2020SS GPPU Progress Report

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

Shinnosuke Nakai

D3 Experimental Nuclear Physics (Exotic nucl.)

My Research

Nuclear Force

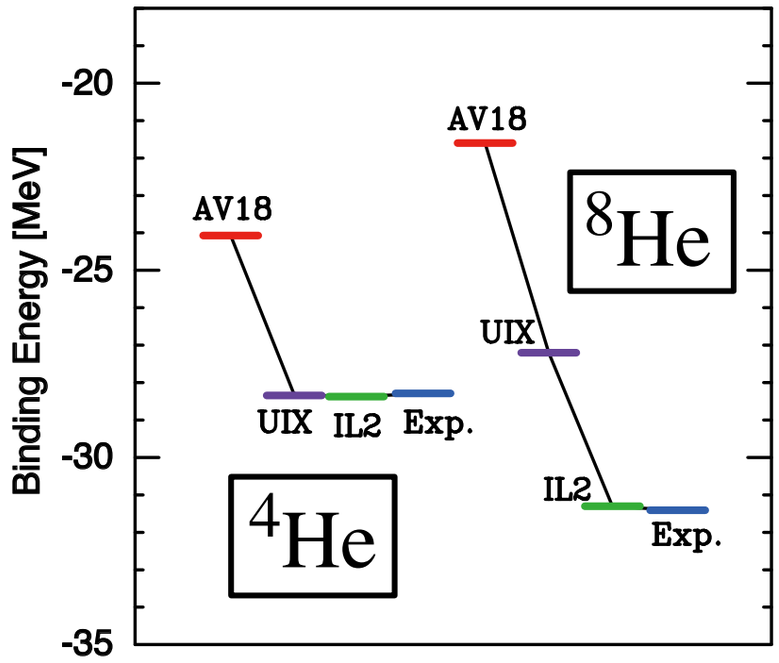
A force that acts between nucleons (protons and neutrons) in nucleus.

3 Nucleon Force (3NF)

Interaction which acts between 3 nucleons at the same time.

It has an important roles to understand various nuclear phenomena.

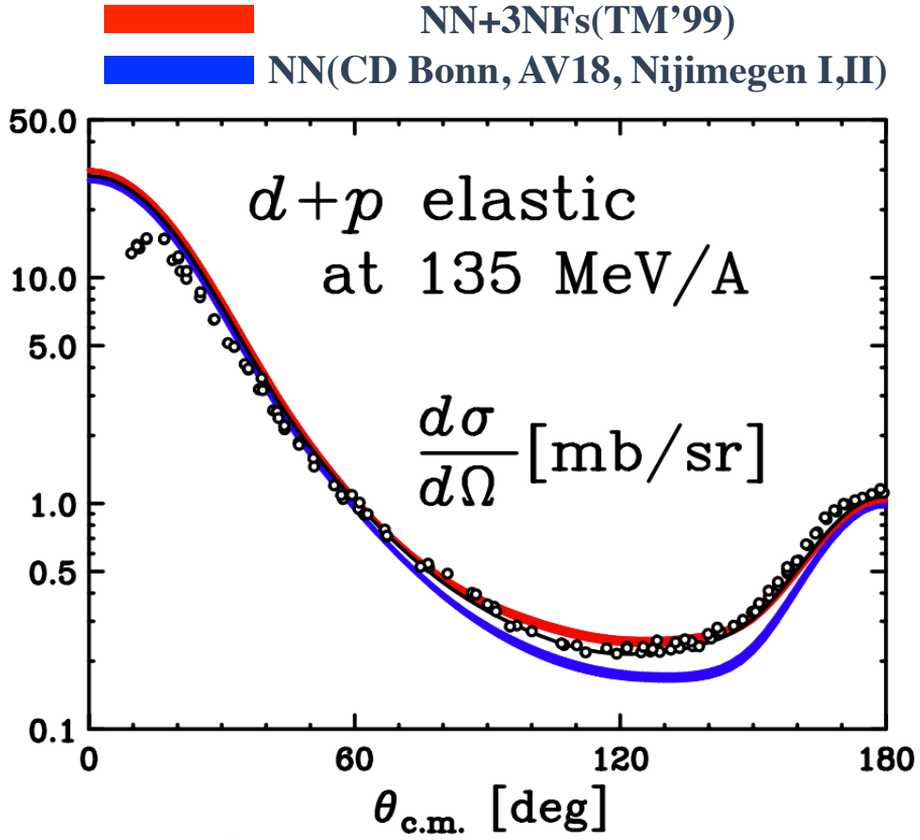
Ex.) Binding Energy of light mass nuclei



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

Ex.) Clear discrepancy was found in N+d scattering (3N) system.
(ex. $d\sigma/d\Omega$ $d + p$ elastic scattering)

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



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

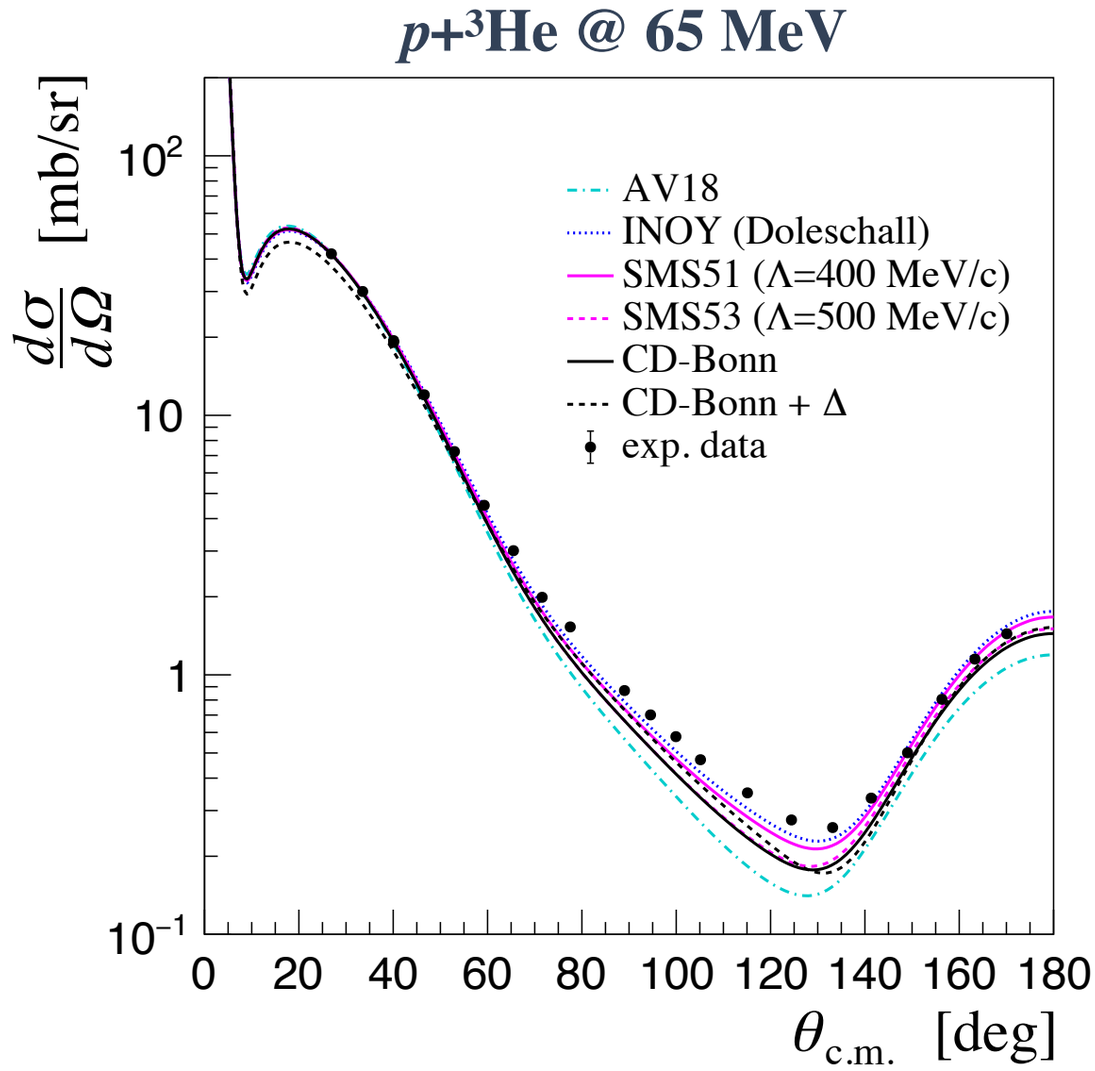
Research Status

Work

I have performed experiments for studying the 3NF effects of p+^{3}He scattering system

- **p+^{3}He scattering experiment at RCNP**
  - Cross section & $A_y(p)$
  - $A_y(p)$, $A_y(^3\mathrm{He})$, C_{yy}
- **Polarization measurement of the polarized target at RIKEN**
  - Absolute value of polarization of pol. ^{3}He target.

I started writing my dissertation.



My Goal

- **p+^{3}He elastic scattering experiment at RCNP (2017, 2018)**

  Quantitative discussion about the 3NF effects in p+^{3}He system
- **Polarization measurement of the polarized target at RIKEN (2019)**

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

GPPU Status

Credits

- **GPPU advanced experiment**
  - ✓ GEP points : 15 pt (2020/5/25)
- **GPPU special seminer I**
  - ✓ GSP points : 19 pt
  - ✓ GASP points : 2 pt (2020/5/25)
- **GPPU overseas training**

I have already registered these credits in this semester.

➡ I have spent 56 days (2020/5/25)

- International conference
  - Few-Body Phys. (Caen, France & Guildford, UK)
  - JPS & APS Mtg. (Hawaii, US)
- Experiments
  - *p*+*d* few-nucleon scattering exp. @Bronowise Cyclotron Center (Krakow, Poland)
  - Fission Product Yield exp. @TUNL (Durham, US)

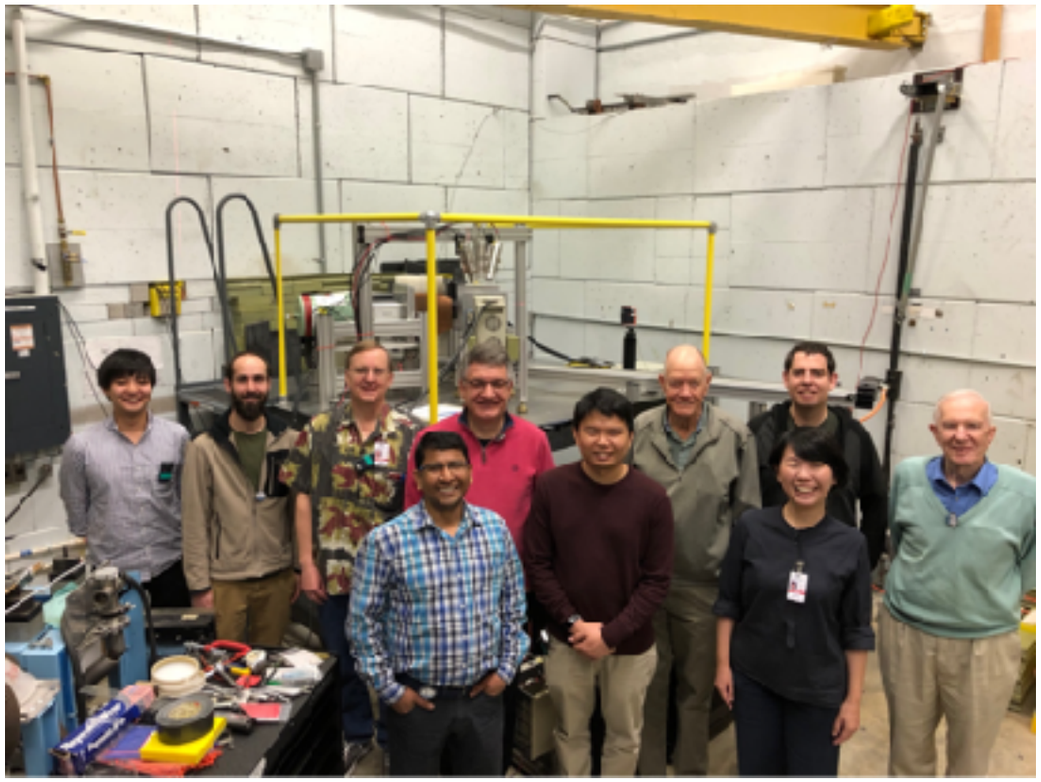
Academic Activity

Experiment

I joined the Fission Products Yields (FPY) experiment at Triangle Universities Nuclear Laboratory (TUNL) at Durham, NC, USA.

They have developed RABBIT system which is designed to transport the target sample over the larger distance of about 10 m within 1 second with respect to the measurements of prompt fission neutron energy spectra.

I checked the performance of Ge-detectors of RABBIT system with the collaborators.



Plan of this year

I'm just planning these web meeting or emailing for international study (still remain 1 month).

- Seminar series of nuclear force by Prof. R. Machleidt (University of Idaho) : 6 days
- Discussion about our experimental data with theoretician Dr. Arnoldas Deltuva : ~14 days
- Instruction or discussion about our polarized ^{3}He target system with Prof. Todd Averett (College of William & Mary) : ~14 days
- Also I will ask some physicist for special seminar : few-days