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Effects of Random Circuit Fabrication Errors on Small Signal Gain and on Output Phase in a Traveling Wave Tube[1] I.M. RITTERSDORF, University of Michigan, T.M. ANTONSEN, JR., University of Maryland, D. CHERNIN, Science Applications International Corporation, Y.Y. LAU, University of Michigan — Random fabrication errors may have detrimental effects on the performance of traveling-wave tubes (TWTs) of all types. A new scaling law for the modification in the average small signal gain and in the output phase is derived from the third order ordinary differential equation that governs the forward wave interaction in a TWT in the presence of random error that is distributed along the axis of the tube. These scaling laws extend previous works in that they account for non-synchronous beam velocities and the inclusion of Pierce's "space charge" term. Analytical results compare favorably with numerical results in the absence of space charge, in both gain and phase modifications as a result of random error in the phase velocity of the slow wave circuit. Results on the effects of non-synchronous beam velocities and ac space charge are reported. Effects of internal reflections are investigated [1].

[1] D. Chernin, et al., IEEE Trans. Electron Devices 59, 1542 (2012).

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