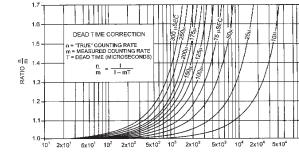
Geiger Mueller Tubes

Dead Time Correction

GM tubes using conventional counting circuitry all exhibit counting losses due to the dead time factor, T. The factors cited in the Canberra tube data tables are based on the recommended operating voltages and test circuits. The chart below enables the user to estimate the counting losses due to the dead time factor at high count rates.



m = MEASURED COUNTING RATE (COUNTS PER SECOND)

		nt Tube for Your ct or Near Equivale							
Can	berra Tube	Military Spec	LND	TGM	Centronic				
	2000	8767	7311	N1002					
2000 Series	2001			N1002-1					
Pancake	2006		73118	N1006					
	2011		7231	N1004	ZP1450				
	2100			N202					
	2106	7616 Equiv.							
	2111				ZP1400				
	2112		712	N205	ZP1401				
2100 Series	2121		7224	N206	ZP1410				
MICA End	2123			N204					
Window	P2123			N204/MHV					
	2126	5979 Equiv.	722	N201					
	2131		723	N210					
	P2131		7232	N210/BNC					
	2135		72314						
	2200		719	N107					
2200 Series	2202		721	N106					
Thin Wall	2206		720	N114					
Beta	2211		725	N112					
	2216			N119					
	2300		72610						
	2305			N305	ZP1200				
2300 Series	2306			N320					
Thick Wall	2311			N309					
Gamma	2314								
	2316		743	N310					
	2350		7802/78017						
	2406		716	N115-1	ZP1300				
	2411		714	N116-1	ZP1310				
2400 Series	2416		713	N117-1	ZP1320				
Miniature	2420	Equivalen	Equivalent to Eurisys Mesures Model 4G60M						
	2422	Equivalen	t to Eurisys Mesure	s Model 3G10					
	2423	Equivalen	t to Eurisys Mesure	s Model 4G15					



Features

■ Product Reliability

The Canberra Geiger Mueller tube has been carefully researched and developed to provide a rugged, reliable, long-lasting means of monitoring nuclear radiation levels. These detectors offer guaranteed advantages, including manufacturing consistency, product reliability and competitive pricing. Many of our tube types, including those approved for the military Quality Product List (QPL), are manufactured and tested to withstand rigorous shock and vibration per military standards.

Our Warranty

All Canberra Geiger Mueller tubes are guaranteed against defects in materials or workmanship for 1 year following shipment.

Geiger Mueller Tubes

All Canberra GM tubes comply with our stringent quality assurance policies, which meet or exceed MIL-STD-9858A.

Description

Guaranteed Analysis As an end user of

Geiger Mueller tubes for over 40 years, we have successfully bridged the gap between technical conception, detector design and field application to achieve the quality performance you demand.

Consider the Source

More than four decades of nuclear

instrumentation design enables us to incorporate quality and reliability into an outstanding line of Geiger Mueller tubes, including 2000 Series pancake detectors. We offer extensive experience as both a manufacturer and end user of all types of radiation detectors. Over the years, our detectors have met and exceeded customer needs in laboratory, military and harsh industrial environments.

Our Geiger Mueller tubes are the obvious choice for the discerning user. These tubes are built to exhibit superior performance, reliability and long-term stability. Our extensive product line provides direct (or near equivalents) for industry-standard tubes, including all versions of pancake detectors and frisker probes.

Manufacturing Excellence

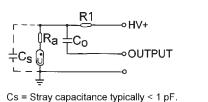
Canberra's manufacturing operation has refined the development and production of GM tubes. We utilize state-of-the-art instrumentation and the finest equipment to monitor and control all manufacturing processes. Our painstaking attention to every detail ensures contamination-free assemblies. We use only the highest quality materials to fabricate critical detector components. Our adherance to stringent design parameters and quality assurance ensures performance that meets or exceeds exacting commercial and military standards.

Canberra's growing detector division can offer substantial volume cost reductions for large orders.

Geiger Mueller Tubes

Derivation of tube parameters

By adding C_a in Figure 2, the effect of variations in tube capacity and circuit wiring due to working tolerances is minimized. However, Ca can be removed in many cases to reduce losses due to dead time at higher counting rates.



Co = High voltage blocking capacitor. Figure 1 - Anode Output

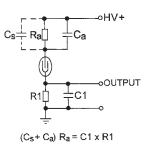
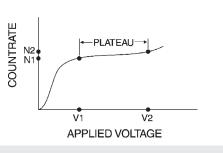
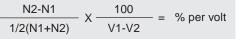


Figure 2 - Cathode Output

Plateau Calculations

Plateau slope calculations for Canberra data sheets are based upon the I.E.C. recommended formula, as prescribed in the ISO-affiliated publication #151-25 part 25, "Methods of measurement of Geiger Mueller counter tubes".





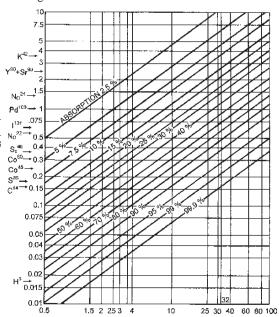
Data Charts – Tube Performance Characteristics Alpha Particle Detection

The table below shows the initial alpha energy required to penetrate a given mica window thickness as well as the approximate a particle range in air at 1 atm. This assumes a negligible air gap between the source and the window.

αEnergy	αRange in Air
1.9 MeV	10 mm
2.6 MeV	15 mm
3.6 MeV	22 mm
4.5 MeV	29 mm
	1.9 MeV 2.6 MeV 3.6 MeV

Beta Particle Detection

The chart below shows the effects of window thickness (mg/cm²) on beta particle absorption



Window thickness (mg/cm²)

Phone contact information

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For other international representative offices visit our Web Site: http://www.canberra.com or contact the Canberra U.S.A. office.

Geiger Mueller Tubes

Performance Data Table

		Pancake Tu	Mica End Window (Halogen Quenched) Tubes													MIL Spec Equiv.					
		I	For α, β, γ Appli	cations								F	or α, β, γ Appl	ications							
	6.4/0.25 0.00 0.		15.50.615 15.30.611 eresis Model		OPT F=Flyin	ONS: g Leads Anode Clip	8.1/ 0.320 Sy		els provided with e cathode strap		15 2/0.60 10 0/0.40		Mil. Version 2121 M Window 2.8 - 3.4 mg/cm²	1.0/0.04	25.4/1.0 Available with BNC, MHV or C connector	Mil. Version 2122 M Window 2.8 - 3.4 mg/cm² 24.1/9.50 DIA 1.0/ 0.040 MIL 25.4/1.000	6.4/0.25 ANODE CAP CAP 25.4/1.0	4 PIN BASE JEDEC A-4-9	Probe contains 2131 tube. Available with BNC, MHV or C connector	6.4/0.25 ANODE CAP 	8.4/0.25 ANODE CAP S 8/0.34
Tube Type → Characteristic ↓	2000/8767 2000/900 LH 2000/900 HA	2000/500 2000/500 LH 2000/500 HA	2006/900 2006/900 LH	2006/500 2006/500 LH	2011/900	2011/500	2100/750	2100/500	2106/900	2106/500	2111	2112	2121	2121S	P2121S	2122	2126	2131	P2131	2126M (JAN 5979)	2106M (JAN 7616)
Application	α, β, γ	α, β, γ	α, β, γ	α, β, γ	α, β, γ	α, β, γ	α, β, γ	α, β, γ	α,β,γ	α, β, γ	α,β,γ	α, β, γ	α, β, γ	α, β, γ	α, β, γ	α, β, γ	α, β, γ	α, β, γ	α, β, γ	α, β, γ	α, β, γ
Sensitivity*** 137Cs cpm at 1 mR/h*	3500	3500	3500	3500	1500	1500	60	60	500	500	1200	1200	1700	1700	1700	1700	2700	1650	1650	2700	500
Window Area Density (mg/cm²)	1.8 – 2.0	1.8 – 2.0	1.8 – 2.0	1.8 – 2.0	1.6 – 2.0	1.6 – 2.0	1.2 – 1.5	1.2 – 1.5	1.4 – 2.0	1.4 – 2.0	2.0 – 3.0	1.8 – 2.0	1.8 – 2.0	1.8 – 2.0	1.8 – 2.0	1.8 – 2.0	1.8 – 2.0	1.8 – 2.0	1.8 – 2.0	3.0 – 4.0	3.0 – 4.0
Window Effective Diameter (mm, in)	44.5, 1.75	44.5, 1.75	44.5, 1.75	44.5, 1.75	27.9, 1.11	27.9, 1.11	3.05, 0.12	3.05, 0.12	6.35, 0.25	6.35, 0.25	12.70, 0.50	12.70, 0.50	19.8, 0.78	19.8, 0.78	19.8, 0.78	19.8, 0.78	19.8, 0.78	28.4, 1.12	28.4, 1.12	19.8, 0.78	6.4, 0.25
Recommended Operating Voltage	900	500	900	500	900	500	750	500	900	500	500	500	575	900	900	575	900	900	900	700	760
Plateau Length Volts min.	850-1000	450-600	850-1000	450-600	850-1000	450-600	700-800	450-550	850-950	450-550	450-600	450-600	450-700	850-1000	850-1000	450-700	850-1000	850-1000	850-1000	660-860	750-960
Plateau Slope (%/100 V max.)	10	10	10	10	5	5	10	10	8	8	6	6	5	5	5	5	15	10	10	15	N/A
Dead Time (µs max.)	50	50	50	50	40	40	50	50	70	70	90	90	100	100	100	100	150	200	200	150	75
Background (c/m)*** Shielding 2" Pb + 1/8" Al	30 max.	30 max.	30 max.	30 max.	18 max.	18 max.	5 max.	5 max.	15 max.	15 max.	10 max.	10 max.	30 max.	30 max.	30 max.	30 max.	60 max.	40 max.	40 max.	60 max.	10 max.
Test Circuit	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1
Resistor, Ra (MQ)	3.3	3.3	3.3	3.3	3.3	3.3	4.7	4.7	1.0	1.0	10.0	10.0	3.3	3.3	3.3	3.3	1.0	1.0	1.0	1.0	1.0
Resistor, R1 (MΩ)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Operating Temp (°C)	-20 to +55	-20 to +55	-20 to +55	-20 to +55	-20 to +55	-20 to +55	-20 to +55	-20 to +55	-20 to +55	-20 to +55	-20 to +70	-20 to +70	-20 to +70	-20 to +70	-20 to +70	-20 to +75	-20 to +55	-20 to +55	-20 to +55	-40 to +75	-20 to +55
Cathode Material	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe
Cathode Wall	N/A	N/A	N/A	N/A	N/A	N/A	1.0, 0.038	1.0, 0.038	1.0, 0.040	1.0, 0.040	0.25, 0.010	0.25, 0.010	1.3, 0.050	2.8, 0.110	2.8, 0.110	40-60 mg/cm ²	1.3, 0.050	1.7, 0.065	1.7, 0.065	1.3, 0.050	1.0, 0.040
Max. Length Including Pins (mm, in)			See above drawing	g			41, 1.6	41, 1.6	64, 2.53	64, 2.5	50.8, 2.0	50.8, 2.0	51.0, 2.0	51.0, 2.0	94.0, 3.7	51.0, 2.0	145, 5.7	115, 4.54	124, 4.85	145, 5.7	64, 2.5
Max. Overall Diameter (mm, in)							8.1, 0.320	8.1, 0.320	8.9, 0.35	8.9, 0.35	15.2, 0.60	15.2, 0.60	25.4, 1.0	25.4, 1.0	25.4, 1.0	25.4, 1.0	25.4, 1.0	35, 1.38	35, 1.38	25.4, 1.0	8.9, 0.35
Window Recess (mm, in)	1.6, 0.062	1.6, 0.062	1.6, 0.062	1.6, 0.062	1.3, 0.05	1.3, 0.05	0.5, 0.020	0.5, 0.020	0.5, 0.020	0.5, 0.020	1.3, 0.050	1.3, 0.050	1.6, 0.062	1.6, 0.062	1.6, 0.062	1.6, 0.062	1.6, 0.062	1.3, 0.050	1.3, 0.050	1.6, 0.062	0.5, 0.020

^{*}An exposure of 115.07 mR in air equates to 1.0 mGy **High temperature version available for 150 °C operation ***At recommended operating voltage

Geiger Mueller Tubes

Performance Data Table

	Thin Wall Tubes					Halogen Quenched, Gamma SensitiveTubes												Miniature Tubes										
		For	β, γ Applicat	ions		For y Applications																						
	3 PIN BASE 12.7/0.50 12.7/0.50 12.7/0.50 12.7/0.50		3 PIN BASE 6.4/0.25 ANODE CAP 12.770.50 St. 28.0.05 St. 28.0.005 St. 28.0.05 St. 28.0.05 St. 28.0.05 St. 28.0.05 St. 28.0.05 S		3 PIN BASE 6.4/0.25 ANODE CAP ANODE CAP CAP ANODE CAP			3 PIN BASE 6.4/0.25 ANODE CAP 6.		3 PIN BASE 6.4/0.25 ANODE CAP 6.4/0.25 ANODE CAP 12.7/0.50 ANODE CAP 12.7/0.50 ANODE CAP 12.7/0.50 ANODE CAP 13.18/1.2/0.2/0.2/0.2/0.2/0.2/0.2/0.2/0.2/0.2/0			3 PIN BASE 3 PIN BASE 6.4/0.25 ANODE CAP CAP LENGE BY THING BOOK 12.7/0.50 10.00 83		1.0/0.040 PIN 15.2/0.60	1.0/0.040 PIN 3 PIN BASE ANODE ANO							ANODE PIN 1.0/0.40 DIA.	Dia Max. Dia Max. Dia Max. ANODE PIN 1.0/0.040 Dia.				
	Flying lead connections available for these models. Indicated by "-F" suffix on order						Flying lead connections available for these models. Indicated by "-F" suffix on order							Anode pin connector and cathode strap are supplied. Stated wall thickness includes glass envelope and cathode wall where appropriate. To achieve maximum linear count rate, always solder Ra directly to the supplied anode pin connector, or to the anode flying lead.														
Tube Type → Characteristic ↓	2200	2202	2206	2211	2216	2300	2301	2305	2306	2311	2314	2316	2350	2400	2406	2411	2416	2420	2422	2423								
Application	β, γ	β, γ	β, γ	β, γ	β, γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ (>0.5 MeV β)	γ (>0.25 MeV β)	γ (>0.5 MeV β)	γ	γ	γ								
Sensitivity*** 137Cs cpm at 1 mR/h*	5275	2900	635	1550	4800	175	175	1200	950	1850	3050	3950	8150	9.0	18.6	84	420	4.2	0.66	0.66								
Window Area Density (mg/cm²)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A								
Window Effective Diameter (mm, in)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A								
Recommended Operating Voltage	900	900	900	900	900	900	700	500	900	900	900	900	900	575	550	575	575	500	460	550								
Plateau Length Volts min.	850-1000	850-1000	850-1000	850-1000	850-1000	850-900	650-750	450-600	850-950	850-950	850-1000	850-1000	850-1000	500-650	500-600	500-650	500-650	450-550	420-500	500-600								
Plateau Slope (%/100 V max.)	8	8	10	8	8	15	15	6	8	8	6	6	10	20	30	15	8	35	40 max.	40 max.								
Dead Time (µs max.)	100	75	90	150	150	20	20	90	100	100	100	100	120	7	11	15	28	10	10	10								
Background (c/m)*** Shielding 2" Pb + 1/8" A	60 max.	30 max.	12 max.	20 max.	50 max.	10 max.	10 max.	10 max.	12 max.	30 max.	47 max.	60 max.	100 max.	1 max.	1 max.	2 max.	12 max.	6 typ.	1 typ.	1 typ.								
Test Circuit	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 1	Figure 2	Figure 2	Figure 2	Figure 2	Figure 2	Figure 2	Figure 2								
Resistor, R _a (MΩ)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	10	3.3	3.3	3.3	3.3	3.3	2.2	2.2	2.2	4.7	4.7	4.7	4.7								
Resistor, R1 (MΩ)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.047	0.047	0.047	0.10	0.010	0.010	0.010								
Operating Temp (°C)	-40 to +75**	-40 to +75**	-40 to +75	-40 to +75	-40 to +75	-40 to +75	-40 to +75	-20 to +75	-40 to +75	-40 to +75	-40 to +75	-40 to +75	-40 to +75	-40 to +75	-40 to +75	-40 to +75	-40 to +75	-20 to +60	-20 to +60	-20 to +60								
Cathode Material	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe	Cr/Fe								
Cathode Wall	40-60 mg/cm ²	40-60 mg/cm ²	40-60 mg/cm ²	40-60 mg/cm ²	40-60 mg/cm ²	0.5, 0.020	0.5, 0.020	0.25, 0.010	0.25, 0.010	0.25, 0.010	0.25, 0.010	0.25, 0.010	0.25, 0.010	95-135 mg/cm ²	75-95 mg/cm ²	75-95 mg/cm ²	32-40 mg/cm ²	360-400 mg/cm ²	360-400 mg/cm ²	360-400 mg/cm ²								
Max. Length Including Pins (mm, in)	276, 10.9	148, 5.83	94, 3.70	110, 4.31	198, 7.8	51, 2.00	51, 2.00	50.8, 2.0	86, 3.4	119, 4.7	165, 6.5	197, 7.75	351, 13.82	23, 0.90	26, 1.02	37, 1.46	51, 2.0	20, 0.80	20, 0.80	20, 0.80								
Max. Overall Diameter (mm, in)	16.0, 0.63	16.0, 0.63	16.0, 0.63	19.3, 0.76	19.3, 0.76	8.8, 0.34	8.8, 0.34	15.2, 0.60	16.0, 0.63	16.0, 0.63	16.0, 0.63	16.0, 0.63	19.3, 0.76	4.3, 0.17	6.2, 0.244	6.2, 0.244	10.0, 0.40	7.0, 0.28	7.0, 0.28	7.0, 0.28								
Window Recess (mm, in)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A								