LVPS (Low Voltage Power Supply)

The LVPS system of each TileCal module consists of an array of eight identical power supplies (bricks), configured in a parallel fashion. The LVPS bricks step down 200V to 10V and are nominally rated at 100W. The combination of the harsh operating environment and high reliability necessitated the custom design of a switching power supply. The environment of which LVPS is located in must remain 100% radiation hardened to single-event upsets as well as total dose accumulated over several years. LVPS also contains custom designed magnetic components to operate reliably within a magnetic field. Wits and UTA have produced a new type of testing station, which build upon the previous generation of testing stations used in the initial production of the TileCal system.

The LVPS (Low Voltage Power Supply) to power the detector front-end electronics.

Test bench design

The full composition of the test bench.
- The test bench is based on a computer controlling and reading out several commercial equipment which perform the tests; a metal case which acts as brick support and provides the interface to the computer and the ground connections.
- The test bench which tests brick individually includes the development of a interface PCB.
- Once successfully set up the test bench will quantifies a multitude of performance metrics of a LVPS brick.
- Tri-state signal which in normal conditions would be coming from the Auxboard through the ELMB mother board to start the brick, keep it on, or shut it down done from the interface board.
- The design of a test fixture interface board modified to include tri-state functionality and monitoring signals.
- The data is acquired primarily through a data acquisition card SCB-68 connected to a peripheral component interface (PCI)
- The data acquisition card can digitize eight channels contemporaneously and has in/out registers.

Control software

In the control software we check that the main functions and parameters of the bricks are correct. The required parameters are set around the nominal value for all test except the over voltage and over current protections, for these tests the requirement is set by quality assurance procedures.

- Set of tests validates fail-safe features of the bricks
- Validates LT1681 controller feedback signals
- Validates feedback signals used for remote monitor
- Manual control feature, allows you to monitor all I/O, enable HV and load to debug any electrical inconsistencies

Performance testing of latest v8.4.2 LVPS brick

Test #8: Signal Feedback Analysis
- This test checks the correct functioning of the monitor circuit of output current. The brick is started at minimum output voltage, the load is then increased up to 80% of trip point. Output of the out monitor are taken at regular intervals of the load.

Test #1: “Minimum Stable Current”
- To determine this value the brick is connected to the nominal load value and in this condition the clock output from LT1681 is read out with the oscilloscope. The load is then decreased until missing clock cycles are registered, the load value is recorded. Permitted values for the test depends on the brick.

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LVPS Box

Test bench

Detector Section

Drawer Electronics