Adopted Levels

History

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

$Q(\beta^-)=24.28\times10^3$ *25*; $S(n)=-9.1\times10^2$ *27* 2017Wa10

In the NUBASE2016 evaluation of nuclear properties (2017Au03), the ground state of ^{6}H is listed as having a mass defect of 41880 keV *250*, a half-life of 2.90×10^{-22} s *70* and an estimated J^π of 2^-. This corresponds to a resonance energy in the ^{3}H+3n system of 2.72 MeV *25* and a resonance width of 1.57 MeV *38*.

Calculations reported in (1985Po10,1989Go24) obtained the ^{6}H ground state to have $J^\pi=2^-$. However, a calculation reported in (1986Be02) gives $J^\pi=1^+$ for the ground state.

Three particle transfer experiments, cited in the articles (1984Al08,1986Be35,2008Ca22), produced ^{6}H in the final state and observed a resonance reasonably consistent with the NUBASE2016 evaluation. However, a pion double charge exchange reaction on ^{6}Li, reported in (1990Pa25), which led to ^{6}H in the final state, showed no sign of a ^{6}H resonance. Also, experiments with stopped pions reported in (2003Gu17,2009Gu17) observed ^{6}H resonances at higher excitation energies than the one given in the NUBASE2016 evaluation. Earlier experiments with stopped pions by the same group (1987Go25,1990Am04) saw no evidence of ^{6}H states, but, as stated in (2003Gu17), that might have been due to poor statistics and energy resolution.

Theory:

A shell model calculation with $(0+1)\hbar\omega$ model space for ^{6}H is reported in (1985Po10). From Fig. 1 in that article, the ground state energy of the p+5n system is about −3 MeV. From Table 1, the four lowest calculated states (using the ground state as E=0.0) are $0.0(2^-),1.78(1^-),2.80(0^-),4.79(1^+)$ MeV. These would correspond to resonant states in the ^{3}H+3n system at approximately $E(^3H+3n)=5.5(2^-),7.3(1^-),8.3(0^-),10.3(1^+)$ MeV, taking into account the ^{3}H binding energy of 8.5 MeV. In the same article, a shell model calculation with $(0+2)\hbar\omega$ model space is also reported.

A shell model calculation for A=6 nuclei is reported in (1986Be02). For ^{6}H, the calculated ground state has $J^\pi=1^+$ and the binding energy is calculated to be 7.144 MeV in p+5n system which corresponds to a resonance at E=1.34 MeV in the ^{3}H+3n system.

A calculation of H and He isotopes using the method of angular potential functions is reported in (1989Go24). For the ^{6}H ground state, an energy of 6.3 MeV in ^{3}H+3n system and $J^\pi=2^-$ were obtained.

A study of H and He isotopes using the anti-symmetrized molecular dynamics method is reported in (2004Ao05).

Positive experimental results: (See reaction data sets).

Negative experimental results:

^{9}Be(π^-,pd)X,^{7}Li(π^-,p)X:

1987Go25,1990Am04: Studies of the reactions ^{9}Be(π^-,pd)X and ^{7}Li(π^-,p)X with stopped pions were reported in (1987Go25,1990Am04). An analysis of the outgoing particle spectra showed no evidence of ^{6}H states.

Note: The comment was made in (2003Gu17) that the failure to observe ^{6}H states in either of the reactions reported in (1987Go25,1990Am04) may have been due to poor statistics and energy resolution.

^{6}Li(π^-,π^+)X:

1990Pa25: $E(\pi^-)$=220 MeV beam from the Los Alamos meson physics facility was incident on a ^{6}LiH target and a missing mass π^+ spectrum obtained. No evidence for ^{6}H was found in the energy range −10 MeV to +30 MeV in the ^{3}H+3n scale, thus casting doubt on the existence of ^{6}H.

Also see (2007Fo05).

^{6}H Levels

Cross Reference (XREF) Flags

A	^{7}Li(^{7}Li,^{8}B)	D	^{11}B(π^-,P4HE)
B	^{9}Be(π^-,pd)	E	^{12}C(^{8}He,^{6}H)
C	^{9}Be(^{11}B,^{14}O)		

Continued on next page (footnotes at end of table)

Adopted Levels (continued)

^{6}H Levels (continued)

E(level)	$T_{1/2}$	$E_{res}(^{3}H+3n)$(MeV)	XREF	Comments
0	1.55 MeV *44*	2.72 *25*	ABCDE	E(level): $E(^{3}H+3n)$=2.72 MeV *25* from (2017Wa17). The weighted average of reported values is $E(^{3}H+3n)$=2.72 MeV *+31-23* from $E(^{3}H+3n)$=2.70 MeV *40* (1984Al08), 2.60 MeV *50* (1986Be35), 2.91 MeV *+77-35* (2008Ca22). Γ=1.55 MeV *+44-18*, from the weighted average of 1.80 MeV *50* (1984Al08), 1.30 MeV *50* (1986Be35), and 1.5 MeV *+18-4* (2008Ca22). Γ: Γ=1.57 MeV *38*, from (2017Au03). J^{π}: $J^{\pi}=2^{-}$ is predicted in (1985Po10) and (1989Go24); see also $J^{\pi}=1^{+}$ predicted in (1986Be02).
4.1×10^{3} *6*	5.6 MeV *15*	6.8 *6*	B D	E(level): From weighted average of $E(^{3}H+3n)$=6.6 MeV *7* $^{9}Be(\pi^{-},pd)$ and 7.3 MeV *10* $^{11}B(\pi^{-},p^{4}He)$ (2003Gu17,2009Gu17). Γ: From weighted average of Γ=5.5 MeV *20* $^{9}Be(\pi^{-},pd)$ and 5.8 MeV *20* $^{11}B(\pi^{-},p^{4}He)$ (2003Gu17,2009Gu17).
8.0×10^{3} *8*	4 MeV *2*	10.7 *7*	B	E(level),Γ: From $^{9}Be(\pi^{-},pd)$ (2003Gu17,2009Gu17).
12.3×10^{3} *7*	4.2 MeV *15*	15.0 *6*	B D	E(level): From weighted average of $E(^{3}H+3n)$=15.3 MeV *7* $^{9}Be(\pi^{-},pd)$ and 14.5 MeV *10* $^{11}B(\pi^{-},p^{4}He)$ (2003Gu17,2009Gu17). Γ: From weighted average of Γ=3 MeV *2* $^{9}Be(\pi^{-},pd)$ and 5.5 MeV *20* $^{11}B(\pi^{-},p^{4}He)$ (2003Gu17,2009Gu17).
18.7×10^{3} *5*	3.9 MeV *9*	21.4 *4*	B D	E(level): From weighted average of $E(^{3}H+3n)$=21.3 MeV *4* $^{9}Be(\pi^{-},pd)$ and 22.0 MeV *10* $^{11}B(\pi^{-},p^{4}He)$ (2003Gu17,2009Gu17). Γ: From weighted average of Γ=3.5 MeV *10* $^{9}Be(\pi^{-},pd)$ and 5.5 MeV *20* $^{11}B(\pi^{-},p^{4}He)$ (2003Gu17,2009Gu17).