

$^{20}\text{Ne}(n,\gamma) E=\text{thermal}$ 

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Full Evaluation	R. B. Firestone	NDS 127, 1 (2015)	15-Jan-2015

EGAF (2007ChZX) and 1986Pr05 thermal neutron capture data have been combined to determine the complete decay scheme for  $^{20}\text{Ne}(n,\gamma)$ . The total neutron cross section determined by this evaluation is 56 mb 3 which is larger than previous values 37 mb 4 (1986Pr05), 45 mb 10 (1968Jo09), and 36.8 mb 45 (1971Be34).

$^{20}\text{Ne}(n,\gamma)$ E(Level)	intensity balance $\sigma(\text{feeding})(b)$	$\sigma(\text{de-exciting})(B)$
0.0	0.056 3	----
350.71	0.0335 6	0.0339 6
2788.71	0.00062 9	0.00061 11
2794.18	0.01415 24	0.014 3
3663.57	0.00019 5	0.00017 3
4684.47	0.00037 6	0.00029 12
4725.35	0.0424 16	0.0420 6
5689.81	0.00756 16	0.0082 3
5992.56	0.00034 5	0.00039 6
6761.11	----	0.0557 16

 $^{21}\text{Ne}$  Levels

E(level)	$J^\pi$	$T_{1/2}$
0.0	$3/2^+$	stable
350.71 4	$5/2^+$	
2788.71 10	$1/2^-$	81 ps 5
2794.18 3	$1/2^+$	
3663.57 7	$3/2^-$	
4684.47 21	$3/2^+$	
4725.35 3	$3/2^-$	
5689.81 4	$1/2^-$	
5992.56 8	$3/2^-$	
6761.11 3		

 $\gamma(^{21}\text{Ne})$ 

I $\gamma$  normalization: Normalized assuming the decay scheme is complete and  $\Sigma\gamma(\text{g.s.})=100$ .

$E_\gamma^\dagger$	$I_\gamma^\ddagger\alpha$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Mult. &	$\delta$	Comments
350.71 4	0.0339 6	350.71	$5/2^+$	0.0	$3/2^+$	(M1+E2)	-0.074 4	I $\gamma$ : From 2007ChZX value adjusted for 6% absorption in the target.
768.53 7	$3.4\times 10^{-4}$ 5	6761.11		5992.56	$3/2^-$	E1		
869.37# 11	$7\times 10^{-6}$ # 3	3663.57	$3/2^-$	2794.18	$1/2^+$			
874.84# 11	$6.2\times 10^{-5}$ # 22	3663.57	$3/2^-$	2788.71	$1/2^-$			
964.44 4	0.00048 6	5689.81	$1/2^-$	4725.35	$3/2^-$			
1071.27 4	0.00756 16	6761.11		5689.81	$1/2^-$	E1		
1890.20# 21	$1.2\times 10^{-5}$ # 5	4684.47	$3/2^+$	2794.18	$1/2^+$			
1931.07 4	0.00966 17	4725.35	$3/2^-$	2794.18	$1/2^+$			
2035.65 3	0.0419 16	6761.11		4725.35	$3/2^-$	E1		I $\gamma$ : Intensity increased by 8% on the basis of intensity balance de-exciting the capture state to the 4725-keV level.

Continued on next page (footnotes at end of table)

$^{20}\text{Ne}(n,\gamma) E=\text{thermal (continued)}$  $\gamma(^{21}\text{Ne})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^{\ddagger a}$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Mult. &	$\delta$	Comments
2076.53 21	$3.7 \times 10^{-4}$ 6	6761.11		4684.47	3/2 <sup>+</sup>	M1		
2437.84 10	0.00054 11	2788.71	1/2 <sup>-</sup>	350.71	5/2 <sup>+</sup>	(M2+E3)	+0.12 3	
2788.51# 10	$7.3 \times 10^{-5}$ # 11	2788.71	1/2 <sup>-</sup>	0.0	3/2 <sup>+</sup>			
2793.98 3	0.014 3	2794.18	1/2 <sup>+</sup>	0.0	3/2 <sup>+</sup>			
2895.41 4	0.00424 17	5689.81	1/2 <sup>-</sup>	2794.18	1/2 <sup>+</sup>			
3097.29 7	$1.9 \times 10^{-4}$ 5	6761.11		3663.57	3/2 <sup>-</sup>	E1		
3312.57@ 8	$1.0 \times 10^{-4}$ @ 3	3663.57	3/2 <sup>-</sup>	350.71	5/2 <sup>+</sup>			
3966.52@ 4	$2.3 \times 10^{-4}$ @ 3	6761.11		2794.18	1/2 <sup>+</sup>	E1		
3971.99 10	0.00056 9	6761.11		2788.71	1/2 <sup>-</sup>	E1		
4333.27 20	$2.6 \times 10^{-4}$ 12	4684.47	3/2 <sup>+</sup>	350.71	5/2 <sup>+</sup>			
4374.14 4	0.0323 6	4725.35	3/2 <sup>-</sup>	350.71	5/2 <sup>+</sup>			
4683.91# 21	$1.6 \times 10^{-5}$ # 6	4684.47	3/2 <sup>+</sup>	0.0	3/2 <sup>+</sup>			
4724.78@ 3	$8.2 \times 10^{-5}$ @ 12	4725.35	3/2 <sup>-</sup>	0.0	3/2 <sup>+</sup>			
5641.04 8		5992.56	3/2 <sup>-</sup>	350.71	5/2 <sup>+</sup>			
5688.98 4	0.00345 22	5689.81	1/2 <sup>-</sup>	0.0	3/2 <sup>+</sup>			
5991.65 8	$3.9 \times 10^{-4}$ 6	5992.56	3/2 <sup>-</sup>	0.0	3/2 <sup>+</sup>			
6409.34@ 4	$2.9 \times 10^{-4}$ @ 4	6761.11		350.71	5/2 <sup>+</sup>	E2		
6759.94 3	0.00424 22	6761.11		0.0	3/2 <sup>+</sup>	M1		

$I_\gamma$ : Expected transition from Adopted Levels, Gammas with 54 % 5 of 5992 $\gamma$  intensity is inconsistent with intensity balance.

<sup>†</sup> Average of 2007ChZX and 1986Pr05 data. Energies least-squares fit to the level scheme.

<sup>‡</sup> Ne thermal neutron capture  $\gamma$ -ray cross sections (b). The relative elemental intensity of the 4374-keV  $\gamma$ -ray in  $^{21}\text{Ne}$  is normalized  $^{22}\text{Ne}$  isotopic cross sections for the 1017-keV (38.6 mb 3), 1980-keV (39.3 mb 3) and 2204-keV (32.3 mb 3)  $\gamma$ -rays in  $^{23}\text{Ne}$  (2009BeZQ) after correction for isotopic abundances. The weighted average  $\gamma$ -ray cross section  $\sigma(4374)=32.3$  mb 8.

# Transition expected from Adopted Levels, Gammas.

@ From 1986Pr05.

& For primary  $\gamma$ -rays from initial and final level  $J^\pi$  values.

<sup>a</sup> For intensity per 100 neutron captures, multiply by 1785.7.

