

AD-751 900

LASER COMMUNICATION SYSTEMS

Defense Documentation Center  
Alexandria, Virginia

November 1972

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**AD-751 900**

# **LASER COMMUNICATION SYSTEMS**

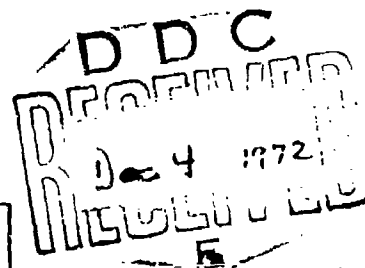
## **A DDC BIBLIOGRAPHY**

**DDC-TAS-72-53**

**NOVEMBER 1972**

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Springfield VA 22151



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Security Classification

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(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

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I

Security Classification

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# **LASER COMMUNICATION SYSTEMS**

**A DDC BIBLIOGRAPHY**

August 1961 - January 1972

**DDC-TAS-72-53**

**NOVEMBER 1972**

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## F O R E W O R D

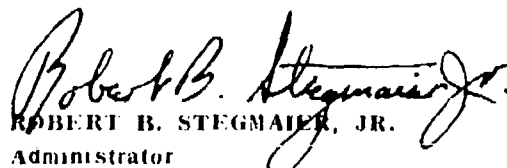
This bibliography is a selection of references to unclassified and unlimited reports in the Defense Documentation Center's collection on *laser Communication Systems*. Entries were selected from references processed into the AD data bank from January 1953 through March 1972.

Corporate Author-Monitoring Agency, Subject, Title, Personal Author, Contract, and Report Number indexes are included.

This bibliography supersedes Report Number DDC-TAS-70-56 dated August 1970, AD-710 460.

BY ORDER OF THE DIRECTOR, DEFENSE SUPPLY AGENCY

OFFICIAL

  
ROBERT B. STEGMAIER, JR.  
Administrator  
Defense Documentation Center

## C O N T E N T S

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| PERSONAL AUTHOR.....                    | P-1         |
| CONTRACT.....                           | C-1         |
| REPORT NUMBER.....                      | R-1         |

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /7LW13

AD-264 455

STANFORD UNIV CALIF STANFORD ELECTRONICS LABS

DIRECT OBSERVATION OF MICROWAVE-FREQUENCY BEATS DUE  
TO PHOTOMIXING OF RUBY-OPTICAL-MASER MODES (U)

1V MCMURTRY, B.J.; SIEGMAN, A.E.

CONTRACT: DA36 039SC85387

MONITOR: AFOSR 1350

UNCLASSIFIED REPORT

DESCRIPTORS: \*MASERS, \*MICROWAVES, \*PHOTOTURES, \*RUBY,  
DESIGN, LASERS, MEASUREMENT, OPTICAL EQUIPMENT, OXIDE  
CATHODES, RADIO RECEIVERS, TRAVELING WAVE TUBES (U)

OBSERVATIONS WERE MADE OF MICROWAVE SIGNALS  
PRODUCED BY PHOTOMIXING OF NEAR-NEIGHBOR AXIALMODE  
COMPONENTS IN THE OUTPUT SPECTRUM OF A RUBY OPTICAL  
MASER (LASER). THE OBSERVATIONS WERE MADE BY  
FOCUSING THE LASER OUTPUT ONTO THE OXIDE CATHODE OF  
AN OPERATING 2500-4000 MC TRAVELINGWAVE TUBE.  
MIXING (HETERODYNING) BETWEEN THE SIMULTANEOUS,  
DISCRETE OPTICAL FREQUENCIES IN THE LASER OUTPUT  
OCCURS IN THE TWT CATHODE, PRODUCING MICROWAVE  
AMPLITUDE MODULATION OF THE BEAM CURRENT. THIS  
AMPLITUDE MODULATION IS AMPLIFIED IN THE HELIX  
SECTION, PRODUCING EASILY OBSERVABLE MICROWAVE  
SIGNALS IN THE TWT OUTPUT. WITHIN THE TWT  
BANDWIDTH, DISCRETE SIGNALS WERE OBSERVED AT 1800  
PLUS OR MINUS 20, 2410 PLUS OR MINUS 3, 3000 PLUS OR  
MINUS 20, AND 3600 PLUS OR MINUS 20 MC,  
REPRESENTING THE 'PHOTO-BEATS' BETWEEN THIRD- THROUGH  
SIXTH-NEAREST NEIGHBORS IN THE LASER-MODE SPECTRUM.  
THIS METHOD OF OBSERVATION IS A POWERFUL TOOL FOR  
STUDY OF OPTICAL MASERS, AND ALSO HAS SIGNIFICANT  
IMPLICATIONS FOR COMMUNICATIONS EMPLOYING  
MICROWAVEMODULATED LIGHT. IT VERIFIES A NUMBER OF  
SUGGESTIONS FOR CONSTRUCTING MICROWAVE PHOTOTURES  
OUTLINED BY THE AUTHORS AT A RECENT CONFERENCE.  
(PHYS. REV. 99:1691, 1955) (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-267 857

OHIO STATE UNIV RESEARCH FOUNDATION COLUMBUS ANTENNA  
LAB

OCT 61 1V LONG, R.K.  
REPT. NO. 1083 11  
CONTRACT: AF33 616 7081

UNCLASSIFIED REPORT

DESCRIPTORS: ABSORPTION, AMPLIFIERS, ATTENUATION,  
COMMUNICATION SYSTEMS, ELECTROMAGNETIC WAVES,  
ELECTRONICS LABORATORIES, INFRARED OPTICAL SYSTEMS,  
INFRARED RADIATION, LABORATORY EQUIPMENT, LASERS, LIGHT,  
MASERS, OPTICAL EQUIPMENT, OPTICAL FILTERS, PHYSICS  
LABORATORIES, PROPAGATION, RUBY, SIMULATION,  
SPECTROGRAPHIC ANALYSIS, TEST FACILITIES (U)

THE DEVELOPMENT OF OPTICAL MASERS HAS RAISED THE  
POSSIBILITY OF THEIR USE IN COMMUNICATION AND HIGH  
POWER TRANSMISSION SYSTEMS. AT THE OHIO  
STATE UNIVERSITY, A FACILITY WAS CONSTRUCTED TO  
MAKE MEASUREMENTS OF THE PROPAGATION EFFECTS  
ASSOCIATED WITH SUCH SYSTEMS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-275 591

LOCKHEED MISSILES AND SPACE CO SUNNYVALE CALIF

OPTICAL COMMUNICATIONS: A BIBLIOGRAPHIC SURVEY OF  
POSSIBLE SPACE AND TERRESTRIAL APPLICATIONS OF THE  
LASER AND MASER (U)

MAR 62 1V GOLDMANN, JACK B.  
REPT. NO. SB 62 7  
CONTRACT: AF04 647 787

UNCLASSIFIED REPORT

DESCRIPTORS: \*BIBLIOGRAPHIES, \*LIGHT COMMUNICATION  
SYSTEMS, COMMUNICATION THEORY, LASERS, MASERS, SPACE  
ENVIRONMENTAL CONDITIONS (U)

THIS ANNOTATED BIBLIOGRAPHY INCLUDES PUBLICATIONS  
RELEASED FROM 1959 THROUGH FEBRUARY 1962. THE  
SURVEY CONTAINS REFERENCES TO THE SOLID STATE AND GAS-  
EOUS AREAS OF INVESTIGATION WHICH HAVE BEEN MADE WITH  
REGARDS TO THE APPLICATION OF MASERS AND LASERS TO  
OPTICAL COMMUNICATIONS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-284 321

TRW SPACE TECHNOLOGY LABS REDONDO BEACH CALIF

ON THE PRODUCTION OF AND SCATTER PROPAGATION FROM  
ARTIFICIAL IRREGULARITIES IN THE IONOSPHERIC D-LAYER(U)

JUN 62 1V GARDNER, JOHN H.;  
REPT. NO. 62 532  
CONTRACT: AF19 604 8844  
MONITOR: AFCRL 62 532

UNCLASSIFIED REPORT

DESCRIPTORS: \*IONOSPHERE, \*LASERS, \*LIGHT COMMUNICATION  
SYSTEMS, \*MASERS, ANTENNA RADIATION PATTERNS, ANTENNAS,  
COMMUNICATION THEORY, DENSITY, ELECTRONS, INTEGRAL  
TRANSFORMS, LIGHT, REFRACTIVE INDEX, RELIABILITY, RUBY,  
SIGNALS, ULTRAHIGH FREQUENCY (U)

THE POSSIBILITY OF UTILIZING IRREGULARITIES  
PRODUCED IN THE IONOSPHERIC D-LAYER BY RF HEATING  
OR BY INTENSE OPTICAL RADIATION FROM LASERS TO  
ENHANCE FORWARD SCATTER PROPAGATION IS CONSIDERED.  
IT IS SHOWN THAT, ON THE ASSUMPTION THAT A  
REDUCTION OF ELECTRON DENSITY BY A FACTOR OF TWO CAN  
BE ACHIEVED AT 70 KM BY RF HEATING WITH A ONE  
MEGAWATT BEAM OF 1 DEGREE HALF-POWER WIDTH AS  
CALCULATED BY MOLMUD, FORWARD SCATTER PROPAGATION  
WITH REDUCTION IN POWER OF ABOUT 50 DB FROM LINE-OF-  
SIGHT PROPAGATION CAN BE ACHIEVED FOR A DISTURBED  
IONOSPHERE. IF LASERS ARE USED TO LAY OUT A  
DIFFRACTION GRATING IN THE D-LAYER, SIMILAR RESULTS  
MAY BE ACHIEVED WITH THE RECEIVED POWER PROPORTIONAL  
TO THE SQUARE OF THE NUMBER OF GRATING LINES AND WITH  
THE ADDITIONAL POSSIBILITY OF UTILIZING HIGH-ORDER  
SPECTRA OF THE GRATING. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-286 062

ARMY RESEARCH OFFICE WASHINGTON D C

LASER PROGRESS AND APPLICATIONS

(U)

DEC 62

1V

MERRILL, HARRISON J.;

UNCLASSIFIED REPORT

DESCRIPTORS: \*LASERS, CHROMIUM, COMMUNICATION SYSTEMS,  
GUIDANCE, ILLUMINATION, RANGE FINDING, RETINA, RUBY,  
SURGERY, THEORY, WELDING (U)

THE INTENSIVE LASER DEVELOPMENT IS BASED ON A CONSIDERATION OF SCHWALOW AND TOWNES WHO DETERMINED THAT OPTICAL STIMULATION COULD OCCUR WHEN THE DIFFERENCE IN ENERGY STATES EXCEEDED A CERTAIN MINIMUM VALUE. THE OUTPUT DEVELOPS THROUGH EMISSION AS THE POPULATION OF A HIGHER ENERGY STATE IS STIMULATED TO RETURN TO THE GROUND LEVEL. THE CONDITION OF OSCILLATION IS CONTROLLED BY REFLECTIVITY OF CAVITY ENDS, THE TEMPERATURE AND THE EFFECTIVE VOLUME. THE MODIFICATION OF THE Q BY CHANGES IN REFLECTIVITY DURING LASER STIMULATION PERMITS OPERATION IN A SINGLE PULSE HAVING A PEAK POWER MORE THAN 3 MEGAWATTS WITH HALF POWER TIME LESS THAN 50 NANO-SEC. THE PINK RUBY DOPED WITH .05% CHROMIUM HAS PROVED MOST USEFUL OPERATED AS THE THREE LEVEL LASER. IMPROVED EFFICIENCY AND QUALITY MAY BE ACHIEVED BY USE OF OTHER MATERIALS. THE LASER SOURCE IS UNIQUE OPTICALLY CHARACTERIZED BY ITS COHERENCE, MONOCHROMATICITY AND HIGH ENERGY DENSITY. IT MAY BE USEFUL IN RANGE FINDING, SPECIAL ILLUMINATION AND COMMUNICATION AND GUIDANCE CONTROL; AS A SOURCE FOR SPECIAL SCIENTIFIC INVESTIGATIONS; IT HAS ALREADY FOUND USES IN MICRO-WELDING AND FOR RESTORING DETACHED RETINAS IN THE EYE. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-286 611

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

AN ASTRO-SHIP CALLS THE EARTH (SUPER-LONG DISTANCE  
COMMUNICATIONS WITH A SPACE SHIP) (U)

AUG 62 1V SOKOLOV,V.A.;IVANOV,YU. F.  
REPT. NO. TT 62 721

UNCLASSIFIED REPORT

DESCRIPTORS: \*LIGHT COMMUNICATION SYSTEMS, \*RADIO  
COMMUNICATION SYSTEMS, \*SPACECRAFT, AIR-TO-SURFACE,  
LASERS, RUBY, SPACE COMMUNICATION SYSTEMS, SURFACE-TO-  
AIR, THEORY, TRANSLATIONS (U)  
IDENTIFIERS: USSR (U)

SUPER LONG-DISTANCE COMMUNICATIONS WITH SPACESHIPS  
TRANSLATION USSR.

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-286 641

ARMY RESEARCH OFFICE WASHINGTON D C

INVESTIGATIONS ON A BEAM WAVEGUIDE FOR OPTICAL  
FREQUENCIES

(U)

DEC 62 1V GOURAU, G.; CHRISTIAN, J. R. I

UNCLASSIFIED REPORT

DESCRIPTORS: \*LASERS, \*LIGHT COMMUNICATION SYSTEMS,  
\*WAVEGUIDES, DIELECTRICS, ELECTROMAGNETIC LENSES, LIGHT,  
LIGHT PULSES, MEASUREMENT, MICROWAVES, OPTICAL  
EQUIPMENT, WAVEGUIDE IRISES

(U)

A BEAM WAVEGUIDE OF 970M LENGTH WAS CONSTRUCTED TO  
DETERMINE ITS APPLICABILITY TO THE TRANSMISSION  
OF COHERENT LIGHT.

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-293 452

PHILCO CORP BLUE BELL PA

STUDY AND INVESTIGATION OF ACQUISITION AND TRACKING  
OF OPTICAL COMMUNICATION SYSTEMS (U)

NOV 62 1V ANDERSON, R.F.;  
REPT. NO. TDR62 733  
CONTRACT: AF33 616 8392  
MONITOR: ASD TDR62 733

UNCLASSIFIED REPORT

DESCRIPTORS: \*LIGHT COMMUNICATION SYSTEMS, \*LUNAR  
PROBES, \*OPTICAL TRACKING, \*SATELLITES (ARTIFICIAL),  
\*SPACECRAFT, AIR-TO-AIR, AIRBORNE, ANALOG COMPUTERS,  
COMMUNICATION EQUIPMENT, COMMUNICATION SYSTEMS,  
COMMUNICATION THEORY, CONTROL SYSTEMS, ERRORS, IMAGE  
TUBES, INTERFERENCE, LASERS, MATHEMATICAL ANALYSIS,  
NUMERICAL ANALYSIS, ORBITAL TRAJECTORIES, PROBABILITY,  
SATELLITE ATTITUDE, SIGNAL-TO-NOISE RATIO, SOLAR  
RADIATION, SOLAR SYSTEMS, SPACE COMMUNICATION SYSTEMS,  
SPACE ENVIRONMENTAL CONDITIONS, STAR TRACKERS, STARS,  
SUN (U)

ACQUISITION AND TRACKING AS APPLIED TO  
REPRESENTATIVE OPTICAL COMMUNICATION SYSTEMS ARE  
STUDIED. THE TWO HYPOTHETICAL COMMUNICATION LINKS  
CONSIDERED WERE BETWEEN AN EARTH-ORBITING SATELLITE  
AND A MOON-ORBITING SATELLITE AND BETWEEN AN EARTH-  
ORBITING SATELLITE AND A CISELUNAR SPACE VEHICLE.  
THE RESULTS SHOW THAT ACQUISITION AND TRACKING ARE  
FEASIBLE. THE STUDY INCLUDES A TYPICAL SYSTEM  
DESIGN BASED ON THE USE OF A LASER COMMUNICATION TRAN-  
SMITTER. THIS SUBSYSTEM UTILIZES A FIVE-MOTOR  
GIMBAL CONFIGURATION WHICH MOUNTS THE OPTICAL  
SYSTEMS AND SENSORS THAT PERFORM THE FAR-BODY  
TRACKING FUNCTION AND THE ACQUISITION AND TRACKING  
OF THE COMMUNICATION BEAM. AN IMAGE TUBE IS USED  
AS THE ACQUISITION SENSOR IN ORDER TO OBTAIN HIGH  
SCANNING RATES. THE TRACKING SENSOR DESIGN IS  
BASED ON STATE-OF-THE-ART STAR TRACKER AND UTILIZES  
A MULTIPLIER PHOTOTUBE. (AUTHOR) (U)

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-407 612  
ILLINOIS UNIV URBANA

STUDY OF MODULATION AND DETECTING OF COHERENT  
OPTICAL RADIATION.

(U)

DESCRIPTIVE NOTE: FINAL SUMMARY REPT.  
FEB 63 2P HOLSHOUSER, D. F. ;  
CONTRACT: AF-AFOSR-62-250  
PROJ: AF-9767  
TASK: 976702  
MONITOR: AFOSR 4812

UNCLASSIFIED REPORT

DESCRIPTORS: \*MICROWAVES, \*MICROWAVE EQUIPMENT,  
LIQUIDS, DIELECTRICS, CARBON COMPOUNDS,  
SULFIDES, MICROWAVE FREQUENCY, DETECTION,  
OPTICAL INSTRUMENTS, MEASUREMENT, KERR CELLS,  
TEMPERATURE, LASERS, PHOTOMULTIPLIERS,  
NEODYMIUM, ELECTRON MULTIPLIERS, MODULATION,  
LIGHT.

(U)

IDENTIFIERS: 1963.

(U)

MICROWAVE-MODULATED LIGHT; FINAL SUMMARY REPT.

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-410 571

OHIO STATE UNIV COLUMBUS

ABSORPTION OF LASER RADIATION IN THE ATMOSPHERE.

(U)

MAY 63 150P LONG, RONALD K.  
REPT. NO. 1579-3, 3630-5237  
CONTRACT: AF 33 657 10824  
PROJ: 5237  
TASK: 523704

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON STUDY OF MICROWAVE  
PROPAGATION.

DESCRIPTORS: (\*LASERS, COMMUNICATIONS SYSTEMS),  
(\*ATMOSPHERE, ABSORPTION), MICROWAVE SPECTROS  
COPY, SOLAR SPECTRUM, DETECTION, MEASUREMENT,  
OZONE, NITROGEN COMPOUNDS, OXIDES, HELIUM GROUP  
GASES, RARE EARTH ELEMENTS, ATTENUATION, MODU-  
LATION, OPTICAL PROPERTIES, RUBY.  
IDENTIFIERS: METHANE, 1963.

(U)

(U)

LASER RADIATION ABSORPTION IN THE ATMOSPHERE.

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-420 983

AMERICAN OPTICAL CO SOUTHBRIDGE MASS

EXPERIMENTAL VERIFICATION OF SUN-POWERED LASER  
TRANSMITTER. (U)

DESCRIPTIVE NOTE: FINAL REPT., MAR 62-MAY 63,

AUG 63 110P SIMPSON, G. R. ;

CONTRACT: AF33 657 8619

PROJ: 4335

TASK: 433513

MONITOR: ASD TDR63 727

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, DESIGN), (\*COMMUNICATION SYSTEMS,  
SUN), SOLAR RADIATION, THERMAL STRESSES, OPTICAL  
EQUIPMENT, CALCIUM COMPOUNDS, TUNGSTATES, IMPURITIES,  
NEODYMIUM, GLASS, RUBY, HEAT EXCHANGERS, COOLANT PUMPS,  
TENSILE PROPERTIES, OPTICAL TRACKING, FIBER OPTICS (U)  
IDENTIFIERS: OPTICAL TRANSMITTERS, 1963 (U)

A PROGRAM OF DESIGN AND EXPERIMENTATION LEADING TO  
THE DELIVERY OF AN EXPERIMENTAL MODEL OF A SUN-  
POWERED LASER TRANSMITTER IS PRESENTED. ANALYTICAL  
WORK IS PRESENTED WHICH RESULTED IN THE CHOICE OF  
ND:CAW04 AND ND:GLASS AS CANDIDATES FOR CW  
SUN-POWERED OPERATION. THE DESIGN AND FABRICATION  
OF THE TRANSMITTER MOUNT, PUMP OPTICS AND LASER  
CAVITIES IS DESCRIBED. COOLING TECHNIQUES DEVELOPED  
(PRIMARILY ORIENTED TOWARD CAW04 ALTHOUGH  
GENERALLY APPLICABLE TO ANY SOLID LASER MATERIAL  
OPERATING AT ROOM TEMPERATURE) AND THE DESIGN OF  
THE COOLING SYSTEM ARE DETAILED. EXPERIMENTAL  
EVALUATION OF A NUMBER OF LASER CONFIGURATIONS OF THE  
MATERIALS DISCUSSED IS PRESENTED. APPENDICES ARE  
PROVIDED WHICH GIVE (1) DEFINITION AND  
MEASUREMENT OF LOSS COEFFICIENT ' $\alpha$ ', (2) THE  
DERIVATION OF THE FIGURE OF MERIT ' $\eta$ ' FOR A 4-  
LEVEL SYSTEM BASED ON QUANTITIES B, THE GAIN  
COEFFICIENT FOR LIGHT IN A LASER AND ' $\alpha$ ', (3)  
THE DERIVATION OF THE GAIN COEFFICIENT BETH, (4)  
THE METHOD OF CALCULATION OF THE POWER OUTPUT OF A  
CW LASER OSCILLATOR, (5) THE METHOD USED IN  
OBTAINING THERMAL CONDUCTIVITY MEASUREMENTS AND  
(6) A DESCRIPTION OF THE ORIGINAL ROOM  
TEMPERATURE OPERATION OF GLASS LASERS. FINALLY,  
RECOMMENDATIONS ARE GIVEN FOR FUTURE INVESTIGATIONS  
OF SUN-POWERED LASER OPERATION. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /7LW13

AD-422 511

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

INFRARED AND VISIBLE LIGHT EMISSION FROM  
FORWARDBIASED P-N JUNCTIONS,

(U)

43 10P REDIKER, R. H. ;

UNCLASSIFIED REPORT

REPRINT FROM SOLID/STATE/DESIGN, PP. 3-12, AUG 63.

(COPIES NOT SUPPLIED BY DDC)

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*SEMICONDUCTOR DEVICES,  
ELECTROLUMINESCENCE), (\*LASERS, SEMICONDUCTOR DEVICES),  
(\*LIGHT COMMUNICATION SYSTEMS, TELEVISION EQUIPMENT),  
(\*MASERS, SEMICONDUCTOR DEVICES), INJECTION, DIODES  
(SEMICONDUCTOR), TRANSISTORS, GALLIUM ALLOYS, ARSENIC  
ALLOYS, INDIUM ALLOYS, PHOSPHORUS ALLOYS, LIGHT  
TRANSMISSION, INFRARED RADIATION, SPECTRA (INFRARED),  
SPECTRA (VISIBLE AND ULTRAVIOLET), PHOTONS (U)  
IDENTIFIERS: 1963, BEAM-OF-LIGHT TRANSISTOR (U)

EFFORTS WERE DIRECTED TOWARD SEMICONDUCTOR DIODE  
LIGHT SOURCES AND SEMICONDUCTOR DIODE OPTICAL MASERS  
(LASERS) WHICH ARE THE FIRST PRACTICAL DEVICES IN  
A NEW FIELD FOR SEMICONDUCTOR DEVICES THAT INVOLVES  
THE EFFICIENT CONVERSION OF ELECTRICAL ENERGY INTO  
INFRARED AND VISIBLE LIGHT. IN THE FIRST PART OF  
THIS PAPER GAAS DIODES WILL BE DESCRIBED WHICH  
PRODUCE INCOHERENT INFRARED RADIATION WITH HIGH  
EFFICIENCY AS ORIGINALLY ANNOUNCED BY KEYES AND  
QUIST. INCOHERENT RADIATION, RADIATION SUCH AS  
IS OBTAINED FROM LIGHT BULBS AND FROM SPARK GAP  
TRANSMITTERS, HAS MANY DISADVANTAGES AS COMPARED TO  
COHERENT RADIATION SUCH AS IS NOW USED IN RADIO AND  
RADAR. ON THE OTHER HAND, INCOHERENT RADIATION CAN  
BE USED IN MANY APPLICATIONS AND I WILL DESCRIBE  
BELOW AN EXPERIMENT IN WHICH AUDIO AND VIDEO SIGNALS  
HAVE BEEN TRANSMITTED 30 MILES ON A BEAM OF THE  
INCOHERENT INFRARED RADIATION EMITTED BY A GAAS  
DIODE. MASER DIODES WILL THEN BE DESCRIBED:  
GAAS DIODES AND INAS DIODES WHICH EMIT  
COHERENT INFRARED RADIATION, AND GAASXP1-X  
DIODES WHICH EMIT COHERENT VISIBLE RADIATION.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-425 126

ARMY ELECTRONICS LABS FORT MONMOUTH N J

DIRECT MODULATION OF A HF-NE GAS LASER, (U)

MAR 63 2P SCHIEL, E. J. ; HOLMARCICH, J.  
J. ;

UNCLASSIFIED REPORT

REPRINT FROM PROCEEDINGS OF THE IEEE, PP. 940-941,  
JUNE 63. (COPIES NOT SUPPLIED BY DDC)

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, GASE.), HELIUM, NEON, MODULATION,  
DISCHARGE TUBES, IMAGE TUBES, ELECTRODES (U)  
IDENTIFIERS: 1963, PHOTODIODES (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-434 378

ITT COMMUNICATION SYSTEMS INC PARAMUS N J

APPLICABILITY OF LASER TECHNIQUES,

(U)

MAR 64 80P LITCHMAN, W. S. ;  
REF. NO. 64TR379  
CONTRACT: AF19 628 3358  
MONITOR: ESD TDR64 249

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, COMMUNICATION SYSTEMS), LIGHT  
TRANSMISSION, MODULATION, DETECTION, LIGHT COMMUNICATION  
SYSTEMS, SURFACE-TO-SURFACE, SURFACE-TO-SPACE, SPACE-TO-  
SPACE, SPACE-TO-SURFACE, DETECTORS, MAGNETO-OPTIC  
EFFECT, MODULATORS, INTERFEROMETERS, ELECTROOPTICAL  
PHOTOGRAPHY, PROPAGATION, MATERIALS, FREQUENCY, OPTICAL  
EQUIPMENT, OPTICAL EQUIPMENT COMPONENTS (U)

IDENTIFIERS: POCKET CELLS, DEMODULATION, FARADAY  
EFFECT, COTTON-MOUTON EFFECT, POCKEL'S EFFECT, 1964 (U)

LASER COMMUNICATION TECHNIQUES ARE PRESENTED THAT  
CAN BE INTEGRATED INTO THE AIRCOM SYSTEM TO SATISFY  
UNMET CURRENT AND ESTIMATED FUTURE AF REQUIREMENTS.  
THE ADVENT OF THE LASER HAS AROUSED GREAT INTEREST  
AMONG COMMUNICATION ENGINEERS BECAUSE IT AFFORDS USE  
OF A NEW SPECTRUM MILLIONS OF MEGACYCLES WIDE.  
ALTHOUGH THE LASER WILL HAVE A GREAT IMPACT IN  
CERTAIN AREAS OF COMMUNICATIONS TECHNOLOGY, ITS  
POTENTIAL IN ANY SPECIFIC AREA MUST BE CAREFULLY  
EVALUATED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-462 245

REDSTONE SCIENTIFIC INFORMATION CENTER REDSTONE ARSENAL  
ALA

LASERS,

(U)

APR 64 42P CARAS, GUS J. ;  
REPT. NO. RSIC-195

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, BIBLIOGRAPHIES),

(\*BIBLIOGRAPHIES, LASERS), REVIEWS, RUBY, MEDICAL  
RESEARCH, DETECTION, COMMUNICATION SYSTEMS, GUIDANCE,  
MANUFACTURING METHODS, FIBER OPTICS, GALLIUM ALLOYS,  
INDIUM ALLOYS, SILICON ALLOYS, ARSENIDES, PHOSPHIDES,  
ANTIMONY ALLOYS, CRYOGENICS, PUMPING (ELECTRONICS),  
FREQUENCY

(U)

IDENTIFIERS: OPTICAL PUMPING, FOUR-LEVEL LASERS, GAS  
LASERS, LIQUID LASERS, SEMICONDUCTOR LASERS, SOLID  
STATE LASERS

(U)

THIS STATE-OF-THE-ART SURVEY CONSISTS OF TWO  
SECTIONS, A TECHNICAL SUMMARY AND A BIBLIOGRAPHY.  
ALTHOUGH THE BIBLIOGRAPHY, WHICH CONSISTS OF 125  
REFERENCES AND COVERS THE PERIOD OF 1 JANUARY 1963  
TO 31 DECEMBER 1963 DEALS MOSTLY WITH THE SUBJECT  
OF LASER PUMPING, THE SUMMARY REVIEWS OTHER TOPICS OF  
LASER TECHNOLOGY INCLUDING A DESCRIPTION OF THE  
VARIOUS TYPES OF LASERS AND THEIR POTENTIAL  
APPLICATIONS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-466 031

DAYTON UNIV OHIO RESEARCH INST

ATMOSPHERIC PROPAGATION STUDIES AT OPTICAL,  
MILLIMETER, AND MICROWAVE FREQUENCIES. PART II. THE  
MECHANISM OF SCINTILLATION. (U)

DESCRIPTIVE NOTE: REPT. FOR 1 JAN 64-20 JAN 65,

MAR 65 20P TAYLOR, PAUL B. ;

CONTRACT: AF33 615 1265

PROJ: 4062

TASK: 02

MONITOR: AL TR-65-79-PT. 2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*MICROWAVES, PROPAGATION),  
(\*MILLIMETER WAVES, PROPAGATION), (\*LASERS,  
PROPAGATION), LIGHT TRANSMISSION, RADIO  
TRANSMISSION, VISIBILITY, LIGHT, MEASUREMENT,  
ATMOSPHERIC MOTION, OPTICAL IMAGES, REFRACTION,  
IONOSPHERE, ANALYSIS (U)  
IDENTIFIERS: SCINTILLATION (U)

THE SCINTILLATION OF RECEIVED SIGNALS PROPAGATED  
THROUGH SOME TEN MILES OF ATMOSPHERE ON NARROW BEAMS  
(ONE AT AN OPTICAL FREQUENCY, THE OTHER AT A  
MICROWAVE FREQUENCY) HAVE BEEN REPORTED IN PART  
I. THE PRESENT REPORT REVIEWS SEVERAL EXPLANATIONS  
WHICH MIGHT ACCOUNT FOR THE PHENOMENA. IT IS FOUND  
THAT THE SCINTILLATION OBSERVED IN THE MICROWAVE  
SIGNAL IS NOT OUT OF LINE WITH THE STATISTICAL  
THEORIES OF PROPAGATION THROUGH A RANDOMLY  
HOMOGENEOUS ATMOSPHERE WHICH HAVE BEEN PROPOSED BY  
OTHERS. HOWEVER, A PRECISE DESCRIPTION OF THE  
MECHANISM IS STILL WANTING. THE SCINTILLATION  
OBSERVED IN THE OPTICAL SIGNAL IS MORE VIOLENT THAN  
ANY PREVIOUSLY REPORTED, AND SHOWS CHARACTERISTICS AT  
VARIANCE WITH THE STATISTICAL THEORIES OF THE  
ATMOSPHERE PRESENTED IN THE LITERATURE--NAMELY, IN  
THE OCCURRENCE OF SHORT INTENSE BURSTS OF SIGNAL  
SUPERIMPOSED ON A LOW-LEVEL RANDOMLY FLUCTUATING  
BACKGROUND. SCINTILLATION IN ANALOGOUS PHENOMENA,  
ESPECIALLY THAT OF RADIO AND OPTICAL STARS, SHOWS  
INDICATIONS OF SIMILAR TRAITS. THE SEVERAL  
EXPLANATIONS WHICH HAVE BEEN PROPOSED ARE MUTUALLY AT  
VARIANCE, AND NONE STANDS UP WELL UNDER CRITICISM.  
FURTHER EXPERIMENT AND STUDY IS REQUIRED IF A  
TENABLE EXPLANATION IS TO BE ESTABLISHED.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-476 149 20/5  
CALIFORNIA UNIV BERKELEY ELECTRONICS RESEARCH LAB  
LASER ARRAYS. (U)

DESCRIPTIVE NOTE: RESEARCH REPT.,  
JUL 65 44P GIBSON, JAMES CLARK ;  
REPT. NO. FRL-65-21  
CONTRACT: AF-AFOSR-139-64, AF-AFOSR-139-65  
PROJ: AF-4751  
MONITOR: AFOSR 66-0402

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, \*ANTENNA ARRAYS), ANTENNA  
CONFIGURATIONS, ANTENNA RADIATION PATTERNS, SPACE  
COMMUNICATION SYSTEMS, POLARIZATION, MATHEMATICAL  
ANALYSIS (U)  
IDENTIFIERS: LINEAR BROADSIDE ARRAYS, DOLPH-  
TCHERBYSCHEFF ARRAYS, UNEQUALLY SPACED ARRAYS,  
SINGLE RING ARRAYS (U)

THIS PAPER DEALS WITH THE APPLICATION OF VARIOUS  
TYPES OF ARRAY TECHNIQUES. THE LASER IS ASSUMED TO  
HAVE A GAUSSIAN FIELD DISTRIBUTION AT ITS APERTURE,  
AND ITS FAR FIELD PATTERN IS DEVELOPED FROM THIS  
APERTURE PATTERN. THE LINEAR BROADSIDE ARRAY  
FACTOR IS APPLIED TO BOTH THE GAUSSIAN ELEMENT  
PATTERN AND TO AN ELEMENT CONSISTING OF A CIRCULAR  
APERTURE UNIFORMLY ILLUMINATED WITH A PLANE WAVE.  
THE DOLPH-TCHERBYSCHEFF AND BINOMIAL AMPLITUDE  
DISTRIBUTION ARRAY FACTORS ARE APPLIED TO THE  
GAUSSIAN ELEMENT PATTERN TO REDUCE SIDELobe LEVELS  
WITH EQUAL ELEMENT SPACING. ISHIMARU'S TECHNIQUE  
OF UNEQUAL ELEMENT SPACING IS APPLIED TO THE  
GAUSSIAN ELEMENT PATTERN TO REDUCE SIDELOBES, AND  
THEN TO SUPPRESS THE SECONDARY BEAM. THE HALF-POWER  
BEAMWIDTHS ARE CALCULATED AND COMPARED, AND THE  
CIRCULAR ARRAY IS INVESTIGATED FOR APPLICATION TO THE  
GAUSSIAN ELEMENT PATTERN. RESULTS CONCERNING  
RELATIVE SIDELobe LEVELS AND GRATING LOBE LEVELS ARE  
TABULATED AND COMPARED. CONCLUSIONS ARE MADE  
CONCERNING THE FEASIBILITY OF APPLYING ARRAY THEORY  
TO LASERS WITH ELEMENT SPACINGS OF HUNDREDS OF  
WAVELENGTHS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-601 660

ROME AIR DEVELOPMENT CENTER GRIFFISS AFB N Y

IN-CAVITY LASER MODULATION STUDY,

(U)

MAY 64 25P RUGARIL, ANTHONY D. ;

PROJ: DS63 9

MONITOR: RADC TOR64 129

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, MODULATION), ELECTRON OPTICS, MIRRORS, PRISMS (OPTICS), CRYSTALS, POTASSIUM COMPOUNDS, PHOSPHATES, QUARTZ, REFRACTIVE INDEX, LIGHT TRANSMISSION, OSCILLATION, DISPLAY SYSTEMS (U)

THEORETICAL AND EXPERIMENTAL STUDY WAS PERFORMED TO INVESTIGATE 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. THE TECHNIQUE INVOLVED THE INTRODUCTION OF CONTROLLABLE LOSSES TO THE LASER CAVITY BY ALTERNATE ALIGNMENT AND MISALIGNMENT OF THE CAVITY REFLECTORS. THIS WAS TO BE ACCOMPLISHED BY INSERTION OF AN ELECTRO-OPTIC PRISM IN THE CAVITY AND VARYING THE ANGLE OF DEVIATION OF THE EXIT BEAM FROM THE PRISM BY ELECTRICALLY CONTROLLING THE MAGNITUDE OF THE INDEX OF REFRACTION OF THE PRISM. THE TRANSMISSION LOSSES ASSOCIATED WITH THE ELECTROOPTIC PRISM WERE EXPERIMENTALLY FOUND TO BE GREATER THAN THE GAIN OF THE LASER CAVITY. THUS, OSCILLATIONS COULD NOT BE MAINTAINED WITH THE ELECTRO-OPTIC PRISM IN THE CAVITY. THE MAJOR FACTORS CONTRIBUTING TO THE TRANSMISSION LOSSES WERE FOUND TO BE REFLECTION LOSSES AND AN INHERENT BIRFRINGENCE OF THE CRYSTALLINE MATERIALS. PERTINENT THEORETICAL DISCUSSIONS AND EXPERIMENTAL RESULTS ARE INCLUDED IN THE REPORT. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-603 004

BAIRD ATOMIC INC CAMBRIDGE MASS

EFFECT OF OPTICAL PATH IMPERFECTIONS ON FARRY-PEROT  
MODULATOR PERFORMANCE. (U)

DESCRIPTIVE NOTE: REPT. FOR 17 FEB-17 JUL 64,  
64 78P DELPIANO, VINCENT, JR.;

CONTRACT: AF 33(615)-1254

PROJ: AF-4335

TASK: 433513

MONITOR: AFAL TDR-64-141

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*MODULATORS, PERFORMANCE (ENGINEERING)),  
LASERS, LIGHT TRANSMISSION, REFRACTION, BROADBAND,  
AMPLIFIERS, FREQUENCY, PROBABILITY, INTERFEROMETERS,  
PIEZOELECTRIC CRYSTALS, SURFACE PROPERTIES, POTASSIUM  
COMPOUNDS, PHOSPHATES (U)  
IDENTIFIERS: FARRY-PEROT MODULATOR, ELECTRO-OPTIC  
EFFECT, POTASSIUM DIHYDROPHOSPHATE (U)

UNDER A PREVIOUS CONTRACT, A THEORETICAL INVESTIGATION WAS CONDUCTED ON THE EFFECTS OF VARIATION IN OPTICAL PATHLENGTH UPON THE PERFORMANCE OF A FABRY-PEROT TYPE WIDEBAND MODULATOR. THE VARIATIONS CONSISTED OF STATISTICAL DISTRIBUTIONS WITHIN OR ACROSS THE APERTURE, AND TWO PROBABILITY DISTRIBUTIONS OF THE VARIABLE PATHLENGTH WERE STUDIED: A RECTANGULAR AND A GAUSSIAN. THE OBJECTIVE OF THE PRESENT WORK WAS TO PROVIDE DIRECT EXPERIMENTAL VERIFICATION OF THE THEORETICAL RESULTS OF THE PROBABILITY STUDY AS WELL AS TO CHARACTERIZE AND ACCESS THE PRESENT PERFORMANCE OF THE MODULATOR IN ORDER TO PROVIDE GUIDANCE FOR FUTURE WORK. IT IS SHOWN THAT THE PLANE-PARALLEL FABRY-PEROT TYPE OF MODULATOR WILL APPROACH IDEAL THEORETICAL PERFORMANCE ONLY FOR EXTREMELY SMALL APERTURES OF THE ORDER OF 0.045 INCH OR LESS AND THAT THIS RESULT IS IN ACCORDANCE WITH THE THEORETICALLY PREDICTED PERFORMANCE. IT IS FURTHER SHOWN THAT THE MODULATOR PERFORMANCE DEPENDS CRITICALLY UPON THE FREQUENCY STABILITY AND BANDWIDTH OF THE SOURCE AND THAT FREQUENCY DRIFTS,  $f \text{ SUB } 0$ , GREATER THAN A FEW MEGACYCLES WILL CAUSE LARGE FLUCTUATIONS IN THE AVERAGE TRANSMISSION. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-603 622

CONTROL DATA CORP MELVILLE N Y TRG DIV

HETERODYNE DETECTION IN OPTICAL COMMUNICATION. (U)

DESCRIPTIVE NOTE: FINAL REPT.,

JUL 64 307P JACOBS, S. F. ; LATOURETTE,  
J. T. ; GOULD, G. ; RABINOWITZ, P. ;

CONTRACT: AF30 602 2591

PROJ: 4519

TASK: 451905

MONITOR: RADC , TOR64 130

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS, MODULATION),  
(\*MODULATION, LIGHT COMMUNICATION SYSTEMS), LASERS,  
INTERFEROMETERS, MIXERS (ELECTRONIC), SIGNAL-TO-NOISE  
RATIO, NOISE (RADIO), LIGHT TRANSMISSION, REFLECTORS,  
BROADBAND, AMPLIFIERS, OPTICS, MEASUREMENT, THEORY,  
EQUATIONS (U)

IDENTIFIERS: HETERODYNE (U)

THE PROPERTIES OF OPTICAL HETERODYNE DETECTION ARE ANALYZED AND MEASURED, USING A LASER AND TWYMAN-GREEN INTERFEROMETER. IT IS SHOWN THAT HETERODYNE AMPLIFICATION PRESERVES THE SIGNAL-TO-NOISE RATIO IN THE DETECTED DIFFERENCE FREQUENCY IN THE PRESENCE OF INCOHERENT NOISE AND THAT THE LIMITING NOISE OF THE SYSTEM IS PHOTOCURRENT SHOT NOISE. SUITABILITY OF THIS TECHNIQUE IS DEMONSTRATED FOR DIFFUSE AS WELL AS SPECULAR MIRRORS AND CORNER REFLECTORS AS WELL AS FLATS. VARIOUS TECHNIQUES OF MODULATION ARE DISCUSSED AND DEMONSTRATED, INCLUDING PHASE, AMPLITUDE AND SINGLE-SIDEBAND MODULATION. A METHOD IS DEVELOPED FOR THE DEMODULATION OF PHASE-MODULATED LIGHT. THE LIMITATIONS IMPOSED ON THE OPTICAL HETERODYNE TECHNIQUE BY THE TRANSMISSION PATH CONDITIONS ARE INVESTIGATED. SINGLE-SIDEBAND VS DOUBLE-DETECTION TECHNIQUES ARE COMPARED EXPERIMENTALLY, UNDER TURBULENT ATMOSPHERIC CONDITIONS. THE FORMER PROVES TO BE THE SUPERIOR TECHNIQUE. DESIGN AND CONSTRUCTION OF A FIELD INSTRUMENT EMBODYING THIS PRINCIPLE IS INITIATED. THE USES AND LIMITATIONS OF HETERODYNE DETECTION IN OPTICAL COMMUNICATIONS, DEMULTIPLEXING OF CHANNELS, DEMODULATION OF FM AND AM, DOPPLER AND DISPLACEMENT MEASUREMENTS, AND LASER STABILIZATION ARE DISCUSSED. RECOMMENDATIONS ARE MADE FOR FUTURE RESEARCH AND DEVELOPMENT. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-604 735

BEGE (J R M) CO ARLINGTON MASS

LASER BEAM ATTENUATION IN THE LOWER ATMOSPHERE, (U)

NOV 63 86P LANGER, R. M. ;

REPT. NO. 6331

CONTRACT: NOBS8A609

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, ELECTROMAGNETIC WAVES),  
(\*ELECTROMAGNETIC WAVES, ATTENUATION), (\*ATMOSPHERE,  
LIGHT TRANSMISSION), WAVE TRANSMISSION, CLOUDS,  
REFRACTIVE INDEX, AEROSOLS, SCATTERING, ABSORPTION,  
OPTICS (U)

SMALL ANGLE SPREADING, AEROSOL SCATTERING AND  
MOLECULAR ABSORPTION ARE CONSIDERED THE IMPORTANT  
MECHANISMS FOR THE WEAKENING OF A LASER BEAM IN THE  
OPEN ATMOSPHERE. THREE DIFFERENT TRANSMISSION LAWS  
ARE WORKED OUT FOR THESE THREE MECHANISMS. BOTH  
THE PHYSICAL PRINCIPLES AND THE NUMERICAL VALUES  
ENCOUNTERED IN THE LOWER ATMOSPHERE ARE DISCUSSED AND  
ILLUSTRATED. RANDOM DENSITY FLUCTUATIONS IN THE  
TURBULENT ATMOSPHERE ARE DISCUSSED AS THE CAUSE OF  
SMALL ANGULAR DEFLECTIONS IN A NARROW PENCIL OF  
LIGHT. BEAM ATTENUATION DUE TO ATMOSPHERIC AEROSOL  
SCATTERING IS TREATED FOR AN AEROSOL SIZE  
DISTRIBUTION DESCRIBED BY THE SUM OF TWO INVERSE  
POWERS OF THE DROPLET RADIUS. LASER BEAMS CAN HELP  
FIND THE PARAMETERS OF SUCH DISTRIBUTIONS.  
MOLECULAR ABSORPTION IS EXAMINED IN TERMS OF THE  
NARROW INFRARED LINES OF WATER VAPOUR. AN EFFORT  
IS MADE TO PRESENT THIS DIFFICULT TOPIC IN AS SIMPLE  
AND USEFUL A FORM AS IS COMPATIBLE WITH THE  
OBSERVATIONAL MATERIAL. THE FORMULAE ARE DESIGNED  
TO MAKE IT POSSIBLE TO ESTIMATE IN DETAIL HOW THE  
ATMOSPHERE WOULD WEAKEN A LASER BEAM UNDER A WIDE  
VARIETY OF CONDITIONS. IT IS FOUND THAT SOME  
EFFECTS ARE SERIOUS EVEN AT SHORT RANGES OF A FEW  
METERS, WHILE IN FAVOURABLE CIRCUMSTANCES, LASER  
SIGNALS WOULD NOT BE DRASTICALLY ATTENUATED OUT TO  
ANY PRACTICAL DISTANCE IN THE LOWER ATMOSPHERE.  
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-605 319

TECHNICAL OPERATIONS INC BURLINGTON MASS

INVESTIGATION OF COHERENT OPTICAL PROPAGATION. (U)

DESCRIPTIVE NOTE: FINAL REPT.

AUG 64 64P SKINNER, T. J. WHITNEY, R. E.

CONTRACT: AF30 602 2619

PROJ: 4519

TASK: 451905

MONITOR: RADC , TDR64 65

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, LIGHT TRANSMISSION), (\*LIGHT SIGNALS, PROPAGATION), (\*LIGHT COMMUNICATION SYSTEMS, LASERS), WAVEGUIDES, OPTICAL EQUIPMENT COMPONENTS, WAVEGUIDE BENDS, ALIGNMENT, FLEXIBLE COUPLINGS, PRISMS (OPTICS) (U)

THE REPORT DISCUSSES THE GUIDED PROPAGATION OF AN OPTICAL SIGNAL. THE BEAM-WAVEGUIDE WAS CHOSEN FOR CONSIDERATION BECAUSE OF ITS EXTREMELY LOW INTRINSIC LOSS. THESE INTRINSIC LOSSES, ALONG WITH MISALIGNMENT AND FEED LOSSES, ARE DERIVED. THE MISALIGNMENT LOSSES ARE HIGH. TO REDUCE THEM, A FLEXIBLE JOINT WAS DESIGNED THAT ALLOWS THE GUIDE TO FLEX WITHOUT INTRODUCING PROHIBITIVE LOSSES. ALTHOUGH MUCH WORK REMAINS TO BE DONE BEFORE A PRACTICAL OPTICAL WAVEGUIDE FOR LONG PATHS EXISTS, THE REPORT DEMONSTRATES THE FEASIBILITY OF THE BEAM-WAVEGUIDE. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-605 466

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

GAS AND LIQUID LASERS,

(U)

AUG 64 8P TSENG, CHAO-SHOU ;  
REPT. NO. FTD-TT-64-565

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF K'IO HSUEH TA  
CHUNG (CHINESE PEOPLE'S REPUBLIC) 1963, NO. 11, P.  
22-23.

DESCRIPTORS: (\*LASERS, REVIEWS), GASES, LIQUIDS, LIGHT  
COMMUNICATION SYSTEMS, CHINA (U)

A POPULARIZED REVIEW OF THE BASIC PRINCIPLES OF GAS  
AND LIQUID LASERS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-605 478

SYLVANIA ELECTRONIC SYSTEMS-WEST MOUNTAIN VIEW CALIF  
ELECTRONIC DEFENSE LABS

RESEARCH OF TECHNIQUES FOR LIGHT MODULATION  
DETECTION. PART I. AMPLITUDE DEMODULATORS.

(U)

DESCRIPTIVE NOTE: FINAL REPT. (PART 1), 15 MAY 62-15  
MAY 63,

JUN 64 136P MCMURTRY, B. J.; CANDES, D. F.;  
TARG, R.; SIEGMAN, A. F.;  
CONTRACT: AF33 657 8995  
PROJ: AF-4156  
TASK: 415610  
MONITOR: AFAL TDR-64-181-PT-1

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: ALSO SEE AD-410 264

DESCRIPTORS: (\*LIGHT, DEMODULATION), (\*AMPLITUDE  
MODULATION, LIGHT), (\*PHOTOTUBES, MICROWAVE EQUIPMENT),  
LIGHT COMMUNICATION SYSTEMS, TRAVELING WAVE TUBES,  
LASERS, BROADBAND, MICROWAVE FREQUENCY,  
PHOTOMULTIPLIERS, ELECTRON GUNS, LIGHT TRANSMISSION,  
VELOCITY, DEMODULATORS, NOISE (RADIO), ELECTRON DENSITY,  
PHOTOCATHODES, DESIGN, CONSTRUCTION, TESTS (U)  
IDENTIFIERS: TRAVELING-WAVE MICROWAVE PHOTOTUBES (U)

THE RESULTS OF A ONE-YEAR APPLIED RESEARCH PROGRAM  
ON THE DEMODULATION OF AMPLITUDE-MODULATED (AM)  
LIGHT ARE PRESENTED. SUFFICIENT INFORMATION IS  
PROVIDED FOR THE DETAILED UNDERSTANDING, DESIGN, AND  
USE OF TRAVELING-WAVE MICROWAVE PHOTOTUBES (TWPS).  
THE MOST PROMISING DETECTOR FOR BROADBAND-MODULATED  
LIGHT. THE REPORT INCLUDES: (1) THE IDEALIZED  
ANALYSIS WHICH FIRST POINTED OUT THE MORE IMPORTANT  
TWP DESIGN CONSIDERATIONS AND OPERATING  
CHARACTERISTICS; (2) A MORE COMPLETE  
COMPUTERAIDED ANALYSIS WHICH GIVES DETAILED  
INFORMATION ON THE EFFECTS OF THE VARIOUS BEAM-  
CIRCUIT PARAMETERS AND OPERATING CONDITIONS; AND  
(3) AN ANALYSIS OF THE ELECTRON GUN REGION, WITH  
EMPHASIS ON VELOCITY SPREAD AND CURRENT DENSITY  
EFFECTS. THE RESULTS OF A DETAILED EXPERIMENTAL  
ANALYSIS OF THE TWP ARE PRESENTED, PROVIDING BOTH  
VERIFICATION OF THE MORE COMPLETE THEORETICAL  
TREATMENT AND INFORMATION ON GENERALLY-USEFUL  
PHOTODETECTOR TEST TECHNIQUES. EXPERIMENTAL DATA  
ARE GIVEN ON SEVERAL OTHER TYPES OF PHOTODETECTORS.

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-605 512

SYLVANIA ELECTRONIC SYSTEMS-WEST MOUNTAIN VIEW CALIF  
ELECTRONIC DEFENSE LABS

RESEARCH ON TECHNIQUES FOR LIGHT MODULATION  
DETECTION; PART II: FREQUENCY DEMODULATORS.

(U)

DESCRIPTIVE NOTE: FINAL REPT. 15 MAY 63-15 MAY 64,

JUN 64 256P

AMMANN, F. O. ; HARRIS, S. E. ;

TARG, R. ;

CONTRACT: AF 33(657)-8995, AF 04(695)-305

PROJ: AF-4156

TASK: 415610

MONITOR: AFAL TDR-64-181-P2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: STUDY MADE IN COOPERATION WITH  
STANFORD UNIV. UNDER CONTRACT TO AIR FORCE SYSTEMS  
COMMAND. SEE ALSO AD-605 478.

DESCRIPTORS: (\*LIGHT, DEMODULATION), (\*FREQUENCY  
MODULATION, LIGHT), (\*PHASE MODULATION, LIGHT),  
(\*PHOTOTUBES, MICROWAVE EQUIPMENT), LIGHT COMMUNICATION  
SYSTEMS, REFRACTION, DISCRIMINATORS, MICROWAVE  
FREQUENCY, DEMODULATORS, CRYSTALS, NOISE (RADIO),  
SIGNAL-TO-NOISE RATIO, LASERS, BROADBAND, DESIGN,  
CONSTRUCTION, TESTS

(U)

IDENTIFIERS: BIREFRINGENT DISCRIMINATORS, OPTICAL  
RATIO DETECTORS, HETERODYNE DETECTION

(U)

THE RESULTS OF A ONE-YEAR PROGRAM ON THE  
DEMODULATION OF FREQUENCY-MODULATED (FM) OR PHASE-  
MODULATED (PM) LIGHT ARE PRESENTED. THEORETICAL  
AND EXPERIMENTAL STUDIES WERE MADE BOTH OF DIRECT  
DEMODULATION AND HETERODYNE DEMODULATION. A  
TECHNIQUE EMPLOYING CONVERSION OF FM TO AM VIA A  
BIREFRINGENT DEVICE WITH SUBSEQUENT DETECTION BY A  
TRAVELING-WAVE PHOTOTUBE IS USED FOR THE DEMODULATION  
METHOD. THE REPORT DEALS WITH TECHNIQUES AND  
DEVICES FOR CONVERTING FM (AND PM) TO AM AT  
OPTICAL FREQUENCIES. COMPREHENSIVE ANALYSES AND  
DISCUSSIONS ARE GIVEN ON TWO SIMPLE BIREFRINGENT  
DEVICES, THE BIREFRINGENT DISCRIMINATOR AND THE  
OPTICAL RATIO DETECTOR, DEVICES CAPABLE OF CONVERTING  
FM TO AM AND PM TO AM, RESPECTIVELY. THE  
USE OF MULTICRYSTAL DEVICES IN DEMODULATORS IS  
TREATED. INCLUDED ARE TWO OPTICAL NETWORK  
SYNTHESIS TECHNIQUES FOR REALIZING BIREFRINGENT  
DEVICES HAVING ARBITRARILY SPECIFIED TRANSFER  
FUNCTIONS.

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-605 940

UNITED AIRCRAFT CORP EAST HARTFORD CONN

ULTRASONIC CONTROL OF LASER PERFORMANCE. (U)

DESCRIPTIVE NOTE: FINAL REPT. FOR 26 JUN 63-25 JUN 64,

SEP 64 64P DEMARIA, A. J. DANIELSON, G.

E. JR.;

REPT. NO. UNAIR-C-920083-12

CONTRACT: DA19 020AMC0170A

PROJ: IG6 22001A056 03 17

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*MODULATION, LASERS), (\*LASERS, CONTROL),  
(\*ULTRASONIC RADIATION, LASERS), GLASS, IMPURITIES,  
NEODYMIUM, REFRACTIVE INDEX, MECHANICAL WAVES, FEEDBACK,  
TUNNELING (ELECTRONICS), STANDING WAVE RATIOS,  
PERFORMANCE (ENGINEERING) (U)

THE REPORT DESCRIBES THE WORK PERFORMED ON A RESEARCH PROGRAM DIRECTED TOWARD DETERMINING THE OSCILLATION CHARACTERISTICS OF A LASER WHEN THE REFRACTIVE INDEX WITHIN THE FEEDBACK CAVITY IS PERTURBED BY MEANS OF ACOUSTIC, ELECTRIC, OR MAGNETIC FIELDS. THE LASER IS REPRESENTED IN TERMS OF A SYSTEM BLOCK DIAGRAM HAVING FORWARD AND FEEDBACK TRANSFER FUNCTIONS WHICH CAN BE VARIED IN A PERIODIC MANNER SO AS TO MODULATE THE OUTPUT OF THE QUANTUM DEVICE. THE MODIFICATION OF A LASER'S FEEDBACK TRANSFER FUNCTION BY AN ULTRASONIC-REFRACTION AND BY AN OPTICAL-TUNNELING SHUTTER HAS BEEN UTILIZED TO GATE THE LASER'S OUTPUT. EXPERIMENTS ARE REPORTED WHICH DEMONSTRATE THAT THE PERIODIC FLUCTUATION OF THE REFRACTIVE INDEX RESULTING FROM THE PROPAGATION OF FOCUSED ULTRASONIC ENERGY WITHIN A SOLID STATE LASER MEDIUM CAN BE UTILIZED AS A Q-SPOILER TO GATE THE OUTPUT OF HIGH GAIN LASERS WITHOUT THE INTRODUCTION OF LOSSY ELEMENTS INTO THE LASER'S FEEDBACK PATH. IN ADDITION, EXPERIMENTS ARE REPORTED WHICH REVEAL AN INCREASE IN THE ENERGY OUTPUT OF A NEODYMIUM DOPED LANTHANUM THORIUM BORATE GLASS ROD WHEN LONGITUDINAL ACOUSTICAL STANDING WAVES WERE PROPAGATED DOWN THE LENGTH OF THE GLASS ROD. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-606 219

STANFORD UNIV CALIF MICROWAVE LAB

PHOTOMIXING IN A BULK SEMICONDUCTOR  
PHOTODETECTOR.

(U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
AUG 64 75P WEAVER, J. N. ;  
REPT. NO. ML-1206  
CONTRACT: NONR-225(48), NSF-G-22929  
PROJ: NR373 361

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SUPPORTED IN PART BY THE U. S. ARMY  
SIGNAL CORPS AND U. S. AIR FORCE.

DESCRIPTORS: (\*LIGHT, DEMODULATION), (\*DEMODULATORS,  
LIGHT), (\*SEMICONDUCTOR DEVICES, CRYSTAL MIXERS),  
(\*PHOTOELECTRIC CELLS (SEMICONDUCTOR),  
PHOTOCONDUCTIVITY), SINGLE CRYSTALS, LASERS, MICROWAVE  
FREQUENCY, PHOTOELECTRIC EFFECT, ELECTRICAL PROPERTIES,  
VOLTAGE, ELECTRIC CURRENTS, THEORY, MATHEMATICAL  
ANALYSIS, EXPERIMENTAL DATA, DESIGN, CADMIUM ALLOYS,  
SELENIUM ALLOYS, SILICON, GALLIUM ALLOYS, ARSENIC  
ALLOYS (U)  
IDENTIFIERS: SEMICONDUCTOR PHOTODETECTORS (U)

THIS STUDY IS CONCERNED WITH BULK SEMICONDUCTORS AS  
DETECTORS OF THE DIFFERENCE FREQUENCY BETWEEN TWO OR  
MORE OPTICAL SIGNALS AND AS A DEMODULATOR OF  
MICROWAVE AM MODULATED LIGHT. THE BASIC  
EXPERIMENT CONSISTED OF MOUNTING SINGLE CRYSTALS OF  
CDSE, SI, AND GAAS IN A COAXIAL MOUNT AND  
ILLUMINATING THE CRYSTALS WITH THE BEAM OF SINGLE  
LASER. A DC BIAS VOLTAGE WAS APPLIED AND THE  
MICROWAVE AND DC PHOTOCURRENTS WERE MEASURED AS A  
FUNCTION OF LIGHT INTENSITY, BIAS VOLTAGE,  
TEMPERATURE, MICROWAVE MATCH, AND THE VARIOUS CRYSTAL  
SAMPLES. SOME OF THE EXPERIMENTAL PROBLEMS  
ENCOUNTERED ARE DISCUSSED. AN OUTLINE OF THE  
PERTINENT, SIMPLIFIED PHOTOCONDUCTOR THEORY IS  
PRESENTED ALONG WITH AN EQUIVALENT CIRCUIT FOR THE  
PHOTODETECTOR DEVICE. ALSO, THE SEMICONDUCTOR  
CAPTURE CROSS SECTION, LIFETIME, AND TRAP DENSITY IS  
CALCULATED FROM THE MEASURED VALUES OF PHOTOCURRENT.  
THE BULK SEMICONDUCTOR PHOTODETECTOR IS SHOWN TO BE  
A RUGGED, SIMPLE, AND INEXPENSIVE DEVICE FOR  
DETECTING OPTICAL BEAT FREQUENCIES, PARTICULARLY AT  
HIGH LIGHT LEVELS AND IN THE INFRARED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-607 487

NAVAL RESEARCH LAB WASHINGTON D C

EXPERIMENTAL OBSERVATIONS OF FORWARD SCATTERING OF  
LIGHT IN THE LOWER ATMOSPHERE. (U)

DESCRIPTIVE NOTE: INTERIM REPT.,

SEP 64 50P CURCIO, J. A. DRUMMETTER, L. F.

.JR.]

REPT. NO. NRL-6152

PROJ: RR004 02 42 5152

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT TRANSMISSION, SCATTERING),  
(\*ATMOSPHERE, LIGHT TRANSMISSION), (\*LIGHT,  
PROPAGATION), AEROSOLS, COMMUNICATION SYSTEMS, LASERS,  
AIR POLLUTION, RUBY (U)

THE REPORT DEALS IN PART WITH THE EXPERIMENTAL  
RESULTS FROM SEVEN MEASUREMENTS ON THE FORWARD  
SCATTERING OF LIGHT BY THE ATMOSPHERIC AEROSOL. IN  
ADDITION, CONSIDERATIONS OF THE PROBLEM OF DETECTING  
FORWARD SCATTERED LIGHT IN THE DAYTIME SHOW THAT  
ESTIMATED RESULTS AGREE WITH THE AVAILABLE  
EXPERIMENTAL DATA. CONSIDERATIONS OF THE  
FEASIBILITY OF USING OVER-THE-HORIZON PROPAGATION AS  
A COMMUNICATIONS LINK LEADS TO THE ESTIMATION THAT  
COMMUNICATION BETWEEN FIXED POINTS AT MORSE CODE  
RATES IS CURRENTLY FEASIBLE OVER RANGES OF THE ORDER  
OF 50 KM IN THE DAYTIME FOR METEOROLOGICAL RANGES OF  
16 KM OR MORE, USING A NARROW-BEAM PROJECTOR AS  
SOURCE. SHIP-TO-SHIP COMMUNICATION WOULD REQUIRE  
SOURCES OF VERY HIGH POWER OR PRECISE STABILIZATION  
AND POINTING OF EXISTING HIGH-INTENSITY SEARCHLIGHT  
SOURCES. (AUTHOR) (U)

UNCLASSIFIED

DNC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-607 852

STANFORD UNIV CALIF STANFORD ELECTRONICS LABS

TUNING OF CW LASERS OVER ANGSTROM BANDWIDTHS: SOME  
POSSIBLE APPROACHES. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. FOR JUN 63-JUN 64,

AUG 64 62P MORRIS, R. J. ;

REPT. NO. SEL-64-092 ,SEL-TR-0576-6

CONTRACT: AF 33(657)-11144

PROJ: AF-4036

TASK: 403602

MONITOR: AFAL TDR-64-227

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, TUNED AMPLIFIERS), (\*TUNED  
AMPLIFIERS, LASERS), TUNING DEVICES, SIGNALS, FREQUENCY  
SHIFT, DIFFRACTION, SOUND, CRYSTALS, MAGNETIC FIELDS,  
DOPPLER EFFECT, TEMPERATURE, PARTICLE BEAMS, FREQUENCY  
MODULATION, MICROWAVE FREQUENCY (U)

THIS REPORT IS AN INVESTIGATION OF SEVERAL  
APPROACHES TO THE PROBLEM OF OBTAINING CW COHERENT  
OPTICAL SIGNALS WHOSE WAVELENGTH CAN BE SCANNED IN A  
CONTROLLED FASHION OVER A RANGE OF APPROXIMATELY 1  
A OR MORE. THE METHODS DISCUSSED INCLUDE THE  
FOLLOWING INTERNAL TUNING METHODS: ZEEMAN TUNING;  
DIFFRACTION FROM ACOUSTIC WAVES; CRYSTAL STRAIN  
TUNING; THERMAL TUNING; TUNABLE MODE SELECTION IN  
WIDE LINES; AND DOPPLER-SHIFT TUNING USING A BEAM  
OF ACCELERATED PARTICLES. THE LAST METHOD LISTED  
IS BELIEVED TO BE A NOVEL SCHEME FOR LASER TUNING.  
FREQUENCY MODULATION USING MICROWAVE FREQUENCIES  
AND LARGE MODULATION INDICES IS ALSO DISCUSSED AS AN  
EXTERNAL TUNING METHOD. OF ALL THE APPROACHES, IT  
IS PROBABLY THE ONE THAT WILL PROVIDE THE SIMPLEST  
AND MOST EFFECTIVE SOLUTION. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-608 817

ARMY ELECTRONICS LABS FORT MONMOUTH N J

PULSE MODULATION OF AN ELECTRON INJECTION LASER  
TRANSMISSION SYSTEM,

(U)

52 3P SCHIEL, F. J. ; BULLWINKEL, E. C. ;  
GAMMARINO, R. R. ; ARMARA, J. F. ; WEBB, R. E. ;

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS, LASERS),  
(\*LASERS, LIGHT COMMUNICATION SYSTEMS), (\*COMMUNICATION  
SYSTEMS, LASERS), TURBULENCE, DISTORTION,  
AUDIOFREQUENCY, PULSE MODULATION, FOURIER ANALYSIS,  
DESIGN, SIGNAL-TO-NOISE RATIO, LIGHT TRANSMISSION,  
GASES, HELIUM, NEON (U)  
IDENTIFIERS: ELECTRON INJECTION LASERS (U)

AMPLITUDE MODULATION OF GAS LASERS IN CW  
OPERATION ARE EASILY ACHIEVABLE IN THE AUDIO  
FREQUENCY RANGE EITHER BY MODULATION OF THE RF PUMP  
POWER OR BY ELECTRO-OPTICAL OR PIEZOELECTRIC  
MODULATORS. IN INITIAL EXPERIMENTS A HE-NE GAS  
LASER (SPECTRA PHYSICS NR. 112) WITH  
HEMISPHERICAL RESONATOR ARRANGEMENT EMITTING AT 6328  
WAS EMPLOYED. PUMP MODULATION ALLOWED A MODULATION  
DEPTH OF THE EMITTED COHERENT RADIATION OF 100%  
WITH AN AVERAGE POWER OUTPUT OF THREE MILLIWATTS.  
THE LIGHT SIGNAL WAS COLLECTED IN A 4 FOOT  
TELESCOPE (QUESTAR) AND RECEIVED BY AN RCA 7265  
PHOTOMULTIPLIER. THIS EXPERIMENTAL SYSTEM WAS USED  
FOR THE TRANSMISSION OF ONE AUDIO CHANNEL. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-609 846

AIR FORCE CAMBRIDGE RESEARCH LABS L G HANSCOM FIELD  
MASS

APPLICATIONS OF LASERS.

(U)

DESCRIPTIVE NOTE: SPECIAL REPORTS,

NOV 64 43P STICKLEY, C. MARTIN ;

PROJ: 4645

MONITOR: AFCRL , AFCRL 64-914, SR15

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: A SHORTER VERSION OF A PAPER PREPARED  
FOR A SEMINAR ON LASERS HELD IN AUGUST 1964 AT NEW  
YORK CITY UNDER THE SPONSORSHIP OF THE EDUCATION AND  
RESEARCH ASSOCIATION.

DESCRIPTORS: (\*LASERS, SYMPOSIA), INSTRUMENTATION,  
COMMUNICATION SYSTEMS, SPACE COMMUNICATION SYSTEMS,  
METALLURGY, MACHINING, MEDICAL RESEARCH, BIOLOGY,  
RETINA, RUBY, TRACKING, ACOUSTICS, ROMAN SPECTROSCOPY,  
ELECTRON OPTICS, COMPUTERS, PHOTOGRAPHY, DEFENSE  
SYSTEMS

(U)

FUNDAMENTALLY THIS ARTICLE IS A SURVEY OF  
APPLICATIONS OF LASERS. THE APPLICATIONS ARE  
DIVIDED INTO SIX MAJOR AREAS: PRECISION  
MEASUREMENTS, COMMUNICATIONS, BIOLOGICAL AND MEDICAL,  
OTHER SCIENTIFIC AREAS, METALWORKING, AND  
MISCELLANEOUS. A TABLE OF THE BASIC  
CHARACTERISTICS OF THE MAJOR TYPES OF LASERS IS  
PROVIDED SO THAT THE USER CAN BE MADE AWARE OF THE  
LIMITATIONS AND CAPABILITIES OF LASERS. GOOD  
EXAMPLES OF APPLICATIONS IN EACH OF THESE AREAS ARE  
DESCRIBED IN SOME DETAIL TO ILLUSTRATE WHICH MAJOR  
PROPERTIES OF LASER RADIATION ARE USEFUL IN THAT  
PARTICULAR AREA. MOST OF THE DISCUSSION PERTAINS  
TO PRESENT-DAY APPLICATIONS BUT IN SOME INSTANCES  
WHAT APPEAR TO BE GOOD FUTURE APPLICATIONS ARE ALSO  
DESCRIBED. SEVENTY-TWO REFERENCES TO THE TECHNICAL  
LITERATURE THAT RELATE TO APPLICATIONS ARE PROVIDED.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-610 071

NAVAL ORDNANCE LAB WHITE OAK MD

TRANSMISSION OF GREEN LASER LIGHT (5300 Å) THROUGH WATER, (U)

SEP 64 29P MATLACK, D. F.; TEMPLIN, H. A.;  
TALBERT, W. W.;  
REPT. NO. NOLTR-64-179  
TASK: RUDC48000 212 1F001 05 02

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LIGHT TRANSMISSION, WATER), (\*LASERS, LIGHT TRANSMISSION), (\*WATER, LIGHT TRANSMISSION), NEODYMIUM, LIGHT, COLORS, ELECTROMAGNETIC WAVES, PROPAGATION, LIQUIDS, ATTENUATION, UNDERWATER COMMUNICATION SYSTEMS, MEASUREMENT, TEST METHODS, TEST EQUIPMENT, OPTICAL EQUIPMENT, NAVAL RESEARCH LABORATORIES, OPTICS, RANGE FINDING, UNDERWATER (U)

THE EXTINCTION COEFFICIENT OF FILTERED POTOMAC RIVER WATER WAS MEASURED AT THE FREQUENCY DOUBLED NEODYMIUM 'GREEN LASER' WAVELENGTH OF 5300 Å. MEASUREMENTS WERE CONDUCTED IN SITU AT THE DAVID TAYLOR MODEL BASIN (DTMB) IN A COOPERATIVE PROGRAM WITH THE NAVAL RESEARCH LABORATORY (NRL). EXTINCTION COEFFICIENTS OF 0.097, 0.104 AND 0.119/M WERE MEASURED ON 4, 5 AND 8 JUNE 1964, RESPECTIVELY. THE INCREASE IN ATTENUATION WITH TIME IS CONFIRMED BY FILTERED ARC LIGHT MEASUREMENTS MADE BY THE NRL AND IS ATTRIBUTED TO CONTAMINATION OF THE WATER AFTER THE BASIN FILTRATION SYSTEM WAS TURNED OFF. SCATTERING EXPERIMENTS INDICATE THAT THE AUREOLE EFFECT FOR THE HIGHLY COLLIMATED LASER BEAM WAS SMALL OVER THE 200 METER RANGE OF THE MEASUREMENTS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-610 130

LIBRARY OF CONGRESS WASHINGTON D C AEROSPACE TECHNOLOGY  
DIV

ELECTROMAGNETIC LIGHT WAVES IN COMMUNICATION  
ENGINEERING,

(U)

JAN 65 17P PROCHAZKA, MIROSLAV ;  
REPT. NO. ATD-T-65-2  
MONITOR: TT , 65 60830

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SVETELNE ELEKTROMAGNETICKE  
VLENENIVE SDELOVACI TECHNIKE, TRANS. OF SLABOPROUDY  
OBZOR (CZECHOSLOVAKIA) 1964, V. 25, NO. 6, P. 313-318.

DESCRIPTORS: (\*COMMUNICATION THEORY, LIGHT COMMUNICATION  
SYSTEMS), (\*LIGHT COMMUNICATION SYSTEMS, COMMUNICATION  
THEORY), (\*ELECTROMAGNETIC WAVES, PROPAGATION),  
(\*LASERS, LIGHT COMMUNICATION SYSTEMS), WAVE  
TRANSMISSION, LIGHT, MODULATION, OSCILLATION,  
DEMODULATORS, RADIO WAVES, QUANTUM MECHANICS, OPTICS,  
ELECTRIC CURRENTS, SIGNAL-TO-NOISE RATIO, ATMOSPHERE,  
METEOROLOGICAL PARAMETERS (U)

BASIC QUESTIONS RELATED TO THE USE OF LIGHT WAVES  
FOR TRANSMISSION OF INFORMATION ARE TREATED. THE  
GENERATION OF LIGHT WAVES, THEIR MODULATION, AND  
DETECTION ARE COVERED. MAIN EMPHASIS IS PLACED ON  
THE TRANSMISSION OF INFORMATION IN THE ATMOSPHERE  
UNDER NORMAL METEOROLOGICAL CONDITIONS AND BY MEANS  
OF LIGHT GUIDES. THE POSSIBILITY OF USING LIGHT  
WAVES FOR INFORMATION TRANSMISSION IN THE NEAR FUTURE  
IS CRITICALLY EVALUATED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-610 422

DELAWARE UNIV NEWARK

QUANTUM LIMITATIONS TO ELECTROMAGNETIC SIGNAL  
MEASUREMENTS.

(U)

DESCRIPTIVE NOTE: FINAL REPT. FOR 1 JAN 63-31 DEC 64.

DEC 64 15P BOLGIANO, L. PAUL, JR.:

CONTRACT: AF AFOSR2.63

MONITOR: AFOSR, 65 0028

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*COMMUNICATION THEORY, QUANTUM MECHANICS),

(\*PHOTOELECTRIC EFFECT, COMMUNICATION THEORY),

ELECTROMAGNETIC WAVES, COMMUNICATION SYSTEMS,

ILLUMINATION, LIGHT, SIGNALS, NARROWBAND, FOURIER

ANALYSIS, PROBABILITY, STATISTICAL ANALYSIS

(U)

IDENTIFIERS: OPTICAL COMMUNICATION SYSTEMS,

PHOTODETECTION

(U)

IT WAS FOUND POSSIBLE TO DEVELOP A MATHEMATICAL  
THEORY OF COMMUNICATION WHICH INCLUDES QUANTUM  
EFFECTS, AND AS IS ALSO IMPORTANT, REDUCES TO THE  
MATHEMATICS OF CLASSICAL COMMUNICATION THEORY WHEN  
QUANTUM EFFECTS CAN BE NEGLECTED. BECAUSE  
PHOTOELECTRIC DETECTION IS USED UNIVERSALLY AT  
OPTICAL FREQUENCIES, AND BECAUSE IT LENDS ITSELF TO A  
SIMPLER THEORETICAL DESCRIPTION, EARLIER PUBLICATIONS  
HAVE CONSIDERED THE STATISTICS OF PHOTO DETECTION -  
HOW THEY DIFFER FOR COHERENT AND INCOHERENT SIGNALS,  
AND THE CONSEQUENCES OF THESE DIFFERENCES FOR  
INFORMATION TRANSMISSION. THE WORK WAS  
CONCENTRATED IN TWO MAJOR AREAS: (A) STATISTICS  
OF PHOTODETECTION, AND (B) QUANTUM STATISTICAL  
ANALYSIS OF COMMUNICATION.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-612 725

PERKIN-ELMER CORP NORWALK CONN

INVESTIGATION OF TECHNIQUES FOR MODULATING AND  
SCANNING A LASER BEAM TO FORM A VISUAL DISPLAY. (U)

DESCRIPTIVE NOTE: FINAL REPT. FOR JUN 63-JUN 64,

JAN 65 353P YODER, PAUL R. ;

REPT. NO. ER-7600

CONTRACT: AF30 602 3122

PROJ: 5578

TASK: 557803

MONITOR: RADC , TDR-64-365

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, DISPLAY SYSTEMS), (\*DISPLAY  
SYSTEMS, LASERS), (\*ELECTRON OPTICS, LASERS), LIGHT,  
VIDEO SIGNALS, MODULATION, DEFLECTION, MODULATORS,  
CRYSTALS, POTASSIUM COMPOUNDS, HYDROGEN COMPOUNDS,  
PHOSPHATES, OPTICAL SCANNING, MIRRORS, BARIUM COMPOUNDS,  
TITANATES, SYNCHRONIZATION (ELECTRONICS), LIGHT  
COMMUNICATION SYSTEMS (U)

VARIOUS TECHNIQUES WHICH MIGHT BE USED TO MODULATE  
AND DEFLECT A LASER BEAM IN RESPONSE TO AN INPUT  
VIDEO SIGNAL SO AS TO FORM A PROJECTED VISUAL DISPLAY  
CONTAINING 1,000,000 RESOLVED INFORMATION BITS AT 30  
FRAMES PER SECOND ARE CONSIDERED IN THIS REPORT.  
ELECTRO-OPTICAL MODULATION TECHNIQUES ARE EVALUATED  
IN GENERAL AND THE POCKEL CELL USING POTASSIUM  
DIHYDROGEN PHOSPHATE IS CONSIDERED IN DETAIL. SLOW  
SCANNING OF THE BEAM AT 30 CYCLES PER SECOND IS FOUND  
TO BE FEASIBLE USING A PIEZOELECTRICALLY DRIVEN  
NODDING MIRROR SCANNER. SEVERAL FAST SCANNING  
TECHNIQUES ARE INVESTIGATED THEORETICALLY AND ONE  
TYPE DEVICE USING A PRISM OF BARIUM TITANATE ELECTRO-  
OPTICALLY ACTIVE CRYSTALLINE MATERIAL IS ALSO  
EVALUATED EXPERIMENTALLY. BRIEF CONSIDERATION OF  
PHOTOMETRIC AND SYNCHRONIZATION ASPECTS OF LASER  
DISPLAY SYSTEMS INDICATES NO PARTICULAR PROBLEM AREAS  
TO BE RESOLVED IN DEVELOPMENT OF ACTUAL HARDWARE  
SYSTEMS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z LW13

AD-614 042

LOCKHEED MISSILES AND SPACE CO PALO ALTO CALIF

TECHNICAL PROGRESS ON FUNDAMENTAL AND APPLIED  
RESEARCH PROGRAMS.

(U)

DESCRIPTIVE NOTE: PROGRESS REPT. FOR JAN-MAR65.

MAR 65 293P

REPT. NO. 6-75-65-10

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, SCIENTIFIC RESEARCH),  
(\*DOCUMENTATION, SCIENTIFIC RESEARCH), (\*ELECTRONICS,  
SCIENTIFIC RESEARCH), (\*PHYSICS, SCIENTIFIC RESEARCH),  
REPORTS, ELECTRONS, SCATTERING, PLASMA PHYSICS,  
ELECTROMAGNETIC WAVES, PROPAGATION, SOLID STATE PHYSICS,  
CESIUM, CRYSTALS, EXCITATION, SEMICONDUCTORS,  
SPECTROSCOPY, QUANTUM MECHANICS, MAGNETIC MATERIALS,  
FERROMAGNETIC MATERIALS, SUPERCONDUCTIVITY, MAGNETIC  
TAPE, LIQUIDS, INFORMATION RETRIEVAL, STORAGE TUBES,  
DISPLAY SYSTEMS, ELECTRONICS LABORATORIES, COMMUNICATION  
THEORY

(U)

CONTENTS: PHYSICAL ELECTRONICS, SOLID STATE  
PHYSICS, LIQUID STATE PHYSICS, INFORMATION  
SCIENCES, LASERS AND COMMUNICATION THEORY.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-614 870

F MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

X-BAND MODULATION OF GAAS LASERS, (U)

DEC 64 1P GOLDSTEIN, B. S. ; WEIGAND, R. M. ;

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PUB. IN PROCEEDINGS OF THE IEEE  
V53 N2 P195 FEB 1965 (COPIES NOT AVAILABLE TO DDC OR  
CLEARINGHOUSE CUSTOMERS).

DESCRIPTORS: (\*LASERS, AMPLITUDE MODULATION), X BAND,  
DIODES (SEMICONDUCTOR), GALLIUM ALLOYS, ARSENIC ALLOYS,  
INJECTION, TRAVELING-WAVE TUBES, COUPLING CIRCUITS,  
RADIOFREQUENCY POWER (U)

THIS CORRESPONDENCE REPORTS CW AMPLITUDE  
MODULATION OF GAAS INJECTION LASERS AT X BAND.  
THE HIGHEST MODULATION FREQUENCY WAS 11 GC/S, A  
LIMIT IMPOSED BY COMPONENTS OF THE EXPERIMENTAL  
SETUP. THE X-BAND MODULATING SIGNAL IS AMPLIFIED  
IN A TRAVELING-WAVE AMPLIFIER AND COUPLED TO THE  
LASER. TWO DIRECTIONAL COUPLERS MONITOR THE  
FORWARD AND REFLECTED RF POWER. THE RF POWER  
IS COUPLED TO THE LASER IN A WAVEGUIDE STRUCTURE.  
IN THIS STRUCTURE, THE COPPER FINS ACT AS A SHORT  
CIRCUIT TO THE X-BAND POWER WHILE THE MODULATED  
INFRARED RADIATION PASSES UNAFFECTED (NEGLECTING  
SOME BLOCKAGE). THE LASER, LOCATED BETWEEN TWO  
SECTIONS OF A COPPER POST, IS SPACED A HALF GUIDE  
WAVELENGTH (AT 9.1 GC/S) FROM THE RF  
SHORTCIRCUITING FINS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-617 717

NAVAL ORDNANCE TEST STATION CHINA LAKE CALIF

FABRY-PEROT TYPE LASER MODULATORS.

(U)

DESCRIPTIVE NOTE: TECHNICAL PROGRESS REPT. FOR JUL 63-  
JUL 64;

APR 65 45P MCCAULEY, DONALD G. ;  
REPT. NO. TPR-386 ;NOTS-TP-3736  
MONITOR: IDEP 461.85.00.00-X7-06

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, MODULATORS), (\*MODULATORS,  
LASERS), (\*INTERFEROMETERS, LASERS), (\*LIGHT  
COMMUNICATION SYSTEMS, LASERS), PIEZOELECTRIC  
EFFECT, OSCILLATION, QUARTZ, POTASSIUM COMPOUNDS,  
PHOSPHATES, COMMUNICATION SATELLITES(PASSIVE),  
CRYSTAL STRUCTURE, REFRACTIVE INDEX

(U)

IDENTIFIERS: ELECTRO-OPTIC EFFECT, FABRY-PEROT  
MODULATORS, POTASSIUM DIHYDROPHOSPHATE

(U)

THIS REPORT DESCRIBES THE OPTICAL CHARACTERISTICS  
OF TWO PROTOTYPE LASER MODULATORS HAVING THE THIN,  
FLAT, DISK-SHAPED FABRY-PEROT (F-P)  
INTERFEROMETER DESIGN. THE MODULATORS ARE BEING  
USED TO INVESTIGATE THE USE OF LASER RADIATION IN  
COMMUNICATIONS. THE REPORT DISCUSSES THE INTENSITY  
MODULATION RESULTING BOTH FROM THE  
CONVERSE PIEZOELECTRICALLY-INDUCED OSCILLATIONS IN THE  
PHYSICAL SEPARATION OF THE INTERFEROMETER REFLECTORS  
AND FROM THE ELECTROOPTICALLY-INDUCED OSCILLATIONS IN  
THE OPTICAL SEPARATION OF THE INTERFEROMETER  
REFLECTORS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-618 297

NORTHEASTERN UNIV BOSTON MASS

RESEARCH ON STORAGE DIODE LASERS.

(U)

DESCRIPTIVE NOTE: FINAL TECHNICAL SUMMARY REPT. FOR 1

APR 63-15 MAY 64,

MAY 64 2P

SEED, RICHARD G. HERGENROTHER,

KARL . ;

CONTRACT: NONR410602

PROJ: ARPA ORDER 306 62

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, DIODES(SEMICONDUCTOR)),

(\*DIODES(SEMICONDUCTOR), LASERS), CIRCUITS,

DESIGN, EFFECTIVENESS, CONFIGURATION,

CRYOGENICS, RANGE FINDING, LIGHT COMMUNICATION

SYSTEMS, LIGHT PULSES, GALLIUM COMPOUNDS,

ARSENIDES, GERMANIUM, SILICON

(U)

IDENTIFIERS: STORAGE DIODE LASERS

(U)

RESEARCH ON A PROPOSED STORAGE DIODE LASER IS DESCRIBED. THE OBJECTIVES ARE (1) COMPLETION OF DESIGN THEORY (2) BASIC PARAMETER MEASUREMENTS (3) EXPERIMENTAL PROOF (4) FABRICATION OF EFFECTIVE DEVICES. THE DESIRABILITY OF SUCH A DEVICE IN MANY POTENTIAL APPLICATIONS IS DISCUSSED. THE DESIGN THEORY IS PRESENTED IN DETAIL. FOUR POSSIBLE STORAGE DIODE LASER CONFIGURATIONS ARE DESCRIBED, OF WHICH THE MOST PROMISING INVOLVES A LOW CURRENT STORAGE PULSE AND HIGH CURRENT TRIGGER PULSE IN A LONG LIFETIME MATERIAL. THE POSSIBILITY OF OBTAINING LONG LIFETIME BY THE SHIFT FROM DIRECT TO INDIRECT TRANSITION IS DISCUSSED. NEGATIVE EXPERIMENTAL RESULTS WITH EXTREME HIGH CURRENT PULSES IN GERMANIUM AND SILICON ARE PRESENTED. REVERSE EMISSION OF GALLIUM ARSENIDE AND THE SHIFT OF THE ABSORPTION EDGE IN GERMANIUM ARE DESCRIBED. THE DESIGN OF DIODE LASER PULSERS IS REVIEWED IN GENERAL. THREE SPECIFIC CIRCUIT CONFIGURATIONS ARE PRESENTED. AN ELECTRICAL DOUBLE PULSER IS DESCRIBED. THE TECHNOLOGY OF IMAGE CONVERTERS AND COOLERS USED IS DESCRIBED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-621 053

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

OPTICAL COMMUNICATIONS;

(U)

JUN 65 11P CHIA-SUNG, LIU ;  
REPT. NO. FTD-TT-65-95  
MONITOR: TT , 65-63953

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF K'IO HSUEH TA  
CHUNG (CHINESE PEOPLE'S REPUBLIC) N2 P46-7, 64  
1964.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS, LASERS),  
(\*LASERS, LIGHT COMMUNICATION SYSTEMS), AMPLITUDE  
MODULATION, WAVEGUIDES, PHOTOMULTIPLIERS, CHINA,  
THEORY

(U)

A GENERAL DESCRIPTION OF THE THEORY AND  
APPLICATIONS OF OPTICAL COMMUNICATION SYSTEMS IS  
PRESENTED.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-621 114

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

SEMICONDUCTOR LASERS.

(U)

DESCRIPTIVE NOTE: MEETING SPEECH:

MAY 65 12P LAX, BENJAMIN ;

REPT. NO. MS-779E

CONTRACT: AF19 628 5167

MONITOR: ESD , TDR-65-319

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PUB. IN ANNALS OF THE NEW YORK  
ACADEMY OF SCIENCES, V122 ARTICLE2 P598-607 MAY 28  
1965 (COPIES NOT AVAILABLE TO DDC OR CLEARINGHOUSE  
CUSTOMERS).

DESCRIPTORS: (\*LASERS, DIODES(SEMICONDUCTORS)),  
(\*DIODES(SEMICONDUCTOR), LASERS), SEMICONDUCTOR  
DEVICES, GALLIUM ALLOYS, ARSENIC ALLOYS, MAGNETIC  
PROPERTIES, LIGHT COMMUNICATION SYSTEMS, INFRARED  
EQUIPMENT, RADAR EQUIPMENT

(U)

IDENTIFIERS: GALLIUM ARSENIDES

(U)

SEMICONDUCTOR LASERS ARE THE MOST RECENT ADDITIONS  
TO THE GROWING FAMILY OF THESE NEW COHERENT SOURCES  
OF LIGHT. ALTHOUGH THEIR CONCEPTION IS ALMOST TEN  
YEARS OLD, THE TECHNOLOGY WAS NOT SUFFICIENTLY  
ADVANCED UNTIL TWO YEARS AGO WHEN HIGHLY EFFICIENT  
LUMINESCENT DIODES OF GALLIUM ARSENIDE WERE  
DISCOVERED. THE DEVELOPMENT OF THE LASER ITSELF BY  
THE GROUPS AT GENERAL ELECTRIC, IBM, AND  
LINCOLN LABORATORY SHORTLY AFTERWARDS WAS READILY  
FORESEEN. TODAY THE PREOCCUPATION OF MANY  
INDUSTRIAL, UNIVERSITY, AND GOVERNMENT LABORATORIES  
WITH RESEARCH AND DEVELOPMENT HAS GIVEN RISE TO MANY  
PUBLICATIONS, WHICH INDICATE A LIVELY INTEREST AND  
PROMISING FUTURE FOR THESE DEVICES. THE ACTIVITY  
IS WELL BALANCED BETWEEN THE BASIC PHYSICS AND THE  
APPLIED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-621 204

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

PROPERTIES OF THE PBSE DIODE LASER,

(U)

JAN 65 4P BUTLER, JACK F. ; CALAWA,  
ARTHUR R. ; REDIKER, ROBERT H. ;  
REPT. NO. JA-2517  
CONTRACT: AF19 628 5167  
MONITOR: ESD, TDR-65-430

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PUB. IN IEEE JOURNAL OF QUANTUM  
ELECTRONICS, VQF-1 N1 P4-7 APR 1965. (COPIES NOT  
AVAILABLE TO DDC OR CLEARINGHOUSE CUSTOMERS).

DESCRIPTORS: (\*LASERS, DIODES(SEMICONDUCTOR)),  
(\*DIODES(SEMICONDUCTOR), LASERS), (\*LEAD ALLOYS,  
SELENIUM ALLOYS), INFRARED COMMUNICATION SYSTEMS,  
INFRARED WINDOWS, HAZE, ATTENUATION, CRYSTAL  
STRUCTURE, HEAT TREATMENT, INFRARED SPECTROSCOPY (U)

DIODE LASER ACTION HAS BEEN OBTAINED AT 8.5 MICRONS  
WITH PBSE. THIS LASER IS OF POTENTIAL INTEREST  
FOR TERRESTRIAL COMMUNICATIONS SINCE ITS EMISSION IS  
IN THE 8-TO-14MICRONS ATMOSPHERIC WINDOW, A SPECTRAL  
REGION OF HIGH ATMOSPHERIC TRANSPARENCY WHERE  
ATTENUATION DUE TO SCATTERING BY HAZE IS LOW.  
FABRICATION TECHNIQUES ARE DESCRIBED WHICH ARE  
BASED ON CONTROLLING CARRIER TYPE AND CONCENTRATION  
BY ADJUSTING THE PB:SE RATIO. BELOW THRESHOLD  
FOR LASER ACTION, THE EMISSION EXHIBITS TWO SPECTRAL  
PEAKS, ONE NEAR 8.5 MICRONS WHICH INCREASES  
SUPERLINEARLY WITH CURRENT AND ANOTHER NEAR 10.1  
MICRONS WHICH INCREASES SLOWLY WITH CURRENT. LASER  
ACTION ASSOCIATED WITH THE 8.5 MICRONS PEAK IS  
OBSERVED ABOVE A THRESHOLD CURRENT DENSITY OF 2000  
A 1/CM-SQ. FROM MEASUREMENTS WHICH DID NOT  
RESOLVE THE CAVITY MODE STRUCTURE, THE EMISSION PEAK  
WAS FOUND TO SHIFT TO HIGHER ENERGIES IN A (100)  
ORIENTED MAGNETIC FIELD AT THE RATE OF  $7.1 \times 10$  TO  
THE -8TH POWER EV PER GAUSS, OR 17 MC/S PER  
GAUSS. THIS IS THE EXPECTED SHIFT IF THE EMISSION  
IS ASSOCIATED WITH BAND-TO-BAND TRANSITIONS. THE  
THRESHOLD CURRENT DECREASED TO A FRACTION OF ITS ZERO  
FIELD VALUE IN A MAGNETIC FIELD OF APPROXIMATELY 10  
KILOGAUSS, THEN INCREASED SLOWLY WITH HIGHER FIELDS.  
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-622 575

UNITED AIRCRAFT CORP EAST HARTFORD CONN RESEARCH LABS

ULTRASONIC LASER MODULATION TECHNIQUES.

(U)

DESCRIPTIVE NOTE: FINAL REPT. FOR 1 JUL 64-30 JUN 65,  
JUN 65 133P DEMARIA, A. J. FLINCHBAUGH, D.

E. DANIELSON, G. E. JR.

REPT. NO. D920259-12

CONTRACT: DA28 043AMC00259E

PROJ: DA 1P622001A056

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: CONTINUATION OF CONTRACT DA19  
020AMC0170A. SEE ALSO AD-613 196.

DESCRIPTORS: (\*LASERS, MODULATION), (\*LIGHT  
TRANSMISSION, MODULATION), (\*ULTRASONIC RADIATION,  
MODULATORS), (\*MODULATORS, ULTRASONIC RADIATION),  
OPTICS, ACOUSTICS, REFRACTION, DIFFRACTION,  
MATHEMATICAL MODELS, ANALOG COMPUTERS,  
INTERFEROMETERS, NEODYMIUM, GLASS,  
OSCILLATORS

(U)

THE FEASIBILITY OF INTERNALLY MODULATING THE OUTPUT  
OF SOLID-STATE LASERS WITHOUT HAVING TO INSERT LOSSY  
ELEMENTS INTO THE FABRY-PEROT FEEDBACK  
INTERFEROMETER HAS BEEN DEMONSTRATED BY THE  
PROPAGATION OF FOCUSED ACOUSTIC WAVES WITHIN A GLASS  
LASER ROD. THESE STUDIES HAVE SHOWN THAT THE  
ESTABLISHMENT OF AN ALTERNATING CONVERGING/DIVERGING  
WAVEGUIDE EFFECT BY THE PROPAGATION OF ACOUSTIC WAVES  
WITHIN THE LASER INTERFEROMETER RESULTS IN GATING OF  
A ND(3+) GLASS LASER AT THE ACOUSTIC FREQUENCY,  
AN INCREASE IN OUTPUT ENERGY BY AS MUCH AS 100%,  
AND AN ABSENCE OF DISCRETE AXIAL MODES UNDER GATING  
CONDITIONS. THE COMPLEXITY OF THE INTEGRAL  
EQUATIONS DESCRIBING THE SLOPE AND TRAJECTORIES OF  
LIGHT RAYS TRAVERSING VARIOUS PERIODIC REFRACTIVE  
INDEX VARIATIONS GENERATED BY ACOUSTIC WAVES LED TO  
THE USE OF ANALOG COMPUTER TECHNIQUES FOR SOLVING  
THREE DIFFERENTIAL EQUATIONS FOR THE SLOPE AND  
TRAJECTORIES OF THE LIGHT RAYS. THE USE OF THE  
SLOPE SOLUTIONS FOR DESIGNING A FABRY-PEROT LASER  
INTERFEROMETER CONFIGURATION FOR PULSE SHAPING THE  
OUTPUT OF LASER OSCILLATORS IS DESCRIBED. THE  
TRAJECTORY SOLUTIONS DESCRIBE THE OPERATION OF THE  
CONVERGING-DIVERGING WAVEGUIDE MODULATION EFFECT  
WITHIN THE LASER'S INTERFEROMETER.

(U)

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DNC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-627 084 20/5 9/1 17/2  
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J ELECTRONIC  
COMPONENTS LAB

HIGH-POWER GALLIUM ARSENIDE LASER DIODES. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
OCT 65 24P WANDINGER, L. ; KLOHN, K. L. ;  
PROJ: DA-1P6-22001-A-056  
TASK: 1P6-22001-A-056-03  
MONITOR: ECOM , 2629

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, DIODES(SEMICONDUCTOR),  
(\*DIODES(SEMICONDUCTOR), LASERS), (\*GALLIUM  
ALLOYS, ARSENIC ALLOYS), PULSE COMMUNICATION  
SYSTEMS, PULSE MODULATION, INFRARED COMMUNICATION  
SYSTEMS, PERFORMANCE(ENGINEERING) (U)  
IDENTIFIERS: GALLIUM ARSENIDE (U)

THE ESSENTIAL FEATURES IN THE DESIGN, DEVELOPMENT,  
AND PERFORMANCE OF GAAS P-N JUNCTION LASER DIODES  
WITH HIGH OUTPUT IN THE COHERENT BEAM FOR APPLICATION  
IN SECURE COMMUNICATION SYSTEMS ARE DISCUSSED.  
AFTER A BRIEF REVIEW OF DEVICE DESIGN PRINCIPLES,  
THE TECHNOLOGY OF WAFER PREPARATION, DIFFUSION OF  
EXTREMELY PLANAR P-N JUNCTIONS AND THE FORMATION OF  
OHMIC, LOW RESISTANCE, AREA CONTACTS DEVELOPED AT  
THIS COMMAND IS PRESENTED. MEASUREMENT  
TECHNIQUES TO DETERMINE THE PERFORMANCE  
CHARACTERISTICS OF THESE LASERS SUCH AS THRESHOLD  
CURRENT DENSITY, OUTPUT POWER, EXTERNAL QUANTUM  
EFFICIENCY, SPECTRAL DISTRIBUTION AND LINEWIDTH OF  
EMITTED RADIATION ARE DISCUSSED. EXPERIMENTAL  
UNITS WITH A TOTAL AVERAGE POWER OUTPUT IN THE  
COHERENT BEAM OF MORE THAN THREE WATTS CORRESPONDING  
TO A QUANTUM EFFICIENCY OF 15 PERCENT HAVE BEEN MADE.  
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-627 266 14/5 20/5  
MICHIGAN UNIV ANN ARBOR

SYNTHETICAL METHODS IN ELECTRO-OPTICAL SCIENCE. (U)

DESCRIPTIVE NOTE: SEMI-ANNUAL REPT.,  
OCT 65 36P STROKE, GEORGE W. ;  
CONTRACT: NONR-1224(54)

UNCLASSIFIED REPORT

AVAILABILITY: PUBLISHED IN PHYSICS LETTERS V18 N2  
P116-8 15 AUG 1965. NATURE V208 N5016 P1159-62 18  
DEC 1965. AGARD PROCEEDINGS, N. A. T. O. MEETING,  
PARIS, FRANCE 6-9 SEP 1965. COPIES TO DDC USERS  
ONLY.

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*PHOTOGRAPHIC TECHNIQUES, LASERS),  
(\*OPTICAL IMAGES, SYNTHESIS), ELECTROOPTICS,  
LIGHT, PHASE MODULATION, INTERFEROMETERS,  
AMPLITUDE MODULATION, PHOTOGRAPHIC IMAGES,  
RESOLUTION, FOURIER ANALYSIS  
IDENTIFIERS: HOLOGRAPHY (U)  
(U)

THREE PAPERS ARE INCLUDED; THEIR TITLES ARE:  
OPTICAL IMAGE SYNTHESIS (COMPLEX AMPLITUDE  
ADDITION AND SUBTRACTION) BY HOLOGRAPHIC FOURIER  
TRANSFORMATION; RECONSTRUCTION OF PHASE OBJECTS BY  
HOLOGRAPHY; ELECTRO-OPTICAL IMAGE SYNTHESIS AND  
COMMUNICATIONS BY HOLOGRAPHIC (WAVE FRONT-  
RECONSTRUCTION) METHODS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-628 546 9/4 20/3  
DELAWARE UNIV NEWARK DEPT OF ELECTRICAL ENGINEERING

COMMUNICATION CHARACTERISTICS OF PHOTOELECTRIC  
DETECTION. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
JUN 64 68P DEAL, JOSEPH HAMILTON, JR.;  
REPT. NO. TR-Q41,  
CONTRACT: AF-AFOSR-2-63,  
MONITOR: AFOSR, 65-0027

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: MASTER'S THESIS.

DESCRIPTORS: (\*INFORMATION THEORY, PHOTOELECTRIC  
EFFECT), (\*PHOTOELECTRIC EFFECT, DEMODULATORS),  
(\*DEMOMULATORS, PHOTOELECTRIC EFFECT), SIGNAL TO-  
NOISE RATIO, LASERS, LIGHT COMMUNICATION SYSTEMS,  
WAVE FUNCTIONS, QUANTUM MECHANICS, THERMAL  
RADIATION, NOISE (RADIO) (U)  
IDENTIFIERS: OPTICAL FREQUENCY (U)

THE PROBABILISTIC NATURE OF THE PHOTOELECTRIC  
CONVERSION PROCESS AUGMENTS OTHER SOURCES OF NOISE IN  
LIMITING THE PRECISION WITH WHICH ELECTROMAGNETIC  
SIGNALS MAY BE MEASURED WITH A PHOTOELECTRIC  
DETECTOR. THIS REPORT DEVELOPS PROCEDURES FOR  
CONSIDERING THIS ADDED UNCERTAINTY IN SIGNAL  
MEASUREMENTS OF INTEREST FOR RADIO TYPE COMMUNICATION  
AT OPTICAL FREQUENCIES. A PROBABILISTIC MODEL OF AN  
IDEAL PHOTODETECTOR IS USED, IN CONJUNCTION WITH THE  
CLASSICAL WAVE THEORY OF THERMAL NOISE, TO COMPUTE  
UNCERTAINTIES ASSOCIATED WITH THE LACK OF  
PREDICTIBILITY INHERENT IN BOTH PHOTOELECTRIC  
CONVERSION AND THERMAL PROCESSES. IT IS SHOWN HOW  
THE UNCERTAINTY IN THE DETECTOR OUTPUT MAY BE  
CHARACTERIZED BY A SIGNAL-TO-NOISE RATIO, AND ALSO  
HOW DECISION CRITERIA FOR SIGNAL DETECTION MAY BE  
BASED ON THE PROBABILITY FUNCTIONS WHICH CHARACTERIZE  
THE DETECTOR OUTPUT. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-628 607

20/5

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

OPTICAL MISALIGNMENT DUE TO TEMPERATURE GRADIENTS IN  
ELECTROOPTIC MODULATOR CRYSTALS, (U)

APR 65

4P

LOSCOE, CLARIE ;METTE, HERBERT

UNCLASSIFIED REPORT

AVAILABILITY: PUBLISHED IN APPLIED OPTICS, V5 N1

P93-6 JAN 1966. COPIES TO DDC USERS ONLY.

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*ELECTROOPTICS, MODULATORS),  
(\*MODULATORS, MISALIGNMENT), (\*THERMAL PROPERTIES,  
MODULATORS), LASERS, CRYSTALS, LIGHT  
COMMUNICATION SYSTEMS, INDEX OF REFRACTION, THERMAL  
EXPANSION, QUARTZ (U)

A POSSIBLE SOURCE OF MISALIGNMENT OF LIGHT IN AN  
OPTICAL COMMUNICATION SYSTEM, UTILIZING ELECTROOPTIC  
MODULATORS, IS THE DEFLECTION OF THE LIGHT BEAM  
WITHIN THE MODULATOR CRYSTAL DUE TO TEMPERATURE  
GRADIENTS. THE PRESENT PAPER INVESTIGATES THE  
LIGHT DEFLECTION RESULTING FROM A LINEAR TEMPERATURE  
GRADIENT ACROSS VARIOUS MODULATOR CRYSTALS. THE  
TOTAL EFFECT IS FOUND TO BE THE SUM OF TWO  
CONTRIBUTIONS, ONE DUE TO THE CRYSTAL EXPANSION, THE  
OTHER DUE TO THE INDEX OF REFRACTION GRADIENT, AND IS  
FOUND TO BE SMALLER, BY THE FACTOR 10, IN QUARTZ THAN  
IN KDP. THE EXPERIMENTAL METHOD DESCRIBED PROVIDES  
ALSO A SIMPLE WAY OF DETERMINING  $dn/dT$  IN CRYSTALS  
FOR BOTH ORDINARY AND EXTRAORDINARY RAYS.  
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-629 473 17/2 22/1  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

A RED BEAM IN THE BLACK SKY, (U)

FEB 66 10P CHERNYSHEV, V. ;  
REPT. NO. FTD-TT-65-1683,  
MONITOR: TT , 66-60733

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: UNEDITED ROUGH DRAFT TRANS. FROM  
KRASNAYA ZVEZDA, (USSR) 14 MAR P1 1965.

DESCRIPTORS: (\*LASERS, SPACE COMMUNICATION SYSTEMS),  
(\*SPACE COMMUNICATION SYSTEMS, ASTRONAUTICS), SPACE  
FLIGHT, RUBY, ATMOSPHERE, SEMICONDUCTORS,  
USSR (U)

TRANSLATION OF RUSSIAN RESEARCH: SPACE COMMUNICATION  
SYSTEMS; USE OF LASERS.

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-629 503 20/5 17/2  
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J ELECTRONIC  
COMPONENTS LAB

PULSE-CODE MODULATION MULTIPLEX TRANSMISSION OVER AN  
INJECTION LASER TRANSMISSION SYSTEM, (U)

OCT 65 2P SCHIEL, E. J. ; BULLWINKEL, E.  
C. ; WEIMER, R. B. ;

UNCLASSIFIED REPORT  
AVAILABILITY: PUBLISHED IN PROCEEDINGS OF THE IEEE  
V53 N12 P2140-1 DEC 1965. COPIES TO DDC USERS ONLY.

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, DATA TRANSMISSION SYSTEMS),  
(\*DATA TRANSMISSION SYSTEMS, LASERS), (\*PULSE CODE  
MODULATION, MULTIPLEX), LIGHT COMMUNICATION SYSTEMS (U)  
IDENTIFIERS: INJECTION LASERS (U)

REPRINT: PULSE-CODE MODULATION MULTIPLEX TRANSMISSION  
OVER AN INJECTION LASER TRANSMISSION SYSTEM.

UNCLASSIFIED

UDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-630 243 17/2 20/5 20/6  
LINCOLN LAB MASS INST OF TECH LEXINGTON

OPTICAL COMMUNICATIONS EMPLOYING SEMICONDUCTOR  
LASERS.

(U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
JUN 65 73P CHATTERTON, F. J. ;  
REPT. NO. TR-392,  
CONTRACT: AF 19(628)-500,  
MONITOR: ESD , TDR-65-232

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, LIGHT COMMUNICATION SYSTEMS),  
(\*LIGHT COMMUNICATION SYSTEMS, LASERS),  
(\*SEMICONDUCTORS, LASERS), LIGHT TRANSMISSION,  
ATMOSPHERE, FREQUENCY MODULATION, AMPLITUDE  
MODULATION, PULSE MODULATION, FIBER OPTICS,  
OPTICAL EQUIPMENT, NARROWBAND, CIRCUITS,  
ELECTRONIC EQUIPMENT, COMMUNICATION SYSTEMS  
IDENTIFIERS: OPTICAL COMMUNICATION SYSTEMS

(U)

(U)

THIS REPORT DISCUSSES THE DEVELOPMENT OF OPTICAL COMMUNICATIONS EMPLOYING SEMICONDUCTOR LASERS-BOTH NONCOHERENT AND COHERENT. THE LARGE MODULATION BANDWIDTH OBTAINABLE WITH THESE DEVICES PERMITS THE DEVELOPMENT OF FREQUENCY- AND PULSE-MODULATION COMMUNICATIONS SYSTEMS WHICH OVERCOME SCINTILLATION NOISE PRODUCED BY THE TURBULENT ATMOSPHERE. EMPHASIS HAS BEEN PLACED ON THE DEVELOPMENT OF COMMUNICATIONS SYSTEMS FOR 98-PERCENT WEATHER CAPABILITY OVER SHORT RANGES, RATHER THAN FAIRWEATHER CAPABILITY OVER LONG RANGES. THE DEVELOPMENT OF SUPPORTING TECHNOLOGY IS PRESENTED IN THE AREAS OF SEMICONDUCTOR LASERS, FIBER OPTICS, OPTICAL SYSTEMS, NARROWBAND OPTICAL FILTERS, PHOTOMULTIPLIERS, AND FREQUENCY- AND PULSE-MODULATION ELECTRONIC CIRCUITRY AND COMPONENTS. MEASUREMENTS OF OPTICAL SIGNALS OVER A TWO-MILE PATH UNDER A FULL VARIETY OF WEATHER CONDITIONS HAVE PERMITTED A COMPARATIVE EVALUATION OF AM, FM, AND PM SYSTEMS. THE RESULTS SHOW CLEARLY THE ADVANTAGE OF FREQUENCY MODULATION AND PULSE MODULATION. MEASUREMENTS OF PULSES TRANSMITTED APPRECIABLY BEYOND THE LIMITS OF VISIBILITY IN SMOG AND FOG INDICATE A CHANNEL BANDWIDTH, LIMITED BY SCATTER-MULTIPATHS, BUT OF THE ORDER OF 200 MCPS. AN ANALYSIS IS PRESENTED OF MULTIPLE-SCATTER PATHS AND SYSTEM DESIGN CONSIDERATIONS FOR THESE CONDITIONS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-631 168 17/2 20/5  
LINCOLN LAB MASS INST OF TECH LEXINGTON

SEMICONDUCTOR LASER COMMUNICATIONS THROUGH MULTIPLE-  
SCATTER PATHS, (U)

OCT 65 2P CHATTERTON, E. J. ;  
REPT. NO. JA-2664,  
CONTRACT: AF 19(628)-5167,  
MONITOR: ESC , TDR-66-150

UNCLASSIFIED REPORT  
AVAILABILITY: PUBLISHED IN PROCEEDINGS OF THE IEEE  
V53 N12 P2114-5 DEC 1965. COPIES TO DDC USERS ONLY.

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
\*LASERS), LIGHT TRANSMISSION, SCATTERING,  
AEROSOLS, ATMOSPHERIC MOTION, MODULATION, FIBER  
OPTICS, SEMICONDUCTOR DEVICES (U)

THE REPORT RELATES TO LIMITATIONS ON RANGE AND  
RELIABILITY OF WIDE-BAND LASER COMMUNICATIONS CAUSED  
BY ATMOSPHERIC TURBULENCE AND MULTIPLE-SCATTERING  
AEROSOLS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-635 749 17/2 20/5 9/1  
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

P-N JUNCTION LASERS FOR COMMUNICATION SYSTEMS. (U)

APR 65 7P WANDINGER, LOTHAR ;KLOHN,  
KENNETH L. ;

UNCLASSIFIED REPORT

AVAILABILITY: PUBLISHED IN IEEE TRANSACTIONS ON  
AEROSPACE AND ELECTRONIC SYSTEMS VAES-2 N3 P271-7  
MAY 1966.

SUPPLEMENTARY NOTE:

DESCRIPTORS: (\*LASERS, LIGHT COMMUNICATION SYSTEMS),  
(\*DIODES(SEMICONDUCTOR), LASERS), GALLIUM ALLOYS,  
ARSENIC ALLOYS, VOICE COMMUNICATION SYSTEMS,  
PUMPING(OPTICAL), PULSE MODULATION,  
COMMUNICATION EQUIPMENT, SEMICONDUCTORS (U)

SECURE GROUND-TO-GROUND COMMUNICATION LINKS,  
COMMUNICATION FROM SATELLITES AND SPACE PROBES, AND  
COHERENT OPTICAL LOGIC IN HIGH-SPEED INTEGRATED  
COMPUTERS LIE WITHIN THE REALM OF SEMICONDUCTOR  
SINGLE LASERS OR LASER ARRAYS. LASERS OF THIS TYPE  
HAVE THE ADVANTAGE OF EXTREMELY SMALL SIZE, EASE OF  
DIRECT MODULATION, AND HIGH EFFICIENCY. RUGGEDNESS  
AND SIMPLICITY OF PUMPING PROMISE HIGH RELIABILITY  
FOR MILITARY ELECTRONICS. A DISCUSSION IS  
PRESENTED ON DESIGN CONSIDERATIONS, TECHNOLOGICAL  
PROBLEMS, AND PERFORMANCE OF P-N JUNCTION LASERS FOR  
SHORT RANGE COMMUNICATION SYSTEMS. AFTER A BRIEF  
REVIEW OF FUNDAMENTAL PRINCIPLES FOR LASING ACTION IN  
SEMICONDUCTORS, AN ACCOUNT IS PRESENTED OF PREVIOUSLY  
UNPUBLISHED TECHNOLOGICAL PROCEDURES REQUIRED TO  
ACHIEVE GAAAS LASER DIODES WITH HIGH OUTPUT IN THE  
COHERENT BEAM AT A HIGH PULSE RATE REQUIRED TO  
OPERATE A PULSE CODE, MODULATED VOICE TRANSMISSION  
SYSTEM. A DESCRIPTION IS GIVEN OF WAFER  
PREPARATION, DIFFUSION OF EXTREMELY PLANAR P-N  
JUNCTIONS, AND THE FORMATION OF OHMIC, LOW-RESISTANCE  
AREA CONTACTS. MEASUREMENT TECHNIQUES TO DETERMINE  
THE PERFORMANCE CHARACTERISTICS OF THESE LASERS WITH  
RESPECT TO SUCH FACTORS AS THRESHOLD CURRENT DENSITY,  
MAXIMUM OUTPUT POWER, EXTERNAL QUANTUM EFFICIENCY,  
SPECTRAL DISTRIBUTION, AND LINEWIDTH OF EMITTED  
RADIATION ARE DISCUSSED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-642 514 20/5 20/12  
MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF ELECTRICAL  
ENGINEERING

EFFECTS OF PRESSURE ON A SEMICONDUCTOR LASER  
RADIATION. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
SEP 66 146P FILHO, JOSE ELLIS RIPPER ;  
REPT. NO. TR-5  
CONTRACT: DA-31-124-ARO(D)-92 ,NONR-1841(51)

UNCLASSIFIED REPORT

DESCRIPTORS: (\*SEMICONDUCTOR DEVICES, \*LASERS),  
(\*LEAD COMPOUNDS, \*BAND THEORY OF SOLIDS),  
SULFIDES, SELENIDES, TELLURIDES, GALLIUM ALLOYS,  
ARSENIC ALLOYS, PRESSURE, EMISSIVITY,  
MODULATION, MOMENTUM, DEFORMATION, POLARIZATION,  
GAIN, FREQUENCY, CARRIERS(SEMICONDUCTORS),  
ULTRASONIC RADIATION, DOPING (U)  
IDENTIFIERS: AUGMENTED PLANE WAVE METHODS, GALLIUM  
ARSENIDE, LEAD SELENIDE, LEAD SULFIDE, LEAD  
TELLURIDE, SEMICONDUCTOR LASERS (U)

THE RESULTS OF THE RELATIVISTIC APW CALCULATION  
OF THE BAND STRUCTURE, MOMENTUM MATRIX ELEMENTS AND  
DEFORMATION POTENTIALS OF THE LEAD SALTS ARE USED TO  
CALCULATE THE EFFECTS OF CONSTANT PRESSURE ON LASERS  
MADE OF THESE MATERIALS. BEHAVIOR OF THE  
FREQUENCY, POLARIZATION AND RELATIVE GAIN OF THESE  
LASERS ARE CALCULATED FOR SEVERAL DOPINGS, AND  
INJECTION LEVELS, WHEN ISOTROPIC AND UNIAXIAL  
PRESSURES ARE APPLIED. THE EFFECT OF SMALL DYNAMIC  
PRESSURE ON SEMICONDUCTOR LASERS IS ANALYZED,  
RESULTING IN A FREQUENCY MODULATION OF THE LASER  
RADIATION. AN EXPERIMENT CONFIRMING THIS ANALYSIS  
WAS PERFORMED. A 2 MC/S FREQUENCY MODULATION WAS  
INTRODUCED INTO A CW GAAS INJECTION LASER WITH AN  
ULTRASONIC WAVE. THIS MODULATION WAS THEN DETECTED  
WITH THE USE OF A FABRY-PEROT INTERFEROMETER. A  
THEORETICAL ANALYSIS OF THE LIMITATIONS OF THE  
METHOD OF MODULATION DEMONSTRATED ABOVE WAS CARRIED  
OUT WITH A REGARD TO ITS DEVICE APPLICATIONS.  
(AUTHOR) (U)

UNCLASSIFIED

DNC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-643 606 20/5

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

LASER.

(U)

NOV 66 20P ANG-JU, CHU ;  
REPT. NO. FTD-TT-65-1453  
MONITOR: TT 67-60190

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF TIEN TZU CHI  
SHU (CHINESE PEOPLE'S REPUBLIC) N3 P24-8 1964.

DESCRIPTORS: (\*LASERS, CHINA), PROPAGATION,  
SCIENTIFIC RESEARCH, RUBY, GASES, MODULATION

(U)

THE SIMILARITIES BETWEEN LIGHT AND ELECTROMAGNETIC  
WAVES ARE COMPARED. THE LASER OSCILLATOR IS  
DESCRIBED ALONG WITH LASER RADIATION. THE USE OF  
THE LASER IN SPACE RESEARCH, COMMUNICATION, MEDICINE,  
PHOTOGRAPHY, ETC., IS DESCRIBED. THE RUBY LASER  
AND A GASEOUS STATE LASER ARE DESCRIBED.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-643 959 20/5 1/2 17/2 17/8  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

LASER LIGHT ADVANCES IN AVIATION. (U)

SEP 66 16P CHIN, YEN YOU ;  
REPT. NO. FTD-TT-65-361

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF HANG K'UNG CHIH  
SHIH (CHINESE PEOPLE'S REPUBLIC) N7 P7-12  
1964.

DESCRIPTORS: (\*LASERS, AERONAUTICS), LIGHT  
COMMUNICATION SYSTEMS, OPTICAL TRACKING, OPDAR,  
OPTICAL EQUIPMENT, RANGE FINDING, CHINA (U)

THE ARTICLE EXAMINES LASER LIGHT ADVANCES IN THE  
FIELD OF AVIATION AND ITS APPLICATIONS IN  
COMMUNICATIONS, SEARCHING, TRACKING AND  
INTERCEPTION. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-645 640 9/4 17/2 20/5  
DELAWARE UNIV NEWARK DEPT OF ELECTRICAL ENGINEERING

QUANTUM LIMITATIONS TO ELECTROMAGNETIC SIGNAL  
MEASUREMENTS. (U)

DESCRIPTIVE NOTE: FINAL REPT.,  
DEC 66 20P BOLGIANO, L. PAUL ;  
CONTRACT: AF-AFOSR-2-65  
PROJ: AF-9768  
TASK: 976802  
MONITOR: AFOSR 67-0152

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-610 422.

DESCRIPTORS: (\*QUANTUM STATISTICS, \*INFORMATION  
THEORY), (\*FIELD THEORY, \*LIGHT COMMUNICATION  
SYSTEMS), ELECTROMAGNETIC WAVES, PHOTOELECTRIC  
EFFECT, LASERS, DETECTION (U)  
IDENTIFIERS: PHOTODETECTION, OPTICAL COMMUNICATION  
SYSTEMS (U)

THE REPORT DESCRIBES WORK ON THE DEVELOPMENT OF AN  
EFFECTIVE STATISTICAL COMMUNICATION THEORY FOR  
OPTICAL COMMUNICATIONS. PHOTODETECTION STATISTICS  
HAVE BEEN COMPUTED FOR AN OPTICAL ILLUMINATION  
CONSISTING OF A CW SIGNAL AND NARROWBAND NOISE AND A  
FORMULA OBTAINED FOR THE INFORMATION TRANSMITTABLE BY  
AN OPTICAL DETECTOR. QUANTUM ELECTRODYNAMICS HAS  
BEEN USED TO EVALUATE THE STATISTICS OF A NARROWBAND  
OPTICAL COMMUNICATION SYSTEM AND TO COMPUTE THE  
STATISTICS OF A COUPLED MODE SYSTEM. THE REPORT  
SUMMARIZES THIS WORK AND LISTS PUBLICATIONS DURING  
THE GRANT PERIOD. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-649 851 20/6 20/10  
BRANDEIS UNIV WALTHAM MASS DEPT OF PHYSICS

QUANTUM THEORY OF INTERNALLY MODULATED LASERS, (U)

FEB 67 132P TITTERTON, PAUL J. ;  
REPT. NO. SCIENTIFIC-4  
CONTRACT: AF 19(628)-5833  
PROJ: AF-4645  
TASK: 464502  
MONITOR: AFCRL 67-0119

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, MODULATION), (\*AMPLITUDE  
MODULATION, LASERS), (\*FREQUENCY MODULATION,  
LASERS), QUANTUM MECHANICS, RESONATORS, FIELD  
THEORY, GAIN, COHERENT RADIATION, THEORY,  
QUARTZ, POTASSIUM COMPOUNDS, PHOSPHATES,  
MODULATORS (U)  
IDENTIFIERS: POTASSIUM DIHYDROPHATE (U)

RECENT EXPERIMENTS HAVE REVEALED TWO DISTINCT MODES  
OF OPERATION OF THE INTERNALLY MODULATED LASER, THE  
AM AND FM MODES, EACH OF WHICH REMOVES ALMOST ALL  
RANDOM PHASE AND AMPLITUDE FLUCTUATIONS IN THE LASER  
OUTPUT. A QUANTUM THEORY OF THE MODULATION PROCESS  
IS DEVELOPED IN TERMS OF THE TRAVELLING WAVE MODES OF  
AN OPTICAL RESONATOR. THE THEORY PREDICTS THE  
EFFECT OF THE MODULATOR ON AN ARBITRARY WAVE PACKET  
OF ELECTROMAGNETIC ENERGY. A SATURATION ANALYSIS  
OF THE STEADY STATE OPERATION OF BOTH THE AM AND  
THE FM LASER IS PERFORMED IN AN EFFECTIVE LINEAR  
RESPONSE APPROXIMATION. EFFECTIVE GAIN CURVES ARE  
FOUND AND PLOTTED FOR MULTIMODE AM, SINGLE MODE  
AM AND SINGLE MODE FM CASES. EXPERIMENTS ARE  
SUGGESTED TO TEST DETAILS OF THE MODULATION PROCESS  
WHOSE EFFECTS ARE REVEALED BY THIS ANALYSIS.  
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-650 870 20/5  
H NU SYSTEMS INC MENLO PARK CALIF

LASER PARAMETER MEASUREMENTS HANDBOOK. VOLUME  
I.

(U)

DESCRIPTIVE NOTE: FINAL REPT.,  
FEB 67 387P HEARD, H. G. ;  
CONTRACT: AF 30(602)-3346  
PROJ: AF-5519  
TASK: 551903  
MONITOR: RADC TR-66-704-VOL-1

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-650 871, AD-650  
872.

DESCRIPTORS: (\*LASERS, HANDBOOKS), ELECTRICAL  
PROPERTIES, OPTICAL PROPERTIES, MEASUREMENT,  
COHERENT RADIATION, PROBES, TEST EQUIPMENT,  
ENERGY, POWER, CALORIMETRY, PHOTOCHEMISTRY,  
SPECTROSCOPY, REVIEWS

(U)

THE HANDBOOK IS A COMPENDIUM OF MEASUREMENT THAT  
ENCOMPASSES THE LASER TECHNOLOGY. IT INCLUDES A  
WEALTH OF INFORMATION GLEANED FROM OVER 650 ARTICLES  
SURVEYED IN AN EXHAUSTIVE LITERATURE SEARCH THAT  
REVIEWED AMERICAN AS WELL AS FOREIGN SCIENTIFIC  
JOURNALS, AND GOVERNMENT REPORTS. THE WORK  
CONTAINS THE CONTRIBUTIONS OF 37 AUTHORS WHOSE WORKS  
WERE EDITED TO CONFORM WITH THE TEXT AND ABRIDGED TO  
ELIMINATE REDUNDANCY. IT IS BELIEVED THAT THE TEXT  
TREATS ALL OF THE SIGNIFICANT LASER MEASUREMENT  
TECHNIQUES THAT HAVE BEEN PUBLISHED TO DATE IN THE  
AREAS OF BEAM SAMPLING, BEAM PARAMETERS, POWER,  
ENERGY, GAIN, WAVELENGTH, BANDWIDTH, STABILITY AND  
FREQUENCY STABILITY. THE TECHNIQUES OF MODULATION  
AND THE METHODS OF MEASUREMENT ARE TREATED AS ARE THE  
COMMUNICATION ASPECTS OF NOISE IN THE LASER SIGNAL  
SOURCE. THIS VOLUME CONTAINS CHAPTERS ENTITLED:  
LASER PARAMETERS AND MEASUREMENT; BEAM SAMPLING  
TECHNIQUES; MEASUREMENT OF BEAM PARAMETERS;  
MEASUREMENT OF ENERGY AND POWER.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-650 871 20/5  
H NU SYSTEMS INC MENLO PARK CALIF

LASER PARAMETER MEASUREMENTS HANDBOOK. VOLUME  
II. (U)

DESCRIPTIVE NOTE: FINAL REPT.,  
FEB 67 235P HEARD, H. G. I  
CONTRACT: AF 30(602)-3346  
PROJ: AF-5519  
TASK: 551903  
MONITOR: RANDC TR-66-704-VOL-2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-650 870, AD-650  
872.

DESCRIPTORS: (\*LASERS, HANDBOOKS), ELECTRICAL  
PROPERTIES, OPTICAL PROPERTIES, MEASUREMENT,  
COHERENT RADIATION, GAS LASERS, GAIN, PLASMA  
MEDIUM, ATOMIC ENERGY LEVELS, LINE SPECTRUM, TEST  
EQUIPMENT, MONOCHROMATIC LIGHT, SPECTROSCOPY,  
REVIEWS (U)

THE LASER PARAMETER MEASUREMENTS HANDBOOK  
IS A COMPENDIUM OF MEASUREMENT THAT ENCOMPASSES THE  
LASER TECHNOLOGY. IT INCLUDES A WEALTH OF  
INFORMATION GLEANED FROM OVER 650 ARTICLES SURVEYED  
IN AN EXHAUSTIVE LITERATURE SEARCH THAT REVIEWED  
AMERICAN AS WELL AS FOREIGN SCIENTIFIC JOURNALS,  
AND GOVERNMENT REPORTS. THIS WORK CONTAINS THE  
CONTRIBUTIONS OF 37 AUTHORS WHOSE WORKS WERE EDITED  
TO CONFORM WITH THE TEXT AND ABRIDGED TO ELIMINATE  
REDUNDANCY. IT IS BELIEVED THAT THE TEXT TREATS  
ALL OF THE SIGNIFICANT LASER MEASUREMENT TECHNIQUES  
THAT HAVE BEEN PUBLISHED TO DATE IN THE AREAS OF BEAM  
SAMPLING, BEAM PARAMETERS, POWER, ENERGY, GAIN,  
WAVELENGTH, BANDWIDTH, COHERENCE AND FREQUENCY  
STABILITY. THE TECHNIQUES OF MODULATION AND THE  
METHODS OF MEASUREMENT ARE TREATED AS ARE THE  
COMMUNICATION ASPECTS OF NOISE IN THE LASER SIGNAL  
SOURCE. THIS VOLUME CONTAINS CHAPTERS ENTITLED:  
MEASUREMENT OF GAIN PARAMETERS; MEASUREMENT OF  
WAVELENGTH. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-650 872 20/5  
H NU SYSTEMS INC MENLO PARK CALIF

LASER PARAMETER MEASUREMENTS HANDBOOK. VOLUME  
III.

(U)

DESCRIPTIVE NOTE: FINAL REPT.,  
FEB 67 296P HEARD, H. G. ;  
CONTRACT: AF 30(602)-3346  
PROJ: AF-5519  
TASK: 551903  
MONITOR: RADC TR-66-704-VOL-3

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-650 870, AD-650  
871.

DESCRIPTORS: (\*LASERS, HANDBOOKS), ELECTRICAL  
PROPERTIES, OPTICAL PROPERTIES, MEASUREMENT,  
COHERENT RADIATION, BANDWIDTH, LINE SPECTRUM,  
FLUORESCENCE, DOPPLER EFFECT, GAIN, GAS LASERS,  
INTERFEROMETERS, STABILITY, NOISE, MODULATION,  
PHOTONS, REVIEWS

(U)

THE HANDBOOK IS A COMPENDIUM OF MEASUREMENT THAT  
ENCOMPASSES THE LASER TECHNOLOGY. IT INCLUDES A  
WEALTH OF INFORMATION GLEANED FROM OVER 650 ARTICLES  
SURVEYED IN AN EXHAUSTIVE LITERATURE SEARCH THAT  
REVIEWED AMERICAN AS WELL AS FOREIGN SCIENTIFIC  
JOURNALS, AND GOVERNMENT REPORTS. THIS WORK  
CONTAINS THE CONTRIBUTIONS OF 37 AUTHORS WHOSE WORKS  
WERE EDITED TO CONFORM WITH THE TEXT AND ABRIDGED TO  
ELIMINATE REDUNDANCY. IT IS BELIEVED THAT THE TEXT  
TREATS ALL OF THE SIGNIFICANT LASER MEASUREMENT  
TECHNIQUES THAT HAVE BEEN PUBLISHED TO DATE IN THE  
AREAS OF BEAM SAMPLING; BEAM PARAMETERS; POWER,  
ENERGY; GAIN; WAVELENGTH; BANDWIDTH; COHERENCE AND  
FREQUENCY STABILITY. THE TECHNIQUES OF MODULATION  
AND THE METHODS OF MEASUREMENT ARE TREATED AS ARE THE  
COMMUNICATION ASPECTS OF NOISE IN THE LASER SIGNAL  
SOURCE. THIS VOLUME CONTAINS CHAPTERS ENTITLED:  
MEASUREMENT OF BANDWIDTH AND COHERENCE;  
MEASUREMENT OF FREQUENCY STABILITY; MEASUREMENT  
OF NOISE AND MODULATION OF LASER CARRIERS.

(U)

UNCLASSIFIED

DNC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-653 962 17/2 20/5

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

RAY PENETRATING INTO THE FUTURE ULTRADISTANT COSMIC  
COMMUNICATION LIGHT PULSES OF SATELLITES. (U)

FEB 67 13P ALEKSANDROV, N. I  
REPT. NO. FTD-HT-66-439  
MONITOR: TT 67-62146

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: LUCH, PRONIKAYUSHCHII V BUDUSHCHEF  
... , UNEDITED ROUGH DRAFT TRANS. OF NAUCHNO-  
TEKHNICHESKIE OBRSHCHESTVA SSSR, V6 N8 P41-3 1964.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
\*LASERS), SEMICONDUCTORS, GALLIUM ARSENIDES,  
RELATIVITY THEORY, SPACE COMMUNICATION SYSTEMS,  
SATELLITES (ARTIFICIAL) (U)

THE LENIN PRIZE FOR 1964 WAS PRESENTED TO  
ASSOCIATE MEMBER OF THE AN SSSR BENTSION  
VUL AND A LARGE GROUP OF COWORKERS FOR THE  
DEVELOPMENT OF A GALLIUM-ARSENIDE SEMICONDUCTOR  
LASER. THE SEMICONDUCTOR LASER IS ALMOST 100%  
EFFICIENT AND ITS MICROMINIATURE SIZE HOLDS GREAT  
PROMISE FOR USE IN COMPUTERS TO ACHIEVE SPEEDS OF  
TENS OF BILLIONS OF OPERATIONS PER SECOND. DIRECT  
COMMUNICATION OVER DISTANCES OF SEVERAL LIGHT YEARS  
IS CONSIDERED POSSIBLE WITH THE USE OF LASERS.  
SATELLITES CARRYING A LASER COULD BE EASILY SEEN  
AND ACCURATELY TRACKED BOTH DAY AND NIGHT.  
APPLICATIONS OF LASERS IN RADIO, TELEPHONE AND  
TELEVISION COMMUNICATIONS AND IN CHEMISTRY ARE  
MENTIONED. QUANTUM TECHNIQUES MAKE POSSIBLE A  
CONSTRUCTION OF CLOCKS ACCURATE TO ONE SECOND IN TEN  
THOUSAND YEARS WHICH COULD BE USED TO CONDUCT  
RELATIVITY EXPERIMENTS. USE OF THE LASER BEAM AS A  
METAL WORKING AND SURGICAL TOOL IS MENTIONED. LONG  
DISTANCE, HIGH-EFFICIENCY TRANSMISSION OF ENERGY BY  
LASER BEAM, ESPECIALLY IN SPACE WHERE THE ABSORBING  
AND SCATTERING EFFECTS OF THE ATMOSPHERE ARE AVOIDED,  
IS CONSIDERED ABSOLUTELY ESSENTIAL IN THE CONQUEST OF  
SPACE. DIRECT CONVERSION OF MATTER INTO ENERGY  
WITHOUT EXPLOSION IS POSSIBLE USING QUANTUM DEVICES.  
QUANTUM ENGINES MAY UTILIZE SOLAR ENERGY DURING  
SPACE FLIGHT. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-655 119 17/2 20/10 20/5  
PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF ELECTRICAL  
ENGINEERING

A QUANTUM STATISTICAL ANALYSIS OF A FREQUENCY  
MODULATED LASER COMMUNICATION SYSTEM.

(U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
APR 67 86P RUGGIERI, NEIL F. ;  
CONTRACT: DA-31-124-ARO(D)-383  
PROJ: DA-20014501B31E  
MONITOR: AROD 5659:3-E

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
LASERS); (\*LASERS; \*QUANTUM STATISTICS);  
FREQUENCY MODULATION; OSCILLATORS; DEMODULATION;  
PROBABILITY DENSITY FUNCTIONS; SIGNAL-TO-NOISE  
RATIO

(U)

IN THIS ANALYSIS THE QUANTUM STATISTICS OF THE  
RECEIVED SIGNAL OF A FREQUENCY MODULATED LASER  
COMMUNICATION SYSTEM ARE DERIVED. IN PARTICULAR  
THE DETECTION STATISTICS FOR HETERODYNE AND ELECTRIC  
FIELD DETECTION OF THE FREQUENCY MODULATED LASER BEAM  
ARE DETERMINED. THESE DETECTION STATISTICS ARE  
USED TO DEFINE A MEASURE OF THE COMMUNICATION SYSTEM  
PERFORMANCE IN TERMS OF A SIGNAL TO NOISE RATIO.  
THE DEVELOPMENT OF THE QUANTUM ELECTROMAGNETIC  
FIELD IN TERMS OF THE PHOTON ANNIHILATION EIGENSTATES  
IS THE BASIS FOR DETERMINING THESE STATISTICS. THE  
DERIVATION USED ACCOUNTS FOR FLUCTUATIONS IN THE  
CARRIER, FLUCTUATIONS DUE TO BACKGROUND RADIATION  
INTRODUCED AFTER MODULATION, FLUCTUATIONS DUE TO THE  
LOCAL LASER OSCILLATOR, AND ZERO POINT FIELD  
FLUCTUATIONS. THE RESULTS OF THIS ANALYSIS  
INDICATE THE PROBABILITY DISTRIBUTION FOR THE OPTICAL  
HETERODYNE DETECTION IS NOT A FAMILIAR ONE OF  
CLASSICAL COMMUNICATION THEORY, BUT IT IS OF THE FORM  
OF PROBABILITY DISTRIBUTION THAT SATISFIES  
EXPERIMENTALLY MEASURED PHOTOCOUNT STATISTICS OF  
UNMODULATED LASER RADIATION. THE PROBABILITY  
DISTRIBUTION FOR THE ELECTRIC FIELD INTENSITY  
DETECTION OF THE FREQUENCY MODULATED LASER BEAM IS  
THE FAMILIAR GAUSSIAN DISTRIBUTION. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-655 774      20/5      17/2      17/8      13/8  
14/5

AIR FORCE CAMBRIDGE RESEARCH LABS L G HANSCOM FIELD  
MASS

A BIBLIOGRAPHY OF LASER APPLICATIONS.

(U)

DESCRIPTIVE NOTE: SPECIAL REPORTS NO. 62,

APR 67 46P      STICKLEY, C. MARTIN ;

GINGRANDE, ARTHUR ;

REPT. NO. AFCRL-67-0223

PROJ: AF-4645

TASK: 464502

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, BIBLIOGRAPHIES),  
MEASUREMENT, LIGHT COMMUNICATION SYSTEMS, OPDAR,  
INSTRUMENTATION, CHEMISTRY, PHOTOGRAPHY,  
MATERIAL FORMING

(U)

THE BIBLIOGRAPHY OF LASER APPLICATIONS CONTAINS 644  
ENTRIES FROM THE OPEN LITERATURE FOR THE PERIOD 1961  
THROUGH SEPTEMBER 1966. THE ENTRIES ARE DIVIDED  
INTO THE FOLLOWING MAJOR AREAS: MECHANICAL  
MEASUREMENTS AND STANDARDS; COMMUNICATIONS  
APPLICATIONS; RADAR AND TRACKING APPLICATIONS;  
MILITARY APPLICATIONS; OPTICAL SIGNAL PROCESSING;  
INTERFEROMETRY AND TESTING OF OPTICAL COMPONENTS;  
APPLICATIONS TO SCIENTIFIC STUDIES; APPLICATIONS IN  
CHEMISTRY; PHOTOGRAPHIC APPLICATIONS; METALWORKING;  
AND MISCELLANEOUS APPLICATIONS. THE ENTRIES ARE  
FURTHER SUBDIVIDED INTO 78 OTHER CATEGORIES.  
APPLICATIONS IN MEDICAL AND BIOLOGICAL RESEARCH ARE  
NOT INCLUDED; COMPLETE COVERAGE IN THE OTHER AREAS IS  
NOT GUARANTEED. UNDER SOME TOPICS (DETECTION  
TECHNIQUES, SPECTROSCOPY, INTERACTION WITH ACOUSTIC  
WAVES, PLASMA DIAGNOSTICS, NONLINEAR OPTICS, GAS  
BREAKDOWN, FILTERING, HOLOGRAPHY) SO MUCH HAS BEEN  
PUBLISHED THAT ONLY REVIEW ARTICLES, ARTICLES OF  
MAJOR IMPORTANCE, AND VERY RECENT ARTICLES COULD BE  
INCLUDED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-658 175 20/5  
TRG INC MELVILLE N Y

MULTI-MODE HIGH ENERGY LASER TRANSMITTER. (U)

DESCRIPTIVE NOTE: INTERIM REPT.,  
AUG 67 95P POGODA, A. L. MCGUIRE, J.  
N. ;  
REPT. NO. TRG-086-IR-1  
CONTRACT: AF 33(615)-3888

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, \*TRANSMITTER-RECEIVERS),  
RUBY, ENERGY, Q METERS, AMPLIFIERS, DESIGN,  
OPERATION, BORESIGHTING, SERVOMECHANISMS,  
TELESCOPES, MULTIPLE OPERATION (U)

THE REPORT OUTLINES THE PROGRESS MADE TOWARD COMPLETION OF THE MULTI-MODE HIGH ENERGY LASER TRANSMITTER SYSTEM (MMHELTS) IN THE PERIOD FROM 6 SEPTEMBER 1966 THROUGH 15 MAY 1967. IN ADDITION, IT DISCUSSES DESIGN CHANGES REQUIRED FOR ENHANCEMENT OF THE OPERATION OF THE EQUIPMENT IN THE FIELD. AREAS WHICH TRG BELIEVE TO BE NECESSARY ADDITIONS AND/OR LOGICAL IMPROVEMENTS TO THE OPERATIONAL CAPABILITY OF THE OVERALL SYSTEM ARE DISCUSSED IN DETAIL. THE OVERALL CONFIGURATION OF THE HIGH ENERGY SYSTEM HAS NOT BEEN CHANGED FROM THAT IN THE DESIGN EXHIBIT, SUBMITTED TO WRIGHT-PATTERSON AIR FORCE BASE ON 1 SEPTEMBER 1966. THE RUBY LENGTH OF THE Q-SWITCHED SYSTEM, HOWEVER, HAS BEEN REDUCED TO A TOTAL OF 17 INCHES. THE OVERALL LENGTH HAS BEEN DIVIDED INTO ONE BREWSTER'S ANGLED 4 IN. Q-SWITCHED OSCILLATOR FOLLOWED BY 13 IN. OF ACTIVE AMPLIFIER. THE 13 IN. AMPLIFIER SECTION CONSISTS OF A 4 IN. CAVITY FOLLOWED BY A 9 IN. CAVITY BOTH OF WHICH ARE BREWSTER'S ANGLED. ALL RUBY RODS WILL REMAIN 15MM IN DIAMETER. THE STATUS OF THE DYNAMIC BORESIGHTING SYSTEM DEVELOPMENT EFFORT IS ALSO DISCUSSED HEREIN. (U)

(AUTHOR)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-658 382 20/5

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

LASERS IN SPACE, ON THE EARTH, AND UNDER WATER, (U)

APR 67 92P CHERNYSHEV, V. N. ;  
REPT. NO. FTD-MT-65-373  
MONITOR: TT 67-62867

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED MACHINE TRANS. OF MONO.  
LAZERY V KOSMOSE; NA ZEMLE I POD VODOI, MOSCOW,  
1964 P1-104.

DESCRIPTORS: (\*LASERS, OPTICAL EQUIPMENT),  
PARTICLE BEAMS, DESIGN, QUANTUM MECHANICS,  
GENERATORS, DETECTION, AMPLIFIERS, ENERGY, GAS  
LASERS, COMMUNICATION SYSTEMS, NAVIGATION,  
UNDERWATER, FIBER OPTICS, USSR (U)

THE WORKING PRINCIPLES ARE CONSIDERED OF QUANTUM-  
MECHANICAL GENERATORS AND AMPLIFIERS OF OPTICAL  
RANGE-LASERS. LASER DEVICES OF DIFFERENT TYPES AND  
ASSIGNMENTS ARE DISCUSSED. LASER RADIATION  
(ABROAD THEY ARE SOMETIMES CALLED 'DEATH RAYS')  
CAN BE USED NOT ONLY AS A WEAPON OF DESTRUCTION, BUT  
ALSO AS A MEANS OF SUPER-RANGE COMMUNICATION,  
DETECTION, AND NAVIGATION. THE PAMPHLET  
GENERALIZES EXTENSIVE BUT SEPARATED MATERIAL  
PUBLISHED IN DOMESTIC AND FOREIGN PERIODIC PRESS.  
THE WORK IS DESIGNED FOR READERS WITH SECONDARY  
EDUCATION, FAMILIAR WITH THE BASES OF RADIO  
ENGINEERING. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-659 738 20/5 20/6 20/12  
TEXAS UNIV AUSTIN LABS FOR ELECTRONICS AND RELATED  
SCIENCE RESEARCH

A UNIQUE LASER DETECTOR UTILIZING THE PHOTODIELECTRIC  
EFFECT IN COOLED SEMICONDUCTORS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
SEP 67 175P STONE, JACKIE L. ; HARTWIG,  
WILLIAM H. ;  
REPT. NO. TR-39  
CONTRACT: AF-AFOSR-766-67  
PROJ: AF-4751  
MONITOR: AFOSR 67-2138

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, \*DETECTORS),  
(\*COMMUNICATION EQUIPMENT, LASERS),  
(\*SEMICONDUCTORS, LASERS), ELECTROOPTICS,  
PHOTOCONDUCTIVITY, GERMANIUM, PHOTOELECTRIC  
MATERIALS, DIELECTRIC PROPERTIES, RELAXATION TIME,  
LIGHT, RESONANT FREQUENCY, SENSITIVITY,  
BANDWIDTH, SPECTRA (INFRARED), SPACE  
COMMUNICATION SYSTEMS (U)

A CHANGE IN THE REAL PART OF THE DIELECTRIC  
CONSTANT OF SEMICONDUCTORS IS OBSERVABLE AT 4.2K.  
THE DIELECTRIC PERTURBATION CAN BE OPTICALLY  
INDUCED AND SUBSEQUENTLY USED TO VARY THE RESONANT  
FREQUENCY OF A HIGH Q, SUPERCONDUCTING RE-ENTRANT  
CAVITY. THE FREQUENCY CHANGES ARE PREDICTABLE FROM  
A CLASSICAL TREATMENT OF THE COMPLEX DIELECTRIC  
CONSTANT IN THE PRESENCE OF OPTICAL AND THERMAL  
CARRIERS. A TRANSMISSION LINE EQUIVALENT CIRCUIT  
IS USED TO ACCURATELY PREDICT THE BEHAVIOR OF A  
PHOTODIELECTRIC DETECTOR. THE IMPORTANT PARAMETERS  
WHICH AFFECT THE PERFORMANCE OF THE DETECTOR ARE THE  
FREE CARRIER RELAXATION TIME, RECOMBINATION LIFETIME,  
THE UNLOADED CAVITY RESONANT FREQUENCY, SAMPLE  
THICKNESS, AND THE CAPACITIVE LOADING EFFECTS.  
THESE ARE REFERRED TO AS THE SENSITIVITY  
PARAMETERS. THE ULTIMATE FREQUENCY RESPONSE  
(I.E. THE RATE AT WHICH THE FREQUENCY CAN BE  
VARIED) IS SHOWN TO BE LIMITED BY THE FREE CARRIER  
LIFETIME IN THE SEMICONDUCTOR SAMPLE. THE  
PHOTODIELECTRIC RECEIVER IS USED IN THE DESIGN OF AN  
OPTICAL COMMUNICATIONS SYSTEM WHICH WAS USED TO  
DETECT VIDEO RATE, AMPLITUDE MODULATION OF A 9000A  
INFRARED LIGHT SOURCE, THREE SUCH SYSTEMS ARE  
DESCRIBED. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-664 197 9/5 20/12  
CALIFORNIA UNIV LOS ANGELES DEPT OF ENGINEERING

RESEARCH ON SOLID STATE HETERODYNE DETECTORS FOR  
ULTRASTABLE OPTICAL SOURCES. (U)

DESCRIPTIVE NOTE: ANNUAL REPT. 15 JUN 66-15 JUN 67,  
DEC 67 18P VISWANATHAN, C. R. ;  
REPT. NO. 67-57  
CONTRACT: DA-28-043-AMC-02341(E)  
PROJ: DA-1H6-22001-A-056  
TASK: 1H6-22001-A-056-03  
MONITOR: ECOM 02341-2

UNCLASSIFIED REPORT

DESCRIPTORS: (\*DEMODULATORS, SEMICONDUCTOR  
DEVICES), PHOTOELECTRIC EFFECT, SILICON, SILICON  
DIOXIDE, GOLD, BAND THEORY OF SOLIDS, RHENIUM,  
TUNGSTEN, MOLYBDENUM, OPTICAL EQUIPMENT,  
LASERS (U)  
IDENTIFIERS: OPTICAL DETECTORS, METAL OXIDE  
SEMICONDUCTORS (U)

PHOTO EMISSION FROM SOLID TO SOLID IN MOS  
STRUCTURES HAS BEEN STUDIED IN A SILICON-  
SILICON OXIDE-GOLD STRUCTURE. THIS STUDY GAVE  
INSIGHT INTO THE LOCATION OF THE SILICON DIOXIDE  
CONDUCTION BAND WITH RESPECT TO THE SILICON ENERGY  
BANDS. IT WAS ALSO FOUND THAT THE NUMBER OF TRAPS  
IS HIGHER IN P SAMPLES THAN IN N SAMPLES.  
PHOTOEMISSION FROM SOLIDS INTO VACUUM WAS STUDIED  
AND THE METHOD OF PERIODIC SCHOTTKY DEVIATION HAS  
BEEN USED AS A TOOL FOR EVALUATING SURFACE BARRIERS  
OF METALS. BY USING PHASE MATCHING INSTEAD OF  
AMPLITUDE MATCHING BETWEEN THE PREDICTED CURVE AND  
THE EXPERIMENTAL CURVE A BARRIER HEIGHT OF 7.4, 6.1  
AND 5.2 eV FOR RHENIUM, TUNGSTEN, AND  
MOLYBDENUM WAS OBTAINED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-665 584 20/5  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

LASER WITH MAXIMUM DEEP MODULATION OF RESONATOR  
QUALITY, (U)

AUG 67 10P STARUNOV, M. H. ;EROMKA, V.  
D. ;BONCHKOVSKII, V. Y. ;  
REPT. NO. FTD-HT-66-554

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: UNEDITED ROUGH DRAFT TRANS. OF  
UKRAYINSKYI FIZYCHNYI ZHURNAL (USSR), V11 N2 P217-8  
1966.

DESCRIPTORS: (\*LASERS, USSR), OPTICAL PROPERTIES,  
MODULATION, RESONATORS, CRYSTALS, RUBY,  
DIELECTRIC FILMS, RODS (U)  
IDENTIFIERS: Q-SWITCHING, TRANSLATIONS (U)

IN EARLIER EXPERIMENTS Q SWITCHING WAS USUALLY  
EFFECTED BY INTERRUPTING THE COUPLING BETWEEN THE  
ACTIVE ROD AND ONLY ONE RESONATOR MIRROR; THE REPORT  
INVESTIGATES THE PROPERTIES OF A LASER IN WHICH THE  
COUPLING WITH BOTH MIRRORS IS INTERRUPTED. AN  
ESTIMATE SHOWS THAT THE GAIN CAN BE INCREASED IN THIS  
CASE TO ALMOST THE THEORETICAL 50%. TWO VARIANTS  
OF SUCH A LASER WERE TESTED. TWO RUBY CRYSTALS  
EACH 24 CM LONG AND 1.25 CM IN DIAMETER WERE USED.  
ONE CRYSTAL OPERATED IN THE Q-SWITCHING MODE.  
THE ENDS OF THE CRYSTALS AND THE HYPOTENUSE FACES  
OF THE TOTAL-REFLECTION PRISMS WERE COATED WITH  
MGF2 AND CAF2 FILMS, RESPECTIVELY. THE  
RESONATOR COMPRISED ALTERNATING DIELECTRIC COATINGS  
OF CAF2 AND ZNS ON PLATE GLASS AND THE PRISM.  
THE PLATE WAS ROTATED AT 12,000 RPM. THE FOCUSED  
GIANT PULSE PRODUCED BREAKDOWN IN AIR.

(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-666 434 20/5  
ILLINOIS UNIV URBANA ANTENNA LAB

COHERENCE OF LASER RADIATION. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
DEC 67 54P BAYAZIT, YASAR NABI ;  
REPT. NO. TR-14, UIAL-67-9  
CONTRACT: AF 19(628)-3819  
PROJ: AF-5635  
TASK: 563502  
MONITOR: AFCRL 68-0035

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, \*COHERENT RADIATION),  
INTERFEROMETERS, LIGHT TRANSMISSION, MONOCHROMATIC  
LIGHT, PHOTOMULTIPLIERS, HELIUM, NEON, OPTICAL  
PROPERTIES (U)  
IDENTIFIERS: FABRY-PEROT RESONATORS (U)

THIS REPORT IS INTENDED TO BE A STUDY OF SOME OF  
THE ASPECTS OF THE COHERENCE PROPERTIES OF OPTICAL  
FIELDS AS THEY PROPAGATE THROUGH CERTAIN TYPE OF  
MEDIA. A MAJOR PART OF THIS REPORT DEALS WITH THE  
RESPONSE OF A FABRY-PEROT RESONATOR TO VARIOUS  
TYPES OF EXCITATION. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-668 713 20/6

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

INFRARED HETERODYNE DETECTION.

(U)

DESCRIPTIVE NOTE: JOURNAL ARTICLE,

OCT 67 11P

TEICH, MALVIN C. ;

REPT. NO. JA-3078

CONTRACT: AF 19(628)-5167

MONITOR: ESD TR-68-45

UNCLASSIFIED REPORT

AVAILABILITY: PUBLISHED IN PROCEEDINGS OF THE

IEEE, V56 N1 P37-46 JAN 1968.

SUPPLEMENTARY NOTE: REVISION OF REPORT DATED 10 AUG 67.

DESCRIPTORS: (\*INFRARED RADIATION, DETECTION),  
GAS LASERS, IRASERS, CARBON DIOXIDE, INFRARED  
DETECTORS, INFRARED PHOTOCONDUCTORS, PHOTODIODES,  
CRYOGENICS, OPDAR, INFRARED COMMUNICATION SYSTEMS,  
INFRARED SPECTROSCOPY, OPTIMIZATION

(U)

IDENTIFIERS: \*HETERODYNE DETECTION, INFRARED  
RADAR

(U)

HETERODYNE EXPERIMENTS HAVE BEEN PERFORMED IN THE  
MIDDLE INFRARED REGION OF THE ELECTROMAGNETIC  
SPECTRUM USING THE CO<sub>2</sub> LASER AS A RADIATION SOURCE.  
THEORETICALLY OPTIMUM OPERATION HAS BEEN ACHIEVED  
AT KHZ HETERODYNE FREQUENCIES USING PHOTOCONDUCTIVE  
GE:CU DETECTORS OPERATED AT 4K, AND AT KHZ  
AND MHZ FREQUENCIES USING PHOTOVOLTAIC DETECTORS AT  
77K. IN ACCORDANCE WITH THE THEORY, THE MINIMUM  
DETECTABLE POWER OBSERVED IS A FACTOR OF  $2/\eta$   
GREATER THAN THE THEORETICALLY PERFECT QUANTUM  
COUNTER. THE COEFFICIENT  $2/\eta$  VARIES FROM 5 TO 25  
FOR THE DETECTORS INVESTIGATED IN THIS STUDY. A  
COMPARISON IS MADE BETWEEN PHOTOCONDUCTIVE AND  
PHOTODIODE DETECTORS FOR HETERODYNE USE IN THE  
INFRARED, AND IT IS CONCLUDED THAT BOTH ARE USEFUL.  
HETERODYNE DETECTION AT 10.6 MICROMETERS IS  
EXPECTED TO BE USEFUL FOR COMMUNICATIONS  
APPLICATIONS, INFRARED RADAR, AND HETERODYNE  
SPECTROSCOPY. IT HAS PARTICULAR SIGNIFICANCE  
BECAUSE OF THE HIGH RADIATION POWER AVAILABLE FROM  
THE CO<sub>2</sub> LASER, AND BECAUSE OF THE 8 TO 14  
MICROMETER ATMOSPHERIC WINDOW. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-669 086 17/5 20/5  
ILLINOIS UNIV URBANA GASEOUS ELECTRONICS LAB

DYNAMICS OF OPTICAL MIXING IN A HE-NE LASER, (U)

FEB 68 42P MILLER, P. S. ; CHERRINGTON,  
B. E. ; VERDEYEN, J. T. ;  
CONTRACT: AF 33(615)-5248  
PROJ: AF-7073  
TASK: 707303  
MONITOR: ARL 68-0033

UNCLASSIFIED REPORT

DESCRIPTORS: (\*INFRARED DETECTORS, GAS LASERS),  
(\*GAS LASERS, ATOMIC ENERGY LEVELS), HELIUM,  
NEON, BANDWIDTH, AMPLITUDE MODULATION,  
EXCITATION, RESPONSE, PERTURBATION THEORY,  
MATHEMATICAL PREDICTION (U)  
IDENTIFIERS: OPTICAL MIXING, RESPONSE TIME,  
COMPUTER ANALYSIS (U)

THE DIFFERENCE FREQUENCY BETWEEN TWO 3.39 MICRON  
SIGNALS INJECTED INTO A 6328 A AND/OR 1.15 MICRON  
HE-NE LASER HAS BEEN DETECTED AS AN AMPLITUDE  
MODULATION OF THE 6328 A AND/OR 1.15 MICRON OUTPUT  
INTENSITY. EXPERIMENTAL MEASUREMENTS OF THE  
BANDWIDTH OF THIS DETECTION SCHEME HAVE BEEN MADE FOR  
A 6328 A LASER DETECTOR. IT IS SHOWN THAT THE  
FUNDAMENTAL EQUATIONS OF LASER ACTION PROPERLY  
PREDICT THE BEHAVIOR OF THE LASER DETECTOR AND  
INDICATE THE OPERATING CONDITIONS WHICH ARE NECESSARY  
IN ORDER TO ACHIEVE OPTIMUM BANDWIDTH. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-669 305 20/5

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

LIGHT - DETECTOR AND WEAPON.

(U)

NOV 67 92P KRASNOV, V. ;  
REPT. NO. FTD-HT-23-809-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: UNEDITED ROUGH DRAFT TRANS. OF MONO.  
SVET - LOKATOR, SVET - ORUZHIE, MOSCOW, 1964 P1-  
103.

DESCRIPTORS: (\*LASERS, USSR), QUANTUM MECHANICS,  
VISIBILITY, COHERENT RADIATION, INSTRUMENTATION,  
RUBY, PULSE SYSTEMS, GAS LASERS,  
PUMPING(OPTICAL), DEMODULATION,  
MARKS(PLANET), COMMUNICATION EQUIPMENT,  
GYROSCOPES, PREDICTIONS

(U)

A BEAM OF LIGHT FROM A QUANTUM GENERATOR IS A  
MILLION TIMES BRIGHTER THAN THE SUN AT THE SAME SOLID  
ANGLE. HAVING A HIGH CONCENTRATION OF ENERGY, THE  
BEAM OF A QUANTUM GENERATOR CAN EASILY PIERCE A THICK  
METAL PLATE, EVEN A DIAMOND. FOCUSED INTO A NEEDLE  
BEAM, THE WEAPON BECOMES A DEADLY WEAPON. USING  
THE BEAMS OF A QUANTUM GENERATOR, DIRECT  
COMMUNICATION WITH THE PLANETS AND THE STARS CAN BE  
ACHIEVED. SUCCESSFUL EXPERIMENTS WITH LIGHT-  
COMMUNICATIONS HAVE BEEN CONDUCTED ON EARTH.  
QUANTUM GENERATORS CAN BE USED ALSO AS OPTICAL  
LOCATORS. IN RANGE AND ACCURACY THEY ARE FAR  
BETTER THAN RADAR. IN 1962 OPTICAL DETECTION OF  
THE MOON WAS MADE. IT BECAME POSSIBLE TO EXAMINE  
IN DETAIL THE LUNAR SURFACE AND, IN THE FUTURE, OTHER  
PLANETS OF THE SOLAR SYSTEM. THE TREMENDOUS  
DENSITY OF THE ENERGY OF THE NEW BEAMS PERMIT THEIR  
WIDE USE IN VARIOUS TECHNOLOGIES. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-670 120 20/5  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

QUANTUM RADIOPHYSICS: SELECTED ARTICLES. (U)

SEP 67 87P  
REPT. NO. FTD-MT-67-31

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED MACHINE TRANS. OF AKADEMIYA  
NAUK SSSR. FIZICHESKII INSTITUT. TRUDY, V31 P74-  
112, 139-77 1965.

DESCRIPTORS: (\*LASERS, REPORTS), ATOMIC ENERGY  
LEVELS, LIGHT COMMUNICATION SYSTEMS, GAS LASERS,  
MASERS, PULSE SYSTEMS, MOLECULAR BEAMS,  
HYDROGEN, RUBY, EXCITATION, COHERENT RADIATION,  
USSR (U)

IDENTIFIERS: TRANSLATIONS, QUANTUM ELECTRONICS,  
ATOMIC BEAMS, COMPUTER ANALYSIS, FREQUENCY  
STANDARDS (U)

CONTENTS: REGENERATIVE OPTICAL QUANTUM  
AMPLIFIERS; CONDITIONS OF PULSATIONS OF EMISSION  
POWER OF QUANTUM GENERATORS; QUESTIONS OF  
CONSTRUCTION AND INVESTIGATION OF WORK OF QUANTUM  
GENERATOR ON BEAM OF HYDROGEN ATOMS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-671 596 17/2 20/5  
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

FREQUENCY-SHIFT KEYING LASER COMMUNICATION  
STUDIES.

(U)

DESCRIPTIVE NOTE: DOCTORAL THESIS,  
APR 68 144P SMITH, DONALD A. I  
REPT. NO. ECOM-2967  
PROJ: DA-1L0-13001-A91A  
TASK: 1L0-13001-A91A-56

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS, GAS  
LASERS), (\*GAS LASERS, \*FREQUENCY SHIFT KEYERS),  
(\*MODULATORS, GAS LASERS), HELIUM, NEON,  
DIGITAL SYSTEMS, FREQUENCY MODULATION,  
ELECTROOPTICS, POTASSIUM COMPOUNDS, BIREFRINGENCE,  
POLARIZATION, MATRIX ALGEBRA, SIGNAL-TO-NOISE  
RATIO, DIAGRAMS, THESES

(U)

IDENTIFIERS: POTASSIUM DIHYDROPHOSPHATE, \*LASER  
MODULATORS

(U)

A UNIQUE OPTICAL MODULATION AND DETECTION TECHNIQUE  
HAS EVOLVED FROM AN INVESTIGATION OF METHODS OF  
DIGITAL MODULATION, TRANSMISSION, AND DETECTION IN  
THE OPTICAL REGION. IN PARTICULAR A FREQUENCY-  
SHIFT KEYING LASER COMMUNICATION SYSTEM HAS BEEN  
DEMONSTRATED AND THE ADVANTAGES OF SUCH A SYSTEM HAVE  
BEEN SHOWN. A DETAILED THEORETICAL ANALYSIS OF  
ELECTROMAGNETIC-WAVE PROPAGATION IN AN ELECTROOPTIC  
CRYSTAL OF ARBITRARY ORIENTATION WAS DEVELOPED. IN  
TURN THE PARAMETERS FOR AN OPTICAL MODULATOR CAPABLE  
OF FREQUENCY-SHIFT KEYING AT A DIGITAL RATE WERE  
DETERMINED. BASED ON THIS ANALYSIS A LABORATORY  
COMMUNICATION SYSTEM INCORPORATING FSK MODULATION  
AND DETECTION CAPABILITIES WAS BUILT AND SUCCESSFULLY  
OPERATED. THE TRANSMITTER CONSISTS OF TWO HELIUM-  
NEON GAS LASERS OPERATING AT WAVELENGTHS OF 6328  
ANGSTROMS AND 11523 ANGSTROMS. THE TWO BEAMS  
ARE COMBINED AND PASS THROUGH THE KDP ELECTRO-OPTIC  
MODULATOR WHICH IS DRIVEN BY A DIGITAL VOLTAGE OF 100  
VOLTS PEAK AMPLITUDE. THE RECEIVER CONSISTS OF TWO  
PHOTODIODES, EACH DETECTING ONE OF THE WAVELENGTHS.  
THE DETECTED SIGNALS ARE PROCESSED BY DECISION  
CIRCUITRY TO RETRIEVE THE TRANSMITTED INFORMATION.  
TO EVALUATE THE PERFORMANCE OF AN OPTICAL FSK  
SYSTEM, ERROR RATE MEASUREMENTS WERE MADE IN A  
SIMULATED ATMOSPHERIC TYPE OF ENVIRONMENT AND  
COMPARED TO SIMILAR MEASUREMENTS MADE

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-672 301 17/2 20/6  
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J INST FOR  
EXPLORATORY RESEARCH

SELF-ALIGNING OPTICAL BEAM WAVEGUIDES, (U)

67 6P CHRISTIAN, J. ROBERT ; GOUBAU,  
GEORG ; MINK, J. W. ;

UNCLASSIFIED REPORT  
AVAILABILITY: PUB. IN IEEE JNL. OF QUANTUM  
ELECTRONICS, VQE3 N11 P498-503 NOV 1967.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
WAVEGUIDES), (\*LENSES, ALIGNMENT), LASERS,  
OPTICAL COATINGS, CONTROL SYSTEMS,  
TOLERANCES (MECHANICS), SEISMOLOGY (U)  
IDENTIFIERS: QUANTUM ELECTRONICS, AUTOMATIC  
CONTROL SYSTEMS, COMPUTER ANALYSIS (U)

PREVIOUS EXPERIMENTS WITH A LENS-TYPE BEAM  
WAVEGUIDE HAVE DEMONSTRATED THE APPLICABILITY OF SUCH  
GUIDES TO EFFICIENT LONG DISTANCE TRANSMISSION AT  
OPTICAL FREQUENCIES. IN PRACTICAL APPLICATIONS IT  
WILL BE NECESSARY TO AUTOMATICALLY COMPENSATE FOR  
MOVEMENTS OF THE GROUND WHICH WOULD MISALIGN THE  
GUIDE AND THUS CAUSE INCREASED TRANSMISSION LOSS.  
IN ORDER TO INVESTIGATE THE PRACTICABILITY OF  
'SELF-ALIGNING' OPTICAL BEAM WAVEGUIDES THE AVAILABLE  
EXPERIMENTAL GUIDE WAS MODIFIED BY ADDING A SENSING  
DEVICE AT EACH LENS WHICH INDICATES ANY DISPLACEMENT  
OF THE BEAM FROM THE LENS CENTER. THIS ALIGNMENT  
ACCURACY COULD BE GREATLY INCREASED, WHICH MIGHT BE  
OF INTEREST FOR GEOLOGICAL MEASUREMENTS CONCERNING  
MOVEMENTS IN THE EARTH'S CRUST. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-672 693 20/6 20/5 17/2  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

INVESTIGATION AND DEVELOPMENT OF OPTICAL MODULATORS  
(ISSLEDOVANIIE I RAZRABOTKA OPTICHESKIKH  
MODULYATOROV), (U)

OCT 67 12P PIRSHIN, I. V. ; KOBLOVA, M.  
M. ; KHLYSTOV, V. I. ; ANTONYANTS, E. V. ;  
REPT. NO. FT -MT-24-222-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED MACHINE TRANS. OF MONO.  
VSESOYUZNAYA NAUCHNAYA SESSIYA, POSVYASHENNAYA  
DNYU RADIO (NO. 22): SEKTSIYA KVANTOVOI  
ELEKTRONIKI (SCIENTIFIC AND TECHNICAL SOCIETY OF  
RADIO ENGINEERING AND ELECTRICAL COMMUNICATION.  
CENTRAL GOVERNMENT 22 ALL-UNION SCIENTIFIC  
SESSION, DEDICATED TO RADIO DAY. SECTION OF  
QUANTUM (ELECTRONICS), MOSCOW, 1966 P33-40.

DESCRIPTORS: (\*LASERS, \*MODULATORS), (\*LIGHT  
COMMUNICATION SYSTEMS, MODULATORS),  
INTERFEROMETERS, CRYSTALS, POTASSIUM COMPOUNDS,  
PHOSPHATES, POWER, OPTIMIZATION, THERMAL  
EXPANSION, MODULATION, TELEVISION COMMUNICATION  
SYSTEMS, USSR (U)

IDENTIFIERS: \*OPTICAL MODULATORS, \*LASER  
COMMUNICATION SYSTEMS, ELECTRO-OPTICAL SYSTEMS,  
TRANSLATIONS (U)

A DEVICE USING A SYMMETRICAL MICHAELSON  
INTERFEROMETER WITH DOUBLE REFLECTING DIAGONALLY CUT  
CRYSTALS IN THE ARMS WAS DEVELOPED. THE LATTER ARE  
CONTROLLED BY A FIELD AT RIGHT ANGLES TO THE  
DIRECTION OF PROPAGATION. THE POWER REQUIRED TO  
CONTROL THE MODULATOR CAN BE LOWERED BY INCREASING  
THE LENGTH OF THE CRYSTAL AND DECREASING ITS CROSS  
SECTION. DETAILS ON THE THERMAL EXPANSION OF  
VARIOUS PARTS AND MATERIALS ARE GIVEN AND THE EFFECTS  
OF EXPANSION ON MODULATOR OPERATION ARE DESCRIBED.  
THE MODULATOR WAS TESTED BETWEEN 0 AND 100 MC  
WITH A CONTROL VOLTAGE OF 15 V. THE MODEL WAS  
TESTED IN AN EXPERIMENTAL TRANSMISSION OF A  
TELEVISION PICTURE WITH THE AID OF A LASER BEAM. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-672 955 20/5 20/6 17/2  
RAND CORP SANTA MONICA CALIF

ELECTROMAGNETIC FIELD AND INTENSITY FLUCTUATIONS IN A  
WEAKLY INHOMOGENEOUS MEDIUM, (U)

JUL 68 40P YURA, H. T. ;  
REPT. NO. RM-5697-PR  
CONTRACT: F44620-67-C-0045

UNCLASSIFIED REPORT

DESCRIPTORS: (\*ELECTROMAGNETIC FIELDS,  
PROPAGATION), (\*COHERENT RADIATION,  
PROPAGATION), (\*LIGHT COMMUNICATION SYSTEMS,  
SCATTERING), REFRACTIVE INDEX, LASERS,  
TURBULENCE, GREEN'S FUNCTION, PERTURBATION THEORY,  
RADAR (U)  
IDENTIFIERS: RYTOV APPROXIMATION, MAXWELL'S  
EQUATIONS, WAVE EQUATIONS (U)

A SELF-CONSISTENT GREEN'S FUNCTION TECHNIQUE IS  
USED TO OBTAIN THE ELECTROMAGNETIC FIELD AND ITS  
CORRESPONDING INTENSITY TO SECOND ORDER IN THE INDEX  
OF REFRACTION FLUCTUATIONS. IT IS FOUND THAT FOR  
PROPAGATION DISTANCES LESS THAN A CRITICAL LENGTH,  
THE PERTURBATION METHOD GIVES VALID RESULTS. THE  
FIELD IS PRIMARILY COHERENT SINCE THE FLUCTUATIONS IN  
THE FIELD ARE SMALL. THE SOLUTION OBTAINED FOR THE  
FIELD IS ALSO SHOWN TO CONSERVE ENERGY. WHEN THE  
SOLUTION OBTAINED HERE IS COMPARED WITH THE RESULTS  
OF THE RYTOV APPROXIMATION, IT IS CONCLUDED THAT  
THE RYTOV APPROXIMATION IS NOT VALID FOR  
PROPAGATION DISTANCES EXCEEDING THE CRITICAL LENGTH.  
FOR THESE DISTANCES, THE PERTURBATION METHOD BREAKS  
DOWN; THE FIELD IS ESSENTIALLY INCOHERENT SINCE THE  
COHERENT COMPONENT OF THE FIELD IS EXPONENTIALLY  
SMALL. FOR THESE RANGE VALUES, A STATISTICAL  
ARGUMENT IS GIVEN TO OBTAIN INTENSITY STATISTICS. AND  
AN APPROXIMATE EXPRESSION VALID FOR ALL RANGE VALUES  
IS DERIVED FOR THE INTENSITY STATISTICS. THIS  
EXPRESSION IS FOUND TO BE IN GOOD AGREEMENT WITH  
EXPERIMENT. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-673 759 20/5  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

RECENT FOREIGN DEVELOPMENTS IN LASER TECHNOLOGY: (U)

AUG 67 26P HUANG WU-HAN,;  
REPT. NO. FTD-HT-67-216

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF K'O HSUEH T'UNG  
PAO (CHINESE PEOPLE'S REPUBLIC) N2 P166-174  
1965.

DESCRIPTORS: (\*LASERS, REVIEWS), MATERIALS,  
INSTRUMENTATION, RANGE FINDING, OPDAR, LIGHT  
COMMUNICATION SYSTEMS, INFRARED DETECTORS, CHINA (U)  
IDENTIFIERS: TRANSLATIONS (U)

A REVIEW IS GIVEN OF NON-CHINESE LASER  
TECHNOLOGY. TOPICS INCLUDE: THE SEARCH FOR  
LASING MATERIALS; IMPROVEMENT OF LASER SYSTEMS AND  
APPARATUS; HIGH-INTENSITY OPTICS; APPLICATION OF  
LASER TECHNIQUES (OPTICAL LOCATING, OPTICAL RADAR,  
INFRARED RECEIVING). (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-673 876 17/2 20/5 22/2  
AEROSPACE CORP EL SEGUNDO CALIF LAB OPERATIONS

DESIGN CONSIDERATIONS OF MULTIPLE LASER COMMUNICATION  
LINKS BETWEEN SYNCHRONOUS SATELLITE AND SEVERAL EARTH  
STATIONS, (U)

SEP 67 30P CHANG, N. C. ; BROCK, F. G.

REPT. NO. TR-0158(9230-02)-1  
CONTRACT: F04695-67-C-0158  
MONITOR: SAMSO TR-68-7

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, LIGHT COMMUNICATION  
SYSTEMS), (\*SYNCHRONOUS SATELLITES, \*LIGHT  
COMMUNICATION SYSTEMS), COMMUNICATION  
SATELLITES(ACTIVE), TELESCOPES, STABILITY,  
ATMOSPHERIC MOTION, SIGNAL-TO-NOISE RATIO, GAIN,  
SPACE-TO-SURFACE, BANDWIDTH, SECRET COMMUNICATION  
SYSTEMS (U)

SECURE AND PRIVATE MEGABIT-PER-SECOND COMMUNICATION  
LINKS BETWEEN A SATELLITE IN SYNCHRONOUS ORBIT AND  
SEVERAL GROUND STATIONS ARE DESIRED IN CERTAIN  
APPLICATIONS. THE HIGHLY DIRECTIONAL PROPERTY OF  
LASER BEAMS MAKES LASER WAVES AN APT CANDIDATE FOR  
THE CARRIER OF THE SYSTEM. THE LARGE POTENTIAL  
BANDWIDTH OF THE LASER SYSTEM CAN BE OF VALUE ALSO IN  
PROVIDING REDUNDANCY FOR RELIABILITY AND CODING FOR  
SECURITY. THE VERY DIRECTIONAL PROPERTY OF THE  
LASER BEAM, HOWEVER, PRESENTS PROBLEMS OF POINTING  
AND ACQUISITION. THESE PROBLEMS ARE PARTICULARLY  
SEVERE FOR THE CASE OF SIMULTANEOUS TRANSMISSION  
BETWEEN THE SATELLITE AND MULTIPLE GROUND TERMINALS.  
AN ADDITIONAL PROBLEM OF EFFICIENT OPTICAL ANTENNA  
GAIN ARISES FOR THIS CASE. RECENT ADVANCES IN  
HIGH-POWER, HIGHER-EFFICIENCY LASERS ENCOURAGE  
CONSIDERATION OF A LASER TRANSMITTER CONFIGURATION  
NOT PREVIOUSLY INVESTIGATED FOR MULTIPLE LINK  
COMMUNICATION OVER SYNCHRONOUS SATELLITE DISTANCES.  
IN THIS CONFIGURATION, A SATELLITE-BORNE LASER IS  
OPERATED IN A RELATIVELY HIGH-ORDER MODE.  
APPROPRIATE OPTICS ARE USED TO PROVIDE MULTIPLE  
LINKS, ONE LOBE OF THE BEAM FOR EACH LINK. ALSO  
MODE SWITCHING CAN PROVIDE ALTERNATIVE LINKS. THE  
GROUND TERMINALS ARE EACH EQUIPPED WITH SEPARATE  
LASERS. ASIDE FROM POOR ATMOSPHERIC SEEING,  
SATELLITE ATTITUDE STABILITY APPEARS TO BE THE KEY  
PERFORMANCE-LIMITING ELEMENT OF THE SYSTEM. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-674 085 17/2 20/5 9/4  
PENNSYLVANIA STATE UNIV UNIVERSITY PARK

SOME RESULTS ON ERROR RATES FOR A LASER BINARY  
COMMUNICATION SYSTEM, (U)

JAN 68 4P LACHS, GERARD ; JANKOWICH,  
EDWARD ;  
CONTRACT: DA-31-124-ARO(D)-383  
PROJ: DA-20014501831E  
MONITOR: AROD 5659:7

UNCLASSIFIED REPORT  
AVAILABILITY: PUB. IN PROCEEDINGS OF THE IEEE,  
V56 N4 P744-745 APR 68.  
SUPPLEMENTARY NOTE: REVISION OF REPORT DATED 11 DEC  
67.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
\*LASERS), ERRORS, PROBABILITY, SIGNAL-TO-NOISE  
RATIO, POWER (U)

THE PROBABILITY OF ERROR IS OBTAINED FOR A SIMPLE  
BUT FUNDAMENTAL FORM OF A LASER BINARY COMMUNICATION  
SYSTEM. THE RESULTS SHOW THAT THE PROBABILITY OF  
ERROR IS STRONGLY DEPENDENT UPON ABSOLUTE SIGNAL  
LEVEL AS WELL AS SIGNAL-TO-NOISE RATIO. (AUTHOR) (U)

UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-674 170 17/2 20/14  
ADVISORY GROUP FOR AERONAUTICAL RESEARCH AND DEVELOPMENT  
PARIS (FRANCE)

PROPAGATION FACTORS IN SPACE COMMUNICATIONS. (U)

DESCRIPTIVE NOTE: CONFERENCE PROCEEDINGS,  
67 553P BLACKBAND, W. T. I  
REPT. NO. AGARD-CP-3

UNCLASSIFIED REPORT  
AVAILABILITY: ADVISORY GROUP FOR AERONAUTICAL  
RESEARCH AND DEVELOPMENT, 7 RUE ANCELLE, 92  
NEUILLY-SUR-SEINE, PARIS (FRANCE).

DESCRIPTORS: (\*SPACE COMMUNICATION SYSTEMS,  
\*PROPAGATION), SYMPOSIA, IONOSPHERIC  
PROPAGATION, PLASMA SHEATH, REENTRY VEHICLES,  
RADIO WAVES, TROPOSPHERE, IONOSPHERE,  
ATMOSPHERIC REFRACTION, ATTENUATION, LASERS,  
COMMUNICATION SATELLITES (ACTIVE) (U)  
IDENTIFIERS: NATO (U)

THE IONOSPHERIC RESEARCH COMMITTEE OF THE  
AVIONICS PANEL OF AGARD/NATO HELD ITS TENTH  
ANNUAL SYMPOSIUM MEETING IN ROME 21-25 SEPTEMBER  
1965. THE SUBJECT CHOSEN FOR DISCUSSION WAS  
'PROPAGATION FACTORS IN SPACE COMMUNICATIONS'.  
THIS VOLUME PRESENTS THE FULL TEXT OF THOSE PAPERS  
WHICH HAVE NOT BEEN PRINTED ELSEWHERE AND ALSO AN  
ACCOUNT OF THE INFORMAL DISCUSSIONS WHICH FOLLOWED  
THE PRESENTATION OF THE PAPERS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-674 274 17/2 20/5  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

APPLICATIONS OF LASERS.

(U)

NOV 67 11P HSIANG CH'UN,  
REPT. NO. FTD-HT-23-1024-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF K'G HSUEH HUA  
FAO (CHINESE PEOPLE'S REPUBLIC) N1 P13-15 1963.

DESCRIPTORS: (\*LASERS, LIGHT COMMUNICATION  
SYSTEMS), (\*COMMUNICATION SYSTEMS, CHINA),  
OPDAR, SPACE COMMUNICATION SYSTEMS, MAPPING,  
UNDERWATER COMMUNICATION SYSTEMS, LIGHT  
TRANSMISSION, UNDERWATER TRACKING, ELECTRON  
ACCELERATORS, DETECTION  
IDENTIFIERS: TRANSLATIONS

(U)

(U)

LASERS CAN PRODUCE A LIGHT BEAM HAVING EXCELLENT  
DIRECTIVITY AND AN INTENSITY SEVERAL MILLION TIMES  
THE INTENSITY OF THE SUN. EXPERIMENTS PROVED THAT  
LASER BEAMS HAVE A BEAM SPREAD LESS THAN 30 CM FOR  
EVERY 1.5-KM PROPAGATION. RESEARCH IS UNDERWAY TO  
USE LASERS IN SPACE, SURFACE, AND UNDERWATER  
COMMUNICATIONS. LASERS WILL BE USED IN MILITARY  
DETECTION, MAPPING, COMPUTING TECHNOLOGY, AND SPACE  
NAVIGATION AND ALSO AS WEAPONS. WHEN LASERS ARE  
USED IN COMMUNICATIONS, THE AUDIO SIGNALS TO BE  
TRANSMITTED ARE USED TO MODULATE THE LIGHT BEAMS.  
THE MODULATED BEAMS ARE THEN TRANSMITTED BY AN  
OPTICAL TRANSMITTER. THE OPTICAL RECEIVER AT THE  
RECEIVING END WILL RECEIVE AND DEMODULATE THE  
INCOMING LIGHT SIGNALS. AN OPTICAL SYSTEM FOR  
SPACE COMMUNICATIONS USING SOLAR ENERGY FOR LASER  
PUMPING IS IN PROCESS OF DEVELOPMENT. OPTICAL  
RADARS REQUIRE A LOWER INPUT POWER THAN MICROWAVE  
RADARS. RESEARCH SHOWS THAT AN OPTICAL RADAR  
HAVING AN AVERAGE OUTPUT POWER OF 56 W IS CAPABLE OF  
DETECTING 2 SPACESHIPS 16,000 KM APART WITH AN  
ACCURACY APPROACHING  $1 \times 0.0001$ . A GROUND OPTICAL  
RADAR HAVING A 10-KM DETECTING RANGE WEIGHS ONLY 10  
KG. LASERS EMITTING BLUE LIGHT BEAMS ARE USED FOR  
UNDERWATER TRACKING AND INTERSUBMARINE  
COMMUNICATIONS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-674 349 17/2  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

CERTAIN DEMANDS ON THE OPTICAL FREQUENCY RECEIVERS IN  
COMMUNICATION SYSTEMS USING COHERENT LIGHT, (U)

NOV 67 16P HENG, CH'EN ;  
REPT. NO. FTD-HT-23-606-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF WU HSIFN TIEN  
CHI SHU (CHINESE PEOPLE'S REPUBLIC) N11 P12-17  
1965.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
DEMODULATION), LASERS, COHERENT RADIATION,  
SEMICONDUCTOR DEVICES, SIGNAL-TO-NOISE RATIO,  
PHOTOTUBES, PHOTOMULTIPLIERS, RESPONSE,  
EFFICIENCY, BANDWIDTH, INFRARED DETECTORS,  
CHINA

IDENTIFIERS: TRANSLATIONS, HETERODYNING

(U)  
(U)

THE DEVELOPMENT OF THE LASER AS A COHERENT,  
EXCELLENT MONOCHROMATIC AND HIGHLY DIRECTIONAL  
OPTICAL SIGNAL SOURCE HAS LED TO ITS POSSIBLE  
APPLICATION IN OPTICAL COMMUNICATION. THE OBJECT  
OF THIS PAPER IS TO SET FORTH SOME SPECIAL  
REQUIREMENTS OF LIGHT DEMODULATORS FOR COHERENT LIGHT  
OPTICAL COMMUNICATION. LIGHT DEMODULATORS OPERATE  
IN A MANNER SIMILAR TO RADIO RECEIVERS, EXCEPT THAT  
THEY REQUIRE THE CONVERSION OF LIGHT INPUT TO  
PHOTOCURRENT AND THEIR NOISE HAS STRONG QUANTUM  
CHARACTERISTICS. GENERAL REQUIREMENTS FOR LIGHT  
DEMODULATORS ARE HIGH SENSITIVITY AND A HIGH SIGNAL  
TO NOISE RATIO. IN AN OPTICAL COMMUNICATION  
SYSTEM, THE PREFERRED MODULATION FREQUENCIES AND BAND  
WIDTHS ARE IN THE INFRA-RED RANGE AND HIGHER. SOME  
SEMICONDUCTORS ARE PROMISING FOR USE IN DEMODULATORS  
OPERATING IN THE INFRA-RED RANGE, BUT THEY DO NOT  
COMPLETELY FULFILL THE OTHER REQUIREMENTS. AMONG  
LIGHT DETECTION METHODS THAT CAN BE USED, OPTICAL  
HETERODYNING APPEARS TO BE OF PARTICULAR IMPORTANCE. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

DA-675 075 2076  
CALIFORNIA UNIV BERKELEY

PHASE MODULATION OF Q-SWITCHED LASER BEAMS IN SMALL-  
SCALE FILAMENTS, (U)

FEB 68 7P CHEUNG, A. C. FRANK, D. M.  
; CHIAO, R. Y. ; TOWNES, C. H. ;  
CONTRACT: DA-ARO(D)-31-124-G976, ARPA ORDER-675  
MONITOR: AROD 7778:1

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN PHYSICAL REVIEW LETTERS,  
V20 N15 P786-789, 8 APR 68.

DESCRIPTORS: (\*COHERENT RADIATION, \*PHASE  
MODULATION), CARBON COMPOUNDS, SULFIDES, LIGHT  
PULSES, BAND SPECTRUM, REFRACTIVE INDEX, LASERS,  
SIDEBANDS (U)  
IDENTIFIERS: Q-SWITCHING, CARBON DISULFIDE (U)

THE SPECTRA OF SMALL-SCALE TRAPPED FILAMENTS OF  
LASER LIGHT IN CARBON DISULFIDE AND OTHER LIQUIDS  
CONTAIN DISCRETE BANDS OF FREQUENCIES EXTENDING TO  
EITHER SIDE OF THE LASER FREQUENCY. THE REGULARITY  
OF THESE PATTERNS, AND YET THE LACK OF A FIXED  
FREQUENCY BETWEEN BANDS AS EXPECTED FOR VARIOUS  
MODULATION PROCESSES, HAVE BEEN PUZZLING. IT IS  
FOUND THAT THE PATTERNS OBSERVED CORRESPOND TO THE  
INTENSITY ENVELOPE OF AN UNDERLYING STRUCTURE OF  
EQUALLY SPACED SIDEBANDS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-676 721 7/4 17/2  
TECHNION - ISRAEL INST OF TECH HAIFA DEPT OF PHYSICS

DETERMINATION OF THE CO2 LINE PARAMETERS USING A  
CO2-N2-HE LASER, (U)

NOV 67 3P OPPENHEIM, URI P. ;DEVIR,  
ADAM D. ;  
CONTRACT: AF-EOAR-26-67  
MONITOR: AFOSR 68-2119

UNCLASSIFIED REPORT  
AVAILABILITY: PUB. IN JNL. OF THE OPTICAL  
SOCIETY OF AMERICA, V58 N4 P585-586 APR 68.

DESCRIPTORS: (\*CARBON DIOXIDE, ABSORPTION  
SPECTRUM), (\*MOLECULAR ENERGY LEVELS, CARBON  
DIOXIDE), (\*LIGHT COMMUNICATION SYSTEMS,  
ATTENUATION), BAND SPECTRUM, IRASERS, INFRARED  
RADIATION, LINE SPECTRUM, INFRARED SPECTROSCOPY,  
ATMOSPHERE, NITROGEN, HELIUM, ISRAEL (U)  
IDENTIFIERS: ATMOSPHERIC ABSORPTION (U)

THE INTEGRATED INTENSITY AND WIDTH OF SINGLE  
ROTATIONAL LINES IN MOLECULAR BAND SPECTRA ARE  
IMPORTANT FACTORS IN THE DETERMINATION OF SPECTRAL  
EMISSIVITIES. THE RESULTS GIVEN IN THIS REPORT  
ALLOW PREDICTION OF LONG-PATH ATMOSPHERIC ABSORPTION  
OF CO2 LASER ENERGY. FOR EXAMPLE, A 10-M PATH OF  
PURE CO2 IS EQUIVALENT TO 30 KM OF AIR, IF A  
CONCENTRATION OF 0.033% OF CO2 IS ASSUMED.  
THUS FIG. 1 SHOWS THE ATTENUATION OF LASER  
RADIANT ENERGY IN A 30-KM PATH IN AIR, IF THE SAME  
PRESSURE BROADENING IN AIR IS ASSUMED AS IN PURE  
CO2. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-676 814 17/2 20/5  
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

ATMOSPHERIC EFFECTS ON DIGITALLY MODULATED LASER  
TRANSMISSION. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
JUL 68 21P WHATLEY, MERLE M. SMITH,  
DONALD A. I  
REPT. NO. ECOM-3005  
PROJ: DA-1-H-620501-A-448  
TASK: 1-H-620501-A-44806

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
\*LASERS), PULSE CODE MODULATION, ATMOSPHERE,  
METEOROLOGICAL PARAMETERS, TACTICAL WARFARE,  
DIGITAL SYSTEMS, ERRORS, AMPLITUDE MODULATION,  
SCINTILLATION (U)  
IDENTIFIERS: POLARIZATION MODULATION (U)

THIS INVESTIGATION HAS PROVIDED DATA WHICH ALLOW  
THE EVALUATION OF THE LASER AS A TRANSMISSION DEVICE  
FOR DIGITAL INFORMATION. IN PARTICULAR, THE EFFECT  
OF THE ATMOSPHERE ON LASER PROPAGATION, MODULATION,  
AND COMMUNICATION CAPABILITIES PERTINENT TO TACTICAL  
APPLICATIONS HAS BEEN STUDIED. THESE STUDIES WERE  
MADE UNDER VARYING CONDITIONS OF WEATHER, PATH  
LENGTH, OPTICAL POWER, MODULATION DEPTH AND  
MODULATION METHOD. THE CHARACTERISTICS OF INTEREST  
IN EACH CASE WAS THE BIT-ERROR RATE OBTAINED WITH  
BINARY SERIAL BIT STREAMS. FROM THIS INFORMATION,  
THE OPERATION OF A LASER PCM SYSTEM MAY BE  
FORECAST. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-677 221 20/5

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

MORE POWERFUL THAN THE HYPERBOLOID,

(U)

DEC 67 9P ANDREEV, O. ;  
REPT. NO. FTD-HT-23-1696-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF VOENNYE ZNANIYA  
(USSR) V41 N2 P38-39 1965, BY L. HEENAN.

DESCRIPTORS: (\*LASERS, REVIEWS), COHERENT  
RADIATION, LIGHT COMMUNICATION SYSTEMS,  
EXTRATERRESTRIAL RADIO WAVES, MIRRORS, FOCUSING,  
HEAT, USSR

(U)

IDENTIFIERS: DEATH RAYS, HYPERBOLOIDS, PLASMA  
DIAGNOSTICS, TRANSLATIONS

(U)

MANY PRE-WORLD WAR II SOVIET PUBLICATIONS  
CARRIED ARTICLES ON THE SO-CALLED 'DEATH RAYS.'  
MORE OFTEN THAN NOT, THESE ARTICLES, BASED LARGELY  
ON NON-SOVIET DATA, WERE PURE SCIENCE FICTION.  
THE FEW SERIOUS ARTICLES REFERRED TO DEADLY WEAPONS  
USING HEAT RAYS. THE CONCEPT OF WEAPONRY CHANGED  
DRASTICALLY WITH THE ADVENT OF LASERS, WHICH EMIT  
STIMULATED RATHER THAN THERMAL RADIATION. MENTION  
IS MADE OF THE USE OF LASERS IN MULTICHANNEL  
COMMUNICATION SYSTEMS, RANGING OF PLANETARY SURFACES,  
METALLURGY, PLASMA DIAGNOSTICS, BIOLOGY, MEDICINE,  
ETC. THE ARTICLE ALSO REVIEWS SOVIET  
CONTRIBUTIONS TO THE DEVELOPMENT OF THE LASER.

(U)

UNCLASSIFIED

DD. REF. & BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-677 374 9/1 17/2  
MICHIGAN UNIV ANN ARBOR ELECTRON PHYSICS LAB

E-TYPE PHOTODEMODULATORS FOR COHERENT LIGHT  
SIGNALS.

(U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPORT,  
AUG 68 47P MASON, JOHN L. ;  
REPT. NO. TR-111, 07094-1-F  
CONTRACT: DA-ARO(D)-31-124-G630  
PROJ: DA-20014501-B-31-E, 07094  
MONITOR: AROD 5427:4-E

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
PHOTOTUBES), (\*PHOTOTUBES, DEMODULATORS),  
DESIGN, S BAND, COHERENT RADIATION, LASERS,  
TRAVELING-WAVE TUBES, RESISTANCE(ELECTRICAL),  
ELECTRON BEAMS, ELECTROSTATIC FIELDS, FOCUSING  
IDENTIFIERS: \*PHOTODEMODULATORS

(U)

(U)

THE THEORETICAL STUDIES ARE SUMMARIZED AND AN  
EXPERIMENTAL INVESTIGATION IS REPORTED FOR AN E-  
TYPE TRAVELING-WAVE PHOTOTUBE. THE PRINCIPAL  
FEATURE OF SUCH A DEVICE IS THE CENTRIFUGAL  
ELECTROSTATIC FOCUSING OF THE ELECTRON BEAM. THE  
THEORETICAL STUDY YIELDS A SMALL-SIGNAL POWER  
THEOREM, THE TYPES OF WAVES PROPAGATING ALONG A THIN  
E-TYPE BEAM, AND A SMALL-SIGNAL ANALYSIS OF THE  
TRAVELING-WAVE PHOTOTUBE. AN EXPRESSION FOR THE  
EQUIVALENT RESISTANCE OF THE DEVICE IS DERIVED, WITH  
NUMERICAL RESULTS GIVEN FOR THE CASE OF ZERO CIRCUIT  
LOSS, ZERO SPACE CHARGE, AND SYNCHRONOUS BEAM  
VELOCITY. FOR COMPARISON, EQUIVALENT RESISTANCE  
VALUES ARE GIVEN FOR O-TYPE PHOTOTUBES. THE  
EXPERIMENTAL INVESTIGATION INVOLVED A PHOTOTUBE  
DESIGNED TO OPERATE AT S-BAND. DESIGN  
CONSIDERATIONS AND MEASUREMENT TECHNIQUES ARE  
DISCUSSED. EXPERIMENTAL CURVES FOR THE EQUIVALENT  
RESISTANCE ARE PRESENTED AND COMPARED WITH THE  
THEORETICAL RESULTS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-679 202 20/5  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

NEWS OF INSTITUTIONS OF HIGHER LEARNING.  
PHYSICS, VOLUME 10, NUMBER 8, 1967 (SELECTED  
ARTICLES),

(U)

MAY 68 17P KABANOV, M. V. !BUKATYI, V.

I. ;

REPT. NO. FTD-HT-23-251-68

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF IZVESTIYA  
VYSSHIKH UCHEBNYKH ZAVEDENII. FIZIKA (USSR) V10  
N8 P26-30, 142-144 1967, BY F. DION.

DESCRIPTORS: (\*LASERS, \*LIGHT TRANSMISSION),  
ATMOSPHERE, LIGHT COMMUNICATION SYSTEMS,  
SCATTERING, FOG, ATTENUATION, USSR  
IDENTIFIERS: TRANSLATIONS

(U)

(U)

CONTENTS: ATTENUATION OF COLLIMATED LIGHT BEAMS  
IN DISPERSIVE MEDIA; ATTENUATION OF LASER BEAMS IN  
ARTIFICIAL WATER FOGS.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-680 574 17/2 20/5  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

LIGHT RAYS THAT CARRY INFORMATION. (U)

MAY 68 14P EIDUS, YA. :  
REPT. NO. FTD-HT-23-1544-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF NAUKA I TEKHNIKA  
(USSR) N11 P5-9 1966, BY R. ZECCOLA.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
\*LASERS), (\*LIGHT, MODULATION),  
ELECTROOPTICS, BANDWIDTH, PUMPING(OPTICAL),  
MAGNETO-OPTIC EFFECT, BIREFRINGENCE, PIEZOELECTRIC  
CRYSTALS, USSR (U)  
IDENTIFIERS: TRANSLATIONS, OPTICAL MODULATORS (U)

THE EVER-EXPANDING NEED FOR EXCHANGE OF INFORMATION HAS CROWDED THE RADIO FREQUENCY SPECTRUM. A QUALITATIVELY NEW SOLUTION TO THE PROBLEM OF CHANNEL CAPACITY IS OFFERED BY THE RECENTLY CREATED SOURCES OF MONOCHROMATIC COHERENT LIGHT. THESE SO-CALLED MASERS AND LASERS OPERATE AT EXTREMELY HIGH FREQUENCIES, AND, SINCE THE QUANTITY OF INFORMATION THEORETICALLY ABLE TO BE TRANSMITTED ON A COMMUNICATIONS CHANNEL IS DIRECTLY PROPORTIONAL TO THE FREQUENCY, THEIR THEORETICAL INFORMATION CAPACITY IS TREMENDOUS. THE CAPACITY OF A LASER COMMUNICATIONS CHANNEL IS AT LEAST 1000 TIMES GREATER THAN THE CAPACITY OF ALL RADIO CHANNELS USED UP TO NOW, INCLUDING MICROWAVE. THE PRIMARY PROBLEM HINDERING LASER COMMUNICATIONS NOW IS MODULATION OF THE LASER BEAM. THEORETICALLY, ANY OF THE FOUR STANDARD PARAMETERS OF A LASER BEAM CAN BE MODULATED TO PLACE INFORMATION OF THE BEAM: FREQUENCY, AMPLITUDE, PHASE AND POLARIZATION. ACTUALLY, TWO PRIMARY METHODS CAN BE USED TO MODULATE THE LIGHT BEAM EXITING FROM A LASER: INTERNAL AND EXTERNAL METHODS. IN THE FIRST CASE, THE LIGHT BEAM IS ACTED UPON AS IT IS BEING FORMED, I.E., WITHIN THE ACTUAL LASER. IN THE SECOND CASE, THE MODULATION IS PERFORMED AFTER THE BEAM HAS BEEN CREATED. INTERNAL METHODS INCLUDE REGENERATION MODULATION, MODULATION USING THE STARK EFFECT AND MODULATION USING THE SEEMAN EFFECT. SCIENTISTS AT PRESENT ARE GIVING PREFERENCE TO THE EXTERNAL MODULATION METHODS, WHICH INCLUDE MODULATION OF THE PUMPING, MECHANICAL MODULATION, MODULATION USING THE FARADAY EFFECT, MODULATION USING THE KERR EFFECT (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-682 079 20/6  
SIGNALS RESEARCH AND DEVELOPMENT ESTABLISHMENT  
CHRISTCHURCH (ENGLAND)

A LOW DRIVE-POWER LIGHT MODULATOR USING A READILY  
AVAILABLE MATERIAL ADP, (U)

MAY 68 16P DORE, M. ;  
REPT. NO. SRDE-68009

UNCLASSIFIED REPORT

DESCRIPTORS: (\*ELECTROOPTICS, MODULATION),  
(\*MODULATORS, LIGHT), LIGHT COMMUNICATION  
SYSTEMS, LASERS, AMMONIUM COMPOUNDS, PHOSPHATES,  
BANDWIDTH, LIGHT TRANSMISSION, BIREFRINGENCE,  
GREAT BRITAIN (U)  
IDENTIFIERS: AMMONIUM DIHYDROGEN PHOSPHATE (U)

A VIDEO-FREQUENCY TRANSVERSE ELECTROOPTIC LIGHT  
AMPLITUDE MODULATOR UTILIZING THE MATRIX ELEMENT R41  
IN ADP IS DESCRIBED AND COMPARED FAVORABLY WITH  
OTHER MODULATOR CONFIGURATIONS USING ADP, KDP,  
AND KD\*P. IT UTILIZES TWO CRYSTALS TO COMPENSATE  
FOR TEMPERATURE AND ANGULAR DEPENDENCES OF  
BIFRINGENCE, AND HAS MORE THAN ADEQUATE STABILITY FOR  
NORMAL LABORATORY USE. A USEFUL BUILT-IN OPTICAL  
BIAS CONTROL IS PROVIDED. FREQUENCY RESPONSE HAS  
BEEN MEASURED BETWEEN 50 HZ AND 5 MHZ AND FOUND  
TO BE FLAT. VIDEO SIGNALS HAVE BEEN TRANSMITTED  
OVER A LASER COMMUNICATION LINK USING ONLY 50-VOLT  
PEAK-TO-PEAK DRIVE. HALF-WAVE VOLTAGE IS 220 VOLTS  
AND CAPACITY IS 53 PF, GIVING A DRIVE-POWER  
REQUIREMENT OF 2.6 WATTS PER MHZ OF BANDWIDTH FOR  
100 PERCENT MODULATION DEPTH, OR 290 MW FOR 50-  
PERCENT MODULATION DEPTH. OPTICAL TRANSMISSION WAS  
70 PERCENT ACHIEVED BY USING AN INDEX MATCHING  
LIQUID. AN EXTINCTION RATIO OF 30:1 WAS OBTAINED  
USING A LASER LIGHT SOURCE. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-682 432 7/3 17/2 9/1  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

DESCRIPTIONS OF INVENTIONS,

(U)

JUN 68 21P BERLIN, A. A. ; MURADYAN, A.  
G. ; NESMEYANOV, A. N. ; ANFILOV, E. A. ;  
VOLKOV, A. S. ;  
REPT. NO. FTD-HT-23-59-68

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: UNEDITED ROUGH DRAFT TRANS. OF A  
COLLECTION OF SOVIET PATENTS, BY L. MAROKUS.

DESCRIPTORS: (\*PATENTS, USSR), CHELATE COMPOUNDS,  
FERROCENES, LIGHT COMMUNICATION SYSTEMS, DATA  
TRANSMISSION SYSTEMS, LASERS, ALKYLATION, DIPOLE  
ANTENNAS, ANTENNA ARRAYS, ELECTRIC FILTERS,  
MAGNETOSTRICTION, DELAY LINES

(U)

CONTENTS: METHOD OF OBTAINING FERROCENE  
DERIVATIVES; DEVICE FOR TRANSMISSION AND RECEPTION  
OF INFORMATION BY LIGHT CARRIER; METHOD OF  
OBTAINING ALKYL DERIVATIVES OF FERROCENE; COPHASIAL  
ANTENNA ARRAY WITH ELECTRIC SCANNING; PASSIVE  
OPTIMUM FILTER.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-682 768 17/2 20/5  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

COMMUNICATIONS APPLICATIONS OF LASERS, (U)

MAR 68 103P KOBZEV, V. V. ; MILINKIS, B.  
M. ; EMEL'YANOV, R. G. ;  
REPT. NO. FTD-HT-23-1179-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: UNEDITED ROUGH DRAFT TRANS. OF MONO.  
PRIMENENIE OPTICHESKIKH KVANTOVYKH GENERATOROV DLYA  
TSELEI SVYAZI, MOSCOW, 1965 P1-120.

DESCRIPTORS: (\*LASERS, \*LIGHT COMMUNICATION  
SYSTEMS), MODULATION, DEMODULATORS,  
PHOTOCATHODES, PHOTOMULTIPLIERS, PHOTODIODES,  
PHOTOELECTRIC MATERIALS, RADIO COMMUNICATION  
SYSTEMS, OPERATION, DESIGN, USSR (U)

IDENTIFIERS: TRANSLATIONS, PHOTODETECTORS, LASER  
MODULATORS (U)

CONTENTS: OPERATING PRINCIPLE AND ARRANGEMENT OF  
THE LASER; METHODS OF MODULATING LASER EMISSION;  
MAIN TYPES OF PHOTODETECTORS; RADIO  
COMMUNICATIONS SYSTEMS EMPLOYING LASERS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-684 149 20/6  
LIBRARY OF CONGRESS WASHINGTON D C AEROSPACE TECHNOLOGY  
DIV

LIGHT PROPAGATION IN A TURBULENT ATMOSPHERE. (U)

DESCRIPTIVE NOTE: SURVEYS OF FOREIGN SCIENTIFIC AND  
TECHNICAL LITERATURE,

MAR 69 37P POLUSHKIN, ANDREY ;  
REPT. NO. ATD-67-52

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT TRANSMISSION, \*ATMOSPHERIC  
MOTION), SCIENTIFIC PERSONNEL, SYMPOSIA,  
SCINTILLATION, COHERENT RADIATION, LASERS,  
OPTICAL IMAGES, USSR (U)

THE REPORT PRESENTS A COMPREHENSIVE OUTLINE OF  
SOVIET RESEARCH ON THE PROPAGATION OF LIGHT IN A  
TURBULENT ATMOSPHERE. THE MAJORITY OF SOURCE  
MATERIALS SCANNED AND PROCESSED FOR THIS STUDY WERE  
PUBLISHED DURING THE LAST DECADE. AN ATTEMPT WAS  
MADE TO TRACE THE DEVELOPMENT OF THE MAJOR AVENUES OF  
RESEARCH ON THIS SUBJECT AS FOLLOWED BY THE PRINCIPAL  
SOVIET INVESTIGATORS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-688 411 17/2 20/6  
RAND CORP SANTA MONICA CALIF

APERTURE AVERAGING OF OPTICAL SCINTILLATION, (U)

APR 69 23P YURA, H. T.; LUTOMIRSKI, R.  
F. ;  
REPT. NO. RM-5902--ARPA  
CONTRACT: DAHC15-67-C-0141, ARPA ORDER-189-1

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS, OPTICAL  
EQUIPMENT COMPONENTS), (\*LIGHT TRANSMISSION,  
ATMOSPHERIC MOTION), TURBULENCE, SCINTILLATION,  
PROPAGATION, LASERS,  
APPROXIMATION(MATHEMATICS), ANALYSIS OF  
VARIANCE (U)  
IDENTIFIERS: APERTURES, SIGNAL PROCESSING (U)

THE APERTURE-AVERAGING FACTOR OF A CIRCULAR  
APERTURE IS DERIVED. THIS FACTOR GIVES THE EFFECT  
OF A FINITE RECEIVING APERTURE ON SPHERICAL AND PLANE  
WAVES IN REDUCING THE VARIANCE OF A FLUCTUATING LIGHT  
SIGNAL. CURVES OF THE REDUCTION FACTOR AND  
NORMALIZED SIGNAL STANDARD DEVIATION AS A FUNCTION OF  
RANGE AND RECEIVER APERTURE DIAMETER ARE PRESENTED  
AND ARE COMPARED WITH THOSE WHICH WERE PREVIOUSLY  
CALCULATED. IT IS SHOWN THAT FRIED'S RESULTS  
AGREE WITH THE RESULTS OBTAINED HERE ONLY FOR  
PROPAGATION DISTANCE WHERE THE AVERAGE FIELD IS DOWN  
BY A FACTOR OF THE ORDER  $E$  TO THE  $-1$  POWER. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-691 846 20/6 20/5  
TRW SYSTEMS REDONDO BEACH CALIF QUANTUM PHYSICS LAB

HIGH INTENSITY LASER PROPAGATION IN THE  
ATMOSPHERE.

(U)

DESCRIPTIVE NOTE: FINAL REPT.,

JUN 69 91P FRANTZ, L. M. HOLSTEIN, T.

D. ;

REPT. NO. 05691-6014-RO-00

CONTRACT: N00014-66-C-0022, ARPA ORDER-306

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, \*LIGHT TRANSMISSION),  
(\*COHERENT RADIATION, IONOSPHERIC PROPAGATION),  
ATMOSPHERE, ABSORPTION, HEATING, FOCUSING,  
BAND SPECTRUM, CARBON DIOXIDE, INTENSITY,  
NONLINEAR SYSTEMS

(U)

THE RESEARCH REPORTED HERE INVOLVES THE THERMAL SELF-DEFOCUSING EFFECT, WHICH OCCURS IN THE CASE OF HIGH ENERGY LASER BEAM PROPAGATION IN THE ATMOSPHERE. TWO SUBJECTS ARE INVESTIGATED, NAMELY, HEATING MECHANISMS, AND THE DYNAMICS OF THE PROPAGATING LASER BEAM. THE HEATING MECHANISM STUDY IS CONCERNED SPECIFICALLY WITH PHOTO-ABSORPTION IN THE FAR WINGS OF PRESSURE BROADENED CO<sub>2</sub> VIBRATION-ROTATION BANDS, WHILE THE BEAM DYNAMICS ANALYSIS TREATS THE EFFECTS OF TARGET MOTION ON THE DEGREE OF SELF-DEFOCUSING OF THE LASER BEAM. A THEORY OF FAR-WING PRESSURE BROADENING IS DEVELOPED IN WHICH THE BASIC BROADENING MECHANISM IS ASSUMED TO ARISE FROM PERTURBATIONS OF THE ABSORBER'S ROTATIONAL MOTION VIA A SHORT RANGE REPULSIVE INTERACTION WITH A COLLIDING MOLECULE. THE THEORY PREDICTS A FAR-WING SPECTRAL BEHAVIOR DESCRIBED BY A PRODUCT OF A LORENTZ LINE SHAPE AND AN EXPONENTIALLY DECREASING FACTOR, IN GENERAL AGREEMENT WITH RECENT MEASUREMENTS. IN THE BEAM DYNAMICS WORK A CONVENIENT CLOSED FORM EXPRESSION HAS BEEN OBTAINED FOR THE MAXIMUM FLUX WHICH THE THERMAL SELF-DEFOCUSING EFFECT PERMITS ONE TO TRANSMIT THROUGH THE ATMOSPHERE. THIS ANALYSIS TAKES INTO ACCOUNT THE EFFECT OF TARGET MOTION. THE EXPRESSION FOR THE MAXIMUM FLUX DEPENDS UPON SUCH PARAMETERS AS THE INITIAL BEAM INTENSITY, THE INITIAL BEAM DIAMETER, THE TARGET DISTANCE, THE ROTATIONAL RATE OF THE BEAM, AND THE EFFECTIVE ABSORPTION COEFFICIENT FOR HEATING OF AIR BY LIGHT AT THE LASER FREQUENCY. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-692 438

20/6

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

INTERFEROMETRIC PHASE AND AMPLITUDE FLUCTUATION  
MEASUREMENTS OVER A 7KM ATMOSPHERIC PATH.

(U)

DESCRIPTIVE NOTE: TECHNICAL NOTE,

MAY 69 35P GEHRELS, ERNST ;

REPT. NO. TN-1969-28

CONTRACT: AF 19(628)-5167, ARPA ORDER-512

MONITOR: LSO TR-69-111

UNCLASSIFIED REPORT

DESCRIPTORS: (\*ATMOSPHERIC MOTION, LIGHT  
TRANSMISSION), (\*COHERENT RADIATION, PHASE  
SHIFT), INTERFEROMETERS, LASERS, FREQUENCY  
MODULATION, CORRELATION TECHNIQUES, DISTRIBUTION  
FUNCTIONS, INTENSITY

(U)

A 6328 A LASER INTERFEROMETER OF THE MICHELSON  
TYPE HAS A ONE-WAY PATH LENGTH OF 7 KM. THE  
FRINGES ARE RESOLVED BY FREQUENCY-MODULATING THE  
LASER SUFFICIENTLY TO SWEEP OVER AT LEAST ONE FRINGE  
WIDTH. BY CORRELATION TECHNIQUES, THE RESULTING  
FRINGE INTENSITY PATTERN IS RESOLVED INTO THE TRUE  
FRINGE CROSSING DIRECTION AND RATE AND INTO LIGHT  
AMPLITUDE FLUCTUATIONS. AN UPPER LIMIT OF 300 PER  
SECOND IS ESTABLISHED FOR THE FORMER, THE AMPLITUDE  
FLUCTUATIONS BEING AT A SLOWER RATE. WITH A  
MEASURED INTENSITY RANGE OF UP TO 5000:1, IT IS  
CLEAR FROM THE DATA THAT NONE OF THE CURRENTLY  
POSTULATED RAYLEIGH, LOG NORMAL, OR RICE  
DISTRIBUTIONS MATCH THE AMPLITUDE STATISTICS OVER  
THIS FULL RANGE. A LIMITING VALUE OF STANDARD  
DEVIATION FOR THE LOG OF THE AMPLITUDE IS 0.85.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-693 230 17/2 9/5  
ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER WASHINGTON D  
C

ANTENNAS FOR THE OPTICAL WAVE BAND: (U)

AUG 69 18P TYZHN OV, YU. V. ; FRIDMAN, G.  
KH. ;  
REPT. NO. FSTC-HT-23-309-69  
PROJ: FSTC-02TR1002301

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: TRANS. OF MONO. SOVREMENNYE  
PROBLEMY ANTENNO-VOLNOVODNOI TEKHNIKI (PRESENT  
DAY PROBLEMS OF ANTENNA WAVEGUIDE TECHNIQUES),  
N.P., 1967 P189-201.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
LASERS), (\*LASERS, \*ANTENNAS), FIELD THEORY,  
ELECTROMAGNETIC FIELDS, ANTENNA RADIATION PATTERNS,  
LIGHT HOMING, LIGHT TRANSMISSION, USSR (U)  
IDENTIFIERS: TRANSLATIONS, OPTICAL ANTENNAS (U)

THIS ARTICLE DESCRIBES ANTENNAS FOR OPTICAL BAND  
USE WITH LASERS FOR COMMUNICATION AND LOCATION  
PURPOSES. THE USE OF VERY SHORT WAVES MAKES IT  
POSSIBLE TO EMPLOY EXTREMELY NARROW BEAM ANTENNAS.  
OPTICAL SYSTEMS FOR USE WITH TRANSMITTING AND  
RECEIVING ANTENNAS ARE DESCRIBED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-693 623 17/2 20/5  
HAWAII UNIV HONOLULU DEPT OF ELECTRICAL ENGINEERING

LASER COMMUNICATIONS FOR THE ALOHA SYSTEM. (U)

DESCRIPTIVE NOTE: PRELIMINARY REPT.,  
MAY 69 21P KANEHIRA, EARL ;  
REPT. NO. THEMIS-869-1  
CONTRACT: F44620-69-C-0030  
PROJ: AF-9749  
TASK: 974901  
MONITOR: AFOSR 69-2028TR

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON THE ALOHA SYSTEM.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
\*LASERS), DATA TRANSMISSION SYSTEMS,  
DIODES(SEMICONDUCTOR), INTERFACES, DIGITAL  
SYSTEMS, PULSE CODE MODULATION, GALLIUM  
ARSENIDES (U)  
IDENTIFIERS: \*ALOHA COMMUNICATION SYSTEM (U)

IN THE LASER COMMUNICATION SYSTEM DESIGNED FOR DATA  
TRANSMISSION AND RECEPTION, THE INFORMATION CARRYING  
BINARY PULSE TRAIN IS USED TO ACTIVATE (FORWARD  
BIAS) AND DEACTIVATE (REVERSE BIAS) A LIGHT  
EMITTING DIODE. WHEN ACTIVATED, THE LIGHT EMITTING  
DIODE EMITS NEAR-INFRARED LIGHT, AND WHEN  
DEACTIVATED, NOTHING IS EMITTED. THE RECEIVER THEN  
DETECTS THE PRESENCE OR ABSENCE OF THE NEAR INFRARED  
RADIATION, USING A LIGHT SENSING DIODE. IN THE  
PRESENCE OF LIGHT, THE LIGHT SENSING DIODE PRODUCES A  
LARGE PHOTOCURRENT, AND IN THE ABSENCE OF LIGHT, IT  
PRODUCES A SMALL CURRENT. ANY DATA TERMINAL THAT  
CAN PRODUCE AND ACCEPT BINARY INFORMATION CAN BE USED  
DIRECTLY IN A LASER COMMUNICATIONS SYSTEM WITHOUT ANY  
INTERFACE PROBLEMS BETWEEN THE TERMINAL AND THE  
TRANSMITTER OR RECEIVER. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-693 905 17/5

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

HOMODYNE DETECTION OF INFRARED RADIATION FROM A  
MOVING DIFFUSE TARGET.

(U)

DESCRIPTIVE NOTE: JOURNAL ARTICLE

MAR 69 9P TEICH, MALVIN CARL ;

REPT. NO. JA-3427

CONTRACT: AF 19(628)-5167, NSF-GK-3620

MONITOR: ESD TR-69-232

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN PROCEEDINGS OF THE IEEE, V57  
N5 P786-792 MAY 69.

SUPPLEMENTARY NOTE: REVISION OF REPORT DATED 20 JAN  
69.

DESCRIPTORS: (\*INFRARED RADIATION, DETECTION),  
GAS LASERS, CARBON DIOXIDE, COHERENT RADIATION,  
SCATTERING, POWER SPECTRA, PROBABILITY DENSITY  
FUNCTIONS, TARGETS, OPDAR, INFRARED DETECTORS  
IDENTIFIERS: CARBON DIOXIDE LASERS

(U)

(U)

EXPERIMENTS HAVE BEEN PERFORMED IN WHICH THE  
RADIATION FROM A CO<sub>2</sub> LASER WAS COHERENTLY DETECTED  
AFTER BEING SCATTERED FROM A MOVING DIFFUSE  
REFLECTOR. THIS IS GENERALLY THE CONFIGURATION OF  
AN INFRARED LASER RADAR. THE POWER-SPECTRAL-  
DENSITY OF THE HETERODYNE SIGNAL WAS MEASURED AND ITS  
WIDTH WAS SHOWN TO AGREE WITH THE CALCULATED VALUE  
BASED ON A THEORETICAL MODEL FOR THE PROCESS.  
EXPRESSIONS ARE OBTAINED FOR THE RATIO OF  
HETERODYNE SIGNAL BANDWIDTH TO HETERODYNE FREQUENCY  
FOR THE CASES OF FOCUSED RADIATION, UNFOCUSED  
RADIATION, AND FOR A TYPICAL RADAR CONFIGURATION.  
IN MOST CASES, THE HETERODYNE SIGNAL IS FOUND TO  
POSSESS A NARROW-BAND CHARACTER. THE PROBABILITY  
DENSITY OF THE SIGNAL ENVELOPE WAS ALSO MEASURED FOR  
A KNOWN SCATTERER (PROVIDING GAUSSIAN SCATTERED  
RADIATION) AND WAS FOUND TO BE RAYLEIGH  
DISTRIBUTED, AS EXPECTED. THE POWER-SPECTRAL-  
DENSITY AND ENVELOPE PROBABILITY DISTRIBUTION PROVIDE  
INFORMATION ABOUT A SCATTERING MEDIUM OR TARGET WHICH  
CANNOT BE OBTAINED FROM AVERAGE-VALUE MEASUREMENTS OF  
THE HETERODYNE SIGNAL-TO-NOISE RATIO. THIS  
INFORMATION IS USEFUL FOR COMMUNICATIONS  
APPLICATIONS, INFRARED RADAR, AND HETERODYNE  
SPECTROSCOPY EXPERIMENTS. FINALLY, A SIMPLE AND  
DIRECT METHOD OF OBTAINING INFORMATION ABOUT THE  
STATISTICS OF AN INCIDENT RADIATION FIELD (WHICH  
DOES NOT INVOLVE PHOTOCOUNTING) IS DISCUSSED.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-693 939 17/2 20/5  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

ROGER EARTH, OVER.... (U)

MAR 69 7P POKROVSKII, G. ;  
REPT. NO. FTD-HT-23-1237-68

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF TEKNIKA-  
MOLODEZHI (USSR) V35 N11 P37-38 1967, BY L.  
THOMPSON.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
FEASIBILITY STUDIES), LASERS, RUBY, GAS  
IONIZATION, CONVEYORS, PIPES, ENERGY, MATERIALS,  
USSR (U)  
IDENTIFIERS: INTERPLANETARY PIPELINES,  
TRANSLATIONS (U)

THE AUTHOR ASSERTS THAT EVENTUALLY SCIENTISTS WITH  
THE AID OF A LASER WILL BE SUCCESSFUL IN THEIR  
ATTEMPTS TO TRANSMIT ENERGY IN THE FORM OF A LIGHT  
BEAM FROM THE EARTH TO THE MOON. HE STATES THAT  
BESIDES ENERGY AND INFORMATION, THIS SAME CONVEYER  
COULD BE USED TO TRANSMIT OTHER MATTER, SUCH AS FUEL,  
AIR, AND METALS, THEREBY PARTIALLY SOLVING ONE OF THE  
MAJOR PROBLEMS OF DELIVERING ESSENTIAL GOODS TO THE  
MOON AND POSSIBLY TO OTHER PLANETS AT A MINIMUM COST.  
HE SUGGESTS A HOLLOW LASER BEAM, WHICH COULD BE  
ACHIEVED WITH THE USE OF LIGHT CONDUCTORS OR A HOLLOW  
RUBY ROD. SUCH PIPELINES COULD REACH THROUGH SPACE  
FROM ONE PLANET TO ANOTHER CARRYING INFORMATION,  
ENERGY, AND MATTER. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-695 279 9/4 17/2  
PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF ELECTRICAL  
ENGINEERING

INFORMATION RATES FOR PHOTOCOUNT DETECTION SYSTEMS,

(U)

JAN 69 7P FILLMORE, GARY L. FLACHS,  
GERARD ;  
CONTRACT: DA-31-124-AROD-383  
PROJ: DA-20-061102-B-13-E  
MONITOR: AROD 5659:8-E

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN IEEE TRANSACTIONS ON  
INFORMATION THEORY VIT-15 N4 P465-468 JUL 69.  
SUPPLEMENTARY NOTE: REVISION OF REPORT DATED 11 OCT  
68.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
\*INFORMATION THEORY), (\*COHERENT RADIATION,  
DETECTION), (\*PHOTOELECTRONS, COUNTING  
METHODS), MATHEMATICAL MODELS, LASERS

(U)

IDENTIFIERS: OPTICAL COMMUNICATION,  
TELECOMMUNICATION, RANDOM NOISE

(U)

A MODEL THAT ALLOWS ONE TO CALCULATE INFORMATION  
RATES FOR OPTICAL COMMUNICATION SYSTEMS THAT USE  
PHOTOCOUNT DETECTION IS PRESENTED. THIS MODEL HAS  
ITS BASIS IN THE COHERENT STATES OF THE FIELD. IT  
CONSISTS OF A SOURCE THAT PLACES THE FIELD IN A  
COHERENT STATE, A CHANNEL THAT CAN INTRODUCE ADDITIVE  
GAUSSIAN NOISE, AND A PHOTODETECTOR THAT PRODUCES THE  
NUMBER OF PHOTOCOUNTS IN THE DETECTION INTERVAL AS  
OUTPUT SYMBOLS. THE CAPABILITY OF INTRODUCING  
ADDITIVE GAUSSIAN NOISE CAN ALSO BE USED TO  
REPRESENT A PHYSICAL SOURCE. THE MODEL IS APPLIED  
TO SEVERAL EXAMPLES TO ILLUSTRATE ITS USE. THE  
RATE OF FLOW OF INFORMATION THROUGH THE CHANNEL IS  
CALCULATED FOR A BINARY CHANNEL WITH AND WITHOUT  
ADDITIVE GAUSSIAN NOISE. THE INFORMATION RATE  
FOR A NOISELESS CHANNEL IS ALSO OBTAINED FOR THE CASE  
IN WHICH THE SIGNALS SENT BY A SINGLE-MODE COHERENT  
SOURCE ARE SELECTED FROM A GAUSSIAN DISTRIBUTION.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-695 945 20/5 17/2  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

CERTAIN CHARACTERISTICS OF A GA AS OPTICAL  
QUANTUM AMPLIFIER,

(U)

JUL 69 12P MOMA, YU. A. ; ABRAMOV, V.  
S. ; KOBZEV, V. V. ;  
REPT. NO. FTD-MT-24-127-69

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED MACHINE TRANS. OF MONO.  
POLUPROVODNIKOVYE PRIBORY V TEKHNIKE ELEKTROSVYAZI.  
SBORNIK STATEI (SEMICONDUCTOR INSTRUMENTS IN THE  
TECHNOLOGY OF TELECOMMUNICATION. COLLECTION OF  
ARTICLES), N.P., 1968 P141-145.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
FEASIBILITY STUDIES), (\*SEMICONDUCTOR DEVICES,  
\*LASERS), GALLIUM ARSENIDES, LIGHT PULSES,  
CRYOGENICS, USSR

(U)

IDENTIFIERS: GALLIUM ARSENIDE LASERS,  
TRANSLATIONS

(U)

THE ARTICLE GIVES RESULTS OF THE MEASUREMENT OF  
AMPLIFICATION FACTORS OF A SEMICONDUCTOR OPTICAL  
QUANTUM AMPLIFIER OKU BASED ON GALLIUM ARSENIDE, IN  
PULSE CONDITIONS AT THE TEMPERATURE OF LIQUID  
NITROGEN. CONCLUSIONS ARE DRAWN AS TO THE  
PROSPECTS OF THE APPLICATION OF OKU IN OPTICAL  
COMMUNICATION LINES. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-699 665

20/5

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

SOME CHARACTERISTICS OF A HELIUM-NEON LASER WITH A  
KDP CRYSTAL INSIDE THE RESONATOR,

(U)

OCT 69 12P KRIVOSHCHIEV, G. V. ;

TELEGIN, G. G. ; FOLIN, K. G. ;

REPT. NO. FTD-HT-23-404-69

PROJ: FTD-7230178

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF AKADEMIYA NAUK  
SSSR. SIBIRSKOE OTDELENIE. IZVESTIYA, SERIYA  
KHIMICHESKIKH NAUK, N1 P127-131 1968, BY H.  
PECK.

DESCRIPTORS: (\*GAS LASERS, \*MODULATION),  
MODULATORS, ELECTROOPTICS, POTASSIUM COMPOUNDS,  
PHOSPHATES, ELECTRIC FIELDS, USSR

(U)

IDENTIFIERS: HELIUM NEON LASERS, POTASSIUM  
DIHYDROGEN PHOSPHATE, POTASSIUM PHOSPHATES,  
TRANSLATIONS, \*LASER MODULATORS

(U)

THE DEPENDENCE OF RADIATION INTENSITY OF A HE-  
NE LASER ON ORIENTATION OF AN ELECTROOPTICAL  
CRYSTAL AND ON CONTROLLING ELECTRIC FIELD STRENGTH  
WAS STUDIED TO OPTIMIZE OPERATING CONDITIONS OF THE  
LASER WITH INTERNAL MODULATION. THE ELECTROOPTICAL  
CRYSTAL WAS PLACED INSIDE A 2-MIRROR RESONATOR SO  
THAT THE NORMAL OF THE CRYSTAL SURFACE MADE THE  
BREWSTER ANGLE WITH THE DIRECTION OF INCIDENT BEAM  
AND SO THAT THE DIRECTION OF THE BEAM INSIDE THE  
CRYSTAL AGREED WITH THE DIRECTION OF THE OPTICAL  
AXIS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-700 049 20/6 20/5  
AIR FORCE CAMBRIDGE RESEARCH LABS L G HANSCOM FIELD  
MASS

TRANSVERSE MODE ELECTRO-OPTIC MATERIALS. (U)

DESCRIPTIVE NOTE: PHYSICAL SCIENCES RESEARCH PAPERS,  
JAN 70 21P ARMINGTON, A. F. JOHANNON,  
J. J. ;

REPT. NO. AFCRL-PSRP-402, AFCRL-70-0005

PROJ: AF-5620

TASK: 562009

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PRESENTED AT THE AVIONICS PANEL,  
TECHNICAL SYMPOSIUM (17TH) TONSBERG (NORWAY) 29  
SEP 69.

DESCRIPTORS: (\*OPTICAL MATERIALS, \*ELECTROOPTICS),  
(\*COPPER COMPOUNDS, CRYSTAL GROWTH),  
(\*MODULATORS, LASERS), CHLORIDES, GELS,  
LASERS, MODULATION, LIGHT TRANSMISSION (U)  
IDENTIFIERS: COPPER CHLORIDES, \*LASER  
MODULATORS (U)

MOST ELECTRO-OPTIC MODULATORS PRESENTLY USED ARE  
CRYSTALS SUCH AS KDP WHICH EXHIBIT A LONGITUDINAL  
ELECTRO-OPTIC EFFECT. IT HAS BEEN DEMONSTRATED  
THAT A MORE EFFICIENT MODULATOR CAN BE PRODUCED WHEN  
A CRYSTAL HAVING A TRANSVERSE ELECTRO-OPTIC EFFECT IS  
EMPLOYED. GENERALLY THESE CRYSTALS ARE PRODUCED  
EITHER FROM THE MELT OR FROM FLUXES. SINCE MELT  
GROWN CRYSTALS MUST BE COOLED THROUGH SEVERAL HUNDRED  
DEGREES AND OFTEN MUST UNDERGO PHASE TRANSITIONS,  
THESE CRYSTALS ARE GENERALLY HIGHLY STRAINED. FLUX  
GROWN CRYSTALS ARE ALSO UNSATISFACTORY BECAUSE OF THE  
TENDENCY TO INCORPORATE THE FLUX INTO THE LATTICE.  
IN THIS PAPER A METHOD OF PRODUCING CRYSTALS WITH A  
TRANSVERSE ELECTRO-OPTIC EFFECT AT ROOM TEMPERATURE  
IS PRESENTED WHICH RESULTS IN STRAIN-FREE CRYSTALS OF  
HIGH PURITY. THE PRINCIPAL MATERIAL DISCUSSED IS  
CUPROUS CHLORIDE WHICH HAS THE ADDED ADVANTAGE THAT  
IT HAS TRANSPARENCY IN THE INFRARED RANGE OUT TO AT  
LEAST TWENTY MICRONS. THE SYSTEM USED FOR THE  
EVALUATION OF MATERIALS IS DISCUSSED AS WELL AS  
RESULTS FOR CUPROUS CHLORIDE AND OTHER MATERIALS  
PRODUCED BY ROOM TEMPERATURE TECHNIQUES. THIS WORK  
HAS PROVIDED A SIGNIFICANTLY IMPROVED LASER MODULATOR  
MATERIAL OF POTENTIAL VALUE FOR COMMUNICATION SYSTEMS  
AND SIMILAR APPLICATIONS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-702 408 17/2  
NAVAL ORDNANCE LAB WHITE OAK MD

THE INTERACTION OF CO2 LASER RADIATION AND  
WATER.

(U)

DESCRIPTIVE NOTE: FINAL REPT. JUN 68-JUN 69.  
JAN 70 22P LONEY, JEREMIAH R. ;  
SULLIVAN, JOHN B. ;  
REPT. NO. NOLTR-69-166  
PROJ: A37-533/000/WF08-123-702

UNCLASSIFIED REPORT

DESCRIPTORS: (\*GAS LASERS, \*UNDERWATER SOUND),  
(\*UNDERWATER COMMUNICATION SYSTEMS, GAS LASERS),  
AIR-TO-UNDERWATER, LIGHT COMMUNICATION SYSTEMS,  
INTERACTIONS  
IDENTIFIERS: CARBON DIOXIDE LASERS

(U)

(U)

THE OUTPUT OF A CO2 LASER WAS FOCUSED UPON THE  
SURFACE OF WATER TO STUDY THE GENERATION OF SONIC  
WAVES FOR AIR TO WATER COMMUNICATION. A ROTATING  
MIRROR Q-SWITCH SYSTEM AND AN ELECTRICAL PULSING  
SYSTEM WERE USED TO OBTAIN LASER PULSES.  
CONTINUOUS WAVE OUTPUT WAS ALSO INVESTIGATED. IN  
EACH CASE, THERE WERE THREE OBVIOUS EFFECTS FROM THE  
INTERACTION (1) GENERATION OF AN ACOUSTIC WAVE IN  
AIR; (2) GENERATION OF AN ACOUSTIC WAVE IN WATER;  
AND (3) GENERATION OF A CIRCULAR SURFACE WAVE.  
THE BEST EFFICIENCY FOR PRODUCING A WATER ACOUSTIC  
DISTURBANCE WAS ABOUT 10 TO THE -6TH POWER. ONE  
PART IN 10,000 OF THE ACOUSTIC ENERGY COUPLED INTO  
THE WATER - THE BALANCE IS DISSIPATED IN THE AIR.  
PLACING A TRANSPARENT WINDOW ON THE SURFACE  
ENHANCED THE WATER ACOUSTIC WAVE SO THAT IT WAS  
COMPARABLE IN ENERGY TO THE AIR ACOUSTIC WAVE. IT  
IS CONCLUDED THAT THE PROCESS IS VERY LOSSY, ALTHOUGH  
FURTHER IMPROVEMENTS IN LASER ENGINEERING MAY YIELD  
BETTER RESULTS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-702 944 17/2

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

MOTION PICTURE AND TELEVISION ENGINEERING. VOLUME  
13, NUMBER 5, 1969 (SELECTED ARTICLES), (U)

DEC 69 32P ARKADEV, D. I. ;MILINKIS, B.  
M. ;SOKOLOV, P. L. ;KRUSSE, B. V. ;  
REPT. NO. FTD-MT-24-350-69  
PROJ: FTD-4160301

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED MACHINE TRANS. OF TEKHNIKA  
KINO I TELEVIDENIYA (USSR) V13 N5 P52-62 1969, BY  
JOHN W. ANDERSON, JR.

DESCRIPTORS: (\*TELEVISION DISPLAY SYSTEMS,  
\*LASERS), (\*IMAGE ORTHICONS, TELEVISION  
EQUIPMENT), OPTICAL IMAGES, DISTORTION,  
MODULATION, USSR (U)

IDENTIFIERS: TRANSLATIONS, TELEVISION  
BROADCASTING (U)

CONTENTS: USE OF LASERS IN TELEVISION; LIGHT  
AND POTENTIAL CHARACTERISTICS OF IMAGE  
ORTHICONS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-706 292 17/2 9/4  
MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF  
ELECTRONICS

EFFICIENT OPTICAL COMMUNICATION IN A TURBULENT  
ATMOSPHERE.

(U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
APR 70 125P HALME, SEPPO J. ;  
REPT. NO. TR-474  
CONTRACT: DA-28-043-AMC-02536(E), NGL-22-009-013  
PROJ: DA-2-0-061102-B-31-F

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: DOCTORAL THESIS.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
ATMOSPHERIC MOTION), LIGHT TRANSMISSION,  
DETECTION, OPTIMIZATION, NOISE(RADIO),  
INFORMATION THEORY, LASERS, STATISTICAL  
DISTRIBUTIONS, PROBABILITY DENSITY FUNCTIONS,  
THESES

(U)

GIVEN A TRANSMITTER THAT RADIATES AN  
ELECTROMAGNETIC LIGHT FIELD, IT IS ASSUMED THAT THE  
RESULTING FIELD AT THE PLANE OF THE RECEIVER APERTURE  
IS LOG-NORMAL WITH SOME COHERENCE PROPERTIES.  
VARIOUS REPRESENTATIONS OF THE FIELD ARE  
DISCUSSED: APERTURE SAMPLING, PLANE-WAVE  
DECOMPOSITION, AND KARHUNEN-LOEVE EXPANSION.  
THE STATISTICAL PROPERTIES OF THE COEFFICIENTS IN  
THESE REPRESENTATIONS ARE INVESTIGATED BY ANALYTICAL,  
SIMULATION, AND EXPERIMENTAL METHODS. BASED ON  
THESE REPRESENTATIONS THE PROBLEM OF OPTIMUM  
DETECTION OF AN ORTHOGONAL SIGNAL SET, SUBJECT TO  
DISTORTION AND NOISE IN THE ATMOSPHERE, IS  
INVESTIGATED. THE OPTIMUM RECEIVER AND ITS  
PERFORMANCE ARE EVALUATED AND DISCUSSED IN THE CASES  
OF LOG-NORMAL AND GAUSSIAN STATISTICS, CLASSICAL  
AND QUANTUM MODELS, LARGE AND SMALL APERTURES, AND  
STRONG, WEAK OR ABSENT BACKGROUND NOISE.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-707 629 20/5  
CALIFORNIA UNIV BERKELEY DEPT OF ELECTRICAL  
ENGINEERING

SWITCHING OF PHASE-LOCKED STATES IN THE  
INTRACAVITY PHASE-MODULATED HE-NE LASER, (U)

FEB 69 12P HONG, G. W. ; WHINNERY, J.

R. ;

CONTRACT: AF-AFOSR-1488-68

PROJ: AF-4751

MONITOR: AFOSR 70-1677TR

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN IEEE JNL. OF QUANTUM  
ELECTRONICS, VQE-5 N7 P367-376 JUL 69.

DESCRIPTORS: (\*GAS LASERS, PHASE-LOCKED SYSTEMS),  
PHASE MODULATION, HELIUM, NEON, ISOTOPES,  
FREQUENCY MODULATION (U)  
IDENTIFIERS: \*HELIUM NEON LASERS, SWITCHING (U)

IT IS KNOWN THAT THERE EXIST TWO SOLUTIONS FOR THE  
HE-NE LASER PHASE LOCKED BY SYNCHRONOUS INTERNAL  
PHASE MODULATION. ONE CORRESPONDS TO A PHASE  
DIFFERENCE BETWEEN ADJACENT MODES OF EVEN INTEGERS OF  
PI (EVEN STATE) AND THE OTHER TO ODD INTEGERS OF  
PI (ODD STATE). ALTHOUGH THEIR FREQUENCY POWER  
SPECTRA IN GENERAL LOOK SIMILAR, THEY APPEAR IN THE  
TIME RESPONSE AS TWO DIFFERENT SETS OF PULSE TRAINS  
180 DEG OUT OF PHASE WITH RESPECT TO EACH OTHER.  
OF THE TWO, FOR A GIVEN SET OF CONDITIONS, IT HAS  
NOT YET BEEN POSSIBLE TO PREDICT WHICH STATE WILL  
OSCILLATE. IT WAS FOUND THAT, IF THE MODULATION  
FREQUENCY IS FIXED SLIGHTLY HIGHER THAN THE AVERAGE  
AXIAL-MODE SPACING NEAR THE LINE CENTER, THE TWO  
STATES CAN BE CONTROLLED BY VARYING THE AMPLITUDE OF  
THE MODULATION SIGNAL, RESULTING IN A SWITCHING  
ACTION BETWEEN THE TWO STATES. FURTHERMORE, IT WAS  
FOUND THAT IN A NARROW REGION OF 'DETUNING' AND IN A  
SMALL RANGE OF MODULATION AMPLITUDES, BOTH STATES  
OSCILLATE SIMULTANEOUSLY. THE ABOVE RESULTS WERE  
ANALYZED BY CONSIDERING THE ASSYMMETRY IN THE  
FREQUENCY CHARACTERISTICS OF THE GAIN MEDIUM DUE TO  
THE PRESENCE OF THE ISOTOPE NE22 IN THE HE-NE  
MIXTURE. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-707 861 20/6  
RAND CORP SANTA MONICA CALIF

PROPAGATION OF A FINITE OPTICAL BEAM IN AN  
INHOMOGENEOUS MEDIUM,

(U)

APR 70 41P LUTOMIRSKI, R. F. ;  
REPT. NO. RM-6055-ARPA  
CONTRACT: DAHC15-67-C-0141, ARPA ORDER-189-1

UNCLASSIFIED REPORT

DESCRIPTORS: (\*ATMOSPHERIC MOTION, LIGHT  
TRANSMISSION), (\*COHERENT RADIATION,  
DIFFRACTION), LIGHT COMMUNICATION SYSTEMS, RANGE  
FINDING, TARGET ACQUISITION, REFRACTIVE INDEX, GAS  
LASERS, IRASERS

(U)

THE MEMORANDUM IS PART OF A STUDY OF THE EFFECT  
OF ATMOSPHERIC TURBULENCE ON OPTICAL AND INFRARED  
RECONNAISSANCE AND GUIDANCE EQUIPMENT. A  
QUANTITATIVE UNDERSTANDING OF THE MANNER IN WHICH AN  
INITIALLY COHERENT BEAM OF FINITE CROSS SECTION  
PROPAGATES IS REQUIRED FOR THE PREDICTION OF THE  
PERFORMANCE OF VARIOUS DEVICES EMPLOYING LASERS FOR  
TARGET ACQUISITION OR GUIDANCE IN TACTICAL MISSIONS,  
OPTICAL COMMUNICATION SYSTEMS, AND OTHER DEVICES.  
THE MEMORANDUM CALCULATES THE MEAN INTENSITY  
DISTRIBUTION FOR AN ARBITRARY AMPLITUDE AND PHASE  
DISTRIBUTION IN A FINITE APERTURE IN BOTH THE NEAR  
AND FAR FIELD AND EXAMINES IN DETAIL THE CASE OF A  
UNIFORM DISTRIBUTION ACROSS A CIRCULAR APERTURE.  
THE RESULTS SHOULD BE OF USE TO THOSE INTERESTED IN  
PROPAGATION THEORY AND ITS APPLICATIONS TO LASER  
RANGE FINDERS, LASER LINE SCANNERS, COMMUNICATION  
SYSTEMS, AND VARIOUS GUIDANCE AND OTHER SYSTEMS  
EMPLOYING AN ILLUMINATING BEAM. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-707 948 17/2 20/6 17/5 17/8  
MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF  
ELECTRONICS

EFFICIENT ANALOG COMMUNICATION OVER QUANTUM  
CHANNELS.

(U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,

JAN 70 112P PERSONICK, STEWART D. ;  
REPT. NO. TR-477

CONTRACT: DA-28-043-AMC-02536(E), NGL-22-009-013

PROJ: DA-2-0-061102-B-31-F

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
FEASIBILITY STUDIES), (\*COHERENT RADIATION,  
LIGHT TRANSMISSION), (\*PHOTONS, COUNTING  
METHODS), INFORMATION THEORY, QUANTUM MECHANICS,  
ANALOG SYSTEMS, THESES

(U)

IDENTIFIERS: STATISTICAL DECISION THEORY

(U)

THE REPORT IS CONCERNED WITH THE INCORPORATION OF  
THE AXIOMS OF QUANTUM MEASUREMENTS INTO CURRENT  
COMMUNICATION ESTIMATION THEORY. IT IS WELL KNOWN  
THAT CLASSICAL ELECTROMAGNETIC THEORY DOES NOT  
ADEQUATELY DESCRIBE FIELDS AT OPTICAL FREQUENCIES.  
THE ADVENT OF THE LASER HAS MADE THE USE OF OPTICAL  
CARRIERS FOR INFORMATION TRANSMISSION PRACTICAL.  
CLASSICAL COMMUNICATION ESTIMATION THEORY  
EMPHASIZES BACKGROUND NOISE AND CHANNEL FADING AS  
PRIMARY LIMITATIONS ON SYSTEM PERFORMANCE. AT  
OPTICAL FREQUENCIES, QUANTUM EFFECTS MAY TOTALLY  
DOMINATE PERFORMANCE. ESTIMATION THEORY IS  
FORMULATED USING THE QUANTUM THEORY SO THAT THIS TYPE  
OF SYSTEM LIMITATION CAN BE UNDERSTOOD, AND OPTIMAL  
RECEIVERS AND SYSTEMS DESIGNED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-708 677 17/2 9/5  
SIGNALS RESEARCH AND DEVELOPMENT ESTABLISHMENT  
CHRISTCHURCH (ENGLAND)

A 1 KM RANGE OPTICAL LINK FOR VIDEO SIGNALS  
INCORPORATING A SIMPLE AGC AND TEMPERATURE  
COMPENSATION CIRCUIT FOR AVALANCHE PHOTODIODES, (U)

APR 70 10P DORE, M. J. ;  
REPT. NO. SRDE-70018  
MONITOR: TRC BR-19358

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
FEASIBILITY STUDIES), AUTOMATIC GAIN CONTROL,  
GALLIUM ARSENIDES, SILICON, INFRARED DETECTORS,  
LASERS, PHOTODIODES, GREAT BRITAIN (U)  
IDENTIFIERS: GALLIUM ARSENIDE LASERS (U)

GALLIUM ARSENIDE LAMPS AND SILICON AVALANCHE  
DETECTORS ARE RELIABLE COMPONENTS FOR OPTICAL  
COMMUNICATION. IT HAS BEEN SHOWN THAT DIRECT  
ANALOGUE MODULATION IS PROBABLY THE BEST APPROACH TO  
A 1KM RANGE OPTICAL COMMUNICATION LINK FOR VIDEO  
BANDWIDTHS. THIS MEMORANDUM DESCRIBES BRIEFLY  
EXPERIMENTAL TERMINALS FOR SUCH A LINK. LABORATORY  
MEASUREMENT INDICATED THAT A CLEAR WEATHER 'IN HAND'  
FACTOR OF 13DB OR MORE ABOVE THE 30DB S/N  
RATIO NEEDED SHOULD BE ACHIEVED RESULTING IN AN  
EXPECTED OUTAGE TIME OF LESS THAN 10 DAYS PER YEAR.  
A SIMPLE AGC AND TEMPERATURE STABILIZATION  
CIRCUIT FOR AVALANCHE DIODES IS DESCRIBED.  
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-708 896 20/5  
AVCO EVERETT RESEARCH LAB EVERETT MASS

LASER BEAM TRANSMISSION THROUGH THE  
ATMOSPHERE.

(U)

DESCRIPTIVE NOTE: RESEARCH REPT.,  
MAR 70 46P WALLACE, J. , JR.; CAMAC, M.

REPT. NO. AERL-RR-347  
CONTRACT: F29601-69-C-0060  
PROJ: AF-3326

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, IONOSPHERIC PROPAGATION),  
COHERENT RADIATION, ELECTROMAGNETIC WAVES,  
REFRACTIVE INDEX, ABSORPTION, CARBON DIOXIDE,  
ATMOSPHERIC REFRACTION

(U)

THEORETICAL EVALUATION OF THE TRANSMISSION OF A  
LASER BEAM AT 10.6 MICRONS HAS BEEN INVESTIGATED  
USING THE TECHNIQUES OF GEOMETRIC OPTICS. THE  
INTERACTION IS NON-LINEAR BECAUSE THE REFRACTIVE  
INDEX DEPENDS THROUGH THE MECHANISM OF ABSORPTION,  
UPON THE INTENSITY OF THE PROPAGATING WAVE.  
ATMOSPHERIC ABSORPTION AT 10.6 MICRONS IS CAUSED BY  
CO<sub>2</sub> AND H<sub>2</sub>O IN THE ATMOSPHERE. ASSOCIATED  
WITH ABSORPTION BY CO<sub>2</sub> AND TRANSVERSE FLOW CAUSED  
BY ATMOSPHERIC WINDS OR BEAM MOTION ARE VIBRATIONAL  
RELAXATION EFFECTS WHICH CAN EITHER HEAT OR COOL THE  
ATMOSPHERE. IF THE ATMOSPHERE IS COOLED, THE BEAM  
IS SELF-FOCUSED. THE VELOCITY-ALTITUDE DEPENDENCE  
OF HEATING AND COOLING REGIMES ARE DEFINED AND  
DETAILED INTENSITY DISTRIBUTIONS IN EACH REGIME ARE  
PRESENTED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-709 434 20/5 4/1  
INSTITUTE FOR DEFENSE ANALYSES ARLINGTON VA SCIENCE AND  
TECHNOLOGY DIV

DESCRIPTION OF ATMOSPHERIC TURBULENCE FOR LINEAR  
PROPAGATION OF LASER BEAMS.

(U)

DESCRIPTIVE NOTE: RESEARCH PAPER,  
JUL 70 75P HIDALGO, HENRY ; VAGLIO-  
LAURIN, ROBERTO ;  
REPT. NO. RP-P-600  
CONTRACT: DAHC15-67-C-0011  
MONITOR: IDA/HQ 70-11343

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, LIGHT TRANSMISSION),  
(\*LIGHT TRANSMISSION, \*ATMOSPHERIC MOTION),  
BOUNDARY LAYER, ATMOSPHERIC REFRACTION,  
PROPAGATION, SIGNALS, SCATTERING

(U)

THE PAPER CONSIDERS THE FLUID MECHANICAL ASPECTS  
AND DATA RELEVANT TO THE PROPAGATION OF LOW POWER-  
DENSITY LASERS IN THE ATMOSPHERIC BOUNDARY LAYER.  
ITS SCOPE INCLUDES THE FOLLOWING TOPICS: (A)  
FORMULATION OF THE ROLE OF THE TURBULENT STRUCTURE IN  
DETERMINING PHASE AND AMPLITUDE CHARACTERISTICS OF  
RECEIVED SIGNALS, WITH EMPHASIS ON SINGLE SCATTERING  
SITUATIONS, (B) REVIEW OF AVAILABLE FLUID  
MECHANICAL DATA FOR MEAN AND FLUCTUATING FLOW  
PROPERTIES FOR VARIOUS ATMOSPHERIC CONDITIONS,  
(C) IDENTIFICATION OF THE ATMOSPHERIC CONDITIONS  
THAT REQUIRE COMPLEMENTARY FLUID MECHANICAL  
MEASUREMENTS, AND (D) PROBLEM AREAS THAT NEED  
FURTHER THEORETICAL INVESTIGATIONS CONCERNING THE  
EFFECT OF ATMOSPHERIC TURBULENCE ON OPTICAL WAVE  
PROPAGATION. (AUTHOR)

(U)

UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-709 579 20/5 20/6  
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

DETERMINATION OF ATMOSPHERICALLY INDUCED PHASE  
FLUCTUATIONS BY LONG DISTANCE INTERFEROMETRY AT  
6328 A.

(U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
MAY 70 21P BUSER, RUDOLF G. ; BORN,  
GUNTARD K. ;  
REPT. NO. ECOM-3283  
PROJ: DA-1-T-061102-B-31-A  
TASK: 1-T-061102-B-31-A-01

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT TRANSMISSION, PHASE  
DISTORTION), LIGHT COMMUNICATION SYSTEMS,  
INTERFEROMETERS, GAS LASERS, ATMOSPHERIC MOTION  
IDENTIFIERS: HELIUM NEON LASERS

(U)

(U)

EXPERIMENTAL VALUES OF ATMOSPHERICALLY INDUCED  
PHASE FLUCTUATIONS HAVE BEEN OBTAINED FOR VARIOUS  
PATHLENGTHS USING A NEAR-GROUND HORIZONTAL MACH-  
ZEHNDER SETUP AT 6328 A. INDEPENDENT  
DETERMINATION OF THE STRUCTURE FUNCTION CONSTANT OF  
THE REFRACTIVE INDEX AND OTHER RELEVANT PARAMETERS  
PERMITTED A CLEAR DEFINITION OF PREVAILING  
METEOROLOGICAL CONDITIONS. IT IS FOUND THAT FOR LOW  
TURBULENCE, OR STRONG TURBULENCE AND SHORT  
PATHLENGTH, TATARSKI'S THEORY GENERALLY UNDER-  
ESTIMATES THE VALUES OF THE OBSERVED RMS PHASE  
FLUCTUATIONS. FOR HIGHER TURBULENCE NO CONTINUOUS  
PHASE INFORMATION IS DIRECTLY OBTAINABLE, AND THE  
CONCEPT OF PHASE STRUCTURE FUNCTION BECOMES  
EXPERIMENTALLY UNDEFINED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-710 178 20/5 17/2  
TECHNION RESEARCH AND DEVELOPMENT FOUNDATION LTD HAIFA  
(ISRAEL)

SPECTROSCOPIC STUDIES WITH A TUNABLE N2O LASER,

(U)

SEP 69 5P OPPENHEIM, URI P. ; MELMAN,  
PAUL ;  
CONTRACT: E00AR-69-0053  
PROJ: AF-9750  
TASK: 975001  
MONITOR: AFOSR 70-2115TR

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN JNL. OF THE OPTICAL  
SOCIETY OF AMERICA, V60 N3 P332-334 MAR 70.

DESCRIPTORS: (\*GAS LASERS, \*NITROGEN OXIDES),  
(\*LIGHT COMMUNICATION SYSTEMS, GAS LASERS),  
INFRARED COMMUNICATION SYSTEMS, ISRAEL  
IDENTIFIERS: \*NITROGEN OXIDE LASERS, NITROGEN  
OXIDE (N2O), \*TUNABLE LASERS

(U)

(U)

AN N2O LASER IS DESCRIBED WHICH IS TUNABLE OVER  
65 ROTATIONAL LINES OF THE 001-100 BAND. A SIMPLE  
METHOD IS USED TO DETERMINE THE CAVITY LOSSES OF THIS  
LASER. ABSORPTION OF A NUMBER OF N2O LINES BY  
THE 001-100 BAND OF CO2 IS DEMONSTRATED. THE P  
(20) LINE OF N2O IS OBSERVED AFTER ATTENUATION  
BY A LONG PATH OF N2O AT 125-TORR PRESSURE AND  
THE PEAK ABSORPTION COEFFICIENT FOR THIS LINE IS  
FOUND TO BE 0.0094/CM AT 300 K. THE N2O LASER  
HAS A CERTAIN ADVANTAGE OVER THE CO2 LASER FOR  
LONG-RANGE COMMUNICATIONS THROUGH THE ATMOSPHERE.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY      SEARCH CONTROL NO. /ZLW13

AD-710 712                      20/6                      20/12  
CALIFORNIA INST OF TECH PASADENA DIV OF ENGINEERING AND  
APPLIED SCIENCE

OPTICAL GUIDING AND ELECTRO-OPTIC MODULATION IN  
GAAS EPITAXIAL LAYERS,

(U)

APR 70                      3P                      HALL, DAVID ; YARIV, AMNON ;  
GARMIRE, ELSA ;

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN OPTICS COMMUNICATIONS, V1 N9  
P403-405 APR 70.

SUPPLEMENTARY NOTE: SPONSORED IN PART BY THE OFFICE OF  
NAVAL RESEARCH, WASHINGTON, D. C.

DESCRIPTORS: (\*GALLIUM ARSENIDES, \*ELECTROOPTICS),  
(\*INFRARED RADIATION, MODULATION),  
SEMICONDUCTING FILMS, EPITAXIAL GROWTH,  
WAVEGUIDES, LASERS

(U)

SINGLE MODE TE OR TM PROPAGATION IS  
DEMONSTRATED IN AN OPTICAL WAVEGUIDE CONSISTING OF A  
HIGH RESISTIVITY SEMICONDUCTOR (GAAS) LAYER  
(ABOUT 10 MICROMETERS) WHICH IS SANDWICHED  
BETWEEN A METAL FILM AND A LOWER RESISTIVITY  
SEMICONDUCTOR. A REVERSE BIAS APPLIED TO THE METAL-  
SEMICONDUCTOR SCHOTTKY BARRIER CAUSES AN ELECTRO-  
OPTIC RETARDATION (OR, IN GENERAL, PHASE  
VARIATION) WHICH CAN BE USED FOR MODULATION  
PURPOSES. AMPLITUDE MODULATION WITH A 'HALF-  
VOLTAGE'  $V_{SUB} (1/2) = 84$  VOLTS IS DEMONSTRATED  
AT  $\lambda_{SUB 0} = 1.15$  MICROMETERS WITH A SAMPLE 2.4  
MM LONG.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-710 946 17/2 20/5  
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

AN INFORMATION FEEDBACK APPROACH APPLIED TO AN  
AMPLITUDE-MODULATED DIGITAL LASER COMMUNICATIONS  
SYSTEM. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
MAR 70 97P DWORKIN, LARRY U. ;  
REPT. NO. ECCM-3258  
PROJ: DA-5016118443001

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
FEEDBACK), DIGITAL SYSTEMS, DIGITAL COMPUTERS,  
AMPLITUDE MODULATION, INFORMATION THEORY, MONTE  
CARLO METHOD, LASERS, PHOTONS, COUNT-RATE  
METERS, ATTENUATION (U)  
IDENTIFIERS: \*LASER COMMUNICATION SYSTEMS (U)

THE USE OF PRECISION FEEDBACK IN A LASER  
COMMUNICATION SYSTEM EMPLOYING AN AMPLITUDE-MODULATED  
LASER TRANSMITTER AND PHOTOMULTIPLIER RECEIVER IS  
CONSIDERED. POISSON STATISTICS ARE USED TO DESCRIBE  
THE DISTRIBUTION OF EMITTED PHOTO ELECTRONS IN A  
FIXED TIME INTERVAL FROM THE PHOTO EMISSIVE SURFACE  
OF THE RECEIVER WHEN THE INCIDENT FIELD IS A MIXTURE  
OF A SINGLE MODE LASER AND BROADBAND THERMAL NOISE.  
THE USE OF A NOISELESS FEEDBACK PATH TO REDUCE THE  
VARIANCE OF THE RECEIVED PHOTO ELECTRON COUNT IS  
EXAMINED. A TECHNIQUE KNOWN AS 'FEEDBACK AVERAGING'  
IS CONCEIVED AND THE FOLLOWING PROPERTIES ARE  
DEMONSTRATED. (A) THE VARIANCE OF THE RECEIVED  
PHOTO ELECTRON COUNTS IS SIGNIFICANTLY REDUCED OVER  
THAT OBTAINED IN A SYSTEM WITHOUT FEEDBACK. (B)  
THE EFFECTS OF BACKGROUND RADIATION AND SHOT NOISE  
AT THE RECEIVER CAN BE REDUCED. (C) THE EFFECT  
OF SLOW FADING ON THE MEAN ARRIVAL RATE OF PHOTONS IS  
REDUCED. THIS IS ACHIEVED IN THE ABOVE SYSTEM WITH  
THE SAME AVERAGE POWER AND ONLY SLIGHTLY MORE PEAK  
POWER, IN MOST CASES, THAN THE SAME SYSTEM WITHOUT  
FEEDBACK. THE APPROACH IS TREATED ANALYTICALLY, AND  
SIMULATED ON A DIGITAL COMPUTER. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-710 955 17/2 20/5  
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

AN INFORMATION FEEDBACK APPROACH APPLIED TO  
POLARIZATION-MODULATED LASER COMMUNICATION  
SYSTEMS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
JUL 70 26P DWORKIN, LARRY U. ;  
REPT. NO. ECOM-3314  
PROJ: DA-5016118443001, DA-A-91-A-3801

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: DOCTORAL THESIS FROM POLYTECHNIC  
INST. OF BROOKLYN, N. Y.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
FEEDBACK), DIGITAL SYSTEMS, DIGITAL COMPUTERS,  
INFORMATION THEORY, PHOTONS, COUNT-RATE METERS,  
ATTENUATION, LASERS, POLARIZATION, THESES (U)  
IDENTIFIERS: \*LASER COMMUNICATION SYSTEMS,  
\*POLARIZATION MODULATION (U)

THE USE OF AN INFORMATION FEEDBACK PROCEDURE,  
CALLED 'FEEDBACK AVERAGING' IS APPLIED TO AN M-  
ARY POLARIZATION MODULATED LASER  
COMMUNICATION SYSTEM. THE SYSTEMS WITH AND  
WITHOUT FEEDBACK, THAT ARE LIMITED BY PHOTON  
FLUCTUATION, ARE CONSIDERED AND COMPARED. A  
SIGNIFICANT IMPROVEMENT IN ERROR RATE OF A SYSTEM  
WITH FEEDBACK IS DEMONSTRATED OVER A ONE-WAY SYSTEM  
FOR A QUATERNARY SYSTEM SUBJECT TO INTENSITY  
CONSTRAINT. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-710 956 17/2 20/5  
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

AN EXPERIMENTAL FEEDBACK AVERAGING LASER  
COMMUNICATIONS SYSTEM.

(U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
JUL 70 25P DWORKIN, LARRY U. ;  
REPT. NO. ECOM-3315  
PROJ: DA-5016118443001, AD-A-91-3901

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: DOCTORAL THESIS FROM POLYTECHNIC  
INST. OF BROOKLYN, N. Y.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
AMPLITUDE MODULATION), GAS LASERS, ATTENUATORS,  
PHOTOMULTIPLIERS, PHOTONS, COUNT-RATE METERS,  
THESES

(U)

IDENTIFIERS: \*LASER COMMUNICATION SYSTEMS, HELIUM  
NEON LASERS

(U)

AN EXPERIMENTAL VERSION OF A 'FEEDBACK AVERAGING'  
AMPLITUDE MODULATED LASER COMMUNICATIONS SYSTEM IS  
DISCUSSED. THE ABILITY OF THE SYSTEM TO REDUCE THE  
VARIANCE OF PHOTON ARRIVALS IS DEMONSTRATED  
EXPERIMENTALLY. PROPERTIES OF A RECEIVER ESTIMATOR  
CALCULATED IN PREVIOUSLY PUBLISHED REPORTS ARE  
VERIFIED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-714 358 20/6 20/5  
NATIONAL RESEARCH COUNCIL OF CANADA OTTAWA (ONTARIO) DIV O  
PHYSICS

PRODUCTION OF SUBNANOSECOND LIGHT PULSES WITH  
THE AID OF A LASER-TRIGGERED SPARK GAP,

(U)

JUN 70 4P ALCOCK, A. J. ; RICHARDSON,  
M. C. ;  
MONITOR: NRC 11487

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN OPTICS COMMUNICATIONS, V2 N2  
P65-68 JUL 70. NO COPIES FURNISHED.

DESCRIPTORS: (\*LIGHT PULSES, LASERS),  
ELECTROOPTICS, LIGHT TRANSMISSION, LIGHT  
COMMUNICATION SYSTEMS, CANADA  
IDENTIFIERS: SPARK GAPS, RUBY LASERS

(U)

(U)

SUBNANOSECOND PULSES, HAVING RISE AND FALL TIMES  
NOT EXCEEDING 300 PSEC, HAVE BEEN SELECTED FROM THE  
OUTPUT OF A SINGLE MODE RUBY LASER. THE PULSE  
WIDTH, APPROXIMATELY 700 PSEC, AGREES WELL WITH THE  
OBSERVED BROADENING OF THE SPECTRUM OF THE PULSE.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-714 718 17/2 20/5  
GEORGETOWN UNIV WASHINGTON D C DEPT OF PHYSICS

FREQUENCY-MODULATED LASER COMMUNICATION  
SYSTEM,

(U)

OCT 69 5P BORSUK, GERALD M. ITHALER,  
WILLIAM J. ;  
CONTRACT: F44620-68-C-0017  
PROJ: AF-7921  
MONITOR: AFOSR 70-2611TR

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN IEEE TRANSACTIONS ON SONICS  
AND ULTRASONICS, VSU-17 N4 P207-209 OCT 70.

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS, GAS  
LASERS), (\*GAS LASERS, FREQUENCY MODULATION),  
VIDEO SIGNALS, ULTRASONIC RADIATION,  
PERFORMANCE (ENGINEERING)

(U)

IDENTIFIERS: HELIUM NEON LASERS, ACOUSTOOPTIC  
INTERACTIONS

(U)

AN ULTRASONIC MODULATION CELL UTILIZING THE  
RAMAN-NATH EFFECT IS USED TO IMPRESS A FREQUENCY-  
MODULATED VIDEO SIGNAL ON A HELIUM-NEON LASER  
CARRIER. A LONGITUDINAL ULTRASONIC WAVE  
PROPAGATING IN THE ULTRASONIC MODULATION CELL  
EFFECTIVELY ACTS AS A DOPPLER SHIFTING PHASE  
GRATING FOR COLLIMATED MONOCHROMATIC-LIGHT INCIDENT  
NORMAL TO THE DIRECTION OF PROPAGATION OF THE  
ULTRASONIC WAVE. A TECHNIQUE HAS BEEN DEVELOPED BY  
WHICH TWO ULTRASONIC ELEMENTS PRODUCE A  
PSEUDOSTANDING WAVE AT THE VARIOUS MODULATING  
FREQUENCIES IMPOSED ON THE ELEMENTS. ALL DOPPLER-  
SHIFTED FREQUENCY COMPONENTS IN THE LASER BEAM ARE  
SCATTERED BACK INTO THE ZERO ORDER. AN OPTICAL  
HETERODYNE DETECTOR AND FM DISCRIMINATOR ARE USED  
TO RECOVER THE SIGNAL. THE ABILITY TO FREQUENCY  
MULTIPLEX DISTINCT CHANNELS ONTO THE LASER BEAM,  
USING ACOUSTIC UNITS IN TANDEM, IS DEMONSTRATED.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-714 895 20/5  
BOLT BERANEK AND NEWMAN INC CAMBRIDGE MASS

PROBLEMS IN THE THEORY OF LASER  
MODULATION.

(U)

DESCRIPTIVE NOTE: FINAL REPT.,  
OCT 70 20P FOX, H. L. ;  
REPT. NO. BBN-2060  
CONTRACT: N00014-68-C-0199

UNCLASSIFIED REPORT

DESCRIPTORS: (\*GAS LASERS, COHERENT RADIATION),  
(\*COHERENT RADIATION, MODULATION), ATOMIC ENERGY  
LEVELS, ZEEMAN EFFECT, MATHEMATICAL ANALYSIS,  
QUANTUM MECHANICS, LIGHT TRANSMISSION,  
ELECTROOPTICS

(U)

IDENTIFIERS: HELIUM NEON LASERS, \*QUANTUM  
ELECTRONICS

(U)

THE REPORT DISCUSSES THE PROBLEM OF INTRINSIC  
INTERNAL MODULATION OF A LASER - MODULATION BY  
ALTERING THE STATE OF THE ACTIVE LASER MEDIUM.  
CONTROLLED MODULATION FOR INFORMATION TRANSMISSION  
AND UNCONTROLLED NOISE-PRODUCING MODULATIONS ARE  
CONSIDERED. TO DEMONSTRATE A CORRESPONDENCE-  
PRINCIPLE DERIVATION OF THE CLASSICAL LASER EQUATIONS  
OF LAMB, IT IS SHOWN THAT THE LIFETIME DISTORTIONS  
PREVIOUSLY REPORTED MUST BE INCLUDED IN A QUANTUM  
TREATMENT. THE PROBLEM OF SOUND WAVES AND TIME-  
DEPENDENT ZEEMAN-EFFECT MODULATION IS DISCUSSED.  
(AUTHOR)

(U)

UNCLASSIFIED

UDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-716 847 20/5  
CALIFORNIA UNIV IRVINE SCHOOL OF ENGINEERING

INVESTIGATION OF SPECTRAL AND STATISTICAL  
PROPERTIES OF SINGLE-MODE CW LASERS. (U)

DESCRIPTIVE NOTE: FINAL REPT, 1 JUL 69-30 JUN 70,  
JUL 70 46P GAMO, HIDEYA ; CHUANG, SHIH-

SHUNG ;

CONTRACT: F19628-69-C-0147

PROJ: AF-4645

TASK: 464502

MONITOR: AFCRL 70-0468

UNCLASSIFIED REPORT

DESCRIPTORS: (\*GAS LASERS, POWER SPECTRA),  
CARBON DIOXIDE, IRASERS, SPECTRA (INFRARED),  
STOCHASTIC PROCESSES, PROBABILITY DENSITY FUNCTIONS,  
LIGHT COMMUNICATION SYSTEMS (U)

IDENTIFIERS: \*CARBON DIOXIDE LASERS, CONTINUOUS  
WAVE LASERS, VAN DER POL DIFFERENTIAL EQUATION (U)

VARIANCE AND POWER SPECTRA OF INTENSITY  
FLUCTUATIONS OF A SINGLE MODE CW CO<sub>2</sub> 10.6 MICRON  
GAS LASER HAVE BEEN MEASURED BY USING A COPPER-DOPED  
GERMANIUM DETECTOR AND ANALOG INSTRUMENTATION.  
RMS INTENSITY FLUCTUATIONS ABOVE THE OSCILLATION  
THRESHOLD WAS SMALLER THAN 0.3% OF THE AVERAGE  
INTENSITY. THE MEASUREMENTS NEAR THE OSCILLATION  
THRESHOLD, HOWEVER, WERE NOT ACCURATE, BECAUSE THE  
ACOUSTIC DISTURBANCE DUE TO ACOUSTICAL NOISE, BUBBLES  
IN THE COOLING WATER AND TEMPERATURE FLUCTUATIONS IN  
THE PLASMA TUBE WERE PREDOMINANT OVER THE  
FLUCTUATIONS DUE TO SPONTANEOUS EMISSION. THE POWER  
SPECTRUM OBSERVED AT FREQUENCIES ABOVE 10KHZ SHOWED  
FEATURES CHARACTERISTIC TO THE LASER MODEL OF VAN  
DER POL OSCILLATOR DRIVEN BY THE RANDOM NOISE.  
IMPROVEMENTS OF CO<sub>2</sub> GAS LASER DESIRABLE FOR  
FURTHER INVESTIGATION ARE DISCUSSED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-716 876 20/5  
ILLINOIS UNIV URBANA GASEOUS ELECTRONICS LAB

FREQUENCY SHIFT AT 3.39 MICRONS DUE TO  
COMPETITION BY 6328-A LASER RADIATION, (U)

APR 69 4P KU, R. T. ; VERDEYEN, J. T.  
; CHERRINGTON, B. E. ;  
CONTRACT: AF 33(615)-5248  
PROJ: AF-7073  
TASK: 707300  
MONITOR: ARL 70-0289W

UNCLASSIFIED REPORT  
AVAILABILITY: PUB. IN JNL. OF APPLIED PHYSICS,  
V40 N9 P3861-3862 AUG 69.

DESCRIPTORS: (\*GAS LASERS, AMPLITUDE MODULATION),  
(\*INFRARED RADIATION, FREQUENCY SHIFT), HELIUM,  
NEON, GAIN, INTERACTIONS, DEMODULATION (U)  
IDENTIFIERS: \*HELIUM NEON LASERS (U)

REPORTED ARE THE RESULTS OF A RELATED INVESTIGATION  
IN WHICH THE FREQUENCY OF A MODE OSCILLATING AT 3.39  
MICROMETERS IS SHIFTED DUE TO AMPLITUDE MODULATION OF  
THE MODES AT 6328A. (AUTHOR: (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-720 937 20/6 17/2  
SIGNALS RESEARCH AND DEVELOPMENT ESTABLISHMENT  
CHRISTCHURCH (ENGLAND)

DETERMINATION OF THE SCATTERING LOSS IN  
OPTICAL GLASS FIBRES,

(U)

DEC 70 28P ORSBORNE, MARGARET A. ;  
REPT. NO. SRDE-70064  
MONITOR: TRC BR-23407

UNCLASSIFIED REPORT

DESCRIPTORS: (\*FIBER OPTICS, LIGHT TRANSMISSION),  
(\*LIGHT COMMUNICATION SYSTEMS, TRANSMISSION  
LINES), SCATTERING, GAIN, POWER SPECTRA, TEST  
METHODS, TEST EQUIPMENT, GREAT BRITAIN

(U)

THE PAPER DESCRIBES THE EQUIPMENT AND METHOD USED  
TO DETERMINE THE TOTAL LOSS OF POWER DUE TO ALL FORMS  
OF SCATTER WITHIN MULTIMODE OPTICAL GLASS FIBRES.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-721 372 20/5 17/2  
MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF ELECTRICAL  
ENGINEERING

THE BEHAVIOR OF LASER MODES IN A MEDIUM  
WITH TIME VARYING DIELECTRIC CONSTANT. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
AUG 70 170P WHITNEY, COLIN GORDON ;  
REPT. NO. TR-9  
CONTRACT: DA-31-124-ARO(D)-92, SD-90  
PROJ: DA-2-0-01051-B-700  
MONITOR: AROD 4109:12-P

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, FREQUENCY MODULATION),  
(\*IRASERS, LIGHT COMMUNICATION SYSTEMS),  
ULTRASONIC RADIATION, FREQUENCY SHIFT CONVERTERS,  
GALLIUM ARSENIDES, PARTIAL DIFFERENTIAL EQUATIONS,  
DIELECTRIC PROPERTIES, GAIN, AMPLITUDE MODULATION,  
THESES (U)

IDENTIFIERS: \*GALLIUM ARSENIDE LASERS,  
\*SEMICONDUCTOR LASERS, INJECTION LASERS (U)

THE EFFECT, ON SEMICONDUCTOR LASER MODES, OF A  
TIME-VARYING MODULATION OF THE COMPLEX DIELECTRIC  
CONSTANT OF THE ACTIVE REGION OF THE LASER, IS  
CONSIDERED. IT IS SEEN THAT THE MAIN EFFECT IS TO  
PRODUCE FREQUENCY MODULATION ASSOCIATED WITH  
MODULATION OF THE REAL PART OF THE DIELECTRIC  
CONSTANT WHILE MODULATION OF THE IMAGINARY PART GIVES  
RISE TO AMPLITUDE MODULATION. TWO METHODS FOR  
PRODUCING THE MODULATION ARE CONSIDERED. THE FIRST,  
PRESSURE VIA ULTRASONIC WAVES, PRODUCES PURE  
FREQUENCY MODULATION IN IMPURE MATERIAL. THE  
SECOND, MODULATION OF THE INJECTION, RESULTS IN BOTH  
AMPLITUDE AND FREQUENCY MODULATION. EXPERIMENTS TO  
CONFIRM THIS ANALYSIS WERE CARRIED OUT ON A CW  
GAAS INJECTION LASER. THE MODULATED LASER  
SPECTRUM WAS OBSERVED WITH A FABRY-PEROT  
INTERFEROMETER. HIGH RESOLUTION MEASUREMENTS ON  
THE PULSED SPECTRAL SHIFT OF A GAAS LASER AT  
77K AND 4.2K WERE PERFORMED USING A FABRY-  
PEROT INTERFEROMETER. THE FEASIBILITY OF  
DETECTING MODULATION ON A PULSED SEMICONDUCTOR LASER  
WAS DEMONSTRATED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-722 308 17/2  
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

MOTION PICTURE AND TELEVISION ENGINEERING.  
VOLUME 14, NUMBER 6, 1970 (SELECTED  
ARTICLES), (U)

JAN 71 24P RAPOPORT, B. I. ; VAINSHTEIN,  
G. G. ;  
REPT. NO. FTD-MT-24-297-70

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED MACHINE TRANS. OF TEKNIKA  
KINO I TELEVIDENIYA (USSR) V14 N6 P51-57 1970, BY  
RENE E. COURVILLE.

DESCRIPTORS: (\*TELEVISION COMMUNICATION SYSTEMS,  
GRAPHICS), (\*STEREOSCOPIC DISPLAY SYSTEMS,  
TELEVISION COMMUNICATION SYSTEMS), SCANNING,  
LASERS, USSR (U)  
IDENTIFIERS: TRANSLATIONS, \*HOLOGRAPHY (U)

DISCUSSED ARE POSSIBILITIES OF DESIGNING A  
HOLOGRAPHIC TELEVISION SYSTEM. GIVEN ARE  
EXPERIMENTAL TEST RESULTS OF THE SYSTEM DURING THE  
LONG IMAGE DURATION AND ALSO THE PROSPECTS OF USING  
SPECIAL TELEVISION SYSTEMS WITH THE TRACKING SCANNING  
FOR CONTOUR IMAGE TRANSMISSION. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY    SEARCH CONTROL NO. /ZLW13

AD-722 475                    20/6  
HUGHES AIRCRAFT CO MALIBU CALIF

RESEARCH IN INTERACTION OF COHERENT LIGHT  
WITH SOLIDS AND WITH TURBULENT ATMOSPHERES.                    (U)

DESCRIPTIVE NOTE: FINAL SCIENTIFIC REPT.,  
FEB 71    238P                    BROWN, W. P. ;  
CONTRACT: AF 49(638)-1607  
MONITOR: AFOSR                    TR-71-0582

UNCLASSIFIED REPORT

DESCRIPTORS: (\*COHERENT RADIATION, LIGHT  
TRANSMISSION), (\*LIGHT TRANSMISSION- MATHEMATICAL  
ANALYSIS), INTERACTIONS, TURBULENCE, SCATTERING,  
REFRACTIVE INDEX, PARTIAL DIFFERENTIAL EQUATIONS,  
BOUNDARY VALUE PROBLEMS, LASERS, DIFFRACTION,  
APPROXIMATION(MATHEMATICS)                    (U)  
IDENTIFIERS: ATMOSPHERIC ATTENUATION, RYTOV  
APPROXIMATION, BORN APPROXIMATION                    (U)

THE REPORT SUMMARIZES THE OBJECTIVES AND RESULTS OF  
RESEARCH ON PROPAGATION IN RANDOM MEDIA CONDUCTED ON  
CONTRACT AF49(638)-1607. THE PRINCIPAL  
RESULTS INCLUDE THE DERIVATION OF A VALIDITY  
CONDITION FOR THE RYTOV APPROXIMATION, THE  
DEVELOPMENT OF DIAGRAMMATIC SUMMATION TECHNIQUES FOR  
TREATING MULTIPLE SCATTERING EFFECTS, AND THE  
DEVELOPMENT OF NONDIAGRAMMATIC TECHNIQUES FOR  
DERIVING EQUATIONS FOR THE STATISTICAL MOMENTS OF A  
WAVE PROPAGATING THROUGH A RANDOM MEDIUM.  
(AUTHOR)                    (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-722 865 20/12  
CITY COLL RESEARCH FOUNDATION NEW YORK

OPTICAL PROPERTIES OF SEMICONDUCTORS. (U)

DESCRIPTIVE NOTE: FINAL SCIENTIFIC REPT. 1 JAN 69-31  
MAR 71,

APR 71 85P TZOAR, NARKIS ;  
CONTRACT: AF-AFOSR-1676-69  
PROJ: AF-9763  
TASK: 976302  
MONITOR: AFOSR TR-71-1095

UNCLASSIFIED REPORT

DESCRIPTORS: (\*SEMICONDUCTORS, OPTICAL PROPERTIES), (\*BAND THEORY OF SOLIDS, SEMICONDUCTORS), ELECTRICAL CONDUCTANCE, DIELECTRIC PROPERTIES, RAMAN SPECTROSCOPY, IRASERS, CYCLOTRON RESONANCE PHENOMENA, MAGNETIC FIELDS, LIGHT TRANSMISSION, PLASMA MEDIUM, X RAYS, PHONONS (U)  
IDENTIFIERS: RAMAN SCATTERING, ELECTRON PHONON INTERACTIONS, SOLID STATE PLASMAS, ELECTRON GAS, PLASMONS (U)

THE PROGRAM OF INVESTIGATIONS WAS DESIGNED TO LEAD TO A BETTER UNDERSTANDING OF THE ELECTRONIC STRUCTURE AND THE OPTICAL PROPERTIES OF SEMICONDUCTING MATERIALS USED IN MODERN SOLID STATE ELECTRONIC CIRCUITRY FOR DETECTION, AMPLIFICATION AND COMMUNICATION IN AEROSPACE ENVIRONMENTS. THIS IS ESSENTIAL TO THE DESIGN OF OPTICAL DETECTORS AND DEVICES. THE STUDY INVOLVED CALCULATIONS OF THE HIGH-FREQUENCY CONDUCTIVITY AND DIELECTRIC PROPERTIES OF SEMICONDUCTORS INCLUDING ANISOTROPIC FEATURES, TAKING INTO ACCOUNT ELECTRONIC AND IONIC CORRELATIONS AND FLUCTUATIONS. EFFECTS OF MAGNETIC FIELDS, IMPURITIES AND BAND STRUCTURE. THE PRINCIPAL TECHNIQUE USED WAS THE MANY-BODY PERTURBATION METHOD, EXTENDED TO INCLUDE VALENCE STATES, STRONG ELECTRON-PHONON AND RADIATION INTERACTIONS AND THE EFFECT OF LOCAL IMPURITY POTENTIALS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-723 834 17/2 20/5  
LOCKHEED MISSILES AND SPACE CO PALO ALTO CALIF PALO ALTO  
RESEARCH LAB

WIDEBAND LASER COMMUNICATIONS: AN  
ANNOTATED BIBLIOGRAPHY,

(U)

APR 71 137P TEMPLETON, JOE H. ;  
REPT. NO. LMSC-N-JY-71-3, LMSC-SB-71-1  
CONTRACT: N00014-71-C-0049, ARPA ORDER-306

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
BIBLIOGRAPHIES), (\*LASERS, LIGHT COMMUNICATION  
SYSTEMS), BROADBAND, OPTICAL PHENOMENA,  
INFORMATION THEORY, GAS LASERS, TRACKING,  
ELECTROOPTICS, DIGITAL SYSTEMS, SIGNAL-TO-NOISE  
RATIO, ABSTRACTS

(U)

IDENTIFIERS: LASER COMMUNICATION SYSTEMS

(U)

261 HIGHLY SPECIFIC ABSTRACT/CITATIONS ON THE SUBJECT  
OF WIDEBAND LASER COMMUNICATIONS MAKE UP THIS  
BIBLIOGRAPHY. JOURNAL ARTICLES, BOOKS, AND  
GOVERNMENT REPORTS HAVE BEEN CHOSEN FOR INCLUSION  
FROM ABSTRACTS APPEARING IN THE NASA STAR, TAB,  
U.S.G.R.D.R., AND IAA. COVERAGE WAS  
FOR THE YEARS 1964-1970. CITATIONS ARE ARRANGED  
ALPHABETICALLY BY AUTHOR. AMONG THE SUBJECTS  
COVERED ARE: OPTICAL COMMUNICATION AT HIGH DATA  
RATES, OPTICAL BEAM ACQUISITION AND FINE TRACKING,  
AND ATMOSPHERIC EFFECTS ON LASER BEAM PROPAGATION.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-723 902 20/5 17/2  
CALIFORNIA INST OF TECH PASADENA

SEMI-ANNUAL TECHNICAL REPORT ON PROGRESS  
FOR THE PERIOD JULY 1970 - DECEMBER 1970, (U)

70 13P LAUSSADE, JEAN-PIERRE ; YARIV,  
AMON ; CASPERSON, LEE ;  
CONTRACT: DAHC04-68-C-0041, ARPA ORDER-675

UNCLASSIFIED REPORT  
AVAILABILITY: PUB. IN VARIOUS JNLS.

DESCRIPTORS: (\*COHERENT RADIATION, LIGHT  
TRANSMISSION), (\*GAS LASERS, GAIN), LIGHT  
COMMUNICATION SYSTEMS, TURBULENCE, REFRACTIVE INDEX,  
CORRELATION TECHNIQUES, DISTRIBUTION FUNCTIONS,  
ATMOSPHERE (U)

IDENTIFIERS: XENON LASERS, WAVE EQUATIONS,  
HELIUM XENON LASERS (U)

CONTENTS: A THEORETICAL STUDY OF OPTICAL WAVE  
PROPAGATION THROUGH RANDOM ATMOSPHERIC TURBULENCE;  
LONGITUDINAL MODES IN A HIGH-GAIN LASER. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY    SEARCH CONTROL NO. /ZLW13

AD-723 972                      20/6  
ILLINOIS UNIV URBANA DEPT OF ELECTRICAL ENGINEERING

SPATIAL MODULATION OF LIGHT USING SURFACE  
WAVES IN AN INTERFEROMETER, (U)

FEB 70            4P            HUNSINGER, BILL J. ;  
HOLSHOUSER, D. ;  
CONTRACT: AF-AFOSR-390-67  
PROJ: AF-9767  
TASK: 976702  
MONITOR: AFOSR                      TR-71-1461

UNCLASSIFIED REPORT  
AVAILABILITY: PUB. IN APPLIED PHYSICS LETTERS,  
V16 N7 P272-273, 1 APR 70.  
SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH  
MAGNAVOX CO., URBANA, ILL. REVISION OF REPORT  
DATED 12 DEC 69.

DESCRIPTORS: (\*LIGHT TRANSMISSION, PHASE  
MODULATION), (\*DIFFRACTION GRATINGS, LIGHT  
TRANSMISSION), INTERFEROMETERS, LASERS, FOURIER  
ANALYSIS, PIEZOELECTRIC CRYSTALS (U)  
IDENTIFIERS: SWIM(SURFACE WAVE INTERFERENCE  
MODULATORS), SURFACE WAVE INTERFERENCE  
MODULATORS, SIGNAL PROCESSING, LITHIUM NIOBATES,  
SURFACE WAVES, ACOUSTIC SURFACE WAVES,  
ACOUSTOOPTIC INTERACTIONS (U)

AN OPTICAL PHASE GRATING HAS BEEN GENERATED BY  
INTRODUCING SURFACE WAVES ON ONE FACE OF A FABRY-  
PEROT INTERFEROMETER. THIS DEVICE CALLED SWIM  
(SURFACE WAVE INTERFERENCE MODULATOR)  
PRODUCES A DIFFRACTION PATTERN AT THE FOURIER PLANE  
IN WHICH THE LIGHT INTENSITY OF THE FIRST-ORDER  
MODULATED BEAM IS 1% OF THE ZEROth ORDER WITH AN  
ACOUSTIC POWER OF 0.85MW/MM BEAM WIDTH. FIRST-  
ORDER INTENSITIES GREATER THAN 10% HAVE BEEN  
REALIZED; HOWEVER, THE PROCESS IS NOT LINEAR AT THIS  
MODULATION DEPTH. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-724 028 20/6  
ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND)

A BIBLIOGRAPHY ON OPTICAL MODULATORS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
JAN 71 32P ELLIS, B. ; WALTON, A. K. ;  
REPT. NO. RAE-TR-71009  
MONITOR: IRC BR-23770

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH  
SHEFFIELD UNIV., YORKSHIRE (ENGLAND), DEPT. OF  
PHYSICS.

DESCRIPTORS: (\*LIGHT TRANSMISSION, MODULATION),  
(\*MODULATORS, \*BIBLIOGRAPHIES), ELECTROOPTICS,  
LASERS, IRASERS, OPTICAL MATERIALS, OPTICAL  
INSTRUMENTS, GREAT BRITAIN, MAGNETO-OPTIC EFFECT (U)  
IDENTIFIERS: \*OPTICAL MODULATORS, ACOUSTOOPTIC (U)  
MODULATORS

APPROXIMATELY 250 REFERENCES, MANY OF WHICH CARRY  
BRIEF ANNOTATION, ARE PROVIDED, COVERING THE FIELD OF  
OPTICAL MODULATION OVER THE SPAN 1950-1970.  
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-724 414 9/4 17/2  
ROCHESTER UNIV N Y DEPT OF PHYSICS AND ASTRONOMY

INFORMATION RATE IN AN OPTICAL COMMUNICATION  
CHANNEL,

(U)

AUG 70 10P JODOIN, R. ; MANDEL, L. ;  
CONTRACT: F44620-69-C-0086  
PROJ: AF-9767  
TASK: 976702  
MONITOR: AFOSR TR-71-1573

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN JNL. OF THE OPTICAL  
SOCIETY OF AMERICA, V61 N2 P191-198 FEB 71.

DESCRIPTORS: (\*INFORMATION THEORY, STATISTICAL  
ANALYSIS), (\*LIGHT COMMUNICATION SYSTEMS,  
INFORMATION THEORY), INTEGRALS, PROBABILITY  
DENSITY FUNCTIONS, LASERS, LIGHT TRANSMISSION,  
CODING

(U)

AN OPTICAL COMMUNICATION CHANNEL IS ANALYZED, IN  
WHICH A LIGHT BEAM IS AMPLITUDE MODULATED AT THE  
SOURCE BY A FILTER OF CONTINUOUSLY VARIABLE  
TRANSMITTANCE, AND THE DETECTOR COUNTS THE RECEIVED  
PHOTONS. SUCH A COMMUNICATION CHANNEL HAS INTRINSIC  
NOISE LIMITATIONS BECAUSE THERE IS NOT A ONE-TO-ONE  
CORRESPONDENCE BETWEEN THE MODULATED BEAM POWER AND  
THE NUMBER OF COUNTS REGISTERED. THE INFORMATION  
RATES ACHIEVABLE WITH SINGLE-MODE AND MULTIMODE  
LASERS ARE EVALUATED AS FUNCTIONS OF THE MEAN NUMBER  
N OF DETECTED PHOTONS PER SYMBOL, FOR SEVERAL  
DIFFERENT INPUT STATISTICS. FOR LARGE N THE  
INFORMATION RATE INCREASES LOGARITHMICALLY WITH N.  
IT IS SHOWN THAT, WHEN THE SYMBOL LENGTH IS SHORT,  
THERE IS A MINIMUM NUMBER OF INDEPENDENT MODES FOR  
WHICH THE MULTIMODE LASER GIVES A GREATER INFORMATION  
RATE THAN THE SINGLE-MODE LASER, IF THE LASER POWER  
IS EQUALLY DIVIDED AMONG ALL THE MODES, AND THE POWER  
PER MODE IS REGARDED AS CONSTANT. HOWEVER, FOR EVEN  
MODERATE NUMBERS OF DETECTED PHOTONS PER SYMBOL, THIS  
MINIMUM NUMBER OF MODES IS SO GREAT THAT THE SINGLE-  
MODE LASER IS TO BE PREFERRED. WHEN THE LIGHT BEAM  
IS DERIVED FROM A THERMAL SOURCE, THE INFORMATION  
RATE IN THE CHANNEL IS, IN EFFECT, GOVERNED BY THE  
SAME EQUATIONS AS THOSE FOR THE SINGLE-MODE LASER, SO  
LONG AS THE DETECTOR AREA IS LIMITED TO A COHERENCE  
AREA. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-725 067 20/5  
CASE WESTERN RESERVE UNIV CLEVELAND OHIO DIV OF  
ELECTRICAL SCIENCES AND APPLIED PHYSICS

STARK EFFECT MODULATION STUDIES. (U)

DESCRIPTIVE NOTE: FINAL REPT. 18 MAR 68-31 DEC 70,  
MAR 71 73P PAO, YOH-HAN ; CLASPY, PAUL

C. ; JOHNSON, W. B. ;

CONTRACT: F19628-68-C-0183

PROJ: AF-4645

TASK: 464507

MONITOR: AFCRL 71-0179

UNCLASSIFIED REPORT

DESCRIPTORS: (\*COHERENT RADIATION, FREQUENCY  
MODULATION), (\*GAS LASERS, STARK EFFECT),  
GAIN, HARMONIC ANALYSIS, ABSORPTION SPECTRUM,  
IRASERS (U)

IDENTIFIERS: INTERMEDIATE INFRARED RADIATION, Q  
SWITCHING, \*CARBON DIOXIDE LASERS (U)

IT HAS BEEN DETERMINED THAT IT IS PRACTICAL TO USE  
THE MOLECULAR STARK EFFECT IN GASES TO MODULATE  
LASER RADIATION IN THE 10 MICRON REGION. A LARGE  
NUMBER OF SUITABLE MODULATOR GAS CONSTITUENTS HAVE  
BEEN STUDIED AND PARAMETERS GOVERNING GAS CELL  
MODULATOR DESIGN HAVE ALSO BEEN IDENTIFIED. SUCH  
MODULATORS MAY BE USED BOTH WITHIN AND EXTERNAL TO  
THE LASER CAVITY. IN INTRA CAVITY CONFIGURATIONS,  
LARGE MODULATION DEPTHS ARE EASILY OBTAINED WITH LOW  
MODULATOR POWER. RESULTS OF THEORETICAL STUDIES  
INDICATE THAT WITHIN THE FREQUENCY RANGES OF  
PRACTICAL INTEREST, THERE IS NO INTRINSIC LIMIT TO  
THE FREQUENCY RESPONSE. HOWEVER WHEN MODULATING  
FREQUENCY IS LARGER THAN THE VALUE OF THE HOMOGENEOUS  
LINEWIDTH, THERE IS A DECREASE IN EFFECTIVENESS.  
EXPERIMENTAL RESULTS SHOWING NON-DISPERSIVE  
MODULATION AT FREQUENCIES TO 30 MEGAHERTZ HAVE BEEN  
OBTAINED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-725 103 17/8 20/6  
PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF ELECTRICAL  
ENGINEERING

APPROXIMATE PHOTOCOUNT STATISTICS FOR  
COHERENT AND CHAOTIC RADIATION OF ARBITRARY  
SPECTRAL SHAPE,

(U)

AUG 70 11P LACHS, GERARD ;  
CONTRACT: DA-31-124-ARO(D)-383  
PROJ: DA-2-0-061102-B-31-E  
MONITOR: AROD 5659:12-E

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN JNL. OF APPLIED PHYSICS,  
V42 N2 P602-609 FEB 71.

SUPPLEMENTARY NOTE: SPONSORED IN PART BY THE NATIONAL  
AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON,  
D. C.

DESCRIPTORS: (\*LIGHT, DETECTION), (\*COHERENT  
RADIATION, DETECTION), (\*PHOTONS, COUNTING  
METHODS), LIGHT COMMUNICATION SYSTEMS, LASERS,  
STATISTICAL ANALYSIS

(U)

A METHOD FOR COMPUTING THE APPROXIMATE PHOTOCOUNT  
STATISTICS FOR GAUSSIAN LIGHT IS PRESENTED. THIS  
METHOD MAY BE USED FOR THE SUPERPOSITION OF COHERENT  
RADIATION WITH CHAOTIC RADIATION OF ARBITRARY  
SPECTRAL SHAPE. DATA IS PRESENTED FOR GAUSSIAN-,  
TRIANGULAR-, AND SQUARE-SHAPED SPECTRA AS WELL AS FOR  
LORENTZIAN-SHAPED SPECTRA. THE RESULTS SHOW THAT  
THE PHOTOCOUNT STATISTICS ARE SIGNIFICANTLY DEPENDENT  
UPON SPECTRAL SHAPE FOR INTERMEDIATE TIME-BANDWIDTH  
PRODUCTS. THE RESULTS ALSO SHOW THAT THE BEDARD,  
CHANG, AND MANDEL APPROXIMATION GIVES A BETTER  
FIT TO A GAUSSIAN-SHAPED SPECTRUM THAN TO A  
LORENTZIAN-SHAPED SPECTRUM. SIGNIFICANT  
DIFFERENCES BETWEEN THE PHOTOCOUNT STATISTICS FOR A  
TIME-BANDWIDTH PRODUCT OF 10 AND POISSON STATISTICS  
WERE ALSO OBTAINED; EVEN FOR A SIGNAL-TO-NOISE RATIO  
OF 40:1. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-726 139 20/5  
INFORMATICS TISCO INC RIVERDALE MD

BIBLIOGRAPHY OF SOVIET LASER  
DEVELOPMENTS.

(U)

DESCRIPTIVE NOTE: INTERIM REPT. NO. 3, JAN-MAR 71,  
APR 71 57P ALLEN, LIDA L. HIBBEN,  
STUART G. ;  
CONTRACT: F44620-70-C-0081, ARPA ORDER-1622  
PROJ: AF-62701D  
MONITOR: AFOSR TR-71-1777

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, USSR), (\*BIBLIOGRAPHIES,  
LASERS), DYES, GAS LASERS, IRASERS, OPTICAL  
EQUIPMENT COMPONENTS, SCIENTIFIC RESEARCH, COHERENT  
RADIATION

(U)

IDENTIFIERS: QUANTUM ELECTRONICS, SOLID STATE  
LASERS, SEMICONDUCTOR LASERS, GALLIUM ARSENIDE  
LASERS, RUBY LASERS, GLASS LASERS, INJECTION  
LASERS, LIQUID LASERS, CHEMICAL LASERS,  
ULTRAVIOLET LASERS, HOLOGRAPHY, LASER  
MATERIALS

(U)

OF ALL MATERIAL REVIEWED, THE MAJOR YIELD HAS BEEN  
FROM THE APPROXIMATELY 300 PERIODICALS WHICH ARE  
KNOWN TO REPORT THE MOST ADVANCED AND INTERESTING  
FINDINGS IN SOVIET LASER TECHNOLOGY. THE PERIOD  
COVERED IS THE FIRST QUARTER OF 1971, AND INCLUDES  
ALL LASER-RELATED ARTICLES RECEIVED BY US IN THAT  
INTERVAL. THE STRUCTURE AND SELECTION CRITERIA ARE  
THE SAME AS USED IN THE FIRST REPORT. SOMEWHAT  
BROADENED SELECTION CRITERIA HAVE BEEN USED FOR ITEMS  
PERTINENT TO CHEMICAL LASERS, IN VIEW OF THE  
EXPANDING POSSIBILITIES IN THIS TECHNOLOGY. OUR  
LITERATURE SEARCH ALSO REVEALS AN INCREASED EMPHASIS  
ON HOLOGRAPHIC STUDIES, AS WELL AS ON USES OF  
STIMULATED RAMAN SCATTERING EFFECTS IN  
SPECTROSCOPY. OTHER ITEMS WORTHY OF MENTION ARE  
TWO ARTICLES ON ULTRAVIOLET LASER AND ONE ON USE OF  
AN ARGON ION LASER FOR UNDER WATER TV TRANSMISSION.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-727 583 20/6 20/5 17/5  
RAND CORP SANTA MONICA CALIF

ON THE PHASE STRUCTURE AND MUTUAL COHERENCE  
FUNCTION OF AN OPTICAL WAVE IN A TURBULENT  
ATMOSPHERE,

(U)

JUN 71 26P LUTOMIRSKI, R. F. ; YURA, H.  
T. ;  
REPT. NO. RM-6266-1-ARPA  
CONTRACT: DAHC15-67-C-0141, ARPA ORDER-189-1

UNCLASSIFIED REPORT

DESCRIPTORS: (\*COHERENT RADIATION, \*LIGHT  
TRANSMISSION), ATMOSPHERE, TURBULENCE, POWER  
SPECTRA, INFRARED DETECTORS, SIGNAL-TO-NOISE RATIO,  
LASERS  
IDENTIFIERS: WAVE EQUATIONS

(U)

(U)

THE PRESENT WORK SHOWS THAT THE MOST COMMONLY USED  
EXPRESSION FOR THE MUTUAL COHERENCE FUNCTION (MCF)  
FOR AN OPTICAL WAVE PROPAGATING IN A TURBULENT  
ATMOSPHERE IS, IN GENERAL, INCORRECT. THIS  
EXPRESSION IS BASED ON AN UNPHYSICAL EXTRAPOLATION OF  
THE KOLMOGOROV SPECTRUM. ALONG AN ATMOSPHERIC  
PATH, WITH SPECIFIED TURBULENCE PARAMETERS, THE NEW  
MCF IS SHOWN TO IMPLY GREATER RESOLUTION, LESS BEAM  
SPREADING, AND GREATER HETERODYNE SIGNAL-TO-NOISE  
RATIOS THAN INDICATED BY PREVIOUS CALCULATIONS. BY  
COMPARING THESE RESULTS WITH THOSE PREVIOUSLY  
OBTAINED FOR HETERODYNE DETECTION, THE PERCENTAGE  
ERRORS IN THE PREVIOUS CALCULATIONS ARE SHOWN TO  
INCREASE WITH DECREASING PROPAGATION PATHS. IN  
PARTICULAR, WHERE IT WAS FORMERLY THOUGHT THAT THE  
ATMOSPHERE LIMITED THE EFFECTIVE COHERENT DETECTION  
SIZE IN HETERODYNE DETECTION AT ALL RANGES, THE  
PRESENT CALCULATION REVEALS THAT OVER SUFFICIENTLY  
SHORT PATHS, THERE IS NO SIZE LIMIT IMPOSED BY THE  
ATMOSPHERE. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-728 101 20/5

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

A STUDY OF LASER RESONATORS AND MODE-  
LOCKING.

(U)

DESCRIPTIVE NOTE: RESEARCH AND DEVELOPMENT TECHNICAL  
REPT.,

MAY 71 48P WOLFE, MARTIN I. ;  
REPT. NO. ECOM-3422  
PROJ: DA-1-H-662701-A-448  
TASK: 1-H-662701-A-44804

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, OPTICAL PROPERTIES),  
LIGHT COMMUNICATION SYSTEMS, WAVE FUNCTIONS,  
FREQUENCY SHIFT, REFRACTION, DOPPLER EFFECT  
IDENTIFIERS: MODE LOCKED LASERS, LASER  
MATERIALS

(U)

(U)

THE FIRST PART OF THE REPORT REPRESENTS A  
THEORETICAL STUDY OF CONFOCAL RESONATORS. THE  
SECOND PART CONSISTS OF A STUDY OF MODE-LOCKING AND  
TECHNIQUES THAT USE MODE-LOCKED LASERS. THE REPORT  
IS INTENDED TO PRESENT A DETAILED ANALYSIS OF A  
CONFOCAL RESONATOR IN ORDER TO ILLUSTRATE THE  
APPLICABILITY OF THE METHOD OF ANALYSIS FOR FURTHER  
INVESTIGATION OF RESONATORS FOR MODE-LOCKED LASERS.  
ALSO THE POTENTIAL OF MODE-LOCKED LASERS FOR USE IN  
A HIGH-BIT RATE COMMUNICATIONS SYSTEM IS  
INVESTIGATED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-728 743 20/6  
RAND CORP SANTA MONICA CALIF

PROPAGATION OF A FOCUSED LASER BEAM IN A  
TURBULENT ATMOSPHERE,

(U)

JUN 71 33P LUTOMIRSKI, R. F. ;  
REPT. NO. R-608-ARPA  
CONTRACT: DAHC15-67-C-0141, ARPA ORDER-189-1

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-707 861.

DESCRIPTORS: (\*COHERENT RADIATION, FOCUSING),  
(\*LIGHT TRANSMISSION, ATMOSPHERIC MOTION), LIGHT  
COMMUNICATION SYSTEMS, RANGE FINDING, TARGET  
ACQUISITION, REFRACTIVE INDEX, GAS LASERS,  
IRASERS

(U)

IDENTIFIERS: CARBON DIODIDE LASERS, LASER  
BEAMS

(J)

A METHOD IS GIVEN FOR CALCULATING THE PERFORMANCE  
OF A LASER SYSTEM WITH BEAM TRUNCATED BY FOCUSING  
OPTICS IN A TURBULENT ATMOSPHERE. PREVIOUS  
ANALYSES HAVE BEEN LIMITED TO VACUUM CALCULATIONS  
WITH UNTRUNCATED BEAMS, AND EVEN THEN HAVE NOT  
CONSERVED THE IRRADIANCE. THIS APPROACH SEPARATES  
THE GEOMETRY OF THE PROBLEM (THE COMPLEX APERTURE  
DISTRIBUTION) FROM THE BEAM PROPAGATION.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-729 263 20/5  
NORTHROP CORPORATE LABS HAWTHORNE CALIF

CO2 LASER PULSING TECHNIQUES. (U)

DESCRIPTIVE NOTE: SEMIANNUAL REPT. DEC 69-DEC 71,  
AUG 71 35P MANN, M. M. ;  
REPT. NO. NCL-71-41R  
CONTRACT: N00014-70-C-0185, ARPA ORDER-306

UNCLASSIFIED REPORT

DESCRIPTORS: (\*GAS LASERS, LIGHT PULSES),  
(\*COHERENT RADIATION, MODULATION),  
ELECTROOPTICS, AMPLITUDE MODULATION, FREQUENCY  
MODULATION, GALLIUM ARSENIDES, LIGHT COMMUNICATION  
SYSTEMS, RANGE FINDING (U)  
IDENTIFIERS: \*CARBON DIOXIDE LASERS, MODE LOCKED  
LASERS (U)

IN A STUDY OF CO2 LASER PULSING TECHNIQUES,  
MODE-LOCKING AND PULSE COUPLING OF A CO2 LASER  
USING A SINGLE ELECTROOPTIC ELEMENT HAVE BEEN  
DEMONSTRATED. DATA ON THE EFFECT OF MODULATOR  
DETUNING AND COUPLING FACTOR VARIATION ARE PRESENTED.  
THE PRELIMINARY RESULTS OF AN INVESTIGATION OF  
ELECTROOPTIC TECHNIQUES FOR AM AND FM LOCKING OF  
TEA LASERS ARE GIVEN. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-729 334 20/5  
ARMY MISSILE COMMAND REDSTONE ARSENAL ALA PHYSICAL  
SCIENCES DIRECTORATE

CO2 LASER PULSING,

(U)

JUL 71 112P PARDUE, ALBERT L. , JR;  
REPT. NO. RR-TR-71-8  
PROJ: DA-1-T-262303-A-308

UNCLASSIFIED REPORT

DESCRIPTORS: (\*GAS LASERS, LIGHT PULSES), PULSE  
MODULATION, COHERENT RADIATION, WAVE FUNCTIONS,  
IRASERS

(U)

IDENTIFIERS: \*CARBON DIOXIDE LASERS, Q SWITCHED  
LASERS, MODE LOCKED LASERS, LASER BEAMS, WAVE  
EQUATIONS

(U)

A THEORETICAL AND EXPERIMENTAL ANALYSIS OF LASER  
MODE COUPLING AND REACTIVE Q-SWITCHING HAS BEEN  
PRESENTED. IN THE FORCED MODE LOCKING SITUATION,  
THE TOTAL CAVITY ELECTROMAGNETIC FIELD INTENSITY  
 $E(Z,T)$  WAS EXPRESSED AS AN EXPANSION OF QUASI-  
NORMAL MODES WHICH SATISFY THE BOUNDARY CONDITIONS AT  
BOTH THE FIXED AND MOVING MIRROR. SOLUTIONS OF THE  
WAVE EQUATION INDICATED THAT THE MODES OF OPERATION  
WERE ANALOGOUS TO THE PHASED LOCKED OSCILLATIONS OF  
THE PHASE-MODULATED LASER. A PEAK MIRROR EXCURSION  
OF 1400 ANGSTROMS WAS USED TO MODE LOCK A CO2  
LASER. REACTIVE Q-SWITCHING WAS OBTAINED BY  
MODULATION OF THE CAVITY LENGTH WITH A MOSSBAUER  
TRANSDUCER. REGULAR Q-SWITCHED PULSES WERE  
OBTAINED AT RATES BETWEEN 1 AND 60 KILOHERTZ.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-729 447 20/6 20/5 4/1  
AIR FORCE CAMBRIDGE RESEARCH LABS L G HANSCOM FIELD  
MASS

ATMOSPHERIC ATTENUATION OF CO LASER  
RADIATION.

(U)

DESCRIPTIVE NOTE: ENVIRONMENTAL RESEARCH PAPERS,  
JUL 71 118P MCCLATCHEY, R. A. 1  
REPT. NO. AFCRL-71-0370, AFCRL-ERP-359

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT TRANSMISSION, ATMOSPHERE),  
(\*COHERENT RADIATION, ATTENUATION), ABSORPTION  
SPECTRUM, INFRARED RADIATION, GAS LASERS, IRASERS,  
TABLES

(U)

IDENTIFIERS: CARBON MONOXIDE LASERS, ATMOSPHERIC  
ATTENUATION

(U)

WITH THE DEVELOPMENT OF THE CO LASER HAVING  
EMISSION LINES IN THE RANGE FROM 1200/CM TO GREATER  
THAN 2000/CM, IT IS OF IMPORTANCE TO ESTABLISH WHICH  
OF THE MORE THAN 200 LINES CAN BE TRANSMITTED THROUGH  
A VARIETY OF ATMOSPHERIC PATHS. THE SPECTRAL REGION  
OF CO EMISSION SPANS A VERY IMPORTANT WATER VAPOR  
ABSORPTION BAND AND, IN ADDITION, THERE IS ABSORPTION  
BY CO<sub>2</sub>, O<sub>3</sub>, N<sub>2</sub>O AND CH<sub>4</sub>. ABSORPTION LINES  
ASSOCIATED WITH ALL OF THESE MOLECULES WERE INCLUDED  
IN THE CALCULATION OF SYNTHETIC SPECTRA COVERING THE  
REGION OF CO EMISSION. AFTER LIMITING THE NUMBER  
OF CO EMISSION LINES TO BE CONSIDERED IN DETAIL  
ACCORDING TO A CRITERION BASED ON ATMOSPHERIC  
ATTENUATION, A SERIES OF TABLES WAS CONSTRUCTED  
PROVIDING QUANTITATIVE ATTENUATION INFORMATION FOR  
EACH OF 88 LASER LINES AND FOR 10 DIFFERENT  
ATMOSPHERIC MODELS. DATA BASED ON TWO DIFFERENT  
AEROSOL SCATTERING MODELS ARE INCLUDED IN THESE  
TABLES. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-729 888 20/5  
INFORMATICS TISCO INC RIVERDALE MD

BIBLIOGRAPHY OF SOVIET LASER  
DEVELOPMENTS.

(U)

DESCRIPTIVE NOTE: INTERIM REPT. JAN 69-JUN 70,  
JAN 71 202P ALLEN, LIDA L. ;  
CONTRACT: F44620-70-C-0081, ARPA ORDER-1622  
MONITOR: AFOSR TR-71-0947

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO INTERIM REPT. NO. 3, AD-  
726 139.

DESCRIPTORS: (\*LASERS, USSR), (\*BIBLIOGRAPHIES,  
LASERS), SCIENTIFIC RESEARCH, GAS LASERS,  
IRASERS, SEMICONDUCTORS, DYES, COHERENT  
RADIATION, OPTICAL EQUIPMENT COMPONENTS, LIGHT  
COMMUNICATION SYSTEMS, STEREOSCOPIC PHOTOGRAPHY,  
PLASMA GENERATORS

(U)

IDENTIFIERS: QUANTUM ELECTRONICS, SOLID STATE  
LASERS, SEMICONDUCTOR LASERS, INJECTION LASERS,  
LIQUID LASERS, CHEMICAL LASERS, ULTRAVIOLET  
LASERS, HOLOGRAPHY, LASER MATERIALS, NONLINEAR  
OPTICS, SECOND HARMONIC GENERATION

(U)

THE BIBLIOGRAPHY OF SOVIET PUBLICATIONS ON LASERS  
COVERS THE PERIOD 1969-1970. APPROXIMATELY 1500  
ARTICLES ARE CITED. THIS OUTPUT IS CLEAR EVIDENCE  
OF INCREASED ATTENTION TO ADVANCED DEVELOPMENT IN  
SUCH AREAS AS HOLOGRAPHY, BEAM-TARGET INTERACTIONS,  
HIGH-TEMPERATURE PLASMA GENERATION AND CHEMICAL  
LASERS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-730 438 20/12 20/6  
NAVAL RESEARCH LAB WASHINGTON D C

OPTICAL WAVEGUIDES AND INTEGRATED OPTICS  
TECHNOLOGY.

(U)

DESCRIPTIVE NOTE: INTERIM REPT.,  
AUG 71 34P ANDREWS, R. A. ;  
REPT. NO. NRL-7291  
PROJ: RR002-07-41-5064, NRL-N01-12

UNCLASSIFIED REPORT

DESCRIPTORS: (\*SEMICONDUCTING FILMS,  
\*ELECTROOPTICS), (\*WAVEGUIDES, ELECTROOPTICS),  
LASERS, DIELECTRICS, FIBER OPTICS, MODULATORS,  
GALLIUM ARSENIDES, OPTICAL EQUIPMENT COMPONENTS,  
DETECTORS, LIGHT COMMUNICATION SYSTEMS, COMPUTERS,  
LOGIC CIRCUITS, DISPLAY SYSTEMS  
IDENTIFIERS: NONLINEAR OPTICS, QUANTUM  
ELECTRONICS, \*OPTICAL WAVEGUIDES, SEMICONDUCTOR  
LASERS, THIN FILMS

(U)

(U)

AN INTRODUCTION IS GIVEN TO THE OPTICAL WAVEGUIDE  
AND INTEGRATED OPTICS TECHNOLOGY WITH EMPHASIS ON  
POTENTIAL APPLICATION IN NAVY SYSTEMS. THE  
FUNDAMENTALS OF OPTICAL WAVEGUIDES ARE PRESENTED, AS  
WELL AS A DISCUSSION OF THEIR IMPORTANT  
CHARACTERISTICS. A DESCRIPTION OF ALL THE  
WAVEGUIDE PASSIVE AND ACTIVE DEVICES THAT HAVE BEEN  
DEMONSTRATED IS GIVEN. AREAS WHERE NEW DEVICES ARE  
POSSIBLE ARE ALSO DISCUSSED. THIS DISCUSSION  
INCLUDES OPTICAL WAVEGUIDES, PASSIVE OPTICAL  
ELEMENTS, COUPLERS, LASERS AND AMPLIFIERS,  
MODULATORS, DEFLECTORS, DETECTORS, NONLINEAR DEVICES,  
AND INPUT AND OUTPUT COUPLERS. THE APPLICATION OF  
THESE DEVICES TO INTEGRATED OPTICAL SYSTEMS FOR  
COMMUNICATIONS, DISPLAY, AND COMPUTERS IS DISCUSSED.  
CONCLUSIONS ARE DRAWN ABOUT THE FUTURE GROWTH OF  
THIS TECHNOLOGY IN LIGHT OF THE CURRENT POTENTIAL AND  
THE IMPORTANT PROBLEM AREAS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-731 109 20/2 20/5  
AIR FORCE CAMBRIDGE RESEARCH LABS L G HANSCOM FIELD  
MASS

PREPARATION AND PROPERTIES OF CUPROUS IODIDE,

(U)

JUN 71 7P O'CONNOR, JOHN J. ;  
ARMINGTON, ALTON F. ;  
REPT. NO. AFCRL-71-0478  
PROJ: AF-5620  
TASK: 562009

UNCLASSIFIED REPORT  
AVAILABILITY: PUB. IN MATERIALS RESEARCH  
BULLETIN, V6 P765-770 1971.  
SUPPLEMENTARY NOTE: REVISION OF REPORT DATED 9 JUN  
71.

DESCRIPTORS: (\*IODIDES, \*CRYSTAL GROWTH), COPPER  
COMPOUNDS, HYDROLYSIS, MODULATORS, LASERS, X-RAY  
DIFFRACTION ANALYSIS

(U)

IDENTIFIERS: \*COPPER IODIDES, \*LASER MODULATORS,  
LASER MATERIALS

(U)

CUPROUS IODIDE, A POTENTIAL LASER MODULATOR  
MATERIAL, HAS BEEN GROWN FROM HYDRIODIC ACID SOLUTION  
BY THE SLOW DECOMPOSITION OF THE CUI:HI COMPLEX.  
EMISSION SPECTROGRAPHIC ANALYSIS DEMONSTRATED THAT  
THE CRYSTALS PRODUCED ARE CONSIDERABLY PURER THAN THE  
STARTING MATERIAL. A LAUE PATTERN INDICATES A  
HIGH DEGREE OF CRYSTAL PERFECTION. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-731 242 20/5  
INFORMATICS TISCO INC RIVERDALE MD

BIBLIOGRAPHY OF SOVIET LASER  
DEVELOPMENTS.

(U)

DESCRIPTIVE NOTE: REPT. NO. 2, JUL-DEC 70,  
JUL 71 146P HIBBEN, STUART G. J  
CONTRACT: F44620-70-C-0081, ARPA ORDER-1622  
MONITOR: AFOSR TR-71-2653

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO REPORT DATED 14 JAN 71,  
AD-729 888.

DESCRIPTORS: (\*LASERS, USSR), (\*BIBLIOGRAPHIES,  
LASERS), SCIENTIFIC RESEARCH, GAS LASERS,  
IRASERS, SEMICONDUCTORS, DYES, COHERENT  
RADIATION, OPTICAL EQUIPMENT COMPONENTS, RADIATION  
DAMAGE, RADIATION EFFECTS, LIGHT COMMUNICATION  
SYSTEMS, STEREOSCOPIC PHOTOGRAPHY, PLASMA  
GENERATORS, STANDARDS

(U)

IDENTIFIERS: QUANTUM ELECTRONICS, SOLID STATE  
LASERS, SEMICONDUCTOR LASERS, LIQUID LASERS,  
CHEMICAL LASERS, ULTRAVIOLET LASERS, LASER  
MATERIALS, NONLINEAR OPTICS, HOLOGRAPHY

(U)

THIS IS THE SECOND ISSUE INTENDED TO GIVE A  
COMPREHENSIVE LISTING OF SOVIET PUBLICATIONS IN  
LASER TECHNOLOGY FOR 1969-1970, AND COMPLEMENTS THE  
FIRST ISSUE BY COVERING ALL THE NON-PERIODIC  
LITERATURE FOR THIS INTERVAL. THIS INCLUDES OVER  
100 SOURCES COMPRISING INSTITUTIONAL TRANSACTIONS,  
COLLECTIONS OF ARTICLES, CONFERENCE PROCEEDINGS, AND  
MONOGRAPHS DEALING WITH LASER DEVELOPMENTS. ALSO  
INCLUDED IS MATERIAL FROM REGULAR PERIODICALS FOR  
JULY THROUGH DECEMBER, 1970. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-731 535 17/2  
MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB  
TOPICS IN MILLIMETER-WAVE AND OPTICAL SPACE  
COMMUNICATION. (U)

DESCRIPTIVE NOTE: TECHNICAL NOTE,  
SEP 71 38P WARD, WILLIAM W. ; ZOLNAY,  
STEPHEN L. ;  
REPT. NO. TN-1971-43  
CONTRACT: F19628-70-C-0230  
PROJ: AF-649L  
MONITOR: ESD TR-71-269

UNCLASSIFIED REPORT

DESCRIPTORS: (\*SPACE COMMUNICATION SYSTEMS,  
MILLIMETER WAVES), (\*LIGHT COMMUNICATION SYSTEMS,  
SPACE COMMUNICATION SYSTEMS), LASERS,  
ATTENUATION, PERFORMANCE (ENGINEERING),  
RELIABILITY (U)  
IDENTIFIERS: FREQUENCY ALLOCATION, YAG LASERS,  
NEODYMIUM LASERS, CARBON DIOXIDE LASERS (U)

MANY COMPARATIVE STUDIES HAVE BEEN MADE OF  
MILLIMETER-WAVE AND OPTICAL SPACE-COMMUNICATION  
SYSTEMS. THE APPLICATIONS CONSIDERED HAVE BEEN  
DIVERSE, INCLUDING LINKS BETWEEN SATELLITES IN LOW  
EARTH ORBITS, SATELLITES IN SYNCHRONOUS ORBITS,  
DEEP-SPACE PROBES, AND EARTH TERMINALS, WITH DATA-  
RATE REQUIREMENTS FROM A FEW BIT/SEC TO GBIT/SEC.  
THIS REPORT PRESENTS A SHORT TUTORIAL ACCOUNT OF  
THE COMMON AND OF THE DISTINCTLY DIFFERENT FEATURES  
OF SOME MILLIMETER-WAVE AND OPTICAL SPACE-  
COMMUNICATION SYSTEMS. FOR EXAMPLE, THE DESIGN OF  
THE TRANSMITTING ANTENNAS IS GOVERNED BY THE SAME  
ELECTROMAGNETIC THEORY, WHICH ACCOUNTS FOR  
DIFFRACTION AT AN APERTURE. HOWEVER, THE SIGNAL-TO-  
NOISE RELATIONSHIPS IN THE RECEIVERS MAY NOT BE THE  
SAME (GAUSSIAN VS POISSON NOISE STATISTICS).  
POSSIBLE SATELLITE APPLICATIONS ARE SURVEYED  
BRIEFLY, WITH MENTION OF THE FAVORABLE AND THE  
UNFAVORABLE FACTORS ASSOCIATED WITH MILLIMETER-WAVE  
AND OPTICAL SPACE-COMMUNICATION SYSTEMS. CANDIDATE  
SYSTEMS ARE POSTULATED AND LINK CALCULATIONS ARE  
GIVEN. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-732 109 20/5  
STANFORD UNIV CALIF MICROWAVE LAB

MODULATOR FREQUENCY DETUNING EFFECTS IN THE  
FM MODE-LOCKED LASER,

(U)

JUL 70 7P SIEGMAN, A. E. ; KUIZENGA,  
DIRK J. ;  
CONTRACT: F44620-69-C-0017  
PROJ: AF-9767  
TASK: 976702  
MONITOR: AFOSR TR-2830

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN IEEE JNL. OF QUANTUM  
ELECTRONICS, VQE6 N12 P803-808 DEC 70.

SUPPLEMENTARY NOTE: REVISION OF REPORT DATED 4 MAY  
70.

DESCRIPTORS: (\*LASERS, FREQUENCY MODULATION),  
COHERENT RADIATION, PHASE SHIFT, GAIN, INTEGRAL  
TRANSFORMS

(U)

IDENTIFIERS: MODE LOCKED LASERS, QUANTUM  
ELECTRONICS, YAG LASERS, NEODYMIUM LASERS

(U)

THE MODE-LOCKING BEHAVIOR OF A HOMOGENEOUS LASER  
WITH AN INTRACAVITY FM MODULATOR CHANGES RAPIDLY  
AND ASYMMETRICALLY WHEN THE MODULATION FREQUENCY IS  
DETUNED BY SMALL AMOUNTS FROM ITS OPTIMUM VALUE. A  
SIMPLE ANALYSIS OF THESE DETUNING EFFECTS IS  
DEVELOPED. THE ANALYSIS GIVES EXPLICIT EXPRESSIONS  
FOR ALL ASPECTS OF THE MODE-LOCKING BEHAVIOR AS  
FUNCTIONS OF DETUNING. A PHYSICAL INTERPRETATION OF  
THE ANALYSIS ALSO MAKES CLEAR WHICH PHYSICAL  
MECHANISMS ARE RESPONSIBLE FOR THE DETUNING BEHAVIOR.  
(AUTHOR)

(U)

UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-732 146 20/5

POLYTECHNIC INST OF BROOKLYN FARMINGDALE N Y DEPT OF  
ELECTROPHYSICS

PASSIVE Q-SWITCHING AND MODE LOCKING OF A  
CO<sub>2</sub> LASER WITH CH<sub>3</sub>BR, PF<sub>5</sub>, OR SF<sub>6</sub> AND  
SELF-MODE LOCKING USING ELECTRICAL PULSE  
EXCITATION.

(U)

APR 71 3P JUNG, C. K. ; RONN, A. M. ;  
LATOURRETTE, J. T. ;  
CONTRACT: F44620-69-C-0047  
PROJ: AF-4751  
MONITOR: AFOSR TR-71-2839

UNCLASSIFIED REPORT  
AVAILABILITY: PUB. IN JNL. OF APPLIED PHYSICS,  
V41 N10 P4240-4242 SEP 70.

DESCRIPTORS: (\*GAS LASERS, OPERATION), LIGHT  
PULSES, MODULATION, GAIN, BROMIDES, FLUORIDES,  
SULFUR COMPOUNDS, PHOSPHORUS COMPOUNDS, METHANE,  
IRASERS

(U)

IDENTIFIERS: \*CARBON DIOXIDE LASERS, \*MODE LOCKED  
LASERS, \*Q SWITCHED LASERS, METHANE/BROMO,  
PHOSPHORUS FLUORIDES, SULFUR HEXAFLUORIDE

(U)

RESULTS ARE GIVEN OF EXPERIMENTAL STUDIES USING THE  
GASES CH<sub>3</sub>BR, PF<sub>5</sub>, SF<sub>6</sub> AND CO<sub>2</sub> WITH ADDED  
BUFFER GASES HE AND H<sub>2</sub> AS SATURABLE ABSORBERS IN  
Q-SWITCHING AND MODE LOCKING OF A CO<sub>2</sub> LASER,  
INCLUDING SELF MODE LOCKING OBTAINED BY ELECTRICAL  
PULSE EXCITING OF HALF OF THE DISCHARGE TUBE.  
(AUTHOR)

(U)

UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-732 229 20/5

RAYTHEON CO WALTHAM MASS SPECIAL MICROWAVE DEVICES  
OPERATION

DEVELOPMENT AND FABRICATION OF A YAG LASER  
SYSTEM FOR STUDY OF MODE LOCKING AND PULSE  
CODING LASER OUTPUT.

(U)

DESCRIPTIVE NOTE: FINAL REPT. 1 JAN-1 JUL -1,  
JUL 71 19P WARGO, LORAND J. ;

REPT. NO. SM-279

CONTRACT: F19623-71-C-0053

PROJ: ILIR-9-70

TASK: ILIR-9-70-01

MONITOR: AFCL 71-0471

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LASERS, YTTRIUM COMPOUNDS),  
SYSTEMS ENGINEERING, PULSE CODE MODULATION, LIGHT  
PULSES, ALUMINATES, GARNET, MODULATORS,  
PUMPING(OPTICAL)

(U)

IDENTIFIERS: \*YAG LASERS, NEODYMIUM LASERS, MODE  
LOCKED LASERS, Q SWITCHED LASERS

(U)

A SPECIAL PURPOSE, HIGH REPETITION RATE ND:YAG  
LASER SYSTEM HAS BEEN DESIGNED, DEVELOPED AND  
FABRICATED FOR USE IN EXPERIMENTS IN MODE LOCKING AND  
PULSE CODING. THE SYSTEM CONSISTS OF A LASER  
TRANSMITTER, POWER SUPPLY AND COOLER. THE  
TRANSMITTER IS A MECHANICALLY STABILIZED, 1 METER  
LONG OPTICAL CAVITY WITH A FLASH-PUMPED SINGLE CAVITY  
OSCILLATOR USING A 1/4 IN. X 2 IN. ND:YAG  
CRYSTAL, A KD CALITA PRIME P POCKELS CELL, AND  
A 150 MHZ MODE-LOCKING MODULATOR CELL. THE SYSTEM  
WAS SUCCESSFULLY TESTED UP TO A REPETITION RATE OF 50  
PPS AND A 100 NANOSECOND Q-SWITCHED OUTPUT OF 130  
MILLIJOULES. MODE-LOCKED PULSES WERE MEASURED AT  
0.8 NANOSECONDS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-732 244 20/5  
INFORMATICS TISCO INC RIVERDALE MD

BIBLIOGRAPHY OF SOVIET LASER  
DEVELOPMENTS.

(U)

DESCRIPTIVE NOTE: INTERIM REPT. NO. 4, APR-JUN 71,  
AUG 71 100P HIBBEN, STUART G. ;  
CONTRACT: F44620-70-C-0081, ARPA ORDER-1622  
PROJ: ARPA-OF10  
MONITOR: AFOSR TR-71-2814

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-726 139.

DESCRIPTORS: (\*LASERS, USSR), (\*BIBLIOGRAPHIES,  
LASERS), GAS LASERS, IRASERS, SEMICONDUCTORS,  
OPTICAL MATERIALS, OPTICAL EQUIPMENT COMPONENTS,  
COHERENT RADIATION, CRYSTAL GROWTH, DATA  
PROCESSING SYSTEMS, LIGHT COMMUNICATION SYSTEMS,  
STEREOSCOPIC PHOTOGRAPHY, PLASMA GENERATORS (U)  
IDENTIFIERS: SOLID STATE LASERS, SEMICONDUCTOR  
LASERS, LIQUID LASERS, CHEMICAL LASERS,  
ULTRAVIOLET LASERS, NONLINEAR OPTICS, ORGANIC  
DYE LASERS, LASER MATERIALS, QUANTUM ELECTRONICS,  
SECOND HARMONIC GENERATION, HOLOGRAPHY (U)

THE REPORT COVERS THE SECOND QUARTER OF 1971 WITH  
THE MAJOR YIELD OF INFORMATION COMING FROM THE  
APPROXIMATELY 30 PERIODICALS KNOWN TO REPORT THE MOST  
ADVANCED AND INTERESTING FINDINGS IN SOVIET LASER  
TECHNOLOGY. THIS AS WELL AS THE PREVIOUS THREE  
REPORTS COVERS THE FOLLOWING TOPICS: (1) LASER  
RESEARCH -- SOLID STATE, LIQUID, GAS AND CHEMICAL  
LASERS; UV; COMPONENTS; NONLINEAR OPTICS;  
SPECTROSCOPY OF LASER MATERIALS; SHORT PULSE  
GENERATION; CRYSTAL GROWING; AND GENERAL THEORY;  
(2) LASER APPLICATIONS -- BIOLOGICAL EFFECTS,  
COMMUNICATION, COMPUTER TECHNOLOGY, HOLOGRAPHY,  
INSTRUMENTATION, MATERIALS PROCESSING, AND PLASMA  
GENERATION. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-733 252 20/6 20/5  
HUGHES AIRCRAFT CO CULVER CITY CALIF ELECTRONIC PROPERTIES  
INFORMATION CENTER

THE ELECTRO-OPTIC EFFECT AND PROPERTIES OF  
GALLIUM ARSENIDE FOR MODULATION  
APPLICATIONS.

(U)

DESCRIPTIVE NOTE: INTERIM REPT.,  
NOV 70 11P MILEK, JOHN T. ;  
REPT. NO. EPIC-IR-77

UNCLASSIFIED REPORT

DESCRIPTORS: (\*GALLIUM ARSENIDES, ELECTROOPTICS),  
(\*COHERENT RADIATION, MODULATORS),  
SEMICONDUCTORS, GAS LASERS, IRASERS, MODULATION,  
INFRARED RADIATION

(U)

IDENTIFIERS: LASER MODULATORS, CARBON DIOXIDE  
LASERS, SECOND HARMONIC GENERATION

(U)

THE ADVENT OF THE CO2 LASER HAS GENERATED THE  
NEED FOR A 10.6-MICRON INFRARED MODULATOR. GALLIUM  
ARSENIDE APPEARS TO BE A VERY SUITABLE MATERIAL FOR  
INFRARED MODULATION AND HAS BEEN WIDELY EXPLORED AS  
EVIDENT BY 66 REFERENCES LISTED IN THE BIBLIOGRAPHY  
PROVIDED BY THIS INTERIM REPORT. (AUTHOR)

(U)

UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-734 046 9/2 18/3  
VISIDYNE INC WOBURN MASS

OPTIR II.

(U)

DESCRIPTIVE NOTE: SPECIAL SCIENTIFIC REPT. ON VOLUME 1,  
SEP 71 190P MANLEY, OSCAR P. ; SMITH,  
HENRY J. P. ; TREVE, YVAIN M. ; CARPENTER, JACK  
W. ; DEGGES, THOMAS C. ;  
REPT. NO. VI-52-1  
CONTRACT: F19628-70-C-0097  
PROJ: AF-5710  
MONITOR: AFCRL 71-0528(I)

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO SPECIAL SCIENTIFIC REPT. ON  
VOLUME 2, AD-734 047.

DESCRIPTORS: (\*COMPUTER PROGRAMS, INSTRUCTION  
MANUALS), (\*NUCLEAR EXPLOSIONS, INFRARED  
RADIATION), (\*EXPLOSION EFFECTS, LIGHT),  
AIRBURST, NUCLEAR RADIATION, MATHEMATICAL MODELS,  
OPTICAL EQUIPMENT, RADIATION DAMAGE, ULTRAVIOLET  
RADIATION, CHEMILUMINESCENCE, OPTICAL TRACKING,  
LIGHT HOMING, LIGHT COMMUNICATION SYSTEMS  
IDENTIFIERS: OPTIR 2 COMPUTER CODE

(U)

(U)

THE REPORT DOCUMENTS THE SECOND GENERATION VERSION  
OF THE OPTIR CODE - OPTIR II. THE EFFORT IS  
AIMED AT ESTABLISHING THE BASIC PHYSICAL PRINCIPLES  
UNDERLYING THE WIDESPREAD, LONG TERM OPTICAL/INFRARED  
RADIATION OBSERVED FOLLOWING ATMOSPHERIC NUCLEAR  
DETONATIONS. THE RESULTS OF SUCH STUDIES ARE  
CRUCIAL TO THE DESIGN AND EVALUATION OF OPTICAL  
SURVEILLANCE, DETECTION, DISCRIMINATION, TRACKING AND  
HOMING SYSTEMS AND FUTURE LASER COMMUNICATION  
SYSTEMS, ALL OF WHICH MUST BE ABLE TO FUNCTION IN A  
NUCLEAR ENVIRONMENT.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-734 047 9/2 18/3  
VISIDYNE INC WOBURN MASS

OPTIR II.

(U)

DESCRIPTIVE NOTE: SPECIAL SCIENTIFIC REPT. ON VOLUME 2,  
SEP 71 174P MANLEY, OSCAR P. ; SMITH,  
HENRY J. P. ; TREVE, YVAIN M. ; CARPENTER, JACK  
W. ; DEGGS, THOMAS C. ;  
REPT. NO. VI-52-2  
CONTRACT: F19628-70-C-0097  
PROJ: AF-5710  
MONITOR: AFCRL 71-0528(II)

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO SPECIAL SCIENTIFIC REPT. ON  
VOLUME 3, AD-734 048.

DESCRIPTORS: (\*COMPUTER PROGRAMS, INSTRUCTION  
MANUALS), (\*NUCLEAR EXPLOSIONS, INFRARED  
RADIATION), (\*EXPLOSION EFFECTS, LIGHT),  
AIRBURST, NUCLEAR RADIATION, GAMMA RAYS, X RAYS,  
RADIATION DAMAGE, ATTENUATION, INTEGRAL EQUATIONS,  
COMPTON SCATTERING, ULTRAVIOLET RADIATION,  
PHOTOCHEMISTRY, ELECTRON DENSITY, IONIZATION,  
THERMAL RADIATION, MATHEMATICAL MODELS (U)  
IDENTIFIERS: OPTIR 2 COMPUTER CODE (U)

THE REPORT, VOLUME 2, DESCRIBING THE OPTIR 2  
COMPUTER CODE IS AN EXTENSION OF VOLUME 1  
PERTAINING TO VARIOUS MODELS OF THE RADIATION EFFECTS  
OF NUCLEAR EXPLOSIONS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-734 048 9/2 18/3  
VISIDYNE INC WOBURN MASS

OPTIR II.

(U)

DESCRIPTIVE NOTE: SPECIAL SCIENTIFIC REPT. ON VOLUME 3,  
SEP 71 136P MANLEY, OSCAR P. ; SMITH,  
HENRY J. P. ; TREVE, YVAIN M. ; CARPENTER, JACK  
W. ; DEGGES, THOMAS C. ;  
REPT. NO. VI-52-3  
CONTRACT: F19628-70-C-0097  
PROJ: AF-5710  
MONITOR: AFCRL 71-0528(III)

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO SPECIAL SCIENTIFIC REPT. ON  
VOLUME 2.

DESCRIPTORS: (\*COMPUTER PROGRAMS, NUCLEAR  
EXPLOSIONS), (\*NUCLEAR EXPLOSIONS, EXPLOSION  
EFFECTS), AIRBURST, LOW ALTITUDE, NUCLEAR  
RADIATION, CHEMILUMINESCENCE, RAYLEIGH SCATTERING,  
AIRGLOW, DIFFERENTIAL EQUATIONS (U)  
IDENTIFIERS: OPTIR 2 COMPUTER CODE, PHOTOCHEMICAL  
REACTIONS, FORTRAN, RKM COMPUTER CODE (U)

THE REPORT, VOLUME 3 OF THE OPTIR 2 COMPUTER  
CODE DESCRIBES VARIOUS MODELS EMPLOYED IN THE CODE. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-734 417 20'5  
NORTHROP CORP HAWTHORNE CALIF LASER SYSTEMS DEPT  
CO LASER LINE SELECTION TECHNIQUE. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. 1 AUG 70-15 DEC 71,  
DEC 71 40P BHAUMIK, MANI L. ?  
REPT. NO. NLSO-71-7R  
CONTRACT: N00014-71-C-0037, N00014-72-C-0043  
PROJ: NR-016-303

UNCLASSIFIED REPORT

DESCRIPTORS: (\*GAS LASERS, LINE SPECTRUM),  
POWER, ABSORPTION SPECTRUM, MOLECULAR  
SPECTROSCOPY, IRASERS, LIGHT TRANSMISSION,  
ATMOSPHERE (U)  
IDENTIFIERS: \*CARBON MONOXIDE LASERS, VIBRATIONAL  
SPECTRA, ROTATIONAL SPECTRA, ATMOSPHERIC  
ATTENUATION (U)

AN INTRACAVITY GAS CELL TECHNIQUE IS DEMONSTRATED  
FOR RESTRICTING THE CARBON MONOXIDE (CO) LASER  
OSCILLATIONS TO LINES COINCIDENT WITH THE  
TRANSMISSION BANDS OF THE ATMOSPHERE. USING AN  
INTRACAVITY WATER VAPOR CELL, THE CO LASER GAIN WAS  
SPOILED IN LINES THAT ARE ABSORBED BY ATMOSPHERIC  
WATER VAPOR, PERMITTING THE OSCILLATIONS TO BUILD UP  
ONLY ON THE HIGHER TRANSMISSION LINES. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-734 547 20/6 20/5 4/1  
OHIO STATE UNIV COLUMBUS ELECTROSCIENCE LAB

INVESTIGATION OF LASER PROPAGATION  
PHENOMENA.

(U)

DESCRIPTIVE NOTE: INTERIM TECHNICAL REPT. 1 JAN-1 JUL  
71,

AUG 71 49P COLLINS, STUART A. , JR. I  
REINHARDT, G. W. ;  
REPT. NO. ESL-3163-2  
CONTRACT: F30602-71-C-0132, ARPA ORDER-1279  
PROJ: ARPA-1E20  
MONITOR: RADC TR-71-248

UNCLASSIFIED REPORT

DESCRIPTORS: (\*COHERENT RADIATION, ATMOSPHERIC  
MOTION), LIGHT TRANSMISSION, PROPAGATION,  
TURBULENCE, MICROMETEOROLOGY  
IDENTIFIERS: LASER BEAMS

(U)

(U)

THIS REPORT DEALS WITH THEORETICAL INVESTIGATIONS  
IN THE AREA OF LINEAR ATMOSPHERIC PROPAGATION  
PHENOMENA AND MICROTURBULENCE STATISTICS. IT  
SPECIFICALLY DEALS WITH THE EXAMINATION OF PROPER  
AVERAGING TIMES REQUIRED FOR PROPAGATION EXPERIMENTS  
AND WITH THEORETICAL BACKUP FOR PHASE STRUCTURE  
FUNCTION MEASUREMENTS. FINALLY, A BIBLIOGRAPHY ON  
OPTICAL PROPAGATION WHICH WAS PREPARED EARLIER HAS  
BEEN UPDATED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-734 798 20/6 20/5  
RCA LABS PRINCETON N J

EFFECTS OF TURBULENCE INSTABILITIES ON LASER  
PROPAGATION.

(U)

DESCRIPTIVE NOTE: QUARTERLY PROGRESS REPT. NO. 1, 9 JUN-  
8 SEP 71,

OCT 71 26P DE WOLF, DAVID A. ;  
REPT. NO. PRRL-71-CR-31  
CONTRACT: F30602-71-C-0356, ARPA ORDER-1279  
PROJ: ARPA-1E20  
MONITOR: RADC TR-71-249

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT TRANSMISSION, ATMOSPHERIC  
MOTION), (\*COHERENT RADIATION, FOCUSING),  
TURBULENCE, OPTICAL IMAGES, DISTORTION  
IDENTIFIERS: \*LASER BEAMS, ATMOSPHERIC  
ATTENUATION

(U)

(U)

WHEN IMAGES ARE FORMED FROM LASER BEAMS PROPAGATING  
THROUGH TURBULENT AIR, A VARIETY OF SCINTILLATION  
PHENOMENA OCCURS: BEAM WANDER, INTENSITY  
FLUCTUATIONS, HOT- AND COLD-SPOT FORMATION, IMAGE  
BLURRING, SPOT BROADENING, ETC. THE PURPOSE OF  
THIS PROJECT IS TO STUDY THESE EFFECTS ANALYTICALLY,  
AND THUS TO INTERPRET MEASUREMENTS AND PREDICT  
PERFORMANCE IN FUTURE LASER SYSTEMS.  
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-735 935 20/6 20/5  
OREGON GRADUATE CENTER BEAVERTON\*

MULTIWAVELENGTH LASER PROPAGATION STUDY. (U)

DESCRIPTIVE NOTE: SEMIANNUAL REPT. JUL-DEC 71,  
JAN 72 87P KERR, J. RICHARD ;  
REPT. NO. 1154-13  
CONTRACT: N00014-68-A-0461-0001, ARPA ORDER-1806

UNCLASSIFIED REPORT

DESCRIPTORS: (\*COHERENT RADIATION, ATMOSPHERIC  
MOTION), (\*LASERS, LIGHT TRANSMISSION),  
SCINTILLATION, TURBULENCE, SCATTERING,  
DISTRIBUTION FUNCTIONS, INFRARED RADIATION,  
IRASERS, LIGHT COMMUNICATION SYSTEMS (U)  
IDENTIFIERS: ATMOSPHERIC SCATTERING, \*LASER  
BEAMS (U)

DURING THE REPORTING PERIOD, PRELIMINARY  
EXPERIMENTS WERE CONDUCTED ON THE NATURE AND EFFECTS  
OF FUNDAMENTAL INTERMITTENCIES IN ATMOSPHERIC  
TURBULENCE. THESE INTERMITTENCIES AFFECT  
SCINTILLATION LEVELS, STATISTICS, AND EXPERIMENTAL  
DATA SPREAD, TO A MUCH GREATER DEGREE THAN HAS BEEN  
GENERALLY RECOGNIZED. FOLLOWING THIS, ATTENTION WAS  
GIVEN TO TRANSMITTER APERTURE EFFECTS, AND CURRENT  
EXPERIMENTS ARE POINTING OUT SERIOUS DEFICIENCIES IN  
CERTAIN THEORETICAL PREDICTIONS. AS AN EXAMPLE,  
THE CONCEPT OF A FOCUSED BEAM SEEMS LARGELY  
MEANINGLESS IN TURBULENCE, AND PREDICTIONS OF SHARP  
REDUCTIONS IN SCINTILLATIONS UNDER SUCH A CONDITION  
ARE NOT BORNE OUT BY PHOTOGRAPHIC AND ELECTRONIC  
OBSERVATIONS. FINALLY, A RECENT SERIES OF  
COMPREHENSIVE MULTIWAVELENGTH SCINTILLATION  
EXPERIMENTS WAS INCORPORATED INTO A PAPER, WITH THE  
ADDITION OF NEW INTERPRETATIVE MATERIAL.  
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-736 037 20/5 4/1  
OHIO STATE UNIV COLUMBUS ELECTROSCIENCE LAB

LASER ABSORPTION IN THE 5 MICRON BAND. (U)

DESCRIPTIVE NOTE: QUARTERLY TECHNICAL REPT. 23 JUN-20  
SEP 71,

NOV 71 42P LONG, RONALD ;  
REPT. NO. ESL-3271-1  
CONTRACT: F30602-72-C-0015, ARPA ORDER-1279  
PROJ: ARPA-OE20  
MONITOR: RADC TR-71-314

UNCLASSIFIED REPORT

DESCRIPTORS: (\*COHERENT RADIATION, ATMOSPHERE),  
ABSORPTION SPECTRUM, ATTENUATION, GAS LASERS,  
CARBON MONOXIDE, ATMOSPHERIC TEMPERATURE,  
HUMIDITY, OPTICAL PROPERTIES, EXPERIMENTAL DESIGN,  
TEST EQUIPMENT, IRASERS (U)  
IDENTIFIERS: CARBON MONOXIDE LASERS, \*ATMOSPHERIC  
ATTENUATION, \*LASER BEAMS, INTERMEDIATE INFRARED  
RADIATION, COMPUTER AIDED ANALYSIS (U)

THE REPORT SUMMARIZED TECHNICAL DETAILS OF THE WORK  
PERFORMED FROM JUNE 23 TO SEPTEMBER 23, 1971.  
A DETAILED DISCUSSION OF WORK PERFORMED AT THE  
OHIO STATE UNIV. ELECTRO-SCIENCE  
LABORATORY IS PRESENTED. THIS WORK CONSISTED OF  
ATMOSPHERIC TRANSMITTANCE CALCULATIONS NEAR 5  
MICROMETER AND THE DESIGN OF A LABORATORY EXPERIMENT  
TO DETERMINE THE TRANSMITTANCE OF CO LASER RADIATION  
THROUGH SYNTHETIC ATMOSPHERES. COMPUTER PROGRAMS  
HAVE BEEN WRITTEN TO CALCULATE THE MOLECULAR  
ABSORPTION DUE TO ATMOSPHERIC ABSORBERS NEAR  
5MICROMETER. THE TYPE OF CALCULATIONS INCLUDE  
COMPUTER PLOTS OF THE CALCULATED SPECTRA, MORE  
ACCURATE TRANSMITTANCE VALUES AT THE FREQUENCIES OF  
THE CO LASER EMISSIONS FOR HORIZONTAL PATHS, AND  
TRANSMITTANCE VALUES AT THE FREQUENCIES OF THE CO  
LASER EMISSIONS FOR SLANT PATHS THROUGH THE  
ATMOSPHERE. PRELIMINARY CALCULATIONS ARE PRESENTED  
WITH WATER VAPOR AS THE ONLY ATMOSPHERIC ABSORBER  
CONSIDERED. THE DESIGN OF AN EXPERIMENT TO MEASURE  
THE TRANSMITTANCE OF THE CO LASER EMISSIONS THROUGH  
SIMULATED ATMOSPHERES IS DESCRIBED. SPECIFIC TOPICS  
COVERED ARE THE CO LASER, SELECTION OF THE EMISSION  
LINES TO BE MEASURED, THE MULTIPLE TRAVERSAL CELL,  
AND THE EXPERIMENTAL PROCEDURE. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-736 282 20/6 4/1  
MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

MULTIPLE-SCATTERING MODEL FOR LIGHT  
TRANSMISSION THROUGH OPTICALLY THICK CLOUDS. (U)

DESCRIPTIVE NOTE: JOURNAL ARTICLE,  
JAN 71 9P HEGGESTAD, HAROLD M. ;  
REPT. NO. JA-3860  
CONTRACT: F19628-70-C-0230  
MONITOR: ESD TR-71-313

UNCLASSIFIED REPORT  
AVAILABILITY: PUB. IN JNL. OPTICAL SOCIETY OF  
AMERICA, V61 N10 P1293-1300 OCT 71.

DESCRIPTORS: (\*LIGHT TRANSMISSION, \*CLOUDS),  
SCATTERING, MATHEMATICAL MODELS, LIGHT  
COMMUNICATION SYSTEMS, DISTRIBUTION FUNCTIONS (U)  
IDENTIFIERS: DIGITAL SIMULATION (U)

A LINEAR-SYSTEM MODEL HAS BEEN DEVELOPED TO PREDICT IRRADIANCE DISTRIBUTIONS OF VISIBLE LIGHT BELOW AN IDEALIZED OPTICALLY THICK ATMOSPHERIC CLOUD, WHICH IS ILLUMINATED FROM ABOVE IN AN ARBITRARY MANNER. THE MODEL OFFERS ELEGANT MATHEMATICAL SIMPLICITY AT THE EXPENSE OF SOME PRECISION. AS SUCH, IT IS APPLICABLE TO A BROAD CLASS OF PROBLEMS IN WHICH CORRECT FUNCTIONAL FORMS ARE REQUIRED, BUT LEVELS OF ACCURACY BETTER THAN A FACTOR OF 2 ARE NOT NECESSARY. OPTICAL THICKNESSES CAN RANGE FROM ABOUT 5 TO 32. ONE EXAMPLE OF A PROBLEM IN THIS CLASS, THE DESIGN OF A LASER COMMUNICATION SYSTEM TO OPERATE THROUGH CLOUDS, PROVIDED THE ORIGINAL MOTIVATION FOR DEVELOPMENT OF THE LIGHT-TRANSMISSION MODEL. THE OPTICAL EFFECTS OF THE CLOUD ARE CALCULATED BY MEANS OF A FOUR-DIMENSIONAL LINEAR SUPERPOSITION INTEGRAL, WHICH TAKES ACCOUNT OF MULTIPLE SCATTERING. TWO ILLUSTRATIONS OF THE METHOD ARE GIVEN IN DETAIL, WITH INCIDENT ILLUMINATION REPRESENTED BY A TIGHTLY COLLIMATED BEAM AND BY A SUM OF INFINITE PLANE WAVES, RESPECTIVELY. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-736 316 20/5 4/1  
GEORGETOWN UNIV WASHINGTON D C DEPT OF PHYSICS

ATMOSPHERIC DEPOLARIZATION AND STIMULATED  
BRILLOUIN SCATTERING, (U)

MAY 71 5P JORNA, SIEBE ;  
CONTRACT: F44620-68-C-0017  
PROJ: AF-7921  
MONITOR: AFOSR TR-72-0247

UNCLASSIFIED REPORT  
AVAILABILITY: PUB. IN APPLIED OPTICS, V10 N12  
P2661-2664 DEC 61.  
SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH  
CALIFORNIA, SAN DIEGO, LA JOLLA, INST. FOR  
PURE AND APPLIED PHYSICAL SCIENCES.

DESCRIPTORS: (\*COHERENT RADIATION, ATMOSPHERE),  
LIGHT TRANSMISSION, POLARIZATION, SCATTERING,  
LIGHT COMMUNICATION SYSTEMS (U)  
IDENTIFIERS: \*LASER BEAMS, ATMOSPHERIC SCATTERING,  
\*BRILLOUIN SCATTERING (U)

THE EFFECT OF ELECTROSTRICTIVELY INDUCED STIMULATED  
BRILLOUIN SCATTERING ON ATMOSPHERIC DEPOLARIZATION  
IS STUDIED. SOLUTIONS FOR STEADY-STATE AND  
TRANSIENT CONDITIONS ARE OBTAINED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-736 354 17/2  
MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF  
ELECTRONICS

VARIABLE-RATE OPTICAL COMMUNICATION THROUGH  
THE TURBULENT ATMOSPHERE. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,  
AUG 71 102P LEVITT, BARRY K. ;  
REPT. NO. TR-483  
CONTRACT: DA-28-043-AMC-02536(E), NGL-22-009-013  
PROJ: DA-2-0-061102-B-31-F

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS,  
\*IONOSPHERIC PROPAGATION), TURBULENCE, LASERS,  
SIGNAL-TO-NOISE RATIO, RAYLEIGH SCATTERING,  
ATTENUATION, MATHEMATICAL MODELS (U)  
IDENTIFIERS: ATMOSPHERIC ATTENUATION (U)

THE PERFORMANCE OF OPTICAL COMMUNICATION LINKS OVER  
ATMOSPHERIC CHANNELS IS SEVERELY LIMITED BECAUSE OF  
THE EFFECTS OF TURBULENCE. ONE METHOD OF  
RECOVERING SOME OF THE ATMOSPHERIC FADING LOSSES IS  
TO MATCH THE INSTANTANEOUS SIGNALLING RATE TO THE  
CHANNEL STATE. THE AUTHORS DEMONSTRATE THAT THE  
DATA TRANSMITTER CAN EXTRACT REAL-TIME CHANNEL-STATE  
INFORMATION BY PROCESSING THE FIELD RECEIVED WHEN A  
PILOT TONE IS SENT FROM THE DATA RECEIVER TO THE DATA  
TRANSMITTER. BASED ON THESE CHANNEL MEASUREMENTS,  
THE AUTHORS DERIVE OPTIMAL VARIABLE-RATE TECHNIQUES,  
AND SHOW THAT SIGNIFICANT IMPROVEMENTS IN SYSTEM  
PERFORMANCE ARE OBTAINED, PARTICULARLY AT LOW BIT  
ERROR RATES. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD\*737 535 20/5  
INFORMATICS TISCO INC RIVERDALE MD

BIBLIOGRAPHY OF SOVIET LASER  
DEVELOPMENTS.

(U)

DESCRIPTIVE NOTE: INTERIM REPT. NO. 5, JUL-SEP 71,  
DEC 71 95P HIBBEN, STUART G. I  
CONTRACT: F44620-70-C-0081, ARPA ORDER-1622  
PROJ: ARPA-0F10  
MONITOR: AFOSR TR-72-0485

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO INTERIM REPT. NO. 4, AD-  
732 244.

DESCRIPTORS: (\*LASERS, USSR), (\*BIBLIOGRAPHIES,  
LASERS), GAS LASERS, IRASERS, SEMICONDUCTORS,  
OPTICAL MATERIALS, OPTICAL EQUIPMENT COMPONENTS,  
COHERENT RADIATION, RADIATION EFFECTS, LIGHT  
COMMUNICATION SYSTEMS, DATA PROCESSING SYSTEMS,  
STEREOSCOPIC PHOTOGRAPHY, RADIATION DAMAGE, PLASMA  
GENERATORS

(U)

IDENTIFIERS: SOLID STATE LASERS, SEMICONDUCTOR  
LASERS, LIQUID LASERS, CHEMICAL LASERS,  
ULTRAVIOLET LASERS, NONLINEAR OPTICS, ORGANIC  
DYE LASERS, LASER MATERIALS, QUANTUM ELECTRONICS,  
HOLOGRAPHY

(U)

THE REPORT COVERS THE THIRD QUARTER OF 1971 WITH  
THE MAJOR YIELD OF INFORMATION COMING FROM THE  
APPROXIMATELY 30 PERIODICALS KNOWN TO REPORT THE MOST  
ADVANCED AND INTERESTING FINDINGS IN SOVIET LASER  
TECHNOLOGY. THIS AS WELL AS THE PREVIOUS FOUR  
REPORTS COVERS THE FOLLOWING TOPICS: (1) LASER  
RESEARCH -- SOLID STATE, LIQUID, GAS AND CHEMICAL  
LASERS; UV; COMPONENTS; NONLINEAR OPTICS;  
SPECTROSCOPY OF LASER MATERIALS; SHORT PULSE  
GENERATION; CRYSTAL GROWING; AND GENERAL THEORY;  
(2) LASER APPLICATIONS -- BIOLOGICAL EFFECTS,  
COMMUNICATIONS, COMPUTER TECHNOLOGY, HOLOGRAPHY,  
INSTRUMENTATION, MATERIALS PROCESSING, AND PLASMA  
GENERATION. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-836 935 17/2 17/8 20/5 20/6  
SYLVANIA ELECTRONIC SYSTEMS-EAST WALTHAM MASS APPLIED  
RESEARCH LAB

ACQUISITION AND TRACKING LASER COMMUNICATIONS  
SYSTEM.

(U)

DESCRIPTIVE NOTE: FINAL REPT. 1 JUL 66-30 APR 68,  
JUL 68 137P LANG, K. PIKE, R. ;  
RATCLIFFE, G. ;  
REPT. NO. F-6170-1  
CONTRACT: DA-28-043-AMC-02434(E)  
PROJ: DA-1P-620501-A-448  
TASK: 1-P-620501-A-44806  
MONITOR: ECOM 02434-F

UNCLASSIFIED REPORT

DESCRIPTORS: (\*LIGHT COMMUNICATION SYSTEMS, GAS  
LASERS), DESIGN, MODEL TESTS, TARGET  
ACQUISITION, OPTICAL TRACKING, MIRRORS,  
REFLECTION, SWEEP GENERATORS,  
RANGES(DISTANCE), ATMOSPHERIC REFRACTION,  
ACCURACY, INSTRUCTION MANUALS, WIRING DIAGRAMS,  
HELIUM, NEON, TELEPHOTO LENSES, FOCUSING,  
CONTROL SYSTEMS, TRACKING TELESCOPES,  
ELECTROOPTICS, PHOTOMULTIPLIERS  
IDENTIFIERS: LASER COMMUNICATION SYSTEMS, BEAM-  
STEERING, BREADBOARD MODELS, APERTURES

(U)

(U)

THREE DIFFERENT TECHNIQUES FOR AN ACQUISITION AND  
TRACKING COMMUNICATIONS SYSTEM WERE EVALUATED, AND A  
DESIGN PLAN WAS MADE FOR THE MOST PROMISING APPROACH.  
IN ADDITION, A SERIES OF ATMOSPHERIC PROPAGATION  
EXPERIMENTS WERE PERFORMED OVER A 1-KILOMETER  
TURBULENT ATMOSPHERIC PATH TO DETERMINE OPTIMUM  
BEAMWIDTHS AND RECEIVING APERTURE SIZES.  
FURTHERMORE, STUDIES OF AN ELECTRO-MAGNETICALLY  
OPERATED BEAM-STEERING MIRROR WERE MADE. IN THE  
RECOMMENDED SYSTEM A MUTUALLY ALIGNED LASER  
TRANSMITTER AND RECEIVER COMBINATION USING A COMMON  
MIRROR STEERING ELEMENT IS USED TO ALWAYS POINT BOTH  
RECEIVER AND TRANSMITTER ALONG THE SAME DIRECTION IN  
SPACE. THE FOCAL PLANE OF THE OPTICS IS SCANNED TO  
ACQUIRE AND SUBSEQUENTLY TRACK THE REFLECTED SIGNAL  
FROM A RETROREFLECTOR MOUNTED ON THE REMOTE TERMINAL.  
THE AUTOMATIC ACQUISITION AND SEARCH PHASE IS  
ACCOMPLISHED BY MOVING THE MIRROR BEAM-STEERING  
ELEMENT IN A RASTER SCAN. THE AUTOMATIC TRACKING  
FUNCTION IS PERFORMED BY ELECTRONICALLY SCANNING THE  
FOCAL PLANE OF THE OPTICS WITH AN IMAGE DISSECTOR (U)

UNCLASSIFIED

CORPORATE AUTHOR - MONITORING AGENCY

•ADVISORY GROUP FOR AERONAUTICAL  
RESEARCH AND DEVELOPMENT PARIS  
(FRANCE)

• • •  
AGARD-CP-3

PROPAGATION FACTORS IN SPACE  
COMMUNICATIONS.  
AD-674 170

•AERONAUTICAL SYSTEMS DIV WRIGHT-  
PATTERSON AFB OHIO

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ASD-TDR62 733

STUDY AND INVESTIGATION OF  
ACQUISITION AND TRACKING OF OPTICAL  
COMMUNICATION SYSTEMS  
AD-293 452

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ASD-TDR62 727

EXPERIMENTAL VERIFICATION OF  
SUN-POWERED LASER TRANSMITTER.  
AD-420 983

•AEROSPACE CORP EL SEGUNDO CALIF LAB  
OPERATIONS

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TR-0198(923D-02)-1

DESIGN CONSIDERATIONS OF  
MULTIPLE LASER COMMUNICATION LINKS  
BETWEEN SYNCHRONOUS SATELLITE AND  
SEVERAL EARTH STATIONS,  
(SAMSQ-TR-68-7)  
AD-673 876

•AEROSPACE RESEARCH LABS WRIGHT-  
PATTERSON AFB OHIO

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ARL-68-0033

DYNAMICS OF OPTICAL MIXING IN A  
HE-NE LASER,  
AD-669 086

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ARL-70-0289W

FREQUENCY SHIFT AT 3.39 MICRONS  
DUE TO COMPETITION BY 0328-A LASER  
RADIATION,  
AD-716 876

•AIR FORCE AVIONICS LAB WRIGHT-  
PATTERSON AFB OHIO

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AFAL-TDR-64-141

EFFECT OF OPTICAL PATH  
IMPERFECTIONS ON FABRY-PEROT  
MODULATOR PERFORMANCE.  
AD-603 004

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AFAL-TDR-64-181-P2

RESEARCH ON TECHNIQUES FOR  
LIGHT MODULATION DETECTION; PART  
II: FREQUENCY DEMODULATORS.  
AD-605 512

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AFAL-TDR-64-181-PT-1

RESEARCH OF TECHNIQUES FOR  
LIGHT MODULATION DETECTION, PART  
I, AMPLITUDE DEMODULATORS.  
AD-605 478

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AFAL-TDR-64-227

TUNING OF CW LASERS OVER  
ANGSTROM BANDWIDTHS: SOME POSSIBLE  
APPROACHES.  
AD-607 852

•AIR FORCE CAMBRIDGE RESEARCH LABS L G  
HANSCOM FIELD MASS

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ON THE PRODUCTION OF AND  
SCATTER PROPAGATION FROM ARTIFICIAL  
IRREGULARITIES IN THE IONOSPHERIC D-  
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APPLICATIONS OF LASERS.  
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AFCRL-67-0119

QUANTUM THEORY OF INTERNALLY  
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A BIBLIOGRAPHY OF LASER  
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AD-655 774

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AFCRL-68-0035

COHERENCE OF LASER RADIATION,

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TRANSVERSE MODE ELECTRO-OPTIC  
MATERIALS.  
AD-700 049

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AFCRL-70-0468  
INVESTIGATION OF SPECTRAL AND  
STATISTICAL PROPERTIES OF SINGLE-  
MODE CW LASERS.  
AD-716 847

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AFCRL-71-0179  
STARK EFFECT MODULATION  
STUDIES.  
AD-725 067

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ATMOSPHERIC ATTENUATION OF CO  
LASER RADIATION.  
AD-729 447

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AFCRL-71-0471  
DEVELOPMENT AND FABRICATION OF  
A YAG LASER SYSTEM FOR STUDY OF  
MODE LOCKING AND PULSE CODING LASER  
OUTPUT.  
AD-732 229

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AFCRL-71-0478  
PREPARATION AND PROPERTIES OF  
CUPROUS IODIDE.  
AD-731 109

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AFCRL-71-0528(I)  
OPTIR II.  
AD-734 046

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AFCRL-71-0528(II)  
OPTIR II.  
AD-734 047

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ATMOSPHERIC ATTENUATION OF CO  
LASER RADIATION.  
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TRANSVERSE MODE ELECTRO-OPTIC  
MATERIALS.  
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APPLICATIONS OF LASERS.  
AD-609 846

• AIR FORCE OFFICE OF SCIENTIFIC  
RESEARCH ARLINGTON VA

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COMMUNICATION CHARACTERISTICS  
OF PHOTOELECTRIC DETECTION.  
AD-628 546

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QUANTUM LIMITATIONS TO  
ELECTROMAGNETIC SIGNAL  
MEASUREMENTS.  
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LASER IRRADIATION.  
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QUANTUM LIMITATIONS TO  
ELECTROMAGNETIC SIGNAL  
MEASUREMENTS.  
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AFOSR-67-2138  
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DETERMINATION OF THE CO2 LINE  
PARAMETERS USING A CO2-N2-HE LASER.  
AD-676 721

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AFOSR-69-2028TR  
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AME-ARM

SWITCHING OF PHASE-LOCKED  
STATES IN THE INTRACAVITY PHASE-  
MODULATED HE-NE LASER.  
AD-707 629

AFOSR-70-2111TR  
SPECTROSCOPIC STUDIES WITH A  
TUNABLE N2O LASER.  
AD-710 178

AFOSR-70-2611TR  
FREQUENCY-MODULATED LASER  
COMMUNICATION SYSTEM.  
AD-714 718

AFOSR-1750  
DIRECT OBSERVATION OF MICROWAVE-  
FREQUENCY BEATS DUE TO PHOTOMIXING  
OF RUBY-OPTICAL-MASER MODES  
AD-264 455

AFOSR-4812  
STUDY OF MODULATION AND  
DETECTING OF COHERENT OPTICAL  
RADIATION.  
AD-407 612

AFOSR-TR-71-0582  
RESEARCH IN INTERACTION OF  
COHERENT LIGHT WITH SOLIDS AND WITH  
TURBULENT ATMOSPHERES.  
AD-722 475

AFOSR-TR-71-0947  
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AD-729 888

AFOSR-TR-71-1095  
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AD-722 865

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SPATIAL MODULATION OF LIGHT  
USING SURFACE WAVES IN AN  
INTERFEROMETER.  
AD-722 972

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INFORMATION RATE IN AN OPTICAL

COMMUNICATION CHANNEL.  
AD-724 414

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BIBLIOGRAPHY OF SOVIET LASER  
DEVELOPMENTS.  
AD-724 129

AFOSR-TR-71-2653  
BIBLIOGRAPHY OF SOVIET LASER  
DEVELOPMENTS.  
AD-731 242

AFOSR-TR-71-2814  
BIBLIOGRAPHY OF SOVIET LASER  
DEVELOPMENTS.  
AD-732 244

AFOSR-TR-71-2839  
PASSIVE Q-SWITCHING AND MODE  
LOCKING OF A CO2 LASER WITH CH3BR,  
PF5, OR SF6 AND SELF-MODE LOCKING  
USING ELECTRICAL PULSE EXCITATION.  
AD-732 146

AFOSR-TR-72-0247  
ATMOSPHERIC DEPOLARIZATION AND  
STIMULATED BRILLOUIN SCATTERING.  
AD-736 316

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BIBLIOGRAPHY OF SOVIET LASER  
DEVELOPMENTS.  
AD-737 535

AFOSR-TR-2870  
MODULATOR FREQUENCY DETUNING  
EFFECTS IN THE FM MODE-LOCKED  
LASER.  
AD-732 109

AMERICAN OPTICAL CO SOUTHBRIDGE MASS  
EXPERIMENTAL VERIFICATION OF  
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(ASD-TDR63 727)  
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ARMY ELECTRONICS COMMAND FORT  
MONMOUTH N J INST FOR EXPLORATORY  
RESEARCH

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SELF-ALIGNING OPTICAL BEAM  
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AD-672 301

\*ARMY ELECTRONICS COMMAND FORT  
MONMOUTH N J

OPTICAL MISALIGNMENT DUE TO  
TEMPERATURE GRADIENTS IN  
ELECTROOPTIC MODULATOR CRYSTALS,  
AD-628 607

P-N JUNCTION LASERS FOR  
COMMUNICATION SYSTEMS.  
AD-625 749

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ULTRASTABLE OPTICAL SOURCES.  
AD-664 197

ECOM-02424-F  
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AD-826 938

ECOM-2967  
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AD-671 596

ECOM-3005  
ATMOSPHERIC EFFECTS ON  
DIGITALLY MODULATED LASER  
TRANSMISSION.  
AD-676 814

ECOM-3258  
AN INFORMATION FEEDBACK  
APPROACH APPLIED TO AN AMPLITUDE-  
MODULATED DIGITAL LASER  
COMMUNICATIONS SYSTEM.  
AD-710 946

ECOM-3283  
DETERMINATION OF  
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FLUCTUATIONS BY LONG DISTANCE  
INTERFEROMETRY AT 6328 A.

AD-709 575

ECOM-3214  
AN INFORMATION FEEDBACK  
APPROACH APPLIED TO POLARIZATION-  
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ECOM-3215  
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AVERAGING LASER COMMUNICATIONS  
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AD-710 956

ECOM-3422  
A STUDY OF LASER RESONATORS AND  
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\*ARMY ELECTRONICS COMMAND FORT  
MONMOUTH N J ELECTRONIC COMPONENTS  
LAB

PULSE-CODE MODULATION MULTIPLEX  
TRANSMISSION OVER AN INJECTION  
LASER TRANSMISSION SYSTEM,  
AD-829 503

ECOM-2629  
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LASER DIODES.  
AD-627 084

\*ARMY ELECTRONICS LABS FORT MONMOUTH N  
J

DIRECT MODULATION OF A HE-NE  
GAS LASER,  
AD-425 126

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INJECTION LASER TRANSMISSION  
SYSTEM,  
AD-608 817

\*ARMY FOREIGN SCIENCE AND TECHNOLOGY  
CENTER WASHINGTON D C

FSTC-HT-22-309-69  
ANTENNAS FOR THE OPTICAL WAVE

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BAND,  
AD-697 220

ARMY MISSILE COMMAND HEADSTONE  
ARSENAL ALA PHYSICAL SCIENCES  
DIRECTORATE

RR-TR-71-6  
CO2 LASER PULSING  
AD-729 274

ARMY RESEARCH OFF: E DURHAM N C

AROD-4109:12 P  
THE BEHAVIOR OF LASER MODES IN  
A MEDIUM WITH TIME VARYING  
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OF A FREQUENCY MODULATED LASER  
COMMUNICATION SYSTEM.  
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PHOTOCOUNT DETECTION SYSTEMS.  
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AD-286 042

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AD-286 641

AVCO EVERETT RESEARCH LAB E EVERETT  
MASS

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LASER BEAM TRANSMISSION THROUGH  
THE ATMOSPHERE.  
AD-708 896

BAIRD ATOMIC INC CAMBRIDGE MASS

EFFECT OF OPTICAL PATH  
IMPERFECTIONS ON FARRY-PEROT  
MODULATOR PERFORMANCE.  
(AFAL-TDR-64-141)  
AD-600 004

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| 1154-13<br>AD-725 925              | AFCRL-70-0468<br>AD-716 847      |
| 1879-3<br>AD-410 571               | AFCRL-71-0179<br>AD-725 067      |
| 2630-5337<br>AD-410 571            | AFCRL-71-0270<br>AD-729 447      |
| 05691-6014-R0-00<br>AD-691 846     | AFCRL-71-0471<br>AD-732 229      |
| 6331<br>AD-604 735                 | AFCRL-71-0478<br>AD-731 109      |
| 07094-1-F<br>AD-677 374            | AFCRL-71-0928(1)<br>AD-734 046   |
| ARL-RR-347<br>AD-708 896           | AFCRL-71-0928(11)<br>AD-734 047  |
| AFAL-TDR-64-141<br>AD-603 004      | AFCRL-71-0928(111)<br>AD-734 048 |
| AFAL-TDR-64-181-P2<br>AD-605 512   | AFCRL-ERP-359<br>AD-729 447      |
| AFAL-TDR-64-181-PT-1<br>AD-605 478 | AFCRL-P3RP-402<br>AD-700 049     |
| AFAL-TDR-64-227<br>AD-607 852      | AFCRL-SR15<br>AD-609 846         |
| AFCKL-62 932<br>AD-284 321         | AFOSH-69-0027<br>AD-628 546      |

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|                                |                                 |
|--------------------------------|---------------------------------|
| AFOSR-68-0028<br>AD-610 422    | AFOSR-TR-71-2693<br>AD-731 242  |
| AFOSR-66-0402<br>AD-476 149    | AFOSR-TR-71-2814<br>AD-732 244  |
| AFOSR-67-0192<br>AD-645 640    | AFOSR-TR-71-2339<br>AD-732 146  |
| AFOSR-67-2138<br>AD-659 738    | AFOSR-TR-72-0247<br>AD-736 316  |
| AFOSR-68-2119<br>AD-676 721    | AFOSR-TR-72-0489<br>AD-737 525  |
| AFOSR-69-2028TR<br>AD-693 623  | AFOSR-TR-2830<br>AD-732 109     |
| AFOSR-70-1477TR<br>AD-707 629  | AGARD-CP-3<br>AD-674 170        |
| AFOSR-70-2119TR<br>AD-710 178  | AL-TR-69-79-PT. 2<br>AD-466 031 |
| AFOSR-70-2411TR<br>AD-714 718  | ARL-68-0033<br>AD-669 086       |
| AFOSR-1390<br>AD-264 455       | ARL-70-0289W<br>AD-716 876      |
| AFOSR-4812<br>AD-407 612       | AROD-4109112-P<br>AD-721 372    |
| AFOSR-TR-71-0982<br>AD-722 475 | AROD-542714-E<br>AD-677 374     |
| AFOSR-TR-71-0947<br>AD-729 868 | AROD-565913-E<br>AD-655 119     |
| AFOSR-TR-71-1095<br>AD-722 865 | AROD-565917<br>AD-674 085       |
| AFOSR-TR-71-1461<br>AD-723 972 | AROD-565918-E<br>AD-695 279     |
| AFOSR-TR-71-1873<br>AD-724 414 | AROD-5659112-E<br>AD-725 103    |
| AFOSR-TR-71-1777<br>AD-726 139 | AROD-777511<br>AD-675 075       |

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ASD-FTD

ASD-TOR62 723  
AD-293 452

ASD-TOR63 727  
AD-420 983

ATD-67-52  
AD-684 149

ATD-T-65-2  
AD-610 130

BBN-2060  
AD-714 895

O920259-12  
AD-622 575

ECOM-02341-2  
AD-664 197

ECOM-02434-F  
AD-836 935

ECOM-2629  
AD-627 084

ECOM-2967  
AD-671 596

ECOM-3005  
AD-676 614

ECOM-3258  
AD-710 946

ECOM-3283  
AD-709 579

ECOM-3314  
AD-710 955

ECOM-3315  
AD-710 956

ECOM-3422  
AD-728 101

EPIC-IR-77  
AD-733 252

ER-7600  
AD-612 725

ERL-68-21  
AD-476 149

ESD-TOR64 249  
AD-434 378

ESD-TOR-65-232  
AD-630 242

ESD-TOR-65-319  
AD-621 114

ESD-TOR-65-430  
AD-621 204

ESD-TOR-66-150  
AD-631 168

ESD-TR-68-411  
AD-668 713

ESD-TR-69-111  
AD-692 438

ESD-TR-69-232  
AD-693 905

ESD-TR-71-269  
AD-731 535

ESD-TR-71-313  
AD-736 282

ESL-3163-2  
AD-734 547

ESL-3271-1  
AD-736 037

F-6170-1  
AD-836 935

FSTC-HT-23-309-69  
AD-693 230

FTD-HT-23-59-68  
AD-692 432

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FTD-NCL

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FTD-HT-23-291-68  
AD-679 802

FTD-HT-23-404-69  
AD-699 665

FTD-HT-23-606-67  
AD-674 349

FTD-HT-23-809-67  
AD-669 305

FTD-HT-23-1024-67  
AD-674 274

FTD-HT-23-1096-67  
AD-677 221

FTD-HT-23-1179-67  
AD-682 768

FTD-HT-23-1227-68  
AD-693 939

FTD-HT-23-1544-67  
AD-680 974

FTD-HT-66-439  
AD-653 962

FTD-HT-66-584  
AD-665 984

FTD-HT-67-216  
AD-673 759

FTD-HT-24-127-69  
AD-695 945

FTD-HT-24-222-67  
AD-672 693

FTD-HT-24-297-70  
AD-722 308

FTD-HT-24-390-69  
AD-702 944

FTD-HT-69-373  
AD-658 382

FTD-HT-67-31  
AD-670 120

FTD-TT-64-568  
AD-608 466

FTD-TT-68-99  
AD-621 093

FTD-TT-68-361  
AD-643 999

FTD-TT-68-1483  
AD-643 606

FTD-TT-68-1683  
AD-629 473

IDA/HQ-70-11343  
AD-709 434

IDEP-461.08.00.00-X7-06  
AD-617 717

JA-2817  
AD-621 204

JA-2664  
AD-631 168

JA-3078  
AS-668 713

JA-3427  
AD-693 903

JA-3860  
AD-736 282

LMSC-N-JY-71-3  
AD-723 834

LMSC-58-71-1  
AD-723 834

ML-1206  
AD-606 219

MS-779E  
AD-621 114

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NLS-SRD

|                                    |                              |
|------------------------------------|------------------------------|
| NCL-71-41R<br>AD-729 263           | RADC-TR-71-248<br>AD-734 547 |
| NLSD-71-7R<br>AD-734 417           | RADC-TR-71-249<br>AD-734 798 |
| NOLTR-64-179<br>AD-610 071         | RADC-TR-71-314<br>AD-736 077 |
| NOLTR-69-166<br>AD-707 408         | RAE-TR-71009<br>AD-724 028   |
| NOTS-TP-2726<br>AD-617 717         | RH-3647-PR<br>AD-672 955     |
| NRC-11487<br>AD-714 358            | RH-3902-ARPA<br>AD-688 411   |
| NRL-6152<br>AD-607 487             | RH-6055-ARPA<br>AU-707 861   |
| NRL-7291<br>AD-730 478             | RH-6266-1-ARPA<br>AD-727 583 |
| PRRL-71-CR-31<br>AD-734 798        | RP-P-600<br>AD-709 434       |
| R-608-ARPA<br>AD-728 743           | RR-TR-71-8<br>AD-729 334     |
| RADC-TDR64 65<br>AD-605 219        | RSIC-195<br>AU-462 245       |
| RADC-TDR64 129<br>AD-601 660       | SAH50-TR-68-7<br>AD-673 876  |
| RADC-TDR64 130<br>AD-603 622       | SB 62 7<br>AD-275 591        |
| RADC-TDR-64-369<br>AD-612 725      | SCIENTIFIC-4<br>AD-649 851   |
| RADC-TR-66-704-VOL-1<br>AD-650 870 | SEL-64-092<br>AD-607 852     |
| RADC-TR-66-704-VOL-2<br>AD-650 871 | SEL-TR-0576-6<br>AD-607 852  |
| RADC-TR-66-704-VOL-3<br>AD-650 872 | SH-279<br>AD-732 229         |

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|                                  |                                 |
|----------------------------------|---------------------------------|
| SRDE-68009<br>AD-682 079         | TR-483<br>AD-736 354            |
| SRDE-70016<br>AD-708 677         | TR-Q41<br>AD-628 546            |
| SRDE-70064<br>AD-720 937         | TRC-BR-19398<br>AD-708 677      |
| TDR62 733<br>AD-292 452          | TRC-BR-23407<br>AD-720 937      |
| THEMIS-869-1<br>AD-692 623       | TRC-BR-23770<br>AD-724 028      |
| TN-1969-28<br>AD-692 438         | TRG-286-IR-1<br>AD-658 175      |
| TN-1971-43<br>AD-731 535         | TT 62 721<br>AD-286 611         |
| TPR-386<br>AD-617 717            | TT-65 60830<br>AD-610 130       |
| TR-5<br>AD-642 514               | TT-65-62953<br>AD-621 053       |
| TR-9<br>AD-721 372               | TT-66-60733<br>AD-629 473       |
| TR-14<br>AD-666 434              | TT-67-60193<br>AD-612 606       |
| TR-39<br>AD-659 738              | TT-67-62146<br>AD-652 962       |
| TR-111<br>AD-677 374             | TT-67-62867<br>AD-658 782       |
| TR-0158(9230-021-1<br>AD-672 876 | UZAL-67-9<br>AD-646 424         |
| TR-392<br>AD-630 243             | JNAIR-C-920083-12<br>AD-605 940 |
| TR-474<br>AD-706 212             | VI-52-1<br>AD-724 046           |
| TR-1<br>AD-717 948               | VI-52-2<br>AD-724 047           |

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VI-92-3  
AD-734 048

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Security Classification

| 1a.<br>KEY WORDS                                                                                                                                                                                                                                                                                                                                                                                                          | LINK A |    | LINK B |    | LINK C |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----|--------|----|--------|----|
|                                                                                                                                                                                                                                                                                                                                                                                                                           | ROLE   | WT | ROLE   | WT | ROLE   | WT |
| *Lasers<br>*Light Communication Systems<br>*Bibliographies<br>*Laser Communication Systems<br>Modulation<br>Modulators<br>Demodulators<br>Communication Equipment<br>Data Transmission Systems<br>Light Transmission<br>Gas Lasers<br>Injection Lasers<br>Q Switched Lasers<br>Trasers<br>Semiconductors<br>Chemical Lasers<br>Propagation<br>USSR<br>Laser Diodes<br>Semiconductor Lasers<br>Space Communication Systems |        |    |        |    |        |    |

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