Opto Hybrid Test in Florence

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System Setup

Digital opto link

FED and FEC

Optohybrid

APV25
Hybrid

CCU25
System Setup

Module

AOH

Kapton

Kapton

CCU 25

Far end

Near end

Battery 5V

Digital optolink

Analog optoreceiver

Analog data

Optical fibre

Scope

FED

TSC

FEC

PC

Single ended to differential

External Trigger

Trigger

I^2C signal Trigger and Clock

Floating power supply 1.25 V, 2.50 V, HV

I^2C signal

Trigger and Clock

Optical fibre up to 150 m

Up to 150 m

Battery

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Software Used

- Laurent Mirabito’s software for module test (no XDAQ) downloaded from CERN cvs
- On this, we made several changes:
  - Enabled the use of the CCU 25 in Fec kernel module and in FecServer
  - Laserdriver version 2 implemented in optosetter.cxx
  - Dialogs set to Florence addresses defaults and Raymond’s APV25 User Guide defaults
Test Procedures

We investigated several configurations, varying:

- The Optohybrid gain
  - 4 possible values: 5, 7.5, 10, 12.5 mS

- The Multiplexer gain (8 switchable parallel resistors on APV hybrid, each of 400 Ohm)
  - 50 or 100 Ohm

- The Optohybrid input impedance (single ended)
  - 50, 100 and 1000 Ohm
Test Conditions

- Measurements done with several modules
- The humidity and the temperature of the room were quite stable but not absolutely controlled
- Internal calibration pulse of the APV25: ICAL = 80
- 1 MIP corresponds to ICAL = 29 in a silicon detector of 300 µm thickness
- Optohybrid bias values between 16 and 22
1000 Ohm

- Gain 3, Mux 255 (50 Ohm)
- S/N = 68.7
- Noise = 2.14 ADC channels

The signal is clean and flat-top in this case

Scope picture
ICAL = 80
1000 Ohm

- Gain 1, Mux 15 (100 Ohm)
- S/N = 74.6
- Noise = 2.28 ADC channels

In both cases the AOH saturates at about 4 MIPs

Scope picture (ICAL = 80)
100 Ohm

- Gain 3, Mux 255 (50 Ohm)
- S/N = 68.1
- Noise = 1.37 ADC channels

Scope picture

Small spike
Flat signal
100 Ohm

- Gain 1, Mux 15 (100 Ohm)
- S/N = 68.7
- Noise = 1.33 ADC channels
50 Ohm

In all this cases
- Gain 1, Mux 255 (50 Ohm)
- Gain 3, Mux 255
- Gain 1, Mux 15 (100 Ohm)

there are a few spikes
switching between APVs

Gain 1, Mux 255
S/N = 60.2
Noise = 0.67

Mux 255 Gain 3
scope picture
Linearity

- Measurements are made connecting the scope on one output of the optoreceiver

- All the tests (1000, 100 and 50 Ohm) show a linearity of the analog optohybrid up to about 600 mV
1000 Ohm

Peak mode, not inverting

Data took at the scope
100 Ohm

Peak mode, not inverting

Data took at the scope

Gain 3 Mux 255
Gain 3 Mux 15
Gain 1 Mux 255
Gain 1 Mux 15
Reproducibility

Connecting and disconnecting several times the optical fibres doesn’t show any important change in results

In the first measure we obtained $N = 1.16$ (ADC channels) and in the tenth $N = 1.15$ (ADC channels)
Also the height of the calibration pulse remained the same
Reproducibility

![Graph showing reproducibility results for various trials. The x-axis represents tries, and the y-axis represents noise in ADC channels. Each trial is represented by a data point on the graph.]

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Common Mode Noise

- Peak mode, not inverting
- Raymond's default values for APV25
- 200 V bias on silicon detector
- 100 Ohm, Gain 1 Mux 15
- Floating power supply

In this conditions
1 MIP = 33.1 ADC channels
Common Mode Noise

In the same conditions, with a prototype power supply and a cable of 150 m
Conclusions For TIB

• We suggest then to use, as the default configuration for the input impedance of the optohybrid a value of 100 Ohm

• In addition to this a Mux resistor of 100 Ohm (corresponding to Mux Resistor Value = 15 in Mirabito’s HybridDialog) and a optohybrid Gain = 1 (in Mirabito’s OptoDialog) should be used
With 100 Ohm…

- No significant reflections in the signal
- Good signal to noise ratio
- Linearity up to 6 MIPs, using all the optohybrid range
- 6 MIPs correspond to 200 ADC channels, well in the range of the FED
To be done...

- We need a software able to control and set several modules at the same time, both for the APV25 and the optohybrid I2C registers