

GLAST Photon Angular Resolution PSF vs. Pitch

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I. Photon Angular Resolution

The angular resolution depends, for fixed pitch, on the mass between point of conversion and measurements, and, to a lesser degree in the energy range up to 10GeV, on the lever arm of the measurements. It is represented by PSF(68), the 68% containment space angle. For the AO layout, the PSF(68) has been evaluated as a function of energy for the front 12 layers and the back 4 layers separately. Figure 1 shows the angular resolution for each layer of the AO design (201micron pitch) for three energies (0.1, 1.0 and 10GeV). The increase in PSF(68) in the Back portion is evident. (There is a curious effect in the last Back layer, where we observed improved resolution: this is due to the additional two tracker layers, which carry no converter.)

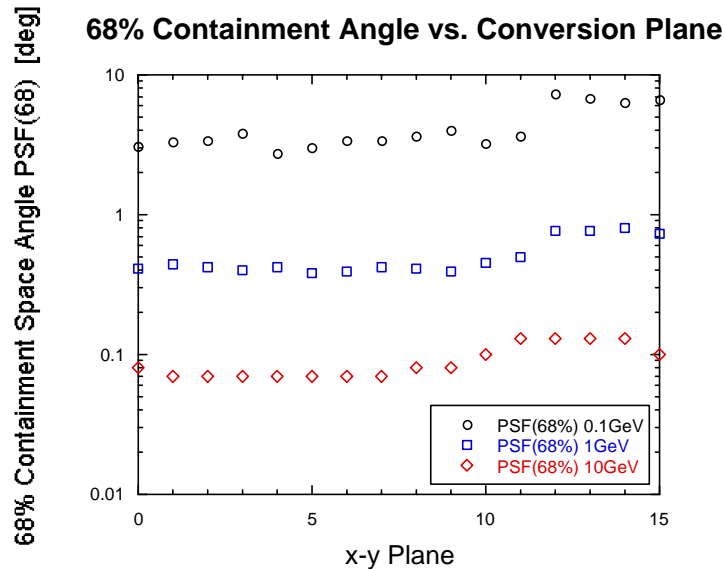


Figure 1 Photon Angular Resolution PSF(68) per layer for the AO layout for three energies: 0.1, 1.0, 10 GeV (12 layer Front section with 2.5% converters, 4 layer Back section with 25% converters, 2 layers w/o converters).

II. Increasing the Pitch

The effect of a pitch change on the PSF(68) is shown in Figure 2: it is more pronounced at higher energies where the multiple scattering is somewhat less of a factor. In Table 1, the angular resolution is shown for three pitches and the three energies considered.

Table 1 Effect of Pitch Increase on Angular Resolution, Power, Noise, Signal

Pitch [micron]	PSF(68) [deg]			TKR Power [W] (Change [%])	Noise Increase EoM@25deg [%]		Signal Increase @80deg Incidence
	0.1GeV	1.0GeV	10GeV		1x	5x	
201	3.17	0.40	0.081	210 (0)	0	0	0
235	3.24	0.41	0.085	184 (- 12)	5	6	17
282	3.26	0.42	0.091	159 (- 24)	25	22	40

Increasing the pitch by 40% increases the PSF(68) by 12% at 10GeV. The slope of the PSF(68) vs. pitch curve gives the sensitivity of the resolution to the pitch. It decreases between 1GeV and 10GeV, which can be understood from the fact that the lever arm of the measurement increases between 1GeV and 10GeV due to the decreased importance of the multiple scattering in the measurement. At very high energy ($E \gg 10\text{GeV}$), we expect that the PSF(68) varies proportional to the pitch increase.

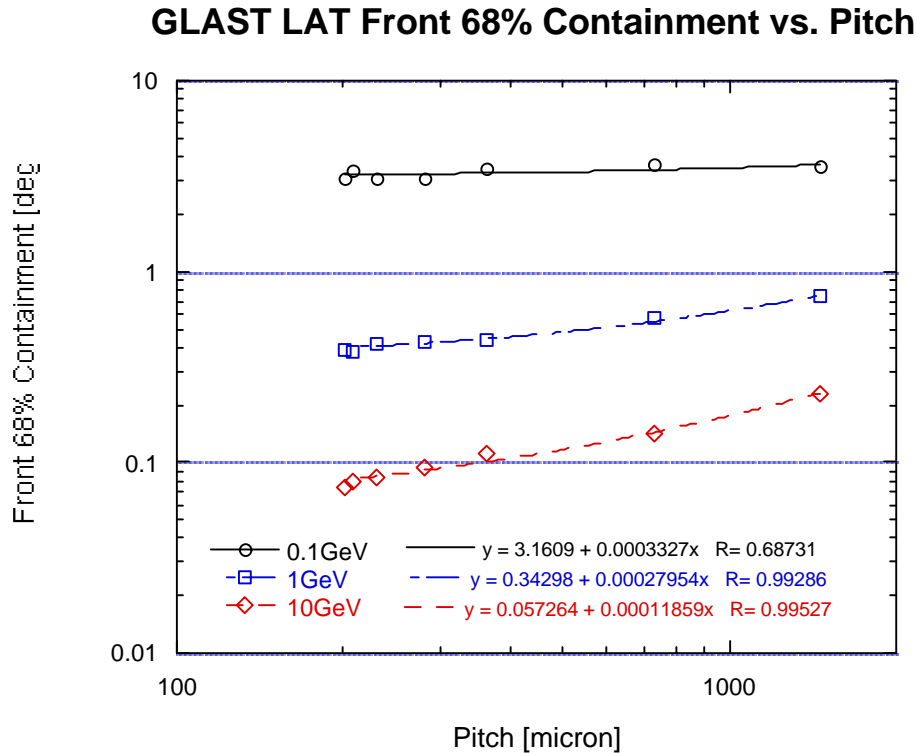


Figure 2 Angular Resolution (PSF(68)) for the 12 layer Front section with 2.5% converters as a function of pitch. The angle of incidence is 5degrees relative to the normal.