SECTION 5E

ACCEPTANCE TESTS FOR G.M. COUNTER TUBES

Unless otherwise stated in the Test Specification Counter Tubes shall comply with the following requirements together with those given in the Test Specification and with all other sections in this specification except 5.2, 5.3, 5.4, 5.5, 5.8, 5.9, 5.10, 5A, 5B, 5C, 5D and 5F.

All Counter Tubes shall operate in the Geiger region and shall be capable of detecting alpha and/or beta electromagnetic radiations according to type, when used with suitable counting apparatus.

Unless otherwise stated in the Test Specification, all G.M. counter tubes shall be operated at a voltage approximating to the specified operating voltage Vw, for a time sufficient to obtain steady values of electrical characteristics, prior to electrical testing. (See 5.E.6).

Mechanical inspection shall be carried out before electrical tests.

5.E.1. General Inspection. A general inspection of the physical features of the counter tubes shall be made and any tubes which do not conform to the requirements specified shall be rejected; in particular, the anode wire shall be taut except where support is made at one end only, and the effective (unscreened) section of anode wire shall be symmetrically located about the line C_L as in individual drawings.

5.E.2. Loose Particles. The tube shall be rejected if it contains any loose particles which may have an adverse effect on its operation.

5.E.3. General Electrical Test Requirements. The counter tube to be tested shall be enclosed in a suitable light proof container unless the design of the tube is such that it is inherently insensitive to light.

The radioactive test source to be used shall, where necessary, be specified both in nature and strength in the Test Specification. Otherwise, any suitable type and strength of source may be used, provided that it shall not cause damage to the counter tube under test.

5.E.3.1. Self-Quenched Counter. All tests shall be carried out with an instrumental resolving time not greater than 350 microseconds, and an instrumental sensitivity as given in the Test Specification.

Test apparatus shall not supply any quenching pulse which may influence performance of the counter tube under test and shall be to the satisfaction of the Approving Authority.

5.E.3.2. Externally Quenched Counter. Test apparatus shall be to the satisfaction of the Approving Authority.

5.E.4. Methods of Plateau Measurement. The count rate/applied voltage characteristic shall be determined by measuring not less than 3000 counts at an average rate of not more than 6000 per minute, at intervals of 40 volts increase in applied voltage when the minimum acceptable plateau length, L_{min}, is 200 volts or greater. If L_{min} lies between 90 and 199 volts inclusive, the interval shall be 20 volts; if L_{min} is under 90 volts, the interval shall be 10 volts. The test shall not be carried on beyond the value of L_{min} + one interval, except where otherwise stated in the Test Specification.

5.E.5. Hysteresis Test. Immediately following completion of the plateau measurement, the count rate at the threshold voltage V_T shall be re-determined, if required by the Test Specification. This value shall not differ from the initial value by more than 10% disregarding statistical fluctuations.

5.E.6. Operating Voltage, Vw. For all tests where the counter tube is required to be operated at the operating voltage Vw, this shall be defined as $(V_T + \frac{1}{2} L_{min})$. The measured value shall be corrected to + 20°C using the average value of temperature coefficient as stated in the Test Specification.

5.E.7. Background Count. This test shall be carried out where required by the Test Specification. The location of the counter tube shall be to the satisfaction of the Approving Authority and measurements made over at least 1000 counts or a time of at least 5 minutes if this gives a lower total count.

Two separate tests are recognised viz.

5.E.7.1. Unshielded Background. This shall be measured with the counter tube screened from light but unshielded by lead or any other material of high atomic number.

5.E.7.2. Shielded Background. This shall be measured with the counter tube screened from light and entirely surrounded by material of sufficient thickness to ensure a weight of material of at least 40 gm per sq. cm (equivalent to 35 mm. of lead). An internal liner of thickness such that the weight is not greater than 1 gm per sq. cm. may be allowed.

5.E.8. Life Tests. For the purpose of Qualification Approval the useful life of a counter is the number of counts after which the plateau length is reduced to $\frac{1}{2} L_{min}$ and/or the plateau slope exceeds the maximum value stated in the Test Specification. The test will be carried out on not less than six tubes at a continuous rate of not greater than 30,000 counts per minute at the operating voltage as defined in 5.E.6 above. Qualification Approval will not be given if the useful life of any one counter tube in the batch is less than 50% of the average value for the batch, or if the average value for the batch is less than 80% of the value as stated in the Test Specification.

5.E.9. Temperature Coefficient. For the purpose of Qualification Approval this will be measured as an average change in threshold voltage (V_T), per degree centigrade change of temperature, over a range of temperature to be specified by the Approving Authority. The test will be carried out on not less than three tubes and Qualification Approval will not be given if the value for any one counter tube exceeds the maximum figure stated in the Test Specification.

5.E.10. Spurious Counts. For Qualification Approval the proportion of spurious counts generated by the counter tube due to any cause will be measured on a sample batch of three tubes using apparatus approved by the Approving Authority. These three tubes will be required in addition to those required for other Qualification Approval tests.