

Table 16.18 from (1982AJ01): Levels of  $^{16}\text{O}$  from  $^{15}\text{N}(p, \gamma)$ ,  $^{15}\text{N}(p, p)$  and  $^{15}\text{N}(p, \alpha)$ 

No.	$E_p$ (keV)	$\Gamma_{\gamma_0}^a$ (eV)	$\Gamma_{\gamma_1}^a$ (eV)	$\Gamma_p^a$ (keV)	$\Gamma_p \Gamma_{\gamma} / \Gamma$ (eV)	$\Gamma_{\alpha_0}^a$ (keV)	$\Gamma_{\alpha_1}^a$ (keV)	$\Gamma_{\text{lab}}$ (keV)	$J^\pi; T$	$E_x$ (MeV $\pm$ keV)	Refs. <sup>b</sup>
1	338	$12 \pm 2$	$0.12 \pm 0.04$	1.2		95	0.025	96	$1^-; 0$	12.444	
2	$429 \pm 1$	$(21 \pm 6) \times 10^{-3}$	$2.1 \pm 2$	0.02		nr	0.90	0.9	$2^-; 0$	12.530	
3	$710 \pm 7$			40		nr		$40 \pm 4$	$0^-; 1$	12.793	
4	$897.37 \pm 0.29$	$(78 \pm 16) \times 10^{-3}$		1.2		nr	$0.69 \pm 0.07$	$2.0 \pm 0.2$	$2^-; 1$	12.9685	(1977BR32)
5	$1028 \pm 10$	$32 \pm 5$		100		40	r	$140 \pm 10$	$1^-; 1$	13.091	(1977BR32)
6	$1050 \pm 150$					$\Gamma_p \Gamma_{\alpha_0} = 500 \text{ keV}^2$			$2^+$	13.1	(1977BR32)
7	$1210 \pm 3$			4.1		r	$8.2 \pm 1.1$	$22.5 \pm 1$	$3^-; 1$	13.261	(1977BR32)
8	$1640 \pm 3$	$\approx 8.5$		10		nr	$59 \pm 6$	$68 \pm 3$	$1^+; 0$	13.664	
9	$1890 \pm 20$			0.5		r	(r)	$90 \pm 2$		13.90	
10	$1979 \pm 3$			r		nr	r	$23 \pm 2$	$2^-$	13.982	
11	$2977 \pm 10$			33		1.5	30	$69 \pm 10$	$2^+$	$14.917 \pm 5^c$	(1977JA11, 1978FR04)
12	$3170^j$			$12^d$		152	163	$327 \pm 100$	$0^+$	$15.10 \pm 50$	(1978FR04)
13	$3260^j$			48		nr	7	$62 \pm 10$	$2^-$	$15.188 \pm 30^c$	(1978FR04)
14	$3340^j$			$15^d$		12	182	$315 \pm 100$	$2^+; (0)$	$15.26 \pm 20^c$	(1978FR04)
15	$3520 \pm 40$			23		103	1	$167 \pm 20$	$3^-$	$15.43^c$	(1977JA11, 1978FR04)
16	$4380 \pm 20$	3.6	r	16	$2.65 \pm 0.22$			$19 \pm 3$	$1^+; 1$	16.23	(1979SN01, 1980IK1A)
17	$4620 \pm 20$			r		(r)	r			16.46	(1977JA11)
18	$5010 \pm 20$			r		nr	r	$75 \pm 10$	$3^+$	16.82	(1977JA11)
19	5200	r						$\approx 1500$	$1^-; 1$	17.0	
20	$5350 \pm 20$	6.5	r	26	$3.75 \pm 0.50$			$38 \pm 5$	$1^+; 1$	17.14	(1979SN01, 1980IK1A)
21	$5490 \pm 20$	67	o	45				$\approx 110$	$1^-; 1$	17.27	
22	$6290 \pm 20$	nr	$5 \pm 2 [4 \pm 2^e]$	$\leq 15^f$				$\leq 40$	$3^-; 1$	18.02	(1977CH19, 1980IK1A)
23	$7310 \pm 20$		$\leq 2^{e,o}$	$\leq 40^f$				$\leq 40$	$4^-; 1$	18.98	(1977CH19, 1980IK1A)
24	$7330 \pm 30$	38		$\leq 130$	$\geq 1.8 \pm 0.3$			$\approx 260$	$1^+$	18.99	(1979SN01)
25	7420	r		$\approx 30$				$\approx 130$	$2^+; (1)$	19.08	
26	$7600 \pm 30$	nr	$1.5^h$					100	$(2, 3; 1)$	19.25	
27	$7840 \pm 30$	59		(r)				350	$1^-; 1$	19.47	
28	$8290 \pm 20$	nr	$17 \pm 6^e$	$25 \pm 10^f$				$80 \pm 30$	3	19.89	(1977CH19)
29	$8860 \pm 30$	nr	$120 \pm 45^e$	$86^f$				$200 \pm 40$	$2^-; 1$	20.43 <sup>g</sup>	(1977CH19)
30	8990			i				160		20.55	
31	$9410^j$	170			$21 \pm 1$			$320 \pm 10$	$1^-; 1$	$20.945 \pm 20$	(1978OC01, 1977CA21)
32	$10000^j$			k				130	$1 \rightarrow 4$	21.50	
33	$10180^j$			l			r	$< 45$	$T = 0$	21.66	
34	$10700^{j,m}$	r		k	$488 \pm 20$			$730 \pm 10$	$1^-; 1$	$22.150 \pm 10$	(1978OC01)
35	$11490^j$	120	$27^h$	k	$69 \pm 5$			$320 \pm 10$	$1^-; 1$	$22.89 \pm 10$	(1978OC01)
36	$12740^j$	r			$130 \pm 13$			$590 \pm 40$	$1^-; 1$	$24.07 \pm 30$	(1978OC01)
37	$13490 \pm 60$		$230 \pm 90$ , or $130 \pm 50^e$	$85^f$				$360 \pm 60$	$(2, 4)^+; 1$	24.76	(1977CH19)
38	$13870^j$	r			$651 \pm 117$			$3150 \pm 320$	$1^-; 1$	$25.12 \pm 60$	(1978OC01)
39	$15250 \pm 80$		$740 \pm 240$ , or $410 \pm 140^e$	$122^f$				$565 \pm 85^n$	$(2, 4)^+; 1$	26.41	(1977CH19)
40	$16250 \pm 100$		$1070 \pm 380$ , or $590 \pm 10^e$	$206^f$				$880 \pm 125$	$(2, 4)^+; 1$	27.35	(1977CH19)

<sup>a</sup> nr = non-resonant; r = resonant.

<sup>b</sup> For earlier references see [Tables 16.21 in \(1971AJ02\)](#) and [16.19 in \(1977AJ02\)](#).

<sup>c</sup> The values for  $\Gamma_x$ ,  $\Gamma$ ,  $J^\pi$  and  $E_x$  are from a multilevel  $R$ -matrix analysis of  $p_0$ ,  $\alpha_0$  and  $\alpha_1$  excitation curves ([1978FR04](#)); in addition to these states, others at  $E_x = 14.0 [0^+]$  (fixed), 14.6 [ $1^-$ ] and 16.2 MeV [ $1^+$ ],  $\Gamma = 0.44$ , 0.68 and 1.23 MeV were included in the analysis.

<sup>d</sup> Not observed in  $p_0$  channel.

<sup>e</sup>  $\Gamma_{\gamma_2}$  (eV) ([1977CH19](#)).

<sup>f</sup>  $\Gamma_{p_0}$  based on  $\Gamma_{c.m.}$  and values of  $\Gamma_{p_0}/\Gamma$  assumed by ([1977CH19](#)).

<sup>g</sup> This state is attributed to the giant M2 resonance based on  $^{16}\text{O}^*(6.13) [J^\pi = 3^-]$  ([1977CH19](#)).

<sup>h</sup>  $\gamma_1 + \gamma_2$ .

<sup>i</sup> Resonant in  $p_2$  ([1971DR06](#)).

<sup>j</sup> Nominal  $E_p$  calculated from  $E_x$ .

<sup>k</sup> Resonant in  $p_1$  ([1971DR06](#)).

<sup>l</sup> Resonant in  $p_0, p_1, p_6$  ([1971DR06](#)).

<sup>m</sup>  $\sigma = 12.9$  mb at peak of GDR ([1978OC01](#)).

<sup>n</sup> Average of values obtained in this experiment and in  $^{12}\text{C}(\alpha, \gamma_2)$  ([1977CH19](#)).

<sup>o</sup> Resonant in  $\gamma_2$ .

<sup>p</sup> Apparent resonance in yield of  $(p, \alpha\gamma_{15,1})$  ([1978OC01](#)).