

$^{144}\text{Sm}(^{19}\text{F},4\text{n}\gamma)$ 2009Sh48,1995Ma46

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. W. Reich	NDS 113, 157 (2012)	31-Dec-2010

Additional information 1.

1995Ma46: $^{144}\text{Sm}(^{19}\text{F},4\text{n}\gamma)$ at 105 MeV; measured γ , $\gamma\gamma$ coincidences, and DCO ratios with five Compton-suppressed Ge detectors and 14 BGO detectors.

2009Sh48: $^{144}\text{Sm}(^{19}\text{F},4\text{n}\gamma)$, $E(^{19}\text{F})=106$ MeV. Enriched self-supporting Sm foils, 1.2 mg/cm^2 thick, enrichment not given.

Measured $\gamma\gamma$ coin, DCO ratios in an array of 12 Compton-suppressed HPGE detectors. Report $E\gamma$, DCO ratios and, for several γ 's, $I\gamma$ values. Discuss conf and band assignments from measured alignments and cranked shell-model considerations.

Data are from 2009Sh48. They are more extensive than those of 1995Ma46, which has a few of the same authors as 2009Sh48.

Where the two level schemes overlap, they are generally consistent, although the level energies from 1995Ma46 tend to be lower than those of 2009Sh48 with this difference increasing as the excitation energy increases.

 ^{159}Lu Levels

E(level) [†]	J^π [‡]	Comments
(0)		
$x^{\#}$	(11/2 ⁻)	J^π : Assignment is based (1995Ma46) on the systematics of the $15/2^-$ to $11/2^-$ transition energies for the odd-mass Lu, Tm, and Ho isotopes which suggest that the 426-keV energy is reasonable for this placement of this γ .
382.8+x [@]	(13/2 ⁻)	
426.0+x [#]	(15/2 ⁻)	
912.1+x [@]	(17/2 ⁻)	
977.5+x [#]	(19/2 ⁻)	
1534.3+x [@]	(21/2 ⁻)	
1619.4+x [#]	(23/2 ⁻)	
1664.8+x ^c	(19/2 ⁺)	J^π : Assigned as (21/2 ⁻) by 1995Ma46.
2131.9+x ^c	(23/2 ⁺)	
2132.1+x [@]	(25/2 ⁻)	
2327.7+x [#]	(27/2 ⁻)	
2357.5+x ^b	(25/2 ⁺)	
2591.2+x ^c	(27/2 ⁺)	
2669.1+x ^e	(27/2 ⁺)	
2801.4+x ^d	(29/2 ⁺)	
2995.1+x ^a	(29/2 ⁻)	
3058.7+x ^b	(29/2 ⁺)	
3088.0+x [#]	(31/2 ⁻)	
3153.6+x ^e	(31/2 ⁺)	
3200.1+x ^{&}	(31/2 ⁻)	
3359.0+x ^d	(33/2 ⁺)	
3555.4+x ^a	(33/2 ⁻)	
3749.7+x ^e	(35/2 ⁺)	
3764.1+x ^{&}	(35/2 ⁻)	
4002.0+x ^d	(37/2 ⁺)	
4080.9+x ^a	(37/2 ⁻)	
4346.4+x ^{&}	(39/2 ⁻)	
4378.8+x ^e	(39/2 ⁺)	
4680.3+x ^d	(41/2 ⁺)	
4685.2+x ^a	(41/2 ⁻)	

Continued on next page (footnotes at end of table)

$^{144}\text{Sm}(^{19}\text{F},4\text{n}\gamma)$ 2009Sh48,1995Ma46 (continued) ^{159}Lu Levels (continued)

$E(\text{level})^\dagger$	$J^\pi^\ddagger$	$E(\text{level})^\dagger$	$J^\pi^\ddagger$	$E(\text{level})^\dagger$	$J^\pi^\ddagger$	$E(\text{level})^\dagger$	$J^\pi^\ddagger$
4987.2+x ^{&}	(43/2 ⁻)	5353.5+x ^a	(45/2 ⁻)	5713.5+x ^{&}	(47/2 ⁻)	6370.4+x ^d	(49/2 ⁺)
5110.6+x ^e	(43/2 ⁺)	5498.1+x ^d	(45/2 ⁺)	5966.1+x ^e	(47/2 ⁺)	6475.8+x ^{&}	(51/2 ⁻)

[†] Computed from a least-squares fit to the listed E_γ values. Equal weight was assigned to the E_γ values in this fit.

[‡] J^π are authors' assignments and band labelling is the evaluator's interpretation of authors' scheme. These are based on general considerations of expected band properties as observed in heavy-ion-induced reactions.

Band(A): $\pi h_{11/2}$ band, $\alpha=-1/2$. (Label=A_p). Dominant orbital is probably $\pi 7/2[523]$ (2009Sh48). Intersected by the aligned $i_{13/2}$ two-neutron-quasiparticle conf (label=AB) near $\hbar\omega=0.34$ MeV.

@ Band(a): $\pi h_{11/2}$ band, $\alpha=+1/2$. (Label=B_p). See the comment on the $\alpha=-1/2$ branch.

& Band(B): Aligned band, label=A_pAB, $\alpha=-1/2$. See the notation given in the comment on the $\pi h_{11/2}$ band.

^a Band(b): Aligned band, label=B_pAB, $\alpha=+1/2$. See the notation given in the comment on the $\pi h_{11/2}$ band.

^b Band(C): $\pi=+$, $\alpha=+1/2$ band. Tentatively assigned by 2009Sh48 as an "unstable octupole vibration" built on $\pi h_{11/2}$, $\alpha=+1/2$ branch.

^c Band(c): $\pi=+$, $\alpha=-1/2$ band. Tentatively assigned by 2009Sh48 as an "unstable octupole vibration" built on $\pi h_{11/2}$, $\alpha=-1/2$ branch.

^d Band(D): $\pi=+$ band, $\alpha=+1/2$ branch.

^e Band(d): $\pi=+$ band, $\alpha=-1/2$ branch.

 $\gamma(^{159}\text{Lu})$

$E_\gamma^\dagger$	$I_\gamma^\ddagger$	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Comments
132.3		2801.4+x	(29/2 ⁺)	2669.1+x	(27/2 ⁺)	
205.0		3200.1+x	(31/2 ⁻)	2995.1+x	(29/2 ⁻)	
205.3		3359.0+x	(33/2 ⁺)	3153.6+x	(31/2 ⁺)	
208.7		3764.1+x	(35/2 ⁻)	3555.4+x	(33/2 ⁻)	
210.2		2801.4+x	(29/2 ⁺)	2591.2+x	(27/2 ⁺)	
225.3		2357.5+x	(25/2 ⁺)	2131.9+x	(23/2 ⁺)	
233.8		2591.2+x	(27/2 ⁺)	2357.5+x	(25/2 ⁺)	
252.3	6.4 8	4002.0+x	(37/2 ⁺)	3749.7+x	(35/2 ⁺)	R(DCO)=0.64 11.
265.5	12.9 15	4346.4+x	(39/2 ⁻)	4080.9+x	(37/2 ⁻)	R(DCO)=1.03 12.
300.3		3359.0+x	(33/2 ⁺)	3058.7+x	(29/2 ⁺)	
301.5		4680.3+x	(41/2 ⁺)	4378.8+x	(39/2 ⁺)	
302.0		4987.2+x	(43/2 ⁻)	4685.2+x	(41/2 ⁻)	
311.6	7.6 8	2669.1+x	(27/2 ⁺)	2357.5+x	(25/2 ⁺)	R(DCO)=0.76 10.
316.8	11.8 14	4080.9+x	(37/2 ⁻)	3764.1+x	(35/2 ⁻)	R(DCO)=0.64 9.
338.8	12.1 16	4685.2+x	(41/2 ⁻)	4346.4+x	(39/2 ⁻)	R(DCO)=0.78 11.
352.3		3153.6+x	(31/2 ⁺)	2801.4+x	(29/2 ⁺)	
355.3	12.9 18	3555.4+x	(33/2 ⁻)	3200.1+x	(31/2 ⁻)	R(DCO)=0.97 10.
360.0	12.7 13	5713.5+x	(47/2 ⁻)	5353.5+x	(45/2 ⁻)	R(DCO)=0.73 12.
366.3	11.3 12	5353.5+x	(45/2 ⁻)	4987.2+x	(43/2 ⁻)	R(DCO)=0.73 10.
376.8		4378.8+x	(39/2 ⁺)	4002.0+x	(37/2 ⁺)	
382.8		382.8+x	(13/2 ⁻)	x	(11/2 ⁻)	
387.5		5498.1+x	(45/2 ⁺)	5110.6+x	(43/2 ⁺)	
390.8		3749.7+x	(35/2 ⁺)	3359.0+x	(33/2 ⁺)	
403.9		2995.1+x	(29/2 ⁻)	2591.2+x	(27/2 ⁺)	
404.3		6370.4+x	(49/2 ⁺)	5966.1+x	(47/2 ⁺)	
426.0	100 8	426.0+x	(15/2 ⁻)	x	(11/2 ⁻)	R(DCO)=1.00 10.
430.3	11.5 16	5110.6+x	(43/2 ⁺)	4680.3+x	(41/2 ⁺)	R(DCO)=0.66 9.
467.1		2131.9+x	(23/2 ⁺)	1664.8+x	(19/2 ⁺)	

Continued on next page (footnotes at end of table)

$^{144}\text{Sm}(^{19}\text{F},4n\gamma)$ [2009Sh48,1995Ma46](#) (continued) $\gamma(^{159}\text{Lu})$ (continued)

$E_\gamma^\dagger$	$I_\gamma^\ddagger$	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult.	Comments
467.4		3555.4+x	(33/2 ⁻)	3088.0+x	(31/2 ⁻)		
467.5		3058.7+x	(29/2 ⁺)	2591.2+x	(27/2 ⁺)		
468.0		5966.1+x	(47/2 ⁺)	5498.1+x	(45/2 ⁺)		
484.4		3153.6+x	(31/2 ⁺)	2669.1+x	(27/2 ⁺)		
486.2		912.1+x	(17/2 ⁻)	426.0+x	(15/2 ⁻)		
529.4	6.2 7	912.1+x	(17/2 ⁻)	382.8+x	(13/2 ⁻)		R(DCO)=0.98 10.
551.3	90 9	977.5+x	(19/2 ⁻)	426.0+x	(15/2 ⁻)		R(DCO)=1.02 11.
556.7		1534.3+x	(21/2 ⁻)	977.5+x	(19/2 ⁻)		
557.6		3359.0+x	(33/2 ⁺)	2801.4+x	(29/2 ⁺)		
564.0		3764.1+x	(35/2 ⁻)	3200.1+x	(31/2 ⁻)		
582.3	5.6 6	4346.4+x	(39/2 ⁻)	3764.1+x	(35/2 ⁻)		R(DCO)=1.03 15.
596.0		3749.7+x	(35/2 ⁺)	3153.6+x	(31/2 ⁺)		
597.8	5.6 7	2132.1+x	(25/2 ⁻)	1534.3+x	(21/2 ⁻)		R(DCO)=0.97 15.
604.3		4685.2+x	(41/2 ⁻)	4080.9+x	(37/2 ⁻)		
622.3	8.7 9	1534.3+x	(21/2 ⁻)	912.1+x	(17/2 ⁻)		R(DCO)=1.04 13.
640.8		4987.2+x	(43/2 ⁻)	4346.4+x	(39/2 ⁻)		
642.0	78 7	1619.4+x	(23/2 ⁻)	977.5+x	(19/2 ⁻)		R(DCO)=1.02 14.
643.1		4002.0+x	(37/2 ⁺)	3359.0+x	(33/2 ⁺)		
668.3		5353.5+x	(45/2 ⁻)	4685.2+x	(41/2 ⁻)		
676.1		3764.1+x	(35/2 ⁻)	3088.0+x	(31/2 ⁻)		
678.3		4680.3+x	(41/2 ⁺)	4002.0+x	(37/2 ⁺)		
708.3	42 4	2327.7+x	(27/2 ⁻)	1619.4+x	(23/2 ⁻)		R(DCO)=1.04 13.
726.3		5713.5+x	(47/2 ⁻)	4987.2+x	(43/2 ⁻)		
731.0	10.7 18	3058.7+x	(29/2 ⁺)	2327.7+x	(27/2 ⁻)	D	R(DCO)=0.79 17. Mult.: Stretched dipole, from DCO data. 2009Sh48 assign it as E1.
738.0	17.8 21	2357.5+x	(25/2 ⁺)	1619.4+x	(23/2 ⁻)	D	R(DCO)=0.72 16. Mult.: Stretched dipole, from DCO data. 2009Sh48 assign it as E1.
752.7	4.2 7	1664.8+x	(19/2 ⁺)	912.1+x	(17/2 ⁻)	D	R(DCO)=0.65 14. Mult.: Stretched dipole, from DCO data. 2009Sh48 assign it as E1.
760.3	16.1 19	3088.0+x	(31/2 ⁻)	2327.7+x	(27/2 ⁻)		R(DCO)=1.02 12.
762.3		6475.8+x	(51/2 ⁻)	5713.5+x	(47/2 ⁻)		
817.8		5498.1+x	(45/2 ⁺)	4680.3+x	(41/2 ⁺)		
872.3		6370.4+x	(49/2 ⁺)	5498.1+x	(45/2 ⁺)		
872.4		3200.1+x	(31/2 ⁻)	2327.7+x	(27/2 ⁻)		

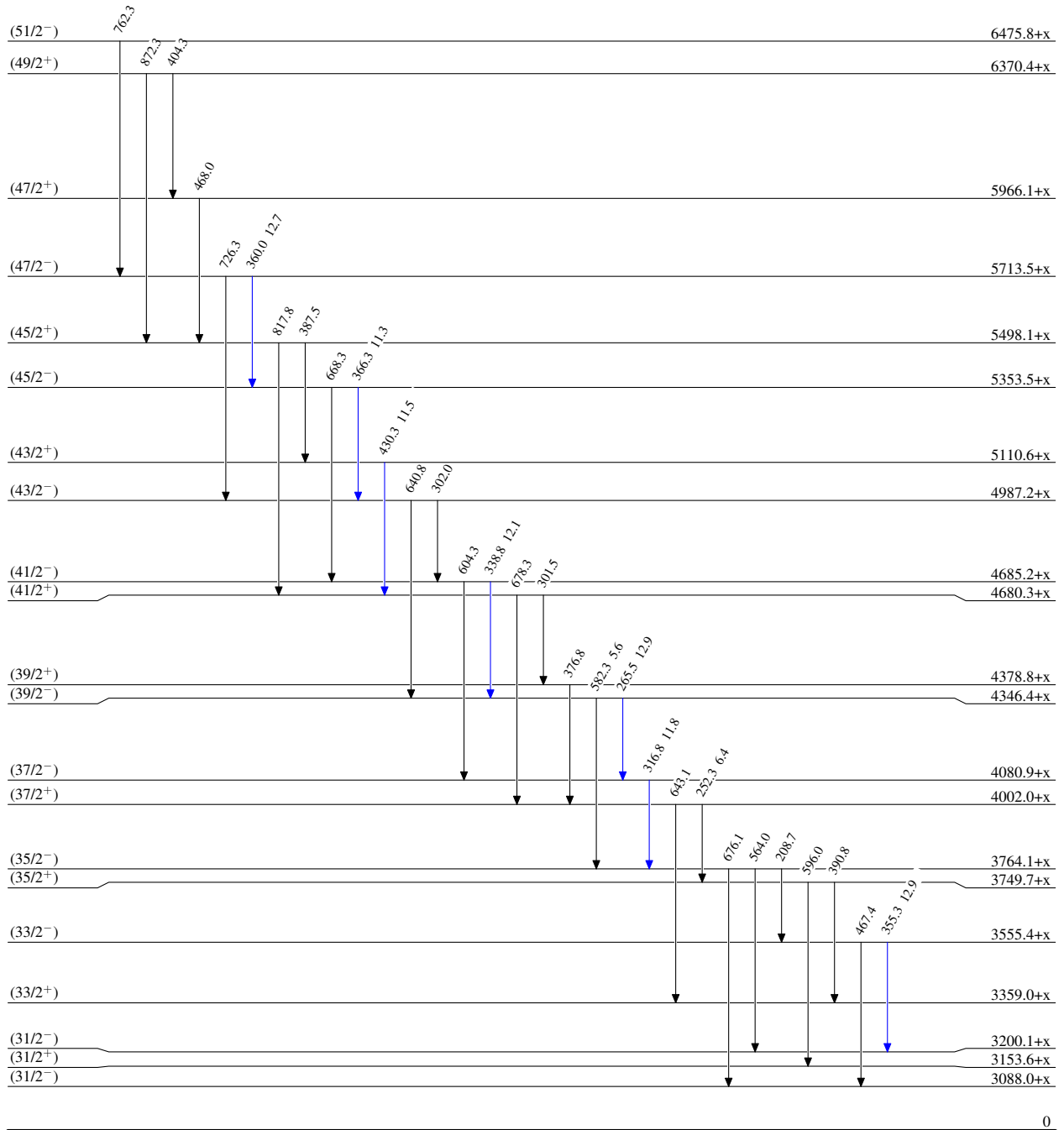
[†] Values without listed I_γ values are given on the level scheme of [2009Sh48](#) only.

[‡] Values listed by [2009Sh48](#) divided by 10. These authors do not list I_γ values for all the γ 's.

$^{144}\text{Sm}(^{19}\text{F},4n\gamma)$ 2009Sh48,1995Ma46Level SchemeIntensities: Relative I_γ

Legend

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



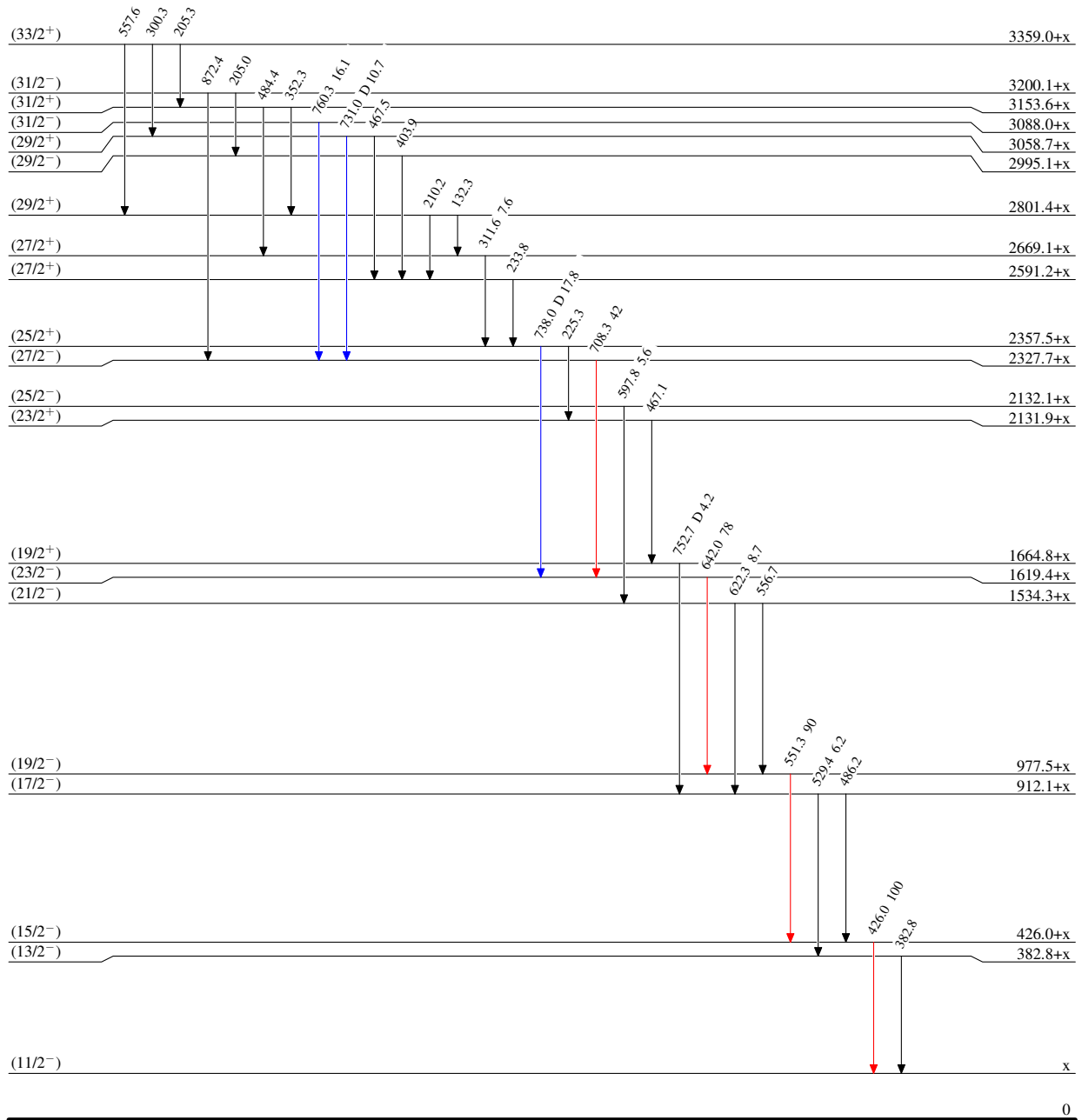
$^{144}\text{Sm}(^{19}\text{F},4n\gamma)$ 2009Sh48,1995Ma46

Level Scheme (continued)

Intensities: Relative I_γ

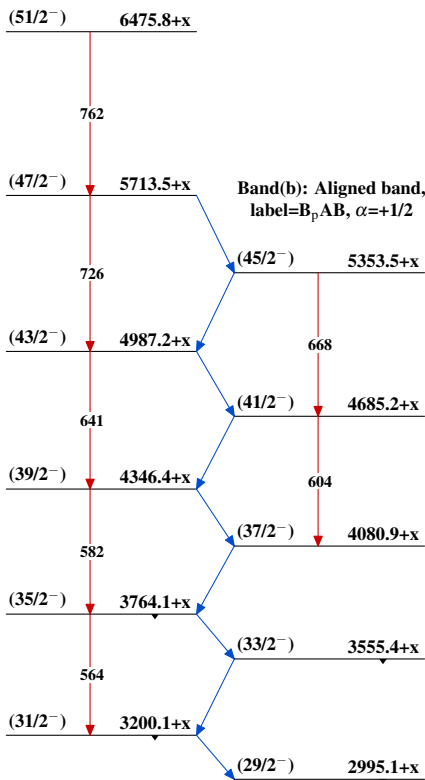
Legend

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

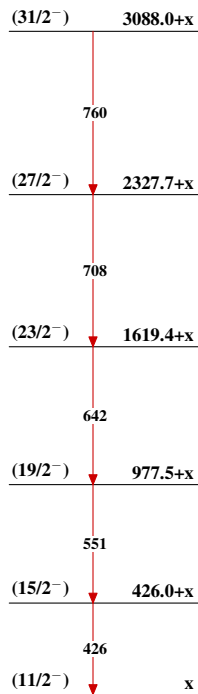


$^{144}\text{Sm}(^{19}\text{F},4n\gamma)$ 2009Sh48,1995Ma46

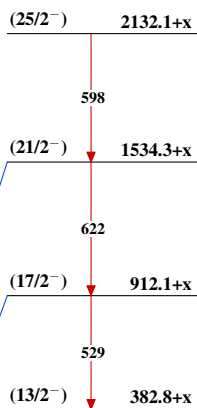
Band(B): Aligned band,
label= A_pAB , $\alpha=-1/2$



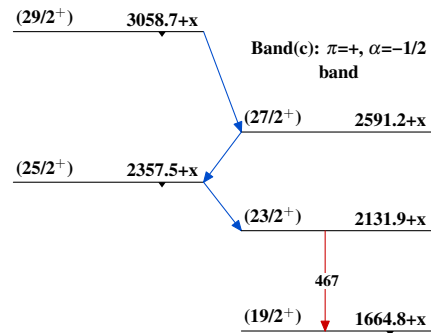
Band(A): $\pi h_{11/2}$ band,
 $\alpha=-1/2$

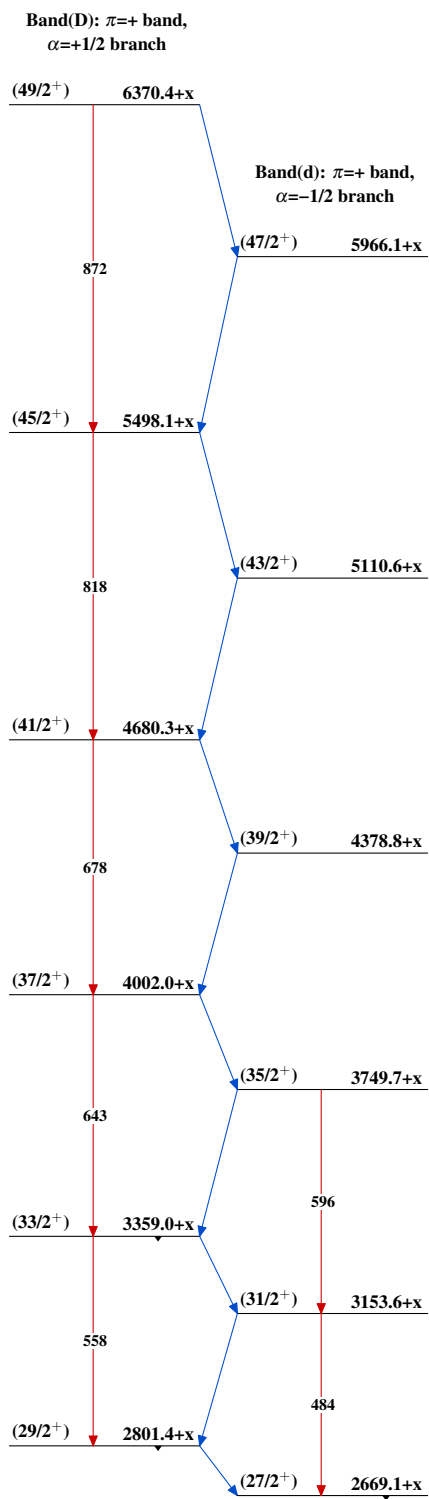


Band(a): $\pi h_{11/2}$ band,
 $\alpha=+1/2$



Band(C): $\pi=+$, $\alpha=+1/2$
band



$^{144}\text{Sm}(^{19}\text{F},4\text{n}\gamma)$ 2009Sh48,1995Ma46 (continued) $^{159}_{71}\text{Lu}_{88}$