^{48}Ca(p,n),(pol p,n) 1968Mc10,1967Mc08,1967Mc07

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 179, 1 (2022)	30-Nov-2021

1968Mc10: E=4.4-5.5 MeV proton beams were produced from the University Alberta pulsed-beam facility. Target was 50 μg/cm^2 84.6% enriched ^{48}Ca on a gold backing. Neutrons were detected with a scintillation detector. Measured neutron spectra at 0°. Deduced levels.

1967Mc07,1967Mc08: E=4.0-5.5 MeV neutrons were produced from the SUNI 5.5-MV Van de Graaff accelerator. Target was ≈100 μg/cm^2 CaO. Neutrons were detected with a liquid scintillator. Measured neutron spectra at 0°. Deduced levels, J.

1965Ch16: E=3.25 MeV proton was produced at BNL. Target was a thin foil of 98% enriched $CaCO_3$. Neutrons were detected with a He^3 neutron spectrometer. Measured neutron spectra at 0°. Deduced levels. 1965Ch16 also report data from (p,nγ).

1985An06,1981Wa08,1980An19: E=134 and 160 MeV. Measured $\sigma(\theta$=0° to 60°. ≈6° steps). FWHM=320-460 keV. DWIA, DWBA.

1986An23: E=134 MeV. Polarization ≈70%. Measured analyzing powers(θ=0° to 60°, 6° steps). FWHM=400 keV ($\theta\leq$42°) to 700 keV. DWIA.

2004Ra26 reanalyzed the data of 1985An06 and a private communication from 1985An06 to extract B(GT$^-$) as part of an effort to deduce the ^{48}Ca $T_{1/2}(2\nu2\beta^-)$. See ^{48}Ca Adopted Levels for results.

Additional information 1.

Others: 2009Ya07, 2004Ra26, 1997Pl01.

1592 *20* state reported by 1965Ch16 and 3919 *10* state reported by 1967Mc07 have not been confirmed in any other work and, therefore, have not been adopted by the evaluator.

^{48}Sc Levels

ΣB(GT$^-$)=1.561 *246* (2004Ra26).

E(level)	J$^\pi$[#]	dσ/dΩ(μb/sr)[b]	Comments
0.0			
133 *7*	5$^+$[&]		E(level): weighted average of 151 *20* (1967Mc07) and 131 *7* (1968Mc10).
255 *7*			E(level): weighted average of 245 *20* (1965Ch16), 237 *20* (1967Mc07), and 258 *7* (1968Mc10).
626 *5*	3$^+$[&]		E(level): weighted average of 631 *20* (1965Ch16), 628 *6* (1967Mc07), and 624 *5* (1968Mc10). J$^\pi$: other: (3,4) from 1967Mc08.
1.1×10^3	7$^+$[&]		E(level): from 1986An23. Results consistent with description as "stretched" particle-hole state (1985An06,1981Wa08).
1140 *5*	(1,2)[&]		E(level): from 1968Mc10. Others: 1140 *20* (1965Ch16) and 1139 *7* (1967Mc07).
1401 *5*	(1,2)		E(level): weighted average of 1405 *20* (1965Ch16), 1397 *7* (1967Mc07), and 1403 *5* (1968Mc10).
1592? *20*			E(level): from 1965Ch16 only; not seen in other studies.
1888 *5*	(2)[@]		E(level): weighted average of 1877 *20* (1965Ch16), 1883 *6* (1967Mc07), and 1892 *5* (1968Mc10).
2059 *5*	(1,2)[@]		E(level): from 1968Mc10. Others: unresolved doublet at 2080 *7* (1967Mc07) and 2077 *20* (1965Ch16).
2104 *5*			E(level): from 1968Mc10. See comment for 2059 level.
2165?[†] *4*			
2185 *6*	(1)[@]		E(level): weighted average of 2188 *20* (1965Ch16), 2175 *5* (1967Mc07), and 2192 *4* (1968Mc10).
2273 *4*	(2,3)		E(level): weighted average of 2270 *20* (1965Ch16), 2267 *6* (1967Mc07), and 2276 *4* (1968Mc10).
2303?[†] *5*			

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^{48}Ca(p,n),(pol p,n) 1968Mc10,1967Mc08,1967Mc07 (continued)

^{48}Sc Levels (continued)

E(level)	Jπ[#]	dσ/dΩ(μb/sr)[b]	Comments
2386 *6*	(2)		E(level): unweighted average of 2380 *5* (1967Mc07) and 2392 *4* (1968Mc10).
2513 *4*	1(+)&	6.80	E(level): weighted average of 2502 *20* (1965Ch16), 2508 *4* (1967Mc07), and 2518 *4* (1968Mc10). Other: 2.52E+3 (1986An23). Jπ: other: (0) from 1967Mc08 is discrepant. B(GT⁻)=1.328 *159* (2004Ra26).
2554 *6*			E(level): unweighted average of 2548 *4* (1967Mc07) and 2560 *4* (1968Mc10).
2637 *5*			E(level): weighted average of 2630 *10* (1967Mc07) and 2639 *5* (1968Mc10).
2668 *4*			E(level): weighted average of 2661 *10* (1967Mc07) and 2669 *4* (1968Mc10).
2729 *4*			E(level): weighted average of 2725 *10* (1967Mc07) and 2730 *4* (1968Mc10).
2782 *4*			E(level): weighted average of 2776 *6* (1967Mc07) and 2784 *4* (1968Mc10).
2807 *5*			E(level): weighted average of 2800 *6* (1967Mc07) and 2810 *4* (1968Mc10).
2891 *4*			E(level): weighted average of 2885 *6* (1967Mc07) and 2893 *4* (1968Mc10).
2921 *4*			E(level): weighted average of 2920 *4* (1967Mc07) and 2921 *4* (1968Mc10).
2960?† *7*			
2974 *5*			E(level): weighted average of 2969 *4* (1967Mc07) and 2978 *4* (1968Mc10).
3024 *4*	1+*a*	0.25	E(level): weighted average of 3021 *6* (1967Mc07) and 3025 *4* (1968Mc10). Other: 3.02E+3 (2004Ra26). B(GT⁻)=0.049 *18* (2004Ra26).
3052 *4*			E(level): weighted average of 3050 *6* (1967Mc07) and 3053 *4* (1968Mc10).
3149 *4*	1+*a*	0.36	E(level): weighted average of 3146 *4* (1967Mc07) and 3152 *4* (1968Mc10). Other: 3.17E+3 (2004Ra26). B(GT⁻)=0.070 *26* (2004Ra26).
3215 *7*			E(level): unweighted average of 3208 *4* (1967Mc07) and 3221 *4* (1968Mc10).
3258‡ *6*			
3290† *5*			E(level): weighted average of 3292 *6* (1967Mc07) and 3289 *5* (1968Mc10).
3298 *6*			E(level): weighted average of 3292 *6* (1967Mc07) and 3303 *5* (1968Mc10).
3328 *6*			E(level): weighted average of 3322 *6* (1967Mc07) and 3333 *5* (1968Mc10).
3353‡ *10*			
3372 *5*			E(level): from 1968Mc10. Other: 3370 *10* (1967Mc07).
3480 *5*			E(level): weighted average of 3479 *5* (1967Mc07) and 3481 *5* (1968Mc10).
3520 *6*			E(level): weighted average of 3515 *5* (1967Mc07) and 3526 *5* (1968Mc10).
3563 *5*			E(level): weighted average of 3557 *10* (1967Mc07) and 3564 *5* (1968Mc10).
3619 *5*			E(level): weighted average of 3617 *10* (1967Mc07) and 3620 *5* (1968Mc10).
3655 *8*			E(level): weighted average of 3640 *10* (1967Mc07) and 3659 *5* (1968Mc10).
3671 *5*			E(level): weighted average of 3667 *5* (1967Mc07) and 3675 *5* (1968Mc10).
3708 *5*		0.58	E(level): weighted average of 3705 *10* (1967Mc07) and 3709 *5* (1968Mc10). Other: 3.69E+3 (2004Ra26). Jπ: dσ/dΩ suggests $J^{\pi}\neq 1^{+}$ (2004Ra26).
3743† *4*			
3774† *5*			
3806 *5*			E(level): weighted average of 3805 *5* (1967Mc07) and 3806 *5* (1968Mc10).
3862‡ *10*			
3919‡ *10*			
3957?† *5*			
3974?† *5*			
3985 *5*			E(level): weighted average of 3975 *10* (1967Mc07) and 3988 *5* (1968Mc10).
4024 *5*			E(level): weighted average of 4017 *10* (1967Mc07) and 4026 *5* (1968Mc10).
4062 *5*			E(level): from 1968Mc10. Other: 4060 *10* (1967Mc07).
4091 *5*			E(level): weighted average of 4086 *10* (1967Mc07) and 4092 *5* (1968Mc10).
4141 *5*	1+*a*	0.17	E(level): from 1968Mc10. Other: 4139 *10* (1967Mc07), 4.14E+3 (2004Ra26). B(GT⁻)=0.032 *12* (2004Ra26).
4173 *5*			E(level): weighted average of 4169 *10* (1967Mc07) and 4174 *5* (1968Mc10).
4290† *5*			

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^{48}Ca(p,n),(pol p,n) 1968Mc10,1967Mc08,1967Mc07 (continued)

^{48}Sc Levels (continued)

E(level)	J^{π}[#]	dσ/dΩ(μb/sr)[b]	Comments
4.79×10^3	1$^+$[&a]	0.42	E(level): from 2004Ra26. B(GT$^-$)=0.082 *30* (2004Ra26).
6.67×10^3	0$^+$[&]		T=4 E(level): from 1986An23. IAS(^{48}Ca g.s.). See 1997Jo08 for parameters of the isovector potential deduced from $\sigma(\theta)$ of ^{48}Ca(p,n) E=35 MeV.
16.81×10^3 *5*	1$^+$[&]		T=4 E(level): from 1980An19 (relative to 2.52-MeV state). J^{π}: from analysis of $\sigma(\theta)$ (1980An19). Interpreted as T=4 Gamow-Teller state (1980An19).

† From 1968Mc10 only.
‡ From 1967Mc07 only.
# From 1967Mc08, based on auto-correlation coefficient obtained assuming pure compound nuclear reaction, unless otherwise noted.
@ Discrepant with the adopted spin.
& Analyzing power $\sigma(\theta)$ fit well by DWIA (1986An23). A qualitative difference was observed in the analyzing power between the low-lying 0$^+$ and 1$^+$ states and the T=4, 1$^+$, state at 16.8 MeV.
a From 2004Ra26, suggested from dσ/dΩ.
b from 2004Ra26, with q=0.077 fm^{-1}. Uncertainties are statistical.