Adopted Levels, Gammas

History

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

$Q(\beta^-)=1.656\times10^4$ *10*; S(n)=580 *90*; $S(p)=2.667\times10^4$ *23*; $Q(\alpha)=-1.984\times10^4$ *19* 2017Wa10

The mass excess adopted by (2012Wa38) is 32.41 MeV *10*. See also 1986Vi09, 1987Gi05, 1988Wo09, 1991Or01.

Halo nucleus:

The ^{19}C nucleus has been suggested as a 1-neutron halo nucleus based on measurements of various reaction cross sections and momentum distributions of breakup products. See discussions in:

1989Sa10: E(^{19}C)=45.12 MeV/nucleon, Cu target, $\sigma_{reaction}$=2.7 b *15*.

1995Ba28: E(^{19}C)≈77.2 MeV/nucleon, Be target, FWHM(^{18}C parallel momentum dist)$_{lab}$=44 MeV/c *6*.

1996Ma25: E(^{19}C)=30.3 MeV/nucleon, Ta target, σ_{1n}=2.5 b *4*, $\sigma_{charge\ changing}$=0.595 b *10*, FWHM(n angular momentum dist)=42 MeV/c.

1998Ba28: E(^{19}C)≈88 MeV/nucleon, Be and Ta targets, $\sigma(Be)_{1n}$=105 mb *17* and FWHM(^{18}C parallel momentum dist)=42 MeV/c *4*. $\sigma(Ta)_{1n}$=1.1 b *4* and FWHM(^{18}C parallel momentum dist)=41 MeV/c *3*.

1998Ba87: E(^{19}C)≈910 MeV/nucleon, carbon target, FWHM(^{18}C parallel momentum dist)=69 MeV/c *3*. See (1999Sm01) who suggest the momentum distributions at different energies are affected by the low-lying excited state.

2001Co06: E(^{19}C)≈910 MeV/nucleon, C and Pb targets, $\sigma(C)_{1n}$=233 mb *51* and $\sigma(Pb)_{1n}$=1967 mb *334*. Evaluated relationship between S_{1n} and the S_{1n} separation energy. See also (2000Co31).

2001Oz03: E(^{19}C)=960 MeV/nucleon, carbon target, $\sigma_{interaction}$=1231 mb *28*, analyzed relation of σ_i to effective matter radius.

2009Na39: E(^{19}C)=240 MeV/nucleon, carbon and lead targets, $\sigma(C)_{1n}$=132 mb *4* and $\sigma(Pb)_{1n}$=969 mb *34*. Deduced σ_{1n}(Coulomb)=690 mb 70.

2016To10: E=307 MeV/nucleon, carbon target, $\sigma_{interaction}=1.125\pm0.025(stat)\pm0.013(sys)$ b; find $R^{matter}_{rms}=3.10^{+0.05}_{-0.03}$ fm.

2001Ma08, 2001Ma21: E(^{19}C)≈50 MeV/nucleon, ^{9}Be target surrounded by 11 NaI detectors, σ_{1n}=264 mb *80* on ^{9}Be, σ_{1n}=1.35 b *18* on Au. Deduced (56 *9*)% of 1n-removal events populate $^{18}C_{g.s.}$ and measured a narrow $^{18}C_{g.s.}$ parallel momentum distribution by gateing on events not in coincidence with γ rays. By considering the relationship between the parallel momentum distribution width and S_n they deduce S_n≈650 keV *150*. Their analysis is found consistent only if $J^\pi(^{19}C)=1/2^+$.

2010Ta04: E(^{19}C)=40 MeV/nucleon, ^{1}H liquid hydrogen target, σ_R=754 mb *22*, using the transmission method.

Analyses of the ^{19}C nuclear halo properties are given in: (1995Gu07, 1998Ri02, 1999Sm01, 2000Ka36, 2002Ka34, 2005Na09, 2013Lu02); discussion on mainly heavy carbon nuclide halos is given in (2000Be58, 2009Ch45, 2011Fo18); and broader discussion on halo nuclei including ^{19}C (1992La13, 1996Sh13, 1999La04, 2000Gu04, 2000Oz03, 2001Le21, 2001Lo20, 2003Li24, 2003Li31, 2004Ne16, 2010Gu15, 2011Al11, 2013Sh05, 2013Sh17, 2015Ha20, 2016Ya05). See also (1997Or03).

Theoretical analysis:

General theoretical analysis of the ^{19}C structure properties is given in (2000Ba24, 2008Ka39, 2014La02); analysis of the carbon isotopes is given in (1996Re19, 1997Ka25, 1998Sh16, 2000De35, 2003Sa50, 2003Su09, 2003Th06, 2004Su23, 2004Ta31, 2006Le33, 2006Ta28, 2007Ma53, 2007Sa50, 2009Um05); and broader analyses of light nuclear properties including ^{19}C are given in (1987Sa15, 1993Po11, 1996Su24, 1997Ba54, 1997Ho04, 2002Gu10, 2002Ka73, 2002Me12, 2003Le34, 2004La24, 2004Sa58, 2004Th11, 2005Sa63, 2006Ko02, 2007Do20, 2010Co05, 2012Yu07, 2013Sh05, 2014Ja14, 2015Sh21).

^{19}C Levels

Cross Reference (XREF) Flags

A	^{1}H(^{19}C,P′γ)	G	^{9}Be(^{40}Ar,^{19}C)	M	^{181}Ta(^{48}Ca,^{19}C)
B	^{1}H(^{19}C,18εN)	H	^{9}Be(^{48}Ca,^{19}C)	N	^{181}Ta(^{40}Ar,^{19}C)
C	^{1}H(^{19}C,X)	I	^{12}C(^{19}C,X)	O	^{208}Pb(^{19}C,^{19}C)
D	^{1}H(^{20}C,^{19}Cγ)	J	^{12}C(^{22}Ne,^{19}C)	P	Th(P,^{19}C)
E	^{9}Be(^{20}N,^{19}Cγ)	K	^{12}C(^{25}Ne,^{19}Cγ)	Q	U(P,^{19}C)
F	^{9}Be(^{22}N,^{19}C)	L	^{19}B β^- decay	R	^{241}Pu(n,F) E=thermal

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{19}C Levels (continued)

E(level)	J$^\pi$	$T_{1/2}$	XREF	Comments
0	(1/2$^+$)	46.3 ms *40*	ABCDEFGHIJK MNOPQR	%β^-=100; %β^-n=47 *3*; %β^-2n=7 *3* $T_{1/2}$: from the weighted average of 49 ms *4* (1988Du09: see also preliminary value 30 ms *10* in 1988DuZT), 45.5 ms *40* (1995Oz02) and 44.1 ms *42* (Reeder et al., Int. Conf. on Nucl. Data for Science and Technology, May 9-13, 1994, Gatlinburg, Tennessee: see also 44 ms *4* in the unpublished private communications of (2008ReZZ)/(1995ReZZ) and 45.5 ms *40* (1994RaZW)). Also see 46.2 ms *40* in (2015Bi05). J$^\pi$: from analysis of breakup fragment momentum distributions in 2001Ma08. Decay: Studies of the β-delayed neutron emission have been carried out in (1991Re02: β^-n=β_{1n}+2(β_{2n})+3(β_{3n})...=(53 *26*)%), (1995ReZZ/2008ReZZ: β^-n=(66 *9*)%), and (1988Du09: β_{1n}=(47 *3*)% and β_{2n}=(7 *3*)%. Analysis of β-γ coincidences indicate the β_{1n} decay populates ^{19}N*(6400,6508,7025), which subsequently neutron decay to ^{18}B*(115,587) see (1995Oz02). There is evidence for additional branches that β-2n decay to ^{17}B with β-2n=(7 *3*)% (1988Du09).
209 *2*	(3/2$^+$)	1.34 ns *10*	A DE K	E(level): from (2015Wh02). See also 2005El07: 197 keV *6*, 2015Va09: 198 keV *10*, and 2008St18: 201 keV *15*. $T_{1/2}$: Analysis of the spectra using lineshape and recoil-distance techniques indicate T_{mean}=198 ns *10* and 190 ns *10* values, respectively (2015Wh02). Additional systematic uncertainties give final uncertainties of T_{mean}=198 ns *12* and 190 ns *13* for the two methods, respectively. The authors give a recommended value T_{mean}=194 ns *15*. J$^\pi$: from 2015Wh02, based on the B(M1) value; E2 components are excluded and neglected.
282? *5*			A	E(level): from Eγ=72 keV *4* to E_x=209 keV *2*. The J^π of this state had initially been suggested as 5/2$^+$ based on expectations from shell model analysis. In this case β_2=0.29 *3*; deduced from integrated experimental cross section for this state from 0°−1.7° and distorted wave analysis (2005El07). However, subsequent observations and discussion in (2011Oz01, 2012Ko38, 2013Th06) support the notion that the first J^π=5/2$^+$ state must be unbound. Cross section: 4.2 mb *5* in (p,p′).
653 *95*	(5/2$^+$)	<100 keV	F	%n≈100 E(level): deduced from E(^{18}C+n)=76 keV *14* and S(n)=577 keV *94*.
1.46×10^3 *10*	5/2$^+$	0.29 MeV *2*	B	%n≈100 E(level): deduced from E(^{18}C+n)=880 keV *10* and S(n)=577 keV *94*.

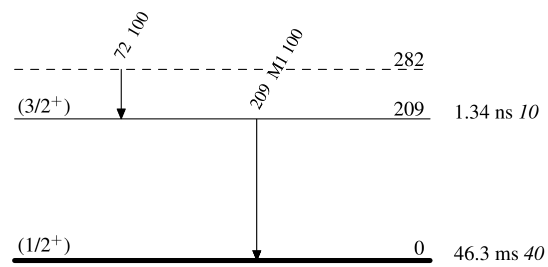
γ(^{19}C)

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.	Comments
209	(3/2$^+$)	209 *2*	100	0	(1/2$^+$)	M1	B(M1)↓=0.00321 *25* (2015Wh02); B(M1)(W.u.)=0.00179 *14* (2015Wh02)
282?		72 *4*	100	209	(3/2$^+$)		

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



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