Specification	Courtois *et al.* Test Unit	ALI Model 101102306
Freq. range, MHz	225–400	225–400
Input VSWR, max	1.4:1	1.5:1
Isolation, min	11 dB*	18 dB
Insertion loss, max		
225 MHz	0.9 dB	1 dB
400 MHz	2.2 dB	1.5 dB
Input power, max	40 W	150 W
Reverse power	10 W	50 W
Temperature range	−40 to +70°C	−10 to +60°C
Size	9 × 13 × 6.5 cm	8.2 × 8.2 × 2.55 cm
Weight	3.3 kg	285 g

* Over most of the frequency range the isolation was at least 15 dB.

The test results quoted above were confirmed by the USAF using both a computer-controlled network analyzer and a special high-power test setup. Detailed test results can be furnished to interested persons upon request.

Feasibility of the isolator described herein was demonstrated by D. Jeong and a unit designed to meet environmental and production requirements by R. Billings. We believe it to be significantly smaller and perform better than the one described by Courtois *et al.*

Comments on "Transmission-Line Transformation Between Arbitrary Impedances"

M. H. N. POTOK

The solution given by the author of the above letter,[1] for the characteristic impedance of the line transformer, has been given before (see H. Jasik, *Antenna Engineering Handbook*, McGraw-Hill, 1961, paragraph 31.3, p. 9). Jasik also gives the correct length of the transformer whereas Milligan and also apparently Day (*IEEE Trans. Microwave Theory Tech.*, vol. MTT-23, p. 772, 1975) give the distance between load and source impedance along the impedance circle, which is not the length of the desired transformer since the transformer should produce at the source the conjugate of the source impedance if matching, which presumably means power matching is desired. Thus in the expression given by Milligan for length, X_2 should be given as $-X_2$, which will now agree with Jasik's expression.

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[1] T. A. Milligan, *IEEE Trans. Microwave Theory Tech.* (Lett.), vol. MTT-24, p. 159, Mar. 1976.

Computer Program Descriptions

CIA (*Ci*rculator *A*nalysis)

PURPOSE: Frequency analysis and optimization of three-port waveguide junction circulators.

LANGUAGE: Fortran IV for the CDC 3800 computer; with 960 cards.

AUTHORS: R. P. Meixner and J. P. Lawrence are with the U.S. Naval Research Laboratory, Washington, DC 20375.

AVAILABILITY: A punched deck is available from the authors upon written request.

DESCRIPTION: A computer optimization routine using sequential-random-search techniques is developed for use with an existing frequency analysis program [1] in the computer-aided design (CAD) of a three-port waveguide junction circulator shown in Fig. 1. A simple error function is defined using the scattering coefficients $[S]$ of each port of the circulator. Since the theoretical properties of any lossless circulator are completely described if the three scattering parameters S_{11},S_{12},S_{13} are known, the energy flow from port 1 to 3 is maximized if S_{13} is maximum while S_{11} and S_{12} are minimum. The following error function, using the absolute values of each scattering coefficient, is used to optimize each initial design over the range of frequencies from f_1 to f_n:

$$\text{total error} = \sum_{f_1}^{f_n} (|S_{11}| + |S_{12}| + 1. - |S_{13}|).$$

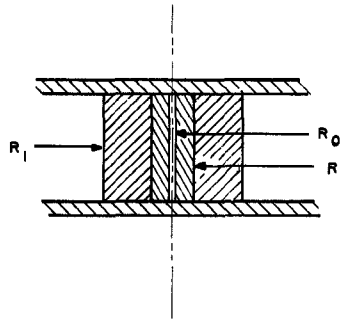

Fig. 1. Basic junction configuration.

The following constraints and/or boundary conditions are imposed on the CAD variables.

—The physical dimensions are $< 20/\sqrt{3}$ cm, the maximum radius of the radial line.

—The matching dielectric constant is $< 20/\sqrt{3}$, for ease of picking random numbers.

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See NAPS document No. 02959 for 31 pages of supplementary material. Order from ASIS/NAPS c/o Microfiche Publications, P.O. Box 3513, Grand Central Station, New York, NY 10017. Remit in advance for each NAPS accession number. Institutions and organizations may use purchase orders when ordering; however, there is a billing charge for this service. Make checks payable to Microfiche Publications. Photocopies are $7.75. Microfiche are $3.00. Outside of the United States and Canada, postage is $3.00 for a photocopy or $1.50 for a fiche.