

AntiCoincidnce Detector

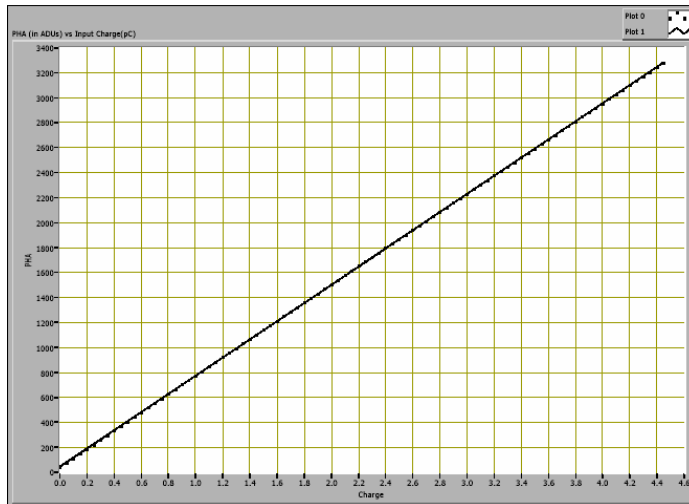
**GLAST Large Area Telescope:
Project Review
July 30,2003
AntiCoincidence Detector (ACD)
Subsystem
WBS: 4.1.6**

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Recent Accomplishments

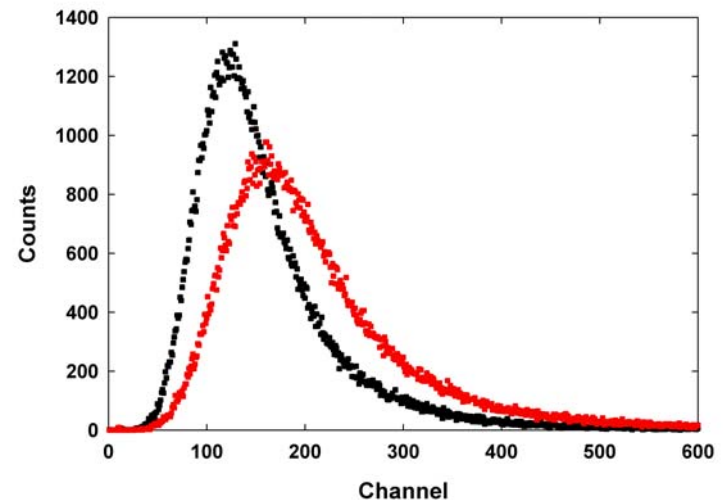
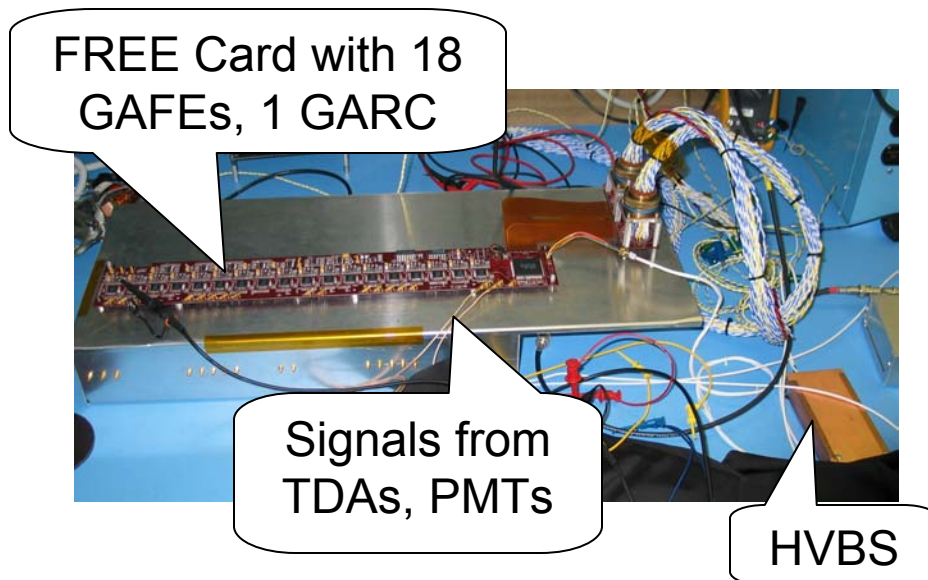
- **ASIC testing**
 - **GAFEv5 (analog ASIC) operated at ≥ 3.6 V (was supposed to operate from 3.0 to 3.6 V) meets requirements**
 - **Acceptable noise down to threshold of 0.1 MIP**
 - **Integral linearity good over full range**
 - **Recovery after large pulse acceptable (required a change in a resistor on the phototube resistor network)**
- **GAFE with corrected voltage biasing was submitted in early July. Scheduled completion date late September.**



Integral linearity response of the GAFEv5

Recent Accomplishments

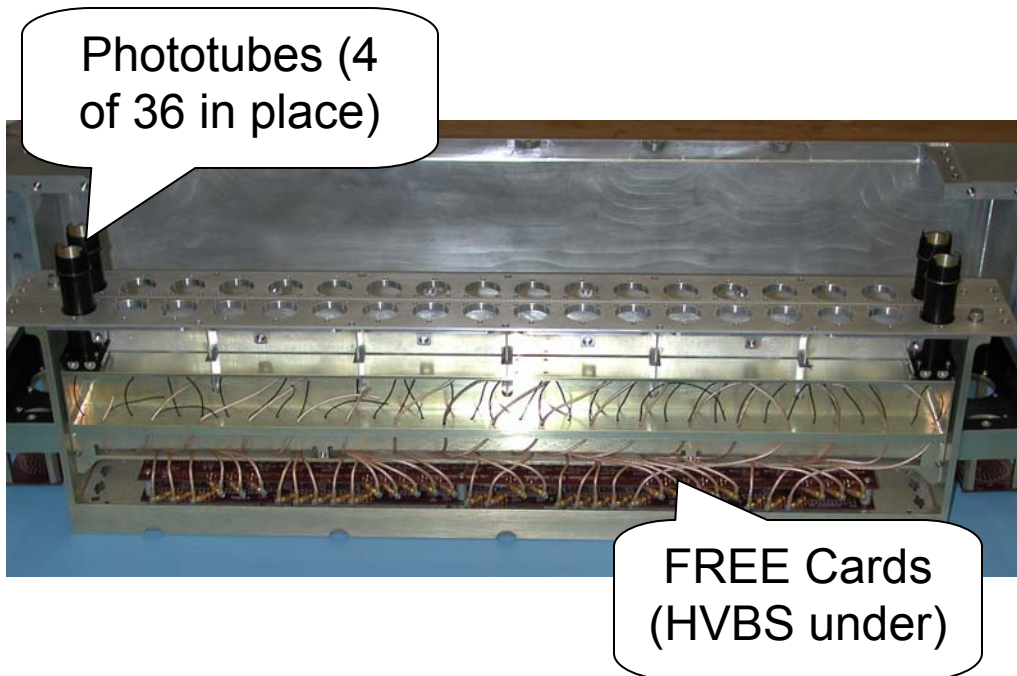
- **End-to-end testing**
 - Good performance with flight-type scintillator Tile Detector Assembly (TDA), phototubes (PMT), High Voltage Bias Supply (HVBS), FREE card (including GAFEv5 operated at 3.6 V and GARCv2)
 - Minor crosstalk on some channels due to trace routing.
- **New FREE card layout is nearly complete.**



TDA PHA spectra for two PMTs obtained from end-to-end test

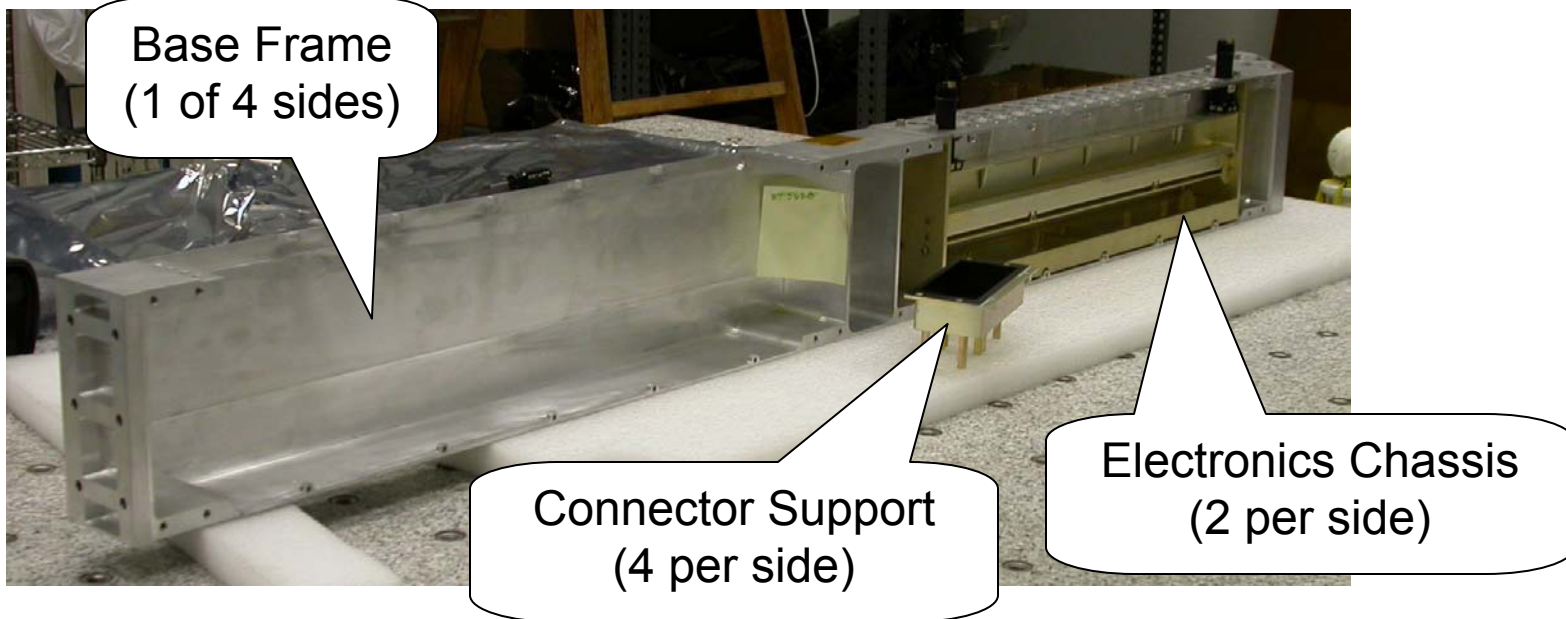
Recent Accomplishments

- **Electronics Chassis Fit Test**
 - Mechanical housing for phototubes, HVBS, FREE cards, and cabling
 - Minor issues with design.
- **Updated Electronics Chassis design is nearly complete.**



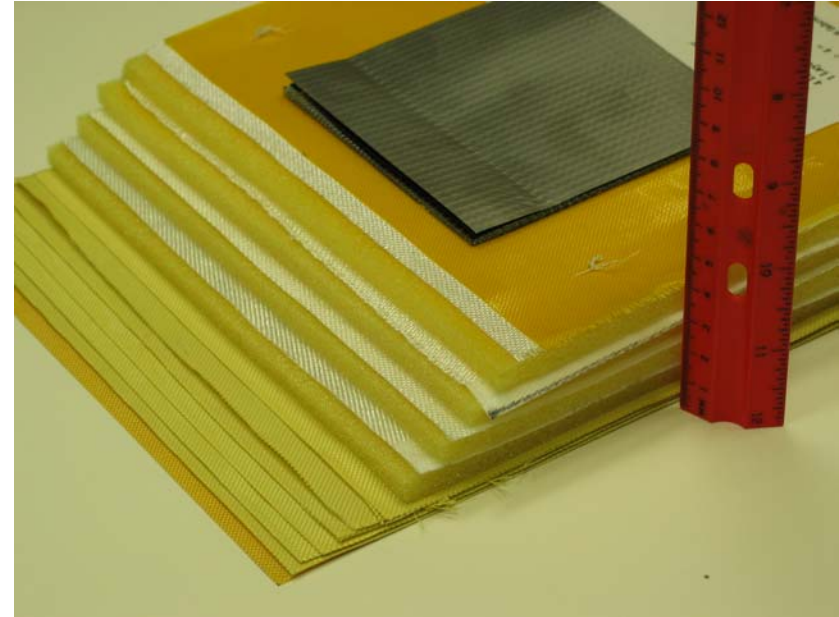
Recent Accomplishments

- **Base Frame Fit Test**
 - Mechanical housing for Electronic Chassis
 - Mechanical interface to LAT grid
 - Minor issues with design.
- **New Base Frame design is nearly complete. Scheduled to complete on August 12.**



Recent Accomplishments

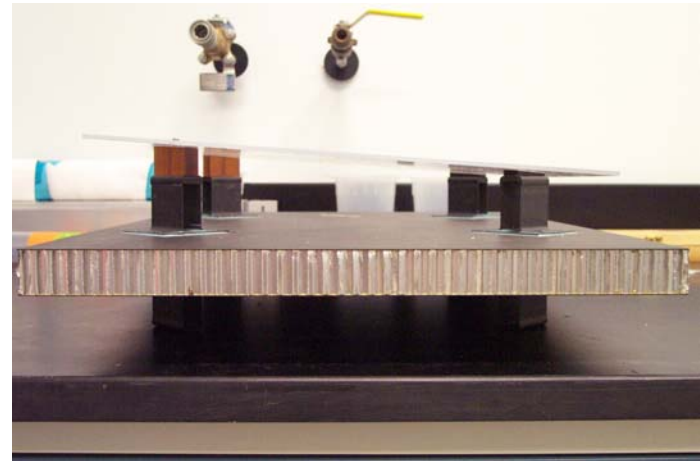
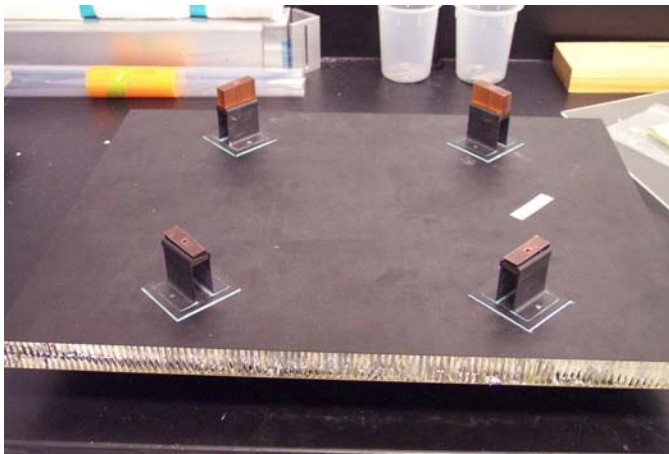
- Detailed planning for Micrometeoroid Shield (MMS) and thermal blanket
 - Analysis completed by Johnson Space Center
 - Planning for assembly at Goddard, led by the same technician who fabricated the EGRET blanket and shield.
- Basic assembly approach identified. Detailed manufacturing document in progress.
- Waiting for information about maximum size of pieces for demisability.



Layout of the planned MMS. The thermal blanket (gray) is standard MLI, followed by multiple layers of ceramic fabric, foam, and Kevlar.

Recent Accomplishments

- **Fabrication of flight composite shell**
 - **Two materials problems discovered by contractor, Canyon Composites**
 - **Delivered material contamination – supplier replaced material**
 - **Voids found in first sample panel – Goddard-supplied process information corrected the problem on a follow-up sample.**
 - **First large panel is in fabrication.**
- **Manufacturing Readiness Review to be conducted on completion of the first large panel.**



Angled TDA Flexure Mounting – Proof of Concept

Recent Accomplishments

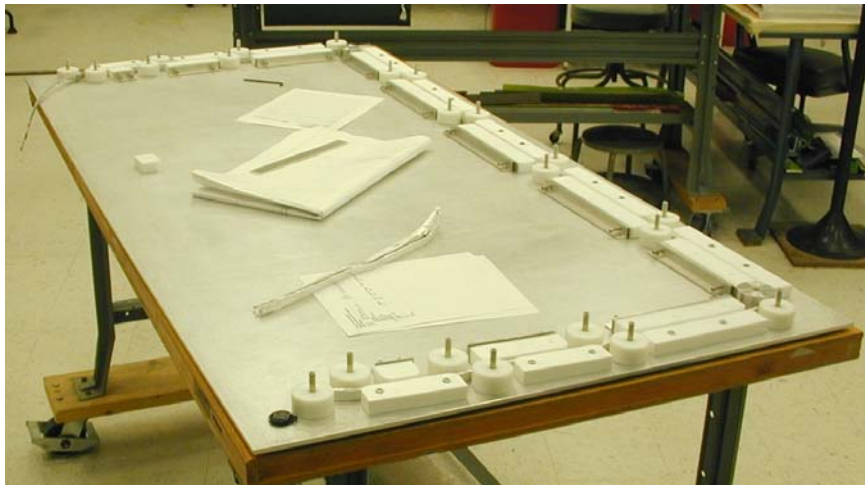
- **Fabrication of Tile Detector Assemblies (TDA)**
 - **Fermilab's assembly line for tiles is up and running**
 - **First connectors delivered to Fermi on July 22**
 - **First set of 28 tiles (top), including bent tiles, have been machined, grooves have been cut, and fibers inserted.**
- **QA will travel to Fermilab in August to inspect first complete TDAs before they are wrapped.**



Prototype TDA
manufactured by
Fermilab.

Recent Accomplishments

- **Scintillating Fiber Ribbons**
 - **Developed procedure for bending and bonding scintillating fiber ribbons to the needed shape to follow the contours of the TDAs**
 - **Scintillator requires careful heating for bending**
 - **Completed ribbon has been tested successfully**



Bending fixture for ribbons



Ribbon assembly

Issues and Concerns

- **Late delivery of G3 Test Stand/EGSE from LAT Electronics and I&T is a concern**
 - **Scheduled for August, recently slipped to November/December**
 - **Planned for testing of multiple FREE cards and Electronic Chassis, scheduled for August - November**
- **Developing workarounds, using older G2 Test Stands and bench electronics. Interfaces are less like the flight interface, but should allow much of the testing.**
- **Developing the G3 software before the arrival of the hardware, to minimize the startup delay once the G3 Test Stands arrive.**
- **ACD cost increases and availability of FY03 funding is an issue**
 - **Cost to Complete exercise identified increased costs for ACD**
- **Goddard Engineering Directorate has provided additional Civil Service support, replacing contractors with CS personnel wherever a qualified Civil Servant could be found.**
- **GLAST Project has offered some support.**
- **Additional ACD funding included in the current LAT request.**

Issues and Concerns

- **Need for a final Qualification and Screening Plan for ASICs is a concern**
 - **LAT has a general Q&S Plan for ASICs**
 - **Issue has been the specific implementation (particularly testing) needed for the ACD ASICs**
- **Working with LAT Parts Control Board in consultation with Goddard parts engineers to finalize details of the plan.**
- **Shortage of test equipment at Goddard is a concern**
 - **In particular, equipment needed for the ASIC Q&S program seems to be in short supply**
- **Working with Goddard local laboratory and Engineering Directorate to locate or repair needed equipment.**
- **Requested Goddard funding (~\$60K) for additional equipment.**

Open Design Issues

- **OPEN:** Outline drawing that defines some interfaces with LAT is still not complete (blanket attachment, grounding, cable tie-downs, optical survey mounts). **Action Plan: Work with LAT mechanical design team to resolve open issues by August 29.**
- **OPEN:** LAT Electronics group requested a change in the backshell of the connector to the ACD. This change requires a change in the bracket that holds the connector, and this bracket is a structural element. Modification should be straightforward, but must be analyzed. **Action Plan: Accept change and incorporate new connector into design. Complete design and analysis by August 12.**
- **OPEN:** FREE Board design updates and finalization. **Action Plan: Complete FREE board design ~2 weeks after LAT approval of GAFE to FREE board circuitry.**
- **OPEN:** Need updated interface loads following Grid design changes. **Action Plan: Review ACD analysis when updated loads are received. ACD will not delay fabrication of mechanical components due to this open issue (slight risk in doing so).**

Mechanical and EEE Parts

- **Mechanical Parts and Materials - ALL APPROVED**
- **PMTs – Qualified, tested, and screened (approx 12 being re-screened)**
- **EEE Parts**
 - **FREE - 36 different part types; approximately 830 parts per board. All parts approved by PCB with the following exceptions.**
 - **MAX494 waiting on review of radiation test results by parts group**
 - **MAX145 and MAX5121 being qualified by GSFC parts group (chips provided by Calorimeter).**
 - **ASICs in fabrication. S&Q plan is complete and has been reviewed by members of the PCB. Detailed GARC procedure in review and GAFE procedure will be released for review soon.**
 - **HVBS - 38 different parts types; 108 total parts per board**
 - **7 parts are not approved, issues are well understood and are being worked.**
 - **Resistor network - 9 different parts types; 26 total parts**
 - **One connector is not approved, waiting for a drawing review**

Near Term Milestones - 3 Month Plan

1. **Begin PMT Assembly (includes fabricating the required mechanical and electrical components) - July**
2. **Begin fabrication of TDA tiedowns (composite flexures) - August**
3. **Begin fabrication of the clear fiber cables - August**
4. **Fabricate Flight HVBS and FREE PCBs – August/Sept**
5. **Complete all flight mechanical drawings - Sept**
6. **Perform testing on the BEA Engineering Unit – Sept**
7. **Receive and test flight ASICs – Late Sept/Early Oct**
8. **Complete assembly of flight shell – Oct**
9. **Continue fabrication of flight TDA's - December**
10. **Continue system test with FREE Board, HVBS, PMT's and TDA's - August**
11. **Continue design work on MGSE and EGSE**