

Abstract Submitted  
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**3D CFDTD PIC Simulation Study on Low-Frequency Oscillations in a Gyrotron**<sup>1</sup> M.C. LIN, D.N. SMITHE, Tech-X Corporation — Low-frequency oscillations (LFOs) have been observed in a high average power gyrotron and the trapped electron population contributing to the oscillation has been measured. As high average power gyrotrons are the most promising millimeter wave source for thermonuclear fusion research, it is important to get a better understanding of this parasitic phenomenon to avoid any deterioration of the electron beam quality thus reducing the gyrotron efficiency. However, understanding of the LFOs remains incomplete and a full picture of this parasitic phenomenon has not been seen yet. In this work, we use a 3D conformal finite-difference time-domain (CFDTD) particle-in-cell (PIC) method to accurately and efficiently study the LFOs in a magnetron injection gun (MIG) of a high average power gyrotron. Employing a highly parallelized computation, the model can be simulated in time domain more realistically. LFOs have been obtained in a 3D time domain simulation for the first time. From our preliminary simulation studies, it is found that not only magnetic compression profile but initial velocity or velocity ratio play an important role in the operation of a MIG electron gun. In addition, the secondary emission effects on the LFOs are also studied. Detailed results will be presented.

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M. C. Lin  
Tech-X Corporation

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