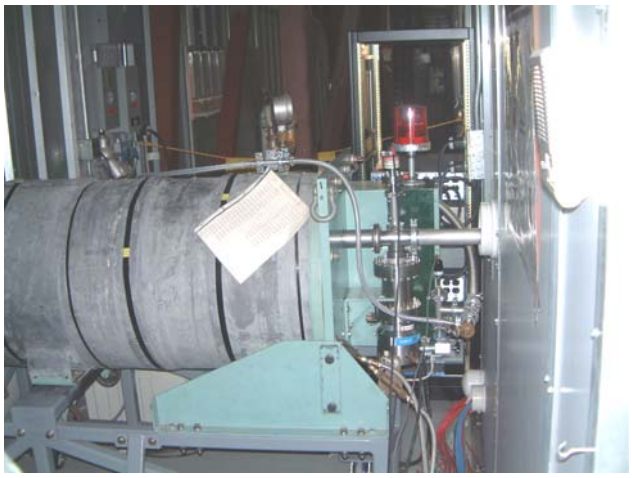
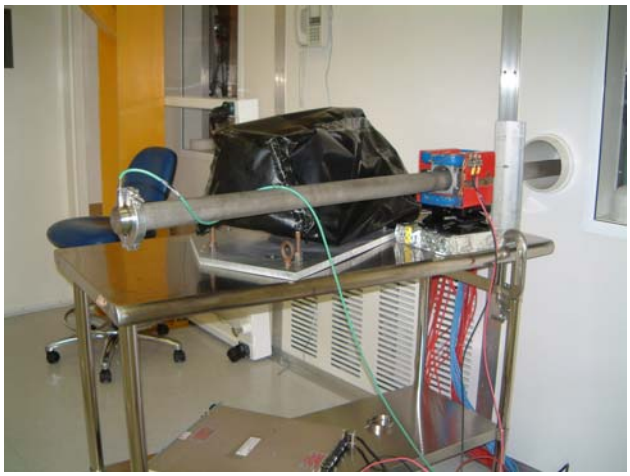
Van de Graaff Photon Rates

May 12, 2004 GLAST All Hands Meeting
Gary Godfrey

1) The Van de Graaff (VG) has been rebuilt with an oil free vacuum system and is reinstalled by the Bldg 33 cleanroom.

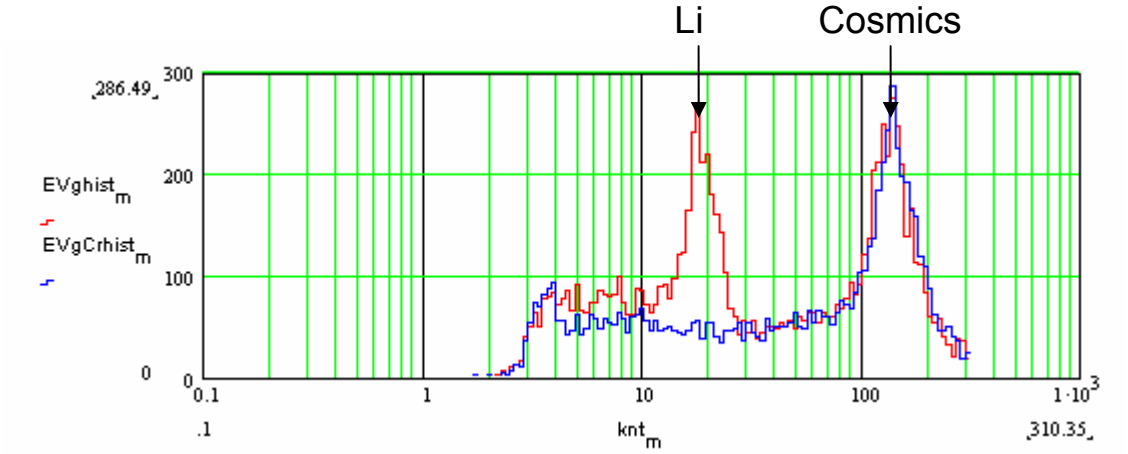




2) The VG now produces 17 MeV gammas from a Li target at the same rate it did for the EM test.

$$P\ (440\ KeV) + Li^{7} \rightarrow Be^{8*} \rightarrow Be^{8} + \gamma\ (17.6 \text{ or } 14.6\ MeV)$$

Gammas per 5% Energy Bin in BGO

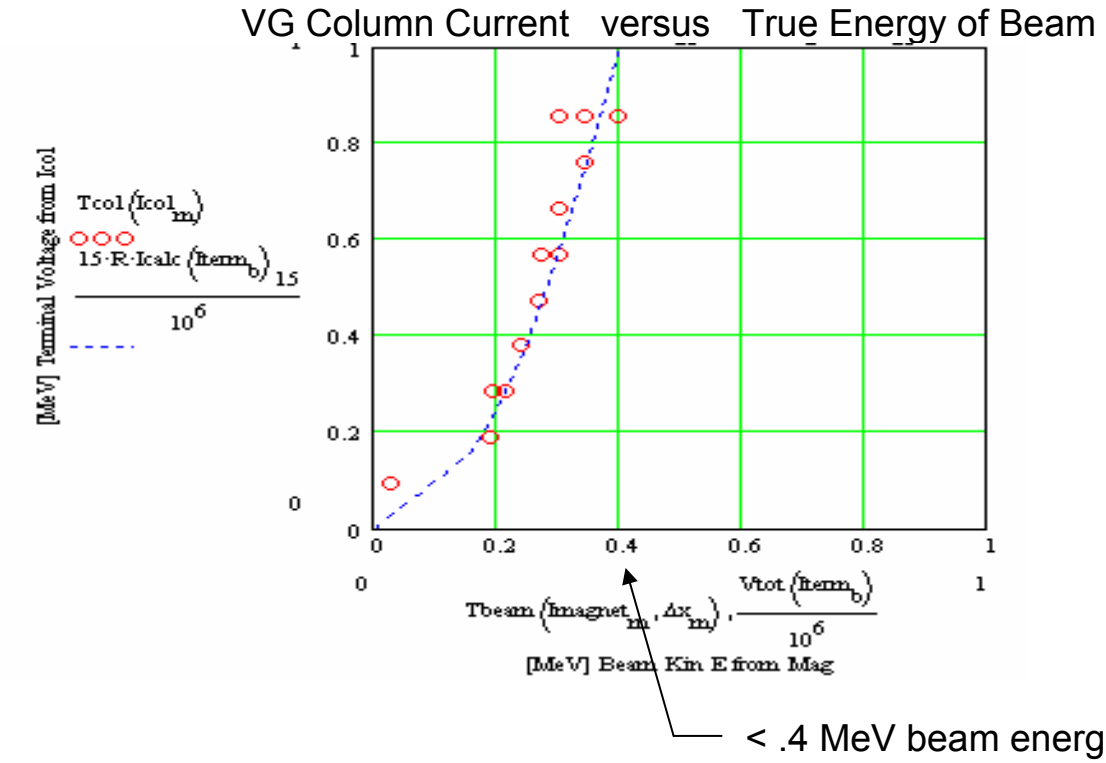


[MeV]

(Red=VG on Blue=VG off)

Expect ~100 times more 17 MeV γs, but VG can't reach 440 keV.

3) Measured the true beam energy by bending the beam with a magnet



The manufacturer says that VG model LC-400 has a 400 KeV max energy.

When the magnet is on, two spots are seen on the scintillator. The dim (~10%) spot is from protons (H^+) and the bright (~90%) spot is from H_2^+.

The spots are typically ~1 cm diam but can sometimes be focused to ~3 mm diam.

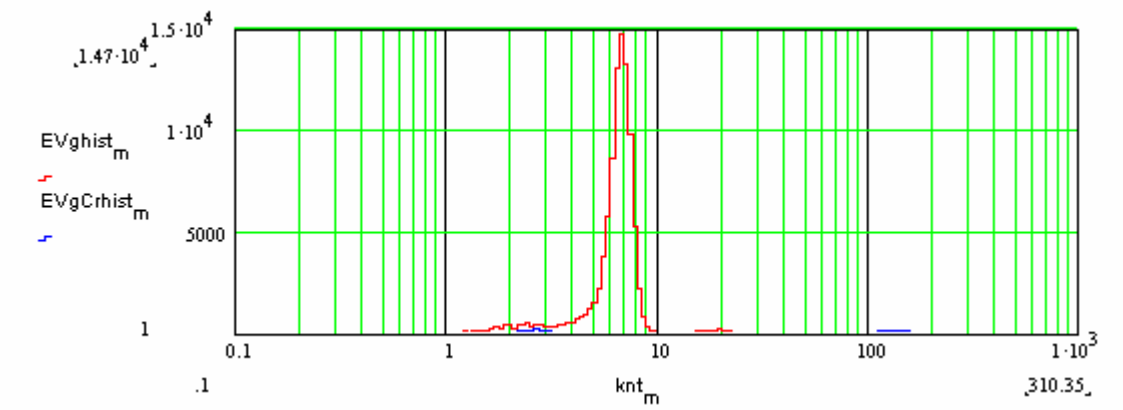
4) For the high rate LAT trigger test, a different target (LiF) and gamma ray energy will be used.

$$P\ (340\ KeV) + F^{19} \rightarrow O^{16*} + \alpha$$

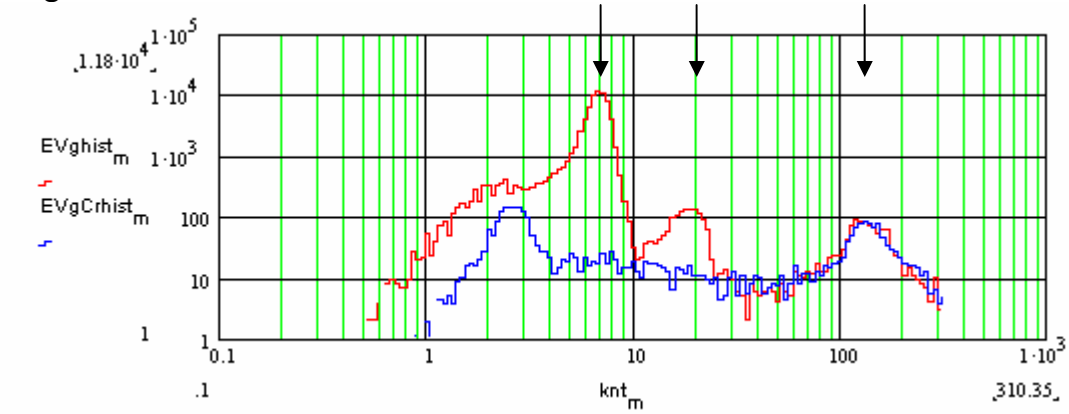
$$\rightarrow O^{16} + \gamma\ (6.1\ MeV)$$

When the O^{16*} resonance is hit, this reaction produces 1.7 x 10^{-8} γ/proton (similar to the 1.9 x 10^{-8} γ/proton for the 17 MeV γs from Li).

Linear counts Gammas per 5% Energy Bin in BGO



Log counts F Li Cosmics



[MeV]

(Red=VG on Blue=VG off)

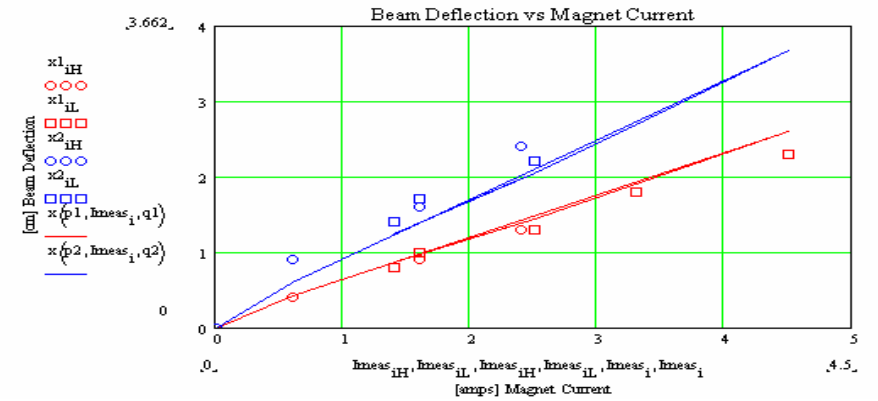
5) Summary of best average VG rates over ~20 minute run.

Target (Lines)	[γ/sec] into 4π sterad	LAT 6 hit TkrTrig Rate (MC acceptance) [Hz]
LiF (17.6 + 14.6 MeV γ)	1,200	300
LiF (6.1 MeV γ)	76,000	1,900 - 19,000 (in progress)

Extra Slide

Magnetic analysis of beam shows two spots due to H^+ and H_2^+.

[cm] Beam Deflection versus Magnet Current



[amps]

Blue= dim(~.1) spot, and curve is for 320 KeV H^+ (makes the γs)
Red= bright(1) spot, and curve is for 320 KeV H_2^+

Thus, beam energy is 320 KeV for this 75 uA column current.