Activities of Hokkaido University Nuclear Reaction Data Centre (JCPRG)

Aug. 27, 2012

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Nuclear Reaction Data Centre (JCPRG)
Hokkaido University
JAPAN
Main Objectives of JCPRG

- Compilation of charged-particle and $\gamma$ induced nuclear reaction data obtained in Japan
- Evaluation of nuclear reaction data on light nuclei
- Development of collaboration among Asian and International Nuclear Reaction Data Centres (NRDC)
- Education for graduate school students
Introduction

• **Members**
  • 2 professors, 2 senior and 5 postdoc researchers (Working Group members)
  • Other colleagues (Centre Meeting, Advisory Board and Steering Committee members)

• **Duration**
  • 5 years, and 4 years remaining (~ Mar., 2016)

• **Collaboration**
  • IAEA and NRDC
  • Meme Media Laboratory, Hokkaido University
  • RIKEN
  • Japan Atomic Energy Agency (JAEA)
Objectives of collaboration

- **IAEA and NRDC**
  - Compilation of charged-particle and $\gamma$ induced nuclear reaction data

- **Meme Media Laboratory**
  - Software development

- **RIKEN**
  - Compilation of recent and old RIKEN data
  - Research of nuclear transformation
  - Research of astrophysical nuclear reaction data

- **JAEA**
  - Education for graduate school students
  - Evaluation of nuclear reaction data on light nuclei
  - Cooperation for NRDC
Compilation result (May, 2011 - Apr., 2012)

• NRDF (Original database of JCPRG)
  • 50 new papers of charged-particle and $\gamma$ induced reaction data were compiled for NRDF.

• EXFOR
  • 50 new and 65 revised/deleted entries were transmitted as 7 trans files (E065-E068, K011, R024-R025) to the NDS open area.

• Nuclear Reaction Data Files for Astrophysics (NRDF/A)
  • 428 bibliographic records were updated.
EXFOR Statistics for Charged-particle Data

<table>
<thead>
<tr>
<th>ID</th>
<th>Centre</th>
<th>Entries</th>
<th>Subentries</th>
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<td>C</td>
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<td>7309</td>
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<td>E</td>
<td>JCP RG</td>
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<td>F</td>
<td>CNPD</td>
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<td>P</td>
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<td>S</td>
<td>CNDC</td>
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<td>1645</td>
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</table>
Evaluation

- $^6,^7\text{Li} + \text{n}$ reactions
  - Method: Continuum-Discretized Couple-Channel (CDCC) Method

Evaluation

- $^{16,17}\text{O}+n$ reactions
  - Method: Cluster Orbital Shell Model (COSM) and Complex Scaling Method (CSM)

System development

• Coding Software
  • “HENDEL” editor
  • “GSYS” digitizer

• Data Retrieval System
  • 4 retrieval systems of different scopes
    • NRDF (http://www.jcprg.org/nrdf/)
    • NRDF/A (http://www.jcprg.org/nrdfa/)
    • EXFOR/ENDF (http://www.jcprg.org/exfor/)
    • CINDA (http://www.jcprg.org/cinda/)

• Mail Archive System
  • “Stock” system
Web-based Editor for Nuclear Data (HENDEL)
Digitizing Software (GSYS)
Mail archive system “Stock”

- The “Stock” system has launched since 2004.
- “Stock” works to receive, distribute, archive and open mails.
- Now over 30,000 mails are available on the website.
- Archived mails can be searched and retrieved with the help of keywords.
Flowchart of “Stock”

Mail Server (sendmail) → Distributed to compilers in a mailing list

“Stock” Script → Analyzed and archived in a directory

Web server (apache) → Accessible by compilers

Delivered to compiler@jcprg.org

Compilers
<table>
<thead>
<tr>
<th>Stock Viewer</th>
</tr>
</thead>
<tbody>
<tr>
<td>[トップへ] Hendel NRDF 分担表</td>
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<tr>
<td>d001-d0100  10/Apr/12  d101-d1200  25/Jun/12</td>
</tr>
<tr>
<td>d011-d0200  25/Jun/12  d101-d1200  25/Jun/12</td>
</tr>
<tr>
<td>d021-d0300  24/May/12  d121-d1300  30/Sep/12</td>
</tr>
<tr>
<td>d031-d0400  09/Mar/11  d131-d1400  30/Sep/12</td>
</tr>
<tr>
<td>d041-d0500  21/Dec/09  d141-d1500  30/Sep/12</td>
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<tr>
<td>d051-d0600  21/Dec/09  d151-d1600  30/Sep/12</td>
</tr>
<tr>
<td>d061-d0700  14/Aug/09  d161-d1000  15/Feb/11</td>
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<tr>
<td>d071-d0800  30/Mar/12  d101-d1100  15/Feb/11</td>
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<td>d101-d1100  15/Feb/11  d111-d1200  30/Sep/12</td>
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Stock Viewer

[トップへ] Hendel NRDF 分担表

d2301.Feb/12  d2302.Feb/12  d2303.Feb/12  d2304.Feb/12  d2305.Feb/12  d2306.Feb/12  d2307.Feb/12  d2308.Feb/12  d2309.Feb/12  d2310.Feb/12  d2311.Feb/12  d2312.Feb/12


[Hendel-e2370-N.F], [トップへ] Hendel NRDF 分担表

d2370


[Hendel-e2370-N.F], [トップへ] Hendel NRDF 分担表

d2370

Namazu による全文検索システム
現在、25,281 の文書がインデックス化され、1,140,057 個のキーワードが登録されています。
インデックスの最終更新日: 2012-04-10

検索式: aaspp

検索結果:

参考ヒット数:
Data retrieval system

- Our data retrieval system of EXFOR consists of Perl scripts and the relational database management system MySQL.
- The EXFOR data in the MySQL database is updated periodically.
Flowchart of data update process

1. Users
2. Run “TRANStoCSV” Script
3. CSV format
4. Run “CSVtoMySQL” Script
5. MySQL format
6. Web interface for user access
<table>
<thead>
<tr>
<th>AUTHOR</th>
<th>REACTION</th>
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<td>&quot;10001001&quot;,&quot;&quot;&quot;,&quot;R.W.&quot;,&quot;HOCKENBURY&quot;,&quot;&quot;</td>
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<td>&quot;10001001&quot;,&quot;&quot;&quot;,&quot;R.C.&quot;,&quot;BLOCK&quot;,&quot;&quot;</td>
<td>&quot;10001005&quot;,&quot;2&quot;,&quot;((26-FE-54(N,EL),,WID,,G)*(26-FE-54(N,G),,WID))/(26-FE-54(N,TOT),,WID))&quot;,&quot;C&quot;,&quot;&quot;</td>
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</tbody>
</table>
Data retrieval system

Hokkaido University Nuclear Reaction Data Centre (JCPRG)

**EXFOR / ENDF - Search**

EXFOR contains an extensive compilation of experimental nuclear reaction data. Neutron reactions have been compiled systematically since the discovery of the neutron, while charged particle and photon reactions have been covered less extensively. EXFOR contains data from more than 15,000 experiments. EXFOR is compiled by the Nuclear Data Centre (NDC) under the auspices of the International Atomic Energy Agency (IAEA). JENDL, ENDF, JEFF, BROND and JENDL are produced based on EXFOR by JAEA Nuclear Data Center and Japanese Nuclear Data Committee (JNDC-JNDC), Cross Section Evaluation Working Group (CSWEG), USA Joint Evaluation Project, Russian Nuclear Data Center (CIRD) and Chinese Nuclear Data Center and Nuclear Data Committee of China, respectively.

### Physical quantity

- clear form
- CQR (Secondary particle correlations)
- CS (Cross section data)
- CPS (Partial cross section data)
- GST (Temperature dependent cross section data)
- DA (Differential data with respect to angle)
- DAE (Differential data with respect to angle and energy)
- DAP (Partial differential data with respect to angle)
- DE (Differential data with respect to energy)
- DEP (Partial differential data with respect to energy)
- E (Kinetic energies)
- FY (Fission product yields)
- INT (Cross section integral over incident energy)
- L (Scattering amplitudes)
- MFG (Miscellaneous fission quantities)
- MLT (Outgoing particle multiplicities)
- ND (Nuclear quantities)
- POL (Polarization data)
- PY (Product yields)
- RI (Resonance integrals)
- RP (Resonance parameters)
- RR (Reaction rates)
- SP (Gamma spectra)
- SQ (Special quantities)
- TT (Thick target yields)
- TTD (Differential thick target yields)
- TTP (Partial thick target yields)
- epx ()

### Basic

<table>
<thead>
<tr>
<th>Target</th>
<th>3-U-6</th>
<th>selector (fe-56, 56Fe, he-4, a...)</th>
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<tbody>
<tr>
<td>Projectile</td>
<td>N</td>
<td>selector (n, p, a, c-12, ...)</td>
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<tr>
<td>Emission</td>
<td>T</td>
<td>selector (e, i, f, g, xstr, rnp2p, ...)</td>
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<td>Residual</td>
<td>2-HE-4</td>
<td>selector (fe-56, 56Fe, a...)</td>
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<tr>
<td>Quantity</td>
<td>CS</td>
<td>selector (CS,DAD, ...)</td>
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<td>Energy (eV)</td>
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<td>Data No.</td>
<td>(10488,1901002, ...)</td>
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### Plot axis

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<th>selector (EN,EN-CM, ...)</th>
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<tr>
<td>Vertical (2)</td>
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Data retrieval system

![Image of data retrieval system](image-url)

### Table: EXFOR / ENDF - Results

<table>
<thead>
<tr>
<th>Plot</th>
<th>Author</th>
<th>Year</th>
<th>Inc. energy (eV)</th>
<th>Work</th>
<th>Type</th>
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</table>
Data retrieval system
Asian Collaboration

- The collaboration among Asian centres in the NRDC network is important.
Asian Collaboration

- This network is expanding to Kazakhstan, Mongolia and Vietnam.
Asian Collaboration

- Research collaboration, workshops and researcher interchanges were supported by the Asia-Africa Science Platform Program of Japan Society for the Promotion of Science (JSPS)
Asian Collaboration

- **Workshops**
  - The 1<sup>st</sup> AASPP Workshop organized by JCPRG in Sapporo on Oct. 25-29, 2010
  - The 2<sup>nd</sup> AASPP Workshop organized by CNDC in Beijing on Sep. 5-9, 2011
  - A workshop organized by JCPRG in Sapporo on Nov. 10-12, 2011
  - The 3<sup>rd</sup> AASPP Workshop organized by KNU, POSTECH, KAERI in Pohang on Aug. 27-29, 2012

- **Researcher interchanges**
  - Researchers from China, India, Kazakhstan, Korea and Mongolia
Asian Collaboration

- Application of the next project must be prepared and discussed in the 3rd day.
  - Purpose
  - Collaborators
  - Contents
For Sustainability

• We must share information on the web and in mailing lists
  • http://www.nrdoc.asia (?)
  • info@nrdoc.asia (?)
    • japan@nrdoc.asia
      • JCPRG, JAEA, RIKEN, ...
  • china@nrdoc.asia
  • korea@nrdoc.asia
  • india@nrdoc.asia
  • ...
  • HOKKAIDO UNIVERSITY
Summary

- **Compilation**
  - Continuous, long term efforts
  - Software development

- **Research**
  - Evaluation for specific fields, such as astrophysics, medicine, and/or engineering

- **Collaboration**
  - Domestic institutes (JAEA, RIKEN and others)
  - Asian centres and other institutes abroad