^{237}Np(^{116}Sn,^{118}Snγ)   **2010Hu02**

		History	
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 122, 205 (2014)	1-Feb-2014

^{116}Sn^{+31} beam at E=801 MeV from ATLAS of ANL bombarded a 0.5 mg/cm^2 ^{237}Np target through a 0.3 mg/cm^2 thick layer of Ni. The energy of the beam on the ^{237}Np target was $\approx$ 20% above the Coulomb barrier of the reacting nuclei.

Detection system: Gammasphere comprising 101 Compton suppressed HPGe was used to detect γ rays in coincidence with particles detected in chico. CHICO consisted of 20 PPACs covering 4π. Only particles emitted in 12°<θ<85° measured in lab system were detected.

Measurements: Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma\gamma$, and (particle)$\gamma(\theta)$. Deduced level scheme using ROOT and RADWARE codes.

^{235}Np Levels

About 70% of the production cross section of this nucleus feeds the ground state band, based on comparison with intensity of similar levels in ^{237}Np. Therefore, parental Nilsson configuration of π5/2[642] for the g.s. is assigned as in ^{237}Np, although π5/2[523] from h$_{9/2}$ orbital cannot be ruled out, as explained in 2010Hu02.

E(level)[†]	J$^{\pi}$[‡]	Comments
0.0[@]	5/2$^+$	
34.23[#&] 10	(7/2$^+$)	Additional information 1.
79.1[#@] 4	(9/2$^+$)	Additional information 2.
133[#&] 2	(11/2$^+$)	Additional information 3.
206.2[@] 10	(13/2$^+$)	
276.4[&] 10	(15/2$^+$)	
359.9[@] 15	(17/2$^+$)	
463.0[&] 15	(19/2$^+$)	
560.4[@] 18	(21/2$^+$)	
690.4[&] 18	(23/2$^+$)	
806.3[@] 20	(25/2$^+$)	
956.1[&] 20	(27/2$^+$)	
1088.9[@] 23	(29/2$^+$)	
1256.1[&] 23	(31/2$^+$)	
1405.3[@] 25	(33/2$^+$)	
1588.0[&] 25	(35/2$^+$)	
1752[@] 3	(37/2$^+$)	
1948[&] 3	(39/2$^+$)	
2124[@] 3	(41/2$^+$)	
2336[&] 3	(43/2$^+$)	
2526[@] 3	(45/2$^+$)	
2751[&] 3	(47/2$^+$)	
2952[@] 4	(49/2$^+$)	
3191?[&] 4	(51/2$^+$)	
3401?[@] 4	(53/2$^+$)	

[†] From Eγ's, except where noted.

[‡] From 2010Hu02, based on the assumption of πi$_{13/2}$ orbital and comparison with the g.s. and assignments in ^{237}Np. 2010Hu02 point out that πh$_{9/2}$, 5/2[523] assignment, thus a negative-parity sequence cannot be ruled out.

[#] From Adopted Levels.

$^{237}\text{Np}(^{116}\text{Sn},^{118}\text{Sn}\gamma)$ **2010Hu02** (continued)

^{235}Np Levels (continued)

[@] Band(A): $\pi 5/2[642]$, $\alpha=+1/2$. The $\pi h_{9/2}$, 5/2[523] assignment is also possible (2010Hu02).
[&] Band(a): $\pi 5/2[642]$, $\alpha=-1/2$. The $\pi h_{9/2}$, 5/2[523] assignment is also possible (2010Hu02).

$\gamma(^{235}\text{Np})$

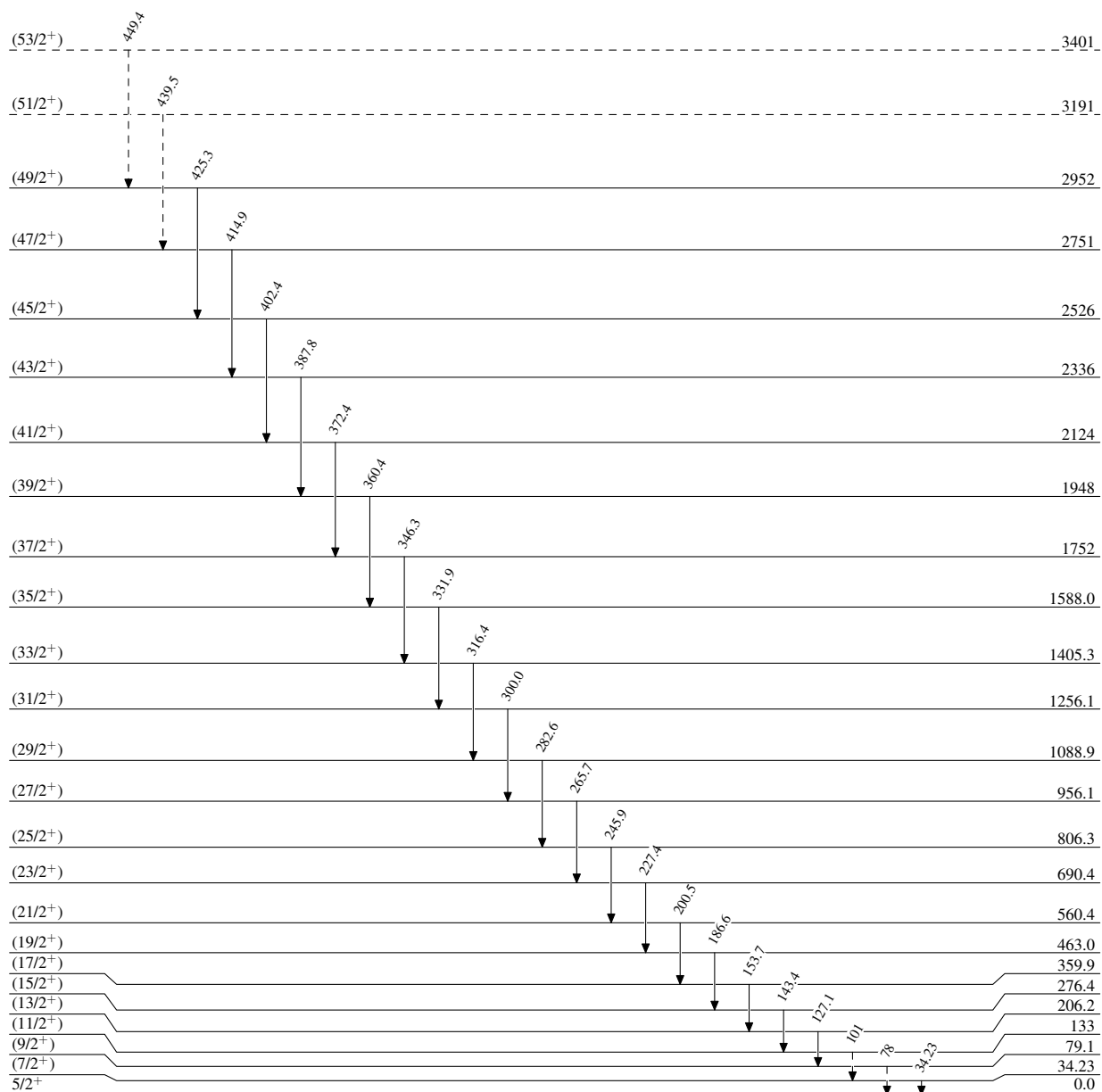| E_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Comments
34.23 *10*	34.23	$(7/2^+)$	0.0	$5/2^+$	E_γ: from Adopted Gammas.
78[‡][#]	79.1	$(9/2^+)$	0.0	$5/2^+$	
101[‡][#]	133	$(11/2^+)$	34.23	$(7/2^+)$	
127.1 *10*	206.2	$(13/2^+)$	79.1	$(9/2^+)$	
143.4 *10*	276.4	$(15/2^+)$	133	$(11/2^+)$	
153.7 *10*	359.9	$(17/2^+)$	206.2	$(13/2^+)$	
186.6 *10*	463.0	$(19/2^+)$	276.4	$(15/2^+)$	
200.5 *10*	560.4	$(21/2^+)$	359.9	$(17/2^+)$	
227.4 *10*	690.4	$(23/2^+)$	463.0	$(19/2^+)$	
245.9 *10*	806.3	$(25/2^+)$	560.4	$(21/2^+)$	
265.7 *10*	956.1	$(27/2^+)$	690.4	$(23/2^+)$	
282.6 *10*	1088.9	$(29/2^+)$	806.3	$(25/2^+)$	
300.0 *10*	1256.1	$(31/2^+)$	956.1	$(27/2^+)$	
316.4 *10*	1405.3	$(33/2^+)$	1088.9	$(29/2^+)$	
331.9 *10*	1588.0	$(35/2^+)$	1256.1	$(31/2^+)$	
346.3 *10*	1752	$(37/2^+)$	1405.3	$(33/2^+)$	
360.4 *10*	1948	$(39/2^+)$	1588.0	$(35/2^+)$	
372.4 *10*	2124	$(41/2^+)$	1752	$(37/2^+)$	
387.8 *10*	2336	$(43/2^+)$	1948	$(39/2^+)$	
402.4 *10*	2526	$(45/2^+)$	2124	$(41/2^+)$	
414.9 *10*	2751	$(47/2^+)$	2336	$(43/2^+)$	
425.3 *10*	2952	$(49/2^+)$	2526	$(45/2^+)$	
439.5[#] *10*	3191?	$(51/2^+)$	2751	$(47/2^+)$	
449.4[#] *10*	3401?	$(53/2^+)$	2952	$(49/2^+)$	

[†] Uncertainty in E_γ is stated as 0.5 to 1 keV in 2010Hu02. The evaluators assign 1.0 keV, since no intensity data are available.
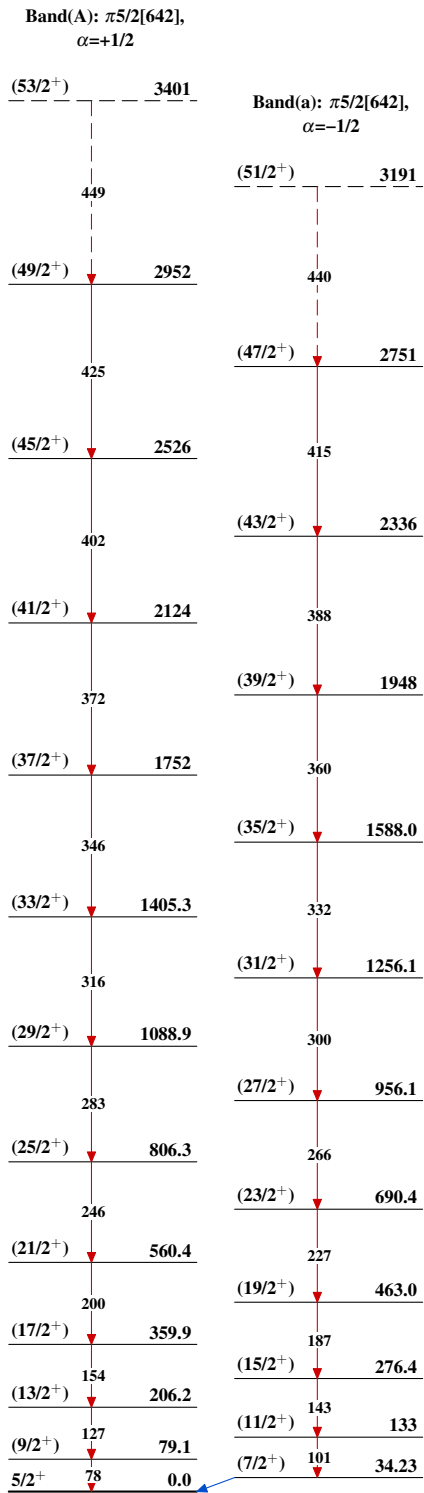[‡] Transition not well established due to expected high internal conversion and superposition by X rays.
[#] Placement of transition in the level scheme is uncertain.

^{237}Np(^{116}Sn,^{118}Snγ)   **2010Hu02**

Legend

Level Scheme

- - - - - → γ Decay (Uncertain)

Level	Energy
(53/2$^+$)	3401
(51/2$^+$)	3191
(49/2$^+$)	2952
(47/2$^+$)	2751
(45/2$^+$)	2526
(43/2$^+$)	2336
(41/2$^+$)	2124
(39/2$^+$)	1948
(37/2$^+$)	1752
(35/2$^+$)	1588.0
(33/2$^+$)	1405.3
(31/2$^+$)	1256.1
(29/2$^+$)	1088.9
(27/2$^+$)	956.1
(25/2$^+$)	806.3
(23/2$^+$)	690.4
(21/2$^+$)	560.4
(19/2$^+$)	463.0
(17/2$^+$)	359.9
(15/2$^+$)	276.4
(13/2$^+$)	206.2
(11/2$^+$)	133
(9/2$^+$)	79.1
(7/2$^+$)	34.23
5/2$^+$	0.0

Transition energies: 449.4, 439.5, 425.3, 414.9, 402.4, 387.8, 372.4, 360.4, 346.3, 331.9, 316.4, 300.0, 282.6, 265.7, 245.9, 227.4, 200.5, 186.6, 153.7, 143.4, 127.1, 101, 78, 34.23

$^{235}_{93}$Np$_{142}$

$^{237}Np(^{116}Sn,^{118}Sn\gamma)$ 2010Hu02

Band(A): $\pi 5/2[642]$,
$\alpha=+1/2$

$(53/2^+)$ ------- 3401

Band(a): $\pi 5/2[642]$,
$\alpha=-1/2$

449

$(51/2^+)$ ------- 3191

$(49/2^+)$ 2952

440

425

$(47/2^+)$ 2751

$(45/2^+)$ 2526

415

402

$(43/2^+)$ 2336

$(41/2^+)$ 2124

388

372

$(39/2^+)$ 1948

$(37/2^+)$ 1752

360

346

$(35/2^+)$ 1588.0

$(33/2^+)$ 1405.3

332

316

$(31/2^+)$ 1256.1

$(29/2^+)$ 1088.9

300

283

$(27/2^+)$ 956.1

$(25/2^+)$ 806.3

266

246

$(23/2^+)$ 690.4

$(21/2^+)$ 560.4

227

200

$(19/2^+)$ 463.0

$(17/2^+)$ 359.9

187

154

$(15/2^+)$ 276.4

$(13/2^+)$ 206.2

143

127

$(11/2^+)$ 133

$(9/2^+)$ 79.1

101

$(7/2^+)$ 34.23

$5/2^+$ 78 0.0

$^{235}_{93}Np_{142}$