

$^{226}\text{Ra}(\text{t},\alpha)$ 1997Bu03

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	A. K. Jain (a), R. Raut (b), J. K. Tuli		NDS 110, 1409 (2009)	1-Dec-2008

1997Bu03: E(t)=18 MeV; Enge split-pole spectrograph with photographic emulsions; FWHM $\approx$ 18 keV; $\theta(\text{lab})=40^\circ, 50^\circ, 60^\circ; \approx 40$ $\mu\text{gm}/\text{cm}^2$ carbon-backed ^{226}Ra ($T_{1/2}=1600\text{y}$) target; measured $E\alpha$, $d\sigma/d\Omega$. Supersedes 1987BuZV.

 ^{225}Fr Levels

Calculated $d\sigma/d\Omega(60^\circ)$ ($\mu\text{b}/\text{sr}$) (1997Bu03) for selected orbitals:

Spin	1/2[400]	1/2[530]	1/2[541]	3/2[402]	3/2[651]	3/2[532]
1/2	121	0.8	1.6			
3/2	23	14	1.5	103	0.0	0.7
5/2	7.6	0.2	13	4.6	0.03	6.2
7/2	0.4	39	2.0	1.2	0.0	3.3
9/2	0.05	0.4	33	0.05	2.0	26
11/2		0.8	0.1		0.01	0.3
13/2					12	

E(level) [†]	J^π [‡]	$d\sigma/d\Omega(60^\circ)$ $\mu\text{b}/\text{sr}$	Comments
0 [#]	3/2 ⁻	≈ 1.5	
28 [#]	5/2 ⁻	14	
82 [#]	7/2 ⁻	20	
≈ 130 [#]	9/2 ⁻	≈ 45	
≈ 142 [@]		≈ 23	J^π : observed $d\sigma/d\Omega$ is far too large for 3/2 3/2[651] level but this may be attributable to $\Delta N=2$ mixing with 3/2[402] band (1997Bu03).
181 ^a	(1/2 ⁺)	120	Possibly the 1/2[400] bandhead, based on very strong excitation; assignment supported by comparison with (t, α) systematics in neighboring odd-A Fr isotopes.
205 ^{&}	(3/2 ⁺)	103	May include small contributions from (9/2) ⁻ and (7/2) ⁻ levels adopted at 203 and 207 keV, respectively.
244 ^{&a}	(5/2 ⁺)	32	
≈ 294 ^{&}	(7/2 ⁺)	≈ 3.1	
≈ 329		≈ 3.8	
401		80	
≈ 448		≈ 2.4	
500 ^a		9	
≈ 570 ^a		≈ 6	
591		75	
≈ 630		≈ 8	
655		29	
676		≈ 13	
≈ 741 ^a		2.6	
799		4.4	
845		6.7	
882 ^a		2.9	
974		8.8	
1028		3.4	
1049		5.6	
1127		70	
≈ 1229 ^a		≈ 23	
≈ 1247		≈ 23	
1321		13	

Continued on next page (footnotes at end of table)

$^{226}\text{Ra}(\text{t},\alpha)$ **1997Bu03 (continued)** ^{225}Fr Levels (continued)

<u>E(level)[†]</u>	<u>dσ/dΩ(60°) μb/sr</u>
1351	13
1398	13
1477 ^a	18
≈1516 ^a	≈23
≈1535	≈31

[†] Average value from spectra at three angles. Uncertainties range from ≈1 keV for well-resolved, low-energy peaks to ≈3 keV for the highest-energy levels.

[‡] Assignment based on comparison of experimental (t,α) cross sections with $[2Nc^2V^2d\sigma/d\Omega(\text{DWBA})]$, where $N=^{23}\text{C}$ are the spherical amplitudes of the Nilsson wave function and V^2 is the probability that orbital has a pair of particles in the target nucleus. See **1997Bu03** for further discussion.

Band(A): π 3/2[532] band. Coriolis mixed with 1/2[541] band.

@ Band(B): π 3/2[651] band. Coriolis mixed with a higher lying expected 1/2[660] band.

& Band(C): possible π 3/2[402] band. Coriolis mixed with $J>1/2$ members of 1/2[400] and expected 1/2[660] bands.

^a It is questionable whether this peak includes the level observed at approximately this energy in β^- decay (**1997Bu03**).

$^{226}\text{Ra}(\text{t},\alpha)$ **1997Bu03**

**Band(C): Possible π
3/2[402] band**

(7/2⁺) $\approx$ **294**

(5/2⁺) **244**

(3/2⁺) **205**

**Band(B): π 3/2[651]
band**

 $\approx$ **142**

**Band(A): π 3/2[532]
band**

9/2⁻ $\approx$ **130**

7/2⁻ **82**

5/2⁻ **28**

3/2⁻ **0**