

JSPS Core-to-Core Program
FY2013 Implementation Plan (Project No. : 21001)

Research Theme Collaborative Research Center on Ultrahigh-speed Optical Communication

Duration of Project April 1, 2011 – March 31, 2014 (36 months)

Core Institution in Japan (Co-Chair) Research Institute of Electrical Communication,
Tohoku University (Masataka NAKAZAWA)

Implementing Organizations

○ **Japan**

Japan	Core Institution	Research Institute of Electrical Communication, Tohoku University	
	Co-Chair (name and title)	Masataka NAKAZAWA, Professor	
	Cooperating Institutions	Graduate School of Engineering, Tohoku University, National Institute of Information and Communication Technology, National Institute of Advanced Industrial Science and Technology	Number of Cooperating Institutions 3

○ **Partner Countries**

Germany	Core Institution	Heinrich-Hertz Institute	
	Co-Chair (name and title)	Colja SCHUBERT, Group Leader	
	Cooperating Institutions		Number of Cooperating Institutions 0

U.K.	Core Institution	University of Southampton	
	Co-Chair (name and title)	David RICHARDSON, Professor	
	Cooperating Institutions		Number of Cooperating Institutions 0

Denmark	Core Institution	Technical University of Denmark	
	Co-Chair (name and title)	Palle JEPPESEN, Professor	
	Cooperating Institutions		Number of Cooperating Institutions 0

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

The goal of this project is form an international research center on ultrahigh-speed optical communication technologies and realize the world's top-level information and communication infrastructure through the collaborative research and development of 160 Gbit/s~1 Tbit/s optical transmission technologies. A core technology is the time-domain optical Fourier transformation technique that we have developed. By combining it with a highly-functional optical signal processing and high-speed optical devices developed by overseas collaborators, we expect the feasibility of next-generation global large-capacity optical backbone network to be increased.

Results to the present

We proposed a novel optical pulse which we named "optical Nyquist pulse," which is expected to realize ultrahigh-speed and high spectral efficiency simultaneously. In order to clarify the advantage of optical Nyquist pulse transmission, we undertook an ultrahigh-speed long-haul transmission at a symbol rate of 160-640 Gbaud over 500 km, and demonstrated that the system tolerance to chromatic dispersion and polarization-mode dispersion is greatly improved compared to a conventional Gaussian or sech optical pulse.

We also organized "Ultrafast Photonics Symposium," which was held in Tokyo on November 5, and "Post-ECOC Workshop," which was held in Eindhoven, the Netherlands, on September 21. These events contributed to stimulate discussion and clarify future directions in the field of ultrafast photonics, ranging over different areas from materials and fundamental devices to biophotonics, nano technology, and terahertz photonics.

Summary of FY 2013 Exchange Plan

Joint Research

We will realize ultrahigh-speed and highly spectral-efficient transmission by using a novel optical pulse called an "optical Nyquist pulse" and combining with multi-level modulation format. Specifically, we will demonstrate a single-channel Tbit/s transmission with ultrahigh spectral efficiency by adopting RZ-QAM transmission technique to the optical Nyquist pulse. It is also a very important to subject to integrate ultrafast optical devices to reduce size and power consumption, which is indispensable to increase the feasibility of ultrahigh-speed transmission systems. To achieve this goal, we will strengthen the collaboration with industry and expand the collaboration partnership to a global scale especially in the US.

Seminar

We will organize an international symposium on Ultrafast Photonic Technologies on October 21-22 at University of Rochester, hosted by Prof. Wayne H. Knox. In addition, we will host an international workshop at University of Southampton on September 27, which is one of the partner institutions of this workshop.

Researcher Exchanges

We will send more than 20 researchers including students to accelerate the collaboration through the latest advances at each group. Leaders of partner groups will have an opportunity of in-depth discussion at international conferences and share the future directions of ultrahigh-speed communication technologies. In addition, more than 10 members of this program will visit the University of Southampton not only to attend the workshop described above but also to enhance the collaboration.