TIME-DOMAIN SIMULATION OF INDUCTIVE OUTPUT TUBES*

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We report the development of three-dimensional, time-domain simulation tools for modeling Inductive Output Tubes (IOTs). The present development is based upon the techniques developed for the NEMESIS [1] simulation code for coupled-cavity traveling wave tubes. This technique relies on the integration of equivalent circuit equations in time coupled with the Lorentz force equations for particle trajectories. In the case of IOTs, the equivalent circuit is a simple LRC model. The connection between the equivalent circuit equations and the forces on the electrons used in the Lorentz force equations is through a scaling of an RF field model in which the amplitude is proportional to the cavity voltage. The RF field model can be obtained analytically (as derived in two dimensions by Kosmahl and Branch [2]) or by means of a field map generated by electromagnetic structure simulators. The electron trajectories are integrated in these RF fields as well as using magnetostatic focusing fields. Originally a Poisson solver using the method of successive over-relaxation was used to obtain the space-charge fields, and NEMESIS was successfully benchmarked [1] for an IOT under developed at CPI-Eimac (K5H90W-2). We report on work to extending NEMESIS to full three-dimensional capability by the addition of a interpolation routine to read in three-dimensional RF cavity fields and the incorporation of a three-dimensionalmulti-grid Poisson solver.

1. H.P. Freund, W.H. Miner, Jr., J. Verboncoeur, Y. Li, and E. Wright, IEEE Trans. Plasma Sci. **35**, 1081 (2007).
2. H.G. Kosmahl and G.M. Branch, IEEE Trans. Electron Dev. **ED-20**, 621 (1973).

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