

ABSTRACTS

Session 1 (Monday)

Rod Tucker (NICTA): "Optical and electronic signal processing and switching for telecommunications"

This talk will provide an overview of the switching and signal processing functions required in telecommunications systems. Many of these functions are currently performed in electronics, but system performance might be improved if at least some of the electronic functions were replaced by optics. In this talk, we will identify a number of key performance metrics that need to be satisfied in optical devices and circuits in order to out-perform electronics.

Vahid Ta'heed (CUDOS): "Chalcogenide glass waveguides for wavelength conversion"

Overview of recent results in wavelength conversion utilizing the principle of cross-phase modulation in chalcogenide glass waveguides. I will discuss system measurements utilizing a fiber platform and compare results to other rival materials, before looking at the current status of an integrated waveguide solution.

Trevor Anderson (NICTA): "Multi-impairment monitoring"

Phase portraits provide an asynchronous alternative to the eye diagram, for displaying and analysing optical signals. We explain this new technique, and show how we can use it to quantify multiple simultaneous impairments.

Ian Littler (CUDOS): "Adjustable fiber-Bragg grating elements for reconfigurable networks"

At CUDOS we have the capability to readily manufacture fibre Bragg gratings which may be used for a multitude of single and multi-channel tasks in optical communications. We have demonstrated the use of these gratings for pulse shape manipulation, pulse burst generation and pulse rate multiplication. These gratings are also suitable for dispersion manipulation and compensation as well as for integrated filters in non-linear optical processing schemes. Reconfigurable networks require flexible components allowing operation at different data rates without the need to change out components. As an example of our endeavours in this area, most recently we have combined tailored fibre Bragg to create an all-optical non-dispersive filter capable of operation at 40Gb/s and 80Gb/s.

Session 2 (Monday)

Peter Farrell (NICTA): "Terabit networking laboratory"

NICTA has just opened this state-of-the-art laboratory at its Victoria Research Laboratory. I will give an overview of the capabilities and objectives of the laboratory.

Mark Pelusi (CUDOS): "160 Gb/s optical system experiment capability"

The recent upgrade of the 40 Gb/s optical communication test platform to 160 Gb/s optical time-division multiplexed based system is discussed highlighting it's features and capability for evaluating bit-error rate performance of high-speed optical signal processing devices

Kerry Hinton (NICTA): "Advanced Modulation Formats"

With the evolution toward higher bit-rate systems, a diverse range of modulation formats are being proposed. I will review and compare some of these formats focusing on those which have attracted most attention in the optical communications industry.

Don Hewitt (NICTA): "Orthogonal Frequency Division Multiplexing using Baseband Optical Single Sideband for Simpler Adaptive Dispersion Compensation"

A novel method for generating OFDM in a baseband single-sideband optical format is proposed for long-haul adaptive dispersion compensation. Simulations on a dispersive link show that nonlinear fibre effects and MZ modulator intermodulation will be the limiting factors on system performance

Jeremy Bolger (CUDOS): "Passive pulse repetition rate multiplication"

Passive means for the multiplication of the repetition rates of high speed optical pulse trains from 10 GHz to 100 GHz or higher can be used to generate ultrahigh speed optical clock trains of possible utility in next-generation communication networks. Two fibre-Bragg grating based techniques for repetition rate multiplication, via the temporal Talbot effect and using chirped superimposed Moire gratings, will be described and their relative features contrasted.

Session 3 (Monday)

Kerry Hinton (NICTA): "Optical Performance Monitoring in All Optical Networks"

Automatically Switched All-Optical Networks will be required to set-up short-lived, all-optical paths, upon customer request. I will review some of the monitoring issues which result from this requirement.

Ben Eggleton (CUODS): "Nonlinear optical signal processing techniques and roadmap for optical performance monitoring at ultrahigh bit-rates"

We usually think about nonlinear optics for optical switching or optical regeneration in ultrafast optical communication systems, based on second order or third order nonlinearities. Nonlinear optics can also provide a simple approach for monitoring (characterizing) ultrafast signals, for example, the common approach used in auto-correlation techniques, based on second harmonic generation. This talk will review our recent demonstrations of all-optical in-band optical signal-to-noise ratio (OSNR) monitoring using a nonlinear optical loop mirror. Monitoring is enabled from the nonlinear power transfer function of the loop mirror. Experimental results are provided at 40 Gb/s for three modulation formats: nonreturn-to-zero, carrier-suppressed return-to-zero, and return-to-zero. The monitor discriminates the various OSNR levels over a dynamic range of more than 25 dB with every modulation format.

Sarah Dods (NICTA): "Optical Signal-to-Noise Ratio monitoring using polarisation diversity"

We present a novel, practical technique for measuring OSNR based on polarisation effects. We show that the technique has good manufacturing tolerances, and is immune to bit-rate, chromatic dispersion and polarisation mode dispersion.

Peter Farrell (NICTA): "Monitoring polarisation mode dispersion using string length"

Differential Group Delay does not give a complete picture of the degradation caused by polarisation mode dispersion, as the signal polarisation also has an effect. We present an alternative measure called "String Length," which correlates well with system penalty by including both effects.

Ben Johnson (CUDOS): "Cascading nonlinear processes in PPLN"

Several prominent research groups and companies (Stanford, South Hampton, Arasor etc) have been working on periodically poled Lithium Niobate (PPLN) based cascaded χ^2 nonlinear optics for some all-optical processing applications. In this presentation I will provide a brief overview of the state of the art in PPLN based optical processing. I will also present some recent results from work at Macquarie, in collaboration with the Nonlinear Physics group at ANU, on some new opportunities in PPLN based nonlinear optical processing.

Session 4 (Tuesday)

Vahid Ta'heed (CUDOS): "Regeneration using chalcogenide waveguides"

Overview of pulse self-phase modulation based pulse regeneration in chalcogenide glass fiber and proof of concept photonic circuit regenerator incorporating on-chip Bragg grating filters.

Mike Lamont (CUDOS): "Impact of two photon absorption on all-optical 2R regeneration"

Overview of how two-photon absorption (TPA) affects self-phase modulation (SPM) based all-optical 2R regeneration. I will present simulation results which demonstrate how TPA affects SPM and how this effect can provide a significant improvement in regeneration performance for a range of figures of merit.

Mark Pelusi (CUDOS): "Chalcogenide waveguide systems experiment roadmap"

Breakthroughs in low loss chalcogenide glass based optical waveguide fabrication at ANU have opened interesting opportunities for implementing nonlinear optical signal processing functions on small compact devices incorporating Bragg grating filters. Upcoming experiments and design considerations using latest waveguides in optical communication applications of signal regeneration, wavelength conversion and all-optical demultiplexing at bit rates up to 160 Gb/s will be described.

Arnan Mitchell (CUDOS): "LiNbO₃ waveguide capabilities for regeneration, performance monitoring, and signal mixing opportunities"

This talk will present an overview of the LiNbO₃ waveguide technology that is currently available at RMIT, a brief overview of the recent developments that have been made in the field in general, and the planned technology developments that will be conducted collaboratively during the next phase of CUDOS. An attempt will be made to put this technology into the context of the photonic systems work that is currently being explored by NICTA, with the aim of stimulating discussion on which of the functions that are possible with LiNbO₃ would be of most interest to NICTA and how the ability to integrate these key functions on a single chip may provide further benefit.

Mick Withford (CUDOS): "Direct writing of integrated microphotonic devices inside bulk glass"

Laser direct write micro-fabrication, where an ultrafast laser is focussed to a spot inside bulk glass, and translated under computer control with respect to a target sample, has emerged as a significant enabling technology creating new opportunities in microphotonics. We are developing this technique in order to modify the internal properties of glass substrates and write waveguides and discrete components such as amplifiers and filters. The talk will present recent results of the performance of laser written microphotonic devices and discuss implications for integrated lightwave circuits.

Session 5 (Tuesday)

Thas Nirmalathas (NICTA): "Optical Access Networks – An Overview "

We will give an overview of research activities in the area of optical access networks within NICTA.

Manik Attygalle - presented by Trevor (NICTA): "Remodulation based upstream transmission in optical access networks"

Remodulation of downstream data signal for upstream transmission in optical access architectures such as in WDM-PON is a cost effective mechanism that will improve the commercial viability of these systems. A number of issues are to be addressed in order to achieve this, which includes low power and low cost remote modulators and/or optical filters and scheme for achieving polarization insensitivity in these devices.

An Tran (NICTA): "Repeater based optical access system"

We present an optical access architecture with remote repeaters to reduce customer transmitter cost and extend feeder fiber reach and split ratio. The integration of additional services such as remote video delivery, video surveillance, and local area internetworking over the proposed architecture is also discussed.