^{9}Be(^{17}Ne,^{16}Ne) 2010Mu12,2015Br11

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	G. C. Sheu, J. H. Kelley	ENSDF	27-Jan-2020

2008Mu13: XUNDL dataset compiled by McMaster University, 2008.

Two-proton radioactive decay of ^{16}Ne to ^{14}O was observed in the reactions of a 410 MeV/nucleon ^{17}Ne secondary beam on a ^{9}Be target. the ^{17}Ne beam was produced by fragmenting a ^{24}Mg beam at the GSI SIS facility. The ^{17}Ne+^{9}Be reaction products were detected with four large area silicon strip detectors. The momenta of ^{14}O fragments and correlated two protons from ^{16}Ne were analyzed along with the p+^{14}O angular correlations.

The two-proton decay process comprises simultaneous emission of 2 protons from $^{16}Ne_{g.s.}$ to ^{14}O and sequential decay from excited states of ^{16}Ne via $^{15}F_{g.s.}$ which decay 100% by proton emission.

2009Mu09: XUNDL dataset compiled by TUNL, 2009.

The authors fragmented a E=450α MeV beam of ^{17}Ne ions in a ^{9}Be target to produce ^{16}Ne nuclei. Residual ^{15}F+p and ^{14}O+2p products were detected in the FRS spectrometer (heavy ions) and a Si Strip Array (protons). Kinematic reconstruction of the reaction product trajectories yielded information on ^{16}Ne levels.

2010Mu12: XUNDL dataset compiled by TUNL, 2011.

A 591 MeV/nucleon beam of ^{24}Mg, from the SIS facility at GSI, was used to produce a beam of 410 MeV/nucleon ^{17}Ne in the FRS. The ^{16}Ne nuclei were produced by (^{17}Ne,^{16}Ne) reactions on a ^{9}Be target. The (p_1-^{14}O)(p_2-^{14}O) angular correlations were analyzed to determine: the decay mode (2p or sequential proton decay), and the excitation energies of states involved in the reactions. Angular correlations were measured; momenta were not measured; hence properties of excited states are deduced based on GEANT simulations of the p-HI (Heavy Ion) and (p_1-HI)(p_2-HI) angular correlations.

2014Br19: XUNDL dataset compiled by NSCL, 2014.

A ^{17}Ne beam with an average E=57.6 MeV/nucleon was produced using the MSU/NSCL A1900 fragment separator. The ^{17}Ne beam impinged on a 1 mm thick ^{9}Be target yielding ^{16}Ne reaction products that decayed into ^{14}O+p+p. These decay products were detected in the High Resolution Array (HiRA), which was configured as 14 ΔE-E Si-CsI(Tl) telescopes subtending zenith angles from 2° to 13.9°. The 2p+^{14}O relative energy distribution was obtained from kinematic analysis of the momenta of the decay particles and ^{16}Ne resonance energies and decay modes were deduced. A limit for the intrinsic decay width of the ground state was deduced.

For the first time a 2p emitter was studied where correlations between the momenta of the three decay products with sufficient resolution and statistics allowed for an unambiguous demonstration of dependence on the long-range nature of the Coulomb interaction.

2015Br11: XUNDL dataset compiled by TUNL, 2015.

The data of 2014Br19 were further analyzed in 2015Br11. The analysis of ^{14}O+2p and ^{13}N+3p relative energy spectra and few-body correlations was extended to gain additional information on ^{16}Ne level spectroscopy.

The ground state and E_x=1.69 MeV first excited state were observed in ^{14}O+2p events. Significant attention was focused on the core-p-p correlations and the comparison of 3-body breakup vs sequential decay via ^{15}F states. In addition to this, kinematic analysis of the ^{13}N+3p events indicated states at E_x=8.37 and 10.76 MeV.

See also (2016ChZV).

^{16}Ne Levels

E(level)[†]	J^{π}[‡]	Γ[&]	Comments
0	0^{+}[#]	<80 keV	%2p=100 Decays 100% by 2p decay mode to ^{14}O (2008Mu13). E(^{14}O+2p) (MeV): We used 1401 keV *20* from (2017Wa10: AME-2016). See also 1350 keV *80* (2008Mu13,2009Mu09,2009Mu17,2010Mu12), 1466 keV *20* (2014Br19,2015Br11) and 1476 keV (2016ChZV: $\tau\approx4\times10^{-19}$ s). Γ: The expected width is ≈0.8-3.1 keV (2002Gr03, 2015Br11), but the experimental resolution limits the result. This Γ<80 keV was determined from the best fit to the excitation function using a Breit-Wigner line shape (2014Br19).

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^{9}Be(^{17}Ne,^{16}Ne) 2010Mu12,2015Br11 (continued)

^{16}Ne Levels (continued)

E(level)†	Jπ‡	Γ&	E(^{14}O+2p) (MeV)	Comments
1.76×10^3 *3*	2+#	153 keV *49*	3.16 *2*	E(^{14}O+2p) (MeV): From (2014Br19,2015Br11); See also E(^{14}O+2p)=3.2 MeV *2* (2010Mu12) and 3160 keV (2016ChZV). Γ: weighted value of 150 keV *50* (2015Br11) and 0.2 MeV *2* (2010Mu12). The width of the state cannot be reproduced in simple models, suggesting that unaccounted for nearby states may influence the observations (2015Br11). Unusual correlations amongst the ^{14}O+2p ejectiles indicate a complex interplay between direct 2p decay and sequential decay via ^{15}F*+p (2015Br11). See also (2010Mu12).
6.20×10^3 *4*	2+@	<0.5 MeV	7.60 *4*	E(^{14}O+2p) (MeV): From (2014Br19,2015Br11). See also E(^{14}O+2p)=7.6 MeV *2* (2009Mu09,2010Mu12). The decay is 24% *8* to ^{15}F(0, 1/2$^+$) and 76% *8* to ^{15}F*(1.3 MeV, 5/2$^+$)) (2009Mu09,2010Mu12). Γ: from ≤0.5 MeV (2015Br11). See also Γ=0.8 MeV $^{+8}_{-4}$ (2009Mu09,2010Mu12).
8.44×10^3 *10*		0.32 MeV *10*	9.84 *10*	E(^{14}O+2p) (MeV): deduced from E(^{13}N+3p)=5.21 MeV *10* (2015Br11).
10.83×10^3 *20*		0.51 MeV *23*	12.23 *20*	E(^{14}O+2p) (MeV): deduced from E(^{13}N+3p)=7.60 MeV *20* (2015Br11).
x				%p=100 Presumably decays 100% by sequential 2p decay mode to ^{14}O through the 0, 1/2$^+$; 1290, 5/2$^+$; 3340 and 4840 levels of ^{15}F (2008Mu13).

† Level energies are deduced using ^{14}O, ^{16}Ne and p mass excesses from (2017Wa10: AME-2016). The literature reports a sizeable spread in measured values for the g.s. E(^{14}O+2p) resonance energy, and use of any different g.s. energy would change the excitation energy scale.
‡ Jπ assigned in (2014Br19,2015Br11) are based on a comparison with theoretical predictions.
\# From (2010Mu12,2014Br19,2015Br11).
@ From (2009Mu09,2010Mu12). See also (2014Br19,2015Br11: (2$^+$)).
& From (2015Br11) except where noted.