Coulomb excitation   2015Si01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia and A. M. Hurst	NDS 134, 1 (2016)	1-Feb-2016

2015Si01: Beam=2.82 MeV/nucleon ^{26}Na produced in bombardment of UC$_x$ target by 1.4 GeV protons provided by the CERN PS
   Booster and ^{26}Na ions separated by ISOLDE General Purpose separator.
Coulomb excitation target=enriched ^{104}Pd.
A radioactive-beam Coulomb-excitation experiment with ^{26}Na (T$_{1/2}$=1.07 s) performed using the REX-ISOLDE facility at CERN.
   ^{26}Na ions (q=6$^+$) were post accelerated to 2.82 MeV/nucleon and impinged upon a 3.6-mg/cm^2 thick ^{104}Pd target with an average
   beam intensity of 6.4×10^4 5 ions/s for an irradiation period of 73 h. Scattered beam and target nuclei were detected using the
   500−μm double-sided silicon strip detector. Deexcitation γ rays following Coulomb excitation of projectile and target nuclei were
   detected using the MINIBALL γ-ray spectrometer comprising eight triple-cluster detectors, each consisting of three
   six-fold-segmented HPGe crystals. Measured Eγ, Iγ, (scattered particle)γ-coin. The coupled-channels Coulomb-excitation code
   GOSIA2 was used to obtain transition matrix elements from observed γ-ray yields and known spectroscopic data (branching ratios,
   multipole mixing ratios and half lives). Deduced B(E2) and B(M1) values are compared to *sd* shell-model calculations using
   various interactions: universal *sd* (USD), universal *sd*-A (USDA), and universal *sd*-B (USDB) interaction.

^{26}Na Levels

E(level)[†]	J$^\pi$	T$_{1/2}$	Comments
0	3$^{+\ddagger}$		
82.4 6	1$^{+\ddagger}$		
233.2 8	2$^{+\#}$	0.7 ns +6−5	B(E2)↑=0.00421 +46−41
			B(E2) from 3$^+$ g.s. to 233 level deduced by evaluators from experimental B(E2)(W.u.)=12.9 +14−13, branching ratio and mixing ratio for 233γ.
			T$_{1/2}$: deduced by evaluators from B(E2)(W.u.) and adopted 233γ properties.
407.0 20	2$^{+\#}$	0.18 ns +17−13	B(E2)↑=0.001039 96
			B(E2) from 3$^+$ g.s. to 407 level deduced by evaluators from experimental B(E2)(W.u.)=3.18 29, branching ratio and mixing ratio for 407γ.
			T$_{1/2}$: deduced by evaluators from B(E2)(W.u.) and adopted 407γ properties.

  [†] From least-squares fit to Eγ data, assuming 0.5 keV uncertainty for 82.5-keV transition.
  [‡] From Adopted Levels.
  [#] Deduced from best fit to (t,^{3}He) angular distributions in 1987Pe06, although these assignments were not adopted in Endt's
   1990En08 evaluation. 2006Le17 in their ^{14}C(^{14}C,dγ) claim to confirm 2$^+$ assignment for both the 233- and 407-keV levels.

γ(^{26}Na)

E$_i$(level)	J$_i^\pi$	E$_\gamma$	I$_\gamma$	E$_f$	J$_f^\pi$	Mult.[†]	δ[†]	α[‡]	Comments
82.4	1$^+$	84 3		0	3$^+$	[E2]		0.137 4	B(E2)(W.u.)=3.10
									E$_\gamma$: From Adopted Gammas.
									B(E2)(W.u.) deduced by 2015Si01 from known half-life of 82.4 level and theoretical conversion coefficient for 82.5γ from BrIcc code.
									Shell-model predictions (2015Si01) for corresponding B(E2)(W.u.) values are 8.66 (USD), 8.39 (USDA) and 6.88 (USDB).
233.2	2$^+$	151 1	81.0 32	82.4	1$^+$	M1+E2	+0.16 7		B(M1)(W.u.)=0.44 +73−22; B(E2)(W.u.)=26 +67−19
									Shell-model predictions for corresponding B(M1)(W.u.) in 2015Si01: 0.0002 (USD), 0.011 (USDA) and 0.023 (USDB).

Coulomb excitation   2015Si01 (continued)

$\gamma(^{26}$Na) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.[†]	δ[†]	Comments
								Shell-model predictions for corresponding B(E2)(W.u.) in 2015Si01: 3.09 (USD); 1.23 (USDA); 1.84 (USDB).
								I_γ: corrected number of counts reported as 3279 *131* in 2015Si01.
233.2	2$^+$	233 *1*	100 *4*	0	3$^+$	M1+E2	−0.32 *14*	B(M1)(W.u.)=0.13 +*28*−*7*; B(E2)(W.u.)=12.9 +*14*−*13*
								Shell-model predictions for corresponding B(M1)(W.u.) in 2015Si01: 0.14 (USD), 0.04 (USDA) and 0.07 (USDB).
								Shell-model predictions for corresponding B(E2)(W.u.) in 2015Si01: 6.25 (USD), 10.06 (USDA) and 10.04 (USDB).
								I_γ: corrected number of counts reported as 4046 *162* in 2015Si01.
407.0	2$^+$	(324)	18	82.4	1$^+$			E_γ,I_γ: from ^{14}C(^{14}C,dγ) (2006Le17).
		407 *2*	100 *10*	0	3$^+$	M1+E2	−0.25 *12*	B(M1)(W.u.)=0.15 +*42*−*8*; B(E2)(W.u.)=3.18 *29*
								Shell-model predictions for corresponding B(M1)(W.u.) in 2015Si01: 0.34 (USD), 0.34 (USDA) and 0.32 (USDB).
								Shell-model predictions for corresponding B(E2)(W.u.) in 2015Si01: 11.27 (USD), 7.91 (USDA) and 7.89 (USDB).
								I_γ: corrected number of counts reported as 1374 *137* in 2015Si01.

[†] From Adopted Gammas.
[‡] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

Coulomb excitation   2015Si01   Legend

Level Scheme

Intensities: Relative photon branching from each level

- - - - - - ▶ γ Decay (Uncertain)

407 M1+E2 100

324 18

2$^+$ 407.0   0.18 ns +*17−13*

233 M1+E2 100

151 M1+E2 81.0

2$^+$ 233.2   0.7 ns +*6−5*

84 [E2]

1$^+$ 82.4

3$^+$ 0

$^{26}_{11}$Na$_{15}$