

Table 20.19 from (1998TI06): Excited states of  $^{20}\text{Ne}$  from  $^{12}\text{C}(^{12}\text{C}, \alpha)^{20}\text{Ne}$  <sup>a</sup>

$E_x$ (MeV $\pm$ keV) <sup>b</sup>	$J^\pi$ <sup>c</sup>	$\Gamma_\gamma/\Gamma$ <sup>d</sup>	$\Gamma_{\text{cm}}$ (keV)	$\theta_\alpha^2$ <sup>e</sup>
1.6329 $\pm$ 1.0	2 <sup>+</sup>			
4.2456 $\pm$ 2.5	4 <sup>+</sup>			
4.9663 $\pm$ 2.5	2 <sup>-</sup>			
5.618 $\pm$ 4	3 <sup>-</sup>			
5.774 $\pm$ 6	1 <sup>-</sup>			
6.725 $\pm$ 6	0 <sup>+</sup>			
7.004 $\pm$ 4	4 <sup>-</sup>			
7.169 $\pm$ 6	3 <sup>-</sup>			
7.196 $\pm$ 6	0 <sup>+</sup>			0.026 <sup>f</sup>
7.435 $\pm$ 6	2 <sup>+</sup>			
7.835 $\pm$ 6	2 <sup>+</sup>			0.015 <sup>f</sup>
8.449 $\pm$ 6	5 <sup>-</sup>			$(1.6 \pm 0.5) \times 10^{-3}$ <sup>g</sup>
8.694 $\pm$ 6	1 <sup>-</sup>			0.0027 <sup>f</sup>
8.779 $\pm$ 6	6 <sup>+</sup>			
8.85	1 <sup>-</sup>			0.0179 <sup>f</sup>
9.033 $\pm$ 6	4 <sup>+</sup>			0.033 <sup>f</sup> , 0.022 <sup>g</sup>
9.110 $\pm$ 6				
9.318 $\pm$ 6	2 <sup>-</sup>	> 0.90		
9.533 $\pm$ 6				
9.872 $\pm$ 6	1 <sup>+</sup> , 2 <sup>-</sup> , 3 <sup>+</sup>	> 0.8		
9.948 $\pm$ 5 <sup>d</sup>	1 <sup>+</sup> , 2 <sup>-</sup> , 3 <sup>+</sup>	> 0.7		
10.024 $\pm$ 6				
10.264 $\pm$ 6	5 <sup>-</sup>			
10.407 $\pm$ 6	(3 <sup>-</sup> )			0.078 <sup>f</sup>
10.545 $\pm$ 6				
10.609 $\pm$ 5	6 <sup>-</sup>	$\equiv 1$		
10.693 $\pm$ 5	4 <sup>-</sup> ; 3 <sup>+</sup>	> 0.95		
10.840 $\pm$ 6	(3 <sup>-</sup> )			0.0099 <sup>f</sup>
10.917 $\pm$ 6	3 <sup>+</sup> ; $T = 0$	> 0.7		
11.013 $\pm$ 6				
11.528 $\pm$ 5 <sup>d</sup>	(3 <sup>+</sup> ; 4 <sup>-</sup> )	> 0.90		

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$E_x$ (MeV $\pm$ keV) <sup>b</sup>	$J^\pi$ <sup>c</sup>	$\Gamma_\gamma/\Gamma$ <sup>d</sup>	$\Gamma_{\text{cm}}$ (keV)	$\theta_\alpha^2$ <sup>e</sup>
11.568 $\pm$ 10 <sup>d</sup>	(3 <sup>+</sup> ; $T = 0$ )	0.75 $\pm$ 0.10		
11.653 $\pm$ 5 <sup>d</sup>	(3 <sup>+</sup> )	> 0.90		
11.892 $\pm$ 8 <sup>d</sup>		0.16 $\pm$ 0.02		
11.949 $\pm$ 6	8 <sup>+</sup>			(7.6 $\pm$ 2.2) $\times 10^{-3}$ <sup>g</sup>
12.014 $\pm$ 10 <sup>d</sup>		> 0.10		
12.097 $\pm$ 8 <sup>d</sup>		> 0.20		
12.135 $\pm$ 5 <sup>h</sup>	6 <sup>+</sup>			(4.9 $\pm$ 2.6) $\times 10^{-4}$ <sup>g, i</sup>
12.172 $\pm$ 8 <sup>d</sup>		> 0.45		
12.219 $\pm$ 10 <sup>d</sup>	2 <sup>+</sup> ; $T = 1$	> 0.45		
12.379 $\pm$ 8 <sup>d</sup>		0.005 $\pm$ 0.001		
12.436 $\pm$ 5 <sup>j</sup>	0 <sup>+</sup> <sup>k</sup>		24 $\pm$ 1	<sup>g, k</sup>
12.596 $\pm$ 5	6 <sup>+</sup>		50 $\pm$ 10	0.09 $\pm$ 0.01 <sup>g</sup>
12.730 $\pm$ 6	(5 <sup>-</sup> )			0.129 <sup>f</sup>
12.919 $\pm$ 6				
13.010 $\pm$ 6				
13.049 $\pm$ 6				
13.190 $\pm$ 6				
13.277 $\pm$ 6				
13.335 $\pm$ 6	7 <sup>-</sup>			(2.4 $\pm$ 1.0) $\times 10^{-4}$ <sup>g, l</sup>
13.441 $\pm$ 6	(5 <sup>-</sup> )			$\leq 0.023$ <sup>f</sup>
13.569 $\pm$ 15				
13.631 $\pm$ 15				
13.679 $\pm$ 15				
13.845 $\pm$ 15				
13.886 $\pm$ 15				
13.927 $\pm$ 5	6 <sup>+</sup>		113 $\pm$ 7	0.10 $\pm$ 0.01 <sup>g</sup>
14.144 $\pm$ 15				
14.308 $\pm$ 10	6 <sup>+</sup>		< 50 <sup>g</sup>	< 0.45 <sup>g</sup>
14.60				
14.812 $\pm$ 15				
15.034 $\pm$ 15				

Table 20.19 from (1998TI06): Excited states of  $^{20}\text{Ne}$  from  $^{12}\text{C}(^{12}\text{C}, \alpha)^{20}\text{Ne}$  <sup>a</sup> (continued)

$E_x$ (MeV $\pm$ keV) <sup>b</sup>	$J^\pi$ <sup>c</sup>	$\Gamma_\gamma/\Gamma$ <sup>d</sup>	$\Gamma_{\text{cm}}$ (keV)	$\theta_\alpha^2$ <sup>e</sup>
15.159 $\pm$ 5 <sup>m</sup>	6 <sup>+</sup>		60 $\pm$ 15	$< 8 \times 10^{-4}$ <sup>g, n</sup>
15.364 $\pm$ 14 <sup>o</sup>	7 <sup>-</sup>		410 $\pm$ 130	
5.438 $\pm$ 10 <sup>p</sup>			100 $\pm$ 20	
15.691 $\pm$ 15				
15.874 $\pm$ 8 <sup>q</sup>	8 <sup>+</sup>		100 $\pm$ 15	0.047 $\pm$ 0.013 <sup>g, r</sup>
16.139 $\pm$ 15				
16.600 $\pm$ 15 <sup>s</sup>	7 <sup>-</sup>		160 $\pm$ 30	0.10 $\pm$ 0.02 <sup>g, t</sup>
16.717 $\pm$ 10			37 $\pm$ 10	
17.259 $\pm$ 11 <sup>u</sup>	7 <sup>-</sup> (9 <sup>-</sup> )		162 $\pm$ 20	0.019 $\pm$ 0.004 <sup>g, v</sup>
18.153 $\pm$ 10 <sup>w</sup>	7 <sup>-</sup>			
18.538 $\pm$ 7 <sup>x</sup>	8 <sup>+</sup>		138 $\pm$ 33	$(3.2 \pm 1.5) \times 10^{-3}$ <sup>g, y</sup>
20.478 $\pm$ 11 <sup>z</sup>	(8 <sup>+</sup> )		250 $\pm$ 30	0.11 $\pm$ 0.04 <sup>g, aa</sup>
20.704 $\pm$ 11 <sup>bb</sup>	(9 <sup>-</sup> )		$\approx$ 120	<sup>g</sup>
20.89 $\pm$ 30				
21.05 $\pm$ 20			140 $\pm$ 50	
21.65 $\pm$ 100	(7 <sup>-</sup> , 9 <sup>-</sup> )		240 $\pm$ 50	
22.03 $\pm$ 70	(8 <sup>+</sup> )		630 $\pm$ 80	
22.7 $\pm$ 100			490 $\pm$ 110	
23.2 $\pm$ 100			300 $\pm$ 100	
23.74 $\pm$ 100			230 $\pm$ 100	
24.374 $\pm$ 30	7 <sup>-</sup> (5 <sup>-</sup> )		210 $\pm$ 50	

<sup>a</sup> For complete references see [Table 20.21 in \(1978AJ03\)](#). [Table 20.19 in \(1983AJ01\)](#) has a number of errors.

<sup>b</sup> Uncertainties shown for  $E_x > 5.7$  MeV are approximate, except for states flagged <sup>d</sup>: see footnote <sup>c</sup> in [Table 20.21 of \(1978AJ03\)](#).

<sup>c</sup> See discussions in [\(1975ME04\)](#), [\(1983HI06\)](#), [\(1984LE19\)](#) and [\(1987FI01\)](#). See also [Table 20.18](#) here.

<sup>d</sup> [\(1987FI01\)](#).  $^{20}\text{Ne}^*(11.89, 12.38)$  also decay via  $\alpha_2$ .

<sup>e</sup> See also [\(1984LE19\)](#).

<sup>f</sup> [\(1979YO04\)](#).

<sup>g</sup>  $\theta_\alpha^2$  shown are  $\theta_{\alpha_0}^2$  [\(1983HI06\)](#). See also [\(1987FI01\)](#).

<sup>h</sup> Alpha decay is by  $\alpha_2$  to  $^{16}\text{O}^*(6.13)$ :  $\Gamma'_\alpha/\Gamma = (6.0 \pm 0.15)\%$ : assuming  $\Gamma_\alpha \Gamma'_\alpha/\Gamma = 7.7 \pm 3.8$  eV this leads to  $\Gamma_\alpha = 0.128 \pm 0.072$  keV for this 6<sup>+</sup> state: see [\(1978AJ03\)](#). [\(1983HI06\)](#) report an  $\alpha_0$  branching ratio of  $(90 \pm 6)\%$ .

- <sup>i</sup>  $\theta_{\alpha_2}^2 = 0.66 \pm 0.36$  (1983HI06).
- <sup>j</sup> (1992LA01) determined  $E_x = 12.436 \pm 0.004$  MeV,  $\theta_{\alpha_1}^2 \approx 1.15$ .
- <sup>k</sup> See footnote <sup>f</sup> in Table 20.21 of (1983AJ01).
- <sup>l</sup>  $\theta_{\alpha_2}^2 = 0.025 \pm 0.010$  (1983HI06).
- <sup>m</sup> Alpha decay is  $(2 \pm 2)\%$  by  $\alpha_0$ ,  $(46 \pm 2)\%$  via  $\alpha_{1+2}$  (mainly  $\alpha_2$ ) and  $(52 \pm 2)\%$  via  $\alpha_{3+4}$  (mainly  $\alpha_3$ ) (1979YO04). See also (1992LA01).
- <sup>n</sup>  $\theta_{\alpha_2}^2 = 0.05 \pm 0.013$ ,  $\theta_{\alpha_3}^2 = 0.91 \pm 0.23$  (1983HI06).
- <sup>o</sup> Alpha decay is  $(32 \pm 2)\%$  by  $\alpha_0$ ,  $(58 \pm 2)\%$  via  $\alpha_{1+2}$  (mainly  $\alpha_2$ ) and  $(10 \pm 2)\%$  via  $\alpha_{3+4}$  (mainly  $\alpha_3$ );  $\Gamma_{\alpha_0}/\Gamma = 0.3 \pm 0.02$ , assuming a single state. The state may correspond to a doublet (1979YO04). See also (1983HI06).
- <sup>p</sup> Alpha decay is  $(20 \pm 5)\%$  by  $\alpha_0$ ,  $(57 \pm 7)\%$  by  $\alpha_{1+2}$  and  $(23 \pm 4)\%$  by  $\alpha_{3+4}$  (1983HI06).
- <sup>q</sup> Alpha decay is  $(9 \pm 2)\%$  by  $\alpha_0$ ,  $(79 \pm 2)\%$  via  $\alpha_{1+2}$  (mainly  $\alpha_2$ ) and  $(12 \pm 4)\%$  via  $\alpha_{3+4}$  (mainly  $\alpha_3$ ) (1979YO04);  $(24 \pm 5)\%$  via  $\alpha_0$ ,  $(51 \pm 7)\%$  via  $\alpha_{1+2}$ ,  $(25 \pm 5)\%$  via  $\alpha_{3+4}$  (1983HI06).
- <sup>r</sup>  $\theta_{\alpha_2}^2 = 0.94 \pm 0.14$ ,  $\theta_{\alpha_3}^2 = 4.2 \pm 0.9$  (1983HI06).
- <sup>s</sup> Alpha decay is  $(72 \pm 3)\%$  via  $\alpha_0$ ,  $(20 \pm 3)\%$  via  $\alpha_{1+2}$  (mainly  $\alpha_2$ ) and  $(8 \pm 3)\%$  via  $\alpha_{3+4}$  (mainly  $\alpha_3$ ) (1979YO04);  $(60 \pm 5)\%$  via  $\alpha_0$ ,  $(20 \pm 5)\%$  via  $\alpha_{1+2}$  and  $(20 \pm 5)\%$  via  $\alpha_{3+4}$  (1983HI06).
- <sup>t</sup>  $\theta_{\alpha_2}^2 = 0.048 \pm 0.013$ ,  $\theta_{\alpha_3}^2 = 0.44 \pm 0.12$  (1983HI06).
- <sup>u</sup> Alpha decay is  $(15 \pm 2)\%$  via  $\alpha_0$ ,  $(50 \pm 6)\%$  via  $\alpha_{1+2}$  and  $(35 \pm 7)\%$  via  $\alpha_{3+4}$  (1983HI06). See also (1979YO04).
- <sup>v</sup>  $\theta_{\alpha_2}^2 = 0.071 \pm 0.013$ ,  $\theta_{\alpha_3}^2 = 0.32 \pm 0.08$  [all  $\theta_{\alpha}^2$  assume  $J^\pi = 7^-$ ] (1983HI06).
- <sup>w</sup> Alpha decay is  $(71 \pm 6)\%$  via  $\alpha_0$  and  $(29 \pm 6)\%$  via  $\alpha_{1+2}$  (mainly  $\alpha_2$ ) (1979YO04).
- <sup>x</sup> Alpha decay is  $(1.8 \pm 0.9)\%$  via  $\alpha_0$ ,  $(60 \pm 8)\%$  via  $\alpha_{1+2}$  and  $(26 \pm 4)\%$  via  $\alpha_{3+4}$ . Decay to  $^{12}\text{C}_{g.s.} + ^8\text{Be}_{g.s.}$  is also observed: the branching ratio is  $(12 \pm 1.2)\%$ . This may be a member of an excited 8p-4h ( $K^\pi = 0_6^+$ ) band of which  $^{20}\text{Ne}^*(12.44)$  is the  $0^+$  band head (1983HI06). The results of (1992LA01), however, argue against this identification.
- <sup>y</sup>  $\theta_{\alpha_2}^2 = 0.085 \pm 0.014$ ,  $\theta_{\alpha_3}^2 = 0.24 \pm 0.04$ ,  $\theta^2(^{12}\text{C}) = 1.50 \pm 0.21$  (1983HI06).
- <sup>z</sup> Decay is  $(66 \pm 26)\%$  via  $\alpha_0$ ,  $(14 \pm 7)\%$  via  $\alpha_{1+2}$  and  $(13.2 \pm 2.5)\%$  via  $^{12}\text{C} + ^8\text{Be}$  (1983HI06).
- <sup>aa</sup>  $\theta_{\alpha_2}^2 = 0.016 \pm 0.008$ ,  $\theta^2(^{12}\text{C}) = 0.24 \pm 0.05$  (1983HI06).
- <sup>bb</sup> Decay is  $\leq 14\%$  via  $\alpha_0$ ,  $(25 \pm 15)\%$  via  $\alpha_{1+2}$ ,  $(46 \pm 22)\%$  via  $\alpha_{3+4}$  and  $(4.5 \pm 0.9)\%$  via  $^{12}\text{C} + ^8\text{Be}$  (1983HI06). See also (1979YO04).