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# OPTICAL MODULATION, TECHNIQUES, AND EQUIPMENT—A BIBLIOGRAPHY

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ABSTRACT

This bibliography is a compilation of the literature on optical modulation, techniques, and equipment. Arrangement is alphabetical by author or corporate source. Where two or more entries have been originated by the same source the arrangement is by date. The references cover the period 1 January 1962 through July 1964. Co-Author, Corporate Source and Periodical, and Subject indexes follow the bibliographic entries.



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# INTRODUCTION

Technological advance of the past few years has shown a trend toward the use of optical frequencies for the performance of functions which are, at present, monopolized by longer wavelength equipment. This trend has come about through the development of the laser and its inherent characteristics of coherent, monochromatic light.

The laser as a light source has made rapid progress in some areas of its development such as power output, efficiency, and operating characteristics. In the areas of scanning, modulation, and receiving techniques, however, progress has been slower. The future application of laser as practical light sources will depend upon the advancement of those areas where progress has been slow.

This bibliography is a compilation of the literature on optical modulation, techniques, and equipment. It is intended as a working tool to guide interested scientists and engineers to the literature in their field of interest. Arrangement is alphabetical by author or corporate source. Where two or more entries have been originated by the same source the arrangement is by date. The references cover the period January 1962 through July 1964. Co-Author, Corporate Source and Periodical, and Subject indexes follow the bibliographic entries.

The readers attention is directed to two additional bibliographies which may be of interest. SID 64-26, "The Literature of Non-Permanent Displays and Display Materials" and SID 64-669, "Optical Scanning Methods and Techniques - A Bibliography" are currently available at the Technical Information Center.



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2. Allen, S.J., K. Linden, B. DiBartolo, M. Mack, and R. Peccei
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Discusses research activities in the following areas: (1) Coherent emission from ions in glass hosts; (2) Optical harmonic generation in ammonium dihydrogen phosphate; (3) rate equation analysis of laser emission; (4) excited state spectroscopy and secondary absorption in lasers; and (5) extension of laser techniques to submillimeter wavelengths and problems of generation, detection, and modulation in this range.

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4. Anderson, L.K.
MICROWAVE MODULATION OF LIGHT USING FERRIMAGNETIC RESONANCE. Journal of Applied Physics, 34:1230-1231, April 1963, 9 refs.



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Describes the operation of an optical modulator based upon the time-varying optical faraday rotation produced by the precessing magnetization in a magnetic material and presents experimental results for an X-band modulator using a thin disk of yttrium iron garnet.

5. Arm, M., L.B. Lambert, and B. Silverberg
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MODULATION EFFECTS IN OPTICAL PUMPING. Laboratory for Physical Sciences, College Park, Maryland, presented at the third International Symposium on Quantum Electronics, Paris, France, February 1963.

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MICROWAVE MODULATION OF LIGHT IN PARAMAGNETIC CRYSTALS. Physical Review, 120:2014-2023, 15 December 1960, 47 refs.

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FEEDBACK MODULATION WITH A RUBY OPTICAL MASER. Bell Telephone Laboratories, Inc., Wippany, New Jersey, presented at



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CONTROL OF POPULATION INVERSION IN PULSED OPTICAL MASERS BY FEEDBACK MODULATION. Journal of Applied Physics, 6:2009-2011, June 1962, 5 refs.

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AD 401 086

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DOPPLER OPTICAL NAVIGATOR. Radio Corporation of America, Camden, New Jersey, Second Quarterly Progress Report for 6 September - 6 December 1963, 19 December 1963, 92 pages, 6 refs.

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INVESTIGATION OF THE STATE OF POLARIZATION OF THE RED AND GREEN O-LINES IN POLAR AURORAE. In: Studies in Auroral Spectroscopy, Oslo University, Blindern, Norway, 30 June 1963, pages 9-11, 1 ref.

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THEORETICAL AND EXPERIMENTAL INVESTIGATION OF MODULATION INDUCING RETRODIRECTIVE OPTICAL SYSTEMS. Philco Corporation, Scientific Laboratory, Blue Bell, Pennsylvania, Monthly Contract Progress Report No. 2 for 21 June - 21 July 1963, NASA CR-52155, 29 July 1963, 12 pages.

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THEORETICAL AND EXPERIMENTAL INVESTIGATION OF MODULATION INDUCING RETRODIRECTIVE OPTICAL SYSTEMS. Philco Corporation, Scientific Laboratory, Blue Bell, Pennsylvania, Monthly Contract Progress Report No. 4 for 21 August - 21 September 1963, NASA CR-52859, 26 September 1963, 8 pages.

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THEORETICAL AND EXPERIMENTAL INVESTIGATION OF MODULATION INDUCING RETRODIRECTIVE OPTICAL SYSTEMS. Philco Corporation, Scientific Laboratory, Blue Bell, Pennsylvania, Monthly Progress Report No. 9 for 21 January - 21 February 1964, NASA CR-56012, 9 March 1964, 11 pages.

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MODULATION AND DEMODULATION OF COHERENT AND INCOHERENT LIGHT AT A MICROWAVE FREQUENCY. Stanford Electronics Laboratory, Stanford, California, Report No. SEL-62-119, September 1962, 7 pages, 4 refs.

AD 296 920

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MODULATION AND DIRECT DEMODULATION OF COHERENT AND INCOHERENT LIGHT AT A MICROWAVE FREQUENCY. Applied Physics Letters, 1:37-39, October 1962, 4 refs.

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69. Harris, S.E.
FM-AM OPTICAL CONVERTER. Stanford Electronics Laboratory, Stanford, California, Presented at the Third International Symposium on Quantum Electronics, Paris, France, February 1963.

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70. Hauser, S.M., L.S. Smith, D.G. Marlowe, and P.R. Yoder, Jr.
THE STRESSED-PLATE SHUTTER, A NEW MODERATE-SPEED ELECTRO-OPTICAL MODULATOR. Applied Optics, 2:1175-1179, November 1963, 11 refs.

Describes an electro-optical shutter system which functions by virtue of uniform photoelastic birefringence induced mechanically by piezoelectric means into a glass plate supported between suitably oriented linear polarizers.

71. Henry, E.E.
ORTHOGONAL ULTRASONIC SIGNALS. University of Michigan, Institute of Science and Technology, Ann Arbor, Michigan, Report No. 4563 61R, April 1964, 12 pages.


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AD 438 036

Describes an ultrasonic light modulator utilizing two quartz crystals as the transducers, each with its own electronic driver. The crystals are mounted in two sides of the unit producing two orthogonal ultrasonic wavetrains with a common area of interaction. Water is used as a delay medium.

72. Holshouser, D.F., H. Von Foerster, and G.L. Clark
MICROWAVE MODULATION OF LIGHT USING THE KERR EFFECT. Journal of the Optical Society of America, 51:1360-1365, December 1961, 5 refs.

Describes the modulation of light at 3 and 6 kMc by applying a superimposed electro static and microwave field to a carbon-disulfide Kerr-cell incorporated within the high-electric-field region of a resonant cavity.

73. Holshouser, D.F.
RESEARCH ON MODULATING LIGHT AT MICROWAVE FREQUENCIES. University of Illinois, Electrical Engineering Research Laboratory, Urbana, Illinois, Interim Final Report for 1 February 1959 - 31 January 1962, AFOSR-2474, 1962, 15 pages, 9 refs.

Progress report on the microwave modulation of light and methods for detecting this modulation. Microwave Kerr cells exhibiting nearly complete modulation at 3 gcps are developed.

74. Holshouser, D.F. and R. Stanfield
MICROWAVE AND ELECTRO-OPTIC PROPERTIES OF LIQUIDS EXHIBITING THE KERR EFFECT. University of Illinois, Urbana, Illinois, Presented at the Third International Symposium on Quantum Electronics, Paris, France, February 1963.

Discusses the results of a program for the measurement of the electrical and optical properties of liquids used in Kerr cell light modulators. Presents data and calculations permitting a comparison with solid-state electro-optical effects for light modulation at microwave frequencies.

75. Inaba, H. and A.E. Siegman
MICROWAVE PHOTOMIXING OF OPTICAL MASER OUTPUTS WITH A P-I-N JUNCTION PHOTODIODE. Proceedings of the Institute of Radio Engineers, 50:1823-1824, August 1962.


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Describes the use of a p-i-n junction photodiode as a mixer in an optical superheterodyne system employing microwave modulated light.

76. Ito, M.
TRANSMITTER FOR COHERENT LIGHT COMMUNICATION SYSTEM. Nippon Electric Company, Ltd., Kawasaki, Japan, Presented at the Institute of Electrical and Electronics Engineers International Convention, 23-26 March 1964, New York, New York.

Discusses the design and performance of a dc excited helium-neon gas laser, a sensitive wide band modulator, alignment, and focusing procedures.

77. Jacobs, S.
OPTICAL HETERODYNE-KEY TO ADVANCED SPACE SIGNALING. Electronics, 36:29-31, 12 July 1963.

Presents a general survey of optical heterodyning methods.

78. Johnson, K.M.
SOLID STATE MODULATION AND DIRECT DEMODULATION OF GAS LASER LIGHT AT A MICROWAVE FREQUENCY. Proceedings of the Institute of Electrical and Electronics Engineers, 51:1368-1369, October 1963, 3 refs.

Presents an experimental investigation of the microwave modulation and direct demodulation of laser light through the use of a cavity-type $KH_2PO_4$ modulator and a Si photovoltaic diode demodulator.

79. Johnson, L.F. and D. Kahng
PIEZOELECTRIC OPTICAL-MASER MODULATOR. Journal of Applied Physics, 33:3440-3443, December 1962, 10 refs.

Describes an optical-maser modulator employing a transparent piezoelectric medium.

80. Kamal, A.K.
PROPOSED TECHNIQUE FOR THE MODULATION OF COHERENT LIGHT. Proceedings of the Institute of Radio Engineers, 49:1331, August 1961.

Proposes a technique for the modulation of coherent light output of a ruby laser utilizing the Stark effect in the ruby itself.



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[redacted]




81. Kaminow, I. P.
MICROWAVE MODULATION OF THE ELECTRO-OPTIC EFFECT IN $KH_2PO_4$. Physical Review Letters, 6:528-530, 15 May 1961, 9 refs.

82. Kaminow, I. P.
MICROWAVE MODULATION OF LIGHT BY THE ELECTRO-OPTIC EFFECT. In: Northeast Electronics Research and Engineering Meeting Record, 3:117, 1961, 5 refs.

83. Kaminow, I. P., R. Kompfner, and W.H. Louisell
IMPROVEMENTS IN LIGHT MODULATORS OF TRAVELING-WAVE TYPE. Institute of Radio Engineers Transactions on Microwave Theory and Techniques, MTT-10:311-313, September 1962, 5 refs.

Analyzes a scheme for the wide-band modulation of light whereby the power is continuously fed into the light-carrying guide to make up for the attenuation as the wave progresses down the guide.

84. Kaminow, I. P.
ELECTRO-OPTICAL LIGHT MODULATION. Bell Telephone Laboratories, Holmdel, New Jersey, presented at the Lasers and Applications Symposium, Ohio State University, November 1962.

Reviews some aspects of the design of microwave light modulators based on the electro-optic effect and discusses recent work on cavity-type and traveling-wave-type microwave structures. Includes information of the measurement on electro-optic materials.

85. Kaminow, I. P.
SPLITTING OF FABRY-PEROT RINGS BY MICROWAVE MODULATION OF LIGHT. Applied Physics Letters, 2:41-42, 15 January 1963, 6 refs.

Discusses an experiment in which the carrier frequency, provided by a He-Ne maser, operating continuously at 6328Å, is phase-modulated at 9.01 Gc by an electro-optic light modulator.

86. Kaminow, I. P. and J. Liu
PROPAGATION CHARACTERISTICS OF PARTIALLY LOADED TWO CONDUCT TRANSMISSION LINE FOR BROADBAND LIGHT MODULATION. Proceedings of the Institute of Electrical and Electronics Engineers, 51:132-136, January 1963, 5 refs.

Derives the characteristics of two-conductor transmission lines containing two dielectrics and applies the results of broad-band traveling-wave light modulators.




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87. Kaminow, I. P.
TEMPERATURE DEPENDENCE OF THE COMPLEX DIELECTRIC CONSTANT IN $KH_2PO_4$-TYPE CRYSTALS AND THE EFFICIENCY OF MICROWAVE MODULATORS. Bell Telephone Laboratories, Holmdel, New Jersey, Presented at the Third International Symposium on Quantum Electronics, Paris, France, February 1963.

Discusses the measurements of the temperature dependence of the complex dielectric constants of $KH_2PO_4$ and several isomorphs at 9.2 Gc.

88. Kaminow, I. P.
STRAIN EFFECTS IN ELECTRO-OPTIC LIGHT MODULATORS. Northeast Electronics Research and Engineering Meeting Record, 5:152, 1963.

89. Kaya, P.
PROPOSAL FOR MODULATING THE OUTPUT OF AN OPTICAL MASER. Proceedings of the Institute of Radio Engineers, 50:323, March 1962, 3 refs.

Letter to the editor.

90. Kibble, B. P. and G.W. Series
FURTHER STUDIES OF MODULATED LIGHT IN A DOUBLE RESONANCE EXPERIMENT. Proceedings of the Royal Society of London, Series A, 274:213-224, 23 July 1963, 6 refs.

Presents a discussion of an investigation, at low frequencies, of the modulation of fluorescent light which has already been found at higher frequencies in a double magnetic experiment.

91. Kiss, Z. J.
ZEEMAN TUNING AND INTERNAL MODULATION OF THE $CAF_2:DY^{2+}$ OPTICAL MASER. In: Proceedings of the Symposium on Optical Masers, Polytechnic Press, Brooklyn, New York, 1963, Pages 271-275, 3 refs.

Describes the achievement of internal modulation of an optical maser using both homogeneous and inhomogeneous small magnetic fields up to a band-width of 1/2 Mc.

92. Klockhaus, W.
LIGHT MODULATORS FOR WIDE FREQUENCY BANDS. Nachrichtentechnische Zeitschrift, 16:561-568, November 1963, 30 refs. (in German).



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Surveys the principal methods for wide-band modulation of light waves with particular attention given to the control of emission processes in semiconductor lasers, and the controlled electrical, magnetic, and mechanical processes used to produce the proper variation of the optical characteristics of solid and gas lasers.

93. Kolk, A.J. and M. Orlovic
INCREASING THE KERR MAGNETO-OPTIC EFFECT IN THIN FILMS. Journal of Applied Physics, 34:1060-1061, April 1963, 8 refs.

Describes observations of the magneto-optic rotations greater than the thick film longitudinal Kerr rotation at certain thicknesses of ferromagnetic films deposited on silver surfaces.

94. Kuckes, A.F.
A MONOCHROMATOR WAVELENGTH MODULATOR. Princeton University, Plasma Physics Laboratory, Princeton, New Jersey, Report No. MATT-162, January 1963, 9 pages.

Describes a technique for modulating the wavelength of a Monochromator and using this technique and a phase detection scheme the Doppler shift is easily obtained.

95. Lambert, L. and W. Konig
TWO-DIMENSIONAL FILTERING. Columbia University, Electronics Research Laboratories, New York, Technical Report No. P-2/179, 2 July 1962, 72 pages, 22 refs.

AD 334 210, Confidential

Descriptors Include: Optical Filters, Modulation, Delay Lines, Light Communication Systems.

96. La Tourrette, J. and S. Jacobs
HETERODYNE DETECTION IN OPTICAL COMMUNICATION. Technical Research Group, Syosset, New York, Report No. TRG-168-TDR-1, 30 November 1962.

AD 269 362

Discusses the use of heterodyne detection in optical communication, demultiplexing of channels, demodulation of FM and AM, Doppler and displacement measurements, and stabilization of lasers.

97. La Tourrette, J.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF OPTICAL



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HETERODYNING. Technical Research Group, Syosset, New York, Report No. 172TRI, 22 February 1963, 96 Pages, ASD-TDR-63-237.

AD 402 814

98. Leray, J. and P. Gramain
MCDULATION DE L'ETAT DE POLARISATION DE LA LUMIERE PAR UNE LAME ISOTROPE INCLINEE TOURNANTE—APPLICATION A LA MESURE PHOTOELECTRIQUE DE L'EFFET MAXWELL. Academie des Sciences des Comptes Rendus, 257:1624-1626, 28 October 1963 (In French).

Discusses the modulation of polarization of light by means of rotating an inclined isotropic optical plate.

99. Lewis, H. R.
LASERS. Radio Corporation of America, Defense Electronic Products Division, Camden, New Jersey, 1963, 31 pages.

Part three investigates wideband laser modulators that utilize crystals exhibiting linear electro-optic effects. Presents information on work being conducted on special microwave phototubes capable of demodulating light that has been modulated at Gigacycle rates. Gives some of the techniques and materials utilized in the systems.

100. Lindberg, E.
SOLID STATE BEAM CONTROLLED LIGHT MODULATOR. Motorola, Inc., Chicago, Illinois, Final Report on Contract AF30(602)-2645, RADC TDR-63-161, 21 June 1961, 43 pages.

AD 413 403

Describes the study and investigation into the feasibility of an electron beam controlled solid-stage light modulator.

101. Lindberg, E., J. Hatchett, and T. Cole
SOLID-STATE BEAM CONTROLLED LIGHT MODULATOR. Motorola, Inc., Military Electronics Division, Chicago, Illinois, Final Report on Contract AF30(602)-2645, RADC TDR-63-161, 21 June 1963, 51 pages.

102. Lindberg, L.
SOLID CRYSTAL MODULATES LIGHT BEAMS. Electronics, 36:58-61, 20 December 1963.

Describes the operation of a light beam modulator using transparent birefringent $KH_2PO_4$ Crystal.



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103. Litchman, W.S.
APPLICABILITY OF LASER TECHNIQUES. ITT Communication Systems, Inc., Paramus, New Jersey, Status Report on Contract AF19(628)-3358, Report No. ICS-64-TR-379, 13 March 1964, ESD—TDR-64-249, 80 pages.

AD 434 378

Presents laser communication techniques capable of being integrated into the AIRCOM System. Describes laser characteristics and problems related to light generation, modulation, and detection.

104. Lohmann, A.
THETA MODULATION IN OPTICS. International Business Machines Corporation, General Products Division Development Laboratory, San Jose, California, presented at the fall meeting of the Optical Society of America, 23-25 November 1963, Chicago, Illinois.

105. Lotsch, H.K.V.
A MODIFIED FABRY-PEROT INTERFEROMETER AS A DISCRIMINATION FILTER AND A MODULATOR FOR LONGITUDINAL MODES. California Institute of Technology, Quantum Electronics Laboratory, Pasadena, California, Scientific Report No. 2, 1 September 1962, 19 pages.

AD 269 948

Describes an unsymmetric modified interferometer.

106. McClung, F.J. and R.W. Hellwarth
CHARACTERISTICS OF GIANT OPTICAL PULSATIONS FROM RUBY. Proceedings of the Institute of Electrical and Electronics Engineers, 51:46-53, January 1963, 10 refs.

Describes a method of laser modulation which produces fast, intense, and controllable giant laser pulses by Q-modulation.

107. McGlees, H.G. and G.W. Saeger
SIMPLE, ECONOMICAL LASER DEMODULATION. Electronic Industries, 22:107-109, May 1963, 8 refs.

Presents a brief description of a simple method of laser microwave demodulation of an optical modulated signal.

108. McMurty, B.J. and S.E. Harris
MODULATION AND DIRECT DEMODULATION OF COHERENT AND INCOHERENT LIGHT AT A MICROWAVE FREQUENCY. Stanford



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Electronics Laboratories, Stanford, California, Technical Report No. 176-3, September 1962.

Discusses the modulation and demodulation of the incoherent light from a mercury-arc lamp and the coherent light from a ruby laser at a modulation frequency of 2700 Mc.

109. McMurty, B. J., J. B. Gaenzle, and R. Targ
RESEARCH ON TECHNIQUES FOR LIGHT MODULATION DETECTION.
Sylvania Electric Products, Inc., Mountain View, California, Interim Engineering Report No. 2 for 1 September—1 December 1962, 47 pages, 16 refs.

AD 292 035

110. Mc Quaid, R. W.
THE POCKELS EFFECT OF HEXAMETHYLENETETRAMINE.
Applied Optics, 2:320-321, March 1963, 9 refs.

Letter to the editor.

111. Mc Quaid, R. W. and M. C. Watkins
LASER MODULATION WITH HEXAMETHYLENETETRAMINE.
Aircraft Armaments, Inc., Cockeysville, Maryland, presented at the fall meeting of the Optical Society of America, 23-25 October 1963, Chicago, Illinois.

112. Mc Quaid, R. W.
CUBIC PIEZOELECTRIC CRYSTALS FOR ELECTRO-OPTIC MODULATION. In: Proceedings of the Institute of Electrical and Electronics Engineers National Aerospace Electronics Conference, 1963, pages 282-286.

Describes the investigation into finding new crystalline materials of crystal classes 43m and 23 that could require less power for operation and be easily grown as large single crystals.

113. McQuistan, R. B. and J. W. Schultz
INFRARED MODULATION BY FREE-CARRIER ABSORPTION.
Minneapolis-Honeywell, Research Center, Hopkins, Minnesota, Presented at the Spring Meeting of the Optical Society of America, 25-27 March 1963, Jacksonville, Florida.

Presents experimental results relating to the electro-optical characteristics of free-carrier modulators and compares them with a theory for the modulation of infrared radiation.



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114. Macek, W. C., R. Kroeger, and J. R. Schneider
MICROWAVE MODULATION OF LIGHT. Institute of Radio Engineers International Convention Record, Part 3, 10:158-176, 1962, 8 refs.

Describes the advantages of utilizing light beams for space communications and navigation and reviews the light source requirements with emphasis on the application of the Pockels effect to an electro-optical microwave light beam modulator.

115. Moorhead, J. E., T. Falk, and V. C. Buonaiuto
INFRA-RED AND ELECTRO-OPTICS. SATELLITE SPECTROMETER, PHASE II. Barnes Engineering Company, Stamford, Connecticut, Report No. BEC-4696, 15 November 1962, 83 pages, 18 refs.

Presents a summary of design work completed on the Weather Bureau Satellite Spectrometer Program. At present a space-to-earth comparison through a chopper and earth mirror arrangement, or a calibrate blackbody (floating temperature) to space comparison may be made.

116. Niblack, W. and E. Wolf
POLARIZATION MODULATION AND DEMODULATION OF LIGHT. Applied Optics, 3:277-279, February 1964.

Describes an optical communication system utilizing polarization modulation-demodulation of light enabling significant improvements in usable transmitted power or extended range, lessened susceptibility to interference from linearly polarized light, and ease of transmitter/receiver alignment over the performance of a comparable intensity-modulated optical communications systems.

117. Pankove, J.I. and J.E. Berkeyheiser
A LIGHT SOURCE MODULATED AT MICROWAVE FREQUENCIES. Proceedings of the Institute of Radio Engineers, 50:1976-1977, September 1962, 3 refs.

118. Pershan, P.S. and N. Bloembergen
MICROWAVE MODULATION OF LIGHT. In: Advances in Quantum Electronics, Columbia University Press, 1961, pages 187-199.

119. Peters, C. J.
WIDEBAND COHERENT LIGHT MODULATOR. Northeast Electronics Research and Engineering Meeting Record, 4:88-89, 1962, 4 refs.

Discusses the construction and performance of a continuous-duty coherent-light modulator exhibiting a bandwidth in kMc.



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120. Peters, C. J.
GIGACYCLE BANDWIDTH COHERENT LIGHT TRAVELING-WAVE PHASE MODULATOR. Proceedings of the Institute of Electrical and Electronics Engineers, 51:147-153, January 1963.

Describes a continuous-duty, coherent-light phase modulator exhibiting a bandwidth in the gigacycle range.

121. Porter, C.S.
TRANSPARENT FERROMAGNETIC LIGHT MODULATOR USING YTTRIUM IRON GARNET. Journal of Applied Physics, 29:495-496, March 1958, 6 refs.

Describes a method of preparation of yttrium iron garnet crystals from $Y_2O_3$ and $Fe_2O_3$, using PbO as a solvent, and the application of Faraday rotation from them to the design of light modulators of which three types are described.

122. Racette, G.
ABSORPTION EDGE MODULATOR UTILIZING A P-N JUNCTION. Proceedings of the Institute of Electrical and Electronics Engineers, 52:716, June 1964, 10 refs.

Discusses the use of a back-biased p-n junction structure to meet the large fields and low currents required for the observation of the shift of the optical absorption edge of semiconductors to longer wavelengths upon the application of an electric field to a semiconductor.

123. Radio Corporation of America, Defense Electronic Products Division
STUDY AND DEVELOPMENT OF A CALCULATING-LIGHT MODULATOR. Camden, New Jersey, Semi-Annual Technical Report No. 1 for 27 August - 31 December 1959.

AD 342 085, Secret

Descriptors include: Light Modulators, Integrators, Test Methods, Transducers, Bandwidth, Propagation, Delay Lines, and Attenuation.

124. Radio Corporation of America, Defense Electronic Products Division
STUDY AND DEVELOPMENT OF A CALCULATING LIGHT MODULATOR. Camden, New Jersey, Semi-Annual Technical Report No. 2 for 1 January - 30 June 1960

AD 342 377, Secret



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Descriptors include: Light Modulators, Delay Lines, Measurement, and Specifications.

125. Radio Corporation of America, Defense Electronic Products Division
STUDY AND DEVELOPMENT OF A CALCULATING LIGHT MODULATOR. Camden, New Jersey, Semi-Annual Technical Report No. 3 for 1 July - 31 December 1960, Report No. IB1076-3, 15 January 1961.

AD 341 924, Secret

Descriptors Include: Light Transmission Modulators, Feasibility Study, Refraction, Spectrum Analyzers, and Design.

126. Radio Corporation of America, Defense Electronic Products Division
STUDY AND DEVELOPMENT OF A CALCULATING LIGHT MODULATOR. Camden, New Jersey, Semi-Annual Technical Report No. 4 for 1 January - 30 June 1961, Report No. IB2025-55, 15 July 1961.

AD 341 564, Secret

Descriptors Include: Light Modulators, Anti-Missile Defense Systems, Display Systems, Delay Lines, Feasibility Studies, Design, and Transducers.

127. Radio Corporation of America, Missile and Surface Radar Division
ELECTRO-OPTICAL ATTITUDE MEASURING SYSTEM - A DESIGN STUDY. Moorestown, New Jersey, Report No. ESD-TDR-63-624, October 1963, 191 pages.

AD 428 002

Investigates a method of Electro-Optically determining the attitude of a missile from lift-off to 50,000 feet. The determination is made by lasers illuminating two missile-borne retroreflectors. The reflected radiation is returned to the receivers where the beams are separated and analyzed by a polarization sensitive system to determine polarization states.

128. Read, W.S. and D.L. Fried
OPTICAL HETERODYNING WITH NONCRITICAL ANGULAR ALIGNMENT. Proceedings of the Institute of Electrical and Electronics Engineers, 51:1787 December 1963, 3 refs.



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Discusses the development of a method of achieving optical heterodyne detection without the usual high degree of angular alignment.

129. Reich, A. and S.S. Verner
VOICE MODULATION OF A ELECTRO-ACOUSTICALLY DEFLECTED LIGHT BEAM. Proceedings of the Institute of Electrical and Electronics Engineers, 51:1661-1662, November 1963, 1 ref.

Letter to the Editor

130. Renton, C.A.
AMPLITUDE MODULATION OF LIGHT BY REVERSED BIASED P-N JUNCTIONS. Proceedings of the Institute of Electrical and Electronics Engineers, 52:93-94, January 1964, 3 refs.

Presents a method utilizing a reversed biased p-n junction to modulate the amplitude of a light beam being transmitted through the junction.

131. Rigrod, W.W. and I.P. Kaminow
WIDE-BAND MICROWAVE LIGHT MODULATION. Proceedings of the Institute of Electrical and Electronics Engineers, 51:137-140, January 1963, 10 refs.

Describes a method for obtaining light modulation of an extremely wideband by traveling-wave interaction in electro-optic or magnet-optic materials.

132. Rosenthal, J.E.
MODULATION OF COHERENT LIGHT. Presented at the 1961 Annual Meeting of the American Physical Society, 1-4 February 1961, New York, New York.

Discusses a light valve which uses carrier density modulation of light passing through an epitaxial semiconductor sheet.

133. Rottman, H.R.
A PRECISION CHOPPER DISK. Applied Optics, 2:1333-1334, December 1963.

Letter to the Editor.

134. Rugari, A.D.
IN-CAVITY LASER MODULATION STUDY. Rome Air Development Center, Griffiss Air Force Base, New York, Report No. TDR-64-129, May 1964, 25 pages.


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AD 601 660

Presents an investigation of a laser modulation technique capable of providing a flat frequency response over the range of 30 cps to 30 mc/s with a modulation index of 0.5 or greater through the introduction of controllable losses to the laser cavity by alternate alignment and misalignment of the cavity mirrors.

135. Rugari, A.D. and P.E. Nordborg
LASER EXPERIMENTS INVOLVING IN-CAVITY MODULATION WITH ELECTRO-OPTIC CRYSTALS. Proceedings of the Institute of Electrical and Electronics Engineers, 52:852, July 1964, 2 refs.

Letter to the Editor.

136. Saito, S. and T. Kimura
MICROWAVE MODULATION OF RUBY LASER LIGHT USING DKP CRYSTAL. Japanese Journal of Applied Physics, 2:658-659, November 1963.

137. Schiel, E.J. and J.J. Bolmarcich
DIRECT MODULATION OF A HE-NE GAS LASER. Proceedings of the Institute of Electrical and Electronics Engineers, 51:940-941, June 1963.

Letter to the Editor.

138. Schmidt, B.M., J.M. Willians, and D. Williams
FARADAY-EFFECT MODULATION OF A LIGHT BEAM. Ohio State University, Columbus, Ohio, presented at the Fall Meeting of the Optical Society of America, 23-25 October 1963, Chicago, Illinois.

139. Schmidt, B.M., J.M. Williams, and D. Williams
MAGNETO-OPTIC MODULATION OF A LIGHT BEAM IN SODIUM VAPOR. Journal of the Optical Society of America, 54:454-459, April 1964, 10 refs.

Describes an experimental application of the Faraday effect in saturated sodium vapor, to produce amplitude modulation of a light beam near the D lines of sodium.

140. Seraphin, B.O. and D.G. McCauley
LOW-POWER LIGHT MODULATORS. Michelson Laboratory, China Lake, California, Presented at the Spring Meeting of the Optical Society of America, 25-27 March 1963, Jacksonville, Florida, 2 refs.


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Presents two approaches which are applicable to low-power light modulation.

141. Seraphin, B.O. and D.A. Orton
FIELD-EFFECT LIGHT MODULATION IN GERMANIUM. Journal of Applied Physics, 34:1743-1748, June 1963, 13 refs.

Discusses the measurement of light modulation as a function of surface conditions.

142. Seraphin, B.O., D.G. McCauley, and L.G. La Marca
PIEZOELECTRIC LASER MODULATOR. In: Proceedings of the Symposium on Optical Masters, Polytechnic Press, Brooklyn, New York, 1963 pages 635-639, 8 refs.

Describes the performance of a Fabry-Perot light modulator in which the intensity of the interference pattern in reflection is modulated by piezoelectric change in thickness of the quartz spacer.

143. Sherman, S. and D.S. Bayley
SPECTRAL SUITABILITY, MODULATION, AND DETECTION TECHNIQUES IN COMMUNICATION WITH WAVELENGTHS BETWEEN 30 AND 10,000 ANGSTROMS, PART II. General Precision Laboratory, Inc., Pleasantville, New York, Report No. A24-4, April 1962, 109 pages, 12 refs.

AD 331 725, Secret

Descriptors include: Lasers, Light Communication Systems, Re-Entry Vehicles, Signal-To-Noise Ratio, Mirrors, and Lenses.

144. Shumate, M.S.
AN INTERFEROMETRIC MEASUREMENT OF INDEX OF REFRACTION. California Institute of Technology, Quantum Electronics Laboratory, Pasadena, California, Report No. SR5, 13 March 1964, 77 pages, AFCRL-64-175, 18 refs.

AD 437 768

Describes a method for measuring the index of refraction of solid optical materials utilizing a two-beam interferometer for determining the optical path length through a flat plate by tipping away from normal incidence through a measured angle.



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145. Siegman, A.E., B.J. McMurty, and S.E. Harris
MICROWAVE MODULATION AND DEMODULATION OF LIGHT.
Stanford Electronics Laboratory, Stanford, California, Report No.
SEL-62-079, July 1962, 16 pages, 21 refs.

AD 291 428

Describes methods for modulating and demodulating coherent light signals at microwave modulation frequencies.

146. Siegman, A.E., B.J. McMurtry, and S.E. Harris
MICROWAVE MODULATION AND DEMODULATION OF LIGHT.
In: Proceedings of the National Aerospace Electronics Conference, 1962, pages 384-389, 16 refs.

Presents a summary of the various methods for modulating and demodulating coherent light signals at microwave modulation frequencies.

147. Siegman, A.E., S.E. Harris, and B.J. McMurty
OPTICAL HETERODYNING AND OPTICAL DEMODULATION AT MICROWAVE FREQUENCIES. In: Proceedings of the Symposium on Optical Masers, Polytechnic Press, Brooklyn, New York, 1963, pages 511-527, 25 refs.

Discusses results of experiments in progress on optical heterodyne reception and optical demodulation, with emphasis on microwave modulation frequencies and microwave bandwidths.

148. Singer, J.R. and S. Wang
THE EMISSION, PULSE-LEVEL INVERSION, AND MODULATION OF OPTICAL MASERS. In: Advances in Quantum Electronics, Columbia University Press, 1961, pages 299-307.

149. Skinner, J.G., J.E. Geusic, and J.A. Koningstein
OPTICAL MASER RESEARCH. Bell Telephone Laboratories, Inc., Murray Hill, New Jersey, Quarterly Report No. 4 for 15 April - 15 July 1962 on Contract DA-36-039-SC-87340, 15 July 1962, 17 pages, 7 refs.

AD 285 947

Discusses work on a mode selective interferometer for the purpose of obtaining optical oscillators of large diameter which have diffraction-limited beams. Includes experimental results on a pulsed ruby optical oscillator using this interferometer.



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150. Sobottka, S. E.
APPLIED RESEARCH ON TECHNIQUES FOR LIGHT MODULATION DETECTION. Watkins-Johnson Company, Palo Alto, California, Interim Engineering Report No. 3 for 1 January - 31 March 1963, Report No. W-J 63-610R12, 18 pages, 2 refs.

AD 404 632

151. Sobottka, S. E.
APPLIED RESEARCH ON TECHNIQUES FOR LIGHT MODULATION DETECTION —ADDENDUM. Watkins - Johnson Company, Palo Alto, California, Interim Engineering Report No. 3 for 1 January - 31 March 1963, Report No. W-J 63-610R12-1, 13 pages, 2 refs.

152. Sterzer, F.
PUSH-PULL OPTICAL MODULATORS AND DEMODULATORS. Applied Optics, 2:1197-1198 November 1963, 3 refs.

Describes methods for doubling the output of push-pull optical amplitude modulators, and demodulators for polarization modulated beams.

153. Sterzer, F., D. Blattner, and S. Miniter
CUPROUS CHLORIDE LIGHT MODULATORS. Journal of the Optical Society of America, 54:62-68, January 1964, 13 refs.

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154. Stitch, M. L. and W. W. Buchman
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155. Stone, S. M.
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AN AUTOMATIC RETARDATION METER FOR AUTOMATIC POLARIMETRY BY MEANS OF AN ADP POLARIZATION MODULATOR. Applied Optics, 3:345-350, March 1964, 21 refs.

Describes the construction of a new automatic retardation meter with an ADP polarization modulator and reports some of the results obtained.

157. Takasaki, H., N. Okazaki, and K. Kida
AN AUTOMATIC POLARIMETER. II. AUTOMATIC POLARIMETRY BY MEANS OF AN ADP POLARIZATION MODULATOR. Applied Optics, 3:833-837, July 1964, 11 refs.

Describes a polarimeter using an ADP Kerr cell in place of the Faraday cell.

158. Targ, R.
OPTICAL HETERODYNE DETECTION OF MICROWAVE-MODULATED LIGHT. Proceedings of the Institute of Electrical and Electronics Engineers, 52:303-304, March 1964, 9 refs.

Describes the demodulation of microwave-modulated light by optical heterodyne techniques.

159. Technical Research Group, Inc.
ANALYSES OF LASER MODULATION TECHNIQUES. Syosset, New York, Report No. ASD-TDR-62-9, June 1962.

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METHOD FOR DETECTING MICROWAVE MODULATED LIGHT. Proceedings of the Institute of Electrical and Electronics Engineers, 51:950, June 1963, 2 refs.

Describes an experimental arrangement for detecting microwave-modulated light through the use of an optical heterodyne employing relatively slow photodetectors.

161. Thurston, G. B.
TRANSMISSION OF POLARIZED LIGHT THROUGH A CONSTANT AND A TIME-VARYING PAIR OF BIREFRINGENT PLATES. Applied Optics, 3:755-759, June 1964, 12 refs.



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Presents a theoretical analyses of the transmission of monochromatic light through a plane polarizer, two birefringent plates, and a plane analyzer.

162. Ujhelyi, G. K. and S. T. Ribeiro
AN ELECTRO-OPTICAL LIGHT INTENSITY MODULATOR. Proceedings of the Institute of Electrical and Electronics Engineers, 52:845, July 1964, 4 refs.

Describes a method for the modulation of the intensity of a light beam through the use of controlled partial reflections at a glass-nitrobenzene boundary surface.

163. Van der Tweel, L. H.
EEG WITH MODULATED LIGHT. Amsterdam University, Amsterdam, The Netherlands, 5 October 1963.

AD 408 411

Descriptors include: Light, Modulation, Stimulation, Eye, Electroencephalography.

164. Ward, W. E.
MIROS PROGRESS LETTER NO. 5 (20 SEPTEMBER TO 20 OCTOBER 1963). Westinghouse Electric Corporation, Aerospace Division, Baltimore, Maryland, NASA CR-55087, 13 pages.

Presents an analysis of the F-center modulation transfer scheme with the essential parts included in the report as: (1) Color centers and optical modulation; (2) Production of colored crystals; (3) Characteristics of colored crystals; and (4) Modulation transfer with colored center crystals.

165. Ward, W. E.
MIROS, OPTICAL SYSTEM STUDY. Westinghouse Electric Corporation, Aerospace Division, Baltimore, Maryland, Monthly Progress Report No. 7 for 20 November - 20 December 1963, NASA CR-55250, 6 pages.

Progress report wherein the first modulation scheme, the Mercury Cell, is successfully operated.

166. Westinghouse Electric Corporation, Aerospace Division
OPTICAL SYSTEMS STUDY. Baltimore, Maryland, Monthly Progress Report No. 10 for 20 February - 20 March 1964, NASA CR-53564, 30 March 1964, 6 pages.



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The mercury-cell modulation transfer-scheme experiment was completed. Some of the experimental results are included for comparison with theory. Empirical and theoretical equations, describing the response of the cell are in close agreement.

167. White, R.M. and C.E. Enderby
ELECTRO-OPTICAL MODULATORS EMPLOYING INTERMITTENT INTERACTION. Proceedings of the Institute of Electrical and Electronics Engineers, 51:214, January 1963, 2 refs.

Describes a family of microwave circuit structures which permit the application of the Pockels effect and traveling-wave interaction to the wide-band modulation of light.

168. Wieder, H.H. and D.A. Collins
FARADAY ROTATION IN FENI FILMS. Applied Optics, 2:411-420, April 1963, 20 refs.

Determines the rotation of the plane of polarization as a function of the quasi-static magnetization reversal process related to the angle of incidence and azimuth of the transmitted plane polarized white light in films of a 35% nickel in iron alloy.

169. Williams, R.L.
HIGH-FREQUENCY LIGHT MODULATION. Journal of Scientific Instruments, 37:205-208, June 1960, 7 refs.

Describes a high frequency light modulator utilizing a magnetically driven rotor suspended by a magnetic field in a vacuum chamber.

170. Wohlers, M.R.
SOME OPTICAL MODULATION AND DEMODULATION TECHNIQUES. Grumman Aircraft Engineering Corporation, Research Department, Bethpage, New York, Report No. RN-166, August 1963, 25 pages, 4 refs.

Discusses the use of electro-optic crystals for modulation; describes techniques which have been proposed, and proposes or re-evaluates additional schemes which appear to be promising.

171. Yariv, A.
ELECTRO-OPTIC FREQUENCY MODULATION IN OPTICAL RESONATORS. Proceedings of the Institute of Electrical and Electronics Engineers, 52:719-720, June 1964, 8 refs.



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Discusses the possibility of using the electro-optic effect for a new class of applications based upon a control of the internal feedback conditions of an optical resonator thus affording an electro-mechanical or magneto-mechanical means for resonator tuning.



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SUBJECT INDEX





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