

Japan Charged-Particle Nuclear Reaction Data Group (JCPRG)

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Quantity code

ALF	Alpha	FY	Fission product yield
AMP	Length or amplitude	INT	Cross section integral over incident energy
CHG	Fragment charge	KE	Kinetic energy
CS	Cross section	KER	Kerma factor
CSN	Differential with respect to number of particles	MLT	Multiplicity
CSP	Partial cross section	NQ	Nuclear quantity
CST	Temperature dependent cross section	NU	Nu
D3A	Triple differential $d\Omega_1/d\Omega_2/dE'$	NUD	Nu delayed
D3E	Triple differential $d\Omega/dE'_1/dE'_2$	NUF	Fragment neutrons
D4A	Quadruple diff. $d\Omega_1/d\Omega_2/dE'_1/dE'_2$	POL	Polarization
DA	Differential $d/d\Omega$	POD	Differential polarization
DAA	Double differential $d\Omega_1/d\Omega_2$	PY	Product yield (other than fission)
DAE	Double differential $d\Omega/dE'$	RI	Resonance integral
DAP	Partial differential $d/d\Omega$	RP	Resonance parameter
DAT	Temperature-dependent Legendre coefficient	RR	Reaction rate
DE	Differential d/dE'	SIF	Self indication
DEP	Energy spectrum for specific group	SPC	Gamma spectrum
DP	Diff. by linear momentum of outgoing part.	TSL	Thermal scattering
DT	Diff. by 4-momentum transfer squared	TT	Thick target yield
ETA	Eta	TTD	Differential thick target yield, $d/d\Omega$
EVL	Evaluation	TT	Partial thick target yield

Special codes in outgoing particle field

abs	Absorption	fus	Fusion	non	Nonelastic	ths	Thermal scattering
el	Elastic	inel	Inelastic	sct	Scattering	tot	Total
f	Fission	incl	Inclusive	tcc	Total charge changing		

Special codes in incident energy field

Fast	Fast reactor spectrum average	Maxw	Maxwellian spectrum average
Fiss	Fission spectrum average	Spont	Spontaneous (for fission)

1 Hydrogen 1

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>d,el</i>	¹ H	DA	2JPNIPC	2.7+08		Jour	PRL,95,(16),162301	Oct 05	K.Sekiguchi+	E1958
¹⁶ C,inel	¹ H	CSP	2JPNIPC	5.3+08		Jour	PR/C,73,(2),024610	Feb 06	H.J.Ong+	E1960
¹⁶ C,inel	¹ H	DAP	2JPNIPC	5.3+08		Jour	PR/C,73,(2),024610	Feb 06	H.J.Ong+	E1960

1 Hydrogen 2

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,el</i>	² H	DA	2JPNIPC	1.4+08		Jour	PRL,95,(16),162301	Oct 05	K.Sekiguchi+	E1958
<i>p,el</i>	² H	DA	2JPNOSA	1.4+08		Jour	PRL,95,(16),162301	Oct 05	K.Sekiguchi+	E1958

4 Beryllium 9

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
⁶ He,2n+α	⁹ Be	DA	2JPNIPC	1.5+08		Jour	CPL,22,(6),1370	Jun 05	J.Wang+	E1957

5 Boron 10

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>α,p</i>	¹³ C	DAP	2JPNTOK	2.8+07	3.3+07	Jour	JPJ,16,(4),583	Apr 61	H.Yamaguchi	E1943
<i>α,p</i>	¹³ C	?	2JPNTOK	0.0+00	3.3+07	Jour	JPJ,16,(4),583	Apr 61	H.Yamaguchi	E1943

6 Carbon 12

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>α,el</i>	¹² C	DA	2JPNTOK	2.7+07		Jour	JPJ,16,(6),1066	Jun 61	T.Mikumo	E1945
<i>α,el</i>	¹² C	DA	2JPNTOK	2.8+07		Jour	JPJ,15,(7),1158	Jul 60	T.Mikumo+	E1944
<i>α,el</i>	¹² C	DA	2JPNTOK	3.0+07		Jour	JPJ,16,(6),1066	Jun 61	T.Mikumo	E1945
<i>α,el</i>	¹² C	DA	2JPNTOK	3.1+07		Jour	JPJ,15,(7),1158	Jul 60	T.Mikumo+	E1944
<i>α,el</i>	¹² C	DA	2JPNTOK	3.1+07		Jour	JPJ,16,(6),1066	Jun 61	T.Mikumo	E1945
<i>α,el</i>	¹² C	DA	2JPNTOK	3.4+07		Jour	JPJ,15,(7),1158	Jul 60	T.Mikumo+	E1944
<i>α,el</i>	¹² C	DA	2JPNTOK	3.4+07	3.6+07	Jour	JPJ,16,(6),1066	Jun 61	T.Mikumo	E1945
<i>α,inel</i>	¹² C	DAP	2JPNTOK	2.7+07		Jour	JPJ,16,(6),1066	Jun 61	T.Mikumo	E1945
<i>α,inel</i>	¹² C	DAP	2JPNTOK	2.8+07		Jour	JPJ,15,(7),1158	Jul 60	T.Mikumo+	E1944
<i>α,inel</i>	¹² C	DAP	2JPNTOK	3.0+07		Jour	JPJ,16,(6),1066	Jun 61	T.Mikumo	E1945
<i>α,inel</i>	¹² C	DAP	2JPNTOK	3.1+07		Jour	JPJ,15,(7),1158	Jul 60	T.Mikumo+	E1944
<i>α,inel</i>	¹² C	DAP	2JPNTOK	3.1+07		Jour	JPJ,16,(6),1066	Jun 61	T.Mikumo	E1945
<i>α,inel</i>	¹² C	DAP	2JPNTOK	3.4+07		Jour	JPJ,15,(7),1158	Jul 60	T.Mikumo+	E1944

$\alpha,inel$	^{12}C	DAP	2JPNTOK	3.4+07	3.6+07	Jour	JPJ,16,(6),1066	Jun 61	T.Mikumo	E1945
α,p	^{15}N	DAP	2JPNTOK	2.5+07	3.9+07	Jour	JPJ,14,(10),1260	Oct 59	I.Nonaka+	E1942

6 Carbon 13

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
p,el	^{13}C	DA	2JPNTOK	3.5+07		Jour	NP/A,456,(1),61	Aug 86	H.Ohnuma+	E1695

7 Nitrogen 14

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
α,p	^{17}O	CSP	2JPNTOK	2.7+07	3.3+07	Jour	JPJ,16,(4),583	Apr 61	H.Yamaguchi	E1943
α,p	^{17}O	DAP	2JPNTOK	2.7+07	3.3+07	Jour	JPJ,16,(4),583	Apr 61	H.Yamaguchi	E1943
$^{16}\text{O},\alpha$	^{26}Al	CS	3CPRBJG	6.6+06	9.5+06	Jour	NIM/B,240,(3),612	Nov 05	M.He+	E1951

7 Nitrogen 15

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
p,α	^{12}C	CSP	2JPNTOK	6.7+06	1.5+07	Jour	JPJ,22,(4),949	Apr 67	I.Nonaka+	E1949
p,α	^{12}C	DAP	2JPNTOK	6.7+06	1.5+07	Jour	JPJ,22,(4),949	Apr 67	I.Nonaka+	E1949

8 Oxygen 16

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
α,p	^{19}F	CSP	2JPNTOK	2.7+07	3.3+07	Jour	JPJ,16,(4),583	Apr 61	H.Yamaguchi	E1943
α,p	^{19}F	DAP	2JPNTOK	2.7+07	3.3+07	Jour	JPJ,16,(4),583	Apr 61	H.Yamaguchi	E1943
α,x	^{18}F	CS	2JPNTOK	2.1+07	4.0+07	Jour	JPJ,16,(1),129	Jan 61	M.Furukawa+	E1953

10 Neon 20

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
α,p	^{23}Na	CSP	2JPNTOK	2.7+07		Jour	JPJ,16,(4),583	Apr 61	H.Yamaguchi	E1943
α,p	^{23}Na	DAP	2JPNTOK	2.7+07		Jour	JPJ,16,(4),583	Apr 61	H.Yamaguchi	E1943

12 Magnesium

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
p,el	^{nat}Mg	DA	2JPNTOK	7.3+06	1.6+07	Jour	NP,27,(1),1	Sep 61	K.Matsuda+	E1941

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Magnesium

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Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max		Ref Vol	Page			
<i>p,inel</i>	²⁴ Mg	CSP	2JPNTOK	7.3+06	1.6+07	Jour	NP,27,(1),1		Sep 61	K.Matsuda+	E1941
<i>p,inel</i>	²⁴ Mg	DA	2JPNTOK	9.6+06	1.6+07	Jour	NP,27,(1),1		Sep 61	K.Matsuda+	E1941
<i>p,inel</i>	²⁴ Mg	DAP	2JPNTOK	7.3+06	1.6+07	Jour	NP,27,(1),1		Sep 61	K.Matsuda+	E1941

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Aluminium

27

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max		Ref Vol	Page			
<i>p,γ</i>		RP	1USAWAU	2.9+06	3.7+06	Jour	PR/C,27,(2),493		Feb 83	K.A.Snover+	E1691

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Calcium

40

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max		Ref Vol	Page			
<i>p,d</i>	³⁹ Ca	DAP	2JPNTOK	5.5+07		Jour	JPJ,21,(1),14		Jan 66	H.Ejiri+	E1947

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Titanium

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max		Ref Vol	Page			
<i>p,x</i>	Many	CS	2JPNLEP	1.2+10		Jour	PR/C,28,(4),1840		Oct 83	T.Asano+	E1952

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Titanium

48

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max		Ref Vol	Page			
<i>p,n</i>	⁴⁸ V	CS	2JPNLEP	1.2+10		Jour	PR/C,28,(4),1840		Oct 83	T.Asano+	E1952

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Chromium

52

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max		Ref Vol	Page			
<i>p,d</i>	⁵¹ Cr	DAP	2JPNTOK	5.5+07		Jour	JPJ,21,(1),14		Jan 66	H.Ejiri+	E1947

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Iron

56

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max		Ref	Vol Page			
<i>p,x</i>	Many	CS	2JPNLEP	1.2+10		Jour	PR/C,28,(4),1840		Oct 83	T.Asano+	E1952

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Iron

57

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max		Ref	Vol Page			
<i>p,n</i>	⁵⁷ Co	CS	2JPNLEP	1.2+10		Jour	PR/C,28,(4),1840		Oct 83	T.Asano+	E1952

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Nickel

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max		Ref	Vol Page			
<i>p,x</i>	Many	CS	2JPNLEP	1.2+10		Jour	PR/C,28,(4),1840		Oct 83	T.Asano+	E1952

28

Nickel

60

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max		Ref	Vol Page			
<i>p,d</i>	⁵⁹ Ni	DAP	2JPNTOK	5.5+07		Jour	JPJ,21,(1),14		Jan 66	H.Ejiri+	E1947
<i>p,el</i>	⁶⁰ Ni	DA	2JPNTOK	5.5+07		Jour	JPJ,21,(11),2103		Nov 66	M.Koike+	E1948
<i>p,inel</i>	⁶⁰ Ni	DAP	2JPNTOK	5.5+07		Jour	JPJ,21,(11),2103		Nov 66	M.Koike+	E1948

29

Copper

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max		Ref	Vol Page			
<i>p,x</i>	Many	CS	2JPNLEP	1.2+10		Jour	PR/C,28,(4),1840		Oct 83	T.Asano+	E1952

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Copper

63

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max		Ref	Vol Page			
<i>p,2n</i>	⁶² Zn	CS	2JPNLEP	1.2+10		Jour	PR/C,28,(4),1840		Oct 83	T.Asano+	E1952
<i>p,el</i>	⁶³ Cu	DA	2JPNTOK	7.6+06	1.5+07	Jour	JPJ,20,(5),679		May 65	M.Koike+	E1946

29

Copper

65

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation		Date	Author	Data #
				Min	Max		Ref	Vol Page			
<i>p,el</i>	⁶⁵ Cu	DA	2JPNTOK	7.6+06	1.5+07	Jour	JPJ,20,(5),679		May 65	M.Koike+	E1946

p,x Many CS 2JPNLEP 1.2+10 Jour PR/C,28,(4),1840 Oct 83 T.Asano+ E1952

30 Zinc

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,x</i>	⁶⁵ Zn	CS	2JPNLEP	1.2+10		Jour	PR/C,28,(4),1840	Oct 83	T.Asano+	E1952

48 Cadmium 111

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,el</i>	¹¹¹ Cd	DA	2JPNTOK	1.4+07		Jour	NP/A,98,(2),209	May 67	M.Koike	E1950
<i>p,inel</i>	¹¹¹ Cd	CSP	2JPNTOK	1.4+07		Jour	NP/A,98,(2),209	May 67	M.Koike	E1950
<i>p,inel</i>	¹¹¹ Cd	DAP	2JPNTOK	1.4+07		Jour	NP/A,98,(2),209	May 67	M.Koike	E1950

48 Cadmium 112

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,el</i>	¹¹² Cd	DA	2JPNTOK	1.5+07		Jour	NP/A,98,(2),209	May 67	M.Koike	E1950
<i>p,inel</i>	¹¹² Cd	CSP	2JPNTOK	1.5+07		Jour	NP/A,98,(2),209	May 67	M.Koike	E1950
<i>p,inel</i>	¹¹² Cd	DAP	2JPNTOK	1.5+07		Jour	NP/A,98,(2),209	May 67	M.Koike	E1950

48 Cadmium 113

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>p,el</i>	¹¹³ Cd	DA	2JPNTOK	1.4+07		Jour	NP/A,98,(2),209	May 67	M.Koike	E1950
<i>p,inel</i>	¹¹³ Cd	CSP	2JPNTOK	1.4+07		Jour	NP/A,98,(2),209	May 67	M.Koike	E1950
<i>p,inel</i>	¹¹³ Cd	DAP	2JPNTOK	1.4+07		Jour	NP/A,98,(2),209	May 67	M.Koike	E1950

78 Platinum

Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
<i>d,x</i>	¹⁹² Ir	CS	2JPNTOH	3.9+07	9.6+06	Jour	NIM/B,243,(1),20	Jan 06	F.Ditroi+	E1955
<i>d,x</i>	¹⁹¹ Pt	CS	2JPNTOH	3.9+07	2.2+07	Jour	NIM/B,243,(1),20	Jan 06	F.Ditroi+	E1955
<i>d,x</i>	¹⁹⁵ Pt	CS	2JPNTOH	3.9+07	9.6+06	Jour	NIM/B,243,(1),20	Jan 06	F.Ditroi+	E1955
<i>d,x</i>	¹⁹⁷ Pt	CS	2JPNTOH	3.9+07	9.6+06	Jour	NIM/B,243,(1),20	Jan 06	F.Ditroi+	E1955
<i>d,x</i>	¹⁹¹ Au	CS	2JPNTOH	3.9+07	3.6+07	Jour	NIM/B,243,(1),20	Jan 06	F.Ditroi+	E1955
<i>d,x</i>	¹⁹² Au	CS	2JPNTOH	3.9+07	9.6+06	Jour	NIM/B,243,(1),20	Jan 06	F.Ditroi+	E1955
<i>d,x</i>	¹⁹³ Au	CS	2JPNTOH	3.9+07	9.6+06	Jour	NIM/B,243,(1),20	Jan 06	F.Ditroi+	E1955
<i>d,x</i>	¹⁹⁴ Au	CS	2JPNTOH	3.9+07	9.6+06	Jour	NIM/B,243,(1),20	Jan 06	F.Ditroi+	E1955
<i>d,x</i>	¹⁹⁵ Au	CS	2JPNTOH	3.9+07	9.6+06	Jour	NIM/B,243,(1),20	Jan 06	F.Ditroi+	E1955
<i>d,x</i>	¹⁹⁶ Au	CS	2JPNTOH	3.9+07	9.6+06	Jour	NIM/B,243,(1),20	Jan 06	F.Ditroi+	E1955

<i>d,x</i>	¹⁹⁸ Au	CS	2JPNTOH	3.9+07	9.6+06	Jour	NIM/B,243,(1),20	Jan 06	F.Ditroi+	E1955
<i>d,x</i>	¹⁹⁹ Au	CS	2JPNTOH	3.9+07	9.6+06	Jour	NIM/B,243,(1),20	Jan 06	F.Ditroi+	E1955

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Lead

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Reaction	Product	Quantity	Lab.	Energy (eV)		Type	Documentation Ref Vol Page	Date	Author	Data #
				Min	Max					
⁷ Li,inel	²⁰⁸ Pb	DAP	2JPNOSA	1.5+08		Jour	JPJ,74,(9),2640	Sep 05	T.Yamagata+	E1959