Subsystem Mgrs F2F Meeting  
Calorimeter Subsystem  

3 September 2003  
W. N. Johnson  
Naval Research Lab
Outline

- Rebaseline Implementation
- Interdependencies with other Subsystems
- Flight hardware procurements
- Greatest Risks to Schedule
## Current Rebaseline Deliveries

**GLAST Calorimeter**

**meeting:**

**LAT F2F**  
**Meeting**  
**3 Sep 2003**

<table>
<thead>
<tr>
<th>Activity description</th>
<th>Float</th>
<th>Available</th>
<th>Latest</th>
</tr>
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<tbody>
<tr>
<td>AV: Calorimeter Module A/B RFI</td>
<td>4</td>
<td>08-Jul-04</td>
<td>14-Jul-04</td>
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<tr>
<td>AV: Calorimeter Module 1/2 RFI</td>
<td>14</td>
<td>22-Jul-04</td>
<td>11-Aug-04</td>
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<td>AV: Calorimeter Module 3/4 RFI</td>
<td>27</td>
<td>30-Jul-04</td>
<td>08-Sep-04</td>
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<td>AV: Calorimeter Module 5/6 RFI</td>
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<td>23-Aug-04</td>
<td>06-Oct-04</td>
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<td>AV: Calorimeter Module 7/8 RFI</td>
<td>35</td>
<td>15-Sep-04</td>
<td>03-Nov-04</td>
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<td>AV: Calorimeter Module 9/10 RFI</td>
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<td>06-Oct-04</td>
<td>17-Nov-04</td>
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<tr>
<td>AV: Calorimeter Module 11/12 RFI</td>
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<td>19-Oct-04</td>
<td>03-Dec-04</td>
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<tr>
<td>AV: Calorimeter Module 13/14 RFI</td>
<td>31</td>
<td>02-Nov-04</td>
<td>17-Dec-04</td>
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<tr>
<td>AV: Calorimeter Module 15/16 RFI (for Calibration)</td>
<td>35</td>
<td>16-Nov-04</td>
<td>14-Jan-05</td>
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</tbody>
</table>
AFEE availability delays assembly of 1st modules.
- AFEE Assembly, test and burn in. (~2 months)
- ASIC parts qualification, screening (~ 2 months)
- ASIC packaging (~ 1 month)
- ASIC grinding, dicing, inspecting (~1 month)

AFEE availability (delayed) compresses work schedule for 1st 6 modules to get back to desired delivery schedule…
- So much for starting slowly and ramping up….
### ASICs to AFEE Assembly

**GLAST Calorimeter**

**LAT F2F Meeting**

3 Sep 2003

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<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Duration</th>
<th>Start</th>
<th>Qtr 4, 2003</th>
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<th>Qtr 2, 2004</th>
<th>Qtr 3, 2004</th>
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<tr>
<td>1</td>
<td>ASIC Manufacture</td>
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<td>2</td>
<td>Mosis fabrication run</td>
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<td>3</td>
<td>OSE packaging 1 wafer</td>
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<td>5</td>
<td>ASIC wafer grind and Dice - flight</td>
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<td>6</td>
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<td>7</td>
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<td>21</td>
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<td>23</td>
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<td>1 day</td>
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<td>24</td>
<td>AFEE 100% therm cycle (unpwd) -30C,85C, 20 cycles [NEW]</td>
<td>2 days</td>
<td>Thu 2/19/04</td>
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<td>25</td>
<td>AFEE 100% dynamic burn in 168 hr 85C [18]</td>
<td>7 days</td>
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<td>30</td>
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<td>AFEE Ready [29]</td>
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<td>32</td>
<td>ASIC Pre-Qual/Qual Flow</td>
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**Naval Research Lab**

**Washington DC**
Need about 5 weeks improvement in availability of AFEE boards.  
NOTE that in the ASICs are already being used before completion of qualification. This buys about 2 weeks.

Other Possibilities:

- ASIC packaging
  - RBSL has 4 weeks to grind, dice and inspect and 4 weeks to package at ASAT. (T31D experience) (Recover 2 weeks?)

- GCFE9A burn in
  - Allocates 4 weeks (28 days, 24 x7) for burn in. This is 4 sequential burn ins of 1 week to get the number of parts completed.
  - Buy x2 (or x4) as many burn in boards, and halve (quarter) the time. (Recover 2 – 3 weeks for $20 – 60K)

- AFEE Assembly at vendor
  - The 1st AFEE card comes out of board assembly 25 days after delivery of the last parts. (Potential for 1 – 2 week faster for 1st boards.)
Interdependencies with other LAT components

- Figure out what we are doing with regard to ASIC grind, dice, and inspection. **NEW**
- Resolve and verify CAL – Grid interface
  - Complete analyses. Detail extra features – cable tray attachment **Done**
  - Release IDDs or whatever **Base plate not released / Not Done**
- Resolve and verify CAL – T&DF box mechanical, thermal design, and EMI/EMC design.
  - Resolve EMI/EMC surface treatments, grounding, shielding
- Identify, cost and schedule needed TEM and PS (EM2???) that support CAL assembly and test schedule. **OK except for documentation??**
- Produce EEE Parts required documentation (as identified by GSFC) for the ASICs or tell them NO and resolve the qualification of the ASICs for flight.
Open Design/EM/Manufacturing Issues

GLAST Calorimeter

- EMI/EMC performance
  - So what are we going to do with all the fine recommendations and when will we know that they then meet GLAST requirements.

- AFEE – TEM Cable
  - EM version of cable is too stiff – caused by several layers of kapton tape and copper tape for EMI protection.
  - Use with and without connector savers on the TEM will be challenging if not impossible.
    - Wire bending at the Nanonics connector poses risk to connections.
    - Violation of CAL stay clear would be essentially impossible to avoid in use w/ connector saver.
  - Adequacy of EMI protection in current design is in question.

Closure:
- Investigate alternate shielding concepts
- Build more support and EMI protection into current cable support bracket on base plate.
- Don’t use connector savers during module test.
Flight Hardware Procurements

- Except for new work in US, most flight procurements are made or are in process.
  - EEE parts complete except for uncertainty on some PPL resistors.
  - AFEE – TEM interconnect cable discussed earlier.
  - AFEE PCB is in design modification. Board assembly spec complete mid Sept and vendor selection will start then.

- PDA manufacturing
  - Vendor selected. Process spec complete. Prototype tooling is being tested on qual unit PDAs. Tooling needs to be replicated ~ 50 times.

- CDE manufacturing – Swales
  - Start manuf. of Qual CDEs next week.
  - Plan CDE Manufacturing Readiness Review in late September.

- Metallic machined parts from NRL.
  - Titanium parts in manufacture. To be delivered to France.
  - Awaiting revised drawings of baseplate.
  - Potential issues relative to recent EMI/EMC testing – surface treatment, more screws.

- Plastic and Elastomeric parts for CDE – structure interface at LLR
  - Specs in place, vendors selected, parts approved. First parts being made.
Flight Manufacturing Plan Status

GLAST Calorimeter

- Except for not knowing if we need to redesign and remanufacture the metallic CAL structure for improved EMI/EMC performance, we’re in good shape.

- The completion of the larger clean room at NRL for PEM and module ass’y and test has dragged on all summer for various reasons.
  - A new problem is the apparent non-compliant status of the A&T building dehumidifying system. Cost and schedule impact of workarounds are being investigated.
  - Room (likely without dehumidification) will be ready by end of October.
Greatest Risks to Schedule

- Resolution of EMI/EMC issues and any potential modifications required
- ASIC acceptability for flight – both performance and qualification.
- CDE Bonding process development and qualification delay.
- Ability of Sweden to maintain the delivery rate and schedule of CsI crystals. (last modules issue)
- EEE parts use approval and impact on assembly of AFEE board.
- Failure or process problem in module assembly or test which stops the production pipeline.
Unresolved Assumptions

CAL will receive 10 (TBR) EM2 TEM and Power Supplies that are fully tested and ready for integration with CAL flight hardware.

- Capable of surviving CAL Vibration Test levels
- Capable of operating in CAL TVAC.
- Capable of providing appropriate EMI/EMC test environment.

~5 EM1 or EM2 TEM boards (unpackaged?) to support AFEE card assembly and test

CAL will receive sufficient VME Interface Cards (COMM & PDU?) and PowerPCs to support XX CAL Test Stands

- 10 CTS to support module Assy & Test
- 6 mini CTS to support AFEE card assembly and test - minimal config, power control not needed.

EGSE communications (COMM to/from TEM) can support required cable lengths for TVAC and EMI/EMC testing over temperature – 10 m or more with bulkhead connector adaptors.