
Positron BG on GLAST/EGRET

GLAST Calibration/Analysis VRVS meeting

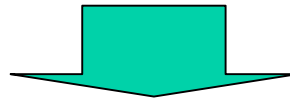
April 17, 2006

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Purpose of this Study

- Expected BG level of LAT is close to extragalactic γ -ray flux for $E < 100$ MeV (Bill's talk at DC2 kickoff meeting). Significant contribution from positron – they are Irreducible.
- EGRET didn't observe rigidity dependence of BG, implying no significant contamination from charged particles.



- Is positron flux in DC2 BG model too high than real? Study by Simulation.

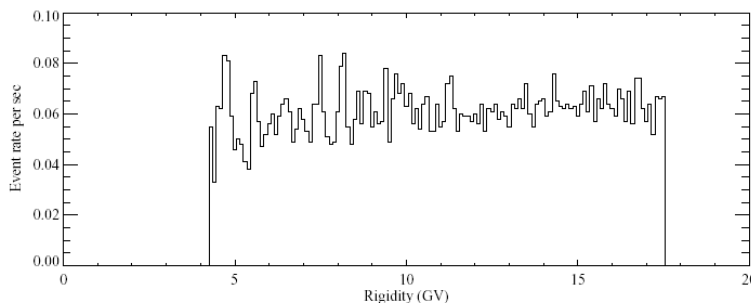
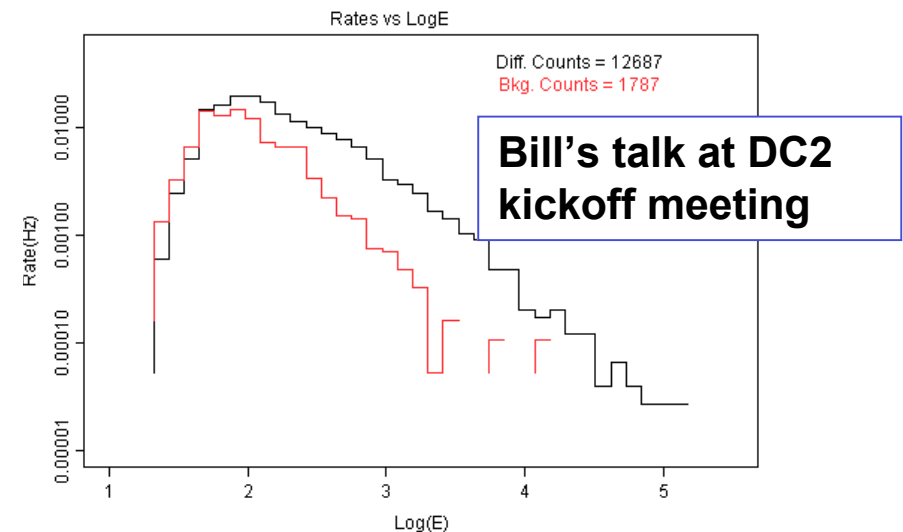


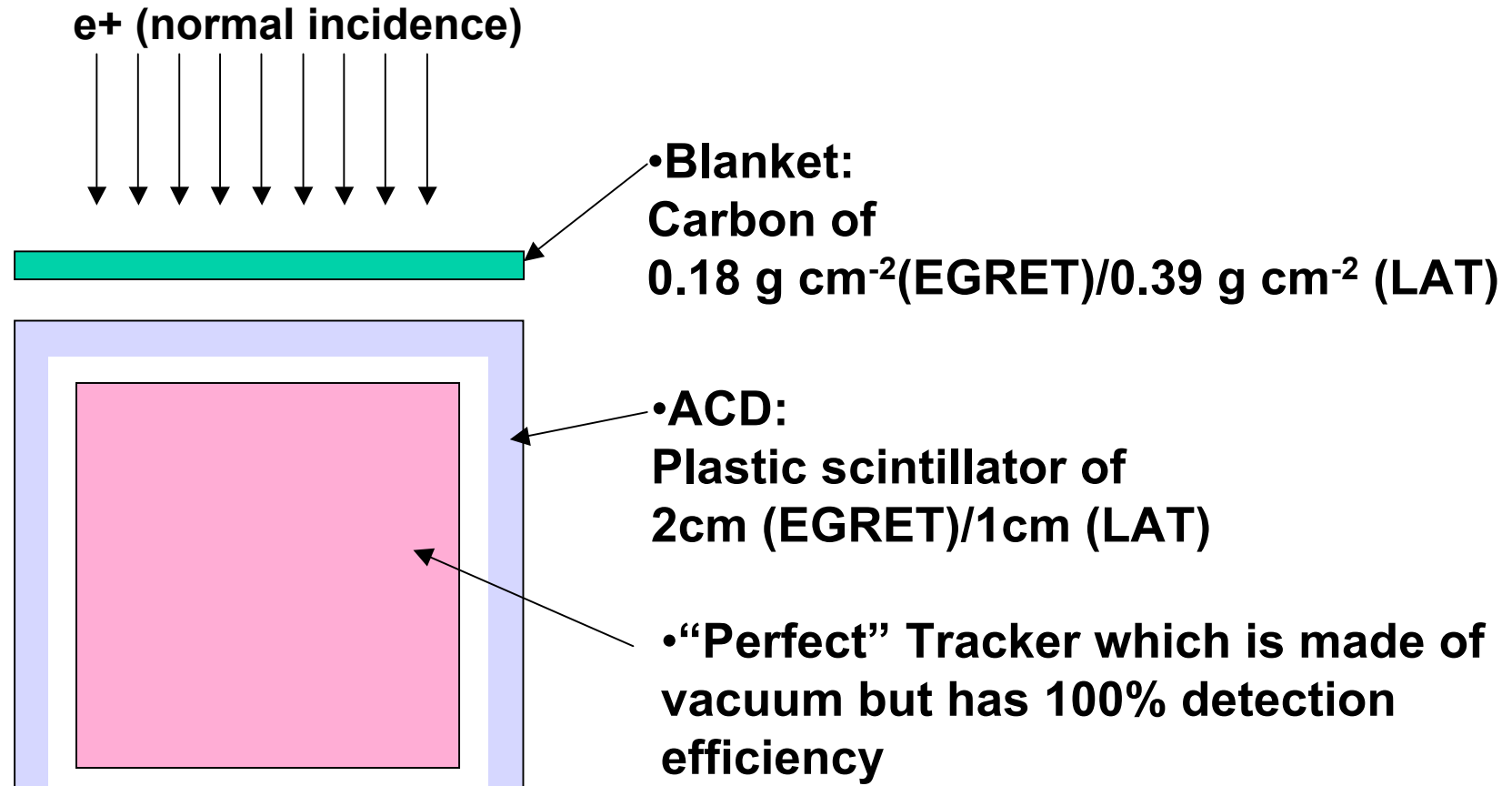
FIG. 1.—Accepted gamma-ray events as a function of geomagnetic rigidity. The absence of a rigidity dependence implies no measurable contamination by charged-particle induced events.

Sreekumar et al. 1998



Simulation

Simulate very simplified LAT/EGRET and evaluate the BG induced by positron.



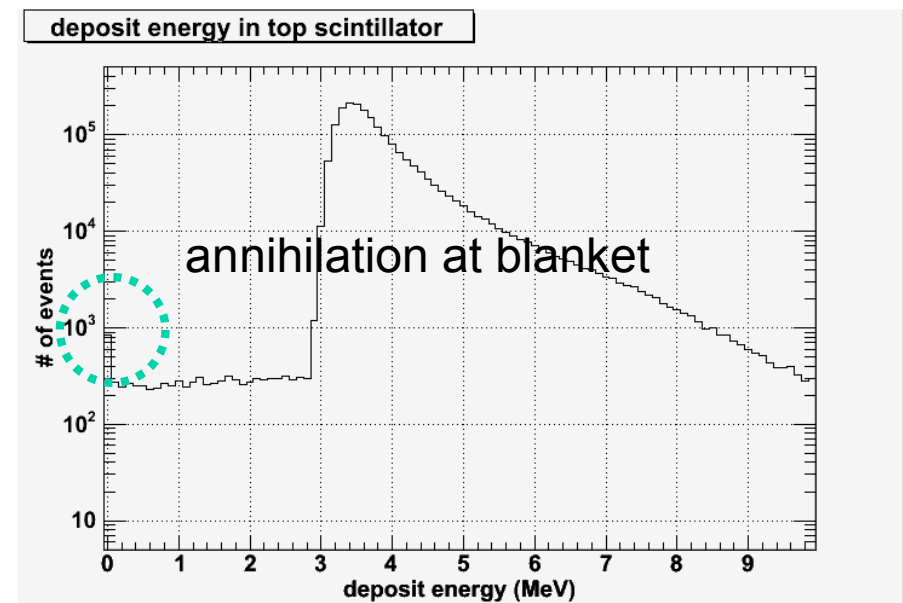
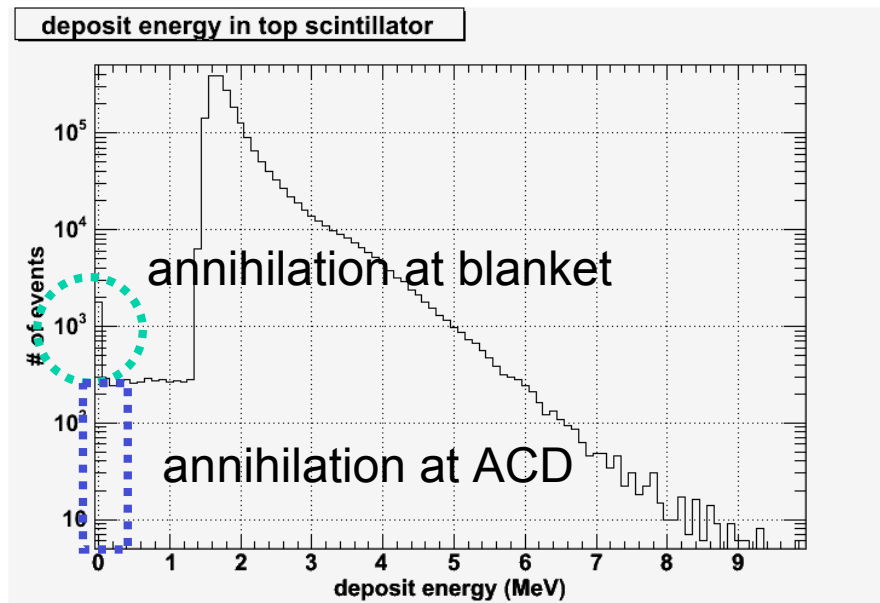
ACD threshold: 10 keV(EGRET)/500 keV(LAT; corresponds to ~ 0.3 MIP)

Result (1)

Deposit energy distribution in top ACD tile. Energy resolution is not taken into account for simplicity

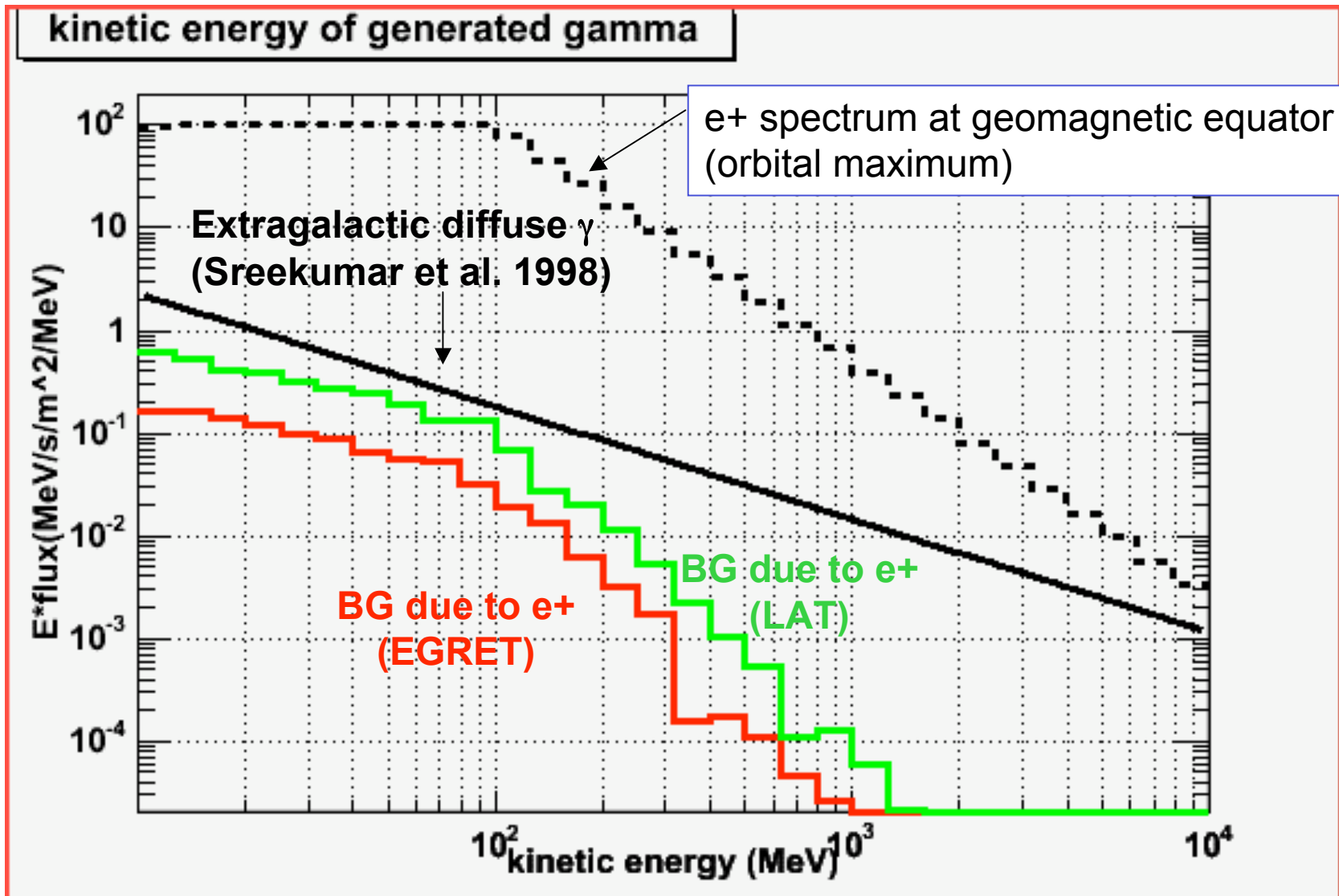
LAT

EGRET



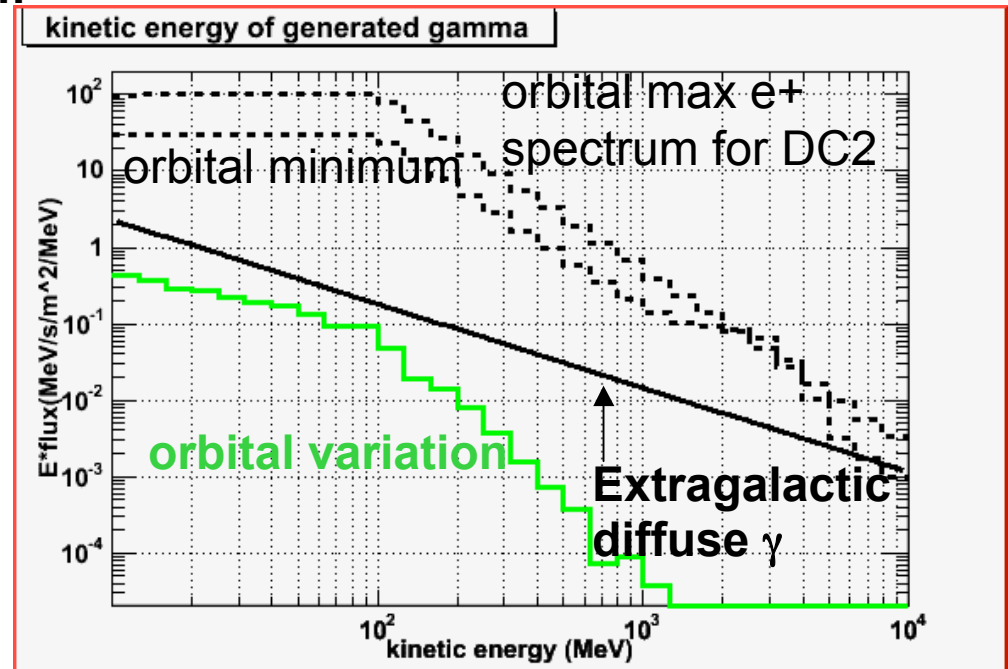
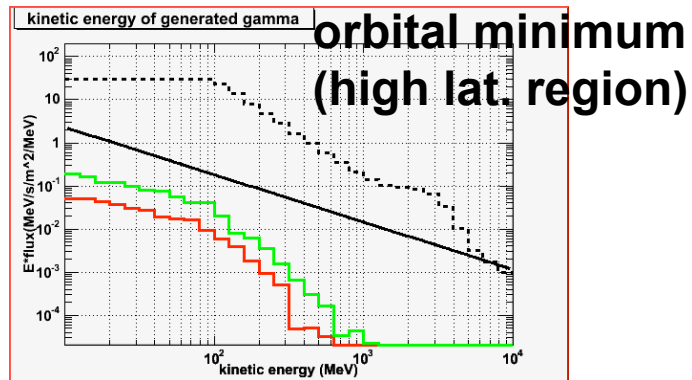
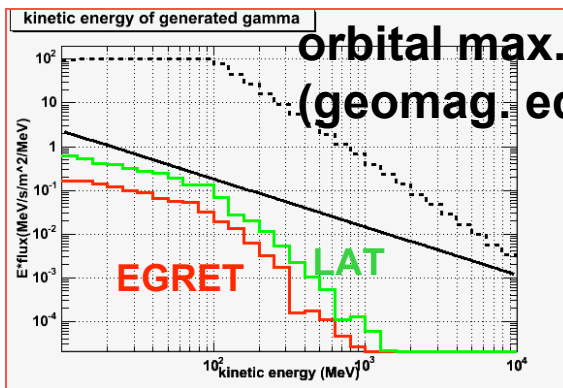
Positron annihilation at blanket (EGRET/LAT) and at ACD (LAT) induces irreducible BG.

Result (2)



Possibility of observing orbital variation

It will be nice if we can bound the BG induced by positron with orbital variation.

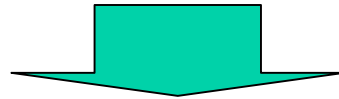


Please note: e-/e+ flux below 150 MeV is uncertain and need to be validated (see also our talk on March 13th), so please don't take this plot as the prediction for real flight.

Conclusion

•BG induced by positron is $\sim 1/10$ or lower of extragalactic γ -ray flux for EGRET. No wonder why EGRET didn't observe significant orbital variation of γ -ray flux. (Sreekumar et al. 1998)

•BG due to e^+ is about $1/2 \sim 1/3$ of extragalactic γ -ray flux for LAT at orbital maximum. Part of them is due to annihilation at blanket and the others is due to annihilation at ACD. (Please note that LAT has thicker blanket and higher ACD threshold than those of EGRET.)



•EGRET observation and DC2 LAT simulation are consistent. It is not that BG flux model for DC2 is much higher than real.

•Orbital variation would be $1/3 \sim 1/4$ of extragalactic diffuse γ -ray flux and could be measurable and constrain the BG level.