

$^{16}\text{O}(\pi^+, \pi^-)$  **1997Fo09**

Type	Author	Citation	Literature Cutoff Date
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- 1977Ho13:** The differential cross sections for  $E_{\text{mean}}(\pi^+)=145$  MeV bombardment of a  $3.18$  g/cm<sup>2</sup> thick gelatin disk, 99.76% enriched in  $^{16}\text{O}$ , were measured at  $0^\circ$  at the Los Alamos Meson Physics Facility. The momentum acceptance was  $\Delta p/p=\pm 5\%$  and the solid angle was  $\Delta\Omega=7.2$  msr. An array of plastic scintillator and Cerenkov counters were used to identify particles based on  $E-\Delta E$ . Time-of-flight, measured relative to the accelerator Rf, provided another means of particle identification. The width of peak was 5 MeV (FWHM). The differential cross section for the  $^{16}\text{O}(\pi^+, \pi^-)^{16}\text{Ne}$  reaction at  $0^\circ$  was  $0.87$   $\mu\text{b/sr}$  21 with measurement efficiency of 43%. The measured mass excess of  $^{16}\text{Ne}$  is 24.4 MeV 5, in agreement with theoretical predictions.
- 1978Bu09:**  $^{16}\text{O}(\pi^+, \pi^-)$ ,  $E=145$  MeV; measured  $\sigma$ .  $^{16}\text{Ne}$  deduced mass excess. The differential cross section at  $0^\circ$  for this reaction is  $0.87$   $\mu\text{b/sr}$  21. The ratio of the ground-state transitions near 140 MeV is  $\sigma(^{18}\text{O})/\sigma(^{16}\text{O})=2.3$  7.
- 1980Bu15:**  $^{16}\text{O}(\pi^+, \pi^-)$ ,  $E=180$  MeV; measured  $\sigma(\theta)$ ,  $Q$ .  $^{16}\text{Ne}$  deduced masses. Isobaric multiplet mass equation analysis.
- 1980Mi05:**  $^{16}\text{O}(\pi^+, \pi^-)$ ,  $E=240$  MeV; measured  $\sigma(E(\pi^-), \theta(\pi^-))$ ; deduced reaction mechanism. Cross sections were measured at  $\theta_{\text{lab}}=50^\circ, 85^\circ$  and  $130^\circ$  with an uncertainty  $\pm 5^\circ$ . The integrated cross section is 5.8 mb 9.
- 1981GrZS:**  $^{16}\text{O}(\pi^+, \pi^-)$ ,  $E=100-290$  MeV; measured  $\sigma(\theta, E)$ ; deduced reaction mechanism, structure effects.
- 1982Bi20:**  $^{16}\text{O}(\pi^+, \pi^-)$ ,  $E=100-292$  MeV; measured  $\sigma(E)$ .  $^{16}\text{Ne}$  deduced non-analog transition, isobar component width. Breit-Wigner analysis, two amplitude model. Data for the reaction  $^{16}\text{O}(\pi^+, \pi^-)^{16}\text{Ne}_{\text{g.s.}}$  at  $\theta_{\text{lab}}=5^\circ$  as a function of  $E_\pi$  are well fitted with a Breit-Wigner resonance at 169 MeV 4 with a width of 66 MeV 6.
- 1982Gr02:**  $^{16}\text{O}(\pi^+, \pi^-)^{16}\text{Ne}_{\text{g.s.}}$ ,  $E=80-292$  MeV; measured  $\sigma(\theta)$  vs  $E$ ; deduced direct double analog, two-step non-analog amplitude interference.
- 1982Mo12:**  $^{16}\text{O}(\pi^+, \pi^-)$ ,  $E=164$  MeV; measured  $\sigma(E(\pi^-))$  at  $\theta=5^\circ$ ; deduced mass dependence,  $A^{-4/3}$  of  $\sigma$ , isobar components in wave function.
- 1983Gr07:**  $^{16}\text{O}(\pi^+, \pi^-)$ ,  $E=164$  MeV; measured  $\sigma(\theta)$ . Diffractive scattering.  $^{16}\text{Ne}$  deduced non-analog transition characteristics. Eikonal fit.
- 1984Gi05:**  $^{16}\text{O}(\pi^+, \pi^-)$ ,  $E=164$  MeV; measured  $\sigma(\theta)$ . Diffractive scattering. Deduced non-analog double charge exchange reaction mechanism characteristics. Damped Bessel function fit.  $^{16}\text{O}(\pi^+, \pi^-)^{16}\text{Ne}_{\text{g.s.}}$  at  $\theta_{\text{lab}}=5^\circ$  as a function of  $E_\pi$  are well fitted (except the 292 MeV point) with a Breit-Wigner resonance at 171 MeV with a width of 75 MeV.
- 1989Gr06:**  $^{16}\text{O}(\pi^+, \pi^-)$ ,  $E=180, 240$  MeV; measured total reaction  $\sigma$ . Phenomenological model.
- 1990Se11:**  $^{16}\text{O}(\pi^+, \pi^-)$ ,  $E=100-300$  MeV; measured  $\sigma(\theta)$  vs  $E$ . Cross sections of  $^{16}\text{O}(\pi^+, \pi^-)^{16}\text{Ne}_{\text{g.s.}}$  at  $\theta=5^\circ$  were measured.
- 1993Be18:**  $^{16}\text{O}(\pi^+, \pi^-)^{16}\text{Ne}_{\text{g.s.}}$ ,  $E=100-300$  MeV; measured  $\sigma(\theta)$  vs  $E$ .
- 1993Be34:**  $^{16}\text{O}(\pi^+, \pi^-)^{16}\text{Ne}_{\text{g.s.}}$ ,  $E=300-500$  MeV; measured  $\sigma(\theta)$  vs  $E$ ; deduced reaction mechanism.
- 1997Fo09:** A beam of  $E_\pi=45-90$  MeV pions impinged on a 4-15 mm thick, target purified water, which was contained in an aluminium frame between thin polyethylene foils, at the Paul Scherrer Institute. Measurements were performed at  $\theta_{\text{lab}}=17^\circ, 30^\circ, 45^\circ$  and  $65^\circ$  using the Low Energy Pion Spectrometer (LEPS) setup at the  $\pi\text{E3}$  channel. The cross sections of the ground state transitions were measured. The transition to the state  $^{16}\text{Ne}^*(2.1 \text{ MeV}; J^\pi=0^+)$  was also observed, which is interpreted as the quadruple isobaric analog state of  $^{16}\text{C}^*(3.03 \text{ MeV}; J^\pi=0^+)$ .
- 2000Dr19:**  $^{16}\text{O}(\pi^+, \pi^-)$ ,  $E=30-90$  MeV; measured  $\sigma(E, \theta)$ ; deduced energy and mass dependence features. Comparisons with theoretical calculations, dibaryon hypothesis.
- See also (1982BIZZ, 1982GrZV, 1982GrZZ, 1984GiZY) and (1977Le16, 1979Hu02, 1981Ma23, 1985Gi01, 1985Gi06, 1986Ch39, 1986Fo03, 1986Gi13, 1987Ka39, 1988Ma27, 1989Vi01, 1989Wi20, 1993Gi03, 1995Ka49, 1998Bi01, 2002Wu07, 2003Wu09: theory).

 $^{16}\text{Ne}$  Levels

T: From (1997Fo09).

$E(\text{level})^\dagger$	$J^\pi^\dagger$	Comments
$0^\ddagger$	$0^+$	$T=2$ $T_z=-2$ , see (1980Bu15). $Q_0=-28.785$ MeV 45 (1980Bu15), which implies $\Delta M=24.051$ MeV 45; analysis of the IMME indicates $d=2.5$

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 ${}^{16}\text{O}(\pi^+, \pi^-)$  **1997Fo09 (continued)**

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 ${}^{16}\text{Ne}$  Levels (continued)

<u>E(level)<sup>†</sup></u>	<u>J<sup>π</sup></u>	<u>Comments</u>
$2.1 \times 10^3 \ddagger$	2 0 <sup>+</sup>	keV 37 (1980Bu15; see also (1981SeZR)). See also $\Delta M=24.4$ MeV 5 (1977Ho13, 1978Bu09). T=2 See also (2000Dr19).

<sup>†</sup> From (1997Fo09).

<sup>‡</sup> See also (1980Mi05, 1982Bl20, 1982Gr02, 1983Gr07, 1984Gi05, 1993Be18, 1993Be34, 1997Fo09, 2000Dr19).