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Priming effects in a relativistic magnetron with a transparent cathode[1] H.L. BOSMAN, S. PRASAD, M.I. FUKS, E. SCHAMILOGLU, University of New Mexico — Theoretical and simulation studies have shown that the transparent cathode can cause shorter start-up times in relativistic magnetrons, compared with the traditional solid cathode (even when cathode priming or magnetic priming is applied). The transparent cathode consists of several individual cathode strips, arranged in a cylindrical geometry. This arrangement allows the RF electric fields to penetrate through the cathode strips, resulting in a larger E_θ field amplitude in the electron hub region which enhances electron capture into spokes. The transparent cathode also allows for priming of the magnetron, defined here as the bunching of electrons into the preferred spoke geometry before the Buneman-Hartree condition for the desired mode is satisfied. A detailed study was undertaken using the 3D electromagnetic particle-in-cell code MAGIC to investigate priming effects for the well-known A6 magnetron geometry with a transparent cathode. The simulations show a correlation between the number of cathode strips and the mode that is primed in the magnetron, and that the magnetron behavior is sensitive to the placement of the cathode strips relative to the anode vanes. However, once the Buneman-Hartree condition is satisfied, RF effects always dominate over priming effects in spoke formation.

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