^{63}Cu(^{31}P,3pnγ) 2005Ch65

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	S. K. Basu, E. A. Mccutchan	NDS 165, 1 (2020)	1-Mar-2020

Results of two experiments are reported:

1. E(^{31}P)=120 and 125 MeV incident on a AP 1.2 mg/cm^2 enriched ^{63}Cu target on a 10 mg/cm^2 gold backing. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma(\theta)$(DCO) using Indian National Gamma Array (INGA), consisting of eight Compton-suppressed Clover HPGe detectors and a 14-element NaI(Tl) multiplicity filter.
2. E(^{31}P)= 120 MeV. Measured Eγ, Iγ, $\gamma\gamma$, γ-(recoil) coin, γ(t) using eight Compton-suppressed Clover HPGe detectors and the Heavy-ion reaction analyzer (HIRA). A 23% HPGe detector was placed at the focal plane for γ(recoil) coincidences.

^{90}Nb Levels

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	Comments
0.0	8^+		
122.6	6^+		
285.6	5^+		
328.1	4^+		
651.4	3^+		
813.4	9^+		
854.7	2^-		
1345.3			
1770.3			
1809.5	9^-		
1845.1	$3^{(+)}$		
1880.3	11^-	0.47 μs *1*	$T_{1/2}$: from γ(t) (2005Ch65).
1985.5	10^+		
2126.0	3^-		
2180.6	(12^-)		
2309.4	3^+		
2487.3	(12^-)		
2793.2			
2813.6	(13^-)		
3071.6	(13^-)		
3654.3	13^-		
4330.6	14		
5051.2			
5557.8	$15^{(-)}$		
6155.5	$16^{(-)}$		
6229.9			
6742.3	$17^{(+)}$		
7024.2	$18^{(+)}$		
7768.1	$19^{(+)}$		

[†] From least-squares fit to Eγ's, by evaluators.
[‡] From 2005Ch65 with assignments based on mutipolarity of γ rays deduced from DCO and polarization data.

γ(^{90}Nb)

DCO values corresponds to angles 90°, 250° and 285° along one axis and 150°, 210° and 325° along the other axis. DCO of ≈1 is expected for same multipolarity as for the gated γ, ≈2 if different.
POL is polarization asymmetry parameter, positive for electric and negative for magnetic multipole character.

Continued on next page (footnotes at end of table)

^{63}Cu(^{31}P,3pnγ) 2005Ch65 (continued)

γ(^{90}Nb) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	Comments
42.5[†]	2 *1*	328.1	4^+	285.6	5^+		
70.8	1.7 *3*	1880.3	11^-	1809.5	9^-	Q	DCO=1.35 *23* (gate: 996γ, ΔJ=0, quadrupole).
122.6[†]	51 *3*	122.6	6^+	0.0	8^+		
163.0	68 *3*	285.6	5^+	122.6	6^+	D	DCO=0.87 *10* (gate: 323γ, ΔJ=1, dipole).
203.3	22.3 *25*	854.7	2^-	651.4	3^+	E1	DCO=0.97 *10* (gate: 163γ, ΔJ=1, dipole). POL=+0.08 *2*.
281.9	5.1 *9*	7024.2	$18^{(+)}$	6742.3	$17^{(+)}$	M1	DCO=1.24 *13* (gate: 598γ, ΔJ=1, dipole). POL=−0.08 *4*.
300.4	5.0 *9*	2180.6	(12^-)	1880.3	11^-		
323.3	22.4 *14*	651.4	3^+	328.1	4^+	M1	DCO=1.17 *11* (gate: 163γ, ΔJ=1, dipole). POL=−0.04 *2*.
425.0		1770.3		1345.3			
490.6		1345.3		854.7	2^-		
584.3	6.0 *11*	3071.6	(13^-)	2487.3	(12^-)	D	DCO=1.19 *14* (gate: 607γ, ΔJ=1, dipole).
586.8	6.5 *12*	6742.3	$17^{(+)}$	6155.5	$16^{(-)}$	E1	DCO=1.09 *20* (gate: 598γ, ΔJ=1, dipole). POL=+0.24 *3*.
597.7	11.9 *21*	6155.5	$16^{(-)}$	5557.8	$15^{(-)}$	M1	DCO=2.08 *20* (gate: 1774γ, ΔJ=2, quadrupole). POL=−0.13 *2*.
607.0	12 *2*	2487.3	(12^-)	1880.3	11^-	M1	DCO=1.04 *12* (gate: 813γ, ΔJ=1, dipole). POL=−0.06 *3*.
633.2	2.0 *4*	2813.6	(13^-)	2180.6	(12^-)		
672.1[@]	#	6229.9		5557.8	$15^{(-)}$		
676.4	4.1 *7*	4330.6	14	3654.3	13^-	D	DCO=2.00 *21* (gate: 1774γ, ΔJ=2, quadrupole.
720.6[@]	#	5051.2		4330.6	14		
744.0	4.4 *8*	7768.1	$19^{(+)}$	7024.2	$18^{(+)}$	M1	DCO=2.0 *5* (gate: 1774γ, ΔJ=2, quadrupole). POL=−0.08 *2*.
807.7[@]	#	2793.2		1985.5	10^+		
813.4	45 *9*	813.4	9^+	0.0	8^+	M1	DCO=2.02 *24* (gate: 1067γ, ΔJ=2, quadrupole). POL=−0.02 *3*.
933.3	2.2 *4*	2813.6	(13^-)	1880.3	11^-		
990.4	2.3 *2*	1845.1	$3^{(+)}$	854.7	2^-	D	DCO=1.38 *20* (gate: 203γ, ΔJ=1, dipole).
996.2	16 *3*	1809.5	9^-	813.4	9^+	(M2)	DCO=0.46 *5* (gate: 813γ, ΔJ=1, dipole). POL=−0.11 *4*.
1025.7[@]	2.1 *4*	7768.1	$19^{(+)}$	6742.3	$17^{(+)}$	(E2)	DCO=1.2 *6* (gate: 1774γ, ΔJ=2, quadrupole). POL=−0.08 *4*. Mult.: Pol is inconsistent with E2 assignment.
1066.8	28 *5*	1880.3	11^-	813.4	9^+	M2	DCO=0.46 *8* (gate: 813γ, ΔJ=1, dipole). POL=−0.06 *3*.
1172.1	1.9 *4*	1985.5	10^+	813.4	9^+		
1271.3	10.9 *8*	2126.0	3^-	854.7	2^-	M1	DCO=1.1 *4* (gate: 203γ, ΔJ=1, dipole). POL=−0.07 *3*.
1454.7	4.2 *3*	2309.4	3^+	854.7	2^-	E1	DCO=0.96 *14* (gate: 323γ, ΔJ=1, dipole). POL=+0.17 *3*.
1773.9	18 *3*	3654.3	13^-	1880.3	11^-	E2	DCO=0.45 *9* (gate: 587γ, ΔJ=1, dipole). POL=+0.12 *5*.
1824.9	#	6155.5	$16^{(-)}$	4330.6	14		
1903.4	6.8 *12*	5557.8	$15^{(-)}$	3654.3	13^-	Q	DCO=0.55 *15* (gate: 598γ, ΔJ=1, dipole).
2744.2	3.2 *6*	5557.8	$15^{(-)}$	2813.6	(13^-)	Q	

[†] Not observed by 2005Ch65; value taken from ^{89}Y(α,3nγ),^{90}Zr(^{3}He,p2nγ) dataset (1981Fi02).
[‡] Deduced from DCO ratio and polarization information in 2005Ch65.
[#] Weak γ ray.
[@] Placement of transition in the level scheme is uncertain.

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Level Scheme

Intensities: Relative I_γ

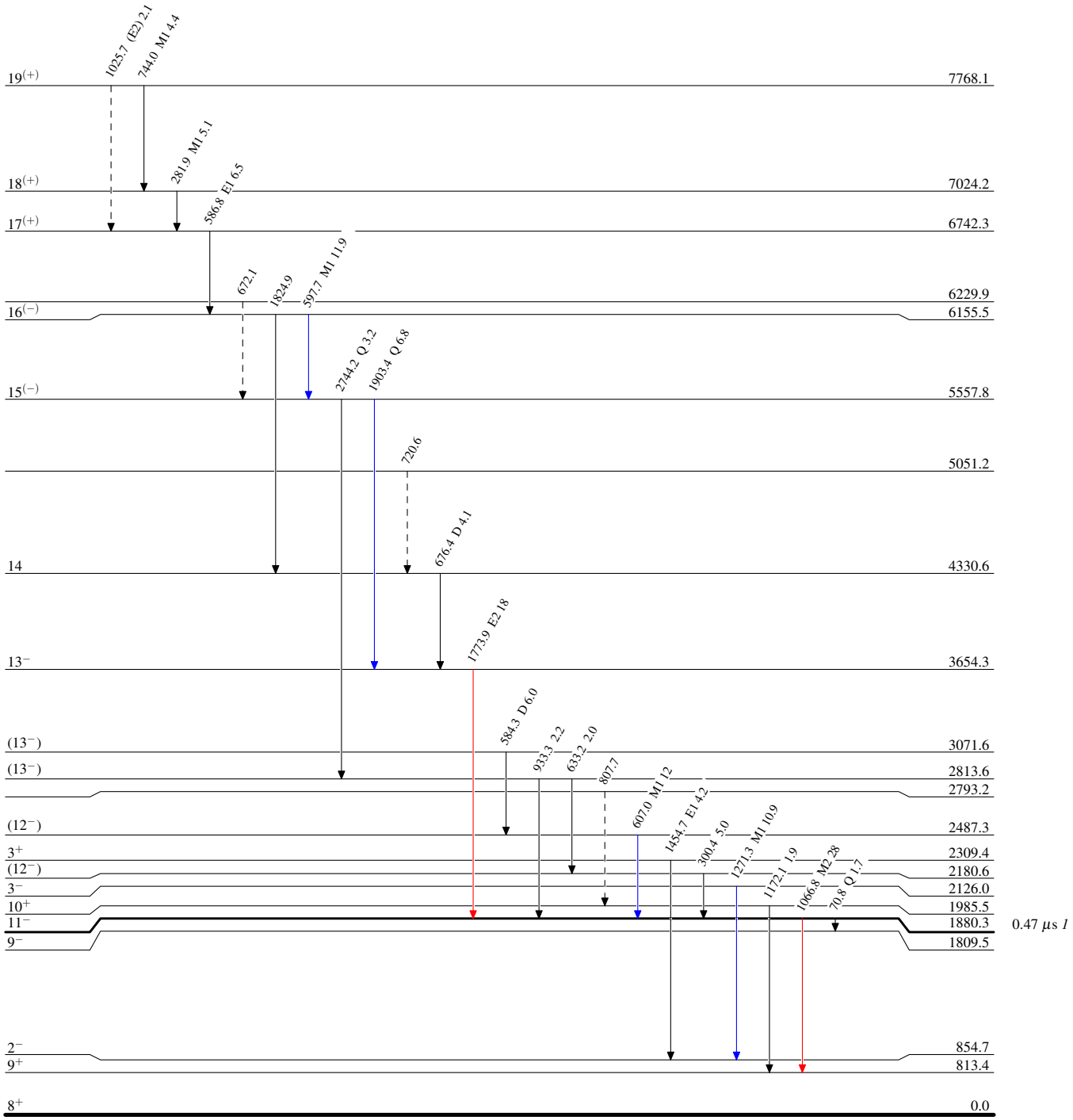
Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$

γ Decay (Uncertain)



$^{90}_{41}Nb_{49}$

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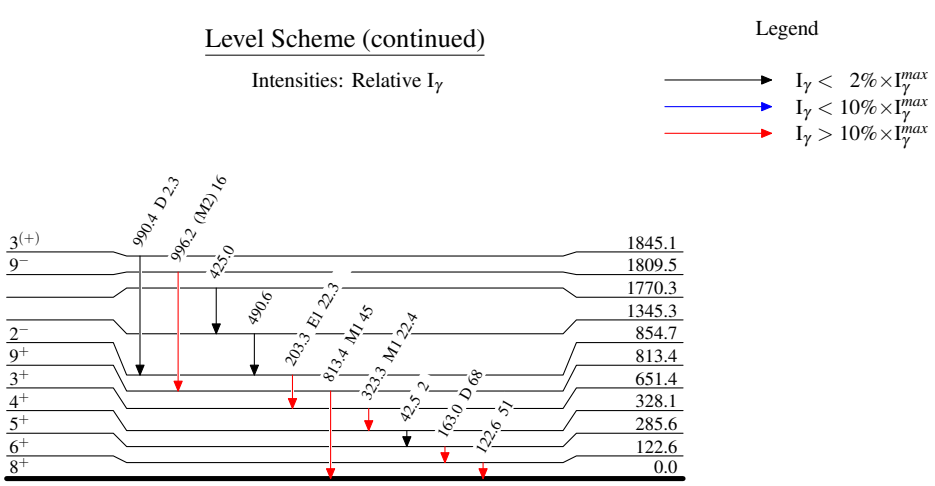
Level Scheme (continued)

Intensities: Relative I_γ



$^{90}_{41}Nb_{49}$