

HARGRAVE'S COMMUNICATIONS DICTIONARY

Frank Hargrave



**IEEE
PRESS**

The Institute of Electrical and Electronics Engineers, Inc., New York

This book and other books may be purchased at a discount from the publisher when ordered in bulk quantities. Contact:

IEEE Press Marketing
Attn: Special Sales
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331
Fax: +1 732 981 9334

For more information about IEEE Press products, visit the IEEE Online Store & Catalog: <http://www.ieee.org/store>.

© 2001 by the Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, 17th Floor, New York, NY 10016-5997.

All rights reserved. No part of this book may be reproduced in any form, nor may it be stored in a retrieval system or transmitted in any form, without written permission from the publisher.

Printed in the United States of America.

10 9 8 7 6 5 4 3 2 1

ISBN 0-7803-6020-6
IEEE Order No. PC5869

Library of Congress Cataloging-in-Publication Data

Hargrave, Frank.

Hargrave's communications dictionary.

/ Frank Hargrave.

p. cm.

Includes index.

ISBN 0-7803-6020-6

1. Telecommunication—Dictionaries. I. Title.

TK5102.H37 2000

621.382'03—dc21

00-061416

mobile station A station in the mobile service intended to be used while in motion or during stops at unspecified points.

Mobile Telephone Switching Office (MTSO) In an automatic cellular mobile communications system, an *MTSO* is a central computer that monitors all cellular telephone transmissions and interfaces the radio portion of the system to the public switched telephone network (PSTN). It performs all signaling functions that are necessary to establish and maintain calls to and from mobile stations. If a connection is too noisy, the *MTSO* searches for a less noisy channel or cell site, and does a hand-off by transferring the connection to another channel in the next cell. Also called the *mobile services switching center (MSC)*. See also *hand-off*.

modal dispersion Regarded by some as an incorrect synonym for *multimode distortion*.

modal distortion A synonym for *multimode distortion*.

modal distribution In an optical waveguide operating at a given wavelength, the number of modes supported and their unit propagation time differences.

modal loss In an open waveguide, a loss of energy on the part of an electromagnetic wave due to obstacles outside the waveguide, abrupt changes in direction of the waveguide, or other anomalies that cause changes in the propagation mode of the wave in the waveguide.

modal noise Noise generated in an optical fiber system by the combination of mode-dependent optical losses and fluctuation in the distribution of optical energy among the guided modes or in the relative phases of the guided modes. Also called *speckle noise*.

mode (1) The operational state of a device or program. For example, a modem in the *command mode* will accept programming information from the DTE and will not transmit it to the remote modem, whereas in the communications mode the modem will transmit the information to the remote modem and will not process it as programming data. (2) In statistics, the value or values that occur most often in a given set of items. For example, if given a set of numbers {1, 2, 3, 4, 5, 6, 7, 8, 9, 9}, the *mode* is 9—that is, there are more 9s than any other number. For the set {1, 2, 2, 3, 5, 7, 9, 9} there are two *modes* 2 and 9; this set is said to be *bimodal*. (3) In transmission lines, waveguides, or cavities, one of the various field patterns or patterns of propagation dependent on physical geometric boundaries, frequency of operation, and the refractive index or medium dielectric constant.

Each mode is characterized by frequency, polarization, electric field strength, and magnetic field strength. (4) Any electromagnetic field distribution that satisfies Maxwell's equations and the applicable boundary conditions.

mode coupling In an electromagnetic waveguide, the exchange of power among modes.

In a multimode optical fiber, *mode coupling* reaches statistical equilibrium (the equilibrium mode distribution) after the equilibrium length has been traversed.

mode field diameter (MFD) An expression of distribution of the irradiance (optical power) across the endface of a single mode fiber.

For a gaussian power distribution in a single mode optical fiber, the mode field diameter is that at which the electric and magnetic field strengths are reduced to 1/e of their maximum values. (Because power is proportional to the square of the field strength, it is also the diameter at which power is reduced to 1/e² of the maximum power.)

mode filter (1) In fiber optics, a device used to select, reject, or attenuate one or more transmission modes. (2) In waveguide components, a device designed to pass energy along a waveguide in one or more selected propagation modes and to reject or substantially attenuate energy in other modes.

mode partition noise In an optical communications link, phase jitter of the signal caused by the combined effects of mode hopping in the optical source and intramodal distortion in the fiber.

Mode hopping causes random wavelength changes that in turn affect the group velocity (propagation time). Over a long length of fiber, the cumulative effect is to create jitter called *mode partition noise*.

mode scrambler A device for inducing mode coupling in an optical fiber. Mode scramblers are used to provide a modal distribution that is independent of the optical source, for purposes of laboratory or field measurements or tests. Also called a *mode mixer*.

mode stripper See *cladding mode stripper*.

mode volume The number of bound modes at a particular wavelength that an optical fiber is capable of supporting.

The mode volume is approximately given by

$$M_S = \frac{V^2}{2} \text{ and}$$

$$M_P = \frac{V^2}{2} \cdot \frac{g}{g+2}$$

where:

M_S is the mode volume for a step index fiber,
 M_P is the mode volume for a power-law profile fiber,
 V is the normalized frequency, and
 g is the profile parameter.

See also *effective mode volume*.

modem An acronym for MOdulator-DEModulator.

(1) A type of DCE which, at the sending station, converts digital data from the DTE to an analog signal suitable for transmission over a communication channel and at the receiving station converts the analog signal back into digital data. Generally, the modem incorporates both the modulating and demodulating functions. The block diagram shows the major blocks of a modem. The computer interface (digital interface) is on the left, and the telephone interface (analog interface) is on the right. To communicate with each other, *modems* must use the same protocol suite. That is, the *modulation* method, the *data*

