

# DEPARTMENTS

## BOOK REVIEWS

### Noise in Digital Optical Transmission Systems

Gunnar Jacobsen, 387 pages, preface, illus., references, appendix, and index. ISBN 0-89006-695-7. Artech House, Inc., 685 Canton Street, Norwood, MA 02062 (1994) \$75 hardbound.

**Reviewed by J.-M. Wang**, InterDigital Telecom, Inc., 833 Northern Boulevard, Great Neck, NY 11021.

Optical fiber transmission systems are widely used in long-haul telecommunication networks, and recent technological improvements in fiber amplifiers make such systems more cost effective. Coherent optical communication systems are unlikely to replace fiber systems based on direct detection techniques. However, their characteristics in improving detector sensitivity will make them very useful in some applications. Although the title of the book is *Noise in Digital Optical Transmission Systems*, it is entirely devoted to describing coherent optical communications. As claimed by the author in the introduction, "all heterodyne systems can be implemented in equivalent optically preamplified configurations described in the same statistical theoretical framework."

In general, this book fills the need for a complete description of heterodyne and preamplified systems based on different modulation formats, including amplitude, phase, polarization, and frequency. As indicated by the title of the book, the author tries to model each system in terms of noise sources such as local oscillator shot noise, thermal noise, laser phase noise, and spontaneous emission amplifier noise. The book is well organized. After a brief introduction, the author describes the fundamental sensitivity limits in Chap. 2 and basic digital receivers in Chap. 3, which are the foundation of the

following chapters. From Chap. 4 to Chap. 10, the author describes several systems including amplitude shift keying (ASK), frequency shift keying (FSK), phase shift keying (PSK), and polarization shift keying (PolSK). Each chapter deals with both single channel and multichannel systems based on frequency division multiplexing. Receiver models are also discussed with both polarization control and polarization diversity. In Chap. 11 the author extends his treatment to ultralong systems using cascaded optical amplifiers. This chapter is especially useful for predicting the performance of transocean systems. Chapter 12 provides a generalized receiver model. All the practical examples in the previous chapters are well summarized in Chap. 13.

Each chapter starts with an overview (introduction) of the entire chapter and ends with a conclusion that summarizes important points. Many references are included in each chapter. Bibliographical notes included in each chapter are very useful for readers who wish to further pursue specific topics. At the end of the book the author gives his views on future research directions and practical system implementations in the field of coherent optical communications. Researchers and especially graduate students who are about to choose their research subject can benefit from this section.

As indicated by the author in the introduction, this book is not written as a textbook but rather as a reference book close to the state of the art in the field of coherent optical communications systems. The only shortcoming is that some of the mathematical derivations are brief. However, this book includes many practical examples and has more than 200 references, which makes it very useful for anyone deeply involved in designing coherent systems.

### BOOKS RECEIVED

**UV and X-ray Spectroscopy of Laboratory and Astrophysical Plasmas**, edited by E. Silver and S. Kahn. xvi + 610 pages, illus., references following each paper, and a list of participants. Proceedings from the Tenth International Colloquium held at Berkeley, CA, 3-5 February, 1992. ISBN 0-521-43470-X. Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211 (1993) \$79.95 hardbound. UV and x-ray spectroscopy of astrophysical and laboratory plasmas draws interest from many disciplines. Contributions from international specialists are collected together in this book from a timely recent conference. In astrophysics, the Hubble Space Telescope, Astro 1, and ROSAT observatories are now providing UV and x-ray spectra and images of cosmic sources in unprecedented detail, while the Yohkoh mission recently collected superb data on the solar corona. In the laboratory, the development of ion-trap facilities and novel laser experiments are providing vital new data on high temperature plasmas. Recent innovations in the technology of spectroscopic instrumentation are discussed.

**Photonic Devices and Systems**, edited by Robert G. Hunsperger. xi + 426 pages, illus., subject index, and references following each chapter. Volume 45 from the Optical Engineering Series. ISBN 0-8247-9243-2. Marcel Dekker, Inc., 270 Madison Avenue, New York, NY 10016 (1994) \$135 hardbound. Discusses lasers; optical modulation in photonic circuits; optical fiber waveguides and couplers; optical amplifiers; photodetectors; fiber optic sensors; application of photonics to microwave devices and systems; photonic integrated circuits; and all-optical communications and networks.