^{208}Pb(^{3}He,d) 1970El13,1980Gr09,1968Ba34

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. Chen # and F. G. Kondev	NDS 126, 373 (2015)	30-Sep-2013

Target ^{208}Pb J^{π}(g.s.)=0^{+}.

1970El13: E=18 MeV ^{3}He beam was produced from the EN tandem Van de Graaff accelerator of the University of Pittsburgh. A 100 μg/cm^2 carbon-backed 99.5% enriched ^{208}Pb target was used. Deuterons were momentum analyzed by an Enge split-pole magnetic spectrometer and detected in photographic plates, FWHM=16 keV. Measured σ(E$_d$,θ). Deduced levels.

1980Gr09: E=30 MeV ^{3}He beam was produced from the Princeton Cyclotron. Target were 65-160 μg/cm^2 thick 99% enriched ^{208}Pb on 5 and 10 μg/cm^2 carbon backings. Deuterons were momentum analyzed with the Princeton quadrupole-three dipole (Q-3D) magnetic spectrograph and detected by a single-wire charge-division position-sensitive proportional counter, FWHM=10-14 keV. Measured σ(E$_d$,θ). Deduced levels, J^{π}, spectroscopic factors from DWBA analysis.

1968Ba34: E=44.2 MeV ^{3}He beam was produced from the University of Michigan 83-inch sector-focused cyclotron. A 0.75 mg/cm^2 thick target of 99.3% enriched ^{208}Pb was used. Deuterons were momentum analyzed by a magnetic spectrographs and detected in nuclear track plate, FWHM≈50 keV. Measured σ(E$_d$,θ). Deduced levels, J^{π}, spectroscopic factors from DWBA analysis.

1967Wi09: E=51.3 MeV ^{3}He beam was produced from the Oak Ridge Isochronous Cyclotron. A target of 0.47 mg/cm^2 thick 95% enriched ^{208}Pb foil was used. Deuterons were momentum analyzed with a broad range magnetic spectrograph, FWHM=60 keV. Measured σ(E$_d$,θ). Deduced levels, L, J^{π}, spectroscopic factors from DWBA analysis.

1967Wo03: E=24 MeV ^{3}He beam was produced from the Los Alamos tandem Van de Graaff accelerator. A target of 200 μg/cm^2 self-supporting ^{208}Pb foil was used. Deuterons were momentum analyzed with an Elbek magnetic spectrograph, FWHM≈25 keV. Measured σ(E$_d$,θ). Deduced levels, J^{π}, spectroscopic factors from DWBA analysis.

1968El01: E=20.3 MeV ^{3}He beam was produced from the tandem accelerator of the Niels Bohr Institute. Target was 300 μg/cm^2 self-supporting foil of ^{208}Pb, 99.3% enriched. Deuterons were momentum analyzed with a broad-range magnetic spectrograph, FWHM=30 keV. Measured σ(E$_d$,θ). Deduced levels, J^{π}, spectroscopic factors from DWBA analysis.

1984Ga37: E= 240 MeV α beam was produced from the Grenoble cyclotron. Deuterons were momentum analyzed with a QD spectrometer and detected by a gas delay-line counter, FWHM=50 keV. Measured $\sigma(\theta)$. Deduced levels, Γ, spectroscopic factors.

^{209}Bi Levels

Spectroscopic factor C^{2}S: N×g×C^{2}S=$\sigma(\theta)^{exp}/\sigma(\theta)^{DWBA}$, where N is the normalization factor and g=(2J$_f$+1)/(2J$_i$+1) for (^{3}He,d) reactions (1966Ba54). N=4.4 (1968Ba34), 4.42 (1967Wi09).

Summary of spectroscopic values. Parameters used by authors for extraction of spectroscopic values given below are very similar except for the spin-orbit strength (so). The second column of so=6 data of 1967Wi09 are from 1974Fo22 based on their reanalysis of data of 1967Wi09 to include non-locality and finite range corrections.

E(level)	configuration	C^{2}S					
		1967Wi09	1967Wo03	1968Ba34	1968El01		1980Gr09
		so=6	so=6	so=?	so=6	so=32	so=6
g.s.	1h$_{9/2}$	1.00	0.54	1.00#	0.95	1.17	1.00#
897	2f$_{7/2}$	1.12	0.65	0.88	1.18	0.78	1.38
1612	1i$_{13/2}$	0.94	0.52	0.92	0.88	0.56	0.85
2601	1i$_{13/2}$				-@	0.06	0.08
2824	2f$_{5/2}$	1.14	0.61	1.12	1.15	0.88	0.87
3116	3p$_{3/2}$	1.08	0.58		1.03	0.67	0.98
3637	3p$_{1/2}$	0.7-0.9		0.49†	0.63	0.49	0.54
4421^{+}	if 3p$_{1/2}$&				0.46&		
4447	if 2f$_{7/2}$&					0.16&	

@ σ is ≈13% of the 1612 1i$_{13/2}$ level
† Level misinterpreted by authors as 3p$_{3/2}$ (see 1967Li09)
& 4421+4447 peak analyzed as single level. 1968Ba34 assumed 3p$_{1/2}$ whereas 1968El01 assumed 2f$_{7/2}$. 1970El13 resolved the doublet and determined σ(4421)/σ(4447)=3. Based on a reanalysis of

the data of 1968El01, 1970El13 suggest that the more intense 4421 level has the $3p_{1/2}$ strength and the weaker 4447 level the $2f_{7/2}$ strength
Spectroscopic values normalized to unity for the ground-state transition

E(level)†	L#	E(level)†	L#	E(level)†	L#	C^2S
0.0	5	3490 *10*		4421 *10*	(1)[a]	
899 *1*	3	3635 *4*	1	4447 *10*	(2,3)[a]	
1613 *2*	6	3810 *22*		4522 *10*	@	
2601 *3*	&	3970 *22*		4600 *10*	@	
2826 *3*	3	4095 *10*		5304 *10*		
3121 *3*	1	4160 *22*		7.15×10^3‡ *15*	6‡	0.15‡
3410 *22*		4240 *22*		10.3×10^3‡ *5*	(6+7)‡	≈1.0‡

† Data with ΔE=10 keV are from 1970El13; data with ΔE=1-4 keV are from 1980Gr09; other data are from 1968Ba34, unless otherwise noted.
‡ From 1984Ga37. Γ(7.15E3)=1.5 MeV *3*, Γ(10.3E3)=5.7 MeV *10*.
# From 1967Wi09 and 1968Ba34 based on DWBA analysis.
@ $\sigma(\theta)$ indicates low-L(n) transfer (1968Ba34).
& $\sigma(\theta)$ indicates high-L(n) transfer (1968Ba34).
[a] From 1970El13 based on a reanalysis of data of 1968Ba34 for 4421+4447 doublet with relative strength 75%(4421) and 25%(4447) as found in the work of 1970El13.