Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh	NDS 190,1 (2023)	20-Jun-2023

Q(β^-)=−10382 *50*; S(n)=13952 *40*; S(p)=1787 *8*; Q(α)=−5702 *8*
S(2n)=32320 *200* (syst), S(2p)=6257 *7*, Q(ε)=13749 *7*, Q(εp)=5099 *8*.

All values quoted above are deduced by the evaluators using newly measured mass of ^{44}V (M.E.=−23800.4 *71*) by 2022Wa39 and other known masses in 2021Wa16. For S(p), newly measured mass of ^{43}Ti (M.E.=−29302.2 *42*) is also used, compared to M.E.=−29316 *6* in 2021Wa16.

Values from AME2020 (2021Wa16) using M.E.(^{44}V)=−23808 *7*: Q(β^-)=−10390 *50*, S(n)=13960 *40*, S(p)=1781 *9*, Q_α=−5710 *8*, S(2n)=32330 *200* (syst), S(2p)=6265 *7*, Q(ε)=13741 *7*, Q(εp)=5091 *8*.

^{44}V first identified in ^{40}Ca(^{6}Li,2n) reaction (1971Ce02). Also produced in Ni(^{58}Ni,X) E=69 MeV/nucleon (1994Ke07) and in ^{40}Ca(^{6}Li,2n) E=35 MeV (1997Ha04) followed by mass separation.

Mass measurement: 2020Pu02, 2019Su25, 2018Zh29, 2004St05.

Other measurements:

2019Su25: ^{9}Be(^{58}Ni,X), E=160 MeV/nucleon, measured frequencies, time-of-flight. Deduced isomer to ground state ratio of 1.4 *2*.

1994Bl10: ^{9}Be(^{58}Ni,X), measured fragment production cross section.

1994Ke07: ^{9}Be(^{58}Ni,X), E=69 MeV/nucleon, measured $\beta\gamma$-coin; deduced isomer to ground state production ratio.

2018Zh29: ^{44}V obtained from $^{58}Ni^{19+}$ primary beam which was accelerated to 467.91 MeV/nucleon by the heavy-ion synchrotron CSRm, and fragmented on a 15 mm thick Be target, followed by separation of fragments by RIBLL2 in-flight separator at HIRFL-Lanzhou facility. Measured precise mass excesses of ^{44}V g.s. and isomer by isochronous mass spectrometry method. Authors compared mass excesses with systematic values in AME2012 and AME2016.

2020Pu02: E=160 MeV/nucleon ^{58}Ni beam was from the Couple Cyclotron Facility at NSCL, MSU. Fragments were separated by A1900 and then transported to Low Energy Beam and Ion Trap (LEBIT) station. Measured precise mass excesses of ^{44}V g.s. and isomer using time-of-flight ion cyclotron resonance (tof-ICR) technique. 2020Pu02 derive a proton separation energy of 1773 keV *10* for ^{44}V.

2022Wa39: mass measurement using isochronous mass spectrometry at the storage ring CSRe in Lanzhou.

2012Ha31: theory: calculated level spacings for positive parity states, B(M1) vs E, deformation using interacting shell model.

Theoretical calculations: 13 references for nuclear structure and two for radioactive decays retrieved from the NSR database (www.nndc.bnl.gov/nsr/) are listed in document records which can be accessed via web-based ENSDF database.

Additional information 1.

^{44}V Levels

From E_p(c.m.)=759 *26* (2014Po05) to 313 *1* level in ^{43}Ti, 2020Fu05 tentatively proposed a level at 2853 *28* as the T=2, 0$^+$ IAS of ^{44}Cr g.s. in ^{44}V, which possibly decays by the 759-keV proton emission. But 2020Fu05 also proposed that the 759-keV proton more likely decays from a level at 3015 keV to the 475 *10* level in ^{43}Ti. See comment for 3015 level. However, evaluators note that intensity of 0.6% *2* of the 759-keV proton peak in 2014Po05 is too low for T=2, 0$^+$ IAS in ^{44}V, as it implies log *ft* value of 4.8 *2*, instead of the expected value of 3.2. For this reason, evaluators have not included this level in the decay scheme.

Cross Reference (XREF) Flags

A ^{44}Cr ε decay (42.8 ms)
B ^{10}B(^{36}Ar,2nγ)

E(level)†	J$^\pi$#	$T_{1/2}$	XREF	Comments
0.0	(2)$^+$	111 ms *7*	AB	%ε+%β^+=100; %$\varepsilon\alpha$=? J$^\pi$: superallowed β transition (log *ft*=3.47 *8*) to 6606, 2$^+$ state in ^{44}Ti. $T_{1/2}$: from 1997Ha04, average of values from decay curves for five different γ rays. Other: 90 ms *25* (1971Ce02). %$\varepsilon\alpha$: reported by 1971Ce02. Measured mass excess=−23800.4 *71* (2022Wa39), −23804.9 keV *80* (2020Pu02), −23827

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Adopted Levels, Gammas (continued)

^{44}V Levels (continued)

E(level)†	J$^{\pi}$#	$T_{1/2}$	XREF	Comments
				keV *20* (2018Zh29).
196.82 *10*	(1^-)		B	
268@ *10*	$(6)^+$	150 ms *3*	B	%ε+%β^+=100 Additional information 2. E(level): weighted average of 266 keV *10* (2022Wa39, measured mass excess of −23800.4 *71* for ^{44}V g.s. and −23534.3 *73* for ^{44}V isomer); 268 keV *10* (2020Pu02, measured mass excess of −23804.9 *80* for ^{44}V g.s. and −23537.0 *55* for ^{44}V isomer); 286 *28* (2018Zh29, measured mass excess of −23827 *20* for ^{44}V g.s. and −23541 *19* for ^{44}V isomer). Note that 2022Wa39 and 2018Zh29 are from the same laboratory in Lanzhou, but different techniques were used, thus the evaluators treat the two results as independent. J$^{\pi}$: allowed β transition (log *ft*=4.11) to 4015, 6^+ level in ^{44}Ti; shell-model prediction (1997Ha04). J=5,7 not completely ruled out. $T_{1/2}$: from 1997Ha04, average of values from decay curves for five different γ rays.
332.0 *4*	(4^+)		B	
368.85 *14*	(2^-)		B	
564.75 *27*	(3^-)		B	
667.5 *8*	(3^-)		B	
676.91 *30*	(1^+)		A	J$^{\pi}$: possible Gamow-Teller β transition from 0^+ parent.
773.35 *29*	(4^-)		B	
985@ *9*	(7^+)		B	
1066.4 *13*	(5^+)		B	
1124.5 *7*	(4^-)		B	
1343.8 *10*	(5^-)		B	
2665@ *9*	(9^+)		B	
3015‡ *29*	(1^+)		A	J$^{\pi}$: possible Gamow-Teller β transition (log *ft*=4.82) from 0^+ parent.
3166‡ *17*	(1^+)		A	J$^{\pi}$: possible Gamow-Teller β transition (log *ft*=4.24) from 0^+ parent.
3497@ *9*	(11^+)		B	
3640‡ *18*	(1^+)		A	J$^{\pi}$: possible Gamow-Teller β transition (log *ft*=4.27) from 0^+ parent.
3833‡ *18*	(1^+)		A	J$^{\pi}$: possible Gamow-Teller β transition (log *ft*=4.62) from 0^+ parent.
4030@ *9*	(10^+)		B	

† From a least-squares fit to γ-ray energies, unless otherwise noted.
‡ From ^{44}Cr ε decay. Levels are proposed by 2020Fu05 based on re-analysis of β-delayed proton data reported in 2014Po05 and 2007Do17.
# From 2011Ta33 in (^{36}Ar,2nγ) for excited states, based on mirror symmetry with levels in ^{44}Sc, unless otherwise noted.
@ Seq.(A): γ sequence based on $(6)^+$.

γ(^{44}V)

E_i(level)	J^{π}_i	E_γ†	I_γ†	E_f	J^{π}_f
196.82	(1^-)	196.8 *1*	100	0.0	$(2)^+$
332.0	(4^+)	332.2 *4*	100	0.0	$(2)^+$
368.85	(2^-)	172.0 *1*	100.0 *33*	196.82	(1^-)
		369‡	<20.0	0.0	$(2)^+$
564.75	(3^-)	194.8 *4*	100 *10*	368.85	(2^-)
		368.3 *4*	55 *5*	196.82	(1^-)
667.5	(3^-)	298.6 *8*	100	368.85	(2^-)
676.91	(1^+)	676.9 *3*	100	0.0	$(2)^+$
773.35	(4^-)	208.4 *2*	100 *10*	564.75	(3^-)
773.35	(4^-)	405.4 *5*	70 *10*	368.85	(2^-)
		442.2 *8*	50 *10*	332.0	(4^+)
985	(7^+)	713.7 *5*	100	268	$(6)^+$
1066.4	(5^+)	734.4 *12*	100	332.0	(4^+)
1124.5	(4^-)	351.1 *9*	75 *25*	773.35	(4^-)
		560.1 *9*	100 *25*	564.75	(3^-)
		754.3 *20*	50 *25*	368.85	(2^-)
1343.8	(5^-)	570.2 *16*	100 *50*	773.35	(4^-)
		779.1 *12*	50 *50*	564.75	(3^-)

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Adopted Levels, Gammas (continued)

$\gamma(^{44}V)$ (continued)

E_i(level)	J^{π}_i	E_{γ}†	I_{γ}†	E_f	J^{π}_f
2665	(9+)	1680.0 *16*	100	985	(7+)
3497	(11+)	832.0 *7*	100	2665	(9+)
4030	(10+)	533.0 *7*	100	3497	(11+)

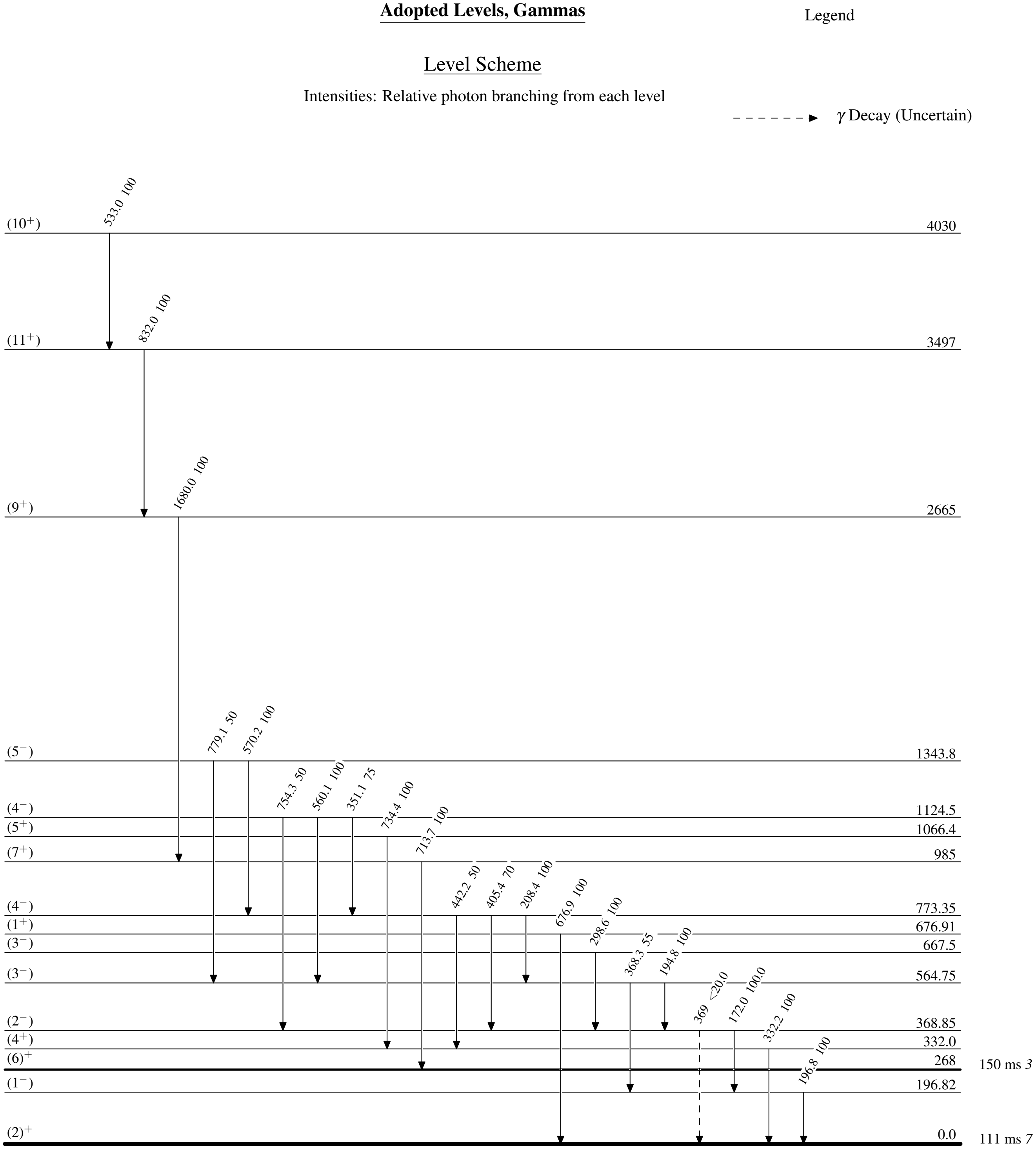
† From (^{36}Ar,2nγ), unless otherwise noted.

‡ Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{44}_{23}V_{21}$

Adopted Levels, Gammas