

Abstract Submitted  
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**Backward Wave Oscillation Thresholds in a Traveling-Wave Tube**<sup>1</sup> ABHIJIT JASSEM, PATRICK WONG, FOIVOS ANTOULINAKIS, Y.Y. LAU, University of Michigan — The threshold for the onset of backward wave oscillation (BWO) in a traveling-wave tube (TWT) was formulated by Johnson [1]. In this paper, we extend Johnson’s model to include random variations of circuit phase velocity along the tube axis. We find that Johnson’s BWO threshold is minimally affected by these random variations. We next ignore these random variations, but include finite reflections at the two ends of a TWT and study their effects on Johnson’s threshold. The latter theory is developed and being compared with results from an experimental helix test circuit. We will explore a 4-wave treatment [2] for BWO, and its connection with the Briggs-Bers criterion for the existence of absolute instability. [1] H. R. Johnson, *Proc. IRE*, **43**, 684 (1955). [2] D. Chernin, *et al.*, *IEEE Trans. Electron Devices* **59**, 1542 (2012).

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