

WPEC Subgroup 30:
Quality improvement of the EXFOR database

Status report June 2008

Arjan Koning
NRG, Petten, The Netherlands

Introduction

The retrieval of experimental data from EXFOR runs the danger of becoming a delaying factor in contemporary data evaluation. Therefore, SG-30 was founded, which is a subgroup that aims to establish EXFOR as an easy accessible and correct database, with as most important spin-off a computational database that contains the entire EXFOR in easy-to-use tabular format. This will enable

- a huge increase in efficiency for the use of experimental data in data evaluation,
- easy and extensive validation of nuclear model codes,
- more feedback from users to the Data Centers to correct data.

To reach this goal, SG30 will focus on the following activities:

- attempt to translate (almost) the entire EXFOR database into computational format,
- Solve the most obvious quantitative errors, using checking codes, plotting packages and comparisons with model codes,
- Identify data which are stored incorrectly and attempt to harmonize the format.

In this document, the status of SG-30 after 1 year will be presented. Before we do that, we here list the most important internet information:

- SG30 mailing list: sg30@nea.fr

- SG30 website at NEA: www.nea.fr/html/science/SG30
- IAEA repository of entire EXFOR and computational format (XC4) databases: www-nds.iaea.org/x4toc4-master

Progress in 2007-2008

On April 20, 2007, Subgroup 30 was endorsed at the WPEC meeting. After discussion, the most important change relative to the initial proposal was to remove quality flagging of individual data sets from the *official* SG30 activities. In the following month, initial emails to probe the interest in SG30 were sent. A lot of moral support for this was received. The mailing list sg30@nea.fr was created, which currently has about 40 members. About 150 emails have been sent to the list so far.

In June 2007, a first important step towards more X4 user-friendliness was taken by Viktor Zerkov (IAEA), who translates the entire X4 database into the so called XC4 format, a convenient extension of the C4 format that has been in use for years now. Use is made of X4toC4, a code maintained by Andrej Trkov, to perform this translation. The IAEA is now regularly providing updated versions of both the entire EXFOR master database and the computational database to SG30, so that plotting, checking and nuclear model codes of EXFOR users can frequently be re-run with a new version of the database. The databases are available at the IAEA website mentioned above. The latest version is from May 7 2008.

Out of this XC4 database, a directory structured database (see Appendix) can be created (Arjan Koning). In the process, a simple checking filter can be applied to find the most flagrant errors. A first list of such errors has been sent to the IAEA in July 2007, after which Otto Schwerer and Svetlana Dunaeva corrected all cases where this was necessary.

Various other error reports were sent to both the IAEA and SG-30, among others by Alexander Konobeyev, Stepan Mashnik, Helder Duarte, Emmeric Dupont, and Sylvie Leray. As mentioned above, some of these errors emerged for the first time, as a filtering product of the automatic checking of new computational databases. Others were encountered by users who were interested in particular data. Svetlana Dunaeva and Otto Schwerer have taken care of most of these errors in the meantime.

Emmeric Dupont (CEA) has performed various statistical checks on the entire collection of tabulated data. This includes calculation of cross section averages over many data sets and individual deviations from that average. This allowed to identify various problems, mostly in the categories of dimension errors or wrong units. A set of tables with possible problems have been added as Appendix.

Nicolas Soppera and Henriksson (NEA) have used the Janis package to read in raw X4 data and

produce C4 tabulated outputs. This is all available on the NEA SG-30 website.

Alexander Konobeyev (FZK) has done large-scale model versus X4 comparisons with the ALICE and TALYS nuclear model codes, for thousands of reaction channels. Obvious problems on the X4-side have been reported to the NRDC.

On October 10-11 2007, the first SG-30 meeting was held at IAEA (see Appendix for the meeting minutes). All issues mentioned above were discussed. In addition, high-energy data testing is taking place at CEA (Jean-Christophe David and Sylvie Leray), showing consistency problems for the storage of residual yields and double-differential spectra. A final issue under study is the possibility to consistently distinguish between systematical and statistical errors (Ohtsuka, JAEA/IAEA)

The current claim is that 91% of the X4 database can be translated into the computational XC4 format. Out of this, about 80% has been translated into a directory-structured (reaction-by-reaction) database by Arjan Koning. One of the Appendices gives the current content statistics of EXFOR.

Translation now includes, cross sections, differential spectra, double-differential spectra, angular distributions, number of fission neutrons, fission yields, resonance parameters, and ratios. Not all of the resulting datasets have been tested however.

Plans and possibilities for the second year

The most error-free X4 database can probably be obtained by using as many different, independent checking methods as possible: through automatic chi-2 based comparison with models, statistical methods, visual inspection, etc., using many different translation and database management codes. Some of the activities mentioned below have been announced by volunteers or have been suggested by others to be valuable additions to the working program. We hope these can be performed in the second year of SG-30:

Robin Forrest (UKAEA): general cross section input, on the basis of comparison with the EAF X4-derived database, and advice on the issue of isomeric versus ground state data,

Boris Pritychenko (BNL): Sigma web interface for testing the quality of X4,

Dorothea Wiarda (ORNL): database management in relation with X4,

David Brown (LLNL): python package x4i to read X4 and put it into python data structures. This route also finds X4 bugs,

Emmeric Dupont (CEA): Use of Inter (BNL Checking codes) to check the quality of resonance integrals.

Actual implementation of these plans would be very helpful, as well as additional independent tests of the current X4 library.

As for X4 in computational format, Viktor Zerkov is currently investigating the issue of data sorting, to get e.g. all equal Legendre coefficients or emission energies in one data block, which seems to be the last major step for the creation of a full user-friendly database. With this, the issue of inconsistently stored reaction data, i.e. under the wrong X4 identifier, is of course not yet solved. However, almost all data is now at least accessible for testing. To solve the remaining format problems, the above mentioned list of different checking routes is indispensable.

Summary

SG-30 is well underway. Basically all milestones and deliverables (See Appendix) foreseen in the original working plan have been met. Now that almost the entire EXFOR database is available in computational format, the second year will mostly be devoted to extensive checking of the data in as many different ways as possible. The previous section lists some of the participants that could contribute to this. A continuously ongoing activity is the reporting of errors to the data centers, after which corrected versions of the entire database can be made available to SG-30.

As final product, a significantly improved X4 database, and related computational databases, can be expected in May 2009.

Summary Report

Consultants' Meeting of

**Subgroup 30 of the Working Group on Nuclear Data Evaluation
Co-operation (SG30 WPEC) on**

Quality improvement of EXFOR

International Atomic Energy Agency (IAEA)
Vienna, Austria

10 and 11 October 2007

Prepared by

Arjan Koning
NRG, Petten, the Netherlands

and

Alberto Mengoni
IAEA Nuclear Data Section, Vienna, Austria

Abstract

Presentations, recommendations and an actions list from a Consultants' Meeting on "Quality improvement of EXFOR" are summarized in this report. The CM was also the first meeting of WPEC/SG30, a recently established subgroup of the NEA/OECD Working Party on International Nuclear Data Evaluation Co-operation, which has the main objective of assessing and improving an important library of nuclear reaction data - EXFOR. The meeting took place in conjunction with the annual meeting of the Network of Reaction Data Centres (NRDC), a world-wide cooperation initiative of the IAEA, established to coordinate compilation and dissemination of nuclear reaction data.

December 2007

TABLE OF CONTENTS

1. General	7
2. Presentations and related discussion	7
3. Other discussions.....	8
4. Tasks/Actions	9
Appendix A-AGENDA	11
Appendix B-LIST OF PARTICIPANTS	13

1. General

The first meeting of Subgroup 30 of the NEA/OECD WPEC on the Quality improvement of EXFOR was held at IAEA Headquarter in Vienna, Austria, on 10-11 October 2007. These discussions followed on from a meeting of the International Network of Nuclear Reaction Data Centers Network (NRDC) to ensure input and comments from the centres maintaining the EXFOR database.

2. Presentations and related discussions

A. Koning presented the general objectives of SG30 to the members of the NRDC, as formulated in the proposal to WPEC. A general discussion followed on the objectives and planned activities of SG30.

A. Koning provided a list of “problems” he has recently encountered in analyzing the tabulated form of EXFOR provided by V. Zerkin. Not all of them turned out to be errors. Instead some of them are allowed within the EXFOR format. The tabulated (“C4” or “T4” formats) file extracted from EXFOR via a translation tool developed by V. Zerkin has been available to SG30 participants since mid-2007. Work is in progress in order to improve the translation capabilities.

A. Mengoni suggested inclusion of an estimate of the level of completeness of EXFOR in the work plan of SG30 (SG30 work plan did not include this task). This proposal was approved.

A. Mengoni, together with S. Dunaeva and other IAEA/NDS staff will investigate how such an estimate can be made. The current estimates are 85% of all incident neutron measurements are contained in EXFOR and about 25% are compiled for incident photons.

P. Oblozinsky gave a short overview of related activities at NNDC that are planned in the coming years. One central issue is the Global Nuclear Data Initiative (GNDI), which integrates nuclear data evaluations and validations into one automated computational scheme. Clearly, a good-quality EXFOR file plays an important role in such an initiative.

V. Zerkin presented another intermediate EXFOR format, which he calls XT4 (“extended T4”) representing a more readable version of the original EXFOR file in which the data are properly aligned in columns. There is 100% conversion from the original EXFOR file to the XT4 file. Another important issue is the conversion of EXFOR to a table in numerical format - the C4 file. Currently, the conversion ratio is about 50%. If the entire reaction dictionary is used for the X4toC4 code, a conversion ratio of 93% can be achieved. This conversion can be done, but the results have not been tested. V. Zerkin will continue to work on increasing the conversion ratio from the current 50% and testing the results.

H. Henriksson and N. Soppera presented the plans of the NEA Data Bank for SG30. A website has been set up: www.nea.fr/science/wpec/SG30. Although the NEA tabular format (which is different from C4) is unlikely to be further extended, the NEA will focus on reading EXFOR directly with the JANIS tool. The success of this translation route will be tested by NEA producing data in C4 tabular format running JANIS in batch mode. The results can then be compared with the X4toC4 route, which will be of benefit to all parties. The production of tabular formatted files will be initiated by the NEA in the coming months.

N. Otsuka presented work on EXFOR undertaken in Japan, primarily by JAEA and Hokkaido University. There is an EXFOR-related website available: www.jcprg.org/exfor. His presentation addressed two important points for SG30: (1) storing uncertainties in a well-defined manner - as a simple example, he showed the problem in distinguishing between systematic and statistical uncertainties in EXFOR; (2) storage of residual products from high-

energy reactions - there is the option of storing them as one product per subentry or by using the ELEM/MASS keyword (no clear preference could be inferred from the discussions).

S. Dunaeva gave a short overview of some recent errors that have been corrected (including the list sent by A. Koning), and stated that error corrections can now be executed much faster than before.

J.C. David presented some problems encountered by CEA while attempting to retrieve complete high-energy data sets. There are at least two problems: (1) double-differential particle spectra, e.g. for (p,xn) reactions - there appear to be different ways to retrieve these data, and for every isotope the identifier required for retrieval is different; (2) residual nuclide production, where the data are stored in too many subsections (same issue as raised by N. Otsuka).

3. Other discussions

The C4 format needs to be extended, maybe even beyond the width of 80 characters, in order to distinguish between the statistical and systematic uncertainties,

Statistical tests performed by E. Dupont are very valuable and they have already given rise to some EXFOR improvements as outlined in one of the NRDC documents of V. Zerkin. However, the participants in the meeting would like to see a different presentation of the results, enabling a clearer view on possible problems.

A. Koning will make available his directory-structured database based on C4. Web links will be placed at the NEA and/or IAEA website.

4. Tasks/Actions

V. Zerkin: continue the X4toC4 translation process and aim for 93% conversion.

H. Henriksson/N. Soppera: extend the capabilities of JANIS to read EXFOR and produce a C4 file from this material.

A. Koning: make available his directory structured database.

A. Mengoni, S. Dunaeva: investigate how to obtain an estimate of the completeness of EXFOR for all incident particles.

V. Zerkin, N. Otsuka and A. Trkov: work on an extension of the C4 format to include the product ZA for residual production cross sections (translation of the ELEM/MASS keyword)

Appendix A



Consultants' Meeting of
SG30 WPEC on
“Quality improvement of EXFOR”
International Atomic Energy Agency (IAEA)
Vienna, Austria
10 and 11 October 2007

Preliminary AGENDA

Wednesday, 10 October - Meeting Room A0742

14:30 - 17:30 Presentations

- Subgroup 30-General introduction and goals, A.J.Koning
- Possibilities of IAEA translation tools, V. Zerkin
- JANIS and revised computational formats, H. Henriksson / N. Soppera
- Ideas from JAEA, N. Otsuka

Thursday, 11 October - Meeting Room A2313

9:00 - 12:00 Presentations (continued)

- Input from BNL, B. Pritychenko
- Experience and proposals from FZK, A. Konobeyev
- Proposals and experience for spallation reactions, S. Leray
- Some recent progress in error correction, S. Dunaeva
- From X4 to C4 to a human-readable database: an example of testing X4, A.J. Koning

12:30 – 14:00 Lunch at VIC restaurant

14:00 – 17:00 General discussions

- Central repository for current X4, C4etc. data collections
- Format conversion tools (X4 to C4, JANIS, NEA comp format codes, Koning's software, others)
- Order: work on all issues continuously or divide into subsets (cross sections, angular distributions, etc.)
- Tests: - Statistical

- Nuclear Models

- Volunteers for model code testing

- Insight in available time at NRDC-link to ambitions
- Set milestones

Close

Appendix B



Consultants' Meeting of
SG30 WPEC on
“Quality improvement of EXFOR”
International Atomic Energy Agency (IAEA)
Vienna, Austria
10 and 11 October 2007

LIST OF PARTICIPANTS

FRANCE

Jean-Christophe **David**
DAPNIA/SPhN
CEA –Centre d’Etudes de Saclay
Gif-sur-Yvette Cedex
91191 Bat. 703 Orme-des-Merisiers
E-mail: jean-christophe.david@cea.fr

Sylvie **Leray**
DAPNIA/SPhN
CEA Saclay
91191 Gif-sur-Yvette-Cedex
Tel.: +33 1 69 088 361
Fax: +33 1 69 087 584
E-mail: sleray@cea.fr

NETHERLANDS

Arjan **Koning**
Building 34.213
NRG Nuclear Research and
Consultancy Group
Westerduinweg 3
P.O. Box 25
NL-1755 ZG Petten
Tel. +31 22456 4051
Fax +31 22456 8490
E-mail: koning@nrg-nl.com

SLOVAKIA

Stanislav **Hlavac**
Department of Nuclear Physics
Institute of Physics
Slovak Academy of Sciences
Dubravska Cesta 9
SK-84228 Bratislava
Tel. + +421 2-69201900
E-mail: hlavac@savba.sk

OBSERVER

JAPAN

Naohiko **Otsuka**
Nuclear Data Evaluation Group
Japan Atomic Energy Agency
Tokai-mura, Naka-gun
Ibaraki-ken 319-1195
E-mail: ohtsuka@nucl.sci.hokudai.ac.jp

INTERNATIONAL ORGANIZATIONS

Hans **Henriksson**
Nuclear Data Services
OECD Nuclear Energy Agency
Le Seine Saint-Germain
12, boulevard de Iles
92130 Issy-les-Moulineaux
Tel. +33 1 45 24 1084
Fax +33 1 45 24 1128
E-mail: henriksson@nea.fr

Nicolas **Soppera**
OECD Nuclear Energy Agency
Le Seine Saint-Germain
12, boulevard de Iles
92130 Issy-les-Moulineaux
Tel. +33 1 45 24 1088
Fax +33 1 45 24 1128
E-mail: soppera@nea.fr

IAEA

Alberto **Mengoni** (Scientific Secretary)
NAPC/Nuclear Data Section
Tel. +43 1 2600 21717
Fax +43 1 2600-7
E-mail: a.mengoni@iaea.org

UNITED STATES OF AMERICA

Dr. Pavel Oblozinsky
National Nuclear Data Center
Brookhaven National Laboratory
P.O. Box 5000
Upton NY 11973-5000
Tel. + 1 631 344 2814
Fax + 1 631 344 2806
E-mail: oblozinsky@bnl.gov

Svetlana Dunaeva
NAPC/Nuclear Data Section
Tel. +43 1 2600 21727
Fax +43 1 2600-7
E-mail: s.dunaeva@iaea.org

Viktor Zerkin
NAPC/Nuclear Data Section
Tel. +43 1 2600 21714
Fax +43 1 2600-7
E-mail: v.zerkin@iaea.org

Nuclear Data Section
International Atomic Energy Agency
P.O. Box 100
A-1400 Vienna
Austria

e-mail: services@iaeand.iaea.org
fax: (43-1) 26007
telephone: (43-1) 2600-21710
Web: <http://www-nds.iaea.org>

WPEC Subgroup 30: Quality improvement of the EXFOR database

Arjan Koning
NRG, Petten, The Netherlands

Justification for a subgroup

A subgroup is proposed that establishes EXFOR (CSISRS in the USA) as an easy accessible and correct database, with as most important deliverables an EXFOR master database from which many data and format errors have been removed, and a computational database that contains the entire EXFOR in tabular ("x-y-dy") format. This enables

- A huge increase in efficiency for the evaluation of data files.
- Easy and extensive validation of nuclear model codes, from low to high energies.

Bringing the EXFOR database to this level can only be accomplished through collaboration of the EXFOR providers, i.e. the Nuclear Reaction Data Centres Network (NRDC) and users. To constrain the ambitions, we should clearly define the plan. SG30 will:

- Attempt to translate (almost) the entire EXFOR database into computational format.
- Solve the most obvious quantitative errors, using checking codes, plotting packages and comparisons with model codes.
- Identify data which are stored incorrectly and attempt to harmonize the format.

SG30 will NOT:

- Assign quality "flags" to experiments in EXFOR. Not only would this be a huge task, it also does not justice to the essence of EXFOR as a compiled, rather than an evaluated, database. Quality flagging is useful but too subjective for SG30.
- Focus on the completeness of EXFOR, i.e. missing data (already handled by NRDC).
- Insist on drastic changes of the EXFOR master format.

If this project is successful, then

- If you ask for all data of a particular reaction channel, either through a web-interface or through tabulated files, you have a larger possibility that you indeed get everything you were looking for.
- The data retrieval will be much easier, enabling users to spend more time on other things.
- These data have a larger probability to be correct.

Proposed activities

The subgroup addresses the accessibility, quality, and formatting issues of the EXFOR database, from the point of view of a user. For this, various activities have to be performed iteratively.

Translation of the entire EXFOR database into tabular format

This is an essential component of the project and requires some effort by the NRDC. The further this is developed, the more errors and problems in EXFOR can be uncovered by users, and the better it will be for the quality of the EXFOR master database. Possible tools:

- X4toC4, a code maintained by Andrej Trkov and used extensively by Victor Zerkin at the IAEA to translate EXFOR. Currently, Victor is using the code to produce many quantities (double-diff x.s. etc.) into tabular format, and will make the resulting database available.
- NEA's computational format (Pierre Nagel), which is different from the X4toC4 format.
- JANIS-3.0 (Nicolas Soppera, Hans Henriksson), which has just been released and which can read the EXFOR format directly.
- Other?

Proposed activities:

- IAEA: To regularly provide the entire EXFOR master database and computational database to the other members of SG30, so that plotting, checking and nuclear model codes etc. of EXFOR users can frequently be re-run with an updated version of the database. This would only require a few links on e.g. the IAEA EXFOR website, with a few large gzipped files. Additional retrieval/translation tools would also be helpful.
- NEA: if possible, to do the above for NEA's computational format
- NEA: Can JANIS be set in batch mode so that it produces x-y-dy tables out of EXFOR?

At first, some (apparent) redundancy is welcome, since not all methods may catch all problems.

Correction of obvious numerical errors

Some obvious errors in the data can easily be found. One could e.g. run a check on the entire database and filter out all partial cross sections above 1 MeV that exceed 4 barns (which is unphysical), and report that to the NRDC (a first batch was sent last year). Closer inspection is then needed to reveal whether it is indeed a published value or that by mistake e.g. barns instead of millibarns were entered by the compiler.

Possible contributions:

- Arjan Koning translates the X4toC4 generated database into his own directory-structured database. The above mentioned filter is used as check. Other filters (for spectra, etc.) could be added, and the problems will be reported to the NRDC. Automatic comparisons with nuclear model codes are also underway.
- Robin Forrest and Jura Kopecky have an experimental database for EAF, derived from NEA's computational format, which is post-adjusted to account for EXFOR errors (it is also quality-flagged). The errors could be reported, so that everybody will have access to the same correct data in the future.
- Luigi Mercatali and Alexander Konobeyev (Karlsruhe) do large-scale model-experiment comparisons with ALICE, TALYS, CEM etc. for thousands of reaction channels. Obvious problems can be, and some have already been, reported to the NRDC.
- Other? Mike Herman, Patrick Talou, Don Smith, David Brown or LLNL colleagues, Cyrille de Saint Jean, Arjan Plompen, Toshihiko Kawano, Osamu Iwamoto, Yu Hongwei or colleagues?

Proposals for format harmonization

This is probably the most complicated part and causing the most EXFOR problems. Format errors in the reaction identification give problems to the codes used at the NRDC to handle the numerical data, e.g. X4toC4. Even worse, some reaction data may appear not to exist, since they are hidden under a different reaction identifier. Actually, some nuclear reactions, from different measurements, are stored in two or even more different reaction classes, again leading to incomplete retrievals.

Possible contributions:

- Reporting of storage of quantities in the wrong reaction channel, e.g. activation data for the $[Z,A] (n,x) [Z-1,A-1]$ should not be stored under the (n,d) reaction since also the (n,np) channel contributes. There are many examples like this.
- Isomeric cross sections: This information is essential for activation libraries such as EAF. Robin Forrest and Jura Kopecky may have proposals for a small format extension so that isomeric data is appropriately included. Also, the wrongly stored data should be reported.
- From the high-energy community, energies above 200 MeV, there are some complaints about retrieving the EXFOR data. For example, some residual nuclide yields, which for some reactions may amount to thousands, are not stored in a logical way. Maybe some of you (Sylvie Leray, other people from the HINDAS project, Helder Duarte, Stepan Mashnik, Alexander konobeyev, etc.) can suggest proposals for changing this.
- Others? See list above.

Meetings

As usual, a lot can be handled via email. However, it is also useful to have a meeting every now and then. Often, SG meetings are done in conjunction with other meetings, workshops etc. where a few participants are already present anyway. Half-day, two hour, or even pre-, during- or post-dinner meetings could be organized. Possibilities in 2007 that come to mind are the NEMEA Workshop in Prague, Oct 16-18 2007, the IAEA RIPL meeting Dec 10-14 2007, and the next WPEC meeting in May 2008 (place unknown).

Deliverables

As the mandate for SG30 is for 2 years, the following deliverables are foreseen for april 2009.

1. An improved EXFOR master database.
2. An improved computational, tabular database, automatically created from [1.].
3. A final WPEC SG30 report (coordinator: Arjan Koning), describing
 - the status of EXFOR in april 2007
 - the SG30 activities performed to check, correct and improve the EXFOR database
 - the status of EXFOR in april 2009

Time-schedule and milestones

- July 2007-April 2009 continuous: Report to SG30 (and thus automatically to NRDC) about problems and suggestions for improvement.
- September 2007: Zeroth version of the full EXFOR and computational library, i.e. the current situation.
- October 2007: Statement about all software that processes EXFOR (X4toC4, NEA's code, JANIS-3.0), and outline of ideas to make use of this.
- December 2007: Correction of EXFOR with first lists of errors (as provided by Forrest/Kopecky, Koning, and others).
- January 2008: A list of all format issues that require attention. (A first version will be sent soon).
- July 2008: First version of a corrected computational library. Target: All cross sections + angular distributions + differential energy spectra + double-differential energy-angle spectra. If possible: + resonance parameters + ratio's + everything else.
- April 2009: Final version of the full computational library + updated EXFOR.

Newbase

```
4096 Oct 8 12:33 a/  
4096 Oct 8 12:31 d/  
5470822 Oct 8 12:33 done.c4  
4096 Oct 8 12:31 g/  
4096 Oct 8 12:33 h/  
4096 Oct 8 12:27 n/  
590985 Oct 8 12:17 newbase*  
30554 Oct 8 11:52 newbase.f  
3098501 Oct 8 12:33 notdone.c4  
8591194 Oct 8 12:33 out  
4096 Oct 8 12:32 p/  
78793 Oct 8 12:33 suspicious.c4  
4096 Oct 8 12:33 t/  
26 Oct 8 11:53 x4all.c4 -> ../exfor/C4-2007-09-26.xc4  
29 Jun 28 17:08 x4all.x4 -> ../exfor/EXFOR-2007-05-21.BCK
```

Newbase

```
/home/finux01b/akoning/14105/newbase/n> ll
4096 Oct 8 12:20 ac/
4096 Oct 8 12:27 ag/
4096 Oct 8 12:26 al/
4096 Oct 8 12:27 am/
.....
/home/finux01b/akoning/14105/newbase/n/ca> ll
4096 Oct 8 12:26 000/
4096 Oct 8 12:25 040/
4096 Oct 8 12:26 041/
4096 Oct 8 12:23 042/
4096 Oct 8 12:26 043/
4096 Oct 8 12:26 044/
4096 Oct 8 12:21 046/
4096 Oct 8 12:23 048/
```

Newbase



```
/home/finux01b/akoning/l4105/newbase/n/ca/048> ll
4096 Oct 8 12:27 001/
4096 Oct 8 12:27 016/
4096 Oct 8 12:21 051/
4096 Oct 8 12:21 051ang/
4096 Oct 8 12:27 102/
4096 Oct 8 12:26 107/
4096 Oct 8 12:21 elang/
4096 Oct 8 12:26 RI/
4096 Oct 8 12:23 specav/
```

Newbase



```
/home/finux01b/akoning/l4105/newbase/n/ca/048/016> ll
908 Oct 8 12:27 Betak1999.tot
760 Oct 8 12:23 Hille1961.tot
686 Oct 8 12:20 Hillman1962.tot
686 Oct 8 12:24 Holmberg1978.tot
1279 Oct 8 12:25 Ikeda1988.tot
686 Oct 8 12:24 Minetti1966.tot
686 Oct 8 12:25 Pepelnik1985.tot
686 Oct 8 12:26 Tiwari1968.tot
```

Newbase



/home/finux01b/akoning/l4105/newbase/n/ca/048/016> cat Ikeda1988.tot

Target : Z= 20 A= 48 Isomer= Projectile=n

Reaction: MT= 16 (n,2n) Isomer=

Quantity: Cross section

Frame: L

Author : Y.Ikeda+

Year: 1988 EXFOR ID: 22089021

#	E (MeV)	xs (mb)	dxs (mb)	dE (MeV)
1	1.49400E+01	8.06000E+02	7.80000E+01	0.00000E+00
1	1.46700E+01	8.05000E+02	6.70000E+01	0.00000E+00
1	1.44300E+01	7.64000E+02	4.80000E+01	0.00000E+00
1	1.42200E+01	7.45000E+02	5.00000E+01	0.00000E+00
1	1.39900E+01	7.59000E+02	5.00000E+01	0.00000E+00
1	1.37500E+01	7.11000E+02	7.00000E+01	0.00000E+00
1	1.35700E+01	6.79000E+02	5.60000E+01	0.00000E+00
1	1.33300E+01	6.77000E+02	4.70000E+01	0.00000E+00

#Y.Ikeda, C.Konno, K.Oishi,

#T.Nakamura, H.Miyade, K.Kawade,

#H.Yamamoto, T.Katoh

#Rept. JAERI Reports

#No.1312, 1988

#-Activation cross section measurements for fusion reactor structural

#materials at neutron energy from 13.3 to 15.0 MeV using FNS facility.

Newbase



```
/home/finux01b/akoning/14105/newbase/p/zr/000> ll
total 12
drwxr-xr-x  2 akoning NRG_fys 4096 Oct  8 12:32 003/
drwxr-xr-x  2 akoning NRG_fys 4096 Oct  8 12:29 004/
drwxr-xr-x 17 akoning NRG_fys 4096 Oct  8 12:32 rp/
```

Newbase



/home/finux01b/akoning/14105/newbase/p/zr/000/rp> ll

4096	Oct	8	12:29	000001/
4096	Oct	8	12:32	004007/
4096	Oct	8	12:32	011022/
4096	Oct	8	12:28	015032/
4096	Oct	8	12:32	021044/
4096	Oct	8	12:32	025054/
4096	Oct	8	12:32	033074/
4096	Oct	8	12:28	037082/
4096	Oct	8	12:32	037083/
4096	Oct	8	12:28	037084/
4096	Oct	8	12:32	039088/
4096	Oct	8	12:32	041091/
4096	Oct	8	12:32	041092/
4096	Oct	8	12:32	041095/
4096	Oct	8	12:32	041096/

Newbase



/home/finux01b/akoning/14105/newbase/p/zr/000/rp/033074> 11

909 Oct 8 12:28 Aleksandrov1993.tot

2254 Oct 8 12:32 Michel1997.tot

/home/finux01b/akoning/14105/newbase/p/zr/000/rp/033074> cat Michel1997.t

Target : Z= 40 A= 0 Isomer= Projectile=p

Reaction: Zres= 33 Ares= 74 Isomer=99

Quantity: Cross section

Frame: L

Author : R.Michel+

Year: 1997 EXFOR ID: 00276238

#	E (MeV)	xs (mb)	dxs (mb)	dE (MeV)
1.	1.65000E+02	2.04000E-01	2.51000E-02	1.20000E+00
2.	2.26000E+02	1.01000E+00	1.51000E-01	1.42000E+00
2.	2.67000E+02	1.16000E+00	1.23000E-01	1.17000E+00
2.	2.77000E+02	1.49000E+00	1.41000E-01	1.42000E+00
3.	3.34000E+02	2.29000E+00	1.73000E-01	1.61000E+00
3.	3.55000E+02	2.42000E+00	1.89000E-01	1.38000E+00
3.	3.72000E+02	2.49000E+00	2.23000E-01	1.16000E+00
5.	5.69000E+02	5.55000E+00	4.26000E-01	1.28000E+00
7.	7.71000E+02	6.24000E+00	4.92000E-01	1.27000E+00
8.	8.00000E+02	6.45000E+00	4.76000E-01	0.00000E+00
1.	1.20000E+03	6.76000E+00	5.44000E-01	0.00000E+00
1.	1.20000E+03	6.54000E+00	4.98000E-01	1.10000E+00

Newbase

1.56000E+03 5.97000E+00 4.67000E-01 1.48000E+00
1.58000E+03 5.80000E+00 4.11000E-01 1.12000E+00
1.60000E+03 5.44000E+00 4.54000E-01 0.00000E+00
2.57000E+03 4.98000E+00 3.97000E-01 1.29000E+00
2.60000E+03 4.43000E+00 3.78000E-01 0.00000E+00

#R.Michel, R.Bodemann, H.Busemann,

R.Daunke, M.Gloris, H.-J.Lange,

B.Klug, A.Krins, I.Leya,

M.Luepke, S.Neumann, H.Reinhardt,

M.Schnatz-Buettgen, U.Herpers, Th.Schiekel,

F.Sudbrock, B.Holmqvist, H.Conde,

P.Malmborg, M.Suter, B.Dittrich-Hannen,

#P.-W.Kubik, H.-A.

#Jour. Nucl. Instrum. Methods in Physics Res., Sect.B

#Vol.129, p.153, 1997

#Cross Sections For the Production of Residual Nuclides

#By Low- And Medium-Energy Protons from the Target

#Elements C, N, O, Mg, Al, Si, Ca, Ti, V, Mn, Fe, Co,

#Ni, Cu, Sr, Y, Zr, Nb, Ba and Au.

EXFOR General Statistics**Information updated: 26-May-2008, 09:27:46**

Total Number of ENTRY: 17909
 Number of ENTRY with data: 17191
 Total Number of SUBENT: 147215
 Number of SUBENT with data: 116649
 Number of Datasets: 129303

EXFOR Quantity

#	Code	Count	Percent	Quantity
1	CS	61478	47.5	Cross section data
2	DAP	15219	11.7	Partial differential data with respect to angle
3	RP	12084	9.34	Resonance parameters
4	DA	10339	7.99	Differential data with respect to angle
5	DAE	6327	4.89	Differential data with respect to angle and energy
6	POL	4798	3.71	Polarization data
7	CSP	4746	3.67	Partial cross section data
8	FY	2990	2.31	Fission product yields
9	TT	1983	1.53	Thick target yields
10	RI	1479	1.14	Resonance integrals
11	DE	1374	1.06	Differential data with respect to energy
12	MFQ	1216	0.94	Miscellaneous fission quantities
13	SP	977	0.75	Gamma spectra
14	PY	844	0.65	Product yields
15	L	711	0.54	Scattering amplitudes
16	E	682	0.52	Kinetic energies
17	NQ	529	0.4	Nuclear quantities
18	INT	462	0.35	Cross section integral over incident energy
19	TTD	279	0.21	Differential thick target yields
20	MLT	226	0.17	Outgoing particle multiplicities
21	RR	114	0.088	Reaction rates
22	SQ	84	0.064	Special quantities
23	DEP	80	0.061	Partial differential data with respect to energy
24	CST	64	0.049	Temperature dependent cross section data
25	COR	23	0.017	Secondary particle correlations
26	TTP	8	0.0061	Partial thick target yields

EXFOR Targets

#	Target	Count	Percent
1	U	9175	7.09
2	Pb	6392	4.94
3	Ni	5613	4.34
4	H	5281	4.08
5	C	5069	3.92
6	Fe	4881	3.77
7	Cu	4030	3.11
8	Li	3266	2.52
9	Sn	3226	2.49
10	Pu	3073	2.37
11	Al	3068	2.37
12	Mo	3014	2.33
13	Zr	2968	2.29
14	O	2697	2.08
15	Au	2431	1.88
16	Si	2344	1.81
17	Ti	2266	1.75

EXFOR Incident particles

#	Projectile	Count	Percent
1	N	59803	46.2
2	P	33097	25.5
3	A	7015	5.42
4	D	6533	5.05
5	G	6246	4.83
6	HE3	2267	1.75
7	92-U-238	2245	1.73
8	6-C-12	1685	1.3
9	82-PB-208	1635	1.26
10	0	1259	0.97
11	8-O-16	771	0.59
12	3-LI-6	740	0.57
13	79-AU-197	738	0.57
14	T	575	0.44
15	3-LI-7	536	0.41
16	7-N-14	515	0.39
17	10-NE-20	291	0.22

EXFOR Reactions

#	Reaction	Count	Percent
1	P,X	13575	10.4
2	N,G	10814	8.36
3	N,EL	8931	6.9
4	N,TOT	6120	4.73
5	N,F	6053	4.68
6	N,INL	5264	4.07
7	N,O	4252	3.28
8	P,INL	4189	3.23
9	N,P	3909	3.02
10	N,X	3704	2.86
11	N,2N	3522	2.72
12	P,EL	2987	2.31
13	P,F	2837	2.19
14	N,A	2588	2
15	P,N	2400	1.85
16	G,X	1876	1.45
17	U-238,X	1854	1.43

18	Th	2250	1.74	18	18-AR-40	225	0.17	18	A,X	1724	1.33
19	Bi	2176	1.68	19	8-O-18	179	0.13	19	Pb-208,X	1628	1.25
20	Ca	2167	1.67	20	PIP	168	0.12	20	P,D	1267	0.97
21	Mg	2020	1.56	21	14-SI-28	148	0.11	21	D,P	1260	0.97
22	Zn	1959	1.51	22	4-BE-9	125	0.096	22	G,N	1254	0.96
23	Be	1931	1.49	23	2-HE-6	119	0.092	23	D,X	1226	0.94
24	Cr	1871	1.44	24	9-F-19	115	0.088	24	D,EL	1085	0.83
25	Co	1861	1.43	25	PIN	105	0.081	25	P,A	1020	0.78
26	B	1734	1.34	26	5-B-11	104	0.08	26	C-12,X	1005	0.77
27	Nb	1675	1.29	27	28-NI-58	94	0.072	27	G,F	980	0.75
28	Cd	1640	1.26	28	10-NE-22	91	0.07	28	A,EL	907	0.7
29	N	1585	1.22	29	5-B-10	88	0.068	29	N,THS	889	0.68
30	W	1577	1.21	30	6-C-13	75	0.058	30	P,G	881	0.68
31	Ag	1553	1.2	31	E	68	0.052	31	P,T	867	0.67
32	Sm	1549	1.19	32	54-XE-129	59	0.045	32	N,ABS	859	0.66
33	Ta	1493	1.15	33	20-CA-40	53	0.04	33	O,F	810	0.62
34	Te	1322	1.02	34	4-BE-11	52	0.04	34	A,N	749	0.57
35	V	1286	0.99	35	3-LI-8	50	0.038	35	D,N	727	0.56
36	Se	1280	0.98	36	26-FE-56	48	0.037	36	G,P	681	0.52
37	He	1141	0.88	37	29-CU-63	41	0.031	37	N,NON	551	0.42
38	In	1113	0.86	38	4-BE-7	38	0.029	38	N,SCT	511	0.39
39	Ba	1087	0.84	39	16-S-32	38	0.029	39	D,A	506	0.39
40	Y	1070	0.82	40	54-XE-132	36	0.027	40	A,INL	487	0.37
...						
Total: 104				Total: 316				Total: 1909			

EXFOR database management: Otto Schwerer (O.Schwerer@iaea.org)
 Web and database programming: Viktor Zerkov (V.Zerkov@iaea.org)
 IAEA, Nuclear Data Section, 1999 - 2008

EXFOR General Statistics

Information updated: 30-Apr-2008, 11:39:13

Database as of: April 30, 2008

Number of ENTRY	17172	experimental works
Number of SUBENT	116556	data tables (can contain data of more than one reaction)
Number of Datasets	129193	data tables of reactions

Percent: [Counts]/[Number of ENTRY], i.e. = [Counts]/17172

Note. Σ [Percent] of a table below can be > 100% because one experimental work can contain many data tables with data of many types**EXFOR Quantity**

#	Code	Quantity	Counts	Percent
1	CS	Cross section data	8855	51.5
2	DA	Differential data with respect to angle	3313	19.2
3	DAP	Partial differential data with respect to angle	2988	17.4
4	RP	Resonance parameters	1635	9.52
5	CSP	Partial cross section data	1410	8.21
6	POL	Polarization data	915	5.32
7	FY	Fission product yields	901	5.24
8	DAE	Differential data with respect to angle and energy	785	4.57
9	SP	Gamma spectra	416	2.42
10	MFQ	Miscellaneous fission quantities	413	2.4
11	RI	Resonance integrals	370	2.15
12	DE	Differential data with respect to energy	344	2
13	TT	Thick target yields	243	1.41
14	E	Kinetic energies	214	1.24
15	L	Scattering amplitudes	182	1.05
16	PY	Product yields	111	0.64
17	INT	Cross section integral over incident energy	107	0.62
18	NQ	Nuclear quantities	93	0.54
19	RR	Reaction rates	45	0.26
20	MLT	Outgoing particle multiplicities	39	0.22
21	TTD	Differential thick target yields	26	0.15
22	CST	Temperature dependent cross section data	16	0.093
23	SQ	Special quantities	12	0.069
24	COR	Secondary particle correlations	6	0.034
25	TTP	Partial thick target yields	6	0.034
26	DEP	Partial differential data with respect to energy	3	0.017

EXFOR Targets (el.)

#	Target	Counts	Percent
1	U	2244	13
2	C	1499	8.72
3	H	1256	7.31
4	Fe	1158	6.74
5	Al	1152	6.7
6	Ni	1106	6.44
7	Pb	1044	6.07
8	Cu	957	5.57
9	Li	875	5.09
10	Pu	852	4.96
11	O	779	4.53
12	Be	737	4.29
13	Th	689	4.01
14	Si	665	3.87
15	Au	660	3.84
16	Zr	648	3.77
17	B	608	3.54

EXFOR Targets

#	Target	Counts	Percent
1	U-235	1144	6.66
2	Al-27	1136	6.61
3	C-12	1042	6.06
4	U-238	943	5.49
5	Be-9	704	4.09
6	Au-197	651	3.79
7	Th-232	633	3.68
8	Pu-239	606	3.52
9	Bi-209	586	3.41
10	H-1	583	3.39
11	Ni-58	583	3.39
12	O-16	572	3.33
13	Fe-0	553	3.22
14	Cu-0	551	3.2
15	H-2	548	3.19
16	Co-59	531	3.09
17	Pb-0	516	3

EXFOR Incident particles

#	Projectile	Counts	Percent
1	N	9317	54.2
2	P	3252	18.9
3	D	1289	7.5
4	A	1216	7.08
5	G	896	5.21
6	HE3	502	2.92
7	0	328	1.91
8	6-C-12	160	0.93
9	T	157	0.91
10	8-O-16	130	0.75
11	3-Li-6	117	0.68
12	3-Li-7	99	0.57
13	2-HE-6	55	0.32
14	7-N-14	48	0.27
15	5-B-11	37	0.21
16	4-BE-9	36	0.2
17	8-O-18	35	0.2

EXFOR

#	R
1	N
2	N
3	N
4	N
5	N
6	N
7	N
8	N
9	P
10	N
11	P
12	P
13	N
14	P
15	C
16	A
17	P

18	Zn	598	3.48	18	Li-7	494	2.87	18	10-NE-20	30	0.17	18	G
19	Mg	597	3.47	19	Li-6	469	2.73	19	9-F-19	30	0.17	19	A
20	Bi	589	3.43	20	Fe-56	455	2.64	20	18-AR-40	29	0.16	20	N
21	Ca	566	3.29	21	Nb-93	446	2.59	21	E	21	0.12	21	C
22	Sn	548	3.19	22	Pb-208	436	2.53	22	14-SI-28	19	0.11	22	P
23	Co	546	3.17	23	U-233	404	2.35	23	92-U-238	19	0.11	23	O
24	Mo	543	3.16	24	Ni-0	372	2.16	24	PIN	19	0.11	24	G
25	Ti	533	3.1	25	Si-28	364	2.11	25	PIP	18	0.1	25	A
26	Ag	495	2.88	26	Ta-181	360	2.09	26	3-LI-8	16	0.093	26	C
27	N	489	2.84	27	Zr-90	355	2.06	27	4-BE-7	16	0.093	27	P
28	Ta	476	2.77	28	Mn-55	353	2.05	28	5-B-10	16	0.093	28	C
29	Nb	449	2.61	29	Cu-63	341	1.98	29	6-C-13	16	0.093	29	A
30	Cr	441	2.56	30	N-14	336	1.95	30	3-LI-9	15	0.087	30	A
31	In	441	2.56	31	V-51	332	1.93	31	10-NE-22	14	0.081	31	N
32	V	431	2.5	32	C-0	330	1.92	32	3-LI-11	14	0.081	32	C
33	W	425	2.47	33	Na-23	330	1.92	33	2-HE-8	13	0.075	33	G
34	He	422	2.45	34	F-19	323	1.88	34	4-BE-11	13	0.075	34	N
35	Cd	410	2.38	35	B-10	321	1.86	35	9-F-17	13	0.075	35	G
36	S	367	2.13	36	Ca-40	306	1.78	36	16-S-32	12	0.069	36	N
37	Mn	361	2.1	37	Fe-54	304	1.77	37	9-F-18	12	0.069	37	A
38	Na	351	2.04	38	Ni-60	302	1.75	38	5-B-8	11	0.064	38	N
39	F	341	1.98	39	Cu-65	297	1.72	39	20-CA-40	10	0.058	39	P
40	Sm	324	1.88	40	Mg-24	294	1.71	40	4-BE-10	10	0.058	40	P
41	Y	290	1.68	41	B-11	293	1.7	41	26-FE-56	9	0.052	41	A
42	Np	282	1.64	42	Ag-0	286	1.66	42	28-NI-58	9	0.052	42	A
43	Te	273	1.58	43	Y-89	284	1.65	43	82-PB-208	9	0.052	43	G
44	I	258	1.5	44	In-115	264	1.53	44	12-MG-24	8	0.046	44	P
45	Sb	257	1.49	45	Np-237	262	1.52	45	20-CA-48	8	0.046	45	P
46	Ba	245	1.42	46	Ti-0	247	1.43	46	4-BE-12	8	0.046	46	C
47	Se	238	1.38	47	Si-0	242	1.4	47	18-AR-36	7	0.04	47	C
48	Rh	234	1.36	48	Zn-64	240	1.39	48	6-C-11	7	0.04	48	P
49	Cl	232	1.35	49	I-127	236	1.37	49	5-B-15	6	0.034	49	F
50	Ge	232	1.35	50	W-0	236	1.37	50	8-O-17	6	0.034	50	N
51	Cf	227	1.32	51	U-0	229	1.33	51	13-AL-27	5	0.029	51	F
52	Nd	225	1.31	52	Rh-103	227	1.32	52	28-NI-64	5	0.029	52	F
53	K	220	1.28	53	Zn-0	225	1.31	53	36-KR-84	5	0.029	53	G
54	Pd	216	1.25	54	Mg-0	224	1.3	54	4-BE-14	5	0.029	54	C
55	Gd	213	1.24	55	He-4	215	1.25	55	6-C-14	5	0.029	55	F
56	Sr	211	1.22	56	Mo-0	212	1.23	56	6-C-15	5	0.029	56	F
57	Ce	204	1.18	57	Sn-0	207	1.2	57	6-C-16	5	0.029	57	P
58	P	203	1.18	58	He-3	205	1.19	58	7-N-13	5	0.029	58	F
59	Hf	192	1.11	59	C-13	203	1.18	59	7-N-15	5	0.029	59	A
60	Am	191	1.11	60	P-31	201	1.17	60	7-N-17	5	0.029	60	N
61	As	189	1.1	61	Cd-0	199	1.15	61	8-O-19	5	0.029	61	P
62	Ho	186	1.08	62	Zr-0	199	1.15	62	8-O-22	5	0.029	62	O
63	Pt	183	1.06	63	Cr-52	196	1.14	63	9-F-24	5	0.029	63	C
64	La	182	1.05	64	H-3	189	1.1	64	10-NE-26	4	0.023	64	G
65	Br	180	1.04	65	As-75	187	1.08	65	12-MG-30	4	0.023	65	A
66	Sc	175	1.01	66	Ni-62	183	1.06	66	12-MG-32	4	0.023	66	N
67	Cs	172	1	67	Ti-48	183	1.06	67	17-CL-37	4	0.023	67	T
68	Er	172	1	68	Mo-92	181	1.05	68	5-B-14	4	0.023	68	P
69	Pr	172	1	69	S-32	181	1.05	69	5-B-17	4	0.023	69	A
70	Eu	171	0.99	70	Ho-165	180	1.04	70	54-XE-132	4	0.023	70	G
71	Dy	169	0.98	71	Cr-0	172	1	71	6-C-10	4	0.023	71	P
72	Ga	163	0.94	72	Sc-45	172	1	72	6-C-17	4	0.023	72	N
73	Hg	158	0.92	73	Zn-68	170	0.98	73	6-C-9	4	0.023	73	C
74	Rb	151	0.87	74	Pr-141	169	0.98	74	8-O-14	4	0.023	74	C
75	Ne	148	0.86	75	Cf-252	165	0.96	75	8-O-15	4	0.023	75	A
76	Yb	148	0.86	76	Ag-107	160	0.93	76	8-O-20	4	0.023	76	G
77	Tl	142	0.82	77	Mo-98	160	0.93	77	8-O-21	4	0.023	77	F

78	Ar	135	0.78
79	Cm	135	0.78
80	Ru	128	0.74
81	Os	125	0.72
82	Ir	122	0.71
83	Tb	118	0.68
84	Re	114	0.66
85	Tm	107	0.62
86	Lu	105	0.61
87	Kr	72	0.41
88	Xe	72	0.41
89	Pa	57	0.33
90	Tc	42	0.24
91	Ra	27	0.15
92	Pm	25	0.14
93	Fm	18	0.1
94	Bk	17	0.098
95	Es	14	0.081
96	NN	14	0.081
97	Ac	11	0.064
98	No	4	0.023
99	Po	3	0.017
100	Rf	3	0.017
101	ELEM/MASS	2	0.011
102	Md	2	0.011
103	Lr	1	0.0058
104	Rn	1	0.0058

Total: 104

78	Ag-109	157	0.91
79	Ca-0	156	0.9
80	La-139	154	0.89
81	Cs-133	153	0.89
82	S-0	153	0.89
83	In-0	150	0.87
84	Mo-100	150	0.87
85	Pu-240	150	0.87
86	Ni-64	149	0.86
87	Sn-120	149	0.86
88	W-186	148	0.86
89	Pu-241	147	0.85
90	Ti-46	147	0.85
91	Sb-0	141	0.82
92	O-0	134	0.78
93	Pb-206	134	0.78
94	Mg-26	133	0.77
95	Zn-66	130	0.75
96	Sn-124	129	0.75
97	Zr-94	127	0.73
98	Am-241	126	0.73
99	U-236	124	0.72
100	Cr-50	120	0.69
101	Tb-159	118	0.68
102	Ta-0	114	0.66
103	Zr-92	114	0.66
104	B-0	113	0.65
105	Sn-118	113	0.65
106	Si-30	110	0.64
107	Ti-50	108	0.62
108	Eu-151	107	0.62
109	Cl-35	106	0.61
110	Sb-121	106	0.61
...			

Total: 749

78	9-F-21	4	0.023
79	9-F-22	4	0.023
80	9-F-23	4	0.023
81	AP	4	0.023
82	10-NE-17	3	0.017
83	10-NE-19	3	0.017
84	10-NE-23	3	0.017
85	10-NE-24	3	0.017
86	10-NE-25	3	0.017
87	11-NA-23	3	0.017
88	11-NA-26	3	0.017
89	11-NA-27	3	0.017
90	11-NA-28	3	0.017
91	11-NA-29	3	0.017
92	11-NA-30	3	0.017
93	12-MG-26	3	0.017
94	12-MG-28	3	0.017
95	12-MG-29	3	0.017
96	12-MG-31	3	0.017
97	12-MG-34	3	0.017
98	14-SI-26	3	0.017
99	14-SI-30	3	0.017
100	17-CL-35	3	0.017
101	2-HE-3	3	0.017
102	26-FE-52	3	0.017
103	28-NI-57	3	0.017
104	30-ZN-70	3	0.017
105	5-B-13	3	0.017
106	7-N-12	3	0.017
107	7-N-18	3	0.017
108	7-N-19	3	0.017
109	7-N-20	3	0.017
110	79-AU-197	3	0.017
...			

Total: 316

78	C
79	A
80	P
81	F
82	G
83	F
84	L
85	P
86	T
87	A
88	P
89	A
90	C
91	F
92	L
93	A
94	C
95	N
96	C
97	F
98	A
99	C
100	C
101	F
102	P
103	A
104	P
105	A
106	C
107	L
108	N
109	A
110	L

Total: 1

Outliers in the EXFOR database

Warning: Further checking is necessary before to conclude whether this is a bug in X4, or in local X4 (C4 or Arjan's database), or simply poor quality data.

The following table lists the main outliers identified within sg30 work

The "Pb" column indicates the possible source (most likely) of the problem,

FA = this outlier is mistakenly detected (false alarm, there is no perfect test)

C4 = this outlier only exists in AK (and probably C4) database

X4 = this outlier is a true X4 outlier

The "Status" column is subdivided into two sub-columns.

The first/left "Status" column indicates whether the outlier was reported or not,

Ok = this outlier is not worth to be reported

∅ (empty cell) = this outlier was not yet reported

other text = this outlier was reported, additional details about the submission are also given

The second/right "Status" column indicates the following actions relative to this outlier: data corrected or not (data as published, only CRITIQUE keyword added), X4toC4 dictionary updated, etc...

	Subwork	Projectile	Target	E _{min}	E _{max}	Year	Reaction	Comments	Pb	Status
AK	O1004.0xx	actinide	82-PB-0	~1GeV	~1GeV	2003	("actinide",F),,SIG	Incomprehensible reaction string	C4	submitted by AK (20080505)
	10044.003	neutron	1-H -2	4.0e+09	5.7e+09	1970	(N,TOT),,SIG	No energy given, only momentum (in Gev/c)	C4	submitted to AK, VZ (20080429)
	10194.003	neutron	1-H -2	1.8e+10	1.8e+10	1971	(N,TOT),,SIG	No energy given, only momentum (in Gev/c)	C4	submitted to AK, VZ (20080429)
	10365.003	neutron	1-H -2	7.0e+08	3.6e+09	1973	(N,TOT),,SIG	No energy given, only momentum (in Gev/c)	C4	submitted to AK, VZ (20080429)
	10403.002	neutron	1-H -2	3.4e+10	2.7e+11	1975	(N,TOT),,SIG	No energy given, only momentum (in Gev/c)	C4	submitted to AK, VZ (20080429)
	11134.003	neutron	1-H -2	1.5e+10	2.7e+10	1968	(N,TOT),,SIG	No energy given, only momentum (in Gev/c)	C4	submitted to AK, VZ (20080429)
	12920.005	neutron	19-K -41	3.0e+04	3.0e+04	1984	(N,G)19-K-42,,SIG,,MXW,DERJV	The MXW average is at kt ~30 keV (not 25 meV)	C4	submitted to AK, VZ (20080429)
	21906.003	neutron	60-ND-143	3.0e+04	3.0e+04	1983	(N,G)60-ND-144,,SIG,,MXW	The MXW average is at kt ~30 keV (not 25 meV)	C4	submitted to AK, VZ (20080429)
	21933.003	neutron	13-AL-27	2.0e+04	4.0e+04	1984	(N,G)13-AL-28,,SIG,,MXW	The MXW average is at kt ~30 keV (not 25 meV)	C4	submitted to AK, VZ (20080429)
	22009.002	neutron	57-LA-139	2.3e+04	2.3e+04	1986	(N,G)57-LA-140,,SIG,,MXW	The MXW average is at kt ~23 keV (not 25 meV)	C4	submitted to AK, VZ (20080429)
	22010.006	neutron	78-PT-198	2.3e+04	2.3e+04	1986	(N,G)78-PT-199,,SIG,,MXW	The MXW average is at kt ~23 keV (not 25 meV)	C4	submitted to AK, VZ (20080429)

Subwork	Projectile	Target	E _{min}	E _{max}	Year	Reaction	Comments	Pb	Status
22037.018	neutron	31-GA-71	2.5e+04	3.0e+04	1984	(N,G)31-GA-72,,SIG,,MXW	The MXW average is at kt ~30 keV (not 25 meV)	C4	submitted to AK, VZ (20080429)
22037.019	neutron	33-AS-75	2.5e+04	3.0e+04	1984	(N,G)33-AS-76,,SIG,,MXW	The MXW average is at kt ~25 keV (not 25 meV)	C4	submitted to AK, VZ (20080429)
22099.002	neutron	79-AU-197	2.5e+04	2.5e+04	1988	(N,G)79-AU-198,,SIG,,MXW	The MXW average is at kt ~25 keV (not 25 meV)	C4	submitted to AK, VZ (20080429)
22177.002	neutron	39-Y-89	2.5e+04	3.0e+04	1990	(N,G)39-Y-90,,SIG,,MXW	The MXW average is at kt ~30 keV (not 25 meV)	C4	submitted to AK, VZ (20080429)
22455.002	neutron	66-DY-0	1.7e-03	1.9e+05	1999	(N,G),,SIG	~1000 times too large. The xs unit is correct (kb) however. It might be an error in the X4TOC4 dictionary (1 KB = 1.0E+06 B ?!?)	C4	submitted to AK, VZ (20080429)
22603.003	neutron	63-EU-151	2.5e+04	2.5e+04	1984	(N,G)63-EU-152-M,,SIG,,MXW	The MXW average is at kt = 25 keV (not 25 meV)	C4	submitted to AK, VZ (20080429)
22928.002	neutron	21-SC-45	3.0e+04	3.0e+04	2005	(N,G)21-SC-46,,SIG,,MXW	The MXW average is at kt = 30 keV (not 25 meV)	C4	submitted to AK, VZ (20080429)
22928.003	neutron	27-CO-59	3.0e+04	3.0e+04	2005	(N,G)27-CO-60,,SIG,,MXW	The MXW average is at kt = 30 keV (not 25 meV)	C4	submitted to AK, VZ (20080429)
22928.005	neutron	29-CU-65	3.0e+04	3.0e+04	2005	(N,G)29-CU-66,,SIG,,MXW	The MXW average is at kt = 30 keV (not 25 meV)	C4	submitted to AK, VZ (20080429)
22963.004	neutron	72-HF-180	2.5e+04	2.5e+04	2007	(N,G)72-HF-181,,SIG,,MXW	The MXW average is at kt = 25 keV (not 25 meV)	C4	submitted to AK, VZ (20080429)
31426.002	neutron	6-C-CMP	1.0e+00	9.7e+00	1995	(N,TOT),,SIG	Teflon (CF2) cross section	C4	submitted to AK, VZ (20080429)

Subwork	Projectile	Target	E _{min}	E _{max}	Year	Reaction	Comments	Pb	Status
31503.002	neutron	14-SI- OXI	1.9e-03	2.8e+00	1999	(N,TOT),,SIG	SiO2 cross section	C4	submitted to AK, VZ (20080429)
41323.003	neutron	28-NI- 0	—	—	1981	(N,TOT),,SIG	No energy given, only cold-neutron wave length (in angstrom)	C4	submitted to AK, VZ (20080429)
A0613.002	alpha	10-NE- 22	4.8e+05	2.0e+06	1993	(A,N)12-MG-25,,SIG	No energy in AK file. The energy is given in the center-of-mass system. It might be a conversion problem to the laboratory frame.	C4	submitted to AK, VZ (20080429)
C0879.013	proton	29-CU- CMP	7.0e+07	1.6e+08	2002	(P,X)30-ZN-65,,SIG	Brass (Cu + Zn) cross section	C4	submitted to AK, VZ (20080429)
G3003.002	gamma	73-TA- 181	8.5e+06	2.2e+07	1988	(E,X)0-NN-1,,SIG	This is an electro-disintegration reaction. The given energies are the electron energies, not photons'. http://dx.doi.org/10.1088/0305-4616/14/6/018	C4	submitted to AK, VZ (20080429)
G3003.003	gamma	82-PB- 208	8.0e+06	2.0e+07	1988	(E,X)0-NN-1,,SIG	idem G3003.002	C4	submitted to AK, VZ (20080429)
M0420.004	gamma	13-AL- 27	3.9e+06	1.3e+07	1980	(G,TOT),,SIG	This is the total ATOMIC cross-section (G,TOT). This is not the photonuclear absorption reaction (G,ABS). http://dx.doi.org/10.1103/PhysRevC.21.2328	C4	submitted to AK, VZ (20080429)
O0949.009	proton	8-O- 16	4.1e+06	1.2e+07	1999	(3-LI-6,A)9-F-18,,SIG	~5 times larger than proton data	C4	submitted to AK, VZ (20080429)
O1400.002	alpha	41-NB-93	3.7e+07	5.0e+07	1992	(6-C-12,2N)47-AG-103,,SIG	~10 times lower than alpha data	C4	submitted to AK, VZ (20080429)
P0046.003	proton	92-U- 238	5.2e+07	3.4e+08	1954	(P,F)56-BA-139,,SIG	This is ¹³⁹ Ba production cross section (not fission)	C4	submitted to AK, VZ (20080429)

Subwork	Projectile	Target	E _{min}	E _{max}	Year	Reaction	Comments	Pb	Status
22495.004	neutron	64-GD-0	1.2e-04	1.2e-04	1999	(N,TOT),SIG,,DERIV	Cold neutrons (~0.1 meV)	FA	~Ok
10860.002	neutron	1-H-2	4.2e-03	4.2e-03	1975	(N,TOT),SIG	The outliers are the other X4 sets. No energy (E=0) in AK files #10365.003, 10194.003, 11134.003, 10403.002, 10044.003	FA	Ok
11447.048	neutron	37-RB-87	2.5e-02	2.5e-02	1947	(N,G)37-RB-88,SIG,,MXW	The outliers are the other points (probably MXW averages at stellar temperature)	FA	Ok
12840.002	neutron	23-V-0	1.0e-07	1.3e-06	1983	(N,TOT),SIG	Ultra-cold neutrons down to 0.1 μeV	FA	Ok
20097.002	neutron	48-CD-0	7.6e-06	1.1e-05	1968	(N,TOT),SIG	Ultra-cold neutrons (~10 μeV)	FA	Ok
21017.002	neutron	13-AL-27	2.0e-07	4.2e-05	1972	(N,TOT),SIG	Ultra-cold neutrons down to 0.2 μeV	FA	Ok
21017.008	neutron	29-CU-0	1.8e-07	4.2e-05	1972	(N,TOT),SIG	Ultra-cold neutrons down to 0.2 μeV	FA	Ok
21017.013	neutron	79-AU-197	3.0e-07	4.2e-05	1972	(N,TOT),SIG	Ultra-cold neutrons down to 0.3 μeV	FA	Ok
21091.006	neutron	63-EU-0	1.5e-04	2.7e-03	1961	(N,TOT),SIG	Sub-thermal neutrons (down to 0.1 eV)	FA	Ok
40974.002	neutron	92-U-235	3.4e-07	3.4e-05	1986	(N,TOT),SIG	Ultra-cold neutrons down to 0.3 μeV	FA	Ok
11274.071	neutron	44-RU-101	1.4e+07	1.4e+07	1953	(N,P)43-TC-101,SIG	~10 times too low. However, the uncertainty is quite large (70%)	X4	~Ok
12181.004	neutron	74-W-186	1.5e+07	1.5e+07	1960	(N,P)73-FA-186,SIG	This is the threshold region and the uncertainty is rather large (36%)	X4	~Ok
21513.002	neutron	82-PB-208	2.5e-02	2.5e-02	1963	(N,G)82-PB-209,SIG,,MXW	~30 times too large. However, the uncertainty is quite large (55%)	X4	~Ok
B0156.002	alpha	29-CU-63	1.5e+07	4.0e+07	1959	(A,N)31-GA-66,SIG,,EXP	Unusual shape above 30 MeV	X4	~Ok
10772.005	neutron	46-PD-104	1.5e+07	1.6e+07	1972	(N,P)45-RH-104-M,SIG	~6 times too large with large uncertainties	X4	Ok

Subwork	Projectile	Target	E _{min}	E _{max}	Year	Reaction	Comments	Pb	Status
11274.048	neutron	32-GE-73	1.4e+07	1.4e+07	1953	(N,P)31-GA-73,,SIG	~5 times too large. However, the uncertainty is fair (50%)	X4	Ok
11274.074	neutron	46-PD-105	1.4e+06	1.4e+06	1953	(N,P)45-RH-105,,SIG	Large uncertainties (70%)	X4	Ok
11333.002	neutron	7-N-15	1.0e+06	9.9e+06	1964	(N,TOT),,SIG	Corrected on 20071015 by NDS	X4	Ok
11491.018	neutron	45-RH-103	1.4e+07	1.4e+07	1962	(N,HE3)43-TC-101,,SIG	Cross section limit only ("DATA-MAX")	X4	Ok
21463.004	neutron	92-U-236	1.3e+05	5.0e+05	1965	(N,F),,SIG	Threshold region	X4	Ok
21786.003	neutron	47-AG-0	2.5e+06	2.5e+06	1937	(N,G),,SIG	Corrected (/10) on 20070718 by NDS	X4	Ok
22044.003	neutron	95-AM-243	1.1e+06	6.8e+06	1987	(N,F),,SIG	This is the fission threshold	X4	Ok
22184.003	neutron	6-C-0	1.8e+04	7.8e+07	1990	(N,TOT),,SIG	See X4 comments "THE CROSS SECTION ABOVE 5 MEV ARE NOT THOUGHT TO BE MEANINGFUL [...]"	X4	Ok
22703.008	neutron	29-CU-63	1.2e+07	3.8e+07	1992	(N,ZN)29-CU-62,,SIG	This is the threshold	X4	Ok
A0494.005	proton	30-ZN-68	1.2e+07	6.8e+08	1991	(P,2N)31-GA-67,,SIG,,,EXP	The first point (12 MeV) is ~10 times too large. This is the threshold however.	X4	Ok
A0494.005	proton	30-ZN-68	1.2e+07	6.8e+08	1991	(P,3N)31-GA-66,,SIG,,,EXP	The first points (~25 MeV) are ~10 times too large. This is the threshold however.	X4	Ok
A0510.276	alpha	21-SC-45	6.9e+06	4.6e+07	1991	(A,N)23-V-48,,SIG,,,EXP	The first two points (~7 MeV) are too high. This is the threshold however.	X4	Ok
A0510.291	alpha	22-TI-48	7.1e+06	4.6e+07	1991	(A,N)24-CR-51,,SIG,,,EXP	Threshold region	X4	Ok
A0510.326	alpha	26-FE-54	6.3e+06	3.5e+07	1991	(A,N)28-NI-57,,SIG,,,EXP	Threshold region	X4	Ok
A0510.368	alpha	29-CU-63	6.3e+06	4.6e+07	1991	(A,N)31-GA-66,,SIG,,,EXP	Threshold region	X4	Ok

Subwork	Projectile	Target	E _{min}	E _{max}	Year	Reaction	Comments	Pb	Status
A0510.375	alpha	29-CU-65	6.3e+06	4.6e+07	1991	(A,2N)31-GA-67,,SIG,,EXP	The outlier is D0119.004	X4	Ok
A0630.004	alpha	25-MN-55	2.5e+07	6.0e+07	1989	(A,3N)27-CO-56,,SIG	Threshold region	X4	Ok
A1066.004	helion	2-HE-3	8.2e+04	1.1e+06	1971	(HE3,2P)2-HE-4,,SIG,,EXP	The outlier is E1890.002	X4	Ok
L0074.003	gamma	90-TH-232	5.4e+06	9.0e+06	1971	(G,F),,SIG	Wrong unit corrected on 20070718	X4	Ok
O0076.007	proton	24-CR-52	6.2e+06	6.2e+06	1985	(P,N)25-MN-52,,SIG,,EXP	Threshold region	X4	Ok
O1180.003	alpha	13-AL-27	3.0e+07	7.0e+07	1997	(A,X)11-NA-24,,SIG	Threshold region	X4	Ok
F0284.002	deuteron	6-C-12	1.4e+06	1.9e+07	1959	(D,N)7-N-13,,SIG,,EXP	The threshold is not correct.	X4	Ok(?)
10772.004	neutron	46-PD-110	1.5e+07	1.6e+07	1972	(N,2N)46-PD-109-M,,SIG	~5 times too large and the shape is not correct.	X4	submitted (AK list)
31161.010	neutron	47-AG-107		1.5e+06	1961	(N,2N)47-AG-106-M,,SIG	"DATA-APRX", ~10 times too large however	X4	submitted (AK list) as published
O1116.002	alpha	23-V-51	1.1e+07	1.1e+08	1995	(A,N)25-MN-54,,SIG	~10 times too large	X4	submitted (AK list) as published
10074.052	neutron	28-NI-60	4.0e+01	9.2e+05	1971	(N,G)28-NI-61,,SIG,,RAW	All flag-3 data are wrong. Flag-1 data are wrong above 401 keV.	X4	submitted to sg30 (20080125)
10238.021	neutron	13-AL-27	4.0e+06	5.9e+06	1975	((N,P)12-MG-27,,SIG)/(92-U-238(N,F),,SIG)	~5 times too large (threshold region)	X4	submitted to sg30 (20080125)
10385.004	neutron	40-ZR-94	5.0e-01		1973	(N,G)40-ZR-95,,RI	~1000 times too large. The xs unit should be milli-barn (not barn)	X4	submitted to sg30 (20080125)
10420.002	neutron	41-NB-93	1.4e+07	1.4e+07	1974	(N,INL)41-NB-93-M,,SIG	~10 times too large. However, this is consistent with the total inelastic.	X4	submitted to sg30 (20080125)

Subwork	Projectile	Target	E _{min}	E _{max}	Year	Reaction	Comments	Pb	Status
10772.003	neutron	46-PD-108	1.5e+07	1.6e+07	1972	(N,2N)46-PD-107-M,,SIG	~4 times too large. However, this data are more or less consistent with the total (n,2n)	X4	submitted to sg30 (20080125)
11265.009	neutron	25-MN-55	2.2e+06	2.8e+06	1957	(N,TOT),,SIG	~10 times too large	X4	submitted to sg30 (20080125)
11274.063	neutron	40-ZR-90	1.4e+07	1.4e+07	1953	(N,A)38-SR-87-M,,SIG	~50 times too large	X4	submitted to sg30 (20080125)
11507.081	neutron	60-ND-146	2.5e-02	2.5e-02	1952	(N,G)60-ND-147,,SIG,,MXW	~6 times too large	X4	submitted to sg30 (20080125)
11603.005	neutron	17-CL-37	2.5e-02	2.5e-02	1966	(N,G)17-CL-38,,SIG,,MXW	~20 times too large, "DATA-MAX" however	X4	submitted to sg30 (20080125)
11684.003	neutron	25-MN-55	1.5e+07	1.5e+07	1961	(N,2N)25-MN-54,,SIG	~1000 times too low (not possible for "DATA-MAX")	X4	submitted to sg30 (20080125)
11740.021	neutron	30-ZN-68	1.5e+07	1.5e+07	1960	(N,A)28-NI-65,,SIG	~5 times too large	X4	submitted to sg30 (20080125)
11858.015	neutron	36-KR-86	2.5e-02	2.5e-02	1950	(N,G)36-KR-87,,SIG,,MXW	~1000 times too large. The xs unit could be milli-barn (not barn). Only few scattered points however.	X4	submitted to sg30 (20080125)
11963.002	neutron	48-CD-108	2.5e-02	2.5e-02	1964	(N,G)48-CD-109,,SIG	~100 times too large, few scattered data however	X4	submitted to sg30 (20080125)
12033.030	neutron	62-SM-154	1.5e+07	1.5e+07	1960	(N,A)60-ND-151,,SIG	~10 times too large	X4	submitted to sg30 (20080125)
12168.006	neutron	74-W-186	3.3e+00	5.2e+05	1951	(N,TOT),,SIG	The last xs value (at 522 keV) is wrong (~10 times too low)	X4	submitted to sg30 (20080125)

Subwork	Projectile	Target	E _{min}	E _{max}	Year	Reaction	Comments	Pb	Status
12208.003	neutron	79-AU-197	1.4e+07	1.4e+07	1957	(N,P)78-PT-197,,SIG	~10 times too large, large uncertainty however	X4	submitted to sg30 (20080125)
12583.008	neutron	95-AM-243	2.5e-02	2.5e-02	1952	(N,F),,SIG,,MXW	"DATA-MAX", however the xs unit might be milli-barn (not barn)	X4	submitted to sg30 (20080125)
12616.003	neutron	12-MG-0	2.5e-02	2.5e-02	1946	(N,G),,SIG,,MXW	~4 times too large	X4	submitted to sg30 (20080125)
12912.003	neutron	13-AL-27	2.0e+07	6.0e+07	1981	(N,A)11-NA-24,,SIG	~4 times too large	X4	submitted to sg30 (20080125)
12912.005	neutron	82-PB-208	2.0e+07	6.0e+07	1981	(N,P)81-TL-208,,SIG	The xs data might be given in reverse order	X4	submitted to sg30 (20080125)
13025.002	neutron	48-CD-106	1.5e+07	1.5e+07	1974	(N,P)47-AG-106-M,,SIG	~10 times too large	X4	submitted to sg30 (20080125)
13033.002	neutron	23-V-51	1.3e+07	1.7e+07	1960	(N,A)21-SC-48,,SIG	~5 times too large	X4	submitted to sg30 (20080125)
13042.003	neutron	63-EU-153	1.5e+07	1.5e+07	1974	(N,2N)63-EU-152-M2,,SIG	~20 times too large. This is consistent with the total (n,2n) however.	X4	submitted to sg30 (20080125)
13845.002	neutron	1-H-1	2.5e-02	2.5e-02	1936	(N,G)1-H-2,,SIG	~100 times too large	X4	submitted to sg30 (20080125)
13846.005	neutron	82-PB-207	2.5e-02	2.5e-02	2002	(N,G)82-PB-208,,SIG,,MXW,DERIV	The target should be 206Pb (not 207Pb).	X4	submitted to sg30 (20080125)
13846.006	neutron	82-PB-206	2.5e-02	2.5e-02	2002	(N,G)82-PB-207,,SIG,,MXW,DERIV	~10 times too large. The target should be 207Pb (not 206Pb).	X4	submitted to sg30 (20080125)

Subwork	Projectile	Target	E _{min}	E _{max}	Year	Reaction	Comments	Pb	Status
14005.002	neutron	82-PB-208	6.3e+06	2.0e+07	1974	(N,P)81-TL-208,,SIG	~5 times too large	X4	submitted to sg30 (20080125)
14050.002	neutron	90-TH-232	2.5e-02	2.5e-02	1957	(N,F),,SIG	1.0E+06 times too large ("DATA-MAX"). However, the xs unit could be micro-barn (not barn).	X4	submitted to sg30 (20080125)
14050.003	neutron	92-U-235	2.5e-02	2.5e-02	1957	(N,F),,SIG	~50 times too low	X4	submitted to sg30 (20080125)
14118.002	neutron	26-FE-56	5.0e+06	1.5e+07	2004	(N,INL)26-FE-56,PAR,SIG	~7 times too large. This is consistent with the total inelastic however (but not partial inelastic)	X4	submitted to sg30 (20080125)
20006.003	neutron	90-TH-232	5.0e-01		1968	(N,G)90-TH-233,,RI	~50 times too low. It seems the integration extends up to a few eV only (below the first resonances).	X4	submitted to sg30 (20080125)
20057.002	neutron	15-P-31	3.8e+06	1.5e+07	1964	(N,2N)15-P-30,,SIG	~10 times too large	X4	submitted to sg30 (20080125)
20289.006	neutron	56-BA-138	1.4e+07	1.4e+07	1961	(N,A)54-XE-135-M,,SIG	~10 times too large	X4	submitted to sg30 (20080125)
20341.007	neutron	13-AL-27	3.5e+06	4.8e+06	1961	(N,INL)13-AL-27,,SIG	~3 times too low... a shift in energy is likely but data might be correct	X4	submitted to sg30 (20080125)
20341.018	neutron	14-SI-28	3.5e+06	4.8e+06	1961	(N,INL)14-SI-28,PAR,SIG	The first point at 3.5 MeV is 2 times larger (!?)	X4	submitted to sg30 (20080125)
20418.010	neutron	68-ER-0	8.0e+05	9.0e+06	1974	(N,TOT),,SIG	The xs value is wrong at 813.55 keV	X4	submitted to sg30 (20080125)
20509.017	neutron	65-TB-159	1.5e+07	1.5e+07	1971	(N,A)63-EU-156,,SIG	~10 times too large	X4	submitted to sg30 (20080125)

Subwork	Projectile	Target	E _{min}	E _{max}	Year	Reaction	Comments	Pb	Status
20523.005	neutron	33-AS-75	1.5e+07	1.5e+07	1974	(N,HE3)31-GA-73,,SIG	~100 times too low. The correction (/1000) applied on 20060313 should be checked	X4	submitted to sg30 (20080125)
20646.006	neutron	31-GA-71	5.0e-01	5.0e-01	1971	(N,G)31-GA-72,,RI	~10 times too large (due to 1/v contribution?). NB: E[eV] and XS[b] for RI !!!	X4	submitted to sg30 (20080125)
20689.006	neutron	72-HF-174	2.5e-02	2.5e-02	1974	(N,G)72-HF-175,,SIG	~5 times too large	X4	submitted to sg30 (20080125)
20742.002	neutron	6-C-0	3.1e+06	3.2e+07	1980	(N,TOT),,SIG	The xs values are wrong at the following four energies: 4.1443, 4.3149, 17.804, 27.913 MeV	X4	submitted to sg30 (20080125)
20748.012	neutron	31-GA-71	1.4e+07	1.4e+07	1976	(N,A)29-CU-68-M,,SIG	~50 times too large (or ~10 times larger than the total (n,alpha) cross section)	X4	submitted to sg30 (20080125)
20922.006	neutron	27-CO-59	1.4e+07	2.1e+07	1963	(N,P)26-FE-59,,SIG	~10 times too large	X4	submitted to sg30 (20080125)
21288.004	neutron	20-CA-43	1.5e+07	1.5e+07	1966	(N,P)19-K-43,,SIG	~5 times too large	X4	submitted to sg30 (20080125)
21322.002	neutron	71-LU-176	1.2e-02	9.5e-01	1960	(N,TOT),,SIG	~20 times too low	X4	submitted to sg30 (20080125)
21352.011	neutron	29-CU-63	1.4e+07	1.4e+07	1961	(N,HE3)27-CO-61,,SIG	~1000 times too large. The xs unit could be micro-barn (not milli-barn)	X4	submitted to sg30 (20080125)
21936.009	neutron	25-MN-55	1.5e+07	1.5e+07	1984	(N,G)25-MN-56,,SIG	~50 times too large	X4	submitted to sg30 (20080125)
21936.018	neutron	27-CO-59	1.5e+07	1.5e+07	1984	(N,G)27-CO-60,,SIG	~100 times too large	X4	submitted to sg30 (20080125)

Subwork	Projectile	Target	E _{min}	E _{max}	Year	Reaction	Comments	Pb	Status
22008.002	neutron	18-AR-40	2.3e+04	2.3e+04	1986	(N,G)18-AR-41,,SIG,,MXW	The MXW average is at kt ~23 keV (not 25 meV). Anyway, the xs unit might be milli-barn (not barn)	X4	submitted to sg30 (20080125)
22052.003	neutron	14-SI-28	1.8e+06	6.0e+06	1987	(N,TOT),,SIG	The xs values are wrong at the following four energies: 5.4359, 5.4382, 5.4518, 5.4541 MeV	X4	submitted to sg30 (20080125)
22580.016	neutron	79-AU-197	9.0e+05	9.0e+05	1949	(N,G)79-AU-198,,SIG	~5 times too large, large uncertainty however	X4	submitted to sg30 (20080125)
22637.054	neutron	49-IN-113	1.3e+07	1.5e+07	1993	(N,INL)49-IN-113-M,,SIG	The first 2 points (at 13.32 MeV and 13.56 MeV) are completely off. However, they are consistent with the total inelastic cross section.	X4	submitted to sg30 (20080125)
30008.024	neutron	40-ZR-92	1.5e+07	1.5e+07	1962	(N,P)39-Y-92,,SIG	~4 times too large	X4	submitted to sg30 (20080125)
30008.025	neutron	40-ZR-94	1.5e+07	1.5e+07	1962	(N,P)39-Y-94,,SIG	~5 times too large	X4	submitted to sg30 (20080125)
30008.031	neutron	37-RB-85	1.5e+07	1.5e+07	1962	(N,A)35-BR-82,,SIG	~20 times too large	X4	submitted to sg30 (20080125)
30136.017	neutron	52-TE-128	1.4e+07	1.4e+07	1963	(N,P)51-SB-128,,SIG	~20 times too large	X4	submitted to sg30 (20080125)
30336.003	neutron	5-B-11	1.5e+07	1.5e+07	1971	(N,P)4-BE-11,,SIG	~5 times too large, large uncertainty however	X4	submitted to sg30 (20080125)
30403.006	neutron	22-TI-50	1.4e+07	1.4e+07	1960	(N,P)21-SC-50,,SIG	~10 times too large	X4	submitted to sg30 (20080125)
30560.003	neutron	63-EU-153	3.6e-03	1.0e+00	1980	(N,TOT),,SIG	The xs value is wrong at 6 meV	X4	submitted to sg30 (20080125)

Subwork	Projectile	Target	E_{min}	E_{max}	Year	Reaction	Comments	Pb	Status
30577.009	neutron	41-NB-93	1.5e+07	1.5e+07	1983	(N,2N)41-NB-92-M _s ,SIG	~4 times too large. However, this is consistent with the total (n,2n)	X4	submitted to sg30 (20080125)
30605.005	neutron	73-TA-181	1.4e+07	1.4e+07	1981	(N,A)71-LU-178-M ₁ ,SIG	~10 times too large	X4	submitted to sg30 (20080125)
31178.002	neutron	4-BE-9	1.6e-02	3.8e-01	1962	(N,TOT),,SIG	~1000 times too low. The xs unit might be kilo-barn (not barn)	X4	submitted to sg30 (20080125)
31316.006	neutron	16-S-32	1.5e+07	1.5e+07	1965	(N,T)15-P-30,,SIG	~10 times too large. However, this is the firethreshold.	X4	submitted to sg30 (20080125)
31410.004	neutron	57-LA-139	1.4e+07	1.5e+07	1986	(N,T)56-BA-137-M _s ,SIG	~1000 times too large. The xs unit should be micro-barn (not milli-barn).	X4	submitted to sg30 (20080125)
31468.002	neutron	22-Tl-0	3.0e+06	6.7e+06	1994	(N,TOT),,SIG	~1000 times too low. The xs unit should be barn (not milli-barn)	X4	submitted to sg30 (20080125)
31468.003	neutron	23-V-0	3.0e+06	6.7e+06	1994	(N,TOT),,SIG	~1000 times too low. The xs unit should be barn (not milli-barn)	X4	submitted to sg30 (20080125)
31468.004	neutron	24-CR-0	2.5e-02	6.7e+06	1994	(N,TOT),,SIG	~1000 times too low. The xs unit should be barn (not milli-barn)	X4	submitted to sg30 (20080125)
31468.005	neutron	26-FE-0	2.5e-02	6.7e+06	1994	(N,TOT),,SIG	~1000 times too low. The xs unit should be barn (not milli-barn)	X4	submitted to sg30 (20080125)
31468.006	neutron	28-NI-0	3.0e+06	6.7e+06	1994	(N,TOT),,SIG	~1000 times too low. The xs unit should be barn (not milli-barn)	X4	submitted to sg30 (20080125)
31468.007	neutron	29-CU-0	3.0e+06	4.0e+06	1994	(N,TOT),,SIG	~1000 times too low. The xs unit should be barn (not milli-barn)	X4	submitted to sg30 (20080125)

Subwork	Projectile	Target	E _{min}	E _{max}	Year	Reaction	Comments	Pb	Status
31520.002	neutron	23-V-51	1.4e+07	1.5e+07	2001	(N,A)21-SC-48,,SIG	The second and last point (14.7 MeV) is ~10 times too large	X4	submitted to sg30 (20080125)
40227.007	neutron	34-SE-80	1.5e+07	1.5e+07	1969	(N,A)32-GE-77,,SIG	~10 times too large	X4	submitted to sg30 (20080125)
40244.004	neutron	13-AL-27	2.7e+06	2.7e+06	1958	(N,G)13-AL-28,,SIG	~10 times too large, xs is very low however	X4	submitted to sg30 (20080125)
41123.009	neutron	67-HO-165	2.5e-02	2.5e-02	1992	(N,G)67-HO-166,,SIG,,MXW	~150 times too large	X4	submitted to sg30 (20080125)
A0271.004	proton	26-FE-56	2.2e+07	2.2e+07	1984	(P,N)27-CO-56,,SIG,,EXP	~10 times too large	X4	submitted to sg30 (20080125)
A0517.020	proton	14-SI-0	5.9e+07	1.6e+08	1995	(P,X)4-BE-10,,SIG,,EXP	~10 times too large (threshold region)	X4	submitted to sg30 (20080125)
C0271.002	proton	22-TI-0	2.5e+07	5.8e+08	1971	(P,X)23-V-48,,SIG	The first point (25 MeV) is ~10 times too large	X4	submitted to sg30 (20080125)
C0999.002	deuteron	6-C-12	1.8e+06	4.8e+06	1937	(D,N)7-N-13,,SIG	~5 times too low and the shape is not correct	X4	submitted to sg30 (20080125)
C0999.004	deuteron	8-O-16	2.1e+06	4.9e+06	1937	(D,N)9-F-17,,SIG	~5 times too low	X4	submitted to sg30 (20080125)
D0046.002	alpha	29-CU-0	1.2e+07	5.4e+07	1983	(A,X)31-GA-66,,SIG	~100 times too low	X4	submitted to sg30 (20080125)
D0092.005	alpha	29-CU-0	1.3e+07	7.7e+07	1991	(A,X)31-GA-66,,SIG	~100 times too low	X4	submitted to sg30 (20080125)

Subwork	Projectile	Target	E _{min}	E _{max}	Year	Reaction	Comments	Pb	Status
D0119.004	alpha	29-CU-65	3.9e+06	3.1e+07	1987	(A,2N)31-GA-67,,SIG	~10 times too low	X4	submitted to sg30 (20080125)
D4018.005	proton	26-FE-0	1.1e+07	1.4e+07	1994	(P,X)25-MN-54,,SIG	~50 times too large (subthreshold region)	X4	submitted to sg30 (20080125)
D4058.032	proton	29-CU-0	3.1e+06	2.5e+07	1991	(P,X)30-ZN-65,,SIG	The last point (25 MeV) is ~40 times too large	X4	submitted to sg30 (20080125)
E1890.002	helion	2-HE-3	0.0e+00	4.5e+04	2004	(HE3,2P)2-HE-4,,SIG	~1000 times too low. The xs unit should be barn (not milli-barn)	X4	submitted to sg30 (20080125)
E1961.008	helion	27-CO-59	1.9e+07	4.0e+07	1977	(HE3,N)29-CU-61,,SIG	The energy scale might be wrong	X4	submitted to sg30 (20080125)
F0207.007	helion	4-BE-9	5.0e+06	2.8e+07	1965	(HE3,N)6-C-11,,SIG	~20 times too low	X4	submitted to sg30 (20080125)
F0284.003	deuteron	5-B-10	1.3e+06	1.2e+07	1959	(D,N)6-C-11,,SIG,,EXP	The first 2 points (1-3 MeV) are ~10 times too low and the shape is not correct.	X4	submitted to sg30 (20080125)
O0076.015	alpha	28-NI-64	1.3e+07	2.4e+07	1985	(A,P)29-CU-67,,SIG,,EXP	The first point (13 MeV) is ~20 times too large. This is the threshold however.	X4	submitted to sg30 (20080125)
O0350.031	proton	26-FE-0	1.9e+07	4.4e+07	1976	(P,X)27-CO-57,,SIG	The shape is not correct (see also T0198.023)	X4	submitted to sg30 (20080125)
O1071.002	alpha	92-U-238	2.6e+07	9.8e+07	1973	(A,F),,SIG	~1000 times too low. The xs unit should be barn (not milli-barn).	X4	submitted to sg30 (20080125)
O1118.005	alpha	41-NB-93	1.6e+07	1.0e+08	1987	(A,2N)43-TC-95-M,,SIG	~10 times too large. However, this is consistent with the total (a,2n) cross section	X4	submitted to sg30 (20080125)

Subwork	Projectile	Target	E _{min}	E _{max}	Year	Reaction	Comments	Pb	Status
O1235.007	alpha	47- AG- 109	2.1e+07	5.4e+07	1985	(A,2N)49-IN-111,,SIG	The energy scale might be wrong	X4	submitted to sg30 (20080125)
P0019.006	proton	48- CD- 111	4.3e+06	1.5e+07	1966	(P,N)49-IN-111,,SIG	~10 times too large (threshold region)	X4	submitted to sg30 (20080125)
T0198.023	proton	26-FE- 0	1.9e+07	4.4e+07	1973	(P,X)27-CO-57,,SIG	The shape is not correct (see also O0350.031)	X4	submitted to sg30 (20080125)

Subwork	Projectile	Target	E _{min} /eV	E _{max} /eV	Year	Reaction	Comments	Pb	Status
10001.002	neutron	13-AL-27	4.0e+03	1.4e+05	1969	(N,G)13-AL-28,,SIG,,RAW	Raw data only ("NO-DIM").	C4	
10001.003	neutron	26-FE-0	2.5e+03	1.9e+05	1969	(N,G),,SIG,,RAW	Raw data only ("NO-DIM").	C4	
10001.004	neutron	28-NI-0	2.5e+03	1.9e+05	1969	(N,G),,SIG,,RAW	Raw data only ("NO-DIM").	C4	
10002.003	neutron	40-ZR-90	1.4e+02	3.1e+05	1969	(N,G)40-ZR-91,,SIG,,RAW	Raw data only ("NO-DIM").	C4	
10002.005	neutron	40-ZR-91	1.4e+02	3.3e+05	1969	(N,G)40-ZR-92,,SIG,,RAW	Raw data only ("NO-DIM").	C4	
10002.007	neutron	40-ZR-92	1.4e+02	3.1e+05	1969	(N,G)40-ZR-93,,SIG,,RAW	Raw data only ("NO-DIM").	C4	
10002.009	neutron	40-ZR-94	1.4e+02	3.1e+05	1969	(N,G)40-ZR-95,,SIG,,RAW	Raw data only ("NO-DIM").	C4	
10002.011	neutron	74-W-182	1.4e+02	4.7e+05	1969	(N,G)74-W-183,,SIG,,RAW	Raw data only ("NO-DIM").	C4	
10002.013	neutron	74-W-183	1.4e+02	4.7e+05	1969	(N,G)74-W-184,,SIG,,RAW	Raw data only ("NO-DIM").	C4	
10002.015	neutron	74-W-184	1.4e+02	4.7e+05	1969	(N,G)74-W-185,,SIG,,RAW	Raw data only ("NO-DIM").	C4	
10002.033	neutron	74-W-186	1.4e+02	4.7e+05	1969	(N,G)74-W-187,,SIG,,RAW	Raw data only ("NO-DIM").	C4	
10803.015	neutron	74-W-184	1.5e+05	3.9e+06	1982	(N,INL)74-W-184,PAR,SIG	This is discrete inelastic scattering on different levels (not only MT51).	C4	
12923.004	neutron	40-ZR-CMP	2.5e+01	8.2e+05	1986	(N,TOT),,SIG	ZrO2 cross section (not Zr-nat)	C4	
13729.002	neutron	56-BA-CMP	1.3e+01	1.4e+06	1996	(N,TOT),,SIG	BaCO3 cross section (not Ba-nat)	C4	
41016.010	neutron	92-U-238	1.0e+04	1.2e+05	1988	(N,G)92-U-239,,SIG,,RAW	Raw data only ("NO-DIM").	C4	

Subwork	Projectile	Target	E_{min} /eV	E_{max} /eV	Year	Reaction	Comments	Pb	Status
A0569.003	proton	48- CD- 114	5.8e+06	9.9e+07	1990	(P,N)49-IN-114-M,,SIG	AK (or C4) value is 1000 times too large. However, the X4 value is correct.	C4	
A0569.004	proton	48- CD-0	9.7e+06	9.9e+07	1990	(P,X)49-IN-114-M,,SIG	AK (or C4) value is 1000 times too large. However the X4 value is correct.	C4	

Outliers in the EXFOR database (part 2)

23.05.2008

Subwork	Projectile	Target	E _{min} /eV	E _{max} /eV	Year	Reaction	Comments
10074.048	neutron	24-CR-53	4.0e+01	2.0e+05	1971	(N,G)24-CR-54,,SIG,,RAW	likely to be the same issue as in 10074.052 (previously reported)
10298.003	neutron	66-DY-164	5.0e+03	1.6e+05	1972	(N,G)66-DY-165,,SIG	~3 times too large
11010.015	neutron	78-PT-198	2.4e+04	2.4e+04	1951	(N,G)78-PT-199,,SIG	~10 times too low
12115.002	neutron	72-HF-180	3.2e+04	4.0e+06	1962	(N,G)72-HF-181,,SIG	The point at 176 keV is ~3 times too large
12558.002	neutron	95-AM-241	2.0e+01	5.2e+04	1967	(N,F),,,SIG	~20 times too large in the 10-30 keV range
12661.002	neutron	5-B-10	1.9e+05	1.9e+05	1977	(N,TOT),,,SIG	~10 times too large
12661.007	neutron	92-U-238	1.9e+05	1.9e+05	1977	(N,TOT),,,SIG	~10 times too low
13731.002	neutron	29-CU-65	6.4e+00	1.7e+05	1990	(N,TOT),,,SIG	~2 times too large. This might be CU-CMP (YBa2Cu3O7) not CU-65.
13731.003	neutron	29-CU-65	6.4e+00	1.7e+05	1990	(N,TOT),,,SIG	likely to be a similar issue as in 13731.002
13733.004	neutron	14-SI-0	1.5e-03	3.0e+04	1982	(N,TOT),,,SIG	The shape is wrong at low energy. This might be raw data.
13761.006	neutron	13-AL-27	7.0e-03	2.6e+04	1977	(N,TOT),,,SIG	~10 times too large. The shape is wrong at low energy. This might be raw sapphire (Al2O3) data (not 27Al total xs).
13761.007	neutron	13-AL-27	1.1e-02	2.6e+04	1977	(N,TOT),,,SIG	~10 times too large. The shape is wrong at low energy. This might be raw sapphire (Al2O3) data (not 27Al total xs).
13761.008	neutron	14-SI-0	6.0e-03	2.5e+04	1977	(N,TOT),,,SIG	~5 times too large. The shape is wrong at low energy. This might be Si2O3 raw data (not natSi total xs).
13799.002	neutron	92-U-235	?	?	1988	(N,F),DL/GRP,NU	Is this reaction code accurate enough? Data looks like delayed neutron energy spectra (not nubar vs. energy). Moreover, the unit (PC/FIS) does not seem appropriate.
13845.008	neutron	53-I-127	2.5e-02	2.5e-02	1936	(N,G)53-I-128,,SIG	~2 times too large
20427.002	neutron	92-U-235	2.2e+05	1.4e+06	1975	(N,F),PR,NU	~100 times too low. The unit might be PRT/FIS (not PC/FIS).
21834.011	neutron	92-U-235	5.0e+05	5.6e+06	1981	(N,F),DL,NU	~100 times too large. These might be prompt fission neutrons (not DL).
22237.002	neutron	94-PU-239	1.0e+03	4.5e+04	1992	(N,TOT),,,SIG	~5 times too large
31538.009	neutron	92-U-238	1.0e+06	1.0e+06	2000	(N,F),NU,,DERIV	~100 times too low. The unit might be PRT/FIS (not PC/FIS).
31538.010	neutron	93-NP-237	1.0e+06	1.0e+06	2000	(N,F),NU,,DERIV	~100 times too low. The unit might be PRT/FIS (not PC/FIS).

Subwork	Projectile	Target	E _{min} /eV	E _{max} /eV	Year	Reaction	Comments
31538.012	neutron	94-PU-240	1.0e+06	1.0e+06	2000	(N,F),NU,,,DERIV	~100 times too low. The unit might be PRT/FIS (not PC/FIS).
40380.003	neutron	59-PR-141	4.6e+00	2.8e+04	1955	(N,TOT),,SIG	~5 times too large
40684.007	neutron	24-CR-53	2.9e+01	5.7e+04	1964	(N,G)24-CR-54,,SIG	~10 times too large (Cr2O3 CMP xs?)
40729.032	neutron	63-EU-153	2.0e+03	2.0e+03	1980	(N,G)63-EU-154,,SIG	~3 to 4 times too low
41148.010	neutron	63-EU-153	5.0e+03	1.0e+06	1991	(N,G)63-EU-154,,SIG,,AV	~1000 times too low. The xs unit could be barn (not milli-barn). Moreover, the shape is not correct.
41500.003	neutron	92-U -235	7.7e+05	4.9e+06	1999	(N,F),DL,NU	~100 times too low. The unit might be PRT/FIS (not PC/FIS).
A0531.003	alpha	41-NB-93	2.1e+07	4.2e+07	1993	(A,2N)43-TC-95-M,,SIG	~2 times too large
A1299.002	deuteron	1-H -2	6.8e+03	1.8e+04	1990	(D,N)2-HE-3,,SIG,,EXP	~10 times too large
F0062.003	proton	3-LJ-6	1.2e+05	5.0e+05	1989	(P,HE3)2-HE-4,,SIG,,EXP	The first point is ~100 times too large

