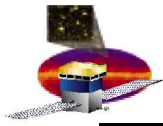


Data Taking Plans for Cosmics and VG Photons

Sept 27, 2004

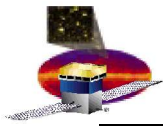
Gary Godfrey
SLAC

godfrey@slac.stanford.edu
650-926-2919



Outline

- **Apparatus**
- **The data the Instrument and Analysis Group people will be analyzing**
 - **SVAC particle data runs with the full LAT at SLAC**
 - Description
 - **E2E particle data runs with the full LAT at SLAC**
 - Description
 - Pass/Fail criteria

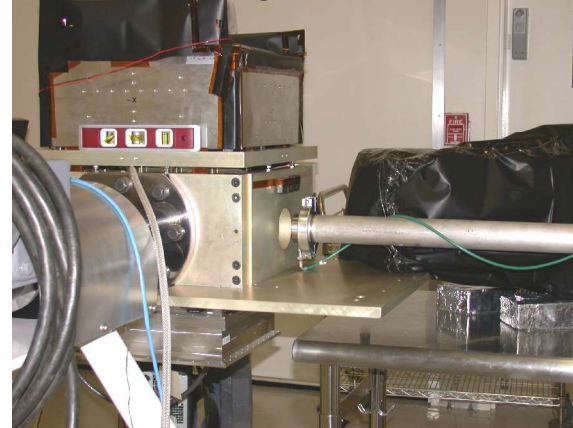


Apparatus

Van de Graaff

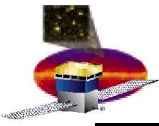


EM1 + VG Target + BGO Photon Monitor



Clean Room 9-25-2004





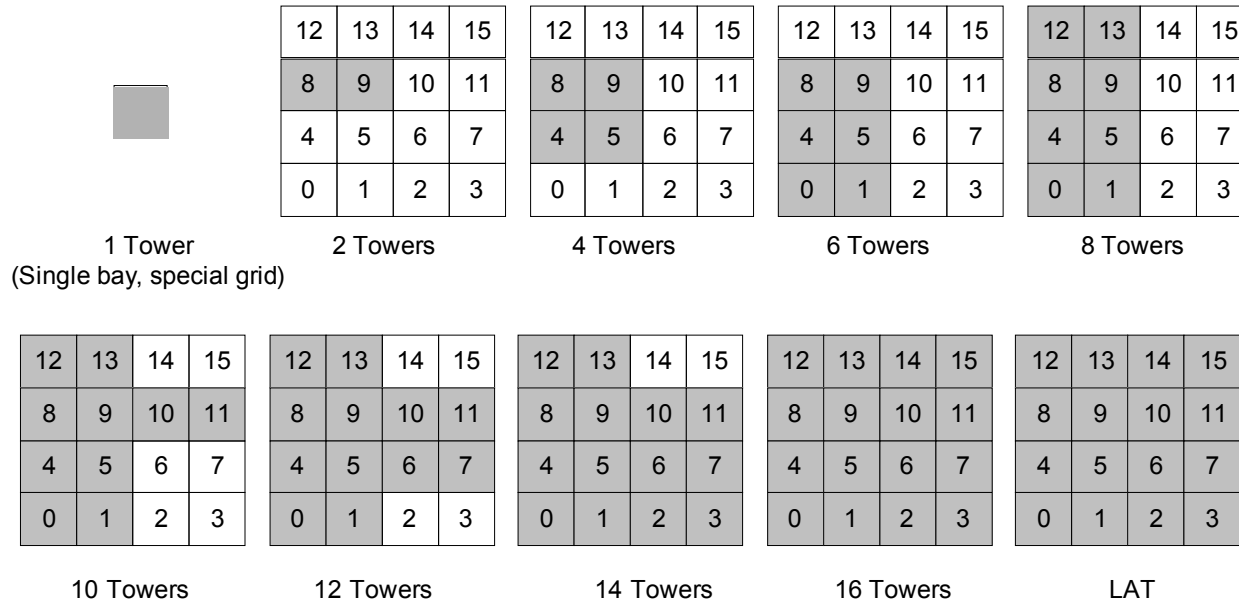
SVAC Data Runs

- **The SVAC data taking consists of cosmic rays and VG data for**
 - **Low level instrument characterization (performance)**
 - **Calibrations**

- **We optimized the data taking time during Integration**
 - **Calibration and characterization use the same data**

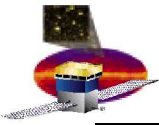
- **Data is taken with the hardware in the following configurations**
 - Partially populated LAT (see next slide)
 - Full LAT in vertical orientation
 - Full LAT in horizontal orientation
 - This is the configuration @ NRL during environmental tests

SVAC Data Taking – Cosmic Rays



- **24 hours of cosmic rays at nominal settings for each configuration**
 - low level instrument characterization
 - Calibrations with cosmic rays
- **Additional 24 hours of charge injection**
 - To provide input to calibrations with cosmic rays
 - To be divided between TKR and CAL

SVAC Data Taking – VG



1 Tower
(Single bay, special grid)

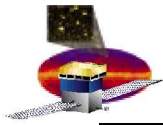
12	13	14	15
8	9	10	11
4	5	6	7
0	1	2	3

2 Towers

12	13	14	15
8	9	10	11
4	5	6	7
0	1	2	3

LAT

- **VG at nominal settings for each configuration**
 - low level instrument characterization
 - Hardware oriented horizontally
- **Cosmic ray samples are also taken horizontally**
 - Used as a control sample for background subtraction



SVAC Data Taking – “Long runs”

- We requested special runs for the LAT
 - 2 weeks at vertical orientation
 - 1 week at horizontal orientation
 - configuration at NRL during Environmental Tests

12	13	14	15
8	9	10	11
4	5	6	7
0	1	2	3

LAT

SVAC Monte Carlo Simulations



1 Tower
(Single bay, special grid)

12	13	14	15
8	9	10	11
4	5	6	7
0	1	2	3

2 Towers

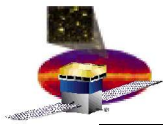
12	13	14	15
8	9	10	11
4	5	6	7
0	1	2	3

8 Towers

12	13	14	15
8	9	10	11
4	5	6	7
0	1	2	3

LAT

- These configurations will be simulated to support
 - low level instrument characterization



LAT E2E Particle Data Runs

LAT-MD-03489-02

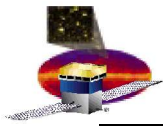
Ad Committee on End-to-End Testing (E2E)

LAT-TD -04136

VG and CR Data Runs for LAT Integration

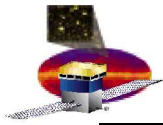
Individual Tests:

	<u># of Runs</u>
1) Baseline Comic Ray (CR) Test	
– Nominal (as in orbit) settings	1
2) Condition Scan CR Test	
– Volts, temp, delays, thresholds min/max	25
3) Baseline CR Trigger Subtests	
– Each trig alone and vetoed	9
4) Nominal Rate CR Test	
– Cosmics + Ext Trigs 1, 5, 10, 20 KHz	4
– Cosmics + Am ²⁴¹ source 1, 5, 10, 20 KHz	4
5) Nominal Rate Condition Scan CR Test	
– Same as (2) + Ext Trig 10 KHz	25



LAT E2E Data Runs

	<u># of Runs</u>
6) CAL Nominal Rate CR Test	
– Lower Cal Low thresh to give 1, 5, 10 KHz	3
– Lower Cal High thresh to give 1, 5, 10 KHz	3
7) Baseline CR Data Volume Sub-Tests	
– Same as (1) but no zero suppression	1
8) Nominal Rate CR Data Volume Sub Tests	
– Cosmics + Ext Trigs 1, 5, 10, 20 KHz No zero supp	4
– Cosmics + Ext Trigs 1, 5, 10, 20 KHz 4 range read	4
9) Van de Graaff (VG) Tests (Target centered at EM2 front face)	
– VG+Cosmics No zero supp	1
– VG+Cosmics Zero supp	1
– VG+Cosmics+Ext Trigs 1, 10 KHz	2



LAT E2E Data Runs

Daily Trending

of Runs

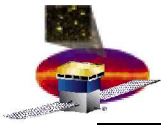
Baseline CR Test (Test 1 above)

1 hr / day

Monthly Long Run

Baseline CR Test (Test 1 above)

24 hrs / once per month



Event Sizes

Zero Supp (=Nominal Trigger Message)	~250 bytes
Zero Supp, All 4 ranges	~450
No Zero Supp	~6,400
No Zero Supp, All 4 ranges	~25,000

Max to SIIIS (Space Craft Instr Interface Sys) ~ 5 Mbytes/sec

High Rate, No Zero Supp

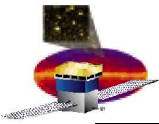
$$= 10 \text{ K events/sec} \times 6.4 \text{ Kbytes/event} = 64 \text{ Mbytes/sec}$$

Prescale the trigger? – No, want to exercise the electronics !

Software Filter (in DAQ) ?– Yes

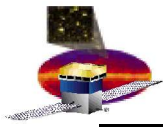
1) to get below 5 Mbytes/sec

2) to get below ~150 Kbytes/sec so 1 hr file <500 Mbytes



E2E Data Volume

- **Software Filter (TBD) keep 1 hour run File Sizes < 500 Mbytes**
 - Prescales Ext Trigs before writing to disk
 - Prescales all Trigs in non-zero supp data
 - Prescales all Trigs for high rate Cal Trigs, Am²⁴¹ data
- **E2E Particle Data volume generated at SLAC by I+T**
 - Individual Tests 87 runs x .5 Gb ~ 44 Gbytes
 - Daily Trending 30 days x 1 hr x .5 Gb ~ 15 Gb
 - Monthly Long Run 1 month x 24 hr x .5 Gb ~ 12 Gb
- **E2E Data volume generated at Thermal Vac by I+T**
 - ~1/2 x Individual Tests ~ 22 Gb
- **Total data volume = 100 – 1000 Gb (depends on software filtering decisions)**



E2E Runs Pass/Fail Criteria

- Each E2E run will have Pass/Fail criteria (TBD). Examples:
 - **System did not crash**
 - **No parity errors**
 - **No time outs**
 - **Data quality measures make sense**
 - Trigger rate
 - Trigger rate per tower
 - Hit and noise occupancy rates
 - TOT distributions
 - Deadtime as a function of time
 - Reconstructed angular distribution of cosmics
 - Reconstructed energy distribution
 - **Cosmics selected (see Dario and Sara's talk) from Ext Trig and Am²⁴¹ high rate runs have distributions similar to Baseline run cosmics.**
 - TOT, angular distribution, energy spectrum
 - . . .