$^{1}H(^{9}C,P)$ 2017Ho10

History

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Full Evaluation	M. S. Narijauskas, J. H. Kelley, C. G. Sheu	ENSDF	20-July-2017

2017Ho10:

The authors studied resonances in the $^{1}H(^{9}C,p)$ reaction at E_{cm}<5.5 MeV using a stopping thickness Methane gas (CH_4) target. The data were analyzed using standard Thick Target Inverse Kinematics (TTIK) techniques. Evidence for two l=0 resonant states with ambiguous spin-parity assignments is presented and discussed.

A beam of 23.4 MeV/nucleon ^{9}C was produced at the MARS facility at the Cyclotron Texas A&M Cyclotron Institute using the $^{10}B(p,2n)$ reaction. A 1 mm thick βc-404 scintillator located near the entrance of a CH_4 filled TPC scattering chamber provided particle identification and degraded the beam to 9.3 MeV/nucleon. A windowless ionization chamber, inside the gas volume, provided further particle ID after the entrance window.

As the ^{9}C ions slowed in the CH_4 gas, energetic protons were produced in scattering reactions. Protons were detected using a set of three ≈1000 μm thick segmented Si detectors that were used to obtain angular distributions for θ_{cm}=129° to 154°, 139° to 162° and 166° to 170°. The data were analyzed using standard TTIK techniques; however, because the detectors were not thick enough to stop all protons, the excitation functions were analyzed by dividing the final proton energy spectra into 3 regions for stopped, close to punch through, and unambiguous punch through protons. The combined analysis of the Si detector energies along with trajectories from the 3D TPC provided further information on the scattered proton momenta.

The angular distributions were analyzed using the MiniMatrix multi-channel multi-level R-Matix code. Two fit solutions that include two L=0 $J^{\pi}=1^{-}$ and 2^{-} resonances are discussed in the text; no apparent preference given for either fit.

While the present result appears to show no preference in the fit, the results of 2002Le16 found a resonance at E_{res}=2.64 MeV *40* with Γ=2.3 MeV *16*; this state compares with the first excited state and consideration of this Γ may suggest a weak favor for the parameters in Fit 2.

	Fit 1			Fit 2		
	J^{π}	E_{res}(MeV)	Γ(MeV)	J^{π}	E_{res}(MeV)	Γ(MeV)
g.s.	2^{-}	2.2 *2*	3.1 *+9−7*	1^{-}	1.9 *2*	2.5 *+20−15*
1st	1^{-}	2.8 *2*	1.2 *+6−4*	2^{-}	2.8 *2*	2.0 *+7−5*

^{10}N Levels

E(level)†	J^{π}	Γ (MeV)‡	$E_{rel.}(^{9}C+p)$ (MeV)
0	(1^{-})	2.5 MeV *+20−15*	1.9 *2*
0.9×10^{3} *3*	(2^{-})	2.0 MeV *+7−5*	2.8 *2*

† $E_{g.s.}$ from Fit 2 with $E_{res}(^{9}C+p)$=1.9 MeV *2*. See alternate analysis described above.

‡ $\Gamma_p\approx\Gamma$.