Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Two-dimensional particle-in-cell simulations of a magnetron with strapping and extraction modeled via circuit elements KEITH CARTWRIGHT, WILKIN TANG, TIM FLEMING, MIKE LAMBRECHT, Air Force Research Laboratory — A two-dimensional (2-D) magnetron model has been developed to investigate the effects of strapping and extraction on operational parameters of the device, including oscillating frequency and mode separation. The effort began with a study of three-dimensional (3-D) electromagnetic (EM) particle-in-cell (PIC) simulations of magnetrons that indicated a uniform electric field distribution along the axial extent of the slow wave structure (SWS). This uniformity led to the creation of a representative 2-D model consisting of a SWS cross-section that approximately represents the entire SWS cavity, and required significantly less computation time. The model was then augmented with circuit elements to represent both strapping and extraction. The phase velocity and characteristic impedance for both 2-D and 3-D models compared favorably, validating the 2-D approximation. The validated 2-D model is now being used to study the influence of strapping and extraction on magnetron behavior through variation of circuit element values, and will provide insight and guidance for future magnetron design.

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Date submitted: 16 Jul 2010 Electronic form version 1.4