

$^9\text{Be}(^{16}\text{Ne},^{15}\text{F})$  2010Mu12,2009Mu09,2008Mu13

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2010Mu12,2009Mu09,2008Mu13:

The authors evaluated the decay product particle correlations for one-proton decays of  $^{15}\text{F}$ ,  $^{16}\text{Ne}$ ,  $^{19}\text{Na}$  and two-proton decays of  $^{15}\text{F}$ ,  $^{16}\text{Ne}$  and  $^{20}\text{Mg}$ . 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<sub>1</sub>-HI)(p<sub>2</sub>-HI) angular correlations.

A 591 MeV/nucleon beam of  $^{24}\text{Mg}$ , from the SIS facility at GSI, was used to produce a beam of 410 MeV/nucleon  $^{17}\text{Ne}$  in the FRS. The beam of  $^{16}\text{Ne}$  was produced by ( $^{17}\text{Ne},^{16}\text{Ne}$ ) on a  $^9\text{Be}$  target. The (p<sub>1</sub>- $^{14}\text{O}$ )(p<sub>2</sub>- $^{14}\text{O}$ ) angular correlations were analyzed to determine: the decay mode (2p or sequential proton decay), and the excitation energies of states involved in the reactions.

 $^{15}\text{F}$  Levels

E(level)	$J^\pi$	$T_{1/2}$	$E(\text{p}+^{14}\text{O})_{\text{cm}}$ (MeV) <sup>†</sup>	Comments
0	$1/2^+$		1.5 1	E(level): This group of counts is observed in (p <sub>1</sub> - $^{14}\text{O}$ )(p <sub>2</sub> - $^{14}\text{O}$ ) correlations from $^{16}\text{Ne}$ breakup.
$1.3 \times 10^3$	$1 \quad 5/2^+$	0.4 MeV 1	2.80 5	$\Gamma_p=0.4$ MeV 1 (2010Mu12) E(level): This group is observed in (p <sub>1</sub> - $^{14}\text{O}$ )(p <sub>2</sub> - $^{14}\text{O}$ ) correlations from $^{16}\text{Ne}$ breakup.
$3.4 \times 10^3$	2 (1/2 <sup>-</sup> )	0.2 MeV 2	4.9 2	$\Gamma_p=0.2$ MeV 2 (2009Mu09,2010Mu12) E(level): This group is observed in (p <sub>1</sub> - $^{14}\text{O}$ )(p <sub>2</sub> - $^{14}\text{O}$ ) correlations from $^{16}\text{Ne}$ breakup.
$4.9 \times 10^3$	2 (3/2 <sup>-</sup> ,5/2 <sup>-</sup> )	0.2 MeV 2	6.4 2	$\Gamma_p=0.2$ MeV 2 (2009Mu09,2010Mu12) E(level): This group is observed in (p <sub>1</sub> - $^{14}\text{O}$ )(p <sub>2</sub> - $^{14}\text{O}$ ) correlations from $^{16}\text{Ne}$ breakup. $J^\pi$ : 3/2 <sup>-</sup> favored from arguments based on the mirror $^{15}\text{C}$ nucleus.
$6.3 \times 10^3$	2 (3/2 <sup>+</sup> ,5/2 <sup>+</sup> )	0.4 MeV 4	7.8 2	$\Gamma_p=0.4$ MeV 4 (2009Mu09,2010Mu12) E(level): from $Q_{2p}(^{15}\text{F})=3.2$ MeV 2 group observed in (p <sub>1</sub> - $^{13}\text{N}$ )(p <sub>2</sub> - $^{13}\text{N}$ ) correlations. This group is associated with decay via the $^{14}\text{O}$ $J^\pi=2^+$ state at $E_x=6.59$ MeV. Decay to the $^{14}\text{O}_{\text{g.s.}}$ is weak, with an upper limit of decay via $^{14}\text{O}_{\text{g.s.}}/^{14}\text{O}(2^+)<0.2$ . The state corresponds to $Q_{1p}(^{15}\text{F})=7.8$ MeV 2.

<sup>†</sup> From 2009Mu09.