

Recent development of the EXFOR output formats: X4+, XML, HTML

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Paris, 16-19 April 2012

Topics:

1. EXFOR interpreted “X4+”

2. EXFOR-XML

1. Goal
2. Basic principles
3. Technical details
4. Release on Web

3. EXFOR Standard output

1. Basic ideas
2. Text output
3. XML output

4. XML read-write experience

1. Recipe of covariance matrix construction (Java-Javascript)

Basic ideas (2006):

1. Similar appearance to original EXFOR format with some extensions
2. Interpretation of codes for keywords from Dictionaries
3. Reference: Volume, Pages, Publisher, etc. are given explicitly;
4. DOI, URL (link to Web-Journal), NSR-Key are given
5. Data are not broken by 6 columns per line
6. Data are aligned and given in a human-readable format

Summary

1. Views EXFOR file + dictionaries; oriented to Web user
2. It is still text not far from EXFOR (comparing to X4± interactive tree); possible for reading by traditional programs

EXFOR data: <http://www-nds.iaea.org/EXFOR/13725.015>
 Data retrieved from the EXFOR database version of March 28, 2012.

ENTRY	13725	19990810	19991101	20050926	0000	
SUBENT	13725001	19990810	19991101	20050926	0000	
BIB	10	13				
INSTITUTE	(1USARPI,1USA ^{KAP})					
	#(1USA ^{KAP}) Knolls Atomic Power Laboratory, Schenectady, NY, USA					
	#(1USARPI) Rensselaer Polytechnic Institute, Troy, NY, USA					
REFERENCE	(J,NSE,128,61,1998)					
	# (JNSE,128,61,1998) Journ.: Nuclear Science and Engineering, Vol.128, p.61 (1998) USA					
	#+ #NSR=1998DA26 #URL= http://www.ans.org/pubs/journals/nse/vv-128					
AUTHOR	(Y.DANON,C.J.WERNER,G.YOUK,R.C.BLOCK,R.E.SLOVACEK, N.C.FRANCIS,J.A.BURKE,N.J.DRINDAK,F.FEINER,J.A.HEL ^M)					
TITLE	Neutron Total Cross-Section Measurements and Resonance Parameter Analysis of Holmium, Thulium, and Erbium					
FACILITY	(LINAC,1USARPI)					
	#(LINAC) Linear accelerator					
	#(1USARPI) Rensselaer Polytechnic Institute, Troy, NY, USA					
INC-SOURCE	(PHOTO) Enhanced thermal target: water-cooled tantalum.					
METHOD	(TOF) Flight Path 14.97 m.					
	#(TOF) Time-of-flight					
DETECTOR	(GLASD) lithium glass detector, enriched to 95% ⁶ Li.					
	#(GLASD) Glass detector					
STATUS	Data received on diskette from J.A.Burke, June 1999. (APRVD) Approved by J. Burke, 10 August 1999.					
HISTORY	(19990701C)					
ENDBIB	13					
NOCOMMON	0	0				
ENDSUBENT	16					
SUBENT	13725015	19990702	19991101	20050926	0000	
BIB	6	8				
REACTION	1(68-ER-0(N,0),,EN) 2(68-ER-0(N,G),,WID) 3(68-ER-0(N,EL),,WID)					
	#(68-ER-0(N,0),,EN) Quantity: [RP] Resonance energy					
	#(68-ER-0(N,G),,WID) Quantity: [RP] Resonance width					
	#(68-ER-0(N,EL),,WID) Quantity: [RP] Resonance width					
	# Process: [EL] Elastic scattering					
ANALYSIS	(MLA) Multi-level analysis using SAMMY code.					
ASSUMED	(ASSUM,68-ER-0(N,G),,WID)					
CORRECTION	Corrected for paramagnetic scattering.					
ERR-ANALYS	(DATA-ERR) 1-sigma errors calculated by SAMMY.					
STATUS	Data taken from Table VI of article.					
ENDBIB	8					
NOCOMMON	0	0				
DATA	1DATA-ERR	1DATA	2DATA-ERR	2DATA	3DATA-ERR	3ASSUM
EV	EV	MILLI-EV	MILLI-EV	MILLI-EV	MILLI-EV	MILLI-EV
-40.4				395.3	0.3	92.
0.4595	0.0001	87.12	0.16	0.2694	0.0006	
0.5834	0.0002	86.2	0.33	0.2472	0.0009	
5.9936	0.0006	104.9	2.1	20.71	0.3	
7.9				0.71	0.03	96.
7.93	0.002	98.82	4.5	0.16	0.005	
9.389	0.001	88.3	2.	9.2	0.14	
15.567	0.003	76.8	4.1	2.63	0.1	
ENDDATA	20					
ENDSUBENT	33					
ENDENTRY	2					

Search by
 Entry: 13725
 Authors:
 Y. Danon
 C.J. Werner
 G. Youk
 R.C. Block
 R.E. Slovacek
 N.C. Francis
 J.A. Burke
 N.J. Drindak
 F. Feiner
 J.A. Helm

X4+
 example

Problems of X4+

1. Repetition of the codes (after # at the end of keyword text-block)
2. Does not show logical structure of EXFOR file
3. Not interactive
Because of 1, 2, 3 X4± was developed
4. Software uses EXFOR database.
Advantage: can use NSR information.
Disadvantage: can not display external EXFOR file

Summary

1. Does not cover modern requirements of Web users
2. Can not be used in compilation process
3. Good candidate for author's prove (can be edited by author)

Task (A52)

1. Develop the program to generate X4+ from standalone EXFOR file

Development in 2012

Standalone program

1. New program is prepared (version-1)
2. Included to EXFOR Web Uploading system
3. Displays Legend for Headers/Units of COMMON and DATA sections

Database program

1. Can display Authors and Title of References (including non first reference), if they are present in the database, i.e. imported from NSR or from Web
2. Displays indexes and Greek characters (when imported from NSR)

Tasks (?)

1. To join programs to use advantages of both
2. Needs discussion to be used for author's prove
3. To consider as "default output" from NDS Web retrieval system

X4+
2012

EXFOR-Interpreted, IAEA-NDS, 2006 - Mozilla Firefox

File Edit View History Bookmarks Tools Help

www-nds.iaea.org/exfor/servlet/X4sGetSubent?reqx=924&subID=40419005&| Google

EXFOR-Interpreted, IAEA-NDS, 20... +

EXFOR data: http://www-nds.iaea.org/EXFOR/40419.005
Data retrieved from the EXFOR database version of March 28, 2012.

ENTRY	40419	850329	20050926	0000
SUBENT	40419001	850329	20050926	0000
BIB	12	24		
INSTITUTE	(4CCPRI)			
	#(4CCPRI) Khlopin Radiev. Inst., Leningrad, USSR			
REFERENCE	(J,NP/A,213,436,73)			
	(J,YF,11,(5),1006,7011)			
	(J,YF,10,(2),233,6910)			
	(C,71KIEV,1,341,7105)			
	(C,73KIEV,3,256,7305)			
	(P,YFI-16,11,73)			
	(R,RI-4,72)			
	# (J,NP/A,213,436,73) Journ.: Nuclear Physics, Section A, Vol.213, p.436 (1973) Netherlands			
	#+ #NSR=1973ZH02 #DOI=10.1016/0375-9474(73)90744-6			
	#+ #Title= Symmetric and Asymmetric Fission of ²²⁶ Ra Induced by 5			
	#+ #+ to 15 MeV Neutrons			
	#+ #Authors= E.A.Zhagrov, I.M.Kuks, Y.A.Nemilov, Y.A.Selitskii, V.B.Funstein			
	# (J,YF,11,(5),1006,7011) Journ.: Yadernaya Fizika, Vol.11, Issue.5, p.1006 (1970) Russia			
	#+ #NSR=1970BA22			
	#+ #Title= Anomalous Angular Distribution of Fragments from Ra Fission			
	#+ #+ Induced by 14-16 MeV Neutrons			
	#+ #Authors= Y.A.Babenko, Y.A.Nemilov, L.A.Peskachevskii, Y.A.Selitskii, V.B.Funstein			
	# (J,YF,10,(2),233,6910) Journ.: Yadernaya Fizika, Vol.10, Issue.2, p.233 (1969) Russia			
	#+ #NSR=1969BA40			
	#+ #Title= Neutron Fission of Ra ²²⁶ Near Threshold			
	#+ #Authors= Y.A.Babenko, V.T.Ippolitov, Y.A.Nemilov, Y.A.Selitskii, V.B.Funstein			
	# (C,71KIEV,1,341,7105) Conf.: Neutron Physics Conf., Kiev 1971, Vol.1, p.341 (1971) USSR			
	# (C,73KIEV,3,256,7305) Conf.: 2.Conf.on Neutron Physics, Kiev 1973, Vol.3, p.256 (1973) USSR			
	# (P,YFI-16,11,73) Prog.Rep.: Yaderno-Fizicheskie Issledovaniya Reports, No.16, p.11 (1973) Russia			
	# (R,RI-4,72) Report: Khlopin Radiev. Inst., Leningrad Reports, No.4 (1972) Russia			
AUTHOR	(JU.A.BABENKO,V.T.IPPOLITOV,I.M.KUKS,JU.A.NEMILOV, JU.SELITSKIJ,V.B.FUNSHEJN,E.A.ZHAGROV, L.A.PLESKACHEVSKIJ)			
TITLE	FISSION OF RA-226 BY NEUTRONS AND ANGULAR DISTRIBUTION OF FRAGMENTS			
FACILITY	(VDG) VAN DE GRAAFF (CYCLO) CYCLOTRON #(VDG) Van de Graaff #(CYCLO) Cyclotron			
INC-SOURCE	(D-D) (D-T)			
SAMPLE	NO INFORMATION			
DETECTOR	(TRD) TRACK DETECTOR #(TRD) Track detector			
MONITOR	NO INFORMATION			
STATUS	(APRVD) APPROVED BY THE AUTHORS 761200 THIS ENTRY SUPERSEEDS DATA OF ENTRY 40395			
HISTORY	(781027C) COMPILED AT THE CENTRE			
ERR-ANALYS	(DATA-ERR) NOT SPECIFIED			

Search by
Entry: 40419
Authors:
Ju.A. Babenko
V.T. Ippolitov
I.M. Kuks
Ju.A. Nemilov
Ju. Selitskij
V.B. Funstein
E.A. Zhagrov
L.A. Peskachevskij

Authors and Titles
imported from NSR

X4+ standalone

EXFOR-Interpreted, IAEA-NDS, 2012 - Mozilla Firefox

File Edit View History Bookmarks Tools Help

www-nds.iaea.org/exfor/servlet/X4sShowX4pp?plus=3&File=XX4t

http://www-nds.iaea.org/exfor/servlet/X4sShowX4pp?plus=3&File=XX4t

EXFOR-Interpreted, I...

http://www-nds.iaea.org/exfor/servlet/X4sShowX4pp?plus=3&File=XX4t

ENTRY 40419001 850329 20050926 0000

SUBENT 40419001 850329 20050926 0000

BIB 12 24

INSTITUTE (4CCPRI)
(4CCPRI) Khlopin Radiev. Inst., Leningrad, Union of Soviet Socialist Republics

REFERENCE (J,NP/A,213,436,73)
(J,YF,11,(5),1006,7011)
(J,YF,10,(2),233,6910)
(C,71KIEV,1,341,7105)
(C,73KIEV,3,256,7305)
(P,YFI-16,11,73)
(R,RI-4,72)
(J,NP/A,213,436,73) Jour: Nuclear Physics, Section A, Vol.213, p.436 (1973), Netherlands
(J,YF,11,(5),1006,7011) Jour: Yadernaya Fizika, Vol.11, Issue.5, p.1006 (1970), Russia
(J,YF,10,(2),233,6910) Jour: Yadernaya Fizika, Vol.10, Issue.2, p.233 (1969), Russia
(C,71KIEV,1,341,7105) Conf: Neutron Physics Conf., Kiev 1971, Vol.1, p.341 (1971), USSR
(C,73KIEV,3,256,7305) Conf: 2.Conf.on Neutron Physics, Kiev 1973, Vol.3, p.256 (1973), USSR
(P,YFI-16,11,73) Prog: Yaderno-Fizicheskie Issledovaniya Reports, No.16, p.11 (1973), Russia
(R,RI-4,72) Rept: Khlopin Radiev. Inst., Leningrad Reports, No.4 (1972), Russia

AUTHOR (JU.A.BABENKO,V.T.IPPOLITO,V.I.M.KUKS,JU.A.NEMILOV,
JU.SELITSKIJ,V.B.FUNSHTEJN,E.A.ZHAGROV,
L.A.PLESKACHEVSKIJ)

TITLE FISSION OF RA-226 BY NEUTRONS AND ANGULAR
DISTRIBUTION OF FRAGMENTS

FACILITY (VDG) VAN DE GRAAFF
(CYCLO) CYCLOTRON
(VDG) Van de Graaff
(CYCLO) Cyclotron

INC-SOURCE (D-D)
(D-T)
(D-D) Deuteron-Deuterium
(D-T) Deuteron-Tritium

SAMPLE NO INFORMATION

DETECTOR (TRD) TRACK DETECTOR
(TRD) Track detector

MONITOR NO INFORMATION

STATUS (APRVD) APPROVED BY THE AUTHORS 761200
THIS ENTRY SUPERSEDES DATA OF ENTRY 40395
(APRVD) Approved by author

HISTORY (781027C) COMPILED AT THE CENTRE

ERR-ANALYS (DATA-ERR) NOT SPECIFIED

ENDBIB 24

NOCOMMON

ENDSUBENT 27

SUBENT 40419004 850329 20050926 0000

BIB 1 1

REACTION (88-RA-226(N,F),,SIG)
(88-RA-226(N,F),,SIG)
Target:RA-226 #Projectile:N #Reaction:N,F #Process:Fission #Quantity:,SIG:CS:Cross section

ENDBIB 1

NOCOMMON

DATA 4 31 12

#Legend: 4 x 31 x 12 : data columns * lines * column width

#EN	Energy of incident projectile, laboratory system	MEV	MeV
#EN-ERR	Uncertainty in incident projectile energy	MEV	MeV
#DATA	Cross section	MB	millibarns
#DATA-ERR	Error in value of quantity, defined under ERR-ANALYS	MB	millibarns

#/Legend

EN	EN-ERR	DATA	DATA-ERR
MEV	MEV	MB	MB
.3	.04	.02	
3.3	.1	.43	.13
3.5	.1	.6	.1
3.8	.1	1.36	.1

Description of codes and parameters

Description of reaction-code

Legend: Headers & Units

2. EXFOR-XML

1. Main tasks:
 1. to learn XML from practical view point
 2. to understand advantages/disadvantages for: compilers, programming physicists and end-users
 3. to find out what can be achieved by using XML
2. Reflects EXFOR structure: full equivalent to EXFOR, allows to create initial EXFOR file from its XML presentation
3. Includes information from Dictionaries (meaning of codes, parameters)
4. Has interpretation to interactive HTML/CSS/JavaScript using XSL (eXtensible Stylesheet Language) Transformation
5. Developed as output from NDS EXFOR system in 2009 (presented in Sapporo, Japan, 2009)
6. It is “My EXFOR-XML” (not discussed within NRDC)
7. Opened for Web users in September 2011 as test output

Examples and technical solutions

```
<keyword kw="REFERENCE" subacc="A1495001" nCodes="1">
  <kwCode pointer="" iCode="0">
    <x4code type="REFERENCE">
      <x4code1 dictionary="REFERENCE" Type="J" Ref="J,PR" Vol="104"
        page="1064" Year="1956"
        URL="http://publish.aps.org/abstract/PR/v104/p1064"
        expansion="Jour: Physical Review, Vol.104, p.1064 (1956),USA"
        >J,PR,104,1064,195611</x4code1>
    </x4code>
  </kwCode>
</keyword>
```

Why

```
<keyword kw="REFERENCE">
```

but not

```
<REFERENCE>
```

?

1. Easier to add new Keyword

2. Easier to write XSL program

Examples and technical solutions (cont.)

```
<keyword kw="FACILITY" subacc="13725001" nCodes="1">
  <kwCode pointer="" iCode="0">
    <x4code type="FACILITY">
      <x4code1 dictionary="FACILITY" expansion="Linear accelerator">
        >LINAC</x4code1>
      <x4code1 dictionary="INSTITUTE" expansion="Rensselaer Polytechnic Institute,
        Troy, NY, United States of America">
        >1USRPI</x4code1>
    </x4code>
  </kwCode>
</keyword>
```

Why

<kwCode><x4code><x4code1>

but not just

<x4code>

?

1. EXFOR is very flexible allowing combination of codes
and free text relevant for groups of codes
2. The same and different types of codes can be grouped in one code limited by ()

INSTITUTE (2SWTPSI) X.Wang,G.Zsigmond.
(2GERMUN) M.Daum,P.Fierlinger,O.Zimmer.
(1USAVID) M.Daum.

INSTITUTE (2SWTPSI,2GERMUN,1USAVID)

Examples and technical solutions (cont.)

1. Why <Free> tag is used?

Because Free text can be pre-formatted (e.g. contain tables)

2. Why every value in a data section is encapsulated with <d></d>?

Because there gaps in the data. (How to store data with gaps in XML arrays?)

DATA	EN	EN-RSL-FW	DATA	1ERR-S	1DATA	2ERR-S	2
MEV	MEV	MB	MB	MB	MB	MB	
32.8	1.8	0.047		0.009			
34.7	1.4			0.08		0.04	
45.3	1.5	0.67	0.03		0.79	0.06	
46.3	1.1						
59.9	1.2	2.96	0.17				
65.4	0.9			5.1	0.3		
96.	1.4			15.2	0.9		
133.6	1.9			24.2	1.8		
173.9	1.9			38.7	3.1		
ENDDATA			11				

```
<datasect type="DATA" col="6" ln="9" acc="22903004">
<data nn="9">
<dd n="1"><d>32.8 </d><d>1.8 </d><d>0.047 </d><d>0.009 </d><d></d></dd>
<dd n="2"><d>34.7 </d><d>1.4 </d><d></d><d>0.08 </d><d>0.04 </d></dd>
<dd n="3"><d>45.3 </d><d>1.5 </d><d>0.67 </d><d>0.03 </d><d></d><d></dd>
<dd n="4"><d>46.3 </d><d>1.1 </d><d></d><d>0.79 </d><d>0.06 </d></dd>
<dd n="5"><d>59.9 </d><d>1.2 </d><d>2.96 </d><d>0.17 </d><d></d><d></dd>
<dd n="6"><d>65.4 </d><d>0.9 </d><d></d><d>5.1 </d><d>0.3 </d></dd>
<dd n="7"><d>96. </d><d>1.4 </d><d></d><d>15.2 </d><d>0.9 </d></dd>
<dd n="8"><d>133.6 </d><d>1.9 </d><d></d><d>24.2 </d><d>1.8 </d></dd>
<dd n="9"><d>173.9 </d><d>1.9 </d><d></d><d>38.7 </d><d>3.1 </d></dd>
</data>
</datasect>
```

SUBENT	30022002	20080215			
BIB	4	37			
REACTION	(92-U-235(N,F),PR,NU,,REL)				
COMMENT	Nu values were calculated using the energy balance equation and the result of fission fragments average kinetic energy measurements listed below. The following 5 variables/data line are used in the data-table.				
	(1) = En (MeV).				
	(2) = En-err due to target thickness (MeV).				
	(3) = avg E-kin(en) minus avg E-kin(thr) (MeV uncorrected for C-M effect).				
	(4) = avg E-kin(en) minus avg E-kin(thr) (MeV corrected for C-M effect).				
	(5) = +- err to variable 4.(MeV).				
	(1)	(2)	(3)	(4)	(5)
	0.37	0.15	-0.42	-0.68	0.59
	0.43	0.14	-0.07	-0.35	0.58
	0.49	0.14	0.27	-0.02	0.58
	0.54	0.14	0.35	0.04	0.37
	0.13	1.25	0.91	0.37	
	0.13	0.50	0.14	0.53	

ENTRY: 12528

SUBENT: 12528001

BIB (descriptive information)

INSTITUTE	(1CANCRC) [A.E.C.L., Chalk River, Ontario, Canada]
REFERENCE	(J,CJP,42,2384,1964) [Jour: Canadian Journal of Physics, Vol.42, p.2384 (1964), Canada] (R,CRRP-1186,1964) [Rept: AECL Chalk River Reports, No.1186 (1964), Canada]
AUTHOR	(D.S.Craig) (C.H.Westcott)
TITLE	The total neutron cross section of Pu241 below 1000 eV
FACILITY	(CHOPF) [Fast chopper] Fast chopper
STATUS	(SCSRS)
HISTORY	(19760804T) Translated from SCISRS (19841004A) Converted to reaction formalism (20051031C) DR Format updated in all entries and subentry 17 corrected (Pu-239 changed to Pu-241)

SUBENT: 12528018

BIB (descriptive information)

REACTION	<ul style="list-style-type: none"> 1 (94-PU-241(N,0),,EN) Target:[PU-241] Quantity: SF58=[,EN] WebQuantity=[RP]Resonance energy 2 (94-PU-241(N,TOT),,WID) Target:[PU-241] Quantity: SF58=[,WID] WebQuantity=[RP]Resonance width 3 (94-PU-241(N,TOT),,SIG,,RES) Target:[PU-241] Quantity: SF58=[,SIG,,RES] WebQuantity=[CS]Cross section at resonance 4 (94-PU-241(N,EL),,WID,,2G) Target:[PU-241] Quantity: SF58=[,WID,,2G] WebQuantity=[RP]2g * resonance width
ANALYSIS	(SLA) Single-level Breit-Wigner analysis.

DATA

DATA Columns

DATA	1	Value of quantity specified under REACTION	EV	electron-Volts
DATA-ERR	1	Error in value of quantity, defined under ERR-ANALYS	EV	electron-Volts
DATA	2	Value of quantity specified under REACTION	EV	electron-Volts
DATA-ERR	2	Error in value of quantity, defined under ERR-ANALYS	EV	electron-Volts
DATA	3	Value of quantity specified under REACTION	B	barns
DATA-ERR	3	Error in value of quantity, defined under ERR-ANALYS	B	barns
DATA	4	Value of quantity specified under REACTION	MILLI-EV	milli-Electron-Volts
DATA-ERR	4	Error in value of quantity, defined under ERR-ANALYS	MILLI-EV	milli-Electron-Volts

DATA Table

DATA 1	DATA-ERR 1	DATA 2	DATA-ERR 2	DATA 3	DATA-ERR 3	DATA 4	DATA-ERR 4
EV	EV	EV	EV	B	B	MILLI-EV	MILLI-EV
14.74	0.05	0.15	0.05	3660.	120.	6.2	1.
15.96	0.08	0.6	0.15	245.	25.	1.8	
16.7	0.08	0.25	0.1	360.	20.	1.2	
17.85	0.05	0.05	0.09	4670.	250.	3.2	0.8
20.75	0.17	0.09	0.1	222.	50.	0.32	
21.99	0.24	0.2	0.1	37.	15.	0.13	
23.04	0.3	0.6	0.25	142.	20.	1.5	
24.12	0.16	0.22	0.14	346.	25.	1.4	0.9
26.45	0.17	0.34	0.1	625.	35.	4.3	1.3
28.97	0.22	0.72	0.1	310.	25.	5.	
29.57	0.25	0.05	0.05	320.	100.	0.36	
31.03	0.21	0.36	0.1	278.	25.	2.4	0.6

Interpretation EXFOR-XML to HTML using XSL Transformation

Collapse/open interactively

EXFOR File

ENTRY: 12528

SUBENT: 12528001

BIB (descriptive information)

SUBENT: 12528018

BIB (descriptive information)

DATA
DATA Columns

DATA	1	Value of quantity specified under REACTION	EV	electron-Volts
DATA-ERR	1	Error in value of quantity, defined under ERR-ANALYS	EV	electron-Volts
DATA	2	Value of quantity specified under REACTION	EV	electron-Volts
DATA-ERR	2	Error in value of quantity, defined under ERR-ANALYS	EV	electron-Volts
DATA	3	Value of quantity specified under REACTION	B	barns
DATA-ERR	3	Error in value of quantity, defined under ERR-ANALYS	B	barns
DATA	4	Value of quantity specified under REACTION	MILLI-EV	milli-Electron-Volts
DATA-ERR	4	Error in value of quantity, defined under ERR-ANALYS	MILLI-EV	milli-Electron-Volts

EXFOR-XML-test, V.Zerkin, IAEA-NDS, 2009-03-31.

DATA Table

DATA 1	DATA-ERR 1	DATA 2	DATA-ERR 2	DATA 3	DATA-ERR 3	DATA 4	DATA-ERR 4
EV	EV	EV	EV	B	B	MILLI-EV	MILLI-EV
14.74	0.05	0.15	0.05	3660.	120.	6.2	1.
15.96	0.08	0.6	0.15	245.	25.	1.8	
16.7	0.08	0.25	0.1	360.	20.	1.2	
17.85	0.05	0.05	0.09	4670.	250.	3.2	0.8
20.75	0.17	0.09	0.1	222.	50.	0.32	
21.99	0.24	0.2	0.1	37.	15.	0.13	
23.04	0.3	0.6	0.25	142.	20.	1.5	
24.12	0.16	0.22	0.14	346.	25.	1.4	0.9
26.45	0.17	0.34	0.1	625.	35.	4.3	1.3
28.97	0.22	0.72	0.1	310.	25.	5.	
29.57	0.25	0.05	0.05	320.	100.	0.36	
31.03	0.21	0.36	0.1	278.	25.	2.4	0.6

Collapse/open

EXFOR File

ENTRY: 12528

SUBENT: 12528001

BIB (descriptive information)

SUBENT: 12528018

BIB (descriptive information)

DATA

XSL Transformation: XML → HTML

```
<?xml version = "1.0" ?>
<xsl:stylesheet version="1.0" xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
<xsl:template match="/x4files">
<xsl:comment >This is a comment</xsl:comment>
<HTML>
<head>
<link rel="stylesheet" type="text/css" href="x4.css"/>
</head>
<BODY>
<H1>EXFOR File</H1>
<table border="0" xwidth="100%"><tr><td>
<xsl:for-each select="x4entry">
<div class="x4entry">
    ENTRY: <u><xsl:value-of select="@accnum"/></u>
<xsl:for-each select="x4subent">
    <div class="x4sub">
        SUBENT: <xsl:value-of select="@subacc"/>
    <br/>
<xsl:if test="bib !=''" >
<div class="x4bib"><font color="blue">BIB</font> <span class="x4hlp">(descriptive information)</span><
</div>
    <table border="0" xwidth="100%">
        <font color="blue">
            <xsl:for-each select="bib/keyword">
                <tr>
                    <td valign="top" class="x4bibkw">
                        <xsl:value-of select="@kw"/>
                    </td>
                    <td class="x4bibkwcode">
                        <xsl:for-each select="kwCode">
                            <div class="x4code">
                                <xsl:if test="Poiter !=''" >
                                    <span class="x4pointer"><xsl:value-of select="Poiter"/></span>
                                    <xsl:text > </xsl:text>
                                </xsl:if>
                                <xsl:if test="Code !=''" >
                                    <span class="x4codel1">(<xsl:value-of select="Code"/>)</span>
                                    <xsl:text > </xsl:text>
                                </xsl:if>
                                <xsl:if test="Free !=''" >
                                    <span class="x4freel1"><xsl:value-of select="Free"/></span>
                                </xsl:if>
                            </div>
                        </xsl:for-each>
                    </td>
                </tr>
            </xsl:for-each>
        </font>
        <span class="endl">ENDBIB</span>
    </table>
</div>
</xsl:for-each>
</div>
</xsl:for-each>
</td></tr></table>
</BODY>
</HTML>
</xsl:template>
</xsl:stylesheet>
```

EXFOR-XML (as output format)

Summary

1. May be interesting for some users advanced in modern programming (students?)
2. Includes XSL transformation to Html + Javascript interactive pages
3. Fancy, but what else?

Tasks (?)

1. To consider as “default output” from NDS Web retrieval system

5. EXFOR “Standard Output”

Problems with EXFOR (as output format for users):

- Difficult to interpret - requires additional knowledge (structure and info)
- Data are spread through the file (Common-1, Common-N, Data-N) and not sorted (order of columns is not fixed)
- As result: difficult to write software reading EXFOR
- Existing output formats (C4, Plots, Tab,...) do not cover all EXFOR data

Does this EXFOR-XML solves these problems?

Not.

This is just EXFOR presented in XML language repeating
the same structure of information.

To write program reading EXFOR-XML you still have to know:

- Structure of the file
- Dictionaries (structure and relations)
- Pointers
- Common sections (Subent-1 and Subent-N)

EXFOR “Standard Output”

Goal:

To define comprehensive output format of EXFOR system: equivalent to EXFOR, but much easier to read and interpret

Mini-goal:

To deliver data to users from EXFOR in format simple for software development and easier for understanding

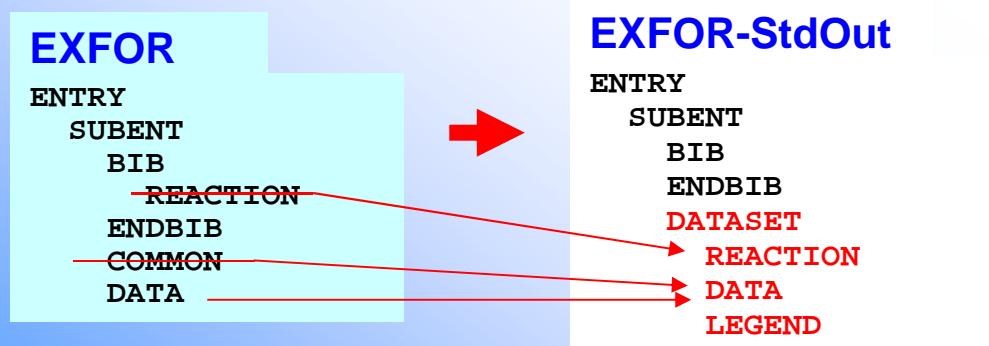
Audience:

- professional evaluators, developers of model codes,... ([programming](#))
- data centres developing retrieval/processing systems ([programmers](#))
- regular users (?)
- all EXFOR users (?)

EXFOR “Standard Output”

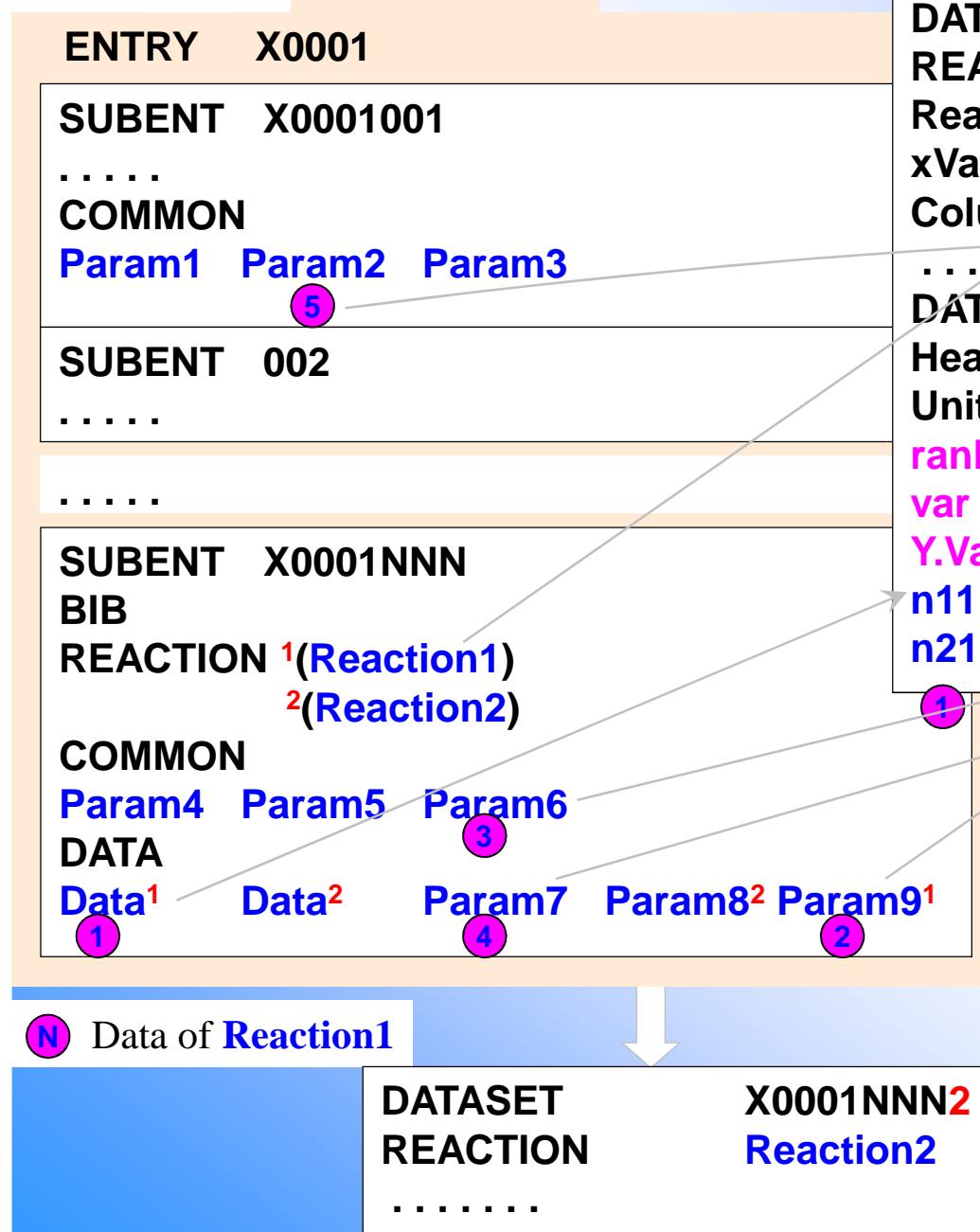
Main Features:

1. Formatted (fixed columns) text
2. Keywords, codes, free-text from EXFOR, but + interpreting information from dictionaries
3. No pointers
4. New level: Dataset – includes all information related to one reaction: reaction-code, interpretation, data-section and legend
5. Data-section contains data from DATA and COMMON sections of an EXFOR file
6. Data columns are sorted (fixed order)
7. Legend contains codes and interpretation of data (includes, e.g. basic-units and conversion factors)



EXFOR

EXFOR Std-out



How-to:

1. For every Pointer one DATASET
2. According to Reaction-Code define Reaction-Type
3. According to Reaction-Type define needed independent variables
4. Find related data (constant and variables) in COMMON and DATA sections
5. Sort them and put in fixed order to columns

Example of DATASET

```

. . . . . 0.2622    300.     3.      33.6     13.7
. . . . . 0.295     300.     3.      35.1     13.7
#ENDDATA      162      6
#Legend       6        12
#
#COL-1        : Data      : variable
#+  Rank       : 0.1      : Y.Value
#+  Type       : 21       : 0.1
#+  Header     : DATA     : [Data: data]
#+  Units      : MB/SR/MEV: [millibarns per steradian per MeV]
#+  BasicUnits: B/SR/EV  : Conv.Factor=1.e-09
#
#COL-2        : Error     : variable
#+  Rank       : 0.901    : Y.Err-
#+  Type       : 21       : 0.901
#+  Header     : -DATA-ERR: [Uncertainty: -error]
#+  Units      : MB/SR/MEV: [millibarns per steradian per MeV]
#+  BasicUnits: B/SR/EV  : Conv.Factor=1.e-09
#
#COL-3        : Data      : constant
#+  Rank       : 1.1      : X1.Value
#+  Type       : 41       : 2.1
#+  Header     : EN       : [Incident energy: energy]
#+  Units      : MEV      : [MeV]
#+  BasicUnits: EV       : Conv.Factor=1.e+06
#
#COL-4        : Error     : constant
#+  Rank       : 1.922    : X1.Resl+-_
#+  Type       : 41       : 2.922
#+  Header     : EN-RSL   : [Uncertainty: +-resolution]
#+  Units      : MEV      : [MeV]
#+  BasicUnits: EV       : Conv.Factor=1.e+06
#
#COL-5        : Data      : variable
#+  Rank       : 2.1      : X2.Value
#+  Type       : 53       : 3.1
#+  Header     : E-EXC    : [Secondary energy: excitation energy]
#+  Units      : MEV      : [MeV]
#+  BasicUnits: EV       : Conv.Factor=1.e+06
#
#COL-6        : Data      : variable
#+  Rank       : 3.1      : X3.Value
#+  Type       : 61       : 4.1
#+  Header     : ANG      : [Angle: angle] Angle of outgoing
particle
#+  Units      : ADEG     : [Angular Degrees]
#
#ENDDATASET   13970003

```

Example of DATASET (continued)

Why EXFOR-StdOut XML?

1. Objections to EXFOR-StdOut:

“Instead of one Fortran style formatted text file you provide us with another similar format - little bit better, but looking the same...”.

So, modern program will be also very much dependent of the columns oriented format.

2. Decision: to provide X4StdOut in XML.

This means, it will have all the features of X4StdOut, namely:

- based on dataset (no pointers, encapsulated DATA and COMMON)
- sorted columns
- includes information from dictionaries (interpreted codes, legend, etc.)

```

<?xml version="1.0" encoding="UTF-8" ?>
<x4files now="2012/03/05:16:59:20">
<dataset id="13970003" updated="20050225" />
<author1>S.A.Long+</author1>
<year>1998</year>
<ref1 code="J,PR/C,57,3191,1998">Jour: Physical Review, Part C, Nuclear Physics, Vol.57, p.3191 (1998)</ref1>
<reaction code="73-TA-181(N,P)72-HF-181,,DA/DE" C4Reaction="(N,P),DA/DE" ReactionType="DAE" Quantity="Double diff.cross
    section d2/dA/dE" IndVarFamCode="0 234" ExpectedUnits="B/SR/EV" />
<dataset xVariables="3" formula="Y = Y(X1,X2,X3)" col="6" row="162">
    <headers col="6">
        <header ii="1" varType="Data" var="variable" nval="150" minval="0.02075" maxval="2.545" varSorted="0.1"
            what="Y.Value" dataType="21" numVar="0.1" x4Header="DATA" expansion="Data: data" x4Units="MB/SR/MEV"
            hlpUnits="millibarns per steradian per MeV" BasicUnits="B/SR/EV" ConvFactor="1.e-09" />
        <header ii="2" varType="Error" var="variable" nval="44" minval="0.01639" maxval="0.295" varSorted="0.911"
            what="Y.Err+-" dataType="21" numVar="0.911" x4Header="DATA-ERR" expansion="Uncertainty: +-error"
            x4Units="MB/SR/MEV" hlpUnits="millibarns per steradian per MeV" BasicUnits="B/SR/EV" ConvFactor="1.e-09" />
        <header ii="3" varType="Data" var="constant" nval="1" minval="300." maxval="300." varSorted="1.1"
            what="X1.Value" dataType="41" numVar="2.1" x4Header="EN" expansion="Incident energy: energy"
            x4Units="MEV" hlpUnits="MeV" BasicUnits="EV" ConvFactor="1.e+06" />
        <header ii="4" varType="Error" var="constant" nval="1" minval="3." maxval="3." varSorted="1.922" what="X1.Resl+-
            " dataType="41" numVar="2.922" x4Header="EN-RSL" expansion="Uncertainty: +-resolution" x4Units="MEV"
            hlpUnits="MeV" BasicUnits="EV" ConvFactor="1.e+06" />
        <header ii="5" varType="Data" var="variable" nval="148" minval="0.1155" maxval="35.1" varSorted="2.1"
            what="X2.Value" dataType="53" numVar="3.1" x4Header="E-EXC" expansion="Secondary energy: excitation
            energy" x4Units="MEV" hlpUnits="MeV" BasicUnits="EV" ConvFactor="1.e+06" />
        <header ii="6" varType="Data" var="variable" nval="7" minval="1.2" maxval="13.7" varSorted="3.1" what="X3.Value"
            dataType="61" numVar="4.1" x4Header="ANG" expansion="Angle: angle" expansion2="Angle of outgoing particle"
            x4Units="ADEG" hlpUnits="angular Degrees" />
    </headers>
    <data row="162" col="6">
        <dd n="1"><d>0.03934</d><d>0.08472</d> <d>300.</d> <d>3.</d> <d>0.2394</d> <d>1.2</d> </dd>
        <dd n="2"><d>0.02584</d><d>0.1355</d> <d>300.</d> <d>3.</d> <d>1.703</d><d>1.2</d></dd> . . . .
        <dd n="162"><d>2.508</d><d>0.295</d><d>300.</d> <d>3.</d> <d>35.1</d><d>13.7</d></dd>
    </data>
</dataset>
</dataset>
</x4files>

```

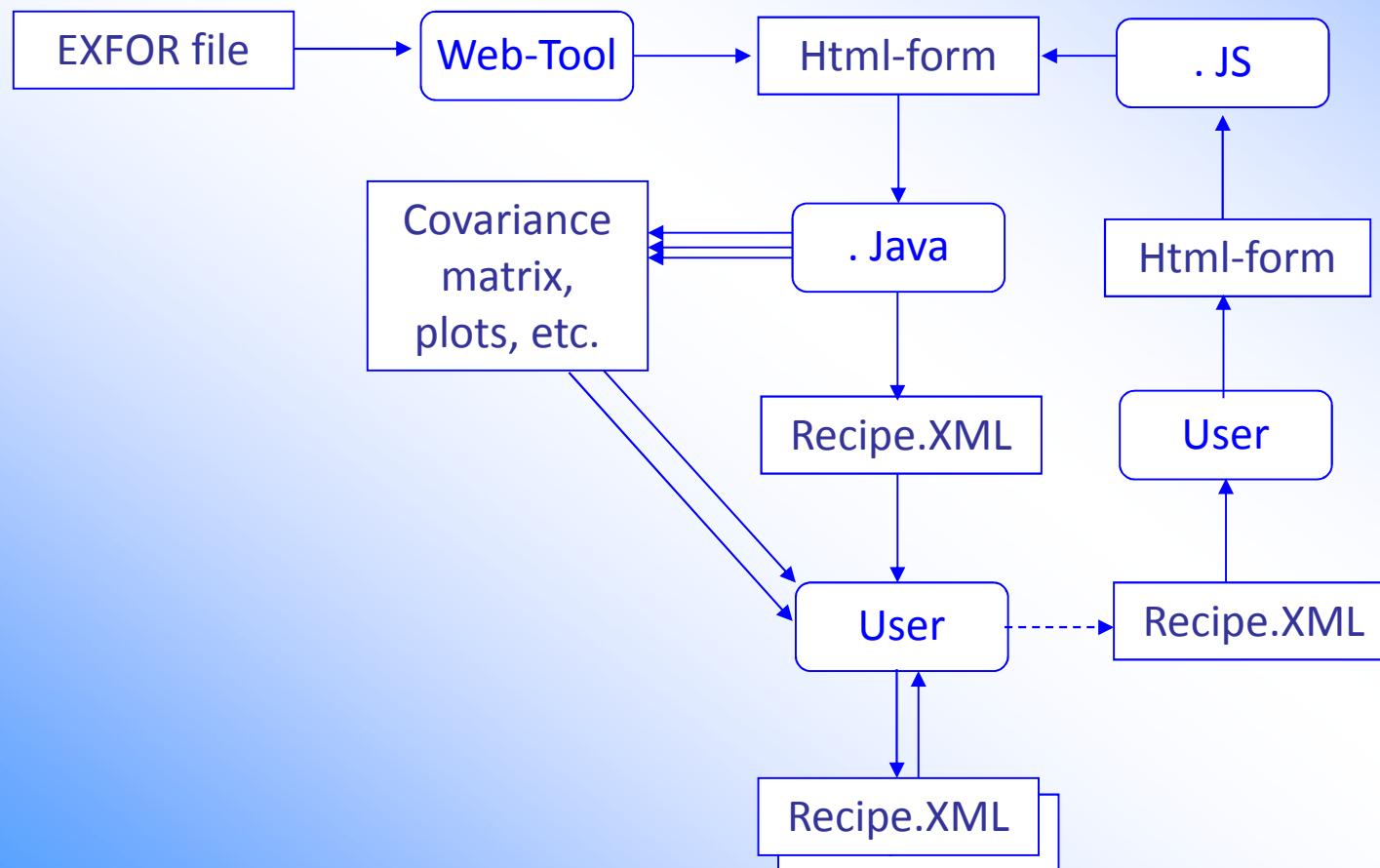
EXFOR-StdOut XML: example

EXFOR-Std-Out in XML: Summary

1. Should be easier to read by modern programs
2. Data and information is prepared for optional reading and will not be changed if format will be extended
3. It presents full information from EXFOR data
(it is not computational format)
4. It is still draft

4. XML read-write experience

**Recipe of covariance matrix construction:
save and reuse (via XML)**



Recipe.xml real example

```
<?xml version="1.0" encoding="UTF-8" ?>
<CovRecipe DatasetID="23114002"
  Created="2012-04-12 20:54:47"
  Software="Web-tool:2012.03.16">
  <Subent id="23114002" x4upd="20100924" />
  <Reacode code="95-AM-241(N,2N)95-AM-240,,SIG" />
  <addCovarFraction errName="MONIT-ERR" errType="EXFOR" corrType="UDERC" fracType="My-Matrix" >
    <dataArray2 what="CorrMatrix" LX="9" LY="9" LL="45" type="triangle" units="NO-DIM">
      1
      .43 1
      0 0 1
      0 0 .06 1
      0 0 .09 .12 1
      0 0 .09 .12 1 1
      0 0 .11 .11 .4 .4 1
      0 0 .11 .11 .4 .4 1 1
      0 0 .11 .11 .4 .4 1 1 1
    </dataArray2>
  </addCovarFraction>
  <addCovarFraction errName="ERR-S" errType="EXFOR" corrType="SERC" fracType="Uncorrelated" ></addCovarFraction>
  <addCovarFraction errName="ERR-1" errType="EXFOR" corrType="SERC" fracType="Uncorrelated" ></addCovarFraction>
  <addCovarFraction errName="ERR-2" errType="EXFOR" corrType="LERC" fracType="Fully-correlated" ></addCovarFraction>
  <addCovarFraction errName="ERR-3" errType="EXFOR" corrType="SERC" fracType="Uncorrelated" ></addCovarFraction>
  <addCovarFraction errName="ERR-4" errType="EXFOR" corrType="UDERC" fracType="My-Matrix" >
    <dataArray2 what="CorrMatrix" LX="9" LY="9" LL="45" type="triangle" units="NO-DIM">
      1
      0 1
      0 1 1
      0 1 1 1
      0 0 0 1
      1 0 0 0 1
      0 0 0 1 0 1
      0 0 0 0 0 0 1
      1 0 0 0 1 0 0 1
    </dataArray2>
  </addCovarFraction>
  <addCovarFraction errName="ERR-5" errType="EXFOR" corrType="LERC" fracType="Fully-correlated" ></addCovarFraction>
  <addCovarFraction errName="ERR-6" errType="EXFOR" corrType="LERC" fracType="Fully-correlated" ></addCovarFraction>
  <addCovarFraction errName="ERR-7" errType="EXFOR" corrType="SERC" fracType="Uncorrelated" ></addCovarFraction>
  <myStamp>EXFOR-Web-Covariance-Recipe, V.Zerkin, IAEA-NDS, 2012-03-19.</myStamp>
</CovRecipe>
```

Why XML was used

1. Does not need to invent format for new type of information
2. Much more easier for programming on the reading side (Javascript) using standard infrastructure (objects, methods/subroutines)
3. Less time for development

Alternatives

1. Using EXFOR format style (introducing RECIPE keyword, Codes with Parameters)
2. Invent my-format suitable for coding.

Both alternatives

- need more time for implementation,
- require specialized programming
- more difficult to update and maintain in future

Concluding remarks

X4+

1. Needs further development as format for author's prove (?)
2. Needs rationalization of software structure

XML, Html

1. Software infrastructure for producing XML on the current EXFOR exists.
2. Since 2011 two types of XML presentations of EXFOR data are available on the IAEA NDS Web site
3. EXFOR XML input and output serve different purposes and oriented to different users' communities
4. There is not enough experience in using of existing EXFOR XML: both EXFOR XML formats have still draft status (no feed back from potential users)
5. XML is good language for new (small?) projects, like recipe.xml for construction of covariance matrices from EXFOR uncertainties.

Thank you