

Neutron source spectra format

History:

https://www-nds.iaea.org/publications/group_list.php?group=INDC-NDS

 INDC(NDS)-0590

EXFOR formats and rules: present status and proposals how to store neutron source data

Olena Gritzay

Institute for Nuclear Research of NAS of Ukraine, prospekt Nauky, 47, Kyiv, Ukraine, 03680

N. Otsuka, V. Semkova, S.P. Simakov, V. Zerkin

Nuclear Data Section, International Atomic Energy Agency

P.O. Box 100, A-1400 Vienna, Austria

Proposal for the source spectral information storage in EXFOR, suggested in this paper

2) To introduce into EXFOR **new special ENTRY/SUBENTRY** for neutron spectrum.

New: type of spectrum and its characteristic should be entered in numeric data type using **separate SUBENTRY** or **ENTRY** for neutron spectrum if the spectrum is commonly applied to measurements performed at the neutron source.

2.1 Use special form of **REACTION** to define the neutron source (see table below) with the proper modifier **SPD** to **REACTION SF8**.

2.2 Use **DATA** to enter **the numerical spectral data**.

2.3 **Data, that are averaged** over broad incident-projectile energy spectrum and entered into the EXFOR system, should be labelled by the keyword **INC-SOURCE** with use of all relevant keywords from the Inc-Source Dictionary (#19) and **the cross-reference** to the EXFOR entry/subentry with **these numerical spectral data**.

2.4 This cross-reference must be coded as an eight-digit integer.

Unfortunately, this proposal was not realized.

We continue to use the following rules.

LEXOR:

Spectrum Average

Cross sections averaged over a broad incident-projectile energy spectrum may be entered into EXFOR using the proper modifier to REACTION SF8⁴. **The type of spectrum and its characteristic should be entered in free text under the information-identifier keyword INC-SPECT.**

The following spectrum types are defined:

1. **Maxwellian Average:** Modifier MXW
The spectrum temperature should be given, if known. For thermal Maxwellian spectrum averaged data, see [Thermal Neutron Energies](#).
2. **Epithermal Spectrum Average:** Modifier EPI
The energy quoted will be, typically the low energy cutoff.
3. **Fission-Neutron Spectrum Average:** Modifier FIS
For details, see [Fission-Neutron Spectra](#).
4. **Fast Reactor Spectrum Average:** Modifier FST
5. **Bremsstrahlung Spectrum Average:** Modifier BRA
The energy quoted will be, typically, EN-MAX, or EN-MIN with EN-MAX.
6. **Average over “good resolution” Bremsstrahlung Spectrum:** Modifier BRS
The energy quoted will be, typically, EN with EN-RSL.
7. **Spectrum Average (unspecified Spectrum):** Modifier SPA
Used for all other spectra, *e.g.*, thermal reactor spectra. Care should be taken to compile only those data that would be of value to the user of EXFOR.

EXFOR:

Chapter 7

INFORMATION-IDENTIFIER KEYWORDS AND CODING RULES

INC-SPECT. Provides information on the characteristics and resolution of the incident-projectile beam. See also **LEXFOR**, [Incident-Projectile Energy](#).

1. Must be present when a spectrum average modifier (*e.g.*, MXW, SPA, or FIS) is present in REACTION SF8. See also **LEXFOR**, [Spectrum Average](#). Otherwise its use is optional. No coded information.

...

1. How can we find Entry with a spectrum presentation?

<https://www-nds.iaea.org/exfor/exfor.htm>

Experimental Nuclear Reaction Data (EXFOR)

Database Version of August 20, 2014

Software Version of 2014.07.09

Request Examples: 1|2|3|4|5|6|7|... ▾

Submit Reset Help

Target »

Reaction »

Quantity CS »

Product »

Energy from to eV ▾ »

Author(s) »

Publication year 2000-2014 »

Accession # »

Extended
Keywords 1

DETECTOR »

METHOD »

MONITOR »

FACILITY »

INC-SOURCE REAC »

ANALYSIS »

Options

Exclude superseded data

No reaction combinations (ratios,...)

Enhanced search of Products

Retrieve listing only

Disable Prompt-Help

Sort by: reaction publication

View: basic extended

Ranges (Z,A)

Reaction Sub-Fields 1

SF1 » Target

SF2 » Incident Particle

SF3 » Product Particle/Process

SF4 » Product

SF5 » Branch

SF6 » Parameters

SF7 » Particles Considered

SF8 SPA » Modifiers

n	Acc#	1st Author	Year	Reference
1)	22815	[5] 2002 R.Reifarth+	[pdf]	J, PR/C, 66, (5), 054605, 200211 Jour. Physical Review, Part C, Nuclear Physics, Vol.66, Issue.5, p.054605 (2002)
Neutron activation measurements on natural tellurium				
<input type="checkbox"/>	1	22815002	Info X4 X4+ T4	Pt:1 2.20e-2 i p 52-TE-126 (N, G) 52-TE-127-M/T, , SIG/RAT, , SPA
<input type="checkbox"/>	2	22815003	Info X4 X4+ T4	Pt:1 2.20e-2 i p 52-TE-128 (N, G) 52-TE-129-M/T, , SIG/RAT, , SPA
<input type="checkbox"/>	3	22815004	Info X4 X4+ T4	Pt:1 2.20e-2 i p 52-TE-130 (N, G) 52-TE-131-M/T, , SIG/RAT, , SPA
2)	22846	[6] 2004 N.Patronis+	[pdf]	J, PR/C, 69, 025803, 200402 Jour. Physical Review, Part C, Nuclear Physics, Vol.69, p.025803 (2004)
Neutron capture studies on unstable ¹³⁵ Cs for nucleosynthesis and transmutation				
...				
13)	33039	[1] 2012 B.S.Shivashankar+[pdf]	J, JRN, 292, 745, 2012	Jour. Journal of Radioanalytical and Nuclear Chemistry, Vol.292, p.745 (2012)
Measurement of reaction cross-sections for ⁶⁴ Ni(n, γ) ⁶⁵ Ni at E _n = 0.025 eV and ⁵⁸ Ni(n, p) ⁵⁸ Co at E _n = 3.7 MeV				
<input type="checkbox"/>	45	33039002	Info X4 X4+ T4	Pt:1 2.53e-2 i p 28-NI-64 (N, G) 28-NI-65, , SIG, , SPA
14)	41569	[1] 2012 R.A.Kuznetsov+	J, R&K, 54, (4), 352, 2012	Jour. Radiokhimiya, Vol.54, Issue.4, p.352 (2012)
Yields of activation products in Ra-226 irradiation in the high-flux SM reactor.				
<input type="checkbox"/>	46	41569002	Info X4 X4+ T4	Pt:1 4.93e2 i p 88-RA-226 (N, G) 88-RA-227, , SIG, , SPA

14 Entries. Only two entries (31733 and 23075) have spectrum presentation.

Without Publication year Results: Entries: 114

Request Examples: [1](#)[2](#)[3](#)[4](#)[5](#)[6](#)[7](#)...

Submit Reset Help

Target »

Reaction »

Quantity CS »

Product »

Energy from to eV »

Author(s) »

Publication year 2000-2014 »

Accession # »

Extended
Keywords ¹

DETECTOR »

METHOD »

MONITOR »

FACILITY »

INC-SOURCE AM-BE »

ANALYSIS »

Options

Exclude superseded data

No reaction combinations (ratios,...)

Enhanced search of Products

Retrieve listing only

Disable Prompt-Help

Sort by: reaction publication

View: basic extended

Ranges (Z,A)

Reaction Sub-Fields ¹

SF1 » Target

SF2 » Incident Particle

SF3 » Product Particle/Process

SF4 » Product

SF5 » Branch

SF6 » Parameters

SF7 » Particles Considered

SF8 SPA » Modifiers

n	Acc#	1st Author	Year	Reference
1)	22853	[3] 2004 Y. Agus+		[pdf] J, RCA, 92, 63, 2004 Jour: Radiochimica Acta, Vol.92, p.63 (2004)
Measurement of cross sections of threshold detectors with spectrum average technique				
<input type="checkbox"/>	1	22853002	Info X4 X4+ T4	Pt:1 4.83e6 i p 45-RH-103 (N, INL) 45-RH-103-M, , SIG, , SPA
<input type="checkbox"/>	2	22853003	Info X4 X4+ T4	Pt:1 4.97e6 i p 49-IN-115 (N, INL) 49-IN-115-M, , SIG, , SPA
<input type="checkbox"/>	3	22853004	Info X4 X4+ T4	Pt:1 5.02e6 i p 90-TH-232 (N, F) , , SIG, , SPA
<input type="checkbox"/>	4	22853005	Info X4 X4+ T4	Pt:1 5.23e6 i p 22-TI-47 (N, P) 21-SC-47, , SIG, , SPA

...

n	Acc#	1st Author	Year	Reference
3)	31724	[1] 2013 S.M. Qaim+		[pdf] J, RCA, 101, 205, 2013 Jour: Radiochimica Acta, Vol.101, p.205 (2013)
Cross section measurements of a few threshold reactions induced by fast neutrons from an Am/Be source: integral tests of differential neutron reaction cross section data				
<input type="checkbox"/>	18	31724002	Info X4 X4+ T4	Pt:1 4.50e6 i p 12-MG-24 (N, P) 11-NA-24, , SIG, , SPA
<input type="checkbox"/>	19	31724003	Info X4 X4+ T4	Pt:1 4.50e6 i p 13-AL-27 (N, P) 12-MG-27, , SIG, , SPA
<input type="checkbox"/>	20	31724004	Info X4 X4+ T4	Pt:1 4.50e6 i p 13-AL-27 (N, A) 11-NA-24, , SIG, , SPA
<input type="checkbox"/>	21	31724005	Info X4 X4+ T4	Pt:1 4.50e6 i p 42-MO-92 (N, P) 41-NB-92-M, , SIG, , SPA
<input type="checkbox"/>	22	31724006	Info X4 X4+ T4	Pt:1 4.50e6 i p 42-MO-95 (N, P) 41-NB-95, , SIG, , SPA
<input type="checkbox"/>	23	31724007	Info X4 X4+ T4	Pt:1 4.50e6 i p 42-MO-98 (N, A) 40-ZR-95, , SIG, , SPA
<input type="checkbox"/>	24	31724008	Info X4 X4+ T4	Pt:1 4.50e6 i p 45-RH-103 (N, P) 44-RU-103, , SIG, , SPA

3 Entries. One entry (31724) has spectrum presentation.

Without Publication year Results: Entries: 4

Request Examples: [1](#)[2](#)[3](#)[4](#)[5](#)[6](#)[7](#)...

Submit Reset Help

Target

Reaction

Quantity CS

Product

Energy from to eV

Author(s)

Publication year 2000-2014

Accession #

Extended Keywords

DETECTOR

METHOD

MONITOR

FACILITY

INC-SOURCE P-Li7

ANALYSIS

Options

Exclude superseded data

No reaction combinations (ratios,...)

Enhanced search of Products

Retrieve listing only

Disable Prompt-Help

Sort by: reaction publication

View: basic extended

Ranges (Z,A)

Reaction Sub-Fields

SF1 Target

SF2 Incident Particle

SF3 Product Particle/Process

SF4 Product

SF5 Branch

SF6 Parameters

SF7 Particles Considered

SF8 SPA Modifiers

n	Acc#	1st Author	Year	Reference	Jour.
1)	22648	A.K.M.Harun-Ar-Rashid+	2000	pdf J,NST,37,(5),421,200005	Jour. of Nuclear Science and Technology
				Measurement of keV-Neutron Capture Cross Sections and Capture Gamma-Ray Spectra of ¹⁶⁷ Er	
	1 22648002	Info X4 X4+ T4	Pt:5	2.20e4 5.46e5	i p 68-ER-167 (N,G) 68-ER-168,,SIG,,SPA
2)	22652	G.N.Kim+	2001	[pdf] J,ANE,28,1549,2001	Jour. Annals of Nuclear Energy, Vol.28, p.1549 (2001)
...					
23)	33033	H.Naik+	2011	[pdf] J,EPJ/A,47,51,2011	Jour. European Physical Journal A: Hadrons and Nuclei, Vol.47, p.51 (2011)
				Measurement of the neutron capture cross-section of ²³² Th using the neutron activation technique	
	77 33033002	Info X4 X4+ T4	Pt:2	3.70e6 9.85e6	i p 90-TH-232 (N,G) 90-TH-233,,SIG,,SPA
24)	33040	P.M.Prajapati+	2012	[pdf] J,EPJ/A,48,35,2012	Jour. European Physical Journal A: Hadrons and Nuclei, Vol.48, p.35 (2012)
				Measurement of the neutron capture cross-sections of ²³² Th at 5.9 MeV and 15.5 MeV	
	78 33040002	Info X4 X4+ T4	Pt:2	5.90e6 1.55e7	i p 90-TH-232 (N,G) 90-TH-233,,SIG,,SPA
	79 33040004	Info X4 X4+ T4	Pt:1	1.55e7	i p 90-TH-232 (N,2N) 90-TH-231,,SIG,,SPA

24 Entries. One entry (22850) has spectrum presentation.
 Without Publication year Results: Entries: 42

**So, spectrum retrieval is not easy.
 It takes a lot of time.**

2. Can we plot this spectrum using

Plot: Quick plot Advanced plot ?

No, we can not plot.

If for spectrum presentation

we use REACTION with

SF6 DE

we **can plot** this spectrum.

For example:

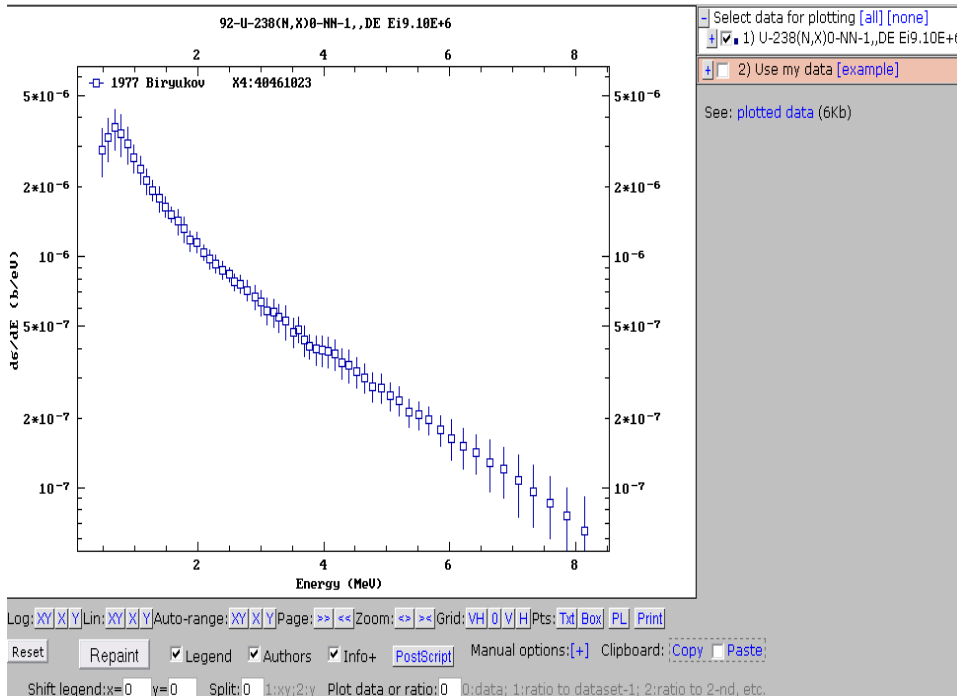
Plot: Quick-plot (cross-sections only) Advanced plot [how-to] using C5 and converting ratios to cross sections using [IAEA-standard]

Narrow incident energy (optional), eV: Min: Max:

Apply Data re-normalization (for advanced users, results in: C4, TAB and Plots)

n	Display	Year	Author-1	Energy range, eV	Points	Reference	Subentry#P	NSR-Key
1)			92-U-238(N,X)0-NN-1,,DE	C4: MF5 MT9000				
Quantity: [DE] Energy spectrum of outgoing particles								
1	<input type="checkbox"/>		2009 N.S.Biryukov+	9.10e6	60		40461023 [p]	E2=5e5.8.1e6

REACTION (92-U-238(N,X)0-NN-1,,DE)



NB! ... , , DE , , REL and ... , , DE , , SPA/REL

Sorry, "Advanced plotting" was not successful...

Possible reasons:

- plotting of the given data type is **not yet implemented**

3. Often this free text is too long.

The type of spectrum and its characteristic should be entered **in free text** under the information-identifier keyword **INC-SPECT**.

For example,

in Subentry 22850001 it has 699 lines (from 769 lines);

in Subentry 23075001 it has 230 lines (from 326 lines).

If information about calculated and experimental spectra are available (e.g., for average cross sections measured by proton recoil counters using the NFBT), length of the text can be up to thousands of lines.

If several spectra are in this free text it is very difficult to find where is the end or the start of these spectra.

It is not convenient.

Proposal for the source spectral information storage in EXFOR

New for EXFOR, the same in  INDC(NDS)-0590

Type of spectrum and its characteristic should be entered **in numeric data type** using separate SUBENTRY or ENTRY for neutron spectrum if the spectrum is commonly applied to measurements performed at the neutron source.

2.1 Use special form of **REACTION** to define the neutron source (see table below) with the proper modifier **SPD** to REACTION **SF8**.

2.2 Use **DATA** to enter **the numerical spectral data**.

2.3 **Data, that are averaged over broad incident-projectile energy spectrum** and entered into the EXFOR system, should be labelled by the keyword **INC-SOURCE** with use of all relevant keywords from the Inc-Source Dictionary (#19) and **the cross-reference** to the EXFOR entry/subentry with **these numerical spectral data**.

2.4 This cross-reference must be coded as an eight-digit integer.

Now

LEXOR:

Spectrum Average

Cross sections averaged over a broad incident-projectile energy spectrum may be entered into EXFOR using the proper modifier to REACTION SF8⁴. The type of spectrum and its characteristic should be entered **in free text** under the information-identifier keyword INC-SPECT or

in numeric data type using separate special SUBENTRY or ENTRY.

Data, that are averaged over broad incident-projectile energy spectrum and entered into the EXFOR system, should be labelled with the code DEP under the keyword STATUS, if spectrum is entered into the EXFOR system **in numeric data type**.

In these special SUBENTRY/ ENTRY

1) use special form of **REACTION** to define the neutron source (see table below) with the proper modifier **SPD** to REACTION **SF8**;

2) use **DATA** to enter **the numerical spectral data**;

Dependent Data

Data that are deduced by a trivial operation from other data sets entered into the EXFOR System or data, that are averaged over broad incident-projectile energy spectrum entered into the EXFOR system in numeric data type (using special SUBENTRY/ENTRY) should be labeled with the code DEP under the keyword STATUS. Free text under STATUS and/or ANALYSIS should give information as to how the data were deduced. Cross-reference to the EXFOR entries from which the data were deduced or to the EXFOR entries with spectrum in numeric data type must be coded as an eight-digit integer following the code.

We leave Exfor rule for INC-SPECT and INC-SOURCE (no changes)

The special form of REACTION to define the neutron source

REACTION: It is a reaction by which neutrons appear.

SF1 – target, SF2 – incident particle (SF2=0 for spontaneous fission),

SF3 – outgoing particle/product X (SF3=F for spontaneous fission),

SF4 – outgoing neutron 0-NN-1,

SF5 – empty,

SF6 – Differential with energy of outgoing particle (neutron),

SF7 – empty,

SF8 – SF8=SPD – SPECTRUM Description, SPD/REL Relative data (ARB-UNITS)

SF9 – CALC/EXP Calculated/Experimental data

Spont. Fission FIS (not SPA)

Name of neutron source	In INC-SPECT	SF1-SF8 in REACTION in SubEntry with SF8= SPD
Alpha-Beryllium	A-BE	4-BE-9(A,X)0-NN-1,, DE,,SPD
Americium-Beryllium ns	AM-BE	4-BE-9(A,X)0-NN-1,, DE,,SPD ?
Spont.fission of Californium-252	CF252	98-CF-252(0,F)0-NN-1,, DE,,SPD
Spont. fission of Curium-244	CM244	96-CM-244(0,F) 0-NN-1,, DE,,SPD
Spont. fission of Curium-246	CM246	96-CM-246(0,F) 0-NN-1,, DE,,SPD
Spont. fission of Curium-248	CM248	96-CM-248(0,F) 0-NN-1,, DE,,SPD
Deuteron-Beryllium	D-BE	4-BE-9(D,X)0-NN-1,, DE,,SPD
Deuteron-Carbon 12	D-C12	6-C-12(D,X) 0-NN-1,, DE,,SPD
Deuteron-Carbon 14	D-C14	6-C-14(D,X) 0-NN-1,, DE,,SPD
Deuteron-Deuterium	D-D	1-H-2(D,X) 0-NN-1,, DE,,SPD
Deuteron-Lithium	D-LI	3-LI-0(D,X) 0-NN-1,, DE,,SPD
Deuteron-Lithium 7	D-LI7	3-LI-7(D,X) 0-NN-1,, DE,,SPD
Deuteron-Nitrogen 14	D-N14	7-N-14(D,X) 0-NN-1,, DE,,SPD
Deuteron-Nitrogen 15	D-N15	7-N-15(D,X) 0-NN-1,, DE,,SPD
Deuteron-Tritium	D-T	1-H-3(D,X) 0-NN-1,, DE,,SPD
Evaporation neutrons	EVAP	13-AI-0(P,X) 0-NN-1,, DE,,SPD 74-W-0(P,X) 0-NN-1,, DE,,SPD 82-Pb-0(P,X) 0-NN-1,, DE,,SPD 92-U-0(D,X) 0-NN-1,, DE,,SPD ...
Nuclear explosive device	EXPLO	Entries with SPA are absent in EXFOR. Time-of-flight method was used
Proton-Beryllium	P-BE	4-BE-9(P, X) 0-NN-1,, DE,,SPD
Proton-Deuterium	P-D	1-H-2(P, X) 0-NN-1,, DE,,SPD
Photo-neutron	PHOTO	1-H-2(G,X) 0-NN-1,, DE,,SPD 13-AI-0(G,X) 0-NN-1,, DE,,SPD 92-U-0(G,X) 0-NN-1,, DE,,SPD ...
Proton-Lithium 7	P-LI7	3-LI-7(P,X) 0-NN-1,, DE,,SPD
Polarized neutron source	POLNS	Entries with SPA are absent in EXFOR.
Proton-Tritium	P-T	1-H-3(P,X) 0-NN-1,, DE,,SPD
Plutonium-Beryllium ns	AM-BE	4-BE-9(A,X) 0-NN-1,, DE,,SPD ?
Spont. fission of Plutonium-240	PU240	94-PU-240(0,F) 0-NN-1,, DE,,SPD
Spont. fission of Plutonium-242	PU242	94-PU-242(0,F) 0-NN-1,, DE,,SPD
Reactor	REAC	92-U-235(N,X) 0-NN-1,, DE,,SPD or 92-U-0(N,X) 0-NN-1,, DE,,SPD
Thermal column	THCOL	92-U-235(N,X) 0-NN-1,, DE,,SPD
Thorium-Beryllium ns	TH-BE	4-BE-9(A,X) 0-NN-1,, DE,,SPD ?

ENTRY	32238	20140507	32238	0	1
SUBENT	32238001	20140507	32238	1	1
BIB	12	35	32238	1	2
INSTITUTE	(4UKRIJD,4UKRUKR)4UKRUKR - State Scientific-Engineering		32238	1	3
	Center for Control and Emergency Response, Kyiv		32238	1	4
REFERENCE	(C,2012KYIV,,430,2013)		32238	1	5 Include!
	#NSR 2013GRZY		32238	1	6
AUTHOR	(O.O.Gritzay, A.K.Grymalo, V.V.Koloty, V.A.Pshenychnyi, V.P.Shakhov, V.M.Venedyktov)		32238	1	7
			32238	1	8
TITLE	Determination of total neutron cross section of 52Cr		32238	1	9
	with using average energy shift method for filtered		32238	1	10
	neutron beam		32238	1	11
FACILITY	(REAC,4UKRIJD) Reactor WWR-M		32238	1	12
INC-SOURCE	(REAC) Neutron filter installed in horizontal channel		32238	1	13
	of the reactor. Filter components: S-116.53 g/cm2,		32238	1	14
	58Ni-81.42g/cm2,V-24.44g/cm2,Al-5.4g/cm2,10B-0.5g/cm2.		32238	1	15
	The calculated energy and width of the neutron line		32238	1	16
	(95% response function) after this filter are:		32238	1	17
	59 (+1.2, -6.7) keV.		32238	1	18
	Calculated and experimental spectra after this filter		32238	1	19
	are presented in 32238002 and 32238003.		32238	1	20
INC-SPECT	The initial neutron line with the average energy 59 keV		32238	1	21
	produces at the scattering angles 15, 20 and 25 ADEG		32238	1	22
	the scattered neutron lines with the average energies		32238	1	23
	55, 52, 48.4 keV and 58.6, 58.3, 58 keV if neutrons		32238	1	24
	are scattered by hydrogen and carbon, respectively.		32238	1	25
	Thickness of the used scattering-samples C and CH2 was		32238	1	26
	10.02+-0.01 and 4.52+-0.01 mm.		32238	1	27
METHOD	(FNB,TRN) Transmission measurement of the scattered		32238	1	28
	filtered neutrons.		32238	1	29
DETECTOR	(PROPC) The proton recoil detector LND-281 (gas filling		32238	1	30
	H+CH4+N2, diameter-38.1 mm, length-254.0 mm,		32238	1	31
	gas pressure-3240 torr)		32238	1	32
SAMPLE	52Cr sample was made of a metal powder, loaded into		32238	1	33
	aluminum container. A thickness of the 52Cr sample was		32238	1	34
	0.0173+-0.0002 nucl/barn.		32238	1	35
STATUS	(TABLE) From text		32238	1	36
HISTORY	(20140425) UKRNDC		32238	1	37
ENDBIB	35	0	32238	1	38
NOCOMMON	0	0	32238	1	39
ENDSUBENT	38	0	32238	199999	
SUBENT	32238002	20140507	32238	2	1
BIB	1	8	32238	2	2
REACTION	(92-U-235(N,X)0-NN-1,,DE,,SPA/REL,CALC)		32238	2	3
	Calculated was done by FILTER-7 using JENDL-3.3		32238	2	4
	(58Ni-81.42 g/cm2, 10B-0.5 g/cm2, 11B-0.088 g/cm2,		32238	2	5
	27Al-5.4 g/cm2, Vnat-24.44 g/cm2),		32238	2	6
	CENDL-2(Snat-116.53 g/cm2). Calculated energy line is		32238	2	7
	58.98 keV, purity about 95%. The limits of 95% response		32238	2	8
	function for the 59 keV filter spectrum were defined as		32238	2	9
	52.111 to 60.319 keV.		32238	2	10
ENDBIB	8	0	32238	2	11
COMMON	2	3	32238	2	12
EN-MIN	EN-MAX		32238	2	13
EV	MEV		32238	2	14
1.e-5	20.		32238	2	15
ENDCOMMON	3	0	32238	2	16
DATA	2	1201	32238	2	17
E	DATA		32238	2	18
KEV	ARB-UNITS		32238	2	19
	40.5499	.318100E-01	32238	2	20
	40.6795	.370900E-01	32238	2	21
...					
	61.5046	.689100E-01	32238	2	1219
	61.5322	.474500E-01	32238	2	1220
ENDDATA	1203	0	32238	2	1221
ENDSUBENT	1220	0	32238	299999	

SUBENT	32238003	20140507	32238	3	1
BIB	1	1	32238	3	2
REACTION	(92-U-235 (N,X) 0-NN-1, ,DE, ,SPA/REL,EXP)		32238	3	3
ENDBIB	1	0	32238	3	4
COMMON	2	3	32238	3	5
EN-MIN	EN-MAX		32238	3	6
EV	MEV		32238	3	7
1.e-5	20.		32238	3	8
ENDCOMMON	3	0	32238	3	9
DATA	3	240	32238	3	10
E	DATA	DATA-ERR	32238	3	11
KEV	NO-DIM	NO-DIM	32238	3	12
39.9696	2.8626	0.0320	32238	3	13
40.0953	2.7958	0.0301	32238	3	14
...					
69.8826	1.0589	0.1184	32238	3	251
70.0083	0.9470	0.0985	32238	3	252
ENDDATA	242	0	32238	3	253
ENDSUBENT	252	0	32238	399999	
SUBENT	32238004	20140507	32238	4	1
BIB	5	24	32238	4	2
REACTION	(24-CR-52 (N,TOT) , ,SIG, ,SPA)		32238	4	3
INC-SOURCE	(REAC)		32238	4	4
STATUS	(DEP,32238002) Calculated neutron spectrum after filter		32238	4	5
	(DEP,32238003) Experimental neutron spectrum		32238	4	6
	after filter		32238	4	7
	(DEP,32238005) Scattered neutron spectrum at the angle		32238	4	8
	15 ADEG (55 keV) calculated by the MCNP 4C code		32238	4	9
	(DEP,32238006) Scattered neutron spectrum at the angle		32238	4	10
	20 ADEG (52 keV) calculated by the MCNP 4C code		32238	4	11
	(DEP,32238007) Scattered neutron spectrum at the angle		32238	4	12
	25 ADEG (48.8 keV) calculated by the MCNP 4C code		32238	4	13
COMMENT	Correction connected with existence in the neutron		32238	4	14
	scattered spectrum on CH2 neutrons scattered on carbon		32238	4	15
	was done. A correction on the self-shielded effect was		32238	4	16
	not be done for the measured values of the total cross		32238	4	17
	sections of 52Cr. The rough estimation, done by the		32238	4	18
	MCNP 4C code calculations, shown that the difference		32238	4	19
	between the total cross sections at these energies and		32238	4	20
	the observed self-shielded cross sections may rich 2-6%		32238	4	21
ERR-ANALYS	Total error includes:		32238	4	22
	statistical error of the transmission measurements;		32238	4	23
	measurement errors of dimension and weight of the		32238	4	24
	sample; error due to presence of impurities in the		32238	4	25
	sample.		32238	4	26
ENDBIB	24	0	32238	4	27
NOCOMMON	0	0	32238	4	28
DATA	3	3	32238	4	29
EN	DATA	ERR-T	32238	4	30
KEV	B	B	32238	4	31
48.8	5.94	0.49	32238	4	32
52.	18.29	0.89	32238	4	33
55.	9.27	0.51	32238	4	34
ENDDATA	5	0	32238	4	35
ENDSUBENT	34	0	32238	499999	
SUBENT	32238005	20140507	32238	5	1
BIB	1	3	32238	5	2
REACTION	(92-U-235 (N,X) 0-NN-1, ,DE, ,SPA/REL,CALC)		32238	5	3
	Scattered neutron spectrum at the angle		32238	5	4
	15 ADEG (55 keV) calculated by the MCNP 4C code		32238	5	5
ENDBIB	3	0	32238	5	6
COMMON	2	3	32238	5	7
EN-MIN	EN-MAX		32238	5	8
EV	MEV		32238	5	9
1.e-5	20.		32238	5	10
ENDCOMMON	3	0	32238	5	11
DATA	2	248	32238	5	12
E	DATA		32238	5	13
KEV	ARB-UNITS		32238	5	14
40.006	0.108		32238	5	15

<-SPD

```

40.087    0.095                                32238  5  16
...
59.969    0.065                                32238  5  261
60.050    0.063                                32238  5  262
ENDDATA                250                0                32238  5  263
ENDSUBENT              262                0                32238 599999
SUBENT                32238006    20140507                32238  6  1
BIB                    1                3                32238  6  2
REACTION    (92-U-235(N,X)0-NN-1,,DE,,SPA/REL,CALC)        32238  6  3 <-SPD
                Scattered neutron spectrum at the angle        32238  6  4
                20 ADEG (52 keV) calculated by the MCNP 4C code 32238  6  5
ENDBIB                3                0                32238  6  6
COMMON                2                3                32238  6  7
EN-MIN    EN-MAX                32238  6  8
EV        MEV                32238  6  9
1.e-5    20.                32238  6  10
ENDCOMMON              3                0                32238  6  11
DATA                2                248                32238  6  12
E        DATA                32238  6  13
KEV      ARB-UNITS            32238  6  14
40.006    0.116                32238  6  15
40.087    0.156                32238  6  16
...
59.969    0.038                                32238  6  261
60.050    0.010                                32238  6  262
ENDDATA                250                0                32238  6  263
ENDSUBENT              262                0                32238 699999
SUBENT                32238007    20140507                32238  7  1
BIB                    1                3                32238  7  2
REACTION    (92-U-235(N,X)0-NN-1,,DE,,SPA/REL,CALC)        32238  7  3 <-SPD
                Scattered neutron spectrum at the angle        32238  7  4
                25 ADEG (48.8 keV) calculated by the MCNP 4C code 32238  7  5
ENDBIB                3                0                32238  7  6
COMMON                2                3                32238  7  7
EN-MIN    EN-MAX                32238  7  8
EV        MEV                32238  7  9
1.e-5    20.                32238  7  10
ENDCOMMON              3                0                32238  7  11
DATA                2                309                32238  7  12
E        DATA                32238  7  13
EV        ARB-UNITS            32238  7  14
35.056    0.110                32238  7  15
35.137    0.115                32238  7  16
...
59.969    0.031                                32238  7  322
60.050    0.014                                32238  7  323
ENDDATA                311                0                32238  7  324
ENDSUBENT              323                0                32238 799999
ENDENTRY               7                0                32238999999999

```

ZCHEX (Version 2012-03-21) run on 01-Oct-2014

Input file: E:\!!!!!!AfterMay2014\EXFOREditor\After_May2014\32238s.EXF

ENTRY 32238

First pass completed with no fatal errors

1

- Second pass checking -

ENTRY 32238

** Illegal code field

32238001

REFERENCE (C,2012KYIV,,430,2013)

32238001

5

^^^^^^^^

Statistics			
ERRORS: 0		WARNINGS: 1	
Error Type	SUBENTRY	Error Message	Line
WARNING	32238001	[REFERENCE]: Bad Conference reference coding, unknown Conference code	8