GLAST Large Area Telescope:

Particle Test
"Roadmap to Integration"

March 9th, 2004

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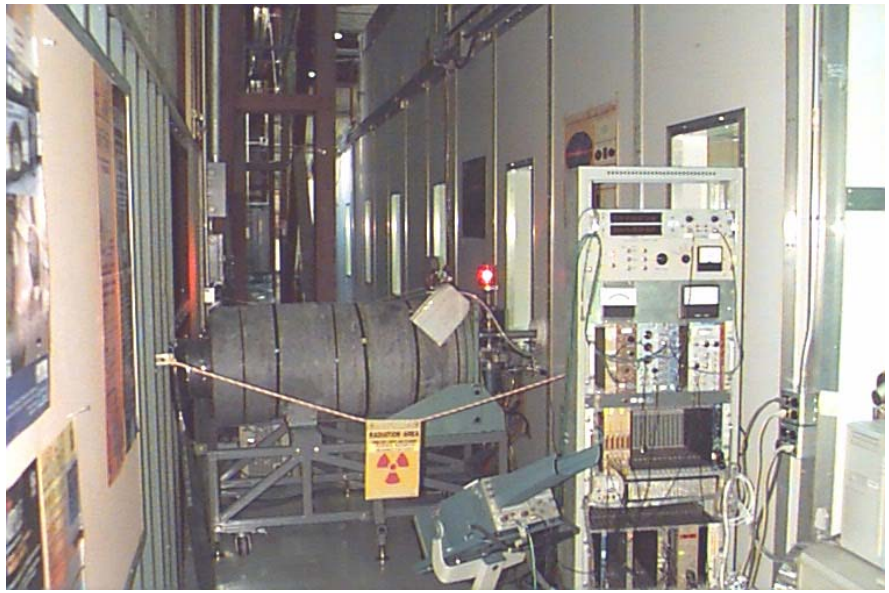
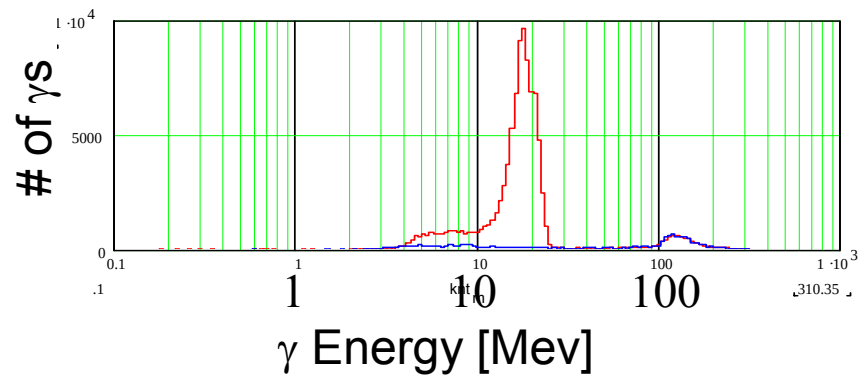
The Equipment

- **Van de Graff**
  - **100% uptime during EM test**
  - **Typically 1 x 10^3 γ/sec into 4π ster**
- **BGO Monitor**
  - **100% uptime during EM test**
- **Cosmic Ray Scintillator Telescope (24” x 24”)**
  - **100% uptime during EM test**



Van de Graff EM Results

- **BGO spectra**
  - **VG off (blue) – see cosmics**
  - **VG on (red) – see γ's + cosmics**



- **EM sees photons**
  - **Tracks point back at target**
  - **EM effic for γ is as expected**
  - **EM psf is as expected**

~0° Effic = $\frac{\gamma \text{ per steradian seen in EM}}{\gamma \text{ per steradian seen in BGO}}$

= $\frac{1200/(.02 \times 2\pi \text{ ster})}{1152 \text{ sec} \times 13.35 \text{ Hz} /(.15 \text{ ster})}$

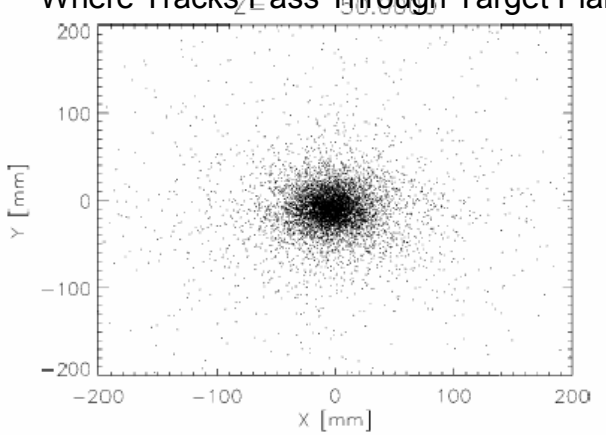
= .093 ± .01 (due to ±5% BGO dist error)

$\theta_{68\ \text{Measured}}$ = acos(.88) = 28° (at 0°)
$\theta_{95\ \text{Measured}}$ = acos(.46) = 63° (at 0°)

θ_{target} ~ (.75"/2.0") x (180/π) = 21°

$\theta_{68\ \text{EM PSF}}$ ~ sqrt($\theta_{68\ \text{Measured}}^2 - \theta_{target}^2$) = 21°
$\theta_{95\ \text{EM PSF}}$ ~ sqrt($\theta_{95\ \text{Measured}}^2 - \theta_{target}^2$) = 59°

Where Tracks Pass Through Target Plane



Van de Graff Rates

Van de Graff has been upgraded to VG2 which has oil free Turbo and Scroll pumps. The interior has also been cleaned of all residual oil. VG2 should be able to saturate EM2 and LAT trigger rates.

	VG1 Typically achieved For BGO and EM2 [Hz]	VG2 (Oil Free) Calculated maximum (not yet demonstrated) [Hz]
γ rate into $\Omega=4\pi$ sr	10^3	10^6
BGO rate Effic x Ω = .15 sr	12	12 x 10^3
EM2 Tkr Trig rate Effic x Ω = .31 sr	25	25 x 10^3
LAT Tkr Trig rate Effic x Ω = 3.1 sr	250	250 x 10^3

Summary of Data to Be Taken

"End Too End Test Committee" report will cause this table to be modified.

	Source	Trigger	Total Triggers	Why	Rate [Hz]	Run Time [Hours]
Each Tower	Cosmics	3-in-row	5×10^5	Compare Towers	20	8
	Cosmics	Scintillator Telescope	5×10^5	Efficiency	6	24
Full LAT	Cosmics	Various Trigs (FilterOFF)	10^7	TKR survey ACD Effic	200	16
	Cosmics	Orbit Trig (Filter ON)	10^7	Filter Effic	200	16
	Van de Graff	Orbit Trig (Filter OFF)	10^7	17 Mev calib MC	200 VG1	16
	Van de Graff	Orbit Trig (Filter ON)	10^8	Performance at orbit rates	10,000 VG2	8

Procedures to be Written

	Completion Date
Procedure to setup 3-in-row trigger and tower to acquire cosmic data	6/15/2004
Procedure to setup scintillator telescope and tower to aquire cosmic ray data	7/1/2004
Procedure to run Van de Graff	7/1/2004
Procedure to setup Van de Graff and LAT and take data	8/15/2004

Spare Parts Ordering

Spare Parts	Order by
Belt (Van de Graff)	4/15/2004
Capacitor (ceramic variable tuning)	Have(1)
Choke (RF HV) Stancor C-2327 1.5 H 1500 V 85W 200 mA DC	4/15/2004
Diode (Focus HV)	Have(2)
Gas (SF_6 cylinder)	4/15/2004
HV supply (belt charging)	Have(1)
Motor (Control rod)	Have(2)
Pump (scroll)	4/15/2004
Pump (turbo)	4/15/2004
Relay (Delay) Amperite 5N030T 9 pin	4/15/2004
Resistor (Column) 625 MΩ	Have(4)
Resistor (Probe tip) 100K 25W	Have(3)
Resistor (Focus) 2 MΩ 15%	4/15/2004
Rheostat (Control Rod)	4/15/2004
Screen (charging)	4/15/2004
Spare source bottle repair	4/15/2004
Springs (column)	Have(5)
Transformer (Probe tip) P-1079 TT-5479 (70,100,115) ->1700 v 5 mA	4/15/2004
Transformer (Focus HV) P-22478 TT-9476 330/400 Hz (95,110,125,135)->15 kV 10mA	4/15/2004
Transformer (RF HV) P-9321 TT-5494 (95,115,135)->480-0-480 V 400 mA, 6.3 V 5 A	4/15/2004
Tube (5T4)	4/15/2004
Tube (6146)	Have(3)

Verification of Equipment Readiness

	Completion Date
Verify VG2 high rate capability	3/19/2004
Verify operation of VG by recording BGO spectrum	Bi-weekly
Verify operation of scintillator telescope by recording cosmic rate	Bi-weekly