GLAST Large Area Telescope:

Electronics, Data Acquisition & Flight Software W.B.S 4.1.7

October Status 10-29-03

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Last Month’s Accomplishment, PDU

• Function of Power Distribution Unit
  – Switches power to TEM’s, GASU, EPU crates
  – Digitizes temperatures to be used for thermal control

• Accomplishment/Status
  – Assembled full PDU box (prim and redundant)
  – Succeeded in
    • communication LCB->GASU->PDU using flight-software
    • programming HW/SW to turn on TEM via PDU using flight-software
  – Updated flight-schematics
    • In layout queue
  – Sent schematics to SAI for comments, interface to SC
    • Finalize input PDU filter, common and diff. mode
  – Engineer finished design of test-box for PDU flight acceptance testing
    • Is in layout queue
  – Plan to connect SAI Power-Regulation Unit (PRU) EM to LAT test-bed in March 04
    • Working out details
  – Added RA E. Delange to write test-scripts for PDU HW/SW tests

• Concern
  – no technical concern, schedule looks ok, driven by need for test-bed and ISIS delivery, not LAT flight hardware delivery
Last Month’s Accomplishment, GASU

- **Function:**
  - global trigger, event builder, command-response unit, ACD control/monitoring/data-readout

- **Accomplishment/Status:**
  - Assembled full GASU box (prim and redundant) including all wiring
  - Succeeded in communication LCB->GASU->TEM using flight-software
  - Succeeded in taking trigger inputs, generating trigger message, triggering TEM
  - Succeeded in configuring AEM and EB
  - Succeeded communication LCB->GASU->FREE card (ACD front-end) for configuration/read-back
  - Succeeded assembling event with GEM message and receipt in LCB
    - Working on getting TEM events and ACD sub-system events readout and assembled with GEM message
  - Added RA Asim to write test-code for HW/SW tests

- **Concern:**
  - Schedule, not for flight, but for test-bed, ISIS, and ACD EGSE test-setup delivery
  - Major hit because we lost main engineer end of last year
    - Jeff Olsen: now main GASU engineer
      - flight schematic; GASU debug; GEM coding
    - Mark Freytag: AEM coding/debug
    - Eric Suskind: EBM/CRU coding/debug
  - after initial hit making rapid progress
Last Month’s Accomplishment, GASU Power Supply

- Function: Generate power for GASU DAQ board and ACD front-end electronics from 28V

- Accomplishment/Status
  - Fabricated/assembled more boards for GASU’s
  - In process of making another copy to send to ACD to connect to FREE’s

- Concern:
  - none
Last Month’s Accomplishment, TEM

- Function of Tower Electronics Module
  - control/readout/monitoring of TKR and CAL sub-system

- Accomplishments/Status:
  - Continue testing, still works including ASIC’s
  - Schematic and Layout is final
  - Difference to flight: none
  - Have enclosure with TEM integrated
  - Working on flight acceptance test code
  - Finalizing bid package/drawings for fabrication/assembly of qual/flight model
  - Working on performance test/thermal cycle/vibration/TV test procedure documents
  - Ordering capacitors: still need 1 cap which has long delivery

- Concern:
  - Schedule for flight:
    - RFP process
    - Receipt of components for TEM assembly
Last Month’s Accomplishment, DAQ ASICs

- TEM Tracker Cable Controller ASIC (GTCC1)
- TEM Calorimeter Cable Controller ASIC (GCCC1)
- GLAST LVDS Translator Chip ASIC (GLTC2)

Accomplishment/Status
- Flight production received from packaging at ASAT (T31D run)
- SEL/SEU testing done
- Total Ionizing Dose testing is waiting for burn-in of devices before testing can be done
  - Burn-in board schematic final and board is in layout
- Awaiting final approval of screening/qual doc from PCB

Concern:
- None, unless flaw is detected while more testing is going on
Last Month’s Accomplishment, TPS

• Function of Tower Power Supply
  – Supply voltages to TKR, CAL sub-system and to TEM from 28V

• Accomplishment/Status:
  • Engineering Module is working
  • Received updated enclosure (was modified from original box to match EM board)
  • Working on finalizing and getting approved drawing package for flight RFP (first article fab is used for qual)
  • Ordered most capacitors, 2 are long lead, looking for options

• Concern:
  • Schedule for flight:
    – RFP process
    – Receipt of components for TEM assembly
Last Month’s Accomplishment, SIU/EPU (1)

• EPU and SIU cCPI crate the same except
  – RAD750 boot code different
  – Storage Interface Card loaded different
  – Status combined

• cCPI crate contains
  – Enclosure
  – Backplane
  – Lat Communication Board (LCB)
  – Storage Interface Board (SIB)
  – Crate Power Supply Board (CPS)
Last Month’s Accomplishment, SIU/EPU (2)

- Enclosure (cPCI crate)
  - Expecting additional crates for test-bed (have only one) end of this month
- Custom Backplane
  - Have version in lab at SLAC, awaiting SIB before making next modified version, minor mods
- LCB (Control/event interface from processor to LAT)
  - Found/fixed problem with PCI core in respect to STOP signal behavior
  - Code from PMC version is ported to cPCI version (has discrete flight FIFO’s as opposed to FPGA integrated)
  - Schematic was updated to include modifications from debugging
  - Is in layout
  - Need documentation, drawing package for flight RFP
Last Month’s Accomplishment, SIU/EPU (3)

- **SIB** (MIL1553 interface to Spacecraft, EEPROM storage for code, control circuit for VCHP heaters)
  - First SIB was fabricated/loaded/debugged incl flight-software
    - Is now at SLAC for integration in SIU crate
    - Board booted with BAE750, turned-on PDU/GASU power from SIB using flight-software
  - Ordering flight components
  - Some concerns about Honeywell SRAM power sensitivity, may change to different Honeywell package which would require layout changes
- **CPS** (Generate crate supplies (5V/3.3V) from 28V)
  - Debugged module, tested with backplane and LCB, all ok
  - Awaits fully loaded crate test
- **CPU**
  - BAE 750 boards boots in crate
  - Designed/laid-out/fabriated/loaded/tested cPCI adapter board to translate TTL serial BAE interface to standard RS232 for debugging
Last Month’s Accomplishment, Misc

• Point-to-point cables ("Harness")
  – Ordered complete set of cables for test-bed
  – Started to add cable-ways on test-bed so one can fit-check cables
    • Need to make sure that it is ok with installation sequence during I&T
    • Need to finalize fly-away sensors and cabling since they live in same space

• Heater Control Box
  – Finished schematic of Heater Control Box circuit
  – In layout
Last Month’s Accomplishment, Simulator

- **Function of Front-End Simulator (FES)**
  - Simulates TKR and/or Calorimeter front-end electronics on test-bed, connects to TEM like subsystem and to PC (later for downloading data-patterns)

- **Accomplishment/Status**
  - Modified schematic to include modifications from first EM test
  - Finished layout
  - Fabricated boards
  - Received first article back from loading
  - Is in test
  - If ok fab/load 36 boards for test-bed
Last Month’s Accomplishment, EGSE

- **Function:**
  - Provides test-setups for CAL, TKR, DAQ HW & SW effort

- **Accomplishments/Status:**
  - Ordered (to arrive at a total of 60 test-stands)
    - VME crates
    - VME single-board computers
    - VME SLAC custom transition board
    - Custom PCI Mezzanine Card (PMC) LCB’s
    - Connectors for cables
    - TEM enclosures
    - Tower Power Supply enclosures
    - Tower electronics modules
    - TEM DAQ boards
    - 28V-power supplies
  - Released first draft of EGSE description/test procedures to CAL for comment
  - Working on modification of ORACLE data-base to be able to enter LAT components before assembly of test-stands
  - Send write-up describing ACD G3 test-stand to ACD
    - Will supply all G3’s with prim and redundant GASU DAQ boards (one of the for 12 FREE’s, the others for 2 FREE’s)

- **Concern:**
  - CRYSTEK CAL/TKR connectors were due 12/1/03, but have received 51-pin connectors only mid January. Still no 69-pin connectors (both used for TEM) CRYSTEK had some problems with supplier.
  - Started to assemble TEM test-stands with limited number of fully-loaded TEM’s
Last Month’s Accomplishment, Testbed (1)

- Started system tests for software test-bed components (flight software components/packages/functions)
  - BAE750 successful boot in real SIU enclosure with SIU custom backplane, SIB, CPS, LCB lite (reset, clock/2 for BAE750 PID’s)
  - FSW communicated via MIL1553 (prim & red) with SIU crate-> SIB -> BAE750
  - FSW turned-on GASU and PDU power under BAE750 control via SIB
  - BAE750 turned on/off heaters via SIB
  - Spacecraft discretes connected to BAE750, FSW received signals (e.g. sys-clock/2 into BAE750 PID’s for time-stamp)
Last Month’s Accomplishment, Testbed (2)

- Started system tests for software test-bed components (flight software components/packages/functions)
  - LCB controls EBM, CRU, GEM, AEM, configuration/read-back with FSW code
  - Controls PDU to turn-on/off clients (TEM’s)
  - Event-builder builds events (TEM/GEM) and get to CPU via LCB
  - Next: Event data from ACD FREE-> AEM-> EBM -> LCB
Manpower

- Lost main GASU HW engineer
  - reallocated existing engineering resources
- Added FSW coding and documentation personnel (see FSW status)
- Interviewing additional FSW help (see FSW status)
- Added Research Assistants for testing (have now 4 RA’s)
- Added S&E Tech for EGSE build-up (R. Rodriguez)
- In process of adding engineer for ASIC qual/screening (hired, starts next Monday)
- Adding assembly technician (in interview process)
- Adding ISIS (Instrument Spacecraft Interface Simulator) (software) engineer, will start in 3 weeks (gave notice to Loral Spacecraft)
- Adding 2 post-doc physicist/software developer to test system. Have accepted offer, will start April 5.
- Adding software developer/physicist A. Perazzo (presently on SLAC BaBar on-line) to help testing. Will start mid February

- To do:
  - Adding man-power for EGSE
Schedule/Budget

- Total budget: $18,733
- Work Scheduled up to date: $8,418
- Work Performed: $9,110
- Actuals: $9,925
- Schedule Variance $692k
  - Some flight components were delivered earlier than expected, thus ahead of schedule in M&S
- Cost Variance: -$816k
  - Additional EGSE test-stands -> CC in progress
  - SIB card in each crate -> CC in progress