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Volume 17, Part A

PROGRAM LINEAR (VERSION 77-1): LINEARIZE DATA IN THE EVALUATED NUCLEAR DATA FILE/ VERSION B (ENDF/B) FORMAT

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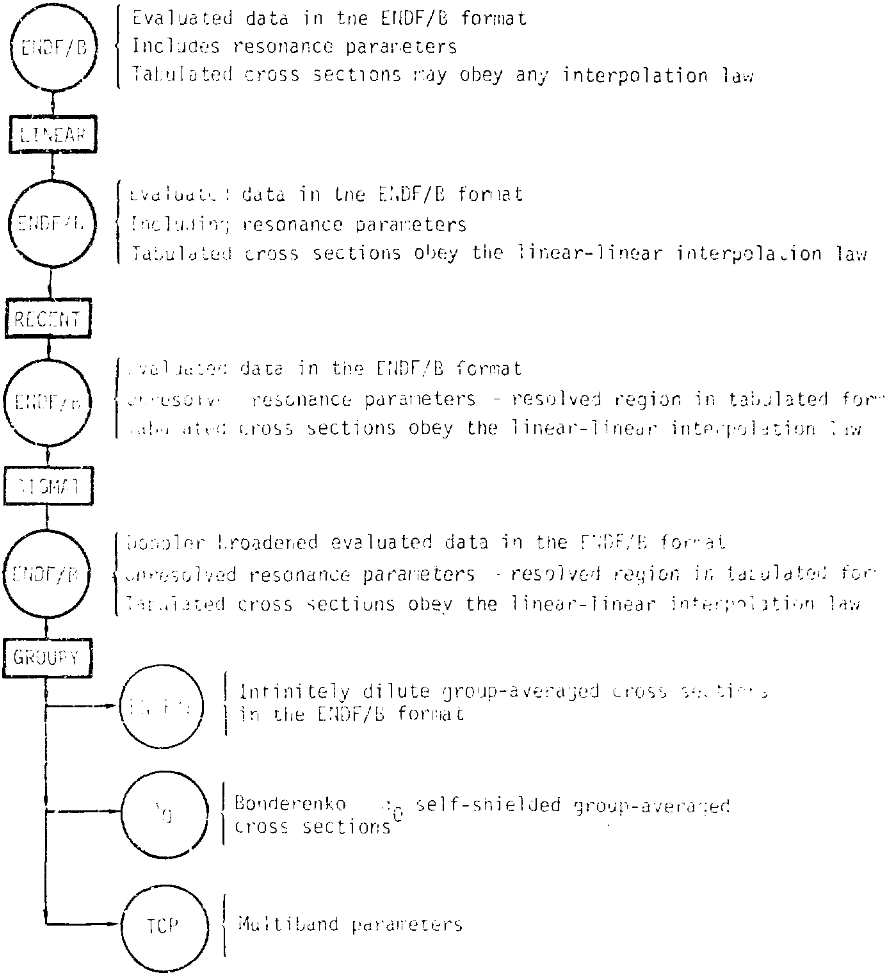
MS. Date: January [illegible], 1977

Foreword

[illegible] probability [illegible] evaluated [illegible] data into [illegible] form. [illegible], we have [illegible] computer codes [illegible] and [illegible].


ENDF/B
Evaluated data in the ENDF/B format
Includes resonance parameters
Tabulated cross sections may obey any interpolation law
LINEAR
ENDF/B
Evaluated data in the ENDF/B format
Including resonance parameters
Tabulated cross sections obey the linear-linear interpolation law
RECENT
ENDF/B
Evaluated data in the ENDF/B format
Unresolved resonance parameters - resolved region in tabulated form
Tabulated cross sections obey the linear-linear interpolation law
SIGMA1
ENDF/B
Doppler broadened evaluated data in the ENDF/B format
Unresolved resonance parameters - resolved region in tabulated form
Tabulated cross sections obey the linear-linear interpolation law
GROUPY
ENDF/B
Infinitely dilute group-averaged cross sections
in the ENDF/B format
σ_0
Bonderenko σ_0 self-shielded group-averaged
cross sections
TCP
Multiband parameters

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PROGRAM LINEAR (VERSION 77-1): LINEARIZE DATA IN THE EVALUATED NUCLEAR DATA FILE/VERSION B (ENDF/B) FORMAT

Abstract

[illegible] called LINEAR that both converts evaluated [illegible] linear-linear interpolatable form and [illegible] The main advantage of the code is [illegible] consider anything but [illegible]

Introduction

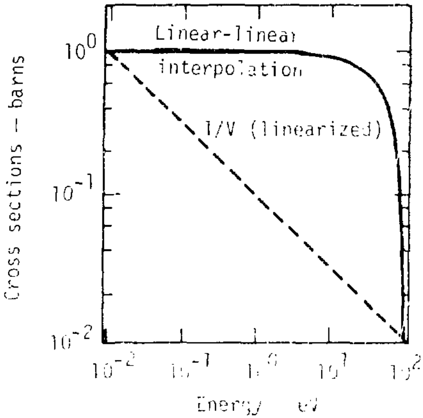
[illegible] Version B (ENDF/B) format is used to [illegible][1] Within the ENDF/B format, each section of [illegible] represented by a table of energy vs cross section [illegible] interpolation laws listed below:

[illegible]

[illegible]

Interpolation Laws

[illegible]



[illegible] plotted assuming linear-linear behavior (dashed curve) between [illegible]

[illegible] through [illegible], the program starts from the [illegible] halving [illegible] The interval is divided [illegible] middle [illegible] from the [illegible] will [illegible] the interval, [illegible] interpolation [illegible]

[illegible] the difference between [illegible] laws are:

[illegible]

[illegible]

[illegible] Laboratory.

[illegible]

[illegible]

[illegible] the difference by differentiating with respect to X

[illegible]

$$Y_K \left[1 - \left(\text{[illegible]} \right)^{D_K} \left(\text{[illegible]} \right)^{\text{[illegible]}} \right] \text{[illegible]} \left(\text{[illegible]} \right)^{\text{[illegible]}}$$

By expanding and studying [illegible] decreases (i.e., n_K [illegible] n_{K+1}), it is possible to [illegible] above difference [illegible] The trivial cases:

(A) Y_r [illegible]

and [illegible] results [illegible] differences [illegible].

[illegible]

and [illegible]

(C) D_K = 0 or 1

and [illegible] r-[illegible] [illegible]

[illegible]

[illegible] arbitrary [illegible]

[illegible]

Thinning

The LINEAR program uses a multi-level, trial [illegible] to minimize the size of each cross section [illegible] determine [illegible]

[illegible]

Limitations and Assumptions

[illegible]

[illegible] described [illegible] FORTRAN-[illegible] computer.

Requirements

[illegible]

Input Cards

[illegible]

Example Output Listing

[illegible]

Error Messages

[illegible] underlined [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Operation at LLL

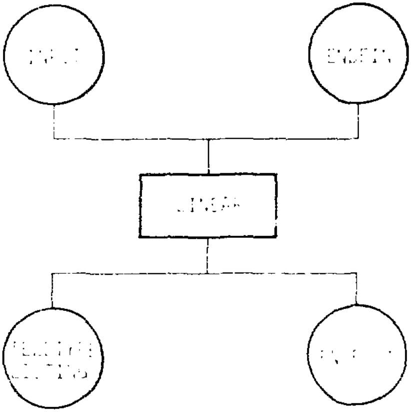
[illegible]

[illegible]

[illegible]

[illegible]

[illegible] program will automatically use disc files as described [illegible] files, below.



[illegible]

Program Listing

```
      PROGRAM [illegible]
     1 TAPE2[illegible],TAPE[illegible],TAPE[illegible]
C
C     PROGRAM [illegible]
C     VERSION [illegible] MAY 19[illegible]
C     VERSION [illegible] APRIL 19[illegible]
C     VERSION [illegible] OCTOBER 19[illegible]
C     VERSION [illegible] JANUARY 19[illegible]
C     REPORT [illegible]
C
C     WRITTEN BY [illegible]
C     [illegible]
C                 [illegible]
C                 [illegible]
C                 [illegible]
C                 [illegible]
C     [illegible]
C
C     [illegible]
C     [illegible]
C     [illegible]
C
C     [illegible]
C     [illegible]
C     [illegible]
C     [illegible]
C     [illegible]
C     [illegible]
C
C     [illegible]
C     [illegible]
C     [illegible]
C
C     [illegible]
C     [illegible]
C     [illegible]
C     [illegible]
C
C     [illegible]
C     [illegible]
C     [illegible]
```

[illegible]

FRACTIONAL CONVERGENCE CRITERIA
MUST BE GREATER THAN ZERO

[illegible]

```
C      IS THIS A SENS,FENS,MENS OR TENS CARD.
       IF(MIND) 20,[illegible]
C  -- YES. IF TEND CARD THIS IS END. IF NOT READ NEXT HEAD CARD
   20 IF(MATH) [illegible]
C  -- SECTION HEAD CARD. [illegible] SECTION.
   30 IF(MEH [illegible]
C      NO [illegible] SECTION [illegible] LINEARIZED FILE
   40 CALL MI[illegible]
       GO TO 10
C  -   YES [illegible] LINEARIZ[illegible] THIS SECTION.
   50 CALL ME[illegible]
C      WRITE [illegible]
       CALL [illegible]
       GO TO 10
C      END [illegible]
   60 END FILE [illegible]
       REWIND [illegible]
       REWIND [illegible]
C      WRITE [illegible]
       WRITE [illegible]
[illegible]
```

```
      [illegible]
      GO TO 130
C     LOG ENERGY [illegible] LINEAR [illegible]
   50 [illegible]
      [illegible]
      GO TO [illegible]
C     LINEAR ENERGY [illegible]
  100 [illegible]
      [illegible]
      [illegible]
C     LOG ENERGY [illegible]
  110 [illegible]
      [illegible]
C     [illegible]
C     [illegible]
  120 IF [illegible]
C     DETERMINE [illegible]
C     [illegible] LINEAR INTERPOLATION
      [illegible]
      [illegible]
C     [illegible] INTERVAL
      [illegible]
```

[illegible]

```
      RETURN
5090  FORMAT [illegible]
5091  FORMAT [illegible]
5100  FORMAT [illegible]
[illegible] FORMAT [illegible]
[illegible] FORMAT [illegible]
[illegible] FORMAT [illegible]
[illegible] FORMAT [illegible]
[illegible]
```

```
C       N?T READ NEXT RA [illegible]
   40 NN 1000
      IF (LEFT [illegible] NN) NN LEFT
      LEFT LEFT NN
      IXTLOW IXTHI
      IXTHI IXTHI NN
      READ (ITAPE [illegible]
      GO TO 30
C     DEFINE INDEX RELATIVE TO BEGINNING OF [illegible] THE TAPE [illegible]
C     RETURN VALUE
   50 INDEX [illegible]
      XRAGE [illegible] INDEX
      RETURN
 5000 FORMAT [illegible]
 5010 FORMAT [illegible]
      END
      FUNCTION [illegible]
C
C       [illegible] ARRAY [illegible] THAT [illegible]
C       [illegible]
C       [illegible] THE DATA [illegible]
C       DATA [illegible] AT A TIME AND [illegible]
C
      [illegible]
```

[illegible]

References

1. D. Garber et al., [illegible], [illegible], Brookhaven National Laboratory, Upton, New York, Rept. BNL-NCS-50496 (ENDF-102), 1972).
2. D. E. Cullen et al., "Tabular Cross Section Generation and Utilization Techniques," in [illegible] (National Bureau of Standards, Washington, D.C., March 1975), p. 419-421.

MSG/vt/mla