==		=====			Linear
					Linear
	PROGRAM	LINEA	R		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) CD	C-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)	*OPTIONINTERNALLY 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
				ALIWORDS.	Linear
				ADDED LIVERMORE CIVIC COMPILER	Linear
	VEDCION	00 1	(TINE 1000)	CONVENTIONS.	Tinear
	VERSION	90-1	(JONE 1990)	THERDACETON DAEA ME-22 AND 27	Tinear
				THIERACIION DAIA, ME-25 AND 27	Linear
				*ADDED FORIRAN SAVE OPTION	Tinear
				* VER MODE CONSIGNER ENERGY OUDDUM	Tinear
				ANEW MORE CONSISTENT ENERGY OUTPUT	Tinear
				TOUTINE.	Linear
				WARNINGINFOI FARAMEIER FORMAI HAS BEEN CHANGED SEE DESCRIPTION	Linear
				BELOW	Linear
	VEDSTON	91_1	(.ππ.v. 1001)	*ADDED INTERPOLATION LAW 6 - ONLY USED	Linear
	VERSION	91 I	(0001 1991)	FOR CHARGED DARTICLE CROSS SECTIONS	Linear
				FOR COULOMB PENETRABILITIES	Linear
	VERSION	92-1	(.TANILARY 1992)	*ADDED NU-BAR (TOTAL DELAYED PROMPT)	Linear
	VERGION	<i>72</i> 1	(0/11/0/11/1 1552)	POLYNOMIAL OR TABILATED ALL CONVERTED	Linear
				TO LINEARLY INTERPOLARLE	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
	VERSTON	92-2	(JULY 1992)	*CORRECTED CONVERSION OF NU-BAR FROM	Linear
		<i></i>	(2021 1992)	POLYNOMIAL TO TABULATED - COPY	Linear
				SPONTANEOUS NU-BAR (BY DEFINITION	Linear
				THE SPONTANEOUS NU-BAR IS NOT AN	Linear
				ENERGY DEPENDENT OUANTITY)	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
	,	(CEE CURROUTINE ENDIE)	Linear
VEDCION 06-1	(TANUADY 1006)	(SEE, SUBROUTINE ENDIT)	Linear
VERSION 90-1	(JANUARI 1996)	* COMPLETE RE-WRITE	Linear
		*ALL DOUBLE DECISION	Linear
		*ON SCREEN OUTDUT	Linear
		*UNTFORM TREATMENT OF ENDE/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 ENDE/B-VII.	Linear
		*INCREASED PAGE SIZE FROM 60,000 TO	Linear
	(576 0007)	600,000 POINTS	Linear
VERS. 2007-2	(DEC. 2007)	*/2 CHARACTER FILE NAMES.	Linear
VERS. 2010-1	(Apr. 2010)	"Skipped leading cross section = 0	Linear
		All original operations to be a set of the s	Linear
		*Peplaged FTHPES by ESTAPT - it is	Linear
		not a threshold - just a minimum	Linear
		epergy - 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 Undates based on User Feedback	Linear
12100. 2012 1	(IIIIg) 2012/	*Added CODENAME	Linear
		*32 and 64 bit Compatible	Linear
		*Added EBROR 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
VERS. 2016-1	(June 2016)	*Cosmetic changes based on FREUD	Linear
		psychoanalysis.	Linear
VERS. 2017-1	(May 2017)	*Updated based on user feedback.	Linear
		*Inceased page size to 3,000,000.	Linear
		*All floating input parameters changed	Linear
		to character input + IN9 conversion.	Linear
VERS. 2018-1	(Dec. 2018)	*Updated based on user feedback.	Linear
		*Added on-line output for ALL ENDERROR	Linear
VERS. 2019-1	(June 2019)	*Additional Interpolation Law Tests	Linear
		*Checked Maximum Tabulated Energy to	Linear
		insure it is the same for all MTs -	Linear
		if not, print WARNING messages.	Linear

*Corrected END Histogram linearized - Linear Previously assumed Y = 0 and deleted Linear now whatever the value it is included 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 RedCullen1.net/HOMEPAGE.NEW Website 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 Linear OPPOSED TO THE BINARY FORMAT) AND CAN HANDLE DATA IN ANY VERSION 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 Linear CORRECTLY OUTPUT ON ALL LINES. THE FORMAT OF SECTION MF=1, MT=451 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 Linear FOR ALL DATA GREATER THAN 1.00000-30 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 Linear MF=1, MT=451 PRESENT IT IS IMPOSSIBLE FOR THIS PROGRAM TO 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	
DEFAUI	T ALLOWABLE ERROR	Linear Linear	
IN ORE	DER TO INSURE CONVERGENCE OF THE LINEARIZING ALGORITHM THE	Linear	
ALLOW	ABLE 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	
INDIC	ATED AS SUCH IN THE OUTPUT LISTING.	Linear	
		Linear	
COULON	MB PENETRABILITY (INTERPOLATION LAW = 6)	Linear	
		Linear	
INTROL	DUCED FOR ENDF/B-VI. THIS IS DEFINED AS,	Linear	
0TO (E)	$= (1 \pm \pi V_D) (-(2) / (2) \pi m + \pi m))$	Linear	
SIG(E)	$= C1 \times EXP(-C2/SQRT(E - T))$	Linear	
THIS F	PROGRAM ONLY CONSIDERS EXOTHERMIC REACTIONS - $T = 0$	Linear	
		Linear	
SIG(E)	$= C1 \times EXP(-C2/SORT(E))$	Linear	
		Linear	
WARNIN	NGTHIS 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	
10	INPUT LINES (BCD - 80 CHARACTERS/RECORD)	Linear	
10	ORIGINAL ENDE/B DATA (BCD - 80 CHARACIERS/RECORD)	Linear	
Ουτρυη	r 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	
SCRATO	CH FILES	Linear	
		Linear	
UNIT	DESCRIPTION	Linear	
12	SCRATCH FILE (RINARY - 190000 WORDS / DECORD	Linear	
12	SCRAICH FILE (BINARI - 180000 WORDS/RECORD	Linear	
OPTION	NAL STANDARD FILE NAMES (SEE SUBROUTINE FILETO)	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	
TNIDIIM		Linear	
	PARAMEIERS	Linear	
FOR VE	RESTONS FARLIER THAN 90-1 THIS PROCRAM ONLY ALLOWED THE USER	Linear	
TO SPE	CITY BY INPUT PARAMETERS WHICH MATERIALS (MAT) TO PROCESS.	Linear	
FOR EA	ACH REQUESTED MATERIAL NEUTRON INTERACTION CROSS SECTIONS	Linear	
(MF=3) WOULD BE LINEARIZED AND THE REMAINDER OF THE MATERIAL			
WOULD	BE COPIED.	Linear	
		Linear	
FOR VE	ERSIONS 90-1 AND LATER THIS PROGRAM WILL ALLOW THE USER TO	Linear	
TO SPECIFY BY INPUT PARAMETERS EXACTLY WHAT SECTIONS OF DATA			
TO PROCESS. FOR EACH SECTION OF DATA, SPECIFIED BY MAT, MF, MT			
RANGES, SECTIONS OF MF=3, 23 AND 27 WILL BE LINEARIZED AND ALL			
OTHER REQUESTED SECTIONS WILL BE COPIED. ALL SECTIONS WHICH ARE			
NOT EXPLICITLY REQUESTED WILL DE SKIPPED AND WILL NOT APPEAR ON			
UNDE/E	STILL OUTFUL DI INIS FRUGRAM.	Linear	
		armear	

WITH 7	CHIS NEW	N PROCEDURE YOU CAN MINIMIZE THE SIZE OF THE ENDF/B	Linear
FILE (OUTPUT E	BY THIS PROGRAM, E.G., IF YOU ONLY WANT NEUTRON	Linear
CROSS	SECTION	NS FOR SUBSEQUENT PROCESSING YOU NEED ONLY REQUEST	Linear
ONLY N	4F=3 DAT	FA.	Linear
			Linear
HOWEVE	ER, YOU	MUST UNDERSTAND THAT ONLY THOSE SECTIONS WHICH YOU	Linear
EXPLIC	CITLY RE	EQUEST WILL APPEAR ON THE ENDF/B FILE OUTPUT BY	Linear
THIS I	PROGRAM	. FOR EXAMPLE, IF YOU WISH TO DOCUMENT EXACTLY	Linear
HOW YO	DU LINEA	ARIZED THE DATA BY INCLUDING COMMENTS IN MF=1, MT=451	Linear
THEN Y	COU MUSI	F EXPLICITLY REQUEST THAT MF=1, MT=451 BE PROCESSED	Linear
FOR EA	ACH MATE	CRIAL THAT YOU REQUEST. SIMILAR IF YOU WANT THE	Linear
ENTIRE	E EVALUA	ATION YOU MUST REQUEST ALL MF AND MT TO BE OUTPUT.	Linear
	~~~~~		Linear
LINE	COLS.	DESCRIPTION	Linear
			Linear
T	10 00	SELECTION CRITERIA (U=MAT, I=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
	24.44	REGARDLESS OF THE MAGNITUDE OF THE CROSS SECTION.	Linear
	34-44	KEEP ORIGINAL EVALUATED DATA POINTS.	Linear
			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
•	1 70	RESULTS.	Linear
Z	1-72	ENDE'B INPUT DATA FILENAME	Linear
2	1 70	(STANDARD OPTION = ENDFB.IN)	Linear
3	1-72	ENDE/B OUTPUT DATA FILENAME	Linear
4 37	1 0	(STANDARD OPTION = ENDEB.OUT)	Linear
4-N	7 0	LOWER MAT OR ZA LIMIT	Linear
	/- 0 0_11	LOWER ME LIMIT	Linear
	9-11 10-17	LOWER MI LIMII	Linear
	10_10	UPPER MAI OR ZA LIMII	Linear
	20-22	UDDED ME IIMIE	Linear
	20-22	UPPER MI LIMII	Linear
		DER LINE THE LIGT OF RANGES TO TEDATNATED BY A	Linear
		RIANK LINE IF THE HODER MAT LINTT OF ANY DECHEST	Linear
		TS LESS THAN THE LOW LIMIT IT WILL BE SET FOUNT TO	Linear
		THE LOWER LIMIT IF THE HODER LIMIT TO SET AGOND TO	Linear
		TT WILL BE SET ECHAL TO 999999 TE THE HODER ME OD	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 FRACE FOR FOR 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 TABILATED	Linear
		IN ALL CASES THE ERROR LAW IS TERMINATED BY A BLANK	Linear
		LINE. IF ONLY ONE ENERGY. ERROR PATE 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 EOUIVALENT 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 0 1.00000- 6 0 Linear 1 ENDFB.IN Linear ENDFB.OUT Linear 92000 3 0 92999 3999 Linear 030 (UPPER LIMIT AUTOMATICALLY SET TO 90232 3999) Linear 90232 3 0 (END OF REQUEST LIST) Linear 0.00000+ 0 1.00000-03Linear 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 0 1.00000- 6 0 1 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 (UPPER LIMIT AUTOMATICALLY SET TO 90232 3999) Linear 90232 3 0 030 (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, THI	) 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 TAK	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, THI	) 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