

Table 3 from (1998TI06): Electromagnetic transitions in $A = 20$ nuclei ^a

Nucleus	$E_{x_i} \rightarrow E_{x_f}$ (MeV)	$J_i^\pi \rightarrow J_f^\pi$ ^b	Γ_γ (eV)	Mult.	S (W.u.)
²⁰ O ^c	1.67 \rightarrow 0	2 ⁺ \rightarrow 0 ⁺	$(6.28 \pm 0.24) \times 10^{-5}$	E2	1.80 \pm 0.07
²⁰ F ^d	0.656 \rightarrow 0	3 ⁺ \rightarrow 2 ⁺	$(1.50 \pm 0.10) \times 10^{-3}$	M1	0.252 \pm 0.017
	0.823 \rightarrow 0	4 ⁺ \rightarrow 2 ⁺	$(2.77 \pm 0.29) \times 10^{-6}$	E2	2.76 \pm 0.29
	\rightarrow 0.656	\rightarrow 3 ⁺	$(5.57 \pm 0.47) \times 10^{-6}$	M1	$(5.72 \pm 0.48) \times 10^{-2}$
	0.984 \rightarrow 0	1 ⁻ \rightarrow 2 ⁺	$(3.36 \pm 0.15) \times 10^{-4}$	E1	$(7.04 \pm 0.32) \times 10^{-4}$
	1.057 \rightarrow 0	1 ⁺ \rightarrow 2 ⁺	$(8.9 \pm 1.9) \times 10^{-2}$	M1	3.59 \pm 0.78
	1.309 \rightarrow 0	2 ⁻ \rightarrow 2 ⁺	$(3.23 \pm 0.16) \times 10^{-4}$	E1	$(2.87 \pm 0.14) \times 10^{-4}$
	\rightarrow 0.656	\rightarrow 3 ⁺	$(8.5 \pm 1.5) \times 10^{-6}$	E1	$(6.1 \pm 1.1) \times 10^{-5}$
	\rightarrow 0.984	\rightarrow 1 ⁻	$(1.72 \pm 0.16) \times 10^{-5}$	M1	$(2.38 \pm 0.23) \times 10^{-2}$
	\rightarrow 1.057	\rightarrow 1 ⁺	$(3.5 \pm 1.1) \times 10^{-6}$	E1	$(4.4 \pm 1.4) \times 10^{-4}$
	1.844 \rightarrow 0	2 ⁻ \rightarrow 2 ⁺	$(9.11 \pm 0.69) \times 10^{-3}$	E1	$(2.90 \pm 0.22) \times 10^{-3}$
	\rightarrow 0.656	\rightarrow 3 ⁺	$(6.68 \pm 0.71) \times 10^{-4}$	E1	$(7.96 \pm 0.85) \times 10^{-4}$
	\rightarrow 1.309	\rightarrow 2 ⁻	$(1.89 \pm 0.33) \times 10^{-4}$	M1	$(5.9 \pm 1.1) \times 10^{-2}$
	1.971 \rightarrow 0	(3 ⁻) ^e \rightarrow 2 ⁺	$(1.91 \pm 0.34) \times 10^{-4}$	E1	$(4.98 \pm 0.88) \times 10^{-5}$
	\rightarrow 0.823	\rightarrow 4 ⁺	$(5.60 \pm 0.88) \times 10^{-4}$	E1	$(7.4 \pm 1.2) \times 10^{-4}$
	\rightarrow 0.984	\rightarrow 1 ⁻	$(8.6 \pm 4.5) \times 10^{-6}$	E2	3.5 \pm 1.8
	\rightarrow 1.309	\rightarrow 2 ⁻	$(3.20 \pm 0.57) \times 10^{-4}$	M1	$(5.27 \pm 0.94) \times 10^{-2}$
	2.044 \rightarrow 0	2 ⁺ \rightarrow 2 ⁺	$(1.27 \pm 0.25) \times 10^{-2}$	M1	$(7.1 \pm 1.4) \times 10^{-2}$
	\rightarrow 0.656	\rightarrow 3 ⁺	0.155 \pm 0.028	M1	2.76 \pm 0.50
	\rightarrow 1.309	\rightarrow 2 ⁻	$(1.18 \pm 0.55) \times 10^{-3}$	E1	$(5.94 \pm 2.76) \times 10^{-3}$
	2.194 \rightarrow 0	3 ⁺ \rightarrow 2 ⁺	$(7.6 \pm 2.3) \times 10^{-2}$	M1	0.34 \pm 0.10
	\rightarrow 0.823	\rightarrow 4 ⁺	$(8.2 \pm 2.4) \times 10^{-2}$	M1	1.52 \pm 0.45
	\rightarrow 1.309	\rightarrow 2 ⁻	$(2.9 \pm 1.1) \times 10^{-3}$	E1	$(8.3 \pm 3.1) \times 10^{-3}$
	2.865 \rightarrow 0	(3 ⁻) ^e \rightarrow 2 ⁺	$(8.7 \pm 2.0) \times 10^{-3}$	E1	$(7.3 \pm 1.7) \times 10^{-4}$
	\rightarrow 0.656	\rightarrow 3 ⁺	$(1.09 \pm 0.57) \times 10^{-3}$	E1	$(2.0 \pm 1.1) \times 10^{-4}$
	\rightarrow 0.823	\rightarrow 4 ⁺	$(2.7 \pm 1.1) \times 10^{-3}$	E1	$(6.3 \pm 2.6) \times 10^{-4}$
	\rightarrow 1.309	\rightarrow 2 ⁻	$(2.70 \pm 0.70) \times 10^{-3}$	M1	$(3.42 \pm 0.88) \times 10^{-2}$
	\rightarrow 1.844	\rightarrow 2 ⁻	$(1.61 \pm 0.59) \times 10^{-3}$	M1	$(7.2 \pm 2.7) \times 10^{-2}$
	\rightarrow 1.971	\rightarrow (3 ⁻)	$(1.61 \pm 0.59) \times 10^{-3}$	M1	0.107 \pm 0.039
	\rightarrow 2.044	\rightarrow 2 ⁺	$(2.7 \pm 1.1) \times 10^{-3}$	E1	$(9.75 \pm 3.92) \times 10^{-3}$

Table 3 from (1998TI06): Electromagnetic transitions in $A = 20$ nuclei ^a (continued)

Nucleus	$E_{x_i} \rightarrow E_{x_f}$ (MeV)	$J_i^\pi \rightarrow J_f^\pi$ ^b	Γ_γ (eV)	Mult.	S (W.u.)
²⁰ Ne ^f	$\rightarrow 2.194$	$\rightarrow 3^+$	$(1.61 \pm 0.59) \times 10^{-3}$	E1	$(1.07 \pm 0.39) \times 10^{-2}$
	2.966 $\rightarrow 0$	$3^+ \rightarrow 2^+$	$(3.43 \pm 0.75) \times 10^{-2}$	M1	$(6.3 \pm 1.4) \times 10^{-2}$
	$\rightarrow 0.656$	$\rightarrow 3^+$	$(1.54 \pm 0.36) \times 10^{-2}$	M1	$(6.0 \pm 1.4) \times 10^{-2}$
	$\rightarrow 0.823$	$\rightarrow 4^+$	$(7.4 \pm 1.6) \times 10^{-2}$	M1	0.357 ± 0.076
	$\rightarrow 2.194$	$\rightarrow 3^+$	$(3.0 \pm 1.0) \times 10^{-3}$	M1	0.32 ± 0.11
	3.488 $\rightarrow 0$	$1^+ \rightarrow 2^+$	$(4.08 \pm 0.28) \times 10^{-2}$	M1	$(4.58 \pm 0.32) \times 10^{-2}$
	$\rightarrow 0.984$	$\rightarrow 1^-$	$(2.14 \pm 0.31) \times 10^{-3}$	E1	$(2.71 \pm 0.39) \times 10^{-4}$
	$\rightarrow 1.057$	$\rightarrow 1^+$	$(4.0 \pm 1.7) \times 10^{-3}$	M1	$(1.32 \pm 0.55) \times 10^{-2}$
	$\rightarrow 1.309$	$\rightarrow 2^-$	$(5.18 \pm 0.50) \times 10^{-3}$	E1	$(9.98 \pm 0.97) \times 10^{-4}$
	$\rightarrow 1.844$	$\rightarrow 2^-$	$(4.16 \pm 0.47) \times 10^{-3}$	E1	$(1.87 \pm 0.21) \times 10^{-3}$
	3.526 $\rightarrow 1.057$	$(0^+)^e \rightarrow 1^+$	0.120 ± 0.013	M1	0.378 ± 0.042
	6.63 $\rightarrow 0$	$2^- \rightarrow 2^+$	$(2.8 \pm 0.9) \times 10^{-2}$	E1	$(1.9 \pm 0.6) \times 10^{-4}$
	$\rightarrow 0.656$	$\rightarrow 3^+$	$(8.4 \pm 2.3) \times 10^{-2}$	E1	$(7.9 \pm 2.2) \times 10^{-4}$
	$\rightarrow 1.309$	$\rightarrow 2^-$	0.43 ± 0.09	M1	0.14 ± 0.03
	$\rightarrow 1.844$	$\rightarrow 2^-$	0.11 ± 0.04	M1	$(4.8 \pm 1.7) \times 10^{-2}$
	$\rightarrow 1.971$	$\rightarrow (3^-)^e$	0.64 ± 0.15	M1	0.30 ± 0.07
	$\rightarrow 2.044$	$\rightarrow 2^+$	$(2.1 \pm 1.5) \times 10^{-2}$	E1	$(4.4 \pm 3.1) \times 10^{-4}$
	$\rightarrow 3.488$	$\rightarrow 1^+$	$(4.2 \pm 1.6) \times 10^{-2}$	E1	$(2.7 \pm 1.0) \times 10^{-3}$
	$\rightarrow 4.082$	$\rightarrow (1^+)^e$	$(3.5 \pm 1.6) \times 10^{-2}$	E1	$(4.2 \pm 1.9) \times 10^{-3}$
	6.65 $\rightarrow 0.984$	$1^- \rightarrow 1^-$	0.29 ± 0.08	M1	$(7.6 \pm 2.1) \times 10^{-2}$
	$\rightarrow 1.057$	$\rightarrow 1^+$	0.14 ± 0.07	E1	$(1.6 \pm 0.8) \times 10^{-3}$
	$\rightarrow 2.044$	$\rightarrow 2^+$	0.94 ± 0.20	E1	$(1.9 \pm 0.4) \times 10^{-2}$
	$\rightarrow 3.488$	$\rightarrow 1^+$	0.22 ± 0.09	E1	$(1.4 \pm 0.6) \times 10^{-2}$
	1.63 $\rightarrow 0$	$2^+ \rightarrow 0^+$	$(6.3 \pm 0.3) \times 10^{-4}$	E2	20.3 ± 1.0
	4.25 $\rightarrow 1.63$	$4^+ \rightarrow 2^+$	$(7.1 \pm 0.7) \times 10^{-3}$	E2	22 ± 2
	4.97 $\rightarrow 0$	$2^- \rightarrow 0^+$	$(8.2 \pm 2.8) \times 10^{-7}$	M2	$(2.5 \pm 0.8) \times 10^{-3}$
	$\rightarrow 1.63$	$2^- \rightarrow 2^+$	$(1.36 \pm 0.14) \times 10^{-4}$	E1	$(7.3 \pm 0.8) \times 10^{-6}$
			$(7.9 \pm 2.0) \times 10^{-7}$	M2	$(1.7 \pm 0.4) \times 10^{-2}$
			$(2.5 \pm 1.0) \times 10^{-7}$	E3	6 ± 2
	5.62 $\rightarrow 0$	$3^- \rightarrow 0^+$	$(1.8 \pm 0.6) \times 10^{-5}$	E3	11 ± 4

Table 3 from (1998TI06): Electromagnetic transitions in $A = 20$ nuclei ^a (continued)

Nucleus	$E_{x_i} \rightarrow E_{x_f}$ (MeV)	$J_i^\pi \rightarrow J_f^\pi$ ^b	Γ_γ (eV)	Mult.	S (W.u.)
	$\rightarrow 1.63$	$\rightarrow 2^+$	$(2.1 \pm 0.6) \times 10^{-4}$	E1	$(6.6 \pm 1.9) \times 10^{-6}$
	$\rightarrow 4.97$	$\rightarrow 2^-$	$(1.2 \pm 0.5) \times 10^{-5}$	M1	$(2.0 \pm 0.9) \times 10^{-3}$
	5.79 $\rightarrow 0$	$1^- \rightarrow 0^+$	$(8.0 \pm 0.3) \times 10^{-4}$	E1	$(8.3 \pm 0.3) \times 10^{-6}$
	$\rightarrow 1.63$	$\rightarrow 2^+$	$(3.8 \pm 0.8) \times 10^{-3}$	E1	$(1.1 \pm 0.2) \times 10^{-4}$
	6.72 $\rightarrow 1.63$	$0^+ \rightarrow 2^+$	3.3×10^{-2}	E2	3.6
	7.004 $\rightarrow 1.634$	$4^- \rightarrow 2^+$	$(7.5 \pm 3.4) \times 10^{-6}$	M2	$(1.52 \pm 0.68) \times 10^{-2}$
	$\rightarrow 4.248$	$\rightarrow 4^+$	$(1.94 \pm 0.40) \times 10^{-4}$	E1	$(1.85 \pm 0.38) \times 10^{-5}$
	$\rightarrow 4.967$	$\rightarrow 2^-$	$(9.7 \pm 2.0) \times 10^{-4}$	E2	10.3 ± 2.1
	$\rightarrow 5.621$	$\rightarrow 3^-$	$(3.29 \pm 0.67) \times 10^{-4}$	M1	$(5.9 \pm 1.2) \times 10^{-3}$
	7.16 $\rightarrow 4.25$	$3^- \rightarrow 4^+$	$(9.7 \pm 1.1) \times 10^{-4}$	E1	$(7.9 \pm 0.9) \times 10^{-5}$
	$\rightarrow 5.79$	$\rightarrow 1^-$	$(6.4 \pm 1.0) \times 10^{-4}$	E2	50 ± 8
	7.19 $\rightarrow 1.63$	$0^+ \rightarrow 2^+$	$(4.4 \pm 0.8) \times 10^{-3}$	E2	0.31 ± 0.06
	7.42 $\rightarrow 1.63$	$2^+ \rightarrow 2^+$	$(4.1 \pm 1.3) \times 10^{-4}$	M1	$(1.0 \pm 0.3) \times 10^{-4}$
			$(2.9 \pm 0.4) \times 10^{-2}$	E2	1.7 ± 0.2
	7.83 $\rightarrow 0$	$2^+ \rightarrow 0^+$	$(5.7 \pm 0.7) \times 10^{-2}$	E2	0.73 ± 0.09
	$\rightarrow 1.63$	$\rightarrow 2^+$	$(1.2 \pm 0.2) \times 10^{-2}$	M1	$(2.3 \pm 0.3) \times 10^{-3}$
	8.45 $\rightarrow 5.62$	$5^- \rightarrow 3^-$	$(1.3 \pm 0.3) \times 10^{-2}$	E2	27 ± 6
	8.71 $\rightarrow 0$	$1^- \rightarrow 0^+$	$(6.1 \pm 1.6) \times 10^{-2}$	E1	$(1.9 \pm 0.5) \times 10^{-4}$
	$\rightarrow 1.63$	$\rightarrow 2^+$	$(9 \pm 6) \times 10^{-3}$	E1	$(5 \pm 3) \times 10^{-5}$
	8.78 $\rightarrow 4.25$	$6^+ \rightarrow 4^+$	0.100 ± 0.015	E2	20 ± 3
	9.03 $\rightarrow 1.63$	$4^+ \rightarrow 2^+$	0.340 ± 0.042	E2	5.8 ± 0.7
	9.12 $\rightarrow 1.63$	$3^- \rightarrow 2^+$	$(1.3 \pm 0.2) \times 10^{-2}$	E1	$(6.2 \pm 1.0) \times 10^{-5}$
	$\rightarrow 4.97$	$\rightarrow 2^-$	$(8.6 \pm 1.7) \times 10^{-3}$	M1	$(5.8 \pm 1.1) \times 10^{-3}$
	$\rightarrow 5.62$	$\rightarrow 3^-$	$(4.4 \pm 1.1) \times 10^{-3}$	M1	$(4.9 \pm 1.2) \times 10^{-3}$
	9.49 $\rightarrow 1.63$	$2^+ \rightarrow 2^+$	0.26 ± 0.10	M1	$(2.5 \pm 1.0) \times 10^{-2}$
	9.99 $\rightarrow 1.63$	$4^+ \rightarrow 2^+$	0.90 ± 0.40	E2	8.3 ± 3.7
	10.27 $\rightarrow 0$	$2^+; 1 \rightarrow 0^+$	$(2.9 \pm 0.8) \times 10^{-2}$	E2	$(9.5 \pm 2.6) \times 10^{-2}$
	$\rightarrow 1.63$	$\rightarrow 2^+$	4.08 ± 0.44	M1	0.30 ± 0.03
	$\rightarrow 4.97$	$\rightarrow 2^-$	$(6.0 \pm 0.8) \times 10^{-2}$	E1	$(8.0 \pm 1.1) \times 10^{-4}$
	$\rightarrow 5.62$	$\rightarrow 3^-$	$(9.7 \pm 1.4) \times 10^{-2}$	E1	$(1.9 \pm 0.3) \times 10^{-3}$

Table 3 from (1998TI06): Electromagnetic transitions in $A = 20$ nuclei ^a (continued)

Nucleus	$E_{x_i} \rightarrow E_{x_f}$ (MeV)	$J_i^\pi \rightarrow J_f^\pi$ ^b	Γ_γ (eV)	Mult.	S (W.u.)
	$\rightarrow 7.42$	$\rightarrow 2^+$	0.31 ± 0.04	M1	0.64 ± 0.08
	$\rightarrow 7.83$	$\rightarrow 2^+$	$(8.0 \pm 2.0) \times 10^{-3}$	M1	$(2.6 \pm 0.7) \times 10^{-2}$
	10.61 \rightarrow 7.00	$6^- \rightarrow 4^-$	$(2.7 \pm 0.9) \times 10^{-2}$	E2	17 ± 6
	$\rightarrow 8.45$	$\rightarrow 5^-$	$(1.3 \pm 0.6) \times 10^{-3}$	M1	$(6.1 \pm 2.8) \times 10^{-3}$
	11.09 \rightarrow 1.63	$4^+; 1 \rightarrow 2^+$	$(2.0 \pm 1.0) \times 10^{-3}$	E2	$(1.0 \pm 0.5) \times 10^{-2}$
	$\rightarrow 4.25$	$\rightarrow 4^+$	0.338 ± 0.040	M1	$(5.0 \pm 0.6) \times 10^{-2}$
	11.26 \rightarrow 0	$1^+; 1 \rightarrow 0^+$	11.2 ± 2.0	M1	0.37 ± 0.07
	$\rightarrow 1.63$	$\rightarrow 2^+$	2.1 ± 0.7	M1	0.11 ± 0.04
	11.27 \rightarrow 0	$1^-; 1 \rightarrow 0^+$	0.390 ± 0.047	E1	$(5.4 \pm 0.7) \times 10^{-4}$
	$\rightarrow 1.63$	$\rightarrow 2^+$	$(1.8 \pm 0.7) \times 10^{-2}$	E1	$(4.0 \pm 1.6) \times 10^{-5}$
	$\rightarrow 4.97$	$\rightarrow 2^-$	$(4.6 \pm 0.9) \times 10^{-2}$	M1	$(8.8 \pm 1.7) \times 10^{-3}$
	$\rightarrow 8.85$	$\rightarrow 1^-$	0.189 ± 0.024	M1	0.63 ± 0.08
	$\rightarrow 9.32$	$\rightarrow (2^-)^e$	$(6.3 \pm 1.0) \times 10^{-2}$	M1	0.40 ± 0.06
	11.93 \rightarrow 1.63	$4^+ \rightarrow 2^+$	$(5.5 \pm 3.0) \times 10^{-3}$	E2	$(1.8 \pm 1.0) \times 10^{-2}$
	$\rightarrow 4.25$	$\rightarrow 4^+$	$(2.05 \pm 0.55) \times 10^{-2}$	M1	$(2.2 \pm 0.6) \times 10^{-3}$
	11.95 \rightarrow 8.78	$8^+ \rightarrow 6^+$	$(7.7 \pm 1.1) \times 10^{-3}$	E2	9.0 ± 1.3
	12.40 \rightarrow 1.63	$3^-; (1) \rightarrow 2^+$	8×10^{-2}	E1	1.3×10^{-4}
	$\rightarrow 4.25$	$\rightarrow 4^+$	0.2	E1	7.4×10^{-4}
	12.43 \rightarrow 1.63	$0^+ \rightarrow 2^+$	0.17 ± 0.05	E2	0.43 ± 0.13
	18.43 \rightarrow 12.22	$2^+; 2 \rightarrow 2^+; 1$	0.3	M1	6×10^{-2}

^a See also (1979EN05). The last columns give the γ -ray strengths, S , [see (1979EN05)] expressed in Weisskopf units (see D.H. Wilkinson, in *Nuclear Spectroscopy Part B*, ed. F. Ajzenberg-Selove (Academic Press, NY, 1960)). The Weisskopf estimates (Γ_w in eV, E_γ in MeV) are:

$$\begin{aligned}\Gamma_w(\text{E1}) &= 6.8 \times 10^{-2} A^{2/3} E_\gamma^3, & \Gamma_w(\text{E2}) &= 4.9 \times 10^{-8} A^{4/3} E_\gamma^5, \\ \Gamma_w(\text{E3}) &= 2.3 \times 10^{-14} A^2 E_\gamma^7, & \Gamma_w(\text{E4}) &= 6.8 \times 10^{-21} A^{8/3} E_\gamma^9, \\ \Gamma_w(\text{M1}) &= 2.1 \times 10^{-2} E_\gamma^3, & \Gamma_w(\text{M2}) &= 1.5 \times 10^{-8} A^{2/3} E_\gamma^5.\end{aligned}$$

The values for these γ -ray strengths are occasionally different from those listed in other tables of this paper because different values of r_0 were used. In this table $r_0 = 1.2$ fm is used consistently. The multipolarities in the next to the last column were used to calculate Γ_w .

^b T shown in usual convention [$J^\pi; T$] only if transitions from the initial state involve a change in T .

^c See also [Table 20.2](#).

^d See also [Tables 20.5](#), [20.6](#), [20.9](#) and [20.10](#).

^e Assuming this J^π .

^f See also [Tables 20.17](#) and [20.18](#).