^{28}Si(p,t)   2010Ma43,2011Ma46,2002Ba25

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia and A. M. Hurst	NDS 134, 1 (2016)	1-Feb-2016

Others: 1970Ne17,1972Pa02,1985Mi06,1996Il01,2005Pa31,2006Ba65,2007ClZZ, 2010Ch44.

2010Ma43: Two-neutron pick-up experiment performed at the high-resolution Grand Raiden (GR) spectrometer at the Research Center for Nuclear Physics. Proton beam energy E(lab)=98.7 MeV from the Ring Cyclotron facility incident upon ^{28}Si self-supporting target (99.94% enrichment) with an areal density of 0.7 mg/cm^2. Measured energy levels in ^{26}Si according to momentum analysis of the outgoing tritons detected using the GR spectrometer. Single-particle spectroscopic factors compared to previous work. Measured angular distributions and DWBA analysis.

2011Ma46: Resonance levels in ^{26}Si observed above the α-emission threshold at 9.164 MeV. ^{26}Si events produced using a 98.7-MeV proton beam from the Ring Cyclotron facility of the Research Center for Nuclear Physics (RCNP) at Osaka University, and impinging a 3-foil- stacked ^{28}Si self-supporting target of thickness 0.7 mg/cm^2. The outgoing tritons were momentum analyzed by the Grand Raiden (GR) spectrometer. Measured angular distributions. Deduced energy levels, J^π, and α spectroscopic factors. Reaction rates deduced for ^{22}Mg(α,p)^{25}Al.

2002Ba25,2006Ba65: Measured differential cross sections for the ^{28}Si(p,t)^{26}Si reaction to study the ^{25}Al(p,γ)^{26}Si reaction rate in novae. E(p)=40,42 MeV, 50 μg/cm^2 natural silicon target. Measured triton spectra using silicon detector array, ΔE-E energy-loss techniques, angular distributions, L-transfer and J^π assignments. See also 2003Ba85.

2010Ch44: Measured triton energy spectra and angular distributions using SIDAR, a segmented annular array of silicon detectors. A 40-MeV proton beam was delivered from the ORNL Holifield Radioactive Ion Beam facility incident on a 200$-\mu$g/cm^2 ^{nat}Si target. Measured proton-triton coincidences, deduced levels, J^π assignments and proton-decay branching ratios. DWBA analysis of $\sigma(\theta)$ data. Astrophysical relevance to the reaction rates for ^{25}Al(p,γ) inferred.

1972Pa02: 28S2011RiI(p,t),E=40-45 MeV. Deduced energy levels, J^π assignments, L-transfer measurements. Two-nucleon distorted-wave calculations compared to experimental angular distributions.

2005Pa31: Measured Q values of the reactions ^{28}Si(p,t)^{26}Si, ^{24}Mg(p,t)^{22}Mg relative to that of ^{16}O(p,t)^{14}O using 33-MeV proton beam. Backed 65 μg/cm^2 ^{28}SiO and 67 μg/cm^2 ^{24}MgO targets. Measured triton-momentum spectra at angles of 15° and 25°. Deduced mass excess of ^{26}Si ΔM=$-$7139.5 keV 10.

2007ClZZ: ^{28}Si(p,t)^{26}Si reaction used to measure mass of ^{26}Si with the Yale spectrograph. Experiment performed using the Van de Graaff accelerator at Yale University. E(lab)=33 MeV proton beam incident upon ^{28}SiO (65 μg/cm^2 with a gold flash) target. Triton momentum spectra corresponding to ground state of ^{26}Si measured at 25° spectrograph angle. Focal-plane detection system comprised position-sensitive gas ionization drift chamber followed by a scintillator. Deduced mass excess of ^{26}Si ΔM=$-$7139.5 keV 10.

^{26}Si Levels

E(level)[†]	J$^{\pi c}$	L[e]	Comments
0	0^+		
1796.7 6	2^+		
2785.2 12	2^+		
3334.2 17	0^+		
3756.8 6	3^+		
4138.7[a] 10	2^+		
4186.9[a] 12	3^+		
4446.2 5	4^+	(2+4)	
4798.5 16	4^+	(0+2+4)[f]	
4808.6 17	(2^+)	(0+2+4)[f]	
4830.3 16	(0^+)	(0+2+4)[f]	
5145.7 13	2^+	2	
5229?[‡] 12			E(level): The authors of 2010Ma43 raise doubts over the existence of this level. They claim its observation in 1972Pa02 is likely from an overlap of the 5145.7(13) and 5289.0(13)-keV levels obscured by the tail of the ^{10}C$_{gs}$ impurity peak at the same position.
5289.0 13	4^+		

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^{28}Si(p,t)　　2010Ma43,2011Ma46,2002Ba25 (continued)

^{26}Si Levels (continued)

E(level)[†]	J$^{\pi c}$	L[e]	S	Comments
5515 5	4$^+$	(4)		E(level): From 2002Ba25. Other values: 5562 keV 28 (1972Pa02); 5517.2 keV 6 (2010Ma43 − used as calibration energy).
5674.9 22	1$^+$		0.0048[i]	S: other value: 0.004 (1996Il01). E$_p$(c.m.)=155 keV (2006Ba65). Γ_p=1.3×10^{-12} keV\$ Γ_γ=1.1×10^{-4} keV (2006Ba65).
5916 2	3$^+$		0.141[i]	E(level): From 2002Ba25. Other values: 5927 keV 4 (2010Ch44), 5921 keV 12 (tentative value in 2010Ma43). J$^\pi$: From angular distribution measurements of tritons in smaller angles and comparison with the mirror ^{26}Mg nucleus (2006Ba65). 2006Ba65 conclude other possible 2$^+$ assignment is less likely due to absence in mirror nucleus. L: 0 from 2002Ba25 based on $\sigma(\theta)$. But new $\sigma(\theta)$ data and re-analysis (by 2006Ba65) of angular distribution by DWBA and FRESCO codes give agreement with L=2 for direct reaction and L=3 for multi-step process. 2010Ch44 also claim experimental confirmation as the first L=0 state above the proton-emission threshold, with a proton-decay branching ratio consistent with unity. See comments for 5890 and 5945.9 keV in Adopted Levels. S: other value 0.14 1996Il01. E$_p$(c.m.)=396 keV (2006Ba65). Γ_p=2.3×10^{-3} keV\$ Γ_γ=3.3×10^{-5} keV (2006Ba65).
5944 20	(0$^+$)		0.039[i]	E(level): Tentative value in 2010Ma43. Other value: 5960 keV 22 (1972Pa02). J$^\pi$: From Adopted Levels. S: other value 0.047 1996Il01. E$_p$(c.m.)=428 keV (2006BA65). Γ_p=1.9×10^{-5} keV\$ Γ_γ=8.8×10^{-6} keV (2006Ba65). $\Gamma_p/(\Gamma_p+\Gamma_\gamma)$=0.91 10 (2010Ch44).
6295.7 24	2$^+$	(2)[g]	0.0087[i]	E(level): Other value: 6300 keV 4 (2002Ba25). S: Other value: 0.028 (1996Il01). $\Gamma_p/(\Gamma_p+\Gamma_\gamma)$=0.88 20 (2010Ch44).
6379 3	(2$^+$)	(2)[g]	0.015[i]	E(level): Other values: 6380 keV 4 (2002Ba25), 6381 keV 20 (1972Pa02). J$^\pi$: From Adopted Levels. S: Other value 0.0089 (1996Il01). $\Gamma_p/(\Gamma_p+\Gamma_\gamma)$=0.88 20 (2010CH44).
6456 3	0$^+$		0.039[i]	J$^\pi$: In Table 1 of 2002Ba25 the J$^\pi$ value is listed as (1$^-$) and sourced from 1996Il01. However, the evaluators could not confirm this assignment.
6785 5	3$^-$	(3)		$\Gamma_p/(\Gamma_p+\Gamma_\gamma)$=1.21 24 (2010Ch44). E(level): Other values: 6787 keV 4 (2002Ba25), 6786 keV 29 (1972Pa02). L: Anisotropic decay (l>0).
6880 30	(3$^-$)		0.0145[i]	E(level): From Adopted Levels. J$^\pi$: From 2002Ba25. [5$^+$] from mirror nucleus assignment (2010Ma43).
7019 10	[3$^+$]		0.0039[i]	E(level): From 2002Ba25. $\Gamma_p/(\Gamma_p+\Gamma_\gamma)$=1.04 25 (2010Ch44).
7151 5	2$^+$		0.045[i]	E(level): Other values: 7160 keV 10 (2002Ba25), 7150 keV 15 (1972Pa02). $\Gamma_p/(\Gamma_p+\Gamma_\gamma)$=1.04 25 (2010Ch44).
7197?[b] 8	[5$^+$]		0.0102[i]	
7415.2 23	(4$^+$)	(2)[h]		E(level): Other value: 7425 keV 7 (2002Ba25). $\Gamma_p/(\Gamma_p+\Gamma_\gamma)$=1.31 27 (2010Ch44).
7498 4	2$^+$	(2)[h]		E(level): From 2002Ba25. Other values: 7479 keV 12 (2010Ma43), 7476 keV 20 (1972Pa02). $\Gamma_p/(\Gamma_p+\Gamma_\gamma)$=1.31 27 (2010Ch44).
7522 12	[5$^-$]			
7661 12	[2$^+$]			
7701 12	3$^-$	3		E(level): Other values: 7687 keV 22 (2002Ba25), 7695 keV 30 (1972Pa02). $\Gamma_p/(\Gamma_p+\Gamma_\gamma)$=1.18 23 (2010Ch44).
7874 4	1$^-$	1		E(level): Other values: 7900 keV 22 (2002Ba25), 7902 keV 21 (1972Pa02). $\Gamma_p/(\Gamma_p+\Gamma_\gamma)$=1.11 22 (2010Ch44).
8166?[#] 7				

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^{28}Si(p,t)   **2010Ma43,2011Ma46,2002Ba25 (continued)**

^{26}Si Levels (continued)

E(level)[†]	J$^{\pi c}$	S	Comments
8222 5	[1$^-$]		
8269 4	[2$^+$]		
8557?[b] 4	[2$^+$]		
8687?[b] 12	[4$^+$]		
8989 7	[4$^+$]		
9124?[#] 8			
9316[@] 5	[4$^+$][d]	0.015[j]	E$_\alpha$(res)=152 keV.
			Mirror state in ^{26}Mg at 9579 keV 3 (2011Ma46).
9605[@] 10	[2$^+$][d]	0.037[j]	E$_\alpha$(res)=441 keV.
			Mirror state in ^{26}Mg at 9856.52 keV 6 (2011Ma46).
9762[@] 4	[5$^-$][d]	0.007[j]	E$_\alpha$(res)=598 keV.
			Mirror state in ^{26}Mg at 10040 keV 2 (2011Ma46).
9903.4[@] 20	[0$^+$][d]	0.037[j]	E$_\alpha$(res)=739.4 keV.
			Mirror state in ^{26}Mg at 10159 keV 3 (2011Ma46).
9952?[#] 17			E(level): Uncertain level not adopted. Present only in this data set.
10436?[&] 10			
10660?[&] 2			
11010?[&] 3			

[†] From 2010Ma43, except where noted.
[‡] Taken from 1972Pa02.
[#] From 2010Ch44, tentative level.
[@] Resonance level above α-emission threshold taken from 2011Ma46.
[&] Possible fluctuation rather than a discrete level (2011Ma46).
[a] Reported as an unresolved doublet in 2002Ba25 with a 4155-keV centroid.
[b] Tentative observation of energy level in 2010Ma43.
[c] Taken from adopted values presented in 2010Ma43 except where noted: From angular distribution measurements in 2007Se02 for
   levels up to 5518 keV; from measured differential cross sections and Hauser-Feshbach analysis in 2004Pa42 for higher levels.
   Values in square brackets are from mirror assignments deduced in 2010Ma43 unless noted otherwise.
[d] Assignment based on correlating observed levels with known natural-parity levels in the mirror nucleus ^{26}Mg in 2011Ma46 since
   population of these levels is preferential in the (p,t) reaction.
[e] Based on distorted-wave Born approximation analysis in 2002Ba25.
[f] Multiplet peak centered on 4805 keV well described by a combination of L=2+4 partial waves in 2002Ba25. However, an
   additional L=0 component reported in 1982Bo14 could not be ruled out.
[g] Angular distribution for 6300+6380-keV doublet peak fit well by an L=2 transfer in 2002Ba25.
[h] Angular distribution for 7425+7498-keV doublet peak fit well by an L=2 transfer in 2002Ba25.
[i] Single-particle spectroscopic factor C^{2}S deduced from measured $\sigma(\theta)$ in 2010MA43.
[j] Alpha-particle spectroscopic factor S$_\alpha$ deduced in 2011MA46 from analysis of mirror states in ^{26}Mg.