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Effects of Random Circuit Fabrication Errors on the Mean and Standard Deviation of Small Signal Gain and Phase of 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, D.M.H. HUNG, University of Michigan — Random fabrication errors in the slow wave circuits may have detrimental effects on the performance of traveling-wave tubes (TWTs) of all types. Pengvanich *et. al.* [1] considered the evolution of the three forward waves in a TWT in which the Pierce parameters vary randomly along the tube axis. A peculiar feature of the results in Ref. [1] is that, in the statistical evaluation of a large number of samples with random errors in the circuit phase velocity, a significant number of these samples show an output gain that is higher than the corresponding error-free tube. It was recently proved that the deviation from the mean (which is a second order effect in random errors), is much less than the standard deviation (which is a first order effect in random errors). A significant number of the samples in a statistical analysis would naturally show an output gain that is higher than the corresponding error-free tube, as observed in [1]. This paper summarizes our recent study, together with an optimization of the random error profile to maximize the small signal gain of a TWT.

[1] P. Pengvanich, D. Chernin, Y. Y. Lau, J. W. Luginsland, and R. M. Gilgenbach, IEEE Trans. Electron Devices 55, 916 (2008).

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