

$^{92}\text{Mo}(\text{d,p}), (\text{d,p}\gamma)$  1969Mo24,1972Ma16

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 112, 1163 (2011)	15-Dec-2010

Others: [1979St23](#), [1972Du13](#), [1969Bo27](#), [1968He02](#), [1968Ye01](#), [1964Hj02](#).

Dataset includes  $^{92}\text{Mo}(\text{pol d,p})$ .

$^{92}\text{Mo}(\text{pol d,p})$ :

[1979St23](#): E=5.6-9.0 MeV; measured  $\sigma(\theta)$ , analyzing power As function of energy; DWBA and resonance analysis.

$^{92}\text{Mo}(\text{d,p})$ :

[1969Mo24](#): E=12 MeV, 97.5%  $^{92}\text{Mo}$  target, magnetic split-pole spectrograph,  $\theta(\text{lab})=8^\circ-55^\circ$  (12 angles), FWHM=7-9 keV; measured proton spectra and  $\sigma(\theta)$ ; DWBA analysis.

[1968He02](#): E=5.0-9.7 MeV; Si(Li) detectors;  $\theta(\text{lab})=165^\circ, 145^\circ, 90^\circ$ ; measured excit; investigated  $\sigma$  anomalies In vicinity of (d,n) threshold for corresponding IAS.

[1968Ye01](#): E=10.1 MeV, 91.3%  $^{92}\text{Mo}$  target, broad range spectrograph + emulsions,  $\theta=15^\circ$  and  $45^\circ$ , FWHM not stated but levels separated by 30 keV are resolved.

[1964Hj02](#): E=15 MeV,  $60^\circ$  wedge spectrograph + photographic plates,  $\theta(\text{lab})=9^\circ-45^\circ$ ; DWBA analysis of  $\sigma(\theta)$ .

$^{92}\text{Mo}(\text{d,p}\gamma)$ :

[1972Du13](#): E=7 MeV, Si proton detector, Ge(Li) detector (4 keV at  $E_\gamma=1000$ ), FWHM=70 keV for protons; measured  $E_\gamma$ , branching,  $p'-\gamma$  coin.

[1972Ma16](#): E=6.0 MeV, Si(Li) and Ge(Li) (3.5 keV FWHM at  $E_\gamma=1300$ ) detectors, FWHM=60 keV for protons; measured p,  $\gamma$  and  $p'-\gamma$  coin spectra,  $E_\gamma$ , branching.

For analysis of 3p wave threshold anomalies In deuteron stripping reactions, see [2006At05](#).

 $^{93}\text{Mo}$  Levels

A 2157-keV level (L=(0),  $S'=0.014$ ), attributed to [1969Mo24](#) by [1970Di06](#), is not mentioned in [1969Mo24](#); the evaluator, therefore, has omitted it here.

E(level) <sup>†</sup>	L <sup>‡</sup>	(2J <sub>f</sub> +1)S <sup>‡</sup>	Comments
0	2	5.04	Configuration=( $\nu$ 2d <sub>5/2</sub> )
944 <i>I</i>	0	1.28	Configuration=( $\nu$ 3s <sub>1/2</sub> )
1364 <i>I</i>	4	2.08	
1478 <i>I</i>	4	2.00	
1493 <i>I</i>	2	0.31	
1521 <i>I</i>	4	1.12	
1696 <i>I</i>	2	0.72	Configuration=( $\nu$ 2d <sub>5/2</sub> )
2146 <i>I</i>	2		
2159?			E from <a href="#">1972Du13</a> . Not included in Adopted Levels. See also the comment on 682 $\gamma$ .
2182 <i>I</i>	2	0.21	
2305 <i>I</i>	5	3.96	L,S': from <a href="#">1969Bo27</a> . Other S': 7.92 ( <a href="#">1969Bo27</a> ). <a href="#">1964Hj02</a> report L= <sup>4</sup> S'=2.96.
2396 <i>5</i>	2	0.17	E(level): from <a href="#">1972Du13</a> .
2437 <i>I</i>	0	0.14	In fig. 5 of <a href="#">1972Ma16</a> , a 2437 $\gamma$ also deexcites this level; however, it is absent in the relevant $p'-\gamma$ spectrum and in the level scheme of fig. 6, so it is not included here.
2529 <i>I</i>			
2555 <sup>#</sup>			
2644 <i>2</i>			E(level): from <a href="#">1972Du13</a> .
2688 <sup>#</sup>	0	0.018	
2705 <i>I</i>	0	0.64	Configuration=( $\nu$ 3s <sub>1/2</sub> )
2834 <i>5</i>			E(level): from <a href="#">1972Du13</a> . Possibly the same level as the 2842 <i>I</i> level in <a href="#">1972Ma16</a> ; not included in Adopted Levels.
2842 <i>I</i>	0	0.052	
2881 <i>I</i>			
2893 <i>15</i>	3	0.38	E(level): from <a href="#">1968Ye01</a> . Other: 2899 ( <a href="#">1969Mo24</a> , as revised by <a href="#">1970Di06</a> ).

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<sup>92</sup>Mo(d,p), (d,p $\gamma$ ) 1969Mo24,1972Ma16 (continued)

<sup>93</sup>Mo Levels (continued)

<u>E(level)<sup>†</sup></u>	<u>L<sup>‡</sup></u>	<u>(2J<sub>f</sub>+1)S<sup>‡</sup></u>	<u>Comments</u>
2991 <sup>#</sup>			
3045 <sup>#</sup>	4	0.38	
3086 <sup>#</sup>			
3160 <i>l</i>	2	0.80	Configuration=( $\nu$ 2d <sub>5/2</sub> )
3230 <sup>#</sup>			
3441? <i>l</i>			
3450 <i>l</i>	2 <sup>@</sup>	0.52 <sup>@</sup>	
3596 <i>l</i>	2 <sup>@</sup>	0.40 <sup>@</sup>	
3710 <i>l</i>	2 <sup>@</sup>	0.33 <sup>@</sup>	
3985 5			
4378 5			
4756 5			
4938 5			
5034 5			

<sup>†</sup> From 1972Ma16, based on authors' E $\gamma$  data, except as noted.

<sup>‡</sup> From 1969Mo24, based on DWBA analysis of  $\sigma(\theta)$  at first peak beyond 10°, if not indicated otherwise; configuration from 1972Ke24.

<sup>#</sup> Only reported by 1969Mo24; E has been revised by 1970Di06 in accord with new calibration ( $\Delta E$  unstated) of spectrometer used by 1969Mo24 for (d,p) and by 1970Di06 for <sup>94</sup>Mo(d,t). However, for E>2000, values are consistently 10-20 keV higher than adopted values.

<sup>@</sup> From 1964Hj02.

$\gamma(^{93}\text{Mo})$

A number of unplaced gammas appear in the p'- $\gamma$  coin spectra in fig. 5 of 1972Ma16; these are included here for the sake of completeness. See 1972Ma16 for information on the gates in which they are observed.

<u>E<sub>i</sub>(level)</u>	<u>E<math>\gamma</math><sup>†</sup></u>	<u>I<math>\gamma</math><sup>‡</sup></u>	<u>E<sub>f</sub></u>	<u>Comments</u>
944	943.6	100	0	
1364	1363.9	100	0	
1478	1478.1	100	0	
1493	549.7 <sup>@b</sup>		944	Very weak, otherwise unknown $\gamma$ ; not adopted.
	1493.3	100 3	0	
1521	577.2 <sup>@</sup>	11 <sup>&amp;</sup> 3	944	Very weak, otherwise unknown $\gamma$ , for which the level scheme indicates mult=M3 (with B(M3)(W.u.) grossly exceeding RUL); not adopted.
	1521.5	100 <sup>&amp;</sup> 3	0	
1696	203.9 <sup>@</sup>	3.1 <sup>&amp;</sup>	1493	
	332 <sup>#b</sup>	<5.3	1364	
	1696.1	100 <i>ll</i>	0	
2146	2146.1 <sup>@</sup>	100 <sup>&amp;</sup>	0	
2159?	682 <sup>ab</sup>		1478	
2182	486.9	30 6	1696	I $\gamma$ : 43 in 1972Ma16.
	1238.4	70 16	944	I $\gamma$ : 190 in 1972Ma16. Value from 1972Du13 is preferred because, in (p, $\eta\gamma$ ) and <sup>93</sup> Tc $\epsilon$ decay (43.5 min), only the 2182 $\gamma$ deexcites the 2182 level, so that $\gamma$ is expected to be the strongest branch here.

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$^{92}\text{Mo}(\text{d,p}), (\text{d,p}\gamma)$  1969Mo24,1972Ma16 (continued) $\gamma(^{93}\text{Mo})$  (continued)

$E_i(\text{level})$	$E_\gamma^\dagger$	$I_\gamma^\ddagger$	$E_f$	Comments
2182	2181.8	100 20	0	
2305	144 <sup>#b</sup>	<3	2159?	Reported by 1972Du13 alone; not adopted.
	827.0	100 5	1478	
2396	2396 <sup>#</sup>	100	0	
2437	256.7 <sup>@</sup>		2182	
	943.6 <sup>b</sup>		1493	944 $\gamma$ and 1493 $\gamma$ possibly in cascade, but order not known.
	961.5 <sup>@</sup>		1478	$\Delta J=4$ required for this transition; absent in 1972Du13. Not adopted. Possibly deexcites a nearby level (see Adopted Levels, Gammas (2440.4 level)); but, if so, $E_\gamma$ is somewhat low here.
	1493.3 <sup>b</sup>		944	944 $\gamma$ and 1493 $\gamma$ possibly in cascade, but order not known.
2529	1038.0 <sup>@</sup>	100 <sup>&amp;</sup>	1493	
2644	2644 <sup>#</sup>	100	0	
2705	524.7	18 5	2182	
	1211.3	64 15	1493	
	2704.9	100 18	0	
2834	656 <sup>#b</sup>	20	2182	Reported by 1972Du13 alone; not adopted.
	1140	50 16	1696	
	1892 <sup>#b</sup>	30	944	Reported by 1972Du13 alone; not adopted.
	2834	100 20	0	
2842	405.0 <sup>@</sup>	23 <sup>&amp;</sup>	2437	
	1146.3	66 <sup>&amp;</sup>	1696	
	2842.4	100 <sup>&amp;</sup>	0	
2881	698.9	25 8	2182	
	733.9 <sup>@</sup>	40 <sup>&amp;</sup>	2146	
	$\approx 1516$ <sup>#b</sup>	25 13	1364	$E_\gamma$ : 1513 (1972Du13); increased by evaluator for consistency with $E_\gamma$ scale in 1972Ma16. Otherwise unknown $\gamma$ , so shown as uncertain.
	1937.1	100 25	944	
	2880.7	100 25	0	
3160	455.3 <sup>@</sup>	4 <sup>&amp;</sup>	2705	
	1014.1 <sup>@</sup>	27 <sup>&amp;</sup>	2146	
	1462.9	50 13	1696	$I_\gamma$ : 37 from 1972Ma16.
	1665.7	100 25	1493	
	$\approx 1795$ <sup>#b</sup>	25 8	1364	$E_\gamma$ : 1792 (1972Du13); increased by evaluator for consistency with $E_\gamma$ scale in 1972Ma16. Otherwise unknown $\gamma$ , so shown as uncertain.
	3160.2	75 25	0	$I_\gamma$ : 37 from 1972Ma16.
3441?	1003.5 <sup>@</sup>		2437	
	3440.8 <sup>@</sup>		0	
3450	1145.4 <sup>@b</sup>	86 <sup>&amp;</sup>	2305	$E_\gamma$ : placed by 1972Ma16 but, from Adopted Levels, this placement requires $\text{mult} \geq E3$ for transition; not adopted.
	1270.3 <sup>@</sup>	100 <sup>&amp;</sup>	2182	
	2506.3 <sup>@</sup>	83 <sup>&amp;</sup>	944	
	3449.9 <sup>@</sup>	69 <sup>&amp;</sup>	0	
3596	1452.3 <sup>@</sup>	72 <sup>&amp;</sup>	2146	
	2103.0 <sup>@</sup>	40 <sup>&amp;</sup>	1493	
	3595.7 <sup>@</sup>	100 <sup>&amp;</sup>	0	
3710	827.0 <sup>@</sup>	36 <sup>&amp;</sup>	2881	
	1180.0 <sup>@</sup>	45 <sup>&amp;</sup>	2529	
	3709.5 <sup>@</sup>	100 <sup>&amp;</sup>	0	
3985	3985 <sup>@</sup> 5	100	0	

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$^{92}\text{Mo}(\text{d,p}), (\text{d,p}\gamma)$  1969Mo24,1972Ma16 (continued) $\gamma(^{93}\text{Mo})$  (continued)

<u><math>E_i(\text{level})</math></u>	<u><math>E_\gamma</math></u> <sup>†</sup>	<u><math>I_\gamma</math></u> <sup>‡</sup>	<u><math>E_f</math></u>
4378	4378 <sup>@</sup> 5	100	0
4756	4756 <sup>@</sup> 5	100	0
4938	4938 <sup>@</sup> 5	100	0
5034	5034 <sup>@</sup> 5	100	0

<sup>†</sup> From 1972Ma16, if not indicated otherwise.  $\Delta E$  is not stated by authors, but  $E_\gamma$  from 1972Ma16 is <1 keV higher than values adopted from other sources. For  $E(\text{level}) > 3710$ , 1972Ma16 report a 5-keV uncertainty; since  $E(\text{level})$ , in these cases, is determined by one transition only, the evaluator has assigned  $\Delta E_\gamma = 5$  keV to the relevant gammas.

<sup>‡</sup> Relative branching from level (1972Du13), normalized so  $I=100$  for the strongest branch.

<sup>#</sup> From 1972Du13 only. Note that  $E_\gamma$  from 1972Du13 is consistently lower than that from 1972Ma16 (by approximately 1-2 keV, 3-4 keV, 6 keV for  $E_\gamma=1, 2, 3$  MeV, respectively).

<sup>@</sup> Not reported by 1972Du13.

<sup>&</sup> From 1972Ma16.

<sup>a</sup> Largely, but not entirely, due to impurity (1972Du13). 1972Du13 place this  $\gamma$  from the known 2162 level ( $J^\pi=13/2^+$ ); excitation of that level via this reaction seems unlikely ( $L=6$  required), but 1972Du13 propose a weak 144 $\gamma$  connecting the  $11/2^-$ , 2305 level with the 2162 level.  $\gamma$  absent in 1972Ma16.

<sup>b</sup> Placement of transition in the level scheme is uncertain.

<sup>x</sup>  $\gamma$  ray not placed in level scheme.

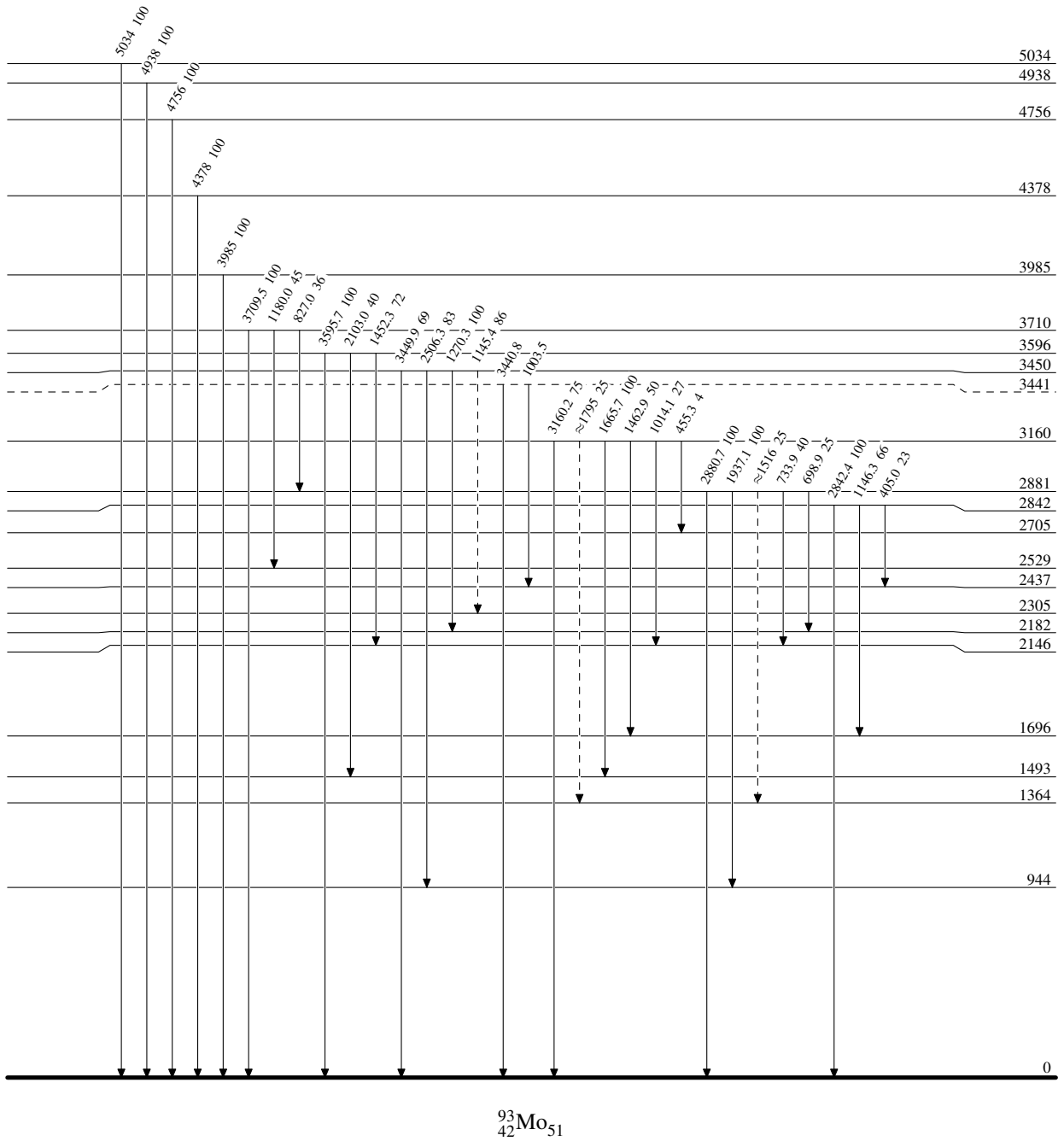
$^{92}\text{Mo}(\text{d,p}), (\text{d,p}\gamma)$  1969Mo24,1972Ma16

Legend

Level Scheme

Intensities: Relative photon branching from each level

-----▶  $\gamma$  Decay (Uncertain)



$^{92}\text{Mo}(\text{d,p}), (\text{d,p}\gamma)$  1969Mo24,1972Ma16

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

-----▶  $\gamma$  Decay (Uncertain)

