RESEARCH SUPPORT INDEX

Page

Bell Telephone Laboratories, Inc. (Grant) 249

California Institute of Technology
  Contract 953524 75, 78, 81

Environmental Measurements Project Laboratory
  grant from the Dean of Science, M.I.T. 8

Joint Services Electronics Program
  Contract DAAB07-71-C-0300 1, 4, 11, 23, 27, 30, 31, 32, 34, 39, 51, 55, 59, 60, 86, 87, 91, 135, 137, 145, 233

National Aeronautics and Space Administration
  Contract NAS1-10693 61
  Grant NGR 22-009-526 51

National Institutes of Health
  Grant 5 PO1 GM14940-07 233
  Grant 5 PO1 HL14332-03 4, 8
  Grant 1 RO1 EY01149-01 249
  Grant 2 RO1 NS04332-11 173, 179, 185, 193, 212

National Science Foundation
  Grant GK-31353 157, 160
  Grant GK-3373X1 233
  Grant GK-37582 135
  Grant GK-37979X1 102, 109
  Grant GP-40485X 59, 60
  Grant GX-36331 137

University of California, Livermore
  Subcontract No. 7877409 32

U.S. Air Force – Electronic Systems Division
  Contract F19628-73-C-0196 68

QPR No. 114 268
<table>
<thead>
<tr>
<th>Agency</th>
<th>Contract Numbers</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Air Force - Office of Scientific Research</td>
<td>Contract F44620-71-C-0051</td>
<td>29</td>
</tr>
<tr>
<td>U.S. Army Research Office - Durham</td>
<td>Contract DAHC04-72-C-0044</td>
<td>34, 39</td>
</tr>
<tr>
<td>U.S. Atomic Energy Commission</td>
<td>Contract AT(11-1)-3070</td>
<td>123</td>
</tr>
<tr>
<td></td>
<td>Contract NO0014-67-A-0204-0069</td>
<td>193, 224</td>
</tr>
</tbody>
</table>
JOINT SERVICES ELECTRONICS PROGRAM

REPORTS DISTRIBUTION LIST

Department of Defense

Chief, R&D Division (340)
Defense Communications Agency
Washington, D.C. 20301

Defense Documentation Center
Attn: DDC-TCA (Mrs. V. Caponio)
Cameron Station
Alexandria, Virginia 22314

Dr. A. D. Schnitzler
Institute for Defense Analyses
Science and Technology Division
400 Army-Navy Drive
Arlington, Virginia 22202

Dr. George H. Heilmeier
Office of Director of Defense Research and Engineering
The Pentagon
Washington, D.C. 20315

Director, National Security Agency
Code R112
Fort George G. Meade, Maryland 20755
Attn: Dr. T. J. Beahn

Department of the Air Force

HQ/USAF (AF/RDPE)
Washington, D.C. 20330

HQ USAF/RDPS
Washington, D.C. 20330

Rome Air Development Center
Attn: Documents Library (TILD)
Griffiss AFB, New York 13440

Mr. H. E. Webb, Jr. (ISCP)
Rome Air Development Center
Griffiss AFB, New York 13440

AFSC (CCJ/Mr. Irving R. Mirman)
Andrews AFB
Washington, D.C. 20334

Directorate of Electronics & Weapons
HQ AFSC/DLC
Andrews AFB, Maryland 20334

Directorate of Science
HQ AFSC/DLS
Andrews AFB, Washington D.C. 20331

Mr. Carl Sletten
AFCRL/LZ
L. G. Hanscom Fld, Bedford, MA 01730

Dr. Richard Picard
AFCRL/OP
L. G. Hanscom Fld, Bedford, MA 01730

LTC J. W. Gregory
AF Member, TAC
Air Force Office of Scientific Research
1400 Wilson Blvd
Arlington, Virginia 22209

Mr. Robert Barrett
AFCRL/LQ
L. G. Hanscom Fld, Bedford, MA 01730

Dr. John N. Howard
AFCRL (CA)
L. G. Hanscom Field
Bedford, Massachusetts 01730

HQ ESD (DRI/Stop 22)
L. G. Hanscom Field
Bedford, Massachusetts 01730

Professor R. E. Fontana
Head Dept of Electrical Engineering
AFIT/ENE
Wright-Patterson AFB, Ohio 45433

AFAL/TE, Dr. W. C. Eppers, Jr.
Chief, Electronics Technology Division
Air Force Avionics Laboratory
Wright-Patterson AFB, Ohio 45433

AF Avionics Lab/CA
Attn: Dr. Robert J. Doran
Acting Chief Scientist
AF Avionics Laboratory
Wright-Patterson AFB, Ohio 45433

AFAL/TEA (Mr. R. D. Larson)
Wright-Patterson AFB, Ohio 45433

Faculty Secretariat (DFSS)
US Air Force Academy
Colorado 80840

Howard H. Steenbergen
Chief, Microelectronics Development & Utilization Group/TE
Air Force Avionics Laboratory
Wright-Patterson AFB, Ohio 45433
JOINT SERVICES REPORTS DISTRIBUTION LIST (continued)

Dr. Richard B. Mack
Physicist
Radiation and Reflection Branch (LZR)
Air Force Cambridge Research Laboratories
L. G. Hanscom Field, Bedford, Massachusetts 01730

Charles S. Sahagian
Chief, Preparation and Growth Branch (LQ)
Air Force Cambridge Laboratories
L. G. Hanscom Field, Bedford, Massachusetts 01730

Major William Patterson
Assistant Chief, Information Processing Branch (ISI)
Rome Air Development Center
Griffiss AFB, New York 13441

LTC Richard J. Gowen
Professor and Deputy Department Head
Dept of Electrical Engineering
USAF Academy, Colorado 80840

Director, USAF Project RAND
Via: Air Force Liaison Office
The RAND Corporation
Attn: Library D
1700 Main Street
Santa Monica, California 90406

AUL/LSE-9663
Maxwell AFB, Alabama 36112

AFETR Technical Library
P. O. Box 4608, MU 5650
Patrick AFB, Florida 32925

ADTC (SSLT)
Eglin AFB, Florida 32542

HQ AMD (RDR/Col Godden)
Brooks AFB, Texas 78235

USAFSAM (RAT)
Brooks AFB, Texas 78235

Commander
Attn: STEWS-AD-L, Technical Library
White Sands Missile Range,
New Mexico 88002

USAF European Office of Aerospace Research
Technical Information Office
Box 14, FPO New York 09510

VELA Seismological Center
312 Montgomery Street
Alexandria, Virginia 22314

Dr. Carl E. Baum
AFWL (ES)
Kirtland AFB, New Mexico 87117

Hqs Elct Sys Division (AFSC)
Attn: ESD/MCIT/Stop 36
Mr. John Mott/Smith
Laurence G. Hanscom Field, Bedford, Massachusetts 01730

USAFSAM/RAL
Brooks AFB, Texas 78235

Dr. Paul M. Kalaghan
AFCRL/LZN
L. G. Hanscom Field, Bedford, Massachusetts 01730

Department of the Army

HQDA (DARD-ARS-P)
Washington, D.C. 20310

Commander
US Army Security Agency
Attn: IARD-T
Arlington Hall Station
Arlington, Virginia 22212

Commander (AMXRD-BAD)
US Army Ballistics Research Laboratory
Aberdeen Proving Ground
Aberdeen, Maryland 21005

Commander
Picatinny Arsenal
Dover, New Jersey 07701
Attn: Science & Tech Info Br
SMUPA-TS-T-S
JOINT SERVICES REPORTS DISTRIBUTION LIST (continued)

Dr. Herman Robl  Mr. A. D. Bedrosian, Rm 26-131
Chief Scientist  US Army Scientific Liaison Office
US Army Research Office  Mass. Institute of Technology
Box CM, Duke Station  77 Massachusetts Avenue
Durham, North Carolina 27706  Cambridge, Massachusetts 02139

Richard O. Ulsh (CRDARD-IP)  Director (NV-D)
US Army Research Office  Night Vision Laboratory, USAECOM
Box CM, Duke Station  Fort Belvoir, Virginia 22060
Durham, North Carolina 27706

Mr. George C. White, Jr.  Commander/Director
Deputy Director, L1000, 64-4
Pitman-Dunn Laboratory  Atmospheric Sciences Laboratory
Frankford Arsenal  Attn: AMSEL-BL-DD
Philadelphia, Pennsylvania 19137
White Sands Missile Range,
New Mexico 88002

Redstone Scientific Information Center  Atmospheric Sciences Laboratory
Attn: Chief, Document Section
US Army Missile Command  Attn: AMSEL-BL-DD
Redstone Arsenal, Alabama 35809
White Sands Missile Range,
New Mexico 88002

Commander  Chief, Missile EW Tech Area
US Army Missile Command  Electronic Warfare Laboratory, ECOM
Attn: AMSL-BL-RA (Dr. Holt)  Attn: AMSL-WL-MY
Redstone Arsenal, Alabama 35809
White Sands Missile Range,
New Mexico 88002

Dr. Homer F. Priest  US Army Armaments
Chief, Materials Sciences Division, Bldg 292  Attn: AMSAR-RD
Army Materials and Mechanics Research Center  Rock Island, Illinois 61201
Watertown, Massachusetts 02172

John E. Rosenberg  US Army ABMDA
Harry Diamond Laboratories  (Attn: RDMD-NC, Mr. Gold)
Connecticut Ave & Van Ness Street N.W.  1300 Wilson Blvd
Washington, D.C. 20438  Arlington, Virginia 22209

Commandant  Harry C. Holloway, M.D. Col, MC
US Army Air Defense School  Director, Div of Neuropsychiatry
Attn: ATSAD-T-CSM  Walter Reed Army Institute of Research
Fort Bliss, Texas 79916  Washington, D.C. 20012

Commandant  Commander, USASATCOM
US Army Command and General Staff College  AMCPM-SC
Attn: Acquisitions, Lib Div  Fort Monmouth, New Jersey 07703
College  Fort Leavenworth, Kansas 66027
Commandant  Director, TRI-TAC
US Army Command and General Staff College  Attn: TT-AD (Mrs. Briller)
Attn: Acquisitions, Lib Div  Fort Monmouth, New Jersey 07703
Fort Leavenworth, Kansas 66027  Commander
Commander  US Army R&D Group (Far East)
US Army Command and General Staff College  APO, San Francisco, California 96343
Attn: Director, Advanced Concepts Office
Commander  Commander, US Army Communications
US Army R&D Group (Far East)  Office
APO, San Francisco, California 96343  Fort Huachuca, Arizona 85613
Commander  Mr. I. A. Balton, (AMSEL-TL-DC)
Executive Secretary, TAC/JSEP  Attn: Director, Advanced Concepts Office
US Army Electronics Command  Fort Huachuca, Arizona 85613
Fort Monmouth, New Jersey 07703
JOINT SERVICES REPORTS DISTRIBUTION LIST (continued)

Project Manager, ARTADS
(AMCPM-TDS)
EAI Building
West Long Branch, New Jersey

US Army White Sands Missile Range
STEWS-ID-R Attn: Dr. Alton L. Gilbert
White Sands Missile Range
New Mexico 88002

Mr. William T. Kawai
US Army R&D Group (Far East)
APO, San Francisco, California 96343

Commander
US Army Electronics Command
Fort Monmouth, New Jersey 07703

Attn: AMSEL-RD-O (Dr. W. S. McAfee)
CT-L (Dr. G. Buser)
CT-LE (Dr. S. Epstein)
BL-FM-A
CT-D
CT-R
NL-O (Dr. H. S. Bennett)
NL-T (Mr. R. Kulinyi)
NL-C
NL-PB
NL-F
NL-M
TL-I
TL-B
VL-D
WL-D
TL-MM (Mr. Lipetz)
BL-FM (Dr. Edward Collett)
NL-O
NL-X
NL-H (Schwering)
NL-Y
TL-DR
TL-E (Dr. S. Kronenberg)
TL-E (Dr. J. Kohn)
TL-I (Dr. C. Thornton)
NL-B (Dr. S. Amoroso)

Director
Naval Research Laboratory
Attn: Library, Code 2629 (ONRL)
Washington, D.C. 20390

Dr. G. M. R. Winkler
Director, Time Service Division
US Naval Observatory
Washington, D.C. 20390

Naval Weapons Center
Technical Library (Code 753)
China Lake, California 93555

Director
Information Systems Program (437)
Office of Naval Research
Arlington, Virginia 22217

Director, Naval Research Lab (Code 6400)
4555 Overlook Avenue, S.W.
Washington, D.C. 20375

Director, Naval Research Laboratory
(Code 6470)
4555 Overlook Avenue, S.W.
Washington, D.C. 20375

Director, Naval Research Laboratory
(Code 6460)
4555 Overlook Avenue, S.W.
Washington, D.C. 20375

Dr. Leo Young (Code 5203)
Electronics Division
Naval Research Laboratory
Washington, D.C. 20375

Commander
Naval Training Equipment Center
Orlando, Florida 32813

Dr. A. L. Slafkosky
Scientific Advisor, Code AX
Hqs, US Marine Corps
Washington, D.C. 20380

US Naval Weapons Laboratory
Dahlgren, Virginia 22448

Commander
US Naval Ordnance Laboratory
Silver Spring, Maryland 20910
Attn: Tech Library & Info Services Div

Director
Office of Naval Research
Boston Branch
495 Summer Street
Boston, Massachusetts 02210
Commander
Naval Missile Center
Attn: 5632.2, Technical Library
Point Mugu, California 93042

Commander
Naval Electronics Laboratory Center
Attn: Library
San Diego, California 92152

Deputy Director and Chief Scientist
Office of Naval Research Branch Office
1030 East Green Street
Pasadena, California 91106

Superintendent
Naval Post Graduate School
Monterey, California 93940
Attn: Library (Code 2124)

Officer in Charge, New London Lab
Naval Underwater Systems Center
(Tech Library)
New London, Connecticut 06320

Commander
Naval Avionics Facility
Attn: D/035 Technical Library
Indianapolis, Indiana 46241

Commander
Office of Naval Research Branch Office
536 South Clark Street
Chicago, Illinois 60605

Naval Air Development Center
Attn: Technical Library
Johnsville
Warminster, Pennsylvania 18974

Naval Oceanographic Office
Technical Library (Code 1640)
Suitland, Maryland 20390

Naval Ship Research & Development Center
Central Library (Code L42 and L43)
Washington, D.C. 20007

Non-Government Agencies

Director
Research Laboratory of Electronics
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139

Director
Microwave Research Institute
Polytechnic Institute of New York
Long Island Graduate Center, Route 110
Farmingdale, New York 11735

Mr. Jerome Fox, Research Coordinator
Polytechnic Institute of New York
333 Jay Street
Brooklyn, New York 11201

Other Government Agencies

Mr. F. C. Schwenk, RD-T
National Aeronautics & Space Administration
Washington, D.C. 20546

Los Alamos Scientific Laboratory
Attn: Reports Library
PO Box 1663
Los Alamos, New Mexico 87544

M. Zane Thornton
Deputy Director Institute for Computer
Sciences & Technology
National Bureau of Standards
Washington, D.C. 20234

Director, Office of Postal Technology (R&D)
US Postal Service
11711 Parklawn Drive
Rockville, Maryland 20852

NASA Lewis Research Center
Attn: Library
21000 Brookpark Road
Cleveland, Ohio 44135

Library - R51
Bureau of Standards
Acquisition
Boulder, Colorado 80302

MIT Lincoln Laboratory
Attn: Library A-082
PO Box 73
Lexington, Massachusetts 02173

Director
Columbia Radiation Laboratory
Dept of Physics
Columbia University
538 West 120th Street
New York, New York 10027

Director
Coordinated Science Laboratory
University of Illinois
Urbana, Illinois 61801
Director
Stanford Electronics Laboratory
Stanford University
Stanford, California 94305

Director
Microwave Laboratory
Stanford University
Stanford, California 94305

Director
Electronics Research Laboratory
University of California
Berkeley, California 94720

Director
Electronics Sciences Laboratory
University of Southern California
Los Angeles, California 90007

Director
Electronics Research Center
The University of Texas at Austin
Engineering-Science Bldg 112
Austin, Texas 78712

Director of Laboratories
Division of Engineering & Applied Physics
Harvard University
Pierce Hall
Cambridge, Massachusetts 02138
Quarterly Progress Report No. 114

Research Progress Report for period ending May 31, 1974

See Author Index

July 15, 1974

DAAB07-71-C-0300
C8-1-01504-C8-CA

114

None

Approved for public release; distribution unlimited

Joint Services Electronics Program through U.S. Army Electronics Command

This report, No. 114 in a series of quarterly progress reports issued by the Research Laboratory of Electronics, reviews some of the research activities of the Laboratory for the period ending May 31, 1974. Future progress reports will be issued semiannually, in January and July.
<table>
<thead>
<tr>
<th>KEY WORDS</th>
<th>LINK A</th>
<th>LINK B</th>
<th>LINK C</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Physics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plasma Dynamics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication Sciences and Engineering</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>