DNP20-2020-000272

Abstract for an Invited Paper
for the DNP20 Meeting of
the American Physical Society

A possible observation of Λnn continuum structure and a bound ΣNN state using the (e,e'K^+) reaction.[1]

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A mass spectroscopy experiment with a pair of nearly identical high resolution spectrometers and a tritium target was performed in Hall A at Jefferson Lab. Utilizing the (e,e'K^+) reaction, two possible Λnn resonance states and a bound ΣNN state were observed for the first time with an energy resolution of better than 1.6 MeV (FWHM), although greater statistics are needed to make definitive identifications. The energy resolution is the best ever reported for reaction mass spectroscopy involving A = 3 hypernuclei. The experimentally measured Λnn states can provide constraints in describing the Λn interaction, for which no scattering data exist. Moreover, although bound A = 3 and 4 Σ hypernuclei have been predicted, only an A = 4 Σ hypernucleus ($^4_\Sigma$He) has been found, utilizing the (K^-, π^-) reaction on a He target. A possibility to study on a ΣNN bound is also discussed and the observed state in this experiment is likely to be a Σ^0nn state. The experiment proves the uniqueness of the (e,e'K^+) reaction with the Tritium target using the CEBAF beam. The experiment needs to be repeated again with the optimized experimental configuration in order to achieve the needed statistics that is necessary to make solid confirmation and obtain the needed precision on the measurement on the binding energy and natural width of these states.

[1]This work was supported by the U.S. Department of Energy (DOE) grant DE-AC05-06OR23177 under which Jefferson Science Associates, LLC, operates the Thomas Jefferson National Accelerator Facility. The hypernuclear program at JLab is supported by US-DOE grant DE-FG02-97ER41047 and Japan-JSPS KAKENHI Grants No. 18H05459 and 17H01121.