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.

Issues/Concerns

- **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

Milestone ID	Milestone Description	Original Date	Current Date	Major Reqmnts to Achieve Milestone	Notes
4T43200035	Static Test Bottom Tray	07/25/03	09/15/03	Completed on schedule for 1 of the 2 trays, to the static equivalent of the random vibe levels. To complete the program: Repair of bottom damaged face sheet. Analysis. Review of detailed plan.	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.
4T43200045	Vibration and T/V Test of EM Tower	08/01/03	10/17/03	Fabricate conforming sidewalls: Fabricate and test coupons from existing prepreg. Procure new prepreg. Review drawings and specs. Make and test coupons from existing material.	Prepreg has been procured.
4T1001430	Delivery of mini-tower to I&T	08/22/03	08/22/03	Completed	
	Tracker replan progress review		09/05/03	Teledyne contract, delivery dates for MCMs	Begin replan using proposed build schedule installing ladders onto trays before MCMs.
4T038927	Deliver 36 MCMs and 8 flex cables to electronics	09/15/03	09/15/03	Provide parts to electronics group.	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.
4T014500 4T014505	Composite panels assembled for towers A/B	09/30/03	09/30/03	Bias circuits, tungsten foils, bottom-tray closeouts. Drawing review and release. Closure of PRR action items.	Assembly of panels will begin in early September
	Start flex-circuit cable production	09/30/03	?	Complete design. PRR	Should we do an 8-week prototype run on 2 cables first?
	Start flight sidewall production	10/15/03		Successful completion of EM sidewalls and coupon tests	
	Completion of the MCM preproduction run	09/30/03	??	*Teledyne proposal received 8/15/03.* Resolution of MCM assembly issues. Remake PWBs. Manufacture pitch adapters. MCM pre-production review. Set up burn-in station at SLAC.	Serious issues of schedule and cost with the Teledyne proposal.
4T039730	Deliver 1st lot of flight MCMs to Italy	10/29/03	10/29/03	Resolution of manufacturing issues. 50 preproduction MCMs. Completion of the PRR	Late delivery can be mitigated by installing ladders onto trays before MCMs
4T045410	Begin Test of completed trays for towers A/B	12/18/03	12/18/03	New "mini-tower" test	

Variance Report

- 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**

Variance Report

- 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