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EXFOR-based Simultaneous Evaluation of Neutron-induced Uranium and Plutonium Fission Cross Sections for JENDL-5 : Inputs and Outputs

Naohiko OTUKA and Osamu IWAMOTO

Nuclear Science and Reactor Engineering Division
Nuclear Science and Engineering Center
Sector of Nuclear Science Research

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国立研究開発法人日本原子力研究開発機構　JAEA イノベーションハブ　研究成果利活用課
〒 319-1195　茨城県那珂郡東海村大字白方 2 番地 4
電話 029-282-6387, Fax 029-282-5920, E-mail:ird-support@jaea.go.jp

2-4 Shirakata, Tokai-mura, Naka-gun, Ibaraki-ken 319-1195 Japan
Tel +81-29-282-6387, Fax +81-29-282-5920, E-mail:ird-support@jaea.go.jp

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EXFOR-based Simultaneous Evaluation of Neutron-induced Uranium and Plutonium Fission Cross Sections for JENDL-5: Inputs and Outputs

Naohiko OTUKA* and Osamu IWAMOTO

Nuclear Science and Reactor Engineering Division
Nuclear Science and Engineering Center
Sector of Nuclear Science Research
Japan Atomic Energy Agency
Tokai-mura, Naka-gun, Ibaraki-ken

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The neutron-induced fission cross sections were simultaneously evaluated for the JENDL-5 library for ^{233,235}U and ^{239,241}Pu from 10 keV to 200 MeV and for ^{238}U and ^{240}Pu from 100 keV to 200 MeV. Evaluation was performed by least-squares fitting of Schmittroth's roof function to the logarithms of the experimental cross sections and cross section ratios in the EXFOR library. A simultaneous evaluation code SOK was used with its extension to data in arbitrary unit. This report describes (1) construction of the experimental database, (2) selection of data points from TUD-KRI collaboration, (3) comparison with the evaluated cross sections in recent major libraries, and (4) impact of of the ^{235}U datasets published in 1970s.

Keyword: Fission Cross Section Evaluation, Covariance, Uranium 233, Uranium 235, Uranium 238, Plutonium 239, Plutonium 240, Plutonium 241, JENDL, EXFOR

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EXFOR に基づく中性子入射ウランおよびプルトニウム核分裂断面積の **JENDL-5** のための同時評価：入力と出力

日本原子力研究開発機構　原子力科学研究部門　原子力基礎工学研究センター　核工学・炉工学ディビジョン
大塚　直彦*、岩本　修

(2022 年 6 月 29 日　受理)

^{233,235}U と ^{239,241}Pu の 10 keV から 200 MeV の中性子入射核分裂断面積、および ^{238}U と ^{240}Pu の 100 keV から 200 MeV までの中性子入射核反応断面積を JENDL-5 のために同時評価した。実験断面積とその比の対数をシュミットロスの屋根関数 (Schmittroth's roof function) の線形結合で表現し、その係数を最小二乗法により決定した。同時評価コード SOK を規格化が任意の実験値に拡張したものを本評価に用いた。本報告書は (1) 実験データベースの構築、(2) ドレスデン工科大学 (TUD)・ラジウム研究所 (KRI) の共同測定で得られたデータの選定、(3) 本評価で得られた断面積の最近の主なライブラリとの比較、(4) 1970 年代に測定された ^{235}U データの影響、について述べる。

原子力科学研究所：〒 319-1195　茨城県那珂郡東海村大字白方 2-4
* 国際原子力機関

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1 Introduction

We performed simultaneous evaluation of the neutron-induced fission cross sections of ^{233,235}U and ^{239,241}Pu from 10 keV to 200 MeV and of ^{238}U and ^{240}Pu from 100 keV to 200 MeV for the JENDL-5 library by using the SOK (Simultaneous evaluation on KALMAN) code [1, 2]. The primary publication of this evaluation [3] describes the background and motivation of the new evaluation, policy on selection of experimental datasets and covariance construction, formalism of least-squares fitting, comparison of the new evaluation with the JENDL-4.0 and IAEA Neutron Standards evaluations, and their validations against integral measurements. This report describes details on (1) construction of the experimental database, (2) selection of data points from TUD-KRI collaboration, (3) comparison with the evaluated cross sections in recent major libraries, and (4) impact of of the ^{235}U datasets published in 1970s.

2 Construction of experimental database

Conversion of experimental datasets in the EXFOR Library [4] to our experimental database (=input files for SOK) was done by the following procedure by using a code system newly developed for the present evaluation SOX (Simple Output of EXFOR):

- Read the subentry number (plus pointer if exists) from the "Data List File".
- Read the "EXFOR File" (exf) and "Header File" (hed) of the dataset of the subentry.
- Read the "Correlation File" (exc) of the dataset of the subentry if exists.
- Calculate the total uncertainty and correlation coefficients of each data point from these files.
- Generate the SOK input files "fort.10" (cross section), "fort.11" (uncertainty) and "fort.12" (correlation coefficient).

2.1 Data List File

Figure 1 shows beginning of the Data List File. Lines 1 to 6 set some basic variables to run SOK, among which `TITLE`, `KCOVEX`, `KCTL1` and `KCTL2` are explained in the original SOK description [2].

- `TITLE`: The title line printed on the first line of the SOK standard output (maximum 80 characters).
- `SOKVER`: 2 in the present evaluation to prepare the SOK standard input since we used a modified SOK code. If it is set to 1, the standard input for the original SOK is produced.
- `NREAC`: The value is ignored since the number of quantity blocks (=13 in the present evaluation) is calculated by SOX.
- `KCOVEX`: 1 in the present evaluation. SOK does not read correlation coefficients in "fort.12" if it is set to 0.
- `KCTL1`: 0 in the present evaluation. This must be set to 20 when we rerun SOK to obtain the final χ^2 value of the fitting result printed in the SOK output "fort.20". But this rerun was done in the present evaluation after replacing 0 with 20 by editing the SOK standard input manually.
- `KCTL2`: 0 in the present evaluation. A smoothed cubic-spline interpolated fitting result is generated to "fort.17" if it is set to 1.

Lines 8 to 20 define the identifier of the 13 quantity blocks (`IEXP(I)` in the original SOK description). For the ratio quantity, the block identifier of the numerator multiplied by 100 plus the block identifier of the denominator is used as written in the original SOK description.

Line 22 opens a new block for ^{233}U(n,f) absolute cross sections with the following instructions:

- Extraction of data points between 7 keV (=7.0×10^3 eV) and 250 MeV (=2.5×10^8 eV) from the EXFOR Files and also print `xrange=[0.007:250]` in the GNUPLOT script.
- Print `yrange=[1.4:4.5]` and `set key right top` (RT) in the GNUPLOT script for logarithmic scale plotting.
- Print `yrange=[1.4:2.5]` and `set key right bottom` (RB) in the GNUPLOT script for linear scale plotting.

Line 23 specifies the input file of the prior (P) cross section (“92238018_pri.txt”) to be printed in the SOK input “fort.50”.

Line 24 specifies the EXFOR File of the first ^{233}U experimental dataset:

- The first column can be blank (absolute dataset), S (shape dataset) or # (dataset to be excluded).
- `23072.009` means the EXFOR dataset 23072.009 is read from the EXFOR File “23072009_exf.txt” and Header File “23072009_hed.txt”. When the dataset is specified not only by a subentry number but also by a pointer, the pointer is added after the subentry number and a full stop (e.g., `10636.002.2`).
- `20170418` specifies the time stamp (N2 field) of the EXFOR data subentry. When the specified date is different from the N2 field of the EXFOR File, SOX prints an error message. The disagreement would imply the EXFOR File was updated after the last update of the Header File. If one confirms that the Head File characterizes the headings coded in the EXFOR File as intended, the time stamp in the Data List File must be updated.
- `1.0000E+00` is the scaling factor for multiplication of the experimental cross section or ratio coded in the EXFOR File.
- `2ZZZCER` is the EXFOR/CINDA code of the laboratory where the experiment was performed (optional).
- `M.Calviani+,2009` is the author and publication year to be printed in the GNUPLOT script.

The flag # at the first column indicates that the dataset is ignored.

2.2 EXFOR File

An EXFOR File (e.g., Fig. 2) consists of the common subentry (the first subentry) and the data subentry of the dataset. In general, an EXFOR File was prepared by extraction from the EXFOR Library without any modification. However, we made exceptions for the 11 datasets summarized in Table 1.

Table 1: EXFOR Files of modified EXFOR entries.

Quantity	EXFOR #		First author (Year)	Ref.	Purpose
	Modified	Original			
^{235}U	51001.002	N/A	V.N.Dushin (1983)	[5]	To use the square-root of the covariance presented by the authors in the article tables.
^{239}Pu	51001.003	N/A	V.N.Dushin (1983)	[5]	(Same as above)
^{233}U	51001.004	N/A	V.N.Dushin (1983)	[5]	(Same as above)
^{238}U	51001.005	N/A	V.N.Dushin (1983)	[5]	(Same as above)
^{238}U/^{235}U	51002.002	10232.002, 10232.003, 10232.004	W.P.Poenitz (1972)	[6]	To include the correlation between the three datasets presented by the author in the GMA database (#816 and #818).
^{238}U/^{235}U	51005.002	23269.003, 23269.004	C.Paradela (2015)	[7]	To include the correlation between the two datasets due to use of the same sample.
^{235}U	51006.002	23453.002.1, 23453.003.1	S.Amaducci (2019)	[8]	To include the correlation between the two datasets due to use of the same fission counts.
^{239}Pu	51007.002	20001.002	J.Blons (1970)	[9]	To include the high resolution dataset after grouping to 50 bins per decade
^{233}U	51008.002	20446.002	J.Blons (1971)	[10]	(Same as above)
^{241}Pu	51009.002	20484.002	J.Blons (1971)	[11]	(Same as above)
^{235}U	51010.002	22304.006	K.Merla (1991)	[12]	To use the statistical uncertainty in a preliminary report (Table 5 of [13])

```
----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----
TITLE:JENDL-5 simultaneous evaluation
SOKVER: 2
NREAC:
KCOVEX: 1
KCTL1:  0
KCTL2:  0

233U(n,f)             ->   1
235U(n,f)             ->   2
238U(n,f)             ->   3
239Pu(n,f)            ->   4
240Pu(n,f)            ->   5
241Pu(n,f)            ->   6
233U(n,f)/235U(n,f)   -> 102
238U(n,f)/233U(n,f)   -> 301
238U(n,f)/235U(n,f)   -> 302
239Pu(n,f)/235U(n,f)  -> 402
240Pu(n,f)/235U(n,f)  -> 502
240Pu(n,f)/239Pu(n,f) -> 504
241Pu(n,f)/235U(n,f)  -> 602

%233U(n,f):7.0E+03:2.5E+08:1.4:4.5:RT:1.4:2.5:RB
P92233.018                                 JENDL-4.0
 23072.009   20170418  1.0000E+00 2ZZZCER  M.Calviani+,2009  # Not for JENDL4
 22698.005   20201216  1.0000E+00 1USALAS  F.Tovesson+,2004  # Not for JENDL4
 13890.004   20180724  1.0000E+00 1USAORL  K.H.Guber+,2000   # 002 for JENDL4 (instead of 004)
 40927.002   20160604  1.0000E+00 4RUSRI   V.I.Shpakov,1986
 12910.002   20180724  1.0000E+00 1USAMHG  K.R.Zasady+,1984
 51001.004   20201022  1.0000E+00 4RUSRI   V.N.Dushin+,1983  # 40911.003 for JENDL (instead of 51001.004)
 40587.002   20090416  1.0000E+00 4UKRIJD  A.V.Murzin+,1980
 40610.002   20180724  1.0000E+00 4RUSRI   E.A.Zhagrov+,1980
 10756.002   20060830  1.0000E+00 1USAANL  W.P.Poenitz,1978  # Makes 233U,235U,239Pu SACS too high
 10267.041   20180724  1.0000E+00 1USAORL  R.Gwin+,1976
 32625.002   20180724  1.0000E+00 3CPRAEP  Yan Wuguang+,1975
 51008.002   20210126  1.0000E+00 2FR SAC  J.Blons+,1971     # converted from 20446.002 (group-wise)
#20446.002   20180724  1.0000E+00 2FR SAC  J.Blons+,1971
#10056.004   20101014  1.0000E+00 1USALAS  D.W.Bergen,1970   # 002 for JENDL4 (instead of 004+005)
#10056.005   20101014  1.0000E+00 1USALAS  D.W.Bergen,1970   # 002 for JENDL4 (instead of 004+005)

%235U(n,f):7.0E+03:2.5E+08:1.0:3.5:RT:1.0:2.4:RB
P92235.018                                 JENDL-4.0
 51006.002   20201215  1.0000E+00 2ZZZCER  S.Amaducci+,2019  # instead of 23453.002.2+003.2
#23453.002.2 20201203  1.0000E+00 2ZZZCER  S.Amaducci+,2019  # Not for JENDL4. Use 51006.002.
#23453.003.2 20201203  1.0000E+00 2ZZZCER  S.Amaducci+,2019  # Not for JENDL4. Use 51006.002.
 23078.002   20201217  1.0000E+00 2BLGLVN+ R.Nolte+,2007     # Not for JENDL4, HE
 14015.002   20100728  1.0000E+00 1USALAS  A.D.Carlson+,1991 # Not for JENDL4
 14016.002   20101008  1.0000E+00 1USALAS  P.W.Lisowski+,1991
 22304.002   20180724  1.0000E+00 2GERZFK  K.Merla+,1991
 51010.002   20210310  1.0000E+00 2GERDRE  K.Merla+,1991     # =22304.006 but MISC-ERR -> ERR-S
#22304.006   20180724  1.0000E+00 2GERDRE  K.Merla+,1991
 41112.002   20150627  1.0000E+00 4RUSRI   V.A.Kalinin+,1991
...
```

Figure 1: Data List File.

2.3 Header File and Correlation File

The Correlation File is not available in many cases, and we needed to estimate the correlation coefficients for almost all datasets. The correlation coefficient between the cross sections σ_i and σ_j within a dataset was estimated by

$$\mathrm{cov}(\sigma_i, \sigma_j) = \sum_p C_p \cdot \delta_p\sigma_i \cdot \delta_p\sigma_j, \tag{1}$$

$$\mathrm{cor}(\sigma_i, \sigma_j) = \mathrm{cov}(\sigma_i, \sigma_j)/(\delta_t\sigma_i \cdot \delta_t\sigma_j), \tag{2}$$

where cov and cor are the fractional (%^{2}) covariance and correlation coefficients, $\delta_p\sigma_i$ and $\delta_t\sigma_i$ are the p-th partial and total fractional (%) uncertainty of σ_i, and C_p is the correlation coefficient of the p-th partial uncertainty between i and j. The coefficient C_p was set to 0 (uncorrelated) or 1 (fully correlated) in the present evaluation. When both the correlated and point-wise uncorrelated partial uncertainties are in the EXFOR File along with the total uncertainty, we usually used the uncorrelated and total uncertainties for generation of the correlation coefficients and discarded the correlated partial uncertainty in the EXFOR File.

Each line of the Header File specifies the role of a data heading in the EXFOR File:

- Line 1: Lower boundary of the energy bin
- Line 2: Upper boundary of the energy bin
- Line 3: Energy bin width (optional)
- Line 4: Cross section
- Line 5: Monitor cross section
- Line 6: Total uncertainty and the correlation property of the residual uncertainty
- Line 7: First partial uncertainty and its correlation coefficient
- Line 8: Second partial uncertainty and its correlation coefficient
- Line 9: ...

The lower and upper boundary energies were used to estimate the central energy of the bin as an input to the least-squares analysis, while the energy bin width is only for plotting purpose. The monitor cross section is for conversion of the absolute monitor cross section uncertainty (e.g., in barn) to the fractional partial uncertainty by `MONIT-ERR/MONIT`, and it is necessary only when `MONIT-ERR` is specified as a partial uncertainty heading at the seventh line or later and its absolute value is given in the EXFOR File (e.g., in barn).

Figures 2 and 3 are for an example where the total uncertainty `ERR-T` and partial uncertainties `ERR-1` to `ERR-6` are used to estimate the correlation coefficients. According to this Header File, the six partial uncertainties are treated as fully correlated (`1`), and the residual uncertainty ($\sqrt{(\mathtt{ERR-T})^2 - (\mathtt{ERR-1})^2 - ... - (\mathtt{ERR-6})^2}$) is treated as uncorrelated (`U`). The correlation coefficients are calculated from the values coded under the eight headings (`DATA`, `ERR-T` and `ERR-1` to `ERR-6`), and added to the SOK input file (fort.12) as shown in Fig. 4.

Figures 5 and 6 show an example where the total uncertainty `ERR-T` and partial uncertainty `ERR-S` are used to estimate the correlation coefficients. According to this Header File, the uncertainty coded under `ERR-S` is treated as uncorrelated (`0`), and the residual uncertainty ($\sqrt{(\mathtt{ERR-T})^2 - (\mathtt{ERR-S})^2}$) is treated as fully correlated (`F`). The correlation coefficients are calculated from the values coded under the three heading (`DATA`, `ERR-T` and `ERR-S`), and added to the SOK input file (fort.12) as shown in Fig. 7. We did not adopt such a constant uncorrelated uncertainty in general since we prefer to have the uncorrelated uncertainty in a point-wise form. However, the quadrature sum of the six constant partial uncertainties (2.1%) exceeds the total uncertainty of the first three data points (1.9 or 2.0%), and therefore we adopted the constant uncorrelated uncertainty (`ERR-S`) while discarded the five constant uncertainties (`ERR-1` to `ERR-4` and `ERR-6`) in the EXFOR File. Another option could be to adopt both the correlated and uncorrelated uncertainties while discard the total uncertainty.

It is possible to insert in a Header File a constant partial uncertainty value missing in the EXFOR File. Figure 8 shows such an example where a constant fully correlated uncertainty of 1.00% not in the EXFOR File is added on the Line 8. The partial uncertainties added by this option are summarized in Table 4 of Ref. [3]. Note that the flag `S` at the first column indicates that the uncertainty is ignored if the dataset is treated as a shape dataset.

Figures 9 and 10 are for an example where the total uncertainty `ERR-T` and partial uncertainties `ERR-S` and `ERR-1` to `ERR-6` are given in the EXFOR File. The flag `*` in the Header File indicates that these partial uncertainties are ignored, and the correlation coefficients are read from the Correlation File (Figure 11). Table 2 summarizes the datasets for which Correlation Files were prepared.

```
----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----
ENTRY           20779   20170724                                   2077900000001
SUBENT        20779001   20170724                                  2077900100001
BIB                 13         50                                  2077900100002
TITLE      Absolute neutron fission cross sections of 235U, 238U,  2077900100003
            and 239Pu at 13.9 and 14.6 MeV                          2077900100004
AUTHOR     (M.Cance, G.Grenier, D.Gimat, D.Parisot)                2077900100005
INSTITUTE  (2FR BRC)                                               2077900100006
REFERENCE  (J,NSE,68,197,1978)                                     2077900100007
           (C,76ANL,,237,1976) Same 235U,238U(n,f) data            2077900100008
           (C,75KIEV,5,363,1976) 14.6 MeV 235,238U data in table   2077900100009
           (J,ANS,22,664,1975)   Prelim. 235,238U data in table    2077900100010
...
ENDBIB              50          0                                  2077900100053
NOCOMMON             0          0                                  2077900100054
ENDSUBENT           53          0                                  2077900199999
SUBENT        20779003   20170724                                  2077900300001
BIB                  4         18                                  2077900300002
REACTION   (92-U-238(N,F),,SIG)                                    2077900300003
...
ERR-ANALYS (ERR-T) Quadrature sum of the following uncertainties:  2077900300011
                   - Statistics including background subtraction   2077900300012
           (ERR-1) Extrapolation to zero pulse height      (0.7%)  2077900300013
           (ERR-2) Loss of fissions                       (0.17%)  2077900300014
           (ERR-3) Number of atoms per cm2                (1.35%)  2077900300015
           (ERR-4) Neutron attenuation in target backing (0.36%)   2077900300016
           (ERR-5) Neutron attenuation in front face of    (0.3%)  2077900300017
                   fission chamber                                  2077900300018
           (ERR-6) Fissions due to other isotopes          (0.4%)  2077900300019
HISTORY    (20170724A) On. ERR-ANALYS added. ERR-S deleted.        2077900300020
ENDBIB              18          0                                  2077900300021
COMMON               6          3                                  2077900300022
ERR-1      ERR-2      ERR-3      ERR-4      ERR-5      ERR-6       2077900300023
PER-CENT   PER-CENT   PER-CENT   PER-CENT   PER-CENT   PER-CENT    2077900300024
 0.7        0.17       1.35       0.36       0.3        0.4        2077900300025
ENDCOMMON            3          0                                  2077900300026
DATA                 4          2                                  2077900300027
EN         EN-ERR     DATA       ERR-T                             2077900300028
MEV        MEV        B          B                                 2077900300029
 13.9       0.13       1.143      0.025                            2077900300030
 14.6       0.13       1.149      0.025                            2077900300031
ENDDATA              4          0                                  2077900300032
ENDSUBENT           31          0                                  2077900399999
ENDENTRY             2          0                                  2077999999999
```

Figure 2: EXFOR File 20779003_exf.txt.

```
----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----
 EN
 EN
 EN-ERR
 DATA

 ERR-T      U
 ERR-1      1.
 ERR-2      1.
 ERR-3      1.
 ERR-4      1.
 ERR-5      1.
 ERR-6      1.
```

Figure 3: Header File 20779003_hed.txt.

```
----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----
20779.003   M.Cance+,1978                      2
 1.000
 0.572 1.000
```

Figure 4: Correlation coefficients of EXFOR 20779.003 printed in “fort.12”.

```
----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----
ENTRY           30669   20190722                                    3066900000001
SUBENT        30669001   20190722                                   3066900100001
BIB                 13         37                                   3066900100002
TITLE      Measurement of fission cross section for 238U induced  3066900100003
            by fast neutron                                         3066900100004
AUTHOR     (Wu Jingxia, Deng Xinliu, Rong Chaofan, Sun Zhongfa,    3066900100005
            Zhou Huiming, Zhou Shuhua)                              3066900100006
INSTITUTE  (3CPRAEP)                                               3066900100007
REFERENCE  (J,CNP,5,158,1983)                                      3066900100008
...
ERR-ANALYS (ERR-T) Total error less than 2.6% contains from:      3066900100026
           (ERR-1) Cross section reduction formula      (0.5%)    3066900100027
           (ERR-2) 238U sample mass                       (1%)    3066900100028
           (ERR-3) Number of hydrogen atom in radiator    (1%)    3066900100029
           (ERR-S) Counting statistics of fission events   (1%)    3066900100030
           (ERR-4) Fission record efficiency             (0.5%)    3066900100031
           (ERR-5,1.,1.5) Instability of neutron monitor           3066900100032
                          and electronics             (1-1.5%)    3066900100033
           (ERR-6) m value and geometrical factor        (0.9%)    3066900100034
           (ERR-7,,0.5) Other miscellaneous sources     (<0.5%)    3066900100035
...
ENDBIB              37          0                                   3066900100040
COMMON               6          3                                   3066900100041
ERR-1      ERR-2      ERR-3      ERR-S      ERR-4      ERR-6      3066900100042
PER-CENT   PER-CENT   PER-CENT   PER-CENT   PER-CENT   PER-CENT   3066900100043
 0.5        1.         1.         1.         0.5        0.9       3066900100044
ENDCOMMON            3          0                                   3066900100045
ENDSUBENT           44          0                                   3066900199999
SUBENT        30669002   20190722                                   3066900200001
BIB                  3          3                                   3066900200002
REACTION   (92-U-238(N,F),,SIG)                                    3066900200003
...
ENDBIB               3          0                                   3066900200006
NOCOMMON             0          0                                   3066900200007
DATA                 3          4                                   3066900200008
EN         DATA       ERR-T                                         3066900200009
MEV        MB         MB                                            3066900200010
 4.0        566.       11.                                          3066900200011
 4.5        565.       11.                                          3066900200012
 5.0        562.       11.                                          3066900200013
 5.5        553.       14.                                          3066900200014
ENDDATA              6          0                                   3066900200015
ENDSUBENT           14          0                                   3066900299999
ENDENTRY             2          0                                   3066999999999
```

Figure 5: EXFOR File 30669002_exf.txt.

```
----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----
 EN
 EN
 DATA
 ERR-T      F
 ERR-S      0.
```

Figure 6: Header File 30669002_hed.txt.

```
----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----
30669.002   Wu Jingxia+,1983                   4
 1.000
 0.736 1.000
 0.737 0.738 1.000
 0.788 0.788 0.790 1.000
```

Figure 7: Correlation coefficients of EXFOR 30669.002 printed in “fort.12”.

```
----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----
 EN
 EN
 EN-RSL-FW
 DATA


 ERR-S      0.
SERR-A      1.         1.00       # Normalization uncertainty (minimum 1%, see 13169.002)
```

Figure 8: Header File 13169003_hed.txt.

```
----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----
ENTRY            41112   20150627                               4111200000001
SUBENT        41112001   20150627                               4111200100001
BIB                 12         43                               4111200100002
TITLE      Correction of the results of absolute measurements of  4111200100003
            U-235 fission cross-section by neutrons with energy   4111200100004
            1.9 and 2.4 MeV                                     4111200100005
AUTHOR     (V.A.Kalinin, V.N.Kuz'min, L.M.Solin, B.I.Shpakov,     4111200100006
            K.Merla)                                            4111200100007
INSTITUTE  (4RUSRI)  Kalinin, Kuz'min, Solin, Shpakov           4111200100008
           (2GERDRE) Merla, former 3DDRTUD                      4111200100009
REFERENCE  (J,AE,71,(2),181,1991) Main Reference.               4111200100010
           (J,SJA,71,700,1991) Engl.translation of AE,71,(2),181  4111200100011
           (J,AE,64,(3),194,1988) Preliminary results.          4111200100012
           (J,SJA,64,239,1988) Engl.translation of AE,64,(3),194  4111200100013
...
ENDBIB              43          0                               4111200100046
NOCOMMON             0          0                               4111200100047
ENDSUBENT           46          0                               4111200199999
SUBENT        41112002   20150627                               4111200200001
BIB                  6         37                               4111200200002
REACTION   (92-U-235(N,F),,SIG)                                 4111200200003
...
ERR-ANALYS (ERR-T)  Total error.                                4111200200024
            Source of errors:                                   4111200200025
           (ERR-S) Coincidence statistics                       4111200200026
           (ERR-1) Random coincidences                          4111200200027
           (ERR-2) Extrapolation of FF spectrum to zero         4111200200028
...
ENDBIB              37          0                               4111200200040
COMMON               5          3                               4111200200041
ERR-3      ERR-4      ERR-5      ERR-6      MISC-ERR            4111200200042
PER-CENT   PER-CENT   PER-CENT   PER-CENT   PER-CENT            4111200200043
 1.00       0.10       0.10       0.10       0.4                4111200200044
ENDCOMMON            3          0                               4111200200045
DATA                 8          2                               4111200200046
EN         EN-ERR     DATA       ERR-T      MISC       ERR-S    4111200200047
ERR-1      ERR-2                                                4111200200048
MEV        MEV        B          B          PER-CENT   PER-CENT   4111200200049
PER-CENT   PER-CENT                                             4111200200050
 1.88       0.003      1.28       0.03       4.0        1.95    4111200200051
 0.26       0.1                                                 4111200200052
 2.37       0.003      1.27       0.03       3.9        2.10    4111200200053
 0.5        0.3                                                 4111200200054
ENDDATA              8          0                               4111200200055
ENDSUBENT           54          0                               4111200299999
ENDENTRY             2          0                               4111299999999
```

Figure 9: EXFOR File 41112002_exf.txt.

```
   ----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----
1: EN
2: EN
3: EN-ERR
4: DATA
5:
6: ERR-T      *
```

Figure 10: Header File 41112002_hed.txt.

```
   ----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----
1: #41112.002   V.Kalinin,+,1992                  2
2:  1.000
3:  0.240 1.000
```

Figure 11: Correlation File 41112002_exc.txt.

Table 2: Datasets included in the present evaluation with Correlation Files.

Quantity	EXFOR	First author (Year)	Ref.	Remark
^{238}U	13169.002.2	J.W.Meadows (1989)	[14]	Correlation coefficient (0.70) in p.473 of Ref. [14]
^{238}U/^{235}U	14498.002	R.J.Casperson (2018)	[15]	Correlation coefficients received from R.J. Casperson and in EXFOR 14498.002
^{240}Pu/^{235}U	22211.002	T.Iwasaki (1990)	[16]	Correlation coefficients in Table 5 of Ref. [16]
^{233}U/^{235}U	22282.003.1	F.Manabe (1988)	[17]	Correlation coefficients in Table V-1 of Ref. [17]
^{238}U/^{235}U	22282.006.1	F.Manabe (1988)	[17]	Correlation coefficients in Table VIII-1 of Ref. [17]
^{235}U	41112.002	V.A.Kalinin (1991)	[18]	Correlation coefficients in Table 2 of Ref. [18]
^{235}U	51001.002	V.N.Dushin (1983)	[5]	Covariances in Table 1 of Ref. [5]
^{239}Pu	51001.003	V.N.Dushin (1983)	[5]	Covariances in Table 2 of Ref. [5]
^{233}U	51001.004	V.N.Dushin (1983)	[5]	Covariances in Table 2 of Ref. [5]
^{238}U	51001.005	V.N.Dushin (1983)	[5]	Covariances in Table 2 of Ref. [5]
^{235}U	51006.002	S.Amaducci (2019)	[8]	Correlation coefficients not provided by the authors explicitly but generated for the present evaluation to express the (1) full correlation of the counting statistics of ^{235}U fission between the ratios to the ^{6}Li(n,t)^{4}He and ^{10}B(n,α)^{7}Li counts at the same incident energy, and (2) full correlation of the detection efficiencies of ^{6}Li(n,t)^{4}He or ^{10}B(n,α)^{7}Li over whole energy range

2.4 List of experimental datasets

Tables 3 - 15 summarize the experimental datasets taken from the EXFOR Library. EXFOR # gives the EXFOR subentry number (and pointer if present), "Ver." shows when the last update of the EXFOR subentry was made (=N2 field of SUBENT record), "Year" is the date of publication (or the date of conference for a conference proceedings, or the date of the original publication for a translation), "Lab." gives the location of the experimental facility in the EXFOR/CINDA abbreviation [1], and "Pts." gives the number of the data points used in the present evaluation.

Table 3: ^{233}U(n,f) absolute cross section datasets.

EXFOR #	Ver.	First author	Year	Lab.	Pts.	Energy range (eV)		Ref.
23072.009	20170418	M.Calviani	2009	2ZZZCER	44	7.5E+03	1.1E+06	[20]
22698.005	20201216	F.Tovesson	2004	1USALAS	5	1.6E+06	7.5E+06	[21]
13890.004	20180724	K.H.Guber	2000	1USAORL	16	7.5E+03	6.5E+05	[22]
40927.002	20160604	V.I.Shpakov	1986	4RUSRI	1	1.9E+06	1.9E+06	[23]
12910.002	20180724	K.R.Zasady	1984	1USAMHG	1	1.5E+07	1.5E+07	[24]
51001.004	20201022	V.N.Dushin	1983	4RUSRI	2	1.5E+07	1.5E+07	[5]
40587.002	20090416	A.V.Murzin	1980	4UKRIJD	1	2.4E+04	2.4E+04	[25]
40610.002	20180724	E.A.Zhagrov	1980	4RUSRI	2	4.4E+04	1.2E+05	[26]
10756.002	20060830	W.P.Poenitz	1978	1USAANL	41	1.4E+05	8.0E+06	[27]
10267.041	20180724	R.Gwin	1976	1USAORL	11	7.5E+03	1.5E+05	[28]
32625.002	20180724	Yan Wuguang	1975	3CPRAEP	2	5.0E+05	1.0E+06	[29]
51008.002	20210126	J.Blons	1971	2FR SAC	30	7.1E+03	2.7E+04	[10]

[1]For example, 2BLGLVN=Université catholique de Louvain (Belgium), 2GERDRE=Technische Universität Dresden (Germany), 2SWDUPP=Uppsala universitet (Sweden), 3CPRIHP=Institute of High Energy Physics (China), and 4UKRIJD=Instytut Yadernykh Doslidzhen (Ukraine). See Table 3 of Ref. [19] for the full institute names of other abbreviations.

Table 4: ^{235}U(n,f) absolute cross section datasets.

EXFOR #	Ver.	First author	Year	Lab.	Pts.	Energy range (eV)		Ref.
51006.002	20201215	S.Amaducci	2019	2ZZZCER	56	7.5E+03	1.7E+05	[8]
23078.002	20201217	R.Nolte	2007	2BLGLVN+	8	3.3E+07	2.0E+08	[30]
14015.002	20100728	A.D.Carlson	1991	1USALAS	44	2.5E+06	3.0E+07	[31]
14016.002	20101008	P.W.Lisowski	1991	1USALAS	141	3.0E+06	2.0E+08	[32]
22304.002	20180724	K.Merla	1991	2GERZFK	3	4.4E+06	1.9E+07	[12]
51010.002	20210310	K.Merla	1991	2GERDRE	2	2.6E+06	1.5E+07	[12]
41112.002	20150627	V.A.Kalinin	1991	4RUSRI	2	1.9E+06	2.4E+06	[18]
22091.002	20170718	T.Iwasaki	1988	2JPNTOH	5	1.4E+07	1.5E+07	[33]
30721.002	20170719	Li Jingwen	1988	3CPRAEP	1	1.4E+07	1.4E+07	[34]
10987.002	20120412	A.D.Carlson	1985	1USANBS	67	3.1E+05	2.8E+06	[35]
12924.003	20170601	M.S.Dias	1985	1USANBS	19	1.1E+06	6.0E+06	[36]
12877.008	20170419	L.W.Weston	1984	1USAORL	12	7.5E+03	9.5E+04	[37]
51001.002	20201022	V.N.Dushin	1983	4RUSRI	6	1.4E+07	1.5E+07	[5]
30634.002	20170719	Li Jingwen	1983	3CPRAEP	1	1.5E+07	1.5E+07	[38]
10950.002	20170601	O.A.Wasson	1982	1USANBS	37	2.4E+05	1.2E+06	[39]
10971.002	20170721	O.A.Wasson	1982	1USANBS	1	1.4E+07	1.4E+07	[40]
12826.002	20170721	M.Mahdavi	1982	1USAMHG	1	1.5E+07	1.5E+07	[41]
21620.002	20170721	M.Cance	1981	2FR BRC	2	2.5E+06	4.4E+06	[42]
21620.003	20170721	M.Cance	1981	2FR BRC	1	2.5E+06	2.5E+06	[42]
40587.003	20090416	A.V.Murzin	1980	4UKRIJD	1	2.4E+04	2.4E+04	[25]
40610.003	20180724	E.A.Zhagrov	1980	4RUSRI	2	4.6E+04	1.2E+05	[26]
31833.002	20201103	R.Arlt	1980	2GERZFK	1	8.2E+06	8.2E+06	[43]

Table 5: ^{238}U(n,f) absolute cross section datasets.

EXFOR #	Ver.	First author	Year	Lab.	Pts.	Energy range (eV)		Ref.
23736.002	20210331	P.Salvador-Castiñeira	2017	2UK NPL	6	1.8E+06	2.4E+06	[44]
14529.002	20210311	Z.W.Miller	2015	1USALAS	13	1.3E+08	2.5E+08	[45]
23078.003	20201217	R.Nolte	2007	2BLGLVN+	9	3.3E+07	2.0E+08	[30]
13586.011	20090928	J.W.Meadows	1996	1USALAS	1	1.0E+07	1.0E+07	[46]
22321.006	20201217	V.P.Eismont	1996	2SWDUPP	1	1.4E+08	1.4E+08	[47]
22304.003	20180724	K.Merla	1991	2GERZFK	4	4.8E+06	1.9E+07	[12]
13169.002.2	20200928	J.W.Meadows	1989	1USAANL	2	2.2E+06	2.5E+06	[14]
13169.003.2	20200928	J.W.Meadows	1989	1USAANL	42	1.9E+06	2.6E+06	[14]
51001.005	20201022	V.N.Dushin	1983	4RUSRI	1	1.5E+07	1.5E+07	[5]
30669.002	20190722	Wu Jingxia	1983	3CPRAEP	4	4.0E+06	5.5E+06	[48]
32766.002	20181121	Hu Zhongkang	1980	3CPRAEP	3	1.4E+07	1.5E+07	[49]
31832.003	20201103	I.D.Alkhazov	1979	2GERDRE	1	1.5E+07	1.5E+07	[50]
20779.003	20170724	M.Cancé	1978	2FR BRC	2	1.4E+07	1.5E+07	[51]
40483.002	20191212	P.E.Vorotnikov	1975	4RUSKUR	71	1.6E+05	1.6E+06	[52]

Table 6: ^{239}Pu(n,f) absolute cross section datasets.

EXFOR #	Ver.	First author	Year	Lab.	Pts.	Energy range (eV)		Ref.
13488.005	20180724	L.W.Weston	1992	1USAORL	4	7.5E+03	1.5E+04	[53]
22304.005	20180724	K.Merla	1991	2GERZFK	3	4.9E+06	1.9E+07	[12]
40927.006	20070914	V.I.Shpakov	1986	4RUSRI	1	1.9E+06	1.9E+06	[23]
12877.009	20170419	L.W.Weston	1984	1USAORL	12	7.5E+03	9.5E+04	[37]
51001.003	20201022	V.N.Dushin	1983	4RUSRI	2	1.5E+07	1.5E+07	[5]
30634.003	20170719	Li Jingwen	1983	3CPRAEP	1	1.5E+07	1.5E+07	[38]
30670.002	20170724	Zhou Xianjian	1982	3CPRAEP	16	1.0E+06	5.6E+06	[54]
40487.003	20170724	Yu.V.Ryabov	1979	4ZZZDUB	13	7.5E+03	9.5E+04	[55]
40487.004	20170724	Yu.V.Ryabov	1979	4ZZZDUB	20	7.3E+03	9.2E+04	[55]
40487.005	20170724	Yu.V.Ryabov	1979	4ZZZDUB	4	7.2E+03	1.2E+04	[55]
40487.006	20170724	Yu.V.Ryabov	1979	4ZZZDUB	13	7.4E+03	3.5E+04	[55]
10314.003	20170724	M.C.Davis	1978	1USAMHG	4	1.4E+05	9.6E+05	[56]
20779.005	20170724	M.Cancé	1978	2FR BRC	2	1.4E+07	1.5E+07	[51]
10267.002	20180724	R.Gwin	1976	1USAORL	10	1.5E+04	1.5E+05	[28]
20618.003	20180724	I.Szabo	1976	2FR CAD	13	2.4E+06	5.5E+06	[57]
51007.002	20210126	J.Blons	1971	2FR SAC	32	7.1E+03	2.9E+04	[9]
20570.003	20180724	I.Szabo	1973	2FR CAD	20	8.0E+05	2.6E+06	[58]
20476.003	20190722	M.G.Schombrg	1970	2UK HAR	7	7.5E+03	2.8E+04	[59]
20567.003	20180724	I.Szabo	1970	2FR CAD	21	3.5E+04	9.7E+05	[60]

Table 7: ^{240}Pu(n,f) absolute cross section datasets.

EXFOR #	Ver.	First author	Year	Lab.	Pts.	Energy range (eV)		Ref.
23281.005	20201201	P.Salvador-Castiñeira	2015	2ZZZGEL	19	5.0E+05	3.0E+06	[61]
31711.006	20110511	K.Gul	1986	3PAKNIL	1	1.5E+07	1.5E+07	[62]
12877.007	20170419	L.W.Weston	1984	1USAORL	3	7.5E+04	9.5E+04	[37]
40673.004	20160602	B.M.Aleksandrov	1983	4RUSRI	1	1.2E+06	1.2E+06	[63]
21821.002	20200928	M.Cance	1982	2FR BRC	1	2.5E+06	2.5E+06	[64]
21764.003	20200924	C.Budtz-Jørgensen	1981	2ZZZGEL	77	7.0E+04	1.5E+05	[65]
30548.002	20090505	N.A.Khan	1980	3PAKNIL	1	1.5E+07	1.5E+07	[66]

Table 8: ^{241}Pu(n,f) absolute cross section datasets.

EXFOR #	Ver.	First author	Year	Lab.	Pts.	Energy range (eV)		Ref.
31711.005	20110511	K.Gul	1986	3PAKNIL	1	1.5E+07	1.5E+07	[62]
40673.005	20160602	B.M.Aleksandrov	1983	4RUSRI	1	1.2E+06	1.2E+06	[63]
21811.002	20210317	C.Wagemans	1982	2ZZZGEL	3	7.5E+03	2.5E+04	[67]
30548.003	20090505	N.A.Khan	1980	3PAKNIL	1	1.5E+07	1.5E+07	[66]
10636.002.2	20201129	G.W.Carlson	1977	1USALRL	10	7.0E+03	6.5E+04	[68]
20570.004	20180724	I.Szabo	1973	2FR CAD	6	1.2E+06	2.6E+06	[58]
51009.002	20210126	J.Blons	1971	2FR SAC	32	7.1E+03	2.9E+04	[69, 11]
20567.004	20180724	I.Szabo	1970	2FR CAD	15	3.5E+04	9.7E+05	[60]

Table 9: ^{233}U(n,f)/^{235}U(n,f) cross section ratio datasets.

EXFOR #	Ver.	First author	Year	Lab.	Pts.	Energy range (eV)		Ref.
14402.003	20150128	F.Tovesson	2014	1USALAS	113	3.1E+05	1.9E+08	[70]
23128.002	20170628	F.Belloni	2011	2ZZZCER	32	5.3E+05	1.9E+07	[71]
41455.002	20170724	O.Shcherbakov	2002	4RUSLIN	166	5.8E+05	2.0E+08	[72]
41432.003	20071122	D.L.Shpak	1998	4RUSFEI	127	2.0E+04	6.4E+06	[73]
13134.004.1	20170724	J.W.Meadows	1988	1USAANL	1	1.5E+07	1.5E+07	[74]
22282.003.1	20130924	F.Manabe	1988	2JPNTOH	4	1.3E+07	1.5E+07	[17]
22014.003	20210315	K.Kanda	1986	2JPNTOH	42	4.9E+05	7.0E+06	[75]
10562.003	20180507	G.W.Carlson	1978	1USALRL	101	7.0E+03	2.9E+07	[76]
40474.002	20180724	B.I.Fursov	1978	4RUSFEI	11	1.3E+05	7.0E+06	[77]
40474.004	20201213	B.I.Fursov	1978	4RUSFEI	81	2.4E+04	7.4E+06	[77]
10236.002.1	20190722	J.W.Meadows	1974	1USAANL	56	1.4E+05	9.4E+06	[78]
20363.002	20170724	E.Pfletschinger	1970	2GERKFK	48	8.3E+03	1.0E+06	[79]

Table 10: ^{238}U(n,f)/^{233}U(n,f) cross section ratio datasets.

EXFOR #	Ver.	First author	Year	Lab.	Pts.	Energy range (eV)		Ref.
10422.006	20190722	J.W.Behrens	1976	1USALRL	87	1.0E+06	2.9E+07	[80]

Table 11: ^{238}U(n,f)/^{235}U(n,f) cross section ratio datasets.

EXFOR #	Ver.	First author	Year	Lab.	Pts.	Energy range (eV)		Ref.
32798.002	20200420	Jie Wen	2020	3CPRIHP	85	1.0E+06	2.0E+07	[81]
14498.002	20180407	R.J.Casperson	2018	1USALAS	72	5.2E+05	3.1E+07	[15]
23269.002	20201207	C.Paradela	2015	2ZZZCER	64	6.9E+05	2.3E+08	[7]
51005.002	20201215	C.Paradela	2015	2ZZZCER	124	6.9E+05	2.3E+08	[7]
23269.005	20201207	C.Paradela	2015	2ZZZCER	59	1.1E+06	2.3E+08	[7]
23269.006	20180426	C.Paradela	2015	2ZZZCER	89	2.9E+05	3.2E+06	[7]
14402.009	20150128	F.Tovesson	2014	1USALAS	174	5.0E+05	2.0E+08	[70]
41455.003	20170724	O.Shcherbakov	2002	4RUSLIN	166	5.8E+05	2.0E+08	[72]
14016.003	20101008	P.Lisowski	1991	1USALAS	191	8.3E+05	2.5E+08	[32]
30722.002	20190722	Li Jingwen	1989	3CPRAEP	1	1.5E+07	1.5E+07	[82]
13134.007.1	20170724	J.W.Meadows	1988	1USAANL	1	1.5E+07	1.5E+07	[74]
22282.006.1	20130924	F.Manabe	1988	2JPNTOH	4	1.3E+07	1.5E+07	[17]
21963.006	20180724	K.Kanda	1985	2JPNTOH	12	1.5E+06	6.9E+06	[83]
30813.012	20190722	I.Gârlea	1984	3RUMBUC	1	1.5E+07	1.5E+07	[84]
40831.003	20180323	A.A.Goverdovskii	1984	4RUSFEI	27	5.4E+06	1.0E+07	[85]
40831.004	20180323	A.A.Goverdovskii	1984	4RUSFEI	5	1.4E+07	1.5E+07	[86]
30588.002	20170724	M.Várnagy	1982	3HUNKOS	6	1.4E+07	1.5E+07	[87]
10635.002	20190722	F.C.Difilippo	1978	1USAORL	149	1.6E+05	2.4E+07	[88]
10653.004	20190722	J.W.Behrens	1977	1USALRL	144	7.6E+05	3.4E+07	[89]
40506.002	20200826	B.Fursov	1977	4RUSFEI	36	9.8E+05	7.0E+06	[90]
40506.003	20200826	B.Fursov	1977	4RUSFEI	4	1.5E+06	3.0E+06	[90]
20409.002	20210210	S.Cierjacks	1976	2GERKFK	91	1.4E+06	3.0E+07	[91]
20869.002	20190722	C.Nordborg	1976	2SWDUPP	23	4.7E+06	8.8E+06	[92]
20870.002	20190722	M.Cance	1976	2FR BRC	9	2.6E+06	7.0E+06	[93]
10506.002.1	20190722	J.W.Meadows	1975	1USAANL	22	5.3E+06	1.0E+07	[94]
51002.002	20201214	W.P.Poenitz	1972	1USAANL	3	2.5E+06	2.5E+06	[6]
10232.006	20201214	W.P.Poenitz	1972	1USAANL	2	2.0E+06	3.0E+06	[6]
10237.003.1	20190722	J.W.Meadows	1972	1USAANL	47	9.0E+05	5.1E+06	[95]

Table 12: ^{239}Pu(n,f)/^{235}U(n,f) cross section ratio datasets.

EXFOR #	Ver.	First author	Year	Lab.	Pts.	Energy range (eV)		Ref.
14271.003.1	20201215	F.Tovesson	2010	1USALAS	600	2.0E+05	2.0E+08	[96]
41455.005	20170724	O.Shcherbakov	2002	4RUSLIN	166	5.8E+05	2.0E+08	[72]
13801.002	20170724	P.Staples	1998	1USALAS	146	8.5E+05	6.2E+07	[97]
14016.004	20101008	P.W.Lisowski	1991	1USALAS	208	5.0E+05	2.5E+08	[32]
13134.009.1	20170724	J.W.Meadows	1988	1USAANL	1	1.5E+07	1.5E+07	[74]
30813.014	20190722	I.Gârlea	1984	3RUMBUC	1	1.5E+07	1.5E+07	[84]
12766.002	20201012	L.W.Weston	1983	1USAORL	121	7.2E+03	2.1E+07	[98]
12826.004	20170721	M.Mahadavi	1982	1USAMHG	1	1.5E+07	1.5E+07	[41]
30588.005	20170724	M.Várnagy	1982	3HUNKOS	6	1.4E+07	1.5E+07	[87]
10562.002	20180507	G.W.Carlson	1978	1USALRL	101	7.0E+03	2.9E+07	[76]
10734.002.1	20190722	J.W.Meadows	1978	1USAANL	73	1.5E+05	9.9E+06	[99]
20786.005	20190722	K.Kari	1978	2GERKFK	202	5.0E+05	2.1E+07	[100]
40824.002	20170724	B.I.Fursov	1977	4RUSFEI	13	1.3E+05	7.0E+06	[101]
40824.003	20170724	B.I.Fursov	1977	4RUSFEI	80	2.4E+04	7.4E+06	[101]
20428.004	20170724	D.B.Gayther	1975	2UK HAR	25	7.5E+03	9.5E+05	[102]
10253.002	20170724	W.P.Poenitz	1972	1USAANL	27	3.0E+04	5.5E+06	[103]
20569.004	20170724	I.Szabo	1971	2FR CAD	15	1.2E+04	2.0E+05	[104]
10086.008	20170724	W.P.Poenitz	1970	1USAANL	11	1.5E+05	1.4E+06	[105]
20363.003	20170724	E.Pfletschinger	1970	2GERKFK	47	8.2E+03	1.0E+06	[79]

Table 13: ^{240}Pu(n,f)/^{235}U(n,f) cross section ratio datasets.

EXFOR #	Ver.	First author	Year	Lab.	Pts.	Energy range (eV)		Ref.
23458.006.1	20210314	A.Stmatopoulos	2020	2ZZZCER	255	7.0E+04	5.8E+06	[106]
41487.014	20150225	A.B.Laptev	2007	4RUSLIN	166	5.8E+05	2.0E+08	[107]
13801.003	20170724	P.Staples	1998	1USALAS	210	5.1E+05	2.5E+08	[97]
22211.002	20200925	T.Iwasaki	1990	2JPNTOH	19	6.7E+05	6.6E+06	[16]
13576.002	20200925	J.W.Behrens	1983	1USALRL	50	7.3E+04	3.3E+05	[108]
12714.002.1	20200925	J.W.Meadows	1981	1USAANL	55	3.4E+05	9.6E+06	[109]
21764.002	20200924	C.Budtz-Jorgensen	1981	2ZZZGEL	49	1.5E+05	3.0E+05	[65]
21764.004	20200924	C.Budtz-Jorgensen	1981	2ZZZGEL	91	2.0E+05	9.8E+06	[65]
20766.002	20200925	K.Wisshak	1979	2GERKFK	6	7.6E+04	2.1E+05	[110]
40509.002	20190722	V.Kupriyanov	1979	4RUSFEI	73	1.3E+05	7.4E+06	[111]
10597.002	20040723	J.W.Behrens	1978	1USALRL	120	3.4E+05	3.4E+07	[112]
20786.003	20190722	K.Kari	1978	2GERKFK	135	4.9E+05	2.1E+07	[100]
20488.002	20200924	J.Frehaut	1974	2FR BRC	22	1.9E+06	1.5E+07	[113]

Table 14: ^{240}Pu(n,f)/^{239}Pu(n,f) cross section ratio datasets.

EXFOR #	Ver.	First author	Year	Lab.	Pts.	Energy range (eV)		Ref.
12766.003	20170419	L.W.Weston	1983	1USAORL	106	7.2E+04	2.1E+07	[98]
40509.004.1	20200826	V.Kupriyanov	1979	4RUSFEI	5	9.8E+05	3.0E+06	[111]

Table 15: ^{241}Pu(n,f)/^{235}U(n,f) cross section ratio datasets.

EXFOR #	Ver.	First author	Year	Lab.	Pts.	Energy range (eV)		Ref.
14271.006.1	20201215	F.Tovesson	2010	1USALAS	460	1.0E+06	2.0E+08	[96]
40474.003	20180724	B.I.Fursov	1978	4RUSFEI	11	1.3E+05	7.0E+06	[77]
40474.005	20201213	B.I.Fursov	1978	4RUSFEI	81	2.4E+04	7.4E+06	[77]
20364.002	20071219	F.Käppeler	1973	2GERKFK	43	1.4E+04	1.1E+06	[114]

2.5 List of correlation properties

Table 16 summarizes the uncertainties used for construction of the correlation coefficients of each dataset. The first line of each dataset is for the total uncertainty, and this line is followed by lines describing partial uncertainties. The three headings `ERR-C`, `ERR-R` and `ERR-A` indicate the total uncertainty calculated from the partial uncertainties, the residual uncertainty calculated by subtraction of the other partial uncertainties from the total uncertainty, and a partial uncertainty not in the EXFOR File, respectively.

- Column 1: EXFOR heading
- Column 2: Flag
  - `AU`: An uncertainty which value is not in the EXFOR File but given in the Header File.
  - `CT`: Total uncertainty calculated according to the quadrature sum rule.
  - `MU`: Lower limit of the uncertainty range in the EXFOR File adopted as a constant uncertainty.
  - `RU`: Residual uncertainty not in the EXFOR File but calculated according to the quadrature sum rule.
- Column 3: Correlation property of the uncertainty (0.0 for uncorrelated, 1.0 for fully correlated).
- Column 4: Lower limit of the uncertainty.
- Column 5: Upper limit of the uncertainty.
- Column 6: Description of the uncertainty.

Table 16: Total uncertainty, partial uncertainties and their correlation properties used in calculation of correlation coefficients

^{233}U cross sections

EXFOR 23072.009 (M.Calviani+,2009)

ERR-C	CT		2.9%	3.3%	Total uncertainty (calculated)
ERR-S		0.0	0.8%	1.8%	Statistical uncertainty
ERR-1		1.0	1.8%	1.8%	Sample mass (1.8%)
ERR-2		1.0	1.5%	1.5%	Pulse height threshold (1.5%)
ERR-3		1.0	1.0%	1.0%	Dead-time correction (1.0%)
ERR-4		1.0	1.0%	1.0%	Normalization to ^{235}U(n,f) (1.0%-2.0%)

EXFOR 22698.005 (F.Tovesson+,2004)

ERR-T			1.8%	2.1%	Combined systematic and statistical error
ERR-1		1.0	1.4%	1.4%	^{237}Np mass (1.4%)
ERR-2		1.0	1.0%	1.0%	^{237}Np(n,f) cross section (1%)
ERR-R	RU	0.0	0.4%	1.2%	Residual uncertainty (specified as uncorrelated)

EXFOR 13890.004 (K.H.Guber+,2000)

ERR-C	CT		1.0%	1.1%	Total uncertainty (calculated)
ERR-S		0.0	0.2%	0.5%	Statistical uncertainty
ERR-A	AU	1.0	1.0%	1.0%	Normalization uncertainty from 22080.002 (0.25% from thermal normalization+0.7% from point-wise uncertainty)

EXFOR 40927.002 (V.I.Shpakov,1986)

ERR-T			3.6%	3.6%	Total error
ERR-S		0.0	2.9%	2.9%	Statistical error
ERR-R	RU	1.0	2.1%	2.1%	Residual uncertainty (specified as fully correlated)

EXFOR 12910.002 (K.R.Zasady+,1984)

ERR-T			3.3%	3.3%	Major sources of uncertainties are:
ERR-1	MU	1.0	1.2%	1.2%	Flux determination (1.2-1.5%)
ERR-2	MU	1.0	0.4%	0.4%	Anisotropy uncertainty (0.40-0.81%)
ERR-3		1.0	0.4%	0.4%	Scattering correction (0.4%)
ERR-4		1.0	0.2%	0.2%	Geometry (0.24%)
ERR-R	RU	0.0	3.0%	3.0%	Residual uncertainty (specified as uncorrelated)

EXFOR 51001.004 (V.N.Dushin+,1983)

Correlation coefficients provided by the authors adopted.

DATA-ERR			1.9%	2.0%	Total uncertainty (calcultaed from the author's covariance matrix by the compiler)

EXFOR 40587.002 (A.V.Murzin+,1980)

ERR-T			2.7%	2.7%	Total Error - 2.8 %.
ERR-1		1.0	0.5%	0.5%	Uncertainty of sample weight.
ERR-2		1.0	1.1%	1.1%	Uncertainty of ^{10}B sample weight.
ERR-R	RU	0.0	2.4%	2.4%	Residual uncertainty (specified as uncorrelated)

EXFOR 40610.002 (E.A.Zhagrov+,1980)

ERR-T			3.9%	4.2%	Total error includes:
ERR-1		1.0	0.8%	0.8%	Neutron flux - Activity of solution (0.8%)
ERR-2		1.0	1.5%	1.5%	Neutron flux - Mn bath calibration (1.5%)
ERR-3		1.0	0.2%	0.2%	Neutron flux - Monitor detector (0.2%)
ERR-4		1.0	1.0%	1.0%	Neutron flux - Instability of equipment (1%)
ERR-5		1.0	1.0%	1.0%	Fission - Registration efficiency (1%)
ERR-6		1.0	1.0%	1.0%	Fission - Geometry (1%)
ERR-7		1.0	2.0%	2.0%	Target uranium density (2%)
ERR-R	RU	0.0	2.2%	2.8%	Residual uncertainty (specified as uncorrelated)

EXFOR 10756.002 (W.P.Poenitz,1978)

ERR-T			1.8%	3.3%	Includes detector uncertainties, neutron backgrounds,neutron flux measurement uncertainty (0.5 percent), and geometric measurement uncertainties
ERR-S		0.0	0.4%	1.8%	Statistical error.
ERR-R	RU	1.0	1.3%	2.9%	Residual uncertainty (specified as fully correlated)

EXFOR 10267.041 (R.Gwin+,1976)

ERR-T			5.2%	10.3%	Uncertainties including all known errors
ERR-2		1.0	5.0%	5.0%	Uncertainty due to normalization
ERR-R	RU	0.0	1.3%	9.0%	Residual uncertainty (specified as uncorrelated)

EXFOR 32625.002 (Yan Wuguang+,1975)

ERR-T			5.0%	5.0%	Total errors which main sources are
ERR-S		0.0	1.0%	1.0%	Fission and neutron counting statistics (1%)
ERR-R	RU	1.0	4.9%	4.9%	Residual uncertainty (specified as fully correlated)

EXFOR 51008.002 (J.Blons+,1971)

ERR-C	CT		1.5%	1.6%	Total uncertainty (calculated)
ERR-S		0.0	0.6%	0.7%	Statistical
ERR-A	AU	1.0	1.4%	1.4%	Uncertainty determined from James's table

^{235}U cross sections

EXFOR 51006.002 (S.Amaducci+,2019)

Correlation coefficients provided by the authors adopted.					
ERR-T			2.7%	5.6%	Total uncertainty excluding MONIT-ERR and ERR-1 in 23453.002 and 003.

EXFOR 23078.002 (R.Nolte+,2007)

ERR-T			5.2%	10.9%	Total uncertainty excluding the uncertainty in the n-p cross section (5%) but including the uncertainties due to
ERR-1	MU	1.0	0.2%	0.2%	Number of fissionable nuclei (0.2-0.5%)
ERR-2		1.0	1.6%	1.6%	Chamber efficiency (1.6%)
ERR-4	MU	1.0	2.5%	2.5%	Peak fluence (2.5-3.5%)
ERR-5		1.0	2.0%	2.0%	Monitor readings (2%)
ERR-6		1.0	0.7%	0.7%	Neutron transport in fiss.chamber(0.7%)
ERR-7		1.0	0.9%	0.9%	Fragment loss below threshold (0.9%)
ERR-8		1.0	0.4%	0.4%	Dead time (0.4%)
ERR-9		1.0	0.2%	0.2%	Telescope - fiss.chamber distance(0.2%)
ERR-10		1.0	0.3%	0.3%	Neutron absorption in air (0.3%)
ERR-11		1.0	1.3%	1.3%	Inhomogeneity of neutron fluence (1.3%)
ERR-12	MU	1.0	1.0%	1.0%	Fiss. due to low-energy neutrons (1-7%)
ERR-R	RU	0.0	3.2%	10.1%	Residual uncertainty (specified as uncorrelated)

EXFOR 14015.002 (A.D.Carlson+,1991)

ERR-C	CT		1.2%	2.0%	Total uncertainty (calculated)
ERR-S		0.0	1.0%	1.9%	Statistics
ERR-1		1.0	0.1%	0.2%	Fission fragment counting efficiency
ERR-2		1.0	0.3%	0.3%	Transmission and scattering
ERR-3		1.0	0.5%	0.5%	Background

EXFOR 14016.002 (P.W.Lisowski+,1991)

ERR-C	CT		1.2%	5.4%	Total uncertainty (calculated)
ERR-S		0.0	0.6%	4.2%	Statistics
ERR-1		1.0	1.0%	5.0%	Efficiency

EXFOR 22304.002 (K.Merla+,1991)

ERR-C	CT		2.1%	2.4%	Total uncertainty (calculated)
ERR-S		0.0	1.0%	1.5%	Statistics
ERR-1		1.0	0.2%	0.6%	Random coincidence
ERR-2		1.0	0.0%	0.0%	Correlated background
ERR-3		1.0	0.2%	0.7%	Fission fragment spectrum extrapolation
ERR-4		1.0	0.7%	0.8%	Fission fragment absorption
ERR-5		1.0	0.2%	1.4%	Associated particle background
ERR-6		1.0	0.4%	0.4%	Neutron scattering and foil thickness effect
ERR-7		1.0	0.0%	0.7%	Cone neutron outside angular extent of foils
ERR-8		1.0	0.7%	0.8%	Fission sample areal density
ERR-9		1.0	1.0%	1.0%	Fission sample inhomogeneity

EXFOR 51010.002 (K.Merla+,1991)

DATA-ERR			1.1%	1.9%	No information on the source of uncertainty
ERR-S		0.0	0.5%	0.8%	Statistical uncertainty in the 1988 preliminary report (Table 5 of 1988 Mito Conf. p.145)
ERR-R	RU	1.0	1.0%	1.8%	Residual uncertainty (specified as fully correlated)

EXFOR 41112.002 (V.A.Kalinin+,1991)

Correlation coefficients provided by the authors adopted.					
ERR-T			2.3%	2.4%	Total error. Source of errors:

EXFOR 22091.002 (T.Iwasaki+,1988)

ERR-T			2.5%	2.8%	Total uncertainty propagated from
ERR-1		1.0	1.0%	1.0%	Sample assay (1.0%)
ERR-2		1.0	1.2%	1.2%	n-p cross section and anisotropy (1.2%)
ERR-R	RU	0.0	2.0%	2.3%	Residual uncertainty (specified as uncorrelated)

EXFOR 30721.002 (Li Jingwen+,1988)

ERR-T			1.9%	1.9%	Total uncertainty (1.90%) propagated from
ERR-S		0.0	0.8%	0.8%	statistics (0.80%)
ERR-R	RU	1.0	1.7%	1.7%	Residual uncertainty (specified as fully correlated)

EXFOR 10987.002 (A.D.Carlson+,1985)

ERR-C	CT		2.0%	2.3%	Total uncertainty (calculated)
ERR-S		0.0	0.9%	1.0%	Statistical uncertainty
ERR-2		1.0	0.0%	0.7%	timing
ERR-3		1.0	0.3%	0.9%	transmission from materials in beam
ERR-4		1.0	0.1%	0.5%	ADC (analog-to-digital conver.) zero for black detector
ERR-5		1.0	0.0%	0.1%	dead time correction
ERR-6		1.0	1.0%	1.0%	black detector efficiency
ERR-7		1.0	1.2%	1.2%	U235 mass
ERR-8		1.0	0.0%	0.0%	fission chamber bias (0.04%)
ERR-9		1.0	0.3%	0.3%	fission chamber background (0.3%)
ERR-10		1.0	0.4%	0.4%	black detector background (0.4%)
ERR-11		1.0	0.0%	0.0%	fission chamber and black detector collimator flight paths (0.02%)
ERR-12		1.0	0.2%	0.2%	collimator area (0.2%)
ERR-13		1.0	0.1%	0.1%	scattering in fission chamber (0.1%)
ERR-14		1.0	0.5%	0.5%	extrapolation to zero pulse height for fission chamber (0.5%)

EXFOR 12924.003 (M.S.Dias+,1985)

ERR-C	CT		1.9%	2.9%	Total uncertainty (calculated)
ERR-S		0.0	0.9%	2.4%	Statistical uncertainty
ERR-1		1.0	1.2%	1.2%	^{235}U mass+fission fragment absorption(1.2%)
ERR-2		1.0	0.5%	0.5%	Extrapolation to zero for fission chamber pulse-height distribution (0.5%)
ERR-3		1.0	0.3%	0.3%	Fission chamber background (0.3%)
ERR-4		1.0	0.4%	0.4%	DTS detector background (0.4%)
ERR-5		1.0	0.1%	0.1%	Multi. scattering in fission chamber (0.1%)
ERR-6		1.0	0.2%	0.2%	DTS detector area defining collimator(0.2%)
ERR-7		1.0	0.0%	0.0%	Deadtime correction (0.01%)
ERR-8		1.0	0.7%	0.7%	DTS detector calibration (0.7%)
ERR-9		1.0	0.3%	0.5%	DTS detector efficiency from uncertainties in ^{1}H and ^{12}C cross sections, lost coincidence correction, and bias channel
ERR-10		1.0	0.1%	0.7%	Relative timing between fission chamber and DTS detector
ERR-11		1.0	0.2%	0.5%	Transmission correction uncertainty

EXFOR 12877.008 (L.W.Weston+,1984)

ERR-C	CT		1.3%	2.0%	Total uncertainty (calculated)
ERR-S		0.0	0.2%	1.5%	Statistical uncertainty (standard deviation)
MONIT-ERR		1.0	0.3%	0.3%	^{235}U(n_{th},f) in ENDF/B-V (0.3%)
ERR-1		1.0	1.2%	1.2%	^{235}U(n,f) normalization statistics (1.2%)
ERR-2		1.0	0.5%	0.5%	Secondary normalization (0.5%)

EXFOR 51001.002 (V.N.Dushin+,1983)

Correlation coefficients provided by the authors adopted.					
DATA-ERR			1.4%	1.7%	Total uncertainty (calcultaed from the author's covariance matrix by the compiler)

EXFOR 30634.002 (Li Jingwen+,1983)

ERR-T			1.9%	1.9%	Total uncertainty (1.92%) propagted from
ERR-S		0.0	0.9%	0.9%	statistics (0.88%)
ERR-R	RU	1.0	1.7%	1.7%	Residual uncertainty (specified as fully correlated)

EXFOR 10950.002 (O.A.Wasson+,1982)

ERR-C	CT		2.1%	3.5%	Total uncertainty (calculated)
ERR-S		0.0	0.8%	1.7%	Statistical uncertainty
ERR-1		1.0	0.4%	1.0%	Air transmission
ERR-2		1.0	0.2%	0.4%	Effective area of collimator
ERR-3		1.0	0.4%	2.4%	Black detector spectral fitting and backgrounds
ERR-4		1.0	0.2%	0.3%	Fission chamber transmission and scattering
ERR-5		1.0	0.3%	0.3%	Position of fission chamber (0.3%)
ERR-6		1.0	0.1%	0.1%	Position of coolimator (0.1%)
ERR-7		1.0	0.5%	0.5%	Geometric area of collimator (0.5%)
ERR-8		1.0	1.2%	1.2%	^{235}U mass in fission chamber (1.2%)
ERR-9		1.0	1.0%	1.0%	Black detector efficiency calculation (1.0%)
ERR-10		1.0	0.4%	0.4%	Fission spectrum extrapolation (0.4%)
ERR-11		1.0	0.3%	0.3%	Black detector shield scattering (0.3%)
ERR-12		1.0	0.3%	0.3%	Neutron beam non-uniformity (0.3%)

EXFOR 10971.002 (O.A.Wasson+,1982)

ERR-C	CT		1.4%	1.4%	Total uncertainty (calculated)
ERR-S		0.0	0.9%	0.9%	Ratio of net alpha-fission coincidence yield to alpha yield (0.9%)
ERR-1		1.0	0.3%	0.3%	Neutrons scattered from beam (0.3%)
ERR-2		1.0	0.8%	0.8%	Fission fragment absorption (0.8%)
ERR-3		1.0	0.3%	0.3%	Fission spectrum loss (0.3%)
ERR-4		1.0	0.3%	0.3%	Neutron beam shape and deposit uniformity (0.3%)
ERR-5		1.0	0.1%	0.1%	Standard ^{235}U reference mass (0.1%)
ERR-6		1.0	0.2%	0.2%	Standard ^{235}U reference areal density (0.2%)
ERR-7		1.0	0.4%	0.4%	Thermal neutron scattering from Pt backing of reference deposit (0.4%)
ERR-8		1.0	0.3%	0.3%	^{235}U areal density uncertainty (0.3%)

EXFOR 12826.002 (M.Mahdavi+,1982)

ERR-C	CT		2.0%	2.0%	Total uncertainty (calculated)
ERR-S		0.0	0.8%	0.8%	Fission track counting (0.84%)
ERR-1		1.0	0.6%	0.6%	Fission fragment anisotropy (0.55%)
ERR-2		1.0	0.5%	0.5%	Angular dist. normalization to lab (0.48%)
ERR-3		1.0	0.4%	0.4%	Total scattering perturbation (0.43%)
ERR-4		1.0	0.2%	0.2%	Total geometric error (0.24%)

ERR-5		1.0	1.5%	1.5%	Total flux uncertainty (1.5%)
ERR-6		1.0	0.5%	0.5%	Deposit masses (0.5%)

EXFOR 21620.002 (M.Cance+,1981)

ERR-C	CT		1.7%	2.2%	Total uncertainty (calculated)
ERR-1		1.0	0.1%	0.1%	Extrapolation to zero spectrum amplitude for fission detection (0.1%)
ERR-2		1.0	0.1%	0.1%	Loss of fission events (0.1%)
ERR-3		1.0	0.2%	0.2%	Fission of due to other isotopes (0.2%)
ERR-4		1.0	0.3%	0.5%	Fission due to scattered neutrons (0.3%-0.5%)
ERR-5		1.0	0.0%	0.7%	Fission without neutron production target at 4.45 MeV (0.7%)
ERR-6		1.0	0.5%	0.5%	Number of ^{235}U atoms (0.5%)
ERR-7		0.0	0.7%	1.1%	Fission counting (0.7%-1.1%)
ERR-8		1.0	0.4%	0.5%	Geometrical factors (0.4%-0.5%)
ERR-9		1.0	0.9%	1.2%	Event without polyethylene radiator (0.9%-1.2%)
ERR-10		1.0	0.1%	0.3%	Events without neutron production target (0.1%-0.3%)
ERR-11		1.0	0.1%	0.1%	Neutron attenuation in backing materials(0.1%)
ERR-12		1.0	0.8%	0.8%	n-p scattering cross section (0.75%)
ERR-13		1.0	0.2%	0.2%	Number of hydrogen atoms (0.2%)
ERR-14		1.0	0.3%	0.3%	Efficiency (0.3%)
ERR-15		0.0	0.3%	0.5%	Statistics (0.3%-0.5%)

EXFOR 21620.003 (M.Cance+,1981)

ERR-C	CT		2.8%	2.8%	Total uncertainty (calculated)
ERR-1		1.0	0.1%	0.1%	Extrapolation to zero spectrum amplitude for fission detection (0.1%)
ERR-2		1.0	0.1%	0.1%	Loss of fission events (0.1%)
ERR-3		1.0	0.2%	0.2%	Fission of due to other isotopes (0.2%)
ERR-4		1.0	0.5%	0.5%	Fission due to scattered neutrons (0.3%-0.5%)
ERR-6		1.0	0.5%	0.5%	Number of ^{235}U atoms (0.5%)
ERR-7		0.0	0.7%	0.7%	Fission counting (0.7%-1.1%)
ERR-8		1.0	0.5%	0.5%	Geometrical factors (0.4%-0.5%)
ERR-9		1.0	0.4%	0.4%	Background from shadow-bar (0.4%)
ERR-10		1.0	0.3%	0.3%	Neutron attenuation in air (0.3%)
ERR-11		1.0	0.3%	0.3%	Neutron attenuation in hybrid detector (0.3%)
ERR-12		1.0	2.5%	2.5%	Efficiency (2.5%)

EXFOR 40587.003 (A.V.Murzin+,1980)

ERR-T			3.0%	3.0%	Total Error - 2.8 %.
ERR-1		1.0	0.5%	0.5%	Uncertainty of ^{235}U sample weight
ERR-2		1.0	1.1%	1.1%	Uncertainty of ^{10}B sample weight
ERR-R	RU	0.0	2.8%	2.8%	Residual uncertainty (specified as uncorrelated)

EXFOR 40610.003 (E.A.Zhagrov+,1980)

ERR-T			3.8%	4.0%	Total error includes:
ERR-1		1.0	0.8%	0.8%	Neutron flux - Activity of solution (0.8%)
ERR-2		1.0	1.5%	1.5%	Neutron flux - Mn bath calibration (1.5%)
ERR-3		1.0	0.2%	0.2%	Neutron flux - Monitor detector (0.2%)
ERR-4		1.0	1.0%	1.0%	Neutron flux - Instability of equipment (1%)
ERR-5		1.0	1.0%	1.0%	Fission - Registration efficiency (1%)
ERR-6		1.0	1.0%	1.0%	Fission - Geometry (1%)
ERR-7		1.0	2.0%	2.0%	Target uranium density (2%)
ERR-R	RU	0.0	2.2%	2.4%	Residual uncertainty (specified as uncorrelated)

EXFOR 31833.002 (R.Arlt+,1980)

ERR-T			6.3%	6.3%	Total error
ERR-S		0.0	5.6%	5.6%	statistical error (5.6%)
ERR-R	RU	1.0	2.9%	2.9%	Residual uncertainty (specified as fully correlated)

^{238}U cross sections

EXFOR 23736.002 (P.Salvador-Castineira+,2017)

ERR-T			4.7%	4.9%	Total uncertainty
ERR-S		0.0	1.3%	1.7%	statistics
ERR-R	RU	1.0	4.5%	4.6%	Residual uncertainty (specified as fully correlated)

EXFOR 14529.002 (Z.W.Miller+,2015)

DATA-ERR			5.0%	5.4%	Total uncertainty obtained by adding systematic uncertainty and statistical uncertainty but excluding the error from the normalization point
ERR-SYS		1.0	3.6%	3.6%	Total systematic uncertainty including - uncertainty in reference cross section - yield summation uncertainty - data acquisition dead time all added in quadrature
ERR-R	RU	0.0	3.5%	4.1%	Residual uncertainty (specified as uncorrelated)

EXFOR 23078.003 (R.Nolte+,2007)

ERR-T			4.9%	9.4%	Total uncertainty excluding the uncertainty in the n-p cross section (5%) but including the uncertainties due to
ERR-1	MU	1.0	0.2%	0.2%	Number of fissionable nuclei (0.2-0.5%)
ERR-2		1.0	1.6%	1.6%	Chamber efficiency (1.6%)
ERR-4	MU	1.0	2.5%	2.5%	Peak fluence (2.5-3.5%)
ERR-5		1.0	2.0%	2.0%	Monitor readings (2%)
ERR-6		1.0	0.7%	0.7%	Neutron transport in fiss.chamber(0.7%)
ERR-7		1.0	0.9%	0.9%	Fragment loss below threshold (0.9%)
ERR-8		1.0	0.4%	0.4%	Dead time (0.4%)
ERR-9		1.0	0.2%	0.2%	Telescope - fiss.chamber distance(0.2%)
ERR-10		1.0	0.3%	0.3%	Neutron absorption in air (0.3%)
ERR-11		1.0	1.3%	1.3%	Inhomogeneity of neutron fluence (1.3%)
ERR-12	MU	1.0	1.0%	1.0%	Fiss. due to low-energy neutrons (1-7%)
ERR-R	RU	0.0	2.7%	8.5%	Residual uncertainty (specified as uncorrelated)

EXFOR 13586.011 (J.W.Meadows+,1996)

ERR-T			8.2%	8.2%	absolute uncertainty. See Table 7 in article for contributions.
MONIT-ERR		1.0	5.2%	5.2%	
ERR-R	RU	0.0	6.3%	6.3%	Residual uncertainty (specified as uncorrelated)

EXFOR 22321.006 (V.P.Eismont+,1996)

ERR-T			11.1%	11.1%	Total uncertainty including
ERR-1	MU	1.0	1.0%	1.0%	Detector calibration (1-3.5%)
ERR-2	MU	1.0	1.0%	1.0%	Target thickness (1-3.5%)
ERR-3		1.0	2.0%	2.0%	Fission fragment anisotropy (2%)
ERR-4	MU	1.0	1.0%	1.0%	Linear momentum transfer (1-2%)
ERR-6		1.0	5.0%	5.0%	spectrum decomposition, ^{238}U (5%)
ERR-9		1.0	8.0%	8.0%	neutron flux (8%)
ERR-R	RU	0.0	5.2%	5.2%	Residual uncertainty (specified as uncorrelated)

EXFOR 22304.003 (K.Merla,1991)

ERR-C	CT		2.2%	3.2%	Total uncertainty (calculated)
ERR-S		0.0	0.9%	2.2%	Statistics
ERR-1		1.0	0.1%	0.2%	Random coincidence
ERR-2		1.0	0.0%	0.6%	Correlated background
ERR-3		1.0	0.1%	0.3%	Fission fragment spectrum extrapolation
ERR-4		1.0	1.4%	1.6%	Fission fragment absorption
ERR-5		1.0	0.3%	0.6%	Associated particle background
ERR-6		1.0	0.4%	0.4%	Neutron scattering and foil thickness effect
ERR-7		1.0	0.0%	0.4%	Cone neutron outside angular extent of foils
ERR-8		1.0	1.0%	1.1%	Fission sample areal density
ERR-9		1.0	0.5%	1.6%	Fission sample inhomogeneity

EXFOR 13169.002.2 (J.W.Meadows+,1989)

Correlation coefficients provided by the authors adopted.

ERR-T			1.0%	1.4%	Total uncertainty propagated from - uncorrelated error - thickness correction - sample - extrapolation correction - sample - ^{234}U and ^{238}U half-life - ^{238}U isotopic analysis - alpha-count

EXFOR 13169.003.2 (J.W.Meadows+,1989)

ERR-C	CT		1.2%	1.6%	Total uncertainty (calculated)
ERR-S		0.0	0.7%	1.3%	Statistical uncertainty
ERR-A	AU	1.0	1.0%	1.0%	Normalization uncertainty (minimum 1%, see 13169.002)

EXFOR 51001.005 (V.N.Dushin+,1983)

Correlation coefficients provided by the authors adopted.

DATA-ERR			2.0%	2.0%	Total uncertainty (calcultaed from the author's covariance matrix by the compiler)

EXFOR 30669.002 (Wu Jingxia+,1983)

ERR-T			1.9%	2.5%	Total error less than 2.6% contains from:
ERR-S		0.0	1.0%	1.0%	Counting statistics of fission events (1%)
ERR-R	RU	1.0	1.7%	2.3%	Residual uncertainty (specified as fully correlated)

EXFOR 32766.002 (Hu Zhongkang+,1980)

ERR-C	CT		2.3%	2.5%	Total uncertainty (calculated)
ERR-1		1.0	1.1%	1.1%	Solid angle of alpha detector (1.1%)
ERR-2		1.0	0.3%	0.3%	Background of alpha detection (0.3%)
ERR-3		1.0	0.5%	0.5%	Direction of alpha emission (0.5%)
ERR-4		1.0	0.8%	0.8%	Effect of material between TiT target and U sample (0.8%)
ERR-5		1.0	0.8%	0.8%	U sample mass (0.8%)
ERR-6		1.0	1.2%	1.2%	Distance between TiT target and U sample (1.2%)
ERR-7		1.0	0.7%	0.7%	Extrapolation of fission fragment spectrum (0.7%)
ERR-8		1.0	0.6%	0.6%	Background subtraction (0.6%)
ERR-S		0.0	0.5%	0.5%	Statistics deviation (0.5%)
ERR-9		1.0	0.0%	1.0%	^{3}He(d,p)^{4}He contribution (1% at 15.04 MeV, <0.4% at 14.10 and 14.60 MeV)

EXFOR 31832.003 (I.D.Alkhazov+,1979)

ERR-T			1.8%	1.8%	Total error (1.8%)
ERR-S		0.0	0.5%	0.5%	statistics of coincidences (0.48%)
ERR-R	RU	1.0	1.7%	1.7%	Residual uncertainty (specified as fully correlated)

EXFOR 20779.003 (M.Cancé+,1978)

ERR-T			2.2%	2.2%	Quadrature sum of the following uncertainties: - Statistics including background subtraction
ERR-1		1.0	0.7%	0.7%	Extrapolation to zero pulse height (0.7%)
ERR-2		1.0	0.2%	0.2%	Loss of fissions (0.17%)
ERR-3		1.0	1.4%	1.4%	Number of atoms per cm^2 (1.35%)
ERR-4		1.0	0.4%	0.4%	Neutron attenuation in target backing (0.36%)
ERR-5		1.0	0.3%	0.3%	Neutron attenuation in front face of (0.3%) fission chamber
ERR-6		1.0	0.4%	0.4%	Fissions due to other isotopes (0.4%)
ERR-R	RU	0.0	1.4%	1.4%	Residual uncertainty (specified as uncorrelated)

EXFOR 40483.002 (P.E.Vorotnikov+,1975)

ERR-C	CT		5.6%	66.7%	Total uncertainty (calculated)
DATA-ERR		0.0	5.6%	66.7%	Not specified

^{239}Pu cross sections

EXFOR 13488.005 (L.W.Weston+,1992)

ERR-C	CT		1.5%	3.1%	Total uncertainty (calculated)
ERR-S		0.0	0.5%	0.6%	Statistical uncertainty
ERR-SYS		1.0	1.4%	3.1%	Systematic uncertainty

EXFOR 22304.005 (K.Merla+,1991)

ERR-C	CT		1.7%	3.6%	Total uncertainty (calculated)
ERR-S		0.0	1.1%	2.5%	Statistics
ERR-1		1.0	0.1%	0.6%	Random coincidence
ERR-2		1.0	0.0%	0.1%	Correlated background
ERR-3		1.0	0.2%	0.9%	Fission fragment spectrum extrapolation
ERR-4		1.0	0.5%	0.6%	Fission fragment absorption
ERR-5		1.0	0.3%	1.7%	Associated particle background
ERR-6		1.0	0.4%	0.4%	Neutron scattering and foil thickness effect
ERR-7		1.0	0.0%	1.0%	Cone neutron outside angular extent of foils
ERR-8		1.0	0.6%	0.6%	Fission sample areal density
ERR-9		1.0	0.9%	0.9%	Fission sample inhomogeneity

EXFOR 40927.006 (V.I.Shpakov,1986)

ERR-T			2.5%	2.5%	Total error
ERR-S		0.0	2.1%	2.1%	Statistical error
ERR-R	RU	1.0	1.3%	1.3%	Residual uncertainty (specified as fully correlated)

EXFOR 12877.009 (L.W.Weston+,1984)

ERR-C	CT		1.9%	2.3%	Total uncertainty (calculated)
ERR-S		0.0	0.2%	1.2%	Statistical uncertainty (standard deviation)
MONIT-ERR		1.0	1.5%	1.5%	^{239}Pu(n_{th},f) in ENDF/B-V (1.5%)
ERR-1		1.0	1.1%	1.1%	^{239}Pu(n,f) normalization statistics (1.1%)
ERR-2		1.0	0.5%	0.5%	Secondary normalization (0.5%)

EXFOR 51001.003 (V.N.Dushin+,1983)

Correlation coefficients provided by the authors adopted.					
DATA-ERR			1.3%	1.9%	Total uncertainty (calcultaed from the author's covariance matrix by the compiler)

EXFOR 30634.003 (Li Jingwen+,1983)

ERR-T			2.0%	2.0%	Total uncertainty (1.98%) propagted from
ERR-S		0.0	0.7%	0.7%	statistics (0.70%)
ERR-R	RU	1.0	1.9%	1.9%	Residual uncertainty (specified as fully correlated)

EXFOR 30670.002 (Zhou Xianjian+,1982)

ERR-T			2.7%	2.9%	Total uncertainty consisting of
ERR-1		1.0	0.8%	0.8%	Effect of ^{240,241}Pu impurities (0.8%)
ERR-2		1.0	1.1%	1.5%	Hydrogen number quantification (1.15%-1.50%)
ERR-3		1.0	0.6%	0.6%	Number of ^{239}Pu (0.6%)
ERR-4		1.0	0.9%	0.9%	Telescope efficiency (n-p cross section and geometry) (0.9%)
ERR-5		1.0	1.0%	1.0%	Fission ionization chamber efficiency (1.0%)
ERR-6	MU	1.0	0.0%	0.0%	Recoil proton spectrum (0.0-0.2%)
ERR-7		1.0	0.0%	0.2%	Neutron scattering (0.0-0.2%)
ERR-8		1.0	0.0%	1.0%	D-D autogeny neutron target (0.0-1.0%)
ERR-9	MU	1.0	0.0%	0.0%	Instability (0.0-2.0%)
ERR-R	RU	0.0	1.5%	1.8%	Residual uncertainty (specified as uncorrelated)

EXFOR 40487.003 (Yu.V.Ryabov,1979)

ERR-T			6.8%	9.6%	Following sources are considered in addition to the counting statistics and ^{10}B(n,a) shape:
ERR-1		1.0	4.6%	4.6%	Normalization (4.56%)
ERR-R	RU	0.0	5.1%	8.5%	Residual uncertainty (specified as uncorrelated)

EXFOR 40487.004 (Yu.V.Ryabov,1979)

ERR-T			5.9%	8.8%	Following sources are considered in addition to the counting statistics and ^{10}B(n,a) shape:
ERR-1		1.0	3.4%	3.4%	Normalization (3.41%)
ERR-R	RU	0.0	4.9%	8.1%	Residual uncertainty (specified as uncorrelated)

EXFOR 40487.005 (Yu.V.Ryabov,1979)

ERR-T			6.7%	9.1%	Following sources are considered in addition to the counting statistics and ^{10}B(n,a) shape:
ERR-1		1.0	3.1%	3.1%	Normalization (3.09%)
ERR-R	RU	0.0	5.9%	8.6%	Residual uncertainty (specified as uncorrelated)

EXFOR 40487.006 (Yu.V.Ryabov,1979)

ERR-T			5.1%	7.1%	Following sources are considered in addition to the counting statistics and ^{10}B(n,a) shape:
ERR-1		1.0	3.0%	3.0%	Normalization (2.98%)
ERR-R	RU	0.0	4.1%	6.5%	Residual uncertainty (specified as uncorrelated)

EXFOR 10314.003 (M.C.Davis+,1978)

ERR-C	CT		2.3%	3.1%	Total uncertainty (calculated)
ERR-1		0.0	0.8%	2.1%	Net fission counts/source neutron
ERR-2		0.0	0.2%	0.3%	Manganese bath comparison of sources
ERR-3		1.0	0.9%	1.4%	Fragment emission anisotropy
ERR-4		1.0	0.1%	0.1%	Angular distribution normalization to lab.
ERR-5		1.0	0.2%	0.2%	Half-life extrapolation

ERR-6		1.0	0.5%	0.5%	NBS-II reference source
ERR-7		1.0	1.4%	1.4%	Fissile foil masses
ERR-8		1.0	0.2%	0.4%	Scattering in Pt backings
ERR-9		1.0	0.2%	0.3%	Scattering in other structures
ERR-10		0.0	0.6%	0.6%	Compensated beam geometry
ERR-11		1.0	0.3%	0.3%	Energy spectrum

EXFOR 20779.005 (M.Cancé+,1978)

ERR-T			2.3%	2.5%	Quadrature sum of the following uncertainties: - Statistics
ERR-1		1.0	0.3%	0.3%	Extrapolation to zero pulse height (0.3%)
ERR-2		1.0	0.1%	0.1%	Loss of fissions (0.15%)
ERR-3		1.0	1.4%	1.4%	Number of atoms per cm^2 (1.36%)
ERR-4		1.0	0.4%	0.4%	Neutron attenuation in target backing (0.36%)
ERR-5		1.0	0.3%	0.3%	Neutron attenuation in front face of fission chamber (0.3%)
ERR-6		1.0	0.2%	0.2%	Fissions due to other isotopes (0.17%)
ERR-R	RU	0.0	1.7%	2.0%	Residual uncertainty (specified as uncorrelated)

EXFOR 10267.002 (R.Gwin+,1976)

ERR-T			3.4%	9.7%	Uncertainties including all known errors
ERR-1		0.0	0.6%	3.9%	Standard deviation between experiments
ERR-R	RU	1.0	3.2%	8.9%	Residual uncertainty (specified as fully correlated)

EXFOR 20618.003 (I.Szabo+,1976)

ERR-C	CT		4.3%	5.7%	Total uncertainty (calculated)
ERR-1		0.0	3.5%	4.8%	Statistical errors, efficiency and position incertitudes in detectors accounted
ERR-2		1.0	2.5%	3.0%	Neutron flux determination

EXFOR 51007.002 (J.Blons+,1971)

ERR-C	CT		2.6%	8.0%	Total uncertainty (calculated)
ERR-S		0.0	2.4%	7.9%	Statistical error considered
MONIT-ERR		1.0	1.0%	1.0%	

EXFOR 20570.003 (I.Szabo+,1973)

DATA-ERR			2.5%	3.2%	No information on the source of uncertainty
ERR-1		1.0	1.8%	1.8%	Uncertainty in neutron flux (1.8%)
ERR-R	RU	0.0	1.7%	2.6%	Residual uncertainty (specified as uncorrelated)

EXFOR 20476.003 (M.G.Schombrg+,1970)

ERR-T			3.1%	3.7%	Total error includes:
ERR-2		1.0	1.0%	1.0%	neutron spectrum determination (~1%)
ERR-3	MU	1.0	0.5%	0.5%	efficiency Li-glass detector (0.5-1%)
ERR-4		1.0	2.0%	2.0%	nu-bar values (2%)
MONIT-ERR		1.0	2.0%	2.0%	Normalization errors (2%)
ERR-R	RU	0.0	0.7%	2.1%	Residual uncertainty (specified as uncorrelated)

EXFOR 20567.003 (I.Szabo+,1970)

DATA-ERR			2.3%	4.6%	No information on the source of uncertainty (Table II of C,70HELSINKI,1,229,1970 summarizes partial uncertainties of preliminary data at 506 keV)
ERR-1		1.0	1.8%	1.8%	Uncertainty in neutron flux (1.8%)

ERR-R	RU	0.0	1.4%	4.2%	Residual uncertainty (specified as uncorrelated)

^{240}Pu cross sections

EXFOR 23281.005 (P.Salvador-Castineira+,2015)

ERR-T			2.3%	5.7%	Total uncertainty. Statistical uncertainty is around 0.5% except for a single case where it amounts to 1.4%.
ERR-2		1.0	0.4%	0.4%	^{240}Pu mass (0.4%)
ERR-3		1.0	1.0%	1.0%	Efficiency - ^{240}Pu (1%)
ERR-4		1.0	1.0%	1.0%	Efficiency - monitor (1%)
ERR-5		1.0	0.0%	0.0%	Sample purity (0.001%)
ERR-7		1.0	0.5%	0.5%	Thermalized neutron flux - ^{240}Pu (0.5%)
ERR-8		1.0	0.5%	0.5%	Thermalized neutron flux - monitor (0.5%)
ERR-R	RU	0.0	1.6%	5.4%	Residual uncertainty (specified as uncorrelated)

EXFOR 31711.006 (K.Gul+,1986)

ERR-T			8.0%	8.0%	Total uncertainty (7.7%)
ERR-S		0.0	6.0%	6.0%	Statistics (6%)
ERR-R	RU	1.0	5.3%	5.3%	Residual uncertainty (specified as fully correlated)

EXFOR 12877.007 (L.W.Weston+,1984)

ERR-C	CT		2.2%	2.4%	Total uncertainty (calculated)
ERR-S		0.0	0.8%	1.2%	Statistical uncertainty (standard deviation)
MONIT-ERR		1.0	1.5%	1.5%	^{239}Pu(n_{th},f) in ENDF/B-V (1.5%)
ERR-1		1.0	1.1%	1.1%	^{239}Pu(n,f) normalization statistics (1.1%)
ERR-2		1.0	0.5%	0.5%	Secondary normalization (0.5%)
ERR-3		1.0	0.7%	0.7%	Normalization to ^{239}Pu(n,f) (0.7%)

EXFOR 40673.004 (B.M.Aleksandrov+,1983)

DATA-ERR			4.0%	4.0%	Mean-squares error, includes an error due to Pu addmixture in samples.
ERR-A	AU	1.0	0.1%	0.1%	Uncertainty due to target half-life (6357+/-10 yr)
ERR-R	RU	0.0	4.0%	4.0%	Residual uncertainty (specified as uncorrelated)

EXFOR 21821.002 (M.Cance+,1982)

ERR-T			1.5%	1.5%	Total uncertainty propagated from
ERR-6		0.0	0.5%	0.5%	Fission statistics (0.5%)
ERR-14		0.0	0.2%	0.2%	Proton recoil statistics (0.2%)
ERR-R	RU	1.0	1.4%	1.4%	Residual uncertainty (specified as fully correlated)

EXFOR 21764.003 (C.Budtz-Jørgensen+,1981)

ERR-T			11.1%	29.8%	Total uncertainty Random uncertainty, ^{240}Pu: 3.1/sqrt(sigma)[^{240}Pu(n,f)] Contamination, ^{239}Pu : 0.13/sigma[^{240}Pu(n,f)] Contamination, ^{241}Pu : 0.12/sigma[^{240}Pu(n,f)]
ERR-1		1.0	0.5%	0.5%	Efficiency, ^{235}U (0.5%)
ERR-2		1.0	1.0%	1.0%	Efficiency, ^{240}Pu (1.0%)
ERR-3		1.0	1.0%	1.0%	Number of atom, ^{235}U (1.0%)
ERR-4		1.0	1.7%	1.7%	Number of atom, ^{240}Pu (1.7%)
ERR-5		1.0	0.6%	0.6%	Difference in ^{235}U/^{240}Pu geometry (0.6%)
ERR-10		1.0	4.0%	4.0%	Normalization (4%)
ERR-R	RU	0.0	10.1%	29.5%	Residual uncertainty (specified as uncorrelated)

EXFOR 30548.002 (N.A.Khan+,1980)

DATA-ERR			10.2%	10.2%	No information
MONIT-ERR		1.0	3.2%	3.2%	
ERR-R	RU	0.0	9.7%	9.7%	Residual uncertainty (specified as uncorrelated)

^{241}Pu cross sections

EXFOR 31711.005 (K.Gul+,1986)

ERR-T			10.0%	10.0%	Total uncertainty (7.7%)
ERR-S		0.0	6.0%	6.0%	Statistics (6%)
ERR-R	RU	1.0	8.0%	8.0%	Residual uncertainty (specified as fully correlated)

EXFOR 40673.005 (B.M.Aleksandrov+,1983)

DATA-ERR			4.2%	4.2%	Mean-squares error, includes an error due to Pu addmixture in samples.
ERR-A	AU	1.0	1.4%	1.4%	Uncertainty due to target half-life (14.4+/-0.2 yr)
ERR-R	RU	0.0	4.0%	4.0%	Residual uncertainty (specified as uncorrelated)

EXFOR 21811.002 (C.Wagemans+,1982)

ERR-T			4.0%	4.0%	
MONIT-ERR		1.0	0.7%	0.7%	
ERR-R	RU	0.0	3.9%	3.9%	Residual uncertainty (specified as uncorrelated)

EXFOR 30548.003 (N.A.Khan+,1980)

DATA-ERR			10.3%	10.3%	No information
MONIT-ERR		1.0	3.2%	3.2%	
ERR-R	RU	0.0	9.8%	9.8%	Residual uncertainty (specified as uncorrelated)

EXFOR 10636.002.2 (G.W.Carlson+,1977)

ERR-C	CT		2.2%	3.9%	Total uncertainty (calculated)
ERR-S		0.0	0.8%	1.6%	Statistical uncertainty (standard deviation).
ERR-SYS		1.0	2.0%	3.7%	Systematic error (root-mean-square). Systematic error below 100 ev primarily due to thermal-neutron cross section uncertainty. Above 100 eV error is mainly due to overlap normalization (1.2%), flux background error, and ^{6}Li cross section error (3% at 50 keV).

EXFOR 20570.004 (I.Szabo+,1973)

DATA-ERR			2.8%	3.5%	No information on the source of uncertainty
ERR-1		1.0	1.8%	1.8%	Uncertainty in neutron flux (1.8%)
ERR-R	RU	0.0	2.1%	3.0%	Residual uncertainty (specified as uncorrelated)

EXFOR 51009.002 (J.Blons+,1971)

ERR-C	CT		1.8%	2.0%	Total uncertainty (calculated)
ERR-S		0.0	1.0%	1.3%	Statistical error considered
ERR-A	AU	1.0	1.5%	1.5%	Normalization uncertainty (James, 1970)

EXFOR 20567.004 (I.Szabo+,1970)

DATA-ERR			4.2%	5.4%	No information on the source of uncertainty
ERR-1		1.0	1.8%	1.8%	Uncertainty in neutron flux (1.8%)
ERR-R	RU	0.0	3.8%	5.1%	Residual uncertainty (specified as uncorrelated)

^{233}U/^{235}U cross section ratios

EXFOR 14402.003 (F.Tovesson+,2014)

ERR-C	CT		3.1%	4.7%	Total uncertainty (calculated)
ERR-S		0.0	0.3%	1.6%	Statistical uncertainty
ERR-1		0.0	0.7%	3.6%	Energy dependent systematic uncertainty
ERR-2		1.0	3.0%	3.0%	Energy independent (scaling) syst. uncertainty

EXFOR 23128.002 (F.Belloni+,2011)

ERR-T			2.9%	3.8%	Total uncertainty
ERR-S		0.0	0.6%	2.0%	Statistical uncertainty
ERR-R	RU	1.0	2.5%	3.4%	Residual uncertainty (specified as fully correlated)

EXFOR 41455.002 (O.Shcherbakov+,2002)

ERR-C	CT		1.8%	2.8%	Total uncertainty (calculated)
ERR-S		0.0	0.5%	1.3%	Statistics
ERR-1		1.0	0.3%	1.5%	Fission and background events separation in pulse-height spectra
ERR-2		1.0	0.0%	0.0%	Energy-independent neutron background
ERR-3		0.0	1.0%	1.5%	Energy-dependent neutron background
ERR-4		1.0	0.8%	0.8%	Correction for neutron beam attenuation for different target foils
ERR-5		1.0	0.0%	1.5%	Correction for anisotropy and linear momentum transfer
ERR-7		1.0	0.4%	0.4%	Admixtures in the target

EXFOR 41432.003 (D.L.Shpak+,1998)

ERR-T			1.1%	2.3%	Total error is quadratic sum of all errors
ERR-A	AU	1.0	0.7%	0.7%	Fissile nucleus number ratio (taken from 40607.002)
ERR-R	RU	0.0	0.8%	2.2%	Residual uncertainty (specified as uncorrelated)

EXFOR 13134.004.1 (J.W.Meadows,1988)

ERR-T			0.7%	0.7%	Total uncertainty
ERR-2		1.0	0.3%	0.3%	Thickness correction
ERR-3		1.0	0.3%	0.3%	Extrapolation correction
ERR-6		1.0	0.2%	0.2%	Prompt neutron scattering
ERR-R	RU	0.0	0.6%	0.6%	Residual uncertainty (specified as uncorrelated)

EXFOR 22282.003.1 (F.Manabe+,1988)

Correlation coefficients provided by the authors adopted.

ERR-T			2.0%	2.2%	Total uncertainty

EXFOR 22014.003 (K.Kanda+,1986)

ERR-C	CT		2.8%	3.0%	Total uncertainty (calculated)
ERR-T		0.0	1.6%	1.9%	Total errors are dominated by
ERR-1		1.0	1.7%	1.7%	^{235}U number of atoms in the sample (1.7%)
ERR-2		1.0	1.5%	1.5%	loss counts by bias setting (1.5%)

EXFOR 10562.003 (G.W.Carlson+,1978)

ERR-T			1.8%	4.1%	Total error
ERR-S		0.0	0.3%	3.6%	Statistical error
ERR-R	RU	1.0	1.7%	2.0%	Residual uncertainty (specified as fully correlated)

EXFOR 40474.002 (B.I.Fursov+,1978)

ERR-T			1.2%	1.4%	Mean square sum of all uncertainties involved
ERR-1		1.0	0.8%	0.8%	^{233}U/^{235}U atom number ratio (0.76%)
ERR-R	RU	0.0	0.9%	1.2%	Residual uncertainty (specified as uncorrelated)

EXFOR 40474.004 (B.I.Fursov+,1978)

ERR-T			1.3%	2.2%	Quadrature sum of the following errors:
ERR-3		1.0	1.2%	1.2%	Absolute values obtained by the glass method (1.23%)
ERR-4		1.0	0.2%	0.2%	Normalization of the energy curve to the reference values (0.16%)
ERR-R	RU	0.0	0.5%	1.8%	Residual uncertainty (specified as uncorrelated)

EXFOR 10236.002.1 (J.W.Meadows,1974)

ERR-T			0.9%	2.1%	Total error - secondary source reactions (20% of correction) - propagation from neutron energy error (~20% of the energy resolution)
ERR-1		1.0	0.8%	0.8%	Normalization of shape ratio: - ^{234}U half-life (0.02%) - ^{233}U/^{235}U thermal ratio (0.25%) - isotopic analysis (0.25%) - alpha counting excluding statistics (0.15%) - thickness correction (0.10%) - extrapolation (0.10%) - dead time correction (0.25%) - scattering correction (0.30%) - statistical - alpha counting etc. (0.50%)
ERR-R	RU	0.0	0.3%	1.9%	Residual uncertainty (specified as uncorrelated)

EXFOR 20363.002 (E.Pfletschinger+,1970)

ERR-T			1.6%	2.5%	Overall total uncertainty consisting of
ERR-1		1.0	0.5%	0.5%	^{233}U capture gamma background (0.5%)
ERR-2		1.0	0.5%	0.5%	^{235}U capture gamma background (0.5%)
ERR-3		1.0	0.8%	0.8%	^{233}U fission fragment absorption loss (0.8%)
ERR-4		1.0	0.8%	0.8%	^{235}U fission fragment absorption loss (0.8%)
ERR-5		1.0	0.4%	0.4%	^{233}U sample mass (0.4%)
ERR-6		1.0	0.4%	0.4%	^{235}U sample mass (0.4%)
ERR-7		1.0	0.5%	0.5%	Correction for isotopic composition (0.5%)
ERR-R	RU	0.0	0.5%	2.0%	Residual uncertainty (specified as uncorrelated)

^{238}U/^{233}U cross section ratio

EXFOR 10422.006 (J.W.Behrens+,1976)

ERR-C	CT		1.6%	19.0%	Total uncertainty (calculated)
ERR-S		0.0	1.4%	19.0%	Data errors include statistical only. See reference text for details of systematic errors.
MONIT-ERR		1.0	0.9%	0.9%	

^{238}U/^{235}U cross section ratios

EXFOR 32798.002 (Jie Wen+,2020)

ERR-T			2.3%	11.3%	The relative experimental uncertainties of the ^{238}U/^{235}U fission cross section ratios are 4.1%-11% in 1-1.4 MeV region while 2.3%-3.6% in 1.4-20 MeV region. The uncertainty mainly comes from the statistical error of fission events and the quantification of target nucleus.
ERR-S		0.0	1.6%	11.2%	Statistics of total fission events for ^{235}U and ^{238}U.

ERR-R	RU	1.0	1.1%	2.0%	Residual uncertainty (specified as fully correlated)
EXFOR 14498.002 (R.J.Casperson+,2018)					
Correlation coefficients provided by the authors adopted.					
ERR-T			0.8%	98.3%	Total uncertainty
EXFOR 23269.002 (C.Paradela+,2015)					
ERR-C	CT		2.6%	20.1%	Total uncertainty (calculated)
ERR-S		0.0	1.2%	20.0%	Counting statistics
ERR-1		1.0	2.0%	2.0%	Sample masses (2%)
ERR-2		1.0	1.0%	1.0%	Efficiency correction (1%)
EXFOR 51005.002 (C.Paradela+,2015)					
ERR-C	CT		3.3%	16.3%	Total uncertainty (calculated)
ERR-S		0.0	0.7%	16.0%	Counting statistics
ERR-1		1.0	1.1%	1.1%	Sample masses (1.1%)
ERR-2		1.0	0.0%	3.0%	Efficiency correction - PPAC perpend. (3%)
ERR-3		1.0	0.0%	3.0%	Efficiency correction - PPAC 45 deg (3%)
EXFOR 23269.005 (C.Paradela+,2015)					
ERR-C	CT		1.7%	4.4%	Total uncertainty (calculated)
ERR-S		0.0	0.9%	4.2%	Counting statistics
MONIT-ERR		1.0	1.0%	1.0%	ENDF/B-VII.1 cross section (~1%)
ERR-2		1.0	1.0%	1.0%	Efficiency correction (1%)
EXFOR 23269.006 (C.Paradela+,2015)					
ERR-C	CT		2.7%	56.1%	Total uncertainty (calculated)
ERR-S		0.0	1.5%	56.1%	Counting statistics
ERR-1		1.0	2.0%	2.0%	Sample masses (2%)
ERR-2	MU	1.0	1.0%	1.0%	Efficiency correction (1-2%)
EXFOR 14402.009 (F.Tovesson+,2014)					
ERR-C	CT		3.0%	8.2%	Total uncertainty (calculated)
ERR-S		0.0	0.3%	7.0%	Statistical uncertainty
ERR-1		0.0	0.2%	3.0%	Energy dependent systematic uncertainty
ERR-2		1.0	3.0%	3.0%	Energy independent (scaling) syst. uncertainty
EXFOR 41455.003 (O.Shcherbakov+,2002)					
ERR-C	CT		1.8%	24.5%	Total uncertainty (calculated)
ERR-S		0.0	0.4%	24.3%	Statistics
ERR-1		1.0	0.0%	1.5%	Fission and background events separation in pulse-height spectra
ERR-2		1.0	0.0%	1.5%	Energy-independent neutron background
ERR-3		0.0	0.0%	1.0%	Energy-dependent neutron background
ERR-4		1.0	0.8%	0.8%	Correction for neutron beam attenuation for different target foils
ERR-5		1.0	0.0%	1.5%	Correction for anisotropy and linear momentum transfer
ERR-7		1.0	0.0%	0.0%	Admixtures in the target
ERR-8		1.0	0.2%	0.2%	Fission cross-section ratio normalization by threshold cross-section method
EXFOR 14016.003 (P.Lisowski+,1991)					
ERR-C	CT		1.4%	464.2	Total uncertainty (calculated)
ERR-S		0.0	1.1%	464.2	Statistics

ERR-1		1.0	0.8%	0.8%	Total fission mass uncertainty
EXFOR 30722.002 (Li Jingwen+,1989)					
ERR-T			2.6%	2.6%	Total error
ERR-S		0.0	1.0%	1.0%	statistical (1.0%)
ERR-R	RU	1.0	2.4%	2.4%	Residual uncertainty (specified as fully correlated)
EXFOR 13134.007.1 (J.W.Meadows,1988)					
ERR-T			1.1%	1.1%	Total uncertainty
ERR-1		1.0	0.7%	0.7%	Neutron energy
ERR-2		1.0	0.3%	0.3%	Thickness correction
ERR-3		1.0	0.3%	0.3%	Extrapolation correction
ERR-R	RU	0.0	0.8%	0.8%	Residual uncertainty (specified as uncorrelated)
EXFOR 22282.006.1 (F.Manabe+,1988)					
Correlation coefficients provided by the authors adopted.					
ERR-T			2.0%	2.0%	Total uncertainty
EXFOR 21963.006 (K.Kanda+,1985)					
ERR-T			2.1%	4.0%	Total uncertainty
ERR-1		1.0	1.7%	1.7%	Number of atoms in the ^{235}U sample (1.7%)
ERR-R	RU	0.0	1.2%	3.7%	Residual uncertainty (specified as uncorrelated)
EXFOR 30813.012 (I.Gârlea+,1984)					
ERR-T			3.7%	3.7%	Total error from
ERR-1		1.0	0.4%	0.4%	Extrapolation to zero (0.4%)
ERR-2		1.0	0.3%	0.3%	Fragment absorption (0.35%)
ERR-3		1.0	0.2%	0.2%	Impurity isotope fission (0.2%)
ERR-4	MU	1.0	1.0%	1.0%	Flux run-to-run monitor (0.97-1.13%)
ERR-5		1.0	3.0%	3.0%	Mass calibration - ^{238}U (3.0%)
ERR-6		1.0	1.6%	1.6%	Mass calibration - ^{235}U (1.6%)
ERR-R	RU	0.0	1.1%	1.1%	Residual uncertainty (specified as uncorrelated)
EXFOR 40831.003 (A.A.Goverdovskii+,1984)					
ERR-T			0.7%	1.8%	Total error
ERR-S		0.0	0.2%	1.3%	Statistical error
ERR-R	RU	1.0	0.6%	1.3%	Residual uncertainty (specified as fully correlated)
EXFOR 40831.004 (A.A.Goverdovskii+,1984)					
ERR-T			2.2%	2.3%	Total error
ERR-S		0.0	0.7%	1.0%	Statistical error
ERR-R	RU	1.0	2.1%	2.1%	Residual uncertainty (specified as fully correlated)
EXFOR 30588.002 (M.Várnagy+,1982)					
ERR-T			5.7%	5.9%	Total uncertainty propagated from
ERR-1	MU	1.0	2.6%	2.6%	Mass ratio (2.6%-4.3%)
ERR-2	MU	1.0	3.2%	3.2%	Detector efficiency (3.2%-4.5%)
ERR-3		1.0	0.2%	0.2%	Spark-counting efficiency (0.2%)
ERR-4		1.0	0.1%	0.1%	Neutron flux variation (0.1%)
ERR-5		1.0	0.1%	0.1%	Fission due to other isotopes (0.1%)
ERR-R	RU	0.0	4.0%	4.2%	Residual uncertainty (specified as uncorrelated)

EXFOR 10635.002 (F.C.Difilippo+,1978)

ERR-C	CT		1.8%	8.7%	Total uncertainty (calculated)
ERR-S		0.0	0.5%	8.1%	Absolute statistical error.
ERR-1		1.0	1.0%	3.0%	Effect of scattered neutrons
ERR-2		1.0	1.0%	2.0%	Energy dependence of efficiency ratio
MONIT-ERR		1.0	1.0%	1.0%	Normalization

EXFOR 10653.004 (J.W.Behrens+,1977)

ERR-T			1.2%	5.7%	One standard deviation rms sum of:
ERR-S		0.0	0.9%	5.6%	Statistical error
ERR-R	RU	1.0	0.6%	1.1%	Residual uncertainty (specified as fully correlated)

EXFOR 40506.002 (B.Fursov+,1977)

ERR-T			0.6%	3.2%	Total error
ERR-2		1.0	0.1%	0.1%	Absolute ratio (0.54%)
ERR-3		1.0	0.5%	0.5%	Normalization procedure (0.1%)
ERR-R	RU	0.0	0.3%	3.2%	Residual uncertainty (specified as uncorrelated)

EXFOR 40506.003 (B.Fursov+,1977)

ERR-T			0.5%	0.6%	At 2.5 MeV: - Statistics of measurement with fast neutrons (0.28%) - Energy dependence of detection efficiency (0.08%) - Neutron scatterred from target structure (0.16%) - Neutron from associated p-n reactions (0.14%) - Neutron scatterred from experimental room (0.10%) - Energy dependence of ^{238}U(n,f)/^{235}U(n,f) (0.56%) - Fraction of ^{235}U nuclei in layer B of ^{238}U (0.95%) - Statistics of measurement with slow neutrons (0.27%) - Neutron flux difference in ^{235}U and ^{238}U (0.22%)
ERR-1		1.0	0.3%	0.3%	Inelastic scattering (0.30%)
ERR-2		1.0	0.3%	0.3%	Energy dependence of detection efficiency (0.30%)
ERR-R	RU	0.0	0.2%	0.4%	Residual uncertainty (specified as uncorrelated)

EXFOR 20409.002 (S.Cierjacks+,1976)

ERR-C	CT		2.9%	7.5%	Total uncertainty (calculated)
ERR-S		0.0	2.1%	7.2%	Statistical uncertainty
MONIT-ERR		1.0	2.0%	2.0%	

EXFOR 20869.002 (C.Nordborg+,1976)

ERR-C	CT		2.5%	3.3%	Total uncertainty (calculated)
ERR-S		0.0	1.8%	2.9%	Statistical error
ERR-1		1.0	1.3%	1.3%	Mass determination (1.3%)
ERR-2		1.0	1.0%	1.0%	Low energy neutron flux calculation (1%)

EXFOR 20870.002 (M.Cance+,1976)

ERR-T			2.6%	2.9%	Total uncertainty of results
ERR-S		0.0	0.7%	1.1%	Statistical
ERR-R	RU	1.0	2.5%	2.8%	Residual uncertainty (specified as fully correlated)

EXFOR 10506.002.1 (J.W.Meadows,1975)

ERR-T			1.2%	1.9%	Total error - secondary source reactions (20% of correction) - propagation from neutron energy error (~20% of the energy resolution)

ERR-2		0.0	0.7%	1.1%	Uncorrelated error, which principle due to the counting statistics, but a part is based on the consistency of repeated measurements.
ERR-R	RU	1.0	0.9%	1.7%	Residual uncertainty (specified as fully correlated)

EXFOR 51002.002 (W.P.Poenitz+,1972)

ERR-C	CT		1.7%	2.3%	Total uncertainty (calculated)
ERR-S		0.0	1.2%	1.6%	Statistical uncertainty
ERR-1		0.0	1.0%	1.5%	Mass ratio
ERR-2		0.0	0.2%	0.2%	Secondary neutrons
ERR-3		0.0	0.2%	0.2%	Inscattering from target
ERR-4		0.0	0.3%	0.3%	Inelastic scattering
ERR-5		0.0	0.3%	0.3%	Fiss. frag. absorption extrapolation
ERR-6		1.0	0.1%	0.1%	Fission of other isotopes
ERR-7		0.0	0.2%	0.2%	Background

EXFOR 10232.006 (W.P.Poenitz+,1972)

ERR-C	CT		2.3%	2.5%	Total uncertainty (calculated)
ERR-S		0.0	1.4%	1.7%	Statistics
ERR-1		1.0	0.2%	0.6%	Secondary neutrons
ERR-2		1.0	0.1%	0.3%	Inscattering from target
ERR-3		1.0	0.2%	0.2%	Inelastic scattering (0.2%)
ERR-4		1.0	0.5%	0.7%	Fission fragment absorption
ERR-5		1.0	0.1%	0.1%	FIssion of other isotopes (0.1%)
ERR-6		1.0	0.2%	0.4%	Background
MONIT-ERR		1.0	1.6%	1.6%	Uncertainty in reference value at 2.5 MeV

EXFOR 10237.003.1 (J.W.Meadows,1972)

ERR-T			0.8%	6.6%	Total error - secondary source reactions (20% of correction) - propagation from neutron energy error (~20% of the energy resolution)
ERR-2		0.0	0.3%	3.7%	Uncorrelated error, which principle due to the counting statistics, but a part is based on the consistency of repeated measurements.
ERR-R	RU	1.0	0.8%	6.4%	Residual uncertainty (specified as fully correlated)

^{239}Pu/^{235}U cross section ratios

EXFOR 14271.003.1 (F.Tovesson+,2010)

ERR-C	CT		2.1%	4.9%	Total uncertainty (calculated)
ERR-S		0.0	0.3%	1.5%	Statistical uncertainty
ERR-1		1.0	2.0%	2.0%	Systematic overall uncertainty of normalization
ERR-2		0.0	0.3%	3.1%	Systematic uncertainty for background correction of ^{235}U
ERR-3		0.0	0.3%	3.2%	Systematic uncertainty for background correction of ^{239}Pu

EXFOR 41455.005 (O.Shcherbakov+,2002)

ERR-C	CT		2.0%	3.1%	Total uncertainty (calculated)
ERR-S		0.0	0.7%	1.9%	Statistics
ERR-1		1.0	0.0%	1.5%	Fission and background events separation in pulse-height spectra
ERR-2		1.0	0.0%	1.5%	Energy-independent neutron background
ERR-3		0.0	0.3%	1.5%	Energy-dependent neutron background

ERR-4		1.0	0.8%	0.8%	Correction for neutron beam attenuation for different target foils
ERR-5		1.0	0.0%	1.5%	Correction for anisotropy and linear momentum transfer
ERR-7		1.0	0.3%	0.3%	Admixtures in the target

EXFOR 13801.002 (P.Staples+,1998)

ERR-C	CT		1.4%	2.4%	Total uncertainty (calculated)
ERR-S		0.0	0.5%	0.9%	Statistical uncertainty
ERR-1		1.0	1.0%	2.0%	Charged-particle subtraction (1-2%)
ERR-2		1.0	0.1%	0.2%	Low energy neutron from previous pulse(0.05-2%)
ERR-3		1.0	0.3%	0.8%	Attenuation and beam spreading (0.3-1.2%)
ERR-4		1.0	0.0%	0.1%	Efficiency (0-0.1%)
ERR-5		1.0	0.1%	0.1%	Impurities (0.1%)
ERR-6		1.0	0.7%	0.7%	Foil mass (0.7%)

EXFOR 14016.004 (P.W.Lisowski+,1991)

ERR-C	CT		1.0%	2.4%	Total uncertainty (calculated)
ERR-S		0.0	0.6%	2.3%	Statistics
ERR-1		1.0	0.8%	0.8%	Total fission mass uncertainty

EXFOR 13134.009.1 (J.W.Meadows,1988)

ERR-T			1.1%	1.1%	Total uncertainty
ERR-1		1.0	0.3%	0.3%	Neutron energy
ERR-3		1.0	0.3%	0.3%	Extrapolation correction
ERR-6		1.0	0.2%	0.2%	Prompt neutron scattering
ERR-R	RU	0.0	1.0%	1.0%	Residual uncertainty (specified as uncorrelated)

EXFOR 30813.014 (I.Gârlea+,1984)

ERR-T			3.0%	3.0%	Total error from
ERR-1		1.0	0.4%	0.4%	Extrapolation to zero (0.4%)
ERR-2		1.0	0.3%	0.3%	Fragment absorption (0.35%)
ERR-3		1.0	0.2%	0.2%	Impurity isotope fission (0.2%)
ERR-4	MU	1.0	1.0%	1.0%	Flux run-to-run monitor (0.97-1.13%)
ERR-5		1.0	1.8%	1.8%	Mass calibration - ^{239}Pu (1.8%)
ERR-6		1.0	1.6%	1.6%	Mass calibration - ^{235}U (1.6%)
ERR-R	RU	0.0	1.4%	1.4%	Residual uncertainty (specified as uncorrelated)

EXFOR 12766.002 (L.W.Weston+,1983)

ERR-C	CT		2.0%	3.6%	Total uncertainty (calculated)
ERR-S		0.0	0.4%	3.0%	Statistical uncertainty
MONIT-ERR		1.0	0.8%	0.8%	^{239}Pu(n_{th},f)/^{235}U(n_{th},f) (0.8%)
ERR-1		1.0	1.7%	1.7%	^{239}Pu/^{235}U normalization statistics (1.7%)
ERR-2		1.0	0.5%	0.5%	Secondary normalization (0.5%)
ERR-3		1.0	0.3%	0.3%	Uncertainty due to time dependent background. The correlation coefficient is exp(-E/5). where E is the energy difference in MeV.

EXFOR 12826.004 (M.Mahadavi+,1982)

ERR-C	CT		2.4%	2.4%	Total uncertainty (calculated)
ERR-1		0.0	0.8%	0.8%	^{235}U Fission track counting (0.84%)
ERR-2		1.0	0.6%	0.6%	^{235}U Fission fragment anisotropy (0.55%)
ERR-3		1.0	0.5%	0.5%	^{235}U Angular dist. normalization to lab (0.48%)
ERR-4		1.0	0.4%	0.4%	^{235}U Total scattering perturbation (0.43%)
ERR-5		1.0	0.2%	0.2%	^{235}U Total geometric error (0.24%)

ERR-6		1.0	0.5%	0.5%	^{235}U Deposit masses (0.5%)
ERR-7		0.0	1.1%	1.1%	^{239}Pu Fission track counting (1.13%)
ERR-8		1.0	0.6%	0.6%	^{239}Pu Fission fragment anisotropy (0.63%)
ERR-9		1.0	0.5%	0.5%	^{239}Pu Angular dist. normalization to lab(0.48%)
ERR-10		1.0	0.4%	0.4%	^{239}Pu Total scattering perturbation (0.43%)
ERR-11		1.0	0.2%	0.2%	^{239}Pu Total geometric error (0.24%)
ERR-12		1.0	1.4%	1.4%	^{239}Pu Deposit masses (1.4%)

EXFOR 30588.005 (M.Várnagy+,1982)

ERR-T			6.1%	6.1%	Total uncertainty propagated from
ERR-1	MU	1.0	2.6%	2.6%	Mass ratio (2.6%-4.3%)
ERR-2	MU	1.0	3.2%	3.2%	Detector efficiency (3.2%-4.5%)
ERR-3		1.0	0.2%	0.2%	Spark-counting efficiency (0.2%)
ERR-4		1.0	0.1%	0.1%	Neutron flux variation (0.1%)
ERR-5		1.0	0.1%	0.1%	Fission due to other isotopes (0.1%)
ERR-R	RU	0.0	4.4%	4.5%	Residual uncertainty (specified as uncorrelated)

EXFOR 10562.002 (G.W.Carlson+,1978)

ERR-T			1.2%	3.8%	Total error
ERR-S		0.0	0.3%	3.6%	Statistical error
ERR-R	RU	1.0	1.1%	1.4%	Residual uncertainty (specified as fully correlated)

EXFOR 10734.002.1 (J.W.Meadows,1978)

ERR-T			1.0%	2.1%	Total error - secondary source reactions (20% of correction) - propagation from neutron energy error (~20% of the energy resolution)
ERR-2		0.0	0.6%	1.9%	Uncorrelated error, which principle due to the counting statistics, but a part is based on the consistency of repeated measureme
ERR-R	RU	1.0	0.7%	1.3%	Residual uncertainty (specified as fully correlated)

EXFOR 20786.005 (K.Kari,1978)

ERR-C	CT		2.2%	3.5%	Total uncertainty (calculated)
ERR-2		1.0	0.4%	0.4%	Fragment anisotropy - ^{239}Pu (0.4%)
ERR-3		1.0	0.3%	0.3%	Neutron scattering (0.3%)
ERR-4		1.0	1.0%	2.0%	Background correction - ^{239}Pu
ERR-5		1.0	1.0%	1.0%	Mass determination - ^{239}Pu (1%)
ERR-6		0.0	0.4%	1.0%	Fission statistics - ^{239}Pu
ERR-12		1.0	0.4%	0.4%	Fragment anisotropy - ^{235}U (0.4%)
ERR-14		1.0	1.0%	2.0%	Background correction - ^{235}U
ERR-15		1.0	1.0%	1.0%	Mass determination - ^{235}U (1%)
ERR-16		0.0	0.3%	0.9%	Fission statistics - ^{235}U

EXFOR 40824.002 (B.I.Fursov+,1977)

ERR-T			1.1%	1.6%	Total uncertainty (1.14% at 3 MeV) includes: - ^{239}Pu/^{235}U number ratio (0.81% at 3 MeV) - glass detector scanning (0.40% at 3 MeV) - neutron flux difference between ^{239}Pu and ^{235}U layers (0.18% at 3 MeV) - fission angular anisotropy (0.35% at 3 MeV) - statistics of measurement with fast neutrons (0.47% at 3 MeV) - admixture isotopes fission (0.17% at 3 MeV) - sample-scattered neutron background (0.16% at 3 MeV) - experimental-hall-scattered neutrons(0.10% at 3 MeV) - (p,n) neutron background (0.10% at 3 MeV) - inelastic scattering (0.20% at 3 MeV)
ERR-1		1.0	0.8%	0.8%	^{239}Pu/^{235}U number ratio (0.81%)
ERR-R	RU	0.0	0.8%	1.3%	Residual uncertainty (specified as uncorrelated)

EXFOR 40824.003 (B.I.Fursov+,1977)

ERR-T			1.4%	2.0%	Total uncertainty (1.14% at 3 MeV) includes:
ERR-2		1.0	1.3%	1.3%	Absolute ratio(average) of glass detector(1.3%)
ERR-3		1.0	0.2%	0.2%	Normalization of energy dependent curve (0.22%)
ERR-R	RU	0.0	0.5%	1.5%	Residual uncertainty (specified as uncorrelated)

EXFOR 20428.004 (D.B.Gayther,1975)

ERR-T			2.3%	3.1%	Total uncertainty
ERR-1	MU	1.0	0.0%	0.0%	^{239}Pu fission neutron detector efficiency (0-0.5%)
ERR-2	MU	1.0	0.0%	0.0%	^{235}U fission neutron detector efficiency (0-0.5%)
ERR-3	MU	1.0	1.0%	1.0%	^{239}Pu background determination (1-1.5%)
ERR-4	MU	1.0	0.0%	0.0%	^{235}U background determination (0-1.5%)
ERR-5		1.0	1.0%	1.0%	^{239}Pu sample thickness correction (1%)
ERR-6		1.0	1.0%	1.0%	^{235}U sample thickness correction (1%)
ERR-7		1.0	1.0%	1.0%	239P $\bar{\nu}_p$ values (1%)
ERR-8		1.0	1.0%	1.0%	^{235}U $\bar{\nu}_p$ values (1%)
ERR-R	RU	0.0	0.5%	2.2%	Residual uncertainty (specified as uncorrelated)

EXFOR 10253.002 (W.P.Poenitz,1972)

ERR-C	CT		2.7%	5.8%	Total uncertainty (calculated)
ERR-S		0.0	1.0%	3.8%	Statistical error
ERR-1		1.0	2.5%	4.4%	Absolute error including 2.5% uncertainty in the mass ratio

EXFOR 20569.004 (I.Szabo+,1971)

DATA-ERR			2.2%	3.9%	No information on the source of uncertainty
ERR-A	AU	1.0	1.0%	1.0%	Sample mass uncertainty 0.8%+0.6%
ERR-R	RU	0.0	2.0%	3.7%	Residual uncertainty (specified as uncorrelated)

EXFOR 10086.008 (W.P.Poenitz,1970)

ERR-C	CT		4.0%	4.6%	Total uncertainty (calculated)
ERR-S		0.0	0.8%	2.1%	Statistics (0.8%-2.1%)
ERR-1		1.0	3.0%	3.0%	^{235}U mass (3.0%)
ERR-2		1.0	0.5%	0.5%	^{239}Pu mass (0.5%)
ERR-3		1.0	0.5%	1.4%	Fission fragment absorption (0.5%-1.4%)
ERR-4		1.0	0.5%	0.5%	Fission fragment extrapolation (0.5%)
ERR-5		1.0	0.1%	0.7%	^{7}Li(p,n$_1$)^{7}Be low energy neutrons(0.1%-0.7%)
ERR-6		1.0	2.0%	2.0%	Background (2.0%)
ERR-7		1.0	0.1%	0.5%	Non ^{235}U fission (0.1%-0.5%)

ERR-8		1.0	1.0%	1.0%	Neutron scattering (1.0%)

EXFOR 20363.003 (E.Pfletschinger+,1970)

ERR-T			1.8%	3.0%	Overall total uncertainty consisting of
ERR-1		1.0	0.5%	0.5%	^{239}Pu capture gamma background (0.5%)
ERR-2		1.0	0.5%	0.5%	^{235}U capture gamma background (0.5%)
ERR-3		1.0	0.8%	0.8%	^{239}Pu fission fragment absorption loss (0.8%)
ERR-4		1.0	0.8%	0.8%	^{235}U fission fragment absorption loss (0.8%)
ERR-5		1.0	1.0%	1.0%	^{239}Pu sample mass (1.0%)
ERR-6		1.0	0.4%	0.4%	^{235}U sample mass (0.4%)
ERR-7		1.0	0.2%	0.2%	Correction for isotopic composition (0.2%)
ERR-8		1.0	0.2%	0.2%	Dead time (0.2%)
ERR-R	RU	0.0	0.5%	2.4%	Residual uncertainty (specified as uncorrelated)

^{240}Pu/^{235}U cross section ratios

EXFOR 23458.006.1 (A.Stmatopoulos+,2020)

ERR-C	CT		2.2%	48.5%	Total uncertainty (calculated)
ERR-T		0.0	1.0%	48.5%	Total uncertainty due to - rejected fission signals (amp) - sample mass - count loss due to dead-time, pile-up, insufficient signal reconstruction effect (DT) above 1 MeV
ERR-1		1.0	0.2%	0.2%	- ^{240}Pu mass uncertainty (0.22%)
ERR-2		1.0	1.9%	1.9%	- ^{235}U mass uncertainty (1.95%)
ERR-3		1.0	0.0%	0.1%	- fission events from contaminant or impurity

EXFOR 41487.014 (A.B.Laptev+,2007)

ERR-C	CT		3.0%	12.0%	Total uncertainty (calculated)
ERR-S		0.0	2.2%	11.7%	Statistical Error Estimated systematic uncertainty caused by
ERR-1		1.0	0.1%	2.2%	- separation of fission and background events in pulse height spectra,
ERR-2		1.0	0.0%	0.0%	- energy-independent neutron background,
ERR-3		1.0	1.0%	1.5%	- energy-dependent neutron background,
ERR-4		1.0	0.5%	2.2%	- correction for neutron beam attenuation for different target foils ,
ERR-5		1.0	0.0%	1.2%	- correction for anisotropy and linear momentum transfer,less 0.1% for EN 50-200 MeV.
ERR-7		1.0	0.1%	0.1%	- admixtures in target.

EXFOR 13801.003 (P.Staples+,1998)

ERR-C	CT		1.9%	6.3%	Total uncertainty (calculated)
ERR-S		0.0	1.4%	6.1%	Statistical uncertainty
ERR-1		1.0	1.0%	2.0%	Charged-particle subtraction (1-2%)
ERR-2		1.0	0.1%	0.2%	Low energy neutron from previous pulse(0.05-2%)
ERR-3		1.0	0.3%	1.2%	Attenuation and beam spreading (0.3-1.2%)
ERR-4		1.0	0.0%	0.1%	Efficiency (0-0.1%)
ERR-5		1.0	0.1%	0.1%	Impurities (0.1%)
ERR-6		1.0	0.7%	0.7%	Foil mass (0.7%)

EXFOR 22211.002 (T.Iwasaki+,1990)

Correlation coefficients provided by the authors adopted.

ERR-T			1.5%	2.6%	Overall uncertainty (1.5-2.6%)

EXFOR 13576.002 (J.W.Behrens,1983)

ERR-T			3.1%	21.0%	Root-mean-square sum including - time-independent background - sample impurity
ERR-S		0.0	2.4%	20.9%	- statistical error
ERR-R	RU	1.0	1.8%	2.5%	Residual uncertainty (specified as fully correlated)

EXFOR 12714.002.1 (J.W.Meadows,1981)

ERR-T			1.2%	8.2%	Total error consisting of
ERR-1		0.0	0.6%	4.1%	Uncorrelated error
ERR-R	RU	1.0	1.0%	8.0%	Residual uncertainty (specified as fully correlated)

EXFOR 21764.002 (C.Budtz-Jørgensen+,1981)

ERR-T			7.5%	17.3%	Total uncertainty
ERR-1		1.0	0.5%	0.5%	Efficiency, ^{235}U (0.5%)
ERR-2		1.0	1.0%	1.0%	Efficiency, ^{240}Pu (1.0%)
ERR-3		1.0	1.0%	1.0%	Number of atom, ^{235}U (1.0%)
ERR-4		1.0	1.7%	1.7%	Number of atom, ^{240}Pu (1.7%)
ERR-5		1.0	0.6%	0.6%	Difference in ^{235}U/^{240}Pu geometry (0.6%)
ERR-8		1.0	1.1%	1.1%	Contamination, ^{239}Pu (1.1%)
ERR-9		1.0	0.8%	0.8%	Contamination, ^{241}Pu (0.8%)
ERR-10		1.0	1.9%	1.9%	Normalization to VdG data (1.9%)
ERR-R	RU	0.0	6.8%	16.9%	Residual uncertainty (specified as uncorrelated)

EXFOR 21764.004 (C.Budtz-Jørgensen+,1981)

ERR-T			2.4%	26.6%	Total uncertainty Random uncertainty, ^{235}U (1.5%) Random uncertainty, ^{240}Pu (2.5%)
ERR-1		1.0	0.5%	0.5%	Efficiency, ^{235}U (0.5%)
ERR-2		1.0	1.0%	1.0%	Efficiency, ^{240}Pu (1.0%)
ERR-3		1.0	1.0%	1.0%	Number of atom, ^{235}U (1.0%)
ERR-4		1.0	1.7%	1.7%	Number of atom, ^{240}Pu (1.7%)
ERR-5		1.0	0.6%	0.6%	Difference in ^{235}U/^{240}Pu geometry (0.6%)
ERR-8		1.0	0.1%	0.1%	Contamination,^{239}Pu (0.1%)
ERR-10		1.0	0.0%	1.5%	Normalization to chamber I data set
ERR-R	RU	0.0	0.4%	26.5%	Residual uncertainty (specified as uncorrelated)

EXFOR 20766.002 (K.Wisshak+,1979)

ERR-T			8.0%	9.0%	Total uncertainty
ERR-S		0.0	1.7%	2.8%	Statistical uncertainty
ERR-R	RU	1.0	7.8%	8.6%	Residual uncertainty (specified as fully correlated)

EXFOR 40509.002 (V.Kupriyanov+,1979)

ERR-T			2.0%	4.8%	Root-mean-square sum of all uncertainties from - Energy dependence of the shape ratio
ERR-1		1.0	1.8%	1.8%	Absolute ratios for normalization (1.8%)
ERR-2		1.0	0.2%	0.2%	Normalization procedure of shape (0.25%)
ERR-R	RU	0.0	0.8%	4.4%	Residual uncertainty (specified as uncorrelated)

EXFOR 10597.002 (J.W.Behrens+,1978)

ERR-T			1.9%	5.2%	Total error
ERR-S		0.0	0.6%	4.6%	Statistical error
ERR-R	RU	1.0	1.8%	2.4%	Residual uncertainty (specified as fully correlated)

EXFOR 20786.003 (K.Kari,1978)

ERR-C	CT		2.2%	3.5%	Total uncertainty (calculated)
ERR-2		1.0	0.4%	0.4%	Fragment anisotropy - ^{240}Pu (0.4%)
ERR-3		1.0	0.3%	0.3%	Neutron scattering (0.3%)
ERR-4		1.0	1.0%	2.0%	Background correction - ^{240}Pu
ERR-5		1.0	1.0%	1.0%	Mass determination - ^{240}Pu (1%)
ERR-6		0.0	0.5%	1.1%	Fission statistics - ^{240}Pu
ERR-12		1.0	0.4%	0.4%	Fragment anisotropy - ^{235}U (0.4%)
ERR-14		1.0	1.0%	2.0%	Background correction - ^{235}U
ERR-15		1.0	1.0%	1.0%	Mass determination - ^{235}U (1%)
ERR-16		0.0	0.3%	0.9%	Fission statistics - ^{235}U

EXFOR 20488.002 (J.Frehaut+,1974)

ERR-C	CT		1.9%	5.2%	Total uncertainty (calculated)
ERR-S		0.0	1.9%	5.1%	Only the statistical ones
ERR-1		1.0	0.2%	0.2%	Anisotropy in fragment emission (0.2%)
ERR-2		1.0	0.1%	0.1%	Fission event loss (0.1%)
ERR-3		1.0	0.1%	0.1%	French effect (0.05%)
ERR-4		1.0	0.2%	0.2%	Fission induced by scattered neutrons (0.2%)

^{240}Pu/^{239}Pu cross section ratios

EXFOR 12766.003 (L.W.Weston+,1983)

ERR-C	CT		2.1%	3.3%	Total uncertainty (calculated)
ERR-S		0.0	0.4%	2.4%	Statistical uncertainty
MONIT-ERR		1.0	0.8%	0.8%	^{239}Pu(n_{th},f)/^{235}U(n_{th},f) (0.8%)
ERR-1		1.0	1.7%	1.7%	^{239}Pu/^{235}U normalization statistics (1.7%)
ERR-2		1.0	0.5%	0.5%	Secondary normalization (0.5%)
ERR-3		1.0	0.3%	0.3%	Uncertainty due to time dependent background. The correlation coefficient is exp(-E/5).
ERR-4		1.0	0.0%	0.9%	Uncertainty due to constant background correction fully correlated with energy. where E is the energy difference in MeV.
ERR-5		1.0	0.7%	0.7%	Normalization to ^{239}Pu(n,f) (0.7%)

EXFOR 40509.004.1 (V.Kupriyanov+,1979)

ERR-T			1.1%	1.2%	Root-mean-square sum of all uncertainties at 3 MeV: - Difference of neutron fluxes through layers (0.2%) - Statistical error with fast neutrons (0.5%) - Fission of minority isotopes (0.2%) - Energy dependence of fission efficiency ratio (0.4%) - Neutron background in laboratory (0.2%) - Neutrons scattered by target (0.3%) - Neutrons from accompanying (p,n) reactions (0.4%) - Neutron scatting by backings (0.5%)
ERR-1		1.0	0.6%	0.6%	Ratio of numbers fissionable nuclei (0.6%)
ERR-R	RU	0.0	0.9%	1.1%	Residual uncertainty (specified as uncorrelated)

^{241}Pu/^{235}U cross section ratios

EXFOR 14271.006.1 (F.Tovesson+,2010)

ERR-C	CT		3.9%	5.2%	Total uncertainty (calculated)
ERR-S		0.0	0.5%	2.6%	Statistical uncertainty
ERR-1		1.0	3.0%	3.0%	Systematic overall uncertainty of normalization
ERR-2		0.0	2.3%	3.1%	Systematic uncertainty of correction for contamination of other Pu isotopes

ERR-3		0.0	0.3%	1.2%	Systematic uncertainty of background correction of ^{235}U data
ERR-4		0.0	0.3%	1.2%	Systematic uncertainty of background correction of ^{241}Pu data

EXFOR 40474.003 (B.I.Fursov+,1978)

ERR-T			1.6%	1.8%	Mean square sum of all uncertainties involved
ERR-1		1.0	1.4%	1.4%	^{233}U/^{235}U atom number ratio (1.35%)
ERR-R	RU	0.0	0.9%	1.1%	Residual uncertainty (specified as uncorrelated)

EXFOR 40474.005 (B.I.Fursov+,1978)

ERR-T			1.8%	2.4%	Quadrature sum of the following errors:
ERR-3		1.0	1.7%	1.7%	Absolute values obtained by the glass method (1.68%)
ERR-4		1.0	0.2%	0.2%	Normalization of the energy curve to the reference values (0.25%)
ERR-R	RU	0.0	0.6%	1.7%	Residual uncertainty (specified as uncorrelated)

EXFOR 20364.002 (F.Käppeler+,1973)

ERR-C	CT		2.9%	4.1%	Total uncertainty (calculated)
ERR-S		0.0	0.9%	3.0%	
ERR-SYS		1.0	2.8%	2.8%	The energy-independent error of 2.75 pc. Resulting from these errors must be combined with the statistical errors given to obtain the total uncertainties.

3 Selection of data points from TUD-KRI collaboration

The Khlopin Radium Institute (KRI) started measurements of the fission cross section of ^{235}U at 14–15 MeV in a program started in 1972 [115] [2]. This was followed by a joint program on measurements of the absolute fission cross sections using the time correlated associated particle method (TCAPM) [3] between Technische Universität Dresden (TUD) and Khlopin Radium Institute (KRI) started in 1975 [4] and completed in 1990 [5]. They presented their cross sections many times in reports, conference proceedings and journals, and it sometimes introduced compilation of the cross section from the same measurement twice or more in EXFOR. However, it is also known that the program sometimes measured the same quantity several times. Rolf-Dieter Arlt (a leading researcher of this joint program at its early stage) was interested in re-evaluation of all data points considering the correlation among them [6], and published the covariances of the 2.6, 8.5 and 14.7 MeV cross sections of ^{233,235,238}U, ^{237}Np and ^{239,242}Pu measured in this program in 1983 [5, 118]. The covariances show presence of several measurements for a given target nuclide and at energy. This means that several values from the same laboratory at the same energy are not always from the same measurement, and it makes selection of the data points from this joint program difficult. The evaluators of the IAEA Neuron Data Standards also met the same problem [119].

To avoid double counting of the same measurement in the present evaluation, we checked all articles reporting their ^{233,235,238}U and ^{239,240,241}Pu fission cross sections from this collaboration by using CINDA. All CINDA records relevant to this collaboration were extracted from the "old CINDA"records (CINDA records manually compiled by

[2] Absolute measurements of the fission cross sections of ^{234}U and ^{236}U induced by ^{252}Cf fission spectrum neutrons and 14.7-MeV neutrons as well as repeated measurements of fission cross section of ^{235}U for 14–15-MeV neutrons have been made at V.G. Khlopin Radium Institute as a part of a program began in 1972. [115]

[3] A method to determine the neutron fluence by detection of the outgoing charged particle from the neutron source reaction (e.g., detection of α particles from ^{3}H(d,n)^{4}He reaction). This is abbreviated to MEZKAT (Methode der zeitlich korrelierten assoziierten Teilchen) in their publications in German.

[4] At the V.G. Khlopin Radium Institute the absolute measurements of fission cross sections for 14,7 MeV-neutrons were started in 1972. These measurements developed further since 1975 in collaboration with Technical University of Dresden. The joint program provided the increase of the number of neutron energy spot points and parallel independent measurements with the same targets using different set-ups. [116].

[5] The comprehensive program of absolute fission cross-section measurements at the Technical University Dresden (TUD) in collaboration with the Khlopin Radium Institute Leningrad (KRI) was completed in 1990 [12].

[6] Arlt proposed re-evaluation of all single fission cross section measurement runs performed earlier in Dresden and Leningrad employing a correlation method to gain a higher significance in the error analysis and a more justified value of the fission cross section for a Research Agreement with the IAEA (2829/CF) [117].

CINDA readers) by the following conditions on the IAEA NDS CINDA Web retrieval system (http://nds.iaea.org/cinda/, Fig. 12):

- Target=U-233; U-235; U-238; Pu-239; Pu-240; Pu-241
- Reaction=N,F
- Product=(blank)
- Quantity=CS
- Energy from 1 MeV
- Work type=E (experimental); M (experimental+theoretical)
- Laboratory=2GERDRE; 2GERZFK; 3DDRTUD; 3DDRROS; 4CCPRI; 4RUSRI

The CINDA records extracted by this way also include the articles for fission spectrum averaged quantities ("Fiss") or articles without data ("NDG", "No data" etc. in CINDA).

After their exclusion and addition of known references missing in CINDA (e.g., PhD theses), the cross section values were extracted from these articles and tabulated in Tables 17–20 to trace the history of each value except for ^{240}Pu and ^{241}Pu, for which only one article by B.M. Aleksandrov et al. [63] was found in CINDA. In these tables, the dates of the references (CINDA dates) are taken from the CINDA records. Note that it is the date of the conference for conference proceedings, and the date of the original Russian publication if it is translated to English). The reference is written in the EXFOR/CINDA abbreviation which full description is given in Table 4 of Ref. [19]. The value adopted in the present evaluation is underlined while the italicized value is superseded by a revised value in EXFOR. The cross section uncertainty in % printed in the reference was converted to b in this table, and it may introduce a minor difference from the same uncertainty published in another article.

In these tables, Dushin et al's report presented in IAEA Consultants' Meeting on the U-235 Fast-Neutron Fission Cross-Section, and the Cf-252 Fission Neutron Spectrum (Smolenice, Czechoslovakia, 28 March - 1 April 1983) [118] is omitted because the same values and uncertainties are repeated in their journal article published in the same year [5].

These tables show that identification of the final value from each measurement is not an easy task. Let us look into the situation by taking the ^{235}U cross section at 14.7 MeV measured at TUD in Table 18 as an example:

- The value seen in the earliest stage (2.073±0.023 b) was published by Alkhazov et al. in December 1979 in a journal [50].
- However, Arlt et al. [116] presented in October 1979 (i.e., before Alkhazov's journal publication) a revised value 2.085±0.023 b and mentioned that the value in Alkhazov et al's 1979 article to be published (2.073±0.023 b) is preliminary. It shows the value published in a journal article is not always the final one.
- In June 1980, Arlt et al. [120] presented these two values as if they are from two measurements — "final result of this work" (2.085±0.023 b) and "first work" (2.073±0.023 b). Here it is not very clear if they intended to supersede 2.073±0.023 b by 2.085±0.023 b.
- The cross section table in Wagner's thesis submitted in 1982 [121] and the covariance matrix of ^{235}U published by Dushin et al. in October 1983 [5] show presence of five measurements at 14.7 MeV from TUD. However, their relation with the two values presented earlier is not clear.
- The higher value presented in 1970s (2.085±0.023) b is still seen in a journal article published by Kovalenko et al. in October 1985 [122].
- The same central value with a slightly higher uncertainty 2.085 b±1.18% (~2.085±0.025 b) is presented by Alkhazov et al. in the 1988 Mito conference [13] as the "values published earlier". In this presentation, the cross section was revised to 2.094 b±1.09% (~2.094±0.023 b) on the basis of the (1) experimentally determined fission fragment detection efficiency as well as (2) more precisely determined fission foil areal density and its nonuniformity [7].

[7]The following comments from Guntram Pausch (who determined the ^{235}U cross section at 4.45 MeV to 1.057±0.022 b (2.10%) in his 1986 PhD thesis [123] and left the TUD-KRI collaboration in 1987) summarizes well the reanalysis performed at TUD in the second half of 1980s and 1990s [124]: What I know is that the alpha activities of the targets used in the Dresden measurements (TUD, ZfK) were re-measured and

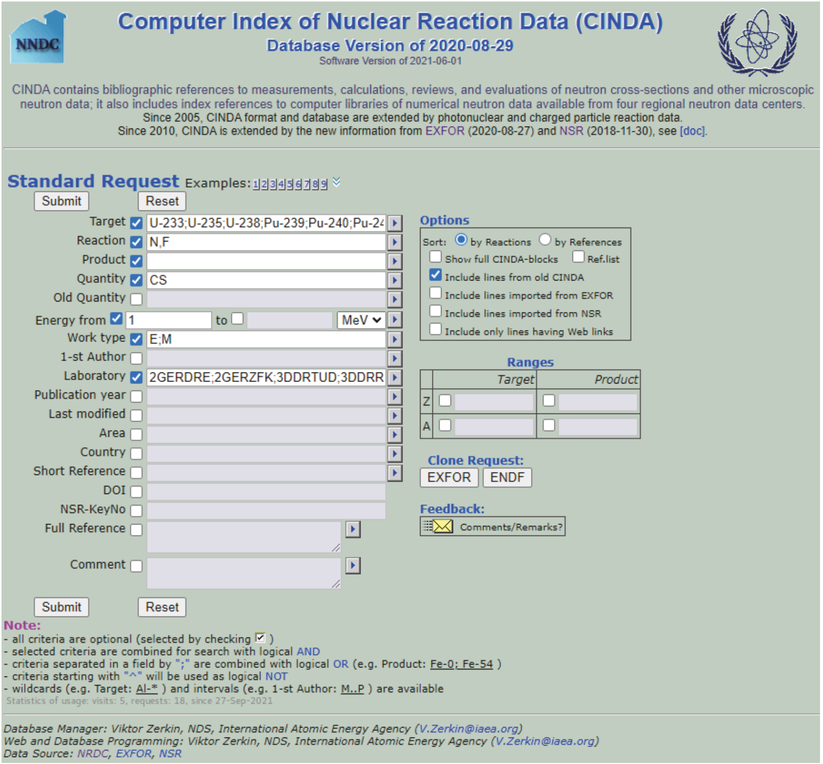


Figure 12: Retrieval of the articles relevant to the absolute cross section measurements from TUD-KRI collaboration.

- This revision is concluded by a slightly higher value (2.096±0.024 b) presented in Merla's thesis submitted in 1989 [125] and the 1991 Jülich conference [12], which are the last publications of the 14.7 MeV cross section measured at TUD.

Under this complicated situation, we tried to select the data points for the present evaluation to incorporate the best and maximum knowledge from this joint program but also avoiding double counting. Our procedures for ^{233,235,238}U and ^{239}Pu are summarized as follows:

- KRI (D-T): None of the publications shows error budget for ^{238}U at 14.1 MeV, and it was excluded from the present evaluation. For all other data points, we adopted the values published by Dushin et al. in 1983 [5] since we do not see later publications with good description on the error budgets. The adopted ^{238}U and ^{239}Pu cross sections (1.171±0.023 b for ^{238}U, 2.309±0.030 and 2.349±0.045 b for ^{239}Pu) are smaller than those presented by Adamov et al. in the 1979 Knoxville conference [115] (1.178±0.024 b for ^{238}U and 2.505±0.051 b for ^{239}Pu). Dushin et al. mentions that the old ^{238}U value was reexamined and the old ^{239}Pu value was excluded from their re-evaluation.

- KRI (D-D): The values of ^{233}U (1.93±0.07 b at 1.9 MeV), ^{235}U (1.28±0.03 b at 1.9 MeV and 1.27±0.03 b at 2.5 MeV) and ^{239}Pu (2.01±0.05 b) were taken from the articles published by Kalinin et al. in 1987 [126], Kalinin et al. in 1991 [18] and Shpakov et al. in 1986 [23], respectively. None of the publications shows the error budget for ^{238}U at 2.5 MeV, and it was excluded from the present evaluation.

re-analyzed in Dresden (TUD facilities located in Pirna-Copitz) with improved methodology and better knowledge in the late eighties and early nineties, which lead to revised area densities of the targets and thus to revised cross sections. In the second half of the eighties we also dealt in more detail with the absorption correction (fission fragments stopped in the target) and its relation with the low-energy tail in the fission chamber spectrum ("extrapolation correction"), and we found a close relation between these effects theoretically (MC simulations, results given in my PhD thesis) and also experimentally (Claus-Michael Herbach's PhD thesis). This work opened a new way to determine these corrections with better accuracy and much less arbitrary assumptions. I remember that the corrections finally turned out to be larger than previously assumed, and this might also have been considered in the revisions of the cross sections results (where Herbach and Merla should be better informed than I am). Of course the revisions could only be made for the measurements with targets that were still available in Dresden.

- ZfK (D-D,D-T): All values presented by Merla et al. in the 1991 Jülich conference [12] were adopted. Their ^{235}U values are almost unchanged from those in his thesis submitted in 1989 [125] while their ^{238}U values are 1–2% higher than the values reported in the thesis. Comparison of the counting statistics between this report and Alkhazov et al's paper presented in the 1988 Mito conference [13] shows that their 1991 and 1988 values are based on the same measurements for ^{235}U though the 1991 article [12] does not report these values as revised ones explicitly.

  Additionally the ^{235}U 8.5 MeV value from an old measurement (1.74±0.11 b) presented by Arlt et al. in 1981 [43] was adopted [8]. The neutron energies slightly vary from publication to publication (e.g., 8.0, 8.2, 8.40, 8.46, 8.5 or 8.75 MeV for "8.5 MeV" neutrons from ZfK).

- TUD (^{233}U): The value of 2.244±0.042 b at 14.7 MeV published by Dushin et al. in 1983 [5] was adopted since its correction factors were not reanalyzed later. Its correlation with the 14.7 MeV ^{233}U value from KRI (2.254±0.045 b) shown in the 1983 report was also taken into account.

- TUD (^{235}U):We adopted the 1991 Jülich values (1.240±0.024 b at 2.6 MeV and 2.096±0.024 b at 14.7 MeV) assuming that (1) the uncertainties in this paper are total, and (2) their fractional statistical uncertainty components are equal to those presented by Alkhazov et al. in the 1988 Mito conference [13].

- TUD (^{238}U, ^{239}Pu): Their latest values at 14.7 MeV (1.228±0.026 b and 2.449±0.027 b) are presented by Merla et al. in the 1991 Jülich conference but without their error budgets. Unlike ^{235}U, the corresponding values are not reported by Alkhazov et al. in the 1988 Mito conference [13], and hence they were discarded in the present evaluation.

  For ^{238}U, a larger value, 1.194±0.022 b at 14.7 MeV from an older measurement ("First work") is presented by Arlt et al. in 1980 [120]. Its error budget is presented by Alkhazov et al. in 1979 [50], and the value from the old measurement was also adopted in the present evaluation [9].

The measurements done at KRI and reported by Kuks et al. in 1970s (e.g., ^{235}U at 2.5 MeV [127, 128], ^{238}U at 2.5 and 14.1 MeV [129, 130]) are most probably independent from the TUD-KRI collaboration measurements, but added in Tables 18 and 19 just for completeness. These articles do not provide detailed descriptions of the partial uncertainties and not for the present evaluation.

The ratios of the cross sections at 14.7 MeV measured at TUD and KRI to the 14.7 MeV cross sections from the present evaluation are plotted in Figs. 13 and 14. The horizontal axis gives the year of publication or presentation. It shows their final values from TUD are consistent with the cross sections evaluated by us and also those in the latest versions of the data libraries except for ^{233}U.

[8]Note: This value seems excluded from further reanalysis in 1980s and 1990s. It means this value does not reflect the latest knowledge of the corrections, and it would be better to exclude this value from our future evaluation.

[9]Note: The report by Arlt et al., in the 1979 Knoxville conference [116] mentions this value (1.194±0.022 b) is preliminary and revised to 1.166±0.021 b, similar to the relation of the ^{235}U 14.7 MeV cross sections in Arlt et al.'s 1980 article[120] (revised from 2.073±0.023 b to 2.085±0.023 b). It would be therefore more reasonable to adopt the revised value including its correlation with the value from KRI (1.171±0.023 b) presented by Dushin et al. in 1983 [5]. (The same treatment also could be done for the ^{239}Pu values from TUD and KRI presented in Dushin et al's article). Or, another option could be simply to discard this measurement since it is not corrected by the latest knowledge of this project, and the value is much lower than the value presented at the 1991 Jülich conference (1.228±0.026 b).

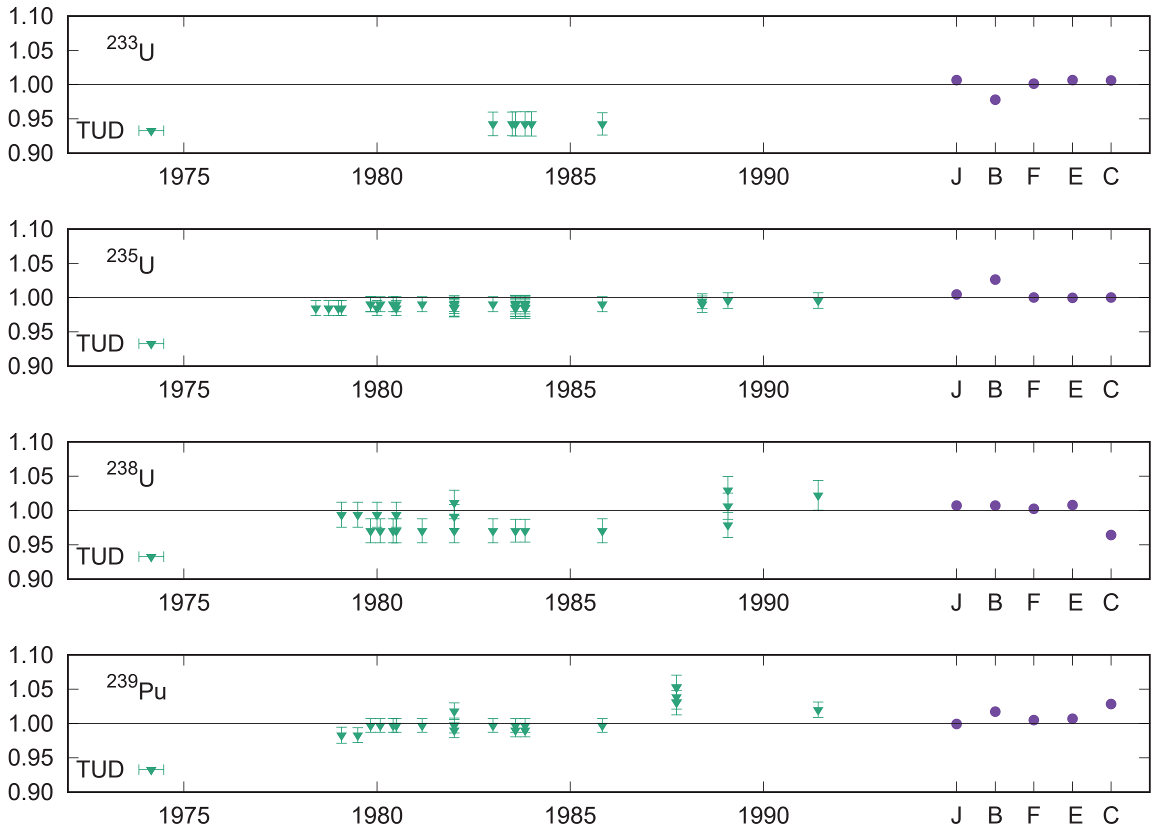


Figure 13: Comparison of the 14.7 MeV ^{233,235,238}U and ^{239}Pu cross sections measured at TUD with evaluated libraries (JENDL-4.0 (2009), BROND-3.1 (2016), JEFF-3.3 (2017), ENDF/B-III.0 (2018) and CENDL-3.2 (2020) from left to right). All symbols show ratios to the cross sections from the present evaluation.

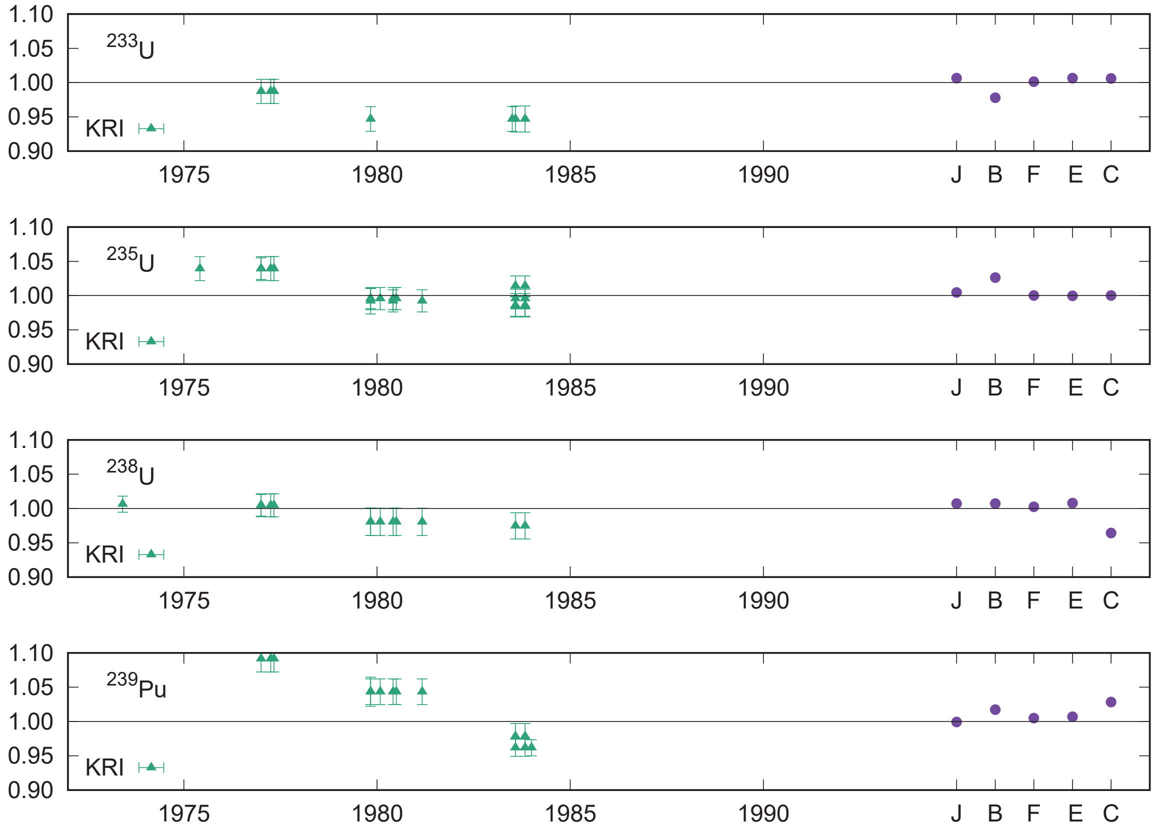


Figure 14: Comparison of the 14.7 MeV ^{233,235,238}U and ^{239}Pu cross sections measured at KRI with evaluated libraries (JENDL-4.0 (2009), BROND-3.1 (2016), JEFF-3.3 (2017), ENDF/B-III.0 (2018) and CENDL-3.2 (2020) from left to right). All symbols show ratios to the cross sections from the present evaluation.

Table 17: ^{233}U fission cross sections from the TUD-KRI collaboration.

Laboratory					KRI	KRI	TUD
E_n(MeV)					1.9	14.7	14.7
n.source					D-D	D-T	D-T
EXFOR#		Data source			Cross section (b)		
40927.002		J,YK,,(4),3,1987			1.93(7)		
40911.003		C,83MOSKVA,2,201,1983					2.244(42)
51001.004		J,AE,55,218,1983				2.254(45)	2.244(42)
40547.011		C,79KNOX,,995,1979				2.254(43)	
40547.003		R,YK-24,8,1977				*2.350(42)*	
CINDA date	Author	Reference	Alias, translation	Ref.	Cross section (b)		
198711	Kalinin+	J,YK,,(4),3,1987	R,INDC(CCP)-365,23,1994	[126]	1.93(7)		
198612	Shpakov	J,YK,,(4),19,1986	R,INDC(CCP)-302,33,1989	[23]	1.93(7)		
198510	Kovalenko+	J,IP,21,344,1985		[122]			2.244(39)
198510	Arlt+	S,INDC(GDR)-34,25,1985		[131]			2.244(39)
198312	Alkhazov+	C,83MOSKVA,2,201,1983		[132]			2.244(42)[a]
198310	Dushin+	J,AE,55,218,1983	J,SJA,55,656,1983	[5]		2.254(45)	2.244(42)
198306	Arlt+	P,ZFK-503,11,1983	P,INDC(GDR)-29,11,1983	[133]		2.254(43)	2.244(41)
198212	Arlt+	S,ZFK-491,135,1982	S,INDC(GDR)-26,135,1982	[134]			2.244(41)
197910	Adamov+	C,79KNOX,,995,1979		[115]		2.254(43)[b]	
197704	Alkhazov+	C,77KIEV,3,155,1977		[135]		2.350(42)	
197703	Adamov+	R,YFI-23,17,1977		[136]		2.350(42)	
197700	Adamov+	R,YK-24,8,1977		[137]		2.350(42)	

Comment by the authors of the reference:

[a] Result of the last measurement completed in 1980-1981.

[b] Earlier result revised for neutron attenuation correction (Monte Carlo instead of analytical method).

Table 18: ^{235}U fission cross sections from the TUD-KRI collaboration.

Laboratory					KRI	KRI	KRI	KRI	KRI	TUD	ZfK	ZfK	TUD	ZfK
E_n(MeV)					1.9	2.5	14.0	14.5	14.7	2.6	4.5	8.5	14.7	18.8
n.source					D-D	D-D	D-T	D-T	D-T	D-D	D-D	D-D	D-T	D-T
EXFOR#		Date source			Cross section (b)									
41112.002		J,AE,71,181,1991			1.28(3)	1.27(3)								
22304.002		C,91JUELIC,,510,1991									1.094(24)	1.855(44)		2.068(50)
22304.006		C,91JUELIC,,510,1991								1.240(24)			2.096(24)	
41013.004		C,88MITO,,145,1988								*1.238(24)*	*1.093(23)*	*1.853(43)*	*2.094(23)*	*2.065(49)*
41013.003		C,88MITO,,145,1988								*1.215(19)*	*1.057(22)*	*1.801(41)*	*2.085(25)*	*1.999(45)*
40927.003		J,YK,,(4),19,1986			*1.26(3)*									
30706.002		S,ZFK-592,152,1986									*1.057(22)*			
30706.003		S,ZFK-592,152,1986												*1.999(45)*
40911.002		C,83MOSKVA,2,201,1983							*[2.086]*	*1.214(18)*		*1.801(43)*		
51001.002		J,AE,55,218,1983					2.084(36)	2.101(37)	2.0960(289)					
51001.002		J,AE,55,218,1983							2.0755(361)					
51001.002		J,AE,55,218,1983							2.1348(308)					
51001.002		J,AE,55,218,1983							2.0714(299)					
30558.002		J,AE,55,218,1983										*1.801(45)*		
30559.002		J,KE,25,199,1982								*1.215(20)*				
31833.002		S,ZFK-459,35,1981										1.74(11)		
31832.002		J,AE,47,416,1979											2.073(23)	
40547.013		C,79KNOX,,995,1979							2.089(40)					
40546.003		J,AE,46,416,1979				1.27(5)								
40547.005		R,YK-24,8,1977							*2.188(37)*					
40258.003		R,YFI-17,33,1974				1.30(5)								
40258.002		C,73KIEV,4,18,1973				*1.31(5)*								
CINDA date	Author	Reference	Alias, translation	Ref.	Cross section (b)									
199108	Kalinin+	J,AE,71,181,1991	J,SJA,71,700,1992	[18]	1.28(3)[a]	1.27(3)[a]								
199105	Merla+	C,91JUELIC,,510,1991		[12]						1.240(24)[b]	1.094(24)	1.855(44)	2.096(24)[b]	2.068(50)
198901	Merla	T,MERLA,1989		[125]						1.240(24)[C]	1.094(23)[D]	1.855(44)[G]	2.096(24)[M]	2.068(50)[O]
198901	Herbach	T,HERBACH,1989		[138]										2.001(47)[N]
198805	Alkhazov+	C,88MITO,,145,1988		[13]						1.238(24)[c]	1.093(23)[c]	1.853(43)[c]	2.094(23)[c]	2.065(49)[c]
198805	Alkhazov+	C,88MITO,,145,1988								1.215(19)[d]	1.057(22)[d]	1.801(41)[d]	2.085(25)[d]	1.999(45)[d]
198803	Kalinin+	J,AE,64,194,1988	J,SJA,64,239,1988	[139]	1.257(30)	1.251(31)								
198612	Shpakov	J,YK,,(4),19,1986	R,INDC(CCP)-302,33,1989	[23]	1.26(3)[e]						1.057(22)[e]			1.999(45)[e]
198604	Herbach+	S,ZFK-592,152,1986	S,INDC(GDR)-42,152,1986	[140]							1.057(22)			1.999(45)
198604	Alkhazov+	S,ZFK-592,140,1986	S,INDC(GDR)-42,140,1986	[141]	1.26(3)									
198600	Pausch	T,PAUSCH,1986		[123]							1.057(22)[P]			
198510	Kovalenko+	J,IP,21,344,1985		[122]						1.215(18)	1.057(22)	1.801(43)	2.085(23)	1.994(44)
198510	Arlt+	S,INDC(GDR)-34,25,1985		[131]							1.047(31)[A]			2.146(78)[A]
198507	Arlt+	P,ZFK-559,25,1985	P,INDC(GDR)-41,25,1985	[142]							1.057(22)[B]			
198507	Herbach+	P,ZFK-559,19,1985	P,INDC(GDR)-41,19,1985	[143]										2.013(50)
198506	Arlt+	S,IAEA-TECDOC-335,174,1985		[144]							1.057(22)			
198500	Herbach+	R,INDC(GDR)-37,1985		[145]							1.057(22)			1.999(45)
198500	Herbach+	R,INDC(GDR)-35,1985		[146]							1.057(22)			1.999(45)
198312	Alkhazov+	C,83MOSKVA,2,201,1983		[132]					[2.086][f]	1.214(18)[g]		1.801(43)[g]	[2.085][f]	
198310	Dushin+	J,AE,55,218,1983	J,SJA,55,656,1983	[5]			2.084(36)	2.101(37)	2.0960(289)	1.214(22)		1.801(45)	2.075(28)	
198310	Dushin+	J,AE,55,218,1983	J,SJA,55,656,1983						2.0755(361)	1.215(28)			2.073(25)	
198310	Dushin+	J,AE,55,218,1983	J,SJA,55,656,1983						2.1348(308)				2.075(34)	
198310	Dushin+	J,AE,55,218,1983	J,SJA,55,656,1983						2.0714(299)				2.087(25)	
198310	Dushin+	J,AE,55,218,1983	J,SJA,55,656,1983										2.083(28)	
198300	Josch	T,JOSCH,1983		[147]						1.225(20)				
198212	Arlt+	S,ZFK-491,135,1982	S,INDC(GDR)-26,135,1982	[134]						1.215(20)		1.801(43)	2.085(23)	
198205	Arlt+	J,KE,25,199,1982		[148]						1.215(20)				
198200	Wagner	T,WAGNER,1982		[121]								1.74(11)[E]	2.075(29)[H]	
198200	Wagner	T,WAGNER,1982										1.801(43)[F]	2.073(25)[I]	
198200	Wagner	T,WAGNER,1982											2.075(27)[J]	
198200	Wagner	T,WAGNER,1982											2.087(24)[K]	
198200	Wagner	T,WAGNER,1982											2.083(27)[L]	
198109	Arlt+	S,ZFK-459,44,1981	S,INDC(GDR)-19,44,1981	[149]						1.215(19)				
198109	Arlt+	S,ZFK-459,35,1981	S,INDC(GDR)-19,35,1981	[43]								1.801(43)[h]		
198109	Arlt+	S,ZFK-459,35,1981	S,INDC(GDR)-19,35,1981									1.74(11)[i]		
198106	Arlt+	P,INDC(GDR)-16,18,1981		[150]								1.801(43)		
198106	Arlt+	P,INDC(GDR)-16,17,1981		[151]						1.215(19)				
198105	Arlt+	P,ZFK-443,190,1981		[152]						1.215(19)		1.802(37)		
198102	Arlt+	J,KE,24,48,1981		[153]					2.089(34)				2.085(23)	
198009	Arlt+	C,80KIEV,3,192,1980		[154]						1.215(24)		1.741(57)[p]		
198006	Arlt+	P,INDC(GDR)-12,24,1980		[155]								1.74(11)		
198006	Arlt+	P,INDC(GDR)-12,9,1980		[120]					2.096(34)[j]				2.085(23)[j]	
198006	Arlt+	P,INDC(GDR)-12,9,1980											2.073(23)[k]	
198005	Arlt+	P,ZFK-408,27,1980	P,INDC(GDR)-14,27,1980	[156]								1.74(11)		
198005	Arlt+	P,ZFK-408,26,1980	P,INDC(GDR)-14,26,1980	[157]					2.096(34)				2.085(23)	
198005	Arlt+	P,ZFK-408,26,1980	P,INDC(GDR)-14,26,1980						2.089(34)					
198001	Arlt+	S,ZFK-410,122,1980	S,INDC(GDR)-13,122,1980	[158]					2.096(34)			1.74(11)	2.085(23)	
197912	Alkhazov+	J,AE,47,416,1979	J,SJA,47,1040,1979	[50]									2.073(23)	
197910	Arlt+	C,79KNOX,,990,1979		[116]					2.096(34)	1.215(28)		1.74(11)	2.085(23)[l]	
197910	Adamov+	C,79KNOX,,995,1979		[115]			2.084(34)	2.101(34)	2.096(31)				2.085(23)	
197910	Adamov+	C,79KNOX,,995,1979							2.089(40)[m]					
197906	Aleksandrov+	J,AE,46,416,1979	J,SJA,46,475,1979	[159]		1.27(5)[n]								
197906	Arlt+	P,ZFK-385,239,1979		[160]						1.215(36)				
197901	Arlt+	S,ZFK-382,180,1979	S,INDC(GDR)-9,180,1979	[161]						1.215(28)[o]			2.073(23)	
197812	Alkhazov+	S,ZFK-376,129,1978	S,INDC(GDR)-10,129,1978	[162]									2.073(23)	
197809	Meiling+	J,KE,21,292,1978		[163]									2.073(23)	
197805	Arlt+	P,ZFK-350,10,1978	P,INDC(GDR)-7,10,1978	[164]									2.073(23)	
197704	Adamov+	C,77NBS,,313,1977		[165]					2.188(37)					
197703	Adamov+	R,YFI-23,17,1977		[136]					2.188(37)					
197700	Adamov+	R,YK-24,8,1977	R,INDC(CCP)-114,8,1977	[137]					2.188(37)					
197612	Alkhazov+	R,YFI-22,12,1976	R,INDC(CCP)-100,10,1977	[166]					2.188(33)					
197505	Alkhazov+	C,75KIEV,6,9,1975		[167]					2.188(37)					
197408	Kuks+	R,YFI-17,33,1974	R,INDC(CCP)-48,34,1975	[128]		1.30(5)								
197305	Kuks+	C,73KIEV,4,18,1973		[127]		1.31(5)								

(Footnote of Table 18)
Comment by the authors of the reference:
[a] Revised from the cross sections in J,AE,64,194,1988 by adopting the experimentally determined fission detection efficiency.
[b] The measurements at TUD were published in detail already in C,79KNOX,990,1979 and J,KE,24,48,1981, but revised basing on the experimentally determined fission fragment absorption and new values of the layer areal density.
[c] Values corrected on the basis of the new analysis of the mass and nonuniformity of the fission foil and fragment detection efficiency.
[d] Values published earlier in R,INDC(GDR)-37,1985; S,ZFK-459,44,1981; S,ZFK-459,35,1981 and J,KE,24,48,1981.
[e] Measurements carried out in 1984-1985.
[f] 14.5–14.7 MeV cross section.
[g] Result of the last measurement completed in 1980-1981.
[h] Citing W.Wagner, Dissertation 1981, TU Dresden, Sektion Physik.
[i] Citing S,ZFK-410,108,1980 and S,ZFK-410,122,1980.
[j] TUD final result of this work.
[k] TUD first work.
[l] Preliminary data of the measurement has been published earlier in S,ZFK-382,180,1979 and Alkhazov et al, to be published in AE.
[m] Earlier result revised for neutron attenuation correction (Monte Carlo instead of analytical method).
[n] Agree with our previous data in R,YFI-17,33,1974 within the limits of error.
[o] Preliminary data.
[A] First TCAPM measurements at ZfK Tandem VdG following the recommendations of the IAEA Consultants Meeting (Smolenice, 1983).
[B] Average of the three measurements in Aug. 1983, Feb. 1984 and Mar. 1984.
[C] Revised from 1.215(19) in S,ZFK-459,44,1981. See also T,JOSCH,1983.
[D] Revised from 1.057(22) in T,PAUSCH,1986, S,IAEA-TECDOC-335,174,1984 and R,INDC(GDR)-35,1985.
[E] Measured in 1979. Cross section at 8.03(25) MeV, citing S,ZFK-410,122,1980 and P,ZFK-408,27,1980.
[F] Measured in 1980. Citing S,INDC(GDR)-19,35,1981.
[G] Revised from 1.801(43) in T,WAGNER,1982 and S,ZFK-459,35,1981.
[H] Measured in Oct. 1977.
[I] Measured in Apr. 1978. Citing S.ZFK-382,180,1979, P,ZFK-408,26,1980 and P,ZFK-385,239,1979.
[J] Measured in Feb. 1979. Citing S,ZFK-410,122,1980, P,ZFK-408,27,1980 and J,KE,24,48,1981.
[K] Measured in Oct. 1977. Citing S,ZFK-376,129,1977, P,ZFK-350,10,1978 and J,AE,47,416,1979.
[L] Measured in May 1977.
[M] Revised from 2.085(21). Citing J,KE,24,48,1981 and T,WAGNER,1982.
[N] Measured in Nov. 1984. Discarding 2.146(78) from Aug. 1983 test run in S,INDC(GDR)-34,25,1985. Citing P,ZFK-530,10,1984.
[O] Revised from 2.001(47) in T,HERBACH,1989.
[P] Average of the three measurements in July-Aug. 1983, Feb. 1984 and Mar. 1984.

Comment by Dushin et al. [5]:
[p]: This preliminary value was reexamined.

Table 19: ^{238}U fission cross sections from the TUD-KRI collaboration.

Laboratory					KRI	KRI	KRI	ZfK	ZfK	ZfK	TUD	ZfK
E_n(MeV)					2.5	14.1	14.7	4.8	5.1	8.2	14.7	18.8
n.source					D-D	D-T	D-T	D-D	D-D?	D-D	D-T	D-T
EXFOR#		Data source			Cross section (b)							
22304.003		C,91JUELIC,,510,1991						0.562(17)	0.554(13)	1.041(33)		1.363(43)
22304.007		C,91JUELIC,,510,1991									1.228(26)	
41013.002		C,88MITO,,145,1988							*0.542(11)*			
40911.004		C,83MOSKVA,2,201,1983					1.178(24)					
51001.005		J,AE,55,218,1983					1.171(23)					
31832.003		J,AE,47,416,1979									1.194(22)	
40547.015		C,79KNOX,,995,1979					1.178(24)					
40546.004		J,AE,46,416,1979			0.52(2)							
40547.007		J,YK-24,8,1977					*1.207(20)*					
40081.002		J,AE,30,55,1971			0.55(2)							
40081.003		J,AE,30,55,1971				1.13(4)						
40256.002		C,73KIEV,4,13,1974					*1.209(14)*					
CINDA date	Author	Reference	Alias, translation	Ref.	Cross section (b)							
199200	Hausch	T,HAUSCH,1992		[168]					0.554(13)[C]			
199105	Merla+	C,91JUELIC,,510,1991		[12]				0.562(17)	0.554(13)	1.041(33)	1.228(26)[a]	1.363(43)
198901	Merla	T,MERLA,1989		[125]				0.551(15)[A]		1.023(18)[D]	1.176(22)[H]	1.353(39)[K]
198901	Merla	T,MERLA,1989									1.209(23)[I]	
198901	Merla	T,MERLA,1989									1.237(24)[J]	
198900	Todt	T,TODT,1989		[169]					0.542(11)[B]			
198805	Alkhazov+	C,88MITO,,145,1988		[13]					0.542(11)[b]			
198604	Herbach+	P,ZFK-584,5,1986	P,INDC(GDR)-46,5,1986	[170]								1.337(38)
198510	Kovalenko+	J,IP,21,344,1985		[122]							1.166(21)	
198312	Alkhazov+	C,83MOSKVA,2,201,1983		[132]			[1.178(24)][c]				[1.166(21)][c]	
198310	Dushin+	J,AE,55,218,1983	J,SJA,55,656,1983	[5]			1.171(23)				1.166(20)	
198212	Arlt+	S,ZFK-491,135,1982	S,INDC(GDR)-26,135,1982	[134]							1.166(21)	
198200	Wagner	T,WAGNER,1982		[121]							1.166(21)[E]	
198200	Wagner	T,WAGNER,1982									1.191(21)[F]	
198200	Wagner	T,WAGNER,1982									1.215(22)[G]	
198102	Arlt+	J,KE,24,48,1981					1.178(24)				1.166(21)	
198006	Arlt+	P,INDC(GDR)-12,9,1980	final result (this work)	[120]			1.178(24)				1.166(21)[d]	
198006	Arlt+	P,INDC(GDR)-12,9,1980	first result								1.194(22)[e]	
198005	Arlt+	P,ZFK-408,26,1980	S,INDC(GDR)-14,26,1980	[157]			1.178(24)				1.166(21)	
198001	Arlt+	S,ZFK-410,122,1980	S,INDC(GDR)-13,122,1980	[158]			1.178(24)				1.166(21)	
197912	Alkhazov+	J,AE,47,416,1979	J,SJA,47,1040,1979	[50]							1.194(22)	
197910	Arlt+	C,79KNOX,,990,1979		[116]			1.178(24)				1.166(21)[f]	
197910	Adamov+	C,79KNOX,,995,1979		[115]			1.178(24)[g]					
197906	Aleksandrov+	J,AE,46,416,1979	J,SJA,46,475,1979	[159]	0.52(2)[h]							
197906	Arlt+	P,ZFK-385,18,1979		[171]							1.194(22)	
197901	Arlt+	S,ZFK-382,180,1979	S,INDC(GDR)-9,180,1979	[161]							1.194(22)	
197704	Adamov+	C,77NBS,,313,1977		[165]			1.207(20)					
197703	Adamov+	R,YFI-23,17,1977		[136]			1.207(20)					
197700	Adamov+	R,YK-24,8,1977		[137]			1.207(20)					
197612	Alkhazov+	R,YFI-22,12,1976	R,INDC(CCP)-100,10,1977	[166]			1.207(19)					
197305	Alkhazov+	C,73KIEV,4,13,1973		[172]			1.209(14)					
197105	Kuks+	R,YFI-10,41,1971	R,INDC(CCP)-15,45,1971	[129]	0.55(2)							
197101	Kuks+	J,AE,30,55,1971	J,SJA,30,64,1971	[130]	0.55(2)	1.13(4)						

Comment by the authors of the reference:
[a] The measurements at TUD were published in detail already in C,79KNOX,990,1979 and J,KE,24,48,1981, but revised basing on the experimentally determined fission fragment absorption and new values of the layer areal density.
[b] Preliminary and the final value will be obtained after an additional investigation of the fissile foils.
[c] 14.5–14.7 MeV cross section.
[d] Final result of this work.
[e] First work.
[f] Preliminary data of the measurement has been published earlier in S,ZFK-382,180,1979 and Alkhazov et al., to be published in AE.
[g] Earlier result revised for neutron attenuation correction (Monte Carlo instead of analytical method).
[h] Agree with our previous data in J,AE,30,55,1971 within the limits of error.
[A] Measured in July 1986.
[B] Measured in June to July 1987.
[C] Revised from 0.542(11) in T,TODT,1989.
[D] Average from two measurements in June 1986 and July 1986.
[E] Measured in Feb. 1979. Citing S,ZFK-410,122,1980, P,ZFK-408,27,1980 and J,KE,24,48,1981.
[F] Measured in Apr. 1978. Citing S,ZFK-382,180,1979, P,ZFK-408,26,1980 and P,ZFK-385,239,1979.
[G] Measured in Oct. 1977. Citing J,AE,47,416,1979.
[H] Revised from 1.166(21) in T,WAGNER,1982. Average of the three values is 1.215(27) after revision.
[I] Revised from 1.191(21) in T,WAGNER,1982. Average of the three values is 1.215(27) after revision.
[J] Revised from 1.215(22) in T,WAGNER,1982. Average of the three values is 1.215(27) after revision.
[K] Measured in Aug. 1985.

Table 20: ^{239}Pu fission cross sections from the TUD-KRI collaboration.

Laboratory					KRI	KRI	ZfK	ZfK	TUD	ZfK
E_n(MeV)					1.92	14.7	4.8	8.5	14.7	18.8
n.source					D-D	D-T	D-D	D-D	D-T	D-T
EXFOR#		Data source					Cross section (b)			
22304.005		C,91JUELIC,,510,1991					1.773(33)	2.395(40)		2.473(59)
22304.009		C,91JUELIC,,510,1991							2.449(27)	
40927.006		J,YK,,(4),19,1986			2.01(5)					
30706.006		S,ZFK-592,152,1986								*2.487(88)*
30706.005		S,ZFK-592,152,1986						*2.350(44)*		
30706.004		S,ZFK-592,152,1986					*1.740(35)*			
40911.007		C,83MOSKVA,2,201,1983				2.309(28)				
51001.003		J,AE,55,218,1983				2.309(29)				
51001.003		J,AE,55,218,1983				2.349(45)				
40547.017		C,79KNOX,,995,1979				2.505(51)				
40547.009		R,YK-24,8,1977				*2.620(46)*				
CINDA date	Author	Reference	Alias, translation	Ref.			Cross section (b)			
199105	Merla+	C,91JUELIC,,510,1991		[12]			1.773(33)	2.395(40)	2.449(27)[a]	2.473(59)
198709	Herbach	T,HERBACH,1989		[138]			1.800(39)[C]	2.420(95)[D]	2.474(43)[G]	2.512(68)[N]
198709	Herbach	T,HERBACH,1989						2.640(111)[E]	2.494(43)[H]	
198709	Herbach	T,HERBACH,1989						2.417(51)[F]	2.527(43)[I]	
198612	Shpakov	J,YK,,(4),19,1986	R,INDC(CCP)-302,33,1989	[23]	2.01(5)		1.740(35)	2.350(44)		2.487(88)
198604	Herbach+	S,ZFK-592,152,1986	S,INDC(GDR)-42,152,1986	[140]			1.740(35)	2.350(44)		2.487(88)
198604	Herbach+	S,ZFK-584,4,1986	P,INDC(GDR)-46,4,1986	[173]			1.740(35)	2.350(43)[A]		2.431(58)[B]
198510	Kovalenko+	J,IP,21,344,1985		[122]			1.739(34)[b]	2.406(70)[b]	2.394(24)	2.479(86)[b]
198507	Herbach+	S,ZFK-559,20,1985	P,INDC(GDR)-41,20,1985	[174]						2.502(95)
198506	Herbach+	R,INDC(GDR)-36,1985		[175]			1.740(35)[c]	2.350(44)[d]		2.487(88)[e]
198505	Herbach+	R,INDC(GDR)-35,1985		[146]			1.740(35)	2.350(44)		2.487(88)
198410	Arlt+	J,AE,57,249,1984	J,SJA,57,702,1984	[176]				2.40(7)		
198312	Alkhazov+	C,83MOSKVA,2,201,1983		[132]		2.309(28)[f]			[2.385][g]	
198310	Arlt+	C,83KIEV,2,129,1983		[177]				2.40(7)		
198310	Dushin+	J,AE,55,218,1983	J,SJA,55,656,1983	[5]		2.309(30)			2.377(23)	
198310	Dushin+	J,AE,55,218,1983	J,SJA,55,656,1983			2.349(45)			2.394(24)	
198212	Arlt+	S,ZFK-491,135,1982	S,INDC(GDR)-26,135,1982	[134]					2.394(24)	
198200	Wagner	T,WAGNER,1982		[121]					2.377(26)[K]	
198200	Wagner	T,WAGNER,1982							2.394(26)[L]	
198200	Wagner	T,WAGNER,1982							2.444(29)[M]	
198102	Arlt+	J,KE,24,48,1981		[153]		2.505(45)			2.394(24)	
198006	Arlt+	P,INDC(GDR)-12,9,1980		[120]		2.505(45)			2.394(24)	
198005	Arlt+	P,ZFK-408,26,1980	S,INDC(GDR)-14,26,1980	[157]		2.505(45)			2.394(24)	
198001	Arlt+	S,ZFK-410,122,1980	S,INDC(GDR)-133,122,1980	[158]		2.505(45)			2.394(24)	
197910	Arlt+	C,79KNOX,,990,1979		[116]		2.505(45)			2.394(24)[h]	
197910	Adamov+	C,79KNOX,,995,1979		[115]		2.505(51)[i,k]				
197906	Arlt+	P,ZFK-385,18,1979		[171]					2.360(26)	
197901	Arlt+	S,ZFK-382,180,1979	S,INDC(GDR)-9,180,1979	[161]					2.360(28)[j]	
197704	Alkhazov+	C,77KIEV,3,155,1977		[135]		2.620(46)				
197703	Adamov+	R,YFI-23,17,1977		[136]		2.620(46)				
197700	Adamov+	R,YK-24,8,1977		[137]		2.620(46)				

(Footnote of Table 20)
Comment by the authors of the reference:
[a] The measurements at TUD were published in detail already in C,79KNOX,990,1979 and J,KE,24,48,1981, but revised basing on the experimentally determined fission fragment absorption and new values of the layer areal density.
[b] Preliminary value.
[c] Measurement in Feb. 1985.
[d] Summarized from three measurements at Mar. 1983, Apr. 1983 and Feb. 1985.
[e] Test measurement in Nov. 1984.
[f] Result of the last measurement completed in 1980-1981.
[g] 14.5–14.7 MeV cross section.
[h] Preliminary data of the measurement has been published earlier in S,ZFK-382,180,1979.
[i] Earlier result revised for neutron attenuation correction (Monte Carlo instead of analytical method).
[j] Preliminary data.
[A] Average of the three measurements in Mar. 1983, Apr.1983 and Feb. 1985.
[B] Average of the two measurements in Nov.1984 and July 1985.
[C] Measured in Feb. 1985.
[D] Measured in Mar. 1983. Average of the three measurements is 2.433(50).
[E] Measured in Apr. 1983. Average of the three measurements is 2.433(50).
[F] Measured in Feb. 1985. Average of the three measurements is 2.433(50).
[G] Revised from 2.377(26) in T,WAGNER,1982. Average of the three measurements is 2.488(38) after revision.
[H] Revised from 2.394(26) in T,WAGNER,1982. Average of the three measurements is 2.488(38) after revision.
[I] Revised from 2.444(29) in T,WAGNER,1982. Average of the three measurements is 2.488(38) after revision.
[K] Measured in Apr.1978. Citing S,ZFK-382,180,1979, P,ZFK-408,26,1980 and P,ZFK-385,239,1979.
[L] Measured in Feb. 1979. Citing S,ZFK-410,122,1980, P,ZFK-408,27,1980 and J.KE,24,48,1981.
[M] Measured in Feb. 1981.
[N] Average of the two measurements in Nov.1984 and July 1985. The Nov. 1984 run gives 2.572(99). Citing P,ZFK-584,4,1986.

Comment by Dushin et al. [5]:
[k] This value was excluded from the statistical analysis since it was known to be inconsistent.

4 Comparison of newly evaluated cross sections with cross sections in libraries

The fission cross sections obtained by least-squares fitting of Schmittroth's roof function by SOK are compared with the experimental cross sections and the evaluated cross sections compiled in IAEA Neutron Standards 2017 [178], CENDL-3.2 [179], ENDF-B/VIII.0 [180], JEFF-3.3 [181] and JENDL-4.0 [182]. The cross sections and their ratios of the evaluated data libraries were extracted from the IAEA ENDF Web retrieval system (http://nds.iaea.org/endf/ [183]). Figure 15 shows a web page where the JENDL-4.0 ^{235}U (dataset 1) and ^{235}U fission cross sections (dataset 2) are ready for plotting, and the quantity to be plotted (ratio to the dataset 1) is specified near the bottom of the screen shot ("Plot data or ratio"). The plotted cross sections and cross section ratios determined by the present evaluation are from the SOK output (fort.15) without further processing such as smoothing by cubic-spline interpolation. Figures 16 to 38 show these comparisons. Readers are referred to Tables 3 to 15 for the reference of each experimental dataset plotted in these figures. The band accompanying the newly evaluated cross sections and their ratios are external uncertainties which are the uncertainties printed in the SOK output (fort.15) multiplied by the square-root of the reduced chi-square (2.00). The ^{233}U fission cross section of ENDF/B-III.0 and ^{241}Pu fission cross section of JEFF-3.3 are not plotted since they adopt the JENDL-4.0 cross sections. For ENDF/B-VIII.0, the ^{235}U cross section above 100 keV, ^{238}U cross section above 2 MeV, and ^{239}Pu cross section above 100 keV are also not plotted because they adopt the IAEA Neutron Standards 2017.

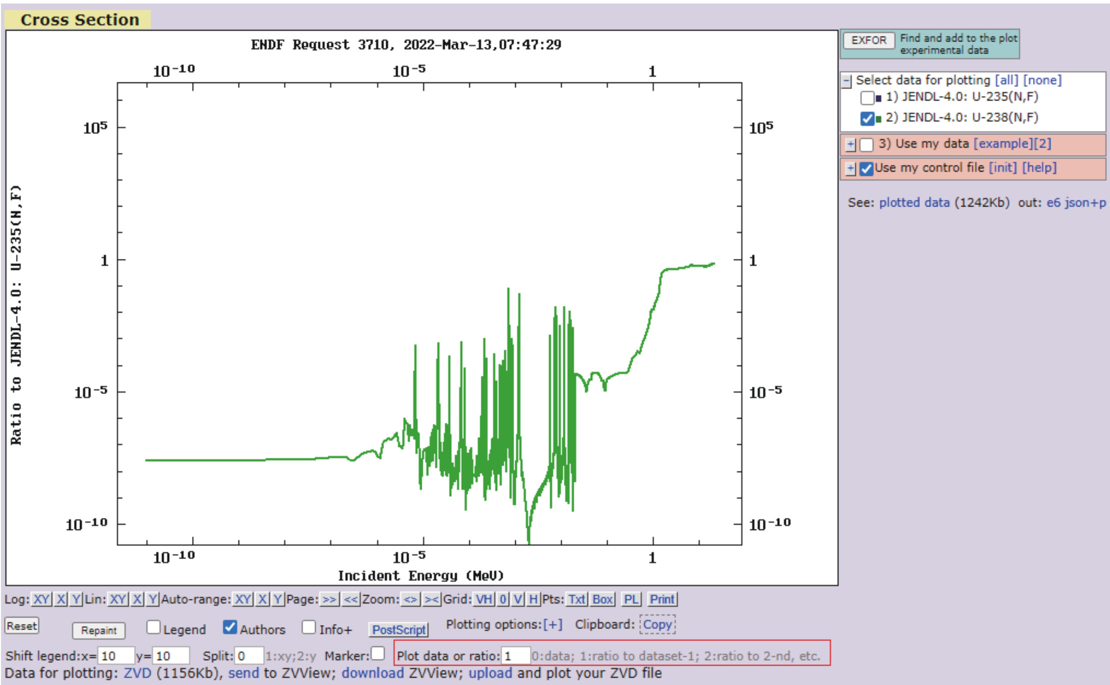
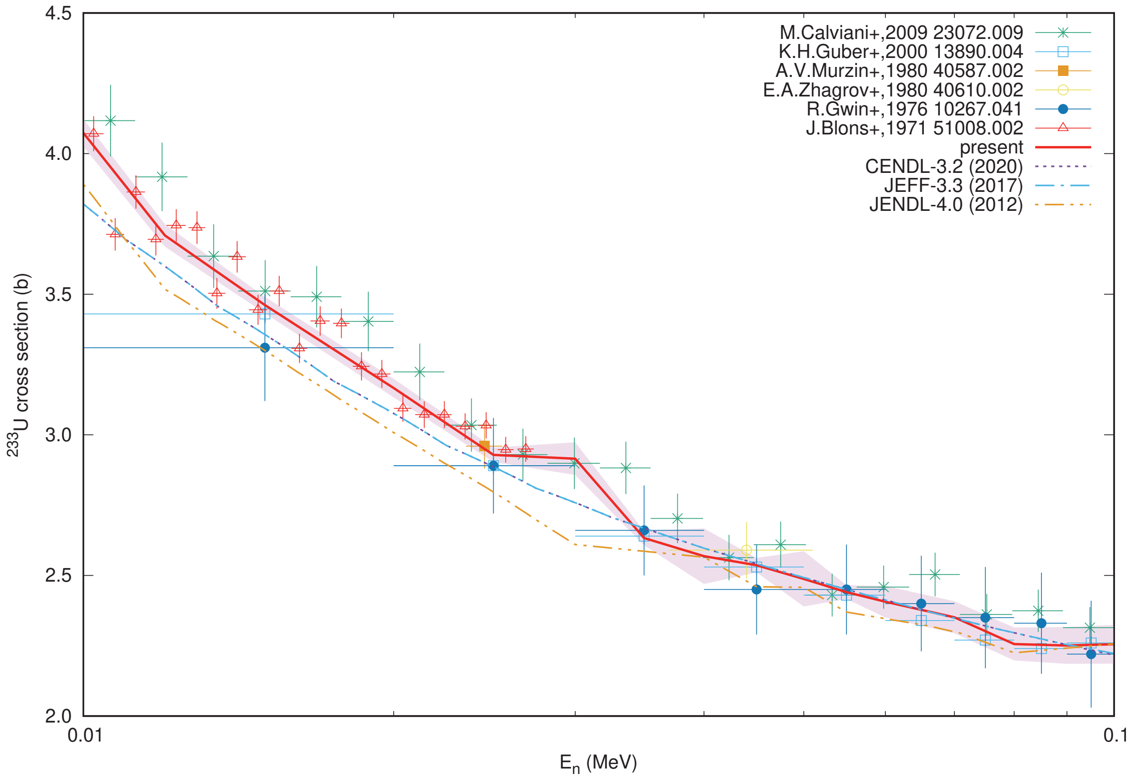


Figure 15: Preparation of ^{238}U/^{235}U fission cross section ratios in JENDL-4.0 on the IAEA ENDF Web retrieval system.



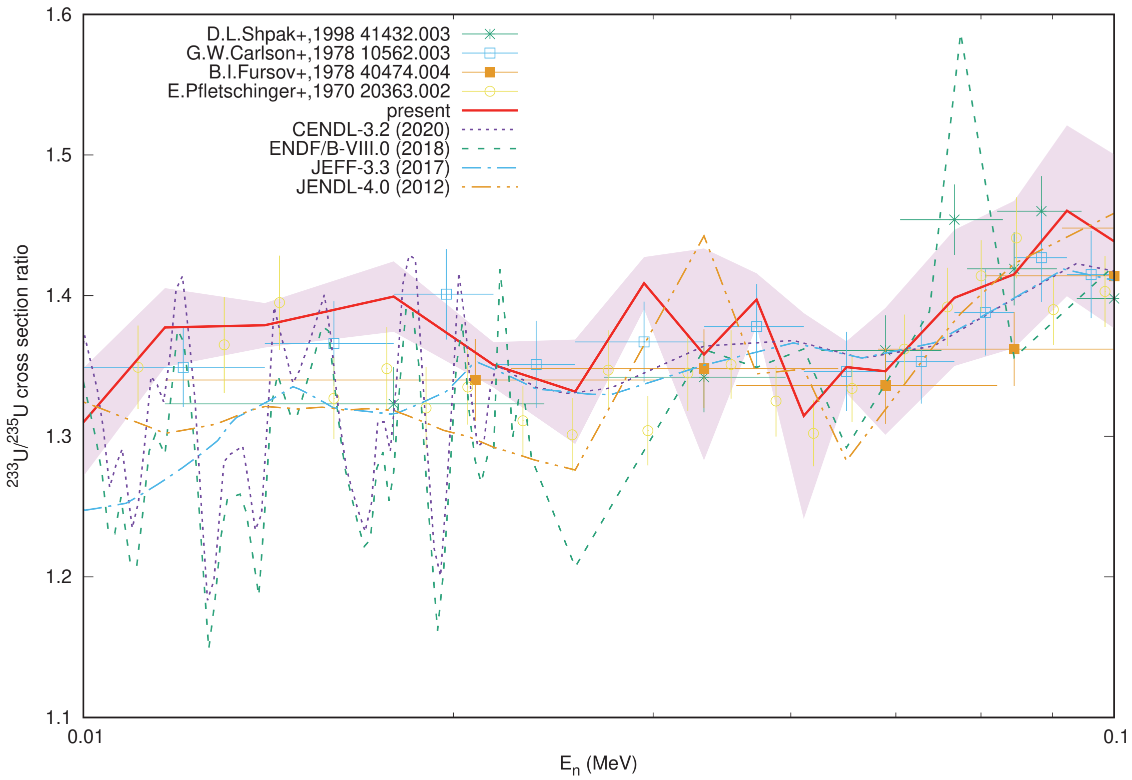


Figure 16: Fission cross section of ^{233}U and its ratio to ^{235}U from 10 keV to 100 keV.

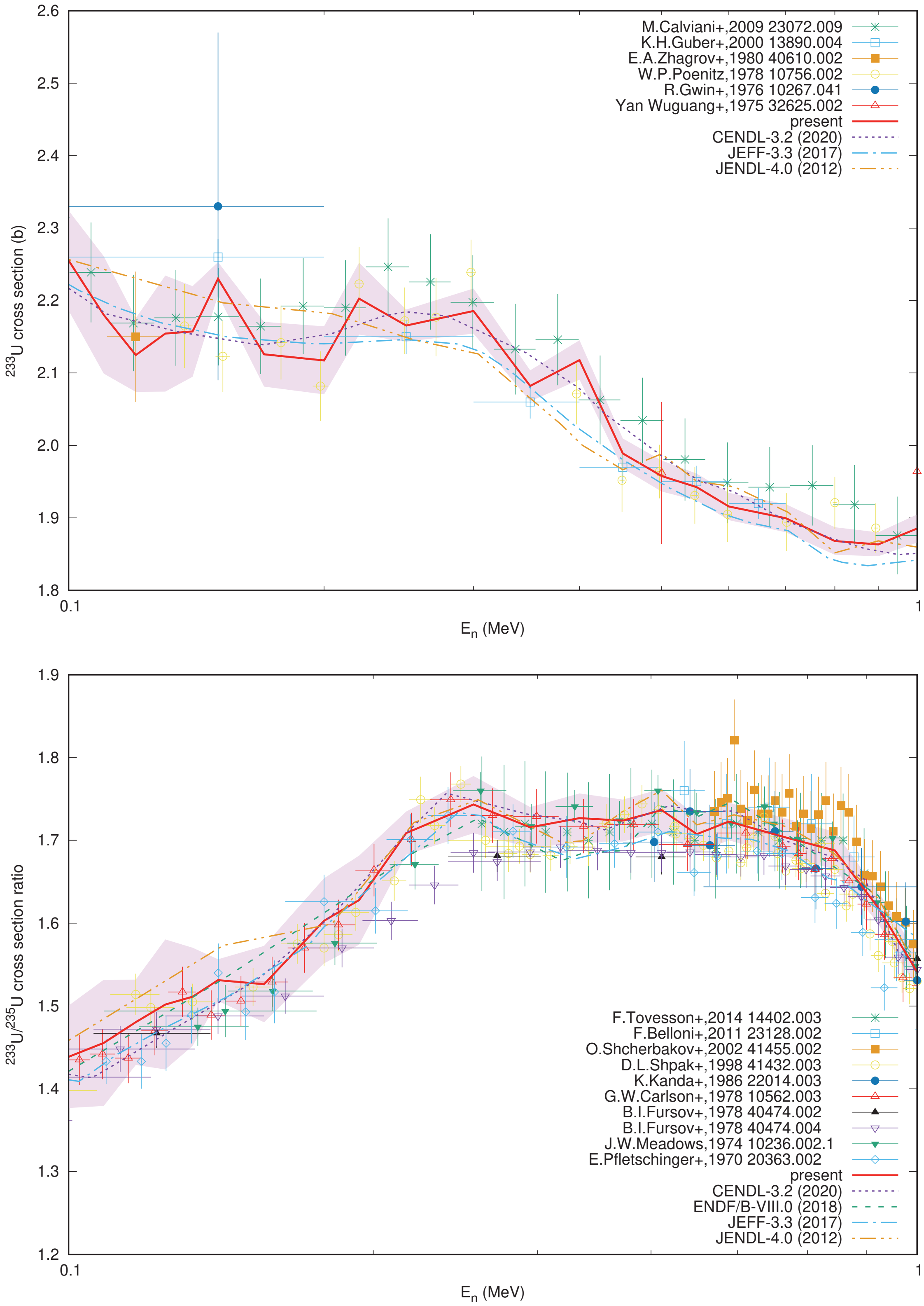
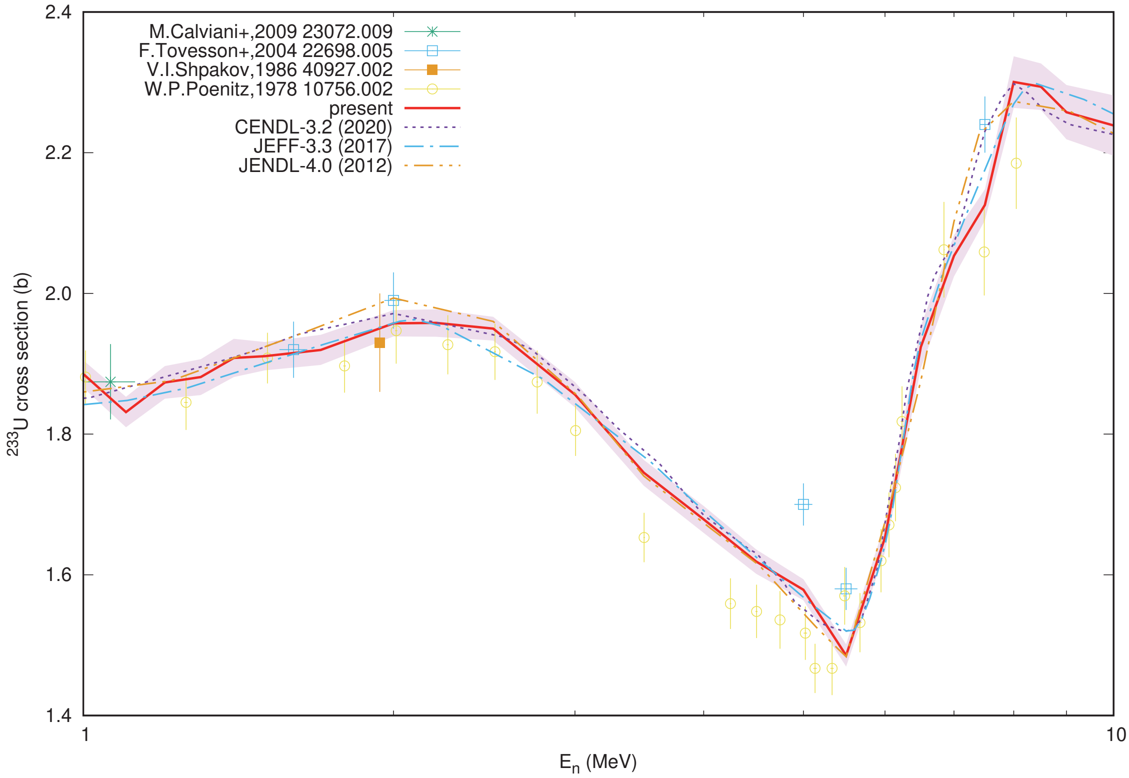


Figure 17: Fission cross section of ^{233}U and its ratio to ^{235}U from 100 keV to 1 MeV.



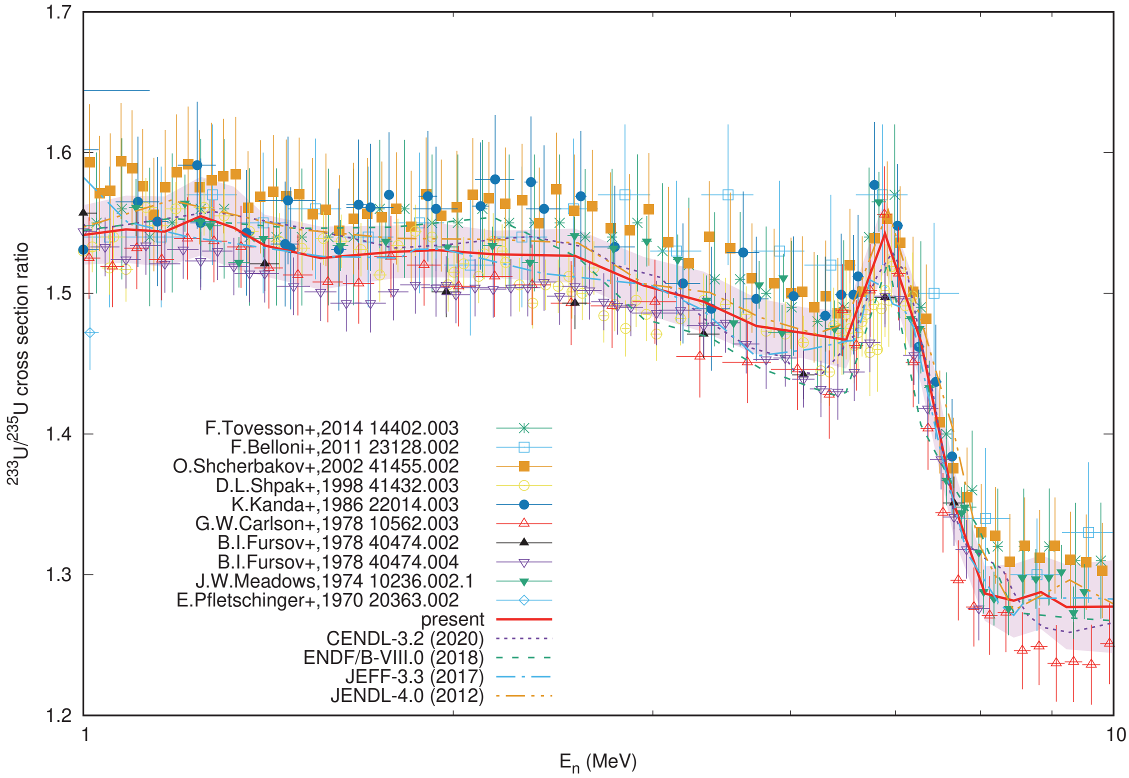


Figure 18: Fission cross section of ^{233}U and its ratio to ^{235}U from 1 MeV to 10 MeV.

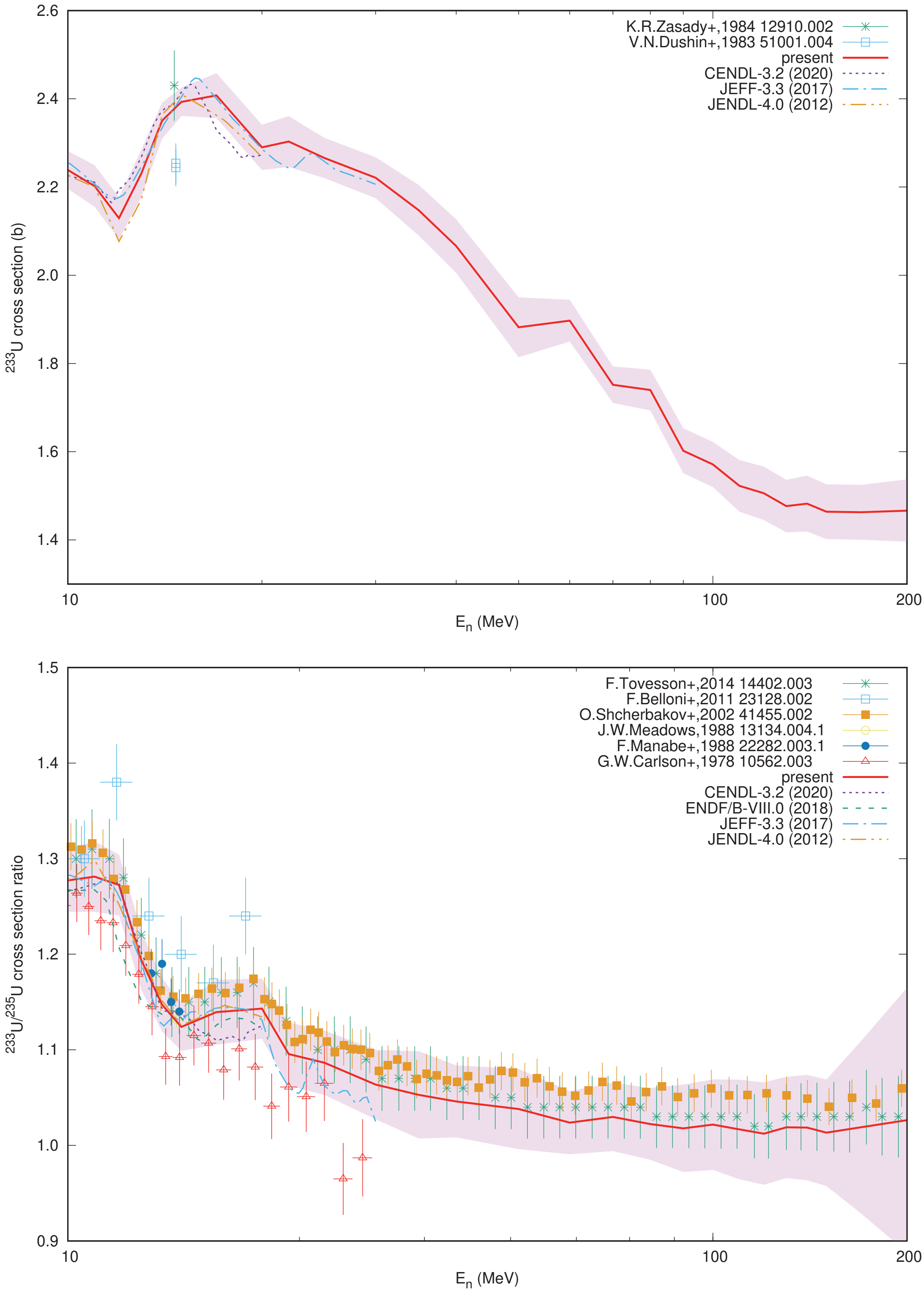


Figure 19: Fission cross section of ^{233}U and its ratio to ^{235}U from 10 MeV to 200 MeV.

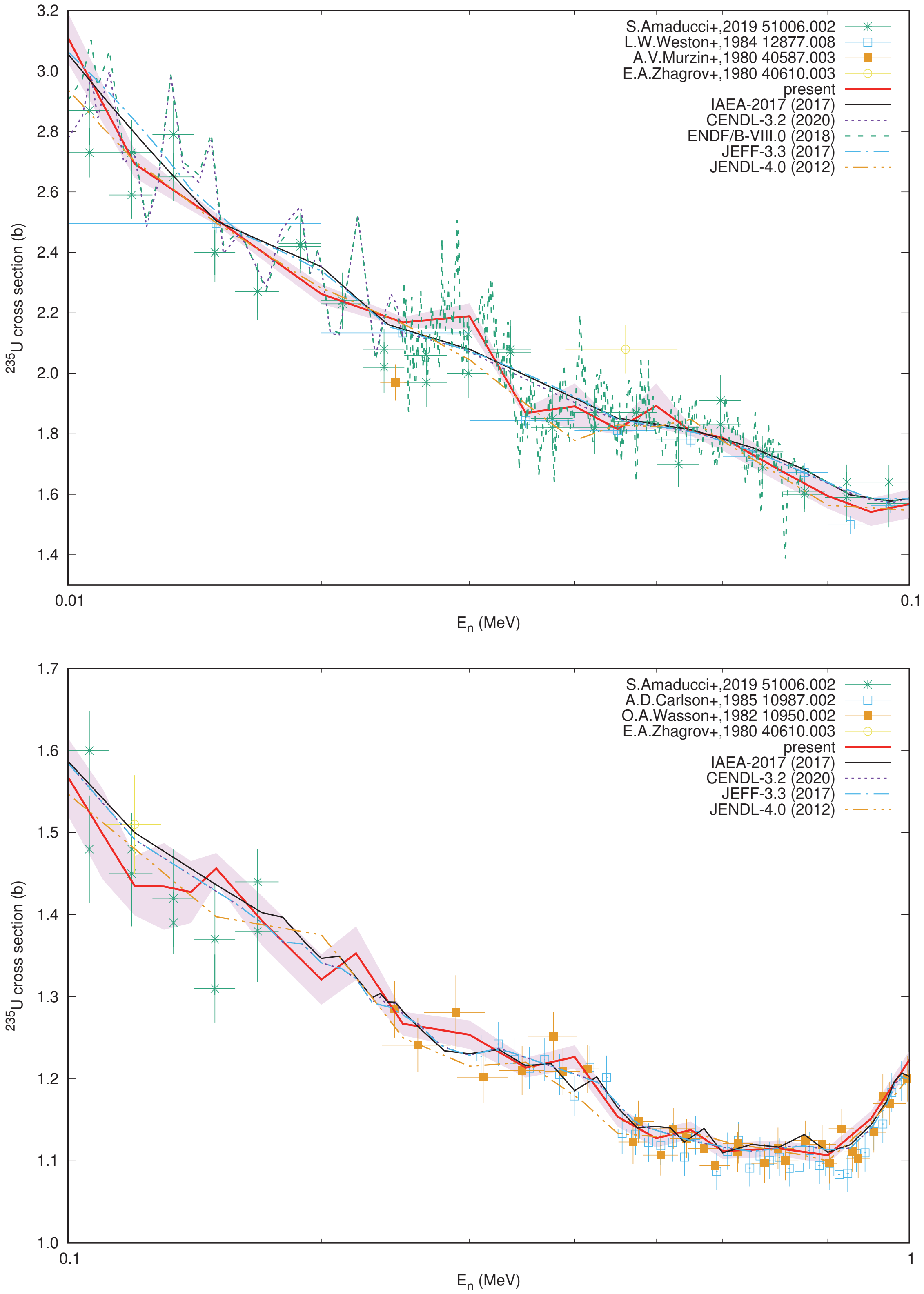


Figure 20: Fission cross section of ^{235}U from 10 keV to 1 MeV.

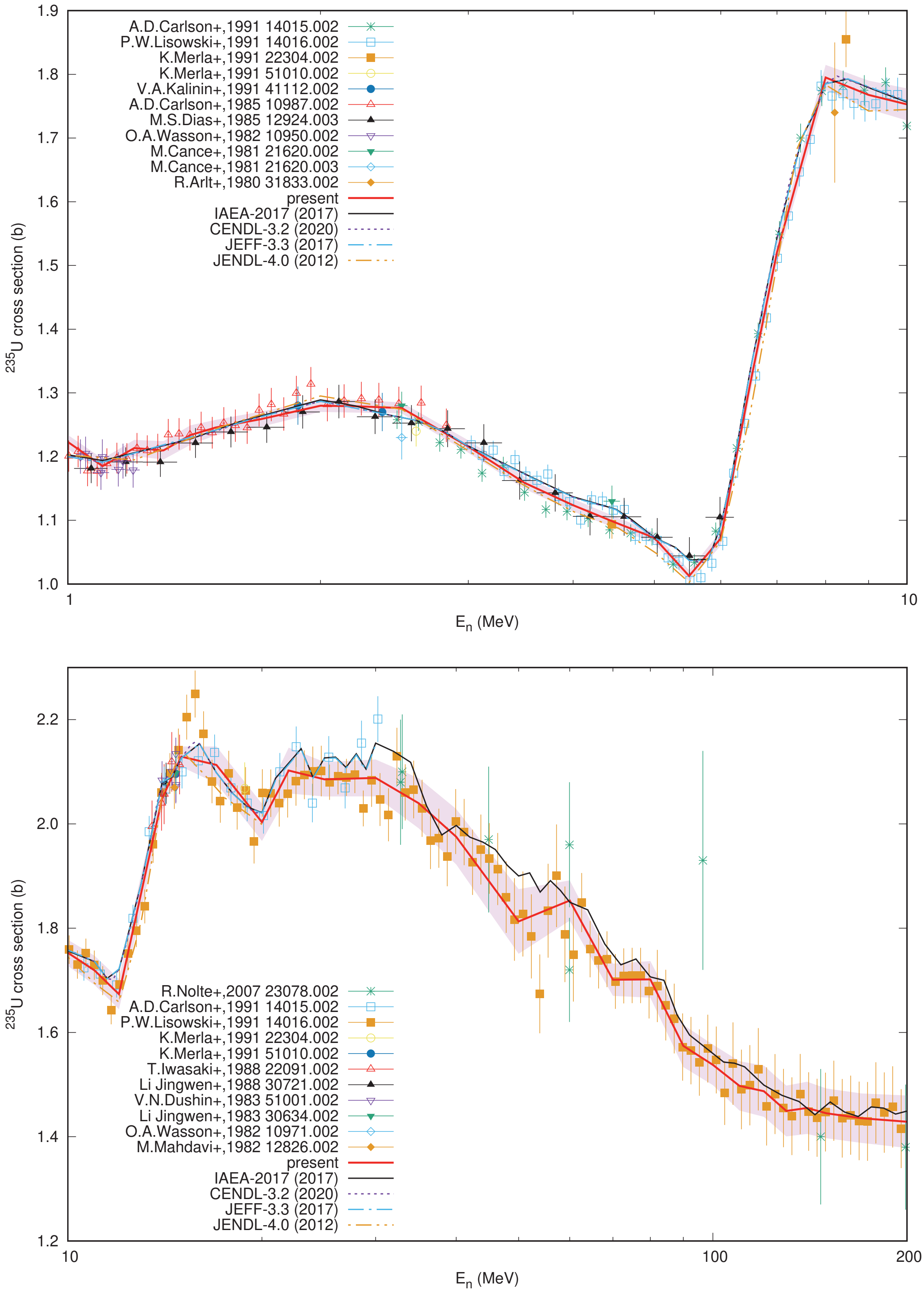
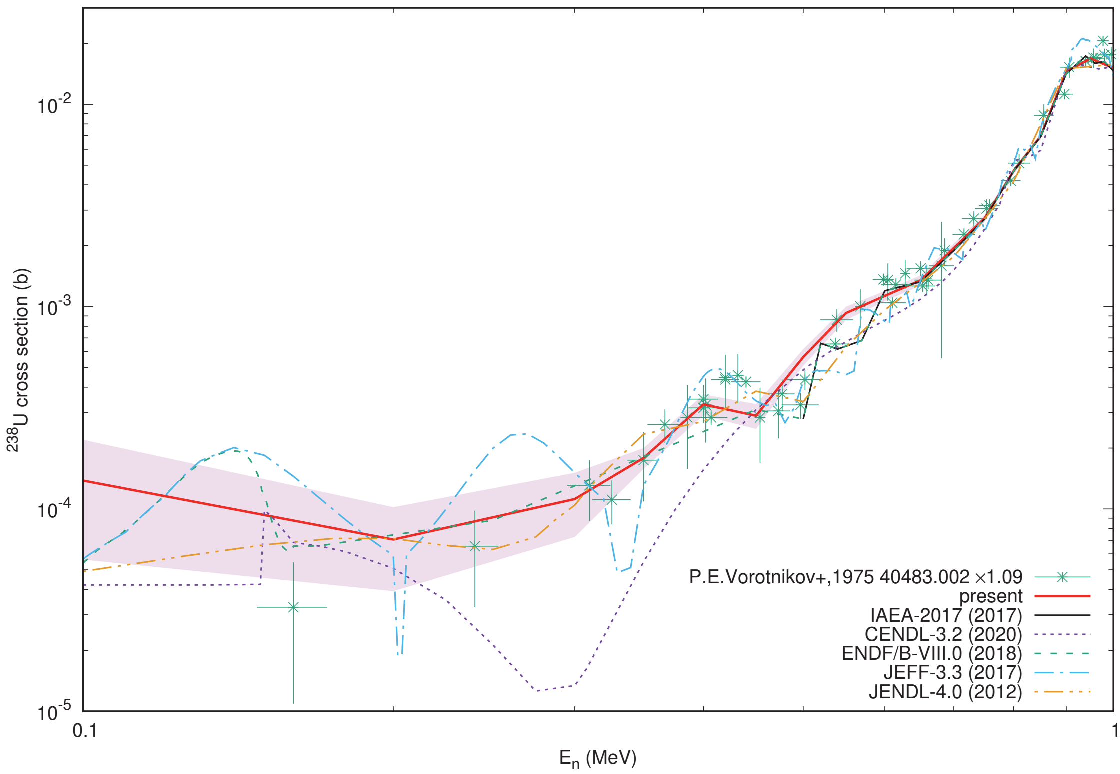


Figure 21: Fission cross section of ^{235}U from 1 MeV to 10 MeV (upper panel) and 10 MeV to 200 MeV (lower panel).



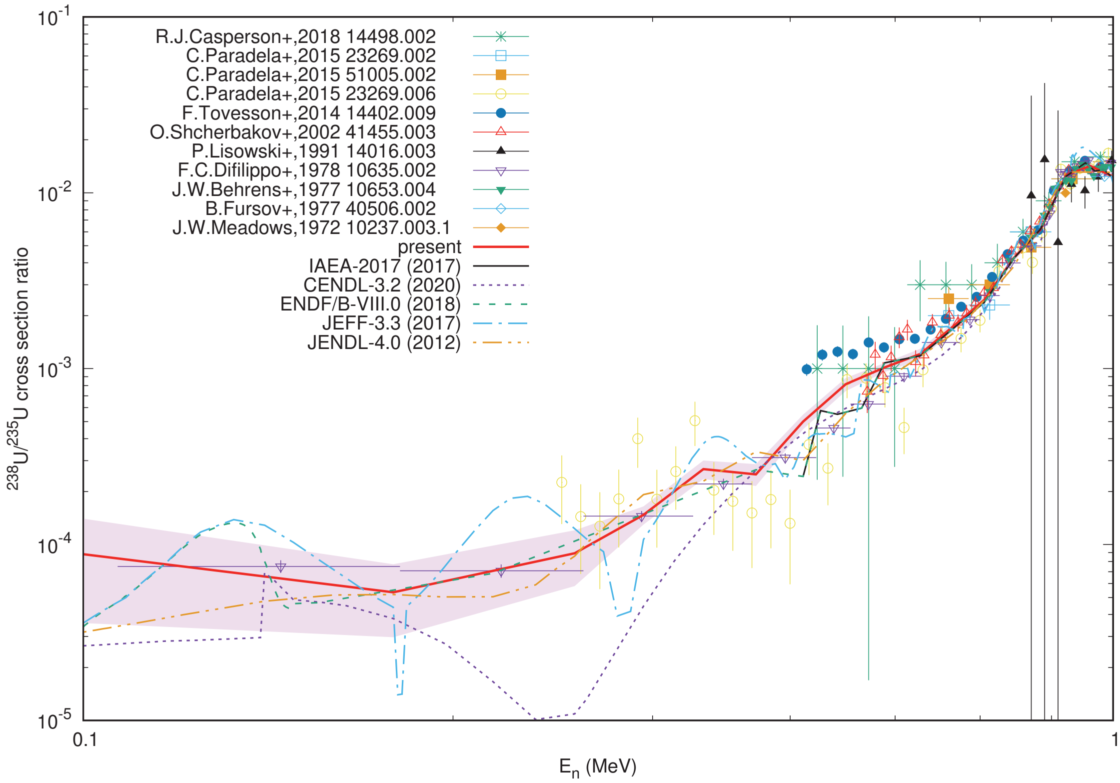


Figure 22: Fission cross section of ^{238}U and its ratio to ^{235}U from 100 keV to 1 MeV.

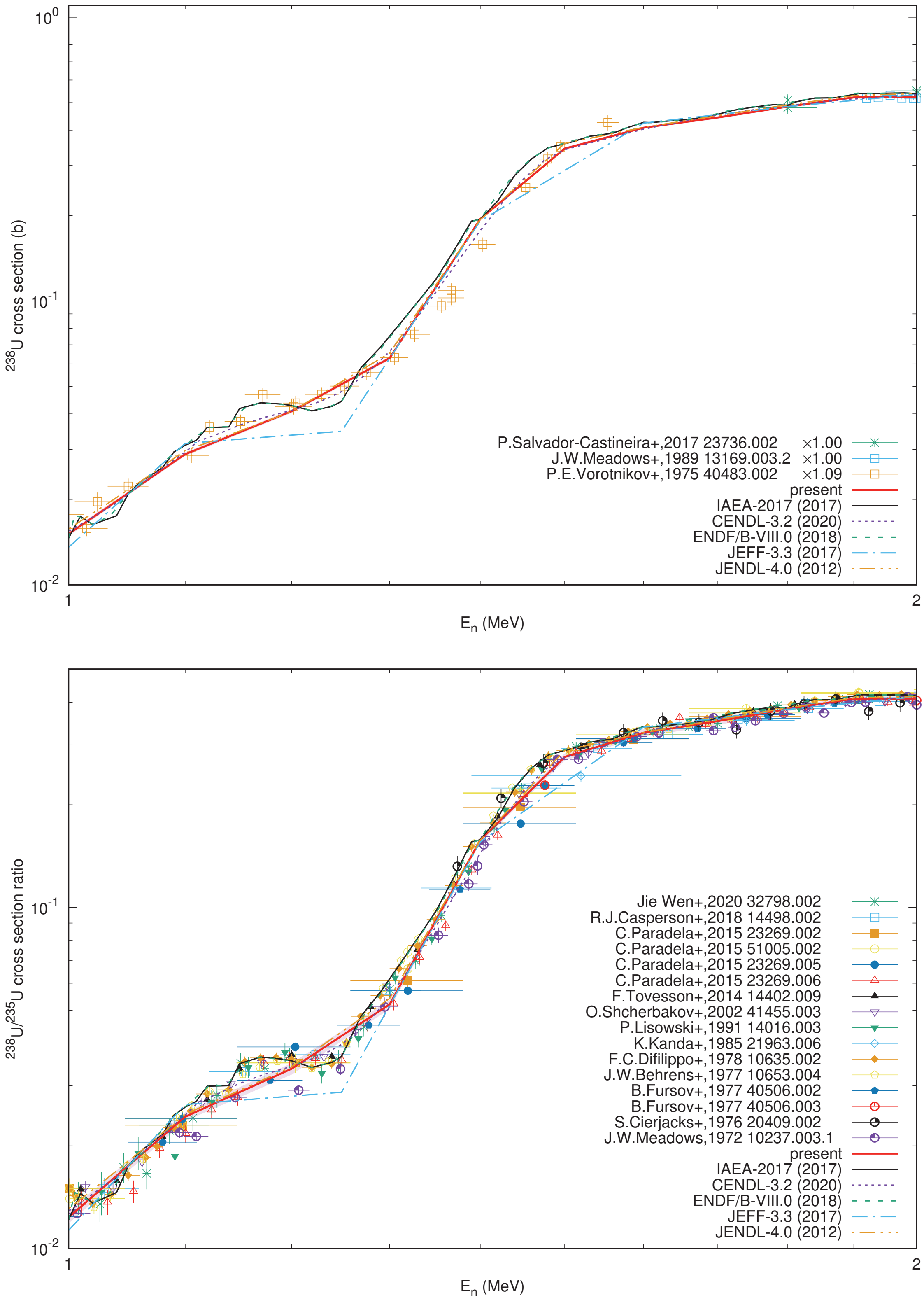
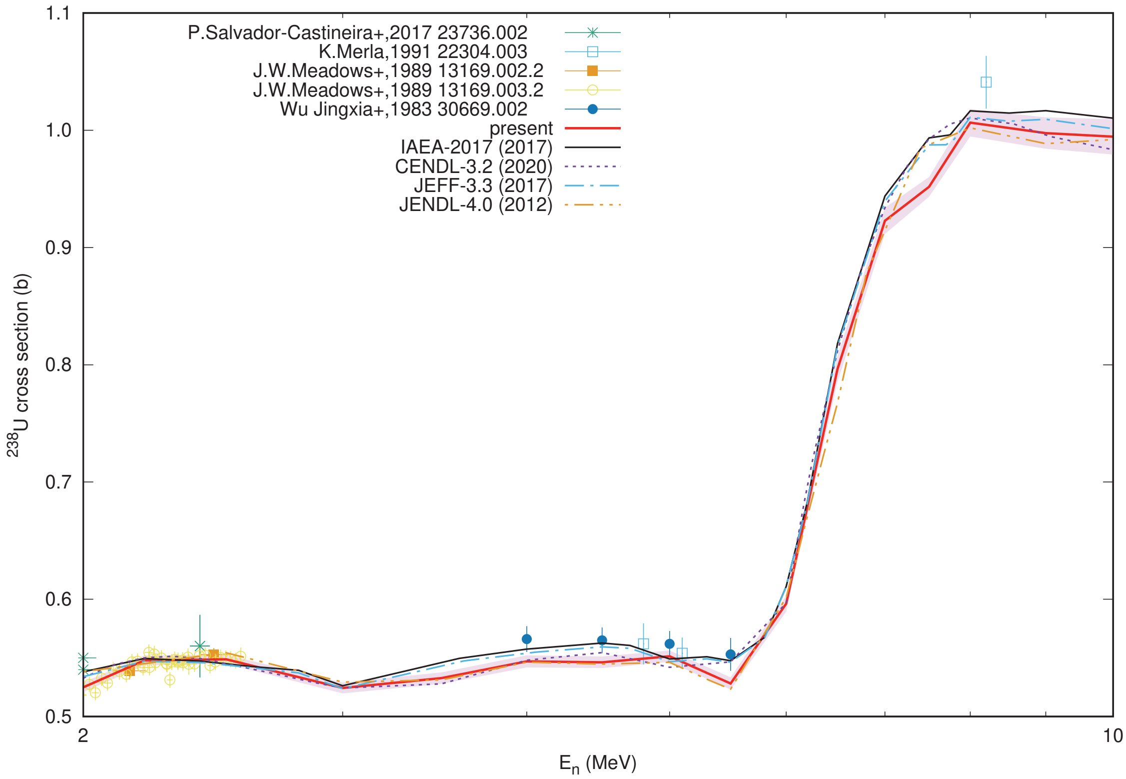


Figure 23: Fission cross section of ^{238}U and its ratio to ^{235}U from 1 MeV to 2 MeV. The data points from Vorotnikov et al. (1975) [52] are multiplied by a renormalization factor 1.09 determined in the present evaluation.



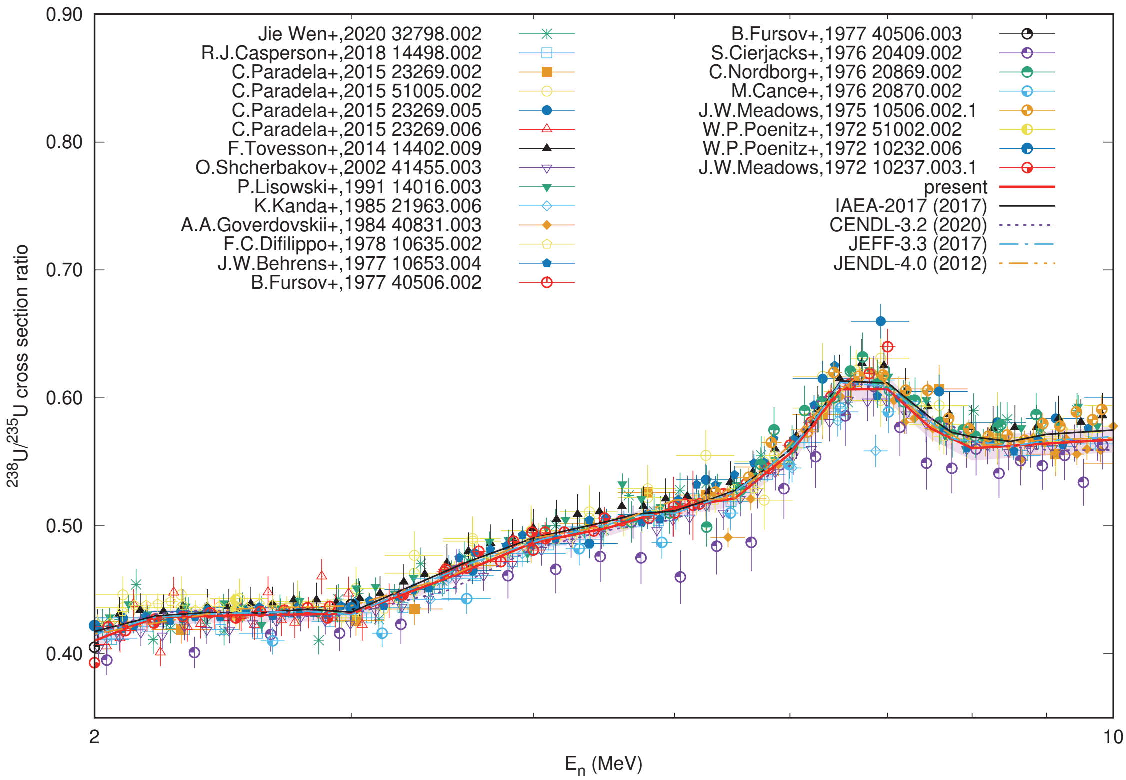


Figure 24: Fission cross section of ^{238}U and its ratio to ^{235}U from 2 MeV to 10 MeV.

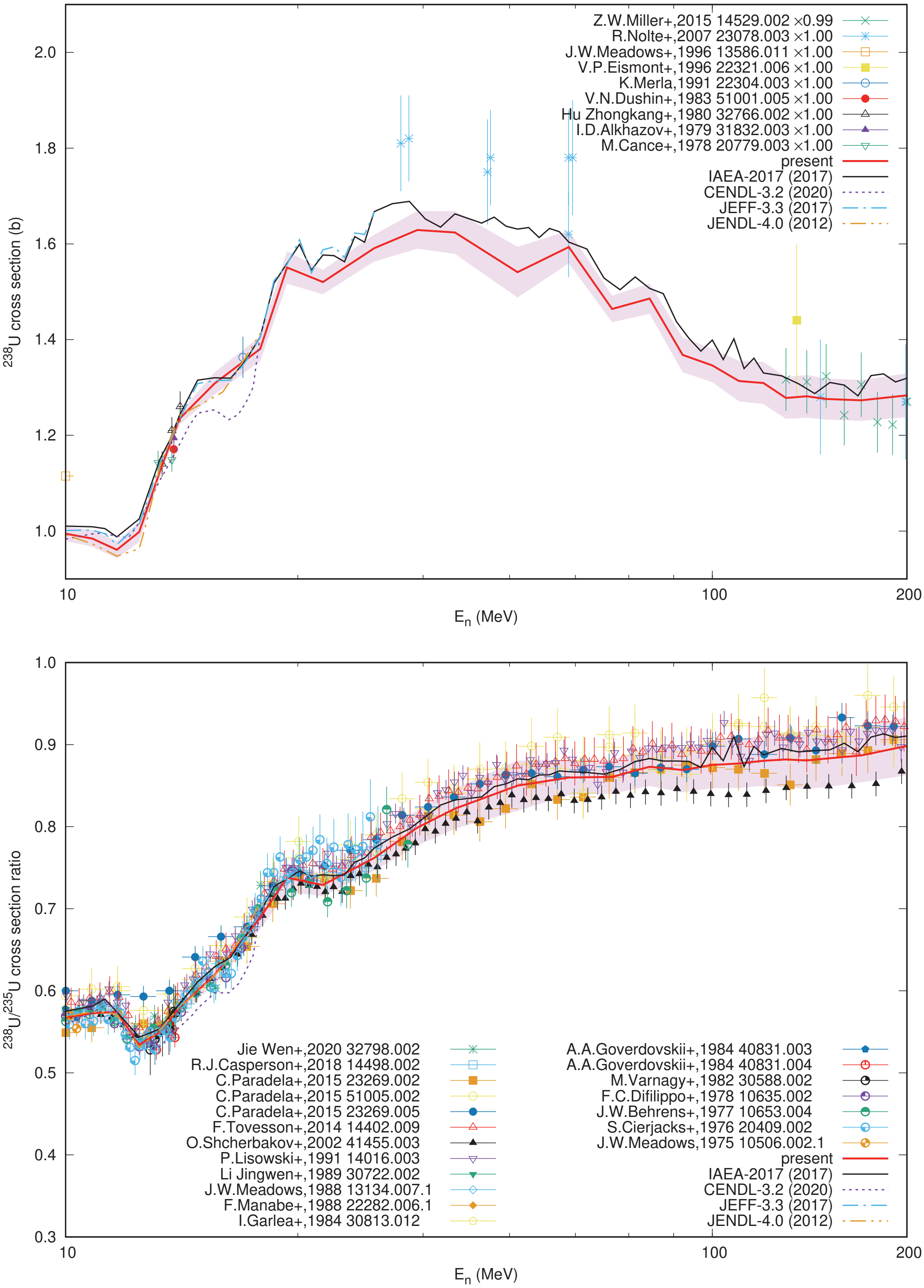
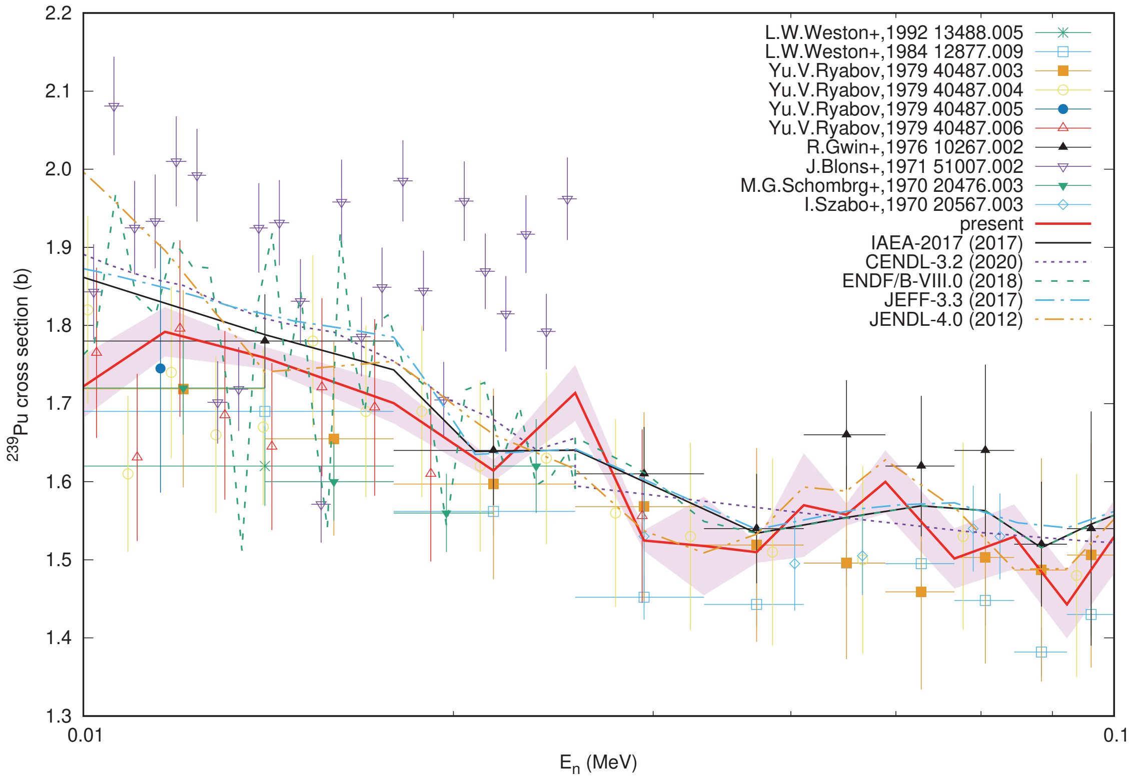


Figure 25: Fission cross section of ^{238}U and its ratio to ^{235}U from 10 MeV to 200 MeV. The data points from Miller (2015) [45] are multiplied by a renormalization factor 0.99 determined in the present evaluation.



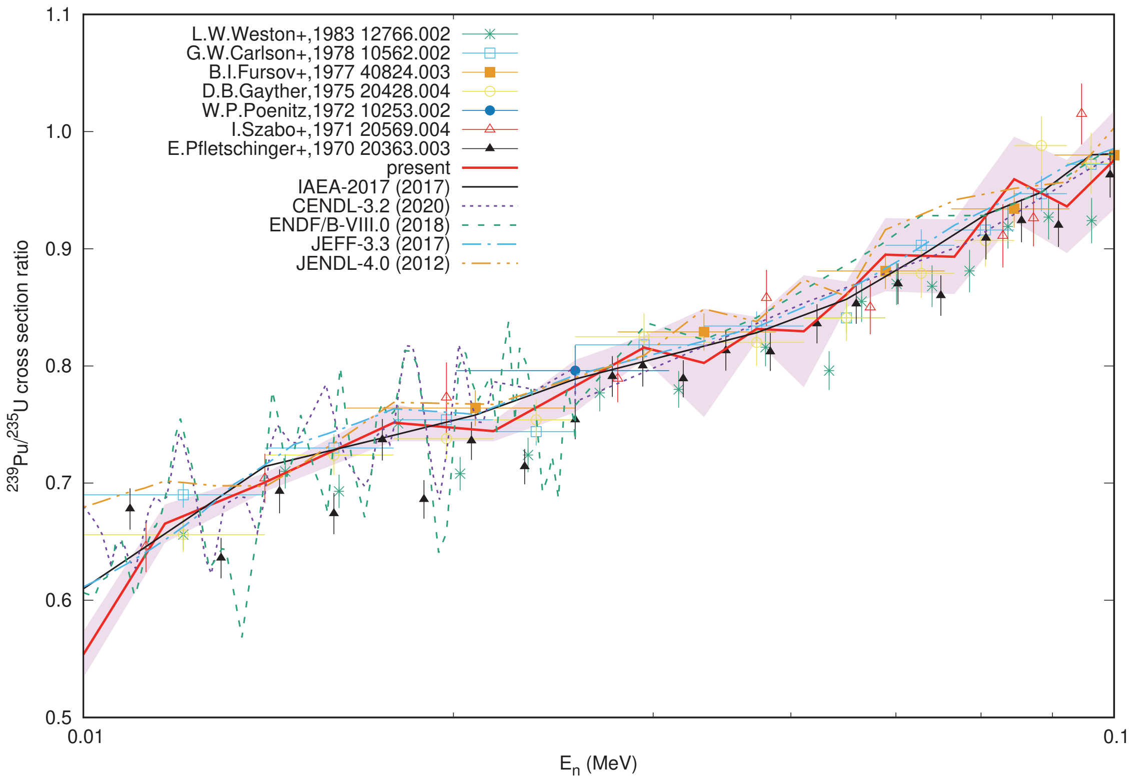
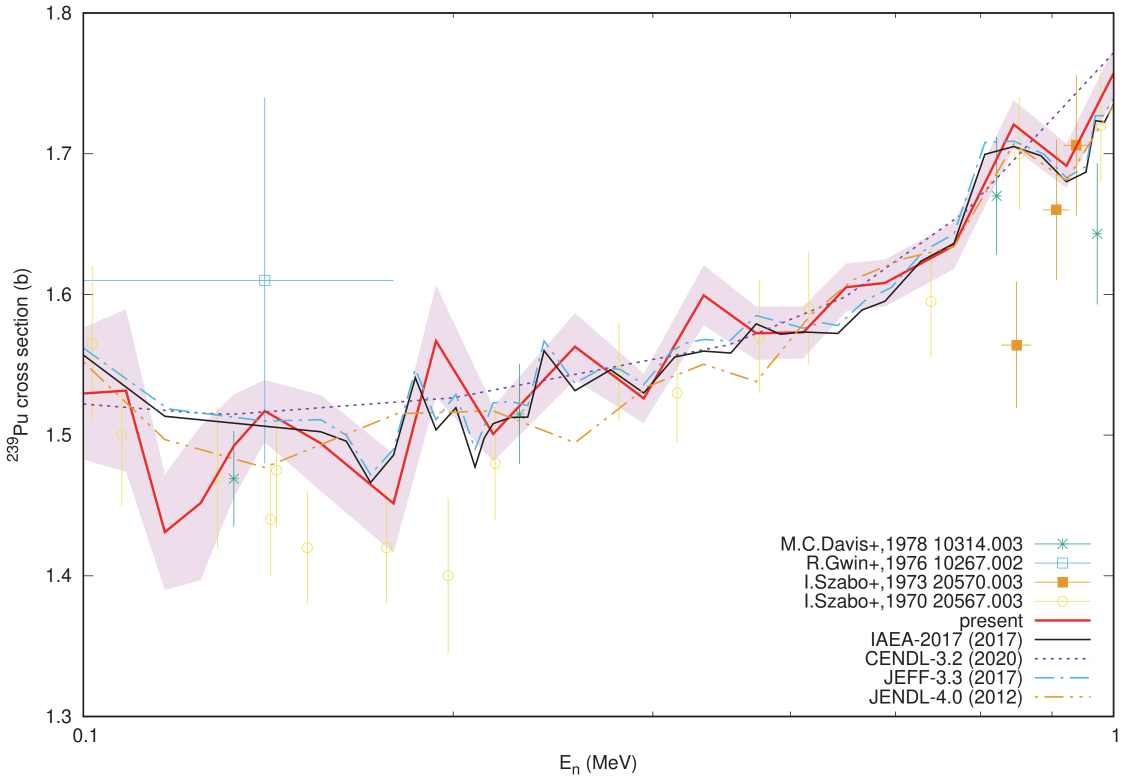


Figure 26: Fission cross section of ^{239}Pu and its ratio to ^{235}U from 10 keV to 100 keV.



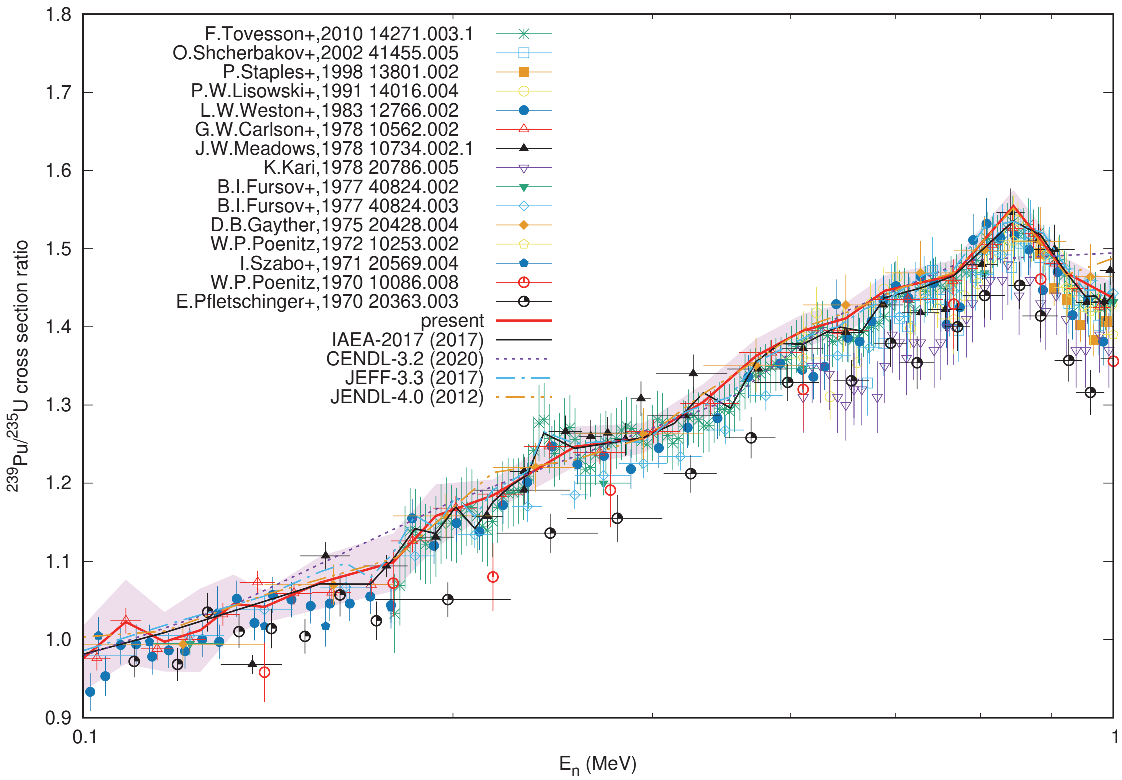


Figure 27: Fission cross section of ^{239}Pu and its ratio to ^{235}U from 100 keV to 1 MeV.

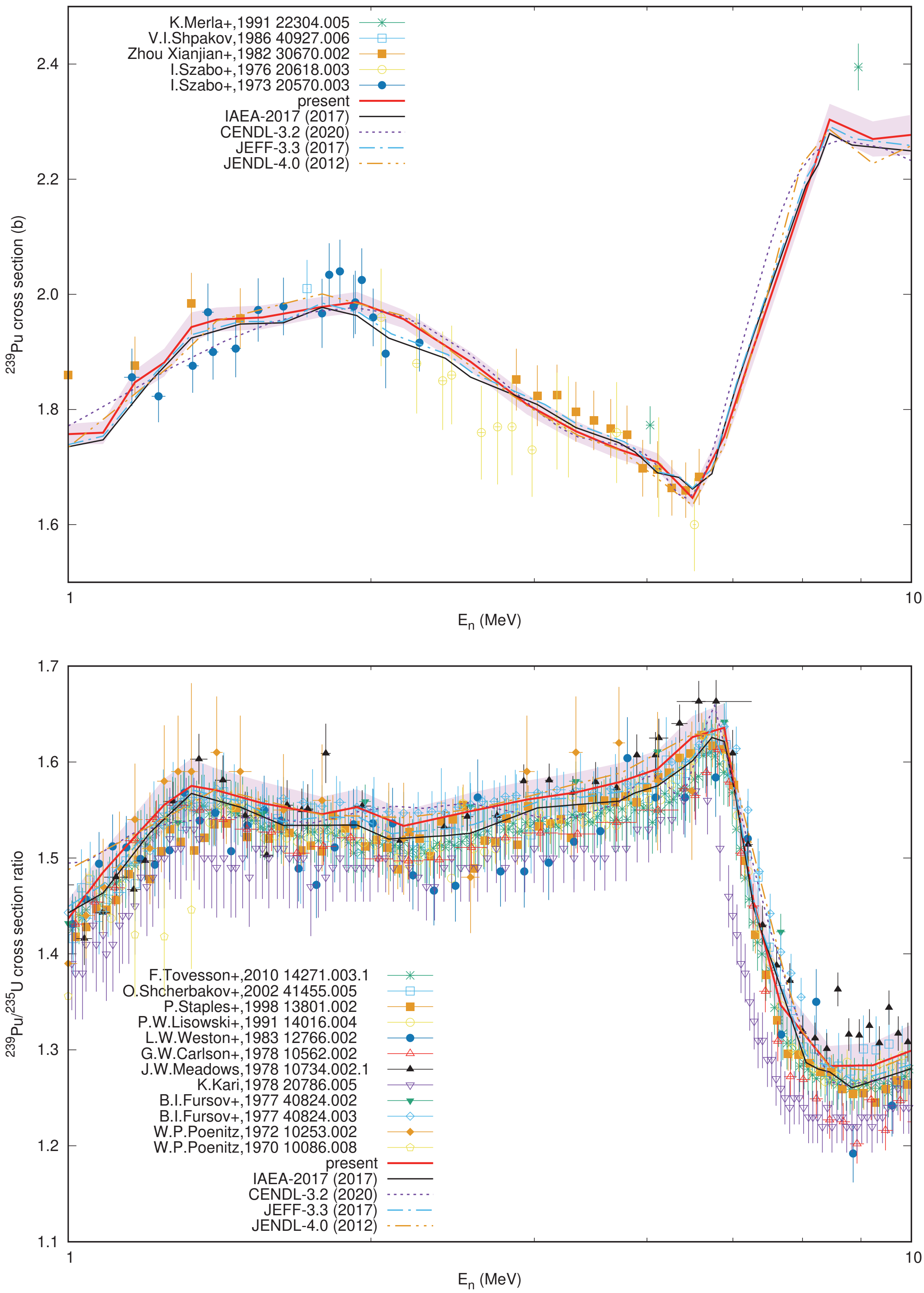
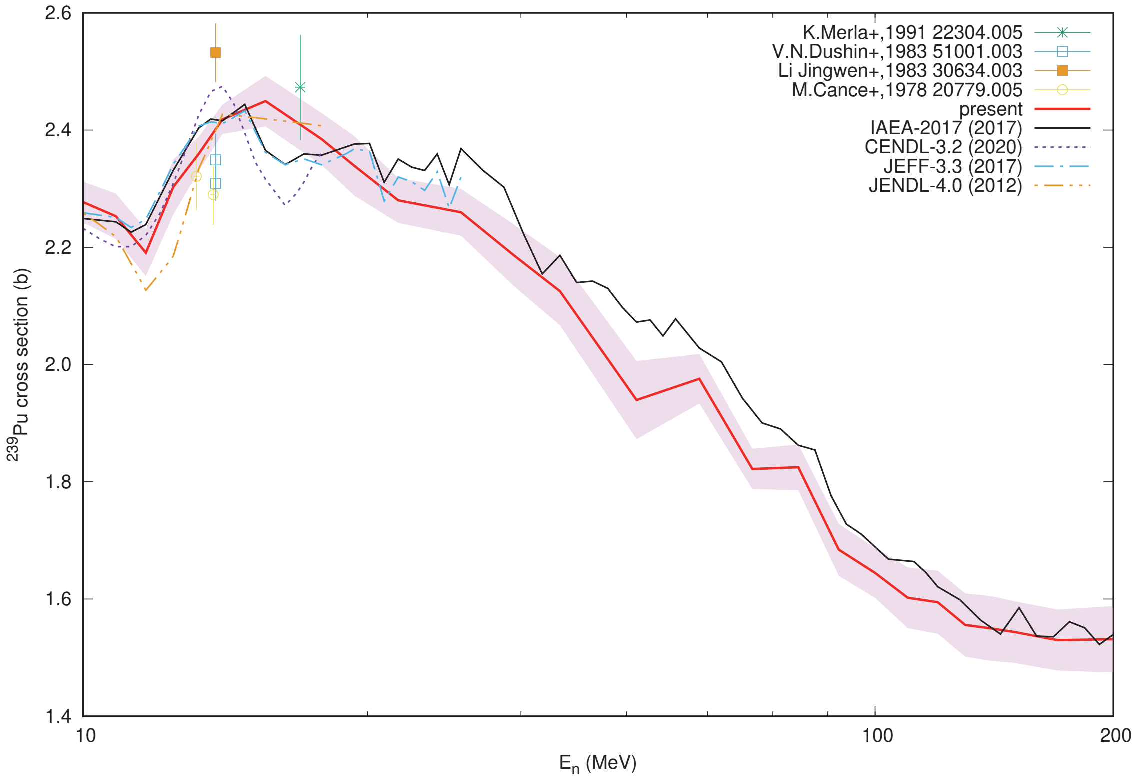


Figure 28: Fission cross section of ^{239}Pu and its ratio to ^{235}U from 1 MeV to 10 MeV.



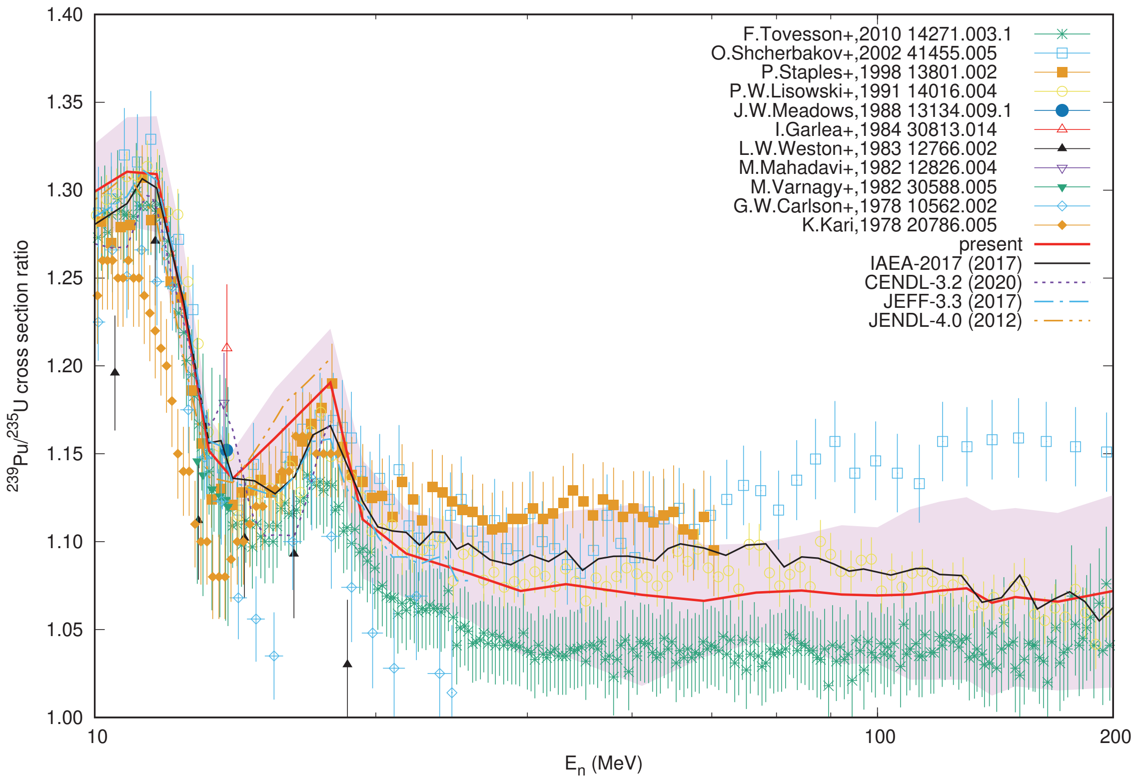
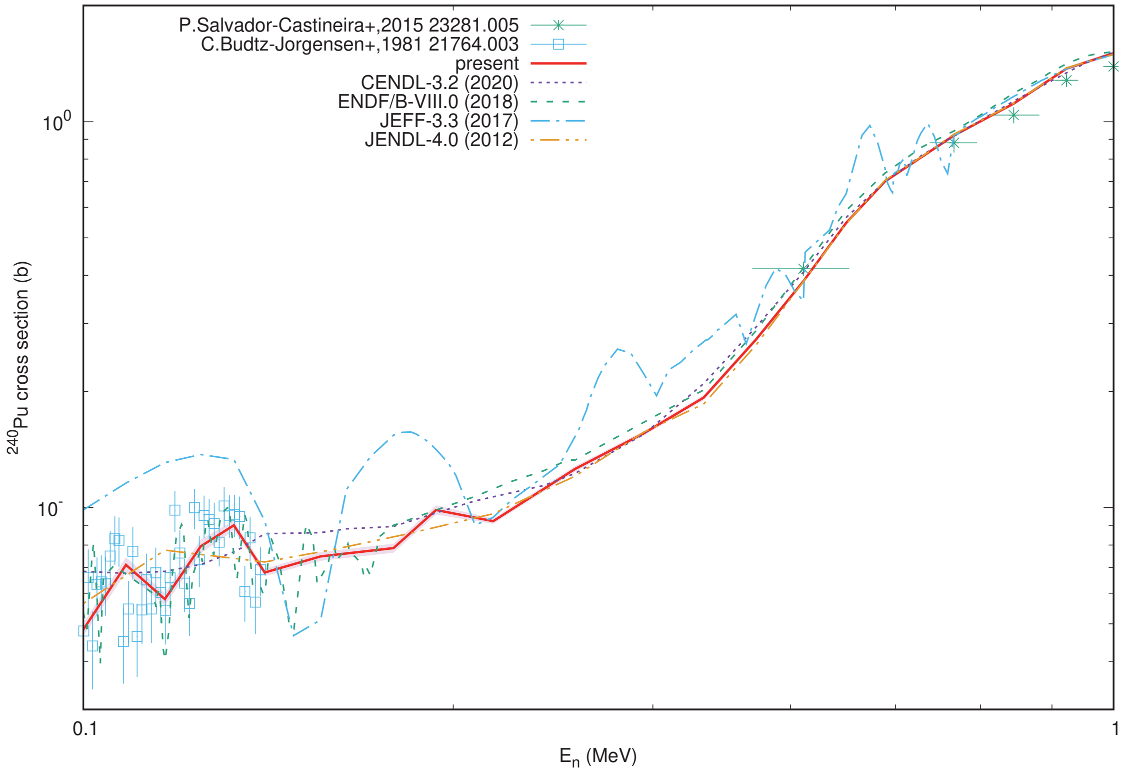


Figure 29: Fission cross section of ^{239}Pu and its ratio to ^{235}U from 10 MeV to 200 MeV.



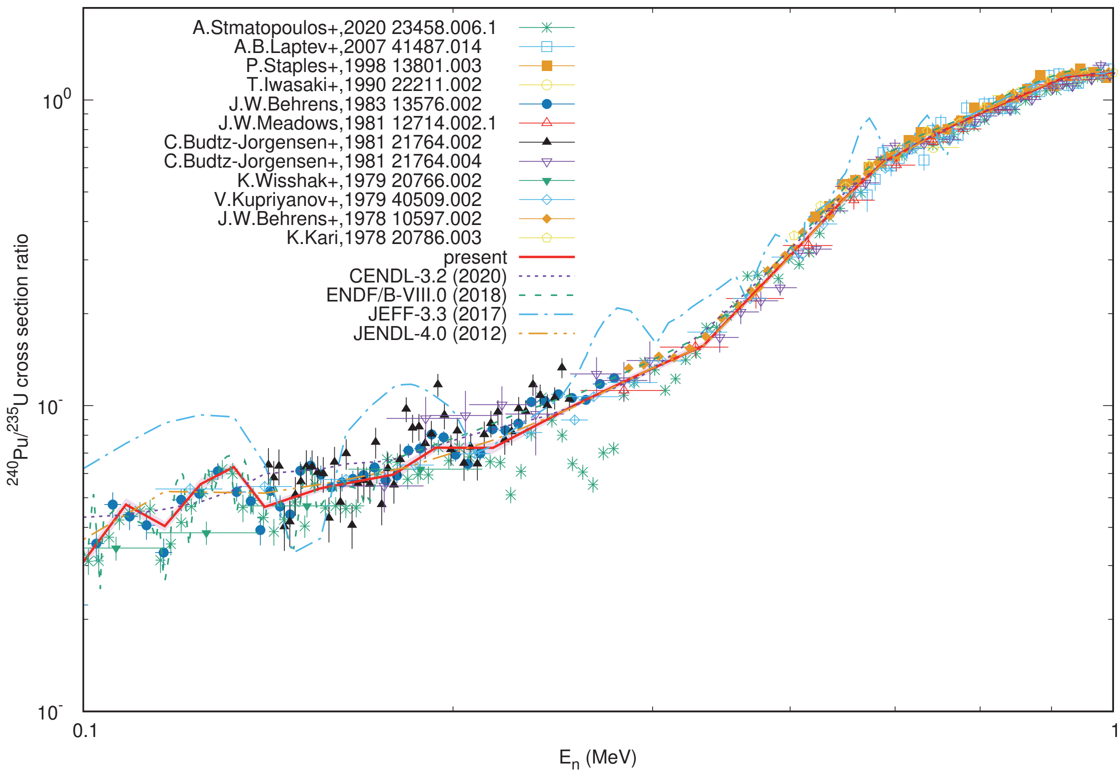
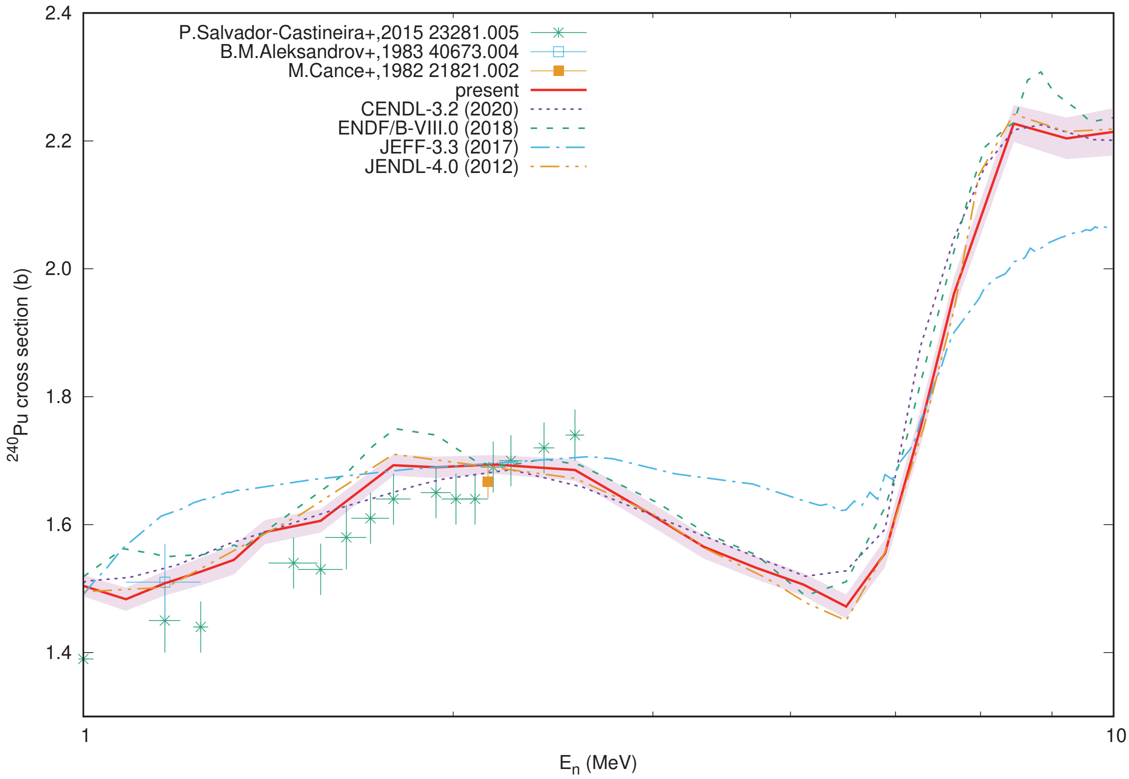


Figure 30: Fission cross section of ^{240}Pu and its ratio to ^{235}U from 100 keV to 1 MeV.



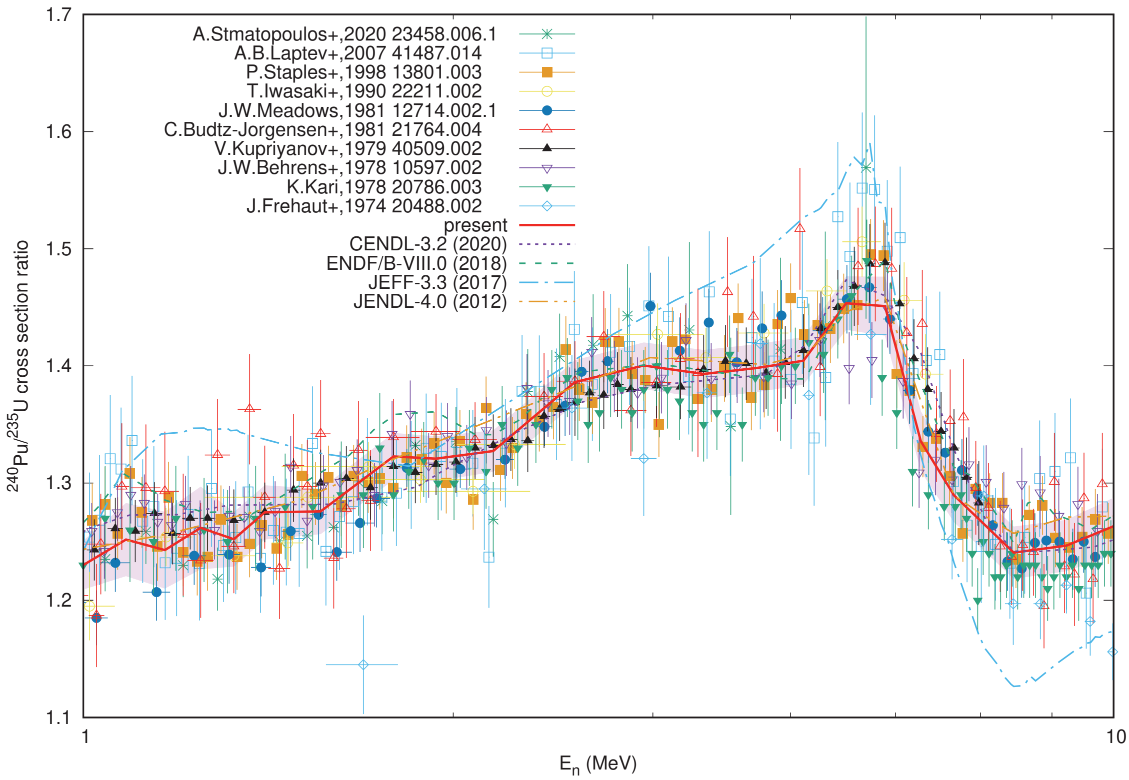
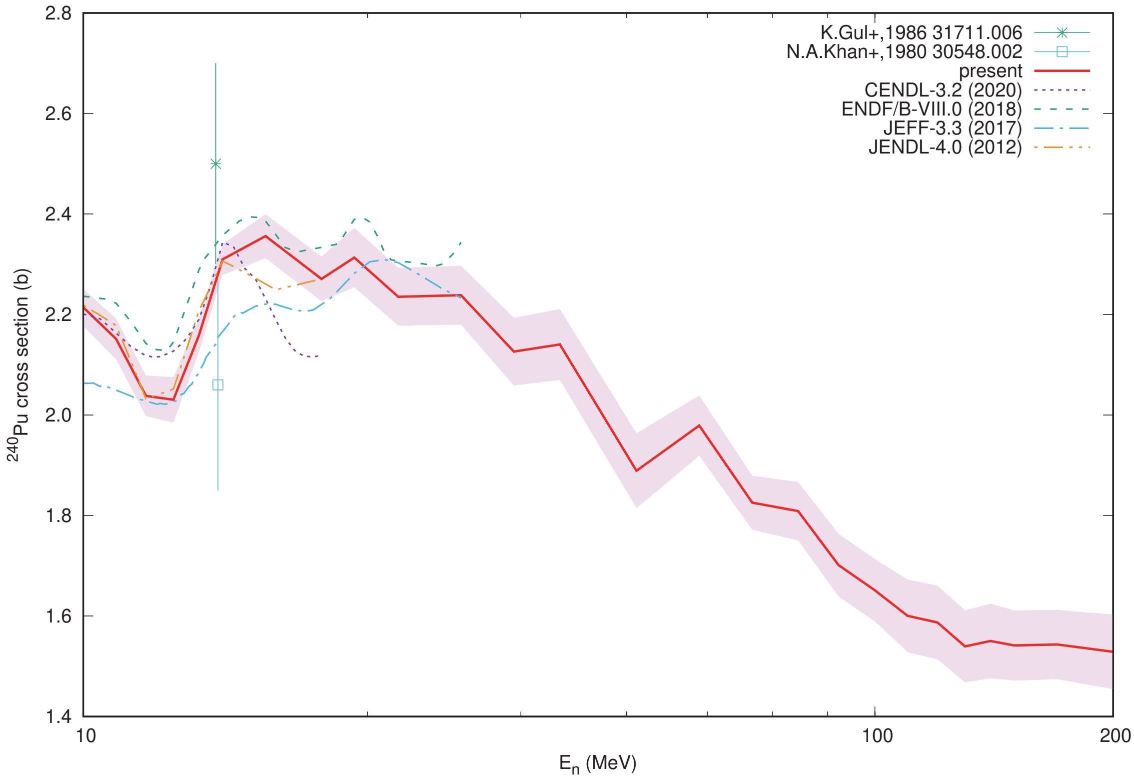


Figure 31: Fission cross section of ^{240}Pu and its ratio to ^{235}U from 1 MeV to 10 MeV.



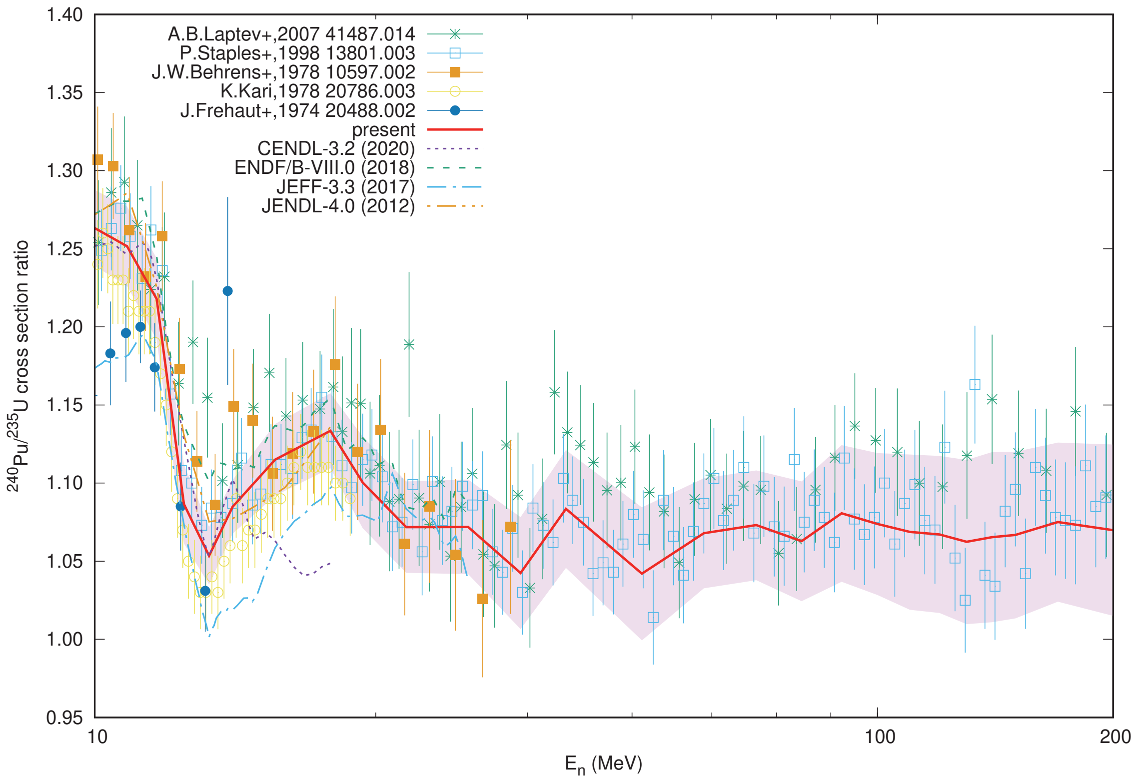


Figure 32: Fission cross section of ^{240}Pu and its ratio to ^{235}U from 10 MeV to 200 MeV.

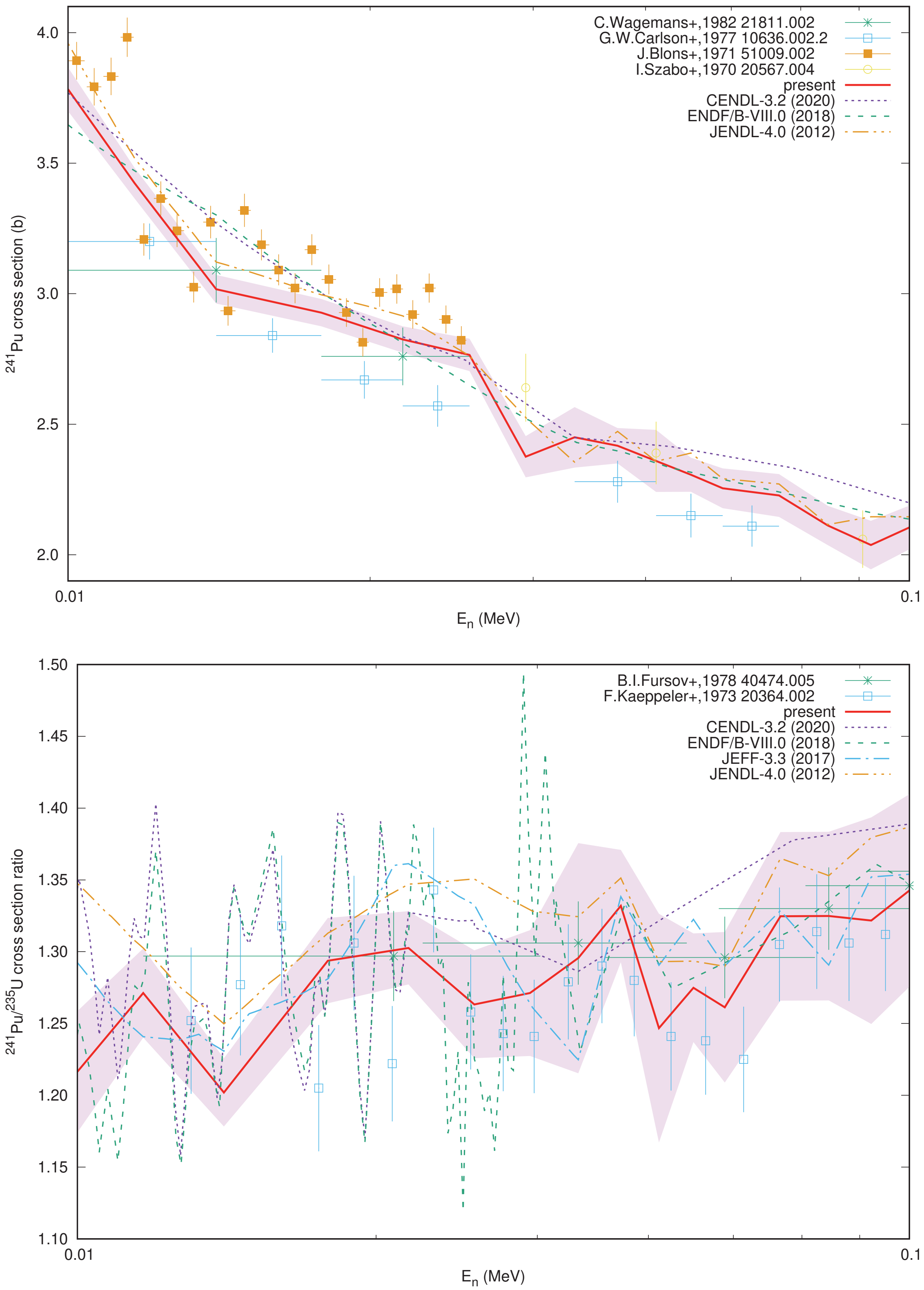
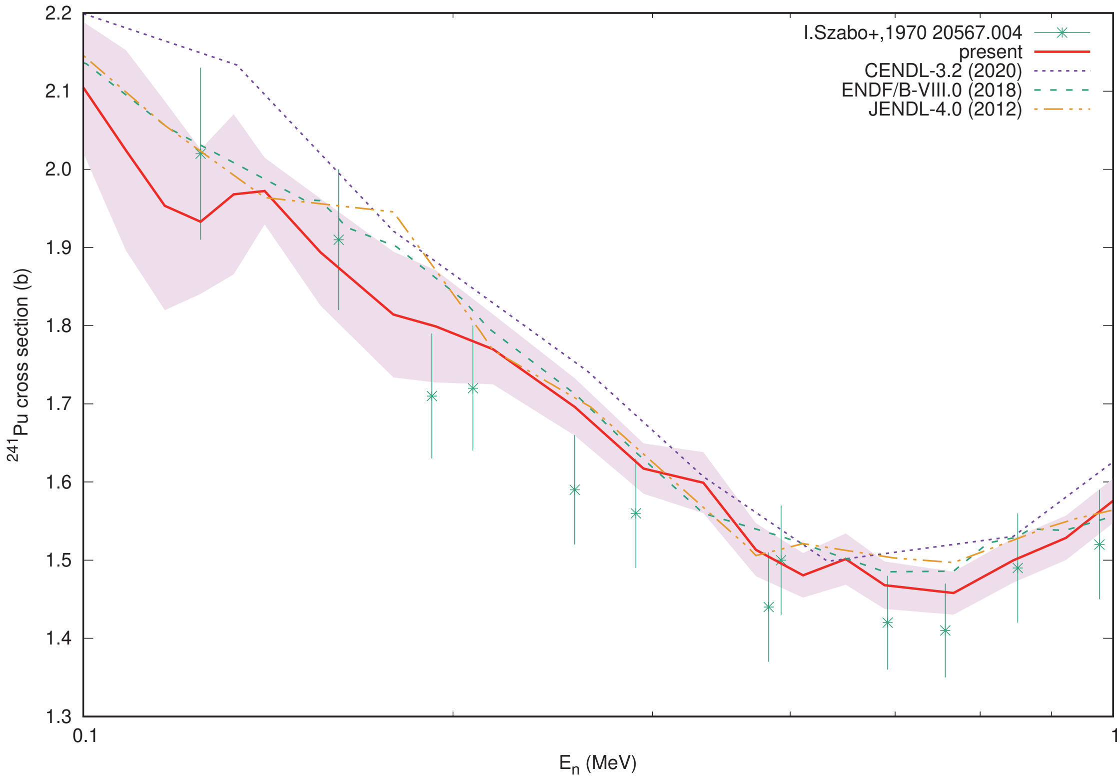


Figure 33: Fission cross section of ^{241}Pu and its ratio to ^{235}U from 10 keV to 100 keV.



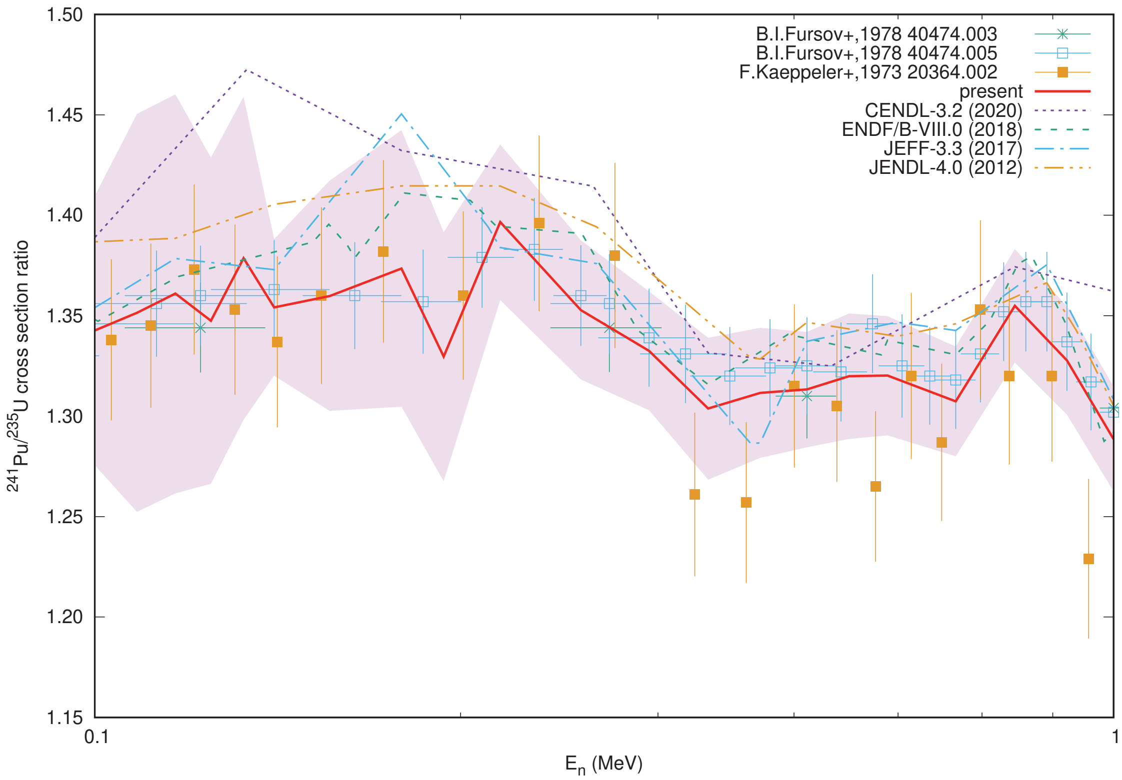
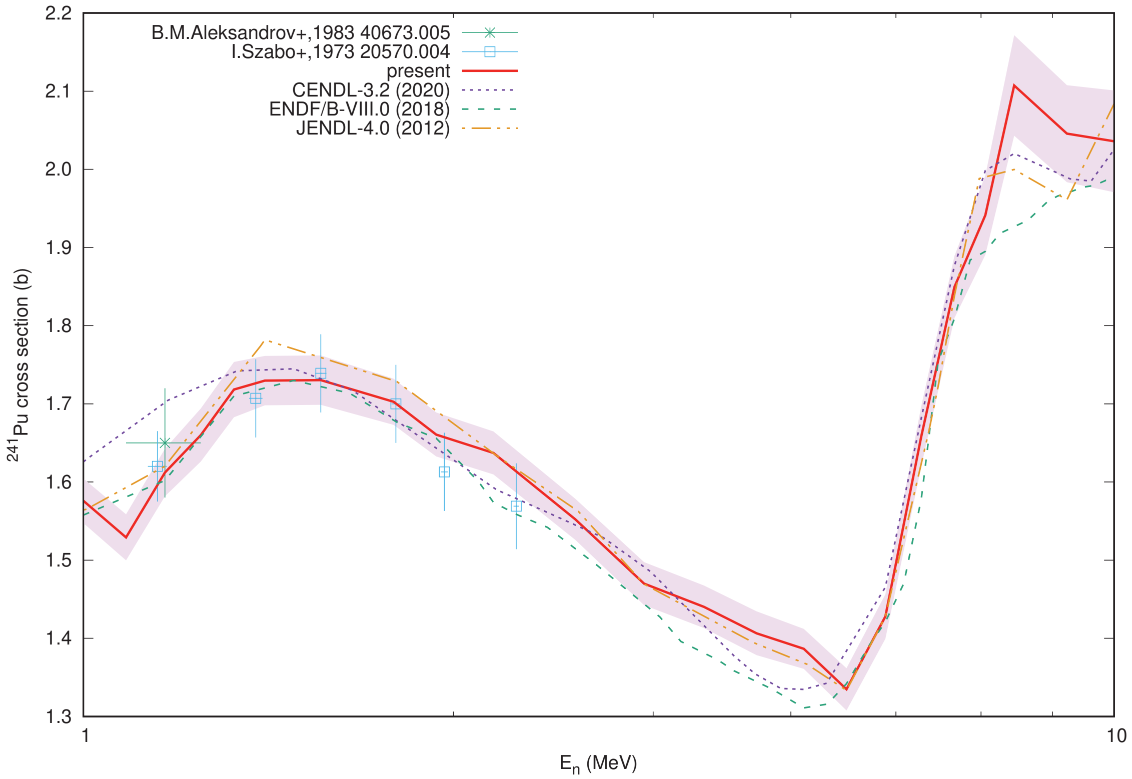


Figure 34: Fission cross section of ^{241}Pu and its ratio to ^{235}U from 100 keV to 1 MeV.



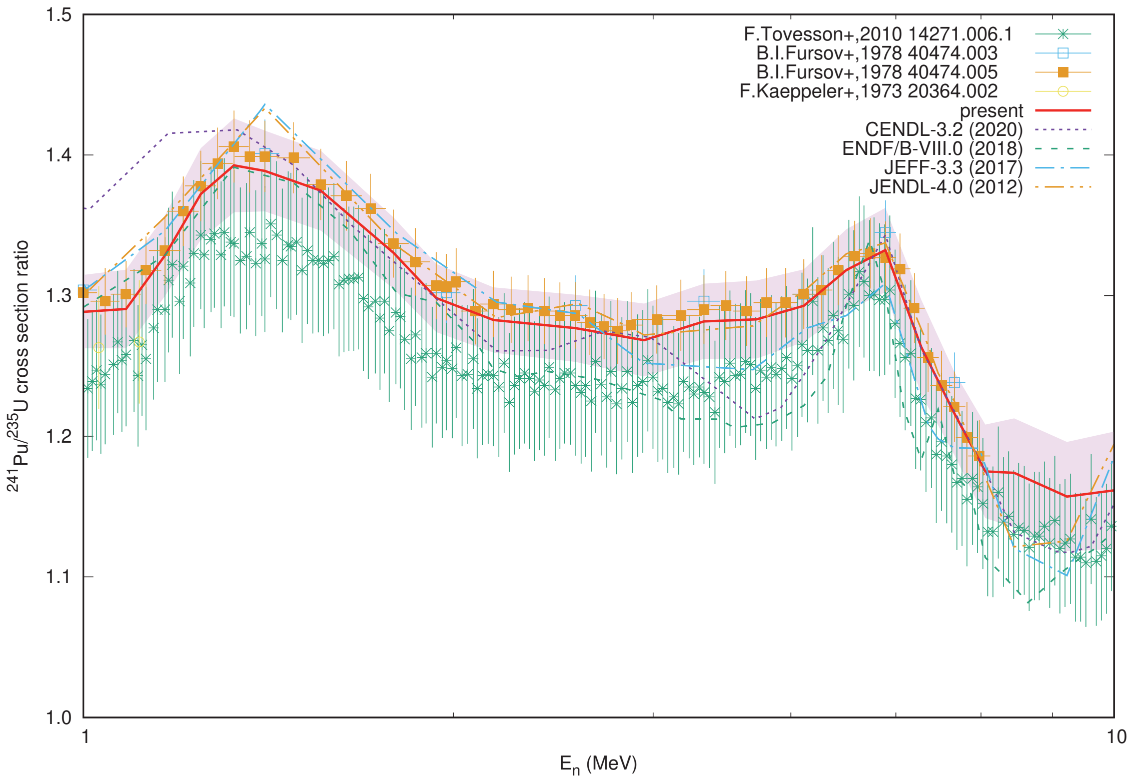


Figure 35: Fission cross section of ^{241}Pu and its ratio to ^{235}U from 1 MeV to 10 MeV.

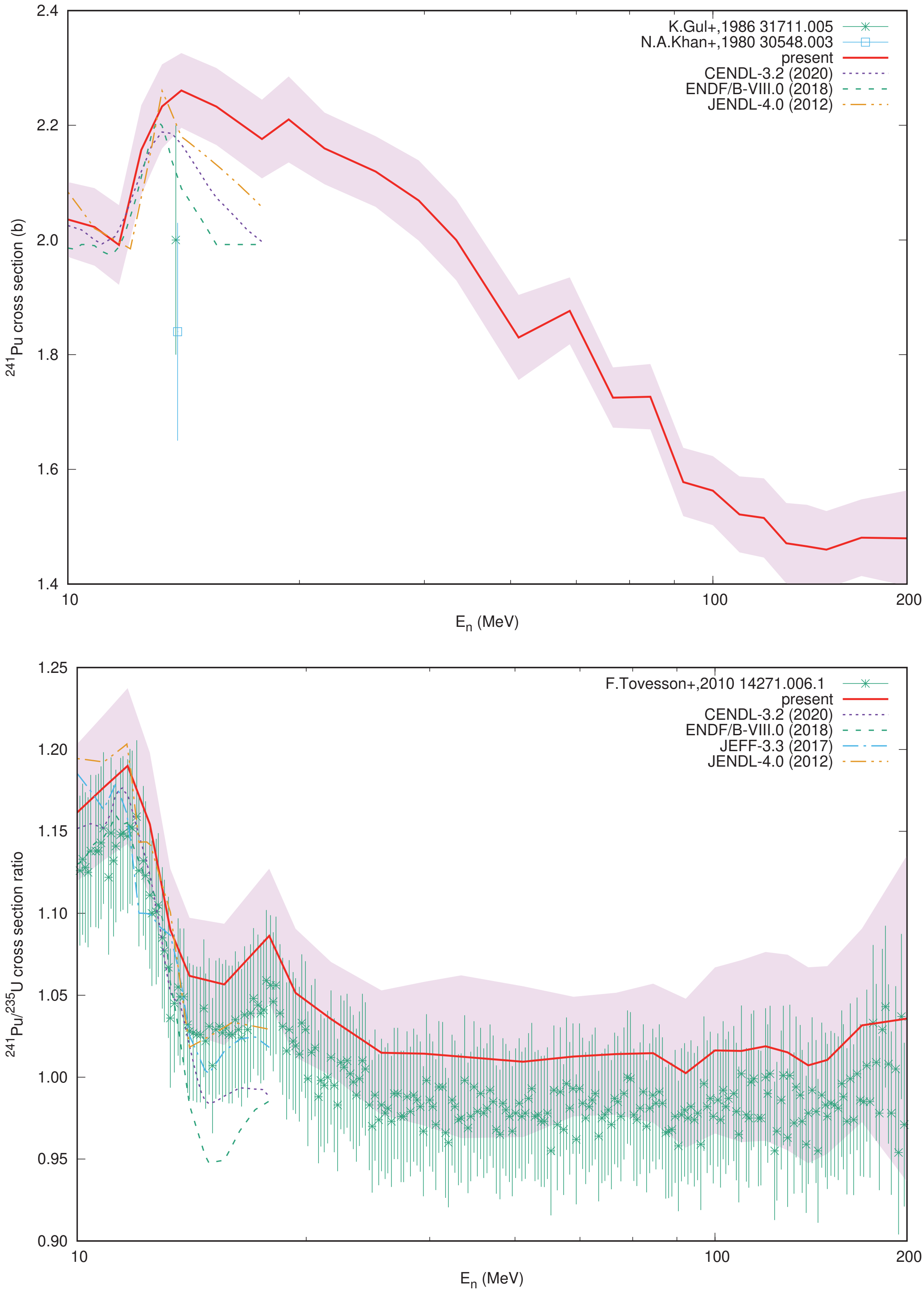


Figure 36: Fission cross section of ^{241}Pu and its ratio to ^{235}U from 10 MeV to 200 MeV.

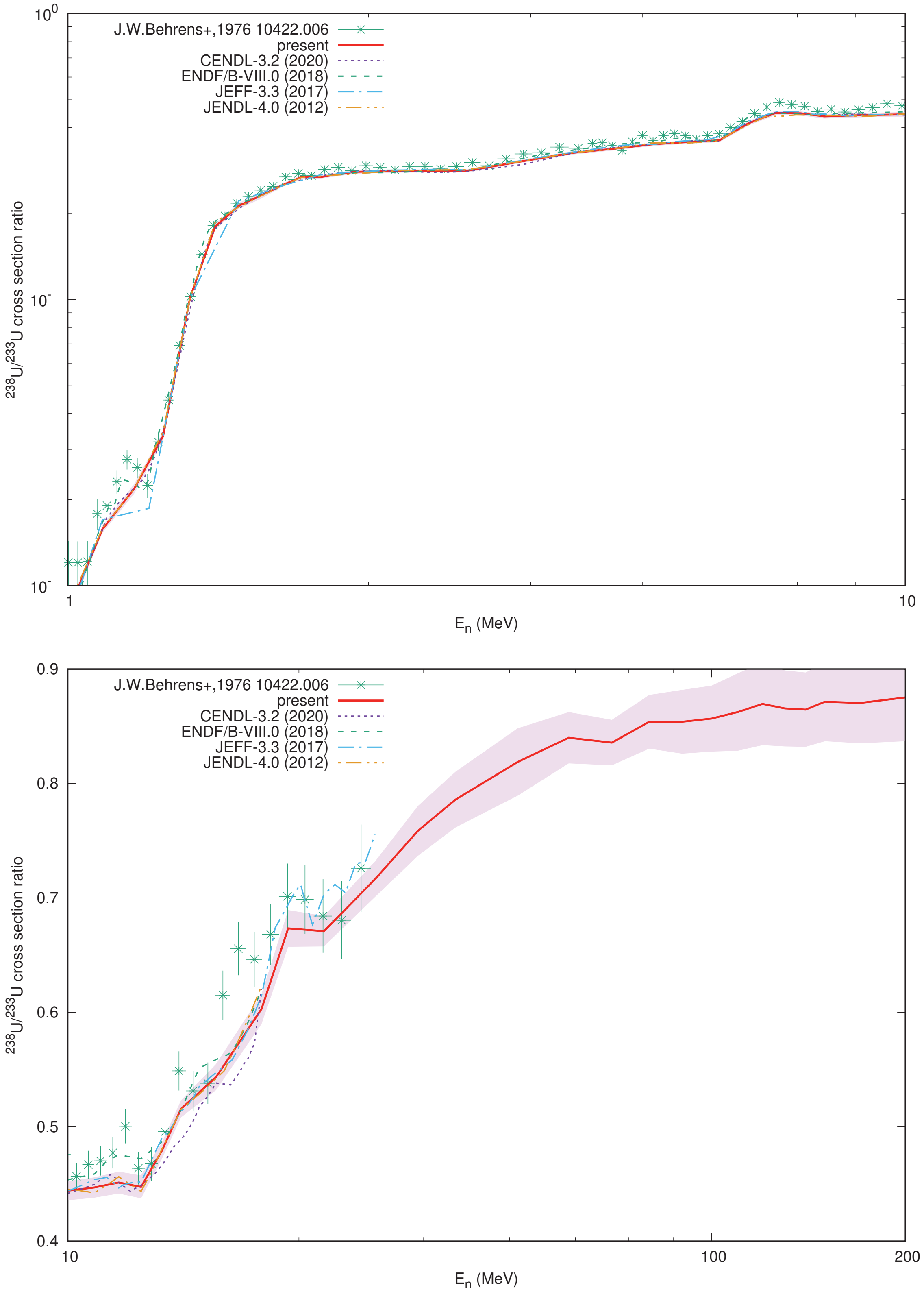


Figure 37: Fission cross section ratio of ^{238}U to ^{233}U from 1 MeV to 10 MeV (upper panel) and 10 MeV to 200 MeV (lower panel).

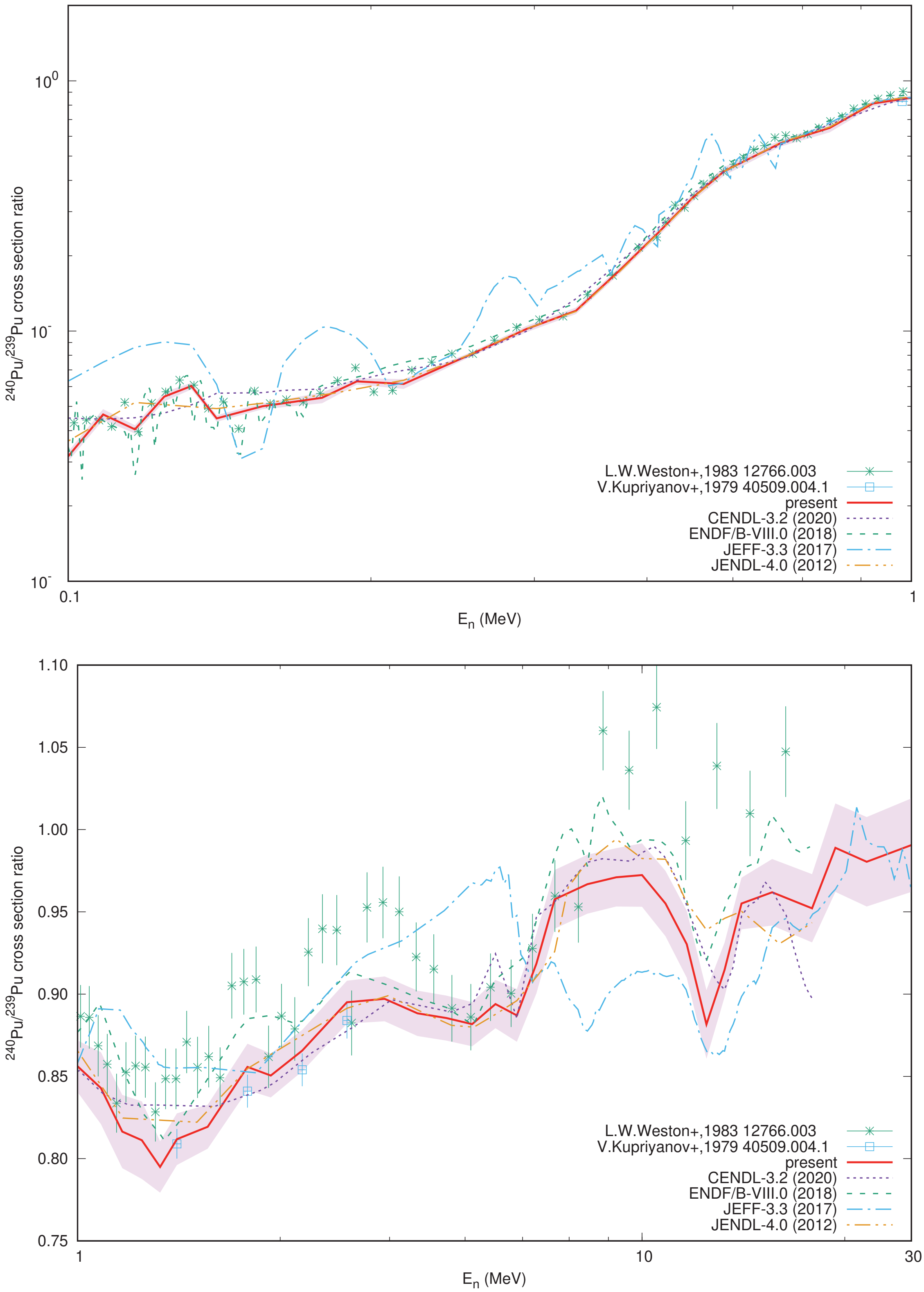


Figure 38: Fission cross section ratio of ^{240}Pu to ^{239}Pu from 100 keV to 1 MeV (upper panel) and 1 MeV to 30 MeV (lower panel).

Tables 21 to 26 summarize the evaluated cross sections in the roof-function expression (log-log interpolation) and rectangular-function expression (histogram interpolation). See Eqs. 1 and 6 of the primary publication [3] for the definitions of these expressions. For the rectangular-function expression, the first column gives the lower boundary of the energy group. The uncertainties are external uncertainties, namely the internal uncertainties multiplied by the square-root of the reduced chi-square (2.00 for the roof-function expression and 3.22 for the rectangular-function expression). The values in the roof-function expression are adopted in the JENDL-5 library but with adjustment for ^{235}U, ^{238}U and ^{239}Pu. In Tables 22 to 24, the JENDL-5 value and its difference from the present evaluation in the roof-function expression are shown (* indicates no difference). Note that the JENDL-5 library adopts the cross sections from the present evaluation without adjustment for ^{233}U, ^{240}Pu and ^{241}Pu though the upper boundary energy of JENDL-5 ^{233}U file is 20 MeV. Details of the adjustment will be published in the reference article of the JENDL-5 library under preparation.

Table 21: ^{233}U evaluated fission cross sections. (1/2)

Energy	(eV)	Roof		Rectangular	
		σ (b)	Unc.(%)	σ (b)	Unc.(%)
1.0	$\times10^4$	4.0736	1.2	3.8893	1.6
1.2		3.7090	1.1	3.6463	1.5
1.5		3.4614	0.8	3.4024	1.3
2.0		3.1663	1.0	3.0881	1.5
2.5		2.9289	0.9	2.9113	1.4
3.0		2.9153	2.0	2.8368	4.9
3.5		2.6331	1.0	2.6147	1.5
4.0		2.5683	3.8	2.5404	4.2
4.5		2.5364	1.0	2.5187	1.6
5.0		2.4877	3.9	2.3991	4.3
5.5		2.4408	1.0	2.4278	1.6
6.0		2.4066	2.3	2.3624	1.6
7.0		2.3513	2.4	2.2881	1.7
8.0		2.2560	2.6	2.2372	1.7
9.0		2.2511	2.9	2.2468	1.7
1.0	$\times10^5$	2.2553	3.1	2.2244	3.6
1.1		2.1802	3.7	2.1254	4.0
1.2		2.1248	2.4	2.1309	6.8
1.3		2.1544	3.7	2.1702	3.0
1.4		2.1574	2.9	2.1073	4.5
1.5		2.2302	1.0	2.2091	1.6
1.7		2.1258	2.1	2.1395	2.6
2.0		2.1173	2.2	2.1471	4.0
2.2		2.2026	2.3	2.1951	2.3
2.5		2.1655	1.0	2.1604	1.5
3.0		2.1856	1.4	2.1189	1.9
3.5		2.0822	1.0	2.0844	1.5
4.0		2.1179	1.3	2.0696	2.0
4.5		1.9890	1.0	1.9776	1.4
5.0		1.9578	1.1	1.9336	1.5
5.5		1.9424	1.0	1.9247	1.4
6.0		1.9157	1.0	1.9118	1.4
7.0		1.8997	1.0	1.8852	1.5
8.0		1.8682	1.0	1.8754	1.3
9.0		1.8635	0.9	1.8550	1.5
1.0	$\times10^6$	1.8854	1.0	1.8631	1.4
1.1		1.8313	1.2	1.8571	1.7
1.2		1.8734	1.2	1.8827	1.8
1.3		1.8811	1.4	1.9049	2.1
1.4		1.9082	1.4	1.9071	1.9
1.5		1.9107	1.1	1.9184	1.5

Table 21: ^{233}U evaluated fission cross sections. (2/2)

Energy	(eV)	Roof		Rectangular	
		σ (b)	Unc.(%)	σ (b)	Unc.(%)
1.7	$\times10^6$	1.9197	1.1	1.9455	1.4
2.0		1.9575	1.0	1.9627	1.5
2.2		1.9580	1.0	1.9542	1.4
2.5		1.9499	0.9	1.9289	1.4
3.0		1.8561	1.0	1.8345	1.4
3.5		1.7451	1.0	1.7271	1.5
4.0		1.6788	1.1	1.6633	1.6
4.5		1.6188	1.1	1.6098	1.6
5.0		1.5787	0.9	1.5641	1.4
5.5		1.4854	1.1	1.5469	1.6
6.0		1.6530	1.2	1.7675	1.8
6.5		1.9238	1.6	1.9721	2.1
7.0		2.0534	1.4	2.1756	1.7
7.5		2.1257	1.0	2.1214	1.7
8.0		2.3005	1.6	2.2974	2.0
8.5		2.2938	1.4	2.3078	2.3
9.0		2.2576	1.7	2.2657	2.3
1.0	$\times10^7$	2.2388	1.9	2.2518	2.5
1.1		2.2023	2.1	2.1737	2.9
1.2		2.1295	2.2	2.1866	3.1
1.3		2.2306	2.4	2.3426	2.7
1.4		2.3503	1.7	2.3680	1.7
1.5		2.3931	1.3	2.4490	2.5
1.7		2.4076	2.1	2.3551	2.6
2.0		2.2899	2.3	2.3153	3.1
2.2		2.3032	2.5	2.2995	3.2
2.5		2.2658	2.0	2.2688	2.4
3.0		2.2211	2.1	2.2321	3.0
3.5		2.1475	2.7	2.1158	3.8
4.0		2.0661	2.9	2.0389	4.0
5.0		1.8821	3.6	1.8861	4.9
6.0		1.8971	2.5	1.8632	3.3
7.0		1.7518	2.4	1.7869	3.4
8.0		1.7399	2.7	1.7196	4.3
9.0		1.6022	3.2	1.6379	4.5
1.0	$\times10^8$	1.5712	3.3	1.5986	4.9
1.1		1.5225	3.9	1.5822	5.9
1.2		1.5057	4.0	1.5389	6.0
1.3		1.4766	4.0	1.5450	6.0
1.4		1.4823	4.3	1.5250	6.3
1.5		1.4640	4.2	1.5241	5.7
1.7		1.4628	4.3	1.5214	5.7
2.0		1.4665	4.8		

Table 22: ^{235}U evaluated fission cross sections. (1/2)

Energy	(eV)	Roof		Rectangular		JENDL-5	
		σ (b)	Unc.(%)	σ (b)	Unc.(%)	σ (b)	Diff.(%)
1.0	$\times10^4$	3.1099	2.7	2.7365	3.4	3.1161	+0.2
1.2		2.6929	1.7	2.6339	2.2	2.6988	+0.2
1.5		2.5103	0.8	2.4806	1.1	2.5166	+0.3
2.0		2.2628	1.4	2.2440	1.7	2.2690	+0.3
2.5		2.1684	0.8	2.1513	1.2	2.1745	+0.3
3.0		2.1892	2.0	2.0582	5.4	2.1963	+0.3
3.5		1.8689	0.9	1.8723	1.3	1.8770	+0.4
4.0		1.8910	4.0	1.8483	4.5	1.9001	+0.5
4.5		1.8154	0.9	1.8136	1.3	1.8242	+0.5
5.0		1.8926	3.9	1.8029	4.6	1.9009	+0.4
5.5		1.8092	0.9	1.7948	1.4	1.8157	+0.4
6.0		1.7877	2.4	1.7284	1.3	1.7928	+0.3
7.0		1.6814	2.5	1.6273	1.9	1.6886	+0.4
8.0		1.5942	2.6	1.5531	1.8	1.6030	+0.6
9.0		1.5414	3.0	1.5492	1.7	1.5512	+0.6
1.0	$\times10^5$	1.5677	3.0	1.5414	3.6	1.5785	+0.7
1.1		1.4979	3.7	1.4515	4.2	1.5083	+0.7
1.2		1.4353	2.5	1.4253	6.7	1.4454	+0.7
1.3		1.4345	3.7	1.4247	3.2	1.4449	+0.7
1.4		1.4276	2.6	1.4034	4.0	1.4383	+0.7
1.5		1.4565	1.3	1.4365	1.8	1.4678	+0.8
1.7		1.3928	2.2	1.3734	2.7	1.4034	+0.8
2.0		1.3209	2.3	1.3328	4.1	1.3303	+0.7
2.2		1.3530	2.4	1.3188	2.4	1.3619	+0.7
2.5		1.2672	1.1	1.2430	1.6	1.2747	+0.6
3.0		1.2537	1.4	1.2298	1.7	1.2608	+0.6
3.5		1.2136	1.0	1.2088	1.3	1.2205	+0.6
4.0		1.2265	1.2	1.2000	1.9	1.2336	+0.6
4.5		1.1538	1.0	1.1355	1.3	1.1597	+0.5
5.0		1.1274	1.0	1.1266	1.3	1.1324	+0.4
5.5		1.1376	0.9	1.1207	1.3	1.1413	+0.3
6.0		1.1120	0.9	1.1120	1.2	1.1141	+0.2
7.0		1.1151	0.9	1.1129	1.3	*	
8.0		1.1069	0.9	1.1253	1.1	1.1052	-0.2
9.0		1.1513	0.8	1.1752	1.3	1.1491	-0.2
1.0	$\times10^6$	1.2231	0.9	1.2028	1.2	1.2206	-0.2
1.1		1.1850	1.0	1.2004	1.4	1.1822	-0.2
1.2		1.2135	1.0	1.2102	1.5	1.2103	-0.3
1.3		1.2098	1.2	1.2256	1.9	1.2062	-0.3
1.4		1.2338	1.2	1.2381	1.7	1.2299	-0.3
1.5		1.2456	1.0	1.2502	1.3	1.2415	-0.3
1.7		1.2588	1.0	1.2713	1.1	1.2544	-0.3
2.0		1.2799	0.8	1.2803	1.1	1.2751	-0.4
2.2		1.2791	0.8	1.2780	1.0	1.2742	-0.4
2.5		1.2763	0.7	1.2600	1.1	1.2713	-0.4
3.0		1.2158	0.8	1.2066	1.1	1.2113	-0.4
3.5		1.1590	0.8	1.1505	1.2	1.1553	-0.3
4.0		1.1237	0.9	1.1167	1.2	1.1207	-0.3
4.5		1.0962	0.8	1.0895	1.2	1.0938	-0.2
5.0		1.0726	0.8	1.0636	1.2	1.0706	-0.2
5.5		1.0126	0.9	1.0304	1.3	1.0110	-0.2
6.0		1.0718	1.0	1.1751	1.4	1.0703	-0.1
6.5		1.3125	1.3	1.3962	1.8	1.3109	-0.1

Table 22: ^{235}U evaluated fission cross sections. (2/2)

Energy	(eV)	Roof		Rectangular		JENDL-5	
		σ (b)	Unc.(%)	σ (b)	Unc.(%)	σ (b)	Diff.(%)
7.0	$\times10^6$	1.5207	1.1	1.6458	1.3	1.5191	-0.1
8.0		1.7951	1.1	1.7886	1.4	1.7938	-0.1
9.0		1.7678	1.3	1.7728	1.8	1.7671	-0.0
1.0	$\times10^7$	1.7528	1.4	1.7522	2.0	1.7524	-0.0
1.1		1.7190	1.6	1.6984	2.2	1.7188	-0.0
1.2		1.6734	1.7	1.7768	2.4	1.6733	-0.0
1.3		1.8684	1.9	1.9974	2.1	1.8683	-0.0
1.4		2.0487	1.1	2.0879	1.1	*	
1.5		2.1291	0.9	2.1523	1.9	*	
1.7		2.1131	1.7	2.0607	2.0	*	
2.0		2.0033	1.8	2.0696	2.5	*	
2.2		2.1023	2.1	2.1080	2.6	*	
2.5		2.0855	1.6	2.1023	1.8	*	
3.0		2.0882	1.7	2.1099	2.6	*	
3.5		2.0396	2.4	2.0120	3.4	*	
4.0		1.9754	2.7	1.9504	3.7	*	
5.0		1.8130	3.4	1.8307	4.6	*	
6.0		1.8531	2.1	1.8112	2.8	*	
7.0		1.7011	1.8	1.7386	2.8	*	
8.0		1.7019	2.1	1.6835	3.7	*	
9.0		1.5742	2.6	1.6035	3.9	*	
1.0	$\times10^8$	1.5378	2.5	1.5694	4.2	*	
1.1		1.4976	3.2	1.5586	4.8	*	
1.2		1.4873	3.3	1.5146	4.9	*	
1.3		1.4493	3.4	1.5153	5.2	*	
1.4		1.4552	3.4	1.4956	4.9	*	
1.5		1.4448	3.3	1.4980	4.9	*	
1.7		1.4355	3.3	1.4870	4.9	*	
2.0		1.4288	3.5			*	

Table 23: ^{238}U evaluated fission cross sections. (1/2)

Energy	(eV)	Roof			Rectangular			JENDL-5		
		σ (b)		Unc.(%)	σ (b)		Unc.(%)	σ (b)		Diff.(%)
1.0	$\times10^5$	1.3808	$\times10^{-4}$	59.3	1.0005	$\times10^{-4}$	24.1	*		
2.0		7.0639	$\times10^{-5}$	44.4	8.7631	$\times10^{-5}$	24.9	*		
3.0		1.1187	$\times10^{-4}$	35.0	1.7537	$\times10^{-4}$	18.0	*		
3.5		1.7883	$\times10^{-4}$	11.8	3.0718	$\times10^{-4}$	39.0	*		
4.0		3.2884	$\times10^{-4}$	12.0	3.4724	$\times10^{-4}$	11.3	3.2885	$\times10^{-4}$	+0.0
4.5		2.8924	$\times10^{-4}$	14.0	3.4322	$\times10^{-4}$	13.4	2.8925	$\times10^{-4}$	+0.0
5.0		5.6384	$\times10^{-4}$	9.5	8.2091	$\times10^{-4}$	9.0	5.6385	$\times10^{-4}$	+0.0
5.5		9.2842	$\times10^{-4}$	7.6	1.0943	$\times10^{-3}$	8.0	9.2845	$\times10^{-4}$	+0.0
6.0		1.1298	$\times10^{-3}$	5.9	1.2479	$\times10^{-3}$	7.1	*		
6.5		1.3511	$\times10^{-3}$	5.8	1.6668	$\times10^{-3}$	5.8	1.3512	$\times10^{-3}$	+0.0
7.0		1.9481	$\times10^{-3}$	5.3	2.3708	$\times10^{-3}$	6.1	1.9483	$\times10^{-3}$	+0.0
7.5		2.7376	$\times10^{-3}$	4.0	3.8653	$\times10^{-3}$	4.0	2.7380	$\times10^{-3}$	+0.0
8.0		4.6742	$\times10^{-3}$	3.3	5.9767	$\times10^{-3}$	4.0	4.6751	$\times10^{-3}$	+0.0
8.5		6.9631	$\times10^{-3}$	2.8	1.0880	$\times10^{-2}$	3.1	6.9649	$\times10^{-3}$	+0.0
9.0		1.4518	$\times10^{-2}$	2.1	1.5911	$\times10^{-2}$	2.5	1.4523	$\times10^{-2}$	+0.0
9.5		1.6858	$\times10^{-2}$	2.0	1.6103	$\times10^{-2}$	2.7	1.6865	$\times10^{-2}$	+0.0
1.0	$\times10^6$	1.5105	$\times10^{-2}$	1.7	2.0975	$\times10^{-2}$	1.9	1.5112	$\times10^{-2}$	+0.0
1.1		2.8853	$\times10^{-2}$	1.4	3.6634	$\times10^{-2}$	1.9	2.8881	$\times10^{-2}$	+0.1
1.2		4.0853	$\times10^{-2}$	1.4	4.9555	$\times10^{-2}$	1.8	4.0919	$\times10^{-2}$	+0.2

Table 23: ^{238}U evaluated fission cross sections. (2/2)

Energy	(eV)	Roof			Rectangular			JENDL-5		
		σ (b)		Unc.(%)	σ (b)		Unc.(%)	σ (b)		Diff.(%)
1.3	$\times 10^{6}$	6.2852	$\times 10^{-2}$	1.4	1.2080	$\times 10^{-1}$	2.1	6.2994	$\times 10^{-2}$	+0.2
1.4		1.9442	$\times 10^{-1}$	1.4	2.7682	$\times 10^{-1}$	1.8	1.9511	$\times 10^{-1}$	+0.4
1.5		3.4441	$\times 10^{-1}$	1.1	3.7544	$\times 10^{-1}$	1.4	3.5303	$\times 10^{-1}$	+2.5
1.6		4.0762	$\times 10^{-1}$	0.8	4.2189	$\times 10^{-1}$	1.4	4.1838	$\times 10^{-1}$	+2.6
1.7		4.4325	$\times 10^{-1}$	1.1	4.6355	$\times 10^{-1}$	1.3	4.5534	$\times 10^{-1}$	+2.7
1.8		4.8406	$\times 10^{-1}$	0.9	5.0000	$\times 10^{-1}$	1.3	4.9733	$\times 10^{-1}$	+2.7
1.9		5.2133	$\times 10^{-1}$	0.8	5.1933	$\times 10^{-1}$	1.2	5.3570	$\times 10^{-1}$	+2.8
2.0		5.2493	$\times 10^{-1}$	0.8	5.3256	$\times 10^{-1}$	1.1	5.3948	$\times 10^{-1}$	+2.8
2.2		5.4787	$\times 10^{-1}$	0.8	5.4432	$\times 10^{-1}$	1.0	5.5751	$\times 10^{-1}$	+1.8
2.5		5.4881	$\times 10^{-1}$	0.7	5.4035	$\times 10^{-1}$	1.1	5.5813	$\times 10^{-1}$	+1.7
3.0		5.2432	$\times 10^{-1}$	0.9	5.3295	$\times 10^{-1}$	1.2	5.3283	$\times 10^{-1}$	+1.6
3.5		5.3273	$\times 10^{-1}$	0.9	5.4170	$\times 10^{-1}$	1.3	5.4102	$\times 10^{-1}$	+1.6
4.0		5.4704	$\times 10^{-1}$	1.0	5.4716	$\times 10^{-1}$	1.3	5.4964	$\times 10^{-1}$	+0.5
4.5		5.4623	$\times 10^{-1}$	0.9	5.4740	$\times 10^{-1}$	1.4	5.4842	$\times 10^{-1}$	+0.4
5.0		5.5137	$\times 10^{-1}$	0.9	5.4578	$\times 10^{-1}$	1.3	5.5320	$\times 10^{-1}$	+0.3
5.5		5.2819	$\times 10^{-1}$	1.0	5.5398	$\times 10^{-1}$	1.4	5.2961	$\times 10^{-1}$	+0.3
6.0		5.9628	$\times 10^{-1}$	1.2	6.8031	$\times 10^{-1}$	1.6	5.9768	$\times 10^{-1}$	+0.2
6.5		7.9631	$\times 10^{-1}$	1.4	8.4873	$\times 10^{-1}$	1.9	7.9792	$\times 10^{-1}$	+0.2
7.0		9.2279	$\times 10^{-1}$	1.2	9.6831	$\times 10^{-1}$	1.4	9.2436	$\times 10^{-1}$	+0.2
7.5		9.5174	$\times 10^{-1}$	0.9	9.3239	$\times 10^{-1}$	1.5	9.5307	$\times 10^{-1}$	+0.1
8.0		1.0065		1.2	1.0041		1.5	1.0076		+0.1
9.0		9.9759	$\times 10^{-1}$	1.3	1.0048		2.0	9.9819	$\times 10^{-1}$	+0.1
1.0	$\times 10^{7}$	9.9448	$\times 10^{-1}$	1.5	9.9416	$\times 10^{-1}$	2.1	9.9488	$\times 10^{-1}$	+0.0
1.1		9.8433	$\times 10^{-1}$	1.7	9.7336	$\times 10^{-1}$	2.4	9.8452	$\times 10^{-1}$	+0.0
1.2		9.6101	$\times 10^{-1}$	1.9	9.9155	$\times 10^{-1}$	2.5	9.6114	$\times 10^{-1}$	+0.0
1.3		9.9813	$\times 10^{-1}$	2.1	1.0805		2.2	9.9822	$\times 10^{-1}$	+0.0
1.4		1.1257		1.2	1.1821		1.3	*		
1.5		1.2342		1.0	1.2890		2.0	*		
1.7		1.3083		1.8	1.3306		2.1	*		
2.0		1.3806		1.9	1.4788		2.7	*		
2.2		1.5508		2.2	1.5487		2.7	*		
2.5		1.5202		1.7	1.5600		1.9	*		
3.0		1.5910		1.8	1.6429		2.7	*		
3.5		1.6291		2.4	1.6337		3.5	*		
4.0		1.6237		2.7	1.6270		3.7	*		
5.0		1.5410		3.4	1.5689		4.7	*		
6.0		1.5934		2.1	1.5554		2.8	*		
7.0		1.4640		1.9	1.5069		2.9	*		
8.0		1.4857		2.1	1.4674		3.8	*		
9.0		1.3681		2.6	1.3965		4.0	*		
1.0	$\times 10^{8}$	1.3460		2.6	1.3822		4.3	*		
1.1		1.3133		3.2	1.3625		4.9	*		
1.2		1.3093		3.4	1.3369		5.0	*		
1.3		1.2780		3.4	1.3355		5.3	*		
1.4		1.2815		3.5	1.3188		5.0	*		
1.5		1.2758		3.4	1.3242		5.0	*		
1.7		1.2731		3.4	1.3313		4.9	*		
2.0		1.2835		3.6				*		

Table 24: ^{239}Pu evaluated fission cross sections. (1/2)

Energy	(eV)	Roof		Rectangular		JENDL-5	
		σ (b)	Unc.(%)	σ (b)	Unc.(%)	σ (b)	Diff.(%)
1.0	$\times 10^4$	1.7219	2.3	1.8425	3.7	1.7223	+0.0
1.2		1.7919	1.8	1.7638	2.3	1.7924	+0.0
1.5		1.7586	0.8	1.7645	1.2	1.7591	+0.0
2.0		1.7005	1.5	1.6802	1.9	1.7009	+0.0
2.5		1.6141	0.8	1.6249	1.3	1.6144	+0.0
3.0		1.7136	2.1	1.6469	5.5	1.7139	+0.0
3.5		1.5246	0.9	1.5179	1.3	1.5251	+0.0
4.0		1.5177	4.2	1.5536	5.4	1.5182	+0.0
4.5		1.5097	0.9	1.5098	1.4	1.5101	+0.0
5.0		1.5700	4.2	1.5000	5.0	1.5701	+0.0
5.5		1.5579	0.9	1.5632	1.4	1.5577	-0.0
6.0		1.5999	2.5	1.5485	1.4	1.5993	-0.0
7.0		1.5017	2.6	1.5059	2.0	1.5018	+0.0
8.0		1.5295	2.7	1.4776	1.9	1.5302	+0.0
9.0		1.4429	3.0	1.4884	1.8	1.4437	+0.1
1.0	$\times 10^5$	1.5296	3.1	1.5211	3.8	1.5307	+0.1
1.1		1.5316	3.8	1.4651	4.5	1.5328	+0.1
1.2		1.4310	2.9	1.4376	6.8	1.4322	+0.1
1.3		1.4518	3.8	1.4616	3.5	1.4531	+0.1
1.4		1.4923	2.5	1.4614	3.9	1.4937	+0.1
1.5		1.5171	1.5	1.5235	2.0	1.5186	+0.1
1.7		1.4942	2.3	1.4785	2.8	1.4956	+0.1
2.0		1.4514	2.4	1.5210	4.3	1.4526	+0.1
2.2		1.5669	2.5	1.5360	2.6	1.5680	+0.1
2.5		1.5008	1.3	1.5258	1.8	1.5017	+0.1
3.0		1.5629	1.5	1.5296	1.9	1.5641	+0.1
3.5		1.5261	1.2	1.5438	1.6	1.5275	+0.1
4.0		1.5993	1.3	1.5927	2.1	1.6011	+0.1
4.5		1.5724	1.2	1.5662	1.5	1.5741	+0.1
5.0		1.5730	1.2	1.5803	1.5	1.5746	+0.1
5.5		1.6051	1.1	1.5931	1.6	1.6062	+0.1
6.0		1.6082	1.0	1.6179	1.4	1.6088	+0.0
7.0		1.6347	1.0	1.6857	1.5	1.6346	-0.0
8.0		1.7207	1.0	1.7105	1.3	1.7201	-0.0
9.0		1.6914	0.9	1.7050	1.5	1.6912	-0.0
1.0	$\times 10^6$	1.7572	1.0	1.7638	1.4	1.7575	+0.0
1.1		1.7599	1.1	1.8008	1.6	1.7603	+0.0
1.2		1.8473	1.1	1.8605	1.6	1.8476	+0.0
1.3		1.8817	1.3	1.9216	2.0	1.8819	+0.0
1.4		1.9433	1.3	1.9451	1.8	1.9435	+0.0
1.5		1.9562	1.1	1.9615	1.4	1.9564	+0.0
1.7		1.9600	1.1	1.9732	1.3	1.9601	+0.0
2.0		1.9783	0.9	1.9890	1.3	1.9779	-0.0
2.2		1.9865	0.9	1.9744	1.2	1.9858	-0.0
2.5		1.9571	0.8	1.9444	1.3	1.9563	-0.0
3.0		1.8829	0.9	1.8753	1.3	1.8820	-0.0
3.5		1.8090	1.0	1.8013	1.4	1.8081	-0.0
4.0		1.7623	1.0	1.7583	1.4	1.7615	-0.0
4.5		1.7307	1.0	1.7327	1.4	1.7300	-0.0
5.0		1.7084	0.9	1.7083	1.4	1.7077	-0.0
5.5		1.6465	1.0	1.6857	1.5	1.6459	-0.0
6.0		1.7531	1.2	1.8177	1.6	1.7526	-0.0
6.5		1.9086	1.4	1.9588	1.9	1.9081	-0.0

Table 24: ^{239}Pu evaluated fission cross sections. (2/2)

Energy	(eV)	Roof σ (b)	Roof Unc.(%)	Rectangular σ (b)	Rectangular Unc.(%)	JENDL-5 σ (b)	JENDL-5 Diff.(%)
7.0	$\times10^6$	2.0479	1.2	2.1691	1.5	2.0474	-0.0
8.0		2.3036	1.2	2.3013	1.6	2.3033	-0.0
9.0		2.2698	1.4	2.2932	2.0	2.2697	-0.0
1.0	$\times10^7$	2.2771	1.5	2.2862	2.1	2.2770	-0.0
1.1		2.2528	1.7	2.2278	2.4	*	
1.2		2.1906	1.8	2.2658	2.5	*	
1.3		2.3030	2.0	2.3829	2.2	*	
1.4		2.3594	1.2	2.3969	1.3	*	
1.5		2.4183	1.0	2.4618	2.0	*	
1.7		2.4493	1.8	2.4278	2.2	*	
2.0		2.3848	1.9	2.4006	2.7	*	
2.2		2.3390	2.2	2.3280	2.8	*	
2.5		2.2800	1.7	2.2929	2.0	*	
3.0		2.2596	1.8	2.2717	2.7	*	
3.5		2.1864	2.4	2.1657	3.5	*	
4.0		2.1252	2.7	2.0961	3.7	*	
5.0		1.9396	3.4	1.9551	4.7	*	
6.0		1.9758	2.1	1.9363	2.8	*	
7.0		1.8219	1.9	1.8638	2.9	*	
8.0		1.8248	2.1	1.8051	3.8	*	
9.0		1.6842	2.6	1.7145	4.0	*	
1.0	$\times10^8$	1.6445	2.6	1.6774	4.3	*	
1.1		1.6022	3.2	1.6723	4.9	*	
1.2		1.5946	3.4	1.6288	4.9	*	
1.3		1.5558	3.5	1.6173	5.3	*	
1.4		1.5501	3.6	1.6035	5.1	*	
1.5		1.5438	3.4	1.5983	5.0	*	
1.7		1.5300	3.4	1.5925	5.0	*	
2.0		1.5315	3.7			*	

Table 25: ^{240}Pu evaluated fission cross sections. (1/2)

Energy	(eV)	Roof σ (b)		Roof Unc.(%)	Rectangular σ (b)		Rectangular Unc.(%)
1.0	$\times10^5$	4.8303	$\times10^{-2}$	3.9	6.5895	$\times10^{-2}$	5.3
1.1		7.1123	$\times10^{-2}$	4.6	6.8571	$\times10^{-2}$	5.6
1.2		5.7924	$\times10^{-2}$	3.7	6.5636	$\times10^{-2}$	7.2
1.3		7.9398	$\times10^{-2}$	4.1	8.5220	$\times10^{-2}$	4.0
1.4		8.9965	$\times10^{-2}$	3.0	7.8327	$\times10^{-2}$	4.4
1.5		6.7905	$\times10^{-2}$	2.2	7.5635	$\times10^{-2}$	2.6
1.7		7.4768	$\times10^{-2}$	2.6	7.6537	$\times10^{-2}$	3.1
2.0		7.8562	$\times10^{-2}$	2.7	9.9457	$\times10^{-2}$	4.6
2.2		9.8621	$\times10^{-2}$	2.8	8.7055	$\times10^{-2}$	3.0
2.5		9.2243	$\times10^{-2}$	1.6	1.1160	$\times10^{-1}$	2.1
3.0		1.2593	$\times10^{-1}$	1.7	1.3752	$\times10^{-1}$	2.1
3.5		1.5579	$\times10^{-1}$	1.4	1.6957	$\times10^{-1}$	1.9
4.0		1.9276	$\times10^{-1}$	1.5	2.3756	$\times10^{-1}$	2.2
4.5		2.7309	$\times10^{-1}$	1.4	3.4088	$\times10^{-1}$	1.8
5.0		3.8604	$\times10^{-1}$	1.3	4.6377	$\times10^{-1}$	1.8
5.5		5.4652	$\times10^{-1}$	1.2	6.1438	$\times10^{-1}$	1.7
6.0		7.0065	$\times10^{-1}$	1.1	8.2297	$\times10^{-1}$	1.5
7.0		9.2147	$\times10^{-1}$	1.1	1.0081		1.6
8.0		1.1147		1.1	1.2414		1.4
9.0		1.3718		1.0	1.4343		1.6

Table 25: ^{240}Pu evaluated fission cross sections. (2/2)

Energy	(eV)	Roof		Rectangular	
		σ (b)	Unc.(%)	σ (b)	Unc.(%)
1.0	$\times10^6$	1.5044	1.1	1.5066	1.5
1.1		1.4834	1.2	1.5090	1.7
1.2		1.5082	1.3	1.5341	1.8
1.3		1.5265	1.4	1.5546	2.2
1.4		1.5448	1.5	1.5815	2.0
1.5		1.5882	1.2	1.6155	1.6
1.7		1.6060	1.1	1.6636	1.4
2.0		1.6929	1.0	1.7081	1.4
2.2		1.6896	1.0	1.7072	1.3
2.5		1.6942	0.9	1.7292	1.3
3.0		1.6854	1.0	1.6930	1.4
3.5		1.6230	1.1	1.6234	1.6
4.0		1.5654	1.2	1.5753	1.6
4.5		1.5325	1.2	1.5395	1.7
5.0		1.5063	1.2	1.5323	1.7
5.5		1.4719	1.3	1.5138	1.8
6.0		1.5551	1.4	1.6496	1.9
6.5		1.7531	1.6	1.8664	2.2
7.0		1.9611	1.3	2.0989	1.6
8.0		2.2271	1.3	2.2572	1.7
9.0		2.2039	1.5	2.2368	2.1
1.0	$\times10^7$	2.2142	1.7	2.2406	2.3
1.1		2.1515	1.9	2.1088	2.6
1.2		2.0380	2.0	2.0540	2.7
1.3		2.0303	2.2	2.1593	2.5
1.4		2.1582	1.6	2.2466	1.9
1.5		2.3097	1.3	2.3874	2.2
1.7		2.3560	1.9	2.3446	2.3
2.0		2.2707	2.0	2.3379	2.8
2.2		2.3132	2.6	2.3150	3.8
2.5		2.2354	2.6	2.2862	3.1
3.0		2.2384	2.6	2.2618	3.7
3.5		2.1261	3.2	2.1650	4.4
4.0		2.1403	3.3	2.0983	4.4
5.0		1.8891	3.9	1.9439	5.5
6.0		1.9789	3.0	1.9754	4.0
7.0		1.8254	2.9	1.8807	4.3
8.0		1.8087	3.2	1.8226	5.0
9.0		1.7011	3.7	1.7563	5.1
1.0	$\times10^8$	1.6513	3.8	1.7064	6.0
1.1		1.6004	4.5	1.6874	6.4
1.2		1.5871	4.6	1.6212	6.5
1.3		1.5396	4.7	1.6680	7.1
1.4		1.5504	4.8	1.6150	7.0
1.5		1.5413	4.5	1.6271	6.3
1.7		1.5432	4.5	1.6209	6.3
2.0		1.5287	4.8		

Table 26: ^{241}Pu evaluated fission cross sections. (1/2)

Energy	(eV)	Roof		Rectangular	
		σ (b)	Unc.(%)	σ (b)	Unc.(%)
1.0	$\times 10^4$	3.7829	2.2	3.7998	2.9
1.2		3.4233	1.7	3.2147	2.4
1.5		3.0172	1.8	3.0528	2.4
2.0		2.9274	1.8	2.8858	2.5
2.5		2.8247	1.8	2.8321	2.6
3.0		2.7657	2.2	2.5968	8.0
3.5		2.3758	3.3	2.4104	4.2
4.0		2.4500	4.7	2.4113	5.9
4.5		2.4179	2.8	2.3841	4.0
5.0		2.3596	5.0	2.2801	6.2
5.5		2.3066	2.8	2.2817	3.9
6.0		2.2548	3.4	2.2315	3.2
7.0		2.2273	3.7	2.1695	5.1
8.0		2.1121	3.6	2.0581	4.0
9.0		2.0373	4.6	2.0625	4.7
1.0	$\times 10^5$	2.1048	4.0	2.0796	5.0
1.1		2.0243	6.3	1.9671	5.3
1.2		1.9534	6.8	1.9302	7.2
1.3		1.9330	4.8	1.9632	5.9
1.4		1.9681	5.2	1.9947	160.8
1.5		1.9722	2.2	1.9526	3.3
1.7		1.8939	3.6	1.8766	4.3
2.0		1.8143	4.4	1.7978	5.2
2.2		1.7990	4.0	1.8108	3.6
2.5		1.7698	2.5	1.7209	3.3
3.0		1.6960	2.2	1.6598	2.9
3.5		1.6171	2.0	1.6023	2.9
4.0		1.5991	2.4	1.5687	3.5
4.5		1.5133	2.2	1.4998	3.1
5.0		1.4806	1.9	1.4825	2.8
5.5		1.5015	2.2	1.4841	3.1
6.0		1.4680	2.1	1.4633	2.8
7.0		1.4579	1.9	1.4813	2.7
8.0		1.4997	1.9	1.5192	2.8
9.0		1.5285	1.9	1.5458	2.8
1.0	$\times 10^6$	1.5760	1.8	1.5552	2.7
1.1		1.5292	1.9	1.5673	2.8
1.2		1.6121	1.9	1.6259	2.9
1.3		1.6601	2.0	1.6922	3.1
1.4		1.7182	2.1	1.7245	3.0
1.5		1.7297	1.8	1.7370	2.7
1.7		1.7304	1.8	1.7304	2.6
2.0		1.7026	1.7	1.6927	2.7
2.2		1.6607	1.7	1.6568	2.5
2.5		1.6371	1.7	1.6177	2.5
3.0		1.5524	1.7	1.5391	2.5
3.5		1.4700	1.9	1.4708	2.9
4.0		1.4403	1.9	1.4350	2.7
4.5		1.4064	2.0	1.4059	3.0
5.0		1.3866	1.8	1.3864	2.7
5.5		1.3348	2.0	1.3697	3.0
6.0		1.4280	2.0	1.5410	2.9
6.5		1.6582	2.3	1.7322	3.4

Table 26: ^{241}Pu evaluated fission cross sections. (2/2)

Energy	(eV)	Roof		Rectangular	
		σ (b)	Unc.(%)	σ (b)	Unc.(%)
7.0	$\times 10^6$	1.8494	2.1	1.9869	3.0
7.5		1.9414	2.6	1.9423	4.4
8.0		2.1073	3.1	2.0918	3.8
9.0		2.0456	3.0	2.0591	4.2
1.0	$\times 10^7$	2.0358	3.2	2.0572	4.3
1.1		2.0227	3.3	2.0095	4.6
1.2		1.9913	3.5	2.1004	4.7
1.3		2.1569	3.6	2.2592	4.5
1.4		2.2329	3.3	2.2507	4.2
1.5		2.2607	2.9	2.2889	3.9
1.7		2.2327	3.0	2.2108	3.8
2.0		2.1759	3.2	2.2233	4.6
2.2		2.2103	3.4	2.2046	4.4
2.5		2.1596	2.9	2.1684	3.6
3.0		2.1193	2.9	2.1441	4.1
3.5		2.0688	3.4	2.0448	4.8
4.0		2.0000	3.5	1.9790	4.7
5.0		1.8300	4.1	1.8588	5.6
6.0		1.8763	3.1	1.8366	4.3
7.0		1.7251	3.0	1.7728	4.4
8.0		1.7267	3.3	1.7006	5.1
9.0		1.5779	3.8	1.6257	5.4
1.0	$\times 10^8$	1.5628	3.9	1.5965	5.7
1.1		1.5214	4.4	1.5916	6.3
1.2		1.5153	4.6	1.5479	6.4
1.3		1.4711	4.8	1.5364	6.8
1.4		1.4657	4.9	1.5172	6.9
1.5		1.4600	4.6	1.5290	6.3
1.7		1.4809	4.5	1.5446	6.2
2.0		1.4798	5.6		

5 Impact of ^{235}U datasets published in 1970s

JENDL-3.3 evaluation included 13 datasets of ^{235}U datasets published in 1970s in the SOK experimental database [2]. However, they were discarded in JENDL-4.0 evaluation because the criticalities of some small-sized LANL fast systems (e.g., Godiva and Flattop) are sensitive to the ^{235}U cross section around 1 MeV, and it has been known that the experimental datasets published in 1970s tend to report relatively high cross sections [184]. In order to see the impact of the old ^{235}U datasets, we added about 30 additional ^{235}U datasets published in 1970s in our experimental database and performed fitting.

Figure 39 shows systematic increase of the cross sections above ~3 MeV due to addition of the old datasets. The increase in the high energy region above ~20 MeV due to addition of the old datasets is remarkable. The high resolution dataset published by Kari et al. between 1 MeV and 21 MeV [100] has strong correlation, and this dataset could be responsible for the significant increase of the cross section above 20 MeV. Figure 40 shows that the cross sections of all nuclides tend to increase above 1 MeV while to slightly decrease below 1 MeV. The californium-252 spontaneous fission neutron spectrum averaged cross sections summarized in Table 27 also show systematic increase is caused by addition of the ^{235}U datasets published in 1970s in fitting.

Even if we exclude the ^{235}U datasets published in 1970s from our experimental database, their impact could remain in our evaluation if the absolute cross section datasets of the nuclide other than ^{235}U in our experimental database are normalized with ^{235}U cross section. In our experimental database, the following four datasets are coded in their EXFOR Files with ^{235}U(n,f) as a monitor reaction:

- ^{233}U(n,f) dataset by M. Calviani et al. (2009, EXFOR 23072.009) [20]
- ^{240}Pu(n,f) dataset by B.M. Aleksandrov et al. (1983, EXFOR 40673.004) [63]
- ^{240}Pu(n,f) dataset by C. Budtz-Jørgensen et al. (1981, EXFOR 21764.003) [65]
- ^{241}Pu(n,f) dataset by B.M. Aleksandrov et al. (1983, EXFOR 40673.005) [63]

Among them, Calviani et al. adopts the ^{235}U cross section in ENDF/B-VII.0 for normalization, and should be free from the problem. Budtz-Jørgensen et al. adopts the evaluation presented by Poenitz and Guenther in a 1976 meeting [185].

Figure 30 shows the present evaluation is consistent with the ^{240}Pu/^{235}U experimental ratios rather than the ^{240}Pu datasets in the low energy region, and one can expect the influence of the old ^{235}U reference cross section by Budtz-Jørgensen et al. in the present evaluation is not large. Each of the two datasets by Aleksandrov et al. provides only one data point at 1.2 MeV. These datasets adopt the ^{235}U fission cross section of 1.257 b at 1.2 MeV, which is about 3.5% higher than the present evaluation.

Figure 31 shows that the present evaluation agrees very well with Aleksandrov's cross section at 1.2 MeV, but it gives cross sections about 4% higher than those measured relative to the reference cross sections of ^{235}U (1.203 b) and ^{237}Np (1.520 b) in a recent measurement by Salvador-Castiñeira et al. [61]. We also observe that the ^{240}Pu/^{235}U ratio from the present evaluation is consistent with the measured ratios in this energy region.

Table 27: Californium-252 spontaneous fission neutron spectrum averaged cross sections (mb).

	^{233}U	^{235}U	^{238}U	^{239}Pu	^{240}Pu	^{241}Pu
Present (with 1970s datasets of ^{235}U)	1914	1229	319	1815	1347	1617
Present (without 1970s datasets of ^{235}U)	1900	1223	316	1808	1340	1606
Grundl [186]	1893±48	1216±19	326±6.5	1824±35	1337±32	1616±80
Mannhart [187]		1210±15	325.7±5.3	1812±25		

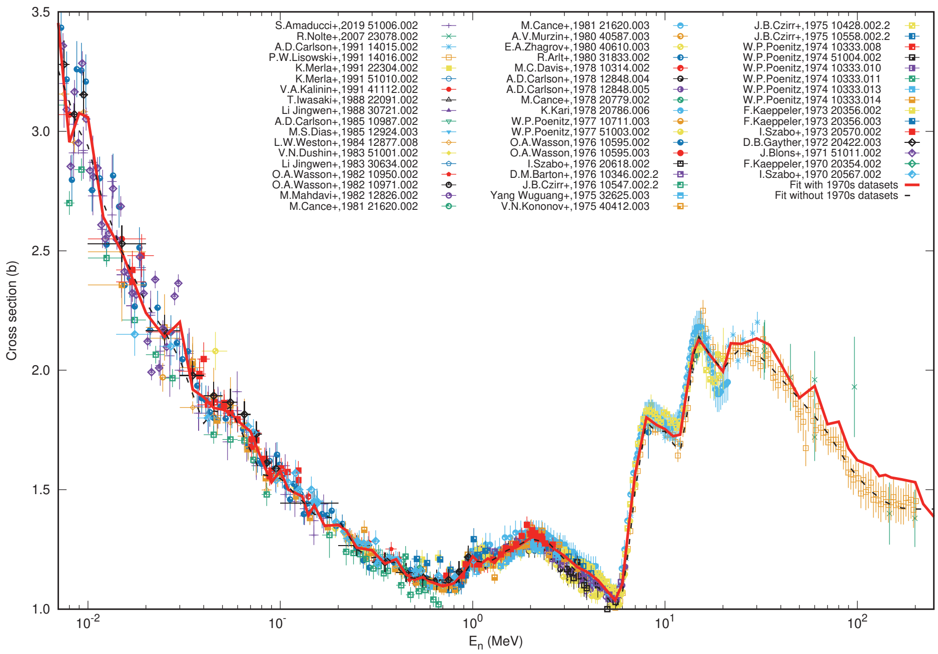


Figure 39: ^{235}U cross sections evaluated with and without the datasets published in 1970s.

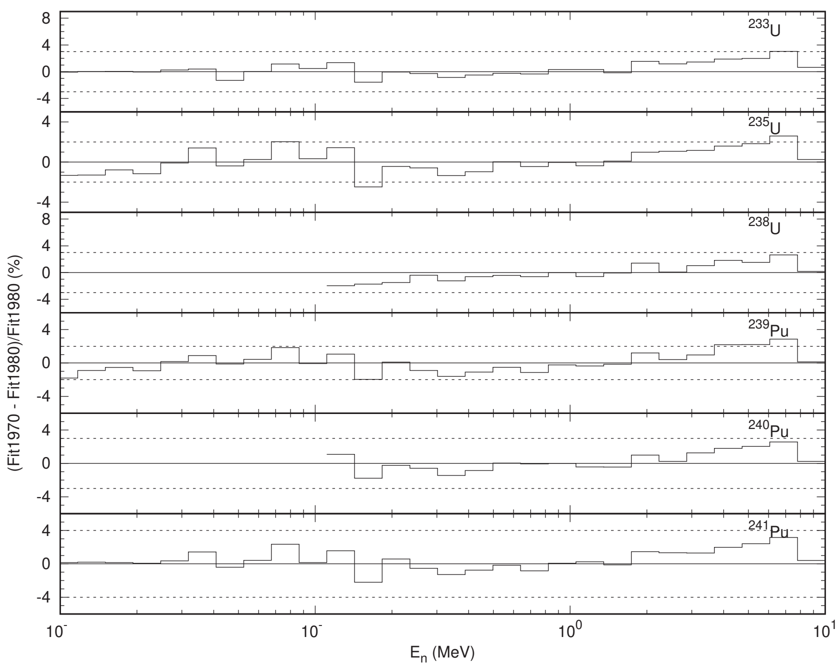


Figure 40: Change in the evaluated cross sections due to inclusion of the ^{235}U datasets published in 1970s. Fit1970 and Fit1980 denote fitting with and without the datasets in 1970s.

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