**=======================================================================SIXPAK**

**SIXPAK**

**PROGRAM SIXPAK SIXPAK**

**============== SIXPAK**

**VERSION 92-1 (JANUARY 1992) SIXPAK**

**VERSION 92-2 (FEBRUARY 1992)\*INCREASED CORE ALLOCATION TO SIXPAK**

**ACCOMMODATE JEF AND EFF EVALUATIONS. SIXPAK**

**VERSION 92-3 (APRIL 1992) \*ADDED ADDITIONAL DATA TESTS. SIXPAK**

**VERSION 92-4 (SEPT. 1992) \*CORRECTED KALBACH-MANN CALCULATIONS. SIXPAK**

**\*FOR PHOTON PRODUCTION OUTPUT MF=12 SIXPAK**

**(MULTIPLICITY), MF=14 (ISOTROPIC SIXPAK**

**ANGULAR DISTRIBUTIONS) AND MF=15 SIXPAK**

**(SPECTRA) - PREVIOUSLY ONLY MF=15. SIXPAK**

**\*FIRST ORDER CORRECTIONS TRANSFORMING SIXPAK**

**CENTER-OF-MASS SPECTRA TO LAB SYSTEM SIXPAK**

**FOR OUTPUT IN MF=5 SIXPAK**

**\*CORRECTED ISOTROPIC ANGULAR SIXPAK**

**DISTRIBUTION FLAG (LI) SIXPAK**

**VERSION 94-1 (JANUARY 1994) \*VARIABLE ENDF/B INPUT DATA FILENAME SIXPAK**

**TO ALLOW ACCESS TO FILE STRUCTURES SIXPAK**

**(WARNING - INPUT PARAMETER FORMAT SIXPAK**

**HAS BEEN CHANGED) SIXPAK**

**\*CLOSE ALL FILES BEFORE TERMINATING SIXPAK**

**(SEE, SUBROUTINE ENDIT) SIXPAK**

**\*INCREASED MAXIMUM TABLE SIZE FROM SIXPAK**

**2000 TO 6000. SIXPAK**

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

**\*IMPROVED COMPUTER INDEPENDENCE SIXPAK**

**\*ALL DOUBLE PRECISION SIXPAK**

**\*ON SCREEN OUTPUT SIXPAK**

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

**\*IMPROVED OUTPUT PRECISION SIXPAK**

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

**POINT READ FOR MORE DIGITS SIXPAK**

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

**VERSION BASED ON RECENT FORMAT CHANGESIXPAK**

**\*GENERAL IMPROVEMENTS BASED ON SIXPAK**

**USER FEEDBACK SIXPAK**

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

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

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

**USER FEEDBACK SIXPAK**

**VERS. 2002-1 (JANUARY 2002) \*CORRECTED ANGULAR DISTRIBUTION (MF=4)SIXPAK**

**OUTPUT TO INSURE USED FIELDS ARE 0 SIXPAK**

**(MAY 2002) \*OPTIONAL INPUT PARAMETERS SIXPAK**

**(NOV. 2002) \*EXTENDED TO ALLOW CHARGED PARTICLE SIXPAK**

**ANGULAR DISTRIBUTION IN MF=4 - SIXPAK**

**WARNING - STRICTLY SPEAKING THIS IS SIXPAK**

**NOT LEGAL, SINCE MF=4 IS SUPPOSED TO SIXPAK**

**BE USED ONLY FOR NEUTRON ANGULAR SIXPAK**

**DISTRIBUTIONS - BUT WHERE MT MAKES SIXPAK**

**IT OBVIOUS THAT THE OUTGOING PARTICLESIXPAK**

**IS NOT A NEUTRON HOPEFULLY IT WILL SIXPAK**

**NOT CAUSE A PROBLEM IF MF=4 IS USED SIXPAK**

**FOR CHARGED PARTICLES. SIXPAK**

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

**\*INCREASED MAXIMUM TABLE SIZE FROM SIXPAK**

**6,000 TO 12,000. SIXPAK**

**\*ADDED DUMMY A FOR ELEMENTS SIXPAK**

**\*CORRECTED OUTPUT INTERPOLATON LAWS SIXPAK**

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

**\*INCREASED MAXIMUM TABLE SIZE FROM SIXPAK**

**12,000 TO 120,000. SIXPAK**

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

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

**VERS. 2011-1 (May 2011) \*Added MF/MT=9/5 yield output startingSIXPAK**

**from MF/MT=6/5 distributions. SIXPAK**

**\*Increased maximum Legendre order fromSIXPAK**

**30 to 1,000 - WARNING - using more SIXPAK**

**than 30 results in NONSENSE = NOISE!!SIXPAK**

**VERS. 2012-1 (Oct. 2012) \*Increased max. point count to 500,000SIXPAK**

**\*Added CODENAME SIXPAK**

**\*32 and 64 bit Compatible SIXPAK**

**\*Added ERROR stop SIXPAK**

**\*For photons, combine discrete and SIXPAK**

**continuum into tabulated increasing SIXPAK**

**energy order. SIXPAK**

**\*Check energy output order increasing.SIXPAK**

**Print WARNING if not increasing - do SIXPAK**

**not STOP- stopping would prevent ALL SIXPAK**

**output - the user may not be at all SIXPAK**

**interested in the BAD data, but may SIXPAK**

**be interested in other output data SIXPAK**

**that is o.k. SIXPAK**

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

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

**\*Deleted unused coding. SIXPAK**

**VERS. 2017-1 (May 2017) \*Increased max. point to 600,000 SIXPAK**

**\*Updated based on user feedback SIXPAK**

**VERS. 2017-2 (Oct. 2017) \*Updated for new P(nu) formats = SIXPAK**

**Recognized and ignored = no MF=5 SIXPAK**

**equivalent. SIXPAK**

**VERS. 2018-1 (Jan. 2018) \*Updated to skip Nu-Bar Data = there SIXPAK**

**is no double-differential data to SIXPAK**

**process. SIXPAK**

**\*On-linr report for ALL ENDERROR SIXPAK**

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

**\*Checked Maximum Tabulated Energy to SIXPAK**

**insure it is the same for all MTs - SIXPAK**

**if not, print WARNING messages. SIXPAK**

**\*WARNING MT=5 - not allowed in MF=4/5 SIXPAK**

**see ENDF102 - but will translate hereSIXPAK**

**to allow diagnostic use ONLY. SIXPAK**

**\*Corrected END Histogram - guarantee SIXPAK**

**it ends with zero cross section,e.g.,SIXPAK**

**(E,Y) only defines upper energy of SIXPAK**

**the last group - Y has no meaning, SIXPAK**

**by ENDF convention it should be Y = 0SIXPAK**

**VERS. 2020-1 (Mar. 2020) \*Added ENDFB.MF3 for MF/MT=3/5 parta SIXPAK**

**based on MF=6/5. SIXPAK**

**\*Added Target Isomer State SIXPAK**

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

**VERS. 2023-1 (Feb. 2023) \*Decreased page siZe from 600,000 SIXPAK**

**to 120,000 SIXPAK**

**SIXPAK**

**OWNED, MAINTAINED AND DISTRIBUTED BY SIXPAK**

**------------------------------------ SIXPAK**

**THE NUCLEAR DATA SECTION SIXPAK**

**INTERNATIONAL ATOMIC ENERGY AGENCY SIXPAK**

**P.O. BOX 100 SIXPAK**

**A-1400, VIENNA, AUSTRIA SIXPAK**

**EUROPE SIXPAK**

**SIXPAK**

**ORIGINALLY WRITTEN BY SIXPAK**

**------------------------------------ SIXPAK**

**Dermott E. Cullen SIXPAK**

**SIXPAK**

**PRESENT CONTACT INFORMATION SIXPAK**

**--------------------------- SIXPAK**

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**SIXPAK**

**COLLABORATION SIXPAK**

**==================================================================SIXPAK**

**DEVELOPED IN COLLABORATION WITH, SIXPAK**

**SIXPAK**

**\*THE NATIONAL NUCLEAR DATA CENTER, BROOKHAVEN NATIONAL LAB SIXPAK**

**SIXPAK**

**\*THE NUCLEAR DATA SECTION, IAEA, VIENNA, AUSTRIA SIXPAK**

**SIXPAK**

**\*CENTRO TECNICO AEROSPACIAL, SAO JOSE DOS CAMPOS, BRAZIL SIXPAK**

**SIXPAK**

**AS A PART OF AN INTERNATIONAL PROJECT ON THE EXCHANGE OF SIXPAK**

**NUCLEAR DATA SIXPAK**

**SIXPAK**

**ACKNOWLEDGEMENT (VERSION 92-1) SIXPAK**

**==================================================================SIXPAK**

**THE AUTHOR THANKS SOL PEARLSTEIN (BROOKHAVEN NATIONAL LAB) FOR SIXPAK**

**SIGNIFICANTLY CONTRIBUTING TOWARD IMPROVING THE ACCURACY AND SIXPAK**

**COMPUTER INDEPENDENCE OF THIS CODE - THANKS, SOL SIXPAK**

**SIXPAK**

**ACKNOWLEDGEMENT (VERSION 92-4) SIXPAK**

**==================================================================SIXPAK**

**THE AUTHOR THANKS BOB MACFARLANE (LOS ALAMOS) FOR SUGGESTING HOW SIXPAK**

**TO PROPERLY OUTPUT THE PHOTON PRODUCTION DATA TO PUT IT INTO SIXPAK**

**EXACTLY THE FORM NEEDED FOR USE IN PROCESSING CODES. SIXPAK**

**SIXPAK**

**THE AUTHOR THANKS CHRIS DEAN (WINFRITH) FOR POINTING OUT ERRORS SIXPAK**

**IN THE EARLIER TREATMENT OF THE KALBACH-MANN FORMALISM AND IN SIXPAK**

**THE DEFINITION OF THE ISOTROPIC ANGULAR DISTRIBUTION FLAG (LI). SIXPAK**

**SIXPAK**

**AUTHORS MESSAGE SIXPAK**

**==================================================================SIXPAK**

**THE COMMENTS BELOW SHOULD BE CONSIDERED THE LATEST DOCUMENTATION SIXPAK**

**INCLUDING ALL RECENT IMPROVEMENTS. PLEASE READ ALL OF THESE SIXPAK**

**COMMENTS BEFORE IMPLEMENTING AND USING THESE CODES. SIXPAK**

**SIXPAK**

**AT THE PRESENT TIME WE ARE ATTEMPTING TO DEVELOP A SET OF COMPUTERSIXPAK**

**INDEPENDENT PROGRAMS THAT CAN EASILY BE IMPLEMENTED ON ANY ONE SIXPAK**

**OF A WIDE VARIETY OF COMPUTERS. IN ORDER TO ASSIST IN THIS PROJECTSIXPAK**

**IT WOULD BE APPECIATED IF YOU WOULD NOTIFY THE AUTHOR OF ANY SIXPAK**

**COMPILER DIAGNOSTICS, OPERATING PROBLEMS OR SUGGESTIONS ON HOW TO SIXPAK**

**IMPROVE THIS PROGRAM. HOPEFULLY, IN THIS WAY FUTURE VERSIONS OF SIXPAK**

**THIS PROGRAM WILL BE COMPLETELY COMPATIBLE FOR USE ON YOUR SIXPAK**

**COMPUTER. SIXPAK**

**SIXPAK**

**PURPOSE SIXPAK**

**==================================================================SIXPAK**

**1) CHECK ALL DOUBLE-DIFFERENTIAL DATA (MF=6) SIXPAK**

**SIXPAK**

**2) OUTPUT EQUIVALENT MF = 4, 5, 12, 14 AND 15 DATA. SIXPAK**

**SIXPAK**

**DATA CHECKING SIXPAK**

**==================================================================SIXPAK**

**ALL OF THE ENDF/B-VI MF=6 DATA IS CHECKED - FOR DETAILS SEE BELOW.SIXPAK**

**SIXPAK**

**THE MF=6 DATA IS NOT CORRECTED AND OUTPUT IN THE ENDF/B FORMAT. SIXPAK**

**IT IS MERELY CHECKED. IF ERRORS ARE FOUND IT IS UP TO THE USER SIXPAK**

**TO TAKE CORRECTIVE ACTION ON THE MF=6 DATA. SIXPAK**

**SIXPAK**

**IN CONTRAST WHEN PROBLEMS ARE FOUND IN DATA WHICH WILL BE OUTPUT SIXPAK**

**IN THE ENDF/B FORMAT (MF=4, 5, 12, 14 AND 15), WHENEVER POSSIBLE SIXPAK**

**CORRECTIVE ACTION WILL BE TAKEN. SIXPAK**

**SIXPAK**

**FURTHER CHECKS AND CORRECTIONS SIXPAK**

**==================================================================SIXPAK**

**ONCE THE DATA HAS BEEN OUTPUT IN MF = 4, 5, 12, 14 AND 15 FORMATS SIXPAK**

**FURTHER CORRECTIVE ACTION CAN BE TAKEN AS FOLLOWS, SIXPAK**

**SIXPAK**

**PROGRAM LEGEND SIXPAK**

**============== SIXPAK**

**CAN BE USED TO CORRECT ANGULAR DISTRIBUTIONS WHICH ARE NEGATIVE, SIXPAK**

**TO CONVERT FROM LEGENDRE COEFFICIENTS TO TABULATED ANGULAR SIXPAK**

**DISTRIBUTIONS AND GENERALLY PERFORM MORE EXTENSIVE TESTS OF SIXPAK**

**ALL MF=4 DATA. SIXPAK**

**SIXPAK**

**PROGRAM EVALPLOT SIXPAK**

**================ SIXPAK**

**VERSION 92-1 AND LATER VERSIONS CAN PLOT ALL OF THE MF=4, 5 AND 15SIXPAK**

**DATA OUTPUT BY THIS CODE. EARLIER VERSIONS CAN PLOT MF=4 AND 5. SIXPAK**

**GRAPHICS IS AN EXCELLENT WAY TO CHECK THIS DATA. SIXPAK**

**SIXPAK**

**PROGRAM PLOTTAB SIXPAK**

**=============== SIXPAK**

**THIS IS A GENERAL PLOTTING PROGRAM AND THERE IS AN INTERFACE IN SIXPAK**

**THIS CODE TO PRODUCE OUTPUT FOR ANY MF=6 DATA IN THE PLOTTAB SIXPAK**

**INPUT FORMAT. THIS PROGRAM CAN BE USED TO CHECK ALL OF THE MF=6 SIXPAK**

**DATA AS WELL AS THE EQUIVALENT MF=4, 5, 12, 14 AND 15 DATA - AS SIXPAK**

**WELL AS COMPARING THE ORIGINAL MF=6 AND EQUIVALENT DATA. SIXPAK**

**SIXPAK**

**DATA OUTPUT SIXPAK**

**==================================================================SIXPAK**

**THE ENDF/B MF=4, 5, 12, 14 AND 15 FORMATS ONLY ALLOW FOR NEUTRONS SIXPAK**

**INCIDENTS SIXPAK**

**SIXPAK**

**THE ENDF/B MF=4 AND 5 FORMATS ONLY ALLOW FOR NEUTRONS OUTGOING. SIXPAK**

**SIXPAK**

**THE ENDF/B MF=12, 14 AND 15 ONLY ALLOWS FOR PHOTONS OUTGOING. SIXPAK**

**SIXPAK**

**THESE ARE THE ONLY COMBINATIONS OF DATA OUTPUT BY THIS CODE. SIXPAK**

**SIXPAK**

**ALL OTHER COMBINATIONS OF INCIDENT AND OUTGOING PARTICLES ARE SIXPAK**

**CHECKED, BUT THE RESULTS CANNOT BE OUTPUT IN THE ENDF/B FORMAT. SIXPAK**

**HOWEVER, USING THE PLOTTAB INTERFACE BUILT INTO THIS CODE THIS SIXPAK**

**DATA CAN, AND HAS BEEN, OUTPUT AND CHECKED. SIXPAK**

**SIXPAK**

**THE NEUTRON DATA IN MF=4 CAN BE IN THE FORM OF EITHER TABULATED SIXPAK**

**ANGULAR DISTRIBUTIONS OR LEGENDRE COEFFICIENTS. SIXPAK**

**SIXPAK**

**THE NEUTRON (MF=5) OR PHOTON (MF=15) SPECTRA ARE BOTH IN EXACTLY SIXPAK**

**THE SAME FORMAT = ARBITRARY TABULATED FUNCTIONS - ENDF/B OPTION SIXPAK**

**LF=1. SIXPAK**

**SIXPAK**

**ENDF/B DATA OUTPUT ORDER SIXPAK**

**==================================================================SIXPAK**

**ENDF/B DATA IS OUTPUT IN ASCENDING MAT, MF, MT ORDER. IN ORDER TO SIXPAK**

**ALLOW THIS PROGRAM TO PRODUCE ALL OUTPUT IN A SINGLE PASS THROUGH SIXPAK**

**THE MF=6 DATA, OUTPUT FOR EACH (MAT, MT) IS OUTPUT TO SEPERATE SIXPAK**

**FILES FOR MF=4, 5, 12, 14 AND 15. SIXPAK**

**SIXPAK**

**FOR SUBSEQUENT USE THE ENDF/B FORMATTED DATA OUTPUT BY THIS CODE SIXPAK**

**CAN BE MERGED TOGETHER USING PROGRAM MERGER (CONTAIN THE AUTHOR SIXPAK**

**OF THIS CODE FOR A COPY OF MERGER), E.G., MERGE MF=12, 14 AND 15 SIXPAK**

**DATA IN ORDER TO THEN CALCULATE PHOTON PRODUCTION DATA OR MF=4 SIXPAK**

**AND 5 CAN BE MERGED TOGETHER TO CALCULATE NEUTRON TRANSFER - OR SIXPAK**

**ALL OF THEM CAN BE MERGED TOGETHER TO PERFORM NEUTRON AND PHOTON SIXPAK**

**CALCULATIONS. SIXPAK**

**SIXPAK**

**CORRELATED (MF=6) VS. UNCORRELATED (MF=4 AND 5) DATA SIXPAK**

**==================================================================SIXPAK**

**THE ENDF/B DOUBLE DIFFERENTAL = CORRELATED - DATA IN MF=6 SIXPAK**

**REPRESENTS DATA IN THE FORM, SIXPAK**

**SIXPAK**

**F(E,EP,COS) = SIG(E)\*Y(E)\*G0(E,EP)\*F(E,EP,COS) SIXPAK**

**SIXPAK**

**SIG(E) = MF=3 CROSS SECTIONS SIXPAK**

**Y(E) = YIELD (MULTIPLICITY) SIXPAK**

**G0(E,EP) = ENERGY SPECTRUM SIXPAK**

**F(E,EP,COS) = ANGULAR DISTRIBUTION SIXPAK**

**SIXPAK**

**IN A SITUATION WHERE YOU HAVE MONOENERGETIC AND MONODIRECTIONAL SIXPAK**

**NEUTRONS INCIDENT YOU WILL BE ABLE TO OBSERVE CORRELATION EFFECTS SIXPAK**

**IN THE NEUTRON SPECTRUM AND ANGULAR DISTRIBUTION. SIXPAK**

**SIXPAK**

**EVEN IN SITUATIONS WHERE YOU HAVE A NARROW SPECTRUM OF NEUTRONS SIXPAK**

**THAT ARE HIGHLY DIRECTIONALLY ORIENTED YOU MAY BE ABLE TO OBSERVE SIXPAK**

**THESE CORRELATION EFFECTS, E.G., A NARROW 14 MEV FUSION SOURCE SIXPAK**

**INCIDENT ON THE FIRST WALL OF A CTR DEVICE. SIXPAK**

**SIXPAK**

**FOR SUCH SITUATIONS USE OF THE CORRELATED (MF=6) DATA IS REQUIRED SIXPAK**

**IN CALCULATIONS. SIXPAK**

**SIXPAK**

**HOWEVER, IN MANY APPLICATIONS WHERE THERE IS A BROAD SPECTRUM OF SIXPAK**

**NEUTRONS AND THE NEUTRON FLUX IS NOT HIGHLY DIRECTIONALLY SIXPAK**

**ORIENTED, THE NEUTRON MULTIPLICATION, SPECTRUM AND ORIENTATION SIXPAK**

**CAN BE FAIRLY ACCURATELY CALCULATED WITHOUT CONSIDERING SIXPAK**

**CORRELATION EFFECTS. SIXPAK**

**SIXPAK**

**THE UNCORRELATED DATA PRODUCED BY THIS CODE REPLACES THE SIXPAK**

**CORRELATED DATA, SIXPAK**

**SIXPAK**

**F(E,EP,COS) = SIG(E)\*Y(E)\*G0(E,EP)\*F(E,EP,COS) SIXPAK**

**SIXPAK**

**BY THE UNCORRELATED DATA, SIXPAK**

**SIXPAK**

**F(E,EP,COS) = SIG(E)\*Y(E)\*G0(E,EP)\*F0(E,COS) SIXPAK**

**SIXPAK**

**BY INTEGRATING G0(E,EP)\*F(E,EP,COS) OVER SECONDARY ENERGY (EP) SIXPAK**

**TO DEFINE AN AVERAGE ANGULAR DISTRIBUTION, F0(E,COS). SIXPAK**

**SIXPAK**

**WHAT IS LOST IN THIS PROCESS IS THE CORRELATION BETWEEN EP AND COSSIXPAK**

**SO THAT IN A TRANSPORT CALCULATION ALL MOMENTS OF THE FLUX WILL SIXPAK**

**HAVE THE SAME SPECTRUM, G0(E,EP) AND EACH WILL BE EFFECTED BY THE SIXPAK**

**AVERAGE ANGULAR DISTRIBUTION. SIXPAK**

**SIXPAK**

**FOR APPLICATIONS TO HIGH ENERGY FUSION APPLICATIONS CORRELATED SIXPAK**

**DATA SHOULD BE USED. HOWEVER, FOR LOWER ENERGY APPLICATIONS, SIXPAK**

**SUCH AS FISSION REACTORS, IT SHOULD BE ADEQUATE TO USE THE SIXPAK**

**UNCORRELATED DATA - IN THIS CASE THE MOST IMPORTANT EFFECT SIXPAK**

**WILL BE THE OVERALL NEUTRON MULTIPLICATION AND SPECTRUM. SIXPAK**

**SIXPAK**

**AN IMPORTANT CONSIDERATION IN DESIGNING THIS PROGRAM IS THAT SIXPAK**

**MANY COMPUTER CODES - DATA PROCESSING AND TRANSPORT CODES - SIXPAK**

**CANNOT USE THE CORRELATED (MF=6) DATA - NOR ARE THEY INTENDED SIXPAK**

**FOR HIGH ENERGY USE. FOR THESE CODES THE UNCORRELATED DATA SIXPAK**

**PRODUCED BY THIS CODE SHOULD BE ADEQUATE TO MEET THEIR NEEDS. SIXPAK**

**SIXPAK**

**WARNING - IT CANNOT BE STRESSED ENOUGH THAT THE OUTPUT OF THIS SIXPAK**

**CODE SHOULD ONLY BE USED FOR LOW ENERGY APPLICATIONS - FAILURE SIXPAK**

**TO HEED THIS WARNING CAN LEAD TO COMPLETELY UNRELIABLE RESULTS. SIXPAK**

**SIXPAK**

**ENDF/B FORMAT SIXPAK**

**==================================================================SIXPAK**

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

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

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

**SIXPAK**

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

**FORMAT AND NO ERROR CHECKING IS PERFORMED. IN PARTICULAR IT IS SIXPAK**

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

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

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

**AND ALL SECTIONS OF MF=6 MUST BE CORRECT. THE PROGRAM SKIPS ALL SIXPAK**

**OTHER SECTIONS OF DATA AND AS SUCH IS INSENSITIVE TO THE FORMAT SIXPAK**

**OF ALL OTHER SECTIONS. SIXPAK**

**SIXPAK**

**CONTENTS OF OUTPUT SIXPAK**

**==================================================================SIXPAK**

**6 ENDF/B FORMATTED OUTPUT FILES ARE PRODUCED FOR NEUTRON INCIDENT SIXPAK**

**DATA, SIXPAK**

**SIXPAK**

**1) ENDFB.MF4 - ANGULAR DISTRIBUTIONS AND LEGENDRE COEFFICIENTS SIXPAK**

**FOR NEUTRONS SIXPAK**

**2) ENDFB.MF5 - TABULATED NEUTRON ENERGY SPECTRA SIXPAK**

**3) ENDFB.M12 - PHOTON EMISSION MULTIPLICITY SIXPAK**

**4) ENDFB.M14 - PHOTON EMISSION ANGULAR DISTRIBUTIONS (ALWAYS SIXPAK**

**ISOTROPIC) SIXPAK**

**5) ENDFB.M15 - TABULATED PHOTON EMISSION SPECTRA SIXPAK**

**6) ENDFB.MF3 - TABULATED Charged Particle Cross Section for MT=5 SIXPAK**

**SIXPAK**

**EMITTED PARTICLE YIELD SIXPAK**

**==================================================================SIXPAK**

**NEUTRONS SIXPAK**

**======== SIXPAK**

**IN MF=6 THE YIELD FOR EACH REACTION IS THE ACTUAL MULTIPLICITY OF SIXPAK**

**THE REACTION, E.G., (N,2N) = 2. IN USING MF=4 AND 5 DATA THE SIXPAK**

**ENDF/B CONVENTION IS THAT THE MULTIPLICITY IS IMPLIED BY THE SIXPAK**

**MT NUMBER, E.G., MT=16 = (N,2N) = 2. SIXPAK**

**SIXPAK**

**THE ONLY EXCEPT IN ENDF/B-VI IS MT=201 = TOTAL NEUTRON PRODUCTION SIXPAK**

**WHERE AN ACTUAL ENERGY DEPENDENT YIELD IS INCLUDED IN MF=6. SIXPAK**

**HOWEVER, IN THIS CASE THE MF=3 CROSS SECTION INCLUDES THE SIXPAK**

**MULTIPLICITY (S. PEARLSTEIN, PRIVATE COMMUNICATION, JAN. 1992), SIXPAK**

**SIG(MT=201) = 2\*SIG(N,2N)+3\*SIG(N,3N).....ETC. SIXPAK**

**SIXPAK**

**SO THAT FOR ALL ENDF/B-VI DATA AS OF JANUARY 1992 THE MF=4 AND 5 SIXPAK**

**DATA OUTPUT BY THIS CODE CAN BE USED IN CONJUNCTION WITH THE MF=3 SIXPAK**

**CROSS SECTIONS - WITHOUT ANY REFERENCE TO THE MF=6 YIELD. SIXPAK**

**SIXPAK**

**PHOTONS SIXPAK**

**======= SIXPAK**

**UNLIKE THE NEUTRONS WHERE WITH ONLY ONE EXCEPTION (MT=201) THE SIXPAK**

**MF=6 YIELD IS ENERGY INDEPENDENT, IN THE CASE OF PHOTON EMISSION SIXPAK**

**ALMOST ALL OF THE PHOTONS HAVE AN ENERGY DEPENDENT YIELD. SIXPAK**

**SIXPAK**

**THIS PROGRAM WILL OUTPUT THE PHOTON MULTIPLICITY IN MF=12 AND SIXPAK**

**INDICATE THAT THERE IS A NORMALIZED DISTRIBUTION IN MF=15 SIXPAK**

**(LF=1 IN MF=12). SIXPAK**

**SIXPAK**

**THIS PROGRAM WILL OUTPUT THE NORMALIZED PHOTON SPECTRA IN MF=15. SIXPAK**

**CONTINUOUS ENERGY SPECTRA AND DISCRETE PHOTONS WILL ALL BE OUTPUT SIXPAK**

**AS NORMALIZED SPECTRA. SIXPAK**

**SIXPAK**

**THIS PROGRAM WILL ALSO OUTPUT MF=14 PHOTON ANGULAR DISTRIBUTION SIXPAK**

**DATA, ALWAYS USING THE ISOTROPIC FLAG TO MINIMIZE OUTPUT. SIXPAK**

**SIXPAK**

**WARNING OF ENERGY DEPENDENT YIELD SIXPAK**

**================================= SIXPAK**

**THIS PROGRAM WILL PRINT A WARNING MESSAGE IF A SECTION OF DATA SIXPAK**

**BEING OUTPUT IN THE ENDF/B FORMAT HAS AN ENERGY DEPENDENT MF=6 SIXPAK**

**YIELD AND THE EMITTED PARTICLE IS A NEUTRON - SINCE THE ENDF/B SIXPAK**

**CONVENTION IS THAT FOR EACH MT NUMBER THE MULTIPLICITY IS IMPLIED SIXPAK**

**WE DO NOT EXPECT AN ENERGY DEPENDENT MULTIPLICITY FOR NEUTRON SIXPAK**

**EMISSION. SIXPAK**

**SIXPAK**

**USING THE OUTPUT SIXPAK**

**==================================================================SIXPAK**

**NOTE, THAT IN USING THIS DATA, STARTING FROM THE RELATIONSHIP, SIXPAK**

**SIXPAK**

**F(E,EP,COS) = SIG(E)\*Y(E)\*G0(E,EP)\*F0(E,COS) SIXPAK**

**SIXPAK**

**USING THE ENDF/B CONVENTION THAT THE MULTIPLICITY IS EITHER SIXPAK**

**IMPLIED BY THE MT NUMBER (E.G., MT=16 = N,2N - MULTIPLICITY = 2) SIXPAK**

**OR INCLUDED IN THE CROSS SECTION (E.G., MT=201 = TOTAL NEUTRON SIXPAK**

**PRODUCTION) ALL THE INFORMATION REQUIRED FOR A CALCULATION IS SIXPAK**

**AVAILABLE IN, SIXPAK**

**SIXPAK**

**MF=3 - SIG(E) SIXPAK**

**MF=4 - F0(E,COS) - FOR OUTGOING NEUTRONS SIXPAK**

**MF=5 - G0(E,EP) - FOR OUTGOING NEUTRONS SIXPAK**

**MF=12 - Y(E) - FOR OUTGOING PHOTONS SIXPAK**

**MF=14 - F0(E,COS) - FOR OUTGOING PHOTONS (ALWAYS ISOTROPIC) SIXPAK**

**MF=15 - G0(E,EP) - FOR OUTGOING PHOTONS SIXPAK**

**SIXPAK**

**DOCUMENTATION SIXPAK**

**==================================================================SIXPAK**

**ONLY SECTIONS OF MF=4, 5, 12, 14, 15 ARE OUTPUT ON A ENDF/B FILE. SIXPAK**

**THE ONLY DOCUMENTATION IS THE ENDF/B TAPE LABEL (FIRST RECORD OF SIXPAK**

**EACH FILE) WHICH IDENTIFIES THE DATA AS SIXPAK OUTPUT. SIXPAK**

**SIXPAK**

**REACTION INDEX SIXPAK**

**==================================================================SIXPAK**

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

**SECTION MF=1, MT=451 OF EACH EVALUATION. SIXPAK**

**SIXPAK**

**SECTION SIZE SIXPAK**

**==================================================================SIXPAK**

**ALL OF THE DATA IN ENDF/B-VI, MF=6 ARE QUITE SMALL TABLES. AS SUCHSIXPAK**

**THIS PROGRAM ONLY ALLOWS TABLES OF UP TO 12000 POINTS (12,000 X, SIXPAK**

**Y VALUES). THIS SIZE IS MORE THAN ADEQUATE TO HANDLE ALL OF THE SIXPAK**

**CURRENT ENDF/B-VI DATA, AND IT CAN BE EASILY INCREASED TO HANDLE SIXPAK**

**ANY NEWER DATA AS IT BECOMES AVAILABLE. SIXPAK**

**SIXPAK**

**PLEASE CONTACT THE AUTHOR IF YOU HAVE AN EVALUATION WHICH EXCEEDS SIXPAK**

**THIS LIMIT. SIXPAK**

**SIXPAK**

**SELECTION OF DATA SIXPAK**

**==================================================================SIXPAK**

**THE PROGRAM SELECTS DATA TO BE PROCESSED BASED ON MAT/MT RANGES SIXPAK**

**(MF=6 ASSUMED). THIS PROGRAM ALLOWS UP TO 100 MAT/MT RANGES TO BE SIXPAK**

**SPECIFIED BY INPUT PARAMETERS. THE PROGRAM WILL ASSUME THAT THE SIXPAK**

**ENDF/B TAPE IS IN MAT ORDER. THE PROGRAM WILL TERMINATE EXECUTION SIXPAK**

**WHEN A MAT IS FOUND THAT IS ABOVE ALL REQUESTED MAT RANGES. SIXPAK**

**SIXPAK**

**PROGRAM OPERATION SIXPAK**

**==================================================================SIXPAK**

**EACH SECTION (MT) OF MF=6 DATA IS SUBDIVIDED INTO SUBSECTIONS - SIXPAK**

**ONE SUBSECTION FOR EACH EMITTED PARTICLE. SIXPAK**

**SIXPAK**

**EACH SUBSECTION OF DATA IS CONSIDERED SEPARATELY. EACH SUBSECTION SIXPAK**

**OF ENDF/B MF=6 DATA TO PROCESS IS IN THE FORM, SIXPAK**

**SIXPAK**

**F(E,EP,COS) = SIG(E)\*Y(E)\*G0(E,EP)\*F(E,EP,COS) SIXPAK**

**SIXPAK**

**SIG(E) = MF=3 CROSS SECTIONS SIXPAK**

**Y(E) = YIELD (MULTIPLICITY) SIXPAK**

**G0(E,EP) = ENERGY SPECTRUM SIXPAK**

**F(E,EP,COS) = ANGULAR DISTRIBUTION SIXPAK**

**SIXPAK**

**G0(E,EP) = 1 WHEN INTEGRATED OVER EP (SECONDARY ENERGY) SIXPAK**

**G0(E,EP)\*F(E,EP,COS) = 1 WHEN INTEGRATED OVER EP AND COS SIXPAK**

**SIXPAK**

**THIS PROGRAM WILL DEFINE THE ZEROTH ORDER MOMENTS OF THE SIXPAK**

**ENERGY AND ANGULAR DISTRIBUTIONS, SIXPAK**

**SIXPAK**

**G0(E,EP) = G0(E,EP)\*F(E,EP,COS) INTEGRATED OVER COS SIXPAK**

**F0(E,COS) = G0(E,EP)\*F(E,EP,COS) INTEGRATED OVER EP SIXPAK**

**SIXPAK**

**FOR NEUTRON INDUCED REACTIONS THE ENDF/B FORMATTED OUTPUT WILL BE SIXPAK**

**SIXPAK**

**F0(E,COS)- IN ENDFB.MF4 FOR NEUTRONS OUT OF A REACTION SIXPAK**

**G0(E,EP) - IN ENDFB.MF5 FOR NEUTRONS OUT OF A REACTION SIXPAK**

**- IN ENDFB.M15 FOR PHOTONS OUT OF A REACTION SIXPAK**

**SIXPAK**

**FOR NEUTRONS INCIDENT AND NEUTRONS EMITTED THIS DATA WILL BE SIXPAK**

**OUTPUT IN MF=4 AND 5 FORMATS. SIXPAK**

**SIXPAK**

**FOR NEUTRONS INCIDENT AND PHOTONS EMITTED THIS DATA WILL BE SIXPAK**

**OUTPUT IN MF=15 FORMAT - THE SPECTRA ARE OUTPUT AND THE SIXPAK**

**ANGULAR DISTRIBUTION IS IGNORED. SIXPAK**

**SIXPAK**

**ALL PHOTON EMISSION IN THE ENDF/B-VI LIBRARY AS OF JANUARY 1992 SIXPAK**

**IS ISOTROPIC AND AS SUCH NO DISTRIBUTION OF PHOTON ANGULAR SIXPAK**

**DISTRIBUTIONS NEED BE OUTPUT - IT IS ALWAYS ISOTROPIC. SIXPAK**

**SIXPAK**

**FOR ALL OTHER COMBINATIONS INCIDENT AND EMITTED PARTICLES SIXPAK**

**THERE WILL BE NO ENDF/B FORMATTED OUTPUT. SIXPAK**

**SIXPAK**

**VARIATIONS FROM ENDF/B MANUAL SIXPAK**

**==================================================================SIXPAK**

**LAW=1, LANG=2 = KALBACH-MANN SIXPAK**

**============================ SIXPAK**

**FOR THE DISTRIBUTIONS, SIXPAK**

**SIXPAK**

**F(MU,E,EP) = G0(E,EP)\*A\*(COSH(MU\*A)+R(E,EP)\*SINH(MU\*A)) SIXPAK**

**SIXPAK**

**G0(E,EP) = 1 - WHEN INTEGRATED OVER EP. SIXPAK**

**SIXPAK**

**A\*(COSH(MU\*A)+R(E,EP)\*SINH(MU\*A)) = 2 - WHEN INTEGRATD OVER MU SIXPAK**

**SIXPAK**

**THIS MEANS AS DEFINED IN THE ENDF/B MANUAL THE DISTRIBUTIONS SIXPAK**

**ARE NORMALIZED TO 2, INSTEAD OF 1. IN ORDER TO OBTAIN CORRECTLY SIXPAK**

**NORMALIZED DISTRIBUTIONS THE DISTRIBUTION SHOULD BE DEFINED SIXPAK**

**TO INCLUDE A FACTOR OF 1/2 MULTIPLYING THE ANGULAR PART OF SIXPAK**

**THE DISTRIBUTION. SIXPAK**

**SIXPAK**

**F(MU,E,EP) = G0(E,EP)\*0.5\*A\*(COSH(MU\*A)+R(E,EP)\*SINH(MU\*A)) SIXPAK**

**SIXPAK**

**THIS IS THE FORM USED IN THIS CODE SIXPAK**

**SIXPAK**

**LAW=1, ND NOT 0 = DISCRETE SECONDARY ENERGY DISTRIBUTION SIXPAK**

**======================================================== SIXPAK**

**THE ENDF/B MANUAL SAYS THESE ARE FLAGGED WITH NEGATIVE ENERGIES. SIXPAK**

**IN ENDF/B-VI ALL OF THESE HAVE POSITIVE ENERGY. THIS CODE DOES SIXPAK**

**NOT CONSIDER THE ENDF/B-VI DATA TO BE IN ERROR. SIXPAK**

**SIXPAK**

**WITH THE CONVENTION ACTUALLY USED IN ENDF/B-VI ALL SECONDARY SIXPAK**

**ENERGIES SHOULD BE NON-NEGATIVE AND IN ASCENDING ENERGY ORDER SIXPAK**

**FOR EACH INCIDENT ENERGY. SIXPAK**

**SIXPAK**

**FROM THE ENDF/B MANUAL IT IS NOT OBVIOUS WHAT G0(E,EP) SHOULD BE SIXPAK**

**FOR DISCRETE PHOTONS - PHYSICALLY THIS IS A DELTA FUNCTION. IN SIXPAK**

**ENDF/B-VI IT IS ENTERED AS 1.0 = INTERPRETING IT AS INTEGRATED SIXPAK**

**OVER SECONDARY ENERGY - IN WHICH CASE THE DELTA FUNCTION = 1.0. SIXPAK**

**SIXPAK**

**LIMITATIONS SIXPAK**

**==================================================================SIXPAK**

**CHECKING DATA SIXPAK**

**==================================================================SIXPAK**

**THIS PROGRAM CHECKS ALL ENDF/B-VI MF=6 DATA. THE FOLLOWING CHECKS SIXPAK**

**ARE PERFORMED. SIXPAK**

**SIXPAK**

**PARAMETERS SIXPAK**

**========== SIXPAK**

**ALL PARAMETERS ARE CHECKED FOR CONSISTENCY. IF PARAMETERS ARE SIXPAK**

**NOT CONSISTENT THE PROGRAM MAY NOT BE ABLE TO PERFORM THE SIXPAK**

**FOLLOWING TESTS AND WILL MERELY SKIP A SECTION OF DATA. SIXPAK**

**SIXPAK**

**INTERPOLATION LAWS SIXPAK**

**================== SIXPAK**

**ALL INTEGRATIONS ARE PERFORMED USING THE INTERPOLATION LAW GIVEN SIXPAK**

**FOR SECONDARY ENERGY AND/OR COSINE. INTEGRATIONS ARE NOT SIXPAK**

**PERFORMED OVER INCIDENT - ONLY INTEGRATION OVER SECONDARY ENERGY SIXPAK**

**AND/OR COSINE ARE PERFORMED AT EACH INCIDENT ENERGY. THEREFORE SIXPAK**

**THE INTERPOLATION LAW FOR INCIDENT ENERGY IS NOT USED BY THIS SIXPAK**

**CODE. SIXPAK**

**SIXPAK**

**ALL INTERPOLATION LAWS ARE CHECKED. ALL DATA ASSOCIATED WITH SIXPAK**

**INTERPOLATION LAWS ARE CHECKED, E.G., NO NON-NEGATIVE VALUES SIXPAK**

**REQUIRING LOG INTERPOLATION. IN ORDER TO PERFORM REQUIRED SIXPAK**

**INTEGRALS OVER COS AND EP IT IS IMPERATIVE THAT THE INTERPOLATION SIXPAK**

**LAWS BE COMPATIBLE WITH THE DATA. SIXPAK**

**SIXPAK**

**ENDF/B-VI ALLOWS NEW INTERPOLATION LAWS FOR CORRESPONDING POINT SIXPAK**

**AND UNIT BASE TRANSFORMATION INTERPOLATION. NONE OF THESE NEW SIXPAK**

**INTERPOLATION LAWS ARE USED IN THE ENDF/B-VI LIBRARY AS OF SIXPAK**

**JANUARY 1992 TO INTERPOLATE IN SECONDARY ENERGY OR COSINE. SIXPAK**

**THEREFORE THIS PROGRAM CAN PERFORM ALL OF THE REQUIRED INTEGRALS SIXPAK**

**OVER SECONDARY ENERGY AND/OR COSINE USING ONLY THE OLDER SIXPAK**

**INTERPOLATION CODES. THIS PROGRAM ONLY PERFORMS INTEGRALS FOR SIXPAK**

**EACH INCIDENT ENERGY, SO THAT INTERPOLATION IN INCIDENT ENERGY SIXPAK**

**IS NOT PERFORMED BY THIS PROGRAM. SIXPAK**

**SIXPAK**

**NEW INTERPOLATION SCHEMES ARE USED FOR INCIDENT ENERGY - FOR SIXPAK**

**EXAMPLE, CORRESPONDING POINT INTERPOLATION IS SPECIFIED TO ALLOW SIXPAK**

**INTERPOLATION IN G0(E,EP) TO SIMULATE CASES WHERE THE INPUT ENERGYSIXPAK**

**LIMIT IS DEFINED BY E-EP = A DIAGONAL CURVE ACROSS (E,EP) SPACE. SIXPAK**

**THIS INTERPOLATION CODE CANNOT BE SPECIFIED IN THE MF=5 OUTPUT SIXPAK**

**OF THIS CODE - MF=5 ONLY ALLOWS THE OLDER INTERPOLATION LAWS SIXPAK**

**INT=1 THROUGH 5. THEREFORE THIS PROGRAM WILL USE THE CLOSEST SIXPAK**

**CORRESPONDING INTERPOLATION CODE FOR OUTPUT TO MF=5. FOR USE SIXPAK**

**WHERE THE OUTPUT OF THIS CODE = LOW ENERGY APPLICATIONS - THIS SIXPAK**

**SHOULD HAVE LITTLE EFFECT ON RESULTS. SIXPAK**

**SIXPAK**

**FOR CONSISTENCY WITH EARLIER VERSIONS OF ENDF/B IN CREATING THE SIXPAK**

**ENDF/B OUTPUT, IF ANY INPUT INTERPOLATION LAW IS NOT IN THE SIXPAK**

**RANGE 1-5, IT WILL FIRST BE TESTED TO SEE IF MOD(10) IT IS SIXPAK**

**IN THIS RANGE, FINALLY IF EVEN THIS DOESN'T WORK IT IS SET SIXPAK**

**EQUAL TO 2 (LINEARLY INTERPOLATION). THIS METHOD WILL EFFECTIVELY SIXPAK**

**REPLACE CORRESPONDING POINT AND UNIT BASE TRANSFORMATION BY THE SIXPAK**

**CLOSEST RELATED INTERPOLATION LAW 1 THROUGH 5 - AGAIN NOTE, AS SIXPAK**

**OF JANUARY 1992 NONE OF THESE NEW LAWS ARE USED IN ENDF/B-VI. IF SIXPAK**

**THIS MUST BE DONE FOR INTERPOLATION IN SECONDARY ENERGY OR COSINE SIXPAK**

**AN ERROR MESSAGE WILL BE PRINTED - SINCE THIS WOULD EFFECT THE SIXPAK**

**ACCURACY OF THE INTEGRALS PERFORMED BY THIS PROGRAM. IF THIS MUST SIXPAK**

**BE DONE FOR INCIDENT ENERGY NO MESSAGE IS PRINTED - SINCE THIS SIXPAK**

**WILL NOT EFFECT THE ACCURACY OF THE INTEGRALS PERFORMED BY THIS SIXPAK**

**PROGRAM. SIXPAK**

**SIXPAK**

**SPECTRA AND ANGULAR DISTRIBUTIONS SIXPAK**

**================================= SIXPAK**

**ALL SPECTRA AND ANGULAR DISTRIBUTIONS ARE CHECKED TO INSURE SIXPAK**

**THEY ARE NORMALIZED AND DO NOT INCLUDE ANY NEGATIVE VALUES. SIXPAK**

**SIXPAK**

**LEGENDRE COEFFICIENTS SIXPAK**

**===================== SIXPAK**

**THE NORMALIZATION, F0, CANNOT BE NEGATIVE. SIXPAK**

**SIXPAK**

**LEGENDRE COEFFICIENTS IN NORMAL FORM ARE CHECKED TO INSURE SIXPAK**

**THEY ARE IN THE RANGE -1 TO +1 = THE LEGENDRE EXPANSION OF A SIXPAK**

**DELTA FUNCTION AT COS=+1 OR -1 - COEFFICIENTS SHOULD NOT SIXPAK**

**EXCEED WHAT YOU GET FROM A DELTA FUNCTION. SIXPAK**

**SIXPAK**

**ANGULAR DISTRIBUTIONS ARE CHECKED AT COS = -1, 0 AND +1. SIXPAK**

**SIXPAK**

**CREATING ENDF/B OUTPUT SIXPAK**

**==================================================================SIXPAK**

**THIS PROGRAM CAN CREATE EQUIVALENT MF =4, 5, 12, 14, 15 DATA FOR SIXPAK**

**ALL OF THE DATA INCLUDED IN ENDF/B-VI AS OF JANUARY 1992, EXCEPT SIXPAK**

**FOR 1 SECTION OF LAW=6 DATA (SEE DETAILS BELOW). SIXPAK**

**SIXPAK**

**THIS PROGRAM HAS NOT BEEN TESTED ON OTHER DATA LIBRARIES, E.G., SIXPAK**

**JEF, JENDL, ETC. SIXPAK**

**SIXPAK**

**THE PROGRAM HAS THE FOLLOWING LIMITATION AS FAR AS CREATING SIXPAK**

**ENDF/B FORMATTED OUTPUT. SIXPAK**

**SIXPAK**

**ISOTROPIC PHOTON EMISSION SIXPAK**

**========================= SIXPAK**

**FOR PHOTON EMISSION THE DISTRIBUTIONS ARE ASSUMED TO BE ISOTROPIC SIXPAK**

**AND ONLY THE MULTIPLICITY IS OUTPUT IN MF=12, ISOTROPIC ANGULAR SIXPAK**

**DISTRIBUTIONS IN MF=14 AND THE SPECTRA IN MF=15. ALL ENDF/B-VI SIXPAK**

**MF=6 DATA AS OF JANUARY 1992 INCLUDE ONLY ISOTROPIC PHOTON SIXPAK**

**EMISSION - SO THAT THIS IS NOT A LIMITATION ON TRANSLATING SIXPAK**

**ENDF/B-VI DATA. SIXPAK**

**SIXPAK**

**EITHER TABULATED OR LEGENDRE COEFFICIENTS SIXPAK**

**========================================= SIXPAK**

**FOR LAW=2 THE REPRESENTATION, EITHER TABULATED OR LEGENDRE SIXPAK**

**COEFFICIENTS, CAN BE SPECIFIED FOR EACH INCIDENT ENERGY. SIXPAK**

**SIXPAK**

**IN ORDER TO OBTAIN CORRECT ENDF/B OUTPUT THE REPRESENTATION SIXPAK**

**MUST BE THE SAME FOR ALL INCIDENT ENERGIES = MF=4 DATA CAN ONLY SIXPAK**

**BE TABULATED OR LEGENDRE OVER THE ENTIRE ENERGY RANGE. SIXPAK**

**SIXPAK**

**YIELD AND OUTPUT NORMALIZATION SIXPAK**

**============================== SIXPAK**

**THE YIELD INCLUDED WITH EACH SECTION OF DATA IS NOT USED FOR SIXPAK**

**OUTPUT FOR NEUTRONS, BUT IS INCLUDED IN THE OUTPUT FOR PHOTONS. SIXPAK**

**IN ALL CASES THE ANGULAR DISTRIBUTIONS AND SPECTRA OUTPUT ARE SIXPAK**

**NORMALIZED TO UNITY. SIXPAK**

**SIXPAK**

**LAW=0 SIXPAK**

**===== SIXPAK**

**NO OUTPUT - INCIDENT NEUTRON - EMITTED PHOTON OR NEUTRON SIXPAK**

**REACTIONS ARE NOT EXPECTED. SIXPAK**

**SIXPAK**

**LAW=1 SIXPAK**

**===== SIXPAK**

**FOR EACH INCIDENT ENERGY DISCRETE AND CONTINUOUS EMISSION SPECTRA SIXPAK**

**CANNOT BE MIXED TOGETHER - THEY MUST BE ALL EITHER DISCRETE OR SIXPAK**

**CONTINUOUS. IF DISCRETE EMISSION IS GIVEN ONLY 1 SECONDARY SIXPAK**

**ENERGY (NEP=1) MAY BE GIVEN = A NORMALIZED DISTRIBUTION FOR A SIXPAK**

**SINGLE DISCRETE EMISSION ENERGY. ALL OF THE ENDF/B-VI DATA AS SIXPAK**

**OF JANUARY 1992 CONFORM TO THESE LIMITATIONS. SIXPAK**

**SIXPAK**

**SINCE THE FLAG NA, TO INDICATE ISOTROPIC DISTRIBUTIONS, IS ONLY SIXPAK**

**GIVEN FOR EACH SECONDARY ENERGY (EP) THE PROGRAM CANNOT DECIDE SIXPAK**

**IN ADVANCE WHETHER OR NOT THE DISTRIBUTION WILL BE ISOTROPIC SIXPAK**

**AT ALL INCIDENT ENERGIES. THEREFORE ISOTROPIC DISTRIBUTIONS SIXPAK**

**WILL BE OUTPUT EITHER: LANG = 1 - AS 1 LEGENDRE COEFFICIENT = 0.0 SIXPAK**

**OR LANG = NOT 1 - AS A 2 POINT ANGULAR DISTRIBUTION AT COS = -1.0 SIXPAK**

**AND +1.0 WITH BOTH VALUES EQUAL TO 0.5 (A NORMALIZED ISOTROPIC SIXPAK**

**DISTRIBUTION). SIXPAK**

**SIXPAK**

**DISCRETE PHOTONS ARE OUTPUT IN MF=15 AS 3 POINT DISTRIBUTIONS SIXPAK**

**WITH SECONDARY ENERGY POINTS AT EP-DEP, EP, EP+DEP, WHERE SIXPAK**

**DEP=0.001\*EP. THE VALUES AT EP-DEP AND EP+DEP ARE 0.0, AND SIXPAK**

**AT EP THE VALUE IS 1000.0/EP TO NORMALIZE THE DISTRIBUTION. SIXPAK**

**SIXPAK**

**LAW=2 SIXPAK**

**===== SIXPAK**

**NO LIMITATION ON REPRESENTATIONS. SIXPAK**

**SIXPAK**

**LAW=3 SIXPAK**

**===== SIXPAK**

**NO LIMITATION ON REPRESENTATIONS. SIXPAK**

**SIXPAK**

**LAW=4 SIXPAK**

**===== SIXPAK**

**NO OUTPUT - INCIDENT NEUTRON - EMITTED PHOTON OR NEUTRON SIXPAK**

**REACTIONS ARE NOT EXPECTED. SIXPAK**

**SIXPAK**

**LAW=5 SIXPAK**

**===== SIXPAK**

**NO OUTPUT - INCIDENT NEUTRON - EMITTED PHOTON OR NEUTRON SIXPAK**

**REACTIONS ARE NOT EXPECTED. SIXPAK**

**SIXPAK**

**LAW=6 SIXPAK**

**===== SIXPAK**

**NO OUTPUT - ENDF/B-VI ONLY INCLUDES 1 SECTION OF THIS TYPE OF DATASIXPAK**

**FOR (N,D) 2N,P. SIXPAK**

**SIXPAK**

**LAW=7 SIXPAK**

**===== SIXPAK**

**FOR EACH INCIDENT ENERGY THE REPRESENTATION MUST BE EITHER, SIXPAK**

**SIXPAK**

**1) SQUARE = FOR EACH INCIDENT COSINE EXACTLY THE SAME SECONDARY SIXPAK**

**ENERGIES. SIXPAK**

**SIXPAK**

**2) LINEAR = FOR EACH INCIDENT COSINE THE INTERPOLATION LAW SIXPAK**

**BETWEEN SECONDARY ENERGIES MUST BE LINEAR. SIXPAK**

**SIXPAK**

**THESE 2 PRESENTATIONS ARE THE ONLY ONES PRESENTED IN ENDF/B-VI SIXPAK**

**AS OF JANUARY 1992 - SO THIS PROGRAM CAN TRANSLATED ALL LAW=7 SIXPAK**

**DATA FOR ENDF/B-VI. SIXPAK**

**SIXPAK**

**LABORATORY VS. CENTER-OF-MASS SYSTEM SIXPAK**

**==================================================================SIXPAK**

**IN MANY CASES PEOPLE ASSUME THAT FOR HEAVY (HIGH ATOMIC WEIGHT) SIXPAK**

**MATERIALS THE CENTER-OF-MASS AND LAB SYSTEMS ARE ALMOST IDENTICAL,SIXPAK**

**SINCE IN THIS CASE THE CENTER-OF-MASS ENERGY WILL BE MUCH SMALLER SIXPAK**

**THAN THE INCIDENT ENERGY. FOR A PROCESS SUCH AS ELASTIC SCATTERINGSIXPAK**

**WHERE FOR HEAVY MATERIALS THE SECONDARY ENERGY, EP, WILL ALWAYS SIXPAK**

**BE A LARGE FRACTION OF THE INCIDENT ENERGY, THIS ASSUMPTION IS SIXPAK**

**VALID. HOWEVER, FOR THE TYPICAL REACTIONS INCLUDED IN MF=6 THIS SIXPAK**

**IS NOT ALWAYS TRUE - IN MANY OF THESE CASES THE SECONDARY ENERGY SIXPAK**

**CAN EXTEND ALL THE WAY DOWN TO ZERO, AND IN PARTICULAR IT CAN SIXPAK**

**BE SMALL COMPARED TO THE CENTER-OF-MASS ENERGY - WHICH MAKES THE SIXPAK**

**TRANSFORMATION FROM CENTER-OF-MASS TO LAB IMPORTANT. THEREFORE SIXPAK**

**GENERALLY TO TREAT MF=6 DATA WE MUST CONSIDER THIS TRANSFORMATION.SIXPAK**

**SIXPAK**

**THE FOLLOWING DISCUSSING ONLY APPLIES TO SPECTRA THAT MAY BE SIXPAK**

**OUTPUT IN MF=5 = ONLY DATA FOR NEUTRONS INCIDENT AND EMITTED - SIXPAK**

**IN PARTICULAR THE FOLLOWING DEFINITIONS ARE NOT GENERAL - THEY SIXPAK**

**ARE ONLY VALID FOR INCIDENT AND EMITTED NEUTRONS. SIXPAK**

**SIXPAK**

**DOUBLE DIFFERENTIAL DATA IN MF=6 MAY BE GIVEN IN EITHER THE LAB SIXPAK**

**OR C.M. SYSTEM. SIMILARLY ANGULAR DISTRIBUTIONS IN MF=4 MAY BE SIXPAK**

**GIVEN IN EITHER THE LAB OR C.M. SYSTEM. IN CONTRAST ENERGY SIXPAK**

**SPECTRA IN MF=5 CAN ONLY BE GIVEN IN THE LABORATORY SYSTEM. SIXPAK**

**SIXPAK**

**THE ANGULAR DISTRIBUTIONS OUTPUT BY THIS CODE IN MF=4 ARE IN THE SIXPAK**

**SAME SYSTEM IN WHICH THEY ARE GIVEN IN MF=6 - EITHER LAB OR SIXPAK**

**CENTER-OF-MASS SYSTEM. SIXPAK**

**SIXPAK**

**THE ENERGY SPECTRA OUTPUT BY THIS CODE IN MF=5 MUST BE IN THE LAB SIXPAK**

**SYSTEM - THIS IS THE ONLY ALLOWED FORM FOR MF=5 DATA. SIXPAK**

**SIXPAK**

**FOR MF=6 SPECTRA GIVEN IN THE LAB SYSTEM THIS MERELY REQUIRES SIXPAK**

**COPYING THE GIVEN SPECTRA TO MF=5 OUTPUT. SIXPAK**

**SIXPAK**

**FOR MF=6 SPECTRA GIVEN IN THE CENTER-OF-MASS SYSTEM ONLY FIRST SIXPAK**

**ORDER CORRECTIONS IN THE SPECTRA AND USED AND THEY ARE THEN SIXPAK**

**OUTPUT IN MF=5 AS IN THE LAB SYSTEM - THE FIRST ORDER CORRECTIONS SIXPAK**

**ARE DESCRIBED BELOW. SIXPAK**

**SIXPAK**

**DEFINING, SIXPAK**

**MM = CENTER OF MASS MOTION SIXPAK**

**CM = OUTGOING (EMITTED) PARTICLE IN CENTER OF MASS SIXPAK**

**LAB = OUTGOING (EMITTED) PARTICLE IN LAB SIXPAK**

**THETA = CM SCATTERING ANGLE RELATIVE TO INCIDENT DIRECTION SIXPAK**

**COS(CM) = COSINE OF THE CM SCATTERING ANGLE SIXPAK**

**SIXPAK**

**FOR NEUTRONS INCIDENT WITH AN ENERGY, E, AND THEREFORE A SPEED, SIXPAK**

**SIXPAK**

**VN(E) = 2\*SQRT(E)/MASS(IN) SIXPAK**

**SIXPAK**

**THE CENTER-OF-MASS SPEED IS GIVEN BY, SIXPAK**

**SIXPAK**

**V(MM) = VN(E)/(1 + A) SIXPAK**

**SIXPAK**

**AND THE CENTER OF MASS ENERGY BY, SIXPAK**

**SIXPAK**

**E(MM) = 1/2\*MASS(IN)\*V(MM)\*\*2 SIXPAK**

**= 1/2\*MASS(IN)\*VN(E)\*\*2/(1 + A)\*\*2 SIXPAK**

**= E/(1 + A)\*\*2 SIXPAK**

**SIXPAK**

**FOR DISTRIBUTIONS GIVEN IN MF=6 IN THE CM, THE SPEED, V(CM), SIXPAK**

**SHOULD BE VECTORIALLY ADDED TO THAT OF OUTGOING PARTICLES TO SIXPAK**

**DEFINE THE OUTGOING PARTICLES LAB VELOCITY, AND IN TURN IT'S SIXPAK**

**ENERGY, SIXPAK**

**SIXPAK**

**V(LAB)\*COS(LAB) = V(MM) + V(CM)\*COS(CM) SIXPAK**

**V(LAB)\*SIN(LAB) = V(CM)\*SIN(CM) SIXPAK**

**SIXPAK**

**V(LAB)\*\*2 = V(MM)\*\*2 + V(CM)\*\*2 + 2\*COS(CM)\*V(MM)\*V(CM) SIXPAK**

**SIXPAK**

**EP(LAB) = 0.5\*MASS(OUT)\*V(LAB)\*\*2 SIXPAK**

**SIXPAK**

**= E(MM) + EP(CM) + 2\*COS(CM)\*SQRT(E(MM)\*EP(CM)) SIXPAK**

**SIXPAK**

**WE CAN ALSO DEFINE THE REVERSE TRANSFORMATION USING, SIXPAK**

**SIXPAK**

**V(CM)\*COS(CM) = V(LAB)\*COS(LAB) - V(MM) SIXPAK**

**V(CM)\*SIN(CM) = V(LAB)\*SIN(LAB) SIXPAK**

**SIXPAK**

**V(CM)\*\*2 = V(MM)\*\*2 + V(LAB)\*\*2 - 2\*COS(LAB)\*V(MM)\*V(LAB) SIXPAK**

**SIXPAK**

**EP(CM) = 0.5\*MASS(OUT)\*V(CM)\*\*2 SIXPAK**

**SIXPAK**

**= E(MM) + EP(LAB) - 2\*COS(LAB)\*SQRT(E(MM)\*EP(LAB)) SIXPAK**

**SIXPAK**

**WE CAN DEFINE COS(LAB) FROM THE RELATIONSHIP, SIXPAK**

**SIXPAK**

**V(LAB)\*COS(LAB) = V(MM) + V(CM)\*COS(CM) SIXPAK**

**SIXPAK**

**COS(LAB) =[V(MM) + V(CM)\*COS(CM)]/V(LAB) SIXPAK**

**SIXPAK**

**[V(MM) + V(CM)\*COS(CM)] SIXPAK**

**COS(LAB) =--------------------------------------------- SIXPAK**

**SQRT[V(MM)\*\*2+V(CM)\*\*2+2\*COS(CM)\*V(MM)\*V(CM)] SIXPAK**

**SIXPAK**

**OR COS(CM) FROM THE RELATIONSHIP, SIXPAK**

**SIXPAK**

**V(CM)\*COS(CM) = V(LAB)\*COS(LAB) - V(MM) SIXPAK**

**SIXPAK**

**COS(CM) =[V(LAB)\*COS(LAB) - V(MM)]/V(CM) SIXPAK**

**SIXPAK**

**[V(LAB)\*COS(LAB) - V(MM)] SIXPAK**

**COS(CM) =------------------------------------------------ SIXPAK**

**SQRT[V(LAB)\*\*2+V(CM)\*\*2-2\*COS(LAB)\*V(LAB)\*V(MM)] SIXPAK**

**SIXPAK**

**THE JACOBIAN CAN BE DEFINED FROM, SIXPAK**

**SIXPAK**

**V(LAB)\*COS(LAB) = V(MM) + V(CM)\*COS(CM) SIXPAK**

**SIXPAK**

**J = D[COS(CM)]/D[COS(LAB)] = V(LAB)/V(CM) SIXPAK**

**= SQRT[EP(LAB)/EP(CM)] SIXPAK**

**SIXPAK**

**WITH THESE DEFINITIONS OF EP(LAB) AND COS(LAB) IN TERMS OF E(MM), SIXPAK**

**EP(CM) AND COS(CM) IT IS POSSIBLE TO PERFORM A POINT-BY-POINT SIXPAK**

**TRANSFORMATION OF DISTRIBUTIONS FROM THE CM TO LAB SYSTEM USING SIXPAK**

**THESE DEFINITIONS - OR IF WE WISHED WE COULD PERFORM THE REVERSE SIXPAK**

**TRANSFORMATION USING THE ABOVE RELATIONSHIPS AND THE IDENTITY, SIXPAK**

**SIXPAK**

**F(E,EP(LAB),COS(LAB))\*D(COS(LAB))=F(E,EP(CM),COS(CM))\*D(COS(CM)) SIXPAK**

**SIXPAK**

**THIS IS NOT WHAT WILL BE DONE HERE, SINCE WE WILL ONLY BE SIXPAK**

**INTERESTED IN THE ZEROTH ORDER MOMENTS OF THESE DISTRIBUTIONS, SIXPAK**

**BUT WE WILL BE INTERESTED IN DEFINING THOSE MOMENTS IN THE SIXPAK**

**LAB SYSTEM IN TERMS OF MF=6 SPECTRA GIVEN IN THE CM SYSTEM USING, SIXPAK**

**SIXPAK**

**F(E,EP(LAB),COS(LAB)) = F(E,EP(CM),COS(CM))\*J SIXPAK**

**SIXPAK**

**THE LIMITS OF EP(LAB) ARE DEFINED BY SETTING COS(CM) = +1 OR -1, SIXPAK**

**SIXPAK**

**EP(LAB) = (SQRT(EP(CM)) + SQRT(E(MM)))\*\*2 FOR COS(CM) = +1 SIXPAK**

**= (SQRT(EP(CM)) - SQRT(E(MM)))\*\*2 FOR COS(CM) = -1 SIXPAK**

**SIXPAK**

**IN THIS FORM WE CAN SEE THAT AS LONG AS THE SECONDARY ENERGY IN SIXPAK**

**THE CENTER-OF-MASS SYSTEM, EP(CM), IS MUCH LARGER THAN THE SIXPAK**

**ENERGY OF THE CENTER-OF-MASS, E(MM), THE CENTER-OF-MASS AND LAB SIXPAK**

**ENERGIES WILL BE ALMOST EQUAL - SIMILARLY FOR THE COSINE, IN SIXPAK**

**THIS CASE COS(LAB) AND COS(CM) WILL BE ALMOST EQUAL - HOWEVER, SIXPAK**

**FOR THE MF=6 DATA WE CANNOT ASSUME THAT THIS IS TRUE. SIXPAK**

**SIXPAK**

**TO FIRST ORDER THE ANGULAR DEPENDENCE CAN BE IGNORED, SIXPAK**

**SIXPAK**

**EP(LAB) = E(MM) + EP(CM) SIXPAK**

**SIXPAK**

**ALL THIS SAYS IS THAT TO FIRST ORDER THE EFFECT OF TRANSFORMING SIXPAK**

**FROM THE CM TO LAB SYSTEM IS TO INCREASE THE ENERGY OF THE SIXPAK**

**EMITTED PARTICLE IN THE CENTER-OF-MASS SYSTEM BY THE ENERGY OF SIXPAK**

**THE CENTER-OF-MASS TO DEFINE THE LAB ENERGY. SIXPAK**

**SIXPAK**

**NOT ONLY THE ENERGY, BUT ALSO THE SPECTRA MUST BE TRANSFORMED. SIXPAK**

**STARTING FROM THE DOUBLE DIFFERENTIAL DATA IN THE LAB SYSTEM, SIXPAK**

**F(E,EP,COS(LAB)), WE CAN DEFINE THE LAB SCALAR SPECTRUM AS, SIXPAK**

**SIXPAK**

**G0(E,EP) = INTEGRAL F(E,EP,COS(LAB))\*D(COS(LAB)) SIXPAK**

**SIXPAK**

**THIS IS THE NORMAL CALCULATION DEFINED ABOVE AND USED FOR DATA SIXPAK**

**GIVEN IN THE LAB SYSTEM. SIXPAK**

**SIXPAK**

**STARTING FROM DATA IN THE CENTER OF MASS SYSTEM F(E,EP,COS(CM)), SIXPAK**

**WE CAN USE THE RELATIONSHIP, SIXPAK**

**SIXPAK**

**F(E,EP,COS(LAB))\*D(COS(LAB)) = F(E,EP,COS(CM))\*J\*D(COS(LAB)) SIXPAK**

**SIXPAK**

**J = SQRT(EP(LAB)/EP(CM)) - THE JACOBIAN SIXPAK**

**SIXPAK**

**= E(MM)/EP(CM) + 1 + 2\*COS(CM)\*SQRT(E(MM)/EP(CM)) SIXPAK**

**SIXPAK**

**AS IN THE CASE OF THE ENERGY, IN THIS FORM WE CAN SEE THAT AS SIXPAK**

**LONG AS THE SECONDARY ENERGY IN THE CENTER-OF-MASS SYSTEM, SIXPAK**

**EP(CM), IS LARGE COMPARED TO THE CENTER-OF-MASS ENERGY, E(MM), SIXPAK**

**THE JACOBIAN IS ESSENTIALLY UNITY AND THE CENTER-OF-MASS AND LAB SIXPAK**

**SPECTRA WILL BE VERY SIMILAR - AGAIN, GENERALLY WE CANNOT SIXPAK**

**ASSUME THAT THIS IS TRUE FOR THE MF=6 SPECTRA. SIXPAK**

**SIXPAK**

**THEREFORE WE CAN ALSO DEFINE THE LAB SCALAR SPECTRUM IN TERMS OF SIXPAK**

**THE CM SPECTRUM IN THE FORM, SIXPAK**

**SIXPAK**

**G0(E,EP) = INTEGRAL F(E,EP,COS(CM))\*J\*D(COS(LAB)) SIXPAK**

**SIXPAK**

**CONSISTENT WITH THE ABOVE ASSUMPTION THAT THE ANGULAR DEPENDENCE SIXPAK**

**OF EP(LAB) CAN BE IGNORED THE JACOBIAN WILL NOT BE USED IN SIXPAK**

**PERFORMING THESE INTEGRALS - IN WHICH CASE THE INTEGRAL REDUCES SIXPAK**

**TO EXACTLY THE SAME FORM AS IF THE DATA WERE IN THE LAB SYSTEM. SIXPAK**

**SIXPAK**

**IT SHOULD BE NOTED THAT SINCE IN THIS CASE THE MF=4 ANGULAR SIXPAK**

**DISTRIBUTIONS ARE GIVEN IN THE CM SYSTEM AND WHEN USED IN ANY SIXPAK**

**APPLICATION THEY WILL BE TRANSFORMED TO THE LAB SYSTEM - WHEN SIXPAK**

**THIS IS DONE THE JACOBIAN WILL BE APPLIED. SIXPAK**

**SIXPAK**

**IN THIS CODE WHERE WE ARE MOSTLY CONCERNED WITH CONSERVING THE SIXPAK**

**NUMBER OF EMITTED PARTICLES AND AVERAGE ENERGIES THE NEUTRON SIXPAK**

**SPECTRA OUTPUT IN MF=5 WILL NOT BE COMPLETELY CONVERTED TO THE SIXPAK**

**LAB SYSTEM - ONLY FIRST ORDER CORRECTIONS WILL BE INCLUDED BY SIXPAK**

**INCREASING THE EMITTED PARTICLE ENERGY BY THE CENTER OF MASS SIXPAK**

**ENERGY, I.E., FOR A CENTER OF MASS SPECTRUM TABULATED AT CENTER SIXPAK**

**OF MASS ENERGIES EP(CM) THESE WILL ALL BE UNIFORMLY INCREASED SIXPAK**

**BY E(MM) TO ACCOUNT FOR THE CENTER OF MASS MOTION - THE SPECTRA SIXPAK**

**WILL NOT BE MODIFIED BY THE JACOBIAN FACTOR SQRT(EP(LAB)/EP(CM)) SIXPAK**

**SINCE THIS WOULD REQUIRE A DETAILED TRANSFORMATION IN ENERGY AND SIXPAK**

**COS(THETA) SPACE - WHICH IS JUDGED NOT TO BE WORTH PERFORMING SIXPAK**

**WITHIN THE LIMITS OF WHERE THE OUTPUT FROM THIS CODE IS INTENDED SIXPAK**

**TO BE USED. SIXPAK**

**SIXPAK**

**SINCE THE ANGULAR DISTRIBUTION IS ALWAYS OUTPUT IN THE SAME SIXPAK**

**SYSTEM AS WHICH IT IS GIVEN IN MF=6, NO TRANSFORMATION IS SIXPAK**

**REQUIRED FOR THE MF=4 OUTPUT. SIXPAK**

**SIXPAK**

**WHEN USED IN LOW ENERGY APPLICATIONS (E.G., FISSION REACTORS) THE SIXPAK**

**HIGH ENERGY SPECTRA PRESENTED IN MF=6 WILL BE MOSTLY IMPORTANT SIXPAK**

**SIMPLY IN CONSERVING PARTICLES, (E.G., AS IN (N,2N)) AND ENERGY SIXPAK**

**AND THE DETAILS OF THE CORRELATION AND GROSS ENERGY SPECTRA WILL SIXPAK**

**NOTE PLAY THAT IMPORTANT A ROLE. IN THIS CASE THE SPECTRA OUTPUT SIXPAK**

**BY THIS PROGRAM IN MF=5 SHOULD BE ADEQUATE. SIXPAK**

**SIXPAK**

**PLOTTAB FORMATTED OUTPUT SIXPAK**

**==================================================================SIXPAK**

**THIS PROGRAM CONTAINS ROUTINES TO PRODUCE OUTPUT THAT CAN BE USED SIXPAK**

**AS INPUT TO THE PLOTTAB CODE TO OBTAIN GRAPHIC RESULTS. SIXPAK**

**SIXPAK**

**THESE ROUTINES ARE DESIGNED ONLY FOR USE BY THE AUTHOR TO CHECK SIXPAK**

**THIS CODE. USERS ARE ASKED NOT TO ACTIVATE OR TRY TO USE THESE SIXPAK**

**ROUTINES. UNLESS YOU COMPLETELY UNDERSTAND THIS CODE THE RESULTS SIXPAK**

**CAN BE UNRELIABLE IF YOU ACTIVATE THESE ROUTINES. SIXPAK**

**SIXPAK**

**INPUT FILES SIXPAK**

**==================================================================SIXPAK**

**UNIT DESCRIPTION SIXPAK**

**---- ----------- SIXPAK**

**2 INPUT LINES (BCD - 80 CHARACTERS/RECORD) SIXPAK**

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

**SIXPAK**

**OUTPUT FILES SIXPAK**

**==================================================================SIXPAK**

**UNIT DESCRIPTION SIXPAK**

**---- ----------- SIXPAK**

**3 OUTPUT REPORT (BCD - 120 CHARACTERS/RECORD) SIXPAK**

**11 ENDF/B DATA MF=4 (BCD - 80 CHARACTERS/RECORD) SIXPAK**

**12 ENDF/B DATA MF=5 (BCD - 80 CHARACTERS/RECORD) SIXPAK**

**14 ENDF/B DATA MF=15 (BCD - 80 CHARACTERS/RECORD) SIXPAK**

**17 ENDF/B DATA MF=12 (BCD - 80 CHARACTERS/RECORD) SIXPAK**

**18 ENDF/B DATA MF=14 (BCD - 80 CHARACTERS/RECORD) SIXPAK**

**15 PLOTTAB INPUT PARAMETERS (BCD - 80 CHARACTERS/RECORD) SIXPAK**

**16 PLOTTAB FORMATTED OUTPUT (BCD - 80 CHARACTERS/RECORD) SIXPAK**

**SIXPAK**

**SCRATCH FILES SIXPAK**

**==================================================================SIXPAK**

**NONE SIXPAK**

**SIXPAK**

**OPTIONAL STANDARD FILE NAMES (SEE SUBROUTINE FILIO1 AND FILIO2) SIXPAK**

**==================================================================SIXPAK**

**UNIT FILE NAME SIXPAK**

**---- ---------- SIXPAK**

**2 SIXPAK.INP SIXPAK**

**3 SIXPAK.LST SIXPAK**

**10 ENDFB.IN SIXPAK**

**11 ENDFB.MF4 SIXPAK**

**12 ENDFB.MF5 SIXPAK**

**14 ENDFB.M15 SIXPAK**

**17 ENDFB.M12 SIXPAK**

**18 ENDFB.M14 SIXPAK**

**19 ENDFB.MT9 SIXPAK**

**20 ENDFB.MT3 SIXPAK**

**15 PLOTTAB.INP SIXPAK**

**16 PLOTTAB.CUR SIXPAK**

**SIXPAK**

**SIXPAK**

**INPUT PARAMETERS SIXPAK**

**==================================================================SIXPAK**

**LINE COLS. DESCRIPTION SIXPAK**

**---- ----- ----------- SIXPAK**

**1 1-72 ENDF/B INPUT DATA FILENAME SIXPAK**

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

**2-N 1-6 MINIMUM MAT FOR REQUESTED RANGE SIXPAK**

**9-11 MINIMUM MT FOR REQUESTED RANGE SIXPAK**

**12-17 MAXIMUM MAT FOR REQUESTED RANGE SIXPAK**

**20-22 MAXIMUM MT FOR REQUESTED RANGE SIXPAK**

**SIXPAK**

**LEAVE THE DEFINITION OF THE FILENAME BLANK - THE PROGRAM WILL SIXPAK**

**THEN USE THE STANDARD FILENAME (ENDFB.IN). SIXPAK**

**SIXPAK**

**UP TO 100 MAT/MT RANGES MAY BE SPECIFIED. THE LIST OF RANGES IS SIXPAK**

**TERMINATED BY A BLANK LINE. IF THE FIRST INPUT LINE IS COMPLETELY SIXPAK**

**BLANK ALL DATA WILL BE PROCESSED. SIXPAK**

**SIXPAK**

**EXAMPLE INPUT NO. 1 SIXPAK**

**------------------- SIXPAK**

**PROCESS ALL MF=6 DATA ON AN ENDF/B TAPE. USE THE STANDARD INPUT SIXPAK**

**DATA FILENAME ENDFB.IN IN THIS CASE THE USER CAN EITHER EXPLICITLYSIXPAK**

**SPECIFY THE FILENAME AND MAT/MT RANGE BY THE FOLLOWING 2 INPUT SIXPAK**

**LINES, SIXPAK**

**SIXPAK**

**ENDFB.IN SIXPAK**

**1 1 9999 999 SIXPAK**

**(BLANK LINE, TERMINATES REQUEST LIST) SIXPAK**

**SIXPAK**

**OR BY INPUTTING 2 BLANK LINE = PROCESS EVERYTHING. SIXPAK**

**SIXPAK**

**EXAMPLE INPUT NO. 2 SIXPAK**

**------------------- SIXPAK**

**PROCESS BE-9, MAT=425, MT=16. READ THE DATA FROM ENDFB6\BE9. SIXPAK**

**IN THIS CASE THE FOLLOWING 3 INPUT LINES ARE REQUIRED, SIXPAK**

**SIXPAK**

**ENDFBB6\BE9 SIXPAK**

**425 16 425 16 SIXPAK**

**(BLANK LINE, TERMINATES REQUEST LIST) SIXPAK**

**SIXPAK**

**EXAMPLE INPUT NO. 3 SIXPAK**

**------------------- SIXPAK**

**PROCESS ALL MT=16 (N,2N) DATA. THIS CAN BE DONE BY SPECIFYING THE SIXPAK**

**MAXIMUM MAT RANGE = 1 TO 9999, AND MT=16 FOR THE MINIMUM AND SIXPAK**

**MAXIMUM MT RANGE. READ THE DATA FROM ENDFB6\K300. IN THIS CASE SIXPAK**

**CASE THE FOLLOWING 3 INPUT LINES ARE REQUIRED, SIXPAK**

**SIXPAK**

**ENDFB6\K300 SIXPAK**

**1 16 9999 16 SIXPAK**

**(BLANK LINE, TERMINATES REQUEST LIST) SIXPAK**

**SIXPAK**

**=======================================================================SIXPAK**