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

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

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Neutron nuclear data of ^9Be 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 \sim 20 MeV

* Mitsubishi Atomic Power Industries, Inc.

JENDL-2 に採用された ^9Be の中性子核データ

日本原子力研究所東海研究所物理部

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(1984年8月17日受理)

JENDL-2 のために ^9Be の中性子核データを 10^{-5} eV から 20 MeV 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。

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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 ${}^6\text{Li}(n,\alpha)\text{t}$ and ${}^7\text{Li}(n,n')\alpha\text{t}$. Thus, neutron nuclear data of ${}^9\text{Be}$ 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 ${}^9\text{Be}$ 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 ${}^9\text{Be}(n,\alpha){}^5\text{He}$ reaction contributes to the (n,2n) reaction, and so its cross section was included in the (n,2n) cross section.

1. 緒 言

通商産業省工業技術院の「高温還元ガス利用による直接製鉄技術」に関する第1期の研究開発の中で、中間熱交換器伝熱管用の耐熱合金の開発が行われ、最終的にNi-Cr-W系合金のKSN合金とSSS113MA合金が選ばれた⁽¹⁾⁽²⁾。これらの合金は、1000℃における付加応力9.8 MPa (1 kgf/mm²)でのクリープ破断寿命が 5×10^4 時間という開発目標を上回る優れたクリープ特性を有している⁽¹⁾⁽²⁾ことが知られている。しかし、これらの合金の高温疲労特性に関しては、高温における材料損傷のうちの重要な部分を占めているにもかかわらず、開発計画が継続しなかったこともあり、十分な検討を加えられるにいたらなかった。

本報告は、多目的高温ガス炉冷却材近似ヘリウム中におけるKSN合金およびSSS113MA合金の高温疲労特性を調べることを目的として、900℃で行った高温低サイクル疲労試験の結果をまとめたものである。

2. 実験方法

供試材料は、Ni-Cr-W系合金のKSN合金およびSSS113MA合金で、その化学組成と高温域における機械的性質をそれぞれTable 1とTable 2に示す。両合金を比較すると、相対的にKSN合金はW含有量が多く、SSS113MA合金はCr含有量が多い。また、高温ガス炉一次系冷却材近似ヘリウムによる腐食において、特に局部腐食に関係のある微量成分としてAlとTiに注目すると、SSS113MA合金はいずれの成分をも含んでいる。KSN合金については、製造者からの分析値には示されていないが、SSS113MA合金と同様に両元素を含んでいることが報告されている⁽³⁾。高温域における機械的性質では、KSN合金の方がSSS113MA合金よりも静的強度は強いが、延性では逆の関係となっている。両合金の組織写真をPhoto. 1に示す。いずれの合金もASTM NO. 0~1程度であり、通常の構造材料としては、粗大粒組織である。

用いた試験片の形状は、Fig. 1に示すような、平行部20mm、標点間距離15mmで、直径10mmの平滑丸棒型である。試験に先立って、標点部を2.5μmまでのダイヤモンドペーストで研磨し、さらに高純度アセトン中で超音波洗浄を施した。

試験装置は、高周波誘導加熱装置(15 kW, 100 kHz)およびヘリウムガスループ直結の雰囲気槽を有する、容量5トンの電気油圧サーボ型疲労試験機である。そのブロック線図をFig. 2に示す。なお、本試験装置の詳細については、既に別に報告した⁽⁴⁾。

試験条件は900℃一定、ひずみ速度 $\dot{\epsilon} = 0.1\%$ /secの完全両振りの軸ひずみ制御疲労試験とした。試験雰囲気は、多目的高温ガス炉冷却材近似ヘリウム中および $1 \sim 3 \times 10^{-6}$ Paの超高真空中である。ヘリウム中の不純物組成は、同型原子炉の経験をもとにして、Table 3に示すよ

うな値に制御しながら、循環式ループで供給した。ここで用いた不純物添加ヘリウムガスは、一般に便宜のため原研B型ヘリウムと呼ばれている標準化された仕様のものである。ヘリウム流量は、不純物の反応による消耗が試料表面において局所的な不純物組成の割合の変化を生じないように配慮し、毎分2ℓとした。この場合、試験セクションにおける気体のみかけの全量置換時間は約20分となる。ヘリウム中の不純物であるH₂Oの分析には、静電容量型センサー使用の露点計（SHAW HYGROMETER）を、その他の不純物の分析には、HID検出器付ガスクロマトグラフ（柳本G-1800-H型）を用いた。

3. 実験結果と考察

3.1 多目的高温ガス炉冷却材近似ヘリウム中における高温低サイクル疲労特性

高温低サイクル疲労試験結果をまとめてTable 4に示す。破損繰返し数 N_f としては、引張側最大応力が定常値から25%減少時を採用した⁽⁵⁾。この表に示すように、破断位置はいずれも標点間内であり⁽⁶⁾、温度分布の均一性が悪いときに生じるといわれる⁽⁷⁾バルジングやネッキングの不安定変形、および標点外破断は起こらなかった。

Fig. 3に、冷却材近似ヘリウム中で得られた全ひずみ範囲 $\Delta \epsilon_t$ および塑性ひずみ範囲 $\Delta \epsilon_p$ と破損繰返し数 N_f の関係を示す。なお、塑性ひずみ範囲 $\Delta \epsilon_p$ としては、 $1/2 N_f$ 時のものを採用した。これらのデータをそれぞれの合金に対してManson-Coffinの関係式⁽⁸⁾⁽⁹⁾

$$\begin{aligned} \Delta \epsilon_t &= \Delta \epsilon_e + \Delta \epsilon_p \\ &= A N_f^{-a} + B N_f^{-b} \end{aligned} \quad (1)$$

$\Delta \epsilon_t$: 全ひずみ範囲, $\Delta \epsilon_e$: 弾性ひずみ範囲

$\Delta \epsilon_p$: 塑性ひずみ範囲, N_f : 破損繰返し数

A, a, B, b : 定数

で整理した場合の定数の値をTable 5にまとめて示す。これらの結果から、本実験条件の範囲内では、SSS113MA合金の方がKSN合金よりも高温低サイクル疲労特性はすぐれており、SSS113MA合金の疲労寿命の方が、KSN合金の疲労寿命よりも50%程度長いことがわかる。

本実験で得られた繰返し応力-ひずみ線図を単純引張の場合のものと併せてFig. 4に示す。繰返し応力-ひずみ線図は、各疲労試験における $1/2 N_f$ 時のヒステリシスループの最大および最小荷重点を採用することにより求めたものであり、単純引張の場合の応力-ひずみ線図は、各疲労試験における $N = 1$ の時のデータの平均値として求めたものである。（付録参照）Fig. 5, Fig. 6にそれぞれ、 $1/2 N_f$ 時におけるヒステリシスループと引張側最大応力の変化の様子を一例として $\Delta \epsilon = 0.8\%$ の場合で示してある。Fig. 4, Fig. 6によると、いずれの合金においても、ごくわずかな繰返し硬化を示すのみであり、いずれの合金も、金属組織的に安定性が高いことを示している。また、これらの図から、同一ひずみ範囲の条件下では、高温域での静的強度の強いKSN合金の方が高い応力を受けることがわかる。そこで、Table 5に示した両合金

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 NDES¹⁾. In the epithermal energy region, the cross section approaches to 6 barns. Thus, below 1 keV the cross section was given by

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

where $\sigma_{\text{n},\gamma}$ 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.

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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 Rosen¹⁸⁾ were employed in the present calculation, and they are listed as follows:

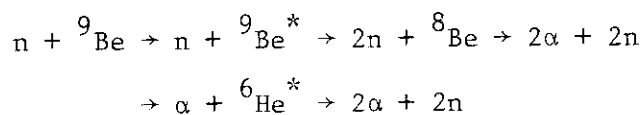
$$\begin{aligned}
 V &= 49.3 - 0.33 \times E_{\text{CM}} \quad (\text{MeV}), \\
 W_s &= 5.75 \quad (\text{MeV}), \\
 V_{\text{so}} &= 5.5 \quad (\text{MeV}), \\
 r_0 &= r_s = r_{\text{so}} = 1.25 \quad (\text{fm}), \\
 a &= a_{\text{so}} = 0.65 \quad (\text{fm}), \\
 b &= 0.70 \quad (\text{fm}),
 \end{aligned}$$

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



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の疲労データの回帰曲線を用いて、ASME Code Section III⁽¹⁰⁾の方法にならって許容応力振幅を試算してみた。その結果をTable 6に示す。許容応力振幅では、KSN合金の方がSSS113MA合金よりもやや上回っている。

3.2 超高真空中での高温低サイクル疲労試験結果

冷却材近似ヘリウム環境の影響を抽出するため、参照条件として $1 \sim 3 \times 10^{-6}$ Paの超高真空中での高温低サイクル疲労試験を行った。その結果を、冷却材近似ヘリウム中での試験結果と併せてFig. 7に示す。Fig. 7の下方の図は、それぞれの合金につき、二種類の試験環境における疲労寿命の比をとったものである。冷却材近似ヘリウム中での疲労寿命（分子の値）として、○印はTable 5に示した回帰曲線上の値を採用したものであり、●印は実際の実験値を採用したものである。これらの図から、KSN合金、SSS113MA合金ともに、冷却材近似ヘリウム中における高温低サイクル疲労寿命は、超高真空中における場合の10～20%程度にまで低下していることがわかる。同様のことを、ハステロイXおよびハステロイXRで調べてみた時には、冷却材近似ヘリウム中における高温低サイクル疲労寿命は、超高真空中における場合の70%程度であったことを既に報告した⁽¹¹⁾。これらの結果を比較してみると、KSN合金およびSSS113MA合金では、冷却材近似ヘリウム環境の影響による疲労寿命の低下が著しいことがわかる。したがって、実機の運転条件のような長時間の経年劣化現象として考えてみると、使用雰囲気の影響がより強く現われてくると思われるので、両合金ともに、その長期健全性保証には問題点のあることが指摘される。

3.3 高温低サイクル疲労試験後の試験片観察および炭素分析

Photo. 2, Photo. 3に、高温低サイクル疲労試験後の試験片の外観および断面の写真を示す。冷却材近似ヘリウム中での疲労試験では、両合金ともに多数のマクロな表面き裂が試験片の平行部全体に一樣に発生した。特にKSN合金における方が多数の表面き裂が観察された。超高真空中での疲労試験では、冷却材近似ヘリウム中で観察されたような多数のマクロな表面き裂の発生はみられなかった。また、Photo. 3の断面写真において、冷却材近似ヘリウム中での疲労試験片では、粒界ファセットに対応すると思われる明瞭な凹凸が観察されるが、超高真空中での疲労試験片では、そうした明瞭な凹凸とは少し様相が異なっている。これらのことは、冷却材近似ヘリウム中における場合と超高真空中における場合で、粒界における疲労破壊抵抗に差があることを示している。

Photo. 4～Photo. 8に、それぞれ高温低サイクル疲労試験後の破面の巨視的写真および微視的写真を示す。いずれの合金においても、冷却材近似ヘリウム中においてはほぼ100%粒界破壊であり、目視でも明瞭な粒界ファセットが観察される。超高真空中の場合には、粒界破面以外の破面も混入してくるが、やはり粒界破壊が支配的であるといえる。

Photo. 9～Photo. 12に、疲労試験後の試験片断面の組成像を示す。いずれの合金においても、冷却材近似ヘリウム中での疲労試験後の試験片では、炭化物の粒界析出が観察されるが、超

高真空中での疲労試験後の試験片では、そういう傾向は認められない。また、SSS113MA合金と比較して、KSN合金では、析出物が微細でかつ密に分布していることが指摘できる。Photo.10~Photo.12にみられるように、き裂は、炭化物の析出した粒界に沿って進行している。さらに、Photo.12のA、Cでは、試験片表面から進行してきた粒界き裂に先行する内部粒界き裂の発生が観察されることから、これらのき裂の合体、成長、先行粒界き裂の発生という現象が繰返されて、破損に至るような機構が示唆される。

Fig. 8に、冷却材近似ヘリウム中および超高真空中での疲労試験後の試験片の炭素分析結果を示す。●印および▲印は、破面を含む破面直下の約1mm長さについての平均の含有炭素量、○印および△印は、破面から4~7mm離れた部分の平均の含有炭素量を示している。冷却材近似ヘリウム中でのものは、いずれもわずかながら含有炭素量は増加しており、若干の浸炭が生じたことを示している。同様のことを、ハステロイXおよびハステロイXRで調べてみた時には、破面から離れた部分では、破面直下程の浸炭を生じていないことを既に報告した⁽¹¹⁾が、KSN合金およびSSS113MA合金では、そのような傾向はみられず、どちらの部分でも同程度の浸炭を生じている。これは、KSN合金およびSSS113MA合金において、Photo. 2, Photo. 3に示したように、多数のマクロな表面き裂が試験片の平行部全体に一樣に発生したことに対応しており、き裂が発生すれば、その先端では、木内ら⁽¹²⁾が指摘しているクレビス効果により、浸炭が促進されるものと思われる。

なお、Fig. 8からわかるように、超高真空中では、逆に脱炭の傾向を示している。

高温低サイクル疲労において、冷却材近似ヘリウム環境の果たす役割の機構を検討する際、上述の脱浸炭特性とともに酸化特性にも注目する必要がある。

Photo.13, Photo.14は、新藤ら⁽³⁾がKSN合金およびSSS113MA合金について、本実験と同一仕様の冷却材近似ヘリウム中で熱サイクル酸化試験(900℃, 酸化時間合計3000hr)を行った試料に認められた粒界酸化物のXMAによる解析結果である。KSN合金では、粒界侵食された部分の表面被膜の盛り上がりが見られ、粒界酸化物としては、表面近傍がCr, さらに深い部分でTi, Alであることが確認されている。また、SSS113MA合金では、粒界酸化物としてTiのみが検出されている。このような粒界侵食の発生は、疲労過程におけるき裂発生の核となりうる可能性があり、避けるべき現象といえる。

Photo.15は、新藤ら⁽³⁾がKSN合金およびSSS113MA合金の冷却材近似ヘリウム中での熱サイクル酸化試験(1000℃, 酸化時間合計3000hr)を行った試料に形成された酸化膜断面をXMAで線分析した結果である。両合金とも、酸化膜はCrとTiの酸化物で構成されていることがわかる。Photo.16は、冷却材近似ヘリウム中での疲労試験後の試験片に形成された酸化膜断面をXMAで線分析した結果である。新藤ら⁽³⁾の実験の場合と同様に、両合金とも、酸化膜はCrとTiの酸化物で構成されている。ところが、疲労試験においては、試験終了までの加熱時間は最長でも100時間にも満たないことから、Photo.16からわかるように、酸化膜は極めて薄く、表面反応の進行累積の程度が、通常の酸化試験における場合とは大幅に異なり、等価の比較はできない。このように、疲労試験においては、通常の酸化試験との加熱時間の差が大きいため、先に述べた熱サイクル酸化試験で認められているような目立った粒界侵食の発生は、疲労試験後の試験片からは認められなかった。また、粒界侵食の発生の有無の他、Cr欠乏層深さお

よび欠乏量、酸化被膜の密着性などの指標と疲労試験における環境感受性との間の直接対応する証拠を、疲労試験片そのものから抽出することは非常に困難である。

しかしながら、疲労試験における荷重交番速度や表面のひずみ速度を考慮すると、局部侵食とき裂の発生、成長の速度過程の相互作用は、巨視的な侵食の形成を待って起こるものではないと思われる。むしろ、長時間の熱サイクル酸化で集積、現出された粒界侵食の傾向を、微視的な粒界侵食反応と瞬時的な表面変形の同時作用へと微小方向へ外挿したモデルを考えると、これらの粒界侵食感受性の高い合金の冷却材近似ヘリウム中疲労寿命が、比較的短いことの有力な理由と考えて不自然ではない。

3.4 他の耐熱合金の疲労データとの比較

本研究での試験条件と同一の試験条件下で得られた Hastelloy X, Hastelloy XR の全ひずみ範囲 $\Delta \epsilon_t$ および塑性ひずみ範囲 $\Delta \epsilon_p$ と破損繰返し数 N_f の関係を⁽¹¹⁾, KSN 合金および SSS 113MA 合金のものと併せて Fig. 9 に示す。冷却材近似ヘリウム中における疲労寿命は、Hastelloy X および Hastelloy XR と比較して、KSN 合金, SSS 113MA 合金では著しく短いことがわかる。

ところで、Hastelloy X, Hastelloy XR > SSS 113MA 合金 > KSN 合金という疲労寿命の順序は、900°C におけるこれらの材料の延性の順と対応しており、低サイクル疲労強度は延性に強く依存する⁽¹³⁾ という一般的傾向と合致している。

Fig. 10 は、上記の四合金に対して、Manson の universal slope 法⁽¹⁴⁾ にならって、延性による正規化を施した塑性ひずみ範囲 $(\Delta \epsilon_p / D)^{0.6}$, $D = 1 \ln \frac{1}{1-RA}$ と破損繰返し数の関係を示している。KSN 合金および SSS 113MA 合金の低ひずみ範囲条件下のデータを除いて、ほぼ良好な直線関係が得られている。ここに示した結果と、3.2 で述べた事実から、冷却材近似ヘリウム中での疲労強度の強弱関係は、それぞれの合金の 900°C における延性の差と冷却材近似ヘリウムに対する環境感受性の差との複合した結果であると考えられる。また、KSN 合金および SSS 113MA 合金では、必要な固溶化熱処理の関係から、既に Photo. 1 に示したように、ASTM NO. 0~1 という非常に粗大粒組織となっている。その結果、クリープ強度は高まるが疲労特性にはむしろ悪い影響を及ぼす⁽¹⁵⁾⁽¹⁶⁾ ことになっていると思われる。なお、Fig. 9, Fig. 10 に示されている Hastelloy X および Hastelloy XR の結晶粒度は、ASTM NO. 4~5 である。

これまでに報告されている種々の耐熱合金の 900°C 付近における疲労データをまとめてみたのが Fig. 11⁽¹¹⁾⁽¹⁷⁾⁽¹⁸⁾ である。これらの比較からも、本研究に用いた KSN 合金および SSS 113MA 合金は、既存の他の耐熱合金と比較して、高温低サイクル疲労特性において劣ることが、十分な有意差で判別できる。一方、上に述べた因子が疲労特性低下の主要な要因であるとするならば、冶金学的な対応によって改善される可能性があるということもできよう。

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 Rosen¹⁸⁾ were employed in the present calculation, and they are listed as follows:

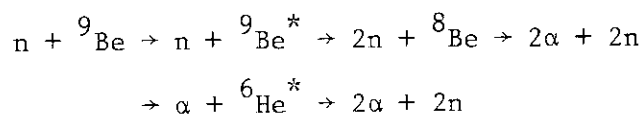
$$\begin{aligned}
 V &= 49.3 - 0.33 \times E_{\text{CM}} \quad (\text{MeV}), \\
 W_s &= 5.75 \quad (\text{MeV}), \\
 V_{\text{so}} &= 5.5 \quad (\text{MeV}), \\
 r_0 &= r_s = r_{\text{so}} = 1.25 \quad (\text{fm}), \\
 a &= a_{\text{so}} = 0.65 \quad (\text{fm}), \\
 b &= 0.70 \quad (\text{fm}),
 \end{aligned}$$

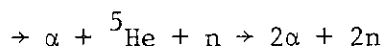
where E_{CM} is the incident energy in the center-of-mass system.

4. The (n,2n) Reaction

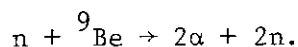
The (n,2n) reaction is supposed to proceed via the following processes:

Sequential decay





Simultaneous breakup



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:

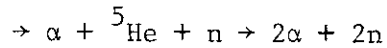
| | | |
|------------------------------------|---------|----------------------|
| Ashby et al. ¹⁹⁾ | (1958), | 14.1 MeV, |
| Catron et al. ²⁰⁾ | (1961), | 6.6 MeV ~ 8.3 MeV, |
| Holmberg and Hansén ²¹⁾ | (1969), | 2 MeV ~ 6.4 MeV, |
| Bloser ²²⁾ | (1972), | 2.4 MeV ~ 3.3 MeV, |
| Drake et al. ²³⁾ | (1977), | 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 Jurney²⁴⁾. 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.,



Simultaneous breakup



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

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

Alburger²⁶⁾ observed β -rays from ${}^9\text{Li}$ and deduced a value of 0.7 mb for the (n,p) cross section at 15.5 MeV. Augustson and Menlove²⁷⁾ measured delayed-neutron production cross sections for the ${}^9\text{Be}(n,p){}^9\text{Li}$ 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 Scobel²⁹⁾ 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:

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

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Alburger²⁶⁾ observed β -rays from ${}^9\text{Li}$ and deduced a value of 0.7 mb for the (n,p) cross section at 15.5 MeV. Augustson and Menlove²⁷⁾ measured delayed-neutron production cross sections for the ${}^9\text{Be}(n,p){}^9\text{Li}$ 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 Scobel²⁹⁾ 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 ${}^9\text{Be}(n, \alpha){}^6\text{He}$ reaction leaving the residual nucleus in the excited states is known²⁸⁾ 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 \sim 4.4 MeV, |
| Bass et al. ³⁸⁾ | (1961), | 3.9 MeV \sim 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 Sellem⁴⁰⁾ were obtained by measuring α -particles, while the others were obtained by measuring β -rays from ${}^6\text{He}$. Figure 12 shows the result.

10. Concluding Remarks

Evaluation of neutron nuclear data for ${}^9\text{Be}$ 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

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

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| | | |
|-------------------------------------|---------|--------------------|
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| 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. |

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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)}.

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| | | |
|-------------------------------------|---------|--------------------|
| 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, |
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Among the above measurements, the data of Paić et al.³⁹⁾ and of Perroud and Sellem⁴⁰⁾ were obtained by measuring α -particles, while the others were obtained by measuring β -rays from ${}^6\text{He}$. Figure 12 shows the result.

10. Concluding Remarks

Evaluation of neutron nuclear data for ${}^9\text{Be}$ 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

The authors wish to acknowledge valuable discussion with Dr. S. Igarasi. They also thank Mr. T. Narita for his aid in making graphs. They are also grateful to Miss T. Maejima for her typewriting.

4. 結 言

高温ガス炉中間熱交換器伝熱管用に開発されたNi-Cr-W系合金のKSN合金およびSSS113MA合金を供試材として、多目的高温ガス炉冷却材近似ヘリウム中における900°Cでの高温低サイクル疲労試験を行った結果、次のような知見を得た。

- (1) SSS113MA合金の方がKSN合金よりも不純ヘリウム中高温低サイクル疲労特性はすぐれており、疲労寿命で50%程度長かった。
- (2) 冷却材近似ヘリウム中での高温低サイクル疲労寿命は、本研究の試験条件下では両合金ともに、超高真空中における場合に比べて、10~20%程度にまで減少した。
- (3) 破壊モードは、いずれの合金においても、ほぼ100%粒界破壊であった。
- (4) KSN合金およびSSS113MA合金はともに、本試験を行った温度領域では、既存の他の耐熱合金と比較して、高温低サイクル疲労特性が明らかに低く、構造部材として改良の余地があるものと判断される。

(19)(20)

なお、SSS113MA合金については、熱処理条件の面から疲労特性改善の試みがなされており、今後、その点に関して検討していく予定である。

謝 辞

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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

The authors wish to acknowledge valuable discussion with Dr. S. Igarasi. They also thank Mr. T. Narita for his aid in making graphs. They are also grateful to Miss T. Maejima for her typewriting.

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Table 1 Reaction Q-values and threshold energies.

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

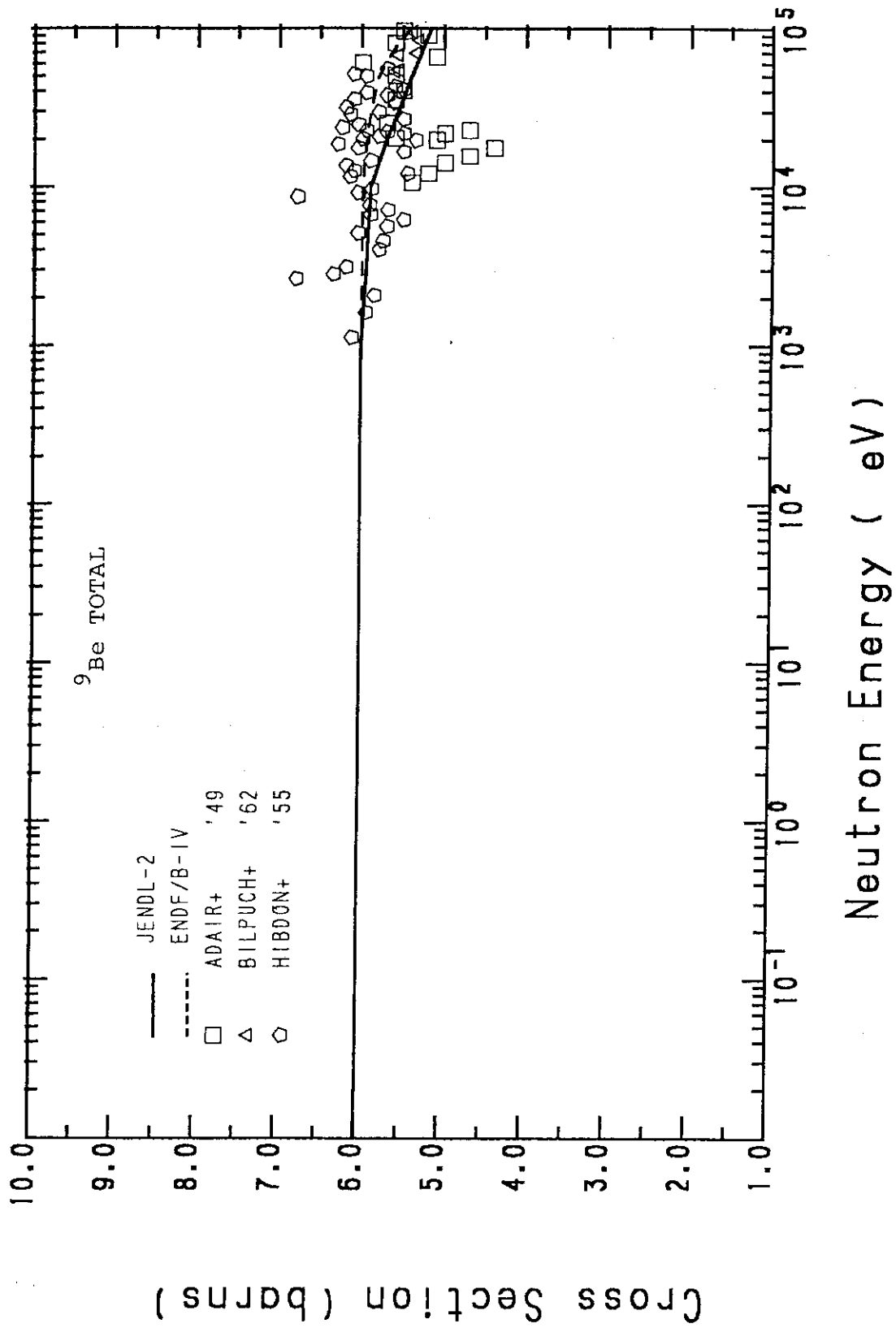


Fig. 1 Measured and evaluated total cross sections from 10^{-2} eV to 100 keV.

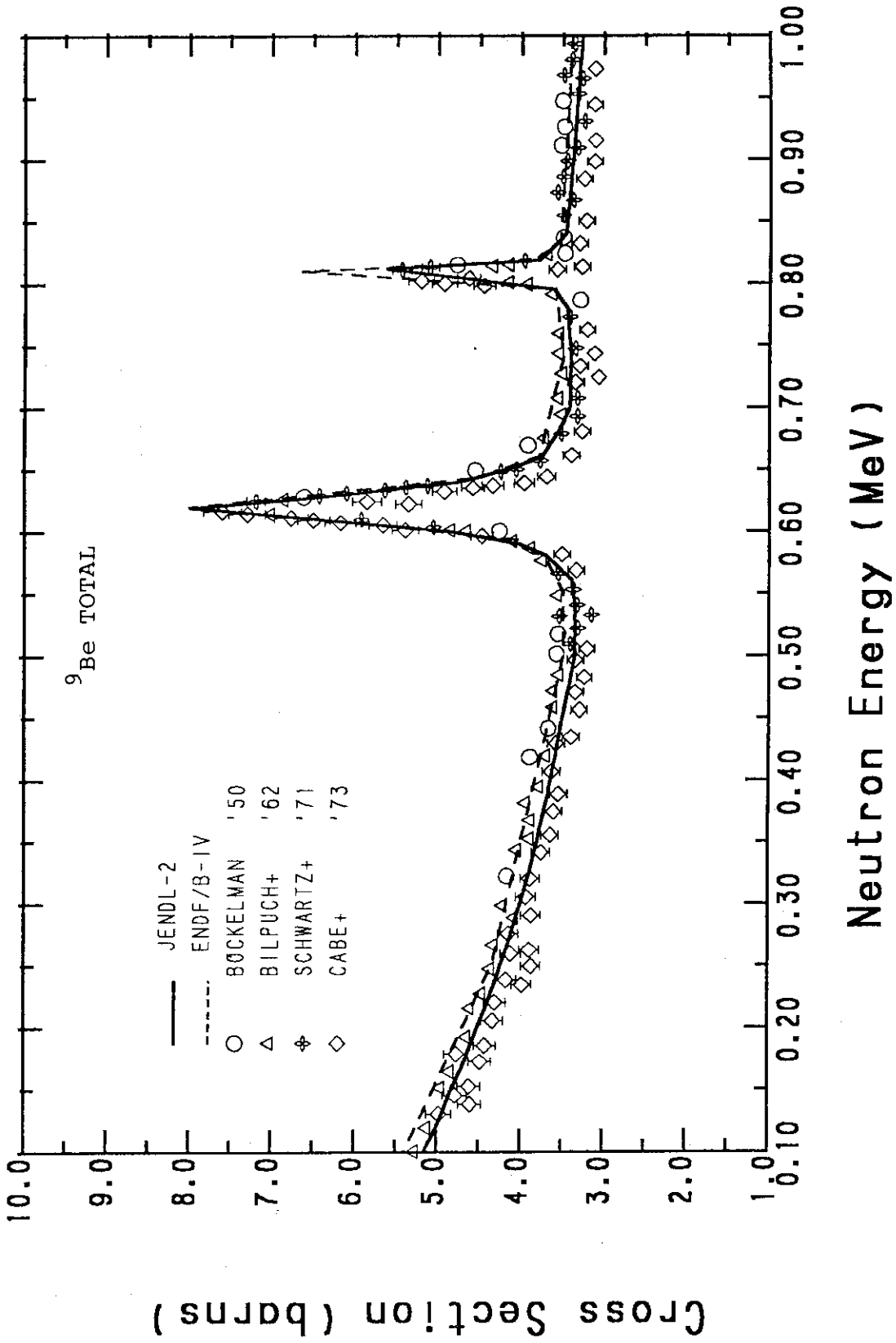


Fig. 2 Measured and evaluated total cross sections from 0.1 MeV to 1 MeV.

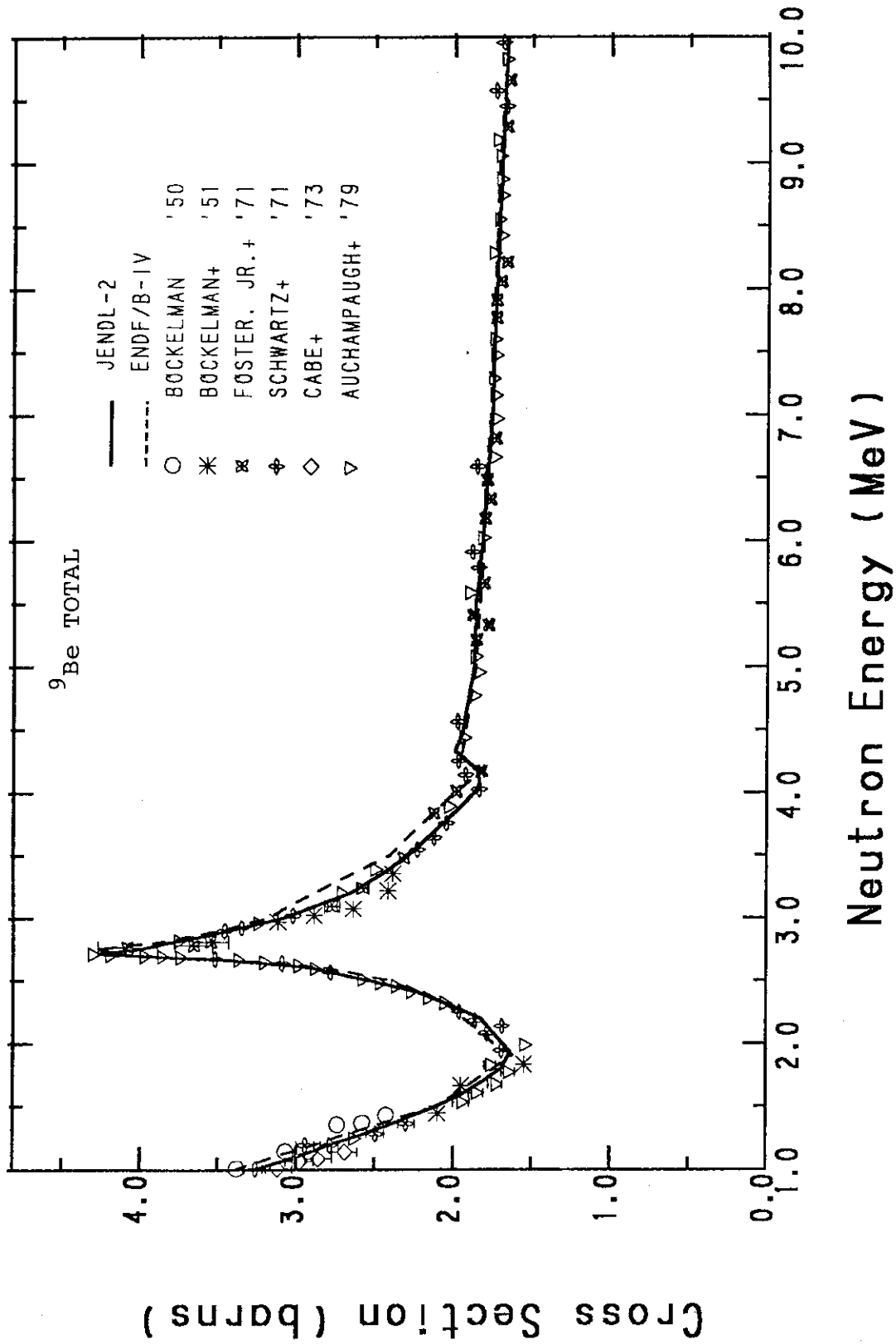


Fig. 3 Measured and evaluated total cross sections from 1 MeV to 10 MeV.

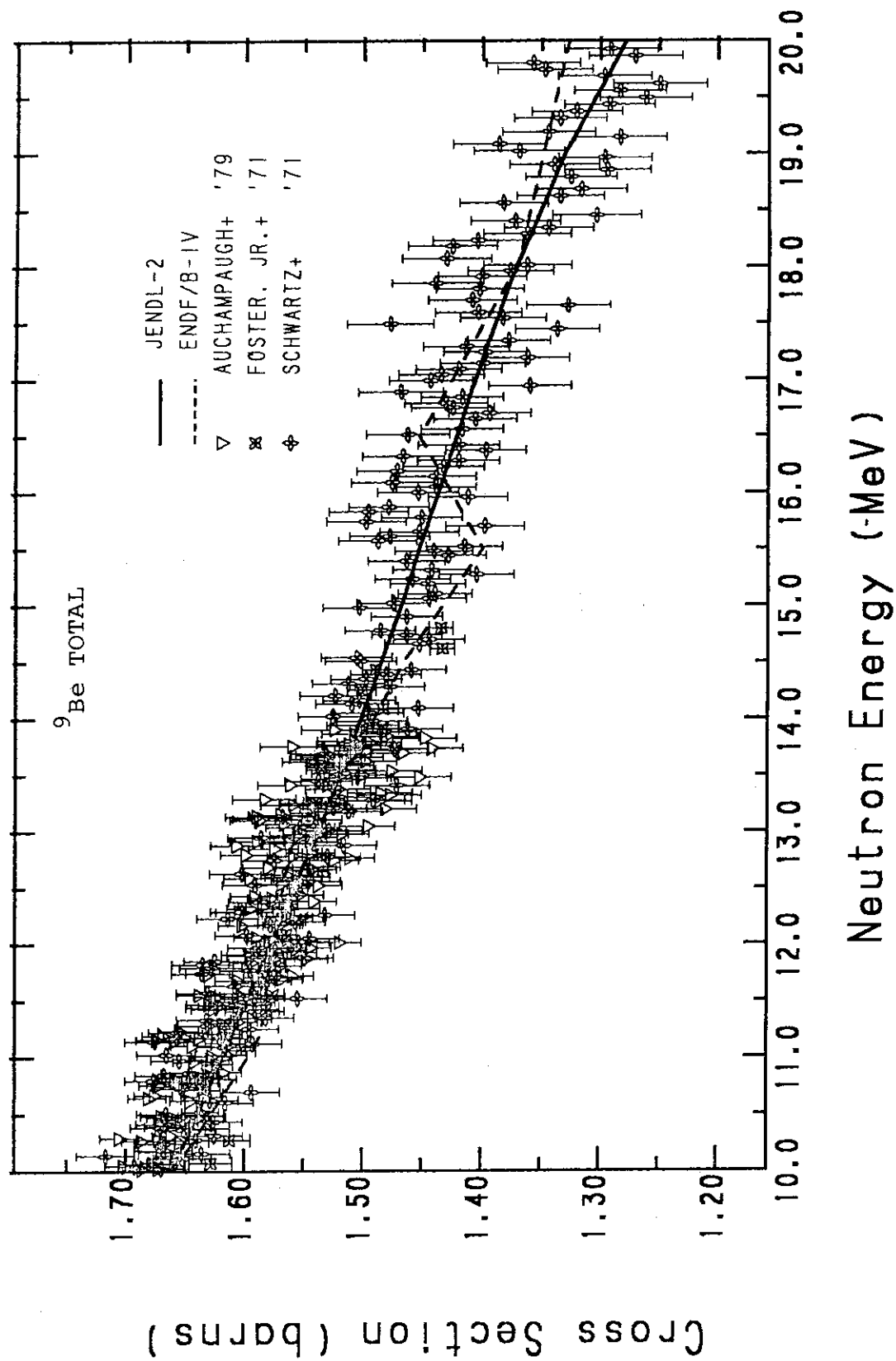


Fig. 4 Measured and evaluated total cross sections from 10 MeV to 20 MeV.

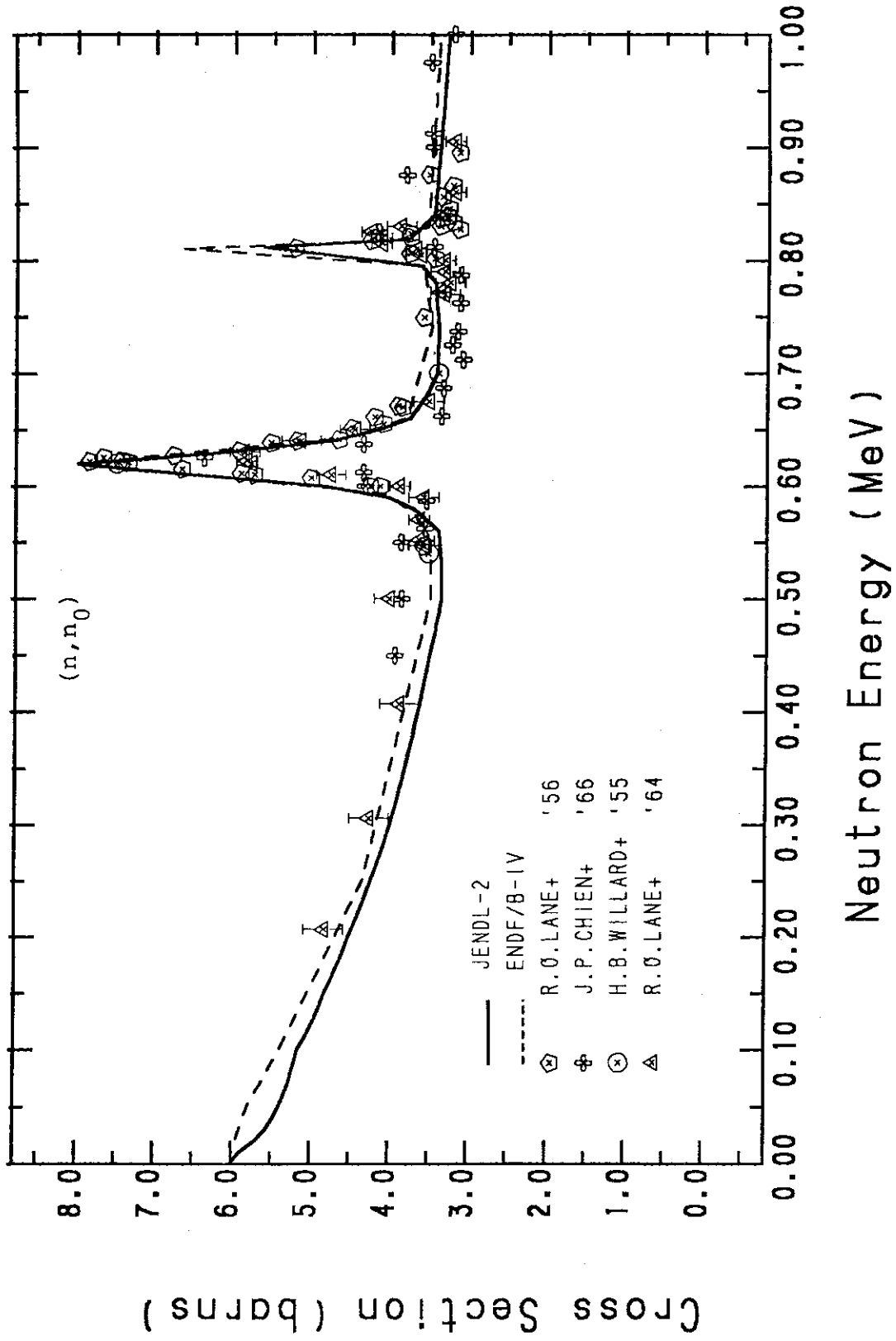


Fig. 5 Measured and evaluated elastic scattering cross sections below

1 MeV.

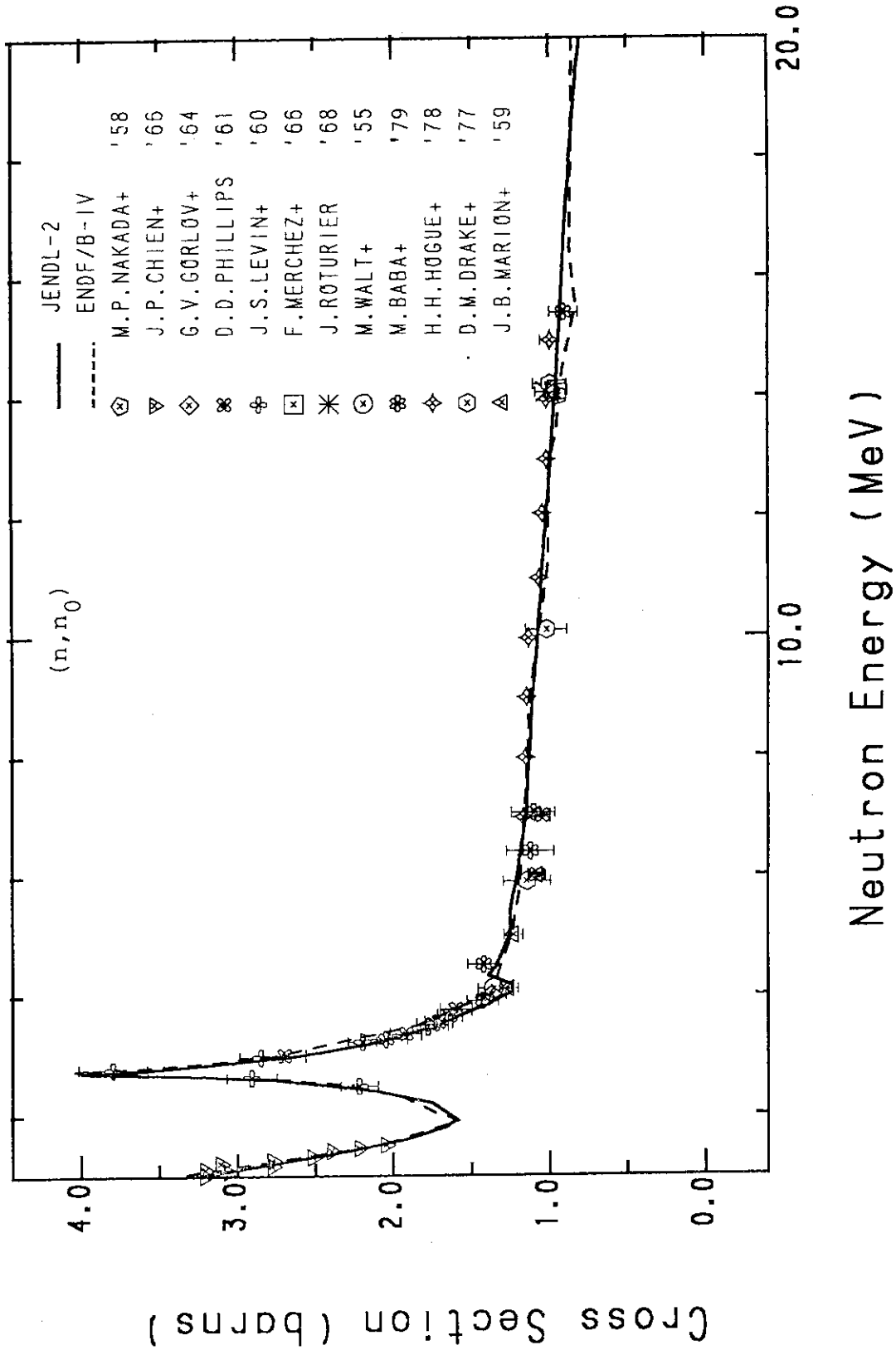


Fig. 6 Measured and evaluated elastic scattering cross sections above 1 MeV.

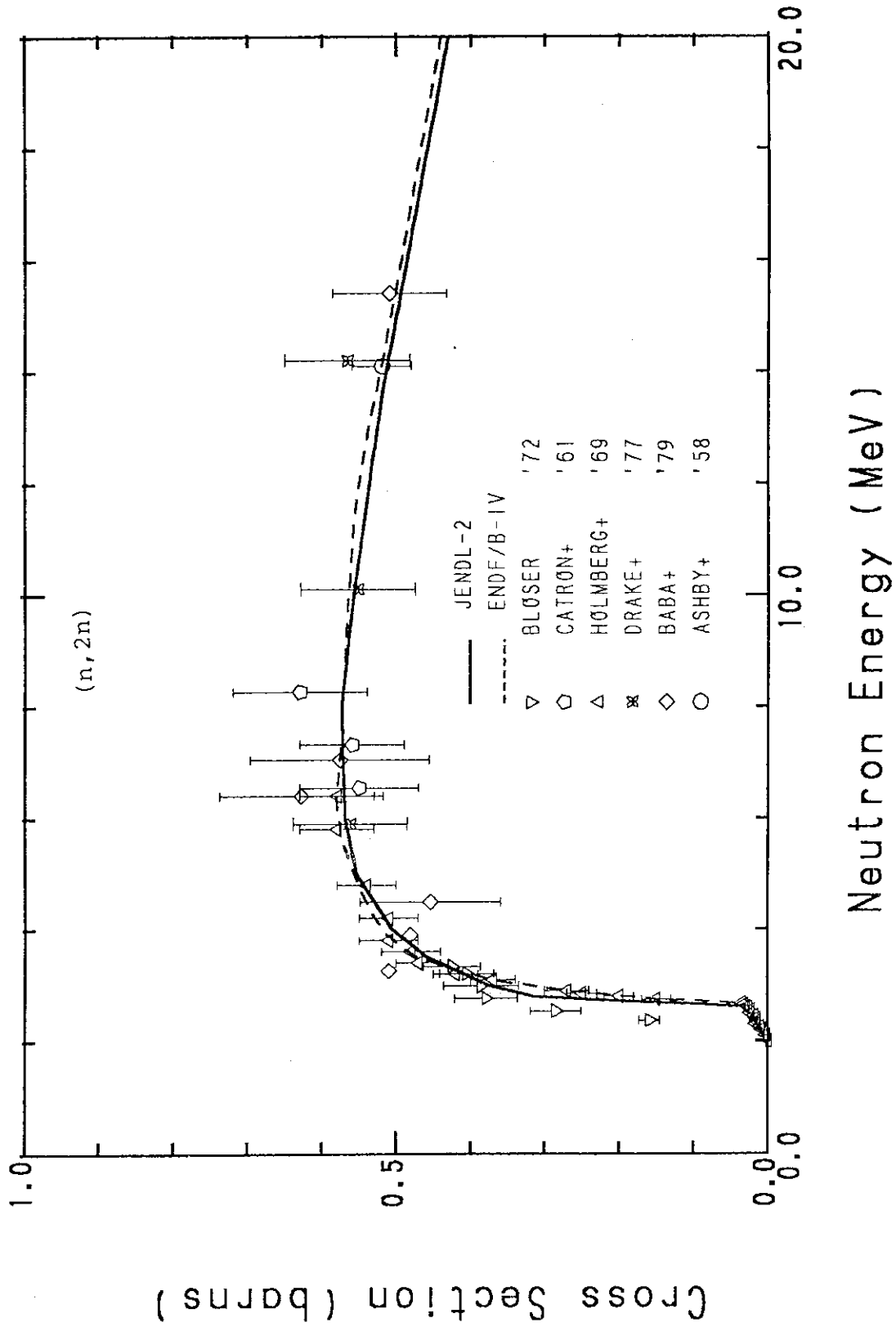


Fig. 7 Measured and evaluated (n,2n) cross sections.

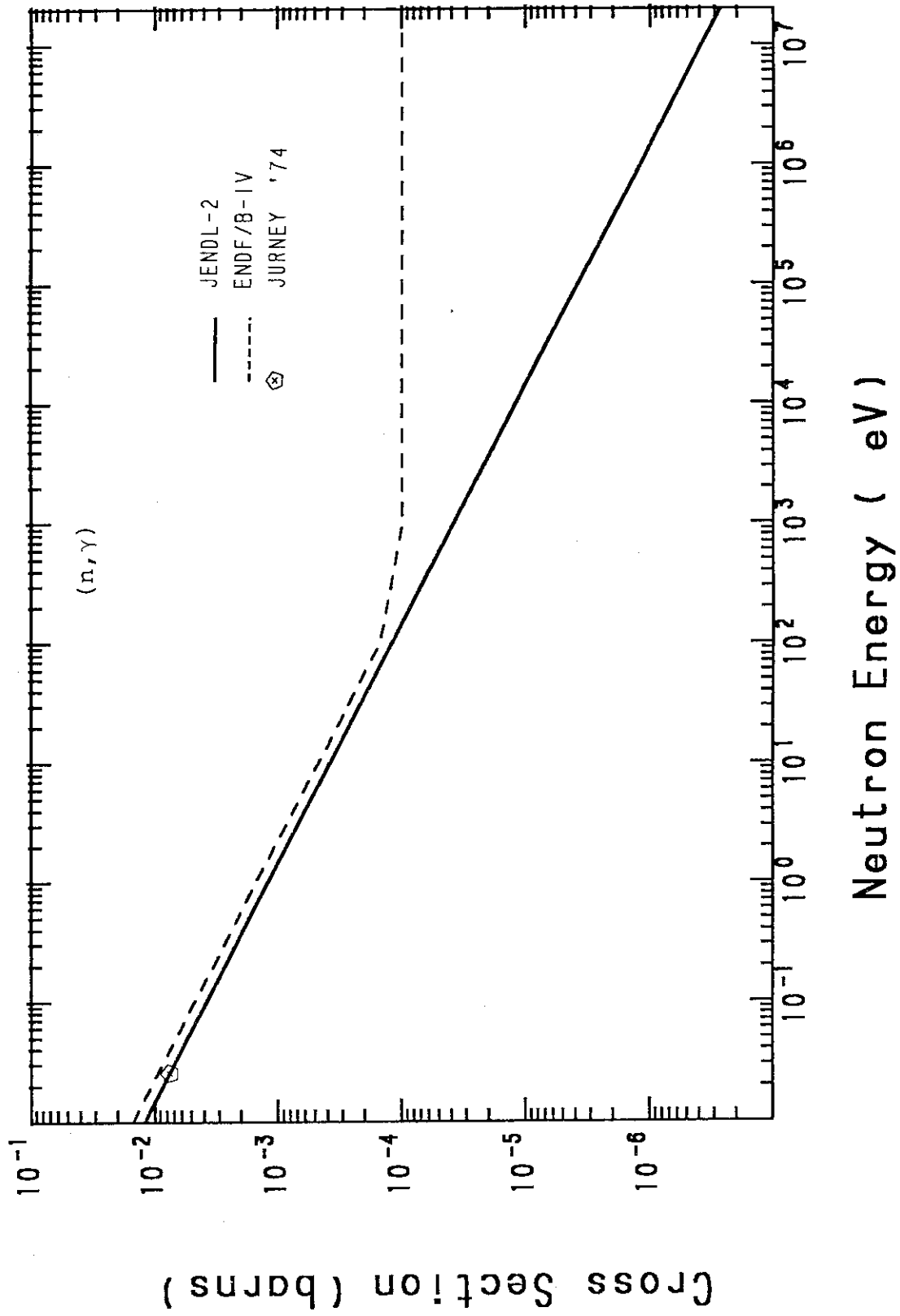


Fig. 8 Measured and evaluated (n, γ) cross sections.

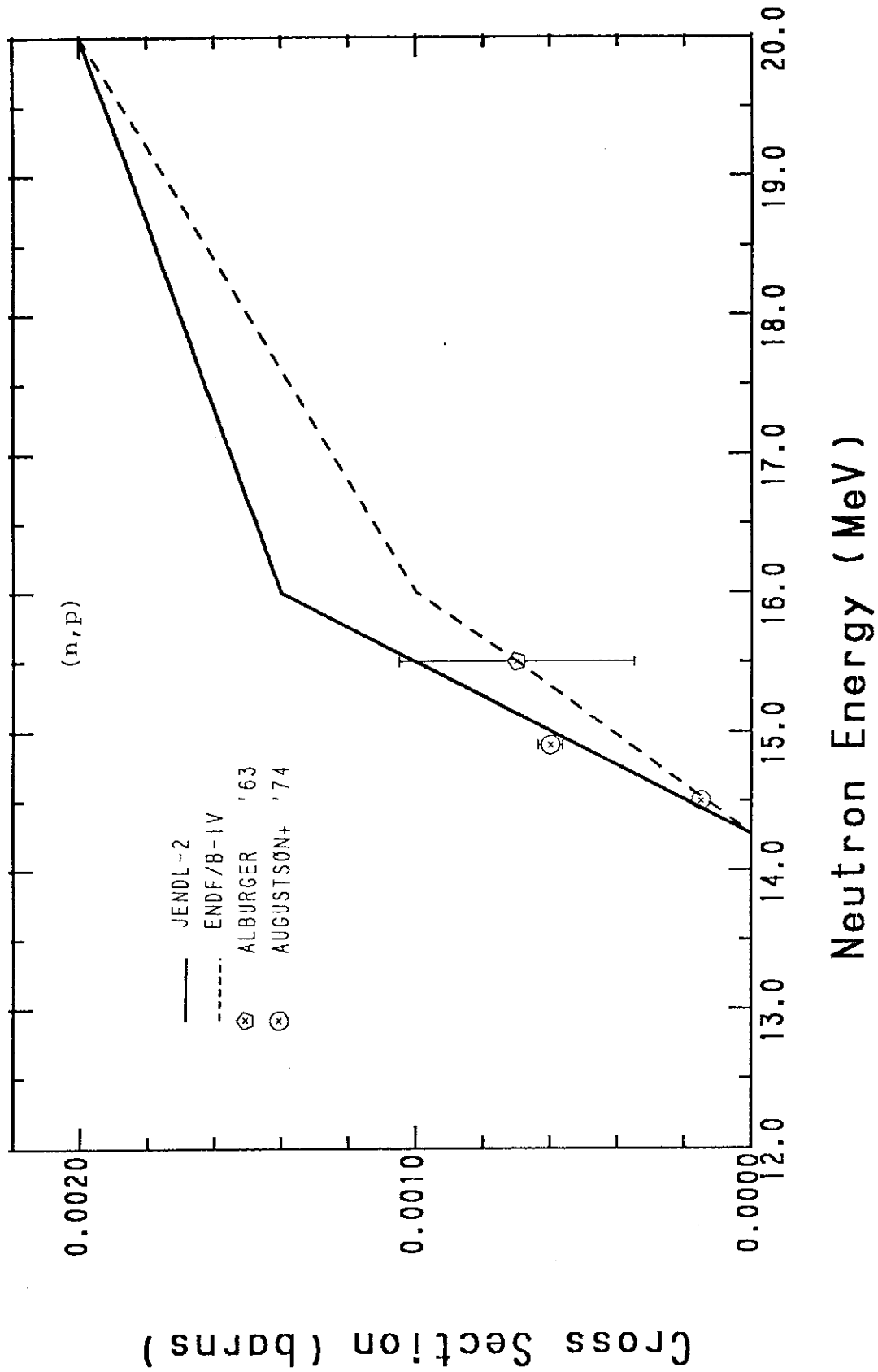


Fig. 9 Measured and evaluated (n,p) cross sections.

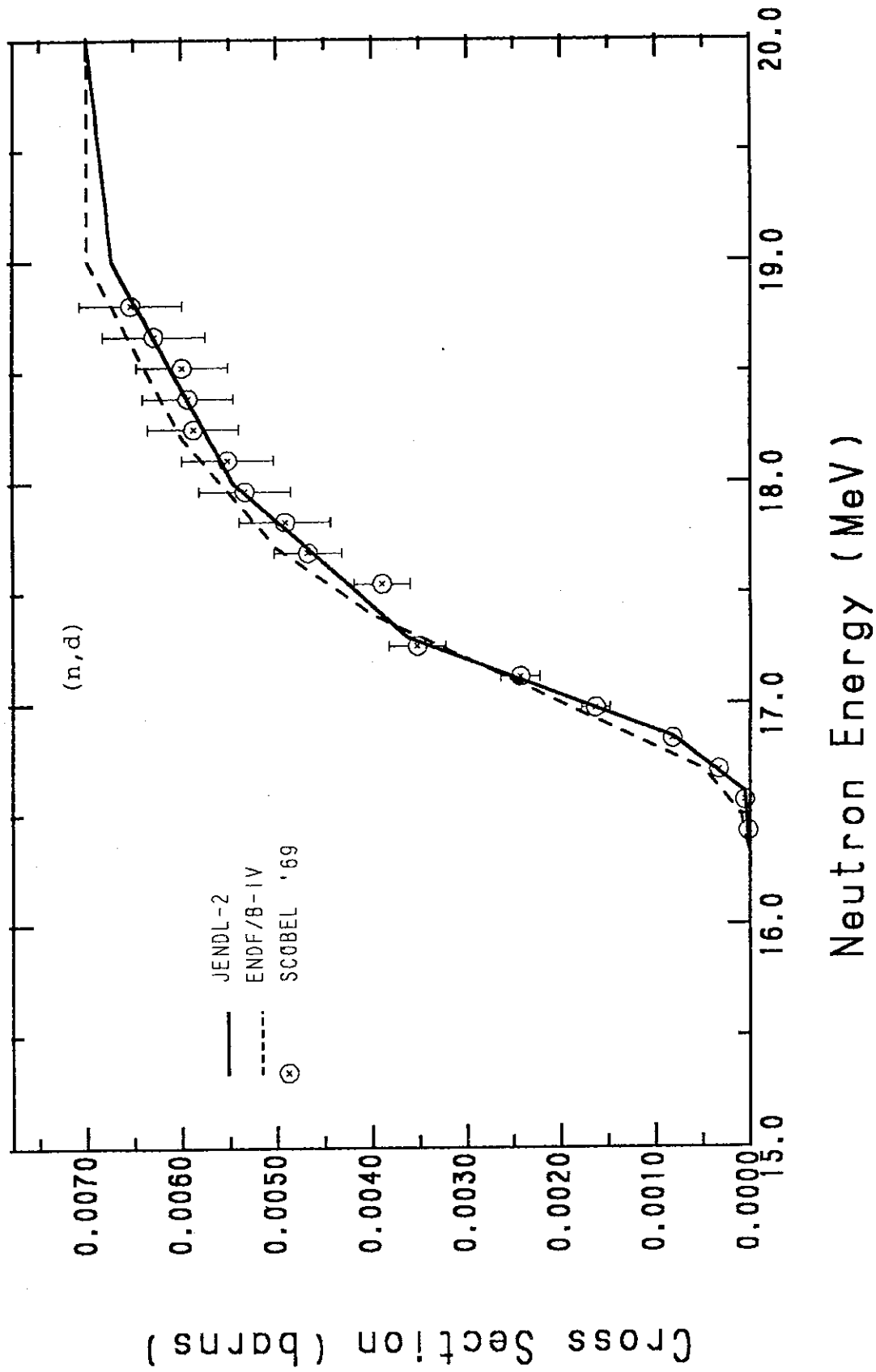


Fig. 10 Measured and evaluated (n,d) cross sections.

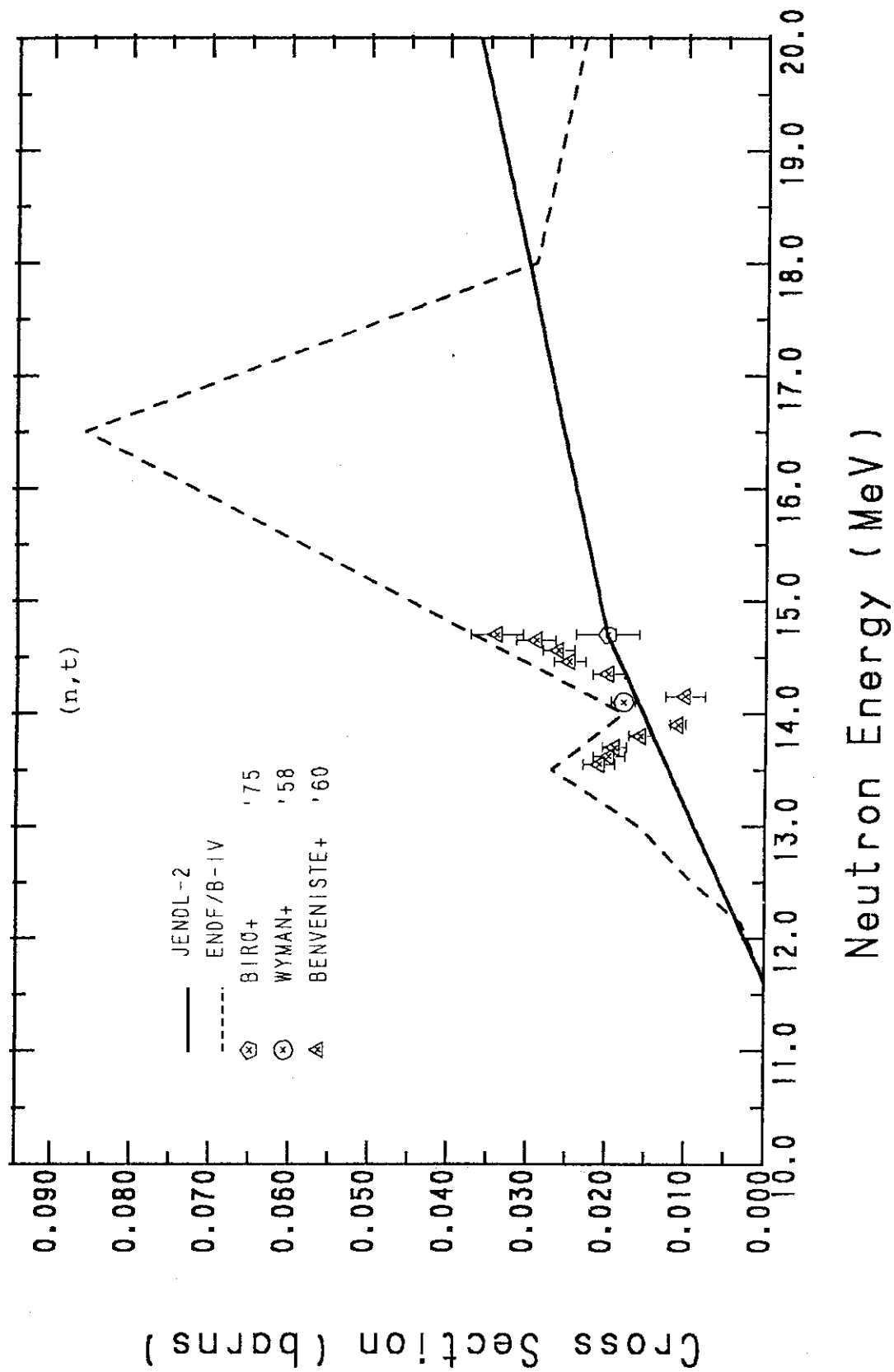


Fig. 11 Measured and evaluated (n,t) cross sections.

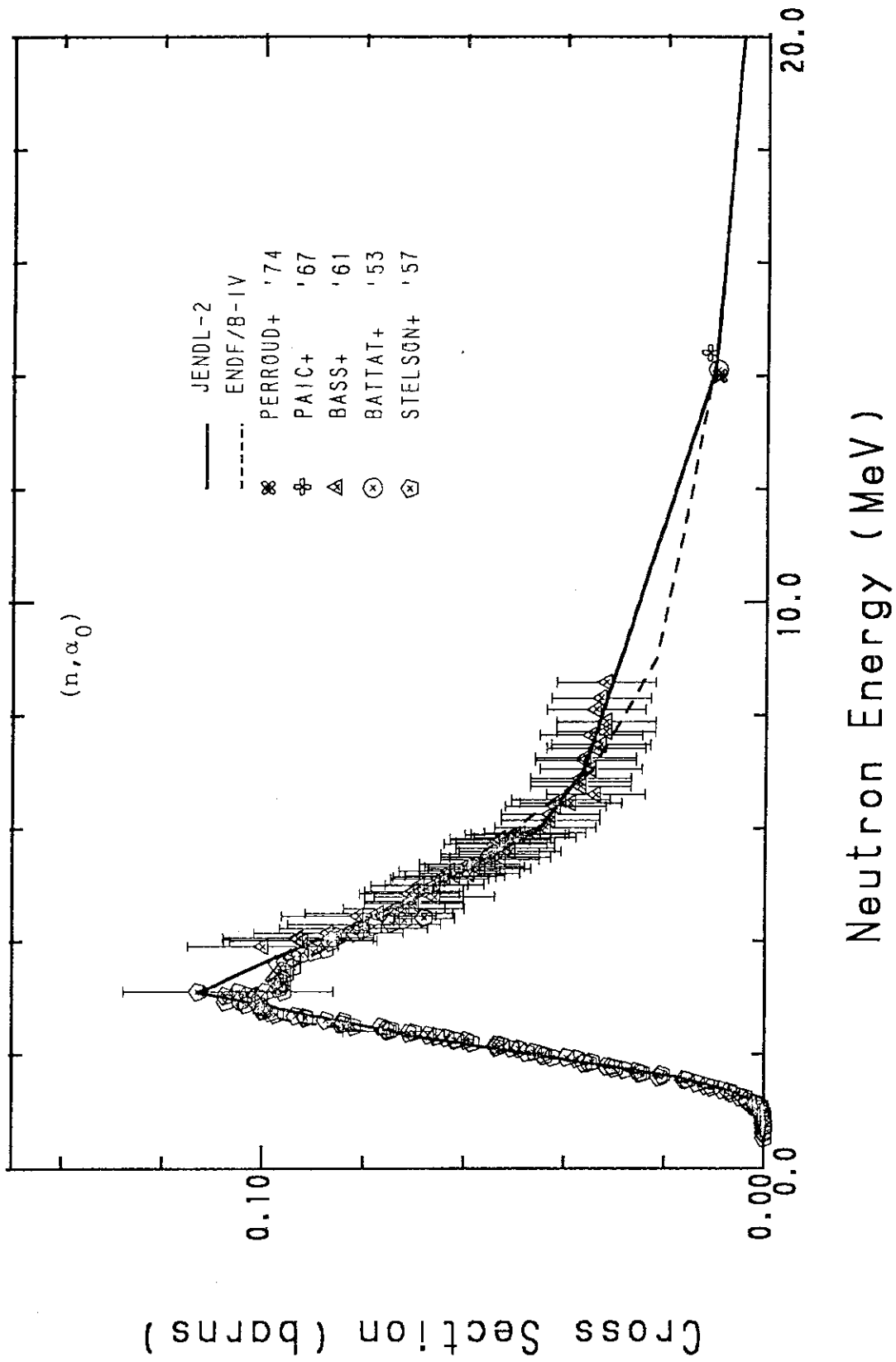


Fig. 12 Measured and evaluated (n, α_0) cross sections.

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 | 14 | 20 | 41 | 1 |
| 0.0 + 0 0.0 + 0 0 0 99 | 02 | 20 | 41 | 2 |
| 4-BE- 9 JAERI+ EVAL-SEP82 K.SIBATA,K.IOKI(MAPI) | 20 | 41 | 1451 | 3 |
| DIST-MAR83 REV1-NOV83 | 20 | 41 | 1451 | 4 |
| HISTORY | 20 | 41 | 1451 | 5 |
| 82-09 NEW EVALUATION WAD MADE BY K.SIBATA(JAERI) AND K.IOKI(MAPI) | 20 | 41 | 1451 | 6 |
| 83-11 COMMENT WAS ADDED. | 20 | 41 | 1451 | 7 |
| | 20 | 41 | 1451 | 8 |
| MF=1 GENERAL INFORMATION | 20 | 41 | 1451 | 9 |
| MT=451 DESCRIPTIVE DATA | 20 | 41 | 1451 | 10 |
| | 20 | 41 | 1451 | 11 |
| MF=2 RESONANCE PARAMETERS | 20 | 41 | 1451 | 12 |
| MT=151 SCATTERING RADIUS ONLY | 20 | 41 | 1451 | 13 |
| | 20 | 41 | 1451 | 14 |
| 2200-M/SEC CROSS SECTIONS AND RESONANCE INTEGRALS. | 20 | 41 | 1451 | 15 |
| 2200 M/SEC RES. INTEG. | 20 | 41 | 1451 | 16 |
| ELASTIC 6.000 B - | 20 | 41 | 1451 | 17 |
| CAPTURE 0.0076 B 3.42 MILLI-B | 20 | 41 | 1451 | 18 |
| TOTAL 6.0076 B - | 20 | 41 | 1451 | 19 |
| | 20 | 41 | 1451 | 20 |
| MF=3 NEUTRON CROSS SECTIONS | 20 | 41 | 1451 | 21 |
| MT=1 TOTAL | 20 | 41 | 1451 | 22 |
| BELOW 1 KEV, TOTAL = 6.0 + CAPTURE (B). | 20 | 41 | 1451 | 23 |
| ABOVE 1 KEV, DATA LISTED IN /1/-/10/ WERE USED. | 20 | 41 | 1451 | 24 |
| | 20 | 41 | 1451 | 25 |
| MT=2 ELASTIC | 20 | 41 | 1451 | 26 |
| ELASTIC = TOTAL - REACTION. | 20 | 41 | 1451 | 27 |
| | 20 | 41 | 1451 | 28 |
| MT=16 (N,2N) | 20 | 41 | 1451 | 29 |
| DATA LISTED IN /11/-/15/ WERE USED. | 20 | 41 | 1451 | 30 |
| | 20 | 41 | 1451 | 31 |
| MT=102 CAPTURE | 20 | 41 | 1451 | 32 |
| 1/V FORM NORMALIZED TO THE DATA OF JURNEY /16/. | 20 | 41 | 1451 | 33 |
| | 20 | 41 | 1451 | 34 |
| MT=103 (N,P) | 20 | 41 | 1451 | 35 |
| EVALUATED ON THE BASIS OF THE DATA OF AUGUSTSON AND | 20 | 41 | 1451 | 36 |
| MENLOVE /17/ BY TAKING ACCOUNT OF THE BRANCHING RATIO | 20 | 41 | 1451 | 37 |
| OF 35 PERCENT FOR LI9 => BE9* => 2A + N. | 20 | 41 | 1451 | 38 |
| | 20 | 41 | 1451 | 39 |
| MT=104 (N,D) | 20 | 41 | 1451 | 40 |
| BASED ON THE DATA OF SCOEBEL /18/. | 20 | 41 | 1451 | 41 |
| | 20 | 41 | 1451 | 42 |
| MT=105 (N,T) | 20 | 41 | 1451 | 43 |
| BASED ON THE DATA OF BIRD ET AL. /19/ AND | 20 | 41 | 1451 | 44 |
| QAIM AND WOLFLE /20/. | 20 | 41 | 1451 | 45 |
| | 20 | 41 | 1451 | 46 |
| MT=107 (N,ALPHA) | 20 | 41 | 1451 | 47 |
| DATA LISTED IN /21/-/25/ WERE USED. | 20 | 41 | 1451 | 48 |
| ONLY THE TRANSITION TO THE GROUND STATE IN HE6 IS GIVEN. | 20 | 41 | 1451 | 49 |

|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 |
| 1) ADAIR, R.K. ET AL. : PHYS. REV. 75 (1949) 1124. | 2041 | 1451 | | 69 |
| 2) BOCKELMAN, C.K. : PHYS. REV. 80 (1950) 1011. | 2041 | 1451 | | 70 |
| 3) BOCKELMAN, C.K. ET AL. : PHYS. REV. 84 (1951) 69. | 2041 | 1451 | | 71 |
| 4) HIBDON, C.T. AND LANGSDORF, JR., A. : PHYS. REV. 98 (1955) 223 | 2041 | 1451 | | 72 |
| 5) FOWLER, J.L. AND COHN, H.O. : BULL. AM. PHYS. SOC. 4(1959)385. | 2041 | 1451 | | 73 |
| 6) BILPUCH, E.G. ET AL. : PRIVATE COMMUNICATION, 1962. | 2041 | 1451 | | 74 |
| 7) SCHWARTZ, R.B. ET AL. : BULL. AM. PHYS. SOC. 16 (1971) 495. | 2041 | 1451 | | 75 |
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| | 2041 | 1451 | | 101 |
| | 2041 | 1451 | | 102 |

| | | | | | | | | | | MAT | MF | MT | SEQ | |
|--------------|--------------|--------------|--------------|--------------|--------------|----------|---|----------|---|----------|-------|----|-----|-----|
|10..... |20..... |30..... |40..... |50..... |60..... | | | | | | | | | |
| | | | 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 |

|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+ | 0 | 02041 | 3 | 1 | 156 |
| 1.37500+ | 7 | 1.51100+ | 0 | 1.40000+ | 7 | 1.50200+ | 0 | 1.41000+ | 7 | 1.49900+ | 0 | 02041 | 3 | 1 | 157 |
| 1.42600+ | 7 | 1.49300+ | 0 | 1.45000+ | 7 | 1.48500+ | 0 | 1.47000+ | 7 | 1.47814+ | 0 | 02041 | 3 | 1 | 158 |
| 1.50000+ | 7 | 1.46800+ | 0 | 1.55000+ | 7 | 1.45300+ | 0 | 1.60000+ | 7 | 1.43700+ | 0 | 02041 | 3 | 1 | 159 |
| 1.62900+ | 7 | 1.42800+ | 0 | 1.63040+ | 7 | 1.42755+ | 0 | 1.66000+ | 7 | 1.41800+ | 0 | 02041 | 3 | 1 | 160 |
| 1.68500+ | 7 | 1.41100+ | 0 | 1.70000+ | 7 | 1.40600+ | 0 | 1.73000+ | 7 | 1.39600+ | 0 | 02041 | 3 | 1 | 161 |
| 1.80000+ | 7 | 1.37200+ | 0 | 1.90000+ | 7 | 1.33100+ | 0 | 2.00000+ | 7 | 1.27800+ | 0 | 02041 | 3 | 1 | 162 |
| | | | | | | | | | | | | 2041 | 3 | 0 | 163 |
| 4.00900+ | 3 | 8.93476+ | 0 | | | | | | | | | 02041 | 3 | 2 | 164 |
| 0.0 | + | 0.0 | + | | | | | | | | | 1072041 | 3 | 2 | 165 |
| | 107 | | 5 | | | | | | | | | 02041 | 3 | 2 | 166 |
| 1.00000- | 5 | 6.00000+ | 0 | 6.67000- | 5 | 6.00000+ | 0 | 1.00000- | 4 | 6.00000+ | 0 | 02041 | 3 | 2 | 167 |
| 1.00000- | 3 | 6.00000+ | 0 | 2.53000- | 2 | 6.00000+ | 0 | 1.00000- | 1 | 6.00000+ | 0 | 02041 | 3 | 2 | 168 |
| 1.00000+ | 0 | 6.00000+ | 0 | 1.00000+ | 1 | 6.00000+ | 0 | 1.00000+ | 2 | 6.00000+ | 0 | 02041 | 3 | 2 | 169 |
| 1.00000+ | 3 | 6.00000+ | 0 | 1.00000+ | 4 | 5.89998+ | 0 | 2.00000+ | 4 | 5.69997+ | 0 | 02041 | 3 | 2 | 170 |
| 5.00000+ | 4 | 5.39994+ | 0 | 1.00000+ | 5 | 5.15890+ | 0 | 1.50000+ | 5 | 4.83085+ | 0 | 02041 | 3 | 2 | 171 |
| 2.00000+ | 5 | 4.51880+ | 0 | 2.50000+ | 5 | 4.23975+ | 0 | 3.00000+ | 5 | 4.00270+ | 0 | 02041 | 3 | 2 | 172 |
| 3.50000+ | 5 | 3.80865+ | 0 | 4.00000+ | 5 | 3.64760+ | 0 | 4.50000+ | 5 | 3.50255+ | 0 | 02041 | 3 | 2 | 173 |
| 5.00000+ | 5 | 3.34950+ | 0 | 5.40000+ | 5 | 3.35546+ | 0 | 5.60000+ | 5 | 3.38744+ | 0 | 02041 | 3 | 2 | 174 |
| 5.80000+ | 5 | 3.70442+ | 0 | 5.90000+ | 5 | 4.02741+ | 0 | 6.00000+ | 5 | 4.83540+ | 0 | 02041 | 3 | 2 | 175 |
| 6.15000+ | 5 | 7.27738+ | 0 | 6.19200+ | 5 | 7.97738+ | 0 | 6.40000+ | 5 | 4.75336+ | 0 | 02041 | 3 | 2 | 176 |
| 6.50000+ | 5 | 4.16235+ | 0 | 6.60000+ | 5 | 3.75934+ | 0 | 6.70000+ | 5 | 3.65833+ | 0 | 02041 | 3 | 2 | 177 |
| 6.80000+ | 5 | 3.55632+ | 0 | 7.00000+ | 5 | 3.41430+ | 0 | 7.40000+ | 5 | 3.40026+ | 0 | 02041 | 3 | 2 | 178 |
| 7.80000+ | 5 | 3.44422+ | 0 | 7.95000+ | 5 | 3.61720+ | 0 | 8.11800+ | 5 | 5.62919+ | 0 | 02041 | 3 | 2 | 179 |
| 8.19000+ | 5 | 3.80018+ | 0 | 8.40000+ | 5 | 3.46816+ | 0 | 1.00000+ | 6 | 3.27400+ | 0 | 02041 | 3 | 2 | 180 |
| 1.20000+ | 6 | 2.77850+ | 0 | 1.40000+ | 6 | 2.30250+ | 0 | 1.60000+ | 6 | 1.91500+ | 0 | 02041 | 3 | 2 | 181 |
| 1.80000+ | 6 | 1.66100+ | 0 | 1.85000+ | 6 | 1.63400+ | 0 | 1.92700+ | 6 | 1.59200+ | 0 | 02041 | 3 | 2 | 182 |
| 2.00000+ | 6 | 1.63600+ | 0 | 2.20000+ | 6 | 1.75300+ | 0 | 2.30000+ | 6 | 1.93100+ | 0 | 02041 | 3 | 2 | 183 |
| 2.40000+ | 6 | 2.11000+ | 0 | 2.50000+ | 6 | 2.43800+ | 0 | 2.60000+ | 6 | 2.80600+ | 0 | 02041 | 3 | 2 | 184 |
| 2.62000+ | 6 | 2.96800+ | 0 | 2.66000+ | 6 | 3.22900+ | 0 | 2.70000+ | 6 | 3.87400+ | 0 | 02041 | 3 | 2 | 185 |
| 2.71400+ | 6 | 3.99344+ | 0 | 2.75000+ | 6 | 3.67500+ | 0 | 2.80000+ | 6 | 3.39300+ | 0 | 02041 | 3 | 2 | 186 |
| 2.85000+ | 6 | 3.17500+ | 0 | 3.00000+ | 6 | 2.60900+ | 0 | 3.10000+ | 6 | 2.37100+ | 0 | 02041 | 3 | 2 | 187 |
| 3.20000+ | 6 | 2.14100+ | 0 | 3.50000+ | 6 | 1.72700+ | 0 | 3.70000+ | 6 | 1.53800+ | 0 | 02041 | 3 | 2 | 188 |
| 4.00000+ | 6 | 1.27700+ | 0 | 4.05700+ | 6 | 1.24500+ | 0 | 4.17500+ | 6 | 1.24900+ | 0 | 02041 | 3 | 2 | 189 |
| 4.32900+ | 6 | 1.39200+ | 0 | 4.47100+ | 6 | 1.34200+ | 0 | 4.50000+ | 6 | 1.33800+ | 0 | 02041 | 3 | 2 | 190 |
| 5.00000+ | 6 | 1.25400+ | 0 | 5.50000+ | 6 | 1.24400+ | 0 | 6.00000+ | 6 | 1.20700+ | 0 | 02041 | 3 | 2 | 191 |
| 6.50000+ | 6 | 1.18000+ | 0 | 7.00000+ | 6 | 1.15050+ | 0 | 7.50000+ | 6 | 1.14133+ | 0 | 02041 | 3 | 2 | 192 |
| 8.00000+ | 6 | 1.12917+ | 0 | 8.50000+ | 6 | 1.11900+ | 0 | 9.00000+ | 6 | 1.10684+ | 0 | 02041 | 3 | 2 | 193 |
| 9.50000+ | 6 | 1.09267+ | 0 | 1.00000+ | 7 | 1.07751+ | 0 | 1.10000+ | 7 | 1.05018+ | 0 | 02041 | 3 | 2 | 194 |
| 1.16000+ | 7 | 1.03438+ | 0 | 1.16100+ | 7 | 1.03411+ | 0 | 1.20000+ | 7 | 1.02133+ | 0 | 02041 | 3 | 2 | 195 |
| 1.21300+ | 7 | 1.01696+ | 0 | 1.30000+ | 7 | 9.89524- | 1 | 1.37500+ | 7 | 9.68423- | 1 | 12041 | 3 | 2 | 196 |
| 1.40000+ | 7 | 9.61723- | 1 | 1.41000+ | 7 | 9.59443- | 1 | 1.42600+ | 7 | 9.54555- | 1 | 12041 | 3 | 2 | 197 |
| 1.45000+ | 7 | 9.49029- | 1 | 1.47000+ | 7 | 9.43703- | 1 | 1.50000+ | 7 | 9.36871- | 1 | 12041 | 3 | 2 | 198 |
| 1.55000+ | 7 | 9.27391- | 1 | 1.60000+ | 7 | 9.16912- | 1 | 1.62900+ | 7 | 9.11244- | 1 | 12041 | 3 | 2 | 199 |
| 1.63040+ | 7 | 9.10937- | 1 | 1.66000+ | 7 | 9.04469- | 1 | 1.68500+ | 7 | 9.00133- | 1 | 12041 | 3 | 2 | 200 |
| 1.70000+ | 7 | 8.95847- | 1 | 1.73000+ | 7 | 8.87285- | 1 | 1.80000+ | 7 | 8.69841- | 1 | 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 | | | | 99 | | | | | 02041 | 3 | 16 | 204 |
| 0.0 | + | 0-1.66378+ | 6 | | | | 0 | | | | | 582041 | 3 | 16 | 205 |
| | 58 | | 2 | | | | 0 | | | | | 02041 | 3 | 16 | 206 |
| 1.85000+ | 6 | 0.0 | + | 1.92700+ | 6 | 1.00000- | 3 | 2.00000+ | 6 | 2.00000- | 3 | 32041 | 3 | 16 | 207 |
| 2.20000+ | 6 | 1.00000- | 2 | 2.30000+ | 6 | 1.40000- | 2 | 2.40000+ | 6 | 1.80000- | 2 | 22041 | 3 | 16 | 208 |

|10..... | |20..... | |30..... | |40..... | |50..... | |60..... | | MAT | MF | MT | SEQ |
|--------------|-----|--------------|-----|--------------|---|--------------|----|--------------|---|--------------|--------|------|----|-----|-----|
| 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 | |

| | | | | | | | | | | MAT | MF | MT | SEQ |
|--------------|--------------|--------------|--------------|--------------|--------------|-------|--------|------|---|-----|----|----|-----|
|10..... |20..... |30..... |40..... |50..... |60..... | | | | | | | | |
| 6.69944+ 5 | 0.0 + 0 | 1.00000+ 6 | 1.00000- 3 | 1.20000+ 6 | 2.50000- 3 | 2041 | 3107 | | | | | | 262 |
| 1.40000+ 6 | 8.50000- 3 | 1.60000+ 6 | 1.80000- 2 | 1.80000+ 6 | 3.20000- 2 | 22041 | 3107 | | | | | | 263 |
| 1.85000+ 6 | 3.60000- 2 | 1.92700+ 6 | 4.10000- 2 | 2.00000+ 6 | 4.70000- 2 | 22041 | 3107 | | | | | | 264 |
| 2.20000+ 6 | 6.10000- 2 | 2.30000+ 6 | 6.80000- 2 | 2.40000+ 6 | 7.40000- 2 | 22041 | 3107 | | | | | | 265 |
| 2.50000+ 6 | 7.90000- 2 | 2.60000+ 6 | 8.50000- 2 | 2.62000+ 6 | 8.60000- 2 | 22041 | 3107 | | | | | | 266 |
| 2.66000+ 6 | 8.80000- 2 | 2.70000+ 6 | 9.10000- 2 | 2.75000+ 6 | 9.30000- 2 | 22041 | 3107 | | | | | | 267 |
| 2.80000+ 6 | 9.60000- 2 | 2.85000+ 6 | 9.90000- 2 | 3.00000+ 6 | 1.07000- 2 | 12041 | 3107 | | | | | | 268 |
| 3.10000+ 6 | 1.13000- 1 | 3.20000+ 6 | 1.10000- 1 | 3.50000+ 6 | 1.03000- 2 | 12041 | 3107 | | | | | | 269 |
| 3.70000+ 6 | 9.80000- 2 | 4.00000+ 6 | 9.00000- 2 | 4.05700+ 6 | 8.80000- 2 | 22041 | 3107 | | | | | | 270 |
| 4.17500+ 6 | 8.50000- 2 | 4.32900+ 6 | 8.10000- 2 | 4.47100+ 6 | 7.80000- 2 | 22041 | 3107 | | | | | | 271 |
| 4.50000+ 6 | 7.70000- 2 | 5.00000+ 6 | 6.60000- 2 | 5.50000+ 6 | 5.60000- 2 | 22041 | 3107 | | | | | | 272 |
| 6.00000+ 6 | 4.50000- 2 | 6.50000+ 6 | 4.10000- 2 | 7.00000+ 6 | 3.65000- 2 | 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- 2 | 22041 | 3251 | | | | | | 279 |
| 2.53000- 2 | 7.44148- 2 | 1.00000- 1 | 7.44148- 2 | 1.00000+ 0 | 7.44148- 2 | 22041 | 3251 | | | | | | 280 |
| 1.00000+ 1 | 7.44148- 2 | 1.00000+ 2 | 7.44148- 2 | 1.00000+ 3 | 7.44148- 2 | 22041 | 3251 | | | | | | 281 |
| 1.00000+ 4 | 7.44148- 2 | 4.00000+ 4 | 7.44148- 2 | 5.00000+ 4 | 8.52035- 2 | 22041 | 3251 | | | | | | 282 |
| 7.00000+ 4 | 8.94477- 2 | 8.50000+ 4 | 8.12994- 2 | 1.00000+ 5 | 7.02596- 2 | 22041 | 3251 | | | | | | 283 |
| 1.20000+ 5 | 7.81956- 2 | 1.55000+ 5 | 9.87164- 2 | 2.07000+ 5 | 9.17464- 2 | 22041 | 3251 | | | | | | 284 |
| 2.55000+ 5 | 1.16025- 1 | 3.06000+ 5 | 1.04111- 1 | 3.50000+ 5 | 1.05636- 2 | 12041 | 3251 | | | | | | 285 |
| 4.07000+ 5 | 9.60539- 2 | 4.32000+ 5 | 1.07647- 1 | 4.50000+ 5 | 1.10027- 2 | 12041 | 3251 | | | | | | 286 |
| 5.08000+ 5 | 1.12086- 1 | 5.50000+ 5 | 1.11329- 1 | 5.70000+ 5 | 1.05277- 2 | 12041 | 3251 | | | | | | 287 |
| 5.90000+ 5 | 1.05819- 1 | 6.00000+ 5 | 1.12699- 1 | 6.10000+ 5 | 9.90909- 2 | 22041 | 3251 | | | | | | 288 |
| 6.20000+ 5 | 8.91607- 2 | 6.30000+ 5 | 8.44238- 2 | 6.40000+ 5 | 9.89445- 2 | 22041 | 3251 | | | | | | 289 |
| 6.50000+ 5 | 1.01714- 1 | 6.75000+ 5 | 1.22280- 1 | 7.70000+ 5 | 1.34873- 2 | 12041 | 3251 | | | | | | 290 |
| 7.80000+ 5 | 1.36356- 1 | 7.90000+ 5 | 1.35435- 1 | 8.00000+ 5 | 1.29542- 2 | 12041 | 3251 | | | | | | 291 |
| 8.05000+ 5 | 1.18315- 1 | 8.10000+ 5 | 1.50991- 1 | 8.15000+ 5 | 1.87559- 2 | 12041 | 3251 | | | | | | 292 |
| 8.20000+ 5 | 2.17693- 1 | 8.25000+ 5 | 2.32859- 1 | 8.30000+ 5 | 2.79454- 2 | 12041 | 3251 | | | | | | 293 |
| 8.40000+ 5 | 2.22648- 1 | 8.60000+ 5 | 2.08963- 1 | 9.05000+ 5 | 2.03064- 2 | 12041 | 3251 | | | | | | 294 |
| 9.30000+ 5 | 2.46414- 1 | 1.04000+ 6 | 2.53852- 1 | 1.14000+ 6 | 2.57371- 2 | 12041 | 3251 | | | | | | 295 |
| 1.24000+ 6 | 2.68960- 1 | 1.34000+ 6 | 2.72819- 1 | 1.44000+ 6 | 2.82937- 2 | 12041 | 3251 | | | | | | 296 |
| 1.54000+ 6 | 2.73770- 1 | 1.65000+ 6 | 2.62681- 1 | 1.75000+ 6 | 2.30930- 2 | 12041 | 3251 | | | | | | 297 |
| 1.85000+ 6 | 2.19703- 1 | 1.95000+ 6 | 1.70852- 1 | 2.05000+ 6 | 1.53776- 2 | 12041 | 3251 | | | | | | 298 |
| 2.15000+ 6 | 1.31208- 1 | 2.25000+ 6 | 1.50125- 1 | 2.48000+ 6 | 1.56754- 2 | 12041 | 3251 | | | | | | 299 |
| 2.63000+ 6 | 2.60449- 1 | 2.77000+ 6 | 4.33762- 1 | 2.97000+ 6 | 3.80782- 2 | 12041 | 3251 | | | | | | 300 |
| 3.00000+ 6 | 3.63646- 1 | 3.35000+ 6 | 4.16736- 1 | 3.50000+ 6 | 4.27736- 2 | 12041 | 3251 | | | | | | 301 |
| 3.55000+ 6 | 4.39985- 1 | 3.65000+ 6 | 4.46522- 1 | 3.75000+ 6 | 4.54040- 2 | 12041 | 3251 | | | | | | 302 |
| 4.10000+ 6 | 4.57198- 1 | 5.00000+ 6 | 5.46590- 1 | 6.00000+ 6 | 5.76250- 2 | 12041 | 3251 | | | | | | 303 |
| 6.97000+ 6 | 6.48646- 1 | 7.97000+ 6 | 6.65313- 1 | 8.96000+ 6 | 6.81760- 2 | 12041 | 3251 | | | | | | 304 |
| 9.96000+ 6 | 7.07599- 1 | 1.09500+ 7 | 7.21544- 1 | 1.20400+ 7 | 7.34780- 2 | 12041 | 3251 | | | | | | 305 |
| 1.29400+ 7 | 7.52003- 1 | 1.39400+ 7 | 7.62448- 1 | 1.49400+ 7 | 7.76810- 2 | 12041 | 3251 | | | | | | 306 |
| 1.50000+ 7 | 7.95866- 1 | 1.60000+ 7 | 8.08747- 1 | 1.70000+ 7 | 8.20488- 2 | 12041 | 3251 | | | | | | 307 |
| 1.80000+ 7 | 8.31169- 1 | 1.90000+ 7 | 8.40804- 1 | 2.00000+ 7 | 8.49535- 2 | 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 + 0 | | 02041 | 4 | 2 | | | | 313 |
| 0.0 + 0 | 0.0 + 0 | 0.0 + 0 | 0.0 + 0 | 0.0 + 0 | 0.0 + 0 | | 02041 | 4 | 2 | | | | 314 |

|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 |

|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 0 0 2 | 2041 | 4 | 2 | 385 |
| 0.0 + 0 5.50000+ 5 0 0 2 | 02041 | 4 | 2 | 386 |
| 3.50877- 2-2.80702- 2 0 0 4 | 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 0 0 4 | 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 0 0 4 | 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 |

|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 | | | | | 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 | | | | | 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 | | | | | 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 | | | | | 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 | | | | | 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 | | | | | 2 | | 02041 | 4 | 2 | 432 |
| 1.73277- | 1 | 0.0 | + 0 | | | | | | | | | 2041 | 4 | 2 | 433 |
| 0.0 | + 0 | 1.04000+ | 6 | | 0 | | | | | 2 | | 02041 | 4 | 2 | 434 |
| 1.80770- | 1 | 0.0 | + 0 | | | | | | | | | 2041 | 4 | 2 | 435 |
| 0.0 | + 0 | 1.14000+ | 6 | | 0 | | | | | 2 | | 02041 | 4 | 2 | 436 |
| 1.86727- | 1 | 3.18760- | 2 | | | | | | | | | 2041 | 4 | 2 | 437 |
| 0.0 | + 0 | 1.24000+ | 6 | | 0 | | | | | 2 | | 02041 | 4 | 2 | 438 |
| 1.98867- | 1 | 3.80160- | 2 | | | | | | | | | 2041 | 4 | 2 | 439 |
| 0.0 | + 0 | 1.34000+ | 6 | | 0 | | | | | 2 | | 02041 | 4 | 2 | 440 |
| 2.02743- | 1 | 3.78600- | 2 | | | | | | | | | 2041 | 4 | 2 | 441 |
| 0.0 | + 0 | 1.44000+ | 6 | | 0 | | | | | 2 | | 02041 | 4 | 2 | 442 |
| 2.12957- | 1 | 3.81360- | 2 | | | | | | | | | 2041 | 4 | 2 | 443 |
| 0.0 | + 0 | 1.54000+ | 6 | | 0 | | | | | 2 | | 02041 | 4 | 2 | 444 |
| 2.04387- | 1 | 4.69400- | 2 | | | | | | | | | 2041 | 4 | 2 | 445 |
| 0.0 | + 0 | 1.65000+ | 6 | | 0 | | | | | 2 | | 02041 | 4 | 2 | 446 |
| 1.94643- | 1 | 6.58620- | 2 | | | | | | | | | 2041 | 4 | 2 | 447 |
| 0.0 | + 0 | 1.75000+ | 6 | | 0 | | | | | 2 | | 02041 | 4 | 2 | 448 |
| 1.62967- | 1 | 7.00700- | 2 | | | | | | | | | 2041 | 4 | 2 | 449 |
| 0.0 | + 0 | 1.85000+ | 6 | | 0 | | | | | 2 | | 02041 | 4 | 2 | 450 |
| 1.53043- | 1 | 8.85120- | 2 | | | | | | | | | 2041 | 4 | 2 | 451 |
| 0.0 | + 0 | 1.95000+ | 6 | | 0 | | | | | 2 | | 02041 | 4 | 2 | 452 |
| 1.03170- | 1 | 7.99300- | 2 | | | | | | | | | 2041 | 4 | 2 | 453 |
| 0.0 | + 0 | 2.05000+ | 6 | | 0 | | | | | 2 | | 02041 | 4 | 2 | 454 |
| 8.86567- | 2 | 1.15796- | 1 | | | | | | | | | 2041 | 4 | 2 | 455 |
| 0.0 | + 0 | 2.15000+ | 6 | | 0 | | | | | 2 | | 02041 | 4 | 2 | 456 |
| 6.68733- | 2 | 1.28560- | 1 | | | | | | | | | 2041 | 4 | 2 | 457 |
| 0.0 | + 0 | 2.25000+ | 6 | | 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 | | | | | 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 | | | | | 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 | | | | | 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 | | | | | 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 | | | | | 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 | | | | | 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 | | | | | 4 | | 02041 | 4 | 2 | 472 |
| 3.78033- | 1 | 3.10220- | 1 | 1.20093- | 1 | 1.91667- | 3 | | | | | 2041 | 4 | 2 | 473 |

|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 | 2.17865- | 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 |

|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 |