



Microwave Tube Operating Hazards

EMI-Varian microwave tubes are safe to operate provided they are correctly installed and maintained. Use the Test Performance Sheet and operating instructions with the information given in this sheet to provide safe and efficient operating conditions for this tube. **DO NOT** operate this tube except in accordance with proper operating instructions, these precautions and any additional information provided by EMI-Varian engineers. EMI-Varian as a component supplier can assume no responsibility for any damage or injury resulting from the operation of EMI-Varian microwave tubes.

SERIOUS HAZARDS EXIST IN THE OPERATION OF ALL MICROWAVE TUBES

The operation of all microwave tubes involves the following hazards:—

- a. HIGH VOLTAGE
- b. MICROWAVE RADIATION
- c. X RAY RADIATION

To ensure safe operation for this tube read the following instruction and take appropriate precautions.

HIGH VOLTAGE

Operating voltages for microwave tubes can range from 200 volts to over 150 kilovolts. These voltages can cause fatality and equipment should be designed so that it is impossible for the operator to come into contact with high voltages accidentally. High voltage circuits and terminals should be enclosed and interlocking switch circuits provided to open the primary circuits of the power supply and discharge high voltage condensers whenever access is required.

MICROWAVE RADIATION

Exposure of the human body to microwave radiation in excess of 10 milliwatts per square centimetre is unsafe. The output of many microwave tubes **EXCEEDS** this level. Therefore r.f. energy must be properly contained by waveguides and shielding. Arrangements should be made to prevent exposure of personnel to strong r.f. fields in the vicinity of microwave tubes and in front of antenna systems.

X RAY RADIATION

Electronic tubes operating at voltages higher than 16 kilovolts produce progressively more dangerous X RAY radiation as the voltage is increased. Therefore many high power microwave tubes are potential X RAY hazards. Adequate X RAY shielding must be provided on all sides of these tubes, as well as the modulator and pulse transformer tanks. Periodic checks should be made on the X RAY levels. High voltage tubes must **NEVER** be operated without adequate X RAY shielding being in place.

DANGER from breathing dust or fumes from BERYLLIUM OXIDE CERAMICS

Some EMI-Varian high power microwave tubes contain Beryllium Oxide Ceramics. No operations should be performed on the ceramic parts of these tubes which produce dust or fumes. In particular avoid operations such as grinding, grit blasting and acid cleaning.

BERYLLIUM OXIDE DUST AND FUMES ARE HIGHLY TOXIC AND BREATHING THEM CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH. If a tube fails and a broken window is suspected, the tube should carefully be removed from the mating waveguide and the output flange of the tube **SEALED** with tape.

Disposal of used tubes containing Beryllium Oxide must be done in a manner which will ensure that personnel involved in the disposal operation will be fully safeguarded and that personnel engaged in any possible salvage operation will be fully warned of the hazards. If proper disposal presents a problem, EMI-Varian is prepared to offer disposal services for tubes containing Beryllium Oxide. Tubes should be returned prepaid with written authorisation to EMI-Varian to dispose of the tubes.

WE STRONGLY URGE THAT EMI-VARIAN BE CONSULTED PRIOR TO PERFORMING ANY WORK ON THE CERAMIC PORTIONS OF ANY EMI-VARIAN HIGH POWER MICROWAVE TUBES.



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