Test Procedure and Results

The Photomultiplier Tubes (PMTs) are to be tested as a part of the final counter assembly, using the shortest counters. The goal of the test is to establish

1. The amount of external shielding [0-,1-,2-,3-cm, Final overhang] required to prevent the PMT signal from degrading in magnetic fields up to 30 Gauss [5-G increments to 30G], incident axially and transverse to the PMT.
2. The effect of rotating the PMT in each of the magnetic field configurations.
3. The effect on time resolution (?)

Some definitions:

* **z^**: PMT axis of cylindrical symmetry, pointing away from photocathode
* **Axial B field (A)**: pointing along -z^
* **Transverse B field (T)** : perpendicular to z^
* **Rotations**: Defined around z^, with 0° = y^ of PMT pointing towards lab ceiling.

Then for example,

T0 = PMT oriented in a T field, with y^ pointing at lab ceiling

T90 = PMT rotated by 90° around the T0 position

To establish *signal degradation,* the PMT's ADC distribution is used. The ADC distribution at 0 Gauss is used as a reference (The baseline voltage is applied to the PMT (?) - try to use 6bar voltage). When the mean of the ADC distribution under an applied B field changes by X%, the signal is said to be degraded.

Establishing B field

Source at center of scintillator

The main parameters of the test are listed in the following table, and any notable deviations from the expected values are highlighted in yellow.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | No Shielding | 0 cm | 1cm | 2cm | 3cm | Final |
| 0 Gauss:  (A0)  (T0) |  |  |  |  |  |  |
| 5 Gauss:  (A0, A90, A180, A270)  (T0, T90,T180, T270) |  |  |  |  |  |  |
| 10 Gauss:  (A0, A90, A180, A270)  (T0, T90,T180, T270) |  |  |  |  |  |  |
| 15 Gauss:  (A0, A90, A180, A270)  (T0, T90,T180, T270) |  |  |  |  |  |  |
| 20 Gauss:  (A0, A90, A180, A270)  (T0, T90,T180, T270) |  |  |  |  |  |  |
| 25 Gauss:  (A0, A90, A180, A270)  (T0, T90,T180, T270) |  |  |  |  |  |  |
| 30 Gauss:  (A0, A90, A180, A270)  (T0, T90,T180, T270) |  |  |  |  |  |  |

**FA0294**

Integrated charge spectrum and oscilloscope snapshot at 1500V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Integrated charge spectrum and oscilloscope snapshot at 1700V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Integrated charge spectrum and oscilloscope snapshot at 1425V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Dark current at 1700V, 1500V, and 1425V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

![A description...](data:None;base64,)

**FA0281**

Integrated charge spectrum and oscilloscope snapshot at 1700V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Integrated charge spectrum and oscilloscope snapshot at 1500V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Integrated charge spectrum and oscilloscope snapshot at 1475V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Dark current at 1700V and 1500V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

**FA0220**

Integrated charge spectrum and oscilloscope snapshot at 1700V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Integrated charge spectrum and oscilloscope snapshot at 1500V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Integrated charge spectrum and oscilloscope snapshot at 1425V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Dark current at 1700V and 1500V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

**FA0425**

Integrated charge spectrum and oscilloscope snapshot at 1700V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Integrated charge spectrum and oscilloscope snapshot at 1500V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Integrated charge spectrum and oscilloscope snapshot at 1425V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Dark current at 1700V, 1500V, and 1425V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

![A description...](data:None;base64,)

**FA0293**

Integrated charge spectrum and oscilloscope snapshot at 1700V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Integrated charge spectrum and oscilloscope snapshot at 1500V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Integrated charge spectrum and oscilloscope snapshot at 1375V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Dark current at 1700V, 1500V, and 1375V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

![A description...](data:None;base64,)

**FA0295**

Integrated charge spectrum and oscilloscope snapshot at 1700V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Integrated charge spectrum and oscilloscope snapshot at 1500V![A description...](data:None;base64,)

![A description...](data:None;base64,)

Integrated charge spectrum and oscilloscope snapshot at 1375V

![A description...](data:None;base64,)

![A description...](data:None;base64,)

Dark current at 1700V, 1500V, and 1375V

![A description...](data:None;base64,)![A description...](data:None;base64,)![A description...](data:None;base64,)