^{60}Ni(p,p′γ) 1973Ro20,1971Mo22

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 114, 1849 (2013)	31-Dec-2012

E(p)=12 MeV. Measured Eγ, Iγ and DSA in coin with protons. Enriched target (99.5%), Si(Li) and Ge(Li) detectors (1973Ro20).
E(p)=7 MeV. Measured Eγ and DSA. Enriched target (99.9%), Ge(Li) detectors (1971Mo22).
E(p)=6.9 MeV. Measured Eγ, Iγ, I(ce), internal pair spectrum, pγ coin, pγ(t). Ge(Li) detectors, magnetic plus Si(Li) internal-pair spectrograph, enriched target (1981Pa10). See also 1986Pa23 from the same group.
E(p)=4.8-7.0 MeV. Measured Iγ, γ(θ). Ge(Li) and NaI detectors, enriched target (1972Va01).
E(p)=5-7 MeV. Measured Eγ, γ(θ). Enriched target, NaI detectors (1965Mo12).
E(p)= 13 MeV. Surface barrier detector, FWHM≈ 70 keV. NaI detectors. Measured σ(E(p), Eγ, θ(p)) (1968Ba14).
For branching of pair- to K-conversion, see 1981Pa10.
For a compilation of mixing ratios from unpublished (p,p′γ) work, see 1971Mo22.
Others: 1963Se02, 1966Ba23, 1969Ho33, 1970Ah03, 1971Be06.

^{60}Ni Levels

E(A),T(A) From 1971Mo22.

E(level)†	Jπ‡	$T_{1/2}$#	Comments
0.0	0^+		
1332.2 *20*	2^+	0.6 ps *+11−2*	
2159.3 *22*	2^+	>0.6 ps	
2284 *5*	0^+	>1.5 ps	
2507 *3*	4^+	0.5 ps *+19−3*	
2626.3 *23*	3^+	>0.5 ps	
3119 *6*	4^+	0.5 ps *+20−3*	
3124.3 *23*	2^+	0.23 ps *+17−10*	$T_{1/2}$: from 1971Mo22. Other: > 0.6 ps (1973Ro20).
3187 *4*		0.14 ps *+4−3*	$T_{1/2}$: other: 0.17 ps *+24−8* (1971Mo22).
3193 *3*	1^+	53 fs *14*	$T_{1/2}$: 45 fs *+17−15* (1971Mo22).
3269 *3*	2^+	71 fs *21*	$T_{1/2}$: 0.21 ps *+11−8* (1971Mo22).
3318.2 *22*	0^+	0.24 ps *+28−11*	
3381 *5*		0.23 ps *+35−11*	
3394 *4*	2^+	0.13 ps *+6−4*	$T_{1/2}$: 0.12 ps *+7−5* (1971Mo22).
3588 *4*	0^+	<40 ps	All data from 1981Pa10 for this level. For total branching ratios, see 1981Pa10.
3619 *4*		0.2 ps *+5−1*	
3671 *5*	4^+	0.06 ps *+4−3*	
3729 *5*		0.21 ps *+29−9*	
3741 *4*	2^+	0.11 ps *+4−3*	
3875 *3*	2^+	>3.0 ps	$T_{1/2}$: 0.21 ps *+16−9* (1971Mo22).
3887 *6*		0.07 ps *+7−4*	
3895 *4*		58 fs *25*	
3928 *4*	$2^+,3^+$	0.19 ps *+19−8*	$T_{1/2}$: 0.09 ps *+16−5* (1971Mo22).
4009 *4*	2^+	20 fs *10*	$T_{1/2}$: 19 fs *+9−7* (1971Mo22).
4035 *4*		25 fs *14*	E(level),$T_{1/2}$: E=4020.4 keV. $T_{1/2}$= 18 fs *+12−8* (1971Mo22).
4045 *4*	3^-	22 fs *10*	$T_{1/2}$: 33 fs *+15−12* (1971Mo22).
4078 *4*	$1^+,2^+$	>12 fs	$T_{1/2}$: 18 fs *+8−7* (1971Mo22).
4116 *3*	2^+		
4169 *5*	5^+		
4191 *5*			
4318 *5*	2^+		
4341 *4*		29 fs *+31−21*	
4355.2 *22*	$1^+,2^+,3^+$	45 fs *+26−18*	
4497 *6*	2^+	16 fs *14*	
4548 *4*	$1^+,2^+$		

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^{60}Ni(p,p′γ) 1973Ro20,1971Mo22 (continued)

^{60}Ni Levels (continued)

E(level)†	Jπ‡	$T_{1/2}$#	E(level)†	Jπ‡	$T_{1/2}$#	E(level)†	$T_{1/2}$#
4578 *4*	2^+	<18 fs	5132 *6*			5448 *6*	
4768 *5*		0.05 ps *+6–3*	5174 *6*			5530 *4*	20 fs *14*
4859 *4*			5206 *6*		16 fs *16*	5782 *6*	
4958 *5*		61 fs *21*	5244 *6*	4^+	0.05 ps *+5–3*	5799 *5*	
4970 *5*		0.06 ps *+5–3*	5319 *6*			5824 *6*	
5107 *5*		0.03 ps *+5–3*	5379 *6*				

† From a least squares fit to the Eγ data of 1973Ro20, except as noted otherwise.
‡ From Adopted Levels.
# From 1973Ro20, except as noted.

γ(^{60}Ni)

E_i(level)	J_i^π	E_γ†	I_γ‡	E_f	J_f^π	Comments
1332.2	2^+	1332 *5*	100	0.0	0^+	
2159.3	2^+	827 *5*	85	1332.2	2^+	δ: + 0.67 *21* for a 2^+ to 2^+ transition (1972Va01,1965Mo12).
		2159 *5*	15	0.0	0^+	
2284	0^+	952 *5*	100	1332.2	2^+	
2507	4^+	1174 *5*	100	1332.2	2^+	
2626.3	3^+	467 *5*	70	2159.3	2^+	
		1294 *5*	30	1332.2	2^+	
3119	4^+	1787 *5*	100	1332.2	2^+	
3124.3	2^+	498@		2626.3	3^+	
		1792 *5*	90	1332.2	2^+	
		3124 *5*	10	0.0	0^+	
3187		681 *5*	30	2507	4^+	
		1028 *5*	46	2159.3	2^+	
		1855 *5*	24	1332.2	2^+	
3193	1^+	910@&		2284	0^+	
		1035 *5*	35	2159.3	2^+	
		1862 *5*	50	1332.2	2^+	
		3194 *5*	15	0.0	0^+	
3269	2^+	643 *5*	20	2626.3	3^+	
		1110 *5*	20	2159.3	2^+	
		1937 *5*	45	1332.2	2^+	
		3269 *5*	15	0.0	0^+	
3318.2	0^+	1986@	100	1332.2	2^+	
3381		1222 *5*	100	2159.3	2^+	
3394	2^+	1235 *5*	20	2159.3	2^+	I_γ: other: %photon branching=70 (1968Ba14).
		2062 *5*	80	1332.2	2^+	I_γ: other: %photon branching=30 (1968Ba14).
3588	0^+	394# *5*	17#	3193	1^+	
		1429# *5*	57#	2159.3	2^+	
		2256# *5*	26#	1332.2	2^+	
3619		993 *5*	70	2626.3	3^+	
		1113 *5*	30	2507	4^+	
		1460& *5*		2159.3	2^+	
3671	4^+	1165 *5*	100	2507	4^+	
3729		605& *5*		3124.3	2^+	
		1223 *5*	75	2507	4^+	
		2397 *5*	25	1332.2	2^+	

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^{60}Ni(p,p′γ) 1973Ro20,1971Mo22 (continued)

γ(^{60}Ni) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π
3741	2^+	617 *5*	39	3124.3	2^+
		2409 *5*	61	1332.2	2^+
3875	2^+	494 *5*	10	3381	
		751 *5*	16	3124.3	2^+
		1249 *5*	14	2626.3	3^+
		1716 *5*	27	2159.3	2^+
		2543 *5*	33	1332.2	2^+
		3871[@&]		0.0	0^+
3887		2555[@] *5*	100	1332.2	2^+
3895		1269 *5*	40	2626.3	3^+
		2563 *5*	60	1332.2	2^+
3928	$2^+,3^+$	739 *5*	10	3193	1^+
		1420 *5*	59	2507	4^+
		1767 *5*	31	2159.3	2^+
4009	2^+	2677 *5*	50	1332.2	2^+
		4009 *5*	50	0.0	0^+
4035		2703 *5*	50	1332.2	2^+
		4035 *5*	50	0.0	0^+
4045	3^-	1886 *5*	31	2159.3	2^+
		2713 *5*	69	1332.2	2^+
4078	$1^+,2^+$	1919 *5*	38	2159.3	2^+
		2746 *5*	62	1332.2	2^+
4116	2^+	992 *5*	24	3124.3	2^+
		1610 *5*	25	2507	4^+
		2784 *5*	26	1332.2	2^+
		4116 *5*	25	0.0	0^+
4169	5^+	1543 *5*	20	2626.3	3^+
		1663 *5*	80	2507	4^+
4191		462[&] *5*		3729	
		572 *5*	43	3619	
		1565 *5*	57	2626.3	3^+
4318	2^+	1812 *5*	20	2507	4^+
		2986 *5*	80	1332.2	2^+
4341		1217 *5*	30	3124.3	2^+
4341		2182 *5*	70	2159.3	2^+
4355.2	$1^+,2^+,3^+$	3023[@]		1332.2	2^+
4497	2^+	3165 *5*	100	1332.2	2^+
4548	$1^+,2^+$	1424 *5*	15	3124.3	2^+
		2264 *5*	40	2284	0^+
		2389 *5*	25	2159.3	2^+
		3216 *5*	20	1332.2	2^+
4578	2^+	2419 *5*	35	2159.3	2^+
		3246 *5*	41	1332.2	2^+
		4578 *5*	24	0.0	0^+
4768		1644 *5*	55	3124.3	2^+
		2142 *5*	45	2626.3	3^+
4859		3527 *5*	38	1332.2	2^+
		4859 *5*	62	0.0	0^+
4958		2452 *5*	60	2507	4^+
		3626 *5*	40	1332.2	2^+
4970		1299 *5*	20	3671	4^+
		2344 *5*	80	2626.3	3^+
5107		1435 *5*	55	3671	4^+
		2600 *5*	45	2507	4^+
5132		3800 *5*	100	1332.2	2^+
5174		2548 *5*	100	2626.3	3^+
5206		2699 *5*	100	2507	4^+
5244	4^+	2120 *5*	100	3124.3	2^+
5319		2812 *5*	100	2507	4^+
5379		2255 *5*	100	3124.3	2^+
5448		4116 *5*	100	1332.2	2^+
5530		2904 *5*	40	2626.3	3^+
		3371 *5*	60	2159.3	2^+
5782		3275 *5*	100	2507	4^+
5799		3293 *5*		2507	4^+
		4467 *5*		1332.2	2^+
5824		2700 *5*	100	3124.3	2^+

[†] From 1973Ro20, except as noted. Authors state uncertainty to be 1-5 keV; 5 keV is assigned here.
[‡] % photon branching from each level as given by 1973Ro20, uncertainty 20-30%, except as noted.
[#] Eγ from level difference. Iγ from 1981Pa10.
[@] From level energy difference (1971Mo22). Not observed in 1973Ro20.
[&] Placement of transition in the level scheme is uncertain.

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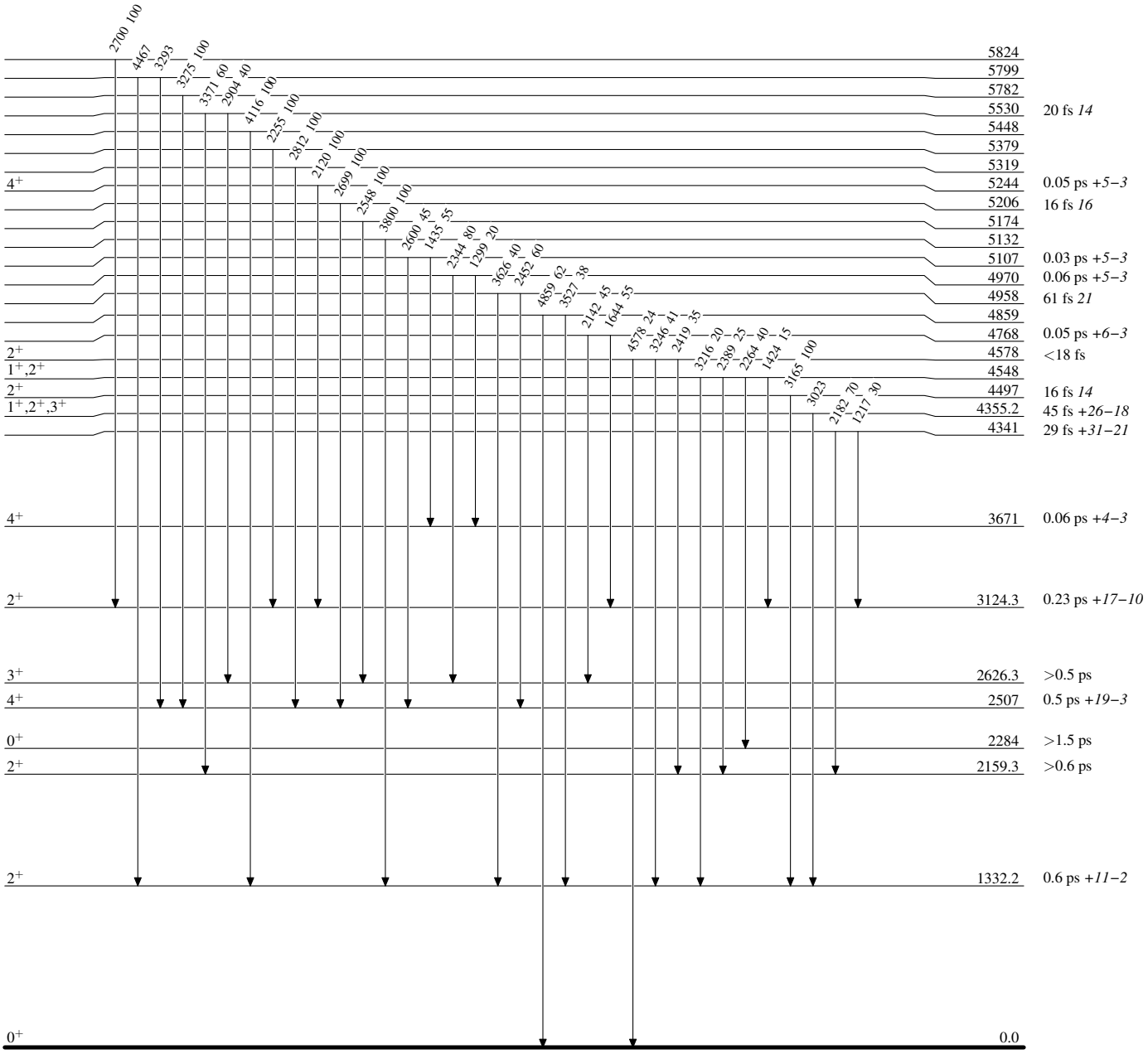
Level Scheme

Intensities: % photon branching from each level



$^{60}_{28}Ni_{32}$

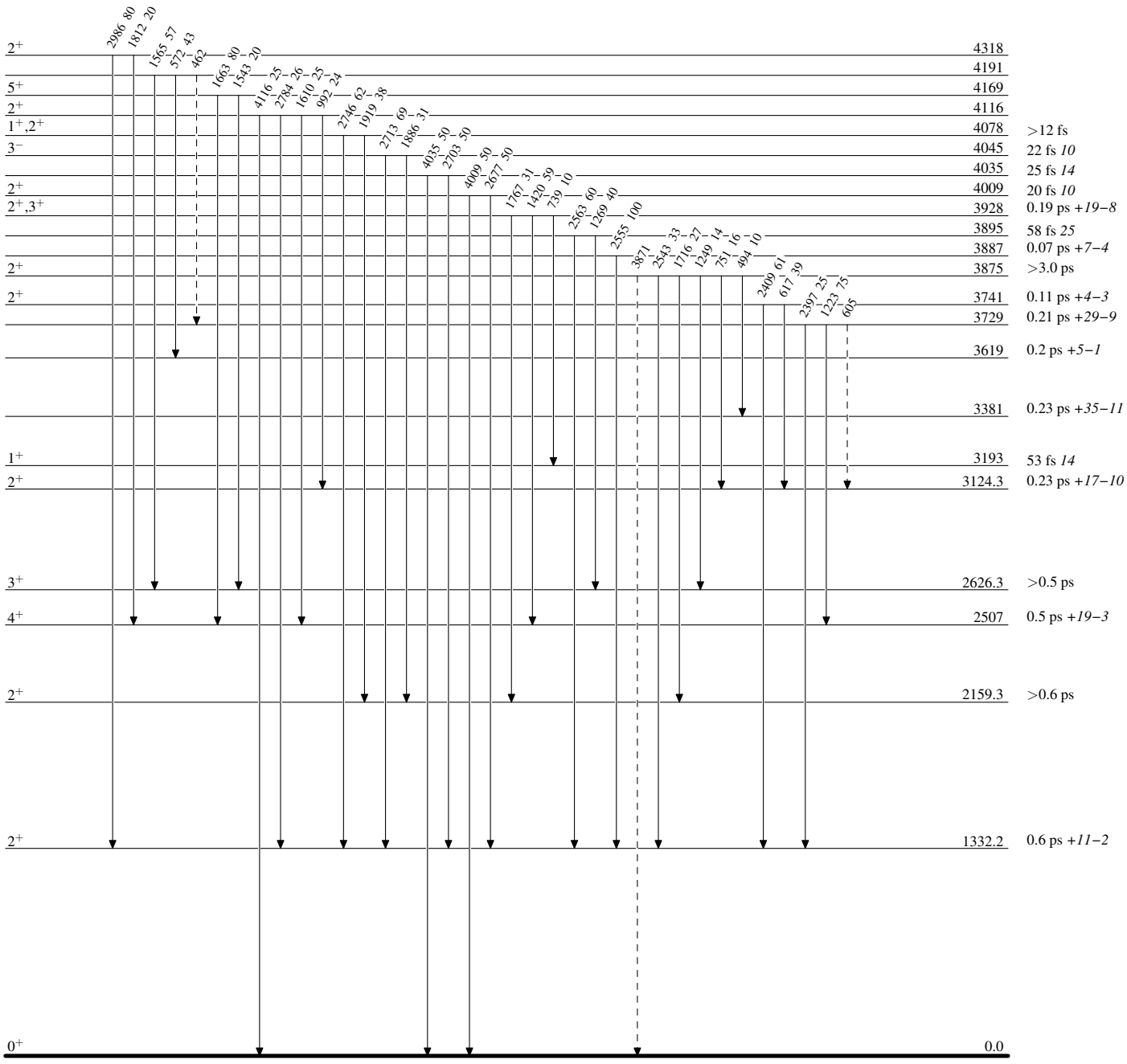
^{60}Ni(p,p′γ) 1973Ro20,1971Mo22

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

γ Decay (Uncertain)



$^{60}_{28}Ni_{32}$

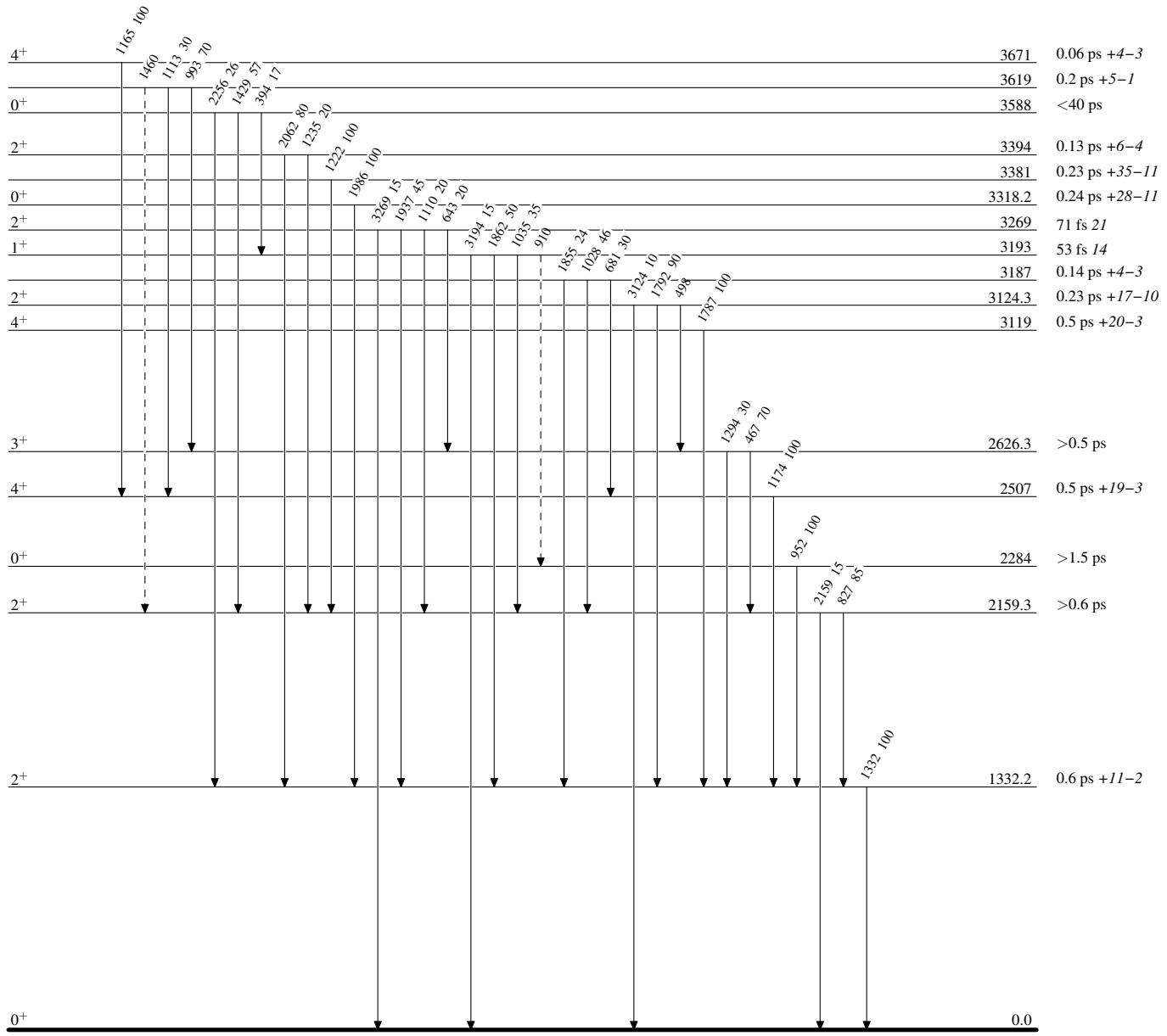
^{60}Ni(p,p′γ) 1973Ro20,1971Mo22

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

– – – – – – ► γ Decay (Uncertain)



$^{60}_{28}Ni_{32}$