

2019AW GPPU Progress Report

The study of three-nucleon force effects in $p+{}^3\text{He}$ elastic scattering

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D2 Experimental Nuclear Physics (Exotic nucl.)

My Research

Nuclear Force

A force that acts between nucleons (protons and neutrons) in nucleus.

3 Nucleon Force (3NF)

Interaction which acts between 3 nucleons at the same time.

It has an important roles to understand various nuclear phenomena.

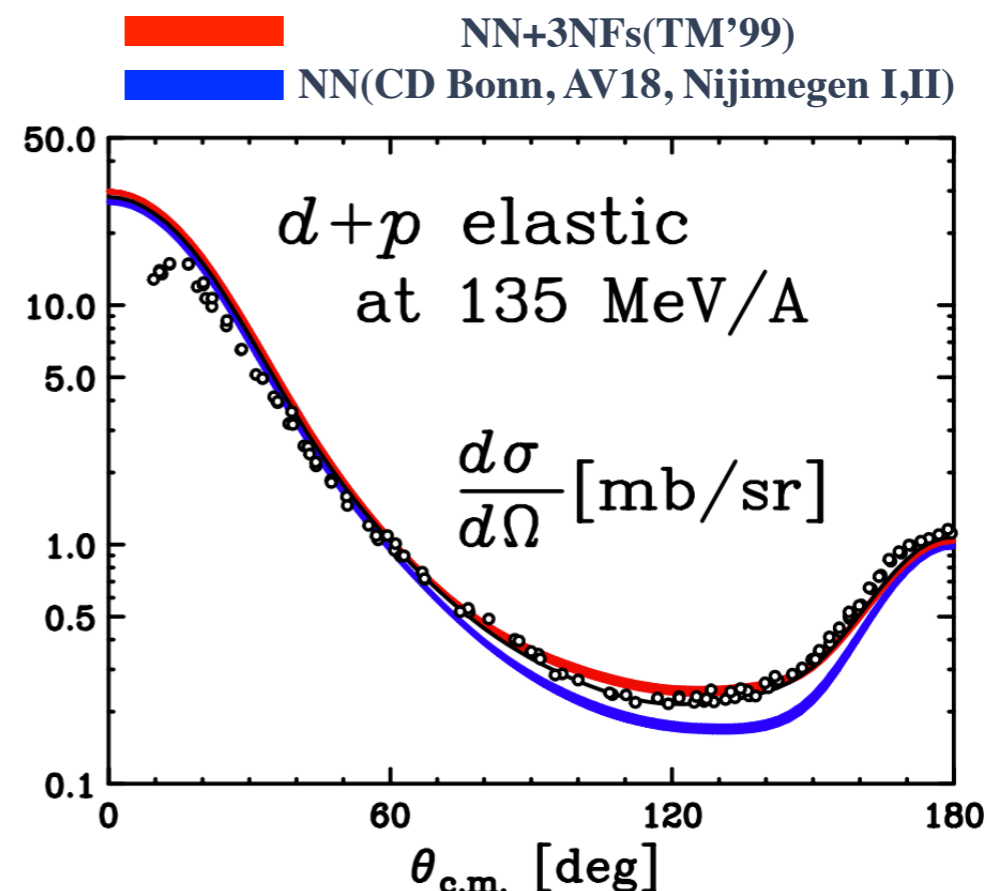
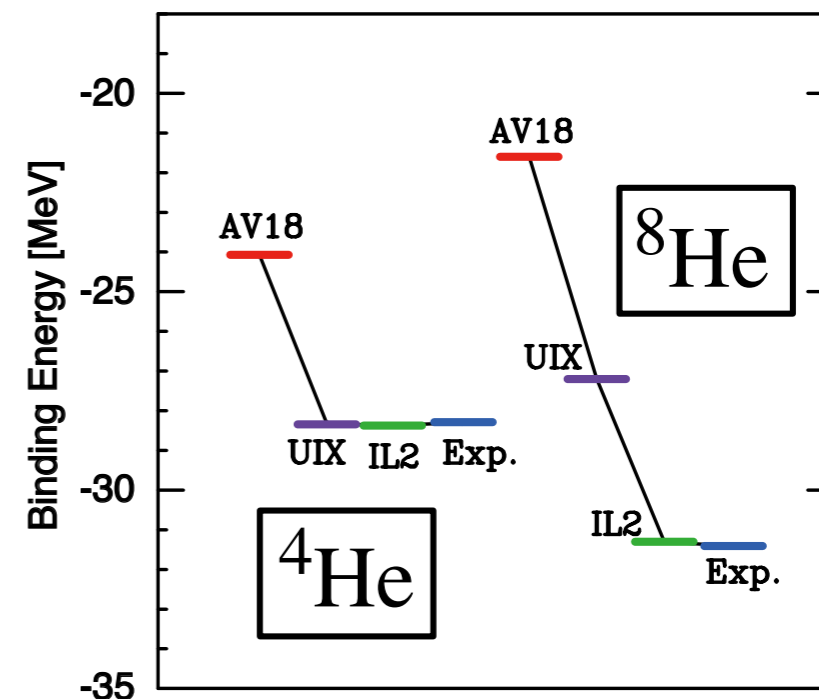
Ex.) Binding Energy of light mass nuclei

In order to study the properties of this 3NF, The direct comparison between experimental data and rigorous numerical calculations is really useful.

Clear discrepancy was found in N+d scattering (3N) system.

(ex. $d\sigma/d\Omega$ $d + p$ elastic scattering)

We perform $p+^3\text{He}$ experiments to study the 3NF effects in 4N scattering system.



Kimiko Sekiguchi et al. PRC 65,034003 (2002)

Research Status

-pol. p + ^3He elastic scattering

($E_p = 65$ MeV)

This experiment was performed in Dec. 2017 at Research Center for Nuclear Physics (RCNP), Osaka Univ.

Observables : $d\sigma/d\Omega$, $A_y(p)$

Data analysis is almost finished. And now I am preparing the paper.

-pol. p + pol. ^3He elastic scattering

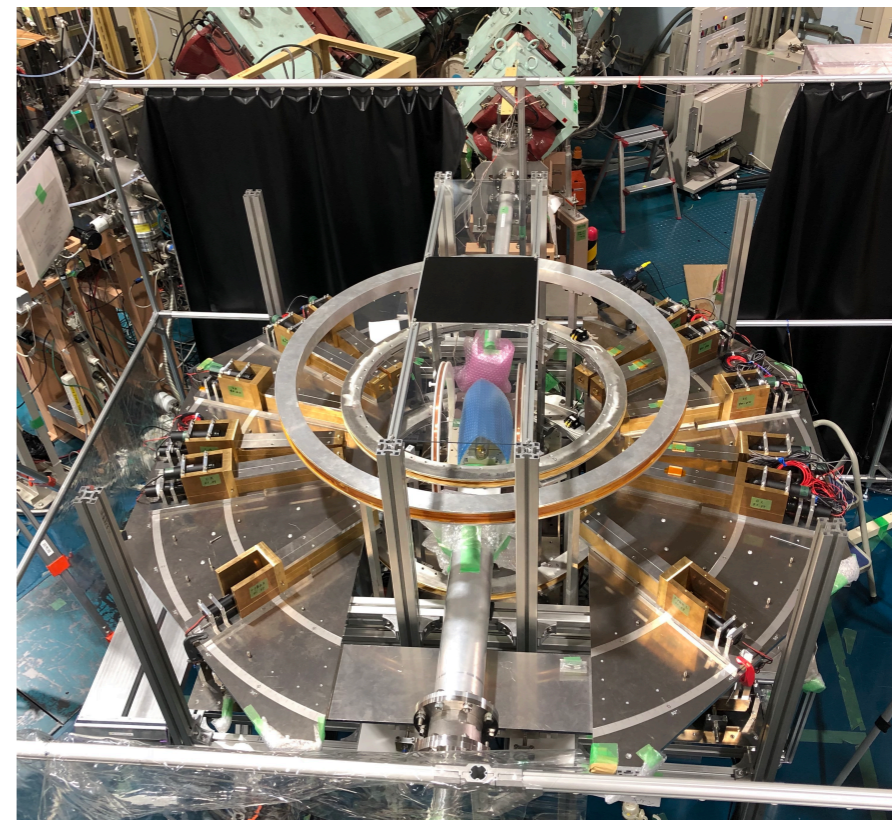
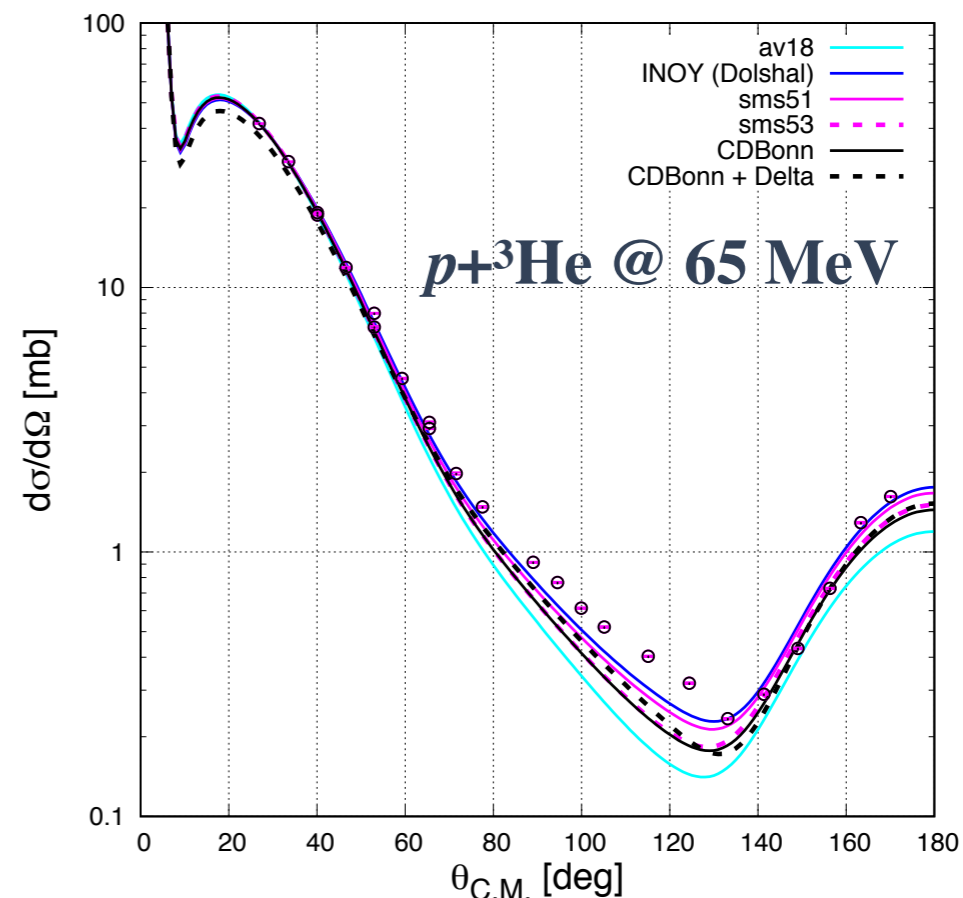
($E_p = 65, 100$ MeV)

This experiment was also performed in Nov. 2018 at RCNP, Osaka Univ.

Observables : $A_y(p)$, $A_y(^3\text{He})$, C_{yy}

We installed the polarized ^3He target system which developed our group at Tohoku Univ.

Data analysis is in progress.



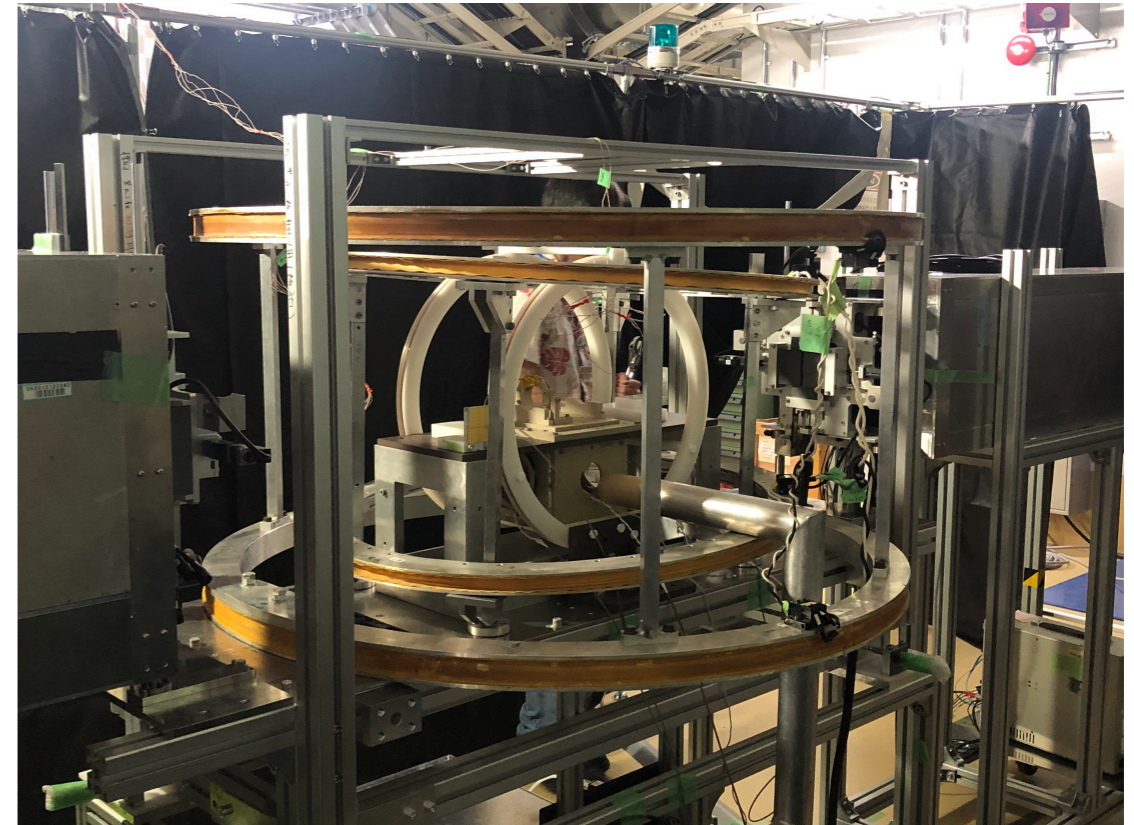
Research Status

-Polarization measurement of pol.³He target by using thermal neutron source

This experiment was performed at RIKEN in Jul. 2019 by using the thermal neutron source (RANS).

The polarization of the target is measured directly.

Data analysis is in progress.



My Goal

- **$p+^3\text{He}$ elastic scattering experiment** (Results at 2017, 2018)

Quantitative discussion about the 3NF effects in $p+^3\text{He}$ system

- **Polarization measurement of the polarized target at RIKEN**

Establish a new technical method to investigate the property of polarized ^3He

- > I summarize these results as my doctoral dissertation.

Academic Activity

-International Conference

I attended the “24th International conference on Few-Body Problems in Physics” on last September at University of Sully, UK.

I reported on my research results and had discussions with other group.

And we visited Prof. Evgeny Epelbaum who is a theoretician of the χ -EFT theory and had a discussion on the future experimental plan.



-Experiment

I joined the few-nucleon scattering experiment ($p+d$ elastic and break-up reaction) at Krakow, Poland. I participated in the preparation for the experiment and take part in the data taking.

-Future Planning

Jefferson Lab. : Developing the polarized 3He target for electron scattering experiment.

