

$^{40}\text{Ca}(^{16}\text{O},\alpha 2p\gamma),(^{12}\text{C},2p\gamma)$ 1974Ku11,1973De09,1994Pa34

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh		NDS 157, 1 (2019)	15-Apr-2019

Also includes $^{12}\text{C}(^{40}\text{Ca},2p\gamma)$.

1974Ku11: $^{40}\text{Ca}(^{16}\text{O},\alpha 2p\gamma)$, E=37-65 MeV ^{16}O beam was produced from the Munich MP tandem Van de Graaff. Target was a $200\text{ }\mu\text{g}/\text{cm}^2$ ^{40}Ca layer sandwiched between Au foils. γ rays were detected with Ge(Li) detectors. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ -coin, $\gamma(\theta)$, $\gamma(\text{lin pol})$. Deduced levels, J, π , band structure, γ -ray multipolarities. Comparisons with shell-model calculations. Measurements with $^{24}\text{Mg}(^{32}\text{S},2p\alpha\gamma)$ and $^{40}\text{Ca}(^{14}\text{N},3p\text{ny})$ are also mentioned with no details given, but results similar to those for $^{40}\text{Ca}(^{16}\text{O},2p\alpha\gamma)$.

1973De09: $^{40}\text{Ca}(^{12}\text{C},2p\gamma)$, E=28 MeV beam from the EN tandem accelerator of the Max-Planck-Institut für Kernphysik in Heidelberg. Measured γ spectra and $\gamma(t)$. Deduced lifetimes by Recoil distance method (RDM).

M.M. Giles et al., Phys. Rev. C, accepted April 9, 2019, (pre-publication copy received from authors April 10, 2019): $^{40}\text{Ca}(^{12}\text{C},2p\gamma)$, E=30.5 MeV ^{12}C beam was produced from the FN Tandem facility of the University of Cologne. Target was $0.5\text{ mg}/\text{cm}^2$ ^{40}Ca foil on ^{197}Au backings. The γ rays were detected by 11 Ge detectors. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ -coin, level lifetimes by recoil-distance Doppler-shifts using Cologne plunger device. Deduced levels, J, π , B(E2) for the first 2^+ and 4^+ states. Comparison with shell-model calculations.

1994Pa34: $^{12}\text{C}(^{40}\text{Ca},2p\gamma)$ E=140 MeV ^{40}Ca beam was from the 20-MV tandem accelerator at Daresbury Laboratory. γ rays were detected with four Compton-suppressed Ge detectors. Measured γ spectra ($=\pm 60^\circ, \pm 120^\circ$), $\gamma(\theta=75^\circ, 135^\circ, 195^\circ, 255^\circ)$, internal rotations. Deduced g factors by transition field method.

1974Br04: $^{40}\text{Ca}(^{16}\text{O},\alpha 2p\gamma)$ E=47 MeV beam from the Stony Brook tandem Van de Graaff accelerator. Measured level lifetimes by recoil-distance Doppler-shift method (RDDS) with target plunger at $\theta=0^\circ$.

1976KiZR: $^{40}\text{Ca}(^{12}\text{C},2p\gamma)$ E=38 MeV. Measured $\gamma(\theta)$, DCO, and ratios of cascade γ rays.

 ^{50}Cr Levels

The g factors are from 1994Pa34 with the following assumptions in the analysis: 1. $T_{1/2}$ values from 1973De09 and 1974Ku11. 2. Feeding from the continuum states completed before the recoil enters the Gd foil; supported by data for ^{49}Cr , ^{39}K , and ^{41}Ca , but side-feeding times not known for ^{50}Cr . 3. Chalk River parametrization for field calibration applied with its strength multiplied by 1.3 2.

E(level) [†]	J π [‡]	$T_{1/2}$ [@]	Comments
0.0 ^{&}	0 ⁺		
783.2 ^{&} 5	2 ⁺	9.0 ps 4	g=+0.64 11 $T_{1/2}$: weighted average of 9.2 ps 4 (M.M. Giles et al., Phys. Rev. C, accepted April 9, 2019), 8.7 ps 15 (1974Br04), and 8.4 ps 8 (1973De09). Method: recoil-distance Doppler shift (RDDS).
1881.1 ^{&} 7	4 ⁺	2.22 ps 28	g=+0.43 9 $T_{1/2}$: others: 3.4 ps 5 (M.M. Giles et al., Phys. Rev. C, accepted April 9, 2019, RDDS); <2.8 ps (1974Br04, RDDS).
3163.7 ^{&} 9	6 ⁺	1.25 ps 28	g=+0.30 9 $T_{1/2}$: other: <1.6 ps (1974Br04). g-factor adjusted for $T_{1/2}=0.69\text{ ps }14$ (1998Br34) from original g=+0.54 16 (1994Pa34) which used $T_{1/2}=1.25\text{ ps }28$ (1973De09).
3324.2 9 3792.1 9	4 ⁺ [#]	<0.7 ps 9.0 ps 14	J π : 4 ⁻ assignment in 2019-Giles paper seems to have been taken from 1998Br34 that was based on systematics and model considerations, but evaluators assign 5 ⁺ in the Adopted Levels based on arguments from experimental evidence in different reactions.
3825.4 10 4366 1	5 ⁻ [#]	3.5 ps +35-14	$T_{1/2}$: other: <1.4 ps (1974Br04). E(level): level proposed by M.M. Giles et al., Phys. Rev. C, accepted April 9, 2019.
4744.9 ^{&} 10	8 ⁺		g=+0.54 9

Continued on next page (footnotes at end of table)

$^{40}\text{Ca}(^{16}\text{O},\alpha 2p\gamma),(^{12}\text{C},2p\gamma)$ **1974Ku11,1973De09,1994Pa34** (continued) ^{50}Cr Levels (continued)

$E(\text{level})^\dagger$	$J^\pi^\ddagger$
6340.6 & 12	10^+
6950.5 13	11^+
7612.3 14	12^+

† From least-squares fit to E_γ data.

‡ From **1974Ku11**, based on deduced γ -ray multiplicities, unless otherwise noted.

Assignment proposed by M.M. Giles et al., Phys. Rev. C, accepted April 9, 2019.

@ From **1973De09** by RDM, unless otherwise noted.

& Band(A): g.s. band.

 $\gamma(^{50}\text{Cr})$

$E_\gamma^\dagger$	$I_\gamma^\dagger$	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. @	Comments
467.9 ‡ 5	1.9 ‡ 3	3792.1		3324.2	4^+		
574 #		4366	5^-	3792.1			
609.9 5	47 5	6950.5	11^+	6340.6	10^+	M1	$A_2=-0.31$ 3, $A_4=+0.01$ 4, $\text{pol}=-0.28$ 7 (1974Ku11).
661.7 ‡ 5	0.3 ‡ 2	3825.4		3163.7	6^+		
661.8 5	41 4	7612.3	12^+	6950.5	11^+	M1	$A_2=-0.29$ 4, $A_4=+0.05$ 5, $\text{pol}=-0.12$ 10 (1974Ku11).
783.2 5	100	783.2	2^+	0.0	0^+	E2	E_γ : weighted average of 783.4 5 (1973De09) and 782.9 5 (1974Ku11).
							$A_2=+0.22$ 3, $A_4=-0.03$ 3, $\text{pol}=+0.35$ 5 (1974Ku11).
1042 #		4366	5^-	3324.2	4^+		
1097.9 5	97 10	1881.1	4^+	783.2	2^+	E2	E_γ : weighted average of 1098.2 5 (1973De09) and 1097.5 5 (1974Ku11).
							I_γ : other: 81 4 (1973De09).
							$A_2=+0.25$ 4, $A_4=-0.05$ 4, $\text{pol}=+0.39$ 7 (1974Ku11).
1271.7 &	<2	7612.3	12^+	6340.6	10^+		
1282.6 5	85 9	3163.7	6^+	1881.1	4^+	E2	E_γ : weighted average of 1283.1 5 (1973De09) and 1282.0 5 (1974Ku11).
							I_γ : other: 32 3 (1973De09) seems in disagreement.
							$A_2=+0.30$ 5, $A_4=+0.05$ 7, $\text{pol}=+0.48$ 10 (1974Ku11).
1443.1 ‡ 5	3.3 ‡ 5	3324.2	4^+	1881.1	4^+		
1581.1 5	82 8	4744.9	8^+	3163.7	6^+	E2	$A_2=+0.28$ 6, $A_4=-0.01$ 7, $\text{pol}=+0.59$ 14 (1974Ku11).
1595.7 5	62 6	6340.6	10^+	4744.9	8^+	E2	$A_2=+0.33$ 11, $A_4=-0.11$ 14, $\text{pol}=+0.53$ 22 (1974Ku11).
1910.9 ‡ 9	1.5 ‡ 3	3792.1		1881.1	4^+		
2205.6 &	<2	6950.5	11^+	4744.9	8^+		This γ from 11^+ to 8^+ is highly unlikely, not included in the Adopted Levels, Gammas dataset.

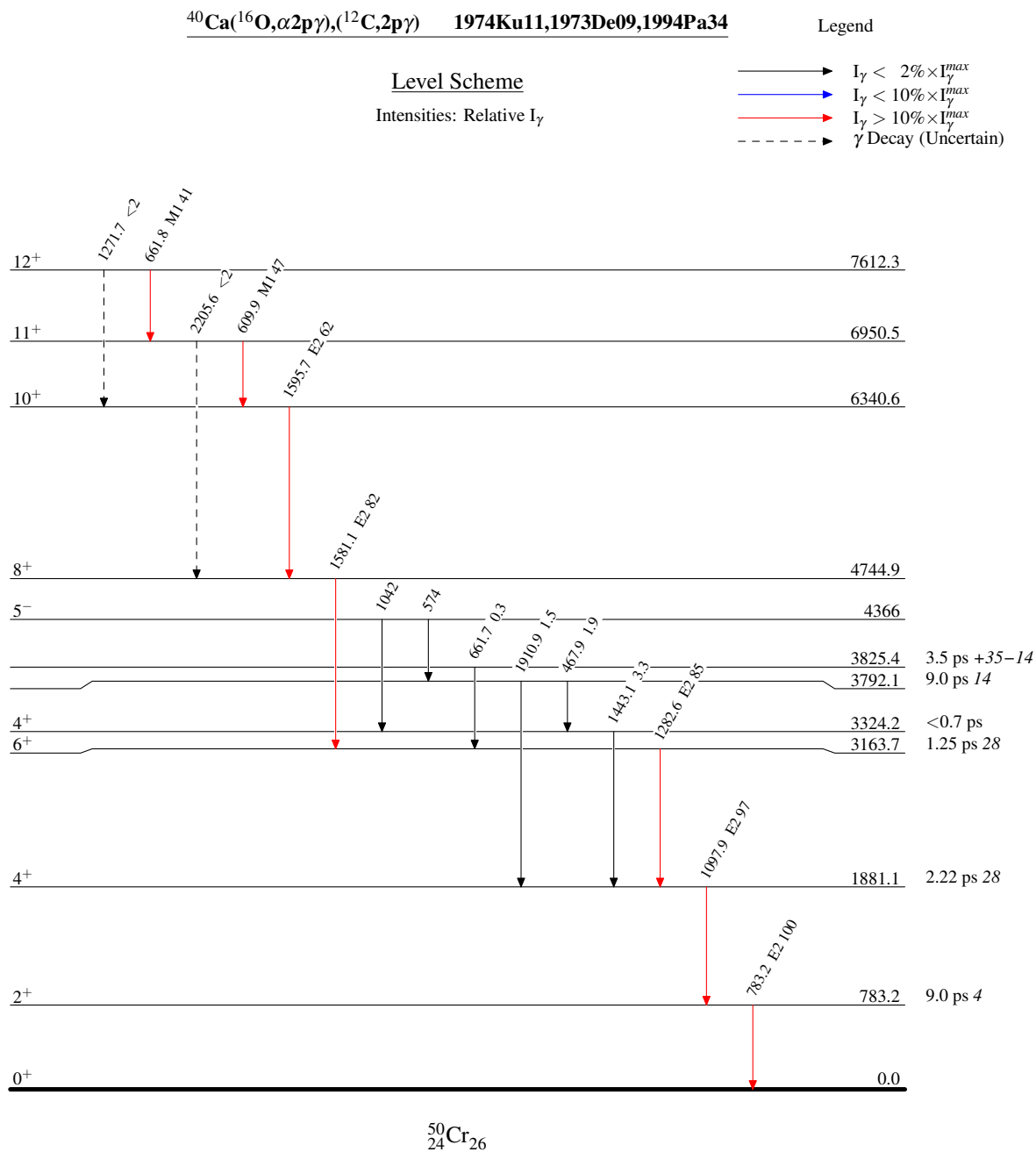
† From **1974Ku11**, unless otherwise noted.

‡ From **1973De09**.

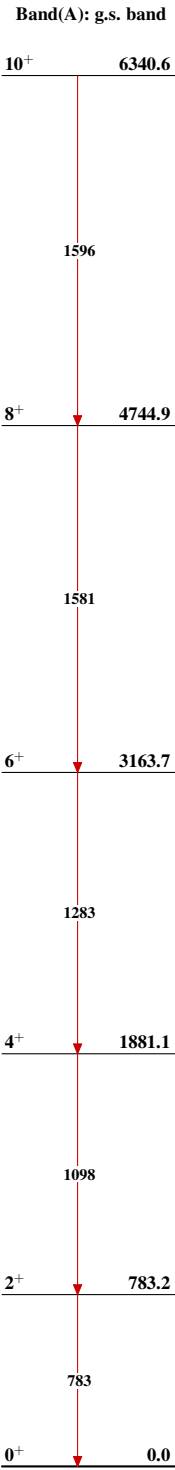
From M.M. Giles et al., Phys. Rev. C, accepted April 9, 2019.

@ From $\gamma(\theta)$ and linear polarization (**1974Ku11**).

& Placement of transition in the level scheme is uncertain.



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$^{50}_{24}\text{Cr}_{26}$