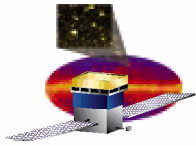


GLAST LAT Tracker TOWER-A PRR

TKR Tower Electrical Test Plan

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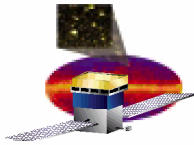


Relevant Documents

- **LAT-TD-00191** **GLAST Lat Tracker Tower Electrical Test Plan**
to be released
- **LAT-TD-03362** **TKR EGSE Test software user's guide**
to be released

Reference documents

- **LAT-PS-03361** **Stacked Trays Test Plan**
to be released
- **LAT-PS-03534** **Single Tray Electrical Test Plan**
released
- **LAT-PS-03359** **MCM Incoming Inspection Test Plan**
released



Test Plan and procedures

Minimal functional Test Suite

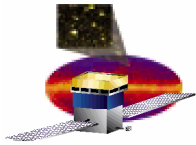
Test ID	Test title	Check	TKR script	Applies to	Pass/fail
TE201	GTRC registers load and readback	GTRC configuration register	TkrGTRCConfiguration	MCM, tray, stack, tower	Data read back must be identical to those written
TE202	GTFE registers load and readback	GTFE channel masks, mode registers	TkrGTFECheck	MCM, tray, stack, tower	Data read back must be identical to those written

Limited Performance Test Suite (LPT)

Test ID	Test title	Check	Test type	TKR script	Pass/fail
TE101	Power consumption and leakage current measurement	power and current	power	TkrPowerConsumptionTest	$I_{leakage} < 4 \text{ mA}$ $IDVDD = (504 \pm 180) \text{ mA}$ $IAVDDA = (504 \pm 180) \text{ mA}$ $IAVDDB = (130.5 \pm 180) \text{ mA}$
TE201	GTRC registers load and readback	GTRC configuration register	functional	TkrGTRCConfiguration	Data read back must be identical to those written
TE202	GTFE registers load and readback	GTFE channel masks, mode	functional	TkrGTFECheck	Data read back must be identical to those written
TE203	Layer readout configurations	MCM readout redundancy	functional	TkrReadingConfigurationTest	The default configuration with 12 GTFEs per GTRC must work, and all pulsed channels must show in the output data stream, with the only exception of possible dead channels
TE302	Single strip noise occupancy	noisy chans search	calibration	TkrNoiseOccupancy	The occupancy of a good channel should not exceed 10^{-3} . A maximum of 16 bad channels are allowed
TE306	Layer threshold scan	layer threshold setting and working point search	calibration	TBD	A single-strip noise occupancy, averaged on each layer, shall be $< 10^{-4}$ at a threshold DAC = 30 (range 0)
TE401	Self-trigger Data taking	trigger line and system operation	system	TkrDataTaking	System must work in operating conditions with reasonable self-trigger rate (to be specified)

Complete Performance Test Suite (CPT)

Test ID	Test title	Check	Test type	TKR script	Pass/fail	offline
TE101	Power consumption and leakage current measurement	power and current	power	TkrPowerConsumptionTest	leakage < 4 mA IDVDD = (504 ±180) mA IAVDDA = (504 ±180) mA IAVddb = (130.5 ±180) mA	No
TE102	Temperature monitoring	cable temperature sensors	power	TBD	At least 8 working sensors roughly uniformly distributed over the tower height on all four sides	No
TE201	GTRC registers load and readback	GTRC configuration register	functional	TkrGTRCConfiguration	Data read back must be identical to those written	No
TE202	GTFE registers load and readback	GTFE channel masks, mode	functional	TkrGTFECheck	Data read back must be identical to those written	No
TE203	Layer readout configurations	MCM readout redundancy	functional	TkrReadingConfigurationTest	The default configuration with 12 GTFEs per GTRC must work, and all pulsed channels must show in the output data stream, with the only exception of possible dead channels	No
TE301	Single strip gain and noise	chans liveness	calibration	TkrNoiseAndGain	Channels with gain below 50mV/fC are dead, channels with noise less than 500 electrons (ENC) are disconnected. A maximum of 16 bad channels is allowed	No
TE302	Single strip noise occupancy	noisy chans search	calibration	TkrNoiseOccupancy	The occupancy of a good channel should not exceed 10 ⁻³ . A maximum of 16 bad channels are allowed	No
TE303	GTFE threshold scan	GTFE threshold setting and working point search	calibration	TkrTriggerRate	The FE maximum trigger rate should be greater than 100 Hz, and lower than 10Hz at threshold DAC =50 (range 0)	No
TE304	TOT Calibration	TOT liveness and gross linearity	calibration	TkrTotTest	The slope of the time_vs_charge straight line fit should be between 1 to 5 microsec/fC	No
TE305	GTFE noise occupancy scan	threshold setting and layer noise performance	calibration	TkrLayerNoiseOccupancy	The layer must be able to issue self-trigger signals with a rate > 1Hz on each layer when operated in standard conditions	No
TE401	Self-trigger Data taking	trigger line and system	system	TkrDataTaking	System must work in operating conditions with reasonable self-trigger rate (to be specified)	No
TE503	Efficiency, resolution and alignment	performance test	system	TkrDetectionEfficiency	LAT-SS-00017 §5.7, §5.8 LAT-SS-00152 §6.1, §6.2	Yes



Hardware tools - EGSE system components and status

Type	Manufacturer/Model/ID Number/Version	
VME Crate	Dawn VME Products 11-1011777-2119, VME64x (series 767)	▶
VME SBC card	Motorola PN MVME2304-0123	▶
VME LCB Mezzanine card	LAT-TD-00860	▶
VME, TST-STP Trans card	LAT-DS-00999	▶
EGSE Software for the local PC	LATTE P03-00-00 or later, TKR v3p0 or later	▶
DC power supply	BK Precision MN1786A	▶
PS Control cable	LAT-DS-02095-20	▶
28 Volt supply cable	LAT-DS-03246	▶
LCB Transition board cable	LAT-DS-03247	▶
CAT5 Ethernet cable	TRD855PL-50	▶
RS-232 Cable	TDC003-7 (RECO98M connectors)	▶
Jumper cables	LAT-DS-03450	▶
Tracker Flex Cable Power Breakout Box	LAT-DS-03867	▶
Digital Multi-Meter	FLUKE	▶
AC/DC mini clamp adaptor	EXTECH 380946	▶

1 used on MCM incoming

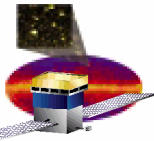
1 used for stacked tray test

1 at G&A for tray acceptance

1 rejected and sent back to SLAC

2 on the way from SLAC

**→ will use one of the new ones
or move the system currently on
trays stack**



Software tools - EGSE Tracking system

EGSE test traveller

1 Fill in the information on the current EGSE session

EGSE session ID: 95 EGSE session type: tray site: INFN/PI
start date: 8/23/2004 2:48:51 PM operator: Massimiliano Fazzi
EGSE configuration: hardware: EGSE TSP104-1 software: LATTE 3.2.0-TKR v3p0

2 Hardware configuration:

2.1 Select device to test and connect them to the test stand via flex cables
2.2 Define configuration and export XML hardware file before running:

egseID	site	MCM serial nb	CC-pair	layer	status
35	INFN/PI	385	(4,5)	0	
*	95	INFN/PI	0		

Dump XML hardware file

Record: 1 of 1

3 Log into EGSE RunControl (from start menu) EGSE TKR Software guide: LAT-TD-03362

3.1 Power up front-end from the Global panel (> this switches on bias line unless otherwise specified on XML file)
3.2 Execute the full test suite by running each of the following scripts from Runcontrol and press the button upon completion of the script to store test result into this traveller
3.3 Click on the arrow to follow the test suite - Ref.doc: LAT-PS-03534

test ID: TE101 test title: Power consumption and leakage current measurement
> Run following LATTE script: TkrPowerConsumptionTest > click the button to import/link test data import/link test data

> Check test execution by scrolling this list of tested MCMs

MCM serial nb	test ID	test date	operator	result	test report	testdata
385	TE101	8/23/2004 2:59:16 PM	Carmelo Sgro	PASSED	http://glastserver.pi.E:\Runcontrol\Data\	
*	TE101					

Record: 1 of 9

4 Close EGSE session

4.1 Assign session status: OK and end date: 8/23/2004 3:32:33 PM

note: post thermal cycle test 011-Mid-Front

close

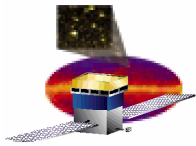
Test configuration

List of hardware under test

Interface to EGSE Runcontrol system

Provide list of test to perform according to test configuration

Retrieve TKR test reports and test outcome and dump them on the Pisa server



Software tools - EGSE Runcontrol and TKR Test reports

TKR parameters GUI

The screenshot shows the 'GLAST Tracker Tests GUI - Select test parameters.' window. It features several sections for configuration:

- Number of strobes per setting:** A text input field.
- EGSE ID (Pisa DB Only):** A text input field.
- Threshold Settings:** Includes 'Thr DAC' (set to 30) and 'Thr Range' (set to 0).
- Calibration Settings:** Includes 'Cal DAC' and 'Cal Range' (set to 0).
- Trigger acknowledge delay Settings:** Includes 'Tack delay (us)' (set to 0.0).
- Threshold Scan Settings:** Includes 'Thr DAC min', 'Thr Range' (set to 0), 'Thr DAC max', and 'Thr DAC step'.
- Calibration Scan Settings:** Includes 'Cal DAC min', 'Cal Range' (set to 0), 'Cal DAC max', and 'Cal DAC step'.
- Trigger Rate Measurement Settings:** Includes 'Minimum counts', 'Timeout (s)', and 'SleepTime (s)'.
- Data Taking Settings:**
 - Trigger Settings:** Radio buttons for 'External Trigger', 'All Layers Enabled', 'Single Layer Enabled', 'Single Layer Efficiency', 'Stacked trays (X side)', and 'Stacked trays (Y side)'. 'Stacked trays (X side)' is selected.
 - Selected Layer:** A dropdown menu showing 'X2'.
 - Checkboxes:** 'Threshold Settings Enabled' and 'Tack Delay Settings Enabled' are checked.

At the bottom, there are 'Start test', 'Run test', and 'Cancel' buttons.

LATTE Main GUI

The screenshot shows the 'Run Control Main' window. It includes a menu bar (File, Control, Edit, View, Tools, Help) and a toolbar with buttons for Run, Control, Global, Power, ACD, CAL, and TKR. The 'User' is set to 'Luca Baldini'. Below are controls for 'Particle Type' (set to None) and 'Orientation' (set to N/A). A 'Select Application' dropdown is set to 'C:/LAT/TKR/TkrTests/TkrDataTaking.py'. There are play, stop, and pause buttons, and the 'State' is 'SETTING UP'. A 3D model of the detector is shown. On the right, a table displays system parameters:

Data	Value
Operator	Luca Baldini
Operator Id	302
Data Dir	G:/
Log Dir	F:/RunControl/Log
App Dir	C:/LAT/TKR/TkrTests
Repos Dir	
Report Dir	
FITS Dir	
Export Dir	
Snapshot Dir	F:/RunControl/snapshots
Log Enabled	1
Log Level	INFO
Log File	msg040825083544.log
Archive On	0
Export On	1
Env Monitoring On	1
Snapshots On	1
Schema Contig File	C:/LAT/TKR/TkrSchema/TkrSch
Run Id	303001497
Test Name	TkrDataTaking
Additional Input Files	[envMonConfigNewTEM.xml], 'Tkr
Completion Status	PASSED
Event Count	67722
Error Events	0
Bad Events	0
Start Time	Wed Aug 25 08:36:01 2004
End Time	Wed Aug 25 10:26:08 2004
Elapsed Time	6606.51 seconds
Event Rate	10.25 events/sec
Pause Count	0
Paused Time	0.00 seconds
Archive File	N/A

At the bottom, it says 'Application TkrDataTaking loaded from C:/LAT/TKR/TkrTests/TkrDataTaking.pyo'.

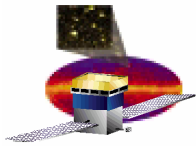
- TKR scripts under configuration control (CVS)
- Already in use for flight MCM and trays tests

LOG window

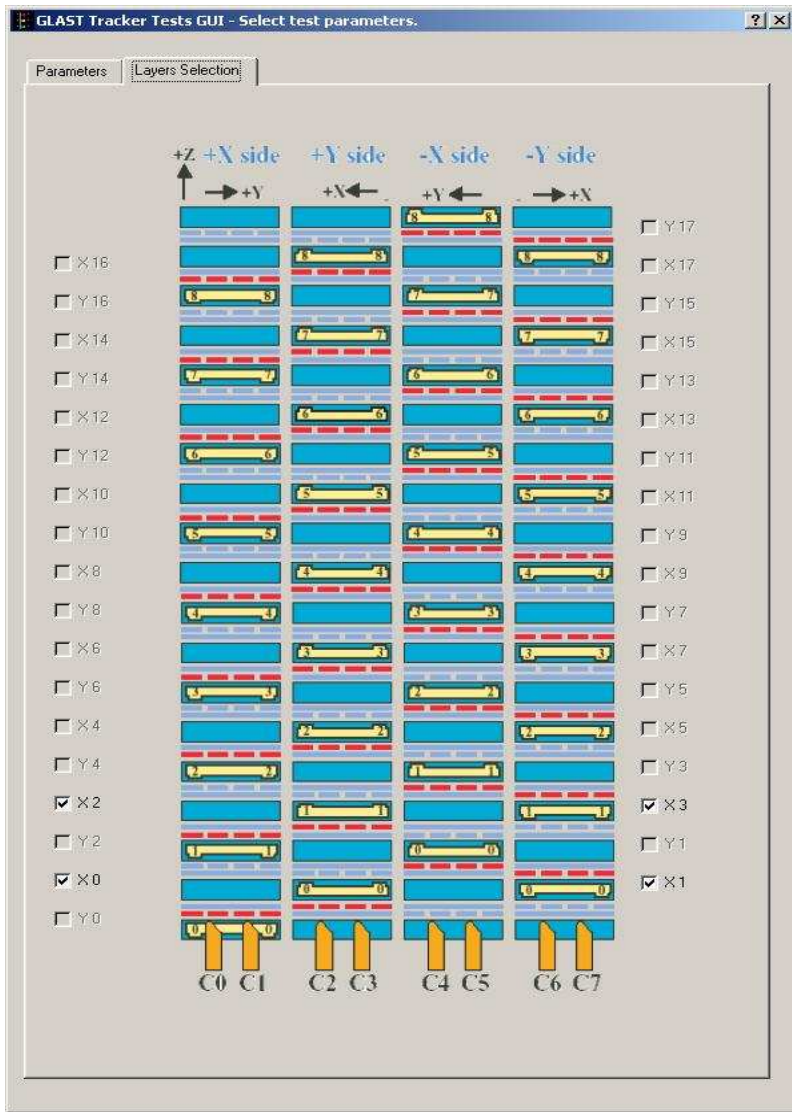
The screenshot shows the 'RunControl Main' window with a terminal view of the log output:

```

INFO:root:Trying to connect to the message logger
INFO:root:Successfully connected to the message logger
INFO:root:Application TkrDataTaking loaded from C:/LAT/TKR/TkrTests/TkrDataTaking.pyo
stack
INFO:root:TEM ID is 0
INFO:root:Trigger acknowledge delay set to 0.0 us
Setting the trigger...
INFO:root:Begin Data Taking on Wed Aug 25 10:36:01 2004
INFO:root:End Data Taking on Wed Aug 25 12:25:57 2004
INFO:root:TkrDataTaking processed 67722 events in 6596.493 seconds = 10.3 events/second
INFO:root:0 events had errors in them
INFO:root:Wait: saving plots for the total number of hits
INFO:root:Wait: saving plots for the trigger requests
INFO:root:Wait: saving plots for layer X2
INFO:root:Wait: saving plots for layer X0
INFO:root:Wait: saving plots for layer X1
INFO:root:Wait: saving plots for layer X3
INFO:root:Completion Status: PASSED
INFO:root:Data saved and output file properly closed.
stack
  
```



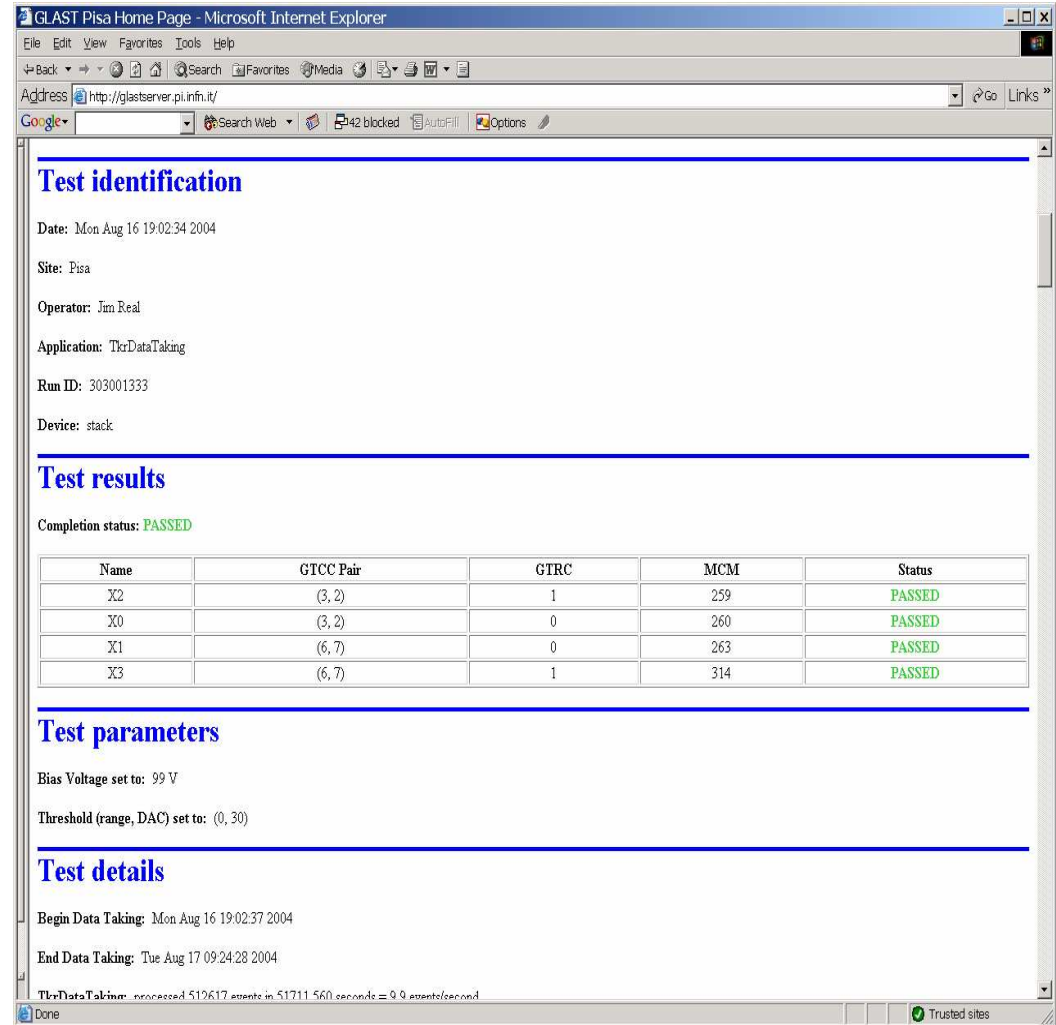
Software tools - EGSE Runcontrol and TKR Test reports

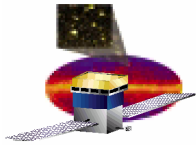


TKR tower GUI for layers selection

Tracker Subsystem

**Test reports generated by TKR test scripts
Pass/fail criteria encoded in TKR scripts**





Conclusions

- **EGSE hardware is well understood and we have valuable experience with it**
- **The EGSE systems for tower test in Pisa (during assembly) and Alenia (after env. Tests) are on their way from SLAC – will need some time to run acceptance test on them**
- **EGSE LATTE framework is well understood and supported from I&T-Online - TKR test script fit very well in the LATTE framework**
- **Most tests have an associated working script, already regularly applied to MCMs, single trays, stack of trays. The few missing are reduced version of other scripts and will be ready soon**
- **A tracking system is already in use**
- **Documentation needs update**

tower A electrical test can be performed on schedule