======================================================================= Spectra

 Spectra

 PROGRAM SPECTRA Spectra

 =============== Spectra

 An extension of LINEAR to linearize ALl MF=5 spectra. Spectra

 05/28/2012 - Added MF=15 neutron induced, photon spectra. Spectra

 Spectra

 First released in 2010 - Earlier below dates refer to LINEAR. Spectra

 Spectra

 VERSION 74-1 (MAY 1974) Spectra

 VERSION 75-1 (APRIL 1975) Spectra

 VERSION 76-2 (OCTOBER 1976) Spectra

 VERSION 77-1 (JANUARY 1977) Spectra

 VERSION 78-1 (JULY 1978) Spectra

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

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

 VERSION 80-2 (DECEMBER 1980) Spectra

 VERSION 81-1 (MARCH 1981) Spectra

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

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

 \*PAGE SIZE INCREASED - 1002 TO 3006. Spectra

 \*ELIMINATED COMPUTER DEPENDENT CODING. Spectra

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

 \*ADDED OPTION TO KEEP ALL ORIGINAL Spectra

 ENERGY POINTS FROM EVALUATION. Spectra

 \*ADDED STANDARD ALLOWABLE ERROR OPTION Spectra

 (CURRENTLY 0.1 PER-CENT). Spectra

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

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

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

 \*SPECIAL I/O ROUTINES TO GUARANTEE Spectra

 ACCURACY OF ENERGY. Spectra

 \*DOUBLE PRECISION TREATMENT OF ENERGY Spectra

 (REQUIRED FOR NARROW RESONANCES). Spectra

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

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

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

 SECTION Spectra

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

 FILE NAMES (SEE, SUBROUTINE FILEIO Spectra

 FOR DETAILS). Spectra

 \*IMPROVED BASED ON USER COMMENTS. Spectra

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

 INSURE PROGRAM WILL NOT DO ANYTHING Spectra

 CRAZY. Spectra

 \*UPDATED TO USE NEW PROGRAM CONVERT Spectra

 KEYWORDS. Spectra

 \*ADDED LIVERMORE CIVIC COMPILER Spectra

 CONVENTIONS. Spectra

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

 INTERACTION DATA, MF=23 AND 27 Spectra

 \*ADDED FORTRAN SAVE OPTION Spectra

 \*UPDATED BASED ON USER COMMENTS. Spectra

 \*NEW MORE CONSISTENT ENERGY OUTPUT Spectra

 ROUTINE. Spectra

 \*WARNING...INPUT PARAMETER FORMAT Spectra

 HAS BEEN CHANGED...SEE DESCRIPTION Spectra

 BELOW. Spectra

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

 FOR CHARGED PARTICLE CROSS SECTIONS Spectra

 FOR COULOMB PENETRABILITIES. Spectra

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

 POLYNOMIAL OR TABULATED ALL CONVERTED Spectra

 TO LINEARLY INTERPOLABLE Spectra

 \*INCREASED PAGE SIZE FROM 3006 TO 5010 Spectra

 POINTS. Spectra

 \*ALL ENERGIES INTERNALLY ROUNDED PRIOR Spectra

 TO CALCULATIONS. Spectra

 \*COMPLETELY CONSISTENT I/O AND ROUNDING Spectra

 ROUTINES - TO MINIMIZE COMPUTER Spectra

 DEPENDENCE. Spectra

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

 POLYNOMIAL TO TABULATED - COPY Spectra

 SPONTANEOUS NU-BAR (BY DEFINITION Spectra

 THE SPONTANEOUS NU-BAR IS NOT AN Spectra

 ENERGY DEPENDENT QUANTITY). Spectra

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

 ON IBM-PCS. Spectra

 \*INCREASED PAGE SIZE FROM 5010 TO Spectra

 30000 POINTS Spectra

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

 TO ALLOW ACCESS TO FILE STRUCTURES Spectra

 (WARNING - INPUT PARAMETER FORMAT Spectra

 HAS BEEN CHANGED) Spectra

 \*CLOSE ALL FILES BEFORE TERMINATING Spectra

 (SEE, SUBROUTINE ENDIT) Spectra

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

 \*IMPROVED COMPUTER INDEPENDENCE Spectra

 \*ALL DOUBLE PRECISION Spectra

 \*ON SCREEN OUTPUT Spectra

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

 \*IMPROVED OUTPUT PRECISION Spectra

 \*DEFINED SCRATCH FILE NAMES Spectra

 \*ALWAYS INCLUDE THERMAL VALUE Spectra

 \*INCREASED PAGE SIZE FROM 30000 TO Spectra

 60000 POINTS Spectra

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

 POINT READ FOR MORE DIGITS Spectra

 \*UPDATED TEST FOR ENDF/B FORMAT Spectra

 VERSION BASED ON RECENT FORMAT CHANGE Spectra

 \*GENERAL IMPROVEMENTS BASED ON Spectra

 USER FEEDBACK Spectra

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

 MF=1, MT-451. Spectra

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

 \*GENERAL IMPROVEMENTS BASED ON Spectra

 USER FEEDBACK Spectra

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

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

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

 NU-BAR POINTS. Spectra

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

 \*NO SUBDIVIDE BELOW MINIMUM XCMIN Spectra

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

 \*INCREASED PAGE SIZE FROM 60,000 TO Spectra

 600,000 POINTS Spectra

 VERS. 2010-1 (JUNE 2010) \*ADDED MF = 5 - MF = 6 STILL PLANNED. Spectra

 \*72 CHARACTER FILE NAMES. Spectra

 \*ONLY PROCESS MF=5 - SKIP ALL OTHERS Spectra

 TO PREVENT CONFLICT WITH LINEAR Spectra

 THINNING. Spectra

 VERS. 2012-1 (Aug. 2012) \*Added MF=15, neutron induced photon Spectra

 spectra. Spectra

 \*Added CODENAME Spectra

 \*32 and 64 bit Compatible Spectra

 \*Added ERROR stop Spectra

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

 \*Replaced ALL 3 way IF Statements. Spectra

 \*Corrected MF=15 Data - it was adding Spectra

 SEND between sub-sections. Spectra

 \*Deleted unused parts, e.g., NUBAR. Spectra

 Spectra

 OWNED, MAINTAINED AND DISTRIBUTED BY Spectra

 ------------------------------------ Spectra

 THE NUCLEAR DATA SECTION Spectra

 INTERNATIONAL ATOMIC ENERGY AGENCY Spectra

 P.O. BOX 100 Spectra

 A-1400, VIENNA, AUSTRIA Spectra

 EUROPE Spectra

 Spectra

 ORIGINALLY WRITTEN BY Spectra

 ------------------------------------ Spectra

 Dermott E. Cullen Spectra

 Spectra

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 Spectra

 AUTHORS MESSAGE Spectra

 --------------- Spectra

 THE REPORT DESCRIBED ABOVE IS THE LATEST PUBLISHED DOCUMENTATION Spectra

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

 THE LATEST DOCUMENTATION INCLUDING ALL RECENT IMPROVEMENTS. PLEASE Spectra

 READ ALL OF THESE COMMENTS BEFORE IMPLEMENTATION. Spectra

 Spectra

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

 INDEPENDENT PROGRAMS THAT CAN EASILY BE IMPLEMENTED ON ANY ONE Spectra

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

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

 COMPILER DIAGNOSTICS, OPERATING PROBLEMS OR SUGGESTIONS ON HOW TO Spectra

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

 THIS PROGRAM WILL BE COMPLETELY COMPATIBLE FOR USE ON YOUR Spectra

 COMPUTER. Spectra

 Spectra

 PURPOSE Spectra

 ------- Spectra

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

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

 LINEAR-LINEAR INTERPOLABLE WILL BE THINNED. Spectra

 Spectra

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

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

 TAPE, CARDS, DISK OR ANY OTHER MEDIUM. Spectra

 Spectra

 ENDF/B FORMAT Spectra

 ------------- Spectra

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

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

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

 Spectra

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

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

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

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

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

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

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

 THE CORRECTNESS OR INCORRECTNESS OF ALL OTHER SECTIONS. Spectra

 Spectra

 OUTPUT FORMAT Spectra

 ------------- Spectra

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

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

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

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

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

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

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

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

 Spectra

 CONTENTS OF OUTPUT Spectra

 ------------------ Spectra

 ENTIRE EVALUATIONS ARE OUTPUT, NOT JUST THE LINEARIZED DATA Spectra

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

 INCLUDED. Spectra

 Spectra

 DOCUMENTATION Spectra

 ------------- Spectra

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

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

 SECTION IN THE FORM Spectra

 Spectra

 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* PROGRAM SPECTRA (2015-1) \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Spectra

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

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

 Spectra

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

 REPRESENTS A COMPLETE HISTORY OF ALL OPERATIONS PERFORMED ON Spectra

 THE DATA BY THESE PROGRAMS. Spectra

 Spectra

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

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

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

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

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

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

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

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

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

 SHOULD BE USED TO CREATE A HOLLERITH SECTION. Spectra

 Spectra

 REACTION INDEX Spectra

 -------------- Spectra

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

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

 Spectra

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

 THIS CONVENTION HAS BEEN ADOPTED BECAUSE MOST USERS DO NOT Spectra

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

 NOT CONSIDERED WORTHWHILE TO INCLUDE THE OVERHEAD OF CONSTRUCTING Spectra

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

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

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

 Spectra

 SECTION SIZE Spectra

 ------------ Spectra

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

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

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

 Spectra

 FOR ANY LINEARIZED SECTION THAT CONTAINS 60000 OR FEWER POINTS Spectra

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

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

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

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

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

 SCRATCH AND OUTPUT TO THE ENDF/B FORMAT. Spectra

 Spectra

 SELECTION OF DATA Spectra

 ----------------- Spectra

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

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

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

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

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

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

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

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

 THE ENTIRE ENDF/B TAPE. Spectra

 Spectra

 PROGRAM OPERATION Spectra

 ----------------- Spectra

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

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

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

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

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

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

 ENERGY AND CROSS SECTION BETWEEN ANY TWO TABULATED POINTS. Spectra

 Spectra

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

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

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

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

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

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

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

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

 THE OUTPUT TAPE. Spectra

 Spectra

 KEEP EVALUATED DATA POINTS Spectra

 -------------------------- Spectra

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

 PRESENT IN THE ORIGINAL EVALUATION AND TO MERELY SUPPLEMENT THESE Spectra

 POINTS WITH ADDITIONAL ENERGY POINTS IN ORDER TO LINEARIZE THE Spectra

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

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

 Spectra

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

 ALL ORIGINAL EVALUATED DATA POINTS BY SPECIFYING 1 IN COLUMNS Spectra

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

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

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

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

 CONSIDERABLE INCREASE IN THE NUMBER OF DATA POINTS OUTPUT BY Spectra

 THIS CODE. Spectra

 Spectra

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

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

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

 PROGRAM WILL OPERATE EXACTLY AS IT DID BEFORE. Spectra

 Spectra

 ALLOWABLE ERROR Spectra

 --------------- Spectra

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

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

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

 ACCURATE TO WITHIN 0.1 PER-CENT. Spectra

 Spectra

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

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

 CAN BE PERFORMED TO VIRTUALLY ANY REQUIRED ACCURACY AND MOST Spectra

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

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

 CONVERSION OF CROSS SECTIONS TO LINEARLY INTERPOLABLE FORM CAN BE Spectra

 PERFORMED WITH ESSENTIALLY NO LOSE OF INFORMATION. Spectra

 Spectra

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

 DEPENDENT. THE ALLOWABLE ERROR IS DESCRIBED BY A TABULATED Spectra

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

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

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

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

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

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

 Spectra

 DEFAULT ALLOWABLE ERROR Spectra

 ----------------------- Spectra

 IN ORDER TO INSURE CONVERGENCE OF THE LINEARIZING ALGORITHM THE Spectra

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

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

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

 INDICATED AS SUCH IN THE OUTPUT LISTING. Spectra

 Spectra

 COULOMB PENETRABILITY (INTERPOLATION LAW = 6) Spectra

 -------------------------------------------- Spectra

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

 Spectra

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

 Spectra

 THIS PROGRAM ONLY CONSIDERS EXOTHERMIC REACTIONS - T = 0 Spectra

 Spectra

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

 Spectra

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

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

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

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

 Spectra

 INPUT FILES Spectra

 ----------- Spectra

 UNIT DESCRIPTION Spectra

 ---- ----------- Spectra

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

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

 Spectra

 OUTPUT FILES Spectra

 ------------ Spectra

 UNIT DESCRIPTION Spectra

 ---- ----------- Spectra

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

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

 Spectra

 SCRATCH FILES Spectra

 ------------- Spectra

 UNIT DESCRIPTION Spectra

 ---- ----------- Spectra

 12 SCRATCH FILE (BINARY - 180000 WORDS/RECORD Spectra

 Spectra

 OPTIONAL STANDARD FILE NAMES (SEE SUBROUTINE FILEIO) Spectra

 ---------------------------------------------------- Spectra

 UNIT FILE NAME Spectra

 ---- ---------- Spectra

 2 SPECTRA.INP Spectra

 3 SPECTRA.LST Spectra

 10 ENDFB.IN Spectra

 11 ENDFB.OUT Spectra

 12 (SCRATCH) Spectra

 Spectra

 Spectra

 INPUT PARAMETERS Spectra

 ---------------- Spectra

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

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

 FOR EACH REQUESTED MATERIAL NEUTRON INTERACTION CROSS SECTIONS Spectra

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

 WOULD BE COPIED. Spectra

 Spectra

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

 TO SPECIFY BY INPUT PARAMETERS EXACTLY WHAT SECTIONS OF DATA Spectra

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

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

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

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

 ENDF/B FILE OUTPUT BY THIS PROGRAM. Spectra

 Spectra

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

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

 CROSS SECTIONS FOR SUBSEQUENT PROCESSING YOU NEED ONLY REQUEST Spectra

 ONLY MF=3 DATA. Spectra

 Spectra

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

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

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

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

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

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

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

 Spectra

 LINE COLS. DESCRIPTION Spectra

 ---- ----- ----------- Spectra

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

 12-22 MONITOR MODE SELECTOR Spectra

 = 0 - NORMAL OPERATION Spectra

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

 EACH TIME A PAGE OF DATA POINTS IS WRITTEN TO Spectra

 THE SCRATCH FILE PRINT OUT THE TOTAL NUMBER OF Spectra

 POINTS ON SCRATCH AND THE LOWER AND UPPER Spectra

 ENERGY LIMITS OF THE PAGE (THIS OPTION MAY BE Spectra

 USED IN ORDER TO MONITOR THE EXECUTION SPEED Spectra

 OF LONG RUNNING JOBS). Spectra

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

 (IF 0.0 OR LESS IS INPUT THE PROGRAM WILL Spectra

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

 SUB-DIVIDED IF THE ABSOLUTE VALUE OF THE CROSS Spectra

 SECTION WITHIN THE INTERVAL IS LESS THAN THIS VALUE. Spectra

 AN EXCEPTION TO THIS RULE IS NEAR THRESHOLDS ENERGY Spectra

 INTERVALS WILL BE SUB-DIVIDED UNTIL CONVERGENCE Spectra

 REGARDLESS OF THE MAGNITUDE OF THE CROSS SECTION. Spectra

 34-44 KEEP ORIGINAL EVALUATED DATA POINTS. Spectra

 = 0 - NO. Spectra

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

 TO LINEARIZE DATA, BUT ALL ORIGINAL Spectra

 DATA POINTS WILL BE INCLUDED IN THE Spectra

 RESULTS. Spectra

 2 1-72 ENDF/B INPUT DATA FILENAME Spectra

 (STANDARD OPTION = ENDFB.IN) Spectra

 3 1-72 ENDF/B OUTPUT DATA FILENAME Spectra

 (STANDARD OPTION = ENDFB.OUT) Spectra

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

 7- 8 LOWER MF LIMIT Spectra

 9-11 LOWER MT LIMIT Spectra

 12-17 UPPER MAT OR ZA LIMIT Spectra

 18-19 UPPER MF LIMIT Spectra

 20-22 UPPER MT LIMIT Spectra

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

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

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

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

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

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

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

 RESPECTIVELY. Spectra

 VARY 1-11 ENERGY FOR ERROR LAW Spectra

 12-22 ALLOWABLE FRACTIONAL ERROR FOR ERROR LAW. Spectra

 THE ACCEPTABLE LINEARIZING ERROR MAY BE SPECIFIED TO Spectra

 BE EITHER ENERGY INDEPENDENT (DEFINED BY A SINGLE Spectra

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

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

 LINEAR INTERPOLATION WILL BE USED TO DEFINE THE ERROR Spectra

 AT ENERGIES BETWEEN THOSE AT WHICH IT IS TABULATED. Spectra

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

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

 THE LAW WILL BE CONSIDERED TO BE ENERGY INDEPENDENT. Spectra

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

 TO BE ENERGY DEPENDENT (NOTE, ENERGY INDEPENDENT Spectra

 FORM WILL RUN FASTER THAN THE EQUIVALENT ENERGY Spectra

 DEPENDENT FORM). FOR AN ENERGY DEPENDENT ERROR LAW Spectra

 ALL ENERGIES MUST BE ASCENDING ENERGY ORDER. FOR Spectra

 CONVERGENCE OF THE LINEARIZING ALGORITHM ALL ERRORS Spectra

 MUST BE POSITIVE. IF AN ALLOWABLE ERROR IS NOT Spectra

 POSITIVE IT WILL BE SET EQUAL TO THE STANDARD OPTION Spectra

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

 IF THE FIRST ERROR LINE IS BLANK IT WILL TERMINATE Spectra

 THE ERROR LAW AND THE ERROR WILL BE TREATED AS Spectra

 ENERGY INDEPENDENT, EQUAL TO THE STANDARD OPTION Spectra

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

 Spectra

 EXAMPLE INPUT NO. 1 Spectra

 ------------------- Spectra

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

 THORIUM 232. RETRIEVE ALL NEUTRON INTERACTION CROSS SECTIONS Spectra

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

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

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

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

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

 PER-CENT ACCURACY. Spectra

 Spectra

 EXPLICITLY SPECIFY THE STANDARD FILENAMES. Spectra

 Spectra

 IN THIS CASE THE FOLLOWING 11 INPUT LINES ARE REQUIRED Spectra

 Spectra

 1 0 1.00000- 6 0 Spectra

 ENDFB.IN Spectra

 ENDFB.OUT Spectra

 92000 3 0 92999 3999 Spectra

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

 (END OF REQUEST LIST) Spectra

 0.00000+ 0 1.00000-03 Spectra

 1.00000+ 2 1.00000-03 Spectra

 1.00000+ 3 1.00000-02 Spectra

 1.00000+ 9 1.00000-02 Spectra

 (END OF ERROR LAW) Spectra

 Spectra

 EXAMPLE INPUT NO. 2 Spectra

 ------------------- Spectra

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

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

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

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

 MATERIAL. Spectra

 Spectra

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

 THEN USE STANDARD FILENAMES. Spectra

 Spectra

 IN THIS CASE THE FOLLOWING 9 INPUT LINES ARE REQUIRED Spectra

 Spectra

 1 0 1.00000- 6 0 Spectra

 (USE DEFAULT FILENAME = ENDFB.IN) Spectra

 (USE DEFAULT FILENAME = ENDFB.OUT) Spectra

 92000 1451 92999 1451 Spectra

 92000 3 0 92999 3999 Spectra

 90232 1451 0 1451 Spectra

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

 (END OF REQUEST LIST) Spectra

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

 Spectra

 EXAMPLE INPUT NO. 3 Spectra

 ------------------- Spectra

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

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

 SPECIFY THE MAT, MF, MT RANGES. Spectra

 Spectra

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

 DATA TO \ENDFB6\LINEAR\ZA092238. Spectra

 Spectra

 IN THIS CASE THE FOLLOWING 6 INPUT LINES ARE REQUIRED Spectra

 Spectra

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

 \ENDFB6\ZA092238 Spectra

 \ENDFB6\LINEAR\ZA092238 Spectra

 (RETRIEVE ALL DATA, END REQUEST LIST) Spectra

 5.00000-03 Spectra

 (END OF ERROR LAW) Spectra

 Spectra

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

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

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

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

 IT IS NECESSARY). Spectra

 Spectra

 EXAMPLE INPUT NO. 4 Spectra

 ------------------- Spectra

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

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

 OF COMPLETELY BLANK LINES WHICH WILL AUTOMATICALLY INVOKE ALL Spectra

 OF THE STANDARD OPTIONS. Spectra

 Spectra

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

 THEN USE STANDARD FILENAMES. Spectra

 Spectra

 IN THIS CASE THE FOLLOWING THREE INPUT LINES ARE REQUIRED Spectra

 Spectra

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

 (USE DEFAULT FILENAME = ENDFB.IN) Spectra

 (USE DEFAULT FILENAME = ENDFB.OUT) Spectra

 (RETRIEVE ALL DATA, END REQUEST LIST) Spectra

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

 Spectra

 ======================================================================= Spectra