Adopted Levels 1992Ti02

Type	Author (History)	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, D. R. Tilley, H. R. Weller and G. M. Hale	NP A541 1 (1992)	8-Oct-1991

$Q(\beta^-)=2.220\times10^4$ *10*; $S(n)=-1.60\times10^3$ *10* 2012Wa38
Note: Current evaluation has used the following Q record $ 23.51E3 11-2.91E3 11 1997Au07.

The stability of the first excited state of ^{8}Li against decay into decay into ^{4}He+^{4}H (1988Aj01) sets an upper limit for B(^{4}H)≤3.53 MeV (see refs in 1992Ti02). This also sets a lower limit to the β^- decay energy ^{4}H–>^{4}He of 17.06 MeV. The upper limit of the β^- decay energy would be 20.60 MeV, if ^{4}H is stable against decay into ^{3}H+n. Estimates for the expected half−life of the β decay: if $J^\pi(^4H)=0^-, 1^-, 2^-$, $T_{1/2}\geq10$ min; if $J^\pi(^4H)=0^+, 1^+$, $T_{1/2}\geq0.03$ s (see discussion in 1992Ti02). Experimentally there is no evidence for any β^- decay of ^{4}H, nor has particle stable ^{4}H been observed. Evidence for a particle-unstable state of ^{4}H has been obtained in ^{7}Li(π^-,t)^{3}H+n at 8 MeV *3* above the unbound ^{3}H+n mass with a width of 4 MeV. For other theoretical work see (1976Ja24, 1983Va31, 1985Ba39, 1988Go27).

The level structure presented here is obtained from a charge-symmetric reflection of the R-matrix parameters for ^{4}Li after shifting all the p-^{3}He E(λ) values by the internal Coulomb energy difference ΔE(Coulomb)=−0.86 MeV. The parameters then account well for measurements of the n-^{3}H total cross section (1980Ph01) and coherent scattering length (1985Ra32), as is reported in (1990Ha23). The Breit-Wigner resonance parameters from that analysis for channel radius a(n-t)=4.9 fm are given. The levels are located substantially lower in energy than they were in the previous compilation (1973Fi04), as will be true for all the T=1 levels of the A=4 system. The ^{4}Li analysis unambiguously determined the lower 1^- level to be predominantly $^3p_1$ and the upper one to be mainly $^1p_1$; that order is preserved, of course, in the ^{4}H levels. In addition to the given levels, the analysis predicts very broad positive-parity states at excitation energies in the range 14-22 MeV, having widths much greater than the excitation energy, as well as antibound p-wave states approximately 13 MeV below the 2^- ground state. Parameters were not given for these states because there is no clear evidence for them in the data.

The structure given by the s-matrix poles is quite different, however. The p-wave resonances occur in a different order, and the positive-parity levels (especially for 0^+ and 1^+) are much narrower and lower in energy. It is possible that these differences in the s-matrix and K(R)-matrix pole structures, which are not yet fully understood, could explain the puzzling differences that occur when these resonances are observed in the spectra of multi-body final states.

^{4}H Levels

Cross Reference (XREF) Flags

A ^{4}He(π^-,X)
B ^{4}He(n,p)

E(level)†	J^π	$T_{1/2}$	XREF	Comments
0.0	2^-		A	%n=100 Γ=5.42 MeV; T=1 3.19 MeV above the N+^{3}H mass.
310	1^-	6.73 MeV	AB	%n=100 T=1 Strength is primarily $^3p_1$.
2080	0^-	8.92 MeV		%n=100 T=1
2830	1^-	12.99 MeV	AB	%n=100 T=1 Strength is primarily $^1p_1$.

† Level energies from an R-matrix calculation.