Coulomb excitation 2014Se02,2008Et01,2002Pr12

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia, A. Chakraborty	NDS 197,1 (2024)	31-May-2024

2014Se02: ^{30}Na beam, E=2.85 MeV/nucleon, provided by REX-ISOLDE linear accelerator at CERN. Targets: 4.1 mg/cm^2 thick ^{104}Pd and 4.0 mg/cm^2 thick ^{120}Sn. The ^{30}Na beam was produced by bombarding UCx target with 1.4-GeV protons and intensity of 3.2× 10^{13} p/pulse spaced in time by integer multiples of 1.2 s allowing average proton current of 2−μA. MINIBALL gamma-ray array consisting of 8 triple cluster detectors, each containing 3 sixfold segmented HPGe crystals, was used for γ-ray detection in coincidence with scattered ^{30}Na particles. A double-sided silicon strip detector (DSSSD) was used for detecting the scattered beam nuclei. Reduced transition probabilities of excited states of ^{30}Na were determined using the relative deexcitation γ-ray yields between ^{30}Na and the Coulomb excited 2$^+$ states of ^{104}Pd and ^{120}Sn. Coupled-channel Coulomb excitation code GOSIA was used to fit the transition matrix elements with the corresponding experimental yields.

2008Et01: ^{30}Na beam of 80.1 MeV/nucleon was produced from a ^{48}Ca primary beam, 140 MeV/nucleon, bombarding a thick ^{9}Be target; particles identified by energy loss and Time-of-Flight; Coulomb excitation of the secondary ^{30}Na beam by a ^{209}Bi target; Measured Eγ using SeGA array of 18 HPGe detectors.

2002Pr12: ^{30}Na beam of 55.6 MeV/nucleon was produced from a ^{48}Ca primary beam, 80 MeV/nucleon, bombarding a thick ^{9}Be target; particles identified by charge determination and Time-of-Flight; Coulomb excitation of the secondary ^{30}Na beam by a ^{197}Au target; γ-rays were detected by an array of 38 NaI(Tl) detectors; deduced Coulomb deformation parameter=0.41 *10* and matter deformation parameter=0.46 *11*; also deduced an intrinsic quadrupole moment=0.51 *15* b.

B(E2) and B(M1) values are from 2014Se02, in units of e^{2}b^2 and μ_N^2, respectively.

^{30}Na Levels

E(level)†	J$^\pi$	T$_{1/2}$	Comments
0.0	2$^+$‡	45.4‡ ms *11*	
151?	1$^+$‡		B(E2)↑<0.0025 (2014Se02) Level not observed in 2014Se02, only an upper limit of B(E2) is given.
424	(3$^+$)‡		B(E2)↑=0.0230 *41* (2014Se02) B(E2) for ^{104}Pd target, BE2=0.032 *10* for ^{120}Sn target (2014Se02). BE2=0.0147 *21* (2008Et01) deduced from the measured Coulomb excitation cross section using the predicted value of B(M1)(2$^+$ g.s. to 3$^+$) =0.268. Predicted value of B(E2)=0.0168 in 2008Et01. B(E2)↑=0.0130 *+90−65* (2002Pr12), extracted from the coupled-channels calculations that took into account both electromagnetic and nuclear contributions to the scattering reaction.
925 *4*	(4$^+$)		B(E2)↑=0.0125 *45* (2014Se02) B(E2) from 2$^+$ to g.s. is for ^{104}Pd target, BE2=0.0096 *50* for ^{120}Sn target (2014Se02). J$^\pi$: from Coulomb-excitation relations and shell model predictions. This state and its γ-ray decay were not observed/reported in 2002Pr12 and 2008Et01.

† From 2014Se02.
‡ From the Adopted Levels.

$\gamma(^{30}Na)$

E$_i$(level)	J$_i^\pi$	E$_\gamma$†	I$_\gamma$†	E$_f$	J$_f^\pi$	Mult.	Comments
424	(3$^+$)	424 *2*		0.0	2$^+$	[M1+E2]	E$_\gamma$: From Adopted Gammas. Others: 424 *3* (2008Et01), 433 *16* (2002Pr12), and 424 (2014Se02).
925	(4$^+$)	501 *4*	33 *10*	424	(3$^+$)	[M1+E2]	B(M1)↓=0.027 *14* (2014Se02) B(M1) was deduced from GOSIA analysis assuming a moderate B(E2)=0.0080 for (4$^+$) to (3$^+$) transition.
		925 *4*	67 *10*	0.0	2$^+$	[E2]	

† From 2014Se02, except where otherwise noted.

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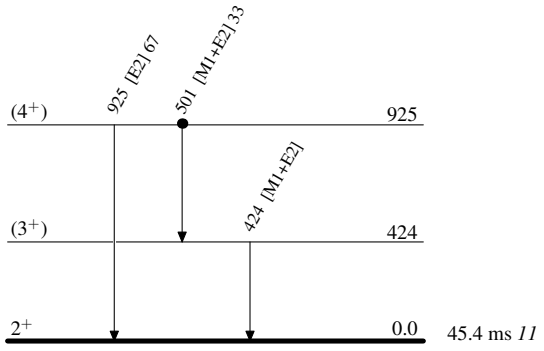
Legend

Level Scheme

Intensities: % photon branching from each level

● Coincidence



$^{30}_{11}Na_{19}$