

**Microwave-Tube Experiments  
Utilizing Ferroelectric Electron-Gun**

M. Einat, G. Rosenman, and E. Jerby  
Faculty of Engineering, Tel Aviv University  
Ramat Aviv 69978, Israel

In this experimental study, an electron gun based on a ferroelectric cathode has been developed and tested in a variety of microwave-tube experiments. In this gun the electrons are emitted from the cathode surface plasma and accelerated in two stages. The electron energy-spread is reduced sufficiently for microwave interactions such as cyclotron-resonance maser (CRM) and free-electron maser (FEM). An electron beam of  $\sim 14$  kV and 1-

2A is obtained with a 0.1-2.1  $\mu$ s pulse width. Up to 3.1 MHz Repetition rate and  $\sim 50\%$  duty-cycle is measured. The electron gun implementation is demonstrated both in FEM and gyrotron-CRM experiments. In the latter, the microwave output exceeds 1.5 kW at  $\sim 7$  GHz with a 12% electronic efficiency. The paper discusses the applicability of the ferroelectric guns in future electron tubes.