

## 博士論文公聴会の公示(物理学専攻)

学位申請者：Wang Wei

論文題目：Study of beta decay of  $^{48}\text{Ca}$   
( $^{48}\text{Ca}$  のベータ崩壊の研究)

日時：2018年 9月 7日 (金) 10:30-12:00

場所：理学研究科 H棟 7階セミナー室 (H701 号室)

主査：能町正治

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論文要旨：

Precise studies about lifetime of the beta decay of  $^{48}\text{Ca}$  are necessary because the beta decay could be substantial background for double beta decay spectrum of CANDLES (Calcium fluoride for studies of Neutrino and Dark matters by Low Energy Spectrometer) experiment. We thus carried out an experiment to measure the lifetime. The principle of this experiment is based on coincidence measurement of 3 gamma rays from concentrated  $^{48}\text{Sc}$  - the beta decay product of  $^{48}\text{Ca}$ . We used 30 CsI(Tl) scintillators to cover ( $4\pi$  solid angle) the sample space with  $13^3 \text{ cm}^3$ . In order to increase the amount of  $^{48}\text{Ca}$  in the sample space, we enriched the  $^{48}\text{Sc}$  using the chelate resin called NOBIAS-CHELATE-PA1 from  $\text{CaCl}_2$  solution that contained 255.1Kg  $\text{CaCl}_2$  powder. The live-time of the measurement was 70.7 days. The half-life time of beta decay of  $^{48}\text{Ca}$  that we got was  $T_{1/2}(\beta) = (2.2 \pm 0.6[\text{statistic}] \pm 0.1[\text{systematics}]) \times 10^{21} \text{ y}$  with 95% C.L. The half-life time is the longest for all known beta minus transition. For the CANDLES experiment, the background contribution from the beta decay for 2 neutrino double beta decay (2nDBD) above 3MeV is less than 1.9(2)%. The present measurement shows that decay rate of 2nDBD is not affected by the beta decay and background contribution for 0nDBD from 2nDBD can be well estimated.