^{62}Ni(p,p′γ) 1969Be20,2019Ev01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, Huang Xiaolong, and Wang Xianghan	NDS 204,1 (2025)	30-Jun-2023

1969Be20: (p,p′),E=12 MeV from CEN Saclay-SPNBE tandem Van de Graaff accelerator. Measured E(p), I(p), Eγ, Iγ, pγ-coin using a cooled surface barrier silicon detector for protons, and NaI(Tl) detector for γ rays. Target was ≈99% enriched ^{62}Ni with a thickness of 250 μg/cm^2 and backing of 30 μg carbon. FWHM≈20 keV for protons.

2019Ev01 (also 2018Ev01): E(p)=9.2 MeV from the 14UD pelletron accelerator at the Australian National University. Target=1.3 mg/cm^2 enriched ^{62}Ni. Measured Eγ, γ(θ) using the CEASAR array of nine Compton-suppressed HPGe detectors. The conversion electrons were measured using superconducting electron spectrometer Super-e with a set of six 9-mm thick Si(Li) detectors for electrons, and a single Compton-suppressed HPGe detector to enable simultaneous measurement of electrons and γ rays. Data for E0 admixed transition from the second 2$^+$ state, and the first excited state. Comparison with configuration-interaction (CI) shell-model calculations.

1981Pa10: E(p)=6.9 MeV. Measured Eγ, Iγ, Ice, pγ-coin using Ge(Li) detectors for γ rays, magnetic spectrometer and Si(Li) detector for conversion electrons at the University of Jyvaskyla cyclotron. Data for the first excited 0$^+$ state at 2048 keV.

1978KoZY: E(p)=7-26 MeV, measured σ for 2$^+$ state.

1976Kr16: E(p)≤3 MeV, measured σ for 2$^+$ state.

1972Va01: E(p)=4.8 MeV. Measured pγ(θ) for 2300-keV level using Ge(Li) detector.

1969Be48: E(p)=7.87 MeV. Measured Eγ, level lifetime for 2300-keV level using DSAM at the Rutgers-Bell FN Tandem accelerator.

1966Ba23: data for first 3$^-$ state.

1963Se03 (also 1963Se16): E(p)=3.4-5.2 MeV. Measured Eγ for five γ rays, γγ-coin, p(880γ)(θ), p(1170γ)(θ), p(2300γ)(θ), (880γ)(1170γ)(θ) using scintillation detector for γ rays.

Additional information 1.

^{62}Ni Levels

E(level)†	J^π†	T$_{1/2}$	Comments
0.0	0$^+$		
1172.8	2$^+$		E(level): from 1972Va01. Other: 1170 (1969Be20).
2048.4	0$^+$		E(level): from 1981Pa10. Other: 2050, 2040 (1969Be20). 2048.4 keV E0 transition with B(E0 to g.s.)/B(E2 to 1173)=0.028 *5* from ce(K)(2048, E0)/ce(K)(876γ)=0.084 *11* (1981Pa10). Monopole strength reported by 1981Pa10, but adopted T$_{1/2}$ corresponds to 2301 and not 2048 level.
2301.6	2$^+$	0.67 ps *+20−14*	E(level): from 1972Va01. Other: 2300 (1969Be20). T$_{1/2}$: from DSAM in (n,n′γ) (2011Ch05), this value used by 2019Ev01 to deduced transition probabilities. Other: 0.76 ps *+29−19* (1969Be48, DSAM in (p,p′γ)).
2330	4$^+$		E(level): from Fig. 6 in 1969Be20, 2340 in authors′ Table 1.
2891.1	0$^+$		E(level): from 1981Pa10. Other: 2880, 2890 (1969Be20).
3050	2$^+$		
3155	2$^+$		
3260			
3460			E(level): from Fig. 6 in 1969Be20, 3470 in authors′ Table 1.
3510			E(level): from Fig. 6 in 1969Be20, 3520 in authors′ Table 1.
3740	3$^-$		
3850			
3960			
3980			
4040			
4130			
4140			
4300			
4400			
4440			
4500			

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^{62}Ni(p,p′γ) 1969Be20,2019Ev01 (continued)

^{62}Ni Levels (continued)

E(level)†	E(level)†	E(level)†	E(level)†
4610	4850‡	5220‡	7170
4640	4870‡	5280	7600
4700	5000	5340‡	7700
4770	5060‡	5420‡	8200
4780‡	5130‡	6320	

† From level-scheme Fig. 6 of 1969Be20, except where noted.
‡ No γ transition shown from this level in Fig. 6 of 1969Be20.

γ(^{62}Ni)

E_i(level)	J_i^π	E_γ†	I_γ‡	E_f	J_f^π	Mult.	δ	Comments
1172.8	2+	1172.8		0.0	0+			E_γ: from level energy. K-conversion line of 1172.8-keV transition observed by 1981Pa10.
2048.4	0+	875.6		1172.8	2+	[E2]		E_γ: from 1981Pa10. K-conversion line of 875.6-keV transition observed by 1981Pa10. Measured I(γ+ce)(875.6γ)/I(ce)(E0)=100/0.013 (1981Pa10). B(E2)=100 *55* (1981Pa10).
		2048.4		0.0	0+	E0		E_γ: rounded value from the Adopted dataset. ρ^2(E0)=0.130 *+60−70* (2019Ev01), q^2_K(E0/E2)=0.084 *11* (2019Ev01). Other: ρ^2(E0)=0.078 *43*; X(E0/E2)=0.028 *5* (1981Pa10). E0 matrix element=0.081 b *+17−26* (2019Ev01). Measured Ice(K)(2048, E0)/Ice(K)(876γ)=0.084 *11* (1981Pa10).
2301.6	2+	1128.8	44.7 *11*	1172.8	2+	M1+E2+E0	+3.1 *1*	α(K)exp=1.95×10^{-4} *11* (2019Ev01) B(M1)↓=0.0018 *+3−5* (2018Ev01); B(E2)↓=0.0200 *+40−50* (2018Ev01) B(M1)(W.u.)=0.0009 *+2−3* (2019Ev01); B(E2)(W.u.)=13 *+3−4* (2019Ev01) E_γ: from 1972Va01. I_γ: from (n,n′γ) (2011Ch05). Other: 50 (1969Be20). E0 Transition strength ρ^2(E0)=0.140 *+50−70* (2019Ev01). q^2_K=0.22 *7* (2019Ev01, ratio of the E0 conversion coefficient to the E2 conversion coefficient of the competing decay branch). E0 transition matrix element=0.084 b *+14−25* (2019Ev01). δ: from weighted average of δ=+3.1 *1* from γ(θ) in (p,p′γ) (2019Ev01) and δ=+2.70 *+38−28* from γ(θ) data in (n,n′γ) (2011Ch05). The second solution of δ(E2/M1)=−0.07 *1* from γ(θ) data in (p,p′γ) (2019Ev01) is inconsistent with value from γ(θ) in (n,n′γ). Others: +1.7 *+9−5* or +0.07 *18* (1969Be48); −3.19 *11* (1972Va01) from A_2=+0.188 *8*, A_4=−0.053 *9* in pγ(θ).
		2301.6	55.3 *18*	0.0	0+			E_γ: from 1972Va01. Other: 2300 (1969Be20). I_γ: from (n,n′γ) (2011Ch05). Other: 50 (1969Be20).

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^{62}Ni(p,p′γ) 1969Be20,2019Ev01 (continued)

γ(^{62}Ni) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Comments
						K-conversion line of 2301.6-keV transition observed by 1981Pa10.
2330	4^+	1157		1172.8	2^+	
2891.1	0^+	1718.3		1172.8	2^+	E_γ: from 1981Pa10. K-conversion line of 1718.3-keV transition observed by 1981Pa10.
3050	2^+	748	70	2301.6	2^+	
		1877	30	1172.8	2^+	
3155	2^+	853	33	2301.6	2^+	
		1982	33	1172.8	2^+	
		3155	33	0.0	0^+	
3260		369		2891.1	0^+	
		2087		1172.8	2^+	
3460		2287		1172.8	2^+	
3510		1208[#]		2301.6	2^+	E_γ: γ not from 3518 level seen in ^{61}Ni(n,γ); perhaps same as 1221γ that deexcites level at 3522 keV.
		2337		1172.8	2^+	
3740	3^-	1438	50	2301.6	2^+	
		2567	50	1172.8	2^+	
3850		3850		0.0	0^+	
3960		2787		1172.8	2^+	
3980		1678		2301.6	2^+	
4040		885		3155	2^+	
		1738		2301.6	2^+	
4130		1828		2301.6	2^+	
4140		1810		2330	4^+	
4300		3127		1172.8	2^+	
4400		3227		1172.8	2^+	
4440		2138		2301.6	2^+	
4500		2198		2301.6	2^+	
4610		2562		2048.4	0^+	
4640		3467		1172.8	2^+	
4700		1545		3155	2^+	
4770		2440	50	2330	4^+	
		3597	50	1172.8	2^+	
5000		2109		2891.1	0^+	
		3827		1172.8	2^+	
		5000		0.0	0^+	
5280		2978		2301.6	2^+	
6320		3060		3260		
		5147		1172.8	2^+	
		6320		0.0	0^+	
7170		5997	50	1172.8	2^+	
		7170	50	0.0	0^+	
7600		7600		0.0	0^+	
7700		7700		0.0	0^+	
8200		8200		0.0	0^+	

[†] From level-energy differences from the level scheme Fig. 6 in 1969Be20, with exceptions noted.
[‡] Branching ratio from 1969Be20, except as noted.
[#] Placement of transition in the level scheme is uncertain.

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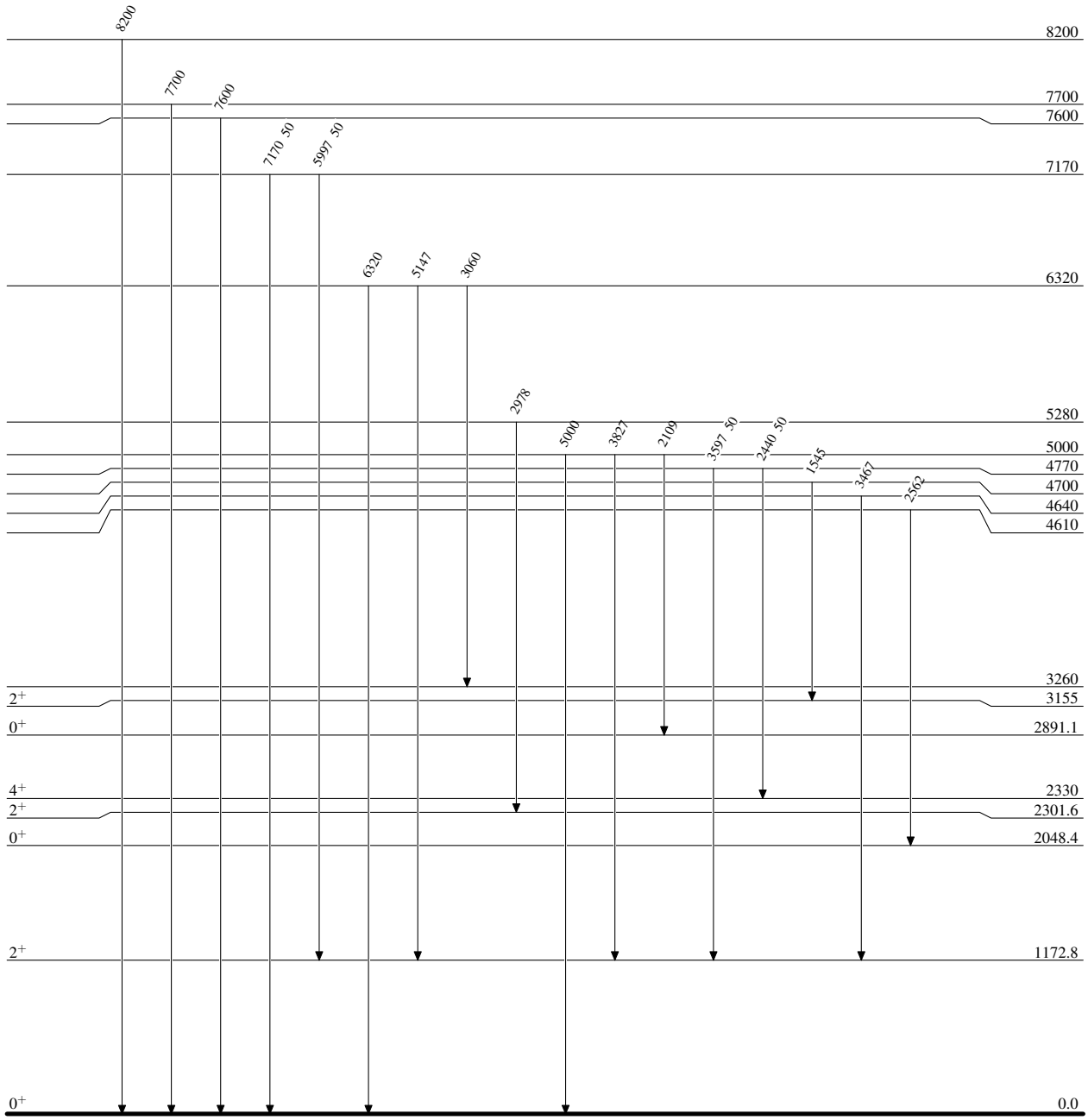
Level Scheme

Intensities: % photon branching from each level



$^{62}_{28}Ni_{34}$

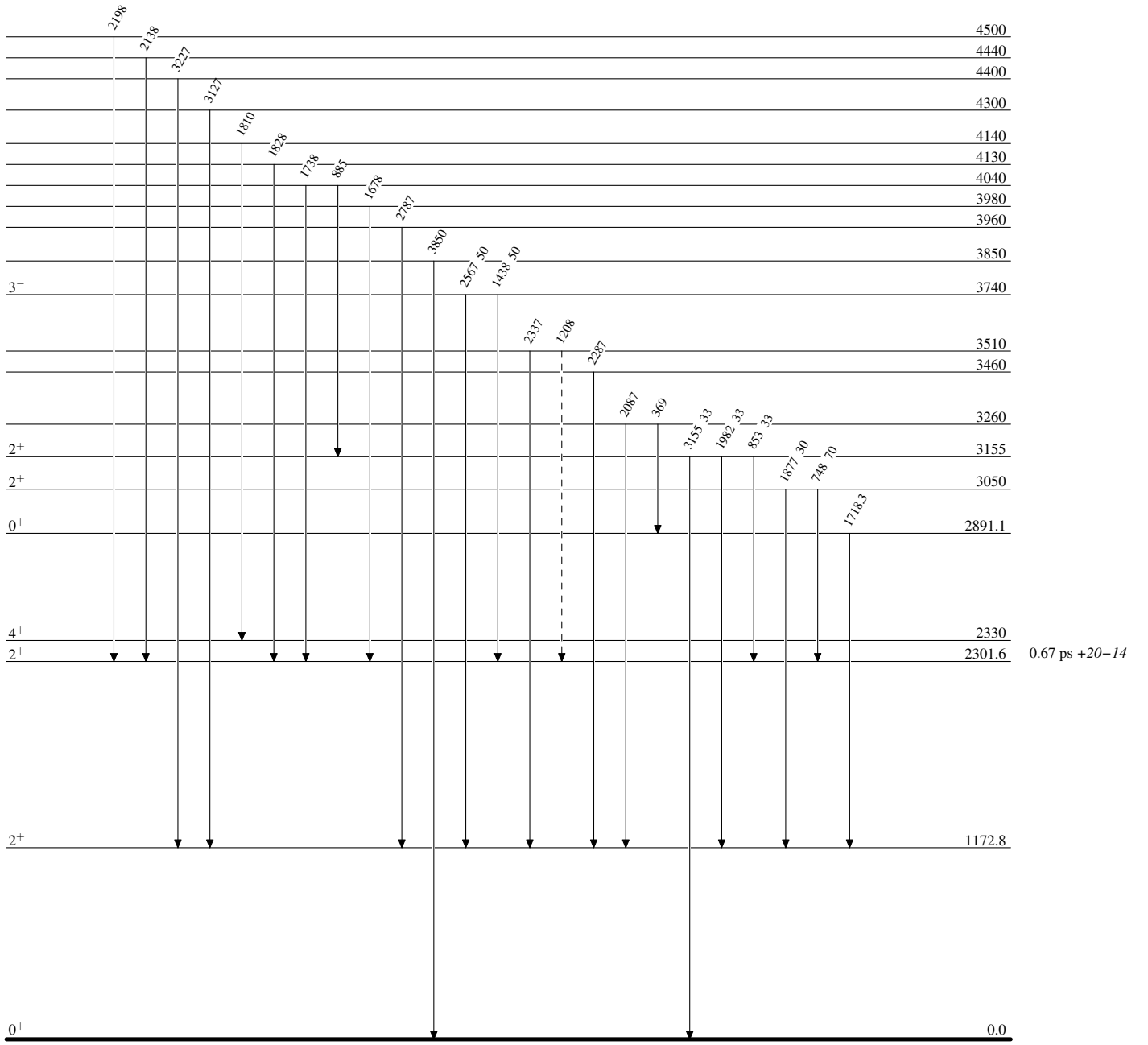
^{62}Ni(p,p′γ) 1969Be20,2019Ev01

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

– – – – – – ► γ Decay (Uncertain)



$^{62}_{28}Ni_{34}$

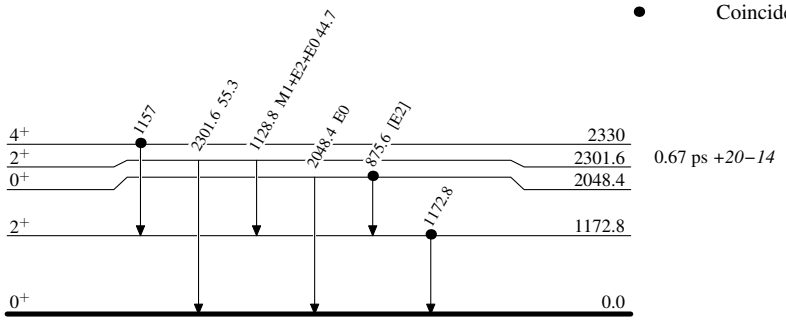
^{62}Ni(p,p′γ) 1969Be20,2019Ev01

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

● Coincidence



$^{62}_{28}Ni_{34}$