Advances in Cold Cathode Physics and Technology

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Invited Paper

We review recent progress in the physics and technology of cold cathode electron emitters. The characteristics of emission from field emitter arrays, photocathodes, and ferroelectrics are presented, together with a summary of the understanding of the physics involved. The paper concludes with a description of L-band micropulse gun, based on secondary emission in an RF cavity. Emphasis is placed on cathode development for electron guns to drive microwave tubes and RF accelerators.

***Keywords*—** *Cathodes, electron beams, electron emission, ferroelectric materials, microwave tubes, linear accelerators, photo electricity.*

a gigahertz. Cathode lifetimes, in this mode of operation, extend to many years. Similarly, continuous operating microwave devices, which operate at power levels in the Watt to multikilowatt regime, require cathodes with comparable multiyear life. Recent advances have been driven by needs for ultrahigh-power devices with higher available emission current densities, and by the desire to directly modulate the electron beam at the source. In addition, direct modulation of the beam to produce a train of short pulses is of interest for cathode use as a buncher for RF linacs. We shall address both of these topics in the following sections.