Energy Levels of Light Nuclei
$A = 16$

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Abstract: An evaluation of $A = 16$–17 was published in *Nuclear Physics A*281 (1977), p. 1. This version of $A = 16$ differs from the published version in that we have corrected some errors discovered after the article went to press. Figures and introductory tables have been omitted from this manuscript. Reference key numbers have been changed to the NNDC/TUNL format.

(References closed November 1, 1976)

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^{16}Be

(Not illustrated)

This nucleus has not been observed. Its atomic mass excess is calculated to be 59.22 MeV. It is then unstable with respect to breakup into ^{14}Be + 2n by 2.4 MeV (1974TH01). See also (1973TA30, 1975BE31; theor.).

^{16}B

(Not illustrated)

This nucleus has not been observed in the 4.8 GeV proton bombardment of a uranium target: it is particle unstable (1974BO05). Its mass excess is predicted to be 37.97 MeV: it would then be unstable with respect to decay into ^{15}B + n by 1.1 MeV, assuming the ^{15}B mass excess is 28.8 MeV [both mass excesses calculated using the transverse form of the mass equation] (1974TH01, 1975JE02). See also (1973BO30), (1972TH13) and (1975BE31; theor.).

^{16}C

(Figs. 1 and 5)

GENERAL: (See also (1971AJ02).):

Experimental work: (1971AR02, 1973KO1D).

Reviews: (1972CE1A, 1973TO16, 1974TH01).

Theory: (1971ST40, 1973RE17, 1973WI15, 1975BE31, 1976BE1G).

1. ^{16}C(β^-)^{16}N $\qquad Q_\mathrm{m} = 8.011$

The half-life of ^{16}C is 0.747 ± 0.008 sec: it decays to ^{16}N*(3.36, 4.32) [both $J^\pi = 1^+$] with branchings of 84% and 16% respectively [log $ft = 3.55$, 3.83]; see Table 16.2 (1976AL02). See also (1976FI03).

2. ^{11}B(^{7}Li, 2p)^{16}C $\qquad Q_\mathrm{m} = -4.695$

See (1976AL02).

Table 16.1: Energy levels of ^{16}C

E_x (MeV $\pm$ keV)	$J^\pi; T$	$\tau_{1/2}$ (sec)	Decay	Reactions
0	$0^+; 2$	0.747 ± 0.008	β^-	1, 2, 3, 4
1.753 ± 12	(2^+)			3

Table 16.2: The β^- decay of ^{16}C [a]

Decay to ^{16}N* (MeV)	J^π	Branch (%)	log ft
0.120	0^-	< 0.5 [b]	> 6.85
0.297	3^-	< 0.5 [b]	> 6.83
0.398	1^-	< 0.7 [b]	> 6.64
3.36	1^+	84.4 ± 1.7	3.551 ± 0.012
4.32	1^+	15.6 ± 1.7	3.83 ± 0.05

[a] (1976AL02).

[b] The combined branching to ^{16}N*(0.120, 0.297, 0.398) is $<$ 1.2% (1976AL02).

3. ^{14}C(t, p)^{16}C $\qquad Q_m = -3.012$

At $E_t = 12$ MeV proton groups have been observed to the ground state and to an excited state at 1.753 ± 0.012 MeV: $L = 0$ and 2 (1964MI05).

4. ^{14}C(^{18}O, ^{16}O)^{16}C $\qquad Q_m = -6.719$

See (1972EY01, 1976AL02).

^{16}N

(Figs. 2 and 5)

GENERAL: (See also (1971AJ02).):

Model calculations: (1971AR1R, 1973RE17, 1973SI1G, 1975RA1T).

Reactions involving muons: (1971GR1U, 1971LA17, 1973JO17, 1973KA30, 1973NA28, 1975FU1F, 1975PA01).

Table 16.3: Energy levels of ^{16}N

E_x (MeV $\pm$ keV)	$J^\pi; T$	τ or $\Gamma_{c.m.}$ (keV)	Decay	Reactions
0	$2^-; 1$	$\tau_{1/2} = 7.13 \pm 0.02$ sec	β^-	1, 15, 16, 17, 18, 22, 26, 28, 29, 31, 33
0.1201 ± 0.5	0^-	$\tau_m = 7.58 \pm 0.09$ μsec	γ, β^-	1, 15, 17, 22, 28, 31, 33
0.2970 ± 0.7	3^-	[a]	γ	5, 15, 16, 17, 22, 28, 29, 31, 33
0.3975 ± 0.7	1^-	$\tau_m = 6.5 \pm 0.5$ psec	γ	5, 15, 17, 22, 28, 31, 33
		$\|g\| = 1.83 \pm 0.13$		
3.355 ± 5	1^+	$\Gamma = 15 \pm 5$	n	3, 15, 17, 19, 22, 31
3.519 ± 5	(2^+)	3	n	3, 15, 17, 19, 22, 29, 31
3.960 ± 5	$(3)^+$	≤ 2	n	3, 15, 16, 17, 19, 22, 31
4.319 ± 5	1^+	20 ± 5	n	3, 15, 17, 19, 22, 31
4.387 ± 6	1^-	82 ± 20	n	3, 15, 17, 19, 22, 31
4.76 ± 50	1^-	250 ± 50	n	17, 19, 22
4.776 ± 10	2^+	59 ± 8	n	15, 17, 19, 22, 31
(4.90 ± 10)				22
5.050 ± 6	2^-	19 ± 6	n	15, 17, 19, 22, 31
5.130 ± 7	≥ 2	$\leq 7 \pm 4$	n	15, 17, 19, 22, 29, 31
5.150 ± 7	$(2, 3)^-$	$\leq 7 \pm 4$	n	15, 17, 19, 22, 29
5.232 ± 5	$(2, 3)^+$	≤ 4	n	15, 17, 19, 22, 31
5.24	1^+	260	n	19
5.25 ± 70	2^-	320 ± 80	n	17, 19, 22
5.518 ± 6	$(1, 2, 3)^+$	$\leq 7 \pm 4$	n	15, 17, 19, 22, 31
5.730 ± 6	(5^+)	$\leq 7 \pm 4$	n	15, 16, 17, 19, 22, 29, 31
6.009 ± 10	1^-	270 ± 30	n	17, 19, 31
6.168 ± 4	$(2, 3, 4)^-$	$\leq 7 \pm 4$	n	15, 17, 19, 22, 29, 31
6.373 ± 6	(3^-)	30 ± 6	n	17, 19, 22, 29, 31
6.426 ± 7		300 ± 30		17, 22
6.513 ± 6	$(0, 1, 2)^+$	34 ± 6	n	17, 19, 22, 31
6.613 ± 6		$\leq 7 \pm 4$		17, 22, 31
6.848 ± 6		$\leq 7 \pm 4$		15, 17, 22, 31
(6.84)	≥ 2	> 140	n	19
7.02 ± 20	≥ 1	22 ± 5	n	17, 19, 22, 31
7.134 ± 7		$\leq 7 \pm 4$		15, 17, 22, 31
7.250 ± 7	≥ 2	17 ± 5	n	17, 19, 22, 31

Table 16.3: Energy levels of ^{16}N (continued)

E_x (MeV ± keV)	$J^\pi; T$	τ or $\Gamma_{c.m.}$ (keV)	Decay	Reactions
7.573 ± 6	≥ 3	$\leq 7 \pm 4$	n	15, 16, 17, 19, 22, 31
7.637 ± 5		$\leq 7 \pm 4$		15, 17, 22, 31
7.675 ± 5		$\leq 7 \pm 4$	n	15, 17, 19, 22, 29, 31
7.877 ± 9	≥ 4	100 ± 15	n	17, 19, 22, 31
8.048 ± 9		85 ± 15	n	17, 19, 31
8.182 ± 9		28 ± 8		15, 17, 31
8.282 ± 8		24 ± 8		17, 31
8.365 ± 8	≥ 1	18 ± 8	n	17, 19, 31
8.49 ± 30	≥ 1	≤ 50	n	19, 31
8.72	≥ 1	40	n	19
8.819 ± 15		≤ 50	n	19, 31
9.035 ± 15		≤ 50		31
9.16 ± 30	≥ 2	100	n	19, 31
9.34 ± 30		≤ 50	n	19, 31
9.459 ± 15	≥ 2	100	n	19, 29, 31
9.760 ± 10	$T = 1$	15 ± 8		15, 31
9.813 ± 10	$T = 1$			15, 31
9.928 ± 7	$0^+; T = 2$	< 12		15, 30
10.055 ± 15	≥ 3	30	n	19, 31
10.27	≥ 2	165	n	19, 31
10.71	≥ 2	120	n	19
11.49	≥ 3		n	19
11.62	≥ 3	220	n, d	9, 19
11.701 ± 7	$1^-, 2^+; T = 2$	< 12		15
(11.92)		390	n, d	9
(12.09)			n	19
12.26		290	n, p, d	9, 10
(12.46)			n	19
12.61		180	n, p, d	9, 10
12.88		155	n, p, d	9, 10, 19
(12.97)		175	n, d	9
13.12			n	19
13.83			n	19

Table 16.3: Energy levels of ^{16}N (continued)

E_x (MeV ± keV)	$J^\pi; T$	τ or $\Gamma_{c.m.}$ (keV)	Decay	Reactions
14.41 ± 50	$(3)^+$	180	d	11

[a] The previously reported τ_m needs, in the opinion of the reviewer, to be remeasured: see (1971AJ02) for the previously reported value.

Reactions involving pions: (1970AL22, 1971EI01, 1971GU13, 1971SR03, 1973CA25, 1973KA1D, 1973LA1G, 1973LA1H, 1973RE10, 1973SR02, 1974LI15, 1974SZ04, 1975RA1R, 1976TR1A).

Other topics: (1971AR02, 1971SR03, 1972EV03, 1973KO1D, 1973RE17, 1973SI1G, 1973WI15, 1974MA1E, 1974SHYR, 1974VA24, 1975BE31, 1975FE1A, 1976NI1E).

Mass of ^{16}N: the atomic mass excess of ^{16}N is 5681.7 ± 2.3 keV (A.H. Wapstra, private communication).

1. ^{16}N(β^-)^{16}O $\quad Q_m = 10.418$

The half-life of ^{16}N is 7.13 ± 0.02 sec: see Table 16.3 in (1971AJ02). See also (1975SA1D). From the character of the beta decay [see Table 16.23] it is concluded that ^{16}N$_{g.s.}$ has $J^\pi = 2^-$: see ^{16}O. The beta decay of ^{16}N*(0.12) [$J^\pi = 0^-$, $\tau_{1/2} = 5.26 \pm 0.05$ μsec] to ^{16}O$_{g.s.}$ has been studied: the β-decay rate $\lambda_\beta = 0.43 \pm 0.10$ sec $^{-1}$. Comparison of this value with the rate of the inverse muon-capture reaction in ^{16}O yields $13 \leq g_p(q^2 \approx M_\mu^2) \leq 20$ for the induced-pseudoscalar form factor (1975PA01).

2. (a) ^{9}Be(^{7}Li, t)^{13}C $\quad Q_m = 8.181 \quad E_b = 20.575$

(b) ^{9}Be(^{7}Li, α)^{12}B $\quad Q_m = 10.462$

(c) ^{9}Be(^{7}Li, ^{8}Li)^{8}B $\quad Q_m = -17.613$

The yields of t_0 and of α_0, α_1 and α_2 have been measured for $E(^7\text{Li}) = 4$ to 14 MeV at 0°: several broad peaks are observed (1971WY01). The yields of α_0 and α_2 have also been studied for $E(^7\text{Li}) = 3.3$ and 5.0 to 6.2 MeV (1969SN02). The cross section for reaction (c) rises monotonically for $E(^7\text{Li}) = 1.1$ to 4 MeV (1957NO17, 1959NO40).

3. ^{10}B(^{7}Li, p)^{16}N $\quad Q_m = 13.990$

Angular distributions have been obtained at $E(^7\text{Li}) = 16$ MeV to ^{16}N*(3.36, 3.52, 3.96, 4.32, 4.39). The σ_t for ^{16}N*(3.36, 3.96, 4.32, 4.39), whose J^π are known, follow the $2J_f + 1$ relation. From the σ_t for ^{16}N*(3.52) it follows then that $J = 2$ if it is a single state or $J = 0$ and 1 (with one of the two states having odd parity) if the group corresponds to two unresolved states (1975FO10). See also (1974KO1G), and see (1971AJ02) for a discussion of the earlier work of (1966MC05).

4. ^{11}B(^{6}Li, p)^{16}N $\quad$ $Q_m = 9.785$

See (1966MC05).

5. ^{11}B(^{7}Li, d)^{16}N $\quad$ $Q_m = 4.759$

See (1966MC05) and (1969TH01: $E_x = 297.6 \pm 0.9$ and 397.8 ± 1.0 keV).

6. ^{13}C(α, p)^{16}N $\quad$ $Q_m = -7.421$

Not reported.

7. ^{13}C(^{7}Li, α)^{16}N $\quad$ $Q_m = 9.927$

Not reported.

8. ^{14}C(d, γ)^{16}N $\quad$ $Q_m = 10.475$

The cross section has been measured for $1.2 < E_d < 2.6$ MeV. It shows some evidence of structure (1964NE09). See also (1971AJ02).

9. ^{14}C(d, n)^{15}N $\quad$ $Q_m = 7.9827$ $\quad$ $E_b = 10.475$

Observed resonances in the yield of n_0 are displayed in Table 16.4 (1961CH14, 1963IM01). The yields of n_{1+2}, n_3 have been measured by (1967LA11) for $2.9 < E_d < 3.1$ MeV. Polarization measurements are reported for $E_d = 1.28$, 1.55 and 1.88 MeV (1973NI01; n_0) and 2.00 to 3.30 MeV (1974ME32; n_0, n_{1+2}, n_3). See also ^{15}N in (1976AJ04).

Table 16.4: Resonances in $^{14}C + d$

E_d (MeV)	Resonant for	$\Gamma_{c.m.}$(keV)	E_x (MeV)	Refs.
1.30 [a]	n_0	220	11.61	(1961CH14, 1963IM01)
1.65	n_0	390	11.92	(1961CH14)
2.04 [a]	n_0, p	290	12.26	(1956DO37, 1961CH14, 1963IM01)
2.44 [a]	n_0, p	180	12.61	(1956DO37, 1961CH14)
2.75	n_0, p	155	12.88	(1956DO37, 1961CH14, 1963IM01)
2.86	n_0	175	12.97	(1961CH14)
(3.10)	n_0	(175)	(13.18)	(1961CH14)
4.50 ± 0.05	d_0	180 [b]	14.41	(1973CO31)

[a] See also (1964NE09).
[b] $\Gamma_d = 45$ keV (1973CO31).

10. $^{14}C(d, p)^{15}C$ $Q_m = -1.007$ $E_b = 10.475$

The cross section of the γ-rays to $^{15}C^*(0.74)$ rise monotonically for $2.7 < E_d < 3.4$ MeV where it is ≈ 75 mb (1962CH14). Observed resonances are shown in Table 16.4 (1956DO37). See also ^{15}C in (1976AJ04).

11. $^{14}C(d, d)^{14}C$ $E_b = 10.475$

Excitation functions for elastic scattering have been measured for $E_d = 4$ to 10 MeV. A resonance is observed at $E_d = 4.50 \pm 0.05$ MeV, $\Gamma_{cm} = 180$ keV, $l_d = 4$, $J^\pi = 3^+, (4^+, 5^+)$ (1973CO31). See also ^{14}C in (1976AJ04).

12. $^{14}C(d, t)^{13}C$ $Q_m = -1.9194$ $E_b = 10.475$

See (1976WE01) and ^{13}C in (1976AJ04).

13. $^{14}C(d, \alpha)^{12}B$ $Q_m = 0.361$ $E_b = 10.475$

See ^{12}B in (1968AJ02).

Table 16.5: Excited states in ^{16}N from ^{14}C(^{3}He, p)^{16}N and ^{14}C(α, d)^{16}N

(1966GA08) [a]	(1968HE03, 1972FR05) [a] E_x (MeV ± keV)	(1969LU07) [b]	Γ (keV)	$J^\pi; T$ [c]
0.121 ± 6				0^-
0.298 ± 6		0.307 ± 20		3^-
0.396 ± 7				
3.348 ± 7				1^+
3.517 ± 7				$2^+, (3)^+$
3.958 ± 7		3.961 ± 20		$(2)^+, 3^+$
4.313 ± 9				1^+
4.386 ± 9				
4.768 ± 11				
5.052 ± 9				
5.137 ± 9				
5.234 ± 9				$(1, 2, 3)^+$
	5.512 ± 5			$(1, 2, 3)^+$
	5.724 ± 5	5.745 ± 20		5^+
	6.168 ± 5			
	6.843 ± 5			
	7.113 ± 5			
	7.570 ± 5	7.599 ± 30		
	7.636 ± 5			
	7.673 ± 5			
	8.205 ± 5			
	9.760 ± 10		15 ± 8	$T = 1$
	9.813 ± 10			$T = 1$
	9.928 ± 7		< 12	$0^+; 2$
	11.701 ± 7		< 12	$1^-, 2^+; 2$

[a] ^{14}C(^{3}He, p)^{16}N.

[b] ^{14}C(α, d)^{16}N.

[c] From (1968HE03, 1972FR05).

Table 16.6: States in ^{16}N from ^{14}N(t, p)^{16}N

(1961SI04)		(1966HE10)		L [a]	J^{π} [a]
E_x (MeV ± keV)	Γ (keV)	E_x (MeV ± keV)	Γ (keV)		
0		0		3	2^- [b]
0.121 ± 10		0.120 ± 10		1	0^- [b]
0.297 ± 10		0.300 ± 10		3	3^- [b]
0.396 ± 10		0.399 ± 10		1	1^- [b]
3.340 ± 25	≤ 25 ± 17	3.359 ± 10	15 ± 5	0	1^+ [b]
3.506 ± 25	≤ 25 ± 8	3.519 ± 10	≤ 7 ± 4	[c]	
3.956 ± 25	≤ 25 ± 8	3.957 ± 10	≤ 7 ± 4	2	3^+ [b]
4.318 ± 25	≤ 25 ± 8	4.318 ± 10	20 ± 5	0	1^+ [b]
4.392 ± 25	110 ± 31	4.391 ± 10	82 ± 20	1	1^- [b]
		4.725 ± 10 [d]	290 ± 30	1	1^-
4.773 ± 25	66 ± 7	4.774 ± 10	59 ± 8	2	2^- [b]
5.059 ± 25	≤ 25 ± 8	5.053 ± 10	19 ± 6	(1 + 3)	2^-
		5.130 ± 10	≤ 7 ± 4	[c]	
5.141 ± 25	38 ± 12				
		5.150 ± 10	≤ 7 ± 4		
5.230 ± 25	≤ 20 ± 8	5.226 ± 10	≤ 7 ± 4	2	$(1, 2, 3)^+$
		5.305 ± 10 [d]	260 ± 30	[c]	
5.526 ± 25	≤ 20 ± 8	5.520 ± 10	≤ 7 ± 4	(1 + 3)	(2^-)
		5.730 ± 10	≤ 7 ± 4	4	5^+ [b]
		6.009 ± 10	270 ± 30	1	(1^-)
		6.167 ± 10	≤ 7 ± 4	3	$(2, 3, 4)^-$
		6.371 ± 10	30 ± 6		
		6.422 ± 10	300 ± 30		
		6.512 ± 10	34 ± 6		
		6.613 ± 10	≤ 7 ± 4		
		6.854 ± 10	≤ 7 ± 4		
		7.006 ± 10	22 ± 5		
		7.133 ± 10	≤ 7 ± 4		
		7.250 ± 10	17 ± 5		
		7.573 ± 10	≤ 7 ± 4		

Table 16.6: States in ^{16}N from ^{14}N(t, p)^{16}N (continued)

(1961SI04)		(1966HE10)		L [a]	J^{π} [a]
E_x (MeV ± keV)	Γ (keV)	E_x (MeV ± keV)	Γ (keV)		
		7.640 ± 10	$\leq 7 \pm 4$		
		7.675 ± 10	$\leq 7 \pm 4$		
		7.876 ± 10	100 ± 15		
		8.043 ± 10	85 ± 15		
		8.183 ± 10	28 ± 8		
		8.280 ± 10	24 ± 8		
		8.361 ± 10	18 ± 8		

[a] From reanalysis of data of (1966HE10): see (1975CR02).
[b] Identified with shell-model counterparts (1975CR02).
[c] Results are ambiguous (1975CR02).
[d] The errors listed here for the E_x to these two broad peaks are probably underestimates: I am indebted to Dr. H. Fuchs for his comments.

14. ^{14}C(t, n)^{16}N $\qquad Q_m = 4.217$

Not reported.

15. ^{14}C(^{3}He, p)^{16}N $\qquad Q_m = 4.981$

Proton groups have been observed to ^{16}N states with $E_x < 12$ MeV and angular distributions (with $E(^3\text{He}) \leq 15$ MeV) lead to the J^{π} assignments shown in Table 16.5 (1966GA08, 1968HE03, 1972FR05). See also (1975FO06) and (1971AJ02).

16. ^{14}C(α, d)^{16}N $\qquad Q_m = -13.373$

At $E_{\alpha} = 46$ MeV the angular distributions of five deuteron groups [see Table 16.5] have been determined: the most strongly populated state is the 5^+ state, ^{16}N*(5.73) (1969LU07).

17. ^{14}N(t, p)^{16}N $\qquad Q_m = 4.843$

Table 16.7: Resonances in ^{15}N(n, n)^{15}N [a,b]

E_n (MeV ± keV)	Γ_{lab} (keV)	E_x (MeV)	J^π
0.921	14	3.355	1^+ [c]
1.095	3	3.518	1
1.563	≤ 2	3.956	1
1.944	29	4.313	1^+ [d]
2.038	56	4.401	1^- [d]
2.30 ± 70 [e]	410 ± 100 [e]	4.65	1^- [d]
2.399	107	4.739	2^+ [d]
2.732	35	5.051	1^-
2.830	12	5.143	$3^{(-)}$
2.84 ± 70 [f]	70 ± 100 [f]	5.15	2^- [d]
2.915	≤ 4	5.223	≥ 2
2.93	260	5.24	1^+
3.225		5.513	
3.454	24	5.728	1^+
3.69	297	5.95	1^-
3.987	88	6.227	(1^+)
4.126	78	6.357	(3^-)
4.252	113	6.475	(2^+)
4.64	> 150	6.84	≥ 2
4.80	37	6.99	≥ 1
5.055	25	7.228	≥ 2
5.43	30	7.58	≥ 3
5.56		7.70	
5.73	165	7.86	≥ 4
5.90		8.02	
6.28		8.37	≥ 1
6.42		8.51	≥ 1
6.65	45	8.72	≥ 1
6.76		8.82	
7.10	110	9.14	≥ 2
7.31		9.34	

Table 16.7: Resonances in ^{15}N(n, n)^{15}N [a,b] (continued)

E_n (MeV ± keV)	Γ_{lab} (keV)	E_x (MeV)	J^π
7.44	105	9.46	≥ 2
7.71	150	9.71	≥ 2
8.07	30	10.05	≥ 3
8.30	175	10.27	≥ 2
8.77	130	10.71	≥ 2
9.61		11.49	≥ 3
9.77		11.64	≥ 3
10.25		12.09	
10.64		12.46	
11.09		12.88	
11.41		13.12	
12.10		13.83	

[a] (1971DO06, 1971ZE02). See Table 16.7 in (1971AJ02) for the earlier work.

[b] Below $E_n = 4.5$ MeV, the multilevel R-matrix formalism was used to determine E_λ, Γ_λ and whenever possible J^π by a χ^2 fitting and minimization technique. Above this energy the $2J + 1$ dependence was used; the parity cannot be determined because no marked interference effects are observed between resonance and potential scattering. Above 5.65 MeV all J-values are lower limits because the inelastic channel is open. [A channel radius $a = 4.69$ fm was used] (1971ZE02).

[c] Parity determined from angular distribution.

[d] J^π also obtained by phase-shift analysis.

[e] The phase-shift analysis indicates that the resonance is at $E_n = 2.42 \pm 0.08$ MeV with $\Gamma = 250 \pm 50$ keV. This is one of two $(d_{3/2}p_{1/2}^{-1})$ single-particle resonances (1971ZE02).

[f] The phase-shift analysis finds $E_\lambda = 2.94 \pm 0.1$ MeV, $\Gamma = 320 \pm 80$ keV. This is the other $(d_{3/2}p_{1/2}^{-1})$ single-particle resonance (1971ZE02).

Angular distributions are reported at $E_t = 1.8$ MeV (1964SC09) and at 12 MeV (1966HE10, 1975CR02): see Table 16.6 for the observed proton groups. See also (1976AL16) and (1970EL17; theor.).

18. ^{15}N(n, γ)^{16}N $\qquad Q_m = 2.492$

The thermal cross section is 24 ± 8 μb (1973MU14, 1974SH1E).

19. ^{15}N(n, n)^{15}N $E_b = 2.492$

The scattering amplitude (bound) $a = 6.5 \pm 0.2$ fm [recommended by (1973MU14)]. The total cross section has been measured for $E_n = 0.4$ to 32 MeV: see (1971AJ02, 1976GAYV) and (1971ZE02). Observed resonances and parameters derived from R-matrix and phase-shift analyses of these data, angular distributions and polarization measurements are displayed in Table 16.7 (1971DO06, 1971ZE02). See (1971AJ02) for the earlier work, (1972LA1F) and (1971BA95, 1972AG02, 1972BA2C, 1972LI13, 1973BA74, 1973MO16, 1974AY01, 1974HO1L, 1975BA61, 1975MO10, 1975RO31; theor.).

20. ^{15}N(n, p)^{15}C $Q_m = -8.989$ $E_b = 2.492$

See (1966PR14, 1971PR09, 1976GAYV). See also (1972ED01, 1974BO1E).

21. ^{15}N(n, α)^{12}B $Q_m = -7.622$ $E_b = 2.492$

See (1971AJ02).

22. ^{15}N(d, p)^{16}N $Q_m = 0.267$

Levels derived from observed proton groups and γ-rays are listed in Table 16.8. Gamma transitions are shown in the inset of Fig. 2: (1971PA28) report that the branchings of ^{16}N*(0.40) to ^{16}N*(0, 0.12, 0.30) are, respectively, $(26.6 \pm 0.6)\%$, $(73.4 \pm 1.6)\%$, and $\leq 2 \times 10^{-3}\%$ [(1963GI11) had reported a $(5 \pm 2)\%$ branch for the latter transition]. The $0.30 \rightarrow 0.12$ transition is $\leq 10^{-2}\%$ (1971PA28).

The mean life of ^{16}N*(0.12) is 7.58 ± 0.09 μsec (1967BE14); together with the angular distribution analyses this leads to $J^\pi = 0^-$ for the state. The very strong evidence for $J^\pi = 2^-$, 3^- and 1^-, respectively, for ^{16}N*(0, 0.30, 0.40) is reviewed in (1971AJ02). See also (1972LI13, 1973BA74, 1973MO16, 1975BA61, 1975MO10; theor.) and reaction 1.

23. ^{15}N(t, d)^{16}N $Q_m = -3.766$

Not reported.

Table 16.8: Levels of ^{15}N(d, p)^{16}N and ^{18}O(d, α)^{16}N

(1966HE10) [a] E_x (MeV ± keV)	l_n [a,b]	(1966HE10) [c]	(1970BO08) [c]	J^π [d]
0	[k]	0		2^-
0.1201 ± 0.5 [e]	[k]	0.119 ± 15		0^-
0.2962 ± 1.0 [e]	[k]	0.301 ± 15		3^-
0.3973 ± 1.0 [e]	[k]	0.400 ± 15		1^-
3.365 ± 10		3.358 ± 15		(1^+)
3.523 ± 10	2 or 1 + 3	3.524 ± 15	[f]	
3.964 ± 10	3	3.964 ± 15		$(2, 3)^+$
4.325 ± 10	1	4.324 ± 15		$(1)^+$
4.40 [b]	0	4.383 ± 15		$(0, 1)^-$
4.715 ± 10	1			$(1, 2, 3)^+$
4.780 ± 10		4.787 ± 15	[f]	
(4.90 ± 10)				
5.032 ± 10	2	5.065 ± 15		$(1, 2)^-$
5.128 ± 10	≥ 2			≥ 2
		5.139 ± 15		
5.150 ± 10	2			$(2, 3)^-$
5.231 ± 10	3	5.240 ± 15		$(2, 3, 4)^+$
5.310 ± 10				
5.523 ± 10	3	5.528 ± 15	[f]	$(2, 3, 4)^+$
5.739 ± 10	2	5.740 ± 15	[f]	$(1, 2)^-$
			6.01 ± 15 [j]	
6.170 ± 10	≥ 3	6.168 ± 15	[g]	≥ 2
(6.28 ± 10)	1			$(0, 1, 2)^+$
6.376 ± 10	2		6.37 ± 15 [j]	$(1, 2, 3)^-$
6.431 ± 10				
6.514 ± 10	1	6.512 ± 15	[g]	$(0, 1, 2)^+$
6.609 ± 10		6.620 ± 15	[g]	
(6.79 ± 10)				
6.847 ± 10		6.852 ± 15	[g]	
7.034 ± 10			7.01 ± 15 [j]	

Table 16.8: Levels of ^{15}N(d, p)^{16}N and ^{18}O(d, α)^{16}N (continued)

(1966HE10) [a] E_x (MeV ± keV)	l_n [a,b]	(1966HE10) [c]	(1970BO08) [c]	J^π [d]
7.135 ± 10		7.141 ± 15	[g]	
7.250 ± 10		7.247 ± 15	[g]	
7.577 ± 10		7.596 ± 15	[g]	
7.638 ± 10			7.64 ± 15 [j]	
7.676 ± 10		7.683 ± 15		
7.840 ± 10			7.88 ± 15 [j]	
			8.06 ± 15 [j]	
			8.18 ± 15 [j]	
		8.286 ± 15	[g]	
		8.374 ± 15	[g]	
			8.49 ± 30 [h]	
			8.819 ± 15 [i]	
			9.035 ± 15	
			(9.16 ± 30)	
			(9.34 ± 30)	
			9.459 ± 15	
			(9.66 ± 40)	
			9.794 ± 15 [i]	
			9.90 ± 30	
			10.055 ± 15 [i]	
			(10.17 ± 30)	
			(10.26 ± 30)	

[a] ^{15}N(d, p)^{16}N.
[b] (1971FU14, 1972FU16; $E_d = 12$ MeV). I am very much indebted to Dr. H. Fuchs for his comments.
[c] ^{18}O(d, α)^{16}N.
[d] J^π assignment from angular distribution analyses and γ-decay (1956ZI1A, 1957WA01, 1970BO08, 1972BO49), 1972FU16.
[e] From γ-decay studies (1963GI11). (1957FR56, 1957WI1B) found $E_x = 120 \pm 1$, 294 ± 5 and 392 ± 3 keV.
[f] Angular distribution reported in ^{18}O(d, α)^{16}N at $E_d = 10.0 - 11.2$ MeV but L not determined (1970BO08).
[g] Alpha group seen but E_x not determined.
[h] Γ for this level and the ones listed below $\leq 40 - 50$ keV (1970BO08).
[i] These levels appear to be correlated with thresholds for neutron emission to excited states of ^{15}N (1970BO08, 1970BO09).
[j] T.I. Bonner, private communication.
[k] Absolute spectroscopic factors for ^{16}N*(0, 0.12, 0.30, 0.40) are 0.55, 0.46, 0.54, 0.52 (1972BO49: average values in the range $E_d = 5$ to 6 MeV).
[l] (1975FO02) suggest $J^\pi = 1^-$ or 2 on the basis of a study at $E_d = 12$ MeV and comparison with the ^{15}N(n, n) results.

24. ^{15}N(α, ^{3}He)^{16}N $\qquad Q_m = -18.087$

Not reported.

25. ^{15}N(^{11}B, ^{10}B)^{16}N $\qquad Q_m = -8.964$

See (1969BR1D).

26. ^{16}C(β^-)^{16}N $\qquad Q_m = 8.011$

See ^{16}C.

27. ^{16}O(n, p)^{16}N $\qquad Q_m = -9.636$

See (1971AJ02) and (1976KI1D).

28. ^{16}O(t, ^{3}He)^{16}N $\qquad Q_m = -10.400$

At $E_t = 23.5$ MeV ^{16}N*(0, 0.30) [$J^\pi = 2^-, 3^-$] are strongly populated relative to ^{16}N*(0.12, 0.40) [$0^-, 1^-$]. This suggests that the 2^- and 3^- states in ^{16}F are those that are strongly populated in the ^{16}O(^{3}He, t)^{16}F reaction [^{16}F*(0.42, 0.72)] and that the other two states in ^{16}F [^{16}F*(0, 0.20)] are 0^- and 1^- [the ordering within the 2^- and 3^-, and the 0^- and 1^- states, in ^{16}F is ambiguous] (1974FL06). See also ^{16}O(^{3}He, t) in ^{16}F.

29. ^{17}O(d, ^{3}He)^{16}N $\qquad Q_m = -8.288$

A comparison has been made at $E_d = 52$ MeV of the population of states in this reaction and in the mirror (d, t) reaction in order to identify $T = 1$ states in ^{16}O and in order to study the mass dependence of the 1p spin-orbit splitting: see reaction ^{17}O(d, t) in ^{16}O (1974MA23). See also (1973WA1E) and (1976SC36; theor.).

30. ^{18}O(p, ^{3}He)^{16}N $\qquad Q_m = -14.107$

At $E_p = 43.7$ MeV, the angular distribution of the ^{3}He nuclei corresponding to a state at $E_x = 9.9$ MeV fixes $L = 0$ and therefore $J^\pi = 0^+$ for ^{16}N*(9.9): it is presumably the $T = 2$ analog of the ground state of ^{16}C. Some lower-lying $T = 1$ states were also observed (1964CE05). See also (1970OL1B, 1972OH1B).

31. ^{18}O(d, α)^{16}N $\qquad Q_m = 4.247$

Forty-three α-particle groups have been observed at $E_d \leq 12$ MeV, corresponding to states of ^{16}N with $E_x < 10.3$ MeV: see Table 16.8 (1966HE10, 1970BO08, 1970BO09). ^{16}N*(8.82, 9.8, 10.06) may be related to nearly bound virtual states of 2s$_{1/2}$ neutron with ^{15}N*(6.32, 7.30, 7.57) (1970BO08, 1970BO09). (1975AS02) find $\tau_m = 6.5 \pm 0.5$ psec for ^{16}N*(0.40) and $|g| = 1.83 \pm 0.13$; $|M|^2$ for the M1 transition to ^{16}N*(0.12) is 0.17 ± 0.02 W.u. See also (1969NI09) and ^{20}F in (1978AJ03).

32. ^{18}O(^{6}Li, ^{8}Be)^{16}N $\qquad Q_m = 2.682$

See (1969NI09).

33. ^{19}F(n, α)^{16}N $\qquad Q_m = -1.521$

Angular distributions have been reported for $E_n = 4.7$ to 14.4 MeV: see (1971AJ02) for the earlier references and see (1972FO21; $E_n = 5.85$ MeV; $\alpha_{0+1+2+3}$). See also ^{20}F in (1978AJ03).

^{16}O

(Figs. 3 and 5)

GENERAL: (See also (1971AJ02).):

Shell model: (1969BO1B, 1969FE1A, 1969IK1A, 1969WI1C, 1970BO33, 1970BO1J, 1970DE1F, 1970DO1A, 1970EI06, 1970EL14, 1970HA49, 1970IR01, 1970MA1Q, 1970NE15, 1970RE1G, 1970RU1A, 1970SV1B, 1970ZO1A, 1971AG02, 1971AN14, 1971AR1R, 1971BA1N, 1971BA67, 1971BE14, 1971BO29, 1971BR1E, 1971BR1J, 1971GO16, 1971HE15, 1971HS02, 1971HU15, 1971IR02, 1971IR03, 1971IR04, 1971IR05, 1971KH01, 1971LA13, 1971LE30, 1971MA60, 1971MO05, 1971RO03, 1971SU08, 1971VI08, 1971ZO03, 1971ZO01, 1971ZO1A, 1972AB12, 1972BO38, 1972BR1G, 1972CA23, 1972EH01, 1972EN03, 1972FR12, 1972GE05, 1972JA18, 1972JA24, 1972KA38, 1972LE1L, 1972MC1C, 1972NE13, 1972NI14, 1972PA21, 1972RA1C, 1972RE02, 1972RO06, 1972SA1B, 1972SH20, 1972VA09, 1972WA08, 1972WO04, 1972ZA1B, 1973EL04, 1973FE04, 1973HA05, 1973IC01, 1973KU03, 1973LA36, 1973LO1C, 1973MA55, 1973MU18, 1973NE20, 1973RE17, 1973RO12, 1973SA05, 1973SH11, 1973TR08, 1973WA35, 1973YA1A, 1974BO31, 1974DA1J, 1974EL05, 1974FA1B, 1974KH01, 1974KU05, 1974MA21, 1974NA13, 1974NE1J, 1974SH1M, 1974TA19, 1974WO02, 1974ZAZW, 1975DI04, 1975DR01, 1975EN01, 1975FR06, 1975GI1C, 1975GR1N, 1975LO05, 1975MC1L, 1975MI1N, 1975MI12, 1975MP01, 1975SP08, 1975VE05, 1975ZA07, 1976BL03, 1976BO1Z, 1976DO04, 1976SA1R, 1976SC03, 1976SC05, 1976ZA07).

Collective and rotational models: (1969FE1A, 1970DA13, 1970FL1A, 1970PA1K, 1970SV1B, 1971AR1R, 1971BO29, 1971GO06, 1971IR05, 1971ON01, 1971OS03, 1971ZO01, 1972AB1C, 1972BO38, 1972HO56, 1972JA24, 1972LA12, 1972LE1L, 1972ZA1B, 1973CA16, 1973IC01, 1973KO1F, 1973LA36, 1973LA35, 1973RO12, 1973SH14, 1973SO07, 1973YA1A, 1974AR04, 1974MP01, 1975AB04, 1975DR01, 1975LE07, 1975LE14, 1975SO07, 1976BO2B, 1976GO17).

Cluster and α-particle models: (1969BA1J, 1969IK1A, 1969TA1C, 1969WI1C, 1970EI06, 1970KO26, 1971AB1B, 1971AN14, 1971FR06, 1971KH06, 1971LIZI, 1971ME15, 1971NO03, 1971RI1D, 1972AB1C, 1972AB05, 1972AV02, 1972BA59, 1972FR1B, 1972GR42, 1972HO56, 1972IK1A, 1972LE1L, 1972NE1B, 1973BE1L, 1973CO13, 1973CO15, 1973DE26, 1973IC01, 1973KU03, 1973LA35, 1973YA1A, 1974DA1J, 1974DZ05, 1974GO12, 1974GO37, 1974KH02, 1974KH05, 1974ME08, 1974SU05, 1974SU1B, 1974TA19, 1974WA15, 1974WE08, 1975BA16, 1975BU03, 1975IK1A, 1975IN04, 1975KA1N, 1975KR1D, 1975KU1N, 1975PA11, 1975TA1K, 1975WA33, 1976BA1N, 1976GO1Q, 1976SA1P, 1976SU10).

Astrophysical questions: (1971LE33, 1972CL1A, 1972KO1A, 1973AR1H, 1973AU1D, 1973CA1B, 1973CO1J, 1973CO1B, 1973GR1G, 1973IB1B, 1973RA1D, 1973SA1J, 1973SM1A, 1973TA1E, 1973TR1C, 1973TR1B, 1973UL1B, 1973WO1B, 1974AR1G, 1974BE1R, 1974PA1E, 1974SC1F, 1974WI1F, 1975AU1D, 1975BA2D, 1975BE1R, 1975DA1G, 1975EN1A, 1975FA1H, 1975IB1A, 1975JA1F, 1975KE1A, 1975LA1E, 1975LE1L, 1975PE1E, 1975RA1M, 1975RY1A, 1975SC1R, 1975SC1H, 1975SC1W, 1975SU1B, 1975TA1G, 1975TR1A, 1975VL1A, 1976AU1F, 1976DW1A,

1976EP1A, 1976FI1E, 1976FU1D, 1976GI1C, 1976JAZV, 1976ME1H, 1976OS1E, 1976RO1J).

Giant resonance (See also reactions 56 and 57.): (1970AL22, 1970KE1A, 1970MA1Q, 1970PA1K, 1971DU13, 1971IR05, 1971SE03, 1972GO20, 1973BA05, 1973CA25, 1973DE26, 1973DE53, 1973GE01, 1973GO23, 1973HA1Q, 1973KI08, 1973WA35, 1974FA1A, 1974KR24, 1974KR22, 1974KRZO, 1974SH1M, 1974WA12, 1974WA1J, 1974WO02, 1975AB04, 1975AU11, 1975CO1E, 1975DO10, 1975DU16, 1975GO22, 1975GR1N, 1975RA02, 1975SH07, 1975VE05, 1976BE45, 1976BR05, 1976FL09, 1976FO11, 1976HO12, 1976KN02, 1976LI14, 1976MA2F).

Electromagnetic transitions: (1969FE1A, 1970DO1A, 1970HA49, 1971IR03, 1971IR05, 1971KH01, 1971MIZQ, 1971RU12, 1972AB12, 1972AU03, 1972BE1E, 1972BE98, 1972BO38, 1972EC01, 1972EN03, 1972FA1D, 1972LO1D, 1972MI1E, 1972NA05, 1972YO1B, 1973BE1L, 1973CA16, 1973EL04, 1973HA1N, 1973HA1Q, 1973HO29, 1973IA1A, 1973JA11, 1973RE17, 1973SH14, 1973SO07, 1973WE14, 1974BU1E, 1974FE1E, 1974FI03, 1974HA1C, 1974KR22, 1974LA1F, 1974MC1F, 1975AR30, 1975BE2E, 1975BR1P, 1975BU03, 1975HO20, 1975HS01, 1975RA02, 1975SA1G, 1975VE05, 1975WE1C, 1975ZA07, 1976BL08, 1976HO12, 1976KI01, 1976KN02, 1976KR14, 1976VO1C).

Special levels: (1969FE1A, 1969WI1C, 1970BO33, 1970BO1J, 1970DA13, 1970HA51, 1970MA1Q, 1970NA16, 1970PA1K, 1970PE18, 1970RU1A, 1970VA1M, 1971AF02, 1971AG02, 1971AR1R, 1971BE2B, 1971BE2D, 1971ER08, 1971GO16, 1971GR1V, 1971GR38, 1971GR49, 1971HE15, 1971HS02, 1971HU15, 1971IR03, 1971IR05, 1971KH01, 1971KO12, 1971MC15, 1971ME15, 1971OS03, 1971RO03, 1971RU12, 1971SC10, 1971SE03, 1971SE1C, 1971SU08, 1971WE03, 1971WE1F, 1971YA1B, 1972AV02, 1972DO02, 1972EN03, 1972FA1D, 1972HA1R, 1972HI17, 1972JA18, 1972JA24, 1972KA67, 1972LA12, 1972NI14, 1972NI15, 1972PA21, 1972SU04, 1972VA09, 1973BA1Z, 1973DO1B, 1973ER12, 1973FA1H, 1973FE04, 1973GA1H, 1973HO29, 1973IA1A, 1973JA11, 1973KI08, 1973KN1C, 1973KU04, 1973MA55, 1973MU18, 1973RO12, 1973SA05, 1973SH14, 1973SO07, 1973YA1A, 1974AR04, 1974DIZR, 1974EL05, 1974FE1E, 1974GA27, 1974GO12, 1974GO1P, 1974GO37, 1974HA1G, 1974ITZZ, 1974KO1L, 1974KRZO, 1974LO11, 1974NA13, 1974NI1A, 1974SU05, 1974VA24, 1974ZAZW, 1975AR1J, 1975BA16, 1975BE2E, 1975BO1T, 1975BR1P, 1975BU03, 1975DI04, 1975GO19, 1975HA30, 1975HS01, 1975MA10, 1975MC1L, 1975MC1H, 1975MI03, 1975MI12, 1975NA21, 1975NG1A, 1975PE07, 1975RA02, 1975SA08, 1975TA1K, 1976BL03, 1976DO04, 1976FO11, 1976JA03, 1976KI01, 1976LI14, 1976SA1P, 1976SU10, 1976WE1P).

Applications: (1975BE1U, 1976EA1A, 1976EC1B, 1976GR1J, 1976RA1J, 1976SC1G).

Special reactions: (1970BE1D, 1971AR02, 1972PU1B, 1973KU03, 1973WI15, 1974AL17, 1974KO1L, 1974KU15, 1974WE08, 1975AL04, 1975AR17, 1975AR14, 1975DR01, 1975FA1D, 1975GR13, 1975KO1F, 1975KU01, 1975ME1F, 1975RE08, 1975RE17, 1975VO09, 1976BA08, 1976EG02, 1976HE1H, 1976HI05, 1976JA1R, 1976NA11).

Muon and neutrino capture and reactions: (1970BU1B, 1970EV1A, 1970KA1E, 1970PR1H, 1971BA96, 1971ER01, 1971GR1U, 1971LA17, 1971MO1Q, 1971PA28, 1971PL01, 1971PL1F, 1971SAZK, 1971WO11, 1972BL01, 1972BO11, 1972DO07, 1972DO17, 1972HI04, 1972LA1C,

1972VO12, 1972WA08, 1973BA68, 1973BE07, 1973DO04, 1973DO1H, 1973ER06, 1973FU11, 1973JO17, 1973KA30, 1973NA28, 1973SA1L, 1973WA1D, 1974DU02, 1974EN10, 1974GO1Q, 1974KO1M, 1974VO12, 1974WA1C, 1975BA40, 1975CH22, 1975DO1F, 1975DO10, 1975DO1D, 1975FU1F, 1975GE1E, 1975MC03, 1975PA01, 1976FO11, 1976LAZV, 1976SU03).

Pion capture and reactions: (1969BA70, 1969MA1C, 1970AL22, 1970BA1E, 1970CH1C, 1970GO1F, 1970HO1D, 1970HU18, 1970KE1A, 1970KO26, 1970WI21, 1971CA01, 1971CA1J, 1971CH41, 1971CH1U, 1971DE31, 1971DE1Y, 1971EI01, 1971FA09, 1971GU13, 1971KO10, 1971KO23, 1971LI1M, 1971MA1C, 1971MA1T, 1971MA2A, 1971MO1G, 1971SE02, 1971SR03, 1972BA2E, 1972BE57, 1972BI09, 1972EN07, 1972FA14, 1972FL1A, 1972HU1A, 1972KO27, 1972KO31, 1972MA1H, 1972RO02, 1972SA10, 1972SE1F, 1972SW1A, 1972YO1C, 1973AG05, 1973AG06, 1973AL1A, 1973AR1B, 1973BA2G, 1973BO49, 1973BR1J, 1973BU1B, 1973CA25, 1973DO1F, 1973EI01, 1973GA20, 1973GE11, 1973GR1F, 1973KA1D, 1973KO1G, 1973LA1G, 1973LA1H, 1973LE1F, 1973LE1G, 1973LE1H, 1973LE22, 1973MA10, 1973NY04, 1973PH01, 1973RE10, 1973RO1Q, 1973SE1E, 1973SR02, 1974AM01, 1974BL10, 1974BO2D, 1974CL04, 1974HU14, 1974LA12, 1974LI1H, 1974LI15, 1974LU1E, 1974LU1D, 1974NE18, 1974OH01, 1974PH1A, 1974PH1B, 1974PI02, 1974ST1G, 1974SZ04, 1974TA18, 1974UL02, 1974VI1B, 1974VO12, 1975AR02, 1975BA1L, 1975BU1A, 1975EN1D, 1975GI13, 1975HE06, 1975HU1D, 1975IA02, 1975KA1G, 1975KO1F, 1975KO25, 1975LI06, 1975MA1M, 1975MU06, 1975NA1K, 1975RA1R, 1975RO11, 1975TA1C, 1975VE05, 1975YA02, 1976AL1L, 1976AS1B, 1976BA1G, 1976BO2A, 1976CA1H, 1976CO13, 1976DO1D, 1976DYZY, 1976EN02, 1976GA1C, 1976GU01, 1976JA04, 1976JO1C, 1976KA02, 1976KI1E, 1976MAYT, 1976MI10, 1976MO1M, 1976MO1N, 1976OS03, 1976TR1A, 1976WA1R).

K-mesons and other meson interactions: (1971BA1N, 1971KO18, 1971MA1T, 1972BA09, 1972WA1F, 1973BA1Y, 1974CA1H, 1975BO1U, 1975OS1B, 1975PO1C, 1976BO2A, 1976EI1A, 1976GA1C, 1976KI1E, 1976NI1E).

Antiproton interactions: (1975TA1C).

Other topics: (1969EL1A, 1969GR1A, 1970AR1C, 1970BA1G, 1970BE1D, 1970BO1J, 1970DR07, 1970EL14, 1970GM1A, 1970GR44, 1970GU13, 1970HA51, 1970KR10, 1970LO07, 1970NE15, 1970PE18, 1970RE1G, 1970RU1A, 1970RY03, 1970TR1E, 1970VA1M, 1970VA1N, 1970ZA1B, 1970ZO1A, 1971AF02, 1971BA67, 1971BE1W, 1971BE2B, 1971BO1F, 1971BR1J, 1971DA03, 1971DA15, 1971ER08, 1971GA1M, 1971GO16, 1971GR13, 1971GR1V, 1971GR35, 1971GR49, 1971GR52, 1971HE01, 1971HE15, 1971IR02, 1971IR04, 1971IR05, 1971KA14, 1971KA40, 1971KO12, 1971KO18, 1971LA1D, 1971LA13, 1971MA63, 1971MA60, 1971MA2B, 1971MC15, 1971MU08, 1971NG01, 1971OS01, 1971OS03, 1971RA01, 1971RU12, 1971SA1C, 1971SC01, 1971SE1C, 1971SR03, 1971ST40, 1971VI08, 1971WE03, 1971WE1E, 1971WI1D, 1971WO06, 1971YA1B, 1971ZH04, 1971ZO03, 1971ZO1A, 1972AB05, 1972AB12, 1972AR18, 1972AR13, 1972AU03, 1972BA29, 1972BR1G, 1972BR1H, 1972CA08, 1972CA23, 1972CU03, 1972DA18, 1972DO11, 1972EH01, 1972EL13, 1972FR1B, 1972FR12, 1972GO41, 1972GR1L, 1972HA57, 1972HA53, 1972JA24, 1972JE01, 1972KA38, 1972KR11, 1972KR1D, 1972LA12, 1972LA21, 1972LE1L, 1972LE27, 1972LO13, 1972MA57, 1972MC1C, 1972MI01, 1972MI07, 1972MU08,

1972NE06, 1972NE13, 1972NI14, 1972NI15, 1972PA32, 1972PL1C, 1972RA1C, 1972RE02, 1972RO06, 1972SA1B, 1972SA1E, 1972SH20, 1972ST02, 1972SU04, 1972TR1C, 1972TR05, 1972VA09, 1972WO04, 1973AN1G, 1973AV03, 1973BA1Y, 1973BA1Q, 1973BE1K, 1973BO18, 1973CI1A, 1973CL09, 1973DA07, 1973DI1D, 1973DO1B, 1973EL04, 1973EL1D, 1973ER1C, 1973FA02, 1973FA09, 1973FA1H, 1973FE04, 1973FO1F, 1973GA03, 1973GA1H, 1973GR11, 1973GR30, 1973GR1H, 1973HA05, 1973HO08, 1973HO36, 1973IA1A, 1973KI08, 1973KO26, 1973KR1B, 1973KU02, 1973KU04, 1973KU03, 1973KU1G, 1973LA29, 1973LA35, 1973LO1C, 1973MA20, 1973MA1R, 1973MA48, 1973MU21, 1973NE1D, 1973NE20, 1973PA15, 1973PA1K, 1973PE05, 1973PO1D, 1973RA1E, 1973RE17, 1973RO1R, 1973RO1P, 1973SA05, 1973SA32, 1973SC1M, 1973SC32, 1973SC1Q, 1973SH11, 1973SH14, 1973SI21, 1973SI1G, 1973SI1H, 1973SP1A, 1973ST21, 1973TR08, 1973WA35, 1973WE14, 1973ZA03, 1974AR04, 1974CO30, 1974DA1J, 1974DZ03, 1974EL01, 1974EL05, 1974FA1A, 1974FA1B, 1974FE1E, 1974FI03, 1974FI13, 1974GA27, 1974GO12, 1974GO1P, 1974GR03, 1974HO1J, 1974MA21, 1974MA1Q, 1974MC1G, 1974ME08, 1974MI03, 1974MI1H, 1974MP01, 1974NA13, 1974NE1J, 1974PA1G, 1974RE03, 1974RO38, 1974SA05, 1974SE1B, 1974SH1J, 1974SH1K, 1974SH10, 1974TI04, 1974TR08, 1974VA24, 1974WA15, 1974WE09, 1974WE1N, 1974WO02, 1974YA11, 1974ZA01, 1974ZA07, 1974ZAZW, 1974ZU1A, 1975BE05, 1975BE2E, 1975BE48, 1975BO1U, 1975CA1N, 1975EN01, 1975FL02, 1975FR06, 1975GI1H, 1975GO1W, 1975HA1Y, 1975HE10, 1975KH01, 1975KH1C, 1975KO1C, 1975KR1H, 1975KR02, 1975KU01, 1975LO1B, 1975LO05, 1975MA10, 1975MA33, 1975MC1L, 1975MC1H, 1975MI02, 1975MI1N, 1975NE1D, 1975PA1L, 1975RO26, 1975SC1M, 1975SH21, 1975SO04, 1975SO07, 1975SP08, 1975WE1C, 1976BL03, 1976BO1Z, 1976BO2B, 1976BR05, 1976BR1V, 1976CU06, 1976DA1D, 1976FA08, 1976FL09, 1976GO1R, 1976HO1L, 1976KI01, 1976KR14, 1976MA04, 1976NA10, 1976NI1E, 1976OS1F, 1976PA03, 1976PA14, 1976QU1B, 1976SA16, 1976SC03, 1976SI14, 1976VA1K, 1976VA1C, 1976WE1P).

Ground state: (1969BO1B, 1970BA1G, 1970GR44, 1970RY03, 1971AF02, 1971BO29, 1971DA15, 1971GR38, 1971GR52,1971IR05, 1971LA13, 1971MO05, 1971MU08, 1971NA19, 1971RU12, 1971SC29, 1971ZO03, 1972AB05, 1972AB12, 1972AU03, 1972BE1E, 1972BR1G, 1972CA23, 1972CU03, 1972DA18, 1972EH01, 1972FR12, 1972GE05, 1972GR42, 1972JA18, 1972KR11, 1972KR1D, 1972LE1L, 1972NI14, 1972RO06, 1972TR1C, 1972VA09, 1972YO1B, 1973AR1C, 1973AV03, 1973BO18, 1973CA16, 1973DA07, 1973DO1B, 1973ER1C, 1973ER12, 1973FA09, 1973FA1F, 1973FO1F, 1973HO29, 1973HO32, 1973KO26, 1973KU02, 1973LA29, 1973LO1C, 1973NE1D, 1973PE05, 1973RO1P, 1973SP1A, 1973ST21, 1973TR08, 1973VA1D, 1974AD1C, 1974AR04, 1974BA1Z, 1974BE15, 1974BO31, 1974CO30, 1974DA1J, 1974DE1E, 1974EL01, 1974EN10, 1974FA1B, 1974FI04, 1974GA27, 1974HO1K, 1974JA1F, 1974KH01, 1974MA21, 1974MA1Q, 1974MI03, 1974MP01, 1974PA11, 1974PA1G, 1974RE03, 1974RO38, 1974SHYR, 1974SI13, 1974SO1E, 1974WA15, 1974ZA01, 1975AL19, 1975BE05, 1975BE31, 1975BU03, 1975CA1N, 1975FL02, 1975FR06, 1975GI1H, 1975HA1Y, 1975KH1C, 1975KU1N, 1975LE05, 1975MA2D, 1975MA33, 1975MA50, 1975MI02, 1975MP01, 1975PE07, 1975RA1T, 1975SA08, 1975SH21, 1975SP08, 1975ZA07, 1976BE1G, 1976CH1W, 1976CU06, 1976DO04, 1976FA08, 1976FL09, 1976KR14, 1976NA10, 1976PA03, 1976PA14, 1976SA1R, 1976ZA1F, 1976ZA07).

The mass of ^{16}O derived from the work of (1975SM02) is 15.994914616 (22) a.m.u. Using the

Table 16.9: Energy levels of ^{16}O [a]

E_x (MeV ± keV)	$J^\pi; T$	K^π	τ_m or $\Gamma_{c.m.}$ (keV)	Decay	Reactions
0	$0^+; 0$		stable		2, 3, 4, 5, 12, 13, 14, 16, 17, 18, 19, 20, 21, 29, 30, 32, 33, 34, 35, 42, 44, 45, 51, 52, 54, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92
6.0494 ± 1.0	$0^+; 0$	0^+	$\tau_m = 96 \pm 7$ psec	π	2, 12, 13, 14, 15, 16, 19, 20, 29, 33, 42, 44, 45, 52, 61, 64, 65, 68, 71, 72, 75, 76, 79, 81, 82, 83, 85, 89, 90
6.13043 ± 0.05	$3^-; 0$		$\tau_m = 26.6 \pm 0.7$ psec $\lvert g \rvert = 0.55 \pm 0.03$	γ	2, 12, 13, 14, 16, 19, 20, 30, 33, 42, 43, 44, 45, 51, 52, 61, 62, 63, 64, 65, 67, 68, 71, 72, 75, 76, 79, 80, 81, 82, 83, 85, 86, 89, 90
6.9171 ± 0.6	$2^+; 0$	0^+	$\tau_m = 6.00 \pm 0.03$ fsec	γ	2, 12, 13, 14, 15, 16, 19, 20, 30, 31, 33, 42, 43, 44, 45, 51, 52, 61, 63, 64, 66, 67, 68, 71, 72
7.11685 ± 0.14	$1^-; 0$		$\tau_m = 12.0 \pm 1.2$ fsec	γ	2, 12, 13, 14, 19, 20, 30, 33, 42, 43, 44, 45, 51, 52, 61, 63, 64, 65, 68, 71, 72, 75, 79, 81, 82, 83, 85, 86, 91
8.8719 ± 0.5	$2^-; 0$		$\tau_m = 180 \pm 16$ fsec	γ, α	2, 12, 13, 14, 20, 30, 31, 42, 43, 45, 51, 52, 55, 63, 64, 65, 67, 68, 72, 79, 80, 81, 82, 85, 86, 89
9.632 ± 21	$1^-; 0$	0^-	$\Gamma_{c.m.} = 510 \pm 60$	γ, α	5, 10, 12, 13, 42, 52, 55
9.847 ± 3	$2^+; 0$		0.9 ± 0.3	γ, α	2, 5, 10, 12, 13, 14, 30, 42, 43, 45, 51, 52, 55, 61, 64, 65, 67, 68, 81, 82, 83, 85, 89

Table 16.9: Energy levels of ^{16}O [a] (continued)

E_x (MeV ± keV)	$J^\pi; T$	K^π	τ_m or $\Gamma_{c.m.}$ (keV)	Decay	Reactions
10.353 ± 4	$4^+; 0$	0^+	27 ± 4	γ, α	2, 5, 10, 12, 13, 14, 15, 16, 19, 20, 30, 31, 42, 43, 45, 52, 61, 64, 65, 67, 68, 71, 72, 79, 81, 82, 83, 85, 89
10.952 ± 3	$0^-; 0$		$\tau_m = 8 \pm 5$ fsec	γ	42, 51, 52, 64, 65, 81
11.080 ± 3	$3^+; 0$		$\Gamma_{cm} < 12$	γ	2, 42, 45, 51, 52, 81
11.095 ± 2	$4^+; 0$		0.28 ± 0.05	γ, α	2, 5, 10, 12, 13, 16, 20, 30, 31, 42, 43, 45, 64, 65, 67, 68, 72, 85
11.26 [b]	$0^+; 0$		2500	α	10, 52, 82
11.52 ± 4	$2^+; 0$		74 ± 4	γ, α	2, 5, 10, 42, 61, 64, 65, 67, 68
11.60 ± 20	$3^-; 0$	0^-	800 ± 10	α	10, 13
12.053 ± 3	$0^+; 0$		1.5 ± 0.5	γ, α	10, 42, 61, 64, 65, 67, 68, 82
12.442 ± 5	$1^-; 0$		98 ± 7	γ, p, α	5, 7, 10, 42, 46, 47, 50, 51, 52, 65, 68
12.530 ± 1	$2^-; 0$		0.8	γ, p, α	2, 42, 46, 47, 50, 51, 52, 61, 64, 65, 68
12.797 ± 5	$0^-; 1$		38 ± 4	p	42, 47, 51, 52
12.9686 ± 0.6	$2^-; 1$		1.9 ± 0.2	γ, p, α	42, 46, 47, 50, 51, 52, 61, 79, 80, 81
13.02 ± 10	2^+		150 ± 11	γ, p, α	2, 5, 10, 47, 50, 61, 64, 65, 67, 68
13.094 ± 7	$1^-; 1$		130 ± 5	γ, p, α	5, 7, 10, 41, 42, 46, 47, 50, 51, 52, 61, 81
13.129 ± 10	$3^-; 0$		110 ± 30	γ, p, α	2, 5, 7, 10, 41, 43, 51, 52, 68
13.254 ± 5	$3^-; 1$		21 ± 1	γ, p, α	5, 7, 10, 42, 47, 50, 51, 52, 64, 79, 80, 81, 83
13.664 ± 3	$1^+; 0$		64 ± 3	γ, p, α	42, 46, 47, 50, 65
13.875 ± 6	$4^+; 0$		75 ± 7	α	2, 10, 42, 50, 68
13.979 ± 3	2^-		22 ± 2	p, α	2, 42, 43, 47, 50, 64, 67, 69
14.032 ± 15	0^+		185 ± 35	γ, α	10, 61
14.1 ± 100	3^-		750 ± 200	α	10
14.30 ± 20			< 30		13, 30, 43
14.400 ± 3	≥ 5		≤ 30		2, 13, 30, 42, 43
(14.52)					30

Table 16.9: Energy levels of ^{16}O [a] (continued)

E_x (MeV ± keV)	$J^\pi; T$	K^π	τ_m or $\Gamma_{c.m.}$ (keV)	Decay	Reactions
14.63 ± 40	4^+		500 ± 100	α	10
14.67 ± 40	5^-	0^-	560 ± 75	α	10, 12, 13, 16, 20, 30
14.815 ± 2	6^+; 0		67 ± 8	α	2, 10, 30, 31, 43, 68
14.922 ± 6	4^+		51 ± 7	p, α	2, 41, 42, 47, 50, 67, 68
15.107 ± 50	0^+		190 ± 30	α	10, 31, 43
15.22 ± 35	2^-		70 ± 14	p, α	47, 50, 79
15.25 ± 50	2^+; (0)		650 ± 100	γ, p, α	46, 47, 50, 61
15.405 ± 20	3^-; 0		95 ± 15	p, α	7, 10, 41, 43, 47, 50, 64, 68, 79
15.8	3^-		≈ 400	α	10
15.838 ± 15			≤ 80		2, 42, 43
15.9	2^+		≈ 600	γ, α	5
16.214 ± 15	(4^+)		96 ± 16		2, 43
16.22 ± 15	1^+; 1		18 ± 3	γ, n, p	46, 47, 48, 61
16.29 ± 15	6^+	0^+	370 ± 40	α	10, 12, 13, 15, 16, 20, 31, 41, 42, 82, 83
16.42 ± 25	2^+		35 ± 5	γ, n, p, α	5, 6, 7, 10, 31, 61, 64, 67, 68
16.8 ± 100	(3^+)		≤ 100	γ	61
16.9	5^-		700	α	10
(16.94)	2^+		≈ 280	α, ^{8}Be	11
(17.0)	1^-; 1		≈ 1400	γ, p	46
17.14 ± 15	1^-; 1		36 ± 5	γ, n, p, α	6, 7, 10, 43, 46, 47, 48, 52, 61
17.200 ± 20	2^+		160 ± 60	α, ^{8}Be	2, 11, 42, 43, 52, 64, 67, 68
17.29 ± 15	1^-; 1		90 ± 10	γ, n, p, α	6, 10, 46, 47, 48
17.55	(4^+)		165	n, α	6, 10
17.64 ± 15	(2^-); 1		59 ± 10	γ, n, p, α	7, 10, 48, 61
(17.7)	0^+, 2^+			α, ^{8}Be	11
17.85 ± 20	4^+		100 ± 10	n, p, α, ^{8}Be	2, 6, 10, 11, 42, 48, 64
18.018 ± 15	4^+; 0		14	(γ), p, α, ^{8}Be	7, 10, 11, 42, 46, 48
18.06 ± 15	$(2^+, 4^+)$; 1		26 ± 5	(γ), n, p, α	6, 10, 46, 47, 48
18.15 ± 30	$(2^+; 0)$		260 ± 50	(γ), n, p	5, 6, 48, 64, 67, 68
18.29			280	γ, p, α	5, 7, 10
18.4	5^-		510	α	10
18.48 ± 25	2^+		60 ± 9	γ, n, p, α, ^{8}Be	2, 11, 48, 61, 64, 67, 68

Table 16.9: Energy levels of ^{16}O [a] (continued)

E_x (MeV $\pm$ keV)	$J^\pi; T$	K^π	τ_m or $\Gamma_{c.m.}$ (keV)	Decay	Reactions
18.6	$(1^-, 5^-)$		140	α	10, 48
18.69 ± 30	$3^-; 0$		280 ± 80		48, 64, 68
(18.75)	(1^-)		55	α	10
18.80	(4^+)		220	n, p, α, ^{8}Be	6, 7, 10, 11
18.94 ± 30	2, 4		< 16	γ, p	2, 46, 81
18.99 ± 30	$3^-; 1$		240	γ, p	46, 68
19.09 ± 30	$2^+; (1)$		120	γ, p	46, 47, 67
19.10 ± 50	$(4^+; 1)$		41	n, (α)	6, 10, 64
19.24 ± 20	$2^-; 1$		90 ± 10	γ, n, p, α	6, 10, 46, 48, 64
(19.34)	6^+		50	^{8}Be	11
(19.39)	$(4^+, 0^+)$		23	α	10
19.48 ± 25	$1^-; 1$		250 ± 60	γ, n, p, α	10, 46, 47, 48, 61
19.55 ± 30	$(3^-; 0)$		240	n, α	2, 6, 10, 64, 68
19.89 ± 20	$3; 0$		100 ± 30	γ, n, p	2, 46, 48, 80
19.91 ± 20	(4^+)		825	α	10
19.98	$(2^+, 0^+, 1^-)$		140	α	10
20.15 ± 100	$2^+; 0$		350 ± 50	γ, n, α	5, 6, 67, 68
20.3			≈ 1500	p, α	7
20.36 ± 70	$2^-; 1$		500 ± 100	γ	61
20.43 ± 20	≥ 2		150 ± 30	γ, n, p, α	6, 46, 48
(20.47)	(4^+)		110	α	10
20.54 ± 15	≥ 1		140 ± 30	n, p, α	2, 10, 47, 48, 64
20.81			< 25	n, α	6
20.88 ± 60	7^-	0^-	650 ± 75	α	7, 9, 10, 11, 13
20.9 ± 100	$2^+; 0$	350 ± 50			10, 12, 13, 16
20.945 ± 20	$1^-; 1$		300 ± 10	γ, n, p	47, 48, 61
21.0	(5^-)		900	α	10
(21.01)			55	n, α	6
21.03 ± 25	1^-		255 ± 60	γ, α	5, 64, 68
(21.1)	(6^+)		450	n, α	6, 10
21.175 ± 15					2
21.50	$(1 \rightarrow 4)$		120	p	47
21.67	$(T = 0)$		< 50	n, p, α	6, 47, 50
21.82 ± 70	$2^+; 0$		400 ± 50		64, 68
21.84 ± 25	6		55	n, α	2, 6, 12
22.04			60	n, d, α	6, 36
(22.07)			340	n, α	6

Table 16.9: Energy levels of ^{16}O [a] (continued)

E_x (MeV ± keV)	$J^\pi; T$	K^π	τ_m or $\Gamma_{c.m.}$ (keV)	Decay	Reactions
22.146 ± 20	$1^-; 1$		675 ± 10	γ, n, p	46, 47, 48
22.2 ± 100			< 150	γ, n, d, α, ^{8}Be	6, 11, 35, 40
22.35				n, d, α	36, 40
22.46 ± 70	$(2^+, 3^-); 0$		450 ± 50	n, d, α	6, 40, 64, 68
22.65 ± 30			60	n, α, ^{8}Be	2, 6, 11
22.721 ± 3	$0^+; T = 2$		12.5 ± 2.5	n, p, d, α	6, 7, 10, 33, 37, 40, 82
22.87 ± 30	$1^-; 1$		300 ± 15	γ, p, d	35, 46, 47
23.1	6^+		$\lesssim 500$	d, α, ^{8}Be	11, 38
23.11			≈ 20	d, α, ^{8}Be	10, 11, 40
23.22 ± 70	$2^+; 0$		400 ± 50		64, 68
23.50 ± 150			1700 ± 300	α	10, 68
23.51 ± 30			300	p, d, α	2, 10, 37, 38
23.85 ± 100	$(2^+, 0^+); 0$		400 ± 50	n, α	6, 68
23.879 ± 6	6^+		26 ± 4	p, α, ^{8}Be	7, 10, 11
24.0 ± 100			1200 ± 300		64
24.065 ± 35	$1^-; 1$		550 ± 40	γ, p, ^{3}He, α, ^{8}Be	11, 21, 46
24.4 ± 100	$(2^+, 3^-)$		400 ± 50	α	10, 68
24.522 ± 11	$2^+; 2$		< 50		33, 82
24.77 ± 60	$(2^+, 4^+; 1)$		340 ± 60	γ, n, p, d, ^{3}He, α	27, 36, 37, 46
25.12 ± 50	$1^-; 1$		2900 ± 300	γ, p, ^{3}He, α	10, 21, 46, 60
25.50 ± 150	$1^-; 1$		1330 ± 300		64
25.6	$(3^-); 1$		≈ 350	^{3}He, α	10, 27
26.1 ± 100	$T = 1$		450	γ d,, ^{3}He, α	10, 21, 27, 38, 40
26.3	2^+		1200	α	10
26.42 ± 80	$(2)^+; 1$		530 ± 80	γ, p, ^{3}He	21, 46
27.0	$(T = 1)$		broad	d, ^{3}He, α	27, 40
27.4 ± 100	$(2^+, 4^+; 1)$		825 ± 110	γ, p, d, ^{3}He, α, ^{8}Be	27, 28, 38, 46
27.6	$(3^-; 0)$		≈ 500	p, d, ^{3}He, α	23, 26, 27, 38
29.7			broad	d, α	10, 38
31.8 ± 600				γ	60
≈ 35	3^-		≈ 5000		64

[a] See also Tables 16.15 and 16.21.
[b] Calculated from E_x of ^{16}O*(6.13) and the ΔE of 81.0 ± 1.0 keV between ^{16}O*(6.05, 6.13) (C.P. Browne, private communication).

conversion factor 931.5016 (26) MeV/a.m.u., the mass excess of ^{16}O would then be -4737.04 ± 0.02 keV. (1971WA37) quotes -4736.68 ± 0.19 keV which we shall continue to assume. See also (1971SM01).

$$\langle r^2\rangle^{1/2} = 2.71 \pm 0.02 \text{ fm (1974DU02)},$$

$$\langle r^2\rangle^{1/2} = 2.718 \pm 0.021 \text{ fm (1973FE13, 1975SC18)}.$$

$|g| = 0.55 \pm 0.03$ for ^{16}O*(6.13) (1973BR31, 1973RA09). See also (1976KA1N).

1. (a) ^{10}B(^{6}Li, p)^{15}N $\quad Q_m = 18.749 \quad E_b = 30.877$
   (b) ^{10}B(^{6}Li, d)^{14}N $\quad Q_m = 10.140$
   (c) ^{10}B(^{6}Li, t)^{13}N $\quad Q_m = 5.844$
   (d) ^{10}B(^{6}Li, ^{3}He)^{13}C $\quad Q_m = 8.8083$
   (e) ^{10}B(^{6}Li, α)^{12}C $\quad Q_m = 23.715$

At $E(^6\text{Li}) = 4.9$ MeV, the cross sections for reactions (a) to (e) leading to low-lying states in the residual nuclei are proportional to $2J_f + 1$: this is interpreted as indicating that the reactions proceed via a statistical compound nucleus mechanism. For highly excited states, the cross section is higher than would be predicted by a $2J_f + 1$ dependence (1966MC05). The yield curves for α_0 and α_1 (reaction (e)) measured at 0° for $E(^6\text{Li}) = 3.2$ to 13.6 MeV show broad structures. At 90°, for $E(^6\text{Li}) = 9.7$ to 13.0 MeV no structure is apparent, suggesting that the 0° yield is explainable in terms of Ericson fluctuations (1967SE08).

2. ^{10}B(^{10}B, α)^{16}O $\quad Q_m = 26.417$

States of ^{16}O observed at $E(^{10}\text{B}) = 20$ MeV are displayed in Table 16.10. The reaction excites known $T = 0$ states: σ_t follows $2J_f + 1$ for 11 of 12 groups leading to states of known J. The angular distributions show little structure (1976AJ02).

3. ^{10}B(^{14}N, ^{8}Be)^{16}O $\quad Q_m = 14.711$

See (1971AJ02).

4. ^{11}B(^{7}Li, 2n)^{16}O $\quad Q_m = 12.170$

See (1971AJ02).

Table 16.10: States in ^{16}O from ^{10}B(^{10}B, α)^{16}O (1976AJ02)

E_x (MeV ± keV)	Corresponds to ^{16}O*[J^π]	σ_t [b] (mb)	Predicted σ_t [c] (mb)
0	$0[0^+]$	0.2	$\equiv 0.2$
6.088 ± 15	$6.05[0^+] + 6.13[3^-]$	1.6	1.6
6.904 ± 20	$6.92[2^+]$	1.1	1.0
7.115 ± 20	$7.12[1^-]$	0.6	0.6
$\equiv 8.8719$	$8.87[2^-]$	1.0	1.0
9.850 ± 15	$9.85[2^+]$	1.5	1.0
10.361 ± 20	$10.35[4^+]$	1.8	1.8
11.106 ± 20	$10.95[0^-] + 11.08[3^+] + 11.10[4^+]$	4.3	3.2
11.54 ± 30	$11.52[2^+]$	1.0	1.0
12.554 ± 15	$12.53[2^-]$	1.2	1.0
13.14 ± 30	$13.13[3^-]$		
d	$13.66[1^+]$		
13.910 ± 20	$13.88[4^+]$		
13.98 ± 30	$13.98[2^-]$		
14.412 ± 15	$14.30[?] + 14.40[> 5]$	4.1	> 2.2
14.86 ± 30	$14.82[6^+] + 14.92[4^+]$	3.9	4.4
15.838 ± 15	$15.84[?]$	1.4 ± 0.3	
16.276 ± 20	$16.21[(4^+)]$		
17.200 ± 20	$17.20[2^+]$		
17.825 ± 25	$17.85[4^+]$		
d	$18.02[(4^+)]$		
18.531 ± 25	$18.48[2^+] + 18.6[1^-, 5^-]$		
18.69 ± 30	$18.69[3^-]$		
d	$18.80[(4^+)]$		
18.90 ± 35			
d	$18.99[3^-]$		
19.55 ± 35	$19.55[(3^-)]$		
19.91 ± 20	$19.91[(4^+)]$		
20.538 ± 15	$20.54[\geq 1]$		
21.175 ± 15			
21.84 ± 25	$21.84[6]$		

Table 16.10: States in ^{16}O from ^{10}B(^{10}B, α)^{16}O (1976AJ02) (continued)

E_x (MeV ± keV)	Corresponds to ^{16}O*[J^π]	σ_t [b] (mb)	Predicted σ_t [c] (mb)
22.65 ± 30			
23.51 ± 30	23.51[?]		

[a] Very broad states in ^{16}O are assumed not to contribute appreciably to the strength of the alpha group from which an appropriate smooth background has been subtracted.

[b] From integrating angular distribution over forward and back hemispheres, by folding the available data at $\theta_{c.m.} = 90$: estimated uncertainties ±20%, except for ^{16}O*(15.84).

[c] Predicted σ based on $2J_f + 1$, assuming that the states listed in col. 2 are involved and that σ_t for a $J = 0$ state is 0.2 mb.

[d] Unresolved in this work.

5. ^{12}C(α, γ)^{16}O $\qquad Q_m = 7.1616$

The yield of capture γ-rays has been studied for $E_\alpha < 27.5$ MeV: see Table 16.11. Observed resonances are displayed in Table 16.12.

This reaction plays an important role in astrophysical processes. (1974DY02) has determined σ_{E1} for $E_\alpha = 1.88$ to 3.92 MeV. From these data $S(E_\alpha(\text{lab}) = 400\ \text{keV}) = 0.08^{+0.05}_{-0.04}$ MeV · b (1974KO06) [used a hybrid R-matrix-optical model analysis (α, γ) and (α, α)], $0.08^{+0.14}_{-0.07}$ MeV · b (1976HU1H) [used a two channel, two level approximation of a modified K-matrix]. See also (1971BA99, 1974WE14). (1974DY02) state that S depends quite strongly on $\theta^2_\alpha(6.92)/\theta^2_\alpha(7.12)$: S may have to be increased to allow for the tail of ^{16}O*(6.92). For astrophysical considerations see (1974DY02) and (1971BA1A, 1971BI1H, 1973AR1E, 1973CL1E, 1973IB1B, 1974BA1X, 1975FO19, 1976AU1F, 1976SC1M), in addition to the references listed above and in (1971AJ02).

Upper limits of the parity forbidden α-decay of ^{16}O*(10.95, 11.08) [$J^\pi = 0^-$; $T = 0$ and 3^+; 0, respectively] are $< 6 \times 10^{-4}$ eV and $< 5 \times 10^{-4}$ eV, respectively (1974BE32). See also (1974DA22) and (1973GA23; theor.).

At higher energies the E2 cross section shows resonances at $E_x = 13.2$, 15.9, 16.5, 18.3, 20.0 and 26.5 MeV [see Table 16.12]. Some E2 strength is also observed for $E_x = 14$ to 15.5 and 20.5 to 23 MeV. In the range $E_\alpha = 7$ to 27.5 MeV the $T = 0$ E2 strength is ≈ 17% of the sum rule. It appears from this and other experiments that the E2 centroid is at $E_x \approx 15$ MeV, with a 15 MeV spread (1974SN02). See also (1969OM1A), (1973HA1Q, 1973HA1Y), (1975RA02; theor.) and (1971AJ02) for the earlier work.

6. ^{12}C(α, n)^{15}O $\qquad Q_m = -8.508 \qquad E_b = 7.1616$

Table 16.11: Recent $^{12}C + \alpha$ yield measurements [a]

E_{α} (MeV)	Yield of	Refs.
$1.88 \rightarrow 3.92$	γ_0	(1974DY02)
$2.9 \rightarrow 4.1$	γ_0	(1970JA24)
$7.0 \rightarrow 27.5$	γ_0	(1974SN02)
$7.6 \rightarrow 8.1$	γ_0	(1971KE09)
$2 \rightarrow 9$	n (^{nat}C)	(1973BA89)
$13 \rightarrow 16$	n_0	(1971BE07)
$8.5 \rightarrow 10.5$	p	(1971OP01)
$11.3 \rightarrow 17.9$	p_0	(1971ZE01)
$13 \rightarrow 16$	p_0	(1971BE07)
$20.2 \rightarrow 21.4$	p_0	(1973AD1B)
$20.7 \rightarrow 20.8$	p_0, p_{1+2}	(1972NE10)
$22.8 \rightarrow 27$	$p\gamma_{10.6}$	(1975SP04)
$3 \rightarrow 10$	α_0	(1974DA22, 1975DA10)
$4.0 \rightarrow 13.3$	α_0	(1972MA01)
$5.22 \rightarrow 5.27$	α_0	(1975BR06)
$8.5 \rightarrow 10.5$	α_0, α_1, $\alpha_1\gamma$	(1971OP01, 1973MA03)
$10.0 \rightarrow 10.3$	α_0, α_1	(1971BE50, 1971RA24)
$15.8 \rightarrow 20.1$	σ_t	(1973LA16)
$16.1 \rightarrow 17.2$	α_2	(1976GL1D)
$18.0 \rightarrow 26.6$	α_0	(1973KU18)
$20 \rightarrow 27$	$\gamma_{12.71}$	(1975SP04)
$20.7 \rightarrow 20.8$	α_0, α_1, α_2	(1972NE10)
$22 \rightarrow 27$	$\gamma_{15.11}$	(1975SP04)
$E(^{16}O) = 6.72$ to 6.98	α_0	(1976MCZX)
0.87 and 2.1 GeV/nucleon	σ_t	(1975JA1A)
$15.0 \rightarrow 19.0$	^{8}Be	(1972MA53)
$18.5 \rightarrow 23.0$	^{8}Be	(1974JA21)
$19.0 \rightarrow 26.5$	^{8}Be	(1973BR1H)
$17 \rightarrow 33$	^{8}Be	(1976BR07)
$63 \rightarrow 68$	^{8}Be	(1974JE1A)

[a] For the earlier work see Table 16.10 in (1971AJ02).

Table 16.12: Resonances in $^{12}C + \alpha$

E_α (MeV ± keV)	$\Gamma_{c.m.}$ (keV)	Outgoing particles [a] (x)	Γ_x	Γ_{α_0}/Γ	$^{16}O^*$ (MeV)	$J^\pi; T$	Refs. [b]
					8.87 [i]		(1976MCZX)
3.322 ± 30	550	γ_0	23 ± 3 meV		9.65 [c]	1^-	(1974KO06, 1975DA10)
		α_0		≈ 1			
3.575 ± 10	0.9 ± 0.3	γ_0	5.9 ± 0.6 meV		9.842	2^+	(1970BR14, 1976MCZX)
		γ_3	2.2 ± 0.4 meV				
		α_0					
4.256 ± 11	27 ± 4	γ_0			10.353	4^+	(1972MA01, 1975CH30)
		γ_3	58 ± 7 meV				
		α_0		1			
5.245 ± 8	0.28 ± 0.05	γ_2	3.1 ± 1.3 meV		11.094	4^+	(1975BR06)
		γ_3	2.5 ± 0.6 meV				
		α_0					
5.47	2500	α_0			11.26	0^+	(but see 1972MA01)
5.809 ± 18	73 ± 5	γ_0	0.65 ± 0.08 eV		11.52	2^+	(1970BR14, 1972MA01)
		γ_3	29 ± 7 meV				
		α_0		1			
5.92 ± 20	800 ± 100	α_0		1	11.60	3^-	(1954BI96, 1972MA01, 1974DA22)
6.518 ± 10	1.5 ± 0.5	α_0			12.049	0^+	
7.045 ± 5	99 ± 7	γ_0	9.5 ± 1.7 eV [d]		12.444	$1^-; 0$	(1972MA01, 1973BR19, 1975DA10)
		γ_1	0.12 ± 0.06 eV [d]				
		p	1.1 keV				
		α_0	92 ± 8 keV	1.0			
		α_1	0.025 keV				
7.82 ± 10	150 ± 11	γ_0	[e]		13.02 [k]	2^+	(1971KE09, 1972MA01, 1974SN02)
		α_0	150 ± 11 keV	0.8			
7.915 ± 10	130 ± 5	γ_0	44 ± 8 eV [f]		13.096	$1^-; 1$	(1971KE09, 1972MA01, 1973BR19)
		γ_4	1.35 ± 0.4 eV				
		p	100 keV				

Table 16.12: Resonances in ^{12}C + α (continued)

E_α (MeV ± keV)	$\Gamma_{c.m.}$ (keV)	Outgoing particles [a] (x)	Γ_x	Γ_{α_0}/Γ	^{16}O* (MeV)	$J^\pi; T$	Refs. [b]
		α_0	45 ± 18 keV	0.3			
		α_1	1 keV				
7.960 ± 10	110 ± 30	γ_0	> 0.01 eV		13.129	3^-; 0	(1971KE09, 1972MA01)
		p	1 keV				
		α_0	90 ± 14 keV	0.7			
		α_1	≈ 20 keV				
8.130 ± 15	26 ± 7	γ			13.257	3^-; 1	
		p	4.5 keV				
		α_0	9 ± 4 keV				
		α_1	7.5 keV				
		$\gamma_{4.4}$					
8.960 ± 10	75 ± 7	α_0	49 keV	0.65 ± 0.05	13.879 ± 8	4^+	(1971OP01, 1972MA01, 1973MA03, 1975DA10)
		α_1	23 keV				
9.1	4800	α_0			14.0	0^+	(1968CL04)
9.164 ± 15	200 ± 50	α_0	≈ 200 keV	> 0.9	14.032	0^+	(1971OP01, 1972MA01, 1973MA03)
9.3 ± 100	750 ± 200	α_0		0.2 ± 0.1	14.1	3^-	(1973MA03)
		α_1					
9.96 ± 40	500 ± 100	α_0		0.8 ± 0.1	14.63	4^+	(1972MA01, 1973MA03)
		α_1					
10.02 ± 40 [g]	650 ± 100	α_0		≈ 0.95	14.67	5^-	(1973MA03)
		α_1					
10.195 ± 7 [g]	70 ± 8	α_0	22 keV	0.45 ± 0.05	14.805	6^+	(1971BE50, 1971OP01, 1971RA24, 1972KE18, 1973MA03)
		α_1	48 keV				
10.68 ± 50	190 ± 30	α_0			15.17	0^+	(1972MA01)
11.05 ± 20	100 ± 20	p_0, α_0, α_1, $\gamma_{4.4}$		0.6	15.45	3^-	(1972MA01)

Table 16.12: Resonances in ^{12}C + α (continued)

E_α (MeV $\pm$ keV)	$\Gamma_{\text{c.m.}}$ (keV)	Outgoing particles [a] (x)	Γ_x	Γ_{α_0}/Γ	^{16}O* (MeV)	$J^\pi; T$	Refs. [b]
11.5	≈ 400	α_0, α_1, $\gamma_{4.4}$			15.8	3^-	
11.6	≈ 600	γ_0			15.9	2^+	(1974SN02)
		$\Gamma_\alpha\Gamma_\gamma/\Gamma \approx 0.4$ eV					
12.18 ± 40	490 ± 40	α_0			16.29	6^+	(1972MA01)
12.32 ± 25	45	γ_0, n, p$_0$, α_0, α_1, $\gamma_{4.4}$			16.40 [h]	2^+	(1974SN02)
		$\Gamma_\alpha\Gamma_\gamma/\Gamma = 0.45$ eV					
12.5	730	p$_0$, α_0			16.5		
12.9	400	α_0			16.8	(4^+)	
13.0	700	α_0			16.9	5^-	
13.05	≈ 280	^{8}Be			16.94	2^+	
13.26	110	n, (p$_0$), α_0, α_1, $\gamma_{4.4}$			17.10	$(1^-, 2^+, 0^+)$	
13.35	200	^{8}Be			17.17	2^+	
13.50	< 100	n			17.28		
13.59	150	α_1, $\gamma_{4.4}$			17.35		
13.86	165	n, α_0			17.55	(4^+)	
13.95	120	p$_0$, α_0			17.62		(1971BE07)
14.1		^{8}Be			17.7	$0^+, 2^+$	
14.21	225	n, α_1, $\gamma_{4.4}$, ^{8}Be			17.81	4^+	
14.483 ± 15	14	p$_0$, α_0, α_1, ^{8}Be			18.018	$4^+; 0$	
14.50	40	n, α_0, α_1, $\gamma_{4.4}$			18.03	(4^+)	
14.6 ± 100	220 ± 60	(γ_0), n$_0$			18.1 [h]	$(2^+; 0+1)$	(1971BE07)
14.85	280	γ_0, p$_0$, (α_0), α_1, $\gamma_{4.4}$			18.29 [h]		(1974SN02)
		$\Gamma_\alpha\Gamma_\gamma/\Gamma = 0.95$ eV					
15.0	510	α_0, $(\alpha_1, \gamma_{4.4})$			18.4	5^-	
15.2		^{8}Be			18.6	$0^+, 2^+$	
15.2	140	α_0, $(\alpha_1, \gamma_{4.4})$			18.6	$(1^-, 5^-)$	
15.46	55	α_0			18.75	(1^-)	

Table 16.12: Resonances in ^{12}C + α (continued)

E_α (MeV ± keV)	$\Gamma_{c.m.}$ (keV)	Outgoing particles [a] (x)	Γ_x	Γ_{α_0}/Γ	^{16}O* (MeV)	$J^\pi; T$	Refs. [b]
15.52	220	n, p_0, α_0, α_1, ^{8}Be			18.80	(4^+)	
15.88	broad	α_1, $\gamma_{4.4}$			19.06		
15.96	41	(n), α_0			19.12	$(2^+, 4^+)$	
16.13	23	(n), α_0			19.25	(5^-)	
16.25	50	^{8}Be, (α_2)			19.34	6^+	(1976GL1D)
16.30	23	α_0			19.39	$(4^+, 0^+)$	
16.4	broad	α_1, α_2			19.5		(1976GL1D)
16.62	240	n			19.62		
16.73	17	α_0			19.70	even	
17.0	825	α_0, α_2			19.9	(4^+)	(1976GL1D)
17.10	140	α_0, α_1			19.98	$(2^+, 0^+, 1^-)$	
17.22	310	γ_0, n			20.07	2^+	(1974SN02)
17.5	≈ 1500	p_0			20.3		
17.66	< 150	n			20.40		
(17.75)	110	α_0			(20.47)	(4^+)	
17.90		α_1			20.58		
18.21	< 25	n			20.81		
18.4	750	α_0			21.0	7^-	
18.48	55	n			21.01		
18.50 ± 25	240 ± 80	γ_0			21.03 [h]	1^-	
18.5	900	α_0			21.0	(5^-)	
(18.6)	450	n, α_0, α_1			(21.1)	(6^+)	
19.37	55	n			21.68		
19.52	55	n			21.79		
19.85	60	n			22.04		
19.89	340	n			22.07		
19.95	< 150	n, ^{8}Be			22.11		(1974JA21)

Table 16.12: Resonances in ^{12}C + α (continued)

E_α (MeV $\pm$ keV)	$\Gamma_{\rm c.m.}$ (keV)	Outgoing particles [a] (x)	Γ_x	Γ_{α_0}/Γ	^{16}O* (MeV)	$J^\pi; T$	Refs. [b]
20.49	375	n			22.52		
20.71	60	n, ^{8}Be			22.68		(1974JA21)
20.760 ± 5	12.5 ± 2.5	n_0, p_0, α_0, α_2			22.721	$0^+; T = 2$	(1972NE10, 1973AD1B)
21.28	≈ 20	α_0, α_1, ^{8}Be			23.11		(1974JA21)
21.3	$\lesssim 500$	^{8}Be			23.1	6^+	(1974JA21)
21.67	< 40	n			23.40		
21.85	300	α_0, α_1			23.54		
22.0	1500	$\gamma_{12.71}$			23.6		(1975SP04)
22.14	120	n			23.75		
22.306 ± 6	26 ± 4	p_0, α_0, α_1, α_2, ^{8}Be	[j]	0.06 ± 0.02	23.879	6^+	(1974JA21, 1976BR07)
22.37	165	n			23.93		
22.75	$\lesssim 500$	^{8}Be			24.21		(1974JA21)
23.2	750	$\gamma_{12.71}$, $\gamma_{15.11}$			24.5	$T = 1$	(1975SP04)
24.1	450	$\gamma_{15.11}$			25.2	$T = 1$	(1975SP04)
24.6	450	$\gamma_{15.11}$			25.6	$T = 1$	(1975SP04)
25.5	450	$\gamma_{15.11}$			26.3	$T = 1$	(1975SP04)
25.6	1200	α_0, $\gamma_{12.71}$			26.3	2^+	(1974SN02, 1975SP04)
		$\Gamma_\alpha\Gamma_\gamma/\Gamma = 1.2$ eV					
30	broad	α_0, α_1			30		

[a] p_0 corresponds to ^{15}N(0). α_0, α_1 correspond to ^{12}C*(0, 4.4) and $\gamma_{4.4}$ corresponds to the γ-ray from the decay of ^{12}C*(4.4); γ_0, γ_1, γ_2, γ_3, γ_4 correspond to the transitions to ^{16}O*(0, 6.05, 6.13, 6.92, 7.12).

[b] See also Table 16.11 in (1971AJ02).

[c] θ^2_α(7.12)/θ^2_α(9.63) $= 0.19^{+0.16}_{-0.11}$ (1974KO06).

[d] Branching ratios to ^{16}O*(0, 6.05) $= 98.8\%$ and 1.2%.

[e] $\Gamma_{\gamma_0} = 0.7 \pm 0.2$ eV (1971KE09), based on $\Gamma_{\alpha_0}/\Gamma = 1.0$ (1968MO08) and $\Gamma_{\rm c.m.} = 190 \pm 40$ keV (1971KE09). See also (1974SN02).

[f] $\Gamma_{\alpha_0}\Gamma_{\gamma_0}/\Gamma^2 = (1.49 \pm 0.17) \times 10^{-4}$ (1971KE09).

[g] See also (1972MA01).

[h] $\Gamma_\gamma\Gamma_\alpha/\Gamma = 0.2$, 0.7 and 6 eV, respectively, for ^{16}O*(16.42, 18.18, 20.9) (1967SU02).

[i] An attempt is reported by (1976MCZX) to observe a 0^+ state in the vicinity of the known 2^- state at 8.87 MeV: no such state exists with $8.842 < E_{\rm x} < 8.907$ MeV [this region was covered in 0.5 keV steps, with 1.5 to 3% statistics for the α_0 yield].

[j] $\Gamma_{^8{\rm Be}}$, Γ_{α_0} and $\Gamma_{\alpha_2} \approx 3.5$, 1.5 ± 0.5 and ≈ 6 keV, respectively (1976BR07).

[k] The previously reported 2^+ state at 13.14 MeV (see 1971AJ02) appears to be identical to this level: a revised value for the width of that state is $\Gamma_{\rm c.m.} \approx 180$ keV (F.C. Barker, private communication).

Cross section measurements have been made from threshold to $E_\alpha = 24.7$ MeV: see (1971AJ02) and Table 16.11. Observed resonances are displayed in Table 16.12. The resonance in n_0 at $E_\alpha = 14.6$ MeV (^{16}O*(18.1)) does not appear in the p_0 yield: a large isospin mixing is suggested for that state (1971BE07). An anomaly is observed in the n_0 yield corresponding to formation of the first $T = 2$ state in ^{16}O [^{16}O*(22.7)] (1973AD1B). See also ^{15}O in (1976AJ04).

7. ^{12}C(α, p)^{15}N $\qquad Q_m = -4.9661 \qquad E_b = 7.1616$

The yield of protons corresponding to ^{15}N(0) has been studied for $E_\alpha = 7.7$ to 23 MeV: see Table 16.10 in (1971AJ02) and Table 16.11 here. (1975SP04) have measured the yield of 10.6 MeV γ-rays [from ^{15}N*($10.45 \rightarrow 10.80$)] at $E_\alpha = 22.8$ to 27 MeV. Observed resonances are displayed in Table 16.12. An anomaly is observed in the p_0 yield corresponding to formation of the $T = 2$ state ^{16}O*(22.7): see (1973AD1B) and (1972WE03). See also ^{15}N in (1976AJ04).

8. ^{12}C(α, d)^{14}N $\qquad Q_m = -13.5751 \qquad E_b = 7.1616$

See ^{14}N in (1976AJ04) and (1974BE41).

9. (a) ^{12}C(α, t)^{13}N $\qquad Q_m = -17.871 \qquad E_b = 7.1616$
(b) ^{12}C(α, ^{3}He)^{13}C $\qquad Q_m = -15.6321$

See ^{13}N and ^{13}C in (1976AJ04) and (1974BE41).

10. ^{12}C(α, α)^{12}C $\qquad E_b = 7.1616$

The yield of α-particles corresponding to ^{12}C*(0, 4.4) and of 4.4, 12.7 and 15.1 MeV γ-rays has been studied at many energies in the range 2.5 to 35.5 MeV: see Table 16.11. Observed resonances are displayed in Table 16.12. The parameters of the first $T = 2$ state of ^{16}O at $E_x = 22.7$ MeV observed as anomalies in the α_0 and α_2 yields are displayed in Table 16.12 (1972NE10). Astrophysical considerations are discussed in reaction 5. See also (1971LE33, 1974KO06, 1974WE14, 1975ME1E, 1975ST1K, 1976GL1D, 1976HU1H).

For angular correlation measurements see (1972BU09, 1972KE18). For differential cross section measurements at $E_\alpha = 58$ MeV see (1974BE41). For polarization parameters see (1972BU09). For π^0 emission at $E_\alpha = 710$ MeV see (1976WA1P). For spallation measurements see (1971FO06, 1971LE33, 1972RU03, 1974GA1K, 1974RA11, 1975FU01, 1975RA12).

See also (1974JA1M, 1974SL01, 1974WI05), (1972HO56, 1973DU1B, 1973FA1G, 1973IC01, 1973SC1N, 1973TE02, 1974HO19, 1974KH05, 1974KU15, 1974WA1D, 1975BA05, 1975CU1B, 1975HA30, 1975SU1F, 1976BO1Y, 1976HU07, 1976SAZS; theor.), ^{12}C in (1975AJ02) and (1971AJ02).

11. (a) ^{12}C(α, ^{8}Be)^{8}Be $Q_m = -7.4587$ $E_b = 7.1616$

(b) ^{12}C(α, 2α)^{8}Be $Q_m = -7.3667$

(c) ^{12}C(α, 4α) $Q_m = -7.2748$

The yield of ^{8}Be (reaction (a)) shows a number of resonances: see Table 16.12. There is no evidence below $E_x \approx 24$ MeV for $J^\pi = 8^+$ states although the existence of such states below this energy cannot be ruled out since it is possible that the L of the entrance channel inhibits the formation of such states. Above 26 MeV $L = 8$ becomes dominant (1976BR07). See also (1972SU04; theor.) and (1971AJ02). For reaction (b) see (1975CO1C). For reaction (c) see (1970KL10, 1973RU09). See also ^{12}C in (1975AJ02) and ^{8}Be in (1974AJ01).

12. ^{12}C(^{6}Li, d)^{16}O $Q_m = 5.6879$

This reaction has been studied at many energies for $E(^6\text{Li}) < 42$ MeV and $E(^{12}\text{C}) = 18$ to 24 MeV: see Table 16.13 in (1971AJ02). Angular distributions are also reported at $E(^6\text{Li}) = 32$ MeV [(1974DE16: to ^{16}O*(10.35, 11.10)), (1972BA2B: to ^{16}O*(10.35))], at 32.5 and 35.5 MeV (1975GO15: to ^{16}O*(10.35, 14.6, 16.3, 20.9)) and at 42 MeV (1976JAZV; to most states with $E_x < 16$ MeV). At the higher energies the spectra are dominated by states with $J \geq 4$ (and natural parity). Among these are states with $E_x = 10.346 \pm 0.006$, 16.304 ± 0.020 and 20.88 ± 0.06 MeV [$\Gamma_{cm} < 50$, 360 ± 40 and 720 ± 100 keV] and $J^\pi = 4^+, (6^+), (8^+)$ (1971BA31). Angular correlation (d, α_0) measurements agree with the 6^+ assignment for ^{16}O*(16.3) [$\Gamma_{cm} = 370 \pm 50$ keV] (1971AR30, 1971AR36) but show that ^{16}O*(20.9) [$\Gamma_{cm} = 590 \pm 100$ keV] is a 7^- state (1971AR30, 1971AR36, 1975AV02). A state at $E_x = 21.8$ MeV is reported by (1975AV02): $J = 6$. Angular correlations also suggest $J^\pi = 5^-$ for a state with $E_x = 14.6 \pm 0.1$ MeV, $\Gamma_{cm} = 480 \pm 100$ keV (1971AR36, 1974AR24): the branching ratios for the decay of ^{16}O*(14.6, 16.3, 20.9) to $^{12}\text{C}_{\text{g.s.}}$ is 85 ± 10, 80 ± 10 and 90 ± 10 %, respectively (1971AR30, 1971AR36, 1974AR24).

At $E(^6\text{Li}) = 32$ MeV the $\sigma(11.10)/\sigma(10.35) \approx 0.5$ even though the ratio of the reduced widths of these two 4^+ states to $^{12}\text{C}_{\text{g.s.}}$ $S_\alpha(11.10)/S_\alpha(10.35) < 10^{-2}$: a two step process via ^{12}C*(4.4) is suggested (1974DE16)[†] . θ^2_α for all ^{16}O states with $E_x < 10.4$ MeV are listed in (1967LO01). See also (1976JAZV). Gamma-ray angular distribution measurements have been carried out at $E(^6\text{Li}) = 4.5$ to 6.5 MeV (1972CA14, 1972ZA08). For angular correlation measurements, see (1973BA53, 1976BAYO) and ^{18}F in (1978AJ03).

See also (1970JO1D), (1971BA2V, 1972GA1E, 1973FO1E, 1973FO1A, 1973OG1A) and (1970DO13, 1971DE1X, 1971OS02, 1972KU12, 1972OS01, 1972PA15, 1973CH17, 1973CH1H, 1973MC17, 1973TI04, 1974DO03, 1974NO03, 1975PA11, 1976NA05; theor.).

13. ^{12}C(^{7}Li, t)^{16}O $Q_m = 4.695$

† However, compound nuclear effects may account for this ratio (F. Becchetti, private communication).

This reaction has been studied at many energies for $E(^7\text{Li}) < 38$ MeV: see Table 16.13 in (1971AJ02) and (1971BA2Q, 1971BA2R: $E(^7\text{Li}) = 32$ MeV) and (1976CO23: $E(^7\text{Li}) = 38$ MeV). In the latter work the spcetra at forward angles are dominated by members of the 4p-4h $K^\pi = 0^+$ band [^{16}O*(6.05, 6.92, 10.35, 16.3): $J^\pi = 0^+, 2^+, 4^+, 6^+$] and by those of the $K^\pi = 0^-$ band [^{16}O*(9.63, 11.60, 14.67, 20.9): $J^\pi = 1^-, 3^-, (5^-), 7^-$]. Hauser-Feshbach calculations have been made for many of the ^{16}O states and, in particular, for a state at $E_x = 14.363 \pm 15$ keV which is not resolved at forward angles. The width of this state is < 120 keV and $J > 5$, $\pi =$ natural (1976CO23; M.E. Cobern, private communication). See also (1971LA1B, 1972CA1E), (1971BA2V, 1972GA1E, 1973FO1E, 1973FO1A, 1973OG1A, 1974ST1L, 1975GO15) and (1970DO13, 1972KU12, 1973IC01, 1974DO03, 1975PA11; theor.).

14. ^{12}C(^{10}B, ^{6}Li)^{16}O $\quad Q_m = 2.701$

At $E(^{10}\text{B}) = 18$ and 45 MeV angular distributions have been studied involving ^{16}O*(0, 6.1, 7.1, 8.9, 9.9, 10.4): this reaction does not appear to select special states of ^{16}O (1970HI08). See (1970JA1B, 1973YO1C). See also (1972GA1E) and (1973KU03, 1974NE18; theor.).

15. ^{12}C(^{11}B, ^{7}Li)^{16}O $\quad Q_m = -1.504$

At $E(^{11}\text{B}) = 110$ MeV, the population of ^{16}O*(6.05, 6.92, 10.35, 16.3) is particularly strong (1975PI1C). See also (1970RO23), (1973SC1J) and (1973ST1D; theor.).

16. ^{12}C(^{12}C, ^{8}Be)^{16}O $\quad Q_m = -0.205$

Angular distributions have been measured at $E(^{12}\text{C}) = 42$ MeV (1976AR02: $^8\text{Be}_{\text{g.s.}} + {}^{16}$O*(0, 6.1, 6.9, 10.4)), $60 \rightarrow 63$ MeV (1973CR1A, 1976MA12, 1976WE04: $^8\text{Be}_{\text{g.s.}} + {}^{16}$O*(0, 6.1, 6.9, 10.4, 11.1, 14.7, 16.3)), and also for the ground state transitions at $E(^{12}\text{C}) = 11.6$ to 13.4 MeV (1972CO1H), 18 to 40 MeV (1976FL05) and 37 MeV (1975EB03, 1976EB01). Angular correlations at $E(^{12}\text{C}) = 78$ MeV confirm $J^\pi = 4^+, 5^-, 6^+$ and 7^- for ^{16}O*(10.35, 14.67, 16.29, 20.88) (1976SAZE; and P.D. Parker, private communication: ^{8}Be(0°), α_0). At the latter energy $l = 12$ seems dominant: for yield measurements see ^{24}Mg in (1978EN06). See also (1972PA1G, 1972WO10, 1974HO30, 1975PI1C), (1972GA1E, 1973FO1E, 1973SC1J, 1974ST1L) and reaction 13 in (1971AJ02).

17. ^{12}C(^{14}N, ^{10}B)^{16}O $\quad Q_m = -4.452$

See (1975ZE1C). See also (1975NA1L) and (1973SC1J).

18. (a) ^{12}C(^{16}O, ^{12}C)^{16}O
(b) ^{12}C(^{18}O, ^{14}C)^{16}O $\quad Q_{\rm m} = 0.934$

For reaction (a) see reaction 72. For reaction (b) see (1974CH1Q, 1976WE05) [see ^{30}Si in (1978EN06)], (1974GO1L), (1970AN1D, 1971AL1D, 1971RO1G, 1972RO35, 1975TA02, 1976KA04; theor.) and reaction 15 in (1971AJ02).

19. ^{12}C(^{19}F, ^{15}N)^{16}O $\quad Q_{\rm m} = 3.149$

Angular distributions have been measured at $E(^{19}{\rm F}) = 40$, 60 and 68.8 MeV involving different states in ^{15}N and ^{16}O*(0, 6.1, 7.0, 10.4) (1972SC17). See also (1970VO1F, 1975PU02), (1972GA1E, 1972MO1E, 1973SC1J) and (1972BO21; theor.).

20. ^{12}C(^{20}Ne, ^{16}O)^{16}O $\quad Q_{\rm m} = 2.4304$

At $E(^{20}{\rm Ne}) = 108$ and 147 MeV the spectrum involves groups at $E_{\rm x} = 6.1$ (u), 7.0 (u), 10.3, 11.1, 14.6 (u) and 16.2 MeV [u = unresolved] (1974ME27, 1975PI1C). Angular distributions are reported at $E(^{20}{\rm Ne}) = 78$ MeV to $E_{\rm x} = 6.1$ (u), 6.9 (u), 8.9 and 10.4 MeV (1970RO23). See also ^{32}S in (1978EN06) and (1975DO06). See also (1972GA1E).

21. ^{13}C(^{3}He, γ)^{16}O $\quad Q_{\rm m} = 22.7937$

The yield of γ_0 has been studied for $E(^3{\rm He}) = 3$ to 8 MeV (1972VE1A; abstract) and 3 to 16 MeV (1974SH01). In the latter experiments the $\gamma_{1+2+3+4}$ yield has also been measured as have many angular distributions: the 90° γ_0 yield is characterized by resonances at $E(^3{\rm He}) \approx 4$ and ≈ 6 MeV, the $\gamma_{1+2+3+4}$ yield by a single broad structure at ≈ 5.5 MeV. The peak cross section for the latter yield is an order of magnitude greater than the cross sections for the peaks observed in the γ_0 yield (1974SH01). The yield of $(\gamma_1 + \gamma_2)$ [$E(^3{\rm He}) = 3.9$ to 12 MeV] shows one resonance at $E(^3{\rm He}) = 4.5$ MeV (1974CH37): see Table 16.13 [also measured the $(\gamma_3 + \gamma_4)$ yield in the range 3.9 to 8.7 MeV]. For the earlier work see (1966PU01). See also (1973SU1E) and reaction 46.

22. ^{13}C(^{3}He, n)^{15}O $\quad Q_{\rm m} = 7.124 \quad E_{\rm b} = 22.7937$

Table 16.13: Resonances in ^{13}C + ^{3}He

$E(^3$He) (MeV ± keV)	$\Gamma_{c.m.}$ (keV)	Outgoing particles	^{16}O* (MeV)	$J^\pi; T$	Refs. [a]
1.55	≈ 80	n_0, n_3	24.05		
1.55 ± 100	450	γ_0	24.1		
2.0	≈ 250	n_0	24.4		
2.6 ± 100		$\alpha\gamma_{15.1}$	24.9	$(T = 1)$	
2.87 ± 50	600	γ_0	25.12	(1^-)	(1972VE1A)
≈ 3.1		α_0, α_2	≈ 25.3		(1971BO26)
≈ 3.5	≈ 300	α_0	≈ 25.6	(3^-)	(1971BO26)
≈ 4	≈ 300	$\alpha_0, \alpha_1, \alpha_2$	≈ 26	(3^-)	(1971BO26)
4.1 ± 100	[b]	$\gamma_0, \alpha\gamma_{15.1}$	26.1	$(T = 1)$	(1972VE1A, 1974SH01)
4.5		$\gamma_1 + \gamma_2$	26.4		(1974CH37) [c]
5.2 ± 100	[b]	$\alpha\gamma_{15.1}$	27.0	$(T = 1)$	
5.6 ± 100	≈ 600	$\alpha\gamma_{15.1}$, ^{8}Be	27.3	$(2^+; T = 1)$	
6.0 ± 100	≈ 500	p_0, p_{1+2}, ^{3}He, $\alpha_0, \alpha_1, \alpha_2$	27.7	$(3^-; T = 0)$	
≈ 6		γ_0	28		(1972VE1A, 1974SH01)
6.5 ± 100	[b]	$\alpha\gamma_{15.1}$	28.1	$(T = 1)$	
6.8 ± 100		$\alpha_0, \alpha_1, \alpha_2$	28.3	$(T = 0)$	
7.5 ± 100	[b]	$\alpha\gamma_{15.1}$	28.9	$(T = 1)$	
8.6 ± 100	[b]	$\alpha\gamma_{15.1}$	29.8	$(T = 1)$	
9.4 ± 100	[b]	$\alpha\gamma_{15.1}$	30.4	$(T = 1)$	
10.1 ± 100	[b]	$\alpha\gamma_{15.1}$	31.0	$(T = 1)$	

[a] For a listing of the earlier references see Table 16.15 in (1971AJ02).

[b] Lab widths $0.5 - 1$ MeV (1969TA09).

[c] And J. Lowe, private communication.

The excitation functions to $E(^3\text{He}) = 11$ MeV [see Table 16.14 of (1971AJ02) and (1972ET01: $E(^3\text{He}) = 4.0 \rightarrow 5.8$ MeV for n to ^{15}O*(0, 6.18, 7.28, 7.56))] are marked at low energies by complex structures and possibly by two resonances at $E(^3\text{He}) = 1.55$ and 2.0 MeV: see Table 16.13. Polarization measurements for the n_0 group have been reported at $E(^3\text{He}) = 3.0$ to 5.7 MeV [see (1971AJ02)] and at $E(^3\text{He}) = 12$, 16 and 20 MeV (1973RH1A; abstract). See also ^{15}O in (1976AJ04).

23. ^{13}C(^{3}He, p)^{15}N $\qquad Q_m = 10.6659 \qquad E_b = 22.7937$

The yield curves for p_0 and p_{1+2} for $E(^3\text{He}) = 4.0$ to 8.0 MeV show a resonance at 6 MeV (1968WE15, 1968WE1C): see Table 16.13. (1972ST22) have measured excitation functions for $E(^3\text{He}) = 3.5$ to 6 MeV for the p_0, p_{1+2}, $p_3 \rightarrow p_6$ groups: some uncorrelated structures are observed. See also ^{15}N in (1976AJ04).

24. ^{13}C(^{3}He, d)^{14}N $\qquad Q_m = 2.0569 \qquad E_b = 22.7937$

See ^{14}N in (1976AJ04).

25. ^{13}C(^{3}He, t)^{13}N $\qquad Q_m = -2.239 \qquad E_b = 22.7937$

The excitation function for formation of $^{13}\text{N}_{\text{g.s.}}$ has been studied for $E(^3\text{He}) = 11$ to 17 MeV (1970NU02). See also ^{13}N in (1976AJ04).

26. ^{13}C(^{3}He, ^{3}He)^{13}C $\qquad E_b = 22.7937$

See (1967WE06, 1968WE15, 1968WE1C) and Table 16.13.

27. ^{13}C(^{3}He, α)^{12}C $\qquad Q_m = 15.6321 \qquad E_b = 22.7937$

Yields of α_0, α_1, α_2 and γ-rays from decay of ^{12}C*(12.71, 15.11) have been studied up to $E(^3\text{He}) = 12$ MeV: see Table 16.14 in (1971AJ02) and (1971BO26: $E(^3\text{He}) = 1.2$ to 5.4 MeV; α_0, α_1, α_2). Observed resonances are displayed in Table 16.13. Those seen in the yield of $\gamma_{15.1}$ are assumed to correspond to ^{16}O states which have primarily a $T = 1$ character. See (1971AJ02) for a summary of the earlier references and ^{12}C in (1975AJ02).

28. ^{13}C(^{3}He, ^{8}Be)^{8}Be $Q_m = 8.173$ $E_b = 22.7937$

The excitation function for ^{8}Be$_{g.s.}$ has been studied for $E(^3\text{He}) = 2$ to 6 MeV. It shows a strong resonance at $E(^3\text{He}) = 5.6$ MeV corresponding to a state in ^{16}O at $E_x = 27.3$ MeV. J^π appears to be 2^+ from angular distribution measurements (1968JA07).

29. ^{13}C(α, n)^{16}O $Q_m = 2.2152$

Angular distributions for the n$_0$ group have been measured for $E_\alpha = 12.8$ to 22.5 MeV: see (1971AJ02). ^{16}O*(6.05) has been observed as a neutron threshold (1956BO61). See also ^{17}O, (1970CL1C, 1973CL1E, 1973TR1B; astrophys. considerations) and (1971TE10; theor.).

30. ^{13}C(^{6}Li, t)^{16}O $Q_m = 6.999$

Angular distributions have been studied at $E(^6\text{Li}) = 20$ and 28 MeV to ^{16}O*(0 [at 28 MeV], 6.13, 7.0, 8.87, 9.85, 10.35, 11.09). At these energies the spectra are dominated by the triton groups to ^{16}O*(11.09, 14.30, 14.39, 14.82). At $E(^6\text{Li}) = 25$ MeV the excitation of ^{16}O*(14.52, 14.66) is also reported (1969BA50, 1971BA2Q, 1971BA2R, 1971DE1X, 1972BA2B). See also (1971BA2V).

31. ^{13}C(^{12}C, ^{9}Be)^{16}O $Q_m = -3.486$

At $E(^{12}\text{C}) = 87$ MeV, angular distributions are reported for transitions to ^{16}O*(6.9, 8.9, 10.4, 11.1, 13.5, 14.8, 15.1, 16.1, 16.5) (1970RO23). The ground state angular distribution has also been studied at $E(^{13}\text{C}) = 36$ MeV (1976WE21).

32. ^{13}C(^{17}O, ^{14}C)^{16}O $Q_m = 4.032$

Table 16.14: Structure in ^{14}N + d

E_d (MeV)	Resonant channel	Γ_{cm} (keV)	$J^\pi; T$	E_x (MeV)	Refs.
1.4	n_0			22.0	(1960RE07)
1.7 ± 0.1	$\gamma_0, \alpha_0 \rightarrow \alpha_3$			22.2	(1962IS02, 1966SU05, 1967LA16)
1.85	n_0, α_0			22.35	(1961IS03, 1965BU1A)
2.0 ± 0.1	α_0, α_3			22.5	(1967LA16)
2.272 ± 0.05 [a]	$p_0, p_{1+2}, p_3, \alpha_0, \alpha_2$	12 ± 3	$0^+; 2$	22.723	(1972NE10)
2.40 ± 0.005 [b]	γ_0	600	$1^-; 1$	22.83	(1966SU05, 1972WE04)
2.5	α_0			22.9	(1961IS03)
2.6	$(n_0, p_0), \alpha_1$			23.0	(1960RE07, 1962GO21, 1962IS02)
2.8	$(n_0, p_0), d_0$			23.2	(1962GO21, 1967FL10)
3.3	p_0, d_0			23.6	(1962GO21, 1967FL10)
4.2	$\gamma_0, p_0, d_0, \gamma_{15.1}$			24.4	(1960RE07, 1962GO21, 1965BR08, 1966SU05, 1967FL10)
4.58	$p_0, d_0, \gamma_{15.1}$			24.74	(1965BR08, 1967FL10)
4.9	n_0, p_0			25.0	(1960RE07, 1962GO21)
5.95	$d_1, \gamma_{15.1}$			25.9	(1965BR08, 1970DU04)
7.1	$\gamma_{15.1}$			26.9	(1965BR08)
7.4	d_2			27.2	(1970DU04)
7.7	d_1			27.5	(1970DU04)
(8.5)	$(\gamma_{15.1})$			(28.2)	(1965BR08)
10.2	d_2			29.7	(1970DU04)

[a] $(\Gamma_{d_0}\Gamma_i/\Gamma^2) \times 10^{-3}$ are greater than 1.6 ± 0.4, 0.27 ± 0.13, 0.41 ± 0.15 and 0.07 ± 0.05 for the α_2, p_0, p_{1+2} and p_3 groups.
[b] If this resonance is fitted with a single-level Breit-Wigner shape, penetrability effects could lower the resonance energy by as much as 50 keV, assuming $l = 1$ (1972WE04). See also (1971AJ02).

See (1974CH1Q).

33. ^{14}C(^{3}He, n)^{16}O $Q_m = 14.6167$

At $E(^{3}\text{He}) = 11$ to 16 MeV, neutron groups are observed to $T = 2$ states at $E_x = 22.717 \pm 0.008$ and 24.522 ± 0.011 MeV ($\Gamma < 30$ keV and < 50 keV, respectively). These two states are presumably the first two $T = 2$ states in ^{16}O, the analog states to ^{16}C*(0, 1.75). J^π for ^{16}O*(24.52) is found to be 2^+ from angular distribution measurements (1970AD01). Angular distributions are also reported at $E(^{3}\text{He}) = 2.1$ to 3.4 MeV and at 6 MeV: see (1971AJ02). See also (1974MA1M, 1975CE1D).

34. ^{14}C(^{18}O, ^{16}C)^{16}O $Q_m = -6.719$

See ^{16}C, reaction 4.

35. ^{14}N(d, γ)^{16}O $Q_m = 20.7368$

The γ_0 yield has been studied for $E_d = 0.5$ to 5.5 MeV (1966SU05, 1966SU1C) and 2.1 to 2.9 MeV (1972WE04). The yield shows a resonance at $E_d = 2.40 \pm 0.05$ MeV, $\Gamma_{cm} \approx 0.6$ MeV (1972WE04, 1974DA30). The angular distribution of γ_0 at resonance is consistent with E1: $J^\pi = 1^-$; $T = 1$: it may be the Gillet 2p-2h quasibound state: see, however, reaction 46. Structures at $E_x = 22.2$ and 24.5 MeV are also reported (1966SU05): see Table 16.14. See also (1971AJ02), (1973SU1E) and (1973JA1E; theor.).

36. ^{14}N(d, n)^{15}O $Q_m = 5.067$ $E_b = 20.7368$

For $E_d = 0.66$ to 5.62 MeV, there is a great deal of resonance structure in the excitation curves with the anomalies appearing at different energies at different angles: the more prominent structures in the yield curves are displayed in Table 16.14 (1960RE07, 1965BU1A). Yield measurements are also reported for $E_d = 2.9$ to 5.0 MeV (1970RI01: n_2, n_3, n_4, n_6, n_7). For polarization measurements see Table 16.16 in (1971AJ02) and (1976LI1R: 4.5 to 15 MeV: n_{1+2}), (1972FO07: 5.16 MeV; n_0, n_{1+2}, n_3, n_{4+5}, n_6, n_7) and (1971HI09: 10.0 and 11.8 MeV; n_0). See also (1969WO09, 1971WA1D, 1974LO1B), (1970ME25; theor.) and ^{15}O in (1976AJ04).

37. ^{14}N(d, p)^{15}N $Q_m = 8.6090$ $E_b = 20.7368$

The yield curves of various proton groups show a great deal of structure: see reaction 30 and Table 16.16 in (1971AJ02) for a summary of the earlier work. Resonant structure reported by (1962GO21, 1972NE10) is displayed in Table 16.14. For polarization measurements see Table 16.16 in (1971AJ02), (1976PA1K; 11.8 MeV, p_0) and (1971EG01; 13.8 MeV; p_0). See also (1974DA13), (1974LO1B), (1972KO30; theor.) and ^{15}N in (1976AJ04).

38. ^{14}N(d, d)^{14}N $E_b = 20.7368$

The yield of elastically scattered deuterons has been studied for $E_d = 0.65$ to 5.5 MeV [see Table 16.16 in (1971AJ02)] and for 14.0 to 15.52 MeV (1974BU06). (1967FL10) report a number of resonances in the d_0 yield corresponding to states in ^{16}O with $22.6 \leq E_x \leq 25.2$ MeV. There is indication of broad structure at $E_d = 5.9$ MeV and of sharp structure at $E_d = 7.7$ MeV in the total cross section of the d_1 group to the $T = 1$ (isospin-forbidden), $J^\pi = 0^+$ state at $E_x = 2.31$ MeV in ^{14}N. The yield of deuterons (d_2) to ^{14}N*(3.95) [$J^\pi = 1^+$; $T = 0$] shows gross structures at $E_d = 7.4$ and 10.2 MeV (1970DU04): see Table 16.14. Polarization measurements involving the elastic group are reported at $E_d = 11.6$ MeV (1973BR15) and 15 MeV (1973DA26, 1974BU06). See also ^{14}N in (1976AJ04) and (1970ME25, 1974FA1A; theor.).

39. (a) ^{14}N(d, t)^{13}N $Q_m = -4.296$ $E_b = 20.7368$
(b) ^{14}N(d, ^{3}He)^{13}C $Q_m = -2.0569$

Polarization measurements have been carried out at $E_d = 15$ MeV for the groups to $^{13}C_{g.s.}$ and $^{13}N_{g.s.}$ (1973DA26, 1974LU06). See also ^{13}C and ^{13}N in (1976AJ04).

40. ^{14}N(d, α)^{12}C $Q_m = 13.5751$ $E_b = 20.7368$

There is a great deal of structure in the yields of various α-particle groups for $E_d = 0.5$ to 12 MeV: see Table 16.16 in (1971AJ02) for the earlier work. The more prominent structures are shown in Table 16.14 (1961IS03, 1962IS02, 1967LA16, 1972NE10). The yield of 15.11 MeV γ-rays [from the decay of ^{12}C*(15.11), $J^\pi = 1^+$; $T = 1$] which is isospin-forbidden has been studied for $E_d = 2.8$ to 12 MeV. Pronounced resonances are observed at $E_d = 4.2$, 4.58 and 5.95 MeV and broader peaks occur at $E_d = 7.1$ and, possibly, at 8.5 MeV (see Table 16.14). Above $E_d = 9.5$ MeV, the yield curve is quite featureless (1965BR08). See also ^{12}C in (1975AJ02). Polarization measurements have been carried out at $E_d = 15$ MeV (1976LU1A; α_0, α_1, (α_2)).

41. (a) ^{14}N(t, n)^{16}O $Q_m = 14.4792$
(b) ^{14}N(t, np)^{15}N $Q_m = 2.351$
(c) ^{14}N(t, nα)^{12}C $Q_m = 7.318$

Table 16.15: Radiative decays in ^{16}O [a]

E_i (MeV)	$J_i^\pi; T$	E_f (MeV)	$J_f^\pi; T$	Branch (%)	Γ_{rad} (eV)	Refs.
6.05	$0^+; 0$	0	$0^+; 0$	100	3.55 ± 0.21 [b]	(1975MI08)
6.13	$3^-; 0$	0	$0^+; 0$	100	$(2.60 \pm 0.13) \times 10^{-5}$	(1975MI08)
6.92	$2^+; 0$	0	$0^+; 0$	> 99	0.130 ± 0.009	(1973BE49)
					0.100 ± 0.004	(1975MI08)
		6.05	$0^+; 0$	$(2.7 \pm 0.3) \times 10^{-2}$	$(3.0 \pm 0.5) \times 10^{-5}$	mean [a,d]
		6.13	$3^-; 0$	$\leq 8 \times 10^{-3}$		(1968WI15)
7.12	$1^-; 0$	0	$0^+; 0$	> 99	$(55 \pm 5) \times 10^{-3}$	best [a]
		6.05	$0^+; 0$	$< 6 \times 10^{-4}$		(1967LO08)
		6.13	$3^-; 0$	$(7.0 \pm 1.4) \times 10^{-2}$		(1968WI15)
8.87	$2^-; 0$	0	$0^+; 0$	7.2 ± 0.8	$(2.4 \pm 0.4) \times 10^{-4}$	(1967PI01, 1968WI15)
		6.05	$0^+; 0$	0.122 ± 0.033	$(2.9 \pm 1.0) \times 10^{-6}$	(1963GO31, 1967PI01)
		6.13	$3^-; 0$	76.0 ± 3.0		(1968WI15)
					$(1.70^{+0.35}_{-0.50}) \times 10^{-3}$ (E2)	(1967PI01)
					$(8.5^{+4.5}_{-2.5}) \times 10^{-4}$ (M1)	(1967PI01)
		6.92	$2^+; 0$	4.2 ± 0.8	$(1.72 \pm 0.25) \times 10^{-4}$	(1967PI01, 1968WI15)
		7.12	$1^-; 0$	12.6 ± 2.0		(1968WI15)
9.63	$1^-; 0$	0	$0^+; 0$	≈ 100	$(23 \pm 3) \times 10^{-3}$	Table 16.12
9.85	$2^+; 0$	0	$0^+; 0$	61 ± 4	$(6.1 \pm 0.5) \times 10^{-3}$	best [a]
					$(5.9 \pm 0.6) \times 10^{-3}$	Table 16.12
		6.05	$0^+; 0$	18 ± 4	$(1.9 \pm 0.4) \times 10^{-3}$	(1967GO08)
		6.92	$2^+; 0$	21 ± 4	$(2.2 \pm 0.4) \times 10^{-3}$	Table 16.12
10.35	$4^+; 0$	0	$0^+; 0$		$(5.6 \pm 2.0) \times 10^{-8}$	(1973BE49)
		6.13	$3^-; 0$		$< 1.0 \times 10^{-3}$	(1963GO31)
		6.92	$2^+; 0$	≈ 100	$(5.8 \pm 0.7) \times 10^{-3}$	Table 16.12
10.95	$0^-; 0$	7.12	$1^-; 0$	> 99	$(0.08 \pm 0.05) \times 10^{-2}$	(1959BR68; Table 16.12)
11.095 [a]	$4^+; 0$	6.13	$3^-; 0$	[a]	$(3.1 \pm 1.3) \times 10^{-3}$	Table 16.12
		6.92	$2^+; 0$	[a]	$(2.5 \pm 0.6) \times 10^{-3}$	Table 16.12
11.52	$2^+; 0$	0	$0^+; 0$	91.7	0.61 ± 0.02	(1973BE50)
					0.65 ± 0.08	Table 16.12
		6.05	$0^+; 0$	4.2 ± 0.7	[a]	
		6.92	$2^+; 0$	4.0 ± 1.0	$(29 \pm 7) \times 10^{-3}$	Table 16.12
		7.12	$1^-; 0$	≤ 0.8		
12.05	$0^+; 0$	0	$0^+; 0$		4.03 ± 0.09 [b]	(1973BE50)
12.44	$1^-; 0$	0	$0^+; 0$	≈ 100	9.5 ± 1.7	(1973BR19)
					12 ± 2	(1974RO37)
		6.05	$0^+; 0$	1.2 ± 0.4 [a]	0.12 ± 0.06	Table 16.12
					0.12 ± 0.04	Table 16.19

Table 16.15: Radiative decays in ^{16}O [a] (continued)

E_i (MeV)	$J_i^\pi; T$	E_f (MeV)	$J_f^\pi; T$	Branch (%)	Γ_{rad} (eV)	Refs.
12.53	$2^-; 0$	0	$0^+; 0$		$(21 \pm 6) \times 10^{-3}$	(1968ST31)
					$(108 \pm 15) \times 10^{-3}$	(1970KI02)
		6.13	$3^-; 0$	60 ± 6	2.1 ± 0.2	(1968GO07)
		6.92	$2^+; 0$	< 10	≤ 0.34	(1968GO07)
		7.12	$1^-; 0$	15 ± 3	0.5 ± 0.1	(1968GO07)
		8.87	$2^-; 0$	25 ± 3	0.9 ± 0.1	(1968GO07)
12.80 [a]	$0^-; 1$	7.12	$1^-; 0$	≈ 100	2.5 ± 0.2	(1968GO07)
12.97 [a]	$2^-; 1$	0	$0^+; 0$		$(71 \pm 2) \times 10^{-3}$	(1970KI02)
		6.13	$3^-; 0$	63 ± 6	2.3 ± 0.2	(1968GO07)
		7.12	$1^-; 0$	12 ± 3	0.44 ± 0.10	(1968GO07)
		8.87	$2^-; 0$	25 ± 3	0.90 ± 0.10	(1968GO07)
13.09 [a]	$1^-; 1$	0	$0^+; 0$	≈ 100	32 ± 5	(1974RO37)
					44 ± 8	(1973BR19)
		6.05	$0^+; 0$	0.58 ± 0.12		(1968WI15)
		7.12	$1^-; 0$	3.1 ± 0.8	1.4 ± 0.4	(1973BR19)
13.26 [a] [c]	$3^-; 1$	6.13	$3^-; 0$	> 85	9.2 ± 1.5	(1968GO07)

[a] See Table 16.12 in (1971AJ02) for the earlier work.
[b] Monopole matrix element in fm^2.
[c] For the radiative decays of higher states see Tables 16.12, 16.19 and 16.24.
[d] Mean for branch. Γ_γ for this state based on $\Gamma_\gamma = 0.11 \pm 0.01$ for $6.92 \to 0$ transition.

Table 16.16: ^{16}O states from ^{14}N(^{3}He, p)^{16}O [a]

E_x (MeV $\pm$ keV)	$\Gamma_{c.m.}$ (keV)	L [c]
0		$0 + 2$
6.052 ± 5	< 20	
6.131 ± 4	< 20	$1 + 3$
6.916 ± 3	< 20	$0 + 2 + 4$
7.115 ± 3	< 20	$1 + 3$
8.870 ± 3	< 20	$1 + 3$
9.614 ± 30	510 ± 60	
9.847 ± 3	< 20	$0 + 2 + 4$
10.353 ± 4	27 ± 8	$2 + 4$

Table 16.16: ^{16}O states from ^{14}N(^{3}He, p)^{16}O [a] (continued)

E_x (MeV ± keV) [a,b]	$\Gamma_{c.m.}$ [a,b] (keV)	L [c]
10.952 ± 3	< 12	1
11.080 ± 3	< 12	
11.096 ± 3	< 12	
11.521 ± 4	78 ± 8	$0 + 2 + 4$
12.053 ± 3	< 12	$0 + 2$
12.437 ± 7	94 ± 5	$1 + 3$
12.528 ± 3	< 12	$1 + 3$
12.798 ± 5	41 ± 10	
12.964 ± 3	< 12	
13.105 ± 15	160 ± 30	
13.253 ± 5	25 ± 8	
13.665 ± 6	65 ± 8	$0 + 2$
13.869 ± 10	85 ± 20	
13.975 ± 4	24 ± 8	
14.922 ± 6	60 ± 10	
b		

[a] (1964BR08): $E(^3\text{He}) = 3.74$ and 3.97 MeV.
[b] Higher states reported in Table 16.18 in (1971AJ02) have not been published.
[c] (1971WE16: $E(^3\text{He}) = 18$ MeV).

At $E_t = 2.2$ to 2.6 MeV, the two-stage reaction (b) proceeds via ^{16}O*(14.92, 16.22) (1961JA14) while reaction (c) proceeds via ^{16}O*(13.10, 15.45) (1962SI04).

42. (a) ^{14}N(^{3}He, p)^{16}O $\qquad Q_m = 15.2430$
(b) ^{14}N(^{3}He, pα)^{12}C $\qquad Q_m = 8.0814$

Observed proton groups are displayed in Table 16.16 (1964BR08). Angular distributions have been measured at $E(^3\text{He}) = 2.5$ to 18 MeV: see (1971AJ02), (1972BI01: $E(^3\text{He}) = 7.96 \rightarrow 18.0$ MeV), (1971GU22: $E(^3\text{He}) = 9$ MeV) and (1971WE16: 18 MeV). Analysis by DWBA is satisfactory for ^{16}O*(6.13, 7.12, 8.87, 10.95). ^{16}O*(6.05, 6.92, 10.35) are very weakly populated in accord with their presumed 4p-4h character. It is suggested that the 2p-2h strength lies mainly above $E_x = 14$ MeV (1971WE16). Branching ratios (shown in Table 16.15) and pγ correlation measurements lead to $J^\pi = 2^-$, 0^- and 3^+ for ^{16}O*(8.87, 10.95, 11.08) (1959BR68, 1959KU78); τ_m are shown in Table 16.21.

At $E(^3\text{He}) = 8$ MeV a study of the protons in coincidence with 4.4 MeV γ-rays (reaction (b)) indicates that the reaction proceeds via ^{16}O*(12.51, 13.97, 14.39, 14.92, 15.82, 16.23, 17.16, 17.82, 18.04) [± 40 keV] (1969HO13). See also (1970ME1N, 1975OT01), (1972BR1J) and (1972AL27; theor.). For the decay of $T = \frac{3}{2}$ states of ^{17}F, see reaction 9 in ^{17}F and (1973AD02).

43. (a) ^{14}N(α, d)^{16}O $\quad Q_m = -3.1108$

(b) ^{14}N(α, dα)^{12}C $\quad Q_m = -10.2725$

Deuteron angular distributions to states of ^{16}O have been reported at many energies up to $E_\alpha = 48$ MeV: see (1971AJ02) for the earlier references and (1975TU02: $E_\alpha = 21$ MeV) and (1972LO08: $E_\alpha = 29.98$ MeV; see Table 16.17). The results of (1972LO08) are consistent with $J^\pi = 5^+$, 6^+ and 4^+ for ^{16}O*(14.40, 14.82, 16.29) [2p-2h] and with 6^+ for ^{16}O*(16.30) [4p-4h].

An experiment to test time-reversal invariance by the principle of detailed balance in this reaction and in ^{16}O(d, α)^{14}N leads to an upper limit of 0.2% for the time-reversal non-invarinat part of the reaction amplitudes (1971TH03).

The two-stage reaction (reaction (b)) at $E_\alpha = 22.9$ MeV appears to proceed via ^{16}O states at $E_x = 9.85 \pm 0.07$, 10.37 ± 0.07 and 11.14 ± 0.07 MeV (1969BA17). See also (1971BA2Q, 1971BA2V, 1973OG1A, 1976LE1K) and (1971BU1K, 1971TE10; theor.).

44. ^{14}N(^{6}Li, α)^{16}O $\quad Q_m = 19.2631$

Angular distributions have been measured at $E(^6\text{Li}) = 5.3$ to 6.0 MeV (1968RI13; α_0, α_{1+2}, α_{3+4}) and $E(^{14}\text{N}) = 27.6$ MeV (1964WA1B; α_0).

45. ^{14}N(^{11}B, ^{9}Be)^{16}O $\quad Q_m = 4.920$

At $E(^{14}\text{N}) = 50$ MeV angular distributions have been measured to ^{16}O*(0, 6.1 (u), 7.0 (u), 8.9, 9.9, 10.3, 11.0 (u)) [u = unresolved] (1975KL1A). See also (1975PO10: $E(^{11}\text{B}) = 113$ MeV) and (1971AJ02).

46. ^{15}N(p, γ)^{16}O $\quad Q_m = 12.1277$

The yield of ground state radiation (γ_0) has been measured for $E_p = 0.15$ to 27.4 MeV: see

Table 16.17: Excited states of ^{16}O from ^{14}N(α, d)

E_x [a] (MeV $\pm$ keV)	Γ_{cm} [a] (keV)
6.13	
6.92	
7.12	
8.87	
9.85	
10.35	
11.094 ± 3	
13.98 ± 50	≤ 80
14.32 ± 20	< 30
14.400 ± 3	≤ 30
14.815 ± 2	60 ± 12
15.17 ± 50	≤ 80
15.44 ± 50	≤ 80
15.78 ± 50	≤ 80
16.214 ± 15	96 ± 16
17.18 ± 50	≤ 80

[a] (1972LO08: E_α = 29.98 MeV); angular distributions are reported to the states below, except ^{16}O*(13.98, 14.32, 15.17, 15.44, 15.78, 17.18) which are weakly excited and ^{16}O*(6.13, 8.87) which are not seen at all angles. See also (1970ZI03).

Table 16.18 for a listing of the measurements and Table 16.19 for a display of the parameters of the obeserved resonances.

Below $E_p = 0.4$ MeV capture to the ground state is dominant: $S(0) = 64 \pm 6$ keV $\cdot$ b, a value which makes the oxygen side cycle in CNO burning more important than previously thought. Study of the direct radiative capture process leads to a single particle spectriscopic factor $C^2S = 1.8 \pm 0.4$ for ^{16}O$_{g.s.}$ (1974RO37). The cross section shows a great deal of structure up to $E_p = 17$ MeV. Above that energy the γ_0 yield decreases monotonically to 27.4 MeV. In the same energy region the γ-yield to ^{16}O states at 6–7 MeV and ≈ 12.9 MeV is large and it also decreases with increasing energy (1973OC1A; prelim. results.).

Measurements with polarized protons have been made over the giant dipole resonance at $E_x = 22.2$ MeV (1972HA52) and over a broad E2 giant resonance at $E_x \approx 24$ MeV (1974HA01). See

Table 16.18: Summary of ^{15}N + p yield measurements [a]

E_p (MeV)	Particles	Refs.
0.15 – 2.50	γ_0	(1974RO37)
0.25 – 1.30	γ_0	(1973BR19)
6.0 – 19.6	γ_{1+2}	(1974CH37)
7.4 – 16	γ_0 [b]	(1972HA52, 1974HA01)
8.5 – 18	γ_0	(1973OC1B)
10 – 18	γ_0 [b]	(1976BUZH) [c]
17.3 – 25	γ_0	(1972SN1A) [c]
17.50 – 27.37	γ_0	(1973OC1A) [c]
8.4 – 10.5	p_0	(1975FI1E)
8.5 – 11.6	$p_0 \rightarrow p_3$	(1971DR06)
9.2 – 11.6	$p_4 \rightarrow p_6$	(1971DR06)
24.0 – 43.5	$t_0 \rightarrow t_2$, $^3He_1$, $^3He_2$	(1974PI05, 1975MI01)
0.093 – 0.418	α_0	(1975PA1M)
0.15 – 2.50	$\alpha_1\gamma$	(1974RO37)
0.25 – 1.10	α_0	(1973BR19)
0.34 – 1.21	α_0 [b]	(1976PE1H)
8.5 – 11.5	α_0, α_1	(1971DR06)
19 – 45	α_0, α_1	(1971GU23, 1974PI05)

[a] See also Table 16.20 in (1971AJ02) for a listing of the earlier measurements.
[b] Polarized protons.
[c] Preliminary results.

also (1976BUZH). The giant M2 resonance is robably centered at $E_x = 20.4$ MeV (1974CH37).

Branching ratios and Γ_γ values for the low energy resonances are listed in Table 16.15 (1968GO07, 1968WI15, 1973BR19). See also (1971AJ02).

See also (1972CA1H, 1973JA1D), (1972HA1Y, 1973GL1B, 1973GL1C, 1973HA1X, 1973HA1Q, 1973SU1E, 1974HA1N, 1974HA1C, 1975CA1T, 1976GL1E), (1972BA2D, 1973BA05, 1973GO23, 1973HO36, 1974DA30, 1975MA2A, 1975RA01, 1975RA02, 1975SN1B, 1975SN1C, 1976LO01, 1976MA2G; theor.) and (1971BA1A, 1973CL1E, 1973TR1E; astrophys. considerations).

47. ^{15}N(p, p)^{15}N $\quad E_b = 12.1277$

Table 16.19: Levels of ^{16}O from ^{15}N(p, γ)^{16}O, ^{15}N(p, p)^{15}N and ^{15}N(p, α)^{12}C

E_p (keV) (keV)	Γ_{γ_0} [a] (eV) (eV)	Γ_{γ_1} [a] (eV) (eV)	Γ_p [a] (keV) (keV)	Γ_{α_0} [a] (keV) (keV)	Γ_{α_1} [a] (keV) (keV)	Γ_{lab} (keV) (keV)	$J^\pi; T$	E_x (MeV ± keV) (MeV ± keV)	Refs. [b]
338	12 ± 2	0.12 ± 0.04	1.2	95 [c]	0.025	96	$1^-; 0$	12.444	(1974RO37, 1973BR19)
429 ± 1	$(21 \pm 6) \times 10^{-3}$	2.1 ± 0.2 [p]	0.020	nr	0.90	0.9	$2^-; 0$	12.530	(1974RO37)
710 ± 7			40	nr		40 ± 4	$0^-; 1$	12.793	
897.37 ± 0.29	$(78 \pm 16) \times 10^{-3}$		1.2	nr	0.69 ± 0.07	2.0 ± 0.2	$2^-; 1$	12.9686	(1974RO37)
1028 ± 10	32 ± 5		100	40	r	140 ± 10	$1^-; 1$	13.091	(1974RO37, 1973BR19)
1050 ± 150				$\Gamma_p\Gamma_{\alpha_0} = 500$ keV^2			2^+	13.1	
1210 ± 3			4.1	r	8.2 ± 1.1	22.5 ± 1	$3^-; 1$	13.261	(1974RO37)
1640 ± 3	≈ 8.5		10	nr	59 ± 6	68 ± 3	$1^+; 0$	13.664	(1974RO37)
1890 ± 20				r	(r)	90 ± 20		13.90	
1979 ± 3			0.5	nr	r	23 ± 2	2^-	13.982	
3000 ± 30			r	r	r	45 ± 10	4^+	14.94	
3300 ± 35			r	nr	r	75 ± 15	2^-	15.22	
3350 ± 50	≈ 0.6		≈ 125	r	r	750 ± 100	$2^+; (0)$	15.27	
3520 ± 40			r	r	r	100 ± 25	$(1 \to 4)$	15.43	
(4280 ± 20)		r [d]						(16.14)	
4380 ± 20	4.5		16 [e]			31	$1^{(+)}; 1$	16.23	
5200	r					≈ 1500	$1^-; 1$	17.0	
5350 ± 20	16		26 [e]			≈ 65	$1^-; 1$	17.14	
5490 ± 20	67		45 [e]			≈ 110	$1^-; 1$	17.27	
6290 ± 20	nr	5 ± 2 [f]	(r)			< 40	3	18.02	(1970BA33, 1974CH37) [p]
7310 ± 20		1 or 2 [f]				< 40	2, 4	18.97	(1974CH37) [p]
7330 ± 30	38					260		18.99	(1970BA33) [p]
7420	r		≈ 30			≈ 130	$2^+; (1)$	19.08	
7600 ± 30	nr	1.5 [d]				100	(2, 3; 1)	19.25	(1970BA33)
7840 ± 30	59		(r)			350	$1^-; 1$	19.47	(1970BA33)
8290 ± 20	nr	13 or 26 [f]				80 ± 30	3	19.89	(1970BA33, 1971BA04, 1974CH37) [p]
8860 ± 20 [g]	nr	137 ± 50				200	$(2^-); 1$	20.43 [h]	(1970BA33, 1971BA04, 1974CH37) [p]
8990 [i]			j			160		20.55	(1971DR06)
9410 [i]	170		k			320 ± 10 [l]	$1^-; 1$	20.945 ± 20	(1970BA33,

Table 16.19: Levels of ^{16}O from ^{15}N(p, γ)^{16}O, ^{15}N(p, p)^{15}N and ^{15}N(p, α)^{12}C (continued)

E_p (keV)	Γ_{γ_0} [a] (eV)	Γ_{γ_1} [a] (eV)	Γ_p [a] (keV)	Γ_{α_0} [a] (keV)	Γ_{α_1} [a] (keV)	Γ_{lab} (keV)	$J^\pi; T$	E_x (MeV ± keV)	Refs. [b]
									1971DR06, 1973OC1B)
10000 [i]			m			130	$4 \geq J \geq 1$	21.50	(1971DR06)
10180 [i]			n	r		< 45	$T = 0$	21.66	(1971DR06)
10700 [i]	r		m			725 ± 10 [l]	1^-; 1	22.146 ± 20	(1970BA33, 1971DR06, 1973OC1B)
11490 [i]	120	27 [d]	m			320 ± 15 [l]	1^-; 1	22.888 ± 30	(1970BA33, 1971DR06, 1973OC1B)
12740 [i]	r					590 ± 40 [l]	1^-; 1	24.065 ± 35	(1973OC1B)
13490 ± 60		260 ± 100 or 140 ± 50 [f]				360 ± 60	$(2^+, 4^+)$; 1	24.77 [o]	(1974CH37) [p]
13870 [i]	r					3150 ± 320 [l]	1^-; 1	25.12 ± 65	(1973OC1B)
15250 ± 80		450 ± 160 [f]				565 ± 90	(2^+); 1	26.42 [o]	(1974CH37) [p]
16250 ± 100		1190 ± 430 or 660 ± 240 [f]				880 ± 120	$(2^+, 4^+)$; 1	27.36	(1974CH37) [p]

[a] nr = non-resonant; r = resonant.

[b] For earlier references see Table 16.21 in (1971AJ02).

[c] $\Gamma_{\alpha_0}\Gamma_{\gamma_0}/\Gamma = (0.97 \pm 0.18) \times 10^{-4}$ (1973BR19).

[d] $\gamma_1 + \gamma_2$.

[e] Γ_n = 6, 19 and 45 keV, respectively, for ^{16}O*(16.23, 17.14, 17.27) (1964TA06).

[f] Decay is via ^{16}O*(6.13) [Γ_{γ_2}] (1970BA33, 1971BA04, 1974CH37).

[g] This state is attributed to the giant M2 resonance (1974CH37).

[h] (1971DR06) suggest two states at E_x = 20.37 and 20.42 MeV [$\Gamma_{c.m.}$ = 120 and 180 keV; $J^\pi \geq 1$ and $(2, 3, 4)^+$, respectively]. The first corresponds to a structure in the p_1 yeild, the second to structures in the n, p_0 and (p_2) yields.

[i] Nominal E_p, calculated from E_x.

[j] Resonant in n, p_2 (1971DR06).

[k] Resonant in p_2 (1971DR06).

[l] $(\Gamma_{p:l=0} + \Gamma_{p:l=2})\Gamma_\gamma\Gamma$ = 21.0 ± 1.0, 488 ± 20, 69 ± 5, 130 ± 13, 650 ± 50 eV for ^{16}O*(20.95, 22.15, 22.89, 24.07, 25.12), respctively (1973OC1B).

[m] Resonant in p_1 (1971DR06).

[n] Resonant in p_0, p_1, p_6 (1971DR06).

[o] These three states are attributed to the configuration $(1p^{-1}_{1/2}1f_{7/2})_{4^+;T=1}$. $J = 2$ and 3 are not excluded (1974CH37).

[p] S.H. Chew and J. Lowe, private comminucation.

Table 16.20: Resonances in $^{15}N(p, n)^{15}O$ (1968BA42) [a]

E_p (MeV ± keV)	$\Gamma_{c.m.}$ (keV)	$J^\pi; T$ [d]	E_x (MeV)
4.37 ± 15	19 ± 6	$1^{(+)}; 1$	16.22
4.45 ± 30	240 ± 30	$0^{(-)}$	16.30
5.35 ± 15	33 ± 5	$1^{(-)}; 1$	17.14
5.52 ± 15	90 ± 10	$1^-; 1$	17.30
5.88 ± 15	59 ± 10	$\geq 1; 1$	17.64
6.12 ± 15	101 ± 10	$\geq 1; 1$	17.86
6.23 ± 15 [b]	≤ 50	$T = 1$	17.96
6.33 ± 15	26 ± 5	$\geq 1; 1$	18.06
6.43 ± 30	≈ 300		18.15
6.76 ± 25	≈ 160		18.46
7.03 ± 30	260 ± 30		18.71
7.59 ± 25	90 ± 10	$2^-; 1$	19.24
7.86 ± 30	300 ± 80	1^- [c]	19.49
8.30 ± 25	120 ± 40		19.90
8.82 ± 25	150 ± 30	≥ 2	20.39
8.89 ± 25	140 ± 30	≥ 1	20.55
9.36 ± 25	≈ 300		20.90
10.7 ± 100	≈ 650	1	22.2

[a] See also (1971AJ02).

[b] Probably a doublet: see (1968BA42).

[c] 1^- is from (p, γ); $J \geq 2$ is required from (p, n) yield.

[d] T-assignments by energy and width comparisons with states in ^{16}N.

Elastic scattering studies are reported for $E_p = 0.6$ to 11.7 MeV: see Table 16.20 in (1971AJ02) and Table 16.18 here. Observed anomalies are displayed in Table 16.19 (1971DR06). Inelastic scattering has been studied for $E_p = 8.5$ to 11.6 MeV: the p_1 yield is dominated by a structure at $E_p = 10.6$ MeV, $\Gamma_{cm} \approx 650$ keV (1971DR06). A study of the elastic yield and the polarization ($E_p = 8.4$ to 10.5 MeV) shows that a narrow s-wave resonance does not exist at the deuteron threshold ($E_x = 20.74$ MeV) (1975FI1E). See also (1973HO36; theor.).

48. $^{15}N(p, n)^{15}O$ $\qquad Q_m = -3.542$ $\qquad E_b = 12.1277$

Table 16.21: Lifetime measurements of some ^{16}O states

^{16}O* (MeV)	τ_m [a]	Reaction	Refs.
6.05	96 ± 7 psec	^{19}F(p, α)	(1973BI17)
6.13	26.6 ± 0.7 psec	^{19}F(p, α)	(1973BR31)
6.92	8.4 ± 1.6 fsec		[b]
	6.00 ± 0.03 fsec	Table 16.15	"best" value
7.12	7.2 ± 1.7 fsec		[b]
	12.0 ± 1.2 fsec	Table 16.15	"best" value
8.87	180 ± 16 fsec		[b]
10.95	8 ± 5 fsec		[b]

[a] See also Table 16.15.

[b] "Mean" or "best" value from Table 16.19 of (1971AJ02).

The absolute total cross section has been measured with excellent resolution and statistics for $E_p = 3.8$ to 12 MeV by (1968BA42): observed resonances are displayed in Table 16.20 (1968BA42) also discusses in detail the relationship of his results and the data reported in other experiments, including a comparison with analog states in ^{16}N [see Fig. 5]. Excitation functions have also been reported from threshold to 13.6 MeV: see Table 16.20 in (1971AJ02). Polarization measurements for n_0 have been carried out at $E_p = 7.9$ to 12.3 MeV (1965WA02) and at 10.3 and 11.3 MeV (1976BY1A, 1976BY1B). See also (1974LO1B) and (1972DU24, 1973BA05, 1973HO36, 1973VO1J, 1974HO1L, 1974MA07, 1975RO31, 1976AR1F; theor.).

49. (a) ^{15}N(p, t)^{13}N $\quad Q_m = -12.905 \quad E_b = 12.1277$

(b) ^{15}N(p, ^{3}He)^{13}C $\quad Q_m = -10.6659$

The yields of the first three triton and ^{3}He groups have been measured for $E_p = 24.0$ to 43.5 MeV (1974PI05, 1975MI01). Polarized protons with $E_p = 43.8$ MeV have been used to study the transitions to ^{13}C*(0, 3.68, 7.55, 15.11) and ^{13}N*(0, 3.51, 7.38, 15.07) (1974MA12). See also (1970HA23, 1972HA1X).

50. ^{15}N(p, α)^{12}C $\quad Q_m = 4.9661 \quad E_b = 12.1277$

Excitation functions for α_0 and α_1 particles [corresponding to ^{12}C*(0, 4.43)] and of 4.43 MeV γ-rays have been measured for $E_p = 0.093$ to 45 MeV: see Table 16.20 in (1971AJ02) and Table

16.18 here. Observed resonances are shown in Table 16.19. Angular correlation measurements lead to $J^\pi = 2^-$, 1^-, 3^- and 1^+ for ^{16}O*(12.97, 13.09, 13.26, 13.66) (1969CL07). For $E_\mathrm{p} > 3.5$ MeV there is continuing structure in the yield curves which is interpreted in terms of fluctuations: see (1971AJ02). For polarization measurements see (1976PE03, 1976PE1H: 0.34 to 1.21 MeV).

A study of $\alpha_1\gamma$ for $E_\mathrm{p} = 0.15$ to 2.50 MeV leads to $S(0) \approx 0.1$ keV · b and shows that this reaction makes a negligible contribution to hydrogen burning at stellar energies compared to the (p, γ_0) and (p, α_0) processes (1974RO37). See also (1973JA1D), (1974CL1F, 1975LA1J, 1976LA1J; applications), (1971BA1A; astrophys. considerations) and (1972MA1K, 1976GA1K; theor.).

51. ^{15}N(d, n)^{16}O $\qquad Q_\mathrm{m} = 9.9031$

Observed neutron groups are displayed in Table 16.22. Angular distributions have been reported for E_d to 6 MeV: see (1971AJ02) and (1971MU09, 1972FO17: $E_\mathrm{d} = 4.83$ and 5.84 MeV) and (1973BA2C: $E_\mathrm{d} = 5.0$, 5.5 and 6.0 MeV): l-values and spectroscopic factors are also shown in Table 16.22.

Slow neutron thresholds have been observed to ^{16}O*(10.954±0.010, 11.080±0.015) (1957WE1A). ^{16}O*(10.95) γ-decays only to ^{16}O*(7.12), $J^\pi = 1^-$. This suggests $J^\pi = 0^-$ for ^{16}O*(10.95), an assignment also strongly favored by the $\gamma - \gamma$ correlation (1957BE61). See also ^{17}O.

52. ^{15}N(^{3}He, d)^{16}O $\qquad Q_\mathrm{m} = 6.6340$

Angular distributions have been measured at $E(^3\mathrm{He}) = 11$ MeV (1969BO13, 1971BO02) and at $E(^3\mathrm{He}) = 16.0$ and 24.9 MeV (1969FU08): l- and S-values are shown in Table 16.22. See also (1973FR1E), (1973OG1A), (1970CO30, 1972EN03, 1975HS01; theor.).

53. ^{15}N(α, t)^{16}O $\qquad Q_\mathrm{m} = -7.6869$

Not reported.

54. ^{15}N(^{11}B, ^{10}Be)^{16}O $\qquad Q_\mathrm{m} = 0.898$

See (1975SC2C) and (1971AJ02).

55. ^{16}N(β^-)^{16}O $\qquad Q_\mathrm{m} = 10.418$

Table 16.22: States in ^{16}O from ^{15}N(d, n)^{16}O, ^{15}N(^{3}He, d)^{16}O and ^{17}O(^{3}He, α)^{16}O

^{16}O state at (MeV)	$J^{\pi}; T$	l [a]	l [b]	S [c]	S [d]	S [e]	"Best" S [f]	S [g]	S [h]	S [p]	l [p]
0	$0^{+}; 0$	1	1			2.5	3.1	1.33	3.52	0.88	2
6.05	$0^{+}; 0$		1					0.05	0.16	0.009	2
6.13	$3^{-}; 0$	2	2	0.72	0.75	0.80		0.40	0.63	0.37	1
6.92	$2^{+}; 0$	not direct	$1 + 3$					0.04 [n]		0.022	$(2 + 0)$
7.12	$1^{-}; 0$	0	$0 + 2$	0.33	0.75 [j]	0.32		0.20 [o]	0.54	0.007 [q]	$(3 + 1)$
8.87	$2^{-}; 0$	2	2	0.33	0.55	0.44	0.72	0.36	0.55	0.26	1
9.63	$1^{-}; 0$		0					0.008			
9.85	$2^{+}; 0$	1	not direct	0.02	< 0.05					0.025	2
10.35	$4^{+}; 0$		3					0.02		0.025	2
10.95	$0^{-}; 0$	0	0	0.48	1.25	0.76	0.76	0.50	1.20	0.008	$(3 + 1)$
11.08	$3^{+}; 0$	3	3	0.30	0.30	0.30	0.18	0.09		0.044 or 0.086	2
11.26	$0^{+}; 0$		broad state								
12.44	$1^{-}; 0$	0	0	(0.16)	0.64 [k]	0.40	0.40	0.25 ± 0.1	0.25		
12.53	$2^{-}; 0$	2	2	(0.52)	0.50 [l]	0.72 [m]	0.72	0.45 ± 0.1	1.45		
12.80	$0^{-}; 1$	0	0	(0.40)	1.20	0.44	0.44	0.40 ± 0.1			
12.97	$2^{-}; 1$	2	2	(0.63)		0.40	0.40	0.35 ± 0.1	0.85	0.38	1
13.10	$1^{-}; 1$	(0)		(0.63)		0.58	0.58	$\leq 0.4 \pm 0.2$		0.10	1
			$2(+0)$								
13.13 [i]	$3^{-}; 0$	(2)				0.32	0.32	0.12 ± 0.05	0.96		
13.26	$3^{-}; 1$	2	2	(0.60)		0.46	0.46	0.27 ± 0.1	0.96	0.34	1
17.14 [b]	$1^{-}; 1$										
17.20 [b]	2^{+}										

[a] (1967FU07, 1971MU09, 1972BO49): (d, n); $E_{\rm d} = 4.8 \rightarrow 6$ MeV.

[b] (1969BO13, 1969FU08, 1971BO02): (^{3}He, d), $E(^3{\rm He}) = 11$, 16.0 and 24.9 MeV.

[c] (1971MU09): (d, n).

[d] (1972FO17): (d, $\overline{\rm n}$).

[e] (1972BO49): (d, n), $E_{\rm d} = 5 - 6$ MeV.

[f] "Best" values as discussed by (1972BO49) [from (d, n) and (^{3}He, d) data]. See also (1975HS01).

[g] (1969BO13, 1971BO02): (^{3}He, d); $E(^3{\rm He}) = 11$ MeV.

[h] (1969FU08): (^{3}He, d); $E(^3{\rm He}) = 16.0$ and 24.9 MeV.

[i] $\Gamma = 128$ keV.

[j] For $2{\rm s}_{1/2}$, 0.18 for $1{\rm d}_{3/2}$.

[k] For $2{\rm s}_{1/2}$, 0.17 for $1{\rm d}_{3/2}$.

[l] For $1{\rm d}_{3/2}$, 0.05 for $1{\rm d}_{5/2}$.

[m] For $1{\rm d}_{3/2}$, 0.62 for $1{\rm d}_{5/2}$.

[n] For $1{\rm f}_{5/2}$, 0.01 for $1{\rm p}_{3/2}$.

[o] For $1{\rm s}_{1/2}$.

[p] (1971BO02): (^{3}He, α); $E(^3{\rm He}) = 11$ MeV.

[q] $1{\rm d}_{3/2}$ (1971BO02).

The ground state of ^{16}N decays to seven states of ^{16}O: reported branching ratios are listed in Table 16.23. The ground state transition has the unique first-forbidden shape corresponding to $\Delta J = 2$, yes, fixing J^π of ^{16}N as 2^-: see (1959AJ76). For the β-decay of ^{16}N*(0.12) see reaction 1 in ^{16}N (1975PA01).

The α-decay of ^{16}O*(8.87, 9.63, 9.85) has been observed: see (1971AJ02). The parity-forbidden α-decay from the 2^- state ^{16}O*(8.87) has been reported: $\Gamma_\alpha = (1.03 \pm 0.28) \times 10^{-10}$ eV [$E_\alpha = 1282 \pm 5$ keV] (1970HA42, 1974NE10). (1971WE14) suggests that the α-width of ^{16}O*(7.12) is an order of magnitude smaller than that for ^{16}O*(9.58). See also (1970SP1D).

Recently reported transition energies derived from γ-ray measurements are: $E_x = 6130.43 \pm 0.05$ keV [$E_\gamma = 6129.170 \pm 0.043$ keV (1975SH18)] and 7116.85 ± 0.14 keV [$E_\gamma = 7115.15 \pm 0.14$ keV (1976AL16)]. See also (1967CH19, 1974AL11) and (1973DO1H, 1974WI1N, 1975BO1V, 1975DO10, 1976LO01; theor.).

Table 16.23: Beta decay of the ground state of ^{16}N [a]

Final state		Branch (%)	log ft [b]
^{16}O* (MeV)	J^π		
0	0^+	26 ± 2 [c]	9.10 ± 0.04 [g]
6.05	0^+	$(1.2 \pm 0.4) \times 10^{-2}$ [d]	9.96 ± 0.15 [g]
6.13	3^-	68 ± 2 [c]	4.47 [h]
7.12	1^-	4.9 ± 0.4 [c]	5.09 [h]
8.87	2^-	1.0 ± 0.2 [c]	4.37 [h]
9.63	1^-	$(1.20 \pm 0.05) \times 10^{-3}$ [e]	6.21 [h]
9.85	2^+	$(6.5 \pm 2.0) \times 10^{-7}$ [f]	9.07 ± 0.13 [i]

[a] See also reaction 1 in ^{16}N.
[b] $\tau_{1/2} = 7.13 \pm 0.02$ sec: see Table 16.3 in (1971AJ02).
[c] (1956WI1A, 1958AL13, 1959AL06).
[d] (1968WA18).
[e] (1961KA06). See also (1974NE10).
[f] (1969HA42).
[g] (1971TO08): log $f_1 t$.
[h] B. Zimmerman, private communication: log $f_0 t$.
[i] E.K. Warburton, private communication: log $f_1 t$.

56. (a) ^{16}O(γ, n)^{15}O $\qquad Q_m = -15.669$

(b) ^{16}O(γ, 2n)^{14}O $\qquad Q_m = -28.8886$

Recent papers reviewing this reaction are (1973DI1C, 1975BE60).

The absorption cross section and the (γ, n) cross section are marked by a number of resonances. Some of the reported structure is displayed in Table 16.25 of (1971AJ02). In view of the availability of experiments using monoenergetic photons and good resolution and statistics we suggest, on the basis of the work of (1974VE06, 1975BE60, 1975BE1F, 1965CA14) that excited states of ^{16}O are observed at $E_x = 17.3$ [u], 19.3 [u] and 21.0 MeV [u = unresolved], followed by the giant resonance whose principal structures are at ≈ 22.2 and 24.1 MeV, with additional structures at 23 and 25 MeV. See also (1972WA13; theor.). The best resolution achieved so far appears to be that of (1974VE06) who measured the (γ, n + γ, pn), (γ, pn) and (γ, 2n) cross sections separately to $E_\gamma = 37$ MeV. Besides the monoenergetic photon work, there are still a number of reports of bremsstrahlung studies: the most convincing of these is by (1975JO04) and (1970JU02). These time-of-flight data confirm the structure indicated above. See also (1970IS08, 1971BA2W, 1972TH12, 1973SY1A). The yield of reaction (a) has been measured for $E_{bs} = 100$ to 800 MeV (1971AD05, 1971FR11; also 6.18 γ). The absorption cross section has been measured from $E_{bs} = 10$ MeV to above the meson threshold (1975AH06). The cross section for reaction (b) has been measured between threshold and $E_\gamma = 120$ MeV: it is usually small compared to the (γ, n) cross section at corresponding energies (1970FI15). Polarization measurements for the n_0 group have been carried out at $E_{bs} = 20$ to 30 MeV and at 64 MeV (1970CO1G, 1971CO1E, 1973NA1F).

Branching ratios for the decay of ^{16}O in the giant resonance region to various excited states in ^{15}O are discussed in ^{15}O (1976AJ04).

See also (1971KA70, 1975SC05), (1970FI1D, 1970HA1F, 1972BU1J, 1973GL1B, 1973GL1C, 1973HA1Q, 1974BU1A, 1975BR1F), (1976AL1L; applied work) and (1970HU18, 1970MU20, 1970VA1M, 1971AN08, 1971PE02, 1971SH05, 1971WE04, 1972AG02, 1972DU24, 1972FI09, 1973BA05, 1973BA2H, 1973CI1A, 1973DE26, 1973GO36, 1973HO36, 1973IS1A, 1973MA1T, 1973ROYN, 1973SR1B, 1973WA03, 1974DO13, 1974FA1B, 1974FI03, 1974KR24, 1974MU1E, 1974WA12, 1975DU16, 1975MA2A, 1975RO31, 1976HE12, 1976KA09, 1976KA1Q, 1976KA34, 1976NI1D; theor.).

57. ^{16}O(γ, p)^{15}N $\qquad Q_m = -12.1277$

The (γ, p_0) cross section derived from the inverse capture reaction (reaction 46) confirms the giant resonance structure indicated above as do also the direct (γ, p_0) measurements. The total (γ, p) cross section is given by (1968DE07). For yields at higher energies see (1973MA1U: $E_{bs} = 50 \rightarrow 80$ MeV) and (1971AD05: $100 \rightarrow 800$ MeV; 6.32 γ-ray). Branching ratios for the decays of ^{16}O states in the giant resonance region to various excited states in ^{15}N are discussed in ^{15}N in (1976AJ04) and in (1973DI1C, 1975BE1F). For a comparison with results from the ^{15}N(p, γ)^{16}O reaction see (1974HA01).

See also (1973DO13, 1976MA2E), (1970FI1D, 1970HA1F, 1972BU1J, 1973CO1N, 1973HA1Q, 1974HA1C) and (1969GR1A, 1970HU18, 1970MU20, 1970WE1H, 1971DE1G, 1971WE04, 1972FI09,

1972WA13, 1973BA05, 1973BL1D, 1973CI1A, 1973DE26, 1973HO36, 1973MA1T, 1974FA1B, 1974KR24, 1975RA02, 1976FI06, 1976HE12, 1976KA1Q, 1976KA34, 1976NI1D; theor.).

58. (a) ^{16}O(γ, d)^{14}N $\quad Q_{\rm m} = -20.7368$
(b) ^{16}O(γ, pn)^{14}N $\quad Q_{\rm m} = -22.9614$
(c) ^{16}O(γ, pp)^{14}C $\quad Q_{\rm m} = -22.3350$
(d) ^{16}O(γ, pd)^{13}C $\quad Q_{\rm m} = -28.2874$

For reactions (b), (c) and (d) see (1973HA2B). For reaction (b) see reaction 56, (1972BU1J) and (1970WE1G, 1973KO1H, 1976HE12; theor.). For the previous work on all these reactions see (1971AJ02).

59. (a) ^{16}O(γ, t)^{13}N $\quad Q_{\rm m} = -25.033$
(b) ^{16}O(γ, α)^{12}C $\quad Q_{\rm m} = -7.1616$
(c) ^{16}O(γ, 4α) $\quad Q_{\rm m} = -14.4364$

For reactions (a) and (c) see (1971AJ02). A study of the ^{16}O(γ, α_0) reaction at $\theta = 45°$ and $90°$ shows a 2^+ resonance at $E_{\rm x} = 18.2$ MeV with an E2 strength which is spread out over a wide energy interval. A strong resonance corresponding to an isospin forbidden 1^- state at $E_{\rm x} \approx 21.1$ is also observed (1975SK06). See also (1973HA1Q, 1976MA62, 1976MA1D) and (1971AJ02).

60. ^{16}O(γ, γ)^{16}O

The differential scattering cross section has been measured for $E_\gamma = 18.5$ to 33 MeV: the main giant resonance peaks are located at ≈ 22 and ≈ 25 MeV (1967LO1B). (1970AH02) report resonances at $E_\gamma = 22.5 \pm 0.3$, 25.2 ± 0.3, 31.8 ± 0.6 and 50 ± 3 MeV: the dipole sum up to 80 MeV exceeds the classical value $60\ NZ/A$ MeV $\cdot$ mb by a factor 1.4. For lifetime measurements of ^{16}O*(6.9, 7.1), see Table 16.19 in (1971AJ02); for widths, see Table 16.12 in (1971AJ02). The separation between the (7.12) and (6.92) γ-lines is 199.8 ± 0.5 keV (1970SW03). Based on 7116.85 ± 0.14 keV (Table 16.9), $E_{\rm x}$ for the lower state is 6917.1 ± 0.6 keV.

61. (a) ^{16}O(e, e)^{16}O
(b) ^{16}O(e, ep)^{15}N $\quad Q_{\rm m} = -12.1277$

The ^{16}O charge radius $= 2.718 \pm 0.021$ fm (1973FE13, 1975SC18). See also (1971BE25) and

Table 16.24: Excited states observed in ^{16}O(e, e′)^{16}O [a]

E_x (MeV ± keV)	$J^\pi; T$	Mult.	Γ (keV)	Γ_{γ_0} (eV)	Refs.
6.05	0^+	E0		3.55 ± 0.21 [b]	(1975MI08)
6.13	3^-	E3		$(2.60 \pm 0.13) \times 10^{-5}$	(1975MI08)
6.92	2^+	E2		0.130 ± 0.009	(1973BE49)
				0.100 ± 0.004	(1975MI08)
7.12	1^-	E1		$(4.6 \pm 2.3) \times 10^{-2}$	(1975MI08) [c]
9.85	2^+	E2		$(8.8 \pm 1.7) \times 10^{-3}$	(1973BE49)
10.35	4^+	E4		$(5.6 \pm 2.0) \times 10^{-8}$	(1973BE49)
11.52	2^+	E2		0.61 ± 0.02	(1973BE50)
12.05	0^+	E0		4.03 ± 0.09 [b]	(1973BE50)
12.53	2^-	M2		0.021 ± 0.006	(1968ST31)
				0.108 ± 0.015	(1970KI02)
12.97	2^-	M2		0.071 ± 0.002	(1970KI02)
13.0	2^+	E2		0.89	(1970KI02) [d]
13.10 ± 250	$1^-; 1$	E1		$\leq 49 \pm 13$	(1970KI02) [d]
14.00 ± 50	0^+	E0	170 ± 50	3.3 ± 0.7 [b]	(1969ST06, 1970ST06)
15.15 ± 150	2^+	E2	500 ± 200	1.0 ± 0.5	(1970ST06)
16.21 ± 30	1^+	M1	18 ± 3	5.1 ± 0.8	(1970ST06, 1975MI08)
16.46 ± 70	2^+	E2	35 ± 5	0.5 ± 0.2	(1970ST06, 1975MI08)
16.80 ± 100	(3^+)		≤ 100	$(1.7 \pm 1.9) \times 10^{-3}$	(1970ST06)
17.14	$1^-; 1$	E1	40 ± 6	62 ± 12	(1970ST06, 1975MI08)
17.60 ± 100	(2^-)		≤ 100	0.07 ± 0.04	(1970ST06)
18.50 ± 100	2^+	E2	60 ± 9		(1970ST06, 1974HO20, 1975MI08)
19.00 ± 100	$1^-; 1$	E1	300 ± 100	41 ± 20	(1965VA09, 1970GO40, 1970ST06)
19.04 ± 50	$2^-; 1$	M2	400 ± 50	1.5 ± 0.3	(1970GO03, 1970GO40, 1970ST06)
			850 ± 150		(1967DR05, 1968DR01)
19.50 ± 100	$1^-; 1$	E1	200 ± 70	40 ± 20	(1970GO40, 1970ST06)
20.36 ± 70	2^-	M2	500 ± 100	2.9 ± 1.0	(1965VA09, 1968DR01, 1969SI10, 1970GO03, 1970GO40, 1970ST06)
20.95 ± 50	$1^-; 1$	E1	270 ± 70	180 ± 50	(1970GO40, 1970ST06)
21.34 ± 250	(2^-)	(M2)			(1965DE1C, 1965VA09)
22.3					(1970GO40)
23.0					(1970GO40)
23.7 ± 250	$(2^-; 1)$				(1965VA09, 1970GO03)
24.2					(1963IS02, 1965VA09, 1970GO03, 1970GO40)
25.5 ± 250	$1^-; 1$	E1			(1963IS02, 1965VA09)
26.7 ± 250	1^+	M1			(1965VA09)
44.5	$(1^-; 1)$		2000–3000	5300	(1961IS06, 1962BI19)
49	$(1^-; 1)$		2000–3000	19000	(1961IS06, 1962BI19)

[a] See also Table 16.26 in (1971AJ02).

[b] Monopole matrix element in fm^2.

[c] See also text and (1975MI13).

[d] See also (1968ST31).

(1971AJ02). Form factors for transitions to the ground and to excited states of ^{16}O have been reported in many studies: see (1971AJ02) and (1970SI08, 1973BE49, 1973BE50). Table 16.24 lists the excited states observed from spectra of inelastically scattered electrons. The isospin-forbidden (E1) excitation of ^{16}O*(7.12) has been reported by (1975MI08, 1975MI13): the isovector contribution interferes destructively with the isoscalar part and has strength $\approx 1\%$ of the $T = 0$ amplitude (1975MI08; and H.H. Miska, private communication).

The 0^+ states ^{16}O*(6.05, 12.05, 14.00) saturate $\approx 19\%$ of an isoscalar monopole sum rule (1973BE50). As for the E2 strength it is distributed over a wide energy region: see Table 16.24 and (1974HO20).

See also (1970SI1K, 1971BI1H, 1975HI1C), (1970BR1C, 1972THZF, 1973TH1B, 1974DE1E, 1975BE1T, 1975BE1G, 1975SI1H) and (1970DO1A, 1970FU1A, 1971BO05, 1971BR42, 1971DU06, 1971EI01, 1971ER08, 1971FR13, 1971KH02, 1971LE31, 1971MA1N, 1972CA23, 1972DO02, 1972DO17, 1972EL11, 1972FI10, 1972FR06, 1972GA26, 1972GU14, 1972WE14, 1973BL1C, 1973BO1Q, 1973DO1H, 1973ER12, 1973FA1F, 1973GA19, 1973GO1P, 1973HO23, 1973HO29, 1973MA07, 1973SP1A, 1973WA1D, 1974BA1Z, 1974BO2D, 1974CI02, 1974DZ06, 1974DZ05, 1974FA1B, 1974FR12, 1974SO13, 1974TR08, 1975AB04, 1975AR30, 1975DE1L, 1975DO10, 1975DO1D, 1975DZ04, 1975IN04, 1975LA1G, 1975LE14, 1975RA02, 1975RO23, 1975WA33, 1976BU1B, 1976CU06, 1976FA08, 1976RA1M; theor.).

62. (a) ^{16}O(π^+, π^+)^{16}O

(b) ^{16}O(π^-, π^-)^{16}O

The small angle scattering of π^+ and π^- has been studied at $E_\pi = 155$, 185 and 213 MeV (1975MU06). At $E_{\pi^-} = 230$ MeV, the excitation of ^{16}O*(6.13) is reported (1974LI15). See also the "General" section here.

63. ^{16}O(n, n)^{16}O

Angular distributions have been measured at energies to $E_n = 14.1$ MeV: see Table 16.27 in (1971AJ02) and Table 16.25 here. Gamma rays have been observed corresponding to the ground state decay of ^{16}O states at $E_x = 6129.1 \pm 1.2$ keV [$E_\gamma = 6127.8 \pm 1.2$ keV] (1966BE1A), 6906 ± 15, 7112 ± 10 and 8865 ± 3 keV (1971NY03). See also (1974HO1E, 1975PO08, 1976NO1F) and (1972JE01, 1973DA1H, 1973SC1L; theor.).

Table 16.25: Recent ^{16}O(n, n), ^{16}O(p, p), ^{16}O(d, d), ^{16}O(t, t), ^{16}O(^{3}He, ^{3}He), ^{16}O(α, α), ^{16}O(^{6}Li, ^{6}Li), ^{16}O(^{7}Li, ^{7}Li), ^{16}O(^{12}C, ^{12}C), ^{16}O(^{16}O, ^{16}O) [a] angular distribution studies

E_n (MeV)	Angular distribution of group	Refs.
$4.34 \to 8.56$	n_0	(1972KI1D)
6.87, 7.82	γ_2	(1970LU16)
7.54, 8.04, 8.56	n_{1+2}	(1972KI1D)
14.1	n_0	(1972BO52)
E_p (MeV)	Angular distribution of group	Refs.
$9.0 \to 20.35$	p_0	(1974SK02)
12.703, 13.600, 16.160, 19.425	p_0	(1974JA25)
$21.5 \to 30.8$	p_0, p_2	(1971BU05)
$23.4 \to 46.1$	p_1, p_2, p_5	(1971AU04)
27.2	p_1	(1976CE1F)
30.3 [b]	p_0	(1976DE12)
30.4 [b]	p_0, p_5	(1972GR02)
$31.7 \to 39.9$ [b]	p_5	(1976LE16)
45	see Table 16.26	(1975BU1F, 1976BU15)
49.5	p_0 (back angles)	(1970CL10)
65.8	p_0	(1973LE07)
E_d (MeV)	Angular distribution of group	Refs.
$1.0 \to 2.0$	d_0	(1972CO15)
8	d_0	quoted in (1971KO21)
9.3, 13.3	d_0	(1973CA30)
10.000, 12.052	d_0 [c]	(1974JA25)
13.6	d_0	(1970VE06, 1972MA47)
15	d_0	(1974BU06)
25.4, 36.0, 63.2	d_0	(1974CO04)
81.6	see Table 16.26	(1974DU06)
E_t (MeV)	Angular distribution of group	Refs.
$1.85 \to 3.70$	t_0	(1973WE11)
20.010	t_0 [c]	(1974JA25)

Table 16.25: Recent ^{16}O(n, n), ^{16}O(p, p), ^{16}O(d, d), ^{16}O(t, t), ^{16}O(^{3}He, ^{3}He), ^{16}O(α, α), ^{16}O(^{6}Li, ^{6}Li), ^{16}O(^{7}Li, ^{7}Li), ^{16}O(^{12}C, ^{12}C), ^{16}O(^{16}O, ^{16}O) [a] angular distribution studies (continued)

$E(^{3}\text{He})$ (MeV)	Angular distribution of group	Refs.
11	g.s.	(1970BO25)
71	see Table 16.26	(1974MO26)
E_{α} (MeV)	Angular distribution of group	Refs.
14.0 → 18.1	α_0, α_{1+2}, α_3, α_4	(1975BI1H)
18.9 → 23.0	α_0	(1971BE17)
20.1	α_0	(1972CA45)
20.40 → 24.28	α_0	(1971TA05)
22, 24, 28, 29	α_0	(1972OE01, 1973OE01)
26.6	α_0	(1972KU19)
60	Table 16.26	(1975BU1F, 1976BU15)
104	α_0	(1970HA1G)
104	see Table 16.26	(1976HA19, 1976HA27)
146	^{16}O*(0, 6.13, 6.92, 11.52, 18.4) [Table 16.26]	(1975KN05)
$E(^{6}\text{Li})$ (MeV)	Angular distribution of group	Refs.
4.5, 5.8, 9.0, 13.0	g.s.	(1976PO02)
20	g.s.	(1969BE90)
22.8 [b]	g.s.	(1976WE10)
29.8	g.s.	(1972BA52)
30	g.s.	(1971CH1P, 1971DA33)
$E(^{16}\text{O}) = 36$	g.s.	(1971OR02)
36	g.s.	(1973SC26)
51	g.s.	(1975CH1Q)
$E(^{7}\text{Li})$ (MeV)	Angular distribution of group	Refs.
9.0, 13.0	g.s.	(1976PO02)
20	g.s.	(1969BE90)
$E(^{16}\text{O}) = 36$	g.s.	(1971OR02)
36	g.s.	(1973SC26)

Table 16.25: Recent ^{16}O(n, n), ^{16}O(p, p), ^{16}O(d, d), ^{16}O(t, t), ^{16}O(^{3}He, ^{3}He), ^{16}O(α, α), ^{16}O(^{6}Li, ^{6}Li), ^{16}O(^{7}Li, ^{7}Li), ^{16}O(^{12}C, ^{12}C), ^{16}O(^{16}O, ^{16}O) [a] angular distribution studies (continued)

$E(^{16}O)$ [reaction 72] [d] (MeV)	Angular distribution of group	Refs.
24, 42, 65, 80	g.s.	(1973GU12)
36	g.s.	(1971OR02)
$40.3 \to 53.2$	g.s.	(1976CH13)
45.3, 46.0, 47.1	g.s.	(1972MA29)
46	^{16}O*(6.05, 6.13, 6.92, 7.12)	(1976SP01)
65, 80	^{16}O*(6.1, 6.9, 8.9, 10.3) [e]	(1973GU12)
$E(^{16}O)$ [reaction 76] (MeV)	Angular distribution of group	Refs.
25 to 63	g.s.	(1969MA40, 1970MA1P)
46.6	g.s.	(1974VA18)
51.5	g.s., $6.1 + 6.9$	(1974RO04)

[a] The earlier work is displayed in Table 16.27 of (1971AJ02).
[b] Polarized.
[c] Very accurate differential cross sections at several angles.
[d] See also reaction 64 in (1971AJ02).
[e] And ^{12}C*(0, 4.4).

64. (a) ^{16}O(p, p)^{16}O
(b) ^{16}O(p, 2p)^{15}N $\qquad Q_m = -12.1277$
(c) ^{16}O(p, pd)^{14}N $\qquad Q_m = -20.7368$
(d) ^{16}O(p, pα)^{12}C $\qquad Q_m = -7.1616$

Angular distributions of elastically and inelastically scattered protons have been measured at many energies up to $E_p = 1000$ MeV: see Table 16.27 in (1971AJ02) and Table 16.25 here. Parameters of the observed groups are displayed in Table 16.26. Evidence, based on a study of the angular distribution and polarization involving ^{16}O*(8.87) [$J^\pi = 2^-$], has been obtained by (1976LE16) for an octupole (E3) giant resonance of predominantly isoscalar nature centered near $E_x \approx 35$ MeV, $\Gamma \approx 5$ MeV.

For reaction (b) see (1971EI06, 1971HA61) and ^{15}N in (1976AJ04). For reaction (c) see (1971AJ02) and (1976GO1E). At $E_p = 46.8$ MeV reaction (d) proceeds predominantly via ^{16}O*(11.0) (1971EP03). See also (1972BO71) and (1971AJ02), (1969BU1B, 1970QU1C, 1971BA1K,

Table 16.26: States of ^{16}O from ^{16}O(p, p′), (d, d′), (^{3}He, ^{3}He′) and (α, α') [a]

E_x [b] (MeV ± keV)	L [b]	E_x [d] (MeV)	E_x [f] (MeV ± keV)	E_x [g] (MeV ± keV)	E_x [k] (MeV ± keV)	L [g]	Γ [b] (keV)	$J^\pi; T$ [h]	β^2 [k] ($\times 10^{-3}$)
		6.05							
6.13 ± 40 [c]		6.13	6.13 [e,f]	6.14 ± 50 [j]	6.13	3 [j,k]		$3^-; 0$	[l]
6.92 [c]		6.92	6.92 [c,f]	6.90 ± 50 [j]	6.92	2 [j,k]		$2^+; 0$ [f]	36 [l]
7.12 [c]		7.12		6.97 ± 50 [j]	7.12	1 [j,k]		$1^-; 0$	
8.75 ± 150 [c]		8.87	8.87 ± 30 [f]	8.876 [j]		3 [j]			
9.70 ± 150 [c]		9.85	9.84 ± 30	9.80 ± 50 [j]	9.85	2 [k]		$2^+; 0$ [f]	1.8
10.35 ± 20	4	10.34	10.35 ± 30	10.35 ± 30	10.35	4 [k]		$4^+; 0$	
10.95 ± 30	1	10.95						$T = 0$	
11.10 ± 20	4	11.1 [e]	11.09 ± 30 [e]	11.10 ± 30	11.10	4 [k]		$4^+; 0$	
11.52 ± 20	2	11.52	11.52 ± 30 [f]	11.52 ± 30	11.52	2 [k]	74 ± 4 [k]	$2^+; 0$	19 [l]
12.05 ± 20		12.05	12.04 ± 30	12.05 ± 30	12.05	(0) [k]		$0^+; 0$	
		12.44			12.44	1 [k]		$1^-; 0$	
12.53 ± 20	1	12.53		12.51 ± 30					
13.02 ± 20	2	13.1 [e]	13.11 ± 30	13.07 ± 20	13.02 ± 13.13 [e]	2 [e,k]		$2^+; 0$	4.4 [l]
13.26 ± 30	3							$3^-; 1$	
		13.66							
13.95 ± 50	$(0 + 4)$		13.97 ± 30	13.95 ± 50	13.88	4 [e,k]	[e]	$4^+; 0$	
			14.94 ± 30	14.87 ± 100	14.82	6 [k]		6^+	
15.26 ± 50	(3)		15.4						
15.50 ± 30	3			15.50 ± 50 [k]	15.45	3 [k]	200 ± 60	$3^-; 0$	
16.52 ± 50	2		16.46 ± 30	16.40 ± 100			< 100	2^+ [f]	
16.93 ± 50	(3)								

Table 16.26: States of ^{16}O from ^{16}O(p, p′), (d, d′), (^{3}He, ^{3}He′) and (α, α') [a] (continued)

E_x [b] (MeV ± keV)	L [b]	E_x [d] (MeV)	E_x [f] (MeV ± keV)	E_x [g] (MeV ± keV)	E_x [k] (MeV ± keV)	L [g]	Γ [b] (keV)	$J^\pi; T$ [h]	β^2 [k] ($\times 10^{-3}$)
17.25 ± 50			17.19 ± 30	17.25 ± 80		(2)	160 ± 60	2^+ [f]	
17.88 ± 50	3			17.83 ± 100			150 ± 60		
18.15 ± 50	(2)		17.8		18.0 ± 100	2 [k]	300 ± 50	$(2^+); 0$	3.4
18.40 ± 100	2		18.52 ± 30	18.35 ± 100	18.5 ± 100	2 [k]		$2^+; 0$	7.7
18.60 ± 100				18.70 ± 100	19.0 ± 100	(3)	280 ± 80 [e]	$3^-; 0$	
19.10 ± 50	(4)						< 100	$4^+; 1$	
			19.09 ± 30					2^+ [f]	
19.35 ± 80	(1)								
19.56 ± 50	3			19.50 ± 100	19.5 ± 100	(3)		$3^-; 0$	2.9
			20.0		20.15 ± 100	2 [k]	350 ± 50 [k]	$2^+; 0$ [f]	3.6
19.95 ± 50	3						< 100	$3^-; 1$	
20.56 ± 80	(1, 2)						370 ± 100		
21.05 ± 50	1			21.1 ± 100	20.9 ± 100	2 [k]	270 ± 80	$(2^+; 0)$	4.7
							350 ± 50 [k]		
21.80 ± 80	1						370 ± 100	$1^-; 1$	
					21.85 ± 100	2 [k]	400 ± 50 [k]	$2^+; 0$	5.7
22.40 ± 80	(1, 2)						420 ± 100	$1^-; 1$	
					22.5 ± 100		400 ± 50 [k]	$(2^+, 3^-); 0$	5.0
23.20 ± 80	1						600 ± 200	$1^-; 1$	
				23.50 ± 150 [i]	23.25 ± 100	2	400 ± 50 [k]	$2^+; 0$	5.6
					23.85 ± 100	(0) [k]	400 ± 50 [k]	$(2^+, 0^+); 0$	4.4

Table 16.26: States of ^{16}O from ^{16}O(p, p′), (d, d′), (^{3}He, ^{3}He′) and (α, α') [a] (continued)

E_x [b] (MeV ± keV)	L [b]	E_x [d] (MeV)	E_x [f] (MeV ± keV)	E_x [g] (MeV ± keV)	E_x [k] (MeV ± keV)	L [g]	Γ [b] (keV)	$J^\pi; T$ [h]	β^2 [k] ($\times 10^{-3}$)
24.00 ± 100	(1, 2)						1200 ± 300	$1^-; 1$	
					24.4 ± 100		400 ± 50 [k]	$(2^+, 3^-); 0$	4.3
25.50 ± 150	(1)						1330 ± 300	$1^-; 1$	

[a] See also Tables 16.28 and 16.29 in (1971AJ02).

[b] (p, p′): (1975BU1F, 1976BU15), $E_p = 45$ MeV, except for the Γ labeled [k].

[c] (p, p′): (1969SU03), $E_p = 185$ MeV.

[d] (d, d′): (1974DU06), $E_d = 81.6$ MeV; energies are nominal (±100 to ±260 keV); angular distributions reported to all but last state.

[e] Unresolved states.

[f] (^{3}He, ^{3}He′): (1974MO26), $E(^{3}\mathrm{He}) = 71$ MeV; angular distributions are reported to states labeled by [f].

[g] (α, α'): (1975BU1F, 1976BU15), $E_\alpha = 60$ MeV, except for states labeled by [j] and [k] where see these references for additional evidence.

[h] Proposed by (1975BU1F, 1976HA19, 1976HA27).

[i] $\Gamma = 1.70 \pm 0.3$ MeV (1976BU15).

[j] (1964HA16, 1966HA19).

[k] Angular distribution at $E_\alpha = 104$ MeV (1976HA19, 1976HA27). The strong excitation of ^{16}O*(7.12) is consistent with a DWBA calculation using a microscopic form factor obtained from a 1p-1h model with $1\hbar\omega$ excitation (1976HA19).

[l] (α, α'): see also (1975KN05).

1971LO25, 1973GO27, 1974AL1G, 1975HI02, 1976NO02), (1971GA1J, 1972PA1A, 1973TH1A, 1975IG1A, 1975KA2D), (1970BA1F, 1970CZ1A, 1971FE10, 1971HE25, 1971RA36, 1972AU1A, 1972BO08, 1972BO39, 1972GE07, 1972GE16, 1972JA1C, 1972JO1A, 1972KE10, 1972LE27, 1972LE28, 1972LE1G, 1972PE04, 1972ST29, 1972WI16, 1973BL02, 1973GE01, 1973GE07, 1973GU1A, 1973JA13, 1973MI19, 1973RU07, 1973SC1L, 1973VA18, 1974BE22, 1974CI02, 1974GO1G, 1974GU21, 1974MA40, 1974PE1D, 1974SC1K, 1974SC1E, 1974SI13, 1974ZE04, 1975AN1N, 1975BA1H, 1975CL1D, 1975DU1A, 1975FR06, 1975GE05, 1975MA18, 1975MA50, 1975SC1T, 1975SM01, 1975TH03, 1976DAZH, 1976GO1E, 1976JA03, 1976YA08; theor.) and ^{17}F.

65. (a) ^{16}O(d, d)^{16}O
(b) ^{16}O(d, pn)^{16}O $\quad Q_{\rm m} = -2.2246$

Angular distribution studies have been carried out for $E_{\rm d}$ up to 81.6 MeV: see Table 16.27 in (1971AJ02) and Table 16.25 here. Observed deuteron groups are displayed in Table 16.26 (1974DU06). For reaction (b) see (1971NE07). See also (1972PA1A), (1969VE09, 1970EL16, 1970OH1C, 1971DO1A, 1971SI24, 1972DM01, 1972GA16, 1974CH58, 1975BO1P, 1975CO12, 1976CO01, 1976LE1U: theor.) and ^{18}F in (1978AJ03).

66. ^{16}O(t, t)^{16}O

Angular distibutions are reported for $E_{\rm t}$ to 20.01 MeV: see Table 16.27 in (1971AJ02) and Table 16.25 here. See also (1976LE19; theor.) and ^{19}F in (1978AJ03).

67. ^{16}O(^{3}He, ^{3}He)^{16}O

Angular distributions have been measured to $E(^3\text{He}) = 71$ MeV: see Table 16.27 in (1971AJ02) and Table 16.25 here. Inelastic groups are shown in Table 16.26 (1974MO26). See also (1970KA1D, 1975GO1L), (1974HA1C) and (1974CH58, 1974KU15, 1975SI09, 1976LE19; theor.).

68. (a) ^{16}O(α, α)^{16}O
(b) ^{16}O(α, 2α)^{12}C $\quad Q_{\rm m} = -7.1616$

Angular distributions of α-particles have been measured up to $E_\alpha = 146$ MeV: see Table 16.27 in (1971AJ02) and Table 16.25 here. The fraction of the isoscalar quadrupole ($T = 0$, E2) energy weighted sum rule (EWSR) exhausted between $E_{\rm x} = 17$ and 25 MeV is 40^{+20}_{-10}%

(1976HA27). See also (1975KN05, 1975MO04, 1976BU15, 1976YO02). The forward angular behavior of the giant resonance structure for $E_x = 23$–24 MeV is consistent with $l = 0$ transfer while $l \geq 3$ contributions cannot be excluded above $E_x = 20$ MeV. For low-lying states coupled channel calculations are required to describe the angular distributions to the 2^+ and 4^+ states at 9.85 and 10.35 MeV while the 1^-, $T = 0$ states require a microscopic wave function analysis (1976HA27).

Reaction (b) proceeds via excited states of ^{16}O: see (1971GU15, 1975SH1K). (1976CH12) find $N_{\text{eff}} = 0.34^{+0.09}_{-0.05}$ at $E_\alpha = 850$ MeV [square well]. (1975SH1K) report that the principal parent of ^{16}O in and α-cluster model is ^{12}C$_{\text{g.s.}}$, and not ^{14}C*(4.4).

See also (1969PI1B, 1973EC1A, 1973LI1F, 1974DO1G), (1971GA1J, 1974HA1C, 1975GR41, 1975RO1B), (1970AG08, 1970BU1C, 1970MI12, 1971BE20, 1971LO24, 1971MC03, 1971MU1H, 1971NO03, 1971TA30, 1971TE10, 1972AV04, 1972BO13, 1972CA44, 1972DM01, 1972LO16, 1972MI05, 1972SH10, 1972SU10, 1973CE01, 1973CO15, 1973RU07, 1973SU1A, 1974BA40, 1974CA31, 1974CH58, 1974KA1P, 1974KU15, 1974MO24, 1974PI11, 1974WA02, 1975AN1F, 1975FL1B, 1975KO28, 1975SI09, 1975SU1C, 1976CO27, 1976LE20, 1976PA1J, 1976RE04; theor.) and ^{20}Ne in (1978AJ03).

69. (a) ^{16}O(^{6}Li, ^{6}Li)^{16}O
(b) ^{16}O(^{7}Li, ^{7}Li)^{16}O
(c) ^{16}O(^{7}Li, tα)^{16}O $\qquad Q_m = -2.4668$

For studies of the elastic scattering see Table 16.25. See also (1974MI1F), (1973FO1A, 1975GR41, 1976FI1F) and (1970SC31, 1972WA31, 1976OH03; theor.). For a study of d-α angular correlations see ^{20}Ne in (1978AJ03) and (1975AR20). For reaction (c) see (1974PA16) and ^{20}Ne in (1978AJ03).

70. ^{16}O(^{9}Be, ^{9}Be)^{16}O

The elastic scattering has been studied for $E(^{16}\text{O}) = 25.7$ to 29.5 MeV (1975FU05). See also (1974TA1C).

71. (a) ^{16}O(^{10}B, ^{10}B)^{16}O
(b) ^{16}O(^{11}B, ^{11}B)^{16}O

The elastic scattering angular distributions have been studied at $E(^{10}\text{B}) = 100$ MeV (1975NA15) and, in reaction (b), at $E(^{16}\text{O}) = 27$, 30, 32.5, 35 and 60 MeV (1972SC03). At $E(^{16}\text{O}) = 60$ MeV, angular distributions involving states of ^{11}B and ^{16}O*(0, 6.1, 7.0, 10.34) have been measured by (1972SC17). See also (1974DE17, 1974KO1P; theor.).

72. ^{16}O(^{12}C, ^{12}C)^{16}O

The elastic scattering has been studied at $E(^{16}$O) up to 168 MeV: see reaction 64 in (1971AJ02) and Table 16.25 here. The scattering to ^{16}O*(6.05, 6.13, 6.92, 7.12, 8.9, 10.3) has also been studied [see Table 16.25] (1973GU12, 1976SP01) and the populations of ^{16}O*(11.1) (1975SH24) and ^{16}O*(15) (1973GU12) have been reported. See also (1970RO23). Most of the studies of this reaction have involved yield measurements as they apply to compound structures in ^{28}Si: see (1978EN06) and (1972MA29, 1972ST09, 1973MA1N, 1974MA1L, 1975MA2C, 1975SH24, 1976CH13, 1976CH1Y, 1976EY01, 1976SP03). For spallation experiments see (1974WI05).

See also (1972MA1P, 1975HA1X, 1975PI1C), (1969HE06, 1972GA1E, 1973BR1C, 1973PA1J, 1973PE1D, 1973ST1F, 1973ST1A, 1975GR41, 1975VO1B), (1973AR1E, 1973CL1E, 1974CO1L, 1976CU04; astrophys.), (1970AN1D, 1971DA30, 1972BA73, 1972CH1E, 1972GO1G, 1972NA14, 1972RI03, 1973DE40, 1973FE1G, 1973LO02, 1973SA1K, 1974GA1L, 1974SA1M, 1974VE05, 1974WA02, 1975CH08, 1975KI01, 1975PE03, 1975SW1A, 1975VE12, 1976CH1X, 1976YO01; theor.) and (1971AJ02).

73. (a) ^{16}O(^{13}C, ^{13}C)^{16}O
(b) ^{16}O(^{14}C, ^{14}C)^{16}O

The elastic scattering has been studied at $E(^{13}\mathrm{C}) = 36$ MeV (1976WE21). See also (1974BE1J, 1975RA33; theor.). The elastic scattering in (b) has been studied at $E(^{16}\mathrm{O}) = 20$, 25 and 30 MeV (1975SC35).

74. (a) ^{16}O(^{14}N, ^{14}N)^{16}O
(b) ^{16}O(^{15}N, ^{15}N)^{16}O

The elastic scattering angular distributions have been studied at $E(^{14}$N) and $E(^{15}\mathrm{N}) = 25$ MeV (1971BO1U), at $E(^{14}\mathrm{N}) = 79$ MeV (1976MO03) and at $E(^{14}\mathrm{N}) = 155$ MeV (1975NA15). For yield measurements see (1973GO01, 1974ST1N, 1976ST12) and ^{30}P and ^{31}P in (1978EN06). See also (1975VO1B) and (1973KA46, 1974BA40, 1975MO23; theor.).

75. ^{16}O(^{16}O, ^{16}O)^{16}O

The angular distributions of elastically scattered ^{16}O ions have been measured with $E(^{16}$O) up to 140.4 MeV: see reaction 66 in (1971AJ02) and Table 16.25 here. See (1973GO01) for a general study of the elastic scattering. The angular distributions corresponding to the excitation of the first four excited states of ^{16}O have been studied at $E(^{16}\mathrm{O}) = 51.5$ MeV (1974RO04) and at 140.4 MeV

(1962WI09). The astrophysical import of the cross section for elastic scattering (and of the total reaction cross section) has been studied by (1974SP06). For other yield measurements see ^{32}S in (1978EN06) and (1974HA44, 1974RO04, 1974VA18). See also (1973RE13).

See also (1971PU1B), (1969HE06, 1973BR1C, 1973PE1D, 1973ST1A, 1974ST1L, 1975VO1B), (1971WO1E, 1973AR1E, 1973CL1E, 1974AR1G, 1974CO1L, 1976AR1H; astrophys. questions) and (1970AN1D, 1970MO35, 1971EC01, 1971FL08, 1971GR1W, 1971HE16, 1971MC03, 1971NE1C, 1971RA1C, 1971RA1G, 1971RE21, 1971TO11, 1971TO09, 1972AL46, 1972AR11, 1972FL11, 1972MO22, 1972PE12, 1972RE14, 1972SE01, 1972TA30, 1972YU01, 1972YU02, 1973BO06, 1973FI07, 1973FU14, 1973LO02, 1973PA20, 1973SC1K, 1973VO1H, 1974FL1C, 1974FR06, 1974GA1L, 1974GL05, 1974KN06, 1974KO1N, 1974MO1E, 1974SC1J, 1974TA16, 1974VE05, 1974WA02, 1974YA11, 1975AN1F, 1975BR13, 1975CU1B, 1975DE02, 1975FU10, 1975KU09, 1975MA2B, 1975PH02, 1975SW1A, 1975TO1D, 1975TO1E, 1976BA07, 1976CH1X, 1976CU01, 1976FEZT, 1976GO12, 1976JA1F, 1976KO09, 1976SAZC, 1976SAZS, 1976ZI01; theor.).

76. (a) ^{16}O(^{17}O, ^{17}O)^{16}O
(b) ^{16}O(^{18}O, ^{18}O)^{16}O

Angular distributions of elastically scattered ions have been studied at $E(^{16}\mathrm{O}) = 24$, 28 and 32 MeV (1973GE04) and $E(^{17}\mathrm{O}) = 53.0$, 57.1, 61.5 and 66 MeV (1975KA24) [reaction (a)] and at $E(^{16}\mathrm{O}) = 24$, 28 and 32 MeV (1972GE18), 31.5 and 42.0 MeV (1975RE15), 39.9, 44.8, 49.9 and 54.8 MeV (1972SI16) and 41.8 and 51.9 MeV (1974VA22: also ^{16}O*(6.1)), and at $E(^{18}\mathrm{O}) = 53.1$, 57.4, 61.6, 76.5 and 89.3 MeV (1975KA24). See also ^{17}O, and ^{18}O in (1978AJ03).

See also (1973FI1C, 1974GO1L, 1975VO1B) and (1973BA2F, 1974BA46, 1974BE1J, 1974BO13, 1974YU01, 1975IM04, 1975WO1E; theor.) [reaction (a)] and (1973FI1C, 1973VO1E, 1975VO1B) and (1973BO1H, 1973MC1D, 1974GE02, 1974KU1E, 1975GR41, 1976GL08, 1976IM01, 1976OH03; theor.) [reaction (b)].

77. ^{16}O(^{19}F, ^{19}F)^{16}O

Angular distributions of elastically scattered ions have been studied at $E(^{16}\mathrm{O}) = 21.4$ and 25.8 MeV (1975MO31) and at $E(^{19}\mathrm{F}) = 33$ and 36 MeV (1973GA14). See also ^{19}F in (1978AJ03), (1973VO1E, 1975VO1B) and (1976OH03; theor.).

78. ^{16}O(^{20}Ne, ^{20}Ne)^{16}O

Elastic scattering angular distributions have been measured at $E(^{16}\mathrm{O}) = 40.7$, 51.1 and 59.4 MeV (1975ZI1C).

79. ^{17}O(p, d)^{16}O $\qquad Q_m = -1.918$

Angular distributions for the ground state deuteron group have been studied at $E_p = 8.62, 9.56$, 10.5, 11.16 and 11.44 MeV (1975CR05). At $E_p = 31$ MeV, angular distributions are reported for the deuterons corresponding to ^{16}O*(0, $6.05 + 6.13$, 7.12, 8.87, 10.35, 12.97, 13.26). States at $E_x = 15.22$ and 15.42 MeV were also observed. Spectroscopic factors were obtained from a DWBA analysis (1970ME01).

80. ^{17}O(d, t)^{16}O $\qquad Q_m = 2.115$

At $E_d = 52$ MeV the spectrum at $10°$ is dominated by ^{16}O*(0, 6.13, 8.87, 12.97, 13.26, 18.97, 19.79). ^{16}O*(18.97, 19.79) are assigned $J^\pi = (4)^-$; $T = 1$ and (4); 0, respectively. Spectroscopic factors are given for various of the ^{16}O states (1974MA23). See also reaction 29 in ^{16}N, (1973WA1E) and (1975HS01, 1976SC36; theor.).

81. ^{17}O(^{3}He, α)^{16}O $\qquad Q_m = 16.436$

Angular distributions to many states of ^{16}O have been observed at $E(^3\text{He}) = 11$ MeV: see Table 16.22 for l- and S-values (1971BO02). At $E(^3\text{He}) = 36$ MeV the widths of ^{16}O*(18.97, 19.79) are < 16 and < 37 keV, respectively (1974DOZO). See also (1976WAZS) and (1971AJ02).

82. (a) ^{18}O(p, t)^{16}O $\qquad Q_m = -3.7070$

(b) ^{18}O(p, pt)^{15}N $\qquad Q_m = -15.8347$

(c) ^{18}O(p, tα)^{12}C $\qquad Q_m = -6.2274$

Angular distributions of tritons (reaction (a)) have been measured for E_p to 43.7 MeV: see (1971AJ02) for the earlier work and (1974FL09: $E_p = 20$ MeV; $t_0 \rightarrow t_5, t_7$), (1974PI05: $E_p =$ 20.0, 24.4, 29.8, 37.5, 43.6 MeV; $t_{1+2}, t_{3+4}, t_5, t_8$), (1973PI09: $E_p = 24.4$ MeV (polarized protons); $t_0, t_{1+2}, t_3 \rightarrow t_5, t_7, t_8$) and (1972AD10: $E_p = 41.7$ MeV; t_0, t_{1+2} and t to ^{16}O*(11.26, 12.05, 16.33, 22.72)). See also (1970OL1B). Most of the states are more strongly populated than expected on the basis of simple calculations: it is suggested that complete coupled channels calculations may be necessary [see (1972AD10, 1974FL09)]. The population of ^{16}O*(22.7, 24.5) is consistent with $L = 0$ and 2, respectively, and with assignments of $T = 2$, $J^\pi = 0^+$ and 2^+ (1964CE05). A study, at $E_p = 43$ MeV, of decay of the first $T = 2$ state at $E_x = 22.72$ MeV shows that it decays via proton emission [reaction (b)] with branchings of $(25 \pm 6)\%$, $(22 \pm 5)\%$ and $(15 \pm 5)\%$ to ^{15}N*(0, $5.27 + 5.30$, 6.32). The α-decay [reaction (c)] is not observed: the branchings to ^{12}C*(0, 4.4) are $(1.1 \pm 4.0)\%$ and $(0.0 \pm 3.4)\%$. The remaining decay modes have not been determined

(1973KO02). See also (1973SO07, 1974MC1F, 1975CH18, 1975HO06, 1975IB01, 1975SE09; theor.) and ^{19}F in (1978AJ03).

83. ^{18}O(α, ^{6}He)^{16}O $\quad Q_{\rm m} = -11.218$

Angular distributions have been measured at $E_\alpha = 58$ MeV to ^{16}O*(0, 6.1, 6.92, 7.12). Groups at $E_{\rm x} = 10.4$, 13.3 ± 0.1 and 16.3 ± 0.1 MeV were also observed. The cross sections are about a factor of 20 smaller than in the ^{18}O(p, t) reaction but the angular distributions are consistent with a direct transfer mechanism (1975VA01). See also (1975VA1F).

84. ^{18}O(^{18}O, ^{20}O)^{16}O $\quad Q_{\rm m} = -0.628$

See (1972EY01, 1976KUZX) and ^{20}O in (1978AJ03).

85. (a) ^{19}F(p, α)^{16}O $\quad Q_{\rm m} = 8.1148$
(b) ^{19}F(p, 2d)^{16}O $\quad Q_{\rm m} = -15.733$

Angular distributions have been reported at many energies to $E_{\rm p} = 44.5$ MeV: see Table 16.30 in (1971AJ02) and (1964BR12: $E_{\rm p} = 2.06$ to 3.30 MeV; α_0) and (1975BU1B: $E_{\rm p} = 13.5$ to 18.0 MeV; α_0). Observed states of ^{16}O are displayed in Table 16.31 in (1971AJ02).

Very accurate γ-ray measurements are reported by (1967CH19) [see reaction 55] and (1970GA09) [the E_γ of the $8.87 \rightarrow 6.13$ transition is 2741.5 ± 0.5 keV]. The E0 transition ($6.05 \rightarrow 0$; $0^+ \rightarrow 0^+$) has been investigated in some detail: the internal conversion to pair production ratio $(4.00 \pm 0.46) \times 10^{-5}$ (1963LE06). The ratio of double γ-emission to pair production $\Gamma_{\rm E1E1}/\Gamma_{\rm E0(\pi)} \leq 1.1 \times 10^{-4}$ (1964AL18), $(2.5 \pm 1.1) \times 10^{-4}$ (1975WA20). The $\tau_{\rm m}$ for ^{16}O*(6.05) $= 96 \pm 7$ psec (1973BI17). An attempt to observe a scalar boson produced in the decay of ^{16}O*(6.05) was unsuccessful; together with other results it demonstrates that the mass of such a boson cannot be $1.030 \leq m \leq 18.2$ MeV (1974KO1Q).

^{16}O*(6.13) has also been studied extensively: $|g| = 0.55 \pm 0.04$, $\tau_{\rm m} = 26.6 \pm 0.7$ psec (1973BR31). A search for double positron-electron pair creation by the 6.13 MeV γ-ray was unsuccessful: the ratio of the cross section for production of such a double pair to the cross section for formation of a single pair is $-(2 \pm 5) \times 10^{-5}$ (1972WI09). See also (1971BE60, 1972VA1H, 1976KA1N). For γ-ray branching ratios and Γ_γ for these and other transitions see Table 16.15. See also (1971AJ02) and ^{20}Ne in (1978AJ03).

See also (1973LI1F, 1974KRZE), (1971ST06, 1973GO1M, 1973GO1N, 1974LO1B) and (1974LE1H, 1975BU1H, 1975GO1T, 1975SW1B; applications). For reaction (b) see (1971DE1F).

86. ^{19}F(^{3}He, ^{6}Li)^{16}O $Q_{\rm m} = 4.095$

Angular distributions have been measured at $E(^{3}\text{He}) = 22.4$, 30 and 40.7 MeV (1972OH01; g.s.), 28 MeV (1970KL09; g.s. of ^{16}O and various ^{6}Li states) and 40.7 MeV (1971DE14; to ^{16}O*(6.13, 6.92, 7.12, 8.87, 11.0, 12.5, 13)). See also (1972YO02).

87. ^{19}F(α, ^{7}Li)^{16}O $Q_{\rm m} = -9.233$

The ground state angular distribution has been measured at $E_\alpha = 42$ MeV (1968MI05).

88. (a) ^{20}Ne(γ, α)^{16}O $Q_{\rm m} = -4.7313$
(b) ^{20}Ne(p, pα)^{16}O $Q_{\rm m} = -4.7313$

For reaction (a) see (1975SK06) and ^{20}Ne in (1978AJ03). See also (1973CL1E; astrophys.). For reaction (b) see (1967CH04).

89. ^{20}Ne(d, ^{6}Li)^{16}O $Q_{\rm m} = -3.2576$

Angular distributions have been studied at $E_{\rm d} = 40$ MeV (1973KI1C, 1974EP1B; to ^{16}O*(0, 8.87)). See also (1975BE01: quote data at 36 MeV). At $E_{\rm d} = 55$ MeV, $\theta = 16°$, the spectrum is dominated by ^{16}O*(0, 6.1, 6.9, 9.85). ^{16}O*(8.87, 10.35) are also observed (1971MC04). See also (1975CO1N).

90. ^{20}Ne(^{3}He, ^{7}Be)^{16}O $Q_{\rm m} = -3.145$

At $E(^{3}\text{He}) = 30$ MeV angular distributions involving ^{16}O*(0, 6.1) and the first two states of ^{7}Be are reported by (1970DO1H). See also (1971DE37: $E(^{3}\text{He}) = 41$ MeV), (1975AU01) and (1973KL1B; theor.).

91. ^{20}Ne(α, 2α)^{16}O $Q_{\rm m} = -4.7313$

At $E_\alpha = 78.6$ MeV the reaction goes predominantly to $^{16}\text{O}_{\text{g.s.}}$ with a small yield to ^{16}O*(7.1). Quasifree $\alpha - \alpha$ scattering plays an important role in the reaction (1974EP01).

92. ^{28}Si(α, ^{16}O)^{16}O $Q_{\rm m} = -9.5928$

See (1967VA18).

^{16}F

(Figs. 4 and 5)

GENERAL: (See also (1971AJ02).):

See (1972JA14, 1973LA1G, 1973LA1H, 1973RO1R, 1974VA24, 1975BE31).

1. (a) ^{14}N(^{3}He, n)^{16}F $\quad Q_m = -0.969$
   (b) ^{14}N(^{3}He, np)^{15}O $\quad Q_m = -0.421$

Observed neutron groups and L-values derived from angular distribution measurements are displayed in Table 16.28 [(1973BO50); $E(^3\text{He}) = 13$ MeV]. See (1971AJ02) for the eariler work. See also (1971ADZZ, 1975OT01). For reaction (b) see (1976OT02) [Table 16.28], (1973AD02) and ^{17}F.

2. ^{16}O(p, n)^{16}F $\quad Q_m = -16.212$

Observed neutron groups are listed in Table 16.28 (1971MO34). See also (1971BE46, 1971TH1D), (1974MO06; theor.) and (1971AJ02).

3. ^{16}O(^{3}He, t)^{16}F $\quad Q_m = -15.448$

Observed triton groups are displayed in Table 16.28 (1965PE04). Comparisons of relative populations of the first four states in this reaction and in the analog reaction (^{16}O(t, ^{3}He)^{16}N) to known states in ^{16}N [see reaction 28 in ^{16}N (1974FL06)] suggest that ^{16}F*(0, 0.20) are 0^- and 1^- and that ^{16}F*(0.42, 0.72) are 2^- and 3^- (the relative ordering of the J^π is ambiguous). (1965PE04) suggest, on the basis of angular distributions, that the ordering is $J^\pi = 0^-, 1^-, 2^-, 3^-$ for the first four states of ^{16}N. At $E(^3\text{He}) = 73$ MeV the spectrum is dominated by a very large peak at $E_x \approx 7$ MeV (1975GO1L; abstract). See also (1976CEZX, 1976MOZD).

4. ^{19}F(^{3}He, ^{6}He)^{16}F $\quad Q_m = -14.845$

This reaction has been studied at $E(^3\text{He}) = 70$ MeV (1976MOZD).

Table 16.27: Energy levels of ^{16}F

E_x (MeV $\pm$ keV)	J^π; T	$\Gamma_{\text{c.m.}}$ (keV)	Decay	Reactions
0	$(1)^-$; 1	40 ± 20	p	1, 2, 3
0.194 ± 9	$(0)^-$	< 40	p	1, 2, 3
0.424 ± 5	$(2)^-$	40 ± 30	p	1, 2, 3
0.720 ± 6	$(3)^-$	< 15	p	1, 2, 3
3.763 ± 8	1^+	< 40	p	1, 3
3.870 ± 7	$(2)^+$	< 20	p	1
4.372 ± 7		50 ± 20	p	1
4.653 ± 7	1^+	60 ± 20	p	1
4.973 ± 10	$\pi = +$			1
5.264 ± 20				1
5.390 ± 20	$\pi = +$			1
5.448 ± 20				1, 3
5.528 ± 20	$\pi = +$			1
5.840 ± 40				1, 3
6.230 ± 50				1
6.371 ± 20				1, 3
6.678 ± 10				1
7.110 ± 20				1, (3)
7.730 ± 40				1

Table 16.28: ^{16}F levels from ^{14}N(^{3}He, n)^{16}F, ^{16}O(p, n)^{16}F and ^{16}O(^{3}He, t)^{16}F [a]

^{16}F* [b] (MeV ± keV)	L [b]	^{16}F* [c] (MeV ± keV)	J^π [d]	^{16}F* [e] (MeV ± keV)	^{16}F* [f] (MeV ± keV)	$\Gamma_{\text{c.m.}}$ [g] (keV)	J^π [h]
0	1	0	(1^-)	0	0	40 ± 20	$(1)^-$
0.192 ± 15	1	0.190 ± 20	(0^-)	0.197 ± 12	[i]	40	$(0)^-$
0.425 ± 15	3	0.425 ± 10	(≥ 2)	0.424 ± 5	[i]	40 ± 30	$(2)^-$
0.722 ± 10	(3)	0.725 ± 10	(≥ 2)	0.720 ± 6	[i]	< 15	$(3)^-$
3.751 ± 10	0	3.775 ± 10	(1)		[i]	< 40	1^+
3.861 ± 10	2	3.880 ± 10				< 20	$(2)^+$
4.370 ± 10		4.375 ± 10	(≥ 2)		4.25 ± 50	50 ± 20	
4.646 ± 10	0	4.661 ± 10				60 ± 20	1^+
4.973 ± 10	2						$\pi = +$
5.264 ± 20							
5.390 ± 20	2				5.45 ± 50		$\pi = +$
5.448 ± 20							
5.528 ± 20	2						$\pi = +$
5.840 ± 40					5.9 ± 50		
6.230 ± 50							
6.371 ± 20					6.4 ± 50		
6.678 ± 10							
7.110 ± 20							
7.730 ± 40							

[a] See also Table 16.33 in (1971AJ02).
[b] ^{14}N(^{3}He, n)^{16}F (1973BO50; $E(^3\text{He}) = 13$ MeV).
[c] ^{14}N(^{3}He, np)^{15}O (1976OT02; $E(^3\text{He}) = 6.5 - 7.8$ MeV).
[d] From angular correlation studies (1976OT02).
[e] ^{16}O(p, n)^{16}F (1971MO34; $E = 23.9$ MeV).
[f] ^{16}O(^{3}He, t) (1965PE04; $E(^3\text{He}) = 40.2$).
[g] ^{14}N(^{3}He, n)^{16}F (1965ZA01, 1976OT02).
[h] See (1965PE04, 1973BO50, 1974FL06, 1976OT02).
[i] These states were observed but E_x was not determined.

^{16}Ne
(Fig. 5)

^{16}Ne has not been observed. The isobaric multiplet mass equation predicts $M - A = 25.15 \pm 0.6$ MeV (1968CE01); ^{16}Ne is then unbound with respect to breakup into ^{14}O + 2p by 2.6 MeV: see (1971AJ02) for the earlier work. See also (1972WA07) and (1975BE31; theor.).

References

(Closed 01 November 1976)

References are arranged and designated by the year of publication followed by the first two letters of the first-mentioned author's name and then by two additional characters. Most of the references appear in the National Nuclear Data Center files (Nuclear Science References Database) and have NNDC key numbers. Otherwise, TUNL key numbers were assigned with the last two characters of the form 1A, 1B, etc. In response to many requests for more informative citations, we have, when possible, included up to ten authors per paper and added the authors' initials.

1954BI96 J.W. Bittner and R.D. Moffat, Phys. Rev. 96 (1954) 374

1956BO61 T.W. Bonner, A.A. Kraus, Jr., J.B. Marion and J.P. Schiffer, Phys. Rev. 102 (1956) 1348

1956DO37 R.A. Douglas, B.R. Gasten and A. Mukerji, Can. J. Phys. 34 (1956) 1097

1956WI1A Wilkinson, Toppel and Alburger, Phys. Rev. 101 (1956) 673

1956ZI1A Zimmerman, Phys. Rev. 104 (1956) 387

1957BE61 R.D. Bent and T.H. Kruse, Phys. Rev. 108 (1957) 802

1957FR56 J.M. Freeman and R.C. Hanna, Nucl. Phys. 4 (1957) 599

1957NO17 E. Norbeck, Jr. and C.S. Littlejohn, Phys. Rev. 108 (1957) 754

1957WA01 E.K. Warburton and J.N. McGruer, Phys. Rev. 105 (1957) 639

1957WE1A Weil, Jones and Lidofsky, Phys. Rev. 108 (1957) 800

1957WI1B Wilkinson, Phys. Rev. 105 (1957) 686

1958AL13 D.E. Alburger, Phys. Rev. 111 (1958) 1586

1959AJ76 F. Ajzenberg and T. Lauritsen, Nucl. Phys. 11 (1959) 1

1959AL06 D.E. Alburger, A. Gallmann and D.H. Wilkinson, Phys. Rev. 116 (1959) 939

1959BR68 D.A. Bromley, H.E. Gove, J.A. Kuehner, A.E. Litherland and E. Almqvist, Phys. Rev. 114 (1959) 758

1959KU78 J.A. Kuehner, A.E. Litherland, E. Almqvist, D.A. Bromley and H.E. Gove, Phys. Rev. 114 (1959) 775

1959NO40 E. Norbeck, J.M. Blair, L. Pinsonneault and R.J. Gerbracht, Phys. Rev. 116 (1959) 1560

1960RE07 T. Retz-Schmidt and J.L. Weil, Phys. Rev. 119 (1960) 1079

1961CH14 R. Chiba, Phys. Rev. 123 (1961) 1316

1961IS03 T. Ishimatsu, J. Phys. Soc. Jpn. 16 (1961) 1529

1961IS06 D.B. Isabelle and G.R. Bishop, J. Phys. Rad. 22 (1961) 548

1961JA14 N. Jarmie, M.G. Silbert and D.B. Smith, Nucl. Phys. 25 (1961) 443

1961KA06 W. Kaufmann and H. Waffler, Nucl. Phys. 24 (1961) 62

1961SI04 M.G. Silbert, N. Jarmie and D.B. Smith, Nucl. Phys. 25 (1961) 438

1962BI19 G.R. Bishop and D.B. Isabelle, Phys. Lett. 3 (1962) 74

1962CH14 L.F. Chase, Jr., R.G. Johnson, F.J. Vaughn and E.K. Warburton, Phys. Rev. 127 (1962) 859

1962GO21 S. Gorodetzky, P. Fintz and A. Gallmann, Compt. Rend. 255 (1962) 879

1962IS02 T. Ishimatsu, T. Nakashima, N. Kato and S. Morita, J. Phys. Soc. Jpn. 17 (1962) 1189

1962SI04 M.G. Silbert, Phys. Rev. 127 (1962) 2113

1962WI09 D.J. Williams and F.E. Steigert, Nucl. Phys. 30 (1962) 373

1963GI11 W.W. Givens, T.W. Bonner, S.H. Fang, R.C. Bearse and A.A. Rollefson, Nucl. Phys. 46 (1963) 504

1963GO31 S. Gorodetzky, P. Mennrath, W. Benenson, P. Chevallier and F. Scheibling, J. Phys. 24 (1963) 887

1963IM01 W.L. Imhof, H.A. Grench and R.G. Johnson, Nucl. Phys. 49 (1963) 503

1963IS02 D.B. Isabelle and G.R. Bishop, Nucl. Phys. 45 (1963) 209

1963LE06 Y.K. Lee, L.W. Mo and C.S. Wu, Phys. Rev. Lett. 10 (1963) 258

1964AL18 D.E. Alburger and P.D. Parker, Phys. Rev. 135 (1964) B294

1964BR08 C.P. Browne and I. Michael, Phys. Rev. 134 (1964) B133

1964BR12 G. Breuer and L. Jahnke, Z. Naturforsch. A19 (1964) 471

1964CE05 J. Cerny, R.H. Pehl and G.T. Garvey, Phys. Lett. 12 (1964) 234

1964HA16 B.G. Harvey, E.J-M. Rivet, A. Springer, J.R. Meriwether, W.B. Jones, J.H. Elliott and P. Darriulat, Nucl. Phys. 52 (1964) 465

1964MI05 R. Middleton and D.J. Pullen, Nucl. Phys. 51 (1964) 63

1964NE09 J.B. Nelson, E.L. Hudspeth and E.M. Bernstein, Phys. Rev. 136 (1964) B71

1964SC09 R.B. Schwartz, H.D. Holmgren, L.M. Cameron and A.R. Knudson, Phys. Rev. 134 (1964) B577

1964TA06 N.W. Tanner, G.C. Thomas and E.D. Earle, Nucl. Phys. 52 (1964) 45

1964WA1B Wachter, Phys. Rev. 135 (1964) B1180

1965BR08 C.P. Browne, W.A. Schier and I.F. Wright, Nucl. Phys. 66 (1965) 49

1965BU1A Busser, Christiansen, Niebergall and Sohngren, Nucl. Phys. 69 (1965) 103

1965CA14 J.T. Caldwell, R.L. Bramblett, B.L. Berman, R.R. Harvey and S.C. Fultz, Phys. Rev. Lett. 15 (1965) 976

1965DE1C Deforest, Walecka, Vanpraet and Barber, Phys. Lett. 16 (1965) 311

1965PE04 R.H. Pehl and J. Cerny, Phys. Lett. 14 (1965) 137

1965VA09 G.J. Vanpraet, Nucl. Phys. 74 (1965) 219

1965WA02 B.D. Walker, C. Wong, J.D. Anderson, J.W. McClure and R.W. Bauer, Phys. Rev. 137 (1964) B347

1965ZA01 C.D. Zafiratos, F. Ajzenberg-Selove and F.S. Dietrich, Phys. Rev. 137 (1965) B1479

1966BE1A Berg and Kashy, Nucl. Instrum. Meth. 39 (1966) 169

1966GA08 A. Gallman, P. Fintz, J.B. Nelson and D.E. Alburger, Phys. Rev. 147 (1966) 753

1966HA19 B.G. Harvey, J.R. Meriwether, J. Mahoney, A. Bussiere de Nercy and D.J. Horen, Phys. Rev. 146 (1966) 712

1966HE10 P.V. Hewka, C.H. Holbrow and R. Middleton, Nucl. Phys. 88 (1966) 561

1966MC05 R.L. McGrath, Phys. Rev. 145 (1966) 802

1966PR14 R. Prasad, D.C. Sarkar and C.S. Khurana, Nucl. Phys. 85 (1966) 476

1966PU01 N.G. Puttaswamy and D. Kohler, Phys. Lett. 20 (1966) 288

1966SU05 M. Suffert, Nucl. Phys. 75 (1966) 226

1966SU1C Suffert, Ann. Phys. (Paris) 1 (1966) 547

1967BE14 J.A. Becker, J.W. Olness and D.H. Wilkinson, Phys. Rev. 155 (1967) 1089

1967CH04 R. Chapman and A.M. Macleod, Nucl. Phys. A94 (1967) 324

1967CH19 C. Chasman, K.W. Jones, R.A. Ristinen and D.E. Alburger, Phys. Rev. 159 (1967) 830

1967DR05 T.E. Drake, R.M. Hutcheon, V.W. Stobie, G.A. Beer and H.S. Caplan, Phys. Rev. 163 (1967) 947

1967FL10 J.L. Flinner, J.C. Harris and B. Mulligan, Phys. Rev. 161 (1967) 1082

1967FU07 H. Fuchs, K. Grabisch, P. Kraaz and G. Roschert, Nucl. Phys. A105 (1967) 590

1967GO08 S. Gorodetzky, J.C. Adloff, P. Chevallier, D. Disdier, P. Gorodetzky, V. Rauch and F. Scheibling, Phys. Lett. B24 (1967) 578

1967LA11 B. Lawergren and I.V. Mitchell, Nucl. Phys. A98 (1967) 481

1967LA16 M. Lambert, H. Beaumevieille, A. Amokrane and M. Yaker, Nuovo Cim. B50 (1967) 1

1967LO01 H.M. Loebenstein, D.W. Mingay, H. Winkler and C.S. Zaidins, Nucl. Phys. A91 (1967) 481

1967LO08 J. Lowe, D.E. Alburger and D.H. Wilkinson, Phys. Rev. 163 (1967) 1060

1967LO1B Loiseaux, Maison and Langevin, J. Phys. (France) 28 (1967) 11

1967PI01 R.E. Pixley and W. Benenson, Nucl. Phys. A91 (1967) 177

1967SE08 W.A. Seale, Phys. Rev. 160 (1967) 809

1967SU02 M. Suffert and W. Feldman, Phys. Lett. B24 (1967) 579

1967VA18 R. Vandenbosch, J.C. Norman and C.J. Bishop, Phys. Rev. 158 (1967) 887

1967WE06 H.R. Weller, N.R. Roberson and D.R. Tilley, Phys. Lett. B25 (1967) 541

1968AJ02 F. Ajzenberg-Selove and T. Lauritsen, Nucl. Phys. A114 (1968) 1

1968BA42 A.R. Barnett, Nucl. Phys. A120 (1968) 342

1968CE01 J. Cerny, Ann. Rev. Nucl. Sci. 18 (1968) 27

1968CL04 G.J. Clark, D.J. Sullivan and P.B. Treacy, Nucl. Phys. A110 (1968) 481

1968DE07 V.P. Denisov, A.P. Komar and L.A. Kulchitsky, Nucl. Phys. A113 (1968) 289

1968DR01 T.E. Drake, E.L. Tomusiak and H.S. Caplan, Nucl. Phys. A118 (1968) 138

1968GO07 S. Gorodetzky, J.C. Adloff, F. Brochard, P. Chevallier, D. Disdier, P. Gorodetzky, R. Modjtahed-Zadeh and F. Scheibling, Nucl. Phys. A113 (1968) 221

1968HE03 D.C. Hensley, P.H. Nettles and C.A. Barnes, Phys. Lett. B26 (1968) 435

1968JA07 K.S. Jayaraman and H.D. Holmgren, Phys. Rev. 172 (1968) 1015

1968MI05 P.F. Mizera and J.B. Gerhart, Phys. Rev. 170 (1968) 839

1968MO08 J.M. Morris, G.W. Kerr and T.R. Ophel, Nucl. Phys. A112 (1968) 97

1968RI13 L.R. Rice and R.T. Carpenter, Nucl. Phys. A120 (1968) 220

1968ST31 M. Stroetzel, Z. Phys. 214 (1968) 357

1968WA18 E.K. Warburton, W.R. Harris and D.E. Alburger, Phys. Rev. 175 (1968) 1275

1968WE15 H.R. Weller, N.R. Roberson and D.R. Tilley, Nucl. Phys. A122 (1968) 529

1968WE1C Weller, Thesis, Duke Univ. (1968)

1968WI15 D.H. Wilkinson, D.E. Alburger and J. Lowe, Phys. Rev. 173 (1968) 995

1969BA17 K. Bahr, T. Becker, R. Jahr and W.R. Kuhlmann, Nucl. Phys. A129 (1969) 388

1969BA1J Balashov, Bochum Conf. STI/PUB/232 IAEA (1969) 59

1969BA50 G. Bassani, T.H. Kruse, N. Saunier and G. Souchere, Phys. Lett. B30 (1969) 621

1969BA70 B. Banerjee, Indian J. Phys. 43 (1969) 746

1969BE90 K. Bethge, C.M. Fou and R.W. Zurmu, Nucl. Phys. A123 (1969) 521

1969BO13 W. Bohne, H. Homeyer, H. Lettau, H. Morgenstern, J. Scheer and F. Sichelschmidt, Nucl. Phys. A128 (1969) 537

1969BO1B Boffi and Campagnoli, Bochum Conf. STI/PUB/232 IAEA (1969) 271

1969BR1D Bromley, Proc. Enrico Fermi School of Phys., Course XL, Lake Como, 1967 (1969) 242

1969BU1B Bunker, UCLA 10 P18-16 (1969)

1969CL07 S.D. Cloud and T.R. Ophel, Nucl. Phys. A136 (1969) 592

1969EL1A Elliott, Cargese Lecture in Phys.; Ed., M. Jean, Vol. 3 (1969) 337

1969FE1A Federman, Cargese Lecture in Phys.; Ed., M. Jean, Vol. 3 (1969) 21

1969FU08 H.W. Fulbright, J.A. Robbins, M. Blann, D.G. Fleming and H.S. Plendl, Phys. Rev. 184 (1969) 1068

1969GR1A Grenier, Cargese Lecture in Phys.; Ed., M. Jean, Vol. 3 (1969) 535

1969HA42 H. Hattig, K. Hunchen, P. Roth and H. Waffler, Nucl. Phys. A137 (1969) 144

1969HE06 H.-D. Helb, H. Voit, G. Ischenko and W. Reichardt, Phys. Rev. Lett. 23 (1969) 176

1969HO13 K. Hofmann, W. Mausberg, M. Raabe, E. Rossle and M. Tauber, Z. Phys. 221 (1969) 417

1969IK1A Ikeda, Bochum Conf. STI/PUB/232 IAEA (1969) 277

1969LU07 C.C. Lu, M.S. Zisman and B.G. Harvey, Phys. Rev. 186 (1969) 1086

1969MA1C Massue et al., Bochum Conf. STI/PUB/232 IAEA (1969) 258

1969MA40 J.V. Maher, M.W. Sachs, R.H. Siemssen, A. Weidinger and D.A. Bromley, Phys. Rev. 188 (1969) 1665

1969NI09 R.J. Nickles, Nucl. Phys. A134 (1969) 308

1969OM1A Omarov, Daruga, Matusevich and Prokhorov, Atomn. Energ. (USSR) 26 (1969) 388, 390

1969PI1B Pizzi et al., Bochum Conf. STI/PUB/232 IAEA (1969) 205

1969SI10 I. Sick, E.B. Hughes, T.W. Donnelly, J.D. Walecka and G.E. Walker, Phys. Rev. Lett. 23 (1969) 1117

1969SN02 F.D. Snyder and M.A. Waggoner, Phys. Rev. 186 (1969) 999

1969ST06 M. Stroetzel and A. Goldmann, Phys. Lett. B29 (1969) 306

1969SU03 O. Sundberg and G. Tibell, Ark. Fys. 39 (1969) 397

1969TA09 M. Tauber, K. Hofmann, W. Mausberg and E. Rossle, Z. Phys. 227 (1969) 71

1969TA1C Tanaka, Bochum Conf. STI/PUB/232 IAEA (1969) 137

1969TH01 M.J. Throop, Phys. Rev. 179 (1969) 1011

1969VE09 A.N. Vereshchagin, I.N. Simonov, K.O. Terenetskii, V.V. Tokarevskii and I.P. Chernov, Izv. Akad. Nauk SSSR Ser. Fiz. 33 (1969) 2064; Bull. Acad. Sci. USSR Phys. Ser. 33 (1970) 1880

1969WI1C Wildermuth, Bochum Conf. STI/PUB/232 IAEA (1969) 3

1969WO09 V.K. Wohlleben and E. Schuster, Radiochim. Acta 12 (1969) 75

1970AD01 E.G. Adelberger, A.V. Nero and A.B. McDonald, Nucl. Phys. A143 (1970) 97

1970AG08 J. Aguilar, C.F. Pineda, C.R. Bauza, J.L. Ferrero, A. Garcia and F. Senent, An. Fis. 66 (1970) 279

1970AH02 J. Ahrens, H. Borchert, K.-H. Czock, D. Mehlig and B. Ziegler, Phys. Lett. B31 (1970) 570

1970AL22 J.C. Alder, R. Jenefsky, C. Joseph, B. Vaucher, T. Bressani, E. Chiavassa, J. Favier, D. Schinzel and C. Zupancic, Lett. Nuovo Cim. 4 (1970) 256

1970AN1D Anni and Taffara, Rivista Nuovo Cim. 2 (1970) 1

1970AR1C Arvieu, Theory of Nucl. Struct., Trieste, 1969, IAEA STI/PUB/249 (1970) 499

1970BA1E Backenstoss, Ann. Rev. Nucl. Sci. 20 (1970) 467

1970BA1F Barashenkov and Toneev, Uspekhi Fiz. Nauk 100 (1970) 425

1970BA1G Baz, Gorbatov, Demin and Pasynkov, JETP Lett. 12 (1970) 105

1970BA33 A.R. Barnett and N.W. Tanner, Nucl. Phys. A152 (1970) 257

1970BE1D Bethge, Ann. Rev. Nucl. Sci. 20 (1970) 255

1970BO08 T.I. Bonner, Phys. Rev. C1 (1970) 1699

1970BO09 T.I. Bonner, Phys. Rev. C1 (1970) 1710

1970BO1J Bouten, Theory of Nucl. Struct., Trieste, 1969, IAEA STI/PUB/249 (1970) 361

1970BO25 W. Bohne, H. Homeyer, H. Lettau, H. Morgenstern and J. Scheer, Nucl. Phys. A156 (1970) 93

1970BO33 M. Bouten, M.-C. Bouten, H. Depuydt and L. Schotsmans, Nucl. Phys. A158 (1970) 217

1970BR14 F. Brochard, P. Chevallier, D. Disdier, V. Rauch and F. Scheibling, J. Phys. (Paris) 31 (1970) 255

1970BR1C Brix, Private Communication (1970)

1970BU1B Budyashov et al., Zh. Eksp. Teor. Fiz. 58 (1970) 1211

1970BU1C Burdet and Perrin, Univ. Lyon Rept. No. Lycen 7036 (1970)

1970CH1C Chung, Huber and Danos, Z. Phys. 240 (1970) 195

1970CL10 N.M. Clarke, E.J. Burge, D.A. Smith and J.C. Dore, Nucl. Phys. A157 (1970) 145

1970CL1C Clayton, 2nd Int. Conf. on Nucl. Data for Reactors, Helsinki (1970) 35

1970CO1G Cole, Thesis, Yale Univ. (1970)

1970CO30 B.J. Cole, R. Huby and J.R. Mines, Phys. Lett. B33 (1970) 320

1970CZ1A Czyz, Thoery of Nucl. Struct., Trieste, 1969, IAEA STI/PUB/249 (1970) 797

1970DA13 M. Danos and B.M. Spicer, Z. Phys. 237 (1970) 320

1970DE1F Delalex, Univ. Lyon Rept. No. Lycen 7047 (1970)

1970DO13 E.I. Dolinskii, V.V. Turovtsev and R. Yarmukhamedov, Izv. Akad. Nauk SSSR Ser. Fiz. 34 (1970) 2188; Bull. Acad. Sci. USSR Phys. Ser. 34 (1970) 1952

1970DO1A Donnelly and Walker, Ann. Phys. 60 (1970) 209

1970DO1H Donnelly, Nucl. Phys. A150 (1970) 393

1970DR07 R.M. Dreizler, F.R. Krejs and A. Klein, Nucl. Phys. A155 (1970) 33

1970DU04 J.R. Duray and C.P. Browne, Phys. Rev. C1 (1970) 776

1970EI06 J. Eichler and A. Faessler, Nucl. Phys. A157 (1970) 166

1970EL14 P.J. Ellis, Nucl. Phys. A155 (1970) 625

1970EL16 M. El-Nadi, O. Zohni and H.M. Hussein, Ann. Phys. (Leipzig) 25 (1970) 1

1970EL17 M. El-Nadi, A. Osman and T.H. Rihan, Acta Phys. Acad. Sci. Hung. 29 (1970) 127

1970EV1A Evseev, Kozlowski, Roganov and Woitkowska, Proc. 3rd Int. Conf. on High-Energy Phys. and Nucl. Struct., New York, 1969 (1970) 157

1970FI15 P. Filss, W. Collin, S. Guldbakke, K. Kayser, H. Reich, J.O. Trier and W. Witschel, Z. Phys. 239 (1970) 461

1970FI1D Firk, Ann. Rev. Nucl. Sci. 20 (1970) 39

1970FL1A Flowers, Meth. and Problems of Theor. Phys. (1970) 289

1970FU1A S. Fujii and K. Morita, Phys. Lett. B33 (1970) 453

1970GA09 A. Gallman, F. Haas, N. Balaux, B. Heusch and M. Toulemonde, Can. J. Phys. 48 (1970) 1595

1970GM1A Gmitro, Theory of Nucl. Struct., Trieste, 1969, IAEA STI/PUB/249 (1970) 697

1970GO03 A. Goldmann and M. Stroetzel, Phys. Lett. B31 (1970) 287

1970GO1F Gotow, Proc. 3rd Int. Conf. on High-Energy Phys. and Nucl. Struct., New York, 1969 (1970) 374

1970GO40 A. Goldmann and M. Stroetzel, Z. Phys. 239 (1970) 235

1970GR44 Y.T. Grin and A.B. Kochetov, Yad. Fiz. 12 (1970) 1154; Sov. J. Nucl. Phys. 12 (1971) 634

1970GU13 M.R. Gunye and C.S. Warke, Phys. Rev. C2 (1970) 2106

1970HA1F Hayward, NBS Monograph 118 (1970)

1970HA1G Habs et al., Kernforsch. Karlsruhe, Ext. Bericht 18/70 2 (1970)

1970HA23 J.C. Hardy, A.D. Bacher, G.R. Plattner, J.A. Macdonald and R.G. Sextro, Phys. Rev. Lett. 25 (1970) 298

1970HA42 H. Hattig, K. Hunchen and H. Waffler, Phys. Rev. Lett. 25 (1970) 941

1970HA49 M. Harvey and F.C. Khanna, Nucl. Phys. A155 (1970) 337

1970HA51 P.K. Haug, Z. Phys. 238 (1970) 289

1970HI08 K.D. Hildenbrand, H.H. Gutbrod, W. von Oertzen and R. Bock, Nucl. Phys. A157 (1970) 297

1970HO1D Holland, Minehart and Sobottka, Proc. 3rd Int. Conf. on High-Energy Phys. and Nucl. Struct., New York, 1969 (1970) 538

1970HU18 M.G. Huber, Ann. Phys. (Paris) 5 (1970) 239

1970IR01 J.M. Irvine and V.F.E. Pucknell, Nucl. Phys. A159 (1970) 513

1970IS08 B.S. Ishkhanov, I.M. Kapitonov, E.V. Lazutin, I.M. Piskarev, V.S. Sopov and V.G. Shevchenko, Yad. Fiz. 12 (1970) 892; Sov. J. Nucl. Phys. 12 (1971) 484

1970JA1B Jacmart et al., Nucl. Reactions Induced by Heavy Ions, Heidelberg, 1969 (1970) 128

1970JA24 R.J. Jaszczak and R.L. Macklin, Phys. Rev. C2 (1970) 2452

1970JO1D Johnson, Thesis, Univ. of Iowa (1970)

1970JU02 J.W. Jury, J.S. Hewitt and K.G. McNeill, Can. J. Phys. Soc. 48 (1970) 1635

1970KA1D Kadmenskii, Kalechits and Furman, Yad. Fiz. 11 (1970) 1237

1970KA1E Kaplan, Pyle, Temple and Valby, Proc. 3rd Int. Conf. on High-Energy Phys. and Nucl. Struct., New York, 1969 (1970) 163

1970KE1A Kelly, McDonald and Uberall, Proc. 3rd Int. Conf. on High-Energy Phys. and Nucl. Struct., New York, 1969 (1970) 95

1970KI02 J.C. Kim, R.P. Singhal and H.S. Caplan, Can. J. Phys. 48 (1970) 83

1970KL09 W.J. Klages, H.H. Duhm, H. Yoshida, P.E. Schumacher and C. Detraz, Nucl. Phys. A156 (1970) 65

1970KL10 A.P. Klyucharev, N.Y. Rutkevich, M.A. Kuzmichev and A.R. Linetskii, Izv. Akad. Nauk SSSR Ser. Fiz. 34 (1970) 1719; Bull. Acad. Sci. USSR Phys. Ser. 34 (1971) 1527

1970KO26 T.I. Kopaleishvili and I.Z. Machabeli, Yad. Fiz. 12 (1970) 525; Sov. J. Nucl. Phys. 12 (1970) 286

1970KR10 H.J. Kreuzer and D. Schutte, Nuovo Cim. A70 (1970) 199

1970LO07 M.A.K. Lodhi, J. Phys. (London) A3 (1970) 533

1970LU16 B. Lundberg, L.G. Stromberg and H. Conde, Phys. Scr. 2 (1970) 273

1970MA1P Maher et al., Proc. Int. Conf. Nucl. Reactions Induced by Heavy Ions, Heidelberg, 1969 (1970) 60

1970MA1Q Mahaux, Theory of Nucl. Struct., Trieste, 1969, IAEA STI/PUB/249 (1970) 731

1970ME01 R. Mendelson, J.C. Hardy and J. Cerny, Phys. Lett. B31 (1970) 126

1970ME1N Meynadier, NP 18862 (1970)

1970ME25 M.M. Meier, R.L. Walter, T.R. Donoghue, R.G. Seyler and R.M. Drisko, Nucl. Phys. A159 (1970) 273

1970MI12 B. Mithra and R. Laverriere, Nucl. Phys. A155 (1970) 535

1970MO35 U. Mosel, T.D. Thomas and P. Riesenfeldt, Phys. Lett. B33 (1970) 565

1970MU20 M.G. Mustafa and F.B. Malik, Phys. Rev. C2 (1970) 2068

1970NA16 H. Nagai and M. Itaya, Bull. Kyushu Inst. Tech. Math. Nat. Sci. (Japan) 17 (1970) 47

1970NE15 J. Nemeth, Nucl. Phys. A156 (1970) 183

1970NU02 F. Nusslin and P. Braun-Munzinger, Z. Phys. 240 (1970) 217

1970OH1C Ohmura, Imanishi, Ichimura and Kawai, Prog. Theor. Phys. 44 (1970) 1242

1970OL1B Olsen, Thesis, Univ. of Minnesota (1970)

1970PA1K Pal, Theory of Nucl. Struct., Trieste, 1969, IAEA STI/PUB/249 (1970) 547

1970PE18 A.K. Petrauskas and L.Y. Sabalyauskas, Yad. Fiz. 12 (1970) 492; Sov. J. Nucl. Phys. 12 (1970) 269

1970PR1H Pratt, Nuovo Cim. A68 (1970) 477

1970QU1C Quinn, Thesis, Univ. of California, Los Angeles (1970)

1970RE1G Reid, Thesis, Univ. of Maryland (1970)

1970RI01 R.C. Ritter, E. Sheldon and M. Strang, Nucl. Phys. A140 (1970) 609

1970RO23 J.C. Roynette, Nucl. Phys. A155 (1970) 548

1970RU1A Ruehl, Thesis, Univ. of California, Los Angeles (1970)

1970RY03 V.F. Rybachenko and A.A. Sadovoi, Yad. Fiz. 12 (1970) 710; Sov. J. Nucl. Phys. 12 (1971) 384

1970SC31 W. Schmidt and U. Strohbusch, Nucl. Phys. A159 (1970) 104

1970SI08 I. Sick and J.S. McCarthy, Nucl. Phys. A150 (1970) 631

1970SI1K Singhal, Thesis, Univ. of Saskatchewan (1970)

1970SP1D Sprenkel-Segal, Proc. 3rd Int. Conf. High-Energy Phys. and Nucl. Struct., New York 1969 (1970) 763

1970ST06 M. Stroetzel and A. Goldmann, Z. Phys. 233 (1970) 245

1970SV1B Svenne, Theory of Nucl. Struct., Trieste, 1969, IAEA STI/PUB/249 (1970) 413

1970SW03 C.P. Swann, Nucl. Phys. A150 (1970) 300

1970TR1E Tripathi, Thesis, Univ. of Kansas (1970)

1970VA1M Vautherin, Theroy of Nucl. Struct., Trieste, 1969, IAEA STI/PUB/249 (1970) 767

1970VA1N van Giai and Marty, Nucl. Phys. A150 (1970) 593

1970VE06 A.N. Vereshchagin, I.N. Korostova and I.P. Chernov, Izv. Vys. Ucheb. Zav. Fiz. 8 (1970) 105; Sov. Phys. J. 13 (1973) 1071

1970VO1F von Oertzen et al, Ncul. Reactions Induced by Heavy Ions, Heidelberg, 1969 (1970) 156

1970WE1G Weise, Huber and Danos, Z. Phys. 236 (1970) 176

1970WE1H Weidenmuller, Comments Nucl. Part. Phys. 4 (1970) 69

1970WI21 C. Wilkin, Lett. Nuovo Cim. 4 (1970) 491

1970ZA1B Zabolitzky, Gari and Kummel, Nucl. Phys. A155 (1970) 526

1970ZI03 M.S. Zisman, E.A. McClatchie and B.G. Harvey, Phys. Rev. C2 (1970) 1271

1970ZO1A Zofka, Czech. J. Phys. 20 (1970) 926

1971AB1B Abgrall and Caurier, Suppl. J. Phys. 32 (1971) C6-63

1971AD05 J.-O. Adler, G. Andersson, B. Forkman, G.G. Jonsson and K. Lindgren, Nucl. Phys. A171 (1971) 560

1971ADZZ J.M. Adams, A. Adams and J.M. Calvert, AERE-R-6473 (1971)

1971AF02 G.N. Afanasev and E.B. Balbutsev, Yad. Fiz. 13 (1971) 1022; Sov. J. Nucl. Phys. 13 (1971) 587

1971AG02 A. Agodi, M. Baldo and F. Catara, Nucl. Phys. A171 (1971) 199

1971AJ02 F. Ajzenberg-Selove, Nucl. Phys. A166 (1971) 1

1971AL1D Alder and Trautmann, Nucl. Phys. A178 (1971) 60

1971AN08 G. Andersson, B. Forkman and B. Friberg, Nucl. Phys. A171 (1971) 529

1971AN14 K. Ananthanarayanan, S. Das Gupta and N. de Takacsy, Phys. Lett. B37 (1971) 143

1971AR02 A.G. Artukh, V.V. Avdeichikov, J. Ero, G.F. Gridnev, V.L. Mikheev, V.V. Volkov and J. Wilczynski, Nucl. Phys. A160 (1971) 511

1971AR1R A. Arima and I. Hamamoto, Ann. Rev. Nucl. Sci. 21 (1971) 55

1971AR30 K.P. Artemov, V.Z. Goldberg, I.P. Petrov, V.P. Rudakov, I.N. Serikov and V.A. Timofeev, Yad. Fiz. 14 (1971) 292; Sov. J. Nucl. Phys. 14 (1972) 165

1971AR36 K.P. Artemov, V.Z. Goldberg, I.P. Petrov, V.P. Rudakov, I.N. Serikov and V.A. Timofeev, Phys. Lett. B37 (1971) 61

1971AU04 S.M. Austin, P.J. Locard, S.N. Bunker, J.M. Cameron, J.R. Richardson, J.W. Verba and W.T.H. van Oers, Phys. Rev. C3 (1971) 1514

1971BA04 A.R. Barnett and J. Lowe, Phys. Rev. Lett. 26 (1971) 266

1971BA1A Barnes, Advances in Nucl. Phys. 4 (1971) 133

1971BA1K Bayer, Proctor and Petrovich, Bull. Amer. Phys. Soc. 16 (1971) 509

1971BA1N W.A. Bardeen and E.W. Torigoe, Phys. Rev. C3 (1971) 1785

1971BA2Q Bassani et al., Suppl. J. Phys. 32 (1971) C6-133

1971BA2R Bassani et al., Suppl. J. Phys. 32 (1971) C6-135

1971BA2V Bassani, CEA-N-1474 (1971)

1971BA2W Baciu, Research Studies Phys. (Romania) 23 (1971) 773

1971BA31 G. Bassani, G. Pappalardo, N. Saunier and B.M. Traore, Phys. Lett. B34 (1971) 612

1971BA67 W.H. Bassichis and M.R. Strayer, Ann. Phys. 66 (1971) 457

1971BA95 H.W. Barz, I. Rotter and J. Hohn, Phys. Lett. B37 (1971) 4

1971BA96 Y.A. Batusov, S.A. Bunyatov, V.A. Vartanyan, G.R. Gulkanyan, N. Kurts, V.M. Sidorov, K.M. Chernev, R.A. Eramzhyan and V.A. Yarba, Yad. Fiz. 14 (1971) 1206; Sov. J. Nucl. Phys. 14 (1972) 673

1971BA99 F.C. Barker, Aust. J. Phys. 24 (1971) 777

1971BE07 E.M. Bernstein, R.E. Shamu, L.Y. Kuo, L.D. Oppliger, G. Hardie and M. Soga, Phys. Rev. C3 (1971) 427

1971BE14 G.F. Bertsch and W. Bertozzi, Nucl. Phys. A165 (1971) 199

1971BE17 C. Bergman and R.K. Hobbie, Phys. Rev. C3 (1971) 1729

1971BE1W H.A. Bethe, Ann. Rev. Nucl. Sci. 21 (1971) 93

1971BE20 A.M. Bernstein and W.A. Seidler, Phys. Lett. B34 (1971) 569

1971BE25 H.A. Bentz, Z. Phys. 243 (1971) 138

1971BE2B Beck and Kleber, Z. Phys. 246 (1971) 383

1971BE2D Bethge, Suppl. J. Phys. 32 (1971) C6-87

1971BE46 R.F. Bentley, J.D. Carlson, D.A. Lind, R.B. Perkins and C.D. Zafiratos, Phys. Rev. Lett. 27 (1971) 1081

1971BE50 E.M. Bernstein and J.J. Ramirez, Phys. Rev. C4 (1971) 1504

1971BE60 Z. Berant, M.B. Goldberg, G. Goldring, S.S. Hanna, H.M. Loebenstein, I. Plesser, M. Popp, J.S. Sokolowski, P.N. Tandon and Y. Wolfson, Nucl. Phys. A178 (1971) 155

1971BI1H Bishop, J. Phys. 4 (1971) L77

1971BO02 W. Bohne, H. Homeyer, H. Lettau, H. Morgenstern, J. Scheer and F. Sichelschmidt, Nucl. Phys. A160 (1971) 257

1971BO05 E. Borie and D. Drechsel, Phys. Rev. Lett. 26 (1971) 195

1971BO1F Bolsterli, LA-DC 12417 (1971)

1971BO1U Bohlen et al., Suppl. J. Phys. 32 (1971) C6-141

1971BO26 K. Boehle, V. Meyer and H.H. Muller, Helv. Phys. Acta 44 (1971) 367

1971BO29 M. Bouten, M.C. Bouten, H. Depuydt and L. Schotsmans, Phys. Lett. B35 (1971) 464

1971BR1E Brown, Rev. Mod. Phys. 43 (1971) 1

1971BR1J Braley, Ford, Becker and Patterson, Bull. Amer. Phys. Soc. 16 (1971) 1165

1971BR42 W.D. Brown and E. Kujawski, Ann. Phys. 64 (1971) 573

1971BU05 S.N. Bunker, H. Appel, J.M. Cameron, M.B. Epstein, J.R. Quinn, J.R. Richardson and J.W. Verba, Nucl. Phys. A163 (1971) 378

1971BU1K Burymov et al., Izv. Akad. Nauk SSSR Ser. Fiz. 35 (1971) 159

1971CA01 P.J. Castleberry, L. Coulson, R.C. Minehart and K.O.H. Ziock, Phys. Lett. B34 (1971) 57

1971CA1J Castleberry, Thesis, Univ. of Virginia (1971)

1971CH1P Chuev et al., Suppl. J. Phys. 32 (1971) C6-161

1971CH1U Charlton, Thesis, Univ. of Virginia (1971)

1971CH41 L.A. Charlton and J.M. Eisenberg, Ann. Phys. 63 (1971) 286

1971CO1E Cole and Firk, Polarization, Madison, 1970 (1971) 626

1971DA03 M. Danos and V. Gillet, Phys. Lett. B34 (1971) 24

1971DA15 K.T.R. Davies and R.J. McCarthy, Phys. Rev. C4 (1971) 81

1971DA30 A. Dar and Z. Kirzon, Phys. Lett. B37 (1971) 166

1971DA33 V.V. Davydov, B.G. Novatskii, A.A. Ogloblin, S.B. Sakuta, D.N. Stepanov and V.I. Chuev, Izv. Akad. Nauk SSSR Ser. Fiz. 35 (1971) 2399; Bull. Acad. Sci. USSR Phys. Ser. 35 (1972) 2176

1971DE14 C. Detraz, C.E. Moss, C.D. Zafiratos and C.S. Zaidins, Nucl. Phys. A167 (1971) 337

1971DE1F Devins, High, Bedi and Shapiro, Bull. Amer. Phys. Soc. 16 (1971) 511

1971DE1G Delsanto, Barrett and Wahsweiler, Bull. Amer. Phys. Soc. 16 (1971) 650

1971DE1X Devries and Bassani, Suppl. J. Phys. 32 (1971) C6-175

1971DE1Y Deka and Laskar, Indian J. Phys. 45 (1971) 59

1971DE31 J.P. Dedonder, Nucl. Phys. A174 (1971) 251

1971DE37 C. Detraz, C.D. Zafiratos, C.E. Moss and C.S. Zaidins, Nucl. Phys. A177 (1971) 258

1971DO06 C.B. Dover, S. Cierjacks, G.J. Kirouac, J. Nebe, H.H. Dubenkropp, R. Putzki and B. Zeitnitz, Nucl. Phys. A166 (1971) 461

1971DO1A Dohnert, Ann. Phys. 62 (1971) 422

1971DR06 G.D. Dracoulis and G.J.F. Legge, Nucl. Phys. A177 (1971) 241

1971DU06 S. Dutta and E.L. Tomusiak, Phys. Lett. B35 (1971) 554

1971DU13 E.I. Dubovoi, Izv. Akad. Nauk SSSR Ser. Fiz. 35 (1971) 199; Bull. Acad. Sci. USSR Phys. Ser. 35 (1972) 180

1971EC01 J.S. Eck, Phys. Rev. C3 (1971) 949

1971EG01 V.G. Egoshin, V.V. Igolkin, L.S. Saltykov, V.A. Senyushko, V.S. Stryuk, V.I. Chirko and O.G. Cheborin, Izv. Akad. Nauk SSSR Ser. Fiz. 35 (1971) 205; Bull. Acad. Sci. USSR Phys. Ser. 35 (1972) 185

1971EI01 J.M. Eisenberg and H.J. Weber, Phys. Lett. B34 (1971) 107

1971EI06 R.M. Eisberg, D. Ingham, M. Makino, C.C. Kim and C.N. Waddell, Nucl. Phys. A175 (1971) 58

1971EP03 M.B. Epstein, J.R. Quinn, S.N. Bunker, J.W. Verba and J.R. Richardson, Nucl. Phys. A169 (1971) 337

1971ER01 P. Erkkila, M. Saarela and A. Kallio, Phys. Lett. B34 (1971) 5

1971ER08 T. Erikson, Nucl. Phys. A170 (1971) 513

1971FA09 J. Favier, T. Bressani, G. Charpak, L. Massonnet, W.E. Meyerhof and C. Zupancic, Nucl. Phys. A169 (1971) 540

1971FE10 H. Feshbach, A. Gal and J. Hufner, Ann. Phys. 66 (1971) 20

1971FL08 T. Fliessbach, Z. Phys. 247 (1971) 117

1971FO06 P. Fontes, C. Perrin, J. Lestringuez, F. Yiou and R. Bernas, Nucl. Phys. A165 (1971) 405

1971FR06 H. Friedrich and A. Weiguny, Phys. Lett. B35 (1971) 105

1971FR11 B. Friberg, G. Andersson and B. Forkman, Nucl. Phys. A171 (1971) 551

1971FR13 J.L. Friar, Nucl. Phys. A173 (1971) 248

1971FU14 H. Fuchs, H. Homeyer, T. Lorenz and H. Oeschler, Phys. Lett. B37 (1971) 285

1971GA1J Gaillard, Conf. on Certain Microscopic Aspects of Nucl. Reactions, La Toursinei, 1971 (1971)

1971GA1M Gambhir, Thesis, Univ. of Maryland (1971)

1971GO06 A.M. Gorbatov, V.F. Demin and I.G. Pasynkov, Yad. Fiz. 13 (1971) 314; Sov. J. Nucl. Phys. 13 (1971) 174

1971GO16 P. Goode, Nucl. Phys. A172 (1971) 66

1971GR13 M.E. Grypeos, Phys. Lett. B34 (1971) 481

1971GR1U Green, Proc. Spring School on Pion Interaction at Low and Medium Energies, Switzerland, 1971 (1971) 67

1971GR1V Grin and Leinson, Suppl. J. Phys. 32 (1971) C6-205

1971GR1W Greiner and Scheid, Suppl. J. Phys. 32 (1971) C6-91

1971GR35 Y.T. Grin and L.B. Leinson, Yad. Fiz. 14 (1971) 96; Sov. J. Nucl. Phys. 14 (1972) 55

1971GR38 Y.T. Grin and L.B. Leinson, Yad. Fiz. 14 (1971) 536; Sov. J. Nucl. Phys. 14 (1972) 300

1971GR49 Y.T. Grin and L.B. Leinson, Phys. Lett. B37 (1971) 253

1971GR52 Y.T. Grin, A.B. Kochetov and A.I. Anankin, Yad. Fiz. 14 (1971) 953; Sov. J. Nucl. Phys. 14 (1972) 534

1971GU13 R. Guy and J.M. Eisenberg, Can. J. Phys. 49 (1971) 1879

1971GU15 A. Guichard, M. Chevallier, P. Gaillard, J-Y. Grossiord, M. Gusakow, J-R. Pizzi and C. Ruhla, Phys. Rev. C4 (1971) 700

1971GU22 P. Guazzoni, S. Micheletti, M. Pignanelli, F. Gentilin and F. Pellegrini, Phys. Rev. C4 (1971) 1086

1971GU23 P. Guazzoni, I. Iori, S. Micheletti, N. Molho, M. Pignanelli and G. Semenescu, Phys. Rev. C4 (1971) 1092

1971HA61 A.M. Hanna, R.J. Griffiths, N.M. Clarke and G.T.A. Squier, Phys. Lett. B37 (1971) 361

1971HE01 V.E. Herscovitz, Nucl. Phys. A161 (1971) 321

1971HE15 K.T. Hecht, Nucl. Phys. A170 (1971) 34

1971HE16 G. Helling, W. Scheid and W. Greiner, Phys. Lett. B36 (1971) 64

1971HE25 V.E. Herscovitz, G. Jacob, T.A.J. Maris and C. Schneider, Rev. Brasil. Fis. 1 (1971) 43

1971HI09 D. Hilscher, J.C. Davis and P.A. Quin, Nucl. Phys. A174 (1971) 417

1971HS02 S.T. Hsieh, T.Y. Lee and C.T. Chen-Tsai, Phys. Rev. C4 (1971) 105

1971HU15 T.A. Hughes, S. Fallieros and B.Goulard, Part. Nucl. 2 (1971) 93

1971IR02 J.M. Irvine, Phys. Lett. B36 (1971) 21

1971IR03 J.M. Irvine and V.F.E. Pucknell, Nucl. Phys. A173 (1971) 129

1971IR04 J.M. Irvine and V.F.E. Pucknell, Nucl. Phys. A174 (1971) 634

1971IR05 J.M. Irvine, C.D. Latorre and V.F.E. Pucknell, Advan. Phys. 20 (1971) 661

1971KA14 I. Kakkar and Y.R. Waghmare, Can. J. Phys. 49 (1971) 1874

1971KA40 N. Kassis, H.A. Mavromatis and B. Singh, Phys. Lett. B37 (1971) 15

1971KA70 N.N. Kaushal, E.J. Winhold, R.H. Augustson, P.F. Yergin and H.A. Medicus, Nucl. Energy 25 (1971) 91

1971KE09 G. Kernel, W.M. Mason and U. von Wimmersperg, Nucl. Phys. A167 (1971) 352

1971KH01 F.C. Khanna, H.C. Lee and M. Harvey, Nucl. Phys. A164 (1971) 612

1971KH02 F.C. Khanna, Nucl. Phys. A165 (1971) 475

1971KH06 S.B. Khadkikar, Phys. Lett. B36 (1971) 451

1971KO10 T.I. Kopaleishvili, I.Z. Machabeli and M.S. Chachkhumashvili, Yad. Fiz. 13 (1971) 534; Sov. J. Nucl. Phys. 13 (1971) 300

1971KO12 H.S. Kohler and Y.C. Lin, Nucl. Phys. A167 (1971) 305

1971KO18 V.A. Komarov, L.V. Krasnov and V.F. Litvin, Yad. Fiz. 13 (1971) 1189; Sov. J. Nucl. Phys. 13 (1971) 684

1971KO21 D.C. Kocher, P.J. Bjorkholm and W. Haeberli, Nucl. Phys. A172 (1971) 663

1971KO23 W.J. Kossler, H.O. Funsten, B.A. MacDonald and W.F. Lankford, Phys. Rev. C4 (1971) 1551

1971LA13 K.R. Lassey and A.B. Volkov, Phys. Lett. B36 (1971) 4

1971LA17 A. Laverne, B. Goulard and G. Do Dang, Can. J. Phys. 49 (1971) 2282

1971LA1B Lanford and Fulbright, Bull. Amer. Phys. Soc. 16 (1971) 35

1971LA1D Lang, Z. Phys. 242 (1971) 179

1971LE30 T.Y. Lee, C.T. Chen-Tsai, W.W. Yeh and S.T. Hsieh, Phys. Rev. C4 (1971) 1991

1971LE31 F. Lenz and R. Rosenfelder, Nucl. Phys. A176 (1971) 513

1971LE33 J. Lestringuez, G.M. Raisbeck, F. Yiou and R. Bernas, Phys. Lett. B36 (1971) 331

1971LI1M Lieb, Thesis, Coll. of William & Mary (1971)

1971LIZI A.E. Litherland, Proc. Mont Tremblant Int. Summer School on Dynamic Struct. of Nucl. States, Canada, 1971 (1972) 310

1971LO24 W.G. Love and L.W. Owen, Phys. Lett. B37 (1971) 463

1971LO25 I.I. Loshchakov, V.I. Ostroumov and A.E. Sadilin, Yad. Fiz. 14 (1971) 676; Sov. J. Nucl. Phys. 14 (1972) 379

1971MA1C Macek et al., Bull. Amer. Phys. Soc. 16 (1971) 512

1971MA1N A. Malecki and P. Picchi, Phys. Lett. B36 (1971) 61

1971MA1T Massue et al., Conf. on Certain Microscopic Aspects of Nucl. Interactions, La Tourinei, 1971 (1971)

1971MA2A Massue, FRNC TH 110 (1971)

1971MA2B Maksimenko, Ukr. Fiz. Zh. 16 (1971) 1783

1971MA60 H.A. Mavromatis and B. Singh, Nucl. Phys. A178 (1971) 30

1971MA63 V.N. Maksimenko and A.I. Steshenko, Yad. Fiz. 13 (1971) 707; Sov. J. Nucl. Phys. 13 (1971) 401

1971MC03 K.W. McVoy, Phys. Rev. C3 (1971) 1104

1971MC04 R.L. McGrath, D.L. Hendrie, E.A. McClatchie, B.G. Harvey and J. Cerny, Phys. Lett. B34 (1971) 289

1971MC15 G.M. McAllen, W.T. Pinkston and G.R. Satchler, Part. Nucl. 1 (1971) 412

1971ME15 R.M. Mendez and T.H. Seligman, Phys. Lett. B36 (1971) 307

1971MIZQ I.N. Mikhailov, E. Nadzhakov, I. Piperova and B. Petrov, JINR-P4-6035 (1971)

1971MO05 R. Mohan, M. Danos and L.C. Biedenharn, Phys. Rev. C3 (1971) 468

1971MO1G Morris and Weber, Bull. Amer. Phys. Soc. 16 (1971) 558

1971MO1Q Morita et al., Suppl. Prog. Theor. Phys. 48 (1971) 41
1971MO34 C.E. Moss and A.B. Comiter, Nucl. Phys. A178 (1971) 241
1971MU08 R. Muthukrishnan, Phys. Rev. C3 (1971) 2091
1971MU09 B.D. Murphy, R.M. Strang and R.C. Ritter, Nucl. Phys. A168 (1971) 328
1971MU1H A. Mullensiefen, Nucl. Phys. B28 (1971) 368
1971NA19 S. Nagamiya and T. Yamazaki, Phys. Rev. C4 (1971) 1961
1971NE07 O.F. Nemets, V.M. Pugach, M.V. Sokolov and B.G. Struzhko, Ukr. Fiz. Zh. 16 (1971) 403
1971NE1C Neudatchin, Kukulin, Korotkikh and Korennoy, Phys. Lett, B34 (1971) 581
1971NG01 Nguyen Van Giai, D. Vautherin, M. Veneroni and D.M. Brink, Phys. Lett. B35 (1971) 135
1971NO03 J.V. Noble and H.T. Coelho, Phys. Rev. C3 (1971) 1840
1971NY03 K. Nyberg-Ponnert, B. Jonsson and I. Bergqvist, Phys. Scr. 4 (1971) 165
1971ON01 N. Onishi and R.K. Sheline, Nucl. Phys. A165 (1971) 180
1971OP01 T.R. Ophel, Ph. Martin, S.D. Cloud and J.M. Morris, Nucl. Phys. A173 (1971) 609
1971OR02 J. Orloff and W.W. Daehnick, Phys. Rev. C3 (1971) 430
1971OS01 E. Osnes, T.T.S. Kuo and C.S. Warke, Phys. Lett. B34 (1971) 113
1971OS02 A. Osman, Phys. Lett. B34 (1971) 478
1971OS03 E. Osnes, T.T.S. Kuo and C.S. Warke, Nucl. Phys. A168 (1971) 190
1971PA28 L. Palffy, J. Lehmann, L. Grenacs and M. Subotowicz, Nuovo Cim. A3 (1971) 505
1971PE02 J.D. Perez and G.J. Stephenson, Jr., Nucl. Phys. A165 (1971) 152
1971PL01 M.E. Plett and S.E. Sobottka, Phys. Rev. C3 (1971) 1003
1971PL1F Plett, Thesis, Univ. of Virginia (1971)
1971PR09 R. Prasad and D.C. Sarkar, Nuovo Cim. A3 (1971) 467
1971PU1B Purser et al., Bull. Amer. Phys. Soc. 16 (1971) 645
1971RA01 K.F. Ratcliff, Phys. Rev. C3 (1971) 117
1971RA1C Rawitscher, Bull. Amer. Phys. Soc. 16 (1971) 100
1971RA1G Rayet and Reidemeister, Suppl. J. Phys. 32 (1971) C6-259
1971RA24 J.J. Ramirez and E.M. Bernstein, Nucl. Phys. A173 (1971) 207
1971RA36 R.B. Raphael and M. Rosen, Part. Nucl. 2 (1971) 29
1971RE21 I. Reichstein and F.B. Malik, Phys. Lett. B37 (1971) 344
1971RI1D Ripka, Supp. J. Phys. 32 (1971) C6-261

1971RO03 D.J. Rowe, N. Ullah, S.S.M. Wong, J.C. Parikh and B. Castel, Phys. Rev. C3 (1971) 73

1971RO1G Rotter, Suppl. J. Phys. 32 (1971) C6-113

1971RU12 F.R. Ruehl, Jr., Acta Phys. 30 (1971) 283

1971SA1C Saunier, FRNC TH 101 (1971)

1971SAZK Y.A. Salganic and R.A. Eramzhyan, JINR-P4-5997 (1971)

1971SC01 D. Schutte, Nucl. Phys. A161 (1971) 73

1971SC10 R. Schaeffer and F.L. Petrovich, Phys. Rev. Lett. 26 (1971) 1380

1971SC29 W. Schutz, H. Theissen, K.H. Schmidt and H. Frank, Z. Naturforsch. A26 (1971) 2070

1971SE02 R. Seki, Phys. Rev. C3 (1971) 454

1971SE03 J.B. Seaborn and B.S. Cooper, Nucl. Phys. A166 (1971) 221

1971SE1C D. Sen and C.S. Shastry, Phys. Rev. C4 (1971) 349

1971SH05 C.M. Shakin and W.L. Wang, Phys. Rev. Lett. 26 (1971) 902

1971SI24 M.H. Simbel and A.Y. Abul-Magd, Nucl. Phys. A177 (1971) 322

1971SM01 L.G. Smith, Phys. Rev. C4 (1971) 22

1971SR03 K. Srinivasa Rao, J. Phys. (London) A4 (1971) 928

1971ST06 U. Strohbusch, W. Schmidt and G. Huber, Nucl. Phys. A163 (1971) 453

1971ST40 A.I. Steshenko and G.F. Filippov, Yad. Fiz. 14 (1971) 715; Sov. J. Nucl. Phys. 14 (1972) 403

1971SU08 S. Suekane and T. Yura, Prog. Theor. Phys. 45 (1971) 654

1971TA05 M. Takeda, S. Kato and T. Yamazaki, J. Phys. Soc. Jpn. 30 (1971) 56

1971TA30 O. Tanimura, Prog. Theor. Phys. 46 (1971) 1738

1971TE10 I.B. Teplov, Izv. Akad. Nauk SSSR Ser. Fiz. 35 (1971) 154; Bull. Acad. Sci. USSR Phys. Ser. 35 (1972) 140

1971TH03 S.T. Thornton, C.M. Jones, J.K. Bair, M.D. Mancusi and H.B. Willard, Phys. Rev. C3 (1971) 1065

1971TH1D Thirion, Conf. on Certain MIcroscopic Aspects of Nucl. Reactions, La Toursinei, 1971 (1971)

1971TO08 I.S. Towner, E.K. Warburton and G.T. Garvey, Ann. Phys. 66 (1971) 674

1971TO09 C. Toepffer, Phys. Rev. C4 (1971) 1964

1971TO11 A. Tohsaki, F. Tanabe and R. Tamagaki, Prog. Theor. Phys. 45 (1971) 980

1971VI08 B.N. Vinogradov and P.E. Nemirovskii, Yad. Fiz. 13 (1971) 1016; Sov. J. Nucl. Phys. 13 (1971) 583

1971WA1D Walter, Polarization Phenom. in Nucl. Reactions, Madison, 1970; Eds., H.H. Barschall and W. Haeberli (1971) 317

1971WA37 A.H. Wapstra and N.B. Gove, Nucl. Data Tabels 9 (1971) 267

1971WE03 M. Weigel, L. Garside and P.K. Haug, Phys. Rev. C3 (1971) 563

1971WE04 W. Weise and M.G. Huber, Nucl. Phys. A162 (1971) 330

1971WE14 C. Werntz, Phys. Rev. C4 (1971) 1591

1971WE16 R. Weibezahn, H. Freiesleben, F. Puhlhofer and R. Bock, Nucl. Phys. A176 (1971) 645

1971WE1E Weigel, Garside and Haug, Bull. Amer. Phys. Soc. 16 (1971) 602

1971WE1F Weidenmuller, Polarization Phenom. in Nucl. Reactions, Madison, 1970; Eds., H.H. Barshall and W. Haeberli (1971) 15

1971WI1D Wilson and Goldhammer, Bull. Amer. Phys. Soc. 16 (1971) 560

1971WO06 S.K.M. Wong, G. Saunier and B. Rouben, Nucl. Phys. A169 (1971) 294

1971WO11 J. Wojtkowska, V.S. Evseyev, T. Kozlowski, T.N. Mamedov and V.S. Roganov, Yad. Fiz. 14 (1971) 624; Sov. J. Nucl. Phys. 14 (1972) 349

1971WO1E S.E. Woosley, W.D. Arnett, and D.D. Clayton, Phys. Rev. Lett. 27 (1971) 213; Erratum Phys. Rev. Lett. 27 (1971) 700

1971WY01 H.W. Wyborny and R.R. Carlson, Phys. Rev. C3 (1971) 2185

1971YA1B Yankauskas and Petrauskas, Litov. Fiz. Sb. (USSR) 11 (1971) 33

1971ZE01 N.S. Zelenskaya, K.G. Tarov, I.B. Teplov and L.N. Fateeva, Izv. Akad. Nauk SSSR Ser. Fiz. 35 (1971) 193; Bull. Acad. Sci. USSR Phys. Ser. 35 (1972) 174

1971ZE02 B. Zeitnitz, H. Dubenkropp, R. Putzki, G.J. Kirouac, S. Cierjacks, J. Nebe and C.B. Dover, Nucl. Phys. A166 (1971) 443

1971ZH04 M.V. Zhukov and K.V. Shitikova, Yad. Fiz. 14 (1971) 297; Sov. J. Nucl. Phys. 14 (1972) 168

1971ZO01 J. Zofka and G. Ripka, Phys. Lett. B34 (1971) 10

1971ZO03 J. Zofka and G. Ripka, Nucl. Phys. A168 (1971) 65

1971ZO1A Zofka, Czech. J. Phys. B21 (1971) 1051

1972AB05 C. Abulaffio and J.M. Irvine, Phys. Lett. B38 (1972) 492

1972AB12 Y. Abgrall, B. Morand and E. Caurier, Nucl. Phys. A192 (1972) 372

1972AB1C Abgrall and Caurier, Private Communication (1972)

1972AD10 E.G. Adelberger, P.T. Debevec, G.T. Garvey and R. Ohanian, Phys. Rev. Lett. 29 (1972) 883

1972AG02 A. Agodi, M. Baldo, F. Catara, M. Di Toro and R. Parisi, Nucl. Phys. A184 (1972) 458

1972AL27 J.F. Allard and M. Amiel, Phys. Lett. B41 (1972) 29

1972AL46 D.R. Alexander and F.B. Malik, Phys. Lett. B42 (1972) 412

1972AR11 A. Arima, G. Scharff-Goldhaber and K.W. McVoy, Phys. Lett. B40 (1972) 7

1972AR13 X. Artru and G.B. Yodh, Phys. Lett. B40 (1972) 43

1972AR18 J. Arponen, Nucl. Phys. A191 (1972) 257

1972AU03 N. Auerbach, Nucl. Phys. A182 (1972) 247

1972AU1A Austin, MSUCL-49 (1972)

1972AV02 Y. Avishai, Phys. Rev. C6 (1972) 677

1972AV04 G.V. Avakov, E.I. Dolinsky and V.V. Turovtsev, Nucl. Phys. A196 (1972) 529

1972BA09 W.A. Bardeen and E.W. Torigoe, Phys. Lett. B38 (1972) 135

1972BA29 B.R. Barrett, R.G.L. Hewitt and R.J. McCarthy, Nucl. Phys. A184 (1972) 13

1972BA2B Bassani et al., Communications, Proc. Aix-en-Provence Conf. 2 (1972) 69

1972BA2C Barz, Wiss. Z. Tech. Univ. Dres. (Germany) 21 (1972) 733

1972BA2D Barz, Rotter and Hohn, Wiss. Z. Tech. Univ. Dres. (Germany) 21 (1972) 736

1972BA2E Balashov, J. Phys. 33 (1972) C5-127

1972BA52 G. Bassani, N. Saunier, B.M. Traore, J. Raynal, A. Foti and G. Pappalardo, Nucl. Phys. A189 (1972) 353

1972BA59 M.K. Basu, Phys. Rev. C6 (1972) 476

1972BA73 G. Baur and M.A. Sharaf, Phys. Lett. B41 (1972) 113

1972BE1E Bertsch and Mekjian, Ann. Rev. Nucl. Sci. (1972) 25

1972BE57 R.W. Bercaw, J.S. Vincent, E.T. Boschitz, M. Blecher, K. Gotow, D.K. Anderson, R. Kerns, R. Minehart, K. Ziock and R. Johnson, Phys. Rev. Lett. 29 (1972) 1031

1972BE98 G.F. Bertsch, Part. Nucl. 4 (1972) 237

1972BI01 O.M. Bilaniuk, H.T. Fortune, J.D. Garrett, R. Middleton and W.P. Alford, Nucl. Phys. A180 (1972) 69

1972BI09 J.A. Bistirlich, K.M. Crowe, A.S.L. Parsons, P. Skarek and P. Truol, Phys. Rev. C5 (1972) 1867

1972BL01 S.D. Bloom, M.S. Weiss and C.M. Shakin, Phys. Rev. C5 (1972) 238

1972BO08 R.N. Boyd, J.C. Lombardi, R. Mohan, R. Arking and A.B. Robbins, Nucl. Phys. A182 (1972) 571

1972BO11 A. Bouyssy and N. Vinh Mau, Nucl. Phys. A185 (1972) 32

1972BO13 E. Boridy and J.M. Pearson, Nucl. Phys. A185 (1972) 593

1972BO21 R. Bock and H. Yoshida, Nucl. Phys. A189 (1972) 177

1972BO38 M. Bouten and M.C. Bouten, Nucl. Phys. A193 (1972) 49

1972BO39 E. Boridy and J.M. Pearson, Nucl. Phys. A193 (1972) 113

1972BO49 W. Bohne, J. Bommer, H. Fuchs, K. Grabisch, H. Kluge and G. Roschert, Nucl. Phys. A196 (1972) 41

1972BO52 G.C. Bonazzola, T. Bressani, E. Chiavassa and L. Naldi, Lett. Nuovo Cim. 5 (1972) 226

1972BO71 V.V. Boikov, B.V. Velberg, I.I. Loshchakov and V.I. Ostroumov, Yad. Fiz. 16 (1972) 901; Sov. J. Nucl. Phys. 16 (1973) 497

1972BR1G Braley, Ford, Becker and Patterson, NASA TN D 6834 (1972)

1972BR1H Brueckner, Few Particle Problems, UCLA, 1972 (1972) 913

1972BR1J Browne, At. Masses Fund. Constants, Teddington, 1971 (1972) 15

1972BU09 G.F. Burdzik and G. Heymann, Nucl. Phys. A185 (1972) 509

1972BU1J Bulow and Forkman, LUNP 7208 (1972)

1972CA08 F. Cannata and R. Leonard, Phys. Rev. C5 (1972) 1189

1972CA14 R.R. Carlson, Phys. Rev. C5 (1972) 1467

1972CA1E Carlson, Bull. Amer. Phys. Soc. 17 (1972) 466

1972CA1H Calarco et al., Bull. Amer. Phys. Soc. 17 (1972) 931

1972CA23 X. Campi and D.W. Sprung, Nucl. Phys. A194 (1972) 401

1972CA44 E. Casal, A. Garcia and F. Senent, An. Fis. 68 (1972) 305

1972CA45 E. Casal and A. Garcia, An. Fis. 68 (1972) 83

1972CE1A Cerny, At. Masses Fund. Constants, Teddington, 1971 (1972) 26

1972CH1E Charles, Dost, Fernandez and Gastebois, Communication, Proc. Aix-en-Provence Conf. 2 (1972) 40

1972CL1A Clayton, Encyclopedia of the Twentieth Century (1972)

1972CO15 K.W. Corrigan, R.M. Prior and S.E. Darden, Nucl. Phys. A188 (1972) 164

1972CO1H Cooper, Reisdorf and Lau, Bull. Amer. Phys. Soc. 17 (1972) 920

1972CU03 R.Y. Cusson, H. Trivedi and D. Kolb, Phys. Rev. C5 (1972) 2120

1972DA18 K.T.R. Davies, R.J. McCarthy and P.U. Sauer, Phys. Rev. C6 (1972) 1461

1972DM01 T.A. Dmitrieva and I.B. Teplov, Yad. Fiz. 15 (1972) 478; Sov. J. Nucl. Phys. 15 (1972) 266

1972DO02 T.W. Donnelly and N. Lo Iudice, Nucl. Phys. A179 (1972) 569

1972DO07 G. Do Dang, Phys. Lett. B38 (1972) 397

1972DO11 C.B. Dover and N.V. Giai, Nucl. Phys. A190 (1972) 373

1972DO17 T.W. Donnelly and J.D. Walecka, Phys. Lett. B41 (1972) 275

1972DU24 E.I. Dubovoi, Izv. Akad. Nauk SSSR Ser. Fiz. 36 (1972) 169; Bull. Acad. Sci. USSR Phys. Ser. 36 (1973) 159

1972EC01 G. Eckart and M. Weigel, Phys. Rev. C6 (1972) 1435

1972ED01 G. Eder, G. Winkler and P. Hille, Z. Phys. 253 (1972) 335

1972EH01 J.W. Ehlers and S.A. Moszkowski, Phys. Rev. C6 (1972) 217

1972EL11 Y.N. Eldyshev, V.N. Lukyanov and Y.S. Pol, Yad. Fiz. 16 (1972) 506; Sov. J. Nucl. Phys. 16 (1973) 282

1972EL13 P.J. Ellis and E. Osnes, Phys. Lett. B41 (1972) 97

1972EN03 T. Engeland and P.J. Ellis, Nucl. Phys. A181 (1972) 368

1972EN07 D.P. Engelberg, Phys. Rev. C6 (1972) 1620

1972ET01 M.P. Etten and G.H. Lenz, Nucl. Phys. A179 (1972) 448

1972EV03 N.N. Evstafev, I.N. Rozantsev and I.V. Estulin, Izv. Akad. Nauk SSSR Ser. Fiz. 36 (1972) 2567; Bull. Acad. Sci. USSR Phys. Ser. 36 (1973) 2230

1972EY01 Y. Eyal, I. Dostrovsky and Z. Fraenkel, Nucl. Phys. A180 (1972) 545

1972FA14 G. Faldt and H. Pilkuhn, Phys. Lett. B40 (1972) 613

1972FA1D Fallieros, Proc. Int. Conf. Statistical Prop. of Nucl., Albany, New York, 1971 (New York, Plenum Press, 1972) 589

1972FI09 M. Fink, H. Hebach and H. Kummel, Nucl. Phys. A186 (1972) 353

1972FI10 M. Fink, H. Hebach, J. Schlitter and H. Kummel, Phys. Lett. B39 (1972) 147

1972FL11 T. Fliessbach, Nucl. Phys. A194 (1972) 625

1972FL1A Fletcher et al., Bull. Amer. Phys. Soc. 17 (1972) 916

1972FO07 R.P. Fogel and S.T. Thornton, Nucl. Phys. A187 (1972) 624

1972FO17 R.P. Fogel and S.T. Thornton, Nucl. Phys. A192 (1972) 391

1972FO21 F. Foroughi and J. Rossel, Helv. Phys. Acta 45 (1972) 439

1972FR05 H. Freiesleben and R. Weibezahn, Nucl. Phys. A184 (1972) 273

1972FR06 J.L. Friar and M. Rosen, Phys. Lett. B39 (1972) 615

1972FR12 W. Fritsch, R. Lipperheide and U. Wille, Nucl. Phys. A198 (1972) 515

1972FR1B Friedrich, Husken and Weiguny, Communications, Proc. Aix-en-Provence Conf. 2 (1972) 85

1972FU16 H. Fuchs, H. Homeyer, H. Oeschler, R. Lipperheide and K. Mohring, Nucl. Phys. A196 (1972) 286

1972GA16 B.L. Gambhir and J.J. Griffin, Phys. Rev. C5 (1972) 1856

1972GA1E Garrett, Symp. on Two-Nucleon Transfer and Pairing Excitations, Argonne (1972) 232; CONF-720309

1972GA26 F.A. Gareev and F. Palumbo, Phys. Lett. B40 (1972) 621

1972GE05 W.J. Gerace and G.C. Hamilton, Phys. Lett. B39 (1972) 481

1972GE07 H.V. Geramb and G.L. Strobel, Phys. Lett. B39 (1972) 611

1972GE16 H.V. Geramb, G.L. Strobel and R. Sprickmann, Lett. Nuovo. Cim. 5 (1972) 333

1972GE18 C.K. Gelbke, R. Bock, P. Braun-Munzinger, D. Fick, K.D. Hildenbrand, A. Richter and W. Weiss, Phys. Rev. Lett. 29 (1972) 1683

1972GO1G Gobbi et al., Bull. Amer. Phys. Soc. 17 (1972) 896

1972GO20 A. Goswami and R.D. Graves, Phys. Lett. B39 (1972) 499

1972GO41 A.M. Gorbatov, Yad. Fiz. 16 (1972) 699; Sov. J. Nucl. Phys. 16 (1973) 391

1972GR02 P.D. Greaves, V. Hnizdo, J. Lowe and O. Karban, Nucl. Phys. A179 (1972) 1

1972GR1L Grillot, AD 737364 (1972)

1972GR42 F. Grummer and A. Faessler, Z. Phys. 255 (1972) 112

1972GU14 R. Guardiola and E. Oset, Lett. Nuovo Cim. 4 (1972) 869

1972HA1R Hanna, 1970 4th Symp. Struct. Low-Medium Mass Nuclei (1972) 30

1972HA1X Hardy, Symp. on Two-Nucleon Transfer and Pairing Excitations, Argonne (1972) 203; CONF-720309

1972HA1Y Hanna, Proc. Int. Conf. on Nucl. Struct. Studies Using Electron Scattering and Photoreaction, Sendai, Japan (1972) 453

1972HA52 S.S. Hanna, H.F. Glavish, E.M. Diener, J.R. Calarco, C.C. Chang, R. Avida and R.N. Boyd, Phys. Lett. B40 (1972) 631

1972HA53 M.I. Haftel, E. Lambert and P.U. Sauer, Nucl. Phys. A192 (1972) 225

1972HA57 H.H. Hackenbroich and T.H. Seligman, Phys. Lett. B41 (1972) 102

1972HI04 L.L. Hill and H. Uberall, Nucl. Phys. A190 (1972) 341

1972HI17 J. Hiura, F. Nemoto and H. Bando, Suppl. Prog. Theor. Phys. 52 (1972) 173

1972HO56 H. Horiuchi, K. Ikeda and Y. Suzuki, Suppl. Prog. Theor. Phys. 52 (1972) 89

1972HU1A W.T. Huang, C.A. Levinson and M.K. Banerjee, Phys. Rev. C5 (1972) 651

1972IK1A Ikeda, Marumori, Tamagaki and Tanaka, Suppl. Prog. Theor. Phys. 52 (1972) 1

1972JA14 J. Janecke, Phys. Rev. C6 (1972) 467

1972JA18 J. Janiszewski and I.E. McCarthy, Nucl. Phys. A192 (1972) 85

1972JA1C Janiszewski and McCarthy, Nucl. Phys. A181 (1972) 97

1972JA24 A. Jaffrin, Nucl. Phys. A196 (1972) 577

1972JE01 J.P. Jeukenne and A. Lejeune, Nucl. Phys. A183 (1972) 666

1972JO1A Johnson and Martin, Communications, Proc. Aix-en-Provence Conf. 2 (1972) 148

1972KA38 N.I. Kassis, Nucl. Phys. A194 (1972) 205

1972KA67 M. Kamimura, T. Marumori and K. Takada, Suppl. Prog. Theor. Phys. 52 (1972) 282

1972KE10 M.P. Keating and J.G. Wills, Phys. Rev. C5 (1972) 1572

1972KE18 L.G. Keller and R.G. Kerr, Nucl. Phys. A194 (1972) 1

1972KI1D Kinney and Perey, ORNL-4780 (1972)

1972KO1A Kocharov, Izv. Akad. Nauk SSSR Ser. Fiz. 36 (1972) 2052

1972KO27 J.H. Koch and M.M. Sternheim, Phys. Rev. C6 (1972) 1118

1972KO30 V.M. Kolybasov and V.A. Khangulyan, Yad. Fiz. 15 (1972) 934; Sov. J. Nucl. Phys. 15 (1972) 520

1972KO31 T.I. Kopaleishvili, I.Z. Machabeli and M.S. Chachkhunashvili, Yad. Fiz. 15 (1972) 1137; Sov. J. Nucl. Phys. 15 (1972) 629

1972KR11 S.J. Krieger and S.A. Moszkowski, Phys. Rev. C5 (1972) 1990

1972KR1D Krieger, 1970 4th Symp. Struct. of Low-Medium Mass Nuclei (1972) 146

1972KU12 K.-I. Kubo and M. Hirata, Nucl. Phys. A187 (1972) 186

1972KU19 B.I. Kuznetsov, P.E. Ovsyannikova and I.P. Chernov, Yad. Fiz. 15 (1972) 673; Sov. J. Nucl. Phys. 15 (1972) 377

1972LA12 C.D. Latorre and J.M. Irvine, Nucl. Phys. A188 (1972) 524

1972LA1C Langworthy, Kelly, Uberall and Lamers, Bull. Amer. Phys. Soc. 17 (1972) 554

1972LA1F Lane, COO-1717-3 (1972)

1972LA21 K.R. Lassey, Nucl. Phys. A192 (1972) 177

1972LE1G Lerner, Thesis, Univ. of Maryland (1972)

1972LE1L Lee and Cusson, Ann. Phys. 72 (1972) 353

1972LE27 G.M. Lerner and E.F. Redish, Nucl. Phys. A193 (1972) 565

1972LE28 G.M. Lerner and J.B. Marion, Nucl. Phys. A193 (1972) 593

1972LI13 R. Lipperheide and K. Mohring, Phys. Lett. B39 (1972) 323

1972LO08 J. Lowe and A.R. Barnett, Nucl. Phys. A187 (1972) 323

1972LO13 M.A.K. Lodhi and B.T. Waak, Phys. Rev. Lett. 29 (1972) 301

1972LO16 W.G. Love, Nucl. Phys. A192 (1972) 49

1972LO1D Lobov, Izv. Akad. Nauk SSSR Ser. Fiz. 36 (1972) 881

1972MA01 T.P. Marvin and P.P. Singh, Nucl. Phys. A180 (1972) 282

1972MA1H Macek, Bull. Amer. Phys. Soc. 17 (1972) 33

1972MA1K Martin and Ophel, 4th Ainse Nucl. Phys. Conf., Sydney, 1972 (1972) 48

1972MA1P Malmin, TID 26290 (1972)

1972MA29 R.E. Malmin, R.H. Siemssen, D.A. Sink and P.P. Singh, Phys. Rev. Lett. 28 (1972) 1590

1972MA47 V.A. Matusevich, V.A. Solovev and I.P. Chernov, Yad. Fiz. 15 (1972) 670; Sov. J. Nucl. Phys. 15 (1972) 375

1972MA53 P. Martin and T.R. Ophel, Nucl. Phys. A194 (1972) 491

1972MA57 H.A. Mavromatis and B. Singh, Phys. Lett. B41 (1972) 251

1972MC1C McManus and Dworzecka, Bull. Amer. Phys. Soc. 17 (1972) 554

1972MI01 L.D. Miller and A.E.S. Green, Phys. Rev. C5 (1972) 241

1972MI05 B. Mithra and R. Laverriere, Nucl. Phys. A184 (1972) 330

1972MI07 L.D. Miller, Phys. Rev. Lett. 28 (1972) 1281

1972MI1E Miller and Arenhovel, Z. Phys. 249 (1972) 327

1972MO1E Morrison, J. Phys. 33 (1972) C5-111

1972MO22 U. Mosel, Part. Nucl. 3 (1972) 297

1972MU08 H. Muther, K. Goeke and A. Faessler, Z. Phys. 253 (1972) 61

1972NA05 P.T. Nang, Nucl. Phys. A185 (1972) 413

1972NA14 B.N. Nagorcka and J.O. Newton, Phys. Lett. B41 (1972) 34

1972NE06 J.W. Negele and D. Vautherin, Phys. Rev. C5 (1972) 1472

1972NE10 A.V. Nero, R.E. Pixley and E.G. Adelberger, Phys. Rev. C6 (1972) 679

1972NE13 J. Nemeth and G. Ripka, Nucl. Phys. A194 (1972) 329

1972NE1B Nemoto and Bando, Prog. Theor. Phys. 47 (1972) 1210

1972NI14 R.A. Nisley and M.H. Hull, Jr., Nucl. Phys. A198 (1972) 561

1972NI15 H. Nissimov and J.P. Elliott, Nucl. Phys. A198 (1972) 1

1972OE01 H. Oeschler, H. Schroter, H. Fuchs, L. Baum, G. Gaul, H. Ludecke, R. Santo and R. Stock, Phys. Rev. Lett. 28 (1972) 694

1972OH01 I.K. Oh, C.S. Zaidins, C.D. Zafiratos and S.I. Hayakawa, Nucl. Phys. A178 (1972) 497

1972OH1B Ohanian and Adelberger, Bull. Amer. Phys. Soc. 17 (1972) 466

1972OS01 A. Osman, Part. Nucl. 3 (1972) 28

1972PA15 G.L. Payne and P.L. von Behren, Phys. Rev. C5 (1972) 1955

1972PA1A Parkinson, At. Masses Fund. Constants, Teddington, 1971 (1972) 38

1972PA1G Panagiotou et al., Comminications, Proc. Aix-en-Provence Conf. 2 (1972) 77

1972PA21 J.C. Parikh and J.P. Svenne, Phys. Rev. C6 (1972) 34

1972PA32 A.A. Pasichnyi, Ukr. Fiz. Zh. 17 (1972) 1139

1972PE04 L.W. Person and P. Benioff, Nucl. Phys. A187 (1972) 401

1972PE12 J.D. Perez, Nucl. Phys. A191 (1972) 19

1972PL1C Plasil, Communications, Proc. Aix-en-Provence Conf. 2 (1972) 51

1972PU1B Puhlhofer et al., Communications, Proc. Aix-en-Provence Conf. 2 (1972) 55

1972RA1C Rao, Coon and Banerjee, Bull. Amer. Phys. Soc. 17 (1972) 554

1972RE02 N.E. Reid, M.K. Banerjee and G.J. Stephenson, Jr., Phys. Rev. C5 (1972) 41

1972RE14 G. Reidemeister, Nucl. Phys. A197 (1972) 631

1972RI03 A.S. Rinat, Phys. Lett. B38 (1972) 281

1972RO02 J. Rohlin, S. Rohlin, B.W. Allardyce, J.J. Domingo, C.H.Q. Ingram, N.W. Tanner, E.M. Rimmer and J.P. Girardeau-Montaut, Nucl. Phys. B37 (1972) 461

1972RO06 B. Rouben and G. Saunier, Phys. Rev. C5 (1972) 1223

1972RO35 A. Roberts, Nucl. Phys. A196 (1972) 465

1972RU03 C. Rudy, R. Vandenbosch, P. Russo and W.J. Braithwaite, Nucl. Phys. A188 (1972) 430.

1972SA10 W.W. Sapp, Jr., M. Eckhause, G.H. Miller and R.E. Welsh, Phys. Rev. C5 (1972) 690

1972SA1B Satpathy, Schmid and Faessler, Communications, Proc. Aix-en-Provence Conf. 2 (1972) 87

1972SA1E Sadovoi, Rybachenko and Aber'yanov, Izv. Akad. Nauk SSSR Ser. Fiz. 36 (1972) 198

1972SC03 U.C. Schlotthauer-Voos, H.G. Bohlen, W. von Oertzen and R. Bock, Nucl. Phys. A180 (1972) 385

1972SC17 U.C. Schlotthauer-Voos, R. Bock, H.G. Bohlen, H.H. Gutbrod and W. von Oertzen, Nucl. Phys. A186 (1972) 225

1972SE01 E. Seglie and D.R. Inglis, Phys. Rev. lett. 28 (1972) 371; Erratum Phys. Rev. Lett. 28 (1972) 527

1972SE1F Seki, Bull. Amer. Phys. Soc. 17 (1972) 917

1972SH10 M.A. Sharaf and M.I. Waly, Phys. Lett. B40 (1972) 67

1972SH20 J. Shao, W.H. Bassichis and E.L. Lomon, Phys. Rev. C6 (1972) 758

1972SI16 R.H. Siemssen, H.T. Fortune, A. Richter and J.W. Tippie, Phys. Rev. C5 (1972) 1839

1972SN1A Snover et al., Bull. Amer. Phys. Soc. 17 (1972) 915

1972ST02 F. Stancu and J.P. Jeukenne, Nucl. Phys. A179 (1972) 714

1972ST09 R. Stokstad, D. Shapira, L. Chua, P. Parker, M.W. Sachs, R. Wieland and D.A. Bromley, Phys. Rev. Lett. 28 (1972) 1523

1972ST22 C.E. Steerman and F.C. Young, Nucl. Phys. A192 (1972) 353

1972ST29 G.L. Strobel, Phys. Rev. Lett. 29 (1972) 1406

1972SU04 Y. Suzuki, H. Horiuchi and K. Ikeda, Prog. Theor. Phys. 47 (1972) 1517

1972SU10 W. Sunkel and K. Wildermuth, Phys. Lett. B41 (1972) 439

1972SW1A Swannack, Thesis, Carnegie-Mellon Univ. (1972)

1972TA30 T. Tamura and H.H. Wolter, Phys. Rev. C6 (1972) 1976

1972TH12 B.W. Thomas, D.M. Crawford and H.H. Thies, Nucl. Phys. A196 (1972) 89

1972TH13 C. Thibault and R. Klapisch, Phys. Rev. C6 (1972) 1509

1972THZF H. Theissen, Springer Tracts in Mod. Phys.; Ed., Hohler, Vol. 65 (1972) 1

1972TR05 R.K. Tripathi and P. Goldhammer, Phys. Rev. C6 (1972) 101

1972TR1C Trivedi, Cusson and Kolb, Bull. Amer. Phys. Soc. 17 (1972) 553

1972VA09 D. Vautherin and D.M. Brink, Phys. Rev. C5 (1972) 626

1972VA1H van der Leun and de Wit, At. Masses Fund. Constanes, Teddington, 1971 (1972) 131

1972VE1A Ventura et al., Bull. Amer. Phys. Soc. 17 (1972) 113

1972VO12 I. Voitkovska, V.S. Evseev, T. Kozlovski and V.S. Roganov, Yad. Fiz. 15 (1972) 1154; Sov. J. Nucl. Phys. 15 (1972) 639

1972WA07 G.E. Walker and R.H. Stokes, Part. Nucl. 3 (1972) 1

1972WA08 G.E. Walker, Phys. Rev. C5 (1972) 1540

1972WA13 W.L. Wang and C.M. Shakin, Phys. Rev. C5 (1972) 1898

1972WA1F Waheed, Juric and Adamovic, Fizika 4 (1972) 87

1972WA31 J.W. Watson, Nucl. Phys. A198 (1972) 129

1972WE03 W. Weise, Phys. Lett. B38 (1972) 301

1972WE04 H.R. Weller, R.A. Blue and S.L.Blatt, Phys. Rev. C5 (1972) 648

1972WE14 W. Weise, Nucl. Phys. A193 (1972) 625

1972WI09 D.H. Wilkinson and D.E. Alburger, Phys. Rev. C5 (1972) 719

1972WI16 U. Wille and R. Lipperheide, Nucl. Phys. A189 (1972) 113; Erratum Nucl. Phys. A211 (1973) 619

1972WO04 C.W. Wong and D.M. Clement, Nucl. Phys. A183 (1972) 210

1972WO10 G.J. Wozniak, H.L. Harney, K.H. Wilcox and J. Cerny, Phys. Rev. Lett. 28 (1972) 1278; Erratum Phys. Rev. Lett. 29 (1972) 760

1972YO02 F.C. Young and A.R. Knudson, Nucl. Phys. A184 (1972) 563

1972YO1B Yoshida and Zamick, Ann. Rev. Nucl. Sci. (1972) 121

1972YO1C Youssef, Bull. Amer. Phys. Soc. 17 (1972) 917

1972YU01 T. Yukawa, Phys. Lett. B38 (1972) 1

1972YU02 T. Yukawa, Nucl. Phys. A186 (1972) 127

1972ZA08 C.S. Zaidins, Phys. Rev. C6 (1972) 1444

1972ZA1B Zamick, 1970 4th Symp. Struct. of Low-Medium Mass Nuclei (1972) 184

1973AD02 E.G. Adelberger, A.B. McDonald, C.L. Cocke, C.N. Davids, A.P. Shukla, H.B. Mak and D. Ashery, Phys. Rev. C7 (1973) 889

1973AD1B Adelberger et al., Bull. Amer. Phys. Soc. 18 (1973) 550

1973AG05 N.M. Agababyan, Y.A. Batusov, S.A. Bunyatov, V.I. Genchev, N.F. Golovanova, G.R. Gulkanyan, V.M. Sidorov, K.M. Chernev and V.A. Yarba, Yad. Fiz. 18 (1973) 256; Sov. J. Nucl. Phys. 18 (1974) 131

1973AG06 N.M. Agababyan, Y.A. Batusov, S.A. Bunyatov, V.I. Genchev, N.F. Golovanova, G.R. Gulkanyan, V.M. Sidorov, K.M. Chernev and V.A. Yarba, Yad. Fiz. 18 (1973) 264; Sov. J. Nucl. Phys. 18 (1974) 135

1973AL1A Allardyce et al., Rept. RL-73-038, Rutherford High Energy Lab. (1973)

1973AN1G Anagnostatos, in Munich, 1 (1973) 101

1973AR1B Arthur, Thesis LA 5230 T (1973)

1973AR1C Arima, in Munich, 2 (1973) 184

1973AR1E Arnett, Ann. Rev. Astron. Astrophys. 11 (1973) 73

1973AR1H Arnett, Explosive Nucleosynthesis (1973) 236

1973AU1D Audouze and Fricke, Astrophys. J. 186 (1973) 239

1973AV03 I.K. Averyanov, A.A. Sadovoi, N.M. Chulkov and L.L. Vakhlamova, Yad. Fiz. 17 (1973) 258; Sov. J. Nucl. Phys. 17 (1974) 132

1973BA05 R.F. Barrett, L.C. Biedenharn, M. Danos, P.P. Delsanto, W. Greiner and H.G. Wahsweiler, Rev. Mod. Phys. 45 (1973) 44

1973BA1Q Barrett, Nucl. Many-Body Problem, Vol. 2, 1972 (1973) 165

1973BA1Y Bamberger et al., Nucl. Phys. B60 (1973) 1

1973BA1Z S. Barshay and G.E. Brown, Phys. Lett. B47 (1973) 107

1973BA2C Bahcall, Nucl. Instrum. Meth. 110 (1973) 381

1973BA2F Baur and Gelbke, in Munich, 1 (1973) 396

1973BA2G Baer and Crowe, in Asilomar (1973) 583

1973BA2H Barz, Rotter and Hohn, Neitronnaya Fiz., Pt. II, Kiev, 1973 (1974) 64

1973BA53 D.P. Balamuth, Phys. Rev. C8 (1973) 1185

1973BA68 Y.A. Batusov, S.A. Bunyatov, L. Vizireva, G.R. Gulkanyan, F. Mirsalikhova and V.M. Sidorov, Yad. Fiz. 18 (1973) 962; Sov. J. Nucl. Phys. 18 (1974) 496

1973BA74 H.W. Barz, V.E. Bunakov and A.M. El-Naiem, Nucl. Phys. A217 (1973) 141

1973BA89 J.K. Bair, Nucl. Sci. Eng. 51 (1973) 83

1973BE07 J. Bernabeu, Nucl. Phys. A201 (1973) 41

1973BE1K Becker, Nucl. Many-Body Problem, Vol. 2, 1972 (1973) 205

1973BE1L Behrman, das Gupta and De Takacsy, in Munich, 1 (1973) 114

1973BE49 J.C. Bergstrom, I.P. Auer, F.J. Kline and H.S. Caplan, Nucl. Phys. A213 (1973) 609

1973BE50 J.C. Bergstrom and I.P. Auer, Nucl. Phys. A215 (1973) 232

1973BI17 M. Birk, J.S. Sokolowski and Y. Wolfson, Nucl. Phys. A216 (1973) 217

1973BL02 E. Bleszynski, M. Bleszynski, A. Malecki and P. Picchi, Phys. Lett. B43 (1973) 355

1973BL1C Bleszynska, Bleszynski, Malecki and Picchi, in Munich, 1 (1973) 665

1973BL1D Bleszynski, Malecki and Picchi, in Munich, 1 (1973) 666

1973BO06 J.P. Bondorf, Nucl. Phys. A202 (1973) 30

1973BO18 S. Boffi and F.D. Pacati, Nucl. Phys. 204 (1973) 485

1973BO1H Bonche, Symp. on Heavy Ion Transfer Reactions, ANL Phy-1973B, Vol. 1 (1973) 235

1973BO1Q S. Boffi and A. Molinari, Phys. Rev. C8 (1973) 504

1973BO30 J.D. Bowman, A.M. Poskanzer, R.G. Korteling and G.W. Butler, Phys. Rev. Lett. 31 (1973) 614

1973BO49 E. Borie, H. Chandra and D. Drechsel, Phys. Lett. B47 (1973) 291

1973BO50 W. Bohne, H. Fuchs, K. Grabisch, D. Hilscher, U. Jahnke, H. Kluge and T.G. Masterson, Phys. Lett. B47 (1973) 342

1973BR15 R.C. Brown, J.A.R. Griffith, O. Karban, L. Mesko, J.M. Nelson and S. Roman, Nucl. Phys. A207 (1973) 456

1973BR19 F. Brochard, P. Chevallier, D. Disdier, V. Rauch and F. Scheibling, J. Phys. (Paris) 34 (1973) 363

1973BR1C Bromley, in Munich, 2 (1973) 22

1973BR1H Brochard et al., in Munich, 1 (1973) 204

1973BR1J Brennen and Werntz, Bull. Amer. Phys. Soc. 18 (1973) 1409

1973BR31 C. Broude, M.B. Goldberg, G. Goldring, M. Hass, M.J. Renan, B. Sharon, Z. Shkedi and D.F.H. Start, Nucl. Phys. A215 (1973) 617

1973BU1B J.E. Butt and D.T. King, Phys. Rev. C8 (1973) 359

1973CA16 E. Caurier, B. Bourotte-Bilwes and Y. Abgrall, Phys. Lett. B44 (1973) 411

1973CA1B Cameron, Explosive Nucleosynthesis (1973) 3

1973CA25 F. Cannata and J. Ros, Lett. Nuovo Cim. 8 (1973) 466

1973CA30 S. Cavallaro, A. Cunsolo, R. Potenza and A. Rubbino, Nuovo Cim. A14 (1973) 692

1973CE01 R. Ceuleneer and F. Michel, Phys. Lett. B43 (1973) 365

1973CH17 L.A. Charlton, Phys. Rev. C8 (1973) 146

1973CH1H Charlton, Symp. on Heavy Ion Transfer Reactions, ANL Phy-1973B, Vol. 1 (1973) 161

1973CI1A Ciofi degli Atti, Nucl. Many-Body Problem, 1972, Vol. 2 (1973) 365

1973CL09 C.F. Clement, Nucl. Phys. A213 (1973) 469

1973CL1E Clayton and Woosley, in Munich, 2 (1973) 718

1973CO13 H.T. Coelho, Phys. Rev. C7 (1973) 2340

1973CO15 H.T. Coelho, Phys. Rev. C8 (1973) 93

1973CO1B Colgate, Explosive Nucleosynthesis (1973) 248

1973CO1J Couch and Arnett, Explosive Nucleosynthesis (1973) 179

1973CO1N Costa, in Asilomar (1973) 1319

1973CO31 W.S. Cole, T. Mo, H.R. Weller and J.J. Ramirez, Nucl. Phys. A213 (1973) 107

1973CR1A Cramer et al., Nucl. Instrum. Meth. 111 (1973) 425

1973DA07 K.T.R. Davies, R.J. McCarthy and P.U. Sauer, Phys. Rev. C7 (1973) 943

1973DA1H Dasgupta, Bull. Amer. Phys. Soc. 18 (1973) 21

1973DA26 S.K. Datta, C.E. Busch, T.B. Clegg, E.J. Ludwig and W.J. Thompson, Phys. Rev. Lett. 31 (1973) 949

1973DE26 P.P. Delsanto, R.F. Barrett and H.G. Wahsweiler, Phys. Lett. B44 (1973) 433

1973DE40 R.M. DeVries, Nucl. Phys. A212 (1973) 207

1973DE53 T.J. Deal, Nucl. Phys. A217 (1973) 210

1973DI1C Dixon, in Asilomar (1973) 727

1973DI1D Dieperink and Brussaard, Z. Phys. 261 (1973) 117

1973DO04 T.W. Donnelly, Phys. Lett. B43 (1973) 93

1973DO13 P. Dougan and W. Stiefler, Z. Phys. 265 (1973) 1

1973DO1B Dolgintseva and Fomenko, Vestnik Leningrad Univ., Fiz. Khim. 4 (1973) 43

1973DO1F C.B. Dover and R.H. Lemmer, Phys. Rev. C7 (1973) 2312

1973DO1H Donnelly, in Asilomar (1973) 846

1973DU1B Dumitrescu, Rev. Roum. Phys. 18 (1973) 277

1973EC1A Eck, Eberhard and Schiele, Bull. Amer. Phys. Soc. 18 (1973) 1427

1973EI01 J.M. Eisenberg, R. Guy, J.V. Noble and H.J. Weber, Phys. Lett. B43 (1973) 20; Erratum Phys. Lett. B45 (1973) 93

1973EL04 E. Elbaz, C. Fayard, G-H. Lamot, J. Meyer, R.S. Nahabetian, J. Pigeon and P. Boschan, Phys. Rev. C7 (1973) 1445

1973EL1D Elliott and Sanderson, in Munich, 1 (1973) 16

1973ER06 R.A. Eramzhyan and Y.A. Salganic, Nucl. Phys. A207 (1973) 609

1973ER12 T. Erikson, Nucl. Phys. A211 (1973) 105

1973ER1C D.J. Ernst, C.M. Shakin and R.M. Thaler, Phys. Rev. C7 (1973) 925

1973FA02 A. Faessler, S. Kusuno and G.L. Strobel, Nucl. Phys. A203 (1973) 513; Erratum Nucl. Phys. A211 (1973) 618

1973FA09 G. Fai and J. Nemeth, Nucl. Phys. A208 (1973) 463

1973FA1F Faessler, Muther and Tripathi, in Munich, 1 (1973) 11

1973FA1G Fang-Landau, in Munich, 1 (1973) 361

1973FA1H Faessler and Muther, Z. Naturforsch. A28 (1973) 362

1973FE04 H. Feshbach and F. Iachello, Phys. Lett. B45 (1973) 7

1973FE13 G. Fey, H. Frank, W. Schutz and H. Theissen, Z. Phys. 265 (1973) 401

1973FE1G Feshbach, in Munich, 2 (1973) 632

1973FI07 B. Fink and C. Toepffer, Phys. Lett. B45 (1973) 411

1973FI1C Fick, MPI H-1973-V27 (1973)

1973FO1A Fortune, Heavy Ion Lecture Series, Kansas State Univ. (1973) 1

1973FO1E Fortune, Symp. on Heavy Ion Transfer Reactions, ANL Phy-1973B, Vol. 1 (1973) 287

1973FO1F Ford, Braley, Becker and Patterson, Nucl. Many-Body Problem, 1972, Vol. 2 (1973) 241

1973FR1E Freiesleben and Fulbright, Bull. Amer. Phys. Soc. 18 (1973) 550

1973FU11 L.P. Fulcher and N.C. Mukhopadhyay, Phys. Lett. B47 (1973) 115

1973FU14 R.C. Fuller, Nucl. Phys. A216 (1973) 199

1973GA03 B.L. Gambhir and J.J. Griffin, Phys. Rev. C7 (1973) 590

1973GA14 A. Gamp, W. von Oertzen, H.G. Bohlen, M. Feil, R.L. Walter and N. Marquardt, Z. Phys. 261 (1973) 283

1973GA19 S. Gamba, G. Ricco and G. Rottigni, Nucl. Phys. A213 (1973) 383

1973GA1H Gari, Phys. Rept. C6 (1973) 317

1973GA20 N.D. Gabitzsch, G.S. Mutchler, C.R. Fletcher, E.V. Hungerford, L. Coulson, D. Mann, T. Witten, M. Furic, G.C. Phillips, B. Mayes et al., Phys. Lett. B47 (1973) 234

1973GA23 M. Gari and A.H. Huffman, Nucl. Phys. A215 (1973) 532

1973GE01 H.V. Geramb, R. Sprickmann and G.L. Strobel, Nucl. Phys. A199 (1973) 545

1973GE04 C.K. Gelbke, R. Bock, P. Braun-Munzinger, D. Fick, K.D. Hildenbrand, W. Weiss, S. Wenneis and G. Baur, Phys. Lett. B43 (1973) 284

1973GE07 H.V. Geramb and D. Eppel, Z. Phys. 261 (1973) 177

1973GE11 J.F. Germond and J.P. Amiet, Nucl. Phys. A216 (1973) 157

1973GL1B Glavish, 5th Symp. Struct. Low-Medium Mass Nuclei (1973) 233

1973GL1C Glavish, in Asilomar (1973) 755

1973GO01 A. Gobbi, R. Wieland, L. Chua, D. Shapira and D.A. Bromley, Phys. Rev. C7 (1973) 30

1973GO1M Goldring, Lect. Notes in Phys. 23 (1973) 178

1973GO1N Goldring, in Munich, 2 (1973) 166

1973GO1P Goswami, Graves and Nalcioglu, Asilomar (1973) Paper 5A11

1973GO23 A. Goswami and R.D. Graves, Phys. Lett. B44 (1973) 335

1973GO27 Y.M. Goryachev, V.P. Kanavets, I.V. Kirpichnikov, I.I. Levintov, B.V. Morozov, N.A. Nikiforov and A.S. Starostin, Yad. Fiz. 17 (1973) 910; Sov. J. Nucl. Phys. 17 (1974) 476

1973GO36 B. Goulard and J. Joseph, Can. J. Phys. 51 (1973) 2376

1973GR11 R. Gross and I. Talmi, Phys. Lett. B44 (1973) 147

1973GR1F Grishin, Eliseev, Inogamov and Kohli, Yad. Fiz. 17 (1973) 1017

1973GR1G Graboske, Explosive Nucleosynthesis (1973) 186

1973GR1H Grauel, Z. Naturforsch. A28 (1973) 185

1973GR30 R.E. Griffin, A.B. Volkov and K.R. Lassey, Can. J. Phys. 51 (1973) 2054

1973GU12 H.H. Gutbrod, R. Bock, W. von Oertzen and U.C. Schlotthauer-Voos, Z. Phys. 262 (1973) 377

1973GU1A Guardiola, Nucl. Many-Body Problem, 1972, Vol. 2 (1973) 433

1973HA05 M. Harvey, Nucl. Phys. A202 (1973) 191

1973HA1N Harvey and Khanna, in Munich, 1 (1973) 277

1973HA1Q Hanna, in Asilomar (1973) 417
1973HA1X Halpern, in Asilomar (1973) 909
1973HA1Y Hasinoff, Bull. Amer. Phys. Soc. 18 (1973) 1568
1973HA2B Hartmann, Hoffmann, Mecking and Noldeke, in Asilomar (1973) 967
1973HO08 R.J.W. Hodgson and Tran Duc Hoang, Can. J. Phys. 51 (1973) 115
1973HO23 H.M. Hofmann, Nucl. Phys. A209 (1973) 233
1973HO29 V. Horsfjord, Nucl. Phys. A209 (1973) 493
1973HO32 V. Horsfjord, Phys. Lett. B45 (1973) 455
1973HO36 Q. Ho-Kim, Phys. Rev. C8 (1973) 1574
1973IA1A Iachello and Feshbach, in Munich, 1 (1973) 57
1973IB1B Iben, Explosive Nucleosynthesis (1973) 115
1973IC01 M. Ichimura, A. Arima, E.C. Halbert and T. Terasawa, Nucl. Phys. A204 (1973) 225
1973IS1A Ishkhanov and Shevchenko, Sov. J. Part. Nucl. 3 (1973) 446
1973JA11 D.H. Jakubassa, Z. Phys. 261 (1973) 305
1973JA13 G. Jacob, T.A.J. Maris, C. Schneider and M.R. Teodoro, Phys. Lett. B45 (1973) 181
1973JA1D Jackson and Rolfs, Bull. Amer. Phys. Soc. 18 (1973) 550
1973JA1E Jang, Asilomar (1973) Paper 5A13
1973JO17 J. Joseph and B. Goulard, Can. J. Phys. 51 (1973) 2382
1973KA1D Karapetyan, Korenman and Popov, Contrib., Uppsala (1973) 154
1973KA30 F.R. Kane, M. Eckhause, G.H. Miller, B.L. Roberts, M.E. Vislay and R.E. Welsh, Phys. Lett. B45 (1973) 292
1973KA46 T. Kaneko, Prog. Theor. Phys. 50 (1973) 1765
1973KI08 M.W. Kirson, Phys. Lett. B47 (1973) 110
1973KI1C King et al., Bull. Amer. Phys. Soc. 18 (1973) 1396
1973KL1B Klages and Duhm, in Munich, 1 (1973) 478
1973KN1C Knupfer and Huner, in Munich, 1 (1973) 29
1973KO02 T.K. Koh, W.R. Falk, N.E. Davison and J.M. Nelson, Phys. Rev. C7 (1973) 50
1973KO1D Kovar, Symp. on Heavy Ion Transfer Reactions, ANL Phys-1973B, Vol. 1 (1973) 59
1973KO1F Kohler and Bethgz, in Munich, 1 (1973) 134
1973KO1G Koltun and Nalcioglu, Bull. Amer. Phys. Soc. 18 (1973) 1409
1973KO1H Kopaleishvili, Sov. J. Part. Nucl. 3 (1973) 512
1973KO26 D. Kolb, R.Y. Cusson and M. Harvey, Nucl. Phys. A215 (1973) 1

1973KR1B Kravtsov and Skachkov, At. Data Nucl. Data Tables 12 (1973) 143

1973KU02 H. Kummel and J.G. Zabolitzky, Phys. Rev. C7 (1973) 547

1973KU03 D. Kurath, Phys. Rev. C7 (1973) 1390

1973KU04 T.T.S. Kuo and E. Osnes, Nucl. Phys. A205 (1973) 1

1973KU18 B.I. Kuznetsov, I.P. Chernov and R.E. Ovsyannikova, Yad. Fiz. 18 (1973) 950; Sov. J. Nucl. Phys. 18 (1974) 490

1973KU1G Kurath, Symp. on Heavy Ion Transfer Readctions, ANL Phy-1973B, Vol. 1 (1973) 221

1973LA16 E. Labie, J. Lega, P. Leleux and P.C. Macq, Nucl. Phys. A205 (1973) 81

1973LA1G Lamers et al., Contrib., Uppsala (1973) 125

1973LA1H Lamers et al., in Munich, 1 (1973) 644

1973LA29 A.M. Lane and A.Z. Mekjian, Phys. Rev. C8 (1973) 1981

1973LA35 K.R. Lassey, M.R.P. Manning and A.B. Volkov, Can. J. Phys. 51 (1973) 2522

1973LA36 S.E. Larsson, G. Leander, S.G. Nilsson, I. Ragnarsson and R.K. Sheline, Phys. Lett. B47 (1973) 422

1973LE07 C.M. Lerner, Nucl. Phys. A205 (1973) 385

1973LE1F Lee, Bull. Amer. Phys. Soc. 18 (1973) 20

1973LE1G Lesniak and Lesniak, Contrib., Uppsala (1973) 60

1973LE1H Lee and Tabakin, in Munich, 1 (1973) 672

1973LE22 C.W. Lewis, H. Ullrich, H.D. Engelhardt and E.T. Boschitz, Phys. Lett. B47 (1973) 339

1973LI1F Little et al., Bull. Amer. Phys. Soc. 18 (1973) 1602

1973LO02 J.T. Londergan and K.W. McVoy, Nucl. Phys. A201 (1973) 390

1973LO1C Lombard, Nucl. Many-Body Problem, 1972, Vol. 1 (1973) 475

1973MA03 P. Martin and T.R. Ophel, Nucl. Phys. A202 (1973) 257

1973MA07 A. Malecki and P. Picchi, Phys. Lett. B43 (1973) 351

1973MA10 R. Mach, Nucl. Phys. A205 (1973) 56

1973MA1N Malmin and Paul, Bull. Amer. Phys. Soc. 18 (1973) 134

1973MA1R Machleidt, Bleuler, Erkelenz and Holinde, in Munich, 1 (1973) 9

1973MA1T Malik and Mustafa, 5th Symp. Struct. Low-Medium Mass Nuclei (1973) 124

1973MA1U Mancini et al., Nuovo Cim. A15 (1973) 705

1973MA20 H.A. Mavromatis, Nucl. Phys. A206 (1973) 477

1973MA48 F. Malaguti and P.E. Hodgson, Nucl. Phys. A215 (1973) 243

1973MA55 H.A. Mavromatis and B. Singh, Nucl. Phys. A217 (1973) 238

1973MC17 C.A. McMahan and W. Tobocman, Nucl. Phys. A212 (1973) 465

1973MC1D McMahan and Tobocman, Symp. on Heavy Ion Transfer Reactions, ANL Phy-1973B, Vol. 2 (1973) 595

1973MI19 V.N. Mileev and T.V. Mishchenko, Phys. Lett. B47 (1973) 197

1973MO16 K. Mohring and R. Lipperheide, Nucl. Phys. A211 (1973) 136

1973MU14 S.F. Mughabghab and D.I. Garber, BNL 325, 3rd Edition, Vol. 1 (1973)

1973MU18 A. Muller-Arnke, Phys. Lett. B46 (1973) 325

1973MU21 H. Muther, A. Faessler and K. Goeke, Nucl. Phys. A215 (1973) 213

1973NA1F Nath et al., Asilomar (1973) Paper 2B9

1973NA28 O. Nalcioglu, A. Goswami and R.D. Graves, Lett. Nuovo Cim. 7 (1973) 897

1973NE1D Nemeth, Machleidt and Holinde, in Munich, 1 (1973) 18

1973NE20 P.E. Nemirovskii and L.G. Manevich, Yad. Fiz. 18 (1973) 295; Sov. J. Nucl. Phys. 18 (1974) 151

1973NI01 M. Niecke and A. Zach, Z. Phys. 261 (1973) 337

1973NY04 E.M. Nyman, Nucl. Phys. A215 (1973) 397

1973OC1A O'connell, Heikkinen and Dietrich, Bull. Amer. Phys. Soc. 18 (1973) 68

1973OC1B O'connell, Latsham, Black and Hanna, Asilomar (1973) Paper 8B9

1973OE01 H. Oeschler, H. Fuchs and H. Schroter, Nucl. Phys. A202 (1973) 513

1973OG1A Ogloblin, Sov. J. Part. Nucl. 3 (1973) 467

1973PA15 R. Padjen, B. Rouben, J. LeTourneux and G. Saunier, Phys. Rev. C8 (1973) 2024

1973PA1J Papineau, Proc. Europhys. 1972 Plitvice Lakes Conf. (1973) 295

1973PA1K Palumbo, Nucl. Many-Body Problem, 1972, Vol. 1 (1973) 685

1973PA20 K.H. Passler, P.G. Zint and U. Mosel, Phys. Lett. B47 (1973) 419

1973PE05 A.K. Petrauskas, G.P. Kamuntavicius and K.I. Jankauskas, Yad. Fiz. 17 (1973) 519; Sov. J. Nucl. Phys. 17 (1974) 266

1973PE1D Pelte, in Munich, 2 (1973) 256

1973PH01 S.C. Phatak, F. Tabakin and R.H. Landau, Phys. Rev. C7 (1973) 1803

1973PI09 M. Pignanelli, J. Gosset, F. Resmini, B. Mayer and J.L. Escudie, Phys. Rev. C8 (1973) 2120

1973PO1D Pougheon and Roussel, in Munich, 1 (1973) 459

1973RA09 W.L. Randolph, N. Ayres de Campos, J.R. Beene, J. Burde, M.A. Grace, D.F.H. Start and R.E. Warner, Phys. Lett. B44 (1973) 36

1973RA1D Ramaty, Borner and Cohen, Astrophys. J. 181 (1973) 891

1973RA1E Rayet, Nucl. Phys. B57 (1973) 269

1973RE10 A.K. Rej and T. Engeland, Phys. Lett. B45 (1973) 77

1973RE13 W. Reilly, R. Wieland, A. Gobbi, M.W. Sachs and D.A. Bromley, Nuovo Cim. A13 (1973) 897

1973RE17 B.S. Reehal and B.H. Wildenthal, Part. Nucl. 6 (1973) 137

1973RH1A Rhea et al., Bull. Amer. Phys. Soc. 18 (1973) 698

1973RO12 D.J. Rowe, Phys. Lett. B44 (1973) 155

1973RO1P Rosina, Nucl. Many-Body Problem, 1972, Vol. 1 (1973) 490

1973RO1Q Rook, in Munich, 2 (1973) 798

1973RO1R Robson, Nucl. Phys. A204 (1973) 523

1973ROYN D.J. Rowe, in Asilomar (1973) 717

1973RU07 F. Ruzzene and K. Amos, Aust. J. Phys. 26 (1973) 315

1973RU09 N.Y. Rutkevich, A.P. Klyucharev, M.A. Kuzmichev and A.R. Linetskii, Izv. Akad. Nauk SSSR Ser. Fiz. 37 (1973) 1697; Bull. Acad. Sci. USSR Phys. Ser. 37 (1974) 114

1973SA05 G. Saunier, J. LeTourneux, B. Rouben and R. Padjen, Can. J. Phys. 51 (1973) 629

1973SA1J Sackmann, Smith and Despain, OAP-324 (1973)

1973SA1K Satchler, Symp. on Heavy Ion Transfer Reactions, ANL Phy-1973B, Vol. 1 (1973) 145

1973SA1L Saarela, Erkkila and Kallio, Phys. Fenn. (Finland) 8 (1973) 51

1973SA32 P.U. Sauer, Ann. Phys. 80 (1973) 242

1973SC1J Scott, Symp. on Heavy Ion transfer Reactions, ANL Phys-1973B, Vol. 1 (1973) 97

1973SC1K Scheid, Fink and Muller, Proc. Europhys. 1972 Plitvice Lakes Conf. (1973) 144

1973SC1L R.R. Scheerbaum, Phys. Rev. C7 (1973) 2166

1973SC1M Schuck, Villars and Ring, Nucl. Phys. A208 (1973) 302

1973SC1N J. Schlitter, Nucl. Phys. A211 (1973) 96

1973SC1Q Schiffrer, Nucl. Many-Body Problem, 1972, Vol. 1 (1973) 805

1973SC26 P. Schumacher, N. Ueta, H.H. Duhm, K.-I. Kubo and W.J. Klages, Nucl. Phys. A212 (1973) 573

1973SC32 J. Schlitter, Z. Naturforsch. 28A (1973) 1586

1973SE1E Seki, Contrib., Uppsala (1973) 69

1973SH11 J. Shao and E.L. Lomon, Phys. Rev. C8 (1973) 53

1973SH14 R.W. Sharp and L. Zamick, Nucl. Phys. A208 (1973) 130

1973SI1G Singh and Scott, Phys. in Canada 29 (1973) 20

1973SI1H Simonov, Nucl. Many-Body Problem, 1972, Vol. 1 (1973) 527

1973SI21 M.H. Simbel, Phys. Rev. C8 (1973) 75

1973SM1A Smith, Sackmann and Despain, Explosive Nucleosynthesis (1973) 168

1973SO07 B. Sorensen, Nucl. Phys. A211 (1973) 565

1973SP1A Sprung, Nucl. Many-Body Problem, 1972, Vol. 2 (1973) 123

1973SR02 K. Srinivasa Rao, Phys. Rev. C7 (1973) 1785

1973SR1B Srivastave and Yadav, Asilomar (1973) Paper 5A7

1973ST1A Stokstad, Proc. Europhys. 1972 Plitvice Lakes Conf. (1973) 179

1973ST1D Strottman and Millener, in Munich, 1 (1973) 107

1973ST1F Stokstad, Symp. on Heavy Ion Transfer Reactions, ANL Phy-1973B, Vol. 1 (1973) 325

1973ST21 M.R. Strayer, W.H. Bassichis and A.K. Kerman, Phys. Rev. C8 (1973) 1269

1973SU1A Sunkel and Wildermuth, in Munich, 1 (1973) 110

1973SU1E Suffert, in Asilomar (1973) 741

1973SY1A Syme and Crawford, Asilomar (1973) Paper 8E3

1973TA1E Talbot, Explosive Nucleosynthesis (1973) 34

1973TA30 K. Takahashi, M. Yamada and T. Kondoh, At. Data Nucl. Data Tables 12 (1973) 101

1973TE02 T. Terasawa, M. Tanifuji and O. Mikoshiba, Nucl. Phys. A203 (1973) 225; Erratum Nucl. Phys. A212 (1973) 628

1973TH1A Thirion, in Munich, 2 (1973) 782

1973TH1B Theissen, in Asilomar (1973) 871

1973TI04 A.I. Titov, Acta Phys. Pol. B4 (1973) 187

1973TO16 L. Tomlinson, At. Data Nucl. Data Tables 12 (1973) 179

1973TR08 R.K. Tripathi, A. Faessler and A.D. MacKellar, Phys. Rev. C8 (1973) 129

1973TR1B Truran, Cosmochemistry; Ed., Cameron (1973) 23

1973TR1C Truran, Space Sci. Rev. 15 (1973) 23

1973TR1E Trimble and Reines, Rev. Mod. Phys. 45 (1973) 1

1973UL1B Ulrich, Explosive Nucleosynthesis (1973) 139

1973VA18 W.T.H. Van Oers and H. Haw, Phys. Lett. B45 (1973) 227

1973VA1D Vallieres, Feng and Ibarra, in Munich, 1 (1973) 415

1973VO1E von Oertzen, Lect. Notes in Phys. 23 (1973) 267

1973VO1H Voit and Helb, Nucl. Phys. A204 (1973) 196

1973VO1J Vogeler and Weigel, in Munich, 1 (1973) 504

1973WA03 W.L. Wang and C.M. Shakin, Phys. Rev. Lett. 30 (1973) 301

1973WA1D Walecka, J. Phys. Soc. Jpn. Suppl. 34 (1973) 302

1973WA1E Wagner, Lect. Notes in Phys. 23 (1973) 16

1973WA35 M.C. Wang, T.Y. Lee, S.T. Shieh and H.C. Chiang, Chin. J. Phys. (Taiwan) 11 (1973) 65

1973WE11 M. Wery, Nucl. Phys. A210 (1973) 329

1973WE14 W.T. Weng, T.T.S. Kuo and G.E. Brown, Phys. Lett. B46 (1973) 329

1973WI15 J. Wilczynski, Phys. Lett. B47 (1973) 124

1973WO1B Woosley, Explosive Nucleosynthesis (1973) 70

1973YA1A Yazaki, Prog. Theor. Phys. 49 (1973) 1205

1973YO1C Youngblood, Nagatani, Kenefick and Bronson, in Munich, 1 (1973) 466

1973ZA03 L. Zamick, Phys. Lett. B45 (1973) 313

1974AD1C S.L. Adler, S. Nussinov and E.A. Paschos, Phys. Rev. D9 (1974) 2125

1974AJ01 F. Ajzenberg-Selove and T. Lauritsen, Nucl. Phys. A227 (1974) 1

1974AL11 D.E. Alburger and D.R. Goosman, Phys. Rev. C10 (1974) 912

1974AL17 V.P. Aleshin, Yad. Fiz. 20 (1974) 407; Sov. J. Nucl. Phys. 20 (1975) 267

1974AL1G Allard et al., Lett. Nuovo Cim. 10 (1974) 841

1974AM01 J. Amato, R.L. Burman, R. Macek, J. Oostens, W. Shlaer, E. Arthur, S. Sobottka and W.C. Lam, Phys. Rev. C9 (1974) 501

1974AR04 A. Arima and S. Yoshida, Nucl. Phys. A219 (1974) 475

1974AR1G Arnett, Astrophys. J. 194 (1974) 373

1974AR24 K.P. Artemov, V.Z. Goldberg, I.P. Petrov, V.P. Rudakov, I.N. Serikov and V.A. Timofeev, Yad. Fiz. 20 (1974) 688; Sov. J. Nucl. Phys. 20 (1975) 368

1974AY01 A.A. Ayad and D.J. Rowe, Nucl. Phys. A218 (1974) 307

1974BA1X Barnes, Kosmos 51 (1974)

1974BA1Z Barrett, Rept. Prog. Phys. 37 (1974) 1

1974BA40 S. Barshay, C.B. Dover and J.P. Vary, Phys. Lett. B51 (1974) 5

1974BA46 G. Baur and H.H. Wolter, Phys. Lett. B51 (1974) 205

1974BE15 R.L. Becker, K.T.R. Davies and M.R. Patterson, Phys. Rev. C9 (1974) 1221

1974BE1J Becker, Joffily, Beccaria and Baron, Nucl. Phys. A221 (1974) 475

1974BE1R Bertojo, Chui and Townes, Science 104 (1974) 619

1974BE22 Y.A. Berezhnoi and A.P. Soznik, Yad. Fiz. 19 (1974) 813; Sov. J. Nucl. Phys. 19 (1974) 414

1974BE32 E. Bellotti, E. Fiorini and P. Negri, Lett. Nuovo Cim. 9 (1974) 251

1974BE41 F.E. Bertrand, R.W. Peelle and C. Kalbach-Cline, Phys. Rev. C10 (1974) 1028

1974BL10 M. Blecher, K. Grotowski, D.K. Anderson, R. Kerns, R. Minehart, K. Ziock, R.W. Bercaw, J.S. Vincent and R. Johnson, Phys. Rev. C10 (1974) 2247

1974BO05 J.D. Bowman, A.M. Poskanzer, R.G. Korteling and G.W. Butler, Phys. Rev. C9 (1974) 836

1974BO13 H.G. Bohlen and W. Norenberg, Phys. Lett. B49 (1974) 227

1974BO1E Bormann, Neuert and Scobel, IAEA, STI/DOC/10/156 (1974) 87

1974BO2D Borie, Chandra and Drechsel, Nucl. Phys. A226 (1974) 58

1974BO31 A. Bouyssy and N. Vinh Mau, Nucl. Phys. A229 (1974) 1

1974BU06 C.E. Busch, T.B. Clegg, S.K. Datta and E.J. Ludwig, Nucl. Phys. A223 (1974) 183

1974BU1A Bulow and Forkman, IAEA, STI/DOC/10/156 (1974) 475

1974BU1E Burkhardt, Zia and Owen, J. Phys. (London) A7 (1974) 1167

1974CA1H T. Cantwell, D.H. Davis, D. Kielczewska, J. Zakrzewski, M. Juric, U. Krecker, G. Coremans-bertrand, J. Sacton, T. Tymieniecka, A. Montwill et al., Nucl. Phys. A236 (1974) 445

1974CA31 E. Casal, A. Garcia and F. Senent, An. Fis. 70 (1974) 18

1974CH1Q Chechik, Stocker, Eyal and Fraenkel, Proc. Conf. Reactions between Complex Nuclei, Vol. 1 (1974) 6

1974CH37 S.H. Chew, J. Lowe, J.M. Nelson and A.R. Barnett, Nucl. Phys. A229 (1974) 241

1974CH58 I.P. Chernov, B.I. Kuznetsov, V.V. Kozyr and V.A. Matusevich, Izv. Akad. Nauk SSSR Ser. Fiz. 38 (1974) 2530; Bull. Acad. Sci. USSR Phys. Ser. 38 (1974) 58

1974CI02 C. Ciofi degli Atti and R. Guardiola, Phys. Lett. B51 (1974) 26

1974CL04 A.S. Clough, G.K. Turner, B.W. Allardyce, C.J. Batty, D.J. Baugh, W.J. McDonald, R.A.J. Riddle, L.H. Watson, M.E. Cage, G.J. Pyle et al., Nucl. Phys. B76 (1974) 15

1974CL1F Close and Malanify, Bull. Amer. Phys. Soc. 19 (1974) 30

1974CO04 M.D. Cooper, W.F. Hornyak and P.G. Roos, Nucl. Phys. A218 (1974) 249

1974CO1L Conlan, Nature 247 (1974) 268

1974CO30 S.A. Coon and H.S. Kohler, Nucl. Phys. A231 (1974) 95

1974DA13 N. Dalkhazhav, G.S. Shabratova, K.D. Tolstov, M.I. Adamovich and V.G. Larionova, Nucl. Phys. A222 (1974) 614

1974DA1J Davies, Bull. Amer. Phys. Soc. 19 (1974) 1023

1974DA22 M. D'Agostino Bruno, I. Massa, A. Uguzzoni, G. Vannini, E. Verondini and A. Vitale, Lett. Nuovo Cim. 9 (1974) 311

1974DA30 M. Danos and H.R. Weller, Phys. Rev. C10 (1974) 2627

1974DE16 P.T. Debevec, H.T. Fortune, R.E. Segel and J.F. Tonn, Phys. Rev. C9 (1974) 2451

1974DE17 G. Delic, Phys. Lett. B49 (1974) 412

1974DE1E De Jager, De Vries and De Vries, At. Data Nucl. Data Tables 14 (1974) 479

1974DIZR A.E.L. Dieperink, Proc. Int. Conf. Nucl. Struct. Spectroscopy, Amsterdam, 1974, Vol. 1 (1974) 33

1974DO03 E.I. Dolinskii, V.V. Turovtsev and R. Yarmukhamedov, Yad. Fiz. 19 (1974) 1003; Sov. J. Nucl. Phys. 19 (1975) 514

1974DO13 G. Do Dang, K. Ramavataram and S. Ramavataram, Nucl. Phys. A231 (1974) 376

1974DO1G Dollhopf, Perdrisat, Kitching and Olsen, Bull. Amer. Phys. Soc. 19 (1974) 43

1974DOZO P. Doll, J.L.C. Ford, M. Goldschmidt, K.T. Knopfle, G. Mairle, S.T. Thornton, G.J. Wagner and C.A. Wiedner, Proc. Int. Conf. Nucl. Struct. Spectroscopy, Amsterdam, 1974, Vol. 1 (1974) 181

1974DU02 T. Dubler, L. Schellenberg, H. Schneuwly, R. Engfer, J.L. Vuilleumier, H.K. Walter, A. Zehnder and B. Fricke, Nucl. Phys. A219 (1974) 29

1974DU06 G. Duhamel, H. Langevin-Joliot, J.P. Didelez, E. Gerlic and J. Van de Wiele, Nucl. Phys. A231 (1974) 349

1974DY02 P. Dyer and C.A. Barnes, Nucl. Phys. A233 (1974) 495

1974DZ03 R.I. Dzhibuti and H.M. Sallam, Yad. Fiz. 19 (1974) 75; Sov. J. Nucl. Phys. 19 (1974) 40

1974DZ05 R.I. Dzhibuti and R.Y. Kezerashvili, Yad. Fiz. 20 (1974) 340; Sov. J. Nucl. Phys. 20 (1975) 181

1974DZ06 R.I. Dzhibuti and R.Y. Kezerashvili, Yad. Fiz. 20 (1974) 33; Sov. J. Nucl. Phys. 20 (1975) 17

1974EL01 P.J. Ellis and E. Osnes, Phys. Lett. B49 (1974) 23

1974EL05 P.J. Ellis and E. Osnes, Phys. Lett. B52 (1974) 31

1974EN10 R. Engfer, H. Schneuwly, J.L. Vuilleumier, H.K. Walter and A. Zehnder, At. Data Nucl. Data Tables 14 (1974) 509

1974EP01 M.B. Epstein, D.J. Margaziotis, N.S.P. King and T.A. Cahill, Phys. Rev. C9 (1974) 581

1974EP1B Epstein et al., Bull. Amer. Phys. Soc. 19 (1974) 453

1974FA1A Faldt, Pilkhun and Schlails, Ann. Phys. 82 (1974) 326

1974FA1B Faessler, Proc. Int. Conf. Nucl. Struct. Spectroscopy, Amsterdam, 1974 (1974) 127

1974FE1E Feshbach and Iachello, Ann. Phys. 84 (1974) 211

1974FI03 M. Fink, M. Gari and H. Hebach, Phys. Lett. B49 (1974) 20

1974FI04 M. Fink, Nucl. Phys. A221 (1974) 163

1974FI13 M. Fink, M. Gari, H. Hebach and J.G. Zabolitzky, Phys. Lett. B51 (1974) 320

1974FL06 E.R. Flynn and J.D. Garrett, Phys. Rev. C10 (1974) 409

1974FL09 D.G. Fleming, A. Arima, H.W. Fulbright and M. Blann, Phys. Rev. C10 (1974) 1350

1974FL1C H. Flocard, Phys. Lett. B49 (1974) 129

1974FR06 H. Friedrich, Nucl. Phys. A224 (1974) 537; Erratum Nucl. Phys. A239 (1975) 531

1974FR12 J.L. Friar and M. Rosen, Ann. Phys. 87 (1974) 289

1974GA1K Gabriel, Santoro, Bertini and Larson, Nucl. Sci. Eng. 53 (1974) 323

1974GA1L Galster, Ischenko, Siller and Voit, Proc. Conf. Reactions between Complex Nuclei, Vol. 1 (1974) 37

1974GA27 Y.K. Gambhir and R.J. McCarthy, Nucl. Phys. A228 (1974) 246

1974GE02 C.K. Gelbke, R. Bock and A. Richter, Phys. Rev. C9 (1974) 852

1974GL05 D. Glas and U. Mosel, Phys. Lett. B49 (1974) 301

1974GO12 V.Z. Goldberg, V.P. Rudakov and V.A. Timofeev, Yad. Fiz. 19 (1974) 503; Sov. J. Nucl. Phys. 19 (1974) 253

1974GO1G Golovanova, Ilin, Neudachin and Smirnov, JETP Lett. 20 (1974) 310

1974GO1L Gobbi, in Nashville, Vol. 2 (1974) 211

1974GO1P P. Goode and M.W. Kirson, Phys. Lett. B51 (1974) 221

1974GO1Q B. Goulard and H. Primakoff, Phys. Rev. C10 (1974) 2034

1974GO37 V.Z. Goldberg, K.A. Gridnev and V.M. Semenov, Izv. Akad. Nauk SSSR Ser. Fiz. 38 (1974) 2524; Bull. Acad. Sci. USSR Phys. Ser. 38 (1974) 52

1974GR03 P. Grange and M.A. Preston, Nucl. Phys. A219 (1974) 266

1974GU21 R. Guardiola and E. Oset, Nucl. Phys. A234 (1974) 458

1974HA01 S.S. Hanna, H.F. Glavish, R. Avida, J.R. Calarco, E. Kuhlmann and R. LaCanna, Phys. Rev. Lett. 32 (1974) 114

1974HA1C Hanna, Proc. Int. Conf. Nucl. Struct. Spectroscopy, Amsterdam, 1974, Vol. 2 (1974) 249

1974HA1G Hanna, Nukelonika (Poland) 19 (1974) 655

1974HA1N Hanna, Private Communication (1974)

1974HA44 M.L. Halbert, C.B. Fulmer, S. Raman, M.J. Saltmarsh, A.H. Snell and P.H. Stelson, Phys. Lett. B51 (1974) 341

1974HO19 H. Horiuchi, Prog. Theor. Phys. 51 (1974) 745

1974HO1E Hollandsworth, Bucher and Youngblood, Bull. Amer. Phys. Soc. 19 (1974) 574

1974HO1J Ho-Kim and Khanna, Ann. Phys. 86 (1974) 233

1974HO1K Hodgson and Tan, Bull. Amer. Phys. Soc. 19 (1974) 992

1974HO1L Hohn, Reif anf Schmidt, Zfk-271 (1974) 155

1974HO20 A. Hotta, K. Itoh and T. Saito, Phys. Rev. Lett. 33 (1974) 790

1974HO30 H. Ho, W. Dunnweber, D. Dehnhard, K. Mudersbach and J.P. Wurm, Nucl. Phys. A233 (1974) 361

1974HU14 J. Hufner, L. Tauscher and C. Wilkin, Nucl. Phys. A231 (1974) 455

1974ITZZ N. Itoh and P.W. Anderson, Proc. Int. Conf. nucl. Struct. Spectroscopy, Amsterdam, 1974, Vol. 1 (1974) 70

1974JA1F Jackson, Prog. in Phys. 37 (1974) 55

1974JA1M James, Morgan, Norton and Fletcher, Bull. Amer. Phys. Soc. 19 (1974) 550

1974JA21 D.R. James, J.L. Artz, M.B. Greenfield and N.R. Fletcher, Nucl. Phys. A227 (1974) 349

1974JA25 N. Jarmie, J.H. Jett and R.J. Semper, Phys. Rev. C10 (1974) 1748

1974JE1A Jelley, Wozniak, Nagarajan and Cerny, Bull. Amer. Phys. Soc. 19 (1974) 431

1974KA1P Kamimura and Matsuse, Prog. Theor. Phys. 51 (1974) 438

1974KH01 S.B. Khadkikar and V.B. Kamble, Nucl. Phys. A225 (1974) 352

1974KH02 V.F. Kharchenko, V.E. Kuzmichev and S.A. Shadchin, Nucl. Phys. A226 (1974) 71

1974KH05 V.F. Kharchenko and V.E. Kuzmichev, Yad. Fiz. 20 (1974) 334; Sov. J. Nucl. Phys. 20 (1975) 178

1974KN06 J. Knoll and R. Schaeffer, Phys. Lett. B52 (1974) 131

1974KO06 S.E. Koonin, T.A. Tombrello and G. Fox, Nucl. Phys. A220 (1974) 221

1974KO1G Kohler and Bethge, Proc. Conf. Reactions between Complex Nuclei, Vol. 1 (1974) 35

1974KO1L Kohler, Becker and Warson, Bull. Amer. Phys. Soc. 19 (1974) 514

1974KO1M T. Kozlowski and A. Zglinski, Phys. Lett. B50 (1974) 222

1974KO1N Kolb, Proc. Conf. Reactions between Complex Nuclei, Vol. 1 (1974) 30

1974KO1P Kohlmeyer et al., Proc. Conf. Reactions between Complex Nuclei, Vol. 1 (1974) 7

1974KO1Q D. Kohler, B.A. Watson and J.A. Becker, Phys. Rev. Lett. 33 (1974) 1628

1974KR22 S. Krewald and J. Speth, Phys. Lett. B52 (1974) 295

1974KR24 S. Krewald, J. Birkholz, A. Faessler and J. Speth, Phys. Rev. Lett. 33 (1974) 1386

1974KRZE N. Krimmelbein, H. Schober and H. Waffler, Proc. Int. Conf. Nucl. Struct. Spectroscopy, Amsterdam, 1974, Vol. 2 (1974) 434

1974KRZO S. Krewald and J. Speth, Proc. Int. Conf. Nucl. Struct. Spectroscopy, Amsterdam, 1974, Vol. 1 (1974) 30

1974KU05 D. Kurath and I.S. Towner, Nucl. Phys. A222 (1974) 1

1974KU15 B.I. Kuznetsov and I.P. Chernov, Yad. Fiz. 20 (1974) 632; Sov. J. Nucl. Phys. 20 (1975) 340

1974KU1E Kubo, Proc. Conf. Reactions between Complex Nuclei, Vol. 1 (1974) 13

1974LA12 W-C. Lam, K. Gotow, B. MacDonald and W.P. Trower, Phys. Rev. C10 (1974) 72

1974LA1F Lawson, Proc. Int. Conf. Nucl. Struct. Spectrosopy., Amsterdam, 1974 (1974) 464

1974LE1H Lee et al., Private Communication (1974)

1974LI15 B.J. Lieb and H.O. Funsten, Phys. Rev. C10 (1974) 1753

1974LI1H V.G. Lind, H.S. Plendl, H.O. Funsten, W.J. Kossler, B.J. Lieb, W.F. Lankford and A.J. Buffa, Phys. Rev. Lett. 32 (1974) 479

1974LO11 M.A.K. Lodhi and B.T. Waak, Phys. Rev. Lett. 33 (1974) 431

1974LO1B Lorenzen and Brune, IAEA, STI/DOC/10/156 (1974) 325

1974LU06 E.J. Ludwig, C.E. Busch, T.B. Clegg, S.K. Datta and A.C. Watkins, Nucl. Phys. A230 (1974) 271

1974LU1D Lucas, Thesis, College of William & Mary (1974)

1974LU1E Lucas, Bull. Amer. Phys. Soc. 19 (1974) 576

1974MA07 V.A. Madsen, J.D. Anderson and V.R. Brown, Phys. Rev. C9 (1974) 1253

1974MA12 J.A. Macdonald, J. Cerny, J.C. Hardy, H.L. Harney, A.D. Bacher and G.R. Plattner, Phys. Rev. C9 (1974) 1694

1974MA1E Maguin, Nuovo Cim. A19 (1974) 638

1974MA1L Malmin, Harris and Paul, Bull. Amer. Phys. Soc. 19 (1974) 46

1974MA1M Masterson et al., Bull. Amer. Phys. Soc. 19 (1974) 15

1974MA1Q Maire, CEA-R-4629 (1974)

1974MA21 C.P. Malta and E.A. Sanderson, Nucl. Phys. A225 (1974) 189

1974MA23 G. Mairle and G.J. Wagner, Phys. Lett. B50 (1974) 252

1974MA40 S.I. Manaenkov, Pisma Zh. Eksp. Teor. Fiz. 19 (1974) 593; JETP Lett. (USSR) 19 (1974) 308

1974MC1F McGrory, Proc. Int. Conf. Nucl. Struct. Spectroscopy, Amsterdam, 1974 (1974) 73

1974MC1G R.J. McCarthy, Phys. Lett. B51 (1974) 123

1974ME08 R.M. Mendez-Moreno, M. Moreno and T.H. Seligman, Nucl. Phys. A221 (1974) 381

1974ME27 A. Menchaca-Rocha, J.C. Cornell, P.S. Fisher, I. Paschopoulos, A.A. Pilt and D. Sinclair, Lett. Nuovo Cim. 11 (1974) 192

1974ME32 G. Meyer-Kretschmer, P.B. Dunscombe, R. Maschuw, P. Suhr and B. Zeitnitz, Nucl. Instrum. Meth. 120 (1974) 469

1974MI03 L.D. Miller, Phys. Rev. C9 (1974) 537

1974MI1F Miljanic, Zabel and Phillips, Bull. Amer. Phys. Soc. 19 (1974) 547

1974MI1H A.B. Migdal, Phys. Lett. B52 (1974) 264

1974MO06 P.J. Moffa and G.E. Walker, Nucl. Phys. A222 (1974) 140

1974MO1E Morovic, Toepffer and Fink, Proc. Conf. Reactions between Complex Nuclei, Vol. 1 (1974) 8

1974MO24 A. Mori, Phys. Lett. B53 (1974) 234

1974MO26 A. Moalem, W. Benenson and G.M. Crawley, Nucl. Phys. A236 (1974) 307

1974MP01 P. Mpanias and M.L. Rustgi, Phys. Rev. C9 (1974) 2261

1974MU1E Mustafa and Malik, Ann. Phys. 83 (1974) 340

1974NA13 G.F. Nash, Nuovo Cim. A19 (1974) 352

1974NE10 K. Neubeck, H. Schober and H. Waffler, Phys. Rev. C10 (1974) 320

1974NE18 V.G. Neudachin, Izv. Akad. Nauk SSSR Ser. Fiz. 38 (1974) 2010; Bull. Acad. Sci. USSR Phys. Ser. 38 (1974) 1

1974NE1J Nemeth, Fiz. Sz. (Hungary) 24 (1974) 144

1974NI1A N.N. Nikolaev and M.Zh. Shmatikov, Phys. Lett. B52 (1974) 293

1974NO03 J.V. Noble, Phys. Rev. C9 (1974) 1209

1974OH01 H. Ohtsubo, T. Nishiyama and M. Kawaguchi, Nucl. Phys. A224 (1974) 164

1974PA11 V.R. Pandharipande, Nucl. Phys. A231 (1974) 257

1974PA16 A.D. Panagiotou, J.C. Cornell, N. Anyas-Weiss, P.N. Hudson, A. Menchaca Rocha, D.K. Scott and B.E.F. Macefield, J. Phys. (London) A7 (1974) 1748

1974PA1E Pardo, Couch and Arnett, Astrophys. J. 191 (1974) 711

1974PA1G Padjen and Rouben, Proc. Int. Conf. Nucl. Struct. Spectroscopy, Amsterdam, 1974 (1974) 14

1974PE1D Petrovich and Robson, Bull. Amer. Phys. Soc. 19 (1974) 453

1974PH1A Phatak and Tabakin, Bull. Amer. Phys. Soc. 19 (1974) 576

1974PH1B Phatak and Tabakin, Bull. Amer. Phys. Soc. 19 (1974) 1000

1974PI02 M.G. Piepho and G.E. Walker, Phys. Rev. C9 (1974) 1352

1974PI05 M. Pignanelli, S. Micheletti, I. Iori, P. Guazzoni, F.G. Resmini and J.L. Escudie, Phys. Rev. C10 (1974) 445

1974PI11 C.F. Pineda, M.L. de Toledo and C. Ruiz Bauza, An. Fis. 70 (1974) 30

1974RA11 J.R. Radin, A.R. Smith and N. Little, Phys. Rev. C9 (1974) 1718

1974RE03 N.E. Reid, N.E. Davison and J.P. Svenne, Phys. Rev. C9 (1974) 1882

1974RO04 H.H. Rossner, G. Hinderer, A. Weidinger and K.A. Eberhard, Nucl. Phys. A218 (1974) 606

1974RO37 C. Rolfs and W.S. Rodney, Nucl. Phys. A235 (1974) 450

1974RO38 B. Rouben, R. Padjen and G. Saunier, Phys. Rev. C10 (1974) 2561

1974SA05 E.A. Sanderson, J.P. Elliott, H.A. Mavromatis and B. Singh, Nucl. Phys. A219 (1974) 190

1974SA1M Satchler, in Nashville, Vol. 2 (1974) 171

1974SC1E Schaeffer, Proc. Int. Conf. Nucl. Struct. Spectroscopy, Amsterdam, 1974, Vol. 2 (1974) 318

1974SC1F Scalo, OAP-352 (1974)

1974SC1J W. Scheid, H. Muller and W. Greiner, Phys. Rev. Lett. 32 (1974) 741

1974SC1K Schurmann, Nucl. Phys. B67 (1974) 425

1974SE1B Serov, Izv. Akad. Nauk SSSR Ser. Fiz. 38 (1974) 84

1974SH01 H.D. Shay, R.E. Peschel, J.M. Long and D.A. Bromley, Phys. Rev. C9 (1974) 76

1974SH10 R.W. Sharp and L. Zamick, Nucl. Phys. A223 (1974) 333

1974SH1E Sher, IAEA, STI/DOC/10/156 (1974) 1

1974SH1J Sharp, Golin and Zamick, Bull. Amer. Phys. Soc. 19 (1974) 59

1974SH1K Shastry, Bull. Amer. Phys. Soc. 19 (1974) 527

1974SH1M Sharp, Thesis, Rutgers State Univ. (1974)

1974SHYR V.S. Shirley and C.M. Lederer, LBL-3450 (1974)

1974SI13 B. Sinha and F. Duggan, Nucl. Phys. A226 (1974) 31

1974SK02 B.M. Skwiersky, C.M. Baglin and P.D. Parker, Phys. Rev. C9 (1974) 910

1974SL01 D.C. Slater, J.R. Hall, J.R. Calarco, B.A. Watson and J.A. Becker, Phys. Rev. Lett. 33 (1974) 784

1974SN02 K.A. Snover, E.G. Adelberger and D.R. Brown, Phys. Rev. Lett. 32 (1974) 1061

1974SO13 M. Sotona and J. Zofka, Phys. Rev. C10 (1974) 2646

1974SO1E Sotona and Zofka, Lett. Nuovo Cim. 9 (1974) 261

1974SP06 H. Spinka and H. Winkler, Nucl. Phys. A233 (1974) 456

1974ST1G G.L. Strobel, Nucl. Phys. A232 (1974) 502

1974ST1L Stokstad, in Nashville, Vol. 2 (1974) 327

1974ST1N Stokstad, Switkowski and Wieland, Bull. Amer. Phys. Soc. 19 (1974) 549

1974SU05 Y. Suzuki and K. Ikeda, Prog. Theor. Phys. 51 (1974) 1621

1974SU1B Suzuki, Prog. Theor. Phys. 52 (1974) 890

1974SZ04 P. Szydlik and C. Werntz, Phys. Lett. B51 (1974) 209

1974TA16 T. Tazawa, Prog. Theor. Phys. 51 (1974) 1764

1974TA18 L. Tauscher and W. Schneider, Z. Phys. 271 (1974) 409

1974TA19 K. Takada and S. Tazaki, Prog. Theor. Phys. 52 (1974) 1205

1974TA1C Takimoto et al., Bull. Inst. Chem. Res. Kyoto Univ. 52 (1974) 240

1974TH01 C. Thibault and R. Klapisch, Phys. Rev. C9 (1974) 793

1974TI04 C. Titin-Schnaider and P. Quentin, Phys. Lett. B49 (1974) 397

1974TR08 R.K. Tripathi, A. Faessler and H. Muther, Phys. Rev. C10 (1974) 2080

1974UL02 H. Ullrich, E.T. Boschitz, H.D. Engelhardt and C.W. Lewis, Phys. Rev. Lett. 33 (1974) 433

1974VA18 R. Vandenbosch, M.P. Webb and M.S. Zisman, Phys. Rev. Lett. 33 (1974) 842

1974VA22 R. Vandenbosch, W.N. Reisdorf and P.H. Lau, Nucl. Phys. A230 (1974) 59

1974VA24 J.H. van der Merwe and C.M. Villet, Phys. Rev. C10 (1974) 1498

1974VE05 G.A. Vershinin and P.A. Cherdantsev, Yad. Fiz. 19 (1974) 1019; Sov. J. Nucl. Phys. 19 (1974) 522

1974VE06 A. Veyssiere, H. Beil, R. Bergere, P. Carlos, A. Lepretre and A. de Miniac, Nucl. Phys. A227 (1974) 513

1974VI1B C.M. Vincent and S.C. Phatak, Phys. Rev. C10 (1974) 391

1974VO12 T. von Egidy and H.P. Povel, Nucl. Phys. A232 (1974) 511

1974WA02 W.L. Wang and R.G. Lipes, Phys. Rev. C9 (1974) 814

1974WA12 W.L. Wang and C.M. Shakin, Phys. Rev. C9 (1974) 2144

1974WA15 C.S. Warke and M.R. Gunye, J. Phys. (London) A7 (1974) 718

1974WA1C Walecka, Proc. Int. Conf. Nucl. Struct. Spectroscopy, Amsterdam, 1974 (1974) 438

1974WA1D W.L. Wang, Phys. Lett. B52 (1974) 143

1974WA1J Wang, Chin. J. Phys. (Taiwan) 12 (1974) 35

1974WE08 M.F. Werby and W. Tobocman, Phys. Rev. C10 (1974) 1022

1974WE09 W.T. Weng, T.T.S. Kuo and K.F. Ratcliff, Phys. Lett. B52 (1974) 5

1974WE14 D.C. Weisser, J.F. Morgan and D.R. Thompson, Nucl. Phys. A235 (1974) 460

1974WE1N Weng, Thesis, State Univ. of New York, Stony Brook (1974)

1974WI05 R. Wieland, R. Stokstad, A. Gobbi, D. Shapira, L. Chua, M.W. Sachs and D.A. Bromley, Phys. Rev. C9 (1974) 1474

1974WI1F Williams and Edmunds, Sci, Prog. 61 (1974) 323

1974WI1N D.H. Wilkinson, Phys. Lett. B48 (1974) 407

1974WO02 S.S.M. Wong, D.J. Rowe and J.C. Parikh, Phys. Lett. B48 (1974) 403

1974YA11 Y. Yamamoto, Prog. Theor. Phys. 52 (1974) 471

1974YU01 T. Yukawa, Phys. Rev. C9 (1974) 864

1974ZA01 J.G. Zabolitzky, Z. Phys. 267 (1974) 161

1974ZA07 J.G. Zabolitzky, Nucl. Phys. A228 (1974) 272

1974ZAZW L. Zamick, Proc. Int. Conf. Nucl. Struct. Spectroscopy, Amsterdam, 1974, Vol. 2 (1974) 24

1974ZE04 N.S. Zelenskaya, I.M. Il'in and E.A. Romanovskii, Izv. Akad. Nauk SSSR Ser. Fiz. 38 (1974) 855; Bull. Acad. Sci. USSR Phys. Ser. 38 (1974) 169

1974ZU1A Zuker, Proc. Int. Conf. Nucl. Struct. Spectroscopy, Amsterdam. 1974 (1974) 115

1975AB04 Y. Abgrall and E. Caurier, Phys. Lett. B56 (1975) 229

1975AH06 J. Ahrens, H. Borchert, K.H. Czock, H.B. Eppler, H. Gimm, H. Gundrum, M. Kroning, P. Riehn, G. Sita Ram, A. Zieger et al., Nucl. Phys. A251 (1975) 479

1975AJ02 F. Ajzenberg-Selove, Nucl. Phys. A248 (1975) 1

1975AL04 R. Albrecht, W. Dunnweber, G. Graw, H. Ho, S.G. Steadman and J.P. Wurm, Phys. Rev. Lett. 34 (1975) 1400

1975AL19 J.M. Alexander, H. Delagrange and A. Fleury, Phys. Rev. C12 (1975) 149

1975AN1F Ando, Ikeda and Suzuki, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 227

1975AN1N Antonov, Bulg. J. Phys. 2 (1975) 287

1975AR02 E.D. Arthur, W.C. Lam, J. Amato, D. Axen, R.L. Burman, P. Fessenden, R. Macek, J. Oostens, W. Shlaer, S. Sobottka et al., Phys. Rev. C11 (1975) 332

1975AR14 A.G. Artyukh, V.V. Volkov, G.F. Gridnev and V.L. Mikheev, Izv. Akad. Nauk SSSR Ser. Fiz. 39 (1975) 2; Bull. Acad. Sci. USSR Phys. Ser. 39 (1975) 1

1975AR17 O. Artun, Y. Cassagnou, R. Legrain, N. Lisbona, L. Roussel, J.P. Alard, A. Baldit, J.P. Costilhes, J. Fargeix, G. Roche et al., Phys. Rev. Lett. 35 (1975) 773

1975AR1J Arima, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 38

1975AR20 K.P. Artemov, V.Z. Goldberg, I.P. Petrov, V.P. Rudakov, I.N. Serikov and V.A. Timofeev, Yad. Fiz. 21 (1975) 1157; Sov. J. Nucl. Phys. 21 (1976) 596

1975AR30 A. Arima, P. Manakos and D. Strottman, Phys. Lett. B60 (1975) 1

1975AS02 J. Asher, J.R. Beene, M.A. Grace, W.L. Randolph and D.F.H. Start, J. Phys. (London) G1 (1975) 415

1975AU01 G. Audi, C. Detraz, M. Langevin and F. Pougheon, Nucl. Phys. A237 (1975) 300

1975AU11 N. Auerbach and A. Yeverechyahu, Ann. Phys. 95 (1975) 35

1975AU1D Audouze, Lequeux and Vigroux, Astron. Astrophys. 43 (1975) 71

1975AV02 M. Avril, M. Lepareux, N. Saunier, A. Foti, G. Pappalardo and A. Strazzeri, J. Phys. Lett. 36 (1975) L229

1975BA05 S. Barshay, C.B. Dover and J.P. Vary, Phys. Rev. C11 (1975) 360

1975BA16 C. Bargholtz, Nucl. Phys. A243 (1975) 449

1975BA1H Balashov, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 281

1975BA1L Batty, Czech. J. Phys. 25 (1975) 286

1975BA2D Barket, Ann. Rev. Astron. Astrophys. 13 (1975) 45

1975BA40 Y.A. Batusov, S.A. Bunyatov, L. Vizireva, G.R. Gulkanyan, F. Mirsalikhova, V.M. Sidorov and K. Chernev, Yad. Fiz. 21 (1975) 1215; Sov. J. Nucl. Phys. 21 (1975) 627

1975BA61 G. Baur, F. Rosel and D. Trautmann, Nucl. Phys. A252 (1975) 77

1975BE01 F.D. Becchetti, L.T. Chua, J. Janecke and A.M. Vander Molen, Phys. Rev. Lett. 34 (1975) 225

1975BE05 M. Beiner, H. Flocard, N. Van Giai and P. Quentin, Nucl. Phys. A238 (1975) 29

1975BE1F Berman and Fultz, Rev. Mod. Phys. 47 (1975) 713

1975BE1G Bertozzi, AIP Conf. Proc. 26 (1975) 409

1975BE1R Beer, Astrophys. J. 200 (1975) L167

1975BE1T Bertozzi, Bull. Amer. Phys. Soc. 20 (1975) 708

1975BE1U Beranger, David, Garcia and Lucas, Rev. Phys. Appliquee 10 (1975) 87

1975BE2E Bertsch and Tsai, Phys. Rept. C18 (1975) 125

1975BE31 M. Beiner, R.J. Lombard and D. Mas, Nucl. Phys. A249 (1975) 1

1975BE48 R.L. Becker and J.P. Svenne, Phys. Rev. C12 (1975) 2067

1975BE60 B.L. Berman, At. Data Nucl. Data Tables 15 (1975) 319

1975BI1H Billen, Bull. Amer. Phys. Soc. 20 (1975) 1181

1975BO1P Borovlev, Slabospitskii abd Chegoryan, Izv. Akad. Nauk SSSR Ser. Fiz. 39 (1975) 2176

1975BO1T Boehm, AIP Conf. Proc. 26 (1975) 41

1975BO1U G.C. Bonazzola, T. Bressani, E. Chiavassa, G. Dellacasa, A. Fainberg, M. Gallio, N. Mirfakhrai, A. Musso and G. Rinaudo, Phys. Rev. Lett. 34 (1975) 683

1975BO1V A. Bottino, G. Ciocchetti and C.W. Kim, Phys. Rev. C11 (1975) 991

1975BR06 F. Brochard, P. Chevallier, D. Disdier, V. Rauch and F. Scheibling, J. Phys. (Paris) 36 (1975) 113

1975BR13 D.M. Brink and F. Stancu, Nucl. Phys. A243 (1975) 175

1975BR1F Brown, At. Data Nucl. Data Tables 15 (1975) 111

1975BR1P Brink, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 3

1975BU03 B. Buck, C.B. Dover and J.P. Vary, Phys. Rev. C11 (1975) 1803

1975BU1A Bugg, Few-Body Problems, Quebec, 1974 (1975) 267

1975BU1B Buck et al., Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 429

1975BU1F Buenerd, ISN 75-24 (1975)

1975BU1H Burnett, Goldberg and Tombrello, Bull. Amer. Phys. Soc. 20 (1975) 32

1975CA1N P.J. Camillo, P.M. Fishbane and J.S. Trefil, Phys. Rev. Lett. 34 (1975) 622

1975CA1T Calarco, Bull. Amer. Phys. Soc. 20 (1975) 81

1975CE1D Cecil et al., Bull. Amer. Phys. Soc. 20 (1975) 1180

1975CH08 P.A. Cherdantsev, I.P. Chernov and G.A. Vershinin, Phys. Lett. B55 (1975) 137

1975CH18 L.A. Charlton, Phys. Rev. C12 (1975) 351

1975CH1Q Chua, Becchetti, Janecke and Milder, Bull. Amer. Phys. Soc. 20 (1975) 716

1975CH22 P. Christillin, A. Dellafiore and M. Rosa-Clot, Phys. Rev. C12 (1975) 691

1975CH30 S.H. Chew and J. Lowe, Nucl. Phys. A252 (1975) 8

1975CL1D Clark, Arnold, Mercer and Ravenhall, Bull. Amer. Phys. Soc. 20 (1975) 1192

1975CO12 S.R. Cotanch, Phys. Lett. B57 (1975) 123

1975CO1C Cowley and Heymann, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 323

1975CO1E Cork, AIP Conf. Proc. 26 (1975) 598

1975CO1N Cossairt et al., Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 411

1975CR02 D.J. Crozier and H.T. Fortune, Phys. Rev. C11 (1975) 308

1975CR05 G.B. Crinean, G.M. Hudson, L.W.J. Wild and B.M. Spicer, Nucl. Phys. A244 (1975) 77

1975CU1B Cusson and Hilko, Bull. Amer. Phys. Soc. 20 (1975) 67

1975DA10 M. D'Agostino Bruno, I. Massa, A. Uguzzoni, G. Vannini, E. Verondini and A. Vitale, Nuovo Cim. A27 (1975) 1

1975DA1G Daub, Astrophys. J. 200 (1975) 82

1975DE02 H.H. Deubler and T. Fliessbach, Nucl. Phys. A238 (1975) 409

1975DE1L T. DeForest, Jr. and J.L. Friar, Phys. Lett. B58 (1975) 397

1975DI04 H. Dirim, J.P. Elliott and J.A. Evans, Nucl. Phys. A244 (1975) 301

1975DO06 H. Doubre, E. Plagnol, J.C. Roynette, J.M. Loiseaux, P. Martin and P. de Saintignon, J. Phys. Lett. (Paris) 36 (1975) 113

1975DO10 T.W. Donnelly, J. Dubach and W.C. Haxton, Nucl. Phys. A251 (1975) 353

1975DO1D Donnelly and Walecka, Ann. Rev. Nucl. Sci 25 (1975) 329

1975DO1F Donnelly, AIP Conf. Proc. 26 (1975) 454

1975DR01 J.P. Draayer, Nucl. Phys. A237 (1975) 157

1975DU16 E.I. Dubovoi, Izv. Akad. Nauk SSSR Ser. Fiz. 39 (1975) 2193; Bull. Acad. Sci. USSR Phys. Ser. 39 (1975) 160

1975DU1A Dubnicka and Dumbrajs, Phys. Rept. 19 (1975) 141

1975DZ04 R.I. Dzhibuti and R.Y. Kezerashvili, Yad. Fiz. 22 (1975) 975; Sov. J. Nucl. Phys. 22 (1976) 508

1975EB03 K.A. Eberhard, E. Mathiak, J. Stettmeier, W. Trombik, A. Weidinger, L.N. Wustefeld and K.G. Bernhardt, Phys. Lett. B56 (1975) 445

1975EN01 Y.M. Engel, D.M. Brink, K. Goeke, S.J. Krieger and D. Vautherin, Nucl. Phys. A249 (1975) 215

1975EN1A Endal, Astrophys. J. 195 (1975) 187

1975EN1D Engelhardt, Lewis, Ullrich and Boschtiz, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 352

1975FA1D G. Faldt and L. Gislen, Nucl. Phys. A254 (1975) 341

1975FA1H C.Y. Fan, G. Gloeckler and D. Hovestadt, Phys. Rev. Lett. 34 (1975) 495

1975FE1A Feather, Commun. Roy. Soc. Edinburgh (Phys. Sci.) 2 (1975) 19

1975FI1E Fick, Huther, Killian and Niewisch, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 201

1975FL02 H. Flocard and D. Vautherin, Phys. Lett. B55 (1975) 259

1975FL1B Fliessbach, Z. Phys. 272 (1975) 39

1975FO02 H.T. Fortune, L.R. Medsker, J.N. Bishop and S.C. Headley, Phys. Rev. C11 (1975) 304

1975FO06 M. Forterre, J. Gerber, J.P. Vivien, M.B. Goldberg, K.-H. Speidel and P.N. Tandon, Phys. Rev. C11 (1975) 1976

1975FO10 H.T. Fortune and L.R. Medsker, Phys. Rev. C12 (1975) 1364

1975FO19 W.A. Fowler, G.R. Caughlan and B.A. Zimmerman, Ann. Rev. Astron. Astrophys. 13 (1975) 69

1975FR06 W. Fritsch, R. Lipperheide and U. Wille, Nucl. Phys. A241 (1975) 79

1975FU01 C.B. Fulmer and D.A. Goldberg, Phys. Rev. C11 (1975) 50

1975FU05 K. Fujii, J. Schimizu, K. Takimoto, I. Yamane and J. Muto, J. Phys. Soc. Jpn. 38 (1975) 1563

1975FU10 R.C. Fuller, Phys. Rev. C12 (1975) 1561

1975FU1F Fulcher and Mukhopadhyay, Nuovo Cim. A28 (1975) 487

1975GE05 H.V. Geramb and P.E. Hodgson, Nucl. Phys. A246 (1975) 173

1975GE1E Gershtein, Folomeshkin, Khlopov and Eramzhyan, Yad. Fiz. 22 (1975) 157

1975GI13 Y.R. Gismatullin, I.A. Lantsev and V.I. Ostroumov, Yad. Fiz. 22 (1975) 1073; Sov. J. Nucl. Phys. 22 (1976) 559

1975GI1C Gillet, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 23

1975GI1H B. Giraud and B. Grammaticos, Nucl. Phys. A255 (1975) 141

1975GO15 V.Z. Goldberg, V.P. Rudakov and V.A. Timofeev, Yad. Fiz. 21 (1975) 1001; Sov. J. Nucl. Phys. 21 (1975) 513

1975GO19 M. Golin and L. Zamick, Nucl. Phys. A249 (1975) 320

1975GO1L Goodman, Bertrand, Kocher and Auble, Bull. Amer. Phys. Soc. 20 (1975) 1156.

1975GO1T Goldberg, Burnett, Furst and Tombrello, Bull. Amer. Phys. Soc. 20 (1975) 32

1975GO1W Gogny and Maire, Conf. on Hartree-Fock and Self Consistent Field Theories in Nuclei, Trieste (1975)

1975GO22 M. Golin and L. Zamick, Nucl. Phys. A251 (1975) 129

1975GR13 D.E. Greiner, P.J. Lindstrom, H.H. Heckman, B. Cork and F.S. Bieser, Phys. Rev. Lett. 35 (1975) 152

1975GR1N Graves, Lunnon and Goswami, Bull. Amer. Phys. Soc. 20 (1975) 629

1975GR41 K.A. Gridnev and A.A. Ogloblin, Fiz. Elem. Chastits At. Yad. (USSR) 6 (1975) 393; Sov. J. Part. Nucl. 6 (1976) 158

1975HA1X Harris et al., Bull. Amer. Phys. Soc. 20 (1975) 1175

1975HA1Y Hammann, Desgrolard and Chetouani, Nuovo Cim. A29 (1975) 199

1975HA30 H. Hahn, Z. Phys. A274 (1975) 59

1975HE06 A.T. Hess and J.M. Eisenberg, Nucl. Phys. A241 (1975) 493

1975HE10 K.T. Hecht and D. Braunschweig, Nucl. Phys. A244 (1975) 365

1975HI02 H.R. Hiddleston, J.A. Aymar and S.E. Darden, Nucl. Phys. A242 (1975) 323

1975HI1C Hirsch et al., Bull. Amer. Phys. Soc. 20 (1975) 567

1975HO06 V. Horsfjord, Phys. Lett. B56 (1975) 9

1975HO20 V. Horsfjord, Nucl. Phys. A253 (1975) 216

1975HS01 S.T. Hsieh, K.T. Knopfle, G. Mairle and G.J. Wagner, Nucl. Phys. A243 (1975) 380

1975HU1D Hufner, Phys. Rept. C21 (1975) 1

1975IA02 F. Iazzi, B. Minetti and T. Bressani, Lett. Nuovo Cim. 12 (1975) 199

1975IB01 R.H. Ibarra, M. Vallieres and D.H. Feng, Nucl. Phys. A241 (1975) 386

1975IB1A Ibragimov and Kocharov, Izv. Akad. Nauk SSSR Ser. Fiz. 39 (1975) 287

1975IG1A Igo, AIP Conf. Proc. 26 (1975) 63

1975IK1A Ikeda and Suzuki, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 543

1975IM04 B. Imanishi, H. Onishi and O. Tanimura, Phys. Lett. B57 (1975) 309

1975IN04 E.V. Inopin, V.S. Kinchakov, V.K. Lukyanov and Y.S. Pol, Izv. Akad. Nauk SSSR Ser. Fiz. 39 (1975) 55; Bull. Acad. Sci. USSR Phys. Ser. 39 (1975) 46

1975JA1A Jaros et al., Bull. Amer. Phys. Soc. 20 (1975) 666

1975JA1F Jaschek and Jaschek, Astron. Astrophys. 36 (1975) 401

1975JE02 N.A. Jelley, J. Cerny, D.P. Stahel and K.H. Wilcox, Phys. Rev. C11 (1975) 2049

1975JO04 R.G. Johnson, J.D. Irish and K.G. McNeill, Can. J. Phys. 53 (1975) 1434

1975KA1G Karol, Yester, Klobuchar and Caretto, Phys. Lett. B58 (1975) 489

1975KA1N Kato and Bando, Prog. Theor. Phys. 53 (1975) 692

1975KA24 D. Kalinsky, D. Melnik, U. Smilansky, N. Trautner, B.A. Watson, Y. Horowitz, S. Mordechai, G. Baur and D. Pelte, Nucl. Phys. A250 (1975) 364

1975KA2D Kallne, Bull. Amer. Phys. Soc. 20 (1975) 1166

1975KE1A Kerridge, Science 188 (1975) 162

1975KH01 K.M. Khanna and P.K. Barhai, Nucl. Phys. A243 (1975) 298

1975KH1C S.B. Khadkikar and S.C.K. Nair, Phys. Lett. B57 (1975) 225

1975KI01 Z. Kirzon and A. Dar, Nucl. Phys. A237 (1975) 319

1975KL1A Klapdor et al., Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 425

1975KN05 K.T. Knopfle, G.J. Wagner, H. Breuer, M. Rogge and C. Mayer-Boricke, Phys. Rev. Lett. 35 (1975) 779

1975KO1C Kohler, Phys. Rept. C18 (1975) 217

1975KO1F Kozodaeva et al., Yad. Fiz. 22 (1975) 730

1975KO25 V.F. Kosmach, A.G. Martirosova and V.I. Ostroumov, Yad. Fiz. 22 (1975) 453; Sov. J. Nucl. Phys. 22 (1976) 233

1975KO28 Y. Kondo, S. Nagata, S. Ohkubo and O. Tanimura, Prog. Theor. Phys. 53 (1975) 1006

1975KR02 S. Krewald, J.E. Galonska and A. Faessler, Phys. Lett. B55 (1975) 267

1975KR1D Krasnopol'sky and Kukjlin, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 157
1975KR1H E.M. Krenciglowa and T.T.S. Kuo, Nucl. Phys. A240 (1975) 195
1975KU01 D. Kurath and D.J. Millener, Nucl. Phys. A238 (1975) 269
1975KU09 V.I. Kukulin, V.G. Neudatchin and Y.F. Smirnov, Nucl. Phys. A245 (1975) 429
1975KU1N Kukulin and Krasnopol'sky, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 77
1975LA1E Lavrukhina, Izv. Akad. Nauk SSSR Ser. Fiz. 39 (1975) 395
1975LA1G Lamers, Graves, Uberall and Ertel, Bull. Amer. Phys. Soc. 20 (1975) 567
1975LA1J Lanford, Trautvetter and Ziegler, Bull. Amer. Phys. Soc. 20 (1975) 1169
1975LE05 G. Leander and S.E. Larsson, Nucl. Phys. A239 (1975) 93
1975LE07 K. Lezuo, Z. Naturforsch. A30 (1975) 158
1975LE14 K.J. Lezuo, Z. Naturforsch. A30 (1975) 1018
1975LE1L Lee and Papanastassiou, Bull. Amer. Phys. Soc. 20 (1975) 32
1975LI06 B.J. Lieb, H.S. Plendl, H.O. Funsten, W.J. Kossler and C.E. Stronach, Phys. Rev. Lett. 34 (1975) 965
1975LO05 G.D. Lougheed and S.S.M. Wong, Nucl. Phys. A246 (1975) 29
1975LO1B Lodhi and Amburgev, Bull. Amer. Phys. Soc. 20 (1975) 1185
1975MA10 N. Mankoc-Borstnik, M.V. Mihailovic and M. Rosina, Nucl. Phys. A239 (1975) 321
1975MA18 S.I. Manaenkov, Yad. Fiz. 21 (1975) 101; Sov. J. Nucl. Phys. 21 (1975) 51
1975MA1M Maslennikova and Tret'yakova, Yad. Fiz. 22 (1975) 687
1975MA2A Mavis, Glavish and Slater, Bull. Amer. Phys. Soc. 20 (1975) 12
1975MA2B Malfliet, Lect. Notes in Phys. 33 (1975) 86
1975MA2C Malmin and Paul, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 540
1975MA2D R. Machleidt, H. Muther and A. Faessler, Nucl. Phys. A241 (1975) 18
1975MA33 R. Machleidt, K. Holinde and J. Nemeth, Nucl. Phys. A251 (1975) 93
1975MA50 P.R. Marwadi and C.S. Shastry, Indian J. Pure Appl. Phys. 13 (1975) 169
1975MC03 R.J. McCarthy and G.E. Walker, Phys. Rev. C11 (1975) 383
1975MC1H B.H.J. McKellar, Nucl. Phys. A254 (1975) 349
1975MC1L J.B. McGrory and B.H. Wildenthal, Phys. Lett. B60 (1975) 5
1975ME1E Meneguzzi and Reeves, Astron. Astrophys. 40 (1975) 91, 99
1975ME1F Medina et al., Nuovo Cim. A28 (1975) 297
1975MI01 S. Micheletti, M. Pignanelli and P. Guazzoni, Phys. Rev. C11 (1975) 64

1975MI02 M.V. Mihailovic and M. Rosina, Nucl. Phys. A237 (1975) 221

1975MI03 M.V. Mihailovic and M. Rosina, Nucl. Phys. A237 (1975) 229

1975MI08 H. Miska, H.D. Graf, A. Richter, R. Schneider, D. Schull, E. Spamer, H. Theissen, O. Titze and T. Walcher, Phys. Lett. B58 (1975) 155

1975MI12 D.J. Millener and D. Kurath, Nucl. Phys. A255 (1975) 315

1975MI13 H. Miska, H.D. Graf, A. Richter, D. Schull, E. Spamer and O. Titze, Phys. Lett. B59 (1975) 441

1975MI1N Miller, Ann. Phys. 91 (1975) 40

1975MO04 J.M. Moss, C.M. Rozsa, D.H. Youngblood, J.D. Bronson and A.D. Bacher, Phys. Rev. Lett. 34 (1975) 748

1975MO10 K. Mohring, R. Lipperheide and B.J. Cole, Nucl. Phys. A243 (1975) 365

1975MO23 P.J. Moffa, J.P. Vary, C.B. Dover, C.W. Towsley, R.G. Hanus and K. Nagatani, Phys. Rev. Lett. 35 (1975) 992

1975MO31 T. Motobayashi, I. Yamane, Y. Nogami, N. Takahashi, M. Hara, K. Sagara, M. Katoh, H. Yamashita and B. Imanishi, Phys. Lett. B59 (1975) 421

1975MP01 P. Mpanias and M.L. Rustgi, Phys. Rev. C12 (1975) 2072

1975MU06 G.S. Mutchler, C.R. Fletcher, L.V. Coulson, D. Mann, N.D. Gabitzsch, G.C. Phillips, B.W. Mayes, E.V. Hungerford, L.Y. Lee, C. Goodman et al., Phys. Rev. C11 (1975) 1873

1975NA15 K.G. Nair, H. Voit, C.W. Towsley, M. Hamm, J.D. Bronson and K. Nagatani, Phys. Rev. C12 (1975) 1575

1975NA1K Nagl, Graves and Uberall, Bull. Amer. Phys. Soc. 20 (1975) 689

1975NA1L Nair et al., Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 423

1975NA21 Y.V. Naumov and O.E. Kraft, Fiz. Elem. Chastits At. Yad. (USSR) 6 (1975) 892; Sov. J. Part. Nucl. 6 (1976) 361

1975NE1D J.W. Negele and D. Vautherin, Phys. Rev. C11 (1975) 1031

1975NG1A Nguyen, Czech. J. Phys. 25 (1975) 1119

1975OS1B Oset, Lett. Nuovo Cim. 13 (1975) 327

1975OT01 T. Otsubo, I. Asada and F. Shinoki, Nucl. Instrum. Meth. 124 (1975) 325

1975PA01 L. Palffy, J.P. Deutsch, L. Grenacs, J. Lehmann and M. Steels, Phys. Rev. Lett. 34 (1975) 212

1975PA11 G.L. Payne and R.R. Carlson, Phys. Rev. C12 (1975) 1260

1975PA1L Padjen, Rouben, Gogny and Pires, Conf. on Hartree-Fock and Self Consistent Field Theories in Nuclei, Trieste (1975)

1975PA1M Parker and Zyskind, Bull. Amer. Phys. Soc. 20 (1975) 1487

1975PE03 D.G. Perkin, A.M. Kobos and J.R. Rook, Nucl. Phys. A245 (1975) 343

1975PE07 A.K. Petrauskas, G.P. Kamuntavichyus, L.Y. Sabalyauskas and K.I. Yankauskas, Yad. Fiz. 22 (1975) 77; Sov. J. Nucl. Phys. 22 (1976) 37

1975PE1E Peimbert, Ann. Rev. Astron. Astrophys. 13 (1975) 113

1975PH02 R.J. Philpott, Phys. Rev. C12 (1975)1540

1975PI1C Pilt et al., Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 415

1975PO08 V.A. Poyarkov, G.A. Prokopets and V.I. Strizhak, Yad. Fiz. 21 (1975) 468; Sov. J. Nucl. Phys. 21 (1975) 245

1975PO10 J.E. Poth, M.W. Sachs and D.A. Bromley, Nuovo Cim. A28 (1975) 215

1975PO1C Povh, AIP Conf. Proc. 26 (1975) 173

1975PU02 F. Puhlhofer, W. Pfeffer, B. Kohlmeyer and W.F.W. Schneider, Nucl. Phys. A244 (1975) 329

1975RA01 K. Ramavataram, C.L. Rao and S. Ramavataram, Phys. Rev. C11 (1975) 450

1975RA02 C.L. Rao, K. Ramavataram and S. Ramavataram, Phys. Lett. B55 (1975) 13

1975RA12 G.M. Raisbeck and F. Yiou, Phys. Rev. Lett. 35 (1975) 155

1975RA1M Ramaty, Bull. Amer. Phys. Soc. 20 (1975) 680

1975RA1R Rao and Devanathan, Can. J. Phys. 53 (1975) 1292

1975RA1T Rao, Can. J. Phys. 53 (1975) 1299

1975RA33 L. Ray, G. Westfall, S.A.A. Zaidi and W.R. Coker, Phys. Lett. B59 (1975) 427

1975RE08 L.P. Remsberg and D.G. Perry, Phys. Rev. Lett. 35 (1975) 361

1975RE15 W.N. Reisdorf, P.H. Lau and R. Vandenbosch, Nucl. Phys. A253 (1975) 490

1975RE17 K.E. Rehm, H.J. Korner, M. Richter, H.P. Rother, J.P. Schiffer and H. Spieler, Phys. Rev. C12 (1975) 1945

1975RO11 R. Rockmore, Phys. Rev. C11 (1975) 1953

1975RO1B Roos and Chant, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 242, 265

1975RO23 R. Rosenfelder, Z. Phys. A274 (1975) 267

1975RO26 B. Rouben, R. Padjen, D. Gogny and P. Pires, Can. J. Phys. 53 (1975) 2261

1975RO31 I. Rotter, H.W. Barz, R. Wunsch and J. Hohn, Fiz. Elem. Chastits At. Yad. (USSR) 6 (1975) 435; Sov. J. Part. Nucl. 6 (1976) 175

1975RY1A Ryter, Cesarsky and Ajdouze, Astrophys. J. 198 (1975) 103

1975SA08 A.A. Sadovoi and Y.A. Simonov, Yad. Fiz. 22 (1975) 65; Sov. J. Nucl. Phys. 22 (1975) 31

1975SA1D Sanchez, Casanova and Casanova, An. Fis. 71 (1975) 119

1975SA1G Savushkin, Vestnik Leningrad Univ., Fiz. Kyimiya 3 (1975) 41

1975SC05 H. Schier and B. Schoch, Lett. Nuovo Cim. 12 (1975) 334

1975SC18 W. Schutz, Z. Phys. A273 (1975) 69

1975SC1H J.M. Scalo, K.H. Despain and R.K. Ulrich, Astrophys. J. 196 (1975) 805

1975SC1M J.P. Schiffer and H.J. Lipkin, Phys. Rev. Lett. 35 (1975) 708

1975SC1R Scalo and Ulrich, OAP-391 (1975)

1975SC1T B. Schurmann, Nucl. Phys. A240 (1975) 521

1975SC1W Scalo and Ross, OAP-424 (1975)

1975SC2C Scott, Lect. Notes in Phys. 33 (1975) 165

1975SC35 W.F.W. Schneider, B. Kohlmeyer, F. Puhlhofer and R. Bock, Nucl. Phys. A251 (1975) 331

1975SE09 H. Segawa, K.-I. Kubo and A. Arima, Phys. Rev. Lett. 35 (1975) 357

1975SH07 S. Shlomo and G. Bertsch, Nucl. Phys. A243 (1975) 507

1975SH18 E.B. Shera, Phys. Rev. C12 (1975) 1003

1975SH1K Sherman, Hendrie and Zisman, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 319

1975SH21 R.W. Sharp, Jr., Phys. Lett. B59 (1975) 4

1975SH24 D. Shapira, R.G. Stokstad, M.W. Sachs, A. Gobbi and D.A. Bromley, Phys. Rev. C12 (1975) 1907

1975SI09 B. Sinha, Phys. Rev. C11 (1975) 1546

1975SI1H Sick, AIP Conf. Proc. 26 (1975) 388

1975SK06 D.M. Skopik, Y.M. Shin and J.J. Murphy, II, Can. J. Phys. 53 (1975) 1398

1975SM01 R. Smith and K. Amos, Phys. Lett. B55 (1975) 162

1975SM02 L.G. Smith and A.H. Wapstra, Phys. Rev. C11 (1975) 1392

1975SN1B Snover and Ebisawa, Bull. Amer. Phys. Soc. 20 (1975) 629

1975SN1C Snover, Bull. Amer. Phys. Soc. 20 (1975) 1186

1975SO04 B. Sommer, J.E. Galonska and A. Faessler, Nucl. Phys. A241 (1975) 1

1975SO07 M. Sotona and J. Zofka, Phys. Lett. B57 (1975) 27

1975SP04 J. Spuller, M.D. Hasinoff, S.T. Lim, D.F. Measday and T.J. Mulligan, Nucl. Phys. A248 (1975) 276

1975SP08 D.W.L. Sprung, M. Vallieres, X. Campi and C.-M. Ko, Nucl. Phys. A253 (1975) 1

1975ST1K Steigman, Astrophys. J. 199 (1975) 336

1975SU1B Sugimoto and Monoto, Pub. Astron. Soc. Jpn. 27 (1975) 197

1975SU1C Sunkel and Wildermuth, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 156

1975SU1F Suzuki, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 73

1975SW1A Switkowski, Wieland, Barnes and Winther, Bull. Amer. Phys. Soc. 20 (1975) 68

1975SW1B Switkowski and Dayras, Nucl. Instrum. Meth. 128 (1975) 9

1975TA02 T. Takemasa, Phys. Lett. B55 (1975) 28

1975TA1C Tauscher, AIP Conf. Proc. 26 (1975) 541

1975TA1G Tassoul, Astrophys. J. 202 (1975) 755

1975TA1K Takada and Tazaki, Clustering Phenom. in Nucl., II, ORO-4856-26 (1975) 75

1975TH03 D.R. Thompson and Y.C. Tang, Phys. Rev. C11 (1975) 1473; Erratum Phys. Rev. C13 (1976) 2597

1975TO1D Tohsaki, Tanabe and Tamagaki, Prog. Theor. Phys. 53 (1975) 1022

1975TO1E Toepffer, Lect. Notes in Phys. 33 (1975) 15

1975TR1A Trimble, Rev. Mod. Phys. 47 (1975) 877

1975TU02 I.M. Turkiewicz, J. Delaunay and J.P. Fouan, Acta Phys. Pol. B6 (1975) 123

1975VA01 A. Vander Molen, F.D. Becchetti, J. Janecke and L. Chua, Phys. Rev. C11 (1975) 734

1975VA1F Vander Molen, Thesis, Univ. of Michigan (1975)

1975VE05 J.D. Vergadosk, Phys. Rev. C12 (1975) 1278

1975VE12 G.A. Vershinin, P.A. Cherdantsev and I.P. Chernov, Yad. Fiz. 22 (1975) 1150; Sov. J. Nucl. Phys. 22 (1976) 599

1975VL1A Vlasov, Sov. J. At. Energy 39 (1975) 690

1975VO09 V.V. Volkov, Fiz. Elem. Chastits At. Yad. (USSR) 6 (1975) 1040; Sov. J. Part. Nucl. 6 (1976) 420

1975VO1B Von Oertzen and Bohlen, Phys. Rept. 19 (1975) 1

1975WA20 B.A. Watson, T.T. Bardin, J.A. Becker and T.R. Fisher, Phys. Rev. Let. 35 (1975) 1333

1975WA33 W. Wadia, M. Khaled and H. Hegab, Atomkernenergie 26 (1975) 269

1975WE1C Weng, Bull. Amer. Phys. Soc. 20 (1975) 600

1975WO1E Wolter, Lect. Notes in Phys. 33 (1975) 140

1975YA02 Y.-Y. Yam, Phys. Rev. C11 (1975) 73

1975ZA07 L. Zamick, Nucl. Phys. A249 (1975) 63

1975ZE1C Zeller et al., Bull. Amer. Phys. Soc. 20 (1975) 718

1975ZI1C Zisman, Vandenbosch and Webb, Bull. Amer. Phys. Soc. 20 (1975) 718

1976AJ02 F. Ajzenberg-Selove, R.R. Betts and D.J. Crozier, Phys. Rev. C14 (1976) 357

1976AJ04 F. Ajzenberg-Selove, Nucl. Phys. A268 (1976) 1

1976AL02 D.E. Alburger and D.H. Wilkinson, Phys. Rev. C13 (1976) 835

1976AL16 D.E. Alburger, Nucl. Instrum. Meth.136 (1976) 323

1976AL1L Alder et al., Meson-Nucl. Phys., 1976 (1976) 628

1976AR02 J.L. Artz, M.B. Greenfield and N.R. Fletcher, Phys. Rev. C13 (1976) 156

1976AR1F Arnould, Polarization, Zurich, 1975 (1976) 503

1976AR1H Arnould and Howard, Bull. Amer. Phys. Soc. 21 (1976) 588

1976AS1B Aslanides, Meson-Nucl. Phys., 1976 (1976) 204

1976AU1F Austin, Bull. Amer. Phys. Soc. 21 (1976) 507

1976BA07 D. Baye and G. Reidemeister, Nucl. Phys. A258 (1976) 157

1976BA08 R. Babinet, L.G. Moretto, J. Galin, R. Jared, J. Moulton and S.G. Thompson, Nucl. Phys. A258 (1976) 172

1976BA1G Bassalleck et al., Meson-Nucl. Phys., 1976 (1976) 272

1976BA1N Baz, Goldberg, Gridnev and Semenov, Contrib. to Dubna Conf. on Selected Topics in Nucl. Struct., Vol. 1, JINR D-9682 (1976) 96

1976BAYO D.P. Balamuth, C.M. Fou, L. Mulligan, K.C. Young, Jr. and R.W. Zurmuhle, Bull. Amer. Phys. Soc. 21 (1976) 1005, ED3

1976BE1G Berlovich, Izv. Akad. Nauk SSSR Ser. Fiz. 40 (1976) 756

1976BE45 J. Berger, J. Duflo, L. Goldzahl, F. Plouin, J. Oostens, M. Van Den Bossche, L. Vu Hai, G. Bizard, C. Le Brun, F.L. Fabbri et al., Phys. Rev. Lett. 37 (1976) 1195

1976BL03 J.P. Blaizot, Phys. Lett. B60 (1976) 435

1976BL08 J.P. Blaizot, D. Gogny and B. Grammaticos, Nucl. Phys. A265 (1976) 315

1976BO1Y A. Boinghoff, H. Husken and A. Weiguny, Phys. Lett. B61 (1976) 9

1976BO1Z P. Bonche, S. Koonin and J.W. Negele, Phys. Rev. C13 (1976) 1226

1976BO2A Bouyssy, Meson-Nucl. Phys., 1976 (1976) 538

1976BO2B O. Bohigas, J. Martorell and A.M. Lane, Phys. Lett. B64 (1976) 1

1976BR05 D.M. Brink and R. Leonardi, Nucl. Phys. A258 (1976) 285

1976BR07 F. Brochard, P. Chevallier, D. Disdier, V. Rauch, G. Rudolf and F. Scheibling, Phys. Rev. C13 (1976) 967

1976BR1V Brack, Chu and Jennings, Contrib. to Dubna Conf. on Selected Topics in Nucl. Struct., Vol. 1, JINR D-9682 (1976) 13

1976BU15 M. Buenerd, P. Martin, P. de Saintignon and J.M. Loiseaux, Phys. Rev. C14 (1976) 1316

1976BU1B Burov and Lukyanov, Contrib. to Dubna Conf. on Selected Topics in Nucl. Struct., Vol. 1, JINR-9682 (1976) 154

1976BUZH J.E. Bussoletti, K.A. Snover, K. Ebisawa, T.A. Trainor, H.E. Swanson, E.G. Adelberger and R. Helmer, Bull. Amer. Phys. Soc. 21 (1976) 996, DD2

1976BY1A Byrd et al., Bull. Amer. Phys. Soc. 21 (1976) 637

1976BY1B Byrd et al., Polarization, Zurich, 1975 (1976) 501

1976CA1H Cammarata and Donnelly, Meson-Nucl. Phys., 1976 (1976) 618

1976CE1F Cecil and Shepard, Bull. Amer. Phys. Soc. 21 (1976) 514

1976CEZX F.E. Cecil, P.D. Kunz, R.J. Peterson and J.R. Shepard, Bull. Amer. Phys. Soc. 21 (1976) 515, AF17

1976CH12 N. Chirapatpimol, J.C. Fong, M.M. Gazzaly, G. Igo, A.D. Liberman, R.J. Ridge, S.L. Verbeck, C.A. Whitten, Jr., D.G. Kovar, V. Perez-Mendez et al., Nucl. Phys. A264 (1976) 379

1976CH13 P. Charles, F. Auger, I. Badawy, B. Berthier, M. Dost, J. Gastebois, B. Fernandez, S.M. Lee and E. Plagnol, Phys. Lett. B62 (1976) 289

1976CH1W Cheon, Meson-Nucl. Phys., 1976 (1976) 188

1976CH1X Christiansen and Switkowski, LAP-155 (1976)

1976CH1Y Christiansen, Switkowski and Dayras, LAP-156 (1976)

1976CO01 S.R. Cotanch and C.M. Vincent, Phys. Rev. Lett. 36 (1976) 21

1976CO13 M.D. Cooper and M.B. Johnson, Nucl. Phys. A260 (1976) 352

1976CO23 M.E. Cobern, D.J. Pisano and P.D. Parker, Phys. Rev. C14 (1976) 491

1976CO27 H.T. Coelho, F.A.B. Coutinho and A.F.R. de Toledo Piza, Phys. Rev. C14 (1976) 1280

1976CU01 R.Y. Cusson, R.K. Smith and J.A. Maruhn, Phys. Rev. Lett. 36 (1976) 1166

1976CU04 B. Cujec and C.A. Barnes, Nucl. Phys. A266 (1976) 461

1976CU06 R.Y. Cusson, H.P. Trivedi, H.W. Meldner, M.W. Weiss and R.E. Wright, Phys. Rev. C14 (1976) 1615

1976DA1D R.H. Dalitz and A. Gal, Phys. Rev. Lett. 36 (1976) 362; Erratum Phys. Rev. Lett. 36 (1976) 628

1976DAZH N.E. Davison and F. Vosniakos, Bull. Amer. Phys. Soc. 21 (1976) 789, CA10

1976DE12 R. de Swiniarski, F.G. Resmini, D.L. Hendrie and A.D. Bacher, Nucl. Phys. A261 (1976) 111

1976DO04 G. Do Dang, K.W. Schmid, R.M. Dreizler and H.G. Miller, Phys. Lett. B62 (1976) 1

1976DO1D Dover, Meson-Nucl. Phys., 1976 (1976) 249

1976DW1A Dwyer and Meyer, Bull. Amer. Phys. Soc. 21 (1976) 540

1976DYZY S.A. Dytman, J.F. Amann, P.D. Barnes, J.N. Craig, K.G.R. Doss, R.A. Eisenstein, J.D. Sherman, W.R. Wharton, R.J. Peterson, G. Burleson et al., Bull. Amer. Phys. Soc. 21 (1976) 998, DE3

1976EA1A Earwacker and Walker, Lowell Conf., CONF-760715-P2 (1976)

1976EB01 K.A. Eberhard and K.G. Bernhardt, Phys. Rev. C13 (1976) 440

1976EC1B Economou and Turkevich, Nucl. Instrum. Meth. 134 (1976) 391

1976EG02 R. Eggers, M.N. Namboodiri, P. Gonthier, K. Geoffroy and J.B. Natowitz, Phys. Rev. Lett. 37 (1976) 324

1976EI1A Eisenstein and Tabakin, Meson-Nucl. Phys., 1976 (1976) 534

1976EN02 H.D. Engelhardt, C.W. Lewis and H. Ullrich, Nucl. Phys. A258 (1976) 480

1976EP1A Epsteain, Arnett and Schramm, Astrophys. J. Suppl. 31 (1976) 111

1976EY01 Y. Eyal, M. Beckerman, R. Chechik, Z. Fraenkel and H. Stocker, Phys. Rev. C13 (1976) 1527

1976FA08 A. Faessler, H. Muther, R. Machleidt and D. Schutte, Nucl. Phys. A262 (1976) 389

1976FEZT H. Feldmeier, K.T.R. Davies, V. Maruhn-Rezwani, S.E. Koonin, S.J. Krieger and J.W. Negele, Bull. Amer. Phys. Soc. 21 (1976) 511, AE6

1976FI03 P. Fintz, G. Guillaume, F. Jundt, I. Ordonez, A. Gallmann and D.E. Alburger, Nucl. Phys. A259 (1976) 493

1976FI06 D.J.S. Findlay and R.O. Owens, Phys. Rev. Lett. 37 (1976) 674

1976FI1E Fisher et al., Atstrophys. J. 205 (1976) 938

1976FI1F Fick, Bull. Amer. Phys. Soc. 21 (1976) 531

1976FL05 N.R. Fletcher, J.D. Fox, G.J. Kekelis, G.R. Morgan and G.A. Norton, Phys. Rev. C13 (1976) 1173

1976FL09 H. Flocard and D. Vautherin, Nucl. Phys. A264 (1976) 197

1976FO11 V.N. Folomeshkin, S.S. Gershtein, M.Y. Khlopov, M. Gmitro, R.A. Eramzhyan and L.A. Tosunjan, Nucl. Phys. A267 (1976) 395

1976FU1D Fujimoto, Nomoto and Sugimoto, Pub. Astron. Soc. Jpn. 28 (1976) 89

1976GA1C Gal, Meson-Nucl. Phys., 1976 (1976) 694

1976GA1K Gadioli, Gadioli Erba and Iori, Lett. Nuovo Cim. 15 (1976) 83

1976GAYV D.I. Garber and R.R. Kinsey, BNL 325, 3rd Edition, Vol. 2 (1976)

1976GI1C Ginzburg and Ptjskin, Rev. Mod. Phys. 48 (1976) 161

1976GL08 N.K. Glendenning and G. Wolschin, Nucl. Phys. A269 (1975) 223

1976GL1D Glukhov et al., Contrib. to Dubna Conf. on Selected Topics in Nucl. Struct., Vol. 1, JINR D-9682 (1976) 97

1976GL1E Glavish, Polarization, Zurich, 1975 (1976) 317

1976GO12 G.-H. Goritz and U. Mosel, Z. Phys. A277 (1976) 243

1976GO17 K. Goeke, Nucl. Phys. A265 (1976) 301

1976GO1E N.F. Golovanova, I.M. Il'in, V.G. Neudatchin, Yu.F. Smirnov and Yu.M. Tchuvilsky, Nucl. Phys. A262 (1976) 444

1976GO1Q Golovanova, Neudachin and Ibraeva, Contrib. to Dubna Conf. on Selected Topics in Nucl. Struct., Vol. 1, JINR D-9682 (1976) 163

1976GO1R Gorbatov, Contrib. to Dubna Conf. on Selected Topics in Nucl. Struct., Vol. 1, JINR D-9682 (1976) 7

1976GR1J Gray and Thompson, Nature 262 (1976) 481

1976GU01 M.K. Gupta and G.E. Walker, Nucl. Phys. A256 (1976) 444

1976HA19 M.N. Harakeh, J.R. Comfort and A. van der Woude, Phys. Lett. B62 (1976) 155; Erratum Phys.Lett. B76 (1978) 663

1976HA27 M.N. Harakeh, A.R. Arends, M.J.A. de Voigt, A.G. Drentje, S.Y. van der Werf and A. van der Woude, Nucl. Phys. A265 (1976) 189; Erratum Nucl. Phys. A280 (1977) 500

1976HE12 H. Hebach, A. Wortbert and M. Gari, Nucl. Phys. A267 (1976) 425

1976HE1H H.H. Heckman and P.J. Lindstrom, Phys. Rev. Lett. 37 (1976) 56

1976HI05 M.D. High and B. Cujec, Nucl. Phys. A259 (1976) 513

1976HO12 T. Hoshino and A. Arima, Phys. Rev. Lett. 37 (1976) 266

1976HO1L K. Holinde and R. Machleidt, Nucl. Phys. A256 (1976) 497

1976HU07 H.M. Hussein and O. Zohni, Nucl. Phys. A267 (1976) 303

1976HU1H Humblet, Dyer and Zimmerman, OAP-436 (1976)

1976IM01 B. Imanishi and B.-I. Kubo, Phys. Rev. Lett. 36 (1976) 132

1976JA03 G. Jacob, T.A.J. Maris, C. Schneider and M.R. Teodoro, Nucl. Phys. A257 (1976) 517

1976JA04 N.P. Jacob, Jr. and S.S. Markowitz, Phys. Rev. C13 (1976) 754

1976JA1F H.R. Jaqaman and A.Z. Mekjian, Nucl. Phys. A259 (1976) 157

1976JA1R Jakobsson, Kullberg and Otterlund, Lett. Nuovo Cim. 15 (1976) 444

1976JAZV J. Janecke, F.D. Becchetti, F. Milder and C.E. Thorn, Bull. Amer. Phys. Soc. 21 (1976) 554, DE8

1976JO1C Johnson and Cooper, Meson-Nucl. Phys., 1976 (1976) 276

1976KA02 P.A. Kazaks and J.A. Smith, Phys. Rev. C13 (1976) 283

1976KA04 T. Kammuri, Nucl. Phys. A259 (1976) 343

1976KA09 N.M. Kabachnik and V.N. Razuvaev, Phys. Lett. B61 (1976) 420

1976KA1N Kalish, Hass, Brennan and King, Bull. Amer. Phys. Soc. 21 (1976) 681

1976KA1Q N.M. Kabachnik and V.N. Razuvaev, Izv. Akad. Nauk SSSR Ser. Fiz. 40 (1976) 173

1976KA34 N.M. Kabachnik and V.N. Razuvaev, Izv. Akad. Nauk SSSR Ser. Fiz. 40 (1976) 177; Bull. Acad. Sci. USSR Phys. Ser. 40 (1976) 148

1976KI01 M.W. Kirson, Nucl. Phys. A257 (1976) 58

1976KI1D King et al., Lowell Conf., CONF-760715-P2 (1976) 1344

1976KI1E Kilian, Meson-Nucl. Phys., 1976 (1976) 497

1976KN02 W. Knupfer and M.G. Huber, Z. Phys. A276 (1976) 99

1976KO09 S.E. Koonin, Phys. Lett. B61 (1976) 227

1976KR14 S. Krewald, R. Rosenfelder, J.E. Galonska and A. Faessler, Nucl. Phys. A269 (1976) 112

1976KUZX S. Kubono, T.K. Li, D. Dehnhard, J.L. Artz, J.F. Peterson, D.A. Lewis and B.F. Bayman, Bull. Amer. Phys. Soc. 21 (1976) 578, EE2

1976LA1J Lanford, Bull. Amer. Phys. Soc. 21 (1976) 551

1976LAZV J.B. Langworthy, B.A. Lamers and H. Uberall, Bull. Amer. Phys. Soc. 21 (1976) 519, AH12

1976LE16 D. Lebrun, G. Perrin, P. Martin, P. de Saintignon, J. Arvieux, M. Buenerd, H.V. Geramb and K.A. Amos, Nucl. Phys. A265 (1976) 291

1976LE19 M. LeMere, Y.C. Tang and D.R. Thompson, Phys. Lett. B63 (1976) 1

1976LE1K Lebedev et al., Contrib. to Dubna Conf. on Slected Topics in Nucl. Struct., Vol. 1, JINR D-9682 (1976) 98

1976LE1U Lemere, Thompson and Tang, Bull. Amer. Phys. Soc. 21 (1976) 560

1976LE20 M. LeMere, Y.C. Tang and D.R. Thompson, Phys. Rev. C14 (1976) 23

1976LI14 K.F. Liu and G.E. Brown, Nucl. Phys. A265 (1976) 385

1976LI1R Lisowski et al., Polarization, Zurich, 1975 (1976) 653

1976LO01 B.A. Logan and A. Ljubicic, Phys. Rev. C13 (1976) 361

1976LU1A Ludwig, Clegg, Ikossi and Jacobs, Polarization, Zurich, 1975 (1976) 687

1976MA04 F. Malaguti and P.E. Hodgson, Nucl. Phys. A257 (1976) 37

1976MA12 E. Mathiak, K.A. Eberhard, J.G. Cramer, H.H. Rossner, J. Stettmeier and A. Weidinger, Nucl. Phys. A259 (1976) 129

1976MA1D Martins, Tavares, Terranova and Di Napoli, Nucl. Instrum. Meth. 131 (1976) 569

1976MA2E Matthews, Bull. Amer. Phys. Soc. 21 (1976) 79

1976MA2F J. Martorell, O. Bohigas, S. Fallieros and A.M. Lane, Phys. Lett. B60 (1976) 313

1976MA2G Mavis, Glavish and Slater, Polarization, Zurich, 1975 (1976) 749

1976MA62 J.B. Martins, O.A.P. Tavares, M.L. Terranova and V. di Napoli, Lett. Nuovo Cim. 15 (1976) 364

1976MAYT D. Malbrough, R.D. Edge, C.W. Darden, T. Marks, B.M. Preedom, F. Bertrand, E.E. Gross, C.A. Ludemann, M.J. Saltmarsh, R.L. Burman et al., Bull. Amer. Phys. Soc. 21 (1976) 983, CB6

1976MCZX A.B. McDonald, T.K. Alexander, J.R. Beene, J.C. Hardy, K.P. Jackson and H.B. Mak, Bull. Amer. Phys. Soc. 21 (1976) 515, AF16

1976ME1H Mewaldt, Stone, Vidor and Vogt, Astrophys. J. 205 (1976) 931

1976MI10 G.A. Miller, Phys. Rev. C14 (1976) 361

1976MO03 T. Motobayashi, I. Kohno, K. Katori, M. Yoshie, T. Ohi and H. Kamitsubo, Phys. Rev. Lett. 36 (1976) 390

1976MO1M Moniz, Meson-Nucl. Phys., 1976 (1976) 105

1976MO1N Moniz, Bull. Amer. Phys. Soc. 21 (1976) 1001

1976MOZD H.P. Morsch, W. Benenson, E. Kashy, D. Mueller and H. Nann, Bull. Amer. Phys. Soc. 21 (1976) 997, DD12

1976NA05 P. Nagel and R.D. Koshel, Phys. Rev. C13 (1976) 907

1976NA10 J. Navarro, Phys. Lett. B62 (1976) 22

1976NA11 M.N. Namboodiri, E.T. Chulick and J.B. Natowitz, Nucl. Phys. A263 (1976) 491

1976NI1D Nixon, Londergan and Walker, Bull. Amer. Phys. Soc. 21 (1976) 67

1976NI1E K. J. Nield, T. Bowen, G. D. Cable, D. A. DeLise, E. W. Jenkins, R. M. Kalbach, R. C. Noggle, and A. E. Pifer, Phys. Rev. C13 (1976) 1263

1976NO02 J.A. Nolen, Jr. and S.M. Austin, Phys. Rev. C13 (1976) 1773

1976NO1F Nordberg, Nilsson, Conde and Stromberg, Lowell Conf., CONF-760715-P2 (1976) 1318

1976OH03 M. Ohta, Prog. Theor. Phys. 55 (1976) 1782

1976OS03 P. Osland and A.K. Rej, Phys. Rev. C13 (1976) 2421

1976OS1E Osmer, Astrophys. J. 202 (1976) 352

1976OS1F Osman, Nuovo Cim. A31 (1976) 487

1976OT02 T. Otsubo, I. Asada, M. Takeda, M. Tsuda and Y. Oda, Nucl. Phys. A259 (1976) 452

1976PA03 K.-H. Passler, Nucl. Phys. A257 (1976) 253

1976PA14 R. Padjen and B. Rouben, Can. J. Phys. 54 (1976) 1854

1976PA1J Partridge, Tang, Thompson and Brown, Private Communication (1976)

1976PA1K Pasechnik, Egoshin, Saltykov and Chirko, Polarization, Zurich, 1975 (1976) 667

1976PE03 G.H. Pepper and L. Brown, Nucl. Phys. A260 (1976) 163

1976PE1H Pepper, Brown and Arnold, Polarization, Zurich, 1975 (1976) 589

1976PO02 J.E. Poling, E. Norbeck and R.R. Carlson, Phys. Rev. C13 (1976) 648

1976QU1B Quentin, Cargese Conf., CERN 76-13 (1976) 124

1976RA1J Randle, Green and Earwaker, Lowell Conf., CONF-760715-P2 (1976) 1269

1976RA1M Radomski and Riska, Meson-Nucl. Phys., 1976 (1976) 175

1976RE04 H. Rebel, Z. Phys. A277 (1976) 35

1976RO1J Ross and Aller, Science 191 (1976) 1223

1976SA16 R. Sartor, Nucl. Phys. A267 (1976) 29

1976SA1P Sapershtein and Troitskii, Izv. Akad. Nauk SSSR Ser. Fiz. 40 (1976) 103

1976SA1R V. Satyan and J.C. Parikh, Phys. Rev. C14 (1976) 1198

1976SAZC K.A. Sage and R.Y. Cusson, Bull. Amer. Phys. Soc. 21 (1976) 973, BB3

1976SAZE S.J. Sanders, L. Martz and P.D. Parker, Bull. Amer. Phys. Soc. 21 (1976) 965, AC2

1976SAZS K.A. Sage and R.Y. Cusson, Bull. Amer. Phys. Soc. 21 (1976) 512, AE9

1976SC03 R.R. Scheerbaum, Nucl. Phys. A257 (1976) 77

1976SC05 R.R. Scheerbaum, Phys. Lett. B61 (1976) 151

1976SC1G Schulte, Kamykowski, Pacawer and Stauber, Bull. Amer. Phys. Soc. 21 (1976) 109

1976SC1M Schramm and Norman, Cargese Conf., CERN 76-13 (1976) 570

1976SC36 J.P. Schiffer and W.W. True, Rev. Mod. Phys. 48 (1976) 191

1976SI14 B. Singh, A. Faessler and H. Muther, Nucl. Phys. A269 (1976) 189

1976SP01 P. Sperr, W. Henning and J.R. Erskine, Phys. Rev. C13 (1976) 447

1976SP03 P. Sperr, S. Vigdor, Y. Eisen, W. Henning, D.G. Kovar, T.R. Ophel and B. Zeidman, Phys. Rev. Lett. 36 (1976) 405

1976ST12 R.G. Stokstad, Z.E. Switkowski, R.A. Dayras and R.M. Wieland, Phys. Rev. Lett. 37 (1976) 888

1976SU03 P.R. Subramanian, R. Parthasarathy and V. Devanathan, Nucl. Phys. A262 (1976) 433

1976SU10 Y. Suzuki, Prog. Theor. Phys. 55 (1976) 1751

1976TR1A Truol, Meson-Nucl. Phys., 1976 (1976) 581

1976VA1C Van Giai, Meson-Nucl. Phys., 1976 (1976) 507

1976VA1K Vagradov and Gareev, Contrib. to Dubna Conf. on Selected Topics in Nucl. Struct., Vol. 1, JINR D-9682 (1976) 11

1976VO1C Voinova, INDC(CCP)-93/N (1976)

1976WA1P Wall, Craig and Ezrow, ORO 4856-45 (1976)

1976WA1R Walker, Meson-Nucl. Phys., 1976 (1976) 674

1976WAZS G.J. Wagner, K.T. Knopfle, G. Mairle, J.L.C. Ford, Jr. and S.T. Thornton, Bull. Amer. Phys. Soc. 21 (1976) 514, AF12

1976WE01 H.R. Weller, R.A. Blue, S.E. Darden and W.A. Yoh, Phys. Rev. C13 (1976) 38

1976WE04 A. Weidinger, K.A. Eberhard, E. Mathiak, J. Stettmeier, W. Trombik and L.N. Wustefeld, Nucl. Phys. A257 (1976) 144

1976WE05 M.P. Webb, R. Vandenbosch, K.A. Eberhard, K.G. Bernhardt and M.S. Zisman, Phys. Rev. Lett. 36 (1976) 779

1976WE10 W. Weiss, P. Egelhof, K.D. Hildenbrand, D. Kassen, M. Makowska-Rzeszutko, D. Fick, H. Ebinghaus, E. Steffens, A. Amakawa and K.I. Kubo, Phys. Lett. B61 (1976) 237

1976WE1P Weng, Kuo and Brown, Meson-Nucl. Phys., 1976 (1976) 187

1976WE21 G.D. Westfall and S.A.A. Zaidi, Phys. Rev. C14 (1976) 610

1976YA08 H.L. Yadav and H.V. Geramb, Phys. Rev. C14 (1976) 1369

1976YO01 H. Yoshida, Nucl. Phys. A257 (1976) 348

1976YO02 D.H. Youngblood, J.M. Moss, C.M. Rozsa, J.D. Bronson, A.D. Bacher and D.R. Brown, Phys. Rev. C13 (1976) 994

1976ZA07 J.G. Zabolitzky, Phys. Rev. C14 (1976) 1207

1976ZA1F Zamick, Bull. Amer. Phys. Soc. 21 (1976) 48

1976ZI01 Zint and Mosel, Phys. Rev. C14 (1976) 1488

1978AJ03 F. Ajzenberg-Selove, Nucl. Phys. A300 (1978) 1

1978EN06 P.M. Endt and C. van der Leun, Nucl. Phys. A310 (1978) 96