^{100}Mo(α,4nγ) 1976De33

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 172, 1 (2021)	31-Jan-2021

1976De33 (also 1975De29): E=45 MeV alpha beam was produced from the 280-cm-diam AVF Groningen cyclotron. Targets were isotopically enriched (97%) metallic ^{100}Mo, 5 mg/cm^2 thick for γ-ray measurements and 0.7 mg/cm^2 for conversion-electron measurements. γ rays were detected with Ge(Li) detectors and conversion electrons were detected with a mini-orange electron spectrometer. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma(\theta)$, γ(t), γ(lin pol), E(ce), I(ce), ce(t). Deduced levels, J, π, conversion coefficients, γ-ray multipolarities, mixing ratios. Comparison with IBA-model calculations. In γ(t) and ce(t) studies, no delayed transitions with $T_{1/2}$>5 ns observed.

Other:
1993GoZU: E=39.04 MeV. Measured relative γ-ray intensities for 34 γ rays.
All data are from 1976De33, unless otherwise noted.

^{100}Ru Levels

E(level)[#]	J$^\pi$[‡]	Comments
0.0	0^+	
539.8 *3*	2^+	
1131.3?[†] *11*	0^+	
1227.2 *5*	4^+	
1362.8[†] *8*	2^+	
1881.7[†] *11*	3^+	
2063.6[†] *7*	4^+	
2076.9 *5*	6^+	
2168.7?[†]	3^-	
2528.9 *5*	5^-	
2953.4 *5*	7^-	
2965.6 *5*	6^-	
3062.1 *6*	8^+	
3141.1 *5*	7^-	
3266.1 *6*	(8^+)	
3356.7 *5*	8^-	
3505.4 *5*	9^-	
3577.6 *6*	$(7,9)^-$	J$^\pi$: 9^- in the Adopted Levels.
3994.5 *6*	$(10)^-$	
4086.1 *6*	10^+	
4233.1 *6*	$(11)^-$	
4318.3 *7*	(9,11)	J$^\pi$: $(11)^-$ in the Adopted Levels.
4800.3 *6*	(12^-)	
4921.3? *7*	(12^+)	
5130.1 *7*	$(10,11,12^+)$	J$^\pi$: (12^+) in the Adopted Levels.
5165.5 *7*	$(13)^-$	
5280.4 *8*	(9 to 13)	J$^\pi$: (13^-) in the Adopted Levels.
5716.8? *8*	(14^+)	
6201.8 *8*	(15^-)	E(level),J$^\pi$: this level corresponds to 7204,(17^-) in Adopted Levels, since the 1036.3γ in 1976De33 from 6202 level is considered the same as the 1036.6γ from 7204, (17^-) level in the cascade: 1037-1005-933-728 from 2000Ti07 in (^{36}S,α2nγ). In 1976De33, the same cascade is defined as 1036-932-728, without the intermediate 1005γ.

[†] Level scheme taken from the Adopted Levels.
[‡] From $\gamma(\theta)$ and γ(lin pol) data. The assignments are from the Adopted Levels for levels up to 2 MeV.
[#] From least-squares fit to Eγ data.

^{100}Mo(α,4nγ) 1976De33 (continued)

$\gamma(^{100}Ru)$

γ(lin pol) for 540γ, 688γ, 850γ, 985γ and 1024γ used to determine polarization sensitivity (1976De33).
The ce data were normalized to α(K)=0.0038 for 539.7γ and α(K)=0.0020 for 687.4γ, both treated as E2 transitions (1976De33).

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[‡]	Comments
148.6 *3*	1.6 *1*	3505.4	9^-	3356.7	8^-	D+Q	−1.5 *15*	A_2=−0.41 *6*; A_4=+0.01 *8*
187.4 *3*	0.9 *1*	3141.1	7^-	2953.4	7^-			
204.0 *3*	1.3 *2*	3266.1	(8^+)	3062.1	8^+			
238.2[&] *3*	<1.2	4233.1	$(11)^-$	3994.5	$(10)^-$			
364.2 *3*	3.7 *2*	3505.4	9^-	3141.1	7^-	E2		A_2=+0.22 *5*; A_4=−0.11 *6*; α(K)exp=0.016 *8*
391.0 *3*	6.7 *4*	3356.7	8^-	2965.6	6^-	(E2)		A_2=+0.26 *3*; A_4=−0.07 *3*; α(K)exp=0.007 *4* Pol=+0.55 *15*.
403.2 *3*	3.7 *2*	3356.7	8^-	2953.4	7^-	E2+M1	+1.7 *5*	A_2=+0.56 *5*; A_4=+0.16 *5*; α(K)exp=0.008 *4* Pol=−0.05 *15*.
424.3 *3*	4.0 *2*	2953.4	7^-	2528.9	5^-	(E2)		A_2=+0.36 *8*; A_4=−0.02 *10*; α(K)exp=0.009 *5*
436.4 *3*	1.6 *1*	2965.6	6^-	2528.9	5^-	(M1+E2)	+2.8 *20*	A_2=+0.65 *20*; A_4=+0.6 *2*; α(K)exp<0.009
443.3 *3*	4.5 *3*	3505.4	9^-	3062.1	8^+	E1(+M2)	−0.11 *5*	A_2=−0.33 *8*; A_4=+0.03 *11*; α(K)exp<0.0025 Pol=+0.25 *9*.
489.3 *3*	3.0 *5*	3994.5	$(10)^-$	3505.4	9^-	E2+M1	+4 *2*	A_2=+0.23 *9*; A_4=+0.06 *11*; α(K)exp=0.0049 *10* Pol=−0.08 *10*.
539.7 *3*	100	539.8	2^+	0.0	0^+	E2[#]		
552.2 *3*	6.2 *4*	3505.4	9^-	2953.4	7^-	(E2)		A_2=+0.26 *5*; A_4=−0.10 *5*; α(K)exp=0.007 *4*
567.4[&] *3*	<1.6	4800.3	(12^-)	4233.1	$(11)^-$			
591.5[@]	0.6[@] *1*	1131.3?	0^+	539.8	2^+			
612.4 *3*	2.1 *2*	3141.1	7^-	2528.9	5^-	E2		A_2=+0.21 *8*; A_4=−0.21 *9*; α(K)exp=0.0030 *15*
624.2 *3*	8.4 *5*	3577.6	$(7,9)^-$	2953.4	7^-	E2+M1		A_2=+0.27 *4*; A_4=−0.15 *4*; α(K)exp=0.0030 *15* Pol=+0.40 *15*.
637.7 *2*	6.5 *4*	3994.5	$(10)^-$	3356.7	8^-	E2		A_2=+0.39 *5*; A_4=−0.02 *6*; α(K)exp=0.0035 *18*
687.4 *3*	87 *5*	1227.2	4^+	539.8	2^+	E2[#]		A_2=+0.24 *2*; A_4=−0.07 *3*
727.7 *3*	9.6 *6*	4233.1	$(11)^-$	3505.4	9^-	(E2)		A_2=+0.33 *6*; A_4=−0.09 *7*; α(K)exp=0.0017 *7*
740.6 *3*	7.0 *4*	4318.3	(9,11)	3577.6	$(7,9)^-$	E2		A_2=+0.34 *3*; A_4=−0.08 *3* Pol=+0.65 *15*.
795.5[&] *3*	3.7 *2*	5716.8?	(14^+)	4921.3?	(12^+)	(E2)		A_2=+0.28 *5*; A_4=+0.05 *5*; α(K)exp=0.0020 *10* Mult.: E2,M1 from α(K)exp.
[x]803.6[@]	3.3[@] *5*							
805.8 *3*	4.5 *2*	4800.3	(12^-)	3994.5	$(10)^-$	(E2)		A_2=+0.27 *5*; A_4=−0.08 *5*; α(K)exp=0.0016 *6*
822.3[@]	1.2[@] *5*	1362.8	2^+	539.8	2^+			
835.2[&] *3*	8.6 *5*	4921.3?	(12^+)	4086.1	10^+			A_2=+0.03 *5*; A_4=0.00 *6*; α(K)exp=0.0008 *4* Mult.: D,E2 from α(K)exp.
849.9 *3*	72 *5*	2076.9	6^+	1227.2	4^+	E2		A_2=+0.28 *6*; A_4=−0.15 *7*; α(K)exp=0.0011 *2*
876.7 *3*	23 *2*	2953.4	7^-	2076.9	6^+	E1		A_2=−0.32 *4*; A_4=0.00 *6*; α(K)exp=0.00045 *10* Pol=+0.38 *8*. δ: 1976De33 give −1.7 *18* which is not consistent with A_2 and A_4 values for 876.7γ. The value should probably be −0.17 *18*, consistent with $\delta\approx0$ in figure 4 (1976De33).
888.8 *3*	4.1 *2*	2965.6	6^-	2076.9	6^+	E1(+M2)	+0.4 *7*	A_2=+0.29 *5*; A_4=−0.05 *5*; α(K)exp<0.0004 Pol=−0.20 *15*.

Continued on next page (footnotes at end of table)

^{100}Mo(α,4nγ) 1976De33 (continued)

$\gamma(^{100}Ru)$ (continued)

E_γ [†]	I_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]	δ [‡]	Comments
932.4 *3*	4.3 *3*	5165.5	$(13)^-$	4233.1	$(11)^-$	(E2)		A_2=+0.28 *8*; A_4=−0.11 *9*; α(K)exp=0.0015 *5*
962.1 *3*	2.1 *1*	5280.4	(9 to 13)	4318.3	(9,11)	(E2,M1)		A_2=+0.23 *10*; A_4=+0.15 *12*; α(K)exp=0.0013 *7*
985.2 *3*	29 *3*	3062.1	8^+	2076.9	6^+	E2		A_2=+0.25 *2*; A_4=−0.05 *3*; α(K)exp=0.007 *1*
1024.0 *3*	11.0 *10*	4086.1	10^+	3062.1	8^+	(E2)		A_2=+0.28 *3*; A_4=−0.05 *3*; α(K)exp=0.0010 *2*
1036.3 *3*	1.4 *2*	6201.8	(15^-)	5165.5	$(13)^-$	(E2)		A_2=+0.43 *12*; A_4=+0.03 *14*; α(K)exp<0.0030 E_γ: this γ ray is most likely the same as 1036.6γ in 2000Ti07 from 7207, (17^-) level in (^{34}S,α2nγ) reaction.
1044.0 *3*	3.9 *3*	5130.1	$(10,11,12^+)$	4086.1	10^+			A_2=+0.25 *11*; A_4=−0.01 *13*
1064.5[&] *3*	<1.7	3141.1	7^-	2076.9	6^+			
1188.1[@&] *10*	1.3[@] *2*	3266.1	(8^+)	2076.9	6^+			
1301.6 *3*	9.8 *6*	2528.9	5^-	1227.2	4^+	E1(+M2)	−0.07 *3*	A_2=−0.31 *3*; A_4=+0.06 *4*; α(K)exp=0.00026 *13* Pol=+0.7 *6*.
1341.9[@]	2.5[@] *2*	1881.7	3^+	539.8	2^+			
1523.8[@]	2.0[@] *3*	2063.6	4^+	539.8	2^+			
1628.9[@&]	1.6[@] *2*	2168.7?	3^-	539.8	2^+			

[†] From 1976De33 at E(α)=45 MeV, unless otherwise stated. Values from 1993GoZU at E(α)=39 MeV are also available.
[‡] From $\gamma(\theta)$, γ(lin pol) and ce data in 1976De33, unless otherwise stated. The sign of δ given by 1976De33 is opposite to that adopted here.
[#] From the Adopted Gammas. $\gamma(\theta)$ data (1976De33) consistent with this assignment.
[@] From 1993GoZU. γ not reported by 1976De33. Relative intensities quoted by 1993GoZU at E=39 MeV and by 1976De33 at E=45 MeV are comparable.
[&] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

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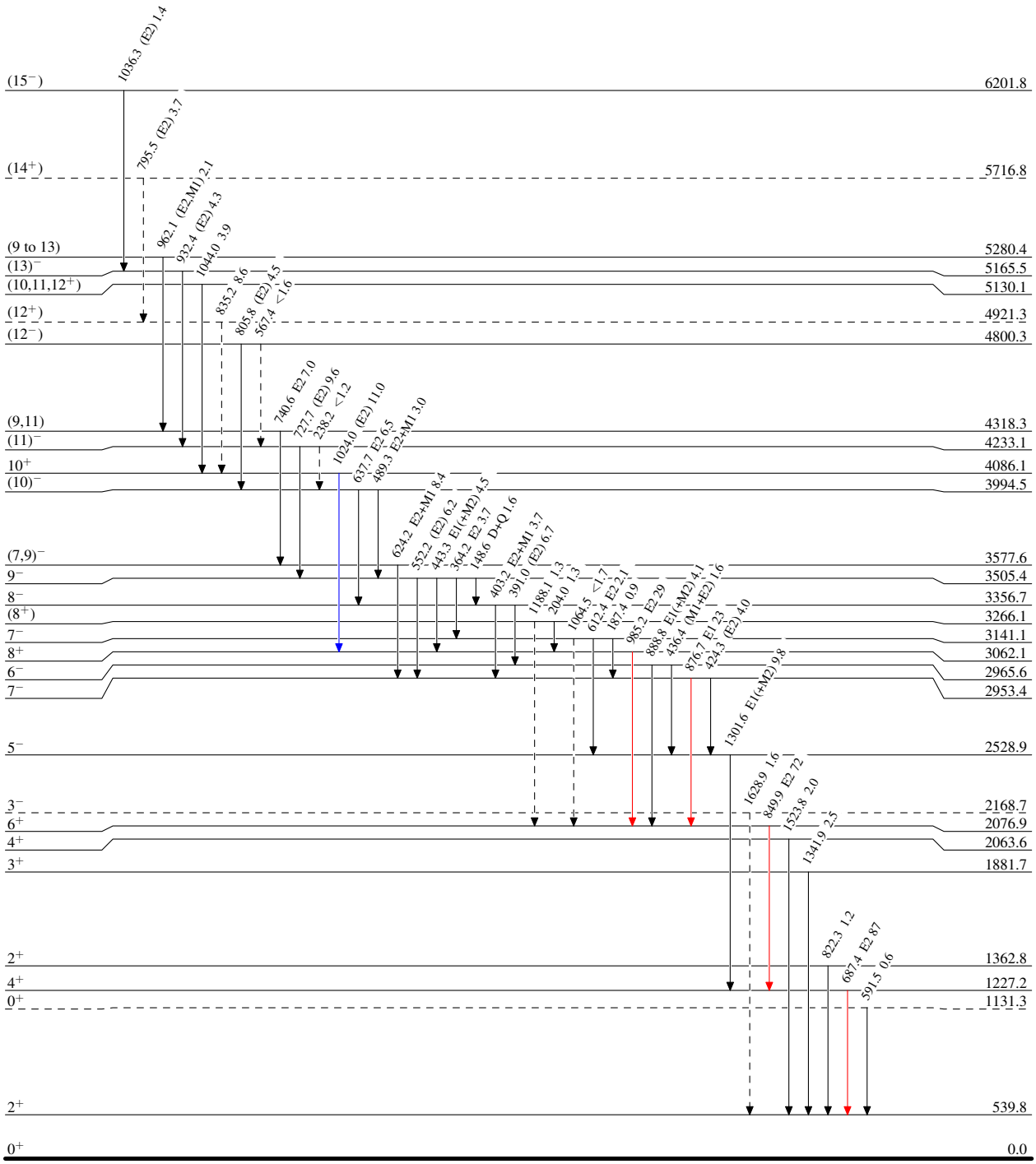
Level Scheme

Intensities: Relative I_γ

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



$^{100}_{44}Ru_{56}$