^{28}Na β^- decay 2012Ku11,1984Gu19

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 114, 1189 (2013)	1-Apr-2013

Parent: ^{28}Na: E=0.0; $J^\pi=1^+$; $T_{1/2}$=30.5 ms *4*; Q(β^-)=14030 *10*; %β^- decay=100.0

Others: 1979De02, 1974Ro31.

Sum of decay energies of this dataset is 13992 keV *735* cf. 14030 keV *10* obtained from ^{28}Na β^- decay Q(g.s.) and branching.

2012Ku11: β^- decay is studied in polarized ^{28}Na isotope. It was produced from fragmentation of tantalum targets by 500 MeV protons at TRIUMF. Separated $^{28}Na^+$ beam, E=30.6 keV, was neutralized by colliding with the Na vapor and nuclear spin was polarized (≈50%) by collinear optical pumping. Polarized ^{28}Na beam was ionized and transported with the polarization direction perpendicular to the beam direction. The spin orientation was flipped by changing the laser helicity in every 5 minutes. The beam was focused and stopped on a Pt foil. Eγ, Iγ, $\beta^-\gamma$ and γ-γ coincidence measurements were performed using 9 HPGe detectors. A pair of plastic scintillators placed in front of each HPGe detectors. Deduced level scheme, J^π.

1984Gu19: ^{28}Na was produced from fragmentation of iridium target by 10 GeV protons from the CERN synchrotron, recoiled fragments were thermalized in graphite, ionized and mass-separated; a thin plastic scintillator, 2 Ge(Li) detectors, Measured: Eγ, $\beta^-\gamma\gamma$ coin, Iγ.

1979De02,1974Ro31: ^{28}Na was produced from fragmentation of uranium target by 24 GeV protons from the CERN synchrotron, recoiled fragments were thermalized in graphite, ionized and mass-separated; a thin plastic scintillator, 2 Ge(Li) detectors, Measured: Eγ, $\beta^-\gamma\gamma$ coin, absolute Iγ.

1984Gu19, 1979De02 and 1974Ro31 are all from the same research group.

^{28}Mg Levels

E(level)†	J^π‡	$T_{1/2}$‡	E(level)†	J^π‡	E(level)†	J^π‡
0.0	0^+	20.915 h *9*	4561.0 *5*	1^+@	5470.2 *5*	2
1473.55 *10*	2^+@		4878.7 *13*	2^+	5916.9 *11*	$(0,1,2)^+$@
3862.15 *15*	0^+@		5171.5 *5*	3^-	6545.0 *5*	(2^+)
4021.1 *5*	4^+		5193.1 *5*	1	7200.9 *7*	$(0,1,2)^+$
4554.6 *5*	2^+		5270.1 *4*	1^+	7461.8 *5*	(2^+)#

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

‡ From Adopted Levels, except otherwise noted.

Assigned in 2012Ku11, based on the angular distribution measurements of β and γ-ray emissions.

@ Assignment reconfirmed in 2012Ku11, based on the angular distribution measurements of β and γ-ray emissions.

β^- radiations

E(decay)	E(level)	Iβ⁻†‡	Log *ft*	Comments
(6568 *10*)	7461.8	1.4 *2*	4.7 *1*	av Eβ=3054.9 *50*
(6829 *10*)	7200.9	0.5 *1*	5.2 *1*	av Eβ=3183.5 *50*
(7485 *10*)	6545.0	0.2 *1*	5.8 *2*	av Eβ=3507.1 *50*
(8113 *10*)	5916.9	0.3 *1*	5.8 *2*	av Eβ=3817.3 *50*
(8560 *10*)	5470.2	<0.1	>6.4	av Eβ=4038.0 *50*
(8760 *10*)	5270.1	1.5 *5*	5.2 *2*	av Eβ=4136.9 *50*
(8859 *10*)	5171.5	0.3 *1*	8.2[1u] *2*	av Eβ=4185.6 *50*
(9151 *10*)	4878.7	0.2 *1*	6.2 *2*	av Eβ=4330.3 *50*
(9469 *10*)	4561.0	3.2 *4*	5.1 *1*	av Eβ=4487.4 *50*
(9475 *10*)	4554.6	1.00 *25*	5.6 *1*	av Eβ=4490.5 *50*
(10168 *10*)	3862.15	20.1 *19*	4.42 *1*	av Eβ=4832.9 *50*
(12556 *10*)	1473.55	11 *6*	5.1 *2*	av Eβ=6013.7 *50*
(14030 *10*)	0.0	60 *5*	4.6 *1*	av Eβ=6741.7 *50*

Continued on next page (footnotes at end of table)

^{28}Na β^- decay 2012Ku11,1984Gu19 (continued)

β^- radiations (continued)

† Deduced by the evaluator from γ-ray intensity balance at each level.
‡ Absolute intensity per 100 decays.

$\gamma(^{28}Mg)$

E_γ †	I_γ ‡@	E_i(level)	J_i^π	E_f	J_f^π	Comments
1150.5# *4*	<0.1	5171.5	3^-	4021.1	4^+	
1373.4 *2*	<0.1	6545.0	(2^+)	5171.5	3^-	
1473.5 *1*	37 *5*	1473.55	2^+	0.0	0^+	I_γ: 2012Ku11 used same value as in 1984Gu19.
1990.7 *5*	0.2 *1*	6545.0	(2^+)	4554.6	2^+	
2007.7 *4*	0.5 *1*	7200.9	$(0,1,2)^+$	5193.1	1	
2191.7 *3*	0.8 *1*	7461.8	(2^+)	5270.1	1^+	
2290.9 *6*	<0.1	7461.8	(2^+)	5171.5	3^-	
2388.5# *1*	22 *3*	3862.15	0^+	1473.55	2^+	I_γ: Other: 18.7 *25* (1984Gu19).
2547.7# *6*	<0.1	4021.1	4^+	1473.55	2^+	
2906.9 *6*	0.6 *1*	7461.8	(2^+)	4554.6	2^+	
3082.4# *11*	1.3 *3*	4554.6	2^+	1473.55	2^+	I_γ: Other: 2.7 *4* (1984Gu19).
3087.3# *5*	4.0 *6*	4561.0	1^+	1473.55	2^+	I_γ: Other: 2.6 *5* (1984Gu19).
3404.9 *13*	0.2 *1*	4878.7	2^+	1473.55	2^+	
3696.8# *6*	0.3 *1*	5171.5	3^-	1473.55	2^+	
3996.3 *5*	<0.1	5470.2	2	1473.55	2^+	
4443.0 *11*	0.3 *1*	5916.9	$(0,1,2)^+$	1473.55	2^+	
5192.6 *5*	0.4 *1*	5193.1	1	0.0	0^+	
5269.6 *4*	2.3 *4*	5270.1	1^+	0.0	0^+	E_γ: Weighted average of 5269.1 keV *5* (2012Ku11) and 5271.7 keV *10* (1984Gu19). I_γ: From 2012Ku11. Other: 0.50 *15* (1984Gu19).

† From 2012Ku11, except otherwise noted. Some γ-ray energies in 2012Ku11 are discrepant compared to 1984Gu19 or other datasets. The source of the discrepancy is not clear.
‡ From 2012Ku11, except otherwise noted. γ-ray intensities reported in 2012Ku11 and 1984Gu19 are mostly in agreement, except a few.
# From Adopted Gammas.
@ Absolute intensity per 100 decays.

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Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays