

$^{24}\text{Mg}(^{16}\text{O},\alpha n\gamma)$ 2007De14,2005DeZZ

2007De14,2005DeZZ: A 70-MeV ^{16}O beam was produced by the XTU-Tandem accelerator at the Legnaro National Laboratory, Italy. The target was a 400 $\mu\text{g}/\text{cm}^2$ self-supporting target of ^{24}Mg . γ ray from fusion evaporation reactions of $^{24}\text{Mg}(^{16}\text{O},\alpha n\gamma)^{35}\text{Ar}$ and $^{24}\text{Mg}(^{16}\text{O},\alpha p\gamma)^{35}\text{Cl}$ were detected using the GASP spectrometer, which consists of an array of 40 Compton-suppressed HPGe detectors and a multiplicity filter of 80 BGO scintillators of 80 BGO scintillators. The GASP spectrometer is operated in conjunction with the 4 π charged-particle detector ISIS and a neutron ring of 6 BC501A scintillators. The events were collected when at least two Ge detectors and one BGO scintillator were fired in coincidence. Measured E_γ , I_γ , $\gamma\gamma$, $\alpha n\gamma$ -coin, $\alpha p\gamma$ -coin, $\gamma(\theta)$, $\gamma\gamma(\theta)$ (ADO). Deduced levels, J, π , and transition multipolarities from γ -ray ADO ratios. Comparisons with Shell-model calculations show the multipole Coulomb interaction and the electromagnetic spin-orbit interaction contribute to the observed mirror energy differences.

 ^{35}Ar Levels

<u>E(level)[†]</u>	<u>J^π[‡]</u>	<u>E(level)[†]</u>	<u>J^π[‡]</u>	<u>E(level)[†]</u>	<u>J^π[‡]</u>	<u>E(level)[†]</u>	<u>J^π[‡]</u>
0.0	3/2 ⁺	3196.7 [#] 7	7/2 ⁻	5613.2 11	(11/2 ⁻)	8212.1 10	15/2 ⁻
1750.8 5	5/2 ⁺	4358.6 8	9/2 ⁻	5765.3 8	13/2 ⁻	9905.5 [#] 21	19/2 ⁻
2603.0 7	7/2 ⁺	5383.7 [#] 7	11/2 ⁻	8109.2 [#] 14	15/2 ⁻	12276.5 [#] 33	23/2 ⁻

[†] From a least-squares fit to γ -ray energies.

[‡] As given in 2007De14 based on known assignments of low-lying levels and mirror levels in ^{35}Cl and the measured $\gamma\gamma(\theta)$ (ADO) ratios. When considered in the Adopted Levels, the firm assignments here are placed within parentheses if there are no other strong arguments to support these firm assignments.

[#] Band(A): Band based on $f_{7/2}$ orbital.

 $\gamma(^{35}\text{Ar})$

$R_{\text{ADO}}=[I_\gamma(34^\circ)+I_\gamma(146^\circ)]/2I_\gamma(90^\circ)$. Expected values are $R_{\text{ADO}}\approx 1.3$ for stretched quadrupole ($\Delta J=2$) and $R_{\text{ADO}}\approx 0.8$ for stretched dipole ($\Delta J=1$) transitions.

<u>E_γ</u>	<u>I_γ</u>	<u>$E_i(\text{level})$</u>	<u>J_i^π</u>	<u>E_f</u>	<u>J_f^π</u>	<u>Mult.</u>	<u>Comments</u>
381.5 3	29 3	5765.3	13/2 ⁻	5383.7	11/2 ⁻	D	$R_{\text{ADO}}=0.81$ 10.
593.7 2	11 2	3196.7	7/2 ⁻	2603.0	7/2 ⁺		
851.8 9	8 2	2603.0	7/2 ⁺	1750.8	5/2 ⁺		
1025.2 4	6 2	5383.7	11/2 ⁻	4358.6	9/2 ⁻		
1162.0 8	15 3	4358.6	9/2 ⁻	3196.7	7/2 ⁻	(D)	$R_{\text{ADO}}=0.95$ 25.
1254.6 8	15 5	5613.2	(11/2 ⁻)	4358.6	9/2 ⁻		
1406.9 7	5 1	5765.3	13/2 ⁻	4358.6	9/2 ⁻	(Q)	$R_{\text{ADO}}=1.3$ 7.
1446.1 6	67 5	3196.7	7/2 ⁻	1750.8	5/2 ⁺	D	$R_{\text{ADO}}=0.87$ 19.
1693.3 27	15 3	9905.5	19/2 ⁻	8212.1	15/2 ⁻	Q	$R_{\text{ADO}}=1.41$ 23.
1750.8 5	100 9	1750.8	5/2 ⁺	0.0	3/2 ⁺		$R_{\text{ADO}}=1.46$ 24.
1756.3 14	17 9	4358.6	9/2 ⁻	2603.0	7/2 ⁺		
1796.3 25	10 3	9905.5	19/2 ⁻	8109.2	15/2 ⁻	Q	$R_{\text{ADO}}=1.8$ 3.
2186.8 4	49 3	5383.7	11/2 ⁻	3196.7	7/2 ⁻	Q	$R_{\text{ADO}}=1.31$ 15.
2342.6 28	8 2	8109.2	15/2 ⁻	5765.3	13/2 ⁻		
2370.9 25	15 5	12276.5	23/2 ⁻	9905.5	19/2 ⁻	Q	$R_{\text{ADO}}=1.8$ 4.
2446.6 16	6 2	8212.1	15/2 ⁻	5765.3	13/2 ⁻		
2602.6 15	60 6	2603.0	7/2 ⁺	0.0	3/2 ⁺	Q	$R_{\text{ADO}}=1.37$ 20.
2725.7 14	4 1	8109.2	15/2 ⁻	5383.7	11/2 ⁻		
2828.3 7	28 5	8212.1	15/2 ⁻	5383.7	11/2 ⁻	Q	$R_{\text{ADO}}=1.7$ 6.
3197 6	16 3	3196.7	7/2 ⁻	0.0	3/2 ⁺	Q	$R_{\text{ADO}}=1.7$ 8.

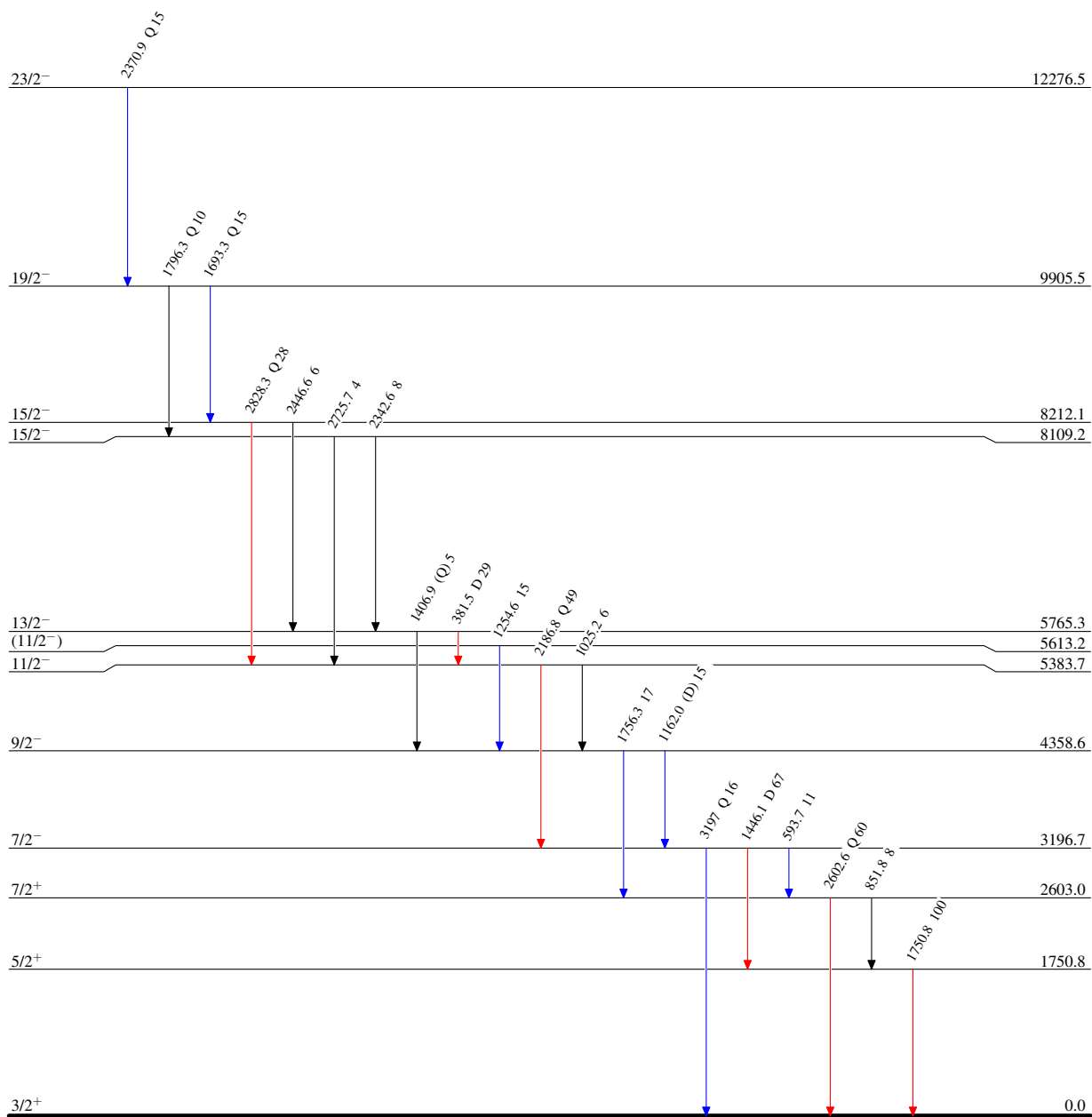
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Level Scheme

Intensities: Relative I_γ

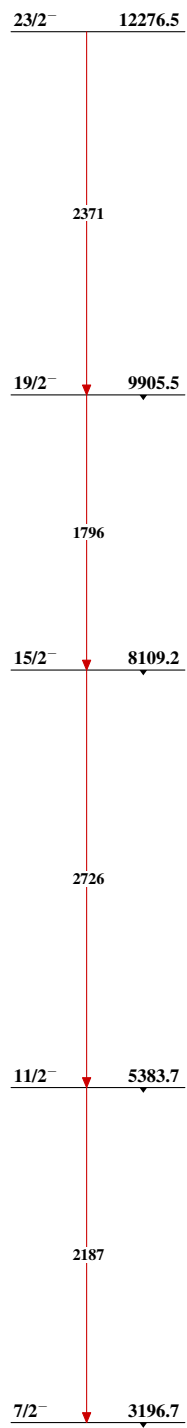
Legend

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

 $^{35}_{18}\text{Ar}_{17}$

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Band(A): Band based on $f_{7/2}$
orbital



$^{35}_{18}\text{Ar}_{17}$