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ARGONNE NATIONAL LABORATORY
P. O. Box 299
Lemont, Illinois

APPLIED MATHEMATICS DIVISION
SUMMARY REPORT

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PREFACE

The objective of the Applied Mathematics Division is to provide mathematical assistance to other scientists in the Laboratory. This goal is achieved, in particular, by (1) conducting research in numerical analysis and other branches of mathematics, (2) providing mathematical consultation, and (3) operating a computational service, using both digital and analog machines. The Division is prepared to provide mathematical assistance at any stage of the development of a problem, from its initial formulation to its final solution.

The Consultation and Research Section is available to assist Laboratory personnel in mathematical consultation, problem formulation, selection of appropriate mathematical and numerical techniques, and to carry out analyses of problems. The Applied Programming Section is specifically set up to program digital computing problems for members of other divisions. The members of this section generally work from a problem description provided either by the problem originator or jointly by the problem originator and a member of the Consultation and Research Section. In addition, this Section also performs hand computations that arise and provides production services for machine programs. It is the responsibility of the Programming Development Section to conduct research and development in new programming techniques, to develop needed subroutines and to provide training courses and instruction in programming techniques for the benefit of members of the Division, as well as other Laboratory personnel. The Digital Operations Group prepares machine input data, schedules machine time and operates the digital machines. The Analog Group is prepared to assist in the formulation, programming and running of problems for the analog computer or to accept the problem and carry out these services entirely within the Group.

APPLIED MATHEMATICS DIVISION

ORGANIZATION CHART
July 1, 1958 thru June 30, 1959

DIVISION OFFICE

W. F. Miller, Director*
 D. A. Davis, Executive Assistant
 E. J. Dreifuerst (B 7/58), Secretary
 P. R. Benson, Clerical

MATHEMATICAL CONSULTATION AND RESEARCH SECTION

E. H. Bareiss	K. Fan (S/59)	W. F. Miller
W. J. Cody (B 6/59)	E. M. Keberle	N. F. Morehouse
H. Cohn (S/58)	J. Kerec (S 6/59)	D. L. Phillips
J. M. Cook	R. F. King	L. T. Wos

PROGRAMMING RESEARCH AND DEVELOPMENT SECTION - R. F. King, Section Head;
 J. E. Denes, Group Leader; L. I. Kassel, Group Leader; H. L. Gray, Machine Design.

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C. Harrison, Jr.	W. A. Rosenkrantz (S/59)	K. A. Cecchi (B 6/59)
N. A. Hartley	S. B. Steidl	A. R. Sinnott (R 9/58)
		J. A. Stytz (B 8/58)

APPLIED PROGRAMMING SECTION - M. Butler (B 4/59), Section Head.

B. S. Garbow, Group Leader	D. C. Jacobson (B 4/59), Group Leader	
A. M. Bates (B 4/59)	I. G. Baksys (B 4/59)	
C. Chamot	S. G. Dean (B 4/59)	Clerical:
C. Y. Cho (S 58/59)	G. J. Duffy	H. M. Glen (B 4/59)
J. S. Dick	J. E. Gustafson (B 4/59, Hand calculations)	S. Katilavas (B 4/59)
M. A. Fisherkeller	J. M. Heestand (B 4/59)	L. E. Meyer (B 4/59)
W. G. Greenhow	D. E. Johnson (B 6/59)	
R. T. Julke	J. A. Koerner (B 4/59)	
R. N. Little (S 58/59)	S. M. McLean (B 4/59)	
R. L. Monroe (S/59)	A. L. Rago (B 6/59)	
W. J. Snow (R 1/59)	J. M. Ramuta (B 4/59, R 5/59)	
A. J. Strecok	M. G. Schlapkohl (B 4/59)	
H. H. Turner (S/59)		

DIGITAL MACHINE OPERATIONS GROUP - S. Zawadzki, Supervisor

R. H. Ivan	V. M. Richards
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R. L. McGrane	P. C. Tonne (S/59)
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J. A. Nelson	C. J. Vallrugo (B 5/59)
L. J. Nelson	

ANALOG PROBLEM ANALYSIS - PROGRAMMING AND MACHINE OPERATION GROUP -
N. F. Morehouse, Group Leader.

R. A. Bare**	L. C. Just
L. T. Bryant	F. J. Maletich
G. T. Hawley**	L. Moffitt**
	W. E. Scott (B 7/58)

CONSULTANTS:

H. Cohn - University of Arizona	B. Friedman - University of California
R. Courant - New York University	N. C. Metropolis - University of Chicago
L. D. Fosdick - University of Illinois	J. N. Snyder - University of Illinois

* Appointed Director 4/59

** Co-op Students

B - Began

S - Summer Employee

R - Resigned

COMPUTER PROGRAMS DEVELOPED OR IN PROGRESS

The summary listing of computer programs which follows includes several which were in an "in progress" status at the beginning of this report period.

The listing contains a file code for each program. This code indicates the extent to which information concerning the program is readily available. The code is identified as follows:

- A - Mathematical Analysis Effort
- P - Programming Effort
- S - Symbolic or Source or Program Listing
- B - Binary or Source Deck or Tape
- G - George Tape
- O - Operating Instructions

Immediately following these six file code symbols the AMD program library classification code may appear. The characters listed in these positions refer to the mathematical class into which the program falls, i.e., C2 is the code for programs used to determine the roots of polynomials. Since the library classification system is currently being set up no attempt is made here to give a complete description of the classification codes in use.

The abbreviations 704, GEO or ANA refer to the computer (IBM 704, GEORGE or Analog, respectively) for which the particular program was developed. For a description of these machines see the section of this report entitled "Equipment."

262 RE34 A REACTOR SHIELDING PROGRAM

REQUESTORS M. GROTENHUIS, J. BUTLER REACTOR ENGINEERING

CONSULTANT J. COOK PROGRAMMER M. BUTLER

THE REACTOR DIFFUSION EQUATION WITH A POINT-BY-POINT SOURCE SPECIFIED FOR THE HIGHEST ENERGY GROUP IS SOLVED IN THREE GEOMETRIES-- PLANE, CYLINDRICAL, AND SPHERICAL.

704 REFERENCES ANL5859

FILE CODES APSB O D3

425 PHY46C MULTIPLE SCATTERING CORRECTIONS FOR NEUTRON SCATTERING DATA.

REQUESTOR R. LANE PHYSICS

CONSULTANT W. MILLER PROGRAMMER N. HARTLEY

THIS PROGRAM IS THE GEORGE VERSION OF PHY38 WITH EXTENSION TO MORE ANGLES, ALTERATIONS IN THE CALCULATION OF THE SCATTERING VOLUME, AND CALCULATION OF THE ERRORS IN THE CORRECTION FACTORS.

GEO REFERENCES 559/PHY46E

FILE CODES APS G0 G6

439 AMD104 IMPLICIT SOLUTION OF A PARABOLIC PARTIAL DIFFERENTIAL EQUATION

REQUESTOR D. FLANDERS APPLIED MATHEMATICS

PROGRAMMER H. HOUSE

THE EQUATIONS OF CHM8A AND CHM8B ARE SOLVED NUMERICALLY BY AN IMPLICIT METHOD TO INSURE STABILITY, AND TWO INTEGRALS INVOLVING THESE SOLUTIONS ARE ALSO EVALUATED.

GEO REFERENCES

FILE CODES APS

440 EL101 FLOATING POINT GEORGE DEVELOPMENT

REQUESTOR D. JACOBSON ELECTRONICS

PROGRAMMER C. HARRISON

THE PROPOSED FLOATING POINT UNIT FOR GEORGE IS SIMULATED.

GEO REFERENCES

FILE CODES

443 AMD105 ENERGY-LOSS SPECTRUM OF GAMMA RAYS IN SODIUM IODIDE

REQUESTOR W. MILLER

APPLIED MATHEMATICS

PROGRAMMER W. SNOW

THIS PROGRAM CALCULATES THE ENERGY-LOSS SPECTRUM OF GAMMA RAYS DURING ABSORPTION IN SODIUM IODIDE CRYSTALS FOR MANY PHOTON ENERGIES, FOR DIFFERENT TYPES OF SOURCES AND DIFFERENT SIZE CRYSTALS.

GEO REFERENCES RSI 12/59

FILE CODES APS GO G6

454 PHY113 DISTRIBUTION OF LEVEL SPACINGS

REQUESTOR M. ROSENZWEIG

PHYSICS

CONSULTANT J. COOK

PROGRAMMER H. GRAY

SYMMETRIC MATRICES ARE SAMPLED FROM GIVEN PROBABILITY DISTRIBUTIONS AND STUDIES MADE OF THE DISTRIBUTIONS OF THEIR EIGENVALUES.

GEO REFERENCES

FILE CODES GO F2

459 PAD102 SELF-TRACKING STUDIES

REQUESTOR E. CROSBIE

PARTICLE ACCELERATOR

CONSULTANT L. WOS

PROGRAMMER M. FISHERKELLER

THIS PROGRAM CALCULATES THE PROPORTIONALITY CONSTANTS WHICH LEAD TO DAMPING, OF THE AVERAGE PHASE AND AVERAGE RADIUS, TO THE IDEAL CASE FOR RANDOMLY SAMPLED PHASES AND RADII.

GEO REFERENCES

FILE CODES APS GO D1

461 PHY116 FIELD FOR RECTANGULAR CROSS SECTION HELMHOLTZ COILS
PHY116A WITH UNIFORM CURRENT DENSITY

REQUESTORS S. WARSHAW, J. HEBERLE PHYSICS

CONSULTANT E. KEBERLE PROGRAMMER N. HARTLEY

THE COMPONENTS OF THE MAGNETIC FIELD PARALLEL TO THE CENTRAL AXIS OF TWO COILS HAS TO BE CALCULATED ALONG THIS AXIS AND PERPENDICULAR TO IT. THE APPEARING INTEGRAL REDUCES IN THE FIRST CASE TO AN EXPLICIT EXPRESSION. THIS IS NOT SO, HOWEVER, BECAUSE OF THE APPEARANCE OF ELLIPTIC INTEGRALS IN THE INTEGRAND, IN THE SECOND CASE. BECAUSE OF THE LARGE INPUT, BOTH CASES ARE PROGRAMMED. PHY116A IS AN EXTENSION OF THIS PROGRAM AND TABULATION OF THE FUNCTION FOR THE GENERAL CASE.

GEO REFERENCES

FILE CODES APS 0

489 PHY120 FIELD CALCULATIONS FOR COMPTON SPECTROMETER

REQUESTOR R. PRESTON PHYSICS

CONSULTANT D. PHILLIPS PROGRAMMER K. HILLSTROM

THIS PROGRAM CALCULATES THE EQUIPOTENTIAL SURFACES FOR THE FIELD OF A SPECTROMETER BY NUMERICAL INTEGRATION OF THE LAPLACE EQUATION WITH CERTAIN INITIAL CONDITIONS.

GEO REFERENCES

FILE CODES APS 0

493 CHM103 ALGEBRAIC LINEAR SYSTEM OF OVER 1000 UNKNOWNNS

REQUESTOR G. MONTET CHEMISTRY

CONSULTANT F. KEBERLE PROGRAMMER B. GARROW

TO SOLVE 467/CHM102 FOR ARBITRARY BOUNDARY CONDITIONS ONE CAN CONSIDER THE ELLIPTIC DIFFERENCE EQUATION AS A LINEAR ALGEBRAIC SYSTEM. FOR THE PHYSICAL SITUATION AT HAND, A VERY LARGE NUMBER OF UNKNOWNNS ARE TO BE TAKEN INTO ACCOUNT. THE ALGEBRAIC SYSTEM IS SOLVED BY THE METHOD OF BEST STRATEGY IN TWO STEPS. THE SECOND STEP REMOVES THE RESIDUES, CORRESPONDING TO THE LOWEST EIGENVALUES OF THE MATRIX, WHICH HAVE BEEN LEFT BY THE FIRST STEP.

GEO REFERENCES

FILE CODES APS G0 F4

495 CHM104 SOLUTION OF EQUATION FOR EXTRACTION EQUILIBRIUM

REQUESTORS J. SULLIVAN, J. PYDBERG CHEMISTRY

CONSULTANT W. MILLER

PROGRAMMER M. HANSON

THIS PROGRAM DETERMINES THE EQUILIBRIUM PARAMETERS A(N) BY LEAST SQUARES ANALYSIS OF THE EXPERIMENTAL DATA.

704 REFERENCES

FILE CODES AP B O G2

497 RPY110 COMPUTATION OF ELECTRON DRIFT VELOCITY

REQUESTOR J. ROWE

RADIOLOGICAL PHYSICS

CONSULTANT E. BAREISS

PROGRAMMER M. HANSON

THE ELECTRON DRIFT VELOCITIES ARE COMPUTED FOR GAS WITH CONSTANT ELECTRON TRANSPORT CROSS SECTIONS.

GFO REFERENCES

FILE CODES APS O D1

498 CHM105 LEAST SQUARES DETERMINATION OF SLATER PARAMETERS FROM OPTICAL SPECTRA

REQUESTOR M. FRED

CHEMISTRY

CONSULTANT E. BAREISS

PROGRAMMER R. JULKE

LINEAR COMBINATIONS OF THE SLATER PARAMETERS YIELD THE ELEMENTS OF A MATRIX WHOSE EIGENVALUES APPROXIMATE THE SPECTRUM OF ATOMS. THE SLATER PARAMETERS ARE DETERMINED BY A METHOD OF LEAST SQUARES TO BEST FIT IN COMPLETE SETS OF OPTICAL SPECTRA.

704 REFERENCES

FILE CODES APSB O F2

499 PHY121 CALCULATIONS OF DECAY TIMES FROM COINCIDENCE
EXPERIMENTS.

REQUESTOR R. HOLLAND

PHYSICS

CONSULTANT D. PHILLIPS

PROGRAMMER W. GREENHOW

AN INTEGRAL EQUATION OF THE FIRST KIND IS GIVEN. THE SOLUTION IS KNOWN TO BE OF THE FORM $C \exp(-\lambda T)$, WHERE C AND λ ARE CONSTANTS. THE DECAY CONSTANT λ IS DETERMINED BY THE METHOD OF MOMENTS.

GEO REFERENCES

FILE CODES

Z

505 AMD108 AMD REPORTS

REQUESTOR D. DAVIS

APPLIED MATHEMATICS

PROGRAMMERS J. HEESTAND, S. STEIDL

COMPUTING MACHINE TIME AND PERFORMANCE RECORDS AND PROGRAMMING TIME RECORDS ARE PROCESSED AS MONTHLY AND OTHER PERIODIC REPORTS.

704 REFERENCES

FILE CODES

B

M2

508 ISNSE SUMMER REACTOR KINETICS SYMPOSIUM PROGRAM

REQUESTOR G. PAWLICKI

INTERNATIONAL SCHOOL

CONSULTANT F. MOREHOUSE

PROGRAMMER J. DICK, L. BRYANT

THE PURPOSE IS TO DEVELOP ANALOG EQUATIONS AND A SERIES OF DEMONSTRATIONS TO ILLUSTRATE TYPICAL EXPERIMENTS WHICH CAN BE PERFORMED ON THE ISNSE REACTOR.

ANA REFERENCES

FILE CODES

509 RE EBWR CONTROL SYSTEM STUDIES

REQUESTOR J. DFSHONG

REACTOR ENGINEERING

CONSULTANT C. PESCE

PROGRAMMER J. DICK

THE PURPOSE IS TO STUDY VARIOUS CONTROL SYSTEMS FOR EBWR.

ANA REFERENCES

FILE CODES

514 AMD109 DECOMPOSITION INTO SQUARES

REQUESTOR H. COHN

APPLIED MATHEMATICS

PROGRAMMERS A. LEMMON, R. LITTLE

THE OBJECT IS TO FIND AN EMPIRICAL LAW AFFECTING THE NUMBER OF SQUARES REQUIRED TO REPRESENT A SPECIFIED FUNCTION.

GEO REFERENCES

FILE CODES

516 RE142 NEUTRON CAPTURE CROSS SECTION COMPUTATION

REQUESTOR P. MOLDAUER

REACTOR ENGINEERING

CONSULTANT L. WOS

PROGRAMMER M. FISHERKELLER

THE PROGRAM COMPUTES THE NEUTRON CAPTURE CROSS SECTIONS AVERAGED OVER MANY RESONANCES IN THE ENERGY REGION UP TO SEVERAL MEV, BASED ON LOW ENERGY RESONANCE PARAMETERS.

GEO REFERENCES

FILE CODES APS GO D1

519 RPY111 COMPUTATION OF ELECTRON ENERGY DISTRIBUTION FUNCTIONS FOR NITROGEN, HELIUM, NEON, AND ARGON WITH EMPIRICAL CROSS SECTION FUNCTIONS.

REQUESTOR J. BOWE

RADIOLOGICAL PHYSICS

CONSULTANT F. BAREISS

PROGRAMMER M. HANSON

(1) SECTIONALLY CONTINUOUS AND STEADY CURVES ARE DETERMINED WHICH APPROXIMATE DISCRETE SETS OF EXPERIMENTAL DATA OF ELECTRON TRANSPORT CROSS SECTIONS, VERSUS ELECTRON ENERGY IN THE SENSE OF LEAST SQUARES AND WITH SUFFICIENT SMOOTHNESS FOR EACH OF THE GASES NITROGEN, HELIUM, NEON, AND ARGON.

(2) FOR EACH OF THESE GASES AND FOR VARIOUS VALUES OF THE PARAMETERS (EE) AND (KT) THE ELECTRON ENERGY DISTRIBUTION FUNCTION IS COMPUTED AND TABULATED.

704 REFERENCES

FILE CODES AP B O C3

520 RPY112 COMPUTATION OF ELECTRON DRIFT VELOCITY IN NITROGEN,
HELIUM, NEON, AND ARGON WITH EMPIRICAL CROSS SECTION
FUNCTIONS

REQUESTOR J. BOWE

RADIOLOGICAL PHYSICS

CONSULTANT F. BAREISS

PROGRAMMER M. HANSON

FOR EACH OF THE GASES NITROGEN, HELIUM, NEON, AND ARGON, AND FOR
DIFFERENT VALUES OF (EE), (KT), AND EMPIRICALLY GIVEN TRANSPORT CROSS
SECTION FUNCTIONS, THE ELECTRON DRIFT VELOCITIES ARE CALCULATED AND
TABULATED.

704 REFERENCES

FILE CODES AP B O D1

521 RE145 CALCULATION OF MICROSCOPIC CROSS SECTIONS WITH
ARBITRARY LAWS OF NEUTRON DISTRIBUTION FOR DIRECT
INPUT TO THE TRANSPORT THEORY CODE

REQUESTOR V. JANKUS

REACTOR ENGINEERING

CONSULTANT E. BAREISS

PROGRAMMER J. DENES

THIS CODE FINDS INELASTIC CROSS SECTION MATRIX ELEMENTS FOR
MULTIGROUP CALCULATIONS BY NUMERIC-ANALYTIC DOUBLE INTEGRATION OF
COHENS FORMULA. SEVERAL APPROXIMATIONS TO THE ACTUAL NEUTRON DENSITY
CAN BE USED AS WEIGHT FUNCTIONS OVER THE VELOCITIES OF THE INITIAL
GROUPS. MODIFIED AND SUPPLEMENTED RESULTS ARE PRESENTED ON BINARY
CARDS AND/OR TAPE FOR DIRECT INPUT TO THE ARGONNE TRANSPORT THEORY
CODES OR THE SNG CODE, OR FOR OFF-LINE OUTPUT.

704 REFERENCES ANL5984

FILE CODES APSB O D1

522 RE URANIUM FUEL BURNOUT STUDIES FOR MIGHTY MOUSE

REQUESTOR D. ROSSIN

REACTOR ENGINEERING

PROGRAMMER J. DICK

THIS IS A SERIES OF PARAMETER STUDIES ON FUEL BURNOUT IN A URANIUM
REACTOR.

ANA REFERENCES

FILE CODES

523 RE146 FOIL COUNT DATA PROCESSING

REQUESTOR R. DOERNER REACTOR ENGINEERING

PROGRAMMERS M. BUTLER, J. RAMUTA

PROCESSING OF FOIL COUNT DATA WITH ADJUSTMENTS FOR BACKGROUND AND
MONITOR CORRECTIONS AND ASSIGNED FOIL WEIGHTS

704 REFERENCES

FILE CODES APSB O

524 RE147

REQUESTOR D. SCHOEPFRLF REACTOR ENGINEERING

PROGRAMMER J. HESTAND

THIS PROGRAM CALCULATES THE TEMPERATURE DISTRIBUTION THROUGH A
SOLID CYLINDRICAL FUEL PIN AS A FUNCTION OF RADIUS AND TIME. THE PIN
MAY BE BARE OR CLAD, AND ITS BOUNDARY COOLED BY EITHER FLOWING OR
STAGNANT COOLANT WHILE THE PIN IS HEATED INTERNALLY.

704 REFERENCES

FILE CODES PSB O

525 AMD110 BAIRSTOW METHOD FOR LINEAR AND QUADRATIC
FACTORIZATION

REQUESTOR E. BAREISS APPLIED MATHEMATICS

PROGRAMMER M. FISHERKELLER

THIS ROUTINE FINDS THE LINEAR AND QUADPATIC FACTORS OF REAL
POLYNOMIALS.

704 REFERENCES

FILE CODES APS C2

526 MET108 LORENTZ-LORENTZ POLARIZATION TABLE

REQUESTOR M. MUELLER METALLURGY

PROGRAMMER S. STEIDL

TABLES OF THE LORENTZ FACTORS AND THE LORENTZ POLARIZATION FACTORS
ARE CALCULATED AS WELL AS THE LEAST SQUARES CORRECTION TERM FOR
LATTICE PARAMETER DETERMINATIONS.

704 REFERENCES

FILE CODES

527 AMD111 ZEROS OF POLYNOMIALS BY RESULTANT PROCEDURE IN
DOUBLE PRECISION

REQUESTOR E. BAREISS APPLIED MATHEMATICS

PROGRAMMER M. FISHERKELLER

THIS IS SHARE ROUTINE ANC203.

704 REFERENCES ANL5997,ANC203

FILE CODES APS 0 C1,C2

529 EL103 COMPUTATION TO OPTIMIZE THE RCTL BUILDING BLOCK
FOR USE IN THE GEORGE FLOATING POINT UNIT

REQUESTOR C. ROCKWOOD ELECTRONICS

CONSULTANT L. WOS

PROGRAMMER C. HARRISON

THIS PROGRAM DETERMINES THE OPTIMUM VALUES OF TWO VOLTAGES AND
THREE RESISTANCES FOR A BASIC RESISTANCE COUPLED TRANSISTOR LOGIC
BUILDING BLOCK TO BE USED FOR THE GEORGE FLOATING POINT UNIT.

GEO REFERENCES

FILE CODES APS C4

532 PAD105 LINAC MATRIX ORBIT TRACING

REQUESTOR D. COHEN

PARTICLE ACCELERATOR

PROGRAMMER K. HILLSTROM

THE INITIAL PROTON STATE REPRESENTED BY A TWO-ELEMENT MATRIX FOR
ONE PLANE OF MOTION IS MULTIPLIED BY FOUR-ELEMENT MATRICES REPRESENT-
ING DRIFT SPACES, QUADRUPOLE MAGNETS, AND RF DEFOCUSING IMPULSES IN
TRACING THE ORBIT THROUGH THE LINAC.

704 REFERENCES

FILE CODES APSB 0

533 ISNSF URANIUM FUEL BURNOUT

REQUESTOR P. PERREIRA

INTERNATIONAL SCHOOL

PROGRAMMERS R. PERREIRA, G. DICK, G. HAWLEY

URANIUM FUEL BURNOUT STUDY TO DETERMINE THE ECONOMIC FEASIBILITY
OF CERTAIN REACTOR FUEL MIXTURES

ANA REFERENCES

FILE CODES

535 RE150 POINT KERNEL ATTENUATION STUDY
 REQUESTOR D. ROSSIN REACTOR ENGINEERING
 PROGRAMMERS A. ANGER, J. HEESTAND

CALCULATION OF RADIATION INTENSITY AT A POINT DUE TO RADIATION
 EMANATING FROM A SET OF POINT SOURCES ATTENUATED BY PASSING THROUGH
 THE REACTOR SHIELD

704 REFERENCES

FILE CODES

537 CHM108 MONTE CARLO CALCULATIONS
 REQUESTORS R. VANDENBOSCH, J. HUIZENGA CHEMISTRY
 CONSULTANTS E. KEBERLE, W. MILLER PROGRAMMER G. DUFFY

CALCULATION OF THE FREQUENCY FUNCTION FOR THE EMISSION OF NEUTRONS
 BY AN EXCITED NUCLEUS AND INVESTIGATION OF VARIATION IN THE FUNCTION
 AFFECTED BY CHANGES IN THE NEUTRON ENERGY SPECTRUM

GEO REFERENCES

FILE CODES APS G0 G6

538 RE151 EBWR CONTAINMENT VESSEL CALCULATION
 REQUESTOR A. HEINEMAN REACTOR ENGINEERING
 PROGRAMMER M. SCHLAPKOHL

THIS PROGRAM COMPUTES THE PARTIAL VAPOR PRESSURE AND THE CORRECTED
 DRY AIR VOLUME FOR THE EBWR CONTAINMENT VESSEL FOR USE WITH THE
 PRESSURE AND LEAKAGE RATE TESTS.

704 REFERENCES

FILE CODES PSB 0

539 AMD112 MULTIPOLYNOMIAL APPROXIMATION TRANSPORT THEORY
 CODE
 REQUESTOR E. BAREISS APPLIED MATHEMATICS
 PROGRAMMER G. DUFFY

704 REFERENCES

FILE CODES

Z

542 RPY113 EVALUATION OF QUADRUPLE INTEGRAL GIVING FRACTION OF
LIGHT ORIGINATING IN AN OTHERWISE ABSORBING CYLINDER
REACHING AN END WINDOW

REQUESTOR W. ANDERSON

RADIOLOGICAL PHYSICS

CONSULTANT E. BAREISS

PROGRAMMER B. GARBOW

704 REFERENCES

FILE CODES APSB

D1

544 MET109 CRYSTAL LATTICE DETERMINATION

REQUESTOR M. MUELLER

METALLURGY

PROGRAMMER W. GREENHOW

THIS PROGRAM EMPLOYS DATA ON BRAGG REFLECTIONS TO CALCULATE BY
LEAST SQUARES THE VALUES OF CRYSTAL LATTICE PARAMETERS.

GEO REFERENCES

FILE CODES

66777332

545 RE152 CALCULATION OF LOW ENERGY ABSORPTION CROSS SECTIONS

REQUESTOR P. PERSIANI

REACTOR ENGINEERING

PROGRAMMER R. BLUMENTHAL, D. JACOBSON

THIS PROGRAM IS IN TWO PARTS. PART 1, CS, CALCULATES THE THEORETICAL
THERMAL NEUTRON ABSORPTION CROSS SECTIONS, PART 2, RI, COMPUTES
THE RESONANCE INTEGRALS.

704 REFERENCES

FILE CODES

546 RE153 BREEDING GAIN CALCULATIONS

REQUESTOR M. BUTLER

APPLIED MATHEMATICS

PROGRAMMER T. CZAJA

CALCULATION OF BREEDING RATIOS AND RELATED WEIGHTED CROSS SECTION
QUANTITIES USEFUL IN ANALYZING UNIVAC RESULTS

704 REFERENCES

FILE CODES

547 PAD107 PHASE OSCILLATIONS IN THE LINAC

REQUESTOR J. HICKES

PARTICLE ACCELERATOR

ANALYST W. MILLER

PROGRAMMER H. HOUSE

CALCULATION OF THE DEPENDENCE OF PHASE OF A PARTICLE IN THE LINAC
ON THE IMPULSE RECEIVED AT EACH SEGMENT

GEO REFERENCES

FILE CODES APS O D2

548 MET110 ELASTIC SHEAR MODULI FOR ALPHA-URANIUM

REQUESTOR E. FISHER

METALLURGY

PROGRAMMER C. CHAMOT

FROM EXPERIMENTALLY DETERMINED VALUES OF $S(I,J)$, THE FUNDAMENTAL
ELASTIC SHEAR MODULI, THE MAXIMUM AND MINIMUM SHEAR MODULI FOR
CRYSTAL PLANES ARE DETERMINED.

704 REFERENCES

FILE CODES PS F1

550 MET111 ALPHA-URANIUM EXPANSION AS A FUNCTION OF CRYSTALLO-
GRAPHIC DIRECTION AND TEMPERATURE

REQUESTOR L. LLOYD

METALLURGY

CONSULTANT J. COOK

PROGRAMMER C. CHAMOT

CONTOUR LINES OF ISO-EXPANSION AS A FUNCTION OF CRYSTALLOGRAPHIC
DIRECTION, FOR A GIVEN TEMPERATURE, ARE LOCATED.

704 REFERENCES

FILE CODES A C4

552 PHY125 MULTIPLE SCATTERING AND INSTRUMENT RESOLUTION CORREC-
TIONS FOR NEUTRON CROSS SECTIONS

REQUESTOR L. RAYBURN

PHYSICS

CONSULTANT L. WOS

PROGRAMMER R. JULKE

GIVEN EXPERIMENTAL CROSS SECTIONS, AN ITERATIVE SCHEME IS USED TO
CALCULATE THE ACTUAL SINGLE SCATTERING CROSS SECTIONS.

GEO REFERENCES

FILE CODES GO G6

554 AMD113 EXPANSION COEFFICIENTS FOR HEMISPHERICAL HARMONICS
 REQUESTOR W. MILLER APPLIED MATHEMATICS
 PROGRAMMER C. CHO

NUMERICAL TABLES FOR COEFFICIENTS OF EXPANSION OF THE ASSOCIATED
 LEGENDRE POLYNOMIALS IN TERMS OF THE HEMISPHERICAL HARMONICS ARE
 CALCULATED FROM RECURRENCE FORMULAE. SOME RESULTS APPEAR IN THE
 UNIVERSITY OF WISCONSIN REPORT WIS-ONR-37, JULY 15, 1959.

704 REFERENCES

FILE CODES S

555 PAD108 NON-LINEAR ORBIT TRACING PROGRAM FOR THE 50 MEV LINEAR
 ACCELERATOR
 REQUESTOR D. COHEN PARTICLE ACCELERATOR
 PROGRAMMER S. STEIDL

THIS PROGRAM DETERMINES THE RADIAL MOTIONS THROUGH THE ACCELERATOR
 UNDER THE INFLUENCE OF LINEAR QUADRUPOLE MAGNETS, ALL MAGNET MIS-
 ALIGNMENTS AND NON-LINEAR FORCES IN THE R-F FIELD AND MAGNET ENDS.

704 REFERENCES ANLAD57

FILE CODES AP B O

556 ISNSE101 FOURIER SERIES TABLE
 REQUESTORS L. SEREN, C. SZUBERT INTERNATIONAL SCHOOL
 PROGRAMMER M. FISHERKELLER

FOURIER COEFFICIENTS FOR THE DELTA FUNCTION ARE COMPUTED.

GEO REFERENCES 585/ISNSE104

FILE CODES S

558 ISNSE102 SELF SHIELDING INTEGRAL EVALUATION
 REQUESTOR H. SCHLUDI INTERNATIONAL SCHOOL
 CONSULTANT E. KERPERLE PROGRAMMER H. HOUSE
 GEO REFERENCES FILE CODES PS O

559 PHY46E MULTIPLE SCATTERING CORRECTIONS IN THIN PLATES

REQUESTOR R. LANE PHYSICS

CONSULTANT W. MILLER PROGRAMMER N. HARTLEY

THIS IS AN EXTENSION OF PHY46C TO INCLUDE COMPOUNDS. PHY46C CAN
HANDLE SINGLE ELEMENTS ONLY.

GEO REFERENCES AMD TM7

FILE CODES APS GO G6

560 BIM101 MONTE CARLO SOLUTION OF A STOCHASTIC DIFFERENTIAL
EQUATION

REQUESTOR G. SACHER BIOLOGY

CONSULTANT J. COOK PROGRAMMER L. KASSEL

THE STOCHASTIC DIFFERENTIAL EQUATION

$$DX(T) = M(T, X(T))DT + S(T, X(T))DY(T)$$

IS SOLVED, WHERE $X(T)$ IS AN N-VECTOR, $S(T, X(T))$ IS AN NXN MATRIX,
AND $Y(T)$ IS AN ISOTROPIC BROWNIAN MOTION PROCESS.

GEO REFERENCES

FILE CODES

G5

561 PHY126 PERTURBATION CALCULATION FOR A DIFFUSE POTENTIAL

REQUESTOR J. SCHIFFER PHYSICS

PROGRAMMER B. GARBOW

THIS PROGRAM COMPUTES EIGENVALUES FOR THE SCHRODINGER EQUATION FOR
A DIFFUSE POTENTIAL BY A PERTURBATION CALCULATION.

704 REFERENCES

FILE CODES APSB

562 AMD114 SPECTRAL TERM ANALYSIS

REQUESTOR W. MILLER

APPLIED MATHEMATICS

PROGRAMMER C. CHO

A SORTING PROCEDURE FOR SELECTING ENERGY LEVELS FROM LINE WAVE LENGTHS IS CARRIED OUT ON THE COMPUTER. THE SCHEME APPEARS TO BE SUITABLE ONLY FOR A SMALL NUMBER OF LINES.

704 REFERENCES

FILE CODES

563 ISNSE FOURIER SERIES SUMMATION AS AN APPROXIMATION OF REACTOR FLUX

REQUESTOR L. SEREN

INTERNATIONAL SCHOOL

CONSULTANT F. MOREHOUSE

PROGRAMMER G. HAWLEY

ANA REFERENCES

FILE CODES

564 ISNSE KINETICS STUDIES

REQUESTOR L. LOIS

INTERNATIONAL SCHOOL

CONSULTANT F. MOREHOUSE

PROGRAMMER L. BRYANT

SOLUTION OF KINETICS EQUATIONS FOR VARIOUS K EX INPUTS

ANA REFERENCES

FILE CODES

566 PHY127 ANALYSIS OF INELASTIC SCATTERING OF 14 MEV NEUTRONS

REQUESTOR H. CASSON

PHYSICS

PROGRAMMER H. HOUSE

EVALUATION OF TIME OF FLIGHT DATA

GEO REFERENCES

FILE CODES APS GO

567   PHY128   ENERGY AND SPATIAL DISTRIBUTIONS OF NEUTRON CAPTURE
EVENTS

REQUESTOR   T. KENNETT   PHYSICS

CONSULTANT   L. WOS   PROGRAMMER   C. HARRISON

GIVEN THE CAPTURE AND SCATTERING CROSS SECTIONS THE BIVARIATE DISTRIBUTION FOR NEUTRON CAPTURE DURING PENETRATION IN A RECTANGULAR PARALLELEPIPED IS CALCULATED. THE TWO VARIABLES ARE DEPTH OF PENETRATION IN THE PLATE AND THE ENERGY AT WHICH THE CAPTURE TAKES PLACE.

GEO REFERENCES

FILE CODES   APS   G6

571   PAD110   NON-LINEAR BETATRON OSCILLATIONS IN ZGS WITH SOFT
EDGES

REQUESTOR   L. TENG   PARTICLE ACCELFRATOR

PROGRAMMER   M. FISHERKELLER

THIS PROGRAM INTEGRATES THE PARTICLE MOTION USING THE EXACT EQUATIONS OF MOTION ACROSS A TANH TYPE OF SOFT MAGNETIC FIELD EDGE AND CARRIES THE PARTICLE ACROSS THE STRAIGHT SECTIONS AND THE MAGNET SECTIONS BY 1 STEP TRANSFORMATIONS OBTAINED FROM EXACT ANALYTICAL SOLUTIONS OF THE EQUATIONS OF MOTION IN THESE REGIONS. THE SOFT FIELD EDGES ARE ASSUMED SLANTED. PROVISION IS MADE TO INTRODUCE EITHER POSITIONAL OR DIRECTIONAL ALIGNMENT ERRORS.

GEO REFERENCES

FILE CODES   APS   GO

572   PHY129   TABLE OF 4TH POWER OF SINE OF HALF-ANGLE

REQUESTOR   B. ZEIDMAN   PHYSICS

PROGRAMMER   A. STRECK

A TABLE OF THE 4TH POWER OF THE SINE OF PRESCRIBED VALUES OF THE HALF ANGLE IS COMPUTED.

GEO REFERENCES

FILE CODES   APS

573 PHY130 GAMMA RAY SPECTRAL ANALYSIS

REQUESTOR B. HAMERMESH PHYSICS

PROGRAMMER B. GARBOW

THIS PROGRAM ANALYZES ENERGY LEVELS OF A GAMMA RAY SPECTRUM INTO A DECAY SCHEME BY FORMING LEVELS FOR COMMON DIFFERENCES AND COMPARING THE RESULTING CALCULATED TRANSITION ENERGIES WITH MEASURED ENERGIES.

704 REFERENCES

FILE CODES PSB

574 RE REACTOR NOISE STUDIES

REQUESTOR J. THIE REACTOR ENGINEERING

CONSULTANT F. MOREHOUSE PROGRAMMER L. BRYANT

A STUDY OF THE RESPONSE OF REACTORS TO RANDOM VARIATIONS IN K EX

ANA REFERENCES

FILE CODES

575 ISNSE REACTOR SIMULATION LABORATORY

REQUESTOR G. PAWLICKI INTERNATIONAL SCHOOL

CONSULTANT F. MOREHOUSE PROGRAMMER L. BRYANT

DEVELOPMENT OF A SERIES OF EXPERIMENTS TO BE USED IN THE ISNSE REACTOR CONTROL AND INSTRUMENTATION COURSE

ANA REFERENCES

FILE CODES

577 PHY46F DIFFERENTIAL CROSS SECTION CALCULATION

REQUESTOR R. LANE PHYSICS

PROGRAMMER W. GREENHOW

GEO REFERENCES

FILE CODES

578 UC101 DALITZ PAIR CALCULATION FOR PI-MINUS + P TO PI-NEUTRAL
+ N INTERACTION

REQUESTOR U. KRUSE UNIVERSITY OF CHICAGO

CONSULTANT W. MILLER PROGRAMMER A. STRECOK

THE PROBABILITY THAT BOTH MEMBERS OF THE ELECTRON-POSITRON PAIR
FORMED IN THE DECAY OF THE PI-NEUTRAL MESON ARE INTERCEPTED BY A
COUNTER AT A FIXED SOLID ANGLE WITH RESPECT TO THE LINE OF FLIGHT OF
THE ORIGINAL PI-MINUS MESON IS CALCULATED.

GEO REFERENCES

FILE CODES APS GO

580 ISNSE103 EVALUATION OF THE FUNCTION PHI/K

REQUESTOR L. SEREN INTERNATIONAL SCHOOL

PROGRAMMER W. SNOW

GEO REFERENCES

FILE CODES APS C3

582 PHY132 CALCULATION OF CROSS SECTION FROM RESONANCE PARAMETERS

REQUESTOR C. HIBDON PHYSICS

CONSULTANT L. WOS PROGRAMMER H. HOUSE

THIS PROGRAM COMPUTES THE SCATTERING CROSS SECTION FROM RESONANCE
HALF-WIDTHS AND THE ENERGY VALUE OF THE RESONANCE PEAKS. THE OBJECT
IS TO FIND THE PARAMETERS WHICH FIT THE EXPERIMENTAL DATA.

704 REFERENCES

FILE CODES APSB C3

583 RE FAST REACTOR FUEL BURNOUT

REQUESTOR L. LINK REACTOR ENGINEERING

CONSULTANT F. MOREHOUSE PROGRAMMER L. BRYANT

FUEL BURNOUT STUDIES

ANA REFERENCES

FILE CODES

584 ISNSE REACTOR KINETICS EVALUATION

REQUESTOR KISHIDA INTERNATIONAL SCHOOL

CONSULTANT F. MOREHOUSE PROGRAMMER L. BRYANT,

KINETIC STUDIES FOR SCHOOL

ANA REFERENCES

FILE CODES

585 ISNSE104 SYNTHESIS OF DELTA FUNCTIONS APPROXIMATIONS

REQUESTOR L. SEREN INTERNATIONAL SCHOOL

CONSULTANT R. KING PROGRAMMER M. FISHERKELLER

GEO REFERENCES

FILE CODES APS GO C3

586 RE157 KLR

REQUESTOR D. ROSSIN REACTOR ENGINEERING

PROGRAMMER T. CZAJA

THIS PROGRAM CALCULATES THE CAPTURE GAMMA RAY FLUX AT THE OUTER SURFACE OF A SHIELD RESULTING FROM AN EXPONENTIALLY VARYING THERMAL NEUTRON FLUX IN THE ADJOINING SLAB.

704 REFERENCES

FILE CODES APSB O

587 MET113 CYLINDRICAL DIFFUSION PROBLEM

REQUESTOR J. DARBY METALLURGY

CONSULTANT E. BAREISS PROGRAMMER K. HILLSTROM

THE DIFFUSION OF A THIN BOUNDARY LAYER OF ISOTOPE INTO AN INSULATED CYLINDER IS DETERMINED.

GEO REFERENCES

FILE CODES APS GO D3

588 MET114 LEAST SQUARES CURVE FITTING BY SUCCESSIVE APPROXIMATION

REQUESTOR S. PAINE METALLURGY

CONSULTANT E. BAREISS PROGRAMMER B. GARBOW

MOST PROBABLE FIT OF TEMPERATURE-POSITION POINTS TO A POLYNOMIAL WITH NEITHER ORDINATE CONSIDERED EXACT IS COMPUTED. THE MOST PROBABLE DEVIATION OF BOTH ORDINATES FOR EVERY POINT IS OBTAINED.

704 REFERENCES

FILE CODES APSB E2

589 ISNSE105 EXPONENTIAL LEAST SQUARE FIT

REQUESTOR R. SIEMS INTERNATIONAL SCHOOL

CONSULTANT E. KEBERLE PROGRAMMER C. HARRISON

EXPONENTIAL LEAST SQUARE FIT WITH THE COMPUTATION OF ERROR RELATIVE TO DATA, APPROXIMATING FUNCTION, AND TRUE FUNCTION.

GEO REFERENCES

704 REFERENCES 419/RE107

FILE CODES AP GO

FILE CODES

590 RE158 HARMONIC ANALYSIS

REQUESTOR A. HATCH REACTOR ENGINEERING

PROGRAMMER M. BUTLER

GIVEN A SET OF Y VALUES CORRESPONDING TO A SET OF EQUALLY SPACED X POINTS, THE FOURIER SERIES COEFFICIENTS, AMPLITUDE, AND PHASE ANGLE (IN DEGREES) OF THE HARMONICS REQUESTED ARE COMPUTED.

704 REFERENCES

FILE CODES B

591 ISNSE106 DECAY OF NEUTRON POPULATION IN A GRAPHITE REACTOR

REQUESTOR R. SIEMS INTERNATIONAL SCHOOL

CONSULTANT E. KEBERLE PROGRAMMER A. STRECOK

704 REFERENCES

FILE CODES APSB O

592 RE159 TEMPERATURES FOR THE EBWR FUEL DEFECT TEST

REQUESTOR R. BAILEY REACTOR ENGINEERING

CONSULTANT E. BAREISS PROGRAMMERS M. FISHERKELLER,
B. GARBOW, H. HOUSE

EVALUATION OF CONDUCTIVITY FUNCTIONS, COMPUTATION OF DIFFUSION
EQUATION PARAMETERS, DETERMINATION OF PEAK TEMPERATURES TO GIVEN SET
OF BOUNDARY TEMPERATURES, AND FOR SELECTED BOUNDARY CONDITIONS, COM-
PUTATION OF TEMPERATURE DISTRIBUTION WITHIN ROD

704 REFERENCES ANC102

FILE CODES

D2, C1

593 RE160 RECHOP

REQUESTOR R. ANDERSON REACTOR ENGINEERING

PROGRAMMER D. JACOBSON

THIS PROGRAM CALCULATES THE HYDRODYNAMIC PERFORMANCE CHARACTERIS-
TICS OF NATURAL CIRCULATION BOILING WATER REACTOR CORES.

704 REFERENCES

FILE CODES

595 PHY133 EFFECTIVE DETECTOR EFFICIENCY

REQUESTOR T. KENNETT PHYSICS

CONSULTANT R. KING PROGRAMMER C. HARRISON

NUMERICAL EVALUATION OF A DOUBLE INTEGRAL

GEO REFERENCES

FILE CODES APS

D1

596 ISNSE107 AUTO-CORRELATION AND POWER SPECTRUM ANALYSIS

REQUESTOR F. PROHAMMER INTERNATIONAL SCHOOL

PROGRAMMER M. FISHERKELLER

USES THE SHARE SUBROUTINE NY CP2

704 REFERENCES

FILE CODES

597 PHY134 MINIMIZING FUNCTIONS

REQUESTOR W. DAVIDON PHYSICS

PROGRAMMER K. HILLSTROM

THE REFINEMENT OF A NUMERICAL METHOD FOR DETERMINING THE MINIMA OF A FUNCTION OF SEVERAL VARIABLES, WITH SPECIFIC APPLICATION TO LEAST SQUARES DATA ANALYSIS.

704 REFERENCES

FILE CODES APSB O

600 RE A LONG TIME DYNAMIC STUDY OF THE MIGHTY MOUSE REACTOR

REQUESTOR A. VIANNA REACTOR ENGINEERING

CONSULTANT F. MOREHOUSE PROGRAMMER W. SCOTT

ANA REFERENCES

FILE CODES

601 RE162 DETERMINATION OF REACTOR CRITICALITY AND BURN-UP

REQUESTOR T. MORITA REACTOR ENGINEERING

PROGRAMMERS M. BUTLER, T. CZAJA

THIS PROGRAM IS A COMPILATION OF SUBROUTINES TO CALCULATE REACTOR CRITICALITY AND BURN-UP FOR EBWR TYPE REACTORS.

704 REFERENCES

FILE CODES

602 PAD ORBIT OF PARTICLE IN A TWISTED QUADRUPOLE MAGNET

REQUESTOR L. TENG PARTICLE ACCELERATOR

PROGRAMMER L. BRYANT

THIS CODE INTEGRATES THE EQUATIONS OF MOTION OF A CHARGED PARTICLE MOVING IN A LINEAR QUADRUPOLE MAGNETIC FIELD TWISTED INTO A HELIX.

ANA REFERENCES

FILE CODES

604 PHY135 ENERGY ANGLE RELATIONS FOR NUCLEAR SCATTERING

REQUESTOR B. ZEIDMAN PHYSICS

PROGRAMMER W. SNOW

FOR EACH GIVEN SET OF PARAMETERS A TABLE OF FINAL ENERGY AS A FUNCTION OF SCATTERING ANGLE IS COMPUTED.

GEO REFERENCES

FILE CODES APS GO

605 MET115 CURVE FITTING FOR ALUMINUM CORROSION

REQUESTOR J. DRALEY METALLURGY

CONSULTANT L. WOS PROGRAMMER H. HOUSE

CURVES OF ALUMINUM CORROSION IN WATER AS A FUNCTION OF TIME ARE GIVEN. THE OBJECT IS TO FIT THESE CURVES AT THE POINTS AT WHICH MEASUREMENTS WERE TAKEN WITH SOME EXPRESSION RESEMBLING ONE OR A COMBINATION OF EXPRESSIONS SUPPLIED. THE METHOD CONSISTS OF USING NEWTONS METHOD TO SOLVE SIMULTANEOUS NONLINEAR EQUATIONS RESULTING FROM APPLICATION OF LEAST SQUARES.

GEO REFERENCES

FILE CODES APS O E2

606 MET116 LENGTH CALCULATIONS FOR URANIUM CRYSTALS

REQUESTOR E. FISHER METALLURGY

PROGRAMMER C. HARRISON

THIS PROGRAM COMPUTES LENGTHS ALONG VARIOUS AXES, RATIOS OF LENGTH AT GIVEN TEMPERATURES TO THAT AT 25 DEGREES C., VOLUME, AND RATIO OF VOLUME AT 25 DEGREES C. TO THAT AT A GIVEN TEMPERATURE. THE USER SUPPLIES TEMPERATURES AND A TABLE OF THIS DATA IS PRODUCED USING GIVEN FORMULAE.

704 REFERENCES

FILE CODES SB O

607 EL104 SIGNAL DICTIONARY FOR FLIP
 REQUESTOR S. HANSON ELECTRONICS
 PROGRAMMER R. JULKE

EACH SIGNAL FOR FLIP, THE GEORGE FP UNIT, IS LISTED WITH DRAWING NUMBER AND DESCRIPTION. THESE ARE SORTED AND LATER ADDITIONS ARE MERGED WITH THE ORIGINAL LIST. EACH REVISED LIST IS PRINTED.

704 REFERENCES FILE CODES B

608 PHY136 FIELD IN RECTANGULAR COIL
 REQUESTOR S. WARSHAW PHYSICS
 PROGRAMMER B. GARBOW

COMPUTATION OF THE VERTICAL COMPONENT OF A MAGNETIC FIELD INSIDE AN ARRAY OF FINITE THICKNESS CONDUCTORS WHICH FORM A RECTANGULAR COIL

704 REFERENCES FILE CODES APSB

609 PHY138 MAGNET FIELD CALCULATIONS FOR A CLOUD CHAMBER
 REQUESTOR J. HEBERLE PHYSICS
 CONSULTANT D. PHILLIPS PROGRAMMER M. FISHERKELLER

THE MAGNETIC FIELD DUE TO THE CURRENT IN SEVERAL STRAIGHT WIRES OF FINITE LENGTH IS DETERMINED AT A SET OF GRID POINTS OF A RECTANGULAR PARALLELEPIPED.

GEO REFERENCES FILE CODES APS GO D3

611   PHY137   NEUTRON DISTRIBUTION STUDIES FOR OBTAINING RESONANCE
PARAMETERS

REQUESTOR   T. KENNETT   PHYSICS

CONSULTANT   L. WOS   PROGRAMMER   C. HARRISON

THIS PROGRAM PRODUCES A TABLE GIVING THE DISTRIBUTION OF PARTICLES NOT ABSORBED BY A TARGET INSIDE A RIGHT CIRCULAR CYLINDER OF INFINITE HEIGHT. THE AXIS OF THE CYLINDER PASSES THROUGH THE CENTER OF THE TARGET AND THE INTERSECTION OF THE PLANE OF THE TOP OF THE TARGET WITH THE CYLINDER IS A CIRCLE. THE PROGRAM CONSISTS OF MONTE CARLO DUPLICATION OF THE FOLLOWING EXPERIMENT. PARALLEL BEAMS OF NEUTRONS ARE DIRECTED AT A PLATE WHICH IS A RECTANGULAR PARALLELOPIPED, DETECTORS ARE ARRANGED CYLINDRICALLY AROUND THE PLATE IN ROWS WITH THE ASSUMPTION THAT THE TOP AND BOTTOM ROWS HAVE INFINITE HEIGHT. THE NUMBER OF ESCAPING PARTICLES IS FIXED AND THE TABLE SHOWS HOW MANY STRIKE THE DETECTOR, ESCAPE FROM THE TOP, AND FROM THE BOTTOM.

GEO REFERENCES

FILE CODES

G6

612   PHY139   RESONANCE AREA ANALYSIS

REQUESTOR   L. BOLLINGER   PHYSICS

PROGRAMMER   A. STRECK

FOR SEVERAL VALUES OF TWO PARAMETERS AN AREA INTEGRAL IS EVALUATED -- THE INTEGRAND INVOLVES A DOPPLER INTEGRAL.

GEO REFERENCES

FILE CODES   PS GO

613   PHY140   TRIPLE ANGULAR CORRELATIONS

REQUESTOR   J. SCHIFFER   PHYSICS

PROGRAMMER   J. DENES

THIS PROGRAM COMPUTES CERTAIN CORRELATIONS IN STUDYING ANGULAR SYMMETRIES.

704 REFERENCES

FILE CODES

614 PHY126B BOUND S-STATES IN A SAXON POTENTIAL OF THE FORM
 $V(P)=V(0)/(1+EXP((R-R(0))/A))$

REQUESTOR J. SCHIFFER PHYSICS

PROGRAMMER G. DUFFY

REFERENCE. LAWSON, PHYSICAL REVIEW, VOL. 101, NO. 1, PP. 311-313

GEO REFERENCES

FILE CODES APS GO

616 AMD115 NUMERICAL SOLUTION OF THE SCHRODINGER EQUATION FOR
 CENTRAL FIELDS

REQUESTOR W. MILLER APPLIED MATHEMATICS

CONSULTANT W. CODY PROGRAMMER K. HILLSTROM

A GEORGE VERSION OF AN ILIAC ROUTINE TO HANDLE SCHRODINGER PROBLEMS FOR ANY SPHERICALLY SYMMETRIC POTENTIAL. THE PROGRAM CAN FIND EIGENVALUES, VALUES OF THE WAVE FUNCTION AT REGULARLY-SPACED INTERVALS, EVALUATE MATRIX ELEMENTS(TRANSITION PROBABILITIES), AND SOLVE SELF-CONSISTENT FIELD PROBLEMS.

GEO REFERENCES

FILE CODES

D2

617 RE164 TIME-DEPENDENT DECAY RATE TABLE FOR TWO RELATED
 MATERIALS

REQUESTOR R. BAILEY REACTOR ENGINEERING

PROGRAMMER J. RAMUTA

704 REFERENCES

FILE CODES PS BO

618 RE165 PHI-SIGMA CALCULATION

REQUESTOR H. HUMMEL REACTOR ENGINEERING

PROGRAMMER M. BUTLER

THIS PROGRAM COMPUTES SUMS OVER ENERGY GROUPS OF FLUX-CROSS SECTION PRODUCTS. THREE DIFFERENT CUTOFFS OF ENERGY MAY BE USED.

704 REFERENCES

FILE CODES B

619 PHY141 LEAST SQUARES FITTING OF RADIOACTIVE DECAY DATA

REQUESTOR G. PERLOW PHYSICS

PROGRAMMER R. GARBOW

COUNTING DATA IS FITTED TO A SERIES OF EXPONENTIALS, WITH THE COEFFICIENTS OF THE SERIES AND THE DECAY RATES DETERMINED BY A LEAST SQUARES PROCEDURE.

GEO REFERENCES ANL5990

FILE CODES APS GO E2

620 ID101 HEAT TRANSFER ANALYSIS OF EBRI

REQUESTOR J. LONG IDAHO

CONSULTANT W. MILLER PROGRAMMER H. HOUSE

CALCULATION OF COOLANT AND FUEL TEMPERATURE DISTRIBUTIONS IN EBRI

704 REFERENCES

FILE CODES PSB D3

622 PHY142

REQUESTOR B. ZEIDMAN PHYSICS

CONSULTANT R. KING PROGRAMMER G. DICK

ANGULAR DISTRIBUTIONS OF MOMENTS FOR DIRECT NUCLEAR REACTIONS ARE COMPUTED.

GEO REFERENCES

FILE CODES APS GO C3

623 RE166 PROCESSING OF EXPERIMENTAL DATA FOR INPUT TO RE
MULTIFIT PROGRAM

REQUESTOR J. WHALEN REACTOR ENGINEERING

PROGRAMMER M. MCLEAN

EXPERIMENTAL DATA IS PROCESSED, WEIGHTING FACTORS CALCULATED, FOR USE IN LEAST SQUARES FITTING TO AN EXPONENTIAL FUNCTION.

704 REFERENCES

FILE CODES PSB O

626 CHM112 DETERMINATION OF STABILITY CONSTANTS FROM EQUILIBRIUM
EQUATION FOR DIFFERENT EXPERIMENTS

REQUESTOR J. SULLIVAN CHEMISTRY

CONSULTANT W. MILLER PROGRAMMER S. STEIDL

THE EQUATION FOR EQUILIBRIUM IN SEVERAL DIFFERENT TYPES OF
EXPERIMENTS IS EXPRESSED IN A CANONICAL FORM AND AN ITERATIVE
PROCEDURE IS EMPLOYED TO CALCULATE THE EQUILIBRIUM CONSTANTS.

704 REFERENCES J ACTA CHEM SCAND FILE CODES APSB O G2

632 AMD116 DETERMINATION OF COEFFICIENTS FOR PI-MINUS SCATTERING

REQUESTOR W. MILLER APPLIED MATHEMATICS

PROGRAMMER K. HILLSTROM

704 REFERENCES 597/PHY134 FILE CODES APSB O

633 PHY145 COMBINATORIAL PROGRAM FOR COMPUTING RACAH COEFFICIENTS

REQUESTOR J. SCHIFFER PHYSICS

CONSULTANT L. WOS PROGRAMMER N. HARTLEY

THIS IS A GENERAL ROUTINE FOR HANDLING THE BASIC ARITHMETIC OPER-
ATIONS WHERE THE ELEMENTS BEING OPERATED UPON ARE RATIONAL NUMBERS
WHICH USUALLY ARISE FROM RATIOS OF FACTORIALS. THE PROGRAM DECOMPOSES
BOTH NUMERATOR AND DENOMINATOR INTO PRIME FACTORS AND PERFORMS THE
ARITHMETIC OPERATIONS. THE PROGRAM WILL DECOMPOSE THE QUANTITIES IF
GIVEN AS FACTORIALS OR INTEGERS. THE RESULT IS GIVEN IN PRIME FACTOR-
ED FORM OR AS A FLOATING POINT NUMBER.

GEO REFERENCES FILE CODES A GO C3

635 RE170 IOU, A LEAST SQUARES FIT TO AN EXPONENTIAL FUNCTION
PLUS CONSTANT

REQUESTOR I. OLSEN REACTOR ENGINEERING

PROGRAMMER T. CZAJA

THIS PROGRAM DETERMINES A AND C THAT BEST FIT THE FUNCTION
 $Y = A \exp(-Bt) + C$ IN THE LEAST SQUARES SENSE.

704 REFERENCES FILE CODES APSB O E2

637 MET117 ANALYSIS OF EXPERIMENTAL DATA - RADIAL DISTRIBUTION OF
THERMAL NEUTRONS IN ABSORBING CYLINDERS

REQUESTOR F. TARABA

METALLURGY

CONSULTANT F. BAREISS

PROGRAMMER G. DUFFY

GEO REFERENCES ANL5872, ANL5945

FILE CODES APS GO Z

638 PHY146 DATA REDUCTION FROM BUBBLE CHAMBER FILM

REQUESTOR S. WARSHAW

PHYSICS

PROGRAMMER B. GARROW

CALCULATION OF VECTOR MOMENTUM FROM TWO STEREO FILM VIEWS OF
PARTICLE TRACKS IN A CLOUD OR BUBBLE CHAMBER IN A MAGNETIC FIELD,
GIVEN RECTANGULAR COORDINATES ALONG THE TRACK WHICH ARE RECORDED ON
A PUNCHED PAPER TAPE IN A FORMAT COMPATIBLE WITH GEORGE INPUT.

GEO REFERENCES

FILE CODES

639 CHM114 EIGENVALUES FOR AN ION WITH 2(5F) ELECTRONS IN A OCTA-
HEDRAL CRYSTALLINE FIELD

REQUESTOR D. GRUEN

CHEMISTRY

PROGRAMMER B. GARROW

A STUDY OF LOW TEMPERATURE ABSORPTION SPECTRUM OF SINGLE CRYSTALS
OF CS 2 UCL 6 AND TMA 2 UCL 6.

GEO REFERENCES

FILE CODES APS GO F2

641 RE171 DETERMINATION OF K EXCESS AS A FUNCTION OF NEUTRON
FLUX

REQUESTOR M. BUTLER

APPLIED MATHEMATICS

PROGRAMMER I. BAKSYS

THIS IS AN ADAPTATION OF THE AVIDAC RE31 PROGRAM WHICH DETERMINES
FROM $T = 0$ VALUES AND EXPERIMENTAL FLUX VALUES OVER A PERIOD OF TIME
THE FLUX INTEGRAL, K EXCESS, $DKEX/DT$, AND D^2KEX/DT^2 CORRESPONDING
VALUES USING THE ONE-GROUP KINETICS EQUATIONS.

704 REFERENCES 249/RE31

FILE CODES APSB O

642 AMD117 DEPLETION EFFECT FOR THE DIFFUSION KINETICS PROBLEM,
CHM8

REQUESTOR H. FRICKE CHEMISTRY

CONSULTANT D. PHILLIPS PROGRAMMER A. STRECOK

THE EFFECT OF THE TRANSIENT DILUTION OF THE SOLUTE FOR THE ONE
RADICAL, ONE SOLUTE DIFFUSION KINETICS PROBLEM IS DETERMINED.

GEO REFERENCES 439/AMD104

FILE CODES APS GO D3

645 PHY147 APPEARANCE POTENTIALS BY SECOND DERIVATIVE OF THE
EXPERIMENTAL IONIZATION CURVE

REQUESTORS M. KAMINSKY, W. CHUPKA PHYSICS

CONSULTANT E. KEBERLE PROGRAMMER M. FISHERKELLER

704 REFERENCES

FILE CODES APSB

646 BIM102 ANALYSIS OF GROWTH AND FEEDBACK CONTROL IN CELLULAR
POPULATIONS

REQUESTOR E. TRUCCO BIOLOGY

CONSULTANT J. COOK PROGRAMMER C. CHAMOT

PRELIMINARY CALCULATIONS OF PARAMETERS AND TESTS OF STABILITY CON-
DITIONS FOR A SYSTEM OF DIFFERENTIAL EQUATIONS TO BE SOLVED ON THE
ANALOG COMPUTER. THESE EQUATIONS DESCRIBE SIZES OF SUBPOPULATIONS AS
FUNCTIONS OF TIME.

704 REFERENCES

FILE CODES APS O C1

647 MET118 CALCULATION OF ELASTIC MODULI C12, C13, AND C23

REQUESTOR F. FISHER METALLURGY

PROGRAMMER C. HARRISON

THIS PROGRAM CALCULATES THE ELASTIC MODULI C_{ij} FROM BASIC MEASURE-
MENTS, LENGTH CHANGE CALCULATIONS AND C_{ii} CALCULATIONS FROM LEAST
SQUARES FORMULAE. THE USER SUPPLIES TEMPERATURES AND THE PROGRAM
PRODUCES A TABLE OF THE ABOVE DATA USING GIVEN FORMULAE TOGETHER WITH
CARD OUTPUT FOR USE ON THE DATAPLOTTER.

704 REFERENCES

FILE CODES SB O

648 AMD118 CURVE FITTING BY LEAST SQUARES

REQUESTOR R. KING

APPLIED MATHEMATICS

PROGRAMMER K. HILLSTROM

AN ADAPTATION OF THE AVIDAC PROGRAM, PHY8, TO GEORGE MACHINE USE.

GEO REFERENCES 241/PHY8

FILE CODES AP GO

649 RE FAST REACTOR DYNAMICS STUDIES EBRI MARK 3 PRIME

REQUESTOR J. CARTER

REACTOR ENGINEERING

CONSULTANT F. MOREHOUSE

PROGRAMMER L. BRYANT

THIS PROGRAM IS BEING USED TO DEVELOP A MODEL TO DESCRIBE THE INTERNAL TEMPERATURE FEEDBACK IN EBRI MARK 3 PRIME.

ANA REFERENCES

FILE CODES

650 PHY148 NUMERICAL SOLUTION OF A CLASS OF INTEGRAL EQUATIONS OF THE FIRST KIND

REQUESTOR R. LANE

PHYSICS

CONSULTANT D. PHILLIPS

PROGRAMMER M. FISHERKELLER

THE INTEGRAL EQUATION $G(L) = \int_{-A}^A (F(X)K(X-L))DX$ IS SOLVED FOR $F(X)$ GIVEN THE FUNCTIONS G AND K . IN ADDITION GRAPHS ARE PLOTTED OF G , F , AND K .

704 REFERENCES

FILE CODES

Z

653 RE172 DETERMINATION OF SINGLE AND DOUBLE SCATTERING EFFECTS

REQUESTOR A. SMITH

REACTOR ENGINEERING

CONSULTANT J. BUTLER

PROGRAMMER I. BAKSYS

THIS PROGRAM DETERMINES THE SINGLE AND DOUBLE-SCATTERED NEUTRON FLUX FOR ELASTIC AND INELASTIC SCATTERING IN A CYLINDRICAL SAMPLE.

704 REFERENCES

FILE CODES

654 RE173 FREQUENCIES OF A SPHERICAL ELECTROMAGNETIC RESONATOR
 REQUESTOR J. BUTLER REACTOR ENGINEERING
 PROGRAMMER J. KOERNER

THIS PROGRAM FINDS THE PROPER FREQUENCIES OF A SPHERICAL ELECTRO-
 MAGNETIC RESONATOR BOTH WITH AND WITHOUT A CENTRAL CONDUCTING SPHERE.

704 REFERENCES

FILE CODES

655 ISNSE103AA MODIFICATION OF THE ISNSE103 PROGRAM
 REQUESTOR L. SFREN INTERNATIONAL SCHOOL
 PROGRAMMER L. KASSEL

GEO REFERENCES 580/ISNSE103

FILE CODES AP G

656 PHY150 BETA DECAY MATRIX ELEMENT COMPUTATION
 REQUESTOR G. PERLOW PHYSICS
 CONSULTANTS R. KING, J. COOK PROGRAMMER A. STRECOK

GAMOW-TELLER MATRIX ELEMENTS ARE COMPUTED FOR P-SHELL NUCLEII AND
 INTERMEDIATE COUPLING.

GEO REFERENCES

FILE CODES APS GO F1

657 MFT119 DIRECTION COSINE CALCULATION
 REQUESTOR L. LLOYD METALLURGY
 PROGRAMMER W. GREENHOW

TABULATION OF THE FUNCTION $Y(I,J)$ FOR VARIOUS VALUES OF THE TEMP-
 ERATURE DEPENDENT PARAMETERS -- ALPHA, BETA, GAMMA, U, V, AND W.

GEO REFERENCES

FILE CODES

658 PHY151 LEAST SQUARE FITTING OF RADIOACTIVE DECAY DATA

REQUESTOR L. RAYBURN PHYSICS

PROGRAMMER B. GARBOW

A MODIFICATION OF THE PHY141 PROGRAM USING A MINIMIZATION SCHEME
DUE TO DAVIDON.

GEO REFERENCES 619/PHY141

FILE CODES APS GO E2

659 CEN REACTION OF URANIUM METAL WITH WATER

REQUESTOR B. LIIMATAINEN CHEMICAL ENGINEERING

CONSULTANT F. MOREHOUSE PROGRAMMER L. JUST

THIS PROGRAM IS USED TO DERIVE THE EQUATIONS FOR DESCRIBING THE
GROWTH OF AN OXIDE FILM ON A URANIUM ROD IMMersed IN WATER IN AN AIR
TIGHT VESSEL.

ANA REFERENCES

FILE CODES A

660 RE FUEL BURNOUT ON PROCESS STEAM REACTORS

REQUESTOR C. KELBER REACTOR ENGINEERING

CONSULTANT F. MOREHOUSE PROGRAMMER L. BRYANT

ANA REFERENCES

FILE CODES

662 PHY152 STUDY OF NUCLEAR LEVEL DENSITY BASED ON REALISTIC SPIN
ORBIT LEVELS

REQUESTOR N. ROSENZWEIG PHYSICS

CONSULTANT L. WOS PROGRAMMER B. GARBOW

THIS PROGRAM FINDS ALL PRIMITIVE NEUTRON CONFIGURATIONS FOR GIVEN EXCITATION ENERGY VALUES, FOR EACH CONFIGURATION, THE NUMBER OF PARTICLES PARTICIPATING, THE NUMBER OF UNPAIRED PARTICLES AND HOLES PARTICIPATING ARE COMPUTED AND PRINTED ALONG WITH THE CONFIGURATION LABEL. IT THEN FINDS THE REALISTIC NEUTRON CONFIGURATIONS AND ASSOCIATED ENERGY, DEGENERACY OF REALISTIC CONFIGURATION, NUMBER OF NEUTRONS PARTICIPATING, NUMBER OF UNPAIRED NEUTRONS, AND THE PARITY OF THE CONFIGURATION, CERTAIN STATISTICAL STUDIES ARE THEN MADE. SIMILAR PROCEDURE IS THEN APPLIED TO NUCLEAR CONFIGURATIONS.

704 REFERENCES

FILE CODES

Z

663 PHY153 DETERMINATION OF RESONANCE PARAMETERS AND PEAKS BY
LEAST SQUARES

REQUESTOR C. HIRDON PHYSICS

CONSULTANT L. WOS PROGRAMMER H. HOUSE

THE PROGRAM ATTEMPTS TO FIT EXPERIMENTAL DATA BY FINDING RESONANCE HALF-WIDTHS AND ENERGY AT WHICH RESONANCE PEAKS OCCUR. THE PARAMETERS ARE DETERMINED BY LEAST SQUARES, WITH THE INITIAL GUESS OF THE TWO PARAMETERS SUPPLIED BY THE USER.

GEO REFERENCES

FILE CODES

G

E2

666 CHM115 TRAJECTORY FUNCTIONS, MAGNETIC FIELD PROFILE, ORBIT
ROTATION, AND DISPERSION EFFECT

REQUESTOR A. JAFFEY CHEMISTRY

CONSULTANT R. KING PROGRAMMER K. HILLSTROM

TRAJECTORY, MAGNETIC FIELD PROFILE, ORBIT ROTATION, AND DISPERSION EFFECT FUNCTIONS ARE TABULATED FOR A WIDE RANGE OF PARAMETERS.

704 REFERENCES

FILE CODES APSB O C3,D1

667 BIM103 NEUTRON DEPTH DOSE IN A TUMOR-CONTAINING TISSUE

REQUESTOR N. FRIGERIO BIOLOGY

CONSULTANT J. COOK PROGRAMMER M. FISHERKELLER

A LARGE VOLUME OF NORMAL TISSUE CONTAINS A SMALL VOLUME OF THE SAME TISSUE RICH IN AN ABNORMAL NUCLIDE. THIS VOLUME IS IRRADIATED WITH A PLANE COLLIMATED BEAM OF NEUTRONS OF KNOWN ENERGY. THE AREA OF THE BEAM IS EQUAL TO THE PROJECTED AREA OF THE SMALL VOLUME, AND THE AXIS OF THE BEAM PASSES THRU THE CENTER OF THE SMALL VOLUME. THE DOSE DISTRIBUTION THROUGHOUT BOTH VOLUMES OF TISSUE IS FOUND.

GEO REFERENCES

FILE CODES PS GO D1

670 CHM116 DIFFUSION KINETICS 111 (2 RADICALS, 2 SOLUTES)

REQUESTOR H. FRICKER CHEMISTRY

CONSULTANT E. BAREISS PROGRAMMER C. CHAMOT

SOLUTION OF A SYSTEM OF FOUR NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS OF PARABOLIC TYPE, INTEGRATION OF REACTION PRODUCTS OVER ENTIRE SPACE AND TIME. DETERMINATION OF DIFFUSION AND REACTION PARAMETERS BY MULTIDIMENSIONAL INTERPOLATION.

704 REFERENCES 234/CHM8

FILE CODES A B O D3

671 MET120 NUMERICAL ANALYSIS OF CORRECTED CONDUCTIVITY DATA

REQUESTOR S. PAINE METALLURGY

CONSULTANT E. BAREISS PROGRAMMER B. GARBOW

FOR METHODS AND FORMULAE, SEE FORTHCOMING REPORT BY S. PAINE.

704 REFERENCES

FILE CODES APSB O E2

681 PHY46G SUBTRACTION OF ADJUSTED AND CORRECTED MULTIPLE SCATTERING COUNTS OF 1 ELEMENT FROM THOSE OF A 2 ELEMENT COMPOUND TO OBTAIN DATA ON SECOND ELEMENT

REQUESTOR P. LANE PHYSICS

PROGRAMMER W. GREENHOW

GEO REFERENCES

FILE CODES

685 RE179 MULTIFIT

REQUESTOR M. BUTLER

APPLIED MATHEMATICS

PROGRAMMER J. RAMUTA

THIS PROGRAM IS A COMBINATION OF THE COSINE, EXPONENTIAL, AND BESSEL FUNCTION LEAST SQUARES FITTING PROGRAMS COMMONLY USED IN REACTOR EXPERIMENTS (RE106,107, AND 163).

704 REFERENCES WAPD-TM-26

FILE CODES PSB O

686 MET121 CORROSION ABSTRACT CODING

REQUESTOR R. MISCH

METALLURGY

CONSULTANT J. COOK

PROGRAMMER S. STEIDL

THE CLASSIFICATION OF CORROSION ABSTRACTS IS DONE BY RANDOM NUMBERS, IN GROUPS OF FOUR, ON A PUNCH-CARD FIELD OF 28 HOLES.

704 REFERENCES

FILE CODES PSB O G5

687 CEN102 URANIUM OXIDATION KINETICS

REQUESTOR L. LIEBOWITZ

CHEMICAL ENGINEERING

CONSULTANT E. BAREISS

PROGRAMMER A. BATES

KINETICS PARAMETERS AND CALIBRATION COEFFICIENTS ARE DETERMINED BY LEAST SQUARES FIT, HYPOTHESIS TESTING.

704 REFERENCES

FILE CODES A

E2,E3

688 ISNSE ISNSE ANALOG COMPUTER COURSE

REQUESTOR G. PAWLICKI

INTERNATIONAL SCHOOL

PROGRAMMER L. BRYANT

A SERIES OF THREE LABORATORY PERIODS FOR 4 INDIVIDUAL GROUPS IS TO BE CONDUCTED ON THE USE OF ANALOG COMPUTERS IN REACTOR DESIGN WORK.

ANA REFERENCES

FILE CODES

689 RE181 MORON

REQUESTOR P. MOLDAUER

REACTOR ENGINEERING

PROGRAMMER M. MCLEAN

GENERATE 10,000 RANDOM NUMBERS, $X(I)$, IN THE INTERVAL (0,1) AND COMPUTE THE FUNCTION $Y(I)$. FROM THE $Y(I)$ DETERMINE SUCCESSIVE 1,2,3, 4,5, AND 6 TERM SUMS LESS THAN A FIXED VALUE.

704 REFERENCES

FILE CODES PSB 0

690 CEN103 TEMPERATURE CORRECTION FOR BOMB CALORIMETRIC DATA

REQUESTOR W. HURBARD

CHEMICAL ENGINEERING

CONSULTANT R. KING

PROGRAMMER S. STEIDL

NUMERICAL INTEGRATION IS USED TO OBTAIN A TEMPERATURE CORRECTION REFLECTING THE EFFECTS OF CONSTANT STIRRING AND HEAT EXCHANGE WITH ENVIRONMENT.

704 REFERENCES

FILE CODES APSB 0 D1,E2

692 PHY156 A LEAST SQUARE FIT OF A FIRST DEGREE POLYNOMIAL USING UNEQUAL WEIGHTS

REQUESTOR P. CARPENTER

PHYSICS

CONSULTANT D. PHILLIPS

PROGRAMMER W. GREENHOW

GIVEN N CURVES OF THE FORM $F(Y(I)) = S \exp(X(I) \log G)$ THE BEST VALUES OF S AND G , AND THE ERRORS ASSOCIATED WITH THESE VALUES DUE TO ERRORS IN $Y(I)$ ARE CALCULATED.

704 REFERENCES

FILE CODES GO E2

693 RPY SPECTRUM TRANSFORMATION

REQUESTOR P. FRENZEN

RADIOLOGICAL PHYSICS

CONSULTANT F. MOREHOUSE

PROGRAMMERS L. BRYANT, R. BARE

ANA REFERENCES

FILE CODES

624 UC104 CALCULATIONS FOR EXPERIMENT PI-MINUS + P TO PI-NEUTRAL
+ NEUTRON

REQUESTORS W. KEPNAN, C. YORK UNIVERSITY OF CHICAGO

PROGRAMMER C. CHAMOT

CALCULATIONS FOR CALIBRATION OF COUNTERS AND KINEMATIC CALCULATIONS ARE MADE FOR VARIOUS ENERGIES OF PI-MINUS, AND THEN PHOTON SPECTRA ARE CALCULATED INCLUDING A LEAST SQUARES FIT BASED ON LEGENDRE POLYNOMIALS.

704 REFERENCES UC-EFI-59-18 RPT 314 FILE CODES B O E1,E2

695 ID102 TWO-DIMENSIONAL HEAT TRANSFER ANALYSIS OF EBRI

REQUESTOR J. LONG IDAHO

CONSULTANT W. MILLER PROGRAMMER H. HOUSE

THE AMPLITUDE AND PHASE OF THE FUEL AND COOLANT TEMPERATURES ARE COMPUTED FOR THE TWO-DIMENSIONAL HEAT TRANSFER ANALYSIS.

704 REFERENCES FILE CODES APSB O D3

698 CFN METAL WATER REACTION

REQUESTOR L. BAKER CHEMICAL ENGINEERING

CONSULTANT F. MOREHOUSE PROGRAMMERS L. BRYANT, L. JUST

ANA REFERENCES FILE CODES AP

700 AMD119 BI-DOUBLE INTEGRAL

REQUESTOR E. KEBERLE APPLIED MATHEMATICS

PROGRAMMER R. JULKE

GEO REFERENCES FILE CODES APS GO

701 ISNSF108 CURVE FITTING BY LEAST SQUARES

REQUESTOR L. SEREN

INTERNATIONAL SCHOOL

PROGRAMMER K. HILLSTROM

THE FUNCTION $Y(I) = \text{ALPHA} \times \text{PHI} (\text{EXP} -2\text{BX}(I))$ IS ADDED TO THE PROGRAM 648/AMD118.

GEO REFERENCES 648/AMD118

FILE CODES APS GO

702 UC105 MU-ELECTRON SPECTRUM ANALYSIS

REQUESTOR D. MILLER

UNIVERSITY OF CHICAGO

CONSULTANT J. COOK

PROGRAMMER J. DICK

THE MICHEL SPECTRUM IS CORRECTED FOR (1) ELECTRON ENERGY LOSS BY BREMSSTRAHLUNG, (2) BY IONIZATION, AND (3) BY THE RESPONSE OF THE SPECTROMETER, THEN THE RESULT IS LEAST SQUARE FITTED TO THE EXPERIMENTALLY OBSERVED NUMBER OF COUNTS.

GEO REFERENCES

FILE CODES

G1

703 ISNSE ISOTOPIC ABUNDANCE IN REACTORS

REQUESTORS A. GNESUTTA, J. WEILLS

INTERNATIONAL SCHOOL

PROGRAMMER L. BRYANT

ANA REFERENCES

FILE CODES

704 CH14 ANALYSIS OF OPTICAL DENSITY (URANIUM(+4)-NEPTUNIUM(+2))

REQUESTOR J. SULLIVAN

CHEMISTRY

CONSULTANT F. MOREHOUSE

PROGRAMMERS L. BRYANT, R. BARE

ANA REFERENCES

FILE CODES

707 CHM115A AN EXTENSION OF 666/CHM115

REQUESTOR A. JAFFEY CHEMISTRY

CONSULTANT R. KING PROGRAMMER K. HILLSTROM

704 REFERENCES FILE CODES APSB O C3,D1

709 PHY159 DATA REDUCTION FOR THE ARGONNE BENT-CRYSTAL
SPECTROMETER

REQUESTOR B. HAMERMESH PHYSICS

CONSULTANT R. KING PROGRAMMER K. HILLSTROM

OVERLAPPING PEAKS OF RAW GAMMA RAY COUNTS ARE FITTED TO STANDARD
CURVES IN THE LEAST SQUARES SENSE.

GEO REFERENCES FILE CODES A GO G2

710 PHY160 BREMSSTRAHLUNG POLARIZATION COMPUTATION

REQUESTOR P. EVANS PHYSICS

CONSULTANT J. COOK PROGRAMMER A. STRECK

THE POLARIZATION IS OBTAINED BY NUMERICAL INTEGRATION OF AN EX-
PRESSION INVOLVING CROSS SECTIONS AND DISTRIBUTION FUNCTIONS.

704 REFERENCES FILE CODES D1

711 ISNSE REACTOR STABILITY STUDIES

REQUESTORS F. VELONA, J. WEILLS INTERNATIONAL SCHOOL

CONSULTANT F. MOREHOUSE PROGRAMMER L. BRYANT

ANA REFERENCES FILE CODES

713 CHM117 U(4)-NP(6) KINETICS

REQUESTOR A. ZIFLEN CHEMISTRY

PROGRAMMER B. GARBOW

A LINEAR LEAST SQUARES FIT WITH ASSIGNED WEIGHTS.

704 REFERENCES

FILE CODES APSB O G2

715 PHY161

REQUESTOR P. MARION

PROGRAMMER R. JULKE

CONVOLUTE THE PRESCRIBED FUNCTION $F(X)$ INTO $T(F)$ WHERE $T(E)$ IS THE TRANSMISSION AS A FUNCTION OF ENERGY. F AND $T(E)$ ARE OUTPUT FROM THE 457/PHY114 PROGRAM.

GEO REFERENCES

FILE CODES APS GO

716 ISNSE109 A MODIFICATION OF THE RE34 SHIELD PROGRAM

REQUESTOR M. GROTENHUIS INTERNATIONAL SCHOOL

PROGRAMMER M. BUTLER

A MODIFICATION TO PERMIT SCATTERING FROM HIGHER ENERGY GROUPS IN THE BASIC 262/RE34 PROGRAM IS USED.

704 REFERENCES

FILE CODES B

718 ISNSE110 A BESSEL FUNCTION LEAST SQUARES FITTING PROGRAM

REQUESTOR L. SEREN INTERNATIONAL SCHOOL

PROGRAMMER C. CHO

LEAST SQUARES FITTING TO THE TWO FUNCTIONS (1) $\Phi(I) = AJO(\alpha, I) + CYO(\alpha, I)$ AND (2) $\Phi(I) = CIO(\alpha, I)$.

704 REFERENCES

FILE CODES APSB O

719 SSS DIFFERENTIATION OF EXPERIMENTAL DATA

REQUESTOR W. PRIMAK SOLID STATE SCIENCE

CONSULTANT F. MOREHOUSE PROGRAMMER L. JUST

ANA REFERENCES FILE CODES

720 RPY114 ATMOSPHERIC PROFILES

REQUESTOR P. FRENZEN RADIOLOGICAL PHYSICS

PROGRAMMER C. CHAMOT

THIS PROGRAM CALCULATES AVERAGE VALUES AND STANDARD DEVIATIONS FOR
METEOROLOGICAL OBSERVATIONS.

704 REFERENCES FILE CODES PSB O GO

721 EL105 TRANSISTORIZED DISTRIBUTED AMPLIFIER

REQUESTOR C. MCMULLIN ELECTRONICS

PROGRAMMER R. LITTLE

THE INPUT AND OUTPUT ADMITTANCE AND VOLTAGE AND CURRENT GAINS OF A
TRANSISTORIZED DISTRIBUTED AMPLIFIER CIRCUIT ARE CALCULATED FOR A
RANGE OF FREQUENCIES -- $F = 10$ CPS TO 1 KMC.

704 REFERENCES FILE CODES PS O

722 MET123 LEAST SQUARES FIT TO PRESCRIBED FORMULA

REQUESTOR S. PAINE METALLURGY

PROGRAMMER H. TURNER

LEAST SQUARES FIT TO THE FORMULA $R = (A1 + 2A2T) / (1 + A1T + A2TSQUARED)$
FOR PAIRS OF R,T VALUES.

704 REFERENCES FILE CODES PS O

726   PHY162   UNSCRAMBLING GAMMA RAY SCINTILLATION SPECTROMETER
PULSE-HEIGHT DISTRIBUTIONS

REQUESTOR L. BOLLINGER PHYSICS

CONSULTANT L. WOS PROGRAMMER W. SNOW

THE PROGRAM FINDS THE RELATIVE INTENSITIES OF THE GAMMA RAYS
PRESENT IN A GIVEN COMPLEX SPECTRUM.

GEO REFERENCES

FILE CODES

F4

749 CEN104 LEAST SQUARES FIT OF HIGH TEMPERATURE ELECTROMOTIVE
FORCE DATA

REQUESTOR I. JOHNSON CHEMICAL ENGINEERING

PROGRAMMER M. DITTMER

ONE OR MORE OF THREE POSSIBLE FITS IS DETERMINED FOR EACH SET OF DATA. RESIDUALS AND STANDARD DEVIATION OF EACH FIT ARE COMPUTED.

704 REFERENCES

FILE CODES

ROUTINES AND SUBROUTINES

GEORGE Subroutine Additions

<u>NUMBER</u>	<u>TITLE</u>	<u>REMARKS</u>
B-17-234	Floating Point Decimal Dump	
B-18-239	General Dump Routine	
B-19-249	Punch n Words, Base 16, from Memory	
B-20-243	Reading, Conversion to Decimal and Punching (with Format) of n Floating Point Sexadecimal Numbers, General Routine.	
D- 4-241	Prime Factor Arithmetic	
D- 5-247	Complex Arithmetic, Floating Point	
E-21-237	Polynomial Evaluation, Using Two-Word Floating Point Complex Arithmetic	
E-22-248	Square Root of a Complex Number, Floating Point	
F- 4-229	Bessel Function J_0 with Extended Range, Fixed Point	$-1 < J_0 \leq 1 - 2^{-32}$
F- 5-232	Legendre Polynomial Generator, Floating Point	
F- 6-238	Spherical Bessel Functions, Fixed Point	
M-13-231	Rectangular Matrix Transposition	Last bit of each element flagged, to save space.
M-14-233	Rectangular Matrix Transposition	All bits of each element preserved.
M-15-236	Matrix Exponential, Fixed Point	
P- 2-244	Determination of the Coefficients of the Characteristic Polynomial of a Real- Valued Matrix Single Precision Floating Point.	
P- 3-245	Determination of the Coefficients of the Characteristic Polynomial of a Real- Valued Matrix, Two-Word Floating Point.	
P- 4-249	Determination of the Coefficients of the Characteristic Polynomial of a Complex- Valued Matrix, Floating Point.	
S- 7-242	Generation, Conversion to Floating Point Decimal, and Punching of n Random Numbers Uniform on the Interval $(-p,p)$, General Routine.	
X-15-250	Wide Magnetic Tape Read-Write Sum Check	

<u>NUMBER</u>	<u>TITLE</u>	<u>REMARKS</u>
X-16-251	General Memory Dump, Service Routine	
X-17-252	Punch N Words, Base 16, from Memory	
X-18-253	Service Routine Loader	
X-19-254	Character-by-Character Tape Comparison	
X-20-255	Code Tape Punch	
Z-14-235	Variable Metric Method for Minimization of Differentiable Functions of Several Variables, Floating Point General Routine.	

PUBLICATIONS AND PAPERS

Publications

- 1) Erwin H. Bareiss, UN 639 "A Survey and Classification of Transport Theory Calculation Techniques," and Supplement "List of Unclassified Transport Theory Calculation Techniques in the United States as of July 1, 1958," Proceedings 2nd International Conference on Peaceful Uses of Atomic Energy, Geneva, 1958.
- 2) W. F. Miller, John Reynolds, and William J. Snow, "Efficiencies and Photofractions for Gamma Radiation on Sodium-Iodide (Thallium Activated) Crystals," Rev. Sci. Instr. 30, 141 (1959) (Letter).

ANL Reports

- 1) ANL-5977, "AX-1, A Computing Program for Coupled Neutronics - Hydrodynamics Calculations on the IBM-704," by D. Okrent, J. M. Cook, D. Satkus, R. B. Lazarus and M. B. Wells.
- 2) ANL-5997, "Resultant Procedure, A Method for Finding the Zeros of Real Polynomials" by Erwin H. Bareiss
- 3) ANL-5984, "Calculation of Group Cross Sections for Hot Monoatomic Moderator with Variable Flux Weighting Within Groups," by E. H. Bareiss, J. Denes and V. Z. Jankus.
- 4) ANL-6027, "Analog Computer Solution of the Non-linear Reactor Kinetics Equation," by N. F. Morehouse and L. T. Bryant.
- 5) ANL-5902, "Efficiencies and Photofractions for Gamma Radiation on Sodium-Iodide (Thallium Activated) Crystals," by W. F. Miller, John Reynolds, and William J. Snow.
- 6) ANL-5995, "GEORGE Programming Manual" by Loretta Kassel with appendices by Donald A. Flanders.
- 7) Special ANL Report. "Functions of a Hyper Complex Variable," Lectures by Rudolph Fueter, written and supplemented by Erwin H. Bareiss.
- 8) ANL-5859 "RE-34, An IBM-704 Reactor Shielding Program" by M. K. Butler and J. M. Cook.

AMD Technical Memoranda

- 1) No. 7 "Multiple Scattering Corrections for Neutron Scattering in Thin Plates," by W. F. Miller.

Papers Presented at Meetings

- 1) AX-1, "A Computing Program for Coupled Neutronics - Hydrodynamics Calculations on the IBM-704," by D. Okrent, J. M. Cook, D. Satkus, R. B. Lazarus and M. B. Wells - presented orally by J. M. Cook at the annual meeting of the American Nuclear Society in Gatlinburg, Tennessee, June 16, 1959.

SEMINARS, LECTURES AND COURSES

Applied Mathematics Seminar

July 17, 1958	"Some Applications of Applied Mathematics to Number Theory. First Lecture: Periodic Motion" by Professor Harvey Cohn, Washington University, St. Louis, Missouri.
July 24, 1958	"Interpretation of Undecidables in Terms of Computers" by Professor Harvey Cohn, Washington University, St. Louis, Missouri.
November 7, 1958	"Problems in Buckling of Plates" by Professor Fritz John, Head, Mathematics Department, and Institute of Mathematical Sciences, New York University, New York, New York.
November 20, 1958	"Mathematical Problems in Controlled Fusion" by James W. Butler, Argonne National Laboratory.
December 4, 1958	"The Asymptotic Solution of Ordinary Linear Differential Equations Involving a Parameter" by Professor R. E. Langer, Director, Mathematics Research Center, United States Army, and University of Wisconsin, Madison, Wisconsin.
December 19, 1958	"Stability" by Professor Peter D. Lax, Institute of Mathematical Sciences, New York University, New York, New York.
January 8, 1959	"Multidimensional Interpolation" by Dr. Henry Thacher, Argonne National Laboratory.
January 26, 1959	"Thermal Stress Calculations" by Professor Hans Bueckner, Mathematics Research Center, University of Wisconsin, Madison, Wisconsin.
February 13, 1959	"Some Methods for Expanding the Characteristic Polynomial," by Dr. Alston S. Householder, Chief, Mathematics Panel, Oak Ridge National Laboratory, Oak Ridge, Tennessee.
February 20, 1959	"Activities of the Computer Institute at The University of Chicago" by Professor Nicholas Metropolis, Enrico Fermi Institute for Nuclear Studies, The University of Chicago, Illinois

- March 13, 1959 "Methods for Solving the Neutron Transport Equation" by Professor Herbert B. Keller, New York University and the Institute of Mathematical Sciences, New York, New York
- March 25, 1959 "Monte Carlo Methods and Systematic Sampling" by Professor R. D. Richtmyer, Director, AEC Computing and Applied Mathematics Center, New York University, New York, New York.
- April 10, 1959 "Numerical Analysis of Nonlinear Problems for Flow in Open Channels" by Professor J. J. Stoker, Director of the Institute of Mathematical Sciences, New York University, New York, New York.
- April 23, 1959 "Unified Approach to Boundary Value Problems of Elliptic, Hyperbolic and Mixed Type" by Professor K. O. Friedrichs, New York University and the Institute of Mathematical Sciences, New York, New York.
- May 4, 1959 "Eigenvalues of Composite Matrices" by Professor Bernard Friedman, Department of Mathematics, University of California, Berkeley, California. (Part I)
- May 4, 1959 "Eigenvalues of Composite Matrices" by Professor Bernard Friedman, Department of Mathematics, University of California, Berkeley, California. (Part II).
- May 15, 1959 "Some Problems in Thermoelasticity" by Professor Ian Sneddon, Simson Professor of Mathematics, University of Glasgow, Glasgow, Scotland.
- May 21, 1959 "The Applications of the Theory of Distributions to Problems of Wave Propagation and Radiation" by Professor Richard Courant, Director, Institute of Mathematical Sciences, New York University, New York, New York.
- May 22, 1959 "The Applications of the Theory of Distributions to Problems of Wave Propagation and Radiation" by Professor Richard Courant, Director, Institute of Mathematical Sciences, New York University, New York, New York.
- June 3, 1959 "The Programming System at Cambridge University" by Professor David J. Wheeler, Cambridge University, Cambridge, England.

- June 11, 1959 "The Bending of a Cylindrical Beam by a Transverse Load" by Professor Em. Louis M. Milne-Thomson, Royal Naval College, Greenwich, England.
- June 25, 1959 "Geometry of Convex Bodies" by Professor Preston Hammer, Director, Numerical Analysis Laboratory, University of Wisconsin, Madison, Wisconsin.

Lectures Presented at Meetings

"Notes on Cross Section Calculating" presented at the AEC Computing Group meeting, by Erwin H. Bareiss, on May 8, 1959.

"The Argonne National Laboratory" presented before the American-Swiss Chamber of Commerce in Chicago by Erwin H. Bareiss on May 18, 1959.

"Transport Theory Codes" presented before the American Nuclear Society, Nuclear Codes Group meeting at Gatlinburg, Tennessee, by Erwin H. Bareiss, June 15, 1959.

"The RDR Flexible Transport Theory Codes, and the Theory of Multi-Polynomial Approximations" presented by Erwin H. Bareiss at the Symposium on Numerical Solution of the Boltzman Transport Equation, CEN, Windsor, Conn. January 15, 1959.

"Digital Computers of the Applied Mathematics Division" presented to members of the Lemont Illinois High School Science Club, by David L. Phillips on February 16, 1959

"The Role of Applied Mathematics and Computers in Basic Research" presented by W. F. Miller before the Mathematics and Physics classes of Vincennes University, April 14, 1959.

Courses Given

Calculus Review: 2- $\frac{1}{2}$ hrs. per week from March through June, 1959.
Instructor: David L. Phillips
Content: Non-credit refresher course for ANL employees
who had previously taken calculus.

GEORGE Programming: 4- $\frac{1}{2}$ hrs. per week for 3 weeks. Began June 22, 1959.
Instructor: Loretta Kassel
Contents: GEORGE order structure and machine language
programming.

COMPUTER SERVICES COUNCIL

A Computer Services Council was organized during the report period. The Council is comprised of one or more representatives from each of the several Laboratory Divisions that are interested in the application of high-speed computers to their work. The Council was established to provide improved communications and liaison between those who desire to use the available computational services and those who provide these services. Regular meetings of the Council are held quarterly.

EQUIPMENT

The computing equipment described below is currently available in the Applied Mathematics Division for carrying out computations.

- 1) An IBM-704 digital computer equipped with:
  - an 8192 word magnetic core memory,
  - an 8192 word magnetic drum memory
  - up to nine on-line magnetic tape units, and
  - an off-line punched card to magnetic tape unit, as well as a magnetic tape to printer off-line unit.
- 2) The Laboratory-designed and built digital computer GEORGE, equipped with:
  - a 4096 word magnetic core memory,
  - paper tape input and output, and
  - 4 magnetic tape units for internal memory storage.
- 3) A PACE analog computer consisting of two computing consoles (which can be coupled) each complete with:
  - 28 integrating amplifiers,
  - 28 summing amplifiers,
  - 10 servo mechanisms,
  - 5 electronic multipliers,
  - 5 diode function generators, and
  - 80 scale factor potentiometers
- 4) An Electronic Associates graph plotter operated from paper tape, punched card, or manual input.
- 5) A paper tape to punched card converter designed to make GEORGE output compatible with the 704 installation.