

# **Collaborative Research Centre on Ultrahigh-Speed Optical Communications**

## **JSPS Core-to-Core Program**

The goal of this JSPS Core-to-Core project was to form an international research center and to foster international collaboration on developing the ultrahigh-speed optical communication technologies and novel data transmission approaches needed to realize the next generation ultrahigh capacity optical networks. Specific technological topics of interest included: ultrashort pulse generation and transmission; 1 Tbit/s/ per-channel optical transmission technology; highly-functional, all-optical data signal processing; and space division multiplexing. The ambition of the project was to identify and explore approaches capable of ultimately delivering orders of magnitude increase in transmission capacity through optical fibre networks of global scale.

The specific project partners were:

- Research Institute of Electrical Communication, Tohoku University, Japan (Prof. Masataka Nakazawa – Project Leader)
- Heinrich Hertz Institute (Dr. Colja Schubert)
- Optical Research Center, University of Southampton (Prof. David J. Richardson)
- Technical University of Denmark (Prof. Palle Jeppesen)

The collaboration has centered around a number of international symposia and workshops in which the project partners have played leading organizational roles.

### 1. International Symposium on Ultrafast Photonic Technologies (ISUPT)

- ISUPT 2009: August 4-5, 2009 at Tohoku University, Sendai, Japan (hosted by Prof. Masataka Nakazawa)
- ISUPT 2011: September 15-16, 2011 at Heinrich Hertz Institute, Berlin, Germany (hosted by Dr. Reinhold Ludwig)
- ISUPT 2013: October 21-22, 2013 at University of Rochester, USA (hosted by Prof. Wayne Knox)

### 2. International Symposium on Ultra-high Capacity Optical Communication and Related Optical Signal Processing and Devices

- September 16-17, 2010 at Technical University of Denmark (hosted by Prof. Palle Jeppesen and Leif Oxenlowe)

### 3. Post-ECOC Workshop – Advanced Communications Technology

- September 27, 2013, at University of Southampton (hosted by Prof. David J. Richardson and Dr. Radan Slavik)

These events have helped stimulate discussion and foster international co-operation in the field of optical communication and indeed ultrafast photonics more broadly (ranging over different areas from materials and fundamental devices to biophotonics, nanotechnology, and terahertz photonics). In particular, by recognizing the capacity limitations of current optical fibers, new directions in optical communications have been explored, including multi-level coherent transmission, multi-core fibers, and multi-mode control for mode division multiplexing (so called 3M technologies).

The JSPS project has had significant impact. For example, it facilitated the formation of a collaborative study group called EXAT (EXtremely Advanced Transmission) in Japan to promote the 3M technologies described above. Within the EU the ModeGap project was launched with the aim to provide a 100-fold increase in transmission capacity of a fibre through mode multiplexing. These two large, forward-looking projects have themselves jointly organized workshops at the main international conferences on optical communications (specifically Optical Fiber Communications (OFC) and the European Conference on Optical Communications (ECOC)), which proved highly successful and attracted many attendees. The JSPS project has enabled the European and Japanese partners (and indeed broader research community) to develop closer collaborative links and has helped build broader international consensus in the communications field. Further direct collaborations and interactions are anticipated in the future to be supported, for example, through further applications to JSPS, Horizon 2020 Joint EU:Japan research calls, and direct one-on-one collaborations leveraging off of existing individual partner projects.

The JSPS funding for the project was as follows:

2009: 16,000,000 JPY

2010: 17,000,000 JPY

2011: 21,250,000 JPY

2012: 23,800,000 JPY

2013: 21,640,000 JPY

Matching funds to facilitate my involvement were sourced through several large ongoing grants – specifically MODEGAP (funded by the EU FP7 Scheme), “The Photonic HyperHighway” Programme grant (funded by the UK Engineering and Physical Sciences Research Council (EPSRC)) and the Royal Society UK (through a Wolfson Merit Award). These grants provided resources to support travel, to undertake the associated research, and to host the 2013 post-ECOC meeting in Southampton.



ISUPT 2013



PostECOC