# Thesis

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# Chapter 1

# Introduction

## 1.1 Pairing interaction in nuclei

Pairing correlation plays an important role near the Fermi energy. Pairing correlation is the two-body interaction which couples two identical nucleons into $J^{\pi} = 0^{+}$ state. There are many evidences of pairing correlation detected from experiment. The most clear evidence is shown in Fig. 1.1. All of the ground states of even-even Sn isotopes are $J^{\pi} = 0^{+}$ states It indicates that the ground states consist of the $J^{\pi} = 0^{+}$ pairs is more stable than other configurations. In addition, the ground states between even-even nuclei and neighborhood odd nuclei has large gaps of binding energy. In odd nuclei, the unpaired last neutron is the last single-particle level. The odd-even mass difference To break the $J^{\pi} = 0^{+}$ pair, we need large energy which is about $2\Delta \approx 24A^{-1/2}$ MeV.

### 1.1.1 A subsection

More text.

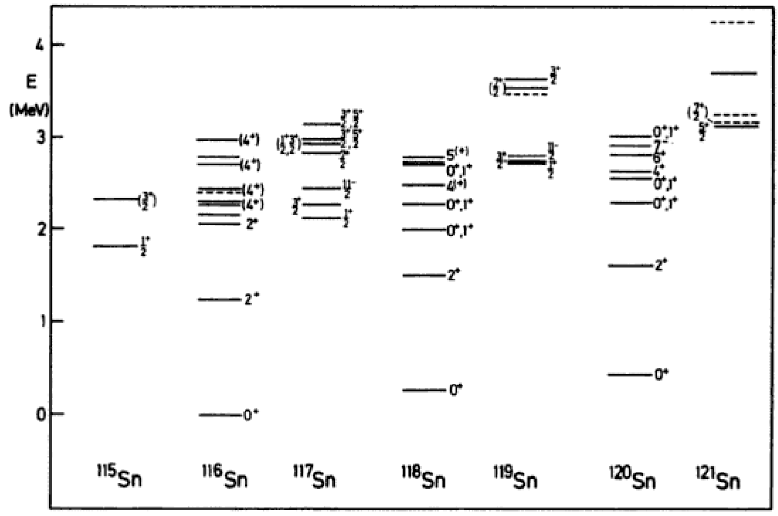


Figure 1.1: Low-lying excited states in Sn isotopes []. The absolute values of binding energy are adjusted at 0 MeV in the ground state of $^{116}$Sn.

# Chapter 2

# Pairing model

To examine the pairing dynamics influencing the structure of nuclei, we can only concentrate the nucleons near the Fermi energy. The Hamiltonian of pairing model is

$$H = \sum_l \epsilon_l n_l - g \sum_{l,l'} S_l^+ S_{l'}^-, \tag{2.1}$$

where

$$n_l = \sum_m a_{lm}^\dagger a_{lm} \tag{2.2}$$

$$S_l^+ = \sum_{m>0} a_{lm}^\dagger a_{l\overline{m}}^\dagger, \quad S_l^- = S_l^{+\dagger} \tag{2.3}$$

## 2.1 Exact solution

## 2.2 TDHFB dynamics

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# Requantization of TDHFB in integrable system

## 3.1 Canonical quantization

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## 3.3 Stationary phase to the path integral

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Chapter 4

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## 4.1 Derivation of the collective subspace in adiabatic self-consistent collective coordinate method

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# Chapter 5

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