

Tests of the Prototype Peripheral Electronics Board for the High Granularity Timing Detector

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Introduction

HGTD

The large increase of pileup is one of the main experimental challenges for the High Luminosity LHC project (HL-LHC) physics program. A High-Granularity Timing Detector (HGTD) is proposed for the ATLAS Phase-II provide upgrade to accurate an measurement of the time of the tracks in order to mitigate the effect of the pile-up in the object reconstruction.



Position of the HGTD within the ATLAS Detector



Global view of the HGTD

Introduction

Peripheral Electronics Board (PEB)

PEB acts as a bridge between the front-end modules and the off-detector electronics. According to the different read-out rows, six types of PEB boards are needed for a layer quadrant but are identical between quadrants.

Basic functions of PEB:

- > Control, monitoring & data aggregation and transmission
- Power-supply distribution: LV & HV
- Thermistor connection between the front-end modules and the interlock system



One quadrant of the HGTD 6 types of PEB: 1F, 2F, 3F, 1B, 2B, 3B(back side)



HGTD electronics architecture

Prototype Peripheral Electronics Board (1F)

PEB	Modules	lpGBT	MUX64	bPOL12v	VTRx+
1F	55	9+3	9	52	9

□ Key dimensions

- ➢ PCB thickness: 2.5 mm
- ➢ 55 FPC connectors
 - Center to center distance: 6.5 mm
- ➢ 52 bPOL12v power blocks
 - Size: 24 mm x 14.5 mm
 - Height above PCB: 5 mm
 - Height under PCB: 2 mm





Tests of PEB 1F

Test setup

- ➢ FLEIX card: DAQ system with 24 GBT channels
- > PEB 1F: connected with FELIX card via optical links
- Front-end modules: ALTIROC3 modules connected with PEB 1F via flexible PCB
- ZC706 can only support 1 ASIC (ASIC0)





ZC706 test setup

Some Tests Results of PEB 1F

Optical eye-diagram test for 10.24 Gbps up link data transmission

Heat test

Jitter and skew test for the PEB 1F output clock

Power check: the distribution of the deviation (%) of the bPol12V output

Some Tests Results of PEB 1F

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Time-domain reflectometry test for the longest 10.24Gbps path

Cross talk check for the stacked flexible PCB

- Module number: 103008
- HV = -70V
- M_VDDA = 0.87V
- M_VDDD = 0.85V
- Q injected: 4 fC

Module scan—PEB 1F

Module scan—ZC706

ASIC 0

Vth scan

Vth scan

Module scan—ZC706

Vthc scan

Module scan—PEB 1F

Vthc scan

Charge scan

Module scan—ZC706

Charge scan

Module scan—PEB 1F

Module scan—ZC706

Noise

Noise

The End