



1st EURO-FOS Workshop on Photonic Systems (WORPS): Technologies for developing terabit capacity switching systems Sunday 28 June 2009

Scope

Research on the design and development of optical processing systems has been a major research thrust of academic and industrial R&D groups worldwide for many years now. The aim is to realize ultra-fast, power efficient and small footprint switching and routing systems. Optical signal processing can offer bit-rate independent low switching energies and can enable data transparency. Following a bottom-up approach, the workshop aims to present current research efforts towards the realization of ultra-high speed and power efficient switching systems, highlighting advantages of photonic technology and key issues that need to be solved for bringing photonics into next generation switching and routing network hardware. The workshop is organized by the Network of Excellence project EURO-FOS, funded by the European Commission under the 7th Framework Programme (FP7), Information & Communication Technologies (ICT).

Organizers

Efstratios Kehayas National Technical University of Athens

Ioannis Tomkos Athens Information Technology

Program

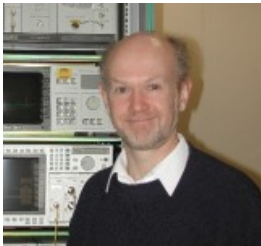
15:30 – 15:40	Organizers introduction <i>Ioannis Tomkos, Efstratios Kehayas</i>
FP7 Network of Excellence Project EURO-FOS	
15:40 – 16:00	EURO-FOS: Pan-European Photonics Task Force: Integrating Europe's Expertise on Photonic Subsystems <i>Efstratios Kehayas</i>
High-Speed Optical Switching Systems	
16:00 – 16:30	Non-linear processes enabling optical signal processing <i>Robert Manning</i>
16:30 – 17:00	Approaching terabit/second switching <i>Hans Christian Hansen Mulvad</i>
17:00 – 17:30	Progress of photonic switching systems for enabling advanced routing functionalities: From bulk UNIs to fully integrated photonic routers <i>Leontios Stampoulidis</i>
17:30 – 18:00	Scalable photonic packet routers <i>Harm Dorren</i>



Talks and Speakers

Non-linear processes enabling optical signal processing

Abstract: This talk will briefly review the non-linear phenomena that are exploited to achieve all-optical processing. It will concentrate on the use of the Kramers-Kronig transformation to analyse non-linear effects. This will illustrate the essential similarity between the many types of non-linear behaviour observed in both passive materials, such as silica fibre, and in semiconductors, both active (e.g. semiconductor optical amplifiers), and passive (e.g. electro-absorption modulators).



Robert Manning

University College Cork, Tyndall National Institute, and Physics Department, Photonic Systems Group

Dr R.J. Manning graduated with a BSc in Physics (first class honours) in 1975 from Imperial College, London, and obtained a PhD in Laser Physics in 1982, also from Imperial College. He joined RSRE, Malvern in 1982, where he studied picosecond carrier dynamics of bulk and quantum well semiconductors using mode-locked lasers. He developed techniques to measure cross-well transport of electrons in quantum well devices, both without and with an applied electric field. In 1989 he joined British Telecom Laboratories at Martlesham Heath, Ipswich, where he worked on optical nonlinearities in a variety of materials for all-optical signal processing applications. He was part of the group that discovered high-speed switching effects in semiconductor optical amplifiers (SOAs). Upon joining Corning in 2000, after their acquisition of the optics group of which he was a part, he continued the development of all-optical switching devices based upon SOAs. This led to the realisation of a hybridly integrated 40 Gbit/s all-optical regenerator. The same device was used to demonstrate a 40 Gbit/s all-optical XOR gate. He is now a Principal Investigator in the Photonics Systems group at Tyndall National Institute, Ireland, where he is continuing to pursue his interests in high speed dynamics in SOAs for optical logic applications. His group has recently demonstrated 170 Gbit/s wavelength conversion using a new technique for switching with SOAs. Dr Manning has published over 140 journal and conference papers. Dr Manning is a member of the IEEE, the Optical Society of America, and the Institute of Physics, and is a Chartered Physicist.

Approaching terabit/second switching

Abstract: All-optical switching techniques for signal processing at terabit/s data rates are steadily growing in maturity. In this presentation, a number of techniques for 640 Gbit/s to 1.28 Tbit/s optical signal processing are reviewed. These will include demultiplexing, clock recovery, transmission, wavelength conversion, add-drop multiplexing, and timing-jitter tolerant switching at 640 Gbit/s. Various switching materials are employed for these functionalities, including highly non-linear fibres, Chalcogenide waveguides, semiconductor amplifiers, and periodically-poled Lithium Niobate. Finally, the first results for switching above 1 Terabit/s are presented, as shown in a recent 1.28 Tbit/s fibre-based demultiplexing experiment.



Hans Christian Hansen Mulvad Technical University of Denmark

H. C. Hansen Mulvad (Copenhagen, Denmark, 1976) received the M. Sc. degree in Physics from the University of Copenhagen, Denmark in 2004, and the Ph.D. degree from DTU Fotonik, Department of Photonics Engineering, at the Technical University of Denmark in 2008. He is currently working as a postdoctoral researcher in the High-Speed Optical Communications Group at DTU Fotonik, where he is involved in research on high-speed signal processing and Terabit/s optical communication systems.



Progress of photonic switching systems for enabling advanced routing functionalities: From bulk UNIs to fully integrated photonic routers

Abstract: We review current state-of-the-art in functional photonic integration with application to high-capacity photonic routing. We make a quick flashback to outline the evolution of optical processing elements from bulk UNIs and TOADs to the recent monolithic InP and hybrid silica-on-silicon photonic “super-chips”. Finally, we review the prospect of the “new players”: silicon-on-insulator and Si₃N₄ waveguide technologies and how they can be used to realize ultra-compact and power efficient all-optical processing components.



Leontios Stampoulidis National Technical University of Athens, Photonics Communications Research Laboratory

Leontios Stampoulidis graduated from the Electronic & Electrical Engineering Department of the University of Patras in 2002. He is with the Photonics Communications Research Laboratory since 2002 and his research interests include optical packet/burst switching architectures and photonic Tb/s routers based on photonic integrated components. Dr. Stampoulidis has been involved in a number of FP6/FP7 research projects including IST-LASAGNE, IST-MUFINS, IST-e-Photon/One, ICT-EURO-FOS, while he is currently the project leader of FP7 ICT-BOOM. He has published more than 30 scientific papers. He is a student member of IEEE/LEOS and a member of the Technical Chamber of Greece.

Scalable photonic packet routers

Abstract: Photonic packet routers that have potential application in telecommunications and interconnects are reviewed. Architectures and devices are discussed that support transparent and scalable packet routers that introduce little latency.



Harmen J. S. Dorren Technical University of Eindhoven, Electro-Optical Communications, Department of Electrical Engineering

H.J.S. Dorren received his M.Sc. degree in theoretical physics in 1991 and the Ph.D. degree in 1995, both from Utrecht University, Utrecht, the Netherlands. After postdoctoral positions he joined Eindhoven University of Technology, Eindhoven, the Netherlands in 1996 where he presently serves as a professor and as the scientific director of the COBRA Research Institute. In 2002 he was also a visiting researcher at the National Institute of Industrial Science and Technology (AIST) in Tsukuba in Japan. His research interests include optical packet switching, digital optical signal processing and ultrafast photonics. Prof. Dorren (co-)authored over 250 journal papers and conference proceedings and currently serves as an associate editor for the IEEE Journal of Quantum Electronics.



Efstratios Kehayas National Technical University of Athens, Photonics Communications Research Laboratory

Efstratios Kehayas obtained his B.Eng. degree in Electronic Engineering from Southampton University (Electronics & Computer Science Department), the M.Sc. degree in Optics & Photonics at Imperial College London and the Ph.D. degree from the Photonics Communications Research Laboratory, National Technical University of Athens (NTUA). He is currently a senior research associate at the Institute of Communications & Computer Systems (ICCS) of NTUA and his research interests are focused on the design and development of DWDM/OTDM fiber-based optical sources and high-speed photonic processing systems applicable to telecommunications. He actively participates in FP6/FP7 EU projects, including IST-LASAGNE, IST-E-Photon/One, CRAFT-MULTIWAVE, ICT-APACHE and ICT-BOOM. Dr. Kehayas has authored and co-authored more than 50 publications in IEEE and OSA journals and conferences and several research proposals including FP6-MULTIWAVE, ICT-APACHE and ICT-EURO-FOS. He is currently the project leader of FP7 ICT-EURO-FOS Network of Excellence. Dr. Kehayas is a member of IEEE/LEOS and a chartered Electrical and Computer Engineer from the Technical Chamber of Greece.



Ioannis Tomkos High Speed Networks and Optical Communication Group, Athens Information Technology

Dr. Ioannis Tomkos has the rank of tenured Full Professor at Athens Information Technology Center since September 2005 and serves as Associate Dean since June 2004. Since 2002, he is an Adjunct Faculty at the Information Networking Institute of Carnegie-Mellon University, PA, USA. At AIT he founded and serves as the Head of the "High Speed Networks and Optical Communication (NOC)" Research Group, which performs advanced research related with its areas of interest. The NOC group participates in a number of FP7 EU funded research projects (DICONET, SARDANA, BONE, APACHE, EUROFOS) in all of which Dr. Tomkos is representing AIT as Principal Investigator. His professional career started in 1996, when he joined the University of Athens, Greece as a Research Fellow. In January 2000, he joined the Photonics Research and Test Center of Corning Inc. as a Senior Research Scientist. Together with his colleagues and students he has authored more than 55 peer-reviewed articles published in international scientific journals/magazines/books and more than 150 presentations at conferences/workshops and other events. He is a member of the Editorial Board of the IEEE/OSA Journal of Lightwave Technology and an Editor for the IET Journal on Optoelectronics and for the International Journal on Communications. Dr. Tomkos received the B.Sc. degree in Physics from the University of Patras, Greece, the M.Sc. degree in Telecommunications Engineering and the Ph.D. degree in Optical Telecommunications from the University of Athens, Greece.

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