[10] N. S. Kopeika, D. Even-Zur, and I. Fishbein, "Low cost glow discharge tube microwave frequency sensor," *Proc. IEEE*, vol. 64, pp. 382–384, Mar. 1976.
[11] N. S. Kopeika, "Glow discharge detection of long wavelength electromagnetic radiation: Cascade ionization process internal signal gain and temporal and spectral response properties," *IEEE Trans. Plasma Sci.*, to be published.
[12] F. A. Benson and G. Mayo, "Effects of ambient-temperature variations on glow-discharge tube characteristics," *J. Sci. Instrum.*, vol. 31, pp. 118–120, Apr. 1954.
[13] P. J. W. Severin, "The interaction of microwaves with the cathode fall and negative glow in a glow discharge," Ph.D. dissertation, Univ. of Utrecht, Utrecht, The Netherlands, 1964; also *Philips Res. Rep. Suppl.*, Suppl. No. 2, 1965.
[14] P. J. W. Severin and A. G. Van Nie, "A simple and rugged wide-band gas discharge detector for millimeter waves," *IEEE Trans. Microwave Theory Tech.*, vol. MTT-14, pp. 431–436, Sept. 1966.
[15] N. S. Kopeika and A. P. Kushelevsky, "Effects of ionizing radiation on glow discharge detectors," *Proc. IEEE*, vol. 64, pp. 369–370, Mar. 1976.
[16] N. S. Kopeika, "Noise spectra of commercial indicator lamp glow discharge detectors," *Int. J. Electron.*, vol. 39, pp. 209–218, Aug. 1975.
[17] J. M. Anderson, "Microwave detection and harmonic generation by Langmuir type probes in plasma," *Proc. IRE*, vol. 48, pp. 1662–1663, Sept. 1960.
[18] N. S. Kopeika, "On the mechanism of glow discharge detection of microwave and millimeter-wave radiation," *Proc. IEEE*, vol. 63, pp. 981–982, June 1975; also "Correction," *ibid.*, p. 1737, Dec. 1975.
[19] N. H. Farhat, "Optimization of millimeter wave glow discharge detectors," *Proc. IEEE*, vol. 62, pp. 279–281, Feb. 1974.
[20] N. S. Kopeika, "Internal signal gain in subnormal glow discharge detection of microwave radiation," *Int. J. Electron.*, in press.
[21] M. A. Herlin and S. C. Brown, "Breakdown of a gas at microwave frequencies," *Phys. Rev.*, vol. 74, pp. 291–296, Aug. 1948.
[22] A. D. MacDonald, *Microwave Breakdown in Gases*. New York: Wiley, 1966.
[23] I. P. Shkarofsky, "Review of gas breakdown phenomena induced by high-power lasers," *RCA Rev.*, vol. 35, pp. 48–79, Mar. 1974.
[24] N. S. Kopeika, A. Emanuel, and M. Chasan, "Antenna properties of glow discharge detectors of microwave radiation," *Int. J. Electron.*, in press.
[25] N. H. Farhat, "A plasma microwave power density detector," *Proc. IEEE*, vol. 52, pp. 1053–1054, Sept. 1964.
[26] N. S. Kopeika, "Millimeter-wave holography recording with glow discharge detectors," *Int. J. Electron.*, vol. 38, pp. 609–613, May 1975.
[27] ——, "Design of glow discharge plasma lamps for economic real-time microwave holography," in *Applications of Holography and Optical Data Processing*, E. Marom, A. A. Friesem, and E. Wiener-Avner, Eds. London: Pergamon Press, 1977, pp. 673–683.
[28] F. M. Gardner, *Phaselock Techniques*. New York: Wiley, 1966.
[29] P. Parzen and L. Goldstein, "Current fluctuations in the direct current gas discharge plasma," *Phys. Rev.*, vol. 82, pp. 724–726, June 1951.
[30] F. L. Warner, "Detection of millimetre and submillimetre waves," in *Millimetre and Submillimetre Waves*, F. A. Benson, Ed. London: Iliffe, 1969, pp. 453–511.
[31] G. Eytan and N. S. Kopeika, "Spectral dependence of gas phototube rise time: Implications regarding miniaturization," submitted for publication.

Letters

Comments on "Experimental Measurement of Microstrip Transistor Package Parasitic Reactances"

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In the above paper,[1] Akello *et al.* describe a method for experimental determination of the parasitics of microstrip-transistor packages, based on a resonance principle. A different method of measuring small reactances and susceptances, also permitting the determination of transistor-package elements based on time-domain techniques, is given by Piller in [1]. This method avoids the difficulties resulting from critical coaxial to microstrip transitions.

As a result, a slightly different equivalent circuit follows for a LID microwave package, as given in Fig. 1 [2], [3]. Because of the simplicity of time-domain techniques for applications up to *X* band, this method seems to be more advantageous.

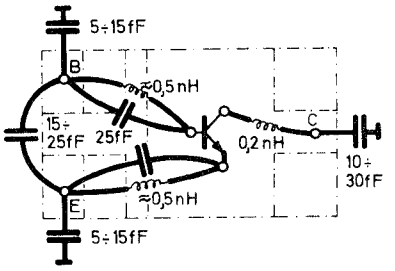

Fig. 1. LID-package equivalent circuit determined from time-domain measurements, after [2], [3].

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[1] R. J. Akello, B. Easter, and I. M. Stephenson, *IEEE Trans. Microwave Theory Tech.*, vol. MTT-25, pp. 367–372, May 1977.

References

[1] U. Piller, "Time domaine immitance measurements," in *Proc. 4th European Microwave Conf.* (Montreux, 1974), pp. 61–65.
[2] H. Beneking and E. Kohn, "*X*-band GaAs-MESFETs," presented at the European Specialist Seminar on Active Microwave Semiconductor Devices, Calvi, Corsica, November 7–9, 1973.
[3] U. Piller, "Transistor-Verbundschaltungspaare und ihre Messtechnik im Mikrowellenbereich," Ph.D. dissertation, RWTH Aachen, Aachen, Germany, 1973.

0018-9480/78/0100-0043$00.75