^{9}Be(^{22}O,^{20}Cγ) 2011Pe21

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. S. Narijauskas, J. H. Kelley, C. G. Sheu	ENSDF	9-June-2017

Beam=^{20}C, Target=^{9}Be.

2011Pe21:

XUNDL set compiled by J.H. Kelley and C.G. Sheu 2011.

The authors measured the lifetime of the ^{20}C $J^{\pi}=2^{+}$ first excited state with the aim of analyzing the systematics of the B(E2) values of the first excited states of neutron rich carbon isotopes.

Neutron rich ^{20}C ions were produced at the NSCL in a multistep process, by first fragmenting a 140 MeV/nucleon ^{48}Ca beam in a 775 mg/cm^2 ^{9}Be target to produce a $\Delta p/p=2.5\%$ momentum analyzed 101 MeV/nucleon ^{22}C beam. The ^{22}C beam then impinged on a 500 mg/cm^2 ^{9}Be target where ^{20}C ions were produced via 2-proton knockout reactions. Analysis suggests roughly 30% of ^{20}C were produced in their $J^{\pi}=2^{+}$ first excited state.

The lifetime was determined using the recoil distance method (see for example (2008De30)). A 3.8 g/cm^2 W degrader foil was placed 0.1 mm downstream of the 500 mg/cm^2 ^{9}Be reaction foil; γ-rays emitted before/after the degrader foil experience different Doppler shifts and the state lifetime can be deduced from the ratio (v/c_i=0.418 and $v/c_f\approx$0.350). Reactions in the W degrader foil introduce a systematic error.

Finally, discussion based on shell model calculations is given suggesting a significantly increasing B(E2) value as a function of increasing A in the carbon isotopes.

^{20}C Levels

E(level)	J^{π}	$T_{1/2}$	Comments
0	0^{+}		
1618 *11*	2^{+}	6.8 ps *20*	$T_{1/2}$: from 2011Pe21. The mean lifetime τ=9.8 ps *28*(stat) +*5*−*11*(syst) is deduced corresponding to $T_{1/2}$=6.8 ps *19*(stat) +*5*−*11*(syst).

γ(^{20}C)

E_γ	E_i(level)	J_i^{π}	E_f	J_f^{π}	Mult.	Comments
1618 *11*	1618	2^{+}	0	0^{+}	E2	B(E2)=7.5 +*30*−*17*(stat) +*10*−*4*(syst) e^{2}fm^4.

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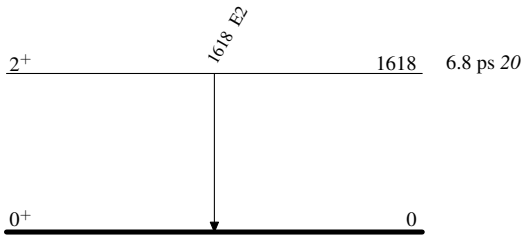
Level Scheme



$^{20}_{6}C_{14}$