

**JSPS Core-to-Core Program**  
**FY2006 Implementation Plan (Project No. : 15002 )**

**Research Theme** Nano-Science and Engineering in Superconductivity

**Duration of Project** April 1<sup>st</sup>, 2006 ~ March 31<sup>st</sup>, 2008 (36 months)

**Core Institution in Japan (Co-Chair)** University of Tsukuba

( Kazuo Kadowaki )

**Implementing Organizations**

**Japan**

Japan	Core Institution	Univeristy of Tsukuba	
	Co-Chair (name and title)	Kazuo Kadowaki, Professor	
	Cooperating Institutions	Tohoku University, University of Tokyo, Tokyo Institute of Technology, Institute for Materials Science, Hitach Fundamental Research, RIKEN, JAEA, Keio University, NEC Fundamental Research	Number of Cooperating Institutions  9

**Partner Countries**

EU	Core Institution	Katholieke Universiteit van Leuven	
	Co-Chair (name and title)	Victor Moshchalkov (Professort)	
	Cooperating Institutions	CNRS-CRTBT, Research Center Julich, Universitat Tubingen, Universitat Erlangen-Nurunberg, Walther-Meissner Institut fur Tieftemperatureforschung der Bayerischen Akademie der Wissenschaften, Universita de Napoli, Universiteit Antwerpen, Universiteit Leiden, Universiteit Twente, Universidad autonoma de Madrid, Chalmers University of Technology, Universite de Geneve, ETH, University of Bath, University of Cambridge, University of Bordeaux	Number of Cooperating Institutions  16

USA	Core Institution	Argonne National Laboratory	
	Co-Chair (name and title)	Wai K. Kwok (Doctor)	
	Cooperating Institutions	Northern Illinois University, University of Notre Dame, Texas A&M University, University of Chicago, University of Illinois at Chicago, University of South Carolina, University of California at Davis, University of Illinois at Urbana-Champaign	Number of Cooperating Institutions  8

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

New development of science and technology making use of nanotechnology is in particular spectacular. Superconductivity is a phenomenon that exhibits absolute zero resistance, and occurs with a quantized magnetic flux, which penetrates through in a magnetic field. This is one of remarkable quantum phenomena, which can be manipulated by using nanotechnology. By doing so, we will open a new area of physics and engineering and establish the basic concept of science and applications based on the quantum mechanics. This global trend can be lead by the international effort in superconductivity during this program.

## Results to the present

During past two years we have made an international effort on developing new science and technology research fields on superconductivity making use of nanotechnology by the three major axes: Japan, EU countries and USA. To be more specific, we performed the international conference and small workshops every year in order to encourage the community as well as younger people. In Japan two or three times domestic workshop have been done. Especially, electromagnetic waves at THz frequencies has been proposed by Prof. M. Tachiki, and the experiment is going on. This THz waves can be called “the third light”. This field is now developing very fast because this phenomenon is also related to the quantum coherence. The electromagnetic waves at THz frequencies as well as quantum coherence are most attractive phenomena in physics, which are the target of “NanoScience and engineering of Superconductivity”

## Summary of FY 2006 Exchange Plan

### **Joint Research**

Not only groups among Japanese researchers but also between international teams, collaborations are expanding and increasing especially in quantum coherences, THz radiations, etc. in intrinsic Josephson junctions. More specifically, collaborations by exchanging young scientists with Univ. of Tokyo (Prof. Tamegai), NIMS (Dr. Hatano), Univ. of Leuven (Prof. Moshchalkov), Univ. of Illinois at Chivago (Prof. Metlushko), Univ. of Erlangen (Prof. Ustinov and Prof. Muller), Univ. of Tübingen (Prof. Kleiner), etc.

### **Seminar**

We plan three international conferences: 5<sup>th</sup> International Symposium on Josephson Effect in High  $T_c$  Superconductors (PLASMA-2006), July 17-19, London, UK, International Workshop on Mesoscopic Superconductivity and Magnetism (MesoSuperMag-2006), Aug. 28-Sept. 1, Chicago, USA, and Joint Meeting of 4<sup>th</sup> International Symposium on “Nano-Science and JSPS-CTC Nanoscience and Engineering in Superconductivity (FIMS/ITS-NS/CTC-2007)” at the end of March, 2007.

### **Researcher Exchanges**

Many international conferences are expected this year, so that many participants plan to participate to the related conferences, symposia, seminars, etc. Young scientists are in particular encouraged in both directions by making use of these opportunities.