

Development of the web-based Data Retrieval and Plotting Engine (DARPE)

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We are continuing the development of the data retrieval and plotting system based on the Nuclear Reaction Data File database (NRDF), compiled by Japan Charged Particle Reaction Group (JCPRG). Main features of this system are outlined below.

Introduction

The JCPRG data retrieval and plotting system DARPE is a tool for searching, retrieval and visualization of the nuclear reaction data stored in the NRDF database. It is designed to service nuclear scientists and engineers, theorists and experimentalists, in Japan and abroad.

The JCPRG has begun compiling the Nuclear Reaction Data File database in 1974. Hundreds of data files have been compiled since then. With the rapid expansion of the Internet in the 1990s, it became possible to make a public access to the database, with a possibility of intelligent search, retrieval and convenient graphical presentation of the data. This was first implemented in 1996 and updated later. For a historical overview of the development of the system, see: H. Masui, in: *NRDF Annual Report 1999*, p. 15 (in Japanese), and: H. Masui et al., in: *NRDF Annual Report 2000*, p. 86 (in English).

The retrieval-and-plotting system is based on the Common Gate Interface (CGI). The user accesses the system via WWW using a conventional browser. No additional software or extra skills are required.

The growing amount of accumulated experimental data and, on the other hand, our aim of making the system as user-friendly as possible made us make important modifications adding such new features as new search criteria and multiple plots. What is written below can be considered as a user's manual for the system.

Front page

The front page is the gateway to the DARPE system (Fig. 1). It is located at

<http://www.jcprg.org/darpe/search.html>

The user is invited to form a query (a set of requests limiting the search) using the following fields (typing is always case insensitive).

- **Author** (family name, or initial(s) and family name)
- **Reference.** The user can select from the list of the most popular journals or type the code of the journal.
- **Year** of publication (from 1960 till present).
- **Projectile.** The user types in or selects from the list.
- **Target.** The user types in or selects from the list.
- **Energy** of the projectile. The user can indicate a range of energies, or a single value. The default unit is MeV, but another unit can be selected. The frame of reference (laboratory or center-of-mass) can also be specified (default option – “unknown”).
- **Physical quantity** (a quantity measured in the experiment, or derived from the data). The user selects from the list.

NRDF Database Search on WWW

Input and/or select your search criteria (case insensitive). For help, consult a manual: [English](#) [Japanese](#)

Author: (e.g. TANAKA, H. TANAKA):

Reference: Nucl. Phys. A or type its code here: Year:

Projectile in the form AAAZZ (e.g. ^{12}C): or select from

Target in the form AAAZZ (e.g. ^{12}C): or select from

Energy, range or single value:
from to Unit: Frame:

minimal in the range, or single value maximum in the range, or leave empty MeV keV GeV AGeV A ? Lab. CM

Physical quantity: none

Figure 1: front page of the system

After filling in the desired fields, the user presses the button “Search” at the bottom of the page and waits for a list of results. If the results are not satisfactory, the user may press the “Back” button of his browser and refine his query. Finally, the “Reset” button clears all the query entries and restores the default values.

Bibliographical query

In the simplest case, the user wishes to check the availability of the data published by some author, in some journal, and/or in some year. He can do using the query options “Author”, “Reference” and “Year”. For example, the user entered “**nakano**” in the “Author” field, and selected “**J. Phys. Soc. Japan**” in the “Reference” list. The “Year” was left to be “Any”. Pressing “Submit” leads to the result shown in Fig. 2.

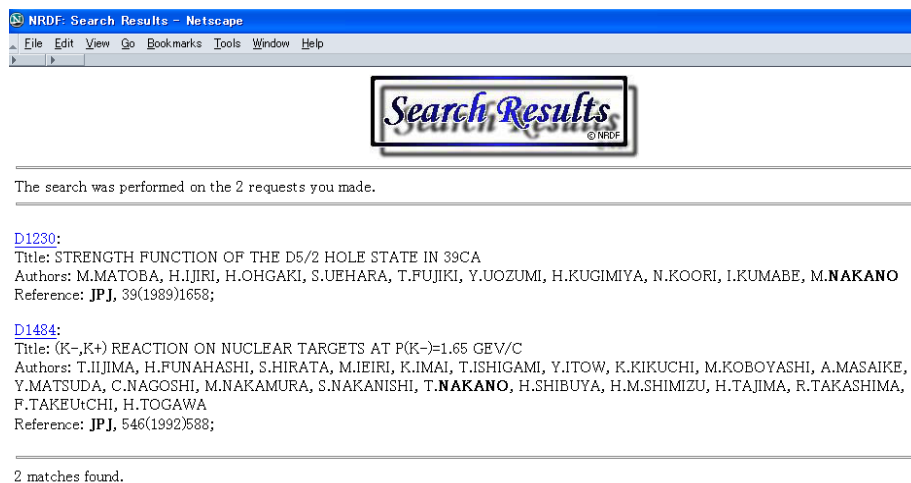


Figure 2: bibliographical query

DARPE informs the user the number of his requests used in the search (there were two: “Author” and “Reference”), and that two papers were found matching his query. Each published paper has its own number in the database that starts with the letter “D”. Clicking on this number, the user may get more information on this paper (Fig. 3). The bibliographical information for each data entry is shown, with the parts matching the query highlighted in **bold font**.

In the “Author” field, a partial match is possible, meaning that entering “TANAKA” will result in “A.TANAKA”, “B.TANAKA”, “C.HATANAKA”, etc. matching the query. To eliminate the latter case (partial name match), put periods before and after the name (e.g., “.TANAKA.”).



D1230 : NRDF's raw-data file is [here](#).

Bibliography

Title :

STRENGTH FUNCTION OF THE D5/2 HOLE STATE IN ³⁹CA

Authors :

M.MATOBA¹,H.IJIRI¹,H.OHGAKI¹,S.UEHARA¹,T.FUJIKI¹,Y.UOZUMI¹,H.KUGIMIZU

Institute of authors : Author index number

KYUSHU UNIV.,DEPT.OF NUCL.ENG.,FUKUOKA : 1, 2
: 3

Reference :

PHYS.REV.C 39(1989)1658

Reactions :

40CA(P,D)39CA

Experimental informations

Institute of experiments : Data number(s)

RESEARCH CENTER FOR NUCLEAR PHYSICS, OSAKA UNIV. : 1-11

Reaction : Data number(s)

40CA(P,D)39CA : 1-11

Incident energy : Data number(s)

65MEV (Lab.) : 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

Figure 3: a database entry

It is possible to fill in two and more names, separated by spaces (e.g.: “TANAKA S.SATO”); the papers have *all* names in the list of authors will be shown. Using the asterisk (*) as a wildcard is also possible (e.g., “TAN*” will match both “TANAKA” and “TANIHATA”).

Reaction query

In general, each data entry in the database contains several data sets. These are tables of data differing in experimental set-up, measured physical quantities, etc. Therefore, if a user's query extends beyond the bibliography, a more thorough search is performed over each of the data sets.

Let us assume that, among the data matching the query considered above, the user wishes to find those where the proton beam was used as a projectile. He may modify his request on the front page entering "P" in the "Projectile" field, or selecting "proton" from the pull-down menu. Pressing "Submit" brings in the following page (Fig. 4).

One of the two papers found in the previous search (Fig. 2) matches this new query. Below the bibliography, there is a table of data sets matching the reaction query. The first column shows the number of the data set, next column the measured physical quantities, and the last – the reactions, as they were scanned to match the query. The physical quantities are shown in abbreviated form ("THTC", "ANALPW", etc.); an explanation ("THTC: Scattering angle theta in c.m. system") can be read by putting the mouse pointer over the abbreviation.



The search was performed on the 3 requests you made.

D1230:

Title: STRENGTH FUNCTION OF THE D5/2 HOLE STATE IN ³⁹CA

Authors: M.MATOBA, H.IJIRI, H.OHGAKI, S.UEHARA, T.FUJIKI, Y.UOZUMI, H.KUGIMIYA, N.KOORI, I.KUMABE, M.NAKANO

Reference: JPI, 39(1989)1658;

The following data sets match your request. Click on the data number to see the plot. Or select the box to plot multiple data.

Data	Physical quantities	Reaction(s)
1 <input type="checkbox"/>	THTC ANALPW DELTA-ANALPW	40CA(P,D)39CA
2 <input type="checkbox"/>	THTC ANALPW DELTA-ANALPW	40CA(P,D)39CA
3 <input type="checkbox"/>	THTC ANALPW DELTA-ANALPW	40CA(P,D)39CA
4 <input type="checkbox"/>	THTC ANALPW DELTA-ANALPW	40CA(P,D)39CA
5 <input type="checkbox"/>	THTC ANALPW DELTA-ANALPW	40CA(P,D)39CA
6 <input type="checkbox"/>	THTC ANALPW DELTA-ANALPW	40CA(P,D)39CA
7 <input type="checkbox"/>	THTC ANALPW DELTA-ANALPW	40CA(P,D)39CA
8 <input type="checkbox"/>	THTC ANALPW DELTA-ANALPW	40CA(P,D)39CA
9 <input type="checkbox"/>	THTC ANALPW DELTA-ANALPW	40CA(P,D)39CA
10 <input type="checkbox"/>	THTC ANALPW	40CA(P,D)39CA
11 <input type="checkbox"/>	EXC-ENGY SPEC-FCTR	40CA(P,D)39CA

1 match found.

Figure 4: reaction query

Energy query

The possibility to select the data with a given beam energy (or an energy range) is a new convenient feature of DARPE. The user can input a single value of the energy in the first of two energy fields leaving the second field blank. Alternatively, a range of energies may be given, when both of the fields are filled in. The units of energy can be selected too, with “MeV” being the default option. Note that at present (March 2003), DARPE does not convert the units; “1000 keV” may not match “1 MeV”. In addition, the user may further indicate that the frame of reference is laboratory (“Lab.”) or center-of-mass (“CM”). The default option is “?”, allowing for either of the frames.

For example, suppose the user have made the following query:

- Reference: **J. Phys. Soc. Japan**
- Projectile: **P**
- Target: **12C**
- Energy: from **10 to 20 MeV**

The result will look like on Fig. 5.

The search was performed on the 6 requests you made.

D1414:

Title: SPIN FLIP IN THE INELASTIC SCATTERING OF PROTONS FROM 12C AT ENERGIES AROUND 13.1 MEV RESONANCE

Authors: S.KOBAYASHI, S.MOTONAGA, Y.CHIBA, K.KATORI, A.STRICKER, T.FUJISAWA, T.WADA

Reference: **JPJ**, 29(1970)1;

The following data sets match your request. Click on the data number to see the plot. Or select the box to plot multiple data.

Data	Physical quantities	Reaction(s)	Energies
1 <input type="checkbox"/>	THTL SFLP DELTA-SFLP	12C(P,P)12C	12.268 MEV
2 <input type="checkbox"/>	THTL SFLP DELTA-SFLP	12C(P,P)12C	12.664 MEV
3 <input type="checkbox"/>	THTL SFLP DELTA-SFLP	12C(P,P)12C	13.099 MEV
4 <input type="checkbox"/>	THTL SFLP DELTA-SFLP	12C(P,P)12C	12.990 MEV
5 <input type="checkbox"/>	THTL SFLP DELTA-SFLP	12C(P,P)12C	13.173 MEV
6 <input type="checkbox"/>	THTL SFLP DELTA-SFLP	12C(P,P)12C	13.377 MEV
7 <input type="checkbox"/>	THTL DSIGMA/DOMEGA	12C(P,P)12C	12.268 MEV
8 <input type="checkbox"/>	THTL DSIGMA/DOMEGA	12C(P,P)12C	12.268 MEV
9 <input type="checkbox"/>	THTL DSIGMA/DOMEGA	12C(P,P)12C	12.664 MEV
10 <input type="checkbox"/>	THTL DSIGMA/DOMEGA	12C(P,P)12C	12.664 MEV
11 <input type="checkbox"/>	THTL DSIGMA/DOMEGA	12C(P,P)12C	13.099 MEV

Figure 5: energy query

The energies matching the desired range are now shown along with the reactions.

In general, it is advised to form a query with an energy range rather with a single energy value.

Physical quantity query

With DARPE, one can specify the physical quantity measured in the experiment in his query. Selecting an item in the “Physical quantity” pull-down menu does this.

An example. The user chooses the following search criteria:

- Reference: **Nuclear Physics A**
- Year: **1979**
- Projectile: **12C**
- Physical quantity: **Polarization (POL)**

Then, after pressing the “Search” button, the user gets the result as shown in Fig. 6. Only data sets 1, 2 and 4 of the entry D350 match the whole query.

The search was performed on the 4 requests you made.

[D350](#):
Title: ELASTIC AND INELASTIC SCATTERING OF 185 MEV PROTONS FROM 12C
Authors: A. INGEMARSSON, O. JONSSON, A. HALLGREN
Reference: NP/A, 319(1979)377;

The following data sets match your request. Click on the data number to see the plot. Or select the box to plot multiple data.

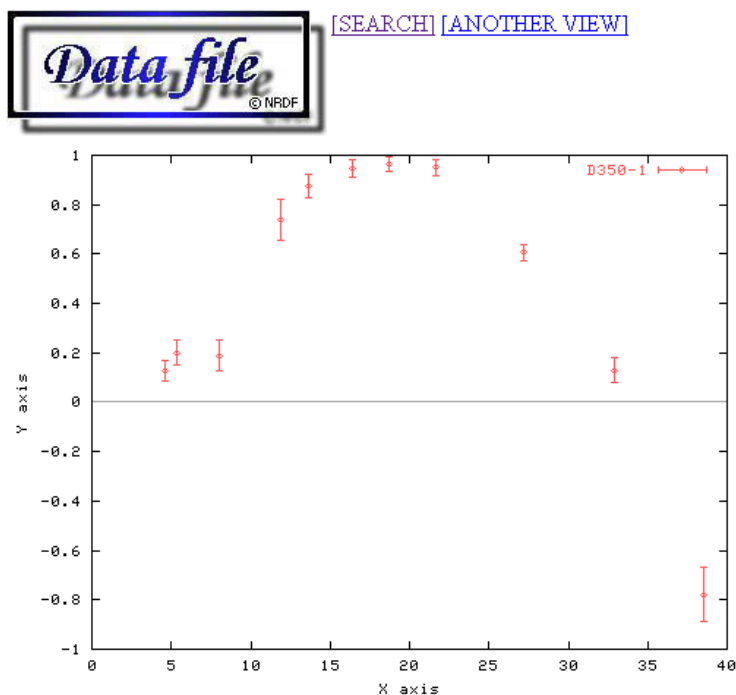
Data	Physical quantities	Reaction(s)
<input type="checkbox"/> 1	TH1C POL DELTA-POL	(12C+(P,P)12C)
<input type="checkbox"/> 3	TH1C POL DELTA-POL	(12C+(P,P)12C)
<input type="checkbox"/> 4	TH1C POL DELTA-POL	(12C+(P,P)12C)

1 match found.

Figure 6: physical quantity query

Plotting the data online

As noted above, when a query extends beyond the bibliographical information, the results are summarized in tables with each line representing a set of experimental data. The number of this set is given in the first column. Clicking on this number with the mouse pointer results in a new page with a plot of this data set. The first and second columns of a data set are used to plot the data points; the corresponding physical quantities are highlighted with color (the second function is plotted as a function of the first). The third column is used for the vertical error bars, if applicable. Otherwise, the data points are connected with lines to guide the eye.



[\[LOG\]](#)

D350-1:

X-AXIS = SCATTERING ANGLE IN CENTER OF MASS SYSTEM (DEG)

Y-AXIS = Polarization (NODIM)

RCT =

NUCL.PHYS.A 319(1979)377

Document: Done (1.182 secs)

Figure 7: plot of a single data set

Thus, a click on the number “1” in the “Data” column (Fig. 6) opens the page shown in Fig. 7. Along with the axis captions and units, bibliographical and other relevant information is given under the plot. With a single mouse click, the plot can be redrawn with the logarithmic scale of the Y-axis, and backwards.

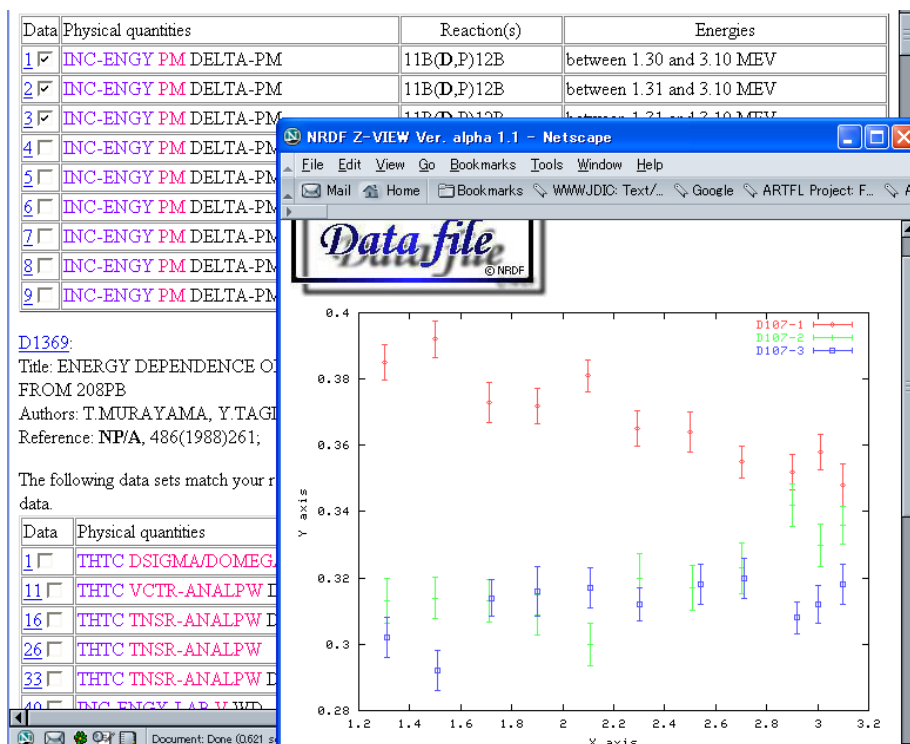


Figure 8: multiple data plot

It is possible to combine several data sets in the same plot. The user selects the sets to plot by checking the boxes next to the corresponding data numbers in the “Search results” page (see Fig. 6) and clicks the “Plot” button at the bottom of the page (Fig. 8). In this way it is possible to plot the data of different database entries; for instance, compare the data obtained in different experiments.

It normally takes DARPE several seconds to make the plot (with the GNU PLOT utility), but making a change in the plot (removing part of the points, connecting them with lines, etc.) requires a contact with DARPE. This is because it is the server hosting DARPE that performs all operations. There is another, experimental version of the DARPE viewer, accessible through the hyperlink

[ANOTHER VIEW] on the top of the page with graphics. This version makes use of a Java applet, transmitting all the necessary information to the client side during the first request. The subsequent modifications of the plot are instantly performed by the applet on the client side. The appearances of the two versions are compared in Fig. 9.

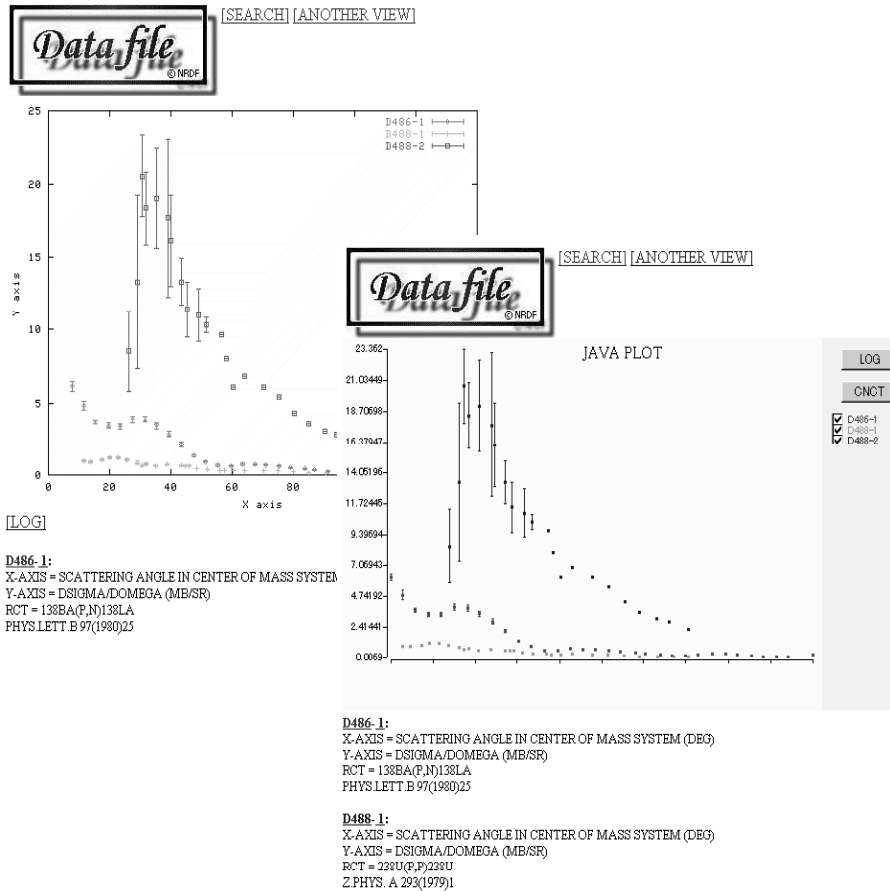


Figure 9: GNUPLOT (left) and Java presentations of the same plot

Summary and further development

Apart from the new name “DARPE”, there are two major upgrades in the system. The first is the “Energy” search field. Along with a selection of units and frame of reference, this eliminates the necessity to scroll through a vast amount of *a priori* useless information. The second main new feature is the multiple data plotting. Up to now, the plotting was only able to reproduce one data set of a single entry; in many cases, the same plot could be found in a published paper. The multiple data plotting system is more flexible and allows for combining data from different tables and even papers, thus making it possible to quickly visually compare the data from different experiments, authors, etc. Even the user’s original, theoretical or experimental, data may be added to the plot (this option is under development).

New features bring new problems to be solved. One of them, the conversion of energy units (MeV to keV and *vice versa*), was mentioned. While plotting multiple data simultaneously, the user may attempt to plot the incompatible data, and some protection against such “illegal” operations is yet to be developed. That is why DARPE is being developed and improved permanently. Here are some of the features that we work on now:

- possibility to assign various columns of data tables to X and Y axes in plots;
- multiple-page output of the result, if it is too long;
- hints on usage, like pop-up small windows or mouse-over tips;
- possibility of saving the data in a plain-text format;
- suggestions if the search result is too long or empty; for example, suggesting a correct spelling of the author’s name;
- possibility for a multiple choices in some search fields.

Finally, we would appreciate any feedback from users that will help make DARPE a more effective and user-friendly system. We encourage test DARPE and report bugs and your suggestions to

darpe-admin@jcprg.org

