

$^{40}\text{Ca}(\mu^{-},\nu\text{p}\gamma)$  2006Me08

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 149, 1 (2018)	1-Jan-2018

**2006Me08:** the  $\mu^{-}$  beam was obtained from decay of  $\pi^{-}$  beam at 90 MeV/c provided by the beamline M9B at TRIUMF. Targets were pure natural calcium turnings with some oxide on the surface.  $\gamma$  rays were detected with two HPGe detectors. Measured  $E_{\gamma}$ ,  $I_{\gamma}$ ,  $E(x\text{ ray})$ ,  $I(x\text{ ray})$ ,  $\gamma\gamma$ -coin., Deduced levels, muon capture yields.

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Muonic Lyman series for natural Calcium

$\mu$ x ray	Energy	Intensity in percent
2p-1s	783.659 25	83.8 10
3p-1s	940.63 10	6.2 2
4p-1s	995.48 10	2.0 1
5p-1s	1020.81 10	2.0 1
6p-1s	1034.62 10	1.8 1
7p-1s	1042.71 20	1.4 1
(8- $\infty$ )p-1s	1046-1063	2.8 4

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Muonic Balmer series for natural Calcium

$\mu$ x ray	Energy	Intensity in percent
3d-2p	157.35 13	64.5 9
4d-2p	212.03 10	8.85 20
5d-2p	237.31 10	4.34 20
6d-2p	251.06 10	3.29 20
7d-2p	259.45 10	1.37 20
(8- $\infty$ )d-2p	261-277	1.4 3

 $^{39}\text{Ar}$  Levels

<u>E(level)<sup>†</sup></u>	<u>J<math>\pi</math><sup>†</sup></u>	<u>Percent Yield per muon capture<sup>‡</sup></u>	<u>Comments</u>
0	7/2 <sup>-</sup>		
1267.21	3/2 <sup>-</sup>	1.1 5	Known cascading=2.5% 4.
1517.54	3/2 <sup>+</sup>	1.1 5	Known cascading=1.16% 26.
2092.75	5/2 <sup>-</sup>	0.6 3	Known cascading=0.2% 1.
2342.2	(5/2 <sup>-</sup> ,7/2,9/2 <sup>-</sup> )	<0.3	
2358.28	1/2 <sup>+</sup>	0.4 1	
2433.48	3/2 <sup>-</sup>	0.3 2	
2481.49	7/2 <sup>-</sup>		
2503.42	(5/2 <sup>+</sup> )	0.35 17	Known cascading=0.26% 7.
2523.74	(5/2 <sup>-</sup> ,7/2,9/2 <sup>-</sup> )		
2631.56	3/2 <sup>-</sup>	0.25 12	
2755.5	5/2 <sup>-</sup>		
2829.94	1/2 <sup>+</sup>	0.6 3	
2949.95	(3/2 <sup>+</sup> ,5/2)	0.54 10	
3265.6	3/2 <sup>-</sup>	<0.3	
3287.0	1/2 <sup>+</sup>	0.4 2	

<sup>†</sup> From Adopted Levels. Energies are rounded-off values.

<sup>‡</sup> Corrected for known cascading (2006Me08).

$^{40}\text{Ca}(\mu^-, \nu p \gamma)$  **2006Me08** (continued) $\gamma(^{39}\text{Ar})$ 

$E_\gamma$ †	Percent $\gamma$ -ray yield	$E_i$ (level)	$J_i^\pi$	$E_f$	$J_f^\pi$
250.33	‡	1517.54	3/2 <sup>+</sup>	1267.21	3/2 <sup>-</sup>
446.53	0.26 7	2949.95	(3/2 <sup>+</sup> , 5/2)	2503.42	(5/2) <sup>+</sup>
538.81	0.2 1	2631.56	3/2 <sup>-</sup>	2092.75	5/2 <sup>-</sup>
985.86	0.57 15	2503.42	(5/2) <sup>+</sup>	1517.54	3/2 <sup>+</sup>
1091.06	0.4 1	2358.28	1/2 <sup>+</sup>	1267.21	3/2 <sup>-</sup>
1166.25	0.22 17	2433.48	3/2 <sup>-</sup>	1267.21	3/2 <sup>-</sup>
1267.19	3.6 3	1267.21	3/2 <sup>-</sup>	0	7/2 <sup>-</sup>
1312.37	0.28 20	2829.94	1/2 <sup>+</sup>	1517.54	3/2 <sup>+</sup>
1432.38	0.28 7	2949.95	(3/2 <sup>+</sup> , 5/2)	1517.54	3/2 <sup>+</sup>
1488.3	<0.2	2755.5	5/2 <sup>-</sup>	1267.21	3/2 <sup>-</sup>
1517.51	1.05 20	1517.54	3/2 <sup>+</sup>	0	7/2 <sup>-</sup>
1562.69	0.28 15	2829.94	1/2 <sup>+</sup>	1267.21	3/2 <sup>-</sup>
1998.3	<0.3	3265.6	3/2 <sup>-</sup>	1267.21	3/2 <sup>-</sup>
2019.7	0.4 2	3287.0	1/2 <sup>+</sup>	1267.21	3/2 <sup>-</sup>
2092.69	0.8 2	2092.75	5/2 <sup>-</sup>	0	7/2 <sup>-</sup>
2342.1	<0.3	2342.2	(5/2 <sup>-</sup> , 7/2, 9/2 <sup>-</sup> )	0	7/2 <sup>-</sup>
2481.40	<0.3	2481.49	7/2 <sup>-</sup>	0	7/2 <sup>-</sup>
2523.65	‡	2523.74	(5/2 <sup>-</sup> , 7/2, 9/2 <sup>-</sup> )	0	7/2 <sup>-</sup>
2755.4	<0.3	2755.5	5/2 <sup>-</sup>	0	7/2 <sup>-</sup>

† Rounded-off values from Adopted Gammas.

‡ Intensity not listed by **2006Me08**, the peak is overlapped by other transitions.

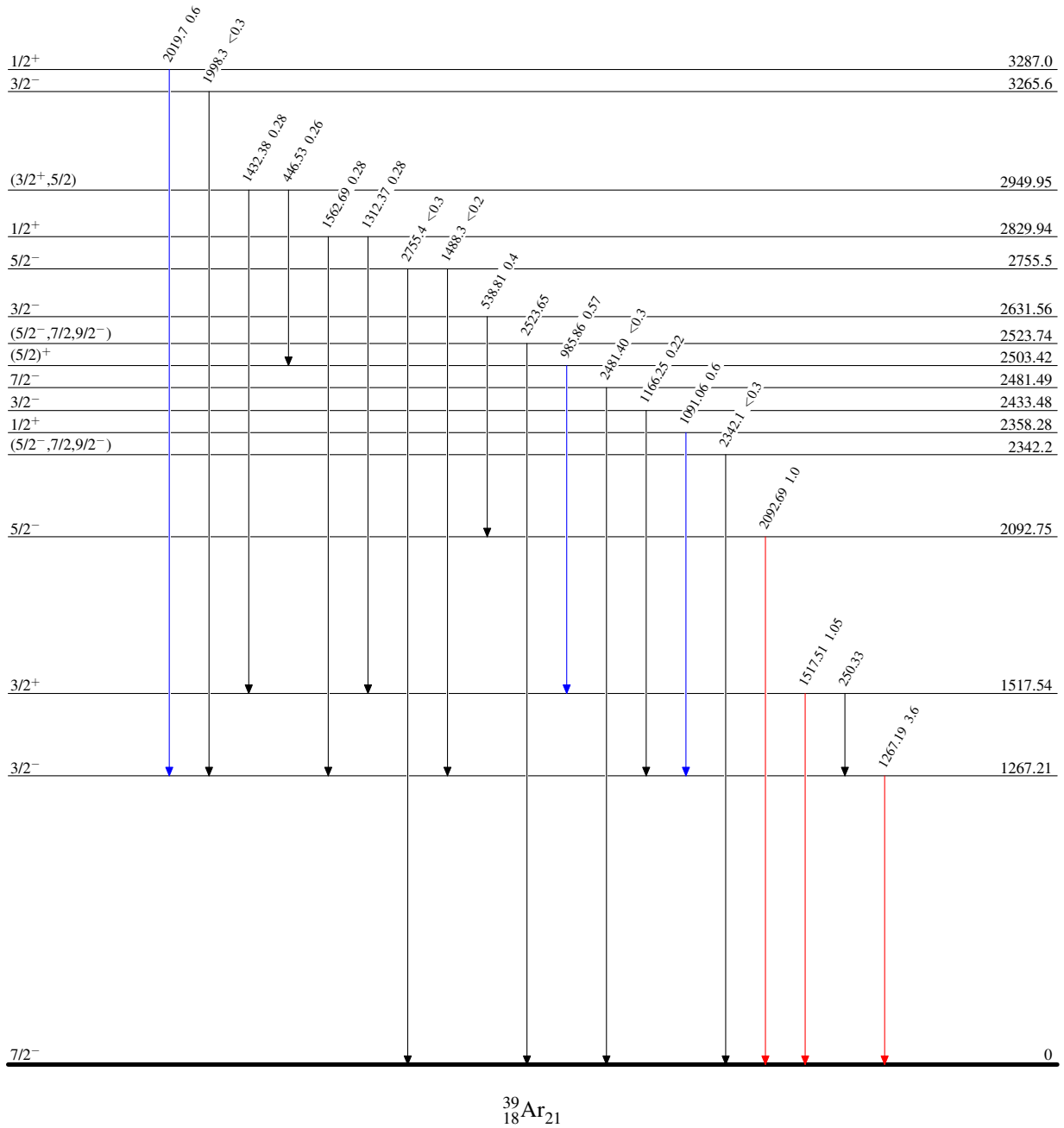
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## Level Scheme

Intensities: Percent  $\gamma$ -ray yield/muon capture

## Legend

- $I_\gamma < 2\% \times I_\gamma^{\max}$   
→  $I_\gamma < 10\% \times I_\gamma^{\max}$   
→  $I_\gamma > 10\% \times I_\gamma^{\max}$

 $^{39}_{18}\text{Ar}_{21}$