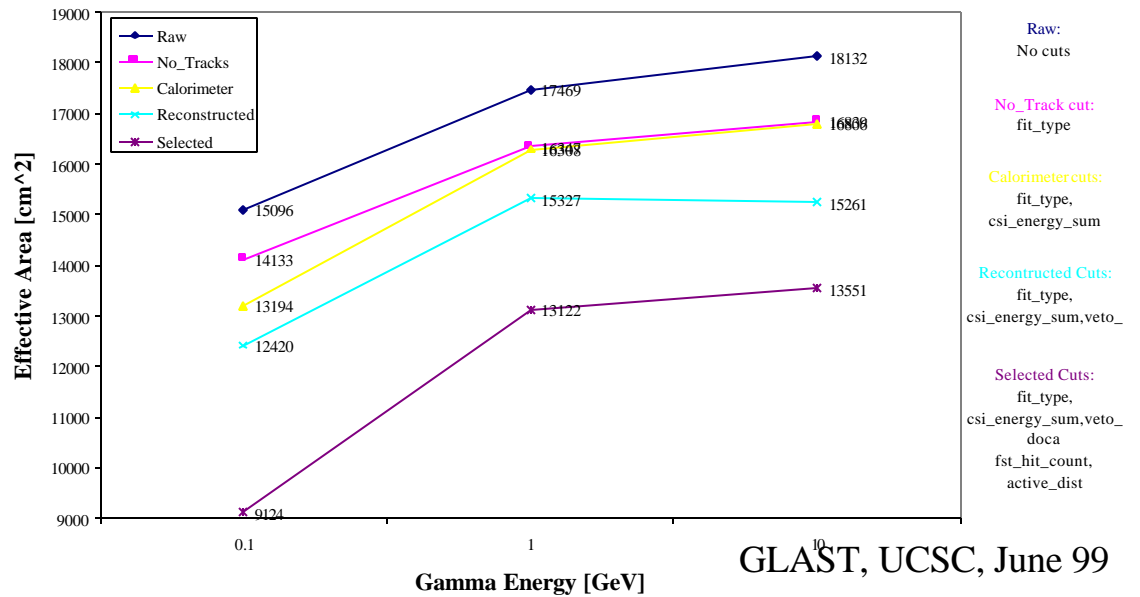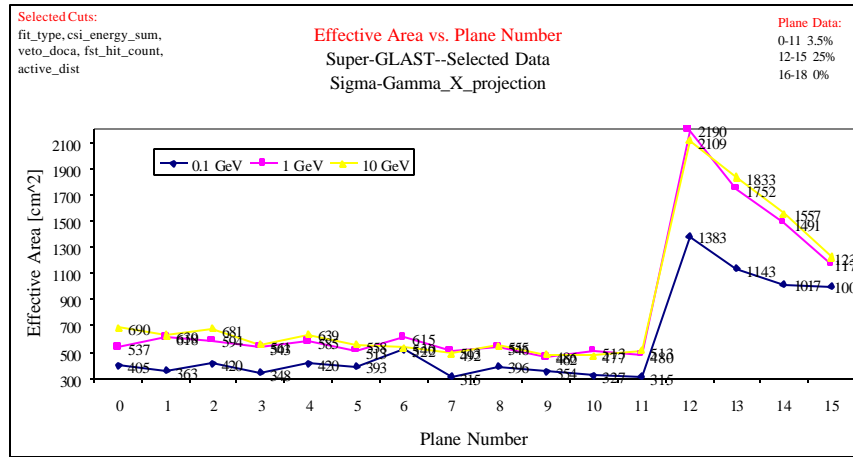Determination of the energy using the tracker.

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Configuration

Effective Area

Effect of the flux reduction

Effect of calorimeter acceptance
for low energy photons

Selected Cuts:
fit_type, csi_energy_sum,
veto_doca, fst_hit_count,
active_dist

Effective Area vs. Plane Number
Super-GLAST--Selected Data
Sigma-Gamma_X_projection

Plane Data:
0-11 3.5%
12-15 25%
16-18 0%

Raw:
No cuts

No_Track cut:
fit_type

Calorimeter cuts:
fit_type,
csi_energy_sum

Recontructed Cuts:
fit_type,
csi_energy_sum,veto_

Selected Cuts:
fit_type,
csi_energy_sum,veto_
doca
fst_hit_count,
active_dist

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Results for 100 MeV gammas

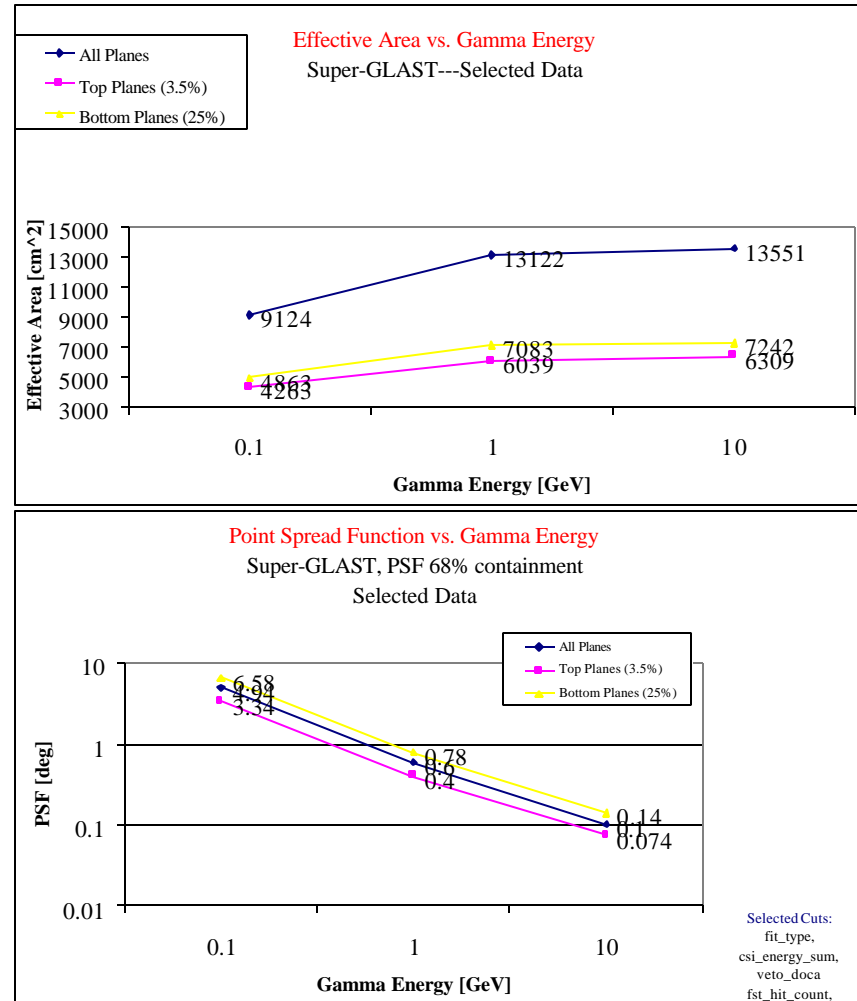| Super-GLAST					
Point Spread Function Studies: Gamma X-direction, Gamma Space					
Data Analysis Program: Interactive Data Language (IDL)					
0.1 GeV, 0deg					
		Gamma X-dir	Gamma Space		
		PSF-68%	**PSF-68%**	**PSF-95%**	**Effective Area**
Total Evetns					15096
Tracker Events					14133
Calorimeter Events					13194
ACD (veto_doca)					12420
Reconstructed	*Top*	0.03366	0.0663	0.2046	5601
	Bottom	0.06015	0.12422	0.286	6819
	Total	0.04434	0.0965	0.263	12420
First_Hit_Count	*Top*	0.03334	0.06207	0.1926	4944
	Bottom	0.05869	0.1183	0.2694	5421
	Total	0.04299	0.0892	0.2452	10365
Selected	*Top*	0.0327	0.0584	0.1728	4263
	Bottom	0.0583	0.1149	0.2645	4863
	Total	0.0425	0.0863	0.2363	9124

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PSF and Aeff for selected data

Selected data:

80% efficiency for selection

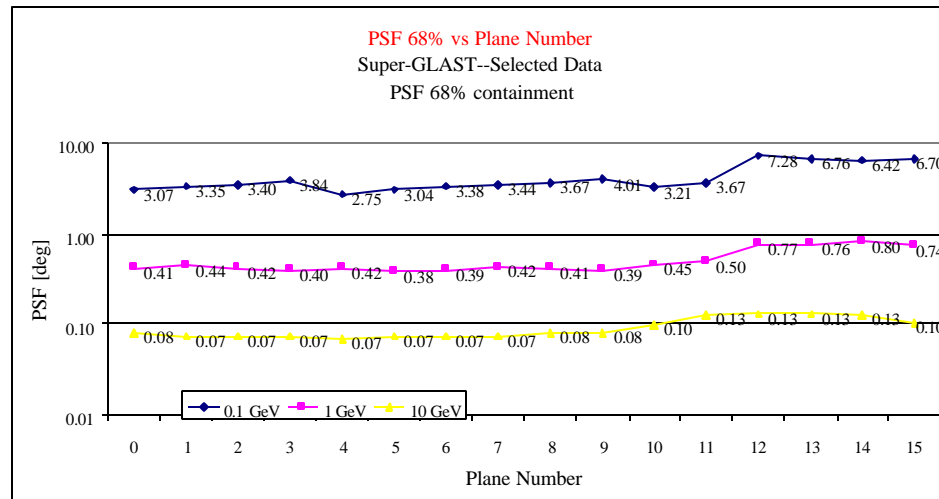Removed tails in low energy photons
(100 MeV), >15% improvement

Effective Area vs. Gamma Energy
Super-GLAST---Selected Data

- All Planes
- Top Planes (3.5%)
- Bottom Planes (25%)

Effective Area [cm^2]

15000
13000
11000
9000
7000
5000
3000

9124

13122   13551

7083   7242
6039   6309
4263

0.1   1   10

Gamma Energy [GeV]

Point Spread Function vs. Gamma Energy
Super-GLAST, PSF 68% containment
Selected Data

10

- All Planes
- Top Planes (3.5%)
- Bottom Planes (25%)

PSF [deg]

1

0.1

0.01

6.58
4.91
3.34

0.78
0.6
0.4

0.14
0.1
0.074

0.1   1   10

Gamma Energy [GeV]

Selected Cuts:
fit_type,
csi_energy_sum,
veto_doca
fst_hit_count,

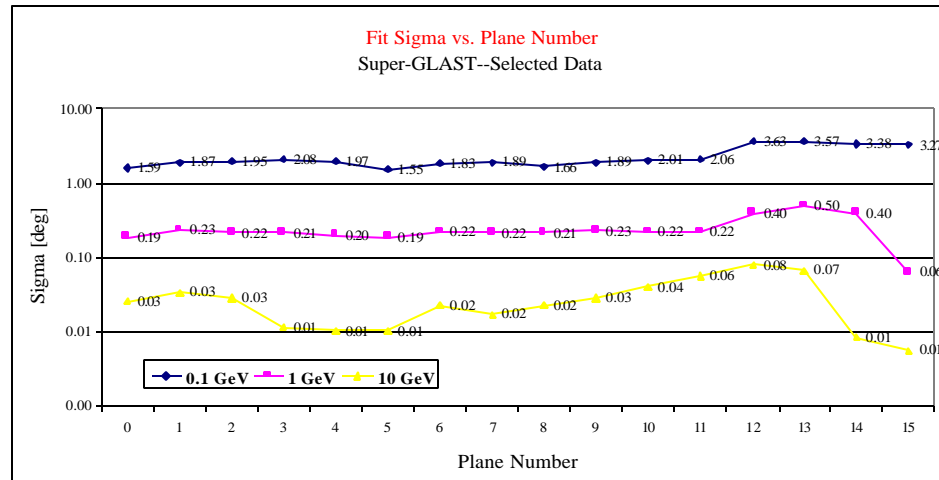U. California, Santa Cruz

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Configuration

Selected Data

Projected resolution behavior depends on conversion plane,

- Improvement for last planes, due to "digital" effects of the SSD.

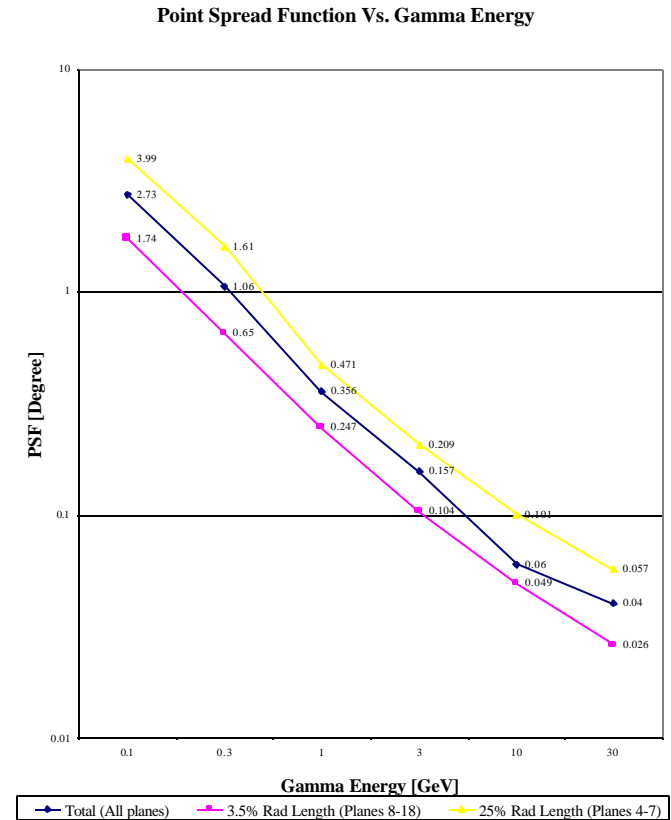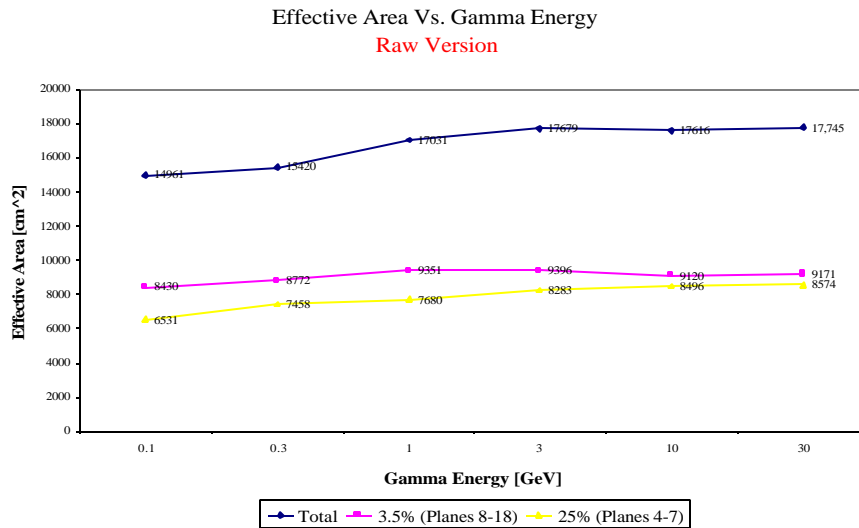The PSF (68%) shows smaller dependence.

Fit Sigma vs. Plane Number
Super-GLAST--Selected Data

PSF 68% vs Plane Number
Super-GLAST--Selected Data
PSF 68% containment

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Aeff and PSF results

Aeff and PSF results obtained with the previous version
of the Pattern Recognition

Point Spread Function Vs. Gamma Energy

Effective Area Vs. Gamma Energy
Raw Version

Acceptance of SuperGLAST

Acceptance of SuperGLAST
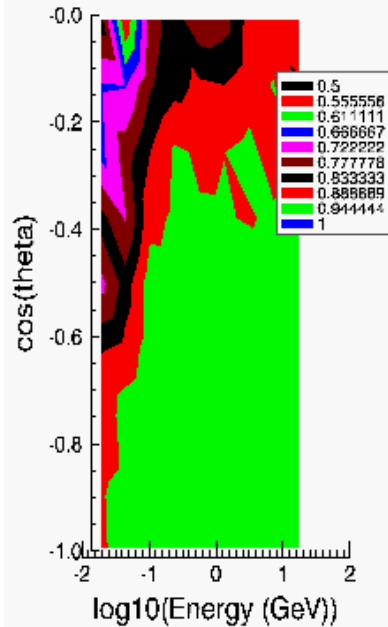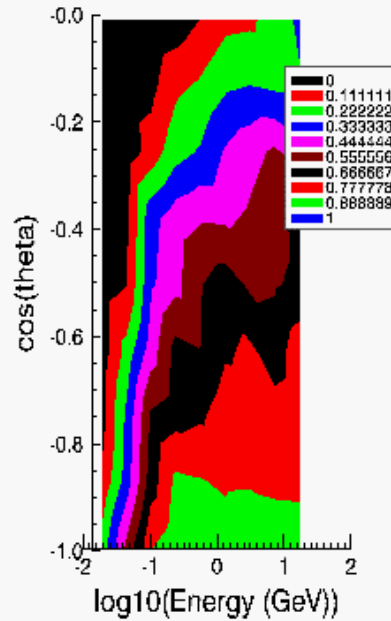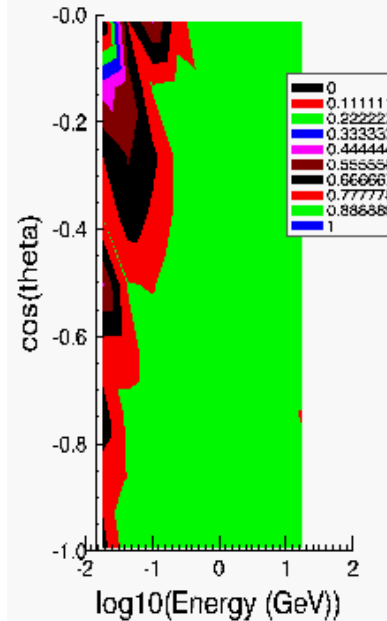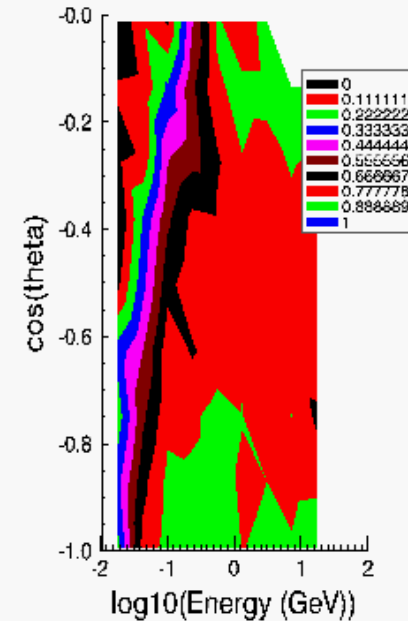
Conclusions

Preliminary studies of SuperGLAST at normal incident gammas:

- The thin part behaves as the Baseline in terms of PSF

- The thick part has slightly worse resolution than expected due to small lever arm and "digital" measurement effects

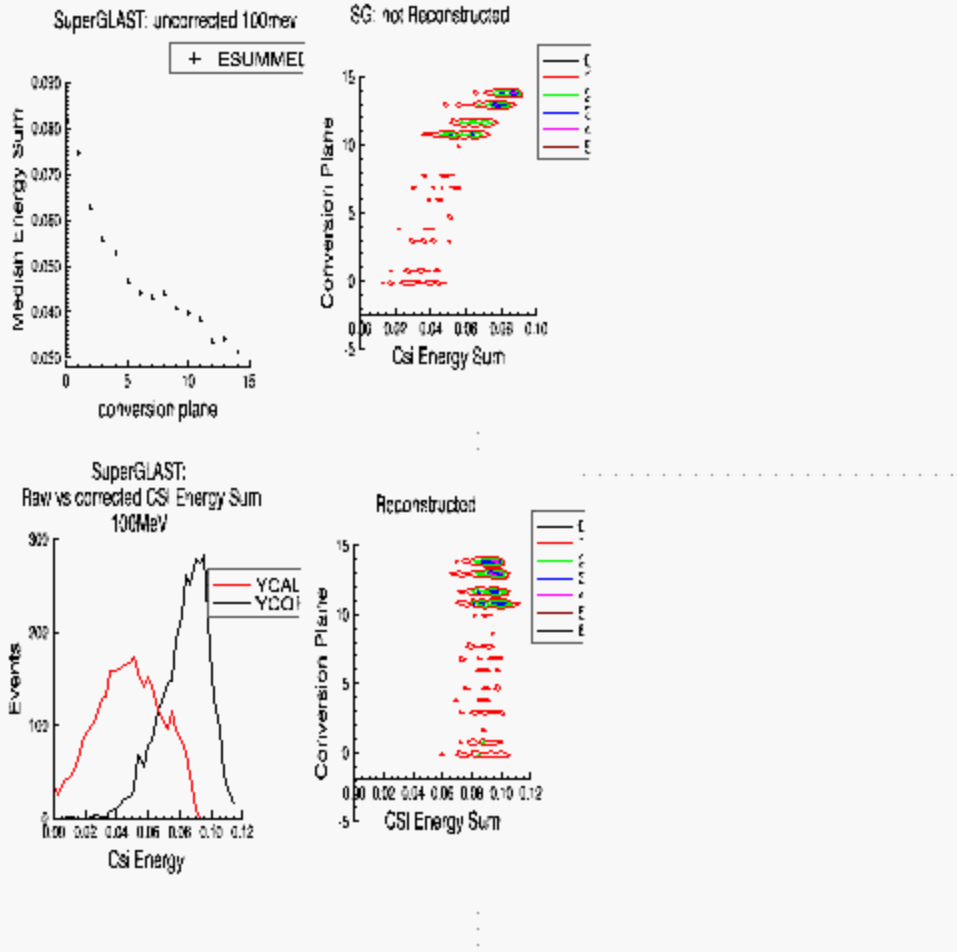- The simulations agree with naïve expectations

Prospect for the future:

- Study All direction gammas

- Implementation of the energy corrections

- Better understanding of the "cleaning" cuts.

Energy correction

Bill Atwood's correction is available and works but hardwire.

Preliminary Energy correction:

    total number of hits

    number of hits on a gamma cone
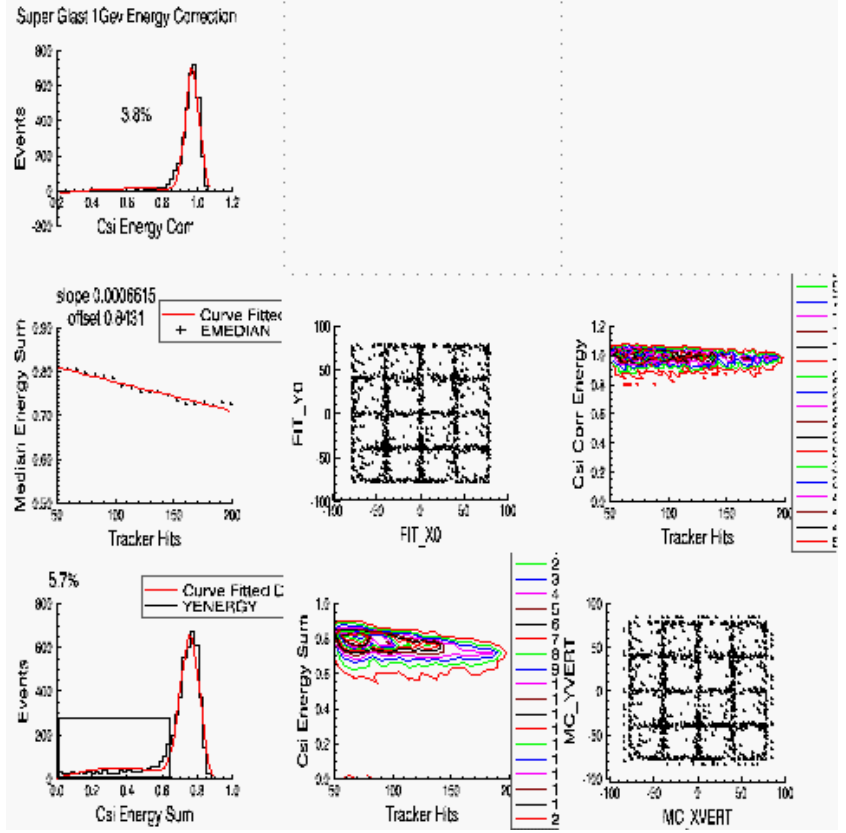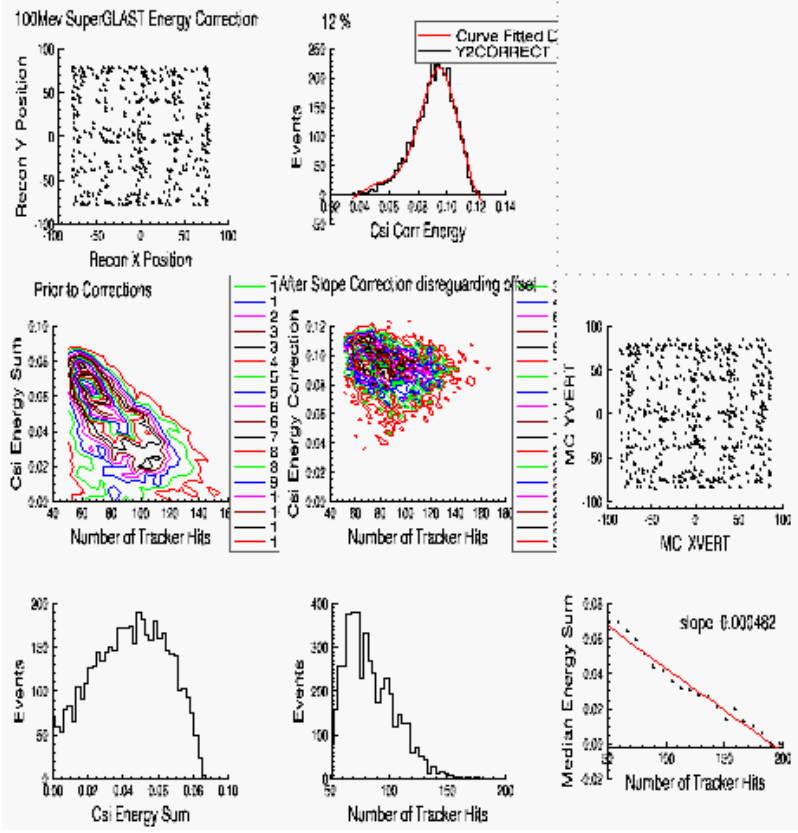
    dependence with the tower distance

Energy correction

100 MeV - total hits correction

1 GeV - total hits correction

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GLAST configuration

PSF and Aeff for selected data

Reconstructed Data

• Aeff double respect to the baseline.

• PSF for the thick part slightly worse than expected, due to the small level arm (few planes) and the "digital" measurement of the SSD.

Effective Area vs. Gamma Energy
Super-GLAST--Reconstructed Data

Effective Area [cm^2]

18000
16000
15327   15261
14000
12420
12000
10000
8316   8178
8000
6819   7011   7083
6000
5601
4000
2000
0

— All Planes   — Top Planes (3.5%)   — Bottom Planes (25%)

0.1   1   10

Gamma Energy [GeV]

Point Spread Function vs. Gamma Energy
Super-GLAST, PSF 68% containment
Reconstructed Data

PSF [deg]

10
7.1
4.53
3.8
1
0.82
0.6
0.4
0.1
0.14
0.074
0.01

All Planes
Top Planes (3.5%)
Bottom Planes (25%)

0.1   1   10

Gamma Energy [GeV]

Recontructed Cuts:
fit_type, csi_energy_sum,
veto_doca

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