

⁹⁴Mo(⁴⁰Ca,3p2n γ) 1998Sm08,1998SmZX

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Janos Timar and Zoltan Elekes, Balraj Singh		NDS 121, 143 (2014)	31-May-2014

Includes ⁵⁸Ni(⁷⁴Se,2p γ) and ¹⁰⁷Ag(²⁸Si,2p2n γ).

1998Sm08 (also 1998SmZX thesis): E= 180 MeV. Measured E γ , I γ , $\gamma\gamma$, $\gamma\gamma(\theta)$, particle- γ coin using GAMMASPHERE array with 92 detectors and MICROBALL array of particle detectors. The ground state band is shown only in figure 4.19 in 1998SmZX thesis 1998SmZX also quote A. Galindo-Uribarri et al., Report AECL-11132, p3.1.15 (1994), for transitions in bands 2 and 3.

1993We05: ¹⁰⁷Ag(²⁸Si,2p2n γ) E=93 MeV; BGO shielded Ge array, measured E γ , I γ , $\gamma\gamma$, $\gamma(\theta)$. The

237-414-559-672-754-811-906-991 γ cascade assigned to the $\pi h_{11/2}$ and 3/2[541] Nilsson configuration was found in this work.

The last two γ rays of 906 and 991 keV were not confirmed in 1998Sm08 or 1987WaZK.

Others:

1987WaZK (also 1986JaZP): ⁵⁸Ni(⁷⁴Se,2p γ); BGO shielded Ge Polytessa array, E γ , $\gamma\gamma$. Level scheme figure lists energies for two bands and spins for one band, no intensities are given. The $h_{11/2}$ band established with γ cascade: 238-416-561-674-755-812-874-954-1056-1157, from 11/2⁻ to 51/2⁻. Other two cross linked bands, not connected to $h_{11/2}$ band, were defined by $\Delta J=1$ γ cascade: 186-210-230-250-266-286-304-322-339-355-374, and all the cross over quadrupole transitions: 396-481-556-626-695 and 440-519-591-661-730 γ cascades. All these structures are verified in 1998Sm08.

1990JaZU: ^{92,94}Mo(⁴⁰Ca,X), measured $\gamma\gamma(t)$. An isomer of 60-ns lifetime is reported.

Additional information 1.

¹²⁹Pr Levels

E(level) [†]	J π [#]	T _{1/2}	E(level) [†]	J π [#]	E(level) [†]	J π [#]
0 ^d	3/2 ⁺		1574.0 ^{‡&} 21	23/2 ⁻	3611.6 ^b 22	31/2 ⁺
90.4 ^c 8	5/2 ⁺		1636.9 ^b 17	19/2 ⁺	3674 ^{‡c} 3	33/2 ⁺
241.6 ^d 8	7/2 ⁺		1744.0 ^d 16	19/2 ⁺	3809 ^{‡&} 3	35/2 ⁻
361 ^{‡&} 3	11/2 ⁻		1922.2 ^a 18	21/2 ⁺	3998.0 ^d 24	35/2 ⁺
417.8 ^c 10	9/2 ⁺		2132.0 ^{‡c} 22	21/2 ⁺	4013.4 ^a 23	33/2 ⁺
495.6 ^a 13	9/2 ⁺	≈60 [@] ns	2225.0 ^b 19	23/2 ⁺	4436 ^{‡c} 3	37/2 ⁺
599.0 ^{‡&} 23	15/2 ⁻		2246.0 ^{‡&} 22	27/2 ⁻	4680 ^{‡&} 3	39/2 ⁻
633.1 ^d 11	11/2 ⁺		2311.0 ^d 19	23/2 ⁺	4821 ^d 3	39/2 ⁺
680.9 ^b 15	11/2 ⁺		2546.3 ^a 19	25/2 ⁺	5327 ^{‡c} 3	41/2 ⁺
889.2 ^a 15	13/2 ⁺		2564.0 ^{‡c} 23	25/2 ⁺	5633 ^{‡&} 3	43/2 ⁻
900.9 ^c 12	13/2 ⁺		2759.0 ^d 21	27/2 ⁺	5771 ^d 3	43/2 ⁺
1014.0 ^{‡&} 21	19/2 ⁻		2884.6 ^b 20	27/2 ⁺	6328 ^{‡c} 4	45/2 ⁺
1118.9 ^b 16	15/2 ⁺		2999.0 ^{‡&} 24	31/2 ⁻	6683 ^{‡&} 3	47/2 ⁻
1147.0 ^d 13	15/2 ⁺		3055.0 ^{‡c} 25	29/2 ⁺	7445 ^{‡c} 4	49/2 ⁺
1368.6 ^a 17	17/2 ⁺		3238.4 ^a 20	29/2 ⁺	7837 ^{‡&} 4	51/2 ⁻
1492.9 ^c 16	17/2 ⁺		3311.0 ^d 22	31/2 ⁺		

[†] From least-squares fit to E γ data, assuming 1 keV uncertainty for each γ ray.

[‡] Note that the level energy is 382.57 for 11/2⁻ bandhead in Adopted Levels based on ¹²⁹Nd ϵ decay (1997Gi07), thus all level energies based on the 11/2⁻ state have been adjusted upwards by ≈21 keV in Adopted Levels.

[#] As proposed in 1998Sm08 and 1998SmZX, based on decay pattern and band structures.

[@] From $\gamma\gamma(t)$ (1990JaZU) in high-spin studies, not clear whether the value listed by the authors is the mean lifetime or half-life. It is assumed as half-life here.

[&] Band(A): $\pi h_{11/2}$ band. Possible Nilsson configuration= $\pi 3/2[541]$ (1993We05).

^a Band(B): $\pi g_{9/2}$, $\alpha=+1/2$.

^b Band(b): $\pi g_{9/2}$, $\alpha=-1/2$.

^c Band(C): $\pi 3/2[411]$, $\alpha=+1/2$. Band from 1998SmZX. The $\pi 3/2[411]$ configuration is probably from a mixture of $d_{5/2}$ and $g_{7/2}$

⁹⁴Mo(⁴⁰Ca,3p2n γ) **1998Sm08,1998SmZX (continued)**

¹²⁹Pr Levels (continued)

proton orbitals.

^d Band(c): $\pi 3/2[411], \alpha = -1/2$. See comment for $\alpha = +1/2$ partner.

$\gamma(^{129}\text{Pr})$

A₂ and A₄ coefficients are from [1993We05](#).

E _{γ}	I _{γ} [†]	E _i (level)	J _i ^{π}	E _f	J _f ^{π}	Mult. [‡]	$\alpha^{\textcircled{a}}$	Comments
90		90.4	5/2 ⁺	0	3/2 ⁺			
151		241.6	7/2 ⁺	90.4	5/2 ⁺			
176		417.8	9/2 ⁺	241.6	7/2 ⁺			
185		680.9	11/2 ⁺	495.6	9/2 ⁺			
208		889.2	13/2 ⁺	680.9	11/2 ⁺			
215		633.1	11/2 ⁺	417.8	9/2 ⁺			
230		1118.9	15/2 ⁺	889.2	13/2 ⁺			
238	67.8 22	599.0	15/2 ⁻	361	11/2 ⁻	(E2)	0.1064	A ₂ =+0.51 10; A ₄ =-0.18 14 $\alpha(\text{K})=0.0823$ 12; $\alpha(\text{L})=0.0189$ 3; $\alpha(\text{M})=0.00415$ 6 $\alpha(\text{N})=0.000908$ 13; $\alpha(\text{O})=0.0001344$ 19; $\alpha(\text{P})=5.16 \times 10^{-6}$ 8
242		241.6	7/2 ⁺	0	3/2 ⁺			
246		1147.0	15/2 ⁺	900.9	13/2 ⁺			
250		1368.6	17/2 ⁺	1118.9	15/2 ⁺			
254		495.6	9/2 ⁺	241.6	7/2 ⁺			
268		900.9	13/2 ⁺	633.1	11/2 ⁺			
268		1636.9	19/2 ⁺	1368.6	17/2 ⁺			
285		1922.2	21/2 ⁺	1636.9	19/2 ⁺			
303		2225.0	23/2 ⁺	1922.2	21/2 ⁺			
321		2546.3	25/2 ⁺	2225.0	23/2 ⁺			
327		417.8	9/2 ⁺	90.4	5/2 ⁺			
338		2884.6	27/2 ⁺	2546.3	25/2 ⁺			
354		3238.4	29/2 ⁺	2884.6	27/2 ⁺			
392		633.1	11/2 ⁺	241.6	7/2 ⁺			
394		889.2	13/2 ⁺	495.6	9/2 ⁺			
415	100 2	1014.0	19/2 ⁻	599.0	15/2 ⁻	(E2)	0.0190	$\alpha(\text{K})=0.01559$ 22; $\alpha(\text{L})=0.00267$ 4; $\alpha(\text{M})=0.000574$ 8 $\alpha(\text{N})=0.0001268$ 18; $\alpha(\text{O})=1.95 \times 10^{-5}$ 3; $\alpha(\text{P})=1.064 \times 10^{-6}$ 15 A ₂ =+0.45 17; A ₄ =-0.09 10
432		2564.0	25/2 ⁺	2132.0	21/2 ⁺			
438		1118.9	15/2 ⁺	680.9	11/2 ⁺			
448		2759.0	27/2 ⁺	2311.0	23/2 ⁺			
479		1368.6	17/2 ⁺	889.2	13/2 ⁺			
483		900.9	13/2 ⁺	417.8	9/2 ⁺			
491		3055.0	29/2 ⁺	2564.0	25/2 ⁺			
514		1147.0	15/2 ⁺	633.1	11/2 ⁺			
518		1636.9	19/2 ⁺	1118.9	15/2 ⁺			
552		3311.0	31/2 ⁺	2759.0	27/2 ⁺			
554		1922.2	21/2 ⁺	1368.6	17/2 ⁺			
560	80 3	1574.0	23/2 ⁻	1014.0	19/2 ⁻	(E2)	0.00834	$\alpha(\text{K})=0.00697$ 10; $\alpha(\text{L})=0.001077$ 15; $\alpha(\text{M})=0.000229$ 4 $\alpha(\text{N})=5.09 \times 10^{-5}$ 8; $\alpha(\text{O})=7.95 \times 10^{-6}$ 12; $\alpha(\text{P})=4.90 \times 10^{-7}$ 7 A ₂ =+0.34 7; A ₄ =-0.06 10
567		2311.0	23/2 ⁺	1744.0	19/2 ⁺			
588		2225.0	23/2 ⁺	1636.9	19/2 ⁺			

Continued on next page (footnotes at end of table)

$^{94}\text{Mo}(^{40}\text{Ca},3\text{p}2\text{n}\gamma)$ 1998Sm08,1998SmZX (continued) $\gamma(^{129}\text{Pr})$ (continued)

E_γ	I_γ^\dagger	$E_i(\text{level})$	J_i^π	E_f	J_f^π	E_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π
592		1492.9	17/2 ⁺	900.9	13/2 ⁺	871	4680	39/2 ⁻	3809	35/2 ⁻
597		1744.0	19/2 ⁺	1147.0	15/2 ⁺	891	5327	41/2 ⁺	4436	37/2 ⁺
619		3674	33/2 ⁺	3055.0	29/2 ⁺	950	5771	43/2 ⁺	4821	39/2 ⁺
624		2546.3	25/2 ⁺	1922.2	21/2 ⁺	953	5633	43/2 ⁻	4680	39/2 ⁻
660		2884.6	27/2 ⁺	2225.0	23/2 ⁺	990	2564.0	25/2 ⁺	1574.0	23/2 ⁻
672	36.5 12	2246.0	27/2 ⁻	1574.0	23/2 ⁻	999 [#]	3998.0	35/2 ⁺	2999.0	31/2 ⁻
687		3998.0	35/2 ⁺	3311.0	31/2 ⁺	1001 ^{&}	6328	45/2 ⁺	5327	41/2 ⁺
692		3238.4	29/2 ⁺	2546.3	25/2 ⁺	1050	6683	47/2 ⁻	5633	43/2 ⁻
727		3611.6	31/2 ⁺	2884.6	27/2 ⁺	1065 [#]	3311.0	31/2 ⁺	2246.0	27/2 ⁻
753	15.9 9	2999.0	31/2 ⁻	2246.0	27/2 ⁻	1117 ^{&}	7445	49/2 ⁺	6328	45/2 ⁺
762		4436	37/2 ⁺	3674	33/2 ⁺	1118	2132.0	21/2 ⁺	1014.0	19/2 ⁻
775		4013.4	33/2 ⁺	3238.4	29/2 ⁺	1154	7837	51/2 ⁻	6683	47/2 ⁻
810		3809	35/2 ⁻	2999.0	31/2 ⁻	1185 [#]	2759.0	27/2 ⁺	1574.0	23/2 ⁻
823		4821	39/2 ⁺	3998.0	35/2 ⁺	1297 [#]	2311.0	23/2 ⁺	1014.0	19/2 ⁻

[†] From 1993We05 in $^{107}\text{Ag}(^{28}\text{Si},2\text{p}2\text{n}\gamma)$.

[‡] From $\gamma(\theta)$ data of 1993We05. Mult=Q refers to $\Delta J=2$, quadrupole. 1993We05 assign E2, also supported by RUL assuming ≈ 10 ns coincidence resolving time.

[#] The γ is not listed in Adopted Levels, Gammas dataset due to energy mismatch.

[@] 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.

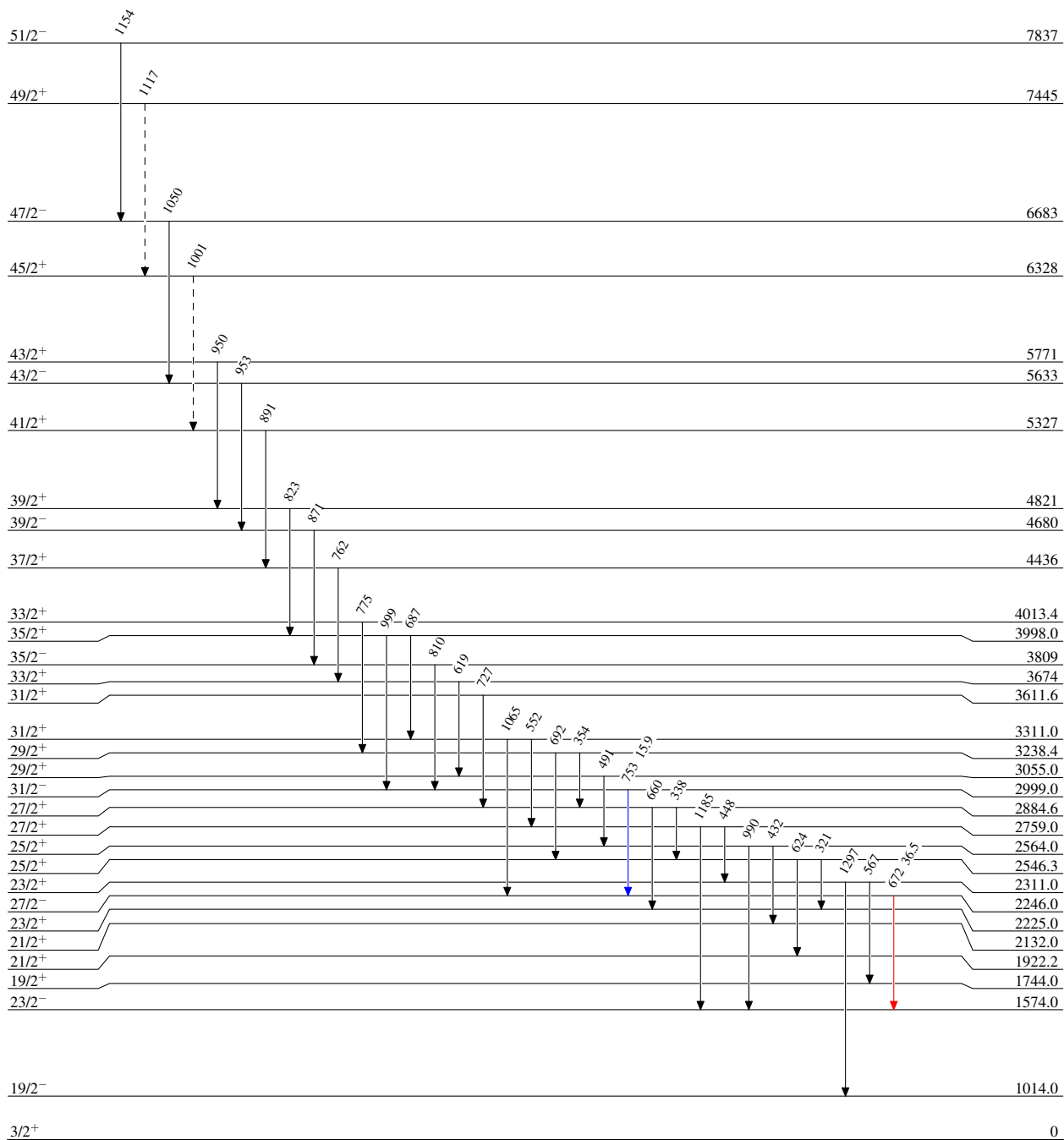
[&] Placement of transition in the level scheme is uncertain.

$^{94}\text{Mo}(\text{}^{40}\text{Ca},3\text{p}2\text{n}\gamma)$ 1998Sm08,1998SmZX

Legend

Level Scheme
Intensities: Relative I_γ

- ▶ $I_\gamma < 2\% \times I_\gamma^{\text{max}}$
- ▶ $I_\gamma < 10\% \times I_\gamma^{\text{max}}$
- ▶ $I_\gamma > 10\% \times I_\gamma^{\text{max}}$
- - -▶ γ Decay (Uncertain)



$^{129}_{59}\text{Pr}_{70}$

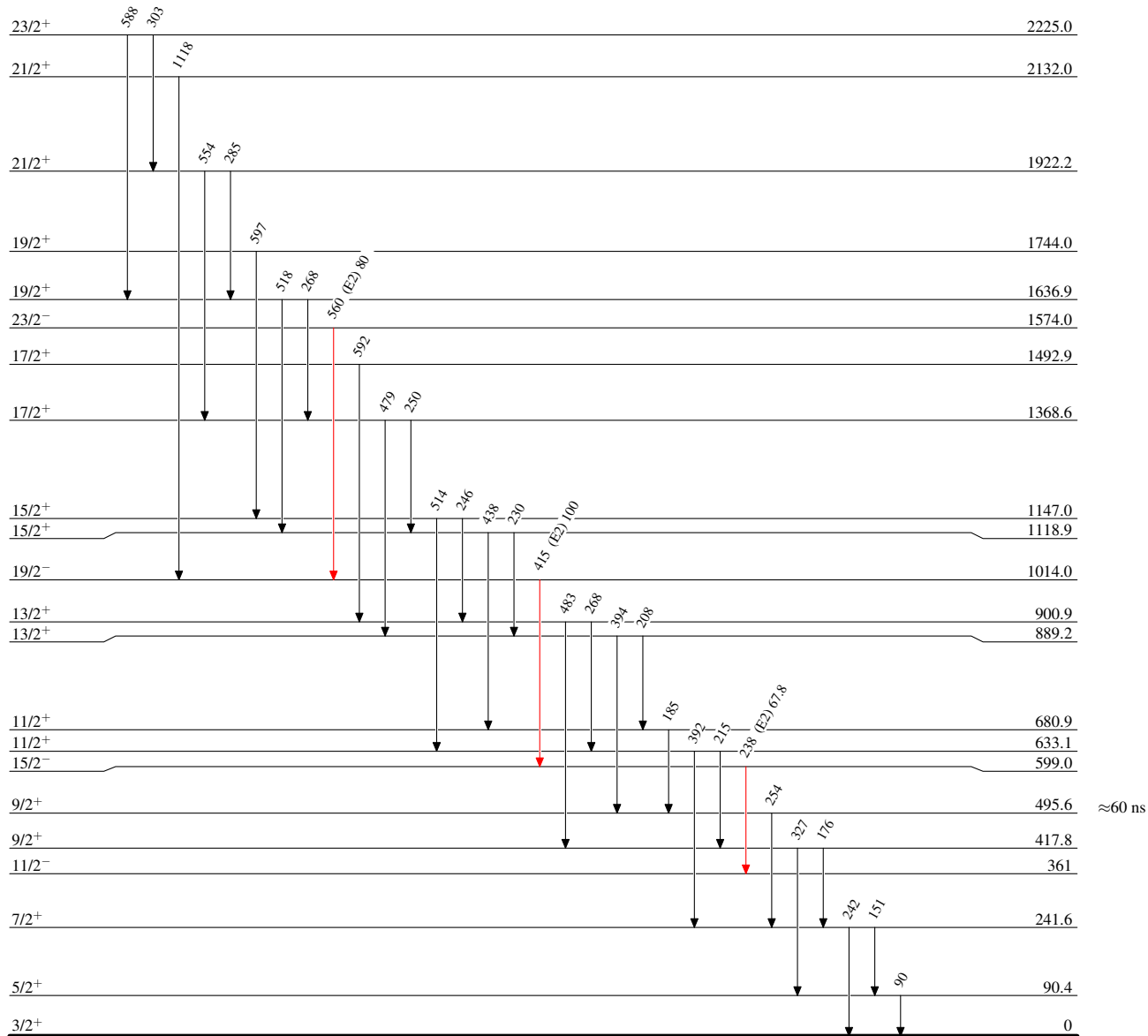
$^{94}\text{Mo}(\text{}^{40}\text{Ca},3\text{p}2\text{n}\gamma)$ 1998Sm08,1998SmZX

Level Scheme (continued)

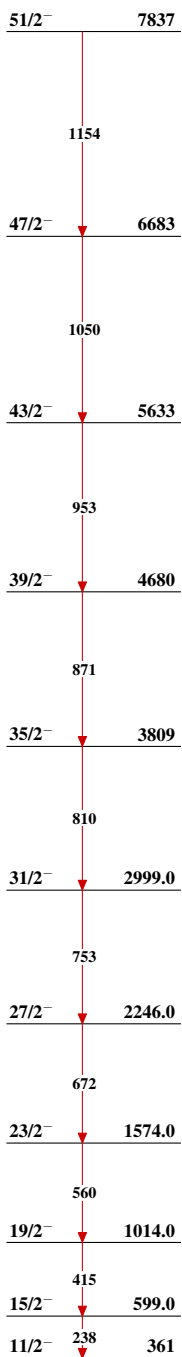
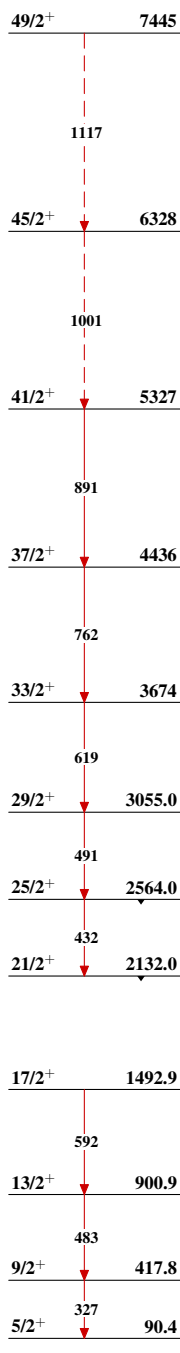
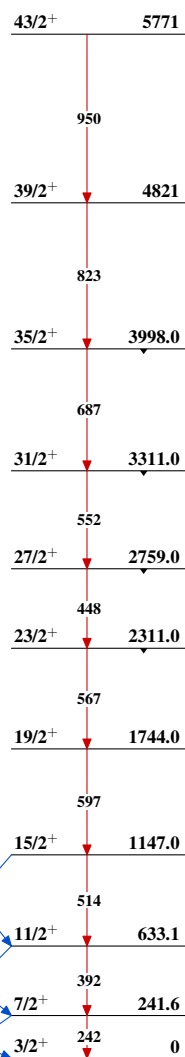
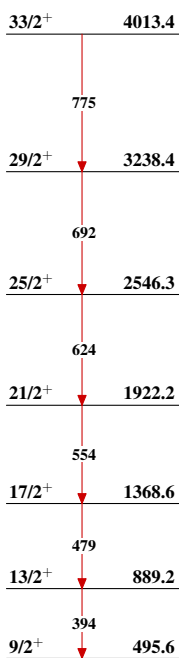
Intensities: Relative I_γ

Legend

- $I_\gamma < 2\% \times I_\gamma^{\text{max}}$
- $I_\gamma < 10\% \times I_\gamma^{\text{max}}$
- $I_\gamma > 10\% \times I_\gamma^{\text{max}}$



$^{129}_{59}\text{Pr}_{70}$

$^{94}\text{Mo} (^{40}\text{Ca}, 3p2n\gamma)$ 1998Sm08, 1998SmZXBand(A): $\pi h_{11/2}$ bandBand(C): $\pi 3/2[411]$,
 $\alpha=+1/2$ Band(c): $\pi 3/2[411]$,
 $\alpha=-1/2$ Band(B): $\pi g_{9/2}$,
 $\alpha=+1/2$ Band(b): $\pi g_{9/2}$,
 $\alpha=-1/2$ 