



Status of MACRO & Hamamatsu PMT pressure tests at SAB

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overview

- ▶ 150 waterproof MACRO EMI PMT assemblies as well as 16 Hamamatsu waterproof PMTs need to be pressure tested at the SAB. They have already passed performance tests at DGUT.
- ▶ We test about 10 PMTs per week (mid-August to December).
- ▶ For more information, see [doc 5373](#).

As of November 4, we have passed 77 of 86 tested MACRO PMTs
and 16 of 16 tested Hamamatsu PMTs.



pressure test results

11 PMTs were tested during the past week (October 28 - November 3).

SN [†]	mass [‡] (g)	pressure (psig)	test time (h:m)	result
WSD2719	4525.5	20.1	14:45	PASS ¹
WSD2722	4550.5	20.1	8:23	PASS ¹
WSD2692	4557.5	20.1	14:47	PASS ¹
WSD2607	4560.0	20.1	7:45	PASS ¹
8589	564.5	12.2	15:17	PASS ²
6346	636.5	12.0	47:52	PASS ²
7196	596.0	12.0	8:35	PASS ²
7031	578.0	12.0	15:39	PASS ³
6287	663.0	12.0	7:54	PASS ²
8377	588.5	12.0	15:01	NOT PASS ⁴
6280	654.0	12.1	8:01	PASS ²

[†] Serinal numbers with(without) "WSD" prefix are Hamamatsu(MACRO) waterproof PMTs.

[‡] For MACRO PMTs, this means unpotted weight. For Hamamatsu PMTs, this is the total weight of PMT+cable.

¹ Cable dry. No cracks. No leaks detected by weighing before and after testing (see the last page.)

² Cable dry. No leaks or cracks.

³ 2+Some water penetrated the mastic tape seal of the cable strain relief plug, but did not penetrate the UW cable plug.

⁴ Cable end sealing tube was full of water. It will be fixed and tested again.

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.

SN [†]	Rate (kHz)	DGUT rate (kHz)	Rise time (ns)	DGUT rise time (ns)
7487	1.3	0.39	5.0	6.0
7508	8.0	0.36	5.0	6.8
WSD2592	3.2	2.0	3.2	4.37
WSD2717	5.5	1.64	3.2	4.28
WSD2606	6.0	1.5	3.2	3.23
WSD2605	5.5	1.22	3.2	4.15
WSD2614	3.5	0.94	3.4	3.75
WSD2719	12.0	1.42	3.2	4.212
WSD2722	2.2	1.56	3.2	3.634
WSD2692	3.0	1.22	3.1	3.782
WSD2607	3.5	1.08	3.2	4.44

[†] Serinal numbers with(without) "WSD" prefix are Hamamatsu(MACRO) waterproof PMTs.

- Rates are all below 10 kHz but in 1 case. It could be below 10 kHz if it was given enough time.

summary

- ▶ We finished testing a sample of 16 Hamamatsu waterproof PMT assemblies at SAB. All pressure and signal tests were passed:
 - ▶ No leaks were detected by weighing before and after pressure testing. Actually, the Hamamatsu PMTs were always lighter by ~ 1.5 g (dirt removed?).
 - ▶ Hamamatsu PMTs' dark rates begin at lower initial values than MACROs and they have shorter rise times and larger pulse heights.
- ▶ 64 MACRO PMTs remain to be tested. At 10 per week, we should finish by Christmas.