Antikaon-nucleon interaction and structure of kaonic nuclei

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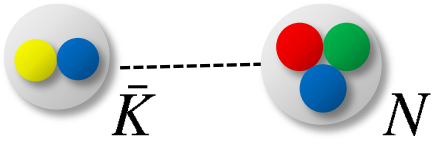
$\Lambda(1405)$; $J^{\pi}=1/2^{-}$, S= -1

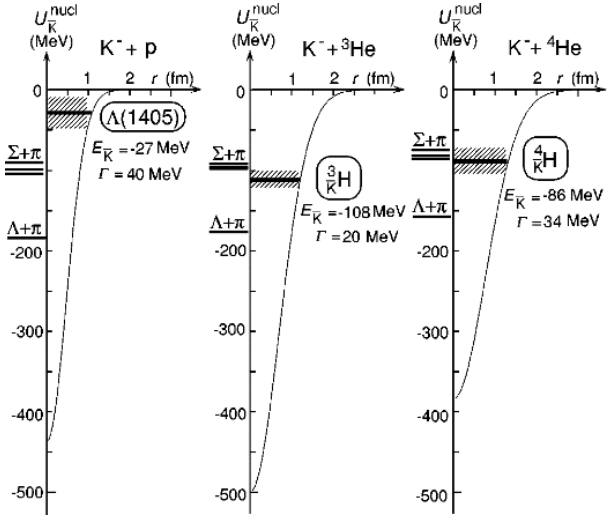
– $\bar{K}N$ unstable bound state

Dalitz, Wong, Tajasekaran, PR 153(1967)1617.

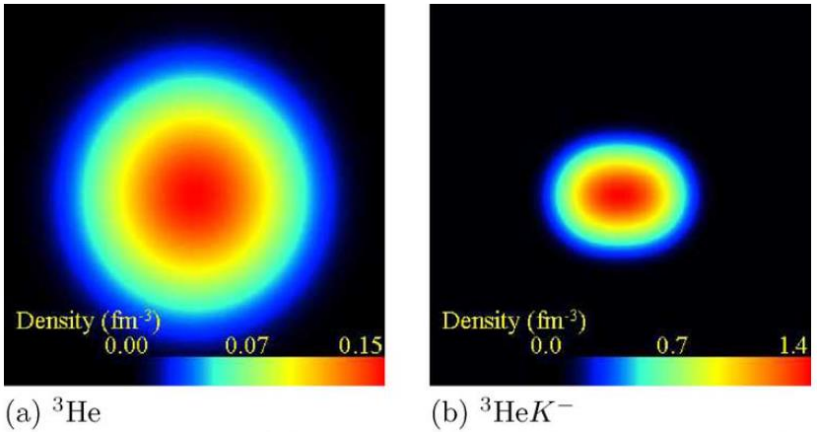


- strongly attractive $\bar{K}N$ interaction in *I=0, L=0*
- Deeply bound and compressed systems are proposed

  - phenomenological $\bar{K}N$ potential and optical potential/ g-matrix approach



Y. Akaishi, T. Yamazaki, PRC 65, 044005 (2002).



(a) ^{3}He (b) ^{3}HeK^{-}

Dote, et. al., PLB590, 51(2004).

Strategy of this work

Y. Akaishi, T. Yamazaki, PRC 65, 044005 (2002).
Dote, et. al., PLB590, 51(2004).

AY-potential
- Phenomenological
- Energy independent

Many-body approximation
- Optical potential
- g-matrix interaction

Deeply binding and compressed systems

?

This works

SIDDHARTA pot.
- Chiral SU(3) dynamics
- Energy dependent

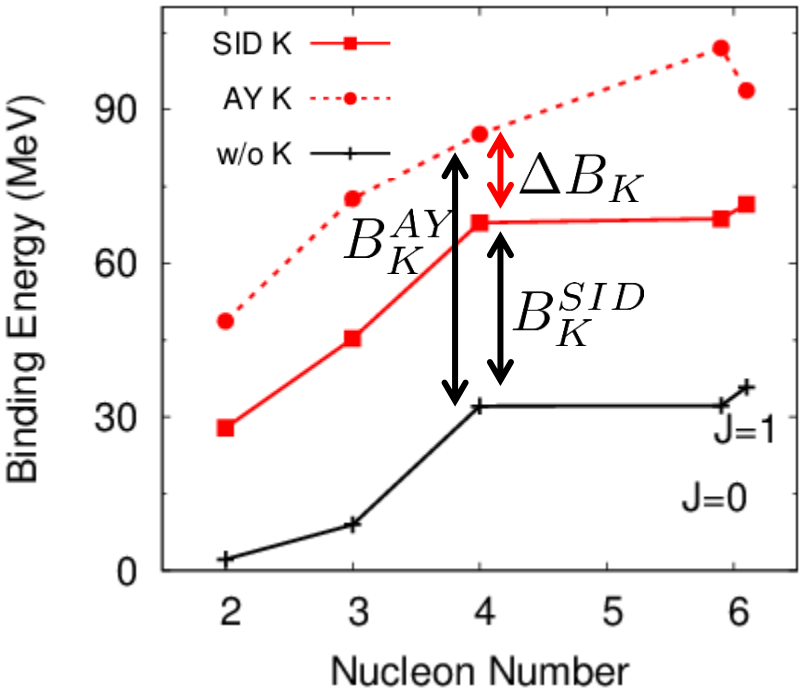
Miyahara, Hyodo,
PRC 93 (2016) 1, 015201.

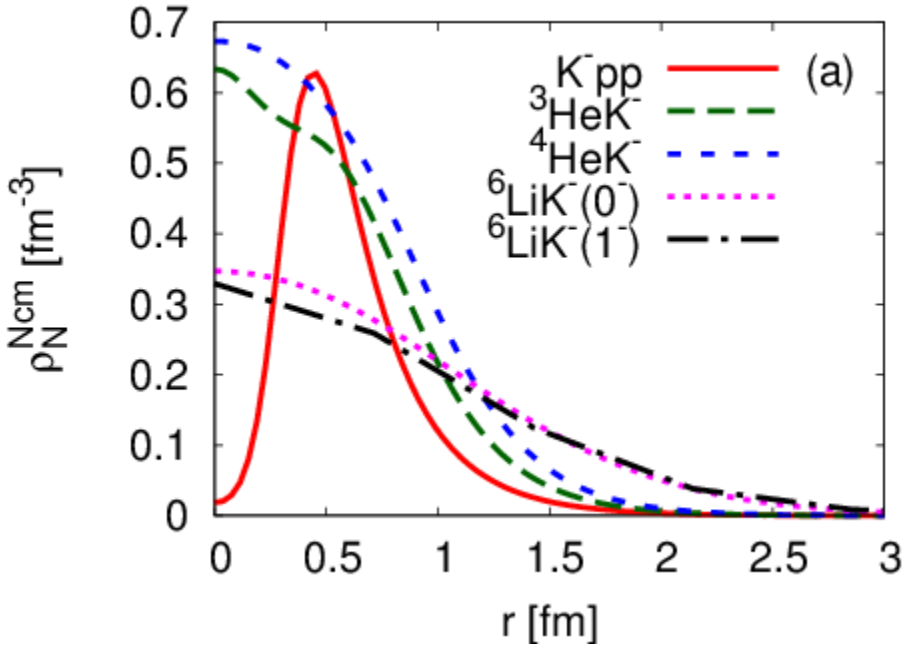
Few-body approach
- Correlated Gaussian basis
- Stochastic variational method
- Three- to seven-body calc.

Varga, Suzuki,
Phys. Rev C52 (1995) 2885.

How structure of light nuclei is changed by injected kaon?

Results





$$B_K^{SID} \equiv B^{SID} - B_N \sim 34 \text{ MeV}$$

$$B_K^{AY} \equiv B^{AY} - B_N \sim 58 \text{ MeV}$$

$$\Delta B_K \equiv B^{AY} - B^{SID} \sim 24 \text{ MeV}$$

(averaged value)