

TID Tests of the TileCal Optical Interface Board

K. Anderson, J. Pilcher
Enrico Fermi Institute, University of Chicago

1. Radiation Requirements

In the TileCal barrel the interface boards are located at $z = 160$ cm. and $r = 410$ cm. Table 1 gives the simulated radiation levels of 21 July 2000, the required safety factors, and resulting radiation tolerance criteria. Radiation levels in the extended barrels are similar or smaller.

Radiation Type	Simulated Level	Safety Factors				Required Level
		Simuln.	Low Dose Rate	Lot Varn.	Total	
Total Ionizing Dose (TID)	0.023 Krad	3.5	5	4	70	1.6 Krad
Non-ionizing energy loss (NIEL)	1.5×10^{10} n/cm ²	5	1	4	20	3.0×10^{11} n/cm ²
Hadrons above 20 MeV (SEE)	6.3×10^8 h/cm ²	5	1	4	20	1.3×10^{10} h/cm ²

Table 1: Radiation levels for 10 years of 10^7 seconds each, at design luminosity.

2. Test Setup for TID Studies

The cobalt-60 hot-cell facility at Argonne National Laboratory was used for this study. The interface boards were placed at 3.00 meters from the source. The boards were powered and the supply current was monitored on a chart recorder. Current changes larger than 1.5% were detectable.

The dose rate was obtained from accurate calibration data corrected by the decay of the source in the time since the calibration. The TID rate at this position is 9.57 Krad/hr. The boards under test were exposed for 15 minutes, giving a dose of 2.4 Krad. This is 50% larger than the required level of 1.6 Krad shown in Table 1. A total of six V3.2 boards were exposed. This is the total number of boards available at this time.

3. Results

During the exposure no increase of supply current could be detected and we conclude that any increase was less than 1.5%.

At the conclusion of the test the six boards were checked for proper operation and were found to be operating normally. A summary of the parts tested is given below in Table 2.

4. Conclusions

The optical interface board continues to operate normally after being exposed to a total ionizing dose 50% larger than the required one.

Components Irradiated			TID (Krad)	Quantity Tested
Part Number	Function	Manuf.		
DS90LV032ATM	Quad LVDS receiver	National	2.4	114
SN65LVDS104D	1:4 LVDS repeater	Texas Inst.	2.4	24
MAX8869EUE18	1.8V regulator	Maxim	2.4	12
SM1145CV	Clock generator	Pletronics	2.4	12
EP20K160EQC208-3	PLD	Altera	2.4	12
MC74AC02D	Quad NOR	ON Semi.	2.4	6
EPC2LC20	Flash memory	Altera	2.4	12
HDMP-1032	GLINK Xmtr.	Agilent	2.4	12
Custom sub-assy.	Optical Xmtr.	Academica Sineca, Twn.	2.4	12
RST-M13A306	PIN Photodiode	Lasermate	2.4	12
TZA3033TD	Transimpedance amp.	Philips	2.4	12
TZA3034TD	Post amp.	Philips	2.4	12
REG101UA-3	Regulator	Texas Inst.	2.4	12

Table 2: The parts and quantities tested on the six V3.2 interface boards.