

# Nuclear Data System Developed at Kitami Institute of Technology

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# Aim of this work

Charged particle reactions in Japan are compiled by JCPRG

The compiled data are formatted as NRDF

The charged reaction data are important, not only for nuclear physics, but also for engineering, medication, and other research fields related to nuclear reactions

Therefore, in this work

- We support to utilize NRDF

- in the view point of Information technology

- We develop a system for data retrieving

- based on the SQL-server and client scheme

# Outline of the system

1 . To provide data easily and widely

**Server and client scheme**

2 . To support for utilizing data

**Develop application for specific uses**

Construct a PostgreSQL-database system  
for NRDF by using the Perl script

Data search and utilizing application  
driven by Perl/CGI

# Data style of NRDF

```
$$$BIB,1[7;
```

```
D#=D1804;
```

```
TITLE=/ Model-independent spin-parity determination by the (d,2He)  
reaction and possible evidence for a 0- state in 12B/;
```

```
ATH=(H.OKAMURA'1', T.UESAKA'1', K.SUDA'1', H.KUMASAKA'1',  
R.SUZUKI'1', A.TAMII'1', N.SAKAMOTO'2', H.SAKAI'2,3');
```

```
INST-ATH=(2JPNSUU'1', 2JPNTOK'2', 2JPNIPC'3');
```

```
/* '1' Department of Physics
```

```
/* '2' Department of Physics
```

```
REF=PR/C;
```

```
VLP=66(2002)054602;
```

```
RCTS=12C(D,2HE)12B;
```

```
PHQS=(ENGY-SPEC, TNSR-ANALPW'4', TNSR-ANALPW'5');
```

```
/* '4' Azz */
```

```
/* '5' Ayy */
```

```
$$$EXP,1[7;
```

```
/* 2004-08-06 : Compiled */
```

```
RTY=RRG-RCT'6';
```

```
/* '6' charge-exchange reaction */
```

```
ENR=X%;
```

```
CHM=ELM;
```

```
PHYS-FORM=SLD
```

```
THK-TGT=10MG/
```

```
BAC=X;
```

```
POL-TGT=0%;
```

```
ALGN-TGT=0%;
```

```
ACC=CYC'7';
```

## Bibliography

```
TA,1;
```

```
ENGY-LAB=270MEV;
```

```
RSD=12B;
```

```
THTC=0.67DEG'12';
```

```
/* '12' Average over angular range of 0 to 1 degree. */
```

```
$$$DATA;
```

```
EXC-ENGY DSIGMA/DOMEGA/DE DELTA-DSIGMA/DOMEGA/DE'13'
```

```
(MEV) (MB/SR/MEV) (MB/SR/MEV)
```

```
-2.9 -0.0059603 +-0.0056119
```

```
-2.7 -0.0056485 +-0.0055827
```

```
-2.5 -0.0079911 +-0.005641
```

```
-2.3 -0.0030757 +-0.0057678
```

```
-2.1 -0.0010533 +-0.0056069
```

```
-1.9 -0.00082878 +-0.0053575
```

```
-1.7 -0.0040707 +-0.0053687
```

```
-1.5 -0.0016 +-0.0053577
```

```
-1.3 0.0012837 +-0.0055185
```

```
-1.1 0.0072813 +-0.0058662
```

```
-0.9 0.022393 +-0.0055858
```

```
-0.7 0.089978 +-0.0068412
```

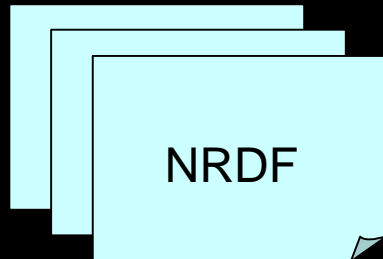
```
-0.5 0.34903 +-0.010446
```

```
-0.3 1.062 +-0.016992
```

## Experimental set up

## Observed data

# Data structure of NRDF



In principle,  
One NRDF data file  
for one article

Bibliography

Exp. Set up

Data

D1804

EXP0001

Data0001

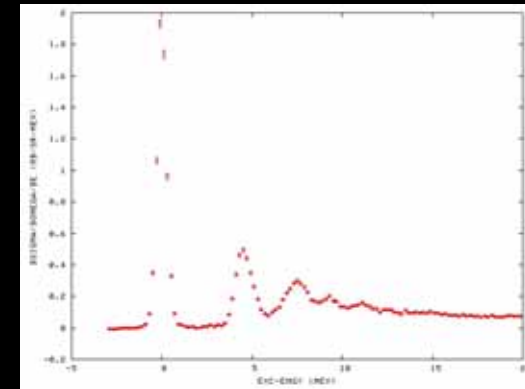
EXP0002

Data0002

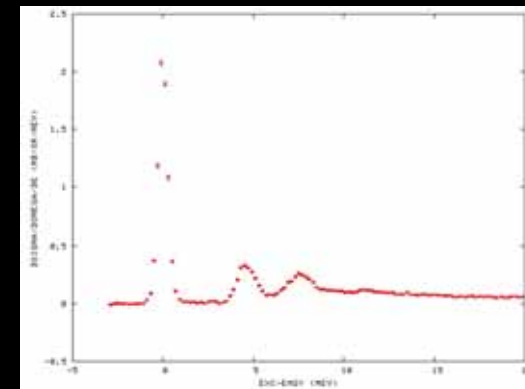
⋮

⋮

Data0001



Data0002



# Why the SQL-database for NRDF is necessary?

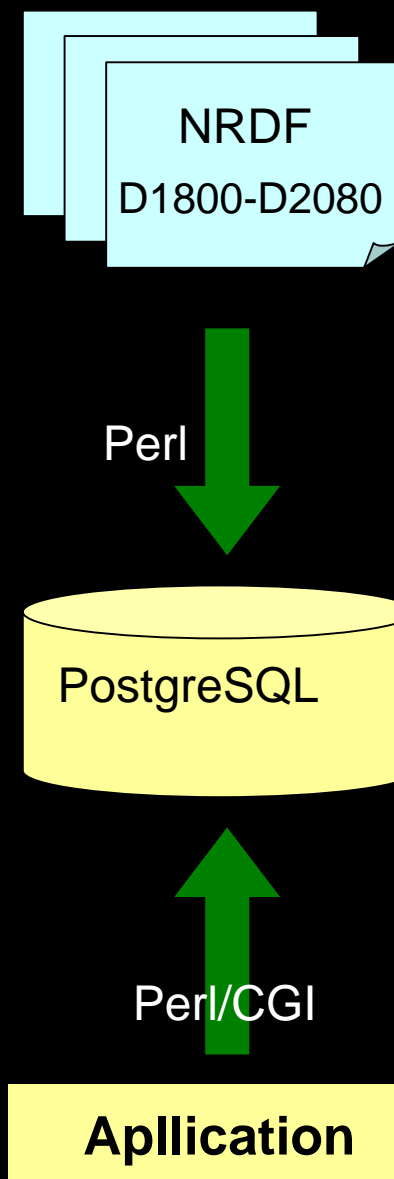
## Problem and difficulty

- We need to handle the files themselves  
Data retrieving by “query” requests
- No-restrict format

Format are fixed restrict in DB

## Solution for these problems

Construct the PostgreSQL-database  
by using the perl script



# Table renormalization

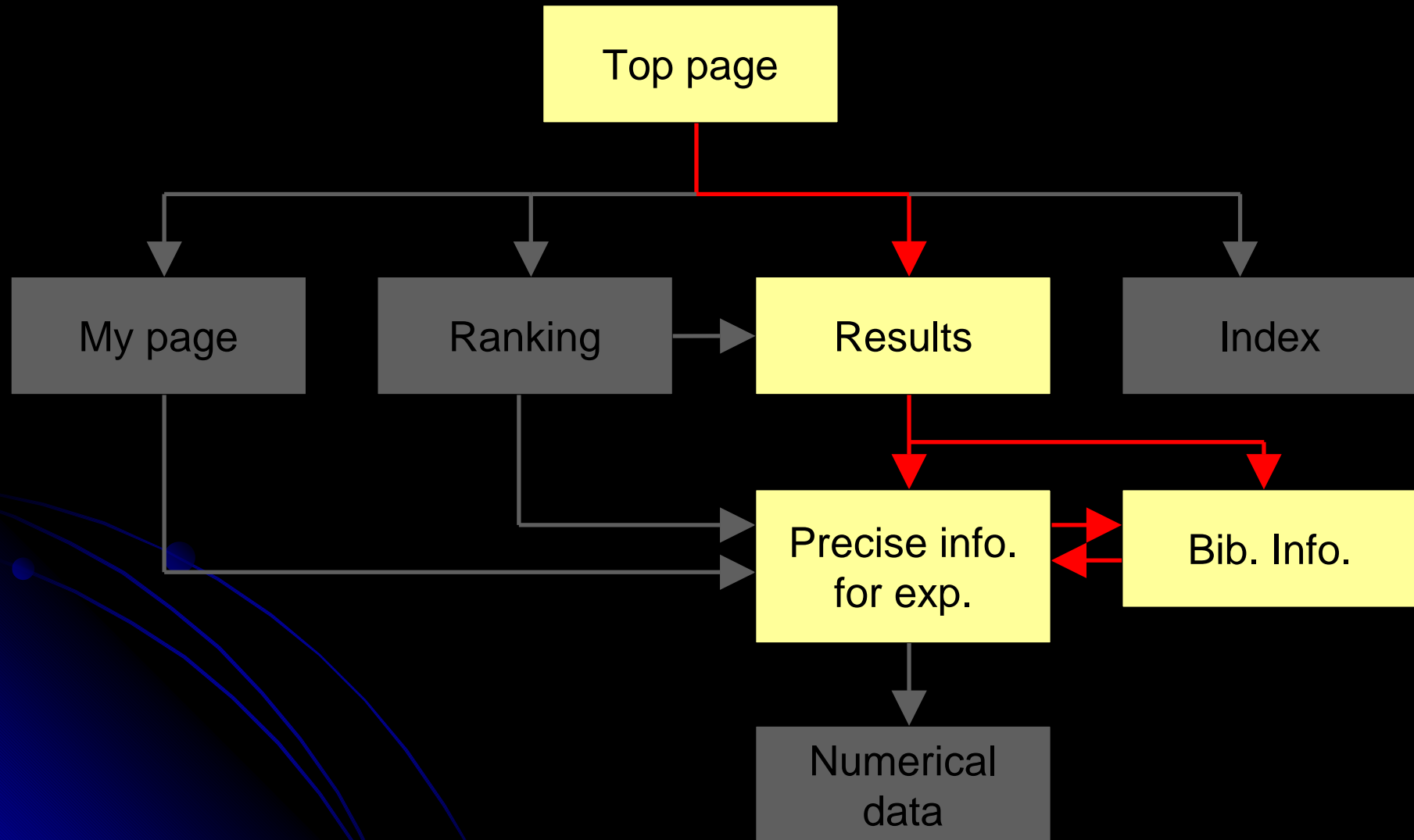
Principle key(s): D-number  
And exp-number in NRDF

EXC-ENGY (MEV)	DSIGMA/DOMEGA/DE (MB/SR/MEV)	DELTA-DSIGMA/DOMEGA/DE'13' (MB/SR/MEV)
-2.9	-0.0059603	+-0.0056119
-2.7	-0.0056485	+-0.0055827
-2.5	-0.0079911	+-0.005641
-2.3	-0.0030757	+-0.0057678
-2.1	-0.0010533	+-0.0056069
-1.9	-0.00082878	+-0.0053575
-1.7	-0.0040707	+-0.0053687
-1.5	-0.0016	+-0.0053577
-1.3	0.0012837	+-0.0055185
-1.1	0.0072813	+-0.0058662
-0.9	0.022393	+-0.0055858
-0.7	0.089978	+-0.0068412
-0.5	0.34903	+-0.010446
-0.3	1.062	+-0.016992
-0.1	1.9318	+-0.022752
0.1	1.7386	+-0.020773

X(xx)	Y(yy)	E(ee)
x01	y01	e01
x02	y02	e02
x03	y03	e03
x04	y04	e04
x05	y05	e05
x06	y06	e06
x07	y07	e07
x08	y08	e08
x09	y09	e09

数値データ

# Flow-chart of the application system





# An ordinary key-word search form

## Top page

Mozilla Firefox

ファイル(F) 編集(E) 表示(V) 履歴(S) ブックマーク(B) ツール(T) ヘルプ(H)

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Welcome takeno  
[Mypage](#) [Logout](#)

## Search Engine

Title  e.g. Spin-parity

1st Author  OKAMURA e.g. OKAMURA

Author  e.g. SUZUKI

Target  12C e.g. 12C

Projectile  e.g. D

Emission  e.g. 2HE

Residual  e.g. 12B

Physical Quantity  ENGY-SPEC e.g. ENGY-SPEC

Journal  PR/C

Published Year  e.g. 1999-2002

Data No. D  e.g. 1804

完了

Mozilla Firefox

ファイル(F) 編集(E) 表示(V) 履歴(S) ブックマーク(B) ツール(T) ヘルプ(H)

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[Mypage](#) [Logout](#)

## Result

Title

1st Author : OKAMURA

Author

Target : 12C

Projectile

Emission

Residual

Physical Quantity : ENGY-SPEC

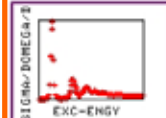
Journal : PR/C

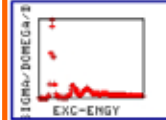
Published Year

Data No. D

Results 1 - 2 of 2

1

☒  [D1804.0001](#)  
RCT = 12C(D,2HE)12B  
INC-ENG-Y-LAB = 270MEV  
Physical Quantity: (EXC-ENG Y) (DSIGMA/DOMEGA/D)

☒  [D1804.0002](#)  
RCT = 12C(D,2HE)12B  
INC-ENG-Y-LAB = 270MEV  
Physical Quantity: (EXC-ENG Y) (DSIGMA/DOMEGA/D)

完了

Info for Exp.

Bibliography

# Bibliography

- Title of the article
- Journal
- Authors
- Link to NRDF file
- Link to numerical data

Top Index Code Link Ranking

Welcome takeno  
[Mypage Logout](#)

Information of... D 1804 **SOURCE** → **Source file of NRDF**

VLP:  
[PR/C](#) 68(2002)54802

TITLE  
Model-independent spin-parity determination by the  $(d, {}^3\text{He})$  reaction and possible evidence for a  $0^-$  state in  ${}^{12}\text{B}$

Author:  
[H.SAKAI](#) Univ. of Tokyo, Tokyo  
Institute for Physical and Chemical Research, Wakou  
[HOKAMURA](#) Saitama Univ., Urawa, Saitama  
[T.UESAKA](#) Saitama Univ., Urawa, Saitama  
[K.SUDA](#) Saitama Univ., Urawa, Saitama  
[H.KUMASAKA](#) Saitama Univ., Urawa, Saitama  
[R.SUZUKI](#) Saitama Univ., Urawa, Saitama  
[ATAMI](#) Saitama Univ., Urawa, Saitama  
[N.SAKAMOTO](#) Univ. of Tokyo, Tokyo

EXPERIMENT:

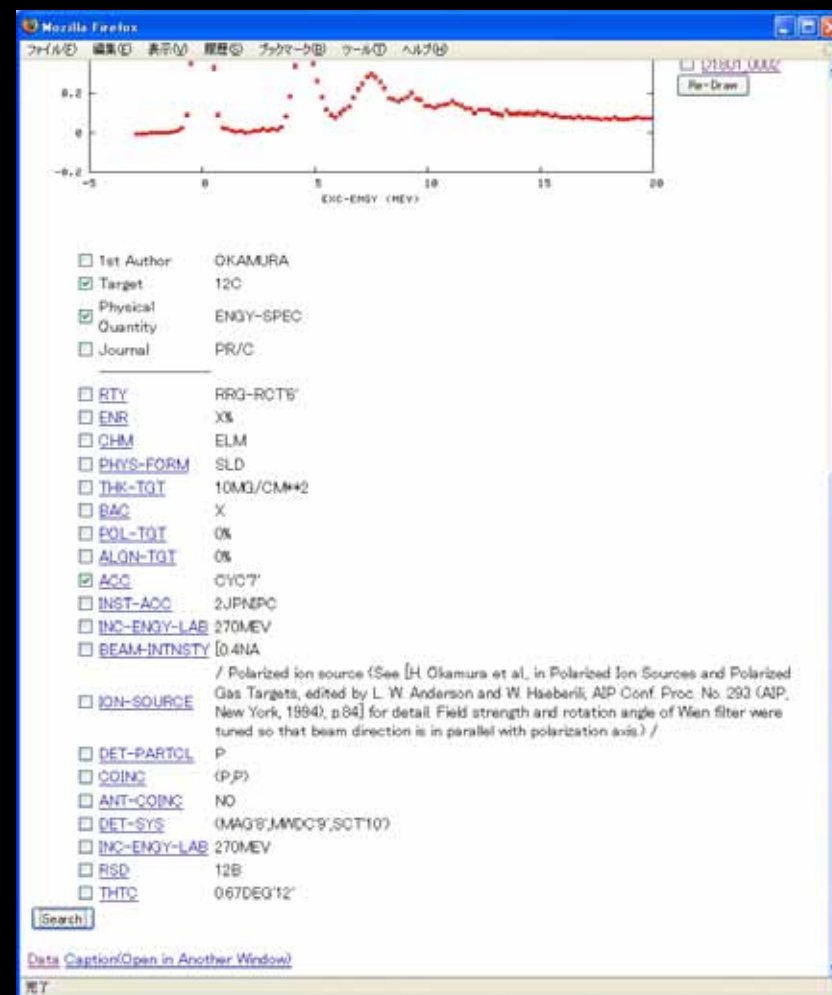
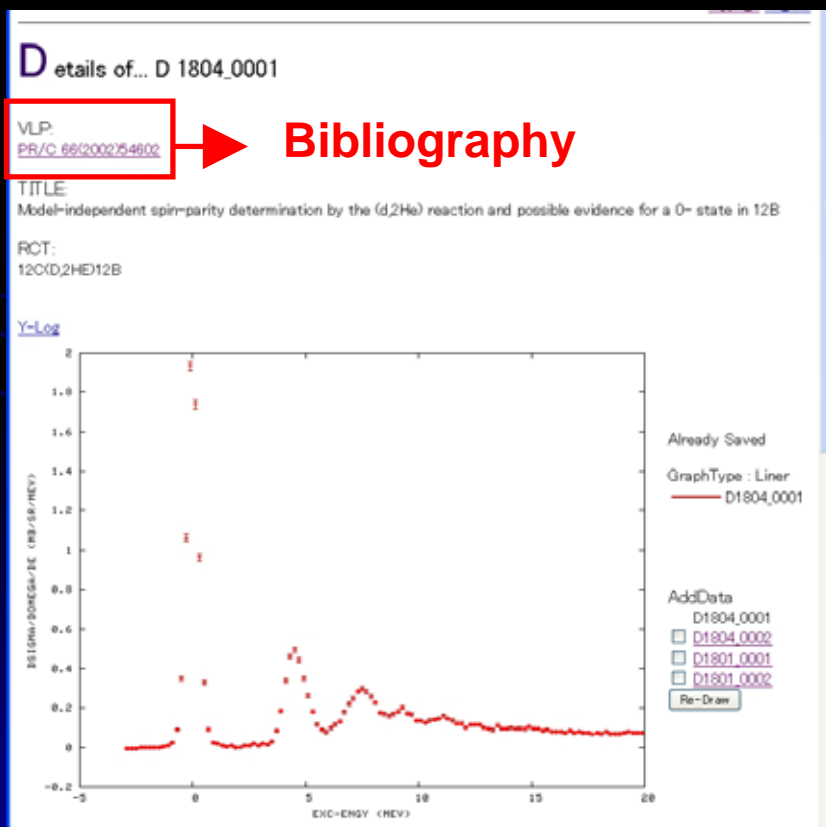
☐ [D1804.0001](#)  
RCT =  ${}^{12}\text{C}({}^3\text{He}, {}^3\text{He}){}^{12}\text{B}$   
INC-ENGY-LAB = 270MEV  
INC-ENGY-LAB = 270MEV  
Physical Quantity: (EXC-ENGY) (DSIGMA/DOMEGA/DE)

☐ [D1804.0002](#)  
RCT =  ${}^{12}\text{C}({}^3\text{He}, {}^3\text{He}){}^{12}\text{B}$   
INC-ENGY-LAB = 270MEV  
INC-ENGY-LAB = 270MEV  
Physical Quantity: (EXC-ENGY) (DSIGMA/DOMEGA/DE)

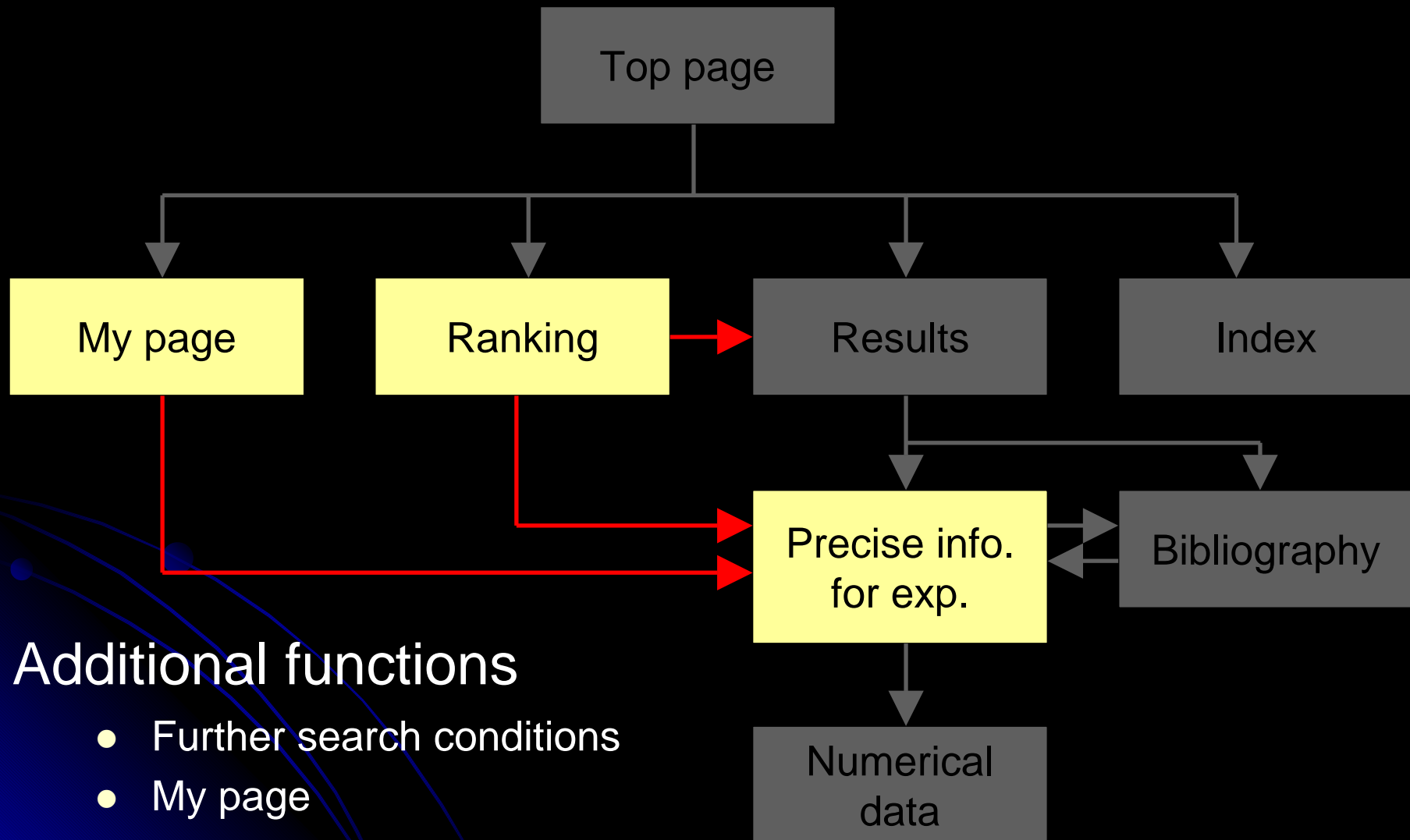
Info. For Exp.

# Precise information for the experiment

- Particles in the reaction
- Figures for experimental data
- Properties of experiment
- Link to the bibliography



# Flow-chart of the application system



## Additional functions

- Further search conditions
- My page
- Ranking

# Further search request with the properties of the experiments

- ☐ 1st Author OKAMURA
- ☒ Target 12C
- ☒ Physical Quantity ENGY-SPEC
- ☐ Journal PR/C

**Target:12C**  
**Physical quantity:**  
**ENG-Y-SPEC**

- ☐ RTY RRG-RCT'6'
- ☐ ENR X%
- ☐ CHM ELM
- ☐ PHYS-FORM SLD
- ☐ THK-TGT 10MG/CM\*\*2
- ☐ BAC X
- ☐ POL-TGT 0%
- ☐ ALGN-TGT 0%
- ☒ ACC CYC
- ☐ INST-ACC 2JPNIPC
- ☐ INC-ENG-LAB 270MEV
- ☐ BEAM-INTNSTY [0.4NA

**Accelerator**  
**:CYC**

- ☐ ION-SOURCE / Polarized ion source (See [H. Okamura et al, in Polar Gas Targets, edited by L. W. Anderson and W. Haeblerli, New York, 1994), p.84] for detail. Field strength and rotated so that beam direction is in parallel with polarization)
- ☐ DET-PARTCL P
- ☐ COINC (P,P)
- ☐ ANT-COINC NO
- ☐ DET-SYS (MAG'8',MWDC'9',SCT'10')
- ☐ INC-ENG-LAB 270MEV
- ☐ RSD 12B
- ☐ THTC 0.67DEG'12'

Search

Mozilla Firefox

ファイル(F) 編集(E) 表示(V) 履歴(S) ブックマーク(B) ツール(T) ヘルプ(H)

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**Experiments with the same condition**

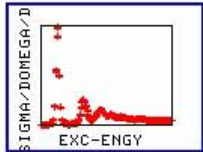
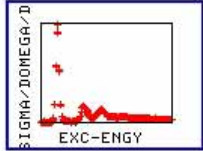
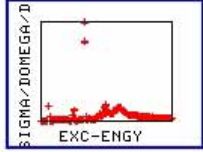
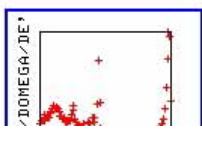
**R**esult

Target : 12C  
Physical Quantity : ENGY-SPEC

ACC = CYC

Results 1 - 5 of 5

1

[D1804\\_0001](#)  
RCT = 12C(D,2HE)12B  
INC-ENG-LAB = 270MEV  
Physical Quantity: (EXC-ENG) (DSIGMA/DOMEGA/DE) [D1804](#)

[D1804\\_0002](#)  
RCT = 12C(D,2HE)12B  
INC-ENG-LAB = 270MEV  
Physical Quantity: (EXC-ENG) (DSIGMA/DOMEGA/DE) [D1804](#)

[D1807\\_0001](#)  
RCT = 12C(P,P)12C  
INC-ENG-LAB = 392MEV  
Physical Quantity: (EXC-ENG) (DSIGMA/DOMEGA/DE) [D1807](#)

[D1891\\_0003](#)  
RCT = 12C(7Li,7Be)12B  
EXC-ENG-EMT = 0.0MEV  
INC-ENG-LAB = 65MEV/A [D1891](#)

# My page

## Login page

**L**ogin

Welcome Guest

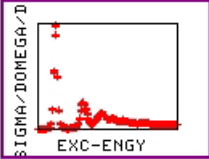
ID:

PassWord:

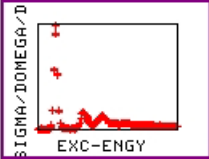
[Make New Member](#)

## "My page" for each user

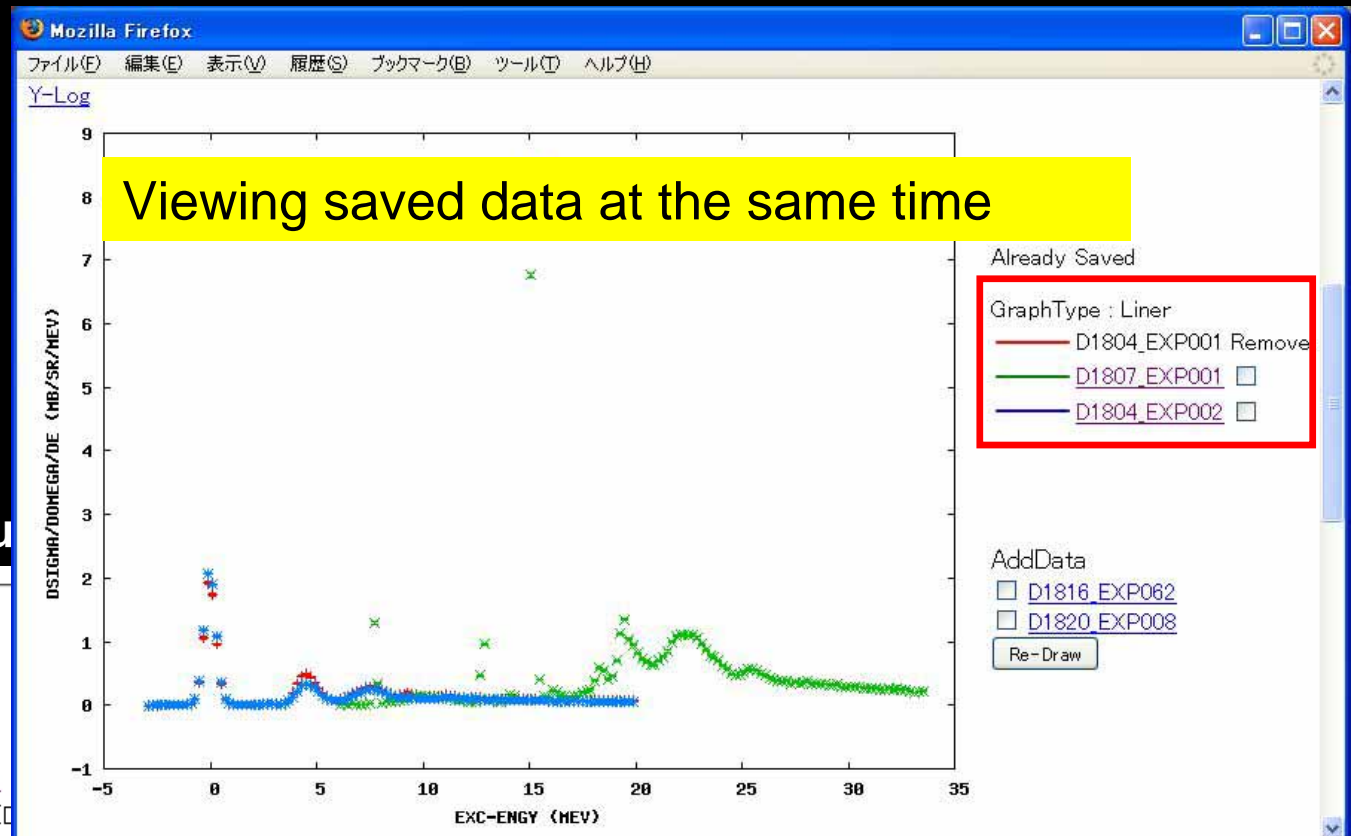
**Y**our **L**ist

☐


[D1804\\_0001](#)  
 RCT = 12C(D,2HE)12B  
 INC-ENGY-LAB=270MEV  
 INC-ENGY-LAB=270MEV  
 Physical Quantity: (EXC-ENGY) (DSIGMA/DOMEGA/DE)

☐


[D1804\\_0002](#)  
 RCT = 12C(D,2HE)12B  
 INC-ENGY-LAB=270MEV  
 INC-ENGY-LAB=270MEV  
 Physical Quantity: (EXC-ENGY) (DSIGMA/DOMEGA/DE)



# Ranking for search times

## Hot List

### Hot Experiments Hot Words

[No.1](#) D1804\_0001

[No.2](#) D1857\_0001

[No.3](#) D1801\_0001

[No.4](#) D1804\_0002

[No.5](#) D1804\_0003

[No.6](#) D2033\_0010

[No.7](#) D1807\_0001

[No.8](#) D2076\_0011

[No.9](#) D1801\_0002

[No.10](#) D1809\_0004

[No.1](#) Target:12C

[No.2](#) Title:Proton

[No.3](#) 1st Author:H.OKAMURA , Target:12C , Physical Quantity:ENGY-SPEC , Journal:PR/C

[No.4](#) Physical Quantity:ENGY-SPEC

[No.5](#) Published Year:-1999

[No.6](#) Journal:JNRS , Data No.:1837

[No.7](#) Target:12C , Residual:12B

[No.8](#) 1st Author:OKAMURA

[No.9](#) Journal:JNRS

[No.10](#) Journal:EPJ/A

To know the “hot” topics

## Details of: D 1804\_0001

VLP:

[PR/C 68\(2002\)54802](#)

TITLE:

Model-independent spin-parity determination by the (d,2He) reaction and possible evidence for

RCT:

12C(d,2He)12B

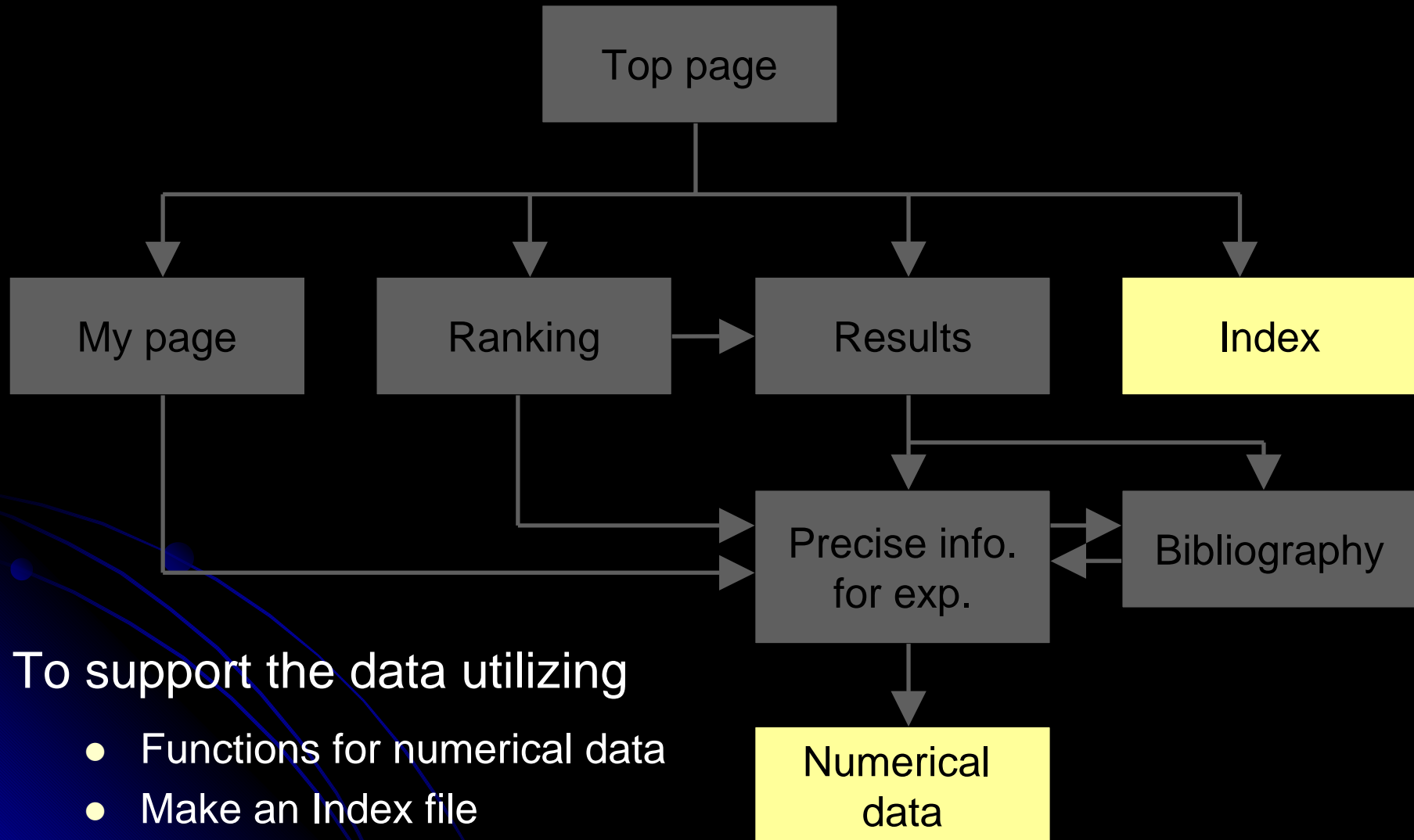
Information for experiment

## Result

Title:   
1st Author: OKAMURA  
Author:   
Target: 12C  
Projectile:   
Emission:   
Residual:   
Physical Quantity: ENGY-SPEC  
Journal: PR/C  
Published Year:   
Data No. D

Results of the search

# Flow-chart of the application system



To support the data utilizing

- Functions for numerical data
- Make an Index file



Pick up numerical data  
with a fixed number

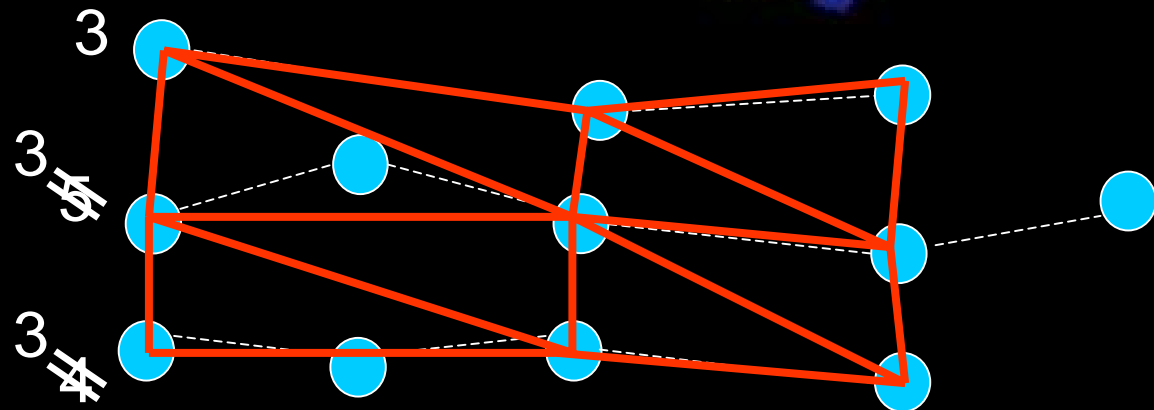
## For the 3-D system

In order to make a mesh point of the object

In the 3-D system, it is necessary to pick up data  
with the same (fixed) number

X	Y	E
x01	y01	e01
x02	y02	e02
x03	y03	e03
x04	y04	e04
x05	y05	e05
x06	y06	e06
x07	y07	e07
x08	y08	e08
x09	y09	e09

Data.txt



AVS/Express

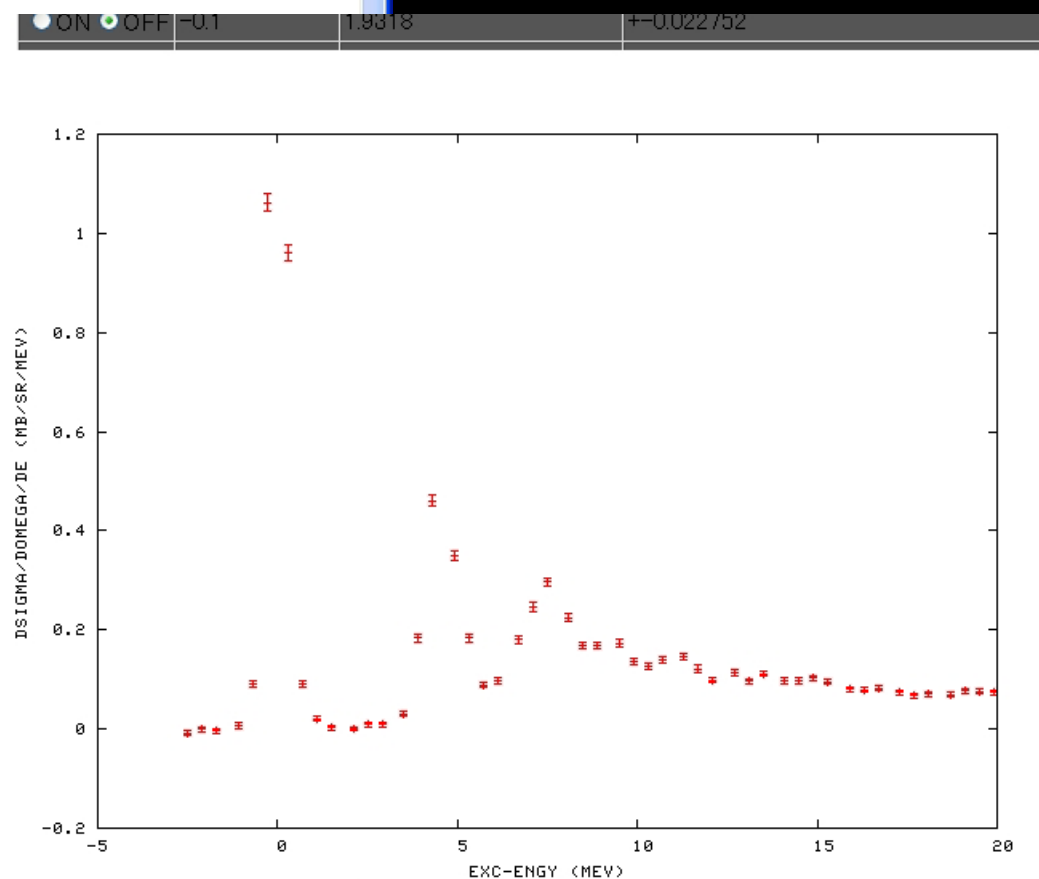
# Function for the data pick up

Data of... D 1804\_0001

☐ All(115)  
☒ Part Average 50 Re-Fresh

Re-Fresh Download

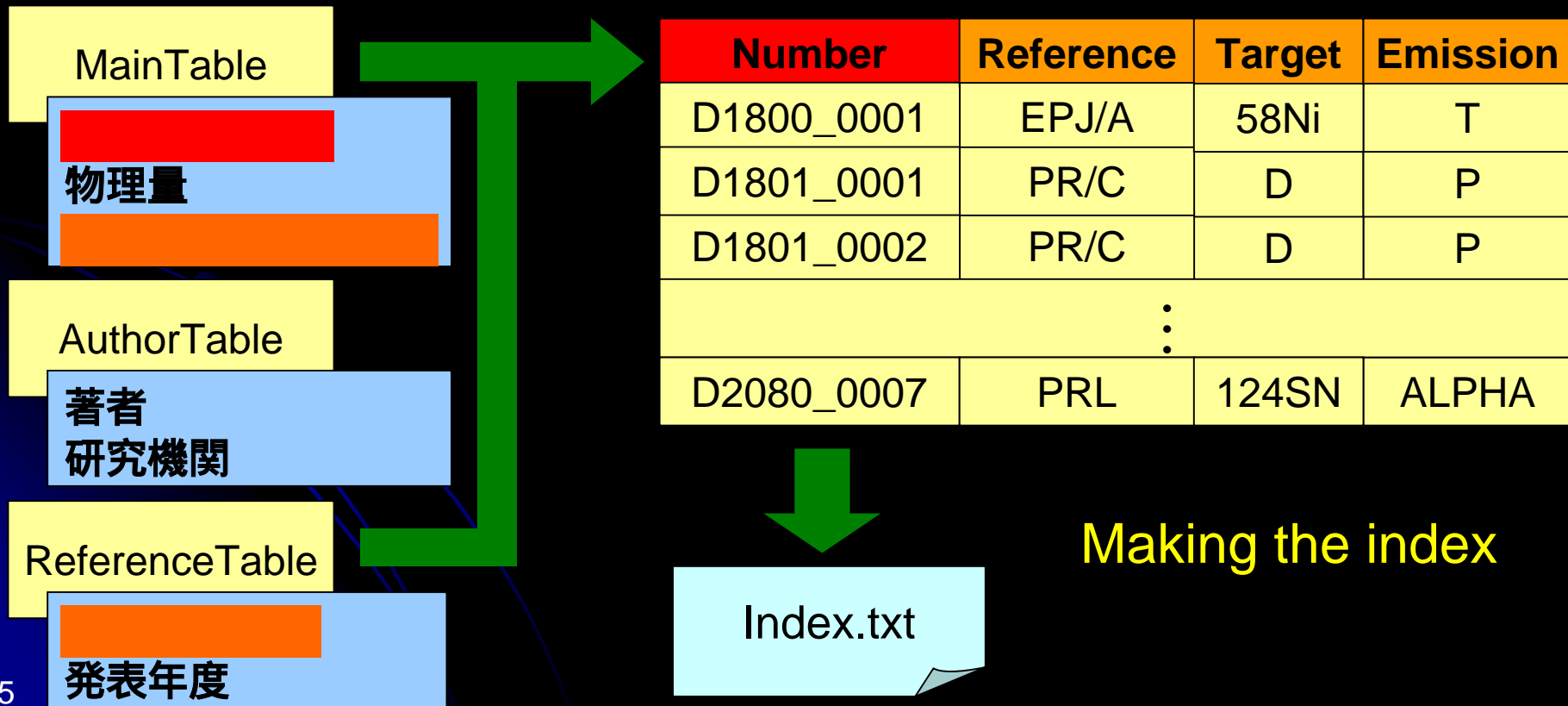
	EXC-ENGY	DSIGMA/DOMEGA/DE	DELTA-DSIGMA
	(MEV)	(MB/SR/MEV)	(MB/SR/MEV)
	<input checked="" type="radio"/> ON <input type="radio"/> OFF	<input type="radio"/> ON <input checked="" type="radio"/> OFF	<input checked="" type="radio"/> ON <input type="radio"/> OFF
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-2.9	-0.0059603	+/-0.0056119
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-2.7	-0.0056485	+/-0.0055827
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-2.5	-0.0079911	+/-0.005641
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-2.3	-0.0030757	+/-0.0057678
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-2.1	-0.0010533	+/-0.0056069
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-1.9	-0.00082878	+/-0.0053575
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-1.7	-0.0040707	+/-0.0053687
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-1.5	-0.0016	+/-0.0053577
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-1.3	0.0012837	+/-0.0055185
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-1.1	0.0072813	+/-0.0058662
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-0.9	0.022393	+/-0.0055858
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-0.7	0.089978	+/-0.0068412
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-0.5	0.34903	+/-0.010446
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-0.3	1.062	+/-0.016992
<input checked="" type="radio"/> ON <input type="radio"/> OFF	-0.1	1.9318	+/-0.022752



# Making an index file

To utilize the data for the “Data mining”

We need to know the trend of each variable in the database as the whole



# Summary and Discussion

- The PostgreSQL-based server and client system for NRDF is developed
- The system is suitable for utilizing data much more than the ordinary text-based search system.
- For Hi-performance data retrieving and using useful functions, e.g. making index, one need more computer power (faster, larger, and multi-pipe)