**=======================================================================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 OPTIONRECENT**

 **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 RECONSTRUCTEDRECENT**

 **AND BACKGROUND ENERGY POINTS. RECENT**

 **\*ADDED STANDARD ALLOWABLE ERROR OPTIONSRECENT**

 **(CURRENTLY 0.1 PER-CENT RECONSTRUCTIONRECENT**

 **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-6 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 FORRECENT**

 **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-6 FORMAT RECENT**

 **TO BE THE SAME AS REICH-MOORE FORMAT RECENT**

 **IN EARLIER VERSIONS OF ENDF/B FORMAT. RECENT**

 **\*CHECK FOR PRELIMINARY ENDF/B-6 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 THERECENT**

 **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 RESONANCESRECENT**

 **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 SECTIONSRECENT**

 **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-6 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 RESONANCERECENT**

 **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 ROUNDINGRECENT**

 **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-6 FORMATS AND RECENT**

 **PROCEDURES MANUAL, PAGE 2.6) RECENT**

 **\*INCREASED PAGE SIZE FROM 4008 TO RECENT**

 **20040 DATA POINTS. RECENT**

 **\*INCREASED MAXIMUM NUMBER OF RESONANCESRECENT**

 **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 ADDL 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 RESONANCESRECENT**

 **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 CHANGERECENT**

 **\*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 FORMALISMRECENT**

 **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 FORRECENT**

 **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 ITERATIONRECENT**

 **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 FORRECENT**

 **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 IFRECENT**

 **PRESENT, THE GROUND LEVEL, MT = 600 RECENT**

 **THROUGH 800. IF COMPETITIVE CHANNEL RECENT**

 **IS mt=4 (TOTAL N.N') IT WILL ALSO ADDRECENT**

 **COMPETITIVE RESONANCE CONTRIBUTION TORECENT**

 **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 CALCULATIONRECENT**

 **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 - USERECENT**

 **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**

 **VERS. 2016-1 (Jan. 2016) \*Do not Change LSSF during the RECENT**

 **reconstrcution - for compatibility RECENT**

 **with later URR treatment. RECENT**

 **\*Insured that all ERROR stops print RECENT**

 **a message explaining why the code RECENT**

 **stopped. RECENT**

 **\*Partial Energy Range Processing RECENT**

 **no longer allowed - today's computersRECENT**

 **are so fast that this option is now RECENT**

 **out-of-date and no longer allowed. RECENT**

 **\*L-Value dependent fission = Earlier RECENT**

 **was done only by entire isotope. RECENT**

 **\*Denser Starting Energy Grid. RECENT**

 **VERS. 2017-1 (May 2017) \*Corrected ERROR in LRF=3 treatment. RECENT**

 **This ERROR only existed in version RECENT**

 **2016-1, which was never released to RECENT**

 **the general public, so it will not RECENT**

 **effect any results calculated by codeRECENT**

 **users. RECENT**

 **\*All floating input parameters changedRECENT**

 **to character input + IN9 conversion. RECENT**

 **\*Added points to starting energy grid RECENT**

 **to approximate the shape of each RECENT**

 **resonance = based on comparisons of RECENT**

 **0.01% to 0.1% results. RECENT**

 **\*Increased max. points to 1,200,000. RECENT**

 **\*LRF=7 Shift option no longer allowed RECENT**

 **Set = 0, print WARNING and continue. RECENT**

 **\*Corrected COMMON/NAPRHO/NRO,NAPS RECENT**

 **/NAPRHO/ mispelled - Freud found. RECENT**

 **VERS. 2017-2 (Sept. 2017) \*Corrected Write statemnt at 5731. RECENT**

 **VERS. 2018-1 (Nov. 2018) \*Added output for ALL ENDERROR RECENT**

 **VERS. 2019-1 (June 2019) \*Terminate if MF/MT=1/451 Temperature RECENT**

 **is NOT = 0 = Incompaible with the RECENT**

 **0 Kelvin data output to MF=3 by this RECENT**

 **code. RECENT**

 **\*Terminate if MF=3 Point Count and RECENT**

 **Interpolation Law do not agree. RECENT**

 **\*Terminate if MF=3 Background RECENT**

 **Interpolation is NOT Linear. RECENT**

 **\*Ignor background if zero at all RECENT**

 **energies - previously merged. RECENT**

 **\*Output competitive data even if no RECENT**

 **MF=3 background = previously skipped.RECENT**

 **\*Additional Interpolation Law Tests. RECENT**

 **\*Check Maximum Tabulated Energy to RECENT**

 **insure it is the same for all MTs - RECENT**

 **if not,print WARNING messages. RECENT**

 **\*Reduced Max. # of Resonance to RECENT**

 **100,000 from 300,000, e.g., for RECENT**

 **ENDF/B-VIII U235 and U238 have about RECENT**

 **3,000 resonances each. RECENT**

 **VERS. 2020-1 (Dec. 2020) \*Major re-write. RECENT**

 **\*Much more detailed starting grid RECENT**

 **\*Updated minimum/maximum convergence RECENT**

 **procedures. RECENT**

 **\*Added Target Isomer State RECENT**

 **\*WARNING - print if resolved resonanceRECENT**

 **enegies do not extend to top of RECENT**

 **resolved energy range. RECENT**

 **\*Stricter convergence for all except RECENT**

 **total and elastic,e.g., narrower RECENT**

 **capture resonances RECENT**

 **\*Increased minimum cross sections to RECENT**

 **handle RML Charged Particles RECENT**

 **VERS. 2021-1 (Mar. 2021) \*Valentin Sinitsa (GRUCON) supplied RECENT**

 **Solution for LRF=7, SHIFT=1 problems.RECENT**

 **Search for Valentin to find changes. RECENT**

 **\*Updated for FORTRAN 2018 RECENT**

 **\*Changed FUNCTION Xdot to RECENT**

 **SUBROUTINE XdotQ with RECENT**

 **arguments returned through COMMON. RECENT**

 **\*Mimimum Cross Section is no longer RECENT**

 **an input option - set to 1.0d-30. RECENT**

 **\*Insure ALL nodes are INCORE10 to RECENT**

 **prevent repeated energies in ENDF RECENT**

 **format output. RECENT**

 **\*Corrected dummy arguments ,1) to ,\*) RECENT**

 **Thank Arjan RECENT**

 **VERS. 2023-1 (Feb. 2023) \*Decreased page size from 1,200,000 RECENT**

 **to 120,000. 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 RedCullen1.net/HOMEPAGE.NEW RECENT**

 **RECENT**

 **Acknowledgement (Version 2021-1) RECENT**

 **==================================================================RECENT**

 **The author thanks Valentin Sinitsa (Kurchatov Institute) for RECENT**

 **providing the FORTRAN coding to handle the Reich-Moore Limited RECENT**

 **(RML) LRF=7, SHIFT=1, case. Valentin, I could not have completed RECENT**

 **the RECENT 2021-1 release without your invaluable contribution - RECENT**

 **I and all RECENT code users are indebted to you = SPASIBO. 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 CONSIDEREDRECENT**

 **THE LATEST DOCUMENTATION INCLUDING ALL RECENT IMPROVEMENTS. PLEASERECENT**

 **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 COMPUTERRECENT**

 **INDEPENDENT PROGRAMS THAT CAN EASILY BE IMPLEMENTED ON ANY ONE RECENT**

 **OF A WIDE VARIETY OF COMPUTERS. IN ORDER TO ASSIST IN THIS PROJECTRECENT**

 **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 CONTRIBUTIONRECENT**

 **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 RANGERECENT**

 **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 RESONANCERECENT**

 **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-6 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 SEQUENCERECENT**

 **TO THE POTENTIAL SCATTERING CROSS SECTION. RECENT**

 **RECENT**

 **THIS IS THE PROCEDURE WHICH WAS FOLLOWED BY ALL VERSIONS OF RECENTRECENT**

 **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-1, 2, 3, 4, 5, 6 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 COPIESRECENT**

 **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-4, 5 AND RECENT**

 **6 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-6 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 2023-1) \*\*\*\*\*\*\*\*\*\*\*\*\*\*\* 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 FORMATRECENT**

 **OF THE HOLLERITH SECTION IN ENDF/B-5 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 WASRECENT**

 **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 PROGRAMRECENT**

 **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 RESONANCERECENT**

 **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 SECTIONSRECENT**

 **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 DEFINITIONRECENT**

 **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 EXPLICITLYRECENT**

 **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 WILLRECENT**

 **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 EVALUATIONSRECENT**

 **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 DEPENDENTRECENT**

 **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 ACCORDINGRECENT**

 **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 SECTIONRECENT**

 **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 POTENTIALRECENT**

 **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 MUSTRECENT**

 **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-4 AND 5 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 THATRECENT**

 **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 EACHRECENT**

 **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 CALCULATERECENT**

 **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 CONVENTIONRECENT**

 **USED IN ENDF/B-4 AND EARLIER VERSIONS OF ENDF/B. THE ENDF/B-5 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 RESULTSRECENT**

 **DEPENDING ON WHICH OF THE THREE ENDF/B UNRESOLVED PARAMTER FORMATSRECENT**

 **IS USED. FOR EXAMPLE, GIVEN A SET OF ENERGY INDEPENDENT UNRESOLVEDRECENT**

 **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-5 CONVENTION TO INTERPOLATE CROSS SECTIONS CAN RECENT**

 **LEAD TO THREE COMPLETELY DIFFERENT RESULTS. IN CONTRAST USING THE RECENT**

 **ENDF/B-4 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 PARAMETERSRECENT**

 **CAN BE UNIQUELY REPRESENTED IN THE ALL PARAMETERS ENERGY DEPENDENTRECENT**

 **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-WIDTHSRECENT**

 **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 REACTIONSRECENT**

 **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 COMPAREDRECENT**

 **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 ENERGYRECENT**

 **DEPENDENT. THE ALLOWABLE ERROR IS DESCRIBED BY A TABULATED RECENT**

 **FUNCTION OF UP TO 20 (ENERGY,ERROR) PAIRS AND LINEAR INTERPOLATIONRECENT**

 **BETWEEN TABULATED POINTS. IF ONLY ONE TABULATED POINT IS GIVEN THERECENT**

 **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 SEPARATELYRECENT**

 **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**

 **-----2016/3/10 - This option is no longer allowed - today's computers RECENT**

 **are so mjuch faster that this option is no longer RECENT**

 **needed. 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 2023-1) \*\*\*\*\*\*\*\*\*\*\*\*\* RECENT**

 **ONLY PROCESS 0.00000+ 0 TO 3.00000+ 3 EV RECENT**

 **\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* PROGRAM RECENT (VERSION 2023-1) \*\*\*\*\*\*\*\*\*\*\*\*\* RECENT**

 **ONLY PROCESS 3.00000+ 3 TO 1.00000+ 4 EV RECENT**

 **\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* PROGRAM RECENT (VERSION 2023-1) \*\*\*\*\*\*\*\*\*\*\*\*\* RECENT**

 **ONLY PROCESS 1.00000+ 4 TO 8.00000+ 4 EV RECENT**

 **\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* PROGRAM RECENT (VERSION 2023-1) \*\*\*\*\*\*\*\*\*\*\*\*\* 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**

 **-----2016/3/10 - This option is no longer allowed - today's computers 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 EVALUATIONRECENT**

 **(E.G. ENDF/B-5 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 PARAMETERSRECENT**

 **= 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 ALLRECENT**

 **DATA TO BE RETRIEVED (SEE EXAMPLE INPUT). RECENT**

 **----- 2016/3/10 - Partial Processing no longer allowed. RECENT**

 **If these fields are not blank the code will STOP RECENT**

 **with a WARNING that this is no longer allowed. 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**

 **----- 2016/3/10 - Partial Processing no longer allowed. 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 ANDRECENT**

 **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 THERECENT**

 **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 BACKGROUNDRECENT**

 **CROSS SECTION IS GIVEN. DO NOT MONITOR THE PROGRESS OF THE PROGRAMRECENT**

 **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**