TABLE I

DISCONTINUITY CAPACITANCE OF OPEN CIRCUITED 50 Ω COAXIAL LINE

Number of Nodes	Total Capacitance*		Capacitance/ Length of Uniform Line	Calculated† R		Value of R (at dc) from Somlo[4]
	Electric Conductor Termination A	Magnetic Conductor Termination B		A	B	
2400 (10×10×24)	22.94559	22.93412	1.889035	0.6181	0.6169	0.6034
16 967 (19×19×47)	45.63527	45.61212	1.884934	0.6100	0.6088	0.6034

* The capacitance figures represent C/ϵ for a quarter section of the line.

† R is defined by Somlo as $R=l/(r_b-r_a)$ where r_a, r_b are defined in Fig. 3. l=distance of electrical open circuit from physical open circuit.

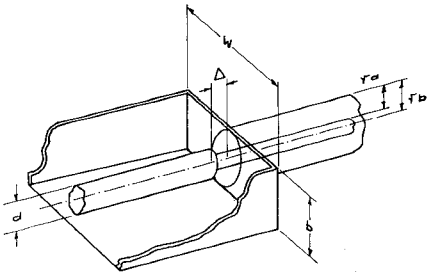

Fig. 3. Transition between 50 Ω coaxial and slab line sections. $r_b/r_a=2.3022$, $d/b=0.545$, $w/b=2.0$.

RESULTS

The program was checked by calculating the discontinuity capacitance associated with an open-circuited coaxial line; accurate results for this configuration have recently become available.[4] The discontinuity capacitance was obtained by the method discussed by Green.[1] Since a numerical process such as this one requires a closed boundary, the infinite extent of coaxial line beyond the open circuit cannot be simulated exactly; calculations were performed using in turn an electric and a magnetic conductor at a distance about equal to the outer conductor beyond the open circuit. The results are summarized in Table I for two sets of calculations using different numbers of meshes.

As a practical application of the program, a transition from coaxial line to slab line was designed using an offset compensation, as shown in Fig. 3. The offset Δ was adjusted until the additional inductance introduced thereby compensated the discontinuity capacitance to give a dc image impedance of 50 ohms. The optimum offset occurs for $\Delta/b=0.47$.

CONCLUSIONS

The practicability of using a numerical solution to Laplace's equation in three dimensions to design TEM mode components has been demonstrated. Further developments in the computer program used will permit more general boundaries and allow for dielectric interfaces. As techniques are refined, greater accuracy in the results can be expected.

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[3] D. M. Young, "Iterative methods for solving partial difference equations of elliptic type," *Trans. Am. Math. Soc.*, vol. 76, p. 92, 1954.

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Comments on "A Nonreciprocal Circular Polarizer"[1]

In a recent paper,[1] the author described two models of a nonreciprocal circular polarizer. The second model was a two-stage device in which the second stage provided a refinement of the approximate circular polarization produced by the first stage. The device used for this purpose consisted of a circular waveguide with a ferrite rod along its axis, so dimensioned that one sense of circular polarization could propagate but not the other. It has been called to the author's attention that a theoretical basis for such a device was provided in a series of papers by Waldron.[2] Furthermore, a patent[3] embodying the application of this principle was obtained by him.

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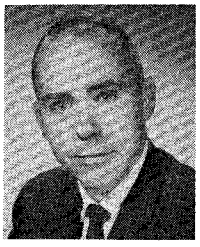
[2] R. A. Waldron, "Electromagnetic wave propagation in cylindrical waveguides containing gyromagnetic media," *J. Brit. IRE*, vol. 18, pp. 597–612, 677–690, 733–746, 1958.

[3] ——, British Patent 850 054, September 28, 1960.

Contributors



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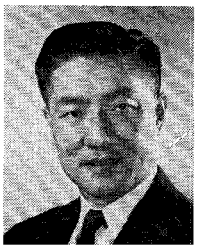

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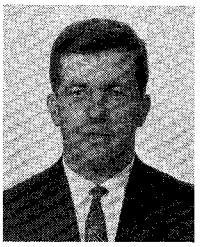

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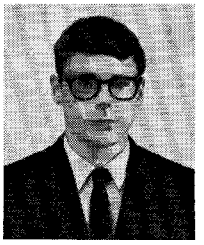

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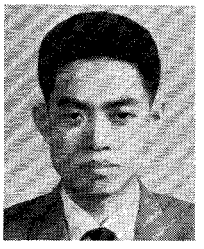

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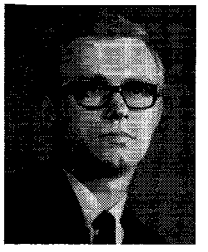

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