

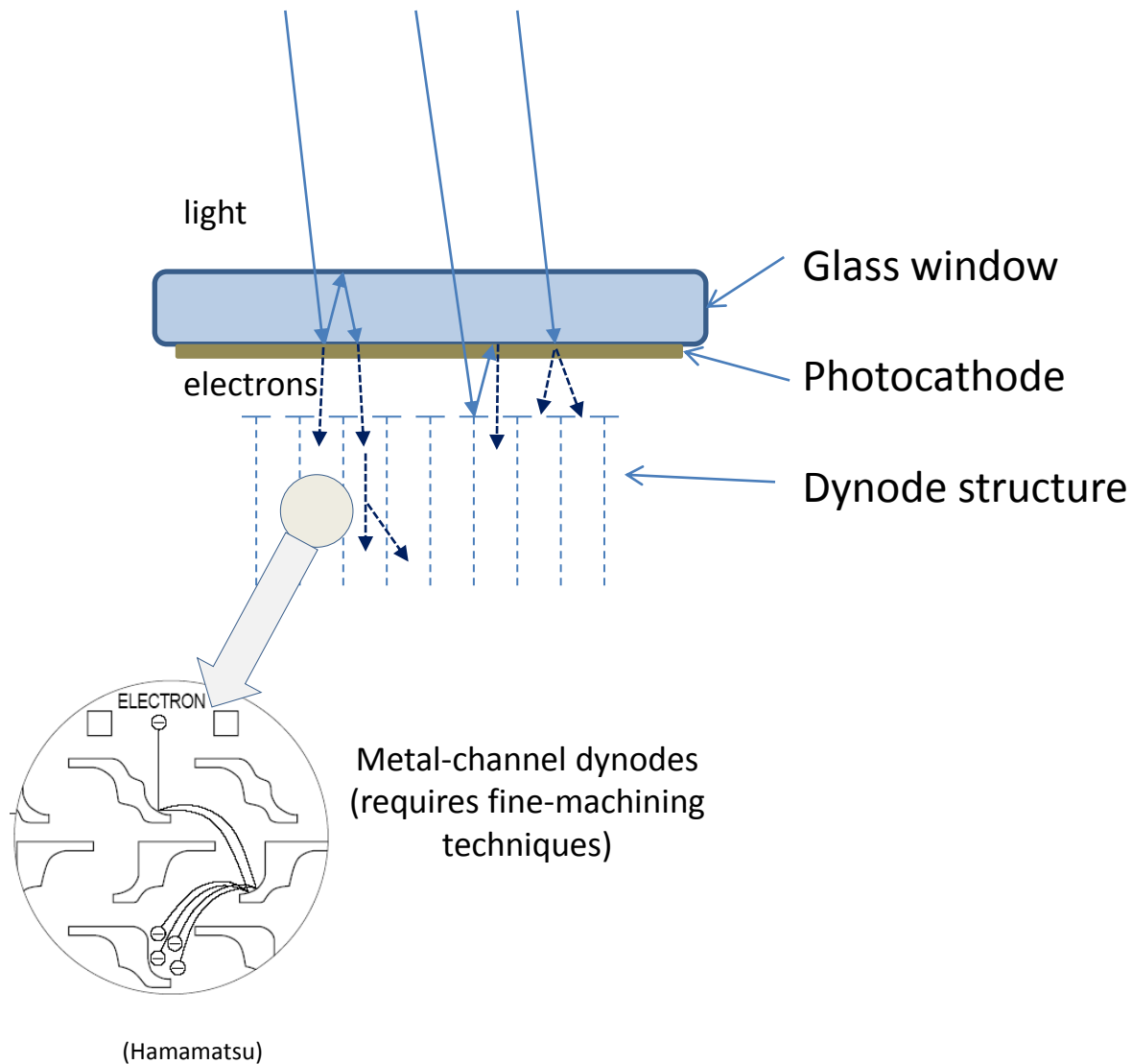
## Estimate the Cross talk of a MAPMT

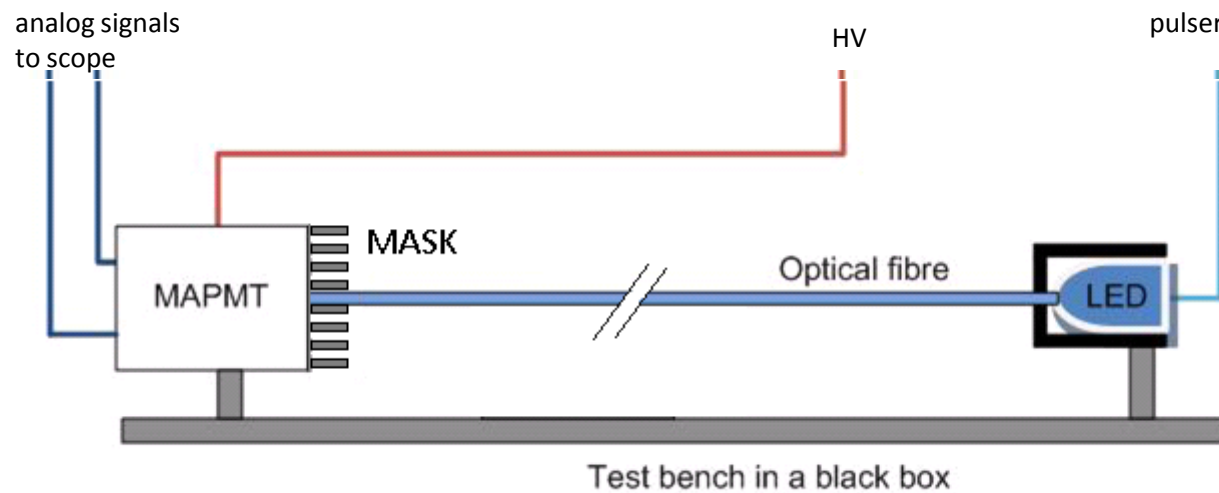
Task: Measure the cross talk of a MAPMT. Illuminate one channel and measure the induced signal on the neighboring channels. Use low light levels (few photoelectrons).

Set-up:

- MAPMT
- blue LED
- pulse generator
- fibre lightguide
- oscilloscope (with histogramming capability)

# Sources of cross-talk in a MAPMT





# HAMAMATSU

TECHNICAL DATA  
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# PHOTOMULTIPLIER TUBE R7600-00-M64

**2 x 2 mm Multianode, High Speed Response, Low Cross-talk  
25.7 mm Square, Bialkali Photocathode, 12-Stage, Head-on Type**

## GENERAL

Parameter		Description	unit
Spectral Response		300 to 650	nm
Wavelength of Maximum Response		420	nm
Photocathode	Material	Bialkali	-
	Minimum Effective Area	18.1 x 18.1	mm
Window Material		Borosilicate glass	-
Dynode	Structure	Metal channel dynode	-
	Number of stages	12	-
Operating Ambient Temperature		-30 to +50	°C
Storage Temperature		-80 to +50	°C

## MAXIMUM RATING (Absolute Maximum vales)

Parameter		Value	Unit
Supply voltage	Between Anode and Cathode	1000	V
Average Anode Current in total		0.1	mA

## CHARACTERISTICS (at 25°C) with Standard Voltage Divider

Parameter		Min.	Typ.	Max.	Unit
Cathode Sensitivity	Luminous(2856K)	60	80	-	uA/lm
	Blue Sensitivity Index (Cs-5-58)	6.5	8.5	-	-
Anode Sensitivity	Luminous ( 2856K )	8	24	-	A/lm
Gain		-	$0.3 \times 10^6$	-	-
Anode Dark Current in Total ( after 30min. storage in darkness )		-	12.8	128	nA
Time Response	Anode Pulse Rise time	-	1.0	-	ns
	Electron Transit Time	-	10.9	-	ns
	Transit Time Spread (T.T.S.)	-	0.3	-	ns
Pulse Linearity per channel at +/-5 % deviation		-	0.6	-	mA
Uniformity Between Each Anode		-	1:2.5	1:4	-

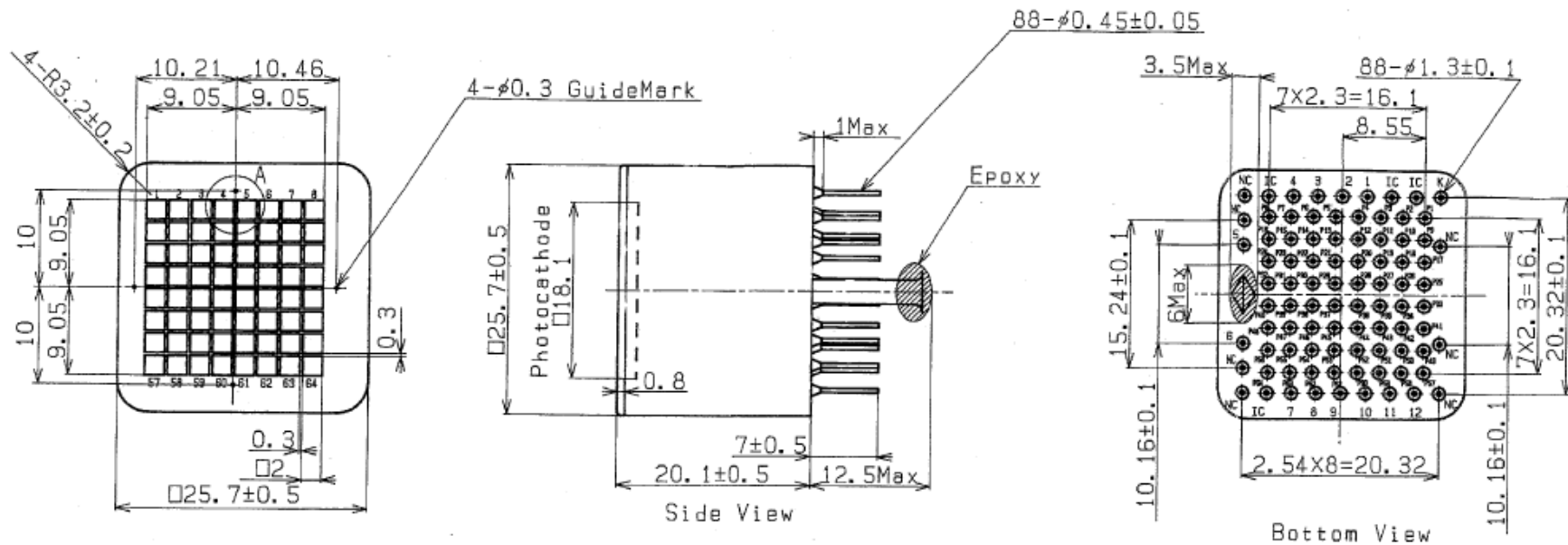
NOTE: Anode characteristics are measured with a voltage distribution ratio shown below :

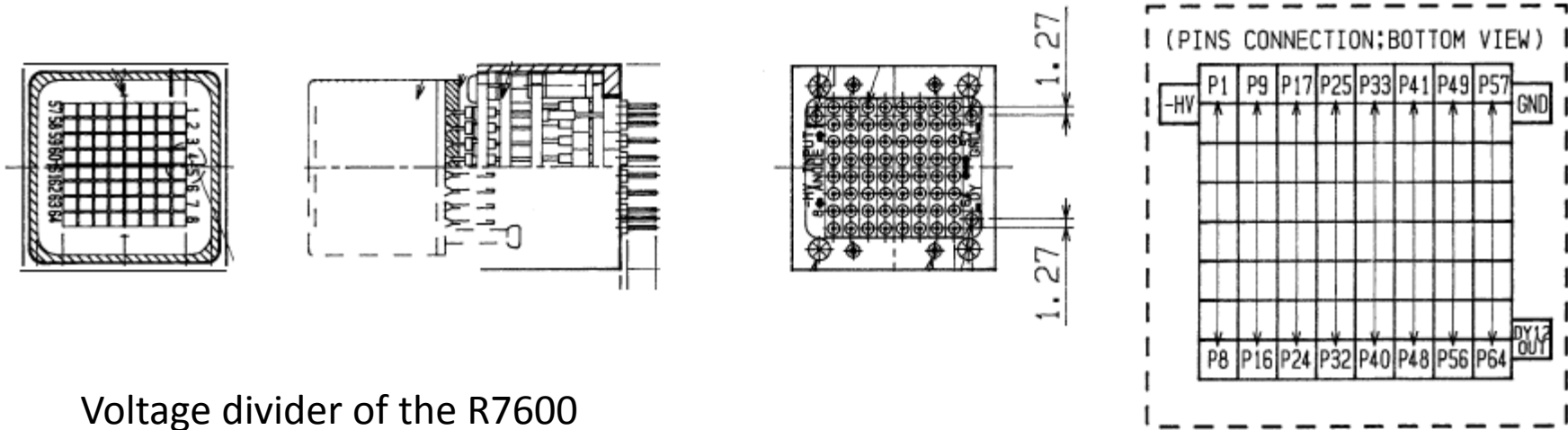
## Standard Voltage Divider and Supply Voltage

Electrodes	K	Dy1	Dy2	Dy3	Dy4	Dy5	Dy6	Dy7	Dy8	Dy9	Dy10	Dy11	Dy12	P
Ratio	3	2	2	1	1	1	1	1	1	1	1	1	1	1

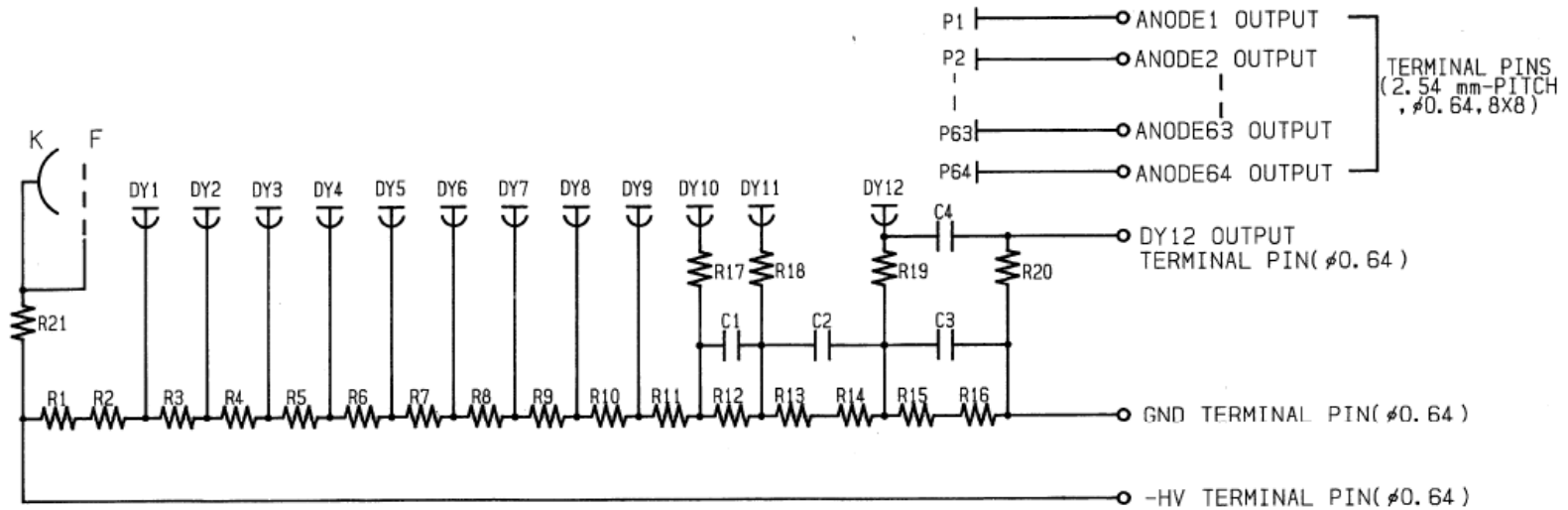
Supply Voltage: 800 V, K: Cathode, Dy: Dynode, P: Anode,

# Channel and pin layout of the Hamamatsu R7600 MAPMT





### Voltage divider of the R7600



R1,R5-R14:100 kΩ(±5 %,0.125 W)  
 R2-R4,R15:200 kΩ(±5 %,0.125 W)  
 R16:300 kΩ(±5 %,0.125 W)  
 R17-R19:51 Ω(±5 %,0.063 W)  
 R20:10 kΩ(±5 %,0.1 W)  
 R21:1 MΩ(±5 %,0.063 W)

C1-C2:0.022 μF(200 V)  
 C3:0.022 μF(500 V)  
 C4:0.01 μF(500 V)

## Example of a result from a quantitative measurement

A (scintillating) fiber (0.5 mm square) is positioned at the centre of a pixel in mechanical contact with the MAPMT window. No optical grease or gel is used. Low intensity light pulses from a LED are coupled into the fibre. The light intensity is chosen such that the average intensity corresponded to 0.2 photoelectrons per pulse, i.e. the probability for pulses with 2 photoelectrons is negligible. The MAPMT is operated at  $U_C = -950V$ . The figures below show the results of the measurement of the signals on the scope (area under pulse) on the illuminated pixel and the adjacent eight pulses. The cross-talk on the direct neighbours is of the order of 2% while diagonal neighbours show a signal of about 0.5%. The relative strength of the cross-talk varies with the applied bias.

