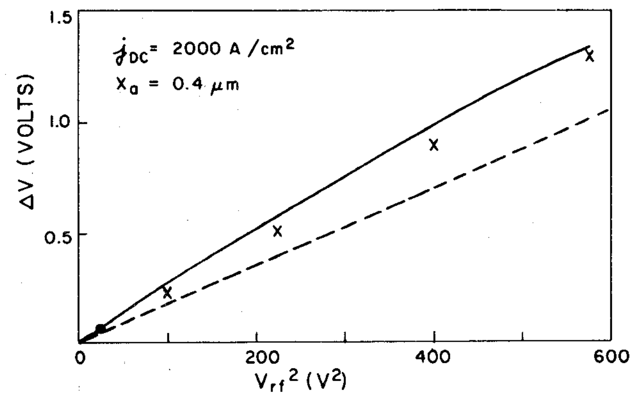

Fig. 2. ΔV versus V_{RF}^2 for $x_a = 0.4$ μm when $j_{DC} = 2000$ A/cm^2. The solid curve includes the effect of space charge on γ while the dashed line assumes $\gamma = 1$.

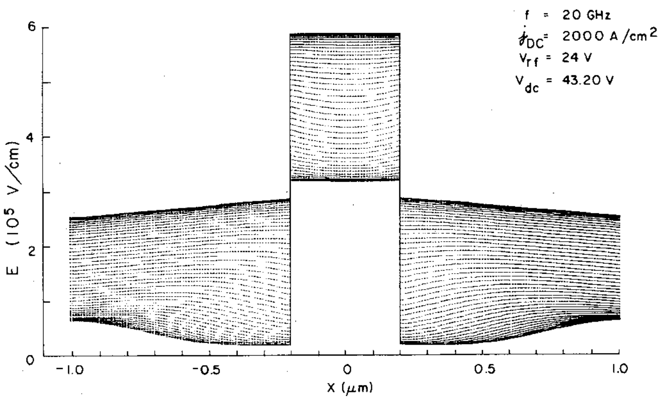

Fig. 3. Electric field versus distance at successive instants of time. The curves for $V_{RF} = 24$ V and the conditions of Fig. 2 are shown as the phase changes from 90° to 270° in steps of 4°.

onstration[1] that the classical Read equation must be modified in order to predict ΔV. Apparently, Tiwari thinks an inaccuracy results from using only the first two terms in the Taylor's expansion. The close agreement of (1) with the computer calculations demonstrates that the Taylor's expansion is adequate if the modified Read equation is used. We should point out that the modification of the classical Read equation, while it is crucial in calculating ΔV, has only a very small effect on the calculation of the negative conductance of the diode.

At larger currents, we must take $E_{RF} = V_{RF}/\gamma w_T$, where γ, which takes into account space-charge effects, is defined in our paper.[1] The solid curve in Fig. 2, in which the dc current has been increased to 2000 A/cm^2, includes the effects of γ in (1), and replaces the dotted straight line which assumes $\gamma = 1$. The electric field values for this current density and $V_{RF} = 24$ V are shown in Fig. 3. Here the curves show the spatial value of E at specific instants of time as the phase of the external voltage increases from 90° to 270° in steps of 4°. The space charge moving into the drift region when the phase is near 180° causes the field lines to curve upward.

References

[1] C. A. Bracket, "The elemination of tuning induced burnout and bias circuit oscillations in IMPATT oscillators," *Bell Syst. Tech. J.*, vol. 52, pp. 271–306, 1973.

[2] C. A. Lee, R. L. Batdorf, W. Wiegmann, and G. Kaminsky, "Time dependence of avalanche processes in silicon," *J. Appl. Phys.*, vol. 38, pp. 2787–2796, 1967.

[3] S. C. Tiwari, "Study of thermal effects on operation and design of solid state microwave devices," Ph.D. thesis, University of Rajasthan, Jaipur, 1978.

[4] S. C. Tiwari, W. S. Khokle, and M. L. Sisodia, "Effect of nonlinear avalanche process in IMPATTS," in *Proc. 10th Eur. Microwave Conf.* (Warsaw, Poland), 1980, pp. 507–511.

[5] S. C. Tiwari, P. Deo, and M. Pujari, "Nonlinear avalanche region analysis in Read IMPATT oscillators," *Int. J. Electron*, 1984.

[6] G. Salmer, J. Pribetich, A. Farrayre, and B. Kramer, "Theoretical and experimental study of GaAs IMPATT oscillator efficiency," *J. Appl. Phys.*, vol. 44, pp. 314–324, 1973.

[7] R. Hall and J. H. Leck, "Temperature dependence of avalanche breakdown in gallium arsenide p-n junctions," *Int. J. Electron*, vol. 25, pp. 539, 1968.

[8] J. J. Goedbloed, "Noise in IMPATT diode oscillators," M. S. thesis, Technological University, Eindhoven, 1973.

[9] D. E. Iglesias, J. C. Irvin, and W. C. Niehaus, "10 W and 12 W GaAs IMPATT," *IEEE Trans. Electron Devices*, vol. ED-22, pp. 200, 1975.

Corrections to "Theory and Application of Coupling Between Curved Transmission Lines"

MOHAMED ABOUZAHRA, MEMBER, IEEE AND
LEONARD LEWIN, FELLOW, IEEE

In the above paper,[1] the following corrections should be made. On page 1990, (8) should read

$$i_1(-\infty) = (\Delta\beta)^2 \left\{ \frac{\pi R}{h} e^{-R\beta_0^2/h} - j\frac{2R\sqrt{\pi}}{h} \cdot e^{-R\beta_0^2/2h} \mathrm{Daw}\left[\beta_0 \sqrt{\frac{R}{2h}}\right] \right\} + 0(\Delta\beta)^4.$$

Equation (9) should read

$$i_2(-\infty) = j\Delta\beta \sqrt{\frac{\pi R}{h}}\, e^{-R\beta_0^2/h} + 0(\Delta\beta)^3.$$

On page 1993, (A11) should read

$$b(s) = \frac{1}{2\beta_0}\frac{d}{ds}\left[\frac{a'(z)}{a^2(z)}\right] + \frac{1}{4\beta_0^2}\left[\frac{a'(z)}{a^2(z)}\right]^2.$$

The sentence that follows (A12) should read, "With $\beta_0 L \gg 1$ and then $\cdots$."

On page 1994, (A14) should read

$$U''_1 + U_1 = \frac{U_0}{2}\frac{d}{ds}\left[\frac{a'(z)}{a^2(z)}\right].$$

Equation (A15) should read

$$U_0(s) = Ae^{-js} + Be^{+js}.$$

Equation (A19) should read

$$U_1(s) = C_1 e^{-js} + C_2 e^{+js} + \frac{e^{-js}}{4j}\int_{r_1}^{s} e^{js'} U_0(s') \frac{d}{ds'}\left[\frac{a'(z')}{a^2(z')}\right] \cdot dz' - \frac{e^{+js}}{4j}\int_{r_2}^{s} e^{-js'} U_0(s') \frac{d}{ds'}\left[\frac{a'(z')}{a^2(z')}\right] ds'.$$

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[1] M. Abouzahra and L. Lewin, *IEEE Trans. Microwave Theory Tech.*, vol. MTT-30, pp. 1988–1995, Nov. 1982.

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The sentence just before (A20) should read, "Upon choosing $r_1 = -\infty$ and $r_2 = +\infty$ and substituting $U_0(s)$ into (A19), and then putting (A19) into (A12), we obtain."

In (A20), C_1 and C_2 should be replaced by $\overline{C}_1$ and $\overline{C}_2$ (different constants).

Equation (A25) should read

$$I(z) = \frac{1}{\sqrt{a(z)}} \left\{ e^{-j\beta_0 z} e^{-j\Delta\beta \int_{-\infty}^{z} e^{-\alpha t^2} dt} - \frac{1}{2} e^{j\beta_0 z} e^{-j\Delta\beta} \right.$$

$$\left. \left[\sqrt{\pi/4\alpha} - \int_0^z e^{-\alpha t^2} dt\right] \cdot \int_\infty^z \frac{a'(z')}{a(z')} e^{-2j\beta_0 z'} e^{-j\Delta\beta \int_0^{z'} e^{-\alpha t^2} dt} dz' \right\}.$$

The paragraph that follows (A22) should read, "By replacing ϵ by $-\epsilon$ and/or $\Delta\beta$ by $-\Delta\beta$ in (A22), the solution of (A2) can be found. The expression of $i(z)$ will be identical to that of $I(z)$ with ϵ replaced by $-\epsilon$ and/or $\Delta\beta$ by $-\Delta\beta$."

Equation (A24) should read

$$i_1(-\infty) = (\Delta\beta)^2 \left\{ \frac{\pi R}{h} e^{-R\beta_0^2/h} \right.$$

$$\left. - j\frac{2R\sqrt{\pi}}{h} e^{-R\beta_0^2/2h} \mathrm{DAW}\left[\beta_0 \sqrt{\frac{R}{2h}}\right\} + 0(\Delta\beta)^4$$

with

$$\mathrm{Daw}(x) = e^{-x^2} \int_0^x e^{t^2} dt.$$

Equation (A25) should read

$$i_2(-\infty) = j\Delta\beta \sqrt{\frac{\pi R}{h}} e^{-R\beta_0^2/h} + 0(\Delta\beta)^3.$$

Corrections to "Coupling of Degenerate Modes on Curved Dielectric Slab Sections and Application to Directional Couplers"

MOHAMED DEEB ABOUZAHRA, MEMBER, IEEE, AND LEONARD LEWIN, FELLOW, IEEE

In the above paper,[1] the following corrections should be made. On page 1099, (29) should read

$$R = \psi e^{-2j\beta_0 l} \sin(2\Delta\beta l).$$

Equation (30) should read

$$D(z = -\infty) = -j\left\{ \Delta\beta \int_0^\infty e^{2j\beta_0 z - 2hcz^2} dz \right.$$

$$\left. + \psi e^{-2j\beta_0 l} \cos(2\Delta\beta l) \right\}.$$

Equation (31) should read

$$D(z = -\infty) = -j\{\psi^* + \psi e^{-2j\beta_0 l} \cos(2\Delta\beta l)\}.$$

Consequently, Fig. 9 on page 1101 should be replaced by the following figure.

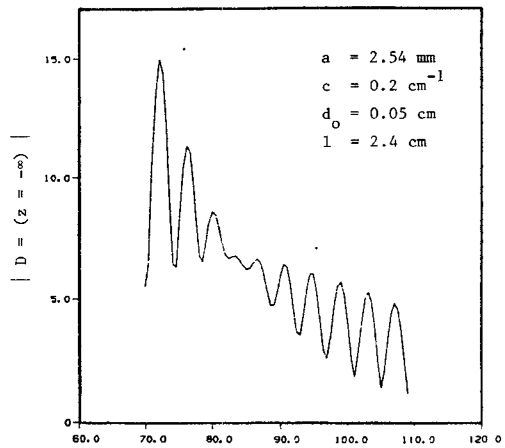

Fig. 9. Directivity versus frequency.

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[1] M. D. Abouzahra and L. Lewin, *IEEE Trans. Microwave Theo. Tech.*, vol. MTT-28, pp. 1096–1101, Oct. 1980.

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