

$^9\text{Be}(^{17}\text{Ne}, ^{17}\text{Ne}')$ 2017Br07

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, G. C. Sheu		ENSDF	16-Jan-2018

[2017Br07](#): XUNDL file compiled by TUNL 2017.

A variety of one-, two- and three-proton unbound levels were populated in the bombardment of a ^9Be target by either a 68 MeV/nucleon ^9C beam or a 58 MeV/nucleon ^{17}Ne beam. The reactions produced short-lived levels that proton decayed before exiting the target. The present result details the decay mode of $^{17}\text{Ne}^*(1.76 \text{ MeV})$.

The ^{17}Ne beam was produced at the NSCL by fragmenting a ^{20}Ne beam in the A1900 beam separator. The beam impinged on a 1 mm thick ^9Be target, which populated ^{17}Ne states by inelastic scattering reactions. The unbound ^{17}Ne states quickly decayed via proton emission.

The complete kinematics of the charged-particle reaction products were measured using the HiRA array, which comprised a set of 14 $64 \text{ mm} \times 64 \text{ mm}$ position sensitive ΔE -E telescopes that covered the forward direction of the outgoing beam ($\theta_{\text{lab}} \approx 2^\circ$ to 13.9°). The telescopes were arranged in vertical towers with a 2-3-4-3-2 configuration where the central tower had a gap between the upper and lower two telescopes to permit the beam a downstream exit at $\theta=0^\circ$.

In addition, 158 CsI(Na) crystals from the CAESAR array covered polar angles between $\theta_{\text{lab}}=57.5^\circ$ and 142.4° and measured the coincident γ -ray deexcitations.

The $2\text{p}+^{15}\text{O}$ invariant mass spectrum reveals three peaks corresponding to $^{17}\text{Ne}^*(1.77, 2.65, 3.55 \text{ MeV})$ states. There is no evidence for the 2-p decay of a state previously reported at $E_x=1.908 \text{ MeV}$ ([1998Gu10](#)) that lies above the 1p-separation energy. Analysis of the Jacobi Y coordinates is consistent with the proton decay of $^{17}\text{Ne}^*(1.76 \text{ MeV})$ sequentially through $^{16}\text{F}_{\text{g.s.}}$ to $2\text{p}+^{15}\text{O}_{\text{g.s.}}$.

[2018Ch25](#): XUNDL dataset compiled by TUNL, 2018.

Analysis of the ([2017Br07](#)) results was extended in ([2018Ch25](#)), where the 2p decay of $^{17}\text{Ne}^*(1.77 \text{ MeV})$ via $^{16}\text{F}_{\text{g.s.}}$ was the focus. A 62.9 MeV/nucleon ^{17}Ne impinged on a 1 mm thick ^9Be target populating ^{17}Ne states including $^{17}\text{Ne}^*(1.77 \text{ MeV})$. As in ([2017Br07](#)), the complete kinematics of the charged-particle reaction products were measured using the HiRA array, that covered the forward direction of the outgoing beam ($\theta_{\text{lab}} \approx 2^\circ$ to 13.9°). The energies of the first and second sequential decay protons, which are similar, were resolved permitting a determination of the level energies. The two protons were analyzed along with the 2p correlations, which resulted in an improved precision in the level energy for $^{17}\text{Ne}^*(1.76 \text{ MeV})$ and an improved precision on the width of $^{16}\text{F}_{\text{g.s.}}$. $E_x=1745 \text{ keV}$ 7 was deduced.

 ^{17}Ne Levels

E(level)	J^π	Comments
1745 7	$5/2^-^\dagger$	$T=3/2$ E(level): From (2018Ch25). See also $E_x=1770 \text{ KeV}$ 20 in (2017Br07). Decays 100% via $\text{p}+^{16}\text{F}_{\text{g.s.}}$ to $2\text{p}+^{15}\text{O}_{\text{g.s.}}$.
2651 † 12	$5/2^+^\dagger$	$T=3/2$ Decays to $2\text{p}+^{15}\text{O}_{\text{g.s.}}$.
3548 † 20	$9/2^-^\dagger$	$T=3/2$ Decays to $2\text{p}+^{15}\text{O}_{\text{g.s.}}$.

† From ([1998Gu10](#)).