Abstracts of Papers by Bell System Authors Published in Other Journals

COMPUTING

A "DOGLEG" Channel Router. D. N. Deutsch, Des. Automation Conf. Proceed., No. 13 (June 1976), pp. 425–433.   A new algorithm for interconnecting two sets of terminals across an intervening channel is presented. The routing is done on two distinct layers, one for horizontal paths, the other vertical. Typical channels (300 terminals, 100 nets) are routed within one track of the mathematical bound (density) in a few seconds.

Impact of On-Line Systems on a Literature Searching Service. D. T. Hawkins, Spec. Libr., *67* (December 1976), pp. 559–567.   Some experiences with on-line literature searching systems in the Bell Laboratories Libraries and Information Systems Center during 1975 are described. A total of 604 sessions, averaging 15 minutes each, occurred. Average cost per session was approximately $22, including connect time, communications, and off-line printing. The actual cost of many sessions, however, was $10 or less. On the average, on-line searching costs $1/minute and 10¢/off-line print. A search on a specific subject took an average of two sessions. Details on types of searches performed, the method of charging costs to the user, and some effects on library services are given, as well as some of the advantages of using an on-line system for information retrieval.

LTX—A System for the Directed Automatic Design of LSI Circuits. G. Persky, D. N. Deutsch, and D. G. Schweikert, Des. Automation Conf. Proceed., No. 13 (June 1976), pp. 399–407.   LTX is a minicomputer-based design system for large-scale integrated circuit chip layout which offers a flexible set of interactive and automatic procedures for translating a circuit connectivity description into a finished mask design. The system encompasses algorithms for two-dimensional placement, string placement, and channel routing.

Pro—An Automatic String Placement Program for Polycell Layout. G. Persky, Des. Automation Conf. Proceed., No. 13 (June 1976), pp. 417–424.   PRO is a minicomputer-based string placement program that reorders cells in polycell rows such that channel routing in the adjacent channels needs fewer routing tracks, and is not blocked by cyclic constraints. PRO utilizes cell reflections and pairwise neighbor exchanges, simultaneously monitoring both channels adjacent to the row being reordered.

ELECTRICAL AND ELECTRONIC ENGINEERING

Birefringent Coupler for Integrated Optics: Comment 2. A. Albanese and J. A. Arnaud, Appl. Opt., *15* (September 1976), p. 2029.   A proof is given of the impossibility to realize lossless and one-directional couplers.

Control of Limit Cycles in Recursive Digital Filters by Randomized Quantization. R. B. Kieburtz, V. B. Lawrence, and K. V. Mina, Proc. 1976 IEEE Int. Symp. Circuits Systems, April 1976, pp. 624–627.   The different types of limit cycles that can occur in single second-order sections respond differently to efforts to reduce them. Length 1 (dc) limit cycles play an important complicating role, especially in cascaded filters. We describe a simple method, involving random requantization of multiplier outputs, which can reduce or eliminate limit cycles in digital filters. We compare limit cycle and roundoff noise in three typical low-pass filters with and without the method.

Impurity and Substrate Diffusion in a Thin Contact Layer. R. P. Goel and F. E. Bader, J. Electrochem. Soc., *123*, No. 8 (August 1976), pp. 1242–1245.   Based on simplifying assumptions, diffusion phenomena of substrate and impurity through a thin contact layer have been compared. Results are presented in terms of nondimensionalized parameters k (a measure of diffusion rate, time, and contact thickness) and $\bar{l}/l$ (film thickness/contact thickness). A single master curve is shown to represent each diffusion process.

Low-Noise GaAs MESFETS. B. S. Hewitt, et al., Electron. Lett., *12,* No. 12 (June 10, 1976), pp. 309–310. GaAs MESFETs with optimum noise figures of 1.6 dB at 6 GHz have been fabricated by projection photolithography. An equation has been developed for the calculation of optimum noise figure which gives good agreement between calculated and measured values.

Measurement of Land to Plated-Through-Hole Interface Resistance in Multilayer Boards. J. N. Hines, 14th Annual Proceed., 1976 Reliability Phys. Symp., April 20, 1976, pp. 132–134. Thermally induced cracks in the bond between an innerlayer land and barrel will occur during the lifetime of an MLB if processing is faulty. A technique to detect incipient failures that features four-terminal resistance measurements with a minimum of bulk resistance to overcome the insensitivity of series circuit measurements is presented.

Mechanical-Chemical Technique for Removal of Epitaxial Spikes. L. E. Katz and W. C. Erdman, J. Electrochem. Soc., *123,* No. 8 (August 1976), pp. 1249–1251. A new mechanical-chemical spike removal technique has been devised which effectively removes epitaxial spikes on silicon substrates. A mask damage technique was used to evaluate masks subjected to spike removal. Results show effective spike removal as well at no subsequent mask damage.

Millimeter Wave Integrated Circuit Technologies. R. H. Knerr and L. F. Moose, Microwave J., *19,* No. 11 (November 1976), pp. 23–24. Introduction to a two part series of short articles authored by the participants in a panel discussion on "Millimeter Wave Integrated Circuit Technologies" at the 1976 IEEE-MTT-S International Microwave Symposium.

A New Digital Echo Canceler for Two-Wire Full-Duplex Data Transmission. K. H. Mueller, IEEE Trans. Commun., *COM-24,* No. 9 (September 1976), pp. 956–962. A new approach to echo canceling for two-wire full-duplex data transmission is proposed. The canceling signal is directly synthesized from the binary data, using a transversal filter approach, and the usual multiplications are replaced by additions and subtractions, thus allowing efficient operation of a large number of taps as required for the canceling of distant echoes. As a specific application, a system processing one sample per baud is discussed where timing signals at both communicating stations are assumed to be synchronized.

Optimization of Digital Postdetection Filters for PSK Differential Detectors. R. D. Gitlin and K. H. Mueller, IEEE Trans. Commun., *COM-24,* No. 9 (September 1976), pp. 963–970. A digital transversal postdetection filter for use in differential PSK detectors is proposed, and a method for optimizing the weighting coefficients is presented. It is shown that even though the detector output signal is quadratic, the optimization problem can be formulated in a way similar to the well-known MMSE equalizer for linear signals.

MATERIALS SCIENCE

Application of Weibull-type Analysis to the Strength of Optical Fibers. B. K. Tariyal and David Kalish, Mater. Sci. Eng., *27* (January 1977), pp. 69–71. The strength distribution for 400 measurements on 0.61-m-length fused silica optical fiber specimens exhibits a bimodal behavior. The cumulative failure probability is presented for Weibull-type distributions and is analyzed by assuming that the strength distribution is comprised of two distinct populations having finite lower and upper strength limits. This procedure provides the best prediction of the strength in long lengths.

Many-Body Effects in Transition Metals: Role of the Density of States. G. K. Wertheim and L. R. Walker, J. Phys. F Metal Phys., *6,* No. 12 (December 1976), pp. 2297–2306. The effects of structure in the density of electron-hole pair excitations is examined by numerical integration of the many-body screening formalism. The results are applied to Ir and Pt.

Oxidation State of Tungsten in the Na_xWO_3 Bronzes. G. K. Wertheim, M. Campagna, J.-N. Chazalviel,* H. R. Shanks[†], Chem. Phys. Lett., *44,* No. 1 (November 15, 1976) pp. 50–52. X-ray photoemission spectra of W 4f electrons in vacuum-cleaved cubic Na_xWO_3 covering the entire composition range give no evidence for the existence of multiple W valence states in the bulk. Strong oxidation effects are observed in air exposed

surfaces.   * Laboratoire PMC, Ecole Polytechnique, France. † Ames Laboratory, Iowa State Univ.

Thin Film Interaction in Aluminum and Platinum. S. P. Murarka, I. A. Blech, and H. J. Levinstein, J. Appl. Phys., *47* (December 1976), pp. 5175–5181.   Aluminum and Platinum interacted very rapidly with the formation of several intermetallics (namely Pt_3Al_2, Pt_5Al_3, $PtAl_2$, $PtAl_3$ and $PtAl_4$) which resulted in large volume changes and loss of adhesion. The Al-Pt interaction rate was dependent on the annealing ambient being higher in forming gas, argon or helium than in vacuum or air.

MECHANICAL AND CIVIL ENGINEERING

Free Vibrations of a Beam-Mass System With Elastically Restrained Ends. R. P. Goel, J. Sound Vib., *47*, No. 1 (July 1976), pp. 9–14.   The vibration problem of a beam with an arbitrarily placed concentrated mass and elastically restrained against rotation at either end is solved. The effects on eigenfrequencies of the system produced by varying the mass, stiffness, and position ratios are presented.

Tranverse Vibrations of Tapered Beams. R. P. Goel, J. Sound Vib., *47*, No. 1 (July 1976), pp. 1–7.   Transverse vibrations of linearly tapered beams, elastically restrained against rotation at either end, have been investigated. Results for the first three eigenfrequencies, with different values of stiffness ratios and taper ratios are presented. Cases of a tapered cantilever beam with a concentrated mass at the free end and spring hinged at the other end have also been presented.

PHYSICS

Absence of the Low-Temperature Specific-Heat Anomaly in bcc ^{3}He. D. S. Greywall, *37*, No. 2 (July 12, 1976), pp. 105–107.   The specific heat of bcc ^{3}He has been measured along three isochores for temperatures T between 50 mK and the melting curve. The data for $T < 0.3$ K can be described well by the function $C_v = \alpha T^{-2} + \gamma T^3$ and are inconsistent with the existence of the low-temperature specific-heat anomaly reported previously by others.

Digital Normalization of Iodine Filter Structure in Quasielastic Light Scattering. K. B. Lyons and P. A. Fleury, Phys. Rev. Lett., *47* (November 1976), pp. 4898–4900.   A molecular iodine filter may be used to reduce the elastic component in a light scattering experiment but also introduces extraneous structure into the spectrum. A technique is reported here to compensate quantitatively for this structure by a digital normalization scheme.

Enhanced Optical Fluorescence by Resonant Mössbauer Excitation. C. P. Lichtenwalner, H. J. Guggenheim, and L. Pfeiffer, Phys. Lett., *56A*, No. 2 (March 8, 1976), pp. 117–118.   Enhanced optical Eu^{2+} fluorescence in Eu-doped CaF_2 crystals is observed following resonant absorption of Mössbauer γ-rays by Eu^{3+} nuclei. The effect is due to scintillation fluorescence from Eu^{2+} ions excited by conversion electrons from decaying 21.6 keV ^{151}Eu.

Particle Brownian Motion Near a Hydrodynamic Instability. J. B. Lastovka and J.-P. Boon,* Phys. Rev., *14*, No. 4 (October 1976), pp. 1583–1586.   We consider the alteration of the normal Brownian motion of seed particle brought about by the enhanced velocity fluctuations that exist near the threshold of a hydrodynamic instability. We utilize our results to quantitatively predict the fluctuation induced effects for the threshold region of the Bénard convective instability.   * Université Libre de Bruxelles.

Pressure-Induced Valence Change in Cerium Phosphide. A. Jayaraman, W. Lowe, L. D. Longinotti, and E. Bucher.   The pressure-volume relationship for cerium monophosphide (CeP) has been determined to 200 kbars pressure. From the data, we conclude that there is an electronic transition involving a change in the valence state of Ce from 3^+ towards the 4^+ state near 100 kbar pressure. Qualitative observations of the reflectivity of CeP under pressure support the valence transition.

The Use of Our Specially Designed Nonachromatic Microscope Objective to Examine Tracks in Nuclear Emulsions. J. S. Courtney-Pratt, Opt. Eng., *15*, No. 4 (July–August 1976), pp. 379–383.   We have shown that our specially designed nonachromatic objective allows us to produce sharp images of particle tracks in nuclear emulsions, for visual study and/or photographic recording, with a lateral resolution of about one micron, and a depth of field many times greater than can be achieved with conventional objectives.