International Atomic Energy Agency

Presentation at NRDC 2009 Meeting

IAEA Nuclear Data Section
N. Otsuka

International Atomic Energy Agency

Review of Corrections since the 2008 NRDC Meeting

(WP 2009-02; Actions A39+A50+A60)

N. Otsuka

Lists Available on the NRDC Webpage

1. Mistakes in contents

- incl. feedbacks from users

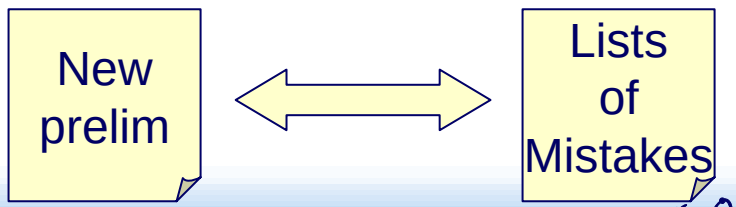
2. Mistakes in format

- mainly found by DB administrators

3. Suspicious entries

- reported by WPEC SG-30

These lists are updated (semi-automatically)
when new prelim files are checked by NDS.



Actions A39+A50+A60 – NRDC 2008

A39 All

"*Correct* all references according to the list given in WP2008-07."

- JP/GL, JP/S -> JP/G etc.

A50 All

" Check error lists available on the NRDC web page, and *correct* as soon as possible"

A60 All

"*Correct* total/elastic cross sections compiled in CPND entries according to the list in WP2008-25"

Other requests of corrections from the last meeting:

- Tensor polarization (WP2008-23) – SF8: ANA → C etc.

Current Statistics of Mistakes (by area)

C (NNDC)	126	A (CAJaD)	34	T (NNDC)	25	L (NNDC)	7
2 (NEA-DB)	62	F (CNDP)	33	3 (NDS)	22	K (JCPRG)	1
D (NDS)	61	1 (NNDC)	33	E (JCPRG)	19	G (NDS)	1
4 (CJD)	46	O (NEA-DB)	32	M (CDFE)	11	S (CNDC)	0

All preliminary files transmitted by the end of April were considered.

Proposed action (continuation of old A39+A50+A60):
To All: Check error lists available on the NRDC web page, and correct as soon as possible

END

International Atomic Energy Agency

EXFOR Completeness for Neutron Data Published in Phys. Rev. C
(WP 2009-10)

N. Otsuka

PR/C Neutron Articles *Missing* in EXFOR

Date of checking	Area 1 (NNDC)	Area 2 (NEA-DB)	Area 3 (NDS)	Area 4 (CJD)	?	Total
2008.08.20	37	29	7	0	1	74
2009.04.16	20	25	7	0	1	53

Published in	1970s	1980s	1990s	2000s
# of missing article	19	12	17	4

Proposed action (new action):

To Neutron Centres: Compile PR/C articles listed in WP2009-10.

END

International Atomic Energy Agency

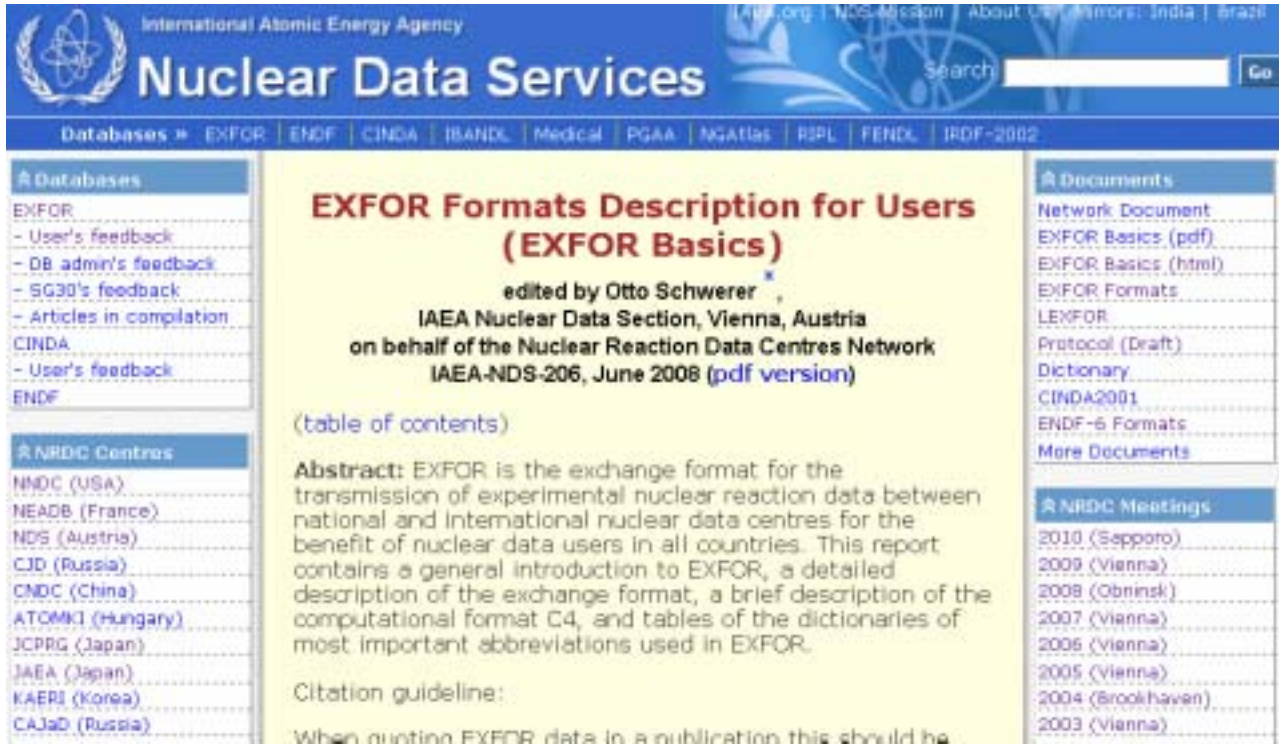
EXFOR Basic Manual in html
(WP 2009-18; Actions A31+A32)

N. Otsuka

Actions A31 – NRDC 2008

A31 Otsuka

"Create EXFOR Basics manual in HTML" Done!



http://www-nds.iaea.org/nrdc/basics/

EXFOR Basics Manual

INTERNATIONAL ATOMIC ENERGY AGENCY

NUCLEAR DATA SERVICES

DOCUMENTATION SERIES OF THE IAEA NUCLEAR DATA SECTION

IAEA-NDS-206
June 2008

EXFOR Formats Description for Users
(EXFOR Basics)

edited by

Otto Schwerer
IAEA Nuclear Data Section
Vienna, Austria

on behalf of the
Nuclear Reaction Data Centres Network

June 2008

Abstract: EXFOR is the exchange format for the transmission of experimental nuclear reaction data between national and international nuclear data centres for the benefit of nuclear data users in all countries. This report contains a general introduction to EXFOR, a detailed description of the exchange format, a brief description of the computational format C4, and tables of the dictionaries of most important abbreviations used in EXFOR.

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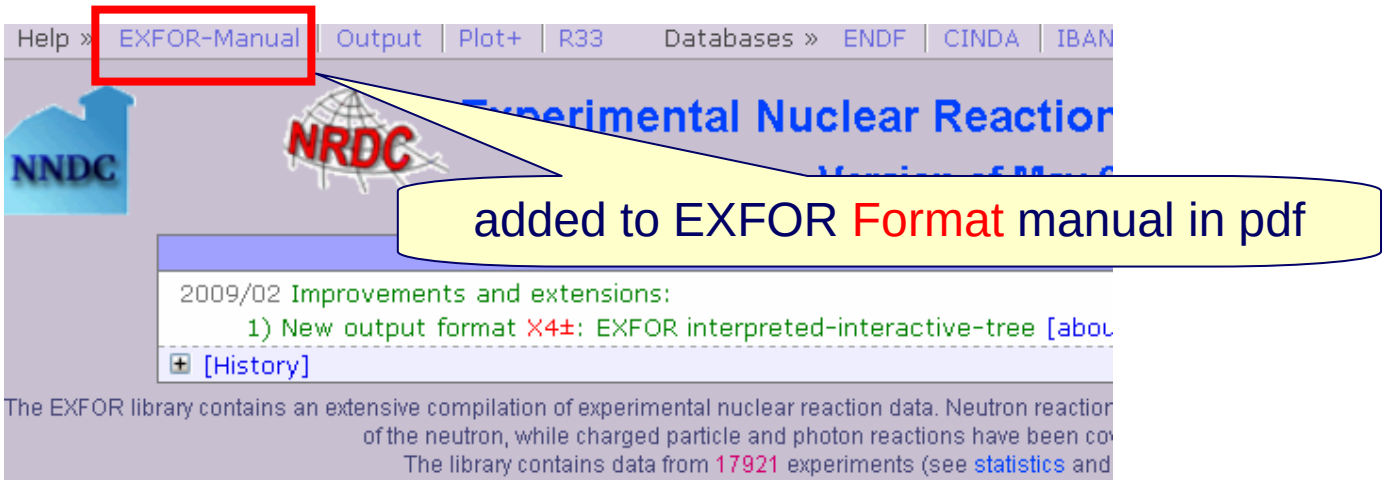
Actions A32 – NRDC 2008

A32 Zerkin

"Add hyperlink on the main EXFOR page to the EXFOR Basics manual"



<u>Proposed action (continuation of old A32):</u>
To Zerkin: Add hyperlink on the main EXFOR page to the EXFOR Basics manual

International Atomic Energy Agency

Coding Mistake in EXFOR REFFERENCE Lines Converted to CINDA

(WP 2009-18; Actions A45+A46)

H. Henriksson, N. Otsuka

Actions A45 + A46 – NRDC 2008

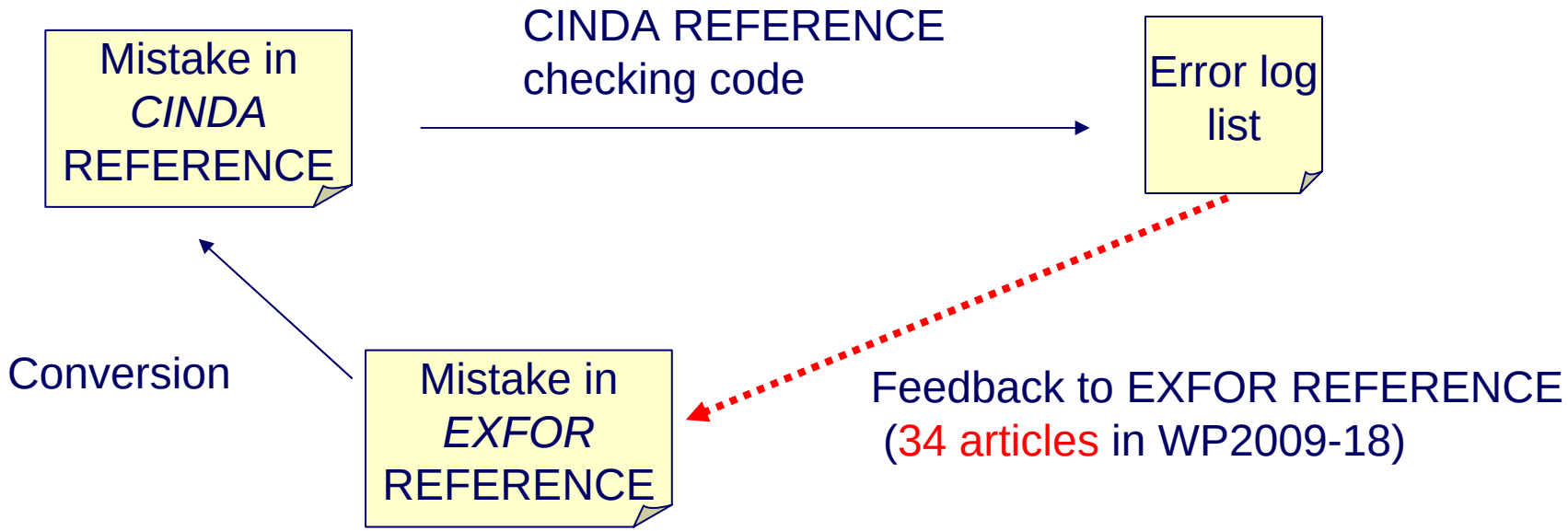
A45 JCPRG

"Send NEA-DB the list of 638 entry errors to NEA-DB" **Done!**

A46 NEA-DB

"Correct all CINDA lines, as described in WP2008-33" …

CINDA Mistakes from EXFOR Mistakes



<u>Proposed action (continuation of old A46):</u>
To NEA-DB: Correct all CINDA lines, as described in WP2008-33.

<u>Proposed action (new)</u>
To All: Correct REFERENCE codes according to the list in WP2009-18.

END

International Atomic Energy Agency

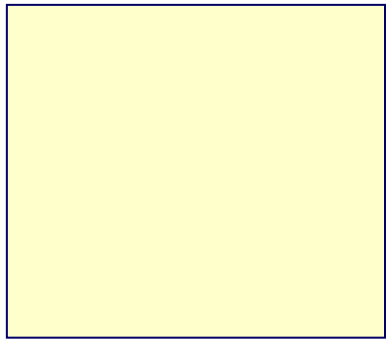
Uncertainty Propagation in TOF-data
(WP 2009-06 – Technical problems in compilation)

N. Otsuka

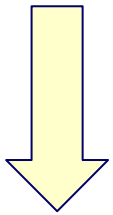
AGS format is friendly to EXFOR !

n (~ 10,000)

n x *n* covariance matrix
(may be compiled under
keyword **COVARIANCE**)



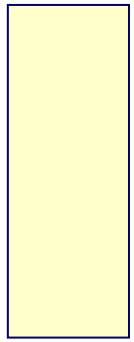
n



AGS format

k (~10)

n x *k* “partial uncertainty” values
(may be compiled under
ERR-1, ERR-2, …, ERR-*k*)



n

Problem in Compilation of AGS data (1)

Error propagation: $\Delta \sigma_i = (\partial \sigma / \partial x_i) \Delta x_i$

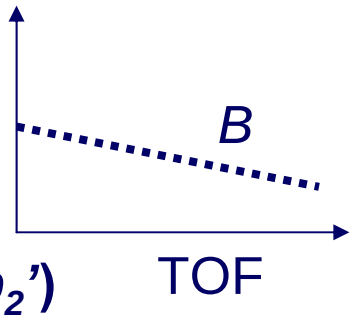
Sensitivity ($\partial \sigma / \partial x_i$) can be negative.

Can we allow negative values as partial uncertainty?

Possible answer:
Yes!
Probably partial uncertainties have been used to estimate covariance, and negative uncertainties are useful for them.

Problem in Compilation of AGS data (2)

More than two parameters for one systematic uncertainty source.



Example:

If background is expressed by a linear function,

$$B = b_1 + b_2 * TOF$$

Cholesky decomposition: $(\Delta b_1, \Delta b_2, V_{12}) \rightarrow \Delta b_1', \Delta b_2'$)

How can we define $\Delta \sigma_i = (\partial \sigma / \partial b_i') \Delta b_i'$ **under `ERR-ANALYS`?**

Possible solution:

Probably we can regard $\Delta \sigma_i$ **as partial uncertainty *ERR-i*. (*i* = 1, 2)**

```
ERR-ANALYS(ERR-1) Uncertainty due to 1st parameter
                  after Cholesky decomposition
                  of background parameter set
          (ERR-2) Uncertainty due to 2nd parameter in …
```

Problem in Compilation of AGS data (3)

Can we treat time of flight as independent variable instead of incident energy in EXFOR?

Possible(?) solution
EN (incident energy): independent variable
TOF (time-of-flight) : additional variable

EN	**EN-ERR**	**TOF**	**TOF-ERR**	**DATA**
EV	**EV**	**NS**	**NS**	**NO-DIM**
x	***dx***	***x'***	***dx'***	***y***

Question: Is there one-to-one relation between *En* and *TOF* ??

(, though theoretically EN = (1/2) * m_n * (flight-path-length / TOF)^2 ...)

Summary

1. AGS would be for covariance compilation in EXFOR.

2. We can compile coefficients after Cholesky decomposition under ERR-1, ERR-2, … if we regard them as partial uncertainties. (Note that
   $(\text{ERR-T})^2 = (\text{ERR-S})^2 + (\text{ERR-1})^2 + (\text{ERR-2})^2 \ldots$
   is still hold. $i=j$ in Eq.(9) in Appendix 3.)

3. What should be independent variable for TOF spectra? Time-of-flight? Corresponding incident energy?

<u>Proposed action (new):</u>

To All: Assess the covariance format proposed in WP2009-06 and send comments to NDS and EC-JRC-IRMM by the end of 2009.

END

International Atomic Energy Agency

Ranged Uncertainty Values
(WP 2009-15)

N. Otsuka

How do you compile uncertainty range?

Source of Uncertainty	Relative Error (%)
$H(n,p)$ or $^{238}U(n,f)$ cross section	1.0 to 2.5
Determination for the number of recoil proton or statistics for fission counts	1.5 to 2.5
Statistics for alpha-particle or triton counts	3.0 to 5.0
Normalization in background subtraction and neutron flux determination	3.0
Atom number of ^{238}U in the fission foil or H in the polyethylene foil	0.5
Atom number of ^{6}Li in the ^{6}LiF sample	0.5
Total	5.0 to 7.0

G.H.Zhang *et al*., Nucl. Sci. Eng.**134**(2000)312

Our Action to compilers (A58 + WP2008-11)

```
ERR-ANALYS  (ERR-1) Minimum uncertainty due to xxx
            (ERR-2) Maximum uncertainty due to xxx
…
ERR-1       ERR-2
PER-CENT    PER-CENT
…
```

According to WP2008-11 cited in A58, uncertainty ranges should be coded under ERR-ANALYS in free text.

But Memo 4C-4/176 proposes to keep uncertainty range as coded information.

Option 1: in free text (CP-D/522)

```
ERR-ANALYS Minimum uncertainty due to aaa is xx %
           Maximum uncertainty due to bbb is yy %
            (ERR-1) Constant uncertainty due to ccc
            (ERR-2) Constant uncertainty due to ddd
…
ERR-1      ERR-2
PER-CENT   PER-CENT
…          …
```

Advantage:

- **We do not need any new codes and format.**

Disadvantage:

- **Uncertainties cannot be extracted by programs.**
- **Range values are hidden in free text.**

Option 2: Coded info. under ERR-ANALYS (CP-D/530)

```
ERR-ANALYS  (ERR-1) Constant uncertainty due to aaa
            (ERR-2) Constant uncertainty due to bbb
            (ERR-3,xxx,yyy) Uncertainty due to ccc
…
ERR-1       ERR-2
PER-CENT    PER-CENT
…           …
```

New field for upper and lower boundaries.
xxx < ERR-3 < yyy

Advantage:

We preserve uncertainty ranges as coded information.

Disadvantage:

CHEX will produce many error messages because of the new format until this new format is implemented by CHEX.

Option 3: in COMMON (4C-4/176)

```
ERR-ANALYS  (ERR-1) Uncertainty due to aaa
            (ERR-2) Constant uncertainty due to bbb
            (ERR-3) Constant uncertainty due to ccc
…
ERR-1-MIN   ERR-1-MAX
PER-CENT    PER-CENT
…           …
```

Advantage:

- We do not need any new format rule.

Disadvantage:

- We have to add many new heading codes (ERR-*n*-MIN/MAX).

- Number of constants under COMMON should not exceed 18.

Which option is preferable?

1. Free text (Memo CP-D/522)

```
ERR-ANALYS Uncertainty due to aaa (1.0-2.5%)
```

2. Coded information under ERR-ANALYS (Memo CP-D/530 Rev.)

```
ERR-ANALYS (ERR-1,1.0,2.5) Uncertainty due to aaa
```

3. Keep it as coded info. under ERR-1-MAX etc. (Memo 4C-4/176)

```
ERR-ANALYS (ERR-1) Uncertainty due to aaa
...
ERR-1-MIN   ERR-1-MAX
PER-CENT    PER-CENT
1.0         2.5
```

- Are users really need uncertainty ranges as coded information? (The current C4 does not treat uncertainty ranges.)

- Which option is more helpful for compilers ?

International Atomic Energy Agency

Coding of Elemental Cross Section Divided by Isotopic Abundance
(WP 2009-14)

N. Otsuka

based on the discussion with

W.Mannhart (PTB), O.Schwerer, S. Maev

Contribution to $^{nat}Ti(n,x)^{47}Sc$

En (MeV)	<9.4	9.4 ~17.7	17.7 ~ …
$^{47}Ti(n,p)^{47}Sc$			
$^{48}Ti(n,x)^{47}Sc$			
$^{49}Ti(n,x)^{47}Sc$			

En < 9.4 MeV: σ ($^{47}Ti(n,p)^{47}Sc$) can be derived by natural sample data.

$$\sigma(^{47}Ti(n,p)^{47}Sc) = \sigma(^{nat}Ti(n,p)^{47}Sc) / a(^{47}Ti)$$

The isotopic cross section depends on– isotopic abundance:
(a(^{47}Ti) ~7.44%).

Isotopic abundance coding (Proposal)

New format for isotopic abundance under SAMPLE:

```
SAMPLE      (22-TI-47,0.0744)
```

Contribution to $^{nat}Ti(n,x)^{47}Sc$

En (MeV)	<9.4	9.4 ~17.7	17.7 ~ …
$^{47}Ti(n,p)^{47}Sc$			
$^{48}Ti(n,x)^{47}Sc$			
$^{49}Ti(n,x)^{47}Sc$			

En > 9.4 MeV : Two nuclides (^{47}Ti and ^{48}Ti) contribute to ^{47}Sc production.

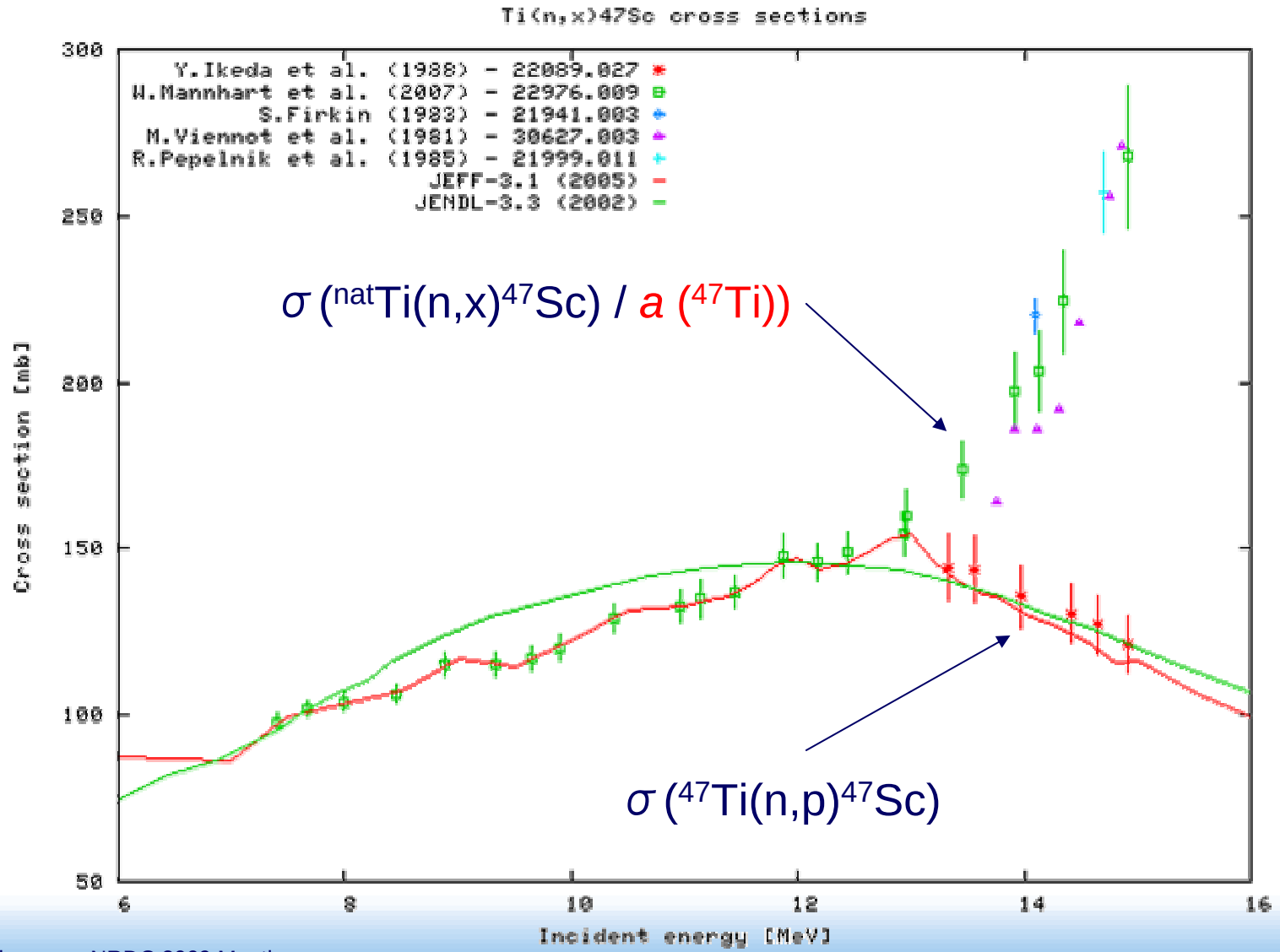
Some authors prefer to give

σ (^{nat}Ti(n,x)^{47}Sc) / *a* (^{47}Ti))

even at E_n>9.4 MeV, too.

We should compile this value, though I personally do *not* like this.

σ (natTi(n,x)47Sc) / a (47Ti))



REACTION for σ (^{nat}Ti(n,x)^{47}Sc) / *a* (^{47}Ti))

En < 9.4 MeV

σ (^{nat}Ti(n,p)^{47}Sc) / *a* (^{47}Ti))

= σ (^{47}Ti(n,p)^{47}Sc)

= EXFOR =>

(22-47-TI(N,P)21-SC-47,,SIG)

9.4 MeV < *En* < 17.7 MeV

σ (^{nat}Ti(n,p)^{47}Sc) / *a* (^{47}Ti))

= σ (^{47}Ti(n,p)^{47}Sc) + σ (^{48}Ti(n,x)^{47}Sc)[*a* (^{48}Ti)/*a* (^{47}Ti)]

= EXFOR =>

(22-47-TI(N,P)21-SC-47,,SIG)

+(22-48-TI(N,P)21-SC-47,,SIG,,FCT)

More specific quantity modifier for

[*a* (^{48}Ti)/*a* (^{47}Ti)] **(ratio of abundance) ??**

Isotopic abundance ratio – RAB (Proposal)

A possible new modifier RAB (Ratio of isotopic ABundance) -

Times natural isotopic abundance,

divided by abundance of target of first term of REACTION sum

Example:

(22-TI-47(N,P)21-SC-47,,SIG)+ (22-TI-48(N,P)21-SC-47,,SIG,,RAB)

means

$\sigma(^{47}Ti(n,p)^{47}Sc) + \sigma(^{48}Ti(n,x)^{47}Sc)[a(^{48}Ti)/a(^{47}Ti)]$

Proposed conclusion:

A new modifier RAB proposed in WP2009-14 is approved.

Proposed action (new):

To All: Include isotopic abundance as proposed in WP2009-14 when isotopic cross section is derived from natural cross section.

To Otsuka: Include a new code RAB (Ratio of isotopic ABundance) into the dictionary 34.

Example (R. Pepelnik et al. (1984))

Table I Cross Sections at 14.7 ± 0.3 MeV

Reaction	σ (mb)	Ref.	Reaction	σ (mb)	Ref.
$^{50}Ti(n,p)^{50}Sc$	14.3 ± 2.1	[12]	$^{61}Ni(n,p)^{61}Co$ / $^{62}Ni(n,np)^{61}Co$	84 ± 4*	[13]
$^{50}Cr(n,2n)^{49}Cr$	27.2 ± 1.9	[13]	$^{62}Ni(n,p)^{62g}Co$	24.8 ± 1.2	[13]
$^{52}Cr(n,p)^{52}V$ / $^{53}Cr(n,np)^{52}V$	85.7 ± 2.6*	[13]	$^{62}Ni(n,p)^{62m}Co$	14.6 ± 0.9	[13]

* The value is calculated taking the abundance of the first mentioned isotope.

should be coded as

(24-CR-52(N,P)23-V-52,,SIG) + (24-CR-53(N,X)23-V-52,,SIG,,RAB)

Note that

(24-CR-52(N,P)23-V-52,,SIG) + (24-CR-53(N,X)23-V-52,,SIG)

is physically no meaning.

END

International Atomic Energy Agency

Institute Code under INSTITUTE and FACILITY (WP 2009-17)

N. Otsuka

Institute codes under INSTITUTE

EXFOR Formats Manual – INSTITUTE:

Designates the laboratory, institute, or university *at which the experiment was performed*, or with which the authors are affiliated. See also LEXFOR, Institute.

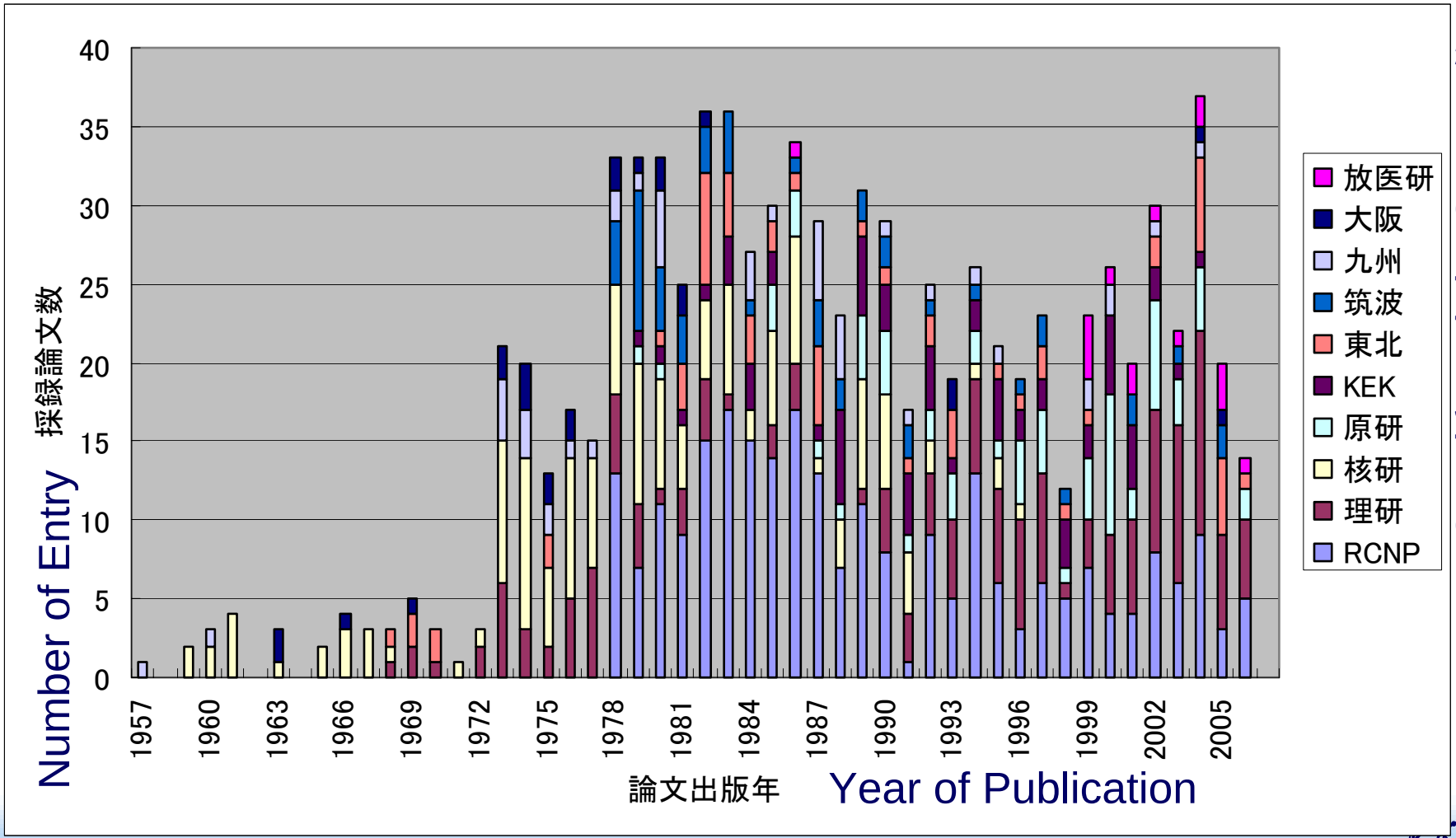
LEXFOR – INSTITUTE (Facility site is not mentioned.):

The laboratories, institutes, or universities with which all authors are affiliated

→The second field of FACILITY is *more appropriate* to give the institute where the experimental facility is located.

```
FACILITY (CYCLO,3HUNDEB)
```

Activity of Exp. Facility seen in EXFOR
(EXFOR seminar at RCNP, Osaka Univ., 2007)



Institute codes under FACILITY

EXFOR Formats Manual – FACILITY:

Defines the main apparatus used in the experiment.

…

When two or more institutes are given under the keyword INSTITUTE, then a facility code is always followed by the appropriate institute code.

→We can omit institute code under FACILITY if one code is in INSTITUTE. However

```
INSTITUTE (3HUNDEB)
FACILITY  (CYCLO)
```

might be ambiguous:

1) The location of the facility is 3HUNDEB.

2) The location of the facility is unknown (*not written in the article*).

Proposals

1. Keyword INSTITUTE is for laboratories, institutes or universities ~~at which the experiment was performed~~, or with which the authors are affiliated.

2. Keyword FACILITY always contain the location of the facility in the second field unless it is unknown.

Proposed conclusion:
New coding rules for keywords INSTITUTE and FACILITY proposed in WP2009-17 are accepted.

END

International Atomic Energy Agency

Coding of REFERENCE and REL-REF
(WP 2009-19)

N. Otsuka

Many REFERENCE lines

Example:

```
REFERENCE   (J,PL/B,597,243,2004) Main Ref.
            (J,NIM/A,489,282,2002) Details of beam facility
            (J,NIM/A,452,484,2000) MEDLEY exp.setup description
            (C,2004SANTA,1,688,200409) Graphs.
            (J,PR/C,74,054002,2006) Data confirmed in Fig.15.
             Details of experiment and data analysis.
```

Some articles give general description of experimental facilities.

Current rule:

All bibliographic references which contain information of importance directly relating to the data compiled in EXFOR …. may be coded under the keyword REFERENCE. …

Proposal

Proposed new rule:

All bibliographic references which contain the preliminary or revised data compiled in EXFOR …. may be coded under the keyword REFERENCE.

…

Example:

```
REFERENCE   (J,PL/B,597,243,2004) Main Ref.
            (C,2004SANTA,1,688,200409) Graphs.
            (J,PR/C,74,054002,2006) Data confirmed in Fig.15.
             Details of experiment and data analysis.
REL-REF     (I,,J.Klug+,J,NIM/A,489,282,2002)
             Details of beam facility
            (I,,S.Dangtip+,J,NIM/A,452,484,2000)
             MEDLEY exp.setup description
```

Proposed new related reference types:

- **I (General description of experimental instrument)**
- **M (General description of experimental technique)**

Proposal (Cont'd)

Proposed conclusion:

New coding rule for keywords REFERENCE proposed in WP2009-19 is accepted.

Proposed action (new):

To All: Code articles which give general description of experimental facility and technique under REL-REF with an appropriate related reference code.

END

International Atomic Energy Agency

HISTORY Coding
(WP 2009-16)

N. Otsuka

Variation in HISTORY Coding

Question:

Where do you insert HISTORY line(s) when you altered a part of data subentries (002, 003, …)?

Compiler A:

insert a HISTORY line in the common subentry (.001) *only*.

Compiler B:

insert a HISTORY line in the corrected data subentry *only*.

Compiler C:

insert a HISTORY line *both* in common and data subentries.

Current Rule of HISTORY Coding

LEXFOR “HISTORY”:

The rules concerning BIB information apply to history, *i.e.*, an entry under history in the common subentry (SAN=1) applies to all other subentries and should not be repeated in the data subentries.

What one wants to see in HISTORY?

DB managers:

want to see the list of all alterations of the Entry in one place (.001).

In 001

```
HISTORY (19610301C)
        (20021123A)Subentry 003 corrected
        (20030511A)Upper to lower cases, 4 digits year
        (20050830A)Subentry 003 and 004 corrected
```

Reviewers (like me)

want to see the list of important alterations in each subentry ("important" – change interpretation of compiled data.)

In 003

```
HISTORY (20021123A)SF5: IND added
        (20050830A)SF3: N -> X
```

Proposal

HISTORY record should be

1. always added in the common subentry (001) when data subentries are updated;

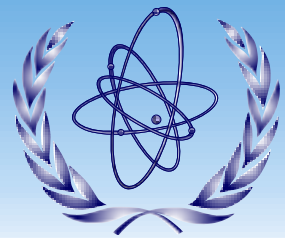
2. also added in data subentries when coded information (except 2 digits year to 4 digits year) is changed in the data subentries.

```
SUBENT 001
HISTORY (19610301C)
        (20021123A)Subentry 003 corrected
        (20030511A)Upper to lower cases, 4 digits year
        (20050830A)Subentry 003 and 004 corrected
SUBENT 003
HISTORY (20021123A)SF5: IND added
        (20050830A)SF3: N -> X
```

Proposed conclusion:

New coding rules for keywords HISTORY proposed in WP2009-16 are accepted.

END



International Atomic Energy Agency

Data Type Code EXP
(WP 2009-13)

N. Otsuka

EXFOR Basics

Abstract:
EXFOR is the exchange format for the transmission of *experimental* nuclear reaction data between national and international nuclear data centres …

Question:
What is the difference between
(4-BE-7(P,G)4-B-8,,SIG,,,**EXP**)
and
(4-BE-7(P,G)4-B-8,,SIG)
?

Answer:
No difference…
Maybe positive indication to data type (experimental).
However, it might be a source of confusion….

Proposal in NRDC2002 (Paris) by Vicki

Proposal in Memo CP-C/304 (also in WP2002-12):

"Eliminate the use of the code EXP in REACTION sub-field 9"

But we cannot find a conclusion/action concerning this working paper in the meeting summary report.

Proposed conclusion:
Data type code EXP is obsolete.

Proposed action:
To Otsuka: Add an obsolete flag to data type code EXP.

END

International Atomic Energy Agency

Level Density Compilation

(WP 2009-23, Actions A40+A41+A57)

N. Otsuka

Actions A40 + A41 – NRDC 2008

A40 Otsuka + Hlavač

"Assess and add to Dictionary 23 an appropriate description of the level density extraction methods."

Done!

New analysis code (Dict. 23) for level densities derived from Ericson fluctuation ERCSN was proposed.

(To be added to dictionary, will be used for area C compilation.)

A41 Otsuka

"Add level densities (LD) to Dictionary 32 (SF6)." Done!

Action A57 – NRDC 2008

A57 All

Compile level densities, as described in revised Memo CP-D/512

Reference	Institute	Entry
A. Schiller *et al*., Phys. Rev. C**63**, 021306(R) (2001)	2NOROSL	O1670
E. Melby *et al*., Phys. Rev. C**63**, 044309 (2001)	2NOROSL	O1446
S. Siem *et al*., Phys. Rev. C**65**, 044318 (2002)	2NOROSL	O1701
M. Guttormsen *et al*., Phys. Rev. C**68**, 064306 (2003)	2NOROSL	O1702
A. Schiller *et al*., Phys. Rev. C**68**, 054326 (2003)	2NOROSL	O1669
U. Agvaanluvsan *et al*., Phys. Rev. C**70**, 054611 (2004)	2NOROSL	O0824
R. Chankova *et al*., Phys. Rev. C**73**, 034311 (2006)	2NOROSL	O1671
A.C. Larsen *et al*., Phys. Rev. C **73**, 064301 (2006)	2NOROSL	O1699

All articles listed in Memo CP-D/512 were compiled by NEA-DB!

Level densities from IPPE (Obninsk)

B. V. Zhuravlev *et al*., INDC(NDS)-0554 (2009)

Level densities derived from (p,n) energy spectra for medium heavy nuclides

have been compiled by NDS (D0526 in PRELIM.D067).

Compilation of energy spectra is in progress (NDS):

B.V.Zhuravlev *et al*., Yad. Fiz. **69**, 387 (2006) *	4RUSFEI
B.V.Zhuravlev *et al*., Izv. Akad. Nauk, Ser. Fiz. **63**,148 (1999)	4RUSFEI
B.V.Zhuravlev *et al*., Yad. Fiz. **51**, 311 (1990)	4RUSFEI

* Compiled in D0522 except ^{122}Sn(p,n)^{122}Sb.

END

International Atomic Energy Agency

DOI Line under REFERENCE

(WP 2009-25, Actions A23+A24)

N. Otsuka

Actions A23 + A24 – NRDC 2008

A23 Zerkin

Include DOI in EXFOR as defined in option 2 of WP2008-20.

A24 All

If available, include DOI in all new entries.

Problem 1: Option 2 of WP2008-20:

```
REFERENCE (J,YF,71,1353,2008) Main reference
          (J,PAN,71,1325,2008)English translation
          $doi=10.1134/S106377808080024
```

→$ (dollar) is not allowed in the EXFOR Format rule!!

Problem 2: Variety in DOI coding ($doi=xxx, DOI=xxx, etc..)

→ Difficult to extract DOI from EXFOR source file automatically.
More strict rule is necessary for DOI coding.

New Proposed Rule for DOI inclusion

- **If available, DOI can be included in the line next to the line of corresponding REFERENCE code.**
- **DOI should be coded after the field identifiers #doi: starting from 12th column, respectively.**
- **DOI should not be coded with other free text in the same line.**

Proposed action (Supersedes A24):

If available, include DOI in all new entries as described in WP2009-25.

Remark and Recommendation

- **Do not trust DOI numbers printed in the articles.**
  Take it from the internet site ,or check if the DOI number really works.
  (e.g. http://dx.doi.org/10.1134/S1063778808080024 should works as a link to the webpage of the article.)

- **Inclusion of DOI is highly recommended when the article is available through the internet only.**
  (e.g. *in press*, *proceedings not printed*)
  It helps users to access the article.

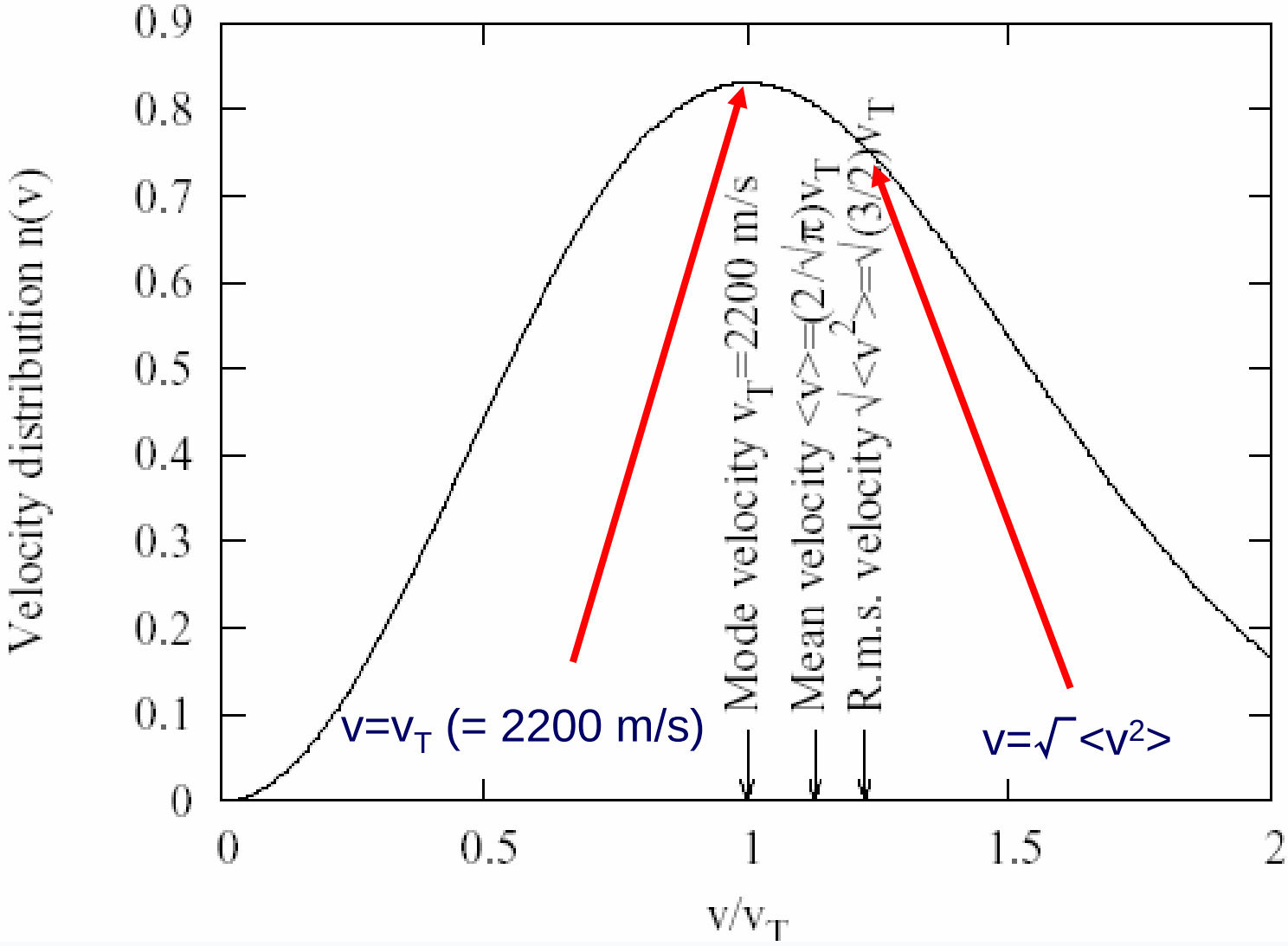
END

International Atomic Energy Agency

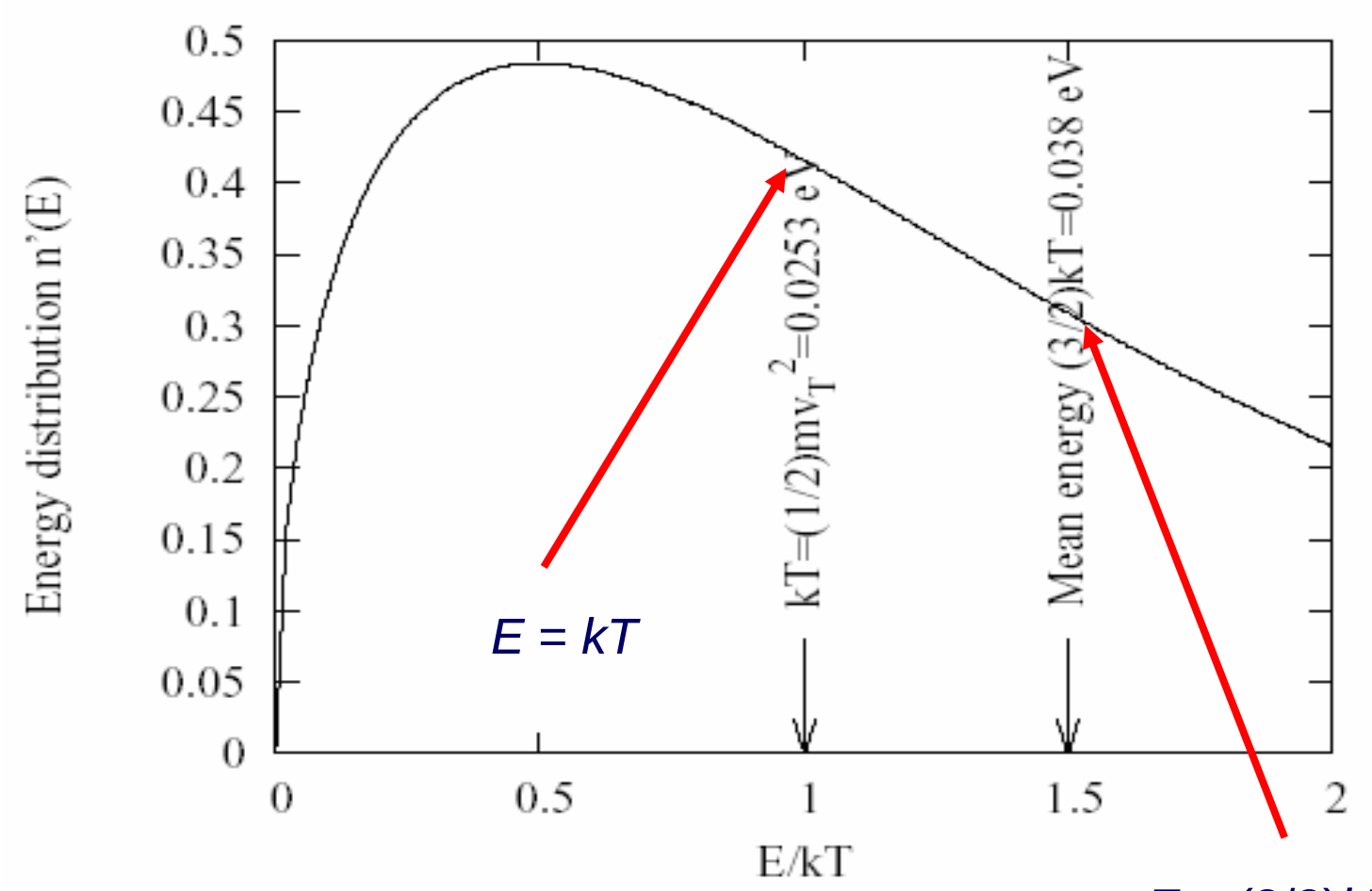
Energy Coding for Spectrum Average
(WP 2009-31)

N. Otsuka

Maxwell Distribution at Room (Velocity)



Maxwell Distribution at Room (Energy)



Characteristic Energy for Maxwell Dist.

Option 1

$E = kT = 0.0253$ eV

(where neutrons take mode (thermal) velocity v_T)

Option 2

$E = (3/2)kT = 0.0380$ eV (mean energy)

Physically both expressions are correct.
(Detail of Mathematics will be distributed later.)
But we usually use kT instead of $(3/2)kT$.

Why *kT* has been used instead of (3/2)*kT*?

I do not know the real reason…

But if σ ~ 1/v, following relation is valid:

`KT → EN`

`(A(a,b)B,,SIG,,MXW)→ (A(a,b)B,,SIG)`

$<\sigma_{max}(kT)> = \sigma(E=kT)$

(Westcott convention,J. Nucl. Energy, 2(1995)59)

Proposal

Code value *kT* instead of the mean energy (3/2)*kT* if a quantity is averaged over for for thermal equilibrated neutron distribution.

(i.e. kT=30 keV instead of EN-MEAN=45 keV at the stellar temperature.)

Use `EN-DUMMY` and `KT` for the room temperature and stellar temperature, respectively.