

Current status of EXFOR and NRDF compilation in JCPRG

Hokkaido Univ.

Naoya Furutachi

Current status of nuclear data complications

EXFOR compilation

● Fiscal 2010

Charged particle data

TRANS. E062, E063, E064

- 29 new entries
- 29 corrected entries

Photo nuclear data

TRANS. K006, K007, K008, K009

- 16 new entries
- 9 corrected entries

● Fiscal 2011

Charged particle data

TRANS. E065

PRELIM. E066

- 35 new entries
- 26 corrected entries

Transmitted files : 2010

TRANS	Prelim.	Final	Entry New	Entry Rev
E062	2010.03.15	2010.06.05	E2152 E2153 E2155	E0900 E1177 E1265
			E2161 E2162 E2169	E1833 E1933 E2060
			E2170	E2077 E2081
E063	2010.07.26	2010.09.03	E0169 E0244 E0251	E1378 E1411 E1730
			E0306 E2150 E2156	E1876 E1919 E1972
			E2157 E2158 E2159	E2107 E2132 E2134
			E2165 E2174	E2139 E2142 E2147
E064	2010.11.29	2011.02.01		E2149 E2151 E2154
			E2160 E2166 E2168	E1148 E1915 E2091
			E2172 E2173 E2176	E2140 E2146 E2148
			E2178 E2223 E2280	
			E2282 E2283	
TRANS	Prelim.	Final	Entry New	Entry Rev
K006	2010.01.20	2010.06.05	K2164	K2111 K2113
K007	2010.04.01	2010.06.05	K2175	K2001 K2002 K2005
				K2021 K2061 K2062
K008	2010.07.26	2010.09.03	K2179 K2199	K2164
K009	2010.09.07	2010.11.10	K2180 K2181 K2183	
			K2184 K2185 K2186	
			K2187 K2188 K2189	
			K2190 K2193 K2198	

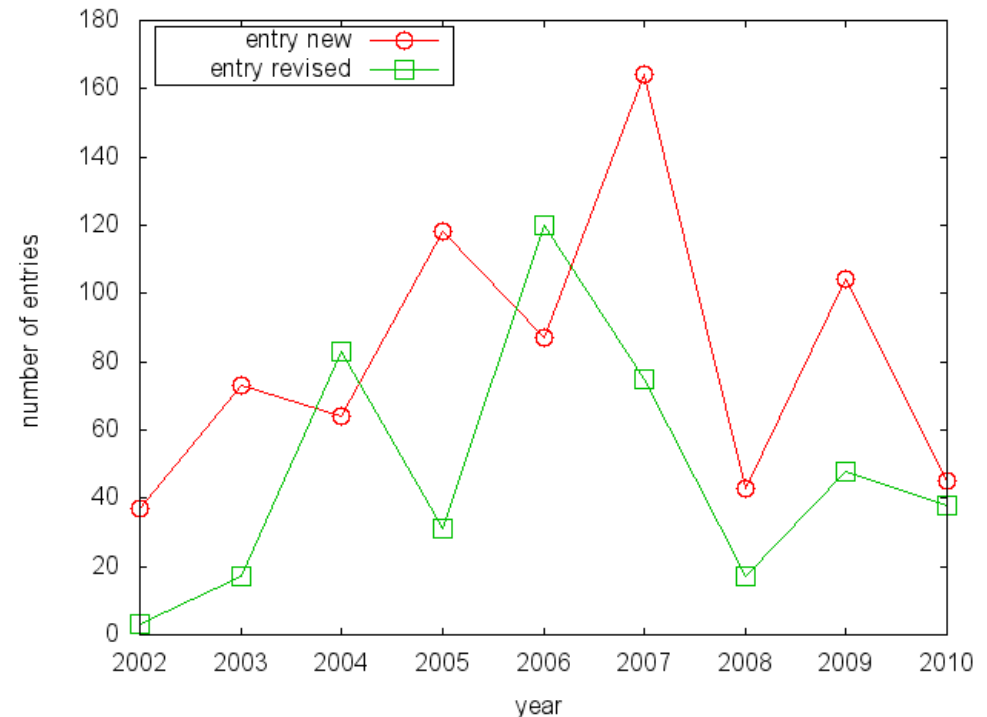
Transmitted files : 2011

TRANS	Prelim.	Final	Entry New	Entry Rev
E065	2011.04.04	2011.05.18	E0024 E0029 E0030	E0801 E0809 E0904
			E0032 E0054 E0057	E0927 E1089 E1090
			E0069 E0072 E0087	E1200 E1236 E1369
			E0094 E0121 E0372	E1426 E1482 E1542
			E2182 E2200 E2201	E1686 E1713 E1756
			E2281 E2284 E2286	E1793 E1826 E1889
			E2287 E2288 E2289	E2043 E2095 E2109
E066	2011.07.17		E2177 E2232 E2290	E1208 E1808 E2054
			E2291 E2292 E2296	E2118 E2289
			E2297 E2324 E2325	
			E2327 E2329 E2331	
			E2337 E2338	

Current status of nuclear data complications

EXFOR compilation

- Compilation of 20~30 papers published every year
- Conversion from old NRDF entries
- Compilation of old papers



● Fiscal 2010

- Compilation of new papers: 17
- Compilation of old paper: 24
- Conversion from NRDF entries: 4

Current status of nuclear data complications

EXFOR compilation

- Most of papers published in 2010 have been compiled

Papers published in 2010

16 papers for charged particle nuclear reaction data
16 entries, 3330 data points

➤ FACILITIES:

6papers - RCNP (Research center for nuclear physics, Osaka univ.)
7papers - RIKEN (Institute of physical and chemical research)
1paper - NIRS (National institute of radiological sciences)
1paper - Kyusyu university
1paper - JAEA (Japan atomic energy agency)

Current status of nuclear data complications

● Details of RIKEN and RCNP experiments

- E2174: RIKEN, Measurement of the reaction cross section of ^{22}C
 - Exotic structure of unstable nuclei, finding of a new halo nucleus ^{22}C
- E2160: RCNP, Differential cross section for 0_2^+ state of ^{12}C
 - Exotic structure in excited state of stable nucleus, α -cluster condensed structure
- E2173: RIKEN, Measurement of the ground state resonance of the unbound nucleus ^{13}Be
 - Exotic property of unstable nucleus, disappearance of $N=8$ magicity
- E2280:RIKEN, Measurement of $^2\text{H}(^8\text{He},^3\text{He})^7\text{H}$ reaction
 - Search for exotic superheavy hydrogen ^7H
- E2282 RCNP, Neutron production cross-sections of carbon, iron, and gold targets
 - Investigation for neutron source of Boron Capture therapy
- E2283 RIKEN, Measurement of the charge changing cross sections of ^{28}Si
- E2200 RIKEN, In-flight fission of ^{238}U beam
 - Search for new neutron-rich isotopes
- E2288 RCNP, Measurement of $^{28}\text{Si}(p,t)^{26}\text{Si}$
 - Investigation for astrophysical reaction rate
- E2289 RCNP, Proton production double-differential cross sections at intermediate energies

Current status of nuclear data complications

● Quality assurance

- EXFOR and NRDF files are checked by 2-nd person after compilation
- Check using CHEX program is performed by compiler.
2-nd person perform manual check.
- Problems in compilations are discussed in working-group.
- Person who is responsible for translation
perform final check of EXFOR files to be translated

Current status of nuclear data complications

CINDA compilation

- Fiscal 2010

SAP012: 81 new lines

Searching journals:

Progress of theoretical physics (PTP)

Journal of the physical society of Japan

Journal of nuclear science and technology (NST)

Journal of nuclear and radiochemical sciences (JNRS)

➤ Transmitted CINDA files

TRANS	PTP	JPJ	NST	JNRS	Lines-Tot	Lines-New	Lines-Rev
SAP007	Vol.117(1)-(6)	Vol.76(1)-(6)	Vol.44(1)-(6)	Vol.8(1)	16	16	0
SAP008	Vol.118(1)-(6)	Vol.76(7)-(12)	Vol.44(7)-(12)	Vol.8(2)	15	15	0
Sum (2007)					31	31	0
SAP009	Vol.119(1)-(6)	Vol.77(1)-(6)	Vol.45(1)-(6)	Vol.9(1)	12	12	0
SAP010	Vol.120(1)-(6)	Vol.77(7)-(12)	Vol.45(7)-(12)	Vol.9(2)	7	7	0
Sum (2008)					19	19	0
SAP011	Vol.121(1)-(6)	Vol.78(1)-(12)	Vol.46(1)-(12)	Vol.10(1)	39	39	0
	Vol.122(1)-(6)						
Sum (2009)					39	39	0
SAP012	Vol.123(1)-(6)	Vol.79(1)-(12)	Vol.47(1)-(12)	Vol.10(2)	81	81	0
	Vol.124(1)-(6)						
	Vol.125(1)-(3)						
Sum (2010)					81	81	0

➤ JCPRG continues to compile CINDA files by manual input

NRDF compilation

- Fiscal 2010

41 new entries

- Fiscal 2011

23 new entries

Current status of nuclear data complications

NRDF compilation

- Data numbers are common with EXFOR entries
EXFOR:Exxxx/NRDF:Dxxxx
- NRDF and EXFOR compilations are performed at the same time by using HENDEL
- NRDF search system

Searching journals

Physical review C (PR/C)
Physical review letters (PRL)
Nuclear Physics (NP/A)
Physics Letters B PL/B)
The European Physical Journal A (EPJ/A)
Journal of Nuclear Science and Technology
Journal of Physics G (JP/G)
Nuclear instrument and methods in physics research A (NIM/A)
Nuclear instrument and methods in physics research B (NIM/B)
Progress of theoretical physics (PTP)
Journal of the physical society of Japan (JPJ)
Nuclear science and engineering (NSE)
Applied radiation and isotopes (ARI)
Radiochimica acta
Journal of radioanalytical and nuclear

Hokkaido University Nuclear Reaction Data Centre (JCPRG)
NRDF - Search
(Database Ver. Jun. 01, 2011 -)

Experimental charged-particle nuclear reaction data produced in Japan. Proton induced reaction data from the world are also compiled. NRDF contains data from more than 1,500 experiments. NRDF is compiled by Nuclear Reaction Data Centre at Hokkaido University (JCPRG) using HENDEL.

[basic] [advance]
(Use ";" (semicolon) for logical OR, "*" (asterisk) for wildcard)

Basic		
Target	<input type="text"/>	selector (fe-56, 56fe, he-4, a,...)
Projectile	<input type="text"/>	selector (n, p, a, g, c-12,...)
Emission	<input type="text"/>	selector (e1, in1, f, g, n+p,2p,...)
Residual	<input type="text"/>	selector (fe-56, 56fe,...)
Quantity	<input type="text"/>	selector (XSECTN,ANGL-DSTRN,...)
Energy (eV)	<input type="text"/>	(1.0e-5:2.0e+7)
Data No.	<input type="text"/>	(D1567,D15670001,...)

Plot axis		
Horizontal (1)	<input type="text"/>	selector (INC-ENGY-LAB,...)
Horizontal (2)	<input type="text"/>	selector (THTL,THTC,...)
Vertical	<input type="text"/>	selector (SIGMA,DSIGMA/DOMEGA,...)

Bibliography		
Pub. Year	<input type="text"/>	selector (1988:1990)
Journal	<input type="text"/>	selector (NP/A,...)
1st Author	<input type="text"/>	selector (Kato,...)

Current status of nuclear data complications

NRDF compilation

➤ A sample of NRDF file E2288

- Bibliographic information

```
\\BIB,1;
D#=D2288;
TITLE=/ High-precision (p,t) reaction to determine 25Al(p,gamma)26Si
reaction rates /;
ATH=(A.MATIC'1', A.M.VAN DEN BERG'1', M.N.HARAKEH'1', H.J.WOERTCHE'1',
G.P.A.BERG'2', M.COUDER'2', J.GOERRES'2', P.LEBLANC'2',
S.O'BRIEN'2', M.WIESCHER'2', K.FUJITA'3', K.HATANAKA'3',
Y.SAKEMI'3', Y.SHIMIZU'3', Y.TAMESHIGE'3', A.TAMII'3', M.YOSOI'3',
T.ADACHI'4', Y.FUJITA'4', Y.SHIMBARA'4', H.FUJITA'5', T.WAKASA'6',
B.A.BROWN'7', H.SCHATZ'7');
INST-ATH=(2NEDKVI'1', 1USANOT'2', 2JPNOSA'3', 2JPNOSA'4', 3SAFWIT'5',
2JPNKYU'6', 1USAMSU'7');
/* '2' Department of physics and the joint institute for nuclear
astrophysics */
/* '3' Research center for nuclear physics */
/* '4' Department of physics */
/* '5' School of physics */
/* '6' Department of physics */
/* '7' Department of Physics and Astronomy, National
Superconducting Cyclotron Laboratory and the Joint
Institute for Nuclear Astrophysics */
REF=PR/C;
VLP=82(2010)025807;
RCTS=28SI(P,T)26SI;
PHQS=ANGL-DSTRN;

\\EXP,1;
/* 2011-02-09 : Compiled+Checked, Nf */
/* Related references
- A.Matic et al., PR/C, 80(2009)055804.
. See also NRDF D2162.
*/
/* Additional results shown but not compiled
- Nuclear structure data (20 resonances are measured: 5.5172(16),
5.921(12), 5.944(20), 6.2957(24), 6.3795(29), 6.4563(28),
6.785(5), 7.151(5), 7.197(8), 7.4152(23), 7.479(12), 7.522(12),
7.661(12), 7.701(12), 7.874(4), 8.222(5), 8.269(4), 8.557(4),
8.687(12), 8.989(7) MeV)
*/
```

- Data section

```
\\DATA,1;
INC-ENGY-LAB=98.7MEV;
DELTA-INC-ENGY-LAB=100KEV;

\\EXP,1;
RCT=28SI(P,T)26SI;
PHQ=ANGL-DSTRN;

\\DATA,1;
\\DATA;
EXC-ENGY THTC DSIGMA/DOMEGA DELTA-DSIGMA/DOMEGA FLAG
(MEV) (DEG) (MB/SR) (MB/SR)
0 1.148E-01 5.949E-01 +-NEGLIGIBLE 1
0 8.865E+00 1.950E-01 +-NEGLIGIBLE 1
0 1.849E+01 1.033E-02 +-NEGLIGIBLE 1
1.797 3.878E-02 7.125E-02 +-5.507E-03 2
1.797 8.760E+00 8.874E-02 +-NEGLIGIBLE 2
1.797 1.845E+01 2.484E-02 +-NEGLIGIBLE 2
2.735 9.013E-03 1.872E-01 +-NEGLIGIBLE 3
2.735 8.746E+00 1.400E-01 +-NEGLIGIBLE 3
2.735 1.837E+01 4.062E-02 +-NEGLIGIBLE 3
3.335 1.447E-01 1.459E-02 +-2.316E-03 4
3.335 8.897E+00 3.899E-03 +-9.592E-04 4
4.138 1.044E-01 8.483E-03 +-3.014E-03 5
4.138 8.853E+00 4.282E-03 +-1.121E-03 5
4.138 1.852E+01 2.609E-03 +-5.390E-04 5
4.138 1.888E+01 4.700E-03 +-2.631E-03 6
```

HENDEL — Nuclear reaction data input system in JCPRG

- All EXFOR and NRDF files are produced by HENDEL
- A little knowledge for EXFOR format is necessary
 - Do not allow errors in EXFOR format
- Many of input are common for NRDF and EXFOR.
physical quantities and data headings are separated for NRDF and EXFOR
- Bibliographic information: common
- Data headings: separated

Target

Target Enrichment	99.94 %	(none)
Chemical Form	Element	(none)
Physical Form	Solid target	(none)
Target Thickness	0.7 mg/cm ²	(none)
Backing	Self-supported	(none)
Backing Thickness	none mg/cm ²	(none)
Target Polarization	0 %	(none)
Target Alignment	0 %	(none)

Accelerator

Accelerator Type and Institute (input from [Dictionary](#))

1: Cyclotron	(Ring Cyclotron)
Institute: Osaka Univ., Osaka	(Research Center for Nuclear Physics)
2: none	(none)
Institute: none	(none)
3: none	(none)
Institute: none	(none)

Inc. Energy Value	98.7 MeV	Lab	(none)
Inc. Energy Uncert.	100 keV		(none)
Inc. Energy Resol.	none keV		(none)
Beam Intensity	none mA		(none)

Data Heading

Data Heading 1

NRDF	Excitation energy
(fac,unit)	none MeV (mega-electron-volt)
EXFOR	E-LVL (Level energy)
(fac,unit)	none MEV (MeV)
(part,data,axis)	none none x-linear
Comment	none

Data Heading 2

NRDF	Scattering angle theta in c.m. system
(fac,unit)	none degree
EXFOR	ANG-CM (Angle, c.m. system)
(fac,unit)	none ADEG (angular Degrees)
(part,data,axis)	none none x-linear
Comment	none

Data Heading 3

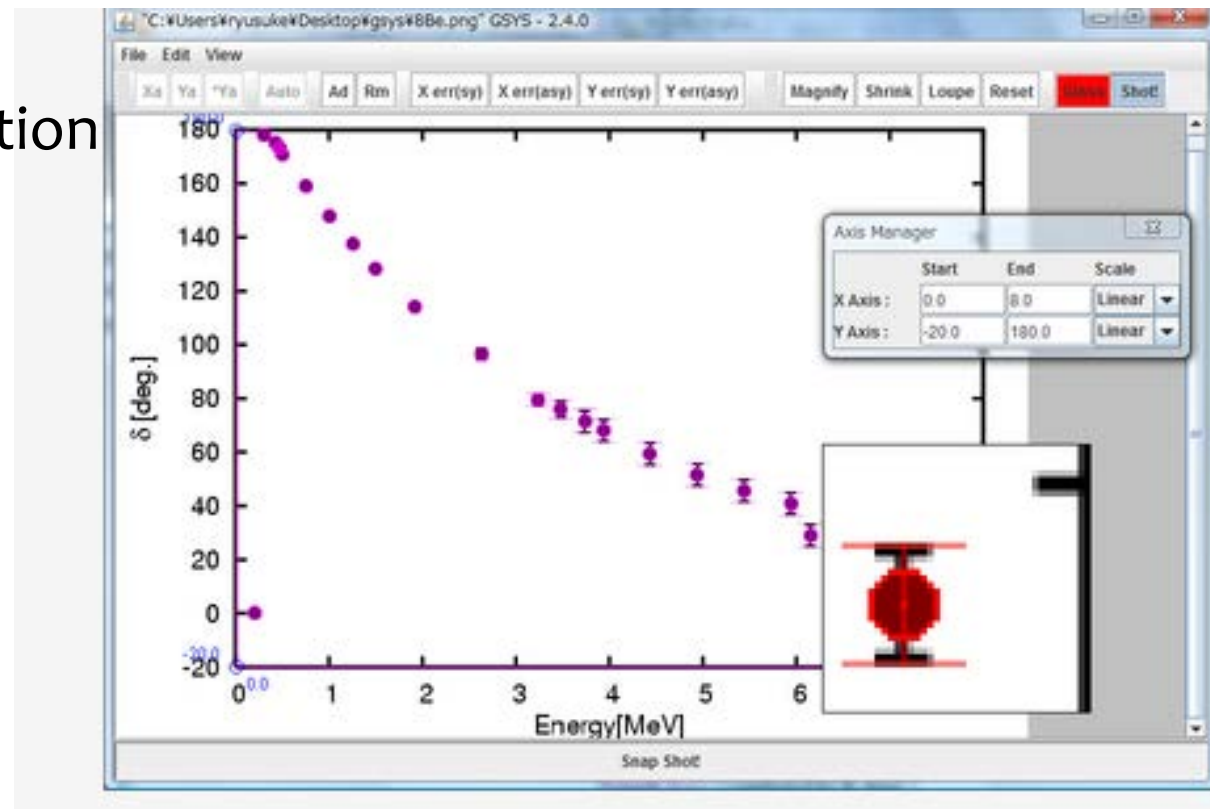
NRDF	dσ/dΩ
(fac,unit)	none mb/sr
EXFOR	DATA-CM (Value of quantity specif. under REACTION, c.m. sys.)
(fac,unit)	none MB/SR (millibarns per steradian)
(part,data,axis)	none none y-log
Comment	none

GSYS — Japanese graph digitizing system

Latest version gsys 2.4 (Announced by CP-E/145)

Gsys 2.4 New features:

- Drag-and-drop feature
- Transparency of points and lines
- Loupe function
- Automatically point recognition
- Addition of point shape
- Snapshot function
- Magnifying glass function



Summary

- Current status of nuclear data compilations are reported

- Statics and details of EXFOR compilations in fiscal 2010, 2011 were reported
- Quality assurance of compilations in JCPRG was introduced
- Statics of NRDF compilations, NRDF formats and compilation using HENDEL was introduced
- Latest version of GSYS (gsys 2.4) was introduced