

Project No.:21002 Core Institution in Japan:Graduate School of Science, Tohoku University
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**JSPS Core-to-Core Program  
-Strategic Research Networks-  
FY2011 Research Report**

Project No.	21002
Research Theme	Establishing an International Collaboration Platform for Strangeness Nuclear Physics by Electron Beams
Duration of Project	2011/4/1~2014/3/31 (36months)
Core Institution in Japan	Graduate School of Science, Tohoku University

**Implementing Organizations**

Country	Japan
Core Institution	Graduate School of Science, Tohoku University
Co-Chair (name and title)	Hirokazu TAMURA (Professor)
Number of Cooperating Institutions	6
Cooperating Institutions	Research Center for Electron Photon Science, Tohoku University; High-energy Accelerator Research Organization; Yamagata University, Osaka Electro-Communication University, RIKEN Nishina Accelerator Center; Advanced Science Research Center, Japan Atomic Energy Agency

Country	USA
Core Institution	Thomas Jefferson National Accelerator Facility (JLab)
Co-Chair (name and title)	Liguang Tang, Staff Scientist (Professor, Hamton Univ.)
Number of Cooperating Institutions	3
Cooperating Institutions	Hampton University, Florida International University, University of Puerto Rico
Matching Fund	Selected problems in hypernuclear physics

Country	Germany
Core Institution	Institut für Kernphysik, Mainz University
Co-Chair (name and title)	Josef Pochodzalla (Director, Professor)
Number of Cooperating Institutions	1
Cooperating Institutions	Giessen University
Matching Fund	MAMI operating budget; 7th Framework, HADRONPHYSICS2 (SPHERE)

Country	Italy
Core Institution	INFN Rome
Co-Chair (name and title)	Franco Garibaldi (Professor)
Number of Cooperating Institutions	3
Cooperating Institutions	INFN Bari, Università di Torino, INFN Torino
Matching Fund	INFN JLab12

Country	Czech
Core Institution	Nuclear Physics Institute, Academy of Science of Czech
Co-Chair (name and title)	Petr Bydzovsky (Staff Scientist)
Number of Cooperating Institutions	0
Cooperating Institutions	
Matching Fund	Hadron and Baryonic systems

## Result of Program Implementation

Based on the international collaboration on the hypernuclear spectroscopy with electron beams, Tohoku University drove two collaborative researches with Jefferson Lab (USA), Mainz University (Germany), INFN Rome (Italy) and theoretical division of NPI (Czech): namely, 1) spectroscopic study of Lambda hypernuclei with electron beams and 2) study of the strangeness nuclear physics with photon and electron beams. Year 2011 was really special year for Japan especially for Tohoku district. One of core institutes, Tohoku University, was severely damaged by the Great East Japan Earthquake. However, with strong supports from over-sea core institutes, the above research works were carried out without serious delay. Two international seminars at ECT\*, Trento and at JLab, Newport News were organized under this program. The first international school for strangeness nuclear physics (SNP school 2012) was successfully performed at Tokai and Sendai.

## Achievements in FY2011 (Self Review)

At MAMI-C, we achieved: 1) a pilot experiment for decay pion spectroscopy from light hypernuclei was performed with a Kaos spectrometer which Tohoku University installed a new Time-of-Flight detectors. Basic data which is essentially important to optimize the design of the experiment was successfully obtained. 2) Data for electro-production of strangeness was successfully obtained with Kaos spectrometer. Now, analysis sub-groups in Japan and Germany are analyzing data. Another achievement was done for analysis of data of Lambda hypernuclei produced by the (e,e'K+) reaction at JLab. Japan as well as US analysis groups have been analyzing the data and obtained the first reliable information about the  ${}^7_{\Lambda}\text{He}$  ground state. The result would give a new insight on  $\Lambda$ -N potential and final result is longed for by experimentalists as well as theoreticians. Though Great East Japan Earthquake forced domestic research activities stop for a while especially in Tohoku, the international collaboration network worked superbly. After the earthquake and Fukushima accident, the international school which was originally scheduled in summer should be shifted to winter, but many lectures and participants gathered to Japan and contributed much to the success of the school. It is really our regret that ex-coordinator Prof. O.Hashimoto who passed away just 10 days before the school, missed the success of it.

## Future Plan (Measures toward Achieving Research Objectives)

So far, ex-coordinator Prof. Hashimoto lead and initiated the international collaborative network for strangeness nuclear physics. It is our duty to extend the network succeeding his intention and objective. Fortunately, objective and achievements of this program have been highly appreciated domestically as well as internationally. With full supports from core institutes, international research exchanges, joint researches, international seminars and young researchers' education program were successfully developing. No optimism is warranted on the recent financial situation in Europe, but Japan, which is now recovering from the disaster, needs to contribute to the research network with more presence. Using this core-to-core program, we will strengthen our collaboration to explore the potential of electro-photo reactions in the strangeness nuclear physics.