A Documentation of Fusion Technology

Institut für Plasmaphysik, Garching

J. Mantel

IPP 4/56 October 1968

INSTITUT FÜR PLASMAPHYSIK

GARCHING BEI MÜNCHEN

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UDC 533.9; 621.039.6; 002(05)

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Abstract

The growing spate of information in fusion technology has created the need for documentation in this field. This documentation covers specific problems which do not arise in documentations of physics or special fields such as plasma or vacuum physics. This is due to the fact that although fusion technology is a relatively narrow field the relevant information is spread over many thousands of periodicals or several million papers annually. The documentation reviews about 80 periodicals, 10 abstract journals and many reports. This paper analyzes the practice gained in Garching, compares documentation methods, and explains the documentation philosophy.

An abstract of the latest copy (September 1968) is included as an appendix.

UDC 533.9; 621,029.6; 002(05)

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1 Introduction

The rate of growth of printed information is greater than an exponential function and thus constitutes an information explosion. This is particularly true of scientific information.

There are at present several libraries with more than 10 million volumes (Library of Congress in Washington, Lenin Library in Moscow, Leningrad Library in Leningrad, and the Library of the British Museum in London) and many more almost as large. The expansion rate of 1 - 2 % annually (500,000 at the Library of the Congress) presents awkward problems.

Since 1950 periodicals have increased in number faster than books. Nowadays large collections of periodicals are to be found in many places. The sizes of the largest collections, approx. 20,000 periodicals at the Science Museum in London, 12,000 at the German Patent Office in Munich, and 624,000 at the Library of Congress in Washington, are significant.

About three million scientific and technical publications are printed annually in about 40,000 periodicals and a larger number of reports (1). This gross of information cannot be reviewed by an individual, but resort may be had to such alternatives as:

a) abstracts on cards
b) abstracts in abstract journals.

Although many card systems of abstracts have been developed (2-3), they are only useful as long as the number

of relevant publications does not exceed a few thousand annually.

If the annual number of publications exceeds this level, electronically sorted punched cards canbe used.

Abstracting in journals and the rapid rise of many abstract journals has resulted in poor coordination between documentation centres and abstracting journals.

This leads every group of information users to want its own particular style of documentation and abstract journal.

2 Documentation Philosophy

The desire to coordinate documentation work has given rise to many national documentation centres and to the International Federation for Documentation at The Hague in the Netherlands. These make use of an international universal decimal catalogue (UDC) which with some changes have been in use since the beginning of the 20th century. For nuclear engineering the UKAEA developed the decimal code (4), which is used in many indexing services (5).

The "science abstracts" representing these services are issued monthly in three parts (Physics, Electrical Engineering, and Control) and include more than 80,000 abstracts annually.

This is more than ten times as much as an individual can review (about 20 papers daily). Unfortunately reviews provide at most only half of the information needed in nuclear, thermonuclear, or fusion engineering.

The availability of computers in most research and developement centres has increased the wish for information retrieval systems combined with abstract journals.

The special properties and features of existing documentations (e.g. UDC) must be taken into account when starting documentation of a new field. According to Lowry (6): "An information retrieval system will tend not to be used whenever it is more painful and troublesome for a customer to have information than for him not to have it." One should keep this in mind and ensure that information, to be useful must be found in less than 1 hour (7).

The "designer" of a new documentation in a special field is therefore obliged to gear his efforts much more to the wishes of the user than to his own knowledge of the conventional state of the art. Compromise in respect of form and content is then inevitable. This is especially true for documentation in the heterogenous field of fusion technology.

Of the three million scientific publications issued annually, about 2 million are concerned with the physical sciences and technology. They are spread over 40,000 journals (out of a total of 80,000 scientific journals).

One has to comb the whole field and pick up only one percent or less, and this in about half of the numerous fields of science and technology. Electronics may be taken as an example. Although electronics is vital for fusion research, the volume of the documentation becomes uneconomical and its value is strongly reduced if all publications in the field of electronics (50,000 - 100,000 annually) are covered. A field such as electronics

has therefore to be sifted for relevant topics (e.g. pulse generation).

In the documentation described here the important topics are compiled in a thesaurus of key words. The key words are selected by information scientists and other interested scientists and engineers. Corresponding to the heterogenous nature of fusion technology and the need for restriction to a suitable selection of topics such a thesaurus of key words is also very heterogenous. But it has the advantage that it adapts itself more easily to changing structures and fields of interest than an universally accepted and confirmed catalogue, which can be revised only in long periods.

Documentations of very similar forms, which existed previously to the one reported here, are the documentation of plasma physics and of vacuum and surface physics (8-9), done in the IPP and for instance the documentation of high energy physics done at DESY (10). This classification is carried out in the Engineering Division, headed by K. H. Schmitter.

The compilation and computer-aided information retrieval are done in the Theory Division, headed by Prof. A. Schlüter. Compiler is D. Hilsenbeck, who is also responsible for the documentation of plasma physics and vacuum and surface physics.

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IN

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INSTITUT FÜR PLASMAPHYSIK

8046 GARCHING BEI MÜNCHEN

ENGINEERING

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INTRODUCTION

In order to ensure quick dissemination of engineering and technology in plasma physics, the Institut für Plasmaphysik, Garching b. München issues a documentation in the form of bound lists.

The latest publications and reports in the library of the institute are listed bibliographically, by author, and by subject. The bibliographic part comprises title, language, author and source. Keywords or combinations of keywords indicating the content are given at the end of each entry. A distinction is made between primary and secondary keywords. The primary keywords are contained in a thesaurus of accepted terms in the field of engineering and technology in plasma physics. They appear in alphabetical order in the subject index, together with the titles of relevant works. The secondary keywords are used to describe important details, so that these together with the primary keywords and the title give a good idea of the content. They are enclosed by slashes and unlike the primary keywords are not included in the subject index.

Both the bibliographic part and the indexes are compiled with an IBM 7090. Cumulative indexes will be issued at the end of the year.

In this way it is possible to inform engineers engaged in the field about the latest publications and reports according to subject matter. The topicality of the information provided is thus ensured.

Russian literature in the original is also included. Russian names are rendered in the Latin alphabet according to the transliteration recommended by USAF systems Command, Foreign Technology Division.

The thesaurus was built up gradually on the basis of catalogued words and suggestions from engineers. From time to time it will be revised and brought up to date.

The language used is English. Titles in other languages are translated into English. Information retrieval by means of the IBM 7090 can be performed if necessary.

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ABBREVIATIONS OF INSTITUTES

ABBREVIATIONS FOR INSTITUTES

A

ADSS-WRE	AUSTRALIAN DEFENSE SCI.SERV.,WEAPONS RES.ESTABL.,SALISBURY, S.AUSTRALIA
AE	AKTIEBOLAGET ATOMENERGI,SWEDEN
AEC	ATOMIC ENERGY COMISSION,WASHINGTON,D.C.
AECA	ATOMIC ENERGY OF CANADA,CHALK RIVER,ONTARIO
AECSU	ATOMIC ENERGY COMMISSION OF THE USSR
AERE	ATOMIC ENERGY RESEARCH ESTABLISHMENT,HARWELL,BERKSHIRE
AEDC	ARNOLD ENGINEERING DEVELOPM.CENTER,AFSC,ARNOLD AF STATION, TENNESSEE
AERL	AVCO RESEARCH LABORATORIES,A DIV.OF AVCO CORP., EVERETT,MASS.
AFAPL	AF-SYSTEMS-COMM.,AERO-PROPULSION LAB.,WRIGHT-PATTERSON-AF-BASE,OHIO
AFCRC	AIR FORCE CAMBRIDGE RESEARCH CENTER,MASS.
AFCRL	AIR FORCE CAMBRIDGE RESEARCH LABORATORIES,BEDFORT,MASS.
AF EOAR GRANT	USAF UNDER GRANT,EUROP.OFF.OF AEROSPACE RESEARCH
AFOSR	AF OFFICE OF SCIENTIFIC RESEARCH, WAHINGTON,D.C.
AFSC-SEG	AF-SYSTEMS COMM.,SYSTEMS ENG.GROUP(RTD),WRIGHT-PATTERSON-AF-BASE,OHIO
AFSWC	AF SPECIAL WEAPONS RESEARCH LAB.,KIRTLAND AFB, N.MEXICO
AFWL	AIR FORCE WEAPONS LAB.,KIRTLAND AF BASE, N.MEXICO
AI	ATOMICS INTERNATIONAL,A DIV.OF NORTH-AM.AVIAT.CORP.,CANOGA PARK,CALIF.
AIAA-PAPERS	AM.INST.OF AERONAUTICS AND ASTRONAUTICS, CONF.PAPERS, NEW YORK
ANL	ARGONNE NATIONAL LABORATORY,LEMONT,ILL.
APL/JHU	JOHN HOPKINS UNIVERSITY,APPL.PHYS.LAB.,SILVER SPRINGS,MARYLAND
ARL (AF)	AEROSPACE RESEARCH LAB., WRIGHT PATTERSON AF BASE, OHIO
ARL (RWD)	AERONAUTICAL RESEARCH LABORATORY,RAMO-WOOLDRIDGE CORP.LOS ANGELES,CALIF.
ASC	AEROSPACE CORP., EL SEGUNDO, CALIF.
ASTIA	ARMED SERVICES TECHNICAL INFORMATION AGENCY, ARLINGTON, VA.
ATD	AEROSPACE INFORMATION DIVISION,LIBRARY OF CONGRESS
ATS	ASSOCIATED TECHNICAL SERVICE,EAST ORANGE,N.JERSEY
AWRE	ATOMIC WEAPON RES.ESTABLISHMENT,ALDERMASTON,BERKSHIRE,G.B.

B

BBCZF	BBC-HEIDELBERG,GERMANY,ZENTRALES FORSCHUNGSLABOR
BBG	BERLINER BUNSEN GESELLSCHAFT FUER PHYSIKALISCHE CHEMIEE, BERLIN
BMWF	BUNDESMINISTERIUM F.WISSENSCHAFT U.FORSCHUNG, BONN, GERMANY
BNL	BROOKSHAVEN NATIONAL LABORATORY,UPTON,N.Y.
BNWL	BATELLE-NORTHWEST, BATELLE MEMORIAL INSTITUTE, RICHLAND, WASH.
BRGAL	BOEING SCIENTIFIC RES. LAB.,GEO-ASTROPHYSICS LAB., SEATTLE, WASH.
BRL	US ARMY MATERIALS COMMAND,BALLISTIC RES.LAB.,ABERDEEN PROVING GROUND,MA.
BRLP	BOEING RESEARCH LAB.,PL.PHYSICS,SEATTLE
BTS	BELL TELEPHONE SYSTEM
BUN-ENG	BROWN UNIVERSITY,DIV.OF ENGINEERING,PROVIDENCE

C

CAL	CORNELL AERONAUTICAL LAB.,INC.,BUFFALO
C.E.A.	COMMISSARIAT A L'ENERGIE ATOMIQUE, FRANCE
CEAF	GROUPE DE RECHERCHE DE L'ASSOCIATION EURATOM,FONTENAY-AUX-ROSES
CEAS	CENTRE D'ETUDE NUCLEAIRE,SACLEY,EURATOM
CERN	ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE ,GENEVE
CHUG	CHALMERS UNIV.OF TECHNOLOGY,RES.LAB.OF ELECTRONICS,GOTHENBURG,SWEDEN
CIT	CALIFORNIAN INSTITUTE OF TECHNOLIGY,PASADENA,CALIF.
CITC	CASE INSTITUTE OF TECHNOLOGY,UNIVERSITY CIRCLE,CLEVELAND,OHIO
CLB	US CUSTOMS LAB.,BALTIMORE,MARYLAND
CNEN	COMITATO NATIONALE ENERGIA NUCLEARE, ROMA
CLM	CULHAM LABORATORY,CULHAM,ABINGDON,BERKSHIRE,G.B.
COA	THE COLLEGE OF AERONAUTICS,CRANFIELD
CPD	AUSTRAL.DEF.SCIENTIFIC SERVICE,WEAPONS RES.ESTABL.,SALISBURY,S.AUSTRALIA
CTO	CULHAM LABORATORY,CULHAM TRANSLATION OFFICE,CULHAM,ABINGDON,BERKSHIRE
CUA-SSAP	THE CATHOLIC UNIV.OF AMERICA,DEP.OF SPACE SCI.AND APPL.PHYSICS,WASH.
CU (PNPL)	COLUMBIA UNIVERSITY IN THE CITY OF N.Y.,PLASMA PHYSICS LABORATORY
CWM-PPL	THE COLLEGE OF WILLIAM AND MARY,WILLIAMSBURG,VIRG.,PLASMA PHYS.LAB.

D

DAC-AD	DOUGLAS AIRCRAFT CORPORATION,AIRCRAFT DIV., LONG BEACH, CALIF.
DAC-MS	DOUGLAS AIRCRAFT COMPANY,MISSILE AND SPACE DIV.,S.MONICA,CALIF.
DCRF	THE DOW CHEMICAL COMPANY,ROCKY FLATS DIVISION
DGGW-EMR	UNIVERSITY LONDON,IMPERIAL COLLEGE
DLR	DEUTSCHE LUFT-UND RAUMFAHRT FORSCHUNGSBER.,ED.BY DVL AND ZLD,MUNICH
DOFL	US ARMY MATERIAL COMMAND,DIAMOND LAB.,WASHINGTON,D.C.
DP-SRL	DUPONT, SAVANNAH RIVER LAB., AIKEN, S.CAROILNA
DRI	UNIVERSITY OF DENNEVER
DTMB	DAVID TAYLOR MODEL BASIN,DEP.OF THE NAVY,CARDEROCK,MD.
DTSCH.PAT.AMT	DEUTSCHES BUNDESPATENTAMT,MUENCHEN,GERMANY
E	
EFNIS	UNIVERSITY OF CHICAGO,ENRICO FERMI INSTITUTE OF TECHNOLOGY
ELP	ELCON LAB.INC.,PEABODY,MASS.
EMI	ERNST-MACH-INSTITUT, FREIBURG, GERMANY
ERM-LPP	ECOLE ROYALE MILITAIRE BRUXELLES,LAB.DE PHYS.DES PLASMAS, BELGIUM
ESRO	EUROPEAN SPACE RESEARCH ORGANIZATION, PARIS, FRANCE
ESSEX-CHEM	DEPARTM.OF CHEMISTRY, UNIVERSITY OF ESSEX, COLCHESTER, G.B.
EUR	EUROPEAN ATOMIC ENERGY COMMUNITY
EUR-CEA	EUR,COMMISSARIAT A L'ENERGIE ATOMIQUE
F	
FOA	FOERSARETS FORSKININGSANSTALT, STOCKHOLM, SWEDEN
FEI	FIZIKA ENERGETICHESKII INSTITUT, USSR
FOM	FUNDAMENTEEL ONDERZOEK DER MATERIE-INST.F.PLASMAPHYS.,RIJNHUIZEN
FOM-IAMPA	FOM-INSTITUT F.ATOMIC AND MOLECULAR PHYSICS, AMSTERDAM, NETHERLANDS
FRM	TECHN.HOCHSCHULE MUENCHEN,PHYSIKALISCHE LABORATORIEN,GERMANY
FTD	AF SYSTEMS COMMAND,FOREIGN TECHNOLOGY DIV.,WRIGHT PATTERSON AFB,OHIO
G	
GA	GENERAL ATOMIC,DIVISION OF GENERAL DYNAMICS,SAN DIEGO,CALIF.
GCA	GCA CORPORATION, TECHNOLOGY DIVISION, BEDFORD , MASS.
GDC	GENERAL DYNAMICS,CONVAIR,SAN DIEGO,CALIF.
GD-FW	GENERAL DYNAMICS,FORT WORTH,TEX.
GE-ZR	GENERAL ELECTRIC RESEARCH LABORATORY,SCHENECTADY,N.JERSEY
GEMS	GENERAL ELECTRIC,MISSILE AND SPACE DIV.,SPACE SCIENCES LAB.,PHILADELPHIA
GGA	GULF GENERAL ATOMIC, INC.,SAN DIEGO, CALIF.
GIT	GEORGIA INSTITUTE OF TECHNOLOGY,ATLANTA,GEORGIA
GMRL	GENERAL MOTORS GROUP,RES.LAB.,DETROIT,ILL.
GM-TR	SPACE TECHNOLOGY LABORATORIES INC.,PHYS.RES.LAB.,L.ANGELES,CALIF.
GRDM	GRUMAN RESEARCH DEPARTMENT MEMORANDUM
H	
HDL	HARRY DIAMOND LABORATORIES,ARMY MATERIAL COMM.,WASHINGTON,D.C.
HEB	HEBREW UNIVERSITY,JERUSALEM,ISRAEL
HMI	HAHN-MEITNER INST.F.KERNFORSCHUNG, BERLIN
HRL	HUGHES RES.LAB.,MALIBU,CLF.
HUX	HARVARD UNIVERSITY,CAMBRIDGE,MASS.
I	
IA	ISRAEL ATOMIC ENERGY COMISSION,TEL AVIV
IAEA	INTERNATIONAL ATOMIC ENERGY AGENCY,VIENNA,AUSTRIA
I AN SSSR	INSTITUTE OF THE ACAD.OF SCI.OF THE USSR
IBJW	INSTITUTE BODAN JADROWICH,WARSHAW
IC	INTERNATIONAL CENTER FOR THEORETICAL PHYSICS,TRIESTE,IAEA
IDA	INSTITUTE FOR DEFENCE ANALYSIS
IEEJ	INSTITUTE OF ELECTRICAL ENGINEERS OF JAPAN
IFA	INSTITUTE FRANCO-ALLEMAND DE RECHERCHES,ST.LOUIS
IFUM	IHT
TECHN.HOCHSCH.STUT	INST.DI SCIENCE FISICHE,UNIV.DEGLI STUDI DI MILANO, ITALY
ILL	UNIVERSITY OF ILLINOIS,ELECTRICAL ENGINEERING DIVISION

ILL-AL	UNIV.OF ILLINOIS,ANTENNA LABORATORY, URBANA,ILL.
ILL-R	UNIV.OF ILLINOIS,COORDINATED SCIENCE LAB.,URBANA
IMJ	INST.F.MAGNETOHYDRODYNAMIK,JENA
INDEC	UNIV.OF PENNSYLVANIA,INST.F.DIRECT ENERGY CONVERSION, PHILADELPHIA,PENN.
IPF	INST.F.PLASMAFORSCHUNG DER TH STUTTGART (FORMERLY IHT)
IPP	INST.F.PLASMAPHYSIK,GARCHING B. MUENCHEN
IPP (COPY)	HARD-TO-FIND LITTERATURE, COPPIED BY THE IPP (SEE ALSO LIT)
IPPCZ	INST.OF PLASMAPHYSICS,THE AKADEMY OF SCIENCES OF THE CSSR
IPPJ	INST.OF PLASMA PHYSICS,NAGOYA UNIVERSITY,NAGOYA,JAPAN
IPPNO	INSTITUT OF PLASMA PHYSICS, NOVOROSSIK (SEE ALSO IYAFSO)
IRLC	LABORATORY FOR INSULATION RESEARCH,CAMBRIDGE
IRTB	INDUSTRIAL RESEARCH INSTITUTE FOR TELECOMMUNICATICN,BUDAPEST
IS	IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY,INST.OF ATOMIC RES.,AMES
ITAB	THE INSTITUTE OF THEORETICAL ASTROPHYSICS,BLINDERN,OSLO
ITEF	INST.OF THEOR.AND EXPERIM. PHYSICS OF THE USSR ATOMIC ENERGY COM.
IYAFSO	INSTITUT YADERNOI FIZIKI SIBIRSKOGO ODTELENIYA AN SSSR, NOVOSIBIRSK
J	
JAERI	JAPAN ATOMIC ENERGY RESEARCH INSTITUTE
JILA	JOINT INST.FOR LABORATORY ASTROPHYSICS,UNIV.OF COLORADO,BOULDER,COL.
JPL	JET PROPULSION LAB.,PASADENA,CALIF.
JPRS	JOINT PUBLICATIONS RESEARCH SERVICE,CITY OF NEW YCRK
JUEL	GES.F.KERNFORSCHUNG,INST.F.PL.PHYSIK,JUELICH,GERMANY
K	
KFA	KERNFORSCHUNGSANLAGE JUELICH DES LANDES NORDRHEIN-WESTFALEN,E.V.
KFK	GESELLSCHAFT FUER KERNFORSCHUNG M.B.H., KARLSRUHE
KIM	KURTCHATOV INSTITUTE FOR ATOMIC ENERGY,MOSCOW
KTHH	KUNGL.TEKN.HOEGSKOLANS HANDLINGAR,SWEDEN
KYU	KYOTU UNIVERSITY,DEPM.OF ELECTRICAL ENG.,FACULTY OF ENG.,KYOTO,JAPAN
L	
LA	LOS ALAMOS SCIENTIFIC LABORATORY,N.MEXICO
LAMS	LOS ALAMOS SCIENTIFIC LABORATORY,N.MEXICO
LB	DOUGLAS AIRCRAFT CORPORATION,LONG BEACH,CALIF.
LCC	LOCKHEED CALIFORNIA CORPORATION, BURBANK, CALIF.
LGI	LABORATORIO GAS IONIZATI,FRASCATI-ROMA
LIM	LEBEDEV INSTITUTE MOSCOW
LIT	HARD-TO-FIND LITERATURE, THESES, CONFERENCE PAPERS (FORMERLY IPP(COPY))
LLM	LINCOLN LAB.,MASSACHUSSETS
LNF	LABORATORI NAZIONALI DE FRASCATI DEL CNEN, FRASCATI, ROMA, ITALY
LRK	LABORATOIRE DE RECHERCHES A KRAAINEN, BRUXELLES, BELGIUM
LRL	LAWRENCE RADIATION LAB., UNIVERSITY OF CALIFORNIA, LIVERMORE, CALIF.
LRP	INSTITUT FUER PLASMAPHYSIK,LOUSANNE
LYCEN	UNIVERSITE DE LYON,INST.DE PHYSIQUE NUCLEAIRE
M	
MATT	PROJECT MATTERHORN,PRINCETON UNIVERSITY,PRINCETON,N.JERSEY
MF	NEW YORK UNIV.,COURANT INST.OF MATHEM.SCI.,MAGNETO-FLUID DYNAMICS DIV.
MIAPH	UNIV.OF MIAMI, DEP.OF PHYSICS, CORAL GABLES, FLORIDA
MIT	MASSACHUSETTS INSTITUTE OF TECHNOLOGY,CAMBRIDGE,MASS.
MIT-CSR	MIT, CENTER FOR SPACE RESEARCH
MIT-FML	MIT,FLUID MECHANICS LAB., DEP.OF MECHANICAL ENGINEERING
MIT-LIR	MIT, LABORATORY FOR INSULATION RESEARCH
MIT-RLE	MIT, RES.LAB.OF ELECTRONICS, CAMBRIDGE, MASS.
MLM	MOUND LABORATORY,MIAMISBURG,OHIO
MND	MARTIN,BALTIMORE DIVISION,BALTIMORE,MARYLAND
MPI	MAX-PLANCK-INSTITUT FUER PHYSIK UND ASTROPHYSIK,MUENCHEN
MRC	US ARMY,MATHEMATICAL RESEARCH CENTER
MSUCP	MICHIGAN STATE UNIVERSITY,DEP.OF PHYSICS,EAST LANSING
MURA	MIDWESTERN UNIVERSITY RESEARCH ASS.,MADISON,WISC.
N	

NACA	LEWIS FLIGHT RESEARCH CENTER,CLEVELAND,OHIO
NAGOYA	NAGOYA UNIV., DEP.OF PHYSICS, CHIKUSA NAGOYA JAPAN
NASA	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. WASHINGTON, D.C.
NBS	NATIONAL BUREAU OF STANDARDS,WASHINGTON,D.C.
NCAR	NATIONAL CENTER FOR ATMOSPHERIC RESEARCH,BOULDER,COL.
NEIC	NUCLEAR ENERGY INFORMATION CENTER,POLAND
NEU	NORTH-EASTERN UNIVERSITY
NIT	NORVEGIAN INST.TECHNOL.,DIV.APPL.ELECTR.,DEP.EL.ENG.,TRONDHEIM,NORWAY
NIT-EIP	NORVEGIAN INST.OF TECHNOLOGY, ELECTRON AND ION PHYSICS RESEARCH GROUP
NIT-GDL	GAS DISCHARGE LABORATORY, THE INST.OF TECHNOLOGY,TRONDHEIM,NORWAY
NMSU	NEW MEXICO STATE UNIVERSITY
NOLC	NAVAL ORDONANCE LABORATORY,CORONA,CALIF.
NRC	NATIONAL RESEARCH COUNCIL OF CANADA
NRL	NAVAL RESEARCH LABORATORY,WASHINGTON,D.C.
NUMEC	NUMEC ENERGY CONVERSION DIVISION
NWU-GDL	NORTHWESTERN UNIVERSITY, GAS DYNAMICS LABORATORY, EVANSTON , ILL.
NYU	NEW YORK UNIVERSITY, N.Y.
NWU	NORTHWESTERN UNIVERSITY,TECHNICAL INST.,EVANSTON, ILL.
O	
OIYAL	JOINT INSTITUTE FOR NUCLEAR RESEARCH,DUBNA
ONERA	OFF.NAT.D'ETUDES ET DE RECHERCHES AEROSP.,CHATILLON SOUS BAGNEUX,SEINE
ONR	OFFICE OF NAVAL RESEARCH,WASHINGTON ,D.C.
ORNL	OAK RIDGE NATIONAL LABORATORY,TENN.
ORTIB	TECHNICAL INFORMATION BRANCH, OAK RIDGE TENN.
OSB	OSRAM STUDIENGESELLSCHAFT,BERLIN
OSU	OHIO STATE UNIVERSITY, COLUMBUS, OHIO
OSU-AL	THE OHIO STATE UNIVERSITY, THE ANTENNA LABORATORY,COLUMBIA,OHIO
OTS	OFFICE OF TECHNICAL SERVICES,WASHINGTON,D.C.
OUCL	CLARENDON LAB.,OXFORD UNIVERSITY
P	
PAPER	CONFERENCE PAPERS OR PAPERS WITHOUT EXACT SOURCE SPECIFICATIONS
PAT.OFF.LONDON	THE PATENT OFFICE , LONDONG.B.
PCC	RCA - RESEARCH LABORATORY,MONTREAL ,CANAD.
PIBAL	POLYTECHNICAL INSTITUTE,BROOKLYN
PIBAL-MRI	POLYTECHNICAL INSTITUTE OF BROOKLYN,MICROWAVE RESEARCH INSTITUTE
PPC	PHILLIPS PETROLEUM COMPANY, IDAHO
PREPRINT	PREPRINTS OF PUBLICATIONS
PRLE	PHILIPS GLOEILAMPENFABRIKEN,RESEARCH LABORATORIES,EINDHOVEN
PSC	THE PENNSYLVANIA STATE UNIVERSITY,UNIVERSITY PARK
PUR-TR-EE	PURDUE UNIVERSITY, LAFAYETTE-INDIANA-SCHOOL OF ELECTRICAL ENGINEERING
R	
RADC-TR	ROME AIR DEVELOPMENT CENTER,GRIFFITH AFB,N.Y.
RAE	ROYAL AIRCRAFT RESEARCH ESTABLISHMENT,FARNBOROUGH HANTS,G.B.
RCA-MSR	RADIO CORP.OF AM.,DEF.ELECTR.PROD.,MISSILE AND SURFACE RADAR DIV.,N.J.
RDW	RADIATION DYNAMICS INC.,WESTBURY,N.Y.
REPRINT	REPRINTS FROM PUBLICATIONS
RFP	THE CHEMICAL COMPANY,ROCKY FLATS DIV.,GOLDEN,COLO.
RHEL	NIMROD DIV.,RUTHERFORD HIGH ENERGY LAB., CHILTON,DIDCOT,BERKSHIRE, G.B.
RITS	ROYAL INSTITUTE OF TECHNOLOGY,STOCKHOLM
RISOE	DANISH ATOMIC ENERGY COMM.RESEARCH ESTABLISHMENT RISOE, DANMARK
RM	THE RAND CORPORATION,S.MONICA,CALIF.
RPI-PDL	RENSSELAER POLYTECHNIC INSTITUTE,PLASMA DYNAMICS LAB., TROY, NEW YORK
RPI-PRL	RENSSELAER POLYTECHNIC INSTITUTE,PLASMA PHYSICS LAB.,TROY, NEW YORK
S	
SAMP	FACULTE DE SCIENCES,PARIS,SECTION ASTROPHYSIQUE MEUDON,PARIS
SC	SANDIA LABORATORIES ALBOUCERQUE,NEW MEXICO AND LIVERMORE,CALIF.
SCTM	SANDIA CORP.TECHNICAL MEMORANDUM,ALBUQUERQUE,N.M.
SEL	STANFORD ELECTRONICS LABORATORY, PL.PHYSICS LAB.,STANFORD UNIV.,CALIF.

SFE	SIEMENS FORSCHUNGSLABORATORIEN,ERLANGEN,GERMANY
SIGO	SERVICE DE PHYSIQUE APPL.SECTION D'IONIQUE GENERALE,OIF-SUR-YVETTE,FR.
SINP	SAHA INSTITUTE OF NUCLEAR PHYSICS, CALCUTTA, INDIA
SIT	STEVENS INSTITUTE OF TECHNOLOGY,CASTLE POINT STATION,HOBOKEN,N.JERSEY
SM	UNIVERSITAET BONN,PHYSIKALISCHES INSTITUT
SPO	SACRAMENTO PEAK OBSERVATORY,SUNSPOT,N.MEXICO
SP.PHYS.INC.	SPECTRA PHYSICS INC.,MOUNTAIN VIEW,COL.
SPPO	SERVICE DE PHYS.DES PLASMAS, FAC.DE SCIENCES, UNIV.DE PARIS,ORSAY
SRRC	SPERRY RAND RESEARCH CENTER, SUDBURY, MASS.
SRI	STANFORD RESEARCH INSTITUTE,MENLO PARK,CALF.
SRL	FRANK J.SEILER RESEARCH LAB., USAF ACADEMY COLORADO
SSD-TDR	AEROSPACE CORPORATION,PHYSICAL RES.LAB., EL SEGUDO,CALF
SSL	SPACE SCIENCE LABORATORY LITTON SYSTEMS INC.,BEVERLY HILL, CALIF.
SUAA	STANFORD UNIV.,DEP.OF AERONAUTICS AND ASTRONAUTICS,STANFORD,CALF.
SUI	UNIV.OF IOWA,DEP.OF PHYSICS AND ASTRONOMY,IOWA CITY
SU-IPR	STANFORD UNIVERSITY,INST.FOR PLASMA PHYSCIS RESEARCH,CALF.
SU-ML	STANFORD UNIVERSITY, W.W.HANSEN LAB.,MICROWAVE LAB., STANFORD, CALIF.
SU-NTL	STANFORD UNIVERSITY,NUCLEAR TECHNOLOGY LAB. STANFORD, CALIF.
SWCAS	SOUTH WEST CENTER FOR ADVANCED STUDIES,DALLAS,TEX.
SWRI	SOUTH WEST RESEARCH INSTITUTE,SAN ANTONIO,TEXAS

T

TAE	TECHNION-ISRAEL,INST.OF TECHNOL.,DEP.OF THEOR.ENG.,HAIFA-ISRAEL
THAA	TECHN.UNIVERSITAET AACHEN,1.PHYSIKALISCHES INST., AACHEN,GERMANY
THB	TECHN.HOCHSCHULE BRAUNSCHWEIG,GERMANY
THH	TECHN.HOCHSCHULE HANNOVER,GERMANY
THK	TECHN.HOCHSCHULE KARLSRUHE,GERMANY
THOMAS	A.S.THOMAS INC. PROVIDENCE, MASS.
THSG	TECHN.HOCHSCH.STUTTGART,INST.F.GASENTLADUNGSTECHN.U.PHOTOELEK.,GERMANY
TID	TECHNICAL INFORMATION SERVICE EXTENSION,OAK RIDGE,TENN.
TNO	CENTRAAL LABORATORIUM,DELFT,NETHERLANDS
TPE	TUFTS COLLEGE RESEARCH LABORATORY OF PYSICAL ELECTRONICS,BEDFORT,MASS.
TRDFH	TECHNICAL RESEARCH AND DEVELOPMENT FOUNDATION, HAIFA, ISRAEL
TUPP	TEMPLE UNIVERSITY, DEPM.OF PHYSICS, PHILADELPHIA, PA.

U

UARI	UNIVERSITY OF ALABAMA,RESEARCH INST.,HUNTSVILLE,ALABAMA
UACRL	UNITED AIRCRAFT RESEARCH LAB.,UNITED AIRCRAFT CORP.,EAST HARTFORD,CONN.
UBR	UNIVERSITY OF BUCAREST,ROMANIA
UCER	UNIV.OF CALIFORNIA,INST.F.ENGINEERING RES.,BERKELEY
UC-IGP	INST.OF GEOPHYSICS AND PLANETARY PHYSICS,UNIV.OF CALIFORNIA,LOS ANGELES
UCOL	COLORADO UNIVERSITY,BOULDER,COLORADO
UCL-PH	UNIVERSITY COLLEGE LONDON, DEP.OF PHYSICS, G.B.
UC-PSS	UNIV.OF CALIF., DEP.OF PLANETARY AND SPACE SCIENCE, CALIF.
UCPLPG	DEPARTM.OF PHYSICS,UNIVERSITY OF CALIFORNIA LOS ANGELES,PL.PHYSICS GROUP
UCRL	UNIV.OF CALIFORNIA,RADIATION LABORATORY,BERKELEY,CALIF.,LIVERMORE,CALIF.
UCSD-IRA	INST.F.RADIATION PHYSICS AND AERODYNAMICS,UNIV.OF CALIF.,LA JOLLA,CALIF.
UCSSL	UNIV.OF CALIF.,SPACE SCIENCE LAB.,BERKELEY, CALF.
UIOWA-AL	UNIV.OF IOWA, DEP.OF EL.ENG., ANTENNA LAB., URBANA, ILL.
UIOWA-PHA	UNIVERSITY OF IOWA,DPTM.OF PHYSICS AND ASTRONOMY,IOWA CITY, IOWA
UKAEA	UNITED KINGDOM ATOMIC ENERGY AUTHORITY
UKAEA-HL	UKAEA,RES.GROUP,ATOMIC ENERGY RESEARCH ESTABLISHMENT,HARWELL
UKI	UNIVERSITAET KIEL,GERMANY
ULB	UNIVERSITE LIBRE DE BRUXELLES
ULIE (MM)	UNIVERSITE DE LIEGE,MECHANIQUE,MATHEMATIQUE
UMAEC	UNIV.OF MICHIGAN,ANN ARBOR,MICHIGAN
UMAEC-RL	THE UNIV.OF MICHIGAN,COLLEGE OF ENG.,RADIATION LAB.,ANN ARBOR,MICHIGAN
UMI	UNIVERSITY OF MIAMI,DEP.OF PHYSICS, MIAMI,FLORIDA
UMI-CTS	UNIVERSITY OF MIAMI, CENTER FOR THEORETICAL STUDIES, CORAL GABLES, FLOR.
UMMI	UNIVERSITY MICROFILMS INC., MICHIGAN
UMN	UNIVERSITAET MUENCHEN,GERMANY
UMNE	UNIVERSITY OF MARYLAND,COLLEGE PARK
UMN/S	UNIVERSITY OF MINNESOTA,DEP.OF PHYS.,MINNEAPOLIS,MINN.
UNBELFAST	QUEEN'S UNIVERSITY OF BELFAST, NORTHERN IRELAND
UNBER	UNIVERS.OF BERGEN,DEP.OF APPL.MATHEMATICS, BERGEN, NORWAY

UNEV	DESERT RESEARCH INSTITUTE, UNIV.OF NEVADA
UNINNS	UNIV.INNSBRUCK, INST.FUER THEORETISCHE PHYSIK, AUSTRIA
UNION CARBIDE ND	UNION CARBIDE CORP.,NUCLEAR DIV.,Y-12 PLANT,OAK RIDGE,TENN.
UNIVOX-ENG	UNIV.OF OXFORD, DEP.OF ENGINEERING SCI.,ENGINEERING LAB.OXFORD, G.B.
UNMOLP	UNIVERSITE DE MONTREAL,DEP.DE PHYS.,LAB.DE PL.PHYS.
UNPR	UNIVERSITY OF PRINCETON,PRINCETON,N.JERSEY.,PLASMA PHYSICS LABORATORY
UNSY	UNIV.OF SIDNEY,SCHOOL OF PHYSICS,SIDNEY,AUSTRALIA
UNUP	UNIVERSITAET UPPSALA,SWEDEN
UPA-LPP	UNIV.DE PARIS,FACULTE DE SCIENCES,LAB.DE PHYS.DE PLASMAS,ORSAY,FRANCE
UR-MAS	THE UNIV.OF ROCHESTER,DEP.MECHANICAL AND AEROSP.SCI.,ROCHESTER,N.Y.
USAFIT	AF INST.OF TECHN.,SCHOOL OF ENGINEERING,WRIGHT-PATTERSON AF BASE,OHIO
USAMIC-PSL	US ARMY MISSILE COMMAND,PHYSICS SCI.LAB.,REDSTONE ARSENAL,ALABAMA
USC-ESL	UNIVERS.OF SOUTHERN CALIFORNIA,SCHOOL OF ENG.,ELECTRONICS SCIENCE LAB.
US PAT.OFFICE	UNITED STATES PATENT OFFICE, WASHINGTON, D.C.
UTEX-PPL	THE UNIV.OF TEXAS, PLASMA PHYSICS LABORATORY, AUSTIN, TEXAS
UTIA	TORONTO UNIVERSITY,INSTITUTE OF AEROPHYSICS,TORONTO, CANADA
UTEX-EERL	UNIV.OF TEXAS,EL.ENGINEERING RES.LAB., AUSTIN, TEXAS
UTEX-PDRL	PLASMA DYNAMICS RESEARCH LAB., AUSTIN
UTO	UNIV.OF TOKYO, DEP.OF PHYSICS, JAPAN
UVA	UNIVERSITY OF BRITISH COLUMBIA,DEP.OF PHYSICS, VANCOUVER
UVAR	UNIV.OF VIRGINIA,DEP.OF AEROSPACE ENG.,CHARLOTTEVILLE
V	
VR	VACUUM PRODUCTS DIVISION, VACUUM ASSOCIATES PALO ALTO, CALIF.
W	
WEET	WESTINGHOUSE ELECTRICS CORP.,NEW YORK
WERL	WESTINGHOUSE RESEARCH LABORATORY,PITTSBURGH,PA.
WIS	UNIVERSITY OF WISCONSIN,DEP.OF PHYS.,MADISON,WISC.
Y	
YALE	YALE UNIVERSITY, NEW HAVEN,

1 375 LINES OUTPUT.

ABBREVIATIONS OF REVIEWED PUBLICATIONS

ABBREVIATIONS OF REVIEWED PUBLICATIONS

ABBREVIATIONS FOR REVIEWED PUBLICATIONS

A

AED-AB	AED-INFORMATIONEN ZUR KERNFORSCHUNG
AFE	ARCHIV FUER ELEKTROTECHNIK
APPL.OPTICS	APPLIED OPTICS
APPL.PHYS.LETT.	APPLIED PHYSICS LETTERS
ARCH.EL.UEBERT.	ARCHIV DER ELEKTRISCHEN UEBERTRAGUNG
ATM	ARCHIV FUER TECHNISCHES MESSEN

B

BATTELLE T.REV.	BATTELLE TECHNICAL REVIEW
BBC MITT.	BBC-MITTEILUNGEN
BBC NACHRICHTEN	BBC NACHRICHTEN
BEITR.PL.PHYSIK	BEITRAEGE AUS DER PLASMAPHYSIK
BELL SYST.T.J.	BELL SYSTEM TECHNICAL JOURNAL
B.J.APPL.PHYS.	BRITISH JOURNAL OF APPLIED PHYSICS

C

CONTEMP.PHYS.	CONTEMPORARY PHYSICS
CONTROL	CONTROL
CRYOGENICS	CRYOGENICS
CURRENT PAPERS	CURRENT PAPERS

E

EDN	ELECTRICAL DESIGN NEWS
EL.ABSTR.J.	ELECTRONICS ABSTRACTS JOURNAL
ELECTR.ENG.	ELECTRONIC ENGINEERING
ELECTR.LETT.	ELECTRONICS LETTERS
ELECTRONICS	ELECTRONICS
ELEKTRONIK	ELEKTRONIK
EL.RUNDSCHAU	INTERNATIONALE ELEKTRONISCHE RUNDSCHAU
ET	ELEKTROTECHNIK
ETZ(A)	ELEKTROTECHNISCHE ZEITSCHRIFT (A)
ETZ(B)	ELEKTROTECHNISCHE ZEITSCHRIFT (B)
EXP.TECH.D.PHYS.	EXPERIMENTELLE TECHNIK DER PHYSIK

F

FREQUENZ	DIE FREQUENZ
FUNKSCHAU	FUNKSCHAU

GALVANOTECHNIK	GALVANOTECHNIK

HEWL.-PCK.J.	HEWLETT-PACKARD JOURNAL

I

IEEE J.QE	IEEE JOURNAL OF QUANTUM ELECTRONICS
IEEE J.SC	IEEE JOURNAL OF SOLID-STATE CIRCUITS
IEEE T.C	IEEE TRANSACTIONS ON COMPUTERS
IEEE T.COM	IEEE TRANSACTIONS ON COMMUNICATION TECHNOLOGY
IEEE T.CT	IEEE TRANSACTIONS ON CIRCUIT THEORY
IEEE T.ED	IEEE TRANSACTIONS ON ELECTRONIC DEVICES

IEEE T.IGA	IEEE TRANSACTIONS ON INDUSTRY AND GENERAL APPLIC.
IEEE T.MAG	IEEE TRANSACTIONS ON MAGNETICS
IEEE T.MTT	IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES
IEEE T.NS	IEEE TRANSACTIONS ON NUCLEAR SCIENCE
IEEE T.PAS	IEEE TRANSACTIONS ON POWER APPARATUS AND SYSTEMS
INSTR.EXP.TECHN.	INSTRUMENTS AND EXPERIMENTAL TECHNIQUES
INT.EL.RUNDSCHAU	INTERNATIONALE ELEKTRONISCHE RUNDSCHAU
INT.J.ENG.SCI.	INTERNATIONAL JOURNAL OF ENGINEERING SCIENCE

J

J.AMER.CER.SOC.	JOURNAL OF THE AMERICAN CERAMIC SOCIETY
JAP.J.APPL.PHYS.	JAPANESE JOURNAL OF APPLIED PHYSICS
J.APPL.PHYS.	JOURNAL OF APPLIED PHYSICS
JETP-LETTERS	JETP-LETTERS
J.RES.NBS(A)	JOURNAL OF RESEARCH OF THE NBS (A)
J.SCI.INSTRUM.	JOURNAL OF SCIENTIFIC INSTRUMENTS

KUNSTSTOFFE	KUNSTSTOFFE

L

LASER ABSTRACTS	LASER ABSTRACTS
LASER FOCUS	LASER FOCUS

N

NICKELBERICHTE	NICKELBERICHTE
NTZ	NACHRICHTENTECHNISCHE ZEITSCHRIFT
NUCL.SCI.ABSTR.	NUCLEAR SCIENCE ABSTRACTS

OPTICAL SPECTRA	OPTICAL SPECTRA

P

PHIL.EL.M.MIC.N.	PHILIPS ELECTRONIC MEASURING AND MICROWAVE NOTES
PHIL.TECH.R.	PHILIPS TECHNISCHE RUNDSCHAU
PHYS.BERICHTE	PHYSIKALISCHE BERICHTE
PHYS.REV.LETTERS	PHYSICAL REVIEW LETTERS
PROC.IEE	PROCEEDINGS OF THE IEE
PROC.IEEE	PROCEEDINGS OF THE IEEE
PROGR.MAT.SCI.	PROGRESS IN MATERIALS SCIENCE

R

RADIO EL.ENG.	RADIO AND ELECTRONIC ENGINEER
RCA-REVIEW	RCA-REVIEW
R.ENG.EL.PHYS.	RADIO ENGINEERING AND ELECTRONIC PHYSICS
REV.SCI.INSTRUM.	REVIEW OF SCIENTIFIC INSTRUMENTS
RT	REGELUNGSTECHNIK
RTP	REGELUNGSTECHNISCHE PRAXIS

S

SCI.ABSTR.(A)	SCIENCE ABSTRACTS (A) - PHYSICAL ABSTRACTS
SCI.ABSTR.(B)	SCIENCE ABSTRACTS (B) - ELECTRONIC ENGINEERING
SCI.ABSTR.(C)	SCIENCE ABSTRACTS (C) - CONTROL ABSTRACTS
SIEMENS E.BER.	SIEMENS ENTWICKLUNGSBERICHTE
SIEMENS T.MITT.	SIEMENS TECHNISCHE MITTEILUNGEN

SIEMENS Z.	SIEMENS-ZEITSCHRIFT
SOV.EL.ENG.	SOVIET ELECTRICAL ENGINEERING
SOV.PHYS.DOKL.	SOVIET PHYSICS DOKLADY
SOV.PHYS.JETP	SOVIET PHYSICS JETP
SOV.PHYS.SOL.ST.	SOVIET PHYSICS - SOLID-STATE
SOV.PHYS.T.P.	SOVIET PHYSICS - TECHNICAL PHYSICS
US.GOV.RES.REP.	U.S. GOVERNMENT RESEARCH AND DEVELOPMENT REPORTS

T

TELEFUNKEN-Z.	TELEFUNKEN-ZEITUNG
T.M.AEG-TELEF.	TECHNISCHE MITTEILUNGEN AEG-TELEFUNKEN

V

VALVO-BER.	VALVO-BERICHTE
VDI-Z.	VDI-ZEITSCHRIFT

Z

Z.ANGEW.PHYS.	ZEITSCHRIFT FUER ANGEWANDTE PHYSIK
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