======================================================================= Linear

 Linear

 PROGRAM LINEAR Linear

 ============== Linear

 VERSION 74-1 (MAY 1974) Linear

 VERSION 75-1 (APRIL 1975) Linear

 VERSION 76-2 (OCTOBER 1976) Linear

 VERSION 77-1 (JANUARY 1977) Linear

 VERSION 78-1 (JULY 1978) Linear

 VERSION 79-1 (JULY 1979) CDC-7600 AND CRAY-1 VERSION. Linear

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

 VERSION 80-2 (DECEMBER 1980) Linear

 VERSION 81-1 (MARCH 1981) Linear

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

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

 \*PAGE SIZE INCREASED - 1002 TO 3006. Linear

 \*ELIMINATED COMPUTER DEPENDENT CODING. Linear

 \*NEW, MORE COMPATIBLE I/O UNIT NUMBER. Linear

 \*ADDED OPTION TO KEEP ALL ORIGINAL Linear

 ENERGY POINTS FROM EVALUATION. Linear

 \*ADDED STANDARD ALLOWABLE ERROR OPTION Linear

 (CURRENTLY 0.1 PER-CENT). Linear

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

 VERSION 84-1 (APRIL 1984) IMPROVED BASED ON USER COMMENTS. Linear

 VERSION 84-2 (JUNE 1984) \*UPDATED FOR ENDF/B-VI FORMATS. Linear

 \*SPECIAL I/O ROUTINES TO GUARANTEE Linear

 ACCURACY OF ENERGY. Linear

 \*DOUBLE PRECISION TREATMENT OF ENERGY Linear

 (REQUIRED FOR NARROW RESONANCES). Linear

 VERSION 85-1 (AUGUST 1985) \*FORTRAN-77/H VERSION Linear

 VERSION 86-1 (JANUARY 1986)\*ENDF/B-VI FORMAT Linear

 VERSION 87-1 (JANUARY 1987)\*DOUBLE PRECISION TREATMENT OF CROSS Linear

 SECTION Linear

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

 FILE NAMES (SEE, SUBROUTINE FILEIO Linear

 FOR DETAILS). Linear

 \*IMPROVED BASED ON USER COMMENTS. Linear

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

 INSURE PROGRAM WILL NOT DO ANYTHING Linear

 CRAZY. Linear

 \*UPDATED TO USE NEW PROGRAM CONVERT Linear

 KEYWORDS. Linear

 \*ADDED LIVERMORE CIVIC COMPILER Linear

 CONVENTIONS. Linear

 VERSION 90-1 (JUNE 1990) \*EXTENDED TO LINEARIZE PHOTON Linear

 INTERACTION DATA, MF=23 AND 27 Linear

 \*ADDED FORTRAN SAVE OPTION Linear

 \*UPDATED BASED ON USER COMMENTS. Linear

 \*NEW MORE CONSISTENT ENERGY OUTPUT Linear

 ROUTINE. Linear

 \*WARNING...INPUT PARAMETER FORMAT Linear

 HAS BEEN CHANGED...SEE DESCRIPTION Linear

 BELOW. Linear

 VERSION 91-1 (JULY 1991) \*ADDED INTERPOLATION LAW 6 - ONLY USED Linear

 FOR CHARGED PARTICLE CROSS SECTIONS Linear

 FOR COULOMB PENETRABILITIES. Linear

 VERSION 92-1 (JANUARY 1992)\*ADDED NU-BAR (TOTAL, DELAYED, PROMPT) Linear

 POLYNOMIAL OR TABULATED ALL CONVERTED Linear

 TO LINEARLY INTERPOLABLE Linear

 \*INCREASED PAGE SIZE FROM 3006 TO 5010 Linear

 POINTS. Linear

 \*ALL ENERGIES INTERNALLY ROUNDED PRIOR Linear

 TO CALCULATIONS. Linear

 \*COMPLETELY CONSISTENT I/O AND ROUNDING Linear

 ROUTINES - TO MINIMIZE COMPUTER Linear

 DEPENDENCE. Linear

 VERSION 92-2 (JULY 1992) \*CORRECTED CONVERSION OF NU-BAR FROM Linear

 POLYNOMIAL TO TABULATED - COPY Linear

 SPONTANEOUS NU-BAR (BY DEFINITION Linear

 THE SPONTANEOUS NU-BAR IS NOT AN Linear

 ENERGY DEPENDENT QUANTITY). Linear

 VERSION 93-1 (MARCH 1993) \*UPDATED FOR USE WITH LAHEY COMPILER Linear

 ON IBM-PCS. Linear

 \*INCREASED PAGE SIZE FROM 5010 TO Linear

 30000 POINTS Linear

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

 TO ALLOW ACCESS TO FILE STRUCTURES Linear

 (WARNING - INPUT PARAMETER FORMAT Linear

 HAS BEEN CHANGED) Linear

 \*CLOSE ALL FILES BEFORE TERMINATING Linear

 (SEE, SUBROUTINE ENDIT) Linear

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

 \*IMPROVED COMPUTER INDEPENDENCE Linear

 \*ALL DOUBLE PRECISION Linear

 \*ON SCREEN OUTPUT Linear

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

 \*IMPROVED OUTPUT PRECISION Linear

 \*DEFINED SCRATCH FILE NAMES Linear

 \*ALWAYS INCLUDE THERMAL VALUE Linear

 \*INCREASED PAGE SIZE FROM 30000 TO Linear

 60000 POINTS Linear

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

 POINT READ FOR MORE DIGITS Linear

 \*UPDATED TEST FOR ENDF/B FORMAT Linear

 VERSION BASED ON RECENT FORMAT CHANGE Linear

 \*GENERAL IMPROVEMENTS BASED ON Linear

 USER FEEDBACK Linear

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

 MF=1, MT-451. Linear

 VERS. 2000-1 (FEBRUARY 2000)\*ADDED MF = 9 AND 10 LINEARIZATION Linear

 \*GENERAL IMPROVEMENTS BASED ON Linear

 USER FEEDBACK Linear

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

 VERS. 2004-1 (JAN. 2004) \*GENERAL UPDATE BASED ON USER FEEDBACK Linear

 VERS. 2005-1 (JAN. 2005) \*ALWAYS KEEP ORIGINAL TABULATED Linear

 NU-BAR POINTS. Linear

 VERS. 2006-1 (FEB. 2006) \*CORRECTED INT=6 NEAR THRESHOLD Linear

 \*NO SUBDIVIDE BELOW MINIMUM XCMIN Linear

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

 \*INCREASED PAGE SIZE FROM 60,000 TO Linear

 600,000 POINTS Linear

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

 VERS. 2010-1 (Apr. 2010) \*Skipped leading cross section = 0 Linear

 up to effective start, unless keeping Linear

 ALL original energy points. Linear

 \*Replaced ETHRES by ESTART - it is Linear

 not a threshold - just a minimum Linear

 energy - if a section starts above Linear

 this energy with a positive cross Linear

 section, an additional point will Linear

 inserted with cross section = 0. Linear

 VERS. 2012-1 (Aug. 2012) \*Minor Updates based on User Feedback. Linear

 \*Added CODENAME Linear

 \*32 and 64 bit Compatible Linear

 \*Added ERROR stops. Linear

 VERS. 2012-2 (Nov. 2012) \*Never thin nu-bar. Linear

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

 VERS. 2015-1 (Jan. 2015) \*Allow Imaginary Anomolous Scattering Linear

 Factor to be Negative (MF/MT=27/506). Linear

 \*Replaced ALL 3 way IF Statements. Linear

 Linear

 OWNED, MAINTAINED AND DISTRIBUTED BY Linear

 ------------------------------------ Linear

 THE NUCLEAR DATA SECTION Linear

 INTERNATIONAL ATOMIC ENERGY AGENCY Linear

 P.O. BOX 100 Linear

 A-1400, VIENNA, AUSTRIA Linear

 EUROPE Linear

 Linear

 ORIGINALLY WRITTEN BY Linear

 ------------------------------------ Linear

 Dermott E. Cullen Linear

 Linear

 PRESENT CONTACT INFORMATION Linear

 --------------------------- Linear

 Dermott E. Cullen Linear

 1466 Hudson Way Linear

 Livermore, CA 94550 Linear

 U.S.A. Linear

 Telephone 925-443-1911 Linear

 E. Mail RedCullen1@Comcast.net Linear

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

 Linear

 AUTHORS MESSAGE Linear

 --------------- Linear

 THE REPORT DESCRIBED ABOVE IS THE LATEST PUBLISHED DOCUMENTATION Linear

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

 THE LATEST DOCUMENTATION INCLUDING ALL RECENT IMPROVEMENTS. PLEASE Linear

 READ ALL OF THESE COMMENTS BEFORE IMPLEMENTATION. Linear

 Linear

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

 INDEPENDENT PROGRAMS THAT CAN EASILY BE IMPLEMENTED ON ANY ONE Linear

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

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

 COMPILER DIAGNOSTICS, OPERATING PROBLEMS OR SUGGESTIONS ON HOW TO Linear

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

 THIS PROGRAM WILL BE COMPLETELY COMPATIBLE FOR USE ON YOUR Linear

 COMPUTER. Linear

 Linear

 PURPOSE Linear

 ------- Linear

 THIS PROGRAM IS DESIGNED TO CONVERT ENDF/B FILE 3, 23 AND 27 DATA Linear

 TO LINEAR-LINEAR INTERPOLABLE FORM. ANY SECTION THAT IS ALREADY Linear

 LINEAR-LINEAR INTERPOLABLE WILL BE THINNED. Linear

 Linear

 IN THE FOLLOWING DISCUSSION FOR SIMPLICITY THE ENDF/B TERMINOLOGY Linear

 ---ENDF/B TAPE---WILL BE USED. IN FACT THE ACTUAL MEDIUM MAY BE Linear

 TAPE, CARDS, DISK OR ANY OTHER MEDIUM. Linear

 Linear

 ENDF/B FORMAT Linear

 ------------- Linear

 THIS PROGRAM ONLY USES THE ENDF/B BCD OR CARD IMAGE FORMAT (AS Linear

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

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

 Linear

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

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

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

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

 CORRECTLY OUTPUT ON ALL LINES. THE FORMAT OF SECTION MF=1, MT=451 Linear

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

 OTHER SECTION OF DATA AS HOLLERITH AND AS SUCH IS INSENSITIVE TO Linear

 THE CORRECTNESS OR INCORRECTNESS OF ALL OTHER SECTIONS. Linear

 Linear

 OUTPUT FORMAT Linear

 ------------- Linear

 IN THIS VERSION OF LINEAR ALL ENERGIES WILL BE OUTPUT IN Linear

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

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

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

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

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

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

 DUE TO TRUNCATION OF ENERGIES TO 6 DIGITS DURING OUTPUT. Linear

 Linear

 CONTENTS OF OUTPUT Linear

 ------------------ Linear

 ENTIRE EVALUATIONS ARE OUTPUT, NOT JUST THE LINEARIZED DATA Linear

 CROSS SECTIONS, E.G. ANGULAR AND ENERGY DISTRIBUTIONS ARE ALSO Linear

 INCLUDED. Linear

 Linear

 DOCUMENTATION Linear

 ------------- Linear

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

 BY THE ADDITION OF 3 COMMENT LINES AT THE END OF EACH HOLLERITH Linear

 SECTION IN THE FORM Linear

 Linear

 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* PROGRAM LINEAR (2015-1) \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Linear

 FOR ALL DATA GREATER THAN 1.00000-10 IN ABSOLUTE VALUE Linear

 DATA LINEARIZED TO WITHIN AN ACCURACY OF 0.1 PER-CENT Linear

 Linear

 THE ORDER OF SIMILAR COMMENTS (FROM RECENT, SIGMA1 AND GROUPIE) Linear

 REPRESENTS A COMPLETE HISTORY OF ALL OPERATIONS PERFORMED ON Linear

 THE DATA BY THESE PROGRAMS. Linear

 Linear

 THESE COMMENT LINES ARE ONLY ADDED TO EXISTING HOLLERITH SECTIONS, Linear

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

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

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

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

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

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

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

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

 SHOULD BE USED TO CREATE A HOLLERITH SECTION. Linear

 Linear

 REACTION INDEX Linear

 -------------- Linear

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

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

 Linear

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

 THIS CONVENTION HAS BEEN ADOPTED BECAUSE MOST USERS DO NOT Linear

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

 NOT CONSIDERED WORTHWHILE TO INCLUDE THE OVERHEAD OF CONSTRUCTING Linear

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

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

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

 Linear

 SECTION SIZE Linear

 ------------ Linear

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

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

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

 Linear

 FOR ANY LINEARIZED SECTION THAT CONTAINS 60000 OR FEWER POINTS Linear

 THE ENTIRE OPERATION WILL BE PERFORMED IN CORE AND THE LINEARIZED Linear

 DATA WILL BE OUTPUT DIRECTLY TO THE ENDF/B FORMAT. FOR ANY SECTION Linear

 THAT CONTAINS MORE POINTS THE DATA WILL BE LINEARIZED A PAGE AT A Linear

 TIME (1 PAGE = 60000 POINTS) AND OUTPUT TO SCRATCH. AFTER THE Linear

 ENTIRE SECTION HAS BEEN LINEARIZED THE DATA WILL BE READ BACK FROM Linear

 SCRATCH AND OUTPUT TO THE ENDF/B FORMAT. Linear

 Linear

 SELECTION OF DATA Linear

 ----------------- Linear

 THE PROGRAM SELECTS DATA TO BE LINEARIZED BASED EITHER ON EITHER Linear

 MAT (ENDF/B MAT NO.) OR ZA AS WELL AS MF AND MT NUMBERS. THIS Linear

 PROGRAM ALLOWS UP TO 100 MAT/MF/MT OR ZA/MF/MT RANGES TO BE Linear

 SPECIFIED BY INPUT PARAMETERS. THE PROGRAM WILL ASSUME THAT THE Linear

 ENDF/B TAPE IS IN MAT ORDER, REGARDLESS OF THE CRITERIA USED Linear

 TO RETRIEVE MATERIALS. IF RETRIEVAL IS BY MAT RANGE THE PROGRAM Linear

 WILL TERMINATE WHEN A MAT IS FOUND THAT IS ABOVE ALL REQUESTED Linear

 MAT RANGES. IF RETRIEVAL IS BY ZA RANGE THE PROGRAM WILL SEARCH Linear

 THE ENTIRE ENDF/B TAPE. Linear

 Linear

 PROGRAM OPERATION Linear

 ----------------- Linear

 EACH SECTION OF DATA IS CONSIDERED SEPARATELY. EACH SECTION OF Linear

 ENDF/B DATA TO LINEARIZE IS REPRESENTED BY A TABLE OF ENERGY Linear

 VS. CROSS SECTION AND ANY ONE OF FIVE ALLOWABLE INTERPOLATION LAWS Linear

 BETWEEN ANY TWO TABULATED POINTS. THIS PROGRAM WILL REPLACE EACH Linear

 SECTION OF DATA CROSS SECTIONS BY A NEW TABLE OF ENERGY VS. Linear

 CROSS SECTION IN WHICH THE INTERPOLATION LAW IS ALWAYS LINEAR IN Linear

 ENERGY AND CROSS SECTION BETWEEN ANY TWO TABULATED POINTS. Linear

 Linear

 DATA IS READ AND LINEARIZED A PAGE AT A TIME (ONE PAGE CONTAINS Linear

 60000 DATA POINTS). IF THE FINAL LINEARIZED SECTION CONTAINS TWO Linear

 PAGES OR LESS, DATA POINTS IT WILL BE ENTIRELY CORE RESIDENT Linear

 AFTER IT HAS BEEN LINEARIZED AND WILL BE WRITTEN DIRECTLY FROM Linear

 CORE TO THE OUTPUT TAPE. IF THE LINEARIZED SECTION IS LARGER THAN Linear

 TWO PAGES, AFTER EACH PAGE IS LINEARIZED IT WILL BE WRITTEN TO Linear

 SCRATCH. AFTER THE ENTIRE SECTION HAS BEEN LINEARIZED IT WILL Linear

 BE READ BACK FROM SCRATCH, TWO PAGES AT A TIME, AND WRITTEN TO Linear

 THE OUTPUT TAPE. Linear

 Linear

 KEEP EVALUATED DATA POINTS Linear

 -------------------------- Linear

 SOMETIMES IT IS CONVENIENT TO KEEP ALL ENERGY POINTS WHICH WERE Linear

 PRESENT IN THE ORIGINAL EVALUATION AND TO MERELY SUPPLEMENT THESE Linear

 POINTS WITH ADDITIONAL ENERGY POINTS IN ORDER TO LINEARIZE THE Linear

 CROSS SECTIONS. FOR EXAMPLE, IT IS OFTEN CONVENIENT TO KEEP THE Linear

 THERMAL VALUE (AT 0.0253 EV) OR THE VALUE AT 14.1 MEV. Linear

 Linear

 THE CURRENT VERSION OF THIS PROGRAM WILL ALLOW THE USER TO KEEP Linear

 ALL ORIGINAL EVALUATED DATA POINTS BY SPECIFYING 1 IN COLUMNS Linear

 34-44 OF THE FIRST INPUT LINE. THIS WILL TURN OFF THE BACKWARD Linear

 THINNING (SEE UCRL-50400, VOL. 17, PART A FOR EXPLANATION) AND Linear

 RESULT IN ALL ORIGINAL ENERGY POINTS BEING KEPT. CAUTION SHOULD Linear

 BE EXERCISED IN USING THIS OPTION SINCE IT CAN RESULT IN A Linear

 CONSIDERABLE INCREASE IN THE NUMBER OF DATA POINTS OUTPUT BY Linear

 THIS CODE. Linear

 Linear

 FOR ALL USERS WHO ARE NOT INTERESTED IN THIS OPTIONS NO CHANGES Linear

 ARE REQUIRED IN THE INPUT TO THIS PROGRAM, I. E. IF COLUMNS Linear

 34-44 ARE BLANK (AS FOR ALL PREVIOUS VERSIONS OF THIS CODE) THE Linear

 PROGRAM WILL OPERATE EXACTLY AS IT DID BEFORE. Linear

 Linear

 ALLOWABLE ERROR Linear

 --------------- Linear

 ALLOWABLE ERROR MUST ALWAYS BE SPECIFIED IN THE INPUT TO THIS Linear

 PROGRAM AS A FRACTION, NOT A PER-CENT. FOR EXAMPLE, INPUT THE Linear

 ALLOWABLE FRACTIONAL ERROR 0.001 IN ORDER TO OBTAIN DATA THAT IS Linear

 ACCURATE TO WITHIN 0.1 PER-CENT. Linear

 Linear

 THE CONVERSION OF THE DATA FROM THE GENERAL INTERPOLATION FORM TO Linear

 LINARLY INTERPOLABLE FORM CANNOT BE PERFORMED EXACTLY. HOWEVER, IT Linear

 CAN BE PERFORMED TO VIRTUALLY ANY REQUIRED ACCURACY AND MOST Linear

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

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

 CONVERSION OF CROSS SECTIONS TO LINEARLY INTERPOLABLE FORM CAN BE Linear

 PERFORMED WITH ESSENTIALLY NO LOSE OF INFORMATION. Linear

 Linear

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

 DEPENDENT. THE ALLOWABLE ERROR IS DESCRIBED BY A TABULATED Linear

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

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

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

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

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

 OF INTEREST AND A LESS STRINGENT ERROR IN OTHER ENERGY RANGES. Linear

 Linear

 DEFAULT ALLOWABLE ERROR Linear

 ----------------------- Linear

 IN ORDER TO INSURE CONVERGENCE OF THE LINEARIZING ALGORITHM THE Linear

 ALLOWABLE ERROR MUST BE POSITIVE. IF THE USER INPUTS AN ERROR Linear

 THAT IS NOT POSITIVE IT WILL AUTOMATICALLY BE SET TO THE DEFAULT Linear

 VALUE (CURRENTLY 0.001, CORRESPONDING TO 0.1 PER-CENT) AND Linear

 INDICATED AS SUCH IN THE OUTPUT LISTING. Linear

 Linear

 COULOMB PENETRABILITY (INTERPOLATION LAW = 6) Linear

 -------------------------------------------- Linear

 INTRODUCED FOR ENDF/B-VI. THIS IS DEFINED AS, Linear

 Linear

 SIG(E) = C1\*EXP(-C2/SQRT(E - T)) Linear

 Linear

 THIS PROGRAM ONLY CONSIDERS EXOTHERMIC REACTIONS - T = 0 Linear

 Linear

 SIG(E) = C1\*EXP(-C2/SQRT(E)) Linear

 Linear

 WARNING...THIS INTERPOLATION LAW SHOULD ONLY BE USED FOR REACTIONS Linear

 WHICH HAVE A POSITIVE Q-VALUE (EXOTHERMIC REACTIONS), Linear

 SINCE HERE WE ONLY CONSIDER T = 0.0 IN THE FORMALISM. Linear

 IN ALL OTHER CASES A WARNING MESSAGE WILL BE PRINTED. Linear

 Linear

 INPUT FILES Linear

 ----------- Linear

 UNIT DESCRIPTION Linear

 ---- ----------- Linear

 2 INPUT LINES (BCD - 80 CHARACTERS/RECORD) Linear

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

 Linear

 OUTPUT FILES Linear

 ------------ Linear

 UNIT DESCRIPTION Linear

 ---- ----------- Linear

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

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

 Linear

 SCRATCH FILES Linear

 ------------- Linear

 UNIT DESCRIPTION Linear

 ---- ----------- Linear

 12 SCRATCH FILE (BINARY - 180000 WORDS/RECORD Linear

 Linear

 OPTIONAL STANDARD FILE NAMES (SEE SUBROUTINE FILEIO) Linear

 ---------------------------------------------------- Linear

 UNIT FILE NAME Linear

 ---- ---------- Linear

 2 LINEAR.INP Linear

 3 LINEAR.LST Linear

 10 ENDFB.IN Linear

 11 ENDFB.OUT Linear

 12 (SCRATCH) Linear

 Linear

 Linear

 INPUT PARAMETERS Linear

 ---------------- Linear

 FOR VERSIONS EARLIER THAN 90-1 THIS PROGRAM ONLY ALLOWED THE USER Linear

 TO SPECIFY BY INPUT PARAMETERS WHICH MATERIALS (MAT) TO PROCESS. Linear

 FOR EACH REQUESTED MATERIAL NEUTRON INTERACTION CROSS SECTIONS Linear

 (MF=3) WOULD BE LINEARIZED AND THE REMAINDER OF THE MATERIAL Linear

 WOULD BE COPIED. Linear

 Linear

 FOR VERSIONS 90-1 AND LATER THIS PROGRAM WILL ALLOW THE USER TO Linear

 TO SPECIFY BY INPUT PARAMETERS EXACTLY WHAT SECTIONS OF DATA Linear

 TO PROCESS. FOR EACH SECTION OF DATA, SPECIFIED BY MAT, MF, MT Linear

 RANGES, SECTIONS OF MF=3, 23 AND 27 WILL BE LINEARIZED AND ALL Linear

 OTHER REQUESTED SECTIONS WILL BE COPIED. ALL SECTIONS WHICH ARE Linear

 NOT EXPLICITLY REQUESTED WILL BE SKIPPED AND WILL NOT APPEAR ON Linear

 ENDF/B FILE OUTPUT BY THIS PROGRAM. Linear

 Linear

 WITH THIS NEW PROCEDURE YOU CAN MINIMIZE THE SIZE OF THE ENDF/B Linear

 FILE OUTPUT BY THIS PROGRAM, E.G., IF YOU ONLY WANT NEUTRON Linear

 CROSS SECTIONS FOR SUBSEQUENT PROCESSING YOU NEED ONLY REQUEST Linear

 ONLY MF=3 DATA. Linear

 Linear

 HOWEVER, YOU MUST UNDERSTAND THAT ONLY THOSE SECTIONS WHICH YOU Linear

 EXPLICITLY REQUEST WILL APPEAR ON THE ENDF/B FILE OUTPUT BY Linear

 THIS PROGRAM. FOR EXAMPLE, IF YOU WISH TO DOCUMENT EXACTLY Linear

 HOW YOU LINEARIZED THE DATA BY INCLUDING COMMENTS IN MF=1, MT=451 Linear

 THEN YOU MUST EXPLICITLY REQUEST THAT MF=1, MT=451 BE PROCESSED Linear

 FOR EACH MATERIAL THAT YOU REQUEST. SIMILAR IF YOU WANT THE Linear

 ENTIRE EVALUATION YOU MUST REQUEST ALL MF AND MT TO BE OUTPUT. Linear

 Linear

 LINE COLS. DESCRIPTION Linear

 ---- ----- ----------- Linear

 1 1-11 SELECTION CRITERIA (0=MAT, 1=ZA) Linear

 12-22 MONITOR MODE SELECTOR Linear

 = 0 - NORMAL OPERATION Linear

 = 1 - MONITOR PROGRESS OF LINEARIZING OF THE DATA. Linear

 EACH TIME A PAGE OF DATA POINTS IS WRITTEN TO Linear

 THE SCRATCH FILE PRINT OUT THE TOTAL NUMBER OF Linear

 POINTS ON SCRATCH AND THE LOWER AND UPPER Linear

 ENERGY LIMITS OF THE PAGE (THIS OPTION MAY BE Linear

 USED IN ORDER TO MONITOR THE EXECUTION SPEED Linear

 OF LONG RUNNING JOBS). Linear

 23-33 MINIMUM CROSS SECTION OF INTEREST (BARNS). Linear

 (IF 0.0 OR LESS IS INPUT THE PROGRAM WILL Linear

 USE 1.0E-10). ENERGY INTERVALS WILL NOT BE Linear

 SUB-DIVIDED IF THE ABSOLUTE VALUE OF THE CROSS Linear

 SECTION WITHIN THE INTERVAL IS LESS THAN THIS VALUE. Linear

 AN EXCEPTION TO THIS RULE IS NEAR THRESHOLDS ENERGY Linear

 INTERVALS WILL BE SUB-DIVIDED UNTIL CONVERGENCE Linear

 REGARDLESS OF THE MAGNITUDE OF THE CROSS SECTION. Linear

 34-44 KEEP ORIGINAL EVALUATED DATA POINTS. Linear

 = 0 - NO. Linear

 = 1 - YES - ADDITIONAL POINTS MAY BE ADDED IN ORDER Linear

 TO LINEARIZE DATA, BUT ALL ORIGINAL Linear

 DATA POINTS WILL BE INCLUDED IN THE Linear

 RESULTS. Linear

 2 1-72 ENDF/B INPUT DATA FILENAME Linear

 (STANDARD OPTION = ENDFB.IN) Linear

 3 1-72 ENDF/B OUTPUT DATA FILENAME Linear

 (STANDARD OPTION = ENDFB.OUT) Linear

 4-N 1- 6 LOWER MAT OR ZA LIMIT Linear

 7- 8 LOWER MF LIMIT Linear

 9-11 LOWER MT LIMIT Linear

 12-17 UPPER MAT OR ZA LIMIT Linear

 18-19 UPPER MF LIMIT Linear

 20-22 UPPER MT LIMIT Linear

 UP TO 100 RANGES MAY BE SPECIFIED, ONLY ONE RANGE Linear

 PER LINE. THE LIST OF RANGES IS TERMINATED BY A Linear

 BLANK LINE. IF THE UPPER MAT LIMIT OF ANY REQUEST Linear

 IS LESS THAN THE LOW LIMIT IT WILL BE SET EQUAL TO Linear

 THE LOWER LIMIT. IF THE UPPER LIMIT IS STILL ZERO Linear

 IT WILL BE SET EQUAL TO 999999. IF THE UPPER MF OR Linear

 MT LIMIT IS ZERO IT WILL BE SET TO 99 OR 999 Linear

 RESPECTIVELY. Linear

 VARY 1-11 ENERGY FOR ERROR LAW Linear

 12-22 ALLOWABLE FRACTIONAL ERROR FOR ERROR LAW. Linear

 THE ACCEPTABLE LINEARIZING ERROR MAY BE SPECIFIED TO Linear

 BE EITHER ENERGY INDEPENDENT (DEFINED BY A SINGLE Linear

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

 ENERGY, ERROR PAIRS). FOR THE ENERGY DEPENDENT CASE Linear

 LINEAR INTERPOLATION WILL BE USED TO DEFINE THE ERROR Linear

 AT ENERGIES BETWEEN THOSE AT WHICH IT IS TABULATED. Linear

 IN ALL CASES THE ERROR LAW IS TERMINATED BY A BLANK Linear

 LINE. IF ONLY ONE ENERGY, ERROR PAIR IS GIVEN THE Linear

 THE LAW WILL BE CONSIDERED TO BE ENERGY INDEPENDENT. Linear

 IF MORE THAN ONE PAIR IS GIVEN IT WILL BE CONSIDERED Linear

 TO BE ENERGY DEPENDENT (NOTE, ENERGY INDEPENDENT Linear

 FORM WILL RUN FASTER THAN THE EQUIVALENT ENERGY Linear

 DEPENDENT FORM). FOR AN ENERGY DEPENDENT ERROR LAW Linear

 ALL ENERGIES MUST BE ASCENDING ENERGY ORDER. FOR Linear

 CONVERGENCE OF THE LINEARIZING ALGORITHM ALL ERRORS Linear

 MUST BE POSITIVE. IF AN ALLOWABLE ERROR IS NOT Linear

 POSITIVE IT WILL BE SET EQUAL TO THE STANDARD OPTION Linear

 (CURRENTLY 0.001, CORRESPONDING TO 0.1 PER-CENT). Linear

 IF THE FIRST ERROR LINE IS BLANK IT WILL TERMINATE Linear

 THE ERROR LAW AND THE ERROR WILL BE TREATED AS Linear

 ENERGY INDEPENDENT, EQUAL TO THE STANDARD OPTION Linear

 (CURRENTLY 0.1 PER-CENT). (SEE EXAMPLE INPUT 4). Linear

 Linear

 EXAMPLE INPUT NO. 1 Linear

 ------------------- Linear

 RETRIEVE DATA BY ZA IN ORDER TO FIND ALL URANIUM ISOTOPES AND Linear

 THORIUM 232. RETRIEVE ALL NEUTRON INTERACTION CROSS SECTIONS Linear

 (MF=3). ALL ENERGY INTERVALS IN WHICH THE CROSS SECTION IS Linear

 AT LEAST 1 MICRO-BARN (1.0E-06 BARNS) WILL BE SUBDIVIDED. Linear

 BACKWARD THINNING WILL BE PERFORMED. FROM 0 TO 100 EV LINEARIZE Linear

 TO WITHIN 0.1 PER-CENT ACCURACY. FROM 100 EV TO 1 KEV VARY Linear

 ACCURACY BETWEEN 0.1 AND 1.0 PER-CENT. ABOVE 1 KEV USE 1 Linear

 PER-CENT ACCURACY. Linear

 Linear

 EXPLICITLY SPECIFY THE STANDARD FILENAMES. Linear

 Linear

 IN THIS CASE THE FOLLOWING 11 INPUT LINES ARE REQUIRED Linear

 Linear

 1 0 1.00000- 6 0 Linear

 ENDFB.IN Linear

 ENDFB.OUT Linear

 92000 3 0 92999 3999 Linear

 90232 3 0 0 3 0 (UPPER LIMIT AUTOMATICALLY SET TO 90232 3999) Linear

 (END OF REQUEST LIST) Linear

 0.00000+ 0 1.00000-03 Linear

 1.00000+ 2 1.00000-03 Linear

 1.00000+ 3 1.00000-02 Linear

 1.00000+ 9 1.00000-02 Linear

 (END OF ERROR LAW) Linear

 Linear

 EXAMPLE INPUT NO. 2 Linear

 ------------------- Linear

 SAME AS THE ABOVE CASE, EXCEPT LINEARIZE ALL DATA TO WITHIN THE Linear

 STANDARD ACCURACY (CURRENTLY 0.1 PER-CENT). IN ORDER TO USE THE Linear

 STANDARD ACCURACY YOU NEED NOT SPECIFY ANY ERROR LAW AT ALL. IN Linear

 THIS CASE INCLUDE THE HOLLERITH SECTION, MF=1, MT=451, FOR EACH Linear

 MATERIAL. Linear

 Linear

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

 THEN USE STANDARD FILENAMES. Linear

 Linear

 IN THIS CASE THE FOLLOWING 9 INPUT LINES ARE REQUIRED Linear

 Linear

 1 0 1.00000- 6 0 Linear

 (USE DEFAULT FILENAME = ENDFB.IN) Linear

 (USE DEFAULT FILENAME = ENDFB.OUT) Linear

 92000 1451 92999 1451 Linear

 92000 3 0 92999 3999 Linear

 90232 1451 0 1451 Linear

 90232 3 0 0 3 0 (UPPER LIMIT AUTOMATICALLY SET TO 90232 3999) Linear

 (END OF REQUEST LIST) Linear

 (0.1 PER-CENT ERROR, END OF ERROR LAW) Linear

 Linear

 EXAMPLE INPUT NO. 3 Linear

 ------------------- Linear

 LINEARIZE ALL MATERIALS ON AN ENDF/B TAPE TO WITHIN AN ACCURACY Linear

 OF 0.5 PER-CENT (0.005 AS A FRACTION). IN THIS CASE YOU NEED NOT Linear

 SPECIFY THE MAT, MF, MT RANGES. Linear

 Linear

 READ THE ENDF/B DATA FROM \ENDFB6\ZA092238 AND WRITE THE ENDF/B Linear

 DATA TO \ENDFB6\LINEAR\ZA092238. Linear

 Linear

 IN THIS CASE THE FOLLOWING 6 INPUT LINES ARE REQUIRED Linear

 Linear

 (MAT, 1.0E-10 BARNS, THIN) Linear

 \ENDFB6\ZA092238 Linear

 \ENDFB6\LINEAR\ZA092238 Linear

 (RETRIEVE ALL DATA, END REQUEST LIST) Linear

 5.00000-03 Linear

 (END OF ERROR LAW) Linear

 Linear

 NOTE THAT IN THIS CASE IF THE INPUT HAD SPECIFIED AN EQUIVALENT Linear

 ENERGY DEPENDENT ERROR LAW BY GIVING A NUMBER OF ENERGY POINTS Linear

 AT EACH OF WHICH THE ERROR IS 0.5 PER-CENT THE PROGRAM WOULD TAKE Linear

 LONGER TO RUN (I.E., ONLY USE AN ENERGY DEPENDENT ERROR LAW WHEN Linear

 IT IS NECESSARY). Linear

 Linear

 EXAMPLE INPUT NO. 4 Linear

 ------------------- Linear

 IN ORDER TO LINEARIZE ALL MATERIALS ON AN ENDF/B TAPE TO THE Linear

 STANDARD OPTION OF 0.1 PER-CENT IT IS ADEQUATE TO INPUT A SET Linear

 OF COMPLETELY BLANK LINES WHICH WILL AUTOMATICALLY INVOKE ALL Linear

 OF THE STANDARD OPTIONS. Linear

 Linear

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

 THEN USE STANDARD FILENAMES. Linear

 Linear

 IN THIS CASE THE FOLLOWING THREE INPUT LINES ARE REQUIRED Linear

 Linear

 (MAT, 1.0E-10 BARNS, THIN) Linear

 (USE DEFAULT FILENAME = ENDFB.IN) Linear

 (USE DEFAULT FILENAME = ENDFB.OUT) Linear

 (RETRIEVE ALL DATA, END REQUEST LIST) Linear

 (0.1 PER-CENT ERROR, END OF ERROR LAW) Linear

 Linear

 ======================================================================= Linear