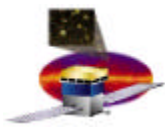


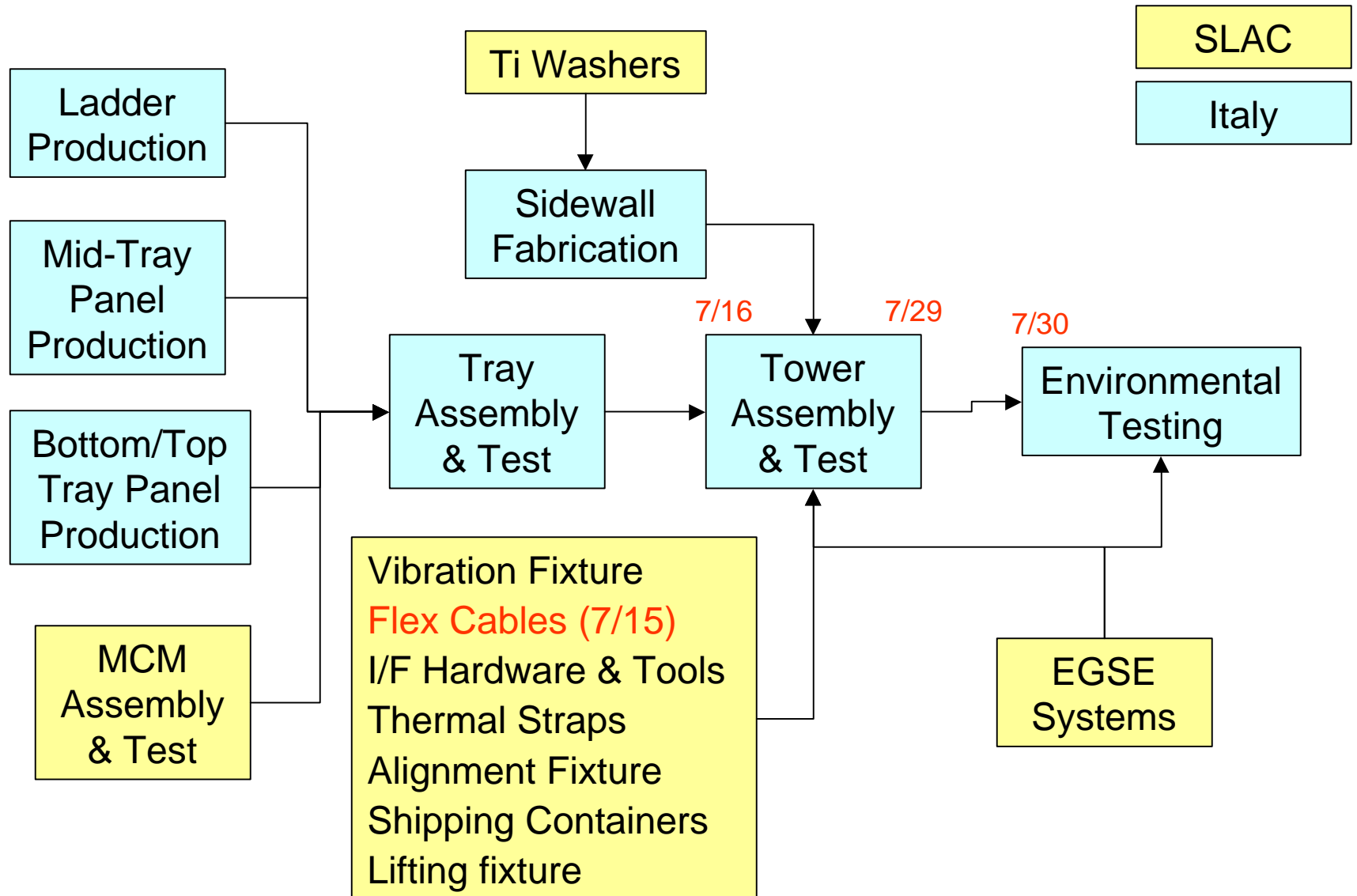
# GLAST Large Area Telescope: Tracker Subsystem WBS 4.1.4

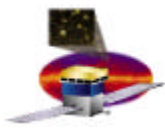
Robert P. Johnson  
U.C. Santa Cruz  
Santa Cruz Institute for Particle Physics  
LAT Tracker Subsystem Manager

[rjohnson@scipp.ucsc.edu](mailto:rjohnson@scipp.ucsc.edu)  
831-459-2125

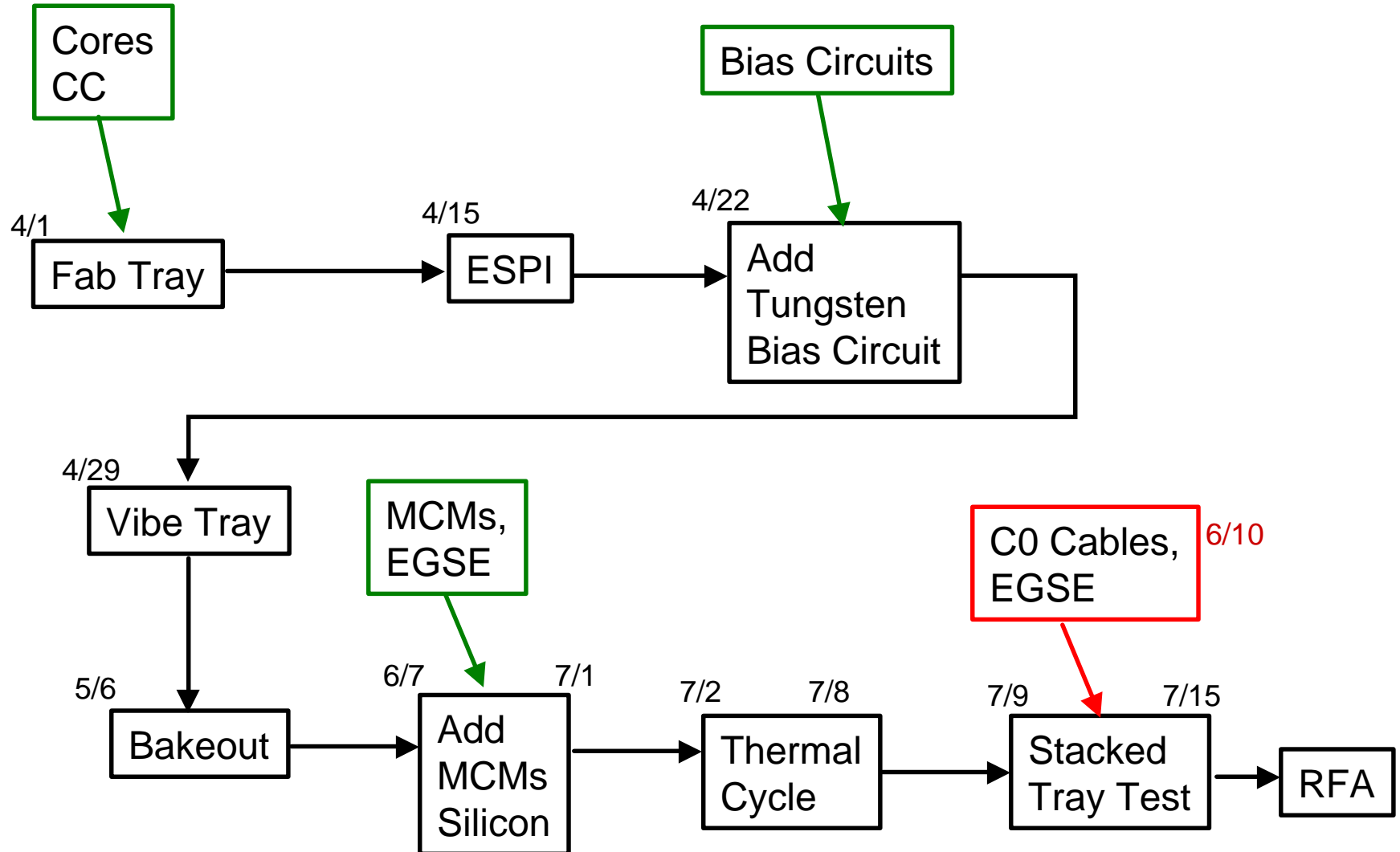


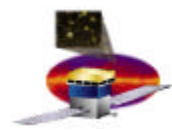
# Tower-A Production Flow



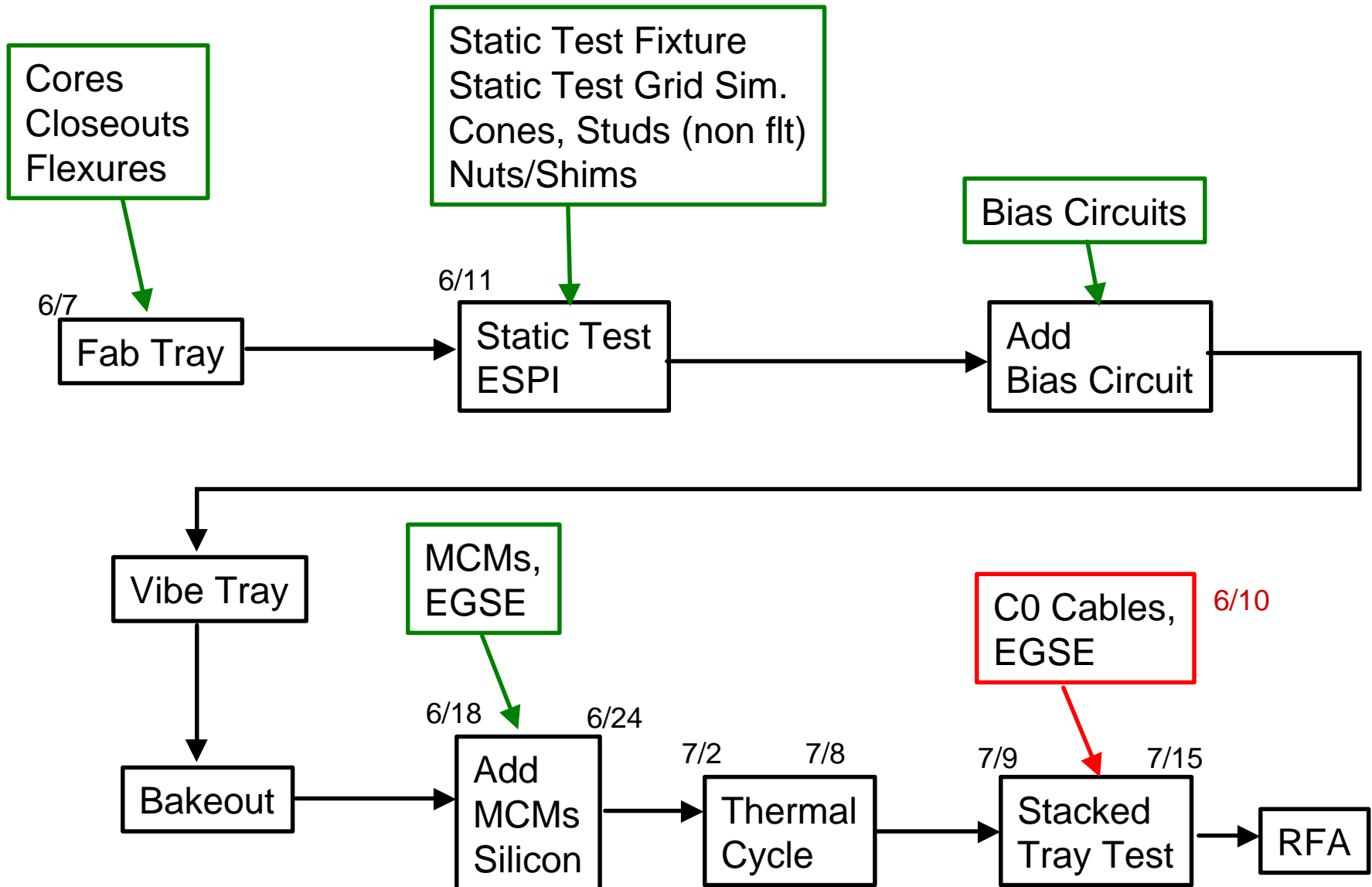


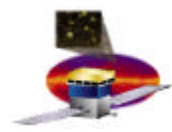
# Tower-A Mid-Tray Production





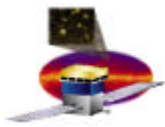
# Tower-A Bottom Tray Production



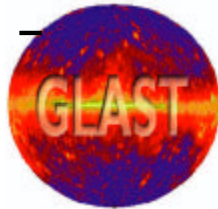


# Tower-A Production Startup

Item	Dates	Status	Issues
<b>MCM Assembly at Teledyne</b>	<b>Completed for Tower-A</b>	<b>76 flight MCMs have been shipped by Teledyne (+4 non-flight for DAQ use)</b>	
<b>MCM Burn-in and Test at SLAC</b>	<b>Completed for Tower-A</b>	<b>48 MCMs have been burned in and passed final test at SLAC. 11 MCMs shipped to Italy and passed incoming tests there.</b>	<b>Register readback errors in the burn-in system.</b>
<b>Mid-Tray Panel Fabrication at Plyform</b>	<b>Completed next week?</b>	<b>All Tower A tray panels have been fabricated and passed through ESPI testing. Seven panels are completely finished with Kapton, tungsten, &amp; tests.</b>	

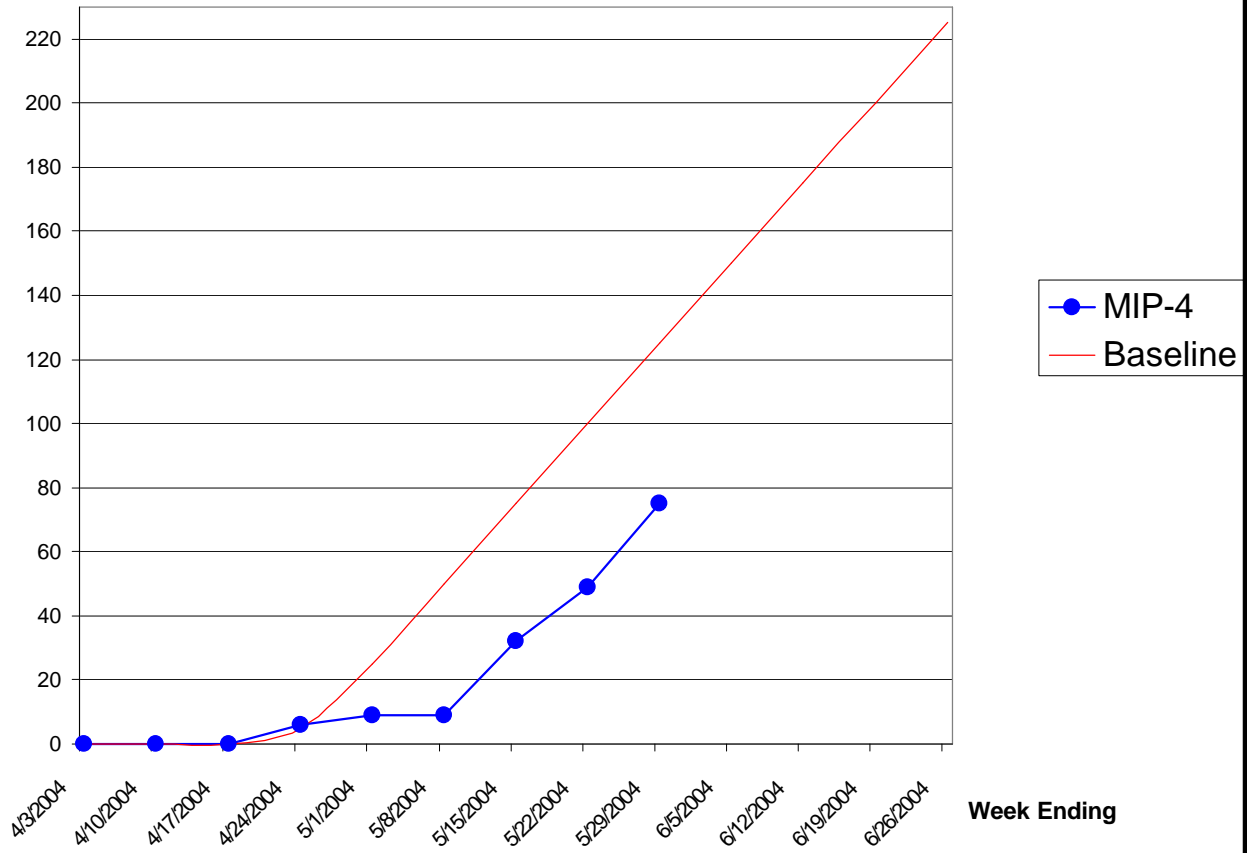


# MCM Production Status

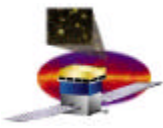


TMCM Units

### TMCM FLIGHT PRODUCTION

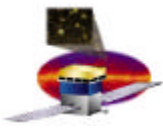


Week Ending



# Tower-A Production Startup

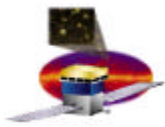
Item	Dates	Status	Issues
<b>Bias Circuits</b>	<b>Tower-A parts are in hand.</b>	<p><b>Never had to use the 1/2-oz circuits.</b></p> <p><b>43 more circuits shipped last week.</b></p> <p><b>127 new circuits arrived this week from Parlex.</b></p>	
<b>Tray Vibration at Centrotecnica</b>	<b>Complete next week for Tower-A?</b>	<b>All documentation is released, and vibration of flight trays is in progress.</b>	
<b>Tray Panel Vacuum Bakeout at Roma-II</b>	<b>Complete next week for Tower-A?</b>	<b>Ready to go. Procedure document has been reviewed and is in the release process.</b>	



# Tower-A Production Startup

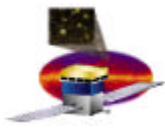
Item	Dates	Status	Issues
<b>Bottom Tray Assembly</b>	<b>First BTM tray to be ready for static test June 10</b>	<b>Completed assembly tooling due at Plyform Friday. Titanium inserts by Thursday. Grounding wire and lug in work.  All other parts are in hand. Assembly drawings and procedure in release.</b>	<b>Delayed by tooling fabrication and insert material</b>
<b>Bottom-Tray Static-Test</b>	<b>End of next week</b>	<b>The test fixture, SLAC personnel, and all equipment are in Italy now. Just waiting on the bottom tray.</b>	





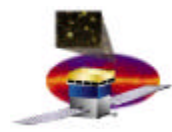
# Tower-A Production Startup

Item	Dates	Status	Issues
<b>Interface Hardware (cones, studs, etc.), AMT</b>	<b>Flight parts needed July 15 in Italy</b>	<b>Development testing was completed. Flight procurement is in progress (drawings in release). Parts are in hand for static test. Studs are being coated &amp; locking feature added for EM vibration testing.</b>	
<b>Top Tray Panel Assembly</b>	<b>Assemble next week</b>	<b>All drawings are released. Titanium inserts this week. Tooling will be ready at Plyform by end of this week. Procedure is in release.</b>	



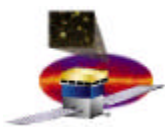
# Tower-A Production Startup

Item	Dates	Status	Issues
<b>Tray Assembly at G&amp;A</b>	<b>Begin June 7</b>	<b>Final testing of MCM mounting tooling is finishing this week. MCM alignment pins will be available by end of week. Procedure document is in release. Assembly drawings are being reworked at SLAC; the first is being reviewed. Tests of the procedure on non-flight trays will begin Monday. Breakout board in fab at SLAC.</b>	<b>Was delayed by tooling issues and drawing release.</b>



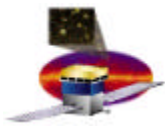
# Tower-A Production Startup

<b>Item</b>	<b>Dates</b>	<b>Status</b>	<b>Issues</b>
<b>C0 EGSE cables for stacked tray testing</b>	<b>June 10</b>	<b>Expected from Parlex June 10.</b>	
<b>Flex-Circuit Cables from Parlex</b>	<b>Needed by 25-Jun-04</b>	<b>Drawings of 8 cables types are complete and released. PO is in progress; needs to go out today. Cost is greater than our estimates, due to no break on quantity, high cost of the longer cables, and need to pay expediting charges. First 2 sets by July 8 (with expediting charge)</b>	<b>Cost; Critical Path to Tower A</b>



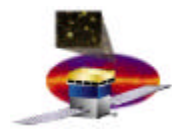
# Tower-A Production Startup

Item	Dates	Status	Issues
Tray Thermal Cycles in Terni	2-Jul-04 to 8-Jul-04	Equipment is ready to go. The procedure is under review for release.	
EGSE Systems	Okay for Tower-A	2 systems are in Italy and have passed through testing to qualify them for use with flight MCMs. 2 more are ready to ship.	
Stacked Tray Testing	9-Jul-04 to 15-Jul-04	All hardware except the C0 cables is ready. Procedure document and test scripts are being finalized.	



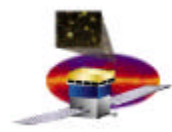
# Tower-A Production Startup

Item	Dates	Status	Issues
<b>Sidewall Fabrication at Plyform</b>	<b>Needed by 15-Jul-04</b>	<b>Prepreg was shipped from COI to Plyform. Drawings are released. Assembly specs are in release (review complete). Ti washers are in hand.</b>	



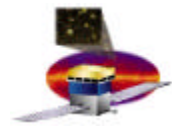
# Tower-A Production Startup

<b>Item</b>	<b>Dates</b>	<b>Status</b>	<b>Open Issues</b>
<b>Tower Assembly and Test</b>	<b>16-Jul-04 to 29-Jul-04</b>	<b>Assembly fixture is ready. Test scripts are in progress. Procedure documentation is in progress.</b>	
<b>Heat Straps and Fasteners</b>	<b>Needed by 15-Jul-04</b>	<b>Design is complete and ready for sign-off.</b>	
<b>Vibration Fixture</b>	<b>Needed asap for EM vibe</b>	<b>Drawing is released and procurement is in progress.</b>	<b>Tight schedule for EM, no ETA yet.</b>



# Tower-A Production Startup

<b>Item</b>	<b>Dates</b>	<b>Status</b>	<b>Open Issues</b>
<b>Shipping Containers</b>	<b>Needed by 15-July-04</b>	<b>Redesign of the inner container is well advanced. A new outer container still needs to be procured.</b>	
<b>Lifting Fixture</b>	<b>Needed by 15-Jul-04</b>	<b>A new design is well advanced.</b>	
<b>Top-Tray Alignment Features and Cable Constraint</b>	<b>Needed by 15-Jul-04</b>	<b>New design concept was agreed upon and is being detailed.</b>	

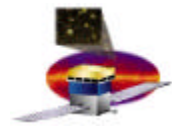


# Towers B through 16

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- **Discussions and negotiations are in progress to increase the Tracker production capacity in Italy.**
  - **More tools at Plyform & G&A to be able to assemble more trays in parallel**
  - **Additional wire bonder at G&A to speed up tray assembly**
  - **Second tower assembly location (Pisa and G&A)**

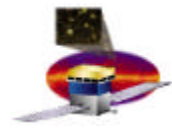




# Flight Hardware Drawings Status

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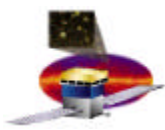
- **Top/Bottom Tray Panels (including flexures)**
  - All drawings complete and released, except for 1: the bottom-tray assembly drawing, which is pending some details on the grounding wire and lug.
- **Mid Tray Panels**
  - Some rework and improvements of the drawings to reflect as-built condition are still needed, but low priority.
- **Tray Assembly (Bonding MCMs + Ladders to tray panels)**
  - 5 drawings (tray types). These are in work at SLAC. The first of the 5 is complete and under review.
- **Sidewall Drawings**
  - Released.
- **Heat Straps**
  - Ready for release.



# Flight Hardware Drawings Status

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- **Flex-Circuit Cables**
  - Released.
- **Top Mount Cable Retainer and Alignment Hardware**
  - New design: 8 drawings in work.
- **Interface Hardware**
  - 8 drawings complete, reviewed, and in release.
- **Tower Assembly**
  - New engineering team has not gotten to this drawing yet, so it needs still a lot of rework and checking before being ready for release.
- **IDD**
  - Should be possible to get this released now that the interface hardware and flex-circuit cable drawings are released.
- **SSDs, Ladders, MCMs, Bias Circuits: all released and final.**



# Cable Retainer & Alignment Hardware

Retro-reflector ball for optical surveying (removed for handling and tests)

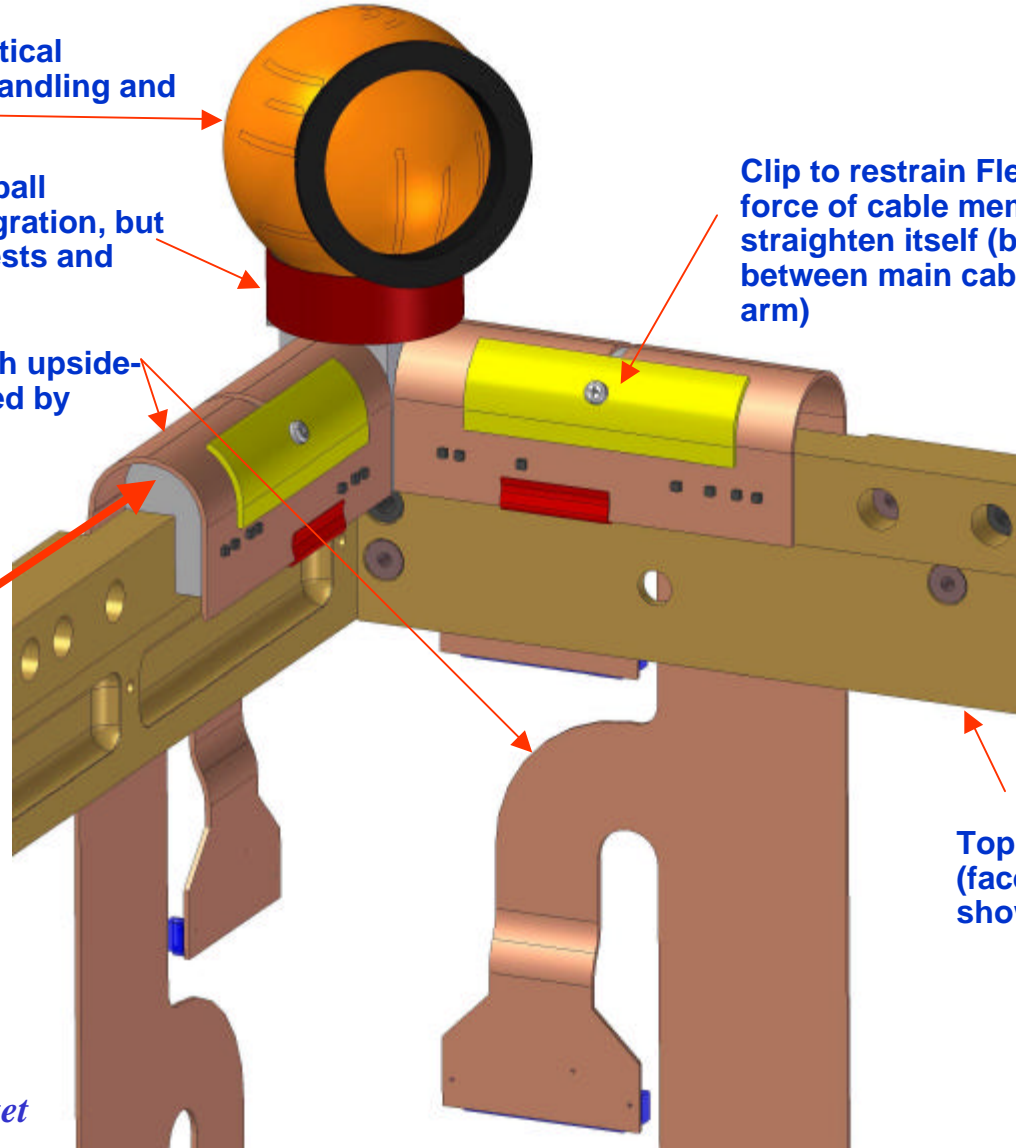
Custom Nest for reflector ball (removed before ACD integration, but present for all TKR-level tests and handling)

Flex Cables C-5 and C-6 with upside-down cactus arms supported by Mount Bracket

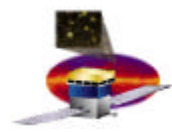
Clip to restrain Flex Cable against force of cable memory wanting to straighten itself (bolt fits through slot between main cable run and cactus arm)

New aluminum part bonded to the top tray closeout

Top Tray Closeout (facesheets and core not shown)



*Corner Mount Bracket*



# Schedule & Cost Variance

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- **April: schedule variance of  $-\$172\text{k}$**
- **Cumulative: schedule variance of  $-\$712\text{k}$  from  $\$12,669\text{k}$  budgeted cost of work scheduled.**
  - Most of the cumulative and  $-\$154\text{k}$  of the monthly variance is due to the production delays of TMCs, which started up slowly in April.
  - Slow delivery of some parts contributes to the cumulative but is not necessarily holding up the critical path:
    - ✓ Not all bottom tray parts received:  $-\$65\text{k}$ .
    - ✓ Not all flight bias circuits received:  $-\$177\text{k}$  cumulative
- **Cumulative Cost Variance:  $+\$106\text{k}$**