Materials Engineering Branch/Code 541 Report ID: MV04-02
Mechanical Testing Laboratory
Test Report

To: 556/M. Amato
From: 541/Viens
cc:
Date: 7/13/04
Project: GLAST/ACD/PMT
Ref: Lab report MV04-01A
Re: Thermal Stress Test Run 2

Test Machine: Thermal Chamber, Delta 3039, ID 1100865
Ramp Rate: 5 °C/min
Test Temperature: 40°C, 23 °C, 0°C, -15°C & -30°C
Test Specification: N/A

Test Description: An additional PMT housing and an additional PMT potted into a housing with RTV (S/N 5) were submitted for testing. Serial number 5 was from the group of PMT's used to qualify the potting process. The preparation of the housings was as described in the reference, i.e. the Mu metal was removed from the PMT, and a biaxial strain gage (Micro Measurements CEA-06-125UT-350) was placed on the outer diameter of both housings oriented longitudinally and circumferentially. The gages were monitored using a Micro measurements 3500 strain indicator and a switch and balance unit. Only the gages in the hoop direction were monitored on the additional housings.

The plain housing was used to assess the thermally induced strain between gage and housing. The strain gages were zeroed at room temperature then strain was recorded at 0 °C, -15°C, -30 °C, 40°C and 23°C.

Test Results: The strains measured in run one are presented in Table 1. The strains measured throughout the run 2 test are presented in Table 2. The net strains from both runs are presented in Table 3. The agreement between the dummy housing in run 1 and 2 is very good. The agreement between the two dummy housings is also quite good. The agreement in the ZL0887 PMT between runs 1 & 2 is good. Not as good as the dummy housing but certainly on the same order of magnitude. The strains in S/N 5 do not agree with ZL0887 at all. The S/N 5 measurements suggest no to very little strain and are suggestive of no or very little tensile strain on the glass.

Table 1. Measured Strains on PMT Housings/ Run 1

Temperature (°C)	Dummy Longitudinal (ue)/#3	Dummy Hoop (ue)/#4	PMT (ZL0887)Hoop (ue)/#5	PMT Longitudinal (ue)#6
23	0	0	0	0
0	-250	-270	-426	-267
-30	-726	-739	-965	-633
23	-6	1	5	-3
41	174	187	325	171
22	-16	-10	-17	-19

Table 2. Measured Strains on PMT Housings/ Run 2

	#2	#3	#4	#5	#6	#8
				PMT ZL0887		
Temperature (°C)	Dummy Hoop (ue)	Dummy Longitudinal (ue)	Dummy Hoop (ue)	PMT Hoop (ue)	PMT Longitudinal (ue)	PMT Hoop (ue)
23	0	0	0	0	0	0
0	-286	-210	-270	-420	-253	-249
-15	-492	-477	-493	-713	-454	-443
-30	-718	-704	-725	-1016	-669	-658
23	16	6	7	1	4	6
41	193	198	199	296	166	174
22	-1	4	6	-3	-2	-3

Table 3. Net Strains on PMT Housing

Temperature (°C)	Hoop Strain				Longitudinal Strain	
	ZL0887		#5			
	Run 1	Run 2	Run 2		Run 1	Run 2
23	0	0	0		0	0
0	-156	-142	-1		-17	-43
-15		-220.5	41.5			23
-30	-226	-294.5	53		93	35
23	4	-10.5	-5		3	-2
41	138	100	-21.5		-3	-32
22	-7	-5.5	-4.5		-3	-6

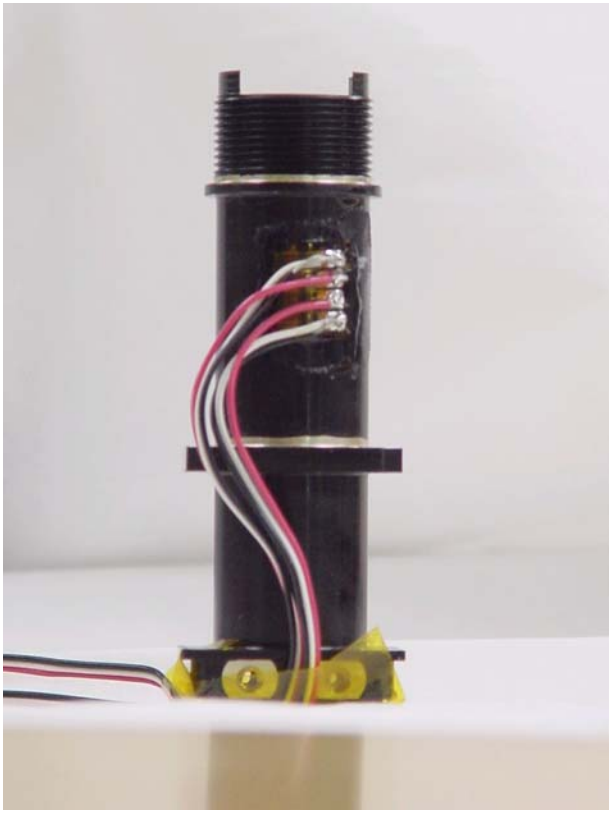

Figure 1. PMT housing wit biaxial strain gage installed

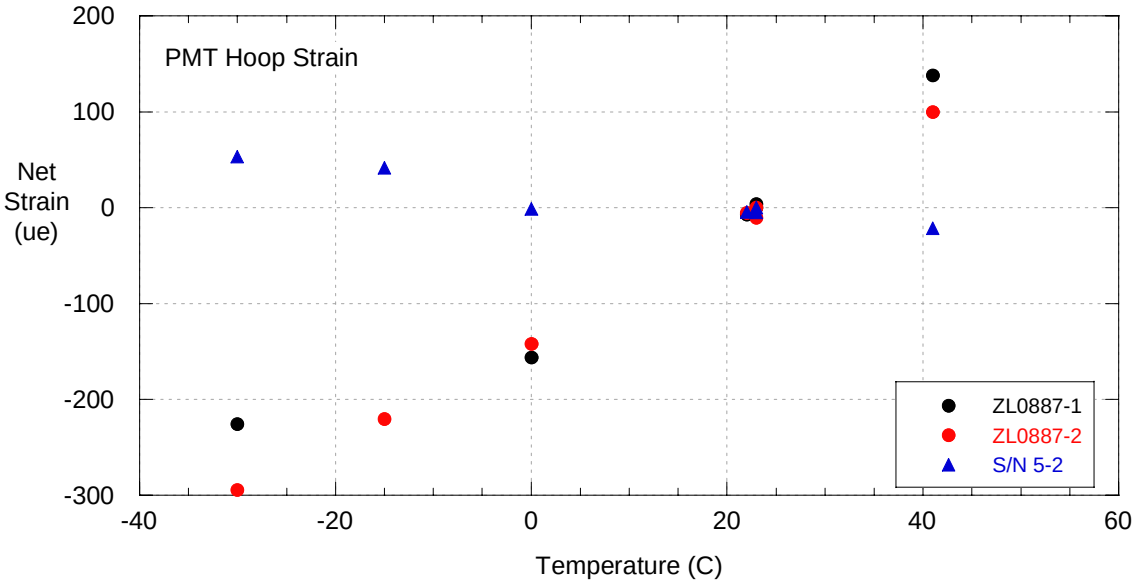

Figure 2. Results of PMT hoop strain measurements as a function of temperature.