Errata

Correction to "Heterostructure Barrier Varactor Simulation Using an Integrated Hydrodynamic Device/Harmonic-Balance Circuit Analysis Technique"

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In addition to reporting on the integration of a hydrodynamic device simulator for Heterostructure Barrier Varactors (HBV's) with a novel harmonic-balance circuit simulation technique, the letter of reference [1] was intended to illustrate the importance of representing active devices with physics-based numerical device models rather than typical analytical device models based on lumped quasi-static equivalent circuits. To accomplish the latter, the novel harmonic-balance circuit simulation technique was combined with both the hydrodynamic device model and a curve-fit analytical device model. Results from the two simulation approaches were then compared to the tripling efficiency versus incident pump power data of Choudhury *et al.* [2] for single barrier GaAs/$A_{0.7}G_{0.3}$As HBV's operating at 64 GHz. The curve-fit analytical device model used to generate the theoretical data shown in Fig. 1, [1], however, did not include the particle current contribution to the total current given by the first term in (5), [1]. If both the particle and displacement current contributions to the total current are utilized, the tripling efficiency increases, peaks, and begins to decrease as the incident pump power is increased. This decrease in tripling efficiency at high pump powers can be attributed to the onset of significant particle current through the device and, thus, the onset of partially resistive (lossy) multiplication. This can be seen clearly in Fig. 1 which shows the original Fig. 1, [1] with the theoretical data for the curve-fit analytical model including particle current. The results from the two curve-fit analytical device models (with and without the particle current contribution to the total current) are consistent with the results (Fig. 3) of Choudhury *et al.* [2]. It is important to note that our results correspond to a parasitic impedance of 7.0 Ω, while the corresponding Choudhury *et al.* results [2] correspond to a parasitic impedance of 5.0 Ω. Although the difference between the results obtained with the hydrodynamic device model and those obtained from the complete analytical device model (particle and displacement current) is not as dramatic as the ideal case (displacement current only), significantly improved correlation with the experimental data of Choudhury *et al.* [2] is still obtained using the hydrodynamic device/ harmonic-balance circuit simulator.

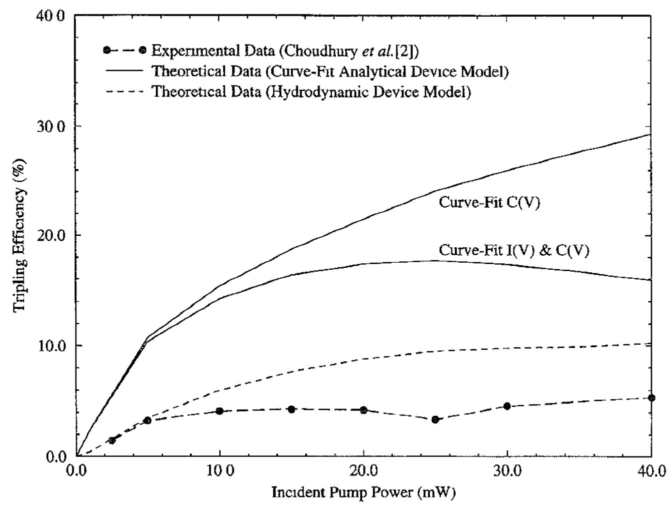

Fig. 1. Experimental and theoretical tripling efficiencies versus incident pump power for single barrier GaAs/AlGaAs HBV's subject to 64-GHz pump excitation. Experimental results are taken from Fig. 7, [2].

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References

[1] J. R. Jones, S. H. Jones, G. B. Tait, and M. F. Zybura, "Heterostrucure barrier varactor simulation using an integrated hydrodynamic device/harmonic-balance circuit analysis technique," *IEEE Microwave and Guided Wave Lett.* vol. 4, no. 12, pp. 411–413, Dec. 1994.
[2] D. Choudhury, M. A. Frerking, and P. D. Batelaan, "A 200 GHz tripler using a single barrier varactor," *IEEE Trans. Microwave Theory Tech.*, vol. MTT-41, no. 4, pp. 595–599, Apr. 1993.