^{1}H(^{20}C,^{19}Cγ) 2015Va09

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, G. C. Sheu	ENSDF	23-March-2017

2015Va09: The authors studied the low-lying structure of ^{19}C using the ^{1}H(^{20}C,^{19}C) reaction to populate levels that de-excited via γ-ray transitions. A single transition was observed and compared with theoretical estimates suggesting decay from a $J^{\pi}=3/2^{+}$ state to the $1/2^{+}$ ground state.

A cocktail beam that included a ^{20}C component was produced by fragmenting a E(^{40}Ar)=63 MeV/nucleon beam in a 0.2 mm thick ^{181}Ta target. The beam was purified in the RIKEN/RIPS fragment separator and transported to a 190 mg/cm^2 liquid hydrogen target. The beam, which was identified via time-of-flight (ToF) using a thin plastic scintillator that was near the target, had an energy of around 50 MeV/nucleon at the center of the target. The heavy ejectiles within $\theta_{lab}<6.5°$ were identified using ΔE vs. E and ΔE vs ToF analysis. De-excitation γ-rays in coincidence with ^{19}C ejectiles were detected using the 160 DALI2 NaI scintillators arranged in a ball-like configuration that covered angles between $\theta_{lab}=15°-160°$. A GEANT4 simulation indicated 54% efficiency at 200 keV.

The Doppler corrected spectrum indicated a transition corresponding to E_{γ}=198 keV *10*, which agrees with prior observations. The cross section σ=4.54 mb *76* was deduced. This cross section is in line with expectations from direct feeding of a $J^{\pi}=3/2^{+}$ state in the one-neutron removal reaction, but it is not in agreement with expectations if the reaction would feed a bound $J^{\pi}=5/2^{+}$ state that cascades through the $3/2^{+}$ state (yielding an order of magnitude higher predicted cross section).

Further discussion focuses on the high degree of certainty for excluding a higher-lying bound $J^{\pi}=5/2^{+}$ state in ^{19}C.

^{19}C Levels

E(level)	J^{π}	Comments
0	$1/2^{+}$	J^{π}: from 2001Ma08.
198 *10*	$3/2^{+}$	

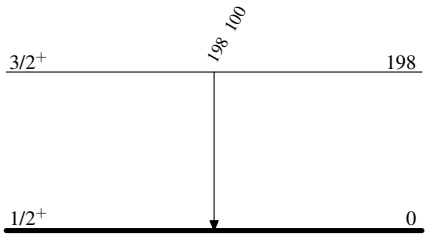
γ(^{19}C)

E_i(level)	J_i^{π}	E_{γ}	I_{γ}	E_f	J_f^{π}
198	$3/2^{+}$	198 *10*	100	0	$1/2^{+}$

^{1}H(^{20}C,^{19}Cγ) 2015Va09

Level Scheme

Intensities: % photon branching from each level



$^{19}_{6}C_{13}$