Monthly Technical / Cost / Schedule Review
GLAST LAT Tracker
August 2003

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Outline

- Last Month's Accomplishments
- Summary of issues & concerns
- Action Item status
- Status of Subsystem's Parts List & qualification program
- Key Milestones for next 3 months
- Cost and Schedule status
August Accomplishments

 ASIC procurement
   - 123 GTFE wafers and 20 GTRC wafers in hand (100% of flight needs).
   - All wafer testing is done (10 spare GTRC wafers remain to be tested).
   - Wafer lapping, dicing, and inspection contract is in place, and wafer lapping is in progress. First 360 GTFE chips were received; 216 given to electronics for assembly of test MCMs.

 MCM Front-End Electronics
   - Work is in progress at Teledyne on 2 boards to test production changes and tooling modifications.
   - A quote was received from Teledyne for MCM production; need to work with them to sharpen the pencils…
   - The 50 preproduction MCM PWBs were found to be defective and rejected. 5 new boards were received this Monday for Teledyne to use to continue to work the assembly issues.
   - The flex-circuit pitch adapters were ordered.
   - All SMT parts are in hand.
   - The Omnetics connectors are in hand for preproduction.
   - MCM/ASIC qualification test plan was worked (still in progress).
August Accomplishments

Flex-circuit cables

- Status and issues were reviewed at the engineering meeting this week.
- Issues with passage through the grid were worked, to provide an IPC-compliant bend radius.
- Vias were moved away from the bend regions.
- All vias were doubled, to provide redundancy against the most likely failure mode.
- We’re getting close to the final layout, we believe.
- Work began on procuring hardware needed to interface the cables to a commercial cable tester.

MCM testing and burn-in

- Work progressed on improving the MCM test stand, for use at Teledyne, to bring it up to the standards for flight production.
- Software was completed and tested for thorough analog performance testing of the MCMs (fitting threshold scans), in addition to the functionality testing.
- The test plan/procedure draft was updated and is being reviewed.
August Accomplishments

- Work progressed on the MCM burn-in station
  - Flex-circuit cables and twist-pair extensions were completed, and one was assembled and tested.
  - A fixture for holding the MCMs was completed.
  - Temperature/humidity monitor was ordered.
  - Good progress was made on controlling the thermal chamber via the PC.
  - Work continued on the scripts for executing continual testing during burn-in.
  - A plan/procedure document was drafted.

- Mini-tower
  - Cosmic-ray tests with the mini-tower were completed in Pisa.
  - A pre-ship review was completed.
  - The mini-tower was shipped to SLAC and delivered to I&T.
  - It has been under test at SLAC since last Friday.
August Accomplishments

- **Sidewalls**
  - Problems that caused failure of the EM sidewall fabrication were extensively reviewed and appear to be well understood.
  - Drawings were updated and are being reviewed.
  - Planning is in progress to use left-over material at Plyform to fabricate in the near term a test panel and to perform coupon tests, incorporating all lessons learned.
  - New prepreg for EM panels was ordered by SLAC from COI and will be available in a matter of days.

- **Bottom tray static testing**
  - A plan was developed and agreed upon with GSFC on how to static test the flexures to the necessary qualification levels, using the existing bottom tray and static test fixture.
  - A plan for repair of the lower face sheet on the bottom tray SN001 was developed and reviewed.
  - A contract was worked between SLAC and Hytec to get the required analysis, test work, and reports done, starting September 2.
Old August Projections

- Complete mini-tower testing in Italy and deliver it to SLAC ✓
- Complete the 5th functional EM tray (used in mini-tower)
- Get all drawings and procedures signed off to start flight tray-panel fabrication. (some progress but incomplete)
- Get contract in place to produce bottom-tray closeouts at COI. Also prepare for flight production of titanium parts. (in progress)
- Procure pitch adapters, test bonding to the PWB and other MCM issues (on order and in progress)
- Start the MCM preproduction at Teledyne (received quote)
- Order the flight bias circuits (in progress)
- Finish the layout of the flex-circuit cables and order 1st articles (still work in progress on layout; some issues resolved)
- Continue wafer IC testing, SSD testing, ladder production ✓
- Continue development of the MCM burn-in system ✓
- Finish EGSE and procedures for EM tower TV testing (little progress)
Issues / Concerns

- **Difficulties in starting the MCM assembly line**
  - The critical path in getting Tracker flight production started.
  - All parts needed to get started are in very close to being in hand, with flex circuits expected next week.
  - PWB preproduction was rejected and restarted. 5 first articles were received this Monday and look correct so far. They are being QC’ed and machined, to be sent to Teledyne Thursday.
  - Teledyne is in progress on a small contract to test the assembly issues.
  - The big problem now is the unreasonably high cost and the slow schedule in the Teledyne proposal. They quote 16 weeks ARO for the 50 preproduction boards.

- **Pitch-adapter bonding (MCM right-angle interconnect)**
  - Hopefully we have finally resolved the issues at the PWB manufacturing (gluing on the raised strip).
  - Special bits were ground for the radius, to ensure smooth transitions.
  - The 200-micron alignment offset was corrected in the tooling and successfully tested.
  - Testing with the new MCMs will begin soon.
MCM attachment and wire-bond encapsulation.

- Procedures and tooling are developed but still being proved at G&A.
- Verification of this interface in thermal vacuum will have to await assembly of the first trays, using preproduction MCMs.

K13D Sidewalls

- Need to verify the layup and resulting laminate strength and quality prior to building new EM sidewalls.

EM Environmental Tests

- Delayed into October by the need to redo the sidewall panels.
- Significant planning and preparation still needed, especially for T/V.

Completion of bottom tray static testing

- Plan is in place but not yet verified by analysis.

Cutting thick tungsten converter foils in half

- Contract with Hytec is being worked to do the analysis needed to ensure that this does not compromise the panel stiffness.
Issues/Concerns

- Design changes and production improvements needed with respect to the EM
  - Plan to make a new “mini-tracker” from the first few trays produced
  - Plan vibration and thermal/vacuum testing of the first trays assembled.

- Late delivery of MCMs and Flex-Circuits to Electronics and I&T
  - Assemble 36 MCMs (without right-angle interconnects) at a quick-turn vendor (9 are already in progress)
  - Initial tests using burn-in cables
  - Make a new set of mini-tower cables to the final cable design
  - Preproduction run of 2 of the full-length cables
EEE Parts List and Qualification Plan

- **ASICs**
  - Wafer probing, lapping, dicing, wafer inspection all approved and in process.
  - Qualification plan (MCM level) needs completion and approval.

- **PWB**
  - Spec, drawing, and procurement approved.
  - 50 preproduction boards will arrive soon (second iteration). They and coupons need to be evaluated to release the remaining production.

- **Pitch-adapter flex**
  - Final drawings and specifications need to be approved.
  - Preproduction articles should arrive in a few days.

- **Nano connectors**
  - Issues in the first preproduction lot were corrected.
  - New connectors will be ready for qualification tests in a couple of weeks.

- **Micro-D connectors**
  - Approved. Qualification testing to be done at GSFC.
EEE Parts List and Qualification Plan

☐ SMT Parts
  - All are approved and at least partial quantities of all of them are in hand.
  - Agreed upon flight-lot qualification tests are in progress on the polyswitches.

☐ Bias-circuit flex
  - No new design changes since the last prototype, except labeling details.
  - Drawings are being readied for production and need to be approved.

☐ Flex-Circuit cables
  - Spec is out for approval; no known issues remain.
  - Some work remains on the layout and drawings.
  - The SOW and contract with Parlex will be finalized once the design is all wrapped up.
## Tracker Near-Term Milestones

**Tracker replan progress review**

### 4T038927 Deliver 36 MCMs and 8 flex cables to electronics

<table>
<thead>
<tr>
<th>Milestone ID</th>
<th>Milestone Description</th>
<th>Original Date</th>
<th>Current Date</th>
<th>Major Reqmnts to Achieve Milestone</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4T43200035</td>
<td>Static Test Bottom Tray</td>
<td>07/25/03</td>
<td>09/15/03</td>
<td>Completed on schedule for 1 of the 2 trays, to the static equivalent of the random vbe levels. To complete the program: Repair of bottom damaged face sheet. Analysis. Review of detailed plan.</td>
<td>The bottom tray for the EM was successfully tested by this completion date. The plan for testing the 2nd tray and flexures is in place.</td>
</tr>
<tr>
<td>4T43200045</td>
<td>Vibration and T/V Test of EM Tower</td>
<td>08/01/03</td>
<td>10/17/03</td>
<td>Fabricate conforming sidewalls. Fabricate and test coupons from existing prepreg. Procure new prepreg. Review drawings and specs. Make and test coupons from existing material.</td>
<td>Prepreg has been procured.</td>
</tr>
<tr>
<td>4T1001430</td>
<td>Delivery of mini-tower to I&amp;T</td>
<td>08/22/03</td>
<td>08/22/03</td>
<td>Completed</td>
<td></td>
</tr>
<tr>
<td>4T1001430</td>
<td>Tracker replan progress review</td>
<td>09/05/03</td>
<td></td>
<td>Teledyne contract, delivery dates for MCMs</td>
<td>Begin replan using proposed build schedule installing ladders onto trays before MCMs.</td>
</tr>
<tr>
<td>4T038927</td>
<td>Deliver 36 MCMs and 8 flex cables to electronics</td>
<td>09/15/03</td>
<td>09/15/03</td>
<td>Provide parts to electronics group.</td>
<td>The only way to meet this schedule is to make MCMs without right-angle interconnects at a quick-turn company, using parts in hand, plus to use burn-in cables that are in hand.</td>
</tr>
<tr>
<td>4T014500</td>
<td>Composite panels assembled for towers A/B</td>
<td>09/30/03</td>
<td>09/30/03</td>
<td>Bias circuits, tungsten foils, bottom-tray closeouts. Drawing review and release. Closure of PRR action items.</td>
<td>Assembly of panels will begin in early September</td>
</tr>
<tr>
<td>4T014505</td>
<td>Start flex-circuit cable production</td>
<td>09/30/03</td>
<td></td>
<td>Complete design. PRR</td>
<td>Should we do an 8-week prototype run on 2 cables first?</td>
</tr>
<tr>
<td>4T014500</td>
<td>Start flight sidewall production</td>
<td>10/15/03</td>
<td></td>
<td>Successful completion of EM sidewalls and coupon tests</td>
<td></td>
</tr>
<tr>
<td>4T039730</td>
<td>Deliver 1st lot of flight MCMs to Italy</td>
<td>10/29/03</td>
<td>10/29/03</td>
<td>Resolution of manufacturing issues. 50 preproduction MCMs. Completion of the PRR</td>
<td>Late delivery can be mitigated by installing ladders onto trays before MCMs</td>
</tr>
<tr>
<td>4T045410</td>
<td>Begin Test of completed trays for towers A/B</td>
<td>12/18/03</td>
<td>12/18/03</td>
<td>New &quot;mini-tower&quot; test</td>
<td></td>
</tr>
</tbody>
</table>
Schedule variance: +$32k for July
- Positive value comes from taking credit for some items purchased but not yet invoiced.
- In reality starting to head more negative because MCM production is not getting underway.

Schedule variance: −$533k total accumulated
- Delays in starting MCM production
- Delays in starting flex-circuit production
Cost variance: –$175K for June

- –$9.6k each month for electronics test engineer
- –$192k removed from budgeted cost to transfer some SSD purchases to Japan
- About –$33k in additional electronics overrun (including cable design and new mini-tower cables)

Cost variance total: –$253K