

# **Linear Theory of the Multi-Stage Gyro-TWT**

G. Nusinovich, M. Walter,  
IPR, University of Maryland  
College Park, MD 20742

## **Abstract:**

The Gyro-TWT is a promising candidate for applications requiring high power mm wave amplifiers with large bandwidth. Single stage devices are limited in their operation by backward wave instabilities. Multistage gyro-TWT's may be used to reduce interaction lengths of each section below minimum startup requirements for the parasitic backward wave. Such a two stage device is comprised of an input section, a cutoff drift region, and an output section. However analysis of such devices is complicated because of a large number of free parameters involved.

We have developed the formalism for operation of the multi-stage gyro-TWT amplifier in the linear regime. Such operation can be characterized by the normalized length, detuning, and electron beam current. Two distinct operating conditions are examined. The first is operation near cutoff, while the second is operation far from cutoff.

Results of gain and bandwidth calculations will be presented for both near and far from cutoff operation for a two stage gyro-TWT at arbitrary detunings of the input and output sections.

This work was supported by the DoD MURI program under grant F49620-95-I-0358 and by the Naval Research Laboratories under grant N00173981G000.