======================================================================= Recent

Recent

PROGRAM RECENT Recent

============== Recent

VERSION 79-1 (OCTOBER 1979) CDC-7600 Recent

VERSION 80-1 (MAY 1980) IBM, CDC AND CRAY VERSION Recent

VERSION 80-2 (DECEMBER 1980) IMPROVED TREATMENT OF UNRESOLVED Recent

REGION TO COMPUTE ALL REACTIONS AT Recent

THE SAME TIME. Recent

VERSION 81-1 (MARCH 1981) IMPROVED BASED ON USER COMMENTS. Recent

VERSION 81-2 (AUGUST 1981) ADDED MONITOR MODE. ADDED SPEED OPTION Recent

TO BYPASS BACKWARDS THINNING IF FILE 3 Recent

ALLOWABLE ERROR = 0.0 (NOTE THIS OPTION Recent

WILL RESULT IN ALL TABULATED POINTS Recent

FROM THE EVALUATION BEING KEPT IN THE Recent

OUTPUT FROM THIS PROGRAM). Recent

VERSION 82-1 (JANUARY 1982) IMPROVED COMPUTER COMPATIBILITY. Recent

VERSION 83-1 (JANUARY 1983)\*MAJOR RE-DESIGN. Recent

\*PAGE SIZES INCREASED. Recent

\*ELIMINATED COMPUTER DEPENDENT CODING. Recent

\*NEW, MORE COMPATIBLE I/O UNIT NUMBERS. Recent

\*ADDED OPTION TO KEEP ALL RECONSTRUCTED Recent

AND BACKGROUND ENERGY POINTS. Recent

\*ADDED STANDARD ALLOWABLE ERROR OPTIONS Recent

(CURRENTLY 0.1 PER-CENT RECONSTRUCTION Recent

AND 0.0 PER-CENT THINNING). Recent

VERSION 83-2 (OCTOBER 1983) IMPROVED BASED ON USER COMMENTS. Recent

VERSION 84-1 (JANUARY 1984) IMPROVED INTERVAL HALFING CONVERGENCE. Recent

VERSION 85-1 (APRIL 1985) \*A BRAND NEW PROGRAM WHICH COMPLETELY Recent

SUPERCEDES ALL PREVIOUS VERSIONS OF Recent

THIS PROGRAM. Recent

\*UPDATED FOR ENDF/B-VI FORMATS. Recent

\*ADDED GENERAL REICH-MOORE FORMALISM Recent

(WITH TWO FISSION CHANNELS). Recent

\*DECREASED RUNNING TIME. Recent

\*SPECIAL I/O ROUTINES TO GUARANTEE Recent

ACCURACY OF ENERGY. Recent

\*DOUBLE PRECISION TREATMENT OF ENERGY Recent

(REQUIRED FOR NARROW RESONANCES). Recent

VERSION 85-2 (AUGUST 1985) \*FORTRAN-77/H VERSION Recent

VERSION 86-1 (JANUARY 1986)\*ENERGY DEPENDENT SCATTERING RADIUS Recent

VERSION 86-2 (JUNE 1986) \*IF FIRST CHANCE FISSION (MT=19) Recent

BACKGROUND IS PRESENT ADD RESONANCE Recent

CONTRIBUTION OF FISSION TO IT. Recent

VERSION 86-3 (OCTOBER 1986)\*MULTI-LEVEL OR REICH-MOORE..CORRECT Recent

POTENTIAL SCATTERING CROSS SECTION FOR Recent

MISSING AND/OR FICTICIOUS (L,J) Recent

SEQUENCES. Recent

VERSION 87-1 (JANUARY 1987)\*IMPROVED COMBINING FILE 2+3 Recent

VERSION 87-2 (MARCH 1987) \*CORRECTED ADLER-ADLER CALCULATIONS. Recent

VERSION 88-1 (JULY 1988) \*UPDATED REICH-MOORE ENDF/B-VI FORMAT Recent

TO BE THE SAME AS REICH-MOORE FORMAT Recent

IN EARLIER VERSIONS OF ENDF/B FORMAT. Recent

\*CHECK FOR PRELIMINARY ENDF/B-VI Recent

REICH-MOORE FORMAT (NOW ABANDONED) Recent

AND TERMINATE EXECUTION IF DATA IS Recent

IN THIS FORMAT. Recent

\*CALCULATE CHANNEL RADIUS OR SET IT Recent

EQUAL TO THE SCATTERING RADIUS. Recent

\*IMPLEMENTED HYBRID R-FUNCTION WITH THE Recent

FOLLOWING RESTRICTIONS Recent

- ONLY INELASTIC COMPETITION (NO Recent

CHARGED PARTICLES) Recent

- NO TABULATED FILE 2 BACKGROUND Recent

- NO TABULATED OPTICAL MODEL PHASE Recent

SHIFT Recent

\*PROGRAM EXIT IF GENERAL R-MATRIX IN Recent

THE EVALUATION (THIS FORMALISM WILL Recent

BE IMPLEMENTED ONLY AFTER THE AUTHOR Recent

RECEIVES REAL EVALUATIONS WHICH USE Recent

THIS FORMALISM...UNTIL THEN IT IS Recent

IMPOSSIBLE TO ADEQUATELY TEST THAT Recent

THE CODING FOR THIS FORMALISM IS Recent

CORRECT). Recent

\*INCREASED MAXIMUM NUMBER OF RESONANCES Recent

FROM 1002 TO 4008. Recent

\*DOUBLE PRECISION RESONANCE REGION Recent

LIMITS. Recent

\*FILE 2 AND FILE 3 ENERGIES WHICH ARE Recent

NEARLY EQUAL ARE TREATED AS EQUAL Recent

(I.E., SAME TO ABOUT 9 DIGITS). Recent

\*CHECK FILE 3 BACKGROUND CROSS SECTIONS Recent

IN EDIT MODE. Recent

\*OPTION...INTERNALLY DEFINE FILENAMES Recent

(SEE SUBROUTINE FILEIO FOR DETAILS). Recent

VERSION 89-1 (JANUARY 1989)\*PSYCHOANALYZED BY PROGRAM FREUD TO Recent

INSURE PROGRAM WILL NOT DO ANYTHING Recent

CRAZY. Recent

\*UPDATED TO USE NEW PROGRAM CONVERT Recent

KEYWORDS. Recent

\*CORRECTED MULTILEVEL, REICH-MOORE AND Recent

HYBRID R-FUNCTION POTENTIAL SCATTER Recent

TO ACCOUNT FOR REPEATED J-VALUES FOR Recent

THE SAME TARGET SPIN AND L-VALUE. Recent

\*ADDED LIVERMORE CIVIC COMPILER Recent

CONVENTIONS. Recent

\*UPDATED TO USE NEW ENDF/B-VI Recent

CONVENTION TO ALLOW UNRESOLVED Recent

RESONANCE CONTRIBUTION TO ALREADY Recent

BE INCLUDED IN THE FILE 3 CROSS Recent

SECTIONS (INFINITELY DIULUTE Recent

CONTRIBUTION). Recent

VERSION 90-1 (JUNE 1990) \*UPDATED BASED ON USER COMMENTS Recent

\*ADDED FORTRAN SAVE OPTION Recent

\*NEW MORE CONSISTENT ENERGY OUTPUT Recent

ROUTINE Recent

VERSION 91-1 (JULY 1991) \*NEW UNIFORM TREATMENT OF ALL RESONANCE Recent

FORMALISMS (SEE, COMMENTS BELOW) Recent

\*NEW REICH-MOORE ALGORITHM Recent

\*MORE EXTENSIVE ERROR CHECKING AND Recent

ERROR MESSAGE EXPLANATIONS Recent

VERSION 92-1 (JANUARY 1992)\*MAJOR RESTRUCTING TO IMPROVE ACCURACY Recent

AND COMPUTER INDEPENDENCE. Recent

\*INCREASED ENERGY POINT PAGE SIZE FROM Recent

1002 TO 4008. Recent

\*NO MORE THAN 2 ENERGY POINTS WHERE Recent

CROSS SECTION IS ZERO AT BEGINNING Recent

OF A SECTION FOR EACH REACTION,E.G., Recent

THRESHOLD FISSION. Recent

\*PROCESS ONLY A PORTION OF RESONANCE Recent

REGION - SEE EXPLANATION BELOW Recent

\*ALL ENERGIES INTERNALLY ROUNDED PRIOR Recent

TO CALCULATIONS. Recent

\*COMPLETELY CONSISTENT I/O AND ROUNDING Recent

ROUTINES - TO MINIMIZE COMPUTER Recent

DEPENDENCE. Recent

VERSION 93-1 (MARCH 1993) \*UPDATED REICH-MOORE TREATMENT TO USE Recent

L DEPENDENT SCATTERING RADIUS (APL) Recent

RATHER THAN SCATTERING RADIUS (AP) Recent

(SEE, ENDF/B-VI FORMATS AND Recent

PROCEDURES MANUAL, PAGE 2.6) Recent

\*INCREASED PAGE SIZE FROM 4008 TO Recent

20040 DATA POINTS. Recent

\*INCREASED MAXIMUM NUMBER OF RESONANCES Recent

FROM 4008 TO 20040. Recent

VERSION 94-1 (JANUARY 1994)\*VARIABLE ENDF/B DATA FILENAMES Recent

TO ALLOW ACCESS TO FILE STRUCTURES Recent

(WARNING - INPUT PARAMETER FORMAT Recent

HAS BEEN CHANGED). Recent

\*CLOSE ALL FILES BEFORE TERMINATING Recent

(SEE, SUBROUTINE ENDIT) Recent

VERSION 94-2 (AUGUST 1994) \*CORRECTED ADDJ FOR ENERGY DEPENDENT Recent

(TABULATED) SCATTERING RADIUS CASE. Recent

VERSION 96-1 (JANUARY 1996) \*COMPLETE RE-WRITE Recent

\*IMPROVED COMPUTER INDEPENDENCE Recent

\*ALL DOUBLE PRECISION Recent

\*ON SCREEN OUTPUT Recent

\*UNIFORM TREATMENT OF ENDF/B I/O Recent

\*IMPROVED OUTPUT PRECISION Recent

\*ALWAYS INCLUDE THERMAL VALUE Recent

\*DEFINED SCRATCH FILE NAMES Recent

VERSION 97-1 (APRIL 1997) \*OPTIONAL MAKE NEGATIVE CROSS Recent

SECTION = 0 FOR OUTPUT Recent

\*INCREASED PAGE SIZE FROM 20040 TO Recent

120000 DATA POINTS. Recent

\*INCREASED MAXIMUM NUMBER OF RESONANCES Recent

FROM 20040 TO 120000. Recent

VERSION 99-1 (MARCH 1999) \*CORRECTED CHARACTER TO FLOATING Recent

POINT READ FOR MORE DIGITS Recent

\*UPDATED TEST FOR ENDF/B FORMAT Recent

VERSION BASED ON RECENT FORMAT CHANGE Recent

\*UPDATED CONSTANTS BASED ON CSEWG Recent

SUBCOMMITTEE RECOMMENDATIONS Recent

\*GENERAL IMPROVEMENTS BASED ON Recent

USER FEEDBACK Recent

VERSION 99-2 (JUNE 1999) \*IMPLEMENTED NEW REICH-MOORE FORMALISM Recent

TO ALLOW DEFINITION OF (L,J,S) FOR Recent

EACH SEQUENCE. Recent

\*ASSUME ENDF/B-VI, NOT V, IF MISSING Recent

MF=1, MT-451. Recent

VERS. 2000-1 (FEBRUARY 2000)\*GENERAL IMPROVEMENTS BASED ON Recent

USER FEEDBACK Recent

VERS. 2002-1 (MAY 2002) \*OPTIONAL INPUT PARAMETERS Recent

(SEPT. 2002) \*OUTPUT RESONANCE WITH 9 DIGITS Recent

\*TO BE C AND C++ COMPATIBLE OUTPUT Recent

VERS. 2004-1 (JAN. 2004) \*ADDED INCLUDE 'recent.h' Recent

\*MADE ENDF/B-VII READY Recent

\*UPDATED FOR NEW REICH-MOORE LRF=7 Recent

PARAMETERS WITH COMPETITION Recent

\*ADDED COULOMB PENETRATION FACTORS FOR Recent

LRF=7 COMPETITIVE CHANNELS. Recent

\*EXTENDED DEFINITIONS OF PENETRATION Recent

FACTOR, LEVEL SHIFT FACTOR, AND Recent

POTENTIAL SCATTERING PHASE SHIFT Recent

ABOVE L = 5 TO INFINITY. Recent

\*ADDED QUICK CALCULATION - IF THE Recent

INPUT ALLOWABLE ERROR IS 1.0 OR MORE Recent

(100 % OR MORE) THERE IS NO ITERATION Recent

TO CONVERGENCE - CROSS SECTION ARE Recent

QUICKLY CALCULATED ONLY AT A FIXED Recent

SET OF ENERGY POINTS, BASED ON THE Recent

ENERGY AND WIDTH OF ALL RESONANCES. Recent

THIS CAN BE USED TO QUICKLY "SEE" Recent

NEW EVALUATIONS THAT MAY CONTAIN Recent

ERRORS, THAT WOULD OTHERWISE CAUSE Recent

THIS CODE TO RUN FOR AN EXCESSIVELY Recent

LONG TIME. Recent

VERS. 2005-1 (JUNE 2005) \*ADDED ENERGY DEPENDENT SCATTERING Recent

RADIUS FOR ALL RESONANCE TYPES Recent

(EARLIER ONLY BREIT-WIGNER ALLOWED). Recent

VERS. 2007-1 (JAN. 2007) \*CHECKED AGAINST ALL ENDF/B-VII. Recent

\*DECOUPLED PAGE SIZE FROM MAX. # OF Recent

RESONANCES. Recent

\*INCREASED PAGE SIZE FROM 120,000 TO Recent

750,000 DATA POINTS. Recent

\*KEPT MAX. # OF RESONANCE AT 120,000. Recent

\*CORRECTED ALL BACKGROUND = 0 CASE Recent

VERS. 2007-2 (OCT. 2007) \*NO MT=19 OUTPUT IF NO BACKGROUND, Recent

REGARDLESS OF INPUT OPTION. Recent

\*72 CHARACTER FILE NAMES. Recent

VERS. 2008-1 (FEB. 2008) \*CORRECTED NAPS ERROR - NOW DEFINE FOR Recent

ALL TYPES OF PARAMETERS - EARLIER Recent

ONLY DEFINED FOR B-W PARAMETERS. Recent

VERS. 2008-2 (APRIL 2008) \*CORRECTED NRO/NAPS=1/1 - MUST Recent

DEFINE RHOX2 AT EACH RESONANCE USING Recent

SETRHO1 BEFORE ENERGY DEPENDENT Recent

CALCULATION. Recent

\*ADDED PRECISION TO RESONANCE PROFILE Recent

IN SUBROUTINE SUBINT Recent

VERS. 2009-1 (JULY 2009) \*NEW REICH-MOORE COMPETITIVE WIDTHS - Recent

IF CHARGED PARTICLE REACTION (MT=103 Recent

THROUGH 107) WILL ADD RESONANCE Recent

CONTRIBUTION TO COMPETITIVE MT AND IF Recent

PRESENT, THE GROUND LEVEL, MT = 600 Recent

THROUGH 800. IF COMPETITIVE CHANNEL Recent

IS mt=4 (TOTAL N.N') IT WILL ALSO ADD Recent

COMPETITIVE RESONANCE CONTRIBUTION TO Recent

MT=50 (N,N' GROUND). Recent

\*NEW REICH-MOORE - SUM COMPETITIVE Recent

WIDTHS IF ALL FOR THE SAME STATE (MT) Recent

VERS. 2009-2 (AUG. 2009) \*RE-WRITE TO USE 12, RATHER THAN 6, Recent

PAAMETERS PER RESONANCE. Recent

\*MAJOR RE-WRITE TO ACCOMODATE GENERAL Recent

REICH-MOORE (LRF=7). Recent

\*COMPLETE RE-WRITE FOR ADLER-ADLER Recent

AND HRF (N O LONGER USED IN ENDF/B) Recent

TO USE 12 PARAMETERS PER RESNANCE. Recent

VERS. 2010-1 (April 2010) \*ADDED SAMRML LOGIC TO HANDLE ALL Recent

LRF=7 CASES. Recent

\*EXTENDED SAMRML LOGIC TO PROCESS ALL Recent

EVALUATIONS = RESOLVED + UNRESOLVED + Recent

TABULATED - SAMRML ONLY DOES ONE Recent

SECTION OF RESOLVED LRF=7 DATA Recent

WITHOUT TABULATED BACKGROUND. Recent

\*UPDATED ELASTIC POTENTIAL CALCULATION Recent

FOR TOTAL (SLBW) AND CORRECTION FOR Recent

MISSING SEQUENCES (MLBW, RM, HRF). Recent

\*ADDED HIDDEN (OPTIONAL) UNRESOLVED Recent

COMPETITION LISTING (NOT ENDF/B). Recent

\*ADDED BOB MACFARLANE'S PROPOSAL - USE Recent

LRX TO DEFINE COMPETITIVE L VALUE - Recent

COMPETITIVE L = LRX - 1, IF LRX > 0. Recent

\*CHECKED FOR NEGATIVE WIDTHS. Recent

VERS. 2012-1 (Nov. 2012) \*ADDED ENERGY DEPENDENT STEP SIZE Recent

FOR STARTING GRID AROUND RESONANCES. Recent

\*Added CODENAME Recent

\*32 and 64 bit Compatible Recent

\*Added ERROR stops Recent

\*Check for no capture for Reich-Moore. Recent

VERS. 2012-2 (Nov. 2012) \*Eliminated ERROR in NHIGH(0) index. Recent

VERS. 2013-1 (Nov. 2013) \*Extended OUT9. Recent

VERS. 2015-1 (Jan. 2015) \*Multiple LRF=7, General Reich-Moore Recent

Resonance Regions. Recent

\*Added OUT10. Recent

\*Replaced ALL 3 way IF Statements. Recent

\*Replaced ALL LOGICAL by INTEGER. Recent

Recent

OWNED, MAINTAINED AND DISTRIBUTED BY Recent

------------------------------------ Recent

THE NUCLEAR DATA SECTION Recent

INTERNATIONAL ATOMIC ENERGY AGENCY Recent

P.O. BOX 100 Recent

A-1400, VIENNA, AUSTRIA Recent

EUROPE Recent

Recent

ORIGINALLY WRITTEN BY Recent

------------------------------------ Recent

Dermott E. Cullen Recent

Recent

PRESENT CONTACT INFORMATION Recent

--------------------------- Recent

Dermott E. Cullen Recent

1466 Hudson Way Recent

Livermore, CA 94550 Recent

U.S.A. Recent

Telephone 925-443-1911 Recent

E. Mail RedCullen1@Comcast.net Recent

Website http://home.comcast.net/~redcullen1 Recent

Recent

Acknowledgement (Version 2004-1) Recent

================================================================== Recent

The author thanks Nancy Larson, ORNL, for providing her SAMRML Recent

code for comparison to RECENT output for Reich-Moore evaluations, Recent

in particular to verify results for the new LFR=7 evaluations. I Recent

also thank her for providing guidance to help me understand and Recent

implement this new teatment for Reich-Moore parameters. Recent

Recent

ACKNOWLEDGEMENT (VERSION 92-1) Recent

================================================================== Recent

THE AUTHOR THANKS SOL PEARLSTEIN (BROOKHAVEN NATIONAL LAB) FOR Recent

SIGNIFICANTLY CONTRIBUTING TOWARD IMPROVING THE ACCURACY AND Recent

COMPUTER INDEPENDENCE OF THIS CODE - THANKS, SOL Recent

================================================================== Recent

Recent

AUTHORS MESSAGE Recent

================================================================== Recent

THE REPORT DESCRIBED ABOVE IS THE LATEST PUBLISHED DOCUMENTATION Recent

FOR THIS PROGRAM. HOWEVER, THE COMMENTS BELOW SHOULD BE CONSIDERED Recent

THE LATEST DOCUMENTATION INCLUDING ALL RECENT IMPROVEMENTS. PLEASE Recent

READ ALL OF THESE COMMENTS BEFORE IMPLEMENTATION, PARTICULARLY Recent

THE COMMENTS CONCERNING MACHINE DEPENDENT CODING. Recent

Recent

AT THE PRESENT TIME WE ARE ATTEMPTING TO DEVELOP A SET OF COMPUTER Recent

INDEPENDENT PROGRAMS THAT CAN EASILY BE IMPLEMENTED ON ANY ONE Recent

OF A WIDE VARIETY OF COMPUTERS. IN ORDER TO ASSIST IN THIS PROJECT Recent

IT WOULD BE APPECIATED IF YOU WOULD NOTIFY THE AUTHOR OF ANY Recent

COMPILER DIAGNOSTICS, OPERATING PROBLEMS OR SUGGESTIONS ON HOW TO Recent

IMPROVE THIS PROGRAM. HOPEFULLY, IN THIS WAY FUTURE VERSIONS OF Recent

THIS PROGRAM WILL BE COMPLETELY COMPATIBLE FOR USE ON YOUR Recent

COMPUTER. Recent

Recent

PURPOSE Recent

================================================================== Recent

THIS PROGRAM IS DESIGNED TO RECONSTRUCT THE RESONANCE CONTRIBUTION Recent

TO THE CROSS SECTION IN LINEARLY INTERPOLABLE FORM, ADD IN ANY Recent

LINEARLY INTERPOLABLE BACKGROUND CROSS SECTION AND OUTPUT THE Recent

RESULT IN THE ENDF/B FORMAT. THE CROSS SECTIONS OUTPUT BY THIS Recent

PROGRAM WILL BE LINEARLY INTERPOLABLE OVER THE ENTIRE ENERGY RANGE Recent

Recent

THE RESONANCE CONTRIBUTION IS CALCULATED FOR TOTAL (MT=1), Recent

ELASTIC (MT=2), CAPTURE (MT=102) AND FISSION (MT=18), ADDED Recent

TO THE BACKGROUND (IF ANY) AND OUTPUT. IN ADDITION, IF THERE Recent

IS A FIRST CHANCE FISSION (MT=19) BACKGROUND PRESENT THE RESONANCE Recent

CONTRIBUTION OF FISSION WILL BE ADDED TO THE BACKGROUND AND Recent

OUTPUT. IF THERE IS NO FIRST CHANCE FISSION (MT=19) BACKGROUND Recent

PRESENT THE PROGRAM WILL NOT OUTPUT MT=19. Recent

Recent

IN THE FOLLOWING FOR SIMPLICITY THE ENDF/B TERMINOLOGY--ENDF/B Recent

TAPE--WILL BE USED. IN FACT THE ACTUAL MEDIUM MAY BE TAPE, CARDS, Recent

DISK OR ANY OTHER MEDIUM. Recent

Recent

PROCESSING DATA IN THE ENDF/B-VI FORMAT Recent

================================================================== Recent

IT HAS NOW BEEN CONFIRMED (PRIVATE COMMUNICATION, CHARLES DUNFORD, Recent

APRIL, 1991) THAT THE PROPER PROCEDURE TO FOLLOW WHEN THERE ARE Recent

MISSING OR DUPLICATE J VALUES IS TO IN ALL CASES ADD A SEQUENCE Recent

WITH NO RESONANCES TO ACCOUNT FOR THE CONTRIBUTION OF THE SEQUENCE Recent

TO THE POTENTIAL SCATTERING CROSS SECTION. Recent

Recent

THIS IS THE PROCEDURE WHICH WAS FOLLOWED BY ALL VERSIONS OF RECENT Recent

SINCE 86-3 AND WILL CONTINUE TO BE THE PROCEDURE. Recent

Recent

INPUT ENDF/B FORMAT AND CONVENTIONS Recent

================================================================== Recent

ENDF/B FORMAT Recent

------------- Recent

THIS PROGRAM ONLY USES THE ENDF/B BCD OR LINE IMAGE FORMAT (AS Recent

OPPOSED TO THE BINARY FORMAT) AND CAN HANDLE DATA IN ANY VERSION Recent

OF THE ENDF/B FORMAT (I.E., ENDF/B-I, II,III, IV, V OR VI FORMAT). Recent

Recent

IT IS ASSUMED THAT THE DATA IS CORRECTLY CODED IN THE ENDF/B Recent

FORMAT AND NO ERROR CHECKING IS PERFORMED. IN PARTICULAR IT IS Recent

ASSUMED THAT THE MAT, MF AND MT ON EACH LINE IS CORRECT. SEQUENCE Recent

NUMBERS (COLUMNS 76-80) ARE IGNORED ON INPUT, BUT WILL BE Recent

CORRECTLY OUTPUT ON ALL CARDS. THE FORMAT OF SECTION MF=1, MT=451 Recent

AND ALL SECTIONS OF MF=2 AND 3 MUST BE CORRECT. THE PROGRAM COPIES Recent

ALL OTHER SECTION OF DATA AS HOLLERITH AND AS SUCH IS INSENSITIVE Recent

TO THE CORRECTNESS OR INCORRECTNESS OF ALL OTHER SECTIONS. Recent

Recent

ENDF/B FORMAT VERSION Recent

--------------------- Recent

THE FORMATS AND CONVENTIONS FOR READING AND INTERPRETING THE DATA Recent

VARIES FROM ONE VERSION OF ENDF/B TO THE NEXT. HOWEVER, IF THE Recent

HOLLERITH SECTION (MF=1, MT=451) IS PRESENT IT IS POSSIBLE FOR Recent

THIS PROGRAM TO DISTINGUISH BETWEEN DATA IN THE ENDF/B-IV, V AND Recent

VI FORMATS AND TO USE THE APPROPRIATE CONVENTIONS FOR EACH Recent

ENDF/B VERSION (SEE, SUBROUTINE FILE1 FOR A DESCRIPTION OF HOW Recent

THIS IS DONE). IF THE HOLLERITH SECTION IS NOT PRESENT THE Recent

PROGRAM WILL ASSUME THE DATA IS IN THE ENDF/B-VI FORMAT AND USE Recent

ALL CONVENTIONS APPROPRIATE TO ENDF/B-V. USERS ARE ENCOURAGED TO Recent

INSURE THAT THE HOLLERITH SECTION (MF=1, MT=451) IS PRESENT IN Recent

ALL EVALUATIONS. Recent

Recent

INPUT OF ENERGIES Recent

----------------- Recent

ALL ENERGIES ARE READ IN DOUBLE PRECISION (BY SPECIAL FORTRAN I/O Recent

ROUTINES) AND ARE TREATED IN DOUBLE PRECISION IN ALL CALCULATIONS. Recent

Recent

OUTPUT ENDF/B FORMAT AND CONVENTIONS Recent

================================================================== Recent

CONTENTS OF OUTPUT Recent

------------------ Recent

ENTIRE EVALUATIONS ARE OUTPUT, NOT JUST THE RECONSTRUCTED FILE Recent

3 CROSS SECTIONS, E.G. ANGULAR AND ENERGY DISTRIBUTIONS ARE Recent

ALSO INCLUDED. Recent

Recent

DOCUMENTATION Recent

------------- Recent

THE FACT THAT THIS PROGRAM HAS OPERATED ON THE DATA IS DOCUMENTED Recent

BY THE ADDITION OF COMMENT CARDS AT THE END OF EACH HOLLERITH Recent

SECTION IN THE FORM Recent

Recent

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* RECENT (VERSION 2015-1) \*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Recent

RESONANCE CONTRIBUTION RECONSTRUCTED TO WITHIN 0.100 PER-CENT Recent

COMBINED DATA NOT THINNED (ALL RESONANCE + BACKGROUND DATA KEPT) Recent

Recent

THE ORDER OF ALL SIMILAR COMMENTS (FROM LINEAR, SIGMA1 AND GROUPY) Recent

REPRESENTS A COMPLETE HISTORY OF ALL OPERATIONS PERFORMED ON Recent

THE DATA, INCLUDING WHICH VERSION OF EACH PROGRAM WAS USED. Recent

Recent

THESE COMMENT CARDS ARE ONLY ADDED TO EXISTING HOLLERITH SECTIONS, Recent

I.E., THIS PROGRAM WILL NOT CREATE A HOLLERITH SECTION. THE FORMAT Recent

OF THE HOLLERITH SECTION IN ENDF/B-V DIFFERS FROM THE THAT OF Recent

EARLIER VERSIONS OF ENDF/B. BY READING AN EXISTING MF=1, MT=451 Recent

IT IS POSSIBLE FOR THIS PROGRAM TO DETERMINE WHICH VERSION OF Recent

THE ENDF/B FORMAT THE DATA IS IN. WITHOUT HAVING A SECTION OF Recent

MF=1, MT=451 PRESENT IT IS IMPOSSIBLE FOR THIS PROGRAM TO Recent

DETERMINE WHICH VERSION OF THE ENDF/B FORMAT THE DATA IS IN, AND Recent

AS SUCH IT IS IMPOSSIBLE FOR THE PROGRAM TO DETERMINE WHAT FORMAT Recent

SHOULD BE USED TO CREATE A HOLLERITH SECTION. Recent

Recent

REACTION INDEX Recent

-------------- Recent

THIS PROGRAM DOES NOT USE THE REACTION INDEX WHICH IS GIVEN IN Recent

SECTION MF=1, MT=451 OF EACH EVALUATION. Recent

Recent

THIS PROGRAM DOES NOT UPDATE THE REACTION INDEX IN MF=1, MT=451. Recent

THIS CONVENTION HAS BEEN ADOPTED BECAUSE MOST USERS DO NOT Recent

REQUIRE A CORRECT REACTION INDEX FOR THEIR APPLICATIONS AND IT WAS Recent

NOT CONSIDERED WORTHWHILE TO INCLUDE THE OVERHEAD OF CONSTRUCTING Recent

A CORRECT REACTION INDEX IN THIS PROGRAM. HOWEVER, IF YOU REQUIRE Recent

A REACTION INDEX FOR YOUR APPLICATIONS, AFTER RUNNING THIS PROGRAM Recent

YOU MAY USE PROGRAM DICTIN TO CREATE A CORRECT REACTION INDEX. Recent

Recent

OUTPUT FORMAT OF ENERGIES Recent

------------------------- Recent

IN THIS VERSION OF RECENT ALL FILE 3 ENERGIES WILL BE OUTPUT IN Recent

F (INSTEAD OF E) FORMAT IN ORDER TO ALLOW ENERGIES TO BE WRITTEN Recent

WITH UP TO 9 DIGITS OF ACCURACY. IN PREVIOUS VERSIONS THIS WAS AN Recent

OUTPUT OPTION. HOWEVER USE OF THIS OPTION TO COMPARE THE RESULTS Recent

OF ENERGIES WRITTEN IN THE NORMAL ENDF/B CONVENTION OF 6 DIGITS Recent

TO THE 9 DIGIT OUTPUT FROM THIS PROGRAM DEMONSTRATED THAT FAILURE Recent

TO USE THE 9 DIGIT OUTPUT CAN LEAD TO LARGE ERRORS IN THE DATA Recent

JUST DUE TO TRANSLATION OF ENERGIES FROM THEIR INTERNAL (BINARY) Recent

REPRESENTATION TO THE ENDF/B FORMAT. Recent

Recent

ACCURACY OF ENERGY Recent

------------------ Recent

IN ORDER TO ALLOW ENERGIES TO BE ACCURATELY OUTPUT TO 9 DIGITS Recent

ON SHORT WORD LENGTH COMPUTERS (E.G. IBM) ALL ENERGIES AND Recent

ENERGY DEPENDENT TERMS ARE READ AND TREATED IN DOUBLE PRECISION. Recent

Recent

OUTPUT OF RESONANCE PARAMETERS Recent

------------------------------ Recent

A SPECIAL CONVENTION HAS BEEN INTRODUCED REGARDING RESONANCE Recent

PARAMETERS. IN ORDER TO ALLOW THE USER TO DOPPLER BROADEN AND/OR Recent

SELF-SHIELD CROSS SECTIONS THE RESONANCE PARAMETERS ARE ALSO Recent

INCLUDED IN THE OUTPUT WITH THE EVALUATION. IN ORDER TO AVOID THE Recent

POSSIBILITY OF ADDING THE RESONANCE CONTRIBUTION A SECOND TIME Recent

TWO CONVENTIONS HAVE BEEN ADOPTED TO INDICATE THAT THE RESONANCE Recent

CONTRIBUTION HAS ALREADY BEEN ADDED TO THE FILE 3 CROSS SECTIONS, Recent

Recent

(1) WHEN THE DATA IS PROCESSED BY THIS PROGRAM LRP (IN MF=1, Recent

MT=451) IS SET EQUAL TO 2. THIS IS A CONVENTION WHICH HAS BEEN Recent

ADOPTED AS A STANDARD CONVENTION IN ENDF/B-VI, BUT IS ONLY TO BE Recent

USED FOR PROCESSED DATA, AS OPPOSED TO THE ORIGINAL EVALUATIONS. Recent

IN EVALUATIONS WHICH CONTAIN MF=1, MT=451 LRP CAN BE USED TO Recent

DETERMINE IF THE MATERIAL HAS BEEN PROCESSED. Recent

Recent

(2) THE LRU FLAG IN EACH SECTION OF FILE 2 DATA IS CHANGED TO Recent

LRU=LRU+3. FOR EXAMPLE WHEN READING AN ENDF/B EVALUATION LRU=0 Recent

(NO RESONANCES), =1 (RESOLVED) OR =2 (UNRESOLVED) INDICATES THAT Recent

THE DATA IS IN THE ORIGINAL ENDF/B FORM. LRU=3 (NO RESONANCES), Recent

=4 (RESOLVED) OR =5 (UNRESOLVED) INDICATES THAT THE RESONANCE Recent

CONTRIBUTION HAS ALREADY BEEN ADDED TO THE FILE 3 DATA. THIS Recent

SECOND CONVENTION HAS BEEN ADOPTED AS INSURANCE THAT THE RESONANCE Recent

CONTRIBUTION WILL NOT BE ADDED TWICE, EVEN FOR EVALUATIONS WHICH Recent

DO NOT CONTAIN MF=1, MT=451 (EVALUATIONS WHICH CONTAIN MF=1, Recent

MT=451 ARE COVERED BY CONVENTION (1), DESCRIBED ABOVE). Recent

Recent

UNIFORM TREATMENT OF RESONANCE FORMALISMS Recent

================================================================== Recent

NORMALIZATION Recent

============= Recent

ALL OF THE RESONANCE FORMALISMS INCLUDE A FACTOR OF, Recent

Recent

PI\*(FRACTIONAL ABUNDANCE)/(K\*\*2) Recent

Recent

THIS FACTOR HAS BEEN REMOVED FROM THE CALCULATION OF EACH TYPE Recent

OF RESONANCE FORMALISM AND IS APPLIED AS A FINAL NORMALIZATION Recent

AFTER THE CALCULATION, ONLY ONE PLACE IN THIS PROGRAM. Recent

Recent

FOR SIMPLICITY THIS TERM IS NOT INCLUDED IN THE FOLLOWING Recent

DERIVATIONS - IN ALL CASES THE ACTUAL CROSS SECTION IS A PRODUCT Recent

OF THE ABOVE FACTOR TIMES THE RESULTS PRESENTED BELOW. Recent

Recent

SIMILARITIES Recent

============ Recent

FOR THE RESOLVED RESONANCE REGION, EXCEPT FOR SINGLE LEVEL BREIT Recent

WIGNER, PARAMETERS ALL OF THE FORMALISMS DEFINE THE CROSS SECTIONS Recent

IN AN EQUIVALENT FORM, Recent

Recent

TOTAL = 2\*GJ\*REAL(1 - U) Recent

= 2\*GJ\*(1 - REAL(U)) Recent

ELASTIC = GJ\*(1 - U)\*\*2 Recent

= GJ\*((1 - 2\*REAL(U)) + (REAL(U)\*\*2 + IM(U)\*\*2)) Recent

= 2\*GJ\*(1 - REAL(U)) - GJ\*(1 - (REAL(U)\*\*2 + IM(U)\*\*2)) Recent

Recent

SINCE THE FIRST TERM IS THE TOTAL, THE SECOND TERM MUST BE Recent

ABSORPTION. SO WE FIND, Recent

Recent

ABSORPTION = GJ\*(1 - (REAL(U)\*\*2 + IM(U)\*\*2)) Recent

Recent

IN ALL CASES U IS DEFINED IN THE FORM, Recent

Recent

U = EXP(-I\*2\*PS)\*((1-X) - I\*Y) Recent

Recent

WHERE (X) AND (Y) ARE RELATED TO THE SYMMETRIC AND ANTI-SYMMETRIC Recent

CONTRIBUTIONS OF THE RESONANCES, RESPECTIVELY. ONLY THE DEFINITION Recent

OF (X) AND (Y) WILL BE DIFFERENT FOR EACH RESONANCE FORMALISM. Recent

BELOW WE WILL SHOW THAT WHAT MIGHT APPEAR TO BE A STRANGE CHOICE Recent

OF DEFINITION OF THE SIGN OF (X) AND(Y) HAS BEEN SELECTED SO THAT Recent

FOR BREIT-WIGNER PARAMETERS (X) AND (Y) CORRESPOND EXACTLY TO THE Recent

SYMMETRIC AND ANTI-SYMMETRIC CONTRIBUTION OF THE RESONANCES. Recent

Recent

U = (COS(2\*PS) - I\*SIN(2\*PS))\*((1-X) - I\*Y) Recent

= ((1-X)\*COS(2\*PS) - Y\*SIN(2\*PS)) Recent

=-I\*((1-X)\*SIN(2\*PS) + Y\*COS(2\*PS)) Recent

Recent

REAL(U) = ((1-X)\*COS(2\*PS) - Y\*SIN(2\*PS)) Recent

IM(U) =-((1-X)\*SIN(2\*PS) + Y\*COS(2\*PS)) Recent

Recent

R(U)\*\*2 =((1-X)\*COS(2\*PS))\*\*2 + (Y\*SIN(2\*PS))\*\*2 Recent

-2\*(1-X)\*Y\*COS(2\*PS)\*SIN(2\*PS) Recent

I(U)\*\*2 =((1-X)\*SIN(2\*PS))\*\*2 + (Y\*COS(2\*PS))\*\*2 Recent

+2\*(1-X)\*Y\*COS(2\*PS)\*SIN(2\*PS) Recent

Recent

THE TERMS 2\*(1-X)\*Y\*COS(2\*PS)\*SIN(2\*PS) CANCEL AND UPON USING Recent

THE IDENTITY COS(2\*PS)\*\*2 + SIN(2\*PS)\*\*2 = 1, Recent

Recent

SUM = (1-X)\*\*2 + (Y)\*\*2 Recent

Recent

WE NOW HAVE ALL THE QUANTITIES THAT WE NEED TO DEFINE THE CROSS Recent

SECTIONS, Recent

Recent

ELASTIC Recent

======= Recent

ELASTIC =GJ\*(1 - 2\*REAL(U) + (REAL(U)\*\*2 + IM(U)\*\*2)) Recent

=GJ\*(1 - 2\*((1-X)\*COS(2\*PS)-Y\*SIN(2\*PS))+(1-X)\*\*2+(Y)\*\*2) Recent

Recent

THIS CAN BE WRITTEN AS A SUM OF 2 SQUARES, Recent

Recent

ELASTIC =GJ\*(COS(2\*PS) - (1-X))\*\*2 + (SIN(2\*PS) + Y)\*\*2) Recent

Recent

=GJ\*((COS(2\*PS))\*\*2 - 2\*(1-X)\*COS(2\*PS) + (1-X)\*\*2) + Recent

(SIN(2\*PS))\*\*2 + 2\*Y\*SIN(2\*PS) + (Y)\*\*2) Recent

Recent

AGAIN USING THE IDENTITY COS(2\*PS)\*\*2 + SIN(2\*PS)\*\*2 = 1, WE CAN Recent

SEE THAT THE DEFINITION AS THE SUM OF 2 SQUARES IS IDENTICAL TO Recent

THE PRECEDING DEFINITION OF THE ELASTIC. Recent

Recent

ELASTIC =GJ\*(COS(2\*PS) - (1-X))\*\*2 + (SIN(2\*PS) + Y)\*\*2) Recent

=GJ\*((COS(2\*PS)-1) + X)\*\*2 + (SIN(2\*PS) + Y)\*\*2) Recent

Recent

USING THE IDENTITY (1 - COS(2\*PS))) = 2\*SIN(PS)\*\*2, WE OBTAIN Recent

THE FINAL FORM FOR THE ELASTIC, Recent

Recent

ELASTIC =GJ\*(2\*SIN(PS)\*\*2 - X)\*\*2 + (SIN(2\*PS) + Y)\*\*2) Recent

Recent

ABSORPTION Recent

========== Recent

ABSORPTION = GJ\*(1 - (REAL(U)\*\*2 + IM(U)\*\*2)) Recent

= GJ\*(1 - ((1-X)\*\*2 + (Y)\*\*2) Recent

= GJ\*(1 - (1 - 2\*X + (X)\*\*2 + (Y)\*\*2) Recent

= GJ\*(2\*X - (X)\*\*2 + (Y)\*\*2) Recent

Recent

SINCE PHYSICALLY THE ABSORPTION CANNOT BE NEGATIVE WE CAN SEE Recent

THAT (X) MUST BE POSITIVE AND 2\*X MUST BE GREATER THAN Recent

(X)\*\*2 + (Y)\*\*2, FOR ALL OF THE FORMALISMS. Recent

Recent

TOTAL Recent

===== Recent

IN THIS PROGRAM THE TOTAL CROSS SECTION IS ALWAYS DEFINED TO BE Recent

THE SUM OF ITS PARTS - SO THE ABOVE DEFINITION IS NEVER EXPLICITLY Recent

USED. HOWEVER, WE CAN LEARN SOMETHING BY EXAMINING THE DEFINITION, Recent

Recent

TOTAL = 2\*GJ\*REAL(1 - U) Recent

= 2\*GJ\*(1 - (((1-X)\*COS(2\*PS) - Y\*SIN(2\*PS))) Recent

= 2\*GJ\*((1 - COS(2\*PS))\*(1-X) - (1-X) + Y\*SIN(2\*PS)) Recent

= 2\*GJ\*(2\*SIN(PS)\*\*2\*(1-X) - (1-X) + Y\*SIN(2\*PS)) Recent

Recent

= 4\*GJ\*SIN(PS)\*\*2 + Recent

2\*GJ\*((X-1) - 2\*X\*SIN(PS)\*\*2 + Y\*SIN(2\*PS)) Recent

Recent

THE IMPORTANT POINT TO NOTE IS THAT THE DEFINITION OF THE TOTAL Recent

DOES NOT EXPLICITLY CONTAIN ANY DEPENDENCE ON X\*\*2 AND Y\*\*2 - Recent

THE LEVEL-LEVEL INTERFERENCE TERMS. Recent

Recent

THIS IMPLIES THAT IF A GIVEN SET OF RESONANCE PARAMETERS ARE USED Recent

WITH THIS DEFINITION THEY WILL PRODUCE EXACTLY THE SAME TOTAL Recent

CROSS SECTION - WHETHER WE CLAIM THE PARAMETERS HAVE BEEN Recent

PRODUCED USING A SINGLE OR MULTI-LEVEL FIT. THIS RESULT COULD Recent

BE VERY MISLEADING, IF THIS RESULT FOR THE TOTAL IS IMPLIED TO Recent

MEAN THAT ONE INTERPRETATION OR THE OTHER WILL NOT HAVE ANY Recent

EFFECT ON THE INDIVIDUAL CROSS SECTIONS. Recent

Recent

STARTING FROM EXACTLY THE SAME RESONANCE PARAMETERS, RELATIVE TO Recent

THE RESULTS OBTAINED USING THE SINGLE LEVEL FORMULA, MULTI-LEVEL Recent

RESULTS WILL TEND TO ALWAYS DECREASE THE ABSORPTION AND INCREASE Recent

THE ELASTIC. THIS CAN BE IMMEDIATELY SEEN FROM OUR GENERAL Recent

MULTI-LEVEL DEFINITION OF ABSORPTION, Recent

Recent

ABSORPTION =GJ\*(2\*X - ((X)\*\*2 + (Y)\*\*2)) Recent

Recent

THE SINGLE LEVEL ABSORPTION IS, Recent

Recent

ABSORPTION =GJ\*(2\*X) Recent

Recent

THE DIFFERENCE BETWEEN THE TWO IS -2\*GJ\*(X\*\*2 + Y\*\*2), SO THAT Recent

REGARDLESS OF HOW WE DEFINE (X) AND (Y) THE INCLUSION OF THIS Recent

TERM WILL ALWAYS DECREASE ABSORPTION. SINCE THE TOTAL CROSS Recent

SECTION IS THE SAME IN BOTH CASE, THIS MEANS THAT THE ELASTIC Recent

HAS BEEN INCREASED BY THIS AMOUNT. Recent

Recent

AGAIN, THESE RESULTS ARE BASED ON STARTING FROM EXACTLY THE SAME Recent

PARAMETERS - IN ANY ACTUAL CASE THE PARAMETERS BASED ON A SINGLE Recent

OR MULTI-LEVEL FIT WILL BE QUITE DIFFERENT - THE POINT THAT WE Recent

WANT TO STRESS HERE IS THAT YOU SHOULD NEVER USE PARAMETERS Recent

WHICH HAVE BEEN DEFINED BY A FIT USING ONE FORMALISM - IN THE Recent

EQUATIONS FOR A DIFFERENT FORMALISM - AND ASSUME THAT THE RESULTS Recent

WILL BE CONSISTENT - AND NEVER USE THE TOTAL CROSS SECTION TO Recent

SEE WHETHER OR NOT A SET OF SINGLE LEVEL PARAMETERS CAN BE USED Recent

WITH A MULTI-LEVEL FORMALISM. Recent

Recent

POTENTIAL CROSS SECTION Recent

======================= Recent

FAR FROM RESONANCES (X) AND (Y) WILL BE SMALL AND THE ELASTIC Recent

CROSS SECTION REDUCES TO, Recent

Recent

ELASTIC =GJ\*(2\*SIN(PS)\*\*2)\*\*2 + (SIN(2\*PS))\*\*2 Recent

=GJ\*4\*(SIN(PS)\*\*4 + SIN(2\*PS)\*\*2 Recent

Recent

USING THE IDENTITY SIN(2\*PS) = 2\*SIN(PS)\*COS(PS) Recent

Recent

=4\*GJ\*(SIN(PS)\*\*4 + (SIN(PS)\*COS(PS))\*\*2) Recent

=4\*GJ\*SIN(PS)\*\*2\*(SIN(PS)\*\*2 + COS(PS)\*\*2) Recent

=4\*GJ\*SIN(PS)\*\*2 Recent

Recent

WHICH IS THE POTENTIAL CROSS SECTION. NOTE THAT THIS RESULT IS Recent

INDEPENDENT OF THE FORMALISM USED, AS IT MUST PHYSICALLY BE, Recent

AND AS SUCH ALTHOUGH AS YET WE HAVE NOT DEFINED IT, WE CAN Recent

NOW SEE THAT IN ALL CASES (PS) MUST BE THE PHASE SHIFT AND FOR Recent

CONSISTENCY IT MUST BE DEFINED USING EXACTLY THE SAME DEFINITION Recent

IN ALL CASES. Recent

Recent

IN ADDITION SINCE PHYSICALLY FOR EACH L VALUE WE EXPECT TO OBTAIN Recent

A POTENTIAL CROSS SECTION, Recent

Recent

4\*(2\*L+1)\*SIN(PS)\*\*2 Recent

Recent

OBVIOUSLY FOR CONSISTENCY WE MUST HAVE, Recent

Recent

(2\*L+1) = (SUM OVER J) GJ Recent

Recent

ONLY IN THIS CASE WILL THE RESULTS BE CONSISTENT - THIS POINT WILL Recent

BE DISCUSSED IN DETAIL BELOW. Recent

Recent

WHAT ARE THIS TERMS (X) AND (Y) Recent

=============================== Recent

(X) AND (Y) CAN BE EASILY IDENTIFIED BY CONSIDERING THE SINGLE Recent

AND MULTI-LEVEL BREIT WIGNER FORMALISMS. IN THESE CASES WE WILL Recent

FIND THAT, Recent

Recent

X = GAM(N)\*GAM(T)/2/DEN Recent

Y = GAM(N)\*(E-ER)/DEN Recent

DEN = ((E-ER)\*\*2 + (GAM(T)/2)\*\*2) Recent

Recent

EXTREME CARE HAS TO BE USED TO PROPERLY DEFINE (Y) SUCH THAT IT Recent

IS NEGATIVE FOR E LESS THAN ER AND POSITIVE FOR E GREATER THAN Recent

ER. I WILL MERELY MENTION THAT THE EQUATIONS FOR ALL FORMALISMS Recent

IN ENDF-102 DO NOT CONSISTENTLY USE (E - ER) - IN SOME CASES Recent

THIS IS WRITTEN AS (ER - E), WHICH CAN LEAD TO AN INCORRECT Recent

SIGN IN THE DEFINITION OF THE (Y) THAT WE REQUIRE. Recent

Recent

THE INTERFERENCE TERMS CAN BE WRITTEN IN TERMS OF, Recent

1) LEVEL-SELF INTERFERENCE = THE CONTRIBUTION OF EACH LEVEL Recent

INTERFERRING WITH ITSELF Recent

2) LEVEL-LEVEL INTERFERENCE = THE CONTRIBUTION OF EACH LEVEL Recent

INTERFERRRING WITH ALL OTHER LEVELS Recent

Recent

WE WILL REFER TO THESE TWO AS (L-S) AND (L-L), Recent

Recent

X\*\*2 = (GAM(N)\*(GAM(T)/2)\*\*2/(DEN)\*\*2 + (L-L) Recent

= (GAM(N)\*\*2\*((GAM(T)/2)\*\*2)/(DEN)\*\*2 + (L-L) Recent

Y\*\*2 = (GAM(N))\*\*2\*((E-ER))\*\*2/(DEN)\*\*2 + (L-L) Recent

Recent

X\*\*2+Y\*\*2= GAM(N)\*\*2\*DEN/(DEN)\*\*2 = GAM(N)\*\*2/DEN + (L-L) Recent

Recent

TO SEE THE EFFECT OF INCLUDING MULTI-LEVEL INTERFERENCE WE CAN Recent

CONSIDER OUR GENERAL EXPRESSION FOR ABSORPTION, Recent

Recent

ABSORPTION =GJ\*(2\*X - ((X)\*\*2 + (Y)\*\*2)) Recent

Recent

AND NOTE THAT FOR BOTH SINGLE AND MULTI-LEVEL BREIT WIGNER THE Recent

ENDF-102 SAYS TO TREAT ABSORPTION IN A SINGLE LEVEL APPROXIMATION Recent

I.E., IGNORE LEVEL-LEVEL INTERFERENCE. IF ALL INTERFERENCE IS Recent

IGNORED THIS IS EQUIVALENT TO COMPLETELY IGNORING X\*\*2 + Y\*\*2 AND Recent

DEFINING, Recent

Recent

ABSORPTION =GJ\*2\*X Recent

=2\*GJ\*GAM(N)\*GAM(T)/DEN Recent

Recent

WHICH IS INCORRECT - SINCE THIS SEEMS TO INDICATE EVERYTHING IS Recent

ABSORBED. IN ORDER TO OBTAIN THE CORRECT EXPRESSION WE CANNOT Recent

COMPLETELY IGNORE INTERFERENCE - WE CAN IGNORE LEVEL-LEVEL Recent

INTERFERENCE, BUT WE MUST INCLUDE LEVEL-SELF INTERFERENCE, Recent

Recent

X\*\*2+Y\*\*2= GAM(N)\*\*2/DEN Recent

Recent

ABSORPTION =GJ\*(2\*X - ((X)\*\*2 + (Y)\*\*2)) Recent

=GJ\*GAM(N)\*(GAM(T)-GAM(N))/DEN Recent

=GJ\*GAM(N)\*GAM(A)/DEN Recent

Recent

SUMMARY Recent

======= Recent

AN IMPORTANT POINT TO NOTE IS THE DEFINITION OF (X) AND (Y) Recent

WHICH IN ALL CASES WILL CORRESPOND TO THE SYMMETRIC AND Recent

ANTI-SYMMETRIC CONTRIBUTION OF THE RESONANCES. IN PARTICULAR Recent

DEFINING (U) IN TERMS OF (1-X) INSTEAD OF (X) IS EXTREMELY Recent

IMPORTANT. NOTE, THAT THE DEFINITION OF THE ELASTIC AND Recent

ABSORPTION ONLY INVOLVE (X), NOT (1-X). FAR FROM RESONANCES Recent

(X) CAN BE EXTREMELY SMALL, THEREFORE (1-X) WILL BE VERY CLOSE Recent

TO (1). IF THE CALCULATION PROCEEDS BY FIRST CALCULATING (1-X) Recent

AND THEN DEFINING (X) BY SUBTRACTING (1), EXTREME ROUND-OFF Recent

PROBLEMS CAN RESULT. THESE PROBLEMS CAN BE AVOIDED BY IN ALL Recent

CASES DEFINING (X) DIRECTLY, WITHOUT ANY DIFFERENCES. Recent

Recent

IN EACH FORMALISM THE DEFINITION OF (X) AND (Y) MAY BE DIFFERENT Recent

BUT ONCE WE HAVE DEFINED (X) AND (Y) WE CAN IMMEDIATELY WRITE Recent

THE CROSS SECTIONS USING A UNIFORM DEFINITION, Recent

Recent

ELASTIC =GJ\*(2\*SIN(PS)\*\*2 - X)\*\*2 + (SIN(2\*PS) + Y)\*\*2) Recent

Recent

ABSORPTION =-GJ\*(2\*X + (X)\*\*2 + (Y)\*\*2) Recent

Recent

AND DEFINE THE TOTAL AS THE SUM OF THESE 2 PARTS. Recent

Recent

RELATIONSHIP TO SINGLE LEVEL Recent

============================ Recent

HOW DO THE SINGLE AND MULTI-LEVEL FORMALISMS COMPARE. TO SEE, Recent

STARTING FROM OUR GENERAL DEFINITION OF THE ELASTIC IN THE FORM, Recent

Recent

ELASTIC =GJ\*(2\*SIN(PS)\*\*2 + X)\*\*2 + (SIN(2\*PS) + Y)\*\*2) Recent

=GJ\*(4\*SIN(PS)\*\*4 - 4\*X\*SIN(PS)\*\*2 + X\*\*2 Recent

+ SIN(2\*PS)\*\*2 + 2\*Y\*SIN(2\*PS) + Y\*\*2) Recent

Recent

=4\*GJ\*SIN(PS)\*\*2 + Recent

GJ\*(X\*\*2 + Y\*\*2 Recent

-4\*X\*SIN(PS)\*\*2 Recent

+2\*Y\*SIN(2\*PS)) Recent

Recent

AND OUR SPECIFIC DEFINITIONS OF (X) AND (Y) FOR MULTI-LEVEL BREIT- Recent

WIGNER PARAMETERS, Recent

Recent

X = GAM(N)\*GAM(T)/2/DEN Recent

Y = GAM(N)\*(E-ER)/DEN Recent

DEN = ((E-ER)\*\*2 + (GAM(T)/2)\*\*2) Recent

Recent

X\*\*2+Y\*\*2= GAM(N)\*\*2/DEN + (L-L) Recent

Recent

WE CAN RECOGNIZE X\*\*2 AND Y\*\*2 AS THE INTERFERENCE - (L-S) + (L-L) Recent

TERMS IN THE MULTI-LEVEL FORMALISM. IN ORDER TO OBTAIN THE SINGLE Recent

LEVEL EQUATION WE CAN ASSUME THAT EACH LEVEL DOES NOT INTERFERE Recent

WITH ANY OTHER LEVEL - THEREFORE THE (L-L) CONTRIBUTION IS ZERO. Recent

Recent

ELASTIC =4\*GJ\*SIN(PS)\*\*2 + Recent

GJ\*GAM(N)\*(GAM(N) Recent

-2\*GAM(T)\*SIN(PS)\*\*2 Recent

+2\*(E-ER)\*SIN(2\*PS))/DEN Recent

Recent

WHICH IS THE FORM THAT IT APPEARS IN ENDF-102, EXCEPT FOR TWO Recent

TYPOGRAPHICAL ERRORS IN THE SECOND TERM, Recent

Recent

-2\*GAM(T)\*SIN(PS)\*\*2 Recent

Recent

WHICH IN ENDF-102 IS WRITTEN, Recent

Recent

-2\*(GAM(T)-GAM(N))\*SIN(2\*PS)\*\*2 Recent

Recent

PROGRAM CONVENTIONS Recent

================================================================== Recent

MINIMUM INPUT DATA Recent

------------------ Recent

FOR EACH MATERIAL TO BE PROCESSED THE MINIMUM INPUT DATA ARE THE Recent

RESONANCE PARAMETERS IN FILE 2. IF THERE ARE NO FILE 2 PARAMETERS Recent

IN A GIVEN MATERIAL THE ENTIRE MATERIAL WILL SIMPLY BE COPIED. Recent

NEITHER THE HOLLERITH SECTION (MF=1, MT=451) NOR THE BACKGROUND Recent

CROSS SECTION (SECTIONS OF MF=3) NEED BE PRESENT FOR THIS PROGRAM Recent

TO EXECUTE PROPERLY. HOWEVER, SINCE THE CONVENTIONS USED IN Recent

INTERPRETING THE RESONANCE PARAMETERS DEPENDS ON ENDF/B VERSION Recent

USERS ARE STRONGLY RECOMMENDED TO INSURE THAT MF=1, MT=451 IS Recent

PRESENT IN EACH MATERIAL TO ALLOW THE PROGRAM TO DETERMINE THE Recent

ENDF/B FORMAT VERSION. Recent

Recent

RESONANCE PARAMETERS Recent

-------------------- Recent

RESONANCE PARAMETERS MAY BE REPRESENTED USING ANY COMBINATION Recent

OF THE REPRESENTATIONS ALLOWED IN ENDF/B, Recent

(1) RESOLVED DATA Recent

(A) SINGLE LEVEL BREIT-WIGNER Recent

(B) MULTI-LEVEL BREIT-WIGNER Recent

(C) ADLER-ADLER Recent

(D) REICH-MOORE Recent

(E) HYBRID R-FUNCTION Recent

(2) UNRESOLVED DATA Recent

(A) ALL PARAMETERS ENERGY INDEPENDENT Recent

(B) FISSION PARAMETERS ENERGY DEPENDENT Recent

(C) ALL PARAMETERS ENERGY DEPENDENT Recent

Recent

THE FOLLOWING RESOLVED DATA FORMALISMS ARE NOT TREATED BY THIS Recent

VERSION OF THE CODE AND WILL ONLY BE IMPLEMENTED AFTER EVALUATIONS Recent

USING THESE FORMALISMS ARE AVAILABLE TO THE AUTHOR OF THIS CODE Recent

FOR TESTING IN ORDER TO INSURE THAT THEY CAN BE HANDLED PROPERLY Recent

(A) GENERAL R-MATRIX Recent

Recent

CALCULATED CROSS SECTIONS Recent

------------------------- Recent

THIS PROGRAM WILL USE THE RESONANCE PARAMETERS TO CALCULATE THE Recent

TOTAL, ELASTIC, CAPTURE AND POSSIBLY FISSION CROSS SECTIONS. THE Recent

COMPETITIVE WIDTH WILL BE USED IN THESE CALCULATIONS, BUT THE Recent

COMPETITIVE CROSS SECTION ITSELF WILL NOT BE CALCULATED. THE Recent

ENDF/B CONVENTION IS THAT ALTHOUGH A COMPETITIVE WIDTH MAY BE Recent

GIVEN, THE COMPETITIVE CROSS SECTION MUST BE SEPARATELY TABULATED Recent

AS A SECTION OF FILE 3 DATA. Recent

Recent

RESOLVED REGION Recent

--------------- Recent

IN THE RESOLVED REGION THE RESOLVED PARAMETERS ARE USED TO Recent

CALCULATE COLD (0 KELVIN), LINEARLY INTERPOLABLE, ENERGY DEPENDENT Recent

CROSS SECTIONS. Recent

Recent

SCATTERING RADIUS Recent

----------------- Recent

FOR SINGLE OR MULTI LEVEL BREIT-WIGNER PARAMETERS THE SCATTERING Recent

RADIUS MAY BE SPECIFIED IN EITHER ENERGY INDEPENDENT (CONSTANT) Recent

OR ENERGY DEPENDENT FORM (A TABLE OF ENERGY VS. RADIUS AND AN Recent

ASSOCIATED INTERPOLATION LAW). IN ALL OTHER CASE ONLY AN ENERGY Recent

INDEPENDENT SCATTERING RADIUS IS ALLOWED. Recent

Recent

FOR ANY ONE MATERIAL (I.E. MAT) IF ENERGY DEPENDENT SCATTERING Recent

RADII ARE GIVEN THE TOTAL NUMBER OF INTERPOLATION REGIONS AND Recent

TABULATED VALUES FOR THE ENTIRE MATERIAL CANNOT EXCEED, Recent

200 - INTERPOLATION REGIONS Recent

500 - TABULATED VALUES Recent

IF THESE LIMITS ARE EXCEEDED THE PROGRAM WILL PRINT AN ERROR Recent

MESSAGE AND TERMINATE. Recent

Recent

IF YOU REQUIRE A LARGER NUMBER OF INTERPOLATION REGION AND/OR Recent

TABULATED VALUES, Recent

(1) INTERPOLATION REGIONS - INCREASE THE DIMENSION OF NBTRHO AND Recent

INTRHO IN COMMON/TABRHO/ THROUGHOUT THE PROGRAM AND CHANGE MAXSEC Recent

IN SUBROUTINE RDAP (MAXSEC = MAXIMUM NUMBER OF INTERPOLATION Recent

REGIONS). Recent

(2) TABULATED VALUES - INCREASE THE DIMENSION OF ERHOTB, RHOTAB Recent

AND APTAB IN COMMON/TABRHO/ THROUGHOUT THE PROGRAM AND CHANGE Recent

MAXRHO IN SUBROUTINE RDAP (MAXRHO = MAXIMUM NUMBER OF TABULATED Recent

VALUES). Recent

Recent

RESOLVED REICH-MOORE AND MULTI-LEVEL BREIT-WIGNER PARAMETERS Recent

------------------------------------------------------------ Recent

CROSS SECTIONS FOR REICH-MOORE PARAMETERS ARE CALCULATED ACCORDING Recent

TO THE EQUATION (1) - (8) OF SECTION D.1.3 OF ENDF-102. IN ORDER Recent

TO CALCULATE CROSS SECTIONS FROM MULTI-LEVEL PARAMETERS IN A Recent

REASONABLE AMOUNT OF TIME THIS PROGRAM EXPRESSES THE CROSS SECTION Recent

IN TERMS OF A SINGLE SUM OVER RESONANCES (SEE, ENDF-102, SECTION Recent

D.1.2, EQUATIONS 6-7), RATHER THAN AS A DOUBLE SUM (SEE, ENDF-102 Recent

SECTION D.1.2, EQUATION 1-2). IN ORDER FOR THE ENDF-102 EQUATIONS Recent

TO BE CORRECT THE PARAMETERS MUST MEET THE FOLLOWING CONDITIONS, Recent

Recent

(1) FOR EACH L STATE ALL PHYSICALLY POSSIBLE J SEQUENCES MUST BE Recent

PRESENT. ONLY IN THIS CASE WILL THE CONTRIBUTIONS OF THE Recent

INDIVIDUAL J SEQUENCES ADD UP TO PRODUCE THE CORRECT POTENTIAL Recent

SCATTERING CONTRIBUTION FOR THE L STATE (SEE, ENDF-102, Recent

SECTION D.1.2, EQUATIONS 6-7). IF ANY J SEQUENCE IS MISSING Recent

THE PROGRAM WILL PRINT A WARNING AND ADD THE J SEQUENCE WITH Recent

NO RESONANCE PARAMETERS IN ORDER TO ALLOW THE POTENTIAL Recent

SCATTERING TO BE CALCULATED CORRECTLY (THIS IS EQUIVALENT TO Recent

ASSUMING THAT THE EVALUATOR REALIZES THAT ALL J SEQUENCES MUST Recent

BE AND ARE PRESENT AND THAT THE EVALUATION STATES THAT THERE Recent

ARE NO RESONANCES WITH CERTAIN PHYSICALLY POSSIBLE J VALUES... Recent

IN THIS CASE POTENTIAL CONTRIBUTION MUST STILL BE CONSIDERED). Recent

Recent

EXAMPLE Recent

======= Recent

AN EXAMPLE OF WHERE THIS OCCURS AND IS IMPORTANT TO CONSIDER Recent

IS U-238 IN ENDF/B-IV AND V LIBRARIES WHERE FOR L=1 THERE IS Recent

ONLY A J=1/2 SEQUENCE. NOT INCLUDING THE J=3/2 SEQUENCE LEADS Recent

TO UNDERESTIMATING THE POTENTIAL SCATTERING AND PRODUCES Recent

MINIMA IN THE ELASTIC CROSS SECTION WHICH ARE AN ORDER OF Recent

MAGNITUDE LOWER THAN THE CROSS SECTIONS OBTAINED BE INCLUDING Recent

THE J=3/2 SEQUENCE. Recent

Recent

(2) FOR A GIVEN TARGET SPIN AND L VALUE THERE MAY BE 2 POSSIBLE Recent

MEANS OF OBTAINING THE SAME J VALUE. WHEN THIS OCCURS IN Recent

ORDER TO CALCULATE THE CORRECT POTENTIAL SCATTERING CROSS Recent

SECTION IT IS IMPORTANT TO INCLUDE THE EFFECT OF BOTH Recent

POSSIBLE J SEQUENCES, EVEN THOUGH FROM THE ENDF/B DATA IT IS Recent

NOT POSSIBLE TO DETERMINE WHICH OF THE 2 POSSIBLE SEQUENCES Recent

ANY GIVEN RESONANCE BELONGS TO. IN THIS CASE THIS PROGRAM Recent

TREAT ALL RESONANCES WITH THE SAME J VALUE AS BELONGING TO Recent

THE SAME J SEQUENCE (TO ALLOW INTERFERENCE) AND WILL ADD AN Recent

ADDITIONAL J SEQUENCE WITH NO RESONANCES IN ORDER TO ALLOW Recent

THE POTENTIAL CROSS SECTION TO BE CALCULATED CORRECTLY. WHEN Recent

THIS OCCURS A WARNING MESSAGE IS PRINTED, BUT BASED ON THE Recent

ENDF/B DATA THERE IS NOTHING WRONG WITH THE DATA AND THERE IS Recent

NOTHING THAT THE USER CAN DO TO CORRECT OR IN ANY WAY MODIFY Recent

THE DATA TO ELIMINATE THE PROBLEM. Recent

Recent

EXAMPLE Recent

======= Recent

FOR A TARGET SPIN =1 AND L=1 THE 2 RANGES OF PHYSICALLY Recent

POSSIBLE J ARE 1/2, 3/2, 5/2 AND 1/2, 3/2. BY CHECKING THE Recent

ENDF/B DATA IT IS POSSIBLE TO INSURE THAT THE 3 POSSIBLE Recent

J VALUES (1/2, 3/2, 5/2) ARE PRESENT AND TO INCLUDE ALL 3 Recent

J SEQUENCES IN THE CALCULATIONS. HOWEVER, UNLESS ALL 5 Recent

POSSIBLE J SEQUENCES ARE INCLUDED THE STATISTICAL WEIGHTS Recent

OF THE J SEQUENCES WILL NOT SUM UP TO 2\*L+1 AND THE Recent

POTENTIAL CROSS SECTION WILL BE UNDERESTIMATED. IN THIS Recent

EXAMPLE THE SUM OF THE 3 J SEQUENCES 1/2, 3/2, 5/2 IS 2, Recent

RATHER THAN 3 AS IT SHOULD BE FOR L=1, AND THE CONTRIBUTION Recent

OF THE L=1 RESONANCES TO THE POTENTIAL SCATTERING CROSS Recent

SECTION WILL ONLY BE 2/3 OF WHAT IT SHOULD BE, UNLESS THE Recent

OTHER 2 J SEQUENCES (WITH DUPLICATE J VALUES) ARE INCLUDED Recent

IN THE CALCULATION. Recent

Recent

(3) EACH RESONANCE MUST HAVE AN ASSIGNED, PHYSICALLY POSSIBLE Recent

J VALUE. PHYSICALLY IMPOSSIBLE OR AVERAGE J VALUES CANNOT BE Recent

UNIQUELY INTERPRETED USING THE EQUATIONS IN ENDF-102 AND Recent

THEIR USE WILL USUALLY RESULT IN PHYSICALLY UNRELIABLE CROSS Recent

SECTIONS. THIS PROGRAM WILL CHECK ALL J VALUES AND IF ANY ARE Recent

ARE FOUND TO BE PHYSICALLY IMPOSSIBLE (BASED ON TARGET SPIN Recent

AND L VALUE) AN ERROR MESSAGE WILL BE PRINTED TO INDICATE THAT Recent

THE RECONSTRUCTED CROSS SECTIONS WILL BE UNRELIABLE AND THE Recent

PROGRAM WILL CONTINUE. IN AN ATTEMPT TO CALCULATE THE CORRECT Recent

POTENTIAL SCATTERING CROSS SECTION THIS PROGRAM WILL SUBTRACT Recent

THE POTENTIAL SCATTERING CONTRIBUTION DUE TO ALL FICTICIOUS J Recent

SEQUENCES AND ADD THE CONTRIBUTION OF ALL PHYSICALLY POSSIBLE Recent

J SEQUENCES (AS DESCRIBED ABOVE). Recent

Recent

WARNING (LET THE USER BEWARE) Recent

============================= Recent

(A) IT CANNOT BE STRESSED ENOUGH THAT CROSS SECTIONS OBTAINED Recent

USING PHYSICALLY IMPOSSIBLE J VALUES FOR REICH-MOORE AND Recent

MULTI-LEVEL BREIT-WIGNER RESONANCE PARAMETERS WILL RESULT Recent

IN UNRELIABLE CROSS SECTIONS. THE DECISION TO HAVE THIS Recent

PROGRAM CONTINUE TO PROCESS WHEN THIS CONDITION IS FOUND Recent

IS BASED ON AN ATTEMPT TO ALLOW THE USER TO AT LEAST HAVE Recent

SOME RESULTS (HOWEVER BAD THEY MAY BE) IF THERE IS NO Recent

OTHER EVALUATED DATA AVAILABLE. Recent

(B) EVEN THOUGH THE REICH-MOORE AND MULTI-LEVEL EQUATIONS ARE Recent

DEFINED AS ABSOLUTE OR SQUARED CONTRIBUTIONS WHICH MUST Recent

ALL BE PHYSICALLY POSSIBLE, ATTEMPTING TO CORRECT THE Recent

POTENTIAL CROSS SECTION (AS DESCRIBED ABOVE) CAN LEAD TO Recent

NEGATIVE ELASTIC CROSS SECTIONS. THIS IS BECAUSE BASED ON Recent

THE INFORMATION AVAILABLE IN THE EVALUATION IT IS NOT Recent

NOT POSSIBLE TO CORRECTLY ACCOUNT FOR THE INTERFERENCE Recent

BETWEEN THE RESONANCE AND POTENTIAL CONTRIBUTIONS FOR EACH Recent

J SEQUENCE. Recent

Recent

UNRESOLVED RESONANCE REGION Recent

--------------------------- Recent

IN THE UNRESOLVED RESONANCE REGION THE UNRESOLVED PARAMETERS Recent

ARE USED TO CALCULATE INFINITELY DILUTE AVERAGE CROSS SECTIONS. Recent

NOTE, IT IS IMPORTANT TO UNDERSTAND THAT FROM THE DEFINITION OF Recent

THE UNRESOLVED PARAMETERS IT IS NOT POSSIBLE TO UNIQUELY CALCULATE Recent

ENERGY DEPENDENT CROSS SECTIONS. ONLY AVERAGES OR DISTRIBUTIONS Recent

MAY BE CALCULATED. Recent

Recent

UNRESOLVED INTERPOLATION Recent

------------------------ Recent

IN THE UNRESOLVED RESONANCE REGION CROSS SECTIONS AT EACH ENERGY Recent

ARE CALCULATED BY INTERPOLATING PARAMETERS. THIS IS THE CONVENTION Recent

USED IN ENDF/B-IV AND EARLIER VERSIONS OF ENDF/B. THE ENDF/B-V Recent

CONVENTION OF INTERPOLATING CROSS SECTIONS, NOT PARAMETERS, HAS Recent

BEEN ABANDONED AS IMPRACTICAL SINCE IT CAN LEAD TO THE SITUATION Recent

WHERE EXACTLY THE SAME PHYSICAL DATA CAN LEAD TO DIFFERENT RESULTS Recent

DEPENDING ON WHICH OF THE THREE ENDF/B UNRESOLVED PARAMTER FORMATS Recent

IS USED. FOR EXAMPLE, GIVEN A SET OF ENERGY INDEPENDENT UNRESOLVED Recent

PARAMETERS IT IS POSSIBLE TO CODE THESE PARAMETERS IN EACH OF THE Recent

THREE ENDF/B UNRESOLVED PARAMETER FORMATS. SINCE PHYSICALLY WE Recent

ONLY HAVE ONE SET OF PARAMETERS WE WOULD EXPECT THE RESULTS TO BE Recent

INDEPENDENT OF HOW THEY ARE REPRESENTED IN ENDF/B. UNFORTUNATELY Recent

USING THE ENDF/B-V CONVENTION TO INTERPOLATE CROSS SECTIONS CAN Recent

LEAD TO THREE COMPLETELY DIFFERENT RESULTS. IN CONTRAST USING THE Recent

ENDF/B-IV AND EARLIER CONVENTION OF INTERPOLATING PARAMETERS LEADS Recent

TO COMPLETELY CONSISTENT RESULTS. Recent

Recent

INTERNAL REPRESENTATION OF UNRESOLVED PARAMETERS Recent

------------------------------------------------ Recent

ANY OF THE THREE POSSIBLE REPRESENTATIONS OF UNRESOLVED PARAMETERS Recent

CAN BE UNIQUELY REPRESENTED IN THE ALL PARAMETERS ENERGY DEPENDENT Recent

REPRESENTATIONS WITH THE APPROPRIATE (ENDF/B VERSION DEPENDENT) Recent

INTERPOLATION LAW. THIS IS DONE BY THE PROGRAM WHILE READING THE Recent

UNRESOLVED PARAMETERS AND ALL SUBSEQUENT CALCULATIONS NEED ONLY Recent

CONSIDER THE ALL PARAMETERS ENERGY DEPENDENT REPRESENTATION. Recent

Recent

RESONANCE RECONSTRUCTION STARTING ENERGY GRID Recent

--------------------------------------------- Recent

AS IN ANY ITERATIVE METHOD THE WAY TO SPEED CONVERGENCE IS TO TRY Recent

TO START CLOSE TO THE ANSWER. THIS PROGRAM ATTEMPTS TO DO THIS BY Recent

STARTING FROM AN ENERGY GRID WHICH IS A GOOD APPROXIMATION TO A Recent

SIMPLE BREIT-WIGNER LINE SHAPE, Recent

Recent

SIGMA(X)=1.0/(1.0+X\*X) Recent

Recent

WHERE X IS THE DISTANCE FROM THE PEAK IN HALF-WIDTHS Recent

Recent

SUBROUTINE SUBINT HAS A BUILT-IN TABLE OF NODES WHICH ARE THE Recent

HALF-WIDTH MULTIPLES TO APPROXIMATE THE SIMPLE BREIT-LINE SHAPE Recent

TO WITHIN 1 PER-CENT OVER THE ENTIRE INTERVAL 0 TO 500 HALF-WIDTHS Recent

Recent

BETWEEN ANY TWO RESOLVED RESONANCES THE STARTING GRID IS BASED ON Recent

THE HALF-WIDTHS OF THE TWO RESONANCES. FROM THE LOWER ENERGY Recent

RESONANCE UP TO THE MID-POINT BETWEEN THE RESONANCES (MID-POINT Recent

IS DEFINED HERE AS AN EQUAL NUMBER OF HALF-WIDTHS FROM EACH Recent

RESONANCE) THE HALF-WIDTH OF THE LOWER ENERGY RESONANCE IS USED. Recent

FROM THE MID-POINT UP TO THE HIGHER ENERGY RESONANCE THE HALF- Recent

WIDTH OF THE UPPER ENERGY RESONANCE IS USED. Recent

Recent

WITH THIS ALOGORITHM CLOSELY SPACED RESONANCES WILL HAVE ONLY Recent

A FEW STARTING NODES PER RESONANCE (E.G. U-235). WIDELY SPACED Recent

RESONANCES WILL HAVE MORE NODES PER RESONANCE (E.G. U-238). FOR Recent

A MIX OF S, P, D ETC. RESONANCES THIS ALOGORITHM GUARANTEES AN Recent

ADEQUTE DESCRIPTION OF THE PROFILE OF EVEN EXTREMELY NARROW Recent

RESONANCES (WHICH MAY IMMEDIATELY CONVERGENCE TO THE ACCURACY Recent

REQUESTED, THUS MINIMIZING ITERATION). Recent

Recent

BACKGROUND CROSS SECTIONS Recent

------------------------- Recent

THE PROGRAM WILL SEARCH FOR BACKGROUND CROSS SECTIONS FOR TOTAL Recent

(MT=1), ELASTIC (MT=2), FISSION (MT=18), FIRST CHANCE FISSION Recent

(MT=19) AND CAPTURE (MT=102). Recent

Recent

(1) THE BACKGROUND CROSS SECTIONS (FILE 3) CAN BE PRESENT OR NOT Recent

PRESENT FOR EACH REACTION. Recent

(2) IF FOR A GIVEN REACTION THE BACKGROUND CROSS SECTION IS Recent

PRESENT, IT WILL BE ADDED TO THE RESONANCE CONTRIBUTION AND Recent

THE RESULT WILL BE OUTPUT. Recent

(3) IF FOR A GIVEN REACTION THE BACKGROUND IS NOT PRESENT THE Recent

PROGRAM WILL, Recent

(A) IF THE INPUT TO THE PROGRAM SPECIFIES NO OUTPUT FOR Recent

REACTIONS WITH NO BACKGROUND THERE WILL BE NO OUTPUT. Recent

(B) IF THE INPUT TO THE PROGRAM SPECIFIES OUTPUT FOR REACTIONS Recent

WITH NO BACKGROUND, Recent

(I) THE RESONANCE CONTRIBUTION TO TOTAL, ELASTIC OR Recent

CAPTURE WILL BE OUTPUT. Recent

(II) IF ALL FISSION RESONANCE PARAMETERS ARE ZERO THE Recent

FISSION CROSS SECTION (MT=18) WILL NOT BE OUTPUT. Recent

OTHERWISE THE RESONANCE CONTRIBUTION OF THE FISSION Recent

(MT=18) WILL BE OUTPUT. Recent

(III) THERE WILL BE NO OUTPUT FOR FIRST CHANCE FISSION Recent

(MT=19). Recent

Recent

COMBINING RESONANCES AND BACKGROUND CROSS SECTIONS Recent

-------------------------------------------------- Recent

IN ORDER TO BE COMBINED WITH THE RESONANCE CONTRIBUTION THE Recent

BACKGROUND CROSS SECTIONS MUST BE GIVEN AT 0 KELVIN TEMPERATURE Recent

AND MUST BE LINEARLY INTERPOLABLE. IF THESE CONDITIONS ARE MET Recent

THE RESONANCE AND BACKGROUND CONTRIBUTIONS WILL BE ADDED TOGETHER Recent

AND OUTPUT. IF THESE CONDITIONS ARE NOT MET THE BACKGROUND CROSS Recent

SECTION WILL BE IGNORED AND ONLY THE RESONANCE CONTRIBUTION WILL Recent

BE OUTPUT. IF THE BACKGROUND HAS NOT BEEN ADDED TO THE RESONANCE Recent

CONTRIBUTION AFTER THIS PROGRAM FINISHES THE USER CAN MAKE THE Recent

RESONANCE AND BACKGROUND CONTRIBUTIONS COMPATIBLE BY, Recent

Recent

(1) IF THE BACKGROUND IS NOT LINEARLY INTERPOABLE, LINEARIZE THE Recent

BACKGROUND (E.G., USE PROGRAM LINEAR). Recent

(2) IF THE BACKGROUND IS NOT GIVEN AT 0 KELVIN, DOPPLER BROADEN Recent

THE RESONANCE (NOT BACKGROUND) CONTRIBUTION TO THE SAME Recent

TEMPERATURE AS THE BACKGROUND (E.G., USE PROGRAM SIGMA1). Recent

Recent

ONCE THE RESONANCE AND BACKGROUND CONTRIBUTIONS HAVE BEEN MADE Recent

COMPATIBLE THEY CAN BE ADDED TOGETHER (E.G., USE PROGRAM MIXER). Recent

Recent

THE RECONSTRUCTION OF THE RESONANCE CONTRIBUTION TO THE CROSS Recent

SECTION CAN BE QUITE EXPENSIVE (IN TERMS OF COMPUTER TIME). SINCE Recent

THE RECONSTRUCTION IS PERFORMED BEFORE THE BACKGROUND CROSS Recent

SECTIONS ARE READ, THE ABOVE CONVENTIONS HAVE BEEN ADOPTED IN Recent

ORDER TO AVOID LOSE OF COMPUTER TIME INVOLVED IN RECONSTRUCTING Recent

THE RESONANCE CONTRIBUTION. Recent

Recent

COMMON ENERGY GRID Recent

------------------ Recent

THIS PROGRAM WILL RECONSTRUCT THE RESONANCE CONTRIBUTION TO THE Recent

TOTAL, ELASTIC, FISSION AND CAPTURE CROSS SECTIONS ALL ON THE Recent

SAME ENERGY GRID. EACH REACTION WILL THEN BE COMBINED WITH ITS Recent

BACKGROUND CROSS SECTION (IF ANY) AND OUTPUT WITHOUT ANY FURTHER Recent

THINNING. IF THERE ARE NO BACKGROUND CROSS SECTIONS, OR IF THE Recent

BACKGROUND CROSS SECTION FOR ALL FOUR REACTIONS ARE GIVEN ON A Recent

COMMON ENERGY GRID, THE OUTPUT FROM THIS PROGRAM WILL BE ON A Recent

COMMON ENERGY GRID FOR ALL FOUR REACTIONS. Recent

Recent

THERMAL ENERGY Recent

-------------- Recent

IF THE RESONANCE REGION SPANS THERMAL ENERGY (0.0253 EV) THIS Recent

POINT IS ALWAYS INCLUDED IN THE COMMON ENERGY GRID USED FOR ALL Recent

REACTIONS AND WILL ALWAYS APPEAR IN THE OUTPUT DATA. Recent

Recent

SECTION SIZE Recent

------------ Recent

SINCE THIS PROGRAM USES A LOGICAL PAGING SYSTEM THERE IS NO LIMIT Recent

TO THE NUMBER OF POINTS IN ANY SECTION, E.G., THE TOTAL CROSS Recent

SECTION MAY BE REPRESENTED BY 200,000 DATA POINTS. Recent

Recent

SELECTION OF DATA Recent

----------------- Recent

THE PROGRAM SELECTS MATERIALS TO BE PROCESSED BASED EITHER ON Recent

MAT (ENDF/B MAT NO.) OR ZA. THE PROGRAM ALLOWS UP TO 100 MAT OR Recent

ZA RANGES TO BE SPECIFIED. THE PROGRAM WILL ASSUME THAT THE Recent

ENDF/B TAPE IS IN EITHER MAT OR ZA ORDER, WHICHEVER CRITERIA IS Recent

USED TO SELECT MATERIALS, AND WILL TERMINATE WHEN A MAT OR ZA Recent

IS FOUND THAT IS ABOVE THE RANGE OF ALL REQUESTS. Recent

Recent

ALLOWABLE ERROR Recent

--------------- Recent

THE RECONSTRUCTION OF LINEARLY INTERPOLABLE CROSS SECTIONS FROM Recent

RESONANCE PARAMETERS CANNOT BE PERFORMED EXACTLY. HOWEVER IT CAN Recent

BE PERFORMED TO VIRTUALLY ANY REQUIRED ACCURACY AND MOST Recent

IMPORTANTLY CAN BE PERFORMED TO A TOLERANCE THAT IS SMALL COMPARED Recent

TO THE UNCERTAINTY IN THE CROSS SECTIONS THEMSELVES. AS SUCH THE Recent

CONVERSION OF CROSS SECTIONS TO LINEARLY INTERPOLABLE FORM CAN BE Recent

PERFORMED WITH ESSENTIALLY NO LOSS OF INFORMATION. Recent

Recent

THE ALLOWABLE ERROR MAY BE ENERGY INDEPENDENT (CONSTANT) OR ENERGY Recent

DEPENDENT. THE ALLOWABLE ERROR IS DESCRIBED BY A TABULATED Recent

FUNCTION OF UP TO 20 (ENERGY,ERROR) PAIRS AND LINEAR INTERPOLATION Recent

BETWEEN TABULATED POINTS. IF ONLY ONE TABULATED POINT IS GIVEN THE Recent

ERROR WILL BE CONSIDERED CONSTANT OVER THE ENTIRE ENERGY RANGE. Recent

WITH THIS ENERGY DEPENDENT ERROR ONE MAY OPTIMIZE THE OUTPUT FOR Recent

ANY GIVEN APPLICATION BY USING A SMALL ERROR IN THE ENERGY RANGE Recent

OF INTEREST AND A LESS STRINGENT ERROR IN OTHER ENERGY RANGES, Recent

E.G., 0.1 PER-CENT FROM 0 UP TO THE LOW EV RANGE AND A LESS Recent

STRINGENT TOLERANCE AT HIGHER ENERGIES. Recent

Recent

DEFAULT ALLOWABLE ERROR Recent

----------------------- Recent

IN ORDER TO INSURE CONVERENCE OF THE RESONANCE RECONSTRUCTION THE Recent

ALLOWABLE ERROR MUST BE POSITIVE. IF THE USER INPUTS AN ERROR FOR Recent

RESONANCE RECONSTRUCTION THAT IS NOT POSITIVE IT WILL BE SET TO Recent

THE DEFAULT VALUE (CURRENTLY 0.1 PER-CENT) AND INDICATED AS SUCH Recent

IN THE OUTPUT LISTING. Recent

Recent

INTERVAL HALVING ALGORITHM Recent

------------------------- Recent

THIS PROGRAM WILL START BY CALCULATING THE CROSS SECTIONS AT THE Recent

ENERGIES CORRESPONDING TO THE PEAK OF EACH RESONANCE, AS WELL AS Recent

A FIXED NUMBER OF HALF-WIDTHS ON EACH SIDE OF EACH RESONANCE. Recent

STARTING FROM THIS BASIC GRID OF POINTS THE PROGRAM WILL CONTINUE Recent

TO HALF EACH INTERVAL UNTIL THE CROSS SECTIONS FOR ALL REACTIONS Recent

AT THE CENTER OF THE INTERVAL CAN BE DEFINED BY LINEAR Recent

INTERPOLATION FROM THE ENDS OF THE INTERVAL TO WITHIN THE USER Recent

SPECIFIED ACCURACY CRITERIA. Recent

Recent

DISTANT RESONANCE TREATMENT Recent

--------------------------- Recent

THE OPTION TO TREAT DISTANT RESONANCES, WHICH WAS AVAILABLE IN Recent

EARLIER VERSIONS OF THIS PROGRAM, IS NO LONGER AVAILABLE, BECAUSE Recent

IT WAS FOUND TO PRODUCE UNRELIABLE RESULTS. IN THIS VERSION OF Recent

THE PROGRAM ALL RESONANCES ARE TREATED EXACTLY. Recent

Recent

PROGRAM OPERATION Recent

================================================================== Recent

EDIT MODE Recent

--------- Recent

IT IS SUGGESTED THAT BEFORE RUNNING THIS PROGRAM TO RECONSTRUCT Recent

CROSS SECTIONS FROM RESONANCE PARAMETERS (WHICH CAN BE QUITE Recent

EXPENSIVE) THE USER FIRST RUN THE PROGRAM IN THE EDIT MODE (SEE, Recent

DESCRIPTION OF INPUT PARAMETERS BELOW). IN THE EDIT MODE THE Recent

PROGRAM WILL READ, LIST AND EXTENSIVELY CHECK THE CONSISTENCY OF Recent

ALL RESONANCE PARAMETERS AND ENDF/B DEFINED RESONANCE FLAGS. THIS Recent

IS A VERY INEXPENSIVE MEANS OF CHECKING ALL DATA BEFORE INVESTING Recent

A LARGE AMOUNT OF MONEY IN RECONSTRUCTING CROSS SECTIONS. ANY AND Recent

ALL DIGNOSTICS RECEIVED FROM THE EDIT WILL SUGGEST HOW TO CORRECT Recent

THE EVALUATED DATA TO MAKE IT CONSISTENT BEFORE RECONSTRUCTING Recent

CROSS SECTIONS. IN ORDER TO OBTAIN MEANINGFUL RESULTS FROM THE Recent

RECONSTRUCTION ALL SUGGESTED CHANGES TO THE EVALUATION SHOULD BE Recent

PERFORMED BEFORE TRYING RECONSTRUCTION (OTHERWISE THE RESULT OF Recent

RECONSTRUCTION WILL NOT BE RELIABLE). Recent

Recent

RECONSTRUCTION MODE Recent

------------------- Recent

FOR EACH REQUESTED MATERIAL Recent

--------------------------- Recent

IF SECTION MF=1, MT=451 IS PRESENT COMMENTS WILL BE ADD TO Recent

DOCUMENT THAT THE MATERIAL HAS BEEN PROCESSED. MF=1, MT=451 WILL Recent

ALSO BE USED TO DETERMINE THE VERSION OF THE ENDF/B FORMAT WHICH Recent

WILL ALLOW THE PROGRAM TO USE THE APPROPRIATE CONVENTIONS. Recent

Recent

ALL OF THE FILE 2 RESONANCE PARAMETERS ARE FIRST READ AND THE Recent

LINEARLY INTERPOLABLE CONTRIBUTION OF THE RESONANCE PARAMETERS Recent

TO THE TOTAL, ELASTIC, CAPTURE AND FISSION CROSS SECTIONS IS Recent

CALCULATED SIMULTANEOUSLY USING A COMMON ENERGY GRID FOR ALL Recent

FOUR REACTIONS. Recent

Recent

AFTER THE RESONANCE CONTRIBUTION HAS BEEN RECONSTRUCTED EACH OF Recent

THE FIVE REACTIONS (MT=1, 2, 18, 19, 102) IS CONSIDERED SEPARATELY Recent

FOR COMBINATION WILL THE BACKGROUND CROSS SECTION, IF ANY, AS Recent

DESCRIBED ABOVE. Recent

Recent

OUTPUT WILL INCLUDE THE ENTIRE EVALUATION, INCLUDING RESONANCES Recent

PARAMETERS WITH LRU MODIFIED (AS DESCRIBED ABOVE) TO INDICATE Recent

THAT THE RESONANCE CONTRIBUTION HAS ALREADY BEEN ADDED TO THE Recent

FILE 3 CROSS SECTIONS. Recent

Recent

THE CYCLE OF RECONSTRUCTING THE RESONANCE CONTRIBUTION AND ADDING Recent

THE BACKGROUND WILL BE REPEATED FOR EACH MATERIAL REQUESTED. Recent

Recent

PROCESS ONLY A PORTION OF RESONANCE REGION Recent

================================================================== Recent

MODERN EVALUATIONS MAY BE EXTREMELY LARGE AND IT MAY NOT BE Recent

POSSIBLE TO PROCESS AN ENTIRE EVALUATION (I.E., ADD THE RESONANCE Recent

CONTRIBUTION) DURING A SINGLE COMPUTER RUN. Recent

Recent

ALSO IN THE CASE WHERE YOU ARE ONLY INTERESTED IN THE CROSS Recent

SECTIONS OVER A SMALL ENERGY RANGE, YOU MAY NOT WANT TO PROCESS Recent

AN ENTIRE EVALUATION, E.G., IF YOU ONLY WANT TO KNOW WHAT THE Recent

CROSS SECTIONS ARE NEAR THERMAL ENERGY, 0.0253 EV. Recent

Recent

IN ORDER TO ALLOW AN EVALUATION TO BE PROCESSED USING A NUMBER OF Recent

SHORTER COMPUTER RUNS AN OPTION HAS BEEN ADDED TO THIS PROGRAM TO Recent

ALLOW THE USER TO SPECIFY THE ENERGY RANGE TO BE PROCESSED. Recent

Recent

USING THIS OPTION YOU MAY START AT THE LOWEST ENERGY (ZERO UP TO Recent

SOME ENERGY) AND USE THE RESULTS OF THIS RUN AS INPUT TO THE Recent

NEXT RUN, WHERE YOU CAN SPECIFY THE NEXT ENERGY RANGE. THIS Recent

CYCLE CAN BE REPEATED UNTIL YOU HAVE PROCESSED THE ENTIRE Recent

EVALUATION. Recent

Recent

WARNING - THIS OPTION SHOULD BE USED WITH EXTREME CARE - THIS Recent

OPTION HAS BEEN RELUCTANTLY ADDED - RELUCTANTLY BECAUSE IT CAN Recent

BE EXTREMELY DANGEROUS TO USE THIS OPTION UNLESS YOU CAREFULLY Recent

CHECKED WHAT YOU ARE DOING. Recent

Recent

THE OPTION SHOULD ONLY BE USED AS FOLLOWS, Recent

1) YOU MUST PROCESS USING ENERGY RANGES STARTING AT LOW ENERGY Recent

AND WORKING YOUR WAY TOWARD HIGH ENERGY, E.G., Recent

0.0 TO 3.0+3 Recent

3.0+3 TO 10.0+3 Recent

10.0+3 TO 80.0+3, ETC. Recent

2) FOR THE LAST ENERGY RANGE THE LOWER ENERGY LIMIT MUST BE Recent

NON-ZERO (WHERE TO START) AND THE UPPER ENERGY LIMIT MUST Recent

BE ZERO (NO LIMIT) Recent

80.0+3 TO 0.0 Recent

Recent

IF YOU ARE ONLY INTERESTED IN THE CROSS SECTION OVER A NARROW Recent

ENERGY INTERVAL AND DO NOT INTENT TO MAKE ANY OTHER USE OF THE Recent

RESULTS, YOU CAN IGNORE THESE WARNINGS AND MERELY SPECIFY ANY Recent

ENERGY INTERVAL OVER WHICH YOU WISH CALCULATIONS TO BE Recent

PERFORMED. Recent

Recent

NORMALLY WHEN THIS PROGRAM PROCESSES AN EVALUATION IT WILL SET Recent

FLAGS IN THE EVALUATION TO PREVENT THE SAME RESONANCE Recent

CONTRIBUTION FROM BEING ADDED TO THE CROSS SECTION MORE THAN Recent

ONCE, SHOULD YOU USE THE OUTPUT FROM THIS PROGRAM AS INPUT TO Recent

THE PROGRAM. Recent

Recent

WHEN PROCESSING ONLY PORTIONS OF THE RESONANCE REGION THIS Recent

PROGRAM CANNOT SET THESE FLAGS TO PROTECT AGAINST ADDING THE Recent

RESONANCE CONTRIBUTION MORE THAN ONCE - WHICH MAKES USE OF Recent

THIS OPTION EXTREMELY DANGEROUS. Recent

Recent

ONLY YOU CAN CHECK TO MAKE SURE THAT YOU HAVE CORRECTLY Recent

INCLUDED EACH ENERGY RANGE ONLY ONCE - SEE THE COMMENT LINES Recent

AT THE END OF SECTION, MF=1, MT=451, FOR A COMPLETE RECORD Recent

OF EACH RUN USING THIS PROGRAM. THIS SECTION WILL CONTAIN Recent

LINES OF THE FORM Recent

Recent

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* PROGRAM RECENT (VERSION 2015-1) \*\*\*\*\*\*\*\*\*\*\*\*\* Recent

ONLY PROCESS 0.00000+ 0 TO 3.00000+ 3 EV Recent

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* PROGRAM RECENT (VERSION 2015-1) \*\*\*\*\*\*\*\*\*\*\*\*\* Recent

ONLY PROCESS 3.00000+ 3 TO 1.00000+ 4 EV Recent

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* PROGRAM RECENT (VERSION 2015-1) \*\*\*\*\*\*\*\*\*\*\*\*\* Recent

ONLY PROCESS 1.00000+ 4 TO 8.00000+ 4 EV Recent

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* PROGRAM RECENT (VERSION 2015-1) \*\*\*\*\*\*\*\*\*\*\*\*\* Recent

ONLY PROCESS 8.00000+ 4 TO 2.00000+ 7 EV Recent

Recent

YOU SHOULD CHECK TO INSURE THAT THERE ARE NO OVERLAPPING ENERGY Recent

RANGES OR MISSING ENERGY RANGES. Recent

Recent

WHEN YOU INDICATE BY INPUT THAT YOU ARE ABOUT TO PROCESS THE Recent

LAST ENERGY RANGE (SEE ABOVE, LOWER ENERGY LIMIT = NON-ZERO, Recent

UPPER ENERGY LIMIT = ZERO), THIS PROGRAM WILL ASSUME THAT Recent

YOU HAVE NOW COMPLETED ALL PROCESSING - AND ONLY THEN WILL Recent

IT SET FLAGS IN THE EVALUATION TO PREVENT THE RESONANCE Recent

CONTRIBUTION FROM BEING ADDED MORE THAN ONCE. FOR THIS REASON Recent

YOU CANNOT PROCESS STARTING WITH ENERGY INTERVALS AT HIGH Recent

ENERGY AND WORKING TOWARD LOW ENERGY - YOU MUST START AT LOW Recent

ENERGY AND WORK TOWARD HIGH ENERGY. Recent

Recent

I/O FILES Recent

================================================================== Recent

INPUT FILES Recent

----------- Recent

UNIT DESCRIPTION Recent

---- ----------- Recent

2 INPUT LINE (BCD - 80 CHARACTERS/RECORD) Recent

10 ORIGINAL ENDF/B DATA (BCD - 80 CHARACTERS/RECORD) Recent

Recent

OUTPUT FILES Recent

------------ Recent

UNIT DESCRIPTION Recent

---- ----------- Recent

3 OUTPUT REPORT (BCD - 120 CHARACTERS/RECORD) Recent

11 FINAL ENDF/B DATA (BCD - 80 CHARACTERS/RECORD) Recent

Recent

SCRATCH FILES Recent

------------- Recent

UNIT DESCRIPTION Recent

---- ----------- Recent

12 SCRATCH FILE FOR DATA RECONSTRUCTED FROM RESONANCE Recent

PARAMETERS (BINARY - 100200 WORDS/RECORD) Recent

14 SCRATCH FILE FOR COMBINED FILE 2 AND 3 DATA Recent

(BINARY - 40080 WORDS/RECORD) Recent

Recent

OPTIONAL STANDARD FILE NAMES (SEE SUBROUTINE FILEIO) Recent

================================================================== Recent

UNIT FILE NAME Recent

---- ---------- Recent

2 RECENT.INP Recent

3 RECENT.LST Recent

10 ENDFB.IN Recent

11 ENDFB.OUT Recent

12 (SCRATCH) Recent

14 (SCRATCH) Recent

Recent

INPUT CARDS Recent

================================================================== Recent

LINE COLS. FORMAT DESCRIPTION Recent

---- ----- ------ ----------- Recent

1 1-11 I11 RETRIEVAL CRITERIA (0=MAT, 1=ZA) Recent

THIS OPTION DEFINED WHETHER COLUMNS 1-22 OF Recent

SUBSEQUENT INPUT CARDS SHOULD BE INTERPRETED Recent

TO BE MAT OR ZA RANGES. Recent

12-22 E11.4 FILE 2 MINIMUM ABSOLUTE CROSS SECTION Recent

(IF 1.0E-10 OR LESS IS INPUT THE PROGRAM Recent

WILL USE 1.0E-10) Recent

23-33 I11 TREATMENT OF REACTIONS FOR WHICH BACKGROUND Recent

CROSS SECTION IS NOT GIVEN. Recent

= 0 - IGNOR (I.E. NO OUTPUT) Recent

= 1 - OUTPUT RESONANCE CONTRIBUTION. Recent

THIS OPTION IS USEFUL WITH PARTIAL EVALUATION Recent

(E.G. ENDF/B-V DOSIMETRY LIBRARY) WHERE ONLY Recent

ONE OR MORE OF THE REACTIONS ARE OF ACTUAL Recent

INTEREST. Recent

WARNING...THE USE OF THIS FIELD HAS BEEN Recent

CHANGED. THIS FIELD WAS PREVIOUSLY USED TO Recent

DEFINE THE PRECISION OF THE CALCULATION AND Recent

OUTPUT. THE FORMER DEFINITION OF THIS FIELD Recent

WAS... Recent

MINIMUM ENERGY SPACING FLAG Recent

= 0 - 6 DIGIT MINIMUM ENERGY SPACING. Recent

STANDARD 6 DIGIT E11.4 OUTPUT. Recent

= 1 - 9 DIGIT MINIMUM ENERGY SPACING. Recent

STANDARD 6 DIGIT E11.4 OUTPUT. Recent

= 2 - 9 DIGIT MINIMUM ENERGY SPACING. Recent

VARIABLE 9 DIGIT F FORMAT OUTPUT. Recent

FROM EXPERIENCE IT HAS BEEN FOUND THAT Recent

FAILURE TO SET THIS OPTION TO 2 CAN RESULT Recent

IN LARGE ERRORS IN THE FINAL DATA. THEREFORE Recent

INTERNALLY THIS OPTION IS SET TO 2. Recent

34-44 I11 OPERATING MODE Recent

= 0 - CACULATE. MINIMUM OUTPUT LISTING Recent

= 1 - CACULATE. LIST ALL RESONANCE PARAMETERS Recent

= 2 - EDIT MODE. NO CALCULATION. LIST ALL Recent

RESONANCE PARAMETERS. Recent

NOTE, THE EDIT MODE (=2) IS THE SUGGESTED Recent

MODE TO FIRST TEST THE CONSISTENCY OF THE Recent

EVALUATED DATA, BEFORE RECONSTRUCTING CROSS Recent

SECTIONS (SEE, COMMENTS ABOVE). Recent

45-55 I11 NEGATIVE CROSS SECTIOIN TREATMENT Recent

= 0 - O.K. - NO CHANGE Recent

= 1 - SET = 0 Recent

56-66 I11 MONITOR MODE SELECTOR Recent

= 0 - NORMAL OPERATION Recent

= 1 - MONITOR PROGRESS OF RECONSTRUCTION OF Recent

FILE 2 DATA AND COMBINING FILE 2 AND Recent

FILE 3 DATA. EACH TIME A PAGE OF DATA Recent

POINTS IS WRITTEN TO A SCRATCH FILE Recent

PRINT OUT THE TOTAL NUMBER OF POINTS Recent

ON SCRATCH AND THE LOWER AND UPPER Recent

ENERGY LIMITS OF THE PAGE (THIS OPTION Recent

MAY BE USED IN ORDER TO MONITOR THE Recent

EXECUTION SPEED OF LONG RUNNING JOBS). Recent

2 1-72 A72 ENDF/B INPUT DATA FILENAME Recent

(STANDARD OPTION = ENDFB.IN) Recent

3 1-72 A72 ENDF/B OUTPUT DATA FILENAME Recent

(STANDARD OPTION = ENDFB.OUT) Recent

4-N 1-11 I11 MINIMUM MAT OR ZA (SEE COLS. 1-11, LINE 1) Recent

12-22 I11 MAXIMUM MAT OR ZA (SEE COLS. 1-11, LINE 1) Recent

UP TO 100 MAT OR ZA RANGES MAY BE SPECIFIED, Recent

ONE RANGE PER LINE. THE LIST IS TERMINATED Recent

BY A BLANK LINE. IF THE THE UPPER LIMIT OF Recent

ANY REQUEST IS LESS THAN THE LOWER LIMIT THE Recent

UPPER LIMIT WILL BE SET EQUAL TO THE LOWER Recent

LIMIT. IF THE FIRST REQUEST LINE IS BLANK IT Recent

WILL TERMINATE THE REQUEST LIST AND CAUSE ALL Recent

DATA TO BE RETRIEVED (SEE EXAMPLE INPUT). Recent

23-33 E11.4 LOWER ENERGY LIMIT FOR PROCESSING. Recent

34-44 E11.4 UPPER ENERGY LIMIT FOR PROCESSING. Recent

\*THE LOWER AND UPPER ENERGY LIMITS MUST BE Recent

ZERO, OR BLANK, UNLESS YOU WISH TO ONLY Recent

PROCESS A PORTION OF RESONANCE REGIONS. Recent

\*THESE ENERGY LIMITS ARE ONLY READ FROM THE Recent

FIRST MAT/ZA REQUEST LINE Recent

\*IF BOTH ARE ZERO (OR BLANK) THE ENTIRE Recent

RESONANCE REGION FOR EACH MATERIAL WILL BE Recent

PROCESSED Recent

\*IF LIMITS ARE INPUT ONLY THAT PORTION OF THE Recent

RESONANCE REGION FOR EACH MATERIAL WHICH Recent

LIES BETWEEN THESE LIMITS WILL BE PROCESSED Recent

\*SEE INSTRUCTIONS ABOVE BEFORE USING THIS Recent

OPTION. Recent

VARY 1-11 E11.4 ENERGY FOR FILE 2 ERROR LAW ( SEE ) Recent

12-22 E11.4 ERROR FOR FILE 2 ERROR LAW (COMMENTS) Recent

( BELOW ) Recent

Recent

NOTE, THIS VERSION OF THE PROGRAM DOES NOT THIN THE COMBINED FILE Recent

FILE 2 + 3 DATA. AS SUCH THE ERROR LAW FOR COMBINING FILE 2 + 3 Recent

WHICH WAS REQUIRED IN EARLIER VERSIONS OF THIS CODE ARE NO LONGER Recent

REQUIRED. Recent

Recent

THE FILE 2 ERROR LAW MAY BE ENERGY INDEPENDENT (DEFINED BY A Recent

SINGLE ERROR) OR ENERGY DEPENDENT (DEFINED BY UP TO 20 ENERGY, Recent

ERROR PAIRS). FOR THE ENERGY DEPENDENT CASE LINEAR INTERPOLATION Recent

WILL BE USED TO DEFINE THE ERROR AT ENERGIES BETWEEN THOSE AT Recent

WHICH THE ERROR IS TABULATED. THE ERROR LAW IS TERMINATED BY A Recent

BLANK LINE. IF ONLY ONE ENERGY, ERROR PAIR IS GIVEN THE LAW WILL Recent

BE CONSIDERED TO BE ENERGY INDEPENDENT. IF MORE THAN ONE PAIR Recent

IS GIVEN IT BE CONSIDERED TO BE ENERGY DEPENDENT (NOTE, THAT Recent

FOR A CONSTANT ERROR THE ENERGY INDEPENDENT FORM WILL RUN FASTER. Recent

HOWEVER, FOR SPECIFIC APPLICATIONS AN ENERGY DEPENDENT ERROR MAY Recent

BY USED TO MAKE THE PROGRAM RUN CONSIDERABLE FASTER). Recent

Recent

ALL ENERGIES MUST BE IN ASCENDING ENERGY ORDER. FOR CONVERGENCE Recent

OF THE FILE 2 RECONSTRUCTION ALGORITHM ALL THE ERRORS MUST BE Recent

POSITIVE. IF ERROR IS NOT POSITIVE IT WILL BE SET EQUAL TO THE Recent

STANDARD OPTION (CURRENTLY 0.001, CORRRESPONDING TO 0.1 PER-CENT). Recent

IF THE FIRST LINE OF THE ERROR LAW IS BLANK IT WILL TERMINATE THE Recent

ERROR LAW AND THE ERROR WILL BE TREATED AS ENERGY INDEPENDENT, Recent

EQUAL TO THE STANDARD OPTION (CURRENTLY, 0.1 PER-CENT). SEE, Recent

EXAMPLE INPUT 4. Recent

Recent

EXAMPLE INPUT NO. 1 Recent

------------------- Recent

CONSIDER ALL URANIUM ISOTOPES AND TH-232. CONSIDER CROSS SECTIONS Recent

WHICH ARE LARGER THAN 1.0E-8 BARNS IN ABSOLUTE VALUE. ONLY OUTPUT Recent

REACTIONS FOR WHICH A BACKGROUND IS GIVEN. LIST ALL PARAMETERS AND Recent

CALCULATE CROSS SECTIONS. MONITOR THE EXECUTION PROGRESS OF THE Recent

PROGRAM. BETWEEN 0 AND 100 EV USE 0.1 PER-CENT ACCURACY. BETWEEN Recent

100 EV AND 1 KEV VARY THE ACCURACY FROM 0.1 TO 1 PER-CENT. ABOVE Recent

1 KEV USE 1 PER-CENT ACCURACY. Recent

Recent

EXPLICITLY SPECIFY THE STANDARD FILENAMES. Recent

Recent

THE FOLLOWING 11 INPUT CARDS ARE REQUIRED. Recent

Recent

1 1.00000-08 0 1 0 1 Recent

ENDFB.IN Recent

ENDFB.OUT Recent

92000 92999 Recent

90232 (UPPER LIMIT AUTOMATICALLY SET TO 90232) Recent

(END REQUEST LIST) Recent

0.00000+ 0 1.00000-03 Recent

1.00000+02 1.00000-03 Recent

1.00000+03 1.00000-02 Recent

1.00000+09 1.00000-02 Recent

(END FILE 2 ERROR LAW) Recent

Recent

EXAMPLE INPUT NO. 2 Recent

------------------- Recent

CONSIDER ALL URANIUM ISOTOPES AND TH-232. CONSIDER CROSS SECTIONS Recent

WHICH ARE LARGER THAN 1.0E-8 BARNS IN ABSOLUTE VALUE. ONLY OUTPUT Recent

REACTIONS FOR WHICH A BACKGROUND IS GIVEN. CROSS SECTIONS WILL BE Recent

CALCULATED, BUT PARAMETERS WILL NOT BE LISTED. THE PROGRESS OF THE Recent

PROGRAM WILL NOT BE MONITORED. USE 0.1 PER-CENT ACCURACY FOR ALL Recent

ENERGIES. SINCE 0.1 PER-CENT IS THE STANDARD OPTION FOR THE ERROR Recent

LAW THE FIRST ERROR LAW LINE MAY BE LEFT BLANK. Recent

Recent

LEAVE THE DEFINITION OF THE FILENAMES BLANK - THE PROGRAM WILL Recent

THEN USE THE STANDARD FILENAMES. Recent

Recent

THE FOLLOWING 7 INPUT CARDS ARE REQUIRED. Recent

Recent

1 1.00000-08 0 0 0 0 Recent

Recent

Recent

92000 92999 Recent

90232 (UPPER LIMIT AUTOMATICALLY SET TO 90232) Recent

(END REQUEST LIST) Recent

(USE STANDARD OPTION FOR ERROR LAW) Recent

Recent

EXAMPLE INPUT NO. 3 Recent

------------------- Recent

THE SAME AS EXAMPLE INPUT NO. 2, ONLY IN THIS CASE ONLY CALCULATE Recent

CROSS SECTIONS OVER THE ENERGY RANGE 0.01 TO 0.1 EV - ACROSS THE Recent

THERMAL ENERGY RANGE. NOTE, THE ONLY DIFFERENCE BETWEEN THE INPUT Recent

PARAMETERS IN THIS CASE AND IN EXAMPLE NO. 2, IS THAT ON THE Recent

SECOND INPUT LINE WE HAVE ADDED THE ENERGY RANGE 0.01 TO 0.1 EV. Recent

USE \PREPRO94\LINEAR\ENDFB.OUT AS INPUT AND ENDFB.OUT AS OUTPUT - Recent

SINCE ENDFB.OUT IS THE STANDARD OUTPUT FILENAME THE NAME CAN BE Recent

EITHER INCLUDED IN THE INPUT OR LEFT BLANK. Recent

Recent

THE FOLLOWING 7 INPUT CARDS ARE REQUIRED. Recent

Recent

1 1.00000-08 0 0 0 0 Recent

\PREPRO94\LINEAR\ENDFB.OUT Recent

ENDFB.OUT Recent

92000 92999 1.00000- 2 1.00000- 1 Recent

90232 (UPPER LIMIT AUTOMATICALLY SET TO 90232) Recent

(END REQUEST LIST) Recent

(USE STANDARD OPTION FOR ERROR LAW) Recent

Recent

EXAMPLE INPUT NO. 4 Recent

------------------- Recent

RECONSTRUCT ALL DATA. OUTPUT ALL REACTIONS, REGARDING OF WHETHER Recent

OR NOT THERE IS A BACKGROUND CROSS SECTION. DO NOT MONITOR THE Recent

PROGRESS OF THE PROGRAM. RECONSTRUCT CROSS SECTIONS TO 1 PER-CENT Recent

ACCURACY. USE \ENDFB6\LINEAR\ZA092238 AS INPUT AND Recent

\ENDFB6\RECENT\ZA092238 AS OUTPUT. Recent

Recent

THE FOLLOWING 6 INPUT CARDS ARE REQUIRED. Recent

Recent

0 0.0 1 0 0 0 Recent

\ENDFB6\ZA092238 Recent

\ENDFB6\RECENT\ZA092238 Recent

(RETRIEVE ALL DATA, END REQUEST LIST) Recent

1.00000- 2 Recent

(END FILE 2 ERROR LAW) Recent

Recent

EXAMPLE INPUT NO. 5 Recent

------------------- Recent

RECONSTRUCT ALL DATA. ONLY OUTPUT REACTIONS FOR WHICH A BACKGROUND Recent

CROSS SECTION IS GIVEN. DO NOT MONITOR THE PROGRESS OF THE PROGRAM Recent

RECONSTRUCT CROSS SECTIONS TO 0.1 PER-CENT ACCURACY. USE ENDFB.IN Recent

AS INPUT AND ENDFB.OUT AS OUTPUT. Recent

Recent

THIS CORRESPONDS TO USING ALL OF THE STANDARD OPTONS BUILT-IN TO Recent

THE PROGRAM AND ALL INPUT CARDS MAY BE BLANK. Recent

Recent

IN THIS CASE THE FOLLOWING 5 INPUT CARDS ARE REQUIRED. Recent

(ZEROES ARE INDICATED ON THE FIRST LINE, BELOW, ONLY TO INDICATE Recent

WHERE THE LINE IS. THE ACTUAL INPUT LINE CAN BE COMPLETELY BLANK). Recent

Recent

0 0.0 0 0 0 0 Recent

(USE STANDARD INPUT FILENAME = ENDFB.IN) Recent

(USE STANDARD OUTPUT FILENAME = ENDFB.OUT) Recent

(RETRIEVE ALL DATA, END REQUEST LIST) Recent

(0.1 ERROR, END FILE 2 ERROR LAW) Recent

Recent

======================================================================= Recent