

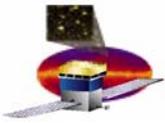
GLAST Large Area Telescope:

Tracker Subsystem WBS 4.1.4

Engineering Meeting Tracker Engineering-Model Plans

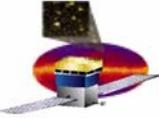
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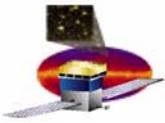
Tracker Engineering Model

- The Tracker Engineering Model is divided into two somewhat separate efforts:
 - Mechanical/Thermal Tower Module:
 - Dummy Si ladders
 - MCMs with dummy ASICs and capacitors replaced by resistors to dissipate the expected MCM power.
 - All 19 trays. The bottom tray is a schedule problem, so initial assembly tests will be done using an existing bottom tray.
 - YS90 Sidewalls exist. Sidewalls in the new K13D material are in progress in Italy (along with coupon testing, etc.).
 - Complete cabling, as in a flight module.
 - Functional “Mini-Tower”:
 - 4 standard trays, the top one with 3% tungsten; 3 x,y SSD planes
 - 1 existing bottom tray without instrumentation, for mechanical interface.
 - Aluminum sidewalls
 - Complete cabling



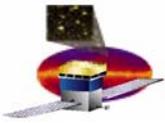
TKR EM Environmental Testing

- Tray-level environmental testing
 - Will test both mechanical dummy trays and functional trays.
 - Functional trays have less test instrumentation, as we cannot attach accelerometers and strain gauges to the live SSDs.
 - Vibration plan: LAT-TD-1004.
 - Thermal-vacuum plan: LAT-TD-1037.
- Tower-module level environmental testing
 - Mechanical/thermal dummy tower only
 - Vibration testing following our flight-model plans (LAT-TD-155) and procedures similar to those used in the prototype tower (LAT-TD-784).
 - Thermal-vacuum testing following LAT-TD-155. Verify heat transport down the tower, with the tower wrapped in a thermal blanket to limit radiated heat loss.



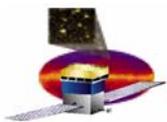
TKR EM Functional Testing

- Tray-level testing:
 - Follow the test program in LAT-TD-249.
 - Repeat functionality tests on the MCMs.
 - Do charge-injection scans (noise measurement) and threshold scans (noise occupancy and trigger rate).
 - Identify bad channels and set thresholds and masks chip by chip.
- Mini-Tower level testing:
 - Functionality tests of the readout and other communication.
 - Repeat noise, occupancy, and trigger measurements in this larger system environment.
 - Accumulate some cosmic-ray data using a scintillator trigger, to get some rudimentary efficiency data.



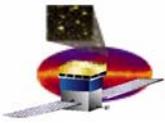
Risk Mitigation

- Vibration testing:
 - Tray level, dummies: crosscheck workmanship of the Italian production (other prior workmanship tests exist in the production process). The design was already fairly thoroughly tested with prototype trays, but the EM will give higher statistics.
 - Tray level, live: verify that functional detectors and electronics survive qualification-level testing. This is a first, but appears to be low risk.
 - Tower level: the issues here are well known.
- Thermal-vacuum testing:
 - Tray level: prototype trays have been thermal cycled and evacuated, but not both at the same time. Live detectors are being tested in vacuum at UCSC now. The EM test is more complete, with better statistics.
 - Tower level: retest revised tower/grid interface. Test cooling.



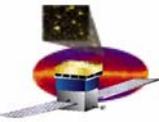
Risk Mitigation

- Mini-Tower noise tests: verify that power filtering and grounding/shielding are adequate to obtain the required noise performance in the larger system.
- Mini-Tower cosmic-ray tests: verify that the detectors actually detect particles! Test of absolute normalization using MIPs.



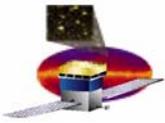
Mini-Tower Schedule

- New MCM PWB and tested chips to Teledyne by October 25
- 7 finished, tested MCMs to Pisa by Nov 15 (plus 6 to M. Huffer).
- Start testing of completed trays Dec 1. Some concerns at present:
 - Bare trays are available. Need to push to get Kapton and tungsten mounted.
 - Propose to mount ladders prior to MCM delivery.
 - Problem getting Nusil conductive glue for ladder attachment.
 - Pisa/G&A need to test out the MCM/SSD integration process.
 - Mini-MCM, VME card, and Interface Board sent to Pisa need to be tried out to get experience prior to the MCM arrival.
- Mini-tower-level assembly & testing starting at SLAC in mid January.
 - Need to get the tray level environmental tests scheduled.
 - Still need to make a detailed plan for the functional and cosmic-ray tests.
- Deliver to I&T mid to late February.



Mechanical/Thermal Tower Schedule

- Complete all dummy MCMs by the end of October (Teledyne).
- Complete all bare tray panels, except bottom, by Nov 8.
- Complete all trays with Kapton and tungsten by Dec 1.
- All ladders are ready at G&A, since a few months ago.
- All trays completed, with ladders and MCMs mounted, and wire bonds made from MCMs to ladders, plus single-tray environmental testing completed, by mid January.
- New tower assembly fixtures ready in early January for assembly testing.
- We to verify the Italian schedule on when sidewalls in the new material will be available. Meanwhile, we have YS90 walls.
- We propose to deliver to I&T, probably in January, the existing prototype tower for I&T assembly and handling tests. The EM tower will come quite a bit later, depending on the outcome of the bottom-tray redevelopment. The Tracker group has to finish tower-level environmental testing first.



Bottom Tray Schedule

- The tower-level environmental testing cannot be done until the new bottom tray development is completed.
- Decide whether invar is acceptable, regarding magnetic issues, by October 25.
- The Hytec schedule for an invar tray does not fit the CDR schedule, so this is a big, unresolved problem with that direction.
- Receive from COI this Friday preliminary analysis and planning for reinforcement of the existing design. The plan will probably be to test the concept initially using the two existing, undamaged bottom trays and the prototype tower. From this plan we can evaluate whether this option can fit into the CDR schedule.
 - (After this next prototype tower test, I&T can have that tower.)