**=======================================================================MIXER**

 **MIXER**

 **PROGRAM MIXER MIXER**

 **============= MIXER**

 **VERSION 76-1 (NOVEMBER 1976) MIXER**

 **VERSION 81-1 (APRIL 1981) \*IBM VERSION MIXER**

 **VERSION 82-1 (AUGUST 1982) \*COMPUTER INDEPENDENT VERSION MIXER**

 **VERSION 84-1 (JUNE 1984) \*SPECIAL I/O ROUTINES TO GUARANTEE MIXER**

 **ACCURACY OF ENERGY. MIXER**

 **\*DOUBLE PRECISION TREATMENT OF ENERGY MIXER**

 **(REQUIRED FOR NARROW RESONANCES). MIXER**

 **VERSION 86-1 (JANUARY 1986)\*FORTRAN-77/H VERSION MIXER**

 **VERSION 88-1 (JULY 1988) \*OPTION...INTERNALLY DEFINE ALL I/O MIXER**

 **FILE NAMES (SEE, SUBROUTINE FILIO1 MIXER**

 **AND FILIO2 FOR DETAILS). MIXER**

 **\*IMPROVED BASED ON USER COMMENTS. MIXER**

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

 **INSURE PROGRAM WILL NOT DO ANYTHING MIXER**

 **CRAZY. MIXER**

 **\*UPDATED TO USE NEW PROGRAM CONVERT MIXER**

 **KEYWORDS. MIXER**

 **\*ADDED LIVERMORE CIVIC COMPILER MIXER**

 **CONVENTIONS. MIXER**

 **VERSION 92-1 (JANUARY 1992)\*UPDATED BASED ON USER COMMENTS MIXER**

 **\*ADDED PHOTON CROSS SECTIONS MIXER**

 **\*ADDED FORTRAN SAVE OPTION MIXER**

 **\*OUTPUT IN ENDF/B-VI FORMAT MIXER**

 **\*COMPLETELY CONSISTENT I/O ROUTINES - MIXER**

 **TO MINIMIZE COMPUTER DEPENDENCE. MIXER**

 **\*NOTE, CHANGE IN INPUT PARAMETER MIXER**

 **FORMAT. MIXER**

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

 **TO ALLOW ACCESS TO FILE STRUCTURES MIXER**

 **(WARNING - INPUT PARAMETER FORMAT MIXER**

 **HAS BEEN CHANGED) MIXER**

 **\*CLOSE ALL FILES BEFORE TERMINATING MIXER**

 **(SEE, SUBROUTINE ENDIT) MIXER**

 **\*INCREASED INCORE PAGE SIZE FROM MIXER**

 **1002 TO 4008. MIXER**

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

 **\*IMPROVED COMPUTER INDEPENDENCE MIXER**

 **\*ALL DOUBLE PRECISION MIXER**

 **\*ON SCREEN OUTPUT MIXER**

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

 **\*IMPROVED OUTPUT PRECISION MIXER**

 **\*DEFINED SCRATCH FILE NAMES MIXER**

 **\*INCREASED INCORE PAGE SIZE FROM MIXER**

 **4008 TO 12000. MIXER**

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

 **POINT READ FOR MORE DIGITS MIXER**

 **\*UPDATED TEST FOR ENDF/B FORMAT MIXER**

 **VERSION BASED ON RECENT FORMAT CHANGEMIXER**

 **\*GENERAL IMPROVEMENTS BASED ON MIXER**

 **USER FEEDBACK MIXER**

 **VERSION 99-2 (JUNE 1999) \*ASSUME ENDF/B-VI, NOT V, IF MISSING MIXER**

 **MF=1, MT-451. MIXER**

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

 **USER FEEDBACK MIXER**

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

 **VERS. 2004-1 (MARCH 2004) \*ADDED INCLUDE FOR COMMON MIXER**

 **\*INCREASED INCORE PAGE SIZE FROM MIXER**

 **12000 TO 60000. MIXER**

 **VERS. 2005-1 (OCT. 2005) \*CORRECTED MERGE ERROR MIXER**

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

 **\*INCREASED INCORE PAGE SIZE FROM MIXER**

 **60,000 TO 240,000. MIXER**

 **VERS. 2007-2 (DEC. 2007) \*72 CHARACTER FILE NAMES. MIXER**

 **VERS. 2008-1 (JUNE 2008) \*ADDED GRAMS OR ATOMS INPUT MIXER**

 **VERS. 2010-1 (Apr. 2010) \*General update based on user feedbackMIXER**

 **VERS. 2012-1 (Aug. 2012) \*Added CODENAME MIXER**

 **\*32 and 64 bit Compatible MIXER**

 **\*Added ERROR stop MIXER**

 **VERS. 2015-1 (Jan. 2015) \*Extended OUT9. MIXER**

 **\*Replaced ALL 3 way IF Statements. MIXER**

 **VERS. 2017-1 (May 2017) \*Increse max. points to 1,200,000 MIXER**

 **\*updated based on user feedbsck. MIXER**

 **\*All floating input parameters changedMIXER**

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

 **VERS. 2018-1 (Jan. 2018) \*Added on-line output for ALL ENDERRORMIXER**

 **VERS. 2019-1 (June 2019) \*Additional Interpolation Law Tests MIXER**

 **\*Added WARNING if ANY MT ends below MIXER**

 **Maximum Tabulated Energy of ANY otherMIXER**

 **MT = the ENDF Data is NOT uniquely MIXER**

 **defined above this energy. MIXER**

 **\*Corrected ERROR that could set last MIXER**

 **(highest energy) cross section = 0.0 MIXER**

 **\*No longer automatically extend cross MIXER**

 **sections as constant above tabulated MIXER**

 **energy range. MIXER**

 **VERS. 2020-1 (June 2020) \*Complete Re-write to allow some MIXER**

 **reactions to be missing, e.g., MIXER**

 **define (n,t) for natural abundant MIXER**

 **element by summing over isotopes, MIXER**

 **where only some isotopes have (n,t). MIXER**

 **\*Additional Interpolation Law Tests MIXER**

 **\*Min 1 File allowed,e.g. select MT MIXER**

 **Previously assumed 2 or more files MIXER**

 **needed for MIX. MIXER**

 **VERS. 2021-1 (Jan. 2021) \*Updated for FORTRAN 2018 MIXER**

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

 **to 120,000 MIXER**

 **MIXER**

 **Acknowledgement 2019 MIXER**

 **-------------------- MIXER**

 **I thank Daniel Lopez Aldama (Agency of Nuclear Energy and AdvancedMIXER**

 **Technologies, Havana, Cuba), for finding and fixing an ERROR in MIXER**

 **MIXER that could result in the last MIXED energy point (highest MIXER**

 **energy output) ERROREOUSLY setting the cross section = 0.0. This MIXER**

 **problem has been corrected in 2019-1. MIXER**

 **MIXER**

 **Defining High Energy Data MIXER**

 **------------------------- MIXER**

 **Starting with MIXER (2019-1), it will no longer automatically MIXER**

 **extend MTs as CONSTANT above the energy range where they are MIXER**

 **tabulated to the Maximum Tabulated Energy of any other MT in MIX. MIXER**

 **Above this energy the ENDF MIX is not UNIQUELY defined - in this MIXER**

 **case it was potentially TOTALLY MISLEADING users of MIXER in that MIXER**

 **it was doing "invisiable evaluation" - starting with 2019-1 MIXER**

 **MIXER will, MIXER**

 **1) Extend the cross section = 0. MIXER**

 **2) Print WARNING messages idenifying the Maximum Tabulated Energy MIXER**

 **of ANY MT - and which MTs stop below this energy. MIXER**

 **3) Print a final WARNING that the MIX is NO UNIQUELY defined MIXER**

 **above the LOWEST common tabulated energy fot any MT. MIXER**

 **MIXER**

 **OWNED, MAINTAINED AND DISTRIBUTED BY MIXER**

 **------------------------------------ MIXER**

 **THE NUCLEAR DATA SECTION MIXER**

 **INTERNATIONAL ATOMIC ENERGY AGENCY MIXER**

 **P.O. BOX 100 MIXER**

 **A-1400, VIENNA, AUSTRIA MIXER**

 **EUROPE MIXER**

 **MIXER**

 **ORIGINALLY WRITTEN BY MIXER**

 **------------------------------------ MIXER**

 **Dermott E. Cullen MIXER**

 **MIXER**

 **PRESENT CONTACT INFORMATION MIXER**

 **--------------------------- MIXER**

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 **MIXER**

 **PURPOSE MIXER**

 **------- MIXER**

 **THIS PROGRAM IS DESIGNED TO CALCULATE THE ENERGY DEPENDENT CROSS MIXER**

 **SECTION FOR A COMPOSITE MIXTURE OF UP TO 10 DIFFERENT MATERIALS. MIXER**

 **MIXER**

 **THE PRESENT VERSION WILL ONLY CALCULATE THE CROSS SECTION FOR ONE MIXER**

 **FINAL REACTION (ENDF/B SECTION), E.G. TOTAL CROSS SECTION, BUT NOTMIXER**

 **ANY OTHER REACTION. MIXER**

 **MIXER**

 **NOTE, THIS PROGRAM WILL NOT COMBINE ALL REACTIONS FOR A MIXTURE MIXER**

 **OF MATERIALS DURING A SINGLE RUN - ONLY ONE REACTION WILL BE MIXER**

 **CREATED PER RUN. MIXER**

 **MIXER**

 **EVALUATED DATA FORMAT MIXER**

 **--------------------- MIXER**

 **THE CROSS SECTIONS ARE READ FROM THE ENDF/B FORMAT AND THE MIXER**

 **COMPOSITE CROSS SECTION IS CONVERTED TO AN EQUIVALENT BARNS/ATOM MIXER**

 **FORM AND OUTPUT IN THE ENDF/B FORMAT WITH AN EQUIVALENT ATOMIC MIXER**

 **WEIGHT. THE USER MUST SPECIFY THE COMPOSITION BY GIVING THE ZA, MIXER**

 **MT AND GRAMS OR ATOMS OF EACH CONSTITUENT. IN ADDITION THE USER MIXER**

 **IDENTIFY THE COMPOSITE CROSS SECTION BY SPECIFYING THE ZA, MAT MIXER**

 **AND MT TO BE USED IN THE ENDF/B FORMATTED OUTPUT. MIXER**

 **MIXER**

 **SINCE ONLY THE CROSS SECTIONS IN FILE 3 AND 23 ARE USED, AND THE MIXER**

 **FORMAT FOR FILE 3/23 IS THE SAME IN ALL VERSIONS ON ENDF/B, THIS MIXER**

 **PROGRAM MAY BE USED WITH ANY VERSION OF ENDF/B DATA (I.E., MIXER**

 **ENDF/B-I, II, III, IV, V OR VI). DURING A SINGLE RUN IT MAY EVEN MIXER**

 **BE USED TO READ AND COMBINE EVALUATIONS WHICH ARE IN DIFFERENT MIXER**

 **VERSIONS OF THE ENDF/B FORMAT. MIXER**

 **MIXER**

 **ENDF/B FORMATTED OUTPUT WILL BE IN THE ENDF/B-VI FORMAT REGARDLESSMIXER**

 **OF THE FORMAT OF THE INPUT ENDF/B DATA. THIS WILL ONLY EFFECT THE MIXER**

 **HOLLERITH SECTION (MF=1, MT=451). THE FORMAT OF CROSS SECTIONS MIXER**

 **(MF=3) IS THE SAME IN ALL VERSION OF THE ENDF/B FORMAT. MIXER**

 **MIXER**

 **IN ORDER TO GUARANTEE PROPER OPERATION OF THIS PROGRAM THE DATA MIXER**

 **MUST BE PROPERLY CODED IN THE ENDF/B FORMAT. NO ERROR CHECKING IS MIXER**

 **PERFORMED. IT IS PARTICULARLY IMPORTANT THAT THE FOLLOWING DATA MIXER**

 **BE CORRECT MIXER**

 **MIXER**

 **(1) ZA, MF, MT - MUST BE CORRECT IN ORDER TO ALLOW PROGRAM TO MIXER**

 **SELECT THE APPROPRIATE SECTIONS TO BE COMBINED. MIXER**

 **(2) AWRE - ATOMIC WEIGHT RATIO MUST BE CORRECT TO ALLOW PROGRAM MIXER**

 **TO CONVERT THE USER SPECIFIED GRAMS INTO ATOMS FOR MIXER**

 **PROPER ATOM RATIO MIXING. MIXER**

 **(3) (ENERGIES, CROSS SECTIONS) - MUST BE CORRECT, LINEARLY MIXER**

 **======== MIXER**

 **INTERPOLABLE, IN ASCENDING ENERGY ORDER OF (E, BARNS). MIXER**

 **============ MIXER**

 **MIXER**

 **TO CONVERT ENDF/B FORMATTED DATA TO THE REQUIRED INPUT FORM MIXER**

 **THE FOLLOWING PROGRAMS MAY BE USED, MIXER**

 **LINEAR - CONVERT TABULATED CROSS SECTIONS TO LINEARLY MIXER**

 **INTERPOLABLE FORM. MIXER**

 **RECENT - RECONSTRUCT RESONANCE CONTRIBUTION, ADD TO BACKGROUNDMIXER**

 **CROSS SECTION AND OUTPUT THE COMBINATION IN LINEARLY MIXER**

 **INTERPOLABLE FORM. MIXER**

 **SIGMA1 - DOPPLER BROADEN CROSS SECTIONS TO ANY TEMPERATURE ANDMIXER**

 **OUTPUT THE RESULT IN LINEARLY INTERPOLABLE FORM. MIXER**

 **MIXER**

 **DOCUMENTATION MIXER**

 **------------- MIXER**

 **THE FACT THAT THIS PROGRAM HAS COMBINED THE DATA IS DOCUMENTED MIXER**

 **IN THE OUTPUT ENDF/B FORMAT IN THE HOLLERITH SECTION BY FIRST MIXER**

 **IDENTIFYING THE VERSION OF THIS PROGRAM THAT WAS USED, IN THE FORMMIXER**

 **MIXER**

 **\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*( PROGRAM MIXER 2023-1) \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*MIXER**

 **MIXER**

 **THIS IS FOLLOWED BY THE TWO LINE IDENTIFICATION INPUT BY THE USER.MIXER**

 **THIS IS FOLLOWED BY COMPOSITION INPUT BY THE USER. MIXER**

 **MIXER**

 **NEUTRON OR PHOTON DATA MIXER**

 **---------------------- MIXER**

 **THIS PROGRAM WILL ALLOW YOU TO PROCESS EITHER NEUTRON OR PHOTON MIXER**

 **CROSS SECTIONS - BUT YOU CANNOT MIX THE TWO TYPES TOGETHER. BY MIXER**

 **INPUT YOU CAN SPECIFY THE OUTPUT MF = 3 (NEUTRONS) OR 23 (PHOTONS)MIXER**

 **WHATEVER TYPE YOU SPECIFIED FOR OUTPUT IS THE ONLY TYPE OF DATA MIXER**

 **WHICH WILL BE PROCESSED BY THIS PROGRAM. MIXER**

 **MIXER**

 **DEFINING THE COMPOSITION MIXER**

 **------------------------ MIXER**

 **THE USER MAY SPECIFY UP TO 10 DIFFERENT SECTIONS OF DATA TO BE MIXER**

 **COMBINED, EACH SECTION IDENTIFIED BY ZA AND MT NUMBER. THE MIXER**

 **AMOUNT OF EACH MATERIAL IS SPECIFIED BY DEFINING THE NUMBER OF MIXER**

 **GRAMS OF EACH MATERIAL IN THE COMPOSITE MIXTURE. THIS CAN BE MIXER**

 **DERIVED FROM THE VOLUME FRACTION SIMPLY BY MULTIPLYING THE STP MIXER**

 **DENSITY OF EACH MATERIAL BY ITS VOLUME FRACTION. NOTE, DO NOT MIXER**

 **INPUT ATOM FRACTIONS. MIXER**

 **MIXER**

 **THE LIST OF SECTIONS TO BE COMBINED MAY BE SPECIFIED IN ANY MIXER**

 **ORDER, I.E. THEY NEED NOT BE IN ZA ORDER OR THE ORDER THAT THE MIXER**

 **EVALUATED DATA APPEARS ON THE ENDF/B FORMATTED TAPE. MIXER**

 **MIXER**

 **IF ANY REQUESTED SECTION OF DATA IS NOT FOUND ON THE ORIGINAL MIXER**

 **ENDF/B FORMATTED FILE, THE PROGRAM WILL PRINT A LIST OF THE MIXER**

 **MISSING SECTIONS AND TERMINATE. IF ALL REQUESTED SECTIONS ARE MIXER**

 **FOUND THE PROGRAM WILL PRODUCE A COMPOSITE SECTION USING THE MIXER**

 **UNION OF ALL ENERGIES FOUND IN ANY SECTION. THE COMPOSITE SECTION MIXER**

 **WILL NOT BE THINNED. MIXER**

 **MIXER**

 **PRIOR TO LATER USE IN ANY APPLICATION THE NUMBER OF ENERGY POINTS MIXER**

 **IN THE COMPOSITE CROSS SECTION MAY BE MINIMIZED BY USING PROGRAM MIXER**

 **LINEAR, UCRL-50400, VOL. 17, PART B TO THIN THE DATA. MIXER**

 **MIXER**

 **ONLY LINEARLY INTERPOLABLE DATA MIXER**

 **------------------------------- MIXER**

 **THE CROSS SECTIONS TO BE COMBINED MUST BE IN LINEARLY INTERPOLABLEMIXER**

 **TABULATED FORM (I. E., FILE 3 OR 23, INTERPOLATION LAW 2). MIXER**

 **MIXER**

 **TO CONVERT TABULATED CROSS SECTIONS TO LINEARLY INTERPOLABLE FORM MIXER**

 **SEE, PROGRAM LINEAR, UCRL-50400, VOL. 17, PART A. MIXER**

 **MIXER**

 **TO CONVERT RESONANCE PARAMETERS TO LINEARLY INTERPOLABLE FORM SEE,MIXER**

 **PROGRAM RECENT, UCRL-50400, VOL. 17, PART C. MIXER**

 **MIXER**

 **TO DOPPLER BROADEN LINEARLY INTERPOLABLE DATA TO ANY TEMPERATURE MIXER**

 **SEE PROGRAM SIGMA1, UCRL-50400, VOL. 17, PART B. MIXER**

 **MIXER**

 **PAGING SYSTEM MIXER**

 **------------- MIXER**

 **THERE IS NO LIMIT TO THE THE NUMBER OF DATA POINTS IN EACH OF THE MIXER**

 **SECTIONS TO BE COMBINED, NOR IS THERE A LIMIT TO THE NUMBER OF MIXER**

 **DATA POINTS IN THE COMPOSITE MIXTURE CROSS SECTION. MIXER**

 **MIXER**

 **ALL REQUIRED SECTIONS OF DATA ARE READ FROM THE ORIGINAL ENDF/B MIXER**

 **FORMATTED FILE. ANY SECTION OF 60000 OR FEWER POINTS WILL BE MIXER**

 **TOTALLY CORE RESIDENT. LARGER SECTIONS ARE LOADED INTO A PAGING MIXER**

 **SYSTEM USING A SCRATCH FILE WITH ONLY 60000 POINTS PER SECTION MIXER**

 **CORE RESIDENT AT ANY ONE TIME. SIMILARLY THE COMPOSITE SECTION MIXER**

 **WILL BE TOTALLY CORE RESIDENT IF IT CONTAINS 60000 OR FEWER POINTSMIXER**

 **AND LARGER COMPOSITE SECTIONS WILL BE LOADED INTO A PAGING MIXER**

 **SYSTEM WHERE ONLY 60000 POINTS ARE CORE RESIDENT AT ANY TIME. SINCMIXER**

 **A PAGING SYSTEM MAY BE USED BY ANY SECTION OF DATA THERE IS NO MIXER**

 **LIMIT TO THE SIZE OF EITHER THE ORIGINAL SECTIONS, NOR TO THE MIXER**

 **COMPOSITE SECTION, E.G. A SECTION MAY CONTAIN 100,000 ENERGIES MIXER**

 **AND CROSS SECTIONS TO DESCRIBE A GIVEN REACTION. MIXER**

 **MIXER**

 **PAGE SIZE MIXER**

 **--------- MIXER**

 **THE PAGE SIZE USED IN THIS PROGRAM IS DEFINED BY THE PARAMETER MIXER**

 **NPAGE AND THE DIMENSIONS OF THE ARRAYS XTAB AND YTAB. IN ORDER MIXER**

 **TO ADAPT THIS PROGRAM FOR USE ON ANY COMPUTER THE PAGE SIZE MAY MIXER**

 **BE INCREASED OR DECREASED BUT THE FOLLOWING RULES MUST BE FOLLOWEDMIXER**

 **==== MIXER**

 **MIXER**

 **(1) NPAGE - MUST BE A MULTIPLE OF 3 IN ORDER TO ALLOW THE PROGRAM MIXER**

 **TO READ FULL CARDS OF ENDF/B DATA (3 POINTS PER LINE). FAILUREMIXER**

 **TO FOLLOW THIS RULE CAN LEAD TO LOSS OF DATA AND/OR PROGRAM MIXER**

 **ERRORS DURING EXECUTION. MIXER**

 **(3) YTAB - THE DIMENSION OF YTAB MUST BE (NPAGE,11). MIXER**

 **(4) XTAB - THE DIMENSION OF XTAB MUST BE (NPAGE,11). MIXER**

 **MIXER**

 **DOPPLER BROADENING MIXER**

 **------------------ MIXER**

 **THE COMPOSITE CROSS SECTION OUTPUT FROM THIS PROGRAM SHOULD NOT MIXER**

 **BE DOPPLER BROADENED USING PROGRAM SIGMA1, OR THE EQUIVALENT. THE MIXER**

 **ATOMIC WEIGHT USED TO IDENTIFY THE COMPOSITE MIXTURE IS BASED ON MIXER**

 **THE ATOM FRACTION OF EACH CONSTITUENT AND CANNOT BE USED TO MIXER**

 **CHARACTERIZE THE BROADENING OF ANY GIVEN RESONANCE IN THE MIXTURE MIXER**

 **DUE TO THE CONTRIBUTION OF ONE CONSTITUENT. IN ORDER TO CONSIDER MIXER**

 **DOPPLER BROADENING FIRST USE PROGRAM SIGMA1 TO BROADEN THE CROSS MIXER**

 **SECTION FOR EACH OF THE CONSTITUENTS AND THEN COMBINE THE MIXER**

 **BROADENED DATA USING PROGRAM MIXER. MIXER**

 **MIXER**

 **EXAMPLE USE MIXER**

 **----------- MIXER**

 **THE OUTPUT FROM THIS PROGRAM HAS BEEN FOUND TO BE EXTREMELY MIXER**

 **USEFUL IN THE FOLLOWING APPLICATIONS... MIXER**

 **MIXER**

 **(1) CALCULATE A COMPOSITE TOTAL CROSS SECTON FOR LATER USE AS MIXER**

 **A WEIGHTING FUNCTION IN SELF-SHIELDING THE CROSS SECTIONS MIXER**

 **OF EACH CONSTITUENT OF THE MIXTURE SEPARATELY. MIXER**

 **MIXER**

 **PROGRAM GROUPIE CAN USE THE CALCULATED COMPOSITE TOTAL CROSS MIXER**

 **SECTION AS THE TOTAL CROSS SECTION FOR EACH CONSTITUENT OF MIXER**

 **THE MIXTURE IN ORDER TO CALCULATE SELF-SHIELDED CROSS SECTIONMIXER**

 **FOR EACH CONSTITUENT OF THE MIXTURE. MIXER**

 **MIXER**

 **(2) CALCULATE COMPOSITE TOTAL AND FISSION CROSS SECTIONS IN MIXER**

 **ORDER TO CALCULATE THE TRANSMISSION AND SELF-INDICATION MIXER**

 **THROUGH COMPOSITE MATERIALS. GENERALLY IN THIS CASE THE MIXER**

 **TOTAL CROSS SECTION WILL BE CALCULATED FOR THE COMPOSITION MIXER**

 **OF THE SAMPLE AND THE FISSION CROSS SECTION WILL BE MIXER**

 **CALCULATED FOR THE COMPOSITION OF THE FISSION CHAMBER MIXER**

 **(WHICH GENERALLY WILL HAVE A DIFFERENT COMPOSITION THAN THE MIXER**

 **SAMPLE). MIXER**

 **MIXER**

 **PROGRAM VIRGIN CAN USE THE OUTPUT FROM THIS PROGRAM TO MIXER**

 **PERFORM TRANSMISSION AND SELF-INDICATION CALCULATIONS. MIXER**

 **PROGRAM VIRGIN WILL ANALYTICALLY CALCULATE THE UNCOLLIDED MIXER**

 **(I.E. VIRGIN) FLUX TRANSMITTED AND REACTION RATE DUE TO ANY MIXER**

 **TABULATED LINEARLY INTERPOLABLE INCIDENT SPECTRUM. RESULTS MIXER**

 **WILL BE PRESENTLY FOR UP TO 10 DIFFERENT SAMPLE THICKNESSES MIXER**

 **AND BINNED INTO ENERGY GROUPS IN ORDER TO SIMULATE AN MIXER**

 **EXPERIMENTAL MEASUREMENT. MIXER**

 **MIXER**

 **(3) THE OUTPUT FROM THIS PROGRAM IS VERY USEFUL TO PLOT IN ORDER MIXER**

 **TO SEE THE IMPORTANCE OF SPECIFIC CROSS SECTION FEATURES IN MIXER**

 **THE COMPOSITE CROSS SECTION. MIXER**

 **MIXER**

 **PROGRAM COMPLOT CAN BE USED TO PLOT THE OUTPUT FROM THIS MIXER**

 **PROGRAM AND IF REQUIRED EXAMINE ANY PARTICULAR ENERGY RANGE MIXER**

 **IN DETAIL. IN ORDER TO DO THIS THE (ZA, MT) EQUIVALENCE OPTIONMIXER**

 **OF PROGRAM COMPLOT SHOULD BE USED. TO COMPARE ANY CONSTITUENT MIXER**

 **CROSS SECTION TO THE COMPOSITE CROSS SECTION THE INPUT TO MIXER**

 **COMPLOT SHOULD EQUATE THE (ZA,MT) OF THE COMPOSITE TO THE MIXER**

 **(ZA,MT) OF ONE CONSTITUENT AND THE MULTIPLIER INPUT TO MIXER**

 **COMPLOT SHOULD BE THE ATOM FRACTION FOR THE CONSTITUENT (THE MIXER**

 **ATOM FRACTIONS ARE DEFINED IN THE OUTPUT LISTING FROM PROGRAM MIXER**

 **MIXER). MIXER**

 **MIXER**

 **INPUT FILES MIXER**

 **----------- MIXER**

 **UNIT DESCRIPTION MIXER**

 **---- ----------- MIXER**

 **2 INPUT CARDS (BCD - 80 CHARACTERS/RECORD) MIXER**

 **10 ORIGINAL EVALUATED DATA IN ENDF/B FORMAT MIXER**

 **(BCD - 80 CHARACTERS/RECORD) MIXER**

 **MIXER**

 **OUTPUT FILES MIXER**

 **------------ MIXER**

 **UNIT DESCRIPTION MIXER**

 **---- ----------- MIXER**

 **3 OUTPUT LISTING (BCD - 120 CHARACTERS/RECORD) MIXER**

 **11 COMPOSITE EVALUATED DATA IN ENDF/B FORMAT MIXER**

 **(BCD - 80 CHARACTERS/RECORD) MIXER**

 **MIXER**

 **SCRATCH FILES MIXER**

 **------------- MIXER**

 **UNIT DESCRIPTION MIXER**

 **---- ----------- MIXER**

 **12 SCRATCH FILE FOR EACH OF THE 10 SECTIONS WHICH MIXER**

 **13 WILL BE ADDED TOGETHER TO DEFINE THE FINAL MIXER**

 **. SECTION (BINARY - 60000 AND 480000 WORDS/RECORD) MIXER**

 **. . MIXER**

 **. . MIXER**

 **20 . MIXER**

 **21 . MIXER**

 **22 SCRATCH FILE FOR COMBINED SECTION. MIXER**

 **(BINARY - 2004 WORDS/RECORD) MIXER**

 **MIXER**

 **STANDARD FILE NAMES (SEE SUBROUTINES FILIO1 AND FILIO2) MIXER**

 **---------------------------------------------------------------- MIXER**

 **UNIT FILE NAME MIXER**

 **---- ---------- MIXER**

 **2 MIXER.INP MIXER**

 **3 MIXER.LST MIXER**

 **10 ENDFB.IN MIXER**

 **11 ENDFB.OUT MIXER**

 **12-22 (SCRATCH) MIXER**

 **MIXER**

 **INPUT CARDS MIXER**

 **----------- MIXER**

 **LINE COLS. FORMAT NAME DESCRIPTION MIXER**

 **---- ----- ------ ------- ---------- MIXER**

 **1-2 1-66 16A4,A2 TITLE TWO LINE TITLE DESCRIBING PROBLEM MIXER**

 **(THIS TITLE IS USED TO IDENTIFY THE MIXER**

 **OUTPUT LISTING AND IS ALSO WRITTEN MIXER**

 **IN MF=1, MT=451 (HOLLERITH SECTION) MIXER**

 **OF THE ENDF/B FORMATTED OUTPUT TO MIXER**

 **IDENTIFY THE COMPOSITE MIXTURE). MIXER**

 **3 1-72 ENDF/B INPUT DATA FILENAME MIXER**

 **(STANDARD OPTION = ENDFB.IN) MIXER**

 **4 1-72 ENDF/B OUTPUT DATA FILENAME MIXER**

 **(STANDARD OPTION = ENDFB.OUT) MIXER**

 **5 1-11 I11 IZAOUT ZA IDENTIFICATION FOR COMBINATION MIXER**

 **5 12-17 I6 MATOUT MAT IDENTIFICATION FOR COMBINATION MIXER**

 **5 18-19 I2 MFOUT MF IDENTIFICATION FOR COMBINATION MIXER**

 **5 20-22 I3 MTOUT MT IDENTIFICATION FOR COMBINATION MIXER**

 **5 23-33 I11 DEFINE INPUT DENSITY MIXER**

 **= 0 = GRAMS = BACKWARDS COMPATIBLE MIXER**

 **> 0 = ATOMS = NEW IN 2008 MIXER**

 **6-N 1-11 I11 IZAGET ZA (1000\*Z+A) OF MATERIAL MIXER**

 **6-N 12-22 I11 MTGET MT OF REACTION MIXER**

 **6-N 23-33 E11.4 DENSE MATERIAL DENSITY (ATOMS OR GRAMS) MIXER**

 **MIXER**

 **THE SIXTH LINE IS REPEATED FOR EACH SECTION (FROM 2 TO 10). MIXER**

 **SINCE THE ENDF/B FORMATTED OUTPUT IS IN BARNS/ATOM FORM A MINIMUM MIXER**

 **OF TWO SECTIONS MUST BE COMBINED (I.E., IF ONLY ONE SECTION IS MIXER**

 **SPECIFIED THE OUTPUT WOULD BE IDENTICAL TO THE INPUT AND AS SUCH MIXER**

 **THE PROGRAM WILL CONSIDER THIS TO BE AN ERROR AND NOT PERFORM THE MIXER**

 **CALCULATION). THE LIST OF SECTIONS IS TERMINATED BY A BLANK LINE. MIXER**

 **MIXER**

 **THE LIST OF SECTIONS TO BE COMBINED MAY BE SPECIFIED IN ANY MIXER**

 **ORDER, I.E. THEY NEED NOT BE IN ZA ORDER OR THE ORDER THAT THE MIXER**

 **EVALUATED DATA APPEARS ON THE ENDF/B FORMATTED TAPE. MIXER**

 **MIXER**

 **EXAMPLE INPUT NO. 1 MIXER**

 **------------------- MIXER**

 **CREATE THE TOTAL CROSS SECTION (MT=1) FOR STAINLESS STEEL AND MIXER**

 **IDENTIFY THE COMBINED MATERIAL WITH ZA=26800 AND MAT=4000, MIXER**

 **THE COMPOSITION BY VOLUME OF THE STEEL WILL BE... MIXER**

 **MIXER**

 **THE DATA FROM \ENDFB6\K300\LIBRARY.DAT AND WRITE DATA TO MIXER**

 **\MIXER\STEEL.DAT MIXER**

 **MIXER**

 **IRON - 74.8 PER-CENT MIXER**

 **CHROMIUM - 16.0 MIXER**

 **NICKEL - 6.0 MIXER**

 **MANGANESE - 2.0 MIXER**

 **SILICON - 1.0 MIXER**

 **CARBON - 0.2 MIXER**

 **MIXER**

 **THE INPUT MUST SPECIFY THE COMPOSITION BY GRAMS OR ATOMS. THIS IS MIXER**

 **DEFINED AS THE PRODUCT OF THE STANDARD DENSITY (GRAMS) MIXER**

 **TIMES THE VOLUME FRACTION. FOR THIS EXAMPLE THE FOLLOWING 12 MIXER**

 **INPUT CARDS ARE REQUIRED.... MIXER**

 **MIXER**

 **STAINLESS STEEL. COMPOSITION BY PER-CENT VOLUME IS 74.8-IRON, MIXER**

 **16-CHROME, 6-NICKEL, 2-MANGANESE, 1-SILICON, 0.2-CARBON MIXER**

 **\ENDFB6\K300\LIBRARY.DAT MIXER**

 **\MIXER\STEEL.DAT MIXER**

 **26800 4000 3 1 0 MIXER**

 **26000 1 5.88676 (NOTE, GRAMS INPUT FOR EACH MIXER**

 **24000 1 1.150448 CONSTITUENT, E.G. FOR IRON THE MIXER**

 **28000 1 0.533928 STP DENSITY IS 7.87 GRAMS. MIXER**

 **25055 1 0.1486 THE INPUT VALUE OF 5.88676 IS MIXER**

 **14000 1 0.0233 0.748 X 7.87,I.E. VOLUME MIXER**

 **6012 1 0.0044958 FRACTION TIMES STP DENSITY). MIXER**

 **(BLANK LINE TERMINATES INPUT LIST)MIXER**

 **MIXER**

 **EXAMPLE INPUT NO. 2 MIXER**

 **------------------- MIXER**

 **THE SAME EXAMPLE AS THE ABOVE PROBLEM, ONLY USE THE STANDARD MIXER**

 **ENDF/B DATA FILENAMES - ENDFB.IN AND ENDFB.OUT (THIS CAN BE MIXER**

 **DONE BY LEAVING THE THIRD AND FOURTH INPUT LINES BLANK). MIXER**

 **FOR THIS EXAMPLE THE FOLLOWING 12 INPUT CARDS ARE REQUIRED.... MIXER**

 **MIXER**

 **STAINLESS STEEL. COMPOSITION BY PER-CENT VOLUME IS 74.8-IRON, MIXER**

 **16-CHROME, 6-NICKEL, 2-MANGANESE, 1-SILICON, 0.2-CARBON MIXER**

 **(NOTE - THIS LINE IS REALLY BLANK) MIXER**

 **(NOTE - THIS LINE IS REALLY BLANK) MIXER**

 **26800 4000 3 1 MIXER**

 **26000 1 5.88676 (NOTE, GRAMS INPUT FOR EACH MIXER**

 **24000 1 1.150448 CONSTITUENT, E.G. FOR IRON THE MIXER**

 **28000 1 0.533928 STP DENSITY IS 7.87 GRAMS. MIXER**

 **25055 1 0.1486 THE INPUT VALUE OF 5.88676 IS MIXER**

 **14000 1 0.0233 0.748 X 7.87,I.E. VOLUME MIXER**

 **6012 1 0.0044958 FRACTION TIMES STP DENSITY). MIXER**

 **(BLANK LINE TERMINATES INPUT LIST)MIXER**

 **MIXER**

 **=======================================================================MIXER**