
ABSTRACTS OF PAPERS FROM OTHER JOURNALS

Signaling Along Elastic Plates with Wideband Acoustic Pulses, James E. Barger, *Journal of the Acoustical Society of America*, 76:1721, December 1984.

High data-rate signaling with acoustic pulses along an elastic plate is made difficult by the conversion of a transmitted pulse into many component pulses that arrive separately during a time span that can exceed the travel time of the first component pulse to arrive. In addition, the amplitude of the received signals fluctuates widely with changes in pulse center frequency. But to obtain high data-rate signaling, many pulses with different center frequencies must be transmitted at closely spaced time intervals. It is important in these circumstances to understand the principal features of the component pulses that originate from a single transmitted pulse.

This paper derives analytical expressions for the arrival times, the peak envelope amplitudes, and the center frequencies of the arriving component pulses that are transmitted by wideband line forces acting normal to the plate surface. Each component pulse is the manifestation of a different mode of propagation. By carefully picking the bandwidth and center frequency of the launching pulse, the number of its component pulses (or, alternatively, excited modes) that have sufficient amplitude can be minimized if the pulse center frequency is low enough. If the frequency is high enough, so that more than about six propagating modes can exist, then the number of arrivals cannot be significantly reduced. At higher frequencies, several of the modes merge to form the Rayleigh wave, which is centered within both earlier and later modes.

Magnetostrictive Transducers for the Measurement of Magnetic Tape Speed, E. M. Deeley and A. M. H. Al-Habib, *IEE Proceedings-A*, 132:33, January 1985.

A method of employing space-periodic magnetostrictive transducers for the direct measurement of the speed of magnetic recording tape is described. The method is, in principle, similar to that devised for measuring strip speed in steel mills, using an inductive transducer. The wavelength-selective transducer is connected in a feedback configuration to an inductive write head placed upstream of the transducer, and the system records an ideally constant-wavelength pattern on the tape, so that the frequency of the transducer output is a direct measure of the tape speed. A digital variable delay line is used to com-

pensate for slight variations in the recorded wavelength caused by variable phase delays encountered in the feedback loop. The error in the speed measurement is less than 0.1%. Three different experimental transducers are investigated, each of which is less than 2 mm long and utilizes track widths of 100 μm or less.

Sky-Hooks, Fish-Warmers and Hub-Caps: Milestones in Satellite Communications, A. W. Rudge, *IEE Proceedings — F*, 132:1, February 1985.

Satellite communications have advanced from the realm of science fiction to the commonplace in less than 40 years. This paper outlines the birth and development of this new industry which was pioneered by the U.S. and the Soviet Union but has since become increasingly international, with growing capabilities in Western Europe, Japan, China, and India. The technological developments that have accompanied the growth of satellite communications have been both diverse and complex. To illustrate the rapid technological advance in communications, three phases have been identified, linked by major changes in the state of the art. The concept of the sky-hook, the end of the fish-warmers, and the era of the hub-cap provide convenient milestones against which this dramatic advance can be calibrated.

Generalized WPD Procedure for Microprocessor-Based Signal Detection, V. M. Milutinović, *IEE Proceedings — F*, 132:27, February 1985.

The suboptimum detection procedure based on the weighting of partial decisions (WPD) was introduced as an improvement on 1-bit-quantization digital matched filtering, also known as binary matched filtering (BMF). The WPD is characterized by minimal additional hardware and software requirements but considerably better performance in comparison with BMF.

A primary application of the WPD is the implementation of cost-effective medium-speed voice-band data modem receivers, but it can also be used in a number of other parametric and nonparametric detection problems. Formerly, the WPD was analyzed only for binary transmission with an antipodal set of signaling waveforms. In this paper, the concept of WPD is generalized and analyzed theoretically for M -ary transmission with an arbitrary set of equal-energy signaling waveforms. Here, it is treated as the generalized pro-

cedure with BMF as its special case. The results of the performance analysis are given.

Materials Requirements for Optical Processing and Computing Devices, Armand R. Tanguay, Jr., *Optical Engineering*, 24:002, January/February 1985.

Devices for optical processing and computing systems are discussed with emphasis on the materials requirements imposed by functional constraints. Generalized optical processing and computing systems are described to identify principal categories of requisite components for complete system implementation. Three principal device categories are selected for analysis in some detail: spatial light modulators, volume holographic optical elements, and bistable optical devices. The implications for optical processing and computing systems of the materials requirements identified for these device categories are described, and directions for future research are proposed.

Optical Bistability for Optical Signal Processing and Computing, N. Peyghambarian and H. M. Gibbs, *Optical Engineering*, 24:068, January/February 1985.

The basic principles of optical bistability are presented, and current advances in semiconductor optical switching are summarized with emphasis on recent results in GaAs, CuCl, InAs, InSb, CdS, ZnS, and ZnSe etalons. These devices have great potential for applications involving optical signal processing and computing. As an example, the authors discuss the use of arrays of bistable devices for parallel optical processing, and for addressable spatial light modulators. The use of nonlinear etalons as optical gates is also illustrated. To date, GaAs devices have shown the most favorable characteristics for practical applications. They operate at room temperature with a few milliwatts of power using a laser diode as the only light source. Quasi-cw operation and optical fiber signal regeneration have also been demonstrated. A GaAs NOR gate operates in 1 ps with ≤ 3 pJ incident energy, which implies a 1-ps switch-on time for a bistable etalon.

Selection of Materials for Acousto-Optic Devices, I. C. Chang, *Optical Engineering*, 24:132, January/February 1985.

This paper discusses the materials issues of acousto-optic (AO) devices. Criteria for the selection of materials for the

three basic types of AO devices, deflectors (Bragg cells), modulators, and tunable filters, are presented. Comparison of physical properties of the various AO materials shows that trade-offs are required to suit specific applications. As an example of how to search for new materials, the potential of a chalcopyrite compound ($ZnGeP_2$) for AO device applications is discussed. Tables that list the properties of selected AO materials are included.

Multiplex Holography: Some New Methods, E. N. Leith and P. Voulgaris, *Optical Engineering*, 24:171, January/February 1985.

Afocal cylindrical lens systems and their prismatic equivalents are used in the formation of multiplex holograms. They introduce the desired, controlled astigmatism, and they assist the low f number final cylindrical lens in the formation of a strip hologram. In addition, a line source and a broad source fringe system applied to the hologram-making process can result in improved signal-to-noise ratios.

Configurations for High-Speed Gallium Arsenide Charge-Coupled Device Imagers, P. B. Kosel, M. R. Wilson, J. T. Boyd, and L. A. King, *Optical Engineering*, 24:176, January/February, 1985.

Several configurations of charge-coupled device (CCD) imagers formed on gallium arsenide are considered. A process

was investigated for the fabrication of overlapping charge transfer electrode structures in CCDs on GaAs with ion-implanted active channels. The electrode metal was aluminum and the inter-electrode isolation medium was anodically formed aluminum oxide. The use of aluminum electrodes and ion-implanted active channels makes this fabrication process compatible with that used for fabricating high-speed integrated circuits on GaAs. Support circuitry can thus readily be integrated with the CCD imager.

A computer model that simulates charge transfer through an implanted channel beneath an array of electrodes with a finite gap between each pair of electrodes is presented. The use of this model in designing the overlapping electrode structure and channel profile is demonstrated. The impetus of the device design is to maximize charge transfer efficiency and minimize channel noise.

Electronic Imaging with CCDs, G. W. Hughes, *RCA Engineer*, 29:4, November/December 1984.

CCD imagers for TV are now becoming available in large quantities. Several solid-state cameras have been announced that are the first generation of high-performance, low-cost cameras that will change the way in which video is used and perceived. This paper reviews the characteristics of various solid-state imager sensor types and compares representative

imagers in use today. Present applications of CCD image sensors and the future direction of imager and camera development are discussed.

A Countour Deformation Model of Capacitance VideoDisc Signal Pickup, P. D. Southgate, *RCA Review*, 45:397, September 1984.

A method of calculating the videodisc pickup signal is described that includes the elastic deformation of the disk by the stylus. The stylus shoe is idealized to a flat, rectangular shape, and small vertical displacements are assumed. Disc-stylus capacitance is calculated using a two-dimensional geometry and an approximation to the field configuration that allows fast computation. Typical results are described for the wavelength and tracking-force dependence of pickup. There is agreement between most general features of calculated and measured pickup.

The mechanism of soundbeat is investigated and shown, within the terms of this model, to depend primarily on the elastic deformation of the signal contour. The calculated magnitude and the wavelength dependence of soundbeat agrees well with the measurement; for "flat-top" signal, drop of soundbeat and change of wavelength of the type observed are predicted. Calculations usually deviate from measurements only by a magnitude similar to the mutual deviation of measurements made under varying conditions.

BOOKS, BOOKLETS, BROCHURES

Extraction of Information from Remotely Sensed Images, ed., Paul F. Hopkins. The book (170 pages) contains the proceedings of a conference sponsored by the Society of Photographic Scientists and Engineers and the American Society of Photogrammetry. It contains articles on digital enhancement of data, thermal infrared data, analysis of multi-spectral images, and recent developments in data acquisition from satellites. The book is available from the American Society of Photogrammetry, 210 Little Falls St., Falls Church, VA 22046, at a price of \$25 (\$18 for members).

Modern Antenna Design, by Thomas A. Milligan, provides comprehensive coverage of antenna types. The book (408 pages, illustrated) is available from McGraw-Hill Book Co., 1221 Ave. of the Americas, New York, NY 10020, at a price of \$44.50. The book is intended to enable the reader to determine the approximate size and type of antenna he might need for a specific project. Thoroughly practical in approach, the book concentrates on design methods through-

out and includes only enough theory to describe the basic concepts involved. The author stresses the limitations and summarizes the characteristics of various antennas.

Silver Recovery from Waste Photographic Solutions by Metallic Displacement is a 25-page report available from National Silver Equities, 2 Gassib Ct., Mahwah, NJ 07430, at a price of \$19.95 (plus \$1.50 postage and handling). The illustrated report notes that the ion-exchange method of silver recovery is easy and cost effective. No electricity is required and precipitant alternatives are widely available. In principle, the report states, one ion of silver exchanges with one ion of precipitant just by contact.

The report examines the effectiveness of various precipitants (window screen, mesh, nails, etc.) under laboratory testing. Critical retention-time data are analyzed. Detailed procedures on flow rate and silver concentration are presented in text and chart formats. How to estimate potential recoverable silver in used fixer is explained. Diagrams of working cells that

can be built easily and inexpensively for both large and small operations are included, as are instructions on marketing and smelting the recovered silver.

Buying an Audio Console for Broadcast Video, an 8-page handbook offering practical information for buyers of audio consoles for broadcast video, is available from Rupert Neve Inc., Berkshire Industrial Park, Bethel, CT 06801. The handbook answers such questions as: Do you really need 24-track monitoring? What grouping and assign functions do you really need? Do you need a console that can be operated in multi-track stereo or mono configurations? The information presented is a general guide, and specific products are not mentioned.

Special Effects — Wire, Tape and Rubber Band Style, by L. B. Abbott, covers almost 50 years of special effects in motion pictures. The author, during his 46 years with 20th Century-Fox, has been instrumental in bringing the art and technique of special effects from the "wire, tape, and rub-