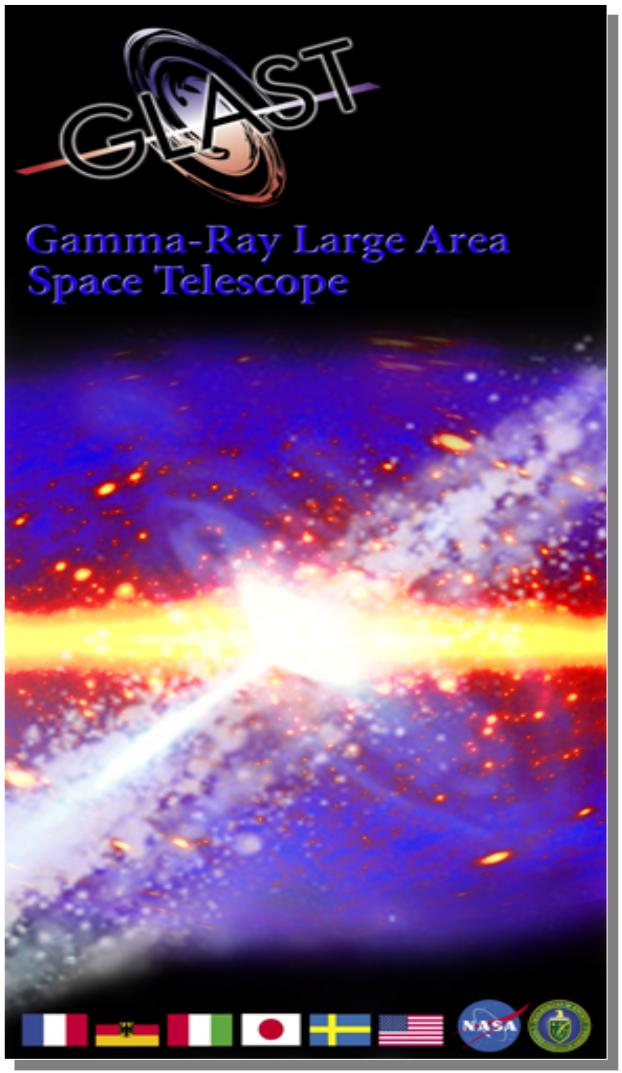

GLAST Program
Test Readiness Review

Flight TKR Towers
(Tower B and 1-16)
Thermal Vacuum Tests

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Agenda

- Introduction
- Status of Alenia Thermal Vacuum Chamber
- Status of Tower B
- TVAC Requirements
- Test Objective
- Overall Plan
- Test Procedure
- Test Responsibility Matrix/Communications
- Test Configuration/Setup
- Success/Failure Criteria
- TVAC Test Flow
- Operational Activities
- Status; Test Article & Facility
- TVAC Known Risks and Limitations
- Conclusion

Introduction

- **TRR for GLAST/LAT Flight Tower B Thermal Vacuum Test:**
  Bakeout Test at 42°C
  4 Thermal Cycles (-15°C / +42°C)

- **TRR chairman – Nicola Mazziotta(INFN)/Jack Goodman (SLAC)**

- **Charter**
  - Verify that all necessary plans and procedures are completed and up to date
  - Verify that test article and GSE is ready or will be ready by date of installation into thermal vacuum chamber
  - Agree on any work yet to be performed ⇒ last minute details

Status of the Alenia TV chamber

19 January 2005

- **Leakage problems on the cold plate**
- **Cold plate shipped back to the manufacturer**

20 January 2005

- **A fast test has been performed in the morning to detect leakages.**
- **Pumping down of chamber in order to verify vacuum capability started on the evening**

21 January 2005

- **Vacuum level @ 2.6 10^{-5} Torr**
- **Chamber opened in order to start the dry run set-up**
- **Set-up preparation completed in late evening (8 pm)**
- **Problems in the Alenia Thermocouples DAQ system**

22 January 2005

- **Problems with the Thermocouples DAQ fixed in the afternoon**
- **Chamber closed and pumping down started (7 pm)**

Status of the Alenia TV chamber (cont'd)

23 January 2005

- **9:00 am:** vacuum @ 2.1 10^{-5} Torr
- **11:00 am:** test of the chiller warming capability
  - Transition from room temperature (20°C) to 50°C
  - Mismatch between temperatures measured by TCs and by the chamber control PT100 probe ($\Delta T \approx 8$°C)
- **1:00 pm:** Transition from 50°C to room temperature (20°C)
- **1:10 pm:** Pressure @ 3.25 10^{-5} Torr
- **4:00 pm:** Vacuum @ 1.85 10^{-5} Torr
- **4:20 pm:** Transition from room temperature (20°C) to -20°C
- **5:00 pm:** Stop Alenia chamber validation
  - Open the chamber
  - Dismount of the installed set-up
  - Alenia states that the chamber will be ready on Tuesday

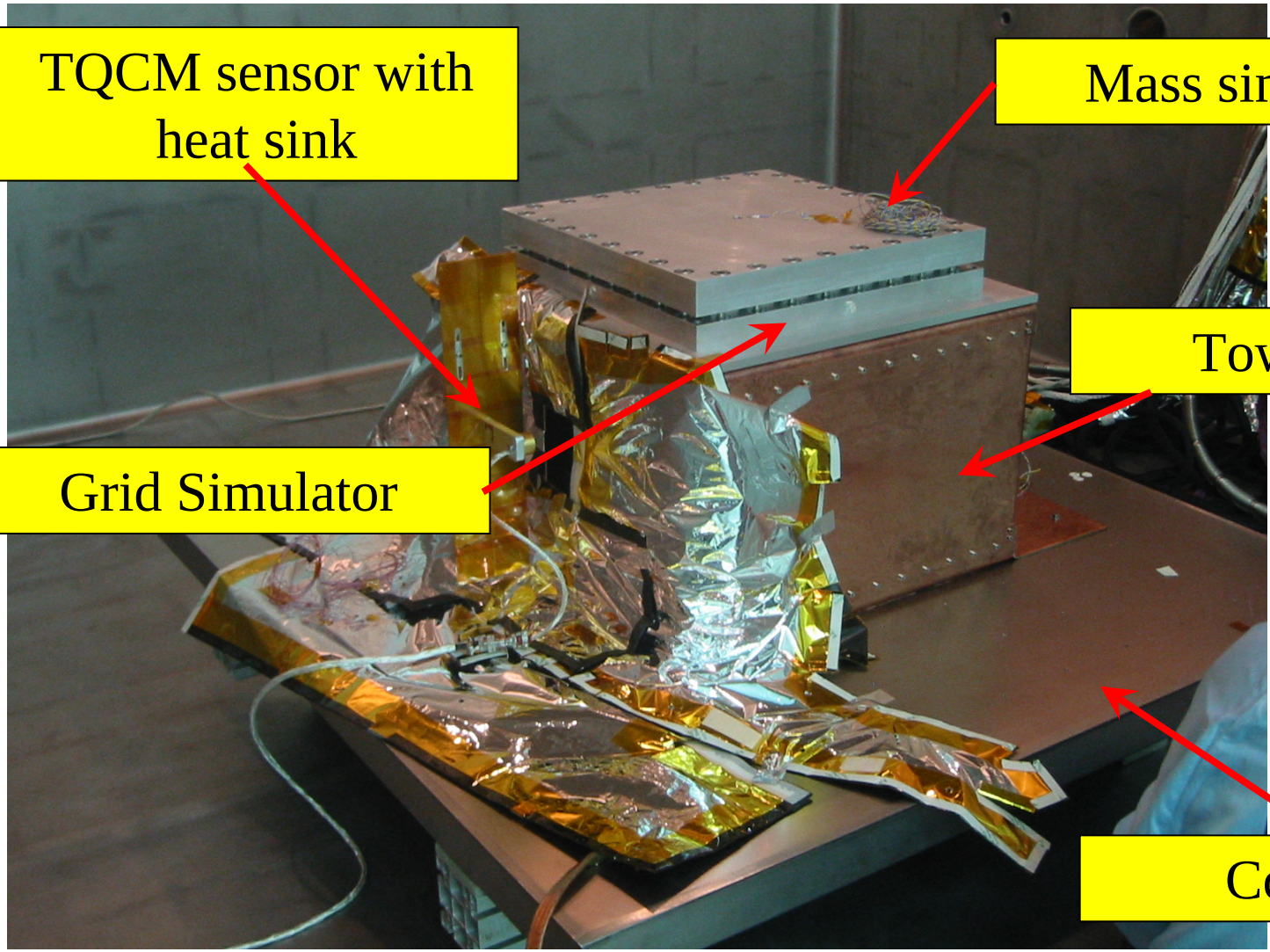
Contingency plan

- **Dismounting of all the MGSE set-up (23 January evening-night)**
- **Wait for:**
  1. **Readiness of chamber**
  2. **Disposition whether to perform dry run or to move directly the test article in the chamber**
     1. **No dry run: to minimize the risk associated with the new test configuration, the test must be conducted slower than planned because of uncertainty.**
     2. **With dry run: we can proceed as planned. The dry run test provides final confirmation of test facility performance.**

Tower B status

- **Tower B**
  - **Assembled with thermocouples**
- **MGSE**
  - **Tower Stand: installed**
  - **Inner Guard Shield: ready**

Dry run set-up



Inputs to this Review

Thermal Vacuum Test Plan: LAT-TD-01840

Thermal Vacuum Test Procedure: LAT-TD-05500

MGSE Test Set-up Drawings: LAT-DS-05562 LAT-DS-05621

EGSE Schematics:

- IGS Heaters
- TEM Tower Connections

Daily Reporting Process

Staff Call-in List

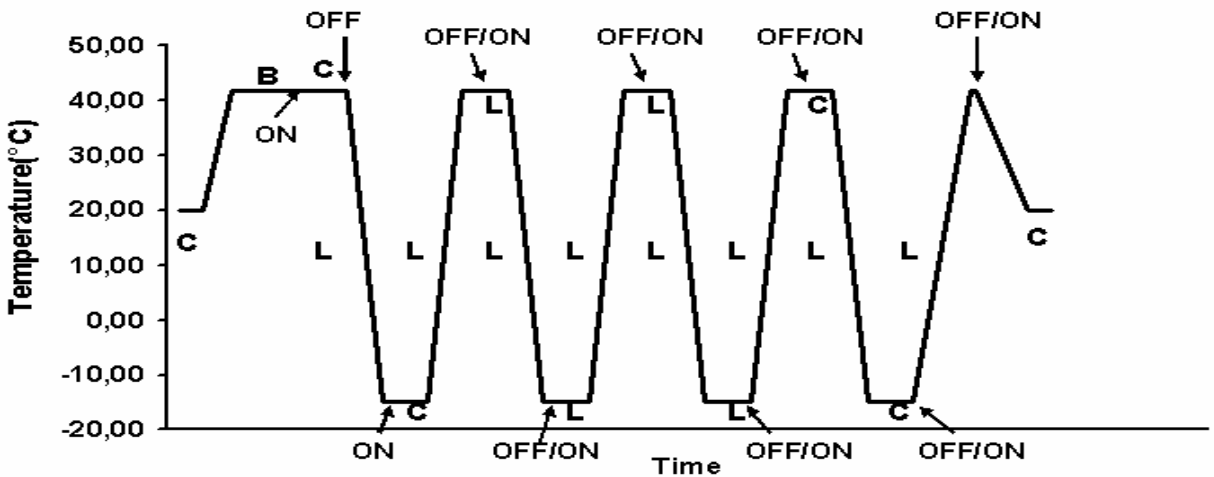
On-site Decision Maker

All documentations available in place.

TVAC Requirements

- Tower shall be capable of full operational performance over four thermal cycles at temperature extremes at **10^{-5} Torr**
  - *LAT Environmental Specification, LAT-SS-00778*

ENVIRONMENT	LAT-SS-00778	LEVELS, TEST ARTICLE
Acceptance	Table 30, Sec. 11.3	-15°C to +42°C (changed from +45°C)



Test Objective

Purpose:

- **The TV test follows the vibration tests that will be performed in the same facility. This document is written in conjunction with the Flight Towers acceptance vibration test procedure: the two tests share some common steps that connect the end of the vibration test with the beginning of the thermal vacuum**

Goal:

- **The goal of the thermal vacuum test is to demonstrate that the hardware is acceptable for flight. This is accomplished by subjecting the Flight TKR Instrument to test at acceptance levels. The TV test of the flight towers of the GLAST LAT Tracker will include four thermal cycles. This testing will be used to verify workmanship of LAT components at integrated subsystem levels. A soak/dwell of 4 hours minimum at each temperature extreme will be observed.**
- **Comprehensive and Limited Performance Test (LPT and CPT) will be performed at both extreme temperatures and also during transitions. CPT will be performed at Ambient, High and Low Temperatures at First and Last Thermal Cycles, while LPT will be performed during transitions and middle soaks. Hot and cold turn on sequence will be performed at all dwell points. A bake-out of the test apparatus in the vacuum chamber will precede TV test cycles**

Operational Activities

Daily Reporting Process

- A log book (separate Test Log file, Bari Web Site) will be kept at the test site, and all personnel will sign in with date/time when they start their respective shifts. Any and all changes/actions made for whatever reason will be noted and described in the log book.

- The person(s) on a particular shift (Alenia, INFN, thermal) shall not leave until the respective next shift person arrives and receives a recount of activities of the previous shift (see separate Staff Support Plan).

- Staff Call In List

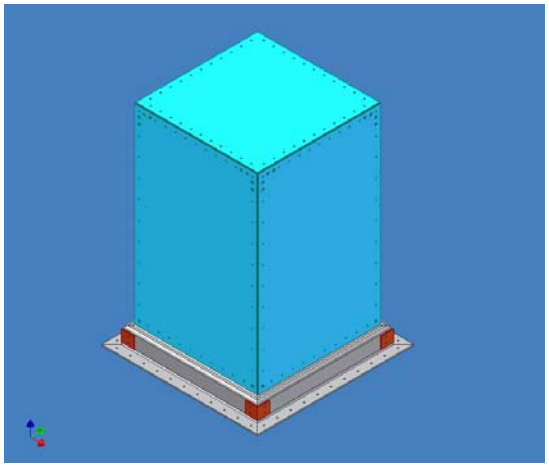
Test Responsibility Matrix/Communications

- Test Engineering/Run Coordinator: Nicola Mazziotta
- Functional Tower Test Responsible people: Luca Baldini
- Thermal engineering and support: Tom McCarthy (NASA), Brett Pugh (SLAC/NASA), Jack Goodman (SLAC).

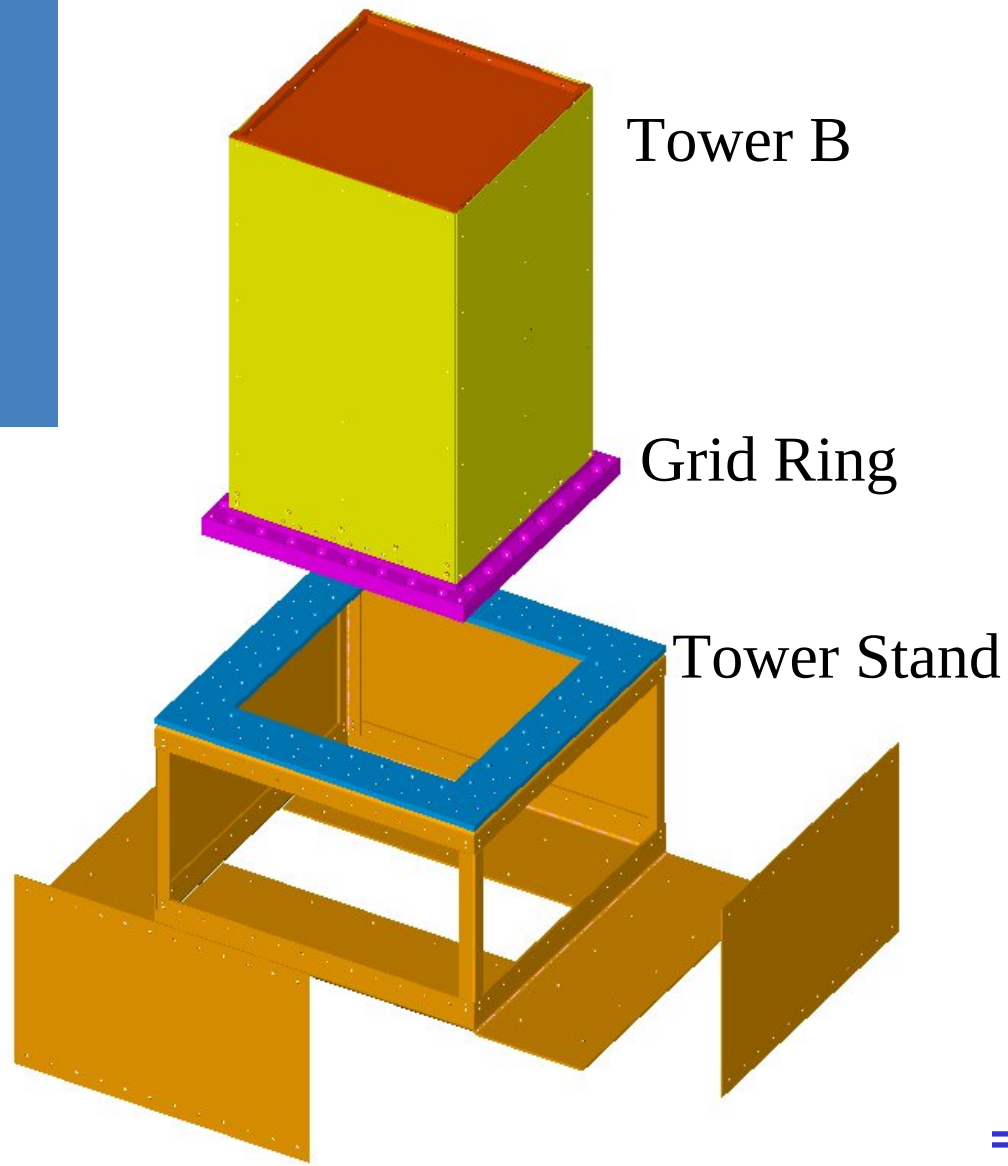
Staffing Plans

- **The Thermal Staff will be composed by Alenia, INFN, SLAC and NASA people**
- **The Staffing plans will be defined in Alenia before the test**

Test Configuration/Setup



IGS



Success/Failure Criteria

- **The thermal vacuum cycle test is considered successful if the temperature profile follows that in the procedures and the following criteria are successfully demonstrated:**
  - The bake-out is successfully achieved when the variation rate of the frequency time derivative is less than 10 % over a few hours period
  - The TURN ON or TURN OFF capability shall be demonstrated during hot and cold survival soaks.
  - The tower shall pass all the tests required by Limited and Comprehensive Performance Tests (TE101, TE201, TE202, TE203, TE303, TE304, TE401, TE301, TE302) according to the criteria stated in the Specification column for each test.
  - Ultimate success decision will rest with the INFN person on duty with input from the thermal engineer, both of whom will consider total number of tests planned and test facility time available.

Test Emergency Plans

- **In any case a test termination criteria case is hit, a contingency procedure shall be followed in order to ensure safety of the test article:**
  - Immediate alert to the test engineer/test director
  - Turn off the tower
  - Drive the tower to room temperature.
  - Alenia shall follow its internal procedures to drive the chamber to room temperature.
  - An NCR shall be opened, followed by an MRB.

Data Acquisition System(s)

- **TCs DAS: provided by Alenia**
- **Tower DAQ: provided by INFN/SLAC**
- **TQCM DAS: provided by INFN/SLAC**

TVAC Status

ITEM	STATUS
Test Requirements	Defined
Test Objective	Defined
Overall Plan	Defined
Test Procedure	Defined
Test Responsibility Matrix	Defined
Configuration/Setup	Defined
Success/Failure criteria	Defined
TVAC Test Flow	Defined
Test Emergency Plans	Defined
Facility Status	**Not Ready Yet**
TVAC Known Risks and Limitations	To be Addressed
Liens on Hardware/Open Issues	None

Conclusion

- **Not ready to start the test**