

# NIFS Retrieval Display System for Atomic Data through the WWW

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## Abstract

The Data and Planning Center at NIFS has developed a retrieval display system for atomic data since 1979. This year we reconstructed our atomic database to be accessible via the World Wide Web. We introduce our atomic and molecular numerical databases and describe how to use them.

## 1 Introduction

Data compilation and evaluation of atomic and molecular data for fusion research was initiated by working groups organized by Professors K. Takayanagi, H. Suzuki et al. in our former institute (Institute of Plasma Physics, Nagoya Univ.) in 1975 [1]. This work has continued in the Research Information Center in IPP, Nagoya from 1979 [2] including surface data and in the Data and Planning Center of the National Institute for Fusion Science since 1989 [3]. The retrieval and display system for four kinds of numerical data, listed below, was developed as a joint research program with Drs. Y. Kanada, K. Takasugi and R. Ogasawara et al. This system has been open for users since 1981 [4, 5] through a main frame computer (FACOM).

In 1997, we changed the database system to be accessible via the World Wide Web, and the system has become easier to access and retrieve data from.

We have four numerical databases:

- AMDIS** Cross sections for ionization and excitation of atoms, ions, and molecules by electron impact
- CHART** Cross sections for charge transfer and ionization of atoms, ions, and molecules by collisions
- SPUTY** Experimental sputtering yields for monatomic solids by ions
- BACKS** Particle and energy-backscattering coefficients of light ions from solids

Each database has numerical data tables with references and empirical formulas. The bibliographic information on numerical data contains the method of the experiment or theory, as well as the authors' names, paper title, journal name, page, and published year. Following, we describe how to access the new databases, how to use the retrieval display system, and provide examples.

## 2 How to Access the Databases and Retrieve Data

We require users to register and get an account before they access the databases. This does not mean that we charge users. We need to know who is using the databases and for what purpose.

For registration, access the URL address, <http://dbshino.nifs.ac.jp/>. Following the instructions, go to the brief description page on the databases and regulations, and then go to the registration page where you may submit your personal information for registration to [dbmaster@dbshino.nifs.ac.jp](mailto:dbmaster@dbshino.nifs.ac.jp). Do not forget to write your purpose for using the databases. We opened the databases only for scientific research, and we will determine who is acceptable as a user. You will receive your account ID and password in a week by e-mail.

At the front page, we also link to our other web site at URL= <http://lamdata.nifs.ac.jp/> for information on the numerical databases. You will find tables showing how many data sets are stored for each ion species. After clicking the position of the ion you are interested in, you will find graphs of the cross section from AMDIS. Also, there are examples of data stored in ALADDIN format with graphs for rate coefficients as well as cross sections.

Here, we briefly describe how to use our numerical databases. The procedure is as follows:

1. Access the system at URL=<http://dbshino.nifs.ac.jp>, type in your account ID and password.
2. Choose a database name from the list.
3. Set searching conditions, such as element name, and search.
4. Select process(es) which you are interested in from the list.
5. Select either *standard* or *custom* for bibliographic information or numerical data for tables and graphs and push the display button.
6. Select units for the data to be displayed for AMDIS, CHART, and BACKS and push the display button.
7. 20 bibliographic data items are shown in one page.
8. For AMDIS, you may choose data one by one to be displayed in tables or graphs.
9. For BACKS, choose angles or energy to be plotted in a graph.
10. Before drawing graphs, you may specify how to draw axes, whether to draw an empirical curve or not, and the positions for drawing symbol descriptions. A postscript file of the graphs can be downloaded after they are drawn.

For each step in this procedure, you move on to a deeper web page. To each web page is attached a help page which pops up as a separate window. In Step 2, you will find CURVE which draws empirical formulas for specific ions.

## 3 Examples

Following are examples of searching for ionization cross sections by electron impact and excitation cross sections (AMDIS).

### 3.1 AMDIS Ionization

To search for cross sections for a single ionization of neutral Neon, put "Ne" for element, "0" for initial ionic state, and "+1" for final ionic state, as shown in Fig. 1. In addition, you may specify author names, published years, and some more conditions or select theoretical, experimental, or evaluated data.

You can make numerical data tables or graphs. The graph of the cross section is shown in Fig. 2 for this case. An empirical curve calculated with Lotz's formula can be drawn together with the data.

AMDIS IONIZATION [Help]

Search Data Form Clear

Element:   
Initial ionic state:   
Number of electrons:  (if you want to search for isoelectronic sequence.)  
Final ionic state:   
 Theoretical  Experimental  Evaluated  
Author:   
Year of Publication: From  To:  (YYYY)  
Additional conditions for search:  [Type Table] [Journal Table]

Figure 1: A sample for setting search conditions for AMDIS-IONIZATION.

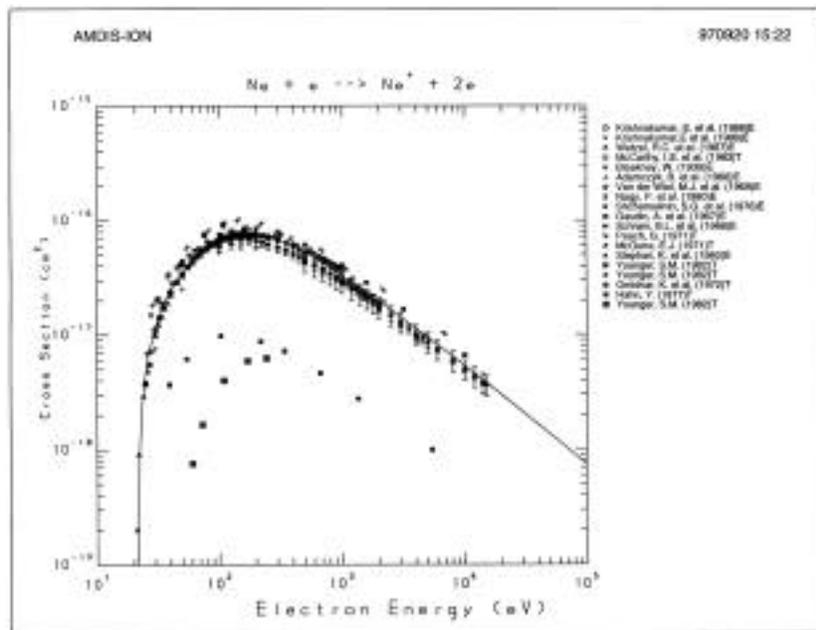


Figure 2: Cross section for the single ionization of neutral Neon, drawn in AMDIS-IONIZATION. The Lotz's empirical formula is also drawn.

### 3.2 AMDIS Excitation

Similarly, you can search for the excitation cross section from  $1s^2\ ^1S$  to  $1s2p\ ^1P$  for He-like carbon, for example. Enter "C" for element and "2" for the number of electrons. For the initial state configuration, enter " $1s^2$ ". For the final state, enter " $1s\ 2p$ " for the configuration, "1" for the multiplicity, and "P" for the orbital angular momentum.

When making a graph, you can select either a cross section or collision strength. An example of the latter is shown in Fig. 3.

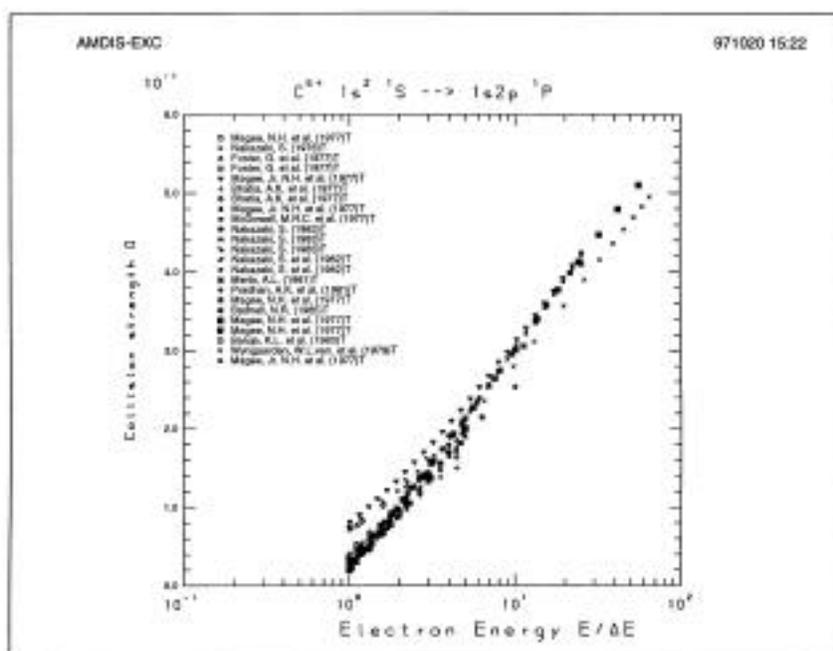


Figure 3: Collision Strength as a function of  $E/\Delta E$ , drawn in AMDIS-EXCITATION.

## 4 Remarks

We are interested in atomic data needs and appreciate your comments and requests. We welcome your suggestions on improving the databases. Please send your requests, questions, and your data by e-mail to [dbmaster@dbshino.nifs.ac.jp](mailto:dbmaster@dbshino.nifs.ac.jp). Instructions on data formats are being prepared and will appear soon.

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## References

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