Status of Hodoscop Design Activities at UCLA.

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An Update On Activities at UCLA.

- Have studied and identified several candidate PMTs for further consideration.
- Have contacted Hamamatsu, Electron Tubes, and Photonis (formerly Philips) and obtained prices and samples of various candidate PMTs for testing and characterization.
- Have ordered samples of BC408 1 x 3 x 100 cm scintillators for testing.
- Have started design of test setup for timing characterizations.

Comparison Chart of Candidate PMTs

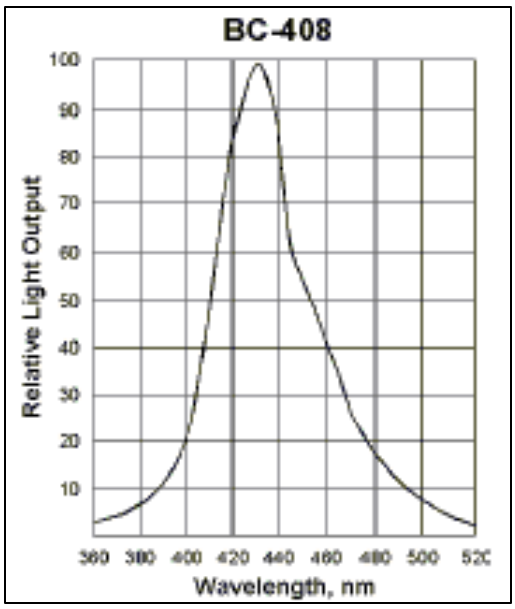
	Electron Tubes		Hamamatsu		
Model	**9111B**	**D832WB**	**R6427HA**	**R5900U**	**R4998**
Diameter (mm)	25	30	25	18 x 18	25
Length (mm)	42	87	85	24	71
Number of stages	10	10	10	10	10
photocathode	Bialkali	Bialkali	Bialkali	Bialkali	Bialkali
Dynode structure	Compact Focused	Linear Focused	Linear Focused	Metal Channel	Linear Focused
Peak QE (%)	25	25	25	20	25
l_{pk} **(nm)**	420	420	420	420	420
Rise Time (ns)	1.8	1.5	1.7	1.4	0.7
Pulse width (fwhm) (ns)	3.1	2.1	-	-	-
Transit Time Spread (ns)	1.2	1.5	0.5	0.26	0.16
Gain (typ)	1×10^6	0.8×10^6	5×10^6	2×10^6	5.7×10^6
Operating Voltage (typ)	-1000	-850	-1500	-800	-2250
Cost (for quantity ~1000)	$295	$295	$231	~$680**	$852.23

Properties of Bicron BC-400 Series Scintillators.

Properties	BC-400	BC-404	BC-408	BC-412	BC-416
Light Output, % Anthracene	65	68	64	60	38
Rise Time, ns	0.9	0.7	0.9	1.0	—
Decay Time, ns	2.4	1.8	2.1	3.3	4.0
Pulse Width, FWHM, ns	2.7	2.2	~2.5	4.2	5.3
Light Attenuation Length, cm*	160	140	210	210	210
Wavelength of Max. Emission, nm	423	408	425	434	434
No. of H Atoms per cm^3, ($x10^{22}$)	5.23	5.21	5.23	5.23	5.25
No. of C Atoms per cm^3, ($x10^{22}$)	4.74	4.74	4.74	4.74	4.73
Ratio H:C Atoms	1.103	1.100	1.104	1.104	1.110
No. of Electrons per cm^3, ($x10^{23}$)	3.37	3.37	3.37	3.37	3.37
Principal uses/applications	general purpose	fast counting	TOF counters, large area	large area	large area economy

*The typical 1/e attenuation length of a 1 x 20 x 200 cm cast sheet with edges polished as measured with a bialkali photomultiplier tube coupled to one end

(continued over)



Hamamatsu Price Quote

Hamamatsu Corporation
360 Foothill Rd.
Bridgewater, NJ 08807
908-231-0960

Quote #sXo01-1172422/sXo01-1163798

PART #	QTY	Unit Price	Lead time
R4998 PMT	100	949.21	3 mos aro
	500	885.42	20-30-50-
	1000	852.23	100 pcs/mo
R6427HA	100	332.04	3 mos aro
PMT	500	248.33	100pcs/mo
	1000	231.58	
E2624	100	71.64	10 weeks aro
Socket assembly	500	69.18	50-100-200 pc/m
For R6427	1000	65.63	

A Preliminary Hodoscop Cost Estimate

Item	Description	Cost (k$)
1	**Scintillator (cut& polished BC408)**	**~75**
2	**Photomultiplier Tubes (R6427HA 232/ea + shipping)**	**240**
3	**PMT assembly (u-metal,base,mech. assembly,ctrl system)**	**260**
4	**Mechanical struct. (1000 hrs/hod. X $20/hr x 3 hod + material)**	**75**
5	**Other costs (transportation 2k/hod, student labor 4k/hod)**	**18**
	Estimated cost (must add 25-30% contingency)	**668**

What Is Needed?

- We need final dimensions for the Hodoscopes from simulation studies to start design efforts.
- Need funding for test setup related costs.
- Need a list of desired electronics. This is required to borrow stuff from Fermilab.
- Will PMTs be used for Hodoscopes alone or do we expect them to be used in Calorimetry? This is required since the performance of the PMT base has to be optimized (i.e., mutually exclusive types of PMT applications.)
- If PMTs are to be used for calorimetry we need to define dynamic range, required linearity and dark noise limits.