少数粒子系多体系問題に基づいたストレンジネスを含む核物理と超冷却原子の研究

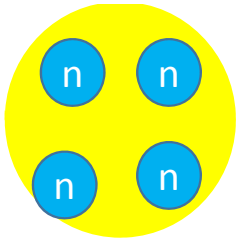
Candidate Resonant Tetraneutron State Populated by the ^{4}He(^{8}He,^{8}Be) Reaction

K. Kisamori[1,2], S. Shimoura[1], H. Miya[1,2], S. Michimasa[1], S. Ota[1], M. Assie[3], H. Baba[2], T. Baba[4], D. Beaumel[2,3], M. Dozono[2], T. Fujii[1,2], N. Fukuda[2], S. Go[1,2], F. Hammache[3], E. Ideguchi[5], N. Inabe[2], M. Itoh[6], D. Kameda[2], S. Kawase[1], T. Kawabata[4], M. Kobayashi[1], Y. Kondo[7,2], T. Kubo[2], Y. Kubota[1,2], M. Kurata-Nishimura[2], C. S. Lee[1,2], Y. Maeda[8], H. Matsubara[12], K. Miki[5], T. Nishi[9,2], S, Noji[10], S. Sakaguchi[11,2], H. Sakai[2], Y. Sasamoto[1], M. Sasano[2], H. Sato[2], Y. Shimizu[2], A. Stolz[10], H. Suzuki[2], M. Takaki[1], H. Takeda[2], S. Takeuchi[2], A. Tamii[5], L. Tang[1], H. Tokieda[1], M. Tsumura[4], T. Uesaka[2], K. Yako[1], Y. Yanagisawa[2], R. Yokoyama[1], and K. Yoshida[2]

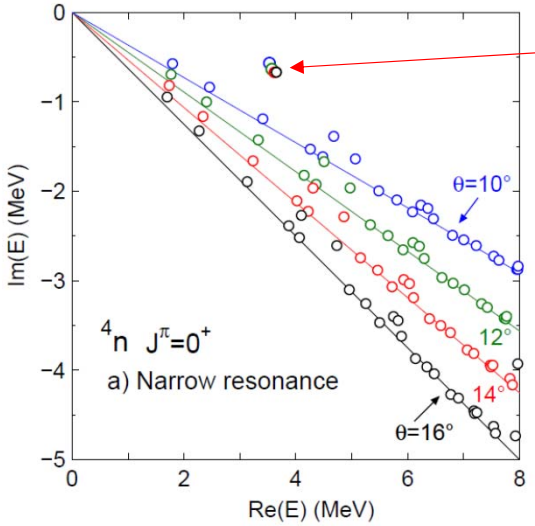
[1]*Center for Nuclear Study, the University of Tokyo, 7-3-1 Hongo, Bunkyo, Tokyo 113-0033, Japan*
[2]*RIKEN Nishina Center, 2-1 Hirosawa, Wako, Saitama 351-0198, Japan*
[3]*IPN Orsay, 15 Rue, Georges, Clemenceau 91400 Orsay, France*
[4]*Department of Physics, Kyoto University, Yoshida-Honcho, Sakyo, Kyoto 606-8501, Japan*
[5]*Research Center for Nuclear Physics, Osaka University, 10-1 Mihogaoka, Ibaraki, Osaka 567-0047, Japan*
[6]*Cyclotron and Radioisotope Center, Tohoku University, 6-3 Aoba, Aramaki, Aoba-ku, Sendai, Miyagi 980-8578, Japan*
[7]*Department of Physics, Tokyo Institute of Technology, 2-12-1 O-Okayama, Meguro, Tokyo 152-8550, Japan*
[8]*Faculty of Engineering, University of Miyazaki, 1-1 Gakuen, Kibanadai-nishi, Miyazaki 889-2192, Japan*
[9]*Department of Physics, the University of Tokyo, 7-3-1 Hongo, Bunkyo, Tokyo 113-0033, Japan*
[10]*National Superconducting Cyclotron Laboratory, Michigan State University, 640 S Shaw Ln, East Lansing, MI 48824, USA*
[11]*Department of Physics, Kyushu University, 6-10-1 Hakozaki, Higashi, Fukuoka 812-8581, Japan*
[12]*National Institute of Radiological Sciences, 4-9-1 Anagawa, Inage, Chiba, Japan*

(Dated: November 28, 2015)

A candidate resonant tetraneutron state was found in the missing-mass spectrum obtained in the double-charge-exchange reaction ^{4}He(^{8}He,^{8}Be) at 186 MeV/u. The energy of the state is 0.83 ± 0.65(stat.) ± 1.25(sys.) MeV above the threshold of four-neutron decay with a significance level of 4.9 σ. Utilizing the large positive Q-value of the (^{8}He,^{8}Be) reaction, an almost recoil-less condition of the four-neutron system was achieved so as to obtain weakly interacting four-neutron system efficiently.

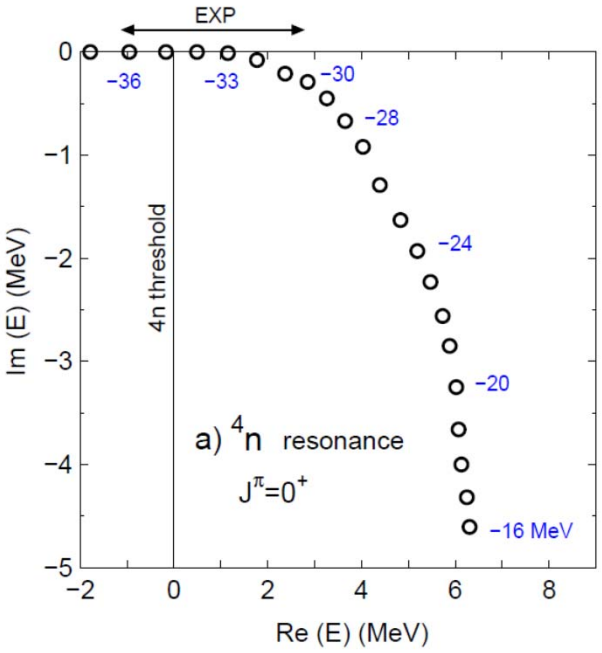


テトラニュートロンの発見
Er=0.83±0.65±1.25 MeV
課題：この実験値を理論的に再現可能か？



共鳴の位置と崩壊幅

この計算を行うために、複素座標回転法を使用



J=0+の共鳴の状態を探したが、
実験の示唆する場所には、
理論的に見つけることができなかった。