

Calibrate PrM Modules

T. Yang

FNAL

Module #	V_{cathode} (mV)	V_{anode} (V)(mV)	$V_{\text{anode}}/V_{\text{cathode}}$	Lifetime(ms)
6 (norm)	5.37±0.06	4.84±0.07	0.90±0.02	8±1
6 (rev)	5.20±0.04	4.79±0.05	0.92±0.02	10±2
7 (norm)	5.40±0.19	5.13±0.05	0.95±0.04	27±20
7 (rev)	5.93±0.30	4.96±0.03	0.84±0.04	5±1
8 (norm)	5.85±0.12	5.27±0.07	0.90±0.02	8±2
8 (rev)	5.86±0.13	5.27±0.03	0.90±0.02	8±2
9 (norm)	5.81±0.06	5.32±0.05	0.92±0.01	9±1
9 (rev)	5.82±0.04	5.22±0.07	0.90±0.01	8±1
10 (norm)	5.54±0.13	4.92±0.10	0.89±0.02	7±2
10 (rev)	5.41±0.12	4.98±0.03	0.92±0.02	11±3

- Reminder of the previous studies.
- Data were taken on 5/25/10.
- Take 5 runs with each module, then switch the anode and cathode amplifiers, than take another 5 runs.
- Two configurations do not usually give the same lifetime.
- Module 7 gives the most inconsistent readings.
- Lifetime is calculated as $\text{Drifftime}/\ln(V_{\text{cathode}}/V_{\text{anode}})$

Calculate g^α/g^β

- Default amplifier: $V_A = g^\alpha Q_A$, $V_C = g^\beta Q_C$
- Switched amplifier: $V'_A = g^\beta Q_A$, $V'_C = g^\alpha Q_C$
- $g^\alpha/g^\beta = \sqrt{(V_A/V_C)/(V'_A/V'_C)}$

Module #	g^α/g^β
6	0.99±0.01
7	1.07±0.03
8	1.00±0.02
9	1.01±0.01
10	0.98±0.02

- g^α/g^β is significantly different from 1 for module 7.

Life time calculation

- Currently calculated as:
 - $\text{Drifttime}/\ln(V_c/V_a) = \text{Drifttime}/\ln[(Q_c/Q_a)/(g^\alpha/g^\beta)]$
- Q_c/Q_a is always higher than 1
 - $Q_c/Q_a = 1$ means no electron absorption, ie lifetime= ∞
- If Q_c/Q_a is slightly higher than 1 and g^α/g^β is slightly higher than 1, $(Q_c/Q_a)/(g^\alpha/g^\beta)$ can be very close to 1
 - This is what happened to module 7
- Corrected lift time
 - $\text{Drifttime}/\ln(Q_c/Q_a) = \text{Drifttime}/\ln[(V_c/V_a)*(g^\alpha/g^\beta)]$

Corrected lifetime

Module #	Lifetime(ms)	Corrected lifetime (ms)
6 (norm)	8±1	9±2
6 (rev)	10±2	9±2
7 (norm)	27±20	8±2
7 (rev)	5±1	8±3
8 (norm)	8±2	8±2
8 (rev)	8±2	8±2
9 (norm)	9±1	8±1
9 (rev)	8±1	8±1
10 (norm)	7±2	9±2
10 (rev)	11±3	8±2

g^α/g^β not a constant?

	Module 6	Module 7	Lifetime (ms)	V_c (mv)
5/25/10	0.99 ± 0.01	1.07 ± 0.03	~8	~5
8/9/10		1.02 ± 0.01	~2	~10
9/7/10	0.99 ± 0.01	1.04 ± 0.01	~8	~15

- We can probably use the average g^α/g^β to correct lifetime.
- This effect is only visible when lifetime is long.