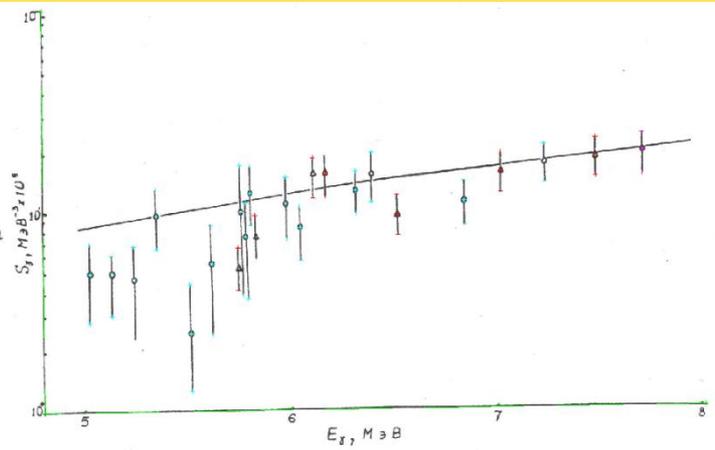
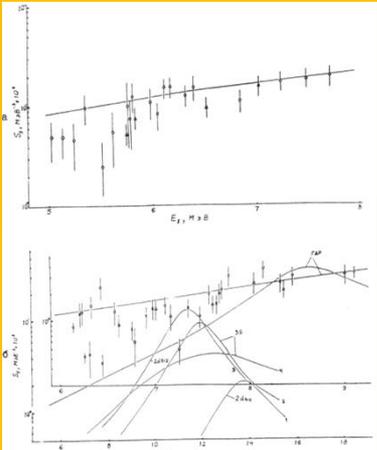


# OPTIMIZATION OF NUMERIC DATA PROCESSING BY THE INPGRAPH 3.4

**MAY 01 – 04, 2018, Technical Meeting of NRDC,  
GCNEP, Bahadurgarh, Haryana, India,**

G. Pikulina, S.Taova

CNPD, Russian Federal Nuclear Center – VNIIEF,  
Sarov, Russia



We often get data from old articles where the results are shown only as charts and table data are absent. The only way to get numeric data in this case is to digitize graphics.

CNPD have worked out a special program InpGraph to digitize data of scanned images or images obtained from PDF-files. This program is available for using by all data centers.

Browser address bar: [https://www-nds.iaea.org/nrdc/nrdc\\_sft/](https://www-nds.iaea.org/nrdc/nrdc_sft/)

International Atomic Energy Agency  
**Nuclear Data Services**  
 Sección Datos Nucleares, OIEA

IAEA.org | NDS Mission | About Us | Mirrors: India | China | Russia

**NRDC Software**  
 Checking code, digitizers, editors etc.

**Current version - Windows**

Software	Centre	Size (kb)	Registered	Contacts
EXFOR Digitizer ver.3.3	CNPD	10867	2016-10-24	taova@expd.vniief.ru
EXFOR Editor ver.3.2	CNPD	113322	2017-12-12	taova@expd.vniief.ru
GDGraph Ver.5.1	CNDC	6316	2016-10-28	cgc@ciae.ac.cn
GSYS ver.2.4.7	JCPRG	-	2014-09-30	gsys@jcprg.org
JANIS TRANS Checker	NEA DB	-	2017-04-28	janisinfo@oecd-nea.org
danlo	NDS	165	-	v.zerkin@iaea.org
xtract ver.2000-1	NDS	165	2007-10-02	v.zerkin@iaea.org

**Documents**

- Network Document
- EXFOR Basics (pdf)
- EXFOR Basics (html)
- EXFOR Formats
- LEXFOR
- Protocol
- Dictionary
- Marina's Short Guide
- CINDA2001
- ENDF-6 Formats
- Reports to ND Conf.
- More Documents

**Codes**

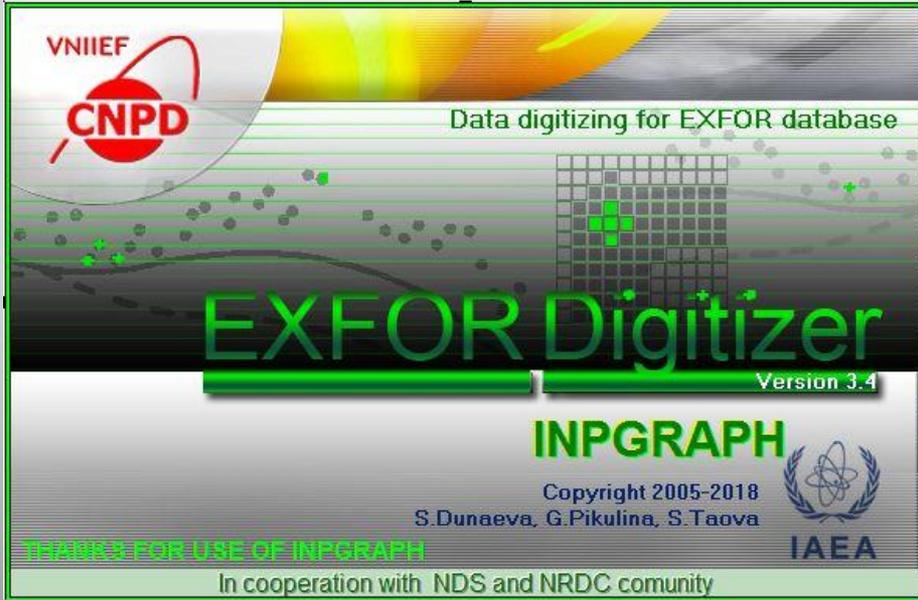
- Codes
- Comments on ZCHEX

A92	CNPD	(Continuing Action) Continue development and testing of the EXFOR-Editor and InpGraph in cooperation with NDS and other data Centres, taking into account compilers' remarks.
A94	Zerkin Pikulina Chen JCPRG	Study problems in 2D calibration of original pictures, and process of approval of results of digitizing using plotting facilities.

CORRECTION OF BUGS



IMPLEMENTAION OF MODIFICATIONS



We keep developing and improving our digitizer according to the actions A92 and A94 and taking into account the users' feedbacks. Now we have issued the new release – number 3.4.

## GUIDELINE FOR EXPRESSION OF DIGITIZED DATA IN EXFOR

1. Keep consistency for the number of digits between the digitized values and uncertainties.
2. Use the fixed and floating decimal point expression for the numbers digitized from linear and logarithmic scale, respectively.
3. Digitization accuracy may be given in the absolute unit or relative unit for the numbers digitized from linear and logarithmic scale, respectively.
4. Consider rounding of digitized values to integers if values are for atomic numbers, mass numbers etc., and digitized values are close to integers.



**IAEA**

International Atomic Energy Agency

INDC(NDS)-0629  
Distr. G+NC

### INDC International Nuclear Data Committee

Summary Report of the Consultants' Meeting on  
**Benchmarking of Digitization Software**

IAEA Headquarters, Vienna, Austria

12 – 14 November 2012

Press to open DataTable Mode

Press to edit COMMON Section

Processing Result

Everything is OK!

Diagnostic Message

```

file name:
E
ANG
      1   1.500000   1.700000
      1.900000   2.100000
      2.300000   2.500000
ipr_xlin=      1 ipr_ylin=
0
      195.0000   900.0000
195.0000   746.0000   195.0000
      859.0000   195.0000
774.0000
      195.0000   900.0000
          
```

Quantization Errors

Axis Name	Error Value
X Axis 1	0.0007 MEV
Y Axis 1	0.0012 NO-DIM
Y Axis 2	0.0023 NO-DIM
Y Axis 3	0.0024 NO-DIM
Y Axis 4	0.0023 NO-DIM

EXFOR File

DATA
COMMON (SUBENT 2)

```

COMMON      2      3
EN-ERR-DIG ERR-DIG
MEV      NO-DIM
0.58364E-030.13598E-02
ENDCOMMON
DATA      5      138
E      ANG      EN      DATA      DATA-ERR
MEV      ADEG      MEV      NO-DIM      NO-DIM
0.75000   150.00   1.8228   0.10631   0.30588E-01
0.75000   150.00   1.8498   0.95479E-010.27052E-01
0.75000   150.00   1.8754   0.10349   0.28235E-01
0.75000   150.00   1.8981   0.12681   0.25889E-01
0.75000   150.00   1.9244   0.13952   0.29405E-01
0.75000   150.00   1.9493   0.16635   0.28255E-01
0.75000   150.00   1.9763   0.18258   0.30588E-01
0.75000   150.00   1.9997   0.20708   0.27046E-01
0.75000   150.00   2.0224   0.21276   0.28242E-01
0.75000   150.00   2.0486   0.20429   0.29405E-01
0.75000   150.00   2.0734   0.19348   0.25863E-01
0.75000   150.00   2.0983   0.22384   0.28216E-01
          
```

**Data Table** [Window Controls]

Selected Column: 1      Selected Row: 2

	E	ANG	EN	DATA	DATA-ERR
	MEV	ADEG	MEV	NO-DIM	NO-DIM
67	0.75000	30.000	2.4520	0.40544	0.55810E-01
68	0.75000	30.000	2.4753	0.40036	0.60461E-01
69	0.75000	30.000	2.5016	0.43709	0.51186E-01
70	0.0000	150.00	1.8250	0.91192E-01	0.58523E-01
71	0.0000	150.00	1.8526	0.66294E-01	0.53699E-01
72	0.0000	150.00	1.8775	0.82913E-01	0.65867E-01
73	0.0000	150.00	1.9016	0.10442	0.58563E-01
74	0.0000	150.00	1.9280	0.18199	0.58537E-01
75	0.0000	150.00	1.9551	0.26930	0.63428E-01
76	0.0000	150.00	1.9778	0.30791	0.58510E-01
77	0.0000	150.00	2.0019	0.36845	0.60989E-01
78	0.0000	150.00	2.0261	0.41191	0.56098E-01
79	0.0000	150.00	2.0502	0.43586	0.46355E-01
80	0.0000	150.00	2.0765	0.42806	0.58523E-01
81	0.0000	150.00	2.1021	0.52028	0.58537E-01
82	0.0000	150.00	2.1256	0.58326	0.53632E-01
83	0.0000	150.00	2.1498	0.66087	0.68333E-01
84	0.0000	150.00	2.1711	0.76049	0.60976E-01
85	0.0000	150.00	2.1999	0.96484	0.60962E-01
86	0.0000	150.00	2.2253	0.89852	0.68293E-01
87	0.0000	150.00	2.2514	0.80048	0.58537E-01
88	0.0000	150.00	2.2762	0.79515	0.63415E-01
89	0.0000	150.00	2.3025	0.84589	0.56151E-01

**DATA**

Import      Sort

Paste      Chart

Clear      Check

---

**Column**

Add      Insert

Copy      Delete

Rename

Move Left      Move Right

Calculations

Set Value

Set Precision

---

**Row**

Add      Insert

Copy      Delete

Move Up      Move Down

---

**Undo**

Undo Last Action

---

**Table**

Precision      Clear

Export      Check

Clear Check Results

---

Save      Cancel

The following corrections are needed:

- Trailing zeroes in the first two columns should be deleted
- Consistency for the number of digits between the digitized values and uncertainties should be kept
- Fixed point format should be used for the numbers because they were digitized from linear scale
- The numbers should be sorted

■ Select column and press the Set Precision button on the Column panel

**Column**

Add    Insert

Copy    Delete

Rename

Move Left    Move Right

Calculations

Set Value

**Set Precision**

**Precision for column DATA**

Number Format

Fixed Point Format

Scientific Format

**Fixed Point Format**

Number of Digits after Decimal Point:

5

Erase Trailing Zero

Example: 1.00001

OK

Cancel

■ Press the Sort button on the DATA panel and select independent variables for data table sorting

**DATA**

Import    **Sort**

Paste    Chart

Clear    Check

**Data Sort**

Choose Table Columns to Sort

Primary Sort Key

E

Secondary Sort Key

ANG

Last Sort Key

EN

OK

Cancel

**Data Table**

Selected Column: 5    Selected Row: 69

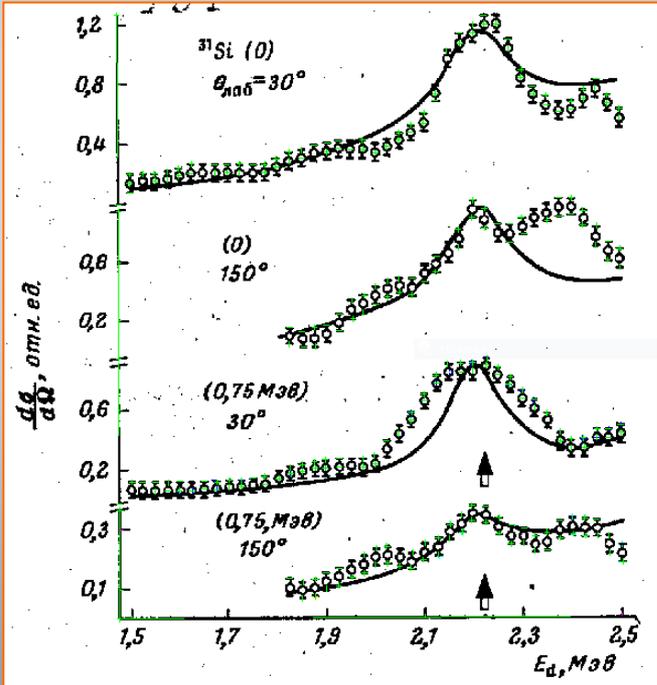
	E	ANG	EN	DATA	DATA-ERR
	MEV	ADEG	MEV	NO-DIM	NO-DIM
66	0.	150.	2.4252	0.89974	0.0488
67	0.	150.	2.4527	0.77728	0.0683
68	0.	150.	2.4766	0.66952	0.0634
69	0.	150.	2.5006	0.62030	0.0634
70	0.75	30.	1.5016	0.07865	0.0465
71	0.75	30.	1.5235	0.06430	0.0605
72	0.75	30.	1.5497	0.06382	0.0604
73	0.75	30.	1.5760	0.06799	0.0511
74	0.75	30.	1.5993	0.06756	0.0604
75	0.75	30.	1.6256	0.06708	0.0512
76	0.75	30.	1.6504	0.08058	0.0465
77	0.75	30.	1.6752	0.07082	0.0511
78	0.75	30.	1.7015	0.08895	0.0465
79	0.75	30.	1.7263	0.09314	0.0372
80	0.75	30.	1.7497	0.10202	0.0465
81	0.75	30.	1.7745	0.10622	0.0512
82	0.75	30.	1.8023	0.14291	0.0511
83	0.75	30.	1.8271	0.17502	0.0419
84	0.75	30.	1.8505	0.18854	0.0465
85	0.75	30.	1.8768	0.21132	0.0419
86	0.75	30.	1.8972	0.21094	0.0558
87	0.75	30.	1.9264	0.21971	0.0558
88	0.75	30.	1.9512	0.22856	0.0419

Press the Chart button on the DATA panel for additional control of digitized values

**DATA**

Import	Sort
Paste	<b>Chart</b>
Clear	Check

Column



**Data Chart**

Options | Chart

- E: 0.; ANG: 30.
- DATA-ERR(0.;30.)
- E: 0.; ANG: 150.
- DATA-ERR(0.;150.)
- E: 0.75; ANG: 30.
- DATA-ERR(0.75;30.)
- E: 0.75; ANG: 150.
- DATA-ERR(0.75;150.)

Statistic Information E: 0.75; ANG: 30.

First Point : 1.502, 0.079  
Last Point : 2.502, 0.437

Number of values: 41  
Maximum value: 0.889 at position 29  
Minimum value: 0.064 at position 2  
Range: 0.825

Scale

Marker Position  
Value X: 2.001  
Value Y: 0.628

Logarithmic Y Scale

Logarithmic X Scale

Show Value

Left Axis Type

Single Axis

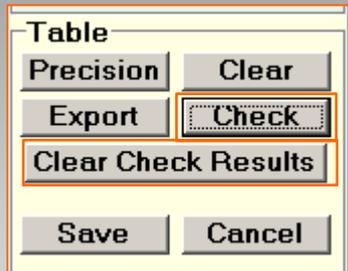
Multiple Axes

Print

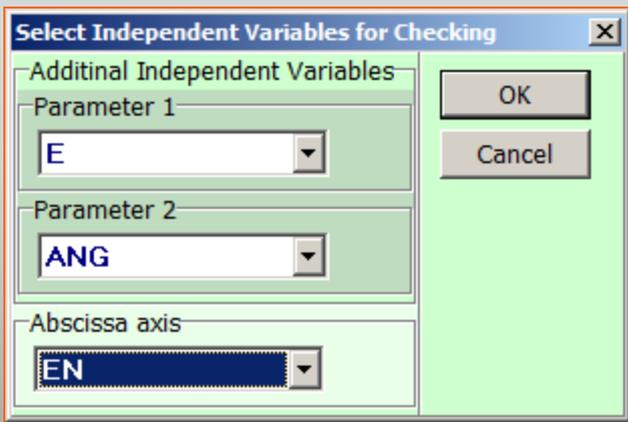
Change Axes Scale

Export

■ Press the Check button on the TABLE panel for equal independent variables checking



■ Select table columns to use as independent variables



■ Use the Clear Check Results button on the TABLE panel to erase the results of checking

Data Table						
Selected Column: 1			Selected Row: 19			
	E	ANG	EN	DATA	DATA-ERR	FLAG
	MEV	ADEG	MEV	NO-DIM	NO-DIM	NO-DIM
1	0.	30.	1.5007	0.1484	0.0605	
2	0.	30.	1.5299	0.1618	0.0512	
3	0.	30.	1.5532	0.1661	0.0465	
4	0.	30.	1.5780	0.1750	0.0512	
5	0.	30.	1.6014	0.1978	0.0512	
6	0.	30.	1.6248	0.2113	0.0651	
7	0.	30.	1.6496	0.2156	0.0512	1.
8	0.	30.	1.6496	0.2156	0.0512	1.
9	0.	30.	1.6758	0.2151	0.0558	
10	0.	30.	1.7007	0.2193	0.0512	
11	0.	30.	1.7254	0.2142	0.0605	
12	0.	30.	1.7532	0.2137	0.0558	
13	0.	30.	1.7765	0.2180	0.0512	
14	0.	30.	1.7999	0.2548	0.0512	2.
15	0.	30.	1.7999	0.2548	0.0512	2.
16	0.	30.	1.7999	0.2548	0.0512	2.
17	0.	30.	1.8262	0.2915	0.0605	
18	0.	30.	1.8525	0.3097	0.0558	
19	0.	30.	1.8774	0.3418	0.0558	
20	0.	30.	1.9037	0.3506	0.0604	
21	0.	30.	1.9271	0.3735	0.0512	
22	0.	30.	1.9518	0.3684	0.0512	

■ Press the Calculations button on the Column panel to convert uncertainties values in absolute units into relative units and vice versa.

**Column**

Add    Insert

Copy    Delete

Rename

Move Left    Move Right

**Calculations**

Set Value

Set Precision

DATA	DATA-ERR
MICRO-B	MICRO-B
1.4904E+01	7.0874E+00
3.2781E+01	8.9674E+00
2.5464E+01	9.443E+00
2.4665E+01	9.1472E+00
5.4255E+01	1.1305E+01
4.5362E+01	4.5021E+00
1.2979E+02	9.9124E+00
2.8856E+02	1.5576E+01
1.9968E+02	1.7525E+01
1.5349E+02	1.172E+01
9.1689E+01	5.9705E+00
9.866E+01	7.5352E+00
8.2495E+01	5.3718E+00
9.4541E+01	6.1562E+00
1.0949E+02	4.703E+00
1.4847E+02	8.0163E+00
2.2603E+02	1.4715E+01
2.7017E+02	1.4579E+01
2.2828E+02	1.2322E+01

**Calculations with columns**

Argument Column: DATA-ERR

Function:

Result Column: DATA-ERR

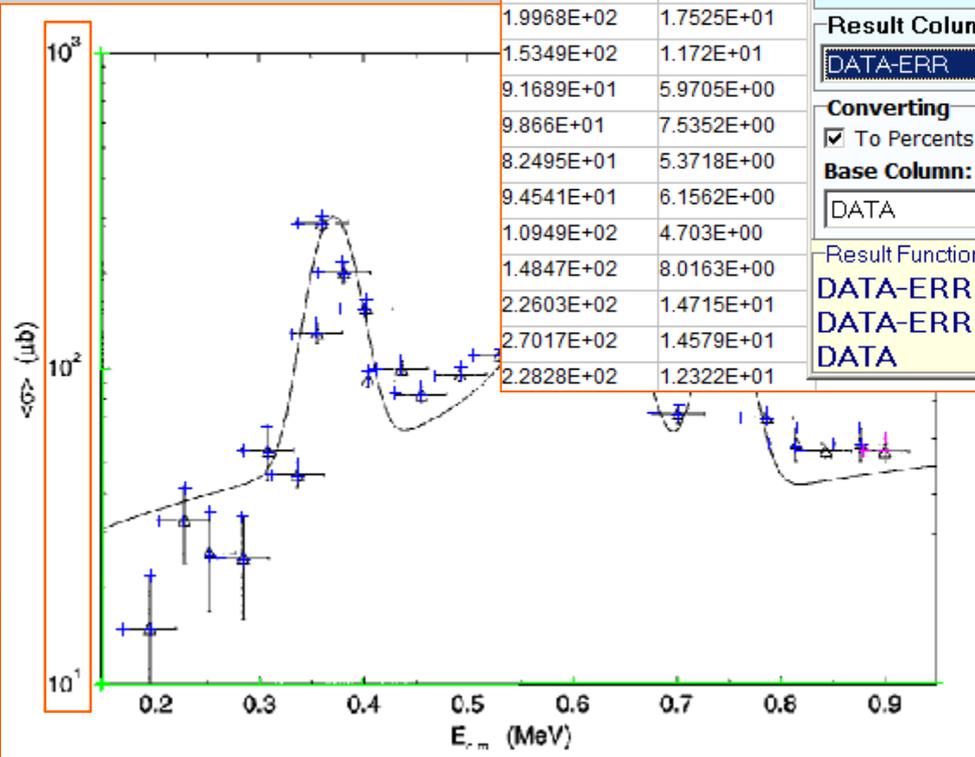
Converting:  To Percents

Base Column: DATA

Result Function:  
DATA-ERR = Convert  
DATA-ERR To Percents for  
DATA

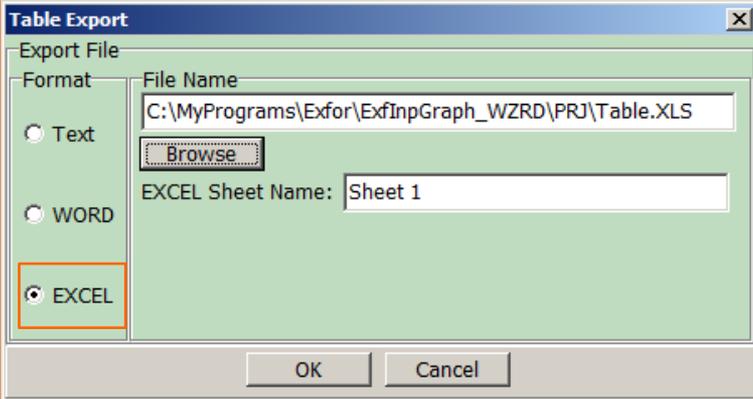
OK    Cancel    Help

DATA	DATA-ERR
MICRO-B	PER-CENT
1.4904E+01	4.7554E+01
3.2781E+01	2.7355E+01
2.5464E+01	3.7084E+01
2.4665E+01	3.7086E+01
5.4255E+01	2.0837E+01
4.5362E+01	9.9248E+00
1.2979E+02	7.6373E+00
2.8856E+02	5.3978E+00
1.9968E+02	8.7765E+00
1.5349E+02	7.6357E+00
9.1689E+01	6.5117E+00
9.866E+01	7.6375E+00
8.2495E+01	6.5117E+00
9.4541E+01	6.5117E+00
1.0949E+02	4.2954E+00
1.4847E+02	5.3993E+00
2.2603E+02	6.5102E+00
2.7017E+02	5.3962E+00
2.2828E+02	5.3978E+00
1.7184E+02	5.3962E+00
1.1401E+02	5.3976E+00
7.1022E+01	7.6359E+00
4.2768E+01	5.3978E+00



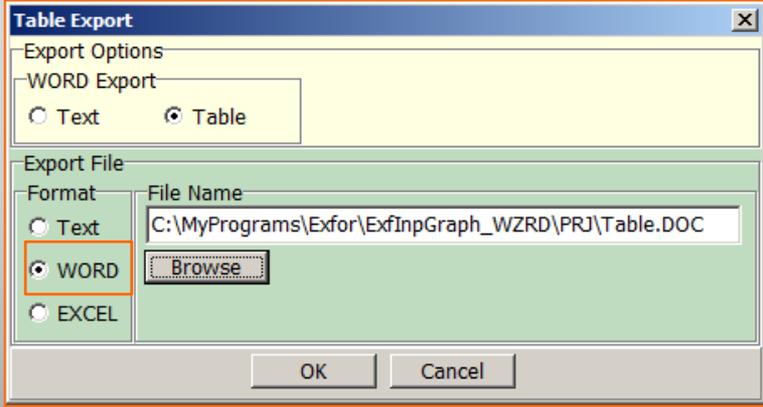
■ Select the Argument Column, Result Column and Base Column to calculate new values.

Press the Export button on the TABLE panel to export data table in the file of another format



	A1		f <sub>x</sub>	E	
	A	B	C	D	E
1	E	ANG	EN	DATA	DATA-ERR
2	MEV	ADEG	MEV	NO-DIM	NO-DIM
3	0	30	1.5007	0.1484	0.06047
4	0	30	1.5299	0.16184	0.05119
5	0	30	1.5532	0.16608	0.04654
6	0	30	1.578	0.17495	0.05116
7	0	30	1.6014	0.19779	0.05116
8	0	30	1.6248	0.21134	0.06507
9	0	30	1.6496	0.21555	0.05116
10	0	30	1.6758	0.21509	0.05584
11	0	30	1.7007	0.21931	0.05119
12	0	30	1.7254	0.21422	0.06047

Select the format and the file to export



The screenshot shows an Excel spreadsheet with the following data:

E <sub>x</sub>	ANG <sub>x</sub>	EN <sub>x</sub>	DATA <sub>x</sub>	DATA-ERR <sub>x</sub>
MEV <sub>x</sub>	ADEG <sub>x</sub>	MEV <sub>x</sub>	NO-DIM <sub>x</sub>	NO-DIM <sub>x</sub>
0 <sub>x</sub>	30 <sub>x</sub>	1.5007 <sub>x</sub>	0.14840 <sub>x</sub>	0.06047 <sub>x</sub>
0 <sub>x</sub>	30 <sub>x</sub>	1.5299 <sub>x</sub>	0.16184 <sub>x</sub>	0.05119 <sub>x</sub>
0 <sub>x</sub>	30 <sub>x</sub>	1.5532 <sub>x</sub>	0.16608 <sub>x</sub>	0.04654 <sub>x</sub>
0 <sub>x</sub>	30 <sub>x</sub>	1.5780 <sub>x</sub>	0.17495 <sub>x</sub>	0.05116 <sub>x</sub>
0 <sub>x</sub>	30 <sub>x</sub>	1.6014 <sub>x</sub>	0.19779 <sub>x</sub>	0.05116 <sub>x</sub>
0 <sub>x</sub>	30 <sub>x</sub>	1.6248 <sub>x</sub>	0.21134 <sub>x</sub>	0.06507 <sub>x</sub>
0 <sub>x</sub>	30 <sub>x</sub>	1.6496 <sub>x</sub>	0.21555 <sub>x</sub>	0.05116 <sub>x</sub>
0 <sub>x</sub>	30 <sub>x</sub>	1.6758 <sub>x</sub>	0.21509 <sub>x</sub>	0.05584 <sub>x</sub>
0 <sub>x</sub>	30 <sub>x</sub>	1.7007 <sub>x</sub>	0.21931 <sub>x</sub>	0.05119 <sub>x</sub>
0 <sub>x</sub>	30 <sub>x</sub>	1.7254 <sub>x</sub>	0.21422 <sub>x</sub>	0.06047 <sub>x</sub>
0 <sub>x</sub>	30 <sub>x</sub>	1.7532 <sub>x</sub>	0.21374 <sub>x</sub>	0.05581 <sub>x</sub>
0 <sub>x</sub>	30 <sub>x</sub>	1.7765 <sub>x</sub>	0.21798 <sub>x</sub>	0.05116 <sub>x</sub>

- The COMMON section mode was implemented
- Functional capabilities of The COMMON Section window are similar to the capabilities of columns processing in the DataTable mode.

	EN-ERR-DIG	ERR-DIG
	MEV	NO-DIM
1	0.0006	0.00136

COMMON (SUBENT 2)

	EN-ERR-DIG	ERR-DIG
	MEV	NO-DIM
1	0.58364E-03	0.13598E-02

Precision for column EN-ERR-DIG

Number Format

Fixed Point Format

Scientific Format

Fixed Point Format

Number of Digits after Decimal Point: 4

Erase Trailing Zero

Example: 1.0001

■ The numeric data processing according to the EXFOR rules is available now in the InpGraph 3.4. It is possible to generate DATA SECTION and COMMON SECTION by the digitizer completely.

Image Edit Mode

Entry + Variables   Axes   Curves

Image Processing

Rotate Image

Skew Image

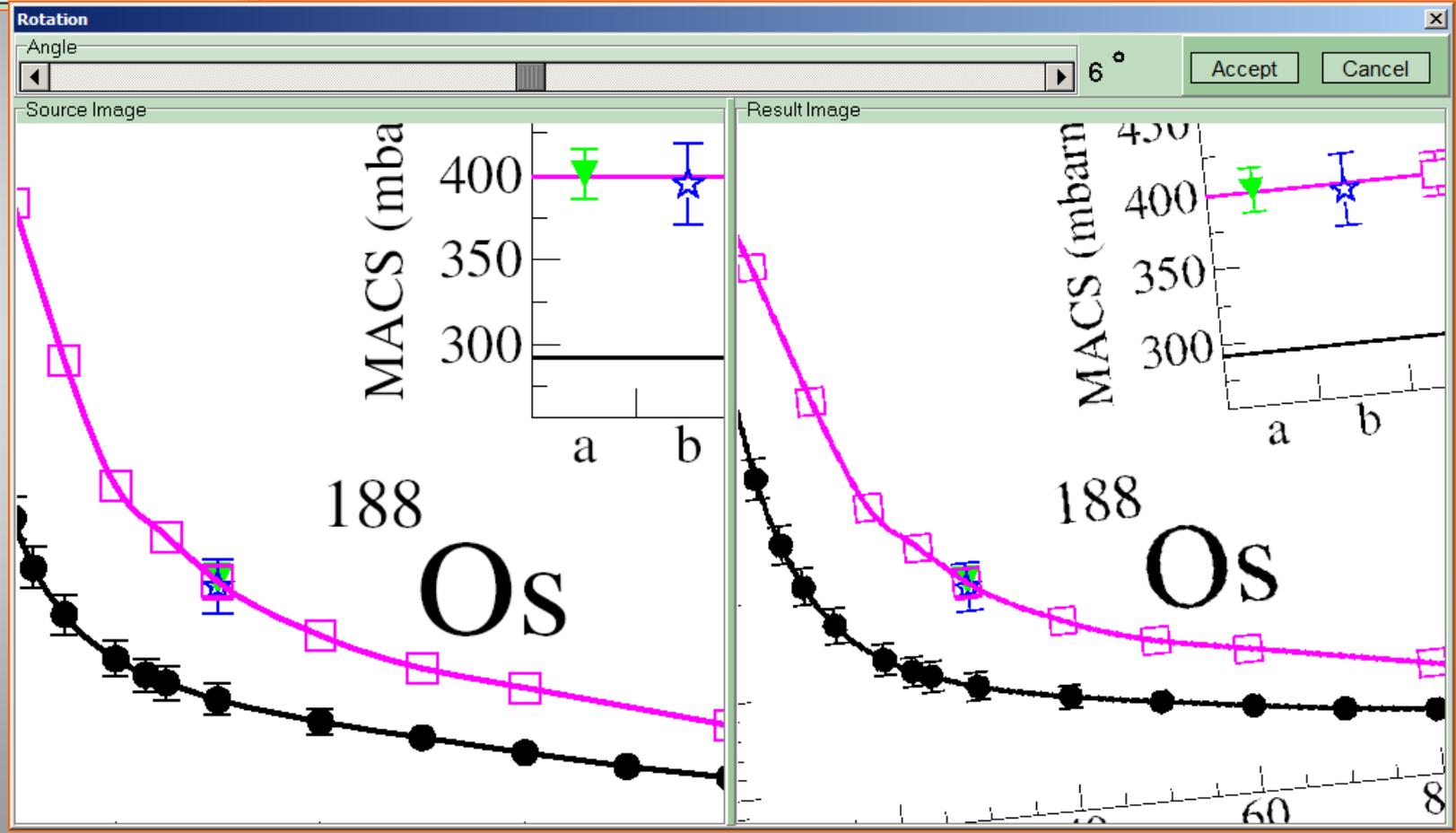


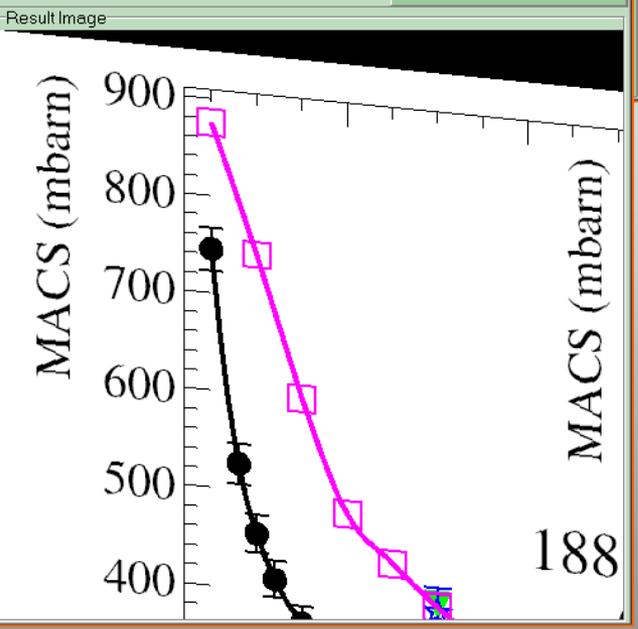
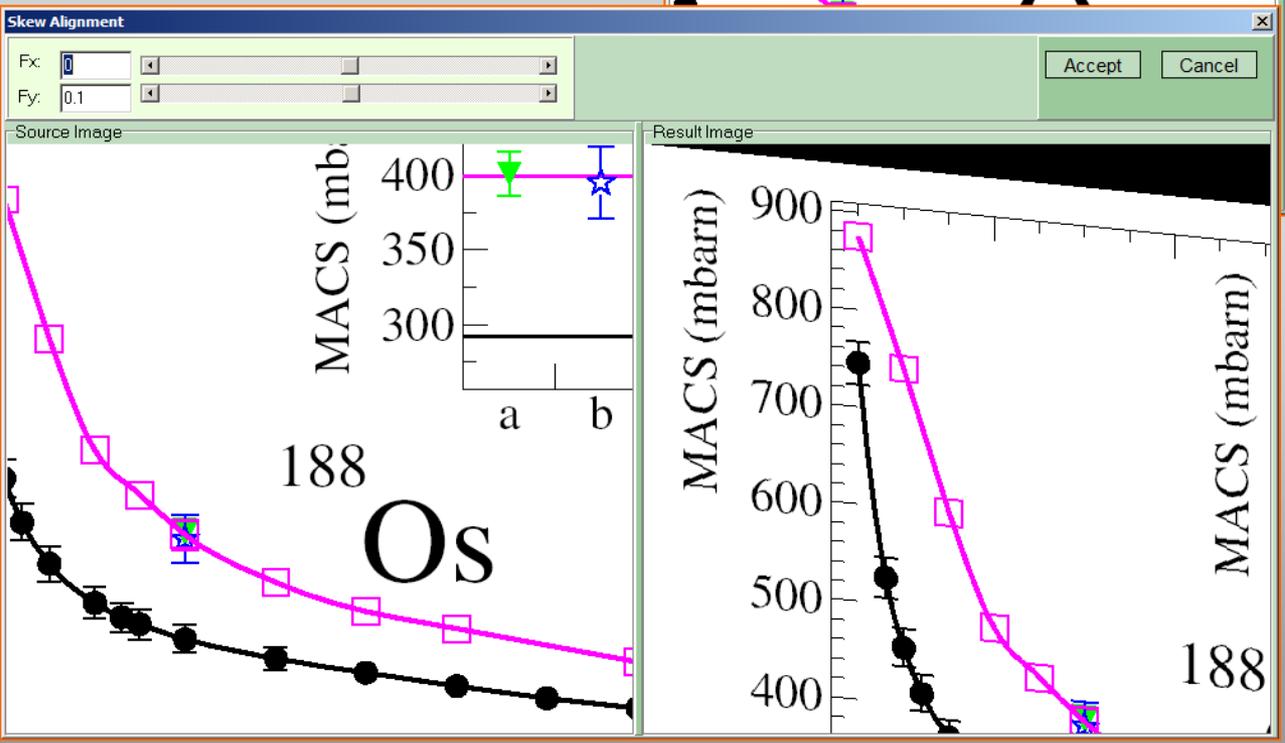
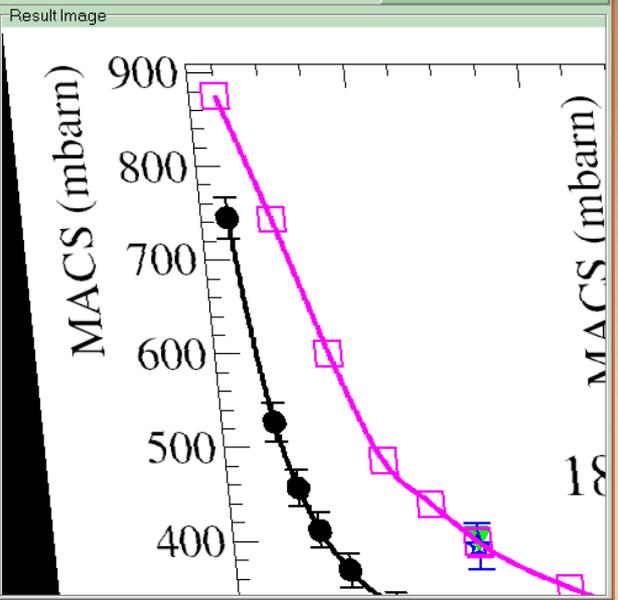
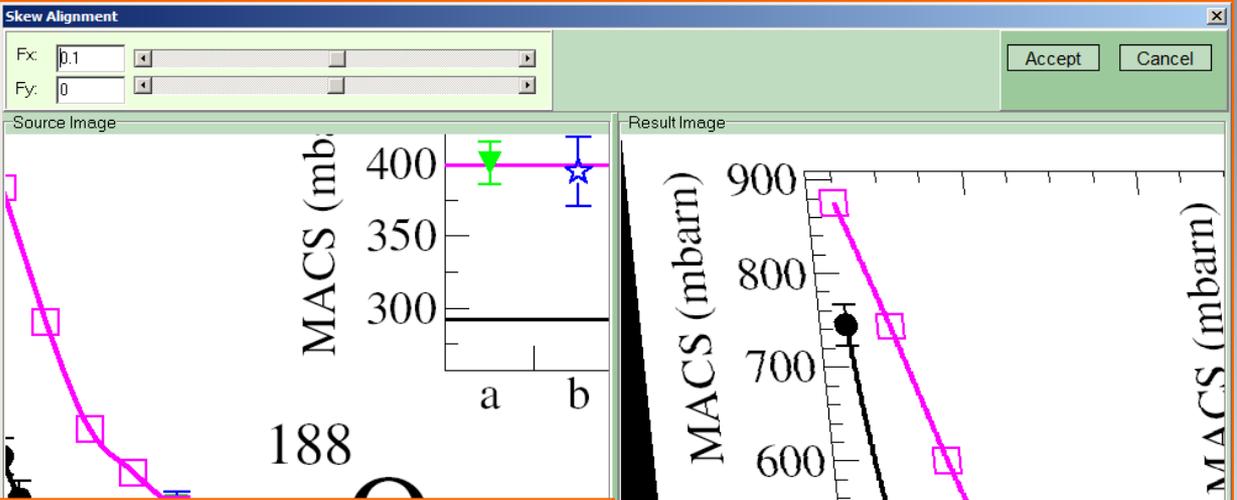
Image Edit Mode

Entry + Variables   Axes   Curves

Image Processing

Rotate Image

Skew Image





**THANK YOU!**