GLAST Large Area Telescope:

Tracker Subsystem
MCM Production Readiness Review

MCM Test Flow

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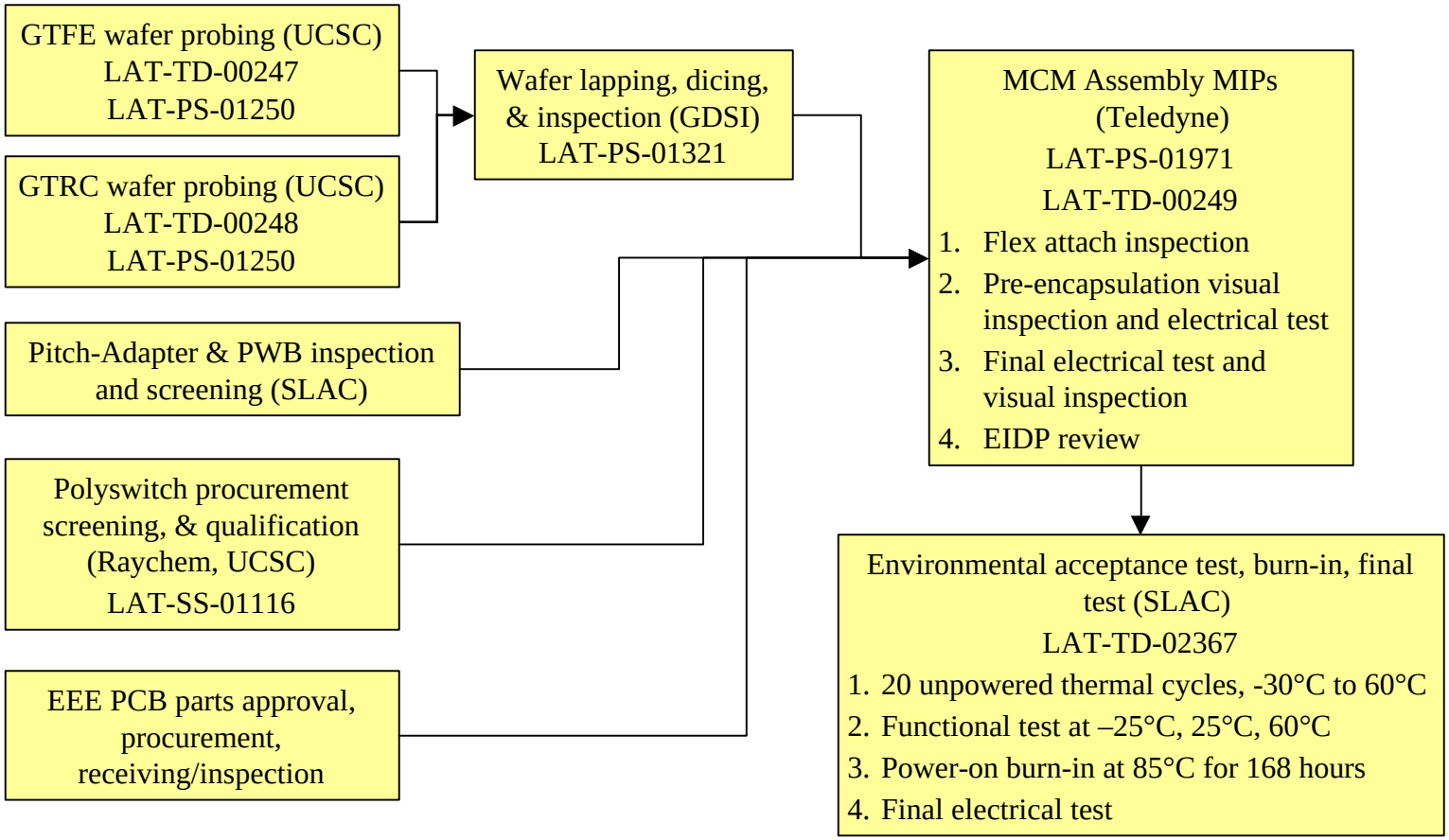
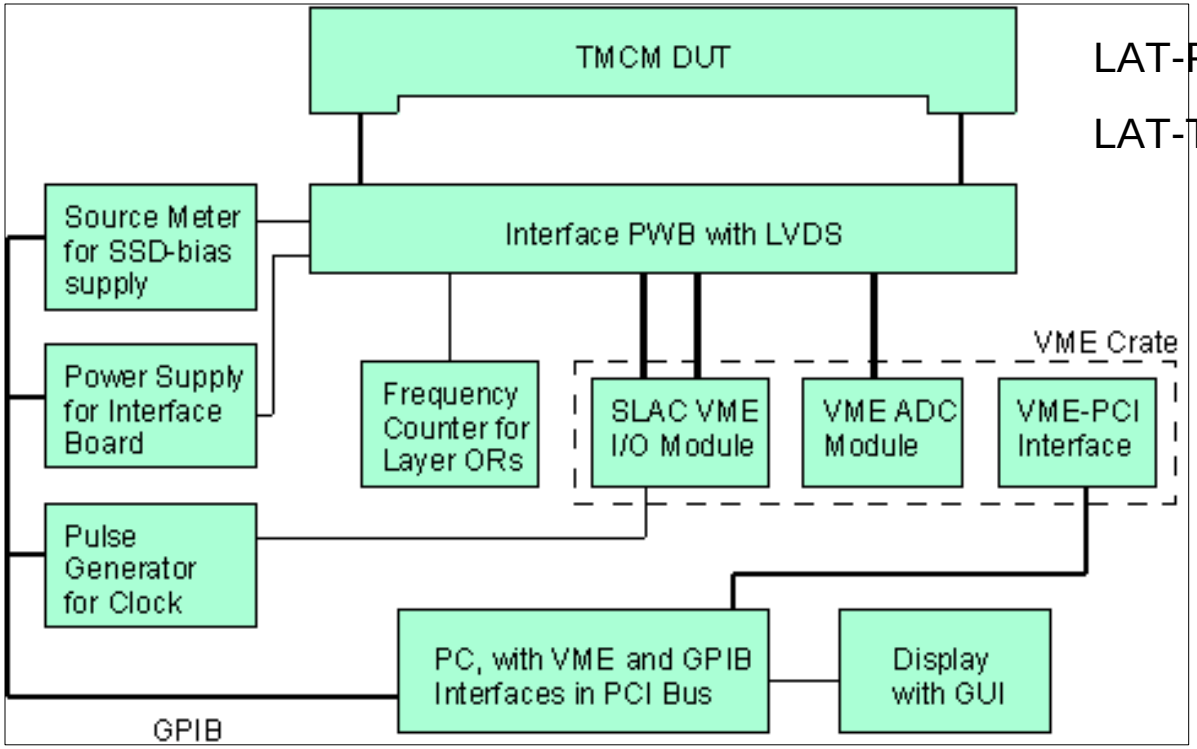
MCM Screening Flow

This entire flow has been exercised in the preproduction, except that the inspections at Teledyne were not repeated by LAT QA.



MCM Test System

- Two rack mounted systems (one at SLAC, one at UCSC).
- The only custom hardware are the interface PWB and the VME I/O module.
- The components have current calibration, and the hardware configuration is controlled.
- Custom software, programmed in Python and C++, configured in CVS.
- The system tests only 1 MCM at a time, but it is capable of cycling through the GTRC address space and can also measure the GTRC LVDS output levels.



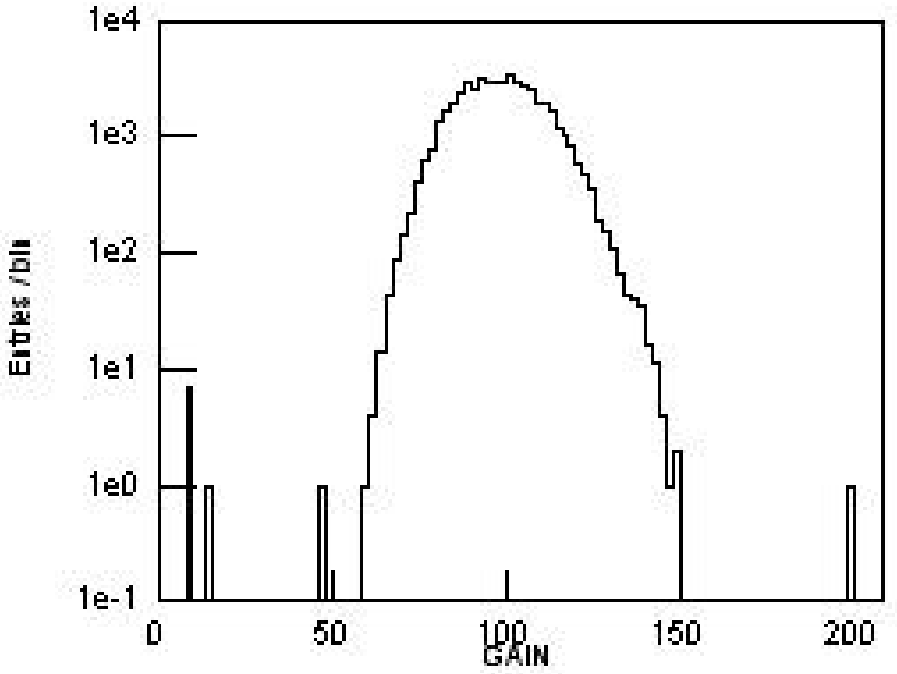
MCM Test System

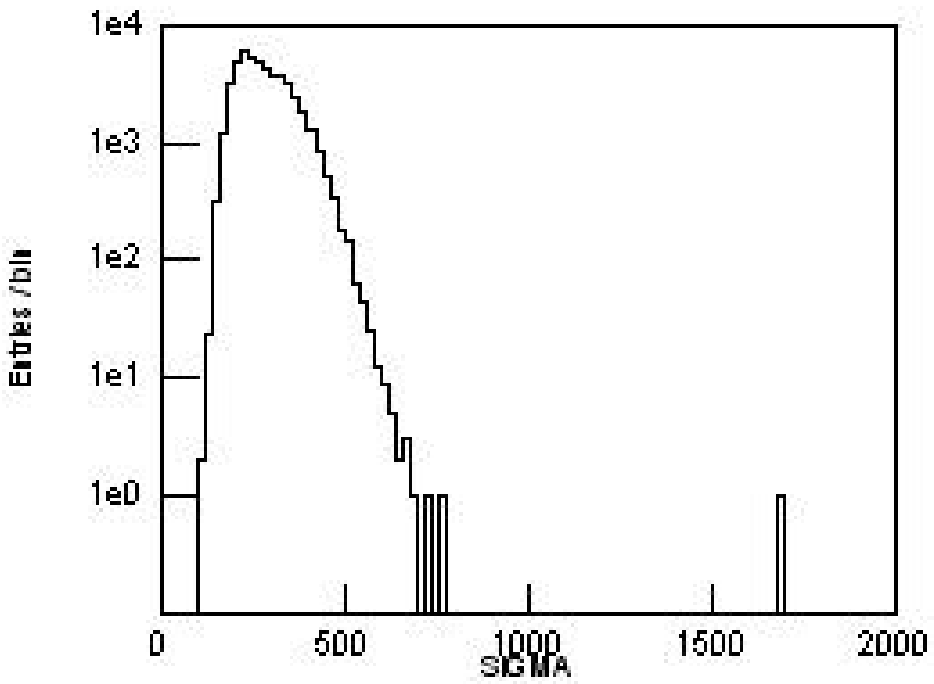
TM702	Measure the current drawn from each of the 3 power supplies.
TM703	Measure the bias leakage current up to 200 V.
TM708	Measure the LVDS output levels.
TM704	Functional test of the GTRC configuration registers.
TM705	Functional test of the GTFE configuration registers.
TM706	Broadcast load of the GTFE configuration registers.
TM707	Functional test of the complete GTRC address space.
TM709	Functional test of the RESET.
TM716	Test of communication from one MCM to another.
TM713	Functional test of the trigger output; trigger propagation from all GTFE chips.
TM711	Test of readout from every channel using charge injection. TOT test.
TM712	Functional test of the channel and trigger masks.
TM715	Quality test: measure the trigger noise rate versus threshold.
TM710	Quality test: measure the noise occupancy in each channel.
TM714	Quality test: measure the gain and noise of each channel.

MCM Acceptance Criteria

- 100% functionality, except that up to 8 individual channels can be bad.
- Supply currents within ranges IDVDD = 50 ± 3 mA, IAVDDA = 50 ± 3 mA, and IAVDDB = 13.5 ± 3 mA.
- Bias leakage current less than 100 nA at 200 V.
- LVDS levels must have both common-mode bias and differential swing within strict limits.
- Bad channel definition:
  - No response from charge injection (dead).
  - Noise occupancy >0.1% at a threshold of about 0.5 fC.
  - Gain not within the range 50 mV/fC to 150 mV/fC.
  - Noise sigma >0.15 fC (940 electrons).

MCM Acceptance Criteria





Gain and Noise sigma measured on preproduction MCMs.

Unpowered Thermal Cycles

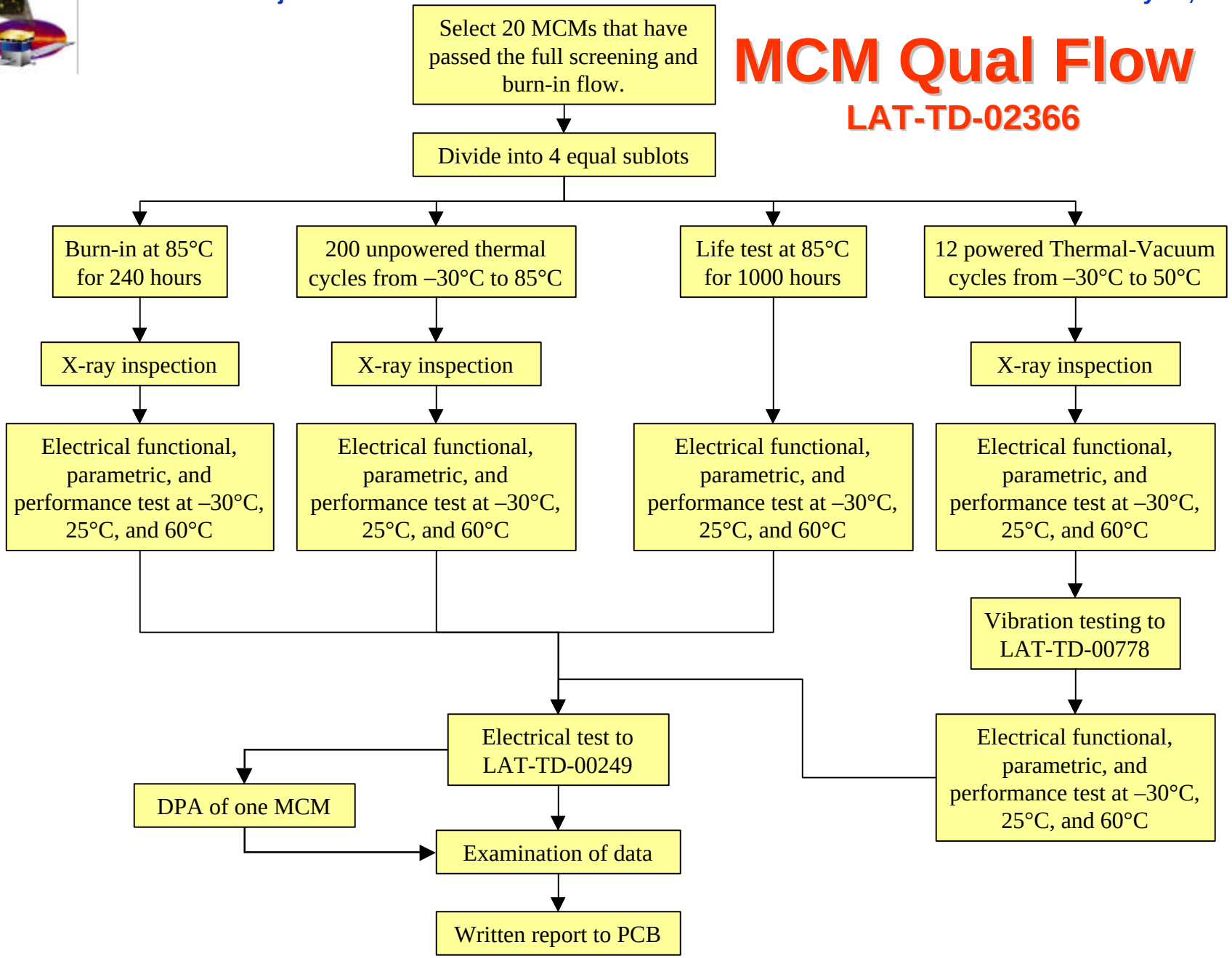
- Procedure documented in LAT-TD-02367.
- Acceptance-level environmental test.
- 20 cycles between –30°C and +60°C.
- Performed in the thermal chamber in the Building 33 clean room.
- Nitrogen flow prevents condensation.
- The chamber is controlled by a PC.
- The PC also monitors the temperature and humidity inside the chamber throughout the test.

MCM Burn-In System

- Procedure documented in LAT-TD-02367.
- Also uses the thermal chamber in the clean room, including the nitrogen flow and humidity and temperature monitoring.
- Based on the SLAC EGSE system with a TEM/PS in the thermal chamber with the MCMs.
- A custom aluminum jig holds 36 MCMs in 4 layers of 9 (i.e. a complete tower), safe inside their black storage cases.
- Custom flex-circuit cables (shorter than the tower cables) and twist-pair jumpers connect the sets of 9 MCMs to the 4 sides of the TEM.
- EGSE scripts execute a full set of functionality tests.
- Tests are run at –25°C, 25°C, 60°C prior to starting the burn-in.
- The burn-in runs for at least 168 hours with the functionality test scripts repeating over and over.
- Following the burn-in, all MCMs are tested again one at a time with the MCM test system, as only it can do a 100% functionality test.

MCM Qual Flow

LAT-TD-02366



MCM and ASIC Qualification

- Plan and procedure are documented in LAT-TD-02366.
- Makes use of the existing electrical test setups, both the MCM test stand and the burn-in setup.
- Thermal-vacuum testing will be done in the new T/V chamber in the SLAC central lab. The MCMs will be tested powered and operational.
- Vibration testing will be done at Wyle labs near Stanford.
- Fixtures for the T/V and vibe testing have been fabricated.
  - Vibration fixture: LAT-DS-02715
  - Thermal/Vacuum fixture: LAT-DS-02716
- Nick Virmani will take care of the X-Ray inspection and DPA.
- Radiation testing has been completed, thanks to Hartmut Sadrozinski, except to repeat the TID test on the V7 GTRC.
- We are preparing to try out the procedures on preproduction MCMs before doing the actual qualification testing on flight MCMs.