

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

**Memo CP-D/421**

**Date:** 9 March 2005  
**To:** Distribution  
**From:** O. Schwerer  
**Subject:** **Separate Covariance Files in EXFOR**

As discussed at the last NRDC meeting (see Action A24), I submit a proposal on the storage of covariance information for EXFOR data in ENDF-6 File 33 format. The idea is that, in cases where the authors present their covariance information in the internationally agreed File 33 format, it is not meaningful to convert the data into another, not so well known format.

The general format of separately stored covariance data is described in the EXFOR Formats Manual, Appendix B. (This is not a strictly defined data format but gives the possibility to define the actual format of the table in the comment records.)

The purpose of the present proposal is to extend the "Appendix B" option by including File 33 formatted data with proper cross-reference to the related EXFOR subentry, while keeping the existing option of a user-defined table format.

For the File 33 option, I think it is meaningful to allow also the inclusion of the actual cross section data in File 3 format, for easy processing. Please give your feedback also on this option (or should it even be obligatory?)

Appended is my draft of a revised "Appendix B", including examples of both the free format (taken from LEXFOR) and a new example for File 3+33 formatted data.

**Distribution:**

oblozinsky@bnl.gov  
vml@bnl.gov  
drochman@bnl.gov  
nordborg@nea.fr  
manokhin@ippe.obninsk.ru  
samaev@obninsk.ru  
Mmarina@ippe.obninsk.ru  
blokhin@ippe.obninsk.ru  
feliks@polyn.kiae.su  
chukreev@polyn.kiae.su  
S.Dunaeva@iaea.org  
taova@expd.vniief.ru

varlamov@depni.sinp.msu.ru  
chiba@earth.sgu.ac.jp  
kato@nucl.sci.hokudai.ac.jp  
ohnishi@nucl.sci.hokudai.ac.jp  
oba@nrdf.meme.hokudai.ac.jp  
yxzhuang@iris.ciae.ac.cn  
gezg@iris.ciae.ac.cn  
hongwei@iris.ciae.ac.cn  
tarkanyi@atomki.hu  
stakacs@atomki.hu  
katakura@ndc.tokai.jaeri.go.jp  
hasegawa@ndc.tokai.jaeri.go.jp

vlasov@kinr.kiev.ua  
kaltchenko@kinr.kiev.ua  
ogritzay@kinr.kiev.ua  
jhchang@kaeri.re.kr  
ohtsuka@nucl.sci.hokudai.ac.jp  
m.wirtz@iaea.org  
schwerer@iaeand.iaea.org  
v.zerkin@iaea.org  
henriksson@nea.fr  
exfor@nea.fr

*(Revised Appendix B of EXFOR Formats Manual)*

## COVARIANCE DATA FILE FORMAT

Covariance data may be stored on a separate covariance file. This is mandatory if

- a) the file is too big to be included conveniently as free text within the EXFOR entry (under the keyword COVARIANCE); and/or
- b) the file is in a format which does not fit within columns 12 - 66 available for free text (e.g. ENDF-6 File 33 format).

The covariance file is named

*aaaaa<sub>sss</sub>.cov*

with *aaaaa* being the accession number, *sss* the subentry number of the corresponding subentry (e.g. 35001002.cov).

There are three record types in the covariance file:

- comment records,
- data records,
- end records.

The actual covariance data can be given either in a free format, defined in the comment records, or in ENDF-6 File 33 format. In the latter case, the cross section may be included also (in File 3 format) for easy processing.

### Comment record format

Column	1	C
	2 - 9	Data set number (subaccession number)
	10	(blank)
	11 - 80	Comment which includes covariance type and format

### Data record format

a) Free format:

Column	1	D
	2 - 9	Data set number (subaccession number)
	10	(blank)
	11 - 80	Data in format given on comment record

b) ENDF 6 File 3/33 format:

First record:

Column	1	F
	2 - 9	Data set number (subaccession number)
	10	(blank)
	11 - 14	MAT number used
	15	(blank)
	16 - 25	File numbers given, separated by commas (e.g. 3,33)
	26 - 80	Comment

Following records:

Column	1 - 80	As in ENDF-6
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**End record format**

Column	1	E
	2 - 9	Data set number (subaccession number)
	10 - 80	(blank)

See also **LEXFOR, Covariance**.

***Example 1: Covariance data in free format as defined in comment records***

```
C10034002 Values given only for elements below diagonal of symmetric
C10034002 matrix on same energy grid as data format.
C10034002 FORMAT(9E5.2)
D10034002 1.0
D10034002 0.98 1.0
D10034002 0.90 0.97 1.0
D10034002 0.70 0.82 0.93 1.0
D10034002 0.54 0.68 0.83 0.96 1.0
D10034002 0.64 0.75 0.85 0.92 0.95 1.0
E10034002
```

**Example 2: Cross section and Covariance data in ENDF-6 File 3/33 format**

```

C35001002 Covariance file for subentry 35001002
C35001002 The file is in ENDF File 33 format, also cross section as File 3
F35001002 6210 3,33          Cross section and covariances in ENDF-6 format
0.000000+0 0.000000+0          0          0          0          06210 0 0      0
6.215100+4 1.496234+2          0          0          0          06210 3102    1
8.256831+6 8.256831+6          0          0          1          316210 3102    2
          31          2          6210 3102    3
0.110000+4 0.244474+2 0.135000+4 0.236065+2 0.162500+4 0.218757+26210 3102    4
0.187500+4 0.196988+2 0.225000+4 0.153861+2 0.275000+4 0.153043+26210 3102    5
0.350000+4 0.127367+2 0.450000+4 0.100073+2 0.625000+4 0.865960+16210 3102    6
0.875000+4 0.656557+1 0.112500+5 0.501474+1 0.137500+5 0.457034+16210 3102    7
0.175000+5 0.387133+1 0.225000+5 0.394818+1 0.275000+5 0.314252+16210 3102    8
0.350000+5 0.258191+1 0.450000+5 0.232481+1 0.550000+5 0.184880+16210 3102    9
0.700000+5 0.157094+1 0.900000+5 0.117749+1 0.110000+6 0.997426+06210 3102   10
0.135000+6 0.992993+0 0.162500+6 0.757935+0 0.187500+6 0.734009+06210 3102   11
0.225000+6 0.678500+0 0.275000+6 0.492988+0 0.350000+6 0.418481+06210 3102   12
0.450000+6 0.372564+0 0.550000+6 0.284066+0 0.700000+6 0.247658+06210 3102   13
0.900000+6 0.194466+0 0.000000+0 0.000000+0 0.000000+0 0.000000+06210 3102   14
0.000000+0 0.000000+0          0          0          0          06210 0 0      15
6.215100+4 1.496234+2          0          0          0          0621033102   16
0.000000+0 0.000000+0          0          1          0          0621033102   17
0.000000+0 0.000000+0          1          5          528          32621033102   18
0.100000+4 0.120000+4 0.150000+4 0.175000+4 0.200000+4 0.250000+4621033102   19
0.300000+4 0.400000+4 0.500000+4 0.750000+4 0.100000+5 0.125000+5621033102   20
0.150000+5 0.200000+5 0.250000+5 0.300000+5 0.400000+5 0.500000+5621033102   21
0.600000+5 0.800000+5 0.100000+6 0.120000+6 0.150000+6 0.175000+6621033102   22
0.200000+6 0.250000+6 0.300000+6 0.400000+6 0.500000+6 0.600000+6621033102   23
0.800000+6 0.100000+7 0.000000+0 0.000000+0 0.000000+0 0.000000+0621033102   24
.....
.....
0.300769-2 0.190133-2 0.194659-2 0.199179-2 0.196701-2 0.199724-2621033102  103
0.208640-2 0.362495-2 0.197938-2 0.202161-2 0.201359-2 0.205954-2621033102  104
0.216937-2 0.302796-2 0.208438-2 0.207471-2 0.212723-2 0.225324-2621033102  105
0.345695-2 0.212488-2 0.218017-2 0.231748-2 0.376135-2 0.218460-2621033102  106
0.232702-2 0.326855-2 0.242255-2 0.444583-2          0          06210 0 0      107
0.000000+0 0.000000+0          0          0          0          06210 0 0      108
E 35001002

```