magnitude and 0.05 radians in argument of measured reflection coefficient. It was found that with an amplitude- and frequency-stabilized source the measurements were highly repeatable over extended periods.

It should be noted that the same technique could be used to measure complex transmission coefficients by replacing coupler C_2 at ports 8 and 10 with the unknown section in tandem with a fixed attenuator.

GARY H. GLOVER
General Electric Res.
and Develop. Ctr.
Schenectady, N. Y. 12301

REFERENCES

[1] K. S. Champlin and J. D. Holm, "Analysis and calibration of a reflection coefficient bridge for use with any waveguide mode," *IEEE Trans. Microwave Theory and Techniques* (Correspondence), vol. MTT-15, pp. 477–478, August 1967.
[2] J. B. Linker, Jr., and H. H. Grimm, "Wide-band microwave transmission measuring system," *IRE Trans. Microwave Theory and Techniques*, vol. MTT-6, pp. 415–418, October 1958.
[3] The reflection coefficient is generally a function of vane angle; however, for a limited range of settings the attenuator may be approximately tuned for "match." See M. H. Rahman and M. W. Gunn, "Wave reflections from rotary vane attenuators," *IEEE Trans. Microwave Theory and Techniques*, vol. MTT-17, p. 402, July 1969.

Correction to "A Computer Optimization of the Rayleigh–Ritz Method"

Equations (1) through (5) are valid for LSM modes, and not for LSE modes as stated in Section II.[1]

The derivation for LSE modes is the following.

Define

$$\bar{E} = -j\omega\mu_0 \nabla \times \bar{\pi}_h \tag{1}$$

where π_h is a vector potential. It can be expressed in terms of a scalar function $\phi_h(x)$:

$$\bar{\pi}_h = \bar{a}_x \phi_h(x) \cos\frac{m\pi y}{b} e^{-\gamma z}. \tag{2}$$

The eigenfunction $\phi_h(x)$ must satisfy a Sturm-Liouville equation:

$$\frac{d^2\phi_h}{dx^2} + (\gamma^2 - h^2 + \epsilon_r k_0^2)\phi_h = 0 \tag{3}$$

Manuscript received February 24, 1970.

[1] A. S. Vander Vorst, A. A. Laloux, and R. J. M. Govaerts, *IEEE Trans. Microwave Theory and Techniques*, vol. MTT-17, pp. 454–460, August 1969.

where

$$h = m\pi/b.$$

Multiplying (3) by ϕ_h, integrating over the interval $0 \leq x \leq a$ and applying the boundary conditions at $x = 0$ and a leads to a variational expression for γ^2

$$\gamma^2 \int_0^a \phi_h^2 dx = \int_0^a \left[\left(\frac{d\phi_h}{dx} \right)^2 - (\epsilon_r k_0^2 - h^2)\phi_h^2 \right] dx. \tag{4}$$

Then let

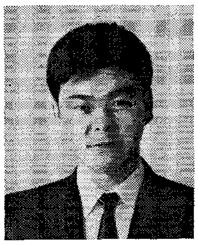
$$\phi_{nk} = \sum_{n=1}^{N} a_{nk} f_n(x). \tag{5}$$

The rest of the derivation is valid.

Acknowledgment is due to Prof. Gardiol who pointed out this error.

A. VANDER VORST
Microwave Laboratory
Catholic University of Louvain
Louvain, Belgium

Contributors



Shigeo Fujiki was born in Hokkaido, Japan, on February 23, 1944. He received the B.E. degree in electronics from Hokkaido University, Sapporo, Japan, in 1966.

Since 1966, he has been with the Faculty of Engineering, Hokkaido University, as an Assistant, where he is engaged in research work on microwaves.

Mr. Fujiki is a member of the Institute of Electronics and Communication Engineers of Japan.

❖

Kazuo Fujisawa (SM'59) was born in Tokyo, Japan, on August 24, 1921. He received the B.S. and Ph.D. degrees in electrical engineering, both from Osaka University, Osaka, Japan, in 1943 and 1955, respectively.

From 1948 until 1954 he was an Associate Professor on the Faculty of Engineering, Osaka University. From 1955 through 1962 he was a Professor at Kobe University. Since 1962 he has been a Professor of the Faculty of Engineering Science, Osaka University, Osaka, Japan. He has done research on reentrant cavities and on a new millimeter-wave tube called "Laddertron." He is now working on electromagnetic field problems and on the waves in semiconductor plasmas.

Dr. Fujisawa is a member of the Institute of Electronics and Communication Engineers of Japan, the Physical Society of Japan, and the Japan Society of Applied Physics.

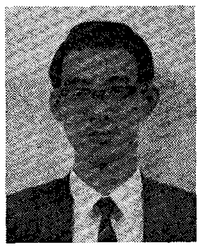
❖

Ronald E. Guentzler (S'54–M'56) was born in Cleveland, Ohio, on May 17, 1934. He received the B.S.E.E. and the M.S.E.E. degrees from Case Institute of Technology, Cleveland, Ohio, in 1956 and 1963, respectively.

From 1956 to 1960 he was employed in the General Engineering Department of the Ohio Bell Telephone Company, Cleveland, where he had various assignments related to transmission. He was a Lecturer in the Technical Institute of Fenn College from 1956 to 1963 and an Instructor in the Department of Electrical Engineering of Fenn College (now the Cleveland State University) from 1963 to 1967. Since 1967 he has been an Assistant Professor in the Department of Electrical Engineering, College of Engineering, Ohio Northern University, Ada.

Mr. Guentzler is a member of Eta Kappa Nu and Tau Beta Pi.

❖

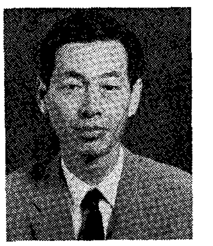


Masahiro Hashimoto was born in Osaka, Japan, on February 26, 1943. He received the B.S. and M.S. degrees from Osaka University, Osaka, Japan, in 1966 and 1968, respectively.

Currently, he is pursuing studies in the numerical analysis of field problems at Osaka University, Osaka, Japan.

Mr. Hashimoto is a member of the Institute of Electronics and Communication Engineers of Japan.

❖



Junzo Hirano was born in Osaka, Japan, on February 25, 1925. He received the B.E. degree in electrical engineering in 1949, and the D.E. degree in 1961, both from the University of Tokyo, Japan.

In 1949 he joined the Electrical Communication Laboratory, Nippon Telegraph and Telephone Public Corporation, Musashino-shi, Tokyo, Japan, where he first worked on microwave communication devices and later shifted to the millimeter-wave communication research group. He has been engaged in work concerning the fields of broad-band traveling-wave amplifiers and waveguide communication systems for millimeter waves, and communication techniques for optical regions. He now heads a group engaged in research on optical communication techniques.

Dr. Hirano is a member of the Institute of Electronics and Communication Engineers of Japan.

Masao Kamimura was born in Sapporo, Japan, on September 15, 1926. He graduated from the Electrical Engineering course in 1952 and received the Doctor of Engineering degree in 1962, both from Hokkaido University, Sapporo, Japan.

From 1952 to 1954, he worked at Japan Broadcasting Corporation. From 1954 to 1958, he was a Research Assistant with the Faculty of Engineering at Hokkaido University where he engaged in the research of microwave circuits. In 1958, he became an Instructor at Muroran University, Hokkaido, Japan. He joined the Central Research Laboratory, Hitachi Ltd., Tokyo, Japan, in 1960, where he is engaged in the research of microwave transmission lines and antennas.

Dr. Kamimura is a member of the Institute of Electronics and Communication Engineers of Japan.

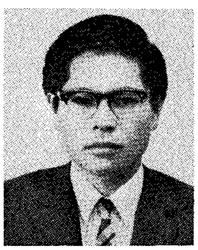
Leonard Lewin (A'69) was born in Southend-on-Sea, England, in 1919. He matriculated from Southend High School in 1935.

During World War II, he was with the British Admiralty, doing research on antenna design, waveguides, and radar. In 1946, he joined Standard Telecommunication Laboratories, Harlow, England, where he became Head of the Microwave Laboratory in 1950, and Assistant Manager of the Transmission Laboratory in 1962. He won the Microwave Prize for a paper on singular integral equations applied to waveguides, also in 1962. In 1967 he was awarded an honorary degree of Doctor of Science from the University of Colorado, Boulder, where he is currently Professor of Electrical Engineering. He is the author of many papers and patents in the field of antennas and waveguides, as well as author of three research books.

Mr. Lewin is a member of the Institution of Electrical Engineers (London) and a fellow of the British Interplanetary Society.

R. Mavaddat was born in Tehran, Iran, in 1935. He received the B.Sc. degree in electrical engineering from the University of Leeds, Leeds, England, and the Ph.D. degree from the University of Wales, Cardiff, Wales, U.K., in 1962. He held the Turner and Newall post-Doctoral Fellowship for the academic year 1962–63 at the University of Wales, where he carried on with his research on parametric amplifiers.

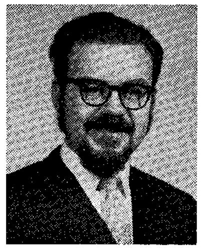
As the Chairman of the Electrical Electronic Engineering Department of Pahlavi University, Shiraz, Iran, he has been responsible for establishment and progress of this department since 1964. During the academic year 1968–69 he was a visiting Associate Professor at the Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, where he worked on millimeter wave image conversion. He is presently active in introducing courses and research activities in the field of electro-optics at Pahlavi University, Shiraz, Iran.



Koichi Mikoshiba (M'67) was born in Nagano, Japan, on March 22, 1937. He received the B.S. degree in electrical engineering and the Ph.D. degree in engineering from Tohoku University, Sendai, Japan, in 1959 and 1967, respectively.

In 1959, he joined Hitachi Cable, Ltd., Tokyo, Japan, where he has been a Research Member of the Research Division. He has been engaged in the development of millimeter circular waveguides and UHF antenna systems for television broadcasting, and in the research and application of such nonconventional waveguide as surface waveguides, leaky waveguides, and beam waveguides.

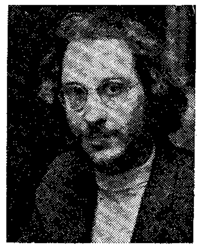
Dr. Mikoshiba is a member of the Institute of Electronics and Communication Engineers of Japan.



Kevin C. O'Brien (M'69) was born in Boston, Mass., on March 30, 1942. He received the B.S. degree in physics from Boston College, Chestnut Hill, Mass., in 1963, and the Ph.D. degree in physics from Brown University, Providence, R.I., in 1969.

Since 1969 he has been a Member of the Technical Staff of Bell Telephone Laboratories, Whippany, N.J., where he is involved in research on microwave and optical transmission through the atmosphere, radio astronomy, and microwave transmission in magnetic media.

Dr. O'Brien is a member of Sigma Pi Sigma and Sigma Xi.



Allan W. Snyder was born in Philadelphia, Pa., on November 23, 1940. He received the B.S. degree in electrical engineering from Pennsylvania State University, University Park, in 1963, the S.M. degree in electrical engineering from Massachusetts Institute of Technology, Cambridge, in 1965, the M.S. degree in applied mathematics and physics from Harvard University, Cambridge, Mass., in 1967, and the Ph.D. degree from the University of London, University College, in 1969.

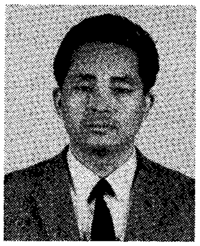
From 1960 to 1961 he was employed by Peter Kiewitt & Sons for a communications study on the Dew Line Ice Cap Project in northern Greenland. During 1962 and 1963 he worked with the Ionospheric Research Laboratory of Pennsylvania State University on problems of ionospheric inhomogeneity and its relation to wave propagation. He joined the Applied Research Laboratory of Sylvania Electronic Systems, Waltham, Mass., in 1963 where until 1968 he investigated a variety of electromagnetic theory problems including a theoretical study of the electromagnetic properties of visual receptors and their relationship to color vision. He was a Consultant to the Applied Research Laboratory during 1968, and a Consultant to the Post Office Research Department of Great Britain, Dollis Hill, London, and the Standard Telecommunications Laboratory, Harlow, England, on the long distance fiber optic communication project in 1969. He joined the Faculty of Engineering and Applied Science and the Medical School, Department of Ophthalmology, Yale University, New Haven, Conn., in January 1970. He was awarded a National Science Foundation Fellowship in biophysics to investigate the electromagnetic properties of visual receptors in March 1970.

Dr. Snyder is a member of Sigma Xi.

Michio Suzuki (SM '57) was born in Sapporo, Japan, on November 14, 1923. He received the B.E. degree and the Doctor of Engineering degree, both from Hokkaido University, Sapporo, Japan, in 1946 and 1960, respectively.

From 1948 to 1962 he was an Assistant Professor, and from 1962, Professor of Electronic Engineering at the Hokkaido University, Japan. From 1956 to 1957 he was a Research Associate at the Microwave Research Institute of Polytechnic Institute of Brooklyn, Brooklyn, N.Y.

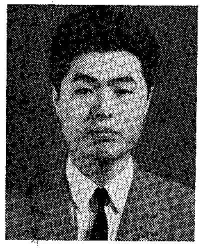
Dr. Suzuki is a member of the Institute of Electronics and Communication Engineers of Japan and the Institute of Electrical Engineers of Japan.



Mitsuru Watanabe was born in Los Angeles, Calif., on April 14, 1932. He received the B.Eng. degree and the M.Eng. degree in electrical engineering from Keio University, Tokyo, Japan, in 1955 and 1957, respectively.

Since 1960 he has been a Researcher at Hitachi Ltd., Central Research Laboratory, Tokyo, Japan, studying millimeter waveguides, millimeter and microwave low-loss leaky waveguides, and beam waveguides for automatic obstacle detection on railway tracks.

Mr. Watanabe is a member of the Institute of Electronics and Communication Engineers of Japan.



Haruo Yoshikiyo was born in Tokyo, Japan, on November 5, 1941. He received the B.S. degree in electrical engineering from the University of Electro-Communications, Tokyo, Japan, in 1965, and the M.S. degree from Osaka University, Osaka, Japan, in 1967.

He is presently with the Electrical Communication Laboratory, Nippon Telegraph and Telephone Public Corporation, Musashino-shi, Tokyo, Japan, where he is working on optical waveguides in a research group on optical communication.

Mr. Yoshikiyo is a member of the Institute of Electronics and Communication Engineers of Japan.