²H(¹²Be,¹³Be) 2023Ko21

	History				
Туре	Author	Citation	Literature Cutoff Date		
Full Evaluation	J. H. Kelley, C. G. Sheu and J. E. Purcell	NDS 198,1 (2024)	1-Aug-2024		

2023Ko21: XUNDL dataset compiled by TUNL (2023).

- A beam of 9.5 MeV/nucleon ¹²Be ions from the TRIUMF ISAC-II facility impinged on a 52 μ m thick solid deuterium target that was frozen on a 4.64 μ m silver foil that was positioned at the center of the IRIS experimental facility. The reaction protons scattered in the backward direction were detected by an annular array of MICRON YY1 position sensitive Si detectors that covered $\theta_{lab.}=122^{\circ}$ to 148°. Associated ¹²Be remnants from ¹²Be(d,p+[¹³Be \rightarrow ¹²Be+n]) were detected at small angles using a position sensitive MICRON S3 annular detector that was paired with a CsI scintillator detector to provide Δ E-E particle identification. Events were analyzed only in a triple coincidence when a ¹²Be was identified in the upstream (IC) and when both the backward recoiling proton and ¹²Be remnant were detected.
- A Q-value spectrum covering Q=-5.5 to -2.0 MeV was obtained from the data. A Bayesian optimization in combination with a GEANT4 Monte Carlo simulation of the experiment guided the interpretation of the spectrum. Two broad structures dominate the lineshape; a low-energy component with $E_{c.m.}(n+{}^{12}Be)=0.55{}^{+8}_{-7}$ MeV and $\Gamma=0.11{}^{+4}_{-5}$ MeV and a high-energy component with $E_{c.m.}=2.22{}^{+4}_{-5}$ MeV and $\Gamma=0.40{}^{+3}_{-4}$ MeV. The addition of a third state had little impact on the quality of the fit.
- The autors evaluated the character of the peaks using several approaches. The higher-energy component was identified as the *d*-wave resonance reported in previous works. For the low-energy strength, a DWBA analysis using the FRESCO code was used to evaluate the *s*-, *p*-, *d*-, *sp*-, *sd*-, or *pd*-wave character. Involvement of two states having \approx 67% *s*-wave and \approx 33% *p*-wave character provided the best fit to the data.
- A *p*-wave resonance is suggested between 0.44-0.55 MeV with an additional less-understood low-energy *s*-wave strength; additionally a *d*-wave resonance is present between 2.11 and 2.3 MeV. Weighing this, the evaluator attributes the lower group as an unresolved combination of $J^{\pi}=1/2^+$ and $1/2^-$ *s* and *p*-wave strength and attributes the higher group to a $J^{\pi}=5/2^+$ *d*-wave resonance.

¹³Be Levels

E(level) [†]	$J^{\pi \dagger}$	Γ^{\dagger}	$E_{c.m.}(n+^{12}Be) \ (keV)$	Comments
0.10×10 ³ 8	1/2-&1/2+	0.11 MeV +4-5	0.55 +8-7	E(level): E=0.10 MeV +8-7. E(level): This peak comprises unresolved <i>s</i> -wave and <i>p</i> -wave resonances.
$1.77 \times 10^3 5$	5/2+	0.40 MeV +3-4	2.22 +4-5	E(level): E=1.77 MeV +4-5.

[†] From R-matrix analysis in (2023Ko21). The ground state is taken as $E_{c.m.}(n+{}^{12}Be_{g.s.})=0.45$ MeV *1*; see Adopted Levels.