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NEUTRON NUCLEAR DATA OF ^{9}Be ADOPTED IN JENDL-2

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Keiichi SHIBATA and Kimihiro IOKI*

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Neutron Nuclear Data of ^{9}Be Adopted in JENDL-2

Keiichi SHIBATA and Kimihiro IOKI*

Department of Physics

Tokai Research Establishment, JAERI

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Neutron nuclear data of ^{9}Be were evaluated for JENDL-2 in the energy range from 10^{-5} eV to 20 MeV. Evaluated quantities are the total, elastic scattering, (n,2n), (n,γ), (n,p), (n,d), (n,t) and (n,α) reaction cross sections and the angular and energy distributions of emitted neutrons. The present evaluation was completely based on available experimental data.

Keywords: Evaluation, Neutron Nuclear Data, Beryllium-9, Cross Section, JENDL-2, 10^{-5} eV ∿ 20 MeV

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* Mitsubishi Atomic Power Industries, Inc.

JENDL-2に採用された^{9}Beの中性子核データ

日本原子力研究所東海研究所物理部
柴田　恵一・伊尾木　公裕*

（1984年8月17日受理）

JENDL-2のために^{9}Beの中性子核データを10^{-5} eVから20MeVのエネルギーにわたって評価した。評価した量は全断面積，弾性散乱断面積，(n, 2n)反応断面積，(n, γ)反応断面積，(n, p)反応断面積，(n, d)反応断面積，(n, t)反応断面積，(n, α)反応断面積および放出中性子の角度分布，エネルギー分布である。今回の評価は全面的に実験値に基づいて行われた。

* 三菱原子力工業㈱

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1. Introduction

Beryllium has been considered as a major constituent of fusion reactors. It is an important neutron multiplying material, and these neutrons produce tritium through the reactions $^{6}Li(n,\alpha)t$ and $^{7}Li(n,n')\alpha t$. Thus, neutron nuclear data of ^{9}Be are necessary for fusion neutronics calculations.

The first version of Japanese Evaluated Nuclear Data Library (JENDL-1), which contains 72 nuclides, was released in autumn 1977. However the data of ^{9}Be are not included in JENDL-1. Hence the new evaluation was planned for the second version (JENDL-2) in spring 1982. It was completed in September 1982, and JENDL-2 was released at the end of that year.

The presently evaluated data were obtained from available experimental data by using Neutron Data Evaluation System (NDES)[1]. The possible neutron-induced reactions below 20 MeV are given in Table 1, together with their Q-values and threshold energies. The data of the (n,np), (n,nd) and (n,nt) reactions were not evaluated, because the cross sections were expected to be very small. Moreover, the $^{9}Be(n,n\alpha)^{5}He$ reaction contributes to the (n,2n) reaction, and so its cross section was included in the (n,2n) cross section.

2. Total Cross Section

The total cross section has been measured by many groups. Disregarding the measurements with poor accuracy and resolution, the following experimental data were considered here:

Adair et al.[2]	(1949),	30 keV ∿ 1 MeV,
Bockelman[3]	(1950),	30 keV ∿ 1.4 MeV,
Bockelman et al.[4]	(1951),	1 MeV ∿ 3.3 MeV,
Hibdon and Langsdorf, Jr.[5]	(1955),	1 keV ∿ 55 keV,
Fowler and Cohn[6]	(1959),	1.9 MeV ∿ 4.6 MeV,
Bilpuch et al.[7]	(1962),	53 keV ∿ 850 keV,
Foster, Jr. and Glasgow[8]	(1971),	2.5 MeV ∿ 15 MeV,
Schwartz et al.[9]	(1971),	0.5 MeV ∿ 20 MeV,
Cabe and Cance[10]	(1973),	0.1 MeV ∿ 6 MeV,
Auchampaugh et al.[11]	(1979),	1 MeV ∿ 14 MeV.

In the MeV region the data of Auchampaugh et al.[11] are the most reliable ones measured with a systematic error of 1.7%, a statistical error of 0.5 ∿ 2% and energy resolution of ± 3 keV at 10 MeV.

Above 1 keV, the evaluation was done with the eye-guide method using NDES[1]. In the epithermal energy region, the cross section approaches to 6 barns. Thus, below 1 keV the cross section was given by

$$\sigma_{tot} = 6.0 + \sigma_{n,\gamma} \quad \text{barns},$$

where $\sigma_{n,\gamma}$ is the radiative capture reaction cross-section described in Sect. 5. The present results are shown in Figs. 1-4.

3. Elastic Scattering

The elastic scattering cross section was obtained by subtracting the reaction cross section from the total cross section. Figures 5 and 6 show the results.

The angular distribution of elastically scattered neutrons below 50 keV was assumed to be isotropic in the center-of-mass system. Between 50 keV and 15 MeV the Legendre coefficients were obtained from the following experimental data:

50 keV ∿ 905 keV	Lane et al.[12]	(1964),
930 keV ∿ 2.25 MeV	Lane et al.[13]	(1961),
2.48 MeV ∿ 2.97 MeV	Levin and Cranberg[14]	(1960),
3.0 MeV ∿ 3.75 MeV	Phillips[15]	(1961),
4.1 MeV ∿ 6.0 MeV	Marion et al.[16]	(1959),
6.97 MeV ∿ 14.94 MeV	Hogue et al.[17]	(1978).

Above 15 MeV, the angular distribution was calculated with the spherical optical model. As the neutron potential parameters, those of Agee and Rosen[18] were employed in the present calculation, and they are listed as follows:

$$V = 49.3 - 0.33 \times E_{CM} \quad \text{(MeV)},$$
$$W_s = 5.75 \quad \text{(MeV)},$$
$$V_{so} = 5.5 \quad \text{(MeV)},$$
$$r_0 = r_s = r_{so} = 1.25 \quad \text{(fm)},$$
$$a = a_{so} = 0.65 \quad \text{(fm)},$$
$$b = 0.70 \quad \text{(fm)},$$

where E_{CM} is the incident energy in the center-of-mass system.

4. The (n,2n) Reaction

The (n,2n) reaction is supposed to proceed via the following processes:

Sequential decay

$$n + {}^9Be \rightarrow n + {}^9Be^* \rightarrow 2n + {}^8Be \rightarrow 2\alpha + 2n$$
$$\rightarrow \alpha + {}^6He^* \rightarrow 2\alpha + 2n$$

$$\rightarrow \alpha + {}^{5}He + n \rightarrow 2\alpha + 2n$$

Simultaneous breakup

$$n + {}^{9}Be \rightarrow 2\alpha + 2n.$$

However, enough information on the reaction mechanism has not been obtained experimentally, and so the present evaluation did not divide the (n,2n) cross section into the partial cross sections. The measurements of the total (n,2n) cross section considered here are the following:

Ashby et al.[19]	(1958),	14.1 MeV,
Catron et al.[20]	(1961),	6.6 MeV ∿ 8.3 MeV,
Holmberg and Hansén[21]	(1969),	2 MeV ∿ 6.4 MeV,
Bloser[22]	(1972),	2.4 MeV ∿ 3.3 MeV,
Drake et al.[23]	(1977),	5.9, 10.1, 14.2 MeV.

The evaluated data were obtained using the eye-guide method, and the result is shown in Fig. 7 together with the ENDF/B-IV data. In ENDF/B-IV the (n,2n) cross section was divided into four partial cross sections, but this division is quite arbitrary.

The angular distribution of neutrons from the (n,2n) reaction was assumed to be isotropic in the laboratory system. The energy spectrum was assumed to have an evaporation shape, and the nuclear temperature was obtained from the measurement of double-differential cross sections by Drake et al.[23]

5. The (n,γ) Reaction

As the thermal cross section we adopted a value of 7.6 mb measured by Jurney[24]. The value was also recommended by Mughabghab et al.[25] The cross section was extrapolated by assuming a form of 1/v up to 20 MeV, i.e.,

$$\sigma_{n,\gamma} = 1.209 \times 10^{-3} \, [E_n(eV)]^{-1/2} \text{ barns.}$$

In higher energy regions, this assumption may not be appropriate. However, the cross section is expected to be extremely small, and thus no problem arises practically. The result is shown in Fig. 8.

6. The (n,p) Reaction

Alburger[26] observed β-rays from ^{9}Li and deduced a value of 0.7 mb for the (n,p) cross section at 15.5 MeV. Augustson and Menlove[27] measured delayed-neutron production cross sections for the ^{9}Be(n,p)^{9}Li reaction at 14.5 and 14.9 MeV. Their values are 0.053 ± 0.005 and 0.210 ± 0.013 mb, respectively. According to "Table of Isotopes"[28], the probability for delayed neutron decay, $^9\text{Li} \rightarrow {}^9\text{Be}^* \rightarrow n + 2\alpha$, is 35%, and so we can obtain the (n,p) cross sections of 0.15 ± 0.02 mb (14.5 MeV) and 0.60 ± 0.05 mb (14.9 MeV). Between the threshold energy and 16 MeV the evaluation was made by using the above experimental data. At 20 MeV we set a value of 2 mb, which was taken from ENDF/B-IV, and the straight line was drawn from 16 to 20 MeV. The present result is illustrated in Fig. 9.

7. The (n,d) Reaction

As to the (n,d) reaction, only the experimental data of Scobel[29] are available. Hence they were adopted for the present evaluation, and the result is shown in Fig. 10.

8. The (n,t) Reaction

As to the (n,t) reaction, the following activation data which were obtained by measuring β-rays from tritium are available:

Wyman et al.[30]	(1958),	14.1 MeV,
Biro et al.[31]	(1975),	14.7 MeV,
Qaim and Wölfle[32]	(1978),	22.5 MeV.

The evaluation was made on the basis of these measurements, and the result is shown in Fig. 11. The $(n,t_1\gamma)$ data of Benveniste et al.[33], which do not include the (n,t_0) component, indicated some structure at 14 MeV, as seen in Fig. 11, and ENDF/B-IV traced it. However, this structure has not been observed in the recent measurements[34,35].

9. The (n,α) Reaction

The $^9Be(n,\alpha)^6He$ reaction leaving the residual nucleus in the excited states is known[28] to proceed to the (n,2n) reaction. Thus, only the data of the (n,α_0) reaction were evaluated. The measurements on which the evaluation was based are the following:

Battat and Ribe[36]	(1953),	14.1 MeV,
Stelson and Campbell[37]	(1957),	0.7 MeV ∿ 4.4 MeV,
Bass et al.[38]	(1961),	3.9 MeV ∿ 8.6 MeV,
Paić et al.[39]	(1967),	14.4 MeV,
Perroud and Sellem[40]	(1974),	13.99 MeV.

Among the above measurements, the data of Paić et al.[39] and of Perroud and Sellem[40] were obtained by measuring α-particles, while the others were obtained by measuring β-rays from ^6He. Figure 12 shows the result.

10. Concluding Remarks

Evaluation of neutron nuclear data for ^9Be was performed in the energy range from 10^{-5} eV to 20 MeV. The present evaluation was completely based on available experimental data.

The (n,2n) cross section is important for fusion reactors, but the

experimental data have large uncertainties. Hence new measurements are required in order to raise the reliability of the nuclear data.

In the present work, the inelastic scattering cross section was not given, because its contribution was included in the (n,2n) cross section. From the viewpoint of transport calculations, however, this treatment is not preferable. This problem is left for future work.

Acknowledgments

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Table 1 Reaction Q-values and threshold energies.

Reaction	Q-value (MeV)	Threshold (MeV)
$^{9}Be(n,\gamma)^{10}Be$	6.81210	0.0
$^{9}Be(n,2n)^{8}Be$	- 1.66378	1.84999
$^{9}Be(n,p)^{9}Li$	-12.8246	14.2600
$^{9}Be(n,d)^{8}Li$	-14.6629	16.3040
$^{9}Be(n,t)^{7}Li$	-10.4414	11.6100
$^{9}Be(n,\alpha)^{6}He$	- 0.60251	0.669944
$^{9}Be(n,np)^{8}Li$	-16.8879	18.7781
$^{9}Be(n,nd)^{7}Li$	-16.6960	18.5647
$^{9}Be(n,nt)^{6}Li$	-17.6892	19.6691
$^{9}Be(n,n\alpha)^{5}He$	- 2.46694	2.74305

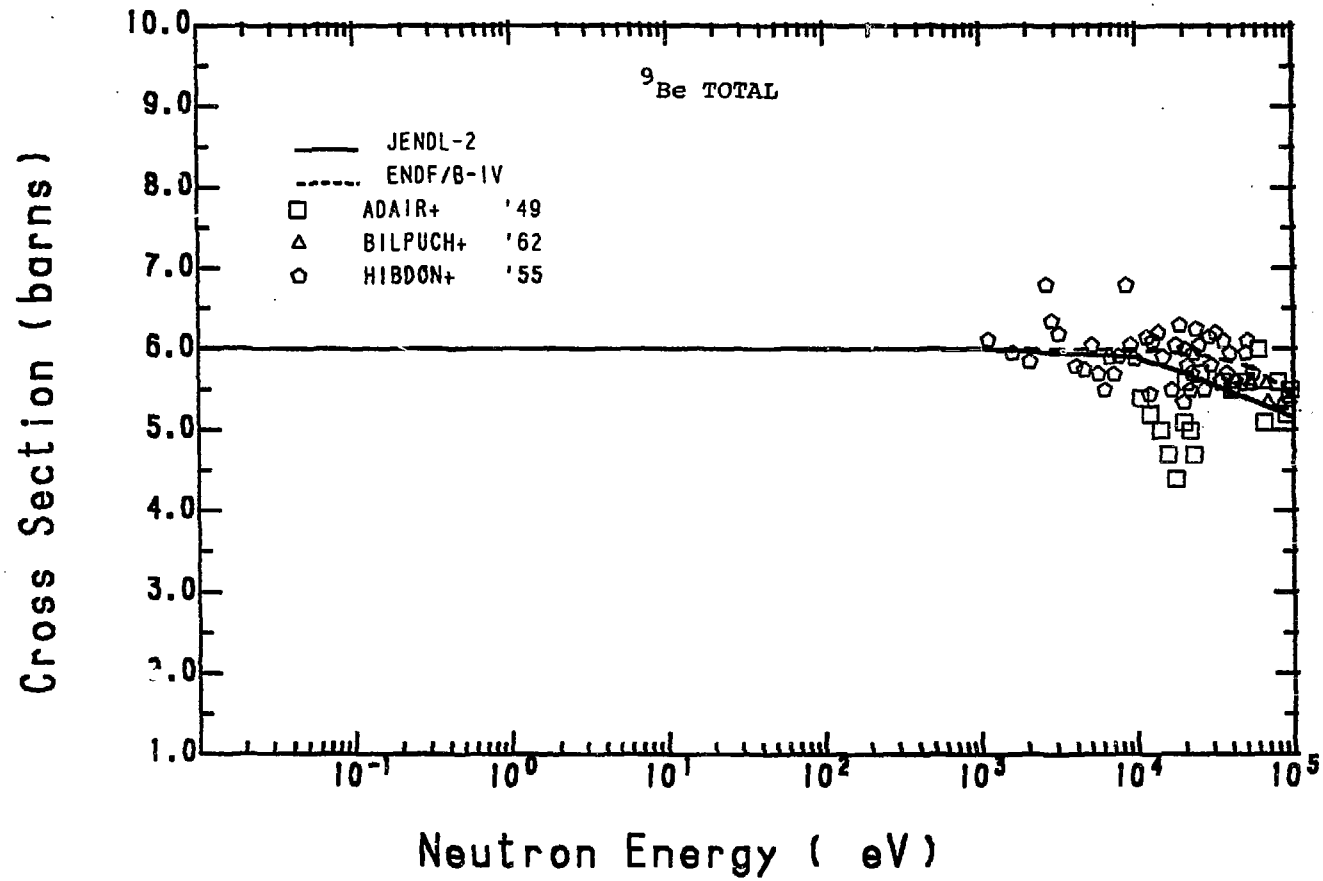

Fig. 1 Measured and evaluated total cross sections from 10^{-2} eV to 100 keV.

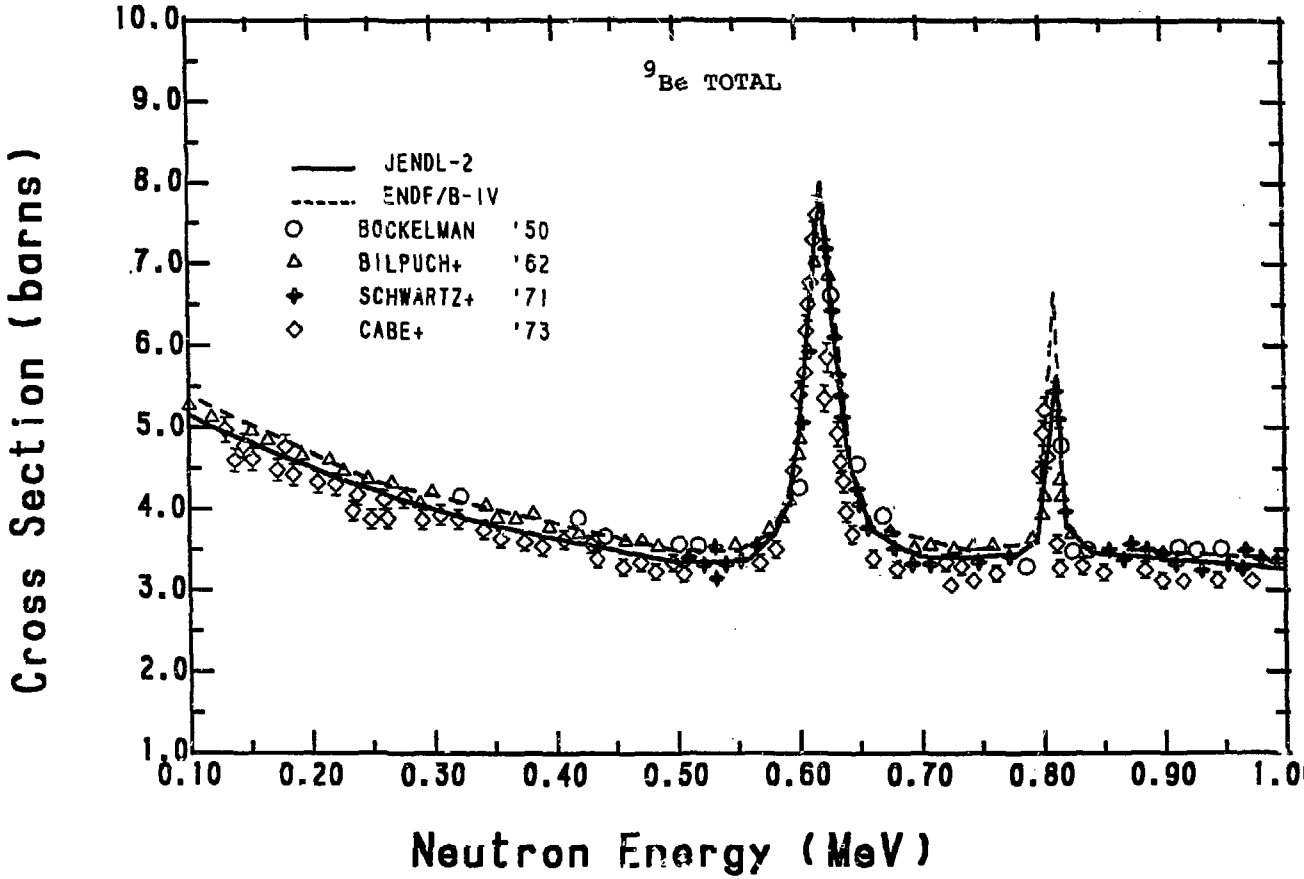

Fig. 2 Measured and evaluated total cross sections from 0.1 MeV to 1 MeV.

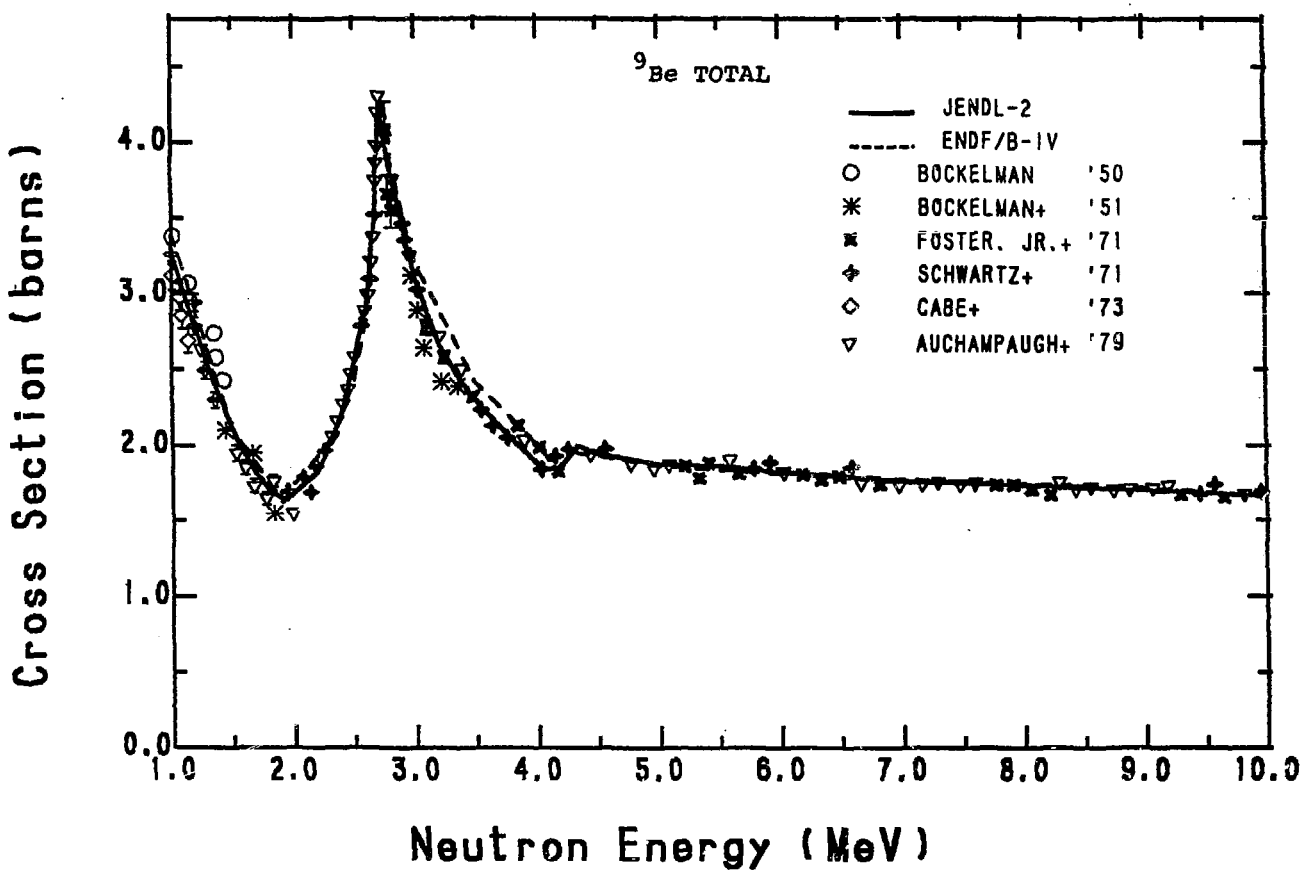

Fig. 3 Measured and evaluated total cross sections from 1 MeV to 10 MeV.

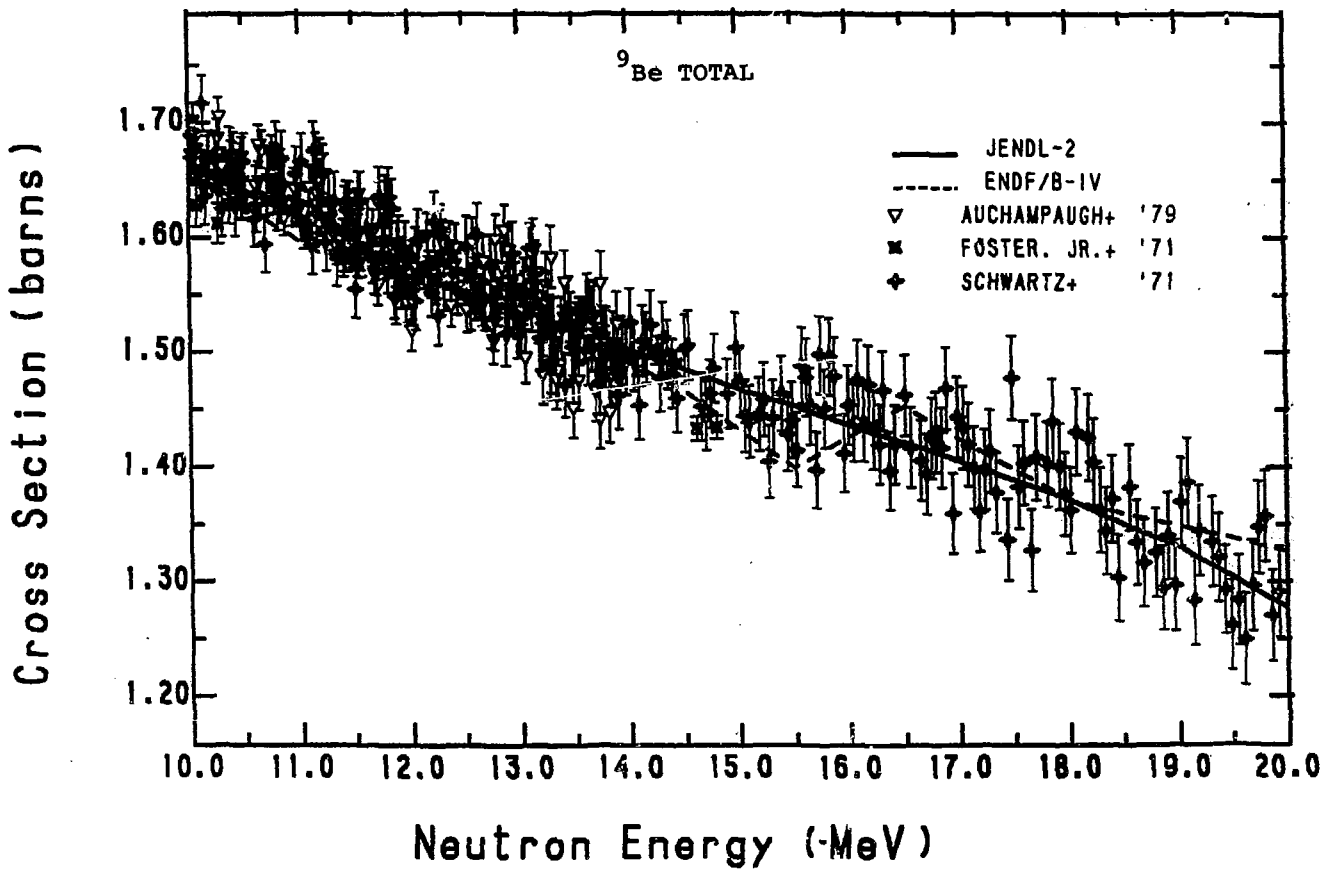

Fig. 4 Measured and evaluated total cross sections from 10 MeV to 20 MeV.

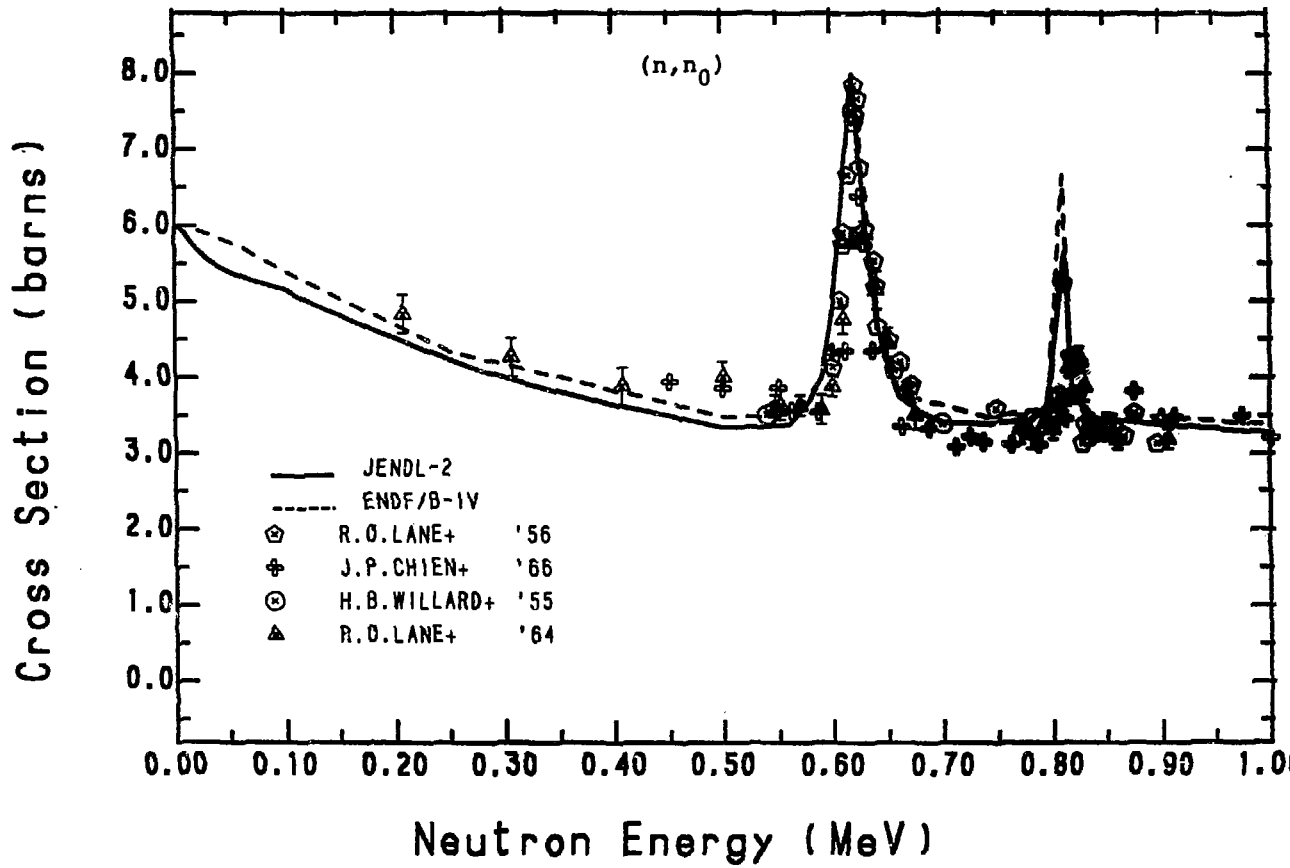

Fig. 5 Measured and evaluated elastic scattering cross sections below 1 MeV.

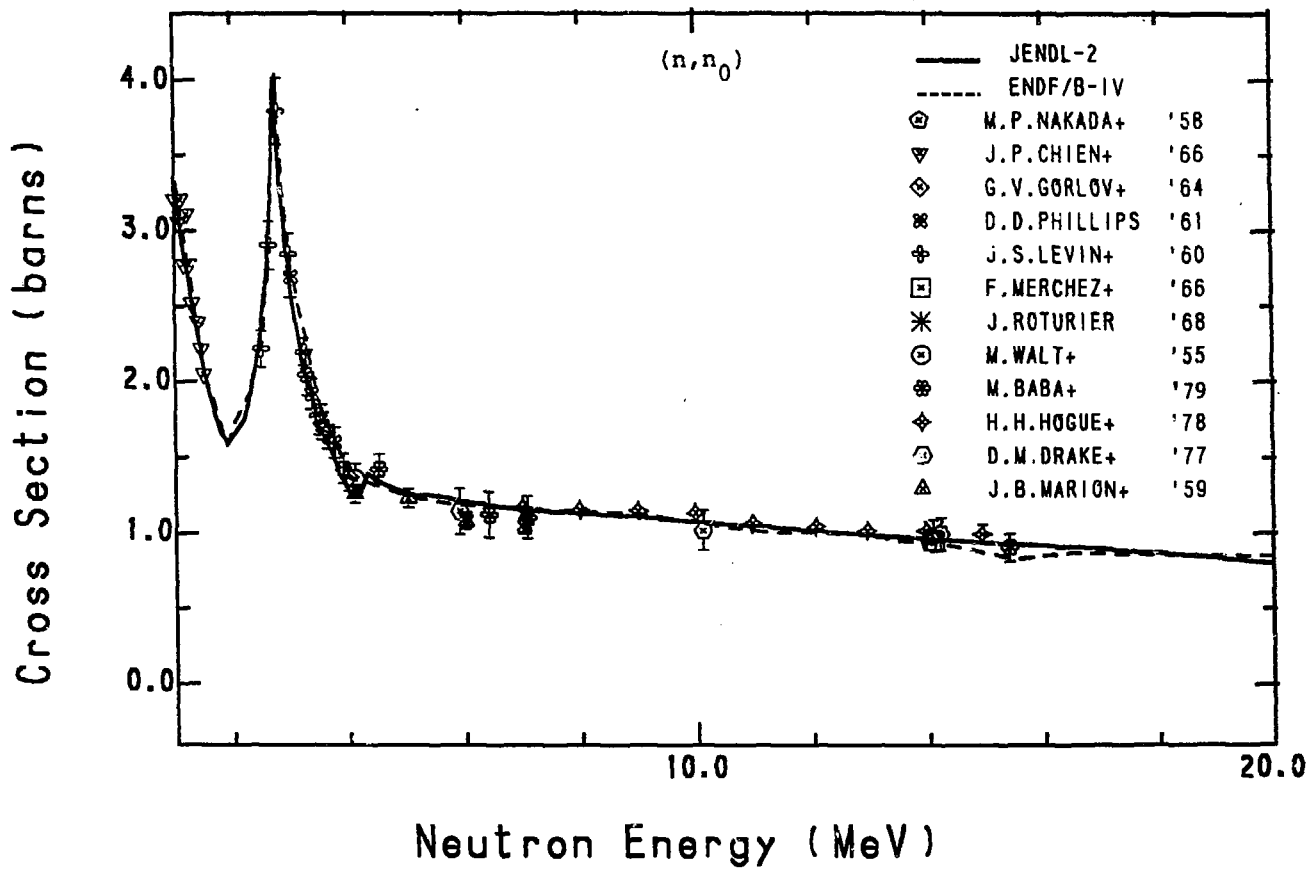

Fig. 6 Measured and evaluated elastic scattering cross sections above 1 MeV.

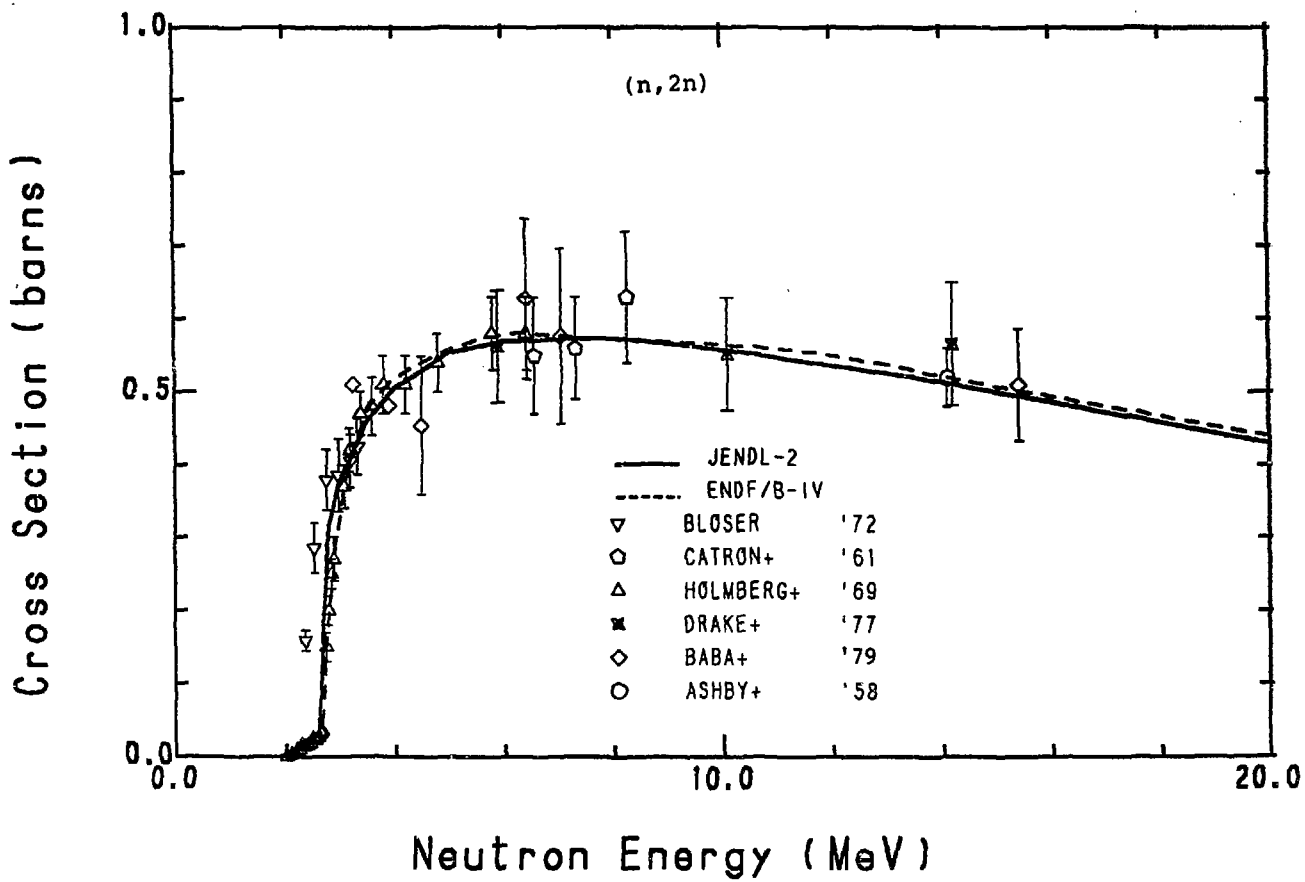

Fig. 7 Measured and evaluated (n,2n) cross sections.

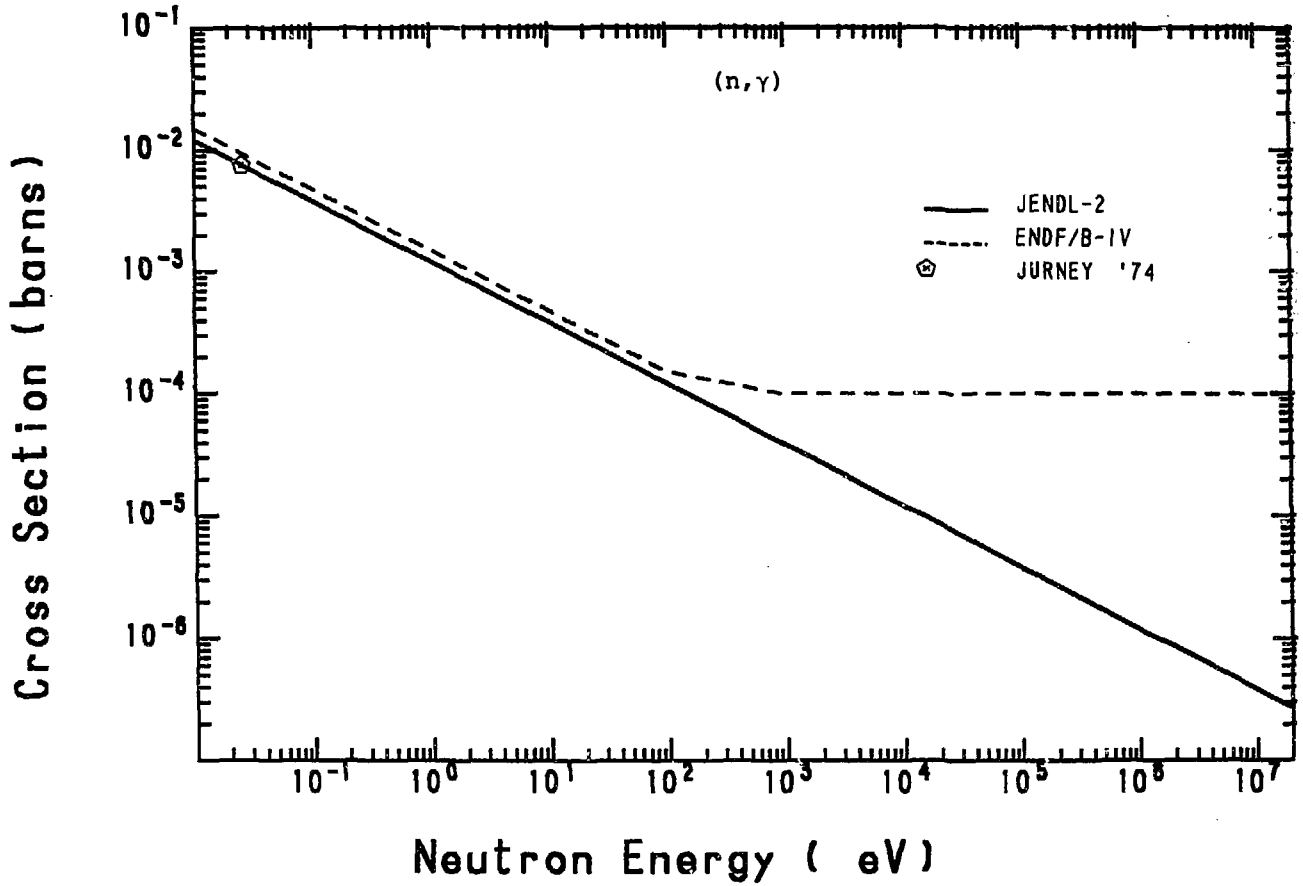

Fig. 8 Measured and evaluated (n,γ) cross sections.

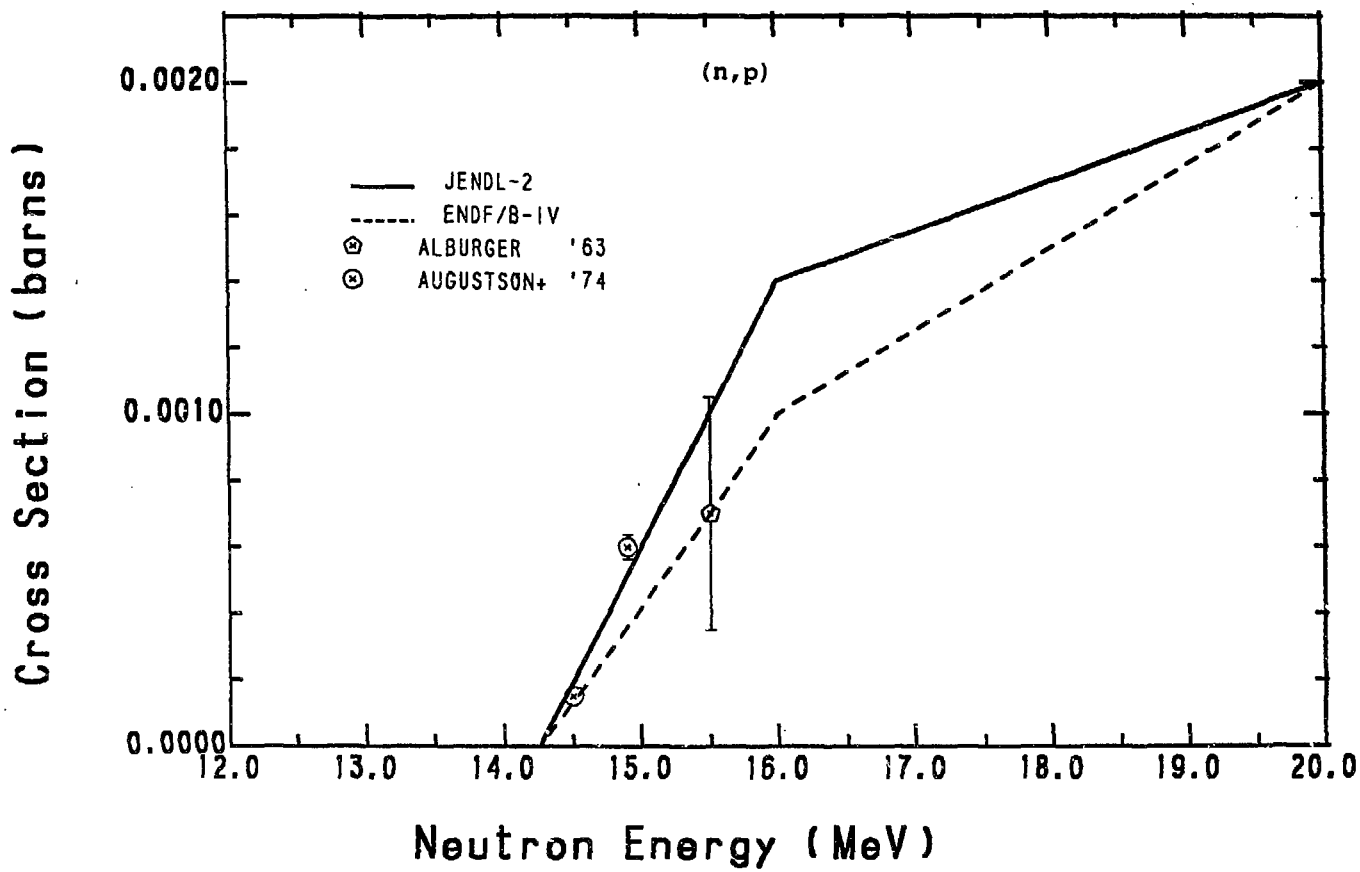

Fig. 9 Measured and evaluated (n,p) cross sections.

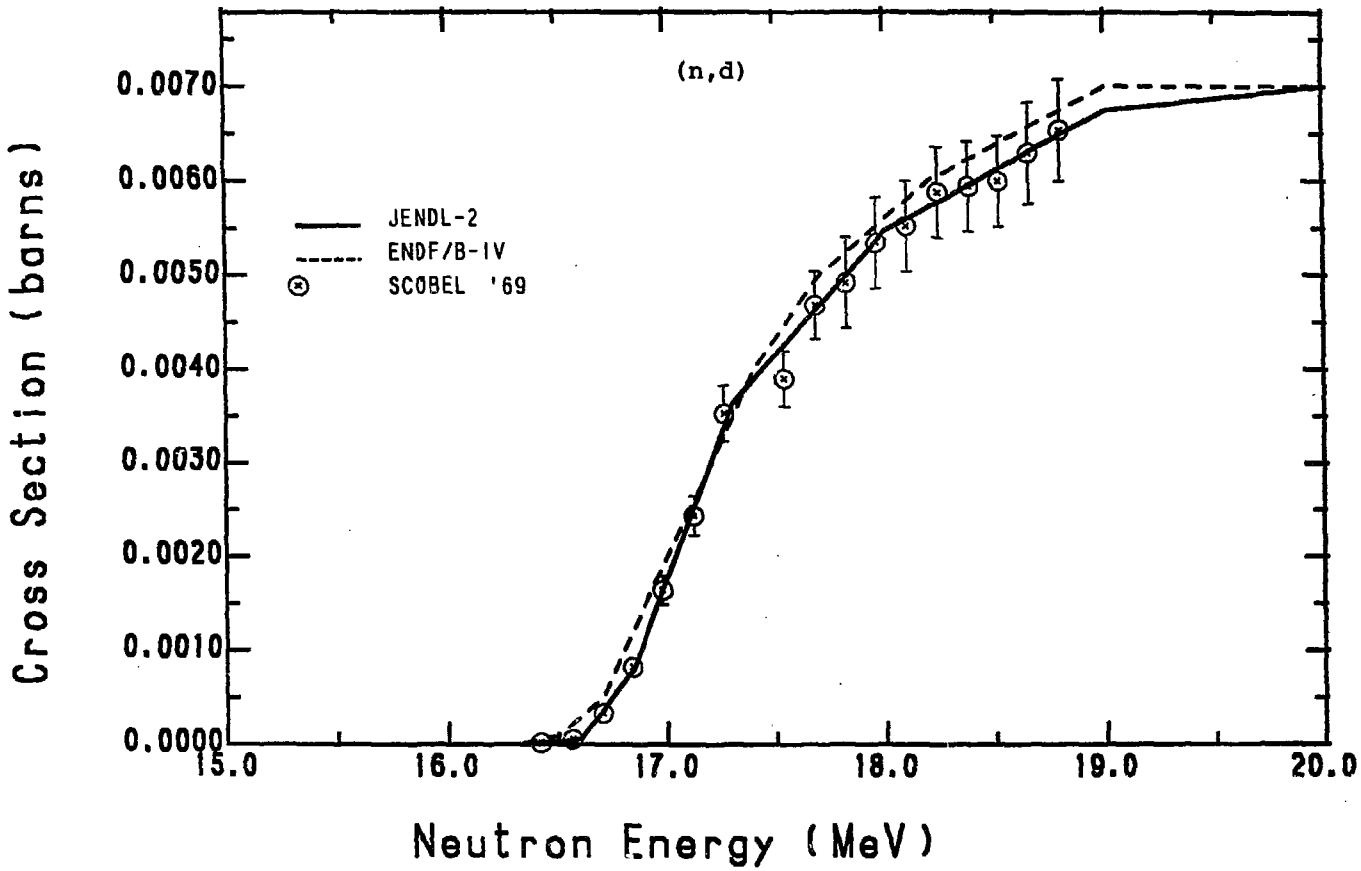

Fig. 10 Measured and evaluated (n,d) cross sections.

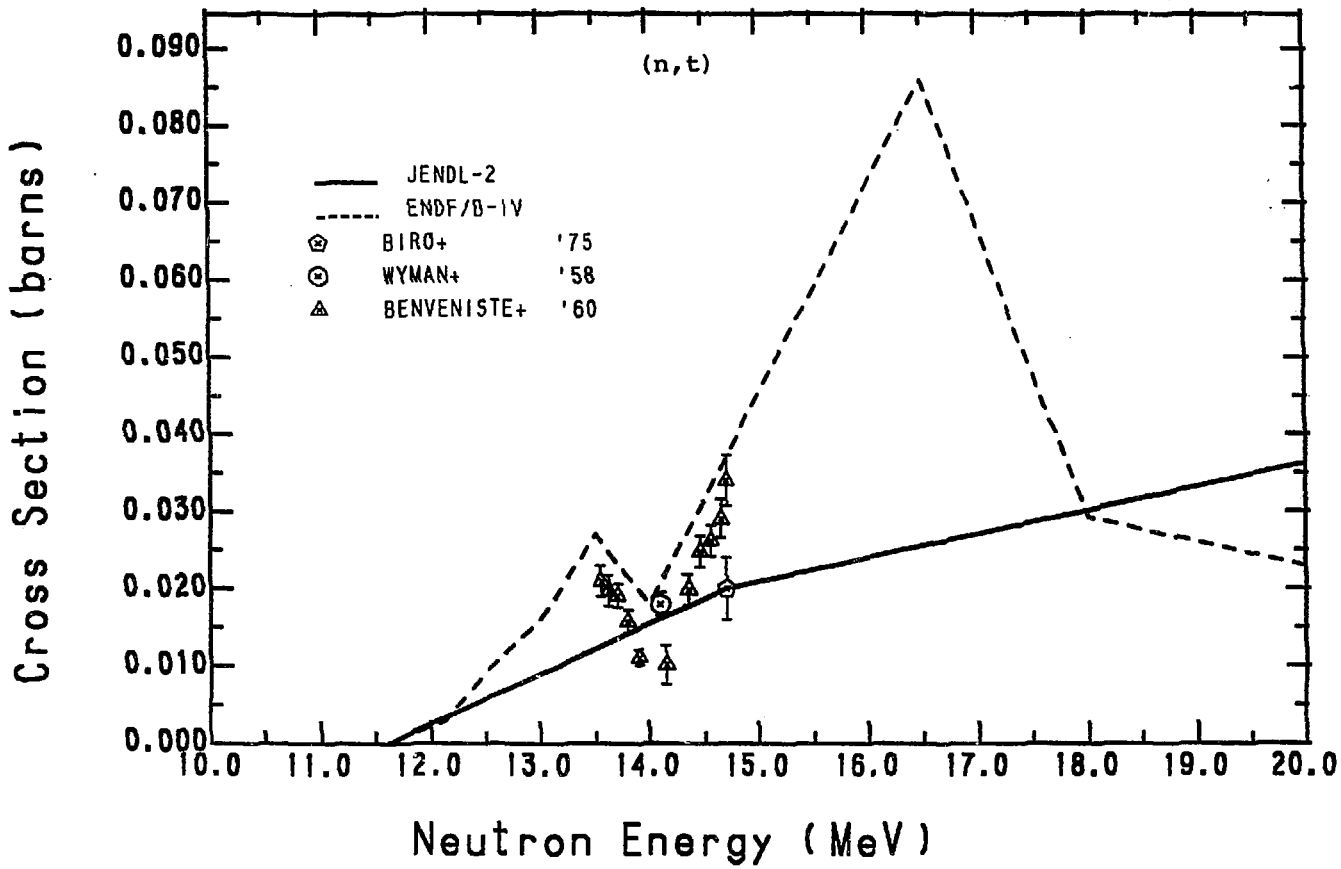

Fig. 11 Measured and evaluated (n,t) cross sections.

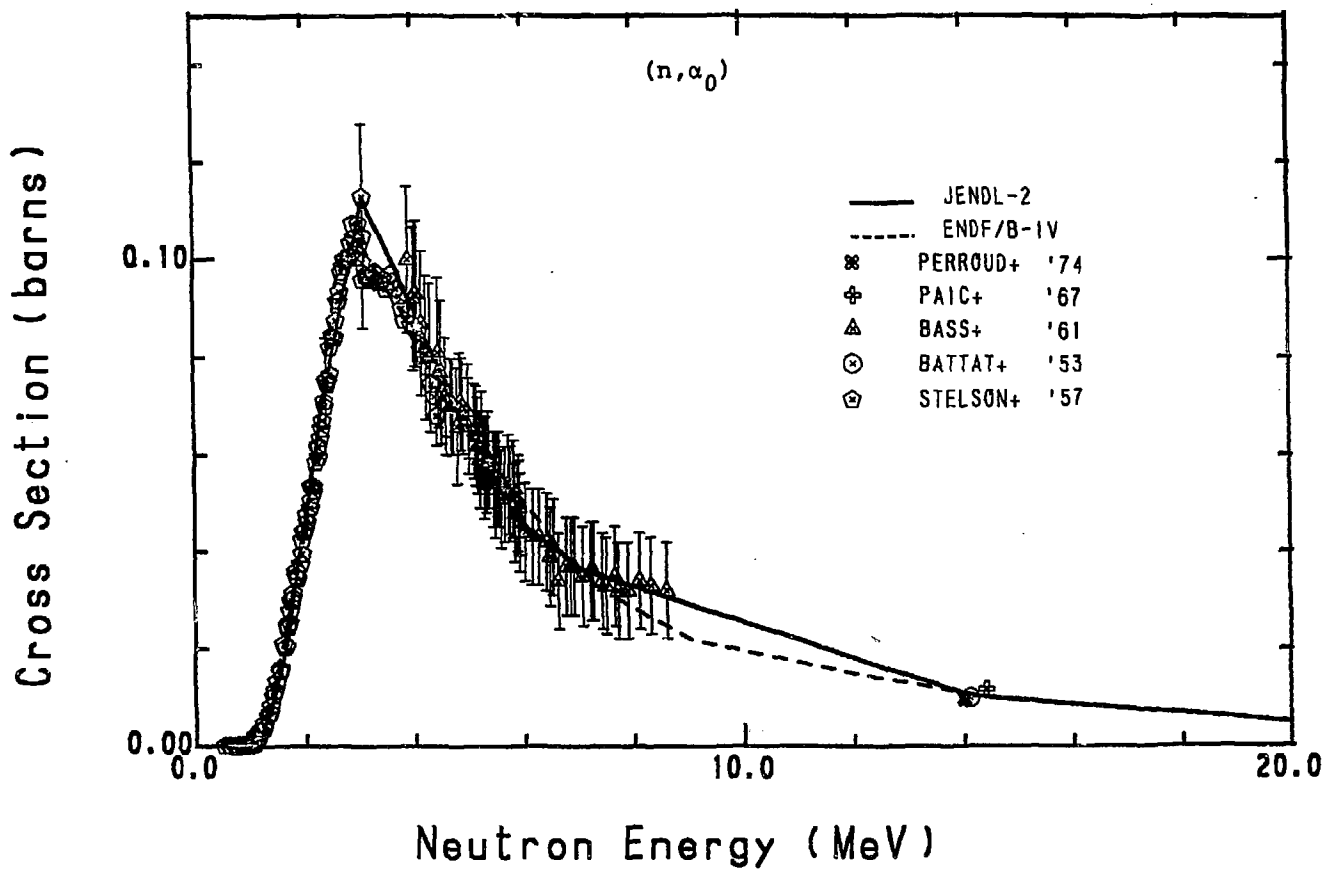

Fig. 12 Measured and evaluated (n,α_0) cross sections.

Appendix

List with ENDF/B-IV format

```
........10........20........30........40........50........60......MAT MF MT   SEQ
 4.00900+ 3 8.93476+ 0          0          0          0          142041 1451    1
 0.0    + 0 0.0    + 0          0          0         99           02041 1451    2
  4-BE-  9 JAERI+     EVAL-SEP82 K.SIBATA,K.IOKI(MAPI)             2041 1451    3
                      DIST-MAR83 REV1-NOV83                        2041 1451    4
HISTORY                                                            2041 1451    5
82-09 NEW EVALUATION WAD MADE BY K.SIBATA(JAERI) AND K.IOKI(MAPI) 2041 1451    6
83-11 COMMENT WAS ADDED.                                           2041 1451    7
                                                                   2041 1451    8
MF=1  GENERAL INFORMATION                                          2041 1451    9
  MT=451   DESCRIPTIVE DATA                                        2041 1451   10
                                                                   2041 1451   11
MF=2  RESONANCE PARAMETERS                                         2041 1451   12
  MT=151   SCATTERING RADIUS ONLY                                  2041 1451   13
                                                                   2041 1451   14
      2200-M/SEC CROSS SECTIONS AND RESONANCE INTEGRALS.           2041 1451   15
                      2200 M/SEC        RES. INTEG.                2041 1451   16
         ELASTIC        6.000  B           -                       2041 1451   17
         CAPTURE        0.0076 B         3.42 MILLI-B              2041 1451   18
         TOTAL          6.0076 B           -                       2041 1451   19
                                                                   2041 1451   20
MF=3  NEUTRON CROSS SECTIONS                                       2041 1451   21
  MT=1      TOTAL                                                  2041 1451   22
        BELOW 1 KEV, TOTAL = 6.0 + CAPTURE (B).                    2041 1451   23
        ABOVE 1 KEV, DATA LISTED IN /1/-/10/ WERE USED.            2041 1451   24
                                                                   2041 1451   25
  MT=2      ELASTIC                                                2041 1451   26
        ELASTIC = TOTAL - REACTION.                                2041 1451   27
                                                                   2041 1451   28
  MT=16     (N,2N)                                                 2041 1451   29
        DATA LISTED IN /11/-/15/ WERE USED.                        2041 1451   30
                                                                   2041 1451   31
  MT=102    CAPTURE                                                2041 1451   32
        1/V FORM NORMALIZED TO THE DATA OF JURNEY /16/.            2041 1451   33
                                                                   2041 1451   34
  MT=103    (N,P)                                                  2041 1451   35
        EVALUATED ON THE BASIS OF THE DATA OF AUGUSTSON AND        2041 1451   36
        MENLOVE /17/ BY TAKING ACCOUNT OF THE BRANCHING RATIO      2041 1451   37
        OF 35 PERCENT FOR LI9 => BE9* => 2A + N.                   2041 1451   38
                                                                   2041 1451   39
  MT=104    (N,D)                                                  2041 1451   40
        BASED ON THE DATA OF SCOEBEL /18/.                         2041 1451   41
                                                                   2041 1451   42
  MT=105    (N,T)                                                  2041 1451   43
        BASED ON THE DATA OF BIRO ET AL. /19/ AND                  2041 1451   44
        QAIM AND WOLFLE /20/.                                      2041 1451   45
                                                                   2041 1451   46
  MT=107    (N,ALPHA)                                              2041 1451   47
        DATA LISTED IN /21/-/25/ WERE USED.                        2041 1451   48
        ONLY THE TRANSITION TO THE GROUND STATE IN HE6 IS GIVEN.   2041 1451   49
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........10........20........30........40........50........60......MAT MF MT  SEQ
                                                                 2041 1451   50
  MT=251   MU-BAR                                                2041 1451   51
        CALCULATED FROM THE DATA IN FILE4.                       2041 1451   52
                                                                 2041 1451   53
MF=4  ANGULAR DISTRIBUTIONS OF SECONDARY NEUTRONS                2041 1451   54
  MT=2                                                           2041 1451   55
        1.0E-5 EV TO 40 KEV : ISOTROPIC IN THE CENTER-OF MASS SYS.2041 1451   56
        50 KEV TO 14 MEV    : DATA LISTED IN /26/-/31/ USED.     2041 1451   57
        15 MEV TO 20 MEV    : OPTICAL MODEL CALCULATION WITH     2041 1451   58
                              PARAMETERS OF REF./32/.            2041 1451   59
                                                                 2041 1451   60
  MT=16                                                          2041 1451   61
        ISOTROPIC IN THE LABORATORY SYSTEM.                      2041 1451   62
                                                                 2041 1451   63
MF=5  ENERGY DISTRIBUTIONS OF SECONDARY NEUTRONS                 2041 1451   64
  MT=16                                                          2041 1451   65
        EVAPORATION SPECTRUM.                                    2041 1451   66
                                                                 2041 1451   67
REFERENCES                                                       2041 1451   68
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                                                                 2041 1451  101
                          1         451         115              2041 1451  102
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........10........20........30........40........50........60......MAT MF MT  SEQ
                                  2         151           4          2041 1451  103
                                  3           1          39          2041 1451  104
                                  3           2          39          2041 1451  105
                                  3          16          23          2041 1451  106
                                  3         102           8          2041 1451  107
                                  3         103           6          2041 1451  108
                                  3         104           6          2041 1451  109
                                  3         105           7          2041 1451  110
                                  3         107          16          2041 1451  111
                                  3         251          33          2041 1451  112
                                  4           2         211          2041 1451  113
                                  4          16          10          2041 1451  114
                                  5          16           8          2041 1451  115
                                                                     2041 1  0  116
                                                                     2041 0  0  117
4.00900+ 3 8.93476+ 0             0           0           1         02041 2151  118
4.00900+ 3 1.00000+ 0             0           0           1         02041 2151  119
1.00000- 5 2.00000+ 7             0           0           0         02041 2151  120
1.50000+ 0 6.90000- 1             0           0           0         02041 2151  121
                                                                     2041 2  0  122
                                                                     2041 0  0  123
4.00900+ 3 8.93476+ 0             0          99           0         02041 3  1  124
0.0    + 0 0.0    + 0             0           0           1       1082041 3  1  125
       108            5            0           0           0         02041 3  1  126
1.00000- 5 6.38227+ 0 6.67000- 5 6.14802+ 0 1.00000- 4 6.12088+ 02041 3  1  127
1.00000- 3 6.03823+ 0 2.53000- 2 6.00760+ 0 1.00000- 1 6.00382+ 02041 3  1  128
1.00000+ 0 6.00121+ 0 1.00000+ 1 6.00038+ 0 1.00000+ 2 6.00012+ 02041 3  1  129
1.00000+ 3 6.00004+ 0 1.00000+ 4 5.89999+ 0 2.00000+ 4 5.69998+ 02041 3  1  130
5.00000+ 4 5.39995+ 0 1.00000+ 5 5.15890+ 0 1.50000+ 5 4.83085+ 02041 3  1  131
2.00000+ 5 4.51880+ 0 2.50000+ 5 4.23975+ 0 3.00000+ 5 4.00270+ 02041 3  1  132
3.50000+ 5 3.80865+ 0 4.00000+ 5 3.64760+ 0 4.50000+ 5 3.50255+ 02041 3  1  133
5.00000+ 5 3.34950+ 0 5.40000+ 5 3.35546+ 0 5.60000+ 5 3.38744+ 02041 3  1  134
5.80000+ 5 3.70442+ 0 5.90000+ 5 4.02741+ 0 6.00000+ 5 4.83540+ 02041 3  1  135
6.15000+ 5 7.27738+ 0 6.19200+ 5 7.97738+ 0 6.40000+ 5 4.75336+ 02041 3  1  136
6.50000+ 5 4.16235+ 0 6.60000+ 5 3.75934+ 0 6.69944+ 5 3.65889+ 02041 3  1  137
6.70000+ 5 3.65833+ 0 6.80000+ 5 3.55635+ 0 7.00000+ 5 3.41439+ 02041 3  1  138
7.40000+ 5 3.40047+ 0 7.80000+ 5 3.44455+ 0 7.95000+ 5 3.61758+ 02041 3  1  139
8.11800+ 5 5.62962+ 0 8.19000+ 5 3.80063+ 0 8.40000+ 5 3.46868+ 02041 3  1  140
1.00000+ 6 3.27500+ 0 1.20000+ 6 2.78100+ 0 1.40000+ 6 2.31100+ 02041 3  1  141
1.60000+ 6 1.93300+ 0 1.80000+ 6 1.69300+ 0 1.85000+ 6 1.67000+ 02041 3  1  142
1.92700+ 6 1.63400+ 0 2.00000+ 6 1.68500+ 0 2.20000+ 6 1.82400+ 02041 3  1  143
2.30000+ 6 2.01300+ 0 2.40000+ 6 2.20200+ 0 2.50000+ 6 2.53900+ 02041 3  1  144
2.60000+ 6 2.91700+ 0 2.62000+ 6 3.08100+ 0 2.66000+ 6 3.40800+ 02041 3  1  145
2.70000+ 6 4.12000+ 0 2.71400+ 6 4.26200+ 0 2.75000+ 6 4.00200+ 02041 3  1  146
2.80000+ 6 3.80300+ 0 2.85000+ 6 3.60300+ 0 3.00000+ 6 3.09100+ 02041 3  1  147
3.10000+ 6 2.87500+ 0 3.20000+ 6 2.65900+ 0 3.50000+ 6 2.28700+ 02041 3  1  148
3.70000+ 6 2.11200+ 0 4.00000+ 6 1.87200+ 0 4.05700+ 6 1.84100+ 02041 3  1  149
4.17500+ 6 1.84700+ 0 4.32900+ 6 1.99400+ 0 4.47100+ 6 1.94800+ 02041 3  1  150
4.50000+ 6 1.94400+ 0 5.00000+ 6 1.87300+ 0 5.50000+ 6 1.86100+ 02041 3  1  151
6.00000+ 6 1.82100+ 0 6.50000+ 6 1.79100+ 0 7.00000+ 6 1.75900+ 02041 3  1  152
7.50000+ 6 1.74900+ 0 8.00000+ 6 1.73600+ 0 8.50000+ 6 1.71999+ 02041 3  1  153
9.00000+ 6 1.70200+ 0 9.50000+ 6 1.68199+ 0 1.00000+ 7 1.66100+ 02041 3  1  154
1.10000+ 7 1.61900+ 0 1.16000+ 7 1.59400+ 0 1.16100+ 7 1.59359+ 02041 3  1  155
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........10........20........30........40........50........60......MAT MF MT  SEQ
 1.20000+ 7 1.57800+ 0 1.21300+ 7 1.57300+ 0 1.30000+ 7 1.53800+ 02041 3  1  156
 1.37500+ 7 1.51100+ 0 1.40000+ 7 1.50200+ 0 1.41000+ 7 1.49900+ 02041 3  1  157
 1.42600+ 7 1.49300+ 0 1.45000+ 7 1.48500+ 0 1.47000+ 7 1.47814+ 02041 3  1  158
 1.50000+ 7 1.46800+ 0 1.55000+ 7 1.45300+ 0 1.60000+ 7 1.43700+ 02041 3  1  159
 1.62900  7 1.42800+ 0 1.63040+ 7 1.42755+ 0 1.66000+ 7 1.41800+ 02041 3  1  160
 1.68500  7 1.41100+ 0 1.70000+ 7 1.40600+ 0 1.73000+ 7 1.39600+ 02041 3  1  161
 1.80000+ 7 1.37200+ 0 1.90000+ 7 1.33100+ 0 2.00000+ 7 1.27800+ 02041 3  1  162
                                                                 2041 3  0  163
 4.00900+ 3 8.93476+ 0           0           0           0           02041 3  2  164
 0.0    + 0 0.0    + 0           0           0           1          1072041 3  2  165
        107            5           0           0           0           02041 3  2  166
 1.00000- 5 6.00000+ 0 6.67000- 5 6.00000+ 0 1.00000- 4 6.00000+ 02041 3  2  167
 1.00000- 3 6.00000+ 0 2.53000- 2 6.00000+ 0 1.00000- 1 6.00000+ 02041 3  2  168
 1.00000+ 0 6.00000+ 0 1.00000+ 1 6.00000+ 0 1.00000+ 2 6.00000+ 02041 3  2  169
 1.00000+ 3 6.00000+ 0 1.00000+ 4 5.89998+ 0 2.00000+ 4 5.69997+ 02041 3  2  170
 5.00000+ 4 5.39994+ 0 1.00000+ 5 5.15890+ 0 1.50000+ 5 4.83085+ 02041 3  2  171
 2.00000+ 5 4.51880+ 0 2.50000+ 5 4.23975+ 0 3.00000+ 5 4.00270+ 02041 3  2  172
 3.50000+ 5 3.80865+ 0 4.00000+ 5 3.64760+ 0 4.50000+ 5 3.50255+ 02041 3  2  173
 5.00000+ 5 3.34950+ 0 5.40000+ 5 3.35546+ 0 5.60000+ 5 3.38744+ 02041 3  2  174
 5.80000+ 5 3.70442+ 0 5.90000+ 5 4.02741+ 0 6.00000+ 5 4.83540+ 02041 3  2  175
 6.15000+ 5 7.27738+ 0 6.19200+ 5 7.97738+ 0 6.40000+ 5 4.75336+ 02041 3  2  176
 6.50000+ 5 4.16235+ 0 6.60000+ 5 3.75934+ 0 6.70000+ 5 3.65833+ 02041 3  2  177
 6.80000+ 5 3.55632+ 0 7.00000+ 5 3.41430+ 0 7.40000+ 5 3.40026+ 02041 3  2  178
 7.80000+ 5 3.44422+ 0 7.95000+ 5 3.61720+ 0 8.11800+ 5 5.62919+ 02041 3  2  179
 8.19000+ 5 3.80018+ 0 8.40000+ 5 3.46816+ 0 1.00000+ 6 3.27400+ 02041 3  2  180
 1.20000+ 6 2.77850+ 0 1.40000+ 6 2.30250+ 0 1.60000+ 6 1.91500+ 02041 3  2  181
 1.80000+ 6 1.66100+ 0 1.85000+ 6 1.63400+ 0 1.92700+ 6 1.59200+ 02041 3  2  182
 2.00000+ 6 1.63600+ 0 2.20000+ 6 1.75300+ 0 2.30000+ 6 1.93100+ 02041 3  2  183
 2.40000+ 6 2.11000+ 0 2.50000+ 6 2.43800+ 0 2.60000+ 6 2.80600+ 02041 3  2  184
 2.62000+ 6 2.96800+ 0 2.66000+ 6 3.22900+ 0 2.70000+ 6 3.87400+ 02041 3  2  185
 2.71400+ 6 3.99344+ 0 2.75000+ 6 3.67500+ 0 2.80000+ 6 3.39300+ 02041 3  2  186
 2.85000+ 6 3.17500+ 0 3.00000+ 6 2.60900+ 0 3.10000+ 6 2.37100+ 02041 3  2  187
 3.20000+ 6 2.14100+ 0 3.50000+ 6 1.72700+ 0 3.70000+ 6 1.53800+ 02041 3  2  188
 4.00000+ 6 1.27700+ 0 4.05700+ 6 1.24500+ 0 4.17500+ 6 1.24900+ 02041 3  2  189
 4.32900+ 6 1.39200+ 0 4.47100+ 6 1.34200+ 0 4.50000+ 6 1.33800+ 02041 3  2  190
 5.00000+ 6 1.25400+ 0 5.50000+ 6 1.24400+ 0 6.00000+ 6 1.20700+ 02041 3  2  191
 6.50000+ 6 1.18000+ 0 7.00000+ 6 1.15050+ 0 7.50000+ 6 1.14133+ 02041 3  2  192
 8.00000+ 6 1.12917+ 0 8.50000+ 6 1.11900+ 0 9.00000+ 6 1.10684+ 02041 3  2  193
 9.50000+ 6 1.09267+ 0 1.00000+ 7 1.07751+ 0 1.10000+ 7 1.05018+ 02041 3  2  194
 1.16000+ 7 1.03438+ 0 1.16100+ 7 1.03411+ 0 1.20000+ 7 1.02133+ 02041 3  2  195
 1.21300+ 7 1.01696+ 0 1.30000+ 7 9.89524- 1 1.37500+ 7 9.68423- 12041 3  2  196
 1.40000+ 7 9.61723- 1 1.41000+ 7 9.59443- 1 1.42600+ 7 9.54555- 12041 3  2  197
 1.45000+ 7 9.49029- 1 1.47000+ 7 9.43703- 1 1.50000+ 7 9.36871- 12041 3  2  198
 1.55000+ 7 9.27391- 1 1.60000+ 7 9.16912- 1 1.62900+ 7 9.11244- 12041 3  2  199
 1.63040+ 7 9.10937- 1 1.66000+ 7 9.04469- 1 1.68500+ 7 9.00133- 12041 3  2  200
 1.70000+ 7 8.95847- 1 1.73000+ 7 8.87285- 1 1.80000+ 7 8.69841- 12041 3  2  201
 1.90000+ 7 8.39257- 1 2.00000+ 7 7.97692- 1                      2041 3  2  202
                                                                 2041 3  0  203
 4.00900+ 3 8.93476+ 0           0          99           0           02041 3 16  204
 0.0    + 0-1.66378+ 6           0           0           1          582041 3 16  205
        58             2           0           0           0           02041 3 16  206
 1.85000+ 6 0.0    + 0 1.92700+ 6 1.00000- 3 2.00000+ 6 2.00000- 32041 3 16  207
 2.20000+ 6 1.00000- 2 2.30000+ 6 1.40000- 2 2.40000+ 6 1.80000- 22041 3 16  208
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 2.50000+ 6 2.20000- 2 2.60000+ 6 2.60000- 2 2.62000+ 6 2.70000- 22041 3 16  209
 2.66000+ 6 9.10000- 2 2.70000+ 6 1.55000- 1 2.71400+ 6 1.77000- 12041 3 16  210
 2.75000+ 6 2.34000- 1 2.80000+ 6 3.14000- 1 2.85000+ 6 3.29000- 12041 3 16  211
 3.00000+ 6 3.75000- 1 3.10000+ 6 3.91000- 1 3.20000+ 6 4.08000- 12041 3 16  212
 3.50000+ 6 4.57000- 1 3.70000+ 6 4.76000- 1 4.00000+ 6 5.05000- 12041 3 16  213
 4.05700+ 6 5.08000- 1 4.17500+ 6 5.13000- 1 4.32900+ 6 5.21000- 12041 3 16  214
 4.47100+ 6 5.28000- 1 4.50000+ 6 5.29000- 1 5.00000+ 6 5.53000- 12041 3 16  215
 5.50000+ 6 5.61000- 1 6.00000+ 6 5.69000- 1 6.50000+ 6 5.70000- 12041 3 16  216
 7.00000+ 6 5.72000- 1 7.50000+ 6 5.73000- 1 8.00000+ 6 5.74000- 12041 3 16  217
 8.50000+ 6 5.70000- 1 9.00000+ 6 5.66000- 1 9.50000+ 6 5.62000- 12041 3 16  218
 1.00000+ 7 5.58000- 1 1.10000+ 7 5.47000- 1 1.16000+ 7 5.40000- 12041 3 16  219
 1.20000+ 7 5.36000- 1 1.21300+ 7 5.35000- 1 1.30000+ 7 5.25000- 12041 3 16  220
 1.37500+ 7 5.17000- 1 1.40000+ 7 5.14000- 1 1.41000+ 7 5.13000- 12041 3 16  221
 1.42600+ 7 5.11000- 1 1.45000+ 7 5.07000- 1 1.50000+ 7 5.00000- 12041 3 16  222
 1.55000+ 7 4.93000- 1 1.60000+ 7 4.86000- 1 1.62900+ 7 4.82000- 12041 3 16  223
 1.66000+ 7 4.78000- 1 1.68500+ 7 4.74000- 1 1.70000+ 7 4.72000- 12041 3 16  224
 1.73000+ 7 4.68000- 1 1.80000+ 7 4.58000- 1 1.90000+ 7 4.44000- 12041 3 16  225
 2.00000+ 7 4.30000- 1                                            2041 3 16  226
                                                                  2041 3  0  227
 4.00900+ 3 8.93476+ 0          0          99          0          02041 3102  228
 0.0    + 0 6.81210+ 6          0           0          1         142041 3102  229
        14          5          0           0          0          02041 3102  230
 1.00000- 5 3.82272- 1 1.00000- 4 1.20885- 1 1.00000- 3 3.82272- 22041 3102  231
 2.53000- 2 7.60000- 3 1.00000- 1 3.82272- 3 1.00000+ 0 1.20885- 32041 3102  232
 1.00000+ 1 3.82272- 4 1.00000+ 2 1.20885- 4 1.00000+ 3 3.82272- 52041 3102  233
 1.00000+ 4 1.20885- 5 1.00000+ 5 3.82272- 6 1.00000+ 6 1.20885- 62041 3102  234
 1.00000+ 7 3.82272- 7 2.00000+ 7 2.70307- 7                      2041 3102  235
                                                                  2041 3  0  236
 4.00900+ 3 8.93476+ 0          0          99          0          02041 3103  237
 0.0    + 0-1.28246+ 7          0           0          1          72041 3103  238
         7          2          0           0          0          02041 3103  239
 1.42600+ 7 0.0    + 0 1.50000+ 7 5.95370- 4 1.60000+ 7 1.40000- 32041 3103  240
 1.70000+ 7 1.55000- 3 1.80000+ 7 1.70000- 3 1.90000+ 7 1.85000- 32041 3103  241
 2.00000+ 7 2.00000- 3                                            2041 3103  242
                                                                  2041 3  0  243
 4.00900+ 3 8.93476+ 0          0          99          0          02041 3104  244
 0.0    + 0-1.46629+ 7          0           0          1          82041 3104  245
         8          2          0           0          0          02041 3104  246
 1.63040+ 7 0.0    + 0 1.66000+ 7 6.00000- 5 1.68500+ 7 8.20000- 42041 3104  247
 1.70000+ 7 1.76000- 3 1.73000+ 7 3.63000- 3 1.80000+ 7 5.46000- 32041 3104  248
 1.90000+ 7 6.74000- 3 2.00000+ 7 7.00000- 3                      2041 3104  249
                                                                  2041 3  0  250
 4.00900+ 3 8.93476+ 0          0          99          0          02041 3105  251
 0.0    + 0-1.04414+ 7          0           0          1         112041 3105  252
        11          2          0           0          0          02041 3105  253
 1.16100+ 7 0.0    + 0 1.20000+ 7 2.52428- 3 1.30000+ 7 8.99677- 32041 3105  254
 1.40000+ 7 1.54693- 2 1.47000+ 7 2.00000- 2 1.50000+ 7 2.09230- 22041 3105  255
 1.60000+ 7 2.40000- 2 1.70000+ 7 2.70768- 2 1.80000+ 7 3.01538- 22041 3105  256
 1.90000+ 7 3.32307- 2 2.00000+ 7 3.63076- 2                      2041 3105  257
                                                                  2041 3  0  258
 4.00900+ 3 8.93476+ 0          0          99          0          02041 3107  259
 0.0    + 0-6.02510+ 5          0           0          1         382041 3107  260
        38          2          0           0          0          02041 3107  261
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.........10........20........30........40........50........60......MAT MF MT   SEQ
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 1.40000+ 6 8.50000- 3 1.60000+ 6 1.80000- 2 1.80000+ 6 3.20000- 22041 3107  263
 1.85000+ 6 3.60000- 2 1.92700+ 6 4.10000- 2 2.00000+ 6 4.70000- 22041 3107  264
 2.20000+ 6 6.10000- 2 2.30000+ 6 6.80000- 2 2.40000+ 6 7.40000- 22041 3107  265
 2.50000+ 6 7.90000- 2 2.60000+ 6 8.50000- 2 2.60000+ 6 8.60000- 22041 3107  266
 2.66000+ 6 8.80000- 2 2.70000+ 6 9.10000- 2 2.75000+ 6 9.30000- 22041 3107  267
 2.80000+ 6 9.60000- 2 2.85000+ 6 9.90000- 2 3.00000+ 6 1.07000- 12041 3107  268
 3.10000+ 6 1.13000- 1 3.20000+ 6 1.10000- 1 3.50000+ 6 1.03000- 12041 3107  269
 3.70000+ 6 9.80000- 2 4.00000+ 6 9.00000- 2 4.05700+ 6 8.80000- 22041 3107  270
 4.17500+ 6 8.50000- 2 4.32900+ 6 8.10000- 2 4.47100+ 6 7.80000- 22041 3107  271
 4.50000+ 6 7.70000- 2 5.00000+ 6 6.60000- 2 5.50000+ 6 5.60000- 22041 3107  272
 6.00000+ 6 4.50000- 2 6.50000+ 6 4.10000- 2 7.00000+ 6 3.65000- 22041 3107  273
 1.41000+ 7 1.04400- 2 2.00000+ 7 5.00000- 3                      2041 3107  274
                                                                  2041 3  0  275
 4.00900+ 3 8.93476+ 0         0         0         0           02041 3251  276
 0.0    + 0 0.0    + 0         0         0         1          902041 3251  277
        90         2           0         0         0           02041 3251  278
 1.00000- 5 7.44148- 2 1.00000- 4 7.44148- 2 1.00000- 3 7.44148- 22041 3251  279
 2.53000- 2 7.44148- 2 1.00000- 1 7.44148- 2 1.00000+ 0 7.44148- 22041 3251  280
 1.00000+ 1 7.44148- 2 1.00000+ 2 7.44148- 2 1.00000+ 3 7.44148- 22041 3251  281
 1.00000+ 4 7.44148- 2 4.00000+ 4 7.44148- 2 5.00000+ 4 8.52035- 22041 3251  282
 7.00000+ 4 8.94477- 2 8.50000+ 4 8.12994- 2 1.00000+ 5 7.02596- 22041 3251  283
 1.20000+ 5 7.81956- 2 1.55000+ 5 9.87164- 2 2.07000+ 5 9.17464- 22041 3251  284
 2.55000+ 5 1.16025- 1 3.06000+ 5 1.04111- 1 3.50000+ 5 1.05636- 12041 3251  285
 4.07000+ 5 9.60539- 2 4.32000+ 5 1.07647- 1 4.50000+ 5 1.10027- 12041 3251  286
 5.08000+ 5 1.12086- 1 5.50000+ 5 1.11329- 1 5.70000+ 5 1.05277- 12041 3251  287
 5.90000+ 5 1.05819- 1 6.00000+ 5 1.12699- 1 6.10000+ 5 9.90909- 22041 3251  288
 6.20000+ 5 8.91607- 2 6.30000+ 5 8.44238- 2 6.40000+ 5 9.89645- 22041 3251  289
 6.50000+ 5 1.01714- 1 6.75000+ 5 1.22280- 1 7.70000+ 5 1.34873- 12041 3251  290
 7.80000+ 5 1.36356- 1 7.90000+ 5 1.35435- 1 8.00000+ 5 1.29542- 12041 3251  291
 8.05000+ 5 1.18315- 1 8.10000+ 5 1.50991- 1 8.15000+ 5 1.87559- 12041 3251  292
 8.20000+ 5 2.17693- 1 8.25000+ 5 2.32859- 1 8.30000+ 5 2.79454- 12041 3251  293
 8.40000+ 5 2.22648- 1 8.60000+ 5 2.08963- 1 9.05000+ 5 2.03064- 12041 3251  294
 9.30000+ 5 2.46414- 1 1.04000+ 6 2.53852- 1 1.14000+ 6 2.57371- 12041 3251  295
 1.24000+ 6 2.68960- 1 1.34000+ 6 2.72819- 1 1.44000+ 6 2.82937- 12041 3251  296
 1.54000+ 6 2.73770- 1 1.65000+ 6 2.62681- 1 1.75000+ 6 2.30930- 12041 3251  297
 1.85000+ 6 2.19703- 1 1.95000+ 6 1.70852- 1 2.05000+ 6 1.53776- 12041 3251  298
 2.15000+ 6 1.31208- 1 2.25000+ 6 1.50125- 1 2.48000+ 6 1.56754- 12041 3251  299
 2.63000+ 6 2.60449- 1 2.77000+ 6 4.33762- 1 2.97000+ 6 3.80782- 12041 3251  300
 3.00000+ 6 3.63646- 1 3.35000+ 6 4.16736- 1 3.50000+ 6 4.27736- 12041 3251  301
 3.55000+ 6 4.39985- 1 3.65000+ 6 4.46522- 1 3.75000+ 6 4.54040- 12041 3251  302
 4.10000+ 6 4.57198- 1 5.00000+ 6 5.46590- 1 6.00000+ 6 5.76250- 12041 3251  303
 6.97000+ 6 6.48646- 1 7.97000+ 6 6.65313- 1 8.96000+ 6 6.81760- 12041 3251  304
 9.96000+ 6 7.07599- 1 1.09500+ 7 7.21544- 1 1.20400+ 7 7.34780- 12041 3251  305
 1.29400+ 7 7.52003- 1 1.39400+ 7 7.62448- 1 1.49400+ 7 7.76810- 12041 3251  306
 1.50000+ 7 7.95866- 1 1.60000+ 7 8.08747- 1 1.70000+ 7 8.20488- 12041 3251  307
 1.80000+ 7 8.31169- 1 1.90000+ 7 8.40804- 1 2.00000+ 7 8.49535- 12041 3251  308
                                                                  2041 3  0  309
                                                                  2041 0  0  310
 4.00900+ 3 8.93476+ 0         1         1         0           02041 4  2  311
 0.0    + 0 8.93476+ 0         0         2       121          102041 4  2  312
 1.00000+ 0 7.46149- 2 2.50960- 3-3.80624- 8 0.0    + 0 0.0    + 02041 4  2  313
 0.0    + 0 0.0    + 0 0.0    + 0 0.0    + 0 0.0    + 0 0.0    + 02041 4  2  314
```

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........10........20........30........40........50........60......MAT MF MT  SEQ
 9.92484- 1 1.33825- 1 8.58724- 3 2.67571- 4 2.43881- 6 2.83958- 72041 4  2  315
 0.0    + 0 0.0    + 0 0.0    + 0 0.0    + 0 0.0    + 0-7.38137- 22041 4  2  316
 9.80381- 1 1.89997- 1 1.78125- 2 9.70429- 4 2.42018- 5-6.94377- 72041 4  2  317
 0.0    + 0 0.0    + 0 0.0    + 0 0.0    + 0 7.42879- 3-1.31698- 12041 4  2  318
 9.61890- 1 2.43974- 1 3.00320- 2 2.27375- 3 1.00355- 4 1.08367- 62041 4  2  319
 0.0    + 0 0.0    + 0 0.0    + 0-7.91568- 4 1.68478- 2-1.85793- 12041 4  2  320
 9.37450- 1 2.95651- 1 4.50999- 2 4.33921- 3 2.68805- 4 1.01198- 52041 4  2  321
-5.79454- 6 0.0    + 0 8.61172- 5-2.09534- 3 2.89461- 2-2.37051- 12041 4  2  322
 9.07319- 1 3.44700- 1 6.28360- 2 7.31493- 3 5.73778- 4 3.03785- 52041 4  2  323
 0.0    + 0-9.46216- 6 2.55852- 4-4.12797- 3 4.36533- 2-2.85396- 12041 4  2  324
 8.71786- 1 3.90739- 1 8.30288- 2 1.13326- 2 1.07033- 3 0.0    + 02041 4  2  325
 1.04538- 6-3.08397- 5 5.60131- 4-7.03468- 3 6.07938- 2-3.30540- 12041 4  2  326
 8.31183- 1 4.33378- 1 1.05440- 1 1.65119- 2 0.0    + 0-1.15882- 72041 4  2  327
 3.68192- 6-7.35917- 5 1.05151- 3-1.09401- 2 8.01446- 2-3.72149- 12041 4  2  328
 7.85893- 1 4.72249- 1 1.29806- 1 0.0    + 0 1.28740- 8-4.36344- 72041 4  2  329
 9.45098- 6-1.49697- 4 1.78787- 3-1.59503- 2 1.01449- 1-4.09891- 12041 4  2  330
 7.36338- 1 5.07014- 1 0.0    + 0-1.43242- 9 5.14084- 8-1.19328- 62041 4  2  331
 2.05918- 5-2.74359- 4 2.83159- 3-2.21525- 2 1.24423- 1-4.43460- 12041 4  2  332
 6.82976- 1                                                        2041 4  2  333
 0.0    + 0 0.0    + 0          0          0          1          902041 4  2  334
         90          2          0          0          0          02041 4  2  335
 0.0    + 0 1.00000- 5          0          0          2          02041 4  2  336
 0.0    + 0 0.0    + 0                                             2041 4  2  337
 0.0    + 0 1.00000- 4          0          0          2          02041 4  2  338
 0.0    + 0 0.0    + 0                                             2041 4  2  339
 0.0    + 0 1.00000- 3          0          0          2          02041 4  2  340
 0.0    + 0 0.0    + 0                                             2041 4  2  341
 0.0    + 0 2.53000- 2          0          0          2          02041 4  2  342
 0.0    + 0 0.0    + 0                                             2041 4  2  343
 0.0    + 0 1.00000- 1          0          0          2          02041 4  2  344
 0.0    + 0 0.0    + 0                                             2041 4  2  345
 0.0    + 0 1.00000+ 0          0          0          2          02041 4  2  346
 0.0    + 0 0.0    + 0                                             2041 4  2  347
 0.0    + 0 1.00000+ 1          0          0          2          02041 4  2  348
 0.0    + 0 0.0    + 0                                             2041 4  2  349
 0.0    + 0 1.00000+ 2          0          0          2          02041 4  2  350
 0.0    + 0 0.0    + 0                                             2041 4  2  351
 0.0    + 0 1.00000+ 3          0          0          2          02041 4  2  352
 0.0    + 0 0.0    + 0                                             2041 4  2  353
 0.0    + 0 1.00000+ 4          0          0          2          02041 4  2  354
 0.0    + 0 0.0    + 0                                             2041 4  2  355
 0.0    + 0 4.00000+ 4          0          0          2          02041 4  2  356
 0.0    + 0 0.0    + 0                                             2041 4  2  357
 0.0    + 0 5.00000+ 4          0          0          2          02041 4  2  358
 1.08696- 2 0.0    + 0                                             2041 4  2  359
 0.0    + 0 7.00000+ 4          0          0          2          02041 4  2  360
 1.46520- 2-6.59341- 3                                             2041 4  2  361
 0.0    + 0 8.50000+ 4          0          0          4          02041 4  2  362
 7.49064- 3 6.74157- 3-3.85233- 3 0.0    + 0                      2041 4  2  363
 0.0    + 0 1.00000+ 5          0          0          4          02041 4  2  364
-3.74532- 3 4.49438- 3-8.02568- 3 0.0    + 0                      2041 4  2  365
 0.0    + 0 1.20000+ 5          0          0          4          02041 4  2  366
 3.78788- 3 0.0    + 0 1.62338- 3 0.0    + 0                      2041 4  2  367
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........10........20........30........40........50........60......MAT MF MT  SEQ
 0.0    + 0 1.55000+ 5          0          0          4          02041 4  2  368
2.46914- 2 2.46914- 3-1.76367- 3 0.0    + 0                      2041 4  2  369
 0.0    + 0 2.07000+ 5          0          0          4          02041 4  2  370
1.73160- 2-2.59740- 3-3.71058- 3 0.0    + 0                      2041 4  2  371
 0.0    + 0 2.55000+ 5          0          0          4          02041 4  2  372
4.22535- 2 3.94366- 3-2.81690- 3 0.0    + 0                      2041 4  2  373
 0.0    + 0 3.06000+ 5          0          0          4          02041 4  2  374
2.94118- 2-5.88235- 3 5.04202- 3 0.0    + 0                      2041 4  2  375
 0.0    + 0 3.50000+ 5          0          0          4          02041 4  2  376
3.12500- 2-3.12500- 3-2.23214- 3 0.0    + 0                      2041 4  2  377
 0.0    + 0 4.07000+ 5          0          0          4          02041 4  2  378
2.15054- 2-4.51613- 3-3.22581- 3 0.0    + 0                      2041 4  2  379
 0.0    + 0 4.32000+ 5          0          0          4          02041 4  2  380
3.27869- 2-9.83607- 3-3.27869- 3 0.0    + 0                      2041 4  2  381
 0.0    + 0 4.50000+ 5          0          0          4          02041 4  2  382
3.44444- 2-2.00000- 2-4.76190- 3 0.0    + 0                      2041 4  2  383
 0.0    + 0 5.08000+ 5          0          0          2          02041 4  2  384
3.74269- 2-7.01754- 3                                             2041 4  2  385
 0.0    + 0 5.50000+ 5          0          0          2          02041 4  2  386
3.50877- 2-2.80702- 2                                             2041 4  2  387
 0.0    + 0 5.70000+ 5          0          0          4          02041 4  2  388
2.87356- 2-3.10345- 2 2.46305- 3 0.0    + 0                      2041 4  2  389
 0.0    + 0 5.90000+ 5          0          0          4          02041 4  2  390
2.92398- 2-3.15789- 2 2.50627- 3 0.0    + 0                      2041 4  2  391
 0.0    + 0 6.00000+ 5          0          0          4          02041 4  2  392
3.76344- 2-1.29032- 2-2.30415- 3 0.0    + 0                      2041 4  2  393
 0.0    + 0 6.10000+ 5          0          0          4          02041 4  2  394
2.63158- 2 1.97368- 2 1.87970- 3 0.0    + 0                      2041 4  2  395
 0.0    + 0 6.20000+ 5          0          0          4          02041 4  2  396
2.17391- 2 9.34783- 2 1.08696- 2 0.0    + 0                      2041 4  2  397
 0.0    + 0 6.30000+ 5          0          0          4          02041 4  2  398
2.13904- 2 1.51872- 1 7.63942- 3 0.0    + 0                      2041 4  2  399
 0.0    + 0 6.40000+ 5          0          0          4          02041 4  2  400
3.65854- 2 1.58537- 1 2.14286- 3 0.0    + 0                      2041 4  2  401
 0.0    + 0 6.50000+ 5          0          0          4          02041 4  2  402
3.75587- 2 1.35211- 1 8.04829- 3 0.0    + 0                      2041 4  2  403
 0.0    + 0 6.75000+ 5          0          0          4          02041 4  2  404
5.35714- 2 7.14286- 2 1.02041- 3 0.0    + 0                      2041 4  2  405
 0.0    + 0 7.70000+ 5          0          0          2          02041 4  2  406
6.28931- 2 2.64151- 2                                             2041 4  2  407
 0.0    + 0 7.80000+ 5          0          0          4          02041 4  2  408
6.41026- 2 2.30769- 2 2.74725- 3 0.0    + 0                      2041 4  2  409
 0.0    + 0 7.90000+ 5          0          0          2          02041 4  2  410
6.28931- 2 1.88679- 2                                             2041 4  2  411
 0.0    + 0 8.00000+ 5          0          0          4          02041 4  2  412
5.66037- 2 1.50943- 2 5.39084- 3 0.0    + 0                      2041 4  2  413
 0.0    + 0 8.05000+ 5          0          0          4          02041 4  2  414
4.59770- 2 2.41379- 2 4.92611- 3 0.0    + 0                      2041 4  2  415
 0.0    + 0 8.10000+ 5          0          0          4          02041 4  2  416
7.90960- 2 2.71186- 2 7.26392- 3 0.0    + 0                      2041 4  2  417
 0.0    + 0 8.15000+ 5          0          0          4          02041 4  2  418
1.16162- 1 3.03030- 2 8.65801- 3 0.0    + 0                      2041 4  2  419
 0.0    + 0 8.20000+ 5          0          0          4          02041 4  2  420
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........10........20........30........40........50........60......MAT MF MT  SEQ
 1.46970- 1 3.63636- 2 9.52381- 3 0.0     + 0                      2041 4  2  421
 0.0     + 0 8.25000+ 5           0          0          4          02041 4  2  422
 1.61765- 1 2.94118- 2 6.30252- 3 0.0     + 0                      2041 4  2  423
 0.0     + 0 8.30000+ 5           0          0          4          02041 4  2  424
 2.09677- 1 4.19355- 2 4.60829- 3 0.0     + 0                      2041 4  2  425
 0.0     + 0 8.40000+ 5           0          0          4          02041 4  2  426
 1.50943- 1 2.26415- 2 8.08625- 3 0.0     + 0                      2041 4  2  427
 0.0     + 0 8.60000+ 5           0          0          4          02041 4  2  428
 1.37255- 1 2.35294- 2 5.60224- 3 0.0     + 0                      2041 4  2  429
 0.0     + 0 9.05000+ 5           0          0          4          02041 4  2  430
 1.30719- 1 1.56863- 2 5.60224- 3 0.0     + 0                      2041 4  2  431
 0.0     + 0 9.30000+ 5           0          0          2          02041 4  2  432
 1.73277- 1 0.0     + 0                                             2041 4  2  433
 0.0     + 0 1.04000+ 6           0          0          2          02041 4  2  434
 1.80770- 1 0.0     + 0                                             2041 4  2  435
 0.0     + 0 1.14000+ 6           0          0          2          02041 4  2  436
 1.86727- 1 3.18760- 2                                             2041 4  2  437
 0.0     + 0 1.24000+ 6           0          0          2          02041 4  2  438
 1.98867- 1 3.80160- 2                                             2041 4  2  439
 0.0     + 0 1.34000+ 6           0          0          2          02041 4  2  440
 2.02743- 1 3.78600- 2                                             2041 4  2  441
 0.0     + 0 1.44000+ 6           0          0          2          02041 4  2  442
 2.12957- 1 3.81360- 2                                             2041 4  2  443
 0.0     + 0 1.54000+ 6           0          0          2          02041 4  2  444
 2.04387- 1 4.69400- 2                                             2041 4  2  445
 0.0     + 0 1.65000+ 6           0          0          2          02041 4  2  446
 1.94643- 1 6.58620- 2                                             2041 4  2  447
 0.0     + 0 1.75000+ 6           0          0          2          02041 4  2  448
 1.62967- 1 7.00700- 2                                             2041 4  2  449
 0.0     + 0 1.85000+ 6           0          0          2          02041 4  2  450
 1.53043- 1 8.85120- 2                                             2041 4  2  451
 0.0     + 0 1.95000+ 6           0          0          2          02041 4  2  452
 1.03170- 1 7.99300- 2                                             2041 4  2  453
 0.0     + 0 2.05000+ 6           0          0          2          02041 4  2  454
 8.86567- 2 1.15796- 1                                             2041 4  2  455
 0.0     + 0 2.15000+ 6           0          0          2          02041 4  2  456
 6.68733- 2 1.28560- 1                                             2041 4  2  457
 0.0     + 0 2.25000+ 6           0          0          4          02041 4  2  458
 8.87600- 2 1.70104- 1 2.66486- 2 0.0     + 0                      2041 4  2  459
 0.0     + 0 2.48000+ 6           0          0          4          02041 4  2  460
 1.01540- 1 2.53220- 1 5.10014- 2 1.49478- 2                       2041 4  2  461
 0.0     + 0 2.63000+ 6           0          0          4          02041 4  2  462
 2.08697- 1 2.94300- 1 9.49529- 2 1.51833- 2                       2041 4  2  463
 0.0     + 0 2.77000+ 6           0          0          4          02041 4  2  464
 3.86100- 1 3.35680- 1 1.21519- 1 1.00020- 2                       2041 4  2  465
 0.0     + 0 2.97000+ 6           0          0          4          02041 4  2  466
 3.30883- 1 3.13580- 1 1.36151- 1 9.12378- 3                       2041 4  2  467
 0.0     + 0 3.00000+ 6           0          0          4          02041 4  2  468
 3.13303- 1 3.09540- 1 1.37199- 1 8.92589- 3                       2041 4  2  469
 0.0     + 0 3.35000+ 6           0          0          4          02041 4  2  470
 3.66667- 1 3.05900- 1 1.20024- 1 5.47111- 3                       2041 4  2  471
 0.0     + 0 3.50000+ 6           0          0          4          02041 4  2  472
 3.78033- 1 3.10220- 1 1.20093- 1 1.91667- 3                       2041 4  2  473
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........10........20........30........40........50........60......MAT MF MT  SEQ
 0.0    + 0 3.55000+ 6          0          0          4           02041 4  2  474
3.90367- 1 3.08940- 1 1.13014- 1 2.71344- 3                         2041 4  2  475
 0.0    + 0 3.65000+ 6          0          0          4           02041 4  2  476
3.96967- 1 3.08940- 1 1.16307- 1 7.55644- 3                         2041 4  2  477
 0.0    + 0 3.75000+ 6          0          0          4           02041 4  2  478
4.04800- 1 3.12000- 1 1.13957- 1 7.73289- 3                         2041 4  2  479
 0.0    + 0 4.10000+ 6          0          0          4           02041 4  2  480
4.06867- 1 2.94000- 1 8.56971- 2 0.0    + 0                         2041 4  2  481
 0.0    + 0 5.00000+ 6          0          0          4           02041 4  2  482
4.98367- 1 3.17480- 1 1.11149- 1 0.0    + 0                         2041 4  2  483
 0.0    + 0 6.00000+ 6          0          0          4           02041 4  2  484
5.32100- 1 3.70040- 1 1.61900- 1 4.17756- 2                         2041 4  2  485
 0.0    + 0 6.97000+ 6          0          0          6           02041 4  2  486
6.08244- 1 4.20215- 1 2.18126- 1 6.47551- 2 1.11437- 2 2.15054- 32041 4  2  487
 0.0    + 0 7.97000+ 6          0          0          6           02041 4  2  488
6.25999- 1 4.33987- 1 2.32649- 1 7.37110- 2 1.11903- 2 3.17865- 32041 4  2  489
 0.0    + 0 8.96000+ 6          0          0          6           02041 4  2  490
6.43691- 1 4.50547- 1 2.53048- 1 8.93508- 2 1.34275- 2 1.68322- 32041 4  2  491
 0.0    + 0 9.96000+ 6          0          0          6           02041 4  2  492
6.71087- 1 4.70276- 1 2.72928- 1 1.04359- 1 2.04922- 2 5.01487- 32041 4  2  493
 0.0    + 0 1.09500+ 7          0          0          6           02041 4  2  494
6.86251- 1 4.86722- 1 2.92429- 1 1.22079- 1 2.65997- 2 6.05622- 32041 4  2  495
 0.0    + 0 1.20400+ 7          0          0          6           02041 4  2  496
6.99880- 1 4.91236- 1 2.96176- 1 1.24316- 1 2.95755- 2 7.20288- 32041 4  2  497
 0.0    + 0 1.29400+ 7          0          0          6           02041 4  2  498
7.18391- 1 5.08128- 1 3.11752- 1 1.37657- 1 3.58262- 2 8.99962- 32041 4  2  499
 0.0    + 0 1.39400+ 7          0          0          6           02041 4  2  500
7.29551- 1 5.17386- 1 3.21649- 1 1.47828- 1 4.20356- 2 1.13820- 22041 4  2  501
 0.0    + 0 1.49400+ 7          0          0          6           02041 4  2  502
7.44430- 1 5.24086- 1 3.24626- 1 1.46140- 1 3.93213- 2 8.63323- 32041 4  2  503
 0.0    + 0 1.50000+ 7          0          0         10           02041 4  2  504
7.65461- 1 5.53280- 1 3.78863- 1 2.25975- 1 1.03277- 1 3.86996- 22041 4  2  505
1.17750- 2 3.15348- 3 7.59965- 4 1.65488- 4                         2041 4  2  506
 0.0    + 0 1.60000+ 7          0          0         10           02041 4  2  507
7.79457- 1 5.68192- 1 3.91807- 1 2.39500- 1 1.15254- 1 4.51577- 22041 4  2  508
1.44680- 2 4.08465- 3 1.03873- 3 2.38880- 4                         2041 4  2  509
 0.0    + 0 1.70000+ 7          0          0         10           02041 4  2  510
7.92273- 1 5.82669- 1 4.04687- 1 2.52558- 1 1.26934- 1 5.18286- 22041 4  2  511
1.74253- 2 5.16640- 3 1.38098- 3 3.34046- 4                         2041 4  2  512
 0.0    + 0 1.80000+ 7          0          0         10           02041 4  2  513
8.03979- 1 5.96562- 1 4.17417- 1 2.65133- 1 1.38257- 1 5.86631- 22041 4  2  514
2.06328- 2 6.40261- 3 1.79243- 3 4.54474- 4                         2041 4  2  515
 0.0    + 0 1.90000+ 7          0          0         10           02041 4  2  516
8.14587- 1 6.09827- 1 4.29928- 1 2.77212- 1 1.49214- 1 6.56283- 22041 4  2  517
2.40780- 2 7.79624- 3 2.27856- 3 6.03626- 4                         2041 4  2  518
 0.0    + 0 2.00000+ 7          0          0         10           02041 4  2  519
8.24242- 1 6.22468- 1 4.42147- 1 2.88854- 1 1.59839- 1 7.27153- 22041 4  2  520
2.77621- 2 9.36288- 3 2.85627- 3 7.97664- 4                         2041 4  2  521
                                                                    2041 4  0  522
4.00900+ 3 8.93476+ 0          0          2          0           02041 4 16  523
 0.0    + 0 8.93476+ 0          0          1          0           02041 4 16  524
 0.0    + 0 0.0    + 0          0          0          1           22041 4 16  525
          2          2          0          0          0           02041 4 16  526
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........10........20........30........40........50........60......MAT MF MT  SEQ
 0.0     + 0 1.85000+ 6           0           0           1          22041 4 16  527
           2           2           0           0           0          02041 4 16  528
-1.00000+ 0 5.00000- 1 1.00000+ 0 5.00000- 1                           2041 4 16  529
 0.0     + 0 2.00000+ 7           0           0           1          22041 4 16  530
           2           2           0           0           0          02041 4 16  531
-1.00000+ 0 5.00000- 1 1.00000+ 0 5.00000- 1                           2041 4 16  532
                                                                       2041 4  0  533
                                                                       2041 0  0  534
 4.00900+ 3 8.93476+ 0           0           0           1          02041 5 16  535
 1.66379+ 6 0.0     + 0           0           9           1          22041 5 16  536
           2           2           0           0           0          02041 5 16  537
 1.85000+ 6 1.00000+ 0 2.00000+ 7 1.00000+ 0                           2041 5 16  538
 0.0     + 0 0.0     + 0           0           0           1          52041 5 16  539
           5           2           0           0           0          02041 5 16  540
 1.85000+ 6 1.00000+ 5 5.90000+ 6 7.30000+ 5 1.01000+ 7 1.62000+ 62041 5 16  541
 1.42000+ 7 2.21000+ 6 2.00000+ 7 2.55000+ 6                           2041 5 16  542
                                                                       2041 5  0  543
                                                                       2041 0  0  544
                                                                          0 0  0  545
                                                                         -1 0  0    0
```