

NRDF/A

NUCLEAR REACTION DATA FILE FOR ASTROPHYSICS IN JCPRG

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NRDF/A

Nuclear Reaction Data File For Astrophysics

I. Theoretical evaluations for astrophysical reactions of light nuclei

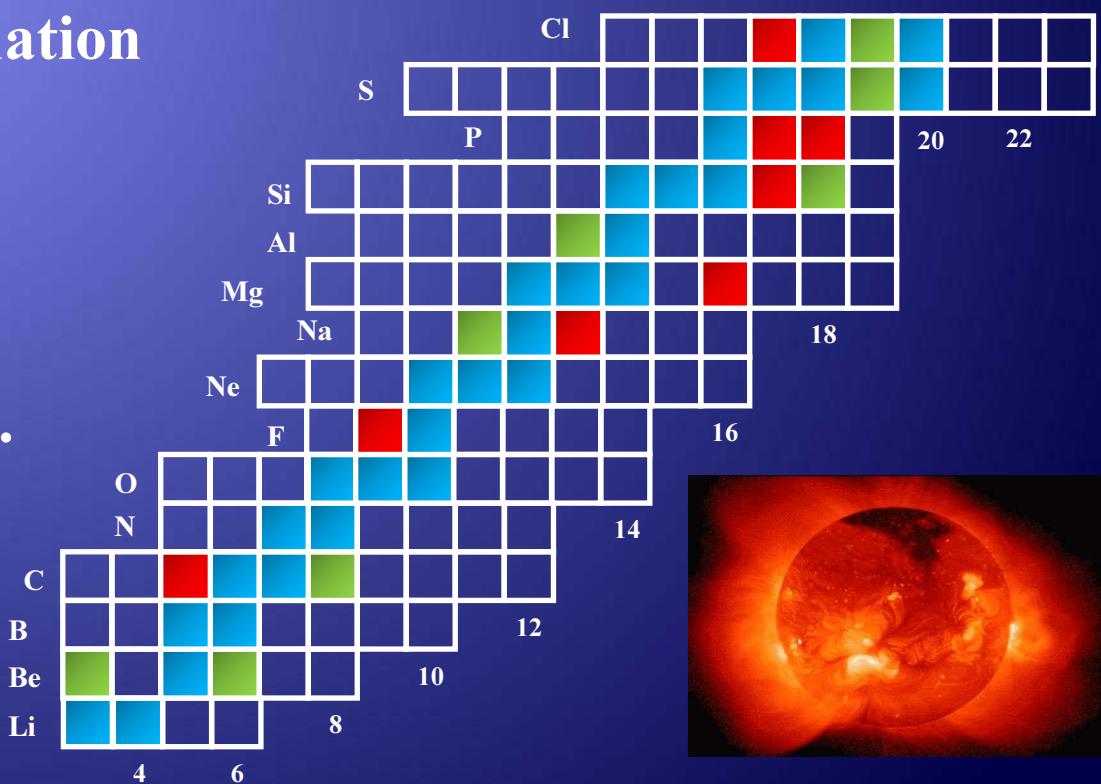
II. Bibliographic information

- NSR based info.

III. Data compilation

- s-factor,
- reaction rate etc..
- experimental
- theoretical

Nucleosynthesis of light element



III. NRDF/A bibliographic information

ICPRG 北海道大学核反応データ研究開発センター
Hokkaido University Nuclear Reaction Data Centre

日本原子核反応データ研究開発センター
Japan Charged-Particle Nuclear Reaction Data Group (JCPRG)

NRDF/A : Nuclear Reaction Data File for Astrophysics

Survey of Bibliographic Information (Compiled in 2009)

Survey of Bibliographic Information (Compiled in 2008)

Target	EXCEL File Download
1H,2H,3H	01H-03H.xls
3He-4He	03He-04He.xls
6Li,7Li	06Li-07Li.xls
7Be,8Be,9Be	07Be-09Be.xls
10B,11B	10B-11B.xls
11C,12C,13C,14C	11C-14C.xls
13N,14N,15N	13N-15N.xls, 13N-15N_final.xls
14O,15O,16O,17O,18O	14O-18O.xls, 14O-18O_final.xls
19F	19F.xls
19Ne,20Ne,21Ne,22Ne	19Ne-22Ne.xls
21Na,22Na,23Na	21Na-23Na.xls
24Mg,25Mg,26Mg	24Mg-26Mg.xls, 26Mg.xls
26Al,27Al	26Al-27Al.xls
27Si,28Si,29Si,30Si	27Si-30Si.xls

Cross Sections of Selected Key Reactions (Compiled in 2006)

Data ID	Reaction	# of points	Data file
A0001	12C(n,y)13C	7	data graph
A0002	12C(a,y)16O	0	(no data available)
A0003	12C + 14N	0	

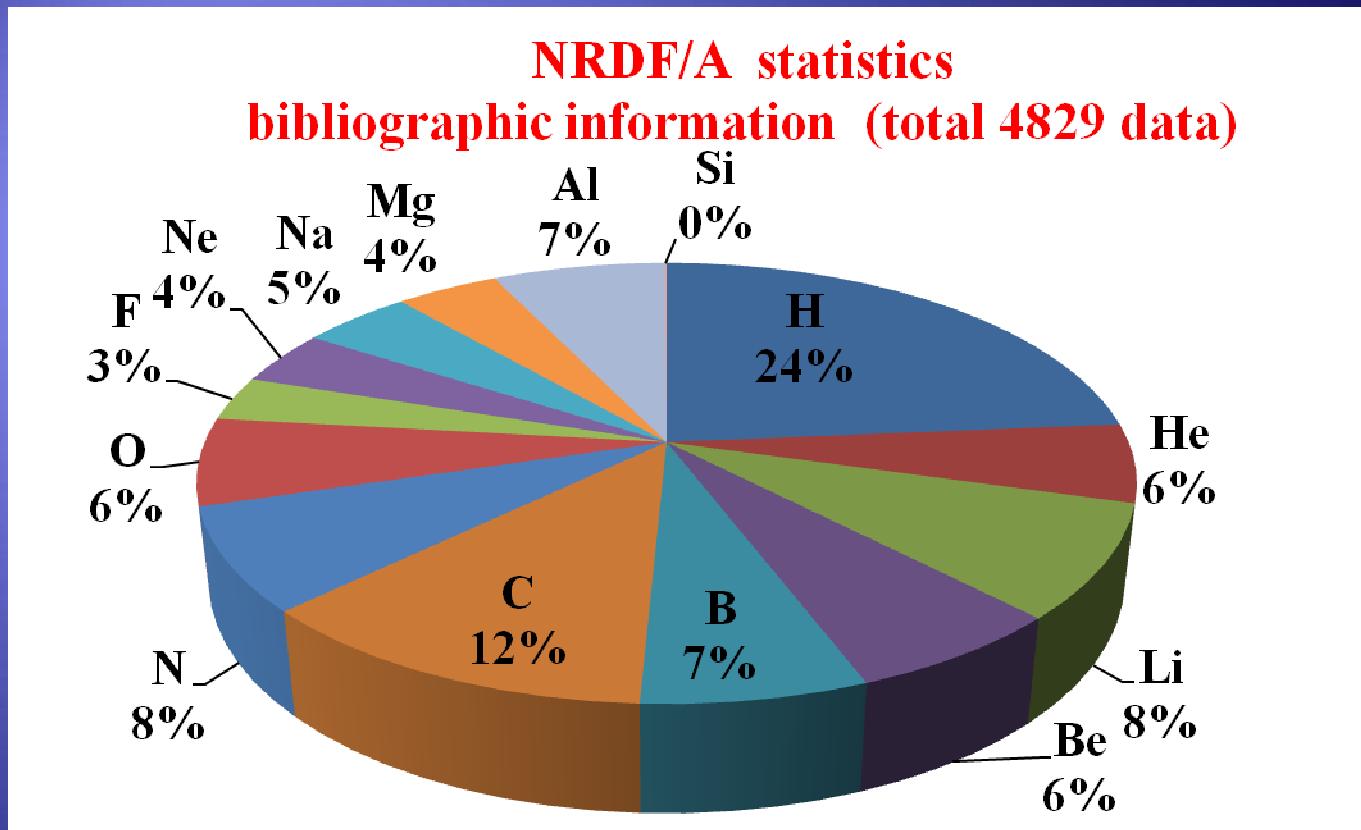
03He-04He.xls [自動計算専用] [直接モード] - Microsoft Excel

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Z
反応	Keynumber	参考文献- 離注	参考文献- 優秀	参考文献- ページ	参考文献- 年次	参考文献- 頁数	Title																	
3He+1H-3H	1996M003	NP/V		598-597	1996	8,L,Mintz	The Reaction $e^- + ^3\text{He} \rightarrow e^- + ^3\text{H}$ and the Determination of Electron Capture Rates of Light Elements of Astrophysics																	
3He+2H-4H	1994M003	NP/V		201-117	1994	S,Ohyabuchi	Electron Capture Rates of Light Elements of Astrophysics																	
3He+3H-4H	2003PA19	PR/0		67-105,206	2003	T-S Park	Parameter-free effective field theory calculation for the Super-Kamiokande hep neutrino best-fit: a possible signal																	
3He+4He-4He	2000C011	Physica A		321-472	2003	M.Gorodnicki	Super-Kamiokande hep neutrino best-fit: a possible signal																	
3He+5He-4He	1994M008	NP/V		689-280	2001	L.E.Marcucci	The hep and the Solar Neutrino Problem																	
3He+6Li-4He	2001M002	PR/0		65-158,01	2001	L.E.Marcucci	Weak Proton Capture on ^6Li																	
3He+7Li-4He	2000M008	PR/0		84-59,9	2000	L.E.Marcucci	Realistic Calculation of the $^3\text{He} + p$ -shell Astrophysical Factor																	
3He+8Be-4He	1999B020	PR/0		60-022,01	1999	C.J.Horowitz	High Energy Solar Neutrinos and p-Wave Contributions to the hep																	
3He+9Be-4He	1998BA94	PL/B		436-242	1998	J.M.Bailey	Do hep Neutrinos Affect the Solar Neutrino Energy Spectrum?																	
3He+10B-4He	1991A16	PR/0		44-61,9	1991	J.Carlson	Weak Proton Capture Reactions on ^3H and ^7He and Tritium																	
3He+14N-4He	1983TE03	AJ		273-911	1983	P.Tegnér	The Rate of the $^3\text{He} + ^{14}\text{N}$ Reaction																	
3He+15O-4He	2007Q02U	Proc.17th International Spin Physics Symposium, N			2007	S.Gotoh	A Three-Body Faddeev Calculation of the Double Polarized																	
3He+16O-4He	2001B010	PR/0		75-02,76,01	2001	F.C.Berker	Electron screening in the $^3\text{He} + ^{16}\text{O}$ reaction																	
3He+17O-4He	2006B01	Eur.Phys.J.D		38-465	2006	V.M.Batritsky	Study of the nuclear fusion in muonic $^3\text{He} + ^{17}\text{O}$ complex																	
3He+18O-4He	2005D046	NP/V		768-782	2005	P.Descouvemont	Resonance reaction rates within the R-matrix model																	
3He+19F-4He	2004P005	Prog.Theor.Phys.		154-295	2004	S.Oyama	Polarization Effects on the $^3\text{He} + ^{19}\text{F}$ and $^3\text{He} + ^4\text{He}$ Fusion Reactions																	
3He+20Ne-4He	2004D048	AT Data Nucl.Data		88-203	2004	P.Descouvemont	Compilation and R-matrix analysis of Big Bang nucleosynthesis																	
3He+21Na-4He	2004B008	PR/0		65-024,08	2004	S.Bazakia	Reentrant and direct components in the $^3\text{He} + ^{21}\text{Na}$ reaction																	
3He+22Na-4He	2003B005	PR/0		65-048,01	2003	K.Hanai	Role of virtual breakup of projectiles in astrophysics at small																	
3He+23Na-4He	2003D043	MPJ/A		16-302	2003	S.Gotoh	Polarization effects in the $^3\text{He} + ^{23}\text{Na}$ fusion reaction																	
3He+24Mg-4He	2002E002	PL/B		53-1	2002	T.Uesaka	$^3\text{He} + ^{24}\text{Mg}$ Reaction at Intermediate Energies and Resonances																	
3He+24Mg-4He	2002B001	PR/0		65-005,80	2002	K.Katori	Resonance correction to astrophysical fusion reactions with the R-matrix model																	
3He+25Mg-4He	2002B003	PR/0		66-057,80	2002	K.A Fletcher	K^{+},IO^{-} for $^3\text{He} + ^{25}\text{Mg}$ near the $J=3/2^{+}$ resonance																	
3He+26Mg-4He	2002B027	NP/V		701-727	2002	F.C.Berker	Electron Screening in Reactions between Light Nuclei																	
3He+27Al-4He	2001UED	NP/V		684-696	2001	T.Uesaka	$^3\text{He} + ^{27}\text{Al}$ Reaction at Intermediate Energies																	
3He+28Si-4He	2001RA01	EP/V,A		104-87	2001	F.Paolis	Stopping Power of Low-Energy Deuterons in ^3He Gas																	
3He+29Si-4He		A		190-199	2001	F.Kaneko	Experimental Data for $^3\text{He} + ^{29}\text{Si}$ Fusion																	

<http://www.jcprg.org/nrdfa/>

Bibliographic information
based on the NSR data base.

III. NRDF/A bibliographic information



- 139 Nuclear Reaction
- Incident particle (e, p, d, t, ^3He , a, n)

III. NRDF/A Data compilation

experimental & theoretical

- s-factor
- reaction rate
- β -decay rate
- resonance parameter
- etc...

The screenshot shows the NRDF/A Nuclear Reaction Data File for Astrophysics interface. At the top, there's a navigation bar with links for NRDF, EXFOR, ENDS, ERRC, English, Japanese, and External. Below the navigation is a search bar with placeholder text "検索". The main content area has two sections: a large table of nuclear reactions and a detailed view of the $d(3\text{He}, p)4\text{He}$ reaction.

Table of Nuclear Reactions:

$1\text{H}(\text{e}-, \nu)\text{D}$	$1\text{H}(\text{p}, \nu)\text{n}^2\text{H}$	$2\text{H}(\text{p}, \bar{\nu})\text{He}$	$2\text{H}(\text{n}, 2\text{p})$	$2\text{H}(\text{d}, \text{p})^4\text{He}$	$2\text{H}(\text{d}, \text{n})^3\text{He}$	$2\text{H}(\text{d}, \text{p})^3\text{H}$	$2\text{H}(\text{a}, \text{g})^6\text{Li}$
$^3\text{H}(\text{p}, \text{p})^4\text{He}$	$^3\text{H}(\text{p}, \nu)\text{He}$	$^3\text{H}(\text{d}, \text{n})^3\text{He}$	$^3\text{H}(\text{t}, 2\text{n})^4\text{He}$	$^3\text{He}(\text{a}, \text{g})^7\text{Li}$	$^3\text{He}(\text{e}^-, \nu)\text{He}$	$^3\text{He}(\text{p}, \nu)\text{n}^4\text{He}$	$^3\text{He}(\text{d}, \text{p})^4\text{He}$
$^3\text{He}(\text{t}, \text{d})^4\text{He}$	$^3\text{He}(\text{t}, \nu)\text{He}$	$^3\text{He}(\text{d}, 2\text{p})^4\text{He}$	$^3\text{He}(\text{a}, \text{g})^7\text{Be}$	$^4\text{He}(\text{t}, \text{n})^6\text{Li}$	$^3\text{He}(\text{e}^-, \nu)\text{He}$	$^3\text{He}(\text{p}, \nu)\text{n}^4\text{He}$	$^3\text{He}(\text{d}, \text{p})^4\text{He}$
$^7\text{Li}(\text{p}, \text{n})^7\text{Be}$	$^7\text{Li}(\text{p}, \text{p})^8\text{Be}$	$^7\text{Li}(\text{p}, \text{d})^4\text{He}$	$^7\text{Li}(\text{d}, \text{n})^2\text{H}^4\text{He}$	$^7\text{Li}(\text{t}, 2\text{n})^4\text{He}$	$^7\text{Li}(\text{a}, \text{g})^11\text{B}$	$^7\text{Li}(\text{p}, \text{n})^10\text{B}$	$^7\text{Be}(\text{p}, \text{p})^8\text{B}$
$^7\text{Be}(\text{d}, \text{p})^4\text{He}$	$^7\text{Be}(\text{t}, \text{n})^2+4\text{He}$	$^7\text{Be}(\text{a}, \text{g})^{11}\text{C}$	$^8\text{Be}(\text{a}, \text{g})^{12}\text{C}$	$^8\text{Be}(\text{p}, \text{p})^{10}\text{B}$	$^8\text{Be}(\text{p}, \text{n})^9\text{B}$	$^9\text{Be}(\text{p}, \text{p})^8\text{Be}$	$^{10}\text{B}(\text{p}, \text{p})^{11}\text{C}$
$^{10}\text{B}(\text{p}, \text{n})^7\text{Be}$	$^{10}\text{B}(\text{a}, \text{n})^{13}\text{N}$	$^{11}\text{B}(\text{p}, \text{p})^{12}\text{C}$	$^{11}\text{B}(\text{p}, \text{n})^{11}\text{C}$	$^{11}\text{B}(\text{p}, \text{a})^{18}\text{Be}$	$^{11}\text{B}(\text{a}, \text{n})^{14}\text{N}$	$^{11}\text{B}(\text{p}, \text{p})^{14}\text{C}$	$^{11}\text{C}(\text{p}, \text{p})^{12}\text{N}$
$^{12}\text{C}(\text{n}, \text{p})^{13}\text{C}$	$^{12}\text{C}(\text{p}, \text{p})^{13}\text{C}$	$^{12}\text{C}(\text{a}, \text{g})^{18}\text{O}$	$^{12}\text{C}(\text{a}, \text{n})^{15}\text{O}$	$^{13}\text{C}(\text{n}, \text{p})^{14}\text{N}$	$^{13}\text{C}(\text{p}, \text{p})^{14}\text{N}$	$^{13}\text{C}(\text{p}, \text{n})^{13}\text{N}$	$^{13}\text{C}(\text{a}, \text{n})^{16}\text{O}$
$^{14}\text{O}(\text{n}, \text{p})^{15}\text{N}$	$^{14}\text{O}(\text{p}, \text{p})^{18}\text{O}$	$^{14}\text{O}(\text{a}, \text{g})^{18}\text{O}$	$^{13}\text{N}(\text{p}, \text{p})^{14}\text{O}$	$^{14}\text{N}(\text{p}, \text{p})^{15}\text{O}$	$^{14}\text{N}(\text{p}, \text{n})^{14}\text{O}$	$^{14}\text{N}(\text{p}, \text{p})^{11}\text{C}$	$^{14}\text{N}(\text{a}, \text{g})^{18}\text{F}$
$^{15}\text{N}(\text{p}, \text{n})^{18}\text{O}$	$^{15}\text{N}(\text{p}, \text{n})^{15}\text{O}$	$^{15}\text{N}(\text{p}, \text{p})^{12}\text{C}$	$^{15}\text{N}(\text{a}, \text{g})^{19}\text{F}$	$^{15}\text{N}(\text{a}, \text{g})^{18}\text{F}$	$^{15}\text{N}(\text{p}, \text{n})^{18}\text{F}$	$^{14}\text{O}(\text{p}, \text{p})^{17}\text{F}$	$^{15}\text{O}(\text{a}, \text{g})^{19}\text{Ne}$
$^{18}\text{O}(\text{n}, \text{p})^{17}\text{F}$	$^{18}\text{O}(\text{p}, \text{p})^{13}\text{N}$	$^{18}\text{O}(\text{a}, \text{g})^{20}\text{Ne}$	$^{17}\text{O}(\text{n}, \text{p})^{19}\text{O}$	$^{17}\text{O}(\text{p}, \text{p})^{18}\text{F}$	$^{17}\text{O}(\text{p}, \text{p})^{14}\text{N}$	$^{17}\text{O}(\text{a}, \text{g})^{20}\text{Ne}$	
$^{18}\text{O}(\text{n}, \text{p})^{19}\text{O}$	$^{18}\text{O}(\text{p}, \text{p})^{19}\text{F}$	$^{18}\text{O}(\text{a}, \text{g})^{15}\text{N}$	$^{18}\text{O}(\text{a}, \text{g})^{22}\text{Ne}$	$^{18}\text{O}(\text{a}, \text{g})^{21}\text{Ne}$			

Detailed View of d(3He, p)4He Reaction:

Code	Data file	Bib	Author	No.
All2001	exp, all	NP/A690/2001/790	M Aliotta	a0043
Cos2000	exp, all	PL/B482/2000/49	H Costantini	a0044
Pra1994	exp, all	ZP/A250/1994/171	P Prati	a0045
3He(d, p)4He	Code	Data file	Bib	Author No.
A82001	exp, all	NP/A690/2001/790	M Aliotta	a0043
3He(a, g)7Be	Code	Data file	Bib	Author No.
Con2007	exp, all	PR/C75/2007/065803	F Confortola	a0039
P... (partially visible)	... (partially visible)	... (partially visible)	... (partially visible)	... (partially visible)

NRDF/A DATA COMPILATION
WEB-SITE WILL BE OPENED
NEAR THE FUTURE



Previous version
NRDF/A CD-ROM
(2006)

III. NRDF/A Data compilation example

```
#NO      A0008-1
#TITLE   Thermonuclear reaction rates of 9Be(p,g)10B
#AUTHOR  D.Zahnow, C.Angulo, M.Junker, C.Rolfs, S.Schmidt, W.H.Schulte, E.Somorjai
#INSTITUTE
#REFERENCE NP/A589(1995)95
#REACTION 9Be(p,g)10B
#PHQ     S-factor
#STATUS   Table.1, Fig.4
#       Experiment
```

Bibliographic information

```
#Compiled A.Wano in 2009/12/28
#Checked  A.Makinaga in 2010/1/29
#COMFNT
```

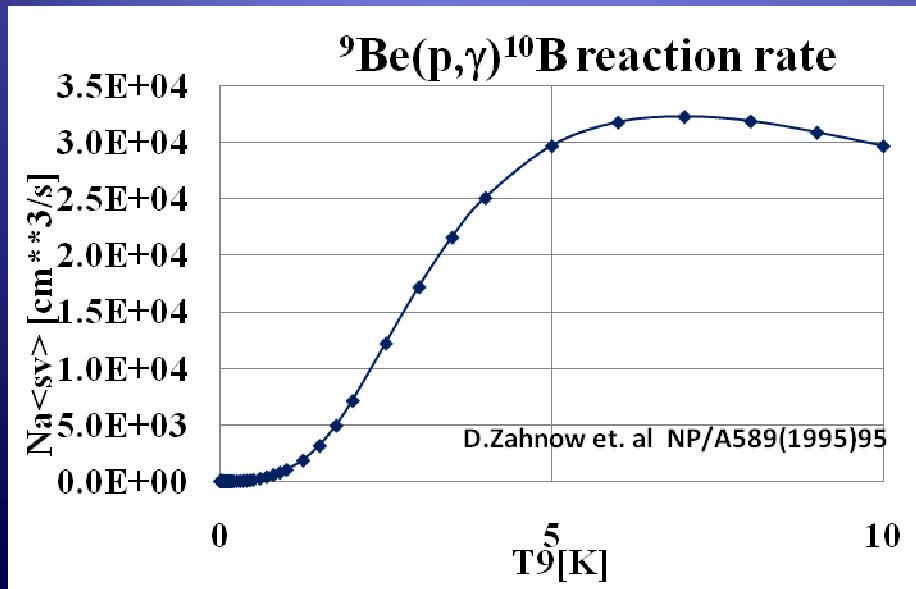
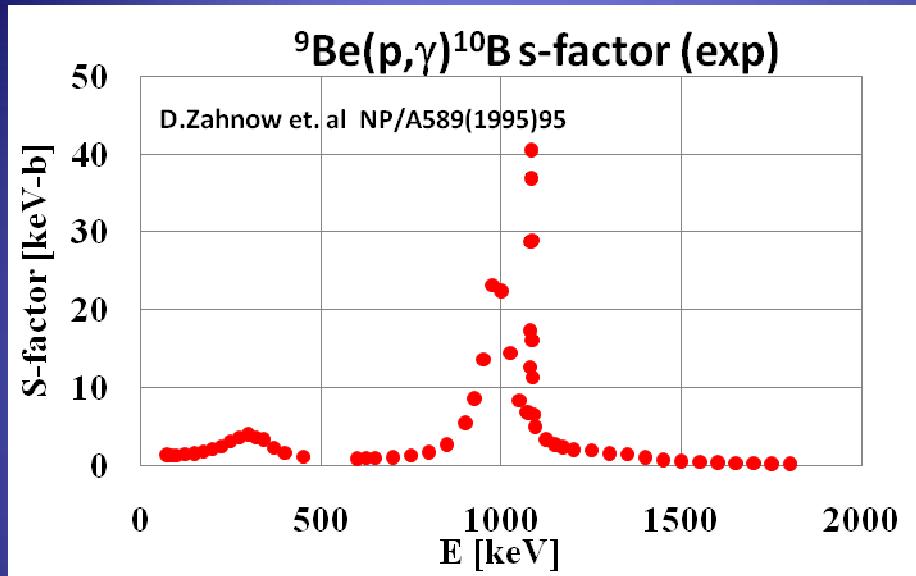
```
#      (a)Effective beam energy within the target.
#      (b)Statistical error only.
#      (c)Standard Value (see text).
#      (d)Reaction yield (not the S(E) factor due to narrow width of the Er=1083 keV resonance.
#
```

Comment

```
# DATA
=====
#Eeff(a) Error S-factor(b) Error Comment
#(keV)  (keV) (keV-b)  (keV-b)
73.3    0.5    1.31    0.07
85.8    0.5    1.24    0.05
98.4    0.5    1.26    0.05
123.5   0.5    1.45    0.06
```

data

III. NRDF/A Data compilation example



ELSEVIER Nuclear Physics A 589 (1995) 95–105

Thermonuclear reaction rates of ${}^9\text{Be}(\text{p}, \gamma){}^{10}\text{B}$ \star

D. Zahnow ^a, C. Angulo ^b, M. Junker ^c, C. Rolfs ^a, S. Schmidt ^a,
W.H. Schulte ^a, E. Somorjai ^d

^a Institut für Physik mit Ionenstrahlen, Ruhr-Universität Bochum, Germany
^b CSNSM, Orsay, France
^c LNGS-INFN, Gran Sasso, Italy
^d ATOMKI, Debrecen, Hungary

Received 23 January 1995; revised 1 March 1995

Abstract

An excitation function of the ${}^9\text{Be}(\text{p}, \gamma){}^{10}\text{B}$ capture reaction has been measured over the proton energy range $E_{\text{p}} = 75$ to 1800 keV using a 4π summing crystal. The data are dominated by three broad resonances including interference effects with the direct-capture process. Near temperatures of $T_9 = 0.8$ the reaction rates are lower by a factor 4 compared to values given in a compilation, while at other temperatures the rates are similar.

Keywords: NUCLEAR REACTIONS ${}^9\text{Be}(\text{p}, \gamma)$, $E = 75$ –1800 keV; measured E_{γ} , I_{γ} ; deduced $\sigma(E)$, thermonuclear reaction rates, astrophysical S -factor.

III. NRDF/A Data compilation example

Lists of new theoretical and experimental data
compiled in NRDF/A.

Reaction	Exp.	Theor.
d(^3He ,p) ^4He	3	0
^3He (d,p) ^4He	1	0
^3He (α , γ) ^7Be	2	0
^9Be (p, γ) ^{10}B	1	1
^9Be (p, α) ^6Li + ^9Be (p,d) ^8Be	1	0
^9Be (p, α) ^6Li	2	
^9Be (p,d) ^8Be	1	0
Total	11	2

Phys. Quant.	Exp.	Theor.
s-factor	11	1
cross section	2	0
reaction rate	0	1
Total	13	2

Compiled in 2009