



Status of MACRO PMT pressure tests at SAB

Logan Lebanowski, Shih-Kai Lin

University of Houston

2010 December 16

overview

- ▶ 146 waterproof MACRO EMI PMT assemblies have been pressure tested at the SAB. They had already passed performance tests at DGUT.
- ▶ We test about 10 PMTs per week (mid-August to December).
- ▶ For more information, see [doc 5373](#).

We have passed 130(?) of all 146 MACRO PMTs



pressure test results

8 PMTs were tested during the past week (December 9 - December 15).

SN	mass(g)	pressure (psig)	test time (h:m)	result
7005	577.5	12.2	14:58	PASS ¹
6944	556.5	12.1	8:12	PASS ¹
8921	567.0	12.0	15:38	PASS ¹
7418	606.0	12.1	7:39	PASS ¹
8724	629.5	12.1	15:22	PASS ¹
6960	569.5	12.0	7:18	PASS ¹
7229	643.0	12.0	20:23	PASS ¹
6572	599.5	12.1	19:21	PASS ¹

¹ Cable dry. No leaks or cracks.

signal test results

The operational capability of a PMT is verified after pressure testing:

The PMT is placed in a dark box, connected to a single channel decoupler box, and set to its 2E7 gain voltage, as recorded in the DGUT data. After tens of minutes, the count rate, rise time, and pulse height are recorded. We use a threshold of 3.00 mV, which is roughly 1/4 pe.

- The last PMT carton is one with PMTs which didn't pass DGUT quality tests. Table 1 shows the reasons.

SN	Rate (kHz)	DGUT rate (kHz)	Rise time (ns)	DGUT rise time (ns)
7383	4.8	0.47	4.7	5.0
536	9.5	0.49	3.7	4.0
8216	3.0	1.12	5.6	6.2
9029	6.0	0.42	5.7	6.2
7418	120-190 [†]	257.24	4.8	3.2
7005	25-50 [†]	28.26	4.9	13.0
6944		14.94		5.5
8921		16.71		3.7
6572		12.46		6.8
6960	2.4	0.60	4.7	6.2
8724	4.5	0.54	4.5	5.1
7229	9.0	2.38	4.9	6.7

SN	reason of rejection
7418	dark rate
7005	dark rate
6944	dark rate
8921	dark rate
6572	dark rate
6960	after pulse ratio
8724	after pulse ratio
7229	after pulse ratio

Table 1: a carton of unqualified PMTs

[†] These PMTs were tested for ~20 hours.
Their rates were unstable.

PMTs not passed so far

SN	reason of not pass
7368	water leaks into acrylic shell cap
7934	water leaks into acrylic shell cap
7343	water leaks into acrylic shell cap
9029	water leaks into acrylic shell cap
7732	water leaks into acrylic shell cap
7330	water leaks into acrylic shell cap
8727	hole in cable jacket
8870	hole in cable jacket
8377	hole in cable jacket
7130	hole in cable jacket
7818	signal failure
7418	high dark rate

Table 2: 12 PMTs not passed

- ▶ We have begun repairing the 6 **leaking** PMTs. Thanks to Weili for her work and instruction.
- ▶ We are preparing to repair the 4 PMTs with **damaged cables**.

SN	reason of failure
8430	broken
6455	broken
7046	imploded
6545	imploded

Table 3: 4 PMTs failed

summary

- ▶ All MACRO PMTs shipped from DGUT on August 10, 2010 have been pressure tested.
- ▶ Repairs of not passed PMTs and the will be presented soon.
- ▶ A summary of test results will be given soon.
- ▶ A complete list of test results will be uploaded to [doc 4617](#).