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Bibliographic databases and ENSDF programmes "An Introduction to Nuclear Science Reference (NSR)"

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An Introduction to Nuclear Science References (NSR)

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BROOKHAVEN NATIONAL LABORATORY

a passion for discovery

Office of Science
U.S. DEPARTMENT OF ENERGY

NSR Nuclear Science References

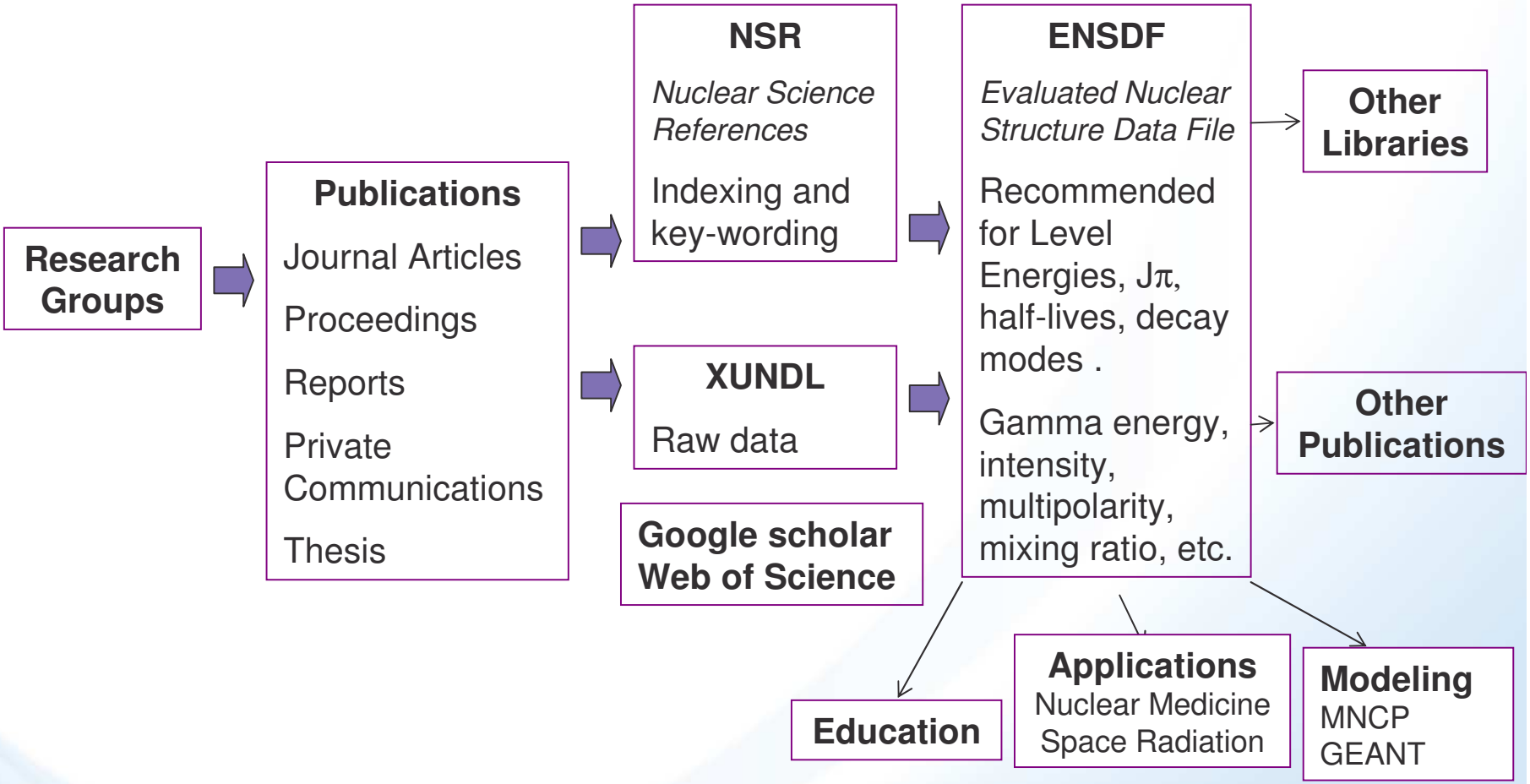
www.nndc.bnl.gov/nsr

NSR (Nuclear Science References) is a bibliographic database containing nearly 200,000 nuclear science articles, indexed according to content. About 4,000 are added each year covering 80 journals as well as conference proceedings, laboratory reports, thesis and private communications. Each article included in NSR is read and assigned a number of variables that succinctly described its content. These variables, also known as keywords, are then incorporated in a database.

One unique feature of NSR is the ability to selectively retrieve articles out of a vast number, satisfying a particular set of conditions. Articles can be retrieved according to: first author, author, nuclide, reaction, target, measured quantity, publication year, type of publication (primary or secondary), journal, topics, etc.

NSR Management at the NNDC, Manojeet Bhattacharya, nsr@bnl.gov.
All programming work done by Dave Winchell, formerly at the NNDC.

Nuclear Structure Evaluation



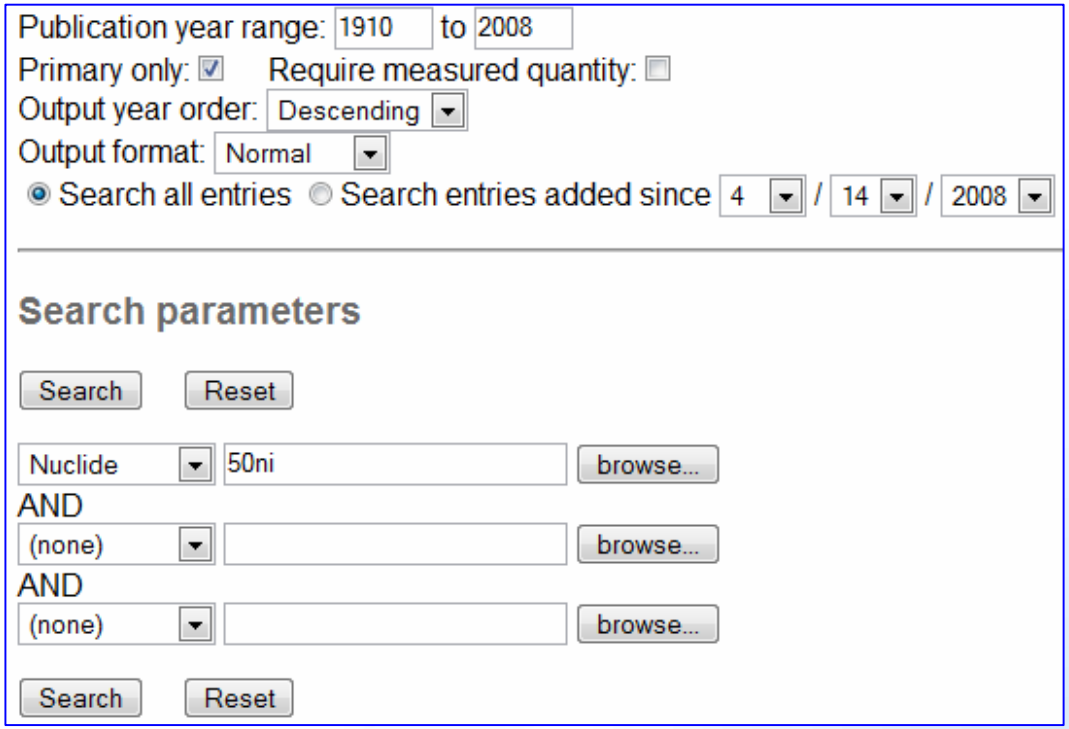
NSR Example #1

Retrieve all articles associated with a given nucleus, for instance, 50Ni

Go to www.nndc.bnl.gov/nsr and click on the Indexed search hyperlink.

Select Nuclide in the first Drop down menu and type "50ni".

Click on Search.



As of April 14 2008, 17 articles should appear, from 1972 to 2007.

NSR Example #1

Some of the Initialization parameters are fairly easy to understand, such as Publication year range, Output year order, Output format and Search all entries / Search entries added since. A couple of them require some explanation:

Primary only

Articles that are appear in NSR that were published in journals are considered "Primary entries", while articles published in books, conference proceedings, laboratory reports, or private communications, are considered "Secondary entries". Conference articles that appear in Journals are primary, the rest are considered secondary.

Require measured quantity

Checking this check box will result in retrieving articles reporting the results of experimental studies.

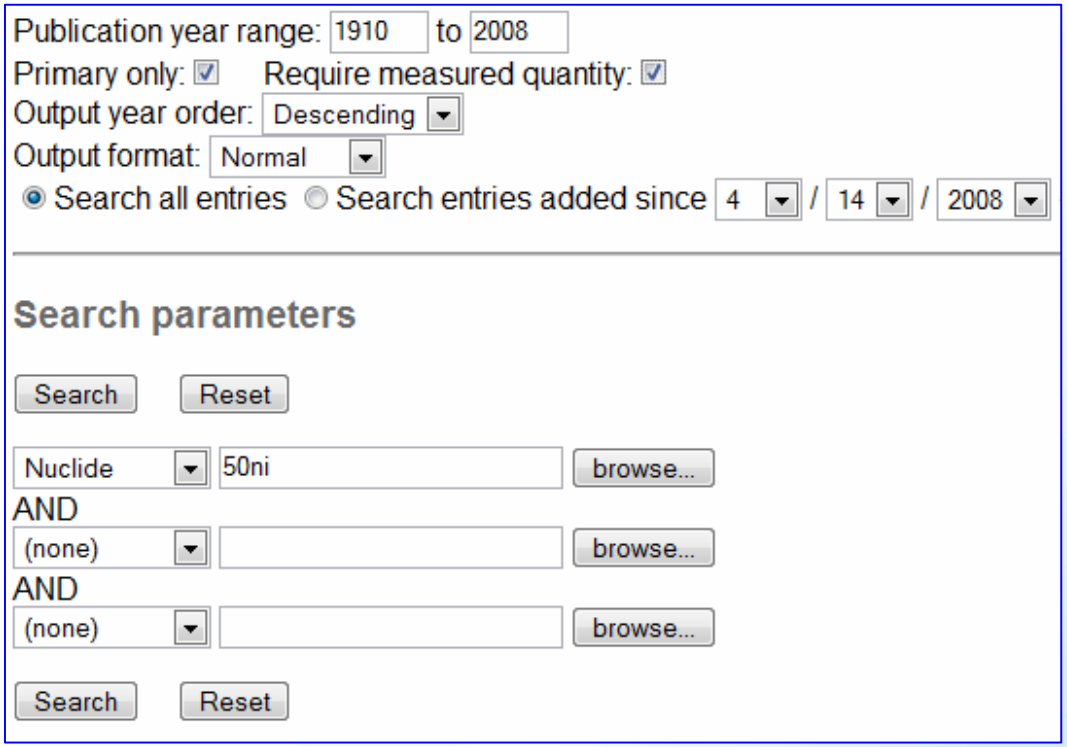
NSR Example #2

Retrieve all articles associated with a given nucleus, for instance, 50Ni that were published in journals and that report experimental results

Go to www.nndc.bnl.gov/nsr and click on the Indexed search hyperlink.

Select Nuclide in the first Drop down menu and type "50ni". Also, check on Primary only and on Require measured quantity

Click on Search.



As of April 14 2008, two articles should appear

Let's examine one element of the search results

NSR Example #2

NSR key number

Reference

Authors

2007DO17

Nucl.Phys. A792, 18 (2007)

C.Dossat, N.Adimi, F.Aksouh, F.Becker, A.Bey, B.Blank, C.Borcea, R.Borcea, A.Boston, M.Caamano, G.Canchel, M.Chartier, D.Cortina, S.Czajkowski, G.de France, F.de Oliveira Santos, A.Fleury, G.Georgiev, J.Giovinazzo, S.Grevy, R.Grzywacz, M.Hellstrom, M.Honma, Z.Janas, D.Karamanis, J.Kurcewicz, M.Lewitowicz, M.J.Lopez Jimenez, C.Mazzocchi, I.Matea, V.Maslov, P.Mayet, C.Moore, M.Pfutzner, M.S.Pravikoff, M.Stanoiu, I.Stefan, J.C.Thomas

The decay of proton-rich nuclei in the mass A = 36-56 region

NUCLEAR REACTIONS Ni(^{58}Ni, X), E=74.5 MeV/nucleon; measured fragments isotopic yields.

RADIOACTIVITY ^{36,37}Ca, ^{39,40,41}Ti, ^{43}V, ^{42,43,44,45}Cr, ^{46,47}Mn, ^{46,47,48,49}Fe, ^{50,51}Co, ^{49,50,51,52,53}Ni, ^{55}Cu, ^{55,56}Zn(β^+), (EC), (β^+p) [from Ni(^{58}Ni, X)]; measured $T_{1/2}$, β-delayed proton and γ spectra, branching ratios. ^{43,45}Cr, ^{46}Mn, ^{46,47,48}Fe, ^{50}Co, ^{50,51,52,53}Ni deduced levels. Two-proton decay observed. Comparison with model predictions.

doi: 10.1016/j.nuclphysa.2007.05.004

Data from this article have been entered in the XUNDL database. For more information, click here.

Link to article (PDF), requires subscritption

Keywords, which describe article's content

Link to data in article

NSR Key Numbers

These are 9-character long strings. The first four identify the publication year, the following two are usually the first two letters of the first author's last name, for instance, SM for Smith. If the last two characters are numeric, the article corresponds to a primary entry. If they are not, it is a secondary entry. NSR key numbers are assigned by the NSR database manager and are unique to each article.

NSR Keywords

They briefly describe the article's content. They follow a firm set of guidelines and they strongly increase NSR search abilities.

The **DOI**, or Data Object Identifier, contains the link to the article. Typically, the abstract and references can be viewed for free. The whole article, in PDF format, can be accessed if you have a paid subscription to the journal.

Some articles contain experimental information, which can be stored in the XUNDL database (eXperimental Unevaluated Nuclear Data List). The data is stored in the ENSDF format.

NSR Example #3

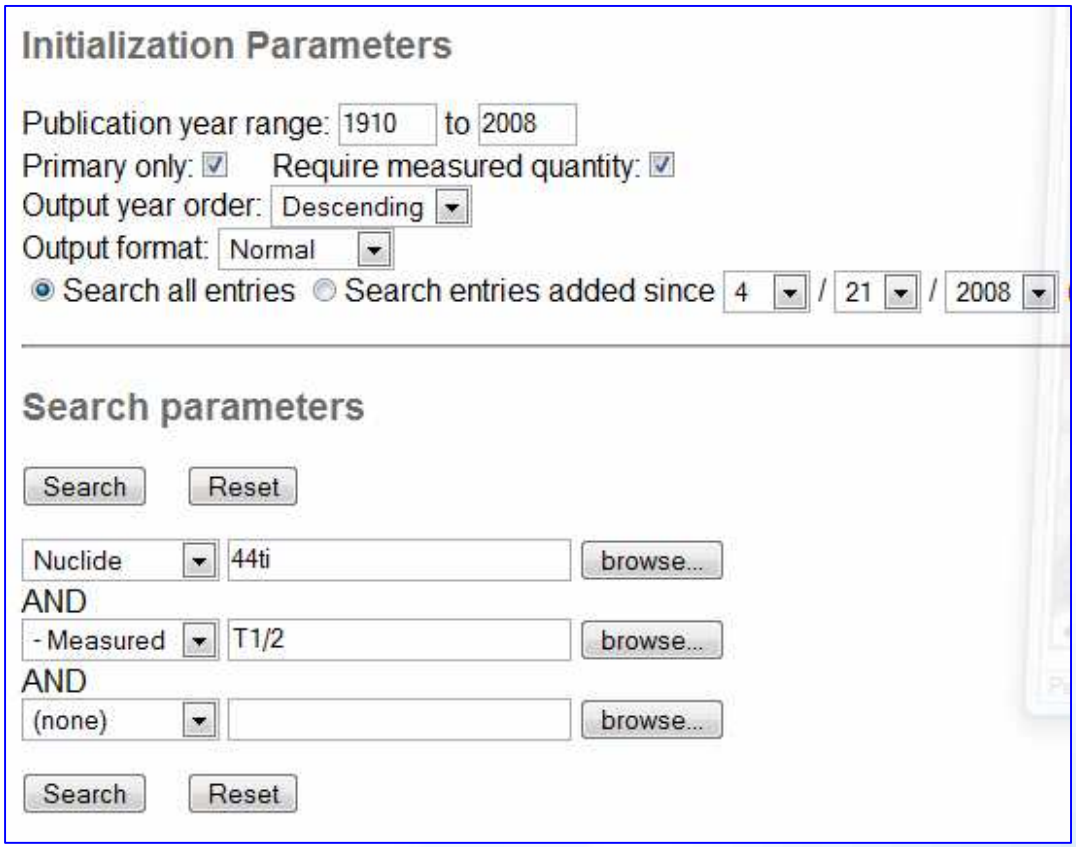
Find articles that report experimental values of 44Ti half-life.
1) Go to www.nndc.bnl.gov/nsr and select indexed search.
2) Check on Required measured quantity
3) Select “Nuclide” from menu and type 44ti
4) Click on search

We find more than 140 articles. However, only some of them report half-life values. To further constraint the search we:

4) Select “Measured” on the second menu and then click the corresponding “browse” button. A list with possible measured quantities will be shown.
5) Scroll down until we find the “T1/2” hyperlink and then click on it. We should now be directed back to the “index search” page.
6) Click on Search. Some eleven articles should now be listed.

NSR Example #3

Finding articles that report experimental values of 44Ti half-life. The form should look like:



The “Measured” fields are of enormous help to perform ENSDF evaluations. For instance:

- Selecting G-SPECTRA will allow to search for articles reporting measured gamma ray spectra, a field that has been dominant in nuclear structure research in the last 30 years.
- The most common decay modes are Electron Capture (EC), Positron Emission (B+), Beta minus (B-), Isomeric Transition (IT), Alpha (A), Spontaneous Fission (SF) and Proton emission (P). By selecting on A-DECAY, we will retrieve articles dealing with alpha-decay, etc.
- The study of nuclear levels at high values of angular momentum is covered by selecting HIGH-SPN.
- Articles dealing with shape parameters can be retrieved by selecting DEFORMATION.
- Selecting DIPOLE/QUADRUPOLE will retrieve articles reporting magnetic dipole moments/electric quadrupole moments.

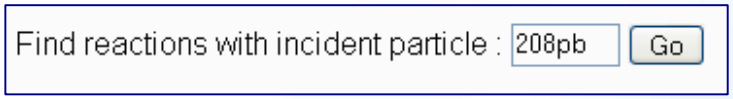
Warning: Do not trust NSR blindly! Some of the “Measured” fields may be more restrictive than what you think.

NSR Example #4

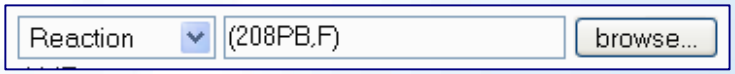
Problem: You vaguely remembered an article of interest that used 208Pb as a beam. How to find it?

1) In the “Indexed search” page, select “Reaction” from the menu and then click on its corresponding “browse” button.

2) Type 208pb in the first text box and click on its go button



Now click on the reaction of interest, i.e. (208PB,F)



3) You should directed back to the indexed search page. Click the “search” button to complete the query

NSR Example #5

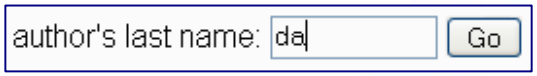
Similar problem as before, you vaguely remember the name of one of the authors of the article you are looking for.

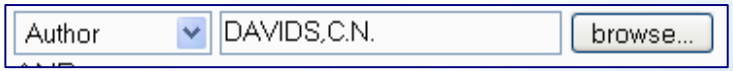
1) Go to “Indexed search”.

2) Select “Author” and click on its corresponding “browse” button.

3) Type at least the first two letters of the author’s last name, i.e. “da”, and click “go”

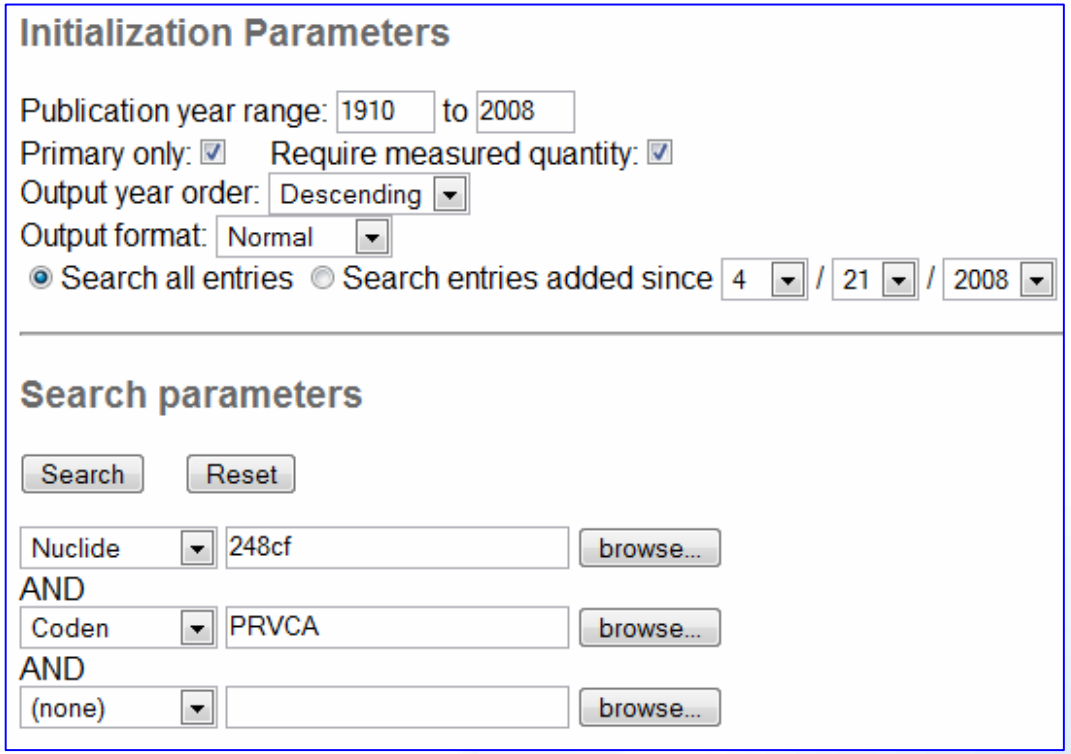
4) A list of all the last names in NSR starting with “da” will be produced, select one, i.e. davids, c.n. You should directed back to the indexed search page. Click the “search” button to complete the query





NSR Example #6

Finding articles that deal with 248Cf and that were published in Physical Review C. The Journal selection is done by selecting Coden and then clicking on browse:



Browsing is a very powerful tool to check NSR contents and to help define searches

More on NSR Key Numbers

Key numbers are used through ENSDF to make reference to a particular article. The following is a comment from 208Pb adopted levels:

> $T_{1/2}$: from B(E3)=0.611 9, a weighted average of 0.611 12 (1983Sp02) in Coulomb excitation, and 0.612 13 (1980Go12) in (e,e'). The value of 32 ps 11 reported by 1962We14 in β^- decay appears to be in error. Other: 15.4 ps 12 from B(E2) in (α,α').
> Isomer shift=6.25 28 from muonic atom (1977Sh07).

A given article can be accessed using the NSR link manager, for instance, we can look at the contents of 1983Sp02 with the following link: www.nndc.bnl.gov/nsr/nsrlink.jsp?1983sp02,b

Two parameters are passed to the jsp page, the key number itself, and the output format, in this case b.

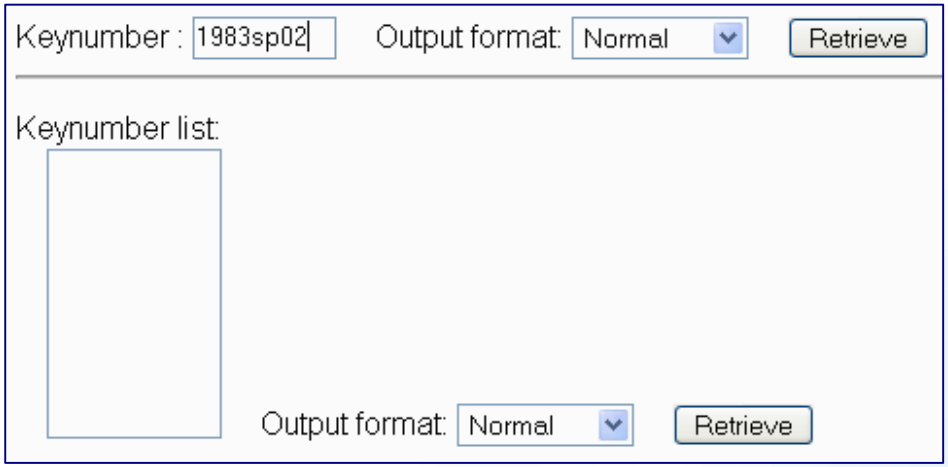
If the output parameter is h, the output is an html page generated by the NNDC. If it is b, you'll be redirected to the publisher's page. If it is x, you'll get an output in the exchange format, the raw format of the NSR database.

NSR Example #7

One can also search on key numbers, for that go to www.nndc.bnl.gov/nsr and click on the Keynumber retrieval hyperlink.

One can retrieve information for a single key number, or for a number of them.

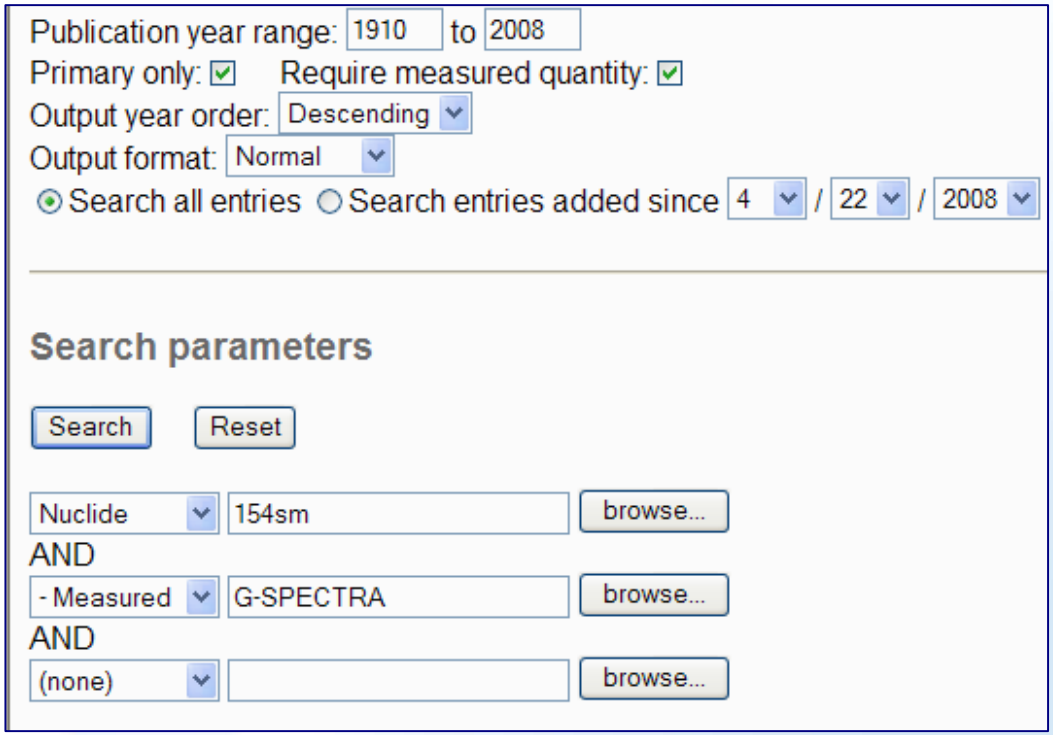
There are several options for the output. A very interesting one is the bibTex option, that allows to generate a bibTex file to be used in LaTex word processing



NSR Example #8

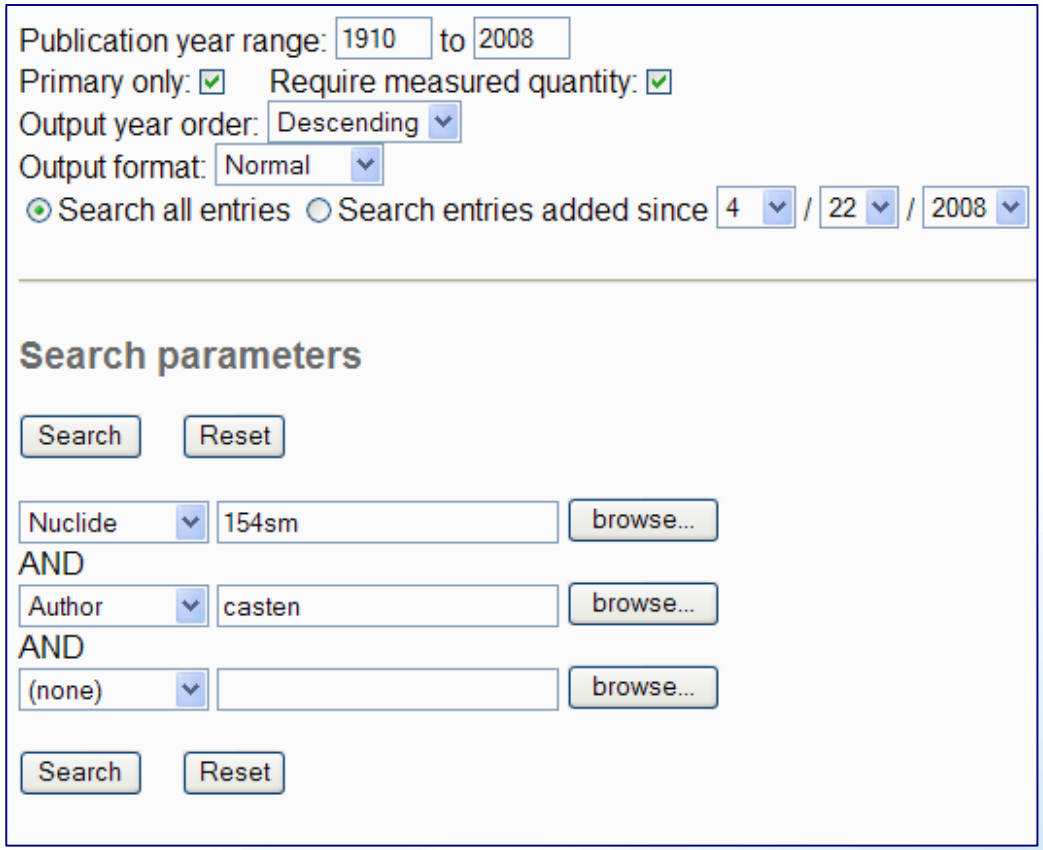
NSR Index search page allows to select up to 3 parameters and search the AND condition between them. More complex searches can be achieved by further filtering with Combine/View lists feature.

For instance, imagine we want to find experimental articles gamma spectra measurements for 154Sm. The search form will look like:



NSR Example #8

We could also search by experimental articles on 154sm requiring one particular author, for instance ‘casten’. The search form will look like:



NSR Example #8

The last 2 results can be combined by clicking on the Combine/view lists Hyperlink. If we want the and of the two, the form will look like:

Combine lists:

1 AND 2 Combine

Output format: Normal Output year order: Descending

Current lists:

List #	Search/Initialization strings	Number found
1	Indexed quantity search: Nuclide=154sm AND Measured=G-SPECTRA YLO:1910; YHI:2008; PRIM:yes; EXPR:yes; Cutoff:None	29
2	Indexed quantity search: Nuclide=154sm AND Author=casten YLO:1910; YHI:2008; PRIM:yes; EXPR:yes; Cutoff:None	1

Clear Lists

And this will retrieve the single article where Casten is an author.

NSR Example #8

Similarly, the 1 and not 2, will return the 28 articles in list 1 where Casten is not an author.

Combine lists:

1 | AND NOT | 2 | Combine

Output format: Normal Output year order: Descending

Current lists:

List #	Search/Initialization strings	Number found
1	Indexed quantity search: Nuclide=154sm AND Measured=g-spectra YLO:1910; YHI:2008; PRIM:yes; EXPR:yes; Cutoff:None	29
2	Indexed quantity search: Nuclide=154sm AND Author=casten YLO:1910; YHI:2008; PRIM:yes; EXPR:yes; Cutoff:None	1

This deliberately simple example illustrates the power of combining lists. However, care should be exercised when dealing with some of the subjects.