Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia, A. Chakraborty	NDS 197,1 (2024)	31-May-2024

Q(β^-)=6982.7 *23*; S(n)=6340.3 *13*; S(p)=18850 *7*; Q(α)=−11787 *18* 2021Wa16
S(2n)=10004.1 *13*, S(2p)=3.476E4 *13*, Q(β^-n)=1255.1 *13* (2021Wa16).
1971Ar32: First identification of ^{30}Mg in bombardment of a ^{232}Th target with 290 MeV ^{40}Ar ions at JNIR, Dubna, USSR. The charged-particle identification was done combining the magnetic analysis and the ΔE-E technique.
1997Fo01: Measured production yield of 100 μb in ^{37}Cl+^{208}Pb reaction, E=230 MeV.
Atomic excess mass measurements: 2013Ch49, 2006Ga04, 1991Or01, 1986Vi09, 1991Zh24.

Nuclear effective root-mean-square (rms) radius measurement: 3.06 fm *2* and 3.08 fm *2*, restricting size and diffuseness parameters, respectively (1998Su07,1997Su04).

Production cross sections ~50 μb and ~0.2 mb were measured in fragmentation of ^{9}Be(^{40}Ar,X): E=90A MeV and 94A MeV and ^{181}Ta(^{40}Ar,X): E=94 MeV/nucleon, respectively (2007No13). Similar data also reported in 2012Kw02.
Production cross sections ~0.12 mb and ~0.19 mb were measured in fragmentation of ^{9}Be(^{40}Ar,X) and ^{181}Ta(^{40}Ar,X), E=57 MeV/nucleon, respectively (2012Zh06).
In 2006Kh08, 55.77 and 48.73 MeV/A beams of ^{30}Mg impinged on a Si target, measured σ=2370 mb *86* and σ=2342 mb *37*, respectively, for the Si(^{30}Mg,x) reaction and a reduced strong absorption radius of $<r_0^2>$=1.215 fm^2 *18* is deduced and used to study the isospin dependence.

^{30}Mg Levels

Cross Reference (XREF) Flags

A	^{30}Na β^- decay (45.4 ms)	D	C(^{30}Mg,^{30}Mg′γ),Ni(^{30}Mg,^{30}Mg′)
B	^{31}Na β^-n decay	E	C(^{31}Mg,^{30}Mgγ)
C	^{32}Na β^-2n decay	F	^{14}C(^{18}O,2pγ)

E(level)[†]	J$^\pi$	T$_{1/2}$[@]	XREF	Comments
0[&]	0$^+$	319 ms *6*	ABCDEF	%β^-=100 %β-n<0.06 (1984La03). $\delta<r^2>$(^{26}Mg,^{30}Mg)=+0.473 fm^2 *5* (stat) *56* (syst) (2012Yo01). $<r^2>^{1/2}$=3.1110 fm *8* (stat) *94* (syst) (2012Yo01). T$_{1/2}$: weighted average of 325 ms *30* (1979De02), 340 ms *20* (1986Du07), also 335 ms *40* (1986Du11) and 342 ms *18* (1988DuZT), 311 ms *8* (2017Ha23), 335 ms *10* (2016Ol06 − 243.8γ(t)), 315 ms *6* (2008Hi05). Others: 270 ms *135* (1982Mu08 − β(t)), 1200 ms *500* (1974Ro31 − β(t)).
1483.14[&] *11*	2$^+$	1.53 ps *20*	ABCDEF	J$^\pi$: from systematics of the first excited state of even-even nuclides. 1482γ E2, ΔJ=2, to 0$^+$. T$_{1/2}$: weighted average of 2.0 ps *5* (^{31}Na β^-n decay), 1.4 ps *2* (^{30}Mg,^{30}Mg′γ), and 1.59 ps *22* (from τ=2.3 ps *3* (stat) *1* (syst) (2021El06)).
1788.21[a] *16*	0$^+$	3.8 ns *4*	AB E	J$^\pi$: 1788γ E0 to 0$^+$ state. T$_{1/2}$: weighted average of 3.9 ns *4* (2005Ma96 − ^{31}Na β-n decay) and 3.6 ns *4* (2020Ni05 − ^{30}Na β- decay). The uncertainty is that of the lowest of the input values.
2468.10[a] *13*	(2$^+$)	<5 ps	AB EF	J$^\pi$: on the basis of the B(E2) value and systematics with the decay pattern of the 2$^+_2$ state in ^{28}Mg (2005Ma96). In (^{31}Mg,^{30}Mgγ) (2018Fe05) (2)$^-$ is proposed. However, authors in 2020Ni05 (^{30}Na β- decay) argue that negative-parity levels at these energies were hardly predicted and support the (2$^+$) assignment.

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Adopted Levels, Gammas (continued)

^{30}Mg Levels (continued)

E(level)[†]	Jπ	XREF	Comments
2543.2 *4*	(2⁻,3⁻)	F	Jπ: in (^{18}O,2pγ), based on 1059.8γ, ΔJ=0 or 1, to 2⁺; negative parity from the absence of ^{30}Na β⁻ decay feeding; and shell model predictions.
3303.75 *25*	(1,2,3)	AB E	Jπ: proposed in 2020Ni05 (^{30}Na β- decay), based on γ from 2⁺ (5095), when the other transition from 2⁺ (5095) to 2⁺ (1483) more of a M1, E1 in nature. Other: 3⁻ in 2020Ki19 and (3)⁻ in 2018Fe05 – both in (^{31}Mg,^{30}Mgγ).
3381.60 *18*	(4⁺)	A EF	Jπ: 1898.3γ Q, ΔJ=2, to 2⁺; shell model predictions (2010De26 – (^{18}O,2pγ)).
3461.72 *13*	(2)	AB EF	XREF: F(3455). Jπ: proposed in 2020Ni05 ^{30}Na β- decay, based on γ from 3⁺ (6066), 2⁺ (5413), and 1⁺ (4967) and γ to 2⁺ and discards 4⁺ in (^{18}O,2pγ). In 2020Ki19 (^{31}Mg,^{30}Mgγ), the momentum distribution measurements also did not support a 4⁺ assignment.
3462.82 *20*	(1,2)	A	Jπ: proposed in 2020Ni05 ^{30}Na β- decay, based on γ from 1⁺ (5022).
3542.65[b] *14*	(2⁺)	A E	Jπ: (2⁺) proposed in 2020Ni05 (^{30}Na β- decay) from the γ-vibrational band based on this level and feeding from the (3⁺) state at 4695. The 3539 keV *3* level in (^{31}Mg,^{30}Mgγ) appears to be the same level, Jπ=1⁻, although variation of spin-parity exists. The depopulating γ-ray energies are statistically the same in both datasets. Note that (1⁻) was orginally proposed in 2018Fe05 based on L(^{31}Mg,^{30}Mgγ)=1 for a better χ^2/ν value, χ^2/ν=1.9 and 2.0 for L=1 and 2, respectively. The L=2 value is closely possible. The evaluators porpose (2⁺) considering the L(^{31}Mg,^{30}Mgγ)=2 and arguments mentioned above from 2020Ni05.
4183.9 *7*	(5)	EF	Jπ: 802γ D to (4⁺); shell model predictions (2010De26 – (^{18}O,2pγ)).
4259.5 *3*	(2,3,4)[#]	A EF	
4262.6 *11*		E	
4297.72 *20*	(1,2⁺)	A	Jπ: 4297.2γ to 0⁺.
4359.2 *24*		F	
4683.76 *19*	(2,3,4)[#]	A E	
4694.78[b] *22*	(3⁺)[‡]	A E	
4783.33 *22*	(2,3,4)[#]	A	
4967.48 *12*	1⁺[‡]	AB E	
5022.03 *15*	1⁺[‡]	A E	
5095.16 *13*	2⁺[‡]	AB E	
5213 *3*	(2)⁻	E	Jπ: based on parallel momentum distributions measurements fit for $2p_{3/2}$ orbital (2020Ki19 – (^{31}Mg,^{30}Mgγ)).
5313? *3*		F	E(level): proposed in 2010De26 (^{18}O,2pγ), however, depopulating 954.0γ appears to be placed from different level in (^{31}Mg,^{30}Mgγ) (2018Fe05) and 955.7γ from 4259.5 in ^{30}Na β- decay (2020Ni05). The evaluators consider this placement questionable.
5413.62 *12*	2⁺[‡]	A E	
5619.33 *19*	(1⁺,2⁺)[‡]	A	
5898.45 *18*	1⁺[‡]	A E	
5921.2 *4*		A E	
6066.34 *15*	3⁺[‡]	A E	

[†] From a least-squares fit to the γ-ray energies. During the fit the uncertainty of 990.0γ depopulating the 3461 keV level is increased from 0.5 to 1.0 to reduce the deviation less than 3σ.
[‡] Based on allowed transition from 2⁺ in ^{30}Na β⁻ decay and β asymmetry measurements for polarized ^{30}Na. Asymmetry parameter (A) values of −1.0, −0.33, and +0.67 were expected for spins 1⁺, 2⁺, and 3⁺, respectively (2020Ni05).
[#] Proposed in 2020Ni05 ^{30}Na β- decay, based on γ feeding from 3⁺ at 6066.
[@] From ^{31}Na β⁻n decay, except otherwise noted.
[&] Band(A): g.s. band.

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Adopted Levels, Gammas (continued)

^{30}Mg Levels (continued)

[a] Band(B): Deformed band.
[b] Band(C): γ-vibrational band.

Adopted Levels, Gammas (continued)

γ(^{30}Mg)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	α[&]	$I_{(\gamma+ce)}$[†]	Comments
1483.14	2^+	1483.1 *2*	100	0	0^+	E2	9.06×10^{-5} *13*		B(E2)(W.u.)=9.3 *+14−11* α(K)=7.84×10^{-6} *11*; α(L)=5.04×10^{-7} *7*; α(M)=1.866×10^{-8} *26* α(IPF)=8.22×10^{-5} *12* E_γ: other: 1480.6 *5* (^{18}O,2pγ).
1788.21	0^+	305.3 *2*	100	1483.14	2^+	[E2]	9.18×10^{-4} *13*		B(E2)(W.u.)=10.1 *+12−10* α(K)=0.000860 *12*; α(L)=5.53×10^{-5} *8*; α(M)=2.037×10^{-6} *29* E_γ: weighted average of 305.1 *2* from ^{30}Na β^- decay and 305.6 *3* from ^{31}Na β^-n decay. Other: 300 *5* from (^{31}Mg,^{30}Mgγ).
		1788		0	0^+	E0		2.0×10^{-5} *4*	E_γ,Mult.,$I_{(\gamma+ce)}$: from 2009Sc11 (^{30}Na β^- decay). Earlier speculation of 1788γ E0 transition is confirmed by 2009Sc11, monopole strength ρ^2(E0)=0.026 *8*.
2468.10	(2^+)	985.0 *2*	100	1483.14	2^+				Mult.: 2005Ma96 (^{31}Na β-n decay) argue 985.1γ to be of dominant M1 character from the B(E2) values.
2543.2	$(2^-,3^-)$	1059.8[‡] *9*	100	1483.14	2^+	(D+Q)			
3303.75	(1,2,3)	1820.4 *4*	100	1483.14	2^+				E_γ: weighted average of 1820.5 *3* from ^{30}Na β^- decay and 1820.4 *6* from ^{31}Na β^-n decay. Other: 1817 *2* from (^{31}Mg,^{30}Mgγ). Placement of 1820γ is shown from the 1820 keV level in ^{30}Na β^- decay (1984Gu19). 2005Ma96 (^{31}Na β^-n decay) placed this γ-ray from the 3303 keV level based on the 1789-1820-1482 cascade γ-rays.
3381.60	(4^+)	838.4[‡] *3*	20[‡] *7*	2543.2	$(2^-,3^-)$				
		1898.3 *2*	100[‡] *8*	1483.14	2^+	Q			E_γ: weighted average of 1898.3 *2* from ^{30}Na β^- decay and 1898.4 *8* from (^{18}O,2pγ). Other: 1898 *2* from (^{31}Mg,^{30}Mgγ).
3461.72	(2)	1978.2 *2*	100	1483.14	2^+				E_γ: weighted average of 1978.2 *2* from ^{30}Na β^- decay and 1978.1 *6* from ^{31}Na β^-n decay. Others: 1974.8 *19* from (^{18}O,2pγ) and 1976 *2* from (^{31}Mg,^{30}Mgγ). Mult.: Q in (^{18}O,2pγ), not consistent with the latest spin assignments.
3462.82	(1,2)	994.7 *3*	5.9 *11*	2468.10	(2^+)				E_γ: Other: 990.0 *5*, in (^{18}O,2pγ) the placement from 3461 keV level – fits poorly (deviation more than 5σ from the calculated value of 993.4). Most likely same Eγ (994.7) from this level. Two close by levels have been proposed and confirmed in 2020Ni05 ^{30}Na β- decay.
		1979.6 *2*	100 *14*	1483.14	2^+				
3542.65	(2^+)	2059.5 *2*	25 *8*	1483.14	2^+				
		3542.3 *3*	100 *7*	0	0^+				

$^{30}_{12}Mg_{18}$-4

Adopted Levels, Gammas (continued)

γ(^{30}Mg) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[@]	Comments
4183.9	(5)	802.3[‡] *6*	100	3381.60	(4$^+$)	D	
4259.5	(2,3,4)	879.0[‡a] *9*		3381.60	(4$^+$)		E_γ: the γ-ray reported in (^{18}O,2pγ) (2010De26) only. It appears that in (^{31}Mg,^{30}Mgγ) (2018Fe05) and in ^{30}Na β- decay (2020Ni05), same level has been proposed but only with 955γ. In (^{18}O,2pγ), however, 955γ has been placed from 5313 keV level. The evaluators mark this Eγ as questionable placement.
		955.7 *2*		3303.75	(1,2,3)		
4262.6		881[#] *1*	100	3381.60	(4$^+$)		
4297.72	(1,2$^+$)	4297.2 *4*	100	0	0$^+$		
4359.2		1816.0[‡] *23*	100	2543.2	(2$^-$,3$^-$)		
4683.76	(2,3,4)	1221.9 *3*	48 *9*	3461.72	(2)		
		3200.0 *3*	100 *14*	1483.14	2$^+$		E_γ: other: 3200 *5* (^{31}Mg,^{30}Mgγ).
4694.78	(3$^+$)	1152.0 *4*	82 *7*	3542.65	(2$^+$)		
		2226.6 *3*	48 *14*	2468.10	(2$^+$)		E_γ: other: 2219 *5* (^{31}Mg,^{30}Mgγ).
		3211.5 *3*	100 *13*	1483.14	2$^+$		
4783.33	(2,3,4)	1479.5 *5*	48 *28*	3303.75	(1,2,3)		
		3300.1 *4*	100 *13*	1483.14	2$^+$		
4967.48	1$^+$	669.5 *4*	2.3 *8*	4297.72	(1,2$^+$)		
		1505.9 *2*	54 *4*	3461.72	(2)		
		2499.2 *2*	11.3 *10*	2468.10	(2$^+$)		
		3179.3 *2*	79 *6*	1788.21	0$^+$		
		3484.1 *2*	71 *6*	1483.14	2$^+$		
		4966.8 *2*	100 *7*	0	0$^+$		
5022.03	1$^+$	724.4 *4*	1.8 *7*	4297.72	(1,2$^+$)		
		1559.6 *2*	25.6 *25*	3462.82	(1,2)		
		3539.4 *5*	14.9 *25*	1483.14	2$^+$		
		5022.1 *2*	100 *6*	0	0$^+$		
5095.16	2$^+$	797.4 *3*	14.0 *13*	4297.72	(1,2$^+$)		
		1552.4 *2*	69 *6*	3542.65	(2$^+$)		
		1633.2 *4*	21.0 *19*	3461.72	(2)		
		1789.5 *10*	60 *10*	3303.75	(1,2,3)		E_γ: In 2005Ma96 (^{31}Na β$^-$n decay), 1788γ is placed from the 5091.7 keV level based on the 1789-1820-1482 cascade γ-rays. In 2005Ma96, it is speculated that the levels at 5091.7 keV and 5093 keV (1993Kl02 – (^{31}Na β-n decay)), are the same. Here only 5095.16 keV in this dataset.
		2627.1 *2*	28 *3*	2468.10	(2$^+$)		
		3611.9 *4*	11.4 *14*	1483.14	2$^+$		
		5094.7 *2*	100 *6*	0	0$^+$		
5213	(2)$^-$	1670[#] *3*	100	3542.65	(2$^+$)		
5313?		954.0[‡a] *15*	100	4359.2			E_γ: other placement: comparable 956γ from 4252 keV level in (^{31}Mg,^{30}Mgγ) (2018Fe05) and 955.7γ from 4259.5 in ^{30}Na β- decay (2020Ni05), perhaps both

$^{30}_{12}Mg_{18}$-5

Adopted Levels, Gammas (continued)

γ(^{30}Mg) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Comments
						4252 and 4259.5 keV levels are same. Evaluators consider it as a questionable placement.
5413.62	2^+	1871.0 *2*	20.8 *20*	3542.65	(2^+)	
		1951.9 *3*	64 *10*	3461.72	(2)	
		2945.3 *2*	19.7 *18*	2468.10	(2^+)	
		3625.2 *3*	47 *4*	1788.21	0^+	
		3930.2 *2*	100 *8*	1483.14	2^+	
		5413.0 *2*	100 *7*	0	0^+	
5619.33	$(1^+,2^+)$	2157.6 *2*	71 *27*	3461.72	(2)	
		5618.6 *3*	100 *11*	0	0^+	
5898.45	1^+	3430.2 *2*	100# *11*	2468.10	(2^+)	
		4414.9 *2*	80 *7*	1483.14	2^+	I_γ: weighted average of 83 *7* from ^{30}Na β^- decay and 74 *11* from (^{31}Mg,^{30}Mgγ).
5921.2		2458.9 *4*	100 *39*	3462.82	(1,2)	
		2618.0 *5*	25 *7*	3303.75	(1,2,3)	
6066.34	3^+	1283.0 *2*	36 *5*	4783.33	(2,3,4)	
		1382.3 *2*	14.2 *22*	4683.76	(2,3,4)	
		1806.6 *3*	29 *4*	4259.5	(2,3,4)	
		2605.1 *3*	65 *5*	3461.72	(2)	
		2684.5 *2*	100 *9*	3381.60	(4^+)	
		3597.9 *3*	34 *4*	2468.10	(2^+)	
		4583.0 *2*	16 *9*	1483.14	2^+	E_γ: Other: 4582 (^{31}Mg,^{30}Mgγ).

† From ^{30}Na β^- decay, except where otherwise noted.
‡ From (^{18}O,2pγ).
# From (^{31}Mg,^{30}Mgγ).
@ From (^{18}O,2pγ) based on $\gamma(\theta)$ measurements, except where otherwise noted.
& Additional information 1.
a Placement of transition in the level scheme is uncertain.

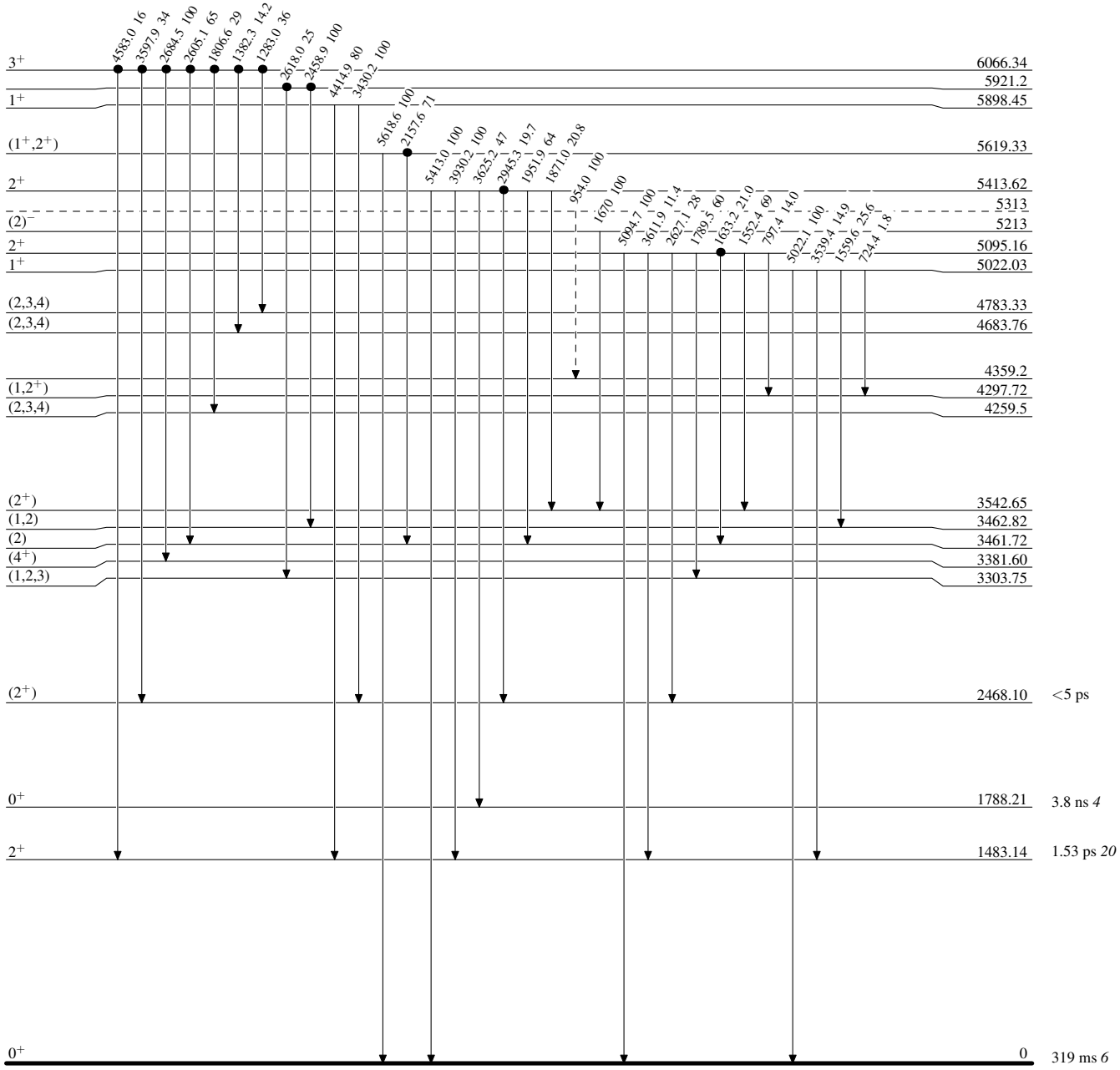
$^{30}_{12}Mg_{18}$-6

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

Legend: γ Decay (Uncertain); Coincidence



$^{30}_{12}Mg_{18}$

Adopted Levels, Gammas

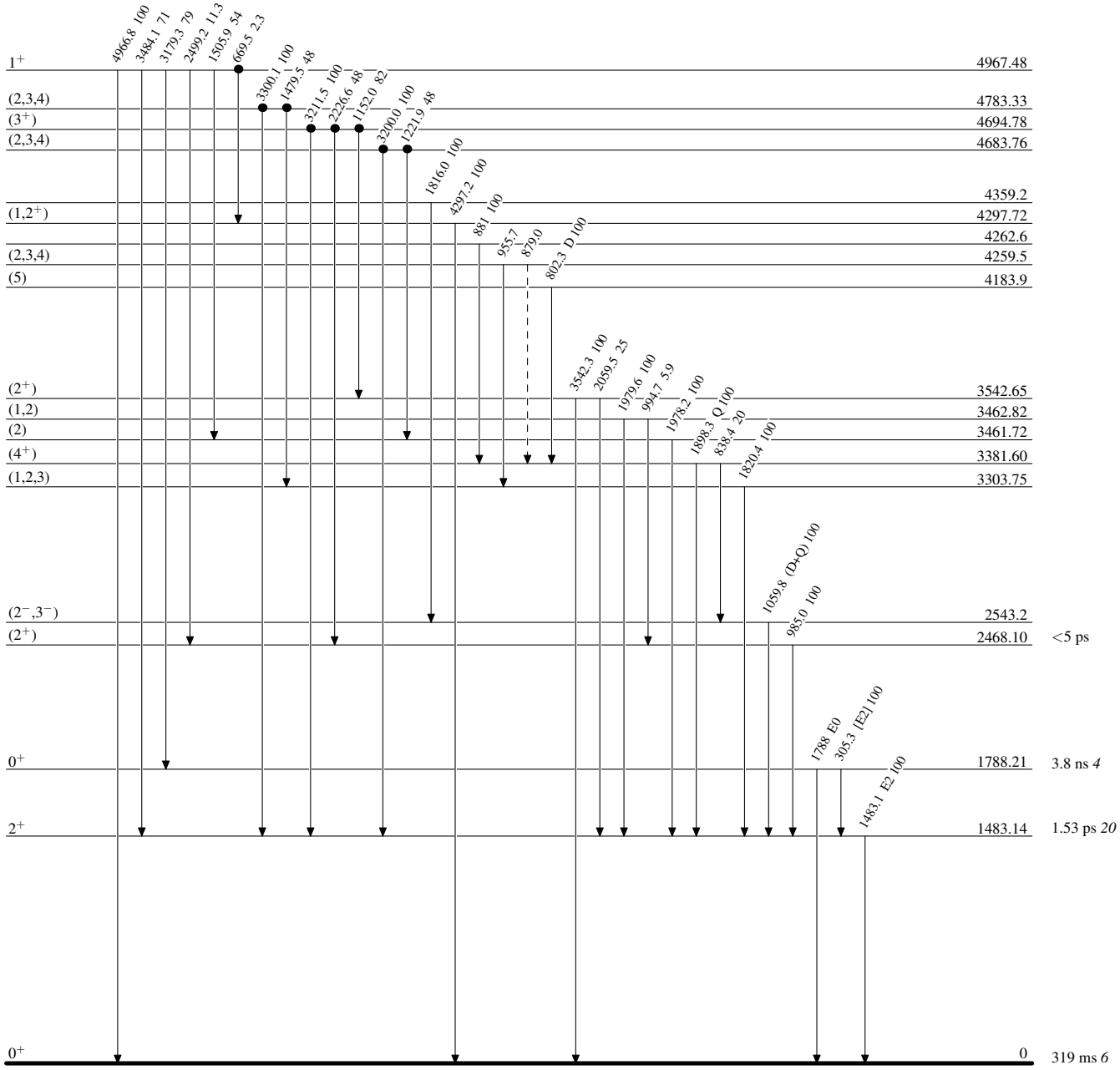
Level Scheme (continued)

Intensities: Relative photon branching from each level

Legend

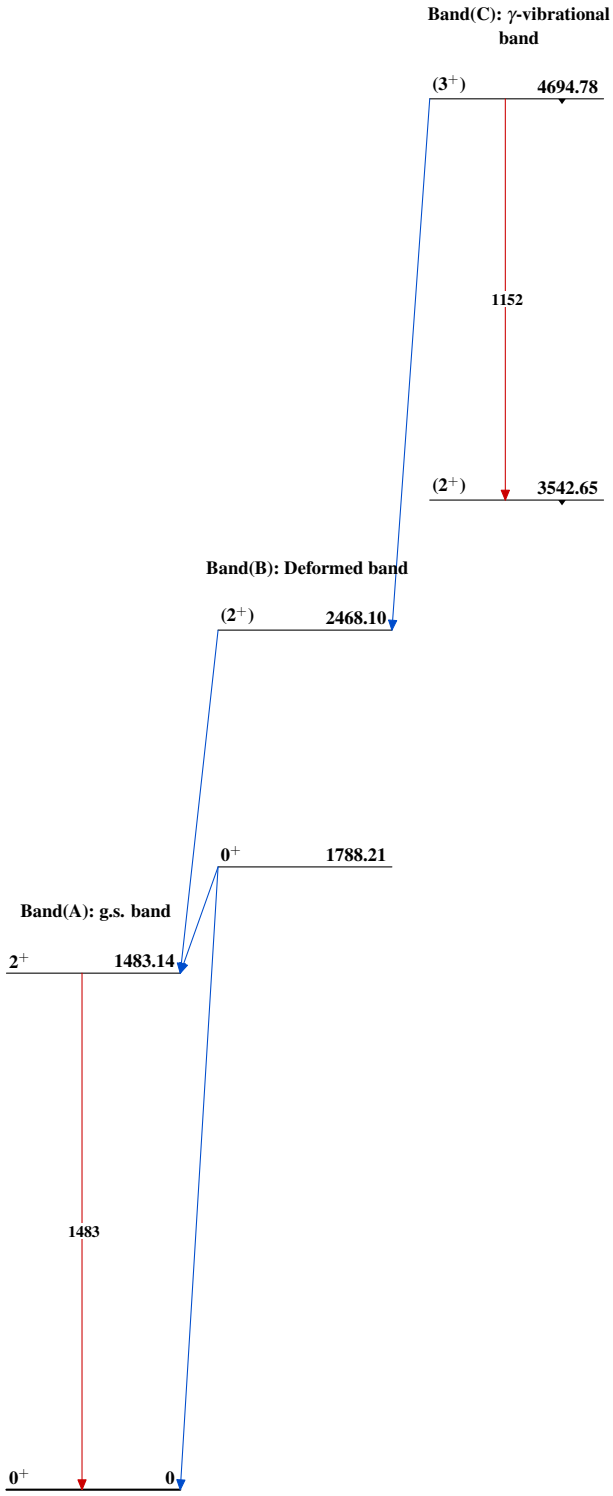
- - - - - - ► γ Decay (Uncertain)

● Coincidence



$^{30}_{12}Mg_{18}$

Adopted Levels, Gammas



$^{30}_{12}Mg_{18}$