

Table 15.5 from (1991AJ01): Radiative decays in  $^{15}\text{N}$  <sup>a</sup>

| $E_i$<br>(MeV)    | $J_i^\pi$       | $E_f$<br>(MeV) | $J_f^\pi$       | Branch<br>(%)  | Mult. mixing<br>ratio $\delta$       |
|-------------------|-----------------|----------------|-----------------|----------------|--------------------------------------|
| 5.27              | $\frac{5}{2}^+$ | 0              | $\frac{1}{2}^-$ | 100            | $-0.131 \pm 0.013$                   |
| 5.30              | $\frac{1}{2}^+$ | 0              | $\frac{1}{2}^-$ | 100            |                                      |
| 6.32 <sup>b</sup> | $\frac{3}{2}^-$ | 0              | $\frac{1}{2}^-$ | 100            | $+0.132 \pm 0.004$                   |
| 7.16 <sup>c</sup> | $\frac{5}{2}^+$ | 5.27           | $\frac{5}{2}^+$ | $100 \pm 0.4$  | $-0.014_{-0.015}^{+0.012}$           |
| 7.30              | $\frac{3}{2}^+$ | 0              | $\frac{1}{2}^-$ | $99.3 \pm 0.7$ | $-0.017_{-0.008}^{+0.005}$           |
|                   |                 | 5.27           | $\frac{5}{2}^+$ | $0.6 \pm 0.1$  | $+0.18 \pm 0.15$ , or $+2.5 \pm 1.0$ |
|                   |                 | 5.30           | $\frac{1}{2}^+$ | $0.2 \pm 0.1$  | $-0.31 \pm 0.15$ , or $+4.6 \pm 3.4$ |
|                   |                 | 6.32           | $\frac{3}{2}^-$ | $< 0.25$       |                                      |
| 7.57 <sup>d</sup> | $\frac{7}{2}^+$ | 0              | $\frac{1}{2}^-$ | $1.3 \pm 0.6$  |                                      |
|                   |                 | 5.27           | $\frac{5}{2}^+$ | $98.7 \pm 1.0$ | $-0.028 \pm 0.012$                   |
| 8.31              | $\frac{1}{2}^+$ | 0              | $\frac{1}{2}^-$ | $79 \pm 2$     |                                      |
|                   |                 | 5.27           | $\frac{5}{2}^+$ | $< 3$          |                                      |
|                   |                 | 5.30           | $\frac{1}{2}^+$ | $10 \pm 2$     |                                      |
|                   |                 | 6.32           | $\frac{3}{2}^-$ | $4.4 \pm 1.0$  |                                      |
|                   |                 | 7.16           | $\frac{5}{2}^+$ | $1.2 \pm 0.6$  |                                      |
|                   |                 | 7.30           | $\frac{3}{2}^+$ | $4.4 \pm 0.7$  |                                      |
| 8.57 <sup>e</sup> | $\frac{3}{2}^+$ | 0              | $\frac{1}{2}^-$ | $33 \pm 2$     | $-0.085_{-0.009}^{+0.005}$           |
|                   |                 | 5.27           | $\frac{5}{2}^+$ | $65 \pm 3$     | $-0.091 \pm 0.007$                   |
|                   |                 | 6.32           | $\frac{3}{2}^-$ | $1.4 \pm 0.6$  |                                      |
|                   |                 | 7.16           | $\frac{5}{2}^+$ | $3.6 \pm 0.5$  |                                      |
| 9.05 <sup>f</sup> | $\frac{1}{2}^+$ | 0              | $\frac{1}{2}^-$ | $92 \pm 3$     |                                      |
|                   |                 | 5.27           | $\frac{5}{2}^+$ | $3.5 \pm 1$    |                                      |
|                   |                 | 6.32           | $\frac{3}{2}^-$ | $4.5 \pm 1$    |                                      |
|                   |                 | 7.30           | $\frac{3}{2}^+$ | $1.2 \pm 0.4$  |                                      |
| 9.152             | $\frac{3}{2}^-$ | 0              | $\frac{1}{2}^-$ | $100 \pm 3$    | $+0.015_{-0.034}^{+0.041}$           |
| 9.155             | $\frac{5}{2}^+$ | 0              | $\frac{1}{2}^-$ | $< 2$          |                                      |
|                   |                 | 5.27           | $\frac{5}{2}^+$ | $11 \pm 1$     |                                      |
|                   |                 | 5.30           | $\frac{1}{2}^+$ | $10 \pm 1$     |                                      |
|                   |                 | 6.32           | $\frac{3}{2}^-$ | $22 \pm 2$     |                                      |
|                   |                 | 7.16           | $\frac{5}{2}^+$ | $57 \pm 3$     |                                      |

Table 15.5 from (1991AJ01): Radiative decays in  $^{15}\text{N}^a$  (continued)

| $E_i$<br>(MeV)     | $J_i^\pi$       | $E_f$<br>(MeV) | $J_f^\pi$       | Branch<br>(%)  | Mult. mixing<br>ratio $\delta$ |
|--------------------|-----------------|----------------|-----------------|----------------|--------------------------------|
| 9.22 <sup>g</sup>  | $\frac{1}{2}^-$ | 0              | $\frac{1}{2}^-$ | $22 \pm 5$     |                                |
|                    |                 | 5.30           | $\frac{1}{2}^+$ | $42 \pm 8$     |                                |
|                    |                 | 6.32           | $\frac{3}{2}^-$ | $35 \pm 6$     |                                |
|                    |                 | 7.30           | $\frac{3}{2}^+$ | $2.6 \pm 0.7$  |                                |
| 9.76 <sup>h</sup>  | $\frac{5}{2}^-$ | 0              | $\frac{1}{2}^-$ | $81.5 \pm 2.8$ |                                |
|                    |                 | 5.27 + 5.30    |                 | $7.5 \pm 1.5$  |                                |
|                    |                 | 6.32           | $\frac{3}{2}^-$ | $3.7 \pm 0.8$  |                                |
|                    |                 | 7.16           | $\frac{5}{2}^+$ | $2.3 \pm 0.5$  |                                |
|                    |                 | 7.57           | $\frac{7}{2}^+$ | $5.0 \pm 0.6$  |                                |
| 9.83 <sup>i</sup>  | $\frac{7}{2}^-$ | 5.27           | $\frac{5}{2}^+$ | $\approx 85$   |                                |
|                    |                 | 6.32           | $\frac{3}{2}^-$ | $2.2 \pm 0.9$  |                                |
|                    |                 | 7.16           | $\frac{5}{2}^+$ | $2.4 \pm 1.1$  |                                |
|                    |                 | 7.30           | $\frac{3}{2}^+$ | $3.7 \pm 0.9$  |                                |
|                    |                 | 7.57           | $\frac{7}{2}^+$ | $7.3 \pm 1.0$  |                                |
| 9.93 <sup>j</sup>  | $\frac{3}{2}^-$ | 0              | $\frac{1}{2}^-$ | $77.6 \pm 1.9$ |                                |
|                    |                 | 5.27 + 5.30    |                 | $15.4 \pm 1.5$ |                                |
|                    |                 | 6.32           | $\frac{3}{2}^-$ | $4.9 \pm 1.2$  |                                |
|                    |                 | 7.30           | $\frac{3}{2}^+$ | $2.1 \pm 0.8$  |                                |
| 10.07 <sup>k</sup> | $\frac{3}{2}^+$ | 0              | $\frac{1}{2}^-$ | $96.0 \pm 0.7$ |                                |
| 10.45 <sup>l</sup> | $\frac{5}{2}^-$ | 5.27           | $\frac{5}{2}^+$ | $55.0 \pm 0.8$ | $+0.021 \pm 0.033$             |
|                    |                 | 6.32           | $\frac{3}{2}^-$ | $31.3 \pm 1.7$ | $-0.59 \pm 0.13$               |
|                    |                 | 7.16           | $\frac{5}{2}^+$ | $5.2 \pm 0.1$  | $+0.13^{+0.03}_{-0.04}$        |
|                    |                 | 8.57           | $\frac{3}{2}^+$ | $3.8 \pm 0.6$  | $-0.3 \pm 0.4$                 |
|                    |                 | 9.152          | $\frac{3}{2}^-$ | $4.7 \pm 0.1$  | $-0.32^{+0.09}_{-0.10}$        |
| 10.53 <sup>m</sup> | $\frac{5}{2}^+$ | 0              | $\frac{1}{2}^-$ | $< 0.1$        |                                |
|                    |                 | 5.27           | $\frac{5}{2}^+$ | $38.7 \pm 0.2$ | $-0.27 \pm 0.03$               |
|                    |                 | 6.32           | $\frac{3}{2}^-$ | $7.7 \pm 0.1$  | $-0.028 \pm 0.004$             |
|                    |                 | 7.16           | $\frac{5}{2}^+$ | $19.4 \pm 0.2$ | $+0.007^{+0.010}_{-0.008}$     |
|                    |                 | 7.30           | $\frac{3}{2}^+$ | $31.4 \pm 0.5$ | $+0.066 \pm 0.005$             |

Table 15.5 from (1991AJ01): Radiative decays in  $^{15}\text{N}^a$  (continued)

| $E_i$<br>(MeV)     | $J_i^\pi$                        | $E_f$<br>(MeV)     | $J_f^\pi$       | Branch<br>(%)  | Mult. mixing<br>ratio $\delta$ |
|--------------------|----------------------------------|--------------------|-----------------|----------------|--------------------------------|
| 10.69 <sup>m</sup> | $\frac{9}{2}^+$                  | 8.57               | $\frac{3}{2}^+$ | $2.4 \pm 0.1$  | $+0.012^{+0.006}_{-0.005}$     |
|                    |                                  | 9.152              | $\frac{3}{2}^-$ | $0.3 \pm 0.1$  | $-0.20^{+0.03}_{-0.02}$        |
|                    |                                  | 5.27               | $\frac{5}{2}^+$ | $61.6 \pm 0.3$ |                                |
|                    |                                  | 7.16               | $\frac{5}{2}^+$ | $2.1 \pm 0.1$  | $-0.03 \pm 0.07$               |
|                    |                                  | 7.57               | $\frac{7}{2}^+$ | $36.3 \pm 0.6$ | $+0.118 \pm 0.008$             |
| 10.70 <sup>m</sup> | $\frac{3}{2}^-$                  | 0                  | $\frac{1}{2}^-$ | $52.6 \pm 0.8$ | $+0.180^{+0.006}_{-0.002}$     |
|                    |                                  | 5.27               | $\frac{5}{2}^+$ | $37.4 \pm 0.6$ | $-0.24^{+0.004}_{-0.008}$      |
|                    |                                  | 5.30               | $\frac{1}{2}^+$ | $0.8 \pm 0.1$  | $-0.13 \pm 0.07$               |
|                    |                                  | 6.32               | $\frac{3}{2}^-$ | $3.8 \pm 0.1$  | $+0.135 \pm 0.015$             |
|                    |                                  | 7.16               | $\frac{5}{2}^+$ | $0.4 \pm 0.1$  | $0.3 \pm 0.3$                  |
|                    |                                  | 7.30               | $\frac{3}{2}^+$ | $2.3 \pm 0.1$  | $-0.027 \pm 0.023$             |
|                    |                                  | 8.31               | $\frac{1}{2}^+$ | $0.8 \pm 0.1$  | $-0.017^{+0.018}_{-0.016}$     |
|                    |                                  | 9.05               | $\frac{1}{2}^+$ | $0.2 \pm 0.1$  | $-0.007 \pm 0.12$              |
|                    |                                  | 9.152              | $\frac{3}{2}^-$ | $0.2 \pm 0.1$  | $-0.11 \pm 0.03$               |
|                    |                                  | 9.23               | $\frac{1}{2}^-$ | $1.5 \pm 0.1$  | $+0.049^{+0.006}_{-0.005}$     |
|                    |                                  | 10.80 <sup>n</sup> | $\frac{3}{2}^+$ | 0              | $\frac{1}{2}^-$                |
| 5.27               | $\frac{5}{2}^+$                  |                    |                 | $4.9 \pm 0.1$  | $-0.63 \pm 0.04$               |
| 5.30               | $\frac{1}{2}^+$                  |                    |                 | $15.5 \pm 0.2$ | $-0.55 \pm 0.02$               |
| 6.32               | $\frac{3}{2}^-$                  |                    |                 | $5.4 \pm 0.2$  | $-0.07 \pm 0.05$               |
| 7.16               | $\frac{5}{2}^+$                  |                    |                 | $7.8 \pm 0.1$  | $+0.14 \pm 0.03$               |
| 7.30               | $\frac{3}{2}^+$                  |                    |                 | $5.8 \pm 0.1$  | $-0.12 \pm 0.02$               |
| 8.31               | $\frac{1}{2}^+$                  |                    |                 | $3.6 \pm 0.1$  | $+0.12 \pm 0.03$               |
| 9.05               | $\frac{1}{2}^+$                  |                    |                 | $0.3 \pm 0.1$  |                                |
| 9.152              | $\frac{3}{2}^-$                  |                    |                 | $0.9 \pm 0.1$  |                                |
| 9.155              | $\frac{5}{2}^-$                  |                    |                 | $4.2 \pm 0.1$  |                                |
| 11.62 <sup>o</sup> | $\frac{1}{2}^+; T = \frac{3}{2}$ |                    |                 | 0              | $\frac{1}{2}^-$                |
|                    |                                  | 5.27               | $\frac{5}{2}^+$ | $< 1$          |                                |
|                    |                                  | 5.30               | $\frac{1}{2}^+$ | $7.4 \pm 1.5$  |                                |
|                    |                                  | 6.32               | $\frac{3}{2}^-$ | $1.9 \pm 1.5$  |                                |
| 12.52              | $\frac{5}{2}^+; T = \frac{3}{2}$ | 0                  | $\frac{1}{2}^-$ | $< 1$          |                                |

Table 15.5 from (1991AJ01): Radiative decays in  $^{15}\text{N}$  <sup>a</sup> (continued)

| $E_i$<br>(MeV)     | $J_i^\pi$       | $E_f$<br>(MeV) | $J_f^\pi$       | Branch<br>(%)  | Mult. mixing<br>ratio $\delta$ |
|--------------------|-----------------|----------------|-----------------|----------------|--------------------------------|
| 13.39 <sup>p</sup> | $\frac{3}{2}^+$ | 5.27           | $\frac{5}{2}^+$ | $94.2 \pm 0.6$ | $-0.02 \pm 0.04$               |
|                    |                 | 5.30           | $\frac{1}{2}^+$ | $< 1$          |                                |
|                    |                 | 6.32           | $\frac{3}{2}^-$ | $5.8 \pm 0.6$  | $-0.02 \pm 0.04$               |
|                    |                 | 0              | $\frac{1}{2}^-$ | 100            |                                |

<sup>a</sup> See also [Tables 15.12](#) and [15.15](#), and [15.6 in \(1986AJ01\)](#). For references see [Table 15.4 in \(1981AJ01\)](#).

Please note that [\(1976BE1B\)](#) is an unpublished Ph.D. thesis.

<sup>b</sup> Transitions to  $^{15}\text{N}^*(5.27, 5.30)$  are  $< 0.1$  and  $< 0.05\%$ , respectively [\(1975MO28\)](#).

<sup>c</sup> Transitions to  $^{15}\text{N}^*(0, 5.30, 6.32)$  are  $< 0.1$ ,  $< 4$  and  $< 0.5\%$ .

<sup>d</sup> Transitions to  $^{15}\text{N}^*(5.30, 6.32)$  are  $< 4$  and  $< 0.6\%$ .

<sup>e</sup> Transitions to  $^{15}\text{N}^*(5.30, 7.30, 7.57)$  are  $< 12$ ,  $< 0.7$  and  $< 3\%$ .

<sup>f</sup> Transitions to  $^{15}\text{N}^*(7.16, 7.57, 8.31)$  are  $< 10$ ,  $< 2$  and  $< 0.5\%$ .

<sup>g</sup> Transitions to  $^{15}\text{N}^*(7.16, 7.57, 8.31)$  are  $< 1$ ,  $< 20$  and  $< 5\%$ .

<sup>h</sup> Transitions to  $^{15}\text{N}^*(7.30, 8.31, 8.57)$  are  $< 2$ ,  $< 1$  and  $< 2\%$ .

<sup>i</sup> Transitions to  $^{15}\text{N}^*(0, 5.30)$  are  $< 4$  and  $< 15\%$ .

<sup>j</sup> Transitions to  $^{15}\text{N}^*(7.16, 7.57, 8.31, 8.57)$  are each  $< 1\%$ .

<sup>k</sup> For upper limits for transitions to other states see [Table 15.4 in \(1981AJ01\)](#).

<sup>l</sup> Transitions to  $^{15}\text{N}^*(0, 5.30, 9.83)$  are  $< 12$ ,  $< 2$  and  $< 0.1\%$ . See also [\(1990GO25\)](#).

<sup>m</sup> See also [\(1990GO25\)](#).

<sup>n</sup>  $\pi$  is + because if  $\pi$  were  $-$  the  $\Gamma_\gamma$  and  $\delta$  of the  $10.80 \rightarrow 5.30$  MeV transition would lead to an unacceptably high M2 value (33 W.u.) (P.M. Endt, private communication). See also [\(1990GO25\)](#).

<sup>o</sup> See [footnote <sup>g</sup> in Table 15.4 \(1981AJ01\)](#).

<sup>p</sup>  $\Gamma_{\gamma_0} = 3.0 \pm 0.9$  eV,  $\Gamma_p \Gamma_{\gamma_0} / \Gamma = 1.70 \pm 0.5$  eV;  $\delta = 0.00 \pm 0.04$  (M2/E1);  $B(E1) = (1.2 \pm 0.4) 10^{-3} e^2 \cdot \text{fm}^2$ . Transitions to  $^{15}\text{N}^*(5.27, 5.30)$  are  $< 8\%$  and to  $^{15}\text{N}^*(6.32, 7.16, 7.30)$  are  $< 5\%$ .