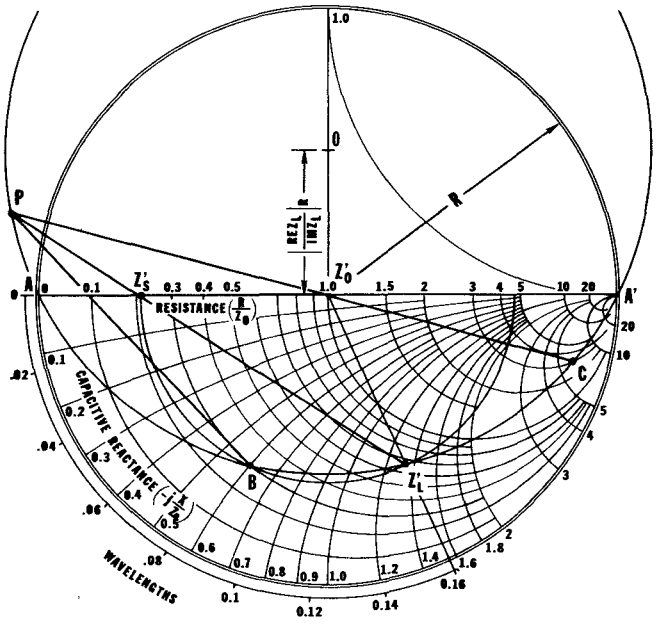

Fig. 1. Construction for matching $Z = K(1 - j2)$ into $Z = 1/3K + j0$.

thus the construction is inaccurate by less than 1 percent in this case. Equation (2) gives $l/\lambda = 0.158$ for less than 1-percent error in electrical length.

REFERENCES

[1] P. H. Smith, *Electronic Application of the Smith Chart in Waveguide, Circuit, and Component Analysis.* New York: McGraw-Hill, 1967, p. xiii.
[2] H. Jasik, *Antenna Engineering Handbook.* New York. McGraw-Hill, 1961, pp. 31–39.

Useful Alternate to an Expression in "Sandwich Slot Line"

ROBERT D. MOYER

In the above correspondence,[1] Cohn presented equations for the wavelength ratio, characteristic impedance, and phase to group velocity ratio observed in sandwich slot line. In this comment, an observation is offered which extends the range of application of those equations.

On page 773, (14)[1] was prescribed for use when the dielectric constant of one substrate differed significantly from that of the second. However, that expression (repeated here for reference)

$$-\frac{|u_i|}{\mu_{ri}}\tanh\left[\frac{\pi d_i|u_i|}{ap}+\tanh^{-1}\left(\frac{\mu_{ri}v}{|u_i|}\right)\right] \qquad (14)$$

is valid only for $(\mu_{ri}v/|u_i|)$ less than unity. Utilizing the hyperbolic identity

$$\tanh(x+y)=\frac{\tanh(x)+\tanh(y)}{1+\tanh(x)\tanh(y)}$$

yields the alternate expression

$$-\frac{|u_i|}{\mu_{ri}}\frac{\tanh(\pi d_i|u_i|/ap)+\mu_{ri}v/|u_i|}{1+(\mu_{ri}v/|u_i|)\tanh(\pi d_i|u_i|/ap)}. \qquad (14)'$$

This expression is valid for any value of $(\mu_{ri}v/|u_i|)$ and seems to follow more directly from the transverse resonance derivation than does (14). Expression (14)′ permits solutions when the two substrates have significantly different dielectric constants such that the higher dielectric constant dominates the solution for the wavelength ratio. Expression (14) does not always yield a solution under these conditions.

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[1] S. B. Cohn, *IEEE Trans. Microwave Theory Tech.* (Corresp.), vol. MTT-19, pp. 773–774, Sept. 1971.

Author's Reply[2]

S. B. COHN

Equation (14) was not intended to be limited to the case of $\mu_{ri}v/|u_i| < 1$. This equation can be transformed in several ways to permit numerical evaluation, including the use of the identity employed by Moyer. This is actually the identity I myself had used in my computer programs for the sandwich slot-line case and other related geometries.

Because a correspondence must be brief, I wrote expressions like the one in (14) in compact form, and assumed that the occasional reader who might be interested in computing from the formulas would use standard transformation identities wherever required. Perhaps I assumed too much; if that is the case, Mr. Moyer has performed a definite service by publishing the best choice of an identity for this particular purpose.

[2] Manuscript received June 4, 1974.
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