======================================================================= Legend

 Legend

 PROGRAM LEGEND Legend

 ============== Legend

 VERSION 80-1 (SEPTEMBER 1980) Legend

 VERSION 84-1 (NOVEMBER 1984) Legend

 VERSION 86-1 (JANUARY 1986) \*CORRECTED BASED ON USER COMMENTS Legend

 \*FORTRAN-77/H VERSION Legend

 VERSION 87-1 (JANUARY 1987) \*CORRECTED BASED ON USER COMMENTS Legend

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

 FILE NAMES (SEE, SUBROUTINE FILEIO Legend

 FOR DETAILS). Legend

 \*IMPROVED BASED ON USER COMMENTS. Legend

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

 INSURE PROGRAM WILL NOT DO ANYTHING Legend

 CRAZY. Legend

 \*UPDATED TO USE NEW PROGRAM CONVERT Legend

 KEYWORDS. Legend

 \*ADDED LIVERMORE CIVIC COMPILER Legend

 CONVENTIONS. Legend

 VERSION 92-1 (JANUARY 1992) \*FOR ANGULAR DISTRIBUTIONS CALCULATED Legend

 FROM LEGENDRE COEFFICIENTS, INTERVAL Legend

 HALF TO CONVERGENCE. Legend

 \*UPDATED BASED ON USER COMMENTS Legend

 \*ADDED FORTRAN SAVE OPTION Legend

 \*ADDED SELECTED OF DATA TO PROCESS Legend

 BY MAT/MF/MT/ENERGY RANGES. Legend

 \*WARNING...THE INPUT PARAMETER FORMAT Legend

 HAS BEEN CHANGED - FOR DETAILS SEE Legend

 BELOW. Legend

 VERSION 92-2 (SEPT. 1992) \*CORRECTED PROCESSING OF ISOTROPIC Legend

 ANGULAR DISTRIBUTIONS Legend

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

 TO ALLOW ACCESS TO FILE STRUCTURES Legend

 (WARNING - INPUT PARAMETER FORMAT Legend

 HAS BEEN CHANGED) Legend

 \*CLOSE ALL FILES BEFORE TERMINATING Legend

 (SEE, SUBROUTINE ENDIT) Legend

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

 \*IMPROVED COMPUTER INDEPENDENCE Legend

 \*ALL DOUBLE PRECISION Legend

 \*ON SCREEN OUTPUT Legend

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

 \*IMPROVED OUTPUT PRECISION Legend

 \*INCREASED MAX. POINTS FROM 5,000 Legend

 TO 20,000. Legend

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

 POINT READ FOR MORE DIGITS Legend

 \*UPDATED TEST FOR ENDF/B FORMAT Legend

 VERSION BASED ON RECENT FORMAT CHANGE Legend

 \*GENERAL IMPROVEMENTS BASED ON Legend

 USER FEEDBACK Legend

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

 USER FEEDBACK Legend

 VERS. 2001-1 (MARCH 2001) \*UPDATED TO HANDLE COMBINATIONS OF Legend

 LEGENDRE COEFFICIENTS AT LOW ENERGY Legend

 AND TABULATED DATA AT HIGH ENERGY. Legend

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

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

 \*ZERO ANGULAR DISTRIBUTIONS ARE O.K. Legend

 (PREVIOUSLY ZERO OR NEGATIVE WAS Legend

 TREATED AS AN ERROR - ZERO IS O.K. Legend

 FOR SOME REACTIONS OVER SOME COSINE Legend

 RANGES) Legend

 VERS. 2006-1 (MARCH 2006) \*INCREASED MAXIMUM NUMBER OF LEGENDRE Legend

 COEFFICIENTS FROM 50 TO 500. Legend

 WARNING - THE RECURSION RELATIONSHIP Legend

 FOR LEGENDRE POLYNOMIALS BECOMES Legend

 UNSTABLE IN HIGHER ORDER POLYTNOMIALS Legend

 EVEN USING DOUBLE PRECISION. Legend

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

 \*INCREASED MAX. POINTS FROM 60,000 Legend

 TO 240,000. Legend

 VERS. 2007-2 (MAY 2007) \*CORRECTED SIZE OF XMUBASE IN ANGLEN Legend

 FOR INCREASED NUMBER OF COEFFICIENTS. Legend

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

 VERS. 2012-1 (Aug. 2012) \*added CODENAME Legend

 \*32 and 64 bit Compatible Legend

 \*Added ERROR stop Legend

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

 \*Replaced ALL 3 way IF Statements. Legend

 Legend

 OWNED, MAINTAINED AND DISTRIBUTED BY Legend

 ------------------------------------ Legend

 THE NUCLEAR DATA SECTION Legend

 INTERNATIONAL ATOMIC ENERGY AGENCY Legend

 P.O. BOX 100 Legend

 A-1400, VIENNA, AUSTRIA Legend

 EUROPE Legend

 Legend

 ORIGINALLY WRITTEN BY Legend

 ------------------------------------ Legend

 Dermott E. Cullen Legend

 Legend

 PRESENT CONTACT INFORMATION Legend

 --------------------------- Legend

 Dermott E. Cullen Legend

 1466 Hudson Way Legend

 Livermore, CA 94550 Legend

 U.S.A. Legend

 Telephone 925-443-1911 Legend

 E. Mail RedCullen1@Comcast.net Legend

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

 Legend

 PURPOSE Legend

 ------- Legend

 CALCULATE LINEARLY INTERPOLABLE TABULATED ANGULAR DISTRIBUTIONS Legend

 STARTING FROM DATA IN THE ENDF/B FORMAT. ANGULAR DISTRIBUTIONS Legend

 MAY BE DESCRIBED IN THE ENDF/B FORMAT IN ONE OF THREE WAYS. Legend

 FOR EACH OF THESE THREE FORMS THE USER MAY CHOOSE (SEE, INPUT Legend

 OPTIONS) TO EITHER COPY EACH TYPE OF DATA OR TO PROCESS IT AT Legend

 AS FOLLOWS, Legend

 Legend

 (1) ANGULAR DISTRIBUTION IS ISOTROPIC AT ALL ENERGIES (LTT=0) Legend

 ------------------------------------------------------------- Legend

 IN THIS CASE THE INPUT DATA DOES NOT INCLUDE ANY ANGULAR Legend

 DISTRIBUTIONS. A SECTION MERELY CONTAINS A FLAG TO INDICATE Legend

 THE ANGULAR DISTRIBUTION IS ISOTROPIC AT ALL ENERGIES. IN THIS Legend

 CASE THE SECTION IS OUTPUT IN EXACTLY THE SAME FORM IN WHICH IT Legend

 WAS READ FROM THE INPUT. Legend

 Legend

 (2) ANGULAR DISTRIBUTIONS GIVEN BY LEGENDRE COEFFICIENTS (LTT=1) Legend

 ---------------------------------------------------------------- Legend

 LEGENDRE COEFFICIENTS ARE GIVEN AT A SERIES OF ENERGIES. AN Legend

 INTERPOLATION LAW IS GIVEN BETWEEN ENERGIES. THE INTERPOLATION Legend

 LAW BETWEEN ENERGIES IS COPIED AS INPUT (I.E., NO ATTEMPT IS Legend

 MADE TO LINEARIZE THE VARIATION WITH ENERGY). FOR EACH ENERGY AT Legend

 WHICH LEGENDRE COEFFICIENTS ARE GIVEN A LINEARLY INTERPOLABLE Legend

 ANGULAR DISITRIBUTION IS RECONSTRUCTED IN THE SYSTEM IN WHICH THE Legend

 THE COEFFICIENTS ARE GIVEN (I.E., CM OR LAB - NO ATTEMPT IS MADE Legend

 TO CONVERT FROM ONE SYSTEM TO THE OTHER). A MAXIMUM OF 50 LEGENDRE Legend

 COEFFICIENTS IS ALLOWED. REGARDLESS OF THE NUMBER OF COEFFICIENTS Legend

 INPUT THE PROGRAM WILL ONLY USE COEFFICIENTS UP TO THE LAST ORDER Legend

 AT WHICH THE COEFFICIENTS ARE NON-ZERO (E.G. IF COEFFICIENTS P1 Legend

 THROUGH P12 ARE READ, BUT P9=P10=P11=P12=0.0, THE PROGRAM WILL Legend

 ONLY USE COEFFICIENTS UP TO P8). IF OVER 50 NON-ZERO COEFFICIENTS Legend

 ARE READ ONLY THE FIRST 50 WILL BE USED. Legend

 Legend

 (2) ANGULAR DISTRIBUTIONS IS TABULATED (LTT=2) Legend

 ---------------------------------------------------------------- Legend

 ANGULAR DISTRIBUTIONS ARE GIVEN AT A SERIES OF ENERGIES. AN Legend

 INTERPOLATION LAW IS GIVEN BETWEEN ENERGIES AND A SECOND Legend

 INTERPOLATION LAW IS GIVEN AT EACH ENERGY TO INTERPOLATE BETWEEN Legend

 THE POINTS IN EACH TABULATED DISTRIBUTION. AT EACH ENERGY THE Legend

 ANGULAR DISTRIBUTION WILL BE CONVERTED TO LINEARLY INTERPOLABLE Legend

 FORM. THE INTERPOLATION BETWEEN ENERGIES IS OUTPUT EXACTLY AS Legend

 INPUT. THE INTERPOLATION LAW AT EACH ENERGY IS OUTPUT TO INDICATE Legend

 THE NOW LINEARLY INTERPOLABLE ANGULAR DISTRIBUTION. Legend

 Legend

 (3) LEGENDRE COEFFICIENTS AND TABULATED (LTT=3) Legend

 ---------------------------------------------------------------- Legend

 ENDF-102 SAYS THIS SHOULD BE LTT=4, BUT ALL OF THE EVALUATIONS Legend

 IN ENDF/B-VI, RELEASE 7, USE LTT=3? THIS CODE WILL TREAT THESE Legend

 AS LTT=4 - SEE BELOW. Legend

 Legend

 (4) LEGENDRE COEFFICIENTS AND TABULATED (LTT=4) Legend

 ---------------------------------------------------------------- Legend

 THIS IS A COMBINATION OF (1) AND (2) DESCRIBED ABOVE. THE Legend

 LEGENDRE DATA IS ALWAYS GIVEN FIRST, FOR LOWER ENERGIES, Legend

 FOLLOWED BY TABULATED ANGULAR DISTRIBUTIONS, FOR HIGHER ENERGIES. Legend

 Legend

 THIS TYPE OF DATA CAN ONLY BE COPIED OR ALL CONVERTED TO Legend

 TABULATED (LTT=2). Legend

 Legend

 POINT VALUES - NORMALIZED VS. UNNORMALIZED Legend

 ------------------------------------------------------------------ Legend

 THE VALUE OF AN ANGULAR DISTRIBUTION AT ANY COSINE WILL BE Legend

 CORRECTLY CALCULATED BY THIS CODE, BASED EITHER DIRECTLY ON THE Legend

 ANGULAR DISTRIBUTION, OR ON THE SUM OF THE CONTRIBUTING LEGENDRE Legend

 MOMENTS. Legend

 Legend

 ENDF/B ANGULAR DISTRIBUTIONS ARE BY DEFINITION NORMALIZED WHEN Legend

 INTEGRATED OVER COSINE. THEREFORE THIS CODE WILL NORMALIZE EACH Legend

 ANGULAR DISTRIBUTION BEFORE IT IS OUTPUT. THE OUTPUT REPORT FROM Legend

 THIS CODE WILL INDICATE THE NORMALIZATION FACTOR USED. Legend

 Legend

 THE REASON THAT AN ANGULAR DISTRIBUTION MAY NOT BE NORMALIZED IS Legend

 DUE TO THE APPROXIMATION OF CREATING LINEARLY INTERPOLABLE Legend

 TABULATED ANGULAR DISTRIBUTIONS - THE MORE ACCURATELY THIS IS Legend

 DONE THE CLOSER THE NORMALIZATION FACTOR WILL BE TO UNITY. AS YOU Legend

 DECREASE THE ALLOWABLE ERROR THE NORMALIZED VALUES WILL APPROACH Legend

 THE CORRECT POINT VALUES CALCULATED BY THE CODE. Legend

 Legend

 SINCE THE DATA IS NORMALIZED PRIOR TO OUTPUT THE RESULTS IN THE Legend

 ENDF/B FORMAT MAY DIFFER SLIGHTLY FROM VALUES REFERRED TO BE ERROR Legend

 MESSAGES, ETC. PRINTED BY THE CODE DURING EXECUTION. IN ALL CASES Legend

 THE VALUES PRINTED BY THE CODE IN ERROR MESSAGES, ETC. SHOULD BE Legend

 CONSIDERED TO BE THE CORRECT VALUES AND THE OUTPUT TABULATED Legend

 ANGULAR DISTRIBUTIONS APPROXIMATE DUE TO THE RE-NORMALIZATION - Legend

 TO RE-ITERATE, THE OUTPUT TABULATED VALUES ARE APPROXIMATE DUE Legend

 TO THE APPROXIMATIONS USED IN CONSTRUCTING LINEAR INTERPOLABLE Legend

 ANGULAR DISTRIBUTIONS TO WITHIN SOME ALLOWABLE TOLERANCE. Legend

 Legend

 ELIMINATION OF NEGATIVE VALUES Legend

 ------------------------------ Legend

 THE RECONSTRUCTED ANGULAR DISTRIBUTION WILL BE TESTED AND IF IT Legend

 IS NEGATIVE AT ONE OR MORE COSINES AN ERROR MESSAGE WILL BE OUTPUT Legend

 AND BASED ON THE INPUT OPTION SELECTED ONE OF THE FOLLOWING Legend

 CORRECTIVE ACTIONS WILL BE TAKEN (SEE, INPUT OPTIONS), Legend

 (1) NO CORRECTION Legend

 (2) CHANGE INDIVIDUAL LEGENDRE COEFFICIENTS (EACH BY LESS THAN Legend

 1.0 PER-CENT) UNTIL THE RECONSTRUCTED ANGULAR DISTRIBUTION Legend

 IS POSITIVE (MINIMUM MORE THAN 1 MILLI-BARN). THE ALLOWABLE Legend

 PER-CENT CHANGE IN COEFFICIENTS AND MINIMUM CROSS SECTION CAN Legend

 BE CHANGED BY INPUT. Legend

 (3) CHANGE ALL LEGENDRE COEFFICIENTS TO FORCE DISTRIBUTION TO BE Legend

 POSITIVE (MINIMUM MORE THAN 1 MILLI-BARN). WITH THIS OPTION Legend

 THERE IS NO RESTRICTION ON THE AMOUNT THAT EACH COEFFICIENT Legend

 IS CHANGED AND AS SUCH THIS OPTION SHOULD BE USED WITH Legend

 CAUTION AND ONLY AS A LAST RESORT IF NO OTHER APPROACH CAN Legend

 BE USED TO MAKE THE DISTRIBUTION POSITIVE. Legend

 Legend

 OUTPUT Legend

 ------ Legend

 THE USER MAY REQUEST OUTPUT OF EITHER, Legend

 (1) TABULATED VALUES - POSSIBLY CORRECTED TO ELIMINATE NEGATIVE Legend

 VALUES. THE TABULATED DISTRIBUTION WILL BE NORMALIZED BEFORE Legend

 OUTPUT. Legend

 (2) LEGENDRE COEFFICIENTS - POSSIBLY CORRECTED TO ELIMINATE Legend

 NEGATIVE VALUES AND WITHOUT HIGHER ORDER ZERO COEFFICIENTS. Legend

 BY DEFINITION DISTRIBUTIONS DEFINED BY LEGENDRE COEFFICIENTS Legend

 ARE NORMALIZED TO UNITY. Legend

 Legend

 (3) ANGULAR DISTRIBUTIONS GIVEN BY A TABULATION (LTT=2) Legend

 ------------------------------------------------------- Legend

 TABULATED ANGULAR DISTRIBUTIONS ARE GIVEN AT A SERIES OF ENERGIES. Legend

 AN INTERPOLATION LAW IS GIVEN BETWEEN ENERGIES. THE INTERPOLATION Legend

 LAW BETWEEN ENERGIES IS COPIED AS INPUT (I.E., NO ATTEMPT IS Legend

 MADE TO LINEARIZE THE VARIATION WITH ENERGY). FOR EACH ENERGY AT Legend

 AT WHICH TABULATED DATA ARE GIVEN A LINEARLY INTERPOLABLE ANGULAR Legend

 DISTRIBUTION IS CONSTRUCTED IN THE SYSTEM IN WHICH THE TABULATED Legend

 DATA ARE GIVEN (I.E., CM OR LAB - NO ATTEMPT IS MADE TO CONVERT Legend

 FROM ONE SYSTEM TO THE OTHER). A MAXIMUM OF 60000 POINTS IS ALLOWE Legend

 TO REPRESENT THE ANGULAR DISTRIBUTION AT EACH ENERGY. Legend

 Legend

 ELIMINATION OF NEGATIVE VALUES Legend

 ------------------------------ Legend

 THE RECONSTRUCTED ANGULAR DISTRIBUTION WILL BE TESTED AND IF IT Legend

 IS NEGATIVE AT ONE OR MORE COSINES AN ERROR MESSAGE WILL BE OUTPUT Legend

 AND BASED ON THE INPUT OPTION SELECTED ONE OF THE FOLLOWING Legend

 CORRECTIVE ACTIONS WILL BE TAKEN (SEE, INPUT OPTIONS), Legend

 (1) NO CORRECTION Legend

 (2) CHANGE ALL TABULATED VALUES TO FORCE DISTRIBUTION TO BE Legend

 POSITIVE (MINIMUM MORE THAN 1 MILLI-BARN). THE MINIMUM VALUE Legend

 MAY BE CHANGED BY INPUT. WITH THIS OPTION THERE IS NO Legend

 RESTRICTION ON THE AMOUNT THAT EACH VALUE IS CHANGED AND AS Legend

 SUCH THIS OPTION SHOULD BE USED WITH CAUTION AND ONLY AS A Legend

 LAST RESORT IF NO OTHER APPROACH CAN BE USED TO MAKE THE Legend

 DISTRIBUTION POSITIVE. Legend

 Legend

 OUTPUT Legend

 ------ Legend

 THE OUTPUT WILL BE THE LINEARIZED ANGULAR DISTRIBUTION. THE Legend

 TABULATED DISTRIBUTION WILL BE NORMALIZED TO UNITY BEFORE OUTPUT. Legend

 Legend

 CORRECTING NEGATIVE ANGULAR DISTRIBUTION Legend

 ---------------------------------------- Legend

 IF AN ANGULAR DISTRIBUTION IS NEGATIVE AN ERROR MESSAGE WILL BE Legend

 PRINTED AND THE USER MAY DECIDE (BASED ON INPUT OPTION) TO, Legend

 (1) NOT PERFORM ANY CORRECTIVE ACTION. Legend

 (2) FOR TABULATED DISTRIBUTIONS - ADD THE SAME VALUE TO EACH POINT Legend

 VALUE SUCH THAT WHEN THE DISTRIBUTION IS RE-NORMALIZED THE Legend

 MINIMUM VALUE IS 0.001 (1 MILLI-BARN). THE MINIMUM VALUE CAN Legend

 BE CHANGED BY INPUT. WARNING...EXCEPT FOR SELECTION OF THE Legend

 MINIMUM VALUE (BY INPUT) THE USER HAS NO CONTROL OVER HOW Legend

 MUCH THE DISTRIBUTION IS CHANGED. THEREFORE THIS OPTION SHOULD Legend

 BE USED WITH CAUTION. Legend

 (3) FOR LEGENDRE COEFFICIENTS ONE OF TWO OPTIONS MAY BE SELECTED, Legend

 (A) CHANGE INDIVIDUAL COEFFICIENTS (NO ONE COEFFICIENT BY MORE Legend

 THAN 1 PER-CENT) TO MAKE THE DISTRIBUTION POSITIVE WITH A Legend

 MINIMUM VALUE OF 0.001 (1 MILLI-BARN). THE MAXIMUM PER-CENT Legend

 CHANGE IN EACH COEFFICIENT AND MINIMUM VALUE MAY BE CHANGED Legend

 BY INPUT. INPUT THE PROGRAM CANNOT MAKE THE DISTRIBUTION Legend

 POSITIVE BY CHANGING EACH COEFFICIENT BY UP TO THE MAXIMUM Legend

 ALLOWABLE AMOUNT, THE ORIGINAL ANGULAR DISTRIBUTION OR Legend

 COEFFICIENTS WILL BE OUTPUT. ONLY IN THE LATTER CASE SHOULD Legend

 ONE CONSIDER USING OPTION (B) DESCRIBED BELOW. Legend

 (B) LOGICALLY ADD THE SAME VALUE TO EACH POINT VALUE SUCH THAT Legend

 WHEN THE DISTRIBUTION IS RE-NORMALIZED THE MINIMUM VALUE IS Legend

 0.001 (1 MILLI-BARN). THIS IS EQUIVALENT AT INCREASING P0 Legend

 BY A CERTAIN AMOUNT AND RE-NORMALIZATION IS EQUIVALENT TO THEN Legend

 DIVIDING EACH COEFFICIENT BY A CERTAIN AMOUNT. THEREFORE, Legend

 WHAT IS PHYSICALLY DONE BY THE PROGRAM IS TO DIVIDE EACH Legend

 COEFFICIENT BY THE SAME AMOUNT. WARNING..EXCEPT FOR SELECTION Legend

 OF THE MINIMUM VALUE (BY INPUT) THE USER HAS NO CONTROL OVER Legend

 HOW MUCH THE DISTRIBUTION IS CHANGED. THEREFORE THIS OPTION Legend

 SHOULD BE USED WITH CAUTION. Legend

 Legend

 WARNING MESSAGES FROM PROGRAM Legend

 ----------------------------- Legend

 THE WARNING MESSAGES PRINTED BY THIS PROGRAM SHOULD ONLY BE Legend

 CONSIDERED TO BE EXACTLY THAT..WARNINGS..NOT AN ABSOLUTE JUDGEMENT Legend

 BY THIS PROGRAM THAT THERE IS SOMETHING WRONG WITH THE DATA. WHEN Legend

 WARNING MESSAGES ARE PRINTED EXAMINE THE DATA AND EITHER TAKE NO Legend

 ACTION (IF YOU FEEL THAT THE DATA IS O.K.) OR CORRECT THE DATA Legend

 (IF YOU FEEL THAT THE DATA IS INCORRECT AND YOU CAN CORRECT IT). Legend

 Legend

 VALIDITY OF MODIFIED DATA Legend

 ------------------------- Legend

 BEFORE BELIEVING AND USING DATA WHICH HAS BEEN MODIFIED (EITHER Legend

 TABULATED ANGULAR DISTRIBUTIONS OR LEGENDRE COEFFICIENTS) THE USER Legend

 SHOULD INSURE THAT THE MODIFIED DATA IS PHYSICALLY MORE ACCEPTABLE Legend

 THAN THE ORIGINAL DATA. IN ORDER TO DO THIS ONE OR MORE OF THE Legend

 FOLLOWING METHODS SHOULD BE USED, Legend

 Legend

 (1) USE THE ENERGY VARIATION TESTS BUILT-IN TO THIS PROGRAM AND Legend

 EVALPLOT TO PLOT THE ENERGY DEPENDENCE OF THE LEGENDRE Legend

 COEFFICIENTS IN ORDER TO IDENTIFY AND CORRECT (BY HAND...NOT Legend

 BY THIS PROGRAM) ANY COEFFICIENTS WHICH HAVE UNREALISTIC Legend

 ENERGY AND L ORDER VARIATIONS. THIS SHOULD ALWAYS BE DONE Legend

 FIRST TO ELIMINATE MAJOR PROBLEMS BEFORE USING THIS PROGRAM Legend

 TO AUTOMATICALLY MAKE MINOR CORRECTIONS. Legend

 (1) OUTPUT AND PLOT THE UNCORRECTED AND CORRECTED ANGULAR Legend

 DISTRIBUTIONS. COMPARE THE PLOTS TO INSURE THAT THE CORRECTED Legend

 DATA DOES NOT SERIOUSLY CHANGE THE ENERGY DEPENDENCE OF THE Legend

 ANGULAR DISTRIBUTION. Legend

 (2) IF PLOTTING CAPABILITY IS NOT AVAIALABLE, USE THE PRINTED OUT Legend

 OF THIS PROGRAM TO DETERMINE HOW MUCH THE TABULATED ANGULAR Legend

 DISTRIBUTION OR LEGENDRE COEFFICIENTS HAVE BEEN MODIFIED. Legend

 GENERALLY IF ONE COEFFICIENT HAS BEEN ONLY SLIGHTLY MODIFIED Legend

 THE DISTRIBUTION WILL BE ACCEPTABLE. HOWEVER IF MANY Legend

 COEFFICIENTS HAVE BEEN MODIFIED THE RESULT WILL NOT BE Legend

 RELIABLE. Legend

 Legend

 SEEING ANGULAR DISTRIBUTIONS AND LEGENDRE COEFFICIENTS Legend

 ------------------------------------------------------ Legend

 PROGRAM EVALPLOT CAN BE USED TO PLOT ANGULAR DISTRIBUTION AND Legend

 LEGENDRE COEFFICIENTS - WHEN IT COMES TO CHECKING THIS TYPE OF Legend

 DATA THERE IS NO SUBSTITUTE FOR PLOTS OF THE DATA TO MAKE THE Legend

 JOB EASY AND STRAIGHTFORWARD. Legend

 Legend

 FOR LEGENDRE COEFFICIENTS EVALPLOT CAN BE USED TO SEE THE ENERGY Legend

 DEPENDENCE OF EACH COEFFICIENT - THIS IS AN EXTREMELY EASY AND Legend

 USEFUL WAY TO CHECK FOR ERRORS IN THE BASIC DATA. Legend

 Legend

 FOR ANGULAR DISTRIBUTION EVALPLOT CAN BE USED TO PLOT THEM AT Legend

 EACH ENERGY THAT THEY ARE TABULATED - THIS IS ALSO AN EASY AND Legend

 USEFUL WAY TO CHECK FOR ERRORS. Legend

 Legend

 I/O UNIT DEFINITIONS Legend

 -------------------- Legend

 UNIT DESCRIPTION Legend

 ---- ----------- Legend

 2 INPUT CARDS Legend

 3 OUTPUT REPORT Legend

 10 ORIGINAL DATA IN ENDF/B FORMAT Legend

 11 FINAL DATA IN ENDF/B FORMAT Legend

 Legend

 OPTIONAL STANDARD FILE NAMES (SEE SUBROUTINE FILIO1 AND FILIO2) Legend

 --------------------------------------------------------------- Legend

 UNIT FILE NAME Legend

 ---- ---------- Legend

 2 LEGEND.INP Legend

 3 LEGEND.LST Legend

 10 ENDFB.IN Legend

 11 ENDFB.OUT Legend

 Legend

 INPUT CARD Legend

 ---------- Legend

 CARD COLS. FORMAT DESCRIPTION Legend

 ---- ----- ------ ----------- Legend

 1 1-11 E11.4 FRACTIONAL THINNING CRITERIA Legend

 12-22 I11 MAXIMUM NUMBER OF POINTS IN ANGULAR DISTRIBUTION Legend

 RECONSTRUCTED FROM LEGENDRE COEFFICIENTS (PRESENT Legend

 LIMITS ARE 11 TO 60000 POINTS) Legend

 \*THIS OPTION CAN BE USED TO RUN QUICK, BUT NOT Legend

 NECESSARILY SO ACCURATE CALCULATIONS - TO ROUGHLY Legend

 SEE WHAT THE ANGULAR DISTRIBUTIONS LOOK LIKE. Legend

 \*IT IS RECOMMENDED THAT YOU USE 0 AS INPUT - IN Legend

 WHICH CASE THE PROGRAM WILL USE THE MAXIMUM Legend

 ALLOWABLE NUMBER OF POINTS = 60000. Legend

 23-33 I11 TABULATED ANGULAR DISTRIBUTION TREATMENT Legend

 = 0 - COPY TABLES Legend

 = 1 - LINEARIZE TABLES (OUTPUT TABLES) Legend

 = 2 - LINEARIZE AND THIN TABLES (OUTPUT TABLES) Legend

 34-44 I11 LEGENDRE COEFFICIENT TREATMENT Legend

 = 0 - COPY LEGENDRE COEFFICIENTS Legend

 = 1 - RECONSTRUCT TABULATED ANGULAR DISTRIBUTION. Legend

 (OUTPUT TABLES). Legend

 = 2 - RECONSTRUCT TABULATED ANGULAR DISTRIBUTION. Legend

 (OUTPUT LEGENDRE COEFFICIENTS). Legend

 45-55 I11 NEGATIVE ANGULAR DISTRIBUTION TREATMENT. Legend

 = 0 - NO CORRECTION Legend

 = 1 - TABULATE DATA - NO CORRECTION. Legend

 - LEGENDRE DATA - CHANGE COEFFICIENTS Legend

 (NONE BY MORE THAN 1.0 PER-CENT - CAN BE Legend

 CHANGED BY INPUT). Legend

 = 2 - FORCE DISTRIBUTIONS TO BE POSITIVE Legend

 (TABULATED OR LEGENDRE DATA). Legend

 56-66 I11 LEGENDRE COEFFICIENT VARIATION TEST FLAG. Legend

 = 0 - TEST TESTS. Legend

 = 1 - PERFORM TESTS, Legend

 (A) LEGENDRE ORDER INCREASES WITH ENERGY. Legend

 (C) MONOTONIC VARIATION OF COEFFICIENTS Legend

 AS A FUNCTION OF ENERGY. Legend

 (C) COEFFICIENTS DECREASE AS A FUNCTION OF Legend

 LEGENDRE ORDER. Legend

 2 1-60 60A1 ENDF/B INPUT DATA FILENAME Legend

 (STANDARD OPTION = ENDFB.IN) Legend

 3 1-60 60A1 ENDF/B OUTPUT DATA FILENAME Legend

 (STANDARD OPTION = ENDFB.OUT) Legend

 4-N 1- 6 I6 LOWER MAT LIMIT Legend

 7- 8 I2 LOWER MF LIMIT Legend

 9-11 I3 LOWER MT LIMIT Legend

 12-17 I6 UPPER MAT LIMIT Legend

 18-19 I2 UPPER MF LIMIT Legend

 20-22 I3 UPPER MT LIMIT Legend

 23-33 E11.4 LOWER ENERGY LIMIT Legend

 34-44 E11.4 UPPER ENERGY LIMIT Legend

 45-55 E11.4 MINIMUM ALLOWABLE VALUE OF ANGULAR DISTRIBUTION Legend

 56-66 E11.4 ALLOWABLE FRACTION (NOT PER-CENT) CHANGE IN ANY Legend

 ONE LEGENDRE COEFFICIENT TO MAKE THE ANGULAR Legend

 DISTRIBUTION POSITIVE (AND AT LEAST EQUAL TO THE Legend

 INPUT MINIMUM ALLOWABLE VALUE). Legend

 Legend

 \*UP TO 100 MAT/MT/E RANGES MAY BE INPUT, EACH SPECIFYING AN Legend

 ALLOWABLE MINIMUM SIGMA AND MAXIMUM CHANGE IN COEFFICIENTS. Legend

 \*INPUT IS TERMINATED BY A BLANK CARD. Legend

 \*ALL MAY/MT/E RANGES NOT SPECIFIED BY INPUT WILL BE TREATED BY Legend

 ALLOWING A MINIMUM SIGMA OF 0.001 (1 MILLI-BARN) AND A CHANGE Legend

 IN EACH COEFFICIENT BY UP TO 0.01 (1 PER-CENT). Legend

 \*THESE MAT/MT/E RANGES ARE NOT USED TO CORRECT ALL ANGULAR Legend

 DISTRIBUTIONS WHERE SIGMA IS LESS THAN THE MINIMUM. THEY ARE Legend

 ONLY USED TO CORRECT DISTRIBUTION THAT ARE NEGATIVE AND TO Legend

 INSURE THAT THE CROSS SECTION AT THE COSINES WHERE THE ANGULAR Legend

 DISTRIBUTION ARE INITIALLY NEGATIVE ARE CORRECTED TO BE POSITIVE Legend

 AND AT LEAST AS LARGE AS THE MINIMUM ALLOWABLE SIGMA (SPECIFIED Legend

 BY INPUT). Legend

 Legend

 EXAMPLE INPUT NO. 1 Legend

 ------------------- Legend

 PROCESS BOTH LEGENDRE COEFFICIENTS AND TABULATED DATA TO OBTAIN Legend

 ANGULAR DISTRIBUTION WHICH ARE ACCURATE TO WITHIN 0.1 PER-CENT Legend

 AND OUTPUT UNCORRECTED TABULATED ANGULAR DISTRIBUTION USING Legend

 A MAXIMUM OF 501 POINTS IN EACH TABULATED ANGULAR DISTRIBUTION. Legend

 SINCE LEGENDRE COEFFICIENTS WILL NOT BE CORRECTED THE INPUT NEED Legend

 NOT SPECIFY MAT/MT/E RANGES. Legend

 Legend

 READ /ENDFB6/K300/LEAD.IN AND WRITE /ENDFB6/K300/LEAD.OUT Legend

 Legend

 THE FOLLOWING 4 INPUT LINES ARE REQUIRED, Legend

 Legend

 1.00000- 3 501 2 1 0 Legend

 /ENDFB6/K300/LEAD.IN Legend

 /ENDFB6/K300/LEAD.OUT Legend

 (BLANK CARD TERMINATED INPUT) Legend

 Legend

 EXAMPLE INPUT NO. 2 Legend

 ------------------- Legend

 PROCESS BOTH LEGENDRE COEFFICIENTS AND TABULATED DATA TO OBTAIN Legend

 ANGULAR DISTRIBUTION WHICH ARE ACCURATE TO WITHIN 0.1 PER-CENT Legend

 AND OUTPUT CORRECTED TABULATED ANGULAR DISTRIBUTION (ONLY THOSE Legend

 RE-CONSTRUCTED FROM LEGENDRE COEFFICIENTS WILL BE CORRECTED). Legend

 FOR ALL MAT/MT/E CORRECT NEGATIVE ANGULAR DISTRIBUTION TO A VALUE Legend

 OF 0.01 (10 MILLI-BARNS) AND ALLOW LEGENDRE COEFFICIENTS TO BE Legend

 CHANGED BY UP TO 0.02 (2 PER-CENT). Legend

 Legend

 USE THE DEFAULT FILENAMES ENDFB.IN AND ENDFB.OUT (THIS CAN BE Legend

 DONE BY LEAVING THE SECOND AND THIRD INPUT LINES BLANK). Legend

 Legend

 THE FOLLOWING 5 INPUT LINES ARE REQUIRED, Legend

 Legend

 1.00000- 3 501 2 1 1 Legend

 Legend

 Legend

 1 1 1 999999999 0.00000+ 0 3.00000+ 7 1.00000- 2 2.00000- 2 Legend

 (BLANK CARD TERMINATED INPUT) Legend

 Legend

 EXAMPLE INPUT NO. 3 Legend

 ------------------- Legend

 PROCESS BOTH LEGENDRE COEFFICIENTS AND TABULATED DATA TO OBTAIN Legend

 ANGULAR DISTRIBUTION WHICH ARE ACCURATE TO WITHIN 0.1 PER-CENT Legend

 AND OUTPUT CORRECTED LEGENDRE COEFFICIENTS AND UNCORRECTED Legend

 TABULATED ANGULAR DISTRIBUTIONS. FOR MAT=1800, MT=2 CORRECT Legend

 NEGATIVE ANGULAR DISTRIBUTIONS TO INSURE THE MINIMUM IS 0.01 Legend

 (10 MILLI-BARNS) ALLOWING EACH LEGENDRE COEFFICIENT TO CHANGE BY Legend

 UP TO 0.02 (2 PER-CENT). ALL OTHER MAT/MT/E WILL BE CORRECTED Legend

 TO A MINIMUM OF 0.001 (1 MILLI-BARN) ALLOWING A 0.01 (1 PER-CENT) Legend

 CHANGE (BUILT-IN OPTION). Legend

 Legend

 READ /ENDFB6/K300/LEAD.IN AND WRITE /ENDFB6/K300/LEAD.OUT Legend

 Legend

 THE FOLLOWING 5 INPUT LINES ARE REQUIRED, Legend

 Legend

 1.00000- 3 501 2 2 1 Legend

 /ENDFB6/K300/LEAD.IN Legend

 /ENDFB6/K300/LEAD.OUT Legend

 1800 4 2 1800 4 2 0.00000+ 0 3.00000+ 7 1.00000- 2 2.00000- 2 Legend

 (BLANK CARD TERMINATED INPUT) Legend

 Legend

 EXAMPLE INPUT NO. 4 Legend

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 TO COPY TABULATED ANGULAR DISTRIBUTION AND CONVERT LEGENDRE Legend

 COEFFICIENTS TO UNCORRECTED TABULAR DISTRIBUTIONS. Legend

 Legend

 USE THE DEFAULT FILENAMES ENDFB.IN AND ENDFB.OUT (THIS CAN BE Legend

 DONE BY LEAVING THE SECOND AND THIRD INPUT LINES BLANK). Legend

 Legend

 THE FOLLOWING 4 INPUT LINES ARE REQUIRED, Legend

 Legend

 1.00000- 3 501 0 1 0 Legend

 Legend

 Legend

 (BLANK CARD TERMINATED INPUT) Legend

 Legend

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