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Adam R Attarian* (arattari@ncsu.edu), Department of Mathematics, Box 8205, Raleigh, NC 27695-8205, and **Jeremy Zuckero, Laura Tarko, John David** and **Lawrence Ives**.

Optimization of Traveling Wave Tubes using Large Signal Codes and Optical Beam Analysis.

Traveling wave tubes are common devices with widespread use in both satellite and terrestrial communications as well as areas such as electronic counter measures. For instance in satellite communications due to constraints on power usage and weight, it is extremely desirable to optimize these devices so that they perform as well as possible. For example, an improvement of 1% in efficiency will result in a savings of \$15 million over the satellite lifetime. We utilize the CHRISTINE suite of large signal codes to model the slow wave portion of the TWT and Beam Optics Analysis (BOA) to model a multi staged depressed collector, where the goal is to optimize the collector given the spent beam data from an optimal circuit. The optimization techniques, including the Nelder-Mead algorithm and formulation of cost functionals as well as the optimized results will be discussed in detail. (Received September 26, 2006)