

**JSPS Core-to-Core Program**  
**FY2014 Implementation Plan (Project No. : 23003 )**

Research Theme Forming research and educational hubs of medical physics  
 Duration of Project April, 2013- Mar. 31 2016 ( 36 months)  
 Core Institution in Japan (Co-Chair) Osaka University  
( Masahiko Koizumi )

**Implementing Organizations**

○ **Japan**

|       |                              |   |                                       |
|-------|------------------------------|---|---------------------------------------|
| Japan | Core Institution             | Osaka University  |                                       |
|       | Co-Chair<br>(name and title) | Masahiko KOIZUMI, MD. PhD. Professor  |                                       |
|       | Cooperating<br>Institutions  | Osaka Medical Center for Cancer and Cardiovascular Diseases, Hyogo Ion Beam Medical Center, National Cerebral and Cardiovascular Center, University of Tokyo, Kyoto University, Juntendo University | Number of<br>Cooperating Institutions |
| 6     |                              |   |                                       |

○ **Partner Countries**

|               |                              |  |                                       |
|---------------|------------------------------|--|---------------------------------------|
| United States | Core Institution             | Indiana University                         |                                       |
|               | Co-Chair<br>(name and title) | Indra J. DAS, PhD. Professor               |                                       |
|               | Cooperating<br>Institutions  | Purdue University, University of Minnesota | Number of<br>Cooperating Institutions |
| 2             |                              |  |                                       |

|             |                              |                                       |                                       |
|-------------|------------------------------|---------------------------------------|---------------------------------------|
| Netherlands | Core Institution             | The University of Groningen           |                                       |
|             | Co-Chair<br>(name and title) | Sytze BRANDENBURG, PhD. Professor     |                                       |
|             | Cooperating<br>Institutions  | Paul Scherrer Institute (Switzerland) | Number of<br>Cooperating Institutions |
| 1           |                              |                                       |                                       |

## Objectives of Research Exchange (including the five years after the project finishes)

International research exchange is to be promoted aiming the development of particle radiotherapy and high-accuracy radiotherapy as medical physics in radiotherapy to cancer. Currently, particle radiotherapy in Japan is storming the world in the development of equipment. Japan-made equipment is introduced to leading cancer treatment facilities all over the world. In order to remain as a leader, it is important to continue developing the particle radiotherapy and associated equipment. In Osaka, the construction of particle radiotherapy center in few years, come off the drawing board and becomes a real possibility. The introduction of new technology of high-accuracy radiotherapy, such as IMRT, SBRT, IGRT has been proceeding rapidly in these two years. It is an urgent business to develop the research which is based on the both of particle radiotherapy and high-accuracy radiotherapy. **The basis to foundation for educational medical physics on international has been formed** through core-to-core Integrated Action Initiative project. At the Integrated Action Initiative project, research exchanges on basic medical physics are centered and mainly, graduate students are sent to counterpart core institutions and tried to cultivate research skill of medical physics. Gradually, our trial is boring fruit. At the Strategic Research Network project, medical physics is to be promoted newly to support and develop these two fields and specific research results can be gained. Moreover, as the basic research, new research fields such as biological signaling response to both particle beam and photon beam, radiation biology on the movement of stem cells at the irradiation and so on, and physical biological chemistry are to be developed. These biological researches are related with low-dose exposure, which has come to an issue since Fukushima nuclear accident. This can be related with the medical physical interpretation on the exposure to low irradiation of scattered rays at particle radiotherapy and of photon beam at the high-accuracy radiotherapy. At the five years after this project has finished integrated fields will blossoming and a solution to low-dose exposure can be offered.

The aim of Strategic Research Networks project is to promote the integration of basic biology and medical physics on particle radiotherapy and high-accuracy radiotherapy.

## Results to the present

In the previous year, three, one and four people (including faculty, student, medical physicist and radiation oncologist) had been sent to Indiana University (USA), Minnesota University (USA) and University of Groningen (the Netherlands), and they were working on the studies in collaboration with the corresponding researchers. They presented their results in overseas conferences (First Author: 5, Coauthor: 1), and in domestic conferences (First Author:1). A paper was submitted to a journal (First Author: 1) and a paper was being written (First Author: 1). We can say that “Researchers with high performance who play an active role in international arena” are being nurtured in the field of medical physics, because the young researchers and students sent overseas advanced their researches in collaboration with the cooperating scientists on their motive.

## Summary of FY 2014 Exchange Plan

### **Joint Research**

Four young researchers and nine students in charge of below research themes are to be sent to co-institutions for one to eight months.

- a. Development of the next generation particle radiotherapy device
- b. Dose calculation for high-accuracy radiotherapy
- c. Development of the next generation diagnostic devices
- d. The research of the image-guided adaptive radiotherapy, and radiotherapy to tumor with respiratory displacement
- e. Development of cancer information systems
- f. Research of particle radiobiological effectiveness

### **Seminar**

1. JSPS Core-to-Core Program Osaka University 2nd Radiation Therapy & Medical Physics Joint Seminar (International Seminar) "Development of Novel Treatments of Skeletal Diseases", Osaka University, Jun. 16, 2014.
2. JSPS Core-to-Core Program Osaka Medical Center for Cancer and Cardiovascular Diseases 1st Radiation Oncology, Medical Physics and Biology Seminar (International Seminar) "Development of Novel Treatments of Skeletal Diseases", Osaka Medical Center for Cancer and Cardiovascular Diseases, Jun. 17, 2014.
3. JSPS Core-to-Core Program "Osaka University - Minnesota University Medical Physics Symposium", Minnesota University (USA), Jul. 25, 2014.
4. JSPS Core-to-Core Program "Osaka University - University of Groningen Medical Physics Symposium", University Groningen (the Netherlands), Aug. 25 - 26, 2014.

### **Researcher Exchanges**

About ten researchers or students will attend overseas conferences and will present their results.