

*LAT Monthly
Technical Review
November 2003*

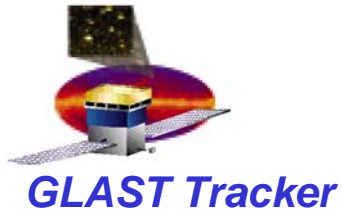
**Monthly Technical / Cost / Schedule Review
GLAST LAT Tracker
November 2003**

December 15, 2003

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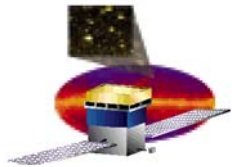
University of California at Santa Cruz



Outline

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- ❑ Last Month's Accomplishments and Present Status
- ❑ Open design issues
- ❑ Summary of issues & concerns
- ❑ IEEE parts status
- ❑ Key Milestones for next 3 months
- ❑ Cost and Schedule status



November Accomplishments & Status

❑ ASIC procurement

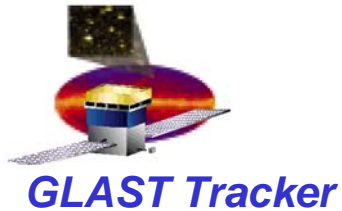
- GTRC V7 production was begun and will complete by January 27.
- A review of the GTRC problems and the V7 fixes was held. Action items are being worked within the Tracker group.
- The wafer dicing specification was updated in preparation for the V7, and a requisition will be started before Christmas.

❑ MCM Front-End Electronics

- MCM preproduction began, with the first units completed in early December.
- Several procedures are being tuned and finalized during the preproduction, most notably the pitch-adaptor attachment inspection, so we have daily meetings with Teledyne.
- Documentation is being updated in preparation for the flight-unit PRR.
- A QA survey of Teledyne was held.

❑ Flex-circuit cables

- Mechanical and electrical layouts were completed.
- The SOW was completed and released.
- A fit check on the mini-tower and 1×1 grid was made using a cable mockup.



November Accomplishments & Status

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□ Sidewalls

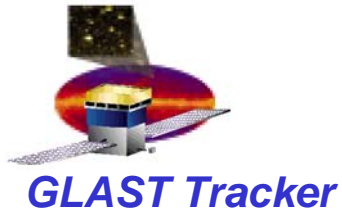
- EM sidewalls were completed both at Plyform and COI.
- COI completed all coupon tests with good results. A full report is available.
- Short sidewalls from COI were tested together with a bottom tray in the static test fixture.
- Plyform sidewalls were installed in the EM tower.
- Many of the strength coupons from Plyform were cut from too close to the panel edge and suffered resin bleed, giving results that are hard to interpret. New coupons are being cut far from the edge, and the tests will be repeated in early January.

□ Mid Tray Production

- Bias circuit production at Parlex was delayed, which is delaying the start of production of non-flight trays (was scheduled to begin Dec 9).

□ Bottom Trays

- Bottom tray closeout drawings were released, so that COI can produce those.
- Titanium parts machining is on hold pending revision of the interface to the Grid.
- New assembly fixtures are being designed and made in Italy.



November Accomplishments & Status

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□ EM Vibration Test

- Low level signature sweeps in Z and X gave results consistent with the model.
- Z and X sine vibes (up to 50 Hz) were completed.
- Z random vibration was completed through the -6dB level.
- X random vibration was completed through the full level (0 dB), but the setup suffered a loss of torque in the fasteners holding the titanium flexures to the aluminum vibration fixture.
- The flexure/Grid interface design is being reassessed in preparation for a new vibration test.

□ EM Thermal Vacuum Test

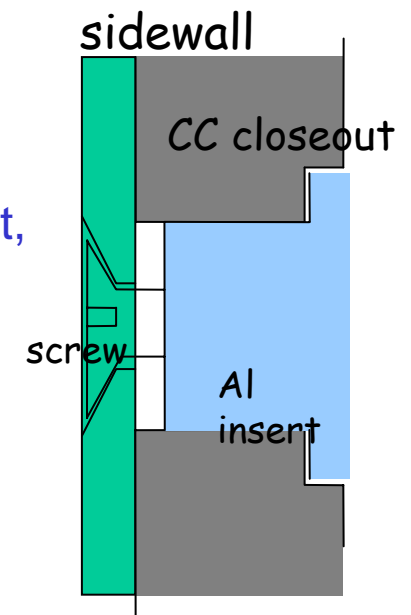
- A strong effort is now going into preparations for this test.
- Work is in progress to address issues with the thermal control and with avoiding flow of heat through the thermal blanket.

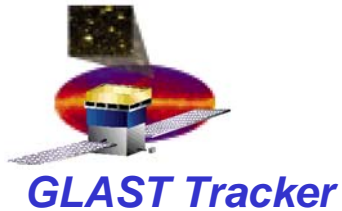
□ Flexure/Grid Interface

- A redesign effort is in progress at SLAC to achieve a tight shear-pin joint without imposing extreme tolerance requirements and without excessive preloading of the bottom tray.
- A secondary locking mechanism will be used in the next test.
- The bolt torque specifications will be carefully reviewed, and lubrication will be used to ensure accurate preloading.

□ Countersunk screws in carbon-fiber walls

- No failures were observed in the TKR in the vibration test, but over-torquing the screws can damage the carbon fibers around the countersunk hole.
- 120 degree heads are being tested at SLAC to allow a higher torque without excessive stress concentration.
- It may be necessary to shim the inserts.

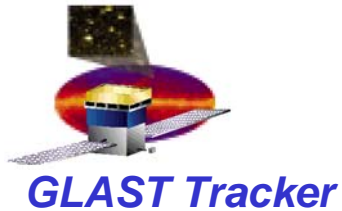




Issues and Concerns

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- **MCM, attachment of flex-circuit pitch adapter to the PWB**
 - Since last month
 - The tooling and processes were tweaked.
 - Inspections were defined.
 - Teledyne production workers have gained experience.
 - Machining of the PWB and the following inspections at SLAC are meeting our straightness and flatness requirements.
 - The gluing results from Teledyne are a big improvement from what we achieved in June but are also probably reaching as good as possible with this process and tooling method.
 - Two recent Teledyne samples were sent to Pisa last week for evaluation. We believe that they are suitable for wire bonding to SSDs, *but that needs to be confirmed at G&A.*
 - In parallel, G&A in Italy has been making progress on an alternative gluing process for the pitch adapter.



Issues and Concerns

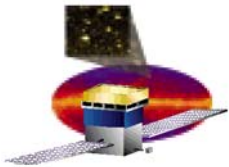
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□ MCM Burn-In

- We are starting a test of the thermal-cycle and burn-in procedure now, on the first preproduction MCMs.
- However, we still have to close on the burn-in requirement. The MCM cannot operate above 85C or else the polyswitches will start to open. An extremely long burn-in presents schedule, equipment, and manpower problems.

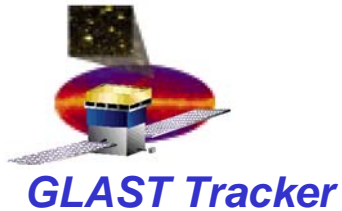
□ Omnetics Nano-Connectors (2 NCRs)

- Due to miscommunication from SLAC, the design got “improved” with a longer jack screw that engages long before the connector pins engage. This results in damaged connectors. The pins must start to engage before the screw. This will be fixed by Omnetics.
- The connectors are fragile, such that the metal shell too easily breaks loose from the plastic insert.
 - This issue is being pursued with Omnetics (bonding procedure).
 - We are investigating our mounting schemes on cables and MCMs to add strength (bonding or fastening both metal shell and plastic to the cable and MCM; potting of the solder pins).



Issues and Concerns

- Drawing release
 - The Tracker needs a full-time person to keep track of the drawing and document release for the Tracker and push them through to completion and keep track of configurations. This is being worked.
 - Experience has demonstrated a need for an expert drawing checker to check mechanical tolerances, consistency, etc.
- Documentation
 - Plyform is ready to build mid trays as soon as they receive the bias circuits. However, a myriad of QA documentation issues stand in the way of making flight trays (we can start some non-flight trays needed for a new mini-tower and T/V testing).
 - Communication of documentation requirements seems to need improvement, to come to a common understand in U.S. and Italy as to what is required for a flight project.
 - Manpower appears to be short in Italy to respond to all of the QA actions in a timely manner and to complete the documentation for all processes (while at the same time get all other aspects of manufacturing going and complete the EM testing).

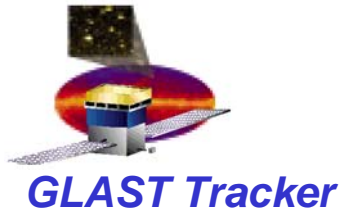


Issues and Concerns

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□ Sidewall coupon testing

- The sidewall mechanical design has been proven by testing of COI coupons and static-test sidewalls.
- The same coupon tests must be done on the Plyform EM sidewall layup to verify workmanship.
 - Some of the coupons were cut from the panel edge, where resin bleed is a significant factor, and this raises questions about the test results, especially of the compression tests. Those tests need to be repeated with new coupons. In progress.
 - Joint coupons (i.e. with inserts) from Plyform still remain to be tested.
 - Thermal conduction tests still need to be made.
- There is at present no reason to believe that there is any problem with the Plyform sidewalls (and they did survive the vibration without damage).
- Coupon test requirements and plans for flight sidewall layups will be an important factor at the PRR for sidewall production.



Issues and Concerns

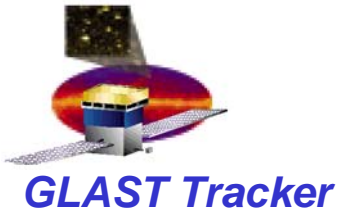
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❑ Installation of cables into the Grid

- Tooling for bending the cables when they are already installed on the tower.
- Procedure for bonding the cables to the Grid chaseways.
 - RTV vs PSA.
 - Clamping methods and curing time in the case of RTV.
- Not urgent, but this is still a poorly defined process.

❑ Schedule Issues

- There is a danger of the tray panels taking over the critical path from the MCMs if we don't get tray production started.
 - Drawings and documentation for the mid trays.
 - Drawings, documentation, parts, and tooling for bottom trays.
- MCMs (Teledyen)
 - The GTRC V7 is a week or two later than forecast last month.
 - We just last week received the first Teledyne prediction for completing the preproduction run (based now on actual experience). We need to push back on them to increase the batch size now and move forward the completion date.
- We need from Italy a schedule and plan for sidewall production.
 - This must include a PRR.
- Failure to complete the EM tests results in a continuing drain on resources.



Near Term Schedule Issues

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| | | | | | | | | | |
|-----------|---------|----------|----------|---------|----------|-------|-------|-----|------|
| September | October | November | December | January | February | March | April | May | June |
|-----------|---------|----------|----------|---------|----------|-------|-------|-----|------|

EM Completion

| | | |
|----------------------|-------------------|-------------|
| Sidewall Fabrication | Vibration Testing | T/V Testing |
| Static Test | | |

Delayed by flexure-Grid interface issues

MCMs

| | | | |
|-------------------------|-------------------|---------|------------------------------|
| Production Preparations | Preproduction Run | Burn In | 1st Production Run & Burn-In |
|-------------------------|-------------------|---------|------------------------------|

Best guess. We hope to have a real schedule soon from Teledyne, based on preproduction experience.

New GTRC

| | | |
|--------------------------|-------------------|-------------|
| Update Design and Verify | Wafer Fabrication | Test & Dice |
|--------------------------|-------------------|-------------|

This is coming in a week or two later than we initially hoped.

Tray Panels

| | |
|---------------------------------------|--------------------------------------|
| Machine Closeouts; Bias Circuits, etc | Assemble Panels for Tower A and Test |
|---------------------------------------|--------------------------------------|

This is on hold pending resolution of documentation issues for mid tray production. Bottom trays are delayed even more, for parts, documentation, and assembly fixtures.

Flex Cables

| | |
|-------------------------|--|
| Complete Design and PRR | Manufacture and Test First Flight Cables |
|-------------------------|--|

Design is almost done, but the PRR also relies on release of the IDD.

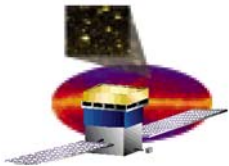
| |
|----------------------------|
| Flight Sidewall Fabricaton |
|----------------------------|

This is my wag. INFN needs to develop a schedule for this production at Plyform.

The Tower A schedule is slipping day for day until we can get tray production started.

Tower A

| | | | |
|---------------------------|---------------|-------------------------------|------------------------------|
| Assemble Ladders on Trays | MCMs on Trays | Test Trays & Assemble Tower A | Tower A Testing and Shipping |
|---------------------------|---------------|-------------------------------|------------------------------|



❑ **ASICs**

- Wafer probing, lapping, dicing, wafer inspection all approved and nearly completed (but must be repeated for the GTRC V7).
- Qualification plan (MCM level) will be executed soon, on the preproduction units.

❑ **PWB**

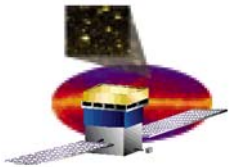
- This production is completed but waiting on GSFC evaluation of coupons.

❑ **Pitch-adapter flex**

- Production is completed.
- Single layer, no vias, so no coupon issues.

❑ **Nano connectors**

- GSFC is still working on mechanical testing.
- SLAC is working 2 issues with the manufacturer. Urgent for MCM flight production!



EEE Parts Status

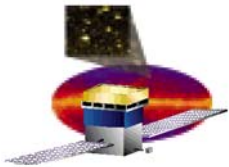
- ❑ **Micro-D connectors**
 - Approved. Qualification testing to be done at GSFC.
- ❑ **SMT Parts**
 - All are approved and in hand.
 - Polyswitch qualification work is still in progress but nearly complete.
- ❑ **Bias-circuit flex**
 - First flight production arrives this week.
 - 2 layers, with 8 vias total, so coupon evaluation will be done.
- ❑ **Flex-Circuit cables**
 - SOW and qualification plan are defined.
 - Design is done and being reviewed and signed off.
 - Test with quick-turn production of short versions (mini-tower).



Tracker Milestones

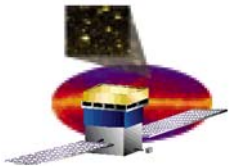
| Milestone Description | Original Date | Current Date | Major Requirements to Achieve Milestone | Notes |
|--|---------------|------------------------|---|---|
| Static Test Bottom Tray | 07/25/03 | 11/26/03 | Completed | |
| Vibration and T/V Test of EM Tower | 08/01/03 | 02/28/04 | Complete testing of Plyform sidewall coupons, including fastener pullout and thermal conduction. Complete engineering of the new flexure-grid joint and implement on the existing tower. Complete TRR for the T/V test. Finish and release T/V test documents. Complete fixtures for T/V testing. | Issues with understanding the Plyform coupon test data still need to be closed to everybody's satisfaction. Plyform coupons with inserts and coupons for thermal conduction still need to be tested. Schedule is uncertain pending closure on the fix to the flexure-grid joint issues. |
| AV: Delv of TKR EM to SLAC I&T/MGSE | 08/22/03 | 03/04/03 | Complete vibration and T/V testing. Ship to SLAC. | |
| Deliver 36 MCMs and 8 flex cables to electronics | 09/15/03 | 12/20/03 | We have provided the MCM and burn-in cable parts to the electronics group. We are helping them with testing and debugging, but it is their schedule now to complete these parts. | Most of the MCMs, as well as the cable hardware were delivered to SLAC by UCSC. Several MCMs are still being debugged and reworked at UCSC. |
| Composite tray panels assembled for tower A | 09/30/03 | 01/31/04 | Bias circuits. Drawing review & release. Closure of PRR action items. | Bias circuits are still late and have delayed the start of production of non-flight panels. Flight panel production cannot start until a big list of QA issues (mostly with documentation) is closed. |
| Top and Bottom tray panel assembled for tower A | 01/31/04 | 01/31/04 | Drawing completion and release. Closure of flexure-grid interface issues. Procure flexures, corner brackets, thermal straps. Procure bottom-tray closeouts from COI. Complete new assembly fixtures. | In progress. Quotes for titanium parts are coming in. |
| Start flex-circuit cable production | 09/30/03 | 12/20/03 | Complete and review the detailed layout. PRR | Design review completed. Need to complete drawings and hold PRR still. SOW still not released. Detailed drawings should be completed by the end of this week. |
| Start flight sidewall production | 10/15/03 | Need a date from Italy | Successful completion of EM sidewalls and coupon tests. Completion of EM T/V testing. Order material in advance. | EM sidewall production is looking good at this point, but some coupon verification remains to be finished in January. |
| Complete the MCM preproduction run | 12/20/03 | 12/20/03 | In progress | The preproduction is progressing reasonably well. The first small lot of completed boards was received 12/5/03. |
| Completion of functional trays for a new mini-tower and T/V testing. | 01/31/04 | 01/31/04 | Deliver 15 good MCMs to Italy. Get panel production going at Plyform. | These will have to be built with GTRC-V6 chips. |
| Deliver 1st lot of flight MCMs to Italy | 10/29/03 | 03/15/04 | Completion, burn-in, and test of the preproduction lot. Completion of the PRR. New GTRC chips. | The date is based on reception of V7 GTRC chips at the end of January. |
| Begin Test of completed trays for tower A | 12/18/03 | | New "mini-tower" test. Vibration and T/V testing of some flight-like trays. | |
| Complete Assembly of tower A | 02/03/04 | | Tower assembly procedures; PRR; fixtures | |
| Deliver Towers A/B to I&T | 04/19/04 | | Environmental tests. Shipping containers | |

Monthly Review
for 2003



Schedule Variance Report

- ❑ Schedule variance: –\$24k for November
 - ❑ –\$8K completion of all the machining of the TMCs for right angle interconnects. This is in progress and is keeping well ahead of the need dates at Teledyne – full completion is expected 2/13/04.
 - ❑ –\$16K receipt of connectors for flex-circuit cables. GSFC has not yet approved production. Also, there are issues with the connectors discovered after delivery of the first lot, which are slowing completion of the delivery.
- ❑ Schedule variance: –\$24k total accumulated
 - ❑ See above



GLAST Tracker

Cost Variance Report

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- ❑ Cost variance: unknown for November
 - **Data are not available**
- ❑ Cost variance total: unknown
 - **Data are not available**